Food Security and Hunger among Low income US Households: Relations to Federal Food Assistance Program Participation

Rebecca Elizabeth Sanders
Portland State University

Follow this and additional works at: https://pdxscholar.library.pdx.edu/open_access_etds

Part of the Social Work Commons

Let us know how access to this document benefits you.

Recommended Citation

This Dissertation is brought to you for free and open access. It has been accepted for inclusion in Dissertations and Theses by an authorized administrator of PDXScholar. Please contact us if we can make this document more accessible: pdxscholar@pdx.edu.
FOOD SECURITY AND HUNGER AMONG LOW INCOME US HOUSEHOLDS: RELATIONS TO FEDERAL FOOD ASSISTANCE PROGRAM PARTICIPATION

by

REBECCA ELIZABETH SANDERS

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY in SOCIAL WORK AND SOCIAL RESEARCH

Portland State University 2007

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
DISserTATION APPROVAL

The abstract and dissertation of Rebecca Elizabeth Sanders for the Doctor of Philosophy in Social Work and Social Research were presented August 3, 2007, and accepted by the dissertation committee and the doctoral program.

COMMITTEE APPROVALS:

Nancy Korotoff, Chair
Barbara Friesen
Richard Hunter
Matthew Carlson
Siobhan Maty
Sherril Gelmon
Representative of the Office of Graduate Studies

DOCTORAL PROGRAM APPROVAL:
Maria Talbott, Director
Graduate School of Social Work
Ph.D. Program
ABSTRACT


Title: Food Security and Hunger Among Low Income US Households: Relations to Federal Food Assistance Program Participation

This dissertation describes the conceptual and empirical framework that guides the definition of food insecurity and hunger, the present status of federal programmatic responses, and the status of current research on the topic. It also examines relations between hunger and federal food assistance program participation. Logistic regression is utilized to build two predictor models. Model 1 predicts federal food assistance program participation from household structure, income, community characteristics, and demographics. Model 2 predicts food insecurity/hunger from household structure, income, community characteristics, demographics, and federal food assistance program participation. Results are based on 2004 Current Population Survey data from low income households. Model 1 performed better than a constant only model, and reliably distinguished between federal food assistance program participating and non-participating households. As a whole, Model 1 explained approximately 30 percent of the variance in program participation. Household size was the strongest predictor of federal food assistance program participation. Model 2 also performed better than a constant only model,
and reliably distinguished between food secure and food insecure/hungry households. As a whole, Model 2 explained less than 10 percent of the variance in food insecurity. Household earnings were the strongest predictor of food insecurity. The odds of food insecurity for households that participated in federal food assistance programs were higher than for households that did not participate. Methodological, philosophical, and policy implications of these findings are discussed. Particular emphasis is placed on the relevance of findings for the field of social work. Suggestions for future research are also provided.
ACKNOWLEDGEMENTS

I would like to thank the many people who contributed to this study. At the USDA, Mark Nord was especially generous with ongoing guidance and good advice about working with the CPS dataset. Mike Leachman at Oregon Center for Public Policy was instrumental in helping me identify gaps in the research and work through the feasibility of some of my preliminary research ideas.

At PSU, Tanya Ostrogorsky and Dianne Yatchmenoff provided critical technical assistance as well as moral support along the way. Jim Nash and Dan Coleman were also very helpful in fielding logistic regression questions as they arose.

Each of my committee members also made important contributions. The unlimited correspondence with my chair, Nancy Koroloff, gave me the direction, expertise, and insight that was absolutely crucial to reaching the finish line. Barbara Friesen provided an abundance of early coaching and important input that helped me solidify my theoretical framework and research questions. Matt Carlson was especially helpful in getting me “unstuck” several times during the analysis and results phase of the study. Siobhan Maty provided great advice regarding my writing and analysis, all of which improved the final product tremendously. Richard Hunter has been a valuable source of sound advice over the years, and was instrumental in keeping policy and practical implications for social workers on the
table. Sherril Gelmon's helpful review of later drafts represented an important critique that also greatly improved the final product.

Finally, Dan O'Donoghue gently nudged me along and afforded me time away from parenting when it looked as though I would never finish: 2 hours per day, every day for three months to be exact. Having a completely supportive and loving husband was an indispensable contribution to my ability to finish.
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS ......................................................................................................................... i

LIST OF TABLES ........................................................................................................................................ v

LIST OF FIGURES ....................................................................................................................................... vi

INTRODUCTION ........................................................................................................................................ 1

CHAPTER 1: HUNGER: THE FRAMEWORK FOR MEASUREMENT .................................................................. 4

   Defining Hunger: Conceptual Framework ............................................................................................. 4
   Measuring Hunger: Empirical Framework .............................................................................................. 7

CHAPTER 2: FOOD INSECURITY/HUNGER: PROGRAMMATIC RESPONSES ............................................. 13

CHAPTER 3: FOOD INSECURITY/HUNGER: REVIEW OF THE LITERATURE ........................................... 17

   National Food Insecurity/Hunger Literature ....................................................................................... 18
   Oregon Specific Food Insecurity/Hunger Literature ........................................................................... 21
   Food Assistance Program Participation Literature ............................................................................... 26

CHAPTER 4: METHODS ............................................................................................................................ 31

   Research Questions .............................................................................................................................. 31
   Sample ................................................................................................................................................ 31
   Instrument .......................................................................................................................................... 33
   Reliability and Validity of Instrument .................................................................................................. 34
   Measures ............................................................................................................................................ 38
   1) Independent Variables ..................................................................................................................... 38
      1a) Household Structure .................................................................................................................. 38
      1b) Income Status ............................................................................................................................. 39
      1c) Community Characteristics ........................................................................................................ 39
      1d) Demographics ............................................................................................................................ 39
   2) Dependent Variables ........................................................................................................................ 40
      2a) Food Assistance Program Participation ..................................................................................... 40
      2b) Food Security Status .................................................................................................................. 41
   Preliminary Analysis ............................................................................................................................ 42
   Main Analysis ..................................................................................................................................... 45

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
CHAPTER 5: RESULTS .................................................................................. 48

Sample Demographics ................................................................................ 48
Model 1: Federal Food Assistance Program Participation as the Dependent
Variable .............................................................................................................. 49
  1a) Model 1: Chi Square Analysis ................................................... 49
  1b) Model 1: Bivariate Logistic Regression Analysis ..................... 52
  1c) Model 1: Multivariate Logistic Regression Analysis ............... 54

2) Model 2: Food Security Status as the Dependent Variable .......... 61
  2a) Model 2: Chi Square Analysis ................................................... 61
  2b) Model 2: Bivariate Logistic Regression Analysis ..................... 62
  2c) Model 2: Multivariate Logistic Regression Analysis ............... 64

CHAPTER 6: DISCUSSION .......................................................................... 70

The Relationship between Household Characteristics and Food Assistance
Program Participation ..................................................................................... 70
The Relationship between Food Assistance Program Participation
and Food Insecurity .................................................................................................. 73
  Strengths of Study ................................................................................. 76
  Limitations of Study .............................................................................. 78
  Contributions of The Study: Methodological, Practical and Policy ... 81
  Implications for Future Research .......................................................... 87
Conclusion ................................................................................................ 90

REFERENCES.................................................................................. 106
LIST OF TABLES

Table 1: Logistic Regression Models 1 and 2: Details of Variables .......... 92

Table 2: Logistic Regression Models 1 and 2: Details of Question Structure and Coding for Chosen Variables .......................................................... 93

Table 3: Tolerance and Variance Inflation Factor Values for Model 2 Independent Variables Using 2004 Current Population Survey Data .......... 95


Table 5: Frequency Distribution of Outcome Variables in Model 1 Logistic Regression Using 2004 Current Population Survey Data ..................... 97

Table 6: Chi Squares and Strengths of Association between Independent Variables in Model 1 and Program Participation Using 2004 Current Population Survey Data .................................................. 98

Table 7: Chi Square and Strength of Association between Program Participation and Food Security Status Using 2004 Current Population Survey Data ........................................................................ 99

Table 8: Odds Ratios and Confidence Intervals for Variables Predicting Food Assistance Program Participation Using 2004 Current Population Survey Data ....................................................... 100

Table 9: Odds Ratios and Confidence Intervals for Variables Predicting Food Insecurity Using 2004 Current Population Survey Data ............. 101
LIST OF FIGURES

Figure 1: Food Insecurity/ Hunger: Population Consequences, and Food Assistance Program Goals ................................................................. 102

Figure 2: Model 1: Proposed Relations between Predictor Variables and Food Assistance Program Participation ....................................................... 103

Figure 3: Model 2: Proposed Relations between Predictor Variables and Food Security Status ...................................................................................... 104

Figure 4: Details of Study Sample Inclusion ............................................................................................................................... 105
INTRODUCTION

An abundance of literature exists on the topic of hunger. Yet, despite the attention given to the subject, U.S. researchers and policy makers have struggled with the definition, conceptualization, and measurement of hunger. Moreover, programmatic strategies and responses to hunger have been somewhat unsuccessful. For example, in 2002, 89 percent of US households had access to enough food, while the other 11 percent reported that they did not (Nord et al. 2003). This translates into approximately 3.8 million families with insufficient resources for food, defined as “someone in the household skipped meals because they couldn't afford them.” This figure is up 8.6 percent from 2001 and 13 percent from 2000 (Nord et al. 2001 and 2002). Of these 11 percent who reported in 2002 that they did not have access to enough food, just over half participated in one or more of the three largest Federal food assistance programs,1 while only 3 percent obtained emergency food from a pantry (Nord et al. 2003).

In the early 1960’s, hunger began to be recognized as a “social problem,” defined as “a condition affecting a significant number of people in ways considered undesirable about which it is felt something can be done through collective social action” (Horton & Leslie 1978: 4; as cited in Reasons & Perdue 1981). Unpleasant

---

1 The Food Stamp Program, Special Supplemental Program for Women, Infants and Children, and The Food Distribution Program.
sensations associated with hunger, negative effects on growth, numerous diseases or conditions, and impaired general performance are among the plethora of potential consequences that allow one to argue that hunger is, indeed, a social problem (LSRO 1990). As such, hunger is relevant to the field of social work given the field's primary mission to "help people in need and to address social problems" (NASW 1997; emphasis added). The relevance of hunger to social work can be further established given the profession's goals to link people with needed resources (i.e. food) and to improve the operation of social service programs and service delivery systems (i.e. food assistance programs) (DuBois and Miley 1996). Moreover, social work strives to promote "social and economic justice," a concept that one might reasonably argue includes ensuring, at the very least, that people have enough food (Poulin 2000).

There is a strong case for the importance of examining the relationship between program participation and hunger. At the most fundamental level, research of this nature will contribute to a knowledge base that ultimately strives to decrease the number of people existing under conditions of insufficient resources for food. Moreover, research that seeks to understand the relationship between program

---

2 Pain, cramping.
3 Stunting.
4 Low birth rate, some cancers, increased severity of disease, depression, dental caries, delayed wound healing etc.
5 Poor school performance, increased length of hospitalization, impaired sleep habits, increased days of missed work, etc.
6 What constitutes "social and economic justice" is essentially a philosophical/political question and as such, is beyond the scope and purpose of this paper.
participation and food security outcomes would contribute to improved responses to this social problem. As such, this dissertation serves as an examination of the knowledge base that is relevant to research along these lines. In particular, it describes:

1) the conceptual framework that guides the definition of hunger,
2) the empirical framework that guides the measurement of hunger,
3) the present status of the programmatic response to hunger, and
4) the status of current research on the topic of hunger.

It also assesses relations between hunger and federal food assistance program participation and the significance of such research to the field of social work. In particular, I build two logistic regression models. Model One explores how well income, household structure, demographic, and community characteristics account for food assistance program participation among households that are below 185 percent of the poverty threshold. Model Two controls for income, household structure, demographics, and community characteristics, and explores how well food assistance program participation among the same households predicts food insecurity.7

Thus, program participation serves as both an independent (Model 1) and dependent (Model 2) variable.

---

7 Thus, program participation serves as both an independent (Model 1) and dependent (Model 2) variable.
CHAPTER 1

FOOD INSECURITY/HUNGER:
THE FRAMEWORK FOR MEASUREMENT

Defining Hunger: Conceptual Framework

The development of a relevant, conceptually sound definition of hunger that could be operationalized for the purpose of measurement began in the mid 1980's. The first notable attempt appeared as *The 1984 Report of the President's Task Force on Food Assistance* (RPTFFA). This landmark report distinguished between hunger as a series of physiological symptoms associated with severe food shortages, and hunger as not having enough to eat due to a lack of resources for access to food. The authors argued that the latter was relevant to U.S. conditions, while the former was not, given its virtual non-existence across the nation (Riches 1998):

> To many people hunger means not just symptoms that can be diagnosed by a physician, it bespeaks the existence of a social, not a medical problem; a situation in which someone cannot obtain an adequate amount of food, even if the shortage is not prolonged enough to cause health problems. It is the experience of being unsatisfied, of not getting enough to eat. This, of course, is the sense in which people ordinarily use the word. It is also the sense in which witnesses before us, and many of the reports and documents we have studied have spoken of hunger. (PTFFA 1984: 36)

This important distinction, in conjunction with the report's recognition that there was no method of estimating the extent of hunger in the sense experienced in developed nations sparked several further attempts at 1) conceptual clarification and 2) the development of instrumentation for measurement (Carlson et al. 1999;
The Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA) acted as the official lead agency in the effort to clarify the concept of hunger and worked in conjunction with three major contributors from 1985-1995: 1) the Community Childhood Hunger Identification Project (CCHIP), 8 2) Cornell University's Division of Nutritional Sciences, and 3) the American Institute of Nutrition (AIN) in conjunction with the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology (Carlson et al. 1999; FRAC 1991; FRAC 1995; LSRO 1990; Radimer et al. 1990; Radimer et al. 1992). 9

The concept that emerged as a result of this work contained three key elements. First, hunger was conceived as a painful or uneasy sensation caused by lack of food, as a result of insufficient resources for obtaining food (LSRO 1990). Thus, hunger is resource-constrained in nature, as opposed to hunger resulting from dieting, being too busy to eat, and the like. Second, hunger was separated out as a severe manifestation on a continuum of increasing food insecurity relative to need, hence the emergence of “food-insecure” as a category in and of itself. The idea here is that that one could conceivably exhibit a series of behaviors (e.g.

8 Sponsored by the Food Research and Action Center (FRAC).
9 The economic analysis by Basiotis (1992) also constitutes a notable contribution to this research.
scavenging or begging for food) as an indicator of food insufficiency rather than as a manifestation of hunger (Carlson et al. 1999). This renders the concept of hunger a potential, albeit not necessary consequence of not having enough food relative to need. Third, the preceding two elements are linked as a managed process of decision-making, subjective reactions, and behavioral responses to constrained resources (Bickel et al. 1990; Radimer 1990).

This (quasi-economic) managed process is linear in nature: it is a continuum of coping strategies resulting from constrained resources that reflect increasingly severe deprivation of food availability relative to need (Basiotis 1992; Rose et al. 1995). The continuum begins with a head of household experiencing anxiety about insufficient food, leading to adjustments in the food budget via altering the quality or variety of the food supply. As the situation worsens, adjustments are made to the quantity of the food supply: adults in the household eventually begin to experience hunger. In the most severe circumstances, decreases in food quantity affect children in the household, and they experience hunger as well (Basiotis 1992; Connell et al. 2001; Hall 2004).

Thus, hunger in this “developed nation” sense is best understood as a particular condition that is both separate from malnutrition, and lies within the broader, sequential phenomena of food insecurity described above (Bickel et al. 1998). In
accordance with these provisions, the formal definitions that emerged (and are still used today) are as follows:

**Food Security** is access by all people at all times to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods, and b) the assured ability to acquire acceptable foods in socially acceptable ways (e.g. without resorting to emergency food supplies, scavenging, stealing and other coping strategies).

**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.

**Hunger**, in its meaning of the uneasy or painful sensation caused by a lack of food is in this definition a potential, although not necessary consequence of food insecurity. (LSRO 1990: 1560)

### Measuring Hunger: Empirical Framework

Although the concept of hunger is multidimensional, it is the conceptualization of the experience of hunger as a series of graduated stages that allows for its measurement on a one-dimensional scale of relative severity (Bickel et al. 1998; Carlson et al. 1999). Attempts to develop a one-dimensional measurement tool began in 1992 with the national *Food Security Measurement Project*. The first 2 years of the project were spent consolidating information into a preliminary survey instrument that would capture the range of food insecurity and hunger severity being reported through the CCHIP and Cornell projects. In January of 1994, a wide array of experts convened at the 2-day *Conference on Food Security Measurement and Research*. Here, specific questionnaire items thought to be

---

10 Established by the FNS and the National Center for Health Statistics (NCHS).
11 Sponsored by the USDA.
indicator variables capable of capturing all levels of food insecurity and hunger severity were initially selected.

