

To What Degree Does Food Assistance Help Poor Households Acquire Enough Food?

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Abstract

The research presented adds to the knowledge base on the efficacy of public and private food assistance in alleviating food shortages among poor households by considering the effects of all major forms of domestic food assistance— Food Stamps, WIC, and food pantries. The analyses are based on detailed data that were collected in 1993 from 398 low-income households in Allegheny County, Pennsylvania. This research contributes to the current food assistance literature in three ways. First, a methodological contribution-- a refinement of the standard food consumption model-- is recommended to address biased estimation procedures. Second, the standard food consumption model is extended to include the effects of both public and private food assistance. The third contribution goes beyond asking to what degree food assistance increases food expenditures and instead examines the effect each of the widely available forms of food assistance has on helping poor households acquire enough resources to potentially meet basic nutritional requirements. Research findings suggest that compared with other forms of food assistance, the receipt of a significant amount in Food Stamps has a much greater impact on whether a household attains at least the Thrifty Food Plan than the receipt of food from a food pantry or through the WIC program.

I. Introduction

Since the 1960's, the United States has taken a variety of approaches to providing a food safety net for the poorest of its population. Currently, two main types of food assistance exist. *Public* assistance is entirely government funded. The federal government's principal food assistance program is the Food Stamp program. The goal of the Food Stamp program has been twofold-- to provide assistance to the poor adequate for them to maintain basic nutritional standards and to help the agricultural industry maintain prices. The success of the Food Stamp program has primarily been measured in terms of take-up rates (the proportion of those who qualify for the assistance who enroll), the rate at which Food Stamps increase food expenditures, and by rates of fraud. This program is supplemented by other public food assistance programs that target certain demographic groups, such as the School Lunch/School Breakfast program and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Private assistance is supplemented by government funding but is privately initiated and also funded through donations. This form of assistance usually takes the form of food pantries and soup kitchens.

The Food Stamp program provides benefits in the form of an electronic benefits transfer (EBT), which is a cash transfer that can be used only for the purchase of food items. The WIC program provides participants with paper vouchers that can be used to purchase a choice of very specific food items at a particular grocery store chosen by the participant. Food pantry users get benefits generally in the form of a few bags of groceries a month.

The existence of a variety of ways of delivering food assistance makes it especially important to assess the relative efficacy of each of these mechanisms in meeting the food needs of poor households. Although there is a substantial body of research on the effects of public food assistance and a smaller amount of research on private food assistance, there are few studies that compare the effects of both in a single population (see Daponte and Bade, 2000; Daponte 2000; Fraker, 1990; Galer-Unti, 1995). This research adds to the knowledge base on the efficacy of public and private food assistance in alleviating food shortages among poor households by jointly considering the effects of all major forms of food assistance. Specifically, this paper contributes to the current food assistance literature in three ways. First, the paper provides methodological insights. To address biased estimation procedures, we recommend a refinement of the standard food consumption model. Second, to include the effects of both public and private food assistance, the food consumption model is extended. The third contribution goes beyond asking to what degree food assistance increases food expenditures and instead examines the effect each widely available form of food assistance has on helping poor households acquire enough resources to potentially meet basic nutritional requirements. To address this question, we create a measure of "enough to meet basic nutritional needs" based on the U.S. Department of Agriculture's (hereafter USDA) Thrifty Food Plan.¹ We then jointly model the effects of each form of food assistance on a household attaining enough food.

The remainder of the paper is organized as follows. We provide a brief history of food assistance in the U. S. followed by a review of literature on the efficacy of food assistance. Then, we describe a recommended model and estimation technique. Following, we describe the data and variables used in the analysis. Finally, we present the analyses done and discuss the results.

II. Background on Food Assistance

Since 1964, the U.S. government has addressed the issue of hunger through the federal Food Stamp program. In 1975, the USDA finally made the Food Stamp program available throughout the country and instituted national eligibility requirements and benefit levels. The Food Stamp program provides eligible households with resources (either in the form of paper Food Stamps or an electronic benefit transfer) that can only be spent on food.

Eligibility criteria for the Food Stamp program are quite complex and are subject to occasional changes. Roughly, eligibility requires that the gross income of most (but not all) households fall below 130% of the poverty level and have applicable assets worth less than \$2,000 or \$3,000, depending on whether the household includes at least one elderly (60+ years of age) or disabled member. If a household is eligible, it is expected to spend 30% of its net monthly income on food.² If 30% of a household's net monthly income is less than the Thrifty Food Plan (computed considering only the number of persons in the household and not their nutritional needs), then the Food Stamp program provides participating households with benefits valued approximately as the difference between the household's Thrifty Food Plan amount and 30% of the household's "net monthly income." Qualifying households with high net monthly incomes may receive a very low benefit amount (say, \$10 per month) while households with \$0 in calculated net monthly income receive Food Stamp benefits valued at their Thrifty Food Plan. Thus, the poorest of low-income households receive the highest benefits from the program.

The USDA designed the Thrifty Food Plan to represent a minimum expenditure required to meet USDA recommended nutritional requirements. This plan has been used as the basis for determining Food Stamp allotments since 1975, when a U. S. Court of Appeals decision ruled that the Economy Food Plan, upon which Food Stamp allotments had been based, was sufficient only on a short-term emergency basis and was not adequate to meet long term nutritional needs (Gregor, 1985). The USDA then changed the market basket of foods upon which it based the dollar amount so that the basket of foods *could* meet long-term nutritional needs within the same budget constraint as the economy food plan.

Currently, Food Stamp benefit levels are based on a formula that assumes that a four-person household consists of a middle-aged man, middle-aged woman, and two children of ages 6-8 and 9-11 years. The Thrifty Food Plan of this household is calculated, and then this composite household's thrifty food plan is scaled, depending on household size. According to this formula, the "average" Food Stamp recipient needs to spend as much on food as an elderly woman or 9-year old child.

When the Food Stamp program began, Food Stamp eligible households had to purchase their Food Stamps by giving their County Assistance Office 30% of their net monthly income, as calculated by the Food Stamp program. In return, the household received Food Stamps valued at approximately its Thrifty Food Plan level. On January 1, 1979, this 'buy-in' was eliminated because it appeared that having to come up with the cash to purchase Food Stamps presented many poor households with a barrier to participating in the program. Participation in the Food Stamp program in 1975 was 16.3 million. Elimination of the 'buy-in' added an estimated 3.6 million participants (Ohls and Beebout 1993, p. 17).

Since 1979, participating households have instead been given, in the form of Food Stamps, only their Food Stamp benefit amount-- the difference between the maximum Food Stamp allotment for a household of its size (approximately valued at the household's Thrifty Food Plan) and 30% of the household's net monthly income. This policy change did not change the total benefit amount, but, unless

a household's net monthly income was \$0, the monthly Food Stamp allotments became less than the Thrifty Food Plan. That is, for most households, the Food Stamp program provides benefits that are *not* designed to cover an entire month's food expenditures.

Before the purchase requirement was lifted, critics contended that the Food Stamp allotment households purchased (at a variable price, depending upon the household's level of need) insufficiently provided for a household's entire food needs throughout a month. However, when the purchase requirement ceased, there was no assurance that a household would reserve the dollars that it formerly budgeted for purchasing Food Stamps for purchasing food directly, perhaps making household members, with respect to their nutritional needs, worse off. No longer was the public assured that households participating in the Food Stamp program could acquire at least the Thrifty Food Plan.

In fact, there is reason to suspect that the end of the purchase requirement may have decreased the food acquisitions for all but the neediest households. In an economics framework, while the cost of food from the Food Stamp program became zero, recipients had to bear the entire marginal cost of additional food. A household no longer had as much of an economic incentive to allocate the "buy-in dollars" for food. Those dollars were now just as valuable being spent on other goods or services the household might need or want.

