

## **Work Trajectories, Income Changes and Food Insufficiency in the Welfare Population.**

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## ABSTRACT

The Welfare Reform Act of 1996 and the accompanying cuts in the Food Stamp Program raised concerns about food insufficiency among single mothers with children, particularly as they transition from welfare-to-work. We examine the change in food insufficiency status over time in a welfare sample drawn in Spring 1997 using both cross-sectional and fixed-effects models that control for individual characteristics that are constant over time. Results of the fixed effect models indicate that marriage (or cohabitation), job losses, and mental health problems each are strongly associated with a change in food insufficiency status.

Despite the strength of the economy in mid to late 1990's, high rates of food insecurity, food insufficiency, and hunger were a significant problem in the United States over those years (Alaimo et al., 1998; Andrews et al., 2000). Roughly 31 million people lived in food insecure households in 1999, meaning that at some time during the previous year, they were unable to acquire or were uncertain of having enough food to meet basic needs due to inadequate household resources (Andrews et al., 2000). Rates of food insecurity were higher in female-headed households and poor households.

The enactment of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) ended the federal guarantee of income support to low-income families with children and replaced the Aid to Families with Dependent Children (AFDC) with the Temporary Aid to Needy Families Program (TANF). The maximum food stamp benefit was reduced, and some TANF recipients who left welfare have stopped receiving Food Stamp benefits altogether (Mills et al, 2001; Ziliak et al., 2000; Quint et al., 2001). These changes raised concerns about increased food insecurity, food insufficiency and hunger and their effects on the well being of current and recent welfare recipients (Lichter and Jayakody 2002, Loprest 1999).

Declines in food insufficiency have been lower than declines in welfare caseloads. Caseloads fell by 50 percent between 1994 and 1999. In contrast, from 1995 to 1999 food insufficiency declined by 16 percent and hunger by 28 percent (Andrews et al., 2000). The persistently high rates of food insecurity are troubling given that food insecurity is not a social problem with isolated consequences. (Olson 1999).

There are several reasons to worry about food insufficiency in the post-TANF welfare population. Women who are sanctioned, women who meet time limits, and women who lose their jobs, may experience income losses and, as a result, be unable to provide for their families' nutritional needs. Bavier (2000), Primus (1999), and Haskins (2001) show that the poorest fifth of single mothers aged 18-54 years experienced income declines in the years surrounding the 1996 welfare reforms, largely because increases in employment income did not fully offset decreases in welfare cash benefits and Food Stamps. Haskins (2001) also finds that the numbers of single mothers and children in "deep poverty", (i.e. with

incomes below half the poverty line) increased from about 6 million in 1995 to about 6.4 million in 1997. This suggests that the economic fortunes of some female-headed families worsened in the initial year following welfare reform. Of course it may be that over time, these families' incomes will improve as the mothers increase their work hours and establish stable work trajectories.

A second worry is that although the increased market work required of recipients may raise their total pre-tax money income, work-related expenses such as transportation costs and childcare costs, may in some cases lower recipients' disposable income, and hence their abilities to meet food costs (Citro and Michael, 1995; Willis et al. 1997). Labor market work will also reduce the time available for household tasks such as shopping and food preparation and for applying to federal and local assistance programs (Edin and Lein 1997). This reduction in available time may hinder recipients' abilities to stretch their limited budgets to meet their families' nutritional needs.

A third worry is that some recipients who move from welfare to work may experience income shocks such as job losses (Gunderson and Gruber 2001). Hershey and Pavetti (1997), Johnson (2002), and Corcoran et al. (2002) report that while most welfare recipients can get jobs, many have a hard time maintaining stable employment. In the past, when recipients lost jobs, it was relatively easy to return to welfare. It is more difficult to do this in the new work-oriented welfare system. Frequent job losses likely increase single mothers' income instability, and this instability might make it difficult for mothers to adequately provide for their families' food requirements. Demographic changes such as divorce or the birth of a child could also lead to income shocks. The safety net provided by AFDC is no longer available to cushion such shocks.

Despite the lack of consensus of the consequences of PRWORA for low income families' abilities to meet their families' nutritional needs, little is known about the extent of food insufficiency in the TANF population, whether food insufficiency is initially high but then declines over time among TANF recipients, and whether increases in income and employment over time actually lead to increases in food insufficiency over time.

Disentangling how work and income are related to food insufficiency among current and former TANF recipients is further complicated because sizable minorities of current and former recipients have few personal resources, have transportation problems, have physical and mental health problems, and have experienced domestic violence (See Lichter and Jayakody 2002). Danziger et al. (2000), for instance, report that in a sample of Michigan TANF recipients, one in five had few work skills; almost one in two lacked a car and/or license; one in five reported a physical health problem; one in four met the diagnostic screening criteria for depression; and one in seven reported having experienced severe physical abuse within the past year. Such factors might limit both a woman's employability and her ability to make ends meet on a limited budget. Thus, an apparent association between employment and food insufficiency might actually be due to some other unmeasured factor such as depression.

We use longitudinal data on a representative sample of TANF recipients in an urban Michigan county to track these recipients' food insufficiency, incomes, and work trajectories over time and to assess the extent to which changes in employment and income are associated with changes in food insufficiency. The women in this sample received cash benefits from TANF in February 1997 and were surveyed in Fall 1997, Fall 1998, and Fall 1999. We use these data to address the following questions:

- (1) What proportion of TANF recipients experienced food insufficiency 7-10 months, 19-23 months, and 30-37 months after first being observed on the welfare rolls? Did the incidence of food insufficiency decline over time?
- (2) Were women with higher levels of income and of work less likely to experience food insufficiency? Were job losses and demographic changes such as the birth of a child or divorce associated with higher levels of food insufficiency?
- (3) Were the observed associations between work and food insufficiency and between income and food insufficiency due to unmeasured individual differences between recipients (i.e. heterogeneity) rather than to income and work? That is, did food insufficiency change in response to employment and income changes? Did food insufficiency decline for women who increased their employment hours and for

women whose incomes rose? Did food insufficiency increase for women who lost jobs and for women whose incomes dropped?

