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# The Effects of Food Stamps on Food Consumption: A Review of **the** Literature

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# The Effects of Food Stamps on Food Consumption: A Review of the Literature

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# I. INTRODUCTION

Studies on the determinants of household food expenditures have a long history, dating to the time of the Prussian statistician Ernst Engel (1857). Engel used several 19th-century data sets to analyze the relationship between food expenditures and income, and used his analytical findings to formulate Engel's Law: the proportion of income spent on food falls as income rises. This law has been confirmed in study after study over the past 130 years.

Research on the effects of food stamps on food consumption has a much shorter history, in that food stamps did not come into existence in the United States until the 1930s.[1] Herman Southworth's pioneering theoretical analysis of the effects of food stamps on household food expenditures was published in 1945, but the first empirical studies on this topic were not conducted until the early 1970s. Interest in the effectiveness of food stamps at increasing food expenditures and the quality of diets was generated at that time by growing concern about the existence of hunger in the United States and by the rapid growth of the Food Stamp Program (FSP). The program's growth during the early-to-mid 1970s can be traced to the adoption of two sets of amendments to the Food Stamp Act of 1964: the amendments of 1970, which mandated nationally uniform food stamp eligibility standards and allotment schedules, and the amendments of 1973, which required that all U.S. counties begin operating the FSP by mid-1974. During this same period, two nationally representative household survey data sets that provide information on household income, food stamp benefits, and food expenditures became available to

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'During the Great Depression of the 1930s, food stamps were provided to needy households not only in an attempt to alleviate hunger but also to reduce surplus agricultural commodities that had been accumulated by the federal government. This early Food Stamp Program was terminated in 1943, after the country's war effort eliminated agricultural surpluses. After a lapse of nearly twenty years, food stamps were reintroduced as a pilot program during the Kennedy Administration. By the late 1970s, the program had evolved into what is essentially the current Food Stamp Program.

researchers: the first five years (1968-72) of the University of Michigan's Panel Study of Income Dynamics and the Bureau of Labor Statistics' 1973-74 Consumer Expenditure Diary Survey. The combination of a pressing public policy problem (hunger among low-income households), a rapidly growing program designed to alleviate that problem, and the availability of data sets capable of supporting research on the problem and the programmatic response precipitated a number of empirical studies of the FSP in the mid-1970s.

The release of data from the low-income supplement to the USDA's 1977-78 Nationwide Food Consumption Survey, and from a special follow-up survey in 1979-80, was followed by a steady flow of empirical research throughout the 1980s on the effects of food stamps on food consumption (including measures of the nutritional quality of food used by households and eaten by individuals, as well as measures of the money value of food used). This research was stimulated by the fact that the FSP was (and continues to be) one of the country's largest social welfare programs, providing benefits to approximately 20 million persons per month over most of the decade. The on-going policy debate about the merits of coupons versus cash food assistance provides additional stimulus for continued research on the effectiveness of food stamps at increasing food consumption and the quality of diets. As this debate continues, the imminent release of data from the 1987-88 Nationwide Food Consumption Survey is likely to generate renewed interest in research on the food consumption effects of food stamps in the 1990s.

## A. OBJECTIVE AND SUMMARY OF THIS REPORT

The many studies of the effects of food stamps on food consumption that have been conducted during the past two decades have been based on underlying data sets, analytic techniques, and food consumption outcome measures that vary widely. Such variation, as well as the sheer volume of the research results, makes it difficult for the potential user of this research to grasp either the consensus findings or the range of findings on the effects of food

stamps on food consumption. The objective of this report is to rectify this situation by systematically summarizing in one document the findings from 17 studies of the effects of food stamps on the money value of food used by households, 8 studies of the effects of the FSP on the availability of nutrients in the household from the home food supply, and 8 studies of the effects of the FSP on the intake of nutrients by individuals.

On the basis of this review, we can report that the provision of an additional dollar's worth of food stamps (i.e., food coupons) to a recipient household is estimated to stimulate the consumption of additional food from the home food supply with a money value of roughly 20 to 45 cents. This effect may be compared with estimates of the food-consumption response to a dollar of cash income that range from 5 to 10 cents. Whether the effect of cash food assistance on food consumption would be more similar to the effect of coupons or the effect of ordinary cash income is a major question that is unanswered by this literature.

This review also notes that the existing estimates of the effects of food stamps on the quantity of nutrients that are available to recipient households from their home food supplies are consistently large and positive. The estimates of the effects on nutrient availability are roughly two to seven times greater for a dollar's worth of food coupons than for a dollar of cash income.

The research findings on the effects of food stamps on the intake of nutrients by individuals are far less definitive than the findings on nutrient availability and the money value of food used by households. Across studies and nutrients, only a small proportion of estimates of the effects of food stamps on nutrient intake differ from zero at conventional levels of statistical significance. The estimated effects are both positive and negative in sign, but, as noted, few of those estimates are statistically significant. Moreover, estimates of the effects of cash income on nutrient intake also tend to be statistically insignificant and inconsistent in sign. Thus, this body of literature provides little support for the hypothesis that food coupons and cash income have positive effects on the intake of nutrients.

## B. THE STRUCTURE OF THIS REPORT

This report consists of four substantive chapters. The first two present background material that provides a context for interpreting the findings from the studies on food consumption that are reviewed in the final two chapters. Chapter II identifies the data sets that have served as the basis for most studies of the effects of food stamps on food consumption. It describes the various measures of food consumption that have been constructed with those data, as well as the limitations of the data for studies of the FSP. Chapter III provides a comparative overview of the food and nonfood expenditure patterns and quality of the diets of households and individuals that receive food stamps and of those that do not, based on published descriptive studies.

Chapter IV summarizes and critiques 17 empirical studies of the effects of food stamps on the money value of food used at home. Central to the chapter is a table that presents estimates from each of the reviewed studies of the effects of an additional dollar of food stamps and of ordinary cash income on food expenditures.

The literature on the effects of food stamps on the availability of nutrients in the household and on the intake of nutrients by individuals is based on more heterogeneous statistical models than is the expenditure literature, and is thus more difficult to summarize succinctly. Chapter V classifies eight existing models of nutrient availability and eight models of nutrient intake into several different categories, describes the qualitative estimates of food stamp and cash income effects generated by the models, and summarizes the quantitative estimates from three studies of nutrient availability and four studies of nutrient intake.

# II. MEASUREMENT ISSUES IN ESTIMATING THE EFFECTS OF FOOD STAMPS ON FOOD CONSUMPTION

The theoretical basis for much of the research on the effects of food coupons and cash benefits on household food consumption is provided by Southworth (1945).[2] Using the basic tools of microeconomic theory that were originally expounded by Hicks (1939), Southworth derived a model which predicts the effects of marginal changes in the value of food stamps, cash food assistance, and ordinary cash income on household food consumption. In analyzing the effectiveness of the Food Stamp Program at achieving its food expenditure and nutritional objectives, researchers often test hypotheses generated by Southworth's theoretical model by using data from household surveys whose methodology and purpose vary widely. The surveys range from geographically limited data collection efforts designed for specific program evaluations, to nationally representative surveys of household food use and individual food intake, to general-purpose, nationally representative surveys that gather a wide range of information from respondent households, including their usual expenditures on food. This chapter describes the major household surveys that provide food consumption data, examines the measures of food consumption that are used, and assesses their appropriateness for analyzing the effects of food stamps. It also examines the implications of the survey designs for the reliability of statistical estimates of the effects of food stamps on food consumption. Finally, the chapter assesses the capacity of the data from these surveys to support modeling food stamp eligibility and participation by low-income households. That capacity can influence the size and even the sign of estimates of the effects of food stamps on household food consumption.

[2] See Appendix A for an analysis of Southworth's theory, including an explanation of Southworth's methodology, a discussion of the hypotheses generated by his theory, and an examination of empirical research findings on household food consumption behavior which, in general, fail to support those hypotheses.

## A. MEASURING FOOD CONSUMPTION

The different measures of food consumption that are used in household surveys and in analyses of data from those surveys can be bewildering. This section defines the most commonly used measures, explains how they are related to each other, and indicates the research applications for which each measure is most appropriate. It also identifies the primary household surveys that provide data on those measures and form the basis for most analyses of the effects of the FSP on food consumption. The section concludes with a discussion of selected issues associated with measuring and analyzing survey data on food consumption.

### 1. Measures of Food Consumption

Measures of food consumption fall into three categories: measures of expenditures on food by the household, measures of food used by the household from its home food supply, and measures of food actually eaten by members of the household. We examine each of these categories in turn.

Food Expenditures. The most straightforward approach for measuring household food consumption is to ask households to recall or to keep a record of their purchases of food over a given period of time. For example, respondents to the 1985-86 Continuing Survey of Food Intakes by Individuals (CSFII) and the 1987-88 Nationwide Food Consumption Survey (NFCS) were asked to recall the average expenditure of cash and food coupons on food per week or per month by their households over the previous several months, both for foods purchased for home use and for meals and snacks eaten away from home. Respondents to the University of Michigan's continuing Panel Survey of Income Dynamics (PSID) are asked to recall their cash expenditures for both at-home and away-from-home food over the previous month. Respondents to the on-going diary component of the Consumer Expenditure Survey (CEX) are provided with structured ledgers in which they record on a daily basis their household food purchases and away-

from-home meals over a two-week period. With all of these methodologies, respondents must distinguish between food purchased in supermarkets, specialty or convenience stores, carry-outs, and the like for home use, and purchases of meals and snacks that are eaten away from home.

A measure of household food expenditures has several deficiencies when used in analyses of the effects of food stamps on food consumption:

1. For some households, a high level of spending on food represents the purchase of more expensive foods rather than foods capable of providing more ample or better diets. Overall, however, the dollar value of food purchased is a good proxy for the physical quantity or nutritional quality of foods purchased.

2. An expenditure measure of food consumption omits home-produced foods and foods received as gifts, charity, or payment-in-kind and, thus, may understate actual food consumption.

3. An expenditure measure of food consumption may, by including food that is provided to boarders or guests, fed to pets, or lost through spoilage or other waste, overstate the actual physical consumption of food by household members.

4. The expenditure recall methodology (as opposed to the diary methodology) is vulnerable to the omission of purchases made with food stamp benefits. Despite instructions to include such purchases, food stamp recipients tend to include only cash purchases in their reported average expenditure on food. The PSID addresses this problem by asking food stamp recipient respondents to report the amount of their cash food expenditures, over and above food-stamp purchases. Because the diary methodology requires that the respondent record the quantity and cost of each food item purchased, it is less vulnerable than the recall methodology to the omission of foods purchased with food stamps.

5. The diary methodology is sensitive to monthly cycles in household food shopping.[3] A large proportion of food stamp recipients conducts its major food shopping on a monthly basis. For some such households that are participating in a diary survey of food consumption, the major food shopping occurs within the reporting period; for others it does not. While such variation has no effect on the sample mean of the diary measure of food purchases, it increases the standard error of the mean,

[3]The monthly food shopping patterns of low-income households are described in Chapter III, below.

thus making it more difficult to obtain statistically significant estimates of the effects of food stamps on food purchases.

A fundamental strategic question in measuring and analyzing household food consumption is whether the two separate measures of food expenditures for home use and for meals and snacks away from home should be combined into one measure of total food expenditure, or whether the two components should be analyzed separately. An argument for treating them separately is that the cost of restaurant meals includes the value added for preparation and serving, as well as the cost of food ingredients, and is thus not strictly comparable with the cost of foods purchased for home use. However, with the proliferation of "fast-food" restaurants which sell foods that may be eaten away from home or brought into the home, and of the many highly pre-processed and "ready-to-eat" foods now available in food markets, this distinction has become less meaningful.

Most measures of the nutrient content of foods consumed have been computed from survey data on household food use and individual food intakes, as described below. However, diary data on the quantities and types of foods purchased by households can also be converted into measures of the nutrients provided by those foods. One of the studies of nutrient availability (Scearce and Jensen, 1979), which is reviewed in Chapter VI, is based on diary data on household food purchases.

Food Use. A methodology for collecting data on food consumption that provides a comprehensive and detailed measure of a household's home food use is employed by the Nationwide Food Consumption Survey. This methodology generates data on all foods used at home by the household, whether purchased, home-produced, or received as a gift or payment-in-kind. The NFCS household food consumption data are thus more inclusive than expenditure measures of home food consumption. Under the NFCS methodology, the survey respondent keeps informal records of all foods used by the household from the home food supply--both foods

eaten at home and those carried from home (e.g., bag lunches)--over a one-week period. The source of the food is noted, as are the quantities used of each item and the costs of all purchased items.

Both dollar scales and nutrient scales can be used to measure a household's use of food from its home food supply. Thus, these data will support both economic analyses of food consumption behavior that focus on the dollar value of foods used from the home supply, and dietary analyses that focus on the nutrient content of the foods used. The money value of food used by a household is computed by multiplying the unit cost of each type of food by the number of units used by the household and summing over all of the different types of food.[4] The availability of nutrients in the food used by a household is computed on a nutrient-by-nutrient basis by multiplying the amount of a nutrient per pound of each type of food by the number of pounds used by the household and summing over all of the different types of food? Most analyses of the effects of food stamps on food consumption have relied on one or the other of these two measures of food used at home. In interpreting the findings from those studies (as reported in Chapters IV and V), readers should note that "money value" and "nutrient availability" are alternative measures of the same food consumption behavior--a household's use of food from its home food supply.

Analysts often use measures of per-capita nutrient availability that have been adjusted to compensate for meals eaten away from home by household members to assess the nutritional

[4]For a food item that was used but not purchased by a household, the price used to compute its money value is the average price paid for the same item by the households of the other respondents to the survey.

[5]One of several university or USDA nutrient databases can be used to convert data on food quantities to data on nutrient availability. These databases provide information on the nutrient content of roughly 4,000 foods and food combinations in the form in which they enter the household, with adjustments for cooking losses and inedible components of foods. Most of the nutrient values are supported by laboratory analyses, but some are imputed on the basis of data for similar foods. Hepburn (1982) provides a description of the USDA's nutrient data base.

adequacy of the food used from the household food supply. They compute the measures of nutrient availability by adjusting the measure of household size downward by an amount that depends on the number of meals eaten away from home, as described in Appendix B. The smaller adjusted measure of size reflects the fact that the household members may not be fully dependent on the home food supply.

Because survey measures of household food use are based on an item-by-item accounting, rather than on an aggregate recall, they are believed to be relatively accurate. Unlike the diary measures of food purchases, which are also based on an item-by-item accounting, measures of food use are subject to relatively little variation from week to week within a month, because households exhiiit greater stability in their food use than in their food purchases.

In addition to measuring home food use, the NFCS uses the recall method to measure usual purchases of food at home and food away from home. According to data from the 1977-78 NFCS core sample, the mean of the money value of food used at home is 9 percent larger than the mean expenditure on food used at home. This difference is to be expected, given that the measure of food use is more comprehensive than the measure of food purchases.

Food Intake. Food intake data are collected at the individual level, in contrast to food use data, which are collected at the household level. Two different survey methodologies are used to measure the food intakes of individuals: a 24-hour recall of all foods eaten and a daily diary of foods eaten. Under either methodology, respondents report the types and quantities of foods that they actually ate during the survey's reference period. The NFCS combines these methodologies, using the recall method to obtain intake data for the first of three consecutive days and the diary method to obtain data for the other two days.

In principle, because individual intake data usually include an indication of where each eating occasion occurred, respondents' at-home and away-from-home food consumption can be distinguished. However, most dietary assessments based on intake data pertain to the total intakes of individuals. The individual intake data are limited for undertaking economic analyses

of food consumption, since the costs of foods are not captured in these measures. However, the intake data lend themselves well to dietary assessments, using separate nutrient-based scales for measuring the nutrient content of food intakes. For example, an individual's intake of calcium can be computed by using a nutrient database to determine the amount of calcium that is provided by each food item eaten by the individual and then summing over all of the reported food items.[6] It is also possible to measure nutrient intake at the household level by summing the computed intakes of all members of the household.

The sum of nutrient intake over all members of a household (i.e., household nutrient intake) differs from a measure of household nutrient availability in two ways. First, nutrient availability is computed only on the basis of food used from the home food supply, whereas nutrient intake can be computed on the basis of both food at home and food away from home. Second, even when nutrient intake is computed on the basis of food obtained from the home food supply, the combined nutrient intake of household members will in principle be smaller than the household's nutrient availability because some food that is used by a household is not eaten by household members; it is served to guests or boarders, lost, wasted, or fed to pets. In addition, the 1977-78 NFCS data for household-level nutrient availability and the combined nutrient intakes of household members from home supplies indicate that the individual data tend to understate food consumption relative to the household-level data, even after all known differences are accounted for (Batcher, 1983). Such understatement suggests that some degree of systematic error also may be present in one or both types of the NFCS food consumption data.

By placing restrictions on the use of food coupons, the FSP is designed to stimulate primarily purchases of food for use at home rather than food away from home. Purchased food

[6]The key distinction between nutrient databases that are used to evaluate individual food intake and those that are used to evaluate household food use is that the former provide nutrient information on foods in the forms in which they are eaten rather than in the forms in which they enter the household.

is by far the largest component of all food used at home; thus, measures of nutrient availability based on food used from the home food supply are well-focused measures for assessing the effectiveness of the FSP at achieving its dietary objectives. On the other hand, because measures of total nutrient intake are based on food eaten away from home as well as at home, they may not be as effective at addressing the behavior on which the FSP is designed to have a direct influence.' It may be that measures of nutrient availability from the home food supply thus provide more sensitive indicators of the potential dietary effects of the FSP than do measures of total nutrient intake by individuals.

2. Existing Survey Data on Food Consumption

Three household surveys have provided the data for most empirical studies of food consumption: the Nationwide Food Consumption Survey provides data on food use and food expenditures by households, as well as data on food intake by individuals; the Consumer Expenditure Survey and the Panel Study of Income Dynamics provide data only on household food expenditures. This section provides an overview of these three surveys and identifies the methodologies that they use to measure food consumption.

The NFCS. The Nationwide Food Consumption Survey is the most widely used source of data for analyzing the effects of food stamps on food consumption. The USDA has conducted seven national surveys of household food consumption since the 1930s, the most recent of which was the 1987-88 NFCS. All of those surveys collected data on food consumption by the household as a unit, and, in addition, the three latest surveys (196566, 1977-78, and 1987-88) collected data on food intake by individual members of the household.

'On the basis of 1977-78 NFCS data, HNIS (July 1982) reports that food away from home accounts for 13 percent of the total expenditure on food by low-income households. This relatively small percentage suggests that food away from home is unlikely to dramatically dampen the effect of the FSP on total nutrient intake relative to its effect on the intake of nutrients from foods used from the home food supply.

To facilitate analyses of USDA food assistance programs, the two most recent editions of the NFCS have included special supplemental surveys of low-income households. These supplements were much like the core surveys, except that the samples were restricted to households that satisfied approximations to the income-eligibility screens for the FSP.[8] Two nationally representative supplemental surveys of low-income households were conducted in conjunction with the 1977-78 NFCS--4,400 low-income households were interviewed in 1977-78, prior to the elimination of the food stamp purchase requirement (EPR), and 2,900 low-income households were interviewed in 1979-80, just subsequent to the EPR.[9] More existing estimates of food stamp effects on food consumption are based upon the 1977-78 low-income supplement than any other data source. The sample of completed interviews for the low-income supplement to the 1987-88 NFCS will contain approximately 2,400 households. Public-use files containing data for that sample are scheduled to be released in 1991.

The NFCS uses the recall methodology to measure a household's usual purchases of food at home and food away from home. In addition, the survey obtains data from each participating household on all foods used from the home food supply over a one-week period. Finally, the NFCS obtains three consecutive days of food-intake data for each member of a participating household. To avoid seasonal biases, the NFCS distributes interviews with sample households evenly over a one-year period.

Over the past two decades, the trend in NFCS sample response rates has been strongly downward. The response rate for the household component of the 1965-66 survey was 85

[8]Households that participated in the two low-income supplemental surveys that were conducted in conjunction with the 1977-78 NFCS satisfied an approximation to the FSP eligibility screen on liquid asset holdings in addition to an approximation to the FSP income screens. The low-income sample for the 1987-88 NFCS was not subjected to an asset screen.

[9]These two supplemental surveys are formally referred to as the "Low-Income Supplement to the 1977-78 NFCS" and the "USDA Survey of Food Consumption in Low-Income Households, 1979-80."

percent, the response rate for the 1977-78 low-income supplement was 69 percent, and a preliminary estimate of the response rate for the 198788 low-income supplement is 50 to 55 percent. The sharp drop in the NFCS response rate appears to be associated with changes in family structures and family meal preparation and eating patterns, and with increases in labor-market activity by women. These fundamental social and economic changes have reduced the likelihood that, for a given sample household, a survey worker will be able to locate and complete an interview with an adult who is knowledgeable about the food consumption of the entire household. If nonresponse is not a random occurrence, but is associated instead with household characteristics, then a low response rate introduces the possibility that the component of the sample for which interviews were completed successfully is not representative of the survey's target population.

The CEX Between 1888 and 1973, the Bureau of Labor Statistics conducted eight surveys of expenditures by U.S. households. In 1979, BLS began to collect household expenditure data on an on-going basis via the continuing Consumer Expenditure Survey. That survey consists of two separate components--an Interview Survey, which collects data on major purchases and on smaller periodic expenses (such as utility bills) over a three-month reference period, and a Diary Survey, which collects data on small, frequently purchased items (such as food) over a two-week reference period. Sample units for the Interview Survey are interviewed quarterly for five successive quarters, generating approximately 4,800 completed interviews per quarter. The sample for the Diary Survey is drawn annually, and interviews with sample units are distributed over all weeks of the year. Each sample unit is interviewed only once, and the completed annual sample size is approximately 4,800.

Respondents to the CEX Interview Survey are asked to recall their usual expenditures on food at home and on food away from home during the preceding three months, whereas respondents to the CEX Diary Survey keep daily logs of their food purchases for two consecutive

weeks. As noted previously, the recall methodology is subject to the omission of food purchases made with food stamps. Because the diary methodology is perceived to measure food purchases more accurately, most CEX-based studies of the effects of food stamps on food consumption have used data from the Diary Survey.

The PSID. The Panel Study of Income Dynamics is an on-going longitudinal survey of approximately 5,000 U.S. households from all income strata. It is conducted annually by the Institute for Social Research at the University of Michigan under contract to DHHS. Historically, approximately 10 percent of the sample of households have reported receiving food stamps in the month preceding the interview. The PSID is not as popular a source of data for research on food consumption as the NFCS or the CEX; however, two of the earliest analyses of the effects of food stamps on food expenditures are based on data from the PSID (Berms, Kmenta, and Shapiro, 1976; and Hymans and Shapiro, 1976), as is one of the most recent of such studies (Senauer and Young, 1986).

The PSID uses the recall methodology for measuring household expenditures on food at home and food away from home. Nonrecipients of food stamps are asked to recall their average weekly or monthly expenditures on food over the preceding year. Survey respondents who received food stamps in the previous month are asked to recall their average weekly or monthly purchases of food away from home, as well as their cash purchases of food at home. The survey assumes that food stamp recipients spend the full amount of their monthly benefits on food at home. Thus, the PSID's measure of total expenditures on food at home is obtained by adding to the food stamp benefit amount the reported amount of cash purchases of food at home. This methodology eliminates the possibility that purchases made with food stamps could be omitted from the measure of expenditures on food at home; however, it overstates actual food expenditure to the extent that food stamps are lost or hoarded by recipient households or are traded for cash or nonfood items. As explained by Senauer and Young (1986), establishing a

floor on measured expenditures on food at home at the amount of the food stamp benefit presents some statistical problems for analyses of food expenditures; however, analytic techniques exist for dealing with those problems.

### 3. Issues Associated with Measuring and Analyzing Food Consumption

This section examines several issues associated with measuring food consumption and analyzing survey data on food consumption. Issues that are specific to the empirical study of food consumption are addressed first, followed by an examination of a general issue associated with analyzing data from complex sample surveys.

The Timeliness of Data. Because the Nationwide Food Consumption Survey uses three different methodologies for measuring food consumption--a recall of usual household expenditures on food, a recall of food used from the home food supply, and a combination recall/diary of food intake by individuals--and because it obtains data from a large sample of low-income households, the NFCS is the most frequently used source of data for analyzing the effects of food stamps on food consumption. However, the survey's decennial schedule and the relatively long lag (as much as two years or more) between the completion of the one-year data collection process and the release of public-use data files mean that most NFCS-based research is conducted with data that are three to ten years old. If a major change in FSP regulations occurs soon after the completion of the survey, as was the case with the elimination of the purchase requirement just one year after the completion of the 1977-78 NFCS, then program analysts may face the unwelcome prospect of conducting research for the better part of a decade on the basis of data that have only limited relevance to the current FSP.

The timeliness of data is far less of a problem with the CEX and the PSID because they are on-going surveys in which sample units are interviewed at least once per year. Unfortunately, neither of those surveys collects information on household food use or individual food intake.

Indeed, the complexity of collecting and processing such data is a major barrier to releasing NFCS public-use files early and to fielding a survey like the NFCS more frequently.

The USDA has responded to the untimeliness of NFCS data by fielding NFCS supplemental surveys on an "as-needed" basis and by fielding the Continuing Survey of Food Intakes by Individuals in selected off-NFCS years. Neither of these solutions has proved to be fully satisfactory. The most notable examples of NFCS supplemental surveys are the USDA Survey of Food Consumption in Low-Income Households, 1979-80, and a 1983 survey of 2,400 low-income households in Puerto Rico. Both of these surveys were conducted shortly after the implementation of major changes in the FSP: the EPR in 1979 and the replacement of the FSP in Puerto Rico with the cash-based Nutrition Assistance Program in 1982. For reasons that are not well-documented, researchers have been wary of the quality of the 1979-80 data, preferring to use pre-EPR data from the 1977-78 low-income supplement to the NFCS. The limitations of the 1984 Puerto Rico data pertain to its narrow geographic scope.

The limitations of the 1985 and 1986 editions of the CSFII pertain to its restricted sample--women ages 19 to 50 years and their children ages 1 to 5 years--and its focus on food intake by individuals rather than on food use by households. As noted previously, the FSP is designed to have its most direct impact on the use of food at home; its impact on the intake of all foods by individuals is less direct, and may be diluted by the fact that some proportion of food eaten is usually not derived from the home food supply and cannot be purchased with food stamps. Along with other factors noted later, this diluted impact on individuals' intakes may explain the fact that, as documented in Chapters IV and V of this report, researchers have consistently found significant positive effects of the FSP on the use of food by households (whether measured in dollar values or by nutrient content), but they rarely have found significant effects of the FSP on food intakes by individuals.

According to current plans, new editions of the CSFII will he fielded annually from 1989 through 1992. The samples in those editions of the survey will be defined more broadly than those in the 1985 and 1986 editions. Separate samples of 1,500 households from all income strata and 750 low-income households will be selected for each of the four survey years regardless of their demographic characteristics. The substantive focus of the survey will continue to be on food intakes by individuals.

Underreporting of Food Expenditures by FSP Participants. The CEX Interview Survey, the NFCS, and the CSFII obtain data on usual household expenditures on food at home through similarly short sequences of questions that include a prompt for respondents to include purchases made with food stamps in their reported food expenditures. Mathematica Policy Research used a similar sequence of questions to obtain data on food expenditures from participants in the SSI/Elderly Food Stamp Cashout Demonstration, which was conducted in 1980 and 1981 (Butler, Ohls, and Posner, 1985). Tabulations of data from early interviews revealed markedly low reported expenditures on food by coupon recipients relative to recipients of cash food assistance. This finding led MPR to append to the sequence of questions on food expenditures a probe which asked respondents whether their estimates of usual expenditures on food at home had included purchases made with food stamps. In response to the probe, approximately 25 percent of coupon recipients said that their estimates had not included purchases made with food stamps. Such omissions could lead to significantly lower sample mean values of food expenditures by food stamp recipients and to negatively biased estimates of the effects of food stamps on food expenditures.

Fortunately, both the CEX and the NFCS provide alternative measures of food costs, based on a recall of individual food items purchased (in the CEX Diary Survey) or a recall of individual food items used (in the NFCS). Thus, researchers who use data from those sources are not restricted to using the problematic measures of usual household food expenditures.

However, the CSFII provides no such alternative measure of food cost. As explained previously, the PSID addresses the omission of purchases made with food stamps from reported usual food expenditures by assuming that recipient households use all of their stamps to buy food in the month in which they receive the benefits, and by asking them to report only additional food purchases made with cash.

Reference Periods for Expenditure and Income Data. The reliability of estimates of the effects of food stamps that are generated by econometric models of food consumption is partly a function of the degree to which the reference periods for the data on food consumption, income, and food stamp benefits coincide. In this regard, the NFCS receives high marks relative to the CEX and the PSID. The NFCS obtains income data for the calendar month that immediately precedes the survey month. It also obtains data on the amount of food stamp benefits as of the most recent receipt of benefits, which for current recipients is either the survey month or the preceding month. Moreover, the NFCS obtains household food-use data for the week prior to the interview, individual intake data for three days including the day before, the day of, and the day after the household interview, and data on usual food expenditures for the three months preceding the household interview. Thus, the degree to which the reference periods for NFCS income, food stamp, and food consumption data coincide is about the maximum that is feasible with existing survey technology.

In the CEX Diary Survey, the degree to which the reference periods for the value of food stamps received (the past month) and food purchases (the past two weeks) coincide is high, but they diverge sharply from the reference period for household income, which is the previous 12 months. The situation is much the same for the PSID, which obtains data on the amount of food stamps received and on food expenditures during the calendar month prior to the month of the survey, but obtains household income data for the calendar year prior to the year of the survey. If current income is a better predictor of current food consumption than is income received over

the course of the previous year, then food consumption models estimated on the basis of CEX and PSID data may not produce valid estimates of the most relevant income-consumption relationship. This in turn may cause the estimates of the effects of food stamps on food consumption that are generated by those models to be biased.

Intra-individual Variation in Dietary Intake. In assessments of the adequacy of dietary intake by individuals, the behavior of interest is the average, or "usual," daily intake that would persist over time. The actual daily intake of food by individuals varies substantially, with intake generally varying more within each person over time (intra-individual variation) than it does among persons (inter-individual variation).[10] The presence of intra-individual variation causes the variance of average daily intake in a sample of individuals to exceed the variance of usual daily intake in the population from which the sample was drawn This discrepancy tends to be largest when only one day of intake data is available for each sample member. The NFCS seeks to reduce the overestimation of the population variance of usual daily intake by collecting three days of intake data from each survey respondent.

The positive bias in the sample variance of conventional survey measures of dietary intake as an estimate of the population variance of usual dietary intake has important implications for the validity of a number of dietary assessment techniques, as explained by the National Research Council (1986). In the context of this review, the most important of those implications is that the standard errors of estimates of the effects of food stamps on dietary intake are positively biased when the estimates are based on a small number of days of intake data. That bias could lead to the incorrect rejection of the hypothesis that the diets of food stamp recipients are of higher nutritional quality than those of eligible nonrecipients. The fundamental problem is that measures of average daily intakes computed on the basis of only a few days of data incorporate

[10]The National Research Council (1986, Chapter 4) and Rittenbaugh et al. (1988, Chapter III) review the literature on intra-individual and inter-individual variation in dietary intake.

substantial intra-individual variation, which amounts to random "noise" in the measurement of usual intake, making it difficult to obtain statistically significant estimates of the effects of food stamps. This may partially explain why few studies have found statistically significant effects of food stamps on dietary intakes, along with the fact that, as noted above, the direct effect of food stamps on at-home consumption may tend to be "diluted" in measures of total food intake that include away-from-home consumption. Findings from that body of research are reviewed in Chapter V of this report.

Complex Sample Designs. In large sample surveys such as the NFCS, the CEX, and the PSID, the probabilities with which sample units are selected into the sample typically vary somewhat. For example, low-income households that reside in high-poverty areas are selected into the NFCS low-income sample with a higher probability than are low-income households that reside in low-poverty areas. Sample units whose probabilities of selection are lower represent more units in the target population of a survey than do sample units whose probabilities of selection are higher. Those differences are reflected in the value of the sample weight for each sample unit.

