Food Stamp Effects on Food Preparation and Consumption Patterns

Contractor and Cooperator Report No. 75
June 2012

By Geetha Waehrer, Pacific Institute for Research and Evaluation

Partha Deb, Department of Economics, Hunter College, City University of New York

Abstract

This study examines whether food stamp participation alters food preparation time and the types of food consumed. Data on time use from the 2006-2008 American Time Use Survey (ATUS) and on food consumption from the 1999-2004 National Health and Nutrition Examination Survey (NHANES) are used. Multinomial treatment effects models of food preparation and consumption that account for the endogeneity of employment and food stamp participation decisions are estimated. Among part-time food stamp participants, results show an increase in food preparation time by 10 minutes (48 percent) compared to what they would have spent in absence of the program. However, food stamp participation is associated with a 30-percent higher share of calories from convenience foods for this group. Food preparation time of nonworkers is not affected by food stamp participation, but nonworking participants significantly decrease consumption of convenience food calories and carbonated or sweetened beverages.

Keywords: Supplemental Nutrition Assistance Program, SNAP, Food Stamp Program, coping strategies, food hardship, qualitative data, Food Assistance and Nutrition Research Program, FANRP

Aknowledgments

The authors would like to thank Shelly Ver Ploeg, Karen Hamrick, and seminar participants at the ERS and the 2009 American Time Use Research Conference for their useful comments.

This study was conducted under a cooperative research agreement with USDA's Economic Research Service (ERS) Food and Nutrition Assistance Research Program (FANRP): agreement number 59-5000-7-0159 (ERS project representative: Michele Ver Ploeg). The views expressed are those of the authors and are not necessarily those of ERS or USDA.

Introduction

The Food Stamp Program is the largest domestic food assistance program in the U.S., helping low-income families cover the cost of a basic, nutritionally adequate diet. As of 2008, approximately 28 million families participated in the Food Stamp Program (formally known as the Supplemental Nutrition Assistance Program) at a cost of $35 billion, an all-time high for a non-disaster period (USDA, 2009). Until very recently, the design and allotment of the food stamp benefit ignored time constraints on participants and assumed that most foods were prepared at home from basic ingredients. At the same time, as a result of welfare reforms in the 1990s, the percentage of employed food stamp participants has risen from 19% in 1990 to 29% in 2005 (USDA, 2006). The work status of these adults, a third of whom live in single parent households, may be a substantial deterrent to home food preparation in food stamp households. Work-related changes in time use may affect eating patterns including the allocation of time to household food preparation, and the choice of home food versus food purchased from outside sources, especially "fast food".

Time spent on food preparation is a powerful correlate of the quality of the food consumed (e.g. Tavera et al., 2005; Duffey et al., 2007; Smith et al., 2009). Fast or convenient foods are associated with increased energy and dietary fat intake compared to home food, increasing the risk for obesity. The food stamp benefit, by subsidizing the home consumption of food, may counteract work-driven trends towards calorie-dense convenience foods in low-income populations. Yet, little is known about how employment interacts with food stamp participation to alter household food production and consumption patterns of participants.

We examine whether food stamp participation alters adults' time inputs into food preparation, with a focus on women's time use using data from the 2006-2008 American Time Use Survey (ATUS). We also examine how food stamp and employment-related changes in food preparation time may alter the types and sources of food consumed in low-income households using data from the 1999-2004 National Health and Nutrition Examination Survey (NHANES). For both questions, we estimate multinomial treatment effects models of food preparation and consumption that account for the endogeneity of employment and food stamp participation decisions. Our results indicate that participation in the food stamp program moderates the work-associated changes in the time devoted to household food production especially for part-time workers. Difference-in-difference models that exploit changes in the distribution cycle of

monthly food stamp benefits also suggest similar results. However, these differences in food preparation time among part-time workers do not translate into healthier consumption patterns. Rather, food stamp participation among these workers is estimated to increase the share of calories from convenience foods at home and from carbonated or sweetened beverages, while also reducing fruit and vegetable consumption. In contrast to the results for part-time workers, food stamps have no significant effect on food preparation time of non-working participants but do significantly decrease their consumption of convenience food calories and carbonated or sweetened beverages. Our results indicate that employment status is an important moderator of food stamp effects on participants' diets and consumption patterns.

Background and Related Literature

Food stamp purchases are meant to be combined with household production time to create meals for home consumption. Families with gross monthly incomes less than 130% of the federal poverty threshold are eligible to receive food stamps. The maximum food stamp allotment for eligible households is based on the Thrifty Food Plan (TFP), a guide for a low-cost meal plan that also aims to be nutritionally adequate. In 2008, the average monthly food stamp benefit was approximately $227 per household. Until very recently, the design of the food stamp benefit ignored time constraints on participants and instead assumed that most foods were prepared at home from basic ingredients. Thus, purchases of convenience foods such as ready-to-eat hot meals or from restaurants were restricted under the program. The 2006 redesign of the TFP made efforts to consider ease of food preparation and convenience in the development of the TFP market baskets (Carlson et al., 2007) by allowing more prepared foods and requiring fewer preparations from scratch. Thus, food such as boxed macaroni and cheese, ready-to-eat cereals and breads, canned soups, chicken parts, canned beans and boxed mashed potatoes were allowed in the market basket. However, the redesigned TFP was set at the same inflation-adjusted cost as the previous version of the plan.

Food Stamp Participation and Household Food Production: It is estimated that the Thrifty Food Plan requires an average of 16 hours per week (or 137 minutes per day) in time inputs into food preparation and cleanup (Rose, 2004). Yet, Mancino and Newman (2007) report that low-income women employed full-time only devote about 38-46 minutes per day to these activities. Similarly, Rose (2007) analysed data from the National Food Stamp Program Survey

1996-97 and found that the amount of time actually spent in food preparation is 2-8 hours less than what is indicated under the TFP. Finally, Davis and Yu (2008) analyse data from the 2004-2005 ATUS and find that time costs account for 35% of the total cost of a home-produced meal and further, that the time costs for food stamp recipients following the TFP were almost 26% higher than for non-program families. These results suggest that time constraints may be an impediment to implementing the TFP for low-income working families.

Should we expect food stamp participation to alter the time use decisions of participating working families? According to the standard economic model of household production (Becker, 1965) in which utility derives from the consumption of final goods produced using a combination of intermediate goods and time, an in-kind benefit like food stamps will only affect food expenditure or consumption decisions for those households who are constrained by the benefit (i.e. those who would choose to spend/consume less food than is offered under the food stamp benefit). For these consumers, the restrictions on ready-to eat meals in the food stamp benefit may cause recipients to spend more time in home food production than they otherwise would have. However, research suggests that the majority of food stamp households are unconstrained (Whitmore, 2002), thus their food expenditures should not be affected by the in-kind design of the food stamp benefit. Both types of recipients will consume or spend more on food under a benefit whether in-kind or a cash transfer due to the income effect. Related changes in the consumption of goods-intensive fast/convenience foods versus time-intensive home food will depend on whether consumers view these goods as normal or inferior. For both types of recipients, an employment-related increase in the relative price of home food will cause a substitution toward food sourced from outside the home.

Few studies have considered the effects of food stamp participation on household food preparation time and the eating patterns of working families eligible for the program. Household production time may be in especially short supply for the single-parent families that two out of three participating children live in (USDA, 2006). The work emphasis of the welfare reform era can only worsen the time squeeze on these families. Crepinsek and Burstein (2004) report that working mothers participate less in meal planning, shopping, and food preparation. Working mothers are more likely to report no involvement in meal planning compared to at-home mothers and the difference is strongest among food stamp-eligible families with incomes upto 130% of the poverty level, suggesting that these poor working families may feel especially time-squeezed.

Food shopping also tends to be lower among working than non-working mothers, but this difference is insignificant among the lowest income families.

The recent availability of time diary data for large, representative samples of American adults has made a direct examination of time use possible. Hamermesh (2007) examined the goods-time tradeoff in food consumption using data from the 2003-2004 American Time Use Survey (ATUS). He finds that, as economic theory would predict, the time devoted to food production falls with an increase in wages. In addition, the decline is greater in the lower part of the income distribution, suggesting an easier substitution of goods for time among poorer households (Hammermesh, 2006).Mancino and Newman (2007) examine the association of time devoted to food production with maternal employment and family structure using the same data and find that full-time employment and single-parent families were stronger determinants of household food production than family income and earnings indicating the influence of time constraints on food consumption choices. Controlling for marital status and the number of children, full-time employed women spent 40 fewer minutes on food preparation than non-working women. However, the authors fail to consider the simultaneous determination of employment choices and time use in household food production and their study does not consider how participation in food support programs may interact with and affect these choices. Cawley and Liu (2006) control for endogeneity of maternal employment and find that employed women do spend less time on food preparation and were more likely to purchase prepared foods, possibly providing a mechanism for the purported link between maternal employment and child obesity (Anderson and Butcher, 2003). However, the study does not address how food stamp participation may moderate employment effects on time use.

Food Stamp Participation and Dietary Intake: There is a large body of research on the food expenditures and dietary intake of food stamp program (FSP) participants (see Fraker (1990) for a review of these studies).Studies consistently find that program participation is associated with higher household food expenditures, with estimates of the marginal propensity to consume from food stamps that are 2-6 times as high as from cash income. Explanations for this cash-out puzzle focus on constrained households whose desired monthly food expenditures are less than their food stamp allotment.

However, despite the higher food expenditures associated with food stamps, studies of

dietary and nutrient intake show inconsistent results with different associations across nutrients and across studies (e.g. Rose et al., 1998; Butler and Raymond, 1996). Food stamps have been positively linked to increased nutrient availability at the household level (e.g. Devaney and Moffit, 1991). Wilde et al. (1999) find that FSP participants had a significantly higher intake of meat, poultry, fish and meat substitutes as well as added sugars and fats in their diet compared to eligible non-participants. However, Gleason et al. (2000) find no significant differences between FSP participants and non-participants in the dietary intake of fruits, grain products, meat, fats or added sugars but significant differences in vegetable intake among adults. The amount of nutrients consumed by FSP participants was also not significantly different relative to non-participants. Bhargava and Amialchuk (2007) use 1996-97 National Food Stamp Survey data and find that food stamp participants had a significantly lower daily intake of energy from added sugars but participation was insignificantly related to intake of fiber, potassium and other nutrients. Among possible explanations for the inconsistency between the expenditure and intake impacts, Gleason et al. hypothesize that food stamp participants may either access free sources of food (such as food pantries) less frequently than non-participants, or that they may be spending more money on costlier foods such as convenience foods. Finally, these studies of dietary outcomes did not control for selection into the food stamp program which may alter the estimated effects.

Little is known about how food stamp families may alter their sources of food in response to time constraints. Gleason et al. (2000) find that compared with low-income non-participants, food stamp participation shifts consumption towards food obtained from food stores rather than from restaurants or other sources. However, the categorization of food sources in this study does not distinguish between quick calories that are purchased from food stores (e.g. chips, granola bars, soda) and basic staples that are inputs into the production of more time-intensive meals. Such a distinction is important for any analysis of how food stamp participation moderates the time-related food choices of working families. Some indication of quick calorie consumption is found in a recent analysis of NHANES data by (USDA, 2008). The study finds that FSP participants are less (more) likely to drink sugar-free (regular) soft drinks, but have similar snacking patterns as income-eligible non-participants. However, this study is descriptive and does not estimate effects of the food stamp program on food choices nor does it consider differences by employment status.

The time-use implications of food choices are more of a focus in studies of the demand for fast foods versus full-service restaurants. Byrne et al. (1998) finds that the demand for fast foods increases with the number of hours worked by the household manager while there is no clear relationship between hours worked and demand for full-service restaurant meals that may not yield much time savings. Stewart et a. (2004) find that a 10% increase in hours worked results in a 1.44% increase in spending on fast food compared to a smaller 0.53% increase in expenditures on full-service meals. More generally, away-from-home foods contributed a significantly larger share of calories in the mid-1990s compared to two decades earlier (Lin et al., 1999). Changes in women's labor force participation over this period may be partly responsible for this trend. Focus groups studies of adolescents by Neumark-Sztainer et al. (1999) identify time-crunched lifestyles as important determinants of eating habits. Crepinsek and Burstein (2004) find that children of full-time working mothers obtain 27% of their meals and snacks from outside-home sources, compared to 20% for stay-at-home mothers. This relationship holds for the sub-sample of food-stamp eligible families even after excluding food from school. The highest percentage of away-from-home food is seen among children of full-time working mothers who are single parents. The authors attribute this to the "most severe time constraints" facing this group of women. Data from a dietary recall survey show that almost a quarter of children from food-stamp eligible households reported eating fast food on a given day (Bowman et al., 2004). While this studies only control for observable differences between program participants and non-participants, Hoynes and Schanzebach (2009) using differential timing in the introduction of the food stamp program to identify effects and report that food stamps have an indeterminate and statistically insignificant effect on the propensity to eat out.

Data

American Time Use Survey (ATUS): We use the 2003-2006 American Time Use Surveys (ATUS) to analyze the relationship between food stamp program participation, employment and time spent in food preparation. The ATUS, which is administered by the Bureau of Labor Statistics and the Census Bureau, is a stratified, three-stage, nationally representative sample of households completing their final month of interviews for the Current Population Survey (CPS) (US Bureau of Labor Statistics, 2006). ATUS respondents are randomly selected from among household members aged 15 years or older.

The ATUS interviews one person per household, and this person is interviewed once about his or her time use. ATUS respondents were asked about the type and duration of each activity during a 24 hour period on the day before their interview. Survey respondents were asked to identify their primary activity if they engaged in two or more activities simultaneously. The ATUS also contains information on age, gender, ethnicity, family structure, household income, an individual's labor force participation and the labor force participation and earnings of other household members.

We define food stamp participation using the Food and Eating Module of the ATUS which asks respondents "*In the past 30 days, did you or anyone in your household get food stamp benefits?*" We limit our ATUS sample to include only individuals who identify themselves as the male or female head of household in the CPS interview between the ages of 18 and 64. While CPS respondents who are teenage children or elderly parents living with other family members may be involved in preparing meals, they are much more likely to do so in collaboration with other family members. Given that the ATUS interviews only one person per household, we exclude them from our sample.

We estimate models for a poor sample of 4,693 respondents with household incomes less than 185% of the federal poverty threshold (FPL). This is a more generous threshold than the food stamp eligibility criterion of 130% FPL. We adopt this threshold because of the argument that if the elasticity of labor supply is not zero, the sample of "eligible" persons should be larger than the sample who qualify for benefits (Ashenfelter, 1983; Newman, 2006). For comparison, we also present results for poor households with children under 18 years (N=3,940), and for poor females (N=3,163).

National Health and Nutrition Examination Survey 1999-2004 (NHANES): The NHANES is a

stratified, multistage probability sample of the civilian, non-institutionalized U.S. population. The survey examines a nationally representative sample of about 5,000 persons each year. It includes demographic, socioeconomic, dietary, and health-related questions designed to assess the health and nutritional status of adults and children in the United States, and a physical examination and testing component administered by trained medical personnel in a mobile examination center (MEC).

