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How Low-Income Households Allocate Their Food Budget Relative to the Cost of the Thrifty Food Plan

Noel Blisard
Hayden Stewart



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Abstract

By allocating their food budgets in accordance with USDA's Thrifty Food Plan (TFP), which serves as a national standard for a low-cost nutritious diet, low-income U.S. households can meet recommended dietary guidelines. This study sought to determine whether selected types of low-income households allocate their food budgets in accordance with the TFP. In addition to expenditures for total food and food-at-home, the study looked at four large food-at-home categories: meats, cereals and bakery goods, fruits and vegetables, and dairy products. The analysis found that low-income households as a whole spent about 86 percent of the TFP costs for food at home. These households spent slightly over the TFP amount (102 percent) on cereals and bakery goods, but only 53 percent of the TFP costs on fruits and vegetables. Simulations for specific types of low-income households indicated that expenditures by female-headed households with children and married couples with children were least likely to equal the TFP expenditures.

Keywords: Thrifty Food Plan, low-income households, food consumption, food assistance programs, Consumer Expenditure Survey

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Summary

USDA's Thrifty Food Plan serves as a national standard for a nutritious diet at minimal cost. It is intended as a guide to food shopping for low-income households. The plan's costs are based on national average food prices and are adjusted every month for price changes. Costs are estimated for the age and sex of each member of a household and are adjusted for economies of size, based on the number of people in the household. The plan helps low-income households allocate their food budgets in order to purchase a nutritious diet.

What Is the Issue?

The Food Stamp Program (FSP) is a safety net that ensures that low-income households can buy foods for a healthy diet. Low-income households that participate in the FSP can achieve such a diet if they use the Thrifty Food Plan (TFP) as a guide for their food shopping. Most studies measuring the degree to which low-income households follow the TFP have compared total household food expenditures—for food at home as well as food away from home—to the TFP. The present study looked at total expenditures, but the emphasis is on how low-income households allocate their budget relative to the TFP for food at home. The study looked at expenditures for food in four broad categories that made up approximately 92 percent of the cost of the TFP:

- Meats, poultry, fish, and eggs
- Cereals and bakery products
- Dairy products
- Fruits and vegetables

To determine whether certain types of households are more likely than others to budget their food purchases in accordance with TFP benchmarks, and to identify households that might benefit most from nutrition education programs, the study compared actual and TFP expenditures for four household categories:

- Female-headed with children
- Married couples with children
- Single females
- Elderly couples

What Did the Study Find?

For combined food at home and food away from home, the study found that the food expenditures of low-income households averaged about 125 percent of the Thrifty Food Plan budget. For only food at home, however, low-income households spent about 86 percent of the TFP benchmark. They spent about the TFP amount on cereals and bakery products, 53 percent of the TFP amount for fruits and vegetables, 70 percent of the TFP amount for meat, poultry, fish, and eggs, and about 74 percent of the TFP amount for dairy products.

Analysis of the four broad groups of low-income households in the simulation showed that elderly couples spent about 96 percent of the TFP guideline for food at home, compared with 90 percent for single women. Married couples with children spent about 73 percent of the TFP costs, and female-headed households with children spent 82 percent. Analysis of the individual food categories showed that households with children spent a much higher percentage of the TFP costs on cereals and bakery products than on produce—79 percent for couples with children and 86 percent for female-headed households with children. For fruits and vegetables, two-parent households spent 43 percent of the TFP costs, and female-headed households spent 50 percent.

How might households allocate their food-at-home budget if they had increases in income? The analysis indicated that low-income households first allocated their food dollars to meats, eggs, cereals, and bakery products. Significant increases in the ratio of expenditures to the TFP for fruits and vegetables and dairy products occurred only after income rose above 130 percent of the poverty line.

How Was the Study Conducted?

The study simulated models of four household types and used statistical models of household food demand to analyze how closely low-income households matched their food expenditures to the TFP benchmark. The analysis compared food expenditures from the 2002 Consumer Expenditure Survey to the levels suggested by the TFP. With the estimated models, the research team was able to simulate and compare the expected expenditures of specific types of low-income households. The team was also able to determine how household budgets would change with specified increments in income, for instance, if income were increased from between 0-130 percent to between 131-260 percent of the poverty line.

Introduction

The Thrifty Food Plan (TFP), developed by the Center for Nutrition Policy and Promotion (CNPP) of USDA, serves as a national standard for a nutritious diet for low-income households, especially those in the Food Stamp Program (FSP). The plan recommends quantities of food in 26 categories for individuals of different ages and gender. The cost is calculated for each age-gender group based on national-average food prices and adjusted monthly for price changes. Food plan costs are estimated for each member of a household and adjusted for economies of household size, based on the number of people in the household. By allocating their food budgets in accordance with the TFP, low-income households should be able to afford a healthy and nutritious diet.

A topic that has received extensive attention in the literature is the affordability of the TFP. Work by Daponte and Stephens (2004) and Nord et al. (2004) shows that, on average, about half of all low-income households spend the TFP amount for their total food purchases (food at home and away from home). Specifically, these studies show that the median low-income household spends just slightly less than the TFP total. However, this figure includes food away from home, which is both more expensive and typically less nutritious than food at home (Lin et al., 1999).

While this study begins by looking at total food expenditures relative to the TFP, our main emphasis is on how closely low-income households match their food-at-home budgets with that of the TFP. By strictly adhering to the TFP options for both food-at-home choices and expenditure levels, an individual or household can potentially follow the *1995 Dietary Guidelines for Americans* (USDA/HHS, 1995). Since completion of the present study, the USDA Food Guide Pyramid and Guidelines have been updated (USDA/HHS, 2005). However, determining the actual food choices and nutritional content of a household's diet is beyond the scope of the study. Rather, we concentrate on comparing how well low-income households, including selected subgroups, allocate their food-at-home budget relative to the TFP. Our assumption is that households striving to achieve a healthy diet based on the TFP will have a budget allocation very similar to the TFP. Through this comparison, we can identify household types that over- or underallocate their food-at-home budget relative to the TFP benchmark. This should help us identify household types—for instance, elderly couples or households with children—that could benefit from nutritional education programs by Government and private agencies. However, final determination of the nutritional adequacy of a household's diet needs to be based on nutritional content, not only on the level of food expenditures.

