RELATIONSHIPS AMONG FOOD INSECURITY, PERCEIVED STRESS, GENERAL SELF-EFFICACY, AND OBESITY IN FEMALE HEADS-OF-HOUSEHOLD WITH CHILDREN

by

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ABSTRACT OF THE DISSERTATION

Relationships Among Food Insecurity, Perceived Stress, General Self-Efficacy, and Obesity in Female Heads-of-Household with Children

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Obesity is a significant issue in the United States with approximately 36% of adults being classified as obese. The etiology of obesity encompasses physical, environmental, behavioral and societal factors. Empirical evidence indicates that among vulnerable populations, obesity exists in the presence of household food insecurity; however, the relationship is not directly causal. Furthermore there are gender differences in the prevalence of obesity in vulnerable populations. To date, these relationships are not well understood. Theory suggests that in vulnerable populations, resource availability, relative risk and health status are related. Theory further suggests that general perceived stress and general self-efficacy are related to both food insecurity and obesity and they may mediate the relationship between food insecurity and obesity. This study explored the relationships among food insecurity, general perceived stress, general self-efficacy, and obesity in female heads-of-household between the ages of 18 and 59 with one or more children under 18 years of age. The Core Food Security Module, the General Perceived Stress Questionnaire, the General Self-Efficacy Scale, calculated Body Mass Index and calculated waist-to-hip circumference ratio were used to measure the study variables. Female heads-of-households, recruited through two food pantries and one

community action agency were invited to participate in the study through staff referral. Data were collected from 86 participants from November 2015 through February 2016. Two mediational models were tested. Results indicated a positive relationship between food insecurity and general perceived stress, general perceived stress and obesity, and general self-efficacy and obesity. However, the relationship between food insecurity and obesity was not significant. These findings indicate that the role of general perceived stress and general self-efficacy as mediators of the relationship between food insecurity and obesity was not supported. This study adds to the body of knowledge through confirmation of the absence of direct causality in the relationship between food insecurity and obesity and supports further investigation to determine the mechanisms of coexistence in vulnerable populations.

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This dissertation is dedicated to my family. To my daughter Catrina, who has always been loving, patient, and kind, I hope that I am a role model for you and that you are inspired to pursue your dreams remembering to never give up and never surrender. To my husband Jim, who has loved and supported me throughout this process and who has always been proud of me.

"I have found the one whom my soul loves"

Song of Solomon 3:4

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CHAPTER 1: THE PROBLEM

Obesity has been recognized as a significant concern in American society. The Centers for Disease Control and Prevention (CDC) view obesity as a national epidemic (Ogden, Lamb, Carroll, & Flegal, 2010). The significance of the problem is underscored by trends in obesity prevalence in the United States are examined. The 2013 CDC data demonstrate a marked increase in obesity rates over the past 25 years. In 1990, 10 states had an obesity prevalence of less than 10% and no state was greater than 15%. In 2013, at least 20% of adults were obese in all 50 states, and thirteen states had an obesity prevalence of 30% or greater (CDC, 2013). Analysis of the National Health and Nutrition Examination Survey (NHANES) 2009-2010 data revealed an overall prevalence of obesity in the United States of 35.7 % in adults or approximately 78 million adults (Ogden, Carroll, Kit, & Flegal, 2012). NHANES data (Flegel, Carroll, Ogden, & Curtin, 2010), revealed an increase in obesity prevalence between survey periods 1976 to 1980 and 1988 to 1994, as well as between survey periods 1988 to 1994 and 1999 to 2000. Current data indicate that this trend is stabilizing; however, the prevalence of obesity has not declined (Flegal, Carroll, Kit, & Ogden, 2012).

The national healthcare agenda, articulated in Healthy People 2010 (HP 2010), sought to address concerns associated with obesity. With the increase in the prevalence of obesity, revised versions of these goals appear in the Healthy People 2020 (HP 2020) objectives. In the topic area Nutrition and Weight Status, the overall goal is stated as "Promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights (HP 2020)." This goal includes the objectives Nutrition and Weight Status-8 (NSW-8) to "Increase the

proportion of adults who are at a healthy weight" and NWS-9 to "Reduce the proportion of adults who are obese (HP 2020)." The 2020 target for NWS-9 is 30 % (HP 2020).

Obesity has been identified as a contributing factor in the development of chronic diseases including hypertension, dyslipidemia, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea and respiratory problems, and some cancers (USDHHS, 2013). In addition to the increased morbidity associated with obesity, obesity is also linked with increased mortality (Flegal, Graubard, Williamson, & Gail, 2005).

These disease processes are integrated into estimates of the health care costs of obesity and the economic impact of obesity is significant. Health care costs related to obesity increased from $78.5 billion in 1998 to an estimated $147 billion in 2008. This increase was attributed to the increased prevalence of obesity rather than per capita cost increases (Finkelstein et al., 2009). The cost of obesity in the full-time workforce has been estimated to be $73.1 billion. Analysis of this expense includes medical expenses (41%), absenteeism (41%), and presenteeism (18%) (Finkelstein, DiBonaventura, Burgess, & Hale, 2010).

The mechanisms underlying development of obesity are unclear however it has been recognized that "the integration of social, behavioral, cultural, physiological, metabolic and genetic factors" (NIH p. xi, 1998) is involved. Consideration of the multifactorial nature of obesity leads to the need to explore the relationships among these factors to further delineate the mechanisms that lead to obesity.

Food insecurity (FI) is among the factors associated with obesity (Pan, Sherry, Njai, & Blanck, 2012; RWJF, 2010). The concept of food insecurity reflects inequality in

the access to adequate food and can be differentiated from hunger or malnutrition (Habicht, Pelto, Frongillo, & Rose, 2004). The United States Department of Agriculture (USDA) defines food insecurity as "a household-level economic and social condition of limited or uncertain access to food" (USDA, 2013, p. 2). The most recognized conceptual definition of food insecurity was first articulated in the landmark report from the Life Sciences Research Office of the Federation of American Societies for Experimental Biology. This was based on discussions of an ad hoc Expert Panel on Core Indicators of Nutritional State for Difficult-to-Sample Populations for the American Institute of Nutrition in agreement with the U.S. Department of Health and Human Services (USDHHS) (Wunderlich & Norwood, 2006). In this report, food insecurity is said to exist "whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain" (Anderson, 1990, pp.1575-1576). The most recent changes to the definition of food insecurity occurred in 2006 with a change in the terminology used to describe the severity of food insecurity (USDA, 2013). This change was based on recommendations by the Committee on National Statistics (CNSTAT) per the request of the USDA. The USDA noted "Even though new labels were introduced, the methods used to assess households' food security remained unchanged, so statistics for 2005 and later years are directly comparable with those for earlier years for the corresponding categories" (USDA, 2013, p.1).

The prevalence of food insecurity has been estimated each year by the USDA through data obtained from the Food Security Supplement (FSS) to the Current Population Survey (CPS) (Wunderlich & Norwood, 2006). In 2012, 14.5 % of U.S. households were food insecure at some time during the year (USDA, 2013). Of these

households 5.7 % had very low food security, in which the eating patterns were disrupted and food intake reduced (USDA, 2013). This equates to 49 million people living in food-insecure households during 2012.

Often adults in food insecure households implement strategies to prevent children in those households from experiencing food insecurity. Strategies include restricting adult intake, feeding children first, eating leftovers, skipping meals, drinking sweetened beverages instead of eating solid foods, and consuming nutrient dense foods (Bove & Olson, 2006; Nackers & Appelhans, 2013) Despite these efforts, in 2012, it was estimated that 8.3 million children lived in food insecure households where one or more child was also food insecure. Individuals in households with very low food security include 12.4 million adults and 977,000 children (USDA, 2013). Households with children that are classified as having very low food security report eight or more food in-secure conditions in the Census Population Survey (USDA, 2013). It is important to carefully consider both categories, children living in food insecure households and children who actually experience food insecurity. The strategies that female heads of households may implement to protect a child from experiencing food insecurity could influence their relative risk of obesity.

Food insecurity is a recurrent phenomenon rather than a continual state. Households reporting very low food security experienced it a few days each month for seven months of the year (USDA, 2013). Analysis of the data from the FSS for 2012 revealed that the prevalence of food insecurity was greater in certain types of households. In all households with incomes below the poverty level, 40.9% were food insecure. In all households with children, 20.0% were food insecure. Gender differences were noted

with 35.4% of households with children headed by a single woman and 23.6% of households headed by a single man determined to be food insecure (USDA, 2013).

The nature of the relationship between food insecurity and obesity is not well understood. In November, 2010, the Institute of Medicine (IOM) held a workshop focused on understanding the relationship between food insecurity and obesity. The planning committee began by acknowledging the coexistence of obesity and food insecurity within the same communities, families, and individuals (IOM, 2011). An outcome of the workshop was the recognition that "food insecurity does not in and of itself explain or cause obesity" (Olander, 2010, p. 2)

It was suggested that food insecurity may be associated with other factors through joint causality or mediation in influencing obesity (Olander, 2010). Mechanisms of the relationship between food insecurity and obesity are undetermined. Factors associated with food insecurity such as poverty, food quality, diet sensitive chronic disease, and stress are not fully explored nor are the potential linkages of these aspects to obesity determined. It was further suggested that the direction of the relationship between food insecurity and obesity be further explored, including consideration of obesity as a causative factor of food insecurity (IOM, 2011).

Various aspects of food insecurity have been linked with obesity in the literature. Described as the "food insecurity-obesity paradox" Franklin et al. (2012) reviewed literature published after 2005 in which mediators between food insecurity and obesity were investigated. Their analysis identified gender, marital status, stressors, and food stamp participation as mediators of the food insecurity and obesity relationship. Their analysis further confirmed the lack of support in the literature of a linear relationship

between food insecurity and obesity (Franklin et al., 2012). Other factors to be considered are cyclic eating, changes in energy efficiency associated with cyclic eating, substitution of energy dense foods, and psychological consequences of food insecurity such as stress, anxiety, and depression (Pan, Sherry, Njai, & Blanck, 2012; Robert Wood Johnson Foundation, 2010; Wilde & Peterman, 2005).

Not only have researchers attempted to describe the mechanisms for an association between food insecurity and obesity, they have also sought to identify at risk populations. In a synthesis of the research published by the Robert Wood Johnson Foundation (RWJF) (2010) it was concluded that "women who experience food insecurity are more likely to be obese compared with food secure women" (p. 1). This result was echoed in a review of literature by Franklin et al. (2012) in which linkages between food insecurity and obesity were noted in women. Other studies have demonstrated the same relationship in women (Larson & Story, 2011; Olson & Strawderman, 2008; Pan et al., 2012; Wilde & Peterman, 2005). Individuals living in food deserts, locations without ready access to healthy and affordable food (USDA, 2015), are also viewed as an at risk population. The lack of access to acceptable food increases the risk of using alternative strategies to obtain food (Ivers & Cullen, 2011). The influence of food deserts on food intake and obesity is largely unknown (Budzynska et al., 2013).

Subsequent to the synthesis of published research, the RWJF identified research gaps in the area of food insecurity and obesity. These included studies "to illustrate the mechanisms through which food insecurity may promote obesity among different demographic groups" (RWJF, 2010, p. 7). Martin and Ferris (2007) recognized the

relationship between societal economic factors, female-headed households, food insecurity, and obesity. However, they inferred that there are other factors, aside from poverty, that increase the risk for obesity in the presence of food insecurity. The articulation of these gaps in the literature, in the context of a gender based focus, are consistent with the identified need to explore mechanisms that mediate the relationship between food insecurity and obesity.

Mediators

Perceived Stress

Perceived stress is defined as an individual's appraisal of a life event as threatening and the perception that coping resources are insufficient to address the threat (Cohen & Williamson, 1988). Levenstein et al. (1993) proposed that life situations, as perceived by the individual, have psychosomatic influences which lead to physical changes in the body. The physiologic reactions to perceived stress have been described as the fight or flight response and depressive reactions. In the presence of overwhelming repeated or chronic perceived stress the hypothalamic-pituitary-adrenal (HPA) axis becomes hyperactive with subsequent inhibition of growth hormone (GH) and the hypothalmo-pituitary-gonadal axes. This results in increased adrenocorticotropin hormone (ACTH) and cortisol levels. This system ultimately results in metabolic changes which include insulin resistance, compensatory hyperinsulinemia and redistribution of lipids to central adipose tissue (Bjorntorp, 1996). Elevated cortisol and insulin levels coupled with low GH and sex steroid hormones result in intra-abdominal visceral fat accumulation. Additionally, levels associated with chronic stress influence food choice, increasing consumption of comfort foods (Dallman, Pecoraro, & Fleur,

2004). Thus, Bjorntorp (1996) suggests that waist-hip ratio is a surrogate marker for chronic stress.

Empirical research has explored the relationship between stress and obesity/weight, building support for the exploration of perceived stress as a mediator of FI and obesity (Sarkar & Mukhopadyay, 2007; Boutin-Foster & Rodriguez, 2009) Other research has examined the link between cortisol and food choice in the presence of chronic stress and the resultant increase in body weight in healthy women (Roberts, 2007; Tomiyama, Dallman, & Epel, 2011).

Furthermore, the relationship between long-term perceived stress and physiological changes have been investigated in patients with ulcerative colitis (Levenstein et al., 2000) and women with vocal nodules (Abeida et al., 2011) using the Perceived Stress Questionnaire. However, the influence of long-term perceived stress in the relationship between FI and obesity has not been explored.

Perceived stress is related to food insecurity in that food insecurity is a stressful condition and individuals with food insecurity are often faced with multiple stressors related to their socioeconomic status and other environmental factors (IOM, 2011). Environmental factors, such as food insecurity, may be appraised by an individual as a threat which will trigger the HPA axis (IOM, 2011). In a study by Cohen, Doyle, and Baum (2006), socioeconomic status, measured by income and education, was associated with higher basal levels of cortisol and catecholamines in a sample of men and women aged 21 to 55 years.

General Self-Efficacy

Social Cognitive Theory (SCT) has served as the theoretical framework for multiple studies that have examined the relationships among factors such as healthful eating patterns and exercise and obesity. In SCT, self-efficacy is the belief that one can successfully perform a behavior required to produce specific outcomes (Bandura, 1977). Self- efficacy determines "how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences" (Bandura, 1977, p. 194).

The concept of self-efficacy has been used to delineate the relationships among an array of variables investigated in the area of obesity. Research from a task specific self-efficacy perspective conducted in adult populations has included dietary adherence for weight change (Warziski, Sereika, Styn, Music, & Burke, 2007); self-efficacy related to exercise and healthy eating (Capers, Baughman, & Logue, 2011); and eating self-efficacy (Emery et al., 2015). Self-efficacy, as a concept of SCT, has been explored as a mediator of the influence of personal and environmental factors on weight management behaviors in low-income, obese African American and white mothers (Chang, Nitzke, Brown, & Baumann, 2011); and as a motivating factor in a qualitative study exploring motivators and barriers to healthful eating and physical activity in low-income, overweight or obese non-Hispanic black or non-Hispanic white women (Chang et al., 2008). These studies illustrate the inclusion of SCT in research related to obesity; however in these situations, self-efficacy is viewed as task specific.

General self-efficacy (GSE) reflects the ability to respond to a variety of stressful situations; it is not situation specific (Luszczynska, Scholz, & Schwarzer, 2005). GSE is a belief in overall competence or capability to perform in a variety of contexts (Chen, Gully, & Eden, 2001). The focus on task specific self-efficacy has been viewed as

inadequate in exploring the multiple contexts and influences related to morbid obesity (Bonsaksen, Kottorp, Gay, Fagermoen, & Lerdal, 2013). GSE has been examined as a variable in studies related to obesity or weight either in combination with task specific self-efficacy or independently. Study designs have included an evaluation of GSE in persons with chronic illness, including morbid obesity (Bonsaksen, Faermoen, Lerdal, 2014); an investigation of health-related quality of life in persons with morbid obesity on treatment waiting lists in Norway (Lerdal et al., 2011); an evaluation of a comprehensive mind body weight loss intervention in overweight and obese individuals (Alert et al., 2013); and a study of a tai chi intervention in sedentary obese women (Dechamps, Gatta, Bourdel-Marchasson, Tabarin, & Roger, 2009). GSE has been evaluated in combination with task specific self-efficacy in a study of cardiovascular risk factors in shift workers (Nabe-Nielsen, Garde, Tuchsen, Hogh, & Diderichsen, 2008). These studies illustrate the emergence of general self-efficacy as a factor associated with obesity.

In this study, GSE is being explored as a potential mediator of the relationship between FI and obesity. The non-causal nature of the relationship between these variables opens the door for the exploration of unique factors as mediators of the relationship. The general belief in their own capabilities when confronted by adversity may influence whether or not women experiencing food insecurity have the internal resources to respond in a resilient direction thereby influencing the probability of becoming obese.

Research Questions

In female heads-of-household between the ages of 18 and 59 living with one or more children under 18 years of age:

1. What is the relationship between food insecurity and the dependent variables of general self-efficacy and perceived stress?
2. What is the relationship between the dependent variable of obesity and the independent variables of (a) food insecurity, (b) general self-efficacy, and (c) perceived stress?
3. What is the relationship between food insecurity and obesity when either general self-efficacy or perceived stress is controlled for statistically?

Sub-Problems

1. What is the relationship between food insecurity and obesity?
2. What is the relationship between food insecurity and general self-efficacy?
3. What is the relationship between general self-efficacy and obesity?
4. What is the relationship between food insecurity and obesity when general self-efficacy is controlled for statistically?
5. What is the relationship between food insecurity and perceived stress?
6. What is the relationship between perceived stress and obesity?
7. What is the relationship between food insecurity and obesity when perceived stress is controlled for statistically?

Theoretical and Operational Definitions

Food Insecurity

Food insecurity exists "whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain" (Anderson, 1990, pp.1575-1576). Within the Vulnerable Populations Model (VPM), it is appropriate to consider food insecurity a dimension of resource availability.

Food insecurity was operationally defined as the score on the 18-item Core Food Security Module (CFSM) (Coleman-Jensen, Nord, Singh, 2013; Wunderlich & Norwood, 2006).

Obesity

An individual is designated as obese when their Body Mass Index (BMI) is 30 or higher. The BMI is a ratio of weight and height and it is calculated by dividing weight in pounds by height in inches squared and multiplying by a conversion factor of 703 (CDC, 2011). Within the VPM, it is appropriate to consider obesity as a dimension of health status. Obesity was operationally defined as Body Mass Index (BMI), measured by the collection of height and weight data and calculation of BMI.

Perceived Stress

Perceived stress is an individual's appraisal of an event as threatening or demanding and the view that coping resources are insufficient to address the threat (Cohen & Williamson, 1988). Perceived stress was operationalized by the score on the General Perceived Stress Questionnaire (General PSQ) (Levenstein et al., 1993).

General perceived stress is defined as perceived stress that has occurred over a year or two (Levenstein et al., 1993). Prolonged stress has been associated with a pattern of central adipose tissue deposits via an endocrine reaction (Bjorntorp, 1996; Dallman, Pecoraro, & Fleur, 2004). Stress was further operationalized by waist to hip circumference ratio calculated from waist and hip measurements following the WHO STEPwise Approach to Surveillance (STEPS) protocol (WHO, 2008).

General Self–Efficacy

Self-efficacy is the belief that one can successfully perform a behavior required to produce specific outcomes (Bandura, 1977). In this study, self-efficacy refers to general

self-efficacy which is an individual's belief in their ability or capability to respond in a variety of situations or in a range of challenging demands (Chen, Gully, & Eden, 2001; Luszczynska, Scholz, & Schwarzer, 2005). Self-Efficacy was operationalized by the score on the 10-item general perceived self-efficacy (GSE) scale by Schwartzer and Jerusalem (1995).

Delimitations

The population was limited to female heads-of-household living with one or more children under 18 years of age. Previous studies have demonstrated a stronger relationship between food insecurity and obesity in women than in men (Franklin et al., 2013). Among men, many studies found a negative association between food insecurity and obesity (IOM, 2011). Additionally, FSS data for 2012 demonstrated greater prevalence of food insecurity in households with children and households with children headed by a single woman (USDA, 2013).

Significance of the Study

Obesity is a significant issue in the United States with 35.7 % of adults or approximately 78 million adults being classified as obese (Ogden et al., 2012) Obesity is a contributing factor in the development of chronic diseases, including heart disease, diabetes, hypertension, stroke, certain cancers and arthritis (NIH, 1998). The healthcare community is diligently pursuing explanations for the high prevalence of obesity.
The etiology of obesity encompasses physical, environmental, behavioral, and societal factors (Mitchell, Catenacci, Wyatt, & Hill, 2011). Obesity exists in the presence of food insecurity (IOM, 2011) and food insecurity may be one of the factors underlying the development of obesity. It is recognized that there is a link between food insecurity and

obesity however, the mechanisms of the relationship are unknown (IOM, 2011). Exploration of the relationship between food insecurity and obesity, as well as perceived stress and general self-efficacy as potential mediators of the relationship would serve to expand existing knowledge.

This study specifically examined the dependent variable of obesity in a sample of female heads-of-households between the ages of 18 and 59 with children in relationship to three independent variables of food insecurity, perceived stress, and general self-efficacy. In addition, the study examined the relationship between food insecurity and the dependent variables of perceived stress and general self-efficacy. Two mediation models were tested. In Model I, perceived stress was proposed as a mediating variable between food insecurity and obesity. In Model II, general self-efficacy was proposed as a mediating variable between food insecurity and obesity. The testing of these relationships can contribute to the current knowledge about the relationship between food insecurity and obesity and can also provide direction for future research in exploring the variables that influence the relationship between food insecurity and obesity.

Summary

The high national prevalence of obesity, 35.7% of adults, is a significant concern for society (Ogden et al., 2012). Obesity, and the associated increase in morbidity and premature mortality, has been demonstrated to impact health and quality of life, and lead to increased healthcare costs, decreased productivity and increased societal burden. There is urgency among the healthcare and scientific communities to identify approaches in practice and policy to decrease the prevalence of obesity. A relationship between food insecurity and obesity has been identified (IOM, 2011). The mechanisms of this

relationship and the associated factors need to be explicated in order to formulate evidence-based practice recommendations, guide program development, frame healthcare policy, and direct future research.

CHAPTER 2: REVIEW OF THE LITERATURE

This chapter will review the theoretical and empirical literature related to the relationship among food insecurity, general perceived stress, general self-efficacy, and obesity in female heads of household living with one or more children under 18 years of age. The Vulnerable Populations Model (VPM) concepts of resource availability, relative risk and health status will be discussed as the framework for examining the relationship among the study variables. In addition, theoretical literature related to the mediator variables of general perceived stress and general self-efficacy will be discussed. A review of empirical literature that has explored the relationship among the study variables will be presented. Finally, gaps in the empirical literature will be identified, theoretical rationale for the study will be discussed and study hypotheses will be presented.

Theoretical Framework

Vulnerable Populations Model

The Vulnerable Populations Conceptual Model (VPM) (Flaskerud & Winslow, 1998) will serve as the theoretical framework for this study. Flaskerud and Winslow (1998) proposed the Vulnerable Populations Model (VPM) as a conceptual model that relates resource availability and relative risk to health status. The VPM is designed to guide nursing research, practice, and policy with vulnerable populations from a population-based focus. The model propositions are (a) a lack of resources increases relative risk, (b) risk factor exposure interacts with health status, thus increased exposure to risk factors leads to increased morbidity and mortality in a population group, and (c) morbidity and mortality in a community may feed back into resource availability.

Resource availability refers to access to socioeconomic resources (human capital, social connectedness, family support and social status) and environmental resources (health care quality and differential access to care). It is the availability of socioeconomic and environmental resources that leads to differential vulnerability in population groups. This lack of resources leads to increased risk in the population groups who experience the lack of resources. Exposure to increased risk factors in population groups results in patterns of increased morbidity and premature mortality (Flaskerud & Winslow, 1998). Relative risk refers to the greater exposure vulnerable populations have to risk factors due to their lack of socioeconomic and environmental resources (Figure 1).

Figure 1. Vulnerable Populations Conceptual Model

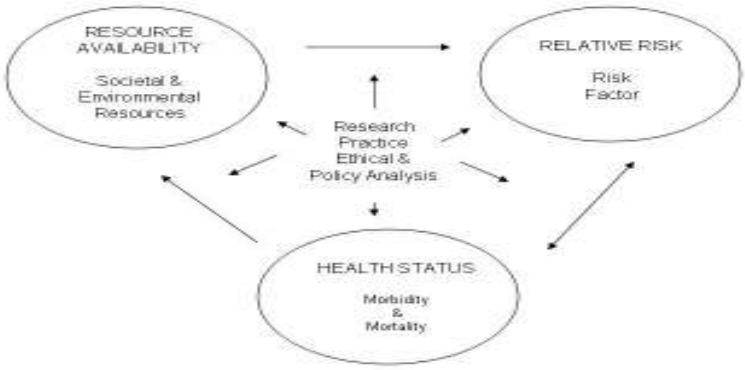


Figure 1. Vulnerable Populations Conceptual Model. Adapted from "Conceptualizing Vulnerable Populations Health-Related Research," by J. H. Flaskerud and B. J. Winslow, 1998, *Nursing Research*, 47(2), p. 70. Copyright 1998 by Lippincott-Raven Publishers

There are a variety of risk factors experienced by vulnerable populations cited by Flaskerud and Winslow (1998). These risk factors "reflect lifestyle, behaviors, and choices; use of screening procedures, immunization programs, and health promotion services; and exposure to or participation in stressful events including abuse, violence, and crime" (Flaskerud & Winslow, 1998, p. 4). The relationship between resource availability and relative risk is often clear. For example, Flaskerud and Winslow (1998) suggest that poor nutrition including obesity is associated with resource availability. Health status, the third concept in the model, is defined as "age and gender specific morbidity and mortality" (Flaskerud & Winslow, 1998, p. 5).

Vulnerable populations have higher relative risk related to lack of socioeconomic and environmental resources, and this greater relative risk is associated with increased morbidity and premature mortality; however, the relationship is complex. Exposure to risk may lead to a change in health status and subsequent additional risk. Ultimately in the model, feedback occurs between the increased morbidity and decreased socioeconomic and environmental resources (Flaskerud & Winslow, 1998). In summary, according to the VPM, vulnerable populations have limited available resources and are therefore at greater relative risk for morbidity and premature mortality.

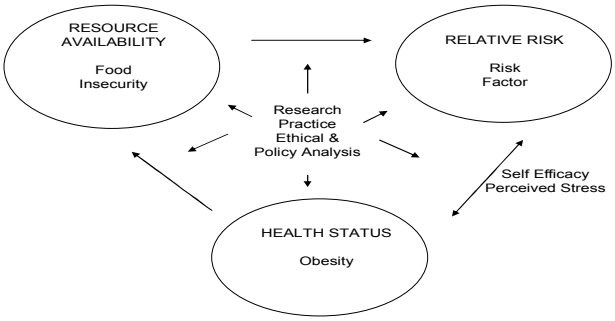
The VPM is a community level model, designed to focus research, practice, and policy addressing the needs of vulnerable populations from a community health perspective (Flaskerud & Winslow, 1998). This model well serves the explication of the relationship between food insecurity and obesity in women with limited socioeconomic resources. The societal nature of these problems is evident not only within existing research but also; it is illustrated through the attention of national bodies such as the

Institute of Medicine and the Robert Wood Johnson Foundation. However, the relationship between food insecurity (resource availability) and obesity (health status) has not been shown to be causal in nature.

In the VPM, decreased resource availability increases relative risk, which subsequently influences health status. An investigation of factors that influence the relationship between increased relative risk and subsequent health status would serve to further explain the relationship between food insecurity and obesity. Flaskerud and Winslow state: "The most challenging aspect of these models is identifying the large number of intervening variables that may moderate health outcomes" (1998, p. 6). In a review of literature exploring mediators of food insecurity and obesity, Franklin et al. (2011) identified gender, marital status, stressors, and food stamp participation as recently studied mediators of the relationship between food insecurity and obesity. The role of maternal stressors in food security and overweight has been examined in low-income children (Gunderson, Lohman, Garasky, Stewart, & Eisenmann, 2008); and the role of individual, maternal, and family stressors has been explored in relation to FI and adolescent overweight and obesity (Lohman, Stewart, Gundersen, Garasky, & Eisenmann). Additionally the association between family stressful experiences and child obesity has been investigated (Garasky, Stewart, Gundersen, Lohman, & Eisenmann, 2009). However, the role of perceived stress in influencing the relationship between FI and obesity in women with children has not been explored. Additionally the impact of GSE on the relationship between FI and obesity has not been previously examined in the study population. Therefore, it is appropriate to evaluate the role of general self-efficacy and perceived stress as mediators of the relationship between food insecurity and obesity.

In this study the concept of resource availability is related to the variable of food insecurity; the concept of relative risk is related to the increased risk of obesity within the vulnerable population of female heads-of-household with children; and the concept of health status is related to the variable of obesity as a disease process. The application of the VPM propositions would be that (a) food insecurity increases relative risk, (b) increased exposure to risk factors leads to increased obesity in female heads-of-household with children, and (c) obesity may feedback into food insecurity. General perceived stress and general self-efficacy would mediate the relationship between food insecurity and obesity (Figure 2

Figure 2. Application of the Vulnerable Populations Conceptual Model



General Perceived Stress.

The concept of perceived stress evolved from the seminal work of Lazarus and Folkman (1984) in which stress was identified as an interaction between the person and environment in which demands exceed resources. The encounter or transaction may be appraised by the individual as harmful or as a positive opportunity in which to overcome obstacles or challenge. Thus the cognitive appraisal of the transaction within the context

of coping resources influences the degree of perceived stress. This definition of perceived stress was further explicated in Cohen's work in the development of the Perceived Stress Scale (Cohen et al., 1983; Cohen & Williamson, 1988). The concept of perceived stress is clearly articulated as an individual's appraisal of a life event as threatening and the perception that coping resources are insufficient to address the threat.

Research into the concept of perceived stress has often been conducted to explore its relationship to health status (Delongis, Folkman, & Lazarus, 1988). Levenstein and colleagues (1993) focused on the exploration of perceived stress as it relates to psychosomatic influences on body changes. The investigation of physical changes related to stress is grounded in the fight-flight reaction and the depressive reactions. Environmental stress or perceived stress initiates the fight-flight reaction which consists of physiologic changes to prepare the body for reaction. When stress is perceived as overpowering the depressive reactions are initiated. The body prepares for survival by saving available energy. The hypothalamo-pituitary-adrenal (HPA) axis becomes hyperactive increasing the level of adrenocorticotropin hormone (ACTH) and cortisol levels. Growth hormone and hypothalamo-pituitary-gonadal axes are inhibited (Bjorntorp, 1996). These metabolic changes result in deposits of intra-abdominal, visceral adipose tissue and a related increase in waist-to-hip circumference ratio (Levenstein et al., 1993).

The first relationship proposed in the VPM is that lack of resources increases relative risk. The second relationship proposed is that risk factor exposure interacts with health status (Flaskerud & Winslow, 1998). The examples of risk factors experienced by vulnerable populations identified by Flaskerud & Winslow (1998) include exposure to or

participation in stressful events. It is congruent with this viewpoint to consider general perceived stress as a mediating variable influencing the relationship between food insecurity (resource availability) and obesity (health status). How an individual perceives the condition of demands exceeding resources (food insecurity) will influence the related physiological changes that lead to increased obesity.

General Self-Efficacy.

The concept of self-efficacy, defined as the belief that one can successfully perform a behavior required to produce specific outcomes, was formulated by Bandura (1977) as a theory to predict behavioral change. Efficacy expectations determine the amount of effort and persistence that individuals will display in the presence of adversity to achieve an outcome. Efficacy expectations vary according to magnitude, generality, and strength, thus accounting for differences in the performance of individuals within the same situation. Individual efficacy expectations are based on performance accomplishments, vicarious experience, verbal persuasion, and physiological states. Performance accomplishments refer to an individual's previous experiences. A pattern of success increases expectations of mastery which may lead to increased behavioral performance in other areas. Efficacy expectations may also be developed through vicarious experience. Individuals observe successful behavior in others which may then increase their confidence in their own capabilities. Additionally, verbal persuasion or the suggestion of success may facilitate coping. Lastly, emotional arousal may lead to cognitive appraisal of a stress producing situation that may inform perceived self-efficacy (Bandura, 1977). Contextual factors associated with events such as social or situational circumstances, will influence the appraisal of self-efficacy (Bandua, 1977).

