An Analysis of Poverty and Food Sufficiency Dynamics

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Abstract

This study examines dynamics in poverty and food insufficiency using newly-available longitudinal data from 1993 panel of the Survey of Income and Program Participation (SIPP) and the follow-on Survey of Program Dynamics (SPD). The study uses these data to characterize the incidence and dynamics of poverty and food problems for the entire U.S. population and for different subgroups. The study also estimates multivariate, discrete-choice regression models to examine the factors associated with transitions into and out of poverty and food insufficiency. It analyzes the empirical results in the context of a life-cycle model of income and food consumption. The study finds that the incidence of food insufficiency in the U.S. is low—less than 3 percent in 1997. There also appears to be little persistence in food problems; 79 percent of people in households with food problems at the start of the study period were in households without problems two years later. The multivariate results indicate that female-headed households face an especially high risk being food insufficient. Low levels of asset income, an indicator of a household's ability to smooth consumption, are also associated with food problems.

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I. Introduction

Policy makers and social scientists are keenly interested in understanding the processes that underlie households' experiences with economic hardship in the United States. Researchers have devoted a vast amount of effort to examining the incidence, correlates and dynamics of income-based measures of poverty and developed a considerable body of knowledge. Researchers have also looked at alternative, consumption-based measures of hardship, such as food insufficiency. However, because less data has been collected on these outcomes, we know relatively little about important characteristics of food problems and other measures of material hardship, including their dynamic properties.

The dynamic aspects of economic hardship involve the movement of individuals, families and households into and out of deprivation. Analyses of these movements consider whether hardship is a brief or long-lasting condition. They also consider whether households that are deprived today run a greater risk of deprivation in the future—that is, whether deprivation is characterized by state dependence. In the case of income poverty, studies have established that most poverty spells in the U.S. are short; only a small percentage of spells last more than a few years. Studies have also found that poverty exhibits state dependence—families that have been poor in the past are more likely than other families to be poor in the future. It is important to know whether food problems have similar dynamic properties.

These properties have implications for the design of welfare programs, especially food assistance programs. The U.S. Department of Agriculture (USDA) currently administers 15 domestic food assistance programs that work individually and in concert to provide a nutrition

safety net for children and low-income adults. These programs are a major component of the Federal safety net, and in fiscal 2001, the USDA spent $34.1 billion on its domestic food assistance programs.

Understanding dynamics in both poverty and food problems may also help us to better define the general concept of economic well-being. The standard (Orshansky) income-poverty measure, which compares a family's annual income to three times its food needs, has serious limitations. Several approaches have been proposed for addressing these limitations. The National Research Council (Citro and Michael 1995) has recommended continuing to compare families' incomes and needs but refining the definition and improving the measurement of each element. At the same time, the USDA, Census Bureau and other agencies have begun to collect information on particular hardships experienced by households. In particular, the USDA has spearheaded the effort to document food insecurity and hunger through its food security scale (Bickel et al. 2000). Other extended measures of well-being such as the ability to meet medical expenses, housing costs, and other specific household needs have been collected and examined periodically by the Census Bureau.

This study examines dynamics in poverty and food insufficiency using newly-available longitudinal data. Specifically, the study links data from the 1993 panel of the Survey of Income and Program Participation (SIPP) with information from the follow-on Survey of Program Dynamics (SPD). Both surveys asked households comparable questions regarding food sufficiency; the resulting data reveal how food problems changed over time within households. In addition, the SIPP and SPD collected a wealth of other economic and demographic data that allow us to construct longitudinal measures of poverty, program participation, and other factors. The study uses these data to characterize the incidence and dynamics of poverty and food

problems for the entire U.S. population and for different subgroups. The study also estimates multivariate, discrete-choice regression models to examine the factors associated with transitions into and out of poverty and food insufficiency. It analyzes the empirical results in the context of a life-cycle model of income and food consumption.

The primary contribution of this study is its analysis of food insufficiency dynamics. Several studies have documented the incidence of food problems and examined the factors associated with those problems at a particular point in time. However, the lack of longitudinal data has prevented researchers from studying dynamic issues. The new data from the SIPP and SPD allow us to examine whether food problems are relatively transient or long-lasting, whether people are more likely to experience food problems in the future if they experienced them in the past, and whether mobility differs across people with different economic and demographic characteristics.

Another contribution of the study is that it investigates whether the longitudinal poverty and food sufficiency outcomes are fundamentally distinct processes or manifestations of the same underlying process. While poverty and food sufficiency are obviously related, the study's theoretical life-cycle model indicates that they will differ depending on a household's ability to borrow and save (smooth consumption). The study formally tests for differences in poverty and food sufficiency outcomes and examines whether the differences are consistent with theory.

Finally, the SPD contains numerous alternative food problem measures, including measures necessary to construct the food security scale and index (Bickel et al. 2000). The food security scale has been widely used in other research, and the availability of this scale helps us to examine whether our results are comparable to previous findings. The scale is also useful for sensitivity analyses. Research by Ziliak (1998) shows that longitudinal analyses of household

well-being may be sensitive to the type of measure used.

The rest of this report is organized as follows. Section II reviews previous studies that have examined food problems, food consumption, poverty, and related economic outcomes in the U.S. Section III develops a simple conceptual model of income and food consumption to illustrate how poverty and food problems are distinct, yet related, outcomes. The construction of the analysis data set and selection of variables from the larger SIPP and SPD files are described in Section IV. Section IV also reports results from descriptive analyses of the data. Section V describes the study's multivariate statistical models and reports estimation results. Conclusions and policy implications are drawn in Section VI.

II. Previous Studies

There is a large body of empirical research that can help to inform an analysis of poverty and food sufficiency dynamics. For brevity, this review focuses on studies that have examined food problems, food consumption or poverty as outcome variables.

Determinants of food insecurity and insufficiency. Several studies have examined factors that are associated with the incidence of food insecurity, food insufficiency and other extended measures of household well-being at a single point in time. Although a few researchers have motivated their empirical analyses using dynamic conceptual models (e.g., Gundersen and Gruber 2001), none has directly examined changes in food problems.

The cross-section studies have generated a variety of, sometimes conflicting, results. For instance, Rose, Gundersen and Oliveira (1998) estimated the effects of different economic and demographic variables on food insufficiency using national samples. They found that food insufficiency fell with income, food stamp benefits, home ownership, and education; they also

found that household structure and race and ethnicity were important factors. Daponte, Haviland and Kadane (2002) used a survey of poor families from Allegheny County in Pennsylvania to examine the effects that food stamp and food pantry use had on the ability to make minimally adequate food expenditures. They found that families with higher incomes and higher food stamp benefit levels fared better than families with lower incomes and benefit levels.

In contrast, Cohen et al. (1999) found that food outcomes were worse among food stamp recipients than among eligibles and near-eligibles. They estimated that half of all food stamp recipients experience some type of food insecurity. Gundersen and Oliveira (2001) similarly found that food stamp use was positively correlated with food insufficiency when program participation was treated as an exogenous variable. However, once they controlled for the endogeneity of food stamp use, the statistical significance of the relationship disappeared. Winship and Jencks (2002) found that single mothers had higher rates of food problems than married mothers but that both groups experienced similar declines in problems over the late 1990s; because single mothers are more likely to need and receive public assistance, the results suggest that welfare reform had little effect on food outcomes. Bauman (2000) examined an aggregate index of economic deprivation, which included food insufficiency as one of the arguments, and found that families with heads that worked part of the year experienced higher rates of hardship than families with non-working heads.

Gundersen and Gruber (2001) developed a detailed dynamic theoretical model of food problems and used descriptive statistics from the 1991 and 1992 panels of the SIPP to test its implications. They found that food-insufficient households were more likely to suffer unexpected income losses and had less stable incomes than other households. In addition, food-insufficient households appeared to have less ability to smooth these changes in incomes because

of low savings and liquidity constraints.

Food consumption in low-income families. An extensive related literature has examined food consumption and nutrition outcomes for low-income households. Fraker (1990) summarized more than 30 studies that used micro-data to look at how household food consumption, household nutrient availability and individual nutrient intakes varied with income, food stamp receipt, household composition and other characteristics. The studies consistently found that the marginal propensity to consume food out of income for low-income households was very small—estimates indicated that low-income households spend five to ten cents on food for each additional dollar of income they receive.

The propensity to consume food out of food stamp benefits was much higher—between 17 to 47 cents out of each dollar. These results are somewhat puzzling because economic theory predicts that the marginal propensities to consume out of each type of income would be much closer. Although food stamps can only be used for food purchases (which would seem to imply a marginal propensity of one), households can presumably shift their remaining resources away from food and toward other goods. Selectivity offers one explanation for the findings (e.g., households that place a high value on food consumption may be more likely to participate in the Food Stamp Program); however, substantial differences in the marginal propensities remained even after researchers incorporated statistical controls for selectivity.