Revisions continued for several months and late in 1994, a version of the instrument was given to the U.S. Bureau of the Census Center for Survey Methods for further analysis, field testing, and modification (Singer and Hess 1994; Bickel et al. 1998). Moreover, the question set was subjected to a variety of exploratory linear factor analyses in order to determine whether response patterns and relationships therein were similar to those observed in prior research (Hamilton et al. 1997). At the same time, the FNS contracted with CCHIP and Cornell to provide further analytic work on the new, unified instrument using their own food-security data sets, each of which contained overlapping indicator variables (Carlson et al. 1999). Exploratory non-linear factor analyses were also performed, and revealed that the items on the measure could be adequately described as a one-dimensional construct (Hamilton et al. 1997). Numerous analytic recommendations were received from all agencies involved and in April of 1995, a completed questionnaire was piloted as a supplement of the Current Population Survey (CPS) with a nationally representative sample of 44,730 households (Anderson et al. 1995; Carlson 1999; Ohlson et al. 1995; Scott et al. 1995, Wehler et al. 1995). The approved supplemental questionnaire, known as the Food Security Supplement (FSS) is administered every December, in conjunction with the labor

12 Also provides data for the nation's monthly unemployment statistics and annual poverty rates.
sector interview of the CPS. The instrument contains items that pertain to food expenditures, the use of food assistance programs, and conditions and behaviors related to food security, food insecurity, and hunger (Nord 2000). The *Food Security Core Module* (FSCM) is an 18-item subscale contained within the larger FSS, used to generate scores along the Household Food Security Scale. In other words, a given household’s food security status is derived from the Food Security Core Module portion of the larger Food Security Supplement.

Each question on the FSCM asks whether a given food-status related condition or behavior occurred at any time during the past 12-months or 30-days, specifying lack of money or other resources necessary to obtain food as the reason (Nord 2003). Data are at the household level. That is, experiences and behaviors being reported pertain to the household as a collective entity, not to individual persons therein (Hall 2004). Questions 1 through 10 are used to assess the food security of households without children, while questions 11-18 are only asked if the household includes children ages 0-18 (Nord 2003).

The FSCM defines the food security of households on a continuum of response patterns, represented by a scale that goes from fully food secure to severely hungry (Hall 2004; Nord 2003). In particular, the structure of the FSCM allows one to observe severity differences in two different ways. First, *more severe* items on the FSCM are less frequently affirmed than less severe items. Second, households that
affirm a more severe item are likely to have also affirmed less severe items. Likewise, denial on an item will likely result in denial on all more severe items (Nord 2003). This “severity-order concept” is formalized using the Rasch model: a (logistic) statistical scaling model commonly used in psychometric research and educational testing (Nord 2003; Opsomer et al. 2003; Hamilton 1997).

All Rasch models assume that responses to an item are independent of responses to other items in a given questionnaire. Further, they are one-parameter, meaning they assume that all items in a questionnaire discriminate equally well for "good" and "poor" respondents. In the case of the FSCM, the Rasch uses a mathematical function to estimate 1) the severity level measured by each item on the questionnaire and 2) the severity level experienced by each household responding to the questionnaire. It also assesses the extent to which a given response pattern in a given data set is consistent with the aforementioned severity-order concept. In technical terms, the Rasch relates the probability of a household affirming an item to the difference between the household severity-level and the severity item score (Nord 2003). In general terms, the model merely calibrates and assembles FSCM responses in accordance with a hunger experience scale.

The concise nature and robustness of the Rasch model across multiple samples and variations make it a desirable measurement scaling analysis tool. Moreover, so long as each intensity level can be identified by one or more dichotomous indicator
variables, the model works well with phenomena that vary through a range of intensity, making it well matched to the FSCM. It also provides a true measure of phenomenon in the sense that intervals between items as well as their order of occurrence are meaningful with respect to the analysis (Carlson et al. 1999).

The end result of Rasch modeling is a categorical measure of food security status (Carlson et al. 1999). More specifically, households are categorized into one of four food security status categories:

**Food Secure**: Households show no or minimal evidence of food insecurity.

**Food Insecure Without Hunger**: Food insecurity is evident in household members' concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members' food intake is reported.

**Food Insecure With Hunger (Moderate)**: Food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger. In most (but not all) food-insecure households with children, such reductions are not observed at this stage for children.

**Food Insecure With Hunger (Severe)**: All households with children have reduced the children's food intake to an extent indicating that the children have experienced hunger. For some other households with children, this has already occurred at an earlier stage of severity. Adults in households with and without children have repeatedly experienced more extensive reductions in food intake. (Bickel et al. 2000)

---

13 For the purpose of analysis, categories 3 and 4 are often combined to "food insecure with hunger."
In particular, households are categorized as *food insecure* in cases of 3 or more affirmative responses on the FSCM. The three *least severe* conditions that would classify a household as food insecure include:

- they were worried their food would run out before they got money to buy more,
- the food they bought didn’t last and they didn’t have money to get more, and
- they couldn’t afford to eat balanced meals.

Households are classified as *food insecure with hunger (moderate)* in cases of affirmative responses to the questions above, in addition to reporting that:

- adults ate less than they felt they should/ needed, and
- adults cut the size of meals or skipped meals in 3 or more months.

At least two additional affirmative responses from a series of questions that indicate more severe experiences and/or behaviors are required for classification as *food insecure with hunger (severe)* (Hall 2004). An example of a more severe item would be reduction in food intake of all children in the house to the extent that they experienced hunger. It is worth noting that the FSCM primarily measures the dimension of the food insecurity concept related to economic access to food (versus social acceptability).
CHAPTER 2: FOOD INSECURITY/ HUNGER: PROGRAMMATIC RESPONSES

There are currently 4 main programmatic responses to hunger and/or food insecurity. Ordered from largest fiscal expenditure to smallest, these are: 1) Food Stamp Program 2) Special Supplemental Nutrition Program for Woman, Infants and Children, 3) Food Distribution Programs and 4) School Meals Programs. While ultimate authority for each program is at the federal level, programs typically operate under state and/or local oversight. As such, the programs vary considerably from community to community, such that households in different geographic regions experience varying levels of program availability as a source of support (Bartfeld et al. 2003).

The Food Stamp Program (FSP) is the most expansive of the four program areas with fiscal expenditures that exceeded $21 billion in 2003 (Nord et al. 2003; USDA 2003a). The program, originally designed to end hunger and improve nutrition and health, has more recently become the major federal safety-net program for low income households given recent reforms in U.S. welfare policy. As such, food stamps represent a significant share of household resources for many families. In

\[14\] Many of the four main program areas are subdivided into a series of smaller programmatic responses. While the list of all program names had been provided below, an in-depth discussion of each program is beyond the scope of this paper.\[15\] Includes Farmer’s Market Nutrition Program; Senior Farmer’s Market Nutrition Program.\[16\] Includes Commodity Supplemental Food Program; Food Assistance in Disaster Situations; Food Distribution on Indian Reserves; Nutritional Services Incentive Program; Schools/ Child Nutrition Commodity Program/ Emergency Food Assistance Program.\[17\] Includes National School Lunch Program; School Breakfast Program; Special Milk Program.
general, the program provides benefits for the purpose of purchasing food to eligible households. Individuals qualify for the program based on household income, assets and lack of money for certain basic expenses (Nord et al. 2004). In 2003, 21 million people participated in the program, with an average monthly benefit of $84 per person per month (Nord et al. 2004). About a third (30.8 percent) of food-insecure households participated in the Food Stamp Program during the month prior to the administration of the CPS in December 2003 (Nord et al. 2004). Amongst those households that participated, over half were food insecure. The prevalence rate of food insecurity with hunger among program participating households was about twice that of nonparticipating households of similar composition that fell in the same income range (Nord et al. 2004).

The Special Supplemental Nutritional Program for Women, Infants and Children (WIC) is a preventative nutrition program that provides state grants to support distribution of nutritious food, nutrition counseling, and referrals to health and social service agencies for low-income pregnant, postpartum, and breastfeeding women and their children up to age 5 (Nord et al. 2004). Approximately $4.5 billion was appropriated to the program in 2002 (USDA-FNS 2003c). Participants must be at “nutritional risk” as defined by household income, a medically-based condition (e.g. anemia, underweight) or a diet-based condition (e.g. inadequate access to food). In 2003, WIC served approximately 7.5 million participants each month. The average monthly benefit was about $35 per person. Of all food-
insecure households, 13.4 percent participated in WIC. About 41 percent of national households that received WIC in 2003 were food insecure (Nord et al. 2004).

The Food Distribution Programs seek to strengthen the nutrition safety net through 1) commodity distribution and 2) meal assistance to low-income families, emergency feeding programs, people residing on Indian Reservations, and the elderly. Distribution services are commonly delivered through contracts with small, community based non-profit organizations such as local food banks or soup kitchens. Most are affiliated with faith-based organizations and depend on a large volunteer base (Nord et al. 2004). Since services are commonly supplemented with local charity dollars and efforts, counts of numbers of people and meals served are difficult to accurately track at the state and national level. Total federal expenditures on Food Distribution Programs were in the range of $785 million in 2002. Among households that reported obtaining food from community food pantries in 2003, 70 percent were food insecure, and about a third were food insecure with hunger. Rates were even higher for those who ate at emergency soup kitchens (Nord et al. 2004).

Finally, the School Meals Programs offer balanced, low-cost or free breakfasts, lunches, and after school snacks to children aged 0-18 in schools (public and private non-profit) and residential child care institutions across the nation. Meals
and snacks must meet Dietary Guidelines for Americans restrictions with respect to caloric fat and must provide one-third of the Recommended Dietary Allowances of protein, Vitamin A, Vitamin C, iron, calcium, and calories. Approximately 28 million children participated in the National School Lunch Program in 2003 at over 100,000 facilities across the nation (Nord et al. 2004). Approximate fiscal expenditures were $8.1 million (USDA-FNS 2003b). Nearly half of the households that received free or reduced-cost school meals were food insecure (Nord et al. 2004). In 2003, the National School Lunch Program reached the largest share of food-insecure households (37.3 percent) compared to other federal and the community food assistance programs (Nord et al. 2004).
CHAPTER 3

FOOD INSECURITY/HUNGER: REVIEW OF THE LITERATURE

Food insecurity and hunger research has grown considerably in the past fifteen years. As explicated above, an abundance of the early literature outlines the development of national definitions and instrumentation for measurement (Anderson 1990; Bickel et al. 1998; FRAC 1983; Nestle and Guttmacher 1992; Radimer 1990; Radimer et al. 1990; Radimer et al. 1992). Obviously, studies that attempt to use the developed food security/hunger language and instrumentation are more recent, having appeared in the past 10 years. What follows is a review of this literature base, much of which explores consequences of, and factors related to food insecurity and hunger. For simplicity, I have grouped the literature into summaries of 1) national studies, 2) Oregon-specific studies, and 3) food assistance program participation studies. I have also provided a one page, general summary of the literature base in Figure 1.

It is worth noting that the literature pertaining to the development of food insecurity/hunger as a concept and its associated measurement is very well developed, a fact that supports the feasibility of this dissertation, the intent of which is to use the national measure of hunger/food insecurity. By contrast, existing attempts to utilize the measure for research purposes (or merely study hunger as currently understood) are less developed consisting largely of descriptive and correlative studies, some of which have small, nongeneralizable samples.
Moreover, findings are somewhat contradictory and the literature base provides little insight into the reasons behind opposing findings. All this translates to difficulty in “making sense” of the literature base as a whole or to ascertain what is and isn’t “known” with certainty. That is, while the conceptual and empirical underpinnings pertaining to food insecurity and hunger are solid, the subsequent applications of such underpinnings are not. This supports the importance of this dissertation that builds on this existing knowledge base.

**National Food Insecurity/ Hunger Literature**

Since 1995, researchers have attempted to use the standardized set of questions from the FSCM to measure food security. As such, similar and/or the same questions have been incorporated into several national surveys, initiating research from a wide array of data sources. Almost all of the research has in common confirmation of the main idea that food insecurity and economic status are linked. In particular, Gunderson and Gruber (2001) found that food insufficient households have low average incomes, face more income fluctuations, and have difficulties coping with the fluctuations via saving or borrowing. Along the same lines, Tarasuk (2001) found that household food security is linked to financial insecurity. Payment delays on bills, giving up services, selling possessions and sending children elsewhere for a meal were all found to be coping mechanisms designed to compensate for lack of finances for food. Nord et al. (2003) established that almost two-thirds of households with incomes below the official poverty line were food
secure, yet food insecurity was almost six times as prevalent in households with annual incomes below 185 percent of the poverty line in comparison to those above 185 percent of the poverty line. This suggests that poverty and food insecurity are distinct yet related phenomena (Nord et al. 2003).

Numerous consequences of food insecurity for individuals have also been examined and found to be deleterious. For example, Kendall, Olson and Frongillo (1995) found that food insecure households have lower rates of consumption of fruits and vegetables and less food on hand in comparison to food secure households. Dunifon and Kowaleski-Jones (2003) observed greater behavioral and health problems among children living in food insecure households, while Tarasuk (2001) found longstanding health problems among food insecure women seeking food assistance via charity. Winicki and Jemison (2003) established that food insecure children typically receive lower math scores.

Research on the determinants of food insecurity and hunger is still in the early stages of development. Authors of this work have established various relations between socio-demographic characteristics of households and food security status. For example, Nord et al. (2002) established that race (African ancestry), ethnicity (Hispanic), and single parenthood are all associated with higher rates of household food insecurity. Low education and lack of home ownership (Rose, Gunderson and Oliveira 1998) were also associated with household food insecurity, as were lack of
savings, larger household size, unexpected expenses (Olson et al. 1998), and recent changes in income (Gundersen and Gruber 2001).

By contrast, a study by Bartfeld and Dunifon (2003) constitutes one of the few attempts thus far to expand the exploration of determinants of food insecurity to include contextual dimensions. This work established that availability and accessibility of federal food programs, policies affecting the economic well being of low income families, economic characteristics of communities, and social characteristics of communities are all related to food security status of households. Along the same lines, Opsomer et al. (2003) explored regional characteristics of communities as related to food security and determined that metropolitan households are more likely to be food insecure than non-metropolitan.

A few studies have explored the effects of changes in social policy on food insecurity. In particular, Cook et al. (2002) studied the effects of recent TANF reform on low-income families with children and found that terminating or reducing welfare benefits is associated with greater odds that children will be food insecure and/ or hospitalized for reasons not necessarily related to food security status. Similarly, Borjas (2001) established that a reduction in the ability of immigrants to obtain welfare benefits leads to an increase in food insecurity. By contrast, Winship and Jencks (2002) found that welfare reform did not have a
negative effect on the food-related problems of single and married mothers during the period between 1995 and 1999.

Thus in sum, at the national level it has been established that a wide array of household-level socio-demographic variables relate to food insecurity and hunger. These include economic status, education level, lack of home ownership, lack of savings, large household size, unexpected expenses, recent changes in income, race (African ancestry), ethnicity (Hispanic), and single parenthood (Figure 1) (Olson et al. 1998; Gunderson and Gruber 2001; Nord 2002). We also know that food insecurity and economic status are linked and that the consequences of food insecurity and hunger are prevalent and deleterious. National studies have also linked food insecurity to contextual characteristics of communities and changes in social policy, yet the research in both of these areas is scant. National research on the determinants of food insecurity and hunger is also still in its infancy.

Oregon-Specific Food Insecurity/ Hunger Literature
Not surprisingly, research looking at Oregon-specific food insecurity/ hunger data is also fairly sparse. The literature is also recent, having emerged only in the past few years. Probably the most well known “local” contributor is Leachman, much of whose work entails yearly reports of the prevalence of hunger on a state by state, ranked basis. Oregon’s notorious national reputation as “the hungriest state in the nation” can be largely attributed to Leachman’s 2001 report entitled Hunger in
Oregon. As a policy analyst with the Oregon Center for Public Policy, his work is for the purpose of advocacy on behalf of hungry populations and as such, distribution is most commonly in the form of web-based reports, issue briefs, and high profile press releases as opposed to peer-reviewed journals (for an example, see Leachman 2002).

The work of Oregon State University researchers Edwards and Weber (2003) includes one of the few studies thus far that investigates why Oregon's hunger rate is so high. Using data from the 1999 and 2000 Current Population Survey, authors of the study identify food insecurity and hunger rates among groups of households with varying demographics, workforce compositions, and income levels. Comparing Oregon households with similar households in other states revealed significantly higher rates of hunger among Oregon households with 1) no unemployed adults, 2) at least one full-year, full-time worker 3) either male blue collar workers or female blue collar/administrative support/sales workers, and 4) two-parent families with children. The anomaly here is that high rates of hunger exist in Oregon for types of households that in other parts of the country typically have below-average rates of hunger. In particular, Oregon's rates of hunger are consistently 2 to 3 percentage points higher for households with two parents, no unemployed adult, and one full time, year round worker. Edwards and Weber (2003) argue that little of this can be explained by a unique population composition since high rates of hunger are observed across almost all demographic groups in the
state. Their findings suggest the need for further examination of how contextual factors (e.g. cost of rent or childcare) and social structures/ supports contribute to state food insecurity and hunger rates.

All of the aforementioned studies examine household-level characteristics and their relation to household-level rates of food insecurity and hunger. Taponga and Suter's work (2003) is the only attempt thus far to use state-level characteristics to predict state-level hunger rates. In particular, the authors examine the relationship between state hunger rates and six independent variables: 1) dwelling mobility, 2) high rent costs, 3) unemployment fluctuations 4) state poverty rates 5) share of population under 18, and 6) share of the population that is non-Hispanic white. Results indicated that six of the independent variables were able to explain 64 percent of the variation in state hunger rates. For 32 states, the model predicted the state hunger rate to within 0.5 percent. The prediction was within 1.0 percent in 17 additional states. For Louisiana and Oregon, the model was off by more than 1.0 percent and the inaccuracies were in opposite directions. More specifically, the Louisiana model constituted an overestimation of state hunger rates while the Oregon model figure was too low.