When analyzing sample-weighted data, most researchers appropriately use the sample weights to compute descriptive statistics such as sample means. Far fewer researchers use the sample weights in multivariate analyses. As explained by DuMouchel and Duncan (1983), the omission of the sample weights in a multivariate analysis may be appropriate if the outcome variable is unrelated to the strata that form the basis for the sample selection probabilities, or if the model fully controls for the effects of those strata. If neither of those conditions is satisfied, then the sample weights should be used.

Most existing estimates of the effects of food stamps on food consumption are based on data from complex surveys in which the probability of selection into the samples varies across the sample units. Nevertheless, very few of those estimates have been generated on the basis of

sample-weighted data. In many studies, the decision to eschew using sample weights appears to have been made without taking into account whether the conditions for omitting the weights from a multivariate analysis were satisfied Devaney and Fraker (1989) show that NFCS-based multivariate estimates of the effects of food stamps on the money value of food used at home are very sensitive to whether or not the sample weights are used in the estimation process.

Sample design effects are a second issue associated with analyzing data from complex sample surveys. Standard multivariate regression procedures typically compute standard errors for regression coefficients on the assumption that the samples were selected through simple random sampling. However, because it is expensive, simple random sampling is rarely undertaken in nationally representative surveys; clustered sampling is much more common. Standard errors that are computed on the basis of clustered samples, under the assumption of simple random sampling, tend to be underestimates. These underestimates can lead to larger t-statistics for regression coefficients and, consequently, to the finding that estimates of program or other effects are statistically significant when in fact those estimates are not. The divergence between standard errors computed on the assumption of simple random sampling and the true standard errors computed on the assumption of clustered sampling reflects sample design effects.

Most of the empirical studies of the effects of food stamps on food consumption that are reviewed in Chapters IV and V of this report are based on complex household surveys that have clustered sample designs. Special regression packages that yield correct standard errors when applied to data from clustered samples have existed for more than ten years (Shah, Holt, and Folsom, 1977) and are widely available; however, there is no indication that these packages were used to generate any of the empirical results that are reported in the studies reviewed in this report.

## B. MEASURING FSP ELIGIBILITY AND PARTICIPATION

Errors in measuring food stamp participation and in modeling food stamp eligibility are additional sources of potential bias in survey-based estimates of the effects of food stamps on food consumption. Furthermore, the ability of researchers to eliminate yet another source of bias in their estimates of the effects of food stamps--sample selection bias--is contingent upon developing and estimating models of the decision to participate in the FSP that have good explanatory power. The success of such modeling depends on the quality of the measures of program participation and eligibility, as well as on the availability of variables that measure or are correlated with the costs and benefits of participation in the FSP. This section explores the availability and quality of these data elements in the data sets that have formed the basis for most existing estimates of the effects of food stamps on food consumption.

### 1. Errors in Measuring FSP Participation and Benefits

A recent report issued by the U.S. Department of Commerce (1987) indicates that FSP participation tends to be systematically underreported in household survey data. For example, that report provides evidence that one-third of food stamp recipients interviewed by the Current Population Survey fail to report receiving food stamps. Of course, the same households fail to report the dollar value of their food stamp benefits. The existing evidence suggests that the underreporting of food stamp participation is a common feature of household surveys. Thus, there is reason to believe that FSP participation is underreported in the household surveys that have provided the data for most of the existing estimates of the effects of food stamps on food consumption.

As explained in Chapters IV and V, most estimates of the effects of food stamps on household food expenditures or on the dollar value of food used are generated with regression models in which the household food stamp benefit is a key explanatory variable. The models that

are used to generate estimates of the effects of food stamps on the nutrients that are available in the food used by a household or on the nutrients that are provided by the food eaten by an individual are more heterogeneous, but virtually all of them include among the explanatory variables either an indicator of participation in the FSP or the dollar amount of the food stamp benefit. If participation or the benefit amount is underreported in the databases that are used to estimate these models, then the models suffer from an "errors in variables" problem. Kmenta (1986) shows that measurement error in an explanatory variable yields estimates of the regression coefficient on that variable that are biased toward zero. Therefore, errors in measuring FSP participation or the dollar value of the food stamp benefit would be expected to yield estimates of the effects of food stamps on food consumption that are smaller than the true effects.

2. Errors in Modeling Food Stamp Eligibility

A household's eligibility to participate in the FSP is determined by its gross income, its net income after certain deductions, its liquid asset holdings, and nonfinancial factors, such as regulations that specify the individuals who are considered to comprise the household for the purpose of determining its eligibility and benefit amount.[11] It is not possible to observe a household's FSP eligibility status directly from survey data. However, it is usually possible to model a survey respondent's eligibility status, which entails using the information obtained by the survey to approximate what the outcome of a formal determination of eligibility would be. The amount of information that general household surveys and surveys of food consumption obtain

"The following are allowable deductions from gross income for determining a household's eligibility: a standard deduction that is invariant across all households, a deduction of 20 percent of earned income, and deductions for qualified expenditures on shelter, dependent care, and (for households with elderly or disabled persons only) medical care. Under the food stamp net income screen, monthly gross income, net of allowable deductions, must be less than the federal poverty guidelines. Households that do not contain elderly or disabled members must also have gross incomes below 130 percent of the poverty guidelines. In addition, households must satisfy a screen on liquid assets, which is set at $3,000 for households that consist of two or more individuals (of whom at least one is elderly), and at $2,000 for all other households.

on the factors that determine food stamp eligibility differs greatly; thus, the degree of error in modeling eligibility varies greatly across survey data sets.

Selected waves of the PSID provide data on most of the factors that are considered in a formal determination of a household's eligibility to receive food stamps. However, those data are provided on an annual basis, whereas a formal determination of food stamp eligibility is made on the basis of monthly income and expenses. Researchers have used PSID data to model FSP eligibility (Coe, 1983), but modeling eligibility with annual data can lead to misclassifying households that have experienced recent changes in income, expenses, and household composition. Given the usual patterns of change in household income, the most frequent error associated with modeling eligibility with annual data is misclassifying currently eligible households as ineligible. Of more importance is the absence of data on liquid asset balances in the PSID and the consequent necessity of imputing those balances on the basis of reported asset income. That process tends to generate underestimates of asset balances and to lead to classifying some asset-ineligible households as eligible to receive food stamps.

The CEX Diary Survey, like the PSID, provides data on annual income, including income from assets, but it does not provide data on asset balances. The data that it provides on deductible expenses are more limited than those provided by the PSID; consequently, researchers have avoided using the CEX data on deductible expenses to model net income eligibility for food stamps. Instead, they approximate net income on the basis of simple rule-of-thumb assumptions about the relationship between deductions and gross income. For example, West (1984) assumes that deductions equal 23 percent of gross income.[12]

[12]Other examples of rule-of-thumb assumptions that have been used to estimate the deductible expenses of respondents to the CEX Diary Survey are provided by Salathe (1980) and Chavas and Yeung (1982).

Unlike the PSID and the CEX, the NFCS low-income supplemental surveys are targeted toward households that might be eligible to receive food stamps. The full NFCS survey instrument is administered only to those sample households that, on the basis of data provided during a short screening interview, are estimated to be eligible to receive food stamps. In 1977-78, the screening instrument obtained data on income and deductible expenses during the previous month and on liquid asset balances. Households were screened into the low-income sample if their gross and net incomes and their liquid asset balances were less than the FSP eligibility limits. In 1987438, the screening instrument obtained data only on income during the previous month. Households were screened into the low-income sample if their reported income was less than the food stamp gross income limit. The NFCS screening procedures for both 1977-78 and 1987-88 represent rough approximations to the food stamp eligibility criteria. The absence of screens on liquid asset balances and net income in the 1987-88 survey suggests that the low-income sample for that survey may include more FSP-ineligibles than does the low-income sample for the 1977-78 survey.

In analyses of the effects of the FSP on food consumption, an analysis sample that consists of FSP eligibles serves two purposes. First, the homogeneity of a sample of FSP-eligibles reduces the risk of obtaining biased estimates of the effects of food stamps if the model of food consumption is not as well-specified as one would like. For example, if an analysis sample included some high-income households, then failing to specify the correct functional form of the relationship between income and food consumption might generate highly biased estimates of the effects of food stamps. We would expect that the bias would be smaller with a more homogeneous sample. Second, a sample of eligibles will support estimating a model of participation in the FSP. As explained in the following section, the estimation of a participation model is a critical component of an econometric procedure that generates estimates of the effects of food stamps on food consumption that are free of sample selection bias.

### 3. Data Requirements for Modeling FSP Participation

Multivariate regression models are used to obtain estimates of the effects of food stamps on food consumption while controlling for observed differences between food stamp participants and eligible nonparticipants that may also influence food consumption, such as income and household size. In the past decade, researchers have become aware that most survey databases do not provide data on all of the important respects in which participants may differ from eligible nonparticipants (e.g., a knowledge of nutritional requirements). If those unobserved differences influence food consumption, then they may bias regression estimates of the effects of the FSP. This bias is referred to as "sample selection bias."

The econometric solution to the problem of sample selection bias is to estimate a model of FSP participation with a sample of eligible households and then to compare the actual program participation of the sample cases with the model's predictions of their probabilities of participation. Actual participation is an outcome of the influence of both observed and unobserved factors, whereas the predicted probability of participation is a function of observed factors only; thus, the difference between the two reflects (and is a measure of) the influence of the unobserved factors.

In his pathbreaking articles on selection bias, Heckman develops a methodology for incorporating the information on unobserved factors from the participation analysis into a synthetic variable that can then be included in the food consumption equation (see Heckman, 1978 and 1979; and Heckman and Robb, 1985). By controlling for the influence of those unobserved factors on food consumption, the synthetic variable may eliminate sample selection bias from the regression estimate of the effect of food stamps on food consumption.[13]

[13]Formally, when applied under appropriate conditions, Heckman's methodology is a consistent estimator of program effects (i.e., it is biased for small samples, but the bias disappears as the sample size increases).

A number of researchers have used Heckman's procedure to control for selection bias in their estimates of the effects of food stamps on food consumption. They include Chen (1983), Aiken et al. (1985), Devaney, Haines, and Moffitt (1989), and Fraker, Long, and Post (1990). However, to ensure that the procedure is fully effective at eliminating selection bias, the program participation model must include some significant predictors of participation, and at least one of those predictors must be a variable that is not also a significant predictor of food consumption. Examples of such variables are the following measures of the cost of participating in the FSP: (1) the mode in which food stamps are issued in a household's home county (e.g., over-the-counter or by mail); (2) the time and monetary cost of traveling to the local food stamp office for over-the-counter issuances; and (3) the psychological costs of participating in the FSP (i.e., stigma). These and similar variables are not generally available in survey databases that provide data on food consumption. In their absence, it may be technically feasible to implement Heckman's procedure, but one cannot be confident that it appreciably reduces the problem of sample selection bias.

# III. THE CONSUMPTION PATTERNS OF FOOD STAMP RECIPIENTS AND LOW-INCOME NONRECIPIENTS

This chapter reviews findings from descriptive studies of the expenditure shares and food consumption patterns of food stamp recipients and low-income nonrecipients.[14] Some of the recipient-nonrecipient differences that are presented herein are attributable to differences in income, household size, and other characteristics, rather than to the effects of food stamps. Subsequent chapters review findings from studies that have attempted to disentangle the effects of the food stamps on consumption from the effects of household and individual characteristics.

## A. HOUSEHOLD EXPENDITURE PATI'ERNS

### 1. Expenditure Shares

Using data from the interview component of the 1982-83 Consumer Expenditure Survey,[15] Boldin and Burghardt (1989) find that expenditures on all food items (food used at home, as well as food purchased and used away from home) account for 28.7 percent and 22.5 percent of the total expenditures of, respectively, food stamp recipient households and low-income nonrecipient households. They do not indicate whether that difference is statistically significant; however, they do note that the actual difference in food expenditure shares between these two groups may be larger than is indicated by those percentages, because it is likely that

[14] All comparisons between food stamp recipients and nonrecipients in this chapter are made between recipient households (or individuals in those households) and low-income nonrecipient households (or individuals in those households).

[15] As the principal source of data on U.S. households' expenditures on all consumer goods and services, the CEX Interview Survey has provided the basis for most recent analyses of the total expenditure patterns of food stamp households. The other component of the CEX, the Diary Survey, provided data for several early studies of food consumption patterns of food stamp households, although the Nationwide Food Consumption Survey is now the most widely used source of data on food consumption. See Chapter II for further description of the CEX and the NFCS.

some food stamp recipients omitted food purchases made with food stamps from the expenditure amounts that they reported in the CEX.

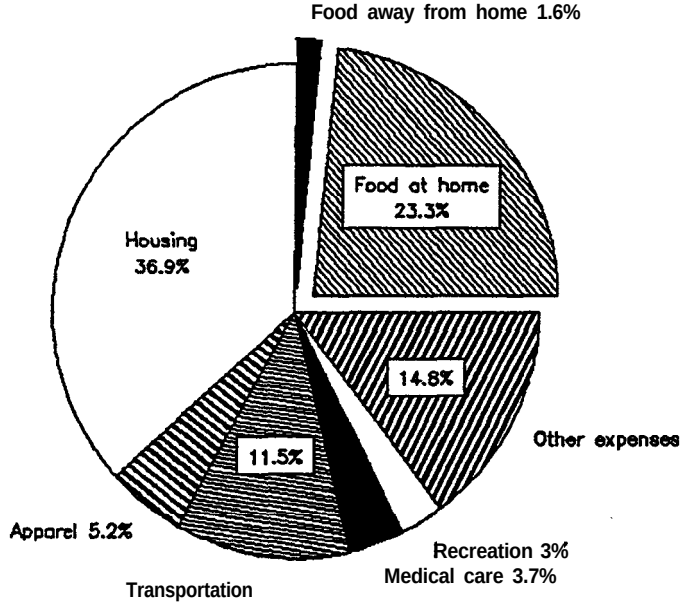
For 27 of 36 expenditure categories, encompassing both food and nonfood items, Brown (1988) reports that the mean expenditure shares of food stamp recipients differ from those of low-income nonrecipients at the .01 level of statistical significance. With some aggregation across expenditure categories, Figure III.1 summarizes the results of Brown's analysis of data from the interview component of the 1984-85 CEX. Most notable among his results is the finding that food stamp households have significantly larger expenditure shares for food used at home and for total food than do low-income households that do not receive food stamps; however, that relationship is the converse for food bought and consumed away from home.

2. The Money Value of Food Used

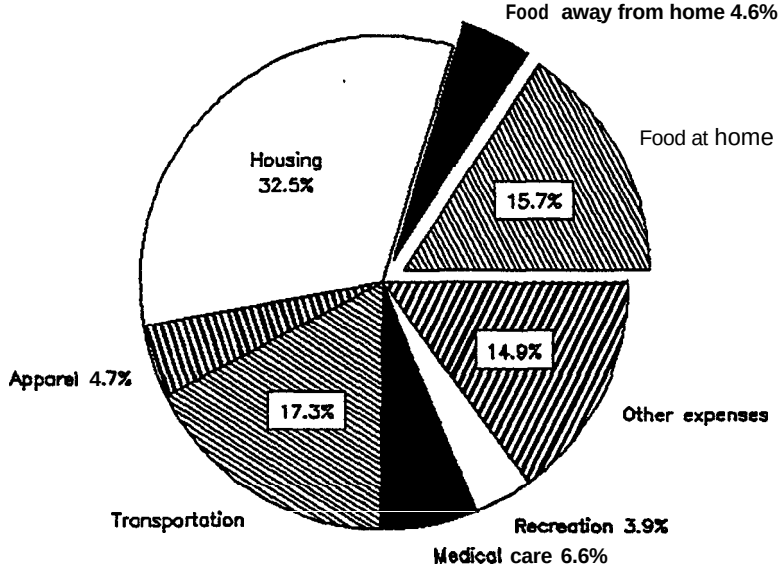
Households that participate in the FSP allocate a larger percentage of their total expenditures to the purchase of food than do low-income nonparticipating households, but the money value of all food used by recipients is less than that of nonrecipients. Based on its analysis of data from the 1979-80 low-income supplement to the 1977-78 NFCS, the Human Nutrition Information Service (July 1982) reports that the average participating household uses food worth $52.97 per week, whereas the average nonparticipating household uses food worth $59.96 per week (see Figure IB.2). Food purchased and used away from home accounts for $5 of the difference, while food used at home accounts for $2 of the difference.

When adjustment is made for the larger average size of nonparticipating households, the average money value of food used by food stamp recipients and nonrecipients converges. Figure III.3 displays the finding by HNIS (July 1982) that the money value of food used at home per household member is slightly higher for food stamp recipient households than for nonrecipient households. However, recipient households spend only about half as much per member on food

FIGURE III.1
HOUSEHOLD EXPENDITURE SHARES BY MAJOR EXPENDITURE CATEGORY
(Source: 1984-85 Consumer Expenditure Survey, interview component)




FSP Participants




FSP Nonparticipants

**FIGURE III.2**
**MONEY VALUE OF FOOD USED IN A WEEK BY HOUSEHOLDS**
(Source: USDA Survey of Food Consumption in Low-Income Households, 1979-80)

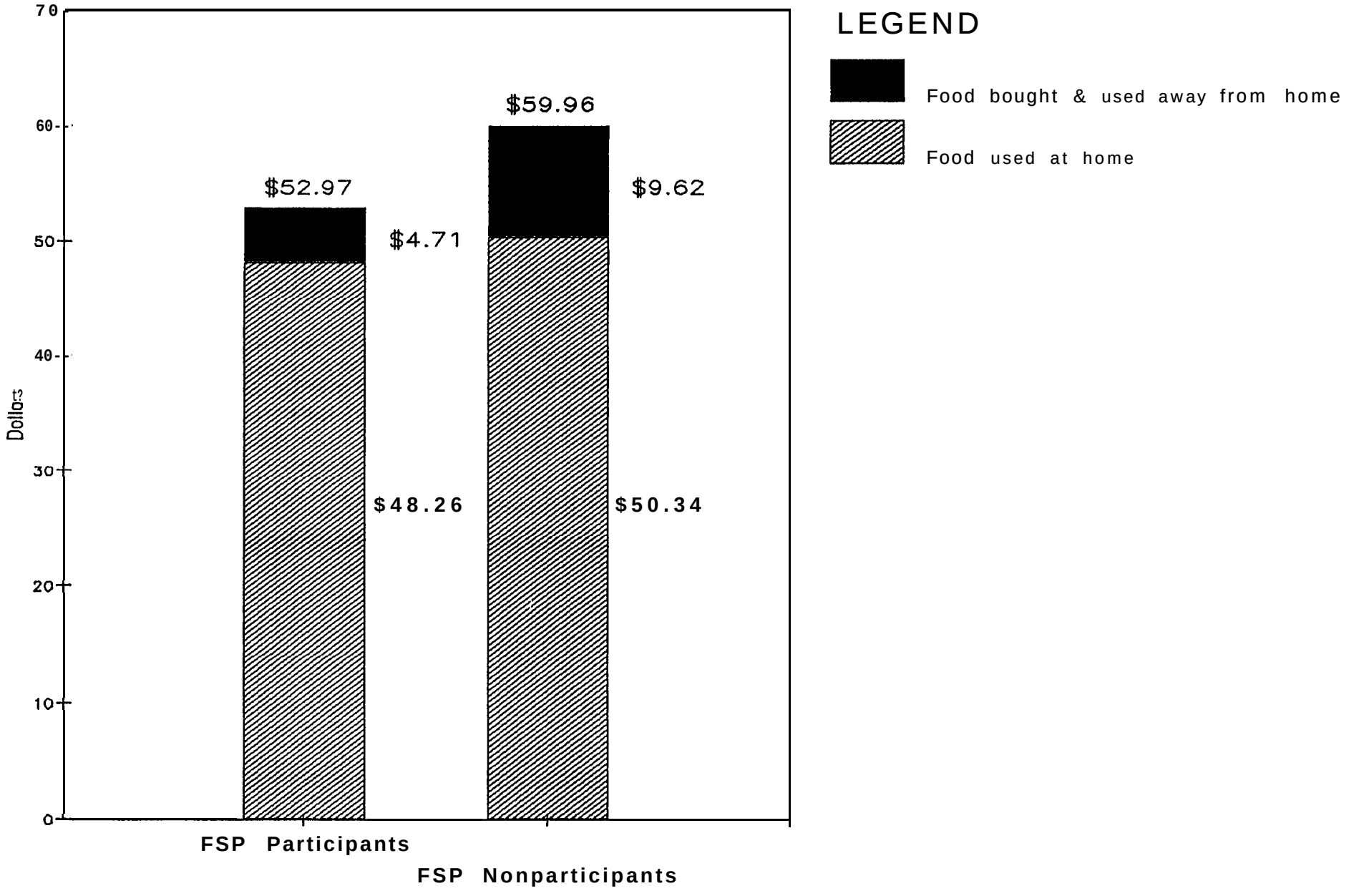
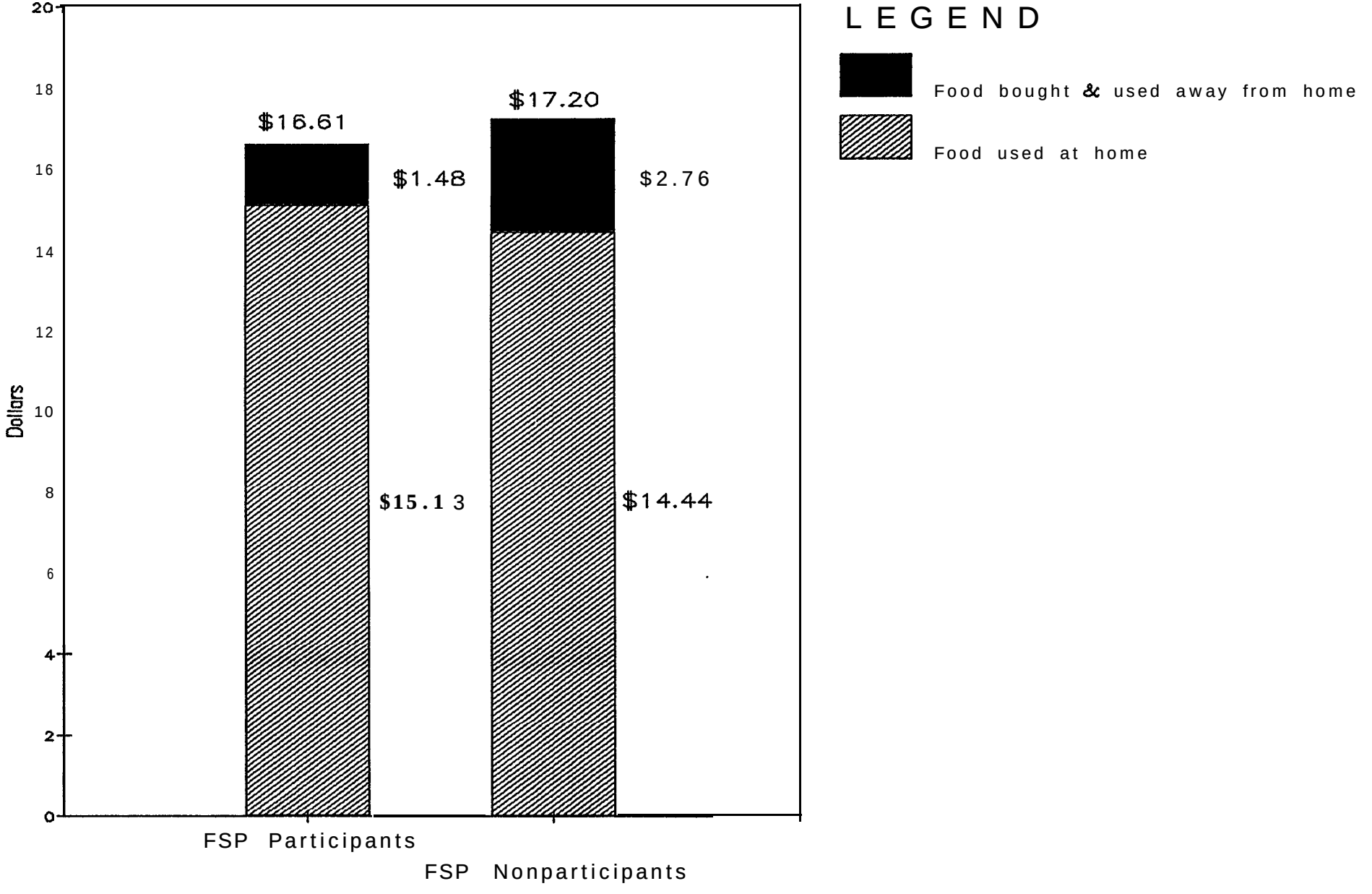


FIGURE III.3
MONEY VALUE OF FOOD USED PER PERSON IN A WEEK BY HOUSEHOLDS
(Source: USDA Survey of Food Consumption in Low-Income Households, 1979-80)



bought and used away from home as do nonrecipient households. These partially offsetting differences mean that the gap in the total money value of food used per person between the two groups is small.

Devaney and Kisker (1988) use a more sophisticated adjusted measure of the average value of food used at home per household member. They measure household size in "equivalent nutrition units" (ENUs), which is the number of adult-male-equivalent persons eating meals from the home food supply. This measure of household size controls for the number of persons in the household and their age-and-sex-based differences in nutritional requirements, for the proportion of meals eaten away from home by household members, and for meals served to guests.[16] Using the same data set as HNIS, Devaney and Kisker fmd that the average money value of food used at home per ENU is 11 percent higher for food stamp households than for low-income households that do not receive food stamps. This figure contrasts with the 5 percent difference obtained by HNIS on the basis of its simpler per-person measure of home food use.

3. Nutrients per Dollar's Worth of Food

Among all households, those with larger money values of food used at home per person (measured in ENUs) obtain fewer nutrients for each dollar's worth of food used than do households with smaller money values of food used (Peterkin and Hama, 1983; and Morgan et al., 1985b). This implies that households with limited food budgets tend to use foods that are relatively high in nutrients and low in cost.

Among low-income households, food stamp recipients have a higher average money value of food used at home per person than nonrecipients, as documented in the previous section. Nevertheless, the nutrient efficiency of the home food dollar is not generally lower for recipients

[16]Appendix B describes the computation of household size in ENUs and compares that measure of size with several alternative measures.

than for nonrecipients. On the basis of a simple comparison of mean values between food stamp recipients and nonrecipients, Peterkin and Hama (1983) report that recipients obtain more nutrients per dollar's worth of food used at home for nine nutrients and less for only two. Using regression analysis to control for the effects of a number of socio-economic factors, Morgan et al. (1985b) find that food stamp recipients, relative to nonrecipients, have a higher availability per dollar's worth of food used at home of food energy, protein, calcium, iron, and magnesium, but a lower availability of vitamin A. The recipient-nonrecipient difference is statistically significant only for calcium.

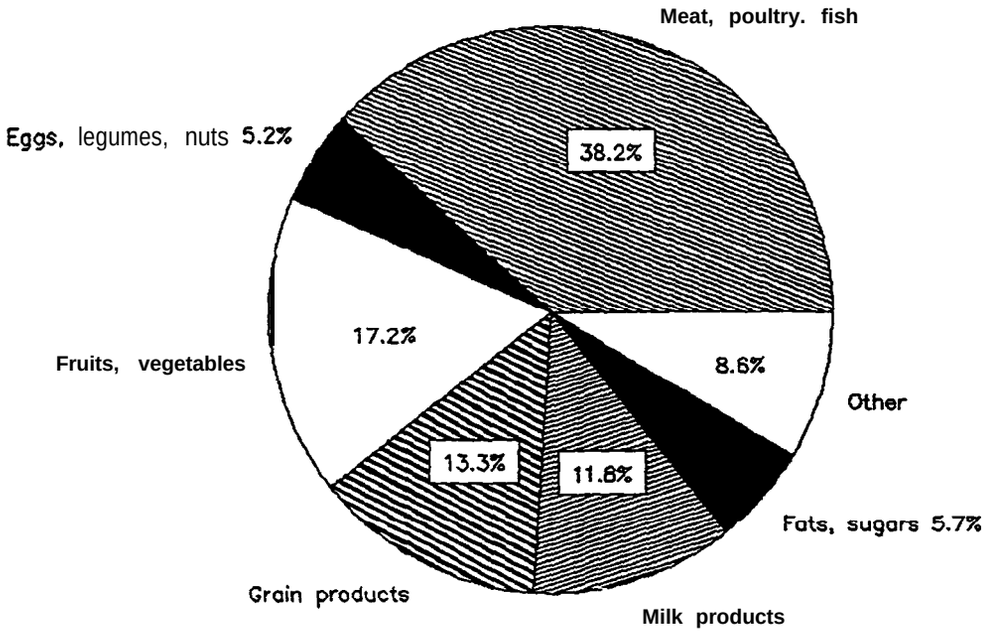
Thus the existing evidence indicates (albeit with limited statistical reliability) that food stamp recipients have a higher average money value of food used at home per person than low-income nonrecipients and they also receive more nutrients for each dollar's worth of food used at home.

4. Home Food Use by Food Group

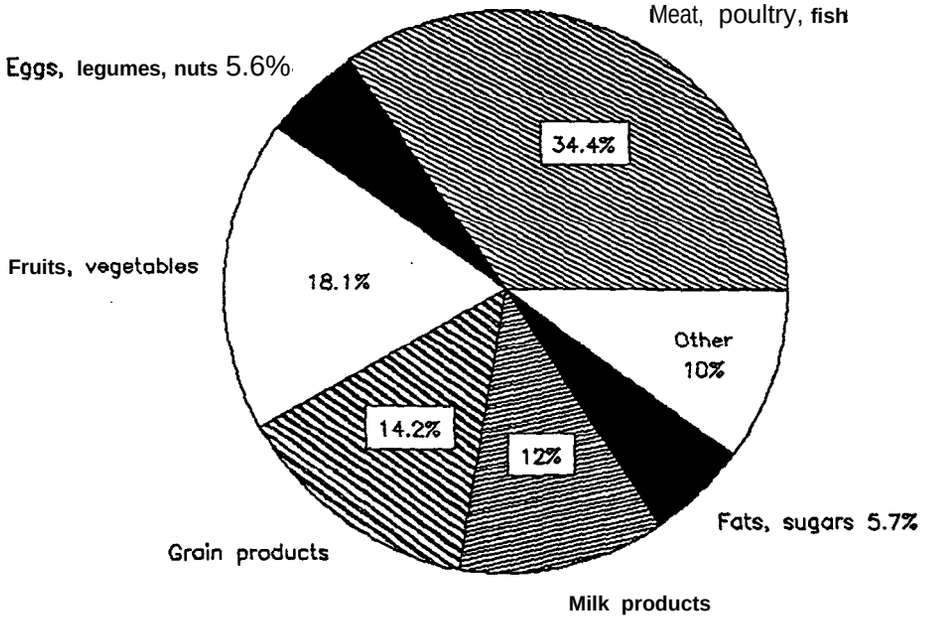
As summarized in Figure III.4, HNIS (July 1982) finds that food stamp recipients and nonrecipients have very similar patterns of home-food use when food groups are defined at a high level of aggregation (i.e., seven groups). The most notable difference is that food stamp recipients allocate a larger percentage of the average home-food dollar to meat, poultry, and fish than do nonrecipients. Conversely, nonrecipients spend a somewhat larger percentage of their average home-food dollar on grain products and on fruits and vegetables than do food stamp recipients. It is not known whether these differences are statistically significant.

A study based on data from the Low-Income Supplement to the 1977-78 NFCS provides additional insight into the recipient-nonrecipient difference in the share of home-food expenditures allocated to meat, poultry, and fish. Morgan et al. (1985a) report that most of this difference is due to greater expenditure shares by recipients on fish, poultry, and lower-cost

FIGURE III.4
SHARE OF HOME FOOD EXPENDITURES BY FOOD GROUP
(Source: USDA Survey of Food Consumption in Low-Income Households, 1979430)




FSP Participants




FSP Nonparticipants

meats. Recipients have slightly lower expenditure shares on higher-cost meats than do eligible nonrecipients.

