THE RELATIONSHIP BETWEEN FOOD SECURITY STATUS AND DIETARY
INTAKE AND WEIGHT FLUCTUATIONS WITHIN INDIVIDUALS WITH SERIOUS
MENTAL ILLNESS

by

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THE RELATIONSHIP BETWEEN FOOD SECURITY STATUS AND DIETARY INTAKE AND WEIGHT FLUCTUATIONS WITHIN INDIVIDUALS WITH SERIOUS MENTAL ILLNESS

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Abstract

Food insecurity is a serious health issue that can lead to many health consequences, including poor nutritional intake and obesity. Individuals with serious mental illness may be susceptible to food insecurity and the accompanying health consequences. The purpose of this study was to determine the effects of food insecurity on nutritional intake and to determine if food insecure individuals with serious mental illness experience a cyclic overconsumption pattern that leads to weight gain.

Twenty-two individuals with serious mental illness, 9 of whom were food insecure and 13 of whom were food secure, completed the 8-week study. All subjects completed the U.S. Household Food Security Questionnaire to determine food security status. Weight was measured weekly, and dietary recalls were taken at the beginning and end of each month (at weeks 1, 4, 5, and 8). The healthy eating index (HEI) was used to determine diet quality. All dietary recalls were entered into NDSR and HEI, and energy intake was determined at each time point. A general mixed modeling analysis that accounts for dependence among observations was used for analysis.

A significant decrease in weight over time was found as well as a significant decrease in energy intake from the beginning of the month to the end of the month in both the food secure and food insecure groups. There was no significant difference in HEI and macronutrient consumption across the month. There was also no significant difference between groups in weight, energy intake, HEI, or macronutrient consumption. Both the food secure and food insecure groups scored
lower than the average American’s HEI score of 58.2 at both the beginning and end of the month.

These findings suggest that all individuals with serious mental illness may have trouble acquiring and keeping a constant and nutritionally adequate food supply throughout the month and may benefit from classes teaching them how to grocery shop for low cost nutritional foods, how to better budget money, how to maintain their food supply, and how to cook with the foods that they do have as well as simple cooking methods.
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Table of Contents

Chapter 1: Introduction ..............................................................................................................1
  Justification .........................................................................................................................1
  Statement of Problem ........................................................................................................3
  Statement of Purpose .........................................................................................................3
  Research Questions ..........................................................................................................5

Chapter 2: Review of Literature ..........................................................................................5
  History and Definition of Food Insecurity ........................................................................5
  Health Consequences of Food Insecurity ........................................................................7
  Magnitude of the Problem .................................................................................................11
  Serious Mental Illness .....................................................................................................12
  Conclusion .........................................................................................................................14

Chapter 3: Methods ...............................................................................................................15
  Overview ..........................................................................................................................15
  Sample ..............................................................................................................................15
  Research Setting ..............................................................................................................16
  Ethics .................................................................................................................................17
  Data Collection Overview and Timeline ......................................................................17
  Baseline Data Collection .................................................................................................18
  Instrumentation ................................................................................................................18
  Anthropometric Measures ..............................................................................................20
  Chart Review ...................................................................................................................21
  Data Collection during 8-Week Assessment Period ..................................................21
  Analysis of Data ..............................................................................................................22

Chapter 4: Results ................................................................................................................28
  Subject Characteristics ....................................................................................................28
  Weight Trends ................................................................................................................29
  Energy Intake ..................................................................................................................31
  Healthy Eating Index .....................................................................................................34
  Macronutrient Consumption ..........................................................................................35
In-Text Tables:

Table 1: Socio-Demographic Characteristics of the Sample........................................28
Table 2: Summary Statistics of the Sample.................................................................29
Table 3: Mean Weight (lbs) by Food Security Groups across the 8-week Period........30
Table 4: Mixed Modeling Results: Weight.................................................................31
Table 5: Energy Intake at Weeks 1, 4, 5, and 8.........................................................32
Table 6: Mixed Modeling Results: Energy Intake.......................................................33
Table 7. Healthy Eating Index Components at the Beginning and End of Month for Total Sample..........................................................................................................................35
Table 8: Percent Calories from Fat by Food Security Groups at the Beginning and End of the Months....................................................................................................................36

In-Text Figures:

Figure 1: Distribution of Subjects at Baseline and Completion of the Study.............16
Figure 2: Weekly Body Weights for Food Secure and Food Insecure Participants....30
Figure 3: Mean Energy Intake by Food Security Group at Weeks 1, 4, 5 and 8........32
Figure 4: Mean Energy Intake by Food Security Group at the Beginning and End of the Months........................................................................................................................33
Figure 5: Healthy Eating Index Scores by Food Security Group at the Beginning and End of the Month..................................................................................................................34
Figure 6: Percent Calories from Carbohydrates by Food Security Group at Beginning and End of the Month........................................................................................................37
Figure 7: Percent Calories from Protein by Food Security Group at Beginning and End of the Month......................................................................................................................38
Chapter 1: Introduction

Justification

Many think an inadequate food supply is a problem that exists only in third world countries, yet food insecurity, the limited availability of food, is a serious health issue that affects millions of Americans each year and continues to be a growing problem in the United States. Health consequences of food insecurity include poor health, poor dietary intake (1, 2), obesity (3-5), type 2 diabetes (6), and metabolic syndrome (7). Regarding food insecurity, poor dietary intake and obesity appear to be causal agents for many of the health outcomes of food insecurity (1, 3).

A study by Dixon et al (1) examined whether dietary intakes and serum nutrients differed between adults in food secure and food insecure families. The study looked at cross-sectional data from 19,528 households, collected from NHANES III. Research found that adults ages 20-59 from food insecure households were more likely to have a lower consumption of milk, fruits, and vegetables compared to young adults from food secure households. Young adults were also found to have calcium, folate, vitamin A, vitamin C, and vitamin E intakes below 50% of the recommended dietary allowance (RDA). The study also found that older adults, ages 60 and older, from food insecure households have lower intakes of energy, vitamin B-6, magnesium, iron, and zinc than their food secure counterparts. They were also found to have iron and zinc intakes below 50% of the RDA(1).

Obesity is the other large issue facing food insecure individuals. Research shows there is an inverse association between overweight and obesity and food
insecurity (3, 4). One study by Wilde and Peterman (3) found that 36% more individuals gained five or more pounds a year in food insecure households than those living in food secure households, and another study by Hanson et al (4) found that 65% of adults in food insecure households are overweight or obese. The reason for the association between food insecurity and increased prevalence of obesity is not known; a commonly held hypothesis among researchers is that the inconsistent availability of food among food insecure households results in cyclic overconsumption patterns. Many times food insecure households face both periods when food is easily accessible and periods when food is scarce. Individuals facing food restrictions may be in the habit of overeating during the times when food is available, for example, after receiving a paycheck or food stamps since they had been recently deprived (8). This cycle of compensatory overconsumption may cause weight gain as an individual's weight increases after over consumption; their weight then tends to slightly decrease during deprivation but never returns to baseline (8).

A group of individuals that may be highly susceptible to food insecurity and the accompanying health consequences are those with serious mental illness (SMI). Research conducted among a sample of 72 individuals with SMI showed that 45.8% of the study sample were classified as food insecure, and 29.2% were classified as having the most severe level of food insecurity, very low food security (9).

Even without food insecurity, individuals with serious mental illness are at an increased risk for obesity and its related health consequences. A study by Wallace and Tennante (10) found that 72% of individuals with SMI have a BMI greater than 25 kg/m² and that 37% of individuals with SMI have a BMI greater than
30 kg/m², classifying them as overweight or obese, respectively. The same study found that SMI individuals are at a greater risk of developing lifestyle diseases related to obesity, such as heart disease, diabetes, and cancer, and have a higher mortality from these diseases than do the general population (10).

**Statement of Problem**

Research has been conducted to show the role of nutritional intake on the health outcomes of food insecure individuals, but minimal research has been conducted studying nutrition’s role on the health outcomes of food insecure individuals with SMI, a group highly at-risk for food insecurity and obesity.

Since no previous research has been conducted, research needs to be completed looking at food intake and overall consumption patterns of individuals with serious mental illness. Studying the food intake patterns, such as quality, amount, and pattern of consumption, could provide insight into why this population has an increased risk of obesity and other poor health outcomes like heart disease, diabetes, and cancer, which could help health professionals and government agencies provide better care and agency support.

**Statement of Purpose**

The purpose of this study was a) to determine if food insecure individuals with serious mental illness experience a cyclic overconsumption pattern that leads to weight gain and b) to determine the effects of food insecurity on nutritional intake, both quality of intake and amount, in individuals with serious mental illness.
Research Questions

Primary Question

1. Do individuals with serious mental illness classified as having food insecurity experience cyclic overconsumption patterns leading to weight gain?

Secondary Questions

1. Do individuals with serious mental illness classified as having food insecurity have higher diet quality index scores at the beginning of the month compared to the end of the month?

2. Do individuals with serious mental illness classified as food secure have a higher diet quality index score than those classified as food insecure?

3. How does the macronutrient content of the diet of individuals with serious mental illness classified as food insecure compare to those individuals with serious mental illness classified as food secure and how does this change across the month?
Chapter 2: Review of Literature

History and Definition of Food Insecurity

Hunger became a public issue in the United States in the late 1960s when CBS aired a documentary titled “Hunger in the US” (11). The public recognition of the existence of hunger in the United States led to an increased number of federal programs and projects aimed at eliminating the effects of poverty. However, at this time there was no agreed upon definition of hunger and, therefore, no way to measure the extent of the problem in the United States.

In the early 1980s, adverse economic conditions and efforts to limit federal spending led to a general belief that hunger was widespread in the United States and may have been increasing (11). This concern led President Reagan to establish the Task Force on Food Assistance to examine the food assistance programs and the claims of a resurgence of hunger. The Task Force on Food Assistance concluded that the issue of hunger was complex and observed that the terms “hunger”, “poverty”, and “unemployment” were often used interchangeably despite being distinct problems. After much investigative work, the task force made a distinction between two different working definitions of hunger: a) a scientific, clinical definition in which hunger means the actual physiological effects of extended nutritional deprivations and b) a definition of hunger as commonly defined, relating more to a social phenomenon than medical results, in which hunger is the inability, even occasionally, to obtain adequate food and nourishment (12). Researchers began to
look more into this social phenomenon of hunger, and extensive research went into understanding household food security, food insecurity, and hunger.