The dwelling mobility figure in Taponga and Suter's study had the most robust and stable relationship with state hunger rates: each percentage point increase was related to a 0.13 percentage point increase in state hunger rates. A 1.0 percent
increase in high rent costs in a state (as defined by the proportion of people that expend more than 50 percent of their income on rent) was also associated with a 0.13 percent increase in the state hunger rate. A percentage point increase in unemployment fluctuations (as defined by peak unemployment rates) increased a state’s hunger rate by 0.31 percentage points. Findings for state poverty rates, share of population under 18, and race were not statistically significant. However, holding all other factors constant, higher state hunger rates were associated with non-Hispanic White populations suggesting that higher rates of food insecurity observed among racial and ethnic minorities can be attributed to other characteristics.

Using the model’s parameters, the authors go on to predict how Oregon and Washington hunger rates would change if the state’s levels were equal to the US mean. For example, share of renters in Oregon paying more than half their income on rent is 2.9 points higher than the US mean of 16.4 percent. If this rate were to drop to the 50-state mean, the authors estimate that the state hunger rate would fall by 0.4 percentage points. Oregon’s peak unemployment rate and mobility are also much higher than the US mean. The model predicts that declines of both of these variables to the US mean would translate to a drop in the state hunger rate by 0.6 percentage points.
Taponga and Suter (2003) suggest that the highly mobile nature of populations in Oregon may be putting upward pressure on the hunger rate. In short, they conceptualize high mobility as a proxy for several kinds of disruptions (divorce, eviction, graduation, poor economic conditions, seasonal labor force, rapid growth in housing prices, etc.), arguing that these disruptions may translate into diminished social cohesion in the state. They suggest that policy responses in Oregon should be in the direction of attempting to substitute for this lack of cohesion. Means suggested include economic development efforts that lower seasonal fluctuations in employment rates, increases in the supply of affordable housing, and short term emergency housing assistance which might reduce long term dwelling mobility caused by financial instability or family problems.

In sum, three main conclusions can be drawn from Oregon’s food insecurity/hunger literature base. First, in comparison to other states in the nation, Oregon ranks poorly with respect to food insecurity/hunger. Second, Oregon is atypical with respect to the types of households experiencing food/hunger (two parent, no unemployed adult, and one full time, year round worker). Third, food insecurity/hunger in Oregon is related to numerous state-level variables (rent, dwelling mobility, and unemployment fluctuations). Unlike the national literature base, links between Oregon’s food insecurity/hunger and contextual characteristics of communities have not yet been established. Similarly, the effect of changes in
social policy on the prevalence of food insecurity/hunger in Oregon is largely unknown.

**Food Assistance Program Participation Literature**

With respect to participation in the main federal food programs, various rates of use over time have been widely documented. In particular, the literature clearly shows that rates *declined* throughout the 1990's (Nord and Winicki 1999). Wilde et al. (2000) demonstrated that some of the decline could be attributed to improved economic conditions, while some was due to program level and political changes. More recently, program use has *remained fairly low* across all of the federal programs. Nord et al. (2002) found that overall, 50 percent of food insecure households in 2002 participated in WIC, while only 32 percent participated in the School Lunch Program. Participation in the Food Stamp Program (FSP) was lower still, at only 23 percent (Nord et al. 2002). The rates of federal program use were similar in 2003 (Nord 2004). Along the same lines, Wilde et al. (2000) found that many households do not participate in the Food Stamp Program, even though they are eligible to do so.

Duffy et al. (1999) also found high rates of non-users of the East Alabama Food Bank System. While transportation to the food pantry site contributed to non-use, the biggest obstacle reported in Duffy’s study was lack of knowledge about the services (Duffy et al. 1999). Martin et al. (2003) also explore *reasons for non-use*
of food pantries and found that with respect to food insecure households, discomfort with services, lack of transportation, lack of knowledge about the location of services and difficulty getting food home were the top reasons. Results from the same study indicate that reasons for non-participation in the FSP amongst food insecure households are more administrative in nature: applying but being found ineligible, the belief that respondents are non-eligible, and difficulties in navigating the application process (Martin et al. 2003). Huffman and Jenson (2003) found that family structure, food stamp benefit level, and labor market conditions were also related to the level of FSP participation. Similarly, Huffman and Jenson (2002) found that Temporary Assistance for Needy Families benefit levels and FSP participation were positively related. That is, higher TANF benefits were associated with higher FSP participation rates (Huffman and Jenson 2002).

An abundance of food participation literature compares the socio-demographic characteristics of food assistance program users and eligible non-users. For example, Farrell et al. (2003) found that non-users of the FSP experience more variability in their monthly incomes and are generally less disadvantaged than program participants. Along the same lines, Gunderson and Oliveira (2001) found that FSP users have higher rates of food insufficiency than non-participants, a finding they attribute to adverse selection: households more likely to be food insufficient are also more likely to receive food stamps. If one controls for adverse selection, their results indicate no difference in the probability of food insufficiency
between FSP users and non-users. Connell et al. (2001) found that while non-participants had significantly higher poverty income ratios there were no differences between FSP and WIC participants and non-participants with respect to household size and race. In the same study, households that were headed by younger females or those headed by someone with less than a high school education were more likely to participate in both programs.

Another group of studies explore the impacts of participation in the federal food assistance programs. For example, Basiotis et al. (1998) found a relationship between food assistance program participation and positive nutritional outcomes. Huffman and Jensen (2002) found a positive relationship between food stamp participation and food security. Similarly, Daponte et al. (2001) found that receipt of Food Stamps had a much greater impact on increasing food acquisitions of households than receipt of food from WIC or a food pantry. Moreover, Food Stamp households were 3 times more likely to become food sufficient in comparison to similar households that lacked assistance. With respect to negative program impacts, Gibson (2002) found that Food Stamp Program participation was positively correlated with adult obesity and higher Body Mass Indices (BMI) among low income men and women.

---

18 The poverty income ratio (PIR) was calculated by dividing the midpoint of the reported household income by the Census Bureau’s poverty threshold for the calendar year and the age of the family reference person. The lower the number, the greater the level of impoverishment.
Five main conclusions can be drawn from the literature base on food assistance program participation. First, food assistance program participation declined steadily throughout the 1990’s. Second, participation remains fairly low across all federal programs (50 percent of eligible and lower). Third, barriers to participation vary widely in their nature (administrative, transportation, lack of knowledge, labor conditions). Fourth, program participants and eligible non-participants vary on a number of socio-demographic characteristics. Finally, program participation is correlated with numerous positive outcomes (nutritional, food security) and some deleterious ones (obesity, increased BMI).

One can argue that the relationships between federal food assistance program participation and food security status are worthy of further exploration, especially given the fact that participation rates are low and outcomes with respect to food security status are mixed. That is, participation in food assistance programs does not necessarily amount to alleviation of food insecurity/hunger (Nord 2004). For example, in 2003, approximately one half of food insecure/hungry households with incomes less than 130 percent of the poverty line participated in the Food Stamp Program. Slightly less than half of those with incomes less than 185 percent of the poverty line participated in the school lunch program, and 40 percent participated in WIC. Moreover, only 30 percent of food insecure/hungry households received food from a pantry while one quarter ate a meal at an emergency kitchen in the past 12 months (Nord 2004). Thus, food assistance programs are not always used by
food insecure/hungry populations and utilization does not always correlate with household food security. In other words, food program participants may still be food insecure, and/or the food insecure may not even be program participants.

This dissertation constitutes a secondary analysis of existing data in order to further explore the relationship between food security status and program participation. This research is significant in that it provides insight into how participation in food assistance programs relates to food security status as well as information about the characteristics of households that participate and households that do not. The results of this research can be used to guide future food assistance service provision and policy development.
CHAPTER 4

METHODS

Research Questions

This study is exploratory in nature. It is designed to gain a preliminary understanding of the relationship between participation in federal food assistance programs and food security status and stimulate the development of subsequent hypotheses, theories and practice implications. Secondary analysis of a cross-sectional dataset is used to explore the following research questions:

1) What are the characteristics of eligible federal food assistance program participating and non-participating households?

2) How do household structure, income, community characteristics and demographics account for household level food assistance program participation?

3) Controlling for household structure, income, community characteristics, and demographics, how does household level food assistance program participation account for food security status?

Sample

The target population for this study is all those eligible for federal food assistance program participation in the US. The sample utilized in this study is drawn from the Current Population Survey (CPS) also known as the census. The CPS uses independent samples from all 50 states and the District of Columbia. To be eligible for participation in the CPS, individuals must be 15 years of age or older, and not in the Armed Forces (Evans et al. 2002). Individuals housed in institutions (prisons, long-term hospitals or nursing homes) are ineligible. Thus, the CPS sample is
representative of the civilian, non-institutionalized population in the United States (Hall 2004; Nord 2003).

The CPS uses a multistage stratified sampling strategy. The first stage of sampling stratification involves division of the 50 states and the District of Columbia into primary sampling units (PSUs). The PSUs are then grouped into strata on the basis of labor market conditions. In particular, the strata are constructed so as to be as homogenous as possible with respect to labor force, social and economic characteristics that are highly correlated with unemployment (Evans et al. 2002).

Stage two of stratification involves forming clusters of “housing units” from within the PSUs. These housing units (known as ultimate sampling units, or USUs) are clustered in accordance with similar demographics and geographic proximity. In the sense that an individual sampling design is created for each state to ensure that most housing units have the same overall probability of selection, the CPS sample can be thought of as a “state-based” probability sample (Evans et al. 2002).

In total, the December 2004 CPS sample includes responses from 55,307 households. Of these, 48,103 households completed the additional Food Security Supplement (FSS). One person per household responds to the survey on behalf of all eligible household members. This “reference person” is typically the person

---

19 Total number of household units within the USUs is established in accordance with reliability requirements, as expressed in terms of the coefficient of variation (a relative measure of sampling error divided by the expected value of a given characteristic) (Evans et al. 2002).
who owns or rents the housing unit. Of the FSS completers, households that met both of the following two conditions have been excluded from the study sample: 1) their household income level was above 185 percent of the poverty threshold and 2) they answered “no” to the following screener:

People do different things when they are running out of money for food in order to make their food or their food money go further. In the past 12 months, since last December, did you ever run short of money and try to make your food or your food money go further?

Exclusion is based on the fact that households meeting both criteria were not asked any questions about food assistance program participation. The details of the Food Security Supplement are outlined in Chapter 2 pages 7 to 12. Details of the sample (N=5638) are presented in Figure 4.

Instrument

The CPS is a primary source of demographic and labor force characteristics in the United States, and is sponsored jointly by the U.S. Census Bureau and the U.S. Bureau of Labor (Evans et al. 2002). The FSS contains items that pertain to food expenditures, the use of food assistance programs, and conditions and behaviors related to food security, food insecurity and hunger. Again, details about the FSS and its development are presented in Chapter 2, pages 7 to 12. All data from the CPS and FSS are cross sectional, and at the household level.

---

20 Household income relative to 185 percent of poverty line is constructed by taking the midpoint of the income range reported by the household respondent, factoring in total number of household members, and comparing to the official poverty threshold for the year.
The CPS is administered by the Census Bureau during the calendar week that includes the 19\textsuperscript{th} of each month of participation.\footnote{The CPS is often administered a week early in December to avoid holiday conflicts.} All households are in the CPS survey for 4 consecutive months, followed by an 8 month break, and 4 more consecutive months of participation prior to permanent departure from the sample (Evans et al. 2002). The FSS is administered every December as a supplement to the labor portion of the CPS. Thus, each housing unit in the study is interviewed eight times total over an 8 month duration. Data are collected by Census Bureau field representatives (computer assisted) via both in-person and telephone administered interviews (Evans et al. 2002).\footnote{All first interviews are in person. About 85 percent of subsequent interviews are administered via the telephone.} FSS data are available in a public database (accessible by anyone at any time), managed through the Economic Research Service of the US Department of Agriculture.

\section*{Reliability and Validity of the Instrument}

The Food Security Core Module (FSCM) exhibits fairly strong reliability with respect to two traditional measures of correlations between alternate test forms (Spearman-Brown Split Half and Rulon's Split Half Reliability Estimate), as well as coefficient alpha (Cronbach's Alpha). Estimated reliability values for all three measures ranged from 0.86 to 0.93 for the FSCM 12-month scale when extreme household scores are included. By contrast, when extreme households are
excluded from the analysis, the range of values is lower, yet still falls within acceptable ranges (0.74 to 0.88) (Hamilton et al. 1997).

All three of the aforementioned reliability indicators (Spearman-Brown Split Half, Rulon’s Split Half and Cronbach’s Alpha) use linear composites and therefore the results do not correspond exactly to the Rasch model that is used in this scale since it is non-linear. Accordingly, calculation of a Rasch-specific measure (the Rasch Reliability Index) allows for a more direct reliability indicator (Hamilton et al. 1997). Ranges on the Rasch Reliability Index for the FSCM fall between 0.70 and 0.74. Dichotomous split-half testing values (which measures the FSCM’s ability to reliably distinguish between households that have versus have not experienced any of the measured food insecurity and hunger conditions) also fall within acceptable ranges (κ statistics = 0.69 to 0.70) (Hamilton et al. 1997).

The external construct validity of the FSCM was analyzed by comparing the food security measures with four construct validation measures thought to have a bearing on food security: 1) household food expenditures, 2) income, 3) income relative to the poverty line and 4) respondent reports of the sufficiency of household food eaten (Hamilton 1997). While each item used to assess the validity of the FSCM instrument contains limitations (e.g. not one of them was actually designed to measure food security), general findings of these analyses suggest that

---

23 For an explanation of Rasch modeling, see Chapter 2, pages 10 to 12.
the FSCM constitutes a valid measure of the underlying constructs of food insecurity and hunger (Hamilton 1997).\textsuperscript{24}

Finally, the development process for the FSCM included an analysis of potential bias yielded from the measure. In particular, three potential sources of bias were examined: 1) Screening bias which may result because the full set of questions was posed to all lower-income respondents, but not all higher-income households; 2) Response bias which may result from systematic over or underreporting of the severity of respondent circumstances, and 3) Random error bias which may occur when the true prevalence of a condition in the population is highly skewed (Hamilton 1997). The analysis revealed that screening and response bias is likely to result in small \textit{underestimations} of the extent of food insecurity. By contrast, random error bias was thought to have a small effect in the opposite direction; an \textit{overestimation} of the extent of food insecurity. The magnitude of the net bias resulting from the measure is thought to be small in that the two types of bias cancel themselves out since they are in opposite directions.

Four main sources of nonsampling bias exist within the CPS: 1) coverage bias; 2) nonresponse bias; 3) response bias, and 4) processing bias (Evans et al. 2002). In particular, a survey is said to have \textit{coverage bias} when the units in a given sampling area have less than a 100 percent chance of being selected for the study.

\textsuperscript{24} For a more detailed account of the external construct validation process, see Hamilton (1997), Chapter Six.
In other words, coverage is flawed in the sense of erroneous exclusion or inclusion into the study based on an inaccurate initial address list. Sources of undercoverage include "frame omissions" wherein housing units are erroneously omitted from the sample (e.g. because of new construction). Unlocatable addresses and failure to include homeless persons are also sources of undercoverage. By contrast, misclassification of both housing units (e.g. recording a single unit as a double), and within-housing unit information (e.g. failure to list all residents in a unit) may result in coverage bias in either direction (Evans et al. 2002).

While coverage bias stems from inadvertent survey omissions or inclusions, nonresponse bias occurs when households that are known to be eligible for inclusion in the sample are not interviewed. For example, a respondent may refuse to participate in the survey, be unavailable (e.g. due to scheduling) or be incapable of survey completion (e.g. due to poor health). Along the same lines, respondents may refuse to answer a given item in the survey, resulting in a "within-survey" nonresponse bias. By contrast, response bias refers to the situation where a response to a particular item is provided, but not true. This may stem from misinterpretation of the question at hand by the respondent, or inaccurate survey administration by the interviewer (e.g. through reading or recording a given item wrong) (Evans et al. 2002). Both nonresponse and response biases are not unique to the CPS. Rather, they are present in all general survey administration.
Finally, several processing biases are inherent to the CPS survey. For example, the industry and occupation coding is subject to bias given the difficulties involved in assigning the proper code for all cases. Similarly, the modeling used in the CPS, for example in generating seasonally adjusted or state labor force estimates may be a source of processing bias. The same is true for the modeling used to generate the CPS population controls (i.e. the monthly population projections used to weight CPS data) (Evans et al. 2002).

Measures

Table 1 provides a summary of the study variables. Table 2 provides in-depth information about each variable, including actual questions asked during administration of the FSS and details about the categories of each variable.

1) Independent Variables
   1a) Household Structure

The measure of Household Structure includes 1) household size: total number of members, 2) age of household head, and 3) education level (Tables 1 and 2). The measure for household size was converted from continuous to categorical, and includes the following five categories: 1 member household, 2 member household, 3 member household, 4 member household, 5 or more member household (Table 2). Age of household head was also converted from continuous to categorical and includes the following five age categories: 21 and under, 22 to 30, 31-40, 51-65,
and 66 and older. Education level was reduced from the 16 original categories to 4: less than high school, high school grad (diploma or equivalent), some college but no degree, and college degree/college plus.

1b) Income Status

The Income Status measure is a categorical measure of household earnings. It was recoded from 14 categories to the 4, as follows: $0 to $14,999, $15,000 to $29,999, $30,000 to $49,999 and $50,000 to $99,999 (Tables 1 and 2).

