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. In particular, it shows that a household's food consumption is not only related to its current income but also to its past and future income, its ability to borrow and save, and its needs and preferences. For instance, a household experiencing a temporary spell of poverty may be able to smooth food consumption over time and maintain food sufficiency, if it is not liquidity constrained. Thus, we might observe households that are poor but food sufficient. Alternatively, a household with exceptionally high food needs might report being food insufficient, even if its income is above the poverty threshold.

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 4 months over nine waves from Winter 1993 until Fall 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 the changes in income, labor supply, household composition, and program participation that are necessary for evaluating the impacts of PRWORA. 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. (See appendix A for more information on the SIPP and SPD.)

The linked data from the SIPP and SPD are useful because they permit us to examine food sufficiency and poverty for individuals at two different points in time. For poverty status, longitudinal data are available from several other surveys; for overall food consumption, they are available from the Panel Study of Income Dynamics (PSID). Although the PSID included food sufficiency questions in the 1999 and 2001 waves, the data have just recently become available. 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 be balanced against several difficulties, however. The main difficulty in working with these data 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 difficulty is that the data from the SPD 1998 Experimental File are unedited. The two SIPP Files and the Longitudinal SPD File were edited by the Census Bureau 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 surveys, the SIPP and the SPD suffer from sample attrition. However, the attrition problems in the SPD are especially severe because the survey did not immediately reinterview respondents from the SIPP (the first SPD "bridge" interview took place in March 1997); this large time gap meant that some participants could not be located. Also, the SIPP purposely dropped a large number of respondents in 1998 for budgetary reasons. The SPD does, however, include 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 nonresponse and linking problems in the experimental SPD file. Because of these various problems, estimates in the study may not be nationally representative. Also, there is no easy way to aggregate the study's statistical results up to population levels (for example, to estimate the number of people in the United States experiencing poverty or food insufficiency).[4]

[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.

[4] For estimates of the levels of food security of different demographic groups, see Nord et al. (2002).

Despite these drawbacks, the study's linked SIPP and SPD dataset remains a unique analytical resource. Subsequent analyses to be discussed indicate that descriptive statistics from the dataset match up well with published statistics and give us confidence that the study's results are sound.

Measuring Food Sufficiency and Security

The principal outcome variables for the longitudinal analyses are measures of household food sufficiency and family poverty.[5] Questions regarding food sufficiency were asked in Wave 9 of the SIPP (1995-96) 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.
4. Often not enough to eat.

The SIPP and the SPD both framed the questions in terms of the preceding 12 months.[6,7] 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 their food problems. For example, households were asked if the problems stemmed from a lack of money, proper kitchen facilities, or health complications. These questions are potentially useful for distinguishing between households that lack resources for enough food and for other reasons (such as preferences or dieting). However, almost all of the food-insufficient households reported 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 scale developed by USDA (Bickel et al., 2000). The food security scale is derived from a long series of questions (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. (See appendix B for more information on food sufficiency and food security measures.)

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 is the benchmarks that the household head uses in answering the questions.[8] 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 fact that the data are longitudinal allows us to control for persistent, idiosyncratic differences in valuations and helps address this problem (that is, each household would be expected to apply the same standard for food sufficiency in each time period). Another issue is applying this household measure to individual members. The head reports the condition for the household as a whole, not for specific members. But the household may act to shield children and other vulnerable members from food problems (Bickel et al., 2000), which would mean that some individuals in the dataset had adequate food but are reported as being food insufficient. We do not think that these measurement issues, although they are present, significantly bias the results.

[5]Note that poverty measures look at family income, whereas survey questions of food sufficiency ask about the household situation. In the vast majority of cases, the family and the household are the same. Cases where they were not the same include households containing unrelated persons. Here we are precise in our usage of "family" and "household."

[6]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.

[7]One other difference was that a single question with the four categories just listed was asked in the SPD, while two questions were asked in the SIPP. First, the household was asked whether they always had enough to eat, sometimes did not have enough to eat, or often did not have enough to eat. Only if they responded that they always had enough to eat were they asked whether or not they had the kinds of food they wanted to eat. In a split-panel experiment in the CPS, the two-part question resulted in a substantially higher reported prevalence of food insufficiency than the single question (Nord, 1998).

[8]In most, but not all cases, the household head was the same person in the two time periods.

Measuring Poverty

The other principal outcome that the study examines is family poverty. The analysis 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 (that is, 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 period.

The analysis includes an indicator for whether anyone in the household received food stamps in the preceding year. As 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 is taken directly from an annual question describing calendar year 1997. We also experimented with other program participation measures, including an indicator for whether anyone in the household received any type of public assistance payment (Temporary Assistance for Needy Families, Aid to Families with Dependent Children, general assistance, foster child payments, or other welfare). These other measures of assistance generally were not significant predictors of food sufficiency once the income-to-needs ratio, food stamp measure, and other controls were included. We also considered alternative measures of food stamp participation, such as number of months of participation, but found that these measures did not perform as well as the annual indicator for any receipt of food stamps.

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 dataset. Standard demographic characteristics for individuals include 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, and 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). Note that here ABAWDs are all able-bodied adults without dependents, not just those who are food stamp recipients.

Characteristics of Food-Insufficient Households

Descriptive statistics for the analysis dataset are reported in tables 1 and 2 and appendix C.[9] Table 1 lists food sufficiency and income-to-needs outcomes for 1994-95 and 1997 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 1994-95 lived in households in which there was sometimes or often not enough food; by 1997, this figure had fallen by a third to 2.7 percent.[10] The figures similarly indicate that food insecurity and hunger only affect a small percentage of people in the United States—an estimated 9 out of 10 people were in food secure households. Only 3.8 percent of people (about 1 out of 26) were in households classified as food insecure with hunger. These figures can be compared with the standard poverty figures. The 1994-95 data indicate that 12.1 percent of the population was in

[9]Despite the concerns about the representativeness of the linked SIPP and SPD because of sample attrition, item nonresponse, 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 1994-95 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 just below Dalaker's CPS estimate. The poverty rates for different demographic subgroups in 1994-95 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 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 1994-95 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 -0.28 in 1994-95 and -0.29 in 1997.

[10]Part of this apparent decline may be an artifact of measurement differences described in footnote 7.

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.

Poverty and food insufficiency were positively related, as expected (table 1). People who lived in families with incomes below the poverty line were several times more likely to face food insufficiency than those in families with higher incomes. For instance, the food insufficiency rate for people in poor families in 1994-95 was 16.2 percent vs. a general rate of 4.3 percent (3.8 percent in households that sometimes do not have enough food and 0.5 percent in households that often do not have enough food). In both 1994-95 and 1997, roughly half of the people in food-insufficient households were also in poor families.[11]

Table 1—Food sufficiency, food insecurity, and income-to-needs, 1994-95 and 1997

Item	1994-95	1997
	Percent	
Family income-to-needs ratio:		
In poverty, people in families with an income-to-needs ratio—		
Under 0.5	3.4	4.3
Between 0.5 and 1.0	8.6	7.3
Above the poverty threshold, people in families with an income-to-needs ratio—		
Between 1.0 and 2.0	19.5	17.4
2.0 or greater	68.5	70.9
Food sufficiency:		
People in households—		
With enough food and of the kinds wanted	82.1	83.2
With enough food but not the kinds wanted	13.6	14.1
That sometimes do not have enough food	3.8	2.3
That often do not have enough food	0.5	0.4
Food security:		
People in households that are—		
Food secure	—	89.1
Food insecure without hunger	—	7.2
Food insecure with hunger	—	3.8
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

Notes: — = Not available. The family income-to-needs ratio, food sufficiency, and food security statistics are all distributions; sums may not add to 100 due to rounding. The food security series of questions was not asked in the 1994-95 SIPP, so estimates cannot be calculated.

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

Table 2 and figure 1 report static and dynamic measures of poverty and food insufficiency for the entire sample and for demographic subgroups. The dynamic measures include indicators for whether people were in poor families or food-insufficient households in either 1994-95 or 1997 or in both years along with transition rates into and out of each state. The figures in table 2 confirm previous findings that poverty is relatively transient. While 16.6 percent of the population were poor in either 1994-95 or 1997, only 7.1 percent were poor in both years. Of those people who were not poor in 1994-95, 5.1 percent entered poverty by 1997. The corresponding exit rate from poverty was 41.3 percent over this period.[12] Although the figures provide evidence of mobility, they also give evidence of state dependence: A person who was poor in 1994-95 was 10 times more likely to be poor in 1997 than a person who was not poor in the earlier period. (See box, "Persistence and State Dependence," and appendix D, "Persistence and State Dependence Examples.")

Food insufficiency was both rarer and more transient than poverty (table 2). Only 6.1 percent of the population lived in a food-insufficient household in either 1994-95 or 1997, and less than 1 percent lived in such households in both years. Only about 1 person out of 50 who were initially food sufficient lost sufficiency status, while roughly 4 out of 5 people who were initially food insufficient attained sufficiency. At the same time, as with the poverty figures, these rates indicate that there was a great deal of state dependence: A person who was initially in a food-insufficient household was 10 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 poor families and

[11] Almost all of the people who were food insecure but not in poverty were near-poor—two-thirds of those above the poverty threshold had an income-to-needs ratio between 1.0 and 2.0.

[12] Because the exit and entry rates in table 2 are calculated over a period of just over 2 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 2 years. For instance, if we take Naifeh's (1998) 1993-94 entry and exit rates of 3.2 and 23.8 percent and project forward an additional year, we obtain 2-year rates of 5.5 and 41.2 percent, respectively.

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 Blacks and African Americans and Hispanics were roughly three times higher than for Whites. Blacks and Hispanics had very high rates of entry for poverty and food insufficiency and low rates of exit. Noncitizens had poverty and food insufficiency rates that were comparable to those of Blacks and Hispanics.

Poverty and food insufficiency declined with increased education. The rates for people who did not complete high school were 2 to 3 times higher than for people who did and 6 to 10 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 demographic group examined. They also had the highest entry rates for each outcome and the lowest exit rates. Married couple households with children had lower than average rates of poverty and food insufficiency. Rates for ABAWDs were lower still.

Multivariate Analysis

The foregoing analysis provides a useful description of those who have experienced poverty and food insufficiency. However, to better study the factors associated with the dynamics of these conditions, one must

Table 2—Poverty and food insufficiency rates and dynamics for selected demographic groups

	Families in poverty						Households with insufficient food					
Characteristics	1994-95	1997	Both years	Either year	Entry rate	Exit rate	1994-95	1997	Both years	Either year	Entry rate	Exit rate
					Percent							
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:												
0-16 years	19.8	17.3	12.3	24.8	6.2	37.9	6.4	4.1	1.5	9.0	2.8	76.6
17-60 years	9.5	9.2	5.2	13.5	4.4	45.3	4.1	2.5	0.8	5.8	1.8	80.5
61+ years	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 or African American	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
Noncitizen	32.5	27.2	20.8	38.8	9.5	36.0	11.8	6.6	2.8	15.5	4.3	76.3
Education level:												
Less than high school diploma	20.9	19.3	13.3	26.9	7.6	36.4	6.5	4.6	1.7	9.4	3.1	73.8
High school diploma	7.8	7.8	3.9	11.8	4.2	50.0	3.5	1.9	0.4	4.9	1.6	88.6
College degree	2.1	3.3	0.8	4.5	2.6	61.9	0.9	0.5	0.2	1.2	0.3	77.8
Household type:												
Married-couple 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 head 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

Notes: Hispanics may be of any race. ABAWD is all able-bodied adults without dependents (whether or not food stamp recipient).
Source: Figures calculated using weighted data from the 1993 SIPP and 1998 SPD.