Dynamics of food consumption. While there have been no studies of food insufficiency using longitudinal data, there have been a number of studies of the dynamics of overall food consumption. These studies have used the annual, longitudinal food consumption measures from Panel Study of Income Dynamics (PSID) and been framed as tests of consumption smoothing and the permanent income hypothesis, rather than food problems specifically. Some researchers,

such as Zeldes (1989), concluded that food consumption patterns were consistent with liquidity constraints, while other researchers, such as Mariger and Shaw (1993), rejected this finding. Several researchers have extended this research to examine the additional implications for food consumption of habit formation (Dynan 2000), unemployment spells (Dynarski and Sheffrin 1987), and different rate of time preferences (Lawrence 1991). Additionally, Ziliak (1998) has examined whether tests of the permanent income hypothesis are sensitive to alternative measures of consumption other than food consumption; he found that food consumption was less likely to lead to a rejection of the permanent income hypothesis than other measures.

Dynamics of poverty spells. In contrast to the dearth of longitudinal research on food problems, there is an extensive research literature that documents the dynamics of poverty spells.[1] Most of this research has been descriptive. For instance, the U.S. Census Bureau produces regular tabulations using the SIPP (see, e.g., Eller 1996, Naifeh 1998). These reports indicate that most poverty spells are brief but that a non-negligible fraction are long-lasting. In the most recent report, Naifeh calculates that three-quarters of poverty spells in the early 1990s ended within a year but that an eighth lasted more than two years.

The pathbreaking research on poverty dynamics by Bane and Ellwood (1986) was also largely descriptive. Bane and Ellwood employed multivariate hazard models but used these mostly to characterize spells and decompose the sources of transitions into those associated with the earnings of different household members and the structure of the household. Their research indicated that there was a great deal of mobility in poverty transitions but also a fair degree of state dependence. Their results also revealed that changes in the head's earnings only accounted

[1] Jäntti and Danziger (2000) summarize the literature for the United States and other advanced countries. Burgess and Propper (1998) and McKernan and Ratcliffe (2002) also provide thorough reviews.

for a portion of the transitions into and out of poverty; earnings of secondary workers and household changes accounted for much of the remainder. Stevens (1994) updated this research and also examined changes over time. Besides confirming Bane's and Ellwood's findings, she found that mobility into and out of poverty decreased in the 1980s, especially for female-headed households. In a subsequent study, Stevens (1999) highlighted the importance of multiple spells of poverty. She estimated reduced form hazard models of poverty exits and re-entry and found that more than half of all those who left poverty returned within four years. Rodgers and Rodgers (1993) applied an alternative depth-of-poverty index to longitudinal data, which also accounted for re-entry into poverty. Like Stevens, they found that there was a high incidence of chronic poverty. More recently, Rank and Hirschl (2001) used life-table methods to describe poverty patterns at all ages and found that while many people experience poverty at some point during adulthood, few are persistently poor.

There have only been a few behavioral studies of poverty dynamics. Burgess and Propper (1998) conducted a detailed analysis. Rather than relying on simple decompositions or reduced-form associations, they estimated a detailed model that treated employment, marriage, fertility and earnings changes as endogenous processes. Burgess and Propper found that each of these processes affected poverty, although changes in marital status appeared to be the most significant factor. McKernan and Ratcliffe (2002) also conducted a behavioral study to identify trigger events in poverty transitions; they found that a variety of household and earnings events contributed to poverty dynamics.

In addition to the studies that have explicitly examined poverty transitions, there have been many studies that have examined the determinants of various components of the poverty measure. Lillard and Willis (1986) focused on men's earnings mobility; they used variance

component techniques in earnings regressions and found that much of the variation in earnings across workers reflects permanent differences. Lichter, Landry and Clogg (1991) looked at transitions between discrete labor force outcomes including movements between unemployment, involuntary part-time employment, low-wage (below poverty) full-time employment and high-wage full-time employment. More recently, Pavetti and Acs (2001) used a similar classification to examine the implications of young women's employment mobility for welfare reform. Blank and Ruggles (1996) estimated dynamic models of food stamp and cash assistance eligibility and participation. Moffitt and Rendall (1995) and Fitzgerald and Ribar (2001) examined spells of female headship.

Contribution of this study. The present study ties together the various strands of this literature and extends the literature in several important respects. First and most importantly, it documents and examines dynamics associated with food insufficiency. All of the previous research on food problems has been conducted using static methods. The availability of longitudinal data means that the study can consider new issues such as whether food problems are relatively transient or long-lasting and whether people are more likely to experience food problems in the future if they have experienced them in the past. The study also extends the studies of poverty and overall food expenditure dynamics by considering an alternative measure of hardship that relies on direct reports of the ability to meet basic needs. Although the measure is subjective (each household uses its own criteria in determining food sufficiency) and only captures one dimension of household functioning, it avoids some of the problems associated with the standard poverty measure (see Citro and Michael 1995).

Second, unlike all but a handful of the studies on poverty dynamics (e.g., Burgess and Propper 1998 and McKernan and Ratcliffe 2002), this study estimates multivariate transition

models that account for a large number of personal and household characteristics. These models will help us to identify economic, demographic, and program factors that are associated with changes in food problems holding other factors constant. Third, because the analysis data set also contains standard poverty measures, the study can compare findings for poverty and food insufficiency dynamics using the same sample and empirical methodology and examine whether alternative measures lead to different conclusions.[2] Finally, the study relies on data from the mid- to late-1990s. Thus, it not only provides a more up-to-date picture than previous research but also considers a period of tremendous economic growth as well as profound programmatic and social change associated with the enactment of welfare reform.

III. Theory - Poverty and Food Insufficiency

Poverty and food insufficiency represent two alternative ways to describe economic hardship. A brief theoretical economic analysis helps to illustrate the ways in which these outcomes are related but also different. To keep the focus on poverty and food insufficiency, the model takes the household's income and needs as given. Sawhill (1988) and others have discussed how income and needs are affected by short-term economic factors such as the employment availability and wage levels, long-term economic factors such as education and training, demographic factors such as marriage, fertility and migration, and programmatic factors such as tax rates and public assistance benefit levels. These are important determinants, and the study examines them in the subsequent empirical analysis. However, for simplicity, the theoretical analysis abstracts from them.

[2]For instance, research by Bhattacharya, Currie and Haider (2002) suggests that poverty and food insecurity measures are not equivalent predictors of children's dietary outcomes.

The theoretical analysis is based on a simplified, two-period version of the household, life-cycle model considered by Gundersen and Gruber (2001). In our model, the household has time-separable preferences defined over its consumption of food, F_t, and all other goods, C_t, in each period (t = 1, 2) such that

$$U = U_1(F_1, C_1) + \beta U_2(F_2, C_2)$$

where β ($0 < \beta \leq 1$) is a discount rate and $U_t(\cdot, \cdot)$ is the preference function (sub-utility) for period t. The needs of the household over time are assumed to be captured by the preference function.

To characterize the resources available to the household, the model assumes that the household begins period 1 with assets A and receives income in each period, Y_t. It also assumes that the household must pay p_F for each unit of food. For convenience, food is priced relative to units of other consumption and assumed not to change over time. Unlike Gundersen's and Gruber's (2001) model, there is no uncertainty—the household knows its income, the price of food, and all other relevant variables for both periods in period 1. The household chooses levels of food and other consumption in each period to maximize utility subject its budget constraint.

We first consider the implications of this model if the household is free to borrow and save in the first period. Specifically, assume that the household can borrow or save at an interest rate, r, and that any loans must be paid off in period 2. With these assumptions, the household has a two-period budget constraint

$$p_F F_1 + C_1 + (p_F F_2 + C_2)/(1+r) \leq A + Y_1 + Y_2/(1+r).$$

The ability to borrow and save means that the household can smooth consumption. Consumption in each period depends the total amount of income available in both periods, not just the income in that period; a low level of income in one period can be offset by a high level

of assets or high level of income in the other period. This implies that an isolated bad realization of income will reduce food consumption but need not lead to an acute reduction, other things held equal.

Food insufficiency can nonetheless occur in this model. For instance, a household with few assets and low levels of income in both periods would experience correspondingly low levels of consumption. The timing and persistence of food insufficiency would depend on the household's discount factor. A relatively myopic household (one with a low value of β that discounts future consumption heavily) would expend most or all of its resources in the first period leaving little for the second period. Conversely, a household with strong preferences for future consumption (a high value of β and low discount rate) might scrimp in the first period and direct most of its resources for the second. A persistently poor household with a discount rate in between these extremes would have low and more equal levels of consumption in both periods.

If the household is constrained in its ability to borrow and save, the implications are different. In the extreme case where there is no possibility of borrowing or saving, consumption in each period depends on that period's resources. A drop in income will lead to a relatively large contemporaneous reduction in consumption; put another way, poverty and food insufficiency will be tied more closely together. In the more realistic case where households are not restricted in their ability to save but somewhat restricted in their ability to borrow (e.g., constrained by the ability to obtain credit or by the credit limit on a charge card), the timing pattern of income changes becomes important. The household can smooth consumption if it starts with a high level of assets or receives a large income in the first period but is less able to smooth if it does not receive a large income until the second period.

Clearly, this model abstracts from many crucial features besides the determinants of

income and needs, such as unexpected price and income changes, multiple periods, actual production of meals, household composition, and time dependencies.[3] Still, it provides a useful framework for motivating the empirical models and interpreting patterns in the data.

IV. Data

The study draws its data for the empirical analyses from the 1993 panel of the Survey of Income and Program Participation and the follow-on Survey of Program Dynamics. The SIPP is a large, national longitudinal survey conducted by the Census Bureau. The 1993 panel interviewed individuals every four months over nine waves from the Winter of 1993 until the Fall of 1995. In each wave, the SIPP asked people about their work behavior, income receipt, program participation and family structure. In the final wave, the survey also collected information about basic needs including food sufficiency.

The SPD is a follow-on to the 1992 and 1993 panels of the SIPP and consists of people who were either original respondents in those surveys or who were living with original respondents. The SPD is an annual longitudinal survey that is designed to capture changes in income, labor supply, household composition, and program participation necessary to evaluate the impacts of the Personal Responsibility and Work Opportunities Reconciliation Act (PRWORA) of 1996. The annual interview in 1998 asked questions about food sufficiency and food security in addition to the regular core questions about economic and demographic status.

The linked data from the SIPP and SPD are unique because they permit us to examine

[3]Gundersen and Gruber (2001) considered some of these issues. In addition, Mariger and Shaw (1993) considered uncertainty and multiple time periods in their analysis of food consumption; Dynan (2000) considered habit formation, and Rose et al. (1998) considered a household production model of nutritional intake.

food sufficiency and poverty for individuals at two different points in time. Longitudinal data for poverty status are available from several other surveys; similarly, longitudinal data for overall food consumption are available from the PSID. However, we are not aware of another national dataset that contains longitudinal measures of food sufficiency. The SIPP and SPD also have other useful features such as detailed information on different sources of income.

The advantages of using the SIPP and SPD need to balanced against several drawbacks, however. The main drawback is the complex structure of the underlying files. The present analysis required us to link together data from two large files from the SIPP (the Longitudinal file and the Wave 9 Topical Module file) and three files from the SPD (the Longitudinal File, the 1998 Experimental File, and the 1998 Food Security Status file). Another drawback is that the data from the 1998 Experimental SPD file are unedited. The two SIPP files and the Longitudinal SPD file were edited for consistency; however the 1998 Experimental SPD file was not. The lack of editing means that it is not possible to link some people from the Experimental file to their records in the other files; it also means that some individual responses are either missing or inconsistent.

A final difficulty is the unusual sampling pattern for the SPD. Like all longitudinal files, the SIPP and the SPD suffer from sample attrition. However, the attrition problems in the SPD are especially severe because it did not immediately re-interview respondents from the SIPP (the first SPD "bridge" interview took place in March 1997); this large gap in time meant that some participants could not be located. Also, it purposely dropped a large number of respondents in 1998 for budgetary reasons. The SPD includes sample weights, which account for the representation problems associated with attrition and the cut in the sample. All of the empirical analyses in this study make use of these weights. Unfortunately, the weights do not account for

observations that are dropped because of item non-response and linking problems in the experimental SPD file. Because of these various problems, estimates in the study may not be nationally representative.

The principal outcome variables for the longitudinal analyses are measures of household food sufficiency and family poverty. Questions regarding food sufficiency were asked in Wave 9 of the SIPP and in the 1998 annual interview of the SPD. In each instance, household heads were asked whether the household had

1 Enough to eat and the kinds of food wanted,

2 Enough to eat but not always the kinds of food wanted,

3 Sometimes not enough to eat, or

4 Often not enough to eat.

The SIPP and the SPD both framed the questions in terms of the preceding 12 months.[4] In the empirical analysis, a household is identified as being food insufficient if the head reports that the unit either sometimes or often did not have enough to eat.

Both surveys also asked household heads who reported being food insufficient about the reasons for those problems. For example, households were asked if the problems stemmed from a lack of money, proper kitchen facilities, or health problems. These questions are potentially useful for distinguishing between households that are food insufficient for resource reasons and

[4]The framing was implicit in the SIPP; the food sufficiency questions followed several other basic needs that were framed in terms of the preceding 12 months. The framing was explicit in the SPD. One other difference was that a single question with the four categories listed above was asked in the SPD, while two questions were asked in the SIPP–first, whether the household was sometimes or often food insufficient and second, if food sufficient, whether it had the kinds of foods wanted. Nord (1998) cautions that the two-part question can lead to artificially higher reports of food insufficiency.

for other reasons (e.g., preferences, dieting). It turns out, however, that almost all of the food insufficient households report resource constraints. The study experimented with a more restrictive food insufficient for resource reasons variable but found that it had no discernable effect on the results.

An alternative way of measuring food problems in households is the food security index (see Bickel et al. 2000). The food security index is derived from a long series of questions (up to 18 items) and has been extensively researched. It is intended to measure the existence and severity of food insecurity and hunger and can be used to distinguish between households that are "food secure," "food insecure without hunger," and "food insecure with hunger." Food security questions were asked as part of the SPD but were not included in the SIPP; thus, they can be used to examine hunger at a point in time but not longitudinally. Food sufficiency and food security are clearly related to one another. The analysis focuses on food sufficiency because repeated measures are available over time; where possible, it also considers measures of food security.

While the food sufficiency and food security measures are useful for providing direct information about food problems and the ability to meet basic needs, we need to be concerned about how to interpret these self-reported data. One issue involves the benchmarks that the household head uses in answering the questions. Where does the head draw the line between having "enough" and "not enough" to eat? It is possible that two respondents who come from households with identical resources and demographic compositions could give opposite yet logically-consistent answers if they value food consumption differently. The availability of longitudinal data, which allows us to control for persistent, idiosyncratic differences in valuations, helps to address this problem (e.g., each household would be expected to apply the

same standard for food sufficiency in each time period). Another issue involves applying this household measure to individual members. The head reports the condition for the household as a whole, not for specific members. It could be the case that the household acts to shield children and other vulnerable members from food problems (Bickel et al. 2000).

The other principal outcome that the study examines is family poverty. The study uses the standard (Orshansky) poverty measure. From the SIPP, an income-to-needs ratio is formed by summing the monthly reports of family income and measures of family needs over the 12 months preceding the Wave 9 interview (i.e., the data are taken from Waves 7-9 and include months from 1994 and 1995). The SPD data come from annual measures describing calendar year 1997. Although the definitions of the measures are similar, there are some differences. In particular, the SIPP measure accounts for month-to-month variation in family composition, while the SPD measure does not. Also, the SIPP measure is based on a shorter recall horizon.

The analysis includes an indicator for whether anyone in the household received food stamps in the preceding year. As is the case with the income measures, the food stamp participation measure from the 1993 panel of the SIPP is constructed from the 12 months preceding the Wave 9 interview; the measure from the SPD are taken directly from an annual question describing calendar year 1997. The analysis also experimented with other program participation measures including an indicator for whether anyone in the household received any type of public assistance payment (TANF, AFDC, general assistance, foster child payments, or other welfare). These other assistance measures generally were not significant predictors of food sufficiency once the income-to-needs ratio, food stamp measure, and other controls were included. The study also considered alternative measures of food stamp participation, such as number of months of receipt, but found that these measures did not perform as well as the annual

indicator for any receipt.

The theoretical analysis and previous permanent income studies point to the importance of liquidity constraints and the household's net financial position. Eligibility for food stamps also depends on the household's net assets. The analysis relies on two measures to capture net worth: an indicator for whether the household's total payments from interest, dividends, and property rentals in the preceding year were less than $500 and an indicator for whether the living quarters were owned by someone in the household.

Other demographic characteristics of individuals, their families, and households are also included in the analysis data set. Standard demographic characteristics for individuals include the person's sex, age, race, ethnicity, education level, and marital status. Some additional characteristics that are especially relevant for the TANF and Food Stamp Programs are the number of children in the household, the person's employment status, whether the person is disabled, is a citizen, or lives in a household headed by an unmarried female,. For some analyses, the study uses data on age, disability status, and family structure to identify able-bodied adults without dependents (ABAWDs).

Descriptive statistics for the analysis data set are reported in Tables 1 and 2 and Appendix A.[5] Table 1 lists food sufficiency and income-to-needs outcomes for 1994-5 and 1997

[5]Despite the concerns about the representativeness of the linked SIPP and SPD because of sample attrition, item non-response, and other issues, the descriptive statistics from Tables 1 and 2 match up well with published estimates. The annual poverty rate from the analysis sample for 1994-5 is close to Naifeh's (1998) estimate of 12.6 percent for 1994 based on SIPP data and slightly below Dalaker's (2001) estimates of 14.5 percent for 1994 and 13.8 percent for 1995 based on CPS data. The 1997 estimate is also close to the figure that Naifeh's data would predict and below Dalaker's CPS estimate. The poverty rates for different demographic subgroups in 1994-5 and 1997 follow the same patterns as Dalaker's CPS estimates; the only exception is the slightly elevated poverty rate for elderly individuals in 1997. The food sufficiency and security measures are also close to previous estimates. The study's estimate of 2.7 to 4.3 percent of the population living in food insufficient households is near the household

and food security outcomes from 1997. The tables indicate that in each year, most of the population (approximately five out of six people) lived in households with enough food and the kinds of food they wanted. Only 4.3 percent of the population in 1994-5 lived in households in which there was sometimes or often not enough food to eat; by 1997, this figure had fallen by a third to 2.7 percent. The figures similarly indicate that food insecurity and hunger only affect a small percentage of people in the United States—an estimated nine out ten people were in food secure households. Only 3.8 percent of people (about one out of 26) were in households that experienced hunger. These figures can be compared to the standard poverty figures. In 1994-5, the data indicate that 12.1 percent of the population was in poverty (lived in a family with an income-to-needs ratio less than one); by 1997, the estimated poverty in the data had fallen to 11.6 percent.

The figures from Table 1 also indicate that poverty and food insufficiency were positively related as expected. People who lived in families with incomes below the poverty line were several times more likely to face food insufficiency than people in families with higher incomes. For instance, the food insufficiency rate for people in poor families in 1994-5 was 16.2 percent versus a general rate of 4.3 percent. In both 1994-5 and 1997, roughly half of the people in food insufficient households were also in poor families.

Table 2 reports static and dynamic measures of poverty and food insufficiency for the

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percentage estimates for 1989-92 reported by Rose et al. (1998). Similarly, its estimate of 10.9 percent of the population living in food insecure households in 1997 matches well with the CPS-based estimate of 9.8 percent, and the estimated decrease in food insufficiency from 1994-5 to 1997 tracks a similar fall in food insecurity (Andrews et al. 2000). Additional calculations reveal that the relationships between key variables are stable over time; for instance, the correlation between the food insufficiency measure and the income-to-needs ratio is -.28 in 1994-5 and -.29 in 1997.

entire sample and for different demographic subgroups. The dynamic measures include indicators for whether people were in poor families or food insufficient households in either 1994-5 or 1997 or in both years as well as transition rates into and out of each state. The figures in the table confirm previous findings that poverty is relatively transient. While 16.6 percent of the population were poor in either 1994-5 or 1997, only 7.1 percent were poor in both years. Of those people who were not poor in 1994-5, 5.1 percent entered poverty by 1997. The corresponding exit rate from poverty was 41.3 percent over this period.[6] While the figures provide evidence of mobility, they also give evidence of state dependence. A person who was poor in 1994-5 was ten times more likely to be poor in 1997 than a person who was not poor in the earlier period.

Food insufficiency was both rarer and more transient than poverty. Only 6.1 percent of the population lived in a food insufficient household in either 1994-5 or 1997, and less than one percent lived in such households in both years. Only about one person out of fifty who were initially food sufficient lost food sufficiency, while roughly four out of five people who were initially food insufficient attained sufficiency. At the same time and like the poverty figures, these rates indicate that the was a great deal of state dependence—a person who was initially in a food insufficient household was ten times more likely to be food insufficient in 1997 than a person who was initially in a food sufficient household.

Estimates for different demographic groups reveal that women were more likely to live in

[6]Because the exit and entry rates in Table 2 are calculated over a period of just over two years, they are not directly comparable to the annual rates reported in other studies. Rough comparisons can be made, however, by projecting the annual rates from previous studies out to two years. For instance, if we take Naifeh's (1998) 1993-94 exit and entry rates of 3.2 and 23.8 percent and project forward an additional year, we obtain two-year rates of 5.5 and 41.2 percent, respectively.

poor families and food insufficient households than men. The higher poverty and food insufficiency rates for women reflected higher rates of entry for each condition and lower rates of exit. Children were more likely to live in poor families or food insufficient households than adults and less likely to exit from either of these conditions. The elderly had higher rates of poverty than working age adults but lower rates of food insufficiency. The elderly also had lower exit rates from poverty and food insufficiency.

Rates varied across racial and ethnic groups and with citizenship status. Poverty rates and food insufficiency rates for people of African and Hispanic origin were roughly three times higher than for people of European origin. People of African and Hispanic origin had very high rates of entry for poverty and food insufficiency and low rates of exit. Non-citizens had rates of poverty and food insufficiency that were comparable to people of African or Hispanic origin.

Poverty and food insufficiency declined with education. The rates for people who did not complete high school were two to three times higher than for people who completed high school and six to ten times higher than for people who completed college.

Rates also varied with family structure. Female-headed households with children had the highest rates of poverty and food insufficiency of any of the demographic groups examined. They also had the highest entry rates for each outcome and lowest exit rates. Married couple households with children had lower than average rates of poverty and food insufficiency. Rates for able-bodied adults without dependents (ABAWDs) were lower still.

V. Multivariate Analysis

The study estimates multivariate discrete logistic models of the transitions between the two measures of economic hardship in 1995—poverty or food insufficiency status—and the

corresponding measures in 1997. Two transition models are estimated for each outcome: a logit model for transitions into (entry into) poverty or food insufficiency and a logit for transitions out of (exits from) each category. For the poverty entry model, the dependent variable is poverty status in 1997, and the model is estimated using the sample of individuals who were not poor in 1995. For the poverty exit model, the dependent variable is an indicator for *not being* in poverty in 1997 (the converse of poverty status), and the model is estimated using the sample of individuals who were initially poor in 1995. Similar specifications are used to examine transitions into and out of food insufficiency. Discrete logistic models of this kind have been employed by Stevens (1994, 1999) and others.

Table 3 lists results from three pairs of entry and exit specifications. The models were estimated on a sample of individuals who were at least 18 years old in 1995 and not enrolled in school in 1995 or 1997. This group was chosen to limit the analysis to people who were potential decision-makers in the household and who were not voluntarily poor because of schooling. The first two columns report coefficient estimates and standard errors from models of poverty transitions. The standard errors in these and subsequent columns have been corrected for clustering within households (i.e., for correlations in the unobserved determinants of transitions among individuals from the same household). The models include a number of variables that have either been included in previous analyses of poverty or that seem relevant for poverty dynamics. Specifically, the models include variables for personal characteristics including age (and age squared), gender, race, ethnicity, citizenship, employment and disability status. They also incorporate measures of family and household characteristics including an indicator for whether the household was headed by a female, the number of children in the household, and the ratio of income and needs (the poverty standard) for the family. With the

exception of citizenship status, all of the variables are measured at the start of the transition period in 1995. Means and standard deviations for the explanatory variables are reported in Appendix A.

Note that care should be taken in interpreting the coefficients from Table 3. The coefficients in the logit specifications do not have the same interpretation as regression coefficients and thus do not represent the direct association between the listed variables and the actual transition outcomes. Instead, the coefficients represent the association between the independent variables and F^{-1}(probability of making a transition), where $F^{-1}(P)$ is the inverse function of the logistic cumulative distribution function. The reported coefficients are useful in determining the direction and statistical significance of associations; however, unless they are transformed, they do not tell us the magnitudes of the direct associations.

The coefficient estimates in the entry specification (first column) are generally consistent with expectations and previous research; most of the estimates are significantly different from zero. The estimates indicate that the probability of entering poverty declines with age through about age 60 then increases thereafter. The probability of entering poverty is estimated to be higher for women, people of African and Hispanic origins, people in female-headed households, and the disabled. The probability is lower for people with a high school diploma and people whose initial incomes were far above the poverty line.

There are fewer statistically significant coefficients in the exit specification (second column). The coefficients for age, race and ethnicity, which were significant in the entry model, are all insignificant in the exit model. However, the coefficient for the number of children, which was small and insignificant in the entry model, is significantly negative for exits, indicating that large households are less likely to leave poverty than small households. Among

the other significant coefficients, the signs are all consistent with the implied associations with poverty in the entry model. The high rates of poverty for women, people living in female-headed households, people who did not complete high school, and the disabled reflect high rates of both entry and exit.

To a rough approximation, the coefficient estimates from the poverty entry and exit models seem to have the same implications for the overall incidence of poverty. That is, variables that are associated with high probabilities of entry are also associated with low probabilities of exit and vice versa. This suggests that there might be a single process describing poverty outcomes that is independent of previous poverty status—i.e., that there might not be state dependence once observable characteristics are taken into account. We tested for this formally and found that a single specification did not fit the data as well as separate entry and exit specifications.[7] Thus, although the entry and exit coefficients are broadly similar, the statistical evidence is consistent with poverty outcomes exhibiting state dependence.

Note that while the results are consistent with the existence of state dependence, there may be other explanations. For instance, if there are person- or household-specific variables that affect the probability of being in poverty in each period but are not captured in the statistical model, the estimation results would indicate that present and past poverty status are related. In this case, the observed relationship would arise through the mutual correlation with the omitted variables rather than through a direct correlation. In general, it is difficult to distinguish between the effects of unobserved heterogeneity and genuine state dependence.

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[7]The test is a variant of the well-known Chow test of structural shift. Specifically, a likelihood ratio test was performed which compared the sum of the log likelihoods from the separate entry and exit models with the log likelihood from a single, restricted specification for the overall incidence of poverty.

The next two columns of Table 3 report results from logit models of transitions into and out of food insufficiency, rather than poverty. The food insufficiency specifications include the same explanatory variables as the poverty models; so, the results for each outcome can be readily compared. Many of the results are similar to those from the first two columns. People of African origin are more likely to transition into food insufficiency, as are people who are disabled and those in female-headed households. Education and the initial income-to-needs ratio are negatively associated with entry into food insufficiency. The most notable difference between the results for the food insufficiency and poverty entry models is that age profile for food insufficiency has an inverted U shape (increases then decreases with age). When we look at the results for the food insufficiency exit models, we see that only a few of the estimates are significant but that all of the significant coefficients have the same signs as the poverty exit models—education and the initial income-to-needs ratio are positively associated with exits while female headship and the number of children are negatively associated. As with the poverty results, a formal comparison of the separate entry and exit specifications indicates that the estimates are consistent with food insufficiency exhibiting state dependence.

The last two columns in Table 3 list results from food insufficiency transition models that were respecified to include the income-to-needs ratio in 1997 as an explanatory variable. From the theoretical model, we expect that food insufficiency and income will be negatively related. Indeed, for the entry model, the coefficient for income-to-needs is significantly negative; however, for the exit model, the coefficient is small and insignificant.

The respecifications are also useful for addressing another question—namely, once the income-to-needs ratio is taken into account, do any of the other variables matter? The answer is clearly "yes." Most of the coefficients that are statistically significant in the initial food

insufficiency models remain significant after the income-to-needs ratio is added. This indicates that while the dynamics of poverty and food insufficiency are related, they are each determined by distinct processes.

Table 4 lists results from poverty and food insufficiency transition models that add several variables from (a) the start of the transition period that are especially relevant for food problems and (b) the end of the transition period that may be endogenous. Among the first set of variables are controls for food stamp receipt, home ownership, and low levels of interest, dividend or rental income in 1994-5. Food stamps do not enter into the calculation of the standard poverty measure; however, they do affect a household's ability to purchase food. Home ownership should not have a direct effect on the income-based poverty measure but should be related to the household's net financial position and ability to smooth consumption. The indicator for asset income is a little different from the other two measures because asset income does directly affect poverty. However, if the returns from assets provide only a small portion of the typical household's income, the measured effect on poverty may be negligible, while they may still indicate an ability to smooth consumption.[8]

Among the second set of variables are controls for female headship, the number of children, disability status, changes in household composition, employment, and food stamp receipt by the end of the transition period in 1997. The headship, number of children, and household composition variables capture demographic changes that may affect needs, while the employment and food stamp variables are economic measures that capture changes in resources.

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[8]Consider a family with exactly $500 in asset income, the threshold for the asset indicator variable. This small amount of income might not have much of an effect on poverty status. However, the assets which generate this income would be available to help smooth consumption. If the rate of return were 5 percent, the corresponding value of the assets would be $10,000.

Because of the large number of potentially endogenous variables, the study does not attempt to correct for the possible biases. The coefficients, therefore, need to be interpreted as partial (conditional) associations rather than partial effects.

In the poverty entry model in Table 4, the coefficients for gender and age lose their significance, and the coefficients on female headship and work hours in 1995 switch signs and become significantly negative. The coefficients on African origin, Hispanic origin, high school completion, disability status, and the income-to-needs ratio in 1995 keep their signs and significance from Table 3. Among the added variables from the start of the transition period, the coefficients on the home ownership and low asset income measures are insignificant and close to zero, while the coefficient on food stamp receipt in 1995 is significantly positive. The positive coefficient on food stamp use in 1995 may reflect households that are especially close to the poverty threshold; it could also reflect households that had high levels of income early in 1994-5 but were just entering a period of poverty at the end of 1995.

Except for disability status in 1997, all of the added variables from the end of the transition period are significant in the poverty entry equation. Female headship and the number of children have the anticipated positive coefficients; the indicator for other changes in household composition also has a positive coefficient. The coefficient on labor supply in 1997 is negative while the coefficient on food stamp use is positive.

In the poverty exit model, only three of the variables which had been significant in Table 3—disability status, initial work hours, and the initial income-to-needs ratio—keep their signs and significance. Of the added variables, household changes and food stamp receipt at the end of the transition period have significant negative coefficients, while annual work hours in 1997 has a significant positive coefficient. Each of the significant coefficients is opposite in sign

to its counterpart in the entry equation indicating that these variables contribute to poverty in similar ways through entries and exits.

In the food insufficiency entry model, the addition of the new variables also leads to some changes in the coefficients from Table 3. The coefficients on African origin and female headship in 1995 lose their significance while the coefficient on gender becomes significantly negative. Among the added variables, low levels of asset income are significantly positively associated with transitions into food insufficiency, which is consistent with the theoretical model. The coefficient for the other net worth variable, home ownership, is insignificant. As in the poverty model, female headship and changes in household composition in 1997 have significant positive associations with food insufficiency. The coefficients on food stamp use in 1994-5 and 1997 are not significant.

There are few significant coefficients in the food insufficiency exit model. High school completion has a significant positive coefficient and food stamp receipt at the start of the transition period and female headship at the end of the period have significant negative coefficients. All of the other coefficients are insignificant. Indeed, a likelihood ratio test indicates that the added variables are not jointly significant.

The final two columns list results from food insufficiency models that also include the income-to-needs ratio at the end of the transition period as an explanatory variable. As with the results from Table 3, the coefficient on the income-to-needs ratio is negative in the entry model but falls just short of being statistically significant. The coefficient is small and insignificant in the exit model. The inclusion of this variable leads to relatively minor changes in the other coefficients. The results are consistent with poverty and food sufficiency being different processes.

Additional sensitivity analyses. As discussed in the previous section, the food insecurity scale may be a better indicator of food problems than the food insufficiency measure. Unfortunately, the questions necessary to construct the food insecurity scale were not asked in the SIPP. The questions were asked in the SPD, and the study uses these data in some sensitivity analyses. In particular, the study respecifies its conditional food insufficiency models using the food insecurity indicator (first and second columns of Table 5) and food insecurity numerical scale (third and fourth columns of Table 5) as the dependent variables. The binary food insecurity indicators are modeled using logit specifications, while the food insecurity scale variables are estimated using tobit specifications. A tobit model is necessary because households that are "food secure" are not assigned a value on the food insecurity scale. The models are estimated using essentially the same sub-samples as the food insufficiency entry and exit models—i.e., the models are estimated conditional on living in a food sufficient or food insufficient household in 1995.[9] Because of differences in the definitions of the initial and terminal conditions, the specifications are not transition models as such. Nevertheless, they help to show whether the use of the food insecurity measures leads to dramatic changes in the results.

There are some differences in the results between the food insufficiency and food insecurity models. Most of the differences, however, are changes in significance rather than changes in estimated directions of associations. There are no instances of significant sign reversals. Robust results for the models estimated on the subset of people who were initially food sufficient (the entry subsample) include the negative coefficients for age squared, the indicator for women, and the income-to-needs ratio in 1997 and the positive coefficient for

[9]The samples used in the models for Table 5 are slightly smaller because of a small amount of item non-response in the food insecurity measure.

disability status. None of the significant results from the food insufficiency exit models was consistently replicated in the food insecurity models. On the whole, it appears that some of the study's findings are sensitive to the way that food problems are measured.

Table 6 lists results from logistic food insufficiency entry and exit models estimated using different subsets of the analysis data. The first two columns list results from models estimated using a sample of working age adults (age 60 or younger in 1995); this subsample drops elderly people who rely more on asset and retirement income, have smaller households, have more health problems than younger adults. The second two columns list results from models estimated on a sample of people living in households with children in both 1995 and 1997. Households with children are more likely to be poor and experience food problems than other households. Female headship is also likely to have different implications in households with children. The final two columns list results from models estimated on a sample of people living in food stamp eligible households in either 1995 or 1997. Eligibility was crudely imputed—a household is treated as "eligible" if it actually received food stamps or if its annual income was less than 1.3 times the poverty standard and it had low levels of asset income.[10] Thus, it might be more appropriate to view these households just as a low-income sample.

As with the other sensitivity analyses, there are some differences in the results across the three subsamples. However, on the whole, the differences are minor. There are no significant sign reversals; most of the differences reflect changes in significance. Among the robust results, female headship at the end of the transition period and changes in household composition have consistent positive associations with entry into food insufficiency while the income-to-needs

[10]This is a very crude imputation procedure that uses monthly rather than annual criteria and mostly ignores the relevant asset and disability tests.

ratio at the end of the transition period generally has a negative association. High school completion has a consistent positive association and female headship at the end of the transition period, a consistent negative association with exits from food insufficiency.

VI. Conclusions

This study uses data from the 1993 panel of the SIPP and the 1998 SPD to examine the incidence of household food insufficiency and family poverty and transitions between these outcomes. The study provides descriptive statistics and cross-tabulations of these outcomes. It also estimates multivariate logit models of the transitions between different food insufficiency and poverty states.

The empirical analyses reveal that the incidence of food problems in the United States is low. In 1997, less than three percent of people were estimated to live in households that were food insufficient and less than four percent were in households that were food insecure with hunger. There also appears to be very little persistence in food problems. Four-fifths of the people who were in households that were food insufficient in 1994-5 were in food sufficient households two years later. However, while the incidence and persistence of food problems are low, there is still strong evidence of state dependence. People who were in food insufficient households in 1994-5 were ten times more likely than people in food sufficient households to be in food insufficient households in 1997.

The study's theoretical analysis demonstrates how income poverty and food insufficiency are related yet distinct processes. Poverty and food insufficiency are both indicators of economic hardship. However, if a household is able to borrow and save, bouts of poverty need not result in food problems. The empirical analysis confirms that food insufficiency depends on

more than just poverty status, a result that indicates that poverty and food insufficiency capture fundamentally different dimensions of hardship. A low level of asset income (an indicator of the household's ability to smooth consumption) is consistently positively associated with food problems. In some specifications, home ownership is negatively related to food problems.

The multivariate analyses of transitions in food insufficiency generate other consistent findings. Female-headed households are significantly more likely to transition into food insufficiency and significantly less likely to exit from food insufficiency than other households. Disability status at the start of the transition period and other changes in household composition also appear to be associated with entry into food insufficiency. High school completion is consistently found to increase the chances of leaving food insufficiency.

The study examines the relationship between food stamp use and food problems. It finds that food stamp use in 1994-5 was significantly positively associated with food problems in 1997 (led to lower rates of exit) but that food stamp use in 1997 was generally not significantly associated with concurrent food problems. As Gundersen and Oliveira (2001) have shown, endogeneity may be affecting the results. In particular, the food stamp variable may be picking up unmeasured aspects of the household's resources or possibly with differential concerns regarding food consumption. Either of these effects could bias the associations downward. In any event, the study provides no evidence that food stamps alleviate food problems.

The study's research results are relevant to several other aspects of food assistance policy. The finding that the incidence of food insufficiency is low and transient supports the general design of the Food Stamp Program as a safety net for low income people, and in particular, for those who experience unexpected income difficulties. However, our finding that food problems might exhibit state dependence suggests that more targeted efforts would be

beneficial for some households. Second, like the analysis by Winship and Jencks (2002), the finding that food insufficiency trends have followed trends in poverty suggests that welfare reform has not led to increases in food problems. Third, the findings that assets and home ownership are important reinforce Gundersen's and Gruber's (2001) findings that improved access to credit for low-income persons might help households maintain food sufficiency. At the same time, these results indicate why asset tests continue to be used to determine food stamp eligibility—households with assets are less likely to experience food insufficiency. Finally, our finding that food insufficiency is related to, yet distinct from, poverty supports ongoing efforts by USDA to collect and analyze data on food problems.

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Table 1. Food sufficiency, food insecurity, and income-to-needs in 1994-5 and 1997

	1994-5	1997
Food sufficiency		
People in households with enough food and the kinds wanted	82.1	83.2
People in households with enough food but not the kinds wanted	13.6	14.1
People in households that sometimes do not have enough food	3.8	2.3
People in households that often do not have enough food	0.5	0.4
Food security		
People in households that are food secure	–	89.1
People in households that are food insecure without hunger	–	7.2
People in households that are food insecure with hunger	–	3.8
Family income-to-needs ratio		
People in families with an income-to-needs ratio under .5	3.4	4.3
People in families with an income-to-needs ratio between .5 and 1.0	8.6	7.3
People in families with an income-to-needs ratio between 1.0 and 2.0	19.5	17.4
People in families with an income-to-needs ratio 2.0 or greater	68.5	70.9
Food insufficiency and poverty		
Food insufficiency among people who were in poverty	16.2	11.0
Poverty among people in food insufficient households	45.8	47.1

Note: Figures calculated using weighted data from the 1993 SIPP and 1998 SPD.

Table 2. Poverty and food insufficiency rates and dynamics for different demographic groups

	Family in poverty						Household with insufficient food					
	1994-5	1997	both years	either year	entry rate	exit rate	1994-5	1997	both years	either year	entry rate	exit rate
All people	12.1	11.6	7.1	16.6	5.1	41.3	4.3	2.7	0.9	6.1	1.9	79.1
Male	10.0	9.4	5.5	14.0	4.3	45.0	3.8	2.4	0.7	5.6	1.8	81.6
Female	14.0	13.8	8.7	19.1	5.9	37.9	4.7	3.0	1.1	6.6	2.0	76.6
Age in 1995 <17	19.8	17.3	12.3	24.8	6.2	37.9	6.4	4.1	1.5	9.0	2.8	76.6
Age in 1995 17-60	9.5	9.2	5.2	13.5	4.4	45.3	4.1	2.5	0.8	5.8	1.8	80.5
Age in 1995 >60	9.4	11.5	6.1	14.9	6.0	35.1	1.8	1.3	0.4	2.8	0.9	77.8
White	9.2	9.2	5.1	13.3	4.5	44.6	3.7	2.2	0.7	5.1	1.6	81.1
Black	31.0	27.3	20.4	37.9	10.0	34.2	8.2	6.5	2.1	12.6	4.8	74.4
Hispanic	29.3	25.4	18.5	36.3	9.8	36.9	12.2	7.7	2.9	17.0	5.5	76.2
Did not finish HS	20.9	19.3	13.3	26.9	7.6	36.4	6.5	4.6	1.7	9.4	3.1	73.8
Completed HS	7.8	7.8	3.9	11.8	4.2	50.0	3.5	1.9	0.4	4.9	1.6	88.6
Completed college	2.1	3.3	0.8	4.5	2.6	61.9	0.9	0.5	0.2	1.2	0.3	77.8
Married-couple HH with children	7.5	6.0	3.4	10.2	2.8	54.7	3.3	1.6	0.4	4.4	1.2	87.9
Female-headed HH with children	45.7	41.8	33.3	54.3	15.7	27.1	13.6	12.7	4.3	22.0	9.7	68.4
ABAWD	4.2	4.4	1.2	7.4	3.3	71.4	3.1	1.5	0.3	4.2	1.2	90.3
Non-citizen	32.5	27.2	20.8	38.8	9.5	36.0	11.8	6.6	2.8	15.5	4.3	76.3

Note: Figures calculated using weighted data from the 1993 SIPP and 1998 SPD.

Table 3. Results for Poverty and Food Insufficiency Transition Models

	Poverty		Food Insufficiency		Food Insufficiency	
Variable	Entry	Exit	Entry	Exit	Entry	Exit
Age	-0.047**	-0.0005	0.030	-0.069	0.037	-0.069
	(0.023)	(0.026)	(0.035)	(0.051)	(0.035)	(0.051)
Age^2 (/ 100)	0.039*	-0.013	-0.061	0.068	-0.069*	0.067
	(0.023)	(0.026)	(0.037)	(0.052)	(0.037)	(0.052)
Female	0.337***	-0.305*	-0.264	0.267	-0.299	0.265
	(0.126)	(0.162)	(0.231)	(0.278)	(0.229)	(0.279)
African origin	0.542***	-0.120	0.454*	-0.477	0.472*	-0.483
	(0.178)	(0.242)	(0.257)	(0.399)	(0.251)	(0.398)
Hispanic origin	0.367*	-0.176	0.423	0.368	0.362	0.330
	(0.221)	(0.228)	(0.280)	(0.458)	(0.284)	(0.439)
U.S. citizen	-0.286	0.045	-0.449	0.075	-0.433	0.034
	(0.306)	(0.302)	(0.483)	(0.508)	(0.478)	(0.497)
Completed high school	-0.410***	0.436**	-0.461*	1.014***	-0.401*	1.013***
	(0.143)	(0.171)	(0.244)	(0.343)	(0.239)	(0.341)
Completed college	-0.218	0.112	-0.994*	0.040	-0.759	0.022
	(0.268)	(0.395)	(0.527)	(0.821)	(0.524)	(0.825)
Female headed household	0.311*	-0.450*	0.762***	-0.777**	0.650**	-0.759**
	(0.171)	(0.232)	(0.273)	(0.389)	(0.287)	(0.386)
Number of children under 18	-0.005	-0.224***	-0.065	-0.203*	-0.102	-0.206*
	(0.072)	(0.074)	(0.115)	(0.119)	(0.118)	(0.119)
Disabled	0.684***	-0.740***	0.691**	0.272	0.587**	0.262
	(0.146)	(0.163)	(0.291)	(0.309)	(0.287)	(0.308)
Annual hours of work 1995 (/ 1000)	-0.122	0.230*	0.103	0.073	0.116	0.080
	(0.092)	(0.122)	(0.133)	(0.173)	(0.134)	(0.174)
Income-to-needs 1995	-0.471***	1.277***	-0.597***	0.473**	-0.321*	0.545*
	(0.104)	(0.405)	(0.145)	(0.193)	(0.169)	(0.283)
Income-to-needs 1997	-	-	-	-	-0.415*	-0.076
					(0.219)	(0.159)
Constant	-0.254	-0.106	-2.303**	2.078	-1.989**	2.185*
	(0.653)	(0.813)	(0.942)	(1.385)	(0.989)	(1.319)
Log likelihood	-1379.28	-712.67	-637.82	-186.72	-623.65	-186.47
Observations	8358	1156	9098	416	9098	416

Note: Logistic transition models estimated using weighted data from the 1993 SIPP and 1998 SPD. Estimated standard errors in parentheses account for repeated observations in households.
* Significant at .10 level. ** Significant at .05 level. *** Significant at .01 level.

Table 4. Results for Poverty and Food Insufficiency Transition Models with Additional Controls

	Poverty		Food Insufficiency		Food Insufficiency	
Variable	Entry	Exit	Entry	Exit	Entry	Exit
Age	-0.032	-0.002	0.043	-0.066	0.049	-0.070
	(0.025)	(0.028)	(0.035)	(0.052)	(0.035)	(0.052)
Age^2 (/ 100)	0.024	-0.011	-0.064*	0.060	-0.070*	0.063
	(0.025)	(0.028)	(0.037)	(0.053)	(0.037)	(0.054)
Female	0.021	0.022	-0.501**	0.366	-0.510**	0.401
	(0.130)	(0.171)	(0.256)	(0.291)	(0.257)	(0.287)
African origin	0.444**	-0.122	0.262	-0.385	0.300	-0.390
	(0.194)	(0.224)	(0.255)	(0.406)	(0.255)	(0.405)
Hispanic origin	0.426*	-0.235	0.335	0.306	0.285	0.261
	(0.232)	(0.243)	(0.281)	(0.444)	(0.282)	(0.427)
U.S. citizen	-0.341	0.086	-0.478	0.095	-0.474	0.042
	(0.333)	(0.338)	(0.488)	(0.532)	(0.484)	(0.523)
Completed high school	-0.297**	0.264	-0.352	0.936***	-0.321	0.941***
	(0.145)	(0.174)	(0.254)	(0.351)	(0.244)	(0.348)
Completed college	0.010	-0.202	-0.787	-0.384	-0.614	-0.407
	(0.277)	(0.397)	(0.515)	(0.947)	(0.508)	(0.981)
Female headed HH 1995	-0.754***	-0.368	0.266	0.063	0.283	0.137
	(0.257)	(0.477)	(0.379)	(0.631)	(0.366)	(0.568)
Number of children under 18 1995	-0.128	-0.078	0.025	-0.256	0.034	-0.245
	(0.112)	(0.108)	(0.182)	(0.191)	(0.178)	(0.194)
Disabled 1995	0.462***	-0.392**	0.464	0.199	0.422	0.202
	(0.153)	(0.169)	(0.286)	(0.334)	(0.279)	(0.336)
Low asset income 1995	-0.097	0.056	1.829***	-0.976	1.799***	-1.112
	(0.174)	(0.387)	(0.581)	(1.181)	(0.582)	(1.250)
Own home 1995	-0.001	-0.034	-0.178	0.558	-0.181	0.536
	(0.160)	(0.193)	(0.287)	(0.370)	(0.277)	(0.369)
Annual hours of work 1995 (/ 1000)	0.502***	-0.317**	0.289*	-0.091	0.224	-0.110
	(0.113)	(0.147)	(0.173)	(0.200)	(0.165)	(0.200)
Received food stamps 1995	0.488**	-0.058	0.567	-0.805*	0.527	-0.804*
	(0.226)	(0.216)	(0.349)	(0.416)	(0.345)	(0.415)
Income-to-needs 1995	-0.432***	1.592***	-0.405***	0.199	-0.203	0.294
	(0.107)	(0.438)	(0.133)	(0.192)	(0.155)	(0.255)
Female headed HH 1997	1.447***	-0.169	0.645**	-1.002*	0.514*	-1.099**
	(0.231)	(0.470)	(0.321)	(0.601)	(0.306)	(0.535)
Number of children under 18 1997	0.202*	-0.129	-0.139	0.107	-0.184	0.078
	(0.104)	(0.114)	(0.165)	(0.217)	(0.158)	(0.215)

Disabled 1997	-0.183	-0.149	-0.111	0.026	-0.109	0.036
	(0.219)	(0.284)	(0.351)	(0.674)	(0.346)	(0.668)
Changed HH 1997	0.456***	-0.429*	0.808***	-0.187	0.756***	-0.153
	(0.162)	(0.233)	(0.260)	(0.338)	(0.267)	(0.344)
Annual hours of work	-0.917***	0.782***	-0.328	0.074	-0.214	0.118
1997 (/ 1000)	(0.119)	(0.136)	(0.202)	(0.204)	(0.199)	(0.207)
Received food stamps	0.991***	-0.925***	0.130	0.222	0.049	0.198
1997	(0.249)	(0.209)	(0.367)	(0.419)	(0.357)	(0.423)
Income-to-needs 1997	-	-	-	-	-0.333	-0.110
					(0.214)	(0.148)
Constant	-0.622	-0.418	-4.801***	3.714*	-4.494***	4.081**
	(0.746)	(0.979)	(1.182)	(1.772)	(1.232)	(1.794)
Log likelihood	-1261.75	-648.32	-605.55	-178.97	-596.75	-178.54
Observations	8358	1156	9098	416	9098	416

Note: Logistic transition models estimated using weighted data from the 1993 SIPP and 1998 SPD. Estimated standard errors in parentheses account for repeated observations in households.
* Significant at .10 level. ** Significant at .05 level. *** Significant at .01 level.

Table 5. Results for Conditional Food Insecurity Models

Variable	Food Insecurity – Logit		Food Insecurity Scale – Tobit	
	Food sufficient in 1995	Food insufficient in 1995	Food sufficient in 1995	Food insufficient in 1995
Age	0.020	0.054	0.068	0.187*
	(0.020)	(0.049)	(0.045)	(0.107)
Age^2 (/ 100)	-0.046**	-0.044	-0.152***	-0.163
	(0.019)	(0.050)	(0.044)	(0.109)
Female	-0.364***	-0.121	-0.872***	0.319
	(0.116)	(0.222)	(0.280)	(0.501)
African origin	0.464***	-0.198	1.110**	-0.011
	(0.163)	(0.353)	(0.441)	(0.782)
Hispanic origin	0.131	-0.156	0.642	-0.204
	(0.177)	(0.406)	(0.445)	(0.714)
U.S. citizen	-0.305	-0.579	-0.658	-1.175
	(0.237)	(0.600)	(0.654)	(0.973)
Completed high school	-0.200	-0.196	-1.156***	0.165
	(0.128)	(0.299)	(0.311)	(0.612)
Completed college	-0.303	0.580	-1.361**	1.849
	(0.230)	(0.687)	(0.544)	(1.560)
Female headed HH 1995	0.494**	-0.331	1.196**	-0.923
	(0.231)	(0.661)	(0.598)	(1.329)
Number of children under 18 1995	0.118	0.021	0.252	0.282
	(0.081)	(0.163)	(0.190)	(0.316)
Disabled 1995	0.509***	-0.273	1.636***	-0.288
	(0.131)	(0.276)	(0.331)	(0.602)
Low asset income 1995	1.042***	0.300	2.634***	0.132
	(0.259)	(0.822)	(0.460)	(2.301)
Own home 1995	-0.099	-0.251	-0.298	-0.761
	(0.142)	(0.320)	(0.345)	(0.627)
Annual hours of work 1995 (/ 1000)	0.109	0.349*	0.054	0.375
	(0.080)	(0.190)	(0.200)	(0.390)
Received food stamps 1995	0.403**	-0.163	1.514***	0.237
	(0.192)	(0.401)	(0.461)	(0.709)
Income-to-needs 1995	-0.222***	-0.452**	-0.319*	-0.869*
	(0.069)	(0.216)	(0.167)	(0.516)
Female headed HH 1997	0.123	0.535	0.191	0.674
	(0.224)	(0.648)	(0.548)	(1.296)
Number of children under 18 1997	-0.078	0.070	-0.267	-0.158
	(0.079)	(0.181)	(0.194)	(0.377)

Disabled 1997	0.040	0.190	0.400	0.416
	(0.227)	(0.529)	(0.585)	(0.924)
Changed HH 1997	0.139	0.275	0.594	0.298
	(0.151)	(0.315)	(0.375)	(0.616)
Annual hours of work	-0.127	-0.224	-0.309	-0.333
1997 (/1000)	(0.083)	(0.178)	(0.198)	(0.372)
Received food stamps	0.549***	0.288	1.847***	1.086
1997	(0.196)	(0.413)	(0.481)	(0.787)
Income-to-needs 1997	-0.363***	-0.305*	-1.169***	-0.844**
	(0.076)	(0.183)	(0.165)	(0.408)
Constant	-1.579***	0.286	-2.400	1.560
	(0.645)	(1.551)	(1.469)	(3.637)
Log likelihood	-1733.25	-243.94	-5398.79	-900.30
Observations	9092	416	9092	416

Note: Conditional logit and tobit models estimated using weighted data from the 1993 SIPP and 1998 SPD. Estimated standard errors in parentheses account for repeated observations in households.

* Significant at .10 level. ** Significant at .05 level. *** Significant at .01 level.

Table 6. Results for Food Insufficiency Transition Models for Selected Groups

	Working-age adults		HH with children		Food stamp eligible	
Variable	Entry	Exit	Entry	Exit	Entry	Exit
Age	0.199**	-0.139	-0.014	0.066	0.066*	-0.038
	(0.088)	(0.111)	(0.056)	(0.116)	(0.037)	(0.058)
Age^2 (/ 100)	-0.271**	0.159	0.030	-0.073	-0.095**	0.038
	(0.111)	(0.141)	(0.063)	(0.145)	(0.040)	(0.061)
Female	-0.430	0.228	-0.462	0.469	-0.380	0.798**
	(0.278)	(0.331)	(0.318)	(0.357)	(0.330)	(0.333)
African origin	0.262	-0.394	0.017	-1.415**	0.386	-0.478
	(0.289)	(0.439)	(0.283)	(0.634)	(0.263)	(0.428)
Hispanic origin	0.361	0.300	0.316	-0.195	0.372	0.015
	(0.308)	(0.447)	(0.373)	(0.570)	(0.309)	(0.482)
U.S. citizen	-0.300	0.023	0.045	0.277	-0.433	0.022
	(0.554)	(0.593)	(0.461)	(0.704)	(0.424)	(0.555)
Completed high school	-0.341	0.934**	0.184	0.834*	-0.118	1.104***
	(0.270)	(0.376)	(0.277)	(0.499)	(0.224)	(0.371)
Completed college	-0.579	-0.416	0.182	-1.391	-0.019	0.092
	(0.532)	(1.045)	(0.518)	(1.828)	(0.529)	(0.961)
Female headed HH 1995	0.311	0.167	0.131	0.064	-0.123	-0.037
	(0.378)	(0.584)	(0.414)	(0.692)	(0.322)	(0.525)
Number of children under 18 1995	-0.127	-0.287	0.087	-0.235	0.008	-0.245
	(0.155)	(0.204)	(0.256)	(0.285)	(0.187)	(0.218)
Disabled 1995	0.437	0.289	0.511*	-0.354	0.309	0.199
	(0.321)	(0.403)	(0.281)	(0.534)	(0.298)	(0.359)
Low asset income 1995	2.353***	-0.602	0.604	-0.205	-	-
	(0.744)	(1.414)	(0.710)	(1.153)		
Own home 1995	-0.074	0.678	-0.080	0.255	-0.315	0.665
	(0.304)	(0.420)	(0.361)	(0.517)	(0.292)	(0.409)
Annual hours of work 1995 (/ 1000)	0.245	-0.103	-0.107	0.036	0.275	-0.071
	(0.175)	(0.231)	(0.197)	(0.280)	(0.168)	(0.224)
Received food stamps 1995	0.727**	-0.621	0.625	-0.133	0.368	-0.544
	(0.368)	(0.452)	(0.437)	(0.734)	(0.313)	(0.446)
Income-to-needs 1995	-0.241	0.288	-0.028	0.049	0.009	-0.117
	(0.170)	(0.252)	(0.182)	(0.311)	(0.128)	(0.287)
Female headed HH 1997	0.529*	-1.158**	1.014***	-1.541**	0.691**	-1.407***
	(0.293)	(0.541)	(0.360)	(0.667)	(0.320)	(0.537)
Number of children under 18 1997	-0.142	0.113	-0.185	-0.217	-0.130	0.029
	(0.144)	(0.224)	(0.222)	(0.369)	(0.167)	(0.249)

Disabled 1997	-0.368	-0.219	0.147	1.924**	0.072	0.115
	(0.391)	(0.712)	(0.485)	(0.861)	(0.388)	(0.757)
Changed HH 1997	0.777***	-0.197	0.637*	-0.153	0.646**	-0.201
	(0.286)	(0.381)	(0.367)	(0.590)	(0.284)	(0.390)
Annual hours of work	-0.228	0.122	-0.001	0.160	-0.351**	0.312
1997 (/ 1000)	(0.216)	(0.225)	(0.192)	(0.282)	(0.172)	(0.221)
Received food stamps	-0.044	0.057	-0.427	-0.661	0.003	0.221
1997	(0.348)	(0.454)	(0.460)	(0.668)	(0.325)	(0.432)
Income-to-needs 1997	-0.291	-0.110	-0.772***	-0.388	-0.234*	-0.313**
	(0.217)	(0.146)	(0.201)	(0.238)	(0.131)	(0.138)
Constant	-7.813***	4.786**	-2.975*	2.053	-3.116***	2.401
	(2.152)	(2.434)	(1.696)	(2.839)	(1.180)	(1.554)
Log likelihood	-506.13	-149.91	-341.48	-96.11	-490.30	-148.64
Observations	7000	358	4507	226	2290	293

Note: Logistic transition models estimated using weighted data from the 1993 SIPP and 1998 SPD. Estimated standard errors in parentheses account for repeated observations in households.
* Significant at .10 level. ** Significant at .05 level. *** Significant at .01 level.

Appendix A. Descriptive Statistics for Subsamples used in Multivariate Analyses.

	Not poor in 1994-5		Poor in 1994-5		Food sufficient in 1994-5		Food insufficient in 1994-5	
Variable	Mean	(S. D.)	Mean	(S. D.)	Mean	(S. D.)	Mean	(S. D.)
Age	47.51	(17.20)	46.80	(18.66)	47.66	(17.40)	41.50	(14.57)
Female	0.50	(0.50)	0.66	(0.47)	0.51	(0.50)	0.58	(0.49)
African origin	0.09	(0.29)	0.29	(0.45)	0.11	(0.31)	0.24	(0.43)
Hispanic origin	0.08	(0.27)	0.22	(0.41)	0.08	(0.28)	0.25	(0.43)
U.S. citizen	0.97	(0.18)	0.88	(0.33)	0.96	(0.19)	0.87	(0.34)
Completed high school	0.58	(0.49)	0.45	(0.50)	0.57	(0.50)	0.54	(0.50)
Completed college	0.24	(0.43)	0.04	(0.20)	0.23	(0.42)	0.05	(0.21)
Female headed HH 1995	0.19	(0.39)	0.49	(0.50)	0.21	(0.41)	0.39	(0.49)
Number of children under 18 1995	0.73	(1.10)	1.39	(1.65)	0.77	(1.16)	1.43	(1.58)
Disabled 1995	0.17	(0.38)	0.45	(0.50)	0.19	(0.39)	0.40	(0.49)
Low asset income 1995	0.64	(0.48)	0.95	(0.23)	0.65	(0.48)	0.95	(0.22)
Own home 1995	0.79	(0.40)	0.40	(0.49)	0.77	(0.42)	0.46	(0.50)
Annual hours of work 1995 (/ 1000)	1.45	(1.08)	0.40	(0.75)	1.37	(1.10)	0.92	(0.97)
Received food stamps 1995	0.04	(0.19)	0.58	(0.49)	0.08	(0.27)	0.47	(0.50)
Income-to-needs 1995	3.91	(2.47)	0.66	(0.25)	3.69	(2.54)	1.55	(1.29)
Female headed HH 1997	0.19	(0.39)	0.50	(0.50)	0.21	(0.41)	0.38	(0.49)
Number of children under 18 1997	0.70	(1.08)	1.27	(1.61)	0.74	(1.13)	1.21	(1.40)
Disabled 1997	0.08	(0.27)	0.10	(0.30)	0.08	(0.28)	0.07	(0.26)
Changed HH 1997	0.19	(0.39)	0.25	(0.43)	0.19	(0.39)	0.31	(0.46)
Annual hours of work 1997 (/1000)	1.40	(1.10)	0.63	(0.97)	1.34	(1.11)	1.10	(1.08)
Received food stamps 1997	0.02	(0.15)	0.40	(0.49)	0.05	(0.22)	0.29	(0.45)
Income-to-needs 1997	4.25	(2.83)	1.27	(1.34)	4.05	(2.86)	1.99	(1.91)
Observations	8358		1156		9098		416	

Note: Statistics estimated using weighted data from the 1993 SIPP and 1998 SPD.