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FOOD STAMP PARTICIPANTS' FOOD SECURITY AND NUTRIENT AVAILABILITY

Final Report

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CONTENTS

CONTENTS *(continued)*

CONTENTS *(continued)*

CONTENTS *(continued)*

TABLES

Table **Page**

TABLES *(continued)*

TABLES *(continued)*

EXHIBITS

EXECUTIVE SUMMARY

The Food Stamp Program (FSP), administered by the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA), provides financially needy households with benefits that are used for the purchase of food from authorized retailers. To receive food stamps, households must meet eligibility requirements (primarily related to income and assets). In 1997, the program provided more than $22 billion in benefits to 22 million people in 9 million households.

The National Food Stamp Program Survey (NFSPS) was conducted for FNS by Mathematica Policy Research, Inc. (MPR) between June 1996 and January 1997, to obtain information with which to assess how well the FSP is serving its current and potential clients. One of the main objectives of the survey was to examine the food security of FSP participants, in terms of the adequacy of the food available to them and their risk of hunger. The study also examined the amount of nutrients FSP participants used from home food supplies. Both of these are important measures of the program's success in improving the nutritional status of its participants. Key research questions included:

- What levels of food security are experienced by program participants and nonparticipants?
- How do food security levels vary by household characteristics and selected program design parameters?
- What are households' perceived reasons for food insecurity?
- What are the main mechanisms for coping with food security problems?
- What is the relationship between food security and nutrient availability?

PRINCIPAL FINDINGS

Nationally, 50 percent of FSP participants experience some level of food insecurity. Using a measure of food security based on 18 survey questions (Hamilton et al. 1997), 28 percent of FSP participants were classified as food insecure without hunger, 17 percent were classified as food insecure with moderate hunger, and 5 percent were classified as food insecure with severe hunger. Virtually all respondents experiencing food insecurity indicated that the main reason for their food insecurity was lack of financial resources. Food security is lower among FSP participants than among the two nonparticipant groups examined, both of which had higher average incomes.

The average levels of nutrients available to respondents, based on a seven-day food use survey, exceed Recommended Dietary Allowances (RDAs) for all of the key nutrients examined. Nutrient availability as a percentage of RDA ranged from 114 for calcium and 117 for zinc to 256 for vitamin C.

However, behind the averages, substantial percentages of households have nutrient availability below their RDAs. For instance, the percentage of households meeting 100 percent of the RDA for iron is 69 percent, while that for the folate is 79 percent. When assessing these results, one must recognize that the RDAs are set conservatively, and most people do not require the full RDAs. When the analysis is repeated using 75 percent of the RDA as the criterion, considerably more households meet the threshold, but not all. The percentage meeting 75 percent of the RDA for iron is 85 percent; that for folate is 88 percent.

The relationships between food security and variables measuring store access are quite weak. The strongest such relationship was with the respondent having access to a car, which was clearly associated with higher levels of food security. No definite correlation was observed between food security and proximity to a supermarket.

There is an unexpected positive correlation between the level of food insecurity and the availability of nutrients--households classified as experiencing hunger tend to have higher levels of nutrient availability than those who are not classified as experiencing hunger. This positive association exists for all eight nutrients studied and is statistically significant for four of them, in an analysis of variance framework. When the analysis is placed in a multivariate regression context that controls for the effects of other factors, the estimated association between the variables remains positive, and it is statistically significant for some nutrients. The reason for these findings is unclear, but the body of the report cites a number of past studies and behavioral hypotheses that could provide at least partial explanations. It is possible, for instance, that there is an association between the likelihood of a family experiencing food insecurity due to lack of resources at certain times and its propensity to consume relatively large amounts of food at other times, when resources to obtain food are available.

DATA AND METHODS

The analysis was based on household surveys conducted using two sample frames: (1) a list frame consisting of administrative lists of FSP participants, which yielded a sample of FSP participants, and (2) a random-digit-dialing (RDD) frame, which yielded samples of FSP-eligible and near-eligible nonparticipants, as well as some FSP participants. Overall, MPR completed surveys of 2,454 FSP participants, 450 FSP-eligible nonparticipants, and 405 near-eligible nonparticipants. The data have been weighted to make them nationally representative of these populations.

Since most of the research questions addressed in this report are descriptive, most findings are based on tabular and cross-tabular analysis. In some instances, however, multivariate techniques were used to examine relationships between the roles of various factors when other factors are held constant.

The data assembled for the study represent a solid basis for examining the research questions highlighted above. As with all survey data, however, they have limitations that should be noted in interpreting the analysis, the three most important being:

1. ***Lags between participant sampling and data collection*** meant that many participants had dropped off food stamps by the time they were contacted. Since most of the research questions were relevant only for active participants, these dropouts were not interviewed. As a result, the sample tends to have too many long-term food stamp participants and too few short-term participants.

2. ***The sample lacks nonparticipants without telephones,*** since the RDD sampling methodology effectively limited the nonparticipant sample to households with telephones. While the sample has been post-stratified in an attempt to correct for this, the correction is probably not complete. To the extent that nonparticipants without phones are different from those with phones, the non-telephone households are not reflected in our analysis.

3. ***The accuracy of nonparticipant eligibility determinations is only approximate,*** since nonparticipant eligibility was determined with a short screening instrument that could not fully replicate all the complex eligibility criteria the FSP uses in assessing applicant eligibility. Furthermore, even for the full interviews, in which more-detailed data on income, household expenses, and living arrangements were obtained, the data were not sufficient to fully replicate the information obtained during an FSP application. As a result, the determinations of "FSP-eligible" and "FSP-near-eligible" used in the analysis must be taken as approximations; some households were undoubtedly misclassified.

I. INTRODUCTION

The Food Stamp Program (FSP), the largest of the 15 nutrition assistance programs administered by the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA), is the cornerstone of America's strategy for ensuring that all Americans have enough to eat. Households participating in the FSP receive benefits that are used to purchase food from authorized retailers. To receive food stamps, households must meet eligibility requirements, primarily related to income and assets. In 1997, the program provided more than $22 billion in benefits to more than 22 million people in 9 million households.

Because the FSP is such an important part of the nation's policy for providing assistance to low-income households, it is essential that the program be assessed periodically to see how well it is achieving its objectives. The National Food Stamp Program Survey (NFSPS), conducted in 1996 by Mathematica Policy Research, Inc. (MPR) was designed to obtain and analyze survey information from program participants and eligible nonparticipants to assess key aspects of how well the program is meeting the needs of low-income households requiring food assistance. Three areas of the FSP structure and operations are of particular interest in the NFSPS:

1. Customer service
2. Access to authorized food retailers
3. Food security and nutrient availability

This report summarizes the findings on food security and nutrient availability. It assesses whether, under the structure of the current FSP, program participants are getting appropriate amounts of food. Two other reports, Ponza et al. 1998 and Ohls et al. 1998, examine questions of customer service and retailer access, respectively.

The rest of this introductory chapter provides a context for the report. Section A provides a brief overview of the FSP. Section B discusses current issues regarding food security and nutrient availability. Section C examines the research questions, and Section D describes the organization of the rest of the report.

A. AN OVERVIEW OF THE FSP

The objective of the FSP, as stated in its authorizing legislation, is to "permit low-income households to obtain a more nutritious diet through normal channels of trade by increasing food purchasing power for all eligible households who apply for participation" (see Food Stamp Act of 1977, Section 2). To accomplish this, the USDA administers a multibillion-dollar program that provides services throughout the United States.

Eligibility standards and benefit levels for the program are set by Congress. Broad policy guidance in implementing these standards is provided by FNS, through its headquarters in Alexandria, Virginia, and through regional offices in various parts of the country. FSP benefits are federally funded, and program administrative costs are shared by federal, state, and local governments. Direct day-to-day administration of the program is carried out by the states (or, in some areas, by counties, under state supervision).

1. Eligibility Criteria

Households must meet eligibility requirements to receive food stamps. Households may have no more than $2,000 in countable resources, such as a bank account ($3,000 if the household contains at least one person age 60 or older). Certain resources (such as a house and lot) are not counted. Households have to meet at least one, and usually two, income tests unless all members are receiving Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), or, in some places, General Assistance (GA). The gross income test assesses whether the household's gross income exceeds 130 percent of the poverty level for its household size. The net income test is based on gross income minus certain deductions for expenses and other factors. To be eligible, a household must have net income below the poverty level. Most households must meet both the gross and net income tests, but a household with an elderly person or a person who is receiving certain types of disability payments has to meet only the net income test. Except for those exceptions noted, households with income over the limits for their size are not eligible to receive food stamps.

The welfare reform act of 1996 ended eligibility for many immigrants and placed time limits on benefits for able-bodied, childless adults. Most noncitizens are ineligible. Exceptions are certain refugees, people seeking asylum, immigrants with credit for 10 years of work in this country, and veterans or active-duty military personnel and their families. If citizenship is in doubt, proof is required. Alien status must be verified. With some exceptions, able-bodied adults between age 16 and 60 must register for work, accept suitable employment, and take part in an employment and training program to which they are referred by the food stamp office. Failure to comply with these requirements can result in disqualification from the program. In addition, able-bodied adults between age 18 and 50 who do not have any dependent children can get food stamps for only 3 months in a 36-month period if they do not work or participate in a workfare or employment and training program other than job search. However, this requirement can be waived in some locations.

2. Application and Recertification Procedures

Households that may be eligible for food stamps can apply at local offices, which are usually located at the county level (in rural areas) and at the subcounty level (in more densely populated urban areas). Most applicants are required to appear in person at their local office. However, elderly or disabled people and anyone who has difficulty getting to the office may be interviewed by telephone or in their homes. During the application process, households are required to supply detailed information about household composition, income, assets, and certain expenses to allow the eligibility staff to determine whether or not they are eligible. In many instances, they are also required to verify the accuracy of the information they have supplied. Because of the verification requirements, as well as office scheduling constraints and other factors, the application process frequently requires two or more trips to the food stamp office.

Households participating in the FSP must periodically be recertified for eligibility. Although local offices exercise some discretion about the length of the certification period, it tends to be six months to a year, except that households with incomes judged to be particularly volatile are recertified more frequently. In general, the recertification process parallels the initial application process, although recertification can be more expeditious, since the basic information about the case is available and the focus is on determining whether any key household circumstances have changed, rather than on obtaining extensive new information.

3. Benefits

Applicant households that meet the legislated income and asset standards are certified as eligible for the program. Once certified, households receive monthly benefits, with the amount based on their income (net of certain deductions) and household size. Benefit levels are determined through formulas derived from the "Thrifty Food Plan," a set of estimated expenditure levels needed to maintain adequate diets.

Households have traditionally received benefits in the form of food coupons. Depending on local procedures and household circumstances, these coupons are issued in one of several ways. They may be sent to clients through the mail, issued directly over the counter at welfare offices, or provided through intermediaries (such as banks or check-cashing establishments) when participants show an Authorization-to-Participate (ATP) card. Except in a few relatively uncommon circumstances, these coupons can be exchanged only for food at authorized food retailers, of which there are about 180,000 throughout the country.

The majority of food stamp households receive their benefits through electronic benefit transfer (EBT) systems, debit-card type mechanisms that debit food stamp accounts electronically after food is purchased at participating retailers. All states are required by law to set up EBT systems by the year 2002. It is anticipated that this will have several effects, including making it harder for food stamp trafficking (selling food stamps for cash) to occur, streamlining retail check-out operations, and reducing the stigma felt by some participants when using food coupons. Fifty-one percent of households, receiving 52 percent of total benefits, were using EBT issuances as of October 1998. Approximately nine percent of the participant sample in the NFSPS received food stamp benefits through EBT.

B. ISSUES RELATED TO FOOD SECURITY AND NUTRIENT AVAILABILITY

A major objective of the FSP is to ensure the availability of adequate nutritious food to low-income households. Therefore, this report on the findings of the NFSPS project focuses on assessing the extent of the program clientele's access to safe, nutritious food. In addition, it examines such matters as the determinants of food security, and the degree to which food security and food availability are correlated.

The report uses mainly two methodological constructs to assess the adequacy of households' access to food. One is "food security," which is measured through 18 survey questions, on a scale which has recently been developed under a different FNS-sponsored project (Hamilton et al. 1997). The other approach is a more traditional "nutrient availability" measure, which has been used on periodic USDA Nationwide Food Consumption Surveys (NFCSs) since the mid-1960s (Peterkin et al. 1988).

1. Food Security

Concern about hunger among Americans has for many decades been an important factor in shaping United States nutrition policy (see Ohls and Beebout 1993). However, attempts to measure hunger systematically have posed major challenges to advocates and policy analysts alike. Early attempts were to define hunger in the medical sense by equating it with the physical manifestations of malnutrition. It is now recognized that, while associated with it, hunger is not identical to malnutrition. It is more likely to be a condition preceding the medical or psychological aspects of malnutrition. Malnutrition is only one of the possible outcomes of hunger. Hunger has also been defined in the social sense as the inability to obtain an adequate amount of food, even if the shortage is not prolonged enough to cause health problems. This has historically been measured by food shortages, missed meals, and inadequate nutrient availability or intake.

The late 1970s and early 1980s marked growing interest in broadening the concept of hunger to the more general construct of income-induced "food insecurity." This broader concept came to be defined in terms of various phenomena and experiences associated with *being at risk* of hunger as well as experiencing hunger directly.[1]

In an attempt to bridge the gap between the social and medical definitions of hunger, several efforts were initiated in the late 1980s and early 1990s to define a concept of food insecurity. An expert working group of the American Institute of Nutrition developed conceptual definitions, which were published by the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology (Anderson 1990). They are as follows:

- ***Food Security.*** "Access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)."

- ***Food Insecurity.*** "Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways."

- ***Hunger.*** "The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time . . . . Hunger . . . . is a potential, although not necessary, consequence of food insecurity."

In part, the broadening of the relevant concepts took place within the government, with the inclusion in the NFCS of a set of questions related to whether households perceived themselves as having adequate food. However, two private research efforts also gave substantial impetus to the evolving focus on food insecurity. First, the Community Childhood Hunger Identification Project (CCHIP), using funding from local and national business and philanthropic organizations, demonstrated that reasonable and consistent answers could be obtained to a set of survey questions about the broad concept of food insecurity (Wehler 1991 and 1995). This CCHIP project involved

[1]This discussion draws heavily on material in Bickel et al. 1996.

the administration of a common survey instrument designed to assess food security in a loosely coordinated set of local community surveys around the country.

Second, work by Katherine Radimer, Christine Olson, and others at Cornell University provided additional theoretical support for the growing body of literature on the food security concept (Radimer et al. 1992; and Olson et al. 1995). Their work also made advances in the use of measurement scales in assessing the answers to food insecurity-related survey questions.

Beginning in 1992, FNS began a systematic effort to develop a common battery of questions on food insecurity that could be administered regularly on government-conducted national surveys. Drawing on the body of research findings on food security that had developed to that point, together with additional research commissioned from outside researchers, FNS staff assembled the full range of instrumentation on food security that had been used up to then and identified sets of items that appeared to have significant promise as indicators of food security. They were assisted in this work by a panel of experts that included many of the leading researchers in the area.

The culmination of the FNS work on designing a detailed approach for monitoring food security was a module of questions that appeared for the first time as a supplement to the Current Population Survey (CPS) in April 1995. These questions obtained information about respondent households' shopping patterns and about various aspects of food security, as experienced both in the previous 30 days and in the previous 12 months.

Using the April 1995 CPS data, FNS and cooperating federal agencies developed a food security scale based on 18 of the CPS questions. This was done using an Item Response Theory (IRT) model, which posits an underlying latent variable (in the present context, food insecurity and hunger) that cannot be observed directly but can be estimated from respondent answers to a set of instrument items. The food security model assigns a relative "severity" to each of the 18 survey questions on which it is based, ranging from such low-severity items as whether the respondent "worried whether our food would run out" to very severe items, such as a child skipping a meal because no food was available. The household's food security scale score is computed on the basis of the total number of affirmative answers to the 18 questions (or 10 questions, if no children are present in the household). This scale is then divided into ranges of severity using cutpoints that allow classification of households to the following categories:

- Food secure
- Food insecure; no hunger evident
- Food insecure with hunger evident
- Food insecure with severe hunger evident

Food security scales have been computed based on two time periods: the 12 months previous to the interview and the 30 days previous to the interview (Hamilton 1997). Based on reliability tests and related analysis, it was concluded that the 12-month scale is the stronger of the two, and subsequent attention has focused principally on it.

The food security scale currently in use has been found to perform quite well on standard tests of statistical reliability, and the model-based ranking of food security questions on which it is based has strong intuitive face validity. In addition, as compared to methods involving observing nutrient intake or nutrient availability, the food security scale represents an inexpensive approach to assessing food security issues for large populations, and it provides an assessment tool which covers a longer period than just a day or a week.

A disadvantage of the scale is that so far it has been estimated with only one year of data, and its stability across years has not been verified. (FNS-sponsored work to examine this is currently under way.) Also, the scale's relationship to direct nutrient-based observation data has not previously been examined, because of lack of suitable data sets.[2]

2. Nutrient Availability Based on Seven-Day Food Use Data

The other main measurement construct used in this report to assess households' access to food is "nutrient availability," as measured through seven-day food use data. (In parts of the discussion, the terms "nutrient availability" and "food use" are used interchangeably. From a formal point of view, nutrient availability is regarded as an outcome variable that is measured through data collection on "food use.") The objective of the seven-day food use data collection technique is to record all the foods the household used from the home food supply during the seven-day period covered by the data collection. This includes foods used within the home, as well as foods (such as lunches taken to school) prepared in the home but then taken elsewhere for consumption. Both purchased food and food obtained at no cost, such as home-grown produce, are included. The food covered in the food use concept also includes any food wastage occurring within the home, including plate waste and food gone bad during storage. For each food used, information is obtained on the type of food, the form of the food as brought into the home (for example, fresh, frozen, canned), the amount used, the amount purchased, and the cost.

In understanding this technique, it is important to note that "food use," as the term is used here, differs significantly from "food eaten" (usually measured by 24-hour-intake interviews). In particular, food use does *not* include foods bought and eaten outside the home. On the other hand, it *does* include foods that were in the home food supplies but were then wasted (not eaten). Further,

[2]However, research undertaken at the Economic Research Service, including that done by Rose and Oliveira (1997a and 1997b) using intake data on food sufficiency, suggests possible associations. This is discussed in a later chapter.

it focuses specifically on food *used* from home supplies, not supplies themselves. Food that is in the home food inventory at the start of the week but is not used and remains in the home's food inventory at the end of the week is not counted.

An obvious analytic disadvantage to focusing on "food use" rather than "food eaten" is that there is no direct link to actual nutrient consumption. On the other hand, advantages include the following: (1) unlike 24-hour recall data, the food use data can be used to examine food expenditures; (2) the food use information focuses on foods from home food supplies, which are the foods the FSP seeks to influence; and (3) given the techniques available for collecting food use data, as discussed below, it is usually possible to cover a longer period (for example, 7 days) for a food use data collection than can, in practical terms, be covered through intake data.

3. Research Issues

While much of the analysis of food security done to date has focused on the overall U.S. population, the NFSPS affords an opportunity to focus specifically on the food security levels of a group of households of particular policy interest: FSP participants. The study estimates the distribution of food security levels among participants and assesses the household characteristics associated with alternative food security statuses.

The NFSPS data, which include eligible and near-eligible nonparticipants, also make it possible to examine food security levels for nonparticipants. For eligible nonparticipants, it is possible that their decisions not to participate may reflect their having adequate levels of food security without FSP assistance, and it is important to assess whether this is the case. For "near eligible" respondents, it is of interest to examine whether significant numbers of near-eligibles appear to need help from the program, as evidenced by their having low levels of food security.

An important challenge in examining such issues is that households with low levels of food security may be more likely to participate in the FSP and other nutrition programs. This self-selection can make it very difficult to assess direct program impacts with cross-section survey data.

Another set of research issues involves examining what household characteristics and other factors are associated with low levels of food security. This can aid in understanding the causes of food insecurity and in devising ways of targeting resources to alleviate the problem. Of particular interest are factors related to the design parameters of the FSP benefit schedules, such as household size and shelter costs.

Additional insight can also be gained through examination of households' perceived reasons for their lack of food security. One relevant question, for instance, is whether households' lack of food security is due principally to lack of general financial resources or to specific elements of their housing situations or household characteristics. The answers to this and similar questions have important implications for food assistance policy choices. Closely related insight can be gained through understanding the "coping" mechanisms that households use to deal with food insecurity.

Additional sets of research issues related to food security revolve around how other sets of policy-relevant variables affect food security. One set of variables of particular interest involves measures of access to food stores. As discussed in Ohls et al. (1998), Kaufman et al. (1997), and Montovani et al. (1997), there has been considerable concern that access of low-income people to food stores with low prices is significantly limited, a factor that could decrease their ability to obtain nutritious foods. While recent evidence suggests that this may not be as serious a problem as had been thought (see each of the above studies), it is nevertheless of interest to assess possible relationships between food security and store access.

So far, the discussion has highlighted research issues focusing on the recently developed food security concept. There are also important issues relating to nutrient availability as measured by NFSPS seven-day food use data. Previous research has shown that *on average* the nutrient availability for food stamp recipients exceeds the Recommended Dietary Allowances (RDAs), often by substantial margins (USDA, Human Nutrition Information Service, 1982, Table 11). For instance, in that previous work, the average nutrient availability as a percentage of RDA was estimated to range from 114 percent for calcium to 274 percent for vitamin C, with most of the percentages ranging from 120 to 190. However, these averages masked the fact that substantial numbers of program participants had nutrient availabilities below 100 percent of their RDAs. For instance 23 percent of households failed to meet their RDA for food energy and 38 percent failed to meet the calcium RDA. The current study affords an opportunity to update these estimates.

Since 1977, food sufficiency has been measured through a single question or a short sequence of questions designed to classify households as having: "enough of the kinds of food you want to eat," "enough but not always the kinds of food you want to eat," "sometimes not enough to eat," or "often not enough to eat" (U.S. Bureau of Census, 1995 April Current Population Survey, data collection instrumentation). Another issue is the degree to which this question taps into the food security construct or other dimensions of food inadequacy.

Finally, an important methodological research issue examined in this report involves the degree to which food security levels and nutrient availability are correlated. Since both of these measures attempt to provide indications of food or nutrient sufficiency, one might expect them to be quite highly correlated. However, it is possible that the two constructs tap different dimensions of sufficiency. Also, a number of technical issues could reduce the degree of correlation. For instance, the principal food security index that has been developed covers a 12-month period, while the seven-day food use data collection is limited to seven days.

It is thus of considerable interest to examine the relationship between the two measures. In the future, both food security data and nutrient-based information will be available in several national datasets, including the Continuing Survey of Food Intake by Individuals (CSFII) and the National Health and Nutrient Examination Survey (NHANES), both of which plan to include the food security module on their next administrations.[3] However, the NFSPS is the first data set that includes both food security information and nutrient-based observations, and it thus provides an early opportunity to examine relationships between the two types of data.

C. RESEARCH QUESTIONS

The research issues discussed above can be summarized in the following key research questions that have guided the development of this report:

- What levels of food security are experienced by program participants and nonparticipants?
- How do food security levels vary by household characteristics and program design parameters?
- What are households' perceived reasons for food insecurity?
- What are the main coping mechanisms used to deal with food security problems?
- What are people's level of dietary knowledge?
- What is the relationship between food security and nutrient availability?

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[3]These other surveys use 24-hour intake observations rather than seven-day food use for their nutrient-based data.

D. OUTLINE OF REPORT

The rest of this report is organized into five chapters. Chapter II describes the NFSPS and presents the characteristics of the participant and nonparticipant samples. Chapter III presents information on the food security levels of survey respondents, both for the sample as a whole and also selected subgroups. A multivariate logit analysis of the determinants of food security is also presented. Chapter IV examines associations between food security and access to food stores. Chapter V presents information from the seven-day food use data collection, and Chapter VI examines correlations between the nutrient availability data and the food security data.

II. DATA AND METHODS

This chapter describes the data collection methodology underlying the NFSPS and the characteristics of the participant and nonparticipant samples analyzed in this report. In addition, it describes analysis methods, including the weights that were constructed to make the participant and nonparticipant data nationally representative. Limitations of the data and analyses, as well as how they may affect the findings, are also discussed.

A. SAMPLING AND DATA COLLECTION METHODS

Addressing the research objectives highlighted in Chapter I, as well as those of the other reports, required obtaining nationally representative data from three different sets of households:

1. A sample of FSP participants, who could provide information about their experiences with the program, their access to stores, their food security, and their food use

2. A sample of FSP-eligible nonparticipants, who could provide information about their reasons for nonparticipation, their levels of food security and need for food stamp assistance, and their access to food stores

3. A sample of "near-eligible" nonparticipants with which to examine the potential need for food stamp benefits by households who were just above the established eligibility limits, as well as about their access to foodstores

Efficiently obtaining data from all three of these groups required a multifaceted data collection design as described below. (See Appendix A for a detailed discussion of the methods used to select the sample, conduct the survey, and process the data.)

1. The Household Surveys

The household surveys, conducted between June 1996 and January 1997, were organized and directed from MPR's main survey facilities near Princeton, New Jersey, and were based on samples obtained from two frames: (1) a random-digit-dialing (RDD) frame of all American households with telephones, and (2) a list frame consisting of administrative lists of FSP participants.

a. Nonparticipant Household Surveys

For identification of eligible and near-eligible nonparticipants for the data collection, randomly drawn U.S. telephone numbers were called and given a short screening interview to determine (1) whether they belonged to a household, and (2) whether the household appeared to meet (eligible) or almost meet (near-eligible) criteria for food stamps. Households who passed this screen, who were not FSP participants, and were willing to participate in the survey were then given a full nonparticipant household interview. Information collected included experiences with the FSP, if any, data on access to food stores, and food security information. The number of nonparticipant completions from the RDD frame was 450 eligible nonparticipants and 405 near-eligible nonparticipants.

In implementing this approach for the RDD sample, RDD respondents were first asked whether they were receiving food stamps and what their household size was. Then they were asked whether the household's monthly income was greater than or less than "X," where "X" was set at 150 percent of the poverty level for a household of that size. Households that passed this initial screen and were not receiving food stamps were then tracked into the full nonparticipant interview, which obtained detailed income, asset, and shelter information. Using these detailed data, gross and net income and deductions, as defined by the FSP, were calculated, as well as countable household assets. Households whose reported income and assets were under the applicable program limits were then placed in the "eligible nonparticipant" sample. Households that were not under these limits but that had assets less than $15,000 were placed in the "near-eligible nonparticipant" sample.[1]

b. Participant Household Surveys

MPR completed 2,454 interviews with FSP participants. Of these, 2,150 were sampled from the participant list frame (lists of FSP households provided by states or local food stamp offices), and 304 came from the RDD frame.[2]

In-Person Participant Household Survey from List Frame. A total of 1,109 in-person interviews were completed with FSP participants from the list frame. These interviews were conducted in person to obtain data on participant households' seven-day food use and shopping behaviors. The in-person participant survey was clustered in a limited number of locations, both to allow efficiencies in obtaining the samples (see below) and to limit interviewer travel costs. Thirty-five "primary sampling units" (PSUs), usually counties, were randomly selected from throughout the country, with probabilities of selection proportional to size. Next, machine-readable lists of FSP participants were obtained from state or local programs for each of these PSUs, and random samples of participants were drawn and then interviewed.

This data collection was conducted in respondents' homes through computer-assisted personal interviewing (CAPI) on laptop computers. In general, it consisted of two main parts. First, after setting up an appointment by telephone, the data collector visited the respondent's home and conducted an interview of about one to one-and-one-half hours, which covered all the survey topics

[1]All households that got this far in the assignment process had reported gross incomes less than 150 percent of the poverty level, since otherwise they would have been screened out during the initial part of the RDD screener interview.

[2]Sample sizes were based on targets set during the design stage of the project, based on trade-offs between precision requirements and costs.

other than those related to the household's food use. At the end of the first appointment, the household was given instructions about how to maintain food use records for the coming week, and a repeat appointment was scheduled for seven days later. During this second interview, which typically took between 90 and 150 minutes, information about the household's food use for the previous week was recorded through a paper and pencil data collection instrument.

Telephone Participant Household Surveys from List Frame. An additional 1,041 participant interviews were completed by telephone with computer-assisted telephone interviewing (CATI) using an additional sample from the FSP participant list frame. It was efficient to conduct some of the participant interviews over the telephone rather than in person, because the questions about food use and detailed shopping behaviors were not administered to all participants. Therefore, a second sample of participants was drawn from the same set of 35 PSUs discussed in the previous section. While clustering was not necessary for the actual data collection with this second sample, there were still considerable costs in assembling the sample frames of participants, so at least some clustering was still efficient. As a result, it was decided that using exactly the same PSUs for the telephone participant survey as for the in-person survey would yield maximum efficiencies.

Telephone Participant Household Surveys from the RDD Frame. While the main purpose of the RDD sample frame was to identify nonparticipants, a number of FSP participants were also identified. To supplement the list frame sample, these households were administered a slightly modified version of the list frame participant interview. A total of 304 completed FSP household telephone interviews were obtained from the RDD frame.

2. Response Rates

Table II.1 summarizes the response rates that were obtained in the various parts of the data collection. With the field list sample, 1,109 (1,070 + 39) laptop CAPI interviews were obtained out of 2,200 sample points released. However, 596 of the sample points proved to be ineligible for the survey by the time they were contacted, usually because they were no longer receiving food stamps. When these ineligibles are removed from the base, the response rate is 69 percent. A small number of the in-person cases completing the first part of the interview failed to complete the food-based second part a week later, leading to a response rate for the food use data of 67 percent.

In the telephone sample, 1,041 responses were obtained out of a total eligible sample of 1,535, a 68 percent response rate.

For the RDD sample, 14,514 numbers were released, of which 5,219 were determined ineligible for the screener, mostly because they were either nonworking or business numbers. Another 1,807 could not be determined. Of the remainder, 6,429 completed the screener, for a completion rate of 75 percent. At the next stage of this interviewing, 1,159 households completed full interviews out of a total of 1,456 (1,159 + 297) that had passed the screen, yielding a response rate of 80 percent for the full interview, conditional upon passing the screen. The combined overall response rate for this sample is 60 percent.

B. ANALYSIS METHODS

The research questions for this study are largely descriptive. Such issues as average levels of food security, the types of coping mechanisms that households use to deal with food security problems, and levels of nutrient availability can be addressed directly from the relevant data.

TABLE II.1

SURVEY RESPONSE RATES

Field List Sample	
Total Released	2,200
Eligible Completes with Food Use	1,070
Eligible Completes with No Food Use	39
Eligible Noncompletes	495
Ineligibles	596
CAPI Response Rate	.69[a]
Food Use Response Rate (if CAPI portion completed)	.96[b]
Combined CAPI-Food Use Response Rate	.67[c]
Phone List Sample	
Total Released	2,121
Eligible Completes	1,041
Eligible Noncompletes	494
Ineligibles	586
Response Rate	.68[d]
RDD Sample[e]	
Total Released	14,514
Screener	
Eligible completes	6,429
Eligible noncompletes	1,059
Ineligible	5,219
Undetermined	1,807
Screener response rate	.75[f]

TABLE II.1 *(continued)*

Interview	
Eligible completes	1,159
Eligible noncompletes	297
Ineligible	4,973
Interview response rate	.80[g]
Overall Response Rate	.60[h]

[a]Computed as 1,109/(1,109 + 495).

[b]Computed as 1,070/1,109.

[c]Product of previous two rates.

[d]Computed as 1,041/(1,041 + 494).

[e]The RDD response rates are adjusted to account for (1) inability to determine whether some of the telephone numbers in the original sample were eligible for the screener; and (2) of those eligible for the screener, inability to determine whether households were eligible for the full survey. The derivation of these response rates, taking these factors into account, is displayed below:

[f]Screener response rate:

$$\frac{12{,}707}{14{,}514} \cdot \frac{6{,}429}{7{,}488} = \frac{6{,}429}{6{,}429 + 1{,}059 + 1{,}807 \cdot ER} = .7517$$

where screener eligibility rate adjustment *ER* equals:

$$\frac{6{,}429 + 1{,}059}{6{,}429 + 1{,}059 + 5{,}219} = .5894$$

[g]Interview response rate:

$$\frac{1{,}159}{1{,}159 + 297} = .7960$$

[h]Combined screener-interview response rate:

$$\frac{12{,}707}{14{,}514} \cdot \frac{6{,}429}{7{,}488} \cdot \frac{1{,}159}{1{,}456} = \frac{1{,}159}{1{,}159 + 297 + 1{,}509 \cdot ER \cdot ER2} = .5984$$

where interview eligibility rate *ER2* equals:

$$\frac{1{,}159 + 297}{1{,}159 + 297 + 4{,}973} = .2265$$

Therefore the principal analysis method was to conduct interpretive tabular and cross-tabular analysis of the relevant data. However, in some instances an attempt was made to separate the associations of several different variables with an outcome of interest, such as food security. In these types of analyses, multivariate logit analysis has been used. The sections below highlight a number of issues that have been addressed in implementing the overall analytic approach.

1. Weighting

The survey was designed to achieve a nationally representative sample by obtaining essentially the same number of list frame interviews in each PSU, except for "certainty" PSUs, where the target sample sizes were adjusted upward to reflect their relative sizes appropriately. However, because of a variety of practical considerations, the goal of equal sample sizes was not always fully achievable, and, as a result, households in different PSUs effectively had somewhat different probabilities of selection. Response rates also varied by location. Weighting was used to adjust for these factors and make the sample representative of the national caseload. The weights used were based on the inverses of the probabilities of selection.

Weighting was also used when combining the three participant samples (list frame in-person, list frame phone, and RDD). Each of these samples was self-representing (except for the issues discussed in the previous paragraph), but because of their different sample sizes, combining the three directly by weighting observations from each equally was not statistically efficient in terms of minimizing variances. As a result, weights were constructed that reflected the different variances implicit in the different sample sizes. (See Appendix B.)

Weighting was used for the nonparticipant sample for a different reason. There was concern that the sample would not be representative, both because of nonresponse and because the RDD data collection methodology that was used meant that only households with telephones could be included in the sample. To correct for this at least partially, it was decided to post-stratify the nonparticipant sample, so that it would better reflect the population of low-income households who do not receive food stamps. This was done by assigning weights based on household characteristics, such that the weighted sample was similar to control data from an external survey with regard to those characteristics. The methods used in doing this are presented in Appendix B.[3]

2. Calculation of Variances

Because of the clustering of the sample and the weighting factors used, the standard methods for computing the variances of sample estimates that are applicable to simple self-weighting samples (and are routinely generated by most statistical software programs) do not apply to most of the tabulations presented in this report. In general, the variances of estimates from the current sample are higher than those that would be applicable to a simple self-weighting sample. This has been taken into account in the analysis.

Appendix C presents, for selected variables, variances that have been computed using the STATA analysis package, which uses Taylor's Series methods for taking into account the sample design. As shown in that appendix, the design effects for the participant sample tend to be on the order of "3," meaning that variances are about three times those that would be observed in a simple self-weighting sample of the same size. This in turn implies that confidence interval widths around

[3]Whereas FSP participant households without phones were included in the in-person list sample frame, such households were not included in either the computer-assisted telephone interviewing (CATI) participant list frame or the RDD frame. Thus, the issue regarding coverage of households without phones is also relevant for the participant sample. However, the number of FSP participants identified from the RDD frame is small (304 cases, or 12 percent of the unweighted FSP sample). In addition, some of the phone list sample cases without phones were followed up in person by field staff using cellular phones to complete the interview. Therefore, it was decided that the statistical gain from adjusting the participant sample for telephone coverage did not warrant the costs.

descriptive statistics are increased by a factor of about 1.76.[4] Design effects are in general considerably lower for the nonparticipant sample, since this sample was not clustered into a limited number of PSUs.

3. Formal Hypothesis Tests

Much of the analysis in the following chapters is descriptive. Therefore, formal hypothesis tests have not been performed to examine statistical significance for all the comparisons made concerning the tabular results; performing a complete set of formal hypothesis tests for every tabular comparison of potential interest would be somewhat cumbersome, and in most instances it probably would not add significantly to meaning. However, a number of formal hypothesis tests have been conducted for certain components of the analysis where they were particularly salient.

C. LIMITATIONS OF THE DATA AND ANALYSIS

The data assembled for the study represent a solid basis for examining the research questions highlighted earlier. As with all survey data, however, they have limitations that should be noted in interpreting the analysis. The most important of these are discussed below.

1. Lags Between Participant Sampling and Data Collection

The list frame participant sample was obtained in spring 1996; however, the data collection extended into early 1997. This means that by the end of the survey, the sample was about eight months old, and considerable numbers of participants had dropped off food stamps by the time they were contacted. Since many of the research questions involved active food stamp participants, these

[4]Design effects may be lower in multivariate analysis, where it is possible to control explicitly for factors that vary across primary sampling units.

dropouts were not interviewed. As a result, the sample tends to have too many long-term food stamp participants and too few short-term participants.[5]

2. Lack of Nonparticipants Without Telephones

As noted above, the sampling methodology effectively limited the nonparticipant sample to households with telephones. While the sample has been post-stratified in an attempt to correct for this, the correction probably is not complete. To the extent that the differences between nonparticipants without phones and those with phones were not adjusted for, the nontelephone households are not reflected in the analysis.

3. Accuracy of Nonparticipant Eligibility Determination

At the beginning of the interview, nonparticipant eligibility was determined with a short screening instrument that could not fully replicate all the complex eligibility criteria the FSP used in assessing applicant eligibility. Further, even for the full interviews, in which more-detailed data on income, household expenses, and living arrangements were obtained, the data were not sufficient to fully replicate the information obtained during an FSP application. As a result, the determinations of "FSP-eligible" and "FSP-near-eligible" used in the analysis must be taken as approximations; some households were undoubtedly misclassified.

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[5]The sample should be interpreted as representing a cross-section of the FSP caseload at a *given point in time.* Even without the interviewing lags, a cross-sectional sample has fewer short-term participants than the alternative of focusing on a cohort of all participants entering the program at a given point in time. The interviewing lags further limit the number of short-term participants in the sample.

D. DESCRIPTION OF THE SAMPLES OF PARTICIPANTS AND NONPARTICIPANTS

Interviews were completed with a total of 3,309 households for the NFSPS: 2,454 households participating in the FSP and 855 households not participating (450 estimated eligible nonparticipant households and 405 ineligible nonparticipant households). This section presents (weighted) descriptive statistics for the samples of participants and nonparticipants.

FSP participants, eligible nonparticipants, and near-eligible nonparticipants differ substantially on their economic and demographic characteristics (Table II.2). FSP participant households are more disadvantaged economically than eligible nonparticipant and near-eligible nonparticipant households. Average annual gross income of FSP participant households is $8,468, which is about $1,500 less than for eligible nonparticipants and more than $6,000 less than for near-eligible nonparticipants. FSP households were substantially more likely to be on AFDC (now TANF) than eligible nonparticipant households (30 percent versus 1 percent) or receive SSI (22 percent versus 7 percent). About one-third of households participating in the FSP have earnings, compared with somewhat more than half of eligible nonparticipants and two-thirds of near-eligible nonparticipants.

Among the three study groups, there are also important differences in household composition. FSP households are substantially more likely to contain children, and particularly to be single-parent households with children. Nearly two-thirds of FSP households have children, and one-third are headed by a single parent. Of eligible nonparticipating households, 40 percent contain children, while only 6 percent are headed by a single parent. FSP households are less likely to contain elderly people: about one-quarter of FSP households contain at least one elderly member, compared with 44 percent of eligible nonparticipating households. With regard to demographic characteristics of the person responsible for the finances of the household, FSP participants are more likely than

TABLE II.2

CHARACTERISTICS OF FOOD STAMP PARTICIPANT AND NONPARTICIPANT HOUSEHOLD SAMPLES
(Percentage of Households, Unless Stated Otherwise)

Characteristic	Participants	Nonparticipants	
		Eligible[a]	Near-Eligible[b]
Household Characteristics			
Average Household Size	3.0	2.7	3.1
Household Contains:			
Elderly[c]	26.5	44.2	31.5
Single person[d]	24.5	31.0	21.5
Children[e]	63.5	40.4	50.4
Single parent with children[f]	34.9	6.0	10.8
Multiple adults with children[g]	28.6	34.4	39.6
Residential Location			
Urban	72.1	66.2	62.4
Rural	22.0	27.4	27.7
Missing	5.9	6.4	9.9
Household Receives:			
Earned income	32.5	52.7	67.0
No income	6.0	0.0	8.4
Aid to Families with Dependent Children (AFDC)	30.0	1.1	1.2
General Assistance (GA)	5.7	0.9	0.5
Supplemental Security Income (SSI)	22.3	6.8	3.9
Social Security Income	28.3	37.2	27.4
Average Annual Gross Income	$8,468	$9,953	$14,906
Average Monthly Food Stamp Benefit	$166	n.a.	n.a.
Demographic Characteristics of Respondent[h]			
Race/Ethnicity			
African American (not of Hispanic origin)	32.7	16.8	11.6
Asian/Pacific Islander	1.8	1.4	2.6
Hispanic	16.1	14.9	14.1
Native American	1.3	1.3	1.5
White (not of Hispanic origin)	46.9	64.7	69.7
Other	1.1	0.9	0.5
Missing	0.1	1.5	2.4
Age			
Less than 20 years	2.9	2.2	2.7
20 to 49 years	67.3	49.1	58.3
50 to 59 years	10.5	11.2	13.6
60 years or more	19.3	37.4	25.5
Female	84.8	76.6	72.5
Marital Status			
Never married	35.0	15.3	13.8
Currently married (formal or consensual union)	18.6	44.8	49.5
Separated or divorced	33.1	18.0	21.9
Widowed	12.7	21.1	13.8
Missing	0.6	0.8	1.0

TABLE II.2 *(continued)*

Characteristic	Participants	Nonparticipants: Eligible[a]	Nonparticipants: Near-Eligible[b]
Highest Grade Completed			
Less than high school	43.1	36.0	28.3
High school/GED	37.7	44.1	46.2
Associate/BA	8.9	11.4	12.7
Vocational certificate	4.1	3.1	3.8
Other	6.2	5.3	9.0
Missing	0.8	1.4	2.8
Sample Size	**2,454**	**450**	**405**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a] Households that meet the income and asset tests for eligibility for food stamps.

[b] Households that do not meet the income or asset tests for eligibility for food stamps and whose gross income does not exceed two times the poverty level for their household size do not have non-vehicle or non-house assets greater than $15,000 and do not have vehicle assets that exceed $25,000.

[c] Households that contain at least one member age 60 years or older.

[d] Households that contain only one member.

[e] Households that contain at least one member age 18 or younger.

[f] Households that contain only one member older than age 18 and children (at least one member age 18 or younger).

[g] Households that contain two or more members older than age 18 and children (at least one member age 18 or younger).