## **Background**

The single greatest predictor of food insufficiency and hunger in the general population is having a low income<sup>1</sup> (Beverly, 2000, Blaylock and Blisard, 1995; Casey et al., 2001; Gunderson and Gruber 2001; Rose, 1999). Analysis of data from the nationally representative Third National Health and Nutrition Examination Survey (NHANES III) found that the overall prevalence of food insufficiency – sometimes or often not having enough food – was 4.1 percent in the general population and 14 percent in the low-income population (Alaimo, et al. 1998). Beverly et al. (2000) and Casey et al. (2001) find similar differences using the 1992 Survey of Income and Program Participation (SIPP), and The Continuing Survey of Food Intakes by Individuals (CSFII) 1994-1996, the most recent national nutrition survey conducted by the U.S. Department of Agriculture.

Although low-income households are more likely than more affluent households to report food insufficiency, over 85 percent of the low-income households in Alaimo et al.'s. (1998), Beverly's (2000), and Casey et al.'s (2001) studies do not report food insufficiency. Similarly, although poverty strongly predicts food insufficiency and hunger, half of all individuals reporting hunger are non-poor (Rose, 1999). Thus, the observed associations between income and food insufficiency in past studies could be due in part to unmeasured individual differences that are correlated both with income and with individuals' abilities to manage a budget.

Employment, like income, is related to food insufficiency in the general population. Rose (1999) showed that losing a job is associated with increased food insufficiency. Alaimo et al. (1998) found that

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<sup>1</sup> We use the term “food insufficiency” here in the narrow sense to distinguish restricted household food stores or too little food intake among adults or children in the household. “Food insecurity” includes those who are food insufficient in addition to those who are anxious about meeting their household's food consumption through

households with an unemployed head were more likely to be food insufficient. Beverly (2000) reports that the prevalence of food insufficiency is 2.8 percent in households with children where at least one adult had worked in the past 12 months and is 10.0 percent in households with children where no adults had worked in the past 12 months. Although food insufficiency is more common in households with no employed adults, nine out of ten families where no adults had worked in the past 12 months did *not* report food insufficiency. This suggests that unmeasured individual differences may play a role in explaining the higher incidence of food insufficiency among non-workers.

Less is known about the prevalence of food insufficiency in the welfare population. Some evidence suggests that rates of food insufficiency may be higher among welfare recipients and poor single mothers with children than among other low-income families. Siefert et al. (2000) report that 25 percent of single mothers in an urban Michigan county who were receiving cash benefits from TANF in February 1997 were food insufficient in Fall 1997. Edin and Lein (1997) conducted extensive interviews between 1991 and 1992 with AFDC recipients in four U.S. cities and reported that 31 percent reported sometimes or often not having enough to eat. Polit, et al. (2001), followed women who had been welfare recipients in Cleveland, Los Angeles, Miami, and Philadelphia in May, 1995 and reported that approximately 15 percent had experienced some hunger in 1998. Loprest (1999) reported that in three state studies of women who left welfare, a third of the leavers reported problems in providing enough food for their families.

There are few estimates of the extent to which work and income predict food insufficiency within low income and welfare populations. Beverly (2000), using 1992 SIPP data, found that rates of food insufficiency varied very little by the employment status of adults in poor families with children. Edin and Lein (1997), on the other hand, got quite different results when they compared food insufficiency in two samples of single mothers – one in which the mother’s primary source of income was AFDC and the other in which the primary source of income was work. The prevalence of food insufficiency was higher

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culturally normalized means, along with various attempt to limit, augment, or stretch the food supply (Scott and Wehler, 1998).

among mothers who relied on welfare and than among mothers who relied on work. Corcoran et al. (1999) also found that work was related to food insufficiency in their sample of current and former TANF recipients in Michigan. But when Corcoran et al. (1999) controlled for these women's human capital characteristics and health status, the association between work and food insufficiency dropped in size and became insignificant. This suggests that any apparent link between work and food insufficiency may be due to other characteristics.

The research on the relationship between income and food insufficiency in the low income and welfare populations is equally mixed. Alaimo et al. (1992) found that income was negatively related to food insufficiency among low-income individuals in the NHANES III. Gunderson and Gruber (2001), using the 1992 SIPP, report that food insufficiency rates varied strongly with income among households with incomes less than 200 percent of the poverty line. Corcoran et al. (1999), on the other hand, reported that the prevalence of food insecurity did not vary significantly by monthly income in the Fall 1997, for a representative sample of single mothers in Michigan who received TANF benefits in February 1997. However, the range of incomes in Corcoran's sample was narrow since recipients were surveyed only 7-10 months after first being observed on the welfare rolls. It may take more time for income changes to occur and for food insufficiency to respond to these income changes.

Gunderson and Gruber (2001) were among the first to examine dynamic determinants of food insufficiency. They hypothesized that negative income shocks may be one reason low-income families become food insufficient. Using 1991-1992 SIPP data, they examined income and food insufficiency for households whose incomes averaged less than 200 percent of the Census poverty line. Rates of earnings loss were higher among families who are food insufficient than among families who were food sufficient, and the variance of income was higher for food insufficient households than for food sufficient households. They did not use fixed-effects models to examine how food insufficiency changed in response to income changes, so it still might be that low-income families who experience income shocks differ in unmeasured ways from low-income families with more stable incomes. For instance, individuals who experience repeated earnings shocks may be less likely to have social support systems to turn to

when day care or transportation arrangements break down. A lack of social support also may reduce one's capacity to make ends meet on a low budget.

Most research that links food insufficiency to income or work in the welfare population is descriptive and/or based on cross-sectional data. As a result, it is hard to tell whether observed associations of income and work with food insufficiency are causal or reflect unmeasured individual differences in single mothers' characteristics that affect both their employment prospects (or incomes) and their abilities to successfully meet their families' food needs. For example, education is associated with higher employment, higher earnings, and more efficient consumption behavior in the general population (Michael 1975). Having to care for a disabled child, may reduce a mother's work hours and income, while at the same time the costs of health care for the child reduces the resources available to provide for the family's nutritional needs. Unmeasured coping skills may improve employment prospects and lead to efficient consumption.