Daponte and Bade (2000) argue that three factors-- the structure of the Food Stamp benefit, decreases in the benefit level, and stricter eligibility rules-- contributed to a heightened increase in the demand for free food in the early 1980s. First, eliminating the purchase requirement may have unintentionally increased the demand for free food (e.g., food from food pantries) among those receiving Food Stamps. Second, legislation passed during the Reagan Administration in 1981 and 1982 decreased the benefits by including a less timely indexing of benefits to the rate of inflation. Decreasing the level of Food Stamp benefits would have increased Food Stamp recipients' demand for food from other sources. Third, that same legislation made it harder for low-income households to qualify for Food Stamps, which would have increased the demand for other food resources amongst those formerly, but not currently, eligible for the Food Stamp program.

In response to what anti-hunger activists perceived as an administration hostile to food assistance, anti-hunger activists "turn[ed] their efforts and energy toward establishing a parallel food assistance system" (Daponte and Bade, 2000, p.21). The private food assistance network emerged as an emergency response by the non-profit sector to a demand for free food from needy households with kitchen access. This sector set up food pantries, which are charitable organizations where needy persons can go to receive a few bags of groceries on a limited basis.

Shortly after the first food pantries appeared, the supply of both publicly and privately provided free food expanded. In 1982, the U.S. government established the Temporary Emergency Food Assistance Program (TEFAP) (Galer-Unti 1995, p. 29). Through this program, the federal government provided charitable organizations with food (usually surplus commodities) to be distributed to the needy. The establishment of this program symbolized the federal government's departure from concentrating on the Food Stamp program to alleviate hunger. In 1979, Second Harvest, a non-profit organization was established. This organization provides a relatively easy way for potential donors of large quantities of food to provide food to food banks. Second Harvest acts as a liason between the food industry and private food assistance network by soliciting large donations of food and then offering the donations to food banks.

(For a discussion of the evolution of both public and private domestic food assistance, see Daponte and Bade 2000).

In the 1980s, it became clear that the demand for private food assistance was not temporary and the number of people in need seemed limitless. To demonstrate the rapid rise of private food assistance, consider that in 1980, the Greater Pittsburgh Community Food Bank (one of the oldest in the nation) distributed one million pounds of food. By 1990, this food bank distributed approximately one million pounds of food per month (Daponte 1996).

The aid given by food pantries differs in several ways from that given through the Food Stamp program. The Food Stamp program is a national assistance program that has fixed eligibility criteria based on income, assets, household size, and number of dependents. Those who apply and qualify may use their Food Stamps at most grocery stores to buy food of their choice. In contrast, food pantries are local and more personal. In Allegheny County, Pennsylvania, a typical food pantry serves between 60 and 100 people (Daponte et al, 1994). Food pantries have a variety of eligibility criteria that are usually less stringent than those for Food Stamps but may also include being a member of the religious parish that maintains the food pantry. Food pantries tend to be open a for very limited number of days and hours. While some pantries offer "shop through," where recipients choose from the food the food pantry happens to have available (with limits on the amount of each type of item and/or the total amount), others offer pre-bagged benefits, where recipients are given a pre-set selection and amount of food, usually amounting to a couple of bags of groceries.

In addition to the Food Stamp program, the federal government offers food assistance programs that target certain demographic groups. For example, the WIC program targets pregnant women and families with young children, and the school lunch/school breakfast program targets school-aged children. The WIC program provides households with vouchers for certain types of food that can be used only at participating grocery stores. The School Lunch/ School Breakfast program provides eligible school-aged children who attend participating schools with free or reduced-price meals.

Although the Food Stamp and other public food assistance programs have been studied extensively, there has been relatively little research conducted on the effects of the private food assistance network and even less comparing the relative effects of public and private food assistance. Following major changes in public assistance and changes in macro economic conditions, research has shown that the private food network may be taking a larger or at least not a decreased role in providing low-income households with food assistance.³ Hence, examining the impact of private food assistance in contrast to public food assistance has become even more pertinent. Next, we provide a brief review of prior research on this topic.

III. Review of Past Research

Research on the impact of food assistance on food consumption has focused on the extent to which food assistance affects the marginal propensity to consume or purchase food. In general, economists find "The net increase in food consumption or expenditure associated with a food assistance program depends in part on how or in what form benefits are provided" (Levedahl and Oliveira 1999, p. 312).

In reviewing a number of studies addressing the question of whether benefits in the form of Food Stamps versus cash more effectively increase the marginal propensity to consume or purchase food

(hereafter MPC_f), Fraker (1990) writes "These studies show that the estimate MPC_f out of food stamps is generally two to ten times larger than the MPC_f out of regular income" (Fraker 1990, p. 77).

Salathe (1980b) used data from the 1972-74 Consumer Expenditure Diary survey and compared Food Stamp recipients with comparably poor non-recipients to estimate that Food Stamps increase at-home food expenditures by 36 cents for each Food Stamp benefit dollar received. "In comparison, a cash transfer would expand at-home food purchases by 6 cents" (Salathe 1980b, p. 40).

Senauer and Young (1986) examined the impact that eliminating the purchase requirement in 1977 had on the MPC_f of households participating in the Food Stamp program. Senauer and Young had the intent of testing Southworth's model (1945), which distinguishes between two types of Food Stamp households: inframarginal households, which have food expenditures that exceed their Food Stamp allotment, and extramarginal households, which spend less on food than their Food Stamp allotment. Southworth hypothesized that for those households that normally spend more on food than their Food Stamp allotment, "the marginal effect of food stamps on food purchases should be no different than for an equivalent cash income" (Senauer and Young 1986, p. 37). By examining results from a multitude of studies previous to theirs, Senauer and Young conclude that "the marginal propensity [to consume food] related to the food stamp bonus is at least twice as large as that for cash income in every case" (p. 38). Analyzing data from the 1978 and 1979 Panel Study of Income Dynamics, they find that among Food Stamp recipient households, 71 percent in 1978 and 86 percent in 1979 spent more than their Food Stamp allotment on food, an increase Senauer and Young attribute to the elimination of the purchase requirement. They also found a change in the marginal propensity to consume food between the two years, from .33 to .26 for Food Stamps and from .05 to .07 for money income, after taking into consideration the two types of recipient households.

In both 1978 and 1979, Senauer and Young found that the marginal propensity to spend money on food from Food Stamps greatly exceeded that from money income, although between these two years, the difference narrowed. One explanation that they give for Food Stamps' effectiveness is that "the dynamics of the household budgetary process may be altered by the receipt of food stamps.... As the food purchased with food stamps runs out later in the month, the family may begin to eat less well, but also will spend cash to buy additional food..." (Senauer and Young 1986, p. 42).

Wilde and Ranney (2000) examined the timing of shopping over the month in relation to the receipt of Food Stamps. They used expenditure data from the Consumer Expenditure Diary Survey for 1988-92 and data from the Survey of Food Intake by Individuals, 1989-91, to graph dollars spent per capita per day. Their graph clearly shows that per capita expenditures peak for the first three days after the receipt of Food Stamps⁴. Wilde and Ranney define frequent shoppers as households that shop more than once a month and infrequent shoppers as those that shop less often. Even defining "frequent" at this low of a threshold, one observes a drop in nutrient intake among infrequent shoppers in the fourth week from the receipt of Food Stamps. Their finding suggests that many Food Stamp recipients (43 percent of the sample) reduce their nutritional intake rather than incur out-of-pocket expenditures for food.

Another approach taken to examining the efficacy of Food Stamps has been to consider the program's impact on nutritional intake directly. Overall, studies that consider nutritional intake have produced mixed results. Studies have shown that "between 1965-66 and 1977-78, a period that marked the national expansion of the FSP and the introduction of WIC, the gap between the diets of low-income

and other families narrowed" (Levedahl and Oliveira, p. 309). Using data from the 1969 to 1973 Rural Income Maintenance Experiment and on elderly persons from the 1980-81 SSI/Elderly Food Stamp Cashout Project, Butler and Raymond (1996) examined whether Food Stamps affect the level of nutrients consumed. They found that "increased income, either restricted to food stamps or otherwise, is associated with reduced nutrient intake in both data sets" (p. 79). They argue that as income increases, so does one's value of time, making the purchase of prepared food (with perhaps relatively low nutritional value) more attractive. Most studies prior to Butler and Raymond's had shown either no or a minimally positive significant impact of Food Stamps on nutrition (Fraker 1990).

