

WP 97-04
March 1997

Working Paper

Department of Agricultural, Resource, and Managerial Economics
Cornell University, Ithaca, New York 14853-7801 USA

A MONTHLY CYCLE IN FOOD EXPENDITURE AND INTAKE BY PARTICIPANTS IN THE U.S. FOOD STAMP PROGRAM

by

Parke Wilde and Christine Ranney

It is the policy of Cornell University actively to support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age or handicap. The University is committed to the maintenance of affirmative action programs which will assure the continuation of such equality of opportunity.

A Monthly Cycle in Food Expenditure and Intake
by Participants in the U.S. Food Stamp Program

Parke Wilde
Christine Ranney

Department of Agricultural, Resource, and Managerial Economics
Cornell University

This research was funded by a grant from the U.S. Department of Agriculture and the Institute for Research on Poverty. We are releasing this working paper to solicit advice and suggestions for a final report under that grant, so we ask that it not be quoted without permission from the authors. We gratefully acknowledge feedback already received during presentations to the American Agricultural Economics Association, the Division of Nutrition Science at Cornell, and the Economic Research Service. All opinions and errors are our own.

Abstract

This paper uses nationally representative data to describe a monthly cycle in food expenditure and food intake by food stamp recipients. Food expenditure peaks sharply in the first three days after food stamps are received. Actual food intake drops at the end of the month, for some foods and some people, although food intake over time is always smoother than food expenditure. The food stamp cycle has implications for two areas of research: the measurement of hunger and food insecurity in the United States, and the measurement of the impact of the U.S. Food Stamp Program.

I. Introduction

Food stamp recipients spend benefits and consume food unevenly over time. Food expenditure peaks sharply in the first three days after food stamps are received. Actual food intake drops at the end of the month, for some foods and some people, although food intake over time is always smoother than food expenditure. These patterns show that program participants commonly store food at home to reduce fluctuations in food consumption, but home storage does not eliminate the fluctuations altogether. Many food stamp recipients experience repeated periods of food plenty and food scarcity, with welfare and nutritional consequences that are not yet well understood.

This research measures these monthly cycles nationally for the first time, but their broad outlines have been well known for years among researchers and officials responsible for the Food Stamp Program. In the press, these cycles have been described with some alarm. "Inevitably," Joseph Lelyveld wrote in the *New York Times Magazine* 12 years ago [Lelyveld 1985], "most food-stamp families live on a nutritional cycle that starts off reasonably well, then deteriorates as the month wears on, becoming marginal if not desperate in the final week or 10 days, depending on how frugal they were earlier.... The cyclical nature of undernutrition in America -- the monthly slide to a meager diet of starches that will stave off the sensation of hunger -- cannot be good for the health of the poor...."

The monthly food stamp cycle has implications for two fields of research that have received much attention in recent years. The first field is the measurement of hunger and food insecurity, which depends on information about the timing and duration of spells without food. For example, the food stamp cycle has been linked to a cycle in the use of soup kitchens [Thompson et al. 1988]. That study found in two samples from New York City and Upstate New York that the mean number of meals served weekly in soup kitchens followed a sharp saw-tooth pattern over the year, with a peak at the end of almost every month. Similarly, a study of the nutritional adequacy of diets in low-

income families in Cleveland found that most food is purchased in the first two weeks of the month [Emmons 1986]. Just as we find with national data, that study said food intake is much steadier over the food stamp month than food spending is. At a 1994 conference on food security measurement and research, Steve Carlson recommended further research in this area: “We need to work harder to figure out how we can identify, measure, and assess the consequences of a recurrent or cyclical pattern of hunger, for example, at the end of each month” [Food and Consumer Service 1994].

The second field of research is the measurement of the impact of the U.S. Food Stamp Program on food spending and food intake. Past research on food stamps has used data from surveys that inquire about short periods of food expenditure or food use for each respondent. It makes a difference whether these short periods occur early or late in the food stamp month. In a 1990 survey of this literature on the Food Stamp Program, Thomas Fraker discussed the state of research on the 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” [Fraker 1990].

This report is organized as follows. After discussing methodology (Section 2), the main results of this report are in the next two sections on patterns in total food expenditure and intake (Section 3) and patterns for particular foods and particular nutrients (Section 4). The concluding section (Section 5) addresses implications for food stamp policy and for future research.

II. Methodology

This research employs two nationally representative surveys. The Diary Consumer Expenditure Survey (CEX), from the Bureau of Labor Statistics, reports spending by consumer units on food and other frequently purchased items [U.S. Department of Labor 1992]. The Continuing Survey of Food Intake by Individuals (CSFII), from the U.S. Department of Agriculture, reports actual food intake by household members [U.S. Department of Agriculture 1991]. Together, these surveys provide a wealth of information about patterns in food spending and intake over the food stamp month.

The expenditure survey contains highly detailed information on one week of purchases by a consumer unit (usually a family). For most consumer units, the expenditure part of the survey was administered twice, thereby providing 14 days of data. The CEX contains plenty of geographic and demographic information at the level of the consumer unit, but only partial information about individual members.

The intake survey covers a shorter period of time. One day of detailed information on food intake was collected by a trained enumerator. In most cases, two more days of information were reported by recipients using blank forms left by the enumerator. Because there are some systematic differences between the two data collection methods, this study uses three-day means of food intake for only those households with complete intake data. The CSFII contains food intake information at the individual level, and demographic information at both the individual and the household level.

Both surveys asked food stamp recipients the amount of their benefits, and the date on which they last received food stamps. Because the date of each expenditure or intake event is also known, we calculate the number of days since food stamps were received by subtraction. We define the food stamp month in terms of this interval. While food stamp benefits tend to become available early in the calendar month, they do not arrive uniformly on the first day of the month, so our food stamp month does not correspond

precisely to a calendar month. It is rather a hypothetical month where the arrival of food stamps marks day 0, and the remaining days are numbered from that starting point.

We use intake data from the CSFII for 1989-1991. The following round of this survey began in 1994 and was not completed at the time of this research. Since the CEX is conducted every year, we chose nearby years (1988-1992) so that the expenditure and intake data generally refer to the same time period. We convert all expenditure values to real January 1990 dollars using the Consumer Price Index (CPI) for all goods. Because the CPI is reported monthly, we use a linear interpolation to avoid having small spurious jumps in expenditure between the end of one month and the start of the next.

Even after selecting only food stamp recipients with complete food stamp date information, the sample size for the expenditure data set is more than sufficient for all our purposes (Table 1). For example, we can investigate mean food expenditure for each day of the food stamp month and still have adequate sample sizes. The intake data set is smaller, requiring more judicious splitting of the sample. We divide the food stamp month into just four weeks for purposes of measuring food intake ("Week 1" represents days 0-6 of the food stamp month). In order to compare food expenditure with food intake, most of the expenditure results are also reported on a weekly basis.

Thus, our analysis is conducted with a main expenditure data set that has 12,308 daily spending observations for consumer units in the first four weeks of the food stamp month. The main intake data set has 1,516 observations, each of which is a 3-day mean for one individual. For most of our analysis we omit the final 0-3 days of the food stamp month, from Day 28 onward, because the sample sizes were smaller for this fraction of a week, and also because we had other concerns with the reliability of the data for this period.¹

¹Food expenditure appears slightly higher in the final 0-3 days of the food stamp month than it does in Week 4 (see Fig. 1), but we suspect this appearance is due to a measurement problem. Food stamps do not always arrive in precise monthly intervals, so some recipients that seem to be at the very end of the food stamp month, by our count, may actually be at the start of their next food stamp cycle.

Table 1. Sample Sizes in the CEX and CSFII Data

CEX (1988-1992)		CSFII (1989-1991)	
<i>Total CU Observations</i>	58,250	<i>Total Households</i>	6,718
<i>Food Stamp CU Observations</i>	3,124	<i>Food Stamp Households</i>	1,003
<i>Food Stamp CU Observations With Complete Dates*</i>	2,825	<i>Food Stamp Households With Complete Dates</i>	979
		<i>Households With Dates in Four-Week FS Month**</i>	639
<i>Individuals in Food Stamp CU Observations</i>	9,530	<i>Individuals in Households in Four-Week FS Month</i>	1,516
<i>CU Spending Days Observed</i>	19,775		
<i>CU Spending Days Observed in Four-Week FS Month</i>	12,308	<i>Ind. Intake Days Observed in Four-Week FS Month</i>	4,548

Notes: * One CU observation is a weekly observation on a food stamp consumer unit. Because most CUs in the CEX were surveyed for two weeks, this value represents 1,675 distinct CUs. ** The four-week food stamp month is the first four weeks after food stamps are received.

Because food needs differ systematically by age, sex, and pregnancy/lactating status, food intake results are reported using an Adult Male Equivalent (AME) scale that accounts for these differences. We use the AME scale based on the Recommended Dietary Allowance (RDA) for total food energy intake [National Research Council 1989], even when we report results for specific foods and macronutrients, so that differences between results are always due to real differences in intake and not differences in the scaling factor. For selected micronutrients, we present intake figures in proportion to the corresponding RDAs for those nutrients, so that the seriousness of potential deficiencies can be assessed. The expenditure survey does not include sufficient information on individuals to construct an AME scale, so we report expenditure results on a per-person basis.

Our analytic approach is spare, since no further complexity seemed necessary to unearth the key results. We calculate mean values for each variable of interest -- for example, “food energy intake by children as a percentage of the RDA” or “expenditure on meat per person in the consumer unit” -- in each week of the food stamp month. For each variable, we conduct a one-tailed *t*-test of the null hypothesis that the Week 1 value is no greater than the Week 4 value. The tests with the CEX data were significant in every case, so we do not report this result repetitiously for the remainder of this paper. With the CSFII data, we mark significantly lower Week 4 intake means (at α equals 0.05) with the traditional star, and we mark “nearly” significant results with the *t*-test statistic so that readers may judge for themselves.

Both surveys use complex sampling designs, and both provide weights to use in generating estimates of population values. The method for estimating population means using weights is straightforward, although calculating unbiased standard errors for these estimates is more difficult. The well-known formulas for standard errors under random sampling generate biased results, whether or not the sampling weights are used. The CEX data contain 44 columns of half-sample weights so that consistent standard errors can be calculated using replication methods. Although we calculated these standard errors for our expenditure estimates with the SAS statistical package, we checked and

confirmed our methodology in a small sub-sample using the program WesVarPC, which is designed to analyze complex survey data using replication methods. For the CSFII data, we used the statistical software package SUDAAN, which accommodates complex survey designs using analytically-derived formulas for linear statistics, and using Taylor series approximations for non-linear statistics. We checked our estimated standard errors using WesVarPC, which produced similar estimates.

III. Total Food Expenditure and Intake

This section reports monthly patterns in total food spending and intake. We first describe patterns for the full sample of food stamp recipients. Then we discuss specific food stamp households that may have different food behavior (for example, households that also receive cash welfare) and specific individuals whose nutrition is a special concern (for example, children).

Expenditure and Intake for All Food Stamp Recipients

The pattern in total food expenditure is striking. Mean daily expenditure per person on food at home peaks sharply in the first three days of the food stamp month and flattens out at a much lower level for the remainder (Fig. 1A). Expenditure on food away from home, which may not be purchased legally with food stamps, is much more steady over the food stamp month. Restaurant food may be purchased more often right after households receive cash, rather than after they receive food stamps, but that pattern would not show up in our data.