### 5. Frequency of Food Shopping

One dramatic difference in expenditure behavior between food stamp recipients and low-income nonrecipients pertains to the frequency of their major food shopping. As shown in Figure III.5, HNIS (July 1982) reports that recipient households are far more likely than nonrecipients to conduct their major food shopping on a monthly basis, presumably timed to coincide with their monthly food stamp allotment. Most nonrecipients conduct their major food shopping on a weekly basis. Data from an ongoing demonstration project in Reading, Pennsylvania, in which an "Electronic Benefit Transfer" (EBT) system is being used to issue food stamp benefits (plastic cards in place of coupons), show that recipients spend an average of 19 percent of their monthly benefit on the day of issuance, 70 percent within the first week, and 89 percent within two weeks.[17]

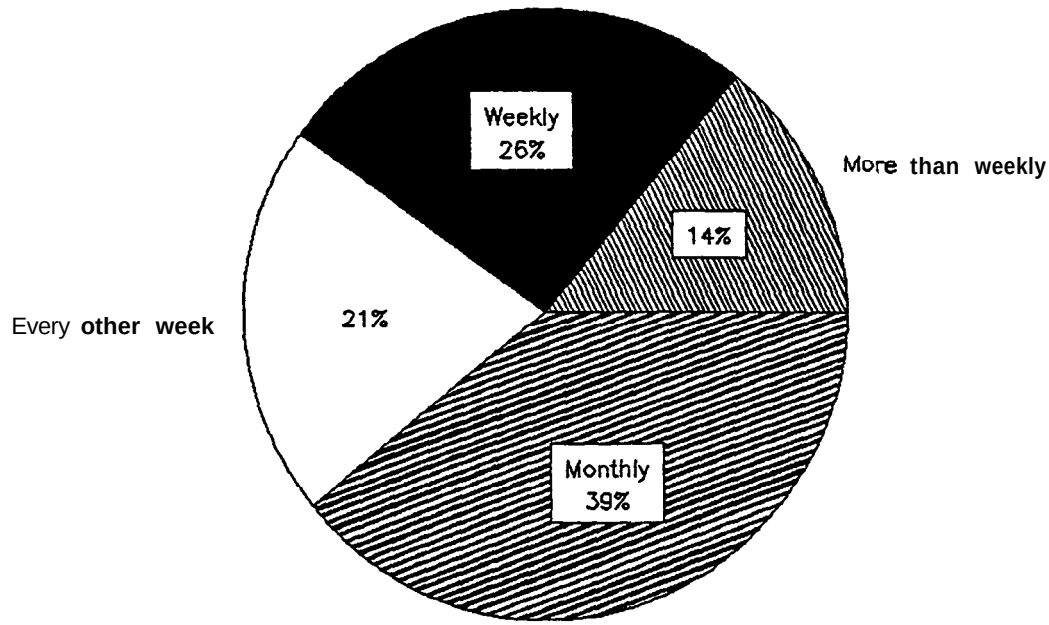
The apparent sensitivity of the frequency of major food shopping to food stamp receipt suggests that the quantity and/or quality of food used by food stamp households may also follow a monthly cycle. Despite the fact that it may enhance our understanding of why econometric studies show that food stamps have a much larger effect on food use than does cash income, research on the existence and nature of this cycle has been scarce.

### 6. Perceived Food Adequacy

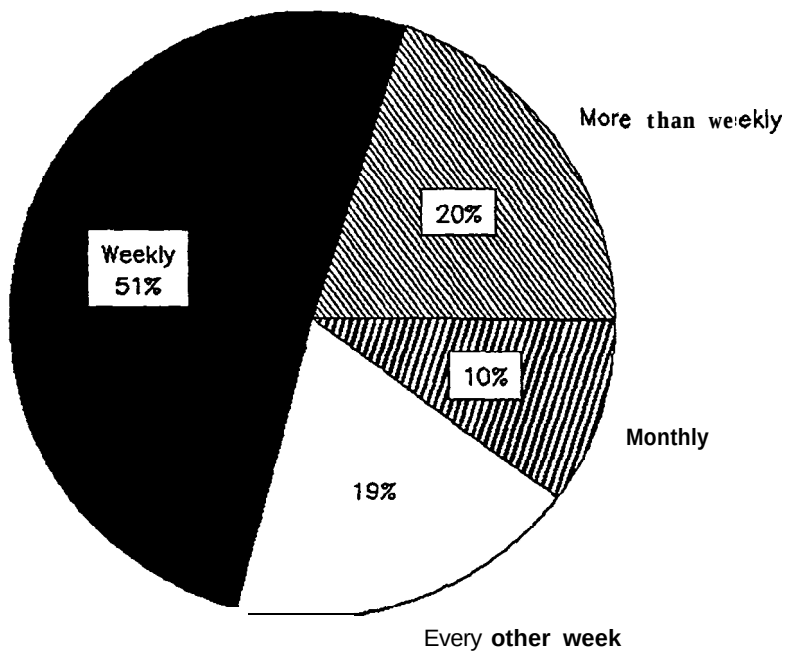
Clear majorities of both food stamp recipient households and nonrecipient households report having adequate supplies of food However, as shown in Figure III.6, HNIS (July 1982)

[17] These findings will be reported in a forthcoming FNS report entitled "Household Shopping Patterns in the Food Stamp Electronic-Benefit-Transfer Demonstration."

FIGURE III .5
FREQUENCY OF MAJOR FOOD SHOPPING BY HOUSEHOLDS
(Source: USDA Survey of Food Consumption in Low-income Households, 1979-80)

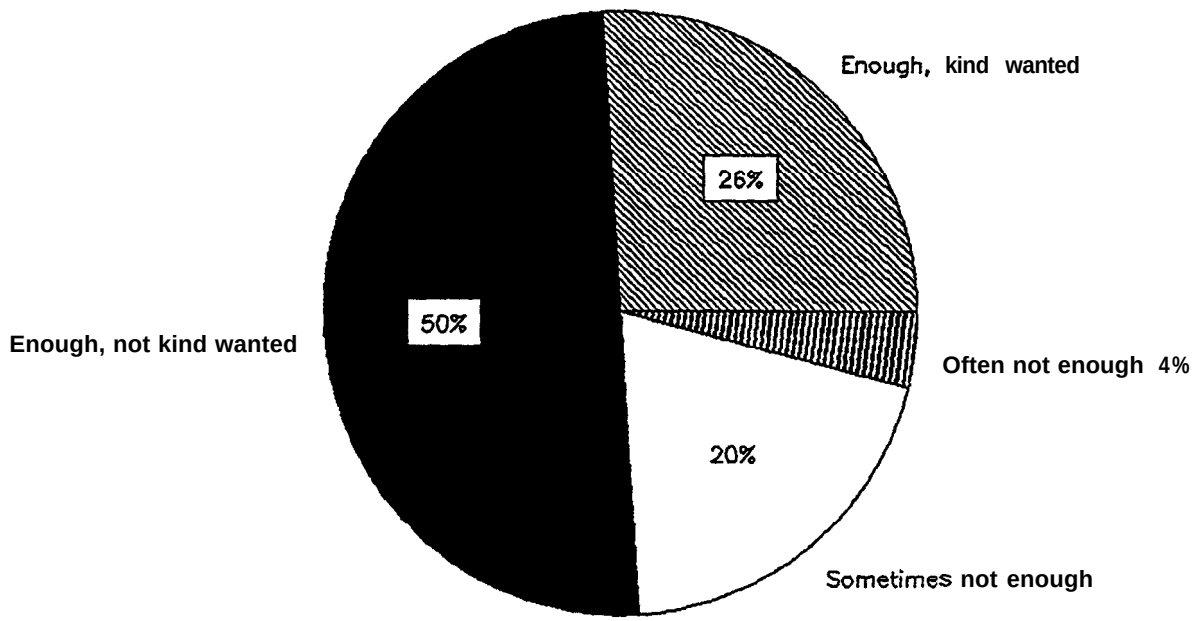



FSP Participants

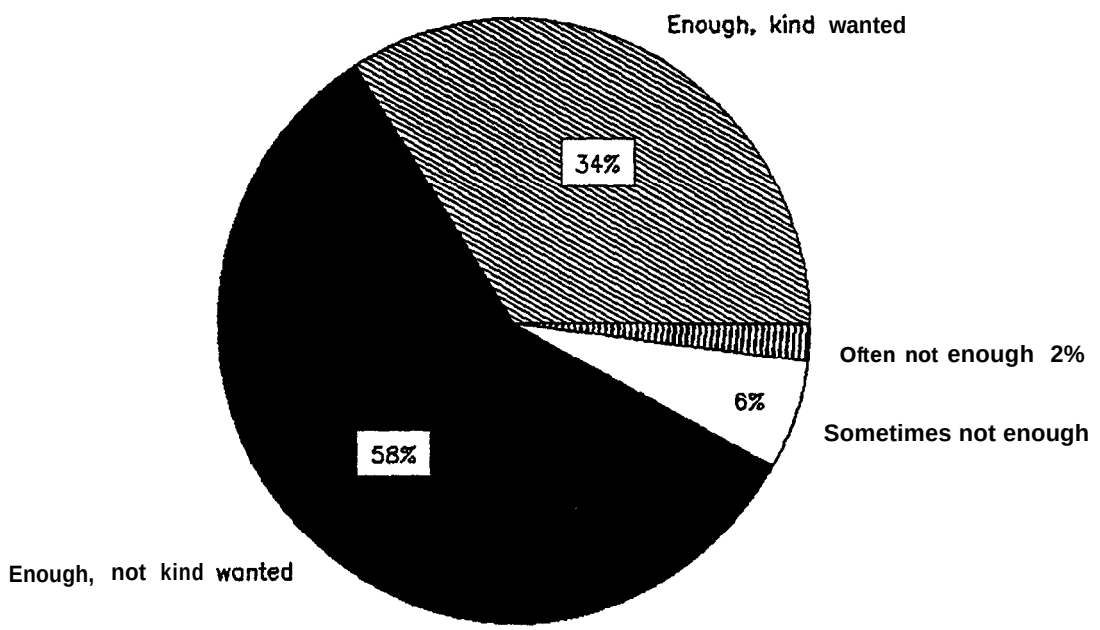



FSP Nonparticipants

FIGURE III.6
SELF-EVALUATION OF HOUSEHOLD FOOD ADEQUACY
(Source: USDA Survey of Food Consumption in Low-Income Households, 1979-80)




FSP Participants




**FSP Nonparticipants**

finds that 24 percent of food stamp recipient households, compared with only 8 percent of nonrecipient households, report that they sometimes or often have inadequate supplies of food.

Basiotis (1987) uses data from the 1977-78 NFCS to investigate whether the expenditures on food and the use of food energy by low-income households that report having inadequate food supplies sometimes or often are more responsive to changes in income (i.e., are more income elastic) than is the case for other low-income households. His estimates of the income elasticities of food expenditure and food energy usage are significantly larger for households that report inadequate food supplies than for other households. The larger elasticities are consistent with more aggressive efforts to economize on food usage in response to reductions in income. This correlation between objective measures of food economizing behavior in response to income reductions and survey respondents' perceptions of the adequacy of their home food supplies substantiate the validity of self-reported measures of food adequacy by low-income households.

## B. THE NUTRIENT AVAILABILITY OF HOUSEHOLDS AND THE NUTRIENT INTAKE OF INDIVIDUALS

As described in Chapter II, the NFCS provides data on the nutrient availability of households that are based on the quantity of each food item used by a household from its home food supply over a one-week period. An existing USDA nutrient database is used to convert the survey data on the quantity of each food item into data on the nutrients provided by that item. The availability of a specific nutrient is the sum of the units of that nutrient provided by all foods used from the home food supply during the reporting period.

As also described in Chapter II, the NFCS data on individual nutrient intake are computed on the basis of the reported types and quantities of foods eaten either at home or away from home by the individual members of a household. The sum of total nutrient intakes over all members of a household may differ from the availability of nutrients in the home food supply for four reasons: (1) some food that is used by a household is lost or wasted rather than eaten; (2)

nutrients provided by foods purchased and eaten away from home are included in the NFCS measure of total nutrient intake but not in the measure of at-home nutrient availability, although the latter measure is often adjusted for meals eaten away for home to obtain a proxy measure of total nutrient availability; (3) food served to guests or boarders or fed to pets may account for some of the food used from the home food supply but not actually consumed by household members; and (4) either or both of the NFCS food-consumption data sets may contain some degree of measurement error (e.g., a tendency to underreport individual intake). Even after making rule-of-thumb adjustments for the first three of these reasons, the nutrient availability of the household tends to exceed the sum of the nutrient intake by all household members (Batcher, 1983). The residual difference in the two nutrient measures is attributable to imprecision in the adjustments and to measurement error.

### 1. Nutrient Availability

Controlling for guest meals, meals away from home, and the age-sex composition of household members, HNIS (July 1982) computes the availability of nutrients in the household as a percentage of the combined household members' recommended dietary allowances (RDAs). The results of its analysis of data from the USDA Survey of Food Consumption in Low-Income Households, 1979-80, are reproduced in Table III.1, which shows that the average availability of each of twelve selected nutrients exceeds the RDA for both food stamp recipient households and nonrecipient households, and for all of the nutrients their availability relative to the RDA is higher for food stamp recipients than for nonrecipients. It should be noted, however, that even though the availability of a nutrient relative to the RDA may be high on average within a population group, the availability of the nutrient may be less than is adequate to meet the dietary requirements of some proportion of households in the group. Furthermore, even within a household for which the availability of a nutrient is, in principle, adequate, the average intake of

## TABLE III.1

## HOUSEHOLD NUTRIENT AVAILABILITY AS A PERCENTAGE OF THE RDA FOR PERSONS EATING IN THE HOUSEHOLDS

**(Source: USDA Survey of Food- Consumption in Low-income Households, 1979-80)**

| Nutrient | FSP Participants (A) | FSP Nonparticipants (B) | Difference (A-B) |
|---|---|---|---|
| Food energy | 139% | 121% | +18% |
| Protein | 232 | 203 | t29 |
| Calcium | 119 | 111 | +8 |
| Iron | 151 | 137 | t14 |
| Magnesium | 134 | 123 | +11 |
| Phosphorus | 202 | 183 | +19 |
| Vitamin A | 213 | 178 | +35 |
| Thiamin | 194 | 165 | +29 |
| Riboflavin | 204 | 180 | t24 |
| Vitamin B6 | 132 | 114 | +18 |
| Vitamin B12 | 235 | 191 | t 4 4 |
| Vitamin C | 290 | 264 | t26 |

NOTE The table shows mean nutrient availability per equivolent nutrition unit as a percentage of the RDA. As explained in Appendix EI, household size in ENUs is a measure of size that adjusts for the age and sex composition of household members, the number of meals per week that they eat from the household food supply, and meals served to guests.

the nutrient by household members may be inadequate due to waste or other food loss; or even when the average intake by household members is adequate, specific individuals within the household may have an inadequate intake of the nutrient due to the pattern of food allocation within the household

2. Nutrient Intake

Because measures of nutrient availability include nutrients provided by food that has been wasted or lost, we expect that (after adjustments are made for guest meals, meals away from home, and age-sex composition) they will indicate the possibility of more nutrients in the diets of the low-income population than do measures of nutrient intake. Table III.2 presents the findings of HNIS (September 1982) on the intake of nutrients by individuals of all ages and sexes in low-income households, based on one day of data from the USDA Survey of Food Consumption in Low-Income Households, 1979-80. The table shows that the mean intake of four and five of the twelve selected nutrients for, respectively, food stamp nonrecipients and food stamp recipients is less than the RDA. For none of the nutrients is the intake by food stamp recipients substantially less than that by nonrecipients, and for three of the nutrients it exceeds the intake by nonrecipients by more than 10 percentage points (relative to the RDA).

On the basis of four days of data from the 1986 Continuing Survey of Food Intakes by Individuals, HNIS (1989) reports that the average intake of ten of twelve selected nutrients by women ages 19 to 50 in food stamp households is slightly lower than that by women in low-income households that do not receive food stamps. Those findings are summarized in Table III.3, along with findings for children ages 1 to 5. The results for children are quite different from those for women. HNIS finds that young children in food stamp households have a higher average intake of nine of the twelve selected nutrients than do young children in low-income

## TABLE III.2

## NUTRIENT INTAKE AS A PERCENTAGE OF THE RDA: MEAN PER INDIVIDUAL, ONE DAY OF INTAKE DATA

(Source: USDA Survey of Food Consumption in Low-Income Households, 1979-80)

| Nutrient | FSP Participants (A) | FSP Nonparticipants (B) | Difference (A-B) |
|---|---|---|---|
| Food energy | 85% | 83% | +2% |
| Protein | 172 | 168 | t4 |
| Calcium | 87 | 90 | -3 |
| Iron | 96 | 100 | -4 |
| Magnesium | 85 | 88 | -3 |
| Phosphorus | 130 | 132 | -2 |
| Vitamin A | 132 | 118 | t14 |
| Thiamin | 130 | 113 | t17 |
| Riboflavin | 141 | 132 | +9 |
| Vitamin B6 | 79 | 72 | t7 |
| Vitamin B12 | 142 | 143 | -1 |
| Vitamin C | 144 | 133 | +11 |

## TABLE III.3

### NUTRIENT INTAKE AS A PERCENTAGE OF THE RDA: MEAN PER INDIVIDUAL, FOUR NONCONSECUTIVE DAYS OF INTAKE DATA

(Source: NFCS-Continuing Survey of Food Intakes by Individuals, 1986)

| Nutrient | Women Ages 19 to 50 | | | Children Ages 1 to 5 | | |
|---|---|---|---|---|---|---|
| | FSP Participants (A) | FSP Non-participants (B) | Difference (A-B) | FSP Participants (C) | FSP Non-participants (D) | Difference (C-D) |
| Food energy | 68% | 71% | -3% | 103% | 97% | +6% |
| Protein | 126 | 130 | -4 | 234 | 214 | i-20 |
| Calcium | 67 | 72 | -5 | 105 | 105 | 0 |
| Iron | 53 | 55 | -2 | 88 | 80 | +8 |
| Magnesium | 59 | 62 | -3 | 119 | 110 | +9 |
| Phosphorus | 109 | 113 | -4 | 135 | 127 | +8 |
| Vitamin A | 99 | 109 | -10 | 188 | 204 | -16 |
| Thiamin | 100 | 100 | 0 | 162 | 146 | i-16 |
| Riboflavin | 101 | 106 | -5 | 202 | 195 | +7 |
| Vitamin B6 | 52 | 55 | -3 | 128 | 119 | +9 |
| Vitamin B12 | 149 | 143 | +6 | 211 | 210 | +1 |
| Vitamin C | 109 | 112 | -3 | 182 | 183 | -1 |

households that do not receive food stamps. Most of those differences exceed 5 percentage points.

Tables III.2 and III.3 provide only a partial picture of the differences between food stamp recipients and nonrecipients in nutrient intake. However, they suggest that small aggregate differences may mask important distinctions across demographic groups. For example, among young children, FSP recipients have substantially larger average intakes of most nutrients than do nonrecipients; among women ages 19 to 50, the intake of most nutrients by food stamp recipients and nonrecipients differs very little.

## C. INDIVIDUAL FOOD INTAKE BY FOOD GROUP

On the basis of data from the USDA Survey of Food Consumption in Low-Income Households, 1979-80, HNIS (September 1982) reports that the average intake of six of seven selected food groups by individuals in food stamp households is smaller than that by individuals in low-income households that do not receive food stamps. These findings, which are based on one day of intake data, are presented graphically in Figure IlI.7. Intake by recipients relative to intake by nonrecipients ranges from -25 percent for eggs, legumes, and nuts to +9 percent for grain products.'*

Figures III.8 and III.9 summarize findings by HNIS (1989) about the patterns of the food intake of women ages 19 to 50 and children ages 1 to 5 by food group. The results are based on four days of intake data from the 1986 CSFII. For women, the findings on differences in food intake by food group between food stamp recipients and nonrecipients are broadly consistent with

[18]It should be noted that Figure III.7 shows grams of food intake by individuals, while Figure III.4 shows shares of home food expenditures by households. Thus, the data in the two figures are not directly comparable; for example, FSP nonparticipating households spend a larger share of their home food expenditures on grain products than do FSP participating households, **but the** average intake of grain products by individuals in nonparticipating households is less than the average intake of grain products by individuals in participating households.

FIGURE III.7
FOOD INTAKE BY FOOD GROUP:
MEAN PER INDIVIDUAL PER DAY, ONE DAY OF DATA
(Source: USDA Survey of Food Consumption in Low-Income Households, 1979 -80)

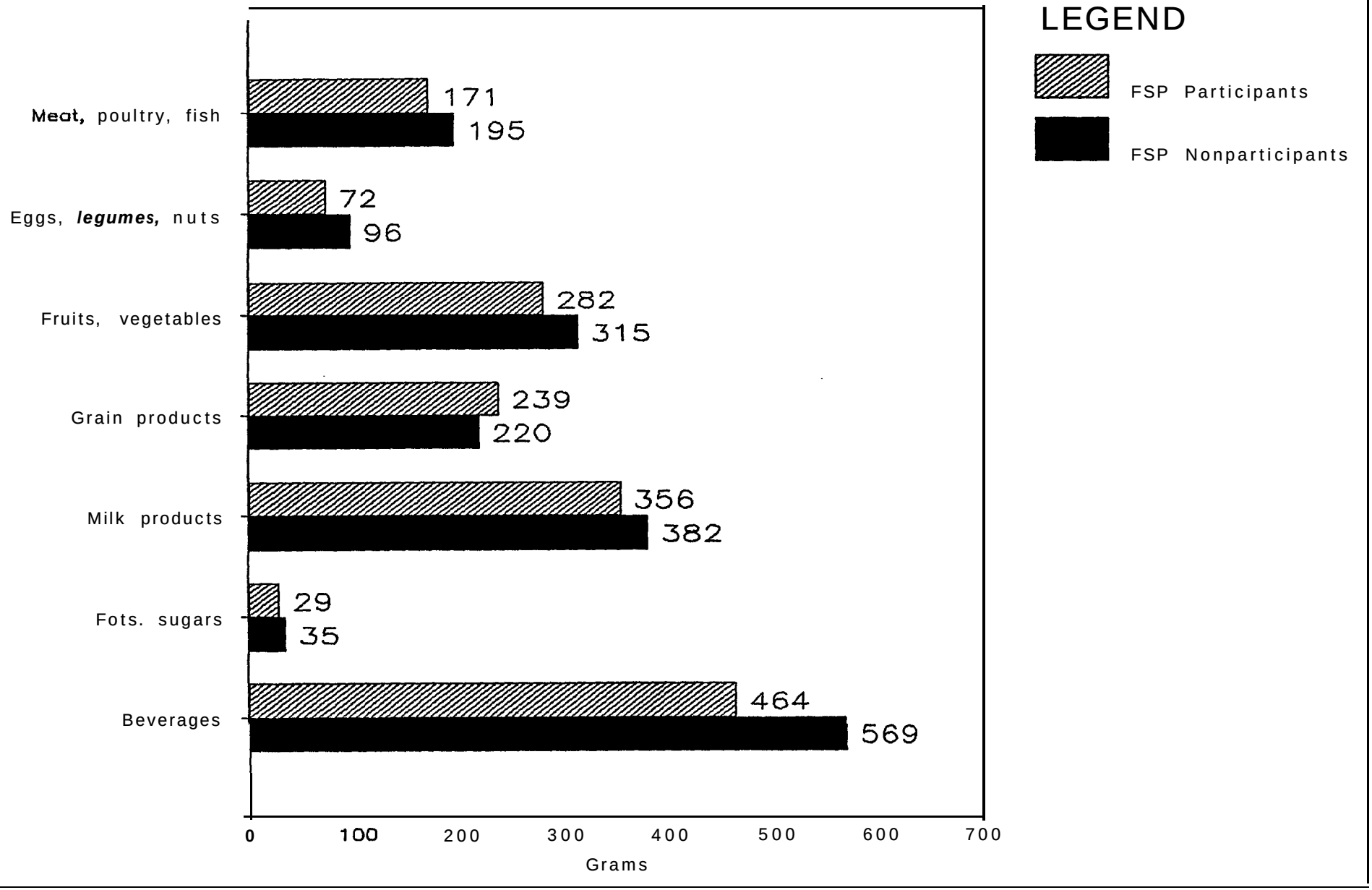


**FIGURE 111.8**
**FOOD INTAKE BY WOMEN AGES 19 TO 50 BY FOOD GROUP: MEAN PER INDIVIDUAL PER DAY. FOUR NONCONSECUTIVE DAYS OF DATA**
(Source: NFCS-Continuing Survey of Food Intokes by Individuals, 1986)

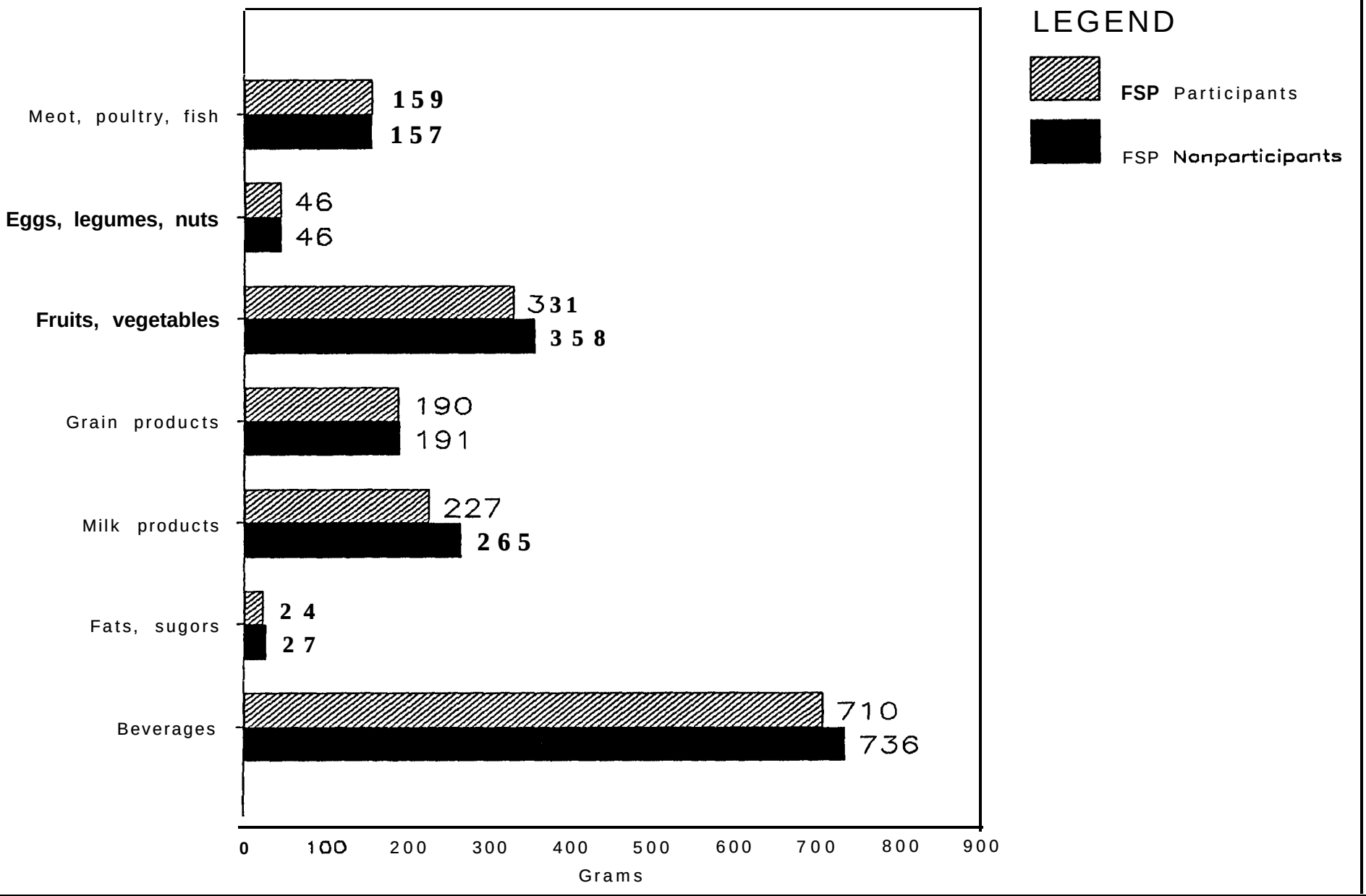
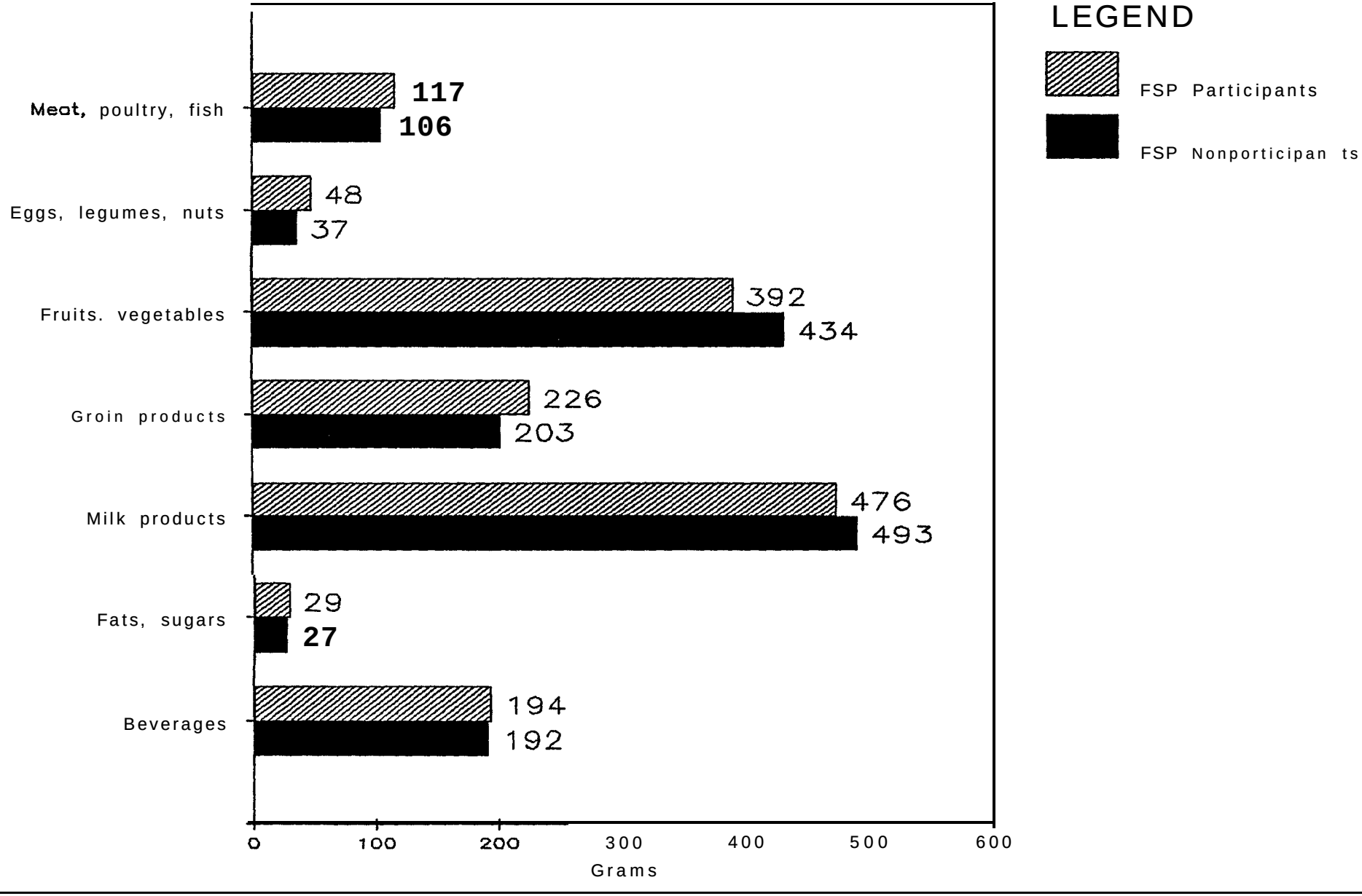


FIGURE III.9
FOOD INTAKE BY CHILDREN AGES 1 TO 5 BY FOOD GROUP:
MEAN PER INDIVIDUAL PER DAY, FOUR NONCONSECUTIVE DAYS OF DATA
(Source: NFCS-Continuing Survey of Food Intakes by Individuals, 1986)



the previously discussed findings on differences in nutrient intake among all individuals in low-income households. For three of the seven food groups (meat, poultry, and fish, eggs, legumes, and nuts; and grain products), the average intake by women in participating households is virtually the same as that by women in nonparticipating households. The average intake of foods from the other four groups by women in participating households is between 4 percent and 14 percent less than that by women in nonparticipating households. Young children in participating households have a substantially greater average intake of foods from three of the seven food groups (meat, poultry, and fish; eggs, legumes, and nuts; and grain products), a substantially smaller average intake of fruits and vegetables, and a similar average intake of foods from the remaining three groups, compared with young children in nonparticipating households.