1c) Community Characteristics

The measure for Community Characteristics is made up of two variables: 1) metropolitan versus non metropolitan status and 2) household geographic region of the US (northeast, midwest, south, or west) (Tables 1 and 2). No modifications were made to either variable.

1d) Demographics

Demographic variables include sex, race, and ethnicity. Sex is a dichotomous variable (male versus female), unmodified from the original. Categories for race were reduced from 17 to the following 6: White only, Black only, American Indian/Alaskan Native only, Asian only, Hawaiian or Pacific Islander Only and Mixed 2 or more Races. Ethnicity is a dichotomous variable (Hispanic versus non-Hispanic), also unmodified from the original.
2) Dependent Variables

2a) Food Assistance Program Participation

The measure for *Food Assistance Program Participation* is more complicated than the independent variables described above. The measure *excludes* participation in the food distribution programs (emergency soup kitchens, food pantries, or food banks) and *includes* participation in 1) Food Stamps, 2) WIC, and 3) Free/ Reduced Breakfast and Lunch Programs. Food Assistance Program Participation is based on programmatic use *in the past 30 days*. With the exception of Food Stamps, this 30 day timeframe is explicated in the actual item during question administration, as shown in Table 2.

The measure for Food Stamp Program Participation is different than the measures for participation in the other programs being examined due to the wording used in the survey. In particular, in the case of Food Stamps, respondents are asked about receipt in specific months (November, December, etc.) versus in the past 30 days. Since the questionnaire was administered sometime during the week of December 19th, whether or not participants received Food Stamps in December was chosen as the “30 day” measure. This decision resulted in a loss of 60 subjects that answered affirmative to Food Stamp receipt in November (i.e. 60 subjects that may or may not have fallen in the 30 day window depending on when they received Food Stamps in November).
A composite, dichotomous variable was created to capture Food Assistance Program Participation: household level participation in the past 30 days in 0 versus 1 or more of the aforementioned programs (i.e. Food Stamps, WIC, and Free or Reduced Breakfast and/or Lunch) (Table 2). It is worth noting that Food Assistance program participation serves as a dependent variable in Model 1 and the independent variable in Model 2.

2b) Food Security Status

Food Security Status, the outcome variable in Model 2 (see Figure 3) was also measured in accordance with the 30-Day (versus 12-Month) scale for measurement of household food security. This decision ensures matching between the timeline for questions about food assistance program use and questions about food security status. Entitled the Food Security Core Module, the 30-day scale is similar to the corresponding 12-month scale except that it does not measure food insecurity in the lower ranges of severity measured by the 12-month scale. That is, a substantial proportion of households that score as “food insecure without hunger” on the 12-month scale will not be identified as food insecure on the 30-day scale. Thus, the 30-day scale can be said to constitute a more conservative measure of the food insecurity without hunger category. Details about the Food Security Core Module have been outlined in Chapter 2, pages 12 to 16.
The food Security Status variable was collapsed from the original three categories (food secure, food insecure without hunger, and food insecure with hunger) to two: food secure versus food insecure (with or without hunger). In order to ease interpretation of the logistic regression analysis, the categories were also recoded using 0 and 1 to indicate food secure versus food insecure respectively.

The decision to collapse the categories of certain variables was a strategy for reducing variability in the sample and meeting the dichotomous restriction for the predictor variable dictated by binary logistic regression. Decisions about categories were guided by the distribution of the dataset in that an attempt was made to 1) collapse only in cases where the original categories contained a limited number of cases and 2) approximately equalize the frequencies for each collapsed category (Pallant 2005).

Preliminary Analysis

All data were analyzed utilizing SPSS version 14.0. The issue of missing data was examined. For the vast majority of variables, there were no missing data. Exceptions include the original Food Assistance Program Participation variables, where missing data (refused or don’t know responses) constituted 0.7 percent of the total or lower for each program. Listwise deletion (i.e. deletion of cases) in instances where only a few have missing data is considered a reasonable option (Tabachnick and Fidell 2001). Therefore, listwise exclusion was chosen as the
strategy for dealing with the missing Food Assistance Program Participation cases. Deletion resulted in a loss of 67 cases total (1.2 percent of the original sample). Twenty three (34.3 percent) of the deleted cases were male respondents, and 44 (65.7 percent) were female. Forty three (64.2 percent) were Caucasian, and 18 (26.9 percent) were African American. Nineteen (28.4 percent) cases identified as Hispanic, and 48 (71.6 percent) identified as Non-Hispanic. Over three quarters (n=52) were metropolitan households. About half were from either 3 or 4 member households. Eighteen percent (n=12) were from either 2 or 5 member households. The vast majority of respondents had a highschool diploma or some college (64.2 percent). Well over half had household earnings in the range of $0 to $14,999 (58.2 percent).

While it is fairly common for missing data rates to be high for a given measure of household income, it is worth noting that this was not the case for this particular dataset. This is because coincidentally, the intentional exclusion of households that were above 185 percent of the poverty threshold also resulted in an unintentional exclusion of all “missing income” households. That is, households that were purposively screened out of the sample based on the design of the study turned out to be the same households that either refused or responded “don’t know” to the

---

25 It is worth noting that Rasch methodology applies a statistical imputation formula (a computational algorithm) that enables the assignment of values to households with some missing data. As a result, sample loss due to missing data (refused or don’t know responses) amounts to only one half of one percent.

26 This group constituted 13.7 percent of the sample prior to application of the sample screener.
household income question. Oddly enough, there were no exceptions, rendering decisions about what to do with missing income data avoidable for this study.

In cases where the Cramer's V (strength of association) values between pairs of independent variables were above 0.6, a decision to omit one of the variables originally proposed was made. In particular, this analysis resulted in the deletion of one originally proposed variable entitled “Household Type” based on a high Cramer's V statistics when crossed with Sex, \( V=0.81 \) \( p<.0005 \). Household Type was originally conceived as part of the Household Structure measure, and included categories such as Husband/ Wife Primary Family, Unmarried Civilian Female Primary Family, and Civilian Male Primary Individual.

Collinearity diagnostics were used to search for sources of multicollinearity among the independent variables. More specifically, Tolerance (1-\( R^2 \) for each predictor)\(^{27} \) and Variance Inflation Factors (VIF) (the inverse of Tolerance) were calculated for each predictor. Results have been summarized in Table 3. For the sake of the procedure, the food security raw score, which is a continuous variable was set to serve as a dependent variable with the rest of the independent variables in the model. No Tolerance values less that 0.10 or VIF values above 10 were detected.

\(^{27} R^2 \) is the Squared Multiple Correlation (SMC) of a variable where it serves as the dependent variable with the rest of the independent variables in multiple correlation. An SMC of 1 indicates singularity (Tabachnick and Fidell 2001)
through this analysis, suggesting it was unnecessary to further delete variables from the model due to multicollinearity (Pallant 2005).

Since outliers can negatively influence the results of logistic regression, prior to recoding of variables, the dataset was also tested for outliers through examination of boxplots and extreme values (Pallant 2005). No problems with the data were revealed through these procedures. The data were further examined for outliers by comparing the five percent trimmed mean with the mean on all variables. The two values were very similar on all variables, the largest difference being a value of 0.55 observed on the variable “age.” This suggests the outlying cases have very little influence on the mean. Thus, all cases were retained in the data file.

Main Analysis

Multivariate statistics were used to investigate the research questions posed in this study. In particular, logistic regression was used to construct two models. Model 1 examined whether there is a relationship between program participation (binary dependent variable) and several household level variables as explicated in the aforementioned research questions. This model is visually depicted in Figure 2. The arrows between groups of household level variables represent my a priori assumptions about the relations between the variables.
Model 2 examined whether there is a relationship between food security status (binary dependent variable) and several household level variables, including food assistance program participation.\textsuperscript{28} This model is visually depicted in Figure 3. It is worth noting that program participation is an outcome variable in Model 1, and becomes a predictor variable in Model 2. Direct logistic regression was chosen given its suitability for use in studies where 1) the dependent variables of interest are categorical and 2) there are no specific hypotheses about the order or importance of the predictor variables in the model at hand (Tabachnick and Fidell 2001).

The purpose of the analysis is fourfold. First, it allows for the determination of the relative effects and direction of the effect of each independent variable in the analysis on the dependent variables (\(b\) coefficient). Second, it provides an estimate of the strength of the effect of any given independent variable in the model (beta weights). Third, it explains how much of the variance in program participation can be explained by the group of independent variables chosen for the analysis as a whole (Cox and Snell's R-square/ Nagelkerke's R-Square/ Odds-Ratio) (Fortune and Reed, 1999; Tabachnick and Fidell 2001). Fourth, the models' equations can

\footnotesize{\textsuperscript{28} While statistically, it is possible to use food security status as a predictor of food assistance program participation or vice versa, the latter has been chosen for Model 2. This is mainly because using program participation to predict food security status corresponds with the research question of interest. Moreover, regarding food security status as a predictor (versus outcome) of participation seems to contain a logical inconsistency since food security status may or may not lead program participation whereas program participation should result in food security given the overriding goals of the federal food assistance system.}
be used to predict both food assistance program participation and food security status on a probabilistic basis for varying scenarios (Tabachnick and Fidell 2001).

Logistic regression is superior for this data set given that it allows for a mix of continuous, discrete and dichotomous predictor variables. Logistic regression also has no assumptions about the distribution of the predictor variables, relations between predictor variables, or variance within each group of predictor variables (Tabachnick and Fidell 2001).

To some extent, data driven inquiry is common to all exploratory research, which seeks to gain a preliminary understanding of a particular phenomena. However, to the extent possible, a priori analysis should be used to specify a theory base in advance of working with data. As such, this study design has incorporated safeguards against a wholly inductive, atheoretical approach to answering the outlined research questions. First, dependent and independent variables have been specified prior to statistical manipulation. The choice of variables used to represent the theoretical construct was driven by examination of the existing research base. Second, to the extent possible, the nature of the relationships between the independent and dependent variables has been specified in advance of analysis. Again, specification was driven by examination of the literature. These proposed relations between predictor variables and food security status are outlined in Table 1.
CHAPTER 5

RESULTS

Sample Demographics

Sample demographics (n=5638) are summarized in Table 4. Frequency tables indicate that 75.1 percent of respondents were White, 17.6 percent were Black, and 13.5 percent self-identified as of Hispanic origin. A much higher percentage of respondents were female (60.2 percent) than male (39.8 percent), however this is merely an indication of the fact that females were chosen as main respondents for the survey more often than males. That is, this variable does not necessarily tell us anything about family structure with respect to presence or absence of a male in the home. Age of household head varied widely with approximately 20 percent of the sample falling into each of the following four categories: 22-30, 31-40, 41-50, and 51-65. Only 4.1 percent of household heads were 21 and under, and 15.4 percent were 66 and older. The most common education level amongst respondents was completion of a high school diploma (36.6 percent). Approximately 30 percent of respondents had less than a high school education, about a fifth had some college and only 15 percent had a college or graduate level degree (Table 4).

Over half of the sample had a total household income of less than $14,999 in the 12 months prior to administration of the interview (54.2 percent). Just over 30 percent fell in the income range of $15,000 to $29,999, while slightly less than 15 percent of the sample fell into higher income brackets. The total number of household
members was widely distributed. Approximately half of the sample was either a one (27.7 percent) or two (23.2 percent) member household, 16.1 percent were 3 member households, 14.7 percent were 4 member, and 18.1 percent of households had 5 or more members. The largest percentage of respondents lived in the south (34.9 percent) and the smallest in the northeast (15.7 percent). About a quarter of respondents lived in the Midwest (24.0 percent) and West (25.4 percent). A much higher percentage of the sample lived in metropolitan regions (67.2 percent) in comparison to nonmetropolitan (31.8 percent) (Table 5).

Frequencies for Model 1 and 2 outcome variables are summarized in Table 5. With respect to program participation, slightly more than half of the sample had not participated in a federal food assistance program in the past 30 days (53.9 percent) and slightly under half had participated in 1 or more of the programs (46.1 percent). About three quarters of participants were food secure (73.8 percent), while the remaining were food insecure with or without hunger (Table 5).

1) Model 1: Federal Food Assistance Program Participation as the Dependent Variable

1a) Model 1: Chi Square Analysis

Characteristics of federal food assistance program participating and non-participating households were explored utilizing the predictor variables summarized above: number of household members, age of household head,
household earnings, metropolitan versus non metropolitan status, geographic region of the US, sex, race, ethnicity, and education level. A series of chi-square tests of independence were performed (N=5638) to examine whether the variables in Model 1 are independent of federal food assistance program participation. Results are summarized in Table 6.

It is fairly common for the null hypothesis to be rejected in a chi-square analysis when the sample size is large. Moreover, the fact that covariation is statistically significant merely tells us information about the status of dependence/independence between the two variables being tested. Accordingly, the strength of the relations between variables was also examined utilizing Cramer's V measures of association for contingency tables. The Cramer's V statistic can be utilized for contingency tables of varying sizes. Values range from zero to one with zero representing no association between the two variables and one representing a very strong association. More specifically, Cramer's V values of 0.25 or higher indicate a very strong relationship, 0.15 to 0.25 are strong, 0.11 to 0.15 indicates moderate, 0.06 to 0.10 indicates weak, and 0.01 to 0.05 indicates a negligible relationship. Results are summarized in Table 6.

The relation between household size (total number of members) and participation was significant, $X^2 (4, N=5638) = 895.76, p < .0005$. Strength of association was very strong for this variable, $V = .40, p < .0005$, with households having higher
numbers of members being associated with program participation. The relation between age of household head and participation status was also significant, $X^2 (5, N=5638) = 444.36, p < .0005$. Age of household head also had a very strong association with program participation status, $V=.28$, $p<.0005$. The general trend is that participation increases with age through the category of 31 to 40 year olds. From 31-40 through ages 66 and up, participation decreases as age of household head increases. The relation between education level and participation was also significant $X^2 (3, N=5638) = 51.83, p < .0005$, however the strength of association was weak, $V=.10$, $p<.0005$ (Table 6).

The relation between household earnings and participation status was significant, $X^2 (3, N=5638) = 34.07, p < .0005$. Household earnings had a weak strength of association with participation status (Table 6). The relation between geographic region and program participation status was not statistically significant indicating that these two variables are independent. Metropolitan status was also independent of program participation status (Table 6).

The relation between sex and program participation was significant, $X^2 (1, N=5638) = 58.89, p < .0005$. While females are more likely to be program participants than males, the strength of the association was weak, $V=.10$, $p<.0005$.

The relation between race and participation status was also significant, $X^2 (5, N=5638) = 43.01, p < .0005$. Race had a weak strength of association with
participation status. $V = 0.09, p < 0.005$. The relation between ethnicity and program participation was significant, $X^2 (1, N = 5638) = 88.53, p < 0.0005$, with respondents of Hispanic origin being more likely to participate in comparison to non-Hispanic respondents. Here, the strength of the association was moderate, $V = 0.13, p < 0.005$ (Table 6).

1b) Model 1: Bivariate Logistic Regression Analysis

Bivariate relationships were explored utilizing logistic regression. Each predictor variable was modeled solely against program participation: the outcome variable in Model 1. Odds ratios and 95 percent confidence intervals were calculated and appear in Table 8. According to the unadjusted odds-ratios, household size was the strongest predictor of program participation, with values ranging from 0.11 ($CI_{95} = 0.09, 0.13$) to 0.55 ($CI_{95} = 0.45, 0.67$). In general, the odds of being a program participating household were lower for larger households in comparison to a household of one. Results were significant for all categories of the household size variable. Unadjusted odds ratios for age of household head were second to household size in terms of their ability to predict program participation with values ranging from 1.87 ($CI_{95} = 1.53, 2.29$) to 5.87 ($CI_{95} = 4.81, 7.15$). Again, results for all variable categories were significant. In comparison to a household headed by someone aged 21 or under, the odds of participation steadily increased through the age categories of 22-30, 21-30, and 41-50, yet declined for both age categories thereafter (51 to 65; 66 and older). Unadjusted odds ratios for education level were
also statistically significant, ranging from 1.40 ($CI_{95} = 1.16, 1.68$) to 1.82 ($CI_{95} = 1.53, 2.16$). The odds of someone with a high school diploma participating were 1.82 times that of someone with an education level that was less than high school (Table 8).

Unadjusted odds ratios for household earnings were all less than one. The odds of households with earnings in the $15000 to $29999 range were 0.55 times that of those in the $0 to $14999 range ($CI_{95} = 0.33, 0.91$). The odds of households with earnings in the $30000 to $49999 range participating in one or more federal food assistance programs was 0.45 times that of someone in the $0 to $14999 range ($CI_{95} = 0.27, 0.75$). Results for the $50000 to $99999 range were not statistically significant (Table 8).

None of the unadjusted odds ratios for metropolitan status was statistically significant. Likewise, none of the unadjusted odds ratios for geographic region was statistically significant (Table 8).

The odds of participation by females was 0.66 that of males ($CI_{95} = 0.58, 0.73$). With the exception of the African American race category, none of the unadjusted odds ratios for race were statistically significant. The odds of participation by African Americans were 0.66 times that of Caucasians ($CI_{95} = 0.49, 0.90$). The unadjusted odds ratio for ethnicity was statistically significant. The odds of
participation of non-Hispanics were 2.10 times that of Hispanics ($CI_{95} = 1.80$) (Table 8).

**1c) Model 1: Multivariate Logistic Regression Analysis**

To create Model 1, direct logistic regression was performed with participation in food assistance programs as the outcome variable and the nine predictors, as follows: number of household members, age of household head, education level, household earnings, metropolitan versus non metropolitan status, geographic region of the US, sex, race, and ethnicity (Figure 2). As described in Chapter 4 (page 67), sixty-seven cases with missing values on the food assistance program participation variable were deleted, leaving 5638 cases available for the analysis.