[h] Respondent most responsible for the finances of the household.

n.a. = not applicable.

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Other	6.2	5.3	9.0
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[a] Households that meet the income and asset tests for eligibility for food stamps.

[b] Households that do not meet the income or asset tests for eligibility for food stamps and whose gross income does not exceed two times the poverty level for their household size do not have non-vehicle or non-house assets greater than $15,000 and do not have vehicle assets that exceed $25,000.

[c] Households that contain at least one member age 60 years or older.

[d] Households that contain only one member.

[e] Households that contain at least one member age 18 or younger.

[f] Households that contain only one member older than age 18 and children (at least one member age 18 or younger).

[g] Households that contain two or more members older than age 18 and children (at least one member age 18 or younger).

[h] Respondent most responsible for the finances of the household.

n.a. = not applicable.

eligible and near-eligible nonparticipants to be African American, between 20 and 49 years of age, unmarried/separated/divorced, and less educated (Table II.2).

E. COMPARISONS OF THE FOOD STAMP SAMPLE WITH OTHER DATA ON FOOD STAMP RECIPIENTS

As noted above, there is at least one significant reason for believing that the sample of food stamp participants is not fully representative--the lags in the sampling and interviewing processes, which resulted in some of the sample having left food stamps before being contacted. Other reasons for differences could include (1) statistical sampling variance in either stage of the sampling process (PSUs and participants); and (2) nonresponse bias, which could be present if some categories of FSP participants are less likely than others to be located and to agree to an interview.

To assess the representativeness of the sample, tabulations were generated of two other national data sources that have characteristics of samples of food stamp participants. One of these sources, the Food Stamp Quality Control Sample (FSQC), is a data set compiled from FSP administrative records. The second source, the Survey of Income and Program Participation (SIPP), is an ongoing survey of American households conducted by the Bureau of the Census, with a special emphasis on examining households' participation in programs for low-income families. Both FSQC and the data sets used in these tabulations can be interpreted as essentially representing cross-sections of the FSP populations, thus making them comparable to the tabulations from the NFSPS.

Comparisons with these other nationally representative samples of FSP participants reveal that the current NFSPS contains more participating households with elderly people and fewer receiving welfare payments than do the other sources (Table II.3). Twenty-seven percent of NFSPS participant households contain elderly people, compared with 16 percent of NFSPS participants in the FSQC and 18 percent of FSP participants in the SIPP. Thirty percent of NFSPS participants receive AFDC,

TABLE II.3

CHARACTERISTICS OF HOUSEHOLDS RECEIVING FOOD STAMPS

	Percentage of Households			Average Number of Persons per Household		
Selected Characteristics of Food Stamp Households	SIPP	FSQC	NFSPS	SIPP	FSQC	NFSPS
Demographic Characteristics						
Households That Contain:						
Elderly[a]	18.1	16.0	26.5	1.3	1.4	2.3
Single person[b]	29.3	35.9	24.5	1.0	1.0	1.0
Children[c,f]	65.5	59.7	60.8	3.6	3.4	4.0
Single parent with children[d,f]	48.2	41.6	31.9	3.2	3.1	3.3
Multiple adults with children[e,f]	16.2	14.9	28.8	4.7	4.5	4.7
Economic Characteristics						
Households That Receive:						
Aid to Families with Dependent Children (AFDC)	44.8	38.3	30.0	3.4	3.3	3.9
Supplemental Security Income (SSI)	22.1	22.6	22.3	1.9	1.9	2.3
General Assistance (GA)	5.1	7.2	5.7	2.1	1.4	3.0
Social Security	21.2	18.6	28.3	1.7	1.7	2.3
Earned income	22.0	21.4	32.5	3.6	3.3	3.9
Unearned income	83.5	86.8	82.0	2.7	2.6	2.9
No income	5.7	9.7	6.0	2.2	1.6	2.8

SOURCE: 1994 Survey of Income and Program Participation (SIPP): Eligible Reporter Units--households that reported receiving food stamps and that are simulated as eligible based on reported income, assets, and other information; Summer 1995 Food Stamp Quality Control sample (FSQC); 1996 National Food Stamp Program Survey (NFSPS).

NOTE: All data are weighted.

[a] Households that contain at least one member age 60 years or older.

[b] Households that contain only one member.

[c] Households that contain at least one member under age 18.

[d] Households that contain only one member age 18 or older and children (at least one member under age 18).

[e] Households that contain two or more members age 18 or older and children (at least one member under age 18).

[f] NFSPS tabulations based on CAPI Food Stamp Program participant sample only (n = 1,109). The telephone data were excluded from these comparisons in order to ensure comparability with the food stamp quality control data. In the telephone interviews, in order to minimize interview time, detailed age data on each household member were not obtained, and it was not possible to fully replicate the definition of children used in the food stamp quality control data.

compared with 38 percent of FSQC participant households and 45 percent in the SIPP. Nearly one-third of NFSPS households participating in the FSP reported having earnings, compared with 21 percent and 22 percent, respectively, for NFSPS participants in the FSQC and SIPP data sets. In general, FSP participants in the NFSPS reported higher income but lower food stamp benefits than participants in the FSQC and SIPP (Table II.4). The reason for this latter finding is not clear.

TABLE II.4

AVERAGE MONTHLY INCOME AND FOOD STAMP BENEFITS FOR FOOD STAMP HOUSEHOLDS, BY SELECTED CHARACTERISTICS
(In Dollars)

	Income per Household			FSP Benefits per Household		
Selected Characteristics of FSP Household	SIPP	FSQC	NFSPS	SIPP	FSQC	NFSPS
All FSP Households	590	529	706	193	177	166
Demographic Characteristics						
Households That Contain:						
Elderly[a]	569	561	677	67	94	94
Single person [b]	433	359	471	67	66	66
Children [c,f]	650	618	758	254	240	219
Single parent with children [d,f]	571	547	631	246	233	231
Multiple adults with children [e,f]	904	877	894	287	275	206
Economic Characteristics						
Households That Receive:						
Aid to Families with Dependent Children (AFDC)	549	542	752	260	246	235
Supplemental Security Income (SSI)	642	630	730	104	97	105
General Assistance (GA)	541	360	629	143	127	189
Social Security	644	630	796	87	83	95
Earned income	880	867	1121	214	191	182
Unearned income	595	580	721	186	176	162
No income	0	0	0	230	172	176

SOURCE: 1994 Survey of Income and Program Participation (SIPP): Eligible Reporter Units--households that reported receiving food stamps and that are simulated as eligible based on reported income, assets, and other information; Summer 1995 Food Stamp Quality Control sample (FSQC); 1996 National Food Stamp Program Survey (NFSPS).

NOTE: Amounts expressed in 1996 dollars. All data are weighted.

[a] Households that contain at least one member age 60 years or older.

[b] Households that contain only one member.

[c] Households that contain at least one member under age 18.

[d] Households that contain only one member age 18 or older and children (at least one member under age 18).

[e] Households that contain two or more members age 18 or older and children (at least one member under age 18).

[f] NFSPS tabulations based on CAPI Food Stamp Program participant sample only (n = 1,109). The telephone data were excluded from these comparisons in order to ensure comparability with the food stamp quality control data. In the telephone interviews, in order to minimize interview time, detailed age data on each household member were not obtained, and it was not possible to fully replicate the definition of children used in the food stamp quality control data.

III. FOOD SECURITY LEVELS AND THEIR DETERMINANTS

The food security scale was developed by FNS to measure the existence and severity of household food security through the presence of a set of indicators. Exhibit III-1 presents the questions that were included in the food security scale as developed by Hamilton et al. and reproduced on the NFSPS. In addition to these questions, other items asked in the survey include indicators of broader food insufficiency, coping mechanisms, and perceived reasons for food insecurity.

This analysis of food security begins with a presentation of the prevalence of several indicators of food insufficiency among the three groups of respondents in the study: FSP participants, eligible nonparticipants, and near-eligible nonparticipants. These indicators are components of the set of questions that were used to determine the food security status of respondents. Next, the levels of food security in the survey population are presented, and corresponding household characteristics are examined. Determinants of food security and coping mechanisms are also considered.

A. LEVELS OF FOOD INSUFFICIENCY AND FOOD SECURITY

The food security scale used in the current analysis is based on a series of 18 questions that ask about various aspects of access to and adequacy of food supplies for a household. National survey data on these 18 items (and others that were later dropped because they were not as useful analytically) were first analyzed by Hamilton et al. (1997). The work was based on Rasch modeling techniques, which essentially assume that an underlying phenomenon (in the current context, food security) is reflected in responses to individual questions. The Rasch model provides a technique for estimating parameters of the individual items in terms of the degree of food security that they

EXHIBIT III-1

FOOD SECURITY QUESTIONS

- In the last 12 months, did you (or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?
- How often did this happen--almost every month, some months but not every month, or in only 1 or 2 months?
- In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?
- How often did this happen--almost every month, some months but not every month, or in only 1 or 2 months?
- In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?
- In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?
- Sometimes people lose weight because they don't have enough to eat. In the last 12 months, did you lose weight because there wasn't enough food?
- In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food?
- In the last 12 months, did any of the children ever skip a meal because there wasn't enough money for food?
- How often did this happen--almost every month, some months but not every month, or in only 1 or 2 months?
- In the last 12 months were the children ever hungry but you just couldn't afford more food?
- In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?
- "I worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?

EXHIBIT III-1 *(Continued)*

- "The food that we bought just didn't last and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?
- "We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?
- "We couldn't feed the children a balanced meal because we couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?
- "The children were not eating enough because we just couldn't afford enough food." Was that often, sometimes, or never true for you in the last 12 months?
- "We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?

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reflect, by identifying the set of parameters that best fit the observed data. These parameters are then used to develop a "food security scale," measuring the degree of food security experienced by each respondent. In the current context of measuring food security, standard statistical tests suggested a relatively good "fit" of the data to the underlying model. Below, the food security concept is introduced empirically by first presenting descriptive data on individual aspects of food security. Then, tabulations based on the overall food security index are presented.

1. Aspects of Food Security

Obtaining adequate food, as measured by concern about and adequacy of the household's food supply or resources for food, is a greater problem for FSP participants than for either eligible or near-eligible nonparticipants (Table III.1). More than 60 percent of the FSP participants reported worrying about their food supply running out, and more than half reported actually running out of food. (The corresponding percentages for the nonparticipant groups ranged from 32 to 43.) Almost half of participants (46 percent) reported not always being able to afford to eat properly as compared to 31 and 23 percent for the nonparticipant groups.[1]

The measurement of food security for households with children under the age of 18 included a specific set of questions regarding the ability of the household to feed the children adequately. These included survey items about not being able to provide (1) balanced meals, (2) enough food, or (3) a varied diet. Participants were more likely than nonparticipants to report difficulty providing balanced meals or enough food for the children (Table III.2). However, the eligible nonparticipants were as likely as participants to report relying on a few kinds of food to feed the children because of a lack of money.

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[1]Appendix I contains complete response frequencies for all the items on the food security scale.

TABLE III.1

SELECTED INDICATORS OF FOOD INSECURITY AMONG PARTICIPANTS AND NONPARTICIPANTS

	Study Group		
		Nonparticipants	
Characteristic	Participants	Eligible	Near-Eligible
Percentage of Respondents Who in the Past 12 Months Were Sometimes or Often Worried Whether Their Household's Food Would Run Out Before They Got Money to Buy More			
Sometimes Worried	40.0	30.7	26.8
Often Worried	22.3	12.7	5.4
Sometimes or Often Worried	62.3	43.4	32.2
Percentage of Respondents Who in the Past 12 Months Sometimes or Often Ran Out of Food and Didn't Have Money to Get More			
Sometimes Ran Out	37.5	26.8	17.8
Often Ran Out	15.6	8.7	5.1
Sometimes or Often Ran Out	53.1	35.4	22.8
Percentage of Respondents Who in the Past 12 Months Sometimes or Often Couldn't Afford to Eat Properly			
Sometimes Couldn't Afford to Eat Properly	32.5	20.5	17.3
Often Couldn't Afford to Eat Properly	13.2	10.4	5.8
Sometimes Couldn't Afford to Eat Properly	45.6	30.9	23.0
Sample Size	**2,454**	**450**	**405**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

NOTE: Sample sizes may be slightly lower in some cells because of item nonresponse. However, in no cell is item nonresponse greater than one percent of sample size shown.

TABLE III.2

SELECTED INDICATORS OF FOOD INSECURITY AMONG PARTICIPANTS AND NONPARTICIPANTS WITH CHILDREN UNDER 18 YEARS OF AGE

	Study Group		
		Nonparticipants	
Characteristic	Participants	Eligible	Near-Eligible
Percentage of Respondents Who in the Past 12 Months Sometimes or Often Couldn't Afford to Feed the Children a Balanced Meal			
Sometimes Worried	25.1	19.9	16.6
Often Worried	5.2	6.1	2.4
Sometimes or Often Worried	30.3	26.0	19.1
Percentage of Respondents Who in the Past 12 Months Sometimes or Often Couldn't Afford to Provide Enough Food to Their Children			
Sometimes Ran Out	17.6	12.3	10.8
Often Ran Out	3.4	3.4	1.9
Sometimes or Often Ran Out	21.0	15.6	12.7
Percentage of Respondents Who in the Past 12 Months Sometimes or Often Relied on a Few Kinds of Food to Feed Their Children Because They Were Running Out of Money to Buy Food			
Sometimes Couldn't Afford to Eat Properly	31.1	33.5	21.0
Often Couldn't Afford to Eat Properly	7.9	6.0	5.3
Sometimes or Often Couldn't Afford to Eat Properly	39.0	39.6	26.3
Sample Size	**1,522**	**182**	**204**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

NOTE: Sample sizes may be slightly lower in some cells because of item nonresponse. However, in no cell is item nonresponse greater than one percent of sample size shown.

Two additional measures used to determine the severity of food insecurity were (1) the frequency of cutting or skipping meals, and (2) the frequency of going without food for a whole day because of a lack of food or money (Table III.3). The prevalence of having to serve smaller meals or skip them entirely was greater among participants than among either group of nonparticipants, with slightly less than one-third of participants reporting this experience (31 percent) as compared to 24 percent and 19 percent for the two nonparticipant groups. More than one-third of the participants (34 percent) and eligible nonparticipants (36 percent) who reported cutting or skipping meals said they did so almost every month. A slightly smaller proportion of near-eligible nonparticipants (29 percent) who cut or skipped meals did so with this frequency. Fewer than 10 percent of the survey respondents went without food for a whole day because of lack of food or money. This included eight percent of participants, seven percent of eligible nonparticipants and four percent of near-eligible nonparticipants.

2. Overall Levels of Food Security

Using the 18 questions presented in Exhibit III-1, the food security scale was estimated for each sample member, with the procedures developed by Hamilton et al. (1997). Each household was assigned to one of four discrete food security levels: (1) food secure, (2) food insecure without hunger, (3) food insecure with moderate hunger, and (4) food insecure with severe hunger. A household answering all 18 questions is classified as food secure if it reports two or fewer experiences with food insecurity (that is, answers affirmatively to no more than two of the questions). Those classified as food insecure without hunger were those answering affirmatively to between three and seven of the component questions. A classification of food insecurity with moderate hunger reflected affirmative answers to 8 to 12 questions. Households were classified as

TABLE III.3

FREQUENCY OF CUTTING/SKIPPING MEALS OR GOING WITHOUT FOOD FOR A WHOLE DAY BECAUSE OF LACK OF FOOD OR MONEY

	Study Group		
		Nonparticipants	
Characteristic	Participants	Eligible	Near-Eligible
Percentage of Households Who in the Past 12 Months Ever Cut the Size of Their Meals or Skipped Meals Because There Wasn't Enough Money for Food	30.9	23.7	18.5
Percentage Distribution of How Often This Happened Among Those Cutting or Skipping Meals[a]			
Almost every month	34.2	36.3	29.1
Some months but not every month	39.9	35.7	37.9
Only one or two months	25.6	27.1	32.9
Percentage of Households Who in the Past 12 Months Ever Went Without Eating for a Whole Day Because There Wasn't Enough Money for Food	8.2	7.3	3.9
Percentage Distribution of How Often This Happened Among Those Not Eating for a Whole Day[b]			
Almost every month	24.8	33.1	37.8
Some months but not every month	42.4	36.4	24.4
Only one or two months	32.3	30.6	37.8
Sample Size	**2,454**	**450**	**405**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

NOTE: Sample sizes may be slightly lower in some cells because of item nonresponse. However, in no cell is item nonresponse greater than one percent of sample size shown.

[a] Sample sizes for the three columns are 789, 107, and 75, respectively.

[b] Sample sizes for the three columns are 221, 33, and 16, respectively.

experiencing food insecurity with severe hunger if they answered more than 12 of the 18 questions affirmatively.

Slightly more than half the FSP participants in the study sample were classified as food secure, according to the scale. Approximately 28 percent were classified as food insecure but not experiencing hunger. Seventeen percent were food secure and experienced some hunger, while the remainder, five percent, experience food insecurity and severe hunger.

As indicated in Table III.4, FSP participants in the survey experience one of the three levels of food insecurity more frequently than eligible or near-eligible nonparticipants (50 percent as compared to 34 percent and 25 percent, respectively). A comparison of participants to these nonparticipant groups also indicates that for all groups, most of those who are food insecure are in the least-severe category and are not experiencing direct hunger. However, 21 percent of participants do experience food insecurity with at least some hunger compared to 14 percent of eligible nonparticipants and 10 percent of near-eligible nonparticipants. Only three to five percent of the various groups were classified into the most-severe hunger category.

When the sample is compared to the overall U.S. population (Table III.5), food insecurity is seen to be much more prevalent and severe among all study groups. For instance, the overall population estimates place the percentage of households that are food secure at 88 percent, as compared to 50 percent for FSP participants. Also, less than one percent of the population nationally is classified as food insecure with severe hunger, compared to about five percent of the NFSPS participant sample. These differences reflect the much higher average income levels in the overall population. A comparison to the U.S. population with income below 130 percent of the poverty level indicates more similarities, particularly between the food security levels of the eligible nonparticipants and the overall population living in poverty. For instance, 32 percent of the national

TABLE III.4

FOOD SECURITY AMONG PARTICIPANTS AND NONPARTICIPANTS

	Study Group		
		Nonparticipants	
Constructed Food Security Scale	Participants	Eligible	Near-Eligible
All Households			
Food Secure	50.4	65.9	75.3
Food Insecure Without Hunger	28.1	20.4	15.2
Food Insecure with Moderate Hunger	16.6	9.4	6.3
Food Insecure with Severe Hunger	4.9	4.4	3.3
Sample Size	**2,396**	**436**	**396**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

TABLE III.5

COMPARISON WITH FOOD INSECURITY LEVEL FOR OTHER POPULATIONS

	Food Secure	Food Insecure Without Hunger	Food Insecure with Moderate Hunger	Food Insecure with Severe Hunger
Participants	50.4	28.1	16.6	4.9
Eligible Nonparticipants	65.8	20.4	9.4	4.4
Near-Eligible	75.3	15.2	6.3	3.3
Overall U.S. Population	88.1	7.8	3.3	0.8
Overall U.S. Population Below 130 Percent of Poverty Level	68.1	20.0	9.3	2.6

SOURCE: First three rows: 1996 National Food Stamp Program Survey, weighted data. Last two rows are from Hamilton et al. (1997).

population below 100 percent of the poverty line is estimated to be insecure, as compared to 50 percent of FSP participants, 34 percent of eligible nonparticipants, and 25 percent of near-eligible nonparticipants. The fact that the participant sample has lower rates of food security than the overall population of households below 130 percent of poverty is consistent with the fact that the likelihood of participating in the FSP is highest among the lowest income groups (see Ponza 1998).

B. HOUSEHOLD CHARACTERISTICS ASSOCIATED WITH FOOD INSECURITY

To understand the dynamics of food security better, selected household characteristics of FSP participants and of eligible and near-eligible nonparticipants experiencing food insecurity were analyzed. A descriptive analysis of household characteristics (size, income, presence of elderly member, age of children in household, employment status, and food stamp benefit per capita) among the FSP participants (Table III.6) indicates that household characteristics do not appear to influence the food security level substantially. The only substantial apparent influencing factor is the presence of an elderly person in the household: those with elderly members were somewhat more likely to be food secure than all household types (58 percent versus 50 percent).

An in-depth analysis of the relationships between household characteristics and food security was developed using logit regression modeling to estimate the marginal effects of household characteristics on whether households experience food security or food insecurity without hunger versus food insecurity with any type of hunger. For each row, the entry in Table III.7 can be interpreted as showing the estimated effect of the corresponding independent variable on the probability of being in one of the "hunger" categories. For instance, the entry under "one-person household" of 7.22 indicates that being in a one-person household increases the estimated probability of being in one of the "hunger" categories by about seven percentage points. The logit model developed for participants confirms the finding of the descriptive analysis, showing that having an

TABLE III.6

FOOD SECURITY LEVELS OF FOOD STAMP PROGRAM PARTICIPANTS, BY HOUSEHOLD CHARACTERISTICS

	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger	Sample Size
All Households	**50.4**	**28.1**	**16.6**	**4.9**	**2,396**
Number in Household					
1	51.7	22.6	19.7	6.0	596
2 to 3	51.1	28.4	15.7	4.8	940
4 to 5	48.4	32.0	16.0	3.6	653
6 or More	50.0	29.7	14.3	6.0	207
Number of Children Under 18 in Household					
0	50.7	25.8	18.3	5.3	901
1	54.6	28.3	12.9	4.2	446
2	50.0	27.8	17.0	5.2	494
3 or More	47.0	31.7	16.8	4.6	555
Presence of Children					
Under 5	55.2	25.3	15.5	4.1	458
5 to 12	52.5	27.5	15.9	4.1	518
13 to 18	52.5	28.1	14.5	4.9	311
Income as Percentage of Poverty					
Below 50 Percent	50.8	29.0	14.3	5.9	869
50 to 74	48.3	30.3	17.9	3.5	546
75 to 99	50.2	25.0	19.2	5.5	523
100 or More	51.1	26.3	18.3	4.4	365
Household with Elderly Member	58.0	25.8	12.9	3.2	644
Household with Wage Income	50.6	28.5	17.2	3.7	733

TABLE III.6 *(continued)*

	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger	Sample Size
Food Stamp Benefits per Household Member					
Less than $20	48.2	24.7	23.4	3.8	347
$20 to $39	52.2	31.9	11.6	4.3	442
$40 to $59	50.8	29.2	15.7	4.4	493
$60 or More	50.3	27.6	16.9	5.2	1,076

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

TABLE III.7

MULTIVARIATE LOGIT ANALYSIS OF THE DETERMINANTS OF FOOD INSECURITY AMONG PARTICIPANTS

Variable	Marginal Effect on Food Insecurity[a]
Income Less Than 100 Percent of Poverty Level	-4.05
Household Has Earned Income (Has an Employed Household Member)	-2.51
One-Person Household	7.22**
Household Includes an Elderly Person	-9.47**
Urban Location	3.95
Mixed Urban and Rural Location	5.28
Presence of Child Under 5	-2.77
Presence of Child 5 to 12	-0.91
Presence of Child 13 to 18	-2.30

SOURCE: 1996 National Food Stamp Program Survey. Sample size = 2,396.

NOTE: Missing value flags were used in the regressions to account for missing data on certain of the variables. For clarity of exposition, these are not included in this table.

[a]Entries in the column show the estimated marginal effect of the variables on the probability of the household being classified in one of the two food security categories involving hunger.

**Significantly different from zero at the .05 level, two-tailed test.

elderly person in a household decreases by about nine percentage points the chances of a household experiencing hunger (Table III.7). (Two other variables that were included in an earlier version of the analysis, receipt of food stamps through electronic benefit transfer (EBT) and whether the household had been on food stamps for at least three years, were not statistically significant and were dropped.)

The descriptive analysis for eligible nonparticipants indicated some household characteristics that may be related to food security levels; however, most are not statistically significant in the logit analysis (Table III.8 and III.9). Table III.8 indicates that households with more than one person, lower income levels, or earned wages were more likely to experience food insecurity and that households with an elderly member were less likely to do so. However, the logit analysis finds the presence of an elderly person in a household to be the only substantiative variable that is statistically significant. Having an elderly person in an eligible nonparticipant household decreased the chances of experiencing hunger by 13 percentage points.

The data analyses for near-eligible nonparticipants follow a similar pattern. The descriptive analysis suggests some variance in food security levels of households with different characteristics (Table III.10). Once again, households with an elderly member were more likely than all households to be food secure (91 percent versus 75 percent). Also, households with income between 75 and 99 percent of the poverty level were less likely to be food secure (65 percent) than households with either higher or lower income levels. The logit analysis found only the presence of an elderly person in the household to be statistically significant, decreasing the chance of experiencing hunger by 14 percentage points (Table III.11).

TABLE III.8

FOOD SECURITY LEVELS FOR ELIGIBLE NONPARTICIPANTS,
BY HOUSEHOLD CHARACTERISTICS
(Entries Are Row Percentages)

	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger	Sample Size
All Households	65.9	20.4	9.4	4.4	436
Number in Household					
1	70.7	14.4	10.4	4.5	134
2 to 3	75.0	16.8	5.3	2.9	169
4 to 5	50.2	28.6	15.5	5.7	105
6 or More	46.6	39.1	7.0	7.3	28
Number of Children Under 18 in Household					
0	76.0	12.5	7.3	4.2	257
1	59.1	28.3	9.4	3.2	63
2	49.6	27.0	15.5	7.8	52
3 or More	45.1	38.8	12.8	3.2	64
Presence of Children					
Under 5	52.1	33.2	9.9	4.8	82
5 to 12	47.5	32.5	15.4	4.6	113
13 to 18	54.1	30.3	9.4	4.4	65
Income as Percent of Poverty					
Below 50 Percent	56.6	24.8	11.1	7.5	65
50 to 74	58.9	28.2	10.6	2.2	92
75 to 99	65.7	16.5	11.5	6.3	114
100 or More	65.2	22.6	7 .9	4.3	115
Household with Elderly Member	79.9	12.3	5.7	2.0	192
Household with Wage Income	57.4	27.4	11.0	4.3	230

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

TABLE III.9

MULTIVARIATE LOGIT ANALYSIS OF THE DETERMINANTS OF FOOD INSECURITY AMONG ELIGIBLE NONPARTICIPANTS

Base Assumption	Marginal Effect on Food Insecurity[a]
Income Less than 100 Percent of Poverty Level	3.54
Household Has Earned Income (Has an Employed Household Member)	-3.12
One-Person Household	9.43
Household Includes an Elderly Person	-12.60**
Urban Location	-6.53
Mixed Urban and Rural Location	-4.43
Presence of Child Under 5	-3.26
Presence of Child 5 to 12	6.70
Presence of Child 13 to 18	0.85

SOURCE: 1996 National Food Stamp Program Survey. Sample size = 436.

NOTE: Missing value flags were used in the regressions to account for missing data on certain of the variables. For clarity of exposition, these are not included in this table.

[a]Entries in the column show the estimated marginal effect of the difference in the assumptions shown on the probability of the household being classified in one of the two food security categories involving hunger.

**Significantly different from zero at the .05 level, two-tailed test.

TABLE III.10

FOOD SECURITY LEVELS FOR NEAR-ELIGIBLE NONPARTICIPANTS, BY HOUSEHOLD CHARACTERISTICS
(Entries Are Row Percentages)

	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger	Sample Size
All Households	75.3	15.2	6.3	3.3	396
Members in Household					
1	80.5	9.8	7.2	2.5	83
2 to 3	75.9	14.1	6.9	3.1	160
4 to 5	71.2	19.1	6.2	3.5	112
6 or More	73.2	19.5	2.3	5.0	41
Number of Children Under 18 in Household					
0	81.4	9.4	7.7	1.5	195
1	70.4	21.4	4.9	3.3	59
2	64.8	25.2	5.0	5.0	59
3 or More	71.9	17.2	4.9	6.1	83
Presence of Children					
Under 5	70.5	22.0	3.7	3.9	78
5 to 12	70.4	19.3	4.7	5.6	125
13 to 18	67.9	19.9	3.2	9.1	99
Income as Percentage of Poverty					
Below 50 Percent	76.8	16.3	3.5	3.4	56
50 to 74	77.9	18.5	0.0	3.6	27
75 to 99	65.1	24.2	8.0	2.7	37
100 or More	74.4	13.8	8.3	3.5	231
Household with Elderly Member	90.9	7.5	1.6	0.0	123
Household with Wage Income	69.7	18.6	8.3	3.5	231

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

TABLE III.11

MULTIVARIATE LOGIT ANALYSIS OF THE DETERMINANTS OF FOOD INSECURITY AMONG NEAR-ELIGIBLE PARTICIPANTS

Variable	Marginal Effect on Food Insecurity[a]
Income Less Than 100 Percent of Poverty Level	-6.31
Household Has Earned Income (Has an Employed Household Member)	-4.08
One-Person Household	2.49
Household Includes an Elderly Person	-13.68**
Urban Location	0.64
Mixed Urban and Rural Location	5.47
Presence of Child Under 5	-3.16
Presence of Child 5 to 12	-1.25
Presence of Child 13 to 18	0.89

SOURCE: 1996 National Food Stamp Program Survey. Sample size = 396.

NOTE: Missing value flags were used in the regressions to account for missing data on certain of the variables. For clarity of exposition, these are not included in this table.

[a]Entries in the column show the estimated marginal effect of the variable on the probability of the household being classified in one of the two food security categories involving hunger.

**Significantly different from zero at the .05 level, two-tailed test.

C. PERCEIVED REASONS FOR NOT HAVING ENOUGH FOOD

To understand better why households did not always have enough food, respondents reporting that they did not always have enough food in the household were asked about their perceived reasons for this experience. Almost all respondents mentioned not having enough money (Table III.12), and this was also considered to be the most important reason by most respondents (not shown).

After lack of money, difficulty in getting to the store was the reason participants mentioned second most frequently (31 percent) for not having enough food, followed by not being able to cook or eat because of health problems (15 percent). Health problems were also frequently cited by the eligible nonparticipant households (22 percent). (About a third of respondents mentioning health problems were elderly.) The other problem cited frequently was having difficulty getting to the store (24 percent). Among the near-eligible nonparticipants, about 18 percent mentioned having difficulty getting to the store and 8 percent mentioned not being able to cook or eat because of health problems.

D. COPING MECHANISMS USED BY HOUSEHOLDS

People concerned about the adequacy of their food supply can take several actions to stretch or supplement the food they have. These "coping mechanisms" may prevent food insecurity in some households or lessen its severity or frequency in others. Table III.13 presents data regarding the use of selected coping mechanisms among participants, eligible nonparticipants, and near-eligible nonparticipants. For each of the most insecure categories, substantial majorities reported such coping patterns as putting off bills and relying on help from friends and relatives.[2] Drawing on emergency food sources, such as food pantries, was also common, particularly for FSP participants.

[2]One surprising pattern in the data is that for eligible nonparticipants, reported use of the various coping mechanisms is lower for households classified as having severe hunger than it is for households classified as experiencing moderate hunger. It is likely that this is due to sampling variation, since the sample sizes in the severe hunger category are extremely small.

TABLE III.12

AMONG THOSE WHO DO NOT HAVE ENOUGH FOOD TO EAT IN THEIR HOUSEHOLD, REASONS FOR NOT HAVING ENOUGH TO EAT
(Percentage of Individuals by Type of Reason)

		Nonparticipants	
	Participants	Eligible	Near-Eligible
Not Enough Money for Food	94.0	95.6	85.5
Too Hard to Get to the Store	30.6	24.0	18.2
No Working Stove	3.2	8.8	3.9
No Working Refrigerator	3.7	4.4	5.9
Not Able to Cook or Eat Because of Health Problems	14.6	21.6	8.1
Sample Size	**501**	**67**	**48**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

NOTE: Percentages add to more than 100, because multiple responses were allowed.

TABLE III.13

COPING MECHANISMS AND FOOD SECURITY AMONG PARTICIPANTS
(Percentages of Respondents Reporting Using Various Coping Mechanisms)

	Food Security Level			
Coping Mechanism	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger
Participants				
Participants Borrowed Money or Food	18.1	42.7	64.7	78.8
Put Off Bills	22.0	58.1	77.7	85.1
Emergency Food Use	8.7	19.2	30.4	50.3
Soup Kitchen Use	1.2	3.7	4.8	13.4
Sample Size	**1,161**	**709**	**401**	**121**
Eligible Nonparticipants				
Borrowed Money or Food	10.7	39.3	77.8	74.1
Put Off Bills	16.7	63.9	83.4	79.3
Emergency Food Use	2.8	19.1	31.5	20.7
Soup Kitchen Use	0.0	1.1	12.1	5.1
Sample Size	**287**	**89**	**41**	**19**
Near-Eligible Nonparticipants				
Borrowed Money or Food	9.1	34.8	55.5	76.6
Put Off Bills	24.4	59.5	72.3	84.3
Emergency Food Use	1.3	5.3	7.8	31.1
Soup Kitchen Use	0.0	0.0	0.0	0.0
Sample Size	**297**	**60**	**25**	**13**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

NOTE: Percentages add to more than 100, because multiple responses were allowed.

The participant households and both sets of nonparticipant households followed similar patterns, reporting the use of the various coping mechanisms in the following order of frequency: putting off bills, borrowing money, using food pantries, and, finally, eating at a soup kitchen. (None of the near-eligible nonparticipants reported eating at a soup kitchen.) As is evident from the data, the proportion of households reporting the use of each coping mechanism increased as the severity of food insecurity increased, except for eligible nonparticipants.

E. RELATIONSHIP BETWEEN FOOD SECURITY AND FOOD SUFFICIENCY LEVELS

Additional perspectives on the food security measure can be gained by comparing it to another measure that has been used in the past to assess households' food status: "food sufficiency." This measure, which has been used on both the NFCS and the CSFII, asks households to characterize the adequacy of the food available to them by choosing one of the following categories:

- Enough of the right kinds of food
- Enough but sometimes not the right kinds of food
- Sometimes not enough food
- Often not enough food

Typically, this is done through instrumentation consisting of a single question or a short sequence of questions. The NFSPS also included a food sufficiency question in addition to the food security items. Since much of the research that immediately preceded the development of the food security concept focused on food insufficiency issues, it is of interest to examine the degree to which the two concepts are related empirically. This is of methodological interest in itself and helps establish linkages between the current study and earlier work.

As shown in Table III.14, there is a substantial degree of overlap between households' responses on the food sufficiency questions and their food security status classifications. For instance, among households classified as "having enough of the right kinds of food," 85 percent are classified at the highest level of food security, with most of the rest (10 percent) at the second-highest food security category. By contrast, when households classified as "often" not having enough food are examined, only 15 percent and 18 percent, respectively, are classified in one of the two highest food security categories, and 29 percent are classified in the most insecure food security status category. To be sure, the correlations are far from perfect. Nevertheless, the substantial association between the two measurement constructs is clear.

F. CONCLUSIONS

About half of FSP participants experienced at least some level of food insecurity during the 12-month period covered by the relevant questions. Most of those with food insecurity were classified as food insecure without hunger. However, approximately 21 percent of participants were classified as experiencing some hunger. The analysis also indicates that substantial numbers of eligible and near-eligible nonparticipants also experience some degree of food insecurity, but the percentages for nonparticipants are lower than for the participant group.

In general, the likelihood of being food insecure does not appear to be highly correlated with the household characteristics examined in the chapter. An exception to this, however, is that having an elderly member increases the probability of a household being classified as food secure.

Among the coping mechanisms examined for dealing with food insecurity, the one mentioned most often was putting off paying bills. Borrowing money or food was also a relatively common method of coping. Among the participants classified into the most severe food insecurity category, approximately 50 percent had obtained emergency food from some source such as a food bank, while about 14 percent indicated that they had eaten meals at a soup kitchen or similar place.

TABLE III.14

FOOD SUFFICIENCY AND FOOD SECURITY
(Entries Are Row Percentages)

	Food Security Level					
Food Sufficiency	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger	Sample Size	Overall Food Sufficiency Distribution
Enough of the Right Kinds of Foods	85.2	10.3	3.6	0.9	1,378	49.8
Enough; Not Always the Right Kinds of Foods	50.0	34.3	12.7	3.0	1,235	34.0
Sometimes Not Enough Foods	14.8	36.4	34.3	14.6	467	13.0
Often Not Enough Foods	15.3	18.1	37.6	28.9	126	3.3
Overall Food Security Distribution	61.8	22.1	11.8	4.3		

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

IV. STORE ACCESS AND FOOD SECURITY

This chapter examines the potential relationship between food security and access to stores by FSP participants and other low-income people. Some observers have suggested that lack of access to retail food stores may be a significant barrier to good nutrition for many low-income households, as a result of poor transportation opportunities, limited numbers of good food stores in low-income areas, and other factors. Here, the issues using the NFSPS data are examined.

A. BACKGROUND

It is often suggested that low-income households, especially those in poor urban areas and sparsely populated rural areas, have only limited access to food retailers and that this poses a significant obstacle for FSP participants in using program benefits efficiently and effectively. Low-income households may not have access to a car and may be limited to using stores that they can reach on foot or by public transportation. This in itself is a significant limitation on access in comparison with shopping patterns for middle-income households. The situation may be compounded by limitations in shopping opportunities in areas with high concentrations of low-income households. Many observers believe that major retailers shun low-income areas because of concerns about security, limited consumer purchasing power, and other factors. Some analysts also believe that stores in low-income areas charge higher prices and provide lower-quality merchandise (see Kaufman et al. 1997, Appendix A for a useful literature review).

These issues are of concern in the context of the FSP, because they relate directly to the effectiveness with which its policies can be carried out through the "normal means of trade," as specified in the program's authorizing legislation. They also interact with food stamp policy issues, since FSP participant access to stores is dependent upon what stores are authorized to accept food stamps. More generally, analyzing the degree to which low-income households have access to stores, and the shopping decisions they make in the context of those choices, sheds light on the constraints they face in securing nutritious diets.

From a conceptual perspective, ensuring access to food retailers by low-income households involves factors related both to the existence of food stores at reasonable distances from the households and to the ability of low-income households to get to those stores. Further, assessing the availability of stores in a meaningful way depends both on examining where the stores are located and on assessing the quality of the shopping opportunities they offer, in terms of prices, quality of merchandise, variety of merchandise, and other factors. Similarly, the ability of households to reach stores readily depends not only on the stores' locations but also on whether a household has access to a car and on what other means of transportation are available.

The completed FNS Authorized Food Retailer Characteristics Study (Mantovani et al. 1997) provided extensive insight into the store side of this "access equation." That study examined the availability of various types of food stores in both urban and rural areas throughout the country. For a sample of the stores, it also obtained data on the prices charged for a standard set of food items, as well as on other characteristics.

The key findings of that study suggest greater degrees of access to stores by low-income households than many observers had expected. The study found that most Americans, both low- and high-income, rely on supermarkets or large grocery stores for the bulk of their shopping and that, nationally, "90 percent of the total population and 90 percent of the population in poverty live in areas with at least one supermarket or large grocery present." Proximity to stores was less common in rural areas but did not vary by the poverty level of the population. Apparently, scarcity of food stores in rural areas is mostly a result of retailers' efforts to gain economies of scale.

The study also concluded that there did not appear to be major cost differences in areas with different poverty concentrations: "There appears to be little effect on the cost, selection, or quality of food [in higher-poverty areas]." If anything, supermarkets in low-income areas appeared to have slightly lower prices.

While the Mantovani et al. study greatly increases understanding of store access by low-income households, it focused on the issue only from the point of view of the stores. The current survey has obtained complementary information by asking respondents about their food shopping experiences, their transportation to food stores, their food shopping patterns, and their perceptions of the adequacy of their food shopping opportunities.

To the extent that limitations to shopping opportunities really are an important barrier to nutrition for low-income households, one might assume a positive association between access to stores and measured food security. A companion report (Ohls et al. 1999) discussed several overall issues related to access to stores by the study population. This report focuses principally on the issue of whether food security and store access are associated.

B. STORE ACCESS IN THE NFSPS SAMPLE

As background for presenting the relevant food security data, Table IV.1 presents selected measures of store access. As shown in the top panel of the table, the majority of FSP households live quite near a supermarket. Overall, approximately 54 percent reported that there was a supermarket within a mile of their home. Another 35 percent of households live one to four miles from a supermarket.

TABLE IV.1

ACCESS TO STORES
(Entries Are Column Percentages)

		Nonparticipants	
Characteristic	Participants	Eligible	Near-Eligible
Distance to Nearest Supermarket (Miles)			
Less than 1	54.0	NA	NA
1 to 4	35.0	NA	NA
More than 4	11.0	NA	NA
Sample Size	589	NA	NA
Distance to Store Usually Used			
Less than 1	30.9	27.2	24.2
1 to 4	34.8	36.5	34.8
More than 4	34.5	36.3	41.1
Sample Size	2,243	408	379
Satisfaction with Shopping Situation in Neighborhood			
Satisfied or Very Satisfied	71.2	78.9	83.1
Dissatisfied or Very Dissatisfied	28.8	21.1	16.9
Sample Size	2,370	426	392
Rank Usual Store as Good/Excellent on 8 or More of 11 Criteria?			
Yes	77.6	77.8	76.8
No	22.4	22.2	23.2
Sample Size	2,454	450	405
Have Access to Car?			
Yes	73.9	86.4	94.7
No	26.1	13.6	5.3

TABLE IV.1 *(continued)*

Characteristic	Participants	Nonparticipants: Eligible	Nonparticipants: Near-Eligible
Sample Size	2,454	450	405
Have Access to Car or Get Rides with Friends, Relatives			
Yes	83.1	90.4	96.4
No	16.9	9.6	3.6
Sample Size	2,454	450	405
Round-Trip Travel Time			
Less than 30 min.	66.3	65.1	69.0
30 Minutes to 1 Hour.	24.3	23.4	22.8
1 to 2 Hours	7.2	9.4	7.2
Over 2 Hours	2.3	1.6	1.0
Sample Size	2,343	426	391
Transportation Usually Used			
Car	44.5	71.0	86.4
Get Ride with Friend or Relative	31.3	13.7	6.5
Walk	13.8	5.1	3.5
Take a Bus	3.8	2.7	0.7
Other	6.6	7.6	3.0
Sample Size	2,454	450	405
Out-of-Pocket Costs			
Nothing	79.5	91.1	97.8
$.01 to $2.00	2.8	1.8	0.5
Over $2.00	17.7	7.1	1.7
Sample Size	2,454	450	405

SOURCE: 1996 National Food Stamp Program Survey, weighted tabulations.

NA = not available.

Interestingly, the data suggest that considerable numbers of food stamp households travel to a store which is farther away than the closest supermarket. Only 31 percent regularly use a food store that is less than a mile from their home.[1]

Approximately 71 percent of households rated themselves as either "satisfied" or "very satisfied" with the shopping situations in their neighborhood. Further, when asked to rank the stores where they usually shopped (which, as shown above, were not necessarily in their neighborhoods), 78 percent of the respondents ranked the stores as excellent or good on most dimensions.