The monthly pattern in food intake is less dramatic (Fig. 1B). Mean food energy intake, measured as the 3-day mean of caloric intake divided by the appropriate RDA for each

Fig. 1A. Food Expenditure by Consumer Units, At-Home and Away-From-Home

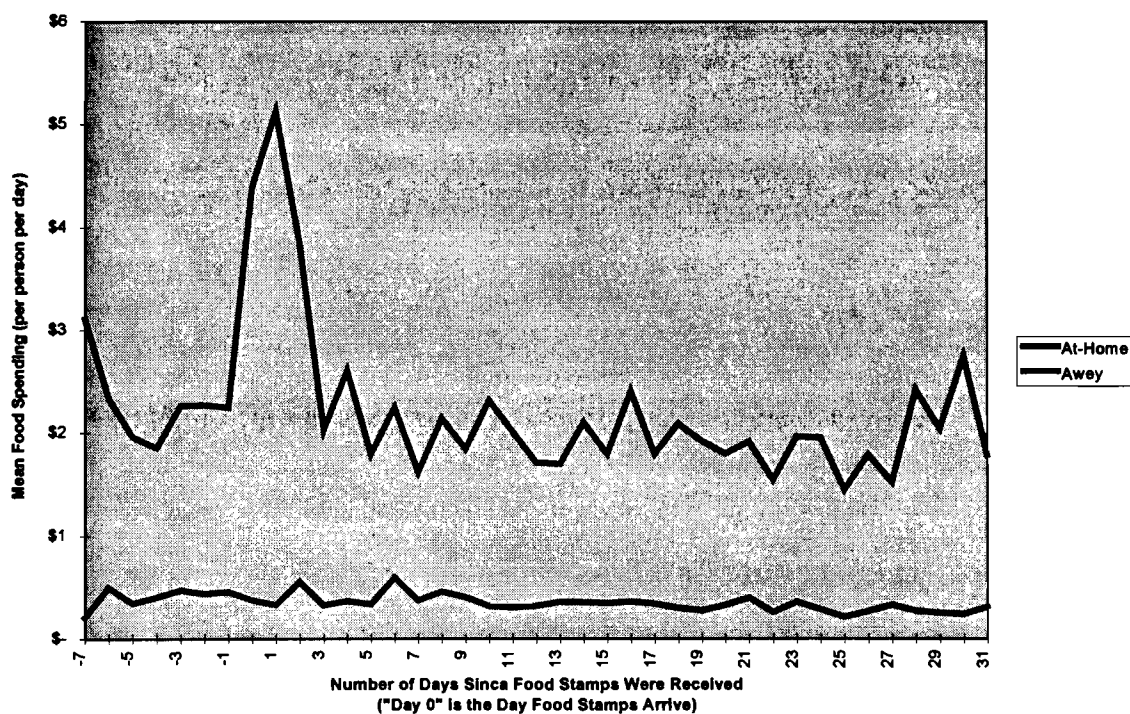
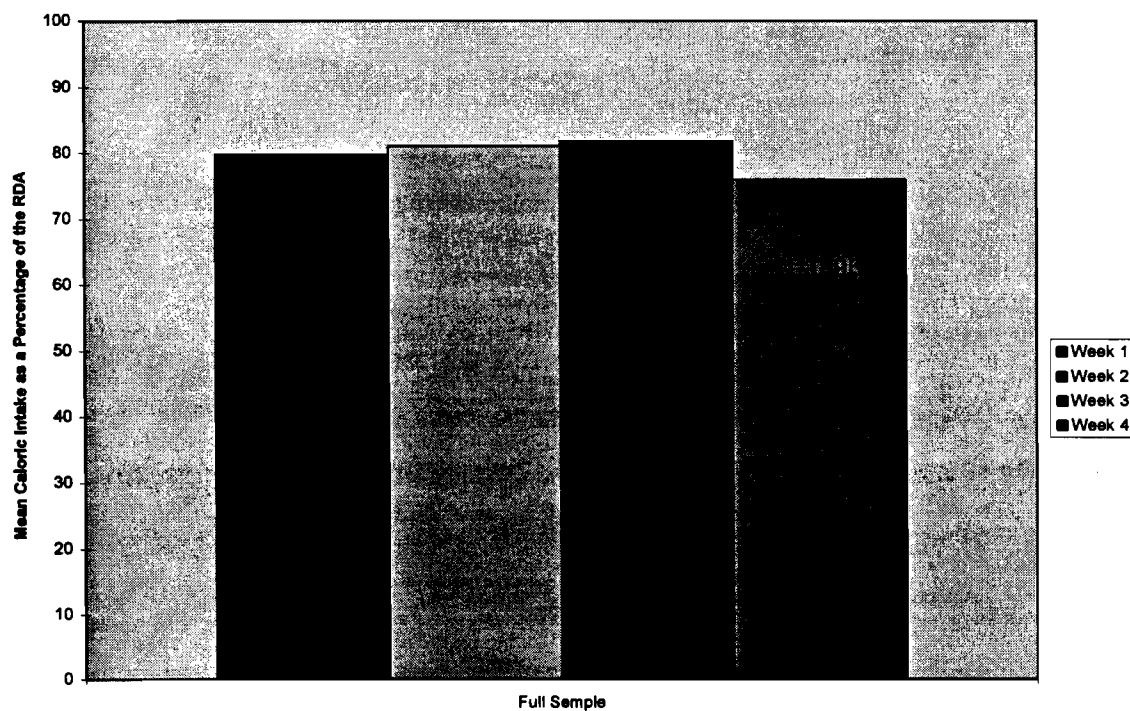


Fig. 1B. Food Intake by Individuals



Note: The t -statistic is for a one-tailed test of the difference between Week 4 intake and Week 1 intake.

individual, remains steady for the first three weeks and dips moderately in week 4.² This dip is small enough that it could be due to sampling variation. As we describe below in this section and the next, this pattern in total food intake for the full sample is muted by the inclusion of different household types and different foods. Some household types and some foods do exhibit a significant fall in food intake.

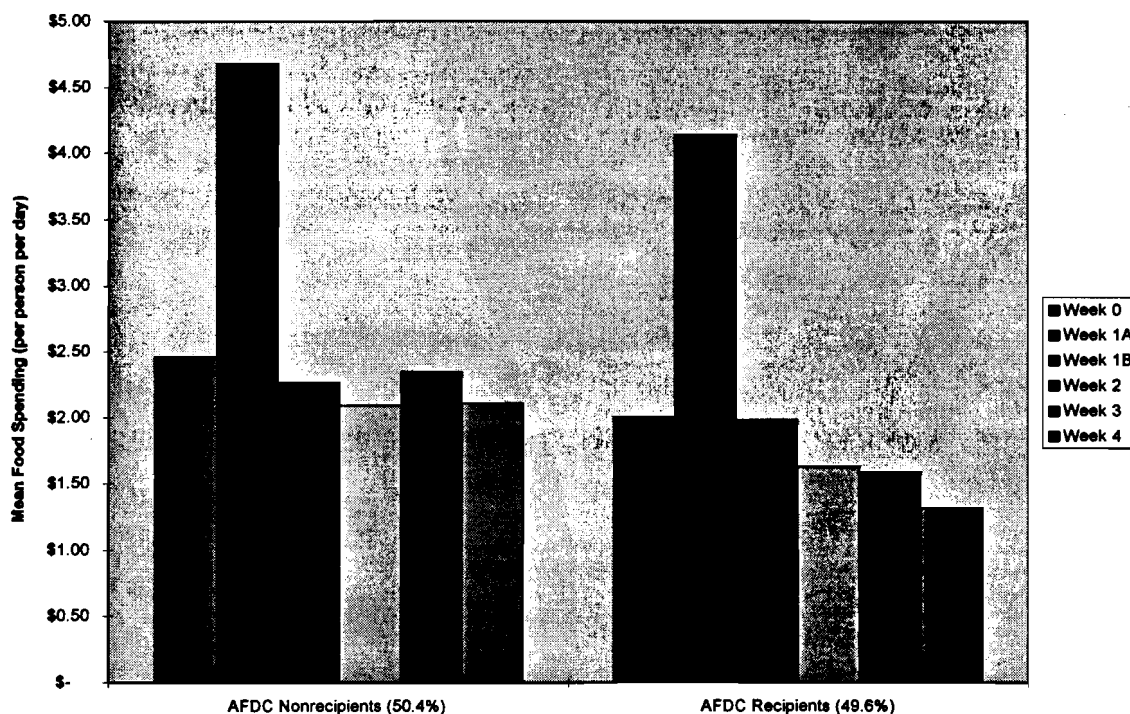
Expenditure and Intake for Joint Food Stamp-AFDC Recipients

With over 25 million participants each month last year, or almost one out of ten Americans, the Food Stamp Program cuts a broader swath through the American population than the archetypal cash welfare program, Aid to Families with Dependent Children (AFDC). Ninety percent of the approximately five million families participating in AFDC receive food stamps. These AFDC families make up about half of all food stamp families (50.6 percent of food stamp households in the CSFII sample received AFDC). Relatively small numbers of food stamp households who receive AFDC have other important sources of cash income such as wage earnings or social security. By contrast, over half of all non-AFDC food stamp households in the CSFII sample receive social security or SSI, and over a third have some wage earnings. As a consequence of their higher levels of cash resources, non-AFDC recipient families get lower food stamp benefits (\$83 per adult male equivalent per month in the CSFII sample) than AFDC recipient families get (\$103 per adult male equivalent per month).

The monthly food cycle is very different for food stamp recipients who receive AFDC and those who do not. The main difference is in food intake patterns, rather than food spending. AFDC recipients and non-recipients both spend heavily on food in the first three days of the food stamp month (Fig. 2A). Despite the similar spending patterns, only AFDC non-recipients have a significant dip in food energy in Week 4 (Fig. 2B). The estimated difference between Week 1 intake and Week 4 intake for non-recipients is too

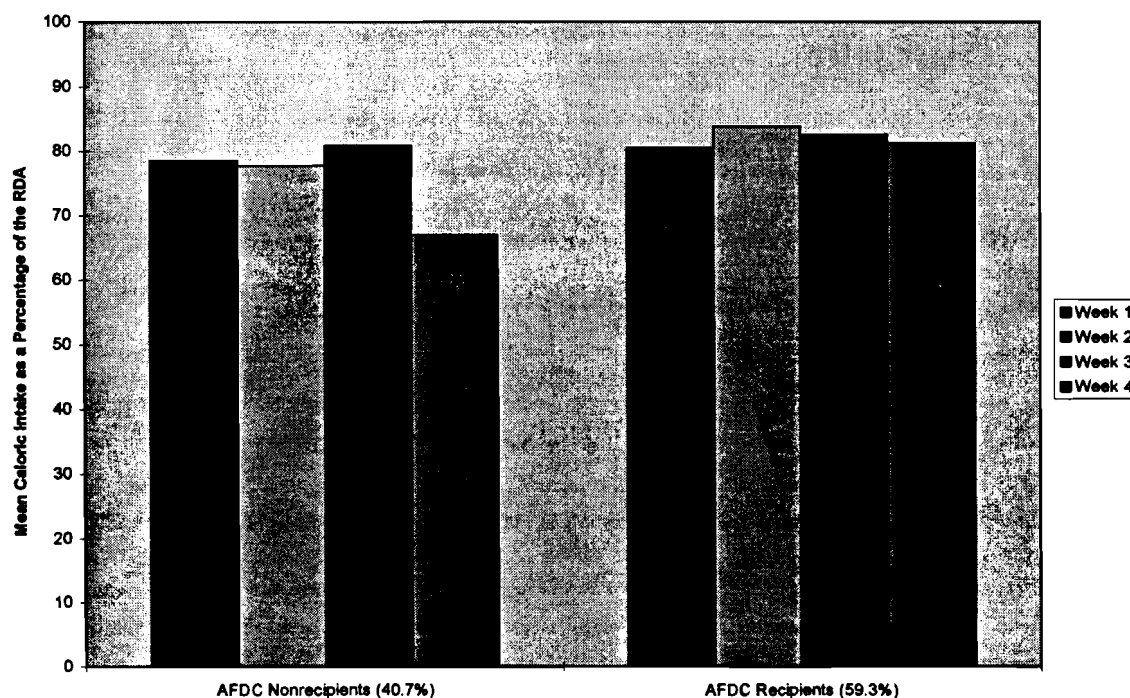
² Even in the first three weeks the caloric intake seems low, relative to the RDA, but this reflects the difficulty of collecting complete intake data in a survey, not general undernutrition. Mean food energy intake as a percentage of the RDA is just as low for CSFII respondents who do not receive food stamps [Tippett et al. 1995], probably due to underreporting of intake.