The concept of self-efficacy originally was defined as task specific. However, as the use of the concept evolved, it was also conceptualized as general self-efficacy. General self-efficacy (GSE) is the ability to respond to a variety of stressful situations; it is not task specific (Luszczynska, Scholz, & Schwarzer, 2005). A general set of expectations is developed from an individual's previous experiences with success or failure in a variety of settings. An individual's expectations for performance in new situations are grounded in the pre-formulated generalized expectancies (Sherer et al., 1982). In commentary, Sherer (1990) states that self-efficacy expectancies occur on a range of generality and that this view of self-efficacy is congruent with Bandura's description of self-efficacy expectancies (Sherer, 1990). Bandura (1977) states "Efficacy expectations also differ in generality. ….Others instill a more generalized sense of efficacy that extends well beyond the specific treatment situation." (Bandura, 1977, p. 194).

In the VPM, it is proposed that lack of resources increases relative risk. Relative risk in vulnerable populations includes exposure to stressful events. Subsequently, risk factor exposure interacts with health status (Flaskerud & Winslow, 1998). It is congruent within the context of the VPM to consider general self-efficacy as a mediator in the relationship between food insecurity (resource availability) and obesity (health status). The individual's general ability to respond to the stressful situation of food insecurity and its antecedents will ultimately influence the health status outcome of obesity.

Empirical Literature

There is an absence of literature explicating the relationship among food insecurity, general perceived stress, general self-efficacy, and obesity. A relationship

between food insecurity (hunger) and obesity was first proposed by Dietz (1994) in a case study report. Subsequently, researchers have described and quantified both food insecurity and obesity and they have examined these variables within the context of the same investigation. Yet a specific mechanism for the linkage between food insecurity and obesity is unknown.

Food Insecurity and Obesity

In this section research studies that have explored the relationship between food insecurity (FI) and obesity will be discussed. Because of gender differences in the relationship between food insecurity and obesity, the literature presented will be delimited to studies that explored these variables in women or in which findings included the analysis by gender. Additionally, studies that have examined the relationship between food insecurity and overweight in women (Townsend et al., 2001) will be included. Although overweight and obese are operationally defined differently, these studies will be presented to substantiate the influence of food insecurity on weight.

Furthermore, the definition of food insecurity has changed across the span of literature presented. Prior to the development of a standardized measure of FI in 1995, there was lack of agreement and inconsistency in the measurement of FI (Wunderlich & Norwood, 2006). Studies in which data were collected prior to 1995, may support the association between FI and obesity, but can not be directly compared with studies that collected or incorporated data in which FI was measured using the USDA Household Food Security Survey Module. The literature review does not include studies conducted outside of the United States. Lastly, studies have been conducted using both cross sectional and longitudinal designs. The literature will be grouped by research design.

One of the first studies to identify a relationship between food insecurity and weight in women was conducted by Townsend, Peerson, Love, Achterberg, and Murphy (2001). Using data from the Continuing Survey of Food Intakes by Individuals (CSFII) for 1994, 1995, and 1996, FI, based on one question with four responses, and weight, based on adjusted self-reported heights and weights, were analyzed. Obesity (BMI = 30 kg/m^2) was not considered due to low numbers in the moderately and severely food insecure categories. In this study overweight was defined as BMI = 27.3 kg/m^2. Study results demonstrated a relationship between FI and overweight status in women ($p < 0.0001$, $N = 4,509$). In the category of mild FI ($n = 966$) 41 % of women were overweight as compared to 34% of food secure women ($p < 0.05$) and in the category of moderate FI ($n = 86$) 52% of women were overweight versus 34% of food secure women ($p < 0.05$). In a logistic regression model that included race, food security, age, education, amount of television watching, and vigorous exercise with income as a continuous variable, women with mild FI were 30% more likely to be overweight (OR 1.3, $p = 0.005$) than food secure women (Townsend et al., 2001).

In a study by Basiotis and Lino (2002), National Health and Nutrition Examination Survey (NHANES) data from 1988 to 1994 were analyzed to explore the relationship between food insufficiency and weight in women ages 19 to 55 who did not live alone. Data included measured BMI, food intake and food sufficiency. The authors describe a relationship between overweight (BMI = 25 kg/m^2) and food insufficiency; however, statistical analysis is not reported. In food insufficient households, 58 % of women ($n = 437$) were overweight while 47 % of women in food sufficient households ($n = 4,804$) were overweight. According to the authors, there was no significant

difference between women in food insufficient households and women in food sufficient households related to obesity. (Basiotis & Lino, 2002).

These studies support the relationship between FI and weight. However, the data that was used ranged from 1988 through 1996. Findings may not reflect the current prevalence of obesity in the U.S. population, nor the current relationship between FI and obesity.

Adams, Grummer-Strawn, and Chavez (2003) used data from the California Women's Health Survey (CWHS) from 1998 and 1999 to explore the relationship between food insecurity and obesity in women (N = 8169). FI was determined via a four question subset from the USDA Household Food Security Survey Module and obesity was defined as BMI $\geq$ 30 kg/m^2. The prevalence of FI in the sample was 18.2%. The prevalence of obesity varied by both FI category and race/ethnicity. Findings showed a higher prevalence of obesity in non-Hispanic White (NHW) women with FI without hunger (28.1%) than in NHW women who were food secure (15.6%). However there was a lower prevalence of obesity in NHW women with FI with hunger (26.5%) than in NHW women with FI without hunger (28.1%). Whereas in women of other race/ethnicities, the prevalence of obesity was highest in women with FI with hunger which is reflected in the prevalence of obesity in all women (food secure 16%; FI without hunger 29.7%; FI with hunger 35.2%). A stratified logistic regression analysis was performed that demonstrated NHW women who were FI without hunger were 36% more likely to be obese than food secure NHW women (Adjusted OR 1.36 [1.00, 1.84]; $p <$ 0.05). Asian, Black, and Hispanic women were 1.47 times more likely to be obese in the presence of FI without hunger (Adjusted OR 1.47 [1.07, 1.94]; $p < 0.05$) and 2.81 times

more likely to be obese in the presence of FI with hunger (Adjusted OR 2.81 [1.84, 4.28]; $p < 0.05$) than Asian, Black, and Hispanic women who were food secure (Adams, Grummer-Strawn, & Chavez, 2003).

Laraia, Siega-Riz, and Evenson (2003) conduced a cross-sectional analysis using 1999 data from the Behavioral Risk Factor Surveillance System (BRFSS) to evaluate the association between concern about food and obesity among adults in New York (n = 2,641) and Louisiana (n = 1,667). The BRFSS question, part of the optional Social Context Module, asked "In the past 30 days, have you been concerned about having enough food for you or your family" (Laria, Siega-Ritz, & Evenson, 2003, p. 176). The survey question is considered a measure of food security (Laria, Siega-Ritz & Evenson).

Prevalence analysis showed that in Louisiana women (10.0%, prevalence ratio 1.8 [1.1, 2.8]) were more likely to be concerned about enough food than men (5.8%, prevalence ratio 1.0). In New York the prevalence was similar (female 12.8%, prevalence ratio 1.2 [0.89, 1.68]; male 10.7%, prevalence ratio 1.0). Multivariate logistic regression was used to analyze the data and control for sex, age, race/ethnicity, education, income, marital status, and general health. In the final model only those confounders that changed the beta coefficient of the BMI variable by greater than 10% were included. Individuals who were normal weight, overweight, and obese had similar concern about having enough food. In the morbidly obese category (BMI $\geq$ 35 kg/m^2), individuals were twice as likely to be concerned about having enough food (Louisiana 17.4%, RR 2.1 [1.13, 4.02]; New York 18.2%, RR 2.2 [1.21, 3.85]). However, in the final model, controlling for education, income, race/ethnicity, marital status, and general health, the relationship between concern for food and morbid obesity was non-significant (Louisiana, RR 1.52

[0.76, 3.02]; New York, RR 1.54 [0.84, 2.83]). The authors state that in examining stratified models, gender did not modify the relationship between morbid obesity and concern about enough food. They discuss the possible explanations to include a hidden association related to the use of cross sectional data versus longitudinal data and FI as a mediator of the relationship between socioeconomic variables and obesity. A recommendation for further research is to explore the complexities of the association between FI and obesity (Laraia, Siega-Riz, & Evenson, 2003).

Holben and Pheley (2006) explored the relationship of food insecurity and measures of several chronic health risks, including obesity, in households in rural Appalachian Ohio. Data for the study was collected over a three month period in 1999 and consisted of a survey (N = 2,580) and a limited clinical health examination (n = 808). Food insecurity was measured within the context of the survey using the USDA Household Food Security Survey Module. BMI was calculated using measured height and weight. Overall, 27.2% (n = 701) of the study sample was classified as a member of a food insecure household with and without hunger. The authors recognize that 10.1% of U.S. households were classified as food insecure with and without hunger for the same time frame. The study explored the relationship between food insecurity and weight by gender. Women who were considered food insecure (with and without hunger) had a mean BMI of 30.8 kg/m^2 (SD 8.1) compared to a mean BMI of 29.0 kg/m^2 (SD 6.8) in food secure women (t1272 = -2.0, p = 0.04) (Holben & Pheley, 2006).

In a multiple regression analysis of cross sectional data from NHANES for 1999-2002, Hanson, Sobal, and Frongillo (2007) examined the relationship among food insecurity, gender, marital status, and body weight. Data from a sample of 4,338 men and

4,172 women were analyzed. In this data set BMI was calculated from measured heights and weights in 7,699 respondents and self reported heights and weights in 449 men and 362 women. FI was measured at the household level using the 18-question USDA Household Food Security Survey Module. Analysis of data revealed differences by gender in the relationship between FI and obesity. When compared with food-secure, obese men, obese men with low food security (*n*= 377) had lower BMI's (-4.7 ± SE = 3), as did obese men with very low food security (*n* = 189), (-0.4 ± SE = 5.2). Whereas when compared to food-secure obese women, obese women who were marginally food secure (*n*= 315) had higher BMI's (5.5 ± SE = 3.7), as did obese women with low food security (*n* = 349) (10.8 ± SE = 2.6, p = <0.01), and obese women with very low food security (*n* = 176) (0.3 ± SE = 3.6). Overall there was a higher likelihood of obesity among married women (+ 14.0 percentage points, $p < 0.05$), among food-insecure women living with partners (+ 20.0 percentage points, $p < 0.05$), and among food-insecure widowed women (+16.9 percentage points, $p < 0.05$) This research supports the relationship between food insecurity and obesity in women with low food security and it confirms the presence of a gender differences among the study variables (Hanson, Sobal, & Frongillo, 2007).

Martin and Ferris (2007) conducted a study to examine the relationships among adult obesity, childhood overweight and food insecurity in a convenience sample of parents (*n* = 200) and their children (*n* = 212). Household food security was measured via the USDA Household Food Security Survey Module and heights and weights were measured. The categories of underweight, healthy weight, overweight, obese, and severely obese were defined according to the Centers for Disease Control using BMI. In

analysis the obese and severely obese categories were combined. The researchers did not collect gender data for adults, as the sample was predominantly female. In the adult regression model (n = 176), analysis found that food insecurity was a predictor of obesity in adults (OR 2.45 [1.15, 5.25] p = 0.02). However, food insecurity was not a significant predictor of overweight status in adults (Martin & Ferris, 2007).

The relationship between food insecurity and obesity was explored in a cross sectional study of patients in New York City primary care clinics (Karnik et al., 2011). The authors included male and female adults and children within the sample (N = 558). Data were collected in primary care sites using a two question food insecurity assessment from the USDA Household Food Security Survey Module and measurements of height and weight. Additionally, enrollment in Women, Infants, and Children and Supplemental Nutrition Assistance Program were determined. The authors report a significant association between food insecurity and BMI in women (1.19 [0.41, 1.97], p = 0.003) (Karnik et al., 2011).

Laria, Siega-Riz, and Gundersen (2010) investigated the relationships among FI and self-reported pregravid weight status, gestational weight gain, and pregnancy complications using data collected between January 2001 and June 2005 from the Pregnancy, Infection, and Nutrition cohort. The analysis was limited to women with incomes ≤ 400% of poverty ratio (N = 810). Pre-pregnancy weight was self reported with a prevalence of 13% underweight, 42% normal weight, 12% overweight, 17% obese, and 16% severely obese. Household food insecurity was determined using the USDA Household Food Security Survey Module. In the adjusted regression models that controlled for age, race, maternal education, marital status, number of children, and

income, women living in households with marginal food insecurity were found to have pregravid weights that were overweight (>26 kg/m^2 to 29.0 kg/m^2 BMI) (Adjusted OR 1.22 [0.60, 2.45]), obese (> 29 kg/m^2 to 35.0 kg/m^2 BMI) (Adjusted OR 0.97 [0.50, 1.88]), or severely obese (≥ 35 kg/m^2 BMI) (Adjusted OR 1.73 [0.95, 3.17]).Women living in households with food insecurity had pregravid weights that were overweight (Adjusted OR 2.11 [0.92, 4.82]), obese (Adjusted OR 1.53 [0.68, 3.43]), or severely obese (Adjusted OR 2.97[1.44, 6.14]) (Laria, Siega-Riz, and Gundersen, 2010).

Martin and Lippert (2012) explored the relationship between income and weight in which food insecurity was proposed to mediate the relationship. The management of food insecurity was viewed to be gender based in the presence of children in the household. Data from the Panel Study of Income Dynamics from 1999, 2001, and 2003 with the sample restricted to men and women of childrearing age (18 to 55) who are heads or partners of households were used for analysis (N = 7,931). FI was measured using the USDA Food Security Scale and BMI was calculated from self-reported height and adjusted self-reported weight. Cross sectional ordinal logistic regression models in which both the presence of a child and household food insecurity are included, found a significant interaction in women for heavier weight (1.106, SE 0.40, $p < 0.01$). Further model analysis found that in single women (n = 2,068) the presence of household food insecurity and a child predicted heavier weight classification (1.471, SE 0.54, $p < 0.01$). Finally, in testing alternate mediating pathways to control for physical activity, smoking and alcohol use, food stamps and WIC participation, and inclusion of all six pathways, the interaction of food insecurity and the presence of children was significant (Martin &

Lippert, 2012). These findings support the further exploration of the relationship between FI and obesity in female heads of households with children.

Recent research by Leung, Williams, and Villamor (2012) was designed to further examine the associations of FI and BMI. Exploration of the relationship was conducted using data collected through the California Health Interview Survey (CHIS) from 2003, 2005, 2007, and 2009. The sample was restricted to adults 18 to 65 years and those with household incomes at or below 200% of the federal poverty level (N = 35,747). FI was measured using the 6-item short form version of the USDA Household Food Security Survey Module and obesity was calculated using self-reported height and weight. This study was designed to compare the associations within gender and racial/ethnic categories. Within women, Hispanic women with very low food security had a higher BMI (p = 0.003) and a 22% higher prevalence of obesity (p = 0.001) compared with food secure Hispanic women. Asian women with low food security had a higher BMI (p = 0.008) compared with food secure Asian women. There were no significant associations between FI and obesity among women of other race/ethnicity. Additionally, the relationship between FI and obesity was significant in food insecure Hispanic men when compared to food secure Hispanic men. Comparable findings were present in multi-racial men (Leung, Williams, & Villamore, 2012). This study found that the relationship between FI and obesity was modified by gender and race/ethnicity within this population.

A study conducted by Robaina and Martin (2013) examined the relationship among FI, diet quality and obesity. This study was performed using data collected from a convenience sample of 212 food pantry participants collected over a 12-month time frame. Food insecurity was measured using the USDA Household Food Security Survey

Module and obesity was calculated from measured height and weight. In bivariate analysis, food insecurity was not significantly associated with obesity ($p = 0.48$). In the logistic regression model predicting obesity, food security was not significant (OR 1.1 [0.5, 1.5], $p = 0.86$) (Robaina & Martin, 2013).

Researchers identified the use of cross sectional data as a limitation to research in the area of food insecurity and obesity. Several longitudinal studies were conducted. In a retrospective analysis of NHANES data, Wilde and Peterman (2006) examined data from the 1999-2000 and 2001-2002 data collection periods to investigate the relationship between food security status and change in weight over time. The NHANES determines household food security category via the 18-item USDA Household Food Security Survey Module. Measured height and weight were obtained in the NHANES mobile examination centers. The Weight History Questionnaire collected self-reported past and current weights. In this analysis, 84.07 % of women were food secure, 6.16 % were marginally food secure, 6.15% were food insecure without hunger, and 3.62% were food insecure with hunger ($N = 5,080$). In bivariate comparisons, the prevalence of obesity was highest in women who were food insecure without hunger (46.34%) and women who were marginally food secure (43.06%) when compared with women in food secure households (30.85%) In a multivariate logistic regression analysis that controlled for education, race/ethnicity, household income, and current health status, women in marginally food insecure households (OR 1.58 [1.11, 2.24], $p < 0.05$) and women in food insecure without hunger households (OR 1.76 [1.44, 2.15], $p < 0.05$) were more likely to be obese when compared to women in food secure households. The prevalence of weight gain of 2.27 kg (5 lb.) was greatest in women who were in food insecure without hunger

households (46.09%, $p = 0.05$) and marginally food secure households (45.21%, $p = 0.05$) when compared with women in food secure households (31.08%). The prevalence of weight gain of 4.54 kg (10lbs) was greatest in women in marginally food secure households (34.62%, $p = 0.05$), followed by women in food insecure without hunger households (32.88%, $p = 0.05$) and food insecure with hunger households (30.56%, $p = 0.05$) when compared with women in food secure households (20.71%) (Wilde & Peterman, 2006).

Jones and Frongillo (2006) articulated the need to further investigate the relationship between food insecurity and obesity because prior research was conducted using cross sectional data. They conducted a study using data from the Panel Study of Income Dynamics, a longitudinal study of U.S. households that included food insecurity data at the household level measured using the USDA Household Food Security Survey Module and self –reported heights and weights in 1999 and 2001. The amount of weight gain and food security status was analyzed in women ($N = 5303$). Women who gained more than 2.3kg in two years and who were overweight at baseline, gained on average 2.2 kg more if they were food secure then if they were food insecure (overweight food secure $\mu = 8.8$kg, overweight food insecure $\mu = 6.6$ kg, $p < 0.004$). Additionally, women who were food insecure and overweight at baseline gained less additional weight than those who were food insecure and not overweight at baseline (food insecure overweight $\mu = 6.6$ kg, food insecure not overweight $\mu = 9.0$, difference = μ 2.4, $p < 0.002$). In multivariate analysis, food insecurity was not a predictor of amount of weight gain (Jones & Frongillo, 2006).

In recognition of the need to further explore change in weight status, Whitaker and Sarin (2007) conducted a longitudinal study in a birth cohort study to determine if changes in weight were related to food security status. Women were surveyed after delivery, and at one, three, and five years later. Height and weight were measured and BMI calculated to determine obesity (BMI $\geq$ 30 kg/m^2). Food security was determined using the USDA Household Food Security Survey Module. Responses were used to assign food secure, marginally food secure and food insecure classifications. The final sample consisted of 1,707 subjects at follow-up. Multivariate logistic regression analysis in the first model demonstrated an association between food security and obesity in women who were marginally food secure (46.1% obese, OR 1.34 [1.04, 1.73]) and women who were food insecure (47.6% obese, OR1.42 [1.07, 1.89])at baseline. At two year follow-up, 51.2% of women were obese who were marginally food secure (OR 1.46 [1.13, 1.88]) and 50.2% of women were obese who were food insecure (OR 1.40 [1.06, 1.86]). However, when the analysis model included covariates the associations were no longer significant. The relationships between food security status and weight change, and change in food security status and baseline BMI were not significant when chi-square analysis was completed. Furthermore, in linear regression analysis with weight change as a continuous value, mean weight change did not differ by food security status (Whitaker & Sarin, 2007).

Also identifying the need for a longitudinal study, Olson and Strawderman (2008) performed a study to clarify the direction of the relationship between food insecurity and obesity in women using data from the Bassett Mothers Health Project. Food insecurity was measured at baseline (early pregnancy) using three items from the women's medical

record from the Institute of Medicine's Nutrition Questionnaire. Food insecurity at two years postpartum was measured using three questions from the USDA Household Food Security Survey Module. Weight status was determined through the use of BMI categories. At the point of two year postpartum analysis, the sample of women with complete data was 311.

Chi-square analysis was performed to determine associations between food insecurity and obesity within and across the two time points of early pregnancy and two years postpartum. Within time period analysis showed that food insecurity was associated with obesity at two years postpartum ($p = 0.04$), but not in early pregnancy ($p = 0.82$). In between group analyses, food insecurity in early pregnancy was not associated with obesity at two years post partum ($p = 0.48$). Obesity in early pregnancy was associated with food insecurity at two years post partum ($p = 0.001$). Lastly, there was an association over time in both food insecurity and obesity ($p = 0.0001$). Multivariate logistic regression models showed that food insecurity in early pregnancy was not associated with obesity at two years. There was a significant relationship between obesity in early pregnancy and food insecurity at two years (OR 2.45 [1.21, 4.95], $p < 0.05$) and obesity at two years (OR 515.7 [118.8, > 999], $p < 0.05$). Additionally, obesity and food insecurity at early pregnancy were related to major weight gain (gaining 4.55 kg or more at 2 years postpartum than in early pregnancy) at two years (OR 7.26 [1.28, 41.15], $p < 0.05$). The authors interpret these results as providing support for a causal influence of obesity on food insecurity. Furthermore, they suggest that the relationship between women who are obese and food insecure and weight gain warrants further investigation to determine common factors (Olson & Strawderman, 2008). The findings from this

study support the feedback mechanism between health status and resource availability proposed in the VPM (Flaskerud & Winslow, 1998). Additionally, they further clarify the relationship between FI and obesity.

Food Insecurity and Perceived Stress

In this section literature that supports the exploration of perceived stress as a mediator of the relationship between food insecurity and obesity will be presented. There is a lack of literature explicating the direct relationship between food insecurity and perceived stress. Additionally, there is a lack of evidence from studies conducted in the study population of female heads-of-households with children. However, the variables are associated within the body of literature pertaining to food insecurity.

Chilton and Rose (2009) discuss the issue of food insecurity in the United States from a human rights approach, discussing the link between the right to food and food security. From their perspective food insecurity is an outcome of social and economic processes that result in lack of access to food. The factors identified are supported as linked to poverty. Food insecurity is viewed to increase vulnerability and the variables of anxiety, stress, depression, and violence are presented within the discussion of vulnerability, supporting the relationship between food insecurity and general stress.

In a phenomenologic study performed by Chilton and Booth (2007), stress emerged as a major theme associated with hunger in a sample ($N = 34$) of African American women participants recruited from food pantries in Philadelphia. Stevens (2009) conducted a descriptive study in a sample of mothers age 15 to 24 ($N = 21$). Individual interviews and cognitive interviews were conducted in which stress related to adequate food for children was described.

In a study of food insufficiency and women's mental health, data from mothers aged 18 through 54 collected in three waves of the Women's Employment Study (N = 753) were analyzed to explore the relationship between food insufficiency and mental health. The authors state that food insufficiency may be experienced as stressful and persistent stressful life events are associated with chronic depression (Heflin, Siefert, & Williams, 2005, p. 1973).

Bisgaier and Rhodes (2011) explored the relationships among adverse financial circumstances and patient health behaviors and health status determined by self-rated health, stress level, and depressed mood. The study was a secondary analysis of a prospective, cross-sectional convenience sample (N = 1, 506) of non-emergent adult patients presenting to an emergency department. Subjects experiencing all five variables of adverse financial circumstances (food insecurity, housing instability, employment concerns, cost-related medication non-adherence and cost barriers to accessing physician care), had an increased level of high stress (Adjusted OR 24.7 [9.3 – 65.2], $p < 0.05$).

Empirical findings from international studies also support the relationship between food insecurity and stress. Booth and Smith (2001) in a review of food insecurity in Australia discuss stress associated with food insecurity. Vozoris and Tarasuk (2002) investigated the prevalence of household food insufficiency in Canada and the relationship of food insufficiency and physical, mental and social health. Data from the 1994 National Longitudinal Survey of Children and Youth and the National Population Health Survey collected between 1996 and 1997 were used (N = 210,377). One individual from each household was selected for assessment of health including a distress index. The odds of individuals in a food insufficient household being assessed as

experiencing distress were 31.8% (OR 2.9 [2.4 – 3.5]) as compared to 9.9% in food sufficient households Vozoras & Tarsus, 2002).

Perceived Stress and Obesity

Support for the consideration of perceived stress as a mediator between food insecurity and obesity requires evaluation of the relationship between perceived stress and obesity. The concept of stress has been linked to obesity in the empirical literature; however, there is limited literature in which the variables have been directly linked. In this section studies that have investigated the relationship between perceived stress and weight will also be included.

Strickland, Giger, Nelson, and Davis (2007) conducted a study to examine the relationships among stress, coping, social support, and weight in a sample of premenopausal African American women ($N = 178$) as risk factors for coronary artery disease. General stress was measured using Cohen's Perceived Stress Scale (PSS). Although there were higher mean scores on the PSS among overweight and obese women (normal = 22.63, overweight = 23.85, obese = 23.97), the p values were non-significant. Although the variables of social support, perceived stress, and life events were not significantly different related to weight, the values were in the expected direction as discussed by the authors (Strickland, Giger, Nelson, & Davis, 2007).

In a study conducted by Tomiyama, Dallman, and Epel (2011), the relationships between high stress, emotional eating, sagittal diameter, BMI, and HPA axis activity in a sample of women *(*$N = 59$) were examined. Participants' scores on the PSS were used to assign stress level categories. It was found that the high stress group had higher levels of emotional eating than the low level stress group (3.16 vs. 2.18, $p = 0.05$); greater sagittal

diameter (20.92 vs. 18.24, $p = 0.05$), and lower cortisol output in response to a lab stressor (51.15 vs. 158.24, $p = 0.03$). These results indicate that highly stressed women had greater emotional eating, increased abdominal fat and decreased response to acute stress indicative of the chronic stress response network (Tomiyama et al., 2011).

Research has been conducted to explore the physiologic relationships between stress and obesity in women. Based on the work of Bjorntorp and Rosmond related to HPA axis changes associated with visceral obesity, Farag and colleagues (2008) explored the relationships among perceived stress levels, hemodynamic and lipid profiles, and cortisol peak-nadir differences in obese women as compared to normal weight women ($N = 78$). The study was conducted as part of a community-based research study at a worksite wellness program. Psychological stress was measured using the PSS. In a final regression model, stress predicted 11% of the variability in diurnal cortisol variation across all weight categories ($R^2 = 0.11$, $p < 0.005$) and perceived stress and waist circumference explained 35% of diurnal cortisol variation in overweight women ($R^2 = 0.35$, $p < 0.011$). The authors conclude that although causality cannot be established, higher stress levels caused altered HPA axis function which subsequently contributed to increased BMI (Farag et al., 2008).

Block, He, Zaslavsky, Ding and Ayanian (2009) explored the association of weight gain with types of psychosocial stress related to work, personal relationships, life constraints, and finances over nine years. Data collected in 1995 from the Midlife in the United States study and data collected from surviving participants in 2004 were analyzed ($N = 1,355$). The survey was constructed from existing stress scales. Significant interactions were found in women for job-related demands ($\beta = 0.18$, SE = 0.05, $p <$

0.001), perceived constraint in life (β = 0.06, SE = 0.02, $p < 0.001$), strain in relations with family (β= 0.08, SE = 0.08, $p = 0.016$), difficulty paying bills (β = 0.06, SE = 0.02, $p = 0.010$), and generalized anxiety (β = 0.32, SE = 0.09, $p = 0.001$). Greater psychosocial stress was associated with greater weight gain in significant interactions (Block, He, Zaslavsky, Ding & Ayanian, 2009).

A study of psychosocial stress, obesity, adiposity, and dietary intake in Hispanic/Latino adults was conducted using a subset of participants from the Hispanic Community Health Study/Study of Latinos ($N = 5077$). Both chronic stress burden and perceived stress over the last month were measured. Analysis indicated that individuals experiencing at least three chronic stressors were more likely to be obese than those without stressors (OR 1.5 [1.01 to 2.1]) (Isasi et al., 2015).

Additionally indirect literature supports the relationship between perceived stress and obesity. A study of the prevalence of coexisting depressive symptoms among overweight and obese US born and immigrant Latino adults ($N = 177$) was conducted in which perceived stress was evaluated as a correlate of depression. Perceived stress, measured using the PSS, was the only significant correlate of depressive symptoms on multivariate analysis (OR 6.5, [2.7-15.6]) (Boutin-Foster & Rodriguez, 2008). The relationship between psychological factors of perceived stress and depressive symptoms and dietary energy density in overweight working adults was explored in a prospective cross-section correlation study (N = 87) (Grossniklaus et al., 2010). Although perceived stress was not a significant predictor of dietary energy density in the models tested, the investigators attributed this finding to low levels of stress among the study participants (Grossniklaus et al., 2010). Tomiyama et al. (2014) conducted a study of the relationship

between weight stigma and cortisol levels, as well as the relationship between weight stigma and oxidative stress. The study was conducted with data from participants in a randomized waitlist-controlled trial of mindfulness-based intervention for stress eating (N = 47). Initially perceived stress was viewed as a confounding variable; however, the investigators found that perceived stress mediated the relationship between weight stigma consciousness and cortisol awakening response ($\beta = 0.33$, $p < 0.05$).

Additional support for the exploration of the relationship between general perceived stress and obesity is found in international studies. Roberts, Troop, Connan, Treasure, and Cambell (2007) report the results of a longitudinal naturalistic study to explore the effects of perceived stress on cortisol secretion, food choice, dietary restriction, mental health and bodyweight conducted in a sample of healthy women (N = 71) in the United Kingdom. After 12 weeks, 56% of the participants had gained weight. This group had the highest baseline BMI, elevated baseline weight concern and dietary restraint scores. They also had the most significant increase in cortisol levels at the end of the study. Analysis determined a fall in dietary restraint mediated the relationship between change in cortisol and change in BMI. After analysis, the final regression model demonstrated an interaction of dietary restraint at baseline and the change in cortisol (-0.006 [-0.01 to -0.001]; T(64) = -2.59, $p < 0.05$)and main effects of dietary restraint at baseline (-0.25 [-0.40 to -0.11]; T(64) = -3.41, $p < 0.001$), change in cortisol (-0.002 [-0.016 to 0.011]; T(64) = -0.36, $p = 0.72$), change in weight concern (0.15 [0.04 to 0.26]; T(64) = 2.74, $p <0.01$), and change in mastery (0.09 [0.31 to 0.15]; T(64) = 3.08, $p < 0.01$) (Roberts et al., 2007).

The relationships between perceived psychosocial stress and cardiovascular risk factors were investigated in a sample of Bhutias of Sikkim, India ($N = 398$). The PSQ was used to measure perceived stress level. In the data analysis, multiple regression was performed using perceived stress score index as a predictor of log-transformed cardiovascular disease risk factor variables. In females ($n = 195$) perceived stress was significant for BMI ($\beta = 0.244$, $p < 0.01$) and waist to hip ratio ($\beta = 0.278$, $p < 0.01$) (Sarkar & Mukhopadhyay, 2007).