In 1990, the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology developed a working definition of food security: “access by all people at all times to enough food for an active, healthy life” (p.1560)(13). Food security included at minimum: a) “the readily availability of nutritionally adequate and safe foods and b) an assured ability to acquire acceptable foods in socially acceptable ways” (p 1560). Food insecurity was then defined as the “limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways”(p.1560) (13). Since then, researchers have continued working to establish methods to assess food security status, to discover the negative health and social implications, and to formulate strategies that could be used to improve the food security status of American households.

Until 2006, food security measures categorized households as either food secure or food insecure. However, in 2006 this terminology changed, classifying households further into four categories of food security status (14). This new system classifies individuals as high food security, marginal food security, low food security, or very low food security. A family exhibiting high food security is one that does not have any indications of food access problems; marginal food security refers to households that may report one or two indications of limitations in accessing food. In these two categories, there is little or no change in dietary intake and these individuals are typically considered food secure. It is not until a household is
identified as low or very low food insecurity that alterations in dietary intake are observed. The alterations may be in the form of reduced variety or poorer quality and desirability. However, a reduction in actual food intake is typically reserved for the very low food security group (14).

Health Consequences of Food Insecurity

Researchers have linked food insecurity directly to a number of health outcomes including poor dietary intake (1, 2), obesity (3-5), type 2 diabetes (6, 15), metabolic syndrome (7), and medication compliance (16).

Dietary Intake

Food insecure individuals try to find food for as low of a cost as possible, and many times the lowest cost items are high in fat and sugar (2). Due to this, the dietary intake of food insecure individuals tends to be high in fats and sugars and low in fruits, vegetables, and milk, as these are higher priced items. These dietary habits can lead to nutritional deficiencies of many vitamins and minerals. A study by Dixon et al (1) used cross-sectional data from 19,528 households from the United States (US) via extensive questionnaires administered by health interviewers and found that those who are food insecure reported a reduced consumption of dairy products, meats, fruits, and vegetables compared to those who were food secure. As a result of this reduced intake, a decreased intake of key nutrients and antioxidants, such as calcium, folate, iron, zinc, and Vitamins A, C, and B-16, was reported (1).

Kempson et al (2) conducted interviews with 51 educators from the expanded food
and nutrition education programs and food stamp education programs. Results showed that one of the major reasons dietary intake is limited or reduced is that individuals living in food insecure households have difficult decisions to make regarding what they can and cannot afford and how best to prioritize the payment of these expenses (2). Likewise, America’s Second Harvest (17) reports that 30% of emergency food clients have to choose between purchasing food and medicine or medical care. Furthermore, 45% of these households are forced to choose between food and utilities, and 36% must choose between food and their rent or mortgage.

Obesity

An inverse association between overweight and obesity and food insecurity has also been reported (3-5). Wilde and Peterman (3) examined the relationship between household food security statistics and current measured weight and weight change by using data obtained from NHANES and food insecurity questionnaires. The researchers found that 36% more individuals, both men and women, gained 4.54 kg or more a year in food insecure households than those living in food secure households. Hanson et al (4) examined 4,338 men and 4,172 women ages 20 and greater using data from 1999-2002 NHANES, and found that 68% of adults in food insecure households are overweight or obese. It should be noted that while 68% of US adults in the average population are also overweight and obese, 40% of food insecure individuals are obese, while only 32% of the average US population is obese (18). However, they also reported that food insecure women were more likely to be obese compared to food secure women while food insecure men were lighter.
when compared to food secure men (4). The reason for the association between food insecurity and increased prevalence of obesity is not yet known; although a commonly held hypothesis among researchers (5, 8) is that the inconsistent availability of food among food insecure households results in a yo-yo dieting effect. Often, these households face both periods when food is easily accessible and periods when food is scarce. Individuals facing food restrictions may be in the habit of overeating during the times when food is available, for example, after receiving a paycheck or food stamps (8). This may occur because they suddenly received money when previously they had been deprived, allowing them access to foods they had previously been deprived. This, along with the fear of going hungry, drives them to over consume foods, which can lead to food becoming scarce, and force them back into food deprivation (5). This cycle of compensatory overconsumption may cause individuals to be at a higher risk for overweight or obesity. Their weight continues to go up then back down each month, but it never returns to baseline (8).

**Type 2 Diabetes**

Due to the higher rates of overweight and obesity in food insecure homes, there is an increased risk of type 2 diabetes (6, 15). Furthermore, since the management of diabetes requires stringent dietary control, food insecure individuals may be susceptible to worsening disease control. Nelson et al (6) interviewed 1,503 adults with diabetes in the Third National Health and Nutrition Examination Survey and found that 64% of food insufficient diabetics reported fair or poor health compared to 43% of food secure diabetics who reported fair or poor
health. Nelson and colleagues (15) recently conducted a study among insulin dependent diabetics where one-third of hypoglycemic episodes resulted from inadequate food supplies.

**Metabolic Syndrome**

For the same reasons that adults in households with marginal and very low food security are at increased risk of obesity and type 2 diabetes, they are also at an increased risk for metabolic syndrome (7). A study by Parker et al (7) reviewed data from the National Health and Nutrition Examination Surveys from 1999 to 2006 to examine the association between food security and metabolic syndrome in US adults. The results show that compared with those who were food secure, adults in food insecure households had 1.80-fold increased odds of metabolic syndrome. Like with obesity, it is believed the increased risk stems from the low quality diets of those who are food insecure. The foods these adults tend to be able to afford are often high in energy, sugar, and fat and the cyclic pattern of overeating may be present in these households as well.

**Medication Compliance**

Another factor that contributes to overall poor health in food insecure persons is medication compliance. Individuals who are food insecure often have competing financial needs. Many times when finances are tight, individuals cannot afford medication and intentionally skip doses to increase the time between refills (16). Many health conditions require medication to help control the disease; missing
medication, or not taking it as prescribed, can lead to worsening of the diseases or further health complications.

**Magnitude of the Problem**

Food insecurity is a national health problem that is continuing to increase in prevalence. In 2008, 14.6% of households (17.1 million households) were food insecure during that year, an increase from 11.1% (13.0 million households) in 2007 (14). However, food insecurity can be very episodic in nature, as some families will only struggle one or two months out of the year. For example, during the 30-day period ending in mid-December 2008, 8.8 percent of all households were food insecure, about 60 percent of the number that were food insecure at any time during the year (14).

A group of individuals that have a high prevalence of food insecurity are those with serious mental illness (SMI). Research conducted among a sample of 72 individuals with SMI showed that 45.8% of the study sample were classified as food insecure, and 29.2% were classified as having the most severe level of food insecurity, very low food security (9).

**Serious Mental Illness**

Mental illnesses are medical conditions that disrupt a person's thoughts, feelings, mood, ability to relate to others, and daily functioning (19). Mental disorders are common in the United States and internationally. An estimated 26.2% of Americans ages 18 and older suffer from a diagnosable mental disorder in a given
year (20). Even though mental disorders are widespread in the population, the main burden of illness is concentrated in a much smaller portion, about 6%, who suffer from a serious mental illness. Serious mental illnesses include major depression, schizophrenia, bipolar disorder, obsessive-compulsive disorder (OCD), panic disorder, post-traumatic stress disorder (PTSD), and borderline personality disorder (21).

Due to limitations from their illness, such as amount of education, lack of work experience, poor social skills, inability to handle stress, and amount of days late or absent from work, individuals with SMI often do not perform as well as their non SMI counterparts in the work environment (22). In fact, data from the 1995 National Health Interview Survey on Disability (NHIS-D) shows only 32-61% of individuals ages 18-65 with SMI are able to maintain employment (23). Additionally, Kessler et al (24) found that these individuals earn approximately $16,000 less per year than those without SMI.

Many individuals in the SMI population experience difficulties with employment and income while also having more health care costs. As a result, many of these individuals live in poverty or become homeless. A study by Folsom, Hawthorne and Lindamer (25) examined the prevalence and risk factors for homelessness among 10,340 patients treated for SMI. Using interviews and surveys, this study found 15% of individuals with SMI had been homeless for at least one year during their lifetime (25).

This population has difficulty accessing health care and mental health services while struggling for food and shelter, leading most of them to become food
insecure and to rely on food stamps and other government or community programs
for groceries. Because they have unreliable access to health care, they are often not
able to obtain mental health treatment and thus are often unable to find a job or
manage money (26). The employment issues, health care costs, limited access to
grocery stores and transportation, lack of nutritional knowledge, and high
homelessness rates are major factors that may contribute to 46% of individuals
with SMI being food insecure (9, 26).

A study by Wallace and Tennante (10) examined the need for nutrition
intervention for those living in mental health homes by conducting nutrition
assessments of 170 subjects living in the mental health residential services (10).
This study found that 72% of individuals with SMI have a BMI greater than 25
kg/m² and that 37% of individuals have a BMI greater than 30 kg/m², classifying
them as overweight or obese, respectively (10). The same study found that SMI
individuals are at a greater risk of developing lifestyle diseases related to obesity,
such as heart disease, diabetes, and cancer, and have a higher mortality from these
diseases than do the general population. Studies also show that cardiovascular
diseases are the leading cause of death in individuals with serious mental illness
(27). Due to this increased risk of disease, individuals with serious mental illness
tend to die earlier than do the general population. A study by Colton and
Manderscheid (27) indicates that the health care disparity in this population
suggests that individuals with serious mental illness may live two to four decades
less than the general population.
Conclusion

Food insecurity is a serious issue affecting 14.6% of households in the US, based on the latest available data from 2008 (14). Food insecurity presents issues as it can lead to obesity and to the serious health consequences that accompany it, such as diabetes, heart problems, and metabolic syndrome. Individuals with serious mental illness are highly susceptible to food insecurity and its related health consequences; factors related to their food insecurity are inability to hold a job, lower income, limited nutrition knowledge, limited transportation, and limited access to grocery stores. More research needs to be conducted to examine nutrient intake patterns of food secure versus food insecure individuals with SMI. In particular, future research needs to determine if this population may exhibit cyclic consumption patterns, leading to weight fluctuations throughout the month and overall weight gain, as well as what effects their quality of diet has on their weight and overall health.
Chapter 3: Methods

Overview

The purpose of this thesis was to determine the effects of food insecurity on nutritional intake and to verify and track weekly body weights in individuals with serious mental illness (SMI). This observational study followed 25 individuals over an 8-week period. Data were collected as part of a sub-study of a larger cross-sectional study looking at the validity and stability of the US Household Food Security Questionnaire in 200 individuals with SMI.