For over 100 years, the USDA has prepared guidelines for nutritious diets. By the 1930s, the agency had published diets with four levels of nutrient content and costs: (1) the Restricted Food Plan Diet for Emergency Use, (2) the Minimum-Cost Food Plan, (3) the Moderate-Cost Food Plan, and (4) the Liberal Food Plan. The Restricted and Minimum-Cost Food Plans were used for low-income families affected by The Depression and were replaced in the early 1940s by the Low-Cost Food Plan. In 1961, the Economy Food Plan was developed as a nutritionally adequate diet for use when the household

expenditure for food had to be lower than the average food cost of low-income households. In 1975, this food plan was replaced by the Thrifty Food Plan, which represented a completely new set of market baskets with the same “minimal cost” as those of the Economy Food Plan (CNPP, 2003, p. 2).

Our study, like most studies concerned with food security or food adequacy, compares total household food expenditures to the TFP. However, it also compares the ratio of total food expenditures to the TFP for four types of low-income households: (1) female-headed with children, (2) married couples with children, (3) single females, and (4) elderly couples. In this way, we can establish whether typical low-income households in these demographic groups spend enough resources on total food to potentially achieve the healthy and nutritious diet envisioned by designers of the TFP.

The TFP was developed as a model plan for at-home food expenditures. To determine how the four household types allocate their food-at-home budgets relative to the TFP, we compared actual food-at-home expenditures with the TFP benchmark. We also compared TFP expenditures with actual household spending on four major food groups, which correspond to the main sections of the Food Guide Pyramid: (1) cereal and bakery products, (2) meat, poultry, fish, and eggs, (3) dairy products, and (4) fruits and vegetables. These foods represent slightly more than 90 percent of the cost of the TFP. The remaining 10 percent of food expenditures are for fats and oils, sugar and sweets, and nonalcoholic beverages (the TFP includes spices and seasonings from miscellaneous foods, but does not include prepared food items such as frozen dinners). By breaking expenditures down by food categories, we can ascertain where low-income households may be over- or underallocating their food-at-home dollars relative to the TFP benchmark, as well as the demographic variables associated with that allocation.

We analyzed a sample of all U.S. households, but focused on the implications for low-income households. Including all households in the analysis provided a degree of variation in our data that allows for more accurate statistical estimates. We can also determine how increases in income influence the food budget allocation of U.S. households—both in the aggregate and across the four major food groups—for households below and above the food stamp income eligibility line (130 percent of the poverty line). There may be a hierarchical allocation of the food budget across food groups with increases in income. For instance, low-income households may concentrate their food purchases on certain food groups and expand the variety of their purchases only with substantial increases in income. If so, we may find evidence of a hierarchical demand.

This study does not address the suitability of the TFP for today’s low-income households. Some low-income advocates have proposed overhauling the current TFP to include more prepared and semiprepared foods, or to include an allowance for food away from home. Relevant to this, we did not consider whether households have the time or cooking skills to prepare meals at home.

Overview of Previous Literature

The literature related to this study and the TFP deals with issues of either food security (do households have enough resources to purchase a nutritious and healthy diet?) or of how low-income households allocate their food budget. For example, Jensen (2002) found that some low-income households were food insecure in the sense that they could not afford the diet of their choice. These households reported needing \$44.79 per capita per week to purchase enough food for their well-being, whereas food-secure households said they required only \$34.05, a level more in alignment with the cost of the TFP.

Other studies have hypothesized that, since the price of food varies from region to region, households may feel food insecure if they face prices higher than the national average prices assumed by the TFP. Andrews et al. (2001) investigated the cost of TFP foods in Washington, DC, and found that items were generally available at or below the assumed TFP prices. It is possible that households in rural or other areas could face higher prices for food in general, which could affect their sense of food security relative to the TFP.

Other research of the literature reveals that low-income households may identify themselves as food insecure because they allocate food dollars elsewhere in the household budget, not because the FSP fails to provide them with sufficient resources. The main reason for this is that cash and food stamps are imperfect substitutes for each other. Studies have shown that if a low-income household without food stamps spends \$20.00 per person per week on food and is extended the equivalent of \$5 per person per week in food stamps, the household will not increase its spending on food to \$25 per person per week. Rather, it will substitute some of the cash previously committed to food for purchasing nonfood goods. In fact, the marginal propensity to consume food, given an extra dollar of food stamps, has been estimated to be much less than \$0.50 (see, for example, Breunig et al., 2001). However, this becomes an issue of household budgeting. It ignores the fact that the FSP provides households with resources for a healthy and nutritious diet if they budget 30 percent or more of their income for food.

Given the above arguments, some researchers, such as Daponte et al. (2001), have analyzed food spending and a household's food security along with other forms of food aid relative to the TFP. Daponte found that the value of food acquired by low-income households increased by \$0.28 with an additional dollar in food stamps, by \$0.69 for every dollar's worth of free food received from a food pantry, and by \$0.73 for every dollar's worth of food received through the Women, Infants, and Children program (WIC). Interestingly, this same study also found that moderately low-income households may be more food insecure than very low-income ones because the moderately low-income households receive fewer dollars of food stamps per capita.

In a second study of food security that defined total food spending (food at home and away from home) relative to the TFP, Daponte and Stephens (2004) used data on over 16,000 low-income households and identified some of the demographic characteristics associated with spending TFP

levels on food. For instance, they found that having an elderly member in the household increased the probability that the household would spend less on food, whereas the effect of having a child in the household was a decreased probability of spending less on food.

Nord et al. (2004) looked at the ratio of total food spending (at home and away from home) relative to the TFP for the total population, for both food-secure and food-insecure households. They found that the median ratio was 1.29 for food-secure households, but that the ratio dropped to 0.95 for those at or under the poverty line. Interestingly, they found that the median ratio for food-secure households with children was 1.17, compared with 1.41 for food-secure households without children. Among food-insecure households, the ratio was 0.96 for all households and 0.87 for households with income at or below the poverty line. Likewise, among food-insecure households, those with children had a lower ratio than those without: 0.92 vs. 1.03.

Other studies have provided nutrition educators with information about how low-income households allocate their food budget among the major food groups. A study by Wilde et al. (1999) investigated low-income household consumption of meats, fruits, vegetables, grains, dairy products, sugars, and fats. This study found that food stamps were not associated with large increases in the consumption of fruits and vegetables, but rather with increased consumption of meats, added sugars, and total fats.

In another study of food budget allocation, Blisard et al. (2004) confirmed that low-income households spend less than their higher income counterparts on fruits and vegetables. Low-income households were also unlikely to increase their spending on produce if they were given an extra dollar in income or food stamps. Blisard and his colleagues found that an extra dollar of purchasing power would likely be allocated to food groups that low-income households perceive to be more basic, such as meats and cereal and bakery products.