The NHANES also collects 24-hour dietary recall data via personal interviews in the MEC. The dietary interview data contain information about each food eaten by a respondent during the previous 24-hour period (interview day of week, name and time of day of eating occasion, food code, food source, whether food was eaten at home or not, amount eaten in grams, and amounts of energy and 62 nutrients/food components) as well as daily aggregates of energy and nutrients/food components and information about water intake. USDA's Food and Nutrient Database for Dietary Studies (FNDDS) is used to code individual foods and portion sizes reported by survey participants and to calculate nutrient intakes. The 2003-2004 NHANES provides two days of dietary intake data for each respondent. To maintain comparability with the earlier years, we use the data from the first day which was recorded in the MEC.

We combine six years of NHANES data from 1999 to 2004 following survey guidelines on assigning sample weights to the combined data. Similar to the analyses of food preparation time, we estimate models a poor sample of 3,188 respondents with household incomes less than 185% of the federal poverty threshold (FPL). However, small sample sizes complicate convergence of models for sub-samples of poor women or poor households with children. For comparison purposes, we present results for an expanded sample of individuals with incomes under 600% of the poverty line.

Dependent Variables: For the analysis of time spent in food preparation, we combine the following four ATUS activity codes related to food preparation into one variable: (1); Preparing food and drinks including cooking and getting food and drinks ready for consumption; (2) Serving food and drinks including activities like setting the table; (3) Food and kitchen cleanup (4) Storing or putting away food and drinks.

We use the NHANES dietary intake data to analyze whether participation in the food stamp program alters food consumption by time intensity, dietary and nutrient intake, and also by

whether food was eaten at home or outside the home. For these analyses, we aggregate calories consumed into five categories: convenience foods eaten at home; convenience foods eaten outside, regular (i.e. not convenience) foods eaten at home, regular fruit and vegetable consumption; and carbonated and sweetened beverage (CSB) consumption.[1]We also analyze aggregate calories consumed by these five categories and analyze whether food stamp participation alters the consumption of such calories or the intake of proteins, carbohydrates, fiber, total fats, and saturated fat.

NHANES information on the source of food provides a flag to identify foods consumed in or out of the home, but does not distinguish between convenience or fast food and regular food. Instead, we use the USDA food code information to group foods into convenience or regular food categories. As Crepinsek and Burstein (2004) point out, the USDA food codes do not clearly identify prepared or convenience foods and "there is some debate as to what types of foods to consider "convenience" items". We include pre-prepared foods (e.g. frozen entrees) eaten at home, items such as CSBs, quick breads, snacks, cakes, granola bars and purchases from vending machines in the convenience food category as well as foods such as pizza, French fries, and hamburgers that are less likely to be home-made. All other foods that are assumed to require more preparation time are grouped into the regular food category. While Appendix A details the grouping of foods into these categories, the following examples illustrate our approach to categorizing foods as being convenience or regular items. Organ meats and mixtures including liver, hearts and kidneys are defined as regular items, frankfurters, sausages and lunchmeats are defined as convenience items. Similarly, while most meat, poultry and fish products are defined as regular items, sandwiches with meat, poultry and fish are defined as convenience items. Frozen and shelf stable plate meals and prepared soups are defined as convenience foods. Finally, the category of carbonated or sweetened beverages includes carbonated soft drinks, fruitades and fruit flavored drinks, beverages from powdered mixes, energy drinks, and alcoholic beverages.

To assess the reasonableness of our unavoidably arbitrary designation of a food as a convenience or non-convenience item, Figure A1(Appendix A) lists convenience food items that together account for approximately 70% of total daily convenience calories consumed. CSBs and

[1] These categories are not mutually exclusive. Fruit and vegetable consumption thus includes items that are tagged as convenience foods or regular foods, while CSBs are convenience foods that may be eaten at home or outside. See Appendix A for further details.

cola drinks are the most prominent, contributing 11% of total convenience calories. This is followed by pizza, French fries and hamburgers, items that are generally not made at home using basic ingredients. Together, these four items account for a quarter of total convenience food calories. Overall, the list of items is roughly consistent with our notion of quick calories. A rough calculation by place of consumption reveals that a sizeable percentage of these calories are consumed at home even among items commonly considered to be purchased at fast food establishments. For example, a third of the calories from french fries and 58% of pizza calories are consumed at home. While this does not preclude the possibility that the food was prepared outside the home, it also emphasizes the importance of ready-to-heat, boxed or frozen preparations and mixes purchased in the grocery aisle for home consumption of quick calories.

While the list of items in Figure A1 provides some reassurance about our classification of convenience foods, misclassification may still be present. For example, while pasta with sauce is included in the convenience category, it is possible that the sauce may be completely homemade. Fortunately, this item contributes only 1.5% of total daily convenience calories thus limiting its impact. More broadly, error in our food categories will only affect our results to the extent that we expect misclassification to vary systematically by food stamp participation and employment status.

Explanatory Variables: Work decisions (whether and how much to work) and participation in the food stamp program are primary explanatory variables in this analysis. We categorize work effort into full-time work, part time work, and no employment. Food stamp participation is coded as a binary indicator equal to one for reported household FSP participation. To examine how FSP participation interacts with work status to determine time spent on food preparation, we create a series of mutually exclusive and exhaustive indicator variables specifying work and food-stamp status. Specifically, the indicators are defined as

1. Does not work and is not enrolled in the food stamp program (d_0 – the omitted category)
2. Does not work and is enrolled in the food stamp program (d_1)
3. Works part time and is not enrolled in the food stamp program (d_2)
4. Works part time and is enrolled in the food stamp program (d_3)
5. Works full time and is not enrolled in the food stamp program (d_4)
6. Works full time and is enrolled in the food stamp program (d_5)

We create a multinomial variable from these indicators that takes on six possible values, one for each combination listed above.

We also control for respondent age, gender, education, and race/ethnicity as well as household-level covariates including the ratio of household income to federal poverty threshold, an indicator for whether the person has a spouse or partner living in the household, the number of children under 18 years in the household, whether or not there is a nonschool-aged child (ages 5 or younger) (or household size as in the case of the NHANES analyses) and dummies for region of residence, survey year and season. Finally, studies show that there is a significant difference in dietary intake between weekends and weekdays (Haines et al., 2003), therefore a dummy variable for weekday versus weekend as well as an indicator for whether the diary day was a Friday are also included in our models.

Methods

The effects of work and food stamp receipt on food preparation time or consumption patterns may be specified using a regression model as follows:

$$y_i^* = \beta_0 + \mathbf{x}_i^{'}\beta_1 + \sum_{j=1}^{5} \alpha_j d_{ji} + u_i$$

where $d_1 - d_5$ indicate the set of possible employment and food stamp program participation status and **x** is a vector of demographic and other covariates. For the analysis of food preparation time, we smooth out spikes in the reported time data by analyzing food prep time in 5-minute intervals.[2]The resulting dependent variable is integer valued and has the classic characteristics of count data, i.e., much of the distribution is concentrated on a few small integer values including a substantial fraction of zeros and the overall distribution is substantially skewed to the right. We use models based on negative binomial distributions that are suitable for count data such as the number of food prep minutes. For the analysis of food consumption, we treat calories consumed on each of the different types of food and total nutrient contents in grams as continuous variables as their empirical distributions are quite smooth. The statistical distributions of calories and of total nutrient contents are, however, quite skewed in some instances. Therefore, we use models based on gamma distributions which are known to accommodate a variety of skewed distribution shapes.

Model of Causal Effects: If work effort and food-stamp program enrollment status are considered exogenous, standard negative binomial regression models and gamma regressions estimated either in the generalized linear model framework or by maximum likelihood are appropriate for estimating causal effects. Controlling for income, the coefficient on the interaction between employment status and food stamp participation would indicate whether the program moderates or exacerbates the effects of employment on food preparation time. However, such a simple scenario is unlikely. Instead, food stamp participants and employed persons are likely to differ in observed and unobserved ways from non-participants and the unemployed, respectively and the above specification would provide asymptotically biased estimates. For example, it is possible that employed persons have a distaste for time spent in

[2] A simple tabulation of food preparation time in the ATUS data shows spikes in reported times at the 5 minute intervals (e.g. at 5, 10, 15 minutes, etc.) suggesting rounding off in the reporting of time.

household production, and hence would allocate less time to this use even if they were unemployed. A simple comparison of time use between the employed and unemployed is likely to overstate the work-driven effects on time use. Conversely, those who enjoy cooking or who place a premium on healthy eating may find the food stamp benefit especially attractive because of its emphasis on the home production of food. In this case, a positive coefficient on the interaction between program participation and employment would overstate the moderating effects of the food stamp program on work-driven changes in time spent in food preparation or in the consumption of convenience foods.

More broadly, as Figure 1 shows, we expect individual unobserved characteristics to affect food stamp participation and work status as well as food preparation time and choice of foods even after controlling for observed socioeconomic characteristics of the individual. We also expect characteristics of the food stamp program and of the work environment to affect food preparation time and choice of foods only indirectly via their influence on program participation and work status. Thus, as we describe in more detail below, we use characteristics of the Food Stamp Program and of the work environment as identifying instruments in our main econometric analysis.

We address the endogeneity of employment status and food stamp program participation using maximum likelihood treatment effects models for nonlinear outcomes and multinomial treatments. As an alternative, we estimate difference-in-difference models of the changes in food preparation time that utilize the variation across states in the monthly distribution dates of food stamp benefits.

Multinomial Treatment Effects models: We extend standard maximum likelihood methods (Heckman, 1978) for binary treatments to the case in which the treatment is multinomial with nonlinear dependent variables. The details of this method follow Munkin and Trivedi (2003) and Deb and Trivedi (2006a, 2006b). The intuition of these models is straightforward and follows exactly that of standard treatment effects models. Imagine that there is an unobserved factor which affects both selection into treatment and outcome. Models that ignore this correlation produce inconsistent estimates. Instead, one specifies the joint distribution of treatment and outcome, which takes into account the correlation between the error term. Maximum likelihood estimation of the parameters of this joint distribution eliminates the bias. In the extension to multinomial treatment, there are now as many unobserved factors as there are possible treatments

that give rise to correlation between each treatment mode and the outcome equation (or equations). Once a joint distribution of the multinomial treatment and outcome is specified, maximum likelihood estimation of its parameters provides consistent causal estimates. We estimate the multinomial treatment effects models and adjust standard errors for clustering at the state-level.

Let the multinomial treatment variable be denoted by a mutually exclusive and exhaustive set of our 5 binary indicators d_{ji} . Suppose that employment status and food stamp program participation is determined by a multinomial logit model given by

$$\Pr(d_{ji} = 1) = g(\mathbf{z}_i^{'}\alpha_1 + l_{1i}\ ,\ \mathbf{z}_i^{'}\alpha_2 + l_{2i}\ ,\ \ldots\ ,\ \mathbf{z}_i^{'}\alpha_5 + l_{5i})$$

where $\mathbf{z}_i$ is the vector of covariates and α_j associated parameters. In addition, the l_{ji} are latent factors reflecting unobserved heterogeneity with respect to alternative *j* and *g* denotes the multinomial logistic distribution function. Generically denote the latent variable (or vector of latent variables) underlying the observed outcome bye y_i^* and

$$y_i^* = \mathbf{x}_i^{'}\beta + \sum_{j=1}^{5}\gamma_j d_{ji} + \sum_{j=1}^{5}\lambda_j l_{ji} + u_i$$

where $\mathbf{x}_i$ is the vector of covariates and β associated parameters. In addition, the γ_j and λ_j are parameters associated with the observed treatment and associated latent factor respectively. Let *f* denote the density function associated with the outcome equation. Then one can express the joint distribution of selection and outcome variables, conditional on the common latent factors as

$$density(y_i, d_{ji} \mid l_{1i}, l_{2i}, \ldots, l_{5i}) = f\left(\mathbf{x}_i^{'}\beta + \sum_{j=1}^{5}\gamma_j d_{ji} + \sum_{j=1}^{5}\lambda_j l_{ji}\right)$$

$$\times\, g(\mathbf{z}_i^{'}\alpha_1 + l_{1i}\ ,\ \mathbf{z}_i^{'}\alpha_2 + l_{2i}\ ,\ \ldots\ ,\ \mathbf{z}_i^{'}\alpha_5 + l_{5i})$$

because *f* and *g* are conditionally independent.

Let $\mathbf{l}_i$ denote the vector of latent factors l_{1i} , l_{2i} , …, l_{5i} . The problem in estimation arises because the $\mathbf{l}_i$ are unknown. However, if the distribution of $\mathbf{l}_i$, denoted by *h* is known, it can be integrated out of the joint density, i.e.,

$$density(y_i, d_{ji}) = \int f\left(\mathbf{x}_i^{'}\beta + \sum_{j=1}^{5}\gamma_j d_{ji} + \sum_{j=1}^{5}\lambda_j l_{ji}\right)$$

$$\times\, g(\mathbf{z}_i^{'}\alpha_1 + l_{1i}\,,\ \mathbf{z}_i^{'}\alpha_2 + l_{2i}\,,\ \ldots\,,\ \mathbf{z}_i^{'}\alpha_5 + l_{5i})h(\mathbf{l}_i)d\mathbf{l}_i$$

The unknown parameters of the model may be estimated by maximum likelihood. The main problem of estimation is the fact that the integral does not have a closed form solution. But, as described in detail in Deb and Trivedi (2006a), the integral may be approximated by a simulation-based estimate:

$$density(y_i, d_{ji}) \approx \frac{1}{S}\sum_{s=1}^{S} f\left(\mathbf{x}_i^{'}\beta + \sum_{j=1}^{5}\gamma_j d_{ji} + \sum_{j=1}^{5}\lambda_j \tilde{l}_{jis}\right)$$

$$\times\, g(\mathbf{z}_i^{'}\alpha_1 + \tilde{l}_{1is}\,,\ \mathbf{z}_i^{'}\alpha_2 + \tilde{l}_{2is}\,,\ \ldots\,,\ \mathbf{z}_i^{'}\alpha_5 + \tilde{l}_{5is})$$

where $\tilde{l}_{jis}$ is the sth random draw from the distribution h and S is the number of simulation draws. A simulated log-likelihood function for the data can then be defined and maximized to obtain estimates of the parameters using a maximum simulated likelihood (MSL) technique.[3] We estimate these models using Stata and adjust standard errors for clustering at the state-level.

Identifying instruments: Note that although these treatment effects models are identified by distributional assumptions alone, it is preferable to use exclusion restrictions of the kind commonly employed in instrumental variables models. Thus, we would like variables that affect employment status and food stamp program participation, but have no direct impact on our outcomes - time spent on food preparation and calories by type of food. As our conceptual framework in Figure 1 demonstrates, we expect characteristics of the Food Stamp program and the employment environment of individuals measured at local but aggregate levels to affect individual-level program participation and employment but have no direct impact on food preparation time or composition of food consumed.

As an instrument for employment status, we use the unemployment rate at the county level for NHANES analyses and at the state level for ATUS models (county identifiers are not

[3] Note that this approach assumes that the latent variables are drawn from continuous distributions. Alternatively, one might assume that the latent variables are drawn from discrete distributions. The assumption of discrete distributions is appealing along two dimensions, first that the distribution can be left unspecified and second that it does not require simulation-based estimation. However, such discrete factor models are considerably more difficult to identify except in the simplest linear / binary contexts.

available in the public-use ATUS data). Data on the county unemployment rate is taken from publicly available County Business Patterns data (U.S. Census Bureau, 2007).