Sample

Research staff recruited 25 individuals from Wyandot Center for Behavioral Health and Johnson County Community Support Services to participate in this study. To be eligible, individuals must have had a confirmed SMI diagnosis and been between the ages of 18 and 65. All individuals met the criteria for SMI as defined by the Kansas Department of Social and Rehabilitation Services, which includes a diagnosis of a schizophrenia spectrum disorder or mood disorder and evidence of impaired functioning for at least two years (28). Individuals were excluded if they had no control over food purchases or choices, such as those in a group home or institution.

Participants were recruited from the overall study based on food security status and body mass index (BMI) classification (BMI ≥18.0 to ≤24.9 kg/m² = healthy weight; BMI ≥25.0 to ≤29.9 kg/m² = overweight; BMI ≥30.0 kg/m² = obese). We attempted to recruit four individuals from each of the six sampling strata (food
secure, healthy weight; food insecure, healthy weight; food secure, overweight; food insecure, overweight; food secure, obese; food insecure, obese). Food insecurity was defined as having a food security score of 3 or greater on the US Household Food Security Questionnaire (14).

Twenty-five subjects were recruited in total. Of the 25 subjects at baseline, 22 subjects completed the study. Figure 1 depicts the breakdown of subjects.

Figure 1. Distribution of Subjects at Baseline and Completion of the Study

Research Setting

All data were collected from subjects at either Wyandot Center for Behavioral Health or Johnson County Community Support Services. In order to recruit participants we talked to the case managers and staff of the center about the study and encouraged them to refer subjects they believed would be interested. Flyers were hung around the center, giving information about the study and a phone
number to call if interested. Finally, we visited the centers during group meetings or lunch and provided a brief overview of the program and asked for names of those who might be interested in participation in the study.

**Ethics**

The procedures for this thesis project were covered under an existing approved protocol (#11928) by the University of Kansas Medical Center Human Subjects Committee to evaluate the validity and stability of the US Household Food Security Questionnaire in 200 individuals with SMI, in which Jeannine Goetz, Ph.D. was the principal investigator.

As this is a vulnerable population, informed consent was carefully read aloud to ensure all participants understood the risks and benefits of the procedures involved before signing the consent form. Individuals that required a surrogate for consent were not eligible to participate in this study. Participants received $50 for completion of all study visits.

**Data Collection Overview and Timeline**

Researchers conducted a brief interview at the baseline assessment to obtain responses to questionnaires outlined in the instrumentation section below and also obtained height and weight measurements to calculate body mass index (BMI). These data were used to determine the appropriate sampling strata for each participant.
At the initial assessment, participants were asked when they would next obtain finances for food, such as food stamps or Social Security Disability Insurance (SSDI). Based upon the date that finances became available, that week served as the first week of data collection for that individual. Researchers then followed participants for an 8-week period, with home visits conducted at weeks 1, 4, 5, and 8 and phone calls to collect self-report data conducted at weeks 2, 3, 6, and 7.

**Baseline Data Collection**

At the baseline assessment, research staff conducted the following questionnaires:

**Instrumentation**

*Demographics Questionnaire*

A questionnaire was administered to collect socio-demographic data necessary to characterize the sample population. This instrument was utilized by the research team during a previous research project conducted among the mental health population, with the majority of participants providing responses to all questions. Research staff read the questions to participants and then documented self-reported responses. Variables included the following: age, gender, race/ethnicity, education, smoking status, and living situation.

*Financial Situation Questionnaire*
Participants were asked to provide the sources and amounts of income they receive on a monthly basis. Questions were asked to determine whether income was stable on a monthly basis or whether income fluctuated. To evaluate monthly expenses, a list of frequent expenses were presented and participants were asked to estimate the amounts paid on a monthly basis. In order to assess other benefits that might contribute to the food supply, a list of common free services were also assessed (i.e. food stamps, food pantries, food kitchens, WIC, etc).

*Food Security Status Questionnaire*

To assess food security status, the U.S. Household Food Security Questionnaire was administered. The USDA created the U.S. Household Food Security Questionnaire, an 18 item rating scale with skip patterns used to assess the level of severity of food insecurity experienced within the household during the previous 12 months (29). This validated questionnaire is the most comprehensive and most widely used food security measure available (14). The greatest strength of the measure is that it contains multiple indicator questions, which are able to capture and distinguish between the various levels of severity that result from an inadequate food supply. The questionnaire was designed to reduce subject burden by means of two successive stages, with many households only being asked 3-5 questions. The estimated average time for administration is 2 minutes in the regular population and 3 to 4 minutes in samples heavily targeted to low-income individuals. An important feature of the measure is the ability to adjust the reference time frame. For the current research, the questionnaire was modified to
assess only the previous 30 days rather than the typical period of 12 months. Many individuals with SMI have cognitive and attention deficits and using a shortened time period may enhance memory and accuracy of reporting. This adjusted time frame is commonly used among food security research and annual data are available from the Economic Research Center at USDA for comparison (29).

**Dietary Intake**

Dietary intake was assessed by trained staff at the beginning and end of each 4-week period during home visits using a standardized, multiple-pass 24-hour recall (i.e. weeks 1, 4, 5 and 8). Multiple 24-hour dietary recalls have been shown to represent usual dietary intakes and are the method used in most national surveys (30). Strassnig and colleagues (31) have also reported the use of dietary recall methodology to assess dietary intake within individuals with schizophrenia. To promote accurate estimation of portion sizes, food models were used. The nutrient content of recalls was determined using Nutrition Data System for Research (NDSR) (version 2008, University of Minnesota, Minneapolis, MN).

**Anthropometric Measures**

**Body Weight and Height**

Precise body weight was measured at baseline using a digital scale accurate to ± 0.1 kilograms (Tanita Corporation, Model TBF 310A, Tokyo, Japan). Participants wore regular clothing but no shoes. Height was measured to the nearest ± 0.1 cm using a portable stadiometer (Seca Model 214, Seca Corporation, Culver City,
Measurements were taken in triplicate and then averaged. BMI was calculated by the researchers using the participant’s weight and height (kg/m²). Procedures for collecting weekly weights are described in the “Weekly Monitoring” section below.

**Chart Review**

*Psychiatric Diagnoses*

Psychiatric diagnoses were documented by having a staff member for each agency provide a list of axis I diagnoses for each subject. By virtue of the program requirements, all individuals receiving services at either mental health facility had a diagnosis and function impairment necessary to meet the definition of SMI (19).

**Data Collection during 8-Week Assessment Period**

Based upon the established start date for each participant, researchers followed participants for an 8-week period, with home visits conducted at weeks 1, 4, 5, and 8 and phone calls to collect self-reported data conducted at weeks 2, 3, 6, and 7.

**Weekly Monitoring**

Body weight was monitored weekly at the same time of day for 8 consecutive weeks. Due to burden on both research staff and participants, half of the weekly weights were verified in person while the remaining weeks were self-reported. Each individual was provided, and trained to properly use, a household digital scale for
self-reported body weight. Subjects were called by a research member during weeks 2, 3, 6, and 7 to collect self-reported body weight.

Home visits were conducted to verify accuracy of reporting and to conduct a 24-hour dietary recall. The home visits and 24-hour recalls were collected at the beginning (weeks 1 and 5) and end (weeks 4 and 8) of each month in order to analyze food patterns for both the beginning of the month when individuals generally have access to money and food, and again at the end of the month when most individuals have trouble with food security due to lack of money and/or food stamps.

Analysis of Data

Food Security Questionnaire

The food security questionnaires were coded according to procedures outlined in the Guide to Measuring Household Food Security – 2000 (29). One point was given to every affirmative answer. In the two temporal-dimension questions, an affirmative answer was considered when subjects reported 3 or more days. For these temporal-dimension questions, the reference period was modified from the original 12 month period to a 30-day period. Nord et al (14) recommended using 3 or more days per month to denote an affirmative response as this number more closely approximates the coding used in the original 12-month reference period. Questions answered “don’t know” had a missing value imputed using the procedures described in the Guide to Measuring Household Food Security -2000 (29), in which the imputed response is based on the answers to the previous questions. After all questions were coded the points were tallied
and subsequently categorized by food security status. A score of 0 to 2 was considered food secure, and a score of 3 to 10 was considered food insecure.

**Dietary Recalls**

All dietary recalls were entered by trained staff into NDSR (version 2008), and the intake property output was used to determine total calories, % of calories from fat, % of calories from carbohydrates, and % of calories from protein consumed per subject at each visit, as well as used to calculate the Healthy Eating Index score.

**Healthy Eating Index**

The data that were obtained from the 24-hour dietary recalls were used to calculate diet quality index scores using the Health Eating Index (HEI). The HEI is a measure of diet quality that assesses conformance to the federal dietary guidelines. The HEI looks at intake of fruit, vegetables, whole grains, milk, meat and beans, oils, saturated fat, sodium, and calories from solid fats, alcoholic beverages, and added sugars (SoFAAS), and gives points based on how well a person meets the dietary guidelines. The dietary standards were created using a density approach, so they are expressed as a percent per 1,000 calories (32).