Perceived stress was evaluated as a mediator in the relationship between interpersonal support and health –promoting behavior among women with abdominal obesity in Seoul, South Korea. Perceived stress, measured by Cohen's Perceived Stress Scale, was found to have a negative correlation with Health Promoting Lifestyle Profile-II ($r = -0.37$, $p < 0.001$, N = 126) (Hyun, Jae, Choo, I. H., & Choo, J., 2013). In Greece a pilot study was conducted of a stress management program's effect on obesity in a sample of overweight and obese women ($N = 34$). After the intervention, the treatment group ($n = 18$, -4.44 (0.83) kg) lost more weight than the control group ($n = 16$, - 1.38 (0.78) kg, $p < 0.05$). (Christaki et al., 2013).

Food Insecurity, Perceived Stress, and Obesity

In an analysis of Behavioral Risk Factor Surveillance System (BRFSS) data, Pan, Sherry, Njai, and Blanck, (2012) explored the relationship between food insecurity and obesity. The study was designed to use 2009 data in which a food insecurity question was redesigned to ask about stress associated with the affordability of nutritious meals. The study was constructed to examine the association between food insecurity and obesity in the twelve states that used this module question ($N = 75,103$). The measurement of FI

using the redesigned question was considered a substitute for the 18-question USDA Household Food Security Survey Module. BMI was calculated from self-reported height and weight. The total prevalence of food insecurity using the redesigned FI question was 19.0% (n = 66,553). The prevalence of FI among obese adults in the sample (24.7%, p = 0.0001) was greater than the prevalence among normal weight adults (16.4%). FI was more prevalent in women (21.2%) when compared to men (16.9%). The prevalence of obesity among food insecure women (37.2% [34.7-39.7] p = 0.001) was greater than the prevalence of obesity among food secure women (22.8% [21.8-23.9] p = 0.001). Multiple regression analysis adjusted for age, race/ethnicity, education level, household income, marital status, employment status and number of children in the household found that food insecure women had a greater probability of obesity (1.48 Adjusted OR [1.27-1.72]) than food secure women. The multivariate regression analysis did not find a significant relationship between FI and obesity in men (Pan et al.) The study, through the inclusion of stress within the definition of FI, serves to link the variable of stress with FI and obesity.

A cross-sectional study of associations between food insecurity, SNAP benefits per household member, perceived stress, and BMI was conducted by Jilcott, Wall-Bassett, Burke, and Moore (2011). Data were obtained from a convenience sample of female SNAP participants. Household food insecurity was measured using the 18-item USDA Household Food Security Survey Module, perceived stress was measured using Cohen's Perceived Stress Scale, and BMI was calculated using measured height and weight. Data analysis revealed that FI was positively associated with BMI (r = 0.18; p < 0.05); perceived stress was positively associated with FI (r = 0.36, p < 0.0001). However,

perceived stress was not associated with BMI. Results of a multivariate linear regression model, indicated that BMI was positively associated with FI (parameter estimate = 0.48, SE = 0.23 $p = 0.04$) when adjusted for age and physical activity. Perceived stress was positively related to FI (parameter estimate = 0.9, SE = 0.18 $p < 0.0001$) with inclusion of SNAP benefits per household member and perceived stress included in the model adjusted for race (Jilcott et al., 2011). This study furthers the linkage of stress with FI; however the absence of a significant relationship with obesity is a contrasting result. The role of perceived stress in mediating the relationship between FI and obesity requires further investigation.

Food Insecurity and Self-Efficacy

There is a lack of evidence explicating the relationship between food insecurity and general self-efficacy. However, the concepts are linked together in the empirical literature. Research has been conducted in which social cognitive theory constructs, including self-efficacy, have been studied in relation to sociodemographic factors.

Dressler and Smith (2013) examined the role of environmental, personal, and behavioral determinants of BMI in a cross-sectional survey of low-income women. A survey was developed using qualitative data from focus groups to examine environmental, personal, and behavioral constructs, as well as food-related self-identity. Food security was measured using the USDA short-form Household Food Security Survey Module and measured heights and weights were obtained. Food insecurity was present in the sample ($N = 330$ women), with 61% with low or very low food insecurity. Within the data analysis, the personal construct explained 31% of the variance in BMI and five of the survey questions were significant (Dressler & Smith, 2013). Although not

specifically addressing the relationship between food insecurity and self-efficacy these concepts are associated in the study.

Food insecurity has been studied in conjunction with task specific self-efficacy in several studies. In a study designed to investigate the association between household food insecurity and health care access/utilization through a cross-sectional survey in a sample of Latinos with type 2 diabetes ($N = 211$) living in Hartford County. The self-efficacy subscale of the Multidimensional Diabetes Questionnaire was used to measure self-efficacy and the short form version of the USDA Household Food Security Survey Module was used to measure food security (Kollannoor-Samuel et al., 2011). Vijayaraghavan, Jacobs, Seligman, and Fernandez (2015) conducted a study to explore the role of food insecurity as a mediator of the relationship between housing status and diabetes self-efficacy in a sample of low-income participants with diabetes ($N = 711$). Food insecurity was measured using the USDA Household Food Security Survey Model short version and diabetes self-efficacy was measured using the Self-efficacy for Diabetes Scale. Food insecurity was present in 45.7% of the sample ($n = 325$). The mediation model analysis suggested that food insecurity was a mediator in the relationship between place to live and diabetes self-efficacy (Vijayaraghavan et al., 2011). The relationship between food insecurity, hemoglobin A_{1c}, self-efficacy, and fruit/vegetable intake was investigated in a sample of patients ($N = 665$) from low-income primary care clinics (Lyles et al., 2013). The study was a secondary analysis of data from a diabetes educational intervention. At baseline, mean diabetes self-efficacy in food insecure individuals was lower than diabetes self-efficacy in food secure individuals

(food insecure $u = 3.3$, SD 0.5; food secure $u = 3.6$, SD 0.4; $p < 0.001$) (Lyles et al., 2013).

The variables were associated in a study that included chronic illness general self-efficacy. Seligman, Davis, Schilinger and Wolf (2010) conducted a study of the relationship between food insecurity, diabetes self-management, and frequency of episodes of hypoglycemia in a sample of participants ($N = 40$) from a study of health literacy and cardiovascular disease. Self-efficacy was measured using a five-item chronic illness general self-efficacy scale. The relationship between food insecurity and indicators of diabetes self-management such as self-efficacy were found to be significant. The mean self-efficacy score was lower among food-insecure participants (34.4) than food secure (41.2; $u = 38.9$, SD 8.6, $p = 0.02$) (Seligman et al., 2010).

These examples support the examination of the relationship between food insecurity and general self-efficacy within the testing of general self-efficacy as a mediator of food insecurity and obesity.

Self-Efficacy and Obesity

The concept of self-efficacy is often found associated with obesity or BMI as task specific self-efficacy, often related to exercise or healthy eating. Dennis and Goldberg (1996), recognizing heterogeneity among obesity treatment clients, performed a study to identify weight-control self-efficacy categories through Q methodology. In a sample of moderately obese women *(N* = 54), two types of weight-control self-efficacy categories were identified; assureds and disbelievers. Participants who were identified as having assured self-efficacy had greater weight loss over the course of treatment. Post-treatment data analysis, which included change in self-efficacy categories, revealed continued

weight loss for participants with assured self-efficacy (Assureds (n = 32), 13 ± 7; Disbelievers (n = 22) 7 ± 6, $p < 0.01$) (Dennis & Goldberg, 1996).

In a randomized controlled trial of an experimental cognitive behavioral intervention for weight loss in middle-aged overweight or obese primary care patients (N = 665), baseline data were used to examine if psychosocial and behavioral variables mediate the relationship between sociodemographic factors and BMI (Baughman et al., 2003). In the regression analysis, self-efficacy for exercise and self-efficacy for healthy eating were not significantly related to weight categories. Furthermore, the addition of these variables to the regression analysis did not eliminate the relationship between four of the psychosocial variables and BMI (Baughman et al., 2003).

A study of modifiable psychosocial constructs and dietary components was performed in a sample of overweight men (N = 441). Psychosocial measures were developed by the authors, including self-efficacy, related to four dietary behaviors. In the final regression models, self-efficacy was significant in fiber ($B^2 = 0.126$, $p = 0.011$), fruit ($B^2 = 0.205$, $p < 0.0001$) and vegetables ($B^2 = 0.174$, $p < 0.0001$) (Hagler et al., 2007).

A secondary analysis of data from the PREFER study, an 18-month behavioral weight-loss study in adults with a BMI between 27 and 43, was performed to examine self-efficacy related to changing eating behaviors. Self-efficacy for eating behaviors was measured via the Weight Efficacy Lifestyle Scale (WEL). Mean weights and WEL scores were measured for the total sample (N = 170) at baseline, 6, 12, and 18 months. The greatest self-efficacy increase (11.81 [SD = 28.83], t(169) = 5.34, $p < 0.001$) was from baseline to 6 months which was the point of greatest weight loss (-6.61kg [SD = 5.55],

$t(169) = 15.54$, $p < 0.001$) The authors suggest that increased weight loss specific self-efficacy supports weight loss in the intervention study (Warziski et al., 2008).

In a study of an urban food store intervention and psychosocial factors in a sample of low-income inner-city residents ($N = 175$), healthy eating self-efficacy was measured in a section of the Customer Impact Questionnaire developed for the study. In multiple linear regressions performed to assess program impact, the differences between intervention and comparison groups related to psychosocial factors were not statistically significant including healthy eating self-efficacy (Gittelsohn et al., 2010);

A comparative explanatory study was performed by Capers, Baughman, and Logue (2011) to explore the role of sociodemographic and psychosocial factors in explaining differences in obesity (dietary and exercise behavior) between African American (AA) ($n = 173$) and European American (EA) ($n = 278$) women. The study was conducted using data from the Reasonable Eating and Activity to Change Health (REACH) trial with participants from the included family medicine practices with a BMI of 27 kg/m^2 and age 40 to 69 years. The psychosocial factors included exercise self-efficacy, measured by a modified version of a scale developed by Marcus, Selby, Niaura, and Rossi, and healthy eating self-efficacy, measured by a modified version of the Weight Efficacy Life-Style Questionnaire. There were no differences in the level of healthy eating self-efficacy (AA $u = 134.0$, SD = 42.2; EA $u = 132.6$, SD = 33.8) or the level of exercise self-efficacy (AA $u = 28.9$, SD = 11.3; EA $u = 28.1$, SD = 11.0). There were significant differences between AA and EA women related to healthy eating self-efficacy and BMI (AA by tertiles: 1 = 38.0, 2 = 37.6, 3 = 37.2; EA by tertiles: 1 = 34.8, 2 = 35.0, 3 = 34.5; $p < 0.05$) and related to exercise self-efficacy and BMI (AA by tertiles:

1 = 37.9, 2 = 37.4, 3 = 37.3; EA by tertiles: 1 = 35.4, 2 = 34.0, 3 = 34.7, $p < 0.05$) (Capers et al., 2011).

In a study of home environment and psychosocial predictors of obesity in community dwelling men and women (Emery et al., 2015) eating self-efficacy measured by the Eating Self-Efficacy Scale (ESE) was included among the factors evaluated. The study sample included obese ($n = 50$) and nonobese ($n = 50$) participants. Total ESE scores were lower (ability to control eating) in the obese (3.69 (0.18)) than the nonobese (2.61 (0.17), $p < 0.001$) participants.

These studies illustrate the inclusion of the concept of self-efficacy in the body knowledge related to obesity. They demonstrate the appropriateness of the consideration of self-efficacy as a mediator in the current investigation.

Further evidence supports the evaluation of general self-efficacy as a mediator of the relationship between food insecurity and obesity. In a systematic review performed by Teixeira and colleagues (2015), predictors and mediators of behavior change in adults with obesity were analyzed. The analysis included the identification of self-efficacy as a mediator variable in weight control. Self-efficacy was found to be a mediator of medium to long-term weight control in two out of three times tested in two studies included in the review (Teixeira et al., 2015).

The empirical literature further supports the evaluation of general self-efficacy, as a component of social cognitive theory, as a mediator of the relationship between food insecurity and obesity. In a clinical review of the role of sense of self-worth in weight-loss treatments, Cochrane (2008) presents a case study and discussion of the role of self-efficacy as it relates to self-worth as an approach to weight loss. This article typifies the

knowledge of the importance of the role of self-efficacy related to weight. Alert and associates (2013) conducted a pilot study of a comprehensive mind body weight loss intervention in a sample of employees between the ages of 18 and 65 in the Boston area ($N = 21$). The General Self-Efficacy Scale was used to measure self-efficacy. Multiple variables were measured at baseline, post-intervention, and 6-month follow-up. Overall BMI decreased (baseline $u = 36.07$; post-intervention $u = 34.43$, $p = 0.0001$; 6-month follow-up $u = 34.29$, $p = 0.01$) and general self-efficacy increased (baseline $u = 31.57$; post-intervention $u = 33.26$, $p = 0.05$, 6-month follow-up $u = 33.65$, $p = 0.05$) (Alert et al., 2013).

Additional support for the evaluation of general self-efficacy as a mediator is found in the inclusion of the concept, measured by the General Perceived Self-Efficacy Scale (GSE), in a study of the relationships among socio-demographic variables, health behaviors, environmental characteristics and personal factors with health-related quality of life scores in a population of morbid obese individual (Lerdal et al., 2011). The authors discuss the inclusion of the concept of self-efficacy in the study as a mediator of life style change in obese individuals (Lerdal et al., 2011). Finally, in a review of literature addressing pre-treatment predictors of weight loss (Teixeira et al., 2005) the concept of self-efficacy was analyzed. The authors found that specific self-efficacy was less predictive of outcomes than generalized measures of efficacy (Teixeiraet al., 2005).

Food Insecurity, Self-Efficacy, and Obesity

There is an absence of literature in which the associations among FI, general self-efficacy and obesity have been explored. One study was identified in which the variables of FI and obesity were investigated within the context of social cognitive theory (SCT).

A cross sectional community-based survey was used to explore various food related environmental, personal, and behavioral factors associated with BMI in low income women on the basis of self-identified racial/ethnic group (Dammann & Smith, 2011). Sample recruitment was purposeful in order to include low income women. Data were collected using a survey that included theoretically based questions to address SCT constructs and 10 supporting components. The survey was developed to include themes obtained from focus groups held with the target population and included environmental (74), behavioral (70), and personal (89) questions. The 18-item USDA Household Food Security Survey Module was used to collect data about food security status and BMI was calculated from measured height and weight. Analysis included Pearson correlation coefficients to determine each question's correlation within the SCT constructs with BMI. Multiple linear regression analysis was performed to explore the SCT constructs and the prediction of BMI in each racial/ethnic group. Questions that were significant predictors of BMI were identified.

Although not specifically identified as self-efficacy by the authors, behavioral questions reflect specific actions targeted to address improved food security and quality of food. In the discussion of the reciprocal determinism of the constructs of SCT, an example provided is "decreased costs and increased availability of fruits and vegetables in low-income neighborhoods may increase an individual's self-efficacy to purchase fruits and vegetables and, in turn, increase his or her consumption of these more healthful foods" (Dammann & Smith, 2011, p. e2). Furthermore, self-efficacy is provided as an example of a SCT component in the discussion of the regression model analysis procedure.

The sample (N = 367) was composed of 49% African-American, 40% American Indian, and 12% Caucasian women. Seventy four percent of participants reported low to very low food security. Eighty two percent of the sample was overweight or obese (BMI $\geq$ 25.0 kg/m^2). Multiple linear regression analyses were performed for each SCT construct within each racial /ethnic group. In African-American women, environmental questions explained 5% of the variance, behavioral questions explained 14% of the variance, and personal questions explained 15% of the variance in BMI. In American Indian women, environmental factors explained 8% of the variance, behavioral questions explained 12% of the variance, and personal questions explained 22% of the variance in BMI. In Caucasian women, environmental questions explained 24% of the variance, behavioral questions explained 22% of the variance, and personal questions explained 37% of the variance (Dammann & Smith, 2011).

Within the models specific questions in the behavioral construct were statistically significant predictors of BMI. In the model for African-American women the questions "If I ate fewer snack foods like chips, candy, and pop, it would help me control my weight" and "Fruits and vegetables are good for my family's health" were statistically significant. In the model for American-Indian women the questions "Food stamps help my family eat a variety of food", "If my children grocery shop with me, I spend more money on food", and "I do not need a grocery list because I but the same foods every time" were statistically significant. Lastly, in the model for Caucasian women the question "If I ate less snack foods like chips, candy, and pop, it would help me control my weight" was statistically significant (Dammann & Smith, 2011).

In the overall analysis, food insecurity and BMI were not significantly correlated. Inconsistency between dietary beliefs and behaviors were identified in African-American and Caucasian women with higher BMI's. American-Indian women with higher BMI's had limited variety in food. Additionally, in the personal construct, stress was a significant correlate of weight status in all racial/ethnic groups (Dammann & Smith, 2011). This study illustrates the appropriateness of evaluating the role of self-efficacy, a behavioral component, as a mediator of the relationship between food insecurity and obesity.

Two additional studies were reviewed that used social cognitive theory to explore relationships among personal and environmental factors and weight related variables. A qualitative cross-sectional study was performed in a sample of low-income overweight and obese women recruited from participants in a Special Supplemental Nutrition Program for Women, Infants, and Children clinics in six counties in Michigan. Participants ($N = 80$) responded to eight semi-structured questions developed from social cognitive theory via focus groups. The authors include self-efficacy in the discussion of personal factors, stating that the concept is related to many of the factors identified by the study participants (Chang et al., 2008).

The role of self-efficacy in mediating the association of psychosocial and environmental variables and weight management was investigated in a sample of obese African American and white mothers (Chang, et al, 2011). The sample ($N = 284$) was recruited from participants in the Special Supplemental Nutrition Program for Women, Infants, and Children in 6 counties of Wisconsin. Data were collected through multiple questionnaires including surveys of personal factors, environmental factors, three task-

specific domains of self-efficacy, weight management strategies, and demographics including self-reported height and weight. Beliefs about diet and health predicted higher food availability self-efficacy (UPE = 0.23, SE = 0.06, $p < 0.05$); higher beliefs about diet and body shape predicted higher negative mood self-efficacy (UPE = -0.20, SE = 0.08, $p < 0.05$); importance of eating low-fat/low-calorie food for weight management predicted higher self-efficacy of positive mode (UPE = -0.25, SE = 0.06, $p < 0.050$, negative mood (UPE = -0.31, SE = 0.07, $p < 0.05$) and food availability (UPE = -0.27, SE = -.06, $p < 0.05$). Availability of time to prepare food (UPE = -0.18, SE = 0.06, $p <0.05$) and cost of food (UPE = -0.14, SE = 0.06, $p <.05$) predicted lower food availability self-efficacy. In data analysis, positive mood self-efficacy predicted healthful weight management behaviors (UPE = 0.49, SE = 0.25, odds ratio = 1.63 [-0.47, 0.32], $p < 0.05$).

The review of literature illustrates several key points about the state of knowledge in the area of food insecurity and obesity. The earliest examinations of the relationship between FI or food insufficiency and weight found a positive relationship between FI and overweight (Townsend et al., 2001; Basiotis & Lino, 2002). Subsequent cross-sectional studies further explored the relationship between FI and obesity. The development of knowledge first confirmed the presence of a relationship between food insecurity and obesity in identifying that food security is a predictor of obesity (Martin & Ferris, 2007). Then investigations focused on exploring factors associated with the relationship between these variables. This led to the identification of gender differences in the relationship between FI and obesity. Findings determined that women with food insecurity are more likely to be obese than men with food insecurity (Hanson, Sobal, & Frongillo, 2007) and

that the relationship between FI and obesity was modified by gender and race/ethnicity (Leung, Williams, & Villamor, 2012).

Subsequent to the establishment of gender differences, several studies were conducted that focused on women. Studies were conducted that reconfirmed the association between FI and obesity in women (Karnik et al., 2011) and which delineated FI as a predictor of obesity (Martin & Ferris, 2007). Additionally, the prevalence of obesity was found to increase in the presence of FI in women of Non-Hispanic White, Asian, Black, and Hispanic race/ethnicity (Adams, Grummer-Strawn, & Chaves, 2003). Several studies identified higher BMIs in women with FI (Holben & Pheley, 2006; Hanson, Sobal, & Frongillo, 2007; Laria, Siega-Riz, & Gundersen, 2010). Moreover, it was found that women residing in households with both a child present and food insecurity are more likely to have higher BMIs (Martin & Lippert, 2012).

Cross sectional studies with contradictory findings include a non-significant association between concern about enough food and morbid obesity in the final logistic regression model in a sample of participants in the BRFSS survey participants (Laria, Wiega-Riz, & Evenson, 2003) and the absence of an association between FI and obesity in a convenience sample of food pantry participants (Robaina & Martin).

Longitudinal studies were conducted to further explore the relationship between FI and obesity. One study confirmed the relationship between FI and obesity (Wilkes & Peterman, 2006). However two longitudinal studies did not support the relationship. Food insecurity was not a predictor of the amount of weight gain in women over a two year time frame (Jones & Frongillo, 2006) and weight changes were not related to food security status in a 5-year birth cohort study (Whitaker & Sarin, 2007).

Lastly, one study identified causal influence of obesity on FI (Olson & Strawderman, 2008). This finding is consistent with the feedback loop proposed in the VPM (Flaskerud & Winslow, 1998).

Researchers have begun to search for explanations of the variation in the relationship between FI and obesity. Factors that have been considered but not fully explored include perceived stress (Jilcott et al., 2011; Pan et al., 2012) and self-efficacy (Dammann & Smith, 2011). Although these concepts have been linked to obesity in other literature, they have not been full explored as mediators of the relationship between FI and obesity. Justification for this linkage is evident in the literature supporting the relationships between FI and perceived stress, perceived stress and obesity, FI and self-efficacy, and self-efficacy and obesity.

Gaps in knowledge are evident in the review of literature. First, although the majority of literature supports the presence of a relationship between FI and obesity, there are several studies that do not support this association. Secondly, this discrepancy has occurred in both cross sectional and longitudinal studies. Because of the contradictory findings there is still a need to investigate the association between FI and obesity. Furthermore, an explanation for the variance in the findings has not been identified. There is a gap in the literature as it relates to other factors that influence the relationship between food insecurity and obesity. The concepts of perceived stress and general self-efficacy are associated with FI and obesity in the literature; however, they have not been tested as mediators of the relationship.

Theoretical Rationale

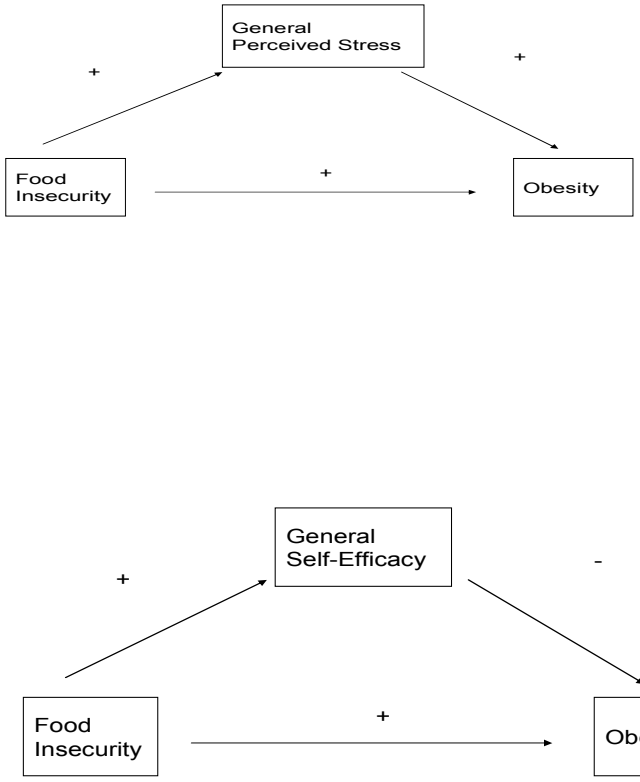
In summary, the empirical evidence supports further analysis of the relationship between food insecurity and obesity. Previous research has shown inconsistencies in the findings, and it does not reflect the current prevalence of FI and obesity. Results have varied based on methodology with cross-sectional versus longitudinal design resulting in diverse findings. Also, when associations between FI and obesity are identified, the factors that influence the relationship remain unknown.

Previous findings do substantiate the focus on women, heads of household, with children as the target population. Food insecurity and obesity are present and associated in this population group. Additionally, these studies document that the factors associated with gender differences between FI and obesity are not fully explicated.

Lastly, in the search for explanation, both perceived stress and general self-efficacy, as part of SCT, have been associated with the variables of FI and obesity. Therefore, based on theory and previous research, the relationships posited in the mediational models (Figure 3) suggest that FI contributes positively to obesity, food insecurity is positively related to general perceived stress and general perceived stress is positively related to obesity. In the current study, general perceived stress was hypothesized to mediate the relationship between food insecurity and obesity.

Likewise, based on theory and previous research, the relationships posited in the mediational models (Figure 3) suggest that FI contributes positively to obesity, food insecurity is positively related to general self-efficacy and general self-efficacy is inversely related to obesity. In the present study, general self-efficacy was hypothesized to mediate the relationship between food insecurity and obesity.

Figure 3. Mediational Models



Hypotheses

The following hypotheses were investigated in female heads-of-household between the ages of 18 and 59 living with one or more children under 18 years of age:

1. There is a positive relationship between food insecurity and obesity.
2. There is a positive relationship between food insecurity and general perceived stress.
3. There is a positive relationship between general perceived stress and obesity.

4. When general perceived stress is controlled for statistically, the relationship between food insecurity and obesity will diminish and will not be statistically significant.
5. There is a positive relationship between food insecurity and general self-efficacy.
6. There is a negative relationship between general self-efficacy and obesity.
7. When general self-efficacy is controlled for statistically, the relationship between food insecurity and obesity will diminish and will not be statistically significant.

CHAPTER 3: METHODS

This chapter will describe the research design for the study of the relationships among FI, general perceived stress, general self-efficacy and obesity in female heads-of-household with children. Components of the research study will be described. The study used a correlational design to evaluate the role of general perceived stress and general self-efficacy in evaluating the process by which FI affects obesity. The research setting and sample characteristics will be described. Instrumentation including psychometric evaluations will be provided. Lastly, the procedure for data collection and the plan for data analysis will be outlined.

Research Setting

This study was conducted in a county located in Northeastern Pennsylvania with a 2013 population estimate of 320,103 as compared to the population estimate for Pennsylvania of 12, 773.801. Population based estimates obtained from the 2008 to 2012 American Community Survey 5-Year Estimates suggest that female householder, no husband present, family with own children under 18 years represents 7.1% of the county population as compared to 6.6% of the state population. In families with female householder, no husband present with related children under 18 years 47.4% had incomes below poverty level in the past 12 months in the selected county as compared to 39.2% in Pennsylvania. Additionally, 13.7% of total county households received SNAP benefits in the past 12 months versus 11.1% of state households (U. S. Census Bureau, 2014).

The research setting for the study included two food pantries and one community action agency located in the same county of Northeastern Pennsylvania. The first food pantry is open one morning a week for one and half hours with the waiting area open one

hour in advance. The food pantry serves approximately 80 households per week. The second food pantry is open from 12 noon to 3 pm Monday through Friday. This food pantry tracks statistics on a monthly basis and serves approximately 185 households per month. Each of the food pantries is affiliated with a faith-based organization and both are members of the regional food bank. The community action agency provides an array of services and programs for vulnerable populations including female heads-of-household with children and it operates the regional food bank.

Sample

The sample for the study was a convenience sample of female heads-of-household between the ages of 18 and 59 with one or more children under 18 years of age. Subjects were required to be able to read and speak English. Sample size was justified via power analysis. The power analysis was completed with an alpha of 0.05, power of 0.80 and a medium effect size of 0.30 for correlation analysis that resulted in a required minimum sample of 85 subjects. A similar power analysis with an alpha of 0.05, power of 0.80 and a medium effect size of 0.15 for multiple regression analysis with three predictor variables (food insecurity, general perceived stress, and general self-efficacy) resulted in a minimum required sample of 76 subjects (Cohen, 1988; Cohen, 1992).

Instruments

Core Food Security Module (CFSM)

The Core Food Security Module (CFSM) (USDA, 2012) (see Appendix C) is a series of questions that are designed to be used to calculate a household's food security status. The instrument is administered through personal or phone interview (U.S. Census Bureau, 2014). The CFSM is constructed in a three-stage design with screeners with the

complete instrument consisting of 10 questions for households with only adults present and two additional stages for households with one or more children totaling 18 questions. The number of food insecure conditions and behaviors is used to calculate household food security status. For households with one or more children scores may range from zero to eighteen. The survey begins with three general household questions that are used to reduce respondent burden. If there are no affirmative responses the survey is ended. If there is at least one affirmative response, the survey continues with five additional questions in Adult Stage 2 and two additional questions in Adult Stage 3 for a total of ten adult-referenced questions. If there are children present in the household there are eight additional questions asked in two stages for a total of eight child-referenced questions. Households are deemed to be food secure if only one or two food insecure conditions are reported or if there is an absence of food insecure conditions. Households are considered food insecure if there is a positive response to three or more food insecure conditions.

The eight child-referenced questions within the CFSM constitute the U. S. Children's Food Security Scale. Households with children are considered to have food insecurity among children if they report two or more food insecure conditions in response to these questions.

Once households are determined to be food insecure, they are further classified as having low food security or very low food security. Households without children are classified as having very low food security if they have a positive response to six or more food insecure conditions since they do not complete the questions related to children. Households with children are classified as having very low food security if they have positive responses to eight or more food insecure conditions. The completion of the

subset of questions in the CFSM identified as the U. S. Children's Food Security Scale is used to further delineate food security among children. Households with five or more food insecure conditions among children are considered to have very low food security among children (USDA, 2012). The distinction between food insecurity in households with one or more children and food insecurity among children may reflect strategies implemented by the household to protect children living in that household from food insecurity.

The CFSM was initially developed in 1995 as an initiative of the Food and Consumer Service of the U. S. Department of Agriculture. The development was based on prior research that had been conducted in the area of food security. Data collected from 45,000 household interviews during the April 1995 Current Population Survey (CPS) within a food security data supplement were analyzed to create the measurement by which to classify household level severity of food insecurity and hunger. Initially there were two measures, one that gauged food insecurity and hunger over the period of 12 months prior to the interview and one that focused on 30 days prior to the interview. Data relevant to the development of the measurement of food insecurity over 12 months prior to interview will be presented.

Initially data for 19 items were analyzed through factor analysis which resulted in a three factor model with eigenvalues of 15.0, 1.6, and 1.4 prior to rotation. The factors included child food intake reduction and hunger, household-level food insecurity, and adult food intake reduction and hunger. Because of large, positive factor intercorrelations, non-linear methods were pursued to explore item loading onto a single factor. Root mean square residual (RMSR = 0.0074) supported a single factor. The Rasch model was used

to evaluate alternate measurement models and determine item calibration. The final 12-month 10-item scale for households without children and 18 item scale for households with children was replicated on subsamples of the data set. The replications demonstrated consistency in the scale in random subsamples and different household types. Item calibrations indicated similar to identical rankings of item severity. Models fit on subsamples correlated at 0.99 (Hamilton et al., 1997).

Initial reliability of the CFSM was determined using the Rasch reliability index. A consideration in reliability analysis was the effect of cases with extreme scores. In the evaluation of food security, 80 percent of the population will have the lowest possible score as this is approximately the percent of the population who are food secure. When extreme scores are included in Rasch reliability estimates, the estimate will be decreased. The initial Rasch reliability scores reported include estimates with and without the extreme scores included. Additionally in this analysis two approaches were taken for the items that included follow-up questions in the scale. These items were treated as both independent dichotomous (i.e. no meals skipped in past 12 months or meals skipped in past 12 months) and combined single trichotomous items (i.e. no meals skipped in past 12 months; meals skipped in one or two months; meals skipped in three or more months). The Rasch reliability estimates were 0.74 (dichotomous) and 0.70 (combined) with extreme scores excluded. With extreme scores included the reliability estimates were 0.63 (dichotomous) and 0.58 (combined). Traditional reliability indices, associated with linear methodology, were also used to evaluate the CFSM. The Spearman-Brown Split-Half reliability estimates in households with children were 0.85 with extreme scores excluded and 0.90 with extreme scores. In all households the reliability estimates were

0.79 with extreme scores excluded and 0.89 with extreme scores included. The Rulon's Split-Half reliability estimates were also calculated. In households with children, the reliability index was 0.81 with extreme scores excluded and 0.89 with extreme scores included. In all households, the reliability index was 0.87 with extreme scores excluded and 0.93 with extreme scores included. Lastly, using Cronbach's Alpha reliability estimates, in households with children alpha was 0.81 with extreme scores excluded and 0.88 with extreme scores included. In all households, alpha was 0.74 with extreme scores excluded and 0.856 with extreme scores included (Hamilton et al., 1997). Internal consistency reliability is present in the CFSM as the reported values are within the acceptable range of 0.70 for new instruments and 0.80 for established measures (Nunnally, 1978).