Using a multivariate model, Wilde, McNamara and Ranney (1999) examined whether receiving Food Stamps is correlated with the food intake of each of the food groups. They found that receiving Food Stamps positively and significantly correlates with the intake of meats, added sugars, and fats. However, receiving Food Stamps showed no significance in equations for other food groups. In contrast, receiving WIC negatively and significantly correlates with the intake of added sugars. Examining nutrient availability, Cohen et al (1999) found a positive association between Food Stamp program participation and the availability of eight nutrients.

Other studies have examined whether food assistance impacts household self-reports of food insecurity or insufficiency. Analyzing SIPP (1992) and CSFII (1989-91) data, Rose, Gunderson, and Oliveira (1998) found that receipt of Food Stamps has a minimal (though statistically significant) negative correlation with food insufficiency. The variable that had the largest impact on reducing food insufficiency in either data set was whether the household included at least one member over the age of 60, perhaps consistent with Butler and Raymond's (1996) finding that "even rudimentary knowledge of nutrition can increase nutrient intake considerably" (p. 79).

Also using a multivariate framework, Daponte (2000) found that in a sample of low-income households in Allegheny County, PA, households that receive Food Stamps were more likely to report food insecurity than economically and demographically comparable non-participating households. Her research also showed no correlation between Food Stamp participation and the probability of a child being an anthropometric outlier. Because of the cross-sectional nature of the data used in that analysis, her finding is not evidence, of course, that Food Stamps contribute to food insecurity or that Food Stamps do not positively affect child nutrition.

Work done by Cohen *et al* (1999) suggests that when examined cross-sectionally, Food Stamp participants are more likely to report food insecurity than households eligible for but not participating in the Food Stamp program (50% vs. 34%) (p. 44). Using a multivariate framework, among both households participating in and those eligible for but not participating in the Food Stamp program, the factor that had the largest, significant impact on food insecurity was the presence of an elderly person, which decreased the likelihood of the household being food insecure.

The structure of the Food Stamp benefit, as a benefit restricted to the purchase of food rather than cash, may be one way in which the program is especially effective in protecting households from food insecurity. Fraker notes:

A way in which the coupon form of the food stamp benefit may help a household attain a higher level of utility from consumption derives from the possible difficulty of the household in meeting its own budget priorities in the face of its marginal and unstable economic circumstances and powerful

external demands. This function of food coupons may come into play when a financial emergency places hard-to-resist claims upon the household's resources.... The diets of food stamp recipients may be insulated from such exigencies, at least to some extent, by the tied form of the food stamp benefits (Fraker 1990, p. A-25).

It is this research base that we build upon by examining jointly the effects of public and private food assistance in the traditional model and in a new framework.

IV. Critique of Total Food Expenditure Models

Fraker's (1990) review of the literature on the effect of Food Stamps on food consumption reports that the models he found in the literature were essentially of the form

$$Total\ Food\ Cost = a_1 + a_2 FS + a_3 INC + a_4 HHSIZE + Xb + e$$

where Total Food Cost is the dollar value of food used at home, FS is the value of the Food Stamp benefit, INC is household income, HHSIZE is the size of the household, and X is a matrix of control variables, usually demographic characteristics of the household or head of household. In this context, a_2 and a_3 are the marginal propensities to consume food from each source. Fraker reports many different versions of this model in terms of model specification, functional form, and techniques to reduce the effects of selection bias. Research based on this model finds the marginal propensity to consume food from Food Stamps ranges between .17 and .47 and the marginal propensity to consume out of income to ranges between .03 and .15.

The data set used in our research allows us to expand the model to include other forms of food assistance. This results in two additional explanatory variables related to food assistance, the value of food received from a food pantry and the value of WIC benefits. Rather than consider food costs, we can instead consider the value of food acquired, either through purchases or donations. The resulting model is:

$$Total\ Food\ Value = a_1 + a_2 FS + a_3 FP + a_4 WIC + a_5 INC + a_6 HHSIZE + Xb + e \quad (1)$$

However, total food value is simply the sum of several of these explanatory variables plus any out of pocket expenditures (OOP):

$$Total\ Food\ Value = FS + FP + WIC + OOP$$

So, replacing *Total Food Value* in equation (1) with the sum of its parts gives

$$FS + FP + WIC + OOP = a_1 + a_2 FS + a_3 FP + a_4 WIC + a_5 INC + a_6 HHSIZE + Xb + e \quad (2)$$

The effect of having the same variables on both sides of the model means that what is actually being estimated is

$$OOP = \mathbf{a}_1 + \bar{\mathbf{a}}_2 FS + \bar{\mathbf{a}}_3 FP + \bar{\mathbf{a}}_4 WIC + \mathbf{a}_5 INC + \mathbf{a}_6 HHSIZE + X \mathbf{b} + \mathbf{e} \quad (3)$$

and then $\mathbf{a}_i = \bar{\mathbf{a}}_i + 1$ for $i=2, 3, 4$. The rest of the coefficients and all the standard errors (and R^2 statistic) are the same for models (1) and (3). If the same null hypothesis is used in both models, typically that $\hat{a}_i = 0$, the t statistics and corresponding p values for the coefficients of the variables that are on both sides of the equation differ. Under this hypothesis, the t statistics and p values calculated in each model will vary depending on whether \mathbf{a}_i or $\bar{\mathbf{a}}_i$ is further from zero. Perhaps more appropriately, the value of these estimates should be tested against whether they equal one instead of zero. Prior literature does not seem to consider this point.

A related issue is that once one recognizes that the model being estimated reduces from total food value to out of pocket food expenditures, it is problematic that the dependent variable (out of pocket food expenditures) is censored at zero. It is censored because some households who rely on food assistance do not spend any of their own money on food. The result of this censoring is that ordinary least squares (OLS) estimation is biased (Tobin, 1958). A common solution to this issue in the economics literature is to use Tobit analysis, a combination of logit and regression analysis named after James Tobin who first published the model in 1958. The Tobit model replaces the estimation problem above with:

$$y_i^* = \mathbf{c}_i' \mathbf{b} + \mathbf{e}_i, \quad \mathbf{e} \sim iidN(0, \mathbf{t}^{-2}) \quad (4)$$

$$y_i = \max(y_i^*, 0), \quad i = 1, 2, \dots \quad (5)$$

where $\hat{\mathbf{a}}$ is a vector of regression parameters and $\hat{\sigma}^2$ is the precision (i.e., the reciprocal of the variance). Likelihood is given by

$$L(\mathbf{b}, \mathbf{t}^2) = \prod_1 \mathbf{t} f[(y_i - \mathbf{x}_i' \mathbf{b}) \mathbf{t}] \prod_0 [1 - \Phi(\mathbf{x}_i' \mathbf{b} \mathbf{t})] \quad (6)$$

$$= (2\pi)^{-n_1/2} (\mathbf{t}^2)^{n_1/2} \exp\left(-\frac{\mathbf{t}^2 \|\mathbf{y}_1 - \mathbf{X}_1 \mathbf{b}\|^2}{2}\right) \prod_0 [1 - \Phi(\mathbf{x}_i' \mathbf{b} \mathbf{t})] \quad (7)$$

where 0 represents censored observations, 1 represents nonzero observations, n_1 is the number of nonzero items, $\mathbf{y}_1: n_1 \times 1$ is the vector of nonzero observations, and $\mathbf{X}_1: n_1 \times k$ is the matrix of explanatory variables corresponding to y_1 . The product over the censored observations is obtained from the independence of the observations and the fact that $\Pr(y_i = 0) = \Pr(y_i^* \leq 0) = 1 - \Phi(\mathbf{x}_i' \mathbf{b} \mathbf{t})$.

Maximum likelihood estimates of $\hat{\mathbf{a}}$ and $\hat{\sigma}^2$ can be found using an iterative method. However, Chib (1992) found that Bayesian methods, even using very diffuse priors, lead to more accurate estimates than maximum likelihood in small to moderate sized samples. In addition, iterative maximum likelihood estimates are sensitive to assumptions about the normality of the errors (Amemiya, 1985). For these

reasons, Gibbs sampling, an iterative simulation technique, was used as described in Chib (1992). The process involves iteratively simulating unobserved values for the censored data (the conditional pdf for the augmented data is available in tractable form) and making draws of the regression parameters from the posterior (which is also available in tractable form.)