The HEI was calculated using three separate NDSR output files: serving counts, intake property, and component ingredient. The serving count food file was used to create scores for nine of the components: total fruit, whole fruit, total vegetables, dark green and orange vegetables, total grains, whole grains, milk, meat
and beans, and oil. The intake property food file was used to calculate the total calories consumed, sodium and saturated fat components, as well as the added sugar and grams of alcohol subcomponents of the SoFFAS. The component ingredient file was used to create scores for the solid fat subcomponent of the SoFFAS (33).

To generate scores from the serving count food file, each component was converted from the NDSR serving to an ounce or cup equivalent per 1000 calories. This was done by determining the daily total energy intake and dividing this number by 1000 for each subject’s diet recall to obtain a calorie denominator. Then each component was converted from the NDSR serving to the ounce or cup equivalent by looking up conversion factors in the NDSR manual. The ounce or cup equivalent was then divided by the calorie denominator to obtain the serving per 1000 calories.

Daily grams of sodium, percent added sugar, percent calories from saturated fat, and grams of alcohol and oil were retrieved from the NDSR Intake Property file. Daily grams of sodium and oil were determined per every 1000 calories consumed by dividing the total grams by the calorie denominator for each component. Percent calories from saturated fat and sugar were already provided within the NDSR output file. The percentage of energy from added sugar and alcohol were combined with energy from solid fat (described below) to calculate the percentage of total energy from SoFAAS.

Scores for solid fat were generated by summing the excess fat from animal meats and dairy products, total fat from lard, meat drippings and dairy products,
total fat from margarine and hydrogenated oils, and food items where the predominate fats were saturated or trans fat (e.g., prepackaged cookies and chocolate). Excess fat in meat, poultry, and dairy was considered the total fat less the allowable fat (9.28g fat /100g of food). The total fat from certain food items such as prepackaged cakes, candy, cookies and other store bought desserts was used in the solid fat component calculation because these items are not separated into individual ingredients by NDSR, but are considered to contain mainly saturated or trans fat as the type of fat (33).

Once all servings per 1000 calories were calculated for each HEI component, a score value was assigned. This was calculated by dividing the serving size that had the highest amount of points by the highest amount of points given for a food component. This provided a point value by which all points could be assigned to specific nutrient serving sizes. The nutrient intake was then examined and was rounded down to the closest serving size, and the corresponding point value was assigned. Point values for each category were summed to give the final HEI score, with 100 points serving as the maximum score. A total score of more than 80 is considered “good”, scores of 51-80 indicate “needs improvement”, and scores of less than 51 are considered “poor” (32).
Statistical Analysis

Dr. Jae Hoon Lee, the statistician at the University of Kansas Energy Balance Lab, ran the statistical analyses for this study. Descriptive statistics were calculated to provide baseline subject characteristics, and general mixed modeling was used to address the research questions of the study.

For the current study, it was essential to recognize the hierarchical nature of the data; observations on outcome variables were repeatedly measured at multiple time points (week; level-1) within the participants (level-2). Participants’ body weight was measured weekly, and their dietary intake was assessed to measure the healthy eating index (HEI) and macronutrient composition – total energy, percent calories from fat, percent calories from protein, and percent calories from carbohydrate – during the first and last weeks of the month. When nested data are analyzed without regard to interdependency within a setting, Type I error is inflated leading to unwarranted rejection of the null hypothesis (34-36). Thus, general mixed modeling that accounts for dependence among observations was used for analysis. This approach expands general linear modeling, such as repeated measures analysis of variance (RM ANOVA), by supporting more variations in specifying the covariance structure of the repeated observations (37). The compound symmetry covariance structure yielded smaller Akaike Information Criterion and Bayesian Information Criterion than did the unstructured, first-order autoregressive, or variance component covariance structures and thus was chosen for current mixed models. The maximum likelihood estimation method was used so as to accommodate the observations missing at random (38). Participants’ age,
gender, and race were included as covariates to account for differences in these factors and thereby further increase power to detect significant effects in the mixed models. Statistical significance was determined at 0.05 alpha level, and all analyses were conducted using SAS 9.2 (39).

For weight and total energy, an individual growth model (40) was fitted separately to examine the time (linear or quadratic change over two-month period) effect as well as food security group (level-2) difference on these outcome variables. When both the time and group effects were significant, time by group interaction (cross-level) effect was further examined. Also, another individual growth model was fitted to test the effect of total energy on weight changes from baseline (Week 1).

For HEI and macronutrient compositions, food security group difference and change between beginning and end of the month (level-1) were estimated in separate person effects models (40). When both the group and seasonal effects were significant, their interaction (cross-level) effect was further examined.
Chapter 4: Results

The objective of this study was to a) to determine if food insecure individuals with serious mental illness experience a cyclic overconsumption pattern that leads to weight gain and b) to determine the effects of food insecurity on nutritional intake, both amount and quality of intake, in individuals with serious mental illness.

Subject Characteristics

The total number of subjects with complete data that were included in the analyses was twenty-two, thirteen food secure and nine food insecure. Of the 13 food secure subjects, 3 were categorized as healthy weight, 4 as overweight, and 6 as obese. Of the 9 food insecure individuals, 4 were categorized as healthy weight, 2 as overweight, and 3 as obese. Participants ranged in age from 23 to 67 years and fifty percent of subjects were males. A summary of the socio-demographic characteristics of the total sample and by food security status is provided in Table 1. Summary statistics of the sample are provided in Table 2.

Table 1. Socio-Demographic Characteristics of the Sample

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total Sample (n=22)</th>
<th>Food Secure (n=13)</th>
<th>Food Insecure (n=9)</th>
<th>Group Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>43.3 ± 13.3</td>
<td>40 ± 14.8</td>
<td>48 ± 9.7</td>
<td>P=0.17</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td>P=0.56</td>
</tr>
<tr>
<td>Caucasian</td>
<td>11 (50%)</td>
<td>8 (62%)</td>
<td>3 (33%)</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>9 (41%)</td>
<td>4 (31%)</td>
<td>5 (55%)</td>
<td></td>
</tr>
<tr>
<td>Mixed Race</td>
<td>2 (9%)</td>
<td>1 (7%)</td>
<td>1 (11%)</td>
<td></td>
</tr>
<tr>
<td>Smoking Status</td>
<td></td>
<td></td>
<td></td>
<td>P=0.18</td>
</tr>
<tr>
<td>Currently a Smoker</td>
<td>11 (50%)</td>
<td>4 (30%)</td>
<td>7 (78%)</td>
<td></td>
</tr>
<tr>
<td>Quit within past 6</td>
<td>1 (5%)</td>
<td>1 (7%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never Smoked</td>
<td>10 (45%)</td>
<td>8 (63%)</td>
<td>2 (22%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Summary Statistics of the Sample

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total Sample (n=22)</th>
<th>Food Secure (n=13)</th>
<th>Food Insecure (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg) (mean ±SD)</td>
<td>84.0 ± 8.7</td>
<td>89.0 ± 23.5</td>
<td>76.7 ± 19.6</td>
</tr>
<tr>
<td>Height (cm) (mean ±SD)</td>
<td>166.7 ± 10.3</td>
<td>168.4 ± 9.1</td>
<td>164.4 ± 11.9</td>
</tr>
<tr>
<td>BMI (percentage)</td>
<td>30 ± 9.1</td>
<td>31.5 ± 8.9</td>
<td>28.8 ± 9.8</td>
</tr>
<tr>
<td>Healthy Weight</td>
<td>7 (31%)</td>
<td>3 (23%)</td>
<td>4 (44%)</td>
</tr>
<tr>
<td>Overweight</td>
<td>6 (27%)</td>
<td>4 (31%)</td>
<td>2 (22%)</td>
</tr>
<tr>
<td>Obese</td>
<td>9 (41%)</td>
<td>6 (46%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td>Diagnosis (percentage)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizoaffective</td>
<td>6 (27%)</td>
<td>5 (38%)</td>
<td>1 (11%)</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>6 (27%)</td>
<td>4 (31%)</td>
<td>2 (22%)</td>
</tr>
<tr>
<td>Bipolar Disorder</td>
<td>1 (5%)</td>
<td>1 (8%)</td>
<td>0</td>
</tr>
<tr>
<td>Major Depressive Disorder</td>
<td>4 (18%)</td>
<td>1 (8%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (23%)</td>
<td>2 (15%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td>Median Food Security Score</td>
<td>3.4</td>
<td>1.1</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Weight Trends

The weight trends over the eight-week period varied by food security group (see Figure 2). The food secure group gained weight over the initial 4 week period (mean change +10.6 lbs), lost weight between weeks 4 and 5 (mean change -12.3 lbs), and then remained fairly weight stable from week 5 through 8 (mean change + 0.43 lbs). In contrast, the food insecure group demonstrated a slight weight loss from week 1 to week 4 (mean change -3.7 lbs) followed by a slight weight regain during weeks 4 and 5 (mean change +1.0 lbs), although weights did not return back to baseline during this period. Between weeks 5 and 8, there was another weight gain (mean change +5.9), with the mean weight being 3.28 lbs higher than baseline. After controlling for participants’ age, gender and race, it was found that weight significantly decreased over time in a linear pattern, \( F(1, 145) = 4.87, p < 0.05 \).
However, food security groups did not differ in weight across the eight week period, $F(1, 16) = 0.55, p = 0.47$. **Table 3** shows the weights for both food security groups across each of the 8 weeks while **Table 4** summarizes the mixed modeling results.