Approximately 74 percent of program participants have access to a car. Another nine percent report usually being able to get to their regular store by obtaining a ride with friends or relatives. Participants (44.5 percent) were less likely to use a car for grocery shopping than were either eligible (71 percent) or near-eligible (86.4 percent) nonparticipants. Conversely, they were more likely to get a ride with a friend or relative or to walk to the store. However, participants had more out-of-pocket costs associated with grocery shopping than did either group of nonparticipants. Overall, these findings suggest that most FSP recipients and other low-income households perceive themselves to have quite satisfactory access to retail food shopping opportunities. Nonetheless, there is a minority of low-income households that may not have satisfactory shopping opportunities. The analysis now turns to an examination of whether there are any clear associations between measures of store access and food security.

[1]The "store where usually shop" variable includes all types of stores, not just supermarkets. However, it is known from other work (see Ohls et al. 1999) that more than 85 percent of food stamp households use a supermarket as their main store.

C. ASSOCIATIONS OF STORE ACCESS AND FOOD SECURITY

Households with access to a car are somewhat more likely to be food secure than those without access to a car; however, the differences are small: 52 percent versus 46 percent (Table IV.2). It is important to note that this association does not necessarily indicate causality. While it is possible that having access to a car tends to increase a household's ability to achieve food security, it is also likely that having access to a car is correlated with income or other factors that are themselves associated with food security.

When store access is gauged in terms of distance to the nearest supermarket, the lowest degree of food security is estimated for the households living less than a mile away, with 43 percent of them estimated to be food secure.[2] This percentage rises to 46 percent for households that are one to four miles from the nearest supermarket but falls back to 42 percent for households more than four miles away.[3] A similar pattern is observed for the tabulations based on distances that households travel to shop. The group in the middle-distance range, one to four miles, has slightly higher levels of food security than the lower- or higher-distance groups. A variable indicating whether households with the double problem of not having a car *and* the nearest supermarket being more than a mile away also did not seem to be correlated with participants' levels of food security.

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[2]Note that the tabulations based on distance to the nearest supermarket are based on a much smaller sample size than others, because the "nearest supermarket" tabulations include only in-person interviews for which it was possible to geocode the necessary location data. This is the reason that the estimated distribution of these households across the four food security classes differs somewhat from the distribution in the other panels of the table.

[3]Households for which the nearest supermarket was less than one mile were mostly (72 percent) urban. Households reporting that the nearest supermarket was one to four miles were 59 percent urban, with most of the remainder living in mixed uran and rural places.

TABLE IV.2

FOOD SECURITY AND ACCESS TO STORES
(Entries Are Row Percentages)

	Sample Size	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger
Participants					
Households with Access to Car					
Yes	1,770	52.0	27.8	16.0	4.2
No	626	45.9	28.8	18.3	6.9
Distance to Nearest Supermarket (Miles)					
Less than 1	304	42.8	34.3	17.4	5.5
1 to 4	215	46.2	30.0	20.2	3.6
More than 4	66	41.8	26.6	21.7	9.9
Distance to Store Usually Used					
Less than 1	629	46.9	30.6	16.3	6.1
1 to 4	743	52.3	26.9	16.9	3.9
More than 4	825	50.4	28.0	16.0	5.6
No Car and >1 Mile from Nearest Store?[a]					
Yes 1	228	49.2	28.5	16.4	5.9
No 0	2,168	50.5	28.1	17.7	4.8
People “Satisfied” or “Very Satisfied” with Neighborhood Shopping Situation					
Yes 1	1,618	53.7	27.7	14.3	4.3
No 2	701	42.4	29.5	21.4	6.6
Round-Trip Travel Time					
Less than 30 Minutes	1,520	50.7	28.5	16.6	4.3
30 Minutes to 1 Hour	578	49.5	29.6	16.2	4.8
1 to 2 Hours	164	46.3	28.4	13.1	12.3
Over 2 Hours	34	44.9	26.4	25.8	3.0
Transportation Usually Used					
Car	1,086	52.4	27.0	16.4	4.3
Get Ride with Friend or Relative	791	52.4	29.3	14.6	3.7
Walk	294	40.6	32.7	19.7	7.0
Take a Bus	85	45.7	26.0	18.9	9.4
Other	140	50.6	2.8	20.3	7.4
Out-of-Pocket Costs					
Nothing	1,901	51.7	27.8	16.4	4.1
$.01 - $2.00	73	40.5	26.4	22.8	10.3
Over $2.00	422	46.0	29.7	16.6	7.7

TABLE IV.2 *(continued)*

	Sample Size	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger
Eligible Nonparticipants					
Households with Access to Car					
Yes	378	66.7	20.3	8 8	4.2
No	58	60.5	20.6	13.8	5.2
Distance to Store Usually Used					
Less than 1	109	68.6	21.0	8.6	1.8
1 to 4	146	61.7	22.6	9.5	6.2
More than 4	142	64.2	19.6	11.9	4.2
No Car and >1 Mile from Nearest Store?					
Yes	18	39.2	22.3	32.9	5.6
No	418	67.0	20.3	8.4	4.3
People "Satisfied" or "Very Satisfied" with Neighborhood Shopping Situation					
Yes 1	327	69.4	18.9	7.7	4.0
No 2	86	49.0	30.1	16.3	4.7
Round-Trip Travel Time					
Less than 30 Minutes	272	69.2	20.2	8.1	2.6
30 Minutes to 1 Hour	95	63.0	19.0	9.5	8.5
1 to 2 Hours	40	40.3	29.3	25.2	5.1
Over 2 Hours	6	65.3	34.7	0.0	0.0
Transportation Usually Used					
Car	309	67.4	20.0	8.7	3.9
Get Ride with Friend or Relative	61	62.2	21.4	11.5	4.9
Walk	23	47.8	34.4	9.2	8.6
Take a Bus	11	55.4	17.9	17.9	8.8
Other	32	74.8	12.5	9.8	3.0
Out-of-Pocket Costs					
Nothing	398	67.4	20.1	8.3	4.3
$.01 to $2.00	7	56.6	13.9	16.0	13.5
Over $2.00	31	48.4	25.8	22.5	3.3
Near-Eligible Nonparticipants					
Households with Access to Car					
Yes	376	75.0	15.2	6.6	3.2
No	20	79.7	15.4	0.0	4.9
Distance to Store Usually Used					
Less than 1	90	79.4	14.0	4.4	2.2
1 to 4	128	75.5	12.7	6.3	5.5

TABLE IV.2 *(continued)*

	Sample Size	Food Secure	Food Insecure, No Hunger	Food Insecure, Moderate Hunger	Food Insecure, Severe Hunger
More than 4	153	73.3	16.9	7.2	2.6
No Car and >1 Mile from Nearest Store?[a]					
Yes	7	84.4	15.6	0.0	0.0
No	389	75.1	15.2	6.4	3.3
People"Satisfied"or"Very Satisfied" with Neighborhood Shopping Situation					
Yes 1	319	77.2	13.7	5.7	3.4
No 2	64	67.2	22.0	7.7	3.1
Round-Trip Travel Time					
Less than 30 Minutes	265	76.3	14.2	6.1	3.4
30 Minutes to 1 Hour	86	75.7	15.1	4.6	4.6
1 to 2 Hours	27	62.2	26.9	11.0	0.0
Over 2 Hours	4	52.0	24.1	23.9	0.0
Transportation Usually Used					
Car	344	74.8	16.0	5.8	3.5
Get Ride with Friend or Relative	23	81.9	9.6	8.6	0.0
Walk	14	72.1	13.5	7.7	6.3
Take a Bus	3	100.0	0.0	0.0	0.0
Other	12	74.1	9.4	16.5	0.0
Out-of-Pocket Costs					
Nothing	388	75.8	14.9	5.9	3.3
$.01 to $2.00	2	49.2	0.0	50.8	0.0
Over $2.00	6	47.2	36.5	16.3	0.0

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a]Includes all kinds of food stores.

Finally, FSP participants who report being satisfied or very satisfied with the shopping situations in their neighborhoods have a higher likelihood than dissatisfied participants of being food secure, 54 percent to 43 percent.

D. CONCLUSIONS

Overall, the data tend to show that households with good access to stores have somewhat higher levels of food security. The positive associations between food access and food security are greatest for the variables indicating access to a car and satisfaction with the neighborhood shopping situation. They are weakest for the distance variables.

V. NUTRIENT AVAILABILITY

In this chapter, the analysis is broadened by examining the nutrient availability levels of households in the NFSPS sample. Section A briefly describes the data used in the analysis. Section B provides an overview of selected characteristics of the sample as they relate to nutrient availability. Section C then describes the nutrient availability levels of the households in the sample. The determinants of nutrient availability are examined in a regression context in Section D.

A. OVERVIEW OF THE DATA

As discussed earlier, a key component of the data collection for the in-person sample of FSP participants was a seven-day food use interview, which obtained detailed data on all the foods used by the household out of home food supplies during a seven-day period (see Chapter II and Appendix A for details). The USDA nutrient data bank files used to process data from the CSFII (adapted as necessary for the food use concept) were then used to convert the data on food use to data on nutrient availability. Data on the numbers of meals eaten by household members from home food supplies and from other sources during the seven-day observation period were also collected.

The sample used in the analysis below consists of 957 seven-day food use interviews collected from FSP participants between May 1996 and December 1996. An additional 92 food use interviews covered a four-day period rather than a seven-day period and are not used in the present analysis.[1] Another 21 cases with food data are excluded from the current analysis because of missing information on data items other than the food use questions.

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[1]The four-day interviews were done as part of a methodological study, and comparisons between the four-day data and the seven-day data are presented and discussed in Appendix H.

It is important to realize that the food use concept used in the analysis in this chapter, which is the same as that used in previous USDA Nationwide Food Consumption Surveys, differs significantly from a second commonly used approach to measuring food use: 24-hour intake data collection. The food use data include all foods prepared or used at home but exclude food obtained and eaten outside the home, such as restaurant meals or meals at friends' homes. Also, foods taken from home food supplies but not actually eaten, such as waste in cooking and plate waste, are included in the food use concept but excluded from 24-hour intake data collection.

The food use data are of direct interest in themselves, in that they support an overall analysis of the nutrient availability of FSP participant households. In addition, they permit a first opportunity to examine relationships between nutrient availability and the recently developed food security concept.

B. NUTRITION-RELATED CHARACTERISTICS OF THE ANALYSIS SAMPLE

As background for the analysis of nutrient availability levels, it is useful to examine a number of characteristics of the sample, particularly several household size variables, which relate directly to nutrient availability. The average household in the sample contains approximately 3.0 persons (Table V.1). As might be expected, this number is considerably lower for households with elderly members (2.2 persons) than for those not containing an elderly person (3.3 persons).

It is common in nutrition analysis to normalize the household size variable for the nutritional requirements of the household members, using the concept of "adult male equivalents" (AMEs). Essentially, this measure scales the food energy requirements (based on RDAs) of each household member in relation to the food energy requirements of a 30-year-old adult male. For instance, a 30-year-old adult male has a food energy RDA of 2,900 kilocalories per day, while a 30-

TABLE V.1

SELECTED CHARACTERISTICS OF THE SAMPLE AVAILABLE FOR THE NUTRIENT AVAILABILITY ANALYSIS

	Household Without an Elderly Member	Household with an Elderly Member	All Households
Percentage with Elderly	0	100	27
Percentage with AFDC Income	44	10	35
Percentage with Children (Percent of Households)	77	19	61
Presence of Children			
Less than 1 yr	12	1	9
1 to 4	37	6	29
5 to 11	45	10	35
12 to 15	20	6	16
16 to 18	12	5	10
Percentage with Wage Income	34	12	28
Percentage Less than 75% Poverty	70	44	63
Persons in Household	3.30	2.15	2.99
Adult Male Equivalents (AMEs)	2.37	1.58	2.16
Average Total Number of Meals Eaten per Day per Person	2.6	2.6	2.6
Average Number Meals Eaten at Home per Day, per Person	2.2	2.4	2.2
Equivalent Nutrition Units (ENUs)[a]	2.03	1.41	1.86
Average Value of All Food Used from Home Food Supplies per Week	$64.08	$44.69	$58.88
Average Value of Purchased Food Eaten from Home Food Supplies per Week	$57.84	$41.19	$53.37
Sample Size	**694**	**262**	**957**

SOURCE: 1996 National Food Stamp Program Source data, weighted tabulation.

[a]Using food energy as the nutrient.

year-old woman has an RDA of 2,200 kilocalories. Therefore, a two-person household consisting of a couple in their thirties would have an AME household size of 1.76.[2] The average household in the sample has an AME of 2.2. Again the number is considerably lower for households with elderly members, 1.6 as compared to 2.4 for non-elderly households.

The typical household in the sample reported having eaten 54.6 meals in total during the seven-day observation period (not shown). Adjustment for household size produces an estimate of 2.6 meals per person per day. Most of these meals were eaten from home food supplies. The average net household meals from home supplies per household member, after subtracting meals from other sources, was 2.2, implying that approximately 85 percent of meals (2.2 divided by 2.6) were eaten from home food supplies.

Because some meals are not eaten from home food supplies, it is useful to define an additional measure of effective household size that takes eating meals away from home into account. This is done through computing "equivalent nutritional units" (ENUs) for each household. As with the AME measure, ENUs normalize the household size for the nutritional requirements of household members. In addition, however, ENUs take into account the proportion of meals eaten by each member at home. For instance, if half the meals of a household member are eaten at home, then in counting ENUs, that member's contribution would count only half as much to ENU household size as it would if all the meals had been eaten at home. Another difference between the ENU measure and the AME measure is that the ENUs are defined separately for each nutrient, thus taking account of the fact that the relative nutrient requirements for the various members of a household may be different for different nutrients. (For instance, an adult woman's requirement for calcium is higher

[2]The man counts as 1 and the woman counts as 2,200 divided by 2,900, or 0.76. Therefore, the AME for the household is 1 plus 0.76, or 1.76.

than that of an adult male relative to her requirement for food energy.) The ENU also takes into account meals and snacks eaten by guests.

ENUs, therefore, can be interpreted as showing the number of people who actually ate meals and snacks from household food supplies, as expressed in terms of adult male nutritional requirements and taking into account meals not eaten from home food supplies. In a previous example, a two-person household was considered, consisting of a man and a woman, which had an AME of 1.76. If both people ate all their meals from home food supplies and if no guests ate meals or snacks, then that household would have an ENU, as defined by food energy, of 1.76. If, however, the two people ate one-third of their meals outside the home, then the household's ENU variable would be approximately 66 percent of 1.76, or 1.17.

As illustrated above, the ENU approach adjusts assumed nutrient requirements proportionately downward for the fraction of meals eaten from sources other than the household food supplies. Implicit in this is an assumption that the meals eaten away from home supply approximate the same level of nutrient availability as do the meals from home food supplies. The degree to which this implicit assumption--which is standard in most analyses of nutrient availability--affects the results reported below is not clear.

In the NFSPS sample, the average ENU for food energy in the sample is about 1.9 persons. The fact that it is lower than the AME reflects the downward scaling to adjust for meals not eaten from home food supplies.

The average value of all food used from home food supplies during the week in the sample was $58.88. This includes both the value of purchased food and the imputed value of foods obtained without payment, such as gifts, foods obtained from WIC, and home-grown foods. When these non-purchased foods are subtracted, the average value of the week's foods that were purchased with money or with food stamps was $53.37.

C. NUTRIENT AVAILABILITY FROM HOME FOOD SUPPLIES

1. Average Nutrient Availability

On average, the nutrient availabilities per ENU of the households in the sample exceed the RDA levels for each of the eight nutrients examined (Table V.2).[3] Mean food energy is estimated to exceed the food energy RDA by 28 percent. For the other nutrients, the amount by which the average nutrient availabilities exceed RDAs ranges widely, from 14 percent for calcium and 17 percent for zinc to 156 percent for vitamin C.

These nutrient availability levels estimated from the NFSPS data are broadly consistent with those found in earlier studies. Comparisons between the earlier data and the current findings are presented in Appendix G.

2. Percentages of Households with Food Use Exceeding RDA-Based Threshold Levels

While the mean nutrient availability variables summarized above are of considerable interest, it has long been recognized that examining *average* nutrient availability can be misleading, because the averages may hide a significant number of households with inadequate diets at the low end of the nutrient availability distribution. A common approach to this problem is to examine the percentages of households who fall above and below certain thresholds on the "nutrient availability as a percent of RDA" scale. Parts of the analysis use the obvious comparison standard of 100 percent of the RDAs. However, it has been argued that use of a 100 percent standard is too stringent

[3]The nutrients studied, in addition to food energy, are ones that have been cited as being either current or potential public health issues (Life Sciences Research Office 1989).

TABLE V.2

NUTRIENT AVAILABILITY MEASURES FOR SELECTED NUTRIENTS

	Food Energy	Vitamin A	Vitamin C	Vitamin B_6	Folate	Calcium	Iron	Zinc
Average Nutrient Availability as Percentage of RDA[a]	128	178	256	147	213	114	161	117
Percentage of Households with Nutrient Availability ≥ 100 Percent of RDA	59	65	79	65	79	47	69	49
Percentage of Households with Nutrient Availability ≥ 75 Percent of RDA	77	77	87	80	88	67	85	69
Sample Size	**950**							

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a] Calculated as total amount of the nutrient available in the week divided by [ENU * daily RDA for adult adult male * 7].

a test, because of the way the RDAs are defined. In particular, to be conservative, the RDAs are set at levels of nutrient intake believed to be adequate for virtually the entire healthy population. Since nutrient requirements vary from person to person, it is generally agreed that most people do not need the full 100 percent of the RDAs. Therefore, it is useful to conduct some of the analysis at a lower RDA percentage level, and a standard of 75 percent of the RDA has been used in parts of the analysis below.

In interpreting the data on percentages of household exceeding threshold criteria (whether 100 percent or 75 percent), it should be noted that the observed food use for a *specific week* may not be the same as *usual food use*. By focusing on a single week, there may be some tendency to classify households as being below a threshold (and hence at nutritional risk) when, in fact, their consumption is adequate when averaged over multiple weeks.

As shown in the second row of Table V.2, substantial numbers of households in the sample failed to have nutrient availabilities in the reference week equal to 100 percent of their RDAs. For calcium and zinc, which were relatively low in the analysis of average intake discussed above, the percentage of households estimated to meet 100 percent of the RDAs is less than half: 47 percent for calcium and 49 percent for zinc. And even for vitamin C, for which average nutrient availability greatly exceeds RDAs, only about 79 percent of households are estimated to be at or above the RDAs.

When the threshold for the analysis is lowered to 75 percent of the RDA, considerably higher percentages of households are found to meet the standards. The percentage of households at or exceeding 75 percent of RDA range from 67 percent for calcium to 88 percent for folate.

3. Subgroup Analysis

It is also of interest to examine nutrient availability for selected subgroups of the overall sample. This is done here, both for the average nutrient availability measure and for percentages of households below the 100 percent and 75 percent RDA cutoff thresholds.

Average nutrient availability as a percentage of RDA. The overall patterns observed in the full data set hold in general for most subgroups as well, though the absolute levels of nutrient availability vary somewhat (Table V.3). The nutrient availability for the elderly, even after correcting for their lower nutrition requirements as reflected in the RDAs, tends to be slightly lower than for the sample as a whole. For instance, for households with elderly members, the availability of food energy exceeds their RDAs by only 23 percent, as compared to 28 percent for the overall sample. Elderly households have higher nutrient availabilities than the overall sample for only two of the nutrients, vitamin A and iron. Households with children present a mixed picture, being slightly lower than the overall sample for some nutrients and slightly higher for others. Single-person households are consistently somewhat higher, except for folate.

Interestingly, households at the lowest income level in relation to the poverty standards tended to have somewhat higher than average nutrient availability, exceeding the sample average for all but two nutrients (iron and vitamin C). Households in the other two income categories shown, 51 to 75 percent of poverty and 76 percent of poverty or higher, tended to have nutrient availability levels similar to each other and somewhat lower than the averages. Households receiving AFDC income tended to be very near the sample averages for most nutrients.

When the NFSPS study was designed, there was interest in assessing nutrient adequacy for subgroups of the population defined according to levels of variables associated with determining

TABLE V.3

NUTRIENT AVAILABILITY AS PROPORTION OF RDA, BY HOUSEHOLD CHARACTERISTICS

	Sample Size	Food Energy	Vitamin A	Vitamin C	Vitamin B_6	Folate	Calcium	Iron	Zinc
All Households	956	1.28	1.78	2.56	1.47	2.13	1.14	1.61	1.17
With Elderly	262	1.23	1.86	2.34	1.32	1.83	1.12	1.71	1.03
With Children	579	1.28	1.71	2.63	1.53	2.35	1.08	1.49	1.18
Single Person	249	1.38	2.11	2.71	1.48	2.01	1.34	1.96	1.25
Presence of Children									
Less than 1 yr	84	1.34	1.75	3.27	1.61	2.49	1.11	1.67	1.27
1 to 4	278	1.32	1.74	2.58	1.56	2.49	1.10	1.48	1.18
5 to 11	336	1.23	1.70	2.61	1.53	2.44	1.06	1.48	1.14
12 to 15	158	1.20	1.51	2.48	1.45	2.12	0.99	1.44	1.11
16 to 18	100	1.14	1.66	2.24	1.31	1.82	0.93	1.30	1.08
Income Level as Percent of Poverty									
0 to 50%	356	1.33	1.84	2.60	1.51	2.25	1.12	1.57	1.23
51 to 75%	224	1.25	1.79	2.55	1.47	2.17	1.12	1.63	1.12
76% or higher	339	1.26	1.73	2.53	1.42	2.00	1.16	1.64	1.14
Received AFDC	320	1.32	1.78	2.65	1.55	2.40	1.09	1.53	1.21
Food Stamp Benefits Level (in Dollars)[a]									
0 to 10	40	1.11	1.48	1.90	1.10	1.51	1.07	1.42	0.93
11 to 99	289	1.26	1.82	2.59	1.40	1.94	1.17	1.72	1.14
100 to 199	304	1.29	1.79	2.62	1.45	2.08	1.14	1.62	1.16
200 to 299	180	1.28	1.78	2.53	1.52	2.23	1.10	1.48	1.21
300 or more	137	1.38	1.77	2.62	1.68	2.68	1.11	1.56	1.26
Household Size									
1	249	1.38	2.11	2.71	1.48	2.01	1.34	1.96	1.25
2	174	1.34	1.72	2.51	1.47	1.98	1.12	1.58	1.19
3	201	1.38	1.85	2.84	1.59	2.37	1.20	1.59	1.26
4	164	1.17	1.59	2.26	1.45	2.24	0.97	1.43	1.07
5 or more	168	1.09	1.49	2.38	1.32	2.07	0.92	1.33	1.01
Purchasing Power[b]									
$0 to $399	158	1.35	1.89	2.79	1.50	2.13	1.16	1.72	1.26
$400 to 599	216	1.26	1.85	2.42	1.39	2.02	1.14	1.64	1.14
$600 to 798	193	1.44	1.88	2.76	1.60	2.27	1.28	1.70	1.27
$800 or more	389	1.19	1.66	2.45	1.43	2.12	1.05	1.50	1.10
Housing Costs as Percent of Income									
No Costs	22	0.97	1.53	1.66	1.03	1.68	0.87	1.12	0.83
1% to 30%	180	1.20	1.52	2.13	1.30	1.88	1.11	1.52	1.07
30% to 45%	159	1.30	2.00	2.42	1.49	2.24	1.10	1.64	1.15
45% to 55%	93	1.23	1.73	2.64	1.42	2.16	1.06	1.54	1.09
Over 55%	419	1.34	1.85	2.80	1.56	2.25	1.18	1.68	1.24

SOURCE: 1996 National Food Stamp Program Survey, weighted tabulations.

[a] Benefit levels are per household.

[b] Monthly food stamp benefits plus gross monthly income.

program benefits. The last three panels of Table V.3 provide selected tabulations in this regard. Overall, households with the lowest benefit levels (typically small households or households with relatively high incomes) tend to have low levels of nutrient availability compared to the sample as a whole, although the sample size for this group is quite small. Correspondingly, households at the two highest benefit levels tend to exceed the averages for the sample as a whole.

As noted above, one-person households tend to have higher-than-average levels of nutrient availability. The largest household category tends to have lower availability levels than the overall sample, and, for several of the nutrients, these differences are substantial. This is the case, for instance, for food energy, for which the overall sample exceeds the RDAs on average by 28 percent, while households with five or more members exceed the standards by only 9 percent.

When the data are examined for different categories of shelter cost measured as a percent of income, two patterns emerge. Households in the lowest shelter cost category tend to have slightly lower average nutrient availability in relation to the RDA. In fact, those with no shelter costs have slightly less than the RDA available for food energy, calcium, and zinc. However, as shelter costs as a percent of income increase to 45 to 55 percent, there is a slight drop in nutrient availability before increasing for those with costs above 55 percent of income.

Analysis of Meeting the RDAs. Similar patterns are found when the subgroup analysis is extended to examine percentages of households that meet either 100 percent or 75 percent standards in their nutrient availability (Tables V.4 and V.5). As with the earlier analysis, for instance, nutrient availability levels of households with elderly members tend to be slightly below the overall sample levels, while those of households with lower incomes tend to be somewhat higher. However, these and similar differences are neither large nor consistent.

TABLE V.4

PROPORTION OF HOUSEHOLDS WITH NUTRIENT AVAILABILITY = 100 PERCENT OF RDA, BY HOUSEHOLD CHARACTERISTIC

	Sample Size	Food Energy	Vitamin A	Vitamin C	Vitamin B_6	Folate	Calcium	Iron	Zinc
All Households	956	0.59	0.65	0.79	0.65	0.79	0.47	0.69	0.49
With Elderly	262	0.56	0.64	0.75	0.57	0.69	0.44	0.72	0.41
With Children	579	0.60	0.68	0.84	0.71	0.86	0.46	0.66	0.50
Single Person	249	0.62	0.64	0.75	0.61	0.74	0.56	0.78	0.52
Presence of Children									
Less than 1 yr	84	0.56	0.71	0.86	0.64	0.85	0.45	0.72	0.44
1 to 4	278	0.64	0.71	0.86	0.72	0.91	0.49	0.68	0.52
5 to 11	336	0.58	0.67	0.83	0.71	0.89	0.42	0.68	0.49
12 to 15	158	0.59	0.68	0.83	0.68	0.83	0.41	0.67	0.47
16 to 18	100	0.58	0.66	0.75	0.67	0.14	0.39	0.63	0.43
Income Level									
0 to 50%	356	0.61	0.65	0.80	0.66	0.80	0.48	0.67	0.50
51 to 75%	224	0.58	0.64	0.80	0.67	0.79	0.43	0.69	0.48
76% or higher	339	0.58	0.64	0.77	0.63	0.77	0.50	0.73	0.49
Received AFDC	320	0.64	0.68	0.83	0.74	0.87	0.48	0.67	0.52
Benefits Level (in Dollars)									
0 to 10	40	0.45	0.44	0.60	0.42	0.61	0.44	0.70	0.33
11 to 99	289	0.57	0.65	0.76	0.60	0.72	0.49	0.70	0.48
100 to 199	304	0.58	0.63	0.78	0.65	0.77	0.49	0.67	0.47
200 to 299	180	0.61	0.66	0.83	0.73	0.87	0.46	0.67	0.53
300 or more	137	0.67	0.72	0.87	0.72	0.91	0.43	0.76	0.52
Household Size									
1	249	0.62	0.64	0.75	0.61	0.74	0.56	0.78	0.52
2	174	0.66	0.65	0.82	0.69	0.76	0.52	0.68	0.55
3	201	0.63	0.71	0.84	0.71	0.81	0.54	0.66	0.54
4	164	0.55	0.66	0.77	0.67	0.81	0.37	0.65	0.44
5 or more	168	0.47	0.57	0.78	0.58	0.84	0.32	0.65	0.35

SOURCE: 1996 National Food Stamp Program Survey, weighted tabulations.

TABLE V.5

PROPORTION OF HOUSEHOLDS WITH NUTRIENT AVAILABILITY ≥75 PERCENT OF RDA, BY HOUSEHOLD CHARACTERISTIC

	Sample Size	Food Energy	Vitamin A	Vitamin C	Vitamin B_6	Folate	Calcium	Iron	Zinc
All Households	956	0.78	0.77	0.87	0.80	0.88	0.67	0.85	0.69
With Elderly	262	0.76	0.73	0.82	0.75	0.83	0.66	0.86	0.63
With Children	579	0.78	0.82	0.92	0.84	0.92	0.66	0.85	0.71
Single Person	249	0.80	0.76	0.82	0.77	0.85	0.75	0.88	0.72
Presence of Children									
Less than 1 yr	84	0.78	0.86	0.93	0.81	0.90	0.65	0.84	0.73
1 to 4	278	0.81	0.85	0.94	0.88	0.95	0.68	0.88	0.74
5 to 11	236	0.77	0.82	0.91	0.84	0.94	0.63	0.86	0.69
12 to 15	158	0.75	0.81	0.89	0.80	0.90	0.60	0.82	0.67
16 to 18	100	0.79	0.77	0.86	0.77	0.87	0.60	0.79	0.69
Income Level									
0 to 50%	356	0.76	0.78	0.89	0.80	0.88	0.64	0.83	0.69
51 to 75%	224	0.76	0.77	0.87	0.82	0.87	0.65	0.88	0.70
76% or higher	339	0.80	0.76	0.87	0.79	0.88	0.71	0.86	0.71
Received AFDC	320	0.83	0.83	0.91	0.86	0.94	0.67	0.86	0.76
Benefits Level (in Dollars)									
0 to 10	40	0.77	0.66	0.76	0.62	0.75	0.61	0.86	0.66
11 to 99	289	0.76	0.75	0.83	0.77	0.85	0.68	0.85	0.66
100 to 199	304	0.74	0.74	0.86	0.79	0.85	0.66	0.83	0.69
200 to 299	180	0.78	0.84	0.93	0.85	0.94	0.69	0.86	0.74
300 or more	137	0.85	0.82	0.94	0.87	0.96	0.66	0.89	0.73
Household Size									
2	174	0.82	0.76	0.89	0.83	0.88	0.72	0.85	0.76
3	201	0.79	0.82	0.92	0.81	0.89	0.70	0.84	0.72
4	164	0.76	0.78	0.86	0.82	0.87	0.60	0.81	0.68
5 or more	168	0.69	0.73	0.88	0.78	0.90	0.53	0.86	0.58

SOURCE: 1996 National Food Stamp Program Survey, weighted tabulations.

D. FOOD USE BY FOOD GROUP

An additional perspective on the foods used by sample members can be obtained by examining the percentage distributions of foods by food groups (Table V.6). In terms of food energy supplied, the most important food groups were fats and oils, which account for 9.2 percent of food energy availability; lower cost red meats, which account for 8.0 percent of food energy; and milk, which accounts for 7.2 percent.

E. DETERMINANTS OF NUTRIENT AVAILABILITY

In order to understand factors that influence nutrient availability among food stamp participants, multivariate regression techniques can be employed to determine how nutrient availability is associated with specific variables after controlling for the effects of other factors. In particular, there is interest in determining the extent to which food stamp benefits are associated with increased levels of nutrient availability. Past research on nutrient impacts of food stamp benefits has shown mixed results regarding the extent to which participation in the Food Stamp Program and the level of benefits received influence nutrition measures. While the current sample is limited to food stamp participants, it is unique in providing the first reliable national measures of nutrient availability for food stamp participants based on household food use data in at least a decade. The remaining sections of this chapter describe the models estimated and discuss the findings, with a particular emphasis on the role played by food stamp benefits.

1. Variables Used in the Regressions

Separate regressions have been estimated for each of the nutrients being studied. The dependent variables used in the regression are nutrient availabilities over the previous seven days for the entire household. Food consumption theory suggests the major factors influencing levels of food intake

TABLE V.6

SHARE OF VARIOUS TYPES OF FOODS IN HOUSEHOLD FOOD USE

	Percentage Based On:	
Food Group	Value of Food	Food Energy
Vegetables, Fruit		
Potatoes	2.4	3.2
High-Nutrient Vegetables	3.8	0.9
Other Vegetables	4.8	1.7
Mixtures, Mostly Vegetables; Condiments	0.6	1.3
Vitamin C-Rich Fruit	4.0	2.3
Other Fruit	3.9	2.2
Subgroup Total	19.6	10.6
Grain Products		
Whole-Grain/High-Fiber Breakfast Cereals	1.7	1.6
Other Breakfast Cereals	3.3	3.3
Whole-Grain/High-Fiber Flour, Meal, Rice, Pasta	0.4	0.7
Other Flour, Meal, Rice, Pasta	2.2	6.9
Whole-Grain/High-Fiber Bread	0.9	1.3
Other Bread	3.9	6.4
Bakery Products, Not Bread	3.9	4.9
Grain Mixtures	3.4	2.7
Subgroup Total	19.7	27.6
Milk, Cheese, Cream		
Milk, Yogurt	7.6	7.2
Cheese	3.0	2.4
Cream; Mixtures, Mostly Milk	1.9	1.9
Subgroup Total	12.5	11.5
Meat and Alternatives		
Lower-Cost Red Meats, Variety Meats	7.8	8.0
Higher-Cost Red Meats, Variety Meats	6.7	4.2
Poultry	5.3	4.3
Fish, Shellfish	3.1	0.9

TABLE V.6 *(continued)*

Food Group	Percentage Based On: Value of Food	Food Energy
Bacon, Sausage, Luncheon Meats	5.9	7.2
Eggs	1.3	1.5
Dry Beans, Peas, Lentils	0.9	1.4
Mixtures, Mostly Meat, Poultry, Fish, Egg, Legume	3.3	1.4
Nuts, Peanut Butter	0.8	1.3
Subgroup Total	34.9	30.2
Other Foods		
Fats, Oils	2.5	9.2
Sugar, Sweets	2.8	6.1
Seasonings	0.1	0.1
Soft Drinks, Punches, Ades	5.6	4.2
Coffee, Tea	1.9	0.4
Alcohol	0.5	0.1
Subgroup Total	13.3	20.1
Sample Size: 957		

SOURCE: 1996 National Food Stamp Program Survey, unweighted tabulations.

[a]Less than 0.05.

include available purchasing power, household size and composition, and food prices. Other potentially important factors, such as tastes and ease of preparation, cannot easily be observed in the data set and are not included in the regression specifications.

The independent variables included in the model have been chosen to reflect consumption determinants, together with other household characteristics that could affect food use. Many of the variables have been included in the model in their logarithmic form to facilitate interpretation of the estimated relationships.

Household purchasing power depends on the level of cash income from a variety of sources. The income variable used in the model combines income from wage earnings, public assistance and other forms of unearned income. For food stamp participants, the level of food stamp benefits is also important. Income and benefits were normalized to a one week period and included in logarithmic form. There were 37 cases with missing income and 2 cases with missing food stamp benefits where imputations were made based on predictions from a regression model estimated on the remaining sample relating gross income to household size and the level of food stamp benefits.

Household size and composition are captured with two variables. The "equivalent nutrition unit" (ENU) adjusts households size for nutrient requirements of household members and guests and for the proportion of meals eaten from the home food supply. The total number of the people in the household is also included. The ENU measures provides a good indication of the level of need for food from household supplies, while the total number of people in the household controls for potential economies of scale that can be achieved in providing food in larger households.

Binary indicators for urbanization and for season are included to capture regional and seasonal affects in availabilities and prices of food. The urban variable indicates household location in an area with more than 90 percent of the population classified as urban; the rural variable indicates an area with less than 10 percent urban. The seasonal indicators identify when the food use observation occurred in the fall and winter. The omitted variable is summer; no interviewing was done in the spring.

Other variables included in the regression include binary variables for whether the household contained an elderly member or a child 18 or under; variables indicating time since the most recent food stamp application; binary variables indicating ethnicity (white but not Hispanic and black but not Hispanic); and a variable indicating the receipt of food stamps through electronic benefit transfer.[4] The log of monthly housing cost divided by household size and the log of the percentage of food used that was not bought were also included.

2. Regression Results

Table V.7 presents the regression results for the estimated equations for the eight nutrients. For those variables indicated in log form, the associated coefficients are elasticities--that is, they show the percentage by which nutrient availability will increase if there is a percentage increase in the explanatory variable. Surprisingly, the estimated coefficients on income are quite small and not statistically significant. However, for all nutrients the results show the expected positive association between nutrient availability and food stamp benefits. For income, the elasticities are small in size and generally insignificant statistically. However, the elasticities associated with food stamp benefits

[4]Earlier specifications of the regressions included a more detailed specification of the "children" variable, with binary indicators of the presence of children in each of five age categories--less than 1 year old, 1 to 4, 5 to 10, 11 to 14, and 15 to 18. The more detailed specification yielded essentially the same results as those reported here, and the more parsimonious specification was retained for simplicity. Similarly, binary variables indicating use by the family of two other child nutrition programs--WIC and the National School Lunch and School Breakfast Program--were tested and found not to substantially influence the results.

TABLE V.7

REGRESSION ANALYSIS OF DETERMINANTS OF NUTRIENT AVAILABILITY
(Standard Errors in Parentheses)

	Calories	Vitamin A	Vitamin C	Vitamin B6	Folate	Calcium	Iron	Zinc
ENU (log)	0.611***	0.87***	0.589***	0.589***	0.574***	0.639***	0.48***	0.545***
	(9.46)	(4.85)	(4.48)	(9.02)	(7.54)	(6.99)	(8.48)	(7.13)
Income (log)	-0.016	0.019	-0.018	0	0.002	0.001	-0.001	-0.002
	(1.27)	(0.82)	(0.8)	(0.02)	(0.1)	(0.04)	(0.09)	(0.16)
FSP Benefits (log)	0.112***	0.123***	0.122***	0.129***	0.136***	0.102***	0.119***	0.113***
	(4.89)	(3.07)	(3.110)	(4.12)	(4.29)	(3.66)	(4.43)	(4.45)
HH Size (log)	0.051	-0.289	0.041	0.07	0.05	-0.023	0.226***	0.087
	(0.67)	(1.57)	(0.30)	(0.84)	(0.47)	(0.23)	(2.97)	(0.95)
Urban (1,0)	-0.107	-0.001	0.023	-0.119	-0.124	-0.082	-0.107	-0.107
	(1.45)	(0.01)	(0.26)	(1.78)	(1.82)	(1.06)	(1.55)	(1.74)
Rural (1,0)	0.005	-0.039	0.033	-0.055	-0.015	-0.067	-0.007	-0.003
	(0.11)	(0.38)	(0.38)	(0.85)	(0.19)	(0.85)	(0.11)	(0.08)
Winter Interview (1,0)	-0.304**	-0.743***	-0.469**	-0.379***	-0.545***	-0.459***	-0.337***	-0.224
	(2.38)	(3.48)	(2.11)	(4.15)	(3.96)	(3.35)	(3.26)	(1.22)
Fall Interview (1,0)	-0.027	-0.106	-0.18***	-0.058	-0.027	-0.03	-0.006	-0.015
	(0.62)	(1.86)	(3.33)	(1.16)	(0.5)	(0.59)	(0.14)	(0.3)
HH Has Elderly Member (1,0)	0.005	0.187***	0.106	0.018	0.063	0.006	0.041	-0.076
	(0.09)	(2.95)	(1.39)	(0.29)	(1.07)	(0.11)	(0.7)	(1.35)
HH Has Child $\leq$ 18 (1,0)	0.174**	0.461***	0.402***	0.271***	0.397***	0.221**	0.059	0.193**
	(2.34)	(3.04)	(3.02)	(2.72)	(3.24)	(2.34)	(0.63)	(2.36)
African-Am; not Hispanic (1,0)	0.046	-0.128	-0.19**	-0.016	-0.142	-0.179**	-0.053	0.101
	(0.68)	(1.36)	(2.09)	(0.25)	(1.69)	(2.34)	(0.76)	(1.34)
White, not Hispanic (1,0)	-0.013	-0.023	-0.215**	-0.082	-0.115	0.074	-0.035	0.044
	(0.24)	(0.23)	(2.18)	(1.35)	(1.44)	(1.13)	(0.6)	(0.73)
Applied 1 to 4 Years Ago	-0.045	-0.038	-0.117	-0.072	-0.101	-0.008	-0.034	-0.058
	(0.83)	(0.62)	(1.5)	(1.4)	(1.81)	(0.17)	(0.67)	(1.21)
Applied 5 or More Years Ago	-0.061	-0.103	-0.243***	-0.088	-0.14	-0.054	-0.094	-0.076

TABLE V.7 *(continued)*

	Calories	Vitamin A	Vitamin C	Vitamin B6	Folate	Calcium	Iron	Zinc
	(0.98)	(1.16)	(2.85)	(1.29)	(1.83)	(0.67)	(1.42)	(1.15)
Electronic Benefit (1,0)	0.068	-0.017	-0.009	0.017	0.023	0.059	0.06	-0.027
	(0.96)	(0.17)	(0.09)	(0.24)	(0.26)	(0.73)	(0.86)	(0.29)
Shelter Cost Per Person (log)	0.056***	0.068**	0.09***	0.073***	0.063***	0.038	0.061***	0.051***
	(3.84)	(2.03)	(3.75)	(4.49)	(2.65)	(1.84)	(3.53)	(3.3)
Percent Food Not Brought (log)	-0.034***	-0.052***	-0.043***	-0.038***	-0.041***	-0.042***	-0.024**	-0.03***
	(3.4)	(3.240	(2.94)	(3.47)	(3.380	(3.91)	(2.07)	(2.67)
Intercept	7.544***	8.346***	4.177***	2.156***	7.098***	6.304***	2.229***	4.092***
	(47.7)	(32.13)	(16.5)	(11.07)	(32.77)	(33.12)	(12.73)	(26.64)

SOURCE: National Food Stamp Program Survey weighted data. Sample size = 957.

NOTE: Statistical significance tests take the survey design into account, using a Taylor's series expansion algorithm as implemented in the STATA statistical package.

**Significantly different from zero at the .05 level, two-tailed .01 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.
NA = Not applicable.

show highly significant positive impacts. For example, the results imply that a 10 percent increase in food stamp benefits would result in a 1.1 percent increase in availability of calories and a 1.4 percent increase in the availability of folate.

Regarding the household size and composition variables, as expected, the level of ENUs is shown to be a highly significant factor determining the level of nutrients available with the household with coefficient size ranging from .48 to .87. The size variable measuring the number of people in the household is generally positive, suggesting that, even after controlling for food purchasing power and the nutrient needs of household members and guests, larger households tend to have more nutrients available, presumably due to scale efficiencies. However, the variable is usually not statistically significant. The urbanization and seasonal indicator variables generally show negative associations with levels of nutrient availability.