Since the TFP represents a nutritious minimal-cost food plan, we sought to determine what proportion of all households and low-income households allocate their food budgets in accordance with the plan, as well as the specific types of low-income households that deviate from it. Existing studies have not shown which types of households either underspend or overspend on food relative to the TFP. This study explored food budget allocation to determine how specific types of low-income households actually allocate their food spending relative to the TFP and its major disaggregated categories, as well as how food budgets are allocated across specified food groups with increases in income. We made the following comparisons:

- (1) Total food costs of all U.S. households, all low-income households, and specified types of low-income households as a ratio of the estimated total expenditures to the TFP.
- (2) Food-at-home costs and allocation to four large food subgroups, for all low-income households and specified types of low-income households, as a ratio of the estimated expenditures to the TFP.
- (3) Changes in food budget allocations across selected food subgroups with large discrete changes in household income.

Some important limitations of the study should be noted. First, our findings may represent the absolute minimal food intakes of low-income households, since significant additional food could come from school breakfast and lunch programs and other types of free or acquired foods. Second, low-income households could achieve a budget allocation that corresponds to the costs of the TFP, yet their food expenditures could be for items that are neither healthy nor nutritious. For example, spending the suggested TFP levels on cereal and bakery products does not ensure that any whole grains are purchased, and in fact the expenditures could be for foods that should be consumed in moderation (such as cookies, donuts, and pastries). Third, the TFP assumes that all households face the same prices across different geographical areas, whereas prices may vary by location (see, for example, Andrews et al., 2001). In addition, low-income households may economize by buying items on sale or in large package sizes that cost less per unit of volume (see, for example, Leibtag and Kaufman, 2003).

Data and Methodology

The study was conducted by combining data on the cost of the TFP based on gender and household size, supplied by the CNPP, and the 2002 Consumer Expenditure Survey (CE), supplied by the Bureau of Labor Statistics (BLS) (2004). The CE is administered annually by the BLS and is designed to measure expenditures, income, and relevant demographic characteristics for the total noninstitutionalized U.S. population. In the diary section of the survey, households report their expenditures on food items for 2 weeks. These data can be matched with household characteristics such as annual income, level of education, age of household members, size of the household, geographic region, and the time of year the survey was administered.

The 2002 CE includes 3,235 households after removal of single-male households, households failing to provide data for both weeks of the diary, and households providing incomplete data on their income or on characteristics of interest (such as the ages of their members). Each household's demographic information was then matched to its expenditure on food, as well as on food subgroups such as fruits and vegetables. The quantities of food purchased were not obtained, and expenditures may vary because of either quantity or quality of the purchases.

The data from the CNPP allowed us to calculate each household's TFP cost, based on sex, age, and household size. TFP costs for older children age 12-19 were averaged across gender, since we could not identify from the CE whether they were male or female. In addition to calculating the overall cost of the TFP, we calculated it for the four main food groups, which represent the majority of food categories in the Food Guide Pyramid (and about 92 percent of the calculated TFP costs). We then took the ratio of the household's actual spending, as reported in the CE, to the calculated TFP cost for this household to potentially achieve a nutritious and healthy diet. In summary, we obtained six variables of interest: ratios for total foods, at-home foods, and each of the four subgroups.

There are several caveats regarding these data. First, CE and TFP food categories may not be perfectly comparable. For instance, the TFP includes dry beans and nut products (including peanut butter) in the meat, poultry, fish, and eggs category because they are sources of protein and a substitute for meats. The CE includes dry beans in the vegetable category, nuts in miscellaneous food, and peanut butter in fats and oils. Since we were not able to separate TFP expenditures for nuts and nut products from the dry beans, we adjusted the TFP benchmark by moving the whole category to fruit and vegetables to achieve maximum comparability across the two datasets. In the adjusted dataset, nuts and peanut butter amount to about 5 percent of a typical low-income household's fruit and vegetable expenditures. We are aware of no other inconsistencies between the two datasets.

As a second caveat, we note that the expenditures required for the TFP are based upon assumptions of how expenditures and food intakes change by age, sex, and household size. We take these as given, but we point out that our results are based upon the accuracy of the assumed "scales" in the TFP. The subject of expenditure scales and how food expenditures vary

by age, sex, and household size has been widely addressed in the literature. In any case, the scales contained within the TFP appear to be consistent with the pattern of expenditures seen in other food expenditure studies (Blisard et al., 2003).

Our modeling efforts focused on estimating the statistical relationship between each of the six ratios and income and selected demographic variables—a variation of the Engel Curve. (One variable from each group, such as PL6 in the income group, was dropped in order to estimate the statistical model.) These variables, along with their definitions and sample means, are shown in table 1. In our modeling effort, an explanatory variable of primary interest was how a household’s income related to the ratio of actual spending to the TFP cost of food. As noted, some previous studies have looked only at low-income households, but we calculated the ratio of actual food expenditures to TFP expenditures for all households. The first income level ranged from 0 to 130 percent of the poverty line, which corresponds to our definition of low-income households and the gross population that is income-eligible to participate in the Food Stamp Program. The second interval ranged from 131 percent to 260 percent of the poverty line. This percentage increase continued up to the last group, where income level was greater than 650 percent of the poverty line. About 18 percent of our sample was in the lowest income category, while 25 percent was in the second-lowest income category (table 1).

For estimation purposes, we created a binary indicator variable to place each household within its appropriate income bracket. For example, the variable PL1 equals 1 if a household’s income is less than or equal to 130 percent of the poverty line, and 0 otherwise (we labeled these variables PL1-PL6, but refer to each as “income group 1” on through income group 6). We justify this because one implicit assumption of cross-sectional analysis is that a lower income household would behave the same way as a higher income household—holding all other variables constant—if they had the same level of income. In addition, we were able to compare how the ratio of actual food-at-home spending changes relative to the TFP with increases in income, especially for the disaggregated food groups. Since additions to income have rather small effects on the level of food spending, one would expect small but positive changes in expenditures as we move from 130 percent of the poverty line to 260 percent. However, we note again that the TFP is designed strictly for the lowest income group and that higher income groups could obtain a healthy and nutritious diet from food groups not contained in the TFP, such as prepared food items, or by eating away from home. In addition, there are food plans designed for households of moderate income, and these, of course, would be more appropriate than the TFP for these households.

