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Family Nutrition Programs

Understanding the Determinants of Supplemental Nutrition Assistance Program Participation

Final Report

United States Department of Agriculture

Food and Nutrition Service

December 2009

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Understanding the Determinants of Supplemental Nutrition Assistance Program Participation

Final Report

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Executive Summary

The Supplemental Nutrition Assistance Program (SNAP)—formerly known as the Food Stamp Program (FSP)—has been providing food assistance to low-income households since 1975.[1] In addition to being the largest food assistance program in the United States, it is unique among assistance programs in general in that it has almost no categorical participation requirements. Households in need may receive benefits regardless of whether any household members are children, or elderly, or disabled; whether they have ever worked; where they reside in the United States; or even whether they have a fixed address.[2]

As the agency responsible for administering SNAP, the Food and Nutrition Service (FNS) has always had a large stake in understanding the impacts of the program on participants' food expenditures, household food supplies, individual dietary intake, and food security. Understanding the effects of SNAP is more important today than ever, as the combination of a broad economic downturn and rising food prices increase participation in SNAP. In June 2009 the program served 15.9 million households at a cost of $4.7 billion, an astonishing increase of 23 percent in caseload and 61 percent in expenditures from a mere 12 months before.[3]

The most universally accepted way of ascertaining program impacts is comparison of outcomes between randomly assigned participant and control groups. In the case of SNAP, this would mean comparing outcomes for eligible households that are assigned to SNAP with outcomes for a control group of eligible households who are refused benefits over the life of the study. Such an assessment poses both legal and ethical challenges for SNAP, however.

FNS therefore developed a research agenda to address the question of whether a ***non-experimental*** approach to assessing impacts can yield estimates whose validity is accepted by the research community at large (Burstein *et al.*, 2005). A non-experimental design would involve comparing participants with non-participants, controlling for differences between the groups. Its validity would depend on whether the analyses sufficiently account for potential differences between those who do and do not participate in SNAP. A strong argument would be required that any differences in outcomes identified between treatment and comparison groups could be confidently attributed to the impact of SNAP, rather than to unobserved differences between the groups (i.e., to selection bias).

To assess the extent and feasibility of controlling selection bias requires a better understanding of the characteristics and circumstances that influence a household's decision to participate in SNAP. Therefore, one branch of the proposed research agenda focuses on identifying appropriate comparison groups for SNAP participants—or determining that this cannot be done. This would answer the question of whether or not it is possible to estimate the impact of SNAP participation non-

[1] The change in program name occurred on October 1, 2008, as part of the Food, Conservation, and Energy Act of 2008. The program is consistently referred to as SNAP throughout this report, although the data used pertain to earlier years when the program was called FSP.

[2] A few groups are excluded from the program, such as certain categories of aliens and fleeing felons. Able-bodied adults without dependents who do not meet specified employment or work program requirements are limited to three months participation in a three-year period.

[3] Source: http://www.fns.usda.gov/pd/34SNAPmonthly.htm, downloaded September 2009.

experimentally, and if so, move one step closer to that goal. The first three sequential steps proposed for this branch are:

- **Study 1:** Develop the best model of SNAP participation that can be achieved using extant survey data, based on a review of previous models. Test the newly-developed model to determine how far we have still to go in understanding participation.
- **Study 2:** Conduct interviews with low-income households to learn about their decision processes with regard to SNAP participation.
- **Study 3:** Build a new model of SNAP participation that includes variables reflecting findings from Study 2, probably using a new survey to collect data on these variables.

The current project corresponds to Study 1. Its objectives are to summarize existing research on the determinants of Supplemental Nutrition Assistance Program participation and assess the capacity of econometric models to correctly classify eligible households as participants or non-participants using available data.

This project was initially conceived, in Burstein *et al.* (2005), as a benchmark or springboard for further research on participation. The expectation was that it would produce an econometric model that is qualitatively similar to those that have been previously published. Instead, it became clear that available findings from the ethnographic literature can be used to generate hypotheses about participation and more robust econometric models.

The current study has three components:

1. Existing literature review: A review of available research on the determinants of SNAP participation among different types of households.
2. Participation model development: An analysis of data from the Survey of Income and Program Participation to identify factors that contribute to a household's decision to participate or not to participate in SNAP.
3. Model assessment and recommendations: An assessment of the "best" participation model, synthesizing findings from the literature review and model assessment, and recommendations for future research.

The Literature Review

Although this review was expected to focus primarily on previous econometric models of participation, two discoveries expanded our view of this study and its function in the broader research agenda. The first was identifying an ethnographic[4] literature that addresses the research question of Study 2. While ethnographers have not explicitly asked low-income households "Why do you participate in the Supplemental Nutrition Assistance Program?" they have asked questions like "How

[4] We use the term "ethnographic" broadly to refer to research based on unstructured or semi-structured interviews, focus groups, and participant observation. Most of the relevant literature aims at describing and understanding the experiences of low-income individuals or households.

do you meet your needs for food?" The responses show how SNAP fits into a wide array of coping mechanisms. The second was learning that the database used in this study, the Survey of Income and Program Participation (SIPP), contains many potentially relevant measures beyond the standard socioeconomic factors.

The findings from the ethnographic studies suggest that the decision-making paradigm underlying previous econometric participation models may be inadequate. Rather than weighing family costs and benefits of participating in SNAP based solely on their needs and resources, low-income households choose from a broad array of subsistence strategies in which the attractiveness of any one depends on the ever-changing set of available alternatives. The literature review thus provided a wider set of psycho-social concepts that, in addition to basic economic factors, may frame a household's SNAP participation decision.

Through this approach, we identified many potentially relevant predictors of participation. A model was developed that includes as many of these predictors as could be measured in the SIPP. The review of both quantitative and qualitative literature identified a large set of potentially relevant covariates that have been discussed in research related not only to food stamps, but also in research on poverty and food security more generally. The qualitative research led us to a number of predictors of participation that had not been included in previous quantitative models of SNAP participation. Many of these variables are measured in SIPP. They include variables such as respondents' reliance on friends and family in times of hardship, beliefs about help from people in their community, and attitudes about taking government assistance or charity.

Model Development

The results of this literature survey guided our modeling approach. We searched the SIPP for questions that measured as many of the concepts identified in the literature review as possible. We also supplemented SIPP data with information from three other sources: the SNAP Rules Database developed by the Urban Institute, which documents variations in SNAP eligibility criteria and policies among States and over time; the Bureau of Labor Statistics' monthly data series on unemployment rates, which document variations in economic conditions among States and over time; and additional data on SNAP parameters provided by FNS.

Issues and recommendations discussed in the literature also guided our econometric approach to the model. The conceptual approach we have taken is to relate SNAP participation by eligible households in a particular month to participation factors including measures of household needs, household resources, personal preferences and traits, SNAP policies, and economic conditions. Within this framework, several modeling approaches were used that varied in terms of which predictors were included and the econometric techniques applied.

The development process resulted in two primary models:

- The *Standard* model, which includes only measures of what are generally recognized to be (and commonly tested as) key factors in SNAP participation, mostly economic factors, and that are available in a wide variety of surveys.

- The *Expanded* model, which incorporates additional factors that were identified through our literature review to the measures in the *Standard* model. This model is more extensive than the *Standard* model, but remains interpretable and parsimonious.

We found that the most important variable by far in the *Expanded* model was an indicator of whether the household had received food stamps at any time in the past. This finding probably reflects a combination of factors: that having participated in the past makes it easier for a household to participate currently; that the models may omit some factors that caused both past and current participation; and that households that misreport current participation may likewise misreport past participation.

Our "best" model, judged in terms of explanatory power, interpretability, and parsimony, is the Expanded model, including prior participation. This model indicates that the following factors are strongly related to SNAP participation among eligible households (with the directions of the relationships shown in parentheses):

- State SNAP policies, in particular the use of biometric technology such as fingerprinting and the use of short certification periods (negative).
- Household current and projected needs, as measured by the numbers of children under age 5, the number of children aged 5 to 12, and the State unemployment rate (positive).[5]
- Household resources, as measured by income relative to poverty and net worth (negative).
- Personal preferences and traits, as measured by bad health (positive), education of the head of the household and other adults in the household (negative), receipt of TANF any time in the past or present (positive), and the composition of household income (earnings (negative) versus means-tested cash and non-cash benefits (positive)).
- Demographic characteristics, in particular whether the household head was married (negative).

Other factors included in the best model that did not show significant relationships with SNAP participation after including the above-mentioned variables were additional measures of household needs (numbers of household members in other age groups, child care expenses, child support expenses, recent change of address) and additional measures of demographics (age, race, and ethnicity of the household head).

We also explored a model that included a larger set of the factors identified in the literature review but that were available for only one of the five waves of data in our analysis sample. Among the significant participation factors in this extended model were having difficulty performing household tasks and several proxies for attitudes regarding receipt of assistance. While these were not included in the final model due to their limited availability, they should be considered as desirable elements for future data collection and model estimation. Other supplemental factors that were tested but did not have significant effects included community networks, material hardships, difficulty hearing or speaking, not speaking English, and depression or anxiety.

[5] A finding that requires further research is that the presence of substantial out-of-pocket medical expenses, which would have been expected to be positively associated with SNAP participation, is negatively associated with participation. The cause may be the correlation of this variable with the measure of bad health.

Several other extensions of the model using the full sample were not found to improve its predictive power.

- Trigger events, or indicators that the household had recently experienced a marked change in circumstances, did not perform well in models that already included measures of the household's circumstances after these events occurred.
- Interaction terms drawn from subgroup analyses (stratifying the sample by household type and the State unemployment rate) did not perceptibly improve the model.
- An indicator of the expansion of the Disaster Supplemental Nutrition Assistance Program associated with Hurricane Katrina did not have a significant effect.

Our best model in linear form produced a large proportion of negative predicted values. Use of logistic functional form solved this problem and substantially improved the fit of the *Expanded* model.

Model Assessment and Recommendations

Whether the project found a "sufficiently good" model to address selection bias is a matter of analytic judgment. This project produced models which predict SNAP participation with over 75 percent accuracy. Regardless of the accuracy of prediction, the key question is whether the remaining sources of variation are most likely systematic, and related to the outcomes of interest (e.g. food expenditures, household food supplies, food security, individual dietary consumption). If so, they pose a threat of selection bias. If instead they are essentially random fluctuations in participation behavior, then they will not be a source of selection bias. The analysis results suggest this may be the case, by the following chain of reasoning:

1. The *Standard* model appeared to omit key factors that could cause selection bias.
2. Most potential participation factors discussed in the literature were measured at least roughly in the SIPP.
3. The *Expanded model with prior participation* included the SIPP versions of many of these factors, and represented a substantial improvement over the *Standard* model in terms of predictive power.
4. The *Expanded model with additional supplemental variables* suggested several other participation factors that could improve predictive power.
5. Three ways that the predictive power of the *Expanded model* might be improved further are through (a) refining the measurement of the factors in the model (e.g., measures that are more reliable); (b) deriving new measures of the few omitted factors (based, say, on lengthy qualitative interviews with low-income families); or (c) identifying new factors through additional search of the research literature in economics, psychology, sociology.
6. It seems unlikely that the first two of these strategies would make a substantive difference to the model, based on the fact that most of the additional supplemental variables made no contribution, and that other elaborations of the *Expanded* model (i.e., with trigger events, with interactions) did not further increase the predictive power of the model.
7. It also seems unlikely that some important determining factors have been ignored to date not only by economists who have studied SNAP participation but also by sociologists and other social scientists who have studied how low-income households meet their food needs.

8. The residual variation is therefore plausibly simply random, rather than systematic.

While this claim is a matter of judgment, and readers are free to draw their own conclusions, the analyses presented here suggest limited return from development of new participation factors.

The conclusion has important implications for the research agenda developed by FNS to study the impact of SNAP (Burstein *et al.*, 2005). ***The findings reported here suggest that performing Study 2 may not improve the predictive accuracy of the model sufficiently to justify the costs of that study.*** An alternative is to modify to goals for Study 3 to include tests of the value of participation model for estimating impacts. It might also be possible to replace the new data collection effort of Study 3 with extant data. Using either extant or new data, a model similar to those developed in this study would be used as the basis for propensity score analysis of a SNAP outcome (e.g., food expenditures, food security, or dietary quality), and statistical tests would be performed to estimate bounds on the magnitude of remaining selection bias.

The challenges of using extant data for such a study are substantial. Although a good set of explanatory variables needed for this task are included in the SIPP, outcome variables are lacking. SIPP does not collect any information on food consumption or expenditures, collects food security measures only in a single wave (not a wave for which high quality eligibility data is available), and collects minimal information on health.[6] Furthermore, underreporting of SNAP participation may be related to observable characteristics, leading to bias in the estimation of relationships (Meyer and Sullivan, 2009). One promising approach is to compare the distribution of participant characteristics in administrative and survey data to determine which types of households are most prone to underreporting, and adjust the survey weights to reflect this information. The distribution of participant characteristics in the survey would be made to match the distribution in the administrative data, without altering the distribution of characteristics for participant and non-participant households combined. For example, members of a group that comprised 10 percent of program participants in the administrative data, but only 5 percent of program participants in the survey, would be given greater weights if they are reportedly participants, and smaller weights if they are reportedly non-participants.

Other data sources that might be considered include the Current Population Survey, the Panel Study of Income Dynamics, the Survey of Program Dynamics, and the National Longitudinal Survey of Youth. These and other available surveys would have to be reviewed and evaluated to determine whether any are appropriate for this analysis, based on factors including sample size, quality of participation data, and availability of appropriate outcome, eligibility, and explanatory variables. It may be that no single extant data source has all the elements required, and that new data collection that included information on both dietary outcomes and the participation factors that have been identified is necessary in order to proceed.

[6] The two SIPP measures that seemed most promising as outcome measures of SNAP impacts are health status and food security. However, food security is only measured in Wave 8, which is fielded 8 months after Wave 6, the wave from which much of the eligibility information would have to come. Self-reported health status is included in Waves 3, 6, and 9, the waves with detailed eligibility data. Although food security is a closely related outcome, the timing of the questions makes it far from ideal as an outcome measure, and although health status is measured at the correct time, its relationship with food consumption is too tenuous to be recommended as the sole outcome measure.

Conclusion

Contrary to our expectations when we developed the full research agenda, this study has found that extant data such as the SIPP can be used to estimate models of SNAP participation that include many non-standard factors.

A deeper understanding of participation is of importance and value in its own right, to enable FNS to tailor its program services and outreach most effectively. We conclude, however, that for purposes of developing program impact estimates, it may not be necessary for FNS to develop additional measures of participation factors based on in-depth interviews with low-income households. Instead, FNS could proceed to test the propensity score approach for suitability in a large-scale national study. It will be essential to allay the concerns of the research community regarding the feasibility and validity of a non-experimental approach to estimating SNAP impacts before engaging in such a major undertaking. Such a test might be done using extant data, if any can be found with suitable measures of both participation factors and nutritional outcomes. Alternatively, FNS could collect new data modeled on parts of the SIPP supplemented with outcomes data.

Chapter One: Introduction

The Supplemental Nutrition Assistance Program (SNAP)—formerly known as the Food Stamp Program (FSP)—has been providing food assistance to low-income households nationwide since 1974.[7] In addition to being the largest food assistance program in the United States, it is unique among assistance programs in that it has it has almost no categorical participation requirements. Households in need may receive benefits regardless of whether any household members are children, or elderly, or disabled; whether they have ever worked; where they reside in the United States; or even whether they have a fixed address. [8]

The Food and Nutrition Service (FNS) has a large stake in understanding the impacts of the program on participants' food expenditures, household food supplies, individual dietary intake, and food security. This issue is more important today than ever, as the combination of a broad economic downturn and rising food prices increase participation in SNAP. In June 2009 the program served 15.9 million households at a cost of $4.7 billion, an astonishing increase of 23 percent in caseload and 61 percent in expenditures from a mere 12 months before.[9]

The most universally accepted way of ascertaining program impacts is comparison of outcomes between randomly assigned participant and control groups. In the case of SNAP, this approach has been ruled out because SNAP is an entitlement program, and hence it is not legally or ethically possible to create a control group by denying services to eligible applicants.

In light of the barriers to mounting a random assignment study of the impacts of SNAP, FNS has developed a research agenda to address the question of whether a ***non-experimental*** approach to assess impacts could yield estimates whose validity would be accepted by the research community at large (Burstein *et al.*, 2005). Perceived validity would depend on whether the analyses performed sufficiently account for differences between those who do and do not participate in SNAP. A strong argument would be required that any differences in outcomes identified between treatment and comparison groups could be confidently attributed to the impact of SNAP, rather than to unobserved differences between the groups (i.e., to selection bias). To assess the extent and feasibility of controlling that bias, we need a better understanding of the characteristics and circumstances that influence a household's decision to participate in SNAP.

One branch of the FNS research agenda is dedicated to identifying appropriate comparison groups for SNAP participants—or determining that this could not be done. This would answer the question of whether it is possible to estimate the impact of SNAP participation non-experimentally, and if so, move us one step closer to that goal. Comparison groups for participants should be eligible non-

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7 The change in program name occurred on October 1, 2008, as part of the Food, Conservation, and Energy Act of 2008. The program is consistently referred to as SNAP throughout this report, although the data used pertain to earlier years when the program was called FSP.

8 A few groups are excluded from the program, such as certain categories of aliens and fleeing felons. Able-bodied adults without dependents who do not meet specified employment or work program requirements are limited to three months participation in a three-year period.

9 Source: http://www.fns.usda.gov.pd/34SNAPmonthly.htm, downloaded September 2009.

participants, who comprise about a third of the eligible population (Wolkwitz, 2008). The first three sequential steps proposed for this branch are:

- Study 1: Develop the best model of participation that can be achieved using extant survey data, based on a review of previous models. Test the newly-developed model to determine how well we understand participation.
- Study 2: Conduct interviews with low-income households to learn about their decision processes with regard to SNAP participation.
- Study 3: Build a new model of SNAP participation, using especially collected data from a new survey with items reflecting the findings from Study 2.

This report describes the results of Study 1. Its objectives are to summarize existing research on the determinants of Supplemental Nutrition Assistance Program participation and assess the capacity of econometric models to correctly classify eligible households as participants or non-participants using available data.

The study has three components:

1. Review existing literature: A review of available research on the determinants of SNAP participation among different types of households.
2. Develop participation model: An analysis of data from the Survey of Income and Program Participation (SIPP) to identify factors that contribute to a household's decision to participate in SNAP.
3. Assess model and develop recommendations: An assessment of the "best" participation model, synthesizing findings from the literature review and model assessment, and recommendations on potentially promising types of data currently omitted from survey sources.

This study was initially conceived as a benchmark or springboard for further research on participation, under the supposition that it would produce an econometric model that was qualitatively similar to those that have been previously published. The role of this project has expanded, however, to subsume in part the objectives of Study 2. Whereas the overall research agenda proposed to conduct new interviews with SNAP participants as a source of factors other than the standard ones such as household income, composition, and demographics in their participation decision, it has become clear that possibly relevant factors could alternatively be identified based on findings from the ethnographic literature. Two insights changed our view of the scope of this study and its potential function in the research agenda.

- Our understanding that the data we will be analyzing, the Survey of Income and Program Participation (SIPP), contains many potentially relevant measures beyond the standard factors, such as measures of household reliance on friends and family in times of hardship. Thus, even using extant data we could test broader models of participation.

- The realization that we could use results from an ethnographic[10] literature that indirectly addresses the research question of Study 2. While ethnographers have not explicitly asked low-income households "Why do you participate in the Supplemental Nutrition Assistance Program?" they have asked questions like "How do you meet your needs for food?" The responses show how SNAP fits into a wide array of coping mechanisms.

The content of the ethnographic studies suggested to us that the decision-making paradigm underlying previous econometric participation models may be inadequate. Rather than weighing in isolation the costs and benefits of participating in SNAP based solely on their needs and resources, low-income households may choose from a broad array of subsistence strategies in which the attractiveness of any one of them depends on the ever-changing set of available alternatives. The literature review was thus used to identify the wider psychological concepts that, in addition to basic economic factors for a household, may frame the household's SNAP participation decision. It also provided suggestions about how the various concepts might be applied in developing and estimating a participation model.

The results of this literature survey guided our modeling approach. We searched the SIPP for questions that measured as many of the concepts identified in the literature review as possible. We also supplemented SIPP data with information from two main sources: the SNAP Rules Database developed by the Urban Institute, which documents variations in SNAP eligibility criteria and policies among States and over time; and the Bureau of Labor Statistics' monthly data series on unemployment rates, which document variations in economic conditions among States and over time.

Issues and recommendations discussed in the literature also guided our econometric approach to the model. The conceptual approach we have taken is to relate SNAP participation by eligible households in a particular month to participation factors including measures of household needs, household resources, personal preferences and traits, SNAP policies, and economic conditions. Within this framework, a variety of modeling approaches were explored that varied in terms of which predictors were included and the econometric technique applied.

This report focuses on the two primary models that resulted from this process:

- The *Standard* model, which includes only measures of what are generally recognized to be (and commonly tested as) key factors in SNAP participation.
- The *Expanded* model, which incorporates in the *Standard* model additional factors that were identified through our literature review and that could be measured based on SIPP data. While more extensive than the *Standard* model, this model remains interpretable and parsimonious, and one version of it is our "best" model.

We also discuss other models that were explored in order to arrive at these final models, including

- The *Expanded Model with Trigger Events*, which incorporates measures of recent changes in circumstances that could affect program participation.

[10] We use the term "ethnographic" broadly to refer to research based on unstructured or semi-structured interviews, focus groups, and participant observation. Most of the relevant literature aims at describing and understanding the experiences of low-income individuals or households.

- The *Expanded Model with Supplemental Measures*, which is run on a small subsample of households in order to allow inclusion of items from special topical modules. The additional variables include measures of factors such as the quality of the support network available to the household.
- The *Expanded Model Applied to Subgroups*, which shows how participation patterns vary depending on households' recent program participation, demographic composition, and economic environment.
- The *Expanded Model with Interaction Terms*, which incorporates findings from the subgroup analyses to the full sample.

The models are estimated using linear regression with clustered standard errors. The final model is re-estimated using logistic regression with clustered standard errors.

The remainder of this report comprises four chapters. Chapter Two reports the results of our literature review, focusing on the factors that have been determined or hypothesized to be related to participation in the Supplemental Nutrition Assistance Program. Chapter Three describes the data and methods used to develop our models, including the method used to determine SNAP eligibility. Chapter Four presents our models and their results, along with model validation and supplementary analyses. Conclusions and recommendations appear in Chapter Five.

Chapter Two: Existing Literature

The first major objective of the project was to draw upon existing research literature to develop an approach to modeling participation in the Supplemental Nutrition Assistance Program. This chapter begins by describing recent econometric analyses of SNAP participation, with attention both to their methods and to their underlying logic models.

Moving from the question of "what *has* been done" to "what *might* be done," the second section examines several bodies of literature that had the potential to offer different perspectives and insights on SNAP participation. These included reports of SNAP participant and non-participant reasons for their choice, quantitative models of food insecurity, qualitative studies of low-income households' strategies for coping with food insecurity, and qualitative studies of general low-income subsistence strategies. The literature was searched using two primary approaches: automated database searches, and "snowballing". We searched databases including Academic Search Premier, PsycInfo, and EBSCOhost using keywords such as food stamps, participation, and food security. In the snowballing approach, we looked at the research that was cited in particularly relevant papers and reports to ensure we had key research that was commonly referenced.

Information from all of these sources was used to refine the basic logic model of SNAP participation derived from the econometric studies. The final section of this chapter presents this expanded logic model and its rationale, which underlie the modeling strategy.

Lessons about SNAP Participation from Standard Econometric Models

Our review of the literature began with econometric models of SNAP participation that used large datasets and regression modeling to study the factors that influence SNAP participation. The participation model presented in subsequent chapters follows this general approach, building on the econometric studies described here.

Although econometric models of SNAP participation have nearly a 30-year history, we focused on 12 recent studies selected to show the range of ideas and approaches in current use. Studies that used the Survey of Income and Program Participation (SIPP) are of particular interest, because the analysis conducted in this project uses SIPP data. Others were included to highlight predictors that are not available in the SIPP. Exhibit 2.1 summarizes the 12 studies included in this section.

Underlying Logic Model

Although only some of the authors explicitly presented logic models of participation, similar implicit models of rational behavior can be said to underlie all of this research. The logic model assumes that each month, households that are eligible for food stamps assess the benefits of program entry or continued participation relative to the costs (Exhibit 2.2). Their considerations

Exhibit 2.1

Recent Econometric Studies of Supplemental Nutrition Assistance Program Participation

Study	Data Source	Sample Size	Dependent Variables	Population Studied	Focal Participation Factors	Methodological Approach	Controls			
							Demographic Characteristics	Socioeconomic Characteristics	Household Composition	Local Economic Conditions
Bartlett, Burstein, and Hamilton (2004)	Researcher-conducted telephone interviews	976 households	Awareness of eligibility, completion of application	Food stamp eligible households	Local office policies and procedures	Logistic models	✓	✓	✓	✓
Bhattarai, Duffy, and Raymond (2005)	Current Population Survey (CPS), March and April 1999	3,010 households	Participation in SNAP and food pantries	Households with income less than 125% of poverty	Receipt of other government benefits, length of food stamp application	Bivariate probit	✓	✓	✓	
Cancian et al. (2001)	State (WI) administrative data	15,707 individuals	Participation in SNAP and Medicaid	Single mothers in WI who left AFDC/TANF in late 1995 and late 1997	Recent employment and welfare receipt, # of quarters eligible for SNAP	Probit of participation at any time in year after leaving AFDC/TANF	✓	✓	✓	✓
Daponte (2000)	Survey of low-income households in Allegheny County, PA	398 households	Participation in SNAP, use of food pantries, use of both, use of neither	Households in Allegheny Co. below 185% of poverty over-representing food pantry users	Percent of household expenditures on shelter, distance to food pantry, household has bank account	Multinomial logit	✓	✓	✓	

Exhibit 2.1 (Continued)

Recent Econometric Studies of Supplemental Nutrition Assistance Program Participation

Study	Data Source	Sample Size	Dependent Variables	Population Studied	Focal Participation Factors	Methodological Approach	Controls			
							Demographic Characteristics	Socioeconomic Characteristics	Household Composition	Local Economic Conditions
Farrell et al. (2003)	SIPP, 1996 panel	1,994-3,387 households	SNAP participation	Income-eligible and fully eligible households	Permanent income, persistent poverty	Linear probability model, instrumenting for current income with past and future income	✓	✓	✓	
Gleason et al. (1998)	SIPP, 1990 and 1991 panels	3,316 spells	SNAP exits and re-entries	SNAP participants	Welfare receipt, number of months spell has been in progress, trigger events	Maximum likelihood estimation	✓	✓	✓	✓
Gundersen and Oliveira (2001)	SIPP, 1991 and 1992 panels	3,439 households	SNAP participation, food insufficiency	SNAP-eligible households	Food insufficiency; expected SNAP benefits; stigma	Probit models	✓	✓	✓	
Haider et al. (2003)	Health and Retirement Study (HRS), 1998 and 2000 waves	19,590 individuals	SNAP participation	Individuals over 50 yrs old	Benefit level, income, assets, wealth, barriers to participation	Logistic models	✓	✓		

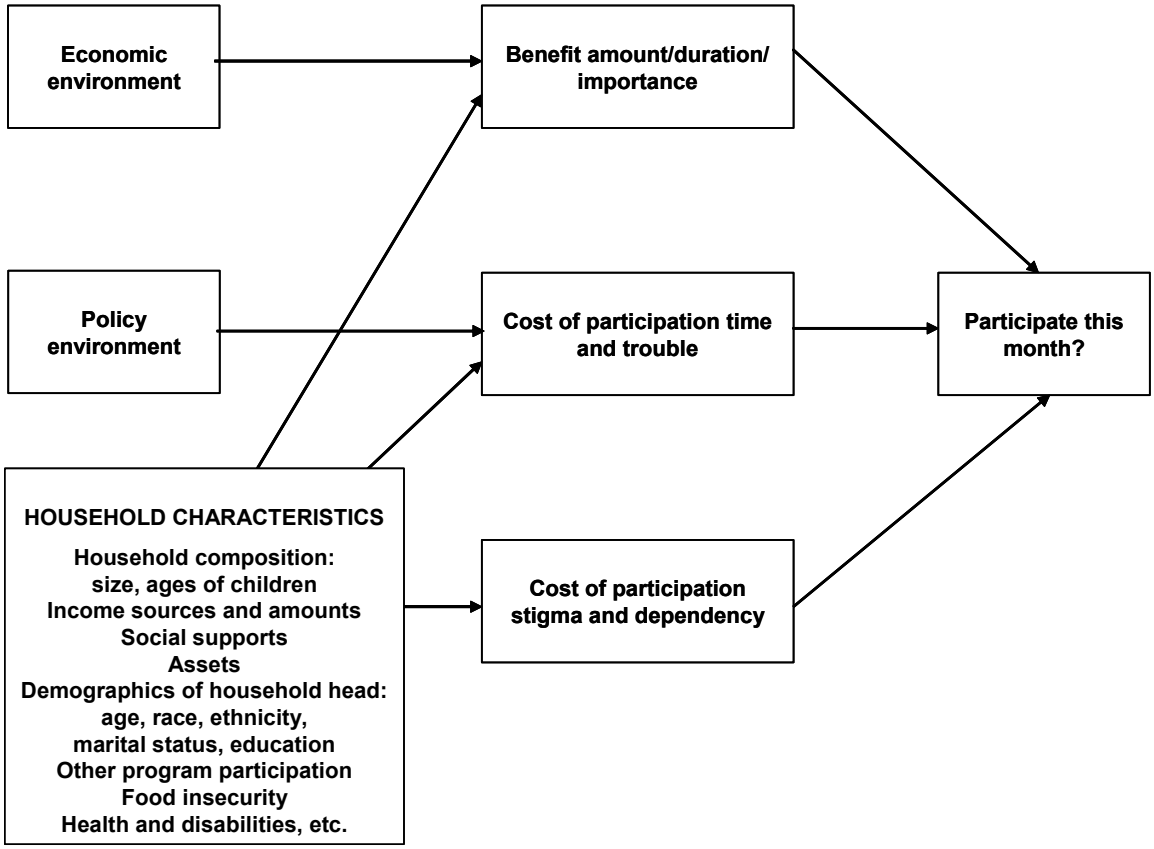
Exhibit 2.1 (Continued)

Recent Econometric Studies of Supplemental Nutrition Assistance Program Participation

Study	Data Source	Sample Size	Dependent Variables	Population Studied	Focal Participation Factors	Methodological Approach	Controls			
							Demographic Characteristics	Socioeconomic Characteristics	Household Composition	Local Economic Conditions
Hanratty (2006)	SIPP, 1996 and 2001 panels	12,600 families	SNAP participation	Gross-income-eligible families with a household head 18-60yrs old who is a legal U.S. resident, with children	State-level SNAP policies, State-level AFDC/TANF policies, mobility	Fixed effects linear probability models	✓	✓	✓	✓
Hernandez and Ziol-Guest (2006)	The Fragile Families and Child Well-Being Study	4,898 births	SNAP and WIC participation	Non-marital births in U.S. cities with populations > 200,000 in 1999	Family structure, income volatility, public assistance receipt, child and maternal health, material hardship	Household level linear probability models	✓	✓		✓
Hisnanick and Walker (2000)	SIPP, 1996 panel	9,302 individuals	SNAP exits	SNAP participants	Welfare reform, past SNAP experience, labor force participation	Logistic models	✓	✓		
McKernan and Ratcliffe (2003)	SIPP, 1990 and 1996 panels	134,780 individuals	SNAP participation	Working-age adults (18-59) in low-income households	Employment status and work hours of adults in household, income volatility, State- level SNAP policies	Fixed effects logistic models	✓	✓	✓	✓

Exhibit 2.2

Logic Model of Supplemental Nutrition Assistance Program Participation



in making this cost/benefit assessment include size and perceived value of the monthly benefit amount and the likelihood of improvement/worsening of the household's economic circumstances; and the costs of participating, in terms of time and trouble as well as stigma and sense of dependence.