3. Summary

The eight regressions summarized in Table V.7 suggest that levels of nutrient availability follow expected patterns in relation to household size, household composition and food purchasing power. Some locational and seasonal effects are also evident. A key finding of the analysis is the strong positive association between the level of food stamp benefits and nutrient availability for the nutrients analyzed. The next chapter explores how these results differ when we take into account the household's food insecurity status.

VI. CORRELATIONS BETWEEN FOOD SECURITY AND NUTRIENT AVAILABILITY

Both the food security and the nutrient availability measures attempt to provide indicators of the adequacy of households' access to food. This chapter examines the degree to which they are correlated in order to gain insight as to whether the two measures are tapping essentially the same phenomenon or different aspects of people's well-being. Section A discusses basic correlations between the two measures. Section B then examines the correlations in a multivariate regression context, which makes it possible to control at least partially for the influence of confounding variables. Section C briefly summarizes a number of other lines of analysis that have been pursued for additional insight into the statistical results. Possible interpretations of the findings are discussed in Section D.

A. NUTRIENT AVAILABILITY FOR DIFFERENT LEVELS OF FOOD SECURITY

As can be seen in Table VI.1, higher levels of nutrient availability appear to be associated with higher levels of food insecurity. The basic pattern of results, which is common to each of the nutrients studied, can be illustrated by focusing on food energy availability (Table VI.1). Households classified as food secure have an average food energy availability of 122 percent of the RDAs of their members (and guests). The number rises to 128 percent and 127 percent for the two middle groups on the food security scale and to 153 percent for the portion of the sample classified as having severe hunger. For three of the nutrients analyzed, the positive association between

TABLE VI.1

HOUSEHOLD NUTRIENT AVAILABILITY, BY FOOD SECURITY INDEX LEVELS
(Food Stamp Participants)
(Entries Are Nutrient Availability as a Proportion of RDA)[a]

		Level of Food Security				
	All Households	Food Secure	Food Insecure/ No Hunger	Food Insecure/ Some Hunger	Food Insecure/ Severe Hunger	Significance Level for Analysis of Variance Test of Whether Food Security Level Related to Nutrient Availability[b]
Food Energy	1.28	1.22	1.28	1.37	1.53	-
Vitamin A	1.78	1.64	1.78	1.97	2.32	-
Vitamin C	2.56	2.48	2.50	2.70	3.16	-
Vitamin B_6	1.47	1.38	1.49	1.56	1.75	**
Folate	2.13	2.00	2.18	2.22	2.63	**
Calcium	1.13	1.06	1.12	1.25	1.36	**
Iron	1.61	1.55	1.60	1.68	1.89	-
Zinc	1.17	1.11	1.18	1.21	1.51	-
Sample Size	**956**	**415**	**313**	**173**	**54**	

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a]Calculated as total amount of nutrient available in week divided by [ENU * daily RDA for adult male * 7]. ENU = Equivalent Nutrition Unit.

[b]Entries are calculated based on an F-test for a regression of nutrient availability on a constant term plus three binary variables, indicating three of the four food security levels. (The omitted category was the food secure group.) Significance tests account for sample design, based on a Taylor's series expansion method as implemented by the STATA statistical package.

[c]The sample size for the "all households" column is greater than the sum of the other column sample sizes, because some households had missing food security data and were not classified into the separate columns.

**Significant at 95 percent level.

nutrient intake and the severity of food insecurity is statistically significant at the 95 percent level as can be seen in the righthand column of the table.[1]

The above findings were unexpected. One would expect that within the general population, households reporting more severe levels of food insecurity would be observed to have fewer nutrients available. Indeed, recent work by Rose and Oliveira (1997a) on a general population sample has shown significantly lower nutrient intakes for food insufficient households. However, the food stamp participant population is different from the general population in that it is receiving food assistance specifically targeted toward alleviating food insecurity and hunger. The next section extends the multivariate analysis of the previous chapter to investigate how the results are affected when key other variables are controlled for and to examine the interactions between nutrient availability, food stamp benefits, and food security.

B. REGRESSION ANALYSIS

Regression analysis can be useful in helping us to gain a better understanding of the different factors which might be leading to the unexpected results reported above. In particular, regression analysis can control for the effects of potentially confounding factors which may be associated with both nutrient availability and food security. In addition, regression analysis can make it possible to explore important interactions between various influences on nutrient availability through the use of interaction terms in the equations.

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[1]To analyze sensitivity, the tests were rerun, omitting the three observations in the severe hunger category with the highest levels of nutrient availability. With this reduced sample, none of the eight relationships was statistically significant at the 95 percent level. Also, while three of the eight relationships are significant with the regular sample, the relationships are weak in terms of variance explained. In all but one case, the classification by food security group explains less than one percent of the variance in nutrient availability.

In specifying the regressions, the analysis has drawn on past research which has found various household characteristics, such as household size, income level, and composition, to be important determinants of nutrient availability. It has also drawn on recent discussions in the literature on food security, which emphasize that "hunger is a managed process," in which a household's response to its circumstances may vary, depending on what level of food security it is currently experiencing. As summarized in Carlson, Andrews, and Bickel (1999), this approach recognizes the experience of

> food insecurity and hunger as a sequence of stages reflecting increasingly severe deprivation of basic food need and characterized by a managed process of decision making and behavior in response to increasingly constrained household resources...This is the "economic" perspective, in which the experience of resource inadequacy to fully meet basic needs and the pattern of chosen behavioral responses revealed by the household in seeking to cope with this constraint on diets exemplify individual and household economizing decisions and behavior generally...This insight into measurement of the economic-behavioral aspect of the phenomenon is nicely captured in the metaphorical phrase "hunger is a managed process"....

To facilitate understanding of the regression results, the analysis is presented below in two stages. First, the relationship between food nutrient availability and food security, holding selected other variables constant, is descriptively examined. Next, after examining these regression results, additional structure is placed on the regression specifications to take into account the potential interactions between food security and the determinants of food security as highlighted in the Carlson, Andrews, and Bickel reference cited above.

1. Descriptive Regressions

Table VI.2 presents the results of simply adding food security indicators to the nutrient availability equations that were estimated in Chapter V. In particular, in addition to the explanatory variables discussed in Chapter V, two additional variables are added. One is a binary indicator of

TABLE VI.2

REGRESSION ANALYSIS OF DETERMINANTS OF NUTRIENT AVAILABILITY
(Standard Errors in Parentheses)

	Calories	Vitamin A	Vitamin C	Vitamin B6	Folate	Calcium	Iron	Zinc
ENU (log)	0.611***	0.871***	0.595***	0.589***	0.575***	0.642***	0.48***	0.545***
	(9.78)	(4.81)	(4.5)	(9.15)	(7.65)	(7.07)	(8.73)	(7.3)
Income (log)	-0.017	0.019	-0.018	-0.001	0.001	0	-0.002	-0.003
	(1.35)	(0.78)	(0.79)	(0.06)	(0.08)	(0.03)	(0.13)	(0.21)
FSP Benefits (log)	0.112***	0.123***	0.123***	0.129***	0.136***	0.1***	0.118***	0.111***
	(4.93)	(3.1)	3.18	4.16	4.26	3.6	4.37	4.35
HH Size (log)	0.049	-0.291	0.037	0.068	0.048	-0.028	0.225***	0.084
	(0.64)	(1.58)	(0.26)	(0.81)	(0.45)	(0.280	(2.94)	(0.93)
Urban (1,0)	-0.106	0	0.024	-0.118	-0.124	-0.081	-0.107	-0.107
	(1.49)	(0)	(0.27)	(1.81)	(1.84)	(1.09)	(1.57)	1.79
Rural (1,0)	0.007	-0.037	0.039	-0.053	-0.013	-0.066	-0.007	-0.004
	(0.15)	(0.35)	(0.45)	(0.85)	(0.160	(0.840	(0.11)	0.09
Winter Interview (1,0)	-0.285**	-0.726***	-0.455**	-0.364***	-0.534***	-0.439***	-0.327***	-0.213
	(2.21)	(3.34)	(2.09)	(3.9)	(3.83)	(3.11)	(3.14)	1.18
Fall Interview (1,0)	-0.023	-0.103	-0.179***	-0.055	-0.025	-0.025	-0.003	-0.011
	(0.54)	(1.78)	(3.32)	(1.1)	(0.47)	(0.48)	(0.08)	0.23
HH Has Elderly Member (1,0)	0.02	0.201***	0.116	0.031	0.072	0.024	0.051	-0.065
	(0.39)	(3.11)	(1.54)	(0.49)	(1.21)	(0.45)	(0.85)	(1.12)
HH Has Child ≤ 18 (1,0)	0.182**	0.468***	0.407***	0.278***	0.402***	0.23**	0.064	0.199**
	(2.45)	(3.13)	(3.06)	(2.8)	(3.3)	(2.45)	(0.68)	(2.43)
African-Am; not Hispanic (1,0)	0.052	-0.124	-0.191**	-0.012	-0.14	-0.172**	-0.049	0.107
	(0.74)	(1.31)	(2.1)	(0.18)	(1.64)	(2.25)	(0.69)	1.39
White, not Hispanic (1,0)	-0.012	-0.024	-0.219**	-0.082	-0.116	0.076	-0.034	0.046
	(0.23)	(0.24)`	(2.23)	(1.36)	(1.46)	(1.14)	(0.58)	0.75
Applied 1 to 4 Years Ago	-0.027	-0.022	-0.108	-0.058	-0.091	0.013	-0.022	-0.045
	(0.54)	(0.39)	(1.46)	(1.21)	(1.72)	(0.29)	(0.46)	(0.98)

TABLE VI.2 *(continued)*

	Calories	Vitamin A	Vitamin C	Vitamin B6	Folate	Calcium	Iron	Zinc
Applied 5 or More Years Ago	-0.056	-0.099	-0.24***	-0.084	-0.137	-0.048	-0.09	-0.072
	(0.92)	(1.12)	(2.86)	(1.26)	(1.81)	(0.61)	(1.39)	(1.13)
Electronic Benefit (1,0)	0.06	-0.025	-0.018	0.011	0.018	0.051	0.056	-0.031
	(0.92)	(0.25)	(0.18)	(0.16)	(0.21)	(0.68)	(0.84)	(0.36)
Shelter Cost Per Person (log)	0.054***	0.066	0.089***	0.071***	0.062**	0.035	0.059***	0.049***
	(3.54)	(1.92)	(3.69)	(4.2)	(2.53)	(1.61)	(3.34)	3.08
Percent Food Not Brought (log)	-0.033***	-0.051***	-0.042***	-0.037***	-0.04***	-0.041***	-0.024**	-0.029***
	(3.28)	(3.17)	(2.9)	(3.36)	(3.3)	(3.81)	(2.01)	(2.6)
Food Insecure (1,0)	0.051	0.031	-0.025	0.041	0.018	0.077	0.047	0.059
	(1.05)	(0.38)	(0.4)	(0.78)	(0.31)	(1.27)	(0.97)	(1.19)
Hunger (1,0)	0.124***	0.108	0.07	0.099**	0.072	0.149**	0.08	0.09**
	(2.62)	(1.4)	(0.88)	(2.3)	(1.35)	(2.43)	(1.94)	(2.01)
Intercept	7.501***	8.311***	4.163***	2.121***	7.075***	6.25***	2.199***	4.056***
	(50.4)	(34.18)	(18.06)	(11.74)	(35)	(35.53)	(13.57)	(27.83)

SOURCE: National Food Stamp Program Survey weighted data. Sample size = 957.

NOTE: Statistical significance tests take the survey design into account, using a Taylor's series expansion algorithm as implemented in the STATA statistical package.

**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.
NA = Not applicable.

whether a household is experiencing food insecurity but no evident hunger (as compared to the omitted category of food secure), while the other is a binary variable indicating food insecure with hunger.

As shown in the table, the introduction of control variables does not alter the basic relationship between nutrient availability and food insecurity that was observed in tabular form in Table VI.1. The coefficient on the variable indicating food insecurity with hunger is positive in all eight regressions, indicating that relatively high levels of food insecurity are associated in the same household with relatively higher levels of nutrient availability. For four of the eight nutrients, this estimated relationship is statistically significant.

These findings suggest that the unexpected associations found in Table VI.1 are not simply due to spurious correlation with other variables. While the possibility of spurious correlations cannot be fully ruled out, many of the most obvious potential control variables have been included, and the unexpected correlations remain.[2]

2. Regressions with an Interactive Specification

Additional insight can be gained by exploring a somewhat more elaborate specification of the regression model. In particular, the conceptual model underlying the measures of food security used in this study suggests differing behavioral responses for households, depending on their food insecurity level. At more severe levels of food insecurity, households may manage their resources more intensively to try and maintain the quality and quantity of food availability. This may be done, for instance, by buying cheaper, more nutrient dense foods with available food purchasing resources or by utilizing social and community networks to obtain emergency food or food resources. Using

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[2]The findings are quite robust to the exact regression specification employed. Appendix K summarizes the range of specifications that was explored.

data from the 1977/78 NFCS, Basiotis (1992) showed differing behavioral responses of food insufficient households. While the NFSPS data provide the opportunity for a quite broad investigation of this assumptions of the conceptual framework, the analysis in this section is specifically oriented toward examining the higher levels of nutrient availability observed among the food insecure.

In implementing this more detailed approach, the multivariate model used earlier is modified to relax the assumption that each additional dollar of income and/or food stamp benefits will have the same impact on nutrient availability, irrespective of the food security status of the household. A more flexible model specification is used allowing for the income and food stamp benefit elasticities to be different depending on which food insecurity status category a household has been assigned to. This is done by interacting three binary variables indicating:

1. Food secure household
2. Food insecure household without hunger
3. Food insecure household with hunger

with the income and food stamp benefit variables. The binary variables themselves (except for one omitted reference category for food secure) are also included.[3] The estimated coefficients for the interactions should indicate whether behavioral differences by food insecurity status are evident. Likewise, the estimated coefficients for the included binary variables should describe any difference

[3]There are three food security level variables and two purchasing power variables (income and food stamp benefits). This yields six (that is, 3 times 2) possible interaction terms, all of which are included. We also include two of the three food security level binary indicators with the third, food secure, being the omitted reference category. This yields eight food security variables in all in this specification. Note that it would not be appropriate to also include the income variable on the food stamp variable separately, because they are the sums of the three associated interaction terms and are thus not linearly independent of those terms.

means between the included groups and the food secure (omitted group) that is not explained by the other variables in the model.

Results of the estimated equations for the eight nutrients are shown in Table VI.3. Regarding the food stamp benefit elasticities, the general pattern is for these elasticities to be larger for food insecure households. For example, in the folate equation, the interaction coefficients indicate that for a food secure household, an increase in food stamp benefits of 10 percent would increase folate availability by .95 percent, as compared to 2.01 percent in a food insecure household without hunger and 1.40 percent in a food insecure household with hunger. Although the differences between elasticities are not statistically significant, the extent to which the pattern of difference conforms to a priori expectations supports use of the flexible specification. Overall, in 5 of the 8 equations, the coefficients on both of the interaction terms between food insecure status and food stamp benefits are higher than the coefficient on the interaction terms involving food secure households.[4]

It should be noted that the regression results reviewed above do not alter the basic descriptive findings, noted at the beginning of the chapter. It remains true in the regression context that food insecure households tend, other things equal, to have higher levels of nutrient availability than households that are food secure. When the regressions are evaluated at the values of the independent

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[4]It should be noted, however, that, less in conformance with the a priori theory, the coefficient on the interaction involving *less* severe insecurity tends to be higher than the coefficients on the interaction terms involving *more* severe insecurity.

TABLE VI.3

REGRESSION ANALYSIS OF ANALYSIS OF INTERACTIONS BETWEEN FOOD SECURITY AND NUTRIENT AVAILABILITY
(Standard Errors in Parentheses)

	Calories	Vitamin A	Vitamin C	Vitamin B6	Folate	Calcium	Iron	Zinc
ENU (log)	0.608***	0.849***	0.58***	0.589***	0.568***	0.636***	0.476***	0.548***
	(9.66)	(4.86)	(4.47)	(9.22)	(7.71)	(7.16)	(8.87)	(7.3)
Income (log)	NA	NA	NA	NA	NA	NA	NA	NA
FSP Benefits (log)	NA	NA	NA	NA	NA	NA	NA	NA
HH Size (log)	0.061	-0.252	0.045	0.08	0.07	-0.013	0.236***	0.092
	(0.79)	(1.35)	(0.32)	(0.95)	(0.65)	(0.13)	(3.14)	(1.0)
Urban (1,0)	-0.109	0.001	0.026	-0.119	-0.124	-0.084	-0.105	-0.109
	(1.53)	(0.01)	(0.28)	(1.8)	(1.85)	(1.13)	(1.54)	(1.84)
Rural (1,0)	0.004	-0.035	0.043	-0.056	-0.015	-0.066	-0.008	-0.008
	(0.09)	(0.35)	(0.5)	(0.89)	(0.2)	(0.84)	(0.13)	(0.18)
Winter Interview (1,0)	-0.281***	-0.719***	-0.463**	-0.355***	-0.526***	-0.434***	-0.325***	-0.205
	(2.45)	(3.57)	(2.14)	(4.24)	(4.17)	(3.45)	(3.44)	(1.23)
Fall Interview (1,0)	-0.023	-0.099	-0.177***	-0.055	-0.025	-0.022	-0.005	-0.013
	(0.53)	(1.69)	(3.19)	(1.08)	(0.46)	(0.42)	(0.1)	(0.26)
Income × Food Security	-0.032**	-0.055***	-0.036	-0.022	-0.035***	-0.028	-0.024**	-0.01
	(2.13)	(3.23)	(1.87)	(1.85)	(2.78)	(1.51)	(2.15)	(0.67)
Income × Food Insecurity	0.009	0.082	-0.026	0.035	0.045	0.033	0.014	0.022
	(0.32)	(1.53)	(0.59)	(1.08)	(1.21)	(1.24)	(0.42)	(0.84)
Income × Hunger	-0.021	0.086	0.033	-0.007	0.017	0.011	0.022	-0.025
	(0.95)	(1.06)	(0.72)	(0.25)	(0.49)	(0.3)	(0.71)	(0.96)
FS Benefit × Food Security	0.086***	0.084	0.125***	0.106***	0.095**	0.085**	0.089**	0.085***
	(2.85)	(1.680	(3.48)	(2.8)	(2.55)	(2.53)	(2.5)	(2.68)
FS Benefit × Food Insecurity	0.156***	0.22***	0.161***	0.152***	0.201***	0.153***	0.151***	0.137***
	(4.84)	(4.19)	(2.76)	(3.85)	(4.14)	(3.76)	(4.25)	(3.69)
FS Benefit × Hunger	0.111***	0.084	0.08	0.142***	0.14**	0.072	0.135***	0.132***

TABLE VI.3 *(continued)*

	Calories	Vitamin A	Vitamin C	Vitamin B6	Folate	Calcium	Iron	Zinc
	(3.1)	(1.2)	(0.98)	(2.9)	(2.560	(1.32)	(4.08)	(3.4)
Food Insecurity	-0.37**	1.057***	-0.19	-0.376	-0.707***	-0.439**	-0.337	-0.267
	(2.09)	(2.77)	(0.63)	(1.75)	(2.84)	(2.01)	(1.76)	(1.49)
Hunger	-0.002	-0.532	-0.1	-0.086	-0.313	0.011	-0.282	0.002
	0.01	1.02	0.26	0.36	1.13	0.03	1.26	0.01
HH Has Elderly Member (1,0)	0.019	0.211***	0.128	0.026	0.071	0.03	0.047	-0.071
	0.37	3.33	1.84	0.43	1.19	0.57	0.78	1.23
HH Has Child ≤ 18 (1,0)	0.173**	0.446**	0.411**	0.264**	0.384***	0.224**	0.055	0.188**
	2.31	2.89	3.01	2.67	3.1	2.35	0.59	2.32
African-Am; not Hispanic (1,0)	0.054	-0.125	-0.197**	-0.008	-0.138	-0.17**	-0.049	0.111
	0.79	1.38	2.2	0.12	1.67	2.19	0.7	1.43
White, not Hispanic (1,0)	-0.013	-0.031	-0.225**	-0.081	-0.119	0.074	-0.038	0.048
	0.24	0.33	2.34	1.34	1.52	1.09	0.64	0.76
Applied 1 to 4 Years Ago	-0.02	-0.006	-0.102	-0.054	-0.081	0.022	-0.017	-0.041
	0.42	0.1	1.42	1.14	1.59	0.49	0.36	0.91
Applied 5 or More Years Ago	-0.056	-0.104	-0.242***	-0.085	-0.138	-0.049	-0.092	-0.071
	0.93	1.24	2.94	1.28	1.89	0.63	1.44	1.12
Electronic Benefit (1,0)	0.064	-0.027	-0.023	0.014	0.022	0.051	0.058	-0.025
	0.98	0.28	0.23	0.21	0.26	0.68	0.88	0.29
Shelter Cost Per Person (log)	0.054***	0.063	0.088***	0.071***	0.061***	0.034	0.058***	0.049***
	3.6	1.95	3.73	4.34	2.6	1.65	3.35	3.15
Percent Food Not Brought (log)	-0.033***	-0.052***	-0.043***	-0.037***	-0.04***	-0.041***	-0.023**	-0.028***
	3.3	3.13	2.96	3.32	3.3	3.95	2	2.59
Intercept	7.648***	8.766***	4.236***	2.292***	7.375***	6.423***	2.4***	4.175***
	48.96	45.86	21.49	14.81	38.19	35.35	15.02	27.69

SOURCE: National Food Stamp Program Survey weighted data. Sample size = 957.

NOTE: Statistical significance tests take the survey design into account, using a Taylor's series expansion algorithm as implemented in the STATA statistical package.

**Significantly different from zero at the .05 level, two-tailed .01 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.
NA = Not applicable.

variables applicable to a typical person in the data set, the predicted availability of nutrients remains, in the regression context, greater for food insecure household than for a food secure household, *holding all variables other than the direct and interaction variables involving of food security constant.* What the equations suggest, however, is that one important reason for this result is that food insecure households may obtain more nutrients from using their food stamp benefits than do food secure households. Other possible factors that could help explain this unexpected positive association of food insecurity and nutrient availability are summarized in the next section.

C. DISCUSSION OF FINDINGS

While the previously reported analysis has explained to some extent why more severely food insecure food stamp households might be observed to have more nutrients available, a major lesson to be learned is that the statistical and conceptual relationships between nutrient intake and food insecurity are more complicated than might have been expected. Data from this survey are available to support investigation of a number of more detailed hypotheses about the possible behavioral linkages between food insecurity and food use. Specifically, further work could be done on the use of non-purchased foods and the utilization of free meals outside the home as related to food insecurity. The data also might be used to determine whether more severely food insecure households are more likely to "binge" (that is, consume large quantities of food at the beginning of a month when they received food assistance benefits) and subsequently experience hunger due to shortages of food at the end of a month.[5] The role of transportation costs and food store access might also be studied. This section lays a groundwork for additional research by examining a number of possible reasons for the patterns observed in the data.

[5]Preliminary investigations of the data do indicate higher variances in nutrient availability for the more seriously food insecure as would be expected by this hypothesis.

The positive association of nutrient availability and food insecurity was unanticipated. While a number of factors were identified that should be considered in assessing these results, there is as yet no full interpretation of the findings. Thus the following discussion is intended more as an identification of "factors to consider" rather than as a strict interpretation of the data.

Section 1 below highlights from the literature some key evidence relevant to examining the current findings. Section 2 then considers whether the timing of various aspects of the data collection could, in part, be leading to the findings being observed. Sections 3 and 4 discuss a number of possible patterns in low-income households' food consumption that could be consistent with the findings.

1. Relevant Past Research

One important step in assessing the puzzling findings on the association of food security and nutrient availability is to examine the previous research for any indications that the relationship between these variables is more complicated than had been expected. As noted earlier, the NFSPS is the first data set to have both full food security information and nutrient-denominated data on food use. Therefore, there is no direct past literature that can be applied to the current analysis. However, indirect evidence can be gained by examining previous studies of food sufficiency in relation to nutrient availability or intake. This is done here.

The focus in this section is on past data about food sufficiency (see Section III.C). This concept uses either one survey question or a short sequence of survey questions to classify households into four categories: (1) having enough of the right kinds of foods to eat, (2) having enough but not always the right kinds of foods to eat, (3) sometimes not having enough food to eat, and (4) usually not having enough food to eat. This concept thus appears to tap conditions that are very similar to those examined with the food security measure. Further, the food security and food sufficiency measures are strongly and positively correlated with one another both in the CPS data (Hamilton et al. 1997) and in the NFSPS data. Here, three past studies based on the food sufficiency measure are examined.

a. Relationship Between Food Energy Availability and Food Sufficiency in Nationwide Food Consumption Data

As part of a broader analysis of food energy demand relationships in the 1977-78 NFCS data, Basiotis (1992) displays the relationship summarized in Table VI.4 between food energy availability in kilocalories and household responses to a food sufficiency scale. (The two most severe categories of insufficiency are aggregated in the Basiotis analysis.)

As shown, the differences in food energy availability between the different categories of food sufficiency are quite small and do not completely follow the pattern that might be anticipated. While the food energy availability is lowest in the most severe food sufficiency category, as might be expected, food energy availability is highest in the middle category, rather than in the category with no food insufficiency. Also, none of the differences between the three numbers is statistically significant.[6] Overall, these data do not provide significant support for the hypothesis that food energy availability increase with food sufficiency.[7]

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[6]Basiotis, whose paper uses the data for other purposes, does not directly report variances. However, based on the variance of similar variables in the NFSPS data set, it is virtually certain that none of the differences in the table even approach being statistically significant.

[7]Unpublished tabulations of data from the 1987-1988 Nationwide Food Consumption Survey by Biing-Hwan Lin of the USDA Economic Research Service lead to conclusions that are broadly consistent with those implied by the Basiotis tabulations of 1977-1978 data. In the tabulations of the more recent data, both nutrient availability and 24-hour intake information were cross-tabulated by food sufficiency level. In neither case did the observed amount of nutrients decline consistently as food sufficiency decreased.

TABLE VI.4

AVAILABILITY OF FOOD ENERGY PER WEEK PER ENU,
BY LEVELS OF FOOD SUFFICIENCY

Food Sufficiency Level	Weekly Food Energy (Kilocalories per ENU)	Sample Size
Enough and Kinds of Food Wanted	21,092	1,306
Enough but Not Always the Right Kinds	21,327	1,144
Not Enough	20,679	297

SOURCE: 1977-78 Nationwide Food Consumption Survey Data, as tabulated in Basiotis (1992), weighted data.

b. Relationship Between Nutrient Availability and Food Sufficiency in the Food Stamp Cashout Demonstration Data

In an unpublished memorandum, Fraker and Schirm (1993) use San Diego and Alabama Food Stamp Cashout Demonstration data to tabulate the relationship between (1) whether households report having enough food (based on a food sufficiency question); and (2) whether the households meet or exceed the RDAs in all of nine selected nutrients (Table VI.5). For Alabama, the data follow the expected pattern: about 39 percent of the households that characterized themselves as having enough food met the RDA for the nine nutrients, as compared to only 31 percent of households who said they did not have enough food. Furthermore, the difference between the 39 percent and the 31 percent estimates is statistically significant.

However, in the San Diego data the pattern reverses itself. The probability of meeting the RDA is greater for the households who report not having enough food, although the difference is not statistically significant. Thus, taking the two sites together, the evidence as to the relationship between food security and nutrient availability is quite mixed.[8]

c. Relationship Between Nutrient Intake and Food Sufficiency in CSFII Data

A third salient piece of evidence is provided by an article recently published by Rose and Oliveira (1997a), which examines the relationship between nutrient intake (as opposed to nutrient availability in the two previous subsections) and food sufficiency. Table VI.6 summarizes selected

[8]The Alabama cashout sample is considerably poorer than the San Diego sample. This leads to an interesting conjecture that would be consistent with the data in Table VI.3. It is possible that in poor populations, where a substantial fraction of households do not have adequate nutrient availability, the relationship between food sufficiency and nutrient availability follows the expected pattern, whereas in more affluent populations, the food sufficiency questions have different meanings to respondents and yield different patterns of results.

TABLE VI.5

NUTRIENT AVAILABILITY BY LEVELS OF FOOD SUFFICIENCY

	Does Availability of Each of Nine Nutrients Exceed 100 Percent of RDA?			
Food Sufficiency	Yes	No	Total	Sample Size
Alabama				
Enough food	39.2	60.8	100.0	1,901
Not enough food	30.9	69.1	100.0	385
San Diego				
Enough food	69.5	30.5	100.0	763
Not enough food	79.5	20.5	100.0	308

SOURCE: Food Stamp Cashout Demonstration, as tabulated in Fraker and Schirm (1993), weighted data.

NOTE: The differences between rows in percentage for Alabama are statistically significant; those for San Diego are not.

TABLE VI.6

MEAN INTAKES FOR WOMEN 19 TO 50, EXPRESSED AS PERCENTAGE OF RDAs

	Answers to Food Sufficiency Question		
	Food Sufficient	Not Food Sufficient	Difference
Food Energy	73.1	61.3	11.8*
Calcium	75.0	56.1	18.9*
Iron	78.5	66.6	11.9
Vitamin A	104.1	82.2	21.9*
Vitamin C	137.6	95.4	42.2*
Vitamin B_6	85.8	73.3	12.5
Folate	115.5	102.2	13.3
Zinc	74.7	66.2	8.5

SOURCE: 1989-91 Continuing Survey of Food Intake by Individuals, weighted data as tabulated by Rose and Oliveiri (1997a).

*Statistically significant at the five percent level.

illustrative results from their analysis for the nutrients that overlap with those being examined in the current study. All the estimated differences in intakes between food sufficient and food insufficient households are in the expected direction, and four out of eight are statistically significant.[9] Thus, of the three studies, this seems to be the one that most strongly supports prior expectations. However, it uses intake data rather than nutrient availability information.[10] Also, the Rose-Oliveira study covers a complete range of income groups, instead of focusing on food stamp participants. Having a broader range of income levels may help sharpen their estimates of the relationship between food sufficiency and nutrient intake. In particular, since income is likely to be correlated with both food sufficiency and nutrient intake, having a relatively broad range of income in the data is likely to increase the range of observations on these other two variables as well. This in turn may accentuate any relationship that exists and thus make it easier to detect.

d. Summary

While none of these studies provides direct evidence about the association of food security with nutrient availability, their findings suggest that the statistical relationships involved may be more complicated than had been realized. Two of the studies parallel the current study in that they focus on nutrient availability. In one of these two works (that by Basiotis), the relationship between food energy availability and food sufficiency is neither in the expected pattern nor statistically significant. In the other study (based on cashout data), one of two sites displays the expected pattern in the data, but at the other site the relevant observed relationship is not statistically significant and has the

[9]They obtain similar results for two other groups, small children and the elderly.

[10]The Rose and Oliveira results are broadly consistent with an earlier study of nutrient intakes by Cristofar and Basiotis (1992), as well as with other recent work by Rose and Oliveira (1997b), which extends the work summarized in Table IV.5 from the individual to the household level of analysis (but is still based on food intakes).

"wrong" sign. Overall, these past studies suggest that the findings of the current study, while still puzzling, are not quite as surprising as they may at first seem.

2. The Time Periods Covered by the Alternative Measures

In assessing the results reported above, it is also useful to consider the time periods covered by the food security and nutrient availability measures. As described in Chapter II, and Appendix A, the module of food security questions was administered during the first of the series of two interviews that were conducted with the in-person FSP sample. Therefore, the 12-month questions on which the main food security measure being analyzed is based cover the 12-month period preceding this interview, and the 30-day food security measure covers the 30-day period preceding the interview. On the other hand, the seven-day food use data collection was done in the second of the interviews, which occurred about seven days later. Thus, there is no overlap in the periods covered between the food security measures and the seven-day food use questions. Furthermore, even if there were an overlap of a full week, the longest period possible, most of the period covered by the food security scales would still not have been in the period covered by the food use analysis.

To the degree that episodes of food insecurity last over a considerable period of time, this non-overlap between the periods covered by the various measures being examined would be of little consequence to the analysis, since it could reasonably be expected that most of the food insecurity episodes reflected in the food security scale would still be ongoing during the food use data collection. However, to the degree that hunger is episodic and comes and goes quickly, perhaps to be followed by another episode later, then the non-overlap of data collection periods could seriously weaken any observed statistical relationship between food use and food security.

This timing issue may be of considerable importance in explaining the lack of the expected relationship between food security and nutrient availability in the data. However, the timing issue would appear to explain, at most, the lack of the expected positive relationship between food security and nutrient availability; it does not explain the observation of an association in the unexpected direction.

Furthermore, if timing of data collection is an issue, one might expect that the use in the current analysis of the 30-day food security measure instead of the 12-month measure would lead to results different from those of the 12-month measure, since the periods covered are, if not overlapping, more proximate on average with the 30-day data. However, as noted in Appendix K, use of the 30-day measure does not substantially alter the findings. (On the other hand, this could be due in part to the lower values of statistical reliability associated with the 30-day index.)

3. Use of Coping Mechanisms

As discussed in Section III.E, many of the households classified on the food security scale as experiencing hunger appear to make substantial use of various coping mechanisms, ranging from borrowing money to using emergency food sources such as food pantries and soup kitchens. One reason for failure to find the expected negative relationship between food insecurity and nutrient availability may be that households use these coping mechanisms to mitigate significantly the worst effects of their food insecurity on the availability of food. To be sure, as with the previous explanation, which focused on data collection timing, this one does not explain the positive relationship between food insecurity and nutrient availability. However, it may be a partial reason that the expected negative relationship is not observed.

4. Possible Behavior-Based Explanations of the Patterns in the Data

It is also useful to consider whether there are possible behavioral explanations of the patterns seen in the data. Two hypotheses are suggested below.

a. Do Low-Income Households That Consume Large Amounts of Food Also Tend to Have Episodes of Food Insecurity?

One conjecture consistent with the patterns seen in the data is that (1) those households with particularly strong preferences for food may tend to “binge” and consume large quantities of food when they have the resources, but (2) by so doing, such households may use up their food budget resources too quickly and thereby place themselves at risk of having an episode of hunger when their resources run out. Recognizing that most households find a way to obtain at least some food during periods of food insecurity, the result of the set of behaviors could be that households observed to consume the most food would also be the most prone to food insecurity.

This explanation is consistent not only with the current findings but also with past attempts to explain a number of other phenomena related to the FSP, such as (1) FSP households tending to have higher nutrient intakes in the early part of the month, shortly after receiving food stamps; (2) FSP households saying that they both buy and sell food stamps at different part of the month; and (3) households having higher propensities to consume food out of food coupons than out of income, even though most have not been constrained to do so since the elimination of the purchase requirement.

b. Do Households That Are Frequently Food Insecure Tend to Compensate by Consuming More Food than Other Households After Their Episodes of Insecurity Are Over?

A second conjecture is different from the first in that it considers the case where food insecurity is exogenous and not related to anything the household does or perceives. Arguably, households that for some external reason are more prone to food insecurity may tend to compensate by consuming more food when they are not experiencing food insecurity. This might happen either as planned behavior or, more likely, as an unconscious adaptation mechanism.

Both this and the previous explanation imply higher variances in the nutrient availability variables for food insecure households, as compared to the corresponding variances for food secure households. The data are consistent with this expectation: most of the estimated variances of the nutrient availability variables are lower for food secure households than for those in the most severe hunger category (Table VI.7). (The pattern is reversed, however, for the two middle groups.)

5. Conclusion

Although further research on these issues is needed before the policy implications are clear, overall the findings suggest that it may not be reasonable to expect a simple association between food insecurity and nutrient availability. One potential implication is that perhaps nutrition education messages should focus somewhat less on increasing the efficiency of food purchasing patterns and more on helping participants develop strategies for stabilizing the consumption of high quality food throughout the month.

TABLE VI.7

STANDARD DEVIATIONS OF NUTRIENT AVAILABILITY VARIABLES, BY FOOD SECURITY LEVEL

Nutrient	Mean	Estimated Standard Deviation for the Study Population[a]			
		Food Secure	Food Insecure/ No Hunger	Food Insecure/ Some Hunger	Food Insecure/ Severe Hunger
Food Energy	1.28	0.70	0.75	0.75	1.01
Vitamin A	1.78	1.35	1.64	1.97	3.32
Vitamin C	2.56	2.15	2.21	2.17	2.65
Vitamin B_6	1.47	0.86	0.96	0.86	1.14
Folate	2.13	1.35	1.56	1.43	1.99
Calcium	1.13	0.75	0.70	0.79	1.16
Iron	1.61	1.07	1.10	1.07	1.55
Zinc	1.17	0.74	0.77	0.71	1.30
Sample Size	**956**	**415**	**313**	**173**	**54**

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a]Entries are standard deviations of nutrient availability as a proportion of RDA, as scaled by ENU.

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APPENDIX A

DATA COLLECTION METHODS

The survey of Food Stamp Program (FSP) participants and nonparticipants was conducted from June 1996 to January 1997. This appendix describes the methods used to select the sample, conduct the Food Stamp Survey, and process the data. It also includes response rates and reasons for ineligibility.

A. METHODS FOR SELECTING AND LOCATING RESPONDENTS

MPR used a dual frame approach to select the samples of FSP households and households containing eligibles who do not receive food stamps.

1. List Frame

List frame samples in this survey were selected from administrative lists of FSP participants. Before identifying the sample, an MPR sampling statistician randomly selected 35 primary sampling units (PSUs) systematically with probability proportional to size. The PSU was usually a county, but sometimes it was a state (in cases where county-level information was unavailable) or a city (the five boroughs of New York). Before selection, the PSUs were first sorted by region, then by state within a region, and finally by size (number of food stamp recipients) within state.[1] Because the three largest PSUs were the same size as or larger than the sampling interval, they were selected with certainty and removed from the systematic sampling process.[2] New York City had a size equivalent to two sampling intervals, so it counted as two PSUs. Thirty-one PSUs were then selected out of the remaining 2,862. Two of these were at the state level and so required subsampling. For the three certainty selections, the decision was made to subsample areas within counties. Three areas were

[1]These numbers were from spring 1995.

[2]Frame size before removing certainty selections was 10,858,961, and the sampling interval for selecting 35 PSUs was 310,256. The frame size after removing the certainty selections was 9,462,582.

sampled from Cook County, three areas from Los Angeles County, and two boroughs and three areas within each borough for New York City.

In spring 1996, FNS provided the names of contacts in the seven regional offices to assist with obtaining list samples for the survey. These regional contacts, in turn, provided the names of contacts in the state offices for the 34 areas selected for the survey. (In California, the state contact provided referrals to county offices.) These offices provided data files containing lists of all active food stamp cases as of the beginning of April 1996.[3]

As these data files were received from the field, the sampling statistician read them in from their various formats and standardized them into SAS data files. For most of the PSUs, 180 cases were selected systematically. For Cook County, 60 cases were selected systematically from each of the three subsampled areas. In Los Angeles County, 81 cases were selected from each of the three subsampled areas. In each of New York City's six selected areas (three from each of the two selected boroughs), 60 cases were selected. The selected cases were then sorted into a random order. The first two-thirds were then assigned to the field sample, and the last third was assigned to the telephone sample.

a. Field List Frame Sample

For the field sample, the objective for most of the survey sites was to obtain 29 completions at each site. However, for the three survey sites that had been selected with certainty and which were self-representing in the sample, the target numbers of completion were set higher, reflecting their relative sizes in the overall population. These targets were as follows: 30 for Cook County, 42 for

[3]A trial run was conducted with most of the selected sites a couple of months earlier, where they supplied their most current data file at the time. It was at this trial stage that the two selected states were subsampled and the three certainty selections were made, using more-current estimates the states provided of food stamp recipients.

Los Angeles County, and 60 for New York City. The total number of targeted completes for the field sample was 1,031. Cases were released as needed in a random order by site from among the 4,242 cases selected for the field component. A total of 2,200 cases were ultimately released.

b. Telephone List Frame Sample

For the telephone sample, the targeted number of completes from each of the non-certainty sites was 14. For the selected areas in the three certainty selections, the targeted number of completes was 15 for Cook County (combined), 21 for Los Angeles County (combined), and 30 for New York City (combined). The total number of targeted completes for the telephone list sample was 500. Cases were released as needed in a random order by site from among the 2,121 cases selected for the telephone component. Ultimately, all 2,121 cases were released.

2. Random-Digit-Dialing Sample

For the random-digit-dialing (RDD) sample, software from Genesys, Inc. was used to obtain a stratified sample of 20,003 telephone numbers in working telephone banks in the United States. A telephone bank is defined as the first 8 digits of a 10-digit telephone number (area code plus exchange plus next two digits). The possible combinations of its last two digits create 100 telephone numbers for a bank to contain, and it is considered a working bank if at least one is a published residential telephone number. Each telephone number was defined as being in one of five strata based on the area code plus exchange (first 6 digits of the 10-digit telephone number). There was no oversampling by stratum. The five strata were defined by the estimated percentage of households with income less than $15,000:

- ***Low Income.*** Exchanges where estimated percentage $\geq$ 35 percent
- ***Mid-Low Income.*** Remaining exchanges where estimated percentage $\geq$ 25 percent

- ***Middle Income.*** Remaining exchanges where estimated percentage $\geq$ 15 percent
- ***Mid-High Income.*** Remaining exchanges where estimated percentage $\geq$ 10 percent
- ***High Income.*** Remaining exchanges (where estimated percentage < 10 percent)

After removing known nonworking and nonresidential telephone numbers, cases were released in a random order as needed to obtain the targeted number of completes: 495 participants and 990 eligible and near-eligible nonparticipants. A total of 14,514 telephone numbers were released.

3. Obtaining Contact Information

Contact information for the FSP study sample was obtained with the original sample from state or county FSP offices. This information, current as of March 1996, included sample member name, address, telephone number (if available), date of birth, and, in some cases, a caseworker identifier. The information received varied widely by site in terms of completeness and accuracy.

a. Contacting Local FSP Offices

Local FSP offices were first contacted, with permission of the state offices, in May 1996. This contact served to inform the local offices about the survey so they could encourage participation and confirm the validity of the survey, should any of the recipients contact them.

MPR survey staff contacted the local offices in July to obtain updated contact information for recipients who could not be located. In addition, offices were asked to confirm if each sampled person was still receiving food stamps. Project staff provided the birth date of the recipient, and the client ID#, case ID#, or caseworker ID#, if this information was available to assist the local offices in identifying the cases. All offices contacted were responsive to requests. Some offices consulted with the caseworkers, while others used their computer files or hard copy files to obtain the information.

The local offices were recontacted in August and September of 1996 to obtain information on additional recipients who could not be located. In September, selected field interviewers went to the local offices and worked with the local contacts to update contact information. Overall, these efforts yielded some addresses and telephone numbers, but the most helpful information provided was whether the recipients were still receiving food stamps and hence eligible for the survey.

b. MPR Locating Department

Telephone numbers were available on the samples provided for approximately 54.5 percent of the list frame telephone sample.[4] However, many of these numbers were either nonworking or incorrect. As a first strategy, telephone interviewers called local directory assistance to obtain telephone numbers for cases with nonworking or incorrect numbers. When these efforts failed, FSP offices were contacted as discussed in the previous section. If the FSP offices could not update the information, MPR's Locating Department searched for sample members.