![Graph showing weekly body weights for food secure and insecure participants.](image)

**Figure 2. Weekly Body Weights (lbs) for Food Secure and Food Insecure Participants**

**Table 3. Mean Weight (lbs) by Food Security Groups across the 8-week Period**

<table>
<thead>
<tr>
<th>Week</th>
<th>Food Secure</th>
<th></th>
<th></th>
<th></th>
<th>Food Insecure</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$n$</td>
<td>$M$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>195.92</td>
<td>50.64</td>
<td>9</td>
<td>168.27</td>
<td>43.77</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>195.63</td>
<td>51.00</td>
<td>8</td>
<td>164.74</td>
<td>45.71</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>200.12</td>
<td>49.57</td>
<td>8</td>
<td>163.61</td>
<td>45.07</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>206.56</td>
<td>47.89</td>
<td>9</td>
<td>164.56</td>
<td>42.56</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>194.25</td>
<td>49.92</td>
<td>9</td>
<td>165.57</td>
<td>44.16</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>194.44</td>
<td>50.96</td>
<td>9</td>
<td>167.22</td>
<td>44.76</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>191.82</td>
<td>53.61</td>
<td>8</td>
<td>163.36</td>
<td>46.33</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>13</td>
<td>194.68</td>
<td>53.08</td>
<td>8</td>
<td>171.55</td>
<td>44.90</td>
<td></td>
</tr>
</tbody>
</table>
Table 4. Mixed Modeling Results: Weight

<table>
<thead>
<tr>
<th>Effect</th>
<th>Estimate</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>229.46</td>
<td>55.83</td>
<td>4.11</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-1.31</td>
<td>0.93</td>
<td>-1.41</td>
<td>0.18</td>
<td>1.98</td>
<td>0.18</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.36</td>
<td>0.56</td>
</tr>
<tr>
<td>Female</td>
<td>15.13</td>
<td>25.34</td>
<td>0.60</td>
<td>0.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (reference)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.24</td>
<td>0.79</td>
</tr>
<tr>
<td>African American</td>
<td>4.28</td>
<td>42.23</td>
<td>0.10</td>
<td>0.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>18.95</td>
<td>42.02</td>
<td>0.45</td>
<td>0.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week</td>
<td>-0.22</td>
<td>0.10</td>
<td>-2.21</td>
<td>0.03</td>
<td>4.87</td>
<td>0.03</td>
</tr>
<tr>
<td>Food security</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.55</td>
<td>0.47</td>
</tr>
<tr>
<td>Insecure</td>
<td>-18.07</td>
<td>24.32</td>
<td>-0.74</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure (reference)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy Intake

Using total energy intake at weeks 1, 4, 5 and 8, the energy intake trend was similar for both food security groups (see Figure 3). In both the food secure and food insecure groups, intake decreased between weeks 1 and 4, increased between weeks 4 and 5, and then decreased again between weeks 5 and 8. Although there was a trend, there was neither a significant change between beginning and end of the month ($F[1, 63] = 3.03, p = 0.09$) nor significant group differences in the energy intake during this time period ($F[1, 16] = 0.19, p = 0.67$). Table 5 shows the mean energy intake for both groups over the 8-week period.
Figure 3: Mean Energy Intake by Food Security Group at Weeks 1, 4, 5 and 8

Table 5. Energy Intake at Weeks 1, 4, 5, and 8

<table>
<thead>
<tr>
<th>Week</th>
<th>Food Secure</th>
<th>Food Insecure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>2016.45</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>1941.33</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>2235.08</td>
</tr>
<tr>
<td>8</td>
<td>13</td>
<td>1536.24</td>
</tr>
</tbody>
</table>

However, when the mean energy intake at the beginning of the month (weeks 1 and 5 averaged) was compared to the energy intake at the end of the month (weeks 4 and 8 averaged) (see Figure 4), it was found that energy intake significantly decreased over time in a linear pattern, $F(1, 21) = 9.12, p = 0.01$. Food
security groups did not differ in body weight, however, across the eight week period \( F(1, 16) = 0.21, p = 0.65 \). See Table 6 for the estimated energy intake differences between groups at the beginning and end of the month.

![Figure 4. Mean Energy Intake by Food Security Group at the Beginning and End of the Months](image)

Table 6. Mixed Modeling Results: Energy Intake

<table>
<thead>
<tr>
<th>Effect</th>
<th>Estimate</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3747.73</td>
<td>798.73</td>
<td>4.69</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-18.48</td>
<td>13.26</td>
<td>-1.39</td>
<td>0.18</td>
<td>1.94</td>
<td>0.18</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.43</td>
<td>0.52</td>
</tr>
<tr>
<td>Female</td>
<td>-236.75</td>
<td>360.61</td>
<td>-0.66</td>
<td>0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (reference)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.69</td>
<td>0.10</td>
</tr>
<tr>
<td>Black</td>
<td>-1361.49</td>
<td>600.17</td>
<td>-2.27</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>-1299.82</td>
<td>597.37</td>
<td>-2.18</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Racial (reference)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Month</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.12</td>
<td>0.01</td>
</tr>
<tr>
<td>Beginning</td>
<td>464.66</td>
<td>153.83</td>
<td>3.02</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End (reference)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food security</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.21</td>
<td>0.65</td>
</tr>
<tr>
<td>Insecure</td>
<td>158.47</td>
<td>345.57</td>
<td>0.46</td>
<td>0.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure (reference)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Healthy Eating Index

The Healthy Eating Index (HEI) scores increased from the beginning of the month (weeks 1 and 5 averaged) to the end of the month (weeks 4 and 8 averaged) in both the food secure and food insecure groups (+2.77 and +11.22 changes, respectively) (see Figure 5). However, there was neither significant change in HEI between beginning and end of the month ($F[1, 21] = 2.32, p = 0.14$) nor significant group difference in the HEI score ($F[1, 16] = 1.30, p = 0.27$). The score of each HEI component for both groups across the month is shown in Table 7.

![Graph showing HEI scores for secure and insecure groups at the beginning and end of the month](image)

Figure 5. Healthy Eating Index Scores by Food Security Group at the Beginning and End of the Months
Table 7. HEI Components at the Beginning and End of Month by Food Security Group

<table>
<thead>
<tr>
<th>HEI Component</th>
<th>Food Secure</th>
<th></th>
<th>Food Insecure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beginning of</td>
<td>End of Month</td>
<td>Beginning of</td>
<td>End of Month</td>
</tr>
<tr>
<td></td>
<td>Month</td>
<td></td>
<td>Month</td>
<td></td>
</tr>
<tr>
<td>Total Fruit</td>
<td>1.35</td>
<td>1.99</td>
<td>1.06</td>
<td>1.06</td>
</tr>
<tr>
<td>Whole Fruit</td>
<td>1.12</td>
<td>1.37</td>
<td>0.67</td>
<td>1.11</td>
</tr>
<tr>
<td>Total Vegetables</td>
<td>1.96</td>
<td>2.22</td>
<td>2.22</td>
<td>1.94</td>
</tr>
<tr>
<td>Green and Orange</td>
<td>1.19</td>
<td>0.94</td>
<td>1.17</td>
<td>1.56</td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Grains</td>
<td>4.12</td>
<td>3.94</td>
<td>3.44</td>
<td>3.83</td>
</tr>
<tr>
<td>Whole Grains</td>
<td>1.15</td>
<td>1.02</td>
<td>0.61</td>
<td>0.61</td>
</tr>
<tr>
<td>Milk</td>
<td>5.81</td>
<td>4.35</td>
<td>4.33</td>
<td>3.83</td>
</tr>
<tr>
<td>Meat and Beans</td>
<td>7.54</td>
<td>8.45</td>
<td>8.67</td>
<td>8.39</td>
</tr>
<tr>
<td>Oils</td>
<td>2.73</td>
<td>2.94</td>
<td>1.44</td>
<td>1.56</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>5.08</td>
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<tr>
<td>Sodium</td>
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<tr>
<td>SoFAAS</td>
<td>10.35</td>
<td>12.55</td>
<td>5.89</td>
<td>10.06</td>
</tr>
</tbody>
</table>

Macronutrient Consumption

Fat

The mean percentage of calories from dietary fat remained fairly stable from the beginning of the month to the end of the month for both food security groups. There was no significant change in percentage of fat between beginning and end of the month ($F[1, 21] = 0.01, p = 0.93$) and no significant group difference in percent calories from fat ($F[1, 16] = 0.57, p = 0.46$). Table 8 depicts the percent calories from fat for the beginning and the end of the months for both group.
Table 8. Percent Calories from Fat by Food Security Group at the Beginning and End of the Months

<table>
<thead>
<tr>
<th>Month</th>
<th>Food Secure</th>
<th>Food Insecure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Beginning (Weeks 1 &amp; 5)</td>
<td>26</td>
<td>35.82</td>
</tr>
<tr>
<td>End (Weeks 4 &amp; 8)</td>
<td>24</td>
<td>36.88</td>
</tr>
</tbody>
</table>

*Carbohydrates*

The percentage of calories from carbohydrates was the same (48%) at the beginning of the month (weeks 1 and 5 averaged) for both the food secure and food insecure groups. At the end of the month (weeks 4 and 8), the food insecure group exhibited an increase in percent calories from carbohydrates (+2% change) while the food secure group had a decrease in the percent calories from carbohydrates (-0.3% change) (See figure 6). While there was a change in percent calories from carbohydrates, it was not significant between beginning and end of the month ($F[1, 21] = 0.00, p = 0.98$) nor was there a significant group difference in the percent calories from carbohydrate ($F[1, 16] = 1.68, p = 0.21$)
Figure 6. Percent Calories from Carbohydrates by Food Security Group at Beginning and End of the Month

Protein

The percentage of calories from protein was similar at the beginning of the month for both the food secure and food insecure groups (16% vs. 16%, respectively). At the end of the month (weeks 4 and 8), however, the food insecure group demonstrated a slight decrease in percent calories from protein (-0.4% change) while the food secure group demonstrated a slight increase in percent calories from protein (+0.1% change). No significant change was found in percent protein between beginning and end of the month ($F[1, 21] = 0.00, p = 0.96$) nor was there a significant group difference in percent calories from protein ($F[1, 16] = 0.50, p = 0.49$). The percent protein for the beginning and end of the month for both groups is shown in Figure 7.
Figure 7. Percent Calories from Protein by Food Security Group at Beginning and End of the Month
Chapter 5: Discussion

This research appears to be the first of its kind to compare energy intake and HEI of food secure individuals with serious mental illness to food insecure individuals with serious mental illness. Due to the large prevalence of food insecurity in individuals with serious mental illness (9) and the health consequences associated with food insecurity such as obesity and obesity related diseases (3, 4) as well as prevalence of obesity (10), it is important to know if the food intake patterns, such as quality, amount, and patterns of consumption lead to obesity.