An initial likelihood ratio test$^{29}$ (model chi-square) was executed to see how well Model 1 performed in comparison to an SPSS generated baseline model with none of the predictors entered (i.e. a constant only model). In general, the likelihood ratio statistic requires the identification of two models to be compared: one is a "full" model (in our case this is Model 1), and the other a special case of the full model, often referred to as the "reduced" model (Kleinbaum 1994). More specifically, the likelihood ratio test of a model tests the hypothesis that *all* population logistic regression coefficients except the constant are zero.$^{30}$ Degrees

---

$^{29}$ Omnibus Tests of Model Coefficients

$^{30}$ In particular, it reflects the difference between 1) error not knowing the independents (i.e. the initial chi-square) and 2) error when the independents are included in the model (i.e. deviance).
of freedom for this test equal the difference between the number of parameters in the two models being compared (Kleinbaum 1994). That is, degrees of freedom are equal to the number of parameters in the full model that must be set to zero in order to obtain the reduced model. Results were favorable, indicating that Model 1 performed better than the computer generated model which assumed that all subjects would report no participation, $\chi^2 (27, N=5638) = 1602.2, p < .0005$.

The Hosmer and Lemeshow (H-L or chi-square goodness of fit) test was used to test whether the Model 1 estimates fit the data at an acceptable level. More specifically, this test divides respondents into deciles based on predicted probabilities. That is, it uses fixed groups of the estimated probabilities and computes a chi-square from the observed and expected frequencies. Using 8 degrees of freedom, a probability value is then calculated from the chi-square distribution in order to test the fit of the model. It is worth noting that for this chi-square goodness of fit test, poor fit is indicated by a significance value of less than .05. The Model 1 H-L test statistic was not significant, $\chi^2 (8, N = 5638) = 13.2, p < .1$, indicating that the predictors, as a set, reliably distinguished between federal food assistance program participating and nonparticipating households.

Strength of association was examined using two logistic R-squared measures: Cox and Snell’s and Nagelkerke’s pseudo R-Square. Both are merely approximations of the actual percent of variance explained or true R-Square measures (Nagelkerke
This is because the purpose of a true R-square measure is to outline the percent of variance explained for a group of dependent variables, but the variance for a given categorical dependent variable will depend on the frequency distribution of that variable. As such, groups of categorical dependent variables cannot be easily compared for the purpose of generating an R-Square measure.

Nagelkerke's pseudo R-Square is usually considered the more relevant of the two values and is more widely reported, as it contains a modification of the Cox and Snell coefficient. The modification is based on the fact that the Cox and Snell coefficient allows for a maximum value of less than one, which is difficult to interpret. In other words, the Nagelkerke statistic corrects the Cox and Snell such that it could theoretically achieve a value of one. Cox and Snell and Nagelkerke pseudo R Square values were .247 and .331 respectively, indicating that somewhere between 25 and 33 percent of the variance in program participation is estimated to be explained by the model.

Model 1 correctly classified 65.4 percent of program participating households (i.e. sensitivity or true positives) and 78.2 percent of nonparticipating households (i.e. specificity or true negatives) for an overall success rate of 72.3 percent. This finding is based on a decision rule of 0.5, meaning when the estimated probability of program participation occurring was greater than or equal to 0.5, the model classified the household as "program participating." Likewise, SPSS classified all
households with an estimated probability of less than 0.5 as "non-participating."

Positive predictive value for the model is 71.9 percent. This indicates that of the households predicted to participate in food assistance programs, our model accurately picked 71.9 percent of them. This figure is calculated by dividing the number of households that are predicted and observed by Model 1 to be program participants by the total number of predicted program participants. Conversely, the negative predictive value for Model 1 is 72.6 percent. This refers to the percentage of households predicted by Model 1 not to be participants that did not actually participate in food assistance programs.

The Wald statistic tests the significance of individual logistic regression coefficients for each predictor variable. Here, the null hypothesis is that a given logic coefficient (i.e. effect of an independent variable) is zero. According to the Wald criterion for Model 1, several of the variable categories reliably predicted program participation. In particular, at least one category within all ten predictor variables was a major factor influencing whether or not a household participates in food assistance programs. However, the Wald statistic has some notable drawbacks. In particular, with the Wald statistic, large effects can lead to large standard errors, small Wald Chi-square values and/or small or zero partial R’s. Accordingly, odds ratios have been utilized in this dissertation to further explore the importance of predictor variables.
An odds ratio is the base of the natural logarithm (e) raised to the power of the logistic regression equation's logit (or "parameter estimate," or b). The closer the odds ratio is to 1, the more the predictor variable categories are independent of the dependent variable, with a value of 1.0 representing full statistical independence.

Looking at odds ratios in conjunction with their associated confidence intervals is a common approach for determining whether a given independent variable is a useful predictor in a logistic model. In logistic regression, this is preferred over examining standardized logit coefficients since standardized logit coefficients refer to the relative importance of the predictors in terms of their effect on the dependent's logged odds which is less intuitive than actual odds in terms of ease of interpretation.

Table 8 summarizes the odds ratios and confidence intervals for each predictor variable in Model 1. Results indicated that numerous variables have predictive power. Amongst those variables with odds ratio values greater than one, number of household members was the strongest predictor of program participation. Larger households were more likely to report participation in comparison to smaller households. That is, odds ratios increased with increasing household size. Findings for all categories of the household size variable were statistically significant. The odds of a household with 2 or more members participating in 1 or more of the federal food assistance programs was 1.65 times greater than that of a household of one (CI.95 = 1.38, 1.98). The odds of a household with 5 or more members
participating was 23.30 times greater than that of a household of one \((CI_{95} = 17.76, 30.57)\). The odds of 3 and 4 member households participating are 5.55 \((CI_{95} = 4.49, 6.84)\) and 10.20 \((CI_{95} = 7.98, 13.05)\) times greater respectively when compared to a household of one (Table 8).

Households headed by older individuals were less likely to participate in comparison to those headed by younger individuals. Findings for three age categories were statistically significant. The odds of households headed by 31-40 year olds participating were 2.06 times greater than those with household heads aged 21 or under \((CI_{95} = 1.48, 2.85)\). Odds ratios for 22-30 and 41-50 year olds were 1.82 \((CI_{95} = 1.32, 2.52)\) and 1.57 \((CI_{95} = 1.14, 2.16)\) respectively. Odds ratios for both older age categories (ages 51 and older) were not statistically significant (Table 8).

Those households where the CPS respondent had a higher education level were less likely to participate in comparison to those with less than high school. The odds of those in the college degree/ college plus category were 0.48 times as large as those where the respondent had a level of education that was less than high school \((CI_{95} = 0.39, 0.60)\). This is equivalent to an odds ratio of 2.08 in the opposite direction. The odds ratio for those in the “some college” category was 0.70, indicating the odds of participation were 30 percent as large as those in the less than high school
category \((CI_{95} = 0.58, 0.84)\). Odds ratios for respondents with a high school diploma or equivalent were not statistically significant (Table 8).

Odds ratios for household earnings were less than one, indicating less likelihood of participation in federal food assistance programs when weighed against the $0 to $14 999 comparison category. Findings for all categories of household earnings were statistically significant. The odds of participation for those households in the income range of $15 000 to $29 999 was 0.32 times that of households in the $0 to $14 999 range \((CI_{95} = 0.27, 0.37)\). By taking the inverse of this value, we can see that it is equivalent to an odds ratio of 3.13 in the opposite direction. Odds ratios for both of the higher income categories were 0.15. This indicates that for both of the higher household income bracket, the odds of participation were 85 percent as large as those in the $0 to $14 999 range \((CI_{95} = 0.12, 0.20 \text{ for } $30 000 \text{ to } $49 000; CI_{95} = 0.09, 0.27 \text{ for } $50 000 \text{ to } $99 999)\) (Table 8).

Non-metropolitan households were more likely to participate than metropolitan, as revealed by an odds ratio of 1.17 \((CI_{95} = 1.02, 1.34)\). Households in the west were less likely to participate than those in the northeast with an odds ratio of 0.80 \((CI_{95} = 0.65, 0.97)\). Findings for other geographic regions were not statistically significant (Table 8).
Female respondents were more likely than males to participate (OR = 1.75, CI,95 = 1.54, 1.99). The odds of participation by African American respondents were 1.56 times greater than Caucasians (CI,95 = 1.31, 1.85). The odds of participation by mixed race respondents were 1.56 times greater than Caucasians (CI,95 = 1.12, 2.24). Findings for all other race categories were not statistically significant. The odds of participation by non-Hispanic respondents was lower than for Hispanics (OR = 0.72; CI,95 = 0.50, 0.87) (Table 8).

2) Model 2: Food Security Status as the Dependent Variable

2a) Model 2: Chi Square Analysis

Chi square analysis was used to explore the relation between the two outcome variables in Models 1 (program participation status) and 2 (food security status). Results are summarized in Table 7. Chi square findings were significant, \( \chi^2 \) (2, N =5638) = 11.22, \( p < .001 \), indicating some level of dependence between the two variables. However, the strength of association between the two variables indicated that the relationship was very small/ negligible, \( \Phi =.05 \), \( p<.001 \). It is worth noting that in comparison to all significant chi-square findings in this dissertation, the strength of association between program participation and food security status was amongst the weakest.
2b) Model 2: Bivariate Logistic Regression Analysis

Bivariate relationships were explored utilizing logistic regression. Each predictor variable was modeled solely against the food insecurity outcome variable in Model 2. Unadjusted odds ratios and 95 percent confidence intervals were calculated and appear in Table 9. Larger households were more likely to be food insecure in comparison to households of one. The odds of a household with two members being food insecure was 1.83 times greater than that of a household of one ($CI_{95} = 1.18, 1.74$). The odds of a household with three members being food insecure was 1.44 times greater than a household of one ($CI_{95} = 1.18, 1.74$). Findings for both 4 member and 5 or more member households were not statistically significant (Table 9).

Households headed by older individuals were more likely to be food insecure in comparison to those aged 21 or under. The odds of food insecurity for households headed by someone aged 22 to 30 were 2.18 times greater than for those that were headed by someone 21 and under ($CI_{95} = 1.58, 3.01$). Findings for the 31-40 age bracket were not statistically significant. The odds of food insecurity for households headed by 41-50 year olds were 1.43 times greater than for 21 and under ($CI_{95} = 1.15, 1.77$). The odds of food insecurity for households headed by someone aged 51-65 were 2.04 times greater than for those headed by someone 21 and under ($CI_{95} = 1.65, 2.52$). The odds of food insecurity for households
headed by someone 66 and older were 1.85 times greater than for those aged 21 and under \((CI_{95} = 1.50, 2.30)\) (Table 9).

The unadjusted odds of households with earnings in the $15,000 to $29,999 range being food insecure were 2.83 times greater than those in the $0 to $14,999 range. No other household earning odds ratios were statistically significant. None of the unadjusted odds ratios for education level, metropolitan status, geographic region, or sex were statistically significant (Table 9).

Unadjusted odds ratios revealed that non-Caucasian respondents were less likely to be food insecure in comparison to Caucasian respondents. The odds of food insecurity for African American respondents were 0.52 times that of Caucasians \((CI_{95} = 0.38, 0.71)\). The odds of food insecurity for American Indian/Alaskan Native respondents were 0.64 times that of Caucasians \((CI_{95} = 0.46, 0.90)\) and the odds of food insecurity for Hawaiian/Pacific Islander respondents were 0.39 times that of Caucasians \((CI_{95} = 0.21, 0.72)\). Unadjusted odds ratios for the categories of Asian and mixed 2 or more races were not statistically significant. The odds of food insecurity for non-Hispanic respondents were 0.81 times that of Hispanic respondents \((CI_{95} = 0.67, 0.97)\) (Table 9).

According to the unadjusted odds ratios, program participating households were less likely to be food insecure compared to non-participating households. The odds
ratio was 0.83 ($CI_{95} = 0.74, 0.94$), meaning the odds of households that participated in one or more federal food assistance programs being food insecure were 0.83 as large as those that did not participate in one or more federal food assistance programs.

### 2c) Model 2: Multivariate Logistic Regression Analysis

To create Model 2, direct logistic regression analysis was performed with food security status as outcome and ten predictors: number of household members, age of household head, education level, household earnings, metropolitan versus non-metropolitan status, geographic region of the US, sex, race, ethnicity, and participation in food assistance programs (Figure 3). Twenty four cases with missing values on the Food Security Status variable were deleted, leaving 5614 cases available for the Model 2 analysis. Slightly more than half of the missing cases were female (54.2 percent). The vast majority was Caucasian (87.5 percent) and the remaining 12.5 percent were African American. Just under half had less than highschool level of education (45.8 percent), and a quarter had a highschool diploma or equivalent. Approximately 30 percent of missing households were headed by someone 51-65, and another 30 percent by someone 66 or older. Three quarters of the households were located in metropolitan areas.

In general, the results for Model 2 were far less favorable in comparison to Model 1. Again, an initial model chi-square test was performed to see how well Model 2
performed in comparison to an SPSS generated constant only model. Results were positive, indicating that Model 2 performed better than the computer generated model which assumed that all subjects would report an absence of food insecurity, $X^2 (28, N=5614) = 254.1, p < .0005$.

The Hosmer and Lemeshow chi-square goodness of fit test was also statistically reliable, $X^2 (8, N=5614) = 2.8, p < .9$, indicating that the predictors, as a set, reliably distinguished between food secure and insecure respondents. Again, it is worth noting that for this particular test, poor fit is indicated by a significance value of less than .05. As such, the significance value of .9 indicates support for Model 2.

Results regarding strength of association for Model 2 were weak. In particular, Cox and Snell and Nagelkerke pseudo R Square values were .04 and .07 respectively indicating approximately 5 percent of the variance in food security status was accounted for by the model. Prediction success was also unimpressive: Model 2 correctly classified 99.3 percent of food secure households and only 3.1 percent of food insecure households for an overall success rate of 74.0 percent. While the overall success rate may seem encouraging at first glance, it is necessary to keep in mind the model’s utter inability to classify the less common category of households (i.e. the food insecure households). The model’s positive predictive value was 59.7 percent meaning that of the households predicted to be food
insecure, our model accurately picked 59.7 percent of them. Negative predictive value was 74.2 percent. This value refers to the percentage of households predicted by Model 2 to be food secure that were actually food secure.

Odds ratios and confidence intervals are presented in Table 9. The odds ratios for Model 2 indicate that just under half of the independent variables have some predictive power.

Larger households were less likely to be food insecure in comparison to smaller households. Findings for all categories of the household size variable were statistically significant. The odds of a household with 2 or more members being food insecure were 0.77 times that of a household of one ($CI_{95} = 0.65, 0.28$). The odds of a household with 3 members being food insecure were 0.58 times that of a household of 1 ($CI_{95} = 0.47, 0.72$). This is equivalent to an odds ratio of 3.57 in the opposite direction. The odds of a household with 4 members being food insecure were 0.64 times that of a household of 1 ($CI_{95} = 0.50, 0.81$). The odds of a household with 5 or more members being food insecure were 0.57 times that of a household of 1 ($CI_{95} = 0.44, 0.73$) (Table 9).

Households headed by older individuals were less likely to be food insecure than those headed by younger individuals. The odds of households headed by 31-40 year olds being food insecure were 0.66 times that of those with household heads...
aged 21 or under ($CL_{95} = 0.48, 0.91$). Odds ratios for households headed by 22-30,
31 to 40, and 41-50 year olds were not statistically significant. The odds of
households headed by someone 66 and older being food insecure were 0.42 times
that of those with household heads aged 21 or under ($CL_{95} = 0.30, 0.59$) (Table 9).

Odds ratios for household earnings were less than one, indicating that those
households with higher earnings were less likely to be food insecure when weighed
against the $0 to $14 999 comparison category. Findings for all categories of
household earnings were statistically significant. The odds of food insecurity for
those households in the income range of $15 000 to $29 999 were 0.74 times that of
households in the $0 to $14 999 range ($CL_{95} = 0.63, 0.85$). The odds of food
insecurity for those households in the income range of $30 000 to $49 000 were
0.51 times that of households in the $0 to $14 999 range ($CL_{95} = 0.39, 0.68$). The
odds of food insecurity for those households in the income range of $50 000 to $99
999 were 0.40 times that of households in the $0 to $14 999 range ($CL_{95} = 0.19,
0.85$) (Table 9).

Adjusted odds ratios for education level, metropolitan status, geographic region,
and sex were not statistically significant. Non-Caucasian respondents were more
likely to be food insecure in comparison to Caucasian respondents. The odds of
American Indian respondents being food insecure were 2.04 times greater than
Caucasian respondents ($CL_{95} = 1.42, 2.95$). The odds of mixed race (2 or more)
respondents being food insecure were 1.77 times greater than Caucasian respondents (CI95 = 1.28, 2.45). Odds ratios for the race categories of African American, Asian, and Hawaiian/Pacific Islander were not statistically significant. The odds of Non-Hispanic respondents being food insecure were 1.23 times greater than Hispanic respondents (CI95 = 1.01, 1.51) (Table 9).

Households that participated in one or more federal food assistance programs were more likely to be food insecure. The odds of food insecurity for program participating households were 1.32 times greater than non-participating households (CI95 = 1.14, 1.52) (Table 9).