In our analysis we also controlled for many of the household demographic characteristics that past studies have identified as important determinants of household food spending. Variations in size and composition across households were controlled in the model by including the inverse of household size and the proportion of household members in selected age groups. The variable for the inverse of household size captured the effects of “conflicts of interest” due to household size, while the proportion of members in each

age group controlled for age composition of the household. We hypothesized that it might be easier for single-person households or households with just two people to make expenditures in accordance with the TFP. As household size increases, the individual preferences of family members may conflict, requiring compromise. Preliminary statistical analysis of our six ratios of expenditures to the TFP categories showed that the ratios declined as household size increased. In addition, eight age groups were used to delineate the effects of household composition. This is important, since

Table 1
Definitions and means of explanatory variables in the study

Variables	Definition	Mean
Independent variables:		
Northeast	=1 if household resides in the Northeast, 0 otherwise	0.17
South	=1 if household resides in the South, 0 otherwise	.32
West	=1 if household resides in the West, 0 otherwise	.24
Black	=1 if household is Black, 0 otherwise	.10
Winter	=1 if household was surveyed in Winter, 0 otherwise	.26
Spring	=1 if household was surveyed in Spring, 0 otherwise	.26
Summer	=1 if household was surveyed in Summer, 0 otherwise	.25
Female head	=1 if household is headed by female, 0 otherwise	.09
PL1 (income level 1)	=1 if household income was between 0 and 130 percent of the poverty line	.18
PL2 (income level 2)	=1 if household income was between 131 and 260 percent of the poverty line	.25
PL3 (income level 3)	=1 if household income was between 261 and 390 percent of the poverty line	.19
PL4 (income level 4)	=1 if household income was between 391 and 520 percent of the poverty line	.13
PL5 (income level 5)	=1 if household income was between 521 and 650 percent of the poverty line	.10
Household size	Inverse of number of people residing in household	.55
High school	=1 if 12 years of schooling or GED, 0 otherwise	.28
Some college	=1 if 1-3 years of college completed, 0 otherwise	.29
College degree	=1 if 4 years or more of college completed, 0 otherwise	.31
Pro75	Proportion of household members age 75 or older	.11
Pro65-74	Proportion of household members age 65-74	.12
Pro30-44	Proportion of household members age 30-44	.20
Pro20-29	Proportion of household members age 20-29	.09
Pro15-19	Proportion of household members age 15-19	.05
Pro10-14	Proportion of household members age 10-14	.06
Pro5-9	Proportion of household members age 5-9	.06
Pro5	Proportion of household members under age 5	.05
Dependent variables;		
Ratiototal	Ratio of total food expenditures to TFP cost	1.58
Ratiodathm	Ratio of food-at-home expenditures to TFP cost	.97
Ratiodcb	Ratio of cereal and bakery product expenditures to TFP cost	1.08
Ratiodm	Ratio of meat, poultry, fish, and eggs to TFP cost	.70
Ratiod	Ratio of dairy product expenditures to TFP cost	.86
Ratiodf	Ratio of fruit and vegetable expenditures to TFP cost	.58

Sample size: 3,235.

Note: One binary variable from each group was dropped, as follows, in order to estimate the statistical model: North Central States, non-Black (race), Fall, PL6 High school dropouts, and Proportion of household members age 45-64.

Source: Economic Research Service, USDA, based on the 2002 Consumer Expenditure Survey.

teenagers and young adults tend to spend a proportionally large amount of their food dollars away from home. Twenty percent of the subjects in our sample were in the 30-44 age bracket, whereas only 5 percent of them were under 5 years of age (table 1).

Regional allocation of household, education, race, and season of the year were also entered as a series of binary variables, as was a variable to indicate if the household was headed by a female. Thirty-two percent of our sample lived in the South, and 17 percent in the Northeast (table 1). Binary variables were also entered to capture the education of the household “reference” member, the person who filled out the diary of the CE survey. Thirty-one percent of our sample had a 4-year college degree or higher and 28 percent had a high school education (table 1). The female-head variable was included in the model because single females head a large percentage of low-income households. In our sample, 9 percent of all households were female-headed (table 1), but among low-income households this increased to 23 percent. Race was defined as either Black or non-Black, because Black households have a slightly different expenditure pattern than White or Asian households. Black households made up about 10 percent of our sample. Finally, winter, spring, and summer were entered to capture seasonal variation in food expenditures. Each season was represented by about 25 percent of the sample.

The ratios of actual food spending to the TFP were then regressed against the income brackets and household demographics, corrected with the statistical population weight. However, our choice of model was complicated by the fact some households did not spend any money on some of the food groups during the 2-week survey period. These data are thus “censored at zero,” and the appropriate econometric model can be described as:

$$y_i = x_i \beta + \varepsilon_i \quad \text{if } x_i \beta + \varepsilon_i > 0 \\ = 0 \quad \text{if } x_i \beta + \varepsilon_i \leq 0$$

Due to censoring, an ordinary least squares regression of y_i on x_i can result in biased estimates of the parameters, β , where y_i is our ratio of actual expenditure to the TFP for a particular household, x_i contains the income and demographic characteristics of that same household as noted above, and ε_i is an error term.

The statistical model used in this study, a Tobit model, assumed that the probability of consumption is related to household income and other selected demographic features. This estimated probability was based on the assumption that all households will eventually purchase all food groups under consideration. This is a strong assumption in general, but our data did not allow us to determine if zero purchases were due to infrequent purchases, nonuse, or economic circumstances such as high prices or income. In any case, it was reasonable to assume that all households would at some point consume some foods from our four broad subcategories.

Furthermore, we used a traditional application of the Tobit model without attempting to correct for any statistical abnormalities that might be present. Most variations of this model attempt to correct for non-normality in the error term. The reason we did not attempt to correct for any statistical

abnormalities is that both the error term and the parameters are simultaneously estimated in this model for all observations that have zero expenditure. Hence, any misspecification of the error term will cause the estimated coefficients to be inconsistent estimators of the true parameters (Deaton, 1997). Even though we used the traditional Tobit model, we checked our results by estimating the equations with censored quantile regressions (which are not affected by any non-normality in the error term), and also by a double-hurdle model (which allows for zero expenditures to arise from an infrequency of purchase by estimating the Tobit with separate probit and truncated regressions). A 95-percent confidence interval of the estimated quantile regression coefficients contained the estimates of our Tobit models. In addition, the coefficients of the double-hurdle model were close to those of the Tobit, most likely because the probability of purchase was rather large for each of our equations.

By employing the statistical model we could control for, or isolate the net effects of, each variable in the model. Hence, we were able to isolate the influence of income, region, race, education, household size, and the age composition of the household. While a similar analysis could be conducted with simple statistics, the use of the statistical model allowed us to readily identify the net effect of any chosen variable, and also to simulate ratios controlling for specific household types based on marital status, race, age, size, region, season, and income.