## D. SUMMARY

The following are selected findings on the differences between FSP recipients and low-income nonrecipients from the studies discussed in detail in this chapter.

- Food Expenditures. Data from the interview component of the 1984-85 Consumer Expenditure Survey show that FSP participating households spend a larger portion of their total expenditures on all food items than do nonparticipating households; however, nonrecipients have larger expenditure shares for food bought and consumed away from home.

  The USDA Survey of Food Consumption by Low-Income Households, 1979-80, was the basis for a study which showed that, although the average money value of food used at home per household member is greater for food stamp recipients, nonrecipients spend about twice as much per household member on food bought and used away from home, thus causing the gap between the two groups in total money value of food used per household member to be small. Another study based on the same data set showed that, when household size is measured on the basis of "equivalent nutrition units" (a measure of household size that controls for the age-and-sex-based differences in nutritional requirements of household members, meals eaten away from home, and meals served to guests), the average money value of food used at home per ENU is 11 percent higher for participating than for nonparticipating households.

- Nutrients per Dollar's Worth of Food. Relative to low-income nonrecipients, food stamp recipients obtain more of most nutrients per dollar's worth of food used at home. Thus, the food used at home by recipients has a greater money value per person and provides more nutrients per dollar than does the food used by nonrecipients.

- Home Food Use by Food Grotto. A study based on the 1979-80 USDA data also showed that, overall, home-food use patterns are similar for participating and nonparticipating households when measured in terms of the share of home food expenditures allocated to each of seven food groups. However, recipients spend a larger percentage of the average home-food dollar on meat, poultry, and fish than do nonrecipients, while nonrecipients spend a larger percentage on grain products and on fruits and vegetables.

- Frequency of Food Shopping. The same study showed that food stamp recipients are far more likely than nonrecipients to conduct their major food shopping on a monthly basis, while most nonrecipients shop for food on a weekly basis.

- Perceived Food Adequacy. Another finding of that study was that, although the majority of both food stamp recipients and nonrecipients report having adequate supplies of food, more recipients than nonrecipients report sometimes or often not having adequate supplies of food (24 percent of recipients, compared with 8 percent of nonrecipients).

- Nutrient Availability, According to the 1979-80 USDA data, the average availability of each of twelve selected nutrients exceeds the RDA for both participating and nonparticipating households; for all of the nutrients, availability relative to the RDA is higher for recipients than for nonrecipients.

- Nutrient Intake. The 1979-80 USDA data also show that the mean nutrient intake by individuals in low-income households is less than the RDA for four of twelve selected nutrients for nonrecipients and for five of the twelve nutrients for recipients.

  Another finding from the 1979-80 USDA data is that the intake of three of the twelve selected nutrients by recipients exceeds that by nonrecipients by more than 10 percentage points (relative to the RDA), and for none of the nutrients is its intake by recipients substantially less than its intake by nonrecipients.

  Data from the 1986 Continuing Survey of Food Intakes by Individuals reveal differences in nutrient intake among demographic groups; for example, among young children, food stamp recipients have higher average intakes of most nutrients than do nonrecipients, whereas among

women ages 19 to 50, food stamp recipients have slightly lower intakes of ten of the twelve nutrients than do nonrecipients.

- Individual Food Intake by Food Group. The 1979-80 USDA data show that the average intake of foods from six of seven selected food groups by individuals in households that participate in the FSP is smaller than that by individuals in nonrecipient households.

  Data from the 1986 Continuing Survey of Food Intakes by Individuals show that young children in participating households have a greater average intake of foods from three of the seven food groups, a roughly equal average intake from three food groups, and a smaller average intake from two food groups than young children in nonparticipating households. Average food intake for women in participating households is similar to that of women in nonparticipating households for three of the food groups, and smaller than that of women in nonparticipating households for four food groups.

# IV. THE EFFECTS OF FOOD STAMPS ON FOOD EXPENDITURES

The economic theory of household consumption behavior predicts that food stamp benefits will tend to increase both the food and nonfood expenditures of recipients. A particular application of general consumer theory, developed by Southworth (1945), further predicts that food stamp benefits may lead to greater spending on food than does an equal amount of cash income. That is, due to the coupon form of the benefit, some recipient households may be "constrained" to spend more on food than they would actually prefer given their level of total resources. If a large proportion of participating households are "constrained," then the model provides a basis for asserting that food stamps exert an overall effect on the food spending of participants that is greater than that of an equivalent cash transfer. Conversely, if only a small proportion of participants are "constrained," then the model predicts that the overall effect of food stamps on food spending is only slightly greater than the overall effect of an equivalent cash transfer. Appendix A provides a more detailed review of Southworth's model.

Since the total desired food spending of constrained households is less than the amount of their food stamp benefit, they will make few if any cash purchases of food for home use. Empirically, only a small proportion of participating households (perhaps 10 to 15 percent) report little or no cash food purchases and thus may be "constrained" as defined in the context of the Southworth model.[19] In this circumstance, the model's prediction is clear-cut: the overall effect of food stamps on food expenditures will be very similar to the overall effect of regular income, exceeding the latter only by a small margin at most.

[19] On the basis of data from the 1979 wave of the PSID, Senauer and Young (1986) estimate that 14 percent of food stamp recipients make no cash purchases of food and, thus, in the framework of Southworth's model, are constrained in their consumption behavior. See Appendix A for additional empirical findings on this topic.

Since the early 1970s, a large number of empirical studies have estimated the effects of food stamps and of regular income on the food spending of participating households. The Southworth model has been cited frequently in this literature. However, in nearly every case, the empirical findings on the effects of food stamps have failed to confirm the model's central prediction that the food-expenditure effects of food stamps and regular cash income are approximately equal. Rather, these studies have consistently found a substantially greater marginal effect on food spending from food stamps than from regular income.[20]

Consequently, it is fair to say that no currently existing theoretical model explains the much greater observed effect of food stamps than of regular income on the food spending of participating households. This anomalous situation might be explained within the framework of the Southworth model if:

- the consumption behavior of many more participating households is in fact "constrained" than appears on the basis of monthly or annual data (e.g., for certain periods of each month); or
- the empirical findings are consistently misleading due to strong, undetected self-selection bias that leads to spuriously high estimates for food spending out of program benefits, or due to other errors in how the empirical model is specified or how the analytic variables are measured

Modem developments in consumption theory may provide several potentially fruitful avenues for addressing this problem, since they incorporate additional dimensions of consumption behavior (e.g., the household production-function approach); but such developments have not yet been explored in depth in the food stamp literature.

[20]In the 17 studies reviewed in the remainder of this chapter, the estimated marginal effect on the food spending of participating households from a given increase in food stamps exceeds the estimated effect of a comparable increase in regular income by approximately 2 to 10 times (excluding the two most extreme values). The median value is a 3.8 times greater marginal effect from food stamps than from cash income.

The previous chapter reviewed a number of descriptive findings on the food expenditures of food stamp recipients and eligible nonrecipients. Those findings fail to show conclusively whether food stamps are effective at increasing food expenditures, and they do not address whether food stamps are more effective than cash assistance at increasing food expenditures. This chapter reports on the application of econometric models for analyzing the effectiveness of food stamps at increasing food expenditures, both absolutely and relative to cash assistance.

## A. A FRAMEWORK FOR ESTIMATING THE EFFECTS OF FOOD STAMPS ON FOOD EXPENDITURES

### 1. Research Strategies

Descriptive studies of the food consumption of food stamp recipients and low-income nonrecipients, such as those reviewed in the previous chapter, generally do not provide a reliable indication of the actual effect of food stamps on food consumption because they do not control for nonprogrammatic differences between food stamp recipients and eligible nonrecipients. Differences in income and other observable characteristics, as well as differences in unobservable characteristics, such as an awareness of nutritional requirements, may influence food consumption in ways that exaggerate or mask differences that are attributable to the form and amount of the food stamp benefit. Two alternative research strategies are available to control for the effects of nonprogrammatic differences:

- Classical experimentation may entail assigning food stamp assistance randomly to some eligible households but not to others, or assigning food coupons randomly to some participating households and cash assistance to others. In either case, the random assignment of benefits ensures that no systematic differences exist between the treatment and control groups other than the amount and/or form of the food assistance benefit.

- Multivariate statistical techniques, primarily regression analysis and related econometric techniques, may be used to estimate the effects of the amount or form of the food assistance benefit on food consumption while controlling for differences in both the observable and unobservable

characteristics of sample households that may influence their consumption behavior.

Of the two strategies, classical experimentation has the potential of generating the more reliable results. However, a classical experiment cannot be implemented within the context of the Food Stamp Program if it entails withholding assistance to some eligible applicants, and it requires waiving certain program regulations if it entails changing the form of the benefit. These restrictions, combined with the high cost of implementing a social experiment, mean that classical experimentation is rarely a realistic research strategy for food stamp research.

The use of multivariate statistical techniques is less expensive and less intrusive on program participants than is classical experimentation. All but two previous studies and three on-going studies have relied on this analytic strategy to estimate the food-consumption effects of food stamps. Unfortunately, several problems are associated with using multivariate analysis which may introduce considerable uncertainty or even bias into the estimates of the effects of food stamps that are generated with these procedures. Among these problems are the following:

- Model specification. The success of regression analysis and related multivariate statistical procedures at generating reliable estimates of the effects of food stamps on food consumption depends heavily on the reasonableness and completeness of the underlying empirical model. Unfortunately, Southworth's theoretical model of household food consumption provides little guidance on such basic issues as the choice and specification of variables to be included in the empirical model, or on more esoteric issues, such as how the household budget constraint should be incorporated in the empirical model. Given this lack of guidance from the theory, most researchers have specified and estimated simple linear models of food consumption. The naivete of these models casts doubt on the reliability of the consequent estimates of the effects of food stamp on food consumption.

- Functional form. Even if a sound theoretical or other basis exists for believing that a variable affects household food consumption, there may be uncertainty about the functional form in which the variable should enter the empirical model. For example, household income is included among the explanatory variables in every multivariate model of food consumption that we have reviewed; however, there is considerable

disagreement about whether income should enter the food consumption equation linearly, log-linearly, or quadratically. An equal diversity -of opinion exists about the appropriate way to control for the consumption effects of the number, age, and sex of household members. Estimates of the effects of food stamps on food consumption may be sensitive to these and other functional-form decisions.

- Selection bias. Participants in the FSP may differ from eligible nonparticipants in ways that cannot readily be measured. For example, participants may derive more satisfaction from the consumption of food than do eligible nonparticipants or may feel a greater desire to improve their families' diets. Standard multivariate regression has the capacity to generate estimates of food stamp effects that are unbiased by observed differences between participants and eligible nonparticipants; however, those estimates are subject to "selection bias" arising from unobserved differences. Procedures developed by Heckman (1978 and 1979), Heckman and Robb (1985), and others have been used to control for selection bias in food consumption analyses (e.g., Chen, 1983; and Devaney and Fraker, 1989). However, implementing these procedures can be expensive, and they have restrictive data requirements which often are not satisfied.

General-purpose surveys of household labor-force and consumption behavior, such as the Panel Study of Income Dynamics, the Consumer Expenditure Survey, and the Nationwide Food Consumption Survey, have provided the basis for most existing estimates of the effects of food stamps on food consumption. These data were not collected in an experimental context; consequently, the researchers who use them must rely on multivariate statistical procedures to estimate the effects of food stamps on food consumption. Those estimates may be subject to bias and uncertainty from the above sources, as well as from other sources that are noted below.

## 2. Specification of an Empirical Model of Food Expenditures

We reviewed 17 studies in which multivariate regression analysis or related econometric techniques were used to estimate the effects of food stamps on food expenditures by households. No two of the empirical models underlying those studies are the same; however, most represent some variant of the following basic model of household food expenditures:

(1) $FOODCOST = a_1 + a2 \times BEN + a3 \times INC + a4 \times SIZE + XB + e,$

where FOODCOST is the money value of food used at home, BEN is the net food stamp benefit amount,"' INC is money income, X is a vector of control variables (e.g., the race, ethnicity, and education of the principal meal preparer), a,. .. $a_4$ are individual regression coefficients, B is a vector of regression coefficients, and e is a random disturbance term.

In this basic specification of the food expenditure model, the coefficients $a_2$ and $a_3$ are the marginal propensities to consume food ($MPC_f$) out of food stamps and income, respectively. Regression estimates of these coefficients, in conjunction with their standard errors, can be used to test hypotheses generated by economic theory about the effects of cash income and food coupons on household food expenditures.

The studies that we reviewed exhibited several noteworthy differences in the specification of the food expenditure model. In some of the studies, FOODCOST, BEN, and INC are measured on either a per-person basis (e.g., Salathe, 1980b; and Smallwood and Blaylock, 1985) or a per-adult-equivalent-person basis (e.g., Hymans and Shapiro, 1976; Brown, Johnson, and Rizek, 1982; and West, 1984). In other studies, those variables are not adjusted as such for household size and composition, although other means may be used to control for the effects of those factors (e.g., Benus, Kmenta, and Shapiro, 1976; Neenan and Davis, 1977; and Chen, 1983). SIZE may be a simple count of household members (West, Price, and Price, 1978; and Chen, 1983), or it may be the number of adult male equivalents in the household (Hymans and Shapiro, 1976; Basiotis et al., 1987; Senauer and Young, 1986; and Devaney and Fraker, 1989). To better capture the expenditure effects of household members in different age categories, some studies

[21]In studies based on data collected prior to the elimination of the food stamp purchase requirement, BEN is the food stamp bonus value--the difference between the face value of the coupons actually received by the household and the amount that the household paid for those coupons. In studies based on post-EPR data, BEN is simply the face value of food coupons received by the household.

use variables that reflect a household's stage in its "life-cycle" (e.g., Allen and Gadson, 1983; and Neenan and Davis, 1977) or that measure the proportion of household members in specified age categories (e.g., Salathe, 1980; and Smallwood and Blaylock, 1985). Benus, Kmenta, and Shapiro (1976) and Chavas and Yeung (1982) use counts of the number of household members in each of five age categories in lieu of SIZE.

The studies that we reviewed also differ according to the functional form in which income and the food stamp benefit enter the food expenditure model. They are roughly equally divided according to whether income enters the expenditure model linearly, as shown in Equation (1) (e.g., Johnson, Burt, and Morgan, 1981; and Devaney and Fraker, 1989), log-linearly (e.g., West and Price, 1976; and West, 1984), or quadratically (e.g., Allen and Gadson, 1983; and Basiotis et al., 1987). The log-linear and quadratic specifications are intended to capture any tendency for the $MPC_f$ out of income to be smaller among households with larger amounts of income. In a majority of the studies, the food stamp benefit enters the model linearly (e.g., Brown, Johnson, and Rizek, 1982; and Chavas and Yeung, 1982); however, it appears in quadratic form in the models specified by Basiotis et al. (1983 and 1987). In the models specified by Neenan and Davis (1977) and West (1984), the food stamp benefit appears linearly and is also interacted with household income. The interaction term allows for the possibility that the $MPC_f$ out of food stamps may vary with the amount of cash income. The model developed by Benus, Kmenta, and Shapiro (1976) uses a Box/Cox transformation to capture the specific degree and form of nonlinearity indicated by the data for each of the key variables--food expenditures, price, and income. Hymans and Shapiro (1976) estimate both linear and double logarithmic models of food consumption, and Senauer and Young (1986) also use the double logarithmic form in their

modeling.[22] This form provides great flexibility, allowing the model to be nonlinear in all of its parameters.

The differences across studies in the manner in which income, benefits, and household size and composition enter the empirical food expenditure model contribute to the diversity in reported estimates of the $MPC_f$ out of income and food stamps. The variation in reported $MPC_f$ estimates is also due to (1) the different control variables (i.e., the X vector in Equation (1)) that are used across studies, (2) the different data sets that are used to estimate the models, (3) the fact that the models are estimated with samples that represent different segments of the population (e.g., food-stamp-eligible households, food stamp participants, and all households), and (4) other factors, such as whether the estimation process uses the sample weights or deals with the potential problem of sample selection bias. Two early studies based on the Michigan Panel Survey of Income Dynamics differ further from all the subsequent studies in that they estimate models on the basis of multiple years of data and estimate long-run equilibrium or steady-state food expenditure responses rather than more immediate single-period effects (Hymans and Shapiro, 1976; and Benus, Kmenta, and Shapiro, 1976).

## B. HOW EFFECTIVE ARE FOOD STAMPS AT INCREASING FOOD EXPENDITURES?

Each of the studies on the effects of food stamps on food expenditures that we reviewed provides estimates of the $MPC_f$ out of food stamps and income and their associated standard errors. This section reviews the estimates of the effects of food stamps on food expenditures from these studies. The next section compares those estimates with estimates of the effects of

[22] In a double logarithmic model, both the dependent and the independent variables appear in logarithmic form. This is in contrast to a logarithmic model in which only one or more independent variables appear in logarithmic form.

cash income on food expenditures and considers the implications of the differences for the effectiveness of food coupons versus cash assistance at increasing food expenditures.

1. Estimates of the $MPC_f$ Out of Food Stamps

Many of the 17 studies that we reviewed provide more than one estimate of the $MPC_f$ out of food stamps. Some of the studies provide multiple estimates because they use the same model to generate estimates with two or more different samples drawn from the same data set (e.g., West, 1984); others estimate alternative models with the same sample (e.g., Brown, Johnson, and Rizek, 1982), and still others estimate the same model with similarly defined samples drawn from two different data sets (Chen, 1983; and Senauer and Young, 1986). Devaney and Fraker (1989) obtain two different estimates of the $MPC_f$ by using weighted and unweighted data to estimate a single model with the same sample. From among the many estimates provided by these studies, we have chosen to display those that were generated with what we believe are the most defensible procedures. They are shown in Table IV.1.[23]

The existing estimates of the $MPC_f$ out of food stamps that are reproduced in Table TV.1 vary greatly in size, ranging from .17 (Johnson, Burt, and Morgan, 1981; West, 1984, and Basiotis et al., 1987) at the low end, to .64 (Hymans and Shapiro, 1976) and .86 (Berms, Kmenta, and Shapiro, 1976) at the high end. The two highest estimates are clearly outliers, since the third highest estimate is .47 (West, 1984), and three other estimates are in the range of .42 (Devaney and Fraker, 1989) to .45 (Neenan and Davis, 1977; and West 1984).

There are several reasons why the Hymans-Shapiro and Benus-Kmenta-Shapiro estimates differ substantially from those found in the other studies reviewed:

[23]Two entries in Table IV.1 appear for the studies by Chen (1983) and by Senauer and Young (1986) because each of these studies provides one set of estimates of the effects of income and food stamps on food expenditures based on pre-EPR data and a second set of estimates based on post-EPR data.

TABLE IV.1

ESTIMATES OF THE MARGINAL PROPENSITY TO CONSUME FOOD ($MPC_f$) AT HOME, FROM SELECTED STUDIES

| Study | Data Set | Target Group: Sample Size | | $MPC_f$ out of: Food Stamps | Money Income |
|---|---|---|---|---|---|
| | | **STUDIES BASED ON PRE-EPR DATA** | | | |
| Benus, Kmenta, and Shapiro (1976) | 1968-72 Michigan PSID data | All households; n = 3,300 | | .86 | .05 |
| Hymans and Shapiro (1976) | 1968-72 Michigan PSID data | All households; | | | |
| | | 1st half sample, n = 1,659 | linear | .35 | .14 |
| | | | logarithmic | .29 | .24 |
| | | 2nd half sample, n = 1,659 | linear | .64 | .17 |
| | | | logarithmic | .30 | .23 |
| | | Full sample | logarithmic | .29 | .23 |
| West and Price (1976) | 1972-73 saqle of Washington State households with children ages 8-12 years | All households; n = 992 | | .37 | .05 |
| Neenan and Davis (1977) | 1976 sample of households in Polk Co., Florida | FSP participants; n = 123 | | .45 | .06 |
| West, Price, and Price (1978) | 1972-73 sample of Washington State households with children ages 8-12 years | FSP eligibles: n = 331 | | .31 | .03 |
| Salathe (1980b) | 1973-74 Consumer Expenditure Diary Survey | FSP eligibles; n = 2,254 | | .36 | .06 |
| Johnson, Burt, and Morgan (1981) | 1977-78 LI supplement to the NFCS | FSP eligibles: n = 3,800 | | .17 | .06 |
| Brown, Johnson, and Rizek (1982) | 1977-78 LI supplement to the NFCS | FSP participants: n = 911 | | .45 | .05 |
| Chavas and Yeung (1982) | 1972-73 Consumer Expenditure Diary Survey | FSP eligibles in South: n = 659 | | .37 | .13 |
| Allen and Gadson (1983) | 1977-78 LI supplement to the NFCS | FSP eligibles; n = 3,850 | | .30 | .08 |
| Chen (1983) | 1977-78 LI supplement to the NFCS | FSP participants; n = 1,809 | | .20 | .09 |
| West (1984) | 1973-74 Consumer Expenditure Diary Survey | FSP participants: n = 587 | | .17 | NA |
| | | FSP eligibles; n = 2,407 | | .47 | NA |
| Smallwood and Blaylock (1985) | 1977-78 LI supplement to the NFCS | FSP eligibles; n = 2,852 | | .23 | .10 |
| Senauer and Young (1986) | 1978 Michigan PSID data | FSP participants: n = 573 | | .33 | .05 |
| Basiotis, Johnson, Morgan, and Chen (1987) | 1977-78 LI supplement to the NFCS | FSP eligibles; n = 2,950 | | .17 | .10 |
| Devaney and Fraker (1989) | 1977-78 LI supplement to the NFCS | FSP eligibles: n = 4,473 | | | |
| | | Weighted data | | .42 | .08 |
| | | Unweighted data | | .21 | .07 |

TABLE IV.1 (continued)

| Study | Data Set | Target Group: Sanule Size | MPC, out of: Food Stamps | MPC, out of: Money Income |
|---|---|---|---|---|
| | | **STUDIES BASED DN POST-EPR DATA** | | |
| Chen (1983) | 1979-80 LI supplement to the NFCS | FSP participants; n = 1,630 | .23 | .11 |
| Senauer and Young (1986) | 1979 Michigan PSID data | FSP participants; n = 574 | .26 | .07 |
| Fraker, Long, and Post (1990) | 1985 Continuing Survey of Food Intake by Individuals | FSP & WIC eligibles: n = 515 | .29 | .05 |

NOTE: Table C.l provides additional information on the estimates shown in this table.

- As noted, these two studies are unique because they use multiple years of data The Hymans and Shapiro study uses average values of the first five years of PSID data (1968-72), thus estimating long-run average or steady-state MPCs. Benus, Kmenta, and Shapiro estimate a dynamic-adjustment model with the same data, drawing on both their cross-sectional and their longitudinal aspects.

- The Berms-Kmenta-Shapiro estimate of the $MPC_f$ out of food assistance benefits of .86 reflects the full long-run or steady-state responses of households to changes in food stamp (and other food subsidy) benefits. The study does not report an explicit value for the corresponding single-year impact, which would be comparable to the $MPC_f$ estimates reported in all the subsequent cross-sectional studies in the literature. However it does note that the estimated steady-state MPCs reported are approximately twice as large as the corresponding initial-impact MPCs.

- Hymans and Shapiro estimate their linear and double logarithmic models of food expenditures twice, with two randomly selected half-samples drawn from the 1968-72 PSID, and also estimate the better-fitting double logarithmic model with the full sample. With the linear model, the first half sample yields an estimate of the $MPC_f$ for low-income urban households of .35, whereas the second half sample yields the outlier estimate of .64 for similar households. In contrast to the instability of the $MPC_f$ estimates produced by the linear model, the double logarithmic model generates estimates of the $MPC_f$ that are highly stable (.29 to .30) across the two half samples and the full sample.

- The income and food stamp benefit variables used in both of the early studies based on the PSID differ substantially from those used in all later studies. For example, the basic income variable excludes welfare and nonwelfare transfers, but includes several imputed income elements not feasible with other data sets. The variable for food subsidy benefits includes, in addition to food stamp benefits, subsidized meals received at school or work and other food assistance program benefits.

With the exception of the two outliers, the estimates of the $MPC_f$ out of food stamps are roughly evenly distributed over the range of .17 to .47, indicating that a one-dollar increase in the face value of the food stamp benefit of a typical recipient household would lead to additional food expenditures of between $.17 and $.47. All these estimates differ significantly from zero at levels of statistical precision that are customarily used in hypothesis-testing. Thus, these studies unanimously confirm the expectation from economic theory that food stamps have a positive effect on household food expenditures.

We are not aware of any pattern in the existing estimates which suggests that the actual current value of the $MPC_f$ out of food stamps is more likely to be in one segment of the range of estimates than in another. For example, on the basis of theoretical considerations, we expect that the $MPC_f$ out of food stamps would be smaller after the EPR than before the EPR, because the consumption choices of a smaller proportion of post-EPR recipients are constrained by the coupon form of the benefit. However, the three estimates that are based on post-EPR data range from .23 to .29 and are only slightly toward the low end of the distriiution of all estimates of the $MPC_f$ out of food stamps.

2. Critiaue of the Estimates

We have sound reasons to believe that the estimates shown in Table TV.1 vary in terms of their reliability as estimates of the current $MPC_f$ out of food stamps. All but three of the estimates are based on data that were collected prior to the EPR, and, as noted, there is a theoretical basis for believing that the EPR led to a downward shift in the $MPC_f$ out of food stamps; hence, were it not for the scarcity of estimates based on post-EPR data, the pre-EPR estimates would now be of historical interest only. As it is, those estimates should be regarded as unreliable estimates of the current $MPC_f$ and as having a high probability of containing positive bias.

The current relevance of the estimates provided by the first five studies cited in Table IV.1 is especially open to question. Those studies are based on data that were collected, at least in part, prior to the adoption of uniform national standards for food stamp eligibility and benefits (Benus, Kmenta, and Shapiro, 1976; and Hymans and Shapiro, 1976), or which are representative of selected demographic groups in limited geographic areas (West and Price, 1976; Neenan and Davis, 1977; and West, Price, and Price, 1978).

With the exception of the studies by Chen (1983), Devaney and Fraker (1989), and Fraker, Long, and Post (1990), all of the cited studies neglect the potential problem of sample selection bias. That is, they neglect the possibility that estimates of the $MPC_f$ out of food stamps may be biased by the fact that decisions to participate in the FSP are made voluntarily by eligible households, and that the underlying food expenditure patterns of those who choose to participate may differ from those of persons who choose not to participate. Furthermore, with only a few exceptions (e.g., Basiotis et al., 1987; Devaney and Fraker, 1989, and Fraker, Long, and Post, 1990), the effects of other food assistance programs are not explicitly incorporated into the empirical food expenditure models, thus introducing the possibility that the estimated effect of food stamps is positively biased because the food stamp benefit amount and the amount of other food assistance are correlated.

None of the reviewed studies deals with the fact that the data that form the basis for the model estimates were obtained largely from complex sample surveys in which the households that were interviewed had varying probabilities of being selected into the survey samples. Two notable issues are associated with analyzing data from such surveys. The first is whether the sample weights should be used in the model estimation process. Devaney and Fraker (1989) show that the estimate of the $MPC_f$ out of food stamps that is generated by applying a conventionally specified model of food expenditures to data from the Low-Income Supplement to the 1977-78 NFCS is nearly twice as large when the sample weights are used as when they are not. Whether or not sample weights were used may account for much of the variability in the NFCS-based estimates reported in Table IV.l. In a comment on the Devaney-Fraker article, Kott (1990) notes that the difference between weighted and unweighted estimates may be due to differences in the $MPC_f$ out of food stamps between recipient household who live in areas that exhibit low poverty rates and those who live in areas that exhiiit higher poverty rates. The area poverty rate was a key sample stratifier in the 1977-78 NFCS and, hence, was used to derive the sample

weights for the survey. Low-income households located in low-poverty areas were undersampled in the NFCS; the sample weights can be used to increase the relative importance of such households in statistical analyses. Kott's hypothesis is plausible, but no research results exist to either confirm or refute it. If correct, his hypothesis would imply that the effectiveness of food stamps at increasing household food expenditures varies with the prevailing poverty rate in the neighborhoods of food stamp recipients, being relatively less effective where the poverty rate is high.

The second issue associated with the statistical analysis of complex sample survey data is that varying probabilities of selection into a sample can create design effects which, if not corrected for in the estimation process, can bias standard errors of regression coefficients (see DuMouchel and Duncan, 1983). The estimated coefficients themselves are not influenced by design effects; however, the problematic standard errors may be a source of bias when the estimated coefficients are used to test hypotheses about the effects of food stamps and cash income. That bias may be present regardless of whether the sample weights are used in the estimation process. Design effects are a potential problem in all of the studies cited in Table IV.1 that are based on nationally representative data sets (i.e., the NFCS, PSID, CEX, and CSFII). There is no indication that steps were taken to correct for design effects in any of those studies; therefore, some unknown amount of bias may be associated with all tests of hypotheses about the MPC, out of food stamps that are based on the statistical results generated by those studies. From a practical perspective, most of the estimates of the $MPC_f$ are sufficiently large that a moderate amount of bias in the standard errors would be unlikely to affect the qualitative results of a test of whether food stamps have a positive effect on household food expenditures. Such bias may be more important in tests of whether the $MPC_f$ out of food stamps is larger than the $MPC_f$ out of cash income.

## C. ARE COUPONS MORE EFFECTIVE THAN CASH BENEFITS AT INCREASING FOOD EXPENDITURES?

**Those** who favor providing food assistance in the form of negotiable checks (i.e., "cash benefits") use three main points to support their position: (1) that providing benefits in the form of cash may enhance the administrative efficiency of the program; (2) that cash benefits may eliminate opportunities for fraud and abuse that are associated with the distribution and handling of coupons; and (3) that the welfare of recipients may be enhanced by the additional flexibility that cash benefits introduce into household budgets. Countering these points is the concern that a cash-based program may not be as effective as a coupon-based program at achieving the basic objectives of the FSP, as stated in the Food Stamp Act of 1977, of "establishing and maintaining adequate national levels of nutrition" (7 CFR 271.1). Central to this concern is whether cash food assistance would be as effective as coupons at increasing food expenditures by recipient households.

Most of the existing research on food expenditures by low-income households provides only indirect evidence about the effectiveness of cash food assistance at increasing food expenditures. This indirect evidence comes from studies that have generated estimates of the effect of general cash income or particular types of cash income on food expenditures, such as the studies cited in Table IV.l. The theory of household food expenditures, as reviewed in Appendix A, provides no basis for asserting that the effects of ordinary cash income and of cash food assistance differ in any way. Hence, estimates of the effects of regular cash income on food expenditures have frequently been taken to be appropriate proxies for unavailable direct estimates of the effects of cash food assistance. However, the existing theory provides uncertain guidance on this question, since the theory is unable to explain why the observed effect of food stamps on food expenditures is so much greater than that of regular cash income.