Fig. 2A. Food Expenditure by Consumer Units, According to AFDC Receipt



Notes: Week 0 is the seven days before food stamps were received. Week 1A is Days 0-2 days of the food stamp month. Week 1B is Days 3-6 of the food stamp month.

Fig. 2B. Food Intake by Individuals, According to AFDC Receipt



Note: * Signifies Week 4 intake is significantly less than Week 1 intake (one-tailed test, $\alpha=0.05$).

big to be due to sampling variation. Because AFDC non-recipients receive lower food stamp benefits on average, it is perhaps surprising that they have a more noticeable monthly food intake cycle.

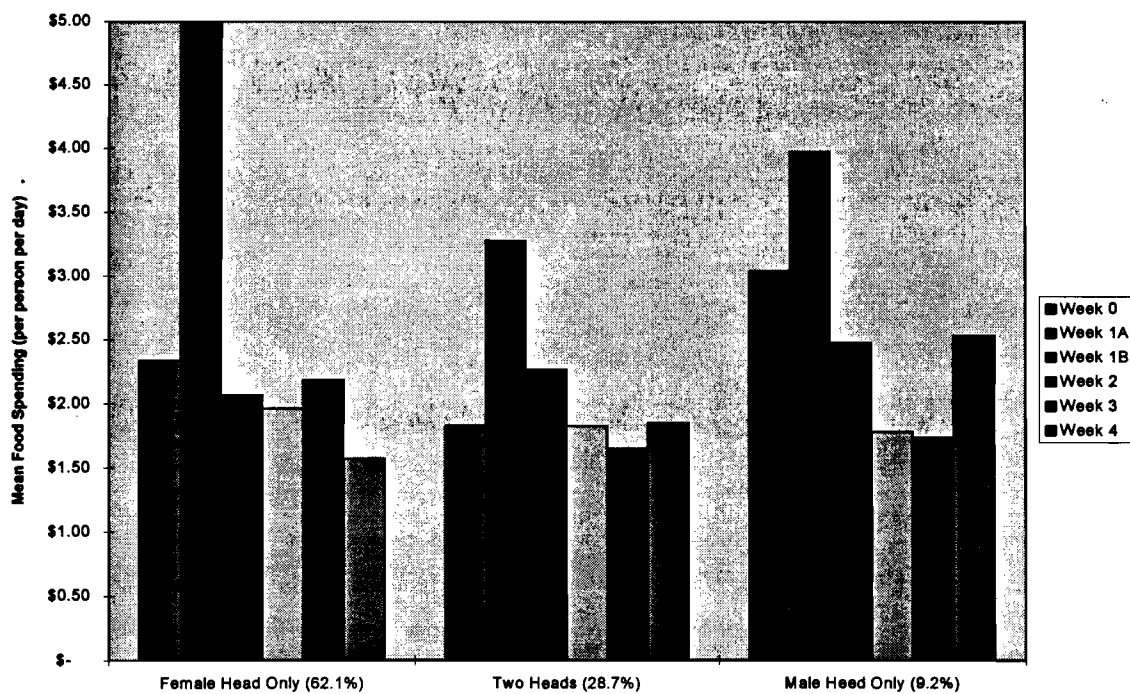
This difference could indicate that some aspect of the AFDC program -- perhaps the receipt of cash benefits twice monthly -- ameliorates food shortages at the end of the food stamp month. On the other hand, other household characteristics could be responsible. In this section, we consider differences in household headship, differences in the frequency of major shopping trips, and differences in the numbers of children.

Expenditure and Intake for Female-Headed Households

AFDC recipients live disproportionately in female-headed households. Almost 70 percent of individuals in AFDC families in our data live in female-headed households, while only 43 percent of individuals in other food stamp families live in female-headed households. Household headship and AFDC receipt interact to influence the monthly cycle in food intake.

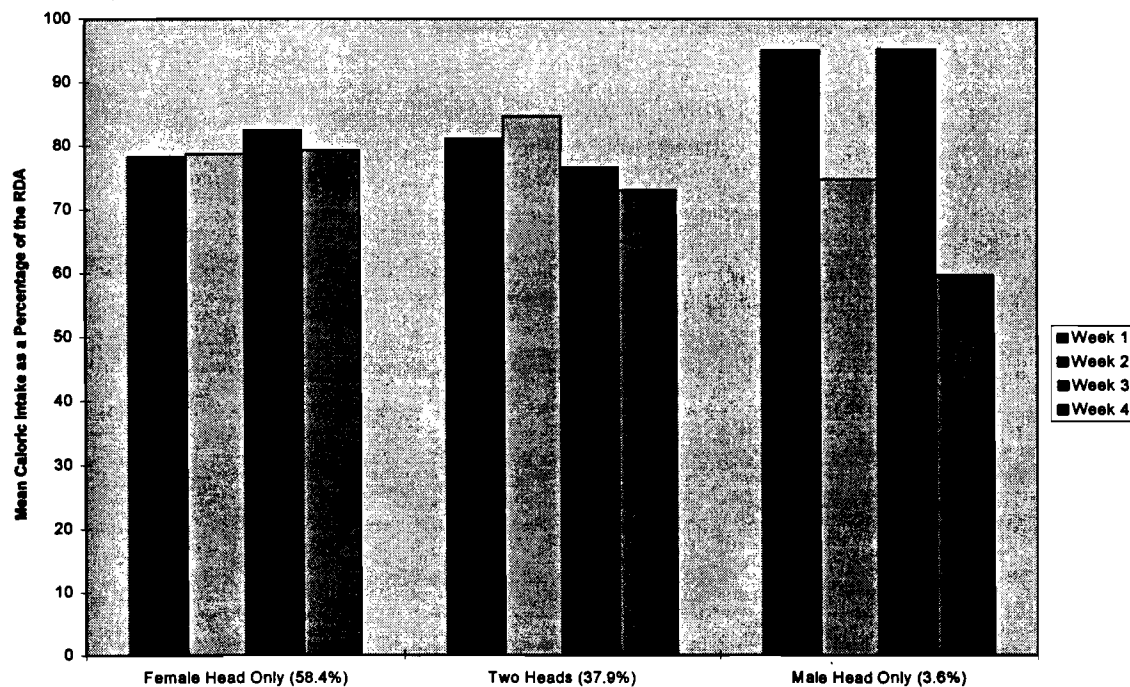
According to the CSFII data, individuals in female-headed households do not experience a dip in food intake at the end of the month (Fig. 3B). Individuals in households headed by couples exhibit some drop in food intake at the end of the month, but because the sample size gets smaller as the data are broken down in such detail this pattern could be due to sampling variation. Male-headed households appear to have the biggest fall in food intake at the end of the month. To sum up our findings on AFDC participation and household headship, the moderate dip in mean food energy intake at the end of the month (noted for the full sample in Fig. 1B) is predominantly due to a larger fall in food intake for individuals in food stamp households with two characteristics: they do not receive AFDC and they are not headed by a single female.

Fig. 3A. Food Expenditure by Consumer Units, According to Household Headship



Notes: Week 0 is the seven days before food stamps were received. Week 1A is Days 0-2 days of the food stamp month. Week 1B is Days 3-6 of the food stamp month.

Fig. 3B. Food Intake by Individuals, According to Household Headship



Note: The *t*-statistic is for a one-tailed test of the difference between Week 4 intake and Week 1 intake.

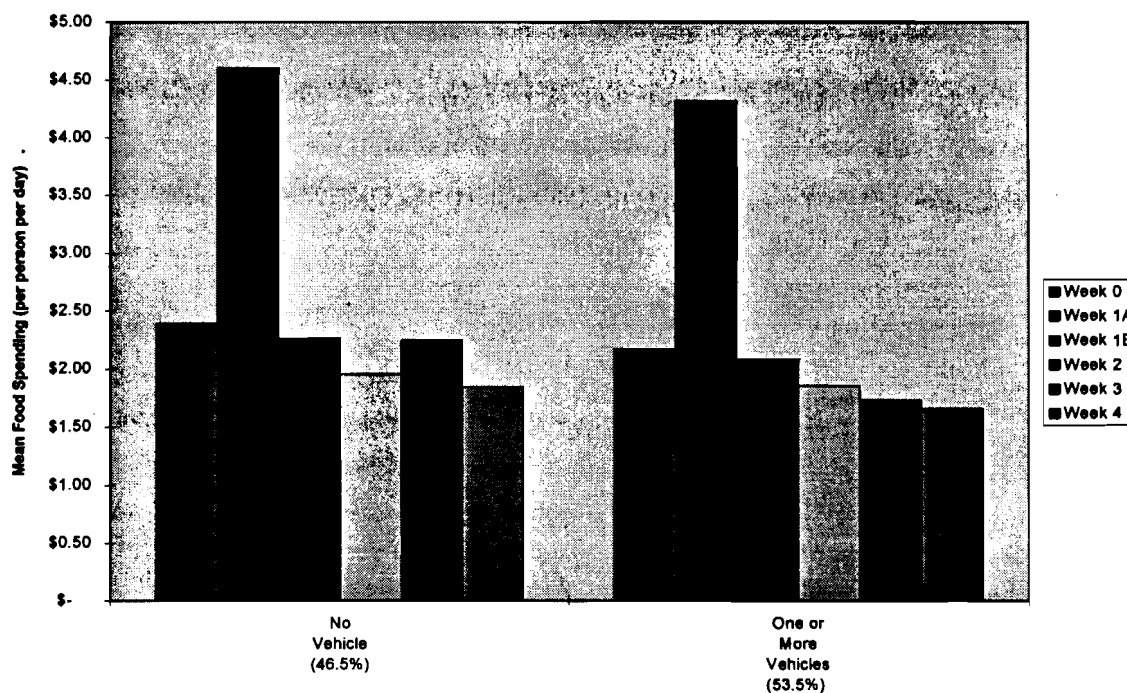
Expenditure and Intake, According to Shopping Frequency

These results might at first suggest that the expenditure peak at the start of the month and the drop in food intake at the end of the month are unrelated phenomena. At least, all categories of food stamp households seem to have the expenditure peak while only some have the food intake drop. However, the CSFII contains other information on shopping patterns which confirms that it is difficult to make food purchased at the start of the month stretch all the way to the end.