For participation in the food stamp program, we use three different instruments in separate models. First, we use data on the average food stamp benefit received in each state (for the analysis using ATUS) or county (for the analysis using NHANES). The average food stamp benefit varies across states or counties because of state differences in recipient income and family size. Such differences reflect local economic conditions as well as state rules and administration of the food stamp program (e.g. recertification periods, efforts to reduce error rates) that change the cost of program participation and alter the composition of recipient families. Thus, controlling for household income and size, a higher (lower) average food stamp benefit may indicate higher (lower) participation costs and a lower (higher) likelihood of program participation among eligible families. At the same time, we do not expect that variation in the average benefit will alter time spent on food preparation and type of food consumed except via participation in the program. To calculate average benefits at the area-level, we use data from the SNAP Quality Control (SNAP QC) database which contains detailed demographic, economic, and SNAP eligibility information for a nationally representative sample of approximately 51,000 SNAP units (USDA, 2007).[4]

Second, we identify models using cross-state variation in the state maximum welfare benefit for a family of three.[5]State TANF policies can alter food stamp participation because TANF recipients are categorically eligible for food stamp benefits. Thus, higher TANF benefits may be accompanied by greater participation in the food stamp program (Ratcliffe, 2007). Conversely, higher TANF benefits may lower the likelihood of food stamp participation by reducing the relative importance of the food stamp benefit in income supplementation (Lerman and Wiseman, 2002). Information on the state maximum TANF benefit for a family of three is taken from the Welfare Rules Database maintained by the Urban Institute (Urban Institute, 2007).We expect the maximum welfare benefit to have no effect on time spent on food preparation or the types of food consumed except via their impact on food stamp participation.

[4]A SNAP unit refers to individuals who together are certified for and receive SNAP benefits.

[5] We also experimented with other characteristics of state food stamp programs as instruments for food stamp program participation including state food stamp error rates and certification intervals (Kornfeld, 2002; Ratcliffe et al., 2008). While the latter may proxy for transaction costs and were found to significantly affect participation in prior research, they were not significant predictors of the joint food stamp-employment variables and therefore were not used to identify the model.

We also use the de jure eligibility rule for eligibility in the food stamp program of income less than 130% of the federal poverty threshold as an instrument for the de facto observation of participation in the program. More precisely, we created an indicator variable for whether an individual was at least 130% above the federal poverty threshold. Because our models already include the poverty to income ratio, this indicator variable plays the role of a regression discontinuity. First note that we expect food preparation time and composition of food consumed to vary smoothly across income levels. We also expect to see a fall in food stamp participation rates across the 130% threshold, but we do not a priori expect time spent on food preparation or composition of food to change across that threshold for independent reasons. Therefore, the indicator variable serves as a valid instrument because, although we expect it to affect food stamp participation, we do not expect it to directly affect time or composition.

We report instrument relevance and exogeneity (overidentification) tests for each set of instrumental variables. Although there is no rule of thumb for the joint significance of the instruments in a nonlinear context, we expect the tests to have very small p-values (e.g., 0.001). The overidentification test is calculated in the same way as the usual tests reported in the context of linear instrumental variables models. We first estimate the model as described above, i.e., with the instruments excluded from the outcome equation. Then we estimate the model with the one instrument (the characteristic of the food stamp program) included in the outcome equation (in addition to being included in the treatment equations). A test of the significance of the instrument in the outcome equation is the overidentification test.

Difference-in-Difference Models: As an alternative strategy for estimating the effects of food stamp participation on food preparation time, we also estimate difference-in-difference (DD) models of food stamp effects that make use of ATUS diary information and the monthly cycling of food stamp expenditures reported in prior research. To elaborate, analysis of EBT redemption patterns finds that food stamp households redeem 80% of the benefits on their Electronic Benefit Transfer cards (EBT) within 14 days of the date of issuance and over half of all households have redeemed 90-100% of their benefits within this period (Cole and Lee, 2005). These redemption rates seem remarkably consistent across households of different types and suggest that toward the latter half of the issuance cycle, recipients have almost exhausted their EBT benefits. In related research, Wilde and Ranney (2000) report that food spending in food stamp households

spikes in the three days after benefits are received while caloric intake drops sharply from the first to last week of the food stamp cycle for infrequent shoppers. Shapiro (2005) finds a 0.45% daily reduction in caloric intake during the food stamp benefit month which he attributes to short-run "impatience". More recently, Hastings and Washington (2009) examine scanner data on food purchases from three grocery stores in Nevada and find that cycling is present for most food types including storable foods, and especially for perishable foods. This monthly cycling of expenditure and intake suggests a pattern of food deprivation followed by binge eating that has been associated with unhealthy outcomes such as obesity. With monthly cycling over the course of the food stamp month, EBT benefits may also have progressively less influence on food decisions of SNAP participants and the second half of the food stamp month will be the least affected by program benefits or restrictions on ready to eat meals or restaurant food.

This scenario suggests a difference-in-difference model to estimate food stamp effects in which, conditional on income, changes in food stamp program's influence arise from random variation across households in the timing of their ATUS diaries. To define whether the food preparation times recorded in the ATUS diary are influenced or not by the food stamp program, we use ATUS information on the date of the time diary as well as state-level information on the dates for monthly issuance of food stamp benefits (Cole and Lee, 2005; pp. 15-16). As of 2005, 32 states replenished EBT benefits by the 10th of month, either on a single day or within a narrow range of days. Thus, the "food stamp month" in these states roughly coincides with the calendar month. For respondents in these states, we use ATUS information on the date of the time diary and define respondents' diary days as being "food stamp days" or not depending on whether their diary dates were on or before the 15th of the month. We specify a difference-in-difference model as follows:

$$Y_i = \beta_0 + x_i^{'}\beta_1 + fday_i\beta_2 + fs_i\,\beta_3 + fday_i{*}fs_i\beta_4 + \varepsilon_i$$

where the dummy variable fs_i indicates food stamp program participation status and $fday_i$ indicates that the diary date was a "food stamp day". Since the data are restricted to a smaller set of respondents, we add in data from the 2007 ATUS for this analysis for sample size reasons.

The above definition of the food stamp benefit month is subject to error, since some of the 32 states in the sample have EBT replenishment dates spread over the first 10 days of the month. Such error can also result in attenuation of estimated food stamp effects. For example, if an EBT card is re-filled on the 10th of the calendar month but the ATUS diary date was prior to

the 10th, we would wrongly flag the food preparation decisions in the ATUS diary as being influenced by program restrictions and benefits even though the recipient would have been partly in week 4 of their food stamp month and their benefits were probably quite depleted in the days prior to the refill. Conversely, if the diary date was on the 16th of the month, we would wrongly classify the day as a "non-food stamp day" even though the recipient's food preparation behaviors were still being guided by the structure of the food stamp benefit. To minimize this error in classifying food stamp diaries, we restrict the sample to cases from 18 states where EBT distribution either takes place on a single day or within a very narrow range of days thus allowing a more precise definition of the two weeks following replenishment. We check the robustness of our results to this stricter definition.

Since other payment schedules such as salary payments or welfare benefits can also follow a similar issuance cycle, food preparation decisions may follow a monthly pattern common to all households. Coefficients on the food stamp day dummies will estimate the percentage difference in food prep time between the first and last half of the food stamp month that is unrelated to program participation. Coefficients on the interactions between food stamp day and food stamp participation will indicate the change in time use on a "food stamp" day versus not for food stamp recipients. Assuming that food stamp recipients would follow similar food preparation behaviors as non-recipients on non-food stamp days (i.e. when their food purchases are not restricted by the food stamp restrictions), we can interpret $\beta 3$ as the causal effect of food stamp participation on food preparation time.

Since the monthly distribution cycle of EBT benefits does not change employment status, the above strategy will not work to identify employment effects as well, therefore we estimate the models on samples stratified by employment status. However, to the extent that employment is endogenous, our estimates from the employment-stratified samples may still be subject to bias. Note also that to the extent that food stamp recipients are "forward thinking" and purchase storable foods such as beans and rice for future home consumption, they can smooth out food preparation and related consumption patterns over the month resulting in under-estimate of food stamp effects on food prep times.

The Effects of Food Stamp Participation and Employment on Food Preparation Time

Descriptive Statistics: Table 1 presents summary statistics for the 4,693 respondents with incomes less than 185% of the federal poverty line (FPL). Household food stamp receipt is reported by 1,135 cases, 24% of the sample. Even accounting for the program ineligibility of many of the cases in these samples, the food stamp participation rate in this data is significantly lower than the 56-65% rates reported for this period (Wolkowitz, 2007).[6]

Women account for almost 3 out of 4 food stamp recipients but just over half of the non-recipient poor. Respondents in recipient households are less likely to have a college education or to have a spouse or partner present. Fewer than half of food stamp recipients are employed compared to 70% of non-recipients. Overall, food stamp recipients reported spending 57.5 minutes on food preparation in their ATUS time diary, approximately 13 minutes more than poor non-recipients but well below the 137 minutes that the Thrifty Food Plan is estimated to require (Rose, 2004; Rose 2007).

Table 2 presents mean food preparation times by food stamp and employment status for all poor respondents, those in households with children under 18 years and by gender. Working food stamp participants report 44% more time on food preparation relative to non-participants, (46 minutes versus 34 minutes), but these differences disappear among non-workers. In general, the data shows larger differences in food preparation time by employment status than by food stamp status. Among those in non-recipient households, non-workers report spending 68 minutes on food preparation, approximately double the amount of time reported by workers. This difference in food preparation time between workers and non-workers was less stark among those in recipient households with non-workers spending 45% more time in food prep compared to workers (67 versus 46 minutes). These data suggest that food stamps may serve to counteract any work-related reduction in home food preparation. Having children under 18 years in the household is associated with an increase in food preparation time among workers but not non-workers. Regardless of work status, males reported spending less time than women on food preparation, with larger differences among non-workers. As with the overall sample, there are significant differences in mean female food prep time by work status but not by food stamp status.

[6] The lower rates in our data are possibly the result of a well-documented underreporting of food stamp usage in the CPS.

Regression Results: Tables 3 and 4 present results from negative binomial models for all poor respondents, those in households with children under 18 years, and women. The full set of coefficients is presented in Appendix B. Table 3 presents results from a naïve model that ignores any endogeneity concerns regarding food stamp or employment status while Table 4 presents estimates from the treatment effects models. Coefficients in Table 4 are identified using the state unemployment rate and the state average food stamp benefit as instruments for work and food stamp participation respectively. The coefficients in the top panels of Tables 3 and 4 represent percentage changes in food preparation time for workers in different food stamp-employment categories compared to the reference group of those who are not working and also do not receive food stamps. The bottom panel presents the percentage change in food prep time within each type of employment category as well as the estimated difference in the number of food prep minutes due to food stamp program participation. Because of the non-linear nature of the outcomes, these marginal effects on food preparation time are evaluated at the means of the sample.

Results from Table 3 show that when food stamp receipt and employment are treated as exogenous variables, food stamp receipt is not significantly associated with food preparation time for either part-time workers or non-workers. Among full-time workers, food stamps are associated with an increase in food prep time though not among women. As explained earlier, these results are not indicative of causal effects because food stamp or employment status may be correlated with unobservable characteristics that are also correlated with time use. Indeed, estimates from the multinomial treatment effects model in Table 4 show that controlling for endogeneity in food stamp participation and employment status significantly alters the results. Now, food stamps have no effect on the food prep time of low-income full-time workers. Instead, food stamp receipt significantly increases the food preparation time of part-time workers by 48%, or an average of almost 10 more minutes on home food preparation than if they were not program participants. Food stamps appear to have no significant effect on food preparation time for non-workers, possibly because these workers are already engaged in over an hour of food prep time, double that of workers.

Food stamp effects among poor women in Table 4 are similar to those for all poor respondents. Food stamp participation increases time on household food production by almost 15

minutes for part-time women workers, and has an insignificant effect on full-time working women. Similarly, part-time workers with children in the household younger than 18 years who receive food stamps spend 11 minutes more (50% more) in food preparation than they otherwise would have.

The bottom panel of Table 4 contains the results of tests for instrument validity. Results show that the instruments (average food stamp benefit and the unemployment rate) are strong and statistically significant determinants of program participation and employment status. The overidentification tests reported in Table 4 lend statistical credence to our claim that the instruments are exogenous and that they affect food preparation time and food quality only through their influence on food stamp participation and employment status.

Among other results, we find that as expected, employment significantly reduces time spent on food preparation. Among poor respondents from non-food stamp households, part-time workers report 91-95% less food preparation time than non-workers (coefficient d3, Table 4). Among food stamp recipients, part-time work results in significantly smaller 39-46% reduction in food prep time compared to non-working participants (Appendix B, d4-d2, Table B1). Full-time workers in non-recipient households also report significantly less time than non-workers in food preparation (48-59%), with larger reductions among households with children under 18 years (d5, Table 4). Among recipient households, full-time work reduces food preparation time by 29-45% compared to not working (Appendix B, d6-d2 Table B1). Comparing the estimated effects of work for food stamp recipients and non-recipients indicates that food stamp receipt moderates the employment related reductions in food preparation time, but with greater impact on part-time relative to full-time workers.

Among other characteristics in our models, age is positively related to household food preparation time as is the presence of children under 18 years, while being a single head of household is associated with a 16% reduction in such time use in for all poor respondents, and a 29% reduction among female respondents (Appendix B, Table B1). Controlling for work status, food stamp participation and other characteristics, education was insignificantly related to food preparation time. However, food preparation was significantly lower on Fridays compared to other days, and higher on other weekdays relative to weekend days.

Sensitivity Analyses: The above models address the issue of spousal time for food preparation only by controlling for presence of a spouse or partner in the household, a crude

indicator of total household time available for food production. In Tables 5 and 6, we include a better measure of available time by also controlling for the respondent's spouse/partner employment status. Including spousal work status in this way assumes it is exogeneous, thus spouse's employment status proxies for nonlabor income in the model.[7] Controlling for spousal employment does not alter estimated food stamp effects. In Table 6, program participation results in a significant 51% increase in household food preparation time for poor part-time workers, similar to results in Table 4. Spousal employment is also positively related to food preparation time suggesting positive income effects.

Note that food stamp effects in Table 4 and 6 are identified in the multinomial treatment effects models using the state average food stamp benefit and state unemployment rate to identify our coefficients. We check the robustness of our results to these identification restrictions by using alternate instruments for food stamp participation, namely, the maximum state TANF benefit for a family of three and the de jure income eligibility threshold for food stamp receipt. Results from these alternate specifications are reported in the bottom two panels of Table 7.