This study extends past research on food insufficiency in several respects. First, we use longitudinal data to track whether food insufficiency declines over a three-year period among current and former TANF recipients. Second, we examine how two aspects of employment – work hours and number of job losses-affect food insufficiency. With the exception of Gunderson and Gruber (2001), most past research has focused only on employment status. Third, we examine whether employment and income changes predict food insufficiency using a logistic regression model which controls for an unusually rich set of individual characteristics – schooling, job-related skills, demographic characteristics, maternal and child health, maternal physical and mental health, transportation problems, and experiences of domestic violence. Most past studies of food insufficiency control for a more restricted set of individual characteristics. Fourth, we examine how work changes and income changes are associated with changes in food insufficiency using fixed-effects logistic regression. This allows us to control for individual characteristics (e.g., values, abilities, constraints, etc.) that are constant across waves of the study and which affect food insufficiency.

### **Data and Variables**

We use the 1997, 1998, and 1999 waves of the Women’s Employment Study (WES) to track changes in work, income, and food sufficiency over time and to assess the extent to which food insufficiency responds to changes in work and income for a sample of single mothers. The women in the sample were systematically selected with equal probability from an ordered list of single mothers with children who were welfare recipients in an urban Michigan county in February 1997. Interviews were conducted with the women in the Fall 1997, Fall 1998, and Fall 1999. The response rate was 86 percent for the first wave, 92 percent for the second wave of this panel study, and 91 percent for the third wave of this study. Our sample consists of the women who were present at all three waves, were not receiving SSI (and so were not subject to work requirements), and who had no missing data on any variables used in the analyses.

In each wave, respondents were asked the question: “Which of the following describes the amount of food your household has to eat – enough to eat, sometimes enough to eat, sometimes not enough to eat?” A respondent was defined as having experienced food insufficiency in the 12 months prior to the interview if she reported that her family “sometimes” or “often” did not have enough to eat. In Waves 2 and 3, respondents were asked whether they and their children had gone hungry in the past twelve months. We defined a respondent as having experienced hunger if she reported that she had gone hungry at some time in the past twelve months. We defined child as having experienced hunger if a respondent reported that her children had gone hungry at least once in the past twelve months.

We defined monthly income at Waves 1, 2, and 3 as the total of monthly income from all sources. Annual income at a wave was the income from all sources received in the calendar year of the wave interview. At Wave 2, respondents reported total annual income for 1997 – the calendar year of the Wave 1 interviews. At Wave 3, respondents reported total annual income for 1998 – the calendar year of the Wave 2 interview. Thus we only have annual income data for 1997 and 1998.

In each wave respondents were asked how many hours they had worked on their main job last week. Monthly work histories from February, 1997 to the Fall, 1999 interview date were collected from respondents. Individuals were asked if and when they had changed jobs between waves. If a respondent

had not changed jobs between waves, we computed hours worked on main job in the year prior to the interview by multiplying usual hours worked on current/most recent main job by 4.3 times the number of months worked. If a respondent had changed her main job across waves, we used the data on timing of job change and on usual hours worked at main job held at the current and previous waves to compute hours worked. Monthly work history reports were used to measure the number of job losses that ended in a period of non-work lasting four weeks or more during the 12 months prior to the interview date.<sup>2</sup>

We created variables to control for demographic characteristics, human capital, maternal and child health, domestic violence experiences, and transportation problems at each wave. Appendix A describes how these variables were constructed.

The WES has several advantages for our purposes. First, interviews were conducted over a three-year period after Michigan redesigned its cash assistance program to meet the requirements of the 1996 PROWRA. These data provide some of the first insights into the short-run and the long-run extent of food insecurity for a welfare population facing the current work requirement. Second, because the data come from a random sample of welfare recipients with an unusually high response rate, analysis will be representative of the post-TANF welfare population in Michigan. Michigan's benefit levels and earnings disregards are typical of those in the ten states that make up 70 percent of the federal TANF caseload in 1999 and, therefore, results may be considered representative of the current policy environment (Allen and Kirby, 2000).

Third, we control for an unusually rich set of individual characteristics which may moderate the relationships between work, income, and food insufficiency – marital status, family size, urban residence, schooling, the skill content of work experience, access to transportation, maternal physical and mental health, child health, and experiences of domestic violence.

Fourth, because the WES measures food insufficiency, employment, income and individual characteristics at three points in time and has monthly work histories, we can track how recipients' food

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<sup>2</sup> For individuals interviewed in Fall 1997, we have from 9 to 12 months of data on months worked prior to the Wave 1 interview. We scale these numbers up to 12 months.

insufficiency is changing over time, and we can use fixed-effects models to relate changes in food insufficiency to changes in employment, income, and measured individual characteristics. Fixed-effects models control for unmeasured individual characteristics which are constant over the roughly 3-year period of the WES study (e.g., values, ability, social support, etc.) and which affect food insufficiency.

### **Descriptive Results**

Food sufficiency was a problem for current and former TANF recipients, even roughly three years after they were first observed on the welfare rolls. Table 1 reports on the food insufficiency and hunger status of women and their children at Waves 1, 2, and 3. The prevalence of food insufficiency was high in all waves – 25.0 percent in Wave 1, 22.9 percent in Wave 2, and 23.3 percent in Wave 3 – and declined very little (by only 1.7 percentage points) between Waves 1 and 3.

Food insufficiency was a common experience. Over 40 percent of our respondents reported being food insufficient in at least one wave. Multiple reports of food insufficiency were less common - 22.9 percent of women were food insufficient at only one wave, 13.3 percent of women were food insufficient at only two waves, and 7.6 percent were food insufficient at all three waves.