The direct determinants of participation, represented by the three boxes in the middle column of Exhibit 2.2, were rarely represented explicitly in the econometric models we reviewed. Instead, the models generally included more distal determinants that are expected to proxy for or to influence the individual's evaluation of costs and benefits, usually *household characteristics*. Along with household characteristics, half of the studies included measures of the *economic environment* as proxies for the expected duration of SNAP benefits, and half of the studies used assorted measures of the State *policy environment* as indicators of the ease or difficulty of application and participation. Exhibit 2.3 lists the factors that the studies used as predictors of participation.

Exhibit 2.3

Variables Included in Recent Econometric Studies that Were Reviewed

Section of Logic Model	Variable
Benefit Amount/ Duration/ Importance	Benefit amount (actual) Food insecurity
Costs of Participation: Time and Trouble	Length of SNAP application Required trips and meetings for application
Costs of Participation: Dependency and Stigma	Perceived stigma (imputed)
Economic Environment	County unemployment rate State unemployment rate State average wage rates (for service workers, for manufacturing, minimum wage) State GDP Region/county Urban/rural Food pantry availability
Policy Environment	State SNAP policies: length of SNAP application form, recertification periods, EBT use, simplified/ semiannual reporting, vehicle exemptions Other State policies: AFDC/TANF benefit, AFDC-UP and GA caseloads Local SNAP policies and procedures (wide variety) State political environment, as proxy for community norms
Personal/ Household Characteristics	Demographics of household head: race/ethnicity, age, education, marital status, immigrant status, citizenship Demographics of other household members Household composition: structure, numbers Employment and earnings: employment status, earnings amount, hours, volatility, # of jobs, work registrant, ABAWD Health: physical, mental, disabilities, for adults and children Assets: financial assets, home ownership, vehicles Income: current, annual average, future, volatility Participation in means-tested programs: AFDC/TANF, prior food stamp receipt, others Financial contributions from friends and family Food security, material hardship, shelter costs relative to income Dynamics of circumstances: number of quarters eligible for SNAP, family structure volatility, moved in last 4 months

Lessons about SNAP Participation from Other Research

The second major component of the literature survey addressed the question of whether Supplemental Nutrition Assistance Program participation may be influenced by factors beyond those included in the econometric models described above. We turned first to studies that focused on households' stated reasons for participating or not participating in SNAP. In addition, we reviewed studies about alternative ways that families may meet their food needs, studies of the determinants of food insecurity, and studies of low-income households' subsistence strategies. Exhibit C.1 (in Appendix C) lists the studies that we reviewed and briefly describes the nature of the research they involved. Studies are listed in groups paralleling the five subsections below.

Several broad themes emerged from this review. First, the SNAP participation decision is just one in a set of choices households make in defining and meeting their food needs. Second, the SNAP participation decision occurs in the context of a broader attempt by members of the household to match an array of household needs against an array of potential resources in a way that reflects personal values and responds to daily changes in both needs and resources. Additional contextual factors in the SNAP participation decision for potential participants are their view of themselves as independent and their concern about how others view them. Econometric models in the literature often proxy for these factors by including related household demographic characteristics such as age, race, and ethnicity.

Stated Reasons for (Non-)Participation

One way to learn why some eligible households fail to participate in SNAP is to ask them in a survey. The literature search identified 19 studies over the past three decades that have done so (see Exhibit C.1).

The USDA commissioned two comprehensive research projects examining reasons for eligible households' non-participation, including national sample surveys that asked apparently eligible respondents for their reasons. The other studies used either broad national surveys that asked a few questions about SNAP participation or special-purpose surveys of selected populations or areas.

The major categories of reasons identified in these studies include: being unaware of SNAP or how to apply; perceiving oneself as ineligible; wanting to avoid dependence on government assistance; perceiving SNAP application or participation requirements as too burdensome; feeling social stigma associated with SNAP participation; expecting that program benefits would be too small to be worthwhile; and having previous bad experiences with SNAP or other programs. Respondents commonly affirm multiple reasons within and across these categories. In a survey of eligible non-participants that offered respondents 17 possible reasons for non-participation, the average respondent selected 4.9 reasons. In general, the most common reasons were perceiving oneself to be ineligible, wanting to avoid dependence on government assistance, and the perceived difficulty or "hassle" of applying (Bartlett, Burstein *et al.*, 2004).

A number of the stated reasons do not readily fit into categories of the logic model presented earlier. Some of the reasons imply a potential misunderstanding of program rules, suggesting that

perceptions of program rules and requirements (as distinct from the requirements themselves) should be incorporated. Other reasons reflect household values, particularly the importance that is placed on "getting by" without assistance. Some of the reasons pertaining to the difficulty of meeting program requirements for application or participation suggest that a complete model should represent the household's abilities and resources relevant to meeting these requirements (e.g., health/disabilities, English language proficiency, and available transportation and child care options), as well as identifying the requirements themselves.

Strategies for Meeting Food Needs

Many apparently eligible households say that they do not apply for SNAP benefits because they do not need assistance, or can get by without it. We hypothesized that some of these households may, as an alternative to food stamps, employ some of the coping strategies that have been identified in the literature on food insecurity. We reviewed 10 studies of coping strategies for dealing with food insecurity, most based on ethnographic or other qualitative research, and often building on research done in constructing an approach to measuring food insecurity (Radimer, Olson *et al.*, 1992).

The studies identified several major categories of coping strategies and a large number of specific practices. One set of studies, using focus groups of low-income persons and of nutrition educators, identified 100 specific coping practices within the following broad categories: rely on resources offered in the community, interact with informal support systems, supplement financial resources, use shopping strategies to reduce food cost, manage food supply, and regulate eating patterns (Kempson, Keenan *et al.*, 2003; Kempson, Keenan *et al.*, 2002a; Kempson, Keenan *et al.*, 2002b.)

The literature on coping strategies often describes the household's choice to participate or not participate in the SNAP as one among many possible strategies for meeting its need for food. Some of these strategies actually help define the need for food (e.g., not inviting friends over for dinner). This suggests that households' relative needs for food should be described by considering the nutritional requirements of the household members, the location-specific "normal" cost of meeting those requirements by buying food at grocery stores, and the degree to which the household applies strategies to reduce the normal cost. To meet this food need, the household draws on the available set of commercial, programmatic, and informal food resources. In addition, the household may increase its cash available for food either by increasing its total financial resources or by reducing non-food expenditures.

Incorporating this list of concepts into a statistical model of SNAP participation presents challenges. Many of these strategies have been identified only in qualitative research and may be difficult to capture in a survey, indicating a need for item development and validation.[11] In addition, a household's mix of strategies may change frequently (Frongillo, Valois *et al.*, 2003), which implies that it may be important to measure some combination of the current and potential

[11] The SIPP includes data on participation in other programs which may be preferred to food stamps, such as WIC, free and reduced price school meals, subsidized housing, and energy assistance. It does not measure the behavioral adaptations referenced here.

future strategies. Future use would depend not only on the actual and perceived availability of strategies, but also on the household's willingness to use particular strategies. Alaimo (2005), reviewing literature on food insecurity, notes that "coping strategies or tactics used by families follow a priority system that is based on how acceptable and/or how invasive that tactic is for the family." If this priority system is reasonably consistent across communities and households, it might be possible to define a progression that would help indicate whether an eligible non-participant is close to or far from the point at which it would seek food stamp benefits. Failure to use some of the more generally acceptable strategies would suggest that a household does not yet need to resort to less acceptable strategies including food stamps.

Predictors and Correlates of Food Insecurity

Food insecurity has repeatedly been found to be closely associated with SNAP participation. We therefore hypothesized that factors that increase a household's likelihood of being food insecure will increase its likelihood of participating in SNAP.

The literature search identified 21 studies that examined factors associated with food insecurity (see Exhibit C.1). The studies used varying measures of food insecurity, most involved modeling food insecurity/insufficiency as a function of various predictors, and all were based on survey data, usually large national surveys.

Apart from the usual economic and demographic measures, the studies found a wide range of economic and non-economic factors to be related to food insecurity. Economic factors include food expenditures, routine and non-routine non-food expenditures (e.g., for smoking, health care, seasonal heating/cooling), financial cushions (e.g., health insurance, child support), and the personal financial support network (e.g., borrowing from sibling). Non-economic factors include personal physical and psychological resources (e.g., health status, depression, food management skills) and community context (e.g., neighborhood cohesion, availability of food assistance programs). Most of these characteristics, although not permanent, might be relatively stable over a several-month period. If these factors help determine a household's ability to get by without food stamp benefits, they could be useful components of longitudinal models.

Studies of Subsistence

Although we did not intend to review the extensive literature on subsistence strategies, electronic searches turned up a substantial pool of work in this field simply because SNAP is frequently found in the array of programmatic supports used in subsistence strategies. We reviewed a few studies (listed in Exhibit C.1) that seemed likely to be useful in defining the context of the SNAP participation decision. These studies principally used qualitative research methods, although four presented quantitative analyses of survey data. The review suggested four overlapping themes that may be useful in framing the context of the SNAP participation decision: income packaging and interactions; support networks; income instability; and values about different sources of income support.

Income Packaging. Often building on the seminal work of Kathryn Edin and Laura Lein (Edin and Lein, 1997), nearly every study offered some description of income packaging, in which a household simultaneously draws on multiple sources of cash and in-kind income. The combined

income often comes from both formal sources (e.g., jobs, cash assistance programs) and informal ones (e.g., borrowing from family, odd jobs, exchange of services). It usually includes unreported income and sometimes income from illegal activity. Packaging is used not only for general income, but to meet specific needs for child care (Chaudry, 2004), transportation, and food.

Support Networks. Networks of family, friendship, and community support pervade the stories of low-income subsistence. Even seemingly isolated homeless individuals may have a network of family or friends to whom they can turn for sporadic assistance under some circumstances (Marcus, 2005). Preferably, but only seldom, the household has a stable and flexible family network, with predictably available help when some component of the income packaging strategy fails. This is sometimes seen as key to sustaining a job long enough to escape reliance on assistance programs (Lein, Benjamin *et al.*, 2005).

Income Instability. Practically all components of the subsistence package are subject to rapid and unanticipated change. Many available jobs are explicitly temporary and many low-income people work through temporary employment agencies, not knowing at the beginning of the day whether they will have work, let alone what the hours and location might be (van Arsdale, 2005). "Permanent" jobs, especially shift work, may have rigid schedules, and missing a few hours to deal with a sick child can lead to instant dismissal. Family and friends may become unable to provide support because of their own crises, or because their reserve of goodwill has been exhausted.

Values Regarding Sources of Support. Households have some ability to choose the sources of support they pursue, and their choices reflect values that are widely shared in their community. The values include a hierarchical ranking of preferred sources of income in which public assistance, including food stamps, ranks below formal jobs, self-reliance strategies (e.g., gardening, skimping), informal jobs (including exchange of services), and support from the personal network. Only income from illegal sources, such as drug-related work and selling sex, ranks lower than public assistance (Edin and Lein, 1997). Using preferred sources yields greater self-respect as well as "moral capital" that have value in relationships and economic transactions in the community (Sherman, 2006).

These four themes pose substantial measurement challenges for modeling SNAP participation. The types and sources of income and other support are so numerous that capturing them all would place an extraordinary burden on a large-sample survey. Additional problems are the difficulty of measuring income that is deliberately unreported and behaviors that are illegal or socially disdained, and the likelihood that an accurate picture of today's subsistence package will be obsolete next week. Finally, it may be necessary to measure the nature and strength of the household's value system as it applies to utilizing the available formal and informal resources.

Other Research

In addition to the four fields discussed above, the search incidentally identified a few studies of low-income people's views of or participation in cash assistance programs (AFDC/TANF/GA) or food assistance other than SNAP (food pantries, food banks). These studies, which are listed in

Exhibit C.1, did not suggest any major predictors of SNAP participation beyond those discussed previously, but added more detailed insights on a few points.

Alternative food assistance. Services such as food pantries and soup kitchens are likely to be less used than SNAP, for both objective and subjective reasons. Local studies, though varied, found issues of awareness, inconvenience (having to carry away commodities), bureaucratization, and location in "bad" areas (Curtis, 1997; Molnar, Duffy *et al.*, 2001; Duffy, Hallmark *et al.*, 2002; Kissane, 2003). One study found receiving such services to be less socially acceptable than receiving SNAP or other government assistance.

Motherhood. Assistance-dependent mothers represent a special case of the values hierarchy discussed above. For low-income single mothers, personal values regarding the responsibilities of motherhood provide important guidance in assembling the subsistence package, particularly in making the tradeoff between public assistance and work. Elements of this issue are the satisfaction felt in being with the child, the acceptability of leaving the child in the care of non-family members, and, especially for older children, the importance of providing a work-based role model and the perceived need to offer consumer items (e.g., brand name shoes) that "compete" with those the child sees as resulting from drug dealing or other illegal activity (Henderson, Tickamyer *et al.*, 2005).

Stigma. The stigma associated with SNAP and other assistance programs may exist as much in the low-income person's mind as in the behaviors of others. In one study, welfare-reliant mothers described welfare recipients in the common terms of negative stereotypes (lazy, don't want to work) while denying that those characteristics applied to themselves or anyone they knew personally (Seccombe, James *et al.*, 1998).

Complex rules. Complexities in SNAP and other programs' rules, together with processing time lags, create unpredictable outcomes for (potential) participants. Some people respond with proactive behaviors such as appeals and timing of reporting that (sometimes) result in expansion of the period during which benefits are received or even a bending of the rules in the household's favor (Romich, 2006).

These points reinforce earlier conclusions drawn about modeling SNAP participation. First, a complete model would need to represent the household's value structure regarding the acceptability and desirability of SNAP participation in the context of other possible sources of support. Second, the model should represent not only the household's understanding of program eligibility and benefit rules, but its ability to "work" the bureaucratic nature of the system.

Implications of the Literature Survey

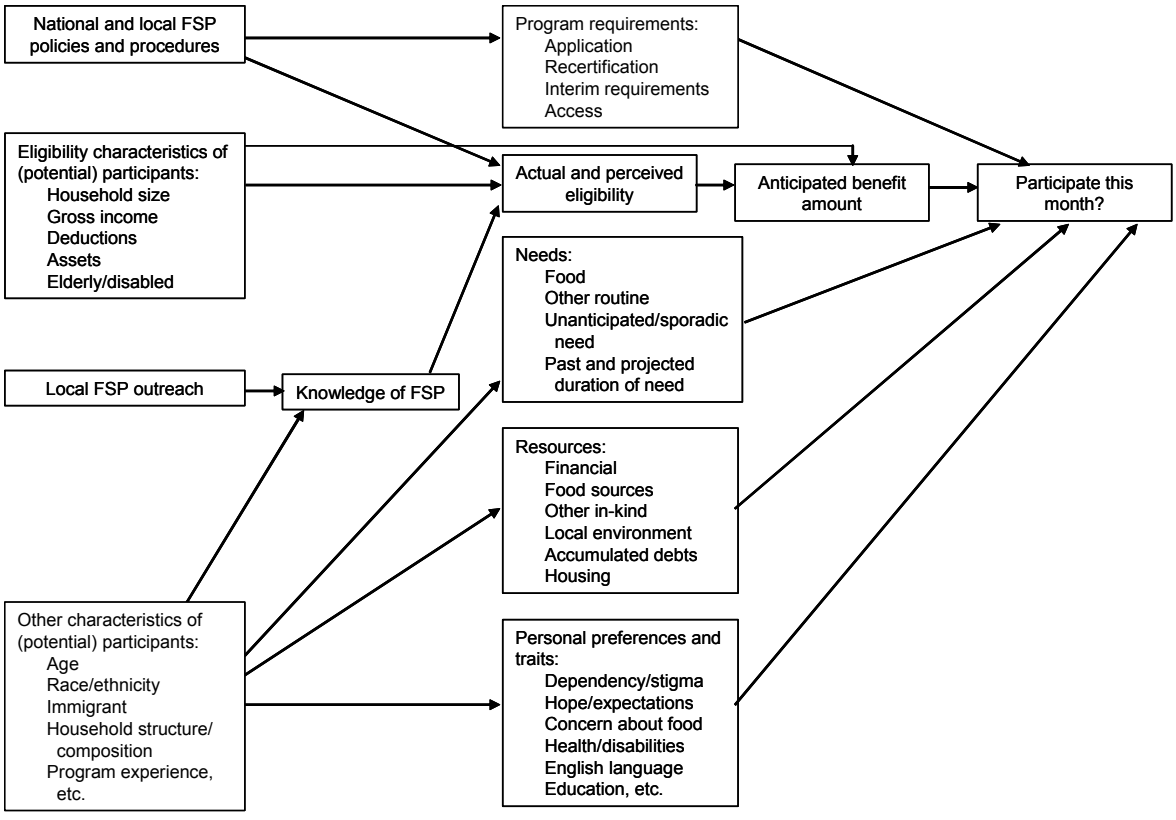
The research described above suggests that the simple logic model presented earlier (Exhibit 2.2) is inadequate to explain the participation decision process. The review suggests that an appropriate model would include household characteristics that are routinely included in standard econometric models; some or all of the more nuanced measures of household circumstances used in various statistical models (subgroup definitions, SNAP work registrant status, work schedules,

persistent versus temporary poverty, expectations based on future values of income, permanent income, material hardship, and food security); and some of the non-standard psychological constructs identified as reasons for non-participation, strategies for coping with food insecurity, and predictors and correlates of food insecurity that have not been used in models of SNAP participation.

We suggest that whether an eligible household participates in a given month is determined by six groups of factors. Conceptually, the decision-maker first considers (1) whether the household is likely eligible for food stamps. The decision-maker then weighs (2) the anticipated SNAP benefit amount against (3) the logistical and out-of-pocket costs of participating, in light of (4) household needs relative to (5) household resources. How the pros and cons balance out, given the data that go into the hopper, depends on (6) the decision-maker's preferences and traits. We expand on each of these domains below, based on our broad reading of the literature (Exhibit 2.4).

Exhibit 2.4

Expanded Logic Model of SNAP Participation



Hypotheses Related to Perceived Eligibility, Expected Benefit Amount, and Costs of Participation

Households that have previously participated in SNAP are more likely to apply when in need than similar households which have never participated, for two reasons. First, prior participants have better information about whether they will be eligible, how much they will receive, and what they need to do to apply. This information and experience reduces the uncertainty about costs and benefits of applying. Second, prior participants incur lower costs of (re)applying. They have already worked out how to get to the local office or apply on-line, and have already obtained the necessary documentation such as proof of identity, and proof of State residence.

In addition to the effect of prior participation, households with little income and households with many members can expect a higher benefit amount, and are more likely to participate on this account. Finally, costs of participation are higher for households that face specific barriers in getting to the local office, communicating with local staff, or completing the application and verification process. These potentially deterred groups include single parents of young children, earners, non-English speakers, elderly and disabled individuals, and those without a high school education. Participation costs can also vary across locales, due to State and local practices such as extended office hours, required frequency of in-person recertification, and use of fingerprinting.

Hypotheses Related to Household Needs

A household's "demand" for food stamps will depend on how readily it can spend them. This will be influenced by (a) how much food the household needs (age and sex of members, their weight and exercise levels); (b) the proportion of food that is prepared at home (whether there is a nonworking adult in the household who can prepare meals, whether the children participate in the School Breakfast Program, the National School Lunch Program, the Child and Adult Care Feeding Program, or the Summer Food Service Program, how often household members eat in other people's homes); (c) dietary preferences for high-quality or expensive food; and (d) local food prices.[12]

Because food purchasing power is fungible, households would also be more likely to participate in SNAP if they had greater non-food needs. Some major sources of ***variations*** in routine needs across households include housing (e.g. might live rent-free), heating bills, child care (if not provided gratis by a household member), and transportation. Sporadic or isolated ***unexpected*** financial demands might also affect participation: out-of-pocket medical costs due to an injury or episode of illness, urgent home or car repairs, a death in the family, and so on.

The ***length of time*** a household has experienced severe need and is expecting the situation to continue before improving is also likely to affect participation. After becoming eligible, households may run through many alternatives before turning to food stamps. The better their networks and resources, the longer they can hold out. It is difficult to predict at what point during a spell of eligibility a household will make the decision to participate. Blank and Ruggles (1996) note that many spells of eligible non-participation for both food stamps and welfare are short and

[12] How readily a household can use food stamps could also be related to how willing or able the household is to use the food stamps illegitimately. However, in 2002-2005 only $0.01 per dollar of food stamps was trafficked, less than half the rate in 1999-2002 (Mantovani and Olander, 2006).

end with an increase in income. This would suggest that length of eligible non-participant spell to date would positively predict subsequent participation. On the other hand, those households with the longest such spells to date may be the most resistant to entering the Supplemental Nutrition Assistance Program. The unmeasured resources and attitudes that have prevented a household from applying in the past may continue to do so in the future.

Hypotheses Related to Household Resources

In addition to the income sources counted by SNAP in determining eligibility, households may have other resources that could diminish the need for food stamps. These include sporadic earnings, monetary contributions by friends and relatives, and implicit loans from landlords, grocers, etc. who are willing to wait to get paid. Food resources include not only other federal programs (SBP, NLSP, SFSP, CACFP, WIC) and community programs (Meals on Wheels, soup kitchens, food pantries), but also meals served by friends and relatives. Similarly, other in-kind resources include federal subsidies of rent and energy costs, community toy and clothing drives, and friends' and relatives' contributions of household goods, child care, and living space. The connectedness of a household to the community might thus modify its perceived need for food stamps. Some of these resources might be limited in availability: needy households can draw on friends or get short-term credit extensions for a few months, after which some longer-term solution is required.

Hypotheses Related to Personal Preferences and Traits

Many personal traits might help explain why some households choose to participate and others in apparently identical circumstances do not. These are useful constructs if they can be measured reliably and (other than expectations) are stable over time. Examples are:

- desire for independence/feeling of stigma: measured by such items as "do not like to rely on government assistance," "do not like to be seen shopping with food stamps," "do not want people to know I need financial assistance," "do not want to go to the welfare office," as well as some that specifically refer to SNAP experiences, such as "ever done anything to hide you got food stamps," "ever avoiding telling people you got food stamps," "ever go out of your way to shop at a store where no one knew you," "ever given your food stamps to someone else because you were embarrassed to use them"
- hopes/expectations: perceived likelihood that current need is short-term
- concern about food: anxiety about obtaining food more than meeting other needs, due e.g. to the presence of children
- poor health, mental or physical disabilities, non-English speaking, low educational attainment: may impede access to applying for food stamps

Hypotheses Related to Program Characteristics

Beyond the household characteristics already discussed, participation may vary because of variations in Supplemental Nutrition Assistance Program policies over time or between localities. At the *national* level, program participation surged dramatically after the Elimination of the Purchase Requirement (EPR) in 1977, and dropped dramatically after the implementation of the Personal Responsibility and Work Opportunities Reconciliation Act of 1996 (PRWORA). While the extent to which PRWORA caused the caseload decline is debatable, the legislation did limit

or eliminate SNAP eligibility for some groups, notably immigrants and able bodied adults without dependents. The EPR and PRWORA changes are now primarily of historical interest; but still relevant for current research is the implementation of the National Evacuees Policies in the wake of Hurricane Katrina three years ago. These policies allowed States and counties that were not directly affected by the hurricane, as well as those that were, to offer Disaster Supplemental Nutrition Assistance Program benefits.

Local variations in SNAP policies and procedures are also likely to affect program participation. Of particular relevance are those related to outreach, application requirements, and certification period lengths.

Characteristics of *other means-tested programs* may also affect SNAP participation. Some households may enter the program without having decided to participate, because their State has a joint application form for food stamps and other benefits, or because their social worker enrolls them.

Dynamic Considerations

The expanded logic model presented here and the related hypotheses described above are essentially static in nature. Even those factors related to decision makers' expectations regarding the duration of their need for assistance pertain to a single point in time. This reflects the focus of this research, namely why eligible households participate or do not participate in a given month.

An alternative way to study participation is to consider why households enter or exit SNAP. Econometric studies of the dynamics of SNAP participation model changes in participation status rather than participation *per se*.[13] The qualitative studies discussed in this chapter do not draw the distinction, and we have noted that some factors they consider are relevant to longitudinal rather than point-in-time participation. For completeness, we note here two dynamic considerations that do not appear in our expanded logic model.

The first of these is whether the household is ***currently receiving food stamp benefits***. This factor has a very large effect on participation in the next period, independent of circumstances, because positive actions are required to enter or exit the program. A household that, if it had not been participating, would see no need to enter the program given its circumstances, might well remain on the program until the end of its certification period simply through inertia. The inertial effects for entering are even greater, because more steps must be taken to enter the program than to exit.

The other dynamic consideration is the effect of a sudden shock, or ***trigger event***. A body of research not reviewed here has addressed the question: "What are the circumstances surrounding SNAP entries and exits?"[14] Many program entries and exits can be associated with exogenous events such as job losses and gains which may be the causes of those transitions.

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[13] Two such studies were included in our literature review—Gleason *et al*. 1998 and Hisnanick and Walker 2000.

[14] See, for example, Gleason *et al.* 1998 and Burstein 1993.

Our model of participation already takes account of the household's circumstances. The explanatory value of these events would therefore lie in their impact on the likelihood of participation ***beyond the effect of the household's new circumstances***. Obviously a household whose head loses his job is more likely to receive food stamps than one whose head keeps his job, because available resources are lower—a static comparison. But is the former household more likely to begin participation if the job loss was recent than if it has been of long duration? We are not aware that trigger events have been tested previously in this way, and we therefore include the recent occurrence of such events in our participation models. Following our logic model, the included trigger events are measures of new information about SNAP (e.g. recent entry into a mean-tested cash-assistance program); changes in needs (through the arrival or departure of a dependent household member); and changes in resources (such as loss of a long-term job, or an entry into the labor force).

Application of the Results to Our Modeling Approach

This expanded logic model directed our search for relevant data in the SIPP. The extensive set of questions asked in the SIPP allowed us to capture a large number of the included concepts. The measures we created and our modeling approach are described in detail in the following chapter.

Chapter Three: Data and Methodology

In this chapter we describe the data and econometric methods used in developing models of SNAP participation. Salient features of the analytic approach are that:

- The primary data source is the Survey of Income and Program Participation (SIPP). We use data from two panels, those beginning in 2001 and in 2004.
- Eligibility is determined based on detailed information on income, assets, and program requirements from the SIPP core, the SIPP Topical Modules, and the SNAP Rules Database.
- Analysis of participation is restricted to the SIPP waves for which eligibility information is available from the SIPP Topical Modules, which are Waves 3, 6, and 9 of the 2001 Panel and Waves 3 and 6 of the 2004 Panel.
- Participation is measured for the last month of the interview reference period in the appropriate waves.
- Households are interviewed repeatedly in the SIPP, and their composition may change from one wave to the next. When multiple waves of data are combined, estimation techniques are used that take account of residual correlations for observations with overlapping household members.
- Models relate participation by eligible households in a month to measures of the participation factors, including those developed from our literature review.

In the sections that follow we describe our sources of data, econometric techniques, explanatory variables, and model assessment and validation measures.

Data Sources

The data used in this analysis come from three main sources: the SIPP, the Supplemental Nutrition Assistance Program Rules Database (supplemented by a communication from FNS), and the Bureau of Labor Statistics' employment statistics. The participation measure and nearly all of the explanatory variables come from the SIPP, while the SNAP Rules Database and BLS statistics provide some additional data on State policies and economic conditions.