Results are remarkably stable across the different model specifications. Food stamp participation has the strongest, positive effect on household food preparation time among poor, part-time workers who are estimated to spend an average of 10 more minutes daily in such activities than they would have in the absence of the program. As in the results of Tables4 and 6, larger effects are obtained for poor female part-time workers who are estimated to spend 15 more minutes in daily food preparation time as a result of participating in the food stamp program. An exception to this consistency across different specifications arises for poor females using the de jure eligibility rule. For these models, poor females who are full-time workers are estimated to spend more time in food prep as a result of food stamp participation. Given that the food stamp allotment is likely to have the smallest impact on the food budgets of full-time workers compared to part-time workers, we treat this counter-intuitive result as an outlier.

As an alternative to the parametric identification of food stamp effects, Table 8 presents

[7] By treating spousal work effort as exogenous, we are ignoring the collective decision-making involved in household time use decisions. However, implementing the simultaneous determination of spousal work effort and food stamp participation is not a simple matter and beyond the scope of this paper. More generally, given that household time use is likely to be the result of collective decision-making in the household, an ideal analysis of household production would capture contributions in different activities by all members of the household. However, the ATUS data only contains time use data for a single member of sampled households, so we are limited in our ability to address this issue substantively.

results from the DD model of food stamp effects that exploits cross-state variation in the monthly distribution cycle of the EBT benefits. Since the intuition underlying this model only holds for states whose distribution dates are concentrated in the beginning of the month, we exclude respondents from states with distribution dates spread over the month resulting in a smaller sample of 2,569 poor respondents, 2,184 of whom are in households with children under 18 years, and 1,745 of whom are women. Since the monthly distribution cycle of EBT benefits does not change employment status, we pool part-time and full-time workers together and estimate food stamp effects separately, for workers and non-workers.

Results from the DD models are qualitatively similar to those from the parametric treatment effects models especially for the sample of poor women. For this group, food stamps do not significantly alter food preparation time for non-workers. However, among poor working women, food stamps increase food preparation time by approximately 33%, equivalent to an average of 19 minutes more per day than they would have spent without food stamps. However, these results do not meet standard thresholds of statistical significance. Note that our failure to distinguish between part-time and full-time workers may depress estimated effects since the food stamp benefit is likely to have bigger impact on part-time workers for whom the benefit is a bigger part of the food budget relative to full-time workers.

As stated earlier, our classification of "food stamp diaries" is imprecise and may result in downward biased estimates of food stamp effects. We assess the sensitivity of our results to this measurement error by further restricting the sample to a group of 18 states with EBT distribution dates either on a single day of the month (generally the 1st) or within a much smaller 2-3 day window. As expected, results indicate larger increases in food prep time due to food stamp participation with effects concentrated among poor, working families. Specifically, the estimated food stamp effect increases from 18% in the 32-state sample to 70% in the 18-state sample. This is equivalent to almost 30 minutes more of food preparation time. However, these effects fall short of statistical significance (p=0.19) possibly because of the smaller number of cases available for analysis in this restricted sample (N=425).

Effects of Food Stamp Participation on Consumption Patterns

The positive estimates of food stamp effects on time spent in food preparation raise the possibility that by de-emphasizing the time costs of food preparation and subsidizing the home consumption of food, food stamps may counteract work-driven trends towards calorie-dense convenience foods in low-income populations. We explicitly examine the program's effects on consumption patterns of participants using NHANES data from 1999-2005.

Descriptive Statistics: Table 9 presents the mean characteristics and caloric intake of food stamp participants and non-participants for four types of consumption: Convenience foods consumed at home; convenience foods eaten outside the home; regular (i.e. non-convenience food) eaten outside the home; regular fruit and vegetable consumption; consumption of primarily carbonated or sweetened beverages (CSB).

As Table 9 shows, there are large differences in socioeconomic background between food stamp participants and non-participants, many of which persist even when the sample is restricted to poor respondents with incomes below 185% of the FPL. Food stamp participants appear significantly less likely to have a college education, and more likely to be without a spouse or partner present. Interestingly, while there are no significant differences in Hispanic representation between program participants and non-participants in the full sample, poor food stamp participants appear to be significantly less likely to be report a Hispanic ethnicity than poor non-participants suggesting that barriers to participation may persist among this ethnic group.

The bottom panel of Table 9 presents a snapshot of the diets recorded in the NHANES by food stamp participation status. The overall picture reveals a diet heavy in convenience foods and sweetened beverages for both food stamp participants and non-participants. While there are significant differences in consumption patterns between food stamp participants and non-participants in the full sample, these differences become statistically insignificant when we restrict the sample to respondents with incomes less than 185% of the FPL. Among the poorer sub-sample, food stamp participants consume an average of 2,040 calories a day, insignificantly different from non-participants who consume an average of 2,077 daily calories. Both program participants and non-participants consume over half of their daily caloric intake (approximately 1100 calories) via convenience foods. A similar consumption of convenience foods is also reported by higher income non-recipients of food stamps indicating that such food is now a

staple part of American diet across the income spectrum. Program participants consume approximately 8% of their caloric intake via regular (i.e. not convenience) fruit and vegetable consumption, similar to non-participants but lower than the 11% share recorded in an earlier study of dietary quality (FRAC, 2010). While the earlier data also reported that soft drinks, punches, and fruitades only accounted for 4.6% of calories consumed by food stamp participants, the 1999-2004 NHANES data indicate that 15-16% of daily caloric intake (over 300 calories) came from carbonated and sweetened beverages for both program participants and non-participants.

Table 10 shows some significant differences in consumption patterns between food stamp participants and non-participants in the full sample but not in the poorer sub-group. Food stamp recipients in the full sample consumed significantly fewer calories from regular (i.e. not convenience) meals outside the home, and significantly more calories from CSBs than non-recipients both among workers and non-workers. Similarly, food stamp recipients in the full sample consumed significantly fewer fresh fruits and vegetables, and had a significantly lower fiber intake, than non-participants regardless of work status. However, these differences disappeared when only poor respondents were analyzed. Where significant differences between low-income program participants and non-participants persist, they are concentrated among workers rather than non-workers and in the consumption of quick convenience calories. Similar to patterns of food preparation time, there are larger and more significant differences in consumption patterns by work status rather than by food stamp program participation. Workers consume approximately 300 calories more per day than non-workers, with slightly smaller differences among the poor sample. Among the poor sample, program participation among workers was associated with 18% more calories from convenience foods eaten at home and 25% more calories from CSBs but no significant differences were apparent for non-workers. Possibly reflecting workers' higher incomes as well as time constraints, working food stamp recipients received 40% of their calories from food eaten outside the home, almost double the rate for non-working participants. At the same time, given the food stamp program's restrictions on purchasing ready-to-eat hot food, program participants have a lower portion of their calories from food consumed outside the home compared to non-participants.

Regression Results: Tables 11 and 12 present estimates of food stamp program effects from

gamma regressions of consumption patterns and dietary intake. Models control for total daily calories, thus the results indicate program effects on the share of calories consumed in the different categories. The full set of coefficients is reported in Appendix C.

Results from the sample of poor respondents indicate that food stamp participation among non-working recipients significantly decreases the share of calories from convenience foods, both in and outside the home, by an average of almost 600 calories. Food stamp receipt also appears to reduce the daily consumption of CSBs among non-working recipients by an average of approximately 80 calories. However, food stamp effects among part-time workers are less positive. For these workers, food stamp participation significantly increases the share of calories from convenience foods at home by 30% or an average of almost 200 calories. Food stamp recipients who are part-time workers also consume 79% more calories from CSBs, equivalent to approximately 250 calories more than if they were not receiving food stamps. At the same time, participation in the food stamp program appears to significantly reduce the intake of fruits and vegetables and protein among part-time workers, and also reduce the intake of fiber among both part-time workers and those who did not work. In contrast to these effects among part-time workers, food stamp effects on consumption patterns and dietary intake of full-time workers in the poor sample are insignificant.

Among other covariates of interest, age and education are negatively associated with consumption of convenience foods as well as CSBs. Consistent with the mean differences in Tables 9and 10, our results also indicate strong employment effects on consumption patterns and dietary intakes of food stamp recipients. Among food stamp recipients, full-time work increases the share of calories from food outside the home significantly both for convenience food and for regular calories. Full-time work also results in significant increases in the share of CSB calories for food stamp recipients. Among food stamp non-recipients, part-time work significantly reduces the share of calories from convenience foods and CSBs. A comparison of work effects for food stamp recipients and non-recipients indicates that food stamp receipt may magnify the consumption of quick calories by part-time workers, especially convenience foods eaten outside the home. Food stamp receipt appears to have a similar magnifying effect on the consumption of CSBs by full-time workers.

The food stamp and employment effects in Tables 11and 12 are identified using cross-state variations in the average food stamp benefit and the unemployment rate. We explore the

robustness of our results to alternative identification restrictions in Table 13 where we present results using the program eligibility threshold and the unemployment rate, and separately, the state maximum TANF benefit and the unemployment rate as instruments. Results are relatively unchanged for the models of nutrient intake. For the analysis of consumption patterns, food stamp receipt among part-time workers is still estimated to increase the share of calories from CSBs, however the effect falls just short of statistical significance when using the eligibility threshold as the instrument. Similar to the main model, food stamp receipt also results in a significant reduction in the share of calories from convenience foods in and outside the home for non-working participants when using the eligibility threshold as an instrument but this result is not obtained when using the maximum TANF benefit. Finally, the eligibility threshold instrumental variable also yields significant effects of food stamp receipt for full-time workers – specifically, a negative effect of food stamp receipt on the share of calories from CSBs and positive effects of food stamp receipt on the share of calories from convenience food outside the home. We treat these results for full-time working food stamp recipients with caution given the small number of cases in this group and the small impact that the food stamp allotment may be expected to have on the food budgets of such recipients.

Discussion

In this research, we analysed how the impact of food stamp participation on food preparation times, consumption and nutrient intake varies by employment status. To account for the endogeneity of program participation and employment status, we estimated multinomial treatment effects models using cross-state variation in food stamp benefits, the unemployment rate, and the maximum TANF benefit for a family of three as well as the income eligibility threshold for program participation to identify program effects.

Our analysis of time diaries in the ATUS reveals that food stamp participants spend significantly more time preparing food than non-participants but the effects are primarily concentrated among low-income part-time workers. For these workers, food stamp receipt is estimated to increase food prep time by 10 more minutes (a 48% increase) compared to what they would have spent in the absence of the program. These results remain fairly robust to alternate identification strategies. Among non-workers, participation in the food stamp program does not have a significant effect on food preparation time. Food stamps appear to moderate the work-associated changes in the time devoted to household food production of low-income working families both for full-time and part-time workers.

At the same time, our analysis of consumption and nutrient intake in the NHANES reveals that, while food stamp receipt may increase food preparation time especially among part-time workers, this increase is not correlated with a healthier diet. Specifically, food stamp receipt is associated with a 30% higher share of calories from convenience foods (equivalent to an average of 200 calories) among part-time workers. However, in keeping with the program's restrictions on the purchase of ready-to-eat foods, our results suggest that these food stamp recipients consume most of their convenience food calories inside the home. Our results for recipients who work part-time also show that food stamp receipt significantly increases the share of calories from CSBs, while reducing the intake of fiber and fruits and vegetables. Results for non-working food stamp participants were the opposite, however; participation in the food stamp program causes non-workers to consume a combined average of 600 fewer calories from convenience foods both at home and outside the home, and fewer CSB calories than they would have in the absence of the program.

Prior studies of food stamp effects on nutrient intake have yielded mixed results and did not always control for selection into the program or consider interactions between the program

and work status. This current research controls for selection into the program and into employment using different sets of instrumental variables to identify our models. However, the results from the models for consumption patterns using the income eligibility threshold are somewhat inconsistent with those from the other identification approaches. For example, these models indicate significant program effects only for full-time workers even though these workers may be expected to receive the lowest food stamp allotment of all the three employment categories. For these reasons, results using the income eligibility threshold should be treated with caution. Our analysis of consumption patterns would also have been improved by an NHANES sample that is large enough to enable separate analysis by gender and household structure. Future rounds of data will make a more detailed analysis of consumption patterns possible.

In spite of these caveats, our study indicates that any policies directed at improving food choices among food stamp recipients must consider the influence of employment and related time constraints on food choices. Non-working recipients already appear to be responsive to restrictions on food stamp purchases on ready-to-eat foods. In contrast, our results for part-time workers suggest that the program may enable working recipients to substitute money for time in the production of food. Thus, the real value of the food stamp allotment for workers may be lower because money is being spent on convenience rather than nutritious but more time-intensive food. Our results indicating higher consumption of CSBs among working food stamp recipients is worrying given that such consumption has been identified in recent studies as a potential source of unhealthy weight outcomes. Finally, while much of the research on dietary quality and obesity has focused on restaurant or fast food meals, our research highlights the significant contribution of at-home convenience food to the poor quality of American diet.

References

Anderson, P., Butcher, K., and Levine, P..2003. Maternal Employment and Overweight Children. *Journal of Health Economics*, 22:477-504.

Angrist, J.D. 2001. Estimation of Limited Dependent Variable Models with Dummy Endogenous Regressors: Simple Strategies for Empirical Practice: Reply. *Journal of Business and Economic Statistics*, 19, 27-28.

Ashenfelter, O. 1983. Determining Participation in Income Tested Social Programs.*Journal of the American Statistical Association* 78(383): 517–25.

Becker, G. 1965. "A Theory of the Allocation of Time," *The Economics Journal* 75(September):493-517.

Bhargava, A, and Amialchuk, A. 2007. Added Sugars Displaced the Use of Vital Nutrients in the National Food Stamp Program Survey. *Journal of Nutrition*, 137: 453-460, 2007.

Bowman, S., Gortmaker, S., Ebbeling, C., Pereira, M., Ludwig, D. 2004. Effects of Fast-Food Consumption on Energy Intake and Diet Quality among Children in a National Household Survey. *Pediatrics*, 2004 (113):122-118.

Burstein, Nancy R. "Dynamics of the Food Stamp Program as Reported in the Survey of Income and Program Participation." Report submitted to the U.S. Department of Agriculture, Food and Nutrition Service. Cambridge, MA: Abt Associates, 1993.

Butler, J.S., Raymond, J.. 1996. The Effect of the Food Stamp Program on Nutrient Intake. *Economic Inquiry*, vol. 34, 1996, pp. 781-798.

Byrne, P., Capps, O., and Saha, A. 1998. Analysis of Quick-serve, Mid-scale, and Up-scale Food Away from Home Expenditures. *The International Food and Agribusiness Management Review*, 1(1998): 51-72.

Carlson, Andrea, Mark Lino, Weh-Yen Juan, Kenneth Hanson, and Peter Basiotis. 2007. *The Thrifty Food Plan, 2006 Administrative Report*, CNPP-19, Center for Nutrition Policy and Promotion, U.S. Department of Agriculture.

Cawley, John, and Liu, Feng. 2008. Maternal Employment and Childhood Obesity: A Search for Mechanisms in Time-Use Data. NBER Working Paper 13600, November 2007. Available at **http://www.nber.org/papers/w13600**

Cole, N. and Lee, E. 2005. Analysis of EBT Redemption Patterns: Methods and Detailed Tables. Abt Associates, Inc.

Crepinsek, M., Burstein, N. 2004. Maternal Employment and Children's Nutrition, Vol. II: Other Nutrition Related Outcomes. U.S. Department of Agriculture, Economic Research Service, E-FAN-04-006-2, June 2004.