Hunger was also relatively common: 15 percent of women reported having gone hungry in the past year at Wave 2, and 15 percent reported having gone hungry at Wave 3. Over one in five (22.6 percent) respondents reported hunger in at least one of Waves 2 and 3. Over 15 percent reported hunger in only one wave; and 7.2 percent reported hunger in two waves.

Like others, we find that child hunger was rare (Polit et al., 2001; Nord et al., 2002). At Wave 2, 5.5 percent of respondents reported a child had gone hungry at some point in the past year. At Wave 3, 4.6 percent reported child hunger. The vast majority of respondents (93.6 percent) never reported that a child had gone hungry.

Table 2 reports on respondents' food insufficiency and hunger at a wave by their income and work status at that same wave. Each respondent enters the sample three times in the food insufficiency tables since food insufficiency questions were asked at all three waves and enters the sample twice in the hunger tables since hunger questions were asked only at waves 2 and 3. The first two columns of

numbers in Table 2 show the numbers and percentages of women falling into the income or employment category listed in the far left column of the table. The next three columns of numbers report the percentages of respondents in that income/employment category who report food insufficiency, hunger, or child hunger.

Although WES is a low-income sample, there was variability in respondents' monthly and annual incomes (see Table 2, columns 1 and 2). Almost one-third of respondents reported monthly incomes of less than \$1,000, while over one-fifth reported monthly incomes of \$2,000 or more, and 8.3 percent reported monthly incomes of \$3,000 or more. Almost one-fifth of respondents reported annual incomes of less than \$5,000, and about 17 percent reported annual incomes of \$20,000 or more.

We, like others, find that in the cross-section, food insufficiency and hunger varied negatively with income (Beverly 2000, Gunderson and Gruber 2001). Food insufficiency rates ranged from a high of 35.2 percent for respondents with monthly incomes of less than \$500 to a low of 5.3 percent for respondents with monthly incomes of \$3,000 or more. Food insufficiency rates were 26 to 29 percent for individuals with annual incomes less than \$10,000 and only 16 percent for individuals with annual incomes of \$15,000 or more.

Table 2 also reports food insufficiency and hunger status by employment status. As with income, there was considerable variability in WES respondents' employment status. On average, across the three waves, 61.5 percent of respondents were employed and 38.5 were not employed at the interview date. About one-fifth of respondents had not worked at all in the 12 months prior to the interview; 23.6 percent had worked 1 to 1,000 hours; 34.3 percent had worked 1001-2000 hours; and 23.4 percent had worked more than 2000 hours. Job losses were common in the year prior to an interview. About 23 percent of respondents had experienced one job loss followed by a month or more of non-work in the 12 months prior to an interview date, and 3.3 percent had experienced two or more job losses followed by a month or more of non-work.

Food insufficiency and hunger rates were lower among women who had worked, were lower the more hours women had worked, and were higher among women who had experienced job losses. Women

who were not employed at an interview date were roughly 1.5 times more likely than were employed women to report having experienced food insufficiency (29.8% vs. 19.9%), hunger (19.0% vs. 12.3%), or child hunger (4.8% vs. 3.3%). Food insufficiency and hunger rates were lower for women who had worked over 1000 hours in the twelve months prior to an interview than for women who had worked fewer hours. Food insufficiency rates were 22.2 percent for women with no job losses in the 12 months prior to an interview, 26.9 percent for women with one job loss, and 36.5 percent for women with two job losses. This result is consistent with Gunderson and Gruber's (2001) hypothesis that income shocks are important determinants of food insufficiency.

### **Multivariate Analyses.**

Food insufficiency was strongly associated with work and income status at a point in time, but bivariate tables do not control for factors such as family composition, education, and health problems that are correlated with income and work and that may influence food insufficiency. We next run two sets of multivariate logistic regressions. The first estimates the following cross-sectional equation:

$$(1) \quad FI_{i,t} = \beta_0 + \beta_1 X_{i,t} + \beta_2 Z_{i,t} + \beta_3 HOURS_{i,t} + \beta_4 INC_{i,t} + \beta_5 LOSS_{i,t} + \varepsilon_{i,t}$$

where:

$FI_{c,t}$  = 1 if respondent reports sometimes or often not having enough to eat at Wave t. 0, if otherwise.

$X_t$  = fixed individual characteristics at Wave t (e.g., schooling, race, age).

$Z_t$  = changing individual characteristics at wave t (marital status, # of children, job skills, physical limitation, child health problem, mental health problem, transportation problem, domestic violence problem).

$HOURS_t$  = hours worked on main job over the 12 months prior to Wave t interview.

$INC_t$  = monthly income at the Wave t interview.

$LOSS_t$  = number of job losses that are followed by a period of non-work in the 12 months prior to Wave t

Equation (1) relates an individual's food insufficiency status in the 12 months prior to year t as a function of fixed and changing individual characteristics, hours worked in the 12 months prior to Wave t, the number of job losses experienced in the 12 months prior to Wave t, and monthly income at Wave t.

Equation (1) controls for *measured* individual characteristics when estimating effects of work hours, job losses, and income on food insufficiency. But unmeasured attributes such as coping abilities, values, and social support networks may well lower women's expected work and incomes, and also lower their food insufficiency. Failure to adjust for such unmeasured attributes could upwardly bias estimates of effects of work, income, and measured individual characteristics on food insufficiency status.

We control for unmeasured individual characteristics by estimating equation (2) below. Equation (2) is a fixed-effects logit model that relates changes in food insufficiency between waves to changes in time-varying individual characteristics, changes in work, and changes in income. Equation (2) allows us to control for all individual characteristics that influence food insufficiency and that are constant over the waves of the study.

$$(2) \quad FI_{i,t+1} - FI_{i,t} \equiv \beta_2(Z_{i,t+1} - Z_{i,t}) + \beta_3(HOURS_{i,t+1} - HOURS_{i,t}) + \beta_4(INC_{i,t+1} - INC_{i,t}) + \beta_4(LOSS_{i,t+1} - LOSS_{i,t}) + \varepsilon_{i,t+1} - \varepsilon_{i,t}$$

Results of estimating equations 1 and 2 are reported in Table 3. The columns numbered 1, 2, and 3 in Table 3 report results of estimating equation (1) using logit regression on pooled cross-section data. The column of numbers marked "1" reports results when food insufficiency is regressed on demographic characteristics, schooling, work skills, work hours last year, and number of job losses last year. The column marked "2" reports results when a measure of monthly income is added to this regression. Comparing the coefficients on the work measures in columns 1 and 2 gives an estimate of how much of the effects of work on food insufficiency are due to the income that work brings. The column marked "3" reports results when measures of health, domestic violence, and transportation are added to the regression reported in column "2".