Direct evidence about the effectiveness of cash food assistance at increasing household food expenditures is available only for food assistance recipients in Puerto Rico and for elderly

recipients of both SSI and food stamps in four counties in New York, South Carolina, and Oregon. This evidence comes from FNS-sponsored evaluations of Puerto Rico's Nutrition Assistance Program (NAP) (Beebout et al., 1985; and Devaney and Fraker, 1986) and the SSI/Elderly Food Stamp Cashout Demonstration (Blanchard et al., 1982; and Butler, Ohls, and Posner, 1985). Beginning in 1980 in selected sites, the SSI/Elderly Food Stamp Cashout Demonstration provided elderly recipients of both SSI and food stamps with a single combined benefit check NAP is an on-going program which has been providing cash food assistance to low-income households in Puerto Rico since 1982. Neither of the evaluations found statistically significant differences in the effects of coupons and cash assistance on food expenditures. However, the research designs for those evaluations and the specialized populations that were studied greatly reduce the relevance of the findings for the full food stamp caseload in the mainland United States. These two food stamp cashout studies are reviewed in more detail in Section C.2., below.

Due to the limitations of existing direct and indirect studies of the effects of cash food assistance on food expenditures, any prediction made on the basis of findings from those studies about the effects of cashout on food expenditures by all food stamp recipients would be subject to a very large margin of error. FNS is currently conducting evaluations of food stamp cashout demonstrations in multiple sites that should greatly improve the quality of the information base for assessing the effectiveness of cash food assistance versus food coupons at increasing food expenditures.

### 1. Findings from Non-Cashout Studies

Each study cited in Table IV.1 provides an estimate of the $MPC_f$ out of ordinary cash income and, hence (according to the received theory), an indirect estimate of the $MPC_f$ out of cash food assistance. Those estimates are subject to remarkably little variation relative to the

variation in estimates of the MPC, out of food stamps from the same studies. The estimates of the $MPC_f$ out of ordinary cash income range from .03 to .17, with three-fourths of the estimates falling in the range of .05 to .10. The consistency of these estimates permits us to conclude with a high degree of confidence that an additional dollar of regular income will prompt an average low-income household to increase its expenditures on food by an amount ranging from $.05 to $.10.

The two early studies from PSID data provide additional estimates that are pertinent to ascertaining the likely effect of cash assistance grants on food spending. Each of these studies provides $MPC_f$ estimates from several different types of income, including cash welfare transfers (Hymans and Shapiro, 1976) and cash welfare-plus-social-insurance transfers (Benus, Kmenta, and Shapiro, 1976). These estimates show that cash welfare (and non-welfare) transfers have a marginal effect on household food spending that is somewhat greater than that of regular income, but is much closer to the effect of regular income than to the effect of in-kind food assistance benefits_

A study-by-study examination of the estimates presented in Table IV.1 reveals that the estimated $MPC_f$ out of food stamps is generally two to ten times larger than the estimated $MPC_f$ out of regular income.[24] For the post-EPR studies, the range of the estimated marginal effect of food stamps is two to six times greater than that of regular income. Thus, a substantial body of empirical findings exists which indicates that food stamps are much more effective than ordinary cash income at increasing food expenditures by low-income households.

[24]The range given for the ratio of the $MPC_f$ out of coupons to the $MPC_f$ out of income is based upon findings from all of the studies cited in Table IV.1 except that by West (1984), which produced no estimate of the $MPC_f$ out of cash income. The range of values for this ratio is 1.3 to 17.2, with two values less than 2.1 and one value greater than 10.3; the remaining sixteen values are between 2.1 and 10.3. The studies by Chen (1983), Senauer and Young (1986), and Devaney and Fraker (1989) each provided two values of the ratio. The value of the ratio for the study by Hymans and Shapiro (1976) is based upon the estimates that they obtained by applying a logarithmic model to their full sample.

Despite the fact that the theory of household food expenditures indicates that cash food assistance and ordinary cash income have identical effects on food expenditures, our confidence in the existing estimates of the $MPC_f$ out of ordinary cash income does not necessarily translate into confidence in those estimates as indirect estimates of the $MPC_f$ out of cash food assistance. Several reasons explain why cash food assistance may have a different effect on food expenditures than does ordinary cash income:

1. A basic assumption underlying the theory of household food expenditures is that the members of a household agree on the household's consumption priorities. In reality, this may not be the case.[25] For example, the female head of a household may place a higher priority on food consumption than does the male head or their adolescent children. If the food assistance check is made out to the female head, whereas paychecks are made out to a variety of household members, then the female head may have more influence on how the food assistance benefit is spent than she does on how the paychecks are spent. Thus, the $MPC_f$ out of cash food assistance might exceed the $MPC_f$ out of ordinary cash income.

2. A household's knowledge of the intended purpose of a food assistance check may influence how it spends the proceeds from that check For example, the household may perceive that the money provided by the check constitutes its food budget for the month and set that money aside for the purchase of food. Thus, the $MPC_f$ out of cash food assistance might exceed the $MPC_f$ out of ordinary cash income.

3. Many low-income households, especially those with wage and salary income, receive ordinary cash income on a weekly or biweekly basis, whereas they would presumably receive cash food assistance on a monthly basis. Just as food stamp receipt may precipitate splurges in household consumption, so might the receipt of a single monthly cash food assistance benefit. If that were the case, and if households were to splurge on different goods than those that they would normally purchase, then the $MPC_f$ out of cash food assistance could be greater than the $MPC_f$ out of ordinary cash income.

[25] In terms of the formal economic theory of Appendix A, what is being suggested is that a household may not have a single utility function; rather, each household member may have a different utility function. The possible influence of intra-household differences in utility functions on the effect of food assistance on food expenditures is noted by Senauer and Young (1986).

The existence of these and other plausible but as yet untested hypotheses about the relative effectiveness of cash food assistance versus ordinary cash income at increasing food expenditures by households detracts from our confidence in estimates of the $MPC_f$ out of ordinary cash income as indirect estimates of the $MPC_f$ out of cash food assistance. Indeed, to the extent that these hypotheses are valid, we expect that an estimate of the $MPC_f$ out of ordinary cash income would be a downwardly biased estimate of the $MPC_f$ out of cash food assistance. Thus, a comparison of the $MPC_f$ estimates in Table IV.1 for coupons and ordinary cash income is likely to provide an exaggerated indication of the effects of a switch from coupons to cash food assistance on food expenditures.

2. Findings from Food Stamp Cashout Studies

Despite their limitations, the estimates of the MPC, out of coupons and ordinary cash income generated by studies such as those cited in Table IV.1 strongly suggest that coupons would be more effective than cash food assistance at increasing expenditures on food. In addition to the empirical evidence, several arguments may be advanced to explain why the MPC, out of coupons may exceed the $MPC_f$ out of cash food assistance. Those arguments can be summarized as follows:

1. The theory of household food consumption indicates that the extent to which coupons are more effective on average than cash food assistance at increasing food expenditures is a function of the proportion of coupon recipients whose food consumption is constrained by the tied form of the benefit. A constrained household is one that would like to reduce its food consumption and increase its nonfood consumption but is prevented from doing so because food coupons can legally be used only to purchase food. The food consumption of roughly 10 to 15 percent of food stamp recipients may be constrained in this sense.

2. Food coupons may facilitate budgeting household food expenditures more carefully than is typically possible with cash food assistance.

3. Individuals within a household may have different priorities for the consumption of food relative to other goods. If such differences exist, then it is reasonable to assume that the household member in whose name the food assistance benefit is provided typically places a higher priority on food consumption than do at least some of the other members of the household. Regardless of the form of the benefit, the individual who receives it may have more control over its allocation than do other household members; however, that control may be even greater if the benefit is in the form of coupons rather than cash.[26]

Only two existing studies have directly estimated the effects of cash food assistance on household food expenditures and compared them with estimates of the effects of food coupons. Neither of those studies provides statistically significant evidence of a difference between the MPC, out of food coupons and the $MPC_f$ out of cash food assistance. Those findings suggest that the above arguments for explaining why the form of the food assistance benefit may influence food expenditures are not relevant for at least the specialized populations that were targeted by the two cashout studies. The fmdings are consistent with the theory of household food consumption, as presented in Appendix A, for "unconstrained" households.

The evaluation of the SSI/Elderly Food Stamp Cashout Demonstration (Blanchard et al., 1982; and Butler, Ohls, and Posner, 1985) used regression analysis in conjunction with a conventional model of household food expenditures to estimate the $MPC_f$ out of cash food assistance and out of coupons for elderly recipients of both SSI and food stamps in four

[26]The current Washington State welfare reform demonstration program provides evidence that can be interpreted as supporting the hypothesis that the ability of the individual who receives the food assistance benefit to control how it is spent is determined in part by the form of the benefit. In Washington State, continuing AFDC recipients in selected counties have the option at recertification of receiving their AF'DC and food stamp benefits in the form of a single combined check, or of receiving the AFDC benefit in the form of a check and the food stamp benefit in the form of coupons. Twenty percent or more of the recertified cases have opted to continue receiving food coupons, which is consistent with the hypothesis that the individual representing the household in the recertification process views coupons as a way to preserve her control over the household's food budget. Anecdotal reports also exist that in some dual-headed households the female head has control over the allocation of food coupons, while the male head has control over the allocation of cash income.

demonstration counties and four matched comparison counties. The evaluation's estimate of the $MPC_f$ out of food coupons is .12, and its estimate of the $MPC_f$ out of cash food assistance is .17. The difference between the two estimates is not statistically significant, thus indicating that the form of the food assistance benefit has no influence on the food expenditures of the low-income elderly who receive SSI.

The evaluation of Puerto Rico's Nutrition Assistance Program (Beebout et al., 1985; and Devaney and Fraker, 1986) relied on a joint model of household food expenditures and participation in a food assistance program to obtain estimates of the $MPC_f$ out of food assistance benefits by Puerto Rico households before and after the conversion to cash food assistance in 1982. The evaluation's estimates of the $MPC_f$ are .27 for coupons and .21 for cash food assistance. Because the difference between the two estimates is not statistically significant, the conclusion of the evaluation is that coupons are no more effective than cash food assistance at increasing food expenditures by low-income households in Puerto Rico.

The findings from both of the previous cashout studies are of little value in predicting the effects of a broad-based cashing out of food stamp benefits. The limitations of the findings are due to the restricted samples on which they are based (the low-income elderly and Puerto Rico households) and to research designs that are less than ideal. Most of the sample-related limitations of these studies are obvious; however, it is worth noting that Puerto Rico had an active black market in food coupons prior to the implementation of NAP. Thus, to a significant degree, a cash food assistance system was already operating in Puerto Rico prior to the official cashing-out of food stamps. Under those conditions, we would not expect that the cash issuance of benefits would have much effect on food expenditures.

The research design for the SSI/Elderly Food Stamp Cashout Demonstration called for selecting four treatment counties (one each in New York and Oregon and two in South Carolina) and four matched comparison counties from the same states. Food stamps were cashed out for

all elderly participants in the FSP in the treatment sites. This type of design is vulnerable to differences between the matched sites that may affect food expenditures. The Puerto Rico evaluation was based on data from two independent cross-sectional samples of Puerto Rico low-income households; one was selected and interviewed prior to cashout, and the other was selected and interviewed after cashout had been implemented in 1982. This type of design is vulnerable to shifts in the expenditure behavior of households that may have occurred over time independent of the cashout policy. The Puerto Rico study was especially vulnerable to such shifts because seven years elapsed between the interviewing of the first cross-section in 1977 and the interviewing of the second cross-section in 1984.

More powerful research designs exist for evaluating the effects of food stamp cashout than those used in the SSI/Elderly and Puerto Rico studies. Several are either currently being implemented in conjunction with state-initiated welfare reform demonstrations in Alabama, Washington State, and San Diego County. The findings from these demonstrations are expected to facilitate making more direct and powerful assessments of the effects of cashing out food stamp benefits than have previously been possible.

## D. SUMMARY

This chapter reviewed the economic theory of household consumption behavior as applied to food stamp receipt (the Southworth model), and discussed studies that have estimated the effects of food stamps on food consumption and expenditures. The Southworth model classifies households as constrained if they would prefer to spend less on food than the amount of the food stamp benefit, but cannot, due to the coupon form of the benefit. Unconstrained households actually spend more on food than the amount of the food stamp benefit and thus the form of the benefit is not expected to affect their food spending. This model predicts that, since only 10 to 15 percent of participating households are constrained, the food-expenditure effect of food

stamps will be very similar, on average, to that of regular income, exceeding the latter only by a small margin at most. However, empirical research has consistently found that food stamps have a substantially greater effect on food spending than does regular income.

Two research strategies for estimating the effects of food stamps on food expenditures were described: classical experimentation, which entails assigning assistance or the form of assistance randomly to the participating population, and muhivariate statistical techniques, primarily regression analysis and related econometric techniques. Most of the existing empirical research has relied on the latter strategy, although several problems associated with that strategy may introduce considerable uncertainty or bias into the estimation results. The primary data sources for the multivariate statistical studies have been the Panel Study of Income Dynamics, the Consumer Expenditure Survey, and the Nationwide Food Consumption Survey.

Seventeen multivariate regression or econometric studies of household food expenditures were reviewed. The diversity of the results from these studies stem from differences in the functional form of the food expenditure model used, the different control variables used, the different data sets used, demographic differences in the samples, and other factors. Each of the studies provides estimates of the $MPC_f$ out of food stamps and income and their associated standard errors. The estimates of the $MPC_f$ out of food stamps vary greatly, ranging from .17 to .86, although all but two outlier estimates are in the range of .17 to .47. The estimates confirm that food stamps have a positive effect on household food expenditures, indicating that a typical recipient household would respond to a one-dollar increase in the value of food stamp benefits by increasing its food expenditures by between $.17 and $.47. All but three of these studies were based on pre-EPR data; consequently, their estimates of the $MPC_f$ out of food stamps should be regarded as unreliable for the current Food Stamp Program. Nevertheless, the post-EPR estimates, which range from .23 to .29, are at neither extreme of the range of all estimates of the MPC, out of food stamps.

Another area of interest is the effectiveness of cash food assistance at increasing food expenditures relative to food coupons. Most existing research provides only indirect evidence about the effectiveness of cash benefits; since the Southworth model provides no basis for asserting that the effects of ordinary cash income and cash food assistance on food expenditures differ, estimates of the effects of the former have frequently been taken to be proxies for direct estimates of the latter. Each of the 17 studies reviewed provides an estimate of the $MPC_f$ out of ordinary cash income and thus, according to the Southworth model, an indirect estimate of the $MPC_f$ out of cash food assistance. Those estimates consistently show that an additional dollar of regular income will prompt an average low-income household to increase its food expenditures by $.05 to $.10. These studies show that the estimated $MPC_f$ out of food stamps is generally two to ten times larger than the estimated $MPC_f$ out of regular income. Since, given the low proportion of participating households that are constrained, the Southworth model predicts that food stamps will have roughly the same effect as regular income, the model is apparently erroneous. Thus, a question exists about whether the food-expenditure effects of cash benefits that are provided explicitly for the purchase of food would be more similar to the food-expenditure effects of food stamps or of regular income.

Several explanations have been advanced for asserting that cash food assistance may have a different effect on food expenditures than ordinary cash income: differences in the timing of the receipt of ordinary cash income and food assistance; household differences in who controls ordinary cash income and who controls cash food assistance; and the household's knowledge of the intended purpose of cash food assistance. Although the importance of these factors is as yet untested, they may cause an estimate of the $MPC_f$ out of ordinary cash income to be a downwardly biased indirect estimate of the $MPC_f$ out of cash food assistance.

Despite their limitations, the results of the 17 studies reviewed strongly suggest that coupons would be more effective than cash food assistance at increasing food expenditures. The

two existing studies which have estimated the effects of cash food assistance directly found that differences in the effects of coupons and cash assistance on food expenditures were not statistically significant. However, the research designs and the specialized populations of those studies (food assistance recipients in Puerto Rico and elderly recipients of both SSI and food stamps in the mainland United States) greatly reduce the relevance of the findings for the full food stamp caseload in the mainland United States. Several more powerful research designs for evaluating the relative effectiveness of coupons versus cash food assistance are currently being implemented and are expected to provide direct estimates of the effects of cashing out food stamps that are more broadly representative of the food stamp caseload.

# V. THE EFFECTS OF FOOD STAMPS ON THE QUALITY OF DIETS

A household purchases food because its members derive enjoyment from eating food and, more importantly, because food is essential to establishing and maintaining adequate levels of nutrition among the members of the household. Similarly, the objectives of the FSP extend beyond stimulating food expenditures by low-income households. In the Food Stamp Act of 1977, Congress states that it is reauthorizing the FSP in order to "alleviate. .. hunger and malnutrition" (7 CFR 271.1).

The studies reviewed in the previous chapter have shown consistently that the Food Stamp Program has positive effects on food expenditures by low-income households; however, only if those increased expenditures are accompanied by improved levels of nutrition can we be assured that the FSP is successfully alleviating malnutrition. For the most part, the existing studies of food expenditures provide little information on the nutritional effects of the FSP. The purpose of this chapter is to review a smaller body of literature which assesses the effects of the FSP on the quality of the diets of food stamp recipients. Unfortunately, because the link between dietary quality and nutritional status is tenuous, even these studies fail to show definitively whether the FSP is successful at achieving its nutritional objectives.

After briefly explaining the relationship between dietary quality and nutritional status, this chapter reviews what is currently known about the effects of the Food Stamp Program on the quality of diets. This body of knowledge is derived from two different types of empirical studies: (1) studies of the nutrients that are available in the foods used by a household from its home food supply; and (2) studies of the nutrients provided by the food that was actually eaten by household members, regardless of the source of the food.

## A. THE RELATIONSHIP BETWEEN DIETARY QUALITY AND NUTRITIONAL STATUS

Nutritional status is defined as the health condition of an individual as influenced by the intake and utilization of nutrients. It is determined by the types and quantities of foods that are ingested, as well as by how that food is digested, metabolized, stored in the body, and excreted. Malnutrition, which is impaired nutritional status, may occur in either or both of two forms: primary malnutrition may occur due to the inadequate (or excess) intake of food; secondary malnutrition may occur due to the body's impaired ability to process and use food

No single measure of nutritional status exists, nor does a methodology for synthesizing information provided by separate measures of the various signs and symptoms of malnutrition. Rather, researchers must assess an individual's nutritional status subjectively on the basis of information provided by the available dietary and health measures. The National Health and Nutrition Examination Survey (NHANES) provides useful examples of the measures that are used to assess nutritional status." NHANES collects four types of data from survey respondents that are relevant to assessing their nutritional status: (1) information on dietary intake, (2) the results of biochemical tests of the blood and urine, (3) the findings from clinical examinations for signs of nutritional problems, and (4) anthropometric measurements which may permit detecting abnormal growth patterns or obesity. The Joint Nutrition Monitoring Evaluation Committee (JNMEC) recommends that these measures be regarded merely as indicators of nutritional status (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 1986).

[27]The first National Health and Nutrition Survey (NHANES I) was conducted by DHHS from 1971 to 1974. NHANES II, which was conducted from 1976 to 1980, collected data on 20,322 individuals drawn from among the noninstitutionalized population ages 6 months through 74 years. For a detailed description of the survey, see Appendix II of U.S. Department of Health and Human Services and U.S. Department of Agriculture (1986). A more succinct description of the survey is provided in the U.S. Department of Health and Human Services and U.S. Department of Agriculture (1989).

Thus, dietary intake is just one of at least four measures that are used to make a comprehensive assessment of an individual's nutritional status. Intervening between dietary intake and nutritional status are complex physiological and environmental factors. Those intervening factors mean that the intake of "recommended" amounts of nutrients is neither a necessary nor a sufficient condition for an individual to achieve and maintain an adequate nutritional status.

1. Nutritional Status, Dietary Quality, and Analyses of the FSP

Research on the nutritional effects of food stamps has been restricted largely to studies of food expenditures and dietary outcomes. The absence of biochemical, clinical, and anthropometric outcome measures in these studies means that definitive conclusions about the impact of the FSP on nutritional status cannot be drawn from their empirical findings. At most, these studies support conclusions about the success of the FSP at reducing the risk of impaired nutritional status due to inadequate (or excess) dietary intake.

The Nationwide Food Consumption Survey is the most frequently used source of data in analyses of the dietary effects of the Food Stamp Program. It provides two distinctly different dietary measures. The first measure is the average daily intake of nutrients by the individual members of a household, computed on the basis of the types and quantities of foods that those individuals reported having eaten over a S-day period. The second dietary measure is the average daily availability of nutrients in the household, computed on the basis of all foods used from the home food supply over a 7-day period. Some food that is used by a householdis not eaten by household members; rather, it is lost through spoilage or is discarded, provided to guests or boarders, or fed to pets. Consequently, in a household in which all meals are prepared from the

home food supply, the total nutrient availability to the household will invariably exceed the aggregate nutrient intake of the household members.[28]

The Recommended Dietary Allowances (RDAs), established by the National Academy of Sciences, Food and Nutrition Board (National Research Council, 1989), are the most frequently used criteria for evaluating dietary data. RDAs are specified for 20 different population groups defined by age, sex, and the pregnancy/lactation status of women. They are standards for the average daily intake of nutrients by members of those groups over an extended period of time. Within each population group, differences in levels of physical activity, metabolic efficiency, the use of medications, and other factors are known to generate large differences in nutritional requirements among individuals. The RDAs include a substantial margin of safety above the average requirement level for a population group, thus ensuring that a diet which meets the RDAs will satisfy the nutritional requirements of nearly all healthy individuals.

The RDA standards provide benchmarks against which the estimated levels of nutrient availability for households or of nutrient intakes by individuals can be measured and compared. For example, the availability of calcium in one household's food supply might be measured as providing 95 percent of the combined RDAs for calcium for the members of that household, while a second household's food supply provides 80 percent of the combined RDAs for its members. On the basis of these figures, it is valid to say that the first household has a higher probability of meeting the actual requirements for calcium of its individual members than does the second, but not to say whether the availability of calcium to the households is in fact either adequate or inadequate for the actual needs of their individual members. That is, the RDA benchmarks should be used as relational or comparative measures only--among individuals,

[28]A comparison of NFCS data on nutrient availability at the household level with NFCS data on combined nutrient intakes by household members from the home food supply has shown a large gap between the two (Batcher, 1983).

households, or population groups--and not as absolute measures of nutrient adequacy or inadequacy for any given person, household, or population group.

Because the RDAs pertain to quantities of nutrients ingested, they are used more appropriately to evaluate individual nutrient intake data than household nutrient availability data. Even their application to intake data may be problematic because those data are typically collected over short periods of time (such as three days in the NFCS), whereas the RDAs are for intake over a protracted period of time.[29] For this reason, the RDAs are used more appropriately to evaluate mean intake values for a population group than to evaluate the adequacy of intake by individual members of a group.

Although not an ideal application of the RDAs, they are often used as a standard against which data on nutrient availability in the household are evaluated. Two problems are associated with this application. First, as noted, the RDAs are for nutrients actually ingested, whereas a measure of nutrient availability in the household includes nutrients provided by foods that were not actually ingested by household members, such as foods that were wasted or fed to pets. Second, data on nutrient availability in the household do not reflect how the nutrients are distributed among household members. Unless the foods used by a household are distributed among household members in proportion to their respective nutritional needs, the measures of nutrient availability to the household as a whole will be biased indicators of the extent of relative dietary adequacy for the household's members. If these problems are given proper consideration, then the RDAs can be a useful reference point for evaluating the adequacy of household nutrient

[29] A committee of the National Academy of Sciences has studied the problems inherent in using RDAs to evaluate short-term dietary intake data (National Research Council, 1986). Among its recommendations are reducing the emphasis on the RDAs in dietary assessments and relying more heavily on individual nutritional requirements. These recommendations remain controversial and cannot at this time be broadly implemented because the existing knowledge on individual nutritional requirements is inadequate.

availability and can provide valid measures of the relative or comparative nutrient adequacy of food consumption among households and population groups.

Two approaches are commonly used to evaluate household nutrient availability on the basis of RDAs. The more straightforward of the two approaches entails summing the RDAs of all members of the household and adjusting both for members who eat meals away from home and for meals served to guests. The household-level RDAs can be used to assess the relative adequacy of the average daily availability of nutrients from the home food supply. The second approach entails using the RDAs in conjunction with household survey data on the number of meals away from home, the number of guest meals, and the age, sex, and pregnancy/lactation status of household members, in order to compute the household's size in adult-male-equivalent nutrition units. The household's average daily availability of nutrients is divided by the adjusted measure of household size to obtain a measure of nutrient availability per adult-male-equivalent nutrition unit.[30] The relative adequacy of the nutrients that are available to the household can be assessed by comparing that measure with the adult male RDA. It should be noted that the findings drawn from either approach should be interpreted in light of the limitations of availability data in dietary assessments that were described in the previous paragraph.

A compelling criterion for assessing the effectiveness of the FSP at improving the quality of diets is whether participation in the program increases the availability or intake of nutrients among the general population or among subpopulations for whom inadequate intake is a priority concern of public health policy. Few existing studies of the dietary effects of the FSP have actually used this or a similar dynamic criterion; rather, most studies have had the more modest objective of determining simply whether the FSP has positive effects on the intake or availability

[30]The methodology for computing household size in adult-male-equivalent units is described in Appendix B.

of selected nutrients. The judgment about whether the enhanced availability or intake of those nutrients is an important policy outcome is left to the reader.

The Joint Nutrition Monitoring Evaluation Committee has classified three nutrients as warranting priority status in public health monitoring due to their low levels of intake among some subpopulations and the consequent adverse impacts on health status (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 1986). The priority nutrients and the adverse health outcomes associated with their deficiency in diets are:

- Vitamin C--soft, spongy gums, prolonged wound healing, and (in advanced cases of deficiency) scurvy
- Calcium--in children, rickets; in adults, osteoporosis
- Iron--weakness, fatigue, and (in advanced cases of deficiency), anemia

The JNMEC also has identified five nutrients about which current evidence does not warrant public health concern, but whose intake should continue to be monitored so as to permit the early detection of trends that might lead to a public health problem. Those nutrients are protein, vitamin A, thiamin, riboflavin, and niacin.

Two nutrients which surveys reveal are present in low levels in U.S. diets were not classified by the JNMEC as warranting either "priority monitoring status" or "continued monitoring status." Those nutrients are vitamin $B_6$ and magnesium.[31] The Committee's decision about vitamin $B_6$ was based on evidence that the need for that nutrient among the survey population is probably overstated by the RDA. Its decision about magnesium was based on the absence of evidence that links low magnesium intake to adverse health outcomes and on the belief of some authorities that the magnesium RDAs are unduly high.

[31]See earlier Tables III.2 and III.3 for survey-based evidence of the low intake of vitamin $B_6$ and magnesium.

## B. THE EFFECTS OF FOOD STAMPS ON NUTRIENT AVAILABILITY

In most of the existing research on the dietary effects of the FSP, the household is the unit of analysis, and measures of nutrient availability are the dependent variables. We can only speculate about why researchers have preferred to analyze the effects of the FSP on household nutrient availability rather than on individual nutrient intake. One possibility is that, since the FSP determines eligibility and assigns benefits on the basis of household characteristics, the household is the natural unit of analysis. Data access issues may also have influenced some researchers to analyze the dietary effects of the FSP at the household level. For example, the Consumer Expenditure Diary Survey provides dietary data only at the household level. The NFCS has provided dietary data at both the household and individual levels since the 196566 survey; however, an analysis of the individual-level data requires greater facility in manipulating hierarchical data files than does an analysis of household-level data, which may deter some researchers.

The models and statistical techniques that have been used to estimate the effects of food stamps on nutrient availability resemble those that have been used to estimate the effects of food stamps on food expenditures. For example, several researchers have used regression analysis to estimate models in which the availability of nutrients in a household is specified to be a linear function of its income, food stamp benefit, and demographic characteristics. In such models, the coefficient on the food stamp benefit is the effect of an additional dollar of benefits on the availability of the nutrient being studied. This coefficient is usually referred to as the "marginal propensity to consume nutrient X out of food stamp benefits."

The existing models of nutrient availability are more heterogeneous in structure than are the existing models of food expenditure. For that reason, we briefly examine the various model structures that have been used to analyze the availability of nutrients in the household, before we review the estimates of the effects of food stamps that they have generated.

1. The Structure of Models of Nutrient Availability

This discussion of the structure of models of nutrient availability in households focuses on two features of the models:

1. Is the model a structural model or a reduced-form model? A structural model assumes that the FSP affects the amount that a household spends on food, which in turn affects the availability of nutrients. A reduced-form model assumes that the FSP affects nutrient availability, but incorporates no assumptions about the path by which that effect occurs.

2. Does the model assume that the dietary effects of the FSP are a function simply of whether or not a household participates in the program, or does it assume that they vary with the amount of the food stamp benefit?[32] If the latter, does the model permit the marginal propensity to consume nutrients out of food stamps to differ from the marginal propensity to consume nutrients out of ordinary cash income?

A structural model of nutrient availability consists of a food expenditure equation (such as those reviewed in Chapter IV) and one or more equations that explain the availability of nutrients as a function of food expenditures. These equations are referred to as "structural equations," and they can be estimated with statistical procedures that were developed for estimating systems of simultaneous equations. Estimates of the effects of the FSP on nutrient availability can be derived from estimates of the structural equations. They are referred to as "derived reduced-form estimates."

The structural approach to modeling nutrient availability has intuitive appeal, however, Devaney, Haines, and Moffitt (1989) identify a feature of that approach which may detract from its usefulness in analyzing the effects of the FSP. They note that a structural model typically assumes that all food expenditures are equally effective at increasing the availability of nutrients

[32]In models which assume that the dietary effects of the FSP are determined by whether or not a household participates in the program, the coefficient on the FSP participation variable is interpreted as the program's average effect on nutrient availability, where the average effect is computed over all participating households. Those households, of course, receive varying amounts of food stamps.

in the household;[33] but it may be the case that the nutritional efficiency of expenditures Out of food stamps is actually greater than that of expenditures out of ordinary cash income. With an assumption that all food expenditures have equal nutritional efficiency, a structural model may generate downwardly biased estimates of the effects of food stamps. The reduced-form model is agnostic in terms of the path by which food stamps affect nutrient availability; hence, reduced-form estimates of the effects of food stamps are not subject to bias from this source. At this time, no empirical evidence exists to substantiate the theoretical concern of Devaney, Haines, and Moffitt.

The basic features of each of eight existing models of nutrient availability are summarized in Table V.l. The fourth column of that table indicates that three of the models are structural, and that five are reduced-form.

We now turn our attention to the assumptions of the models about whether it is food stamp participation or the size of the food stamp benefit that affects nutrient availability. For those models in which nutrient availability is a function of the size of the benefit, we also want to know whether the MPCs out of food stamps and income are constrained to be equal. This examination requires that we consider the derived-reduced forms of the structural models. With respect to these assumptions, the eight models summarized in Table V.1 can be grouped into five categories:

[33]In contrast to most other structural models, the structural model of Lane (1978) explicitly allows the nutritional efficiency of food expenditures to differ, according to whether the expenditures are made out of food stamp benefits or out of cash income.