Davis, George, and You, Wen. 2008. The Time Cost of Food at Home: General and Food Stamp Profiles.

Deb, P., and P. K. Trivedi. 2006a. Specification and Simulated Likelihood Estimation of a Non-normal Treatment-outcome Model with Selection: Application to Health Care Utilization. *Econometrics Journal*, 9, 307-331.

Deb, P., and P. K. Trivedi. 2006b. Maximum Simulated Likelihood Estimation of a Negative-binomial Regression Model with Multinomial Endogenous Treatment. *The Stata Journal*, 6, 246-255.

Duffey KJ, Gordon-Larsen P, Jacobs DR Jr, Williams OD, Popkin BM. 2007. Differential associations of fast food and restaurant food consumption with 3-y change in body

mass index: the Coronary Artery Risk Development in Young Adults Study. *American Journal of Clinical Nutrition*, 85(1):201-208.

Devaney, Barbara, and Robert Moffitt. 1991. Dietary Effects of the Food Stamp Program. *American Journal of Agricultural Economics*, February 1991, pp. 202-211.

FRAC, 2010. Food Purchases of Food Stamp Shoppers. Available at **http://www.frac.org/pdf/Foodstamppurchases.PDF**

Fox, M., Cole, N. 2004. Nutrition and Health Characteristics of Low-Income Populations. Vol. I: Food Stamp Participants and Non-participants. U.S. Department of Agriculture, Economic Research Services, E-FAN-04-014-1, Washington, D.C.

Fraker, T. 1990. "The Effects of Food Stamps on Food Consumption: A Review of the Literature." Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, 1990.

Gleason, P., A. Rangarajan, and C. Olson. 2000. Dietary Intake and Dietary Attitudes Among Food Stamp Participants and Other Low-Income Individuals. USDA, Food and Nutrition Service.

Gleason, Philip M., Peter Z. Schochet, and Robert A. Moffitt. 1998. "The Dynamics of Food Stamp Program Participation in the Early 1990s." Report submitted to the U.S. Department of Agriculture, Food and Nutrition Service. Princeton, NJ: Mathematica Policy Research, Inc., June 1998.

Haines, P., Hama, M., Guilkey, D., Popkin, B.. 2003. Weekend Eating in the United States is Linked with Greater Energy, Fat, and Alcohol Intake. *Obesity Research*, 2003 (11):945-949.

Hamermesh D. 2006. Time to Eat: Household Production Under Increasing Income Inequality. Paper presented at the ATUS Early Results Conference, 2005.

Hamermesh, D. 2007. Direct Estimates of Household Production. Forthcoming *Economic Letters*, 2007.

Hamrick, K., Shelley, K. 2005. How Much Time Do Americans Spend Preparing and Eating Food? Amber Waves, November 2005.

Hastings, J. and Washington, E. 2009. The First of the Month Effect: Consumer Behavior and Store Responses. NBER Working Paper, No. w14578.

Heckman, J. J. 1978. Dummy Endogenous Variables in a Simultaneous Equation System. *Econometrica*, 46, 931-959.

Hoynes, H., and D. Schanzenbach. 2009. Consumption Responses to In-Kind Transfers: Evidence from the Introduction of the Food Stamp Program. *Amercian Economic Journal: Applied Economics*, 1(4): 109-139.

Kornfeld, R. 2002. Explaining Recent Trends in Food Stamp Program Caseloads, U.S. Department of Agriculture, Economic Research Services, E-FAN-02-008, Washington,D.C.

Lerman, R. and M. Wiseman. 2002. Restructuring Food Stamps for Working Families. U.S. Department of Agriculture, Economic Research Services, Washington,D.C.

Lin, B., and E. Frazao. Away-From-Home Foods Increasingly Important to Quality of American Diet, U.S. Department of Agriculture, Economic Research Service, AIB-749, 1999.

Mancino, L, and Newman C. 2007. Who Has Time to Cook? How Family Resources Influence Food Preparation. USDA Economic Research Report Number 40, USDA Economic Research Service, May 2007.

Munkin, M.K. &P.K. Trivedi. 2003. Bayesian Analysis of a Self-Selection Model with Multiple Outcomes Using Simulation-Based Estimation: an Application to the Demand for Healthcare, *Journal of Econometrics*, 114(2), 197-220.

Neumark-Sztainer, D., Story, M., Perry, C., Casey, M. 1999. Factors Influencing Food Choices of Adolescents: Finding from Focus-Group Discussions with Adolescents. *Journal of the American Dietetic Association*, August, 1999;99(8): 929-937.

Newman, C. 2006. The Income Volatility See-Saw: Implications for School Lunch, in Income Volatility and Food Assistance in the United States, Jolliffe, D. and J. Ziliak (eds.), Chapter 6. MI: W.E. Upjohn Institute, 2008

Ratcliffe, C. McKernan, S., Finegold, K. 2007. The Effects of Food Stamp and TANF Policies on Food Stamp Program Participation. Match 2007, Urban Institute: Washington, DC.

Rose, D., Habicht, JP, Devaney, B. 1998. Household Participation in the Food Stamp and WIC Programs Increases the Nutrient Intakes of Preschool Children. *Journal of Nutrition*, 128 (3): 548-555.

Rose, Diego. 2004. "Who Has Time to Cook? New Directions for Food and Nutrition Policy Research on Household Meal Production," Paper presentedat the Food and Eating Consequences of Time-Use Decisions: A Researchand Policy Conference, Washington, DC, July.

Rose, Donald. 2007. Food Stamps, The Thrifty Food Plan, and Meal Preparation: The Importance of the Time Dimension for US Nutrition Policy. *J Nutr Educ Behav*.39:226-232.

Shapiro, J., 2005. "Is there a Daily Discount Rate? Evidence from the Food Stamp Nutrition Cycle." *Journal of Public Economics*, 89(2-3): 303-325, February.

Smith KJ, McNaughton SA, Gall SL, Blizzard L, Dwyer T, Venn AJ. 2009. Takeaway food consumption and its associations with diet quality and abdominal obesity: a cross-sectional study of young adults. *Int J BehavNutrPhys Act*. 2009 May 28;6:29.

Stewart, H., Blisard, N., Bhuya, S., Nayga, R. 2004. The Demand for Food Away from Home: Full Service or Fast Food? USDA Agricultural Economic Report Number 829, USDA Economic Research Service, January 2004.

Taveras EM, Berkey CS, Rifas-Shiman SL, Ludwig DS, Rockett HR, Field AE, Colditz GA, Gillman MW. 2005. Association of consumption of fried food away from home with body mass index and diet quality in older children and adolescents. *Pediatrics*, 116(4):e518-524.

U.S. Bureau of Labor Statistics. 2006. "American Time Use Survey User's Guide: Understanding ATUS 2003, 2004, and 2005," available at **http://www.bls.gov/tus/atususersguide.pdf**.

U.S. Census Bureau. 2007. County Business Patterns, Available at **http://www.census.gov/epcd/cbp/view/cbpview.html**

U.S. Department of Agriculture. 2006. USDA Food and Nutrition Service, Office of Analysis, Nutrition and Evaluation, Characteristics of Food Stamp Households: Fiscal Year 2005, FSP-06-CHAR, By Allison Barrett. Project Officer, Jenny Genser: Alexandria, VA 2006.

U.S. Department of Agriculture, Food and Nutrition Service. Office of Analysis, Nutrition, and Evaluation. 2007. Food Stamp Program Quality Control Data. Available at **http://www.fns.usda.gov/oane/MENU/otherresources.htm**.

U.S. Department of Agriculture, Food and Nutrition Service, Office of Research, Nutrition and Analysis, Diet Quality of Americans by Food Stamp Participation Status: Data from the National Health and Nutrition Examination Survey, 1999-2004, by Nancy Cole and Mary Kay Fox.

Urban Institute. 2007. Welfare Rules Database: An Assessing the New Federalism Project at the Urban Institute. Available at **http://anfdata.urban.org/wrd/WRDWelcome.CFM**

Wolkwitz, Kari. “Trends in Food Stamp Program Participation Rates: 1999 to 2005.”MathematicaPolicy Research, Inc. for the Food and Nutrition Service, U.S. Department of Agriculture(June 2007), http://www.fns.usda.gov/oane/MENU/Published/FSP/participation.htm.

Whitmore, Diana. 2002. What Are Food Stamps Worth? Working Paper #468, Princeton University: Industrial Relations Section, July 2002.

Wilde, P., P.E. McNamara, and C.K. Ranney. 1999. “The Effects of Income and Food Programs on Dietary Quality: a Seemingly Unrelated Regression Analysis with Error Components,” *American Journal of Agricultural Economics*, 81:201-213.

Wilde, P. and Ranney, C. (2000a). The monthly food stamp cycle: Shopping frequency and food intake decisions in an endogenous switching regression framework. *American Journal of Agricultural Economics*, 82(1):200-213, February 2000.

Table 1: Weighted Means by Food Stamp Status

Variable	<= 185% FPL (N=4693)	
	Food stamp=0 (N=3558)	Food stamp=1 (N=1135)
Age in years	40.6*	36.0*
Female	0.56*	0.72*
White	0.47	0.41
< High school	0.33*	0.26*
High school grad.	0.40	0.42
Some college	0.24	0.20
College graduate	0.10*	0.05*
Part-time	0.15	0.15
Full-time	0.54*	0.31*
Spouse/partner present	0.78*	0.48*
Spouse/partner employment	0.51*	0.25*
Number of Children < 18 years	1.49*	2.17*
Child <= 5 yrs	0.37*	0.56*
Weekly Work Hours	27.0*	16.2*
Food Prep min.	44.3*	57.5*

*: significant differences (p<0.05) by food stamp status.

Table 2: Time Use by Food Stamp Participation and Work Status in Poor Households, 2006-2008

	FS=0,NW	FS=1,NW	FS=0, W	FS=1,W
By Gender, Family Structure				
Work hrs/week- All Poor	-	-	39.6 [38.9, 40.4]*	36.5 [35.2, 37.8]*
Work hrs/week-Poor Female	-	-	35.8 [34.8, 36.9]	33.6 [32.3, 34.9]
Work hrs/week- Poor with children under 18 years	-	-	40.1 [39.4, 40.8]*	36.1 [34.8, 37.4]*
Work hrs/week-Poor Male	-	-	43.3 [42.3, 44.3]*	41.3 [39.1, 43.5]*
Prep minutes-All Poor	68.4 [62.5, 74.4] +	67.3 [59.7, 74.8] +	33.6 [30.9, 36.3] +	45.9 [33.7, 58.2] +
Prep minutes-Female	85.8 [78.6, 92.9] +	75.8 [67.1, 84.5] +	49.4 [45.5, 53.3] +	49.2 [43.3, 55.2] +
Prep minutes-Poor with children under 18 years	79.6 [72.9, 86.2]+	73.5 [65.6, 81.4] +	34.0 [31.2, 36.9] +	45.9 [32.9, 58.9] +
Prep minutes-Poor Male	22.9 [16.6, 29.1]	31.9 [21.5, 42.3]	18.2 [14.7, 21.6]	40.6 [8.6, 72.5]

Table 3: Negative Binomial Models of Time Spent on Food Preparation[a]

	< 185% FPL	< 185% FPL with Children Under 18 years	< 185% FPL& Female
Variable	Coeff. (S.E)	Coeff. (S.E)	Coeff. (S.E)
d2, fs=1, emp=0	-0.04 (0.09)	-0.04 (0.08)	-0.09 (0.09)
d3, fs=0, pt=1	-0.35*** (0.08)	-0.41*** (0.07)	-0.33*** (0.08)
d4, fs=1, pt=1	-0.32*** (0.11)	-0.38*** (0.12)	-0.26** (0.12)
d5, fs=0, ft=1	-0.54*** (0.07)	-0.61*** (0.07)	-0.51*** (0.07)
d6, fs=1, ft=1	-0.27*** (0.13)	-0.42*** (0.13)	-0.52*** (0.12)
N	4693	3940	3163
Food Stamp Effects By Employment status			
d2 (not working)	-0.04 -1.3 min.	-0.04 -1.7 min.	-0.09 -5.1 min.
d4-d3 (part-time)	0.03 +1.2 min.	0.04 +1.3 min.	0.07 +3.8 min.
d6-d5 (full-time)	0.27** +10.2 min.	0.25* +10.4 min	0.08 +5.9 min.

[a] Models treat food stamp and employment status as exogenous variables
Models are weighted and also control for age, race/ethnicity, gender, education, income-to-poverty ratio, family structure, region of residence, weekend day, Friday, season, and year.

Table 4: Treatment Effects Models of Time Spent on Food Preparation

	< 185% FPL	< 185% FPL with Children Under 18 years	< 185% FPL& Female
Variable	Coeff. (S.E)	Coeff. (S.E)	Coeff. (S.E)
d2, fs=1, emp=0	-0.07 (0.11)	0.02 (0.13)	-0.03 (0.10)
d3, fs=0, pt=1	-0.93*** (0.06)	-0.95*** (0.07)	-0.91*** (0.07)
d4, fs=1, pt=1	-0.46*** (0.12)	-0.45*** (0.12)	-0.44*** (0.13)
d5, fs=0, ft=1	-0.49*** (0.07)	-0.59*** (0.12)	-0.48*** (0.08)
d6, fs=1, ft=1	-0.37*** (0.10)	-0.44*** (0.12)	-0.32*** (0.11)
N	4693	3940	3163
Food Stamp Effects By Employment status			
d2 (not working)	-0.07 -2.2 min.	0.02 0.5 min.	-0.03 -1.3 min.
d4-d3 (part-time)	0.48*** +9.9 min.	0.50*** +10.7 min.	0.47*** +14.8 min.
d6-d5 (full-time)	0.13 +5.2 min.	0.16 +7.1 min	0.15 +7.2 min.
Test for Joint Significance of Instrumental Variables - $X^2_{(10)}$ (p-value)	20.05 (0.03)	22.33 (0.01)	19.03 (0.04)
Test of Exogeneity of Instruments – $X^2_{(1)}$ (p-value)	0.57 (0.45)	0.28 (0.60)	0.01 (0.91)

*** p<0.01, ** p<0.05, * p<0.1

Models are weighted and also control for age, race/ethnicity, gender, education, income-to-poverty ratio, family structure, region of residence, weekend day, Friday, season, and year (see Appendix Table B1 for the full set of results).

Table 5: Negative Binomial Models of Time Spent on Food Preparation Controlling for Spousal Employment [a]

	< 185% FPL	< 185% FPL with Children Under 18 years	< 185% FPL& Female
Variable	Coeff. (S.E)	Coeff. (S.E)	Coeff. (S.E)
d2, fs=1, emp=0	-0.01 (0.08)	-0.03 (0.08)	-0.07 (0.09)
d3, fs=0, pt=1	-0.36*** (0.08)	-0.41*** (0.07)	-0.35*** (0.08)
d4, fs=1, pt=1	-0.28** (0.11)	-0.33*** (0.11)	-0.23** (0.12)
d5, fs=0, ft=1	-0.53*** (0.06)	-0.58*** (0.07)	-0.52*** (0.07)
d6, fs=1, ft=1	-0.20 (0.13)	-0.29** (0.13)	-0.38*** (0.12)
Spouse Employed	0.41*** (0.08)	0.39*** (0.08)	0.38*** (0.10)
N	4693	3940	3163
Food Stamp Effects By Employment status			
d2 (not working)	-0.01 -0.5 min.	-0.03 -0.9 min.	-0.07 -4.0 min.
d4-d3 (part-time)	0.09 +2.7 min.	0.08 +2.6 min.	0.12 +6.1 min.
d6-d5 (full-time)	0.33*** +11.7 min.	0.29** +11.3 min	0.14 +8.4 min.