Extant large-scale survey data such as the SIPP were used in nine of the 12 standard econometric SNAP participation models reviewed in our literature survey. This type of data has the advantages of (a) low cost; (b) national representativeness (usually); and (c) synergy from many researchers using the same data. Although survey data have the disadvantages of potential reporting error and sample attrition over time (in the case of longitudinal data), they are essential

for participation studies because administrative data exclude non-participants.[15] A further disadvantage of extant survey data is that as the surveys are not tailored to the specific research task, they do not include all of the data that would ideally be collected. However, the SIPP is a very rich source of data and contains a large portion of the desired variables.

Many of the studies reviewed also obtained external information on the local economic and policy environment to supplement survey data on household characteristics. Data included local and State unemployment rates, average wages in manufacturing, and quarterly GDP. The measure we chose of the local economic conditions, unemployment rates, was the one most commonly used in the literature.

SIPP

The SIPP is a multi-panel longitudinal survey that has been in operation since 1984. Each SIPP panel comprises a nationally representative sample of the non-institutionalized U.S. population. Panel members are interviewed every four months, for a total time span ranging from two-and-half to four years depending on the panel. The models presented in this memorandum are based on the 2001 and 2004 panels. The 2001 panel ran for three years and began with a sample size of 35,106 households in 2001; the 2004 panel with the full sample and all topical modules ran for slightly under three years and began with 43,549 households in 2004.[16] The 2008 SIPP panel is currently in the field. Future panels of the SIPP will consist of annual interviews only.

The SIPP interview has three components: the control card, the core questionnaire, and topical modules. The control card contains information about the type of housing and the household roster with basic demographics (date of birth, race/ethnicity, gender, and education). The relationship of each household member to the reference person is shown, and additional variables identify members' spouses and parents when they are in the same household. The core questionnaire covers labor force participation, earnings, sources and amounts of unearned income, assets, health insurance, program participation, and education activities. This information is collected for all members aged 15 and older in every wave.

Topical modules vary by wave. These modules collect information on events that occurred prior to the initiation of the panel and characteristics that tend to change slowly and can be summarized annually. Modules used in this analysis include recipiency history; education and training history; assets, liabilities, and eligibility; child care; and welfare reform. The richness and depth of these modules is a notable strength of the SIPP, and a primary reason it was chosen for use in this study, as well as in six of the 12 studies reviewed in our literature survey.

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[15] These and other data quality issues that must be considered when using the SIPP are discussed in Appendix B.

[16] The 2004 panel continued for longer, but with a smaller sample and without the topical modules, due to budget pressures.

Supplemental Nutrition Assistance Program Rules Database

The Supplemental Nutrition Assistance Program Rules Database was created by the Urban Institute with funding from ERS and includes data on 59 program rules, for all 50 States and Washington, DC, from January 1996 through December 2004. We use these data on program rules both as explanatory variables and for eligibility determination.

BLS Unemployment Data

Our unemployment rates are the unadjusted State monthly unemployment rates from the Bureau of Labor Statistics series LAUST01000006 to LAUST56000006.[17]

Census Bureau Poverty Thresholds

The poverty thresholds used to create the poverty-related explanatory variables were obtained from the Census website.[18] These poverty thresholds were used to create household-level variables indicating the ratio of the household's income to the poverty threshold for the household, based on household size and composition.

Data Spreadsheet from FNS

Additional data used to determine eligibility came from an internal FNS spreadsheet. This spreadsheet included information not available on the FNS website on annual cutoffs for gross income, net income, and the standard deduction (which vary by household size) and the shelter deduction (which is the same for all households).[19]

Determination of Eligibility

Our algorithm for ascertaining households' eligibility used information on the FNS website, in the Supplemental Nutritional Assistance Program Rules Database developed by the Urban Institute, in the Excel spreadsheet on SNAP parameters provided by FNS, and in the SIPP. The algorithm involves calculating net monthly income and net assets for each household in Waves 3, 6, and 9 of the 2001 SIPP Panel and Waves 3 and 6 of the 2004 SIPP Panel as described in Appendix B.

An unusual feature of our approach was that determination of household's net income incorporated State-specific information on the Standard Utility Allowance from the SNAP Rules

[17] Downloaded from http://data.bls.gov/PDQ/outside.jsp?survey=la on June 27, 2008.

[18] http://www.census.gov/hhes/www/poverty/threshld.html.

[19] *SNAP Parameters Over Time FY 83-08* provided to us by Rosemarie Downer of FNS/ORA on June 13, 2008

Database.[20] Among the econometric studies we examined, only Farrell *et al.* had a similarly comprehensive eligibility determination process.

Exhibit 3.1 below displays the resulting analysis sample.

Exhibit 3.1

Analysis Sample

Panel	Wave	Interview Months	Number of Households Eligible for Food Stamps
2001	3	September-December 2001	4,406
2001	6	September-December 2002	4,418
2001	9	September-December 2003	4,034
2004	3	September-December 2004	6,059
2004	6	September-December 2005	5,500

Detailed information required to determine eligibility, primarily data on assets, was collected in Waves 3, 6, and 9 only. Using these data from the SIPP to infer eligibility in other waves seemed likely to introduce unacceptable error into our sample construction. Some households would have attained eligibility in Wave 3, 6, or 9 by drawing down their assets in the previous waves, and thus would not have been eligible in those past waves. As we could not identify such households, we restricted our sample to the waves in which assets were explicitly measured.

Explanatory Variables

A central goal of this project is to develop a model that explains as well as possible which households participate in SNAP. To achieve this goal, we constructed an extensive set of explanatory variables to be tested, all of which can be derived from the SIPP and readily available supplementary sources. These variables include (a) factors that previous researchers have hypothesized may influence SNAP participation, and which have been tested in large numbers of quantitative studies of participation, such as household demographics and income levels; and (b) other factors that have been studied primarily qualitatively, such as the degree of support received from the community, whose relationship to SNAP has not previously been tested. These additional factors are derived from the logic model described in Chapter Two.

Exhibits 3.2 and 3.3 show how the variables we have developed fit into this framework. The first two columns of Exhibit 3.2 show the domains and concepts from the logic model, with the names of our variables that now measure these concepts in the final column. Exhibit 3.3 provides a

[20] Information on State vehicle rules, available in the Rules database and in State Options reports for later years, was also examined but ultimately disregarded due to lack of detail on vehicles in the SIPP. A sensitivity analysis found that vehicle exclusion rules made only a trivial difference in the number of households deemed eligible.

Exhibit 3.2

Domains and Concepts from Logic Model and Explanatory Variables to Measure Them

Domain	Concept	Variable Name
National SNAP Policies	Eligibility criteria	(Used only to determine eligibility)
State and Local SNAP Policies	Application requirements	**State Biometric Tech**
	Recertification requirements	(Not measured)
	Interim requirements	(Not measured)
	Certification period length	**Pct Earners Frequent Recert**, Pct Non Earn Frequent Recert, Pct Non Earn Eld Freq Recert
	Access	(Not measured)
Eligibility and Benefit Amount	Household size	(Used only to determine eligibility)
	Gross income	(Used only to determine eligibility)
	Deductions	(Used only to determine eligibility)
	ABAWD status	(Not measured)
	Citizenship	(Used only to determine eligibility)
Perceived Eligibility	SNAP experience	**Prior SNAP**
	Local program outreach	(Not measured)
	Knowledge of SNAP	(Not measured)
Needs	Food	**Child Under 13, Num Children Under 5, Num Children Age 5-12, Num Dep Children Age 13-17, Num Adults Under 60, Num Elderly, Child Dayplus Oth Parent, Food Security Low**, Adult Male Equivalents, Elderly No Earnings, Num Work Age Non-Disab
	Other routine	**Pay Care Child or Disab** , **Pay Child Support** , Work Related Expenses, Tuition Over 5000
	Unanticipated/sporadic	**Recent Move, Paid Over 1000 for Hlth Care, Did Not Pay Utilities, Did Not Pay Rent, Utilities Cut Off, Phone Service Cut Off, Could Not Afford Doctor**
	Past and projected future duration of need	**State Annual Unemp Rate,** *High Unemployment*
Resources	Household Income	**Inc Above Poverty, Inc Under 50 Pct Pov**
	Financial assets	**Net Worth Above 0**; **Net Worth Above 25,000**; Net Worth Above 100,000; Home Equity Above 0; Vehicle Equity Above 0
	Food sources	(Not measured)
	Other in-kind	**Nonprofit Assist**, Free Red Price Meals, Medicaid, WIC, Free Util or Energy Assist, Employer Paid Hlth Ins
	Local environment/ neighborhood characteristics	**Comm Watches Out**, **Comm Help Others**, **Can Count On**, **Do Not Expect Help**
	Accumulated debts	(Not measured)
	Housing characteristics	(Not measured)

Exhibit 3.2 (Continued)

Domains and Concepts from Logic Model and Explanatory Variables to Measure Them

Domain	Concept	Variable Name
Personal Preferences and Traits	Dependency/stigma	No Health Ins–Don't Believe/Need
	Hope/expectations	Looking for Work
	Health/disabilities	**In Bad Health, Dif Hear Speak**, **Dif Meals Money Housework**, Disabled, Recent Disab
	English language	**No Adult Speaks English**
	Education	**RP Educ Below HS, RP Educ Above HS, Highest Educ At Least HS,** RP Educ HS, RP Educ Below GED, RP Educ GED
	Depression/anxiety	**Anxious Dif Coping**
	Reason for not applying for assistance	**Didn't Apply Don't Need, Didn't Apply Not Elig, Didn't Apply Didn't Know, Didn't Apply No Charity, Didn't Apply Plan To, Didn't Apply Other, Didn't Apply None Avail, Didn't Apply Effort Troub**
	Participation in means-tested programs	**Ever TANF**
	Sources of Income	**Any Earnings, GA/SSI/SSDI, Non Cash Public Benefits, Alimony Child Support, Other Income,** Pension Income, Property Income, TANF, Social Security, SSI, Other Disability Benefits, VA Benefits, Public Housing or Gov Subs Rent, Means Tested Income, Two or More Means Tested Prog, Log Earnings, Log Earnings Squared
	Other	None Employed, Some Employed, All Employed Not Full Time, All Employed Full Time, Hlth Ins All Covered, Hlth Ins None Covered, Hlth Ins Some Covered
Demographic Characteristics	Age	**Childless RP Aged 25 or Under**, **Childless RP Aged 60 or Over**, **RP Aged 25 Or Under**, **RP Aged 60 Or Over**, RP Age 26-40, RP Age 41-59
	Race/ethnicity	**RP Black Non-Hispanic**, **RP Hispanic**, **RP Other Race**, RP White Non-Hispanic
	Immigrant	(Used only to determine eligibility)
	Household structure/composition	**RP Married,** *Elderly Disab Only, Able Bodied No Child, Single Parent, Married Parents, Other HH Composition*
Dynamic Measures	History of food stamps receipt	*Food Stamps Previous Wave*
	Trigger events: information	**New SSI**, **New WIC**, **New TANF**, **New GA**, **New UI State**, New SSI Prior Wave, New WIC Prior Wave, New TANF Prior Wave, New GA Prior Wave, New UI State Prior Wave
	Trigger events: household composition	**New Earner**, **New Dependent**, **Departed Earner**, **Departed Dependent**, New Earner Prior Wave, New Dependent Prior Wave, Departed Earner Prior Wave, Departed Dependent Prior Wave
	Trigger events: employment	**Newly Employed Member**, **Newly Unemployed Member**

NOTES: Table includes all explanatory variables considered for inclusion in the models, including those not used in the models presented in this report. The variables in **bold** were used in the models and those in *italics* were used to construct subgroups. See Exhibit 3.3 for further details on variables in bold and italics. See Appendix A Exhibit A.1 for further details on all other variables.

Exhibit 3.3

Descriptions of Explanatory Variables Used in Models, by Domain

Domain	Variable Name	Variable Description
State and Local SNAP Policies	State Biometric Tech	Indicator for the State using biometric technology, most commonly fingerprinting, as part of the application process
	Pct Earners Frequent Recert	Percent of participating households with earnings that are required to be recertified every three months or more frequently
Perceived Eligibility	Prior SNAP	Indicator for prior history of Supplemental Nutrition Assistance receipt
Needs	Child Under 13	Indicator for there being at least one child under 13
	Num Children Under 5, Num Children Age 5-12, Num Dep Children Age 13-17, Num Adults Under 60, Num Elderly	Number of persons in the household in different age groups
	Child Dayplus Oth Parent	Indicator for there being a child in the household who spent at least one day with a parent outside of the household in the last year
	Food Security Low	Indicator for the respondent answering the questions in the SIPP food security module in a combination that signifies that they have had low or very low food security during the last four months. This data was obtained from http://www.ers.usda.gov/data/FoodSecurity/SIPP/
	Pay Care Child or Disab	Indicator for someone in household paying for care of a child or disabled person
	Pay Child Support	Indicator for someone in household being required to pay child support
	Recent Move	Indicator for having moved into the current home recently (2000 or 2001 for the 2001 panel, 2003 or 2004 for the 2004 panel)
	Paid Over 1000 for Hlth Care	Indicator for someone in household having spent over $1,000 on health care for any household member
	Did Not Pay Utilities, Did Not Pay Rent	Indicators for the respondent saying they were not able to pay their gas or electric bill, or were not able to pay their rent, at some time in the last year
	Utilities Cut Off, Phone Service Cut Off	Indicators for the respondent saying they had their gas or electric service shut off, or had their phone service cut off, at some time in the last year
	Could Not Afford Doctor	Indicators for the respondent saying someone in the household did not go to the doctor when they needed to at some point in the last year because they could not afford it
	State Annual Unemp Rate, High Unemployment	The annual unemployment rate for the State the household lives in (from BLS data as described in description of data sources), and an indicator of whether it was above the natural rate of unemployment of 5.2 percent (CBO estimate)

Exhibit 3.3 (Continued)

Descriptions of Explanatory Variables Used in Models, by Domain

Domain	Variable Name	Variable Description
Resources	Inc Above Poverty, Inc Under 50 Pct Poverty	Categories of income as fraction of the household's poverty threshold: above poverty or below half of poverty
	Net Worth Above 0; Net Worth Above 25,000	Indicators for the net worth of the household being above 0 and being above $25,000
	Nonprofit Assist	Indicator for whether someone in the household receives assistance from a nonprofit
	Comm Watches Out, Comm Help Others, Can Count On	Indicators for whether the respondent agreed or strongly agreed with each of the following statements: the people in the community watch out for each other's children; people in the community help each other out; there are people they can count on in the community
	Do Not Expect Help	An indicator for the respondent indicating expecting to receive very little or no help from friends, family, or others if they had a problem for which they needed help.
Personal Preferences and Traits	In Bad Health	Indicator for whether anyone in the household reports they are in fair or poor health
	Dif Hear Speak	Indicator for whether anyone in the household has difficulty hearing what is said in normal conversation or having speech understood
	Dif Meals Money Housework	Indicator for whether anyone in the household has difficulty preparing meals, keeping track of money or bills, or doing light housework
	No Adult Speaks English	Indicator for all adults in the household indicating they speak English either "not well" or "not at all"
	RP Educ Below HS, RP Educ Above HS	Indicators for the education level of the reference person: below high school, above high school
	Highest Educ At Least HS	Indicator for whether any working-age adult in the household has at least a high school education
	Anxious Dif Coping	Indicator for whether anyone in the household is frequently depressed or anxious; or has trouble getting along with people, concentrating enough for everyday tasks, or coping with day-to-day stresses
	Didn't Apply Don't Need, Didn't Apply Not Elig, Didn't Apply Didn't Know, Didn't Apply No Charity, Didn't Apply Plan To, Didn't Apply Other, Didn't Apply None Avail; Didn't Apply Effort Troub	Indicator for why someone in the household didn't inquire about or complete an application for any assistance programs: don't need any; not eligible because of immigration status or some other reason; didn't know there was anything else or /didn't know I could; don't take charity/don't accept aid from the government; haven't done it yet/plan to; some other reason; no other assistance available; too much run-around/couldn't get a straight answer/bureaucratic hassle, or no transportation to office, or the money is not worth it
	Ever TANF	Indicator for whether anyone in the household ever received public assistance
	Any Earnings	Indicator for nonzero earnings
	GA/SSI/SSDI, Non Cash Public Benefits, Alimony Child Support, Other Income	Indicators for whether anyone in the household receives any cash public benefit except TANF (GA, SSI, or Social Security); any non-cash benefit (WIC, Public Housing or Subsidized Rent, Free or Reduced Price School Breakfast and/or Lunch, Medicaid, Free Utilities or Energy Assistance) not including food stamps; alimony or child support; or a source of income other than earnings, public benefits, alimony or child support.

Exhibit 3.3 (Continued)

Descriptions of Explanatory Variables Used in Models, by Domain

Domain	Variable Name	Variable Description
Demographic Characteristics	Childless RP Under Age 25 or Under, Childless RP Aged 60 Or Over	Indicators for the age of the reference person for a childless household (under 26 and 60+)
	RP Aged 25 Or Under, RP Aged 60 Or Over	Indicators for the age of the reference person (under 26, 60+)
	RP Black Non-Hispanic, RP Hispanic, RP Other Race	Indicators for race/ethnicity of reference person (Black, Hispanic, Other Non-Hispanic Non-White)
	RP Married	Indicator for whether the reference person is married with their spouse present
	Elderly Disab Only, Able Bodied No Child, Single Parent, Married Parents, Other HH Composition	Indicators for whether the households consists of: all elderly or disabled members, at least one able bodied member and no children, a single parent with children, married parents with children, and other households with children
Dynamic Measures	Food Stamps Previous Wave	Indicator for whether anyone in the household received food stamps in the previous wave
	New SSI, New WIC, New TANF, New GA, New UI State	Indicators for new participation (current wave) in benefit programs that could act as information triggers for SNAP entry
	New Earner, New Dependent, Departed Earner, Departed Dependent	Indicators for changes in the household composition that could act as entry or exit triggers
	Newly Employed Member, Newly Unemployed Member	Indicators for recent changes in long-term employment of household member that could act as entry or exit triggers

NOTES: See Appendix A Exhibit A.1 for explanation of other variables not included in the models.

description of each of the variables used in our two primary models, which we call the *Standard* and the *Expanded* models, organized by domain. Note that SIPP uses the term "reference person" (RP) to refer to the person on record as owner or renter of the household's residence. If the residence is owned or rented by a married couple, either member of the couple may be the reference person.

Our explanatory variables capture nearly all of the concepts shown in the logic model. The concepts for which we do not have measures are mostly in the domain of State or local application and recertification requirements. Some of the concepts in the eligibility domain are used only to determine eligibility, and not as explanatory variables in our models. In selecting variables to use in the model, we considered every variable in the SIPP that our literature review had suggested might be relevant. Based on preliminary examination, some variables were eliminated because of insufficient observations and/or too many imputed values. For example, the variable denoting amount paid for child care was eliminated because it had very few observations, and even within that small number, almost 20 percent of values were imputed. The selection of our two explanatory variables to use from the SNAP Rules Database was also based in part on availability and completeness. Other variables were dropped from the final models due to redundancy or lack of relevance.

Nearly all of the explanatory factors have been measured as binary indicators or discrete categories rather than as continuous variables. This approach has two strengths. First, it is robust to specification error. For example, we allow the likelihood of participation to vary with the age of the reference person, but need not make the risky assumption that the relationship is linear, or even monotonic. Second, this approach protects against observations with extreme values of the underlying continuous variables (e.g. a 100-year-old reference person) having undue influence on the estimated models.

Exhibit 3.4 shows sample sizes, means, and standard deviations for the explanatory variables used in the models for all five survey waves combined. Some of these measures are only available for households in Wave 9 of the 2001 Panel.

Econometric Approach

We present results using several econometric techniques. The first of these is linear regression: ordinary least squares (OLS) with clustered residuals. This technique is the most common, simple, robust, and interpretable regression approach. The residuals are clustered because the usual OLS assumption that the errors are independently distributed is inappropriate for our data. The SIPP includes multiple observations on households that are identical or very similar, in the sense that they include adults that were in the same original household in Wave 1 (the SIPP sample unit). If ignored, this feature of the data could lead to underestimation of the standard errors. Hence, we allow for correlation among residuals for observations from the same SIPP sample unit.

The second technique used is logistic regression, also with clustered residuals. Linear regression does not account for the dichotomous nature of the dependent variable, SNAP participation. A linear probability model may be an inappropriate functional form, because it does not require that

Exhibit 3.4

Summary Statistics of Explanatory Variables for SNAP Eligible Households in Sample

Variable Name	N	Mean	Std Error
State and Local SNAP Policies			
State Biometric Tech	24,417	0.2656	0.4417
Pct Earners Frequent Recert	24,417	0.0436	0.1366
Perceived Eligibility			
Prior SNAP	23,747	0.5466	0.4978
Needs			
Child Under 13	24,417	0.3527	0.4778
Num Children Under 5	24,417	0.2665	0.6077
Num Children Age 5-12	24,417	0.4376	0.8381
Num Dep Children Age 13-17	24,417	0.2340	0.5809
Num Adults Under 60	24,417	1.1064	0.9372
Num Elderly	24,417	0.4175	0.6061
Child Dayplus Oth Parent *	13,952	0.0514	0.2208
Food Security Low *	4,034	0.2186	0.4134
Pay Care Child or Disab	24,417	0.0525	0.2230
Pay Child Support	24,417	0.0260	0.1590
Recent Move	24,417	0.4085	0.4916
Paid Over 1000 for Hlth Care	24,417	0.1160	0.3203
Did Not Pay Utilities *	9,534	0.2081	0.4060
Did Not Pay Rent	9,534	0.1370	0.3438
Utilities Cut Off *	9,534	0.0419	0.2003
Phone Service Cut Off *	9,534	0.1052	0.3068
Could Not Afford Doctor *	9,534	0.1288	0.3350
State Annual Unemp Rate	24,417	5.4465	0.8885
Resources			
Inc Above Poverty Level	24,417	0.3299	0.4702
Inc Under 50 Pct Pov	24,417	0.2525	0.4345
Net Worth Above 0	24,417	0.6280	0.4833
Net Worth Above 25000	24,417	0.2477	0.4317
Nonprofit Assist *	9,534	0.5223	1.1257
Comm Watches Out *	4,034	0.2400	0.4271
Comm Help Others *	4,034	0.2184	0.4132
Can Count On *	4,034	0.2434	0.4292
Do Not Expect Help *	9,534	0.1920	0.3939
Personal Preferences and Traits			
In Bad Health	24,417	0.4466	0.4971
Dif Hear Speak *	13,744	0.1050	0.3066
Dif Meals Money Housework *	13,744	0.1550	0.3620
No Adult Speaks English *	4,034	0.0781	0.2683

Exhibit 3.4 (Continued)

Summary Statistics of Explanatory Variables for SNAP Eligible Households in Sample

Variable Name	N	Mean	Std Error
Personal Preferences and Traits (Continued)			
RP Educ Below HS	24,417	0.4650	0.4988
RP Educ Above HS	24,417	0.2753	0.4467
Highest Educ At Least HS	24,417	0.3560	0.4788
Anxious Dif Coping *	13,744	0.2673	0.4426
Didnt Apply Dont Need *	4,034	0.2581	0.4376
Didnt Apply Not Elig *	4,034	0.1177	0.3224
Didnt Apply Didnt Know *	4,034	0.1346	0.3413
Didnt Apply No Charity *	4,034	0.0196	0.1386
Didnt Apply Plan To *	4,034	0.0374	0.1898
Didnt Apply Other *	4,034	0.0518	0.2217
Didnt Apply None Avail *	4,034	0.0501	0.2181
Didnt Apply Effort Troub *	4,034	0.0530	0.2242
Ever TANF	24,417	0.2011	0.4008
Any Earnings	24,417	0.4082	0.4915
GA/SSI/SSDI	24,417	0.2811	0.4495
Non Cash Public Benefits	24,417	0.6448	0.4786
Alimony Child Support	24,417	0.0840	0.2775
Other Income	24,417	0.2155	0.4112
Demographic Characteristics			
Childless RP Aged 25 Or Under	24,417	0.0430	0.2030
Childless RP Aged 60 Or Over	24,417	0.3117	0.4632
RP Aged 25 Or Under	24,417	0.1041	0.3054
RP Aged 60 Or Over	24,417	0.3352	0.4721
RP Black Non Hispanic	24,417	0.2581	0.4376
RP Hispanic	24,417	0.1512	0.3583
RP Other Race	24,417	0.0575	0.2329
RP Married	24,417	0.2384	0.4261
Trigger Events			
New SSI	24,417	0.0263	0.1601
New WIC	24,417	0.0191	0.1368
New TANF	24,417	0.0165	0.1274
New GA	24,417	0.0052	0.0719
New UI State	24,417	0.0150	0.1217
New Earner	24,417	0.0112	0.1053
New Dependent	24,417	0.0441	0.2053
Departed Earner	24,417	0.0410	0.1984
Departed Dependent	24,417	0.0387	0.1929
Newly Employed Member	24,417	0.0579	0.2335
Newly Unemployed Member	24,417	0.0632	0.2432

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Variables marked with * are available for 2001 Panel, Wave 9 only.

predicted values lie between zero and one. Also, a linear model may misestimate the strength of the relationships.

Finally, a random effects model is used to take full advantage of the information in the panel structure of the SIPP survey. While clustering, as described above, corrects the standard errors of the parameter estimates to acknowledge that additional observations from the same Wave 1 households do not give as much information as observations from different Wave 1 households, a random effects model further assumes that each such sample unit has its own effect drawn from a probability distribution. The approach accounts for household-level time-invariant characteristics not otherwise captured in the model by in effect assigning each sample unit ID its own intercept (see Greene 2001). The improved fit relative to the linear regression model translates into better predictions for additional observations *from the same sample units*. For predicting outside the sample, however, this advantage is lost.

The decision not to weight the observations in any of the approaches was made for reasons of transparency, tractability, and econometric consistency (see Appendix B).

Model Assessment and Validation

Three measures of explanatory power are shown for each of the models estimated. The first of these is ***R-squared***. It is included because of its familiarity and ease of interpretation, although for dichotomous variables it is of limited value. A model that discriminated perfectly by always assigning higher predicted probabilities to participants than to eligible non-participants could still have a mediocre R-squared, if it did not assign predicted values close to 100 percent and 0 percent. We have calculated an R-squared for the logistic and random effects models as well as for the linear probability models, equal to the percentage of the variance in the dependent variable that is explained by the model.

The second measure of fit is the ***percent of observations that are correctly assigned*** to participant versus non-participant status. The models only generate likelihoods, not assignments to participation status. To ensure that our assignments result in roughly the correct number of households participating in the aggregate, we have used a stochastic procedure that assigns a particular household to participation with probability equal to its predicted probability from the model. Thus, if there are 100 households that were each found to have a 20 percent probability of participation, we assign about 20 of them to the participant category and the remainder to the non-participant category.[21] To guard against a bad draw of the randomization, we performed this procedure 1000 times for each model and averaged the results for this statistic.

[21] An alternative approach would be to choose a cutoff value, and assign all observations with predicted values above that cutoff to participant status, and all others to non-participant status. A receiver operating characteristic (ROC) curve showing the tradeoff between sensitivity and specificity could be used to determine the optimal cutoff. The stochastic approach is superior because it allows us to use all of the information contained in the predicted probability, rather than just whether it is below or above a cutoff.

As previously noted, linear probability models may generate predicted values that are outside the range of zero to unity. Observations with negative predicted probability values were all treated as zeros for the purpose of prediction, and the corresponding observations were all assigned to non-participation with certainty. A consequence of the truncation of negative predicted probabilities was that the number of households participating in the aggregate was overestimated by as much as 2 percentage points for the linear probability models.

The third measure of fit is the ***kappa statistic*** showing the level of agreement between actual and predicted participation status, using the assignment rule described above. The kappa statistic quantifies the strength of agreement between two measures, taking into account the level of agreement that would occur purely through chance. It is calculated as:

$$\frac{O-E}{1-E}$$

where O is the observed agreement (in our case, the proportion of correct assignments), and E is the expected agreement by chance. If the proportion of participants is p_1 in the sample and p_2 for our assignments, then $E = (p_1 \times p_2) + [(1-p_1) \times (1-p_2)]$. A kappa statistic above 0.75 is considered almost perfect agreement, 0.45 to 0.75 is substantial agreement, and 0.20 to 0.45 is moderate (Munoz and Bangdiwala, 1997). As the kappa statistic uses predicted values, we calculated the average based on the same 1000 realizations used in computing the percent of observations correctly assigned.

Our validation approach involves cross-validation using multiple samples. Under this approach, the full sample is divided randomly into ten subsamples. A model estimation and refinement process is then carried out systematically ten times, each time omitting a different one-tenth of the data. The omitted data are then used as a validation sample, to show how well the methodology of model refinement does outside the sample which it used. We take the average of correct classifications across the 10 excluded subsamples to judge the model's performance. Our final model is however based on an analysis of all subsamples together.

We follow a simple rule for the systematic model refinement: any variable that is not significant at the 10 percent level on a particular subsample is removed.[22] This is a direct approach to creating a set of slightly varied models measured on different subsamples in order to study the robustness of the estimated model.

[22] Often when using this approach, researchers choose a few variables to exempt from this rule, no matter how significant their coefficients are, because their theoretical justification for inclusion in the model is too great. We have chosen to make this exemption for the variables indicating the age and race/ethnicity of the household reference person.