TABLE V.1

SELECTED STUDIES OF THE EFFECTS OF FOOD STAMPS ON NUTRIENT AVAILABILITY

| Study | Data Set: Target Group: Sample Size | Nutrients Examined | Description of Model and Key Independent Variables | Estimated Effects of Cash Income, FS Benefit, and/or FSP Participation |
|---|---|---|---|---|
| 1. Adrian and Daniel (1976) | 1965-66 NFCS; all households: n = 6,950 | Protein, fat, carbohydrates, vitamin A, vitamin C, thiamin, calcium, iron | Reduced-form model. Nutrient availability is a function of income. FS benefit does not appear to be included in income. | Income has small but significant positive effects on all nutrients studied except carbohydrates. |
| 2. Lane (1978) | 1973 survey of food consumption in Kern Co., CA: FSP eligibles: n = 329 | Food energy, protein, vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, iron | Structural model. Food cost is determined by income and FS benefit. Nutrient availability is a function of food cost. Food stamp effects on nutrient availability are estimated through microsimulation. | Total food stamp effect is significant and positive for protein, calcium, vitamin A, and riboflavin; significant and negative effect on vitamin C. All effects are small. |
| 3. Scearce.and Jensen (1979) | 1972-73 Consumer Expenditure Diary Survey: FSP eligibles in southern region of U.S.; n = 1,360 | Food energy, protein, vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, iron | Reduced-form model. Nutrient availability is a function of income and FSP participation. FS benefit does not appear to be included in income. | Income and FSP participation have positive effects on all nutrients studied except riboflavin. All positive income effects are significant. Positive FSP effects are significant for protein, thiamin, calcium, and iron. |
| 4. Johnson, Burt, and Morgan (1981) | 1977-78 LI supplement to the NFCS; FSP eligibles; n = 3,800 | Two alternative indices measure the availability of 7 nutrients: protein, vitamin A, vitamin C, thiamin, riboflavin, calcium, and iron. A third index measures the availability of food energy. | Reduced-form model. Nutrient availability is a function of income and FSP participation. FS benefit is included in income. | Income and FSP participation have positive and significant effects on a food energy index and on one of the two 7-nutrient indices; positive but insignificant effects on the other 7-nutrient index. |

TABLE V.1 (continued)

| Study | Data Set: Target Group: Sample Size | Nutrients Examined | Description of Model and Key Independent Variables | Estimated Effects of Cash Income, FS Benefit, and/or FSP Participation |
|---|---|---|---|---|
| 5. Allen and Gadson (1983) | 1977-78 LI supplement to the NFCS; FSP eligibles; n = 3,850 | Food energy, protein, fat, carbohydrates; vitamin A, vitamin C. thiamin. riboflavin, niacin, vitamin $B_6$, vitamin $B_{12}$, calcium phosphorus, magnesium, iron | Reduced-form model. Nutrient availability is a function of income and FS benefit. | Income and FS benefit have positive and significant effects on all nutrients studied. Marginal effects of benefit are 7 times larger than marginal effects of income, on average. |
| 6. Basiotis, Brown, Morgan, and Chen (1983) | 1977-78 LI supplement to the NFCS: FSP eligibles: n = 3,542 | Food energy, protein, vitamin A, vitamin C, thiamin, riboflavin, calcium, iron | Structural model. Food cost is a function of income and FSP participation. FS benefit is included in income. Nutrient availability is a function of food cost and FSP participation. Estimates of income and participation effects on nutrient availability are from derived reduced-form equations. | Income has positive and significant effects on all nutrients studied. FSP participation has positive effects on nutrients studied except riboflavin and calcium; effects are significant for food energy, vitamin C, and thiamin. |
| 7. Basiotis, Johnson, Morgan, and Chen (1987) | 1977-78 LI supplement to the NFCS; FSP eligibles; n = 2,950 | Principal components analysis was used to create a single index of the availability of vitamin A, vitamin C, thiamin, riboflavin, niacin, vitamin $B_6$, vitamin $B_{12}$, calcium, phosphorus, magnesium, and iron. | Structural model. Food cost is a function of income. FS benefit, and FSP Participation. Nutrient availability is a function of food cost, income, FS benefit, and FSP participation. Estimates of income, benefit, and participation effects on nutrient availability are from a derived reduced-form equation. | Income has positive and significant effect on index of nutrient availability: FS benefit has positive but insignificant effect: FSP participation has negative but insignificant effect. Marginal effect of FS benefit is 62% larger than marginal effect of income. Estfmated total food stamp effect is an 11.6% increase in the value of a nutrient availability index. |
| 8. Devaney, Haines, and Moffitt (1989) | 1979-80 LI supplement to NFCS; FSP eligibles: n = 2,925 | Food energy, protein, vitamin A, vitamin C, thiamin, riboflavin, vitamin $B_6$, calcium, phosphorus, magnesium, iron | Reduced-form model. Nutrient availability is a function of income and FS benefit. Two types of selection bias were found to have minimal effects on estimates. | Income and FS benefit have positive and significant effects on all nutrients studied. Marginal effects of benefit are 5 times larger than the marginal effects of income, on average. |

1. Nutrient availability is determined by ordinary cash income; the effects of food stamps are not addressed explicitly by the model (Adrian and Daniel, 1976).[34]

2. Nutrient availability is determined by the size of the food stamp benefit and ordinary cash income; the MPCs out of benefits and income are permitted to differ (Lane, 1978; Allen and Gadson, 1983; and Devaney, Haines, and Moffitt, 1989).

3. Nutrient availability is determined by food stamp participation and ordinary cash income (Scearce and Jensen, 1979).[35]

4. Nutrient availability is determined by food stamp participation and total income (including the food stamp benefit); the MPCs out of food stamps and ordinary cash income are constrained to be equal (Johnson, Burt, and Morgan, 1981; and Basiotis et al., 1983).

5. Nutrient availability is determined by food stamp participation, the size of the food stamp benefit, and ordinary cash income; the MPCs out of benefits and income are permitted to differ (Basiotis et al., 1987).

## 2. Estimates of the Effects of Food Stamps on Nutrient Availability

The eight studies summarized in Table V.l vary greatly in terms of the usefulness of the information that they provide on the effects of the current FSP on nutrient availability. The study by Adrian and Daniel (1976) is based on data that were collected prior to the emergence of the FSP as a major source of food assistance. The nonstochastic analytic methodology used by Lane (1978) is highly idiosyncratic, generating findings of uncertain reliability. Due to the severe limitations of these two studies, the findings from them are not highlighted in this section.

[34]The study by Adrian and Daniel is based on NFCS data for 1965 and 1966, when the FSP was not operating in all counties in the United States and, in general, was secondary in importance to direct commodity distribution. It was not the objective of the study to estimate the effects of food stamps on nutrient availability. The authors do not state whether food stamp benefits are included in their model's income variable. We believe that food stamps are not included in their income measure, but even if they were they would constitute only a small fraction of income due to the small size of the FSP in 1965 and 1966.

[35]Scearce and Jensen do not state whether their measure of income includes the food stamp benefit. On the basis of our reading of their article, we infer that the income variable does not include the food stamp benefit.

Five of the remaining six studies are based on food-use data that were collected prior to the elimination of the food stamp purchase requirement, and one of those (Scearce and Jensen, 1979) is based on data collected prior to the adoption of nationally uniform food stamp eligibility standards and allotment schedules. Only the study by Devaney, Haines, and Moffitt (1989) is based on post-EPR data.

Scearce and Jensen (1979) find that the availability of four of the nine nutrients that they studied is significantly greater for households that participate in the FSP than it is for eligible nonparticipants. They report participation-related increases of 27 percent for protein, 18 percent for thiamin, 43 percent for calcium, and 26 percent for iron. Johnson, Burt, and Morgan (1981) find statistically significant evidence that the availability of food energy is greater in participating households; however, their two alternative indices of the availability of seven nutrients yield such different estimation results that they are unable to draw firm conclusions about the effects of the FSP on the availability of those nutrients. Basiotis et al. (1987) find that the total effect of the FSP (including both an effect of participation per se and an effect associated with the size of the benefit) is an 11.6 percent increase in an index of the availability of eleven nutrients.

One disadvantage of a study in which the dependent variable is an index of the availability of multiple nutrients is that it is generally not possible to use the estimation results to assess whether the FSP is successful at increasing the availability of those nutrients--vitamin C, calcium, and iron--whose deficiency in U.S. diets is a priority public health concern. The studies by Allen and Gadson (1983), Basiotis et al. (1983), and Devaney, Haines, and Moffitt (1989) do permit such an assessment. For food energy and twelve nutrients, Table V.2 presents estimates of the MPCs out of income and food stamp benefits that were derived in these three studies. To facilitate cross-study and cross-nutrient comparisons, we have converted the MPC estimates to a common metric: the table shows the percentage change relative to the RDA in the availability of a nutrient that would be generated by an additional dollar of income or food stamp benefits.

TABLE V.2

THE EFFECTS OF INCOME AND FOOD STAMPS ON NUTRIENT AVAILABILITY, MEASURED AS A PERCENTAGE OF THE ADULT MALE RDA: A COMPARISON OF ESTIMATES FROM THREE STUDIES

| study | Food Energy | Protein | Vitamin A | Vitamin C | Thiamin | Ribo-flavin | Niacin | Vitamin $B_6$ | Vitamin $B_{12}$ | Calcium | Phos-phorus | Magnes-ium | Iron |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allen and Gadson (1983) | | | | | | | | | | | | | |
| MPC--Income | .2 | .6 | 1.0 | 1.5 | .2 | .4 | .4 | .4 | 1.0 | .2 | .4 | .3 | .5 |
| MPC--FS Benefit | 1.7 | 2.9 | 3.2 | 4.2 | 2.1 | 2.5 | 2.5 | 1.7 | 5.1 | 1.9 | 4.1 | 1.7 | 3.3 |
| Basiotis, Brown, Johnson, and Moroan (1983) | | | | | | | | | | | | | |
| MPC-Income (Incl. FS Benefit)[a] | .2 | .5 | .4 | 1.2 | .2 | .5 | NA | NA | NA | .4 | NA | NA | .5 |
| Devaney, Haines. and Moffitt (1989) | | | | | | | | | | | | | |
| MPC--Income | .4 | .6 | .5 | 1.0 | .4 | .5 | NA | .3 | NA | .5 | .9 | .4 | 1.2 |
| MPC--FS Benefit | 1.9 | 3.2 | 3.1 | 3.3 | 2.9 | 3.3 | NA | 1.8 | NA | 2.3 | 3.8 | 2.0 | 3.9 |
| Total Effect--FSP[b] | 20.9 | 33.9 | 33.8 | 35.0 | 31.0 | 35.3 | NA | 19.2 | NA | 24.4 | 40.6 | 22.0 | 42.0 |

NOTES: All effects are presented as a percentage of the adult male RDA. The percentage MPC is the change in nutrient availability generated by an additional dollar of income or benefit, divided by the adult male RDA. All MPC estimates are statistically significant at the .05 level.

[a]In this model, the effects of the FSP are captured through a program participation variable, as well as a total income variable.

[b]The total effects of the FSP are calculated at the mean benefit amount for food stamp participants.

For the three priority nutrients, all of the income and benefit MPC estimates from the three studies are positive and statistically significant.[36] The estimates from the two studies that do not combine benefits and ordinary cash income in a single explanatory variable indicate that the marginal effects of food coupons on these nutrients are 3 to 9 times larger than the marginal effects of ordinary cash income.

On the basis of their estimates of the MPC out of food coupons, Devaney, Haines, and Moffitt derive estimates of the total effect of the FSP on nutrient availability.[37] Those estimates, which are reproduced in the bottom line of Table V.2, show that participation in the FSP increases the availability of vitamin C, calcium, and iron by 35, 24, and 42 percent, respectively, relative to the RDA.

The studies by Allen and Gadson, Basiotis et al., and Devaney, Haines, and Moffitt provide a consistent set of statistically significant findings that food stamps have substantial positive effects (both at the margin and in total) on the availability of the three nutrients that have been assigned public health priority status. They also show consistent, statistically significant positive effects on the five nutrients that the JNMEC has identified as meriting "continued monitoring status" and on four additional nutrients (vitamins $B_6$ and $B_{12}$, magnesium, and phosphorus).

## C. THE EFFECTS OF FOOD STAMPS ON NUTRIENTINTAKE

The Food Stamp Program is designed to augment the use of food from the home food supply; with only minor exceptions, food stamps cannot be used to purchase prepared food. As customarily measured, nutrient intake is based on all food eaten by an individual, whereas the

[36] All of the MPC estimates shown in Table V.2, including those for nutrients that do not have priority public health monitoring status, are positive and statistically significant.

[37] The estimate of the total effect of the FSP on the availability of a nutrient was obtained by multiplying the estimated MPC out of food stamps by the average size of the food stamp benefit.

NFCS measure of nutrient availability is based only on food used by a household from its home food supply. Thus, nutrient availability is a well-focused measure of the behavior that the FSP is designed to influence, whereas nutrient intake is a more inclusive measure that encompasses behavior that the FSP is not designed to influence as directly. For that reason, we expect that the FSP would have weaker effects on nutrient intake than on nutrient availability.

Existing research findings confirm our expectation that the effects of the FSP on nutrient intake are weaker than its effects on nutrient availability. The estimates of the effects of the FSP on nutrient intake are less consistently positive and less often statistically significant than is the case with nutrient availability. In addition to reflecting the true pattern of FSP effects, the existing estimates may reflect the fact that, when compared with availability studies, intake studies generally have smaller sample sizes, more diverse population groups under study, and more heterogeneous model structures. The remainder of this section reviews the models and data sets used in the existing studies of nutrient intake and, for selected studies, summarizes and compares estimates of the effects of food stamps on the intake of a large set of nutrients. The section concludes with an examination of evidence from the only relevant study based on an experimental research design on the relative effectiveness of cash versus coupons at increasing nutrient intake by individuals.

1. The Data Sets and Models Used in Studies of Nutrient Intake

Data Sets. Eight studies that have generated estimates of the effects of the FSP on nutrient intake are described in Table V.3. These studies are far more heterogeneous with respect to the sources of data and the population groups studied than are the previously reviewed studies of nutrient availability. For example, NFCS data form the basis for six of the eight availability studies but only for two of the intake studies. More importantly, with the exception

TABLE V.3

SELECTED STUDIES OF THE EFFECTS OF FOOD STAMPS ON NUTRIENT INTAKE

| Study | Data Set: Target Group: Sample Size | Unit of Analysis: Nutrients Examined | Description of Model and Key Independent Variables | Estimated Effects of FS Benefit and/or FSP Participation |
|---|---|---|---|---|
| 1. Price, West, Scheier, and Price (1978) | 1972-73 sample of students in Washington State: children ages 8-12 years from households of all incomes: n = 728 | Individual: food energy, protein, vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, phosphorus, iron | Nutrient intake is a function of food cost and FSP participation (preliminary specification): FSP participation not included in final specification. | In preliminary model, coefficients on FSP participation vary in sign: none is significant. |
| 2. Davis and Neenan (1979) | 1976 sample of households in Polk Co., FL; FSP participants: n = 84 | Household; protein, vitamin A, vitamin C, calcium, iron | Nutrient intake is a function of food cost and FS benefit.. | Coefficients on FS benefit vary in sign: none is significant. |
| 3. Butler, Ohls, and Posner (1985) | 1981 SSI/Elderly Food Stamp Cashout Demonstration survey: elderly FSP participants; n = 856 coupon recipients and 828 cash recipients | Individual; food energy, protein, vitamin A. vitamin C, thiamin, riboflavin, niacin, calcium, iron | Nutrient intake is a function of FSP participation. Model is estimated separately for coupon recipients and recipients of cash food assistance. | For coupon recipients, coefficients on FSP participation vary in sign; none is significant. |
| 4. Aiken, Guilkey, Popkin, and Smith (1985) | 1977-78 NFCS, basic sample; FSP eligibles age 55+; n = 1,315 | Individual; food energy, protein, vitamin A, vitamin $B_6$, calcium, iron | Switching regression model permits participants and nonparticipants to have different coefficients. Nutrient intake is a function of FS benefit amount for participants. | None of the coefficients on the FS benefit is significant. Simulations show that the intake of all nutrients studied is higher for participants. |
| 5. Rush et al. (1986) | 1983 survey for the National WIC Evaluation: pregnant women in low-income households and their children younger than age 5; n = 530 women and 763 children (control group only) | Individual: food energy, protein, vitamin A, vitamin C, thiamin, riboflavin, niacin, vitamin $B_6$, vitamin $B_{12}$, calcium, phosphorus, magnesium, iron | Nutrient intake is function of FSP participation. Different models for women and children. | For women and children, FSP participation has a positive coefficient for same 10 nutrients, and a negative coefficient for vitamins A, $B_6$, and $B_{12}$; the only significant coefficient is for food energy intake by women. |

TABLE V.3 (continued)

| Study | Data Set; Target Group: Sample Size | Unit of Analysis: Nutrients Examined | Description of Model and Key Independent Variables | Estimated Effects of FS Benefit and/or FSP Participation |
|---|---|---|---|---|
| 6. Butler and Raymond (1986) | 1981 SSI/Elderly Food Stamp Cashout Demonstration survey: elderly FSP participants: n = 1,542. 1969-73 Rural Income Maintenance Experiment (RIME) survey: low-income households: n = 1,054. | Individual (SSI/Elderly), household (RIME): food energy, protein;.vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, phosphorus (RIME only), iron | Nutrient intake is a function of FS benefit. Model constrains cash and coupon recipients in SSI/Elderly data to have same coefficient on FS benefit. | For SSI/Elderly data, all coefficients on FS benefit are negative; only the coefficients for food energy, protein, and vitamin C are significant. For RIME data, 8 negative and 2 positive coefficients on FS benefit; the only negative coefficient for protein is significant. |
| 7. Basiotis, Johnson, Morgan, and Chen (1987) | 1977-78 LI supplement to the NFCS; FSP eligibles; n = 2,950 | Household: principal components analysis was used to create a single index of the availability of vitamin A. vitamin C, thiamin, riboflavin, niacin, vitamin $B_6$, vitamin $B_{12}$, calcium, phosphorus, magnesium, and iron | Three-equation structural model of food cost, nutrient availability, and nutrient intake. In derived reduced-form, nutrient intake is a function of income, FS benefit. and FSP participation. Estimate's of food stamp effects are derived from a reduced-form equation. | FS benefit has a positive but insignificant effect on an index-of nutrient intake: FSP participation has a significant negative effect. Estimated total food stamp effect is an 11.9% increase in value of the index. |
| 8. Fraker, Long, and Post (1990) | 1985 CSFII; WIC-eligible women and their children ages 1-4 years: n = 236 women and 445 children | Individual; food energy, protein, vitamin A, vitamin C, vitamin E, calcium, iron, zinc (women and children); vitamin $B_6$, folacin, magnesium (women only) | Nutrient intake is a function of FSP participation. Different models for women and children. | For women, coefficients on FSP participation vary in sign; only the negative coefficient for vitamin A is significant. For children, food energy, protein, and zinc coefficients are positive and significant: vitamin C, calcium, and iron coefficients are positive but insignificant; vitamin E coefficient is negative and significant: vitamin A coefficient is negative but insignificant. |

of the NFCS-based study by Basiotis et al. (1987), the target populations for the intake studies are restricted geographically (Studies 1, 2, 3, and 6 in Table V.3) and/or are restricted demographically--WIC-eligible women and children are the subjects of Studies 5 and 8, elementary school children are the subjects of Study 1, and the elderly are the subjects of Studies 3, 4, and 6. This geographic and demographic heterogeneity in target populations contributes to the lack of consistency in the reported estimates of FSP effects on nutrient intake across studies.

Relatively small sample sizes for the intake studies may also be an important factor behind the wide range of estimates of the effects of the FSP. Five of the studies of nutrient intake are based on samples of less than 1,000 cases, whereas only one of the studies of nutrient availability is based on a sample that small. The most extreme case of a study based on a small sample size is that by Davis and Neenan (1979). On the basis of respondents' participation or nonparticipation in the Expanded Food and Nutrition Education Program, they divide their sample of food stamp recipients into two subsamples of 50 and 34 cases. Separately for the two subsamples, they estimate models of nutrient intake that encompass approximately 20 parameters. Given the few degrees of freedom in those analyses, it is not surprising that they report no statistically significant effects of the FSP on nutrient intake.

Models. With one exception (Basiotis et al., 1987), the estimates of the effects of food stamps on nutrient intake that are provided by the studies summarized in Table V.3 are based on reduced-form models. Those models generate estimates of program effects on nutrient intake, but provide no information on the paths by which those effects occur. For example, a reduced-form model cannot reveal whether the FSP affects nutrient intake by altering the availability of nutrients in the household or by altering the proportion of available nutrients that are actually ingested by household members. Basiotis et al. specify and estimate a structural model in which food stamp participation and the food stamp benefit affect nutrient intake not only directly but also indirectly via the enhanced availability of nutrients in the household.

The models underlying the studies by Price et al. (1978) and Davis and Neenan (1979) appear to be misspecified in a way that constrains the estimates of the effects of food stamps on nutrient intake to be small. The two models are fundamentally the same. They assume that intake is a function of the money value of food used from the home food supply (food cost) and either the food stamp benefit or an indicator of participation in the FSP. The flaw in this specification is that the models treat food cost as if it were not affected by the program. Thus, any effects that the program might have on intake via food cost is not reflected in the estimates generated by these models. Given this model structure, it is not surprising that none of the estimates of the effects of food stamps on nutrient intake that are reported in these two studies is statistically significant.

The "switching regression model" of Aiken et al. (1985) assumes that the same factors which affect nutrient intake by FSP participants also affect nutrient intake by eligible nonparticipants; however, it permits the coefficients on those factors to differ between the two groups. For example, the responsiveness of intake to income is permitted to differ between participants and eligible nonparticipants. For FSP participants, the benefit amount is found to have no significant effect on nutrient intake; however, when all of the estimated regression coefficients are used to predict the intake of nutrients by a hypothetical person who exhibits the average characteristics of the cases in the sample, FSP participation is found to be associated with a higher intake of the nutrients studied. The structure of the model and the absence of significant effects of the food stamp benefit suggest that the positive association between FSP participation and nutrient intake is a function of behavioral differences between participants and nonparticipants rather than to the program per se.

Both Butler, Ohls, and Posner (1985) and Butler and Raymond (1986) use data from the SSI/Elderly Food Stamp Cashout Demonstration to estimate the effects of the FSP on dietary intake by the elderly. The studies differ in two notable respects. First, Butler, Ohls, and Posner

estimate their model of nutrient intake separately for coupon recipients and recipients of cash food assistance, whereas Butler and Raymond estimate their model on pooled data for both coupon and cash recipients. In the pooled analysis, cash benefits and coupons are constrained to have the same impact on intake. Second, an indicator of FSP participation is the program-intervention variable in the model of Butler, Ohls, and Posner, whereas the food assistance benefit amount is the program-intervention variable in the model of Butler and Raymond. The latter specification permits the estimate of the total effect of the program to vary with the amount of the benefit, while the former specification produces an estimate of the average total effect of the program, without regard for the size of the benefit.

## 2. Estimates of the Effects of Food Stamps on Nutrient Intake

This section reviews estimates of the effects of food stamps on nutrient intake from six studies. For reasons given in the previous section, we believe that the estimates obtained by Price et al. (1978) and Davis and Neenan (1979) understate the true effects of the program; thus, those estimates are not reviewed here.

Overview. Table V.4 summarizes estimates of the percentage change in the intake of food energy and 14 nutrients that are associated with participation in the FSP. These estimates come from two studies of older persons (Butler, Ohls, and Posner, 1985; and Aiken et al., 1985) and two studies of WC-eligible women and children (Rush et al., 1986; and Fraker, Long, and Post, 1990). Basiotis et al. (1987) do not provide estimates of the effects of food stamps on individual nutrients; thus, their findings are not included in the table. They report that participation in the FSP is associated with an 11.9 percent increase in an index of the intake of 11 nutrients; however, underlying this estimate are a coefficient on the food stamp benefit amount that is positive but statistically insignificant and a coefficient on a food stamp participation variable that is negative and significant. Given the signs and significance of the underlying coefficients, we must conclude

TABLE V.4

THE PERCENTAGE CHANGE IN NUTRIENT INTAKE ASSOCIATED WITH PARTICIPATION IN THE FSP:
A COMPARISON OF ESTIMATES FROM FOUR STUDIES

| Study | Food Energy | Protein | Vitamin A | Vitamin E | Vitamin C | Thiamin | Ribo-flavin | Niacin | Vitamin $B_6$ | Folacin | Vitamin $B_{12}$ | Calcium | Phos-phorus | Magnes-ium | Iron | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Butler, Ohls, and Posner (1985) | | | | | | | | | | | | | | | | |
| Coupon Recipients Age 65+ | -1.1 | -.7 | 3.9 | NA | -3.5 | 20.0 | -9.2 | 1.0 | NA | NA | NA | 2.3 | NA | NA | 1.9 | NA |
| Cash Recipients Age 65+ | 6.5 | 11.1* | 10.0 | NA | 25.8* | 11.5* | 9.4 | 5.1 | NA | NA | NA | 18.5* | NA | NA | 7.6 | NA |
| Aiken, Guilkey, Poukin, and Smith (1985) | | | | | | | | | | | | | | | | |
| Adults Age 55+ | .1 | 0.0 | 4.9 | NA | NA | WA | NA | NA | 4.8 | NA | NA | 6.3 | NA | NA | 1.7 | NA |
| Rush et al. (1986) | | | | | | | | | | | | | | | | |
| Pregnant Woman | 10.5* | 14.7 | -5.0 | NA | 4.1 | .6 | .6 | 4.3 | -1.2 | NA | -4.3 | 13.6 | 11.4 | 1.4 | 4.3 | NA |
| Children Under Age 5 | 6.9 | 3.2 | -8.1 | WA | 7.2 | 7.8 | 9.7 | 12.3 | -.3 | NA | -4.1 | 5.6 | 2.8 | 1.6 | 17.9 | NA |
| Fraker, Lona, and Post (1990) | | | | | | | | | | | | | | | | |
| WIC-Eligible Women | -5.2 | 3.5 | -42.3* | 3.1 | -5.0 | NA | NA | NA | 1.7 | -17.2 | NA | -10.5 | NA | -10.0 | -6.7 | 4.7 |
| Children Under Age 5 | 14.7* | 20.0* | -9.7 | -25.6* | 10.3 | NA | NA | NA | NA | NA | NA | 13.4 | NA | NA | 9.4 | 18.4* |

'Underlying coefficient is statistically significant at the .05 level.

that the Basiotis et al. study does not provide strong evidence that the FSP increases nutrient intake.

The estimates from the study by Butler and Raymond (1986) cannot readily be converted into the percentage change format of Table V.4. They used data from the SST/Elderly Food Stamp Cashout Demonstration to obtain estimates of the effects of food assistance benefits on the intake of nine nutrients by elderly persons. The estimated effect of food assistance is negative for each of those nutrients, but only for food energy, protein, and vitamin C does it differ from zero at the .05 level of statistical significance. Their analysis of data from the Rural Income Maintenance Experiment yielded negative estimates of the effects of food stamps on the intake of eight of the ten nutrients studied, but only the negative estimate for protein is statistically significant. Butler and Raymond's finding of consistently negative but generally insignificant estimates of the effects of food stamps on nutrient intake is at odds with a priori expectations and with findings of generally positive but statistically insignificant estimates of the effects of food stamps from another analysis of the SSI/Elderly Cashout data (Butler, Ohls, and Posner, 1985), as well as from analyses of intake data for other population groups.

Two notable patterns in the estimates of the effects of food stamps on nutrient intake that are presented in Table V.4 are the scarcity of statistically significant estimates and the presence of a substantial proportion (one-fourth) of negative estimates. There is no evidence of either of these patterns in the summaries of estimates of the marginal effects of food stamps on food expenditures (Table IV.1) or on nutrient availability (Table V.2). In those tables, all estimates of the effects of food stamps are positive and statistically significant. Thus, nutrient intake is unique among the three types of outcome measures in that it fails to provide a preponderance of evidence that the FSP is achieving its objectives of augmenting household food expenditures and improving the quality of diets.

The estimates for elderly recipients of cash food assistance that are shown in the second row of Table V.4 are not directly relevant to the current Food Stamp Program; thus, we reserve discussion of those estimates for Section C.3.

Effects on the Elderly. The studies by Butler, Ohls, and Posner (1985) and Aiken et al. (1985) provide no statistically significant evidence that the receipt of food coupons affects the intake of nutrients by the elderly. For three nutrients--vitamin A, calcium, and iron--the estimates generated by the two studies consistently show that coupons have positive, but statistically insignificant, effects on intake. Two of those nutrients--calcium and iron--have priority status for public health monitoring. Vitamin C is the third nutrient with priority monitoring status. Butler, Ohls, and Posner estimate that the intake of vitamin C by the elderly is associated with FSP participation in a negative but statistically insignificant way. Vitamin C is not among the nutrients analyzed by Aiken et al.

Effects on Women and Children. The estimates of the effects of food stamps on the intake of nutrients by WIC-eligible women and young children are generally larger in absolute value than the estimates for elderly persons, and they are statistically significant more frequently. For the three nutrients with priority monitoring status, Rush et al. (1986) and Fraker, Long, and Post (1990) find consistently positive but insignificant estimates of the effects of food stamps on intake by young children. The two studies yield inconsistent and statistically insignificant estimates of the effects of food stamps on the intake of those nutrients by WIC-eligible women. The two studies show similarly that the FSP has positive effects on the intake of protein and negative effects on the intake of vitamin A by both women and children. But, even for these nutrients, few of the estimated food stamp effects are statistically significant.[38]

[38]The primary objective of Rush et al. (1986) was to estimate the effects of the WIC program on dietary intake. Fraker, Long, and Post (1990) analyzed the joint effects of WIC and food stamps on dietary intake--thus explaining why the samples for these studies were restricted to persons who were eligible to receive WIC benefits.

Summary. The estimates summarized in Table V.4, in conjunction with the generally insignificant estimates of the effects of food stamps on nutrient intake by Butler and Raymond (1986) and by Basiotis et al. (1987), suggest that the FSP does not have strong effects on nutrient intake. Certainly, the effects are not as strong as those on the money value of food used at home or on nutrient availability. Of course, it is likely that researchers have not yet estimated an appropriately specified model of nutrient intake by individuals; however, given the evidence of weak food stamp effects from a wide range of models, it is unlikely that even an ideally specified model would generate large estimates of the effects of food stamps on nutrient intake.

3. Estimates of the Effects of Cash Food Assistance on Nutrient Intake

The SST/Elderly Food Stamp Cashout Demonstration provided cash food assistance to elderly FSP participants in four treatment counties, while continuing to provide coupons to their counterparts in four comparison counties. The data from this demonstration have provided researchers with the only opportunity thus far to estimate the effects of substituting cash assistance for food coupons on dietary intake. Using data from the demonstration, Butler, Ohls, and Posner (1985) estimate intake models separately for cash and coupon recipients. Their findings for coupon recipients are summarized in the first line of Table V.4 and were reviewed in the previous section. Their findings for cash recipients are summarized in the second line of Table V.4.

The Butler, Ohls, and Posner estimates of the effects of cash food assistance on nutrient intake by the elderly are positive for all of the nutrients studied. They are statistically significant for four of the nine nutrients and are generally larger in absolute value than the estimates of the effects of coupons on nutrient intake. While some of the differences between the estimates of cash and coupon effects are large, only one of the differences--for vitamin C--is statistically significant. The authors attribute the cash-coupon differences in the estimated effects on nutrient

intake to sampling error rather than to true differences in the effectiveness of cash and coupons at increasing nutrient intake.

## D. SUMMARY

This chapter reviewed studies which relied on survey data on food consumption by households and individuals to estimate the effects of the Food Stamp Program on the quality of the diets of food stamp recipients. Two types of dietary outcome measures were assessed: the availability of nutrients in the food used by a household, and the nutrients provided by the food eaten by individuals. Because diet is only one of a number of factors that determine an individual's nutritional status, the findings from these studies cannot show definitively whether the FSP is successful at achieving its nutritional objectives.

The data on which these studies are based come from a number of surveys, but the Nationwide Food Consumption Survey is the most frequently used source of data on the dietary effects of the FSP. It provides measures of (1) the average daily intake of nutrients by an individual over a three-day reference period, and (2) the average daily availability of nutrients in the food used by a household from its home food supply over a seven-day reference period. The latter measure includes nutrients from food not eaten by household members but which is lost through spoilage, discarded, provided to guests or boarders, or fed to pets, and thus, after adjustments have been made for meals eaten away from home and for meals served to guests, may exceed the aggregate intake of nutrients by household members.