In the development of the CFSM, correlations of the scale with related measures were used to assess construct validity. As there were no previously developed, recognized standards for the measurement of food security, the scores on the CFSM were compared to other factors related to food security: household food expenditures, income, income relative to the poverty line, and report of sufficiency of food eaten in the household. These factors were selected based on their relationship to the dimensions of food security identified by the Life Science Research Office: quantity of food intake, the quality of food intake, anxiety about the adequacy of food supply, and social acceptability of the source of food. The correlations between the CFSM and weekly food expenditures were -0.12, between the CFSM and annual household income was -0.32, and between the CFSM and income relative to the poverty line was -0.33. In the last comparison with household food sufficiency, which was measured with a single item, 84 percent of

households reporting "often not enough to eat" were classified as food insecure by the CFSM (Hamilton et al., 1997). As expected, there is a negative correlation between annual household income, poverty level, weekly food expenditures and food insecurity. As the availability of financial resources increases the ability to purchase high quality sufficient food also increases. The positive relationship between food insufficiency and food insecurity measured by the CFSM is expected. The areas of food quality and quantity measured by the food sufficiency measure are two of the dimensions of food insecurity. The high percentage of respondents who were both determined to have household food insufficiency and food insecurity supports the construct validity of the CFSM. Findings in which a combination of measurements behave as expected support construct validity (Nunnally, 1998).

Ongoing oversight and revision of the CFSM has been under the direction of the USDA. The Current Population Survey (CPS) data from 1995, 1996, and 1997 were analyzed by an independent contractor who confirmed the stability of the CFSM (Ohls, Radbill, & Schirm, 2001). Ongoing technical evaluation has occurred to substantiate the use of the CFSM in the areas of assessment of prevalence of food insecurity, calibration related to statistical methods associated with Rasch measurement modeling, and severity (Cohen et al., 2002; Opsomer et al., 2002). Additionally, the "Guide to Measuring Household Food Security" was revised in 2000 (Bickel et al.). In 2006, the Committee on National Statistics (CNSTAT) of the National Academies convened an expert panel to complete a review of food security measurement methods. The final recommendations included a clear distinction between food insecurity and hunger and the use of alternate labels to remove "hunger" from food security categories (Wunderlich & Norwood, 2006).

This recommendation is reflected in the current CFSM, which was used in the proposed study.

The CFSM is a standard measurement tool used in studies that include measurement of household food security status as a variable. Studies that have used this measure or an earlier version of the CFSM have been conducted in populations similar to that of the proposed study. These include: women (Adams, Grummer-Strawn, & Chaves, 2003; Dammann & Smith, 2011; Jilcott et al., 2011; Jones & Frongillo, 2006; Karnik et al., 2011; Laria, Siega-Riz & Gundersen, 2010; Martin & Ferris, 2007; Olson & Strawderman, 2008; Pan et al., 2012; Whitaker & Sarin, 2007; Wilde & Peterman, 2006) and men and women (Hanson, Sobal, & Frongillo, 2007; Holben & Pheley, 2006; Leung, Williams, & Villamor, 2012; Martin & Lippert, 2012; Robaina & Martin, 2013).

General Self-Efficacy Scale

The General Self-Efficacy Scale (GSE Scale) (see Appendix C) is a unidimensional measurement of perceived self-efficacy. In the context of the General Self-Efficacy Scale, self-efficacy is viewed as the belief that one can cope with adversity or perform difficult tasks. It is the belief in personal competency in stressful situations (Schwarzer et al., 1997). The instrument consists of 10 items, each with a four-point response scale of 1 = not at all true, 2 = hardly true, 3 = moderately true, 4 = exactly true. The values of the responses are totaled with final scores ranging from 10 to 40. Higher scores indicate a stronger sense of generalized self-efficacy. The scale is self-administered with pencil and paper (Schwarzer & Jerusalem, 1995).

The scale was originally developed in German. Initial psychometric analyses were completed with German samples resulting in acceptable internal consistency values with

alphas from 0.82 to 0.93 (Schwarzer & Jerusalem, 1995). Values for Cronbach's alpha of at least 0.80 indicate acceptable internal consistency for the GSE Scale (Nunnally, 1978). Concurrent validity for the GSE Scale is reported as: positive correlations with self-esteem (0.52), internal control beliefs (0.40), and optimism (0.49); negative correlations with general anxiety (-0.54), performance anxiety (-0.42), shyness (-0.58), and pessimism (-0.28) (Schwarzer & Jerusalem, 1995). The authors of the GSE scale designate the "Generalized Self-Efficacy Scale" as included in *Measures in Health Psychology: A User's Portfolio*. *Causal and Control Beliefs* by Weinman, Wright, and Johnston (1995) as the English language source for the instrument (Schwarzer, 2009). At the time of publication, psychometric analysis of the English language version had not been completed (Weinman, Wright, & Johnston, 1995).

Psychometric analysis of the GSE Scale in order determine comprehensibility, reliability and validity of the English language version was completed in a sample of individuals with arthritis is the United Kingdom. The analysis was completed via four studies. Study one (N = 53) examined the comprehensibility of the English language version in two parts. First 53 subjects completed the questionnaire and after two minor adjustments, the modified version was tested in 16 additional subjects. In item 2 "means and ways" was changed to "ways and means" and in item 9 "in a bind" was changed to "in trouble" (Barlow, Williams, & Wright, 1996). Study two (N = 80 over 50 years old) had subjects complete the questionnaire at two points in time four months apart. Studies three (N = 79 adults over 18 years old) and four (N = 66 adult education participants) consisted of questionnaire completion at one point in time. Results included Cronbach's alphas of 0.88 (study two), 0.91 (study three) and 0.89 (study four). Test-retest reliability

was 0.63 ($p < 0.0001$) within study two. Inter-item correlations were between 0.08 to 0.83 in the three studies. Corrected item total correlations were between 0.30 and 0.81 across the studies. Factor analyses resulted in a unidimensional solution with 49.9% (study one), 56.9% (study two), and 52.4% (study three) of the variance explained. There was one significant association with a demographic variable. Male gender was associated with a higher score on the GSE scale in study three ($r = -0.27$, $p = 0.029$). Analysis of concurrent validity revealed inverse correlation with depression in studies two ($r = -0.50$, $p < 0.0001$), three ($r = -0.38$, $p = 0.002$) and four ($r = -0.29$, $p = 0.018$); and positive correlations with positive affect ($r = 0.52$, $p \leq 0.0001$; $r = 0.44$, $p \leq 0.0001$, $r = 0.34$, $p = 0.006$). In study two there was a positive correlation with social support ($r = 0.25$, $p = 0.024$) and a negative correlation with health distress ($r = -0.33$, $p = 0.002$) (Barlow et al., 1996). Lastly, predictive validity was established through hierarchical regression analyses using data from study two to evaluate whether the GSE scale score at time one predicted psychological health status at time two (Barlow et al., 1996).

In a synopsis of the development and usage of the GSE Scale, Schwarzer (2009) reports that the instrument has been used in more than 1,000 studies and that it has been adapted to 30 languages. It is further reported that in samples from 23 nations, the Cronbach's alphas ranged from 0.76 to 0.90 (Schwarzer, 2009). Furthermore, general self-efficacy has been evaluated as a universal construct in a study conducted in a sample of internet users ($N = 1,314$). The results were compared with three other samples, German ($N = 274$, $N = 3,077$), and Canadian ($N = 290$). Internal consistency was 0.87 for the internet sample, 0.89 for the Canadian sample, and 0.86 and 0.78 in the German samples (Schwarzer, Mueller, & Greenglass, 1999). Additional evidence for the validity

of the instrument was also obtained. Correlations were reported with test anxiety (r = -0.40), introversion (r = -0.16), GPA (r = 0.19), and income (r = 0.18) (Schwarzer et al., 1999).

A study conducted to determine psychometric properties of the GSE Scale in 25 countries (N = 19, 120) yielded internal consistency of 0.86 for the total sample (Scholz et al., 2002). In data reported for the United States subsample (n = 1594), internal consistency was demonstrated by an alpha coefficient of 0.87 (Scholz et al., 2002). Additionally assessment of construct validity was reported. Item-total correlations reported for the United States subsample ranged from 0.42 to 0.69. Principle component analyses were performed for each of the 25 subsamples resulting in one factor solutions for most of the subsamples (Scholz, et. al., 2002). Confirmatory factor analyses were performed using the total sample resulting in Goodness-of-Fit Index (GFI) of 0.98; Adjusted Goodness-of-Fit Index (AGFI) of 0.97; Normal Fit Index (NFI) of 0.97; and Root Mean Residual of 0.03 (Scholz, et. al., 2002).

Additional studies reflect the reliability of the GSE Scale in similar clinically based populations as the current investigation: in a sample of individuals with morbid obesity and COPD in Norway (N = 220, α = 0.92) (Bonsaksen, Lerdal, & Fagermoen, 2012); in Rasch analysis of the GSE scale in a sample of morbid obese individuals in Norway (N = 141) the Rasch-equivalent Cronbach's alpha was 0.93 in both the original 10-item scale and an alternate 7-item scale (Bonsaksen, Kottorp, Gay, Fagermoen, & Lerdal, 2013); in a sample of persons with schizophrenia in Israel (N = 148, α = 0.88) (Ritsner & Ratner, 2006); and in a study of unemployed individuals in China (N = 1,832)

the Chinese version of the GSE Scale had a Cronbach's alpha of 0.756 (Wang et al., 2014).

The GSE Scale has been used as a measurement of general self-efficacy in the United States. In a convenience sample of African Americans with end stage renal disease (N = 85), the GSE scale was used to identify the overall level of self-efficacy. Prior to this study, a pilot study was conducted to test reliability resulting in a Cronbach's alpha of 0.89 and a Guttman split-half coefficient of 0.91 (Wells & Anderson, 2011). In a study conducted to compare three measures of general self-efficacy, the GSE Scale was shown to be reliable (Chronbach's alpha = 0.85) in a sample of students in a northeastern university (N = 606). Through item response theory analysis, the study demonstrated that the GSE Scale had a strong relationship with the latent trait of GSE, supporting the use of the measure (Scherbaum, Cohen-Charash, & Kern, 2006). In a study examining the association between religious coping and quality of life in cancer patients at four national cancer centers (N = 205) the GSE Scale had a Chronbach's alpha of 0.87. Although self-efficacy was controlled for in the final regression model of the data analysis, there was a significant relationship between quality of life and self-efficacy as predicted ($\beta = 0.162$, $p = 0.04$ in positive religious coping; $\beta = 0.162$, $p = 0.04$) (Tarakeshwar et al., 2006). When the GSE Scale was used as a measure of recovery outcomes in a study of peer-led groups for people with severe mental illness in the Midwest (N = 47), the Chronbach's alpha was 0.90 (Fukui, Davidson, Holter, & Rapp, 2010).

The GSE Scale has been used in additional studies in the United States that have not reported study specific reliability: in a study of motivation and self-efficacy related to health promotion behaviours in a convenience sample of overweight and obese middle-

aged American women (*N* = 140) (Fisher & Kridli, 2013); as a predictor of attrition in a sample of associate degree nursing students (*N* = 34) (Peterson-Graziose, Bryer, & Nikolaidou, 2013); and in a study of the effectiveness of the Girls' Circle intervention in a sample of girls in support group programs in the United States and Canada (*N* = 63) (Steese, Dollette, Phillips, Hossfeld, Matthews, & Taormina, 2006).

More recently in a five country study, data collected from the United States subsample of students (*n* = 539) was used to explore the relationship between the GSE Scale and other constructs. The constructs of personality, positive and negative affect, and social relationships were compared to general self-efficacy using a combination of variables and associated measurements for each construct in the total sample (*N* = 8,796). Correlations were reported for the United States subsample via bar graph figures with variable results indicating: an approximate correlation of 0.3 between GSE and orientation towards the future (as measured by Consideration of Future Consequences instrument); an approximate correlation of 0.4 between GSE and life satisfaction (as measured by the Satisfaction with Life Scale); an approximate correlation of 0.3 between job/school satisfaction (as measured by school grades) and GSE. The authors conclude that the hypothesized relationships were supported in this study. Therefore, validity of the instrument in a United States sample is supported. However, they further recognize that the majority of coefficients indicated low or moderate correlations to the other constructs, stating that general self-efficacy is associated with a broad range of psychological constructs. They also note that there are differences in the strength of the associations between general self-efficacy and the constructs by countries. They suggest that this may

indicate the influence of culture, differences in socioeconomic status, or be related to non-representative subsamples (Luszczynska, Gutierrez-Dona, & Schwarzer, 2005).

Additionally, the GSE Scale has been used to measure the concept of general self-efficacy in similar investigations: in a sample of adults in Australia with BMI > 27 kg/m^2 (N = 176) (Ash et al., 2006); and in a randomized intervention trial in sedentary obese women in France (N = 21) (Dechamps et al., 2009). The GSE Scale is a widely used scale and precedence has been established for its use in clinical and behavioral research in diverse populations.

General Perceived Stress Questionnaire

The General Perceived Stress Questionnaire (General PSQ) (see Appendix C) was developed as a measure of stress for clinical psychosomatic research. The General PSQ measures the degree to which individuals experience psychosocial factors proven to correlate with physical symptoms (Levenstein et al., 1993). This instrument evaluates perceived stress that has occurred "during the last year or two" (Levenstein et al., 1993, p. 32). The thirty item questionnaire is designed to identify subtle psychosomatic influences related to stress on structural alterations in the body. Items were developed to be applicable to all adults regardless of age, sex, occupation or stage of life. Each item is ranked as almost never (1), sometimes (2), often (3), or usually (4). The instrument is self-administered with pencil and paper. Subjects are instructed to circle the number that describes how often each item applies to them in general, during the last year or two. Questionnaire items are scored as 5 minus the circled number for eight positive items and the circled number for the other items. The values for each item are then totaled to yield the raw score. The PSQ Index is calculated as the raw score minus 30 which is then

divided by 90 to obtain an index score between 0 and 1. Calculated scores for the PSQ Index range from 0, lowest possible score to 1, highest possible score and would be considered ratio level data. (Levenstein et al., 1993).

Initial psychometric testing of the instrument performed in Italy in a sample of 64 Italian ulcerative colitis out-patients, 16 Italian gastroenterology in-patients, 93 students in four classes (34 native English speakers, 38 native Italian speakers, 21 native speakers of other languages, and 9 health care workers) (N = 182) resulted in an internal consistency alpha coefficient of 0.90 for the General PSQ. Test-retest reliability of the General PSQ in 8.03 ± 1.64 days was 0.82 in 101 subjects from the original sample (Levenstein, et al, 1993). In a subsequent study to measure the prevalence of perceived stress and to evaluate gender differences and association with depression, anxiety, and classes of self-reported medication (psychotropics, analgesics, antiasthmatics, antidiabetics, antihypertensives, diuretics, female hormones, and L-thyroxines), in a representative sample of Swedish population (N = 1275), the internal consistency of the General PSQ was 0.90 (Bergdahl & Bergdahl, 2002). In a study designed to translate the General PSQ into German and revise its structure, initial testing of the instrument in a mixed sample (N = 650), the overall score for Cronbach's alpha was 0.85 and split-half reliability was 0.80. Exploratory factor analysis resulted in a four factor solution in this version (Fliege et al., 2005). Additionally, the Recent PSQ (based on perceived stress in the last month) was tested for internal consistency in a study designed to contribute to the construct validity of the PSQ with a Cronbach's alpha of 0.93 in a sample of the German general population (N = 2552) (Kocalevent et al., 2007).

The General PSQ content was first proposed by four clinicians with input from patients resulting in 60 possible items. These items were reduced via pilot testing with 15 patients and health care workers. English and Italian versions were developed simultaneously in Italy with the equivalency of versions evaluated through back translations and by completion of the questionnaires by bilingual individuals. A revised 36-item version was tested in a sample of 48 subjects (12 gastroenterology out-patients, 10 gastroenterology in-patients, 14 out-patients from a private internal medicine practice, and 12 health care workers) who were native speakers of either Italian or English. At this point in the development of the measure, two separate questionnaires were identified which measured either general perceived stress or recent perceived stress. The questionnaires both include the same items; however, the instructions designate the time frame as either "during the last year or two" or as "during the last month" (Levenstein et al., 1993). Through this process six items were eliminated resulting in the final 30-item version of the General PSQ. The final version was administered to 182 subjects (64 Italian ulcerative colitis out-patients, 16 Italian gastroenterology in-patients, 93 students in four college classes {34 native English speakers, 38 native Italian speakers, 21 native speakers of other languages}, and 9 health care workers). Construct validity was determined in subsamples through comparison with the State-Trait Anxiety Inventory (n = 24, Trait $r = 0.69$, $p < 0.001$; State anxiety was not significant), the Center for Epidemiologic Studies Depression scale (n = 24, $r = 0.49$, $p < 0.01$), the Paykel Interview for Recent Life Experiences, comparison with subjects' own estimates of the degree of stress experienced (n = 52, following PSQ $r = 0.40$, $p < 0.01$), and the Cohen's Perceived Stress Scale (n = 89, $r = 0.56$, $p < 0.001$). These correlations are consistent with the

expectations of the authors. Moderate correlation with life events as measured by the Paykel Interview for Recent Life Experiences is theoretically supported as stress is related to interactions with the individual, not just a consequence of the antecedent events. The stronger correlation with Cohen's Perceived Stress Scale is expected as the PSQ is based upon the concept of perceived stress. Items in the PSQ are associated with trait anxiety and the correlation between the PSQ and trait anxiety are expected. There was a moderate correlation with depression. The correlation with self-reported stress changed in relation to when the assessment occurred. The results are consistent with theoretical considerations and they support construct validity (Polit & Beck, 2004).

Predictive validity was determined using Kellner's Symptom Questionnaire (n = 73, r = 0.50, $p < 0.001$), comparison of PSQ scores of in-patients (n = 16) with those of out-patients (n = 64) (General PSQ higher in in-patients, $p < 0.01$), and examination for physical symptoms (n = 27, rectal inflammation present in 57.1% of patients with General PSQ score in upper quartile compared to 16.7% of patients with General PSQ in lowest quartile). Predictive validity is supported through the correlation with somatic symptoms. The authors state that this is significant as the PSQ is designed to predict adverse health outcomes. Factor analysis through principal components analysis with Varimax transformation with an oblique solution resulted in seven factors. Although a specific number of factors were not hypothesized, the theoretical premise that "processes capable of producing organic disease may not always be mediated by states of conscious distress" (Levenstien et al., 1993, p. 30) was confirmed by the factors that emerged from the data (Levenstein et al., 1993).

When included in later studies, the PSQ was correlated with the Beck Depression Inventory ($\alpha = 0.35$, $p < 0.001$), and the State-Trait Anxiety Inventory (state $\alpha = 0.40$, $p < 0.001$; trait $\alpha = 0.53$, $p < 0.001$) (Bergdahl & Bergdahl, 2002). The General PSQ was used to validate a stress measure used in a health test interview which resulted in a significant correlation between the measures ($N = 342$, $r = 0.67$, $p < 0.001$) in samples from a longitudinal Swedish population-based study (Ohman, Bergdahl, Nyberg, & Nilsson, 2007). In a study designed to contribute to the construct validity of the PSQ in a representative sample of the German population, the Recent PSQ was correlated with an instrument on self-efficacy expectation ($r = -0.51$, $p < 0.01$) , optimism ($r = -0.53$, $p < 0.01$), and pessimism (not reported); the Ten-Item Personality Inventory (short version) to determine neuroticism ($r = 0.48$, $p < 0.01$); and the SF-8 Quality of Life questionnaire (physical $r = -0.33$, $p < 0.01$; mental $r = -0.55$, $p < 0.01$) (Kocalevent et al., 2007). Additionally, the PSQ was used as a measure of perceived stress in studies in which the reliability and validity are not reported (Abeida et al., 2011; Levenstein et al., 2000; Sarkar & Mukhopadhyay, 2007).

The General PSQ has been used as a measurement of stress in multiple studies and populations including: a ten-year longitudinal study of health outcomes related to stress in which cardiovascular disease, diabetes, psychiatric disease, tumors, and musculoskeletal disease was assessed in a prospective population-based study in Sweden (Ohman et al., 2006); a study in which the relationship between cardiovascular risk and perceived stress is investigated in Bhutias of Sikkim, India and in which there is a significant relationship between stress and BMI and waist-hip ratio in females (Sarkar & Mukhopadhyay, 2007); in patients with ulcerative colitis (Levenstein et al., 2000); in

patients with vocal nodes (Abeida, et al, 2013); and in the general population in Sweden (Bergdahl & Bergdahl, 2002).

Studies conducted in populations in the United States include: an ancillary study in the Seasonal Variation of Blood Cholesterol Levels (SEASON) study examining the influence of psychosocial factors on lipid values in patients of a healthcare system HMO (N = 150) (Merriam, Ockene, Hebert, Rosal, & Matthews, 1999); a study to determine the psychological and behavioral correlates of BMI in participants from Diabetes Prevention Program centers (N = 274) in which baseline BMI had a significant correlation with perceived stress (r = 0.14; p = 0.02) (Delahanty et al., 2002); a study using the Recent PSQ to determine predictive factors of self-reported health status and perceived stress in college students (N = 232) (Largo-Wight, Peterson, & Chen, 2005); a study of social support and ambulatory blood pressure in undergraduate students (N = 96) (Piferi & Lawler, 2006); a study of factors affecting stress in emergency medicine residents (N = 18) (Wrenn et al., 2010); a case report of the response to hypnotically assisted relaxation therapy in patients with globus sensation (N = 10); a study of attachment and forgiveness in students in a psychology class (N = 114) in which the PSQ was used a measure of well being (Lawler-Row, Hyatt-Edwards, Wuensch, & Karremans, 2011); a randomized control trial to compare gut-directed hypnosis and active attention control in subjects with quiescent ulcerative colitis (N = 36 in preliminary analysis) in which the Recent PSQ was used as a baseline measure of stress (Keefer et al., 2012); a study designed to identify measures of adjustment to irritable bowel disease in adults (N = 389) (Kiebles, Doerfler, & Keefer, 2010); a validation study of a measure of the IBD Self-Efficacy Scale in a sub-sample of clinic participants

(n = 42) (Keefer, Kiebles, & Taft, 2010); a study of the relationship between nature contact in the workplace and employee stress and health in office staff (N = 1,622) (Largo-Wight et al., 2011); and in a study of predictors of stress and coping strategies in accelerated and generic baccalaureate nursing students (N = 210) (Wolf, Stidham, & Ross, 2015). These studies support the use of the PSQ in United State populations; however, they do not provide reliability data.

Additional studies conducted in the United States support the reliability and validity of the PSQ. In a sample of HIV-infected women and men at a primary health care association (N = 79), Cronbach's alpha for the Recent PSQ was 0.95. The study was designed to evaluate the correlation of perceived stress with selected physiological and psychological factors in HIV-infected individuals. Significant correlations were identified between perceived stress and state (r = 0.77) and trait (r = 0.80) anxiety, depression (r = .80), HIV-related symptoms (r = 0.54), sleep quality (r = 0.41), daytime sleepiness (r = 0.34) and fatigue (r = 0.71) (Hand, Phillips, & Dudgeion, 2006). The same data were also used to examine the physiological, psychological and sociological factors related to fatigue in HIV disease (Phillips, et. al, 2004).In a convenience sample of adults with sickle cell disease (N = 52), examining the predictive relationship between perceived injustice and perceived stress and pain, the Cronbach's alpha for the General PSQ in the sample was 0.89 (Ezenwa, Molokie, Wilkie, Suarez, & Yao, 2014). These are acceptable values to support reliability of the PSQ (Nunnally, 1978). In a study conducted to evaluate the relationship between chronic stress and salivary cortisol in a sample of adult men and women from a health maintenance organization (N = 146), the PSQ was used to construct a stress index along with the Hassles Scale and the Life Events List (Rosal,

King, Ma, & Reed, 2004). In this sample, the component loading for the PSQ was 0.85 demonstrating construct validity (Waltz, Strickland, & Lenz, 2005). These studies support the use of the General PSQ in a general, broad based population, as well as, disease specific populations.

Body Mass Index

Obesity is defined as a Body Mass Index (BMI) of ≥ 30 kg/m^2 (NIH, 1998) or as excess body weight as measured by BMI (USDHHS, 2010). BMI is calculated by dividing weight in kilograms by height in meters squared (USDHHS, 2010). BMI is a standard method to quantify the degree of obesity in an individual. Furthermore, BMI has been used consistently in previous studies that have explored the relationship between food insecurity and obesity using both measured height and weight (Basiotis & Lino, 2002; Hanson, Sobal, & Frongillo, 2007; Holben & Pheley, 2006; Jilcott et al., 2011; Karnik et al., 2011; Martin & Ferris, 2007; Robaina & Martin, 2013; Whitaker & Sarin, 2007; Wilde & Peterman, 2006) and self-reported height and weight (Adams, Grummer-Strawn, & Chavez, 2003; Jones & Frongillo, 2005; Laria, Siega-Riz & Gundersen, 2010; Leung, Williams, & Villamor, 2012; Martin & Lippert, 2012; Pan et al., 2012; Townsend et al., 2001).

In this study BMI was calculated using measured height and weight. Lyons, Park, and Nelson (2008) noted the discrepancies in results in studies that explored the relationship between food insecurity and obesity. Subsequently, they investigated the impact of the selection of food insecurity measure and self-reported versus measured height and weight. Using data from the Canadian Community Health Survey (CCHS) in cycle 1.1 (2000 – 2001) and cycle 2.2 (2004) the effect of measurement approach was

investigated. In the CCHS 1.1 data included self-reported height and weight and food insecurity was determined via a three question measurement which was modified into a dimensional model; whereas, the CCHS 1.2 data included measured height and weight and an 18 question household food security scale adopted from the CFSM. Findings revealed that the prevalence of obesity was higher in individuals with any of the dimensions of food insecurity if self-reported height and weight data were used versus no significant difference in obesity prevalence related to food insecurity dimensions when measured height and weight were used (Lyons et al., 2004). This suggests a discrepancy between findings based on self-reported height and weight versus measured height and weight, indicating the need for further investigation.

Biomedical instruments selected are Seca Portable Stadiometer 213 for measurement of height and Seca Digital Flat Scale 803 for measurement of weight. All measurements were obtained by the investigator. Accuracy of the measures obtained through the use of these instruments was insured through compliance with the manufacturer's instructions. The Seca Portable Stadiometer 213 has a measuring range of 20 to 205 cm. and a graduation length of 1 mm. Height was measured without shoes. The Seca Digital Flat Scale 803 has a capacity of 330 pounds and a graduation 0.2 pounds. Discriminatory power of 1mm for height and 0.2 pounds is acceptable to calculate BMI. The levels of accuracy and precision are adequate for portable instruments and for the purposes of this study.

Waist to Hip Circumference Ratio

The World Health Organization (WHO) recognized the need to identify other indicators of obesity in addition to BMI (WHO, 2011). In the report of the WHO Expert

Consultation held in Geneva in December, 2008, comparisons of the procedures for measurement of waist and hip circumference between the WHO STEPwise Approach to Surveillance (WHO STEPS), the National Institutes of Health (NIH), and the U.S. National Health and Nutrition Examination Survey (NHANES) III are made. The resultant recommendations are:

Waist circumference should be measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch-resistant tape that provides a constant 100g tension. Hip circumference should be measured around the widest portion of the buttocks, with the tape parallel to the floor (WHO, 2011, p.7).

Furthermore, the WHO protocol recommends that the subject should stand with arms at the sides, feet positioned close together and weight evenly distributed in a relaxed posture. Additionally, the waist circumference should be measured at the end of expiration. Each measurement should be repeated twice. If the difference is less than one centimeter, the results should be averaged; however, if the difference is greater than one centimeter, the measurements should be repeated (WHO, 2011, p.7). The WHO protocol for obtaining waist and hip circumference serves to insure that the criteria of accuracy and precision are met in obtaining measurements. The directions are explicit and specific (Waltz, Strickland, & Lens, 2005).

This procedure is consistent with the step-by-step outline of measurements in the WHO STEPS Manual (WHO, 2008) with the additional recommendation for two measurements. The WHO protocol (WHO, 2011) for obtaining waist and hip measurements was followed. In the current investigation the waist to hip circumference ratio is an indicator of central adipose tissue deposits that occur with the endocrine

reaction associated with prolonged stress. The measurement of waist to hip circumference ratio as a surrogate measurement of this reaction is supported in the literature (Bjorntorp, 1996; Dallman, Pecoraro, & Fleur, 2004).

Demographic Questionnaire

A demographic questionnaire was used to collect the following data to describe the study participants: age, race/ethnicity, work status, education, annual household income, household composition, number of children residing in household, number of total individuals residing in household (Appendix B).

Procedure for Data Collection

Following approval from Rutgers Institutional Review Board (IRB), the director of each food pantry site, and the director of the community action agency, data were collected at the three sites located in the same county in Pennsylvania. Data were collected by the investigator during food pantry and community action agency hours of operation using convenience sampling. Study eligibility criteria were reviewed with the food pantry and community action agency staff by the PI. Clients who were eligible for participation in the study were asked if they were willing to participate in the study by the food pantry or community action agency staff and then referred to the PI. Additionally, flyers were posted at the site during data collection time frames to inform potential participants about the study (Appendix D). The PI was present on site and met with potential participants in a private area of the food bank or community action agency to ask if they were willing to participate in the study. A fifteen dollar grocery gift card was provided as an incentive to participate in the study. The study purpose and data collection procedure were explained to the potential subject. The consent form was reviewed as part

of the consent process and the investigator read the consent form if requested by the subject. Once the questions of the potential subject were answered, informed consent was obtained. Subsequently, the subject's waist and hip measurements and their measured height and weight were obtained. After obtaining the subject's measurements, they were interviewed to complete the CFSM. The subject was then given the self-administered questionnaires that included demographic information, the General PSQ, and the GSE Scale. Completion of the questionnaires was done independently; however, investigator administration of the questionnaire was provided if requested by the subject. Only one participant required assistance with the General PSQ. In order to protect subject confidentiality, the forms did not contain any identifying data. A separate list of subject contact information was maintained.

Data Analysis

A database was created by the PI using IBM Statistical Package for the Social Sciences (SPSS) version 22.0 software. Data were entered into the database for analysis by the PI. The raw data were first reviewed for outliers, wild data values, and inconsistencies (Polit & Beck, 2013). The PI then verified the data through comparison of a printout of the data file with original data forms. A descriptive analysis of the demographic data was completed including means, standard deviations, and frequencies. Scores on the CFSM, GSE Scale, and General PSQ were calculated and internal consistency reliability of the instruments within the study sample were evaluated by calculating Cronbach's alpha for each instrument. Histograms, bar graphs, and scatter plots were obtained to assess study variables for normal distribution. Tests for skewness

and kurtosis were performed. Data that were not normally distributed were evaluated for possible transformation (Ott & Longnecker, 2001).