The overall sample means of our six dependent variables are also contained in table 1. For total food expenditures, the average household spent about 58 percent more than the recommended level of the TFP. However, for food-at-home expenditures, all households spent about 97 percent, on average, of the calculated TFP costs. Hence, in our data all households, including those above 130 percent of the poverty line, spent about the cost of the TFP on food at home. We emphasize that food away from home becomes a larger share of the food budget as income increases: money spent on food away from home accounts for the increase in expenditures when we look at total food costs.

In addition, we found that all households allocated about 8 percent more to cereal and bakery goods than the TFP does, but spent just 58 percent of the TFP cost on fruits and vegetables. Somewhat surprisingly, all households spent about 70 percent of the TFP cost on meats, poultry, fish, and eggs and 86 percent of the TFP cost of dairy products. Further examination of the TFP budget indicated that the meat, poultry, fish, and egg component represents about 33 percent of the total budget. However, an examination of our expenditure data indicated that American households allocate about 25 percent of their food-at-home budget to this group. This finding contrasts with a study by Cohen et al. (1999), which found that low-income households participating in the Food Stamp Program spent about 30 percent of their food budget on this category. Differences between the two datasets may be due to the sample, to the effect of relative prices between the two points in time, or to a combination of both.

Estimation Results

Estimated Tobit coefficients need to be adjusted by the probability of purchase in order to make the correct literal interpretation (see appendix table 1 for the unadjusted estimated coefficients). Many estimated coefficients (the variables are in the same order as table 1) are statistically significant at the 10-percent level or better, especially the income and age composition coefficients (table 2). These adjusted coefficients represent the “marginal net effect” each variable has on the ratio of actual food spending to the TFP level. For example, in the total food equation, the net effect of being a Black household is to decrease the ratio by 22 percentage points relative to non-Blacks, whereas this same variable’s net effect on meat, poultry, fish, and eggs is to increase the ratio of spending by 10 percentage points.

The income bracket variables have a slightly different interpretation. Each of our estimated income variables is relative to the omitted upper-income group (incomes greater than 650 percent of the poverty line). Estimated results indicate that the ratio of total food spending will be 82 percent lower for the lowest income group (0 to 130 percent of the poverty line) relative to the highest income group. In general, our estimated income coefficients indicate that income groups 1 through 5 have statistically significant lower ratios than the highest income group.

The household age composition variables are of particular interest in this study, along with the income variables. As with income, the age composition variables are interpreted relative to the omitted age group—in this case the 45- to 64-year-old group. All age groups are highly statistically significant except for the proportion of the household under 5 years of age, which is significant only in the fruits and vegetables equation. Notably, household members ages 5 through 44 exert large negative declines in the ratio of actual spending to TFP costs. The largest negative effect for food at home is for household members between the ages of 15 and 19. A family member in this age group will decrease the ratio for food at home by 49 percentage points relative to a person age 45-64 (the exact value would be 0.49 times the proportion of the household in this age bracket; for example, if a married couple had two children ages 15 and 17, the net effect would be $0.49 \times 0.5 = 0.245$).

This large negative effect is consistent for this age group across the four subaggregated food-at-home groups. This age effect is not due to the addition of a household member in this age bracket. Rather, it is the effect of age on the calculated ratio, given household size. Past research on food expenditures shows that teenagers and young adults tend to have higher food expenditures away from home than older household members (Blisard et al, 2003) and exert large negative effects on food-at-home expenditures. In fact, Blisard and his colleagues found that at-home food expenditures by 15- to-19-year-olds were just 47.2 percent of those of the 45- to 64-year-old group. In the present study, the effect of the younger group is not signifi-

Table 2

Tobit model for ratio of actual expenditures to Thrifty Food Plan

Independent variables	Total food	Food at home	Cereals and bakery	Meat, poultry, fish, and eggs	Dairy products	Fruits and vegetables
Adjusted marginal beta coefficients ¹						
Constant	1.87***	1.11***	1.12***	0.90***	0.91***	0.41***
Northeast	0.20***	0.13***	0.15***	0.15***	0.09**	0.12***
South	.03	.05*	.01	.09***	.03	.04**
West	.06	.12***	.07	.07**	.12***	.13***
Black	-.22***	-.07**	-.15***	.10**	-.25***	-.03
Winter	-.04	-.04	.02	-.02	-.07**	-.03
Spring	-.05	-.04	-.04	.02	-.03	-.01
Summer	-.05	-.06*	-.06	-.02	-.04	-.01
Female head	.15	.16***	.15**	.13***	.09*	.10***
PL1 (income level 1)	-.82***	-.27***	-.21***	-.13***	-.15***	-.14***
PL2 (income level 2)	-.67***	-.20***	-.15***	-.13***	-.09**	-.09***
PL3 (income level 3)	-.58***	-.16***	-.14**	-.12***	-.08*	-.08**
PL4 (income level 4)	-.37***	-.08*	-.10*	-.03	-.02	-.07**
PL5 (income level 5)	-.33***	-.05	-.06	-.06	-.01	.02
Household size	.30***	.12**	.07	-.24***	-.02	.19***
High school	.03	-.05	-.02	-.08**	.02	-.04
Some college	.08	-.07	-.03	-.13***	-.01	-.03
College degree	.21***	.01	.05	-.13***	.09**	.09***
Pro75	-.24***	-.15***	.09	-.17***	-.07	-.01
Pro65-74	-.08	.01	.13**	-.01	.03	.03
Pro30-44	-.17**	-.20***	-.32***	-.13***	-.21***	-.14***
Pro20-29	-.24***	-.34***	-.43***	-.34***	-.30***	-.18***
Pro15-19	-.15	-.49***	-.69***	-.50***	-.63***	-.29***
Pro10-14	-.50***	-.28***	-.41***	-.32***	-.39***	-.04
Pro5-9	-.37**	-.31***	-.43***	-.46***	-.39***	-.10
Pro5	-.27	-.07	-.40	-.20	-.14	.20***
Sigma	1.04	.66	.99	.79	.78	.55
Probability of purchase	.94	.93	.85	.79	.85	.84

¹Coefficients were derived by multiplying the unadjusted coefficients from the estimated models, shown in appendix table 1, by the probability of purchase.

*=Estimated coefficient significant at the 10-percent level or better.