The Recommended Dietary Allowances established by the National Academy of Sciences, Food and Nutrition Board, are the most frequently used criteria for evaluating dietary data. The RDAs exceed the nutritional requirements of most healthy individuals; they are intended to be used as benchmarks for relative comparisons of dietary quality among individuals, households, or population groups, rather than as standards for an absolute assessment of nutrient adequacy.

Food Stamp Effects on Nutrient Availability. This chapter reviewed findings from eight studies which used regression analysis and related multivariate statistical models to estimate the effects of food stamp participation and/or the size of the food stamp benefit on the availability of nutrients from the food used by a household from its home food supply. Each of these models can be classified as either structural (i.e., food stamps affect the money value of food used, which in turn affects nutrient availability) or reduced-form (i.e., food stamps affect the availability of nutrients directly) and further classified according to whether the model assumes that nutrient availability is determined by food stamp participation or by the size of the food stamp benefit. In addition, if nutrient availability is assumed to be a function of the size of the benefit, a model can be classified according to whether or not the marginal propensities to consume nutrients out of food stamps and cash income are constrained to be equal. On the basis of these assumptions, we classified the models underlying the eight studies into five categories and compared their findings on the effects of the FSP on nutrient availability.

The eight studies show fairly consistently that food stamp participation and/or the size of the food stamp benefit, as well as ordinary cash income, have positive effects on the availability of most nutrients studied. However, due to differences in the timing of the data (most of the data sets predate EPR) and in the appropriateness of the analytic methodologies, the estimates generated by these studies vary greatly in terms of how reliably they represent the dietary effects of the current FSP.

In another comparison, we converted estimates from three of the eight studies into the percentage change relative to the RDA in the availability of a nutrient that would be generated by an additional dollar of food stamp benefits. This comparison showed that for the three nutrients that have been identified by the Joint Nutrition Monitoring Evaluation Committee as warranting priority status in public health monitoring (vitamin C, calcium, and iron), all of the benefit estimates from the three studies are positive and statistically significant. These estimates

imply increases in nutrient availability relative to the RDA that range from less than .4 percent to as much as 4.2 percent for each additional dollar of benefits.

Food Stamp Effects on Nutrient Intake. The Food Stamp Program is designed to promote the use of food from the home food supply; thus, the availability of nutrients from food used at home is a well-focused measure of the dietary behavior to be influenced by the FSP. In contrast, nutrient intake is a measure that encompasses dietary behavior (e.g., the consumption of restaurant meals) that the FSP is not designed to influence directly. Thus, we would expect that a measure of nutrient intake would show weaker food stamp effects than would a measure of nutrient availability.

Our review of the findings from eight studies of the effect of food stamps on the intake of nutrients by individuals confirmed the validity of the expectation that the effects of food stamps on nutrient intake are relatively weak The findings from the studies show little consistency; the signs of the estimated food stamp effects often vary greatly across nutrients within the same study and across studies for the same nutrient. Only a small proportion of the estimated food stamp effects are statistically significant. The geographic and demographic heterogeneity in the target populations for these intake studies, the relatively small sample sizes, and differences in model specifications contributed to the lack of consistency across the studies.

Finally, this chapter also reviewed a study that used data from the SSI/Elderly Food Stamp Cashout Demonstration to estimate the effects of cash food assistance benefits on the intake of nine nutrients. The study shows that the estimated effects of cash benefits are more consistently positive and larger in magnitude than are the estimated effects of food stamps. However, the authors attribute the cash-coupon differences to sampling error rather than to true differences in the effectiveness of cash and coupons at increasing nutrient intake.

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# APPENDIX A

# THE ECONOMIC THEORY OF THE EFFECTS OF FOOD STAMPS ON FOOD CONSUMPTION[1]

[1]Gary Bickel of the Food and Nutrition Service and Thomas Fraker of Mathematica Policy Research are the coauthors of this appendix.

## A. BACKGROUND

Two principal strands of economic analysis have contributed to an understanding of the effects of food stamp benefits on the food consumption of participating households. The earlier of these is the empirical analysis of household budgets, originating in a late-18th~century concern for the circumstances of the English rural and urban poor.[2] Similar studies of household budgets were conducted throughout Europe in the 19th century, seeking to determine the costs of subsistence empirically. Such studies received further impetus when the Prussian statistician Ernst Engel (1857) applied statistical techniques to household budget data for the first time.[3] Studies of U.S. household budgets drew on Engel's work and in turn influenced subsequent European studies.[4]

The observed regularity. in household spending led Engel to propose a "law" of food consumption: "the poorer a family, the greater the proportion of its total expenditure that must be devoted to the provision of food" (Engel, 1857, 1895). This broad generalization from budget data--that the proportion of income spent on food declines as income increases--has been confirmed by virtually every subsequent study on this topic. It provides the most fundamental element in analyses of the effects of food stamp benefits on household consumption--the estimation of "Engel functions," in which household spending on food (or other consumption categories) is related to total income, including food stamp benefits and other current resources.

The focus of interest in Engel functions is their "slope"--that is, the change in food (or other) spending in response to a change in income or other resources. The change may be

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[2]The first important studies of household budgets are those by Davies (1795) and Eden (1797). These and other early studies of household budgets are described by Stigler (1954).

[3]Engel's original research on household budgets was republished in 1895 and is described by Stigler (1954).

[4]Stigler (1954) describes research by Wright (1875) and Ogbum (1918-19) on the budgets of U.S. households.

measured either as the ratio of the percentage change in food expenditures to the percentage change in income--the "income elasticity" of food expenditures--or as the ratio of the dollar change in expenditures to the dollar change in income--the "marginal propensity to consume" food ($MPC_f$) out of income. Modem studies have explored numerous mathematical forms for expressing Engel functions appropriately (Prais and Houthakker, 1955; Leser, 1963; Salathe, 1980a; and Blaylock and Green, 1980).

The second basic strand in the economic analysis of household food consumption is theoretical in nature and is based on the modem "neoclassical" economic theory of consumer demand. In this theory, the household is visualized as an economic decision-making unit, engaged in a continuous process of choosing among the alternative consumption possibilities open to it, guided by its members' preferences, and constrained by its available resources or budget. The theory postulates that the household carries out this activity so as to maximize the total satisfaction or "utility" realized by household members from the consumption choices made.

In formal notation, the household "solves" the following constrained maximization problem:

maximize:

$$(1) \quad U = U(X_1, X_2, \ldots, X_n),$$

subject to:

$$(2) \quad P_1X_1 + P_2X_2 + \ldots + P_nX_n = M,$$

where $X_i$ is the quantity of the i-th market commodity consumed by the household, $P_i$ is the price of that commodity, U is the utility that the household derives from all of the commodities that it consumes, and M is the household's total income or resources. The nature of the available commodities and their prices are determined by the market; they are taken by the household as

"givens." Equation (1) represents the household's "utility function"; Equation (2) represents its budget constraint.

This postulate of the utility-maximizing household with limited resources, confronting a market for commodities, implies the existence of a demand function for each commodity. The demand function specifies that the quantity of a commodity demanded by a household depends on its market price, the prices of all other desired commodities, and the household's total income or resources:

(3) $X_i = X_i(P_1, P_2, \ldots, P_n, M)$; $i = 1, 2, \ldots, n$.

In this demand function, the marginal propensity to consume commodity (i) is $\partial X_i/\partial M$, and the income-elasticity of demand for commodity (i) is $(\partial X_i/\partial M) \times (M/X_i)$.

In this theory, the household's utility from the consumption of each market good depends solely upon the quantity of the good consumed.[5] The household maximizes its total utility from consumption by selecting that combination of quantities of goods for which the (subjective) marginal rate of substitution between each pair of goods in the household's utility function corresponds to the (objective) marginal rate of substitution between the same goods in the expenditures necessary to acquire them--i.e., it corresponds to their relative market prices. (In formal notation: $MU_i/MU_j = P_i/P_j$ [$i = 1, \ldots, n$; $j = 1, \ldots, n$; $i \neq j$] where $MU_i$ is the marginal utility of the i-th commodity and $P_i$ is its price.)

The neoclassical theory of the utility-maximizing consumer is consistent with the empirical observations from household budget studies and the empirical generalization expressed in "Engel's Law." However, the theory as such provides no guidance about the determinants or actual dimensions of households' consumption preferences. These preferences are taken as 'given,"

[5] "Good" is used throughout in a broad sense, synonymous with "commodity;" it includes all purchasable items of consumption--services and intangibles as well as physical goods.

treated within the standard theory as "unchallengeable axioms" (Stigler and Becker, 1977). Thus, the specific shape of any Engel function that relates household food consumption to household income must still be determined empirically.

## B. THE SOUTHWORTH MODEL OF HOUSEHOLD FOOD ASSISTANCE

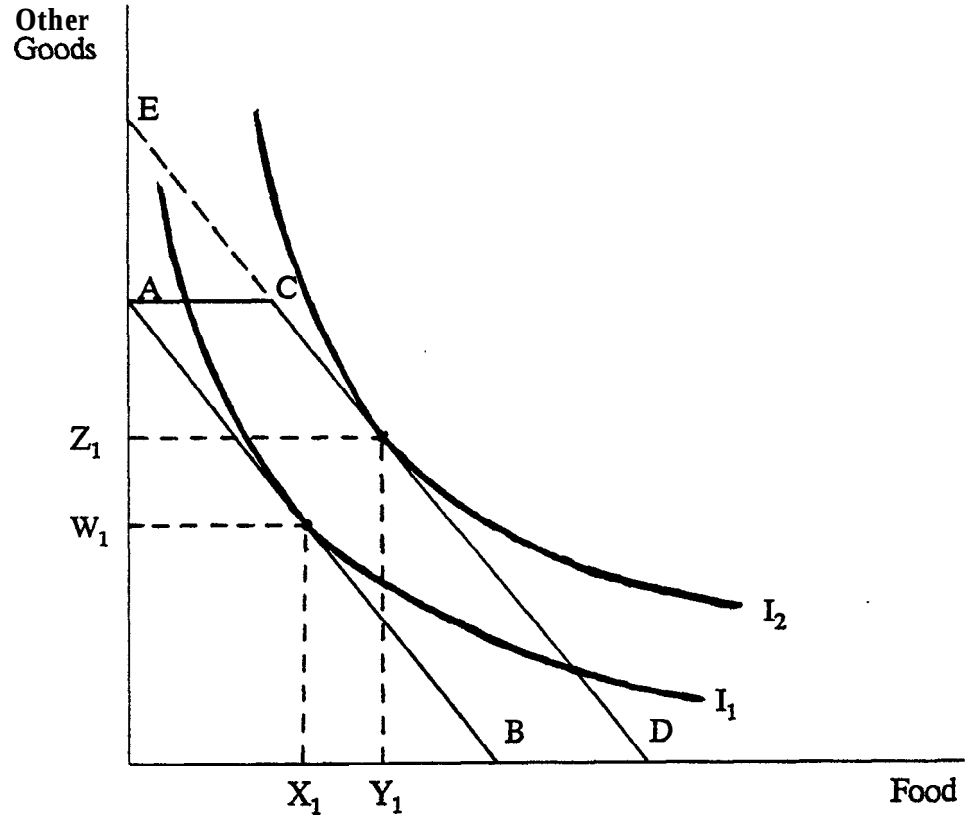
Using the tools of graphic exposition introduced by J. R. Hicks (1939) to explain traditional consumer demand theory, Southworth (1945) developed the implications of the theory for households that receive food stamps. His model compares the household's food-consumption response to a resource increase in the form of an in-kind food benefit, or a benefit tied to the purchase of food, with its response to a resource increase in the form of regular income or a cash transfer.

The indifference curve is the first of two components of Southworth's theoretical model. On a graph in which a household's consumption of a composite good "food" is plotted along the X-axis and its combined consumption of other available market goods is plotted along the Y-axis, an indifference curve is a theoretical line that joins all of the combinations of the two composite goods "food" and "other goods" that would provide the household with an equal level of satisfaction or utility. Indifference curves that lie successively further out from the graph's origin represent increasingly higher levels of utility for the household. An unlimited set of such curves would represent, in effect, a "map" of the household's utility function, defined over all possible combinations and quantities of the two composite goods.

Figure A.1 shows two indifference curves, $I_1$ and $I_2$, for food and other goods for one hypothetical household (Household 1). For another such household (Household 2), Figure A2 shows three indifference curves for food and other goods.

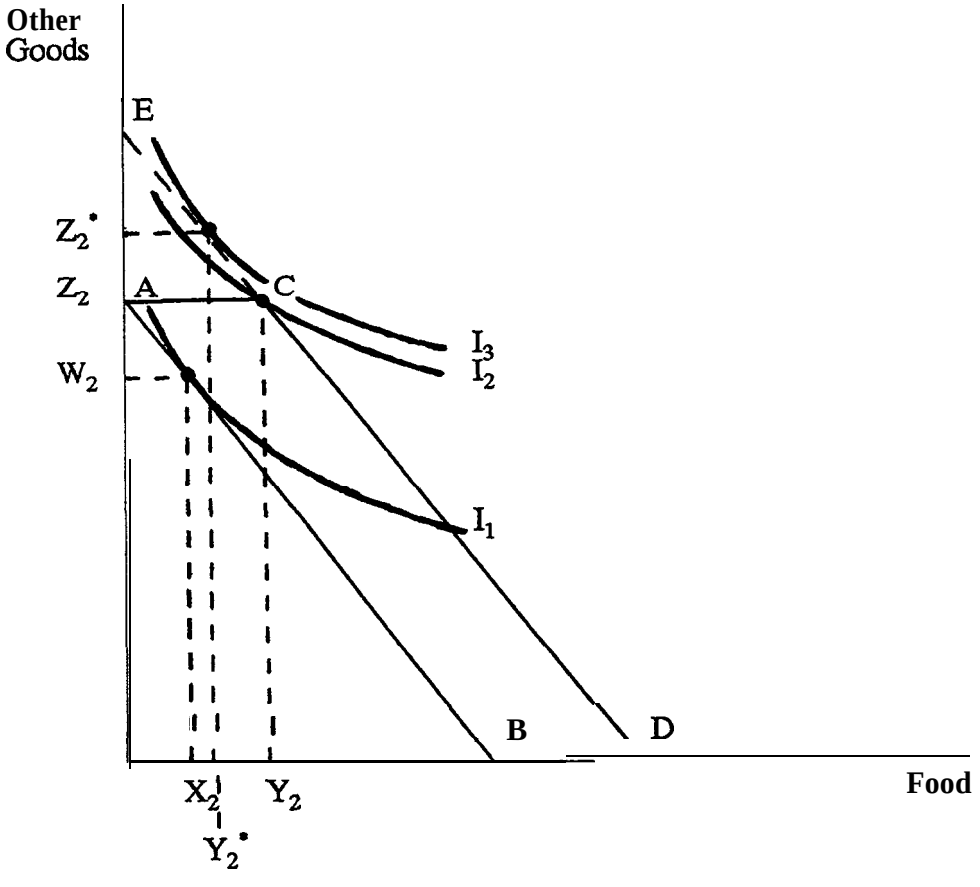
**FIGURE A.1**

THE EFFECT OF FOOD STAMP BENEFITS
ON FOOD CONSUMPTION BY HOUSEHOLD **1**



## FIGURE A.2

## THE EFFECT OF FOOD STAMP BENEFITS ON FOOD CONSUMPTION BY HOUSEHOLD 2



The second component of Southworth's analytic model is the household's budget constraint. On a two-good graph, the budget constraint shows all the alternative possible combinations of the two goods that a household could purchase if it spent its entire current income on those goods.[6] The household's current income (including the amount and form of any assistance benefits that it receives) and the prices that it pays for the goods in question determine the shape and location of its budget constraint on the graph.' The further from the origin that a budget constraint is located, the greater the consumption possibilities that are available to the household and the higher the level of utility from consumption that it can achieve. In Figure AS, the diagonal lines AB and ECD represent alternative budget constraints at two different levels of income for a household, given the fixed prices for the composite goods "food" and "other goods" that it faces.

A household maximizes the total utility obtainable given its current income (including any assistance benefits) by selecting from among all of the alternative combinations of goods on its budget constraint the one combination that allows it to reach its highest feasible indifference curve. That combination is found at the point where the budget constraint just touches--but does not cross--one of the household's indifference curves (i.e., the point of tangency between the two).[8]

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[6]In this analytic framework, it usually is assumed that the household spends its total income on consumption and does not borrow nor draw down its assets to finance current consumption.

'The relative prices of the goods determine the slope of the budget constraint. Given the prices of the goods, the household's income determines how far from the origin the budget constraint is located.

[8]The respective slopes of the household's budget constraint and its highest attainable indifference curve are equal at the point of tangency between the two. Thus, at that particular point, the household's marginal rate of substitution between "food" and "other goods" in its utility function ($MU_i/MU_j$) is equal to the marginal rate of substitution between the two commodities in the market, as given by their relative prices ($P_i/P_j$). As previously noted, this is the condition for the household to maximize its utility from its given budget.

In the absence of a food assistance program, the diagonal line AB, drawn at the same location in Figures Al and A2, represents the budget constraint for food and other goods of Households 1 and 2, respectively. Under that constraint, Household 1 chooses to consume $X_1$ units of food and $W_1$ units of other goods. Household 2, which has the same income as Household 1 but a stronger preference for other goods relative to food (as indicated by the orientation of its indifference map) chooses combination $(X_2, W_2)$, which is richer in nonfood items.

In this theoretical framework, the current Food Stamp Program can be represented by a shift to the right of the budget constraint of a participating household, creating an enlarged budget constraint, such as that represented by line ACD in Figures Al and A2. The new budget constraint is "kinked" at point C, since food stamps can legally be used only to purchase food. The distance AC represents the additional quantity of food that either household could purchase with its food stamp benefit.

Under the assumption that food and other goods are "normal goods" (Le., that a household's consumption of those goods increases as its income increases), the theory indicates that both Households 1 and 2 would increase their consumption of both food and other goods under the enlarged budget constraint provided by the food stamp benefit. This outcome is feasible because each of these households would make cash food purchases in the absence of food stamps. The food stamp benefit permits them to purchase other goods with some or all of the cash income that they would have used otherwise to purchase food. For example, Figure Al shows that the receipt of food stamps permits Household 1 to use some of the cash income that it would have spent otherwise on food to increase its consumption of nonfood items from $W_1$ to $Z_1$. In contrast, Figure A2 shows that the receipt of food stamps permits Household 2 to divert all of the cash income that it otherwise would have spent on food to increase its consumption of other goods from $W_2$ to $Z_2$. In addition, the food stamp benefit permits both households to

increase their consumption of food, as shown by the movement from $X_1$ to $Y_1$ in Figure Al and from $X_2$ to $Y_2$ in Figure AZ.

A cash grant equal to the face value of the food stamp benefit **would shift** the budget constraint from AB, the pre-transfer level, to ECD. Segment EC of that constraint represents consumption bundles that contain particularly high proportions of nonfood items. Those bundles would be attainable by households under a cash food assistance program, but not under an in-kind food assistance program or a program such as food stamps that provides a "tied" benefit that can legally be used only to purchase food. Figure A.1 shows that the consumption behavior of Household 1 would be the same under a cash assistance program as under an equally generous in-hind or tied food assistance program: it would choose $Y_1$ units of food and $Z_1$ units of other goods under either program. In contrast, Household 2 would choose less food and more nonfood items under a cash program than under an in-kind or tied program. Figure A.2 shows that, given its particular indifference map, Household 2 could reach a higher indifference curve (curve $I_3$, representing a higher level of satisfaction to the household than curve $I_2$) under a cash program than under a tied or an in-hind program. It would do so by using its income, plus the cash benefit, to purchase $Y_2^*$ units of food and $Z_2^*$ units of other goods, rather than the less-preferred combination $Y_2$ and $Z_2$ that it would purchase under a tied or an in-hind program.

Household 1 is said to be "unconstrained"--i.e., its consumption choices are not constrained by the form of the assistance benefit--while Household 2 is said to be "constrained"--i.e., the form of the benefit constrains the household to purchase relatively more food and relatively less of other goods than it would prefer, given its resources.[9] An unconstrained recipient of food

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'Among food stamp recipients, a constrained household is one that, if its benefit were in the form of cash rather than coupons, would reduce its food consumption and increase its nonfood consumption relative to the levels under the current Food Stamp Program A slightly different way of stating this definition is that constrained recipients of food stamps would like to reduce their food consumption and increase their nonfood consumption but are prevented from doing so by the tied nature of the food stamp benefit.

stamps achieves maximum utility by selecting a combination of food and other goods somewhere on segment CD of his or her budget constraint. (It would be rare that the unconstrained household's preferred combination would fall exactly on the kink-point, C.) In contrast, a constrained household can maximize its utility only by selecting that combination of food and other goods that is represented by the kink point on its budget constraint.

In this model, equal amounts of food stamps or cash benefits would have the exactly same effect on the food consumption of unconstrained households. In contrast, both forms of assistance would cause constrained households to increase their food consumption, but the increase would be greater if the assistance were provided as in-kind or tied benefits. The presence among food stamp recipients of households whose desired consumption patterns are constrained by the tied form of the benefit is the sole reason in the Southworth theory that food stamp benefits can have a greater impact on food spending than would equivalent cash transfers.

The Southworth model also has implications for the effects of incremental changes in the benefit amount provided under the existing Food Stamp Program on household food consumption. Among unconstrained recipients, the model predicts that a small change in food stamp benefits would have exactly the same effect on consumption as would an equivalent change in regular cash income. Assuming, as before, that food and nonfood commodities are normal goods, the effect of a benefit increase would be to increase the consumption of both types of commodities. (In formal notation, for unconstrained households: $0 < MPC_f$ out of food stamps $= MPC_f$ out of cash income c 1, where $MPC_f$ is the marginal propensity to consume food)

Among constrained households that receive food stamps, the Southworth model predicts that a small change in the benefit would affect only the consumption of food. The tied nature of the benefit constrains these households to use the entire amount of any increase only for increased food consumption. Because these households do not make cash purchases of food, an increase in their food stamp benefit would not release any cash to purchase nonfood items.

Similarly, a small reduction in their food stamp benefit would be likely to reduce only food consumption by these households, without affecting their nonfood consumption.[10] Thus, in principle, the $MPC_f$ out of food stamp benefits is equal to 1 for constrained households.

Figure A3 shows the predictions of the Southworth model about the effects of a small increase in the food stamp benefit received by a constrained household on its food and nonfood consumption. The benefit increase shifts the household's budget constraint from ABC to ABDE. The household's food consumption increases from $Y_1$ to $Y_2$, while its consumption of nonfood items ($Z_1$) is unaffected (i.e., it remains at the kink-point of its enlarged budget constraint). An analogous graphical analysis of a small reduction in the food stamp benefit of a constrained household would show a reduction in food consumption with no change in nonfood consumption.

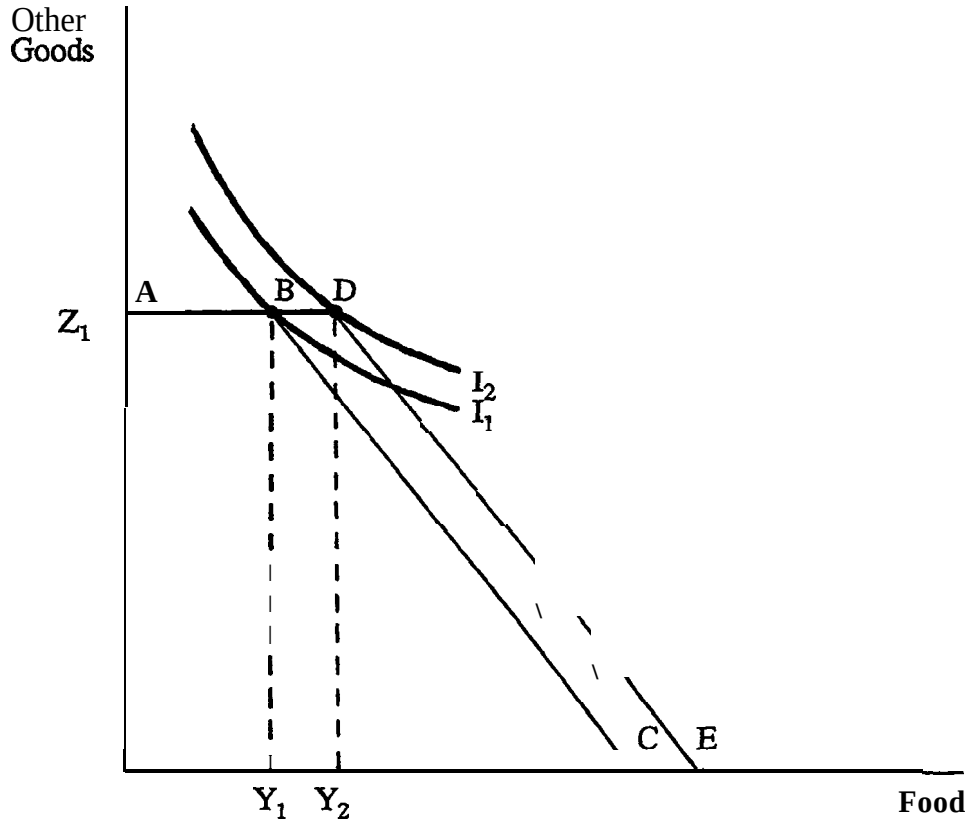
For constrained households only, Southworth's model indicates that the marginal effect of food stamp benefits on food consumption exceeds the marginal effect of ordinary cash income. Finally, the Southworth model provides no basis to expect that if the existing FSP were replaced by a cash program the $MPC_f$ out of cash food assistance would be any different than the $MPC_f$ out of ordinary cash income for either constrained or unconstrained households.

Under the assumption that both food and nonfood are normal goods (i.e., that their consumption increases as income increases), the predictions of Southworth's model about the effects of marginal changes in food stamp benefits, cash food assistance, and regular cash income on the food consumption of individual food-stamp-recipient households may be summarized as follows:

[10]Since a constrained recipient household is consuming relatively more food than it would prefer given its total income, including the food stamp benefit, the Southworth model predicts that it would respond to a small benefit reduction solely by reducing its food consumption, continuing to allocate all of its cash income to nonfood purchases. This would not be the case only if the household's preferred consumption choice happened to fall exactly at the kink-point in its budget constraint, or very close to it. (In that case, the reduction in benefit could shift the household from being constrained to being unconstrained.) As noted, this might happen, but only rarely.

FIGURE A3

**THE EFFECT OF A SMALL INCREASE IN FOOD STAMP BENEFITS ON FOOD CONSUMPTION BY A CONSTRAIN-ED HOUSEHOLD**



Unconstrained Recipients of Food Stamps

Hypothesis 1: $0 < MPC_f$ out of food stamps $< 1$.

Hypothesis 2: $MPC_f$ out of food stamps = MPC, out of ordinary cash income.

Constrained Recipients of Food Stamps

Hypothesis 3: $MPC_f$ out of food stamps = 1.

Hypothesis 4: $MPC_f$ out of food stamps $> MPC_f$ out of ordinary cash income.

Any Recipient of Cash Food Assistance

Hypothesis 5: $MPC_f$ out of cash food assistance = $MPC_f$ out of ordinary cash income.

If both constrained and unconstrained households exist among all food stamp recipients, then Hypotheses l-5 for individual households imply the following three hypotheses about the average values of the $MPC_f$ across all food-stamp-recipient households:

Hypothesis 6: $0 < MPC_f$ out of food stamps $< 1$.

Hypothesis 7: $MPC_f$ out of food stamps $> MPC_f$ out of ordinary cash income.

Hypothesis 8: $MPC_f$ out of food stamps $> MPC_f$ out of cash food assistance.

## C. EMPIRICAL REJECTION OF THE SOUTHWORTH MODEL

Since the beginning of the modern Food Stamp Program in the 1960s, the Southworth model has been influential in studies of the program's effects on food consumption. It has frequently been cited in the literature as providing the economic theory of the effects of food stamps on household food consumption. Even when not specifically attributed to Southworth, this model has often been presented as providing the theoretical underpinning for the empirical analysis undertaken. Senauer and Young (1986) describe the Southworth model (as refined and

modified by subsequent researchers) as "universally accepted as the conceptual basis for explaining the relation between food stamps and food spending."

Actually, with only a few exceptions, most empirical studies of the effects of food stamps on food consumption which either explicitly or implicitly cite Southworth's model as their theoretical basis have not derived their estimating equations formally from the theoretical model. Rather, the estimating equations have largely been straightforward Engel functions, relating household food consumption to income, other resources, and other variables believed to influence food consumption. Two notable exceptions in the literature present empirical analyses of food consumption that are developed explicitly and formally from the underlying theory. The first of these is based on data collected from households in Puerto Rico before and after the 1982 conversion of the Food Stamp Program there to a cash benefit program (Moffitt, 1989). The second is based on data for the mainland United States before and after the 1979 elimination of the food stamp purchase requirement (Senauer and Young, 1986).

The key element of the studies by Moffitt and by Senauer and Young is their structural modeling of the kinked budget constraint (first emphasized by Southworth) that characterizes the consumption possibilities of the recipient of an m-kind or tied transfer payment. Rather than treating them as homogeneous, this structural modeling distinguishes the two types of households that Southworth's theory identifies and predicts to have different food-consumption behaviors. One group consists of the households that normally spend more on food than the face value of their food stamps; as illustrated in Figure Al, their preferred position on their budget constraints is somewhere on the CD segment (generally not including point C), unconstrained by the tied benefit form. The second group consists of the households that purchase only as much food as their food stamp benefits allow; as illustrated in Figure A.2, they are constrained by the tied benefit form to locate at the kink points (C) in their budget constraints, where they consume more food than they would choose if their benefits were in the form of cash.

As noted earlier, the Southworth model provides just one possible basis for the effect of food stamp benefits on recipient households' food consumption to differ from the effect of equivalent cash benefits--the existence of at least some constrained households for which the food stamp benefit is larger than their desired level of food spending out of their (post-transfer) level of resources. An important implication of this theoretical result is that the average value of the $MPC_f$ out of food stamps across all program participants is a positive function of the proportion of constrained households among such participants. If the proportion of constrained households is greater than zero, then the theory implies that the $MPC_f$ out of food stamps exceeds the $MPC_f$ out of ordinary cash income (Hypothesis 7), and that the $MPC_f$ out of food stamps exceeds what the $MPC_f$ out of cash food assistance would be if coupons were replaced by a cash benefit (Hypothesis 8). However, if the proportion of such households is small, then the overall or average effect of food stamps among all recipients will deviate little from that of cash income or cash benefits. Thus, Southworth's theory indicates that the proportion of constrained households among food stamp recipients is a critical variable that must be considered to formulate a realistic expectation about the magnitude of the marginal effect on aggregate food consumption of food stamp benefits, relative to the marginal effects of ordinary cash income and cash food-assistance benefits.

The Southworth model also provides a simple criterion in using existing survey data to determine whether food stamp recipients are either constrained or unconstrained. Based on a comparison of the reported food expenditures of recipient households with the face value of the food stamps they receive, constrained households are identified as those whose food purchases do not exceed the value of their food stamps, whereas unconstrained households are identified as those whose food purchases do exceed the value of their food stamps.

The available empirical evidence on the proportion of food stamp recipients who may be constrained under the current form of the Food Stamp Program (i.e., since the elimination of the

purchase requirement in 1979, or "post-EPR") is quite limited. However, the evidence that does exist is consistent among several independent sources. Senauer and Young (1986) provide one recent estimate of the prevalence of constrained households among food stamp recipients, based on data from the 1979 wave of the University of Michigan Panel Study of Income Dynamics (PSID). They report that 14 percent of food stamp recipients spend no additional cash on food and, thus, in terms of the Southworth theory, are constrained.

A second estimate, by Mathematica Policy Research, is based on unpublished tabulations of data from the post-EPR USDA Survey of Food Consumption in Low-Income Households, 1979-80; this estimate indicates that the ratio of food stamps to food purchases exceeds .90 for 14 percent of recipients and exceeds 1.00 for 11 percent of recipients.[11] These households are unlikely to be making significant cash purchases of food and are thus likely to be constrained.