In more detail, let z_i be the simulated values which replace y_0 , y_z be the data with the censored values replaced by the simulated ones, and $\hat{\mathbf{b}}_z = (X'X)^{-1}X'y_z$ be the corresponding OLS estimate. If diffuse prior information is modeled by independent uniform distributions for $\hat{\mathbf{a}}$ and $\log \mathbf{t}^2$, i.e., $\mathbf{p}(\mathbf{b}, \mathbf{t}^2) \propto \mathbf{t}^{-2}$ then the posteriors for $\hat{\mathbf{a}}$ and \mathbf{t}^2 are normal and gamma respectively. Thus the Gibbs algorithm for the Tobit model uses the following simulations:

$$z_i \text{ from } f(z_i | y, \mathbf{b}^{(0)}, \mathbf{t}^{2(0)}) = \frac{f_N(z_i | x_i \mathbf{b}^{(0)}, (\mathbf{t}^{2(0)})^{-1})}{(1 - \Phi(x_i \mathbf{b}^{(0)} \mathbf{t}^{(0)}))} \quad (8)$$

$$\mathbf{b}^{(1)} \text{ from } \mathbf{p}(\mathbf{b} | y, z^{(1)}, \mathbf{t}^{2(0)}) = f_N(\mathbf{b} | \hat{\mathbf{b}}_z, \mathbf{t}^{-2} (X'X)^{-1}) \quad (9)$$

$$\mathbf{t}^{2(1)} \text{ from } \mathbf{p}(\mathbf{t}^2 | y, z^{(1)}, \mathbf{b}^{(1)}) = f_G(\mathbf{t}^2 | n/2, \frac{\|y_z - X\mathbf{b}^{(1)}\|^2}{2}) \quad (10)$$

In the next section, we discuss the data used for this examination.

V. Data

In 1993, the Food Distribution Research Program (FDRP) collected detailed data on 405 households in Allegheny County with incomes below 185 percent of the national poverty level. The data set included food pantry users and comparably poor nonusers. Households sampled came from three sources. The vast majority were randomly selected from 25,000 households screened by the Community and Childhood Hunger Identification Project (CCHIP). CCHIP divided Allegheny County into 5 geographical sectors and then further divided these into 44 mutually exclusive strata so that each stratum contained approximately the same number of poor households with children. The CCHIP screening involved door-to-door interviews with all households in randomly selected "blocks" within the stratum (based on percent professional, percent minority, and percent of poor households with children). In this screening, a household member reported whether the household's income fell below 185% of the poverty level, whether there were children in the household, and whether they used a food pantry in the last year. For the purposes of FDRP, the strata were re-weighted just by percent below 185% of the poverty level (since they were not screening for households with children), and within each stratum weighted to include two pantry users for every non-user. By design, households that did not use a food pantry were from the

same neighborhoods as those that did use a food pantry. Selected households were contacted by phone using a reverse phone directory (Daponte et al, 1994).

However, some households selected to be sampled declined to participate, did not have a phone, had a disconnected phone, or had an unlisted phone number. Out of concern that households without phones (perhaps having lower incomes) were not being sampled, interviewers left their phone number with selected households and asked that it be passed on to anyone they knew without a telephone. Anyone who called in from this source was interviewed. Also, if the interviewers were having a difficult time getting enough respondents from a particular block or stratum, they sometimes resorted to calling everyone in the block regardless of the CCHIP screening results, or going to the nearest food pantry and recruiting respondents, although this resulted in fewer than 20 participants. Respondents were interviewed either in person or over the phone and received \$10 for participating in the study.

Although the sample was not entirely random, when compared with the demographics of all households in Allegheny County with income below the poverty level (based on 1990 census results), the sample had similar age, sex, race and household structure distributions (Daponte et al, 1994). In addition, the sample had similar Food Stamp take-up rates as those reported in other surveys (Daponte 1996). Thus, there is some evidence that results from this sample may be cautiously generalized within the region and perhaps to other low-income populations.

An interviewer administered a formal survey that asked an array of detailed questions about the dynamics of household composition, household economics, participation in various social support programs, food assistance, and health. The data collected are unique in providing information on the totality of food assistance and estimates of the value of food acquired from each possible source of food assistance (with the exception of school lunch/breakfast programs). To the authors' knowledge, this is one of few data sets that includes detailed information on food pantry usage and the only one to date that includes estimates of the value of food obtained from food pantries in addition to other forms of food assistance.

The three limitations of the data are selection effects, a small but unknown number of participants that were not randomly selected, and the self-reported, retrospective nature of the data. The extent to which the observations are not independent and the presence of a selection bias is not known and all results must be interpreted carefully in this context. The accuracy of the data is also questionable, a problem that is present in much of the data on food assistance. For example, respondents were asked to estimate dollar amounts that their household had spent in 20 different categories in the previous month, the previous year, and 2 years prior. There are numerous inconsistencies, both small and large, in the data. In a couple of areas respondents were asked for similar information in more than one part of the survey and the responses to these questions do not always match. Often the differences are small, but occasionally they are sizable.

For our purposes here, 7 households had insufficient data for them to be useful for our analysis, resulting in a sample size of 398 households. To address these data issues, we use robust methods in much of the analysis that follows. One should interpret results with these caveats in mind.

VI. The Extended Thrifty Food Plan

Determining whether the food that households in the sample acquired could be enough to meet basic nutritional needs requires a measure of "enough." We base a definition of enough on the USDA's

Thrifty Food Plan for 1993 (the year of data collection). The Thrifty Food plan is one of four food plans that the USDA has devised. The other three are called the low-cost, the moderate cost, and the liberal food plans. Benefits for the Food Stamp program are roughly based on the Thrifty Food Plan.

Since its creation in 1975, the Thrifty Food Plan has been re-evaluated twice-- once in 1983 and once in 1999-- to reflect new nutritional standards and new data on the eating habits of low-income families. At both times, analysts used linear programming to minimize the "distance" between the eating habits of low-income households and a market basket of items that met nutritional needs while staying within the budget constraint of the Thrifty Food Plan. Both re-evaluations found that a satisfactory diet could be bought within the budget constraints of the Thrifty Food Plan (Anand 1999; Kerr 1984). However, in 1999, a sensitivity analysis performed determined that if Thrifty Food Plan amounts were decreased by 4%, it would no longer be possible to meet basic nutritional requirements.

There are many reasons why acquiring food, either through purchases and/or donations, worth the Thrifty Food Plan amount may not provide adequate nutrition. First, the Thrifty Food Plan is based on average national prices. In areas where food prices exceed the national average, it is likely that a household will not be able to meet its basic nutritional needs without additional food acquisitions. Second, households typically lose between 5% and 10% of their food to spoilage or waste (Gregor, 1985). (Formerly, the Food Stamp program addressed this by basing Food Stamp benefits on 103% of the Thrifty Food Plan. In 1996, benefits were reduced and based on 100% of the Thrifty Food Plan.) Third, for a variety of reasons, people may not buy exactly the market basket intended by the Thrifty Food Plan. Fourth, preparing food in the market basket of food included in the Thrifty Food Plan is estimated to take approximately 3 hours a day (Gregor, 1985) and involves cooking skills that household members may not have. Thus, the Thrifty Food Plan gives a minimum amount in the sense that it is quite possible to acquire the Thrifty Food Plan amount (or even more) in food and not meet basic nutritional requirements. Households that spend or acquire less than the Thrifty Food Plan probably do not meet basic nutritional needs.

Our goal was to calculate a Thrifty Food Plan dollar amount for each household in our sample. We start by using the USDA's Thrifty Food Plan, which gives a dollar amount that should be spent for each individual in 13 age/gender groups given a household size of 4. However, the USDA's Thrifty Food Plan does not account for persons with any special nutritional needs, such as infants and pregnant or lactating women. We base the amount of food acquisitions needed for persons in these categories on the voucher allotments provided by the WIC program in 1993.