MPR's Locating Department made extensive use of a service bureau that searches using a crisscross or reverse directory, surnames, and the existing telephone number. The on-line system was accessed from a terminal in the Locating Department. MPR's Locating Department also utilized directory assistance, involving locations neighboring the sample member's city or town. In total, 642 cases were referred to the Locating Department. Reliable contact information was obtained for 16 percent (105) of these cases.

[4]Often, the telephone number data in the estimated files from which the sample were drawn is incomplete.

B. SELECTION AND TRAINING OF DATA COLLECTION STAFF

1. Hiring and Training of Field Staff

Field interviewers were hired in each of 35 PSUs. It was determined that some PSUs would require two interviewers, while one experienced interviewer would be sufficient for other areas. A single interviewer was hired in each of 17 PSUs, while two interviewers were hired in each of 18 PSUs. Approximately one month after the start of the field period, six additional interviewers were hired because of attrition among original interviewers and a reevaluation of field needs. Field interviewers were recruited from three sources: an MPR database, local community contacts, and state job services. Preference was given to people with Computer-Assisted Personal Interviewing (CAPI) experience or experience in food management or nutrition. Twenty-eight of the 53 interviewers had experience conducting CAPI interviews. Three additional interviewers had some experience in field interviewing or field locating. Seventeen interviewers had no direct survey experience. Four PSUs were targeted as requiring bilingual interviewers. In addition, three of the interviewers were trained nutritionists. Three field supervisors were hired to manage the field effort. All field supervisors had experience conducting food use surveys. Two of the supervisors had experience working for MPR.

The main field interviewer training was held May 4-10, 1996. A two-day trainers' training was conducted for field supervisors, trainers, and assistant trainers at the MPR offices immediately before the general training session. This training included a question-by-question review of the survey instrument, and testing and practice on the CAPI questionnaire.

One week before the general training session, interviewers were sent an advance study manual that contained an introduction to the survey and a review of basic interviewing techniques. Interviewers were required to complete an assignment related to food use data collection before leaving their homes. They were also instructed to schedule a practice interview to be completed at the conclusion of training.

The six-day intensive training was held off site, at a conference and training center in Princeton, New Jersey. Two training formats were used: (1) large-group lecture format, and (2) small-group practice sessions. During the training, interviewers moved from large format to small-group sessions as dictated by the agenda. Interviewers were divided into five small groups based on interviewing and computer experience. Each small group was led by one senior trainer and one assistant trainer. One-on-one CAPI enrichment sessions were also provided each evening. The first two-and-a-half days of training included a general introduction and background to the study, instruction and practice with the hard-copy screener and hands-on practice with the CAPI interview. In addition, an MPR training tape about the role of the interviewer was shown during an evening session, with discussion afterward. Training on the hard-copy food use instrument was conducted for three days by MPR staff, including MPR's nutritionist; Margaret Andrews, the Contracting Officer's technical representative; and Pat McKinney, an FNS nutritionist. In large-group sessions, trainers presented an overview to the food use module as well as specific rules for completing the food use instrument. In small-group sessions, interviewers were paired for one-on-one practice and question-by-question review. Key definitions of food categories and instruction in reporting food use quantities were reviewed in the smaller sessions. Trainers administered CAPI proficiency exercises and food use recording exercises to evaluate interviewer performance before the conclusion of training. A small number of interviewers were able to be identified who required one-on-one supplementary training during evening sessions. Interviewers spent the final half day of training integrating data collection components, reviewing administrative issues, and meeting with field supervisors.

2. Hiring and Training of Telephone Interviewers

By early June 1996, 74 telephone interviewers were hired and trained to administer screening and survey instruments. The group contained experienced and inexperienced interviewers. Inexperienced interviewers received eight hours of general interviewer training prior to participating in project-specific training. Both experienced and inexperienced interviewers participated in project-specific training, which included overviews of the program and study, sample member screening, item-by-item review of the questionnaire, role plays, questions and answers, and Computer-Assisted Telephone Interviewing (CATI) practice. Project-specific training lasted for close to eight hours. About seven percent of the interviewing staff was bilingual.

C. METHODS FOR COLLECTING THE DATA

1. Field Data Collection

Data collection for the in-person component included a telephone or in-person screener and a two-interview series. Part I of the main interview was administered by CAPI and collected information about the household, program access, food security, and shopping patterns. Part II involved both CAPI and hard-copy administrations and included either a four- or a seven-day recording of foods used from the home food supply. Part II was conducted either four or seven days following Part I.

a. Survey Materials

In addition to Dell 486 Latitude laptop computers with English and Spanish versions of the CAPI instrument, materials for the survey included:

- ***Advance Letter.*** Mailed to the respondent three to five days before telephone contact was made

- ***Record of Contacts Form.*** For documenting attempts made to locate and interview sample persons
- ***Eligibility Screener.*** Brief hard-copy interview to determine respondent eligibility
- ***Reminder Postcard.*** To remind respondents of their appointment for the second part of the interview
- ***Food Use Instrument.*** Hard-copy instrument administered during Part II of the interview to obtain detailed information about household food use
- ***Food Use Checklist.*** To help respondents keep track of food use during the survey period

All hard-copy materials were available in both English and Spanish.

b. Components of the Interview

Advance Letter. All persons selected to participate in the National Food Stamp Survey were notified of their selection by a letter in advance of any other form of contact. The advance letter explained the study, encouraged participation, and informed the sample member that the interviewer would be contacting him or her. Letters were mailed to respondents three to five days before the screening contact was made.

Screener. Next, the interviewers screened the respondents by telephone. They called their assigned sample members to introduce themselves, administer a brief eligibility screener, answer any questions the respondent might have, and, if the household passed the screen, schedule the two parts of the interview with the food manager for the household. (If telephone contact was not possible, this screening was done in person.)

Part I of Main Interview. Part I of the main interview was conducted by CAPI. At the conclusion of the interview, respondents were instructed to keep track of foods used and shopping trips made during the seven-day period before Part II of the interview. The interviewer provided materials to aid the respondent in keeping detailed records of all the food purchased and used by the household. These materials included a plastic bag for saving food receipts and a large envelope for the collection of food labels. Two days after completion of the Part I interview, interviewers mailed the respondent a reminder postcard that included the date of the appointment for the Part II interview.

Part II of Main Interview. The first section of the Part II interview was conducted by CAPI. This section collected information about shopping trips and identified household members and guests who used food from the household food supply. The second section of the interview used hard-copy administration. It identified what foods were used, with a level of detail sufficient to determine actual nutritional availability, such as calories, fat, and vitamins. This section also captured the cost of each of the foods. Upon the completion of the Part II interview, respondents were given a $20 incentive for their time and cooperation. (Respondents were told of $20 payment when they were first contacted as an inducement to participate and maintain the food use records.)

c. Field Management

Field interviewers reported progress to their field supervisor weekly by telephone at prearranged times. They reported hours worked, expenses, and field progress. During the reporting session, the supervisor reviewed each case being worked by the interviewer and suggested modifications to searching and interviewing techniques where appropriate. Supervisors also handled administrative needs (such as supply orders) and answered non-urgent questions. In turn, the supervisors reported summaries of field progress and expenses to an MPR survey specialist weekly. Interviewers were encouraged to contact the MPR help line immediately for urgent matters.

d. The MPR Help Line

Interviewers and field supervisors had 24-hour access to the survey director and to technical support staff by means of a toll-free number that reverted to a paging system during non-business hours.

e. Bonuses

To encourage interview productivity at the end of the project, MPR offered field interviewers a bonus of $10 for every interview completed after November 21, 1996. This kept enthusiasm high when sample was sparse. It also kept interviewers motivated to finish their final assignment rather than move to new projects.

f. Special Procedures Used for the Seven-Day Food Use Data Collection

A week before the food use food use data collection interview, MPR field personnel discussed the data collection in person with the respondent, establishing the boundaries of the seven-day period covered, explaining the food use concept, and requesting that the respondent keep grocery receipts, food labels, and other material that would help her or him provide information on the foods used during the relevant period. For storing receipts and labels, the respondent was given an envelope, which also contained a grid for recording the foods used each day, along with a plastic bag for holding messy labels.

The interview itself was conducted as soon as possible after the conclusion of the observation period--usually within 24 hours. It proceeded as a detailed assisted-recall process, based on a set of categories of foods listed in the data collection instrument. In particular, within the instrument, all possible foods were divided into major categories, such as meats, fish, fruits, sweets, baby food, and so forth. A separate page on the instrument corresponded to each category. For each page, the interviewer first asked if any of the category (for example, meats) was used during the seven-day period. If the respondents said no, the interviewer recorded that answer and went on to the next page. When the respondent replied that the household had eaten something from a food category, the interviewer then read a detailed list of possible items to identify what item or items the person had used (for example, pork chops, ground beef, veal cutlets). This information was then recorded, along with auxiliary information about prices, costs, and so forth, and this process continued until all the foods used in a category had been recorded. After one category was finished, the next was asked about, until all the categories had been covered.

The data collection was usually done in the respondents' kitchen. This allowed the respondent to refer to packages and containers when supplying information about the foods recorded (for example, the size of the oatmeal box the household typically uses).

2. Telephone Data Collection

For the telephone sample, CATI techniques were used to facilitate the screening and interviewing. Sample points were electronically assigned to individual interviewers, and the CATI system stored the results of interview attempts. An automated system reassigned unsuccessful attempts and scheduled callbacks. Interviewers who conducted the screening interviews also conducted the telephone interviews of both participants and nonparticipants. A senior staff member at the survey operations center supervised the interviewers, and assistant supervisors assessed interviewer performance by monitoring randomly selected segments of the interviewing.

a. Bonuses

A bonus system was instituted in the survey operations center on September 13, 1996, as an incentive to maintain interviewer interest and commitment when it became increasingly difficult to obtain completed interviews. One dollar was offered for each completed RDD or list frame interview and one dollar and fifty cents for each refusal that was converted to a complete interview.

b. In-Person Locating of Telephone List Frame Sample Members

In mid-November, field locators with cellular telephones were deployed in 24 areas to locate telephone list frame sample members who could not be contacted by telephone. Locators received written training materials and participated in telephone training on implementing locating strategies and operating the telephone equipment.

Field locators searched for sample members by starting with the last known address and then contacting neighbors and community sources. After locating a sample member, if a telephone was available in the household, the locator was responsible for facilitating a phone call to MPR's survey operations center. Staff were available throughout the day and evening hours to conduct the interview. If the sample member could not participate in the interview at that time, a telephone number was obtained and communicated to the operations center. Appointments were made when possible. If a telephone was not available in the household, the locator saw that the interview was conducted by cell phone and remained with the sample member until it was completed. Within a six-week period, the locators were able to facilitate 122 interviews from the 625 sample members that were previously unlocatable by telephone. They also determined that an additional 44 sample members were ineligible for the study.

3. Problems Faced During the Survey Period

The data collection began at a time when the government was contemplating major changes in the welfare program. This news created nervousness among respondents. Uncertain about their eligibility for food stamps and other entitlement programs, they were reluctant to participate in the study and had to be reassured that their responses would not affect their future eligibility.

Immigrant ethnic communities would have been severely affected by the policies considered. In contrast with previous successful interviewing in the Vietnamese community in California for the cashout evaluations, a Vietnamese interpreter and community worker was unsuccessful in facilitating interviews in that community. A Russian interpreter had a similar experience with the immigrant Russian community in New York City.

D. QUALITY ASSURANCE AND DATA PROCESSING

1. Transmittal and Tracking of Field Data

On a weekly basis, field interviewers submitted completed work to MPR by Federal Express. Weekly field shipments included the transmittal forms used to report cases submitted, hard-copy food use instruments, supporting food use materials, and data diskettes.

The packages were received by the MPR data clerk, who checked the contents against the transmittal form to verify that all materials had been included. An ACCESS database was developed to track the field cases. Interim status codes were entered on a weekly basis following receipt of supervisor reports. The database also included fields for entering dates when the MPR office received completed cases.

The database identified cases reported as complete but not received within 10 days after the supervisor's report. Using weekly reports, the data clerk made reminder calls to field interviewers who had outstanding cases.

After logging in completed cases, the data clerk delivered MPR diskettes to MPR's systems analyst for downloading into a SAS data file. Food use instruments and contact records were delivered to a coding center set up to implement coding using the Food Intake Analysis System (FIAS) developed by the University of Texas (see Appendix C).

Verification and Callbacks. FIAS coding center staff conducted verification of completed cases. Coders were required to telephone at least 10 percent of the respondents interviewed by each interviewer. Using a verification form designed by MPR, coders asked about the date and length of their interview, the mode of the interview (telephone or in person), and the names and locations of the stores the respondent used. Coders also asked about foods and recorded the answers on the food instrument. Food use instruments that were not completed according to specifications were reviewed. As a result of the verification process, two interviewers were terminated and their cases assigned to other field staff. For each of these interviewers, the MPR survey director personally contacted each one of the households who had previously been submitted by the interviewers as completions to test their validity. In most instances, the interview could be validated and was retained. In a small number of instances, the interviews were assigned to a different interviewer or a supervisor to be redone.

2. Food Coding[5]

Analysis of home food use required coding all the foods from hard-copy food instruments, as well as data entry of all foods purchased and the prices paid by respondents. To facilitate these goals, a coding room was set up at MPR. Coders were hired, trained, and then provided with their own coding stations and reference materials in the coding room. A supervisor directed the flow of activity in the coding room and consulted with the MPR nutritionist or the co-principal investigators

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[5]The discussion in this section focuses principally on the operational aspects of the coding work. See Appendix D for a discussion of the conceptual basis of the coding operations.

for the project to resolve problems arising from unavailable codes, missing data on the hard copy, or any other causes.

Hard-copy food instruments delivered to the coding room were logged into an ACCESS database by the coding supervisor and then filed according to interviewer. All coders were required to code instruments by all interviewers, and instruments were coded in chronological order so that those instruments received first were usually coded first. Coding entailed reading the nine-digit survey code on the food instrument, assigning a corresponding six-digit FIAS code, and then entering this six-digit code and the amount of the food that was *used* into the FIAS file.[6]

a. Staffing and Training of Food Coders

Following the recommendations of the FIAS staff at the University of Texas, coders were required to have completed high school (though some college education was preferred), to be the food manager at home, and to be familiar with simple mathematical computations. In addition, MPR required coders to have some basic computer experience.

Including practice experience, coders were required to participate in 2.5 days of training at MPR. After being given an overview of the project, coders were shown how to start a new file in FIAS, how to move around while in FIAS, and how to close a file. Coders were then shown how to extract the nine-digit survey code from the food instrument and how to relate this code to its corresponding six-digit FIAS code. They were also taught how to input the six-digit FIAS code for each food into a FIAS file along with the amount of that food used during the seven-day period. For each food line, coders were also required to compute, if applicable, the total amount of food bought

[6]The six-digit coding system was developed by MPR and its subcontractor, ROW Sciences, Inc., to convert the food assumptions used in previous USDA food use studies to codes that were compatible with the FIAS coding system.

and the amount of money paid. The mathematical operations that facilitated these steps were reviewed, and coders were provided with a training manual, written by the project director and the MPR nutritionist, which contained all the topics covered during training. (At a later time during the project, coders were taught how to "clean" and data-enter the completed price-related data on the food instruments.)

Ongoing Procedures. The coders were responsible mainly for coding the hard-copy food instruments as outlined above. They also called the respondent when more-detailed information was required for a reported food. For example, if the amount of food used or purchased was missing or unclear or if the form of the food was not indicated (dehydrated, ready-to-eat, condensed, etc.), the coder called the respondent for clarification. Many food instruments generated questions about package size and price paid for a food item. Since some respondents were not able to remember these details, a list was constructed of all the foods that required information on package size or price paid. Two of the coders then went shopping at regular intervals to obtain this information.

Once most of the hard-copy food instruments had been coded and entered into FIAS, the coders were trained to data-enter the information on the food purchased and the price paid into a Lotus spreadsheet.

b. Problems Encountered in Coding

Five main problems delayed the food-coding process: (1) missing information about the food or the price paid for the food, (2) new foods that had no assigned nine-digit survey code or six-digit FIAS code, (3) nonfunctional six-digit FIAS codes, (4) foods that were miscoded in the instrument, and (5) ethnic foods (Russian, Vietnamese, Mexican, among others) that were unfamiliar to the coders.

Several approaches were used to resolve these problems. Information about the unit weight of a food, package size, or unit price was obtained from advertisements from food stores across the country and from food lists solicited from large supermarket chains. In addition, published reference material from the USDA, cookbooks, and food preparation books was used. Uncertainty about the type or amount of food recorded in the instrument was clarified by telephoning the respondent. In other instances, the coders kept a list of unknown package sizes or cost, and at regular intervals one or two of the coders themselves visited a large supermarket to ascertain this information. When none of the above measures supplied the resolution, the problem was referred to the MPR nutritionist, who in turn consulted with a nutritionist at MPR's subcontractor, ROW Sciences, Inc.

c. Data Cleaning

When all food items of a case were completely entered into FIAS and there were no outstanding problems, the case was "cleaned"--that is, all the foods were analyzed for specific nutrients, and cases with outlier values on key nutrients were examined by the project director and/or the project nutritionist. If any problems were uncovered in these outliers checks, the FIAS files were changed accordingly, and the cases were recleaned.

d. Data Entry and Edit Checks

After cleaning, price-related data on each case were also data entered into a Lotus file. The information required for data entry was the six-digit code, the amount of food *purchased*, and the total price paid for the food.

For each case, the FIAS analysis file and the Lotus file were used to generate a FIAS edit file and a Lotus edit file. For a given case, the FIAS edit resulted in a list of those foods that exceeded a preset standard for the normal consumption of specific nutrients in those foods, and the Lotus edit resulted in a list of foods that seemed to exceed the usual unit price, had different FIAS and Lotus codes, or showed a higher amount used than bought. The MPR nutritionist reviewed the FIAS edits and made appropriate adjustments, while the coders reviewed and corrected the Lotus edits, under the supervision of the coding supervisor.

While the coders were encouraged to use reference materials to resolve questions about package size or price, the MPR nutritionist resolved all questions about portion sizes, usual weekly amounts of consumption, and classification of unusual foods or foods not included in the food instrument. She also developed new codes for foods as appropriate and periodically reviewed completed files for quality control purposes.

E. COMPLETION AND OTHER FINAL STATUSES

Eligibility for Surveys. Among the 14,514 cases that were released for the RDD sample, 7,488 were determined to be working residential telephone numbers, making those numbers eligible to complete the income-screening questions (see Table A.1).[7] Among the remaining cases, 5,219 were determined to be either nonworking telephone numbers or nonresidences. It was not possible to make this determination for the remaining 1,807 cases. Among the 7,488 eligible to complete the income screener, 6,429 completed the screener. Among these cases, 4,973 were determined to be ineligible for the interview because the household income was too high, leaving 1,456 cases eligible for the interview.

For the telephone list sample, among the 2,121 released cases, 546 were determined not to be receiving food stamps at that time, 7 were deceased, and 33 had moved out of state. This left 1,535

[7]This is derived as follows: 14,514 cases released minus 7,026 ineligible or undetermined cases (5,219 + 1,807) yields 7,488 working numbers.

TABLE A.1

ELIGIBILITY RATES AND REASONS FOR INELIGIBILITY

Eligibility Status	Reason	RDD Sample[a]	Phone List Sample	Field List Sample
Total Released		14,514	2,121	2,200
Undetermined	Did not determine if working residential telephone number	1,807		
Ineligible for Survey	Nonworking telephone number or non-residence	5,219		
	Income too high	4,973		
	Not receiving food stamps		546	508
	Deceased		7	7
	Institutionalized			25
	Moved		33	56
Eligible for Survey	Working residential telephone number meeting income criteria	1,456		
	Receiving food stamps in sampled area		1,535	1,604

SOURCE: Administrative files for the 1996 National Food Stamp Program Survey, Mathematica Policy Research, Inc.

[a]For the RDD sample, eligibility refers to the interview itself, not eligibility for the screener. Of course, if a household is ineligible for the screener, it is also ineligible for the interview. Similarly, if it is not determined that the telephone number is a working residential number, then eligibility for the interview is not determined either.

eligible cases for the telephone list sample. For the in-person sample, among the 2,200 cases released, 508 were no longer receiving food stamps, 7 were deceased, 25 were institutionalized, and 56 had moved out of the sampled area. This left 1,604 eligible cases for the in-person sample.

Completion Status. Among the 1,456 known eligible cases in the RDD sample, 1,159 completed the interview (see Table A.2). Most of the remaining cases were refusals and broken appointments (n=144) or cases that could not be contacted by the end of the field period (n=134).

Among the 1,535 known eligible cases in the phone list sample, 1,041 completed the interview. One hundred five cases were nonrespondents due to refusal or broken appointment; 39 were cases of a language, cognitive, or physical barrier; 17 were cases where the person was hospitalized or too ill to complete the interview; and in 333 cases, the person could not be contacted or located.

The field sample had two parts to the interview. Among the 1,604 cases determined to be eligible for the interview, 1,109 completed at least Part I. There were 196 refusals or broken appointments, 41 with an illness or hospitalization, 123 cases unable to be contacted or located, 93 other cases that could not be resolved by the end of the field period, and 42 "other." Among the 1,109 cases that completed Part I, all but 39 completed Part II.

TABLE A.2

COMPLETION TOTALS AND REASONS FOR NONRESPONSE
(Among Known Eligibles)

Response Status	Reason	RDD Sample	Phone List Sample	Field List Sample Part I	Field List Sample Part II[a]
Completed Interview		1,159	1,041	1,109	1,070
Did Not Complete Interview	Refusal/broken appointment	144	105	196	39
	Language/cognitive/ physical barrier	10	39		
	Too ill or hospitalized		17	41	
	Unable to locate or contact		333	123	
	Exhausted attempts	134		93	
	Other	9		42	
Total Known Eligibles		**1,456**	**1,535**	**1,604**	**1,109**

SOURCE: Administrative files for the 1996 National Food Stamp Program Survey, Mathematica Policy Research, Inc.

[a] Among those who completed Part I.

APPENDIX B

WEIGHTING

This appendix describes the steps taken to calculate analysis weights for the 1996 Food Stamp Survey (FSS). Each of the following four groups is discussed separately. Then ways are reviewed for combining results across the various groups. The four groups are (1) the in-person list frame sample, (2) the telephone list frame sample, (3) the telephone random-digit-dialing (RDD) sample of Food Stamp Program (FSP) participants, and (4) the telephone RDD sample of FSP-eligible and near-eligible nonparticipants.

A. IN-PERSON LIST FRAME SAMPLE

To estimate the in-person list frame sample weights, first the probabilities of selection for each sample member were calculated. The inverses of these probabilities were then used to calculate an initial set of weights. Next, these initial weights were adjusted to reflect survey nonresponse. Section 1 below describes how the selection probabilities were calculated. Section 2 then describes the nonresponse adjustments.

1. Sampling Weight

The first step in calculating weights for the in-person list frame sample was to determine the probability of selection. Both the in-person and the telephone list frame samples originated from the same sample frames. For the in-person list frame cases, probabilities of selection were computed as the product of five terms:[1]

(1) *overall prob selection = prob [PSU] * prob [sub-PSU\PSU] * prob [local area\PSU and sub-PSU]*

** prob [case selected for either the in-person or field samples\earlier stages]*

** prob [case selected for the in-person sample\previous step]*

[1] Note that in what follows the “slash” character, i.e., “\”, is used to denote “given.”

a. First Stage

The first step in the process was to select with probability proportional to size (PPS) the 35 primary sampling units (PSUs), which were counties (or sometimes states, if county-level size measures not available) in the contiguous United States.[2] Four PSUs were set aside as certainty selections because their measures of size were larger than the sampling interval: New York City (which counted for two selections), Cook County, and Los Angeles County. Once these four PSUs were removed, 31 other counties were selected PPS. Thus, the first term in the equation for the probability of selection (for the noncertainty selections) was:

$$P(PSU_i) = \frac{31 \cdot MOS_i}{\sum_{j=1}^{2862} MOS_j}$$

where MOS_i was the measure of size of PSU *i*. Note that 2,862 non-certainty PSUs were eligible for selection, with a combined measure of size of 9,462,582. For the certainty selections, the first term in the equation was simply 1. The three certainty PSUs had a combined measure of size of 1,396,379.

b. Second and Third Stages

For the three certainty selections and for two PSUs that were at the state level, there were one or two more stages of selection prior to the selection of FSP participants. Each of these will be discussed in turn:

[2]The measures of size used were figures reported to the FCS in spring 1995. Note that they refer to cases, not persons.

Maine. One county within Maine was selected PPS, based on November 1995 counts provided by the state. The second term of the equation for the probability of selection was then:

$$P(county_k|PSU_{Maine}) = \frac{1 \cdot CMOS_k}{\sum_{j=1}^{16} CMOS_j}$$

where $CMOS_k$ was the measure of size for county k in Maine.

Cook County. Three offices were selected PPS, based on counts provided by Cook County in January 1996. The second term of the equation for the probability of selection was then:

$$P(office_k|PSU_{Cook}) = \frac{3 \cdot OMOS_k}{\sum_{j=1}^{25} OMOS_j}$$

where $OMOS_k$ was the measure of size for office k in Cook County.

Los Angeles County. Three districts were selected PPS, based on December 1995 counts provided by Los Angeles County. The second term of the equation for the probability of selection was then:

$$P(district_k|PSU_{LA}) = \frac{3 \cdot DMOS_k}{\sum_{j=1}^{29} DMOS_j}$$

where $DMOS_k$ was the measure of size for district k in Los Angeles County.

Oregon. One district within Oregon was selected PPS, based on October 1995 counts provided by the state. The second term of the equation for the probability of selection was then:

$$P(district_l | PSU_{Oregon}) = \frac{1 \cdot DMOS_l}{\sum_{j=1}^{15} DMOS_j}$$

where $DMOS_l$ was the measure of size for district *l* in Oregon. Because each district contained multiple counties, one county was selected PPS within the selected district. The third term of the equation was then:

$$P(county_k | district_l) = \frac{1 \cdot CMOS_k}{\sum_{j=1}^{5} CMOS_j}$$

where $CMOS_k$ was the measure of size for county *k* in selected district *l* in Oregon.

New York City. Two boroughs were selected PPS, based on December 31, 1995, counts provided by the state. The second term of the equation for the probability of selection was then:

$$P(borough_l | PSU_{NYC}) = \frac{2 \cdot BMOS_l}{\sum_{j=1}^{5} BMOS_j}$$

where $BMOS_l$ was the measure of size for borough *l* in New York City. Then three zip codes were selected PPS within each selected borough. The third term of the equation was then:

$$P(zipcode_k | borough_l) = \frac{3 \cdot ZMOS_k}{\sum_{j=1}^{J} ZMOS_j}$$

where $ZMOS_k$ was the measure of size for zip code *k* in selected borough *l* in New York City, and J is the total number of zip code areas within the borough.

All Other PSUs. For the other 29 PSUs, the second and third terms of the equation for the probability of selection were equal to 1. For Maine, Cook County, and Los Angeles County, the third term of the equation was equal to 1.

c. Fourth and Fifth Stages

The last terms in the equation for the probability of selection pertain to the selection of cases within the last stage selected (county, office, district, zip code). Cases were selected with equal probability at the last stages. The fourth term of the equation was:

$$P(case_m | laststage_k) = \frac{n_k}{N_k}$$

where n_k was the number of cases selected from, and N_k was the frame size for, last-stage unit *k*. From these selected cases, two-thirds were randomly selected for the in-person sample. From these two-thirds, a certain number of cases were actually released. For estimates being made only from the in-person list sample, this sample was treated as though it were independent from the telephone list sample, in which case, the fifth and last term of the equation would be:

$$P(case_m | \text{selected for in-person sample [independent]}) = \frac{2}{3} \cdot \frac{f_k}{n_k \cdot 2/3} = \frac{f_k}{n_k}$$

where f_k was the number of cases released for the in-person (or "field") list sample from last-stage unit *k*. However, as discussed below, estimates were made that combined the two list samples, in which case this sample must not be treated as independent from the telephone list sample. The fifth and last term of the equation is then quantified as:

$$P(case_m | selected\ from\ N_k) = \frac{f_k}{n_k} + \left(1 - \frac{f_k}{n_k}\right) \frac{t_k}{n_k - f_k} = \frac{f_k + t_k}{n_k}$$

when the two list samples were being used to produce an estimate, and where t_k was the number of cases released for the telephone list sample from last-stage unit k. The second term in this formula accounts for the fact that the case could have been selected into either the in-person sample or the telephone sample (but not both).

d. Summary

The probability of selection for each selected case was the product of these five terms. The sampling weight was the reciprocal of the probability of selection. All released cases (including nonrespondents and those later found to be ineligible) have a sampling weight greater than zero.

2. Weighting Adjustments

The sampling weight was then adjusted to account for nonresponse. To do this, all released cases were classified as one of the following: eligible respondent, eligible nonrespondent, ineligible, or eligibility status undetermined. Movers were classified as undetermined for weighting purposes.

To carry out this nonresponse adjustment, weighting classes were formed that met both of the following criteria: (1) information used to form these classes must be available for all released cases (that is, it must be information provided on the sample file), and (2) the cases within each class should be relatively homogeneous with respect to characteristics expected to be related to study (dependent) variables and the propensity to respond. In addition, each class should have at least 20 respondents and the adjustment factor (described below) for each class should be less than or equal to 2. Classes were collapsed with similar classes when they failed to meet these criteria. Classes defined by the site (generally, the PSU) usually met these criteria.

The first step adjusted for the determination of eligibility. Only movers fell into the undetermined eligibility category. The first adjustment factor was:

$$s_c = \frac{\sum_{i \in c} SWT_i}{\sum_{i \in c_{det}} SWT_i}$$

where SWT_i was the sampling weight for case *I*, *c* was the weighting class indicator for the in-person list sample (site), and c_{det} was the subgroup within class *c* for which eligibility status was determined. Those with undetermined eligibility have s_c set equal to 0. Then the eligibility-adjusted weight was calculated as:

$$EWT_i = SWT_i \cdot s_c$$

The next step adjusted for interview nonresponse among those known to be eligible. This adjustment factor was calculated as:

$$r_c = \frac{\sum_{i \in c_{elig}} EWT_i}{\sum_{i \in c_{resp}} EWT_i}$$

where c_{elig} was the subgroup within class c determined to be eligible, and c_{resp} was the subgroup within class c for which the interview was completed. Those with undetermined eligibility and those known to be ineligible have r_c set equal to 1, and those who were eligible but did not respond have r_c set equal to 0. Then the nonresponse-adjusted weight was calculated as:

$$WT_i = EWT_i \cdot r_c$$

Finally, outlier weights (both too small and too large) were examined, and it was determined whether to truncate smooth the weights. In this sample, no truncation was indicated.

B. TELEPHONE LIST FRAME SAMPLE

1. Sampling Weight

The first four terms of the equation for the probability of selection were the same as for the in-person list frame sample. From the n_k cases selected from last-stage unit k, one-third were randomly selected for the telephone sample. From this one-third, a certain number of cases were actually released. For estimates being made from only the telephone list sample, this sample as though it were independent from the in-person list sample, in which case the fifth and last term of the equation would be:

$$P(case_m \backslash selected\ for\ telephone\ sample\ [independent]) = \frac{1}{3} \cdot \frac{t_k}{n_k \cdot 1/3} = \frac{t_k}{n_k}$$

However, as discussed below, estimates were made that combined the two list samples, in which case this sample must not be treated as independent from the in-person list sample. The fifth and last term of the equation would then be quantified as:

$$P(case_m | selected\ from\ N_k) = \frac{t_k}{n_k} + \left(1 - \frac{t_k}{n_k}\right) \frac{f_k}{n_k - t_k} = \frac{t_k + f_k}{n_k}$$

when the two list samples were being used to produce an estimate. The second term in this formula accounts for the fact that the case could have been selected into either the telephone sample or the in-person sample (but not both). The probability of selection for each selected case was the product of these five terms. The sampling weight was the reciprocal of the probability of selection. Again, all released cases (including nonrespondents and those later found to be ineligible) have a sampling weight greater than 0.

2. Weighting Adjustments

The weighting adjustments for the telephone list frame sample were carried as outlined above for the in-person list frame sample, again using site as the weighting class. No weight truncation was indicated.

C. TELEPHONE RDD SAMPLE OF PARTICIPANTS, ELIGIBLE NONPARTICIPANTS, AND NEAR-ELIGIBLE NONPARTICIPANTS

1. Sampling Weight

The RDD sample was selected in multiple steps, and the procedures employed in each of these steps determine the probabilities of selection. In the first step, a stratified random sample of telephone numbers was selected. The second and third steps consisted of using the Genesys ID procedure to identify presumptively nonworking telephone numbers and then releasing other numbers for calling by interviewers. In the fourth step, numbers were screened to identify whether they reached households and, if so, whether the household was eligible for the survey (that is, whether it contained food stamp participants or eligible or near-eligible nonparticipants). Although sampling these subgroups differentially was considered, this was not done. Thus, in the RDD sample, probabilities of selection among survey-eligible households may vary somewhat by stratum, but not by characteristics.

The sample weight was the inverse of a case's overall probability of selection, which in turn was the product of the probabilities of selection for those steps where sampling took place:

$$W_sRDD_{jh} = \frac{1}{P(RDD)_{jh}} = \frac{1}{P(init)_h P(rel)_j (numphone_{ih})}$$

$$P(init)_h = \frac{n(ph.num)_h}{N(ph.num)_h}$$

$$P(rel)_j = \frac{n(rel)_j}{\sum_{h=1}^{H} n(ph.num.)_{jh}}$$

where:

$P(RDD)_{jh}$ was the cumulative probability of selection for a case sampled in stratum h;

$P(init)_h$ was the initial probability of selection for a telephone number sampled in stratum h;

$P(rel)_j$ was the probability of releasing a telephone number for calling in group j; there were two groups: (1) "bads" were those listed as business numbers or those that, when dialed with an automatic dialer, returned a signal indicating a disconnected or nonworking number; and (2) "goods," which included all other sampled numbers.[3]

$numphone_{ih}$ was the number of unique telephone numbers that can be called to reach the *ith* household in stratum h; *numphone* was assumed to be 1, since the data on number of telephones were not collected;

[3]Numbers were identified as "bad" using Genesys Sampling Systems' proprietary ID software.

$n(ph.\ num.)_h$ was the number of phone numbers initially selected in stratum *h*;

$N(ph.\ num.)_h$ was the population of phone numbers in stratum *h*;[1]

$n(rel)_j$ was the total number of telephone numbers released for calling in group *j*; strata were pooled for release of sample; 150 "bads" were released, chiefly to see if any bias was introduced by the method used to identify them.

$n(ph.\ num.)_{jh}$ was the number of phone numbers selected in stratum *h* and assigned to group *j*.

2. Weighting Adjustments

Nonresponse adjustments employed procedures similar to those specified above for the list frame samples. For the RDD sample, the cells were defined by sampling strata, and no collapsing of cells was necessary. However, the RDD survey had different types of eligibility criteria from those of the two list samples.

The first step adjusted for the determination of telephone eligibility; that is, whether it was determined if the selected telephone number was a working number associated with a residence. The first adjustment factor was:

$$s_c = \frac{\sum_{i \in c} SWT_i}{\sum_{i \in c_{det}} SWT_i}$$

where SWT_i was the sampling weight for case *I*, *c* was the weighting class indicator for the RDD sample (stratum), and c_{det} was the subgroup within class *c* for which telephone eligibility status was

[1] $N(ph.\ num.)_h$ was the number of phone numbers available for sampling in stratum *h*; the list-assisted method used to select the RDD sample restricts selection to consecutive banks of 100 (a bank would include XXXYYYZZ00 through XXXYYYZZ99) 10-digit telephone numbers in which at least one number was published in a telephone company residential directory.

determined. Those with undetermined telephone eligibility had s_c set equal to 0. Then the telephone eligibility-adjusted weight was calculated as:

$$EWT_i = SWT_i \cdot s_c$$

The next step adjusted for the determination of income eligibility among known residences, that is, whether the income questions were answered. This adjustment factor was:

$$i_c = \frac{\sum_{i \in c_{res}} EWT_i}{\sum_{i \in c_{inc}} EWT_i}$$

where c_{res} was the subgroup within class c determined to be residences and c_{inc} was the subgroup within class c for which income was determined. Those with undetermined telephone eligibility and those known to be telephone-ineligible had i_c set equal to 1. Those with undetermined income eligibility had i_c set equal to 0. Then the income eligibility-adjusted weight was calculated as:

$$IWT_i = EWT_i \cdot i_c$$

The next step adjusted for interview nonresponse among those known to be income-eligible. This adjustment factor was calculated as:

$$r_c = \frac{\sum_{i \in c_{elig}} IWT_i}{\sum_{i \in c_{resp}} IWT_i}$$

where c_{elig} was the subgroup within class c determined to be income-eligible, and c_{resp} was the subgroup within class c for which the interview was completed. Those with undetermined telephone eligibility, those known to be telephone-ineligible, those with undetermined income, and those with ineligible income had r_c set equal to 1; those who were income-eligible but did not respond had r_c set equal to 0. Then the nonresponse-adjusted weight was calculated as:

$$WT_i = IWT_i \cdot r_c$$

Four RDD weights were determined to be outliers. The range of the weights after the above adjustments was 17,692.46 to 21,064.07, except for four outlier weights having values equal to approximately 400,000. These four weights were trimmed to the value 21,064.07, and their excess values were not redistributed to the rest of the sample.[5]

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[5]That the four cases initially had very high weights was largely an artifact of the RDD sampling process. Following standard procedures, an early step in the RDD sampling was to use specialized software to screen out nonresidential telephone numbers. As a check on this work, a few numbers that had been screened out were introduced into the sample. For the most part, the screening was found to be accurate; however, four of the telephone numbers that were checked in this way were found to be residential and ultimately received a screening interview. Because the probability of entering the sample in this route was extremely low, an application of the standard probability-based weighting algorithms led to these households initially receiving very high weights. However, it was decided to trim the weights as described in the text, because there was no reason to believe that these household were dramatically different from others in the sample, and the very high weights would lead to very high variances in the estimation work.

3. Post-Stratification Adjustments

Because the nonparticipants were the only group targeted in the survey whose non-telephone-accessible members were not covered by any of the samples, a ratio adjustment was done for this group so that they better reflected the targeted population.[6] An iterative raking procedure was used to adjust their weighted proportions so that certain distributions matched those found on the March 1996 and March 1997 Current Population Survey (CPS) estimates for households with gross income under 150 percent of the poverty guideline and not receiving food stamps.

First, the weights of the nonparticipants were adjusted so that the proportion in various poverty level ranges matched the 1997 CPS. The next adjustment was for household size, followed by an adjustment for race of the householder (using the 1996 CPS). Then the weights were adjusted once more by poverty level. The last step was to do an overall post-stratification adjustment so that weights for this group summed to the same total they had prior to the raking procedure.

4. Combining List Frame and RDD Participants

When the combined list frame sample (including both in-person and telephone together) was pooled with the RDD participant sample, a weighting system was used that was designed to maximize the statistical efficiency--that is, minimize the variances--of the resulting estimates. This was done by making the relative weights for the two samples proportional to the effective sample sizes for the two samples. This gives more weight to the sample with the larger effective sample size

[6]Whereas FSP participant households without phones were included in the in-person list sample frame, such households were not included in either the CATI participant list frame or the RDD frame. Thus, the issue regarding coverage of households without phones is also relevant for the participant sample. However, the number of FSP participants identified from the RDD frame is small (304 cases, or 12 percent of the unweighted FSP sample). In addition, some of the phone list sample cases without phones were followed up in person by field staff using cellular phones to complete the interview. Therefore, it was decided that the statistical gain from adjusting the participant sample for telephone coverage did not warrant the costs.

while still giving some weight to the information contained in the sample with the smaller effective sample size. In implementing this approach, the focus was on *effective* sample sizes, rather than actual sample sizes, to take into account the impacts on the relevant variances of the design effects associated with the two samples. Following is a more formal treatment.

As an initial step, the weights were normalized by scaling both the combined list frame weights and the RDD weights so that the weighted sums were the same. (The number each is scaled to does not matter for the tabulations included in the report; in fact, it was decided to scale both sets of weights to an estimate of the approximate size of the food stamp household population, 10,060,000.) This involved multiplying the list frame weights by 1.40 and the RDD weights by 1.81.

Now, to derive the relative weights, assume it is desired to estimate the combined estimate $\hat{y}_T$ as follows:

$$\hat{y}_T = f_1 \hat{y}_{LF} + f_2 \hat{y}_{RDD}$$

where $\hat{y}_{LF}$ and $\hat{y}_{RDD}$ are the estimates for the statistic y from the LF and RDD samples.

The weights f_1 and f_2 are defined as follows:

$$f_1 = \frac{n_{LF}^{eff}}{n_{LF}^{eff} + n_{RDD}^{eff}} = \frac{n_{LF} / deff(\hat{y}_{LF})}{n_{LF} / deff(\hat{y}_{LF}) + n_{RDD} / deff(\hat{y}_{RDD})}$$

$$f_2 = 1 - f_1$$

where $deff(\hat{y}_{LF})$ and $deff(\hat{y}_{RDD})$ are the design effects of the estimates $\hat{y}_{LF}$ and $\hat{y}_{RDD}$, and n_{LF} and n_{RDD} are the actual sample sizes for the LF and RDD samples.

In implementing these algorithms, it was assumed, based on tabulations of selected illustrative variables, that the list frame design effect was 3.78 and the RDD design effect was 1.13 (see Appendix C). The effective sample sizes were then calculated as (2150/3.78 = 569) and (304/1.13 = 269), respectively. The final weights were then calculated as .68 and .32.

APPENDIX C

VARIANCES

This appendix describes the estimation of variances for representative variable estimates reported in the text. First, the overall approach is discussed. Then selected variance estimates are presented.

A. APPROACH

The "Design Effect" Concept. A common way of characterizing the changes (usually increases) in variances in estimated variables due to survey design features is to focus on the "design effect (deff)." The deff is defined as the proportional change in variance caused by the survey design as compared to the variance that could be achieved by a simple random sample of the same size. In most contexts, design effects are greater than 1, meaning that variances are increased as a result of the survey design features.

Approach Being Followed. A very large number of estimates of variable means and other parameters are being made in the current study, and, while procedures exist for making individual estimates of the true variances, their application to all the estimates included in the study would be unwieldy. Hence, the approach is to estimate the true variances for the means of a number of representative variables and to compute average design effects based on these variables. These design effects can then be used by readers of the report to approximate variances associated with the means of other variables. This analysis is based on estimated means. It is likely that the design effects associated with regression coefficients may be lower, since the regressions can control for factors that differ across primary sampling units.