Fully 43 percent of households in the intake sample reported that they conduct a major shopping trip only once a month or even less frequently. As shorthand, we will say these families shop “seldom.” The remaining households report shopping more frequently (generally, once every week or two weeks). We will say they shop “often.” Individuals in households that shop “seldom” have a significant drop in food energy intake during the last week of the food stamp month (Fig. 4B), while individuals in households that shop “often” have smooth food intake over the whole period.

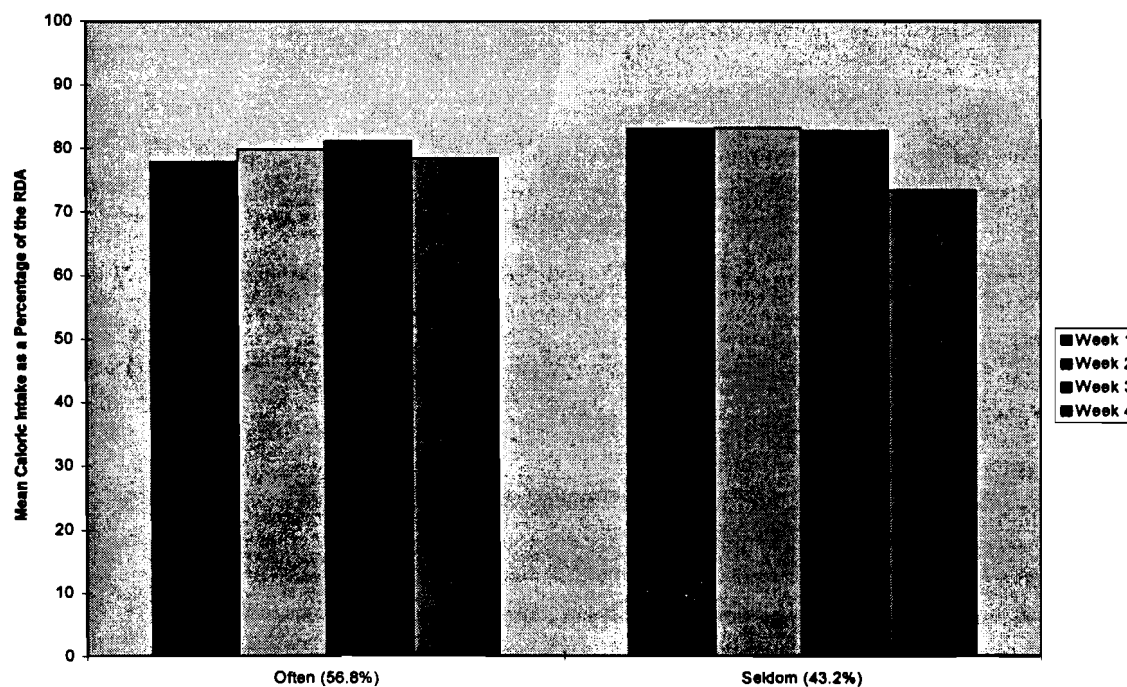
The direction of causation for this relationship between food shopping and food intake is not obvious. Households that face transportation difficulties or time constraints may shop only once monthly, and they may have trouble storing food for consumption four weeks later as a consequence (although Fig 4A shows a sharp spending cycle even for households with cars). Or, as the quotation from the *New York Times Magazine* in the introduction suggests, some households may experience low food intake at the end of the month because they found it difficult to save their food stamp resources so long. Without resources to shop with, there would be little reason to conduct a second “major” grocery trip in the last half of the month, even if shopping costs were negligible. To shed light on this issue, Section 4 below investigates how food intake of perishable and non-perishable foods differs for recipients who shop “often” or “seldom.”

Fig. 4A. Food Expenditure by Consumer Units, According to Vehicle Ownership



Notes: Week 0 is the seven days before food stamps were received. Week 1A is days 0-2 days of the food stamp month. Week 1B is days 3-6 of the food stamp month.

Fig. 4B. Food Intake by Individuals, According to Shopping Frequency



Note: * Signifies Week 4 intake is significantly less than Week 1 intake (one-tailed test, $\alpha=0.05$).

Expenditure and Intake for Families with Children

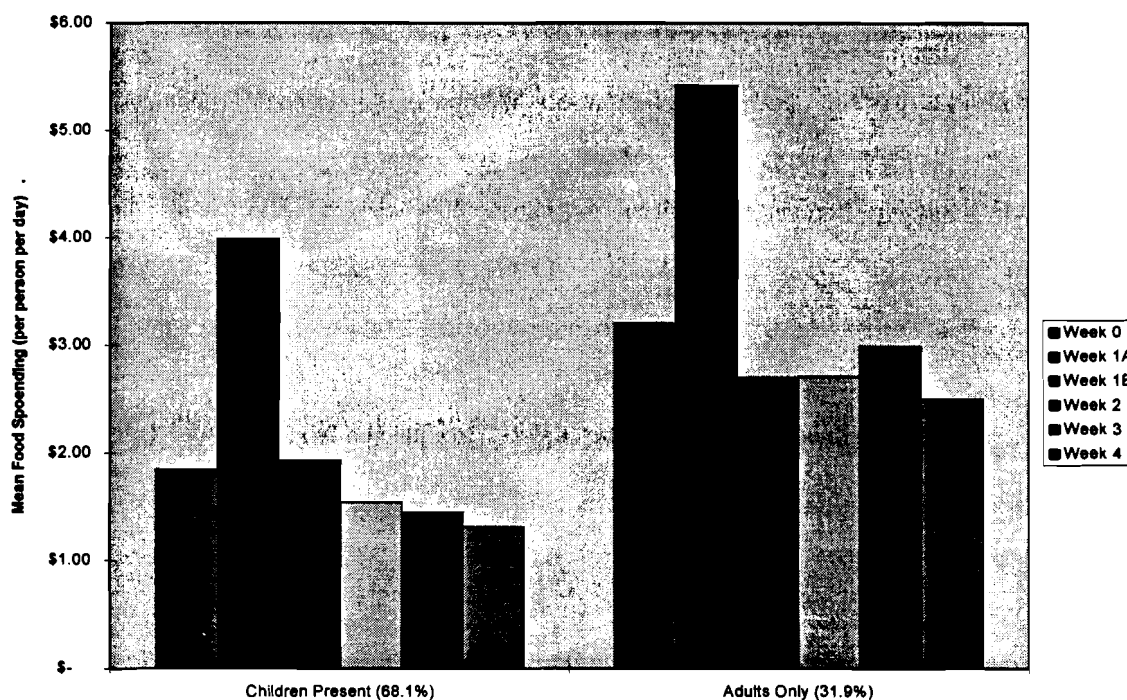
A cyclical drop in food intake for children would be especially worrisome for several reasons. In extreme cases, periodic nutritional deprivation can stunt growth and development in children. Also, nutritionists and other researchers have identified changes in children's meals as a symptom of the most severe categories of household food insecurity [Food and Consumer Service 1994]. Finally, in the rhetoric of U.S. public policy debates, children are held blameless for household food decisions while adults are often held responsible if they fail to acquire or save adequate food resources for themselves.

There is little difference in the amplitude of the spending cycle for families with and without children under age 18 (Fig. 5A). Food expenditure per person is lower for families with children because children consume less food than adults in absolute terms (teenagers excepted), so this difference does not indicate less adequate food supplies for households with children. In contrast with the expenditure cycle, mean food energy intake is quite different for children and adults (Fig. 5B). Adults absorb almost the full drop in food intake, and for them Week 4 intake is significantly less than Week 1 intake. For children, food intake on average remains quite constant over the food stamp month. Children also have higher food energy intake relative to the RDA for their sex and age, indicating that the difference in the RDAs for children and adults is greater than the difference in their actual intake. Relative to the RDAs, children have higher food energy intake as well as a smoother intake pattern over the food stamp month.

IV. Expenditure and Intake for Selected Foods and Nutrients

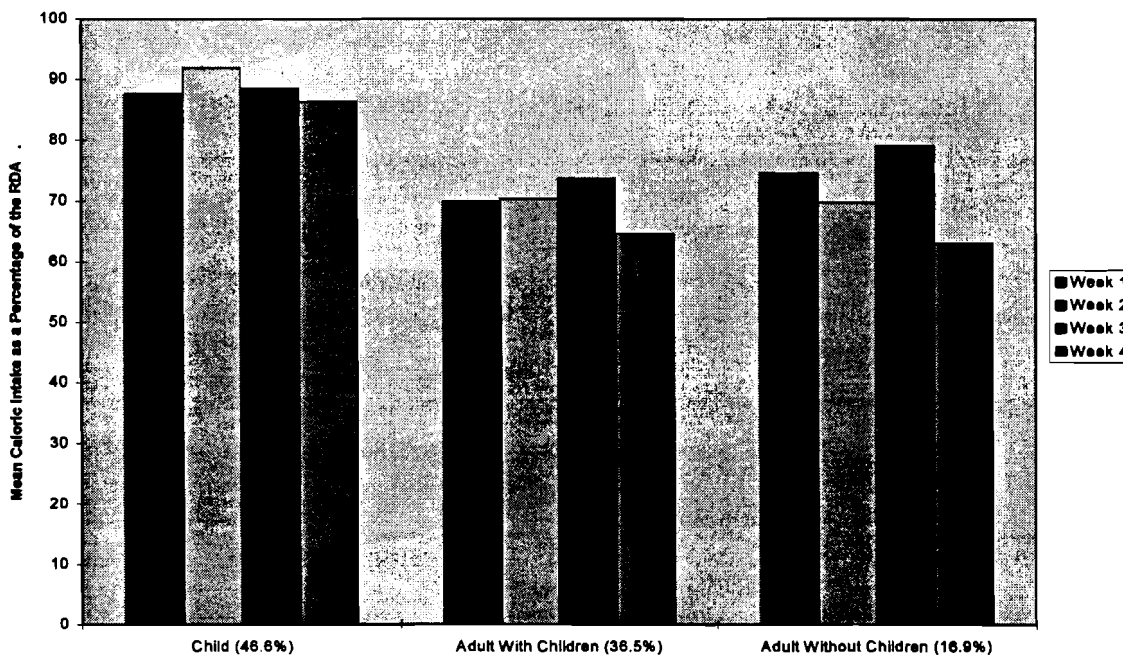
Different foods may exhibit different monthly cycles for at least two reasons: some foods are more perishable than others, and some foods are more expensive than others. In this section, we discuss monthly cycles for different foods in three ways. First we consider 19

Fig. 5A. Food Expenditure by Consumer Units, According to Presence of Children



Notes: Week 0 is the seven days before food stamps were received. Week 1A is Days 0-2 days of the food stamp month. Week 1B is Days 3-6 of the food stamp month.

Fig. 5B. Food Intake by Individuals, For Children and Adults



Note: * Signifies Week 4 intake is significantly less than Week 1 intake (one-tailed test, $\alpha=0.05$).

detailed categories of food expenditure. Second, we compare food expenditure to food intake using six more highly aggregated food categories from the “Food Guide Pyramid” [U.S. Department of Agriculture 1992]. Third, we consider monthly cycles in particular macronutrients and micronutrients of nutritional concern.

Food Expenditure, by Detailed Food Category

The expenditure data employ hundreds of UCC codes for specific items purchased. The codes for food at-home are organized into 18 categories in the public data files, and there is also a category for food away-from-home. To illuminate differences in the monthly spending cycle for different foods, we measured Week 4 expenditure for each category as a proportion of Week 1 expenditure (Fig. 6). This scale shows the degree to which expenditure drops off over the course of the food stamp month for different foods.