Chapter Four: Models of Participation

In this chapter we present the results of modeling SNAP participation. We begin by comparing several versions of the ***Standard model*** estimated using econometric procedures that were described in Chapter Three. Next, we present an ***Expanded model*** that includes new measures identified in the literature survey described in Chapter Two, using the same econometric approach. We estimate the expanded model for various ***subgroups*** of households, in order to explore variations in participation patterns, and to develop potential interaction terms of interest to use in the full model. For example, the latter might indicate that the effect of household income on program participation is different for households with and without dependent children. We then re-estimate the best model using a logistical functional form, to obtain a somewhat improved fit. The chapter concludes with the results of our model ***validation*** procedure.

Two issues related to the interpretation of the models should be borne in mind. First, the relationships shown here are ***correlational***, not causal. Assuming that we have not erred substantially by omitting factors that are more important than the ones we have included, the models will appear plausible. Nonetheless, the variables in the models are still carrying the effects of any related omitted variables. Hence we are not warranted in inferring that if we could change the value of some measure for a household, we would change its likelihood of participation by exactly the corresponding coefficient. This phenomenon is strikingly illustrated when we compare the standard and expanded models: the strength of the relationships for the standard variables such as race and ethnicity fall dramatically as we include measures of other factors for which they serve as a proxy. With still richer measures of the factors, the point estimates of the coefficients of our "best" model would likewise change.

The second issue of interpretation pertains to the treatment of ***prior participation***. The strongest predictor of current program participation is participation in the immediate past—defined in our analysis as participation at the end of the immediately preceding interview wave (four months previous). Of eligible households reportedly receiving food stamps the preceding wave, 90 percent continue to do so, while of those not participating in the preceding wave, only 7 percent do so. These statistics however do not tell us anything about the *types* of households that participate in the program; they merely push the question back four months in the past.[23] Prior participation is undoubtedly standing in for other more direct drivers of the participation decision. We have therefore not included last wave participation as a predictor. We have however used a broader measure of lifetime attachment to the program, namely an indicator of whether anyone in the household ever received food stamps in the past (as an adult).

The Standard Model

To provide a benchmark for assessing the effects of including measures of new participation factors, we examine models comprising the basic economic and demographic factors typically

[23] The statistics may also be misleading, if reporting errors in the SIPP are correlated over time—i.e. if households that misreport their participation in one interview continue to do so in the next interview.

found in econometric studies. We begin with a linear probability version of such a model. We then show the effects of varying this model in three ways: using a logistic instead of a linear functional form; incorporating random effects; and including an indicator for prior participation.

The *Standard* model includes only those variables that appear in a broad range of quantitative analyses of SNAP participation (such as those that were summarized in Exhibit 2.1). Generally, this research implicitly assumes that participation is less likely for households with greater current resources and better prospects for future earnings. Previous studies have repeatedly found that households are less likely to participate if they:

- have greater income (Farrell et. al., 2003, Bhattarai *et al.*, 2005);
- have earnings (McKernan and Ratcliffe, 2003, Gundersen and Oliveira, 2001);
- live in areas with low unemployment rates (Bartlett *et al.*, 2004, Hanratty 2006);
- are childless (Farrell *et al.*, 2003, Bhattarai *et al.*, 2005);
- have older heads (Gundersen and Oliveira, 2001, Haider *et al.*, 2003);
- are headed by non-Hispanic whites rather than by blacks or Hispanics (Haider *et al.*, 2003, Cancian *et al.*, 2001);
- are headed by a married couple (Farrell *et al.*, 2003, Gundersen and Oliveira, 2001);
- are headed by an individual with more rather than less education (Farrell *et al.*, 2003, Bhattarai *et al.*, 2005, Gundersen and Oliveira, 2001).

In addition to these factors, we also have included control variables to account for the geographic and temporal span of the data. These variables are fixed effects for the four US Census regions and fixed effects for the five distinct waves of survey data.

The Standard Model Estimated Using Linear Regression

Our version of the Standard model, estimated by OLS, replicates previous findings (Exhibit 4.1, column 1). Specifically, the ***correlational*** relationships of SNAP participation with household income, presence of children, presence of earnings, education, age, race, and marital status of the reference person (RP), and the local unemployment rate are all strong and in the expected directions. We report the results below in terms of the categories from the logic model:

- ***Household income and resources:*** Income above poverty is associated with a 12 percentage point reduction in the likelihood of participation ($p < 0.01$)
- ***Household needs:*** Households with children under the age of 13 are 25 percentage points more likely to participate ($p < 0.01$).
- ***Household characteristics and traits:*** Households with earnings are 17 percentage points less likely to participate ($p < 0.01$).
- ***Demographic characteristics:*** Relative to households where the RP has a 12^{th} grade ***education***, participation rates are 8 percentage points higher and 6 percentage points lower for households where the RP has less than and more than a 12th grade education,

respectively. Compared with households with RPs of non-Hispanic white ***race and ethnicity*****,** those whose RPs are non-Hispanic black and non-Hispanic other race are 9 and 7 percentage points more likely to participate. Relative to the excluded category of households with RPs whose ***age*** is 26 to 59, households with older and younger RPs are 13 and 5 percentage points less likely to participate. Households with a ***married*** reference person are 13 percentage points less likely to participate. (All results $p < 0.01$).

- ***Local economy:*** Participation rates are 1 percentage point higher for each additional percentage point of unemployment at the State level ($p < 0.01$).

As noted above, it is not appropriate to interpret these relationships as causal. These variables are correlated with each other (e.g. race/ethnicity of reference person with both age and education of reference person). The quantitative effects of each of these variables on participation depend critically on what else is included in the model, as will be illustrated below.

The summary statistics of this model indicate that despite the strong relationships, the fit is not very good. The proportion of observations that were correctly predicted is 0.62, and the kappa statistic of 0.17 indicates barely moderate agreement between predicted and actual participation.[24]

The Standard Model Estimated Using Logistic Regression

The linear version of the standard model generated negative predicted values for only 4 percent of observations, and did not generate values greater than unity (within rounding error) for any observations. The estimated relationships were very similar using logistic regression rather than linear regression (Exhibit 4.1, columns 2 and 3). Comparing the OLS point estimates with the logistic impacts at the mean, we can see that the logistic version tends to give estimates that are a few percentage points higher, but not markedly different. For example, the OLS coefficient on "income above poverty level" is –0.12, while the logistic coefficient of –0.66 corresponds to an impact at the mean of –0.15.[25] Significance levels are unchanged.

The linear probability and logistic models also yield similar predictions. The percent correctly predicted, the R-squared, and the kappa statistic of the logistic model differ from the corresponding statistics for the linear model by no more than a percentage point. Furthermore, the correlation of the predicted values for the two models is 0.99. We conclude that for the *Standard* model the logistic functional form does not add to the predictive capacity of the model.

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[24] Computation of these statistics is described above, in Chapter Three.

[25] The nonlinear logistic functional form implies that the effect of a factor varies depending of the values of other factors. A useful summary of its overall effect is the value of its effect at the sample mean. This value is calculated as

$$b \times p \times (1–p),$$

where b is the logistic coefficient and p is the mean of the dichotomous dependent variable. In the example above, this is calculated as

$$–0.6619 \times 0.3613 \times (1–0.3613) = –0.1527.$$

Exhibit 4.1

The Standard Model, Linear Probability and Logistic Functional Forms

Variable Name	Linear Probability	Logistic	
		Coefficient (Std Error)	Impact at the Mean
Needs			
Child Under 13	0.2542***	1.2532***	0.2892***
	(0.0086)	(0.0455)	
State Annual Unemp Rate	0.0130***	0.0626***	0.0145***
	(0.0045)	(0.0235)	
Resources			
Inc Above Poverty Level	-0.1243***	-0.6619***	-0.1527***
	(0.0071)	(0.0389)	
Personal Preferences and Traits			
RP Educ Below HS	0.0811***	0.4095***	0.0945***
	(0.0088)	(0.0454)	
RP Educ Above HS	-0.0610***	-0.3363***	-0.0776***
	(0.0095)	(0.0523)	
Any Earnings	-0.1658***	-0.8432***	-0.1946***
	(0.0078)	(0.0425)	
Demographic Characterisitics			
RP Aged 25 Or Under	-0.0525***	-0.2866***	-0.0661***
	(0.0107)	(0.0554)	
RP Aged 60 Or Over	-0.1294***	-0.6583***	-0.1519***
	(0.0100)	(0.0529)	
RP Black Non Hispanic	0.0874***	0.4241***	0.0979***
	(0.0092)	(0.0457)	
RP Hispanic	-0.0096	-0.0249	-0.0057
	(0.0119)	(0.0611)	
RP Other Race	0.0661***	0.3418***	0.0789***
	(0.0168)	(0.0856)	
RP Married	-0.1246***	-0.6621***	-0.1528***
	(0.0087)	(0.0502)	
Summary Statistics			
Kappa Statistic	0.1661	0.1733	
SNAP Part. Rate	36.1%	36.1%	
Predicted SNAP Part. Rate	36.3%	36.2%	
Percent Correctly Predicted	61.5%	61.8%	
R-Squared	0.1687	0.1731	
Number of Observations	24,417	24,417	

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. Percentage point impacts for the logistic model are calculated at the sample mean. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

The Standard Model Estimated Using Random Effects versus Inclusion of Prior Participation

In the model just described (Exhibit 4.1), the mean residual is assumed to be the same for each sample unit cluster—that is, that the probability of participation conditional on observed covariates is the same for each cluster. A random effects model assumes, in contrast, that every sample unit cluster has its own underlying probability of participation conditional on observed covariates, and that these values follow a probability distribution.

The random effects model generates coefficients and standard errors quite similar to those of the OLS model (Exhibit 4.2, columns 1 and 2). The summary statistics, however, are markedly different. The percent correctly predicted is 0.86 (versus 0.62 for OLS) and the kappa statistic is 0.70 (versus 0.17 for OLS). The distribution of predicted values, which made a bell-shaped curve for the OLS model, is bi-modal (or perhaps tri-modal) for the random effects model (Exhibit 4.3). This suggests that there are important factors excluded from the model that are constant over the several observations for the sample unit. These factors are captured in the random effects, which shift the predicted values by a given amount for each sample unit.

The hypothesis is supported by comparing the random effects model with an OLS model that includes an indicator for prior participation in SNAP by any household member (Exhibit 4.2, final column).[26] This single dichotomous variable does not provide as much information as the continuous measure of random effects, but its effect is qualitatively similar. Salient features of the new model are that:

- The estimated coefficient for participation some time in the past is very large, 53 percentage points. The predicted values have a bimodal distribution (Exhibit 4.3). The predictive power of this variable relative to the rest of the model can be seen in the distribution of the predicted values separated for participants and nonparticipants (Exhibit 4.4).
- Estimated coefficients on other covariates that do not change over time are substantially reduced. For example, the coefficient on black relative to non-Hispanic white reference person drops from 9 to 10 percentage points in the standard linear and random effects models to only 2 percentage points in the model that includes past participation. For factors which do vary over time (income above poverty, presence of earnings), the coefficients resemble those in the random effects models.
- The proportion of observations correctly predicted, 72 percent, is substantially higher than in the standard model (62 percent)—an impressive addition from a single variable. Other measures of fit are likewise greatly improved relative to the standard linear model.

[26] The sample size is slightly reduced in the third column of this exhibit because data are unavailable on prior participation for some households. Removing these observations from the sample results in only trivial changes in the models shown in Columns 1 and 2.

Exhibit 4.2

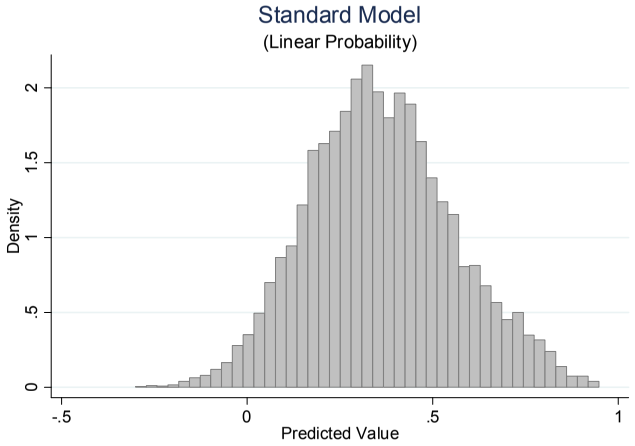
The Standard Model Estimated via Linear Probability, with Random Effects, and with the Addition of Prior Participation

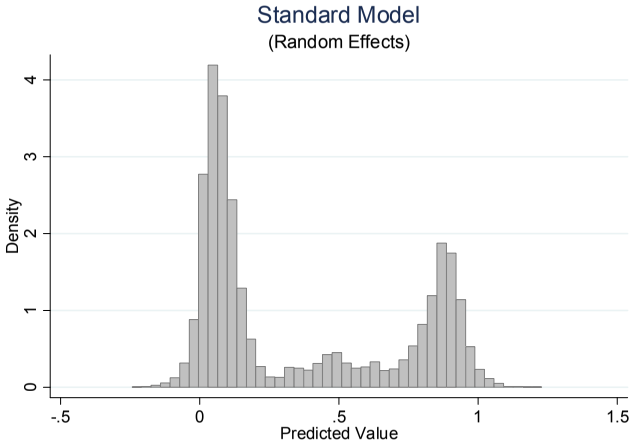
Variable Name	Standard Model		With Prior Participation
	Linear Probability	Random Effects	
Perceived Eligibility			
Prior SNAP			0.5328***
			(0.0065)
Needs			
Child Under 13	0.2542***	0.2381***	0.1280***
	(0.0086)	(0.0073)	(0.0076)
State Annual Unemp Rate	0.0130***	0.0110***	0.0079**
	(0.0045)	(0.0039)	(0.0038)
Resources			
Inc Above Poverty Level	-0.1243***	-0.0817***	-0.0863***
	(0.0071)	(0.0056)	(0.0059)
Personal Preferences and Traits			
RP Educ Below HS	0.0811***	0.0773***	0.0233***
	(0.0088)	(0.0076)	(0.0071)
RP Educ Above HS	-0.0610***	-0.0613***	-0.0312***
	(0.0095)	(0.0084)	(0.0077)
Any Earnings	-0.1658***	-0.1234***	-0.1137***
	(0.0078)	(0.0064)	(0.0067)
Demographic Characteristics			
RP Aged 25 Or Under	-0.0525***	-0.0431***	0.0189**
	(0.0107)	(0.0096)	(0.0089)
RP Aged 60 Or Over	-0.1294***	-0.1102***	-0.0282***
	(0.0100)	(0.0082)	(0.0081)
RP Black Non Hispanic	0.0874***	0.0981***	0.0189**
	(0.0092)	(0.0084)	(0.0076)
RP Hispanic	-0.0096	-0.0131	-0.0119
	(0.0119)	(0.0104)	(0.0094)
RP Other Race	0.0661***	0.0792***	0.0368***
	(0.0168)	(0.0145)	(0.0131)
RP Married	-0.1246***	-0.1211***	-0.0546***
	(0.0087)	(0.0076)	(0.0071)
Summary Statistics			
Kappa Statistic	0.1667	0.7020	0.4072
SNAP Part. Rate	36.1%	36.1%	36.9%
Predicted SNAP Part. Rate	36.0%	36.1%	37.7%
Percent Correctly Predicted	61.6%	86.2%	72.3%
R-Squared	0.1687	0.8268	0.4219
Number of Observations	24,417	24,417	23,747

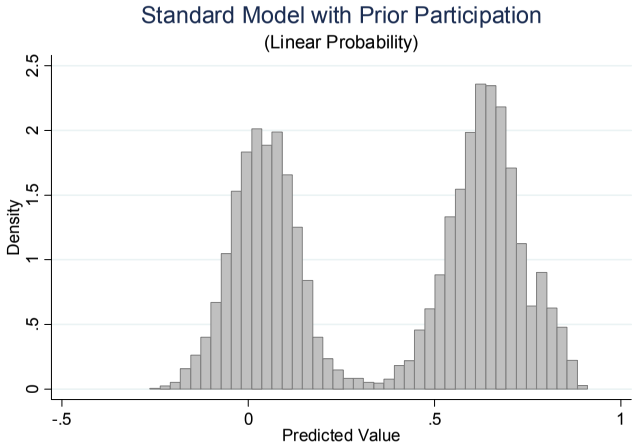
SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

Exhibit 4.3

Distributions of Predicted Values of the Standard Models



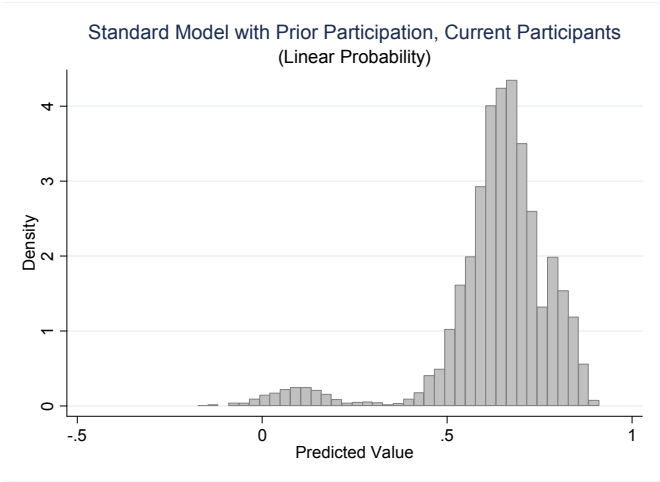


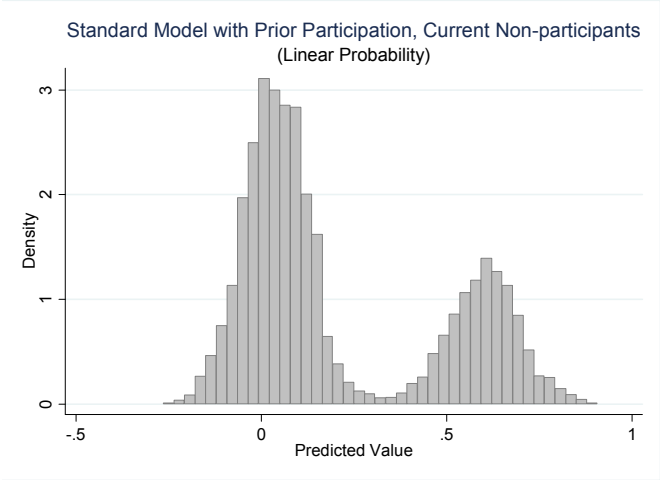


The inference is that there are household characteristics missing from the model that would provide additional explanation. Attributing the effects to prior participation is not fully satisfactory. This variable carries along several distinct influences such as perceived eligibility, acquired experience with the program, and attitudes towards assistance. We therefore turn to expanded models that include such additional covariates.

Exhibit 4.4

Distribution of Predicted Values for Participants and Non-participants, Standard Model with Prior Participation





The Expanded Model and its Variants

The *Expanded* model supplements the variables in the *Standard* model. . We examine the effects of these new factors in three groups.

The first set of new factors is ***descriptors that are available for the entire sample***. As suggested by the literature, these include:

- More detailed measures of ***household income and resources***: Households with income below 50 percent of poverty are expected to be more likely to participate (Farrell *et al.*, 2003, Bhattarai *et al.*, 2005), while those with net worth above zero or above $25,000 are expected to be less likely to participate (Gundersen and Oliveira, 2001, Haider *et al.*, 2003).
- More detailed measures of ***household needs***: Larger, needier households are expected to be more likely to participate (Bhattarai *et al.*, 2005, Haider *et al.*, 2003, Gundersen and Oliveira 2001).We include separate counts of children under age 5, children aged 5 to 12, dependent children aged 13 to 17[27], adults under 60, and adults aged 60 and above. Other measures of needs are a recent move, a household member in poor health (see Gundersen, Weinreb *et al.* 2003; Stuff, Casey *et al.*, 2004), high out-of-pocket health care expenses (Olson, Anderson *et al.*, 2004), child or disabled adult care payments, and child support payments. Food insecurity, which is thought to predict program participation, has been found to be related to unexpected expenses (Olson, Rauschenbach *et al.*, 1996)
- Additional measures of ***personal characteristics and traits:*** Labor market participation, current or past receipt of TANF (see Edin and Lein 1997), receipt of other means-tested cash benefits (General Assistance or GA, SSI, SSDI), receipt of other means-tested non-cash benefits (e.g. WIC, Medicaid, housing subsidies), receipt of alimony or child support, receipt of other income (pensions, investments). Current receipt of cash or non-cash public benefits is expected to be positively associated with higher participation rates (Bhattarai *et al.*, 2005, Cancian *et al.*, 2001), as is receipt of income from relatively unstable sources such as alimony or child support.
- Measures of ***State SNAP participation requirements***: Percent of households with earnings that are assigned certification periods of 3 months or less, and whether the State uses biometric technology during the application process, i.e. fingerprinting, are both expected to be associated with lower participation, (McKernan and Ratcliffe, 2003, Hanratty 2006).

The second set of new factors, also available for the entire sample, is ***measures of trigger events***, or recent changes in circumstances that could signal (a) that the household has been made specifically aware of the program and its likely eligibility; (b) that it needs to find new food resources on short notice; or (c) conversely, that its food needs are suddenly less urgent. This set of variables differs from the previous set in that it captures changes rather than the household's current situation. Because the model already takes account of current circumstances, the

[27] A few individuals aged 15, 16, or 17 are treated as adults if they are reference persons.

additional explanatory power associated with these sorts of events comes from the rapid dynamic adjustments. The measures of trigger events are:

- Starting up receipt of benefits from a program that would likely refer the household to SNAP. These include:
    - SSI for children or adults
    - WIC
    - TANF
    - General Assistance
    - Unemployment insurance
- An increase in needs: a new dependent household member
- Loss of an income stream
    - Departure of an earner from the household
    - Loss of employment for a current household member
- New source of earnings
    - Entry of an earner to the household
    - Gain of employment for a current household member

The final group of new factors consists of ***descriptors that are available only for part of the sample***, because they are measured only in topical modules in Waves 7 and 8 of the 2001 Panel. These factors include:

- Several additional measures of ***household income and resources,*** related to available support networks. The first three of these measures were based on the respondent's self-reported agreement with the following statements:
    - "We watch out for each other's children in this (neighborhood/community.)"
    - "People in this (neighborhood/community) help each other out."
    - "There are people I can count on in this (neighborhood/community.)"

  The fourth measure was based on the response to a series of questions asking whether the respondent believes they would receive help from friends, family, or their community if they needed it. The measure used in the model is an indicator for households that do not expect to receive significant amounts of help from any of these sources (friends, family, or their community) if they need it. Network resources have been found negatively associated with food insecurity (Gundersen, Weinreb *et al.*, 2003; Wehler, Weinreb *et al.*, 2004) and shown in qualitative research to be a critical factor in economic subsistence (Edin and Lein, 1997; Edin and Lein, 1997; Marcus, 2005).
- Additional measures of ***household needs*** pertain to
    - whether a child in the household spent at least one day in the past year with a non-custodial parent;
    - whether the household experienced low or very low food security;

    - experience of other material hardships in the past year including not paying the utilities bill, not paying rent, having utility service cut off, having phone service cut off, and inability to afford to see a doctor.

- Additional measures of ***personal characteristics and traits*** pertaining to attitudes towards receipt of assistance.
    - Receipt of assistance from nonprofits in the past year. Such recipients were expected to be more open to receiving assistance generally, because this type of assistance is sometimes the most stigmatized (Kissane, 2003). This may include assistance from any non-profit organization, from a volunteer tutoring service to a food pantry.
    - Reported reasons for failing to inquire about or complete an application for any assistance program, or for any additional ones if they did apply to some. Many of these would also be reasons to avoid food stamps.
- Additional measures of ***personal characteristics and traits*** relating to language barriers (inability to speak English) and to household members' functional limitations. Various forms of physical or mental impairment have been found associated with food insecurity (Lee and Frongillo, 2001; Stuff, Casey *et al.*, 2004; Hall and Brown, 2005, Nord and Romig, 2006). They may also represent barriers to participation. Our models include three (self-reported) measures:
    - frequently depressed or anxious, or had trouble coping with day-to-day stresses,
    - experienced difficulty hearing normal conversation or making their speech understood, or,
    - experienced difficulty preparing meals, keeping track of money or bills, or doing light housework such as washing dishes or sweeping a floor.

This list covers many concepts that are part of the logic model (Exhibit 2.4) and that are discussed in qualitative research but are rarely included in quantitative models of SNAP participation.

In order to show the incremental explanatory power associated with each of these three sets of variables, we add them to the model sequentially. A final variant of the *Expanded Model* included in this section investigates the effect of the Disaster Supplemental Nutrition Assistance Program in the wake of Hurricane Katrina.

The Expanded Model

Adding the first set of variables described above (measures of current circumstances available for the whole sample) to the *Standard* model substantially increases its explanatory power (Exhibit 4.5, column 1). The percent correctly predicted increases from 62 percent to 68 percent, and the kappa statistic increases from 0.17 to 0.32, a level indicating moderate agreement. Although the coefficients on most of the variables in the *Standard* model retained the same sign, their magnitude and level of significance often decreased substantially when the new measures were added to the model. This illustrates the previous caution that the coefficients of the participation model measures cannot be interpreted causally; their values depend on what else is included. For

example, households with a reference person who is 60 or older are13 percentage points less likely to participate according to the *Standard* model, but only 5 percentage points less likely in the *Expanded* model. (The presence in the household of each individual aged 60 or older has an additional estimated effect in the *Expanded* model of 2 percentage points.) The effects of race and ethnicity are likewise much less. The effects of income above the poverty line and of the local unemployment rate were, however, practically unchanged.

Most of the additional variables had significant effects in the expected direction. Adding more detail to the measures of income and wealth improved the model. Compared to households with income between 50 and 100 percent of poverty, those with income below 50 percent of poverty are 3 percentage points more likely, and those with income above poverty are 11 percentage points less likely to participate ($p < 0.01$ for both). Positive net worth is associated with a 3 percentage point lower likelihood of participation, and net worth above $25,000 with an additional 7 percentage point decrease ($p < 0.01$ for both).

Additional household members of various ages all add significantly to the likelihood of participation, especially children under age 5 (6 percentage points). Another significant need factor is a recent move (2 percentage points). Unexpectedly, large out-of-pocket health care expenses are significantly associated with a lower likelihood of participation (4 percentage points), perhaps countered by the –5 percentage points effect of the trait of a household member in bad health.

Controlling for income amount, those households with earnings were significantly less likely to participate (6 percentage points) while those with other income sources were significantly more likely to participate (19 percentage points for past or present TANF, 12 percentage points for other cash means-tested benefits, 28 percentage points for non-cash benefits).

One measure of program access had a significant effect as hypothesized: participation is 7 percentage points lower in States which use biometric technologies ($p < 0.01$).

The Expanded Model with Trigger Events

Adding trigger events does not improve the expanded model (Exhibit 4.5, column 2). They increase the kappa statistic by less than half a percentage point, and about half of them have signs that are not in the expected direction. The five informational variables, new receipt of various types of benefits, were all expected to have positive signs. Two were significant and positive, one was significant and negative, and two were insignificant. The entry and exit of an earner to the household were expected to have negative and positive effects, respectively; both had significant negative effects. The entry and exit of a dependent were expected to have positive and negative effects, respectively; neither had significant effects at conventional levels. Gain and loss of employment for ongoing household members were expected to have negative and positive effects, respectively; both had significant effects in the wrong direction.

We conclude that trigger event measures are not helpful predictors in a model of participation in a given month. As will be shown in the next section, however, they are relevant for predicting entry and exit.