Work hours and job losses strongly predict food insufficiency in the pooled cross-section (Table 3, column 1). Work hours affected food insufficiency in part by increasing monthly income. When monthly income was controlled, the coefficient on monthly income was negative and significant, and the coefficient on work hours dropped in size by one-third and became insignificant. When we further controlled for maternal physical and psychological health problems, child health problems, experiences of domestic violence, and transportation problems, the coefficient on work hours dropped to zero. Part of the apparent association between work hours and food insufficiency may have been due to the health and safety issues which affected both hours worked and food insufficiency. The coefficients on job losses and monthly income, however, remained large and significant, even after controlling for health and safety problems.

Demographic characteristics, human capital, the health measures, and the domestic violence measures predict food insufficiency in the cross-sectional analyses. Rates of food insufficiency rose with the number of children and were lower when a woman was married or cohabitating. Women over 35 years old had higher rates of food insufficiency than did younger women. We were surprised to find that education was not significantly associated with food insufficiency since education is associated with more efficient consumption behavior in the general population (Michael 1975). Work skills were negatively associated with food insufficiency. This suggests that skills acquired on the job may lead to more efficient consumption. The measures of maternal physical limitations, maternal mental health problems, child health problems, and domestic violence all had large, positive, and significant coefficients.

We, like other researchers, find that work (i.e. job losses) and income are associated with food insufficiency in cross-sectional analyses. But this result could reflect unmeasured individual differences. We next use fixed effects models to examine the extent to which changes in work hours, job losses, and income were related to changes in food insufficiency. Columns 4 to 6 of Table 3 report the results of fixed-effects logit regressions predicting the changes in women's reports of food insufficiency between Waves  $t$  and  $t+1$ . Column 4 reports results of estimating changes in food insufficiency as a function of changes in number of children living in the household, changes in marital status, changes in work skills,

changes in hours worked last year, and changes in number of job losses. Column 5 in Table 3 reports the results when a measure of income changes is added to the fixed-effects regression in column 4. Column 6 reports results when measures of changes in health, safety, and access to transportation are added to the regression reported in column 5.

Work hours and income are not strong predictors of food insufficiency in the fixed-effect regressions. When we compare the coefficients reported in column 5 to those in column 2 of Table 3, the coefficients on both work hours and monthly income in the fixed effects model are smaller than those in the cross-sectional model and are insignificant. When controls for changes in health and safety measures are added to the fixed-effects model, the coefficient on annual work hours becomes very small; and the coefficient on monthly income remains small, (Table 3, column 6). Job losses remain a strong predictor of food insufficiency in the fixed-effects models. In fact, the fixed-effects coefficients on job losses are larger than the comparable cross-sectional coefficients. Experiencing periods of non-work due to job loss seems to put women at risk for food insufficiency.

Several control variables had large coefficients in the fixed-effects models. Women who either married or began cohabitating between waves experienced significantly more improvement in food insufficiency than did women whose marital/cohabitation status did not change. The coefficient on this measure was larger in the fixed-effects regression than in the cross-sectional regression and was significant in both regressions. The cross-sectional and fixed-effects estimates of the coefficient on work skills were both large, but the fixed effects coefficient was not significant.

The coefficients of the health and safety measures were often smaller and were less likely to be significant in the fixed-effects regression than in the cross-sectional regression. The coefficient on the mental health dummy variable dropped in size but remained significant. The coefficient on the physical limitations measure was similar in size in the cross-sectional and fixed-effects regressions, but the fixed-effect coefficient was not significant. The coefficient on the child health and domestic violence measures were much smaller in the fixed-effect regression and were very insignificant.

Table 4 presents estimates of the change in the predicted likelihood of food insufficiency based on coefficients from the logistic regressions reported in Table 3. In computing these changes we set values of the independent variables to their mean values. The columns of numbers in Table 4 correspond to the columns in Table 3. The numbers in columns marked 1 to 6 represent the percentage point increases in the average woman's predicted likelihood of experiencing food insufficiency if she experienced a one-unit change in the predictor variable listed in the far left column of Table 4. Thus, based on the logistic regression results reported in Table 3, column 1, an additional child is associated with a 1.3 percentage point increase in the average WES respondent's predicted probability of experiencing food insufficiency (see column marked "1" in Table 4).<sup>3</sup>

Turning to Table 4, column 6, we see that changes in married/cohabitation status, changes in job losses, and changes in mental health status are each associated with a significant and sizable change in the average woman's predicted likelihood of food insufficiency, even after controlling for changes in women's and children's health status, changes in income, changes in work hours, and for individual characteristics that are constant over time. Marriage or cohabitating is associated with a 9.2 percentage point decrease in the predicted likelihood of food insufficiency. An additional job loss between waves  $t$  and  $t+1$  is associated with a 6.6 percentage point increase in the predicted likelihood of food insufficiency. A change in mental health status is associated with a 7.8 percentage point increase in the predicted probability of food insufficiency.

Changes in work skills and in reports of physical limitations had sizeable associations with food insufficiency – even after controlling for individual characteristics that are constant across time, but these associations were not significant. An increase in work skills across waves was associated with a 10.1 percentage point drop in the likelihood of food insufficiency, and a change in physical limitations was associated with a 6.6 percentage point change in the likelihood of food insufficiency.