Hypotheses one, two, three, five, and six were tested through correlation analysis. Correlation analysis was performed using Pearson Product Moment Correlation to assess the direction and strength of the relationships between study variables. A conservative two-tailed test of significance was set at the 0.05 level, even if the hypothesized relationship was directional (Polit & Beck, 2013). Hypotheses four and seven were tested using Baron and Kenny's (1986) method for testing mediation. Multiple regression analysis was conducted to estimate three regression equations for each hypothesis to evaluate the presence of a mediator effect.

According to Baron and Kenny (1986), several conditions must be met for mediation. In the first mediational model, food insecurity as the causal variable must affect obesity as the outcome variable in the predicted direction. The strength of the correlation between these variables is the total effect (Kenny, 2015). Then food insecurity must affect perceived stress in the predicted direction. In this equation, food insecurity is the causal variable and perceived stress is the outcome variable. Subsequently, perceived stress as the mediator variable must affect the outcome variable, obesity in the predicted direction. Lastly, the effect of food insecurity on obesity, the direct effect, when perceived stress is statistically controlled should be zero if perfect mediation is present. In this equation, if the effect of food insecurity on obesity is less than the total effect in the first equation, then partial mediation is present (Kenny, 2015). Likewise in the second mediational model, food insecurity as the causal variable must affect obesity as the outcome variable in the predicted direction. Then food insecurity must affect general self-

efficacy in the predicted direction. Subsequently, general self-efficacy as the mediator variable must affect obesity in the predicted direction. Lastly, the direct effect of food insecurity on obesity, when the effect of general self-efficacy is statistically controlled, should be zero for perfect mediation. In this equation, if the direct effect of food insecurity on obesity is less than the total effect in the first equation, then partial mediation is present (Kenny, 2015).

Human Subjects Protection

This study was submitted to the Institutional Review Board (IRB) of Rutgers, The State University of New Jersey to protect the rights of human subjects participating in the study. The study was submitted for a full review as participants were considered part of a vulnerable population. On initial screening by the IRB staff, the study was deemed appropriate for an expedited review as the study only required the completion of questionnaires and physical measurements and was considered to have minimal risk. Participant responses and measurements were kept anonymous. The investigator maintained a separate list of participant contact information and no indentifying information was linked to the study data. The computer files were password protected and encrypted. Only the PI had access to the files. Computer files were backed up to a flash drive that was password protected and the drive was maintained in a locked cabinet in a locked office.

Data collected from this study that will be published or presented will be reported only as aggregate data and participants will not be identified by name. Data from this study and computer files will be destroyed after the six year mandatory IRB maintenance period.

CHAPTER 4: DATA ANALYSIS

The purpose of this study was to investigate the relationships among food insecurity, general perceived stress, general self-efficacy and obesity in female heads-of-household between the ages of 18 and 59 years living with one or more children under 18 years of age. Data were collected from a sample of 86 women who were identified as heads-of-household at three community agency sites. The following instruments were used for data collection: (a) a demographic questionnaire, developed by the principle investigator (PI) to collect information about participants' age, ethnicity, education, employment, income, and household composition and size; (b) the Core Food Security Module (CFSM) was used to measure household food security status (USDA, 2012); (c) general self-efficacy was measured by the General Self-Efficacy Scale (GSE Scale) (Schwarzer & Jerusalem, 1995); (c) general perceived stress was measured by the General Perceived Stress Questionnaire (General PSQ) (Levenstein et al., 1993); (d) waist to hip circumference ratio was used as a surrogate measurement of prolonged stress with waist and hip measurements obtained following the WHO protocol (WHO, 2011); (e) measured height and weight values were obtained using a Seca Portable Stadiometer 213 and a Seca Digital Flat Scale 803 with data used to calculate Body Mass Index (BMI) (USDHHS, 2010). Analysis of the data is presented in this chapter.

Demographics of the Study Sample

An overview of the study sample is presented in Table 1. The sample consisted of 86 participants who were female head-of-household between the ages of 18 and 59 years with one or more children below the age of eighteen years enrolled at two food pantries and one community agency. The mean age of the sample population was 35.88 (SD =

9.75) ranging from 19 through 58 years. The most frequent characteristics of the sample population was white (76.7%), with a high school level of education (36%), retired/not working, (59.3%), and an annual income before taxes less than $4,999 (32.6%). Household composition varied with husband (25.6%) or long-term partner (15.1%) living in the household most frequently in addition to children. During the participant recruitment process, participants self-identified as head-of-household. Head-of-household has multiple definitions in addition to the federal income tax law definition. Two examples include: "An individual in one family setting who provides actual support and maintenance to one or more individuals who are related to him or her through adoption, blood, or marriage" and "The designation head-of-household…is applied to one whose authority to exercise family control and to support the dependent members is founded upon a moral or legal obligation or duty" (West's Encyclopedia of American Law, 2008). There are variations in the definition of head-of-household. Those individuals who self-identified as head-of-household were included in the study sample. All participants were also self-identified as the financial head-of-household. Lastly, the mean number of children in the household was 2.16 (*SD* = 1.136) and the mean household size was 3.92 (*SD* = 1.512).

Table 1

Demographic Characteristics of Sample (N = 86)

Variable	Mean	SD	N	%
Age	35.88	9.750	84	
Racial/Ethnic Group			86	100%
Black (not Hispanic)			6	7%
White (not Hispanic)			66	76.7%
Hispanic			6	7%
Asian or Pacific Islander			2	2.3%
Other			6	7.%

Highest level of school completed			86	100%
Some high school			13	15.1%
High school			31	36%
Some college			23	26.7%
Completed college			15	17.4%
Some grad school			1	1.2%
Completed grad school			3	3.5%
Work status			86	100%
Retired/Not working			51	59.3%
Working part-time			18	20.9%
Working full-time			17	19.8%
Income from all sources before taxes			85	98.8%
$4,999 or less			28	32.6%
$5,000-$9,999			18	20.9%
$10,000-$19,999			19	22.1%
$20,000-$29,999			14	16.3%
$30,000-$39,999			3	3.5%
$50,000-$59,000			1	1.2%
$60,000-$69,000			1	1.2%
$70,000-$79,000			1	1.2%
$100,000 or more			0	0%
Head of Household			86	100%
Yes			86	100%
Living in Household			86	100%
Husband			22	25.6%
Long-term partner			13	15.1%
Roommate			1	1.2%
Parent/s			4	4.7%
Child/children			84	97.7%
Grandchild/grandchildren			7	8.1%
Other family members			7	8.1%
Number of children less than 18 years of age in household	2.16	1.136		
Number of individuals in household	3.92	1.512		

Statistical Description of the Variables

Data Management

Data were collected from participants using data collection instruments during site visits by the PI. The data were subsequently reviewed and manually entered into the Statistical Package for the Social Sciences (SPSS), Version 22 by the PI. Accuracy of

data entry was verified by the PI through comparison of a printout of the data file and original data forms. The raw data were reviewed for outliers, wild data values, and inconsistencies as recommended by Polit and Beck (2013). Household food security status raw score was calculated from participant responses to the 18-item U.S. Household Food Security Scale following coding procedures (USDA, 2012). These scores were further transformed into the household food security status categories of high food security, marginal food security, low food security and very low food security. The scores for the 10-item GSE Scale were evaluated. One participant was missing one response. As all items are equivalent in the measure, the GSE Scale score was calculated for this participant through the use of the participant's mean responses. The scores for the GSE Scale were then calculated following scoring instructions (Schwarzer & Jerusalem, 1995). The scores for the 30-item General PSQ were calculated after reverse coding of items following instrument scoring instructions (Levenstein et al., 1995). Eight participants were missing one response item. The items were unique per participant with the exception of question seven which was not completed by two participants. The General PSQ scores for these participants were calculated through the use of mean responses as all scale items are equivalent. This enabled the inclusion of data from all participants in the description of study variables and hypothesis testing. Height and weight measurements were used to calculate BMI. The BMI scores were subsequently transformed into the weight status categories of underweight (BMI < 18.5 kg/m^2), normal (BMI 18.5 to 24.9 kg/m^2), overweight (BMI 25.0 to 29.9 kg/m^2), and obese (BMI 30.0 to 34.9 kg/m^2). Additionally, participants' BMI scores were categorized by obesity class if applicable (Class 1 = BMI 30.0 to 34.9 kg/m^2; Class II = BMI 35.0-39.9 kg/m^2; Class III

= BMI ≥ 40 kg/m²) (USDHHS, 2013). Waist and hip circumference measurements were used to calculate the waist to hip circumference ratio (WHCR).

Data quality was first evaluated via visual screening of the data distribution for each study variable. Frequency tables, histograms and scatter plots were used to scan for skewness and kurtosis. Normality was further assessed through Fisher's skewness and kurtosis measures, presented in Table 2. Z-scores were calculated to interpret Fisher's measure of skewness and Fisher's measure of kurtosis. Z-scores in the range of -1.96 to 1.96 are acceptable as they reflect a normal distribution. (Plichta & Kelvin, 2013). The Z-scores indicated that the distribution of values for all variables, with exception of the GSE Scale, were similar to a normal distribution. The scores for the GSE Scale were mildly skewed and not transformed to facilitate interpretation (Tabachnick & Fidell, 2007).

Table 2

Distribution of Variables

	CFSM	General PSQ	GSE Scale	BMI	WHCR
Skewness	-.268	-.175	-.544	.452	.237
SE Skewness	.260	.260	.260	.260	.260
Z-score	-1.030	-.673	-2.092	1.738	.912
Kurtosis	-1.001	-.252	.968	-.317	-.137
SE Kurtosis	.514	.514	.514	.514	.514
Z-score	-1.947	-.490	1.883	-.617	-.267

Dependent Variable

Descriptive statistics of the study variables are presented in Table 4. The dependent variable, obesity, was measured by BMI calculated from measured height and weight. Obesity is defined as a BMI score of ≥ 30 kg/m^2 (USDHHS, 2010). The mean

score of 32.83 kg/m^2 (*SD* = 8.46) in the study sample indicates that participants on average were obese. BMI categories further illustrated the degree of obesity within the sample (see Table 4). In the sample population, 60.5% were obese, 20.9% were overweight, 16.3% were normal weight and 2.3% were underweight. Participants with BMI scores above 30 kg/m^2 were further categorized as obesity class I, 25.6%; obesity class II, 14%; and obesity class III, 20.9% of total sample (USDHHS, 2013).

Independent Variables

Household food security status was measured by the CFSM on which the study sample had a mean score of 6.97 (*SD* = 4.08). Study values indicate that on average, study participants were residing in households that were food insecure. The degree of household food insecurity among the sample population was further delineated through analysis of the household food security categories of high food security, 9.3%; marginal food security, 10.5%; low food security, 30.2 %; and very low food security, 50%. Scores on the General PSQ for the study population yielded a mean of .50 (SD.18) (USDA, 2012). Scores represent the lowest possible level of stress at 0 and the highest possible level of stress at 1 (Levenstein et al., 1993). The scores of the study population indicate that on average, participants were experiencing a moderate level of stress during the last year or two. General self-efficacy was measured by the GSE Scale with a mean score of 31.05 (*SD* = 4.97) for the study sample. Potential scores may range from 10 to 40 with higher scores indicating a stronger sense of general self-efficacy (Schwarzer & Jerusalem, 1995). On average, study participants had a higher sense of general self-efficacy.

Table 3

Descriptive Statistics of Study Variables

Variable	Mean	SD	Score	
			Minimum	Maximum
CFSM	6.97	4.08	0	15
General PSQ	.50	.18	.07	.92
GSE Scale	31.05	4.97	13	40
BMI	32.83	8.46	16.83	54.50
WHCR	.86	.06	.73	1.02

Table 4

Weight Status Categories

	N	%
Underweight	2	2.3%
Normal weight	14	16.3%
Overweight	18	20.9%
Obese	52	60.5%
Class I	22	25.6%*
Class II	12	14%*
Class III	18	20%*

*Obesity class percentages based on total sample ($N = 86$).

Table 5

Household Food Security Status

	N	%
High Food Security	8	9.3%
Marginal Food Security	9	10.5%
Low Food Security	26	30.2%
Very Low Food Security	43	50%

Demographic Variables

Bivariate correlational analysis was conducted to determine if a significant relationship was present between any of the demographic variables and obesity (BMI) prior to hypothesis testing. Demographic variables at the categorical level were recoded into dichotomous variables based on frequency distributions as follows: 1) Racial/Ethnic

Group consisted of six categories which were dichotomized with White (not Hispanic) recoded as "1" (76.7%) and Black (not Hispanic) (7%), Hispanic (7%), Asian or Pacific Islander (2.3%), and other (7%) recoded as "0"; 2) Work status which consisted of three categories was dichotomized with retired/not working recoded as "1" (59.3%) and working part-time (20.9%) and working full-time (19.8%) recoded as "0"; 3) Living in household data were coded in the data file as eight separate categorical variables as household composition data overlapped. Data were recoded into one dichotomous variable with a code of "1" for other adult in household for husband (25.6%), long-term partner (15.1%), roommate (1.2%), parent/s (4.7%), and other family members (8.1%) and a code of "0" for no other adults in household. All participants had either children or grandchildren residing in the household and these categories were not included in the new dichotomous variable. There were no participants who lived alone (0%) and this category was not included in the new dichotomous variable. Subsequent correlational analysis of demographic variables and the dependent variable obesity demonstrated that highest level of education (r = -.288, $p < 0.01$) and annual income before taxes (r = -.221, $p < 0.05$) were inversely, significantly related to obesity.

Psychometric Properties of Instruments

Reliability

Internal consistency reliability coefficients for the study instruments are located in Table 6. Reliability coefficients are considered acceptable at a level of .70 for new instruments and at a level of .80 for established instruments (Nunnally, 1978). The Cronbach's alpha for each of the study instruments was .80 or greater, indicating internal consistency reliability of the instruments in this sample.

Table 6

Alpha Coefficients for Study Instruments

Study Instrument	Cronbach's alpha coefficient
Core Food Security Measure (CFSM)	.859
General Perceived Stress Questionnaire (General PSQ)	.935
General Self-Efficacy Scale (GSE Scale)	.899

Hypothesis Testing

Hypotheses one, two, three, five, and six were tested using Pearson product-moment correlations which are presented in Table 7. Inferential analyses were performed with two tailed tests at the 0.05 level of significance. Hypotheses four and seven were tested using multiple regression analyses as outlined by Baron and Kenny (1986) for testing mediation models.

Table 7

Correlation Coefficients of Study Variables

	Household Food Security	General PSQ	WHCR	GSE Scale	Obesity
Household Food Security					
Pearson Correlation	1				
Sig. (2-tailed)					
General PSQ					
Pearson Correlation	.507**	1			
Sig. (2-tailed)	.000				
WHCR					
Pearson Correlation	.005	.097	1		
Sig. (2-tailed)	.966	.374			
GSE Scale					
Pearson Correlation	-.203	-.342**	-.055	1	
Sig. (2-tailed)	.061	.001	.614		
Obesity					
Pearson Correlation	.142	.221*	.129	-.224*	1
Sig. (2-tailed)	.191	.041	.235	.038	

*significant at the 0.05 level; **significant at the 0.01 level

Hypothesis 1

Hypothesis 1 proposed a positive relationship between food insecurity and obesity. The hypothesis is derived from the theoretical proposition that resource availability (food insecurity) will lead to a change in health status (obesity). Correlational analysis indicated that food insecurity was not significantly related to obesity in the study sample (r = .142, p = 0.191). Hypothesis 1 was not supported.

Hypothesis 2

Hypothesis 2 proposed a positive relationship between food insecurity and general perceived stress. The hypothesis is derived from the theoretical proposition that lack of resources (food insecurity) increases relative risk (general perceived stress). Correlational analysis indicated that food insecurity was positively and significantly related to general perceived stress (r = .507, p = 0.000) in the study sample. Hypothesis 2 was supported.

Hypothesis 3

Hypothesis 3 proposed a positive relationship between general perceived stress and obesity. The hypothesis is derived from the theoretical proposition that risk factor exposure/relative risk (general perceived stress) interacts with health status (obesity). Correlational analysis indicated that general perceived stress was positively and significantly related to obesity (r = .221, p = 0.041) in the study sample. Hypothesis 3 was supported.

Hypothesis 4

Hypothesis 4 proposed that when general perceived stress is controlled for statistically, the relationship between food insecurity and obesity will diminish and will not be statistically significant. The hypothesis is derived from the VPM. General

perceived stress, as related to food insecurity, would mediate the relationship between food insecurity and obesity through an increase in relative risk of obesity. To test the mediation model the following conditions must be present: food insecurity must positively affect general perceived stress; food insecurity must positively affect obesity; and general perceived stress must positively affect obesity (Baron & Kenny, 1986). There was a positive and significant relationship between food insecurity and general perceived stress; and there was a positive and significant relationship between general perceived stress and obesity. However, the independent variable food insecurity was not significantly related to the dependent variable obesity in the study sample: therefore, a mediation model could not be tested. Hypothesis 4 was not supported.

Hypothesis 5

Hypothesis 5 proposed a positive relationship between food insecurity and general self-efficacy. The hypothesis is derived from the theoretical proposition that lack of resources (food insecurity) increases relative risk. The individual's general ability to respond (general self-efficacy) to lack of resources is related to the degree of risk and the subsequent impact on health status (obesity). Correlational analysis indicated that food insecurity was not significantly related to general self-efficacy (r = -.203, p = 0.061) in the study sample. Hypothesis 5 was not supported.

Hypothesis 6

Hypothesis 6 proposed a negative relationship between general self-efficacy and obesity. This hypothesis is derived from the theoretical proposition that increased relative risk will increase health status change (obesity). Correlational analysis indicated that

general self-efficacy was inversely and significantly related to obesity (r = -.224; p = 0.038) in the study sample. Hypothesis 6 was supported.

Hypothesis 7

Hypothesis 7 proposed that when general self-efficacy is controlled for statistically, the relationship between food insecurity and obesity will diminish and not be statistically significant. This hypothesis derived from the VPM. General self-efficacy, as related to food insecurity, would mediate the relationship between food insecurity and obesity through a decrease in relative risk of obesity. To test the mediation model the following conditions must be present: food insecurity must positively affect general self-efficacy; food insecurity must positively affect obesity, and general self-efficacy must negatively affect obesity (Baron & Kenny, 1986). Although there was a positive and significant relationship between general self-efficacy and obesity, a relationship between food insecurity and general self-efficacy was not supported. In addition, the independent variable food insecurity was not significantly related to the dependent variable obesity in the study sample; therefore, a mediation model could not be tested. Hypothesis 7 was not supported.

Ancillary Testing

Additional statistical analyses were performed to further explore the relationship between food insecurity and obesity. A significant relationship between these variables is required as a component of mediational model testing (Baron & Kenny, 1986). Multiple factors for inconsistent correlation between food insecurity and obesity have been suggested in the literature. Correlational analysis to explore the relationship between these variables based on the classification of food insecurity (high food security, marginal

food security, low food security, and very low food security) and the classification of obesity (BMI) (obesity class I, II, III, overweight, normal, and underweight) was conducted. The relationship between the independent variable household food security status and the dependent variable obesity remained not significant in all classifications of the variables.

Analysis of demographic variables revealed significant correlations between the demographic variable of education level and the dependent variable of obesity (r = -.288, p = 0.007) and the demographic variable of annual income and obesity (r = -.221, p = 0.042). This inverse relationship suggests that individuals with higher education and higher income are less likely to be obese. Hierarchical regression analysis was performed to explore the influence of education level and annual income on the relationship between food insecurity and obesity. Education level and annual income were entered as independent variables in model one; household food security status was included in model two. In the second model, controlling for education level and annual income, household food insecurity was not significant (Table 8).

Table 8

Hierarchical Regression Demographic Variables

	Standardized β	R^2 Change	Sig.
Model 1			
Level of Education	-.247	.106	.025
Annual Income	-.157		.150
Model 2			
Level of Education	-.239	.004	.032
Annual Income	-.144		.199
Household Food Security	.064		.559

Then additional analysis of the demographic variable of household composition or "living in household" was performed. Participants had self-identified as head-of-household, and approximately 41% of the participants had either a husband or long-term partner living in the household. To determine if the presence of a husband/partner in the household composition influenced the relationship between food insecurity and obesity, the data was first recoded into a dichotomous variable where husband/long-term partner were coded as "1" and the remaining responses were coded as "0". Correlational analysis revealed the absence of a significant relationship between food insecurity and the presence of a husband/partner (r = .077, p = 0.48); and an absence of a relationship between the presence of a husband/partner and obesity (r = .03, p = 0.782). Further analysis indicated the absence of a correlation between general perceived stress and the presence of a husband/partner (r = .053, p = 0.627), and an absence of a relationship between general self-efficacy and the presence of a husband/partner (r = .107, p = 0.327). This finding suggests that the presence of a husband or partner in the household did not influence the relationships among study variables.

Next, WHCR, as a surrogate marker of prolonged stress was evaluated. The relationship between food insecurity and WHCR was not significant (r = .005, p = 0.966). The relationship between WHCR and obesity was not significant (r = .129, p = 0.235). Lastly, it should be noted that in correlational analysis of study variables, general self-efficacy was moderately and inversely correlated with general perceived stress (r = -.342, p = 0.001). As general perceived stress was correlated with obesity (r = .221, p = 0.041) and general self-efficacy was correlated with obesity (r = -.224, p = 0.038) a mediation model to evaluate general self-efficacy as a mediator between general

perceived stress and obesity was tested (Baron & Kenny, 1986). Hierarchical regression revealed that when general self-efficacy was controlled for statistically, the relationship between general perceived stress and obesity was no longer statistically significant (Table 9). Therefore general self-efficacy mediated the relationship between general perceived stress and obesity in the study sample.

Table 9

Hierarchical Regression General Perceived Stress, General Self-Efficacy, and Obesity

	Standardized β	R^2 Change	Sig.
Model 1			
GSE Scale	-.224	.050	.038
Model 2			
GSE Scale	-.168	.023	.138.
General PSQ			.151

CHAPTER 5: DISCUSSION OF THE FINDINGS

The purpose of this study was to determine the relationships among food insecurity, general perceived stress, general self-efficacy and obesity in female heads-of-household between the ages of 18 and 59 living with one or more children under 18 years of age. This chapter presents an interpretation of the findings of the hypothesized relationships based on theoretical propositions of the Vulnerable Populations Conceptual Model (VPM) (Flaskerud & Winslow, 1998). The VPM relates resource availability and relative risk to health status and is designed to serve as a foundation in research, practice, and policy development related to vulnerable populations. The model propositions were mapped to the study variables as follows: (1) a lack of resources increases relative risk. This proposition was tested as food insecurity increases stress; and food insecurity increases relative risk which is ameliorated by general self-efficacy. (2) risk factor exposure interacts with health status, such that increased exposure to risk factors leads to increased morbidity and mortality in a population group. This proposition was tested in the study as increased risk (increased perceived stress) and increased general self-efficacy as a response to increased food insecurity are related to an increased presence of obesity (morbidity). (3) morbidity and mortality in a community may feed back into resource availability. A feedback mechanism is proposed by Flaskerud & Winslow (1998) in that increased morbidity in a community will lead to decreased socioeconomic and environmental resources.

Hypotheses

Food Insecurity and Obesity

The relationship between food insecurity and obesity was not supported in the study ($r = .142$, $p = 0.191$). First, from a theoretical perspective there are several aspects of the VPM to consider. The VPM, as a population-based model, includes resource availability as a key concept within the model. Resource availability, as both socioeconomic and environmental resources is a very broad concept. Within the vulnerable population of female heads-of-household with children who are experiencing food insecurity, multiple factors may be interacting to influence their lack of resources and their relative food insecurity. The population level factors that lead to food insecurity may be inconsistent across the study sample, the factors may or may not interact with each other to influence vulnerability and relative risk, and they may or may not be related to food insecurity and/or the health status variable of obesity. Also, the relative risk experienced by each individual participant is a reflection of their unique set of available resources. The combination of factors that increase relative risk and lead to obesity may be too complex and too unique for each individual participant to explain the variance in obesity within the sample. This finding confirms the statement made at the IOM workshop on food insecurity that "food insecurity does not in and of itself explain or cause obesity" (Olander, 2010, p. 2) and confirms the lack of a linear relationship identified by Franklin et al. (2007) in a review of literature.

From a methodological standpoint, data met statistical assumptions for calculation of the Pearson product-moment coefficient and the calculation is independent of sample size (Tabachnick & Fidell, 2007), suggesting accurate methodology. Secondly, the prevalence of obesity in the general population of approximately 35.7% (Ogden, et al, 2012), may impact the correlation of food insecurity to obesity. Within the study sample

60.5% of the participants were obese (n = 52, M = 32.83, SD = 8.46). Although the frequency of obesity is greater than the national average within the sample, the causative and mediating factors leading to obesity may not be population specific. A further methodological consideration is the use of measured height and weight to calculate BMI versus self-reported height and weight. Lyons et al. (2004) conducted a study to explore discrepancies noted in the literature related to the method of measuring height and weight. The findings indicated that the prevalence of obesity was higher in individuals with food insecurity who self-reported height and weight and there was no significant difference in obesity prevalence related to food insecurity when height and weight were measured. The findings of the current study are based on measured height and weight to calculate BMI.

Food Insecurity and General Perceived Stress

There was a significant correlation between food insecurity and general perceived stress, that is stress over the last year or two, in the study sample (r = .507, p = 0.000). This finding is related to the theoretical proposition: a lack of resources increases relative risk (Flaskerud & Winslow, 1998) in the VPM. The variable food insecurity is considered a lack of available resource within the study and general perceived stress represents increased relative risk. Furthermore, the finding is congruent with the concept of perceived stress developed from the work of Lazarus and Folkman (1984) and Cohen and colleagues (Cohen et al., 1983; Cohen & Williamson, 1988). Perceived stress occurs when a life event or interaction between the person and environment is viewed as exceeding coping resources. Thus, in the current study, food insecurity is an event that is viewed as exceeding coping resources. The results indicate that on average, individuals in

the study population who are food insecure experience general perceived stress. The correlation coefficient demonstrates that the relationship is positively correlated; as food insecurity increases, general perceived stress also increases. The strength of the correlation coefficient (r = .507) is considered large (Cohen, 1988). The positive relationship between food insecurity and stress is consistent with findings in the empirical literature (Bisgaier & Rhodes, 2011; Booth & Smith, 2001; Chilton & Booth, 2007; Chilton & Rose, 2009; Heflin, Siefert, & Williams, 2005; Stevens, 2009; Vozoris & Tarasuk, 2002).

General Perceived Stress and Obesity

There was a significant correlation between general perceived stress and obesity in the study sample (r = .221, p= 0.041). This finding reflects the VPM theoretical proposition: increased risk factor exposure interacts with health status (Flaskerud & Winslow, 1998). The variable general perceived stress is considered a risk factor; obesity is considered morbidity related to health status. Furthermore, the finding of a relationship between perceived stress and obesity is supported in the literature (Delongis, Folkman, & Lazarus, 1988; Levenstein et al.,1993). The impact of perceived stress on hormonal regulation of the body (Bjorntorp, 1996) and psychosomatic influences on the body (Levenstein et al., 1993) link perceived stress to obesity. The correlation coefficient confirms that the relationship is positive; as general perceived stress increases, obesity also increases. The findings suggest that on average individuals who have higher values on the PSQ Index (or higher general perceived stress) are more likely to be obese. The strength of the correlation coefficient (r = .22) is considered small. Values for effect size are considered small at r = .10 and medium at r = .30 (Cohen, 1988). Although the

variables are correlated, the correlation does not explain a large portion of the variance (Cohen, 1988). The small effect size suggests that the variance in obesity (BMI) may be related to other factors in addition to perceived stress. This finding is congruent with the consideration of general self-efficacy as a mediator in addition to perceived stress, as well as the consideration of multiple factors of resource availability and relative risk influencing health status (obesity) in the VPM.

Food Insecurity, General Perceived Stress, and Obesity

The hypothesis that when general perceived stress is controlled for statistically, the relationship between food insecurity and obesity will diminish was not supported. The hypothesis was derived from the relationships within the VPM. Resource availability influences relative risk which subsequently influences health status (morbidity and mortality). Thus, the influence of food insecurity on obesity would be mediated by general perceived stress. Within this study, general perceived stress is viewed as a mediator between food insecurity and obesity. In order to test a mediation model, there must be a correlation between the independent variable and the dependent variable; there must be a correlation between the independent variable and the mediator; and there must be a correlation between the mediator variable and the dependent variable (Baron & Kenny, 1986). Food insecurity was not significantly correlated with obesity ($r = .142$, $p = 0.191$) in the sample. Although general perceived stress was correlated with both food insecurity and obesity, a mediation model could not be evaluated. These findings suggest that food insecurity and obesity, although both present in the study sample, may be related to other unidentified factors. The correlation of general perceived stress with both food insecurity and obesity may also be related to unidentified factors. The influence of

multiple socioeconomic factors has been proposed in the literature (Martin & Ferris, 2007; Martin & Lippert, 2012; RWJF, 2010).

Food Insecurity and General Self-Efficacy

The proposed relationship between food insecurity and general self-efficacy was not supported in the study (r = -.203, p = 0.061). This finding is related to the theoretical proposition in the VPM: a lack of resources increases relative risk (Flaskerud & Winslow, 1998). The variable food insecurity is considered a lack of available resource within the study and general self-efficacy influences relative risk. The results indicate that there was not a significant relationship between food insecurity and general self-efficacy within the study population. The result of this hypothesis testing was unsupported in the literature. Empirical literature supports the use of adaptive strategies by adults in food insecure household to protect children from experiencing food insecurity (Bove & Olson, 2006; Nackers & Appelhans, 2013). Implementation of preventative strategies would be consistent with general self-efficacy as the ability to respond to a variety of stressful situations (Luszczynska, Scholz, and Schwarzer, 2005). It was hypothesized that as food insecurity increases, general self-efficacy would increase. The positive correlation between self-efficacy and obesity may then reflect other unidentified factors.

General Self-Efficacy and Obesity

There was a significant correlation between general self-efficacy and obesity in the study sample (r = -.224; p = 0.038). This finding is related to the theoretical proposition: relative risk influences health status (Flaskerud & Winslow, 1998). It was hypothesized that there would be a negative correlation between general self-efficacy and

obesity. Thus, as general self-efficacy increased, obesity would decrease. This finding supports the hypothesis and suggests that on average, as general self-efficacy increased in the study sample, obesity decreased. The strength of the coefficient is considered small (Cohen, 1988). General self-efficacy, as the ability to respond to a variety of stressful situations (Luszczynska, Scholz, & Schwarzer, 2005), may be present in the study sample unrelated to food insecurity. Unlike task specific self-efficacy, general self-efficacy would support a broader sense of confidence and ability to be successful (Sherer, 1990). The presence of general self-efficacy would influence the level of obesity; however, the strength of the effect size in the study sample may be related to the generality of the variable and the focus of the associated measurement tool.

Food Insecurity, General Self-Efficacy, and Obesity

The hypothesis that when general self-efficacy is controlled for statistically, the relationship between food insecurity and obesity will diminish was not supported. This hypothesis, was derived from the relationships within the VPM. Resource availability influences relative risk which subsequently influences health status (morbidity and mortality). Thus, the influence of food insecurity on obesity would be mediated by general self-efficacy. In order to test a mediation model, there must be a correlation between the independent variable and the dependent variable; there must be a correlation between the independent variable and the mediator; and there must be a correlation between the mediator variable and the dependent variable (Baron & Kenny, 1986). Food insecurity was not significantly correlated with obesity (r = .142, p = 0.191). Additionally, food insecurity and general self-efficacy were not correlated (r = -.203, p = 0.061) in the sample. Therefore, a mediational model could not be tested. General self-

efficacy, or the ability to respond to a variety of stressful situations (Luszczynska, Scholz, & Schwarzer, 2005), was measured and tested for correlational relationships in the study sample rather than task specific self-efficacy. Thus it is theoretically congruent to have general self-efficacy present in the study sample that is unrelated to food insecurity. Furthermore, it is theoretically congruent for general self-efficacy to have a small effect on obesity.