Exhibit 4.5

The Expanded Model, with and without Trigger Events and Prior Participation

Variable Name	Expanded Model	With Trigger Events	With Prior Participation
State and Local SNAP Policies			
State Biometric Tech	-0.0740***	-0.0738***	-0.0479***
	(0.0089)	(0.0088)	(0.0079)
Pct Earners Frequent Recert	-0.0301	-0.0304	-0.0471**
	(0.0215)	(0.0214)	(0.0208)
Perceived Eligibility			
Prior SNAP			0.4299***
			(0.0076)
Needs			
Num Children Under 5	0.0597***	0.0557***	0.0543***
	(0.0060)	(0.0062)	(0.0054)
Num Children Age 5-12	0.0300***	0.0297***	0.0228***
	(0.0047)	(0.0047)	(0.0043)
Num Dep Children Age 13-17	0.0107*	0.0096	0.0068
	(0.0059)	(0.0059)	(0.0056)
Num Adults Under 60	0.0042	0.0025	-0.0014
	(0.0057)	(0.0059)	(0.0051)
Num Elderly	0.0249**	0.0227**	0.0227**
	(0.0110)	(0.0110)	(0.0096)
Pay Care Child or Disab	0.0034	-0.0004	-0.0131
	(0.0141)	(0.0141)	(0.0136)
Pay Child Support	0.0066	0.0032	-0.0217
	(0.0181)	(0.0180)	(0.0177)
Recent Move	0.0194**	0.0214**	0.0123
	(0.0091)	(0.0091)	(0.0083)
Paid Over 1000 for Hlth Care	-0.0400***	-0.0401***	-0.0168**
	(0.0078)	(0.0078)	(0.0074)
State Annual Unemp Rate	0.0128***	0.0128***	0.0091**
	(0.0041)	(0.0041)	(0.0037)
Resources			
Inc Above Poverty Level	-0.1117***	-0.1117***	-0.0820***
	(0.0069)	(0.0069)	(0.0062)
Inc Under 50 Pct Pov	0.0332***	0.0325***	0.0379***
	(0.0078)	(0.0078)	(0.0071)
Net Worth Above 0	-0.0339***	-0.0345***	-0.0288***
	(0.0069)	(0.0069)	(0.0063)
Net Worth Above 25000	-0.0655***	-0.0652***	-0.0201***
	(0.0078)	(0.0078)	(0.0069)

Exhibit 4.5 (Continued)

The Expanded Model, with and without Trigger Events and Prior Participation

Variable Name	Expanded Model	With Trigger Events	With Prior Participation
Personal Preferences and Traits			
In Bad Health	0.0472***	0.0475***	0.0175***
	(0.0065)	(0.0064)	(0.0058)
RP Educ Below HS	0.0051	0.0051	-0.0073
	(0.0085)	(0.0085)	(0.0075)
RP Educ Above HS	-0.0253***	-0.0254***	-0.0173**
	(0.0083)	(0.0083)	(0.0075)
Highest Educ At Least HS	-0.0394***	-0.0392***	-0.0290***
	(0.0091)	(0.0091)	(0.0083)
Ever TANF	0.1878***	0.1733***	0.0552***
	(0.0094)	(0.0096)	(0.0094)
Any Earnings	-0.0576***	-0.0603***	-0.0517***
	(0.0082)	(0.0084)	(0.0075)
GA/SSI/SSDI	0.1194***	0.1198***	0.0731***
	(0.0096)	(0.0099)	(0.0084)
Non Cash Public Benefits	0.2763***	0.2737***	0.1668***
	(0.0077)	(0.0077)	(0.0071)
Alimony Child Support	0.0488***	0.0500***	0.0290***
	(0.0120)	(0.0120)	(0.0109)
Other Income	-0.0475***	-0.0463***	-0.0288***
	(0.0070)	(0.0070)	(0.0063)
Demographic Characteristics			
Childless RP Aged 25 Or Under	-0.0593***	-0.0553***	0.0077
	(0.0116)	(0.0117)	(0.0113)
Childless RP Aged 60 Or Over	-0.0489***	-0.0495***	-0.0189
	(0.0157)	(0.0157)	(0.0135)
RP Black Non Hispanic	0.0055	0.0049	-0.0103
	(0.0085)	(0.0085)	(0.0076)
RP Hispanic	-0.0338***	-0.0333***	-0.0251***
	(0.0109)	(0.0108)	(0.0096)
RP Other Race	0.0121	0.0118	0.0125
	(0.0146)	(0.0145)	(0.0127)
RP Married	-0.0762***	-0.0749***	-0.0472***
	(0.0093)	(0.0093)	(0.0085)
Trigger Events			
New SSI		-0.0410**	
		(0.0192)	
New WIC		0.0341	
		(0.0208)	

Exhibit 4.5 (Continued)

The Expanded Model, with and without Trigger Events and Prior Participation

Variable Name	Expanded Model	With Trigger Events	With Prior Participation
Trigger Events (Continued)			
New TANF		0.1732***	
		(0.0181)	
New GA		0.2217***	
		(0.0304)	
New UI State		0.0083	
		(0.0216)	
New Earner		-0.0457*	
		(0.0260)	
New Dependent		0.0068	
		(0.0137)	
Departed Earner		-0.0321**	
		(0.0132)	
Departed Dependent		-0.0271*	
		(0.0139)	
Newly Employed Member		0.0543***	
		(0.0125)	
Newly Unemployed Member		-0.0189*	
		(0.0106)	
Summary Statistics			
Kappa Statistic	0.3201	0.3239	0.4314
SNAP Part. Rate	36.1%	36.1%	36.9%
Predicted SNAP Part. Rate	37.1%	37.0%	38.5%
Percent Correctly Predicted	68.4%	68.6%	73.3%
R-Squared	0.3369	0.3413	0.4604
Number of Observations	24,417	24,417	23,747

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

The Expanded Model with Prior Participation

In the *Standard* model, prior participation was an extremely powerful predictor. Its coefficient was 53 percentage points, and by itself it increased the kappa statistic by 23 percentage points (see Exhibit 4.3). For a model that already includes the expanded list of descriptors and trigger events, the influence of prior participation, though still considerable, is reduced (Exhibit 4.5, column 3). It coefficient is 43 percentage points and its effect on the kappa statistic is 11 percentage points. We infer that the expanded list of factors accounts for a good part of the

difference between participant and non-participant households that had been captured by prior participation.

Relative to the *Expanded* model and the *Expanded model with trigger events*, the addition of prior participation substantially reduces (without eliminating) the estimated impacts of several key factors: income above the receipt of TANF, receipt of other cash assistance, and receipt of non cash public benefits. In addition, once this factor is accounted for, the age of childless reference persons no longer has a significant effect on the likelihood of participation.

The Expanded Model with Supplemental "Wave 9" Measures

The Topical Modules for Waves 7 and 8 of the 2001 Panel include an array of unique data items, such as information as whether the household's utilities have been cut off in the last year and measures of food security. Many of these items pertain to circumstances over the last four months or over the last year. These supplemental variables thus can only be used to predict participation in Wave 9. To examine their contribution, we re-estimated the *Expanded* model on the Wave 9 sample with and without prior participation (Exhibit 4.6, columns 1 and 2), and then compared it with versions that include these supplemental factors (columns 3 and 4).

While the effects of most of the supplemental factors are not statistically significant, a few interesting relationships emerged. Controlling for prior participation, SNAP participation is significantly related to having trouble performing household tasks (–4 percentage points; $p < 0.05$), suggesting that this difficulty represents a barrier to participation. Several proxies for attitudes regarding assistance in general were significantly related to SNAP participation. Households reported their reasons for not applying for different assistance programs, and some of these reasons would be relevant to their SNAP decision, e.g. that they do not believe in receiving charity, or that it is too much trouble or not worth the effort. Those who reported these specific reasons were in fact 12 and 10 percentage points less likely respectively to participate in SNAP. Two other reasons for failing to apply to other programs are signals that the household would indeed participate in SNAP, namely, they didn't know they could apply to other programs (11 percentage points) or that there were no other programs available (10 percentage points). Households reporting these reasons are indicating that if they had known about a program, they would have applied for it. As knowledge of SNAP is virtually universal, they most likely applied for SNAP. Furthermore, those reporting having received assistance from a nonprofit organization were 14 percentage points more likely to participate in SNAP. All five of these proxies for attitudes towards assistance had significant effects at the 1 percent level.

Despite the addition of many unusual and potentially important measures, some of which have statistically significant and large coefficients, the predictive power of the model is little changed. Comparing columns 2 and 4, the percent correctly predicted and the kappa statistic each increase by about 1 percentage point through the addition of all the supplemental variables.[28]

[28] Note that the summary statistics for the *Expanded* model are higher in columns 1 and 2 of Exhibit 4.6 than for the identical models in columns 1 and 3 of Exhibit 4.5. The differences are due to the different sample; model runs for the individual waves, not shown, have a somewhat better fit in Wave 9 of the 2001 panel and Wave 6 of the 2004 panel than in the other waves.

Exhibit 4.6

The Expanded Model with Supplemental Measures and Prior Participation
2001 Panel Wave 9 Only

Variable Name	Expanded Model	Expanded Model with Prior Participation	With Supplemental Measures	With Supplemental Measures and Prior Participation
State and Local SNAP Policies				
State Biometric Tech	-0.0837***	-0.0618***	-0.0739***	-0.0572***
	(0.0178)	(0.0165)	(0.0175)	(0.0163)
Pct Earners Frequent Recert	-0.0094	-0.0087	0.0102	0.0008
	(0.0709)	(0.0780)	(0.0679)	(0.0748)
Perceived Eligibility				
Prior SNAP		0.3988***		0.3845***
		(0.0153)		(0.0155)
Needs				
Num Children Under 5	0.0591***	0.0615***	0.0596***	0.0613***
	(0.0130)	(0.0119)	(0.0129)	(0.0118)
Num Children Age 5-12	0.0314***	0.0268***	0.0269***	0.0230**
	(0.0102)	(0.0095)	(0.0099)	(0.0094)
Num Dep Children Age 13-17	0.0153	0.0128	0.0168	0.0139
	(0.0127)	(0.0118)	(0.0126)	(0.0119)
Num Adults Under 60	-0.0121	-0.0199*	-0.0147	-0.0201*
	(0.0119)	(0.0113)	(0.0115)	(0.0111)
Num Elderly	-0.0046	-0.0183	0.0021	-0.0121
	(0.0215)	(0.0194)	(0.0211)	(0.0192)
Child Dayplus Oth Parent			0.0588*	0.0444
			(0.0318)	(0.0300)
Food Security Low			0.0249	0.0072
			(0.0182)	(0.0169)
Pay Care Child or Disab	-0.0361	-0.0467	-0.0473	-0.0552
	(0.0354)	(0.0357)	(0.0345)	(0.0349)
Pay Child Support	0.0199	-0.0119	0.0073	-0.016
	(0.0390)	(0.0399)	(0.0396)	(0.0404)
Recent Move	-0.0096	-0.0109	-0.0181	-0.0195
	(0.0189)	(0.0177)	(0.0189)	(0.0179)
Paid Over 1000 for Hlth Care	-0.0185	0.0113	-0.0182	0.0128
	(0.0171)	(0.0162)	(0.0168)	(0.0160)
Did Not Pay Utilities			0.0537**	0.0265
			(0.0212)	(0.0197)
Did Not Pay Rent			0.0001	0.0038
			(0.0229)	(0.0224)

Exhibit 4.6 (Continued)

The Expanded Model with Supplemental Measures and Prior Participation
2001 Panel Wave 9 Only

Variable Name	Expanded Model	Expanded Model with Prior Participation	With Supplemental Measures	With Supplemental Measures and Prior Participation
Needs (Continued)				
Utilities Cut Off			0.0203	0.0278
			(0.0388)	(0.0375)
Phone Service Cut Off			0.0155	0.0149
			(0.0245)	(0.0226)
Could Not Afford Doctor			(0.0012)	(0.0092)
			(0.0200)	(0.0187)
State Annual Unemp Rate	0.0182**	0.0199**	0.0195**	0.0208**
	(0.0089)	(0.0083)	(0.0086)	(0.0081)
Resources				
Inc Above Poverty Level	-0.0996***	-0.0677***	-0.0917***	-0.0645***
	(0.0148)	(0.0138)	(0.0146)	(0.0136)
Inc Under 50 Pct Pov	0.0262	0.0283*	0.0272	0.0270
	(0.0177)	(0.0168)	(0.0174)	(0.0166)
Net Worth Above 0	-0.0294*	-0.0259*	-0.0306**	-0.0288**
	(0.0150)	(0.0139)	(0.0148)	(0.0138)
Net Worth Above 25000	-0.0679***	-0.0111	-0.0611***	-0.0088
	(0.0159)	(0.0147)	(0.0156)	(0.0146)
Nonprofit Assist			0.1580***	0.1364***
			(0.0432)	(0.0407)
Comm Watches Out			0.0199	0.0078
			(0.0337)	(0.0333)
Comm Help Others			(0.0407)	(0.0267)
			(0.0312)	(0.0307)
Can Count On			0.0367	0.0410
			(0.0338)	(0.0317)
Do Not Expect Help			0.0161	0.0231
			(0.0183)	(0.0169)
Personal Preferences and Traits				
In Bad Health	0.0323**	0.0118	0.0214	0.0082
	(0.0138)	(0.0129)	(0.0140)	(0.0132)
Dif Hear Speak			0.0138	0.0087
			(0.0218)	(0.0192)
Dif Meals Money Housework			-0.0430**	-0.0403**
			(0.0197)	(0.0176)

Exhibit 4.6 (Continued)

The Expanded Model with Supplemental Measures and Prior Participation
2001 Panel Wave 9 Only

Variable Name	Expanded Model	Expanded Model with Prior Participation	With Supplemental Measures	With Supplemental Measures and Prior Participation
Personal Preferences and Traits (Continued)				
No Adult Speaks English			(0.0190) (0.0270)	0.0202 (0.0235)
RP Educ Below HS	0.0227 (0.0162)	0.0085 (0.0149)	0.026 (0.0159)	0.0124 (0.0147)
RP Educ Above HS	-0.023 (0.0165)	-0.0085 (0.0157)	-0.0213 (0.0161)	-0.0078 (0.0153)
Highest Educ At Least HS	0.0028 (0.0190)	0.0129 (0.0178)	0.0121 (0.0186)	0.02 (0.0176)
Anxious Dif Coping			0.0200 (0.0167)	0.0127 (0.0153)
Didnt Apply Dont Need			(0.0112) (0.0136)	(0.0111) (0.0126)
Didnt Apply Not Elig			0.0202 (0.0206)	0.0132 (0.0187)
Didnt Apply Didnt Know			0.1454*** (0.0198)	0.1053*** (0.0177)
Didnt Apply No Charity			-0.1132*** (0.0376)	-0.1153*** (0.0366)
Didnt Apply Plan To			(0.0481) (0.0367)	(0.0477) (0.0341)
Didnt Apply Other			0.0439 (0.0303)	0.0073 (0.0278)
Didnt Apply None Avail			0.1368*** (0.0319)	0.0969*** (0.0293)
Didnt Apply Effort Troub			-0.0837*** (0.0292)	-0.1031*** (0.0276)
Ever TANF	0.2474*** (0.0206)	0.1134*** (0.0210)	0.2233*** (0.0204)	0.1025*** (0.0207)
Any Earnings	-0.0483*** (0.0177)	-0.0448*** (0.0171)	-0.0461*** (0.0174)	-0.0433** (0.0169)
GA/SSI/SSDI	0.1262*** (0.0195)	0.0855*** (0.0179)	0.1215*** (0.0193)	0.0853*** (0.0178)
Non Cash Public Benefits	0.2826*** (0.0163)	0.1848*** (0.0156)	0.2530*** (0.0163)	0.1666*** (0.0157)

Exhibit 4.6 (Continued)

The Expanded Model with Supplemental Measures and Prior Participation
2001 Panel Wave 9 Only

Variable Name	Expanded Model	Expanded Model with Prior Participation	With Supplemental Measures	With Supplemental Measures and Prior Participation
Personal Preferences and Traits (Continued)				
Alimony Child Support	0.0188 (0.0263)	0.0118 (0.0249)	0.0084 (0.0269)	0.0029 (0.0255)
Other Income	-0.0564*** (0.0146)	-0.0321** (0.0133)	-0.0526*** (0.0141)	-0.0293** (0.0130)
Demographic Characteristics				
Childless RP Aged 25 Or Under	-0.0579** (0.0237)	0.0130 (0.0261)	-0.0491** (0.0236)	0.0181 (0.0263)
Childless RP Aged 60 Or Over	0.0043 (0.0292)	0.0400 (0.0261)	0.0176 (0.0289)	0.0486* (0.0259)
RP Black Non Hispanic	0.0184 (0.0165)	0.0015 (0.0154)	0.0162 (0.0163)	0.0008 (0.0152)
RP Hispanic	-0.0254 (0.0201)	-0.0162 (0.0187)	-0.0133 (0.0211)	-0.0181 (0.0199)
RP Other Race	0.0031 (0.0301)	0.0249 (0.0281)	0.0054 (0.0299)	0.0174 (0.0283)
RP Married	-0.0545*** (0.0187)	-0.0391** (0.0176)	-0.0540*** (0.0182)	-0.0426** (0.0172)
Summary Statistics				
Kappa Statistic	0.3395	0.4335	0.3649	0.4477
SNAP Part. Rate	33.5%	34.2%	33.5%	34.2%
Predicted SNAP Part. Rate	34.4%	35.9%	34.5%	35.9%
Percent Correctly Predicted	70.4%	74.2%	71.5%	74.8%
R-Squared	0.3570	0.4650	0.3854	0.4820
Number of Observations	4,034	3,941	4,034	3,941

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

Furthermore, the additional variables did not account for very much of the explanation that is otherwise provided by prior participation. The coefficient on prior participation falls by only 1 percentage point (comparing columns 2 and 4); and accounting for prior participation increases the kappa statistic by practically the same amount regardless of whether the supplemental variables are included (.09 increase in kappa, columns 1 and 2; .08 increase, columns 3 and 4).

The Disaster Supplemental Nutrition Assistance Program

Following Hurricane Katrina, the Disaster Supplemental Nutrition Assistance Program (D-SNAP) disbursed over $400 million in payments to new households and supplements to existing SNAP participants in Louisiana and Mississippi, during September, October, and November of 2005.[29] Relative to the population of the States, these D-SNAP payments were far larger than those received by residents in other States for Katrina or for any other disaster during the time period covered by our data. Because the benefits are more generous than for SNAP, we would expect that the program expansions would increase participation in the affected States and months, even controlling for measured household circumstances. We use residence in the aforementioned States during the three months as a proxy for D-SNAP eligibility.

Contrary to expectations, when added to the *Expanded* model, the measure of D-SNAP eligibility is associated with an 8 percentage point decline in SNAP participation ($p < 0.01$; Appendix A, Exhibit A.2). We might speculate that the chaos associated with the hurricane reduced program participation despite the availability of disaster relief—or alternatively, that D-SNAP recipients did not understand that this benefit was part of the Supplemental Nutrition Assistance Program, and therefore did not report participation in SNAP. As the inclusion of this variable did not change any of the other coefficients perceptibly, and as D-SNAP is unlikely to affect SNAP participation in general, we do not incorporate it in our model.

Subgroup Analysis and Interaction Terms

To explore variations in participation patterns among different types of households and households in different situations, the sample was segmented in three ways and the *Expanded* model was estimated on each segment. Some variables were definitionally excluded from some segment models, e.g. measures of dependent children from the models of participation by childless households.

Previous authors have shown that the effects of participation factors vary for different types of eligible households—most notably, for past participants versus those who have not participated in the past (Hernandez and Ziol-Guest, 2006; Hisnanick and Walker, 2000), but also depending on household composition, e.g. single adults, single parents, elderly adults only (Gleason et al, 1998; Hernandez and Ziol-Guest, 2006). We therefore stratified our sample along the dimensions of:

- program participation in the previous wave; and
- household type.

In addition, in response to FNS interest in how participation patterns vary with the state of the economy, we stratified our sample by

- high versus low unemployment rate.

[29] Source: http://www.fns.usda.gov/Disasters/response/disaster_chart.pdf, February 28, 2008.

There are innumerable ways to segment the eligible population, so we view these analyses as exploratory rather than definitive. In addition to their inherent interest, they are of value in suggesting key interaction terms to incorporate into the expanded model. We therefore note, for each stratification, the implications for terms to be added to the overall model.

SNAP Participation in Previous Wave

When we segment the eligible population into a group that participated in SNAP in the previous wave (37 percent) and a group that did not (63 percent) and model participation for the two groups separately, we are essentially building models of program entry for recent non-participants and program retention (or exit) for recent participants (Exhibit 4.7). The *Expanded Model with Trigger Events and Prior Participation* for the full sample is shown in column 1. Similar models are estimated for the two subgroups, with the exception that the indicator of past history of SNAP participation is omitted from the model for recent participants. We show these subgroup models both excluding trigger events (columns 2 and 4) and including them (columns 3 and 5).

As noted in an earlier section, the recent SNAP participants and non-participants are dramatically different when it comes to current participation. While only 7 percent of the recent non-participants are current SNAP participants, 90 percent participants in the prior wave also participate in the current wave. As a result the models in columns 2 and 4, when considered jointly for the full sample, predict participation more accurately than the corresponding model that combines the two groups—achieving 87 percent and 84 percent correct for recent non-participants and recent participants respectively, versus 73 percent for the full sample model in Exhibit 4.5, column 3. But these subgroup model predictions are no more accurate than simply assuming that all recent participants continue to participate; the entry or retention models contribute little additional predictive accuracy after accounting for prior wave participation. Therefore, the kappa statistics for these models are 0.09 (recent non-participants) and 0.08 (recent participants), much lower than the kappa statistic of 0.32 for the full sample (Exhibit 4.5, column 1).

The kappa statistics of the entry and retention models improve slightly (0.15 for recent non-participants and 0.11 for recent participants) when trigger events are added to the expanded model (Exhibit 4.7, columns 3 and 5). This small gain (5 percentage points for recent non-participants and 2 percentage points for recent participants) contrasts with the lack of difference in predictive accuracy of the expanded models with and without trigger events for the full sample (Exhibit 4.5 column 3 versus Exhibit 4.7 column 1).[30]

Moreover, all the trigger events in the entry and retention models have signs in the expected direction and most of them are significant. In the entry model, new participation in programs that increase awareness of SNAP have large positive and significant effects on SNAP participation (SSI 10 percentage points, WIC 15 percentage points, TANF 50 percentage points, GA 53 percentage points, UI 6 percentage points; $p < 0.01$ for all). In addition, an increase in food needs

[30] The kappa statistics of the expanded models with and without the trigger events are the same even when past SNAP participation is not in the model (Exhibit 4.5, columns 1 and 2).

Exhibit 4.7

The Expanded Model with Prior Participation, with and without Trigger Events, by Previous Wave Participation

Variable Name	Full Sample	Previous Wave Non-Participants		Previous Wave Participants	
		Without Trigger Events	With Trigger Events	Without Trigger Events	With Trigger Events
State & Local SNAP Policies					
State Biometric Tech	-0.0476***	-0.0227***	-0.0200***	-0.0183*	-0.0191*
	(0.0079)	(0.0058)	(0.0056)	(0.0101)	(0.0099)
Pct Earners Frequent Recert	-0.0477**	-0.0052	-0.0071	-0.1175***	-0.1112***
	(0.0207)	(0.0156)	(0.0153)	(0.0426)	(0.0417)
Perceived Eligibility					
Prior SNAP	0.4319***	0.0513***	0.0591***		
	(0.0075)	(0.0065)	(0.0063)		
Needs					
Num Children Under 5	0.0480***	0.0347***	0.0195***	0.0160***	0.0177***
	(0.0055)	(0.0067)	(0.0067)	(0.0052)	(0.0052)
Num Children Age 5-12	0.0220***	0.0150***	0.0116**	0.0066	0.0054
	(0.0043)	(0.0051)	(0.0049)	(0.0041)	(0.0040)
Num Dep Children Age 13-17	0.0053	0.0053	0.0034	-0.0051	-0.0047
	(0.0056)	(0.0061)	(0.0060)	(0.0057)	(0.0056)
Num Adults Under 60	-0.004	0.0171***	0.0069	-0.0064	-0.0004
	(0.0053)	(0.0047)	(0.0045)	(0.0064)	(0.0063)
Num Elderly	0.0182*	0.0176**	0.0024	0.0094	0.0135
	(0.0096)	(0.0076)	(0.0072)	(0.0123)	(0.0123)
Pay Care Child or Disab	-0.0173	0.0285*	0.0233	-0.0499***	-0.0505***
	(0.0135)	(0.0153)	(0.0146)	(0.0171)	(0.0171)
Pay Child Support	-0.0254	0.0189	0.01	-0.0588**	-0.0522**
	(0.0176)	(0.0168)	(0.0162)	(0.0268)	(0.0264)
Recent Move	0.0136	-0.0058	-0.0006	-0.0002	-0.0028
	(0.0083)	(0.0075)	(0.0074)	(0.0103)	(0.0101)
Paid Over 1000 for Hlth Care	-0.0173**	0.0107*	0.0090*	-0.0135	-0.0121
	(0.0073)	(0.0055)	(0.0053)	(0.0152)	(0.0151)
State Annual Unemp Rate	0.0093**	0.0071**	0.0069**	-0.003	-0.0026
	(0.0037)	(0.0029)	(0.0028)	(0.0043)	(0.0043)
Resources					
Inc Above Poverty Level	-0.0827***	-0.0190***	-0.0210***	-0.0557***	-0.0578***
	(0.0062)	(0.0046)	(0.0045)	(0.0095)	(0.0094)
Inc Under 50 Pct Pov	0.0358***	0.0303***	0.0248***	0.0027	0.0019
	(0.0071)	(0.0067)	(0.0064)	(0.0090)	(0.0088)
Net Worth Above 0	-0.0297***	-0.0126**	-0.0133**	-0.0135*	-0.0128*
	(0.0062)	(0.0057)	(0.0054)	(0.0073)	(0.0072)
Net Worth Above 25000	-0.0190***	-0.0131***	-0.0119***	0.0093	0.009
	(0.0069)	(0.0046)	(0.0045)	(0.0113)	(0.0110)

Exhibit 4.7 (Continued)

The Expanded Model with Prior Participation, with and without Trigger Events by Previous Wave Participation

Variable Name	Full Sample	Previous Wave Non-Participants		Previous Wave Participants	
		Without Trigger Events	With Trigger Events	Without Trigger Events	With Trigger Events
Personal Preferences and Traits					
In Bad Health	0.0177***	0.0128***	0.0140***	0.0058	0.0068
	(0.0058)	(0.0047)	(0.0046)	(0.0073)	(0.0071)
RP Educ Below HS	-0.0071	-0.0016	-0.0008	-0.0051	-0.0013
	(0.0074)	(0.0055)	(0.0053)	(0.0087)	(0.0086)
RP Educ Above HS	-0.0174**	-0.0103*	-0.0094*	-0.0074	-0.0075
	(0.0075)	(0.0056)	(0.0055)	(0.0101)	(0.0100)
Highest Educ At Least HS	-0.0285***	-0.0051	-0.0066	-0.0301***	-0.0252**
	(0.0083)	(0.0073)	(0.0070)	(0.0104)	(0.0102)
Ever TANF	0.0377***	0.0617***	0.0237**	0.0338***	0.0393***
	(0.0096)	(0.0116)	(0.0109)	(0.0079)	(0.0079)
Any Earnings	-0.0528***	-0.0276***	-0.0173***	-0.0333***	-0.0264***
	(0.0077)	(0.0063)	(0.0062)	(0.0102)	(0.0102)
GA/SSI/SSDI	0.0700***	0.0071	-0.0028	0.0268***	0.0253***
	(0.0086)	(0.0077)	(0.0073)	(0.0085)	(0.0083)
Non Cash Public Benefits	0.1632***	0.0714***	0.0621***	0.1969***	0.1832***
	(0.0071)	(0.0053)	(0.0051)	(0.0205)	(0.0201)
Alimony Child Support	0.0310***	0.0242*	0.0293**	0.0166	0.0149
	(0.0109)	(0.0136)	(0.0130)	(0.0102)	(0.0102)
Other Income	-0.0279***	-0.0194***	-0.0186***	0.0051	0.0066
	(0.0063)	(0.0041)	(0.0040)	(0.0104)	(0.0102)
Demographic Characteristics					
Childless RP Aged 25 Or Under	0.009	0.0041	-0.0075	-0.1703***	-0.1261***
	(0.0113)	(0.0087)	(0.0085)	(0.0458)	(0.0427)
Childless RP Aged 60 Or Over	-0.0174	-0.0309***	-0.0144	0.0338**	0.0304*
	(0.0135)	(0.0101)	(0.0097)	(0.0160)	(0.0158)
RP Black Non Hispanic	-0.0105	0.0022	0.0044	0	-0.0024
	(0.0076)	(0.0062)	(0.0060)	(0.0080)	(0.0079)
RP Hispanic	-0.0247***	-0.0278***	-0.0255***	-0.0109	-0.0103
	(0.0095)	(0.0075)	(0.0071)	(0.0116)	(0.0114)
RP Other Race	0.0125	-0.0043	-0.001	0.0037	-0.0014
	(0.0126)	(0.0102)	(0.0099)	(0.0137)	(0.0136)
RP Married	-0.0441***	-0.0334***	-0.0181***	-0.0114	-0.0185*
	(0.0085)	(0.0073)	(0.0069)	(0.0113)	(0.0111)

Exhibit 4.7 (Continued)

The Expanded Model with Prior Participation, with and without Trigger Events by Previous Wave Participation

Variable Name	Full Sample	Previous Wave Non-Participants		Previous Wave Participants	
		Without Trigger Events	With Trigger Events	Without Trigger Events	With Trigger Events
Trigger Events					
New SSI	-0.0081		0.1013***		
	(0.0180)		(0.0240)		
New WIC	0.0539***		0.1479***		
	(0.0204)		(0.0307)		
New TANF	0.2134***		0.5007***		
	(0.0181)		(0.0422)		
New GA	0.2352***		0.5329***		
	(0.0299)		(0.0691)		
New UI State	-0.0063		0.0578***		
	(0.0210)		(0.0217)		
New Earner	-0.0460*				-0.1867***
	(0.0267)				(0.0445)
New Dependent	0.0221*		0.0499***		
	(0.0131)		(0.0161)		
Departed Earner	-0.0034		0.0425***		
	(0.0129)		(0.0122)		
Departed Dependent	-0.0458***				-0.1778***
	(0.0136)				(0.0227)
Newly Employed Member	0.0428***				-0.0208
	(0.0127)				(0.0167)
Newly Unemployed Member	-0.0181*		0.0172*		
	(0.0101)		(0.0096)		
Summary Statistics					
Kappa Statistic	0.4364	0.0946	0.1464	0.0869	0.1068
SNAP Part. Rate	36.9%	7.3%	7.3%	90.0%	90.0%
Predicted SNAP Part. Rate	38.5%	7.9%	7.7%	89.9%	89.8%
Percent Correctly Predicted	73.5%	87.3%	88.0%	83.5%	83.8%
R-Squared	0.4659	0.1045	0.1591	0.0885	0.1100
Number of Observations	23,747	14,998	14,998	8,241	8,241

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

and loss of income stream have positive effects on SNAP participation (new dependent 4 percentage points, departed earner 5 percentage points; $p < 0.01$ for both; and loss of long-term earnings 2 percentage points). In the retention model, decrease in food needs and gain of income stream have negative effects on SNAP participation (departed dependent 18 percentage points, new earner 19 percentage points; $p < 0.01$ for both; and gain in employment for an existing household member 2 percentage points). In contrast, in the model for the full sample (Exhibit 4.7, column 1) significant coefficients on trigger events were in the wrong direction in four instances, and in the correct direction in only three instances.