**=Estimated significant at the 5-percent level or better.

***=Estimated significant at the 1-percent level or better.

Notes: PL1 = 0-130 percent of the poverty line; PL2 = 131-260 percent; PL3 = 261-390 percent; PL4 = 391-520 percent; PL5 = 521-650 percent. One binary variable from each group was dropped, as follows, in order to estimate the statistical model: North Central States, non-Black (race), Fall, PL6 High school dropouts, and Proportion of household members age 45-64.

Source: Economic Research Service, USDA, based on the 2002 Consumer Expenditure Survey.

cantly different statistically from the omitted 45- to 64-year-old group in the ratio of total food expenditures to the TFP, which implies that this younger group has food-away-from-home expenditures larger than the 45- to 64-year-old group.

Do Households Devote Adequate Resources To Buying Food?

We first simulated our total food equation (both food at home and food away from home) in several different ways to ascertain how much American households in general spent relative to the TFP to determine whether specific types of low-income households might be devoting too little of their resources to food. First, we simulated each household's ratio for the entire sample, and then we calculated the average value for all simulated values. We then repeated this exercise, but restricted our sample to the lowest income households. Next, we repeated the exercise restricting the low-income households to one of four types: female-headed with children, married couples with children, single females, and elderly couples.

For our total sample, the calculated average value of the ratio of total food to the TFP was 1.61, with just 4.5 percent of all households having a ratio less than 1 (table 3). For low-income households alone, the same ratio was 1.25, with 20.2 percent having a ratio less than 1. Hence, on average, all low-income households spent approximately 25 percent more than the benchmark level of the TFP. However, one-fifth of all low-income households spent the amount of the TFP benchmark or less. From this perspective, it appears that the majority of low-income households spend enough of their resources on food to achieve an adequate diet.

However, the average value of the ratio for total food expenditures masks some variation among certain types of low-income households. For example, the average value for married couples with children was just 1.05—indicating that the average household of this type just managed to expend the suggested level of the TFP (table 3). Likewise, female-headed households with children managed to have expenditures just 14 percent higher than the suggested level. The range of the ratios for each of the specific households reveals additional detail: For single females and elderly couples, the ratio of total food expenditures to the level of TFP ranged from 0.97 to 1.84—indicating that even households with the lowest ratios spent very near the benchmark levels suggested by the TFP. In fact, just 2 percent of single-female households and 8.2 percent of elderly couples had ratios less than 1. In direct contrast, both household types with children had households with ratios below 1. Fully 61.9 percent of married couples with children had ratios less than 1, whereas 29.1 percent of the female-headed households with children were in this category. Clearly, these household types are more likely than the other types to have expenditure levels less than the TFP benchmark.

While these findings suggest that the average low-income household devotes enough resources to potentially achieve a healthy and nutritious diet, they also suggest that households with children might be targeted for both nutritional education and food stamp participation if they do not already receive program benefits. Our results also hold for median expenditure values, though these are not shown in table 3. In the following section, we discuss how these four types of low-income households allocate their food-at-home budgets.

Table 3

Expected value of the ratio of total food expenditures to the TFP

Household type	Ratio of total food to TFP	Range of ratio	Percent of households with ratios less than 1
All households	1.61	0.70 – 2.71	4.5
All low-income households	1.25	.70 – 1.84	20.2
Low-income female-headed households with children	1.14	.73 – 1.61	29.1
Low-income married couples with children	1.05	.70 – 1.51	61.9
Low-income single females	1.37	.99 – 1.84	2.0
Low-income elderly couples	1.29	.97 – 1.66	8.2

Low-income = Less than or equal to 130 percent of the poverty line.

Source: Economic Research Service, USDA.

How Specific Types of Low-Income Households Allocate Their Food-at-Home Budgets

There are several merits to simulating ratios of food-at-home expenditures by specific types of low-income households to costs of the TFP. First, it demonstrates that much variation can exist within the low-income group for food-at-home expenditures. Second, it allows us to determine if households with children are the ones most likely to deviate from the suggested benchmark of the TFP.

Given the large negative effects on the food expenditures/TFP ratio that are associated with children, teenagers, and young adults in our five models for food at home, it is perhaps not surprising that households with children had the lowest ratios in our simulations (table 4). Married couples with children spent about 73 percent of the benchmark levels on food at home, while female-headed households spent about 82 percent. In contrast, households comprised of single females or of elderly couples spent about 90 percent or more of the calculated TFP costs for food at home. Clearly, given actual household food expenditures, households with children are most likely to have food-at-home budgets below the TFP benchmark.

This trend of lower food spending by households with children continued over the four sub-aggregated food groups as well. While single females and elderly couples spent more than the suggested levels on cereals and bakery products, female-headed households with children and couples with children spent just 86 and 79 percent, respectively. The lowest spending level for all four food groups was for fruits and vegetables, with female-headed households and couples with children spending the least, 50 and 43 percent, respectively. Dairy products were likewise a category on which all four

household types underspent, with female-headed households spending the least—61 percent of the TFP cost level—and elderly couples the most, at 95 percent of the TFP level. However, even married couples with children managed to spend just two-thirds of the TFP cost of the dairy component.

There is only one food category in which a household type other than female-headed with children or couples with children had the lowest ratio: Single-female households in the meat, poultry, fish, and eggs category (table 4). The generally lower ratios exhibited by households with children could stem in part from the fact that many school age children partly fulfill their dairy and other nutritional requirements by participating in school breakfast and lunch programs, as well as from the possibility that our simulated results may be driven by race as well as household composition. In addition, these households may be acquiring additional free food from various sources, such as food pantries or the WIC program.

Can Low-Income Households Be Induced To Purchase Specific Food Categories?

In our analysis of low-income households and the TFP, an explanatory variable of primary interest was how a household's income related to the ratio of actual spending to the cost of the TFP. Unlike previous studies that looked only at low-income households, we calculated this ratio for all households, grouped by income level. The first income level, from 0 to 130 percent of the poverty line, is our definition of low-income households and the level that makes a household income-eligible for food stamps.

This technique allows us to ascertain if certain food groups enter into the budgeting process only at higher levels of income. If just one or two food groups are sensitive to changes in income between the lowest and the next higher income level, it suggests that the lowest income households concentrate their initial dollars on preferred basic foods, perhaps on meats and

Table 4

Expected value of the ratio of actual at-home expenditures to the TFP for low-income household types

Food category	All low-income	Female-headed with children	Married couples with children	Single females	Elderly couples
Food at home	0.86	0.82	0.73	0.90	0.96
Cereals and bakery	1.02	.86	.79	1.13	1.30
Meat, poultry, fish, and eggs	.70	.77	.71	.61	.82
Dairy products	.74	.61	.67	.79	.95
Fruits and vegetables	.53	.50	.43	.59	.58

Low-income = less than or equal to 130 percent of the poverty line.
Source: Economic Research Service, USDA.

eggs, and allocate resources to other food areas only after obtaining an income greater than 130 percent of the poverty line.