When the effect of one independent variable on the dependent variable is thought to vary according to the value of a second independent variable, the inclusion of interaction effects can help provide a more accurate estimation of the relationship between variables. The inclusion of interaction effects also provides a means of reducing error in the form of omitted variable bias. For Model 2, interaction effects between program participation and household earnings were tested based on the assumption that the effect of program participation on food insecurity may be conditional upon household earnings. Findings were not statistically significant.

Interaction effects between program participation and household size were also tested based on the assumption that the effect of program participation on food
insecurity may be conditional upon household size. Again, the interaction effects for program participation and household size were not statistically significant.
CHAPTER 6

DISCUSSION

The Relationship between Food Assistance Program Participation and Household Characteristics

As explicated in Chapter 5, Model 1 explained somewhere between 25 and 33 percent of the variance in program participation. Logistic regression was the main analysis used to answer the Model 1 research question, as follows:

How well do household structure, income, community characteristics and demographics account for household level food assistance program participation?

Household size (i.e. number of members) was by far the strongest predictor of program participation wherein households with higher numbers of members were more likely participate. A quarter of one member households participated in food assistance programs and 75 percent of households with 5 or more members participated. The odds of participation for households with 4 members were about 10 times larger than a household of one. The odds of participation by households with 5 or more members were just under 25 times that of a household of one.

Household earnings were second to household size in terms of the magnitude of predictive power for program participation. Higher household incomes were less likely to participate in comparison to households with incomes in the $0 to $14,999 range. The odds of households in both the $30,000 to $49,999 and $50,000 to $99,999 range were both 0.15 that of a household with earnings from $0 to $14,999,
which has the equivalent effect as an odds ratio of 6.67 in the opposite direction. It makes sense that higher household incomes would participate less, given they have more money that could perhaps be used to buy food without programmatic assistance.

The predictive power of education level was not as large as either household size or earnings. Households where the respondent had a higher education level were less likely to participate in comparison to households where the respondent had a "less than high school" level of education. This finding is consistent with the income findings, in the sense that those with higher education levels probably also have higher household incomes, a larger portion of which could perhaps be used to buy food without programmatic assistance. That is, it makes intuitive sense that the program participation would have an inverse relationship with both these variables.

Findings for age of household head are also noteworthy, although more difficult to interpret because the odds of participation were both greater than and less than one. In comparison to households headed by someone 21 and under, the odds of participation were greater for those in age categories 22 to 30, 31 to 40, and 41 to 50. By contrast, for those aged 66 and older, the odds of participation were slightly less than one in comparison to households headed by someone 21 and under.31 One might speculate that this odds ratio "reversal" finding is consistent

31 The odds ratio for age category 51-65 was not statistically significant.
with the idea that household size and age of household head are somehow related. For example, perhaps those 66 and older have smaller household sizes due to the fact that those in younger categories are likely raising dependents. Indeed, of those households with 5 or more members (which was the strongest overall predictor of program participation in Model 1), 42.9 percent are aged 31 to 40 (which was the strongest predictor for program participation within that variable) while only 2.3 percent are aged 66 or older. That is, larger households both participated more, and were of the age (31-40) where their household size can plausibly be attributed to dependents.

This finding can be further explained by the measure of program participation employed in the dissertation. In particular, two of the programs that make up participation measure (WIC and Meals) necessitate that households have dependents. That is, it does not make sense that a household of one would be eligible for either WIC or the Meals programs based on the target populations for these two programs. In other words, the idea that larger households participate more is actually built into the measure of participation itself.

Both geographic region and metropolitan status had no relationship to program participation. Sex, education level, household earnings, and race all had statistically significant, but weak relationships to program participation.
Unadjusted odds ratios for many of the Model 1 variables revealed effects in the opposite direction. This phenomenon is commonly referred to as the “reversal paradox,” or “Simpson’s Paradox” (Messick and Van De Geer 1981). In short, the paradox refers to situations where the direction of the correlation between two variables in aggregated (i.e. adjusted) data containing several variables is opposite to the direction of the correlation in unadjusted data containing only two variables (Messick and Van De Geer 1981; Tu et al. 2005). The most likely interpretation of such findings is that the relation between the two variables is enhanced through adjustment. This reiterates the importance of going beyond the examination of bivariate relationships in attempts to understand the relationship between program participation and food insecurity.

The Relationship between Food Assistance Program Participation and Food Insecurity

As a whole, Model 2 only explained between 4 and 7 percent of the variance in food insecurity. Again, logistic regression was the main analysis used to answer the Model 2 research question, as follows:

Controlling for income, household structure, demographics, and community characteristics, how well does household level food assistance program participation account for food security status?

Odds ratios for many of the Model 2 variables were close to one and there were several categories within the variables for which the odds ratios were not

32 Also commonly referred to as Lord’s Paradox, Yule’s Paradox the Yule-Simpson effect and suppression effect.
statistically significant. Exceptions include household size, age of household head, and household earnings. These three variables emerged as the best predictors of food insecurity.

Larger households were less likely to be food insecure in comparison to smaller households. The odds of a household with 5 or more members being food insecure was 0.57 times (or 43 percent) as large as a household of one. This finding is puzzling, in that, intuitively, one would think it would be harder for larger households to maintain food security given that an increase in household size is often due to more dependents (i.e. more mouths to feed with no increase in earnings). Households headed by older individuals were also less likely to be food insecure compared to those headed by younger individuals. The odds of a household headed by someone 22 to 30 being food insecure were 0.66 times that of a household headed by someone 21 or under. This makes sense given the fact that increases in earnings are often associated with increases in age. Households with higher incomes were less likely to be food insecure in comparison to those with lower household incomes. The odds of a household in the range of $50 000 to $99 000 being food insecure were 0.4 times (or 60 percent as large) as a household with earnings in the range of $0 to $14 999. Again, this finding makes sense in that higher household incomes have more money that could probably be used to buy food.
One of the most pertinent findings of this dissertation pertains to the relationship between program participation and food insecurity status given the ultimate goal of this research. According to Model 2, the odds of program participating households being food insecure were 1.32 times greater than that of non-participating households. In other words, households that participated in food assistance programs were approximately 30 percent more likely to be food insecure in comparison to non-participating households. Yet, the unadjusted odds ratio for program participation versus food insecurity was in the opposite direction. Possible explanations for this finding include Simpson's paradox as defined above, or the presence of a suppression effect.

A suppressor variable is one that increases the predictive validity of another variable (or set of variables) through its inclusion in a regression equation. Contrary to what the name implies, the magnitude of a given relationship between an independent and dependent variable will become larger when the third variable is a suppressor (Mackinnon, Krull, and Lockwood 2000). The idea here is that rather than a being a good predictor of food insecurity in and of itself, program participation may be a suppressor variable to other, better predictors of food insecurity that are not included in the current version of Model 2. In this case, the inclusion of participation in any modified predictor models for food insecurity may serve to increase the real effects of these other predictors.
**Strengths of the Study**

The relevance of the topic explored constitutes a primary strength of this dissertation. It is relevant given that food is one of the most fundamental basic needs of people, with consequences of food insecurity and/or hunger that are both widespread and deleterious. In other words, food security matters. Moreover, the topic has practical applicability and significance to other disciplines. Food security is highly interdisciplinary, and of importance to a number of fields including social work, community health, economics, geography, philosophy, agriculture, and political science. It is also of importance to those working directly with the provision of food assistance to those in need, and policy makers alike.

The research also has the potential to be of interest and relevance to other researchers given the fact that in some ways, it is part of the larger USDA research effort on food insecurity and hunger. In particular, the study has uncovered numerous strengths and weaknesses of utilizing a major national survey for applied research related to outcomes of program participation. A strength of the study is that this information could be useful to those attempting to design and implement similar research.

The analysis strategy used in this dissertation constitutes another strength of the study. In particular, logistic regression is well suited to both the research questions and available dataset. As outlined in Chapter 4, no violations of the main
assumptions of logistic regression were detected during preliminary data analysis.

The research questions themselves are another strength, in that they are current, and have application and relevance to the social work profession and its primary mission to “help people in need” (NASW 1997). Model 2 is also unique, and breaks new ground given the lack of literature looking at relationships between food insecurity and general program participation.

Additional strengths include 1) the conceptual and empirical measurement of hunger employed, 2) the dataset, and 3) the large sample size available for analysis. As outlined in Chapter 1, the Food Security Supplement took approximately 10 years to advance, and the process included extensive theoretical development and piloting. Likewise, as outlined in Chapter 4, the census is highly reputable given the methods employed for subject selection and data collection and the sample size employed for analysis (N=5638) far exceeds that of most social work research.

The census also includes hundreds of variables and is free for public use. The data set is fairly easy to work with, and comes with a host of written manuals and available technical assistance through federal government staff. Moreover, only 91 subjects were dropped from the analysis (67 subjects in Model 1 and 24 subjects in Model 2) due to missing data. All these features strengthen the validity of findings from this dissertation. They also translate into endless opportunities to expand upon, alter, and ultimately improve the models built in this dissertation.
Limitations of the Study

While there are many advantages to conducting secondary data analyses of a large data set, there are also some limitations to the approach. First, researchers attempting to work with secondary data lack a level of familiarity with the dataset. This is largely due to the fact that secondary data analysis in and of itself implies having no part in the process of determining what variables will be included, how variables will be construed, or how scales will be constructed in a given data set (McCall and Appelbaum 1991). Yet, perhaps the biggest drawback to conducting secondary analysis is the fact that it necessitates a certain amount of “fitting” research questions to available data; a process that is fundamentally different than the traditional approach to research which typically begins with a question, followed by study design, measurement, and analysis. That is, the very nature of secondary data analysis necessitates that question formulation and derivation of an analysis plan is somewhat “data driven” in that the availability and structure of the data drives attempts to formulate the research questions (McCall and Appelbaum 1991). As such, the specificity and quality of the research questions can be compromised if what is answerable drives the process of question formulation more than any other factor.

The CPS-FSS dataset itself also has some weaknesses. Most relate to its lack of capacity to be used for various purposes. For example, regional, county, municipal, and individual level data are not captured in the USDA data set, which
severely limits the kinds of research questions that can be explored. Similarly, the
data are cross-sectional in nature, which limits the ability to answer questions about
cause and effect.\textsuperscript{33}

Moreover, while causal inferences were not the aim of this dissertation, nor are
they even possible given the design of the study, the cross-sectional nature of the
data translates to a logical weakness of the study that is somewhat related. The
connection stems from the fact that Model 2 constitutes an attempt to \textit{predict} food
security status from cross sectional data. In other words, cross-sectional data is
less than ideal for building predictor models in general, and Model 2 in particular.
Yet, the research question examined in Model 2 may \textit{not} be better suited for
examination utilizing longitudinal data wherein the measurement of program
participation is prior to the measurement of food security status. This is because of
what can be termed the problem of “reverse causation” which is inherent in the
main relationship being explored.

Typically, examinations of cause and effect assume one-way causality, wherein an
event causes a subsequent effect. Or stated more simply, one “thing” causes another
“thing” to happen. However, arguably reverse causation is inherent in the program
participation and food security status variables. That is, program participation
affects food security status just as food security status affects program

\textsuperscript{33} This is also true given the study design and analysis strategy.
participation. In a logical sense, this is quite different from one-way causality: smoking may cause lung cancer, yet it is unlikely that lung cancer would cause further smoking. The point here is that reverse causation significantly complicates any analytical attempts to explore relations between variables, regardless of whether the data is cross sectional or longitudinal in nature.

The measurement of program participation constitutes another weakness of this study. First, information about use of food banks and soup kitchens is altogether excluded from the study. Second, as described in Chapter 4 (page 40), the measurement for participation in the Food Stamp program resulted in a loss of 60 subjects who may or may not have participated during the 30 day window. Third, conceptualizing participation as "participation in one or more food assistance programs" is somewhat problematic. In particular both the 1) dichotomization of the measure and 2) the multi-program inclusion may well have weakened the findings. This is because the sample ended up including "apples and oranges" with respect to both associated dosage and type of programmatic intervention received. In other words, participating households were lumped into one rudimentary group regardless of their programmatic experiences or amount of service received. No doubt, this is somewhat related to the problem of secondary data analysis explicated above wherein the researcher is limited to whatever data is available. While the measure of food security status used in this dissertation is well-founded, using such a crude measure of program participation may have undermined the
ability of this dissertation to adequately describe the relationship between the two variables. It also likely contributed to the weak association found between “program participation” and food security status, and severely limits inferences and applications that can be drawn.

Contributions of the Study: Methodological, Practical, and Policy

Albeit minor, this dissertation has made a unique methodological contribution to the literature base. In particular, almost all studies reviewed explore food security status in the past year. Only 4 (of which this dissertation is one) have explored programmatic impacts utilizing the 30 day food security scale (Kabbani and Yazbeck 2004; Kabbani and Kmeid 2005; Yen et al. 2006). Yen, Andrews, Chen, and Eastwood (2006) suggest that this methodology may improve the ability to accurately estimate program participation impacts since both the participation and food security status variables are being measured over the same time frame. Utilizing a 30 day measure also constitutes a more charitable way to measure program effects on food security status, since it is more conservative than the 12 month scale. That is, many households that would appear as food insecure on the 12 month scale will appear as food secure on the 30 day scale.

Indeed, in contrast to many of the insignificant findings in the literature that utilize the 12 month scale (e.g. Gunderson and Oliveira 2001; Huffman and Jenson 2003; Jenson 2002; Nord 2001), Yen et al. (2006) found that participation in the Food
Stamp program decreased household food security. Kabbani and Kmeid (2005) found that when food stamp participation was explored as a dichotomous effect (participation versus non-participation), there was no effect on hunger. However, when the amount (i.e. dosage) of food stamp receipt was accounted for, participation significantly reduced the odds of hunger. Results utilizing the 30 day scale from Kabbani and Yazbeck (2004) were not significant.

Improving one’s general understanding of the characteristics of participating and non-participating households is another main contribution of this dissertation to the literature base: one that has numerous practical implications for social workers and policy makers alike. First, the information could be used to assist with identification of “underserved” or “underutilizing” groups. That is, it can help identify those who are eligible, potentially in need, yet not accessing services for whatever reason. Along the same lines, it may help to identify those who are ineligible, yet potentially in need. In turn, this kind of information can assist with understanding and ultimately removing barriers to participation, strengthening outreach efforts, and/or providing direction for future research efforts assuming the goal is to increase participation for those that are in need of food assistance.

However, all of the above stated practical implications for social workers and policy makers hinge on the assumption that the goal should be to increase participation in the federal food assistance programs. That is, they hinge on a
normative (versus empirical) claim; one that professes a prescription about something that should be done. In short, all normative claims require justifications in support of their prescriptions. In this case, inherent to the claim that we should increase participation is the idea that federal food assistance programs are generally worthwhile. Yet the findings from Model 2 cast a small degree of doubt on the existence of solid grounds for justifying claims to increased participation in federal food assistance programs. Households that participated in food assistance programs were more likely to be food insecure in comparison to their non-participating counterparts.

The fact that data is cross-sectional offers one possible explanation for this finding in that one would expect households that are food insecure to seek assistance. That is, the finding is consistent with a chain of events wherein a household is food insecure, obtains assistance that eventually helps enough to alleviate their food insecurity status, yet still shows up as food insecure in the dataset due to the fact that the data about food security status was collected at the same time as the data about program participation.

The finding is also consistent with a chain of events wherein a household is food insecure, and obtains assistance that is not enough to alleviate their food insecurity status. In other words, these households show up as food insecure in the dataset because they are food insecure, despite participation in a given food assistance
While these results have been contradicted in the existing literature base (e.g. Cohen et al. 1999; Nord 2001; Yen, Andrews, Chen, and Eastwood 2006), findings that suggest a weak (or nonexistent) relationship between program participation and food security status are also prevalent (e.g. Connell et al. 2001; Gunderson and Oliviera 2001; Huffman and Jenson 2003; Jenson 2002).34 Meanwhile, USDA programs were funded at a level of $42.9 billion in 2004 while an estimated one in five Americans participated in one or more of the federal food assistance programs at some point during the year (USDA-ERS 2005). In 2005, approximately 11 percent of U.S. households (12.6 million) were food insecure meaning they were either uncertain about having or unable to acquire enough food to meet the needs of all of household members because they had insufficient money or other resources for food (USDA-ERS 2005). Of these households, 3.9 percent (4.4 million) were food insecure with hunger, meaning that the normal eating patterns of members was disrupted and food intake reduced because they had insufficient money or other resources for food (USDA-ERS 2005). With respect to the sample utilized in the Model 2 analysis, approximately one half of the food insecure/hungry households participated in one or more federal food assistance programs (N=729) and one half did not (N=747). The point here is that federal food assistance program expenditures are enormous, yet the status of food

34 Details of findings from these studies are presented in Chapter 3.
insecurity/hunger amongst US households is fairly bleak, as is the accompanying explanatory literature base.

The main policy implications here are threefold. First, a concerted exploratory conversation may be in order such that the fundamental purpose of federal food assistance programs is rethought and well understood. That is, mixed findings many of which indicate weak relations between food security status and program participation may serve as grounds to ask “what should the fundamental purpose of federal food assistance programs be?” Philosophers are well equipped to take the lead in such a discussion given it is inherently normative in nature and is inextricably linked to larger ethical questions about the role of government in general, entitlement rights, provision for basic needs of a citizenry, and so on. Social workers are also well poised to have a main role in a discussion of this nature, given that the profession’s foundation is built around issues related to poverty. Moreover, the profession has an expansive history in the realm of evoking institutional change. Once defined, findings from this dissertation also serve as solid grounds to rethink how best to achieve the fundamental goals of federal food assistance programs, and who should be responsible for such achievement.