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<sup>3</sup> The logistic regression coefficients are transformed to compute these percentage point changes for the average sample member. Each coefficient is multiplied by the probability of being food insufficient and the probability of food sufficiency (See Wooldridge, P. 465-469).

Even very large (1000 hours) variations in work hours had virtually no effect on food insufficiency once we controlled for health and safety problems in both cross-sectional and fixed-effects regressions. Monthly income was significantly associated with food insufficiency in the pooled cross-sectional logit regressions, but this association dropped sharply in size and was insignificant in the fixed-effects regressions.

In the pooled cross-sectional regression, having a recent experience of domestic violence was associated with a significant 10.1 percentage point increase in the predicted probability of food insufficiency for the average respondent and having a child with a health problem was associated with a significant 5 percentage point increase in the predicted probability of food insufficiency. When we controlled for individual characteristics using fixed effects, the predicted impacts of a change in domestic violence or a change in children's health on changes in food insufficiency were small and insignificant. This suggests that changes in domestic violence or in child health problems are not likely to lead to changes in food insufficiency.

### **Summary of Results**

We examined an unusually broad array of potential predictors of food insufficiency – work hours, job losses, income, education, job skills, marriage/cohabitation, number of children, maternal physical and mental health, child health problems, experiences of severe physical abuse, and access to transportation. Our descriptive and cross-sectional findings were consistent with those of past research. Work hours, income, and marriage/cohabitation were associated with less food insufficiency. Surprisingly, education was not related to food insufficiency. We also found aspects of work and individual characteristics not typically included in analyses of food insufficiency – job losses, job skills, physical health problems, maternal mental health, experiences of severe physical abuse, and child health problems – were strongly associated with food insufficiency in the cross-sectional analyses.

But when we used fixed-effects models to control for individual characteristics (for example, unmeasured values, abilities, supports, and constraints) that were constant over time, the picture changed. Work hours, income, experiences of domestic violence, and child health problems had small and very

insignificant associations with food insufficiency. On the other hand, marriage (or cohabitation), job losses, and mental health problems each remained strongly associated with food insufficiency in the fixed-effects models, while jobs skills and physical limitations had sizeable but insignificant associations with food insufficiency.

The job loss results are consistent with Gunderson's and Gruber's (2001) hypothesis that negative economic shocks lead to food insufficiency in low-income households. Mental health problems may be another reason rates of food insufficiency were high in this sample of current and former TANF recipients. These results provide suggestive but inconclusive evidence that skills learned on the job may reduce risks of food insufficiency and that mental health problems may increase risks of food insufficiency.

## **Discussion**

Food insufficiency was common among current and former TANF recipients. Over 40 percent of women in our sample reported sometimes or often not having enough food to eat at least once in three interviews conducted over a three-year period. Furthermore, reports of food insufficiency did not decline much over the three years these women were followed. This is discouraging given that, on average, women's employment and incomes rose over this period. A more encouraging finding was that, consistent with other research, child hunger was relatively rare. Nord et al. (2002) note that children in U.S. households, especially the very young, are usually protected from hunger except when households experience very high levels of food insecurity.

Welfare reform advocates claimed that the new welfare reforms will lead to increases in work and income among welfare recipients. The implied assumption is that these increases, in turn, will lead to improvement in material well being for former recipients and their children. On average, recipients' employment and incomes did rise over time. But the increases in work hours and in incomes were not associated with decreases in food insufficiency in our sample of current and former TANF recipients, once we controlled for measured and unmeasured individual characteristics. Of course, it may take more than three years for families' material well being to respond to improvements in work and income.

Some analysts worry that PROWRA has weakened the safety net for some poor women and children, and that a subset of families may be left unprotected when parents lose jobs or experience income drops. Although, on average, work and income changes were positive for WES women, sizable minorities of women did experience reductions in work hours, reductions in incomes, and job losses followed by periods of non-work between waves of the study. Income losses and work hour reductions were not associated with increased food insufficiency, but a job loss between waves was associated with a 6.6 percentage point increase in a woman's predicted probability of food insufficiency, even after controlling for individual characteristics that are constant over time. The high incidence and high cost of jobs losses among current and former TANF recipients is an issue for welfare and food policy-makers. Policies that help women maintain stable employment provide an economic cushion for women and their families during periods following job losses, and help women find new jobs could help here.

Mental health status strongly and significantly predicted food insufficiency. A change in mental health status was associated with a 7.8 percentage point change in the predicted probability of food insufficiency. Since the mental disorders that we measured are often recurrent or episodic, this finding suggests the need to be aware of the risk of household food insufficiency among recipients with a history of mental illness and the need for screening, referral and counseling programs.

The current administration is strongly encouraging marriage promotion policies. Marriage/cohabitation was also associated with a 9.2 percentage point reduction in food insufficiency, even after controlling for the added income that marriage brings and for differences in individual characteristics. The policy implications of this finding are less clear. Perhaps having two adults in a household improves a family's coping strategies. On the other hand, women may choose to marry or cohabitate only with men who they judge to be responsible and able to support a family (Edin 2001). Edin (2001) warns that if the supply of such men (i.e., responsible men with a stable incomes) available to low income women is limited, then encouraging marriage is unlikely to lead to improvements in women's material well being.

Job skills had a large but insignificant association with food insufficiency in the fixed-effect models. An improvement in job skills was associated with a 10.1 percentage point decrease in the predicted probability of food insufficiency. It is not clear what this means. Perhaps, jobs that provide opportunities to learn new skills lead to more efficient consumption behavior. If so, perhaps state job placement programs need to examine the skill content of jobs when placing TANF recipients. Other research shows that experience in jobs that require workers to use cognitive and computer skills is associated with higher wages, more benefits, and higher rates of wage growth than is work experience in jobs with fewer skill requirements (Johnson 2002).

Having a physical limitation, like job skills, had a large but insignificant association with food insufficiency in the fixed-effect models. If this effect is real, then programs that increase availability of health benefits to low-income mothers may have the potential to reduce food insufficiency.