Consider the seven foods for which the relative drop in spending from Week 1 to Week 4 is greatest (at the bottom of Fig. 6). These foods include some low-cost non-perishables, such as canned vegetables and cereals, which are saved for use throughout the month. These foods also include some high-cost items, such as ice cream and seafood, which are probably luxuries consumed mainly at the start of the food stamp month. By contrast, most foods that are highly perishable are purchased more evenly over the month. For example, fresh fruit and fresh vegetables are purchased more steadily over the month than processed fruit and processed vegetables. Milk and food away from home, which is perishable in the sense that it is generally eaten on the spot, are consumed most smoothly over the month.

Expenditure and Intake, According to the “Food Guide Pyramid”

In order to compare expenditure and intake patterns, we also organized foods into six broader categories that approximately represent the cells of the federal government’s well-known “Food Guide Pyramid” (Fig. 7), which reflects consensus recommendations regarding the composition of a healthy diet. We employed the existing food categories in the public data files as much as possible, although some changes were made. For

Fig. 6. Expenditure by Consumer Units at End of Month, for 19 Detailed Food Categories

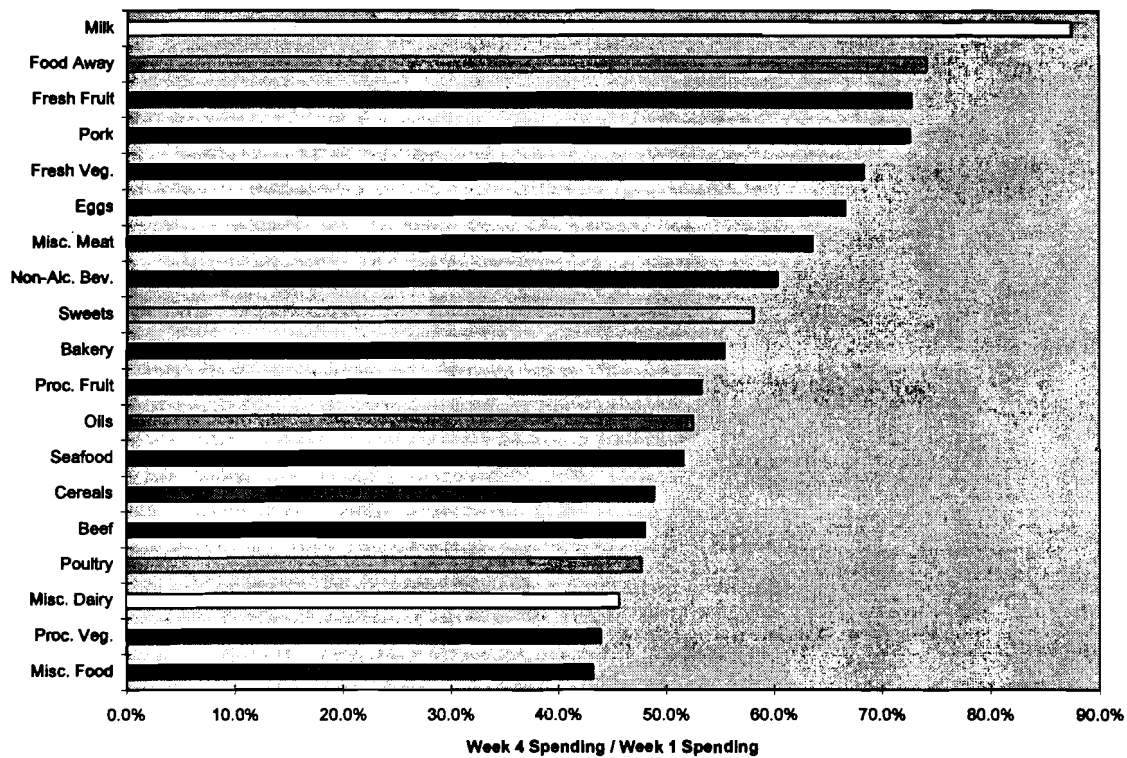
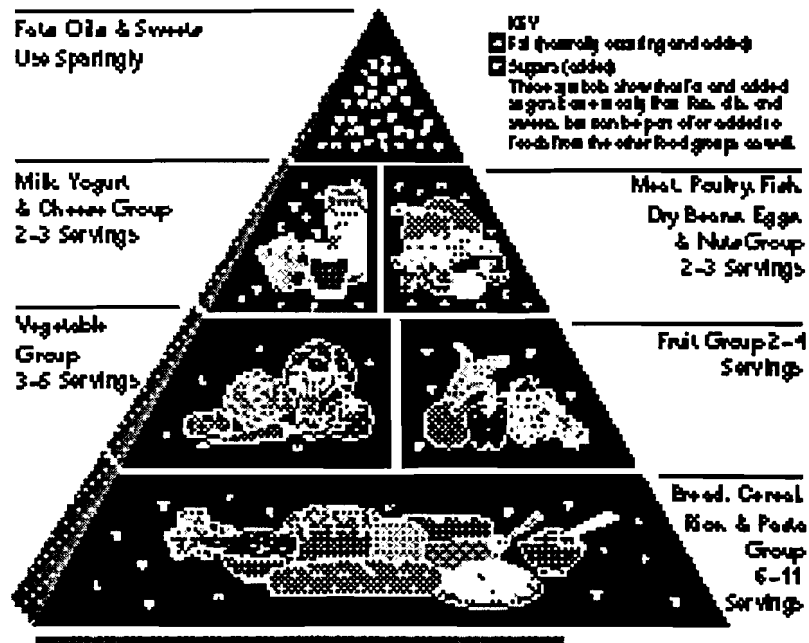


Fig. 7. Food Guide Pyramid



Source: USDA. Temporary low-resolution graphic.

example, fresh and processed vegetable expenditures were combined to make the category “VEG”, and sweets and oils were combined to make the category “SWTOIL”, which is the small triangle at the top of the Pyramid. Our only reorganization within food categories was to move potatoes from the vegetable category to the starchy staples in “GRAINS,” where they find a better home in terms of carbohydrate content and perishability, if not in terms of biological origin and some vitamins. A disadvantage of combining foods into the “Pyramid” food categories is that relevant details, such as the difference between processed and fresh vegetables, are hidden. An advantage is that the nutritional implications of the food stamp cycle can be assessed using a small and easily-comprehended set of well-known food categories.

Meats constitute a high proportion of both food expenditure and food intake (Fig. 8A and 8B). Dairy products make up a higher proportion of food intake than they do of food expenditure, in part because our intake variables for specific food categories are measured by weight including water. Fruits and vegetables make up a small proportion of both expenditure and intake, in comparison with the recommended amounts. The most-consumed item in the FRUIT category is fruit juices, and the most-consumed item in the VEG category (after removing potatoes) is tomatoes.

It is easier to perceive relative differences in the monthly expenditure and intake cycles when the variables are expressed as the ratio of Week 4 values to the corresponding values in Week 1 (Fig. 9A and 9B). As one might expect from the more detailed discussion of different food expenditures above (Fig. 6), food expenditures are much lower at the end of the month for all “Pyramid” food categories than they are at the start. The drop is greatest for GRAINS, which is mainly non-perishable foods that are easily purchased at the start of the month for consumption later.

As for food intake, we noted previously (Section 3) that households who shop “often” -- more than once monthly -- experience no drop in food intake at the end of the month. Even for households who shop “seldom,” the drop in food intake is concentrated almost

Fig. 8A. Expenditure by Consumer Units, for Pyramid Food Categories

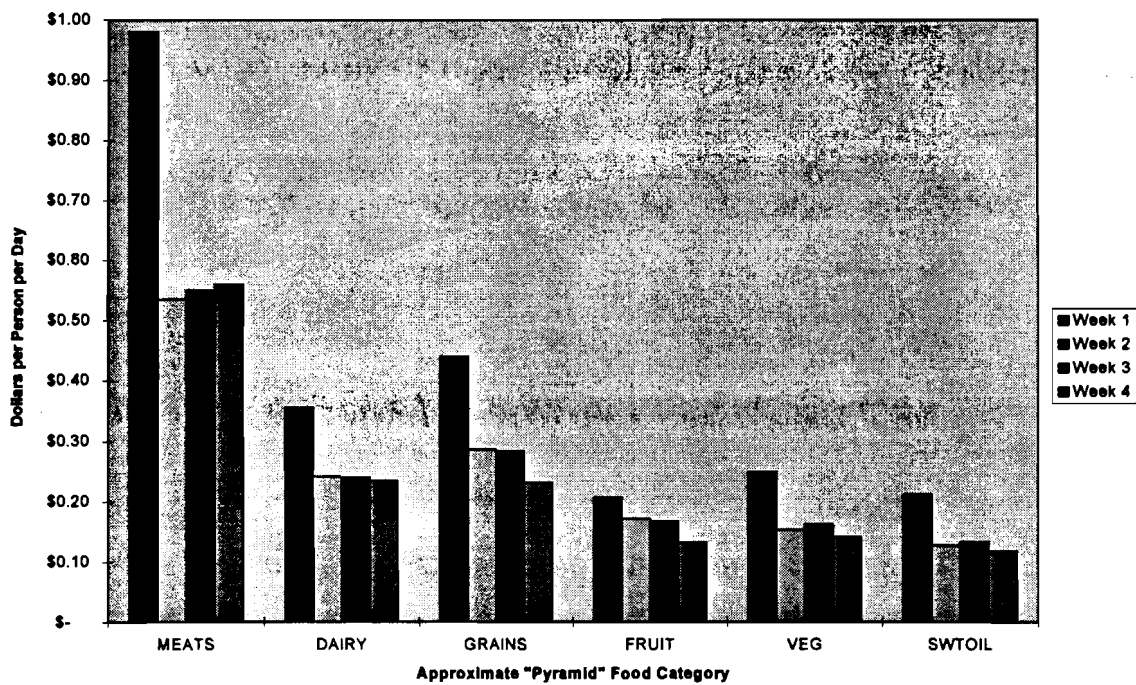


Fig. 8B. Food Intake by Individuals, for Pyramid Food Categories

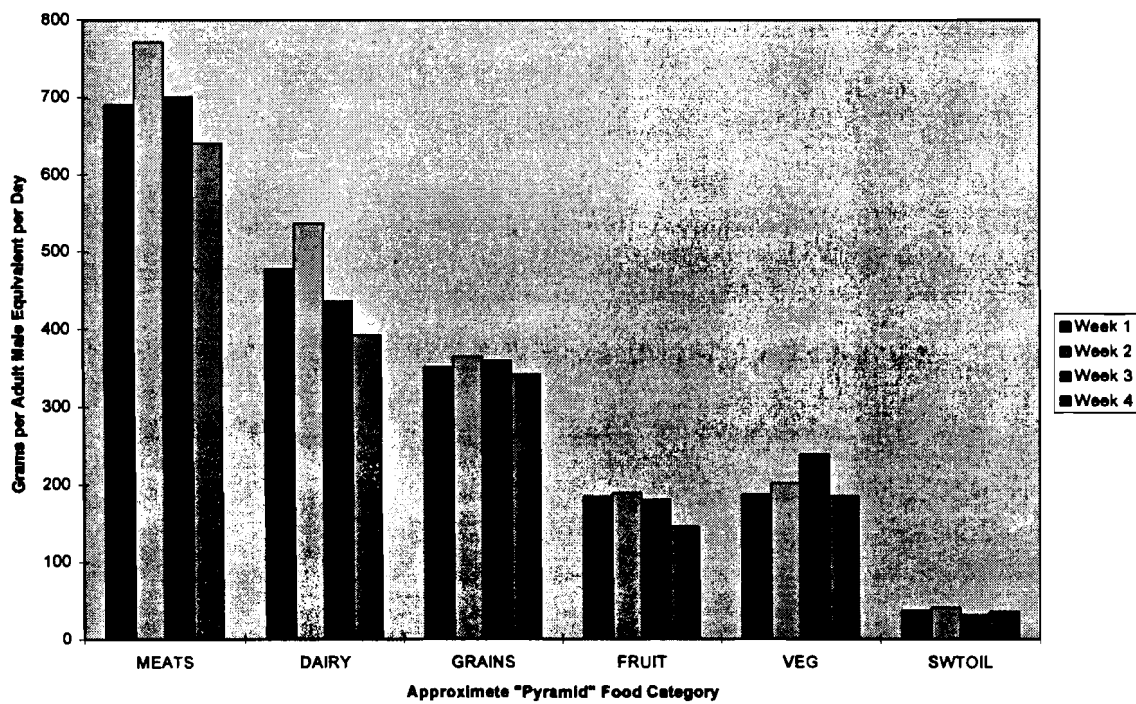


Fig. 9A. Expenditure by Consumer Units at End of Month, For Pyramid Food Categories