Second, more research is warranted to develop analytical tools that can adequately assess programmatic outcomes. Again, mixed findings in the literature may be
some indication that the various approaches to assessing programmatic outcomes could be improved.

Third, demonstration of improved programmatic outcomes in and of themselves is warranted, especially given that the odds of food insecurity for households that participated were 1.32 greater than for households that did not participate. The good news here is that compared to many other social problems and areas of social service provision (e.g. mental health, child welfare, juvenile delinquency, etc.) improved outcomes should be easier to demonstrate in the realm of food security given that the link between the intervention and outcome is so basic. That is, (at least in theory) more food directly translates to more food security since quantity of food is inherently linked to the concept of food security. This is a huge advantage over other domains of social work, many of which are much more complicated with respect to associations between a given intervention and desired outcome. For example, “more therapy” often does not translate into “less depression” given the realities of the condition and ineffectiveness of various interventions. Similarly, “more housing” does not necessarily mean “less homelessness” given the complexities of the homeless population. Yet more food to those that are food insecure should, in fact, mean less food insecurity.

The idea here is that comparatively speaking, the programmatic task of producing an outcome along the lines of food security is conceptually straightforward, which
is a distinct advantage for social workers and policy makers alike. This "conceptual simplicity" considerably limits the scope of future research efforts that are necessary to those that seek to examine barriers (e.g. inadequate benefit levels) to a fairly uncomplicated intervention.\textsuperscript{35} In turn, the number of people existing under conditions of insufficient resources for food could ultimately be reduced.

Implications for Future Research

The methodology and findings from this study can be used to formulate several specific questions for future research. First, as already explicated, two fundamental philosophical questions seem worthy of further exploration, namely, what should the purpose of food assistance programs in the United States be, and who should be responsible for achievement?

Second, while not pursued in this study, the role of the food distribution (i.e. soup kitchens and emergency food banks) programs is an important area of research. In particular, one might explore the demographics and household characteristics associated with participation in the food distribution programs and how they differ from households that participate in other programs. Likewise, one could examine food security outcomes associated with participation in the food distribution programs, and how they differ from other programs.

\textsuperscript{35} It is worth noting that the pursuit of future research along these lines is ultimately dependent on 1) what the purpose of food assistance programs is determined to be and 2) whether the inadequacies in establishing positive outcomes lie in the research itself or the federal programmatic responses.
Third, assuming any analytical barriers related to a small sample size could be overcome, it would be interesting to investigate the relationship between participation in food assistance programs and outcomes related to hunger (versus food insecurity and hunger). Perhaps the programs would fare better given this change in outcome being measured.

Future research should also both limit and tighten the measure for "program participation," as this constitutes one of the biggest weaknesses of this study. By limit, I mean consider choosing fewer programs—perhaps even only one at a time—for further examination. By tighten, I mean include some cutoff dosage of programmatic intervention (e.g. dollars received, days received, amount of food received etc.) such that what it means to be a participating household would have more definitional clarity and consistency across households. This would allow one to explore how food security levels vary by both household characteristics and selected program parameters. In turn, results might be more meaningful, and practice implications for the field of social work could be more legitimately drawn.

All of the suggestions explicated above constitute specific modifications and improvements to this research that stem directly from the methodology utilized and/or the findings. Yet this study can also be used to formulate several general
future research agendas that constitute expansions (as opposed to modifications) of this research. New ideas for further development are as follows:

1) The USDA’s measurement of food insecurity concentrates on the economic dimension of the construct. It does not represent the social acceptability, or the nutritional adequacy/food safety aspects of the conceptual definition. Multi-dimensional measures would be required to capture these other aspects of the concept, and have yet to be developed.

2) The economic dimension of the food security construct is inherently subjective (as are the unmeasured dimensions). For example, whether or not households had “enough” of the food they wanted to eat, enough of the “kinds of food” they wanted to eat, or whether they could afford to eat “balanced meals” may vary widely amongst respondents since it is open to much individual interpretation. Research utilizing qualitative methods to further explore the variability of these phrases amongst respondents would provide useful interpretative context for those using the USDA measure.

3) Food security status is likely affected by participation in not only food assistance programs, but in other federal programs as well (e.g. Temporary Assistance for Needy Families, Supplemental Security Income, General Assistance, Medicaid). Future research that looks more extensively at
numerous federal programmatic effects may provide insights into the best overall models of service provision for a given outcome (e.g. bundled versus unbundled provision models).

4) Based on the literature review from this dissertation, it is clear that econometrics and agricultural economics are central to food security research, while social work is at the periphery. Yet, the argument can be made that social workers should be central given the overriding goals and history of the profession. Research into why social work remains at the periphery of this social problem, and strategies for realigning the profession would be a valuable contribution to the field.

Conclusion

This study examined 1) the conceptual framework that guides the definition of food insecurity and hunger in the United States; 2) the empirical framework for its measurement; 3) federal programmatic responses, 4) the status of current research on the topic, 5) details about who uses federal food assistance programs and 6) relations between food assistance program participation and food security status.

The study is unique in its exploration of a topic that has been somewhat limited in the literature base thus far. It is also significant to the field of social work in that it provides descriptive insights about federal food assistance program utilizing households, and relations between groups of predictor variables. Ultimately, it
makes a small contribution to our understanding of relations between program participation and food security status. With some changes to the measures employed, future research along these lines has the potential to contribute to improved responses by social workers to the social problem of hunger/food insecurity.
<table>
<thead>
<tr>
<th>Concept of Interest</th>
<th>Indicator Variables</th>
<th>Type of Variable</th>
<th>Proposed Relation to Food Security Status</th>
<th>Variable Label in Logistic Regression Model(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Structure</td>
<td>Household size</td>
<td>Predictor</td>
<td>Negative</td>
<td>X₁</td>
</tr>
<tr>
<td></td>
<td>Age of Household Head</td>
<td>Predictor</td>
<td>Positive</td>
<td>X₂</td>
</tr>
<tr>
<td></td>
<td>Education Level</td>
<td>Predictor</td>
<td>Positive</td>
<td>X₃</td>
</tr>
<tr>
<td>Income Status</td>
<td>Household Earnings</td>
<td>Predictor</td>
<td>Positive</td>
<td>X₄</td>
</tr>
<tr>
<td>Community Characteristics</td>
<td>Metropolitan vs. Non-metropolitan</td>
<td>Predictor</td>
<td>Unknown</td>
<td>X₅</td>
</tr>
<tr>
<td></td>
<td>Geographic region</td>
<td>Predictor</td>
<td>West-negative</td>
<td>X₆</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td>Predictor</td>
<td>Female-negative</td>
<td>X₇</td>
</tr>
<tr>
<td>Demographic Characteristics</td>
<td>Race</td>
<td>Predictor</td>
<td>African American-negative</td>
<td>X₈</td>
</tr>
<tr>
<td></td>
<td>Ethnicity</td>
<td>Predictor</td>
<td>Hispanic-negative</td>
<td>X₉</td>
</tr>
<tr>
<td>Program Participation Status</td>
<td>Participation 1 or more vs. nonparticipation</td>
<td>Outcome (Model 1)</td>
<td>Participate-positive</td>
<td>Y (model 1) X₁₀ (model 2)</td>
</tr>
<tr>
<td>Food Security Status</td>
<td>Food Secure vs. Food Insecure/Hungry</td>
<td>Outcome</td>
<td>N/A</td>
<td>Y (model 2)</td>
</tr>
</tbody>
</table>
Table 2

Logistic Regression Models 1 and 2: Details of Question Structure and Coding for Chosen Variables

<table>
<thead>
<tr>
<th>Concept of Interest</th>
<th>Indicator Variables/ CPS Question</th>
<th>Variable Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Structure</td>
<td>Household size&lt;br&gt;Total number of persons in the household (household members).</td>
<td>1 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 5 or more</td>
</tr>
<tr>
<td>Age of Household Head</td>
<td>21 21 and under&lt;br&gt;30 22 to 30&lt;br&gt;40 31 to 40</td>
<td>50 51 to 65</td>
</tr>
<tr>
<td>Education Level</td>
<td>-1 not in Universe&lt;br&gt;31 less than high school&lt;br&gt;39 High School Grad- Diploma or Equiv (GED)</td>
<td>40 Some College But No Degree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41 College Degree or College Plus</td>
</tr>
<tr>
<td>Income Status</td>
<td>Earnings&lt;br&gt;I am going to read a list of income categories. Which category represents the total combined income of all members of this family during the past 12 months. This includes money from jobs, net income, from business, farm or rent, pensions, dividends, interest, social security payments and any other money income received by members of this Family who are 15 years of age or older</td>
<td>-3 Refused&lt;br&gt;-2 Don't Know&lt;br&gt;-1 Blank</td>
</tr>
<tr>
<td>Community Characteristics</td>
<td>Metropolitan vs. Non-metropolitan</td>
<td>Metropolitan</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Geography - metropolitan status</td>
<td>Metropolitan</td>
<td>1</td>
</tr>
<tr>
<td>Geographic region</td>
<td>1 Northeast</td>
<td>2 Midwest</td>
</tr>
<tr>
<td>Geography - Region</td>
<td>1 Male</td>
<td>2 Female</td>
</tr>
<tr>
<td>Demographic Characteristics</td>
<td>Sex</td>
<td>Male</td>
</tr>
<tr>
<td>What is your Sex</td>
<td>1 White Only</td>
<td>2 Black Only</td>
</tr>
<tr>
<td>Race</td>
<td>1 Hispanic</td>
<td>2 Non-Hispanic</td>
</tr>
<tr>
<td>What is your race? Probe: Are you White, Black, American Indian, Aleut or Eskimo, Asian or Pacific Islander or something else. Note: When calculations are made for totals, all races will be included. When calculations are made for Whites and Blacks, other races will be Excluded. Hispanic is not a race category.</td>
<td>1 Hispanic</td>
<td>2 Non-Hispanic</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>1 Hispanic</td>
<td>2 Non-Hispanic</td>
</tr>
<tr>
<td>Program Participation Status</td>
<td>Participate vs. nonparticipate</td>
<td>9 No Response</td>
</tr>
<tr>
<td>Composite variable, participation in 0 versus 1 or more of food programs (Food Stamps, WIC, School Lunches and School Breakfasts)</td>
<td>1 One or more</td>
<td></td>
</tr>
<tr>
<td>Food Security Status</td>
<td>Food Secure vs. Food Insecure</td>
<td>9 No Response</td>
</tr>
<tr>
<td>Summary Food Security Status, 30 day</td>
<td>1 Food Insecure with or without Hunger</td>
<td>-1 Not in universe</td>
</tr>
<tr>
<td>Variable</td>
<td>Tolerance</td>
<td>Variance Inflation Factor</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Household Size: Total Number of Members</td>
<td>0.48</td>
<td>2.07</td>
</tr>
<tr>
<td>Age of Household Head</td>
<td>0.82</td>
<td>1.23</td>
</tr>
<tr>
<td>Education Level</td>
<td>0.89</td>
<td>1.13</td>
</tr>
<tr>
<td>Household Earnings</td>
<td>0.61</td>
<td>1.64</td>
</tr>
<tr>
<td>Metropolitan Status</td>
<td>0.97</td>
<td>1.04</td>
</tr>
<tr>
<td>Geographic Region</td>
<td>0.96</td>
<td>1.05</td>
</tr>
<tr>
<td>Sex</td>
<td>0.96</td>
<td>1.04</td>
</tr>
<tr>
<td>Race</td>
<td>0.98</td>
<td>1.02</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.86</td>
<td>1.16</td>
</tr>
<tr>
<td>Program Participation</td>
<td>0.77</td>
<td>1.30</td>
</tr>
</tbody>
</table>
Table 4

Frequency Distribution of Independent Variables in Model 1 Logistic Regression Using 2004 Current Population Survey Data (N=5638)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable Categories</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size:</td>
<td>1</td>
<td>1564</td>
<td>27.7</td>
<td>27.7</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1306</td>
<td>23.2</td>
<td>50.9</td>
</tr>
<tr>
<td>Total Number of Members</td>
<td>3</td>
<td>918</td>
<td>16.3</td>
<td>67.2</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>831</td>
<td>14.7</td>
<td>81.9</td>
</tr>
<tr>
<td></td>
<td>5 or more</td>
<td>1019</td>
<td>18.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Age of Household Head</td>
<td>21 and under</td>
<td>233</td>
<td>4.1</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>22 to 30</td>
<td>1051</td>
<td>18.6</td>
<td>22.8</td>
</tr>
<tr>
<td></td>
<td>31 to 40</td>
<td>1212</td>
<td>21.5</td>
<td>44.3</td>
</tr>
<tr>
<td></td>
<td>41 to 50</td>
<td>1161</td>
<td>20.6</td>
<td>64.9</td>
</tr>
<tr>
<td></td>
<td>51 to 65</td>
<td>1114</td>
<td>19.8</td>
<td>84.6</td>
</tr>
<tr>
<td></td>
<td>66 and older</td>
<td>867</td>
<td>15.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Education Level</td>
<td>Less than high school</td>
<td>1596</td>
<td>28.3</td>
<td>28.3</td>
</tr>
<tr>
<td></td>
<td>High school diploma</td>
<td>2061</td>
<td>36.6</td>
<td>64.9</td>
</tr>
<tr>
<td></td>
<td>Some college</td>
<td>1135</td>
<td>20.1</td>
<td>85.0</td>
</tr>
<tr>
<td></td>
<td>College degree/ +</td>
<td>846</td>
<td>15.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Household Earnings</td>
<td>0 to 14 999</td>
<td>3056</td>
<td>54.2</td>
<td>54.2</td>
</tr>
<tr>
<td></td>
<td>15 000 to 29 999</td>
<td>1874</td>
<td>33.2</td>
<td>87.4</td>
</tr>
<tr>
<td></td>
<td>30 000 to 49 999</td>
<td>643</td>
<td>11.4</td>
<td>98.8</td>
</tr>
<tr>
<td></td>
<td>50 000 to 99 999</td>
<td>65</td>
<td>1.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Metropolitan Status</td>
<td>Metropolitan</td>
<td>3787</td>
<td>67.2</td>
<td>67.2</td>
</tr>
<tr>
<td></td>
<td>Non-Metropolitan</td>
<td>1793</td>
<td>31.8</td>
<td>99.0</td>
</tr>
<tr>
<td>Geographic Region</td>
<td>Northeast</td>
<td>885</td>
<td>15.7</td>
<td>15.7</td>
</tr>
<tr>
<td></td>
<td>Midwest</td>
<td>1351</td>
<td>24.0</td>
<td>39.7</td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>1969</td>
<td>34.9</td>
<td>74.6</td>
</tr>
<tr>
<td></td>
<td>West</td>
<td>1433</td>
<td>25.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>2243</td>
<td>39.8</td>
<td>39.8</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3395</td>
<td>60.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Race</td>
<td>White only</td>
<td>4233</td>
<td>75.1</td>
<td>75.1</td>
</tr>
<tr>
<td></td>
<td>Black only</td>
<td>991</td>
<td>17.6</td>
<td>92.7</td>
</tr>
<tr>
<td></td>
<td>American Indian/</td>
<td>133</td>
<td>2.4</td>
<td>95.0</td>
</tr>
<tr>
<td></td>
<td>Alaskan Native only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asian only</td>
<td>85</td>
<td>1.5</td>
<td>96.5</td>
</tr>
<tr>
<td></td>
<td>Hawaii/ Pac Is only</td>
<td>24</td>
<td>0.4</td>
<td>96.9</td>
</tr>
<tr>
<td></td>
<td>Mixed 2 or more</td>
<td>172</td>
<td>3.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Hispanic</td>
<td>761</td>
<td>13.5</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>Non-Hispanic</td>
<td>4877</td>
<td>86.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Variable</td>
<td>Variable Categories</td>
<td>Frequency</td>
<td>Percent</td>
<td>Cumulative Percent</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------</td>
<td>-----------</td>
<td>---------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Food Assistance</td>
<td>None</td>
<td>3040</td>
<td>53.9</td>
<td>53.9</td>
</tr>
<tr>
<td>Program Participation</td>
<td>1 or more</td>
<td>2598</td>
<td>46.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Food Security Status</td>
<td>Food secure</td>
<td>4138</td>
<td>73.4</td>
<td>73.4</td>
</tr>
<tr>
<td></td>
<td>Food insecure with</td>
<td>1476</td>
<td>26.2</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>or without hunger</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( n=5638 \)

\( n=5614 \)
Table 6

**Chi Squares and Strengths of Association between Independent Variables in Model 1 and Program Participation Using 2004 Current Population Survey Data (N=5638)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pearson Chi-Square</th>
<th>Cramer's V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of Members</td>
<td>895.76*</td>
<td>0.40*</td>
</tr>
<tr>
<td>Age of Household Head</td>
<td>444.36*</td>
<td>0.28*</td>
</tr>
<tr>
<td>Education Level</td>
<td>51.83*</td>
<td>0.10*</td>
</tr>
<tr>
<td>Household Earnings</td>
<td>34.07*</td>
<td>0.08*</td>
</tr>
<tr>
<td>Metropolitan Status</td>
<td>0.88</td>
<td>0.01</td>
</tr>
<tr>
<td>Geographic region</td>
<td>0.55</td>
<td>0.01</td>
</tr>
<tr>
<td>Sex</td>
<td>58.89*</td>
<td>0.01*</td>
</tr>
<tr>
<td>Race</td>
<td>43.01*</td>
<td>0.09*</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>88.53*</td>
<td>0.13*</td>
</tr>
</tbody>
</table>