Other than the complementary effects of trigger events, the coefficients are in general quite similar for the two subgroups. The same factors that induce households to enter SNAP likewise induce them to remain in the program. For example, income compared to the poverty level and receipt of non-cash public benefits have effects in the same direction for both subgroups based on immediate prior participation (although the magnitudes are slightly different). In comparison to households between 50 percent of poverty and the poverty level, those above the poverty level are less likely to participate in SNAP (–2 percentage points for prior non-participants, and –6 percentage points for prior participants; $p < 0.01$ for both). In addition, households receiving non-cash public benefits such as WIC and public housing or subsidized rent are more likely to participate in SNAP (6 percentage points for prior non-participants, and 18 percentage points for prior participants, $p < 0.01$ for both).

As discussed in Chapter Three, we do not use immediately prior participation in our SNAP participation model. Hence differences in participation behavior between the two subgroups that are defined by immediately prior participation are not incorporated into our expanded model.

Household Composition

The eligible household sample is also stratified into five groups on the basis of household composition[31]:

- Households with only elderly or disabled members and no children (37 percent)
- Households with at least one able-bodied, prime-age (18 to 59) adult and no children (21 percent)
- Single parent households (one adult with one or more children) (18 percent)
- Married-couple households with children (there may be other adults as well) (15 percent)
- Other household with children (9 percent)

Every household composition subgroup model excludes some variables as irrelevant. In particular:

- indicators for presence of children of various ages and for receipt of TANF are omitted from the two models for childless households
- indicators for age of RP are retained only for the model for able bodied adults without children

[31] These groups are based on the typology used in Gleason et al. (1998).

Exhibit 4.8

The Expanded Model with Prior Participation by Household Composition

Variable Name	Full Sample	All Elderly or Disabled	At Least One Potential Worker, No Children	Single Parent Family	Married Couple with Children	Other House-holds with Children
State and Local SNAP Policies						
State Biometric Tech	-0.0479***	-0.0708***	-0.0461***	-0.0358*	-0.0106	-0.0512*
	(0.0079)	(0.0134)	(0.0143)	(0.0198)	(0.0183)	(0.0281)
Pct Earners Frequent Recert	-0.0471**	0.1651***	-0.0492	0.0034	-0.0292	-0.1215*
	(0.0208)	(0.0583)	(0.0310)	(0.0477)	(0.0391)	(0.0723)
Perceived Eligibility						
Prior SNAP	0.4299***	0.5140***	0.2831***	0.4423***	0.3968***	0.3779***
	(0.0076)	(0.0127)	(0.0143)	(0.0198)	(0.0175)	(0.0253)
Needs						
Num Children Under 5	0.0543***			0.0457***	0.0369***	0.0641***
	(0.0054)			(0.0099)	(0.0091)	(0.0122)
Num Children Age 5-12	0.0228***			0.0205***	0.0076	0.0182*
	(0.0043)			(0.0070)	(0.0072)	(0.0106)
Num Dep Children Age 13-17	0.0068			0.0024	-0.0085	0.0087
	(0.0056)			(0.0093)	(0.0096)	(0.0126)
Num Adults Under 60	-0.0014	-0.0547**	0.0125	0.0457	0.0313***	-0.0156
	(0.0051)	(0.0231)	(0.0085)	(0.0433)	(0.0108)	(0.0180)
Num Elderly	0.0227**	-0.0429*	0.0267		0.019	-0.005
	(0.0096)	(0.0231)	(0.0258)		(0.0173)	(0.0309)
Pay Care Child or Disab	-0.0131	0.1271**	0.0803	-0.0315*	-0.0237	-0.0016
	(0.0136)	(0.0535)	(0.0496)	(0.0190)	(0.0267)	(0.0368)
Pay Child Support	-0.0217		-0.0265	-0.1311*	0.0361	0.0474
	(0.0177)		(0.0230)	(0.0738)	(0.0363)	(0.0434)
Recent Move	0.0123	0.0101	-0.0046	-0.0133	-0.0249	0.0151
	(0.0083)	(0.0228)	(0.0140)	(0.0217)	(0.0214)	(0.0256)
Paid Over 1000 for Hlth Care	-0.0168**	-0.003	-0.0059	-0.0685***	-0.0329*	-0.0574*
	(0.0074)	(0.0097)	(0.0156)	(0.0262)	(0.0199)	(0.0340)
State Annual Unemp Rate	0.0091**	0.0141**	0.0145**	-0.0061	0.007	0.0145
	(0.0037)	(0.0060)	(0.0067)	(0.0088)	(0.0101)	(0.0133)
Resources						
Inc Above Poverty Level	-0.0820***	-0.0745***	-0.0461***	-0.1215***	-0.0840***	-0.0789***
	(0.0062)	(0.0093)	(0.0132)	(0.0195)	(0.0144)	(0.0233)
Inc Under 50 Pct Pov	0.0379***	-0.0340**	0.0197	0.0402**	0.0566***	0.0562**
	(0.0071)	(0.0156)	(0.0127)	(0.0162)	(0.0178)	(0.0235)

Exhibit 4.8 (Continued)

The Expanded Model with Prior Participation by Household Composition

Variable Name	Full Sample	All Elderly or Disabled	At Least One Potential Worker, No Children	Single Parent Family	Married Couple with Children	Other House-holds with Children
Resources (Contd)						
Net Worth Above 0	-0.0288***	-0.0275**	-0.0302***	-0.0264*	-0.0334**	-0.0155
	(0.0063)	(0.0113)	(0.0112)	(0.0143)	(0.0160)	(0.0209)
Net Worth Above 25000	-0.0201***	-0.0034	-0.0276**	-0.0395	-0.0374**	-0.014
	(0.0069)	(0.0100)	(0.0135)	(0.0253)	(0.0162)	(0.0273)
Personal Preferences and Traits						
In Bad Health	0.0175***	0.0105	0.0489***	0.0276*	0.0118	0.0072
	(0.0058)	(0.0084)	(0.0130)	(0.0156)	(0.0162)	(0.0208)
RP Educ Below HS	-0.0073	-0.0103	-0.0139	0.021	0.0053	-0.0146
	(0.0075)	(0.0105)	(0.0167)	(0.0271)	(0.0198)	(0.0262)
RP Educ Above HS	-0.0173**	0.001	-0.0276**	-0.0017	-0.0356*	-0.0582**
	(0.0075)	(0.0125)	(0.0128)	(0.0192)	(0.0192)	(0.0286)
Highest Educ At Least HS	-0.0290***		-0.0348**	-0.011	-0.0256	-0.0322
	(0.0083)		(0.0151)	(0.0264)	(0.0194)	(0.0232)
Ever TANF	0.0552***			0.0761***	0.0630***	0.1112***
	(0.0094)			(0.0164)	(0.0228)	(0.0230)
Any Earnings	-0.0517***	-0.0966***	-0.0340***	-0.0509***	-0.0484**	-0.0701***
	(0.0075)	(0.0175)	(0.0123)	(0.0178)	(0.0212)	(0.0248)
GA/SSI/SSDI	0.0731***	0.0906***	0.0915***	0.0112	0.1312***	0.1246***
	(0.0084)	(0.0151)	(0.0233)	(0.0209)	(0.0247)	(0.0239)
Non Cash Public Benefits	0.1668***	0.1079***	0.2046***	0.2824***	0.1552***	0.2504***
	(0.0071)	(0.0116)	(0.0161)	(0.0222)	(0.0152)	(0.0303)
Alimony Child Support	0.0290***	0.0879**	0.0463	0.0199	-0.0027	-0.001
	(0.0109)	(0.0426)	(0.0612)	(0.0146)	(0.0348)	(0.0239)
Other Income	-0.0288***	-0.0076	-0.0190*	-0.1118***	-0.0439***	-0.0202
	(0.0063)	(0.0092)	(0.0112)	(0.0217)	(0.0154)	(0.0269)
Demographic Characteristics						
Childless RP Aged 25 Or Under	0.0077		-0.0038			
	(0.0113)		(0.0117)			
Childless RP Aged 60 Or Over	-0.0189		-0.0159			
	(0.0135)		(0.0318)			
RP Black Non Hispanic	-0.0103	-0.0244*	-0.0024	-0.0021	-0.0177	-0.0031
	(0.0076)	(0.0125)	(0.0148)	(0.0164)	(0.0236)	(0.0258)
RP Hispanic	-0.0251***	0.0193	-0.0137	-0.0315	-0.0759***	-0.012
	(0.0096)	(0.0193)	(0.0197)	(0.0225)	(0.0196)	(0.0306)

Exhibit 4.8 (Continued)

The Expanded Model with Prior Participation by Household Composition

Variable Name	Full Sample	All Elderly or Disabled	At Least One Potential Worker, No Children	Single Parent Family	Married Couple with Children	Other House-holds with Children
Demographic Characteristics (Contd)						
RP Other Race	0.0125	-0.0016	0.0349*	-0.008	-0.0067	0.0611
	(0.0127)	(0.0232)	(0.0212)	(0.0343)	(0.0262)	(0.0421)
RP Married	-0.0472***	0.0606**	-0.0643***			
	(0.0085)	(0.0252)	(0.0162)			
Summary Statistics						
Kappa Statistic	0.4314	0.4858	0.3458	0.3498	0.3727	0.3173
SNAP Part. Rate	36.9%	30.7%	20.7%	62.3%	33.4%	56.0%
Predicted SNAP Part. Rate	38.5%	32.3%	22.3%	63.1%	34.9%	56.6%
Percent Correctly Predicted	73.3%	77.8%	77.9%	69.6%	71.8%	66.4%
R-Squared	0.4604	0.5176	0.3748	0.3675	0.3988	0.3333
Number of Observations	23,747	8,760	5,001	4,244	3,611	2,133

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

The participation rates for eligible households differ greatly among these subgroups, with a pattern that conforms to expectations. The participation rate varies from a low of 21 percent for childless households with at least one potential earner and no children to a high of 62 percent for single parent families. In terms of predictive accuracy of the model, the kappa statistic for the subgroup with only elderly or disabled members is the highest (0.49) and that for the subgroup of other households with children is the lowest (0.31). The kappa statistic for the other three subgroups is between 0.35 and 0.37. The model makes correct prediction for about 78 percent of the households in the two subgroups without children, for 70 to 72 percent of the households with single mothers and married couples with children, and for 66 percent of other households with children.

As expected, some variables in the model have different associations with SNAP participation in different subgroups. In particular, three variables stand out in terms of potential interaction terms.

- The effects of household income on program participation are greater for households with children. Households with income less than 50 percent of poverty are more likely to participate in SNAP when compared to households with income between 50 percent of

poverty and the poverty level among the subgroups with children in the household (4 percentage points, 6 percentage points and 6 percentage points; all significant). Moreover, the difference in SNAP participation between the households with income above the poverty level and those with income less than 50 percent of poverty relative to households in the middle group is the smallest for the subgroups without children (4 percentage points each) than for the subgroups with children (16 percentage points, 14 percentage points, and 14 percentage points).

- Households in subgroups without children who pay for child care or disability are more like to participate in SNAP (13 percentage points and 8 percentage points).

- The effect of SNAP attachment on current participation is greatest for households with only elderly and disabled individuals (51 percentage points, $p < 0.01$) and weakest for childless households with able-bodied adults (28 percentage points, $p < 0.01$).

Thus the following terms are included in the expanded model with interactions:

- the two poverty level indicators interacted with indicators for the presence and absence of children in the household
- payment of childcare and disability interacted with indicators for the presence and absence of children in the household, and
- prior SNAP participation interacted with indicators for the absence of children in the household, the presence of children in the household with an elderly reference person, and the presence of children in the household with a non-elderly reference person.

Economic Conditions

The eligible households were divided into two roughly equal groups based on the annual unemployment rates (obtained from the BLS) in the States where those household lived during the years when they were interviewed for the 2001 and 2004 panels of the SIPP. As a useful benchmark, the CBO estimate of the natural rate of unemployment of 5.2 percent in 2002 is used to stratify the two groups.[32] The high unemployment subgroup (46 percent) contains households in States and years with unemployment rate as high as 8.1 percent and the low unemployment subgroup (54 percent) contains households in States and years with unemployment rate as low as 2.7 percent.

The *Expanded model with prior SNAP participation* is qualitatively similar for the low and the high unemployment subgroups (Exhibit 4.9 columns 2 and 3). Both subgroups have kappa statistics of 0.44 and percentage of correct predictions of roughly 73 percent. The high unemployment subgroup has slightly higher SNAP participation rate (38 percent) than the low unemployment subgroup (36 percent). The only meaningful difference between the models for the two subgroups is that households in the low unemployment subgroup that are in States with a

[32] "The Effect of Changes in Labor Markets on the Natural Rate of Unemployment." April 2002. Congressional Budget Office. (http://www.cbo.gov/ftpdocs/33xx/doc3367/LaborMarkets.pdf)

Exhibit 4.9

The Expanded Model with Prior Participation by Level of Unemployment

Variable Name	Full Sample	Low Unemployment[a]	High Unemployment[a]
State and Local SNAP Policies			
State Biometric Tech	-0.0479***	-0.0402***	-0.0502***
	(0.0079)	(0.0109)	(0.0103)
Pct Earners Frequent Recert	-0.0471**	-0.0791***	-0.0074
	(0.0208)	(0.0269)	(0.0316)
Perceived Eligibility			
Prior SNAP	0.4299***	0.4340***	0.4251***
	(0.0076)	(0.0097)	(0.0104)
Needs			
Num Children Under 5	0.0543***	0.0599***	0.0480***
	(0.0054)	(0.0069)	(0.0075)
Num Children Age 5-12	0.0228***	0.0221***	0.0237***
	(0.0043)	(0.0055)	(0.0061)
Num Dep Children Age 13-17	0.0068	0.001	0.0131*
	(0.0056)	(0.0072)	(0.0076)
Num Adults Under 60	-0.0014	-0.0014	-0.0026
	(0.0051)	(0.0064)	(0.0073)
Num Elderly	0.0227**	0.0283**	0.0153
	(0.0096)	(0.0121)	(0.0138)
Pay Care Child or Disab	-0.0131	-0.0272	0.0002
	(0.0136)	(0.0183)	(0.0196)
Pay Child Support	-0.0217	-0.0018	-0.0405
	(0.0177)	(0.0230)	(0.0253)
Recent Move	0.0123	0.0165	0.0078
	(0.0083)	(0.0107)	(0.0115)
Paid Over 1000 for Hlth Care	-0.0168**	-0.0195**	-0.0139
	(0.0074)	(0.0098)	(0.0108)
State Annual Unemp Rate	0.0091**	0.0134**	-0.0117
	(0.0037)	(0.0067)	(0.0079)
Resources			
Inc Above Poverty Level	-0.0820***	-0.0811***	-0.0823***
	(0.0062)	(0.0080)	(0.0090)
Inc Under 50 Pct Pov	0.0379***	0.0383***	0.0386***
	(0.0071)	(0.0094)	(0.0101)
Net Worth Above 0	-0.0288***	-0.0258***	-0.0324***
	(0.0063)	(0.0082)	(0.0090)
Net Worth Above 25000	-0.0201***	-0.0272***	-0.011
	(0.0069)	(0.0088)	(0.0099)
Personal Preferences and Traits			
In Bad Health	0.0175***	0.0215***	0.0126
	(0.0058)	(0.0076)	(0.0083)
RP Educ Below HS	-0.0073	-0.012	-0.0016
	(0.0075)	(0.0094)	(0.0102)
RP Educ Above HS	-0.0173**	-0.0144	-0.0211**
	(0.0075)	(0.0095)	(0.0105)

Exhibit 4.9 (Continued)

The Expanded Model with Prior Participation by Level of Unemployment

Variable Name	Full Sample	Low Unemployment[a]	High Unemployment[a]
Personal Preferences and Traits (Continued)			
Highest Educ At Least HS	-0.0290***	-0.0371***	-0.0197*
	(0.0083)	(0.0106)	(0.0116)
Ever TANF	0.0552***	0.0448***	0.0670***
	(0.0094)	(0.0122)	(0.0128)
Any Earnings	-0.0517***	-0.0360***	-0.0682***
	(0.0075)	(0.0098)	(0.0106)
GA/SSI/SSDI	0.0731***	0.0681***	0.0797***
	(0.0084)	(0.0108)	(0.0116)
Non Cash Public Benefits	0.1668***	0.1658***	0.1675***
	(0.0071)	(0.0093)	(0.0101)
Alimony Child Support	0.0290***	0.0323**	0.0248
	(0.0109)	(0.0142)	(0.0157)
Other Income	-0.0288***	-0.0331***	-0.0238***
	(0.0063)	(0.0081)	(0.0090)
Demographic Characteristics			
Childless RP Aged 25 Or Under	0.0077	0.0116	0.0024
	(0.0113)	(0.0152)	(0.0160)
Childless RP Aged 60 Or Over	-0.0189	-0.0168	-0.022
	(0.0135)	(0.0169)	(0.0191)
RP Black Non Hispanic	-0.0103	-0.0079	-0.011
	(0.0076)	(0.0096)	(0.0106)
RP Hispanic	-0.0251***	-0.0203*	-0.0295**
	(0.0096)	(0.0119)	(0.0127)
RP Other Race	0.0125	0.0183	0.0075
	(0.0127)	(0.0165)	(0.0173)
RP Married	-0.0472***	-0.0454***	-0.0479***
	(0.0085)	(0.0108)	(0.0119)
Summary Statistics			
Kappa Statistic	0.4314	0.4291	0.4360
SNAP Part. Rate	36.9%	36.2%	37.8%
Predicted SNAP Part. Rate	38.5%	37.8%	39.4%
Percent Correctly Predicted	73.3%	73.4%	73.3%
R-Squared	0.4604	0.4581	0.4649
Number of Observations	23,747	12,761	10,986

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.
[a] Indicator of whether the annual unemployment rate for the State (obtained from BLS) the household lives in is above (or at or below) the natural rate of unemployment of 5.2 percent (CBO estimate).

higher percent of assignment to certification periods of 3 months or less are less likely to participate in SNAP (–8 percentage points; $p < 0.01$) than such households in the high unemployment subgroup (–1 percentage point, ns).[33] In other words, the participation cost of shorter certification periods is associated with lower SNAP participation during low unemployment, whereas during high unemployment, it does not seem to have such a deterrent effect on participation. Therefore, this interaction term is included in the model discussed in the next section.

Incorporating Interaction Terms into the Expanded Model

Based on the notable differences among subgroups defined by household type and environments of high and low unemployment as discussed above, we compiled the following set of interaction terms to incorporate into the expanded model.

- the two poverty level indicators interacted with indicators for the presence and absence of children in the household
- payment of childcare and disability interacted with indicators for the presence and absence of children in the household
- proportion of cases with shorter certification periods interacted with indicators for the low and high unemployment subgroups, and
- prior SNAP participation interacted with indicators for the absence of children in the household, the presence of children in the household with an elderly reference person, and the presence of children in the household with a non-elderly reference person.

The inclusion of these interaction terms does not perceptibly improve the predictive accuracy of the model over the *Expanded model with prior participation*. While the kappa statistic of the static expanded model with past participation is 0.43 (Exhibit 4.10, column 1), that of the model with interactions is 0.44 (Exhibit 4.10, column 2). The difference in correct predictions between the two is only 0.3 percentage points. .

It should be noted here that the subgroup models, by and large, are quite similar to each other. While there are small differences in coefficients, the same factors have similar effects on different types of households. Even the effects of poverty level variables or past participation on current SNAP participation, which we have highlighted for their variations, do not vary qualitatively by the presence or absence of children.

Interpretation of the interaction of proportion of cases with shorter certification periods and high versus low unemployment is complicated by the fact that these are both measured at the State level. The certification period measure is undoubtedly acting as proxy for other State level policy variables, and may itself be influenced by the economic climate of the State. In fact, our approach is not an ideal one for measuring the effects of State policies. In the context of the goals of this study regarding accurate measurement of SNAP impacts, these State policies will be held

[33] This coefficient corresponds to a 1 percentage point increase in assignment of short certification periods

Exhibit 4.10

The Expanded Model with Prior Participation, with and without Interactions

Variable Name	Without Interactions	With Interactions
State and Local SNAP Policies		
State Biometric Tech	-0.0479*** (0.0079)	-0.0480*** (0.0080)
Pct Earners Frequent Recert	-0.0471** (0.0208)	
Pct Earners Frequent Recert X Low Unemployment		-0.0698*** (0.0253)
Pct Earners Frequent Recert X High Unemployment		(0.0142) (0.0291)
Perceived Eligibility		
Prior SNAP	0.4299*** (0.0076)	
Prior SNAP X HH without Kids Non-Elderly RP		0.4424*** (0.0130)
Prior SNAP X HH without Kids Elderly RP		0.3851*** (0.0115)
Prior SNAP X HH with Kids		0.4522*** (0.0102)
Needs		
Num Children Under 5	0.0543*** (0.0054)	0.0441*** (0.0056)
Num Children Age 5-12	0.0228*** (0.0043)	0.0157*** (0.0044)
Num Dep Children Age 13-17	0.0068 (0.0056)	-0.0029 (0.0057)
Num Adults Under 60	-0.0014 (0.0051)	-0.0006 (0.0051)
Num Elderly	0.0227** (0.0096)	0.0203** (0.0096)
Pay Care Child or Disab	-0.0131 (0.0136)	
Pay Care Child or Disab X HH without Kids		0.0923** (0.0411)
Pay Care Child or Disab X HH with Kids		(0.0174) (0.0140)
Pay Child Support	-0.0217 (0.0177)	-0.0178 (0.0176)
Recent Move	0.0123 (0.0083)	-0.0037 (0.0085)
Paid Over 1000 for Hlth Care	-0.0168** (0.0074)	-0.0184** (0.0074)
State Annual Unemp Rate	0.0091** (0.0037)	0.0078** (0.0037)

Exhibit 4.10 (Continued)

The Expanded Model with Prior Participation, with and without Interactions

Variable Name	Without Interactions	With Interactions
Resources		
Inc Above Poverty Level	-0.0820***	
	(0.0062)	
Inc Under 50 Pct Pov	0.0379***	
	(0.0071)	
Inc Above Poverty Level X HH without Kids		-0.0714***
		(0.0074)
Inc Above Poverty Level X HH with Kids		-0.1045***
		(0.0100)
Inc Under 50 Pct Pov X HH without Kids		(0.0047)
		(0.0088)
Inc Under 50 Pct Pov X HH with Kids		0.0646***
		-0.0098
Net Worth Above 0	-0.0288***	-0.0287***
	(0.0063)	(0.0063)
Net Worth Above 25000	-0.0201***	-0.0195***
	(0.0069)	(0.0069)
Personal Preferences and Traits		
In Bad Health	0.0175***	0.0185***
	(0.0058)	(0.0058)
RP Educ Below HS	-0.0073	-0.0074
	(0.0075)	(0.0074)
RP Educ Above HS	-0.0173**	-0.0166**
	(0.0075)	(0.0075)
Highest Educ At Least HS	-0.0290***	-0.0321***
	(0.0083)	(0.0083)
Ever TANF	0.0552***	0.0475***
	(0.0094)	(0.0098)
Any Earnings	-0.0517***	-0.0496***
	(0.0075)	(0.0076)
GA/SSI/SSDI	0.0731***	0.0768***
	(0.0084)	(0.0084)
Non Cash Public Benefits	0.1668***	0.1583***
	(0.0071)	(0.0072)
Alimony Child Support	0.0290***	0.0230**
	(0.0109)	(0.0109)
Other Income	-0.0288***	-0.0287***
	(0.0063)	(0.0063)
Demographic Characteristics		
Childless RP Aged 25 Or Under	0.0077	0.0119
	(0.0113)	(0.0112)
Childless RP Aged 60 Or Over	-0.0189	-0.0497***
	(0.0135)	(0.0133)
RP Black Non Hispanic	-0.0103	-0.0094
	(0.0076)	(0.0076)

Exhibit 4.10 (Continued)

The Expanded Model with Prior Participation, with and without Interactions

Variable Name	Without Interactions	With Interactions
Demographic Characteristics (Continued)		
RP Hispanic	-0.0251*** (0.0096)	-0.0239** (0.0096)
RP Other Race	0.0125 (0.0127)	0.0135 (0.0126)
RP Married	-0.0472*** (0.0085)	-0.0453*** (0.0085)
Summary Statistics		
Kappa Statistic	0.4314	0.4359
SNAP Part. Rate	36.9%	36.9%
Predicted SNAP Part. Rate	38.5%	38.4%
Percent Correctly Predicted	73.3%	73.5%
R-Squared	0.4604	0.4631
Number of Observations	23,747	23,747

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

constant between the treatment and the control groups as they will be drawn from the same geographic location. Our current model of SNAP participation is simply using these covariates as control variables.

Because inclusion of interactions does not improve the predictive accuracy of the model and complicates the interpretation, our "best" model excludes these terms.

The Expanded Model with Logistic Functional Form

Earlier in this chapter we showed that the results of the linear probability *Standard* model were unaltered when a logistical functional form was used. The logistic version of the *Expanded Model with Prior Participation* (Exhibit 4.11, columns 2 and 3), however, offers a notable improvement over the linear version (Exhibit 4.11, column 1). In addition to providing a better fit, the logistic functional form avoids the problem of out-of-range predicted probabilities. Such anomalies were rare in the *Standard* model, comprising only 4 percent of observations. In the *Expanded Model with Prior Participation*, however, a much more substantial 19 percent of observations had negative predicted probabilities of participation, as a consequence of the bimodal distribution of predicted values.

The point estimates of the logistic coefficients are generally similar to those of the linear probability model when converted to percentage point effects at the sample mean (columns 1 and 3). The levels of statistical significance are also similar, with the exception that two factors that are significant at the 5 percent level in the linear probability model are no longer significant in the logistic model: the number of elderly adults, and Hispanic ethnicity of the reference person.

While qualitatively similar to the linear probability model, the logistic model makes better predictions; the kappa statistic is 0.50 and the proportion of correct predictions is 77 percent. We conclude that the logistic functional form is superior.

The impact at the mean shown for prior SNAP participation (70 percentage points) should be interpreted with caution. For variables with small or moderate logistic coefficients, the impact at the sample mean is a reasonable measure of the importance of the factor. For variables with very large influences this can be misleading, as the impact varies considerably along the logistic curve and is lower at both extremes than in the middle. For example, for a household with a 10 percent probability of participating, the impact of prior participation would be 27 percentage points.

In addition to the effect of prior SNAP participation, the logistic version of the *Expanded Model with Prior Participation* indicates the following significant relationships ($p < 0.05$ or $p < 0.01$):

- States' use of ***biometric technologies*** and ***short certification periods*** for earners are each associated with a 9 percentage point reduction in participation.
- Additional ***children under age 5*** and additional ***children aged 5 to 12*** are associated with 8 and 3 percentage point increases in participation, respectively.
- ***Out-of-pocket medical expenditure*** exceeding $1000 is associated with a 5 percentage point increase in participation.
- Higher ***unemployment*** is associated with greater participation: 1.5 percentage points per additional percent of unemployment.
- Relative to households with income between 50 and 100 percent of poverty, those with more ***income*** are 15 percentage points less likely to participate, and those with less income are 7 percentage points more likely to participate.
- Participation is 4 percentage points lower among those with some ***net worth***, and an additional 9 percentage points lower among those with net worth exceeding $25,000.
- Households with a member reportedly in ***bad health*** are 4 percentage points more likely to participate.
- Households headed with an individual with more than a high school ***education***, and those containing at least one adult with at least a high school diploma, are each 4 percentage points less likely to participate.
- Households that ever received ***TANF*** are 5 percentage points less likely to participate.
- Current receipt of ***earnings*** and of ***"other" income*** are respectively associated with 8 and 7 percentage points smaller likelihoods of participating, while current receipt of ***GA/SSI/SSDI*** and ***non-cash public benefits*** are associated with 10 and 39 percentage points greater likelihoods of participating.
- Households headed by ***married couples*** are 8 percentage points less likely to participate.