We calculate what we call an Extended Thrifty Food Plan (ETFP) amount for each household by summing the amounts from the Thrifty Food Plan for each individual in the household, based on age, gender, and pregnancy or lactation status, and multiplying this amount by an economy of scale factor based on household size. The economy of scale factors we used are those that the USDA uses when calculating maximum Food Stamp benefits. These factors lower the amounts for larger households (under the assumption that it is less expensive to buy larger amounts) and increase the amounts for smaller households. (See Appendix A for the full ETFP amounts and the economy of scale factors.) Overall, we found that 55% of this sample report total food acquisitions below their ETFP.

VII. Description of Variables

We define **total food acquisitions** as the value of all food the respondents reported either purchasing or receiving. This includes the value of Food Stamps, the value of food received from a food pantry as estimated by the respondent, the value of WIC vouchers, and any out-of-pocket food expenditures. Not included is the dollar value of food acquired through school lunch and/or school breakfast programs. Instead, indicator variables are used to indicate participation, whether any child in the household participated in only the school lunch program, in the school breakfast and school lunch programs, or no child in the household participated in school feeding programs. Dollar amounts for the value of food eaten at soup kitchens, restaurants, work, or given to the household by friends or family are also not included.⁵

Estimates of the value placed on various forms of food assistance by respondents seem reasonable. Food Stamp amounts are reported twice within the survey and are usually consistent. The amounts reported seem appropriate given household sizes, incomes and the maximum Food Stamp allotments in 1993. WIC amounts also seem consistent with allocations given that year. The estimated value of food received from food pantries is consistent with average values reported by food pantry administrators and the Greater Pittsburgh Community Food Bank. Respondents estimated out-of-pocket food expenditures for the prior month. The accuracy of these estimates is unknown.

(Table 1 about here)

Table 1 includes descriptive statistics on variables used in later analyses and the percent of households within these categories that acquire at least their ETFP amount. The table shows that 51% of the sample receives Food Stamps. Overall, households that receive Food Stamps tend to acquire relatively more food, with 56% of recipient households acquiring at least their ETFP amount, compared to only 33% of non-recipient households. Considering various levels of Food Stamps benefits received, only 36% of households that received relatively low Food Stamp benefits (valued at less than 35% of the household's ETFP) acquired their ETFP, while 51% and 77% of households receiving moderate (35%-74% of its ETFP) or high (more than 75% of its ETFP) levels of Food Stamps acquired their ETFP amount. Further, while 38% of this sample used a food pantry (within 30 days of the survey), 55% of these households acquired at least their ETFP, compared with only 38% of those that did not use a food pantry. Likewise, a greater proportion of households receiving WIC (which account for 18% of the sample) acquired their ETFP (72% of participants compared with 39% of non-participants).

The presence of children (persons younger than 18 years) was recoded into 4 categories: no child(ren) in the household (45% of the sample); child(ren) present but no child participates in school feeding programs (24% of the sample); child(ren) present and at least one child participates in both the school breakfast and school lunch programs (19% of sample); and child(ren) present and they participate in only the school lunch program (12% of sample). There is no clear association between these four categorical variables and whether the household acquires its ETFP.

A few different variables were used to describe a household's structure. First, approximately 29% of the sample included households with a married couple. These households were less likely to acquire their ETFP, with one third of them doing so, than households without a married couple. One can examine

the gender of the head of the household,⁶ with 52% of female-headed compared with 34% of male-headed households acquiring their ETFP.

The level of the most educated household member is used to indicate the household's education level. While half of the sample included a member with more than a high school degree, there appears to be little correlation between education level and whether the household acquires at least its ETFP.

Households were classified according to whether they have a vehicle and household income. The age and race of the householder were also considered and households with younger heads and households with African-American heads were slightly more likely than other households to acquire at least the ETFP. With respect to household size, only 34% of households that contained four or more household members acquired their ETFP. We now turn to examining total household food acquisitions in a multivariate framework.

VIII. Models and Data Analysis

A. The Total Value of Food Acquired Model

One of the goals of all forms of food assistance is to increase the amount of food that a household acquires. Thus, even though the Food Stamp program typically contributes much more to a food budget than a food pantry (partly because households that participate in the Food Stamp program tend to be eligible for more sizeable benefits than eligible non-participating households (Daponte, Sanders, and Taylor 1999)), the concern is that households may reallocate the money they would have spent on food to other needs and the total amount of food may not increase.

Figure 1 about here

Figure 1 displays a boxplot of the number of households in the sample receiving each form of food assistance and how the per capita value of food received from each source compares with the amount households spent out of their own pockets for food in the prior month. This plot shows that Food Stamp allocations are typically much larger than amounts received from WIC or food pantries and that there is substantial variation in out-of-pocket food expenditures between households.

The Tobit model described in a previous section was fit to estimate the marginal propensity to acquire food from each food assistance source controlling for a variety of demographic characteristics. This estimation resembles those previously done in the food assistance literature that examined the marginal propensity to consume food. The estimation procedure we use is Gibbs sampling and Table 2 displays its results. The Gibbs sampling procedure is likely to provide more accurate results than MLE would.

Table 2 about here

This model of monthly out of pocket food expenditures suggests that households in this sample begin by allocating \$73 to food, add \$29 for each household member, add \$21 for each \$1,000 of income, and subtract \$0.72 for each dollar they receive in Food Stamps, holding the levels of all other variables constant. Alternatively, the model may be interpreted as estimating that total food acquisitions are

increased by \$0.28 for every dollar in Food Stamps received, \$0.69 for every dollar worth of food received from a food pantry, and \$0.73 for every dollar worth of food received from the WIC program.

The point estimate for the Food Stamp coefficient (marginal propensity to consume food for an additional dollar in food stamps) is well within the range of previously published research on the subject (Fraker, 1990). Regarding WIC, the nature of the survey data makes it difficult to reliably estimate the effect of the WIC program since it is unclear in many cases whether the out of pocket amounts reported include WIC vouchers or not. With respect to the food pantry estimates, this problem does not present itself, but these estimates may be affected by measurement error. Errors in variables bias parameter estimates toward zero, which in this case would lead to overestimates of the MPC from food pantries.

Further, interpretation of the food pantry coefficient depends on exactly how the household received food from the pantry. Some pantries allow recipients to “shop through” for groceries. In this setting, the pantry is set up like a store and recipients are allowed to select specific items with limits placed on the amount any household can select. Presumably, people use the items they select. In contrast, some pantries pre-bag groceries so when recipients go to the pantry they can quickly be handed the bags. It is possible that some of the items contained in the bags have no utility to the household. Although America’s Second Harvest (the non-profit organization that provides large donations of food to the national food bank network) and the Greater Pittsburgh Community Food Bank recommend that clients be allowed to “shop through” for groceries, pantries that provided pre-bagged groceries were common in 1993. If a recipient received bags of food that were useless to the household, then it is possible that the coefficient for the food pantry variable could be as high as 1.

On the other hand, the groceries contained in the bag may actually encourage the household to acquire more food. For example, if the food pantry provided the ingredients for half of a complete nutritious dinner, the household may be encouraged to spend money on food so it could prepare a nutritious dinner. In a focus group done with food pantry recipients, participants were paid \$10 to discuss food issues and the discussion turned to the food received from the food pantry. One man said “they give you the spaghetti sauce and pasta, but there is no meat” and a woman commented that they expect you to make “poor man’s spaghetti.” (Daponte and Bade 1998, p. A-2). After being given cash for participating in the focus group, the man commented that he intended to buy meat to make “rich man’s spaghetti.” The point we make is that one should interpret the food pantry coefficient cautiously. On one hand, it may be high because some of the food received may have little utility; but on the other hand, providing *some* ingredients for meals may encourage households to spend *more* money on food to make the meals complete.