Sample

Twenty-five subjects were recruited in total. Of the 25 subjects at baseline, 22 subjects finished the study. All three of the subjects who dropped the study were in the food insecure group, causing the number of subjects in the food secure group to be greater than that of the food insecure group.

There were no significant differences between groups at baseline. While there was a trend that more food insecure individuals were smokers, suggesting that those who smoke spend their money on cigarettes and not food, there was no significant differences between groups, p=0.18.

Weight Trends

One of the main objectives of this study was to determine if food insecure individuals with serious mental illness experience a cyclic overconsumption pattern that leads to gradual and persistent weight gain. Body
weight was monitored over an 8-week period to determine if there was an overall weight gain over time. It was expected that there would be an increase in weight over the first part of the month, as this is when food quality and quantities are generally greatest, followed by a gradual weight loss towards the end of the month as food supplies decline. Despite this anticipated weight loss, it was also anticipated that there would be an overall net increase in weight change over the course of the month because it is believed that food insecure individuals with serious mental illness would consume more calories at the beginning of the month, due to the availability of food from receiving SSDI and food stamps. It was also expected that these individuals would then consume fewer calories at the end of the month due to running out of food stamps and funds and having over consumed the food they had purchased earlier that month, resulting in a slight weight loss. However, one could expect the net result to be an overall weight gain as suggested by Scheier (8).

While there were trends in which weight would greatly increase and decrease over the two-month period, the above hypothesized trends were not observed. The food secure group had an increase at the end of month one and an overall decrease at the end of month two. In contrast, the food insecure group demonstrated a decrease in weight at the end of month one and an overall increase at the end of month two. Overall weight trends showed a significant trend leading to an overall decrease in weight in both groups.

One reason results were not as anticipated could be because the previous studies examined individuals in the general population who were food insecure
while this study examined individuals with serious mental illness who were food insecure.

A major issue that occurred during the study that could have affected the results and led to the overall weight loss trend was that by presenting the subjects with a scale, they became cognizant of their weight, and this may have prompted weight loss. Many subjects commented that since they had a scale, they had been watching their weight and what they were eating more than they had before the program in an effort to lose weight. To support this premise, many subjects reported trying to lose weight when research staff obtained dietary recalls.

**Energy Intake**

In order to look at overconsumption patterns that would lead to weight gain, energy intake was observed. As explained above, it was believed that the subjects, especially those in the food insecure group, would consume more energy at the beginning of the month compared to the end of the month. It was found that, in both the food secure and food insecure groups, energy intake was higher at the beginning of the month compared to the end of the month. The food insecure group did appear to have greater caloric fluctuations throughout the month compared to the food secure group, but it was not great enough to be significant. However, when the mean energy intake at the beginning of the month (weeks 1 and 5) was compared the end of the month (weeks 4 and 8) there was a significant decrease in energy intake over the month.
Changes in weight over this time period could be directly related to the observed energy intake. In the food secure group, the energy intake fluctuation between week 1 and 4 was minimal and would probably not produce much weight change; however, the change in energy intake between weeks 5 and 8 was approximately 700 calories, thus contributing to a weight gain during this period. In the food insecure group, the energy intake difference between weeks 1 and 4 was close to an 800-calorie deficit, thus leading to weight loss in this group. The energy intake between weeks 4 and 5 increased by about 700 calories and resulted in weight gain. Finally, the energy intake between weeks 5 and 8 decreased by approximately 300 calories, which could elicit a slight reduction in body weight.

**Diet Quality**

The other objective of this study was to determine the effects of food insecurity and serious mental illness on nutritional intake. This was done by looking at overall diet quality using the Healthy Eating Index as well as by looking at total energy intake and percentage of calories from fat, carbohydrates, and protein. Previous studies (1, 2, 17) have shown that diet quality decreases throughout the month as food quality and quantities decline.

It was anticipated that individuals with SMI with food insecurity would have a poorer diet quality at the end of the month as compared to the beginning of the month. This was believed to occur due to having greater access to food and having more money to spend on high quality foods at the beginning of the month and a low food supply and little money to spend on high diet quality foods at the end of the
month. It was also believed that individuals with serious mental illness that are food secure would have a higher diet quality than those who are food insecure, similar to the studies by Dixon et al (1) and Kempson et al (2). These studies show that food insecure individuals try to obtain as much food as possible for their money, and typically the least inexpensive foods are high in sugar and fat and low in vitamins and minerals.

Results from the current study showed that the HEI increased from the beginning of the month to the end of the month in both groups. There were no significant differences between food security groups; however, the food insecure group did report a lower HEI in the beginning and the end of the month compared to the food secure group. It should also be noted that the HEI score for both groups at the beginning and end of the month was below the average Americans score of 58.2 (32), demonstrating that their diet quality is below that of the average American, with the food secure group having a mean score of 45 and the food insecure group having a mean score of 39. Furthermore, these scores were even below that of low income individuals from the general population, those whose household income is below $30,000 a year, which is 51.9 (41). No studies have looked at the Healthy Eating Index in the SMI population before, and it appears this could be a health concern that needs improvement and should be explored in more depth in future studies.

When looking at the HEI component breakdown for the food secure subjects at the beginning and the end of the month, the components in which the scores increased more than half a point over the month were total fruit (+0.64) and meat
and beans (+ 0.9), meaning that the intake of those foods increased across the month. SoFAAS score decreased by 2.2 and sodium decreased by 0.9, showing that intake of excess fat, sugar, and alcohol and sodium increased across the month. Milk scores decreased by 1.5 showing that intake decreased across the month. Furthermore, sodium scores decreased by 0.9 over the course of the month, showing that sodium intake increased.

Comparing the HEI component breakdown for the food insecure subjects at the beginning and end of the month, whole fruit score increased by 0.5 showing that they consumed more whole fruit at the end of the month compared to the beginning. Saturated fat and SoFAAS scores both increased across the month, by 1.79 and 4.17 respectively, showing that intake of these nutrients decreased across the month. The only scores that decreased greater than half a point across the month were milk (-0.5), showing that milk intake decreased across the month, and sodium (- 0.5), showing that sodium intake increased across the month.

The only component scores that increased or decreased in both groups were SoFAAS which increased in both groups, milk which decreased in both groups, and sodium which decreased in both groups. This shows that SoFAAS and milk intake decreased across the month for both groups and sodium intake increased across the month for both groups.

One hypothesis why the HEI increased over the month instead of decreasing as anticipated is that at the beginning of the month individuals had access to many foods they may have been recently deprived of and may have chosen more unhealthy foods such, such as fried chicken, macaroni and cheese, cake, and fast
food, that are higher in added fats and sugars as shown in the HEI component breakdown. In contrast, towards the end of the month these individuals may have had fewer foods remaining and had to resort to eating healthier, but high in sodium, foods like canned fruits and vegetables, which are often available due to gifts from food pantries and other charitable organizations, which is shown in the decreased sodium score for both groups in the HEI component breakdown.

Fat intake remained the same throughout the month in both the food secure and food insecure groups. It was expected that fat intake would increase in the food insecure group and stay about the same in the food secure group. This hypothesis is supported by Dixon et al (1) and Kempson et al (2), which shows that food insecure individuals often select the most inexpensive foods, which are high in sugar and fat, especially towards the end of the month. Our current findings could be because individuals in the food insecure group chose inexpensive foods that are high in carbohydrate and low in fat towards the end of the month, such as ramen noodles, Kool-Aid, and potatoes. Carbohydrate intake increased over the month in the food insecure group and decreased in the food secure group, which is what was expected. Protein intake decreased over the month in the food insecure group and increased in the food secure group, which was also to be expected as it was believed that food insecure individuals would not be able to afford foods high in protein, such as meat and dairy products, towards the end of the month when they were low on money, and thus intake would decrease.
Limitations

This study exhibits a few limitations that must be taken into consideration. Given that the current study was a pilot, one major limitation was the small sample size. As the final sample size was only 22, with only 9 in the food insecure group and 13 in the food secure group, the power of the study was very small. If the sample size had been larger, the power of the study would have increased, and some significance may have been found between groups and over time. It was difficult to recruit a larger sample of individuals, as it was hard to recruit an even group of subjects. One reason for this was that there were few food insecure individuals who were interviewed that also had a healthy body weight.

Another major limitation that has already been suggested is that, by giving the subjects a scale, it prompted them to attempt to lose weight and watch what foods they were consuming. Weight was also self-reported on weeks when subjects were not interviewed, and this self-reported weight could have been inaccurate as subjects may not have followed protocol and may have weighed themselves at different times of the day, worn shoes or heavy clothing, or placed the scale on the carpet or uneven surfaces. Additionally, it was also difficult to contact subjects to collect their self-reported weight as they often forgot to call or did not always have their own phone number for research staff to directly contact them during those weeks. Consequently, some weekly weights were not collected for all participants.

Another limitation was that the data collection period for some participants was in November and December, during which the Thanksgiving and Christmas holidays fall. Thus, participants may have eaten more food towards the end of these
months, when the holidays are, and received additional food from charitable
organizations, community centers, family members, and friends that they would not
normally get during the rest of the year.

Food recalls were also only preformed once per time period. To get a better
understanding of the dietary intake during those time periods recalls should have
been taken on multiple days, preferable three, including one weekend day as intake
on weekends may differ from intake on a weekday.

One last factor that may have affected this study was the inability to control
loss to dropout. Due to dropouts, the food secure and food insecure groups were not
equal in size or in BMI distribution, which lowered the power of each group, and
could have affected the results.