Ancillary Findings

To further investigate the relationship between food insecurity and obesity, correlations between the classifications of the variables were examined. Food insecurity, as a decrease in resource availability, is classified based on its severity. Previous findings have indicated inconsistent correlation between classes of food insecurity and obesity (Adams et al., 2003; Jones & Frongillo, 2005;Martin & Lippert, 2012). The ancillary findings suggest an absence of a direct relationship at any level of these variables, supporting previous findings. Exploration of the influence of demographic variables indicated an inverse relationship between education level and obesity. (r = -.288, p = 0.007) and the demographic variable of annual income and obesity (r = -.221, p = 0.042). These findings suggest that as education level and annual income increase, obesity decreases. However, the strength of the correlations explains only a small portion of the variance (Cohen, 1988). In multiple regression analysis, controlling for education level and annual income did not significantly influence the regression model. The amount of variance in obesity explained by food insecurity in this model was 0.4%. The relationship between food insecurity and obesity was not significant in the hierarchical regression model. Further exploration of the demographic variable of household composition related

to the self identification of participants as head-of-household, revealed the absence of a significant correlation between study variables and the presence of a husband or partner in the household. This indicates that the presence of sub-groups related to head-of-household in the study sample did not affect the findings. Additionally, WHCR was not significantly correlated with either food insecurity or obesity. Lastly, general self-efficacy was evaluated as a mediator of the relationship between general perceived stress and obesity. Mediational analysis revealed that general self-efficacy has a mediating effect on the relationship between general perceived stress and obesity. This finding suggests that participants who experience general perceived stress who have higher general self-efficacy are less likely to be obese. The finding is consistent with the VPM in that general self-efficacy may influence relative risk of obesity related to general perceived stress (Flaskerud & Winslow).

In summary, the hypothesized role of general perceived stress and general self-efficacy as mediators of the relationship between food insecurity and obesity was not supported in the study. Significant relationships were identified between food insecurity and general perceived stress; general perceived stress and obesity; and general self-efficacy and obesity.

CHAPTER 6: SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Summary

This study examined the relationships among food insecurity, general perceived stress, general self-efficacy utilizing the Vulnerable Populations Conceptual Model (Flaskerud & Winslow, 1998). Components of the model explored were resource availability (food insecurity); relative risk (general perceived stress, general self-efficacy) and health status (obesity). Within the conceptual model, resource availability influences relative risk which subsequently influences health status. Health status may also feed back to influence resource availability. The following hypotheses were investigated in a sample of female, heads-of-household between the ages of 18 and 59 living with one or more children under the age of 18:

1. There is a positive relationship between food insecurity and obesity.
2. There is a positive relationship between food insecurity and general perceived stress.
3. There is a positive relationship between general perceived stress and obesity.
4. When general perceived stress is controlled for statistically, the relationship between food insecurity and obesity will diminish and will not be statistically significant.
5. There is a positive relationship between food insecurity and general self-efficacy.
6. There is a negative relationship between general self-efficacy and obesity.

7. When general self-efficacy is controlled for statistically, the relationship between food insecurity and obesity will diminish and will not be statistically significant.

The study consisted of 86 participants who were female heads-of-household living with one or more children under the age of 18, ages 18 to 59, who could read and speak English. The mean age of the sample was 35.88 (*SD* = 9.75) years. The majority of the participants were white (76.7%), with the remainder black (7%), Hispanic (7%), other (7%), and Asian or Pacific Islander (2.3%). Most of the participants had completed high school (84.8%) and many had attended or completed college (48.8%). Most of the participants were not working or retired (59.9%) and had incomes lower than $29,999 (91.9%) with many lower than $4,999 (32.6%). All participants were heads-of-households, but the majority had other adults present in the household (54.7%). The participants had on average two children under 18 in the household (*M* = 2.16, *SD* = 1.56) and approximately four total individuals (*M* = 3.92, *SD* = 1.512).

The participants were recruited from three community sites; two food pantries and one community action agency. Data were collected during site visits by the PI. The following instruments were used: (1) a demographic questionnaire designed by the PI; (2) the Core Food Security Module (USDA, 2012); (3) the General Perceived Stress Questionnaire (Levenstein et al., 1993); (4) the General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995); (5) a Seca Portable Stadiometer 213 and a Seca Digital Flat Scale 803 were used to measure height and weight with values used to calculate BMI (USDHHS, 2010); and (6) a standard, stretch-resistant measuring tape was used to measure waist and hip circumference following the WHO protocol (WHO, 2011).

The focus of the study was the evaluation of two separate mediation models in which general perceived stress and general self-efficacy were each hypothesized to mediate the relationship between food insecurity and obesity. Hypothesis testing was conducted following methodology recommended by Baron and Kenny (1986) for testing mediation models. Hypotheses one, two, three, five and six were examined using Pearson product moment correlation coefficients. Results indicated: (1) a significant, positive correlation between food insecurity and general perceived stress, and a significant positive relationship between perceived stress and obesity; (2) the absence of a significant relationship between food insecurity and general self-efficacy and a significant inverse relationship between general self-efficacy and obesity: and (3) no significant relationship between food insecurity and obesity. Hypotheses four and seven were not tested because the conditions for mediation testing were not met for either proposed mediator. Ancillary testing included hierarchical multiple regression to evaluate the effect of two correlated demographic variables, level of education and level of income, on the relationship between food insecurity and obesity which was not significant. The demographic variable "living in household" as recoded to evaluate the effect of the presence of a husband or partner in the household was not significantly correlated with study variables. Additionally, classification levels of food insecurity and obesity were examined for correlation between the variables, which was not significant. WHCR, as a surrogate marker of prolonged stress, was not correlated with either food insecurity or obesity. Lastly, there was a significant correlation between general perceived stress and general self-efficacy. General self-efficacy was found to have a mediating effect between general perceived stress and obesity. In conclusion, although bivariate correlations were

identified, the role of general perceived stress and general self-efficacy as mediators of the relationship between food insecurity and obesity was not supported.

Limitations

The main limitations of this study were the sampling methodology and the study sites. Study participants were recruited via a cross-sectional sample from three community-based sites. Study sites were selected to provide a sample with multiple levels of household food security and a sufficient enrollment of participants living in food insecure households. This recruitment strategy did not generate enough diversity within the sample to accurately determine the relationship among the study variables. Additionally, study participants self-identified as head-of-household. Because of the variations within the definitions of head-of-household, subgroups were present in the study sample. A stratified sampling method would provide for a comparison of the findings among subgroups of female head-of-household participants. Lastly, a cross-sectional design limits data collection to one point in time, despite the use of the General PSQ and the GSE Scale that are designed to reflect the variables of perceived stress and general self-efficacy over the last year or two. A longitudinal design would be able to more accurately reflect the relationship between household food security and obesity.

Conclusions

The main findings from this study do not support, as theorized, the role of general perceived stress and general self-efficacy as mediators of the relationship between food insecurity and obesity. The mediation models could not be tested due to the lack of significant correlation between food insecurity and obesity in the study sample. This finding confirms the absence of direct causality in the relationship between the variables

in empirical literature (Franklin et al., 2012) It further confirms previous findings (Lyons et al., 2004) regarding the absence of a significant relationship between food insecurity and obesity when using data collected through measured height and weight. Furthermore, ancillary findings did not support correlation between the degree of food insecurity and the degree of obesity and the effect of the demographic variables of education and income was not significant in hierarchical regression. Additionally, WHCR was not correlated with food insecurity or obesity.

Theoretical congruence is challenged by the study findings; however, the breadth of the VPM related to the multi-factorial nature of resource availability and relative risk inherent with food insecurity and obesity supports the continued appropriateness of the conceptual model. The significant relationships between food insecurity and general perceived stress; general perceived stress and obesity; and general self-efficacy and obesity, as well as the mediating effect of general self-efficacy between general perceived stress and obesity, illustrate the continued value of evaluating these variables within the context of available resources, relative risk and health status. The linkage of societal factors to the VPM supports the continued exploration of unknown parameters of the relationship between food insecurity and obesity using the model. The VPM is appropriate for the investigation of the complex issues of the study population.

Implications for Nursing

Findings from this study suggest that women who are heads-of-household in food insecure households with children experience increased general perceived stress. Also, challenges to general self-efficacy are present in the study population related to obesity. When viewed as factors with the potential to change relative risk to health status, the

need to address perceived stress and self-efficacy through nursing intervention becomes apparent. Unlike the free healthcare clinic setting, the food pantry environment, as well as community action agencies, are not organizations that traditionally provide nursing care. However, these environments may serve as sites of contact with this "well" vulnerable population. The provision of health promotion and wellness interventions within the context of the food pantry to decrease stress and increase self-efficacy would function to decrease the relative risk of general morbidity (health status). Nursing interventions designed to be delivered in the food pantry or community action agency setting would serve to increase access to nursing services. Furthermore, findings suggest a need for nursing involvement in the formation of health policy related to the funding and provision of services at these non-traditional sites.

Recommendations

The findings of this study and the study limitations support the following recommendations for future research:

1. Study replication using stratified random sampling according to food security classification. This sampling methodology would facilitate a comprehensive comparison of the impact of all levels of food insecurity on obesity. It would further facilitate the analysis of demographic variables.
2. Study replication using stratified random sampling according to female head-of-household subgroups. This sampling methodology would facilitate the comparison of relationships among study variables across subgroups within the female head-of-household population.

3. Study replication across multiple sites. Increasing the number of sites and expanding the geographic range of the study would increase the diversity within the study sample. This would serve to improve the explication of the relationships of study variables and increase the generalizability of findings.
4. Study redesign to a longitudinal design. The collection of data at different points of time would facilitate examination of the interrelationship of variables over time.
5. Study redesign through community-based participatory research. Redesign of the study from a community-based participatory research perspective would incorporate expertise of partner agencies and the population of .interest. The contribution of community-based expertise may serve to reformulate the articulation of study variable relationships within the VPM.
6. Qualitative studies. Reexamination of factors related to obesity in female heads-of-household with children through qualitative methods. The identification of factors that influence obesity within the VPM through qualitative methods would confirm the appropriateness of the variables incorporated into quantitative research.
7. Interventional studies. Studies designed to decrease perceived stress, increase general self-efficacy, and decrease obesity in the study population would serve to improve the health status of this vulnerable population.

References

Abeida, M. E., Liesa, R. F., Varela, V., Campayo, J. G., Gormedino, P. R., & Garcia, A. O. (2011). Study of the influence of psychological factors in the etiology of vocal nodules in women. *Journal of Voice,* 27(1), 129e15-129e20.

Adams, E. J., Grummer-Strawn, L., & Gilberto, C. (2003). Food insecurity is associated with increased risk of obesity in California women. *The Journal of Nutrition*, 133 (4), 1070-1074.

Alert, M. D., Rastegar, S., Foret, M., Slipp, L., Jacquart, J., Macklin, E., ...Yeung, A. (2013). The effectiveness of comprehensive mind body weight loss intervention for overweight and obese adults: A pilot study. *Complementary Therapies in Medicine* 21, 286-293.

Anderson, S. A. (1990). Core indicators of nutritional state for difficult-to-sample populations. *The Journal of Nutrition* Retrieved from jn.nutrition.org

Ash, S., Reeves, M., Bauer, J., Dover, T., Vivanti, A., Leong, C., …Capra, S. (2006). A randomized control trial comparing lifestyle groups, individual counseling and written information in the management of weight and health outcomes over 12 months. *International Journal of Obesity*, 30, 1557-1564.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2). 191-215.

Baron, R. M. & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182.

Basiotis, P. P., & Lino, M. (2002). Food insufficiency and prevalence of overweight among adult women. *Family Economics and Nutrition Review*, 15(2), 55-57.

Bauchman, K., Logue, V., Sutton, K., Capers, C., Jarjoura, D., & Smucker, W. (2003). Biopsychosocial characteristics of overweight and obese primary care patients: Do psychosocial and behavior factors mediate sociodemographic effects? *Preventive Medicine* 37(2), 129-137.

Bennett, J. A. (2000). Mediator and moderator variables in nursing research: Conceptual and statistical differences. *Research in Nursing & Health*, 23, 415-420.

Bergdahl, J. & Bergdahl, M. (2002). Perceived stress in adults: Prevalence and association of depression, anxiety and medication in a Swedish population. *Stress and Health*, 18, 235-241.

Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2002). *Guide to measuring household food security*. Retrieved from United States Department of Agriculture http://www.fns.usda.gov/guide-measuring-household-food-security-revised-2000

Bisgaier, J., & Rhodes, K. V. (2011). Cumulative adverse financial circumstances: Associations with patient health status and behaviors. *Health & Social Work*, 36(2), 129-137.

Bjorntorp, P. (1996). Behavior and metabolic disease. *International Journal of Behavioral Medicine*, 3(4), 285-302.

Block, J. P., He, Y., Zaslavsky, A. M., Ding, L. & Ayanian J. Z. (2009). Psychosocial stress and change in weight among US adults. *American Journal of Epidemiology*, 170(2), 181-192.

Booth, S. & Smith, A. (2001). Food security and poverty in Australia: Challenges for dietitians. *Australian Journal of Nutrition and Dietetics*, 58(3), 150-156.

Bonsaksen, T., Kottorp, A., Gay, C., Fagermoen, M. S., & Lerdal, A. (2013). Rasch analysis of the general self-efficacy scale in a sample of persons with morbid obesity. *Health and Quality of Life Outcomes*, 11(202).

Bonsaksen, T., Lerdal, A. & Fagermoen, M. S. (2012). Factors associated with self-efficacy in persons with chronic illness. *Scandinavian Journal of Psychology*, 53, 333-339.

Boutin-Foster, C. & Rodriguez, A. (2009). Psychosocial correlates of overweight or obese status in Latino adults with coronary artery disease. *Journal of Immigrant Minority Health*, 11, 359-365.

Bove, C. F. & Olson, C. M. (2006). Obesity in low-income rural women: Qualitative insights about physical activity and eating patterns. *Women & Health*, 44(1), 2006.

Budzynska, K., West, P., Savoy-Moore, R. T., Lindsey, D., Winter, M., et al. (2013). A food desert in Detroit: Associations with food shopping and eating behaviours, dietary intakes and obesity. *Public Health Nutrition*, 16(12), 2114-23.

Capers, C. F., Baughman, K., & Logue, E. (2011). Behaviors and characteristics of African American and European American females that impact weight management. *Journal of Nursing Scholarship*, 43(2), 133-144.

Centers for Disease Control and Prevention (2011). *About BMI for Adults*, Retrieved from http//www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/

Centers for Disease Control and Prevention (2013). *Adult Obesity Facts*, Retrieved from http://www.cdc.gov/obesity/data/adult.html.

Chang, M. W., Nitzke, S., Brown, R., & Baumann, L. (2011). Predictors of low-income, obese mothers' use of healthful weight management behaviors. *Journal of Nutrition Education and Behavior*, 43(2), 87-95.

Chang, M. W., Nitzke, S., Guilford, E., Adair, C. H., & Hazard, D. L. (2008). Motivators and barriers to healthful eating and physical activity among low-income overweight and obese mothers. *Journal of the American Dietetic Association*, 108(6), 1023-1028.

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods*, 4(1), 62-83.

Chilton, M., & Booth, S. (2007). Hunger of the body and hunger of the mind: African American women's perceptions of food insecurity, health and violence. *Journal of Nutrition Education and Behavior*, 39, 116-125.

Chilton, M., & Rose, D. (2009). A rights-based approach to food insecurity in the United States. *American Journal of Public Health*, 99(7), 1203-1211.

Cho, J. H., Jae, S. Y., Choo, I. H., Choo, J. (2013). Health-promoting behaviour among women with abdominal obesity: A conceptual link to social support and perceived stress. *Journal of Advanced Nursing*, 70(6), 1381-1390.

Christaki, E., Kokkinos, A., Costarelli, V., Alexopoulos, E. C., Chrouso, G. P., & Darviri, C. (2013). Stress management can facilitate weight loss in Greek overweight and obese women: A pilot study. *Journal of Human Nutrition and Dietetics*, 26, 132-139.

Cochrane, G. (2008). Role for a sense of self-worth in weight-loss treatments: Helping patients develop self-efficacy. *Canadian Family Physician*, 54, 543-547.

Cohen, B., Parry, J., & Yang, K. (2002). Household food insecurity in the United States, 1998-1999: Detailed statistical report. U. S. Department of Agriculture: Washington, D. C.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Cohen J. (1992). A power primer. *Quantitative Methods in Psychology*, 112(1), 155 -159.

Cohen, S., Doyle, W. J., & Baum, A. (2006). Socioeconomic status is associated with stress hormones. *Psychosomatic Medicine,* 68, 414-420.

Cohen, S. & Williamson, G. M. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), *The Social Psychology of Health* (pp. 31 – 67). Newbury Park, CA: Sage.

Coleman-Jensen, A., Nord, M., & Singh, A. (2013). Household food security in the United States in 2012. Economic Research Report Number 155 United States Department of Agriculture.

Dallman, M. F., Pecoraro, N. C., & Fleur, S. E. (2004). Chronic stress and comfort foods: Self-medication and abdominal obesity. *Brain, Behavior, and Immunity*, 19(2005), 275-280.

Dammann, K. W., & Smith, C. (2011). Food-related environmental, behavioral, and personal factors associated with body mass index among urban, low-income African-American, American Indian and Caucasian women. *American Journal of Health Promotion*, 25(6), e1-e10.

Dechamps, A., Gatta, B., Bourdel-Marchasson, I., Tabarin, A., & Roger, P. (2009). Pilot study of a 10-week multidisciplinary tai chi intervention in sedentary obese women. *Clinical Journal of Sports Medicine*, 19(1), 49-53.

Delahanty, L. M., Meigs, J. B., Hayden. D.,Williamson, D. A., & Nathan, D. M. (2002). Psychological and behavioral correlates of baseline BMI in the diabetes prevention program (DDP). *Diabetes Care*, 25(11), 1992-1998.

Dennis, K. E. & Goldberg, A. P. (1996). Weight control self-efficacy types and transitions affect weight-loss outcomes in obese women. *Addictive Behavior*, 21(1), 103-116.

Dressler, H., & Smith, C. (2013). Environmental, personal, and behavioral factors are related to body mass index in a group of multi-ethnic low-income women. *Journal of the Academy of Nutrition and Dietetics*, 113(12), 1662-1668.

Ezenwa, M. O., Molokie, R. E., Wilkie, D. J., Suarez, M. L., & Yao, Y. (2014). Perceived injustice predicts stress and pain in adults with sickle cell disease. *Pain Management Nursing,* 1-13.

Farag, N. H., Moore, W. E., Lovallo, W. R., Mills, P. J., Khandrika, S., & Eichner, J. E. (2008). Hypothalamic-pituitary-adrenal axis function: Relative contributions of perceived stress and obesity in women. *Journal of Women's Health*, 17(10), 1647-1655.

Finkelstein, E. A., DiBonaventura, M. D., Burgess, S. M., Hale, B. C. (2010). The costs of obesity in the workplace. *Journal of Occupational and Environmental Medicine*, 52(10), 971-976.

Finkelstein, E. A., Trogdon, J. G., Cohen, J. W., & Dietz, W. (2009). Annual medical spending attributable to obesity: Payer and service specific estimates. *Health Affairs,* 28(5), w822-2831. Retrieved from content.healthaffairs.org.

Fisher, K., & Kridli, S. A. (2014). The role of motivation and self-efficacy on the practice of health promotion behaviours in the overweight and obese middle-aged American women. *International Journal of Nursing Practice*, 20, 327-335

Flaskerud, J. H. & Winslow, B. J. (1998). Conceptualizing vulnerable populations health-related research. *Nursing Research*, 47(2). 69-78.

Flegal, K. M., Carroll, M. D., Kit, B. K., & Ogden, C. L. (2012). Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *Journal of the American Medical Association*, 307(5), 491-497.

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2010) Prevalence and trends in obesity among US adults, 1999-2008. *Journal of the American Medical Association*, 303(3), 235-241.

Flegal, K. M., Graubard, B. I., Williamson, D. F., Gail, M. H. (2005). Excess deaths associated with underweight, overweight, and obesity. *Journal of the American Medical Association*, 293(15), 1861-1867.

Fliege, H. et al. (2005). The perceived stress questionnaire (PSQ) reconsidered: Validation and reference values from different clinical and healthy adult samples. *Psychosomatic Medicine*, 67, 78-88.

Franklin, B., Jones, A., Love, D., Puckett, S., Macklin, J., & White-Means, S. (2012). Exploring mediators of food insecurity and obesity: A review of recent literature. *Journal of Community Health*, 37(1), 253-264.

Fukui, S., Davidson, L. J., Holter, M. C., & Rapp, C. A. (2010). Pathways to recovery (PTR): Impact of peer-led group participation on mental health recovery outcomes. *Psychiatric Rehabilitation Journal*, 34(1), 42-48.

Garasky, S., Stewart, S. D., Gundersen, C. , Lohman, B. J., Eisenmann, J. C. (2009). Family stressors and child obesity. *Social Science Research*, 38, 755-766.

Gittelsoh, J., Song, H. J., Suratkar, S., Kumar, M. B., Henry, E. G., Sharma, S.,….Anliker, J. A. (2009). An urban food store intervention positively affects food-related psychosocial variables and food behaviors. *Health Education & Behavior*, 37, 390-402.

Grossniklaus, D. A., Dunbar, S. B., Tohill, B. C., Gary, R., Higgins, M., & Frediani, J. (2010). Psychological factors are important correlates of dietary pattern in overweight adults. *Journal of Cardiovascular Nursing*, 25(6), 450-460.

Gundersen, C., Lohman, B. J., Garasky, S., Stewart, S. & Eisenmann, J. (2008). Food security, maternal stressors, and overweight among low-income US children: Results from the national health and nutrition examination survey (1999-2002). *Pediatrics,* 122(3), e529-e540.

Habicht, J. P., Pelto, G., Frongillo, E., & Rose, D. (2004, July). *Conceptualization and Instrumentation of Food Insecurity*. Paper prepared for National Academy of Science workshop.

Hagler, A. S., Norman, G. J., Zabinski,k M. F., Sallis, J. F., Calfas, K. J., & Patrick, K. (2007). Psychosocial correlates of dietary intake among overweight and obese men. *American Journal of Health Behavior*, 31(1), 3-12.

Hamilton, W. L., Cook, J. T., Thompson, W. W., Buron, L. F., Frongillo, E. A., Olson, C. M., & Wehler, C. A. (1997*). Household food security in the United States in 1995: Technical report of the food security measurement project*. United States Department of Agriculture.

Hand, G. A., Phillips, K. D., & Dudgeion, W. D. (2006). Perceived stress in HIV-infected individuals: Physiological and psychological correlates. *AIDS Care*, 18(8), 1011-1017.

Hanson, K. L., Sobal, J., & Frongillo, E. A. (2007). Gender and marital status clarify associations between food insecurity and body weight. *The Journal of Nutrition*, 137, 1460-1465.

Head-of-Household (2008). In *West's encyclopedia of American law* (2nd ed.), The Gale Group, Inc. Retrieved from http://legaldictionary.thefreedictionary.com/Head+of+Household

Healthy People, 2010 (2011). Healthy People 2010. Retrieved from http://wonder.cdc.gov/DATA2010

Healthy People, 2020 (2013). Healthy People 2020. Retrieved from http://www.healthypeople.gov/2020

Heflin, C. M., Siefert, K., & Williams, D. R. (2005). Food insufficiency and women's mental health: Findings from a 3-year panel of welfare recipients. *Social Science & Medicine*, 61, 1971-1982

Holben, D. H., & Pheley, A. M. (2006). Diabetes risk and obesity in food-insecure households in rural Appalachian Ohio. *Preventing Chronic Disease*, 3(3), 1-9.

Institute of Medicine (2011*). Hunger and obesity: Understanding a Food Insecurity Paradigm: Workshop Summary*. Washington, DC: The National Academies Press.

Isasi, C. R., Parrinello, C. M., Jung, M. M., Carnethon, M. R., Birnbaum-Weitzman, O., Espinoza, R. A., …Gallo, L. C. (2015). Psychosocial stress is associated with obesity and diet quality in Hispanic/Latino adults. *Annals of Epidemiology*, 25, 84-89.

Ivers, L. c. & Cullen, K. A. (2011). Food insecurity special considerations for women. *The American Journal of Clinical Nutrition*, 94(6), 1740S-1744S.

Jilcott, S. B., Wall-Bassett, E. D., Burke, & S. C., Moore, J. B. (2011). Associations between food insecurity, supplemental nutrition assistance program (SNAP) benefits, and body mass index among adult females. *Journal of the American Dietetic Association*, 111, 1741-1745

Jones, S. J. & Frongillo, E. A. (2006). Food insecurity and subsequent weight gain in women. *Public Health Nutrition*, 10(2), 145-151.

Karnik, A., et. al. (2011). Food insecurity and obesity in New York City primary care clinics. *Medical Care*, 49(7), 658-661.

Keefer, L., Kievles, J. L., Kwiatek, M. A., Palsson, O., Taft, T. H., Martinovich, Z., & Barrett, T. A. (2012). The potential role of a self-management intervention for ulcerative colitis: A brief report from the ulcerative colitis hypnotherapy trial. *Biological Research for Nursing*, 14(1), 71-77.

Keefer, L., Kiebles, J. L., Taft, T. H. (2011). The role of self-efficacy in inflammatory bowel disease management: Preliminary validation of a disease-specific measure. *Inflammatory Bowel Diseases*, 17, 614-620.

Kiebles, J. L., Doerfler, B., Keefer, L. (2010). Preliminary evidence supporting a framework of psychological adjustment to inflammatory bowel disease. *Inflammatory Bowel Diseases*, 16(10), 1685-1695.

Kocalevent, R. D., et al. (2007). Contribution to the construct validity of the perceived stress questionnaire from a population-based survey. *Journal of Psychosomatic Research*, 63, 71-81.

Kollannoor-Samuel, G., Vega-Lopez, S., Chhabra, J., Segura-Perez, S., Damio, G., & Perez-Escamilla, R. (2011). Food insecurity and low self-efficacy are associated with health care access barriers among Puerto-Ricans with type 2 diabetes. *Journal of Immigrant and Minority Health*, 14, 552-562.

Laraia, B. A., Siega-Riz, A. M., & Gundersen, C. (2010). Household food insecurity is associated with self-reported pregravid weight status, gestation weight gain, and pregnancy complications. *Journal of the American Dietetic Association*, 110, 692-701.

Largo-Wight E., Chen, W. W., Dodd, V., Weiler, R (2011). Healthy workplaces: The effects of nature contact at work on employee stress and health. *Public Health Reports*, 126, Supplement 1, 124-130.

Largo-Wight, E., Peterson, P. M., & Chen, W. W. (2005). Perceived problem solving, stress, and health among college students. *American Journal of Health Behavior*, 29(4), 360-370.

Larson, N. I., & Story, M. T. (2011). Food insecurity and weight status among U.S. children and families: A review of the literature. *American Journal of Preventive Medicine*, 40(2), 166-173.

Lawler-Row, K. A., Hyatt-Edwards, L., Wuensch, K. L., & Karremans, J. C. (2011). Forgiveness and health: The role of attachment. *Personal Relationships*, 18, 170-183.

Lazarus, R. & Folkman, S. (1984). *Stress, appraisal, and coping.* New York, NY: Springer Publishing Company, Inc.

Leganger, A., Kraft, P., & Roysamb, E. (2000). Perceived self-efficacy in health behavior research: Conceptualisation, measurement and correlates. *Psychology and Health*, 15, 51- 69.

Lerdal, A., Andenaes, R., Bjornsborg, E., Bonsaksen, T., Borge, L., Christiansen, B., …Fagermoen, M. S. (2011). Personal factors associated with health-related quality of life in persons with morbid obesity on treatment waiting lists in Norway. *Quality of Life Research,* 20(8), 1187-1196.

Leung, C. W., Williams, D. R., & Villamor, E. (2012). Very low food security predicts obesity predominantly in California Hispanic men and women. *Public Health Nutrition,* 15(12), 2228-2236.

Levenstein, et al. (1993). Development of the perceived stress questionnaire: A new tool for psychosomatic research. *Journal of Psychosomatic Research*, 37(1), 19-32.

Levenstein, et al. (2000). Stress and exacerbation in ulcerative colitis: A prospective study of patients enrolled in remission. *The American Journal of Gastroenterology*, 95(5), 1213-1220.

Lohman, B. J., Stewart, S., Gundersen, C., Garasky, S., & Eisenmann, J. C. (2009). Adolescent overweight and obesity: Links to food insecurity and individual, Maternal, and family stressors. *Journal of Adolescent Health*, 45, 230-237.

Luszczynska, A., Scholz, U., & Schwarzer, R. (2005). The general self-efficacy scale: Multicultural validation studies. *The Journal of Psychology* 139(5), 439-457.

Lyles, C. R., Wolf, M. S., Schillinger, D., Davis, T. C., DeWalt, D., Dahlke, A. R., …Seligman, H. (2013). Food insecurity in relation to changes in hemoglobin A_{1c}, self-efficacy, and fruit/vegetable intake during a diabetes educational intervention. *Diabetes Care,* 36, 1448-1453.

Lyons, A. A., Park, J., Nelson, C. H. (2008). Food insecurity and obesity: A comparison of self- reported and measured height and weight. *American Journal of Public Health*, 98(4), 751-757.

Martin, K. S., & Ferris, A. M. (2007). Food insecurity and gender are risk factors for obesity. *Journal of Nutrition Education and Behavior*, 39(1), 31-36.

Martin, M. A. & Lippert, A. M. (2012). Feeding her children, but risking her health: The intersection of gender, household food insecurity and obesity. *Social Science & Medicine,* 74, 1754-1764.12q w

Merriam, P. A., Ockene, I. S., Hebert, J. R., Rosal, M. C., & Matthews, C. E. (1999). Seasonal variation of blood cholesterol levels: Study Methodology, *Journal of Biological Rhythms*, 14(4), 330-339.

Mitchell, N., Catenacci, V., Wyatt, H. R., & Hill, J. O. (2011). Obesity: Overview of an epidemic. *Psychiatric Clinics of North America*, 34(4). 717-732.

Nabe-Nielsen, K., Garde, A. H., Tuchsen, F., Hogh, A., & Diderichsen, F.(2008). Cardiovascular risk factors and primary selection into shift work. *Scandinavian Journal of Work, Environment & Health,* 34(3), 206-212.

Nackers, L. M. & Appelhans, B. M. (2013). Food insecurity is linked to a food environment promoting obesity in households with children. *Journal of Nutrition Education and Behavior*, 45(6). 780-784.

National Institutes of Health (1998). *Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults: The Evidence Report.* (NIH Publication No. 98-4083) Bethesda, MD: National Institutes of Health.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill Book Company.

Ogden, C. L., Carroll, M. D., Kit, B. K., Flegal, K. M. (2012, February). *Prevalence of Obesity in the United States, 2009-2010*. (Data Brief No. 82) Hyattsville, MD: National Center for Health Statistics.

Ogden, C. L., Lamb, M. M., Carroll, M. D., & Flegal, K. M. (2010, December). *Obesity and Socioeconomic Status in Adults: United States, 2005-2008.* (Data Brief No. 5 0) Hyattsville, MD: National Center for Health Statistics.

Ohls, J., Radbill, L., & Schirm, A. (2001). Household food security in the United States, 1995-1997: Technical issues and statistical report. U.S. Department of Agriculture.

Ohman, L., Bergdahl, J., Nyberg, L., and Nilsson, L. G. (2007). Longitudinal analysis of the relation between moderate long-term stress and health. *Stress and Health*, 23, 131-138.

Olander, C. (2010, November). *Olander talking points*. Symposium presented at the IOM Workshop on Food Security and Obesity, Washington, D.C. Retrieved from

http://www.iom.edu/~/media/Files/Activity%20Files/Nutrition/FoodInsecurityandObesity/Olander.pdf

Olson, C. M., & Strawderman, M. S. (2008). The relationship between food insecurity and obesity in rural childbearing women. *The Journal of Rural Health*, 24(1), 60-66.