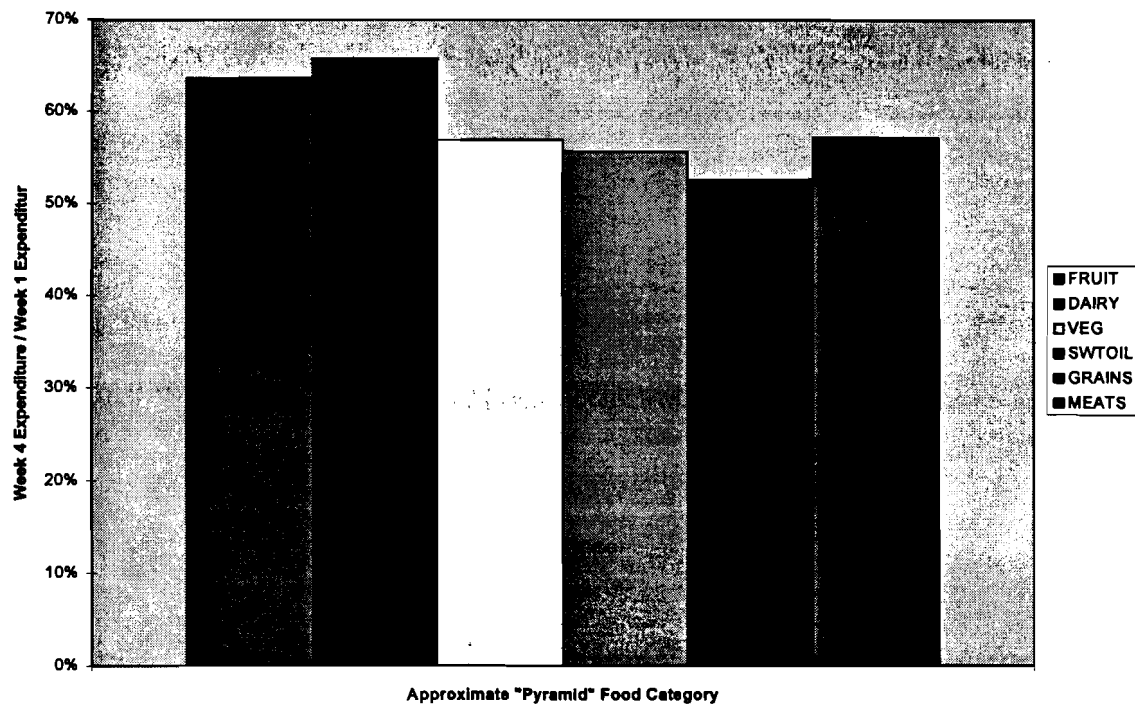
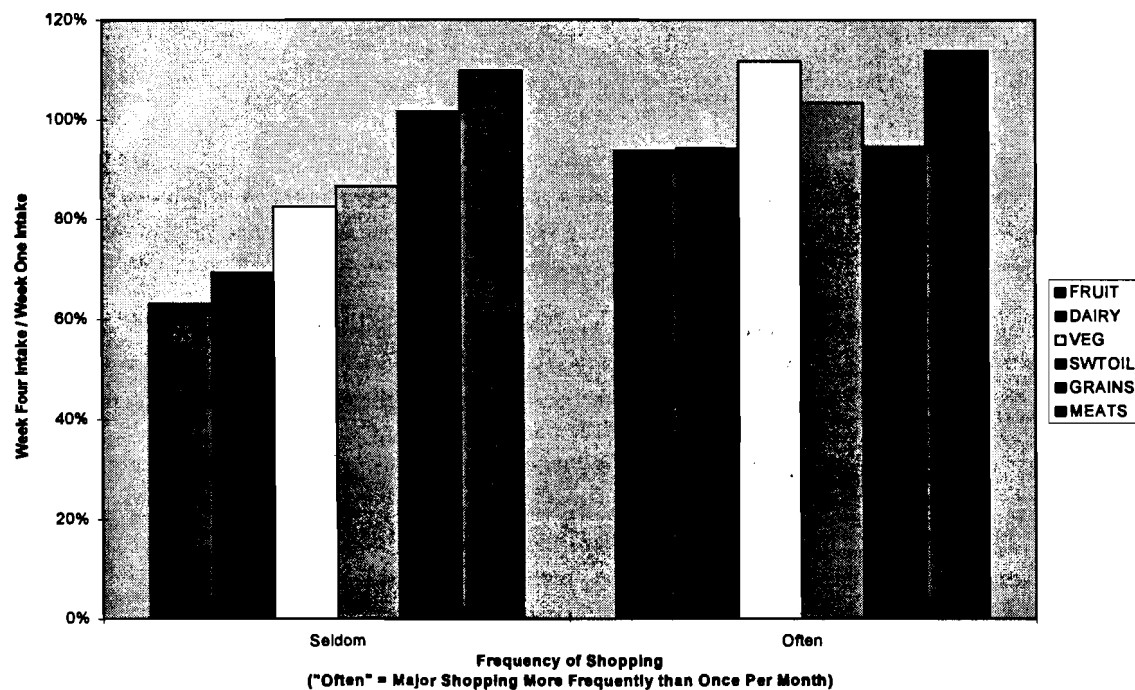


Fig. 9B. Intake by Individuals at End of Month, For Pyramid Food Categories



Note: * Signifies Week 4 intake is significantly less than Week 1 intake (one-tailed test, alpha=0.05).

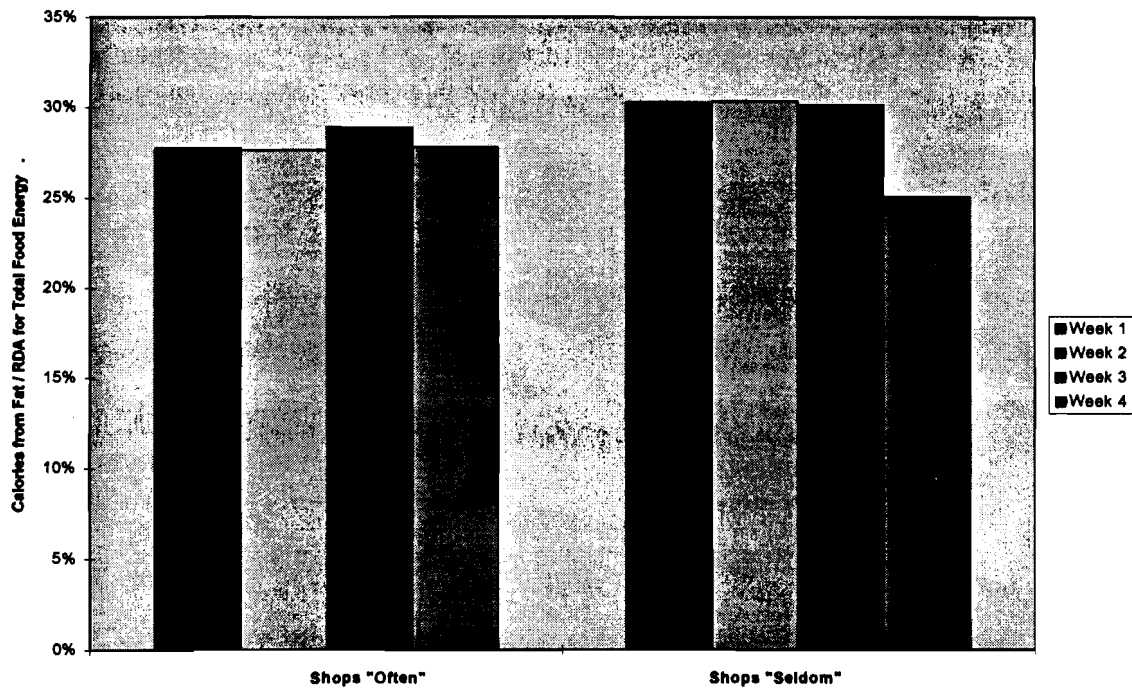
entirely in the relatively perishable food categories: dairy, fruits, and vegetables. For dairy and fruits, this apparent drop is too great to be explained by sampling variation. The comparatively steady intake of meat over the food stamp month is surprising, since even after accounting for low-cost items such as hot dogs one might expect meat to be a relative luxury that is consumed less frequently at the end of the month. The observed pattern does not corroborate anecdotal reports, for example in the *New York Times Magazine* quotation in the introduction, that only starchy staples are available late in the month. Also, while our intake results otherwise correspond very closely to those found by Emmons [1986] in her Cleveland sample, she found a significant drop in the consumption of “high-protein foods” in Week 4. In the CSFII sample, by contrast, the key feature of foods that are consumed less at the end of the month appears to be their perishability.

Macronutrients and Micronutrients

We close this section with a look at selected macronutrients and micronutrients. Food stamp recipients in the CSFII sample receive 35 percent of their calories from fat on average, which is about the same proportion that all CSFII respondents receive (34.4 percent), and greater than the maximum of 30 percent that is generally recommended. For recipients who shop “seldom,” fat intake drops significantly in Week 4 (Fig. 10). However, that fall mainly reflects the fall in all sources of calories for these recipients. The share of their calories that come from fat does not drop as steeply (Fig. 11). Instead, it appears that the shares of food energy from each of the major macronutrients -- fats, carbohydrates, and proteins -- remains relatively steady even as total caloric intake falls at the end of the month.