[a] Models treat food stamp and employment status as exogenous variables
Models are weighted and also control for age, race/ethnicity, gender, education, income-to-poverty ratio, family structure, region of residence, weekend day, Friday, season, and year (see Appendix Table B for the full set of results).

Table 6: Treatment Effects Models of Time Spent on Food Preparation Controlling for Spousal Employment

	< 185% FPL	< 185% FPL with Children Under 18 years	< 185% FPL& Female
Variable	Coeff. (S.E)	Coeff. (S.E)	Coeff. (S.E)
d2, fs=1, emp=0	-0.02 (0.10)	0.06 (0.10)	-0.005 (0.10)
d3, fs=0, pt=1	-0.93*** (0.06)	-0.94*** (0.07)	-0.92*** (0.07)
d4, fs=1, pt=1	-0.43*** (0.13)	-0.42*** (0.12)	-0.42*** (0.12)
d5, fs=0, ft=1	-0.47*** (0.08)	-0.56*** (0.09)	-0.48*** (0.08)
d6, fs=1, ft=1	-0.36*** (0.10)	-0.42*** (0.11)	-0.31*** (0.11)
Spouse Employed	0.40*** (0.06)	0.42*** (0.07)	0.32*** (0.07)
N	4693	3940	3163
Food Stamp Effects By Employment status			
d2 (not working)	-0.02 -0.6 min.	0.06 +2.1 min.	-0.005 -0.2 min.
d4-d3 (part-time)	0.51*** +10.6 min.	0.53*** +11.3 min.	0.49*** +15.7 min.
d6-d5 (full-time)	0.11 +4.8 min.	0.14 +6.3 min	0.14 +7.8 min.
Test for Joint Significance of Instrumental Variables - $X^2_{(10)}$ (p-value)	19.9 (0.03)	22.03 (0.02)	18.9 (0.04)
Test of Exogeneity of Instruments – $X^2_{(1)}$ (p-value)	0.60 (0.44)	0.26 (0.61)	0.009 (0.92)

Models are weighted and also control for age, race/ethnicity, gender, education, income-to-poverty ratio, family structure, region of residence, weekend day, Friday, season, and year (see Appendix Table 1 for the full set of results).

Table 7: Marginal Effects of Food Stamps on Food Preparation Time by Employment Status - Alternate Instruments

	Not Working	Part-time Worker	Full-time Worker	Chi-squared Test for Significance of Instruments
FSBEN, UNEMP				
Poor (Income < 185% FPL)	-2.2 min.	+9.9 min.***	+5.2 min.	20.1 (p=0.03)
-control for spousal employment	-0.6 min.	+10.6 min.***	+4.8 min.	19.9 (p=0.03)
Poor with children < 18 yrs.	+0. 5 min.	+10.7 min.***	+7.1 min.	22.3 (p=0.01)
-control for spouse employment	+2.1 min.	+11.3 min.***	+6.3 min.	22.0 (p=0.02)
Poor Female	-1.3 min.	+14.8 min.***	+7.2 min.	19.0 (p=0.04)
-control for spouse employment	-0.2 min.	+15.7 min.***	+7.8 min.	18.9 (p=0.04)
MAXBEN, UNEMP				
Poor (Income < 185% FPL)	-2.5 min.	+10.3 min.***	+4.4 min.	5.3 (p=0.005)
-control for spousal employment	-0.8 min.	+11.0 min.***	+3.7 min.	25.5 (p=0.004)
Poor with children < 18 yrs.	-0.3 min.	+11.0 min.***	+6.1 min.	23.4 (p=0.01)
-control for spousal employment	+1.3 min.	+11.5 min.***	+5.3 min.	23.5 (p=0.01)
Poor Female	-1.3 min.	+15.0 min.***	+6.4 min.	21.9 (p=0.02)
-control for spousal employment	-0.3 min.	+15.7 min.***	+7.1 min.	22.3 (p=0.01)
ELIGIBILITY THRESHOLD, UNEMP				
Poor (Income < 185% FPL)	-1.5 min.	+10.2 min.***	+3.7 min.	90.3 (p=0.000)
-control for spousal employment	-0.1 min.	+10.9 min.***	+4.0 min.	93.5 (p=0.000)
Poor with children < 18 yrs.	+1.0 min.	+10.7 min.***	+5.5 min.	76.9 (p=0.000)
-control for spousal employment	+2.2 min.	+11.3 min. ***	+5.6 min.	80.9 (p=0.000)
Poor Female	-5.5 min.	+2.1 min.	+20.8 min.**	66.2 (p=0.000)
-control for spousal employment	-5.1 min.	+3.3 min.	+20.8 min.***	67.3 (p=0.000)

Table 8: Difference-in-difference models of Food Stamp Effects on Food Prep Time (p-values in parentheses)

	32 states with EBT replenishment before 10th of the month			18 states with EBT replenishment on a single date or narrow range of days before the 10th of the month
	All Poor	Poor w/ Children < 18 yrs.	Female Poor	All Poor
Variable		All	< 1.85 FPL	
Not Employed				
food stamp recipient	-0.11	-0.15	-.17	0.54***
	(0.31)	(0.17)	(0.14)	(0.03)
food stamp*fspdate	-0.02	0.003	0.04	-0.22
	(0.91)	(0.99)	(0.78)	(0.47)
Fspdate	-0.07	-0.08	-0.12	0.13
	(0.37)	(0.32)	(0.14)	(0.50)
D-D (in minutes)	-0.5	+1	+4.5	-13.5
N	922	757	758	234
Employed				
food stamp recipient	-0.01	-0.02	-0.03	-0.16
	(0.94)	(0.88)	(0.81)	(0.73)
food stamp*fspdate	0.18	0.22	0.33*	0.70
	(0.28)	(0.20)	(0.08)	(0.19)
Fspdate	-0.09	-0.05	-0.12	0.19
	(0.23)	(0.53)	(0.17)	(0.36)
D-D (in minutes)	+7.5	+9.5	+19*	+29
N	1647	1427	987	425

Table 9: Mean Characteristics By Food Stamp Participation, 1999-2004 NHANES

	Full Sample		Income < 1.85 FPL	
VARIABLES	FS=0	FS=1	FS=0	FS=1
Female	0.540*	0.655*	0.546*	0.665*
College Graduate	0.206*	0.046*	0.075*	0.042*
Black	0.188*	0.409*	0.200*	0.392*
Hispanic	0.308	0.294	0.464*	0.309*
Married/partnered	0.580*	0.372*	0.476*	0.368*
Household size	3.438*	4.124*	3.890*	4.076*
Calories per day	2,142.674*	2,046.702*	2,077.342	2,040.381
Convenience calories outside home	505.045*	371.641*	465.831*	362.155*
Convenience calories @ home	625.929*	728.713*	650.415*	737.145*
Carbonated/sweet beverage calories	297.108*	340.732*	313.119	335.775
Fruit and Vegetable calories	192.025*	168.602*	183.265	165.759
Total fat (grams)	78.463*	74.127*	74.305	74.014
Saturated Fat (grams)	25.562	24.588	24.264	24.532
Observations	7326	990	2717	874

Table 10: Consumption Patterns and Nutrient Intake by Food Stamp Participation and Work Status, 1999-2004 NHANES

	FS=0 Work=0 N=2584	FS=1 Work=0 N=659	FS=0 Work=1 N=5446	FS=1 Work=1 N=416
Calories/Day				
Full Sample	1,989.281^{+}	1,958.113^{+}	2,204.884^{+}	2,201.284^{+}
Income < 1.85 FPL	1,972.685^{+}	1,953.326^{+}	2,159.884^{+}	2,199.559^{+}
Convenience Foods Eaten Outside the Home (calories)				
Full Sample	325.604*$^{+}$	247.276*$^{+}$	581.949^{+}	572.046^{+}
Income < 1.85 FPL	314.485^{+}	253.266^{+}	585.194^{+}	561.257^{+}
Convenience Foods eaten at Home (calories)				
Full Sample	686.927^{+}	750.382	595.498*$^{+}$	689.249*
Income < 1.85 FPL	711.900^{+}	751.152	601.923*$^{+}$	711.534*
Regular Food Eaten Outside the Home (calories)				
Full Sample	217.857*$^{+}$	160.531*$^{+}$	401.862*$^{+}$	334.221*$^{+}$
Income < 1.85 FPL	197.956^{+}	157.338^{+}	359.752^{+}	324.702^{+}
Carbonated and Sweetened Beverages (calories)				
Full Sample	251.583*$^{+}$	281.711*$^{+}$	317.617*$^{+}$	432.947*$^{+}$
Income < 1.85 FPL	273.631^{+}	282.945^{+}	344.261*$^{+}$	432.372*$^{+}$
Regular Fruits and Vegetables (calories)				
Full Sample	195.526*	168.427*	190.158*	167.848*
Income < 1.85 FPL	190.839	165.258	177.292	166.675
Protein (grams)				
Full Sample	73.417^{+}	71.561^{+}	81.042*$^{+}$	77.017*$^{+}$
Income < 1.85 FPL	71.759^{+}	71.011	78.374^{+}	77.597
Carbohydrates (grams)				
Full Sample	255.503^{+}	252.196^{+}	275.849^{+}	277.991^{+}
Income < 1.85 FPL	256.631^{+}	251.144^{+}	279.937^{+}	274.826^{+}
Fiber (grams)				

Full Sample	14.340*+	12.535*	15.058*+	12.695*
Income < 1.85 FPL	13.914*+	12.514*	14.836*+	12.671*
Total fats (grams)				
Full Sample	72.423+	71.707+	80.816+	78.028+
Income < 1.85 FPL	71.087+	71.710	76.843+	78.227
Saturated Fats (grams)				
Full Sample	23.883+	23.786+	26.238+	26.148+
Income < 1.85 FPL	23.446+	23.588+	24.910+	26.257+

*Indicates significant differences at the 95% level by food stamp status, conditional on work status.

+ Indicates significant differences at the 95% level by work status, conditional on food stamp status.

Table 11: Food Stamp Effects on Consumption Patterns by Employment Status (S.E.)

VARIABLES	(1) Convenience Outside Home	(2) Convenience at Home	(3) Regular Calories Outside	(4) CSB	(5) Regular Fruits and Vegetables
		Full Sample :N=8963			
d2 (Not Working)	-0.24**	0.107*	-0.266*	0.025	0.050
	-115 cal.	+68 cal.	-88 cal.	+8 cal.	+10 cal.
d4-d3 (Part-time Work)	0.33*	0.69***	0.20	0.42**	-0.66
	+159 cal.	+437 cal.	+65 cal.	+127 cal.	-125 cal.
d6-d5 (Full-time Work)	-0.19	-0.046	-0.55***	0.75***	0.03
	-93 cal.	-29 cal.	-181 cal.	+226 cal.	+6 cal.
		Income <=185% FPL:N=3886			
d2 (Non-Working)	-0.68***	-0.43***	-0.25	-0.25**	-0.001
	-300 cal.	-290 cal.	-68 cal.	-79 cal.	~0 cal.
d4-d3 (Part-time Work)	-0.39	0.30**	0.14	0.79***	-0.50**
	-173 cal.	+199 cal.	+36 cal.	+252 cal.	-90 cal.
d6-d5 (Full-Time Work)	0.02	-0.10	0.58*	-0.002	0.19
	+8 cal.	-66 cal.	+158 cal.	-1 cal.	+35 cal.

[a] Endogenous treatment effects identified through cross-state variation in average food stamp benefits and the unemployment rate.

Table 12: Food Stamp Effects on Nutrient Intake, by Employment Status (S.E.)

VARIABLES	(1) CSB	(2) Regular Fruits and Vegetables	(3) Protein	(4) Carbohydrate	(5) Fiber	(6) Total Fats	(7) Saturated Fat
			Full Sample :N=8963				
d2	0.025	0.050	0.006	0.00	-0.149***	0.016	0.054**
(Not Working)	+8 cal.	+10 cal.	+5 gms.	0 gms.	-11 gms.	+14 gms.	+10 gms.
d4-d3	0.42**	-0.66	-0.054	-0.025	-0.202***	0.027	0.052
(Part-Time Work)	+127 cal.	-125 cal.	-45 gms.	-117 gms.	-14.5 gms.	24 gms.	+10 gms.
d6-d5	0.75***	0.03	-0.03	0.007	0.039	-0.062**	-0.026
(Full-Time Work)	+226 cal.	+6 cal.	-22 gms.	+34 gms.	+3 gms.	-55 gms.	-5 gms.
			Income <=185% FPL:N=3886				
d2	-0.25**	-0.001	0.012*	0.006	-0.107**	0.001	0.030
(Not Working)	-79 cal.	~0 cal.	+9 gms.	+29 gms.	-7 gms.	+1 gms.	+5 gms.
d4-d3	0.79***	-0.50**	-0.09**	-0.017	-0.345***	0.016	0.036
(Part-Time Work)	+252 cal.	-90 cal.	-66 gms.	-78 gms.	-23 gms.	+13 gms.	+6 gms.
d6-d5	-0.002	0.19	0.015	-0.035	0.035	-0.039	0.023
(Full-Time Work)	-1 cal.	+35 cal.	+12 gms.	-167 gms.	+2 gms.	-31 gms.	+4 gms.

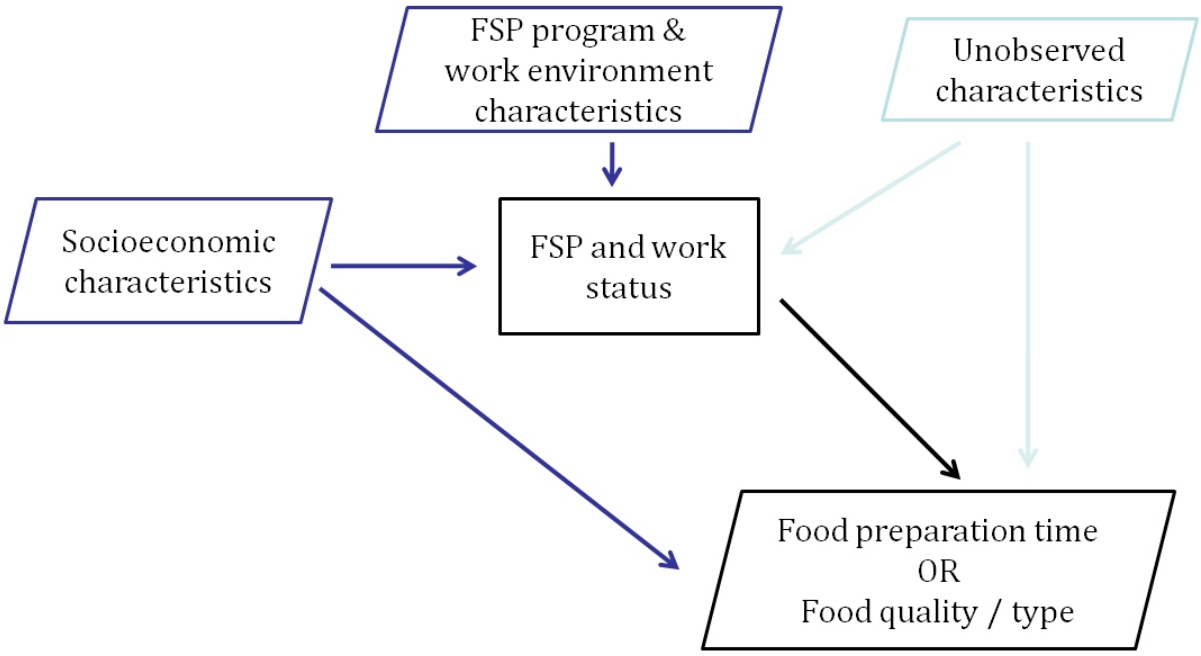
[a] Endogenous treatment effects identified through cross-state variation in average food stamp benefits and the unemployment rate.