Opsomer, J. D., Jensen, H. H., Nusser, S. M., Drignei, D., & Amemiya, Y. (2002). *Statistical considerations for the USDA food insecurity index*. Ames, Iowa: Center for Agricultural and Rural Development Iowa State University.

Ott, R. L., Longnecker, M. (2001). *An introduction to statistical methods and data analysis* (5th ed.). Pacific Grove, CA: Duxbury.

Pan, L., Sherry, B., Njai, R., & Blanck, H. M. (2012). Food insecurity is associated with obesity among US adults in 12 states. *Journal of the Academy of Nutrition and Dietetics,* 112(9), 1403-1409.

Peterson-Graziose, V., Bryer, J., & Nikolaidou, M. (2013). Self-esteem and self-efficacy as predictors of attrition in associate degree nursing students. *Journal of Nursing Education* 52(6), 351-354.

Phillips, K. D., Sowell, R. L., Rojas, M., Tavakoli, A., Fulk, L. J., & Hand, G. A. (2004). Physiological and psychological correlates of fatigue in HIV disease. *Biological Research for Nursing*, 6(1), 59-74.

Piferi, R. L. & Lawler, K. A. (2006). Social support and ambulatory blood pressure: An examination of both receiving and giving. *International Journal of Psychophysiology*, 62, 328-336.

Plichta, S. B. & Kelvin E. (2013). *Munro's statistical methods for health care research* (6th ed.). Philadelphia: Lippincott Williams & Wilkins.

Polit, D. F. & Beck C. T. (2013*). Essentials of nursing research: Appraising evidence for nursing practice*(8th ed.). Philadelphia: Lippincott Williams & Wilkins.

Pyykkonen, A.J., Raikkonen, K., Tuomi, T., Eriksson, J. G., Groop, L., & Isomaa, B. (2010). Stressful life events and the metabolic syndrome. *Diabetes Care*, 33(2), 378-384.

Ritsneer, M. S. & Ratner, Y. (2006). The long-term changes in coping strategies in schizophrenia: Temporal coping types. *The Journal of Nervous and Mental Disease* 194(4), 261-267.

Robaina, K. A., & Martin, K. S. (2013). Food insecurity, poor diet quality, and obesity among food pantry participants in Hartford, CT. *Journal of Nutrition Education and Behavior*, 45(2), 159-164.

Robert Wood Johnson Foundation (April, 2010). Food insecurity and risk for obesity among children and families: Is there a relationship? *Healthy Eating Research: A National Program of the Robert Wood Johnson Foundation.*

Roberts, C. J., Troop, N., Connan, F., Treasure, J., & Campbell, I. C. (2007). The effects of stress on body weight: Biological and psychological predictors of change in BMI. *Obesity*, 15(12), 3045-3055.

Rosal, M. C., King, J., Ma, Y., & Reed, G. W. (2004). Stress, social support, and cortisol: Inverse associations? *Behavioral Medicine* 30(Spring), 11-21.

Sarkar, S. & Muklopadhyay, B. (2007). Perceived psychosocial stress and cardiovascular risk: Observations among the Bhutias of Sikkim, India. *Stress and Health*, 24, 23-34.

Scholz, U., Dona, B. G., Sud, S., & Schwarzer, S. (2002). Is general self-efficacy a universal construct? Psychometric findings from 25 countries. *European Journal of Psychological Assessment*, 18(3), 242-251.

Schwarzer, R. (2009). *Everything you wanted to know about the general self-efficacy scale but were afraid to ask.* Retrieved from http://www.ralfschwarzer.de/

Schwarzer, R., Bäbler, J., Kwiatek, P., & Schröder, K. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the general self-efficacy scale. *Applied Psychology: An International Revi*ew, 46(1), 69-88.

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston. *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). Windsor, UK: NFER-NELSON.

Schwarzer, R., Mueller, J. & Greenglass, E. (1999). Assessment of perceived general self-efficacy on the internet: Data collection in cyberspace. *Anxiety, Stress, and Coping*, 12, 145-161.

Seligman, H. K., Davis, T. C., Schillinger, d., & Wolf, M. S. (2010). Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. *Journal of health Care for the Poor and Underserved*, 21(4), 1227-1233.

Sherer, M. (1990). General self-efficacy more development needed. *Psychological Reports,* 66, 1242.

Siefert, K., Heflin,C. M., Corcoran, M. E., & Williams, D. R. (2001). Food insufficiency and the physical and mental health of low-income women. *Women & Health*, 32, 159-177.

Steese, S., Dollette, M., Phillips, W., Hossfeld, E., Matthew, G., Taormina, G. (2006). Understanding Girls' Circle as an intervention on perceived social support, body image, self-efficacy, locus of control, and self-esteem. *Adolescence*, 41(161), 55-74.

Stevens, C. A. (2009). Exploring food insecurity among young mothers (15-24 years). *Journal for Specialists in Pediatric Nursing*, 15(2), 163-171.

Strickland, O. L., Giger, J. N., Nelson, M. A., & Davis, C. M. (2007). The relationships among stress, coping, social support, and weight class in premenopausal African American women at risk for coronary heart disease. *Journal of Cardiovascular Nursing*, 22(4), 272-278.

Tarakeshwar, N., Vanderwerker, L. C., Paulk, E., Pearce, M. J., Kasl, S. V., & Prigerson, H. G. (2006). Religious coping is associated with the quality of life of patients with advanced cancer. *Journal of Palliative Medicine*, 9(3), 646-657.

Teixeira, P. J., Carraca, E. V., Marques, M. M., Rutter, H., Oppert, J. M., De Bourdeaudhuij, I., ...Brug, J. (2015). Successful behavior change in obesity interventions in adults: A systematic review of self-regulation mediators. *BMC Medicine*, 13 (84) 1-16.

Teixeira, P. J., Going, S. B., Sardinha, L. B., & Lohman, T. G. (2005). A review of psychosocial pre-treatment predictors of weight control. *The International Association for the Study of Obesity, Obesity Reviews*, 6 43-65.

Tomiyama, A. J., Dallman, M. F., & Epel, E. S. (2011). Comfort food is comforting to those most stressed: Evidence of the chronic stress response network in high stress women. *Psychoneuroendocrinology*, 36, 1513-1519.

Tomiyama, A. J., McClatchey, T. M., McCoy, S. K., Epel, E. S., Poelke, G., Kemeny, M. E., Daubenmier, J. (2014). Associations of weight stigma with cortisol and oxidative stress independent of adiposity. *Health Psychology*, 33(8), 862-867.

Townsend, M. S., Peerson, J., Love, B., Achterberg, C., & Murphy, S. P. (2001). Food insecurity is positively related to overweight in women. *The Journal of Nutrition,* 131(6), 1738-1745.

United States Census Bureau (2014). *Current population survey (CPS).* Retrieved from http://www.census.gov/cps/methodology

United States Census Bureau (2014). *Selected social characteristics in the United States*. Retrieved from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk

United States Department of Agriculture (2015). *Food deserts.* Agricultural Marketing Service. Retrieved from http://apps.ams.usda.gov/fooddeserts/fooddeserts.aspx

United States Department of Agriculture (2013). *Food insecurity in the U.S.: Definitions of food security.* Economic Research Service. Retrieved from

http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitio...

United States Department of Agriculture (2012). *U.S. Household Food Security Survey Module: Thee-Stage Design, with Screens.* Economic Research Service. Retrieved from http://www.ers.usda.gov/datafiles/Food_Security_in_the_United_States/Food_Security_Survey_Modules/hh2012.pdf

United States Department of Health and Human Services (2013). *Managing overweight and obesity in adults: Systematic evidence review from the obesity expert panel, 2013.* Rockville, MD: United States Department of Health and Human Services, National Heart, Lung, and Blood Institute.

United States Department of Health and Human Services (2010). *The surgeon general's vision for a healthy and fit nation*. Rockville, MD: United States Department of Health and Human Services, Office of the Surgeon General.

Vijayaraghavan, M., Jacobs, E. A., Seligman, H., & Fernandez, A. (2011). The association between housing instability, food insecurity, and diabetes self-efficacy in low-income adults. *Journal of Health Care for the Poor and Underserved*, 22(4), 1279-1291.

Vozoris, N. T. & Tarasuk, V. S. (2003). Household food insufficiency is associated with poorer health. *The Journal of Nutrition*, 133, 120-126.

Waltz, C. F., Strcikland, O. L., Lenz, E. R. (2005). *Measurement in nursing and health research* (3rd ed.). New York: Springer Publishing Company, Inc.

Wang, Y., Yao, L., Liu,L., Yang, X., Wu, H., Wang, J., & Wang, L. (2014). The mediating role of self-efficacy in the relationship between big five personality and depressive symptoms among Chinese unemployed population: A cross-sectional study. *BMC Psychiatry* 14(61).

Warziski, M. T., Sereika, S. M., Styn, M. A., Music, E., & Burke, L. E. (2007). Changes in self-efficacy and dietary adherence: The impact on weight loss in the PREFER study. *Journal of Behavioral Medicine,* 31, 81-92.

Wells, J. R. & Anderson, S. T. (2011). Self-efficacy and social support in African Americans diagnosed with end stage renal disease. *Association of Black Nursing Faculty Journal*, 22(1), 9-12.

Whitaker, R. C. & Sarin, A. (2007). Change in food security status and change in weight are not associated in urban women with preschool children. *The Journal of Nutrition*, 137, 2134-2139.

Wilde, P. E., & Peterman, J. N. (2006). Individual weight change is associated with household food security status. *The Journal of Nutrition*, 136(5), 1395-1400.

Wolf, L., Stidham, A. W., Ross, R. (2014). Predictors of stress and coping strategies of US accelerated vs. generic baccalaureate nursing students: An embedded mixed methods study. *Nurse Education Today*, 35, 201-205.

World Health Organization (2011). *Waist circumference and waist-hip ratio*: *Report of a WHO expert consultation, Geneva, 8-11 December 2008*. Retrieved from http://whqlibdoc.who.int/publications/2011/9789241501491_eng.pdf

Wrenn, K., Lorenzen, B., Jona, I., Zhou, C., k& Aronsky, D. (2010). Factors affecting stress in emergency medicine residents while working in the ED. *Clinical Key,* 28(8), 897-902.

Wunderlich, G. S. & Norwood, J. L. (Eds.). (2006). *Food insecurity and hunger in the United States: An assessment of the measure.* National Research Council of the National Academies:Washington, D.C.

Appendix A

Evidence Table

Reference	Purpose	Sample	Measurement	Significant Findings
Food Insecurity & Obesity Cross-Sectional Studies				
Townsend et al. (2001)	To examine the relationship between food insecurity and overweight as measured by body mass index	*n* = 4,537 women, *n* = 5,004 men 1994, 1995, 1996 data Continuing Survey of Food Intakes by Individuals (CSFII)	FI – one question with four responses Self-reported height & weight Overweight – BMI 27.3 kg/m^2	Relationship FI & overweight: Logistic regression model women with mild FI were more likely to be overweight than food secure women (OR 1.3, *p* = 0.005).
Basiotis & Lino (2002)	To gain additional insight, we also examined women's overall diet quality as gauged by the Healthy Eating Index and its components	*n* = 4,804 women in food sufficient households and *n* = 437 women in food insufficient households 1988-1994 National Health and Nutrition Examination Survey (NHANES)	Measured BMI Healthy Eating Index Food sufficiency – reported household had enough food to eat Food Insufficiency – reported household sometimes or often did not have enough to eat	Relationship between overweight and food insufficiency (as per authors)

Adams, Grummer-Strawn, & Chavez (2003)	To determine the prevalence of food insecurity with and without hunger in women living in California in 1998 and 1999, and to examine the relationship between food insecurity and obesity as identified by body mass index of ≥ 30 kg/ m^2	*N* = 8,169 women 1998, 1999 California Women's Health Survey	FI – four question subset of the USDA Household Food Security Survey Module Self reported data	Sample FI prevalence 18.2% Stratified logistic regression: NHW FI without hunger (Adj OR 1.36 [1.00 – 1.84], $p < 0.05$) Asian, Black, & Hispanic FI with hunger (Adj OR 2.81 [1.84 – 4.28], $p < 0.05$) FI without hunger (1.47 [1.07 – 1.94], $p < 0.05$)
Laria, Siega-Riz, & Evenson (2004)	To investigate the association between concern about enough food and obesity in an adult population at the state level	*N* = 3,945 1999 Social Context Module of the Behavioral Risk Factor Surveillance System (BRFSS) Louisiana, New York	FI – one question "In the past 30 days, have you been concerned about having enough food for you or your family Self-reported height & weight	FI prevalence: LA – Women 10.0%; men 5/8% NY – Women 12.8%; men 10.7% Multivariate logistic regression – morbidly obese twice as likely to be concerned about having enough food (LA 17.4%, RR 2.1 [1.3,

				4.02]; NY 18.2%, RR2.2 [1.21, 3.85]). Final model non-significant
Holben & Pheley (2006)	To assess the relationship of food security to clinical measure-ments of several chronic health risks among residents in six rural Appalachian Ohio counties	*N* = 2,580 completed survey *n* = 808 health examination	FI – USDA Household Food Security Survey Module BMI- calculated using measured height & weight	By gender - Women FI with/without hunger mean BMI 30.8kg/m^2, food secure women mean BMI 29.030.8kg/m^2 (t1272 = -2.0, *p* = .04)
Hanson, Sobal, & Frongillo (2007)	To analyze associations between food insecurity and body weight, and whether gender and marital status are involved in that relationship	*n* = 4,338 men and *n* = 4,172 women 1999 -2002 NHANES data	FI – 18-question USDA Household Food Security Survey Module BMI – calculated from measured height and weight	Compared with food secure obese men, obese men with low food security had lower BMIs (*n* = 377, -4.7 ± SE = 3) and obese men with very low food security had lower BMIs (*n* = 189, -0.4 ± SE = 5.2). Compared to food secure obese women,

				obese women who were marginally food secure had higher BMIs (*n* = 315, 5.5 ± = 3.7), as did obese women with low food security (*n* = 349, 10.8 ± SE = 2.6, *p* = <0.01), and obese women with very low food security (*n* = 176, 0.3± SE = 3.6). Likelihood of obesity by marital status: Married women (+14.0 percentage points, *p* < 0.05), FI women living with partners (+20.0 percentage points, *p* <0.05) and FI widowed women (+16.9 Percentage points, *p* <0.05)
Martin & Ferris (2007)	To examine relation-ships between adult	*n* = 200 parents (predominantly female) and *n* = 212 children	FI – USDA Household Food Security Survey Module	Multivariate regression analysis: FI predictor of obesity (OR

	obesity, childhood overweight, and household food insecurity.			2.45 [1.15, 5.25] p = 0.02)
Karnik et al. (2011)	To assess the prevalence of food insecurity, obesity, and nutritional assistance program usage among patients in an urban primary care clinical network; test the hypothesis that food insecurity is associated with increasing body mass index, with receiving food assistance mitigating this association	N = 558 (male, female, children)	FI – USDA Household Food Security Survey Module Measured height and weight	Significant association between FI and BMI in women (1.19 [0.41, 1.97], p = 0.003)
Laria, Siega-Riz & Gundersen (2010)	To identify whether an independent association exists between household	N = 810 women with incomes ≤ 400% of poverty ratio	FI – USDA Household Food Security Survey Module Self-reported pre-pregnancy weight	Regression model for women living in households with marginal FI had pregravid

	food insecurity and pregnancy related complica-tions			weights: Overweight (Adjusted OR 1.22 [0.60, 2.45]), obese (Adjusted OR 0.97 [0.50, 1.88]) severely obese (Adjusted OR 1.73[0.95, 3.17]) Regression model for women living in households with FI had pregravid weights: Overweight (Adjusted OR 2.11 [0.92, 3.43]), obese (Adjusted OR 1.53 [0.68, 3.43]), severely obese (Adjusted OR, 2.97 [1.44 6.14])
Martin & Lippert (2012)	Food insecurity mediates the association between income and weight, but that the manage-ment of food insecurity	*N* = 7,931 men and women of childrearing ages (18-55) who are heads or partners of U.S. households in the Panel Study of Income Dynamics – 1999, 2001, 2003	FI – USDA Food Security Scale Self-reported height and weight. Weight is adjusted using Cawley's regressions of measured weight	Cross-sectional ordinal regression models in which both a child present and household FI is included: Interaction in women for heavier

	intersects with gender to create differential risks of obesity between mothers and non-mothers			weight (1.106, SE 0.40, $p <$ 0.01). In single women the presence of household FI and child predicted heavier weight classification (1.471, SE 0.54, $p <$ 0.01). Testing alternate pathways – interaction of FI and presence of children was significant.
Leung, Williams, & Villamor (2012)	To examine the heterogenei-ty in the associations of food insecurity with BMI and obesity within different gender and racial/ethnic groups.	N = 35,747 adults who participated in the California Health Interview Survey from 2003, 2005, 2007, and 2009	FI – 6 item short form version of the USDA Household Food Security Survey Module. Self-reported height and weight	Relationship between FI and obesity modified by gender and race/ethnicity Multivariate linear regression models: Hispanic women with very low food security had a higher BMI (p = 0.003) and a 22 % higher prevalence of obesity (p = 0.001) compared

				with food secure Hispanic women. Asian women with low food security had a higher BMI (p = 0.008) compared with food secure Asian women. There were no significant associations between FI and obesity among women of other race/ethnicity.
Robaina & Martin (2013)	To examine the relation-ships between food security, diet quality, and BMI among food pantry users	N = 212 food pantry participants	FI – USDA Household Food Security Module BMI was calculated from measured height and weight	FI was not significantly associated with obesity in bivariate analysis. Logistic regression model predicting obesity, food security was not significant (OR 1.3 [0.5, 1.5], p = 0.86)
Longitudinal Studies				
Wilde & Peterman (2006)	To examine the association between food	n = 5,080 women and n = 4,618 men 1999-2000 and 2001-2002	FI – USDA Household Food security Survey Module Measured height	Bivariate comparisons – prevalence of obesity was highest in

security status and change in weight over time.	NHANES	and weight Weight History Questionnaire – self-reported past and current weights.	women who were food insecure without hunger (46.34%) and women who were marginally food insecure (43.06%) when compared to women in food secure households (30.85%). Multivariate logistic regression: Women in marginally food insecure households (OR 1.58 [1.11, 2.24], $p < 0.05$) and women in food insecure without hunger households (OR 1.76 [1.44, 2.15], $p < 0.05$) were more likely to be obese when compared to women in food secure households. Prevalence of weight gain

				2.27 kg (5 lb): Women in FI without hunger households (46.09%, p = 0.05) Women in marginally food secure households (34.62%, p = 0 .05) Women in food secure households (31.08%) Prevalence of weight gain 4.54 kg (10 lb): Women in marginally food secure households (34.62%, p = 0.05) Women in FI without hunger households (32.88%, p = 0.05) Women FI with hunger households (30.56%, p = 0.05) Women in food secure households (20.71%)
Jones & Frongillo	To examine the	N = 5,303 women Panel Study of	FI – USDA Household Food	Women who gained more

(2005)	relationship of food insecurity with subsequent weight gain in women	Income Dynamics 1999 and 2001	Security Survey Module Self-reported height and weight	than 2.3kg in two years and who were overweight at baseline, gained 2.2 kg more if they were food secure (μ = 8.8 kg) then if they were food insecure (μ = 6.6 kg, $p < 0.004$). Women who were FI and overweight at baseline gained less additional weight (μ = 6.6 kg) than those who were FI and not overweight (μ = 9.0, $p = < 0.002$) at baseline. Multivariate analysis – FI was not a predictor of amount of weight gain
Whitaker & Sarin (2007)	To determine whether changes in women's food security status were	$N = 1,751$ women part of the cohort for The Fragile Families and Child Wellbeing Study who agreed to participate in the in-home	FI – USDA Household Food security Survey Module BMI calculated from measured height and weight	Multivariate logistic regression analysis: First model – association between food

	associated with changes in their body weight in 20 large U.S. cities.	assessments at both 3 and 5 years		security and obesity in women who were marginally food secure (46.1 % obese, OR 1.34 [1.04, 1.73]) and women who were food insecure (47.6% obese, OR 1.42 [1.07, 1.89]) At two year follow up – 51.2% of women were obese who were marginally food secure (OR 1.46 [1.13, 1.88]) and 50.2% of women were obese who were food insecure (OR 1.40 [1.06. 1.86]). In final analysis model including covariates, the associations were not significant.
	Olson & Strawderman (2008)	*N* = 622 healthy childbearing women living in a	FI – at entry in early pregnancy – 3 items from the	Chi-square analysis : Within time

	10-county rural area of upstate New York , followed from early pregnancy to 2 years postpartum 311 complete data at 2 years Data were used from the Bassett Mothers Health Project.	Institute of Medicine's Nutrition Questionnaire. FI – at 2 years postpartum 3 questions from the USDA Household Food Security Survey BMI (self-reported or measured heights and weights are not reported)	periods – FI associated with obesity at two years post partum. FI not associated with obesity in early pregnancy. Across time periods – FI in early pregnancy was not associated with obesity at two years post partum. Obesity in early pregnancy was associated with FI at two years post partum. There was an association over time in FI and obesity Multivariate logistic regression: Relationship between obesity in early pregnancy and FI at two years (OR 2.45 [1.21, 4.95], p <0.05) and

				obesity at two years (OR 515.7 [118.8, > 999], $p <$ 0.05). Obesity and FI at early pregnancy were related to major weight gain (4.55 kg or more) at two years (OR 7.26 [1.28, 41.15], $p <$ 0.05).
Food Insecurity and Perceived Stress				
Chilton & Rose (2009)	To discuss addressing food insecurity through a human rights framework.	Position paper	Not applicable	Food insecurity increases vulnerability. The variables of anxiety, stress, depression and violence are included in the discussion. Supports the exploration of the association between FI and general perceived stress.
Chilton & Booth	To examine the	$N = 34$ African American women	Qualitative study	Two major themes

(2007)	relationship between health, hunger, and food insecurity among African American women in Philadelphia	aged 18 to 60 years who received groceries at a food pantry two or more times in the past six months.	Focus groups and in-home semistructured interviews. Demographic questionnaire USDA HFSM short form	emerged: physical experience of hunger; emotional experience of hunger manifested physically by loss of appetite or nervousness with three subcategories of stress and depression, deliberate hunger, and violence and inability to eat.
Stevens (2009)	To explore the experience of food insecurity in young mothers	*N* = 21 mothers aged 15 to 24.	Individual interview Cognitive interviews USDA HFSM	76% (*n* = 16) participants reported food insecurity Factors contributing to FI included income, affordable food sources, housing, and transportation. Constant stress related to balancing budget versus needs emerged in the discussion.
Heflin, Siefert, and	To examine the relationship	Analyzed data from first three waves of the	Food insufficiency question	Authors state food insufficiency

Williams (2005)	between change in household food insufficien-cy and change in women's self-reported mental health	Women's Employment Study (N = 753). The study was conducted among mothers who were receiving cash assistance.	12-month screening version of WHO's Composite International Diagnostic Interview. Pearlin Mastery Scale Sociodemographic and personal characteristics including: Difficult Life Circumstances scale, 11-item neighborhood hazards scale, Conflict Tactics Scale, questions related to discrimination.	may be experienced as stressful and persistent stressful life events are associated with chronic depression.
Bisgaier and Rhodes (2011)	To examine the prevalence of patient-disclosed food insecurity, housing instability, employment concerns, and lack of adequate health coverage for medications and physician care.	Secondary analysis of a prospective, cross-sectional study. Non-emergent adult ED patients (N = 1,506)	Demographic characteristics 19-item checkbox of five variables of adverse financial circumstances and three additional questions. Single items for: overall health status, depression, stress, and behavioral risk factors.	Participants who experienced all five variables of adverse financial circumstances had increased stress (Adjusted OR 24.7 [9.3-65.2], $p <$ 0.05)
Booth and Smith (2001)	To discuss food security and	Review paper	Not applicable	Psychological suffering related to

	poverty in Australia			stress, social constraints and social disruptions to family life is discussed as a consequence of food insecurity
Vozoris and Tarasuk (2003)	To contribute to the understand-ing of FI in Canada	Analysis of data from the 1994 National Longitudinal Survey of Children and Youth and the 1998-1999 National Population Health Survey (*N* = 210,377)	Three food insufficiency questions Sociodemographic variables and health variables through self-reported health scale, functional health index, restricted activity status, number of chronic conditions, depression index, distress index and social support index. Included self-reported height and weight	Odds of individuals in a food insufficient household experiencing distress were 31.8% (OR 2.9 [2.4-3.5]) as compared to 9.9% in food sufficient households.
Perceived Stress and Obesity				
Strickland, Giger, Nelson, and Davis (2007)	To determine the nature of the relationship s among stress, coping, social support and weight class in	Civilian or active military premenopausal African American women aged 18-45 who had regular menstrual periods, were not pregnant and did not plan to become pregnant for 2 years, were	Perceived Stress Scale - Cohen Norbeck Life Events Questionnaire Norbeck Social Support Questionnaire Jalowiec Coping Scale Measured height and weight.	Higher scores on the PSS among overweight and obese women (normal = 22.63, overweight = 23.85, obese = 23.97), but the

	premenopausal African American women as risk factors for coronary heart disease	at least 12 months postpartum and were likely to reside in the study areas for at least 2 years (*N* = 178). Secondary analysis of data.		relationship was not significant in this sample. Authors state the values were in the expected direction.
Tomiyama, Dallman, and Epel (2011)	To test hypotheses in humans related to chronic stress: 1. High stress will be related to higher scores on self-reported emotional eating. 2. High stress will be associated with greater abdominal fat distribution and overall adiposity 3. If individuals with high stress have greater abdominal fat distribution they will also have dampened	Healthy premenopausal women aged 20-50 (*N* = 59). Participants were caregivers of chronically ill children or caregivers of healthy children (to include participants with chronic stress).	The Perceived Stress Scale Dutch Eating Behavior Questionnaire Measured height, weight, and sagittal diameter. Cortisol level measurements	High stress group had higher levels of emotional eating than low level stress group (3.16 vs. 2.18, $p = 0.05$); greater sagittal diameter (20.92 vs. 18.24, $p = 0.05$); and lower cortisol output in response to lab stressor (51.15 vs. 158.24, $p = 0.03$).

	HPA axis activity and increased sensitivity to dexamethasone.			
Farag, Moore, Lovallo, Mills, Khandrika, and Eichner (2008)	To examine associations among diurnal cortisol levels, perceived stress, and obesity patterns.	Women aged 24-72 employed in a rural public school system (N = 78).	Salivary cortisol levels Measured height, weight, waist circumference; BP, heart rate, lipid assessments The Perceived Stress Scale – Cohen Hollingshead four-factor index for socioeconomic status.	Final regression model showed stress predicted 11% of the variability in diurnal cortisol variation across all weight categories (R^2 = 0.11, p < 0.005). Perceived stress, waist circumference explained 35% of diurnal cortisol variation in overweight women (R^2 = 0.35, p < 0.011).
Block, He, Zaslavsky, Ding and Ayanian (2009)	To examine if baseline body mass index would be an effect modifier of the relationship between psycho-social stress	Surviving participants in the Midlife in the United States study who completed the follow-up survey (N = 1,355).	Self-reported height and weight Stress scales including work experiences related to skill discretion, decision authority, and job related demands; perceived constraints in life;	Significant interactions were found in women for job-related demands (β = 0.18, SE = 0.05, p < 0.001), perceived constraint in

	and weight gain.		financial stress Clinical and demographic variables	life (β = 0.06, SE = 0.02, p < 0.001), difficulty paying bills (β = 0.06, SE = 0.02, p = 0.010) and generalized anxiety (β = 0.32, SE – 0.09, p = 0.001). Authors report and conclude greater psychosocial stress associated with greater weight gain.
Isasi, et al. (2015)	To examine the association of psycho-social stress with obesity, adiposity, and dietary intake.	Participants from the Hispanic Community Health Study/Study of Latinos (N = 5,077).	Measured height, weight, and waist circumference. Percentage body fat Chronic Stress Burden Perceived stress scale 24-hour Dietary Recall World Health Organization Global Physical Activity Questionnaire Center for Epidemiological Studies Depression Scale	Individuals with at least three chronic stressors were more likely to be obese than those without stressors (OR 1.5 [1.01 to 2.1]).

			Self-reported chronic conditions Sociodemographic variables	
Boutin-Foster and Rodriguez (2008)	To determine the prevalence of coexisting depressive symptoms among a sample of overweight or obese Latino adults with coronary artery disease	Use of baseline data from an ongoing prospective study. Latino adults with coronary artery disease (N = 177).	Demographic characteristics Measured height and weight Center for Epidemiologic Studies Depression Scale Perceived Stress Scale - Cohen	Perceived stress was the only significant correlate of depressive symptoms (OR = 6.5, [2.7 – 15.6]).
Grossniklaus, Dunbar, Tohill, Gary, Higgins, and Frediani (2010)	To examine the relationship between psychological factors (perceived stress and depressive symptoms) and dietary energy density in overweight working adults	Overweight working adults recruited from community settings (N = 87).	Demographic factors Measured height and weight Beck Depression Inventory II Perceived Stress Scale – Cohen 3-day food records	Perceived stress was not a significant predictor of dietary energy density. Authors state may be due to low levels of stress among the participants.
Tomiyama, Epel, McClatchey, Kemeny, McCoy, and	To test whether weight stigma relates to increased cortisol	Data from participants in a randomized waitlist-controlled trial of mindfulness-based intervention	Measured height and weight; DEXA assessed abdominal and total body fat. The Stigmatizing Situations	Perceived stress mediated the relationship between weight stigma consciousness

Daubenmier (2014)	indices and to test whether weight stigma relates to oxidative stress.	for stress eating who had completed the study measures before randomization (*N* = 47 women)	Inventory The Stigma Consciousness Scale Diurnal salivary cortisol samples F^2-isoprostane levels for systemic oxidant stress status Perceived Stress Scale - Cohen	and cortisol awakening response (β= 0.33, p < 0.05).
Roberts, Troop, Connan, Treasure and Campbell (2006)	To investigate the effects of perceived stress on cortisol secretion, food choice, dietary restriction, mental health and bodyweight.	Healthy women volunteers from three consecutive student cohorts at a London university *(N* = 71)	BMI Eating Disorders Examination Questionnaire The Mastery Scale Hospital Anxiety and depression Scale List of Threatening experiences Questionnaire Salivary cortisol	Final regression model showed interaction between dietary restraint at baseline and change in cortisol (-0.006 [-0.01 to -0.001]; T(64) = -2.59, *p* < 0.001). Main effects of dietary restraint at baseline (-0.25 [-0.40 to -0.11]; T(64) = -3.41, *p* < 0.001), change in cortisol (-0.002 [-0.016 to 0.011]; T(64) = -0.36, *p* = 0.72, change in weight concern (0.15 [0.04 to 0.26];

				T(64) = 2.74, $p < 0.01$) and change in mastery (0.09 [0.31 to 0.15]; T(64) = 3.08, $p < 0.01$)
Sarkar and Mukhopadhyay (2007)	To examine the independent effect of perceived psychosocial stress on three major cardiovascular risk factors	Healthy adults, ≥ 20 years of age who are members of he Bhutias, a tribal population, of Sikkim, India ($N = 398$)	Socioeconomic characteristics Physical activity questionnaire Daily energy expenditure (food and Agriculture Organization criteria) Perceived Stress Questionnaire – Levenstein Anthropometric measurements including height, weight, waist and hip circumference Blood pressure Serum lipid levels, total cholesterol, triglyceride	In females ($n = 195$), perceived stress was significant for BMI (β = 0.244, $p < 0.01$) and waist to hip ratio (β = 0.278, $p < 0.01$)
Cho, Jae, I. H. Choo, and Choo (2013)	To identify a conceptual link among health-promoting behaviour, inter-personal support and perceived stress. To examine	Women who completed baseline enrolment session for a parent study, the Community-based Heart and Weight Management Study in Seoul, South Korea ($N = 126$). Eligibility	Health Promoting Lifestyle Profile-II Interpersonal Support Evaluation List Perceived Stress Scale – Cohen (Korean version)	Perceived stress had a negative correlation with Health Promoting Lifestyle Profile II ($r = -0.37$, $p < 0.001$)

	whether the link between inter-personal support and health-promoting behaviour would be mediated by perceived stress among women with abdominal obesity.	included ages 18 to 65, waist circumference 85 cm or greater, no current medical conditions, no physical limitations, and willingness for treatment randomization in the parent study.		
Christaki, Kokkinos, Costarelli, Alexopoulos, Chrousos, and Darviri (2013)	To evaluate the efficacy of an 8-week stress manage-ment program that includes progressive muscle relaxation and diaphragma-tic breathing on weight loss, perceived stress, emotional and external eating, and dietary restraint in a sample of obese women who intended to lose weight under	$N = 34$ overweight and obese women with a BMI > 28 kg/m^2 who visited an obesity clinic in Greece.	Anthropometric data included measured height and weight Dutch Eating Behaviour Questionnaire Eating Attitudes Test Perceived Stress Scale Health Locus of Control	The treatment group ($n = 18$, -4.44 (0.83) kg) lost more weight than the control group ($n = 16$,-1.38 (0.78) kg, $p < 0.05$).

	medical supervision.			
Food Insecurity, Perceived Stress, and Obesity				
Jilcott, Wall-Bassett, Burke, & Moore (2011)	To examine cross-sectional associations between food insecurity, Supplemental Nutrition Assistance Program (SNAP) benefits per household member, perceived stress, and body mass index (BMI)	*N* = 215 women from the Pitt County North Carolina Department of Social Services waiting area	FI – USDA Household Food Security Survey Module Perceived stress – Cohen's Perceived Stress Scale BMI calculated from measured heights and weights (SNAP benefits per household member)	FI positively associated with BMI (r = -.18, $p <$ 0.05) Perceived stress positively associated with FI (r = 0.36, $p <$ 0.0001) Perceived stress not associated with BMI Multivariate linear regression: BMI positively associated with FI (parameter estimate = 0.48, SE = 0.23 p = 0.04) Perceived stress positively related to FI (parameter estimate = 0.9, SE = 0.18 $p <$ 0.0001)

Pan, Sherry, Njai, & Blanck (2012)	To examine the association between food insecurity and obesity in 12 states using the redesigned module question (In 2009 a redesigned food insecurity question asking about stress associated with the affordability of nutritious meals was included in the Behavioral Risk Factor Surveillance System Social Context Module	*N* = 66,553 (after exclusion of pregnant women, subjects with missing information, subjects with extreme data)	FI - redesigned food insecurity question that is a proxy for the USDA Household Food Security Survey Module (includes stress within the definition) BMI calculated based on self-reported heights and weights	Prevalence: FI in sample 19.0% (*n* = 66, 553) FI among obese adults (24.7%, *p* = 0.0001) FI among normal weight adults (16.4%) FI more prevalent in women (21.2%) than men (16.9%) Obesity more prevalent among FI women (37.2% [34.7-39.7] *p* = 0.001) than food secure women (22.8% [21.8 – 23.9] *p* = 0.001). Multiple regression analysis: FI women had a greater probability of obesity (1.48 Adjusted OR [1.27, 1.72]) than food secure women.