Exhibit 4.11

The Expanded Model with Prior Participation, Linear Probability and Logistic Functional Forms

Variable Name	Linear Probability	Logistic	
		Coefficient (Std Error)	Impact at the Mean
State and Local SNAP Policies			
State Biometric Tech	-0.0479*** (0.0079)	-0.3687*** (0.0643)	-0.0859***
Pct Earners Frequent Recert	-0.0471** (0.0208)	-0.3815** (0.1760)	-0.0889**
Perceived Eligibility			
Prior SNAP	0.4299*** (0.0076)	3.0166*** (0.0606)	0.7026***
Needs			
Num Children Under 5	0.0543*** (0.0054)	0.3390*** (0.0401)	0.0790***
Num Children Age 5-12	0.0228*** (0.0043)	0.1282*** (0.0304)	0.0299***
Num Dep Children Age 13-17	0.0068 (0.0056)	0.0292 (0.0371)	0.0068
Num Adults Under 60	-0.0014 (0.0051)	0.0113 (0.0389)	0.0026
Num Elderly	0.0227** (0.0096)	0.1412* (0.0767)	0.0329*
Pay Care Child or Disab	-0.0131 (0.0136)	-0.0792 (0.0897)	-0.0184
Pay Child Support	-0.0217 (0.0177)	-0.0509 (0.1275)	-0.0119
Recent Move	0.0123 (0.0083)	0.0517 (0.0645)	0.012
Paid Over 1000 for Hlth Care	-0.0168** (0.0074)	-0.2125*** (0.0752)	-0.0495***
State Annual Unemp Rate	0.0091** (0.0037)	0.0652** (0.0299)	0.0152**
Resources			
Inc Above Poverty Level	-0.0820*** (0.0062)	-0.6439*** (0.0506)	-0.1500***
Inc Under 50 Pct Pov	0.0379*** (0.0071)	0.3012*** (0.0582)	0.0701***
Net Worth Above 0	-0.0288*** (0.0063)	-0.1689*** (0.0467)	-0.0393***
Net Worth Above 25000	-0.0201*** (0.0069)	-0.2936*** (0.0644)	-0.0684***
Personal Preferences and Traits			
In Bad Health	0.0175*** (0.0058)	0.1553*** (0.0470)	0.0362***
RP Educ Below HS	-0.0073 (0.0075)	-0.0337 (0.0621)	-0.0079

Exhibit 4.11 (Continued)

The Expanded Model with Prior Participation, Linear Probability and Logistic Functional Forms

Variable Name	Linear Probability	Logistic	
		Coefficient (Std Error)	Percentage Point Impact
Personal Preferences and Traits			
RP Educ Above HS	-0.0173**	-0.1918***	-0.0447***
	(0.0075)	(0.0644)	
Highest Educ At Least HS	-0.0290***	-0.1774***	-0.0413***
	(0.0083)	(0.0647)	
Ever TANF	0.0552***	0.2036***	0.0474***
	(0.0094)	(0.0553)	
Any Earnings	-0.0517***	-0.3386***	-0.0789***
	(0.0075)	(0.0628)	
GA/SSI/SSDI	0.0731***	0.4359***	0.1015***
	(0.0084)	(0.0586)	
Non Cash Public Benefits	0.1668***	1.7045***	0.3970***
	(0.0071)	(0.0675)	
Alimony Child Support	0.0290***	0.1387*	0.0323*
	(0.0109)	(0.0723)	
Other Income	-0.0288***	-0.2892***	-0.0674***
	(0.0063)	(0.0582)	
Demographic Characteristics			
Childless RP Aged 25 Or Under	0.0077	-0.1149	-0.0268
	(0.0113)	(0.1638)	
Childless RP Aged 60 Or Over	-0.0189	-0.1633	-0.038
	(0.0135)	(0.1079)	
RP Black Non Hispanic	-0.0103	-0.0598	-0.0139
	(0.0076)	(0.0587)	
RP Hispanic	-0.0251***	-0.107	-0.0249
	(0.0096)	(0.0718)	
RP Other Race	0.0125	0.1636	0.0381
	(0.0127)	(0.0999)	
RP Married	-0.0472***	-0.3614***	-0.0842***
	(0.0085)	(0.0665)	
Summary Statistics			
Kappa Statistic	0.4314	0.4963	
SNAP Part. Rate	36.9%	36.9%	
Predicted SNAP Part. Rate	38.5%	36.9%	
Percent Correctly Predicted	73.3%	76.5%	
R-Squared	0.4604	0.4962	
Number of Observations	23,747	23,747	

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. Percentage point impacts for the logistic model are calculated at the sample mean. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

Model Validation

Model validation was conducted on the logistic version of the *Expanded Model with Prior Participation* to determine if the model is well-specified and not driven in any direction by a small set of observations. The validation process, as described in Chapter Three, compares the consistency of model results across ten different estimation samples in terms of the percent of cases classified correctly. To create these, the full sample was first randomly divided into ten validation subsamples. Each estimation sample excludes one of the validation subsamples. Every household in the full sample appears in one validation sample and in nine estimation samples.

Exhibit 4.12

Cross-Validation of the Expanded Model with Prior Participation

Validation Subsample	Percent of Estimation Sample Classified Correctly	Percent of Validation Sample Classified Correctly
A	76.65%	75.92%
B	76.50%	76.69%
C	76.47%	76.71%
D	76.54%	76.37%
E	76.47%	76.76%
F	76.58%	76.08%
G	76.39%	77.51%
H	76.40%	77.17%
I	76.61%	75.68%
J	76.61%	75.65%

Exhibit 4.12 shows the results of our model validation procedure for the "best" model. In each of the ten models run, variables that do not have significant coefficients ($p < 0.10$) are removed and the models with the remaining variables are re-estimated. Five variables were removed from the model in this way for every estimation sample (recently moved, pay child care or disability, pay child support, RP education below high school, and childless RP under the age of 26), and another four variables were removed from some of them (alimony or child support, RP education above high school, childless RP aged 60 or over, and state unemployment rate). The ten different models thus differ from each other by at most three variables and from the "best model" by no more than eight. The results of the models are consistent across the different estimation samples and variations in specification. The percent of the estimation samples classified correctly is between 76.39 percent and 76.65 percent, a difference of roughly 0.25 percentage points.

The ten validation samples are the omitted tenths of the complete sample for each of the ten different estimation samples. The percent of the validation samples classified correctly is between 75.65 percent and 77.51 percent. Thus the percent classified correctly is very similar between the estimation and validation samples; in fact, the difference in percent classified correctly between them is 1 percentage point for three subsamples, roughly 0.75 percentage points for two subsamples, half a percentage point for one subsample, about 0.25 percentage points for the remaining two subsamples. We conclude that our model is robust to included variables and included households.

Chapter 5: Summary and Recommendations for Future Research

The purpose of this study was to develop and assess the best model of SNAP participation that can be achieved using predictors drawn from previous research and using extant survey data. A model that accurately predicts participation would be an important step toward controlling for the selection bias that threatens the validity of non-experimental designs for estimating impacts. The results of this study provide a first step in a research agenda whose ultimate goal is, if possible, to design a study to estimate the impacts of the Supplemental Nutrition Assistance Program.

This research has four parts: a literature review, model development informed by the literature review, model assessment, and the development of recommendations. The literature review and the results of the model developed have been presented in earlier chapters; here, we summarize those results and present an assessment of the model and our recommendations.

Summary of Findings

The review of both quantitative and qualitative research identified a large set of potentially relevant variables that have been related not only to participation in SNAP specifically, but also more generally to strategies used by low-income families to manage their food acquisition and needs. The qualitative research led us to a number of predictors of participation that had not been included in previous quantitative models of SNAP participation and that are measured in the SIPP.

The review of previous econometric analyses of SNAP participation also guided our methodology in modeling participation with the larger set of predictors. For example, concerns in the literature about misreporting and seam bias led us to the choice of only using SNAP participation in the last reference month of each wave (McKernan and Ratcliffe, 2003; Farrell *et al.*, 2003) and our eligibility determination method was informed by methods used in other research based on SIPP data.

Based on the literature review, two primary models were developed:

- The *Standard* model (Exhibit 4.1), which includes only measures of what are generally recognized to be (and commonly tested as) key factors in SNAP participation, mostly economic factors, and that are available in a wide variety of surveys.
- The *Expanded* model (Exhibit4.5), which adds other factors that were identified through our literature review, including participation in SNAP at any time in the past, State SNAP policies, numbers of household members of various ages, various household expenses, net worth, health status, and household income sources. Some factors that were present in the *Standard* model are treated in more detail, such as

household income and education. This model is more extensive than the *Standard* model, but remains interpretable and parsimonious.

In the process of arriving at these models, we explored other more extensive models that included a larger set of factors identified in the literature review and as well as factors from other sources. While several supplemental measures relating to ability to perform household tasks and reasons for non-participation had statistically significant (and substantively important) coefficients, it was not possible to include them in the final model because they were only available for a subsample of the data. Predictive power was not notably improved further by the inclusion of measures of trigger events, of interaction terms drawn from subgroup analyses, or of other supplemental variables taken from SIPP Topical Modules pertaining to community networks, material hardships, difficulty hearing or speaking, not speaking English, and depression or anxiety. The model fit was improved by using a logistic functional form.

Exhibit 5.1

Explanatory Power of Participation Models

Type of Model	R^2	Percent Correctly Predicted	Kappa Statistic
Standard	0.1687	61.5%	0.1661
Standard, logistic	0.1731	61.8%	0.1732
Standard, with random effects	0.8268	86.2%	0.7020
Standard, with prior participation	0.4219	72.3%	0.4072
Expanded (without prior participation)	0.3369	68.4%	0.3201
Expanded (including trigger events)	0.3413	68.6%	0.3239
Expanded (including prior participation)	**0.4604**	**73.3%**	**0.4314**
Expanded (with supplemental measures; subsample)[a]	0.3854	71.5%	0.3649
Expanded (with supplemental measures and prior participation; subsample)[b]	0.4820	74.8%	0.4477
Expanded (with prior participation and interaction terms)	0.4631	73.5%	0.4359
Expanded (with prior participation), logistic	**0.4962**	**76.5%**	**0.4964**

NOTES: The bolded row corresponds to the "best" model.
[a] This model was estimated on Wave 9 of the 2001 Panel. In this subsample the R^2, percent correctly predicted, and kappa statistic of the Expanded model excluding prior participation were 0.3570, 70.4% and 0.3395, respectively.
[b] This model was estimated on Wave 9 of the 2001 Panel. In this subsample the R^2, percent correctly predicted, and kappa statistic of the Expanded model including prior participation were 0.4650, 74.2% and 0.4335, respectively.

Two ways to obtain a very good fit to the data are (a) to include an indicator of immediately prior participation (not shown) or (b) to estimate random household level effects. The first of these is effective because 90 percent of eligible households that reportedly participate at the end of one survey wave do so at the end of the next wave, and 93 percent of those that do not participate at

the end of one wave continue not to participate at the end of the next wave. The second of these is effective because random effects capture all of the factors about a household that do not change over time. We did not use either of these approaches in our best model because both of them beg the question of what types of households participate. On the other hand, a history of past participation in SNAP is a crucial predictor of current participation. This factor captures information about households' attitudes towards and experience with the program which would help determine their likelihood of (re)applying for assistance. Our best model includes this general historical variable; we also show results for the model omitting this factor.

Model Assessment

As stated in the Request for Proposals (p. 7), "This present study could conceivably generate a sufficiently good model to address selection bias so that further research on participation determinants would be deemed unnecessary. A more likely outcome, however, is that the 'best' model will still have a significant amount of unexplained variation." With this expectation, the research agenda developed by FNS to study the impact of SNAP (Burstein *et al.*, 2005) calls for this study to be followed by two additional projects,

- Study 2, to conduct interviews with low-income households to learn about their decision processes with regard to SNAP participation, and
- Study 3, to build a new model of SNAP participation, using specially collected data from a new survey with items reflecting the findings from Study 2.

Whether the project has found a "sufficiently good" model to address selection bias is a matter of analytic judgment. This project has produced models which predict SNAP participation with over 75 percent accuracy. Accuracy rates of nearly 90 percent can be achieved if the sample is stratified by immediate past participation. Regardless of the accuracy of prediction, the key question is whether the remaining sources of variation are most likely systematic, and related to the outcomes of interest (e.g. food expenditures, household food supplies, food security, individual dietary consumption). If so, they pose a threat of selection bias. If instead they are essentially random fluctuations in participation behavior, then they will not be a source of selection bias.

It is typically argued that absent a randomized experiment, we can never be sure that there are not omitted systematic factors that could lead to selection bias. We would claim, however, that the analysis presented in this report gives reason for optimism. Our reasoning is as follows.

1. The *Standard* model appeared to omit key factors that could cause selection bias.
2. Most potential participation factors discussed in the literature were measured at least roughly in the SIPP.
3. The *Expanded model with prior participation* included the SIPP versions of many of these factors, and represented a substantial improvement over the *Standard* model in terms of predictive power.

4. The *Expanded model with additional supplemental variables* suggested several other participation factors that could improve predictive power.
5. Three ways that the predictive power of the *Expanded model* might be improved are through (a) refining the measurement of the factors in the model (e.g., measures that are more reliable); (b) deriving new measures of the few omitted factors (based, say, on lengthy qualitative interviews with low-income families); or (c) identifying new factors through additional search of the research literature in economics, psychology, sociology.
6. It seems unlikely that the first two of these strategies would make a substantive difference to the model, based on the fact that most of the additional supplemental variables made no contribution, and that other elaborations of the *Expanded* model (i.e., with trigger events, with interactions) did not further increase the predictive power of the model.
7. It also seems unlikely that some important determining factors have been ignored to date not only by economists who have studied SNAP participation but also by sociologists and other social scientists who have studied how low-income households meet their food needs.
8. The residual variation is therefore plausibly simply random, rather than systematic.

While this claim is a matter of judgment, and readers are free to draw their own conclusions, the analyses presented here suggest limited return from development of new participation factors.

Recommendations

The findings reported here suggest that performing Study 2 may not improve the predictive accuracy of the model sufficiently to justify the costs of these studies. An alternative is to modify to goals for Study 3 to include tests of the value of participation model for estimating impacts. It might also be possible to replace the new data collection effort of Study 3 with extant data. Using either extant or new data, a model similar to those developed in this study would be used as the basis for propensity score analysis of a SNAP outcome (e.g., food expenditures, food security, or dietary quality), and statistical tests would be performed to estimate bounds on the magnitude of remaining selection bias.

The challenges of using extant data for such a study are substantial. Although a good set of explanatory variables needed for this task are included in the SIPP, outcome variables are lacking. SIPP does not collect any information on food consumption or expenditures, collects food security measures only in a single wave (not a wave for which high quality eligibility data is available for), and collects minimal information on health. Furthermore, underreporting of SNAP participation may be related to observable characteristics, leading to bias in the estimation of relationships (Meyer and Sullivan, 2009). One promising approach is to compare the distribution of participant characteristics in administrative and survey data to determine which types of households are most prone to underreporting, and adjust the survey weights to reflect this information. The distribution of participant characteristics in the survey would be made to match the distribution in the administrative data, without altering the distribution of characteristics for participant and non-participant households combined. For example, members of a group that

comprised 10 percent of program participants in the administrative data, but only 5 percent of program participants in the survey, would be given greater weights if they are reportedly participants, and smaller weights if they are reportedly non-participants.

Other data sources that might be considered include the Current Population Survey, the Panel Study of Income Dynamics, the Survey of Program Dynamics, and the National Longitudinal Survey of Youth. These and other available surveys would have to be reviewed and evaluated to determine whether any are appropriate for this analysis, based on factors including sample size, quality of participation data, and availability of appropriate outcome, eligibility, and explanatory variables. It may be that no single extant data source has all the elements required, and that new data collection that included information on both dietary outcomes and the participation factors that have been identified is necessary in order to proceed.

If SNAP impacts are ever to be measured non-experimentally, a propensity score analysis is probably the best way to proceed. While propensity score matching is one of the strongest methods for non-experimental data, it must be acknowledged that it is not always suitable and is far from a panacea (Shadish *et al*., 2002). In its favor, it is preferable to direct regression approaches because of the steps that create more closely matched treatment and comparison groups. This method has been known to reduce large biases, especially when a suitable comparison group exists. It requires, however, that the composition of the groups be well understood. In addition, the overlap between the two groups needs to be substantial for the method to work well. It is not possible to determine program impacts on households that are virtually certain to participate because there are no counterfactuals for them. Even if these conditions are accepted, hidden bias may remain because propensity score matching only controls from observed variables, and to the extent that they are accurately measured.

As described in Rosenbaum and Rubin (1983), a number of tests can be performed to check that the treatment and comparison groups are sufficiently well matched. Building on this, Harding (2003) proposed a method for sensitivity analysis that produces estimates of the amount of the impact that could possibly be accounted for by selection bias. Rosenbaum (2002) also provides an overview of several approaches to sensitivity analysis.

Gibson-Davis and Foster (2006) have used propensity score analysis to analyze the impact of food stamps on food insecurity. They find that food stamps do not decrease the probability of being food insecure, although some of their models suggest that food stamps do lessen the severity of the problem. Their analysis is limited, however, by the quality of the data: the Early Childhood Longitudinal Study—Kindergarten Cohort. The measure of SNAP participation is based on self-reports on the number of months of participation in the last 12 months. In addition, SNAP participation and food security are measured over different time periods. As Nord and Golla (2008) show, timing is very important as food insecurity tends to worsen in households in the months before entry into SNAP, and then improve shortly after entry. Finally, the unavailability of household asset data makes it impossible for them to determine eligibility adequately (Daponte *et al.* 1999). For future analysis, this may be much less of an issue as more States adopt broad-based categorical eligibility. Currently 28 States have virtually eliminated the SNAP asset test.

Conclusion

Our best model indicates that the following factors are strongly related to SNAP participation among eligible households (with the directions of the relationships shown in parentheses):

- State SNAP policies, in particular the use of biometric technology such as fingerprinting and the use of short certification periods (negative).
- Household current and projected needs, as measured by the numbers of children under age 5, the number of children aged 5 to 12, and the State unemployment rate (positive).[34]
- Household resources, as measured by income relative to poverty and net worth (negative).
- Personal preferences and traits, as measured by bad health (positive), education of the head of the household and other adults in the household (negative), receipt of TANF any time in the past or present (positive), and the composition of household income (earnings (negative) versus means-tested cash and non-cash benefits (positive)).
- Demographic characteristics, in particular whether the household head was married (negative).

Other significant participation factors, not included in the final model because they were only available for a subsample of the data, were having difficulty performing household tasks and several proxies for attitudes regarding receipt of assistance.

Contrary to our expectations when we developed the full research agenda, this study has found that (1) extant data such as the SIPP can be used to estimate models of SNAP participation that include many non-standard factors; and (2) within the population of SIPP measures, there are diminishing returns in predictive power from adding all possible participation factors .

A deeper understanding of participation is of importance and value in its own right, to enable FNS to tailor its program services and outreach most effectively. This is an argument for collecting additional information on participation through the ethnographic approach associated with Study 2 in the original research agenda. For purposes of developing program impact estimates, however, this step may not be necessary. Instead, FNS could proceed to test the propensity score approach for suitability in a large-scale national study. It will be essential to allay the concerns of the research community regarding the feasibility and validity of a non-experimental approach to estimating SNAP impacts before engaging in such a major undertaking. Such a test might be done using extant data, if any can be found with suitable measures of both participation factors and nutritional outcomes. Alternatively, FNS could collect new data modeled on parts of the SIPP supplemented with outcomes data.

[34] A finding that requires further research is that the presence of substantial out-of-pocket medical expenses, which would have been expected to be positively associated with SNAP participation, is negatively associated with participation. The cause may be the correlation of this variable with the measure of bad health.

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Appendix A: Additional Variables and Results

Exhibit A.1

Descriptions of Explanatory Variables Not Included in Models, by Domain

Domain	Variable Name	Variable Description
State and Local SNAP Policies	Pct Non Earn Frequent Recert, Pct Non Earn Eld Freq Recert	Percent of participating households in both groups that are required to be recertified every three months or more frequently: households without earnings, without an elderly member; and households without earnings, with an elderly member
Needs	Adult Male Equivalents	Number of adult male equivalents in the household based on the food energy requirements as defined in http://www.health.gov/dietaryguidelines/dga2005/document/html/chapter2.htm
	Elderly No Earnings	Indicator for the household having no earnings and at least one elderly member (needed to control for categories for the recertification variables in the top row of this table
	Num Work Age Non-Disab	The number of non-disabled adults aged 18-59 in the household
	Work Expenses	Indicator for someone in household driving own vehicle to work or having other work expenses
	Tuition Over 5000	Indicator for someone in household paying tuition over $5000 for a household member
Resources	Net Worth Above 100000, Home Equity Above 0, Vehicle Equity Above 0	Indicators for presence of net worth of the household being above $100,000; home equity; and vehicle equity
	Free Red Price Meals, Medicaid, WIC, Free Util or Energy Assist	Indicators for whether someone in the household receives each type of assistance: Free or Reduced Price School Breakfast or Lunch, Medicaid, WIC, Free utilities or energy assistance
	Employer Paid Hlth Ins	Indicator for someone in household having some of their health insurance paid for by their insurance
Personal Preferences and Traits	No Hlth Ins Don't Believe Need	Indicator for whether anyone in the household is not covered by health insurance because they do not believe in it or say they do not need it
	Looking for Work	Indicator for there being someone in the household who is looking for work
	Disabled	Indicator for there being someone in the household who receives SSI or SSDI disability benefits

Exhibit A.1 (Continued)

Descriptions of Explanatory Variables Not Included in Models, by Domain

Domain	Variable Name	Variable Description
Personal Preferences and Traits (Continued)	Recent Disab	Indicator for there being someone in the household who has a work-limiting disability that began in 2000 or 2001
	RP Educ HS, RP Educ Below GED, RP Educ GED	Indicators for the education level of the reference person: high school, below GED, or GED
	Pension Income, Property Income, TANF, Social Security, SSI, Other Disability Benefits, VA Benefits, Public Housing or Gov Subs Rent	Indicators for whether someone in the household receives each type of income or assistance: pension plan, property income, TANF, Free or Reduced Price School Breakfast or Lunch, Medicaid, WI, Free utilities or energy assistance, Social Security, SSI, other disability benefits (such as private benefits through an employer), VA benefits, public housing or government subsidized rent
	Means Tested Income, Two or More Means Tested Prog	Indicators for receiving some type of means tested income, and for participating in two or more means tested programs
	Log Earnings, Log Earnings Sq	If the household has nonzero earnings, the natural logarithm of total household earnings; zero if the household has no earnings.
	None Employed	Employment status indicators: Nobody in HH employed
	Some Employed, All Employed Not Full Time, All Employed Full Time	Employment status indicators: Some employed, but not every working-age adult, in HH had job at least 1 week of month; Everyone working-age is employed, but not everyone working at least 35hrs/wk; Everyone working-age in HH employed & working at least 35hrs/wk
	Hlth Ins All Covered, Hlth Ins None Covered, Hlth Ins Some Covered	Indicators for: all HH members covered by insurance; some HH members covered by insurance, some not; no HH members covered
Demographic Characteristics	RP Aged 26-40, RP Aged 41-59	Indicators for the age of the reference person (26-40, 40-59)
	RP White Non-Hispanic	Indicators for race/ethnicity of reference person (White)
Dynamic Measures	New SSI Prior Wave, New WIC Prior Wave, New TANF Prior Wave, New GA Prior Wave, New UI State Prior Wave	Indicators for new participation (prior wave) in benefit programs that could act as information triggers for SNAP entry
	New Earner Prior Wave, New Dependent Prior Wave, Departed Earner Prior Wave, Departed Dependent Prior Wave	Indicators for changes in the household composition prior wave that could act as entry or exit triggers

Exhibit A.2

The Expanded Models with Prior Participation and Katrina Indicator

Variable Name	Without Katrina Indicator	With Katrina Indicator
Katrina		-0.0872***
		-0.0333
State and Local SNAP Policies		
State Biometric Tech	-0.0479***	-0.0495***
	(0.0079)	(0.0080)
Pct Earners Frequent Recert	-0.0471**	-0.0470**
	(0.0208)	(0.0208)
Perceived Eligibility		
Prior SNAP	0.4299***	0.4299***
	(0.0076)	(0.0076)
Needs		
Num Children Under 5	0.0543***	0.0543***
	(0.0054)	(0.0054)
Num Children Age 5-12	0.0228***	0.0227***
	(0.0043)	(0.0043)
Num Dep Children Age 13-17	0.0068	0.0068
	(0.0056)	(0.0056)
Num Adults Under 60	-0.0014	-0.0013
	(0.0051)	(0.0051)
Num Elderly	0.0227**	0.0226**
	(0.0096)	(0.0096)
Pay Care Child or Disab	-0.0131	-0.0129
	(0.0136)	(0.0136)
Pay Child Support	-0.0217	-0.0218
	(0.0177)	(0.0176)
Recent Move	0.0123	0.0124
	(0.0083)	(0.0083)
Paid Over 1000 for Hlth Care	-0.0168**	-0.0167**
	(0.0074)	(0.0074)
State Annual Unemp Rate	0.0091**	0.0116***
	(0.0037)	(0.0038)
Resources		
Inc Above Poverty Level	-0.0820***	-0.0819***
	(0.0062)	(0.0062)
Inc Under 50 Pct Pov	0.0379***	0.0379***
	(0.0071)	(0.0071)
Net Worth Above 0	-0.0288***	-0.0288***
	(0.0063)	(0.0063)
Net Worth Above 25000	-0.0201***	-0.0200***
	(0.0069)	(0.0069)

Exhibit A.2 (Continued)

The Expanded Models with Prior Participation and Katrina Indicator

Variable Name	Without Katrina Indicator	With Katrina Indicator
Personal Characterisitcs and Traits		
In Bad Health	0.0175***	0.0174***
	(0.0058)	(0.0058)
RP Educ Below HS	-0.0073	-0.0072
	(0.0075)	(0.0074)
RP Educ Above HS	-0.0173**	-0.0173**
	(0.0075)	(0.0075)
Highest Educ At Least HS	-0.0290***	-0.0290***
	(0.0083)	(0.0083)
Ever TANF	0.0552***	0.0551***
	(0.0094)	(0.0094)
Any Earnings	-0.0517***	-0.0518***
	(0.0075)	(0.0075)
GA/SSI/SSDI	0.0731***	0.0730***
	(0.0084)	(0.0084)
Non Cash Public Benefits	0.1668***	0.1670***
	(0.0071)	(0.0071)
Alimony Child Support	0.0290***	0.0292***
	(0.0109)	(0.0109)
Other Income	-0.0288***	-0.0288***
	(0.0063)	(0.0063)
Demographic Characteristics		
Childless RP Aged 25 Or Under	0.0077	0.0077
	(0.0113)	(0.0113)
Childless RP Aged 60 Or Over	-0.0189	-0.0185
	(0.0135)	(0.0135)
RP Black Non Hispanic	-0.0103	-0.0101
	(0.0076)	(0.0076)
RP Hispanic	-0.0251***	-0.0253***
	(0.0096)	(0.0096)
RP Other Race	0.0125	0.0125
	(0.0127)	(0.0127)
RP Married	-0.0472***	-0.0473***
	(0.0085)	(0.0085)
Summary Statistics		
Kappa Statistic	0.4314	0.4324
SNAP Part. Rate	36.9%	36.9%
Predicted SNAP Part. Rate	38.5%	38.5%
Percent Correctly Predicted	73.3%	73.3%
R-Squared	0.4604	0.4607
Number of Observations	23,747	23,747

SOURCE: Survey of Income and Program Participation, 2001 and 2004 Panels
NOTES: Standard errors clustered by sample unit are shown in parentheses. SIPP Wave and Census Region fixed effects are included in all models but not shown. For variable definitions, see Exhibit 3.3. Symbols used for statistically significant coefficients are: * 10 percent level, ** 5 percent level, and *** 1 percent level.

Appendix B: Methodology

In this appendix we describe four methodological issues that arise in using the SIPP to estimate participation models, and our chosen approach to address each one. These issues are the definition of the dependent variable, definition of the analysis sample, use of sample weights, and the complex structure of the sample. Six papers included in our literature survey used the SIPP to estimate standard econometric models of SNAP Participation, and the respective authors' insights on these issues have helped guide our methodological decisions.

Dependent Variable

SNAP participation is not measured perfectly in the SIPP. Research on misreporting of SNAP participation in the SIPP was well summarized by McKernan and Ratcliffe:

> Estimates suggest that the SIPP underreports food stamp receipt by 7 percent to 19 percent (Cody and Tuttle 2002; Bitler, Currie and Scholz 2002) … One could consider adjusting the SIPP data to account for the underreporting, but this requires understanding the root cause(s) of the underreporting. Cody and Tuttle's analysis suggests that "it may not be possible to identify the root causes [of the underreporting]" and that "underreporting is most likely the result of multiple causes, making it difficult to identify the right adjustment" (p. 28). These authors also suggest that choosing the wrong adjustment strategy could lead to greater biases (Cody and Tuttle 2002, p. 25). Bitler *et al.* (2002) also examine underreporting of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in the SIPP and find that the SIPP underreports WIC participation to a greater extent than SNAP participation—25 percent versus 10 percent, respectively (p. 13). Their analysis further suggests that the underreporting of WIC participation in the SIPP is randomly distributed across categorically eligible WIC groups (Bitler *et al.* 2002, p. 15), suggesting that any bias from the underreporting is likely to be small.

A related concern is sample attrition and its interaction with underreporting. The concern, as discussed in Farrell *et al.* (below), is two-fold—that those who fail to report participation in earlier waves are more likely to attrit in later waves, and that participation relationships are biased toward zero as a result of this pattern:

> There is substantial evidence that under-reporting biases estimates of relationships between participation, household earnings potential, and assets. Bollinger and David (2001) examined the extent of underreporting, its relationship to attrition, and its effects on analyses of the determinants of participation using 1984 SIPP, matched with administrative program records in three States. They found that the number of respondents in the three States who participated in the program at the time of the first or second wave interview was about 13 percent higher than the number that reported participating. They also found that those who failed to report participation in these early waves were also less likely than others to participate in later waves.

Bollinger and David modeled the relationship between participation rates and both earnings potential and assets using data from the fourth wave of the SIPP (the wave in which asset data was collected). They specified a probit model for actual participation and embedded it within a model for reporting error and biased attrition. They found that, in comparison to models that ignored this problem, their estimates showed higher participation rates among the households with the lowest earnings potential and assets, and lower participation rates among the households with higher earnings potential and assets. Thus, under-reporting and biased attrition make it appear that the relationship between the probability of participation and these two variables is not as strong as it really is.

More recently, Meyer *et al.* (2008) found that among the five large household surveys, SIPP had the highest reporting rate for government transfers, including the Supplemental Nutrition Assistance Program. They found an average reporting rate of 82 percent over the period they studied, 1983-2005.

None of the six studies that we surveyed attempted to correct for underreporting of SNAP participation, nor have we attempted to do so. It is quite difficult to adjust for misreporting of SNAP participation without first estimating SNAP participation more accurately using administrative data. The overall participation rate found in our sample is 36 percent. Although this is much lower than the rates found using administrative data for this time period of 48 to 59 percent, it is in line with the participation rates calculated by other researchers using the SIPP.[35] Although we have not adjusted for underreporting for this project, Kreider *et al.* (2008) explore a method to incorporate adjustments for misreporting into an estimate of the effects of food stamps on child health outcomes. This method could be used to establish bounds, based on the extent of misreporting, on any impact estimates from analysis of extant data that may be obtained as part of this research agenda.