The STATA computer program was used to estimate the true variances of selected variables. This package is based on a Taylor Series approximation of the true variances. It directly computes the estimated variances and design effects using standard formulas that relate the size of the design effect to the relative sizes of two variables: (1) the component of the variances of those variables due to variation within individual clusters in the survey design, and (2) the component of the variances due to differences between clusters in the relevant underlying population characteristics.

B. FINDINGS

The following tables present illustrative design effects for selected variables from the analysis. Tables C.1 to C.5 report typical design effects for the in-person sample of participants, the combined in-person and telephone survey of participants, the RDD sample of participants, the sample of eligible nonparticipants, and the sample of "near-eligible" nonparticipants. It is likely that these design effects are typical of those which would be found more generally.

Implications for the Width of Confidence Intervals. In general, 95 percent confidence intervals extend ± 1.96 times the true standard error of an estimate, which is equal to the square root of the variance of the estimate. Design effects are defined as a multiplier on the *variance*, while confidence intervals are based on the *standard error*, which is the *square root of the variance*. Therefore, observed design effects in the range of 2 and 4 imply that the size of confidence intervals are increased by a factor of between 1.7 and 2, relative to what they would be with a simple random sample. For instance, if, for a given sample size, a confidence interval around an estimated percentage--say 55 percent--was plus-or-minus 4 percentage points in a simple random sample, the confidence interval would have a width of 6.9 percentage points with a design effect of 3.

Illustrative Confidence Intervals. Given information about the size of the design effects, it is relatively straightforward to compute estimated confidence intervals for estimates of *proportions*, such as the proportion of food stamp households whose heads of households are female, or the proportion receiving AFDC. Table C.6 presents representative confidence intervals for different sample sizes and different assumed design effects.

TABLE C.1

ILLUSTRATIVE DESIGN EFFECTS FOR THE COMBINED IN-PERSON AND TELEPHONE SURVEY SAMPLE OF PARTICIPANTS

Variable	Sample Size	Mean[a]	Estimated Design Effect	"Corrected" Standard Error of Estimated Mean
Household Size	2,150	3.0	4.2	.079
Annual Earnings	2,074	$3,043	2.3	186
Whether Household Has an Elderly Member	2,150	.274	3.0	.017
Whether Single-Person Household	2,150	.257	2.2	.014
Whether Household Has AFDC Income	2,123	.311	4.1	.020
Whether Household Has General Assistance Income	2,134	.061	6.8	.014
Average Design Effect			3.8	

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a]Means may differ slightly from those reported in text because of slight differences in samples.

TABLE C.2

ILLUSTRATIVE DESIGN EFFECTS FOR THE IN-PERSON INTERVIEW SAMPLE OF PARTICIPANTS

Variable	Sample Size	Mean[a]	Estimated Design Effect	"Corrected" Standard Error of Estimated Mean
Household Size	1,109	3.0	2.0	.074
Annual Earnings	1,071	$2,858	1.5	204
Whether Household Has an Elderly Member	1,109	.266	1.8	.018
Whether Single-Person Household	1,109	.255	1.6	.018
Whether Household Has AFDC Income	1,089	.351	3.2	.026
Whether Household Has General Assistance Income	1,099	.061	7.9	.020
Average Design Effect			3.0	

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a]Means may differ slightly from those reported in text because of slight differences in samples.

TABLE C.3

ILLUSTRATIVE DESIGN EFFECTS FOR THE RDD SURVEY SAMPLE OF PARTICIPANTS

Variable	Sample Size	Mean[a]	Estimated Design Effect	"Corrected" Standard Error of Estimated Mean
Household Size	304	3.1	1.0	.107
Annual Earnings	296	$3,811	1.0	369
Whether Household Has an Elderly Member	304	.245	1.0	.025
Whether Single-Person Household	304	.220	1.0	.023
Whether Household Has AFDC Income	301	.278	1.0	.026
Whether Household Has General Assistance Income	299	.047	1.0	.012
Average Design Effect			1.0	

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a]Means may differ slightly from those reported in text because of slight differences in samples.

TABLE C.4

ILLUSTRATIVE DESIGN EFFECTS FOR THE RDD SURVEY SAMPLE OF ELIGIBLE NONPARTICIPANTS

Variable	Sample Size	Mean[a]	Estimated Design Effect	"Corrected" Standard Error of Estimated Mean
Household Size	450	2.1	.9	.066
Annual Earnings	450	$4,180	1.1	279
Whether Household Has an Elderly Member	450	.514	1.4	.027
Whether Single-Person Household	450	.493	1.4	.027
Whether Household Has AFDC Income	449	.012	1.3	.006
Whether Household Has General Assistance Income	449	.008	1.0	.004
Average Design Effect			1.2	

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a]Means may differ slightly from those reported in text because of slight differences in samples.

TABLE C.5

ILLUSTRATIVE DESIGN EFFECTS FOR THE RDD SURVEY SAMPLE OF "NEAR ELIGIBLE" NONPARTICIPANTS

Variable	Sample Size	Mean[a]	Estimated Design Effect	"Corrected" Standard Error of Estimated Mean
Household Size	405	2.5	1.0	.090
Annual Earnings	347	$8,118	1.0	$509
Whether Household Has an Elderly Member	405	.407	1.3	.029
Whether Single-Person Household	405	.379	1.4	.030
Whether Household Has AFDC Income	405	.008	[b]	.004
Whether Household Has General Assistance Income	405	.004	[b]	.003
Average Design Effect			1.2	

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

[a] Means may differ slightly from those reported in text because of slight differences in samples.

[b] Design effects could not be estimated satisfactorily because of the very low probability being computed.

TABLE C.6

WIDTH OF 95 PERCENT CONFIDENCE INTERVALS
WHEN ESTIMATING A PROPORTION

	Proportion Being Estimated		
Variable	.1	.2	.5
If Design Effect =1 and:			
N=200	±.04	±.06	±.07
N=400	±.03	±.04	±.05
N=600	±.02	±.03	±.04
N=800	±.02	±.03	±.03
N=1,200	±.02	±.02	±.03
If Design Effect =2 and:			
N=200	±.06	±.08	±.10
N=400	±.04	±.06	±.07
N=600	±.03	±.05	±.06
N=800	±.03	±.04	±.05
N=1,200	±.02	±.03	±.04
If Design Effect =3 and:			
N=200	±.07	±.10	±.12
N=400	±.05	±.07	±.08
N=600	±.04	±.06	±.07
N=800	±.04	±.05	±.06
N=1,200	±.03	±.04	±.05
If Design Effect =4 and:			
N=200	±.08	±.11	±.14
N=400	±.06	±.08	±.10
N=600	±.05	±.06	±.08
N=800	±.04	±.06	±.07
N=1,200	±.03	±.05	±.06

APPENDIX D

CONVERSION OF FOOD USE DATA INTO NUTRIENT AVAILABILITY ESTIMATES

During the in-person survey, data were collected on the foods used by the household over a seven-day period. (See Section II.E and Appendix A.) This appendix describes how those data were converted into estimates of the nutrient contents of those foods, through use of a modified version of the Food Intake Analysis System (FIAS), developed by the University of Texas at Houston.

First, a summary of the steps involved in the nutrient coding/conversion process is provided. Subsequent sections then provide details of how each step was performed.

SUMMARY

The following steps were followed in the nutrient conversion work:

- Development of FIAS recipe files and recipe codes. It was necessary to create a coding structure that linked each food code used in the current survey data collection instrument to a "recipe" that was expressed in constituent food codes and quantities and that could be used to access the nutrient data base used in FIAS.
- Setting up a coding center and hiring staff.
- Manual entry of food recipe codes and the weights of the foods used into the FIAS system.
- Manual entry of the survey data on amounts bought and prices paid into a separate LOTUS spreadsheet format, to determine unit prices, which were subsequently merged back into the food quantity data.
- Calculation of nutrient values.
- Quality control checks of the FIAS entry process, together with extensive edits of the FIAS data at the individual food level, using "high" value checks.
- Aggregation of the individual food-level data to the household level by summing over food lines.
- Additional household-level edits, based on "high" and "low" value checks.
- Imputation of prices for foods that had not been bought or whose purchase price was unknown.

These steps are described below.

1. Preliminary Development of Recipe Files

To support the entry of food data into FIAS, a preliminary set of FIAS recipe codes was developed. For every food item covered by the survey, a recipe into FIAS was entered, using the FIAS recipe feature. In general, these recipes were taken from similar ones that were used in coding the 1987-88 Nationwide Food Consumption Survey (NFCS). In some instances, the recipes consisted of a single ingredient. For instance, orange juice was orange juice. In such situations, the use of the FIAS recipe codes simply translated the coding structure of the survey into a coding structure for which FIAS could supply nutrient information. In other instances, recipes had more than one ingredient and also embodied cooking assumptions, as discussed below.

The recipes served several purposes:

- As noted above, the recipes allowed conversion of the coding structure of the instrument to that of FIAS. A "link file" was used from the Washington State Food Stamp Cashout Demonstration Evaluation to convert the codes used on the survey for that study to 11-digit USDA codes that were then linked to FIAS codes. (The Washington State survey had used the same codes as in the current study.)

- The use of recipes provided a convenient way of incorporating the assumptions from the 1987-1988 NFCS coding into the current coding procedures.

- The recipes provided a context for dealing with "mixtures," where assumptions had to be made as to what is included in foods with multiple ingredients. For instance, a "Big Mac" sandwich, which might have been brought into respondents' homes as a take-out food item, consists of bread, ground beef, vegetables, and other ingredients. To account for this, recipe files were read into FIAS to link individual food codes from the survey (in this case, the code for a Big Mac) into their individual constituent ingredient codes.

- The FIAS recipes also allowed incorporation of assumptions about cooking methods used for the foods reported. In the current food use survey, as in previous food use surveys, it was not known how the foods brought into the home were ultimately cooked, and thus what their ultimate nutrient availability was (since cooking can affect nutrient availability). For example, the nutrient availability of raw carrots differs from that of cooked carrots, so "retention codes" were used that account for nutrient loss (or gain) from cooking. Previous USDA surveys had dealt with this matter by creating recipes even for some single-ingredient foods. For instance, a recipe for a food that can be eaten raw or cooked might consist of a certain proportion (for example, 30 percent) of the food being eaten raw and the remainder (for example, 70 percent) being cooked, with, for the latter, an appropriate retention code indicating how the cooking changed nutrient availability. This convention was followed in the current survey coding.

- Recipes allowed for situations where a single survey code may track into several possible, slightly different food codes. For instance, if a respondent reported using frankfurters but didn't know what kind, an assumption had to be made about whether they were made from beef or pork. This was done using a recipe that assumed part pork and part beef, based on how common the two kinds of frankfurters are estimated to be.

In developing FIAS recipes for use in the coding work, it was necessary to take into account that some foods encountered in the survey were not in the previous USDA files that formed the basis of most of the recipe-coding work.[1] An example is that "no-fat cream cheese" had not been developed when the previous files were created. Ethnic foods for recent immigrant groups were also frequently not represented in the earlier files. Therefore, project nutritionists created new FIAS recipes, using a variety of information sources, including information from food labels, information from food manufacturers, a later version of FIAS (FIAS-3, which became available midway through the survey), and recipe books.[2] A total of 6,090 recipes were used. Of these, 5,724 were developed from previous USDA recipes, 213 were new recipes composed using nutrient data on the FIAS files, and 153 were recipes for which new nutrient data had to be entered into the FIAS system.

[1]The USDA recipe files that were used were ones that had been used in the 1987-88 NFCS coding. Each food was identified by an 11-digit USDA code.

[2]Two types of recipes were created, depending on the nature of a new food. If a new food could be characterized in terms of a combination of foods already in the FIAS database, then a "regular" FIAS recipe was created. If a food was so different that it couldn't be characterized in terms of existing foods, then FIAS's "user data set" feature was used, making it possible to enter nutritional information directly into the database.

The FIAS recipe database that was created can be interpreted as showing the food ingredients and their retention factors (expressed in terms of the seven-digit USDA food codes and the USDA survey), and recipe books.[3] A total of 6,090 recipes were used. Of these, 5,724 were developed "primary data set" codes) assumed to have been associated with a unit amount--such as 100 grams--of each of the foods reported in the survey. Staff of MPR's subcontractor, ROW, Inc., under the supervision of one of the principal investigators, used the recipe creation feature of FIAS to enter the recipes into FIAS as FIAS recipe files and assigned them six-digit codes. Both principal investigators undertook extensive spot-checking to ensure the accuracy of this entry.

Besides recipe files, the coding required a set of "refuse" factors, reflecting the fact that not all of certain foods are available for eating. For instance, a whole cauliflower gets trimmed before cooking, and thus some of the original weight is thrown away as refuse. Similarly, a significant amount of a whole fish is discarded in preparation. The 1987-88 NFCS recipe files, in addition to listing ingredients and their codes, noted these refuse factors where appropriate, and these codes were carried over into the files for the current survey.

Once FIAS recipe files were assembled for this project, they were tested with completed data collection instruments that had been used in the San Diego Food Stamp Cashout Evaluation. (These data collection instruments had been coded by National Analysts, Inc., the same firm that coded the most recent several Nationwide Food Consumption Surveys.) A sample of the San Diego cases was coded using the FIAS-based procedure, and the nutrient values computed with FIAS were compared line by line to the values of the nutrients on the San Diego database. These tests proved satisfactory

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[3]Two types of recipes were created, depending on the nature of a new food. If a new food could be characterized in terms of a combination of foods already in the FIAS database, then a "regular" FIAS recipe was created. If a food was so different that it couldn't be characterized in terms of existing foods, then FIAS's "user data set" feature was used, making it possible to enter nutritional information directly into the database.

in that most of the food lines yielded the same nutrients in both coding structures, and the discrepancies were, in general, explicable in terms of either coding errors or likely changes in the underlying nutrient databases.

2. Setting Up the Coding Center and Hiring Staff

To facilitate the work, MPR set up a separate coding room. Coders were hired and trained and then provided with their own coding stations and reference materials in the coding room. A supervisor was also selected from MPR's ongoing coding staff to direct the flow of activity in the coding room.

Following the recommendations of the FIAS staff at the University of Texas, coders were required to have completed high school with, preferably, some college education; to be the food manager at home; and to be familiar with simple mathematical computations. In addition, MPR required coders to have some basic computer experience.

Including practice experience, coders were required to participate in 2.5 days of training at MPR. After being given an overview of the project, coders were shown how to start a new file in FIAS, how to move around while in FIAS, and how to close a file. Coders were then shown how to extract the nine-character survey code from the food instrument and how to relate this code to its corresponding six-digit FIAS recipe code. They were also taught how to input the six-digit FIAS code for each food into a FIAS file, along with the amount of that food that was used during the seven-day period. The mathematical operations that facilitated these steps were reviewed. Coders were provided with a training manual, written by the project director and the MPR nutritionist, containing all the topics covered during training. (At a later time during the project, coders were taught how to "clean" and data-enter the completed price-related data on the food instruments.

3. Manual Entry of Foods into FIAS

Once the FIAS recipe files were set up, coding work could be started. This section describes how the food coding was done.

As data collection instruments were received in Princeton, they were logged into an ACCESS database and then taken to the coding room at MPR's Princeton facility. Upon arrival in the coding room, cases were given a quick line-by-line review to determine whether all the necessary information was available. Frequently, additional information was needed about a quantity or a type of food. When possible, the problem was resolved through a call-back to the respondent, either by telephone directly from Princeton or by the original interviewer.

a. Entering Food Data

After the necessary data were available, the coder determined the survey code of the food being used, for each coded line on the food use instrument. Then, using either a hard-copy look-up table or an automated look-up program, the coder accessed a database to determine the six-digit FIAS recipe code (see the previous section) that had been assigned to that food and also noted whether or not there was a refuse factor associated with it. The appropriate FIAS recipe code was then entered into FIAS.

If the quantity of a food was expressed in weight, the coder then entered the weight directly into FIAS, after subtracting the "refuse factor" amount, if appropriate. If the quantity was expressed in some other way, such as "units" or a volume measure, then the coder attempted to identify a factor for converting that quantity to a weight, often using food label information that had been obtained from the respondents during the interviews. In other situations, the weight equivalent codes built into FIAS were used to determine the weights of various measures, such as a medium apple.[4] Other sources, such as supermarket flyers, recipe books, the household weight file used in the 1987-88 NFCS, and visits to stores, were also sometimes used. (The visits to the stores were done to weigh unit quantities of various produce and to examine food labels.) After weights were determined, refuse factors were subtracted where appropriate, and the weights were then entered into FIAS.

Any problems (such as lack of a recipe for a food or uncertainty about how to translate an amount into a weight) were referred to the project nutritionist.[5] If the project nutritionist was not able to resolve a problem, the nutritionist who acted as the co-principal investigator for the project made final resolution.

In addition to entering food items into FIAS, coders also entered from the hard copy the approximate number of meals eaten during the observation period. This information was entered into an unused field in one of the preliminary FIAS data entry screens for each case. This number-of-meals variable was not used in the final analysis, since a more accurate meal count was available in the CAPI portion of the interview. But the appropriate meal count was useful in conducting edit checks, before the food data and the CAPI data had been merged.

The project nutritionist and the project director reviewed the first two or three cases coded by each coder. After that, the project nutritionist reviewed random cases for quality control. In

[4]No information on portion sizes or weight equivalents was directly available for the recipes read into FIAS. However, the coders could access unit weight information in FIAS by independently entering the name of the food and viewing the relevant screen. Having observed that information, the coder had to exit from the FIAS portion screen and enter the relevant weight directly into the original screen where the food code had been entered.

[5]The project nutritionist had a Master's Degree in nutritional science and extensive experience in food preparation.

addition, the extensive edit-checking the project nutritionist (see below) conducted provided additional quality control. Any problems were brought to the attention of the coder for resolution.

The coders were responsible mainly for coding the hard-copy food instruments as outlined above. They also called the respondent when more-detailed information was required for a reported food. If the amount of food used or purchased was missing or unclear, or if the form of the food was not indicated (for example, dehydrated/ready-to-eat/condensed), the respondent was called for clarification. Many food instruments generated questions about package size and price paid for a food item. Since some respondents were not able to remember these details, a list was constructed of all the foods that required information on package size or price paid. Two of the coders then went shopping locally to obtain this information.

Once most of the hard-copy food instruments had been coded and entered into FIAS, the coders were trained to data-enter the information on the food purchased and the price paid into a LOTUS spreadsheet. (See Section 4.)

4. Entry of Data on Amounts Bought and Prices

The data collection instrument also obtained information on the amounts of foods bought (as opposed to the amounts used, as discussed above) and on the prices paid for the foods. Because there was no obvious way of incorporating these data into the FIAS software, they were data-entered separately and then merged with the FIAS information through use of SAS.

The data on amounts bought and on prices paid were keyed into a LOTUS spreadsheet. Each case had a separate spreadsheet, and each line in the spreadsheet corresponded to a food line in FIAS. The data were entered twice, by different coders, on two different spreadsheets, and then reconciled against each other to detect and correct data entry errors. Missing price data were left blank in the file and were then imputed at a later step (see below).

5. Assigning Nutrient Values to Foods

The standard FIAS software and its corresponding nutrient database were used to assign nutrient values to the foods consumed. This procedure drew on the fact that the FIAS recipes were expressed in terms of the foods in the database. In a small number of cases, the project nutritionist had to use the "user dataset" of FIAS to add foods to the database to reflect new foods encountered in the survey. Nutrient values were assigned on the basis of food labels, manufacturer information, a later version of FIAS, and recipe information.[6]

6. Edit Checks

After each case was entered and nutrient values were assigned to the foods, edit checks were run line by line on each food to identify foods that exceeded threshold quantities of key nutrients. In particular, the nutrients and their cutoff limits for the edits for the first round of checks were:

Nutrient	Edit Threshold
Food Energy	7700 kc* (household size)
Calcium	3200 mg* (household size)
Vitamin A (re)	2700 µg* (household size)
Vitamin C	160 mg* (household size)
Riboflavin	4.8 mg* (household size)

[6]FIAS 3 became available partway through the survey. Although it was not practical at that point to convert the coding operation to the new version, the new version was often useful in providing information to help the coding, particularly with regard to new foods.

These cutoffs are considerably higher than the standard edit thresholds built into the FIAS system. They were set higher because the current study focused on food used for the entire household during the week, rather than 24-hour intake for an individual. Thus, quantities tended to the much larger than with individual intakes. For instance, a food line on the present survey might typically include 5 or 10 pounds of potatoes, rather than an individual serving of potatoes, as would be the case as with an intake record. The threshold cutoffs were chosen so as to be low enough to identify potentially erroneous entries but high enough to discriminate between likely problems and likely correct entries.

Typically, on the first round of edits, about four to six foods for each case were highlighted by the edit runs. Each of these flagged food items was manually checked by the project nutritionist, who consulted the hard-copy data collection instrument if an item appeared questionable based on the printout information. Changes were made as appropriate.

On a subsequent round of edits, essentially the same computer checks were performed, but the cutoff thresholds were set approximately three times higher. Typically, this caused about half the cases to be flagged, usually with just one to three items highlighted. On this round, the project director for the study reviewed the output and manually identified food entries that appeared problematic. These were then reviewed against the hard copy by coding personnel, who made any changes needed to correct clear errors. The results of this coder review were then examined by the project director, who made final edit determinations.

An additional type of automated checking was a comparison, for all foods, of the amounts reported used during the week and the amounts reported bought. All items where the amount consumed exceeded the amount bought were flagged for manual review against the hard copy. In most situations, the food item was found to be coded correctly, since it was sometimes the case that the amount used was based on more than one shopping trip, but only the latest one was reported. However, this set of edits was also found to be useful in identifying miscoded cases.

All the checks described so far were based on the *individual food items*. In addition, the foods for a household were aggregated, and editing was performed at the *household* level. In particular, for food energy, vitamin A, vitamin B_6, vitamin B_{12}, calcium, and vitamin C, the households with the highest levels of each nutrient per meal were reviewed manually, food line by food line, and any apparently problematic entries were examined against the hard copy.

Editing on the food prices computed from the data was done for each food code. Whenever one of the reported prices for a food code was more than twice or less than half the median price, the relevant data were printed out and reviewed manually. In addition, the 50 lowest prices and the 50 highest prices in the data set were printed out and reviewed manually to identify any apparent errors.

7. Price Imputations

In some instances, respondents were unable to remember the prices they had paid for the foods they had used. In other instances, there was no actual price, because the food was home produced, received as a gift, or otherwise obtained without a direct payment. For estimation of the value of all food used by households, prices had to be imputed in these instances. For each food code where a price imputation was needed, the following algorithm was used:

1. If there were at least five valid reported prices for a food code (that is, at least five respondents had reported price information for that item), then the median of the reported prices was automatically imputed.

2. If there were between one and four valid prices in a food code, the project director reviewed the range of prices and considered the food at issue to determine whether or not the median represented a reasonable estimate of the price. If it was judged to be reasonable, the median was imputed; if not, Step 3 below was used.

3. If there were no reported prices for the food code or if it was determined that the median was not appropriate, then a price was imputed, usually either from the price of a similar food or from store prices. This was done using the rules summarized in Exhibit D.1.

EXHIBIT D.1

IMPUTATION PROCEDURES WHEN INSUFFICIENT DATA WERE AVAILABLE FOR IMPUTING BASED ON OTHER PRICES OF THE SAME FOOD

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1. If the project nutritionist determined that there was in the dataset a very similar food that did have a valid price, then the median price of that similar food was imputed. For instance, the price of low-sodium canned corn might be imputed from the price of regular canned corn.

2. If the project nutritionist determined that two foods were essentially the same except that their "form" led to different refuse factors, the median price of the food for which a price was available was used to impute the other, adjusting for the refuse factor. For instance, suppose that for a certain type of fish a price was available for the fillet, but not for the whole fish, including head and bones. And assume that, on the basis of the refuse factor, the fillet weight was known to be approximately 60 percent of the whole weight. Then the per-pound price of the whole fish was imputed as the median per-pound price of the fillets times .60.

3. If none of the above methods applied, the price was estimated by examining the prices in a supermarket in a low-income area in central New Jersey. (This was necessary in only about half of one percent of the foods.)

4. For a very small number of foods, mostly game, where no reasonable direct market price could be found, the price was imputed based on the price of similar foods. For instance, the price of venison could conceivably have been imputed based on the price of beef. To be sure, a price for venison could have been found in a specialty shop. But all instances of venison in the data were of venison obtained through hunting, and it was judged that the price of beef provided a better representation of the value of the meat to the households. The number of foods for which this type of imputation was done was less than 40 out of a total of more than 40,000 food lines in the data set.

APPENDIX E

GEOCODING

This appendix describes the development of the database on geographic locations of households and stores, the database used to compute certain of the distance measures cited in the report. Potential biases in the data are also assessed.

Basic Procedures

During the in-person survey operations, information was obtained on the locations of (1) the respondents' homes, (2) the stores where they shopped, and (3) the supermarkets nearest their homes. Both the address and the name of the nearest cross street were obtained, when possible. In addition, for the store data, an attempt was made to identify the stores on hard-copy lists the interviewers carried of authorized food stamp retailers. When possible, the data were linked through the store program identification codes used in administering the program.

All the address information was then transmitted to a geocoding vendor, Geographic Data Technology (GDT) of Lebanon, New Hampshire, which, when they could locate the address, returned precise longitude and latitude of the location. Interview information on the stores and household locations GDT could not code on the first attempt was printed out at MPR, manually edited, and then sent to GDT a second time, leading to the identification of additional locations. Altogether, these procedures produced geocodes for about 80 percent of the households and 70 percent of the stores. Reflecting these "hit" rates, geocoded distance to the nearest store was available for approximately 58 percent of the in-person sample, while geocoded distance to the store most often used was available in about 55 percent of the cases.

Potential Biases in the Data

Because about 40 percent of the store/home pairs of locations could not be fully geocoded, it is important to examine whether there may be biases implicit in the resulting data. For examination of this issue, Table E.1 displays two sets of data on distance to the store usually shopped: one set based on the geocoding and the other on a direct question asked during the interview. Comparison of the two columns shows that the geocoded data clearly imply shorter distances, on average, than the direct interview data. This suggests the possibility that the stores that could not be geocoded may be disproportionately the ones at greater distances from respondents. Based on the interviewing and coding experience, this type of bias is indeed likely to have occurred, since it tended to be harder for respondents to supply detailed address information for stores that were outside their own neighborhoods.

This potential bias needs to be taken into account in interpreting data based on the geocoding. It is believed, however, that it does not reverse any conclusions made in the report. This issue is examined further in the next section.

Reassessment of Whether Respondents Frequently Travel Farther than the Nearest Supermarket to Shop, in Light of the Possible Biases in the Geocoded Data

An analysis in an earlier NFSPS Report (Ohls 1998) concludes that FSP participants frequently travel farther than the nearest supermarket for their food shopping. However, as noted in that discussion, the conclusion may be influenced by the fact that direct survey responses about distances to the store most often used are being compared with geocoded information about the nearest supermarket. (Use of the two different types of data maximized available sample sizes. No direct interview data are available on distance to the nearest supermarket.)

TABLE E.1

DISTANCE TO STORE USUALLY USED, WITH
ALTERNATIVE DATA SOURCES
(Percentage of FSP Participants)

	Direct Response to Survey Question	Geocoding
Less than .5 miles	8.3	16.2
.5 to .99 miles	22.6	19.4
1 to 1.99 miles	22.0	24.3
2 to 3.99 miles	11.2	20.0
Over 4 miles	35.9	20.2
Sample Size	**1,091**	**635**

SOURCE: Unweighted data from the 1996 National Food Stamp Program Survey.

NOTE: Percentages may not add to 100, due to rounding.

However, while comparable direct interview data are not available, comparable geocoded data are available for both the most-used stores and the nearest stores for the subset of the sample for which full geocoding was possible. It is therefore possible to make comparisons of the relevant distances with consistent data. These comparisons, as shown in Table E.2, suggest that, even when the analysis is confined to the same type of data, the analysis still supports the conclusion that substantial numbers of households do their primary shopping at stores more distant than the closest stores. For instance, 53 percent of households with full geocode data have a supermarket within a mile of their residence, but only 36 shop within a mile. Further, only 11 percent of the nearest supermarkets are more than four miles away from the households, but 20 percent say they usually go more than four miles to shop.

The assessment, therefore, is that, even though there may be some bias in comparing the direct interview estimates of distance with geocode-based distance estimates, the conclusions reached in the report are not caused by this bias. Even with comparable data, the analysis suggests that many households in the sample travel beyond their nearest supermarket to shop.

TABLE E.2

DISTANCES TO STORE USUALLY USED AND TO NEAREST SUPERMARKET, BASED ON COMPARABLE DATA SOURCES
(Percentage of FSP Participants)

	Distance to Store Usually Used	Distance to Nearest Supermarket
Less than .5 miles	16.2	25.9
.5 to .99 miles	19.4	26.8
1 to 1.99 miles	24.3	22.2
2 to 3.99 miles	20.2	13.9
Over 4 miles	20.2	11.2
Sample Size	**635**[a]	**598**[b]

SOURCE: Unweighted data from the 1996 National Food Stamp Program Survey.

NOTE: Percentages may not add to 100, due to rounding.

[a]Sample consists of all households for which full geocode data were available on the household location and the location of the store usually used.

[b]Sample consists of all households for which full geocode data were available on the household location and the location of the nearest supermarket.

APPENDIX F

COMPARISON OF NFSPS SEVEN-DAY FOOD USE DATA WITH OTHER SOURCES

As a partial check on the validity of the seven-day food use data collected during the NFSPS, it is useful to compare summary variables from this data collection with a number of benchmarks from other data sources. This is done below for two key sets of variables: data on the value of food used at home, and data on nutrient availability, scaled by equivalent nutrition unit (ENU).

DATA ON THE VALUE OF FOOD USED AT HOME

The discussion of the value of food used at home as measured by alternative sources draws heavily on the examination of these data in Lutz et al. (1992). The focus is on two sets of comparisons, as summarized in Table F.1. One comparison is with data on households in the lowest income quintile in the 1987-88 NFCS. That study estimated the value of all food used at home per low- income household per week to be $50.65 (in 1987-88 dollars). As shown in the table, adjustment for inflation produces a value in 1996 dollars of $66.64. The corresponding estimate in the current survey is $59.10. The number here may be lower because the value of food used at home by low-income households appears to be declining over time, the result of greater use of meals bought away from home and possibly other factors.[1]

The second comparison shown in Table F.1 is with data from the Bureau of Labor Statistics Consumer Expenditure Survey (CES), which provides an estimate of the value of purchased food used at home. How foods to be included in CES data are defined is not exactly the same as in the NFSPS (see Lutz et al.). Nevertheless, the definitions are sufficiently similar to make the comparisons of interest, and as explained in the notes to Table F.1, some of the noncomparable factors may at least partially offset one another.

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[1]Lutz et al. (1992), in comparing the results of the 1977-78 and the 1987-88 NFCSs, estimate a drop in average low-income household consumption per week from $65 to $51, a decrease of more than 20 percent. Similarly, using 1977-78 NFCS data and data from the 1979-80 NFCS Low Income Supplement Survey, the U.S. Human Nutrition Information Service, in "Preliminary Report No. 10," estimated that between 1977-78 and 1979-80, the weekly real value of food used at home per household declined about six percent over that two-year period (see HNIS Table 13 and p. 31).

TABLE F.1

FOOD USE AT HOME BY LOW-INCOME HOUSEHOLDS
(Per Week per Household)

	1987-88 Nationwide Food Consumption Survey	1994 Consumer Expenditure Survey	1996 National Food Stamp Participant Survey
Purchased Food Used at Home (Current Dollars)	NA	$52.15	$53.59
All Food Used at Home (Current Dollars)	$50.65	NA	$59.10
Consumer Price Index for Food at Home	.76	.93	1.00
Purchased Food Used at Home (1996 Dollars)	NA	$56.08	$53.59
All Food Used at Home (1996 Dollars)	$66.64	NA	$59.10

NOTE: NA means not available.

Line 1, Column 2: From *U.S. Statistical Abstract 1996*, Table 707. Calculated as $2,712/52. Note that this is for *all* households, not just low-income households. A possible adjustment that has not been made is to multiply by a factor of .82, based on Table 4 of Lutz et al., which estimates that for food at home, the ratio of low-income average household expenditures to overall average expenditures is 1102/1348, or .82. On the other hand, the Consumer Expenditure data included in the table do *not* include the value of take-out food purchased away from home and then brought into the home, whereas the NFCS and current survey numbers in the table do include this. Any adjustments for the low-income household factor and for this exclusion of take-out food would be at least partly offsetting.

Line 2, Column 1: Data for lowest income quintile, based on Table 4 of Lutz et al. Calculated as $1,102 times the average equivalent household size of 2.39 divided by 52 weeks.

Line 3: Based on 1982-1984 = 100, the price index values used are as follows: 1988 = 116.6; 1994 = 144.1; and 1996 = 154.3.

As summarized in the table, the CES estimate of the value of purchased food as of 1994, the latest year for which the data are available, is $52.15. After adjusting for inflation, this estimate becomes $56.08, which is similar to the estimate here of $53.59.

From this analysis, it is believed that these benchmark comparisons support the assertion that the NFSPS data appear reasonable in light of earlier studies.

NUTRIENT AVAILABILITY DATA

As summarized in Table F.2, the nutrient availability data from the current survey are also quite similar to those observed in the 1987-88 NFCS. The first two columns compare mean nutrient availability as a percentage of RDA from the two sources. The NFSPS data are slightly higher than the NFCS data for six of the nutrients, slightly lower for one nutrient, and exactly the same for the remaining nutrient. In no case is the difference large.

The picture is somewhat different when percentages of households meeting 100 percent of the RDAs are examined, as shown in the second set of columns in the table. Here the NFSPS is consistently lower than the NFCS on all nutrients, with all the differences generally being in the range of two to eight percentage points. The reasons for these differences are not clear, particularly in light of the comparability of the averages, as discussed in the previous paragraph. It is possible that the differences reflect true changes over time. They might also reflect differences in the populations for which data are available in the two survey (FSP participants in the case of the NFSPS versus all households below $12,500 in the case of the NFCS). Another possible explanation is that the NFSPS underestimated food used at the low-to-moderate end of the range. In any event, the discrepancies are not large, and there is no evidence that they have had any material influence on the analysis presented in the current report.

TABLE F.2

COMPARISON OF NFSPS NUTRIENT AVAILABILITY WITH
1987-88 NFCS DATA ON HOUSEHOLDS WITH
INCOME BELOW $12,500

	Mean Nutrient Availability as Percentage of RDA		Percentage of Households Meeting RDA	
	1987-88 NFCS	1996 NFSPS	1987-88 NFCS	1996 NFSPS
Food Energy (Kcal)	127	130	63	59
Vitamin A (re.)	189	181	73	65
Vitamin C	246	262	84	79
Vitamin B_6	135	149	68	65
Folate	191	216	82	79
Calcium	114	114	55	47
Iron	161	163	78	69
Zinc	112	118	52	49

SOURCE: NFCS data from NFCS Report Number 87-H-1, USDA, Agriculture Research Service, 1994.

APPENDIX G

COMPARISON OF SEVEN-DAY AND FOUR-DAY FOOD USE INTERVIEW RESULTS

The food use data collection method has traditionally been implemented over a seven-day period, which has the advantage of minimizing distortions due to cycles of food use over the course of the week. In addition, as opposed to shorter possible observation periods, it allows enough time for day-to-day variation in food use to be smoothed out.

However, the seven-day food use technique imposes considerable burden on respondents, and in planning the current study, there was interest within the government in assessing whether it would be reasonable for similar future data collections to use a shorter observation period. Accordingly, it was decided to conduct approximately 10 percent of the interviews as four-day observations and to compare the results. This appendix makes these comparisons.

COMPARISONS OF RESULTS

To allow meaningful comparisons, the data on total amounts of nutrients used have been converted to a daily basis, by dividing by seven or four, as appropriate (Table G.1). This normalization is not necessary when considering variables that have been scaled by equivalent nutrition units (ENUs), since these estimates do not have a direct time dimension.

As shown in the table, when the expenditure data and the nutrient data are compared between the seven-day and the four-day data collection, the estimates of expenditures and nutrients per day are consistently higher for the four-day data collection. Most of the differences in the per-day variables are in the range of 10 to 20 percent. An exception to this is that when micrograms of vitamin C per day are compared, the difference is more than 30 percent. Interestingly, however, when vitamin C availability is normalized by ENU, the difference is reduced to about 15 percent.

Only one of the differences between the four-day and the seven-day estimates is statistically significant--that for total vitamin C. Since the differences are substantial, this largely reflects the small sample size for the four-day interviews: 92 observations.

TABLE G.1

COMPARISON OF SELECTED EXPENDITURE AND NUTRIENT DATA PER HOUSEHOLD BETWEEN SEVEN-DAY AND FOUR-DAY FOOD USE DATA COLLECTION

	Seven-Day Food Use			Four-Day Food Use			Difference of Daily Average		
Variable	Seven-Day Total	Daily Average	Std. Error of Daily Average	Seven-Day Total	Daily Average	Std. Error of Daily Average	Absolute Diff.	Percent Diff.	Statistical Signif.
Household Size	2.99	2.99		3.08	3.08		.09	3.0	--
Household Size in Adult Male Equivalent	2.16	2.11		2.23	2.23		.07	3.2	--
Value of Food Used	$59.10	$8.44	.38	$37.50	$9.38	.85	$0.94	11.1	--
Value of Food Used per Person	$11.77	$3.24	.15	$12.18	$3.62	.31	$0.41	3.5	--
Calories[a] (kcal)	44,386	6,340	308	28,606	7,151	675	811	12.8	--
Calories per ENU	1.30	1.30	.05	1.45	1.45	.11	.15	11.5	--
Iron[b] (µg)	313.4	44.8	2.19	199.0	49.7	6.12	4.9	10.9	--
Iron per ENU	1.63	1.63	.06	1.84	1.84	.22	.21	12.9	--
Calcium (mg)	15,699	2,242	103	10,893	2,723	310	181	21.4	--
Calcium per ENU	1.14	1.14	.04	1.36	1.36	.13	.22	19.3	--
Vitamin C (µg)	2,291	327	14.8	1,717	429	43.5	102	33.6	**
Vitamin C per ENU (µg)	2.62	2.62	.11	3.00	3.00	.27	.38	14.5	--
Sample Size		**957**			**92**				

SOURCE: 1996 National Food Stamp Program Survey, weighted data.

kcal = kilocalories
ENU = equivalent nutritional units

**Statistically significantly with 95 percent two-tailed test.

DISCUSSION

The reasons for the apparent tendency for the four-day interviews to record more food use are unclear. One possibility is obviously statistical sampling variance; however, this is probably not the entire explanation. Another possibility is that respondents may have better recall over a shorter period of time and are thus able to supply more complete information. A third potential explanation is that with the shorter period of time there is more likely to be what is known in the survey literature as "telescoping" error, whereby respondents confuse time boundaries. With this type of error, respondents tend to report more events (in this case, food use) in a limited amount of time than actually occurred, because they include events that happened just before or just afterwards.

In summary, the experiment that has been conducted suggests that the four-day and the seven-day data collection approaches tend to get somewhat different results. However, the differences are not enormous, and it is not clear which approach yields the more accurate data.

APPENDIX H

DETAILED REGRESSION RESULTS

Chapter V summarized results of regression analysis where the dependent variable was nutrient availability and the independent variables included various demographic and economic characteristics of the households. Chapter VI summarized similar regressions that also included indicators of food security. This appendix presents the detailed regression results on which the summaries in Chapters V and VI are based.