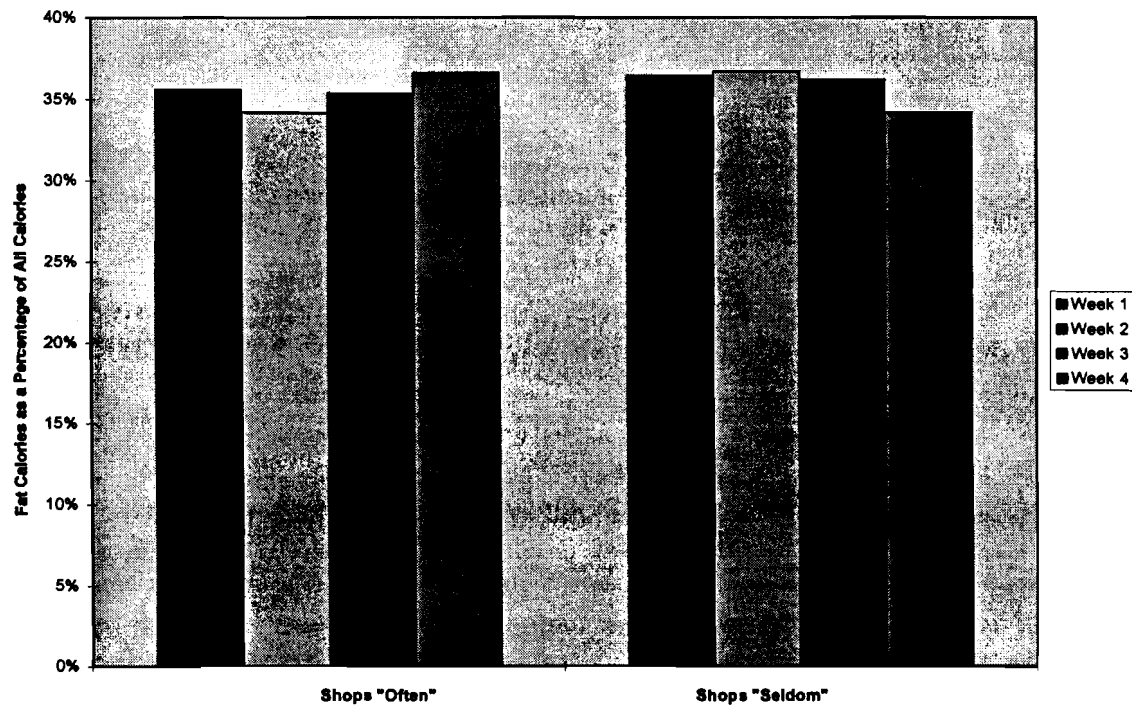
With regard to micronutrients -- vitamins and minerals -- we consider seven that are mentioned as “concerns for low-income, high-risk populations” in the *Third Report on Nutrition Monitoring in the United States* [Federation of American Societies for Experimental Biology 1995]: vitamin A, vitamin C, vitamin B6, folate, calcium, iron, and zinc. Iron and calcium are also highlighted in *The Surgeon General’s Report on*

Fig. 10. Fat Intake by Individuals, According to Shopping Frequency



Note: * Signifies Week 4 intake is significantly less than Week 1 intake (one-tailed test, $\alpha=0.05$).

Fig. 11. Proportion of Calories from Fat, According to Shopping Frequency



Nutrition and Health [U.S. Department of Health and Human Services 1988] as special concerns for some people.

The seven micronutrients are measured as a proportion of the corresponding RDA for each nutrient (Fig. 12). The Recommended Dietary Allowances for micronutrients, unlike the RDA for food energy discussed above, are not recommendations for the typical or median consumer, but higher and more conservative levels that are designed to ensure that almost all consumers who achieve the RDA will be free of symptoms of deficiency. For our sample of food stamp recipients, the lowest intakes relative to the RDA occurred for vitamin B6 (98 percent), calcium (85 percent), iron (104 percent), and zinc (80 percent). Due to the underreporting of total food intake suspected in the CSFII, these estimates are probably biased downwards.

Once again, it is easier to perceive relative differences in the monthly cycle for these micronutrients when their intake is measured as the ratio of Week 4 intake to Week 1 intake (Fig. 13). As with the pattern in specific foods, there is little or no drop in intake at the end of the month for those recipients who shop “often,” while for some nutrients there is a significant drop for those who shop “seldom.” In particular, intake of vitamin C and calcium is significantly lower at the end of the month for these recipients. Calcium is the only micronutrient whose consumption was both lower than the RDA on average, and also significantly lower at the end of the food stamp month.

V. Policy Conclusions and Suggestions for Future Research

The most direct policy implication of this research is that food spending and intake patterns might be smoother if food stamp benefits were delivered twice monthly. We consider advantages and disadvantages of this potential program change, but make no recommendation. At present, the more important implications of this research are

Fig. 12. Intake by Individuals, Selected Micronutrients

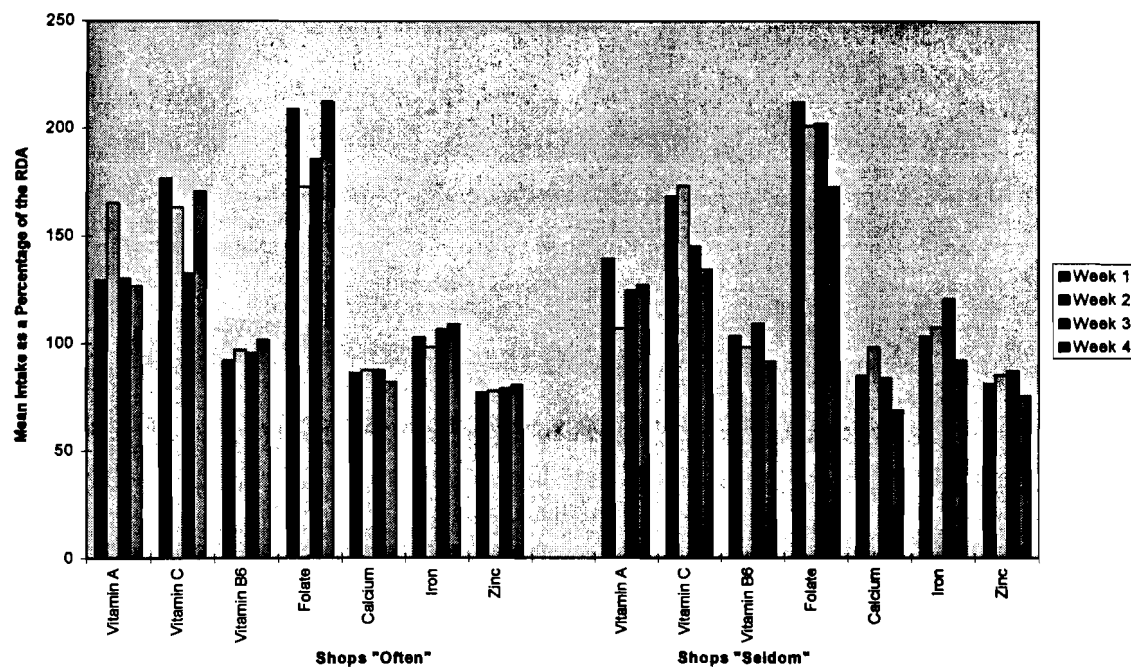
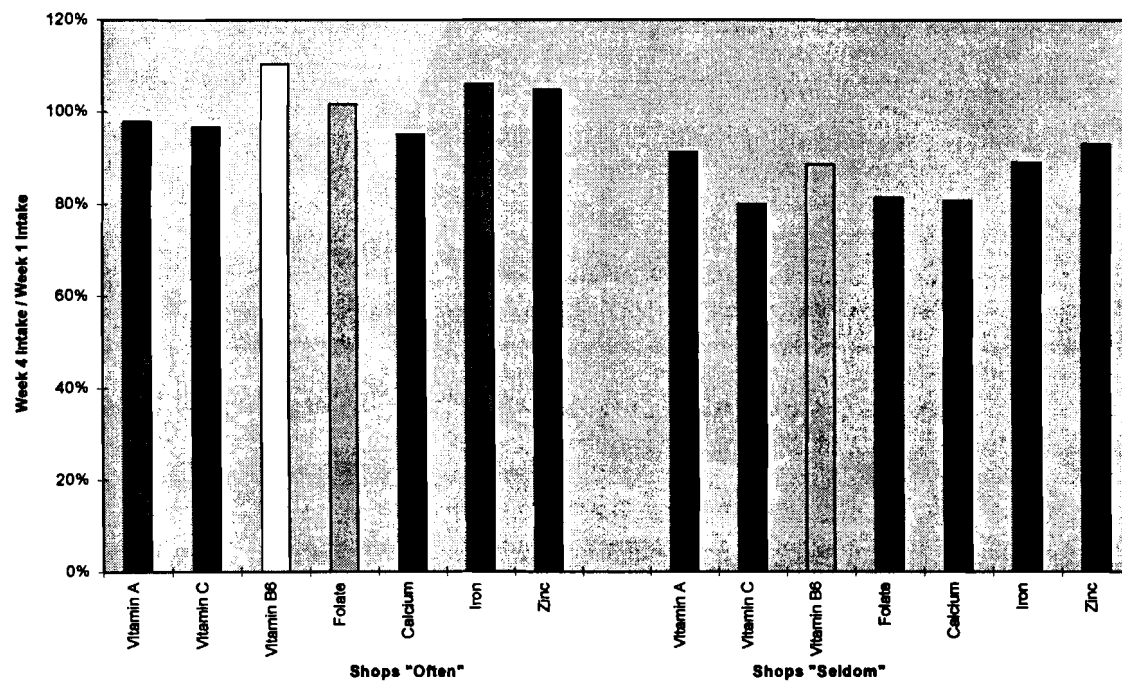


Fig. 13. Intake by Individuals at End of Month, Selected Micronutrients



Note: * Signifies Week 4 intake is significantly less than Week 1 intake (one-tailed test, $\alpha=0.05$).

indirect, through its implications for research on food insecurity and on the impact of the Food Stamp Program.

Delivering Food Stamp Benefits Twice Monthly

From our research, it appears that delivering food stamp benefits twice monthly would greatly smooth food expenditure patterns over the food stamp month. It also could help recipients smooth their food intake over the month, especially for three perishable food categories of substantial nutritional importance: dairy products, fruits, and vegetables. Perhaps surprisingly, this change was recommended by some food stamp recipients themselves, in focus group discussions conducted as part of the San Diego cashout experiment [Ohls et al. 1992]. Depending on the cause of the current dip in food intake at the end of the month, this program change might also slightly increase the overall impact of the Food Stamp Program on monthly food consumption.

There are also disadvantages to delivering food stamp benefits twice monthly. Recipients who currently shop once monthly may be optimizing their welfare as best they can, given financial constraints and the costs of shopping. A program change designed to encourage more frequent “major” shopping trips may impose more costs than benefits on these recipients. Even recipients whose food intake cycle results from splurging at the start of the month may not be better off with a smoother consumption path. As we discuss below, in suggestions for further research, the wisdom of overriding consumer preferences in this case depends on the nutritional harm sustained during occasional periods of low food intake, which is not yet well understood. We do know that children, whose nutritional welfare might otherwise provide the strongest rationale for overriding adults’ revealed preferences, are already somewhat protected from the monthly food intake cycle.

The increased administrative costs of delivering benefits twice monthly are also not known. They are likely to be large, but because this program change would not complicate program applications and eligibility verification, delivering benefits twice as

often would not nearly double administrative costs. Because new electronic benefit transfer (EBT) programs may lead to increased coordination in the delivery of food stamps and AFDC, and AFDC benefits are generally delivered twice monthly, it may be that EBT will reduce the extra administrative costs of delivering food stamps twice monthly. But joint AFDC-food stamp recipients already have almost no dip in food intake at the end of the month, so there would be little nutritional advantage to delivering benefits more frequently for this population. At this time, pending further research on the nutritional consequences of a cycle in food intake, we cannot recommend that food stamp benefits be delivered twice monthly.