Implications and Future Studies

One implication of this study is that food insecure individuals with serious
mental illness have trouble maintaining their food supply throughout the month,
which may lead to weight gains and losses possibly contributing to the rate of
obesity in this population. They also have low diet quality scores, which show that
they are not getting a nutritionally adequate diet. Due to this, these individuals may
benefit from classes teaching them how to grocery shop for low cost nutritional
foods, how to better budget money, how to maintain their food supply, and how to
cook with the foods that they do have as well as simple cooking methods. These
classes could be taught at the Wyandot Center for Behavioral Health or Johnson
County Community Support Servies where subjects were recruited.
Future studies should look at energy intake, weight gain, and diet quality using a larger sample size. Subjects' weight should not be self-reported, instead being collected weekly by the researcher while blinding the subjects to their weights.

**Conclusion**

Significant differences in body weight and energy intake over the month were found in both food insecure and food secure individuals with serious mental illness. Mean weight slightly decreased over time as energy intake decreased across the month. No significant differences in HEI or macronutrient consumption were found; however, HEI was found to be low in both groups at all time points. There were no significant differences between the food secure and food insecure groups in energy intake, weight changes, and diet quality. Small sample size and subject acquisition of a scale may have contributed to inconsistent findings compared to past studies listed above. This study suggests that all people with serious mental illness, both food secure and food insecure, may have trouble maintaining their food supply throughout the month, leading to weight fluctuations and choosing a diet low in quality, and both of these factors may contribute to the health consequences seen in this population.
Chapter 6: Summary

The purpose of this thesis project was a) to determine the effects of food insecurity on nutritional intake, both quality of intake and amount, in individuals with serious mental illness and b) to determine if food insecure individuals with serious mental illness experience a cyclic overconsumption pattern that leads to weight gain. The final sample consisted of 22 individuals with serious mental illness, 9 of whom were food insecure and 13 of whom were food secure. All individuals were observed over an 8-week period. Weight was self-reported weekly, and dietary intake was measured by researchers at weeks 1, 4, 5, and 8 by use of 24-hour diet recalls. Diet quality was measured by use of the Healthy Eating Index.

A significant decrease in weight over time was found ( \( F(1, 145) = 4.87, p < 0.05 \) ) as well as a significant decrease in energy intake from the beginning of the month to the end of the month in both the food secure and food insecure groups (2125 kcals at the beginning of the month vs. 1721 kcals at the end of the month for the food secure, and 2188 kcals at the beginning of the month vs. 1619 kcals at the end of the month for the food insecure). There was no significant difference in HEI or macronutrient consumption across the month. There was also no significant difference between groups in weight, energy intake, HEI, or macronutrient consumption. Both the food secure and food insecure groups scored lower than the average American’s HEI score of 58.2 at both the beginning and end of the month (food secure scored 44 and 46, respectively; food insecure scored 37 and 43, respectively) suggesting that they are at an increased risk for nutritional deficiencies. These findings suggest that all individuals with serious mental illness,
both food secure and food insecure, may have trouble acquiring and keeping a
constant and nutritionally adequate food supply throughout the month.

The lack of significant differences in groups may have occurred due to having
a small sample size and thus a low power. Another limitation of this study was that,
by providing the subjects with a scale, it encouraged them to lose weight and watch
their nutritional intake. Future studies should use a larger subject population and
blind them from their weekly weights.
References


APPENDIX A
Consent Forms
RESEARCH CONSENT FORM

Sub-study Consent Form: Assessment of the Validity and Stability of the US Household Food Security Questionnaire in Individuals with Serious Mental Illness

As a person with mental illness, you are being asked to join a research study to evaluate food security (whether you are able to have enough food throughout the month) and its relationship with body weight fluctuations (increases and decreases in your weight) throughout the month depending upon when and how much food is available to you. You do not have to participate in this research study. The main purpose of research is to create new knowledge for the benefit of future patients and society in general. Research studies may or may not benefit the people who participate.

Research is voluntary, and you may change your mind at any time. There will be no penalty to you if you decide not to participate, or if you start the study and decide to stop early. Either way, you can still get medical care and services at the University of Kansas Medical Center (KUMC).

This consent form explains what you have to do if you are in the study. It also describes the possible risks and benefits. Please read the form carefully and ask as many questions as you need to, before deciding about this research.

You can ask questions now or anytime during the study. The researchers will tell you if they receive any new information that might cause you to change your mind about participating.

This research study is being conducted through the University of Kansas Medical Center with Jeannine Goetz as the researcher. The study will take place at the Wyandot Center for Community Behavioral Health Care, Johnson County Community Support Services and your home. About 24 people will be in the study at KUMC.

BACKGROUND
Many households in the United States (US) are not able to keep enough food in the house. Not having enough food has been shown to cause individuals to have many issues including increased stress, poor diet quality and may also lead to health conditions including overweight/obesity.

PURPOSE
By doing this study, the researchers hope to learn more about how weight changes and diet are affected by when people buy food and when their food supply starts to run down.
PROCEDURES
If you are eligible and decide to participate in this study, your participation will involve approximately 10 appointments during an 8 week period. Your participation will involve:

First Assessment (will occur at the mental health facility and should take approximately 45-60 minutes). Your participation will involve:
1. Giving permission to the researchers to access your records at the mental health setting where you receive services to verify your mental health diagnosis. This information will be collected to determine whether food security status varies by type of psychiatric diagnoses. This is the only piece of health information that will be collected from your medical record.
2. Completing questionnaires that ask about your demographics (age, gender, race/ethnicity, etc), monthly income and expenses, and sources that you use to obtain food. This will take approximately 30 minutes.
3. Completing the US Household Food Security Questionnaire to assess whether you have enough food available to you during the previous 30 days. This will take approximately 10 minutes.
4. Allowing a research team member to weigh you and measure your height. This will take approximately 5 minutes.

Second Assessment (will occur at the mental health facility 2 to 4 days after the initial assessment and should take 10-15 minutes. Your participation will involve:

1. Completing the US Household Food Security Questionnaire again to assess whether you have enough food available to you during the previous 30 days.

8 Week Assessment of Weight and Dietary Intake (will occur after the next time you receive funds for food purchases and will include one assessment per week during the next 8 weeks. Your participation will involve:

1. Week 1 - Allowing a research team member to come to your home and train you on how to measure your weight using a digital scale. This scale will be given to you for your use during the next 8 weeks and is yours to keep following the study. Also at this visit we will conduct a 24 hour recall to assess everything that you ate and drank during the previous day. This assessment should take approximately 20-30 minutes.

2. Weeks 2 and 3- Obtaining and recording your weight directly after waking on a specified morning each week. Each week, you will weigh on the same day of the week at approximately the same time (example: weight every Monday morning at 9:30 AM). A research staff member will call that morning (or at an arranged time) so that you can tell them your weight for that day.
3. **Weeks 4 and 5:** Allowing a research team member to come to your home and confirm your weight and administer another 24-hour recall to assess everything you ate and drank of the previous day. These assessments will take approximately 20-30 minutes.

4. **Weeks 6 and 7:** Obtaining and recording your weight directly after waking on the specified day of the week. A research staff member will call that morning (or at an arranged time) so that you can tell them your weight on those days.

5. **Week 8:** Allowing a research team member to come to your home and confirm your weight and administer a final 24-hour recall to assess everything you ate and drank of the previous day. This assessment will take approximately 20-30 minutes.

**RISKS**
You may feel uncomfortable or embarrassed answering some of the questions in the questionnaires. If at any time you do not want to answer a question you can skip that question or stop participating all together. All information that will be collected about you will be stored in secure files. All information that could potentially identify you will be kept separately from your questionnaire responses in separate files. There may be other risks that have not yet been identified.

**NEW FINDINGS STATEMENT**
You will be told about anything new that might change your decision to be in this study. You may be asked to sign a new consent form if this occurs.

**BENEFITS**
You will not directly benefit from participating in this research study. It is hoped that the information gained will help researchers learn more about studying food security among individuals with serious mental illness.

**ALTERNATIVES**
Participation in this study is voluntary. Deciding not to participate will have no effect on the care or services you receive at the University of Kansas Medical Center and/or the Wyandot Center for Community Behavioral Health Care and Johnson County Community Support Services.

**COSTS**
There is no cost for being in the study.
PAYMENT TO SUBJECTS
If you complete all procedures for this research study, you will receive a total of $40. You will receive $10 after the first assessment, $5 after the second assessment, $5 at each of the first three home visits (total $15) and $10 after the completion of the final home visit.

The KUMC Research Institute will be given your name, address, social security number, and the title of this study to allow them to write checks for your study payments. Study payments are taxable income. A Form 1099 will be sent to you and to the Internal Revenue Service if your payments are $600 or more in a calendar year.

IN THE EVENT OF INJURY
If you have a serious side effect or other problem during this study, you should immediately contact Jeannine Goetz at 913-588-1449. If it is after 5:00 p.m., a holiday or a weekend, you should call 660-864-5483. A member of the research team will decide what type of treatment, if any, is best for you at that time.

INSTITUTIONAL DISCLAIMER STATEMENT
If you think you have been harmed as a result of participating in research at the University of Kansas Medical Center (KUMC), you should contact the Director, Human Research Protection Program, Mail Stop #1032, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160. Under certain conditions, Kansas state law or the Kansas Tort Claims Act may allow for payment to persons who are injured in research at KUMC.

CONFIDENTIALITY AND PRIVACY AUTHORIZATION
The researchers will protect your information, as required by law. Absolute confidentiality cannot be guaranteed because persons outside the study team may need to look at your study records. The researchers may publish the results of the study. If they do, they will only discuss group results. Your name will not be used in any publication or presentation about the study.

Your health information is protected by a federal privacy law called HIPAA. By signing this consent form, you are giving permission for KUMC to use and share your health information. If you decide not to sign the form, you cannot be in the study.

The researchers will only use and share information that is needed for the study. To do the study, they will collect health information from the study activities and from your medical record. You may be identified by information such as name, address, phone, date of birth, social security number, or other identifiers. Your health information will be used at KU Medical Center by Dr. Goetz, members of the research team, the KUMC Research Institute, the KUMC Human Subjects Committee and other committees and offices that review and monitor research studies. Study records might be reviewed by government officials who oversee research, if a regulatory review takes place.
All study information that is sent outside KU Medical Center will have your name and other identifying characteristics removed, so that your identity will not be known. Because identifiers will be removed, your health information will not be re-disclosed by outside persons or groups and will not lose its federal privacy protection.