*p<.0005*
Table 7

Chi Square and Strength of Association between Program Participation and Food Security Status Using 2004 Current Population Survey Data (N=5638)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pearson Chi-Square</th>
<th>Cramer’s V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Participation</td>
<td>11.22*</td>
<td>0.05*</td>
</tr>
</tbody>
</table>

*p<.001
<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Frequencies</th>
<th>OR Unadjusted</th>
<th>Unadjusted 95% CI</th>
<th>OR Adjusted</th>
<th>Adjusted 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size</td>
<td>1</td>
<td>1564</td>
<td>0.11</td>
<td>0.09, 0.13</td>
<td>1.65</td>
<td>1.38, 1.98</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1306</td>
<td>0.15</td>
<td>0.13, 0.18</td>
<td>5.55</td>
<td>4.49, 6.84</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>918</td>
<td>0.49</td>
<td>0.41, 0.60</td>
<td>10.20</td>
<td>7.98, 13.05</td>
</tr>
<tr>
<td></td>
<td>4 or more</td>
<td>1019</td>
<td>0.55</td>
<td>0.45, 0.67</td>
<td>23.30</td>
<td>17.76, 30.57</td>
</tr>
<tr>
<td>Age of Household Head</td>
<td>21 and under</td>
<td>233</td>
<td></td>
<td>0.15, 0.18</td>
<td>5.55</td>
<td>4.49, 6.84</td>
</tr>
<tr>
<td></td>
<td>22 to 30</td>
<td>1051</td>
<td>2.52</td>
<td>1.86, 3.42</td>
<td>1.82</td>
<td>1.32, 2.52</td>
</tr>
<tr>
<td></td>
<td>31 to 40</td>
<td>1212</td>
<td>4.60</td>
<td>3.76, 5.63</td>
<td>2.06</td>
<td>1.48, 2.85</td>
</tr>
<tr>
<td></td>
<td>41 to 50</td>
<td>1161</td>
<td>5.87</td>
<td>4.81, 7.15</td>
<td>1.57</td>
<td>1.14, 2.16</td>
</tr>
<tr>
<td></td>
<td>51 to 65</td>
<td>1114</td>
<td>3.47</td>
<td>2.85, 4.23</td>
<td>1.17</td>
<td>0.84, 1.61</td>
</tr>
<tr>
<td></td>
<td>66 and older</td>
<td>867</td>
<td>1.87</td>
<td>1.53, 2.29</td>
<td>0.62</td>
<td>0.44, 0.87</td>
</tr>
<tr>
<td>Ed Level</td>
<td>Less than HS</td>
<td>1596</td>
<td>0.55</td>
<td>0.33, 0.91</td>
<td>0.32</td>
<td>0.27, 0.37</td>
</tr>
<tr>
<td></td>
<td>HS diploma</td>
<td>2061</td>
<td>1.82</td>
<td>1.53, 2.16</td>
<td>0.85</td>
<td>0.73, 1.00</td>
</tr>
<tr>
<td></td>
<td>Some college</td>
<td>1135</td>
<td>1.62</td>
<td>1.38, 1.91</td>
<td>0.70</td>
<td>0.58, 0.84</td>
</tr>
<tr>
<td></td>
<td>College deg/+</td>
<td>846</td>
<td>1.40</td>
<td>1.16, 1.68</td>
<td>0.48</td>
<td>0.39, 0.60</td>
</tr>
<tr>
<td>House Earn</td>
<td>0 to 14 999</td>
<td>3056</td>
<td>0.55</td>
<td>0.33, 0.91</td>
<td>0.32</td>
<td>0.27, 0.37</td>
</tr>
<tr>
<td></td>
<td>15 000 to 29 999</td>
<td>1874</td>
<td>0.45</td>
<td>0.27, 0.75</td>
<td>0.15</td>
<td>0.12, 0.20</td>
</tr>
<tr>
<td></td>
<td>30 000 to 49 999</td>
<td>643</td>
<td>0.71</td>
<td>0.42, 1.20</td>
<td>0.15</td>
<td>0.09, 0.27</td>
</tr>
<tr>
<td>Metro Status</td>
<td>Metropolitan</td>
<td>3787</td>
<td>1.11</td>
<td>0.66, 1.88</td>
<td>1.17</td>
<td>1.02, 1.34</td>
</tr>
<tr>
<td></td>
<td>Non-Metro</td>
<td>1793</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geog Region</td>
<td>Northeast</td>
<td>885</td>
<td>0.95</td>
<td>0.80, 1.12</td>
<td>0.91</td>
<td>0.74, 1.10</td>
</tr>
<tr>
<td></td>
<td>Midwest</td>
<td>1351</td>
<td>0.96</td>
<td>0.83, 1.12</td>
<td>0.83</td>
<td>0.69, 1.00</td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>1969</td>
<td>0.96</td>
<td>0.84, 1.11</td>
<td>0.80</td>
<td>0.65, 0.97</td>
</tr>
<tr>
<td></td>
<td>West</td>
<td>1433</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>2243</td>
<td>0.66</td>
<td>0.58, 0.73</td>
<td>1.75</td>
<td>1.54, 1.99</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3395</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>White only</td>
<td>4233</td>
<td>0.66</td>
<td>0.49, 0.90</td>
<td>1.56</td>
<td>1.31, 1.85</td>
</tr>
<tr>
<td></td>
<td>Black only</td>
<td>991</td>
<td>0.95</td>
<td>0.69, 1.32</td>
<td>1.18</td>
<td>0.78, 1.77</td>
</tr>
<tr>
<td></td>
<td>Amer Indian/Alask Nat only</td>
<td>133</td>
<td>0.62</td>
<td>0.37, 1.05</td>
<td>2.37</td>
<td>0.89, 6.30</td>
</tr>
<tr>
<td></td>
<td>Asian only</td>
<td>85</td>
<td>1.13</td>
<td>0.72, 1.79</td>
<td>0.78</td>
<td>0.47, 1.30</td>
</tr>
<tr>
<td></td>
<td>Haw/ Pac Is only</td>
<td>24</td>
<td>0.62</td>
<td>0.37, 1.05</td>
<td>2.37</td>
<td>0.89, 6.30</td>
</tr>
<tr>
<td></td>
<td>Mixed 2 or more</td>
<td>172</td>
<td>1.70</td>
<td>0.69, 4.18</td>
<td>1.58</td>
<td>1.12, 2.24</td>
</tr>
<tr>
<td>Ethn</td>
<td>Hispanic</td>
<td>761</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Hispanic</td>
<td>4877</td>
<td>2.1</td>
<td>1.80, 2.46</td>
<td>0.72</td>
<td>0.59, 0.87</td>
</tr>
</tbody>
</table>

p<.05, adjusted for household size, age of household head, household earnings, metropolitan status, geographic region, sex, race, ethnicity and education level. Findings with confidence intervals containing the value of 1 are not statistically significant.
### Table 9

**Odds Ratios and Confidence Intervals for Variables Predicting Food Insecurity Using 2004 Current Population Survey Data (N=5614)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Frequencies</th>
<th>OR Unadjusted</th>
<th>Unadjusted 95% CI</th>
<th>OR Adjusted</th>
<th>Adjusted 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household size:</td>
<td>2</td>
<td>1296</td>
<td>1.83</td>
<td>1.51 - 2.20</td>
<td>0.77</td>
<td>0.65 - 0.92</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>916</td>
<td>1.44</td>
<td>1.18 - 1.74</td>
<td>0.58</td>
<td>0.47 - 0.72</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>829</td>
<td>1.21</td>
<td>0.97 - 1.50</td>
<td>0.64</td>
<td>0.50 - 0.81</td>
</tr>
<tr>
<td></td>
<td>5 or more</td>
<td>1017</td>
<td>1.12</td>
<td>0.90 - 1.40</td>
<td>0.57</td>
<td>0.44 - 0.73</td>
</tr>
<tr>
<td>Age of Househld Head</td>
<td>21 and under</td>
<td>232</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>22 to 30</td>
<td>1049</td>
<td>2.18</td>
<td>1.58 - 3.01</td>
<td>0.66</td>
<td>0.48 - 0.91</td>
</tr>
<tr>
<td></td>
<td>31 to 40</td>
<td>1209</td>
<td>1.21</td>
<td>0.97 - 1.52</td>
<td>0.85</td>
<td>0.62 - 1.17</td>
</tr>
<tr>
<td></td>
<td>41 to 50</td>
<td>1157</td>
<td>1.43</td>
<td>1.15 - 1.77</td>
<td>1.05</td>
<td>0.77 - 1.43</td>
</tr>
<tr>
<td></td>
<td>51 to 65</td>
<td>1107</td>
<td>2.04</td>
<td>1.65 - 2.52</td>
<td>0.84</td>
<td>0.62 - 1.15</td>
</tr>
<tr>
<td></td>
<td>66 and older</td>
<td>860</td>
<td>1.85</td>
<td>1.50 - 2.30</td>
<td>0.42</td>
<td>0.30 - 0.59</td>
</tr>
<tr>
<td>Education Level</td>
<td>Less than HS</td>
<td>1585</td>
<td>0.95</td>
<td>0.78 - 1.14</td>
<td>0.95</td>
<td>0.81 - 1.12</td>
</tr>
<tr>
<td></td>
<td>HS diploma</td>
<td>2055</td>
<td>0.95</td>
<td>0.78 - 1.14</td>
<td>0.95</td>
<td>0.81 - 1.12</td>
</tr>
<tr>
<td></td>
<td>Some college</td>
<td>1131</td>
<td>0.91</td>
<td>0.76 - 1.09</td>
<td>0.96</td>
<td>0.79 - 1.16</td>
</tr>
<tr>
<td></td>
<td>College deg/ +</td>
<td>843</td>
<td>0.95</td>
<td>0.77 - 1.16</td>
<td>1.00</td>
<td>0.82 - 1.23</td>
</tr>
<tr>
<td>Household Earn</td>
<td>0 to 14 999</td>
<td>3040</td>
<td>2.83</td>
<td>1.40 - 5.73</td>
<td>0.74</td>
<td>0.63 - 0.85</td>
</tr>
<tr>
<td></td>
<td>15 000 to 29 999</td>
<td>1867</td>
<td>2.83</td>
<td>1.40 - 5.73</td>
<td>0.74</td>
<td>0.63 - 0.85</td>
</tr>
<tr>
<td></td>
<td>30 000 to 49 999</td>
<td>642</td>
<td>1.77</td>
<td>0.87 - 3.61</td>
<td>0.51</td>
<td>0.39 - 0.68</td>
</tr>
<tr>
<td></td>
<td>50 000 to 99 999</td>
<td>65</td>
<td>1.20</td>
<td>0.58 - 2.51</td>
<td>0.40</td>
<td>0.19 - 0.85</td>
</tr>
<tr>
<td>Metropolitan Status</td>
<td>Metropolitan</td>
<td>3769</td>
<td>1.24</td>
<td>0.68 - 2.34</td>
<td>0.91</td>
<td>0.80 - 1.05</td>
</tr>
<tr>
<td></td>
<td>Non-Metro</td>
<td>1787</td>
<td>0.91</td>
<td>0.83 - 1.06</td>
<td>1.00</td>
<td>0.88 - 1.13</td>
</tr>
<tr>
<td>Geographic Region</td>
<td>Northeast</td>
<td>880</td>
<td>0.89</td>
<td>0.73 - 1.07</td>
<td>1.03</td>
<td>0.84 - 1.26</td>
</tr>
<tr>
<td></td>
<td>Midwest</td>
<td>1343</td>
<td>0.94</td>
<td>0.79 - 1.11</td>
<td>0.95</td>
<td>0.78 - 1.15</td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>1964</td>
<td>0.87</td>
<td>0.74 - 1.01</td>
<td>1.18</td>
<td>0.96 - 1.44</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>2232</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3382</td>
<td>0.91</td>
<td>0.83 - 1.06</td>
<td>1.00</td>
<td>0.88 - 1.13</td>
</tr>
<tr>
<td>Race</td>
<td>White only</td>
<td>4212</td>
<td>0.52</td>
<td>0.38 - 0.71</td>
<td>1.15</td>
<td>0.97 - 1.36</td>
</tr>
<tr>
<td></td>
<td>Black only</td>
<td>988</td>
<td>0.64</td>
<td>0.46 - 0.90</td>
<td>2.04</td>
<td>1.42 - 2.95</td>
</tr>
<tr>
<td></td>
<td>Amer Indian/ Alask Nat only</td>
<td>133</td>
<td>0.64</td>
<td>0.46 - 0.90</td>
<td>2.04</td>
<td>1.42 - 2.95</td>
</tr>
<tr>
<td></td>
<td>Asian only</td>
<td>85</td>
<td>1.11</td>
<td>0.70 - 1.75</td>
<td>0.77</td>
<td>0.44 - 1.32</td>
</tr>
<tr>
<td></td>
<td>Haw/ Pac Is only</td>
<td>24</td>
<td>0.39</td>
<td>0.21 - 0.72</td>
<td>1.30</td>
<td>0.52 - 3.23</td>
</tr>
<tr>
<td></td>
<td>Mixed 2 or more</td>
<td>172</td>
<td>0.65</td>
<td>0.25 - 1.64</td>
<td>1.77</td>
<td>1.28 - 2.45</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Hispanic</td>
<td>757</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Hispanic</td>
<td>4857</td>
<td>0.81</td>
<td>0.67 - 0.97</td>
<td>1.23</td>
<td>1.01 - 1.51</td>
</tr>
<tr>
<td>Participation</td>
<td>No Part</td>
<td>3023</td>
<td>0.83</td>
<td>0.74 - 0.94</td>
<td>1.32</td>
<td>1.14 - 1.52</td>
</tr>
<tr>
<td></td>
<td>Part in 1+</td>
<td>2591</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05 adjusted for household size, age of household head, household earnings, metropolitan status, geographic region, sex, race, ethnicity, education level and food assistance program participation.*

Findings with confidence intervals containing the value of 1 are not statistically significant.
Figure 1

Food Insecurity/Hunger: Population Consequences, and Food Assistance Program Goals

**TARGET POPULATION**
- Federal Food Assistance Program Participants
- National-US

**VARIABLES RELATED TO FOOD SECURITY STATUS**

<table>
<thead>
<tr>
<th>Household Structure</th>
<th>Income Status</th>
<th>Community Characteristics</th>
<th>Demographic Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Household Size</td>
<td>- Earnings</td>
<td>- Housing costs</td>
<td>- Sex (f)</td>
</tr>
<tr>
<td>- Marital Status</td>
<td>- Employment</td>
<td>- Public Assistance</td>
<td>- Ethnicity (Hispanic)</td>
</tr>
<tr>
<td>- Number of Heads</td>
<td>status</td>
<td>- Benefit Level</td>
<td>- Education Level</td>
</tr>
<tr>
<td>- Number/ Age of</td>
<td></td>
<td>- Metropolitan Status</td>
<td>- Race (African American)</td>
</tr>
<tr>
<td>Children</td>
<td></td>
<td>- Transportation</td>
<td>- Mobility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Availability</td>
<td>- Age of household head</td>
</tr>
</tbody>
</table>

**CONSEQUENCES OF FOOD INSECURITY/HUNGER**
- nutritional status ↓
- health status ↓
- behavioral problems in children ↑
- academic achievement in children ↓
- food on hand ↓
- vegetable/fruit consumption ↓
- general quality of life ↓
- stress level ↑

**GOALS OF FOOD ASSISTANCE PROGRAMMATIC INTERVENTION**

**ALL FEDERAL PROGRAMS**
- food insecurity/ hunger ↓
- meet basic needs of population ↑
- household nutritional status ↑

**WIC**
- health status of infants/children ↑

**SCHOOL BASED PROGRAMS**
- academic achievement of children ↑
- school-based behavioral problems in children ↓
Figure 2

Model 1: Proposed Relations between Predictor Variables and Food Assistance Program Participation

\[ P(Y) = \frac{1}{1 + \exp(- (\alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9))} \]
Figure 3

Model 2: Proposed Relations between Predictor Variables and Food Security Status

- **HOUSEHOLD STRUCTURE**
  - # of Household members
  - Age of household head
  - Education level

- **INCOME STATUS**
  - Household Earnings

- **COMMUNITY**
  - Metropolitan vs. Non-metropolitan
  - Geographic region

- **DEMOGRAPHIC**
  - Sex
  - Race
  - Ethnicity

- **FOOD ASSISTANCE PROGRAM PARTICIPATION**
  - In federal food assistance programs
    - Food Stamps
    - WIC
    - Free/Reduced Meals
  - Participation in 0, 1, or 2 or more 30-Day scale

- **FOOD SECURITY STATUS**
  - FOOD SECURE
  - VERSUS FOOD INSECURE/HUNGRY

\[ P(Y) = \frac{1}{1 + \exp(- (a + p_1 x_1 + p_2 x_2 + p_3 x_3 + p_4 x_4 + p_5 x_5 + p_6 x_6 + p_7 x_7 + p_8 x_8 + p_9 x_9 + p_{10} x_{10})))} \]
Figure 4

Details of Study Sample Inclusion

BELIEW 185 PERCENT OF POVERTY THRESHOLD

FOOD SECURE

FOOD INSECURE/HUNGRY

PARTICIPATION 0, versus 1 OR MORE PROGRAMS

INCLUDED IN SAMPLE
REFERENCES


