Food Insufficiency, Food Stamp Participation, and Mental Health*

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Objectives. This study examines whether the mental health consequences associated with food insufficiency vary by food stamp participation status and/or the value of the food stamp benefit received. *Methods.* We use longitudinal data from the Panel Study of Income Dynamics along with fixed-effect methods that control for unobserved heterogeneity to test our hypotheses. *Results.* We find that, conditional on the food stamp benefit amount, the emotional distress associated with food insufficiency is higher among food stamp participants. Moreover, we find evidence of a dosage effect such that food-insufficient individuals who receive higher amounts of food stamp benefits suffer greater emotional distress than food-insufficient individuals who receive lower levels of food stamp benefits. However, the negative mental health effects of food insufficiency and food stamp participation are driven primarily by periods of transition onto the Food Stamp Program and into food insufficiency. *Conclusions.* The negative mental health aspects of participating in the Food Stamp Program seem to outweigh the positive mental health aspects, at least during the period of application and initial receipt, suggesting that programmatic reform is needed to improve overall well-being among new participants.

Mental health problems are of great social, economic, and policy concern. A recent review estimated that every year, 5 to 6 million workers in the United States lose, fail to seek, or fail to obtain employment because of psychiatric disorders; in addition, mental illness decreases annual income by $3,500–6,000 (Marcotte and Wilcox-Gok, 2001). Psychiatric disorders such as depression and anxiety are higher in women than in men, lower in blacks and higher in Hispanics compared to whites, and are inversely related to educational level and income (Kessler et al., 1994). High rates of food insecurity and hunger are also a significant problem in the United States.

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It is currently estimated that more than 35.1 million people live in food-insecure households, 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 (Nord, Andrews, and Carlson, 2006). Rates of food insecurity are substantially higher among those in households with incomes below the poverty line (36.0 percent) and in households with children headed by a single woman (30.8 percent).

There has been some research on the links between food insufficiency and mental health (Campbell, 1991; Corcoran, Heflin, and Siefert, 1999; Siefert et al., 2000, 2001, 2002); however, none to date has been conducted on the general population and none has examined the impact of policy interventions on the relationship between food insufficiency and mental health.[1] The latter omission is particularly surprising in light of the fundamental changes to the social safety net over the past decade. As part of the 1996 Welfare Reform Act, the primary cash assistance program for low-income families, Aid to Families with Dependent Children