Such a hierarchical allocation would be consistent with past ERS studies, such as that by Wilde et al. (1999). Wilde and his colleagues found that increases in income due to food stamps were associated not with increases in the consumption of fruits and vegetables, but with more meats, added sugars, and total fats.

Our preliminary analysis of the impact of large discrete increases in income indicated that the difference between the lowest income group and the next higher income group was 7 percentage points in the ratio of their food-at-home spending to the TFP costs (table 5). In fact, and not surprisingly, for food at home, all other income groups had statistically significant increases in this ratio relative to income group 1.

Further analysis across the four major food groups revealed that if a low-income household were to receive enough additional income to move into income group 2 (PL2), we would expect a 6-percent increase in dairy product expenditures and a 5-percent increase in fruit and vegetable expenditures. Both increases are statistically significant, but increases in cereal and bakery goods, as well as in meat, poultry, fish, and eggs, were not statistically different from zero. In fact, significant increases in these two food categories did not occur until a household reached income group 4 (391 to 520 percent of the poverty line). This finding suggests that cereals and bakery goods and meat, poultry, fish, and eggs are, in general, food

Table 5
Net marginal difference in food spending between income groups relative to the lowest income households (PL1)

Income level	Food at home	Cereals and bakery	Meat poultry, fish and eggs	Dairy products	Fruits and vegetables
Net marginal difference					
PL2 relative to PL1	0.07**	0.05	0.00	0.06*	0.05**
PL3 relative to PL1	.11***	.08	.02	.09**	.08***
PL4 relative to PL1	.20***	.11*	.10**	.14***	.08***
PL5 relative to PL1	.22***	.14**	.08	.15***	.16***
PL6 relative to PL1	.27***	.21***	.13***	.15***	.14***

*=Estimated coefficient significant at the 10-percent level or better.

**=Estimated significant at the 5-percent level or better.

***=Estimated significant at the 1-percent level or better.

Note: PL1 = 0-130 percent of the poverty line; PL2 = 131-260 percent; PL3 = 261-390 percent; PL4 = 391-520 percent; PL5 = 521-650 percent.

Source: Economic Research Service, USDA.

groups preferred by low-income households, and that significant increases in dairy products and fruits and vegetables will not occur until higher levels of income are reached. Thus, it is likely that a marginal increase in income for households below 130 percent of the poverty line will primarily be dedicated to increased purchases of meat, poultry, fish, and eggs and cereal and bakery products. As noted, significant changes in expenditures for these two food groups did not occur until income was four times greater than the poverty line. Likewise, significant increases in spending on fruits and vegetables did not occur until household income was above 130 percent of the poverty line.

Our finding regarding expenditures for the four food subgroups is consistent with a hierarchical demand, whereby low-income households concentrate their purchases on the most preferred food groups. Whether this concentration is due to preferences, affordability, or both cannot be determined from our data. However, previous studies have shown that all income groups, on average, tend to underconsume fruits and vegetables. Hence, one could argue that our finding is based on preferences. If true, it is unlikely that low-income households could be induced to increase their purchases of fruits and vegetables without a massive nutrition education program. Even with education, any increases in fruit and vegetable purchases are likely to occur only after income has significantly increased.

Implications and Conclusions

The average ratio of total food spending from our data (food at home as well as food away from home) relative to the TFP for low-income households was 1.25. The lowest average value for a low-income household was 1.05 for couples with children, while the highest average value was 1.37 for single females. However, median values are often used to measure central tendency, and based on this statistic, the median low-income household appears to be able to just afford the TFP benchmark, with 0.99 as the total food-spending ratio. If we take the mean and median statistics together, these values suggest that the typical low-income household spends just enough resources, on average, to purchase an adequate amount of food relative to the TFP benchmark.

Given the goal of a healthy and nutritious diet at minimal cost, as exemplified by the TFP, it appears that the typical low-income household might allocate too much of its food budget to food away from home. In our sample, the median low-income household, which spent about the TFP amount for total food, allocated 20 percent of this budget to eating outside the home (table 6). By contrast, the average low-income household allocates about 27 percent of its total food budget to food away from home (hence, 73 percent was allocated to food at home, as shown in table 6). Single mothers allocate about 30 percent of their total food budget to food away from home, raising the question of time constraints. For example, a single mother may take her child to a fast-food restaurant because she lacks the time to cook and because her child can be kept entertained. However, ignoring possible time constraints and lack of cooking skills—which may be real problems faced by these households—it would be possible to reallo-

Table 6

Percent of total food budget spent on food away from home and percent of total food-at-home budget for the four main food groups, miscellaneous foods, and beverages

Household type	Actual food away ¹	Median food away ²	Recommended percentage TFP ³	Actual percentage TFP ⁴	Miscellaneous: Foods ⁵	Beverages ⁶
All low-income households	27.0	20.0	92.0	71.0	12.0	9.0
Female-headed	30.	22.	93.	72.	13.	9.
Married couple with children	24.	19.	93.	73.	13.	8.
Single female	29.	17.	90.	69.	12.	11.
Elderly couple	21.	17.	94.	75.	11.	7.

¹Percent of the total food budget spent away from home, average value.

²Percent of the total food budget spent away from home by median household.

³Sum of cereals, bakery, meat, poultry, fish, eggs, dairy, fruits, and vegetables divided by the Thrifty Food Plan.

⁴Sum of the four food groups divided by food-at-home expenditures.

⁵Percent of food-at-home budget spent on miscellaneous (ready-to-eat) foods.

⁶Percent of food-at-home budget spent on beverages (including soft drinks, coffee, tea, and other noncarbonated fruit flavored drinks).

Source: Economic Research Service, USDA.

cate this amount of the food budget back to food-at-home expenditures that are closer to the TFP benchmark. Food away from home is typically more expensive and less healthful than the meals that households tend to consume at home (Lin et al., 1999).

When we subtracted their away-from-home expenditures from their total food expenditures, typical low-income households, who were income-eligible for food stamps, were likely to be spending only 86 percent of the level suggested by the TFP for food at home (table 4). In particular, there is reason to be concerned about households with children. Couples with children spent just 73 percent of the suggested levels and female-headed households with children spent just 82 percent (table 4). As noted, however, this may have been offset by WIC, meals provided at school, or other food sources and programs.