Also on the basis of post-EPR data, Boldin and Burghardt (1989) and Chen (1983) estimate that the food expenditures of food stamp recipients exceed the value of their stamps by an average of 60 percent and 100 percent, respectively. Neither of these studies provides estimates of the proportion of recipients whose expenditures exceed the value of their food stamps. However, the large differences between the mean food expenditures and the mean value of food stamps received by the households in these samples suggest that the proportion of constrained households is probably quite low.

Thus, on the basis of a handful of descriptive statistics computed with post-EPR data, it appears that the consumption behavior of the large majority of food stamp recipients is not

[11]The finding that food expenditures are less than the value of food stamps for some households may reflect problems with the data--for example, the respective time periods for households' food stamp allotments and reported food consumption may not coincide in the data. The finding is also consistent with the hoarding or loss of some food stamps by some recipients (a small proportion of all food stamps that are issued are never redeemed) or with the existence of trafficking in food stamps (i.e., the illegal exchange of food stamps for cash or nonfood items). A simple extension of the Southworth theory can show that constrained households face an economic incentive to traffick in food stamps.

constrained by the form of the benefit. In the framework of the Southworth model, this finding implies the following basic prediction: that, on average, the $MPC_f$ out of food stamps should exceed the $MPC_f$ out of ordinary cash income only very slightly for recipient households as a whole. In turn, this prediction implies that the cashing out of food stamps should have little effect on food consumption.

When the basic prediction from the Southworth model is compared with the extensive empirical findings reported in the literature, the @mediately striking fact is that the theoretical prediction fails to be confirmed in virtually every study. As reviewed in Chapter IV of this report, the empirical findings strongly and consistently show statistically significant estimates of the effects of food stamps on household food consumption that are substantially greater than the comparable impacts from equivalent regular cash income. In the 17 studies reviewed there, the estimated marginal effect of food stamps on the food spending of participating households exceeds the estimated marginal effect of regular income by a factor of between 2 and 10, excluding the most extreme estimates. The median value is a 3.8-times greater marginal effect of food stamps than of cash income on participant household's food consumption. Moreover, this body of findings appears to be robust across a wide variety of time periods, data sets, and estimation methods.

The two studies that estimated "structural models" of the consumption of food stamp recipients (Moffitt, 1989; Senauer and Young, 1986) stand out from the rest of the literature because they estimated the food-stamp and cash-income effects on food consumption explicitly for each subgroup of recipient households--constrained and unconstrained. Based on his analysis of data from the Puerto Rico supplement to the 1977-78 Nationwide Food Consumption Survey, Moffitt reports no significant difference between the coupon and cash benefit forms for either group of households. A large proportion of the food stamp recipient households in these data appear to be unconstrained (92 percent). For these, Moffitt's finding is the result predicted by the Southworth theory. For the small but theoretically important group of "constrained"

households, however, this empirical result is at odds with the theory. One explanation, examined by Moffitt, is that the opportunity to traffick in food stamps may have already given these households the same flexibility that a more formal cashout of the program would have achieved.[12]

Using national panel data from the 1977-1979 waves of the PSID, Senauer and Young (1986) modeled the structure of the Food Stamp Program both before and after the EPR. The primary purpose of their study was to subject the Southworth model for the first time to explicit validity tests in a formal hypothesis-testing framework One testable hypothesis implied by the model is that, for unconstrained households, the proportion of total household income received in the form of food stamp benefits should have no consequences for their food consumption. When this was framed as a null hypothesis and tested against the PSID data, it was rejected at the 95 percent confidence level on the basis of the post-EPR data, and at the 99 percent level on the basis of the pre-EPR data.

One possible explanation for the consistent sharp discrepancy between the theoretical predictions of the Southworth model and the large body of empirical evidence on the respective food-stamp and cash-income effects on food consumption is that the empirical findings are consistently wrong. In particular, in estimating the effects of food stamps and income on the food consumption of participating households based on a statistically controlled comparison with data for eligible nonparticipating households, few of the studies reported in the literature attempted

[12]Moffitt suggests that "the lack of any detectable effect on food expenditures of the conversion of Food Stamps to cash in Puerto Rico in 1982 occurred because the stamps were equivalent to cash even before the cashout." In a study of household production and consumption under a PL-480 in-kind food assistance program in rural Panama, Franklin and Harrell (1988) also found no significant difference between the marginal impacts of in-kind benefits and regular income on household food consumption. The Panamanian study sample consisted of very-low-income families, among whom constrained households according to the Southworth model would be expected to be numerous. Bartering or trafficking in the donated foods by recipient households evidently was a factor also in this case.

to control or correct for the potential effect of self-selection bias. Such bias, associated with the self-selection of eligible households into the program, in principle could have invalidated the study results.

This possibility has recently been investigated with data from both the 1979-80 Survey of Food Consumption in Low-Income Households (Devaney, Haines, and Moffitt, 1989) and the 1985 Continuing Survey of Food Intakes of Individuals (Fraker, Long, and Post, 1990). The results from both studies show only slight evidence of self-selection bias in estimates of the food-consumption functions for food stamp participating and eligible nonparticipating households.[13] Thus, on the basis of the evidence that does exist, this potential source of bias in estimates of the effects of food stamps does not appear to be capable of explaining more than a small part of the observed discrepancy between the received theory and the empirical findings.[14]

Another reason that the empirical estimates may be wrong is that the estimation models may have included inappropriate measures of household income among their explanatory variables. For example, the findings obtained by Boldin and Burghardt (1989) from the 1982-83 Consumer Expenditure Survey--that the expenditures of low-income households exceed their income by 60 percent--suggest either that income is measured with error or that a measure of permanent income is more relevant than a measure of current income in explaining consumption. If either is true, then a model that includes a measure of current income among its explanatory variables has an "errors-in-variables" problem, and the coefficient on the income variable is biased

[13]Chen (1983) reported no statistically significant evidence of self-selection bias in his analysis of food consumption by food stamp participants; however, such bias was a significant factor in his analysis of food consumption by eligible nonparticipants.

[14]The statistical power of the analytic techniques that have been used to attempt to control for the effects of selection bias has been greatly weakened by the absence of adequate "identifying variables" in available data sets. These are variables that influence an eligible household's participation in the FSP but that do not affect its food consumption; the presence of at least one such variable is essential to the effectiveness of these analytic techniques. Consequently, analyses of food consumption that have addressed the selection-bias problem to date may have underestimated the actual extent of such bias.

toward zero. Such bias could partially explain why estimates of the marginal effect of income on food consumption are consistently smaller than estimates of the marginal effect of food stamps.

## D. THEORETICAL CHALLENGES TO THE SOUTHWORTH MODEL

If the general thrust of the consistent empirical fmding that food stamp benefits have a substantially greater marginal effect on recipients' food consumption than does cash income is accepted as valid, then it is Southworth's theoretical model that must be recognized as erroneous and either reformulated or replaced. This task has not yet been fully addressed, but several approaches to such a reformulation appear to offer some promise. Some of these are relatively narrow and within the scope of traditional consumer demand theory and the Southworth model, based on household utility functions and budget constraints that are defined solely on quantities of market commodities. Other potential approaches are more fundamental, requiring a more comprehensive view of the household's realization of utility through the choice and consumption of goods and services. This section examines two narrowly focused potential modifications of Southworth's theory, and the next section discusses more fundamental approaches to a possible reformulation of the theory.

Underlying Southworth's model is the implicit assumption of a consistent planning horizon or time period within which the household takes into account its expected income, food stamps, and other assistance benefits for the period, considers its consumption options, and makes its budgeting decisions. The model presupposes that a household's consumption decisions are made in awareness of, and are consistent with, the resources that are available to it throughout this period so as to maximize the household's expected utility over the period The model also assumes that the members of a household have homogeneous preferences for goods and services, or are able to reach a consensus on their consumption choices, and exercise those choices as a single economic unit. If either of these assumption is invalid, then the hypotheses generated by

the Southworth model about the relative effects of food stamps, cash food assistance, and ordinary cash income on food consumption may be incorrect.

1. The Absence of Monthlv Planning of Consumntion

A significant proportion of food stamp recipients may not in fact plan their consumption on a monthly basis (i.e., over a time period consistent with their receipt of food stamps). Smallwood and Blaylock (1985) speculate that low-income households may "spend their money and stamps today and heavily discount the value of future consumption." Madden and Yoder (1972) report that many food stamp recipients spend a large portion of their stamps in the first two weeks after receiving them. Data from an ongoing demonstration project in Reading, Pennsylvania, in which an "electronic benefit transfer" (EBT) system is being used to issue food stamp benefits (using an encoded plastic card in place of coupons) show that recipients spend an average of 19 percent of their monthly benefit on the day of issuance, 70 percent within the first week, and 89 percent within two weeks.[15,16]

Reports in the news media of recipients' "splurging" on food consumption during the days immediately following food stamp receipt provide further anecdotal confirmation of this behavior (see, for example, Schoen, 1983; and Lelyveld, 1985). Such behavior may deplete a household's food stamps and food stocks days or even weeks before it next receives food stamps, necessitating some combination of purchasing food with cash, relying on food banks or gifts of food from relatives or friends, and reducing food consumption during the latter days of the month.

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[15] These findings will be reported in a forthcoming report by Abt Associates to the Food and Nutrition Service, entitled "Household Shopping Patterns in the Food Stamp Electronic-Benefit-Transfer Demonstration."

[16] The statistics on the use of food stamp benefits that are cited are consistent with the concentration of food consumption early in the monthly benefit cycle, but they do not prove the existence of such a pattern. Indeed, there is little direct evidence to support or refute the hypothesis of a monthly cycle in food consumption by food stamp recipients. (The 1977-78 NFCS provides data on the timing of food consumption but not on the timing of food stamp receipt.) Some anecdotal evidence suggests that such a cycle may exist.

Some households may splurge on food consumption because they budget inadequately or plan consumption poorly. Others may do so in a deliberate response to the need for variety in food consumption or to obtain a respite from the pressure of continuous economizing. The latter households pose no challenge to Southworth's theory--they do not differ fundamentally from households that spend more on food than the value of their food stamps and then spread their consumption of that food more evenly over the month.

Some researchers have suggested that inadequate budgeting and consumption planning by some food stamp recipients may pose a challenge to Southworth's theory (West, Price, and Price, 1978; Smallwood and Blaylock, 1985; and Senauer and Young, 1986). Based on a monthly accounting period, such households would be classified as "unconstrained" from survey data, since the value of their monthly food use would exceed the value of their food stamp allotment. However, during the critical first part of the month, these households may in fact be constrained according to the Southworth model, consuming more food and fewer nonfood items than they would have chosen had their assistance benefit been in the form of cash. For the full monthly accounting period, the $MPC_f$ out of food stamps for such households may be high, perhaps as high as 1, despite the fact that they appear to be unconstrained under the criterion that their monthly food expenditures are greater than the amount of their food stamp benefit.[17]

[17]The data sets used most frequently to estimate the effects of food stamps on food consumption provide food-use or food-expenditure data for less than a full month. The Nationwide Food Consumption Survey provides data on one week of household food use, while the Consumer Expenditure Survey provides data on two weeks of food purchases. Researchers use these data to classify food stamp recipients as constrained or unconstrained, by converting the reported consumption or expenditure amounts to monthly values and comparing the converted values with the household's monthly food stamp benefit. Following this procedure, a household would be classified as unconstrained if it were observed early in the month and as constrained if it were observed later in the month. The hypothesis presented in this section--that some households are actually constrained by the form of the food stamp benefit during consumption-splurge periods--suggests that the procedure for classifying households as constrained or unconstrained on the basis of data only for part of a month may misclassify some households. Furthermore, regardless of whether consumption splurges are of theoretical importance in testing the Southworth model, the existence of an irregular pattern of food expenditures or food

In the Southworth theory, the extent to which the $MPC_f$ out of food stamps diverges from the $MPC_f$ out of ordinary cash income on average across all food stamp recipients depends entirely on the proportion of those recipients whose consumption choices are constrained by the tied form of the benefit. If the proportion of such constrained households among food stamp recipients is substantially greater than appears from the data, it might account for the discrepancy observed between the theoretical prediction of little expected divergence between the food-stamp effect and the cash-income effect on food consumption and the consistent empirical finding of a very substantial divergence. This would be the case if a sufficiently large proportion of the (apparently unconstrained) food stamp recipients observed in the data are unable to manage their desired food consumption over a month due to inadequate planning and budgeting, and are thus in fact effectively constrained during that part of each month when most of their food consumption occurs.

2. Heterogeneous Preferences among Members of a Household

Southworth's theoretical model assumes that all members of a household share the same preference for food versus other goods, thus allowing the household's preferences to be represented as a single set of indifference curves. Senauer and Young (1986) note that, if consumption preferences vary among household members, the theory's prediction that the effects of coupons and cash on food consumption by unconstrained households do not differ may be incorrect. As a simple example, consider a hypothetical household in which the female head has a greater preference for the consumption of food--by all members of the household--relative to nonfood items than does the male head. If the ability of the female head to influence the household's food budget and make purchases according to her preferences is enhanced by the

consumption within a month, combined with the collection of only one or two weeks of consumption or expenditure data could mean that some households will be misclassified as constrained or unconstrained, based on existing data.

coupon form of the benefit, then food stamps would be expected to have a larger marginal effect on the household's food consumption than would either cash food assistance or ordinary cash income.

## E. LIMITATIONS AND POSSIBLE EXTENSIONS OF TRADITIONAL THEORY

Within the traditional theory of consumer demand, anything that limits a household's freedom of choice among market goods and services potentially reduces the total utility that the household can realize from its available resources. One consequence of this fundamental premise of traditional consumer theory is that, in the context of the Southworth model, food stamps can enable a household to attain, at most, the same level of utility that it would obtain with equivalent cash benefits, while some households--those whose free choice is constrained by the tied benefit form--necessarily derive less utility from consumption if their food stamp benefit is in the form of coupons rather than cash. The various conceivable reasons that assistance benefits earmarked for the purchase of food might enable a household to attain a higher level of utility than it would with cash benefits cannot be analyzed, nor even addressed, within the framework of the Southworth model.

However, there are several plausible reasons that food coupons as opposed to cash benefits may facilitate attaining greater utility from consumption by low-income households. For example, the distinctive physical form of the coupons in itself may make them a useful aid to some households in planning and budgeting their monthly food expenditures. (This conceivable positive function of the coupons may be viewed as akin to the budgeting technique used by some households--whatever their incomes--of depositing money in separate envelopes, jars, bank accounts, etc., each earmarked to a specific household requirement such as food, rent, medical expenses, debt repayment, or whatever.)

A second way in which the coupon form of the food stamp benefit may help a household attain a higher level of utility from consumption derives from the possible difficulty of the household in meeting its own budget priorities in the face of its marginal and unstable economic circumstances and powerful external demands. This function of food coupons may come into play when a financial emergency places hard-to-resist claims upon the household's resources. For example, a landlord or creditor may demand payment, threatening severe consequences if not immediately satisfied; a medical emergency may arise, while past-due doctor bills inhibit seeking further help; or the household's sole means of transportation may break down.

The diets of food stamp recipients may be insulated from such exigencies, at least to some extent, by the tied form of the food stamp benefit. Fragmentary evidence supports the hypothesis that some households value the relatively inflexible payment instrumentality provided by food stamps, which reduces the likelihood that creditors or bill collectors will demand them as payment, thus forcing the debt repayment to be spread over a longer period of time and protecting the household's baseline level of food consumption. A related but more tenuous hypothesis is that some households may value the tied nature of the food stamp benefit because it reduces the likelihood that they will voluntarily respond to financial emergencies in a manner that they know is inappropriate--that is, by reducing their purchases and consumption of food. These households may recognize that they are prone to respond to financial emergencies in this way and also recognize that the adverse long-run implications of this response, especially for young children, make it unacceptable. Thus, the tied form of the food stamp benefit may help them attain a higher level of utility from consumption over the long run.

**A** third possible source of utility associated with the coupon form of the stamp benefit pertains to the internal issue of interpersonal control over the household's food expenditure that exists in some families. As noted earlier, the household's principal food shopper may find it easier to influence the household's food spending when the benefit is in the form of coupons (or

EBT card) instead of cash. This is the "heterogeneous preferences" challenge to the Southworth model described earlier. However, the contribution of the distinctive coupon benefit form may conceivably extend further, allowing the possibility of an additional source of positive utility for the household in facilitating a "division of labor" among household members in their authority over various segments of the household's consumption--that is, by providing a practical means of conflict avoidance.

These few possibilities are enough to suggest that the theoretical framework of the Southworth model may be too narrow to fully accommodate the relevant range of consumption-related behaviors of food-stamp-recipient households. The model allows the inflexibility of a tied food assistance benefit to diminish households' utility from consumption relative to that which they would achieve with a cash benefit. However, it does not allow for any possible augmentation of utility from consumption that might stem from the tied benefit form, nor, for that matter, does it allow for other recognized disutilities associated with the form, such as stigma that may be associated with using food stamps. In implicitly excluding any possible influence of the in-kind or tied benefit form, either positive or negative, on households' utility from consumption--apart from the possible loss to some households due to the limitation on their freedom of choice--the Southworth model may represent an unduly restricted version of utility theory. Within a more general theoretical framework, all aspects of the food assistance benefit which influence the level of utility that a household may attain from consumption would in principle determine the effect that food stamps could have on the household's food consumption decisions. A model that could allow for such influences would have additional "handles" not available in the Southworth model for explaining a distinctive food stamp effect on food spending, one that differs from the effect of cash.

Several modem developments in utility theory provide more flexible and comprehensive frameworks for modeling some of the more complex aspects of consumer behavior. They include

the "household production function" approach of Becker (1964, 1965), the "new consumer economics" of Lancaster (1966, 1971), and the theory of "hedonic" demand functions (Lancaster, 1971; Triplett, 1987). Each of these extensions of traditional utility theory may allow consumer behavior to be modeled in ways that can account for the observed difference in the effects of food stamps versus cash income on food consumption. For example, George Lady (1984) has shown that the Lancaster model of wnsumer choice, applied to food stamp participating households, can in principle explain a divergent impact of food stamps and cash income on recipients' food consumption decisions, for both unconstrained and constrained consumers.[18]

In this approach, households are viewed as forming their consumption preferences in terms of the perceived attributes of commodities, rather than directly in terms of the commodities themselves. For example, an automobile may embody the attributes of transportation, recreation, prestige, display, etc. for any particular consumer, which influence that consumer's choices. The "qualitative" aspects of wnsumer choice, or some of the motivating factors for choices, can thus be treated explicitly in this framework, as well as the sheer commodity-quantity dimension of consumption choices.

In the case of food stamps, the experience of purchasing a selection of food items with stamps and purchasing the identical selection with cash may have different utility implications for the consumer. If so, this felt or perceived difference can be expressed in the commodity-attributes framework as if the food selection itself were actually two distinct commodities or commodity bundles (say, "cash food" and "stamp food") that differ in at least one key attribute for this consumer. This framework allows the effect of stigma and other possible utility-diminishing aspects of food stamp use to be modeled explicitly, and it also allows for possible utility-enhancing aspects of the in-kind benefit form to be considered as well. As noted earlier,

[18]Lady and Bickel (forthcoming) further develop the analysis of the consumption behavior of unconstrained food stamp recipients under the Lancaster version of wnsumer utility theory.

it can then be shown that the different possible forms of the food benefit, received either as cash or as an in-kind or tied benefit, can influence the impact of the benefit on food consumption for both constrained and unconstrained households (Lady, 1984, Lady and Bickel, forthcoming).

## F. SUMMARY

The history of the formal empirical analysis of household food consumption and its relationship to income can be traced from the late 1700s, thus predating by a century the development of the modem neoclassical theory of consumer behavior. The empirical research on the effects of food stamp benefits on household food consumption has a comparatively brief history, dating from the emergence of the Food Stamp Program in the early 1970s as a nationwide program with uniform standards governing eligibility and benefits. Southworth's (1945) application of the basic tools of neoclassical consumer theory to analyze the effects of food stamps and ordinary cash income on food consumption provides the theoretical underpinning for the empirical research of the past two decades.

An important implication of Southworth's analysis is that, given the apparently low percentage of food stamp recipients who purchase no food with cash, the effect of a small increase in the food stamp benefit on food consumption by an average recipient household should be virtually identical to that of an equal increase in its cash income. However, the empirical estimates of the effects of food stamps and cash income on food consumption that are reported in the literature consistently fail to confirm this hypothesis. Furthermore, a formal test of the hypothesis rejected the Southworth model at a high level of statistical confidence (Senauer and Young, 1986).

One possible explanation for the discrepancy between the theoretical prediction of roughly equal effects of food stamps and cash income on food consumption and the extensive empirical findings of a substantially larger effect of food stamps is that the empirical findings are

consistently wrong. In principle, this explanation could be correct if participation in the Food Stamp Program were subject to such a pervasive "self-selection bias" that the diverse data sets that form the basis for the various estimates of food stamp effects all yield invalid results under conventional estimation methods. However, this possibility has been examined in the literature (Chen, 1983; Devaney and Moffitt, 1989; and Fraker, Long and Post, 1990), and the consensus finding that estimates of food stamp effects contain only slight apparent self-selection bias casts doubt on this line of explanation for the discrepancy between the theoretical prediction and the empirical findings. Substantial error in the measurement of income by household surveys could, in principle, also be responsible for the discrepancy. If such error exists, and there is evidence that it does (Boldin and Burghardt, 1989), it could bias estimates of the effect of income on food consumption toward zero. The existing literature does not address this possible explanation for the fact that food stamps are consistently estimated to have a larger effect on the food consumption of recipient households than does cash income.

A second possible explanation for the discrepancy between the prediction from theory and the large body of empirical findings on the effects of food stamps and cash income on food consumption is that the assumptions of the underlying theoretical model may be violated, or that the theory may be fundamentally inadequate for analyzing the consumption behavior of food stamp recipients. Southworth's theoretical model presupposes the existence of a consistent time period within which a household assesses its resources, makes its budgeting decisions, and allocates its consumption of goods and services over the days within that period. It also presupposes that the individual members of a household basically agree on their consumption choices, so that the household can be treated as a single decision-making unit. Anecdotal evidence exists that these assumptions of the model may be violated for some proportions of food stamp recipients, thus casting doubt on the validity of hypotheses generated by the model.

Alternately, the inability of the Southworth model to accommodate any of several conceivable positive effects of food stamp benefits, relative to cash food assistance, on the utility that recipients can attain through consumption may also be a source of its apparently erroneous prediction about the relative effects of food stamps and cash income on food consumption. A model capable of accommodating such positive effects stemming from the tied nature of the food stamp benefit might generate hypotheses of larger food-consumption effects of food stamps compared with regular cash income--something not possible under the Southworth model.

# APPENDIX B

# MEASURES OF HOUSEHOLD SIZE AND COMPOSITION

A consistent finding of previous research based on household food-use data is that household size and composition have important effects on food expenditures and nutrient availability. Larger households and households with certain types of members (e.g., teenage males) have been found to consume greater quantities of food, leading to higher food expenditures and greater nutrient availability than is found for households of other sizes and/or compositions. Four measures of household size and composition are used in research on food-use data:

1. Number of persons in the household
2. Household size in 21-meal-at-home equivalent persons
3. Household size in adult male equivalent (AME) persons
4. Household size in equivalent nutrition units (ENU)

Number of Persons in the Household. The first measure of household size and composition is simply the number of persons in the household. It is the easiest of the four measures to compute and use in analyses of food expenditures and nutrient availability; however, it is insensitive to the possibility that households of equal size may have different requirements for food at home depending upon the proportion of meals eaten by household members at home, the age, sex, and pregnancy/lactation status of the household members, and the number of meals served to guests.

Household Size in 21-Meal-at-Home Equivalent Persons. In analyses of the use of food from the home food supply, the number of persons in the household is often adjusted to account for differences among households in the proportion of meals eaten at home and in the number

of meals served to guests.[1] The purpose of the adjustment is to obtain a measure of the number of equivalent persons who are fully dependent on the home food supply. The adjustment assumes that each household member eats 21 meals per week Household size in 21-meal-at-home equivalent persons is computed by summing the number of meals eaten from the household food supply during a week by all members of the household and their guests and dividing by 21. For example, a household consisting of a woman who eats 17 meals per week at home and a man who eats 18 meals per week at home would have an adjusted size of 1-2/3 (= 35/21) 21-meal-at-home equivalent persons.

Household Size in Adult Male Equivalent Persons. One problem with the number of household members and the number of 21-meal-at-home equivalent persons as measures of household size in analyses of home food use is that they treat all household members identically; thus, they assume that the age, sex, and pregnancy/lactation status of household members are unrelated to the actual amount of food used. This assumption is questionable, since it is likely that variation in the food expenditures and nutrient availability of households can be attributed in part to differences in these factors, as well as to differences in the number of household members. For example, a household consisting of a woman and two preschool children has different nutritional requirements (and, hence, is likely to have different food expenditures and food use) than a household of the same size that consists of a woman and two teenage male children.

The third measure of household size and composition--household size in adult male equivalent persons--adjusts for the age, sex, and pregnancy/lactation status of household members.

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'Among food stamp and other low-income households, expenditures on food away from home are a relatively low percentage of total expenditures on food (see Chapter III of this report), implying that the proportion of meals eaten away from home by these households is low. Thus, the impact of an adjustment for meals eaten away from home on a measure of household size is likely to be small for these households.

The adjustment procedure weights each household member by his or her RDA for a selected nutrient relative to the RDA for an adult male age 25 to 50. The sum of these weights yields the household size in adult male equivalent persons. For example, consider the following four-person household:

| Household Member | RDA for Food Energy (Kilocalories) | Relative Need |
|---|---|---|
| Male, age 35 | 2,900 | 1.00 |
| Female, age 35 | 2,200 | .76 |
| Male, age 15 | 3,000 | 1.03 |
| Female, age 12 | 2,200 | .76 |
| Household size in adult male equivalent persons | | 3.55 |

The number of adult male equivalent persons in this household, based on the RDAs of the household members for food energy, is 3.55.[2]

Household Size in Equivalent Nutrition Units. The fourth measure of household size and composition--household size in equivalent nutrition units--adjusts the number of household members for their age, sex, and pregnancy/lactation status, as well as for the proportion of meals that they eat away from home and for meals served to guests. Thus, this measure of size and composition incorporates the adjustment associated with the second measure as well as the adjustment associated with the third measure. Continuing with the previous example, suppose

[2]The RDAs for food energy are obtained from the Committee on Dietary Allowances of the National Research Council (1989).

that the male head ate two-thirds of his weekly meals at home, and that the other household members ate all their meals at home:

| Household Member | Relative Need | | Proportion of Meals Eaten at Home | | Equivalent Nutrition Units |
|---|---|---|---|---|---|
| Male, age 35 | 1.00 | x | .67 | = | .67 |
| Female, age 35 | .76 | x | 1.00 | = | .76 |
| Male, age 15 | 1.03 | x | 1.00 | = | 1.03 |
| Female, age 12 | .76 | x | 1.00 | = | .76 |
| Household size in equivalent nutrition units | | | | | 3.22 |

Household size in equivalent nutrition units for this hypothetical household, based on the RDA for food energy, would be 3.22 persons.

Household size in equivalent nutrition units may be used to compute a household's average daily availability per ENU of nutrients from food used at home during a week. A comparison of this measure with a dietary standard such as the RDA provides an assessment of the nutritional quality of food used by the household at home.

Kennedy, Harrell, and Frazao (1982) examine the validity of a critical assumption underlying the concept of the equivalent nutrition unit as well as the measure of size in 21-meal-at-home equivalent persons: that each meal contributes equally to the intake of nutrients. Their research shows that the intake of nutrients at a meal varies greatly according to the meal occasion (breakfast, lunch, dinner, or other). For each of six nutrients examined, dinner provides the largest proportion of the total daily intake (36 to 50 percent), with breakfast and lunch providing approximately equal proportions, and other eating occasions (snacks) contributing from 8 to 12

percent of total intake. The meal-specific pattern of intake is strongly influenced by age but not by sex. This study suggests that, in addition to the age, sex, and pregnancy/lactation status of household members and the proportion of meals that they eat away from home, the meal occasions for meals eaten away from home should be considered when household size is calculated in equivalent nutrition units. For example, because it assumes that each meal provides one-third of a person's total intake of any given nutrient in a day, the standard adjustment for lunches eaten away from home is too large; only 18 to 25 percent of the six nutrients examined by Kennedy, Harrell, and Frazao are actually supplied by lunch.

# APPENDIX C

## INFORMATION ON THE SOURCE OF THE $MPC_f$ ESTIMATES IN CHAPTER IV

TABLE C.1

NOTES IN SUPPORT OF TABLE IV.1--$MPC_f$ ESTIMATES

| Study | Page Reference for Estimates | Notes |
|---|---|---|
| | | STUDIES BASED ON PRE-EPR DATA |
| Benus, Kmenta, and Shapiro (1976) | 137 | None. |
| Hymans and Shapiro (1976) | | $MPC_f$ out of food stamps is for urban households in lowest quintile of per capita income. For log model, $MPC_f$ out of food stamps computed on assumption that food stamps is only income: $MPC_f$ out of money income computed on assumption that wages/salaries is only income. Mean values of income and food consumption for first half sample used in all $MPC_f$ computations. |
| Linear Model | 178 & 184 | |
| Logarithmic Model | 185 & 186 | |
| West and Price (1976) | 729 | Income enters model in log form. $MPC_f$ out of income computed at sample mean income. |
| Neenan and Davis (1977) | 95 | Model includes interactions of food stamp benefit with income and household size. $MPC_f$ out of benefit and income computed at sample mean values of income, benefit, and household size. |
| West, Price, and Price (1978) | 137-38 | Model includes food stamp participation dummy and log of income. $MPC_f$ out of benefit and income computed at sample mean values of income and benefit. |
| Salathe (1980b) | 40 | $MPC_f$ out of income obtained from equation estimated on eligible nonparticipants. Those coefficients were used to predict what the food expenditures of participants would be if they were not participating. The $MPC_f$ out of food stamp benefits was derived by comparing those predicted values with the actual expenditures of participants. |
| Johnson, Burt, and Morgan (1981) | 62-63 | $MPC_f$ estimates are from Equation 3. |
| Brown, Johnson, and Rizek (1982) | Table 4 | $MPC_f$ estimates are from the unrestricted model (Model 3). |
| Chavas and Yeung (1982) | Table 5 | $MPC_f$ estimates are for metropolitan households with nonblack, noncollege-educated heads. |
| Allen and Gadson (1983) | 42 | None. |
| Chen (1983) | 91-92 | Based on 1977-78 data. Model includes square of income. $MPC_f$ out of income computed at sample mean value of income for food stamp participants. |
| West (1984) | 31-34 | Model includes log of income and interaction of food stamp benefit with log of income. $MPC_f$ out of benefit computed at sample mean value of income for food stamp participants. Insufficient descriptive data on income and benefits to compute $MPC_f$ out of income. Estimates are from Model 3. |
| Smallwood and Blaylock (1985) | 49 | None. |
| Senauer and Young (1986) | 40-41 | Based on 1978 data. Model is nonlinear in income and food stamp benefit. $MPC_f$ out of benefit and income are the median values for the sample households. |

TABLE C.1 (continued)

| Study | Page Reference for Estimates | Notes |
|---|---|---|
| | | **STUDIES BASED ON PRE-EPR DATA (continued)** |
| Basiotis, Johnson, Morgan, and Chen (1987) | 393 | Model includes squared values of benefit and income. $MPC_f$ out of benefit and income computed at sample mean values of benefit and income for food stamp participants. |
| Devaney and Fraker (1989) | 101 | None. |
| | | **STUDIES BASED ON POST-EPR DATA** |
| Chen (1983) | 91-92 | Based on 1979-89 data. Model includes square of income. $MPC_f$ out of income computed at sample mean value of income for food stamp participants. |
| Senauer and Young (1986) | 40-41 | Based on 1979 data. Model is nonlinear in income and food stamp benefit. $MPC_f$ out of benefit and income are the median values for the sample households. |
| Fraker, Long, and Post (1990) | 107 | None. |