Even considering possible sources of error, these results clearly show that food assistance has a greater impact on increasing food acquisitions than cash, a point consistently made in the literature. These estimates suggest that providing food assistance in a voucher form (as in the WIC program) or by providing actual food items (as is the case of food pantries) increases food acquisitions to a greater relative degree than do Food Stamps. That is, while in this model for every dollar of Food Stamps provided food acquisitions increase by \$.28, for every dollar of food received through a food pantry, food acquisitions increase by approximately \$.69.⁷

B. Percent Difference Model

A more innovative way of examining the impact of food assistance is to ask how food assistance affects a household's food acquisitions with respect to the household's Extended Thrifty Food Plan. Here, we inquire about:

- 1) whether food assistance increases food acquisitions enough for low income households to meet basic nutritional requirements; and
- 2) the effect each form of food assistance has on the extent to which a household acquires at least its Extended Thrifty Food Plan.

The analysis in this section considers the percent difference, calculated by subtracting the household's ETFP amount from the value of the food they had acquired in the prior month and dividing this amount by the ETFP amount. This percent difference indicator, $((\text{Food value} - \text{ETFP})/\text{ETFP})$, shows the degree to which a household falls above or below its Extended Thrifty Food Plan. If this figure is positive, then the household is acquiring more food, or more expensive food, than the Thrifty Food Plan suggests it needs. Conversely, a negative figure shows that the household is food deficient. So, for example, a -20 percent difference for a household means that the household acquired food worth 20 percent less than the ETFP threshold amount suggests it needs.

Figure 2 about here

Figure 2 displays a boxplot of the sample broken down by the type of food assistance received. The figure shows that only those households using both Food Stamps and food pantries have a median food acquisition amount that exceeds the ETFP. Also, an increasing trend in terms of percent of the ETFP acquired appears from no food assistance to both Food Stamps and food pantries.

Nationally, roughly half of all American households spend more on food than the USDA's Moderate Cost Food Plan (USDA 1983). In this sample, 88% of households report food acquisitions below the Extended Moderate Cost Food Plan and approximately 55% of households reported food acquisitions below the Extended Thrifty Food Plan.

Robust multivariate linear regression was used to examine the degree to which different types of food assistance correlate with the percent of the Thrifty Food Plan a household acquires, controlling for a variety of household characteristics.⁸ All of the explanatory variables in this model are indicator variables, where 1 indicates that the household has that characteristic and 0 indicates that it does not.

We were particularly interested in whether receiving a substantial amount in Food Stamps has a differential impact on obtaining the ETFP than receiving nominal amounts. To examine this question, we first considered the relationship between the amount in Food Stamps received and the percent of the ETFP obtained by the household. Figure 3 shows little difference in the percent of the ETFP attained between households that received no Food Stamps and those that received a low amount (<35% of the ETFP) in Food Stamps.

Figure 3 about here

Further, the percent of the ETFP received increases slightly for those receiving a medium amount (35-74% of the ETFP) in Food Stamp benefits and increases greatly for those receiving a high amount (at least 75% of the ETFP) in Food Stamp benefits. Part of the correlation between Food Stamp benefit amount and the percent of the ETFP obtained is determined by the definition of the "low", "medium", and "high" Food Stamp groups. For example, households in the High Food Stamp group, by definition, receive at least 75% of their ETFP in Food Stamps. So, when calculating the percent of the ETFP obtained by the household, the group is censored at the 75% level. This would be problematic if the question of interest concerned whether households receiving close to the maximum amount in Food Stamps are near their ETFP. Instead, we examine whether households receiving lower levels in Food Stamps reach their ETFP and how the benefit levels received from the Food Stamp program compare with respect to households obtaining their ETFP levels.

Table 3 displays the regression's results. In this regression, Food Stamp reciprocity was disaggregated into three levels, depending on whether the value of the Food Stamps was low (accounted for less than 35% of the household's ETFP), moderate (accounted for 35% to 74% of the household's ETFP), or high (accounted for at least 75% of the household's ETFP).⁹ Food pantry usage was included as an indicator variable. Considering that persons who receive assistance from a food pantry tend to value the assistance as worth \$20 of food per month and that this assistance translates into 11% of their ETFP (both median amounts), food pantry usage is most analogous with a low level of Food Stamps.

Table 3 about here

The results shown in Table 3 suggest that holding all other variables constant, households that receive high Food Stamp benefits acquire on average nearly 20% more of their ETFP amount than similar households that do not receive any food assistance. Households that receive a moderate level in Food Stamps acquire 8% more of their ETFP amount. The receipt of a low level of Food Stamp benefits does not statistically significantly impact a household's food acquisitions. That is, the model suggests that those households receiving low Food Stamp benefits are not significantly closer to reaching their ETFP levels than comparable households not receiving any Food Stamp benefits. In spite of their higher net monthly incomes, both of these groups are worse off than households receiving high Food Stamp benefits in terms of attaining their ETFP.¹⁰

In contrast, receipt of food from a food pantry increases a household's food acquisitions relative to its ETFP by 6%, and this increase is statistically significant. Participation in the WIC program also positively impacts households' food acquisitions.¹¹

One should be cautious here in interpreting the negative coefficients for the school food program variables. Since it is difficult to estimate the value of the program to participating households, the calculated total amount of food acquired does not include food from these programs. The coefficients for these variables may be negative because households that include at least one child on a school food program may not need to acquire the ETFP at home, since the child(ren) are eating a substantial number of meals at school. On the other hand, the coefficients may instead reflect a shortfall of food in participating households.

With respect to the other independent variables included in the model, none but the variable that reflects whether the household is headed by an African-American show statistical significance.¹² The results show that such households acquire 10% less of their ETFP than comparable households that do not have an African-American head.

C. Results from Multinomial Logistic Regression: Acquiring Less Than, Reaching, or Exceeding the ETFP

Yet another way of exploring the relationship between food assistance and getting enough food uses multinomial logistic regression. Households were separated into three categories based on whether they were clearly *below* their ETFP amount (more than 10% below), clearly *above* their ETFP amount (more than 10% above), or if they were just reaching their ETFP amount (within 10% of it). Then, logistic regression was used to estimate the odds of being in one of these categories versus another if all other variables are held constant. Table 4 displays these results.

Table 4 about here

This model produced interesting results. With respect to food assistance, households receiving a high level of Food Stamps (at least 75% of their ETFP amount) are three times more likely than those receiving no food assistance to acquire rather than acquire less than their ETFP amount. Receipt of Food Stamps benefits below 75% of a household's ETFP does not statistically significantly impact whether a household acquires at least rather than less than its ETFP amount. Considering households being above versus just reaching its ETFP, receipt of Food Stamps, regardless of the benefit level, has no statistically significant impact.

Considering other forms of food assistance, use of food pantries is not statistically significant, while participation in the WIC program is associated with a 76% increased probability of a household exceeding rather than just reaching its ETFP.

IX. Discussion

The research presented here examines the impact of various types of food assistance available to the poor in Allegheny County, Pennsylvania. This research has yielded three primary results.

First, we make methodological suggestions regarding the estimation and interpretation of models typically used in similar research. The central focus of research assessing the effectiveness of food assistance has been in the form described by Fraker (1990) in models estimating the effect of Food Stamps on total food expenditures. There are several weaknesses of the typical model, including biased estimation procedures (see Senauer and Young, 1986 for one example of research not using biased estimation procedures), potentially misleading *p*-values, and utilizing estimation procedures sensitive to parametric assumptions that are often violated in food assistance data.

The second contribution is the consideration of the private food assistance network. Since this network has become a substantial part of the food safety net over the past 20 years, it is important to assess the efficacy of the support it provides. Indeed, as the number of Food Stamp recipients has declined in the past six years and food pantry usage has remained constant, the private food assistance network now

addresses a greater portion of the food assistance needs of the poor than it did when the data used here were collected.

Third, the model we estimated to assess the impact of each form of food assistance on the percent of the extended thrifty food plan acquired suggests that each type of food assistance-- Food Stamps, WIC, and food pantries-- increases total food acquisitions, but to differing extents. Receiving a high amount (>75% of the ETFP) in Food Stamps has the greatest impact, followed by participating in the WIC program, receiving a medium amount (35-74% of the ETFP) in Food Stamps, and receiving food from a food pantry.