## Appendix A: Construction of Control Variables

Demographic controls include dummy variables indicating if the respondent was African-American, if she was married or cohabitating, whether she resided in an urban area, and a measure of number of children. To test for non-linearity in the relationship between age and employment, we categorized women into three groups and created two dummy variables -- ages 25-34, and ages 35-54 (women between ages 18-25 were the omitted reference group). A dummy variable that indicates whether a respondent did not have a license and/or access to a car measured transportation problems.

Schooling is measured by a dummy variable indicating if the respondent lacks a high school diploma or GED. A second dummy variable measures the skill content of all jobs held by the respondent. Based on a set of work skills adapted from Holzer (1996), a respondent was coded as having low work skills if on previous jobs she had performed fewer than four of nine listed tasks, such as having written letters or memos, filled out forms, used math, worked with electronic machines, talked with customers, worked with computers, supervised people, etc. (See Danziger et al, 1999 for a description of this measure).

Women's physical health was assessed using items from the Physical Functioning subscale of the SF-36 (Ware and Sherbourne, 1992). Respondents are asked a series of questions about whether their health limits their daily activities a lot, a little, or not at all in walking, lifting, climbing stairs, bending, carrying bundles, etc. Respondents who scored in the lowest age-specific quartile (based on population norms) in a wave were defined as having physical limitations in that wave. We defined a respondent as having a child health problem in a wave if she reported that one of her children had a physical, emotional, or learning problem that limited his/her activity.

WES collected data on four mental health disorders: major depression, post-traumatic stress syndrome (PTSD), generalized anxiety disorder (GAD), and social phobia. Major depression and PTSD are measured in all three waves, GAD in Waves 1 and 3, and social phobia in Waves 2 and 3. The measurement of depression and the other mental health disorders was based on the definition and the criteria specified in the revised third edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) (APA, 1987).<sup>4</sup> We define a woman as having a mental health problem in a wave if she met the criteria for any of the mental health disorders measured in that wave. (See Corcoran et al 2002 for a more detailed description of the mental health variables.)

Domestic violence was assessed with a modified version of the Conflict Tactics Scale (CTS, Straus, and Gelles 1986). We define severe abuse in a wave as having experienced one or more of the following in the 12 months prior to the wave interview: being hit with a fist, being hit with an object that could hurt, being beaten, being choked, being threatened with or hurt by a weapon, being forced into sexual activity against her will.

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<sup>4</sup> The diagnosis was put into operation in screening versions of the World Health Organizations (WHO) Composite International Diagnostic Interview, Version 1.0 (CIDI). The short form CIDI is a structured interview schedule designed to be used by trained interviewers who are non-clinicians to assess the prevalence of specific psychiatric disorders (Robins et

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Table 1. Prevalence of Food Insufficiency, Hunger, and Child Hunger at Waves 1, 2, and 3 (N=632)

	Prevalence at			Never	Only	Only 2	All 3
	Wave 1	Wave 2	Wave 3		1	Waves	Waves
<b>Food Insufficient</b>	25.0%	22.9%	23.3%	56.7%	22.9%	13.3%	7.6%
<b>Experienced Hunger</b>	N/A	14.9%	14.9%	77.4%	15.4%	7.2%	N/A
<b>Experienced Child Hunger</b>	N/A	5.5%	4.6%	93.6%	2.9%	3.6%	N/A

Note: Sample includes respondents present at all three waves.

Table 2. Food Insufficiency by Income, Work, and Welfare at Both Waves (N=1896)

	<b>N</b>	<b>% of Sample</b>	<b>Food Insufficient</b>	<b>Hungry</b>	<b>Child Hungry</b>
<b>Monthly Income</b>					
Less than \$500	88	4.7	35.2	16.7	3.2
\$500 to \$999	532	28.2	26.7	17.8	5.1
\$1000 to \$1499	563	29.8	25.2	14.4	3.2
\$1500 to \$1999	325	17.2	22.5	16.3	4.1
\$2000 to \$2999	225	11.9	18.7	11.6	4.3
More than \$3000	156	8.3	10.3	8.3	1.6
<b>Annual Income^^</b>					
Less than \$5000	241	19.6	26.1	17.0	4.1
\$5000 to \$9999	415	33.7	28.7	17.5	3.4
\$10,000 to \$15,000	274	22.3	23.4	13.0	3.5
\$15,000 to \$19,999	93	7.6	16.1	13.6	2.3
\$20,000 or more	208	16.9	15.9	12.1	1.4
<b>Employed at Interview</b>	1162	61.5	19.9	12.3	3.3
<b>Not Employed at Interview</b>	726	38.5	29.8	19.0	4.8
<b>Hours Worked in Previous Year</b>					
0	333	19.0	29.4	18.9	8.1
1 to 500	189	10.8	24.3	17.6	1.2
501 to 1000	224	12.8	27.2	16.5	3.4
1001 to 2000	601	34.3	21.5	13.0	3.8
2001 or more	406	23.2	18.0	11.3	3.2
<b># Job Losses in Previous Year</b>					
0	1401	73.9	22.2	13.7	4.3
1	432	22.8	26.9	16.5	3.0
2 or More	63	3.3	36.5	22.6	2.1

Note: Sample pools all interviews from each wave.

^^ The sample tabulates only data from waves 2 and 3

Table 3. Logistic Regressions of Food Insecurity on Work, Income, and Health  
(Standard errors are in parentheses; odds ratios are in italics.)