In addition, typical low-income households may need to reallocate their food-at-home dollars across the four major food subgroups of this study to obtain expenditure levels in accord with the TFP benchmark. While these four food groups accounted for approximately 92 percent of the total TFP purchases, table 6 indicates that low-income households spent approximately 71 percent of their food-at-home budget on items in these groups. Our household data show that these households are allocating more than the TFP share of their food-at-home budget to miscellaneous prepared foods (12 percent), nonalcoholic beverages (9 percent), and sugar and sweets and fats and oils (8 percent), in addition to their food-away-from-home purchases. This mirrors the habits of higher income Americans, who also value convenience and taste appeal. However, like food away from home, miscellaneous food costs include marketing services that may save time, but are more costly, and the foods themselves may be less healthy.

Of the four food categories that we analyzed, the one least purchased by the study households was fruits and vegetables. Given the importance of these foods in a healthful diet, special emphasis might be placed on this category, followed by dairy and then meat, poultry, fish, and eggs, in nutrition education programs. In an alternative approach, proposals have been made by dietary advocates to modify the food stamp benefit to create incentives for buying from underconsumed food groups, for instance, by creating a “green stamp” for fruit and vegetable purchases. However, our income analysis indicates that foods like cereal and bakery products, along with meats and eggs, may be preferred by low-income households over fruits and vegetables.

In short, our findings indicate that although a typical low-income household spends about the same amount on total food (at home and away) as the overall TFP benchmark, it does not tend to allocate these dollars in accordance with the food groups that make up the components of that benchmark. The findings include evidence that households that have women with children tend to deviate most from the TFP benchmark when we compare their actual food expenditures to those of the TFP. Definitive conclusions about the nutritional intake of these households would require further research into exactly what foods they buy, at what prices, and any foods they receive at little or no cost.

Alternatively, one might view the problem of food-at-home budget allotment in terms of time allocation and food preparation skills. Some low-income households may need to purchase either prepared foods or foods that require little cooking skill. There is some evidence for this in the fact that 12 percent of the food-at-home budget for all low-income households in our sample was for miscellaneous prepared foods and about 27 percent was for food away from home. These households may need different TFP benchmarks, based on prepared and semiprepared foods, that could meet the dietary guidelines and still be affordable to low-income households. In all likelihood, the cost of the TFP would have to increase to accommodate prepared foods, as would the food stamp allotment in order to make the plan affordable.

Finally, our estimated models suggest that a potential challenge in any household is the presence of older children and teenagers. Even though a female head of household has a positive net effect on at-home food expenditures (table 2), one or more older children can offset this advantage. Several programs are now in place to educate these children about a thoughtful and balanced approach to diet, especially regarding snack foods and away-from-home food consumption. These programs include efforts to increase the consumption of fruits and vegetables, low-fat dairy, whole-grain cereal and bakery goods, and lean meat, poultry, fish, and eggs in accordance with the new dietary guidelines. In any case, low-income households—and especially the children of these households—need a meal provider who is not only aware of the benefits of a well-rounded and nutritious diet, but who has the skills and resources to shop for and prepare the foods necessary to achieve this diet.

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Appendix

The appendix contains the unadjusted coefficients of our models, from which the reported coefficients of table 2 are derived. The coefficients of table 2 are found by multiplying the coefficients of the appendix by the appropriate probability of purchase. Values of the probability of purchase are contained in both the appendix and table 2.

Appendix table 1

Estimated Tobit model for ratio of Thrifty Food Plan to actual expenditures

Independent variables	Food away from home	Food at home	Cereals and bakery	Meat, poultry, fish and eggs	Dairy products	Fruits and vegetables
Constant	2.00***	1.19***	1.32***	1.14***	1.07***	0.49***
Northeast	0.22***	0.14***	0.18***	0.19***	0.10**	.14***
South	.034	.05*	.01	.12***	.03	.05**
West	.06	.13***	.08	.09**	.14***	.16***
Black	-.24***	-.08**	-.18***	.13**	-.29***	-.03
Winter	-.05	-.04	.02	-.03	-.08**	-.03
Spring	-.05	-.04	-.05	.02	-.04	-.01
Summer	-.05	-.06*	-.07	-.02	-.05	-.01
Female head	.16**	.17***	.18**	.16***	.11*	.12***
PL1 (income level 1)	-.88***	-.29***	-.25***	-.16***	-.18***	-.17***
PL2 (income level 2)	-.71***	-.21***	-.18***	-.16***	-.11**	-.11***
PL3 (income level 3)	-.62***	-.17***	-.16**	-.15***	-.09*	-.09**
PL4 (income level 4)	-.39***	-.09*	-.12*	-.04	-.02	-.08**
PL5 (income level 5)	-.36***	-.05	-.07	-.07	-.01	.02
Household size	.32***	.13**	.08	-.31***	-.02	.23***
High school	.03	-.05	-.02	-.10**	.02	-.05
Some college	.08	-.07	-.03	-.17***	-.01	-.04
College degree	.22***	.01	.06	-.16***	.10**	.11***
Pro75	-.26***	-.16***	.11	-.21***	-.08	-.01
Pro65-74	-.09	.01	.15**	-.01	.04	.03
Pro30-44	-.18**	-.22***	-.38***	-.17***	-.25***	-.17***
Pro20-29	-.26***	-.37***	-.51***	-.43***	-.35***	-.21***
Pro15-19	-.16	-.53***	-.81***	-.63***	-.74***	-.34***
Pro10-14	-.53***	-.30***	-.48***	-.41***	-.46***	-.05
Pro5-9	-.39**	-.33***	-.50***	-.51***	-.46***	-.12
Pro5	-.29	-.08	-.47	-.25	-.17	.24***
Sigma	1.04	.66	.99	.79	.78	.55
Probability of purchase	.93	.93	.85	.79	.85	.84

*=Estimated coefficient significant at the 10-percent level or better.

**=Estimated significant at the 5-percent level or better.

***=Estimated significant at the 1-percent level or better.

Notes: PL1 = 0-130 percent of the poverty line; PL2 = 131-260 percent; PL3 = 261-390 percent; PL4 = 391-520 percent;

PL5 = 521-650 percent. One binary variable from each group was dropped, as follows, in order to estimate the statistical model: North Central States, non-Black (race), Fall, PL6 High school dropouts, and Proportion of household members age 45-64.

Source: Economic Research Service, USDA.