Receiving a low amount (< 35% of the ETFP) in Food Stamps does not significantly impact the percent of the ETFP a household acquires. One reason why may involve household budgeting decisions. Households receiving low amounts in Food Stamps may not be supplementing the benefit and incurring enough out-of-pocket food expenses to make up for the difference between the household's ETFP and the household's Food Stamp benefit level. That is, although households receiving a low amount in Food Stamps have higher incomes than those receiving a high Food Stamp benefit, they tend not to use this income advantage for food to the extent that policymakers may have anticipated when the Food Stamp buy-in was eliminated.

Another way of considering the impact of food assistance is to examine whether the food safety net helps households acquire *enough* food to meet basic nutritional needs. We found that compared with households receiving no food assistance, similar households receiving a high amount in Food Stamps are three times more likely to acquire rather than be below their ETFP. No other form of food assistance has a statistically significant impact on a household reaching its ETFP rather than acquiring too little food. This finding suggests that when the Food Stamp program assures that a household receives at least 75% of its ETFP in the form of a restricted benefit, a household benefits nutritionally. Further, households receiving Food Stamps are not more likely to be acquiring *more* than a household's ETFP than comparable households not using any food assistance. However, households receiving WIC benefits are more likely to acquire more than their ETFP than those not receiving any food assistance.

Due to limitations in the data set, that it is local, self-reported, retrospective data, these results are inconclusive outside of Allegheny County, PA. However, if national data were also to show that receiving a significant amount of Food Stamps is the most effective means of increasing a low income households' likelihood of attaining enough food, there would be strong policy implications that run counter to current trends in food assistance policy. These results suggest that more emphasis should be placed on the role of Food Stamps and that increasing benefit levels would improve a household's food security. One could increase maximum allotments by basing them on the low cost or moderate cost food plans instead of the Thrifty Food plan.

Further, a careful examination of the Food Stamp program's relationship with the Thrifty Food plan revealed that Food Stamp benefits are based on a composite household consisting of two adults and two children, making the "average" Food Stamp recipient a person with essentially the same food expenditure needs as a nine-year old child. If a household differs from this theoretical composition then its Food Stamp benefits may be insufficient. For example, a family consisting of one parent and three teenagers (who have tremendous food needs) will find the benefits grossly insufficient. Rather than base the benefit level on a

theoretical household composition, the USDA might consider basing it on the actual age-sex composition of the household.

This research also points to areas for further research. Specifically, we would like to see detailed information on food acquisitions included on nationally representative surveys so that this research could be replicated on a national level. Unfortunately, in spite of the prevalence of private food assistance, few data sets consider this form of assistance and we know of no other data set that includes estimates of the value of private food assistance, along with information on assistance received from public food assistance programs.

Table 1
Descriptive Statistics of Variables Used in Analyses

Variable	Sample Frequency	[N]	% at or above ETFP amount
Total	100%	398	44.5%
Food Stamps			
No Food Stamps	49.2%	196	32.7%
Low Food Stamps	12.6%	50	36.0%
Moderate Food Stamps	19.8%	79	50.6%
High Food Stamps	18.3%	73	76.7%
Any Food Stamps	50.8%	202	56.4%
Food Pantry Usage			
Non-users	62.3%	248	38.3%
Users	37.7%	150	54.7%
WIC			
Non-participants	82.2%	327	38.5%
Participants	17.8%	71	71.8%
Presence of Children			
No children in household	44.5%	177	40.7%
Children present			
• Do not participate in school food pgms.	24.4%	97	49.5%
• Receive School Breakfast & Lunch	19.1%	76	55.3%
• Receive only School Lunch	12.1%	48	31.3%
Household Structure			
Married couple household	29.4%	117	32.5%
Not a married couple household	70.6%	281	49.5%
Female-headed household	58.8%	234	51.7%
Male-headed household	41.2%	164	34.1%
Female-headed with children	32.2%	128	57.0%
Not female headed with children	67.8%	270	38.5%
Highest level of education attained by any hh member			
< High School Diploma	18.1%	72	41.7%
High School Diploma	31.9%	127	43.3%
> High School Diploma	50.0%	199	46.2%
Household Wealth			
Have a vehicle	45.7%	182	40.1%
No vehicle	54.3%	216	48.1%
< 100% of poverty	58.0%	231	50.2%
Above poverty	42.0%	167	36.5%

Age of Householder			
18-34	27.9%	111	55.9%
35-64	52.0%	207	40.1%
65+	20.1%	80	40.0%
Race of Householder			
Not African American	63.1%	251	43.8%
African American	36.9%	147	45.6%
Household Size			
1	25.4%	101	45.5%
2	21.4%	85	56.5%
3	20.4%	81	48.1%
4+	32.9%	131	33.6%

Table 2
Monthly Out Of Pocket Food Expenditures: Results from Gibbs Sampling

	<u>Posterior Mean</u>	<u>95% Credible Interval</u>	
		<u>0.025 Q</u>	<u>0.975 Q</u>
Intercept)	72.58	28.01	117.88
HH Size	29.35	18.07	40.88
Total Income (\$)	0.0213	-0.0037	0.0463
Food Assistance			
Food Stamps	-0.7190	-0.8585	-0.5842
Food Pantry	-0.3099	-0.8014	0.1830
WIC	-0.2687	-0.6289	0.0969
Presence of Children			
Kids present, no school food	21.19	-22.31	63.94
Kids present, receive school bkfst + lunch	48.61	-1.74	99.91
Kids present, receive only school lunch	7.76	-40.61	57.10
Household Structure			
Female headed HH	-3.31	-39.52	31.97
Female headed HH+Kids	30.77	-13.28	74.87
Married Couple	45.09	4.80	85.67
Highest Education in Household			
Less than high school	-1.19	-31.27	28.45
More than high school	3.78	-19.34	26.24
Household Wealth			
Vehicle	17.52	-6.16	41.23
< Poverty	-1.08	-29.19	27.56
Age of Householder			
18-34	-18.29	-44.38	8.10
65 +	11.21	-18.47	41.33
Race of Head of Household			
Black	-21.20	-44.69	2.28

Note: Omitted categories are: households that: receive no food assistance; have no residents younger than 18 years of age; are male headed; the highest level of education among all household member is high school; do not own a vehicle, live above 100% of the poverty level; the head of household is between 35 and 64 years of age; and the householder is not black.

$$MPC_{FS} = -0.7190 + 1 = 0.2810 \quad 95\% \text{ CI } (0.14, 0.42)$$

$$MPC_{FP} = -0.3099 + 1 = 0.6901 \quad 95\% \text{ CI } (0.20, 1.18)$$

$$MPC_{WIC} = -0.2687 + 1 = 0.7313 \quad 95\% \text{ CI } (0.37, 1.10)$$

Table 3

Percent Difference Between Food Acquisitions and the Extended Thrifty Food Plan,
Robust Regression

Variable	Coefficient	Std. Error	t value
Intercept	0.1779	0.0997	1.7836
Food Assistance			
Low Food Stamps	0.0243	0.0316	0.7683
Medium Food Stamps	0.0826	0.0287	2.8756
High Food Stamps	0.1970	0.0319	6.1748
Food Pantry	0.0606	0.0198	3.0589
WIC	0.0871	0.0274	3.1801
Presence of Children			
Kids no School Food	-0.0360	0.0363	-0.9915
School bkfst + lunch	-0.0687	0.0409	-1.6806
School lunch only	-0.0765	0.0417	-1.8355
Household Structure			
Female Headed HH	0.0376	0.0339	1.1097
Female Headed HH+Kids	0.0181	0.0403	0.4489
Married Couple	-0.0075	0.0729	-0.1035
Highest Education in Household			
Less than High School	-0.0320	0.0555	-0.5769
More than High School	0.0325	0.0423	0.7696
Household Wealth			
Vehicle	0.0612	0.0458	1.3359
< 130% Poverty	-0.0369	0.0245	-1.5084
Age of Householder			
18-34	0.0083	0.0233	0.3555
65 +	0.0256	0.0281	0.9124
Race of Head of Household			
Black	-0.1054	0.0427	-2.4694

Note: The dependent variable is calculated by taking a household's total food acquisitions, subtracting the Extended Thrifty Food Plan amount considering each household's composition, and then dividing by the household's Extended Thrifty Food Plan amount. The dependent variable reflects the percent above or below its thrifty food plan that the household acquires in food resources. Positive coefficients imply receiving a greater portion of food acquisitions, while negative coefficients imply the converse.