Your permission to use and share your health information will not expire unless you cancel it.

**QUESTIONS**
Before you sign this form, Dr. Goetz or other members of the study team should answer all your questions. You can talk to the researchers if you have any more questions, suggestions, concerns or complaints after signing this form. If you have any questions about your rights as a research subject, or if you want to talk with someone who is not involved in the study, you may call the Human Subjects Committee at (913) 588-1240. You may also write the Human Subjects Committee at Mail Stop #1032, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160.

**SUBJECT RIGHTS AND WITHDRAWAL FROM THE STUDY**
You may stop being in the study at any time. Your decision to stop will not prevent you from getting treatment or services at KUMC. The entire study may be discontinued for any reason without your consent by the investigator conducting the study.

You have the right to cancel your permission for researchers to use your health information. If you want to cancel your permission, please write to Dr. Jeannine Goetz. The mailing address is Dr. Jeannine Goetz, University of Kansas Medical Center, 3901 Rainbow Boulevard, MS 4013, Kansas City, KS 66160. If you cancel permission to use your health information, you will be withdrawn from the study. The research team will stop collecting any additional information about you. The research team may use and share information that was gathered before they received your cancellation.
**CONSENT**

Dr. Goetz or the research team has given you information about this research study. They have explained what will be done and how long it will take. They explained any inconvenience, discomfort or risks that may be experienced during this study.

By signing this form, you say that you freely and voluntarily consent to participate in this research study. You have read the information and had your questions answered.

*You will be given a signed copy of the consent form to keep for your records.*

________________________
Print Participant’s Name

________________________
Signature of Participant                  Time                  Date

________________________
Print Name of Person Obtaining Consent

________________________
Signature of Person Obtaining Consent                  Date
Appendix B
Questionnaires
BODY COMPOSITION FORM

SUBJECT # __________

Date: ______________

Site: ______________

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</tr>
<tr>
<td>2. ____________</td>
</tr>
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</tbody>
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BMI (Calculated): __________

---

**Research Staff Only**

BMI Classification (circle one): Underweight Healthy Weight Overweight Obese

Food Security Classification (circle one): Food Insecure Food Secure
### DEMOGRAPHIC FORM

**Subject ID # ____________**
**Age ____________**

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<tr>
<td>Don’t Know</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Didn’t attend school</td>
<td>1</td>
</tr>
<tr>
<td>Special Education</td>
<td>2</td>
</tr>
<tr>
<td>Up to eighth grade</td>
<td>3</td>
</tr>
<tr>
<td>Some high school</td>
<td>4</td>
</tr>
<tr>
<td>High School graduate, G.E.D.</td>
<td>5</td>
</tr>
<tr>
<td>Post High School, not college</td>
<td>6</td>
</tr>
<tr>
<td>Some College</td>
<td>7</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>8</td>
</tr>
<tr>
<td>Beyond Bachelor’s Degree</td>
<td>9</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>99</td>
</tr>
</tbody>
</table>

**Highest Grade in school Completed**
### Living Situation

Where do you presently live?

Please circle client’s current Living arrangement

<table>
<thead>
<tr>
<th>Living Situation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lives with relatives (heavily dependent for personal care and control)</td>
<td>1</td>
</tr>
<tr>
<td>Lives with relatives (but is largely independent)</td>
<td>2</td>
</tr>
<tr>
<td>Supervised care housing (live in staff)</td>
<td>3</td>
</tr>
<tr>
<td>Independent living</td>
<td>4</td>
</tr>
<tr>
<td>Long-term care facilities</td>
<td>5</td>
</tr>
<tr>
<td>Emergency shelter</td>
<td>6</td>
</tr>
<tr>
<td>Homeless</td>
<td>7</td>
</tr>
<tr>
<td>Other (specify)</td>
<td>8</td>
</tr>
<tr>
<td>Don’t know</td>
<td>9</td>
</tr>
</tbody>
</table>

If not presently hospitalized ask “With whom do you live?”

<table>
<thead>
<tr>
<th>With any other non-related persons</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>With spouse or live-in partner</td>
<td>2</td>
</tr>
<tr>
<td>With parents</td>
<td>3</td>
</tr>
<tr>
<td>With children</td>
<td>4</td>
</tr>
<tr>
<td>With other family members</td>
<td>5</td>
</tr>
<tr>
<td>No one, lives alone</td>
<td>6</td>
</tr>
<tr>
<td>Don’t know</td>
<td>9</td>
</tr>
</tbody>
</table>

### Smoking Status

“Are you currently or have you previously smoked (tobacco products)?”

<table>
<thead>
<tr>
<th>Currently a Smoker</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently a Smoker, but trying to quit</td>
<td>2</td>
</tr>
<tr>
<td>Non-smoker, quit within past 6 months</td>
<td>3</td>
</tr>
<tr>
<td>Non-smoker, quit greater than a year ago</td>
<td>4</td>
</tr>
<tr>
<td>Never Smoked</td>
<td>5</td>
</tr>
<tr>
<td>Other (Specify) _________________</td>
<td>6</td>
</tr>
<tr>
<td>Don’t know</td>
<td>9</td>
</tr>
</tbody>
</table>
Financial Questionnaire

Subject ID# ____________
Date# ________________
Interviewer: ______

1. Please indicate the sources and amounts of income you receive on a monthly basis (i.e., SSI, SSDI, food stamps, retirement, etc)

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Date when received each month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Are you on a fixed income (is the amount of money you receive each month consistent) or does your income vary each month? If it varies, please describe:

____________________________________________________________________________________

3. Did you file a tax return in 2008? If so, do you know the amount of annual income that was reported?

____________________________________________________________________________________

4. How many times a month do you go grocery shopping? Is this related to when you receive your money?

____________________________________________________________________________________

5. How much do you typically spend on food each month?

____________________________________________________________________________________

6. Do you feel that you have the same quality and amount of food available to you throughout the entire month? If not, please describe:

____________________________________________________________________________________
7. Are there other sources than the grocery store that you use to obtain food?

<table>
<thead>
<tr>
<th>Source</th>
<th>Yes / No</th>
<th>How Frequent do you get these sources?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Pantry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soup Kitchen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angel Food Ministries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Health Facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WIC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. What expenses do have each month? Please indicate an estimated amount.

<table>
<thead>
<tr>
<th>Expenses</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent/Mortgage/taxes</td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td></td>
</tr>
<tr>
<td>Healthcare/Doctor/Therapist</td>
<td></td>
</tr>
<tr>
<td>Credit Card payments</td>
<td></td>
</tr>
<tr>
<td>Insurance (health, home, etc)</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
</tr>
<tr>
<td>Phone Bills</td>
<td></td>
</tr>
<tr>
<td>Utilities (gas, electric, water, sewer)</td>
<td></td>
</tr>
<tr>
<td>Car payments (car payment, gas, etc)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

In the past 6 months, have you ever had to make a decision as to whether to pay these expenses versus obtaining food for that month? If so, how frequently has this happened?
U.S. HOUSEHOLD FOOD SECURITY SURVEY MODULE:
Economic Research Service, USDA
Revised 2006, Adapted for Grant by Jeannine Goetz

How many individuals live in your household? # adults _____ # children _____

HH1. [IF ONE PERSON IN HOUSEHOLD, USE "I" IN PARENTHEticals, OTHERWISE, USE "WE." ]

Which of these statements best describes the food eaten in your household in the last 30 days: —enough of the kinds of food (I/we) want to eat; —enough, but not always the kinds of food (I/we) want; —sometimes not enough to eat; or, —often not enough to eat?

[1] Enough of the kinds of food we want to eat
[2] Enough but not always the kinds of food we want
[3] Sometimes not enough to eat
[4] Often not enough to eat
[ ] DK or Refused

Household Stage 1: Questions HH2-HH4 (asked of all households; begin scale items).

[IF SINGLE ADULT IN HOUSEHOLD, USE "I," "MY," AND "YOU" IN PARENTHEticals; 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 30 days.

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 30 days?

[ ] 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 30 days?

[ ] 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 30 days?

[ ] Often true
[ ] Sometimes true
[ ] Never true
[ ] DK or Refused

**Screener for Stage 2 Adult-Referenced Questions:** If affirmative response (i.e., "often true" or "sometimes true") to one or more of Questions HH2-HH4, OR, response [3] or [4] to question HH1 (if administered), then continue to **Adult Stage 2**; otherwise skip to **End of Food Security Module**.

**Adult Stage 2: Questions AD1-AD4** (asked of households passing the screener for Stage 2 adult-referenced questions).

AD1. In the last 30 days, 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] In the last 30 days, how many days did this happen?

______ days

[ ] DK

AD2. In the last 30 days, did you ever eat less than you felt you should because there wasn’t enough money to buy food?

[ ] Yes
[ ] No
[ ] DK
AD3. In the last 30 days, were you ever hungry but didn’t eat because there wasn’t enough money for food?

[ ] Yes
[ ] No
[ ] DK

AD4. In the last 30 days, did you lose weight because there wasn’t enough money for food?

[ ] Yes
[ ] No
[ ] DK

**Screener for Stage 3 Adult-Referenced Questions:** If affirmative response to one or more of questions AD1 through AD4, then continue to Adult Stage 3, otherwise skip to End of Food Security Module.

**Adult Stage 3: Questions AD5-AD5a** (asked of households passing screener for Stage 3 adult-referenced questions).

AD5. In the last 30 days, did you or other adults in your household ever not eat for a whole day because there wasn’t enough money for food?

[ ] Yes
[ ] No (Skip 12a)
[ ] DK (Skip 12a)

AD5a. [IF YES ABOVE, ASK] In the last 30 days, how many days did this happen?

[ ] DK

**END OF FOOD SECURITY MODULE**

Data Entered _____  Data Checked____