REGRESSIONS FOR TABLE V.7

```
. set mem 50000;
(50000k)

. set matsize 150;

. set more off;

. use "D:\FSS\codedata.dta", clear;

. svyset strata stratlf;

. svyset psu psuid;

. svyset pweight hhwt1;

. svyreg ltotvb6 lenuvb6 linc lfsb lhsze nurban nrural mdurbloc wintint fallint
>  elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =     76.37
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4919

------------------------------------------------------------------------------
 ltotvb6 |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
 lenuvb6 |   .5885555    .0652659      9.018   0.000      .4560587    .7210523
    linc |  -.0002973    .0152018     -0.020   0.985     -.0311587     .030564
    lfsb |   .1292071     .031369      4.119   0.000      .0655247    .1928895
   lhsze |   .0697502    .0831695      0.839   0.407      -.099093    .2385933
  nurban |  -.1189287    .0669149     -1.777   0.084     -.2547732    .0169158
  nrural |  -.0548666    .0643698     -0.852   0.400     -.1855441     .075811
mdurbloc |    .024792    .1247115      0.199   0.844     -.2283858    .2779698
 wintint |  -.3785371    .0912301     -4.149   0.000     -.5637441   -.1933302
 fallint |  -.0575672    .0498248     -1.155   0.256      -.158717    .0435826
 elderly |   .0180564    .0625704      0.289   0.775     -.1089684    .1450811
 child18 |    .271119    .0995944      2.722   0.010      .0689316    .4733064
afnothis |  -.0156967    .0640676     -0.245   0.808     -.1457609    .1143674
whnothis |  -.0818947    .0604756     -1.354   0.184     -.2046666    .0408773
  ap1to4 |  -.0721032    .0516488     -1.396   0.171     -.1769559    .0327495
   ap5up |  -.0884301    .0685509     -1.290   0.206     -.2275959    .0507357
ltotshlt |   .0734033    .0163465      4.490   0.000      .0402182    .1065883
lpctnotb |  -.0381943    .0110214     -3.465   0.001      -.060569   -.0158196
 elecben |   .0167451    .0712609      0.235   0.816     -.1279223    .1614125
   _cons |   2.155821     .194796     11.067   0.000      1.760364    2.551278
------------------------------------------------------------------------------

. svyreg ltotcalc lenucalc linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
```

```
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =     49.34
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4554

------------------------------------------------------------------------------
ltotcalc |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenucalc |   .6387202    .0913324      6.993   0.000      .4533055    .8241349
    linc |   .0005002    .0143092      0.035   0.972     -.0285491    .0295495
    lfsb |   .1016367    .0277372      3.664   0.001      .0453271    .1579463
   lhsze |  -.0225823    .1005548     -0.225   0.824     -.2267194    .1815549
  nurban |  -.0818499     .077193     -1.060   0.296     -.2385601    .0748603
  nrural |   -.066512    .0784722     -0.848   0.402      -.225819    .0927951
mdurbloc |     .04639    .1216107      0.381   0.705     -.2004929    .2932728
 wintint |  -.4593057    .1369433     -3.354   0.002     -.7373154   -.1812961
 fallint |   -.029745    .0502729     -0.592   0.558     -.1318044    .0723143
 elderly |   .0056466    .0518576      0.109   0.914     -.0996299    .1109231
 child18 |   .2206702    .0943634      2.339   0.025      .0291024     .412238
afnothis |  -.1788691    .0764264     -2.340   0.025     -.3340228   -.0237153
whnothis |   .0740961    .0657839      1.126   0.268     -.0594523    .2076445
  ap1to4 |  -.0084952    .0503609     -0.169   0.867     -.1107333    .0937428
   ap5up |  -.0544709    .0819601     -0.665   0.511     -.2208587    .1119169
ltotshlt |   .0382658    .0208464      1.836   0.075     -.0040547    .0805862
lpctnotb |   -.041705    .0106613     -3.912   0.000     -.0633485   -.0200614
 elecben |    .059271    .0815849      0.726   0.472     -.1063551    .2248971
   _cons |    6.30387    .1903596     33.116   0.000       5.91742    6.690321
------------------------------------------------------------------------------

. svyreg ltotcals lenucalo linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =    135.90
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.5274

------------------------------------------------------------------------------
ltotcals |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenucalo |   .6107473    .0645522      9.461   0.000      .4796994    .7417952
    linc |  -.0158892    .0125054     -1.271   0.212     -.0412765    .0094981
    lfsb |   .1123953     .022976      4.892   0.000      .0657515    .1590392
   lhsze |   .0513456    .0771705      0.665   0.510     -.1053189    .2080102
  nurban |  -.1069802    .0738728     -1.448   0.156       -.25695    .0429896
  nrural |   .0050854    .0448563      0.113   0.910     -.0859778    .0961486
mdurbloc |   .0091889    .0964419      0.095   0.925     -.1865987    .2049764
 wintint |   -.303561    .1277344     -2.377   0.023     -.5628755   -.0442464
 fallint |   -.026807    .0434828     -0.616   0.542     -.1150818    .0614679
 elderly |   .0048002    .0518704      0.093   0.927     -.1005024    .1101028
 child18 |   .1742575    .0744352      2.341   0.025      .0231459     .325369
afnothis |   .0464296    .0687877      0.675   0.504     -.0932168    .1860759
whnothis |    -.01271     .053622     -0.237   0.814     -.1215685    .0961485
  ap1to4 |  -.0447955    .0537956     -0.833   0.411     -.1540064    .0644155
   ap5up |  -.0613863     .062852     -0.977   0.335     -.1889826      .06621
ltotshlt |   .0563819     .014701      3.835   0.001      .0265373    .0862265
lpctnotb |   -.034273     .010095     -3.395   0.002      -.054767   -.0137789
```

```
 elecben |   .0676638    .0708445      0.955   0.346     -.0761582    .2114859
   _cons |   7.544277    .1581786     47.695   0.000      7.223158    7.865397
------------------------------------------------------------------------------

. svyreg ltotfola lenufola linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =     69.34
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4259

------------------------------------------------------------------------------
ltotfola |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenufola |   .5737019     .076122      7.537   0.000      .4191661    .7282378
    linc |   .0017963    .0174279      0.103   0.918     -.0335842    .0371768
    lfsb |   .1361592    .0317792      4.285   0.000      .0716441    .2006743
   lhsze |   .0502938    .1076124      0.467   0.643     -.1681709    .2687585
  nurban |  -.1240207    .0682725     -1.817   0.078     -.2626212    .0145798
  nrural |  -.0145779    .0782146     -0.186   0.853      -.173362    .1442062
mdurbloc |   .0212312    .1259851      0.169   0.867      -.234532    .2769945
 wintint |   -.545172    .1376553     -3.960   0.000     -.8246272   -.2657168
 fallint |  -.0269596    .0542202     -0.497   0.622     -.1370326    .0831133
 elderly |   .0628973    .0590007      1.066   0.294     -.0568804     .182675
 child18 |   .3969308    .1225411      3.239   0.003      .1481592    .6457024
afnothis |  -.1423381    .0844927     -1.685   0.101     -.3138673    .0291912
whnothis |  -.1149936     .079781     -1.441   0.158     -.2769577    .0469705
  ap1to4 |  -.1008508    .0558228     -1.807   0.079     -.2141772    .0124755
   ap5up |  -.1398612    .0764765     -1.829   0.076     -.2951168    .0153945
ltotshlt |   .0634218    .0239309      2.650   0.012      .0148395     .112004
lpctnotb |  -.0405411    .0120123     -3.375   0.002     -.0649273    -.016155
 elecben |   .0232476    .0889428      0.261   0.795     -.1573158     .203811
   _cons |   7.098049       .2166     32.770   0.000      6.658328    7.537771
------------------------------------------------------------------------------

. svyreg ltotiron lenuiron linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =     45.21
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4737

------------------------------------------------------------------------------
ltotiron |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuiron |   .4803313    .0566459      8.480   0.000       .365334    .5953286
    linc |  -.0013507    .0146136     -0.092   0.927     -.0310178    .0283164
    lfsb |   .1190072    .0268657      4.430   0.000      .0644669    .1735475
   lhsze |   .2263399     .076233      2.969   0.005      .0715787    .3811012
```

```
   nurban |  -.1069355    .0691494     -1.546   0.131     -.2473163    .0334453
   nrural |  -.0071536    .0641616     -0.111   0.912     -.1374086    .1231014
 mdurbloc |   .0116422    .0949665      0.123   0.903     -.1811499    .2044344
  wintint |  -.3371268    .1034749     -3.258   0.002      -.547192   -.1270616
  fallint |  -.0062791    .0455509     -0.138   0.891     -.0987523    .0861941
  elderly |   .0414398    .0592119      0.700   0.489     -.0787667    .1616463
  child18 |   .0589194    .0941489      0.626   0.535     -.1322131     .250052
 afnothis |   -.053237    .0704467     -0.756   0.455     -.1962514    .0897774
 whnothis |  -.0351076    .0589523     -0.596   0.555     -.1547872     .084572
   ap1to4 |  -.0338644    .0502723     -0.674   0.505     -.1359225    .0681937
    ap5up |   -.093552    .0658596     -1.420   0.164      -.227254      .04015
 ltotshlt |   .0610337     .017302      3.528   0.001      .0259088    .0961585
 lpctnotb |  -.0240913    .0116357     -2.070   0.046      -.047713   -.0004696
  elecben |   .0597157     .069394      0.861   0.395     -.0811616     .200593
    _cons |   2.229435    .1750962     12.733   0.000      1.873971    2.584899
------------------------------------------------------------------------------

. svyreg ltotvita lenuvita linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =     48.51
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.3267

------------------------------------------------------------------------------
ltotvita |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuvita |   .8700862     .179352      4.851   0.000      .5059823     1.23419
    linc |   .0194249    .0237063      0.819   0.418     -.0287016    .0675513
    lfsb |   .1228736    .0400401      3.069   0.004      .0415878    .2041593
   lhsze |  -.2893354    .1841125     -1.572   0.125     -.6631036    .0844328
  nurban |  -.0005113    .0935129     -0.005   0.996     -.1903526    .1893301
  nrural |  -.0392268    .1042428     -0.376   0.709     -.2508508    .1723973
mdurbloc |   .0079103    .0898014      0.088   0.930     -.1743963    .1902169
 wintint |  -.7430068    .2136827     -3.477   0.001     -1.176806   -.3092078
 fallint |  -.1057239    .0569592     -1.856   0.072     -.2213573    .0099094
 elderly |   .1870756    .0633903      2.951   0.006      .0583864    .3157648
 child18 |   .4610126    .1517996      3.037   0.004      .1528429    .7691822
afnothis |  -.1277191    .0940553     -1.358   0.183     -.3186615    .0632232
whnothis |  -.0231242    .1024922     -0.226   0.823     -.2311945    .1849461
  ap1to4 |  -.0377488    .0612501     -0.616   0.542     -.1620931    .0865955
   ap5up |   -.103348    .0889913     -1.161   0.253     -.2840099    .0773139
ltotshlt |   .0678602    .0335124      2.025   0.051     -.0001736     .135894
lpctnotb |  -.0522463    .0161492     -3.235   0.003     -.0850309   -.0194616
 elecben |  -.0173564     .103651     -0.167   0.868     -.2277792    .1930664
   _cons |   8.346023    .2597744     32.128   0.000      7.818653    8.873393
------------------------------------------------------------------------------

. svyreg ltotvitc lenuvitc linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
```

```
PSU:      psuid                                        Number of PSUs   =        39
                                                       Population size  = 6305419.8
                                                       F(  18,     18)  =     19.55
                                                       Prob > F         =    0.0000
                                                       R-squared        =    0.3465

------------------------------------------------------------------------------
ltotvitc |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuvitc |   .5888066    .1314626      4.479   0.000      .3219233      .85569
    linc |  -.0182158    .0229199     -0.795   0.432     -.0647456     .028314
    lfsb |   .1215784     .039084      3.111   0.004      .0422336    .2009232
   lhsze |    .041372    .1398931      0.296   0.769     -.2426261    .3253702
  nurban |   .0232222     .090469      0.257   0.799     -.1604397    .2068842
  nrural |   .0332283    .0887212      0.375   0.710     -.1468853    .2133419
mdurbloc |   .0000696    .1513918      0.000   1.000     -.3072721    .3074113
 wintint |  -.4691128    .2227736     -2.106   0.042     -.9213674   -.0168583
 fallint |  -.1795714    .0539237     -3.330   0.002     -.2890423   -.0701005
 elderly |   .1062464    .0765943      1.387   0.174     -.0492483    .2617411
 child18 |   .4016696    .1329514      3.021   0.005       .131764    .6715752
afnothis |  -.1901612    .0912082     -2.085   0.044     -.3753236   -.0049988
whnothis |  -.2150043    .0987724     -2.177   0.036     -.4155229   -.0144856
  ap1to4 |  -.1168631    .0778747     -1.501   0.142     -.2749571    .0412309
   ap5up |  -.2434029    .0854381     -2.849   0.007     -.4168515   -.0699542
ltotshlt |   .0901928    .0240332      3.753   0.001      .0414029    .1389828
lpctnotb |    -.04286    .0145706     -2.942   0.006     -.0724399   -.0132801
 elecben |  -.0093756     .106428     -0.088   0.930      -.225436    .2066848
   _cons |   4.176995    .2530899     16.504   0.000      3.663195    4.690795
------------------------------------------------------------------------------

. svyreg ltotzinc lenuzinc linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                        Number of obs    =       957
Strata:   stratlf                                      Number of strata =         4
PSU:      psuid                                        Number of PSUs   =        39
                                                       Population size  = 6305419.8
                                                       F(  18,     18)  =    117.96
                                                       Prob > F         =    0.0000
                                                       R-squared        =    0.4750

------------------------------------------------------------------------------
ltotzinc |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuzinc |   .5450828    .0764561      7.129   0.000      .3898687    .7002968
    linc |  -.0023577    .0145193     -0.162   0.872     -.0318334    .0271181
    lfsb |   .1125191    .0252976      4.448   0.000      .0611623    .1638759
   lhsze |   .0865714    .0909877      0.951   0.348     -.0981436    .2712863
  nurban |  -.1072776    .0616249     -1.741   0.091     -.2323828    .0178276
  nrural |  -.0030182    .0403956     -0.075   0.941     -.0850257    .0789893
mdurbloc |  -.0036691    .0873666     -0.042   0.967     -.1810328    .1736945
 wintint |  -.2243769    .1844707     -1.216   0.232     -.5988723    .1501184
 fallint |  -.0148927     .049055     -0.304   0.763     -.1144796    .0846942
 elderly |   -.075896    .0564361     -1.345   0.187     -.1904674    .0386755
 child18 |      .1926    .0817047      2.357   0.024      .0267307    .3584694
afnothis |   .1013682    .0755409      1.342   0.188      -.051988    .2547245
whnothis |   .0444783    .0608527      0.731   0.470     -.0790592    .1680158
  ap1to4 |  -.0581068    .0478485     -1.214   0.233     -.1552444    .0390309
   ap5up |  -.0755493    .0657614     -1.149   0.258      -.209052    .0579533
ltotshlt |   .0513147    .0155557      3.299   0.002       .019735    .0828945
```

```
lpctnotb |  -.0295563    .0110922     -2.665   0.012     -.0520746   -.0070381
 elecben |  -.0267415    .0908313     -0.294   0.770     -.2111389    .1576558
   _cons |   4.091698    .1536005     26.639   0.000      3.779872    4.403524
------------------------------------------------------------------------------

. svyreg ltotprot lenuprot linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt elderly child18
> afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =    130.50
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4834

------------------------------------------------------------------------------
ltotprot |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuprot |   .5218497    .0535437      9.746   0.000      .4131502    .6305493
    linc |  -.0090619     .013345     -0.679   0.502     -.0361538    .0180299
    lfsb |   .1365039    .0240918      5.666   0.000      .0875949    .1854128
   lhsze |   .0965578    .0659733      1.464   0.152     -.0373751    .2304908
  nurban |  -.1183569     .060677     -1.951   0.059     -.2415378    .0048241
  nrural |  -.0067241    .0396328     -0.170   0.866     -.0871829    .0737348
mdurbloc |   .0094617    .0833513      0.114   0.910     -.1597505    .1786739
 wintint |  -.2766024    .1497619     -1.847   0.073     -.5806352    .0274305
 fallint |  -.0296055    .0404649     -0.732   0.469     -.1117536    .0525426
 elderly |  -.0646355    .0540083     -1.197   0.239     -.1742782    .0450072
 child18 |   .1899525    .0779683      2.436   0.020      .0316684    .3482367
afnothis |   .0571131     .063173      0.904   0.372     -.0711348     .185361
whnothis |  -.0715402    .0541126     -1.322   0.195     -.1813947    .0383143
  ap1to4 |  -.0422665    .0454575     -0.930   0.359     -.1345501    .0500172
   ap5up |  -.0605228    .0652738     -0.927   0.360     -.1930357    .0719901
ltotshlt |   .0585167    .0151652      3.859   0.000      .0277296    .0893038
lpctnotb |   -.032619    .0107416     -3.037   0.004     -.0544256   -.0108124
 elecben |  -.0017644    .0786521     -0.022   0.982     -.1614366    .1579079
   _cons |   6.132764    .1583485     38.730   0.000      5.811299    6.454229
------------------------------------------------------------------------------
```

REGRESSIONS FOR TABLE VI.2

ltotcals	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenucalo	.6108217	.0624716	9.778	0.000	.4839976	.7376458
linc	-.0165813	.0122714	-1.351	0.185	-.0414936	.0083311
lfsb	.1117146	.0226426	4.934	0.000	.0657477	.1576815
lhsze	.0493144	.077001	0.640	0.526	-.1070059	.2056346
nurban	-.106383	.0716234	-1.485	0.146	-.2517862	.0390202
nrural	.0068346	.0444009	0.154	0.879	-.083304	.0969731
mdurbloc	-.0037865	.0913471	-0.041	0.967	-.189231	.1816581
wintint	-.2852959	.1292988	-2.206	0.034	-.5477865	-.0228054
fallint	-.0231703	.0433027	-0.535	0.596	-.1110794	.0647389
elderly	.0204205	.0528055	0.387	0.701	-.0867803	.1276213
child18	.182261	.0744471	2.448	0.020	.0311254	.3333966
afnothis	.0515307	.069349	0.743	0.462	-.0892553	.1923166
whnothis	-.0123557	.053983	-0.229	0.820	-.121947	.0972356
ap1to4	-.0268848	.0497931	-0.540	0.593	-.1279702	.0742005
ap5up	-.0560905	.0606779	-0.924	0.362	-.1792731	.0670921
ltotshlt	.0537943	.0152009	3.539	0.001	.0229349	.0846538
lpctnotb	-.0332751	.0101498	-3.278	0.002	-.0538803	-.0126699
elecben	.0601754	.0657609	0.915	0.366	-.0733263	.1936772
fdsec1	.0513234	.0489836	1.048	0.302	-.0481186	.1507653
fdsh	.1238529	.047343	2.616	0.013	.0277415	.2199643
_cons	7.501269	.1488281	50.402	0.000	7.199131	7.803406

ltotvita	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenuvita	.8708972	.1812583	4.805	0.000	.5029233	1.238871
linc	.0189255	.024243	0.781	0.440	-.0302904	.0681414
lfsb	.1227049	.0396393	3.096	0.004	.0422328	.203177
lhsze	-.291295	.1846752	-1.577	0.124	-.6662057	.0836156
nurban	.0001127	.0916705	0.001	0.999	-.1859884	.1862137
nrural	-.0365609	.1035453	-0.353	0.726	-.2467691	.1736472
mdurbloc	-.0042643	.0883388	-0.048	0.962	-.1836016	.175073
wintint	-.7260427	.2174954	-3.338	0.002	-1.167582	-.2845035
fallint	-.1030932	.057854	-1.782	0.083	-.2205431	.0143568
elderly	.2009611	.0646158	3.110	0.004	.069784	.3321383
child18	.4680719	.1496186	3.128	0.004	.1643299	.7718139
afnothis	-.1243026	.0951399	-1.307	0.200	-.317447	.0688417
whnothis	-.023799	.1009657	-0.236	0.815	-.2287704	.1811724
ap1to4	-.0224908	.0581925	-0.386	0.701	-.1406279	.0956464
ap5up	-.0986223	.0879307	-1.122	0.270	-.2771312	.0798866
ltotshlt	.0657685	.0343352	1.915	0.064	-.0039357	.1354727
lpctnotb	-.0513215	.0161997	-3.168	0.003	-.0842087	-.0184343
elecben	-.0248869	.0994354	-0.250	0.804	-.2267515	.1769776
fdsec1	.0312137	.0826188	0.378	0.708	-.1365114	.1989389
fdsh	.1078139	.0768822	1.402	0.170	-.0482654	.2638932
_cons	8.311178	.2431357	34.183	0.000	7.817586	8.804769

ltotvitc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenuvitc	.594967	.1320977	4.504	0.000	.3267945	.8631396
linc	-.0182329	.0231125	-0.789	0.435	-.0651538	.028688
lfsb	.1228562	.0386469	3.179	0.003	.0443989	.2013135
lhsze	.0367299	.1404792	0.261	0.795	-.248458	.3219177
nurban	.0240565	.0895861	0.269	0.790	-.1578129	.2059259
nrural	.0389046	.0860987	0.452	0.654	-.1358851	.2136942
mdurbloc	-.0105389	.1481469	-0.071	0.944	-.3112931	.2902153
wintint	-.4545401	.2172185	-2.093	0.044	-.895517	-.0135631
fallint	-.1794964	.0540748	-3.319	0.002	-.2892741	-.0697187
elderly	.1160505	.0753409	1.540	0.132	-.0368997	.2690008
child18	.4068288	.1331405	3.056	0.004	.1365392	.6771184

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
afnothis	-.1912859	.0912338	-2.097	0.043	-.3765004	-.0060713
whnothis	-.2185872	.0980694	-2.229	0.032	-.4176787	-.0194957
ap1to4	-.1081257	.0743085	-1.455	0.155	-.2589799	.0427285
ap5up	-.2398571	.0839209	-2.858	0.007	-.4102256	-.0694885
elecben	-.0178008	.1010658	-0.176	0.861	-.2229752	.1873737
ltotshlt	.0893882	.0242237	3.690	0.001	.0402115	.1385648
lpctnotb	-.0420517	.0144908	-2.902	0.006	-.0714695	-.0126339
fdsec1	-.025117	.0624979	-0.402	0.690	-.1519944	.1017604
fdsh	.0701597	.0795124	0.882	0.384	-.0912591	.2315786
_cons	4.162947	.2305242	18.059	0.000	3.694958	4.630936

ltotvb6	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenuvb6	.5892307	.0643837	9.152	0.000	.4585249	.7199366
linc	-.0008599	.0154597	-0.056	0.956	-.0322448	.030525
lfsb	.128653	.0309645	4.155	0.000	.0657918	.1915142
lhsze	.067514	.0834372	0.809	0.424	-.1018725	.2369005
nurban	-.118435	.065494	-1.808	0.079	-.2513949	.0145249
nrural	-.0534671	.0631761	-0.846	0.403	-.1817213	.0747872
wintint	-.3639313	.0933169	-3.900	0.000	-.5533746	-.174488
fallint	-.0546123	.0496397	-1.100	0.279	-.1553863	.0461617
elderly	.0305642	.0626047	0.488	0.628	-.0965301	.1576585
child18	.2777267	.0991216	2.802	0.008	.0764991	.4789544
afnothis	-.0115735	.0650309	-0.178	0.860	-.1435933	.1204462
whnothis	-.0815646	.0600409	-1.358	0.183	-.203454	.0403249
ap1to4	-.0577483	.0478423	-1.207	0.236	-.1548733	.0393767
ap5up	-.0841733	.0670292	-1.256	0.218	-.2202499	.0519033
elecben	.0107366	.0667416	0.161	0.873	-.124756	.1462293
ltotshlt	.0713285	.0169841	4.200	0.000	.036849	.105808
lpctnotb	-.0373942	.0111452	-3.355	0.002	-.0600203	-.0147682
fdsec1	.0413617	.0531194	0.779	0.441	-.0664764	.1491999
fdsh	.0993239	.0432628	2.296	0.028	.0114958	.187152
_cons	2.121409	.1807696	11.735	0.000	1.754427	2.488391

ltotfola	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenufola	.5751029	.0752044	7.647	0.000	.4224298	.7277759
linc	.0014781	.0177608	0.083	0.934	-.0345783	.0375345
lfsb	.1361509	.0319718	4.258	0.000	.0712446	.2010571
lhsze	.0483091	.1075856	0.449	0.656	-.1701012	.2667195
nurban	-.1235697	.0672722	-1.837	0.075	-.2601395	.013
nrural	-.012561	.0769093	-0.163	0.871	-.1686952	.1435731
wintint	-.5337079	.1394761	-3.827	0.001	-.8168594	-.2505564
fallint	-.025276	.0543738	-0.465	0.645	-.1356607	.0851087
elderly	.072166	.0595731	1.211	0.234	-.0487739	.1931059
child18	.4019587	.12186	3.299	0.002	.1545697	.6493477
afnothis	-.1402678	.085375	-1.643	0.109	-.3135883	.0330527
whnothis	-.1156321	.0794556	-1.455	0.154	-.2769355	.0456714
ap1to4	-.0907327	.0526751	-1.722	0.094	-.1976687	.0162034
ap5up	-.1366653	.0755516	-1.809	0.079	-.2900432	.0167126
elecben	.0179837	.0854175	0.211	0.834	-.1554231	.1913905
ltotshlt	.0620628	.0245168	2.531	0.016	.0122911	.1118345
lpctnotb	-.0399099	.0121043	-3.297	0.002	-.0644828	-.0153369
fdsec1	.0180935	.0590579	0.306	0.761	-.1018003	.1379874
fdsh	.0719311	.0531835	1.353	0.185	-.0360371	.1798994
_cons	7.075338	.2021455	35.001	0.000	6.66496	7.485715

ltotcalc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]

lenucalc	.6415637	.0907408	7.070	0.000	.4573501	.8257772
linc	-.0004777	.0144332	-0.033	0.974	-.0297786	.0288233
lfsb	.1002994	.0278389	3.603	0.001	.0437834	.1568153
lhsze	-.0282449	.0995468	-0.284	0.778	-.2303357	.1738458
nurban	-.0811228	.0745686	-1.088	0.284	-.2325052	.0702595
nrural	-.0655768	.077877	-0.842	0.405	-.2236755	.092522
wintint	-.4385956	.1408461	-3.114	0.004	-.7245285	-.1526628
fallint	-.0246355	.0513642	-0.480	0.634	-.1289104	.0796394
elderly	.023994	.0533624	0.450	0.656	-.0843375	.1323255
child18	.2304655	.0942284	2.446	0.020	.0391718	.4217593
afnothis	-.1715325	.0763862	-2.246	0.031	-.3266047	-.0164603
whnothis	.0758043	.0665319	1.139	0.262	-.0592628	.2108713
ap1to4	.0132723	.0458499	0.289	0.774	-.0798079	.1063524
ap5up	-.0481416	.078872	-0.610	0.546	-.2082603	.1119771
elecben	.0513579	.0753337	0.682	0.500	-.1015776	.2042935
ltotshlt	.0349932	.0217101	1.612	0.116	-.0090807	.0790671
lpctnotb	-.0405522	.0106552	-3.806	0.001	-.0621834	-.0189209
fdsec1	.0766662	.0601886	1.274	0.211	-.0455232	.1988556
fdsh	.1485262	.0610293	2.434	0.020	.0246301	.2724223
_cons	6.2497	.1759028	35.529	0.000	5.892598	6.606801

ltotiron	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenuiron	.4796517	.0549483	8.729	0.000	.3681007	.5912027
linc	-.0019039	.0148966	-0.128	0.899	-.0321456	.0283378
lfsb	.118151	.0270342	4.370	0.000	.0632686	.1730334
lhsze	.2251114	.0766654	2.936	0.006	.0694724	.3807505
nurban	-.1066798	.0678483	-1.572	0.125	-.2444191	.0310595
nrural	-.0072187	.0641521	-0.113	0.911	-.1374543	.123017
wintint	-.3265109	.1038391	-3.144	0.003	-.5373156	-.1157062
fallint	-.0033792	.0452507	-0.075	0.941	-.095243	.0884846
elderly	.0511382	.0600359	0.852	0.400	-.0707411	.1730175
child18	.0642311	.0943406	0.681	0.500	-.1272905	.2557526
afnothis	-.0488641	.0713344	-0.685	0.498	-.1936807	.0959524
whnothis	-.0338606	.0588389	-0.575	0.569	-.1533098	.0855887
ap1to4	-.021988	.047663	-0.461	0.647	-.118749	.074773
ap5up	-.090264	.0647893	-1.393	0.172	-.2217933	.0412653
elecben	.0559275	.0663302	0.843	0.405	-.0787299	.190585
ltotshlt	.0592022	.0177201	3.341	0.002	.0232285	.0951758
lpctnotb	-.0235119	.0116913	-2.011	0.052	-.0472465	.0002227
fdsec1	.0471018	.0483635	0.974	0.337	-.0510812	.1452849
fdsh	.0797718	.0410296	1.944	0.060	-.0035228	.1630663
_cons	2.199172	.1620259	13.573	0.000	1.870242	2.528102

ltotzinc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenuzinc	.544887	.0746891	7.295	0.000	.3932601	.6965139
linc	-.0030347	.0144942	-0.209	0.835	-.0324596	.0263901
lfsb	.1113585	.0256319	4.345	0.000	.059323	.163394
lhsze	.0844935	.0908848	0.930	0.359	-.1000125	.2689995
nurban	-.10698	.0597261	-1.791	0.082	-.2282304	.0142703
nrural	-.0035161	.0402342	-0.087	0.931	-.085196	.0781637
wintint	-.2127568	.1799954	-1.182	0.245	-.5781669	.1526532
fallint	-.0113537	.0485221	-0.234	0.816	-.1098588	.0871514
elderly	-.0649762	.0581358	-1.118	0.271	-.1829981	.0530458
child18	.1985928	.0816198	2.433	0.020	.0328958	.3642899
afnothis	.1067101	.0765647	1.394	0.172	-.0487244	.2621446
whnothis	.0463159	.0616491	0.751	0.458	-.0788384	.1714703
ap1to4	-.0445272	.0453476	-0.982	0.333	-.1365877	.0475333

ap5up	-.0718476	.0637065	-1.128	0.267	-.2011786	.0574835
ltotshlt	.0491785	.0159767	3.078	0.004	.0167442	.0816129
lpctnotb	-.0289146	.0111326	-2.597	0.014	-.0515151	-.0063142
elecben	-.0306527	.0863104	-0.355	0.725	-.2058721	.1445668
fdsec1	.058527	.0492731	1.188	0.243	-.0415027	.1585566
fdsh	.0903749	.0449229	2.012	0.052	-.0008234	.1815732
_cons	4.056428	.1457813	27.825	0.000	3.760476	4.35238

ltotprot	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lenuprot	.5209535	.0518462	10.048	0.000	.4157	.6262069
linc	-.0096651	.0134238	-0.720	0.476	-.0369168	.0175866
lfsb	.1355216	.0241516	5.611	0.000	.0864914	.1845519
lhsze	.0954314	.0654804	1.457	0.154	-.0375008	.2283636
nurban	-.1180595	.0590294	-2.000	0.053	-.2378955	.0017765
nrural	-.0068522	.0394067	-0.174	0.863	-.0868519	.0731476
mdurbloc	.0014827	.0803248	0.018	0.985	-.1615853	.1645506
wintint	-.2651458	.1443621	-1.837	0.075	-.5582163	.0279248
fallint	-.026456	.0398492	-0.664	0.511	-.1073542	.0544422
elderly	-.0541199	.055308	-0.979	0.335	-.1664012	.0581614
child18	.1952966	.0772949	2.527	0.016	.0383796	.3522137
afnothis	.0618594	.0645878	0.958	0.345	-.0692608	.1929797
whnothis	-.070135	.054502	-1.287	0.207	-.18078	.0405099
ap1to4	-.029438	.0430442	-0.684	0.499	-.1168224	.0579465
ap5up	-.0569831	.0634434	-0.898	0.375	-.18578	.0718139
ltotshlt	.0565288	.0154697	3.654	0.001	.0251237	.0879339
lpctnotb	-.031991	.0105886	-3.021	0.005	-.0534869	-.010495
elecben	-.0057681	.0747066	-0.077	0.939	-.1574306	.1458943
fdsec1	.0514903	.0488013	1.055	0.299	-.0475816	.1505621
fdsh	.0860399	.0406969	2.114	0.042	.0034208	.1686589
_cons	6.099833	.1511103	40.367	0.000	5.793063	6.406603