Low Food Stamps: Household receives less than 35% of their Extended Thrifty Food Plan amount in Food Stamps

Medium Food Stamps: Household receives at least 35% but less than 75% of their Extended Thrifty Food Plan amount in Food Stamps

High Food Stamps : Household receives at least 75% of their Extended Thrifty Food Plan amount in Food Stamps

Table 4

Multinomial Logistic Regression of Examining the Probability of a Household
Attaining Various ETFP Thresholds

Variable	Attaining vs. Below ETFP	Above vs. Attaining the ETFP
Intercept	0.5831 (0.7804)	0.5776 (0.8261)
Food Assistance		
Low Food Stamps	-0.2167 (0.2701)	0.3619 (0.2913)
Moderate Food Stamps	0.3654 (0.2239)	0.2020 (0.2343)
High Food Stamps	1.1886 (0.2882)	0.2207 (0.2402)
Food Pantry	0.2149 (0.1608)	0.1831 (0.1573)
WIC	0.2390 (0.2331)	0.5821 (0.2139)
Presence of Children		
Kids present, no school food program	0.2291 (0.2728)	-0.6707 (0.3079)
School bkfst + lunch	0.2491 (0.3127)	-0.8343 (0.3362)
School lunch only	-0.1885 (0.3235)	-0.5755 (0.3676)
Household Structure		
Female Headed HH	-0.1242 (0.2762)	0.2530 (0.2726)
Female Headed HH+Kids	-0.0719 (0.3146)	0.5357 (0.3329)
Married Couple	-0.9220 (0.5383)	0.6820 (0.5942)
Highest Education in Household		
Less than High School	-0.7082 (0.4756)	0.6889 (0.4764)
More than High School	-0.1913 (0.3216)	0.5243 (0.3313)
Household Wealth		
< 130% Poverty	-0.0794 (0.1838)	-0.1238 (0.2017)
Vehicle	1.0190 (0.3687)	-0.5819 (0.3744)
Age of Householder		
18-34	-0.2044 (0.1839)	0.2011 (0.1841)
65 +	0.0533 (0.2245)	0.2026 (0.2353)
Race of Respondent		
Black	-0.1263 (0.3419)	-0.8516 (0.3542)

Notes: Coefficients given are log odds with standard error in parenthesis.

Column 2 contrasts attaining the ETFP threshold versus having food acquisitions below it.

Column 3 contrasts acquiring more than the ETFP vs. just acquiring it.

Low Food Stamps: Household receives less than 35% of their ETFP amount in Food Stamps. Med Food Stamps: Household receives at least 35% and less than 75% of their ETFP amount in Food Stamps. High Food Stamps: Household receives at least 75% of their ETFP amount in Food Stamps.

Appendix A
The Extended Thrifty Food Plan, 1993

The monthly costs given below apply to persons in 4-person households. Ages are given in years.

Sex-Age Group	Monthly Cost
Child (either sex)	
0-1 years	\$98.00
1-2 years	\$57.80
3-5 years	\$62.10
6-8 years	\$75.80
9-11 years	\$90.20
Female	
12-50 years	\$94.60
51 years and over	\$93.60
Pregnant or lactating	add \$40.00
Male	
12-14 years	\$93.60
15-19 years	\$97.50
20-50 years	\$104.50
51 years and over	\$94.80

This research uses the following economy of scale adjustments, recommended by the USDA:

- 1-person household: add 20%;
- 2-person household: add 10%;
- 3-person household: add 5%;
- 5 or 6-person household: subtract 5%;
- 7 or more person household: subtract 10%.

The amounts for infants (<1 year) and pregnant or lactating women were obtained using the value of WIC vouchers in 1993. The amount for pregnant or lactating women should be added to the usual monthly amount for a woman in her respective age category (for most cases, yielding \$134.60).

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ENDNOTES

1. The USDA outlines four "food plans" which indicate how much households of specific sizes should spend on food (i.e., Thrifty, Low Cost, Moderate, and Liberal). The Thrifty Food Plan is the USDA's most conservative food plan. One could surely argue that the USDA's Thrifty Food Plan does not actually provide a household with "enough" food.
2. Net monthly income is calculated using 80% of earned income, all unearned income, and subtracting a portion of shelter, child care and health costs (Daponte, 1996).
3. From 1995 to 1999 there was a drop in Food Stamp participation from 27.5 to 18.2 million people (Wilde et al, 2000). This followed a steady rise in the number of people participating in the Food Stamp program. It has been estimated that at least some of this drop is due to more stringent eligibility requirements (Wilde et al, 2000) and not to less need. Local data show that there has been no corresponding drop in food pantry usage but instead that it has remained stable from 1995 to 1999 (Daponte and Bade, 1999)
4. Similarly, a focus group participant, who, when asked how long Food Stamps last, responded "really only one day because once you get them you use them" (Daponte and Bade 2000).
5. Because of a lack of data, we do not consider the value of food acquired at soup kitchens, in school feeding programs, at work, or from family members or friends.
6. The head of the households is defined as the husband if two persons living in the household are married to each other; otherwise, the head of the household is the male partner of a consensual-union household; otherwise, if there are two or more related adults in the household, then the head of the household is the oldest related adult; otherwise, if there is only one adult in the household or if there are no related adults in the household, then the head of the household is the respondent.
7. Despite the difference in magnitude of the point estimate, the 95% credible intervals for the increase due to Food Stamps and that due to food pantries overlap. In addition, there is a 6% probability that the increase due to food pantries is greater than that due to Food Stamps.
8. Robust linear regression was used due to concerns about the influence of a couple of seemingly outlying households. The robust method iteratively weights the observations based on the size of their residual, down weighting those with particularly large residuals. This method permits use of these observations without having them unduly influence the coefficients. It is also less extreme than choosing some observations and omitting them (giving them weight zero) and keeping the rest of the observations (giving them each weight one). Specifically, the model was fit using Huber's M-estimator, with the median absolute deviation scale estimate based on the residuals.
9. Since few households with income over 130% of the poverty level are eligible for Food Stamps, the effects of Food Stamps and income become intertwined in this model. Among those receiving Food

Stamps, the correlation between the Food Stamp level (as percent of the household's ETFP) and income level (as percent of poverty) is -.42. To further investigate this relationship, separate robust regressions were run for those on Food Stamps and those not on Food Stamps, with the 130% of poverty income variable replaced by the continuous income variable. Surprisingly, for those not receiving Food Stamps, income had no statistically significant effect on whether the household acquired enough food. However, for households receiving Food Stamps, higher income had a small but significant negative effect on their acquiring enough. One interpretation of this is that for these low income households, having a higher income negatively affects their Food Stamp allotment more than increased income benefits their out of pocket food expenditures.

10. Separate regressions (not shown) were run for each of the four Food Stamp benefit level groups. These regressions separated out the forced correlation due to the category definitions from other effects and allowed us to see whether interactions exist between the other independent variables and Food Stamp level. The four regressions showed results similar to those presented here. However, for the low Food Stamp group, having an elderly head of household is associated with obtaining more of one's ETFP.

11. Due to the form of the questions in the survey about food acquisitions and the WIC program, it is possible that the coefficient for the effect of the WIC program is overestimated here. It may be that in a subset of the households receiving assistance from the WIC program, some of the amount reported as out of pocket expenditures may have actually been from the WIC program.

12. Most of the demographic variables have little or no effect on the the parameters of interest. Taking out all variables with t statistics less than 1.2 does not change the coefficients of the food assistance variables considerably. Similarly, if the same (or a smaller model) is run not using robust methods but omitting seemingly outlying observations the coefficients differ by very little, and the model has an R^2 value of 0.15. Since the robust regression presented is quite similar to this non robust regression it is likely that the R^2 value of that model gives a rough idea of how much of the percent difference is explained by the model presented here.