Food Insecurity and Self-Efficacy				
Dressler & Smith (2013)	To determine SCT and self-identity associations of both healthier and less healthy BMI.	*N* = 330 low-income women between 18 and 64 years recruited at homeless shelters, food pantries, libraries, and soup kitchens recruited within an urban area. Eligible if qualified for food and nutrition assistance program.	Survey developed from qualitative analysis of focus group information. Survey included 20 self-identity questions and SCT based questions to reflect environmental, personal, and behavioral constructs. USDA 6-item short-form HFSM. BMI calculated from measured height and weight.	Personal construct explained 31% of variance in BMI. Five personal construct survey questions significant.
Kollannoor-Samuel, et al. (2011)	To assess the independent influence of FI on different health care access barriers adjusting for socio-demographic, cultural, psycho-social and diabetes self-care variables.	*N* = 211 primarily Puerto Rican adults with Type 2 Diabetes participating in the Diabetes among Latinos Best Practices Trial. Participants from a metabolic syndrome clinic at Hartford Hospital who were older than 21 years, were living in Hartford County, Hemaglobin A1c ≥ 7%, and no	11 item health care barriers questionnaire developed for the study. Fasting blood sample for fasting plasma glucose and hemoglobin A1c. Self-rated health. Sociodemographic variables USDA short-form HFSM. Center for	Higher diabetes related self-efficacy (OR = 0.87 [CI = 0.80 to 0.96]) decreased risk of experiencing "enabling factor" barrier. FI risk factor for experiencing medication access barrier (OR = 1.26 [CI = 1.06 to

		medical conditions limiting physical activity.	Epidemiologic Studies (CES-D) Scale. Modified 21-item version of the Acculturation Rating Scale for Mexican Americans-II "Seriousness" subscale of the diabetes attitude scale and short version of diabetes knowledge test. Self-efficacy via Multidimensional Diabetes Questionnaire.	1.50])
Vijayaraghavan, et al. (2011)	To explore whether housing instability was associated with diabetes self-efficacy in low-income adults with diabetes and if FI mediated this relationship	*N* = 711 participants who were 18 years of age or older, with self-reported diabetes. Speak fluent English or Spanish, seek ongoing medical care in free-standing or hospital-based safety net practices in the San Francisco Bay Area or Chicago and self-identify as Mexican American, African American or Non-Hispanic White.	Housing category Self-Efficacy for Diabetes Scale USDA HFSM, short version Sociodemographic variables	Adults who were food insecure had 0.52 unit lower diabetes self-efficacy score. When FI was added to the regression model adults who lacked a usual place to live had a mean self-efficacy score that was not longer significant. This suggests that FI medicated the association

				between housing instability and diabetes self-efficacy.
Lyles, et al. (2013)	Hypothesized that participants who are FI in a diabetes self-management intervention would have greater challenges with diabetes self-management and poorer hemoglobin A1c control over time compared with participants who are food secure.	*N* = 655 patients from low-income primary care clinics who received primary care in a participating clinic, had a HbA1c level > 6.5 %, spoke English and had no significant auditory, visual, or cognitive impairments.	USDA 6-item HFSM. HbA1c from electronic medical record. Validated 8-item diabetes self-efficacy scale. Self-reported fruit and vegetable intake with questions from the Behavioral Risk Factor Surveillance System. Sociodemographic variables	Mean diabetes self-efficacy was lower at baseline in FI participants (*u* = 3.3, SD 0.5) than in food secure participants (*u* = 3.6, SD 0.4; *p* <0.001).
Seligman, et al. (2010)	Hypothe-sized that the association between FI and suboptimal glycemic control is due to increased difficulty with diabetes self-	*N* = 40 participants from a study of health literacy and cardiovascular disease	Baseline interviews for demographic characteristics, insurance coverage, physical activity and tobacco use. Self-efficacy with the chronic illness general self-efficacy scale Chart data for hemoglobin A1c	FI participants had a mean self-efficacy score (34.4) lower than food secure participants (41.2) (*u* = 38.9, SD 8.6, *p* = 0.02). Statistically significant relationship between FI

	manage-ment and more frequent episodes of clinically significant hypogly-cemia.		USDA 6-item HFSM.	and indicators of diabetes self-management, including self-efficacy
Self-Efficacy and Obesity				
Dennis & Goldberg (1996)	To determine whether Q methodolo-gy would identify distinct types of weight-control self-efficacy beliefs in obese women that would be linked to outcomes of a weight-loss program	*N* = 54 women who were 20% to 50% over "weight-for-height". Also free of metabolic or endocrine disorders and not taking medication that would impact weight loss.	Demographic information Measurement of weight Weight Control Self-efficacy Q Set developed for the study. Eating Self-Efficacy Scale Profile of Mood States The Coopersmith Self-Esteem Inventory Eating Behavior Inventory	Identified two types of women's weight control self-efficacy beliefs: assureds and disbelievers. Post-treatment data included change in self-efficacy categories and continued weight loss for assured self-efficacy (*n* = 32) (13 ± 7) and less for disbelievers *(n* = 22) (7 ± 6, $p < 0.01$)
Baughman , et al. (2003)	To ascertain whether theoretically important psycho-social and behavioral variables mediate the	*N* = 665 overweight or obese patients with a BMI > 27.3 for females and > 28.6 for males or an elevated waist/hip ratio between the	Anthropometric measurements Self-efficacy for exercise Weight Efficacy Life-Style	In the final regression model self-efficacy for exercise and self-efficacy for healthy eating were not

	empirical relation-ships between sociodemo-graphic factors and BMI	ages of 40 and 69. Also able to participate in moderate physical activity and willing to change one or more dietary and/or physical activity behaviors.	Decisional balance for healthy eating Decisional balance for exercise Social support for exercise Social support and discouragement of healthy eating Comorbidity checklist and SF-12 Health Survey Stanford Physical Activity Recall Dietary intake data Marlow-Crowne Social-Desirability Scale Personal Reaction Inventory	significantly related to weight categories. The addition of these variables did not eliminate the relationship between for of the psychosocial variables and BMI.
Hagler, et al. (2007)	To investigate the relationship between theoretically based psycho-social constructs and dietary components among overweight men	$N = 441$ men recruited from the community who were between 25 to 55 years of age and with a BMI between 25.0 and 39.9.	Fred Hutchinson Cancer Research Center Food Frequency Questionnaire Psychosocial scales developed by the authors including self-efficacy for fruit and vegetables, self-efficacy for increasing whole grains, and self-efficacy for decreasing fat.	In the final regression model, self-efficacy was significant for fiber ($\beta^2 = 0.126$, $p = 0.011$), fruit ($\beta^2 = 0.205$, $p < 0.0001$), and vegetables ($\beta^2 = 0.174$, $p < 0.0001$).
Warziski, et al. (2008)	To determine if self-efficacy	Secondary analysis of PREFER trial	Weight Efficacy Lifestyle Scale	The greatest self-efficacy increase

	and dietary adherence were associated with weight change after controlling for adherence.	data. *N* = 170 adults with BMI between 27 and 43.	Three Day Food Record Measured weight	(11.81 [SD = 28.83], *t*(169) = 5.34, *p* <0.001) was concurrent with the greatest weight loss (-6.61 kg, [SD = 5.55], *t*(169) = 15.54, *p* < 0.001), baseline to 6 months.
Gittelsohn, et al (2009)	To determine the impacts of an urban food store intervention between respondents living in the intervention versus comparison areas. To determine the effect of level of exposure to the intervention on study outcomes	*N* = 175 participants from study supermarkets and corner stores and community action centers in area of intervention.	Customer Impact Questionnaire: included a section on healthy eating self-efficacy Quantitative Food Frequency Questionnaire were developed for the study. Intervention Exposure Evaluations – post intervention	Multiple regression performed to assess program impact. Differences between intervention and comparison groups related to psychosocial factors were not statistically significant, including healthy eating self-efficacy.
Capers, et al., 2011	To explore the extent to which selected demographic, medical, physiologic, psycho-	Secondary analysis of data from the Reasonable Eating and Activity to Change Health (REACH) trial.	Demographic characteristics Anthropometric measures, medical history, and SF-12 Health Survey	Significant differences between AA and EA women related to healthy eating self-efficacy

	social, and behavioral factors interact with race in their relationship with obesity and weight manage-ment among EA and AA women	Baseline data for n = 173 AA and n = 278 EA women, age 40 to 69 years, elevated BMI (≥ 27 kg/m2), membership in one of the study primary care practices, no contraindications to dietary change or increased activity.	Exercise self-efficacy scale Weight Efficacy Life-Style Questionnaire Standford Physical Activity Recall Psychosocial measures of family and friend support for healthy eating and exercise Dietary recall up to three 24-hours periods	and BMI (AA by tertiles: 1 = 3m.0, 2 = 37.6, 3 = 37.2; EA by tertiles: 1 = 34.8, 2 = 35.0, 3 = 34.5; $p <$ 0.05) and related to exercise self-efficacy and BMI (AA by tertiles: 1 = 37.9, 2 = 37.4, 3 = 37.3; EA by tertiles: 1 = 35.4, 2 = 34.0, 3 = 34.7, $p <$ 0.05)
Emery, et al., 20153	To identify the best predictors of obesity status from among relevant environ-mental and psycho-social variables.	Sample of community dwelling men and women; n = 50 obese (BMI ≥ 30 kg/m^2) and n = 50 nonobese (BMI < 30 kg/m^2).	Measured height, weight, waist circumference, hip circumference, body composition Blood draw for lip, triglycerides, and glucose 24-hour dietary recall Food frequency questionnaire Home food shelf inventory; food storage; exercise equipment and televisions, home measurements, food consumption areas Demographic characteristics	ESE scores were lower in the obese (3.69 (0.18)) than the nonobese (2.61 (0.17), p < 0.001) participants.

			Food related activities USDA HFSM 6-item short form Hospital Anxiety and Depression Scale Eating Self-Efficacy Scale (ESE) Medical Outcomes Survey Short Form 36 Impact of Weight on Quality of Life Questionnaire Perceived Social Support Scale Pittsburg Sleep Quality Index 7-Day Physical Activity recall	
Teixeira, et al. 2015	Systematic review To identify and summarize psychology-cal self-regulation mediators of successful weight change, or change in energy	N = 35 studies	Data extraction informed by PRISMA statement and Cochrane Collaboration's tool for assessing risk	42 mediators/predictors were identified 2 studies included formal mediation analyses of self-efficacy in the category of medium/long-term weight

	balance related behavior			control with 3 tests equating to a 67% effect.
Cochrane (2008)	Clinical review Role of sense of self-worth in weight-loss treatments.	Case study	Literature search for weight-loss research articles and treatment reviews	Application of SCT. Self-efficacy correlates positively with success.
Alert, et al. (2013)	To examine the effective-ness of a 20-week comprehens ive mind body weight loss intervention.	*N* = 21 participants, between 18 and 65 years, who were obese (BMI ≥ 30/kg/m2) or overweight (BMI ≥ 25 kg/m2) with an obesity related comorbidity.	Measured weight, waist and hip circumference, additional physical measurements Lab draw for metabolic panel and lipid panel Eating Inventory General Self-Efficacy Scale Positive and Negative Affect Schedule Impact of Weight on Quality of Life-Lite Health-Promoting Lifestyle Profile-II	Overall BMI decreased (baseline *u* = 36.07; post-intervention *u* = 34.43, *p* = 0.0001; 6-month follow-up *u* = 34.29, *p* = 0.01) and general self-efficacy increased (baseline *u* = 31.57; post-intervention *u* = 33.26, *p* = 0.05, 6-month follow-up *u* = 33.65, *p* = 0.05)
Lerdal, et al. (2011)	To explore relationship s of socio-demograph-ic variables, health behaviours, environment -al	*N* = 128 adult attendees at mandatory educational course in Norway.	Health-related quality of life by Short Form 12. Sociodemographic variables Level of physical activity by two	Self-efficacy is included in the study as a potential mediator of lifestyle change in obese individuals.

	characteris-tics and personal factors with physical and mental health variables in persons with morbid obesity.		items on the Norwegian "HUNT-2" measure Rosenberg Self-Esteem Scale Environmental characteristics by Likert-type response; one question. General Perceived Self-Efficacy Scale Sense of Coherence measure Brief Approach/Avoiding Coping Questionnaire	However, the relationship between self-efficacy and MCS scores (health related quality of life measure) was not supported.
Teixeira, et al. (2005)	To review individual-level psycho-social pre-treatment predictors of weight loss and to identify research needs and direction.	Review of Literature. *N* = 29 studies published after 1995 reporting associations between pre-treatment, individual factors and weight loss.	Identification of predictive models	Reviewers report six studies identify general self-efficacy to be more predictive of outcomes than task specific self-efficacy. Conclusion that general measures are broad enough to cover multiple dimensions involved in weight control subsequently

				predicting success.
Food Insecurity, Self-Efficacy, and Obesity				
Dammann & Smith (2011)	To examine racial/ethnic differences in relation-ships between food-related environment-al, behavioral an personal factors and low-income women's weight status using Social Cognitive Theory as a framework	*N* = 367 women, urban low-income. Purposeful recruitment. Eligibility included mother or primary caregiver of at least one 2 to 18 – year old child in their household and current use of food assistance program.	Survey instrument – designed to include demographic and theoretically based questions. Addressed each SCT's main constructs and 10 supporting components. FI – USDA Household Food Security Survey Module	Multiple linear regression: African-American women: Environmental model (adjusted R^2 = 0.47; F [4, 17] 3.154; p = .016) Behavioral model (adjusted R^2 = .138; F [6,170] = 5.714; p = .000) Personal model (adjusted R^2 = .150; F [7, 169] = 5.448; p = .000) American Indian women: Environmental model (adjusted R^2 = .079; F [6, 137] = 3.051; p = .008) Behavioral

					model (adjusted R^2 = .124; F [6, 137] = 4.382; p = .000) Personal regression model (adjusted R^2 = .224; F [16, 128] = 3.596; p = .000)
					Caucasian women: Environmental model (adjusted R^2 = .235; F [8, 33] = 2.577; p = .026) Behavioral model (adjusted R^2 = .216; F [5, 36] = 3.257; p = .016) Personal model (adjusted R^2 = .371; F [11, 30] = 3.198; p = .016)
					Authors report FI and BMI were not significantly correlated propose cross-sectional design or majority of women were FI (too few food-secure

				women to compare).
Chang, et al. (2008)	To identify personal and environmental factors motivating or preventing healthful eating and physical activity.	*N* = 80 obese women recruited from participants in a Special Supplemental Nutrition Program for Women, Infants, and Children clinics.	Eight semi-structured questions developed from SCT through focus groups. Eight focus groups	Self-efficacy identified as a factor related to many other factors within the study.
Chang, Nitzke, Brown, and Bauman (2011)	To examine the influence of personal and environment-al factors on healthful weight manage-ment behaviors mediated through self-efficacy among low-income obese mothers	*N* = 284 participants recruited from the Special Supplemental Nutrition Program for Women, Infants, and Children.	Demographics Self reported height and weight Predisposing Factor and Reinforcing Factor Surveys measured personal factors Enabling Factor Survey measured environmental factors Self-Efficacy Survey measured three task-specific aspects of self-efficacy Personal goals for weight management	In relationships between personal factors and self -efficacy: Beliefs about diet and health predicated higher food availability self-efficacy (UPE = 0.23, SE = 0.06, $p <$ 0.05); higher beliefs about diet and body shape predicted higher negative mood self-efficacy (UPE = -0.20, SE = 0.08, $p <$ 0.05); importance of eating low-fat/low-calorie food for weight

management predicted self-efficacy of positive mood (UPE = -0.25, SE = 0.06, $p <$ 0.05), negative mood (UPE = -0.31, SE = 0.07, $p <$ 0.05), and predicted lower food availability self-efficacy (UPE = -0.27, SE = 0.06, $p <$ 0.05). Availability of time to prepare food and cost of food predicted lower food availability self-efficacy (UPE = -0.18, SE = 0.06, $p < 0.05$; UPE = -0.14, SE = 0.06, $p <$ 0.05), Positive mode self-efficacy predicted healthful weight management behaviors (UPE = 0.49, SE = -.25, OR = 1.63 [-0.47, 0.32], $p <$ 0.05).

Appendix B

Demographic Questionnaire

1. What is your age? AGE_____

2. What is your main racial or ethnic group?

BLACK (not Hispanic)	_____01
WHITE (not Hispanic)	_____02
HISPANIC	_____03
ASIAN or PACIFIC ISLANDER	_____04
AMERICAN INDIAN or ALASKAN NATIVE	_____05
OTHER (What?)_____	06

3. What is the highest level of school you completed?

NO FORMAL SCHOOL	_____01	SOME COLLEGE	_____05
GRAMMAR SCHOOL	_____02	COMPLETED COLLEGE	_____06
SOME HIGH SCHOOL	_____03	SOME GRAD SCHOOL	_____07
HIGH SCHOOL	_____04	COMPLETED GRAD SCHOOL	_____08

4. Work status (outside the home)

RETIRED/NOT WORKING	_____01
WORKING PART-TIME	_____02
WORKING FULL TIME	_____03

5. What was your income from all sources before taxes last year?

$4,999 or less	_____01	$40,000-$49,000	_____06
$5,000-$9,999	_____02	$50,000-$59,000	_____07
$10,000-$19,999	_____03	$60,000-$69,000	_____08
$20,000-$29,999	_____04	$70,000-$79,000	_____09
$30,000-$39,999	_____05	$100,000 or more	_____10

6. Are you the head of the household in which you live?

YES	_____01
NO	_____02

7. Right now, which of the following are living together with you (check all that apply):

HUSBAND	_____01
LONG-TERM PARTNER	_____02
ROOMMATE	_____03
PARENT/S	_____04
CHILD/CHILDREN	_____05
GRANDCHILD/GRANDCHILDREN	_____06
OTHER FAMILY MEMBERS	_____07
LIVE ALONE	_____08

8. How many children less than 18 years of age are living together with you?

   NUMBER OF CHILDREN _____

9. How many individuals, including children, are living together with you?

   NUMBER OF INDIVIDUALS _____

Appendix C

Instruments

Core Food Security Module (CFSM)

<u>Household Stage 1: Questions HH2-HH4</u> (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 <u>often</u> true, <u>sometimes</u> true, or <u>never</u> true for (you/your household) in the last 12 months—that is, since last (name of current month).

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

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

HH3. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that <u>often</u>, <u>sometimes</u>, or <u>never</u> true for (you/your household) in the last 12 months?

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

HH4. "(I/we) couldn't afford to eat balanced meals." Was that <u>often</u>, <u>sometimes</u>, or <u>never</u> true for (you/your household) in the last 12 months?

[ ] 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, if children under age 18 are present in the household, skip to ***Child Stage 1,*** otherwise skip to ***End of Food Security Module.***

NOTE: In a sample similar to that of the general U.S. population, about 20 percent of households (45 percent of households with incomes less than 185 percent of poverty line) will pass this screen and continue to Adult Stage 2.

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

AD1. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

[ ] Yes
[ ] No (Skip AD1a)
[ ] DK (Skip AD1a)

AD1a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

[ ] Almost every month
[ ] Some months but not every month
[ ] Only 1 or 2 months
[ ] DK

AD2. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

[ ] Yes
[ ] No
[ ] DK

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

[ ] Yes
[ ] No
[ ] DK

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

[ ] Yes
[ ] No
[ ] DK

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, if children under age 18 are present in the household, skip to ***Child Stage 1,*** otherwise skip to ***End of Food Security Module.***

NOTE: In a sample similar to that of the general U.S. population, about 8 percent of households (20 percent of households with incomes less than 185 percent of poverty line) will pass this screen and continue to Adult Stage 3.

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

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

[ ] Yes
[ ] No (Skip AD5a)
[ ] DK (Skip AD5a)

AD5a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

[ ] Almost every month
[ ] Some months but not every month
[ ] Only 1 or 2 months
[ ] DK

Child Stage 1: Questions CH1-CH3 (Transitions and questions CH1 and CH2 are administered to all households with children under age 18) Households with no child under age 18, skip to ***End of Food Security Module.***

SELECT APPROPRIATE FILLS DEPENDING ON NUMBER OF ADULTS AND NUMBER OF CHILDREN IN THE HOUSEHOLD.

Transition into Child-Referenced Questions:
Now I'm going to read you several statements that people have made about the food situation of their children. For these statements, please tell me whether the statement was OFTEN true, SOMETIMES true, or NEVER true in the last 12 months for (your child/children living in the household who are under 18 years old).

CH1. "(I/we) relied on only a few kinds of low-cost food to feed (my/our) child/the children) because (I was/we were) running out of money to buy food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

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

CH2. "(I/We) couldn't feed (my/our) child/the children) a balanced meal, because (I/we) couldn't afford that." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

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

CH3. "(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

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

Screener for Stage 2 Child Referenced Questions: If affirmative response (i.e., "often true" or "sometimes true") to one or more of questions CH1-CH3, then continue to ***Child Stage 2;*** otherwise skip to ***End of Food Security Module.***

NOTE: In a sample similar to that of the general U.S. population, about 16 percent of households with children (35 percent of households with children with incomes less than 185 percent of poverty line) will pass this screen and continue to Child Stage 2.

Child Stage 2: Questions CH4-CH7 (asked of households passing the screener for stage 2 child-referenced questions).
NOTE: In Current Population Survey Food Security Supplements, question CH6 precedes question CH5.

CH4. In the last 12 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?

[ ] Yes
[ ] No
[ ] DK

CH5. In the last 12 months, did (CHILD'S NAME/any of the children) ever skip meals because there wasn't enough money for food?

[ ] Yes
[ ] No (Skip CH5a)
[ ] DK (Skip CH5a)

CH5a. [IF YES ABOVE ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

[ ] Almost every month
[ ] Some months but not every month
[ ] Only 1 or 2 months
[ ] DK

CH6. In the last 12 months, (was your child/were the children) ever hungry but you just couldn't afford more food?

[ ] Yes
[ ] No
[ ] DK

CH7. In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?

[ ] Yes
[ ] No
[ ] DK

END OF FOOD SECURITY MODULE
User Notes

(1) Coding Responses and Assessing Household Food Security Status:
Following is a brief overview of how to code responses and assess household food security status based on various standard scales. For detailed information on these procedures, refer to the *Guide to Measuring Household Food Security, Revised 2000,* and *Measuring Children's Food Security in U.S. Households, 1995-1999.* Both publications are available through the ERS Food Security in the United States Briefing Room.

Responses of "yes," "often," "sometimes," "almost every month," and "some months but not every month" are coded as affirmative. The sum of affirmative responses to a specified set of items is referred to as the household's raw score on the scale comprising those items.

- Questions HH2 through CH7 comprise the U.S. Household Food Security Scale (questions HH2 through AD5a for households with no child present). Specification of food security status depends on raw score and whether there are children in the household (i.e., whether responses to child-referenced questions are included in the raw score).
    - For households with one or more children:
        - Raw score zero—High food security
        - Raw score 1-2—Marginal food security
        - Raw score 3-7—Low food security
        - Raw score 8-18—Very low food security
    - For households with no child present:
        - Raw score zero—High food security
        - Raw score 1-2—Marginal food security
        - Raw score 3-5—Low food security
        - Raw score 6-10—Very low food security

    Households with high or marginal food security are classified as food secure. Those with low or very low food security are classified as food insecure.

- Questions HH2 through AD5a comprise the U.S. Adult Food Security Scale.
        - Raw score zero—High food security among adults
        - Raw score 1-2—Marginal food security among adults
        - Raw score 3-5—Low food security among adults
        - Raw score 6-10—Very low food security among adults

- Questions HH3 through AD3 comprise the six-item Short Module from which the Six-Item Food Security Scale can be calculated.
    - Raw score 0-1—High or marginal food security (raw score 1 may be considered marginal food security, but a large proportion of households that would be measured as having marginal food security using the household or adult scale will have raw score zero on the six-item scale)
    - Raw score 2-4—Low food security
    - Raw score 5-6—Very low food security

- Questions CH1 through CH7 comprise the U.S. Children's Food Security Scale.
    - Raw score 0-1—High or marginal food security among children (raw score 1 may be considered marginal food security, but it is not certain that all households with raw score zero have high food security among children because the scale does not include an assessment of the anxiety component of food insecurity)
    - Raw score 2-4—Low food security among children
    - Raw score 5-8—Very low food security among children

(2) Response Options: For interviewer-administered surveys, DK ("don't know") and "Refused" are blind responses—that is, they are not presented as response options, but marked if volunteered. For self-administered surveys, "don't know" is presented as a response option.

(3) Screening: The two levels of screening for adult-referenced questions and one level for child-referenced questions are provided for surveys in which it is considered important to reduce respondent burden. In pilot surveys intended to validate the module in a new cultural, linguistic, or survey context, screening should be avoided if possible and all questions should be administered to all respondents.

To further reduce burden for higher income respondents, a preliminary screener may be constructed using question HH1 along with a household income measure. Households with income above twice the poverty threshold, AND who respond <1> to question HH1 may be skipped to the end of the module and classified as food secure. Use of this preliminary screener reduces total burden in a survey with many higher-income households, and the cost, in terms of accuracy in identifying food-insecure households, is not great. However, research has shown that a small proportion of the higher income households screened out by this procedure will register food insecurity if administered the full module. If question HH1 is not needed for research purposes, a preferred strategy is to omit HH1 and administer Adult Stage 1 of the module to all households and Child Stage 1 of the module to all households with children.

General Self-Efficacy Scale (GSE)

		Not at all true	Hardly true	Moderately true	Exactly true
1.	I can always manage to solve difficult problems if I try hard enough.	1	2	3	4
2.	If someone opposes me, I can find the means and ways to get what I want.	1	2	3	4
3.	It is easy for me to stick to my aims and accomplish my goals.	1	2	3	4
4.	I am confident that I could deal efficiently with unexpected events.	1	2	3	4
5.	Thanks to my resourcefulness, I know how to handle unforeseen situations.	1	2	3	4
6.	I can solve most problems if I invest the necessary effort.	1	2	3	4
7.	I can remain calm when facing difficulties because I can rely on my coping abilities.	1	2	3	4
8.	When I am confronted with a problem, I can usually find several solutions.	1	2	3	4
9.	If I am in trouble, I can usually think of a solution.	1	2	3	4
10.	I can usually handle whatever comes my way.	1	2	3	4

Perceived Stress Questionnaire

For each sentence, circle the number that describes how often it applies to you in general, during the last year or two. Work quickly, without bothering to check your answers, and be careful to describe your life in the long run.

		Almost never	Sometimes	Often	Usually
1.	You feel rested	1	2	3	4
2.	You feel that too many demands are being made on you	1	2	3	4
3.	You are irritable or grouchy	1	2	3	4
4.	You have too many things to do	1	2	3	4
5.	You feel lonely or isolated	1	2	3	4
6.	You find yourself in situations of conflict	1	2	3	4
7.	You feel you're doing things you really like	1	2	3	4
8.	You feel tired	1	2	3	4
9.	You fear you may not manage to attain your goals	1	2	3	4
10.	You feel calm	1	2	3	4
11.	You have too many decisions to make	1	2	3	4
12.	You feel frustrated	1	2	3	4
13.	You are full of energy	1	2	3	4
14.	You feel tense	1	2	3	4
15.	Your problems seem to be piling up	1	2	3	4
16.	You feel you're in a hurry	1	2	3	4
17.	You feel safe and protected	1	2	3	4
18.	You have many worries	1	2	3	4
19.	You are under pressure from other people	1	2	3	4

20.	You feel discouraged	1	2	3	4
21.	You enjoy yourself	1	2	3	4
22.	You are afraid for the future	1	2	3	4
23.	You feel you're doing things because you have to not because you want to	1	2	3	4
24.	You feel criticized or judged	1	2	3	4
25.	You are lighthearted	1	2	3	4
26.	You feel mentally exhausted	1	2	3	4
27.	You have trouble relaxing	1	2	3	4
28.	You feel loaded down with responsibility	1	2	3	4
29.	You have enough time for yourself	1	2	3	4
30.	You feel under pressure from deadlines	1	2	3	4

Appendix D

Recruiting Participants for a Research Study

Study: To find ways in which food insecurity is related to obesity.

Investigator: Emily Havrilla is a doctoral student in the School of Nursing, Rutgers, The State University of New Jersey. E-mail address: emily.havrilla@rutgers.edu

When & Where: The investigator is on site today to explain the research study and collect information.

Who is Eligible to Participate: Females between 18 and 59 years old who are heads-of-household with a child or children under the age of 18.

Requirements & Time:

- The investigator will explain the study and the participant will sign the informed consent form.

- The investigator will measure participant's height, weight, waist circumference, and hip circumference. The participant will complete study questionnaires. (Assistance available if requested.)

- Participation will take about 30 minutes

If Interested in Participating: Please see agency staff. Participants will receive a $15.00 grocery card to thank them for their participation.