REGRESSIONS FOR TABLE VI.3

```
. set mem 50000;
(50000k)

. set matsize 150;

. use "D:\FSS\codedata.dta", clear;

. svyset strata stratlf;

. svyset psu psuid;

. svyset pweight hhwt1;

. svyreg ltotcals lenucalo lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     69.18
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.5336

------------------------------------------------------------------------------
ltotcals |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenucalo |   .6080435    .0629399      9.661   0.000      .4802688    .7358182
   lhsze |   .0613874     .078162      0.785   0.438     -.0972899    .2200648
  nurban |   -.108867    .0711599     -1.530   0.135     -.2533293    .0355953
  nrural |   .0041938    .0456066      0.092   0.927     -.0883926    .0967801
mdurbloc |  -.0089434      .08961     -0.100   0.921     -.1908615    .1729746
 wintint |  -.2807217    .1147877     -2.446   0.020     -.5137532   -.0476902
 fallint |  -.0234391    .0440707     -0.532   0.598     -.1129074    .0660293
 ncrinc0 |  -.0316967    .0148998     -2.127   0.041      -.061945   -.0014485
 ncrinc1 |   .0086242    .0270051      0.319   0.751      -.046199    .0634474
 ncrinch |  -.0210775    .0222761     -0.946   0.351     -.0663004    .0241454
 ncrfsb0 |   .0862041    .0302317      2.851   0.007      .0248305    .1475776
 ncrfsb1 |   .1563472    .0322852      4.843   0.000      .0908047    .2218897
 ncrfsbh |   .1107729    .0357176      3.101   0.004      .0382624    .1832835
  fdsec1 |   -.370262    .1775383     -2.086   0.044     -.7306839   -.0098402
    fdsh |  -.0023443     .199031     -0.012   0.991     -.4063987      .40171
 elderly |   .0194054    .0530902      0.366   0.717     -.0883734    .1271842
 child18 |   .1728856    .0748271      2.310   0.027      .0209786    .3247926
afnothis |   .0543052    .0692179      0.785   0.438     -.0862145    .1948249
whnothis |  -.0134189    .0549201     -0.244   0.808     -.1249126    .0980749
  ap1to4 |  -.0203572     .048845     -0.417   0.679     -.1195178    .0788034
   ap5up |  -.0558464    .0599125     -0.932   0.358     -.1774752    .0657825
ltotshlt |   .0537127    .0149109      3.602   0.001      .0234419    .0839834
lpctnotb |  -.0331494    .0100565     -3.296   0.002     -.0535653   -.0127336
 elecben |   .0642105    .0655277      0.980   0.334     -.0688178    .1972387
   _cons |   7.648141    .1562262     48.956   0.000      7.330985    7.965298
------------------------------------------------------------------------------

. svyreg ltotiron lenuiron lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;
```

```
Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     30.35
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4774

------------------------------------------------------------------------------
ltotiron |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuiron |   .4758699    .0536783      8.865   0.000      .3668971    .5848427
   lhsze |   .2358008    .0749985      3.144   0.003      .0835457    .3880559
  nurban |  -.1046881    .0677826     -1.544   0.131      -.242294    .0329178
  nrural |  -.0081769    .0646145     -0.127   0.900     -.1393513    .1229975
mdurbloc |   .0096302    .0940824      0.102   0.919     -.1813672    .2006276
 wintint |  -.3250886    .0944702     -3.441   0.002     -.5168732   -.1333039
 fallint |  -.0046707    .0453093     -0.103   0.918     -.0966534     .087312
 ncrinc0 |  -.0243724    .0113262     -2.152   0.038     -.0473658   -.0013791
 ncrinc1 |    .014225     .033573      0.424   0.674     -.0539318    .0823819
 ncrinch |   .0215971    .0302472      0.714   0.480     -.0398079    .0830021
 ncrfsb0 |   .0890329    .0356316      2.499   0.017      .0166968     .161369
 ncrfsb1 |   .1510283    .0355314      4.251   0.000      .0788958    .2231609
 ncrfsbh |   .1351949    .0331549      4.078   0.000      .0678868     .202503
  fdsec1 |  -.3371225    .1913402     -1.762   0.087     -.7255637    .0513188
    fdsh |  -.2815931     .223129     -1.262   0.215     -.7345692    .1713829
 elderly |   .0468096    .0599879      0.780   0.440     -.0749724    .1685915
 child18 |   .0549286    .0930147      0.591   0.559     -.1339013    .2437585
afnothis |  -.0491809    .0704601     -0.698   0.490     -.1922226    .0938607
whnothis |  -.0375251    .0589269     -0.637   0.528      -.157153    .0821029
  ap1to4 |  -.0169924    .0466956     -0.364   0.718     -.1117895    .0778048
   ap5up |  -.0918183    .0639499     -1.436   0.160     -.2216436     .038007
ltotshlt |   .0584674    .0174377      3.353   0.002      .0230671    .0938677
lpctnotb |  -.0231943    .0115785     -2.003   0.053     -.0466999    .0003114
 elecben |   .0580199    .0663159      0.875   0.388     -.0766086    .1926483
   _cons |   2.399871    .1597322     15.024   0.000      2.075598    2.724145
------------------------------------------------------------------------------

. svyreg ltotcalc lenucalc lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     33.76
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4629

------------------------------------------------------------------------------
ltotcalc |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenucalc |   .6357407    .0888478      7.155   0.000      .4553701    .8161114
   lhsze |  -.0134259    .1009888     -0.133   0.895      -.218444    .1915921
  nurban |  -.0835556    .0738975     -1.131   0.266     -.2335755    .0664643
  nrural |  -.0660087    .0783987     -0.842   0.406     -.2251666    .0931492
```

```
mdurbloc |   .0338713    .1177675      0.288   0.775     -.2052094     .272952
 wintint |  -.4341103    .1259473     -3.447   0.001     -.6897969   -.1784236
 fallint |  -.0219152    .0524694     -0.418   0.679     -.1284338    .0846034
 ncrinc0 |   -.028479    .0188788     -1.509   0.140      -.066805     .009847
 ncrinc1 |   .0332915    .0269074      1.237   0.224     -.0213335    .0879164
 ncrinch |   .0112367    .0376713      0.298   0.767     -.0652401    .0877136
 ncrfsb0 |   .0845951    .0335089      2.525   0.016      .0165685    .1526218
 ncrfsb1 |     .15289    .0406156      3.764   0.001       .070436    .2353441
 ncrfsbh |   .0719909    .0544555      1.322   0.195     -.0385597    .1825415
  fdsec1 |  -.4386858    .2181326     -2.011   0.052     -.8815186     .004147
    fdsh |    .010589    .3320159      0.032   0.975     -.6634391    .6846172
 elderly |   .0302619    .0534528      0.566   0.575     -.0782531    .1387769
 child18 |   .2238131    .0954601      2.345   0.025      .0300189    .4176073
afnothis |  -.1696412    .0775254     -2.188   0.035     -.3270261   -.0122563
whnothis |   .0742759    .0679604      1.093   0.282      -.063691    .2122429
  ap1to4 |   .0216473     .044058      0.491   0.626     -.0677951    .1110897
   ap5up |  -.0492958    .0780615     -0.631   0.532     -.2077691    .1091775
ltotshlt |   .0340892    .0207045      1.646   0.109     -.0079431    .0761216
lpctnotb |  -.0408677    .0103518     -3.948   0.000      -.061883   -.0198524
 elecben |   .0514927    .0756017      0.681   0.500     -.1019868    .2049722
   _cons |   6.422593    .1816685     35.353   0.000      6.053787      6.7914
------------------------------------------------------------------------------

. svyreg ltotvitc lenuvitc lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     10.02
                                                  Prob > F         =    0.0001
                                                  R-squared        =    0.3497

------------------------------------------------------------------------------
ltotvitc |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuvitc |   .5800775    .1297122      4.472   0.000      .3167477    .8434072
   lhsze |   .0454484    .1410037      0.322   0.749     -.2408044    .3317011
  nurban |   .0255132    .0902143      0.283   0.779     -.1576316     .208658
  nrural |   .0431176    .0865876      0.498   0.622     -.1326647    .2188998
mdurbloc |   .0065097    .1557057      0.042   0.967     -.3095897    .3226091
 wintint |  -.4631703     .216476     -2.140   0.039     -.9026398   -.0237007
 fallint |  -.1770158    .0554357     -3.193   0.003     -.2895563   -.0644753
 ncrinc0 |  -.0362384    .0193491     -1.873   0.069     -.0755191    .0030423
 ncrinc1 |   -.026295    .0442498     -0.594   0.556     -.1161269    .0635369
 ncrinch |   .0327321    .0453094      0.722   0.475     -.0592509    .1247151
 ncrfsb0 |   .1251951    .0360234      3.475   0.001      .0520638    .1983265
 ncrfsb1 |   .1609202    .0583127      2.760   0.009      .0425391    .2793013
 ncrfsbh |   .0801547    .0815776      0.983   0.333     -.0854567    .2457661
  fdsec1 |  -.1901534    .3044324     -0.625   0.536      -.808184    .4278772
    fdsh |  -.1000645    .3823872     -0.262   0.795     -.8763518    .6762228
 elderly |   .1280345      .06971      1.837   0.075     -.0134844    .2695533
 child18 |   .4114947    .1369135      3.006   0.005      .1335455    .6894439
afnothis |  -.1966634    .0892553     -2.203   0.034     -.3778612   -.0154655
whnothis |  -.2251096    .0964085     -2.335   0.025     -.4208293     -.02939
  ap1to4 |  -.1024115    .0721427     -1.420   0.165     -.2488689     .044046
   ap5up |   -.242123    .0823065     -2.942   0.006     -.4092142   -.0750319
ltotshlt |   .0884396    .0236968      3.732   0.001      .0403325    .1365468
```

```
lpctnotb |  -.0433485    .0146446     -2.960   0.005     -.0730785   -.0136184
 elecben |  -.0230168    .0999186     -0.230   0.819     -.2258624    .1798289
   _cons |   4.235816    .1971223     21.488   0.000      3.835637    4.635996
------------------------------------------------------------------------------

. svyreg ltotvita lenuvita lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     44.18
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.3386

------------------------------------------------------------------------------
ltotvita |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuvita |   .8489246     .174681      4.860   0.000      .4943033    1.203546
   lhsze |  -.2517704    .1860421     -1.353   0.185     -.6294558    .1259151
  nurban |   .0013668    .0956637      0.014   0.989     -.1928409    .1955744
  nrural |  -.0348463    .0988117     -0.353   0.726     -.2354447     .165752
mdurbloc |    .015913    .0872336      0.182   0.856     -.1611807    .1930066
 wintint |  -.7188984    .2011892     -3.573   0.001     -1.127334   -.3104627
 fallint |  -.0987273    .0584486     -1.689   0.100     -.2173843    .0199297
 ncrinc0 |  -.0548132    .0169509     -3.234   0.003     -.0892253   -.0204011
 ncrinc1 |   .0823097    .0537676      1.531   0.135     -.0268443    .1914637
 ncrinch |   .0856805    .0810375      1.057   0.298     -.0788344    .2501953
 ncrfsb0 |    .084179    .0501732      1.678   0.102     -.0176781     .186036
 ncrfsb1 |   .2200356    .0525293      4.189   0.000      .1133955    .3266758
 ncrfsbh |   .0839574    .0700791      1.198   0.239     -.0583107    .2262254
  fdsec1 |  -1.056985    .3819483     -2.767   0.009     -1.832381    -.281589
    fdsh |  -.5324526    .5211167     -1.022   0.314     -1.590376    .5254705
 elderly |   .2106877    .0632698      3.330   0.002      .0822433    .3391321
 child18 |   .4457915    .1542485      2.890   0.007      .1326505    .7589326
afnothis |  -.1249408    .0908465     -1.375   0.178      -.309369    .0594874
whnothis |  -.0309591    .0935241     -0.331   0.743     -.2208231     .158905
  ap1to4 |  -.0062441    .0605181     -0.103   0.918     -.1291025    .1166142
   ap5up |  -.1038612    .0839543     -1.237   0.224     -.2742975    .0665752
ltotshlt |   .0626677    .0321067      1.952   0.059     -.0025123    .1278477
lpctnotb |  -.0516343    .0164796     -3.133   0.003     -.0850897   -.0181789
 elecben |  -.0272462     .096391     -0.283   0.779     -.2229304     .168438
   _cons |   8.766471    .1911746     45.856   0.000      8.378366    9.154576
------------------------------------------------------------------------------

. svyreg ltotzinc lenuzinc lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     97.11
                                                  Prob > F         =    0.0000
```

```
                                                   R-squared       =    0.4792

------------------------------------------------------------------------------
ltotzinc |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuzinc |   .5477366    .0750246      7.301   0.000       .3954286    .7000446
   lhsze |   .0923184    .0921657      1.002   0.323      -.094788    .2794248
  nurban |   -.109257    .0593672     -1.840   0.074     -.2297788    .0112648
  nrural |  -.0076443    .0415172     -0.184   0.855     -.0919287    .0766401
mdurbloc |  -.0224822    .0831981     -0.270   0.789     -.1913833    .1464188
 wintint |  -.2054139    .1666298     -1.233   0.226     -.5436904    .1328627
 fallint |  -.0130395    .0494203     -0.264   0.793     -.1133681    .0872891
 ncrinc0 |  -.0104245     .015549     -0.670   0.507     -.0419907    .0211417
 ncrinc1 |   .0222538    .0265543      0.838   0.408     -.0316544    .0761619
 ncrinch |  -.0245544    .0256722     -0.956   0.345     -.0766717    .0275629
 ncrfsb0 |   .0846021     .031629      2.675   0.011      .0203918    .1488125
 ncrfsb1 |   .1365865    .0370488      3.687   0.001      .0613734    .2117996
 ncrfsbh |   .1323929    .0389469      3.399   0.002      .0533265    .2114593
  fdsec1 |  -.2667328    .1787726     -1.492   0.145     -.6296605    .0961949
    fdsh |   .0016048    .2195926      0.007   0.994     -.4441919    .4474014
 elderly |  -.0713687    .0578578     -1.234   0.226     -.1888264    .0460889
 child18 |   .1876942    .0808654      2.321   0.026      .0235288    .3518596
afnothis |   .1111077     .077661      1.431   0.161     -.0465524    .2687679
whnothis |   .0475318    .0626689      0.758   0.453     -.0796928    .1747563
  ap1to4 |  -.0409364    .0448009     -0.914   0.367      -.131887    .0500142
   ap5up |  -.0709154    .0634065     -1.118   0.271     -.1996373    .0578066
ltotshlt |   .0494356    .0157173      3.145   0.003      .0175279    .0813434
lpctnotb |  -.0282282    .0109039     -2.589   0.014     -.0503642   -.0060922
 elecben |  -.0246168    .0860098     -0.286   0.776      -.199226    .1499924
   _cons |   4.175272    .1507863     27.690   0.000       3.86916    4.481385
------------------------------------------------------------------------------

. svyreg ltotfola lenufola lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;

Survey linear regression

pweight:  hhwt1                                    Number of obs    =       957
Strata:   stratlf                                  Number of strata =         4
PSU:      psuid                                    Number of PSUs   =        39
                                                   Population size  = 6305419.8
                                                   F(  24,     12)  =     65.49
                                                   Prob > F         =    0.0000
                                                   R-squared        =    0.4318

------------------------------------------------------------------------------
ltotfola |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenufola |   .5681467    .0737013      7.709   0.000       .4185251    .7177683
   lhsze |    .070272    .1081641      0.650   0.520     -.1493129    .2898568
  nurban |  -.1243425     .067322     -1.847   0.073     -.2610134    .0123285
  nrural |   -.015115     .076914     -0.197   0.845     -.1712587    .1410286
mdurbloc |   .0139678    .1233373      0.113   0.910     -.2364202    .2643558
 wintint |  -.5261878    .1262787     -4.167   0.000     -.7825471   -.2698285
 fallint |  -.0253234    .0549487     -0.461   0.648     -.1368752    .0862284
 ncrinc0 |  -.0352664     .012669     -2.784   0.009     -.0609858    -.009547
 ncrinc1 |   .0445343    .0368535      1.208   0.235     -.0302822    .1193508
 ncrinch |   .0170802    .0348844      0.490   0.627      -.053739    .0878994
 ncrfsb0 |   .0946397    .0371654      2.546   0.015      .0191899    .1700896
 ncrfsb1 |   .2011337    .0486222      4.137   0.000      .1024253    .2998421
 ncrfsbh |   .1398898    .0546421      2.560   0.015      .0289605    .2508191
```

```
  fdsec1 |   -.706778     .248959     -2.839   0.007     -1.212192   -.2013643
    fdsh |   -.312903    .2772607     -1.129   0.267     -.8757721    .2499662
 elderly |    .070644    .0594978      1.187   0.243     -.0501429     .191431
 child18 |   .3837456    .1237041      3.102   0.004       .132613    .6348782
afnothis |  -.1375966    .0825815     -1.666   0.105     -.3052458    .0300527
whnothis |   -.118581    .0778179     -1.524   0.137     -.2765598    .0393977
  ap1to4 |  -.0806933    .0508256     -1.588   0.121     -.1838747     .022488
   ap5up |  -.1381817    .0733253     -1.885   0.068     -.2870399    .0106765
ltotshlt |   .0610188    .0235034      2.596   0.014      .0133043    .1087333
lpctnotb |   -.039546    .0119709     -3.304   0.002     -.0638482   -.0152438
 elecben |   .0221963    .0842077      0.264   0.794     -.1487545    .1931471
   _cons |   7.374813    .1931054     38.191   0.000      6.982788    7.766837
------------------------------------------------------------------------------

. svyreg ltotvb6 lenuvb6 lhsze nurban nrural mdurbloc wintint fallint ncrinc0 n
> crinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     55.14
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4963

------------------------------------------------------------------------------
 ltotvb6 |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
 lenuvb6 |   .5888935    .0638954      9.217   0.000      .4591789    .7186081
   lhsze |   .0803511    .0850392      0.945   0.351     -.0922876    .2529898
  nurban |  -.1192061    .0661666     -1.802   0.080     -.2535313    .0151192
  nrural |  -.0561392      .06307     -0.890   0.379     -.1841781    .0718998
mdurbloc |    .010408    .1189485      0.088   0.931     -.2310703    .2518863
 wintint |  -.3546281    .0836777     -4.238   0.000     -.5245028   -.1847534
 fallint |  -.0547082    .0505099     -1.083   0.286     -.1572487    .0478324
 ncrinc0 |  -.0221071    .0119528     -1.850   0.073     -.0463726    .0021583
 ncrinc1 |   .0348848    .0322357      1.082   0.287     -.0305572    .1003268
 ncrinch |  -.0073855    .0299527     -0.247   0.807     -.0681927    .0534217
 ncrfsb0 |   .1057226    .0378062      2.796   0.008       .028972    .1824733
 ncrfsb1 |   .1517482    .0394404      3.848   0.000      .0716799    .2318166
 ncrfsbh |   .1424913    .0492064      2.896   0.006       .042597    .2423856
  fdsec1 |  -.3762919    .2156757     -1.745   0.090     -.8141369    .0615531
    fdsh |  -.0860034     .240547     -0.358   0.723     -.5743398     .402333
 elderly |   .0263833    .0620132      0.425   0.673     -.0995103    .1522768
 child18 |   .2643857    .0991715      2.666   0.012      .0630569    .4657145
afnothis |  -.0078939    .0650117     -0.121   0.904     -.1398746    .1240868
whnothis |  -.0805631    .0599843     -1.343   0.188     -.2023376    .0412114
  ap1to4 |  -.0536453    .0470458     -1.140   0.262     -.1491534    .0418627
   ap5up |  -.0848588    .0664714     -1.277   0.210      -.219803    .0500854
ltotshlt |   .0706614    .0162669      4.344   0.000      .0376379    .1036849
lpctnotb |   -.036642    .0110373     -3.320   0.002     -.0590488   -.0142352
 elecben |     .01414    .0685038      0.206   0.838     -.1249301    .1532101
   _cons |   2.292226    .1547579     14.812   0.000      1.978051    2.606401
------------------------------------------------------------------------------

. svyreg ltotprot lenuprot lhsze nurban nrural mdurbloc wintint fallint ncrinc0
>  ncrinc1 ncrinch ncrfsb0 ncrfsb1 ncrfsbh
> fdsec1 fdsh elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb
> elecben;
```

```
Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  24,     12)  =     83.24
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4881

------------------------------------------------------------------------------
ltotprot |      Coef.   Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuprot |   .5200543    .0511185    10.174   0.000      .4162783    .6238304
   lhsze |   .1081915    .0658224     1.644   0.109     -.0254352    .2418181
  nurban |   -.117499    .0594612    -1.976   0.056     -.2382115    .0032136
  nrural |  -.0099662    .0414674    -0.240   0.811     -.0941494    .0742171
mdurbloc |  -.0021238    .0809911    -0.026   0.979     -.1665444    .1622969
 wintint |  -.2568354    .1313179    -1.956   0.059     -.5234249     .009754
 fallint |  -.0281273     .040038    -0.703   0.487     -.1094088    .0531541
 ncrinc0 |  -.0279113    .0119689    -2.332   0.026     -.0522093   -.0036132
 ncrinc1 |   .0196767    .0289742     0.679   0.502     -.0391441    .0784974
 ncrinch |  -.0139975    .0263145    -0.532   0.598     -.0674189    .0394239
 ncrfsb0 |   .1074183    .0311356     3.450   0.001      .0442096     .170627
 ncrfsb1 |   .1519938    .0319877     4.752   0.000      .0870554    .2169323
 ncrfsbh |   .1658658    .0368814     4.497   0.000      .0909926     .240739
  fdsec1 |  -.3168319    .1820423    -1.740   0.091     -.6863973    .0527335
    fdsh |  -.1673244    .2061235    -0.812   0.422     -.5857774    .2511286
 elderly |  -.0621099    .0546625    -1.136   0.264     -.1730807    .0488609
 child18 |   .1806238    .0767752     2.353   0.024      .0247619    .3364857
afnothis |   .0648744     .065385     0.992   0.328     -.0678642     .197613
whnothis |  -.0698317    .0550936    -1.268   0.213     -.1816776    .0420142
  ap1to4 |   -.026483    .0423508    -0.625   0.536     -.1124596    .0594936
   ap5up |  -.0577099    .0632102    -0.913   0.367     -.1860334    .0706135
ltotshlt |   .0559894    .0151712     3.691   0.001      .0251902    .0867886
lpctnotb |  -.0310125    .0103641    -2.992   0.005     -.0520527   -.0099724
 elecben |  -.0013243    .0753556    -0.018   0.986     -.1543042    .1516556
   _cons |   6.276554    .1420851    44.175   0.000      5.988106    6.565002
------------------------------------------------------------------------------

. svyreg ltotcals lenucalo linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt
> elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =    135.90
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.5274

------------------------------------------------------------------------------
ltotcals |      Coef.   Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenucalo |   .6107473    .0645522     9.461   0.000      .4796994    .7417952
    linc |  -.0158892    .0125054    -1.271   0.212     -.0412765    .0094981
    lfsb |   .1123953     .022976     4.892   0.000      .0657515    .1590392
   lhsze |   .0513456    .0771705     0.665   0.510     -.1053189    .2080102
  nurban |  -.1069802    .0738728    -1.448   0.156       -.25695    .0429896
```

```
  nrural |   .0050854    .0448563      0.113   0.910     -.0859778    .0961486
mdurbloc |   .0091889    .0964419      0.095   0.925     -.1865987    .2049764
 wintint |   -.303561    .1277344     -2.377   0.023     -.5628755   -.0442464
 fallint |   -.026807    .0434828     -0.616   0.542     -.1150818    .0614679
 elderly |   .0048002    .0518704      0.093   0.927     -.1005024    .1101028
 child18 |   .1742575    .0744352      2.341   0.025      .0231459     .325369
afnothis |   .0464296    .0687877      0.675   0.504     -.0932168    .1860759
whnothis |    -.01271     .053622     -0.237   0.814     -.1215685    .0961485
  ap1to4 |  -.0447955    .0537956     -0.833   0.411     -.1540064    .0644155
   ap5up |  -.0613863     .062852     -0.977   0.335     -.1889826      .06621
ltotshlt |   .0563819     .014701      3.835   0.001      .0265373    .0862265
lpctnotb |   -.034273     .010095     -3.395   0.002      -.054767   -.0137789
 elecben |   .0676638    .0708445      0.955   0.346     -.0761582    .2114859
   _cons |   7.544277    .1581786     47.695   0.000      7.223158    7.865397
------------------------------------------------------------------------------

. svyreg ltotiron lenuiron linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt
> elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
                                                  Population size  = 6305419.8
                                                  F(  18,     18)  =     45.21
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.4737

------------------------------------------------------------------------------
ltotiron |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenuiron |   .4803313    .0566459      8.480   0.000       .365334    .5953286
    linc |  -.0013507    .0146136     -0.092   0.927     -.0310178    .0283164
    lfsb |   .1190072    .0268657      4.430   0.000      .0644669    .1735475
   lhsze |   .2263399     .076233      2.969   0.005      .0715787    .3811012
  nurban |  -.1069355    .0691494     -1.546   0.131     -.2473163    .0334453
  nrural |  -.0071536    .0641616     -0.111   0.912     -.1374086    .1231014
mdurbloc |   .0116422    .0949665      0.123   0.903     -.1811499    .2044344
 wintint |  -.3371268    .1034749     -3.258   0.002      -.547192   -.1270616
 fallint |  -.0062791    .0455509     -0.138   0.891     -.0987523    .0861941
 elderly |   .0414398    .0592119      0.700   0.489     -.0787667    .1616463
 child18 |   .0589194    .0941489      0.626   0.535     -.1322131     .250052
afnothis |   -.053237    .0704467     -0.756   0.455     -.1962514    .0897774
whnothis |  -.0351076    .0589523     -0.596   0.555     -.1547872     .084572
  ap1to4 |  -.0338644    .0502723     -0.674   0.505     -.1359225    .0681937
   ap5up |   -.093552    .0658596     -1.420   0.164      -.227254      .04015
ltotshlt |   .0610337     .017302      3.528   0.001      .0259088    .0961585
lpctnotb |  -.0240913    .0116357     -2.070   0.046      -.047713   -.0004696
 elecben |   .0597157     .069394      0.861   0.395     -.0811616     .200593
   _cons |   2.229435    .1750962     12.733   0.000      1.873971    2.584899
------------------------------------------------------------------------------

. svyreg ltotcalc lenucalc linc lfsb lhsze nurban nrural mdurbloc wintint falli
> nt
> elderly child18 afnothis whnothis ap1to4 ap5up ltotshlt lpctnotb elecben;

Survey linear regression

pweight:  hhwt1                                   Number of obs    =       957
Strata:   stratlf                                 Number of strata =         4
PSU:      psuid                                   Number of PSUs   =        39
```

```
                                                 Population size  = 6305419.8
                                                 F(  18,     18)  =     49.34
                                                 Prob > F         =    0.0000
                                                 R-squared        =    0.4554

------------------------------------------------------------------------------
ltotcalc |      Coef.    Std. Err.       t     P>|t|      [95% Conf. Interval]
---------+--------------------------------------------------------------------
lenucalc |   .6387202    .0913324      6.993   0.000       .4533055    .8241349
    linc |   .0005002    .0143092      0.035   0.972      -.0285491    .0295495
    lfsb |   .1016367    .0277372      3.664   0.001       .0453271    .1579463
   lhsze |  -.0225823    .1005548     -0.225   0.824      -.2267194    .1815549
  nurban |  -.0818499     .077193     -1.060   0.296      -.2385601    .0748603
  nrural |   -.066512    .0784722     -0.848   0.402       -.225819    .0927951
mdurbloc |     .04639    .1216107      0.381   0.705      -.2004929    .2932728
 wintint |  -.4593057    .1369433     -3.354   0.002      -.7373154   -.1812961
 fallint |   -.029745    .0502729     -0.592   0.558      -.1318044    .0723143
 elderly |   .0056466    .0518576      0.109   0.914      -.0996299    .1109231
 child18 |   .2206702    .0943634      2.339   0.025       .0291024     .412238
afnothis |  -.1788691    .0764264     -2.340   0.025      -.3340228   -.0237153
whnothis |   .0740961    .0657839      1.126   0.268      -.0594523    .2076445
  ap1to4 |  -.0084952    .0503609     -0.169   0.867      -.1107333    .0937428
   ap5up |  -.0544709    .0819601     -0.665   0.511      -.2208587    .1119169
ltotshlt |   .0382658    .0208464      1.836   0.075      -.0040547    .0805862
lpctnotb |   -.041705    .0106613     -3.912   0.000      -.0633485   -.0200614
 elecben |    .059271    .0815849      0.726   0.472      -.1063551    .2248971
   _cons |    6.30387    .1903596     33.116   0.000        5.91742    6.690321
------------------------------------------------------------------------------

. log close;
```

APPENDIX I

RESPONSES ON INDIVIDUAL FOOD SECURITY ITEMS, BY PARTICIPATION STATUS

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=PARTICIPANTS

WORRIED FOOD WOULD RUN OUT, LAST 12 MTHS

E45	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	95159.59	0.5	95159.59	0.5
OFTEN TRUE	4503848	22.5	4599008	23.0
SOMETIMES TRUE	7976108	39.9	12575116	62.9
NEVER TRUE	7402021	37.1	19977137	100.0

FOOD RAN OUT, LAST 12 MTHS

E46	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	119039.7	0.6	119039.7	0.6
OFTEN TRUE	3140084	15.7	3259123	16.3
SOMETIMES TRUE	7502279	37.6	10761403	53.9
NEVER TRUE	9215735	46.1	19977137	100.0

NOT AFFORD TO EAT PROPERLY, LAST 12 MTHS

E47	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	138541.8	0.7	138541.8	0.7
OFTEN TRUE	2642825	13.2	2781366	13.9
SOMETIMES TRUE	6485799	32.5	9267165	46.4
NEVER TRUE	10709972	53.6	19977137	100.0

ONLY AFFORD A FEW KINDS OF FOOD

E51	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	7413271	37.1	7413271	37.1
OFTEN TRUE	1012472	5.1	8425743	42.2
SOMETIMES TRUE	3944466	19.7	12370209	61.9
NEVER TRUE	7606929	38.1	19977137	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=PARTICIPANTS

CUT SIZE/SKIPPED MEALS B/C NOT ENOUGH MO

E14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	48231.38	0.2	48231.38	0.2
NO	13705316	68.6	13753547	68.8
OFTEN TRUE	6223590	31.2	19977137	100.0

NOT AFFORD TO FEED CHLD BALANCED MEAL, L

E49	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	7382338	37.0	7382338	37.0
OFTEN TRUE	672576.3	3.4	8054914	40.3
SOMETIMES TRUE	3194180	16.0	11249094	56.3
NEVER TRUE	8728043	43.7	19977137	100.0

ATE LESS THAN YOU FELT YOU SHOULD, LACK

E22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	61817.81	0.3	61817.81	0.3
NO	13644572	68.3	13706390	68.6
OFTEN TRUE	6270747	31.4	19977137	100.0

HOW OFTEN CUT SIZE/SKIPPED MEALS, NOT EN

E15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	13771301	68.9	13771301	68.9
OFTEN TRUE	2123593	10.6	15894894	79.6
SOMETIMES TRUE	2475714	12.4	18370608	92.0
NEVER TRUE	1606529	8.0	19977137	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=PARTICIPANTS

NOT AFFORD ENOUGH FOOD FOR CHLD, LAST 12

E50	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	7394770	37.0	7394770	37.0
OFTEN TRUE	439709.8	2.2	7834480	39.2
SOMETIMES TRUE	2229668	11.2	10064148	50.4
NEVER TRUE	9912989	49.6	19977137	100.0

E25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DON T KNOW	86157.58	0.4	86157.58	0.4
REFUSED	28321.5	0.1	114479.1	0.6
NO	16578561	83.0	16693040	83.6
OFTEN TRUE	3284097	16.4	19977137	100.0

LOST WEIGHT B/C NOT ENOUGH FOOD, LAST 12

E28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	309831.7	1.6	309831.7	1.6
NO	17602464	88.1	17912296	89.7
OFTEN TRUE	2064841	10.3	19977137	100.0

E31	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DON T KNOW	35443.33	0.2	35443.33	0.2
MISSING	7322097	36.7	7357540	36.8
REFUSED	17764.13	0.1	7375304	36.9
NO	11624491	58.2	18999796	95.1
OFTEN TRUE	977341.6	4.9	19977137	100.0

NOT EAT FOR ENTIRE DAY DUE TO LACK OF MO

E18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	29114.65	0.1	29114.65	0.1
NO	18267986	91.4	18297101	91.6
OFTEN TRUE	1680036	8.4	19977137	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=PARTICIPANTS

E38	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DON T KNOW	37724.76	0.2	37724.76	0.2
MISSING	7322097	36.7	7359821	36.8
REFUSED	24024.4	0.1	7383846	37.0
NO	11678955	58.5	19062800	95.4
OFTEN TRUE	914336.9	4.6	19977137	100.0

HOW OFTEN NOT EAT WHOLE DAY DUE TO LACK

E19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	18307173	91.6	18307173	91.6
OFTEN TRUE	429859.8	2.2	18737032	93.8
SOMETIMES TRUE	712050.3	3.6	19449083	97.4
NEVER TRUE	528054.7	2.6	19977137	100.0

E34	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DON T KNOW	19882.03	0.1	19882.03	0.1
MISSING	7322097	36.7	7341979	36.8
REFUSED	17764.13	0.1	7359743	36.8
NO	12040900	60.3	19400643	97.1
OFTEN TRUE	576494.7	2.9	19977137	100.0

E35	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	19400643	97.1	19400643	97.1
OFTEN TRUE	140721.8	0.7	19541364	97.8
SOMETIMES TRUE	255385.9	1.3	19796750	99.1
NEVER TRUE	180387.1	0.9	19977137	100.0

E41	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DON T KNOW	19882.03	0.1	19882.03	0.1
MISSING	7322097	36.7	7341979	36.8
REFUSED	17764.13	0.1	7359743	36.8
NO	12478784	62.5	19838527	99.3
OFTEN TRUE	138610.6	0.7	19977137	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=ELIGIBLE, NONPARTICIPANTS

WORRIED FOOD WOULD RUN OUT, LAST 12 MTHS

E45	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	39466.2	0.5	39466.2	0.5
OFTEN TRUE	1047236	12.7	1086702	13.1
SOMETIMES TRUE	2539335	30.7	3626037	43.8
NEVER TRUE	4645299	56.2	8271336	100.0

FOOD RAN OUT, LAST 12 MTHS

E46	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	35384.93	0.4	35384.93	0.4
OFTEN TRUE	713962.1	8.6	749347	9.1
SOMETIMES TRUE	2204419	26.7	2953766	35.7
NEVER TRUE	5317570	64.3	8271336	100.0

NOT AFFORD TO EAT PROPERLY, LAST 12 MTHS

E47	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	56162.35	0.7	56162.35	0.7
OFTEN TRUE	852155.7	10.3	908318.1	11.0
SOMETIMES TRUE	1683997	20.4	2592315	31.3
NEVER TRUE	5679021	68.7	8271336	100.0

ONLY AFFORD A FEW KINDS OF FOOD

E51	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	4874836	58.9	4874836	58.9
OFTEN TRUE	219489.7	2.7	5094326	61.6
SOMETIMES TRUE	1120885	13.6	6215211	75.1
NEVER TRUE	2056125	24.9	8271336	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=ELIGIBLE, NONPARTICIPANTS

CUT SIZE/SKIPPED MEALS B/C NOT ENOUGH MO

E14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
NO	6311209	76.3	6311209	76.3
OFTEN TRUE	1960126	23.7	8271336	100.0

NOT AFFORD TO FEED CHLD BALANCED MEAL, L

E49	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	4874836	58.9	4874836	58.9
OFTEN TRUE	204172.5	2.5	5079008	61.4
SOMETIMES TRUE	682644.6	8.3	5761653	69.7
NEVER TRUE	2509683	30.3	8271336	100.0

ATE LESS THAN YOU FELT YOU SHOULD, LACK

E22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	18402.14	0.2	18402.14	0.2
NO	6236944	75.4	6255346	75.6
OFTEN TRUE	2015990	24.4	8271336	100.0

HOW OFTEN CUT SIZE/SKIPPED MEALS, NOT EN

E15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	6329612	76.5	6329612	76.5
OFTEN TRUE	711120.8	8.6	7040732	85.1
SOMETIMES TRUE	700064.3	8.5	7740797	93.6
NEVER TRUE	530539.3	6.4	8271336	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=ELIGIBLE, NONPARTICIPANTS

NOT AFFORD ENOUGH FOOD FOR CHLD, LAST 12

E50	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	4913306	59.4	4913306	59.4
OFTEN TRUE	130017.2	1.6	5043323	61.0
SOMETIMES TRUE	409341.3	4.9	5452664	65.9
NEVER TRUE	2818672	34.1	8271336	100.0

E25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DON T KNOW	17692.46	0.2	17692.46	0.2
NO	6972121	84.3	6989813	84.5
OFTEN TRUE	1281523	15.5	8271336	100.0

LOST WEIGHT B/C NOT ENOUGH FOOD, LAST 12

E28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	36094.6	0.4	36094.6	0.4
NO	7441501	90.0	7477595	90.4
OFTEN TRUE	793740.6	9.6	8271336	100.0

E31	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	4874836	58.9	4874836	58.9
NO	3023800	36.6	7898636	95.5
OFTEN TRUE	372699.9	4.5	8271336	100.0

NOT EAT FOR ENTIRE DAY DUE TO LACK OF MO

E18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
NO	7666888	92.7	7666888	92.7
OFTEN TRUE	604448.3	7.3	8271336	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=ELIGIBLE, NONPARTICIPANTS

E38	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	4874836	58.9	4874836	58.9
NO	3154717	38.1	8029553	97.1
OFTEN TRUE	241782.5	2.9	8271336	100.0

HOW OFTEN NOT EAT WHOLE DAY DUE TO LACK

E19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	7666888	92.7	7666888	92.7
OFTEN TRUE	199831.1	2.4	7866719	95.1
SOMETIMES TRUE	219953.1	2.7	8086672	97.8
NEVER TRUE	184664.2	2.2	8271336	100.0

E34	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	4874836	58.9	4874836	58.9
NO	3285554	39.7	8160390	98.7
OFTEN TRUE	110945.7	1.3	8271336	100.0

E35	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	8160390	98.7	8160390	98.7
OFTEN TRUE	53787.07	0.7	8214177	99.3
SOMETIMES TRUE	57158.67	0.7	8271336	100.0

E41	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	4874836	58.9	4874836	58.9
NO	3304953	40.0	8179789	98.9
OFTEN TRUE	91547.28	1.1	8271336	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=NEAR-ELIGIBLE, NONPARTICIPANTS

WORRIED FOOD WOULD RUN OUT, LAST 12 MTHS

E45	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	55602.94	0.7	55602.94	0.7
OFTEN TRUE	408985.2	5.4	464588.1	6.2
SOMETIMES TRUE	2011852	26.8	2476440	33.0
NEVER TRUE	5037122	67.0	7513562	100.0

FOOD RAN OUT, LAST 12 MTHS

E46	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	17692.46	0.2	17692.46	0.2
OFTEN TRUE	379170.4	5.0	396862.8	5.3
SOMETIMES TRUE	1330805	17.7	1727667	23.0
NEVER TRUE	5785895	77.0	7513562	100.0

NOT AFFORD TO EAT PROPERLY, LAST 12 MTHS

E47	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	57827.96	0.8	57827.96	0.8
OFTEN TRUE	429722.2	5.7	487550.2	6.5
SOMETIMES TRUE	1286465	17.1	1774015	23.6
NEVER TRUE	5739547	76.4	7513562	100.0

ONLY AFFORD A FEW KINDS OF FOOD

E51	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	3745320	49.8	3745320	49.8
OFTEN TRUE	199885.3	2.7	3945206	52.5
SOMETIMES TRUE	796292.6	10.6	4741498	63.1
NEVER TRUE	2772064	36.9	7513562	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=NEAR-ELIGIBLE, NONPARTICIPANTS

CUT SIZE/SKIPPED MEALS B/C NOT ENOUGH MO

E14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	17692.46	0.2	17692.46	0.2
NO	6103006	81.2	6120698	81.5
OFTEN TRUE	1392864	18.5	7513562	100.0

NOT AFFORD TO FEED CHLD BALANCED MEAL, L

E49	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	3727478	49.6	3727478	49.6
OFTEN TRUE	91451.28	1.2	3818929	50.8
SOMETIMES TRUE	629867.7	8.4	4448797	59.2
NEVER TRUE	3064766	40.8	7513562	100.0

ATE LESS THAN YOU FELT YOU SHOULD, LACK

E22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	56599.26	0.8	56599.26	0.8
NO	6084740	81.0	6141339	81.7
OFTEN TRUE	1372223	18.3	7513562	100.0

HOW OFTEN CUT SIZE/SKIPPED MEALS, NOT EN

E15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	6120698	81.5	6120698	81.5
OFTEN TRUE	405654	5.4	6526352	86.9
SOMETIMES TRUE	528409.2	7.0	7054761	93.9
NEVER TRUE	458800.9	6.1	7513562	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=NEAR-ELIGIBLE, NONPARTICIPANTS

NOT AFFORD ENOUGH FOOD FOR CHLD, LAST 12

E50	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	3727478	49.6	3727478	49.6
OFTEN TRUE	72489.73	1.0	3799967	50.6
SOMETIMES TRUE	408425.8	5.4	4208393	56.0
NEVER TRUE	3305169	44.0	7513562	100.0

E25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
REFUSED	17692.46	0.2	17692.46	0.2
NO	6808994	90.6	6826686	90.9
OFTEN TRUE	686876.1	9.1	7513562	100.0

LOST WEIGHT B/C NOT ENOUGH FOOD, LAST 12

E28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	17692.46	0.2	17692.46	0.2
NO	6973153	92.8	6990846	93.0
OFTEN TRUE	522716.6	7.0	7513562	100.0

E31	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	3727478	49.6	3727478	49.6
NO	3621338	48.2	7348816	97.8
OFTEN TRUE	164746.7	2.2	7513562	100.0

NOT EAT FOR ENTIRE DAY DUE TO LACK OF MO

E18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	17692.46	0.2	17692.46	0.2
NO	7201052	95.8	7218744	96.1
OFTEN TRUE	294818.1	3.9	7513562	100.0

FREQ OF THE 18 FOOD SECURITY QUESTIONS WEIGHTED WITH HHWT1

FRAME=NEAR-ELIGIBLE, NONPARTICIPANTS

E38	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DON T KNOW	20067.75	0.3	20067.75	0.3
MISSING	3727478	49.6	3747545	49.9
NO	3600561	47.9	7348106	97.8
OFTEN TRUE	165456.4	2.2	7513562	100.0

HOW OFTEN NOT EAT WHOLE DAY DUE TO LACK

E19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	7218744	96.1	7218744	96.1
OFTEN TRUE	111519	1.5	7330263	97.6
SOMETIMES TRUE	71780.06	1.0	7402043	98.5
NEVER TRUE	111519	1.5	7513562	100.0

E34	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	3727478	49.6	3727478	49.6
NO	3676941	48.9	7404418	98.5
OFTEN TRUE	109143.7	1.5	7513562	100.0

E35	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	7404418	98.5	7404418	98.5
OFTEN TRUE	36244.87	0.5	7440663	99.0
SOMETIMES TRUE	55206.41	0.7	7495870	99.8
NEVER TRUE	17692.46	0.2	7513562	100.0

E41	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MISSING	3727478	49.6	3727478	49.6
NO	3767683	50.1	7495160	99.8
OFTEN TRUE	18402.14	0.2	7513562	100.0

APPENDIX J

FOOD USE SHARES BY FOOD GROUP FOR FOOD STAMP HOUSEHOLDS, BY HUNGER CLASSIFICATION STATUS

To further assess possible reasons for the observed relationship between food security and nutrient availability, differences have been tabulated in the distribution of food among food groups between households that are measured on the food security scale as experiencing hunger and those that are not. The food group classification used is the same as that discussed in Section V.D. Two criteria for determining food groups shares have been used in this work. One is based on expenditures on food, the other on food energy provided by the food.

In general, the pattern of expenditures is similar for the two groups (Table J.1). Only one of the subgroup totals in the distribution, meat products and alternatives, differs more than a percentage point between households classified as experiencing hunger and those not classified.

Of the differences that exist at the detailed group level, one of the largest is in the use of grain products, where households experiencing hunger are substantially more likely to use foods in the "other bread" category, which includes white bread from refined flour. The difference between the groups is .9 percentage points when the criterion for assigning shares is expenditures and .8 percentage points when it is food energy. In addition, the group experiencing hunger is more likely to use milk products, poultry, and sugars or sweets. They are less likely to use red meats and soft drinks.

TABLE J.1

SHARE OF VARIOUS TYPES OF FOODS IN HOUSEHOLD FOOD USE
BY FOOD SECURITY STATUS

	Share Based on Value of Food Used			Share Based on Food Energy		
Food Group	Households with Hunger	No Hunger	Difference	Households with Hunger	No Hunger	Difference
Vegetables, Fruit						
Potatoes	2.3	2.5	−0.2	3.1	3.2	−0.1
High-Nutrient Vegetables	3.9	3.8	0.1	0.9	0.9	0.0
Other Vegetables	4.9	4.8	0.1	1.7	1.7	0.0
Mixtures, Mostly Vegetables; Condiments	0.7	0.6	0.1	0.3	0.3	0.0
Vitamin C-Rich Fruit	4.0	4.0	0.0	2.5	2.3	0.2
Other Fruit	4.2	3.8	0.4	2.3	2.1	0.2
Subgroup Total	20.0	19.5	0.5	10.8	10.5	0.3
Grain Products						
Whole-Grain/High-Fiber Breakfast Cereals	1.7	1.7	0.0	1.7	1.6	0.1
Other Breakfast Cereals	3.1	3.4	-0.3	2.9	3.4	-0.5
Whole-Grain/High-Fiber Flour, Meal, Rice, Pasta	0.4	0.4	0.0	0.6	0.7	-0.1
Other Flour, Meal, Rice, Pasta	2.4	2.2	0.2	6.8	7.1	-0.3
Whole-Grain/High-Fiber Bread	0.8	0.9	-0.1	1.0	1.3	-0.3
Other Bread	4.6	3.7	0.9	7.0	6.2	0.8
Bakery Products, Not Bread	4.3	3.8	0.5	5.0	4.8	0.2
Grain Mixtures	3.1	3.6	-0.5	2.7	2.7	0.0
Subgroup Total	20.4	19.7	0.7	27.7	27.8	-0.1
Milk, Cheese, Cream						
Milk, Yogurt	8.3	7.6	0.7	7.8	7.1	0.7
Cheese	2.9	3.0	-0.1	2.5	2.4	0.1
Cream; Mixtures, Mostly Milk	2.0	1.8	0.2	2.1	1.9	0.2
Subgroup Total	13.2	12.4	0.8	12.4	11.4	1.0

TABLE J.1 *(continued)*

Food Group	Share Based on Value of Food Used			Share Based on Food Energy		
	Households with Hunger	No Hunger	Difference	Households with Hunger	No Hunger	Difference
Meat and Alternatives						
Lower-Cost Red Meats, Variety Meats	7.1	7.9	-0.8	7.5	8.1	-0.6
Higher-Cost Red Meats, Variety Meats	5.9	7.0	-1.1	3.6	4.4	-0.8
Poultry	5.6	5.2	0.4	4.3	4.3	0.0
Fish, Shellfish	3.1	3.0	0.1	0.9	0.9	0.0
Bacon, Sausage, Luncheon Meats	5.8	5.8	0.0	6.9	7.1	-0.2
Eggs	1.3	1.3	0.0	1.4	1.6	-0.2
Dry Beans, Peas, Lentils	0.9	0.9	0.0	1.3	1.5	-0.2
Mixtures, Mostly Meat, Poultry, Fish, Eggs, Legumes	2.8	3.4	-0.6	1.2	1.4	-0.2
Nuts, Peanut Butter	0.8	0.8	0.0	1.6	1.2	0.4
Subgroup Total	33.3	35.3	-2.0	28.7	30.5	-1.8
Other Foods						
Fats, Oils	2.3	2.5	-0.2	9.3	9.2	0.1
Sugar, Sweets	3.4	2.6	0.8	7.0	5.8	1.2
Seasonings	0.2	0.1	0.1	0.1	0.1	0.0
Soft Drinks, Punches, Ades	5.1	5.7	-0.6	3.7	4.4	-0.7
Coffee, Tea	2.0	1.9	0.1	0.5	0.3	0.2
Alcohol	0.2	0.6	-0.4	0.1	0.2	-0.1
Subgroup Total	13.2	13.4	-0.2	20.7	20.0	0.7
Sample Size	**216**	**703**	**216**	**703**		

SOURCE: 1996 National Food Stamp Program Survey, unweighted tabulations.

[a]Less than 0.05.

[b]Criteria for assigning share to food groups.

TABLE J.1

SHARE OF VARIOUS TYPES OF FOODS IN HOUSEHOLD FOOD USE
BY FOOD SECURITY STATUS

	Share Based on Value of Food Used			Share Based on Food Energy		
Food Group[a]	Households with Hunger	No Hunger	Difference	Households with Hunger	No Hunger	Difference
Vegetables, Fruit						
Potatoes	2.3	2.5	−0.2	3.1	3.2	−0.1
High-Nutrient Vegetables	3.9	3.8	0.1	0.9	0.9	0.0
Other Vegetables	4.9	4.8	0.1	1.7	1.7	0.0
Mixtures, Mostly Vegetables; Condiments	0.7	0.6	0.1	0.3	0.3	0.0
Vitamin C-Rich Fruit	4.0	4.0	0.0	2.5	2.3	0.2
Other Fruit	4.2	3.8	0.4	2.3	2.1	0.2
Subgroup Total	20.0	19.5	0.5	10.8	10.5	0.3
Grain Products						
Whole-Grain/High-Fiber Breakfast Cereals	1.7	1.7	0.0	1.7	1.6	0.1
Other Breakfast Cereals	3.1	3.4	-0.3	2.9	3.4	-0.5
Whole-Grain/High-Fiber Flour, Meal, Rice, Pasta	0.4	0.4	0.0	0.6	0.7	-0.1
Other Flour, Meal, Rice, Pasta	2.4	2.2	0.2	6.8	7.1	-0.3
Whole-Grain/High-Fiber Bread	0.8	0.9	-0.1	1.0	1.3	-0.3
Other Bread	4.6	3.7	0.9	7.0	6.2	0.8
Bakery Products, Not Bread	4.3	3.8	0.5	5.0	4.8	0.2
Grain Mixtures	3.1	3.6	-0.5	2.7	2.7	0.0
Subgroup Total	20.4	19.7	0.7	27.7	27.8	-0.1
Milk, Cheese, Cream						
Milk, Yogurt	8.3	7.6	0.7	7.8	7.1	0.7
Cheese	2.9	3.0	-0.1	2.5	2.4	0.1
Cream; Mixtures, Mostly Milk	2.0	1.8	0.2	2.1	1.9	0.2
Subgroup Total	13.2	12.4	0.8	12.4	11.4	1.0

TABLE J.1 *(continued)*

Food Group[a]	Share Based on Value of Food Used			Share Based on Food Energy		
	Households with Hunger	No Hunger	Difference	Households with Hunger	No Hunger	Difference
Meat and Alternatives						
Lower-Cost Red Meats, Variety Meats	7.1	7.9	-0.8	7.5	8.1	-0.6
Higher-Cost Red Meats, Variety Meats	5.9	7.0	-1.1	3.6	4.4	-0.8
Poultry	5.6	5.2	0.4	4.3	4.3	0.0
Fish, Shellfish	3.1	3.0	0.1	0.9	0.9	0.0
Bacon, Sausage, Luncheon Meats	5.8	5.8	0.0	6.9	7.1	-0.2
Eggs	1.3	1.3	0.0	1.4	1.6	-0.2
Dry Beans, Peas, Lentils	0.9	0.9	0.0	1.3	1.5	-0.2
Mixtures, Mostly Meat, Poultry, Fish, Eggs, Legumes	2.8	3.4	-0.6	1.2	1.4	-0.2
Nuts, Peanut Butter	0.8	0.8	0.0	1.6	1.2	0.4
Subgroup Total	33.3	35.3	-2.0	28.7	30.5	-1.8
Other Foods						
Fats, Oils	2.3	2.5	-0.2	9.3	9.2	0.1
Sugar, Sweets	3.4	2.6	0.8	7.0	5.8	1.2
Seasonings	0.2	0.1	0.1	0.1	0.1	0.0
Soft Drinks, Punches, Ades	5.1	5.7	-0.6	3.7	4.4	-0.7
Coffee, Tea	2.0	1.9	0.1	0.5	0.3	0.2
Alcohol	0.2	0.6	-0.4	0.1	0.2	-0.1
Subgroup Total	13.2	13.4	-0.2	20.7	20.0	0.7
Sample Size	**216**	**703**	**216**	**703**		

SOURCE: 1996 National Food Stamp Program Survey, unweighted tabulations.

[a]Criteria for assigning share to food groups, are based on the coding structure used by the USDA, Human Nutrition Information Service for analyzing data from the 1977-78 Nationwide Food Consumption Survey.

APPENDIX K

ANALYSIS OF THE ROBUSTNESS OF THE FINDINGS IN CHAPTER VI

Because the finding in Chapter VI that food insecure households have higher levels of nutrient availability is unexpected, extensive analysis of factors that could help account for the result has been conducted. None of these lines of analysis has provided an explanation, and none of them is described in detail here. However, to provide readers with an overview of the range of factors that have been explored, the main types of analysis that were undertaken in this work are listed here.

The findings reported in Chapter VI, that there is a positive association between measured food insecurity and nutrient availability and that in some analysis specifications this relationship is statistically significant, have proven robust when examined through the following research activities:

- The analysis was repeated using the 30-day rather than the 12-month food security scale. While the 30-day scale is not viewed as statistically as strong as the 12-month scale (see Hamilton et al. (1997), it was thought that the 30-day scale might be more closely associated with food use over the seven-day period of food data collection.

- Outliers on the nutrient availability variables were hand-checked against the hard-copy interview information to see if any explanations for the findings would be apparent.[1] In addition, to examine sensitivity to outliers, the regression equations were rerun, omitting the 23 lowest and 23 highest observations in terms of nutrient availability.

- The dependent variables in the regressions, which are defined in terms of nutrient availability, were replaced first with a set of dichotomous variables indicating whether the household met 100 percent of the RDAs and then again with the comparable variable for meeting 75 percent of the RDAs.

- The coding of the food security variable was spot-checked manually against printouts of the 18 constituent items.

- The analysis was performed with both weighted and unweighted data.

- To limit sensitivity of the analysis to households that consumed very little from home food supplies, the analysis was limited to households that consumed at least 10 meals from home food supplies during the observation week.

[1]These checks were in addition to the routine editing of all observations, described in Chapter II and Appendix A.

- The analysis was done separately for households that had children and those without children, so that any interaction caused by the fact that the food security index has to be calculated using fewer data items for households without children could be discovered.

- To verify that the complex ENU calculations were being done correctly, for a sample of cases from the CAPI interviewing data the raw information on ages and genders of household members and on meals eaten for each household member was printed out.

- The distribution of food by food group was examined separately for households classified as experiencing hunger and those not so classified.

- The calculations were performed using "food sufficiency" rather than "food security" as a variable. Food sufficiency is a simpler measure that Hamilton et al. (1997) found correlates with food security. This was done in part to examine whether the findings could be stemming from some error in the food security calculations. However, the same type of unexpected findings were found for the food sufficiency variable as for the food security measure.

- Various changes in the functional form of the regression were tried, such as (1) using interaction terms, and (2) using a set of three dichotomous variables to fully characterize the four-level food security measure.

- Parts of the analysis were limited to households with no missing data in the variable set needed to compute food security.

- Different ways of scaling the nutrient availability variable were tried. Besides ENU, adult male equivalents, household size, and no scale factor were used.

The basic patterns in the data, which are evident in Table VI.1 and in the regression analysis of Table VI.2, have proven to be very robust to all the above variants of the analytic methods used.