An additional source of error in measured participation is that reported spells of participation tend to be coextensive with the SIPP interview reference period, with program entries and exits piling up disproportionately at the seams between the waves. (This tendency has been greatly reduced in later panels of the SIPP relative to earlier panels through use of better interviewing techniques.) A conservative solution to this issue of "seam bias," which we have adopted, is to define participation based on the reference period rather than the individual months. This approach was taken by Hanratty, who restricted the sample to the most recent month in each wave of the survey. McKernan and Ratcliffe used monthly data and made two adjustments: including a

[35] Two papers reviewed in our literature survey used the SIPP to construct a full sample of eligible households and then calculated a participation rate. (The remaining studies instead examined broader or narrower groups such as low-income households or TANF leavers.) Comparing participation rates calculated in those two papers to the ones appearing in Cunnyngham (2005) calculated for those years based on SNAP administrative data, their participation rates were approximately 64.9 percent, 72.1 percent, and 74.3 percent of Cunnyngham's rate for a given time period. (One of the papers had one year of data that could be compared with Cunnyngham and the other had two years of data that could be compared.) Those resulting from our calculations were similarly 64 percent and 64.9 percent of Cunnyngham's rate for the years her calculations overlap with ours. (Gundersen & Oliveira, 2001; Farrell et al., 2003)

dummy variable for the seam month, and filling in one-month gaps in spells on or off the program. It might be argued that not only should the seam month be distinguished from the others, but the remaining months in the reference period should be distinguished from each other. Some of underreporting of SNAP participation in SIPP could be a result of recall error, i.e. higher omission of reporting participation the longer the interval between the reference month and the interview month. We have therefore chosen to use participation data from the fourth month of the reference period only.

Our dependent variable is thus an indicator of whether a household reportedly received food stamps in the calendar month preceding the SIPP interview. We define a household as a group of individuals at a common address at a point in time.[36] The strict SNAP definition of a group of people that prepare and share meals together cannot be applied in the SIPP. The household is deemed to be receiving food stamps if anyone in the household is receiving food stamps.

Analysis Sample

The appropriate analysis sample for a participation study is the set of households that are eligible to participate. Researchers using the SIPP identify eligible households based on reported household size, presence of elderly and disabled individuals, income, assets, and various deductions. No survey, however, can include all the information (and verification) used by caseworkers to determine eligibility. *Overestimating eligibility* (due to ignoring information on household's assets) is the analytic counterpart to underreporting of participation. If the study sample includes many ineligible households, the predictors of participation will not be meaningful. Farrell *et al.* compared measures based on income-eligibility and full eligibility for food stamps. Other authors have focused on the danger of *underestimating eligibility*. Gleason *et al.* found that 20 to 25 percent of SNAP participants in a given month were coded as ineligible for the program when they attempted to replicate the eligibility criteria in the 1991 SIPP. Hanratty likewise noted that some families with assets above the 2003 asset limit reported having received food stamps, and suggested that it was due to measurement error in the eligibility imputations.

A challenge for users of the SIPP is deciding how to integrate data that are measured in every month or wave (such as SNAP participation) with other data that are measured less frequently in the topical modules, especially eligibility factors. Authors who have estimated monthly participation or participation in waves where assets or income deductions data are not collected have (a) used less stringent eligibility criteria (b) assumed that net income eligibility and/or asset eligibility do not change between the waves they were measured in and waves considered in the study or (c) done both.

Our algorithm for ascertaining eligibility was developed based on information on the FNS website, in the Supplementary Nutrition Assistance Program Rules Database developed by the Urban Institute, in the Excel spreadsheet on SNAP parameters provided by FNS, and in the SIPP. Data on key eligibility factors are collected in Assets, Liabilities, and Eligibility Topical Modules

[36] The group may include individuals whose relation to the reference person is roomer/boarder. This situation occurred in 50 out of 11,508 Wave 1 gross income-eligible households in the 2001 SIPP Panel.

that are administered annually, in Waves 3, 6, and 9 of the 2001 SIPP and Waves 3 and 6 of the 2004 SIPP. To ensure that eligible households were identified as accurately as possible, we chose a conservative approach of only including observations in waves when data on assets were collected, and only using other topical module data from the same wave and from the two prior waves. (For example, data collected in the topical module in Wave 8 could only be associated with participation in Wave 9.)

Several simplifying assumptions were made in determining eligibility because of incomplete data in the SIPP or unavailability of sufficient detail on State practices. In particular,

- We assumed that gross income eligibility was conferred by receipt of General Assistance in all States in all years.

- For the States in each of the two "State groups" that appear in the 2001 SIPP Panel (Maine and Vermont, and North Dakota, South Dakota, and Wyoming) we applied the most conservative rules to each of the States.[37]

- We did not implement the special eligibility requirements pertaining to able-bodied adults without dependents (ABAWDs) because SIPP does not contain data on work registration and referral to employment and training programs by the Food Stamp Office.

- Several eligibility factors that affect only a small number of households and are measured poorly in the SIPP were omitted from the eligibility calculations: receipt of SSI, TANF, or GA by children, for purposes of determining gross income eligibility; cost of dependent care; and cost of child support.

- We deducted the value of all vehicles to compute net assets. Many States exclude multiple vehicles, and vehicles with net equity less than $1500 are not counted even under the Federal rule. [38]

Our eligibility determination consisted of four steps: a gross income screen, a net income screen, an assets screen, and a check of citizenship/qualifying immigrant status. We evaluated ***gross monthly income*** (GMI) of households in the fourth reference month against the appropriate poverty level value (determined by State, fiscal year, and household size). Households with all adult members receiving SSI, AFDC/TANF, or GA are considered gross income eligible as are households with at least one elderly or disabled member and GMI less than or equal to 300

[37] These groups are used only in the 2001 Panel. In the 2004 Panel every State is identified, and each State's rules are used for the appropriate sample members.

[38] We explored the possibility of doing a more detailed determination of eligibility based on vehicle exemption rules. Because we do not have the rules for 2005, we were only able to apply these rules for the 2001 panel. When we applied a more detailed set of vehicle exemption rules we found that 98 percent of our sample remains eligible with the new rules, and regression results were not qualitatively different.

percent of the poverty level.[39] Of the remaining households, we consider those with GMI less than or equal to 130 percent of the poverty level as also gross income eligible.

We subtracted the following from the GMI to obtain ***net monthly income before shelter deduction*** (NMIBSD):

1. 20 percent of monthly earned income,
2. Standard deduction based on State, fiscal year, and household size, and
3. Out of pocket medical expenses for elderly or disabled members in excess of $35.

We then calculated the monthly shelter cost using monthly rent or mortgage and the standard utility allowance by State and calendar month, and compared the excess monthly shelter cost from half of NMIBSD against the maximum allowed shelter deduction.[40] The lesser of the two was then deducted from NMIBSD to compute ***net monthly income*** (NMI). We consider gross-income-eligible households with NMI less than or equal to 100 percent of the poverty level as net income ineligible, in addition to households with all adult members receiving SSI, AFDC/TANF or GA, which are categorically net income eligible.

We then calculated net wealth less home and vehicle (NWLHV), by subtracting home equity and total vehicle value from total net worth. NWLHV is adjusted by the share of adults in the household with SSI or TANF, to calculate ***net assets*** (NETA). We consider net-income-eligible households with at least one elderly or disabled member as asset eligible if NETA is less than or equal to $3,000; other net-income-eligible households are asset eligible only if NETA is less than or equal to $2,000.

Finally, we consider an asset-eligible household SNAP ineligible if it does not have at least one U.S. citizen or qualifying immigrant. Prior to the 2002 Farm Bill, immigrants who were children below the age of 18, or elderly persons born before August 22, 1931, qualified if they were living in the U.S. lawfully as of August 22, 1996. Immigrants receiving disability benefits also qualified. After the 2002 Farm Bill, immigrants who were permanent residents for at least 5 years became eligible on October 1, 2002 and all children became eligible regardless of entry date on October 1, 2003.[41] For each wave, we use the immigrant eligibility rules in effect at the time.

Our detailed algorithm appeared to be successful, in that only about 2 to 3 percent of the households that it found to be ineligible in Waves 3, 6 and 9 of the 2001 SIPP panel reported receiving food stamps. This low level of error is most likely because restricting our sample to only those waves in which full eligibility data is available results in a more accurate eligibility determination. These few households are excluded from the analysis.

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[39] This resulted in a few relatively higher income households being eligible—1.3 percent of the households in the 2001 Panel final sample have income greater than 200 percent of the poverty level. The participation rate of these households was 24 percent.

[40] Because we were only able to obtain data on Standard Utility Allowances through December 2004, the December 2004 values were used for months in 2005.

[41] This separate eligibility rule for children cannot be used as in our algorithm as we only have SNAP participation data for the adults in the household.

Functional Form and Sample Weights

The models estimated are unweighted linear probability and logistic models. Our rationale for not weighting is that we are estimating relationships that are equally true (or not) for all sample households. If the model is correct, then unweighted estimation is consistent, and more precise (lower variance) than weighted estimation. If the model is incorrect, then weighting does not help.

Weighted regression is also sometimes urged to capture variations in a relationship over the population. These advantages can be more flexibly achieved by use of explicit interaction terms and sample segmentation, both of which were explored in our model development process.

Advantages of linear probability models include ease of interpretation, tractability of estimation in the presence of a complex sample structure, and econometric consistency, which is lost in logistic regression if the assumed distribution of the residual is incorrect.

An important disadvantage of linear probability models, however, is that they fit badly in the tails of the distribution, predicting probability values that are greater than one or less than zero. In the *Expanded Model with Prior Participation*, a substantial proportion of observations (19 percent) had negative predicted values. Logistic regression was therefore used to re-estimate the final model.

Sample Structure

The complex design of the SIPP requires attention to correlations between observations in order to conduct valid significance tests. Methods used were discussed by several of the study authors. Our main estimation technique incorporates clustered standard errors, where the unit of clustering is the SIPP "sample unit", which is the original Wave 1 household along with its descendents in subsequent waves. [42] Correlations between observations may also occur due to geographic clustering by primary sampling unit (PSU). PSUs are not identified in the SIPP, however. We address geographic clustering in a rudimentary fashion by including fixed effects for the four US Census regions.

We also estimated random effects models, although this was not our preferred approach. The random effects were based on the SIPP sample unit. The models were estimated via SAS PROC MIXED, using the between-within method to compute the denominator degrees of freedom and the minimum variance quadratic unbiased estimation method to compute the covariance parameters.

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[42] Some change does occur in household composition within a sample unit over the course of a panel. In Wave 3 of the 2001 Panel, 12 percent of households had changed in some way since Wave 1; in Wave 6, 25 percent had changed since Wave 1, and by Wave 9 31 percent had changed. In households headed by a married couple, the reference person can be either member of the couple; however, of households who are headed by married couples and eligible in both Wave 3 and Wave 6, or Wave 6 and Wave 9, fewer than 1 percent change reference person.

Appendix C: Summary Table of Qualitative Studies Reviewed for Chapter Two

Exhibit C.1 Qualitative Studies Reviewed for Chapter Two

Study	Title	Type of Data	Nature of Information
Studies of Reasons for Supplemental Nutrition Assistance Program Non-participation			
Bartlett and Burstein, 2004	Food Stamp Program Access Study: Eligible Non-participants	National survey of SNAP-eligible households, 2000-01	Tabulations of reasons for non-participation
Bartlett, Burstein *et al*., 2004	Food Stamp Program Access Study: Final Report	National survey of SNAP-eligible households, 2000-01	Tabulations of reasons for non-participation; models of elements of participation
Blank and Ruggles, 1996	When Do Women Use Aid to Families with Dependent Children and Food Stamps?	National survey (SIPP) 1986-89	Models of eligibility and participation spells
Blaylock and Smallwood, 1984	Reasons for Non-participation in the Food Stamp Program	National survey (LINFCS) 1979-80	Logit relating stated reasons to characteristics
Brown and Nilsen, 2004	Food Stamp Program: Steps Have Been Taken to Increase Participation of Working Families, but Better Tracking of Efforts Is Needed: GAO-04-346	Synthesis of past research, administrator interviews, some CPS analysis	Interpretation of prior research
Cody and Ohls, 2005	Evaluation of the USDA Elderly Nutrition Demonstrations. Volume I, Evaluation Findings	Comparison design using surveys, admin data, focus groups in 6 States, 2002-2004	Regression-adjusted impact estimates Tabulations of eligible non-participants' statements about reasons
Coe, 1983	Non-participation In Welfare Programs By Eligible Households: The Case of the Food Stamp Program	National survey (PSID) 1979	Stated reasons of apparently eligible non-participants

Exhibit C.1 Qualitative Studies Reviewed for Chapter Two

Study	Title	Type of Data	Nature of Information
Daponte, Sanders *et al.*, 1999	Why Do Low-Income Households Not Use Food Stamps?	Experimental design, survey of 405 low-income households, PA, 1993	Impact estimate of giving treatment group eligibility information
Ejimakor and Acharaeke, 2006	Objective and Subjective Impediments to the Use of Food Stamps by Food-Insecure Households	Survey of 171 Salvation Army food users, NC, 2004	Statements of SNAP non-participants
Fey-Yensan, English *et al.*, 2003	Food Stamp Program Participation and Perceived Food Insecurity in Older Adults	2 structured interviews, 100 elderly SNAP eligibles, CT	Statements of SNAP non-participants Bivariate comparison of participants vs non-participants
Jensen, Garasky *et al.*, 2002	Iowa Food Stamp Leavers Survey: Final Report	1999 survey of 735 SNAP case heads who left or stayed in 1997	Tabulation of reasons for leaving SNAP
Martin, Cook *et al.*, 2003	Public versus Private Food Assistance: Barriers to Participation Differ by Age and Ethnicity	Survey of 330 low income households in Hartford, 1999	Tabulations of reasons for non-participation
McConnell and Ponza, 1999	The Reaching the Working Poor and Poor Elderly Study: What We Learned and Recommendations for Future Research	12 focus groups with elderly and working poor SNAP participants and non-participants, six locations around US, 1994	Low-income households statement s about reasons for non-participation
Ponza, Ohls *et al.*, 1999	Customer Service in the Food Stamp Program	National sample of SNAP non-participants (NFSPS) 1996	Tabulations of reasons for non-participation
Rangarajan and Gleason, 2001	Food Stamp Leavers in Illinois - How Are they Doing Two Years Later?	Survey of 497 IL respondents in 1999 who left SNAP in 1997	Tabulation of reasons for leaving SNAP
Richardson, Schoenfeld *et al.*, 2003a	Food Stamp Leavers Research Study-Study of Nonwelfare Families Leaving the Food Stamp Program in South Carolina: Final Report	Survey of 899 families leaving SNAP in SC, 1998-2000	Tabulations of reasons for returning to SNAP

Exhibit C.1 Qualitative Studies Reviewed for Chapter Two

Study	Title	Type of Data	Nature of Information
Richardson, Schoenfeld *et al.*, 2003b	Food Stamp Leaveers Research Study - Study of ABAWDs Leaving the Food Stamp Program in South Carolina	Survey of 572 ABAWDs leaving SNAP in SC, 1998-2000	Tabulations of reasons for returning to SNAP
Teitler, Reichman *et al.*, 2004	Sources of Support, Child Care, and Hardship among Unwed Mothers, 1999—2001	National survey (Fragile Families), 1998-2000	Bivariate association of characteristics with participation
US GAO, 1988	Food stamps : reasons for non-participation : report to the Ranking Minority Member, Subcommittee on Domestic Marketing, Consumer Relations, and Nutrition, Committee on Agriculture, House of Representatives	National survey (PSID) 1986	Tabulations of reasons for non-participation
Zedlewski and Brauner, 1999	Declines in Food Stamp and Welfare Participation: Is There a Connection?	National sample of SNAP leavers 1995-1997	Tabulations of reasons for leaving SNAP
Studies of Food Coping Strategies			
Alaimo, 2005	Food Insecurity in the United States	Literature synthesis	Summary and interpretation of prior research
Connell, Lofton *et al.*, 2005	Children's Experiences of Food Insecurity Can Assist in Understanding Its Effect on Their Well-Being	Qualitative, 32 kids age 11-16 in Mississippi	Kid-reported feelings and behaviors connected with food insecurity
Frongillo, Valois *et al.*, 2003	Using a Concurrent Events Approach to Understand Social Support and Food Insecurity Among Elders	Weekly interviews for 4 months with 9 food insecure or marginally secure elderly persons in upstate NY	Concurrent accounts of food sources
Greder and Brotherson, 2002	Food Security and Low-income Families: Research to Inform Policy and Programs	Focus groups, in-depth interviews, case studies with 49 low-income mothers in Iowa, 1999	Categorization and examples of food coping strategies

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Study	Title	Type of Data	Nature of Information
Kempson, Keenan *et al.*, 2003	Maintaining Food Sufficiency: Coping Strategies Identified by Limited-Resource Individuals versus Nutrition Educators	11 focus groups with low-income persons	People's statements about what "they or others" did to cope – also nutrition educators' views
Kempson, Keenan *et al.*, 2002a	Educators; Reports of Food Acquisition Practices Used by Limited-Resource Individuals to Maintain Food Sufficiency	Semi-structured interviews, 51 nutrition educators in NJ, 1999-2000	Educators' perceptions of strategies used by low-income people
Kempson, Keenan *et al.*, 2002b	Food Management Practices Used by People with Limited Resources to Maintain Food Sufficiency as Reported by Nutrition Educators	Semi-structured interviews, 51 nutrition educators in NJ, 1999-2000	Educators' perceptions of strategies used by low-income people
Morton, Oakland *et al.*, 2002	Iowa Community Food Assessment Project Report 2001=02	8 focus groups, low-income residents in Iowa rural and urban neighborhoods, 2002	Low-income people's statements about food coping
Polit, London *et al.*, 2000	Food Security and Hunger in Poor, Mother-Headed Families in Four U.S. Cities	Longitudinal ethnographic study, 125 families, 1998-2001	Low-income mothers' statements about food coping
Wolfe, Frongillo *et al.*, 2003	Understanding the Experience of Food Insecurity by Elders Suggests Ways to Improve Its Measurement	2 qualitative interviews, 53 low-income urban elders	Elderly persons' statements about their food situation
Studies of Predictors of Food Insecurity			
Armour, Pitts *et al.*, 2007	Cigarette Smoking and Food Insecurity among Low-Income Families in the United States, 2001	National survey (PSID) 2001	Model of food security

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Study	Title	Type of Data	Nature of Information
Bhattacharya, DeLeire *et al.*, 2003	Heat or Eat? Cold-Weather Shocks and Nutrition in Poor American Families	National surveys (CEX) 1980-1998	Model of food expenditures
Borjas, 2004	Food Insecurity and Public Assistance	National survey (CPS) 1995-99	Models of SNAP participation, food insecurity
Casey, Goolsby *et al.*, 2004	Maternal Depression, Changing Public Assistance, Food Security, and Child Health Status	In-hospital survey, 5306 mothers of kids <3, 2000-2001, 6 States	Model of food insecurity
Gundersen and Gruber, 2001	The Dynamic Determinants of Food Insufficiency	National survey (SIPP) 1992	Bivariate analyses of food insufficiency
Gundersen and Oliveira, 2001	The Food Stamp Program and Food Insufficiency	National survey (SIPP) 1991-92	Simultaneous model of food insufficiency and SNAP participation
Gundersen, Weinreb *et al.*, 2003	Homelessness and food insecurity	436 homeless and housed female-headed families, Worcester MA, 1992-95	Models of food security
Hall and Brown, 2005	Food Security Among Older Adults in the United States	Literature synthesis	Factors associated with food insecurity in other research
Laraia, Siegaariz *et al.*, 2006	Psychosocial Factors and Socioeconomic Indicators Are Associated with Household Food Insecurity among Pregnant Women	Survey of 606 pregnant women in UNC hospitals, 2000-04	Models of food insecurity
Lee and Frongillo, 2001	Factors Associated With Food Insecurity Among U.S. Elderly Persons: Importance of Functional	National and NY surveys (NHANES III, NSENY) 1988-94, 1994	Model of food insecurity
Martin, Rogers *et al.*, 2004	Social capital is associated with decreased risk of hunger	Survey of 330 low income households in Hartford, 1999	Model of food insecurity with hunger

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Study	Title	Type of Data	Nature of Information
Mazur, Marquis *et al.*, 2003	Diet and Food Insufficiency Among Hispanic Youth: Acculturation and Socioeconomic Determinants in NHANES III	National survey (NHANES III), 1988-94	Models of 3 food insufficiency measures
Morton, Bitto *et al.*, 2005	Solving the Problems of Iowa Food Deserts: Food Insecurity and Civic Structure	Survey of 720 in 2 Iowa "food desert" counties, 2003	Model of food security
Nord and Kantor, 2006	Seasonal Variation in Food Insecurity Is Associated with Heating and Cooling Costs among Low-Income Elderly Americans	National sample of households in poverty with no school-age kids(CPS) 1995-2001	Model of food security
Nord and Romig, 2006	Hunger in the Summer	National survey (CPSS), 1995-2001	Model of food security
Olson, Anderson *et al.*, 2004	Factors Protecting Against and Contributing to Food Insecurity Among Rural Families	Survey 316 rural low-income families, 16 States, 2000	Model of food security
Olson, Rauschenbach *et al.*, 1996	Factors Contributing to Household Food Insecurity in a Rural Upstate New York County	Survey + HH food inventory, 200 women, rural NY	Model of food insecurity
Quandt and Rao, 1999	Hunger and food security among older adults in a rural community	Survey 192 elderly in rural KY	Model of food insecurity
Ribar and Hamrick, 2003	Dynamics of Poverty and Food Sufficiency	National survey (SIPP) 1993-1997	Models of entry/exit to/from food insecurity
Stuff, Casey *et al.*, 2004	Household Food Insecurity Is Associated with Adult Health Status	Survey of 1488 households in lower Mississippi delta, 2000	Regression/logit of health status measures on food security & demographics

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Study	Title	Type of Data	Nature of Information
Wehler, Weinreb *et al.*, 2004	Risk and Protective Factors for Adult and Child Hunger Among Low-Income Housed and Homeless Female-Headed Families	Survey of 354 homeless or welfare-reliant women in Worcester, 1992-95	Model of hunger
Studies of Low-Income Subsistence			
Almgren, Yamashiro *et al.*, 2002	Beyond Welfare or Work: Teen Mothers, Household Subsistence Strategies, and Child Development Outcomes	173 teen mothers and first-borns, Seattle, 6-yr longitudinal, 1987-94	Exploratory factor analysis of relationships among income sources
Chaudry, 2004	Putting Children First: How Low-Wage Working Mothers Manage Child Care	Longitudinal ethnography, 42 low-income mothers of young children in NY, 1998-2001	Stories of mothers coping with work and child care
Drumm and McBride, 2005	I Don't Beg. I Don't Steal: Drug Users' Front-Stage Self-Perceptions	In-depth interviews with 28 drug users, Miami	Drug users' statements about factors that help them get along
Dunlap, Golub *et al.*, 2003	The Lived Experience of Welfare Reform in Drug-Using Welfare-Needy Households in Inner-City New York	72 households in NYC, 3-5 year ethnography, ending 2001	Drug user statements, observed behavior in coping with/without welfare
Edin and Lein, 1997	Making ends meet: How single mothers survive welfare and low-wage work	Ethnographies of 379 low-income women in 4 cities, 1989-92	Patterns of income sources, expenditures, and coping
Gemelli, 2006	Definitions of Motherhood: A Study of Low-Income Single Mothers	12 semi-structured interviews, women in Portland OR, 2003	Mothers' statements about motherhood
Hill and Gaines, 2007	The Consumer Culture of Poverty: Behavioral Research Findings and Their Implications in an Ethnographic Context	Interpretation of five previous ethnographies of homeless persons	Stories about how homeless persons get along

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Study	Title	Type of Data	Nature of Information
Jarrett, 1996	Welfare Stigma Among Low-Income, African American Single Mothers	10 focus groups of low-income African-American mothers in Chicago, 1988	Welfare recipients' statements about work
Katras, Zuiker *et al.*, 2004	Private Safety Net: Childcare Resources from the Perspective of Rural Low-Income Families	52 rural low-income families in 13 States, qualitative interviews, 1999-2000	Mothers' statements about how they piece together child care
Lein, Benjamin *et al.*, 2005	Economic Roulette	99 low-income families in 3 cities interviewed monthly for 12-18 months, 2002-03	Mothers' histories of work and work-related functioning
London, Scott *et al.*, 2004	Welfare Reform, Work-Family Tradeoffs, and Child Well-Being	46 women initially on welfare in 2 cities, 2 open-end interviews one year apart, 1997-98	Mothers' statements about work and work problems
Luck, Elifson *et al.*, 2004	Female drug users and the welfare system: a qualitative exploration	61 female drug users on welfare in Atlanta, one in-depth interview, 1998-99	Drug users' statements about assistance programs and coping strategies
Marcus, 2005	Whose Tangle is it Anyway? The African-American Family, Poverty and United States Kinship	Participant observation and ethnography of homeless men in NY, 1989-91	Long- or short-term homeless men's statements about family
Reed, 2004	Poor Women's Work: A Look at the Employment Opportunities and Experiences of Low-Income, Inner-City Women	in-depth interviews, 90 families, Chicago public housing, 2003	Low-income women's statements about work
Robles, 2006	One Size Does Not Fit All: Low-Income Women Choreographing Work and Family	Ethnographic study, 44 families, Milwaukee, 1998-2001	Stories of low-income women's work arrangements
Scott and London, 2006	Consequences of the Triumph of Individualism: Insights from the Lives of Women Who Hit Time Limits	15 women who hit time limit, Cleveland, annual qualitative interviews 1997-2001	Women's histories of welfare, work, coping

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Study	Title	Type of Data	Nature of Information
Scott, London *et al.*, 2005	Instability in patchworks of child care when moving from welfare to work	38 women, initially welfare-reliant, Cleveland, annual qualitative interviews 1997-2001	Women's histories of child care usage
Sherman, 2006	Coping with Rural Poverty: Economic Survival and Moral Capital in Rural America	55 in-depth interviews, mainly low-income, poor rural CA – also participant observation, 2003-2004	Stories about subsistence strategies
Smith, 2002	Commitment to mothering and preference for employment: The voices of women on public assistance with young children	Weekly open-ended group discussions, 14 welfare-reliant women, NY State, 1999-2000	Mothers' statements about reasons for/against work vs. stay-at-home
van Arsdale, 2005	Waiting for Work: An Ethnography of Temporary Help Workers from a Deindustrialized City	Participant observation, ethnography in northeastern city, 2000-2003	Workers's stories about structure and issues in temporary work
Zippay, 2002	Dynamics of Income Packaging: A 10-Year Longitudinal Study	87 displaced steelworkers, PA, qualitative and quantitative interviews in 1987 & 1997	Stories of "income packaging" by mostly low-income workers
Other research			
Anderson, Halter *et al.*, 2004	Difficulties after Leaving TANF: Inner-City Women Talk about Reasons for Returning to Welfare	5 focus groups of TANF leaver-returners in Chicago, 1999-2000	Statements of reasons for returning to TANF
Curtis, 1997	Urban poverty and the social consequences of privatized food assistance	Participant observation and interviews with food assistance organizations and staff, Delaware, 1993	Qualitative data on operations of voluntary organizations
Duffy, Hallmark *et al.*, 2002	Food Security of Low-Income Single Parents in East Alabama: Use of Private and Public Programs in the Age of Welfare Reform	Survey of 216, food pantry users and comparison group, Alabama	Tabulations of reasons for non-use of pantries; model of pantry use

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Study	Title	Type of Data	Nature of Information
Henderson, Tickamyer *et al*., 2005	The impact of welfare reform on the parenting role of women in rural communities	48 assistance recipients in Appalachian Ohio, in-depth interviews	Mothers' statements about motherhood and welfare rules
Henly and Danziger, 1996	Confronting welfare stereotypes: Characteristics of general assistance recipients and postassistance employment	46 in-depth interviews with GA recipients, plus survey & admin data, in 3 Michigan counties, 1993	GA (former) recipients statements about their situation
Kissane, 2003	What's Need Got to Do with It? Barriers to Use of Nonprofit Social Services	In-depth interviews, 20 poor women, Philadelphia, 1998-99	Low-income women perceptions of services available in non-profit sector
Kretsedemas, 2003	Immigrant households and hardships after welfare reform: a case study of the Miami-Dade Haitian community	Survey of 380 Haitian immigrants in Miami, 2001	Bivariate descriptive analysis of use of public services
Molnar, Duffy *et al.*, 2001	Private Food Assistance in a Small Metropolitan Area: Urban Resources and Rural Needs	Qualitative interviews with staff & clients, 12 food pantries in Alabama, 1999	Observed characteristics of food pantries
Rogers-Dillon, 1995	The Dynamics of Welfare Stigma	10 divorced or separated on welfare, Philadelphia, one in-depth interview,	Recipients' statements about experiences with welfare, using food stamps
Romich, 2006	Difficult Calculations: Low-Income Workers and Marginal Tax Rates	40 low-income women with young children in Milwaukee, 18 ethnographic interviews, 1997-2000	Recipient histories of welfare interactions
Seccombe, James *et al*., 1998	"They Think You Ain't Much of Nothing": The Social Construction of the Welfare Mother	In-depth interviews, 47 women on AFDC, Florida, 1995	Welfare mothers' statements about selves, others
Seccombe, Walters *et al.*, 1999	Welfare Mothers Welcome Reform, Urge Compassion	In-depth interviews, 47 women on AFDC, Florida, 1995	Welfare mothers' statements about welfare reform