An alternative intervention would be nutrition education focused on shopping patterns. An implication of this research is that intake of fruits and dairy products might be increased, in Week 4 and perhaps overall, if more recipients saved food stamps voluntarily for a second major shopping trip each month. A nutrition education effort emphasizing more frequent shopping might be an easier “sell” than a program that encourages recipients directly to consume more fresh fruit, for example.

Implications for Research on Food Insecurity

Most discussion of hunger and food insecurity in the nutrition and public health literatures could incorporate more detailed consideration of the food stamp cycle without much difficulty. Some survey questions that are employed to assess food insecurity already appear robust to these considerations. The “USDA food sufficiency question” that has appeared in several national surveys refers to the two months prior to the interview and asks whether household members generally have “enough and the kind of food we want to eat,” etc. The “Radimer/Cornell” hunger and food insecurity questions even seem to take as given a pattern of plenty followed by scarcity. For example, they ask respondents whether it is often true that “the food that I bought just didn’t last, and I didn’t have money to get more” [Food and Consumer Service 1994]. Because the reference time period for these survey questions is sufficiently broad, the food stamp cycle does not cause mismeasurement.

The food stamp cycle causes more trouble for nutritional assessments that depend on short periods of survey information, such as one day or several days. For example, in a study of low-income women in Upstate New York, Kendall et al. [1996] did not find expected associations between some food intake measures and food security status. They suspected this result was because “food intakes were not captured at distinct points in time when households were expected to be most food insecure.” This problem could be addressed either by explicitly accounting for the monthly cycle, or simply through a larger random sample.

Implications for Research on the Food Stamp Program

Fraker [1990] mentioned that systematic variation in food shopping at different times of the month might cause problems for research using expenditure survey data that were collected with a diary methodology, such as the Diary CEX. Many regression analyses of food spending as a function of food stamp benefits, reviewed by Fraker, have used this type of data. “While such variation has no effect on the sample mean of the diary measure of food purchases,” Fraker cautioned, “it increases the standard error of the mean, thus making it more difficult to obtain statistically significant estimates of the effects of food stamps on food purchases.”

As noted above, this problem has also been encountered using diary intake data [Kendall et al. 1996], but in general it is less severe with intake data because of the milder monthly cycle in food intake. An exception is that analyses of intake for particular perishable goods may still be more strongly affected. Another popular food measure is the “money value of food used out of household stores,” which is available in the Nationwide Food Consumption Surveys and the pure food stamp cashout experiments. We did not study that measure in this paper, but the amplitude of its cycle presumably lies in between those for food expenditure and actual food intake.

Relatively recent analytic methods, which are designed to be more consistent with the well-developed economic theory of choice subject to targeted benefits, face the most severe problems if they ignore the monthly food stamp cycle [i.e. Moffitt 1989; Wilde and Ranney 1996]. These studies depend centrally on the classification of participants as “unconstrained” (inframarginal) or “constrained” (extramarginal), depending on whether their monthly food spending appears greater than or equal to their food stamp benefits. If food spending and food stamp benefit variables refer to different time periods, common methods of comparing them will lead to missclassification.³ This, in turn, could lead to statistical bias as well as the less serious efficiency problem that Fraker discussed. Studies that simply omit consideration of seemingly extramarginal recipients may face a less serious case of this bias, since the proportion of the sample dropped is usually small [i.e. Levedahl 1995]. Future studies that rely on the classification of food stamp participants as extramarginal or inframarginal should either use only food data and benefit data that refer to the same period, or they should explicitly account for time-of-month.

Future Research

We recommend further research in two areas. First, it is important to assess the nutritional implications of the cycle in food intake. A central goal of the Food Stamp Program is to reduce periodic undernutrition. Also, some very recent research has suggested that indications of mild food insecurity that are accompanied by “disordered” or irregular eating patterns may be associated with overweight [Frongillo et al. 1997]. The association between voluntary cyclical dieting and overweight has already received much study, but further research is needed on cyclical food intake patterns among food stamp recipients.

³ One of the earliest empirical articles to incorporate this body of theory explicitly is by Senauer and Young. They used a food spending variable from the Panel Study of Income Dynamics (PSID) whose reference period is a whole year, so it would not be so affected by the monthly food stamp cycle.

Second, economists should develop both theoretical models and empirical methods that can deal with intertemporal choice over periods as short as the food stamp month. Wilde and Ranney discuss a model of choice between food and other goods over four weeks of the food stamp month, subject to liquidity constraints as well as the constraint that food stamps may only be spent on food [Wilde and Ranney 1997]. A central feature of this model is discounting over time, a workhorse of dynamic economics that may or may not be appropriate for periods as short as a month. More generally, econometricians have paid greater attention in recent years to the fact that consumption of many goods is smoother than expenditure, which complicates empirical work using typical expenditure survey data with a reference period as short as a week. Typically, the solution has been to assume that consumption is perfectly smooth, and a fixed frequency is chosen for each good's expenditure [see Meghir and Robin 1992 for an example with food goods]. This solution is unattractive for research on the Food Stamp Program, where consumption is not entirely smooth and there is a deterministic pattern in the timing of expenditures.

Finally, we recommend improved data collection. Normally, this suggestion at the end of a research paper is considered a bit of a cop-out, because the author is usually proposing large amounts of work at somebody else's expense. In this case, however, we believe some small additions to current national surveys could open up a lot of research in this area. For example, a current question on the frequency of "major" shopping trips could be followed with one on the date of the most recent such trip. Current questions on the amount of cash income received from major sources could be followed with questions on the most recent date of receipt. Since cyclical shopping by food stamp recipients may be merely the most accessible example of more common spending cycles in the larger population, these questions may shed light on consumption patterns for all respondents. We believe these modest recommendations would make existing surveys more informative about the dynamics of food consumption, the Food Stamp Program, and food insecurity in the United States.

References

- Emmons, L. (1986). "Food Procurement and the Nutritional Adequacy of Diets in Low-Income Families." *Journal of the American Dietetic Association* **86**(12): 1684-1693.
- Federation of American Societies for Experimental Biology, Life Sciences Research Office (1995). *Third Report on Nutrition Monitoring in the United States, Executive Summary*. Prepared for the Interagency Board for Nutrition Monitoring and Related Research. Washington D.C.: Government Printing Office.
- Food and Consumer Service (1994). *Conference on Food Security Measurement and Research: Papers and Proceedings*. U.S. Department of Agriculture and National Center for Health Statistics, U.S. Department of Health and Human Services. Washington D.C.
- Fraker, T. (1990). *The Effects of Food Stamps on Food Consumption: A Review of the Literature*. Washington, D.C.: Mathematica Policy Research, Inc.
- Frongillo, E. A. J., C. M. Olson, B. S. Rauschenback, and A. Kendall (1997). Nutritional Consequences of Food Insecurity in a Rural New York State County. Madison: Institute for Research on Poverty.
- Kendall, A., C. M. Olson, and E. A. Frongillo (1996). "Relationship of Hunger and Food Insecurity to Food Availability and Consumption." *Journal of the American Dietetic Association* **96**: 1019-1024.
- Lelyveld, J. (1985). "Hunger in America: the Safety Net Has Shrunk But It's Still In Place." *New York Times Magazine*. June 16.
- Levedahl, W. (1995). "A Theoretical and Empirical Evaluation of the Functional Forms Used to Estimate the Food Expenditure Equation of Food Stamp Recipients." *American Journal of Agricultural Economics* **77**: 960-968.
- Meghir, C. and J.-M. Robin (1992). "Frequency of Purchase and the Estimation of Demand Systems." *Journal of Econometrics* **53**: 53-85.
- Moffitt, R. (1989). "Estimating the Value of an In-Kind Transfer: the Case of Food Stamps." *Econometrica* **57**(2): 385-409.
- National-Research-Council (1989). *Recommended Dietary Allowances, 10th Edition*. Washington DC, National Academy of Sciences.

- Ohls, J. C., T. M. Fraker, et al. (1992). *The Effects of Cash-Out on Food Use by Food Stamp Program Participants in San Diego*. Princeton, NJ: Mathematica Policy Research, Inc.
- Senauer, B., and N. Young (1986). "The Impact of Food Stamps on Food Expenditures: Rejection of the Traditional Model." *American Journal of Agricultural Economics* 66(1): 37-43.
- Thompson, F. E., D. L. Taren, E. Andersen, G. Casella, J. K. J. Lambert, C. C. Campbell, E. A. Frongillo, and D. Spicer (1988). "Within Month Variability in Use of Soup Kitchens in New York State." *American Journal of Public Health* 78(10): 1298-1301.
- Tippett, K. S., S. J. Mickle, J. D. Goldman, K. E. Sykes, D. A. Cook, R. S. Sebastian, J.W. Wilson, and J. Smith (1995). *Food and Nutrient Intakes by Individuals in the United States, 1 Day, 1989-91*. Washington DC, U.S. Department of Agriculture, Agricultural Research Service.
- U. S. Department of Agriculture, Human Nutrition Information Service (1991). "Continuing Survey of Food Intake by Individuals." Public Use Tape. Also 1989, 1990.
- U. S. Department of Agriculture (1992). *The Food Guide Pyramid*. Home and Garden Bull. No. 252. Washington D.C.: Government Printing Office.
- U. S. Department of Health and Human Services (1988). *The Surgeon General's Report on Nutrition and Health*. Washington D.C.: Government Printing Office.
- U. S. Department of Labor, Bureau of Labor Statistics (1992). "Consumer Expenditure Survey." Diary Public Use Tape. Also 1988-1991.
- Wilde, P. and C. Ranney (1996). "The Distinct Impact of Food Stamps on Food Spending." *Journal of Agricultural and Resource Economics* 21(1): 174-185.
- Wilde, P. and C. Ranney (1997). "A Dynamic Model of Consumer Choice Subject to Food Stamp Constraints and Income Constraints." Selected paper for the annual meeting of the American Agricultural Economics Association, July.

OTHER A.R.M.E. WORKING PAPERS

No. 96-17	The G-3 Free Trade Agreement: Member Countries' Agricultural Policies and its Agricultural Provisions	Ricardo Arguello Steven Kyle
No. 96-18	The G-3 Free Trade Agreement: A Preliminary Empirical Assessment	Ricardo Arguello Steven Kyle
No. 96-19	Penn State - Cornell Integrated Assessment Model	Eric J. Barron Duane Chapman James F. Kasting Neha Khanna Adam Z. Rose Peter A. Schultz
No. 96-20	The Impact of Economic Development on Redistributive and Public Research Policies in Agriculture	Harry de Gorter Johan F. M. Swinnen
No. 96-21	Policy Implications of Ranking Distributions of Nitrate Runoff and Leaching by Farm, Region, and Soil Productivity	Richard N. Boisvert Anita Regmi Todd M. Schmit
No. 96-22	Conditions for Requiring Separate Green Payment Policies Under Asymmetric Information	Richard N. Boisvert Jeffrey M. Peterson
No. 97-01	Climate Policy and Petroleum Depletion	Neha Khanna Duane Chapman
No. 97-02	Demand Systems for Energy Forecasting: Practical Considerations for Estimating a Generalized Logit Model	Weifeng Weng Timothy D. Mount
No. 97-03	Estimating Individual Farm Supply and Demand Elasticities Using Nonparametric Production Analysis	Zdenko Stefanides Loren Tauer