Table 13: Marginal Effects of Food Stamps on Consumption Patterns and Nutrient Intake (in calories), by Employment Status - Alternate Instruments

	Not Employed	Part-time Work	Full-time Work
ELIGIBILITY THRESHOLD, UNEMP			
Poor Sample: Income<=185% FPL			
Convenience Food Outside Home	-115* cal.	-166 cal.	247** cal.
Convenience Food At Home	-291*** cal.	-85** cal.	-64 cal.
Regular Food Outside Home	-17 cal.	-239 cal.	126 cal.
Carbonated/Sweetened Beverages	-56 cal.	+104 cal.	-165*** cal.
Regular Fruits and Vegetables	+54 cal.	-111 cal.	-89 cal.
Protein	+9.5 gms.	-66** gms.	+12 gms.
Carbohydrate	+24.5 gms.	+83 gms.	-172 gms.
Fiber	-6.7** gms.	-23 gms.	+3 gms.
Total Fats	+1 gms.	+ 13.5** gms.	-31 gms.
Saturated Fat	+5 gms.	+6 gms.	+4 gms.
MAXBEN, UNEMP			
Poor Sample: Income<=185% FPL			
Convenience Food Outside Home	-254 cal.	-215 cal.	+106 cal.
Convenience Food At Home	+26 cal.	+490*** cal.	-58 cal.
Regular Food Outside Home	-22 cal.	-187 cal.	+169 cal.
Carbonated/Sweetened Beverages	-60 cal.	+266*** cal.	-9 cal.
Regular Fruits and Vegetables	0 cal.	-130 cal.	+3 cal.
Protein	+9 gms.	-67** gms.	+12 gms.
Carbohydrate	+29 gms.	-88 gms.	-172 gms.
Fiber	-6** gms.	-22*** gms.	+1 gms.
Total Fats	+1 gms.	+13.5 gms.	-31 gms.
Saturated Fat	+5 gms.	+6 gms.	+4 gms.

Figure 1

Conceptual Framework



Appendix A: Regular and Convenience Food Categories

Regular Foods

Milk and Milk Products

111-113 Milk, fluid (regular, buttermilk, dry, evaporated or condensed, imitation)
114 Yogurt
115 Flavored milk and milk drinks
116 Milk-based meal replacements
118 Milk, dry, and powdered mixtures
121-123 Creams and cream substitutes, sour cream
140-145 Cheese (natural, imitation, cottage, cream, processed and cheese spreads) excluding cheese mixtures and cheese soups

Meat, Poultry, Fish and Mixtures

200 Meat, unspecified
210-216 Beef (incl. beef patties, meatballs, dried beef), excluding beef baby food
220-226 Pork (including ham, bacon, cracklings) excluding pork baby food
230-233 Lamb, goat, veal, game; excluding baby food
241-244 Chicken, turkey, duck, other poultry; excluding poultry baby food
251 Organ meats and mixtures
261-263 Fish and Shellfish
271 Meat, Poultry or fish in gravy, sauce, or creamed
272 Meat, poultry, fish with starch item (includes white potatoes)
273 Meat, poultry, fish with starch item and vegetables
274 Meat, poultry, fish with vegetables (excluding white potatoes)

Eggs

311-312; 321, 324 Chicken and poultry eggs, egg dishes, meringues excluding egg sandwiches, egg soups
330-333 Egg Substitutes

Dried peas, beans, legumes, Nuts, Seeds

411-414 Dried peas, beans, lentils, soybean-derived products (excluding milks)
418-419 Meat substitutes (mainly legume protein), meat substitute sandwiches
421-425 Nuts, nut butters, nut mixtures
431 Seeds
441-442 Carob Products

Grain Products

500 Flour and dry mixes
510-518 Yeast breads, rolls
551-558 Pancakes, waffles, french toast, other grain products
561-562 Pasta, cooked cereals, rice
590 Meat substitutes, mainly cereal protein

Fruits

611-612 Citrus fruits, juices
621 dried fruits
631-634 Other fruits

641-644 Fruit juices and nectars excluding citrus

Vegetables

710-712, 715 White potatoes; baked, boiled, chips, sticks, mashed, stuffed puffed
716-717, 719 Potato salad, potato recipes, Puerto Rican starchy vegetables
721-722 Dark green leafy and non-leafy vegetables
731-734 Deep yellow vegetables excluding deep yellow vegetable soups
741-745, 747 Tomato and tomato mixtures excluding tomato soups
751-755 Other vegetables excluding other vegetable soups
771-775 vegetables with meat, poultry and fish

Fats, Oils, Salad Dressing

811-813 Fats (table, cooking , other)
821 Vegetable oils

Sugars, Sweets, Beverages

911 Sugars and sugar substitute blends
912 Sugar replacements or substitute
913 Syrups, honey, molasses, sweet toppings
914 Jellies, jam, preserves
921 Coffee
922 Coffee substitutes
923 Tea
940-942 Water, non-carbonated

Convenience Food

Milk and Milk Products

131, 132, 134 Milk Desserts Sauces and Gravies excluding baby food
146-147 Cheese mixtures and cheese soups

Meat, Poultry, Fish and Mixtures

252 Frankfurters, sausages, lunchmeats, meat spreads
275 Sandwiches with meat, poultry, fish
281-285 Frozen and shelf-stable plate meals, soups, gravies with meat, poultry, fish base; gelatin or gelatin-based drinks

Eggs

322-323 Egg sandwiches and Egg soups
350 Frozen plate meals with egg as major ingredient
Dried peas, beans, legumes, Nuts, Seeds
415-416 Soups and Frozen plate meals with legumes as major ingredient

Grain Products

521-524 Quick Bread (biscuits, cornbread, muffins, tortillas, popovers etc.)
531-533 Cakes, cookies, Pies, Pastries (including Danish, breakfast pastries, granola bars)
540-544 Crackers and salty snacks
570-576 Cereals, ready-to-eat or uncooked; excluding baby food
581-584 Grain mixtures, frozen plate meals, soups; excluding grain mixtures baby food

Vegetables

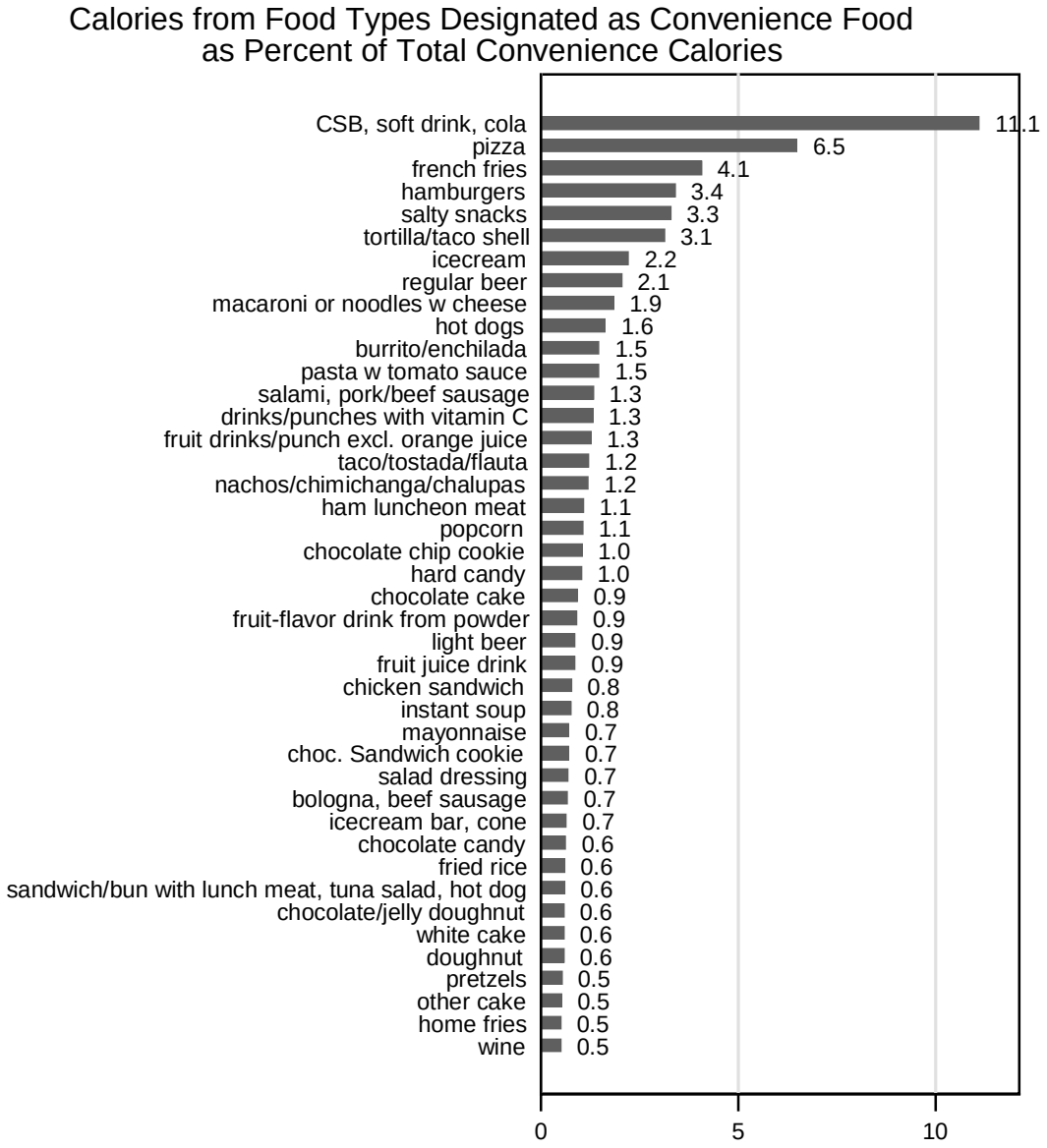
713-714 White potatoes, creamed, scalloped, au gratin, fried
718 Potato soups
723 Dark-green vegetable soups

735 Deep yellow vegetable soups
746 Tomato soups
756 Vegetable soups
Fats, Oils, Salad Dressings
831-832 Regular and low-calories salad dressings
Sugars, Sweets, Beverages
915-918 Gelatin desserts, popsicles, candies, chewing gum
924 Soft drinks, carbonated
925 Fruitades and drinks
9252 Fruitades and drinks, low calorie, unspecified as to vitamin c content
9253 Fruitades and drinks with added vitamin C, ready-to-drink or made from frozen concentrate
9254 Fruit-flavored drinks with added vitamin C, made from powdered mix
9255 Fruitades, drinks, and juice drinks, low calorie
9256 Beverages, low sugar, fruit-flavored, no vitamin C added, ready-to-drink
9257 Beverages, fluid replacement
9258 Beverages, fruit-flavored, fortified
926 Beverages, nonfruit
9265 Beverages, nonfruit, fortified (include energy drinks)
927 Beverages, noncarbonated, without vitamin C, made from powdered mixes
928 Nonalcoholic beers, wines, cocktails
929 Beverage concentrates, dry, not reconstituted
931-935 Alcoholic beverages

Carbonated or Sweetened Beverages (CSB)

924 Soft drinks, carbonated
925 Fruitades and drinks
9252 Fruitades and drinks, low calorie, unspecified as to vitamin c content
9253 Fruitades and drinks with added vitamin C, ready-to-drink or made from frozen concentrate
9254 Fruit-flavored drinks with added vitamin C, made from powdered mix
9255 Fruitades, drinks, and juice drinks, low calorie
9256 Beverages, low sugar, fruit-flavored, no vitamin C added, ready-to-drink
9257 Beverages, fluid replacement
9258 Beverages, fruit-flavored, fortified
926 Beverages, nonfruit
9265 Beverages, nonfruit, fortified (include energy drinks)
927 Beverages, noncarbonated, without vitamin C, made from powdered mixes
928 Nonalcoholic beers, wines, cocktails
929 Beverage concentrates, dry, not reconstituted
931-935 Alcoholic beverages

Figure A1



Excludes food types that account for <1% of all convenience calories
Food types included total 67% of all convenience calories
Labels are a general description of the actual food labels in the USDA coding system

Appendix B:

Table B1: Coefficients from Negative Binomial Treatment Effects Models of Food Preparation Time

VARIABLES	(1) Poor < 1.85 FPL	(2) Poor & Children Under 18 years	(3) Poor Female
D2, FS=1, Work=0	-0.068	0.015	-0.027
	(0.107)	(0.133)	(0.101)
D3, FS=0, PT=1	-0.933***	-0.951***	-0.912***
	(0.063)	(0.071)	(0.067)
D4, FS=1, PT=1	-0.457***	-0.448***	-0.438***
	(0.123)	(0.118)	(0.132)
D5, FS=0, FT=1	-0.493***	-0.598***	-0.477***
	(0.074)	(0.121)	(0.082)
D6, FS=1, FT=1	-0.367***	-0.437***	-0.323***
	(0.102)	(0.117)	(0.108)
18-24 years old	-0.342***	-0.308***	-0.418***
	(0.089)	(0.091)	(0.094)
25-34 years old	-0.039	-0.032	-0.074
	(0.048)	(0.049)	(0.052)
45-54 years old	0.179***	0.212***	0.144**
	(0.060)	(0.064)	(0.068)
55-64 years old	0.137*	0.148	0.179**
	(0.077)	(0.107)	(0.085)
No partner/spouse present	-0.156***	-0.185***	-0.285***
	(0.048)	(0.053)	(0.049)
# children < 18 years	0.093***	0.071***	0.090***
	(0.018)	(0.020)	(0.020)
Presence of child < 5 years	0.044	0.018	0.064
	(0.047)	(0.047)	(0.051)
Female	1.334***	1.296***	
	(0.061)	(0.075)	
Black	-0.133**	-0.118*	-0.102
	(0.061)	(0.066)	(0.068)
Hispanic	0.139***	0.133**	0.294***
	(0.050)	(0.053)	(0.054)
Less than High School	-0.056	-0.067	0.000
	(0.053)	(0.056)	(0.057)
Some college	-0.050	-0.055	-0.088*
	(0.049)	(0.052)	(0.053)
College graduate	-0.033	-0.042	-0.069
	(0.070)	(0.073)	(0.078)
Poverty to Income ratio (PIR)	-0.012	0.013	-0.024

	(0.019)	(0.022)	(0.022)
Winter	0.015	0.007	-0.014
	(0.050)	(0.054)	(0.055)
Summer	-0.007	0.013	-0.011
	(0.056)	(0.059)	(0.061)
Fall	0.036	0.041	0.028
	(0.062)	(0.065)	(0.067)
Weekday	0.147***	0.149***	0.173***
	(0.039)	(0.042)	(0.043)
Friday	-0.266***	-0.327***	-0.210***
	(0.072)	(0.078)	(0.075)
Northeast	0.126**	0.083	0.146**
	(0.059)	(0.063)	(0.064)
Midwest	0.020	-0.010	0.032
	(0.053)	(0.056)	(0.057)
West	0.097*	0.053	0.068
	(0.051)	(0.054)	(0.055)
Non-metropolitan area	-0.077	-0.085	-0.030
	(0.050)	(0.054)	(0.055)
Year=2006	0.029	0.024	0.005
	(0.045)	(0.048)	(0.049)
Year=2007	-0.023	-0.013	-0.017
	(0.047)	(0.050)	(0.052)
D4-D3	0.48***	0.50***	0.47***
	(0.13)	(0.13)	(0.15)
D6-D5	0.13	0.16	0.15
	(0.12)	(0.12)	(0.12)
D4-D2	-0.39***	-0.46***	-0.41**
	(0.15)	(0.18)	(0.18)
D6-D2	-0.29**	-0.45***	-0.30**
	(0.14)	(0.12)	(0.13)
Observations	4693	3940	3163

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Models use cross-state variation is the average food stamp benefit and in the state unemployment rate to identify effects.

Table B2: Coefficients from Negative Binomial Treatment Effects Models of Food Preparation Time –Controlling for Spousal Employment

VARIABLES	(1) Poor < 1.85 FPL	(2) Poor & Children Under 18 years	(3) Poor Female
D2, FS=1, Work=0	-0.017	0.059	-0.005
	(0.097)	(0.103)	(0.096)
D3, FS=0, PT=1	-0.933***	-0.941***	-0.917***
	(0.063)	(0.069)	(0.066)
D4, FS=1, PT=1	-0.425***	-0.415***	-0.415***
	(0.130)	(0.116)	(0.121)
D5, FS=0, FT=1	-0.469***	-0.564***	-0.479***
	(0.075)	(0.094)	(0.083)
D6, FS=1, FT=1	-0.355***	-0.420***	-0.307***
	(0.103)	(0.112)	(0.106)
18-24 years old	-0.339***	-0.304***	-0.414***
	(0.088)	(0.090)	(0.093)
25-34 years old	-0.038	-0.033	-0.079
	(0.048)	(0.049)	(0.052)
45-54 years old	0.194***	0.222***	0.156**
	(0.060)	(0.064)	(0.068)
55-64 years old	0.225***	0.206*	0.256***
	(0.079)	(0.107)	(0.087)
No partner/spouse present	0.131*	0.140*	-0.042
	(0.068)	(0.078)	(0.077)
# children < 18 years	0.086***	0.069***	0.083***
	(0.018)	(0.020)	(0.020)
Presence of child < 5 years	0.040	0.020	0.052
	(0.046)	(0.047)	(0.051)
Female	1.243***	1.185***	
	(0.063)	(0.073)	
Black	-0.132**	-0.121*	-0.101
	(0.061)	(0.066)	(0.068)
Hispanic	0.126**	0.120**	0.279***
	(0.050)	(0.053)	(0.054)
Less than High School	-0.046	-0.056	-0.000
	(0.052)	(0.056)	(0.056)
Some college	-0.052	-0.056	-0.090*
	(0.049)	(0.051)	(0.053)
College graduate	-0.016	-0.025	-0.065
	(0.069)	(0.073)	(0.078)
Poverty to Income ratio (PIR)	-0.024	0.001	-0.030

	(0.019)	(0.022)	(0.022)
Spouse Employed	0.400***	0.418***	0.323***
	(0.062)	(0.071)	(0.074)
Winter	0.017	0.005	-0.012
	(0.050)	(0.053)	(0.055)
Summer	-0.010	0.007	-0.016
	(0.055)	(0.058)	(0.060)
Fall	0.031	0.034	0.025
	(0.061)	(0.065)	(0.067)
Weekday	0.150***	0.152***	0.174***
	(0.039)	(0.042)	(0.043)
Friday	-0.269***	-0.331***	-0.206***
	(0.072)	(0.077)	(0.075)
Northeast	0.123**	0.082	0.142**
	(0.058)	(0.063)	(0.064)
Midwest	0.019	-0.013	0.036
	(0.052)	(0.055)	(0.057)
West	0.095*	0.054	0.070
	(0.051)	(0.054)	(0.055)
Non-metropolitan area	-0.087*	-0.095*	-0.033
	(0.050)	(0.054)	(0.055)
Year=2006	0.018	0.010	0.001
	(0.045)	(0.048)	(0.049)
Year=2007	-0.031	-0.023	-0.020
	(0.047)	(0.050)	(0.052)
D4-D3	0.51***	0.53***	0.50***
	(0.14)	(0.12)	(0.14)
D6-D5	0.11	0.14	0.17
	(0.12)	(0.11)	(0.13)
D4-D2	-0.41***	-0.47***	-0.41***
	(0.14)	(0.14)	(0.16)
D6-D2	-0.34***	-0.48***	-0.30**
	(0.13)	(0.12)	(0.13)
Observations	4693	3940	3163

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Models use cross-state variation is the average food stamp benefit and in the state unemployment rate to identify effects.

Appendix C:

Table C1: Coefficients from Negative Binomial Model of Consumption Patterns in Low-Income Population, NHANES 1999-2004

VARIABLES	(1) Convenience Calories Outside Home	(2) Convenience Calories @ Home	(3) Regular Calories Outside	(4) CSB	(5) Regular Fruits and Vegetables
D2, FS=1, Work=0	-0.680***	-0.433***	-0.251	-0.247**	-0.001
	(0.204)	(0.064)	(0.295)	(0.118)	(0.136)
D3, FS=0, PT=1	0.460	-0.207**	0.014	-0.412***	0.429***
	(0.377)	(0.088)	(0.389)	(0.146)	(0.104)
D4, FS=1, PT=1	0.068	0.089	0.149	0.379**	-0.074
	(0.283)	(0.134)	(0.288)	(0.167)	(0.209)
D5, FS=0, FT=1	0.712	-0.175**	0.083	0.382***	-0.255**
	(0.526)	(0.069)	(0.269)	(0.091)	(0.115)
D6, FS=1, FT=1	0.730	-0.273**	0.667**	0.380***	-0.062
	(0.607)	(0.124)	(0.286)	(0.128)	(0.159)
18-24 years old	0.285***	0.046	0.054	0.212***	-0.375***
	(0.101)	(0.064)	(0.108)	(0.073)	(0.087)
25-34 years old	0.124	0.120*	-0.154	0.239***	-0.320***
	(0.109)	(0.063)	(0.099)	(0.072)	(0.088)
45-54 years old	-0.220*	0.073	-0.221*	-0.201**	0.045
	(0.116)	(0.069)	(0.119)	(0.089)	(0.091)
55-64 years old	-0.468***	0.187**	-0.482***	-0.482***	0.108
	(0.169)	(0.073)	(0.164)	(0.111)	(0.103)
Female	0.196*	0.046	0.071	-0.068	0.087
	(0.115)	(0.045)	(0.101)	(0.056)	(0.063)
Less than High School	-0.191*	0.096*	-0.236**	0.149**	-0.188***
	(0.100)	(0.054)	(0.096)	(0.063)	(0.071)
Some college	0.052	-0.060	-0.018	-0.035	0.050
	(0.085)	(0.060)	(0.095)	(0.074)	(0.082)
College graduate	0.129	-0.342***	0.414***	-0.350***	0.118
	(0.113)	(0.090)	(0.124)	(0.105)	(0.110)
Black	-0.098	0.046	-0.048	0.076	0.130*
	(0.075)	(0.049)	(0.086)	(0.055)	(0.071)
Hispanic	-0.155	-0.015	0.024	-0.239***	0.236***
	(0.125)	(0.051)	(0.099)	(0.062)	(0.074)
Married or with Partner	-0.219**	0.084*	-0.132	-0.031	0.115*
	(0.091)	(0.046)	(0.082)	(0.056)	(0.065)
Household Size	0.041*	-0.011	0.005	-0.007	0.026
	(0.021)	(0.013)	(0.022)	(0.016)	(0.019)
Poverty to Income ratio (PIR)	0.251	-0.365**	0.152	0.114	-0.153
	(0.248)	(0.150)	(0.278)	(0.187)	(0.211)
PIR squared	-0.121	0.107	0.024	-0.064	0.094

	(0.125)	(0.078)	(0.131)	(0.097)	(0.112)
Weekday	-0.121*	0.080*	-0.202**	-0.068	0.060
	(0.074)	(0.046)	(0.080)	(0.055)	(0.063)
Friday	0.251**	-0.082	0.089	0.095	-0.063
	(0.108)	(0.069)	(0.119)	(0.085)	(0.106)
2001-2002 sample	-0.036	0.208***	-0.186**	0.011	-0.161**
	(0.077)	(0.052)	(0.090)	(0.060)	(0.070)
2003-2004 sample	0.009	0.208***	-0.082	-0.012	-0.011
	(0.091)	(0.055)	(0.099)	(0.062)	(0.075)
Log(daily calories)	0.958***	1.082***	0.792***	1.162***	0.772***
	(0.070)	(0.045)	(0.079)	(0.056)	(0.062)
D4-D3	-0.393	0.296	0.135	0.791	-0.503
	(0.570)	(0.143)	(0.534)	(0.186)	(0.226)
D6-D5	0.019	-0.097	0.584	-0.002	0.193
	(1.111)	(0.138)	(0.316)	(0.145)	(0.193)
D4-D2	0.747	0.522	0.400	0.627	-0.0733
	(0.425)	(0.135)	(0.485)	(0.187)	(0.218)
D6-D2	1.410	0.160	0.918	0.627	-0.0606
	(0.467)	(0.136)	(0.323)	(0.160)	(0.195)
Observations	3886	3886	3886	3886	3886

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Models use cross-state variation is the average food stamp benefit and in the state unemployment rate to identify effects.

Table C2: Coefficients from Negative Binomial Models of Nutrient Intake for Low Income Population, NHANES 1999-2004

VARIABLES	(1) Protein	(2) Carbohydrate	(3) Fiber	(4) Total Fat	(5) Saturated Fat
D2, FS=1, Work=0	0.012	0.006	-0.107**	0.001	0.030
	(0.027)	(0.016)	(0.047)	(0.020)	(0.026)
D3, FS=0, PT=1	0.005	0.005	0.181***	-0.014	-0.029
	(0.024)	(0.015)	(0.052)	(0.021)	(0.027)
D4, FS=1, PT=1	-0.086**	-0.011	-0.163**	0.002	0.006
	(0.036)	(0.028)	(0.079)	(0.036)	(0.046)
D5, FS=0, FT=1	-0.029	0.014	-0.126***	-0.006	-0.018
	(0.021)	(0.013)	(0.045)	(0.017)	(0.021)
D6, FS=1, FT=1	-0.013	-0.020	-0.091	-0.045	0.005
	(0.042)	(0.026)	(0.062)	(0.035)	(0.041)
18-24 years old	-0.059***	0.060***	-0.055	-0.027	0.014
	(0.022)	(0.014)	(0.033)	(0.018)	(0.023)
25-34 years old	-0.056**	0.035**	-0.089***	-0.035*	-0.035
	(0.023)	(0.015)	(0.034)	(0.020)	(0.024)
45-54 years old	0.006	-0.010	0.112***	0.025	0.028
	(0.025)	(0.017)	(0.041)	(0.022)	(0.028)
55-64 years old	0.046*	-0.035*	0.167***	0.063***	0.052*
	(0.027)	(0.020)	(0.044)	(0.024)	(0.031)
Female	-0.086***	0.034***	0.017	0.040***	0.075***
	(0.016)	(0.011)	(0.026)	(0.014)	(0.017)
Less than High School	-0.002	0.001	-0.022	-0.053***	-0.067***
	(0.019)	(0.013)	(0.028)	(0.017)	(0.020)
Some college	0.001	0.005	0.035	-0.022	-0.025
	(0.021)	(0.014)	(0.033)	(0.018)	(0.022)
College graduate	0.061**	-0.004	0.186***	0.004	0.009
	(0.028)	(0.021)	(0.052)	(0.027)	(0.038)
Black	0.017	-0.024*	-0.071***	0.030*	-0.002
	(0.018)	(0.012)	(0.027)	(0.016)	(0.020)
Hispanic	0.075***	0.023*	0.329***	-0.029*	-0.043**
	(0.019)	(0.012)	(0.030)	(0.017)	(0.020)
Married or with Partner	0.007	0.005	0.005	0.004	0.006
	(0.016)	(0.011)	(0.025)	(0.014)	(0.017)
Household Size	0.003	0.002	0.013	0.002	0.001
	(0.005)	(0.003)	(0.008)	(0.004)	(0.005)
Poverty to Income ratio –PIR	-0.006	0.014	-0.062	-0.005	-0.004
	(0.055)	(0.037)	(0.086)	(0.050)	(0.058)
PIR squared	-0.000	-0.007	0.021	0.002	0.017
	(0.028)	(0.018)	(0.045)	(0.025)	(0.029)
Weekday	-0.024	0.035***	-0.032	0.005	0.002

	(0.016)	(0.011)	(0.025)	(0.014)	(0.017)
Friday	0.003	-0.014	0.029	0.018	0.020
	(0.023)	(0.016)	(0.040)	(0.020)	(0.027)
2001-2002 sample	-0.007	0.003	0.064**	0.023	-0.016
	(0.018)	(0.012)	(0.028)	(0.015)	(0.018)
2003-2004 sample	-0.003	-0.013	0.077**	0.020	0.008
	(0.019)	(0.013)	(0.030)	(0.016)	(0.021)
Log(daily calories)	0.886***	0.927***	0.871***	1.075***	1.089***
	(0.020)	(0.011)	(0.029)	(0.015)	(0.024)
D4-D3	-0.090	-0.017	-0.345	0.016	0.036
	(0.039)	(0.030)	(0.097)	(0.038)	(0.049)
D6-D5	0.015	-0.035	0.035	-0.039	0.023
	(0.042)	(0.027)	(0.068)	(0.035)	(0.041)
D4-D2	-0.098	-0.017	-0.056	0.0012	-0.024
	(0.040)	(0.030)	(0.090)	(0.038)	(0.048)
D6-D2	-0.025	-0.026	0.016	-0.046	-0.025
	(0.045)	(0.028)	(0.071)	(0.036)	(0.043)
Observations	3865	3864	3860	3864	3867

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1