Independent Variables	Cross-Sectional			Fixed Effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Number of Children	<b>0.073</b> (.055) <i>1.076</i>	<b>.094*</b> (.055) <i>1.098</i>	<b>0.082</b> (.055) <i>1.086</i>	<b>0.086</b> (.121) <i>1.090</i>	<b>0.110</b> (.124) <i>1.116</i>	<b>0.122</b> (.132) <i>1.130</i>
Married or Cohabiting	<b>-0.501***</b> (.157) <i>0.606</i>	<b>-0.311*</b> (.166) <i>0.733</i>	<b>-0.282*</b> (.168) <i>0.755</i>	<b>-0.688***</b> (.266) <i>0.502</i>	<b>-0.593**</b> (.284) <i>0.553</i>	<b>-.509*</b> (.289) <i>0.601</i>
African-American	<b>-0.088</b> (.156) <i>0.915</i>	<b>-0.146</b> (.156) <i>0.864</i>	<b>-0.058</b> (.156) <i>0.943</i>	--	--	--
Age 25 to 34	<b>0.087</b> (.177) <i>1.091</i>	<b>0.084</b> (.177) <i>1.088</i>	<b>0.047</b> (.187) <i>1.048</i>	--	--	--
Age over 35	<b>0.516***</b> (.191) <i>1.675</i>	<b>0.516***</b> (.192) <i>1.674</i>	<b>0.432**</b> (.199) <i>1.540</i>	--	--	--
Lives in Urban Census Tract	<b>-0.106</b> (.216) <i>0.900</i>	<b>-0.136</b> (.214) <i>0.873</i>	<b>-0.182</b> (.222) <i>0.833</i>	--	--	--
HS Diploma/GED	<b>-0.045</b> (.139) <i>0.956</i>	<b>-0.059</b> (.139) <i>0.943</i>	<b>0.026</b> (.143) <i>0.146</i>	--	--	--
Has 4 Skills or More	<b>-0.339*</b> (.191) <i>0.713</i>	<b>-0.299</b> (.193) <i>0.741</i>	<b>-0.352</b> (.202) <i>0.703</i>	<b>-0.339</b> (.401) <i>0.712</i>	<b>-0.356</b> (.4) <i>0.700</i>	<b>-0.556</b> <i>0.429</i> <i>0.573</i>
Hours Worked Last Year	<b>-0.189**</b> (.084) <i>0.828</i>	<b>-0.116</b> (.083) <i>0.890</i>	<b>0.002</b> (.088) <i>1.002</i>	<b>-0.126</b> (.132) <i>0.882</i>	<b>-0.096</b> (.137) <i>0.908</i>	<b>-.026</b> (.141) <i>0.975</i>
# of Job Losses	<b>0.351***</b> (.104) <i>1.420</i>	<b>0.306***</b> (.107) <i>1.358</i>	<b>0.225**</b> (.11) <i>1.252</i>	<b>0.444***</b> (.156) <i>1.558</i>	<b>0.399**</b> (.158) <i>1.491</i>	<b>0.362**</b> (.161) <i>1.437</i>
Monthly Income	--	<b>-0.282***</b> (.078) <i>0.755</i>	<b>-0.245***</b> (.088) <i>0.782</i>	--	<b>-0.093</b> (.12) <i>0.916</i>	<b>-0.106</b> (.122) <i>0.900</i>
1 or More Mental Health Problem <sup>^</sup>	--	--	<b>0.820***</b> (.134) <i>2.271</i>	--	--	<b>0.429**</b> (.208) <i>1.536</i>
Physical Limitation	--	--	<b>0.323**</b> (.136) <i>1.381</i>	--	--	<b>0.364</b> (.226) <i>1.440</i>
Experienced Domestic Violence	--	--	<b>0.609***</b> (.161) <i>1.838</i>	--	--	<b>0.171</b> (.259) <i>1.187</i>
Transportation Problem	--	--	<b>0.149</b>	--	--	<b>-0.184</b>

			(.139)			(.289)
			1.161			0.832
Child Health Problem	--	--	<b>0.303*</b>	--	--	<b>0.163</b>
			(.16)			(.246)
			1.354			1.177
Cox and Snell R-Squared	0.030	0.037	0.088	0.036	0.034	0.054
-2 Log Likelihood	1979.29	1953.19	1831.22	477.10	471.21	456.11
N	1865	1859	1846	676	666	659

^Mental health problems include depression, post-traumatic stress disorder, general anxiety disorder, alcohol dependence, and drug dependence.

\* denotes that the coefficient is statistically significant at the 10% level using a two-tailed test

\*\* denotes that the coefficient is statistically significant at the 5% level using a two-tailed test

\*\*\* denotes that the coefficient is statistically significant at the 1% level using a two-tailed test

Table 4. Change in Probability of Food Insufficiency Based on Logistic Regression Coefficients^  
 (Probabilities associated with significant coefficients are in bold.)

	Cross-Sectional			Fixed Effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Predicted Probability	0.228	0.223	0.210	--	--	--
<b>Independent Variables</b>						
Number of Children	0.013	<b>0.016</b>	0.014	0.016	0.020	0.022
Married or Cohabiting	<b>-0.088</b>	<b>-0.054</b>	<b>-0.047</b>	<b>-0.124</b>	<b>-0.107</b>	<b>-0.092</b>
African-American	-0.016	-0.025	-0.010	--	--	--
Age 25 to 34	0.015	0.015	0.008	--	--	--
Age over 35	<b>0.096</b>	<b>0.094</b>	<b>0.075</b>	--	--	--
Lives in Urban Census Tract	-0.019	-0.024	-0.030	--	--	--
HS Diploma/GED	-0.008	-0.010	0.004	--	--	--
Has 4 Skills or More	<b>-0.063</b>	-0.055	-0.063	-0.061	-0.064	-0.101
Hours Worked Last Year	<b>-0.033</b>	-0.020	0.000	-0.023	-0.017	-0.005
# of Job Losses	<b>0.062</b>	<b>0.055</b>	<b>0.037</b>	<b>0.080</b>	<b>0.072</b>	<b>0.066</b>
Monthly Income (1,000)	--	<b>-0.049</b>	<b>-0.041</b>	--	-0.017	-0.019
1 or More Mental Health Problem^			<b>0.147</b>			<b>0.078</b>
Physical Limitation			<b>0.054</b>			0.066
Experienced Domestic Violence			<b>0.101</b>			0.031
Transportation Problem			0.025			-0.033
Child Health Problem			<b>0.050</b>			0.029

^ Probabilities are computed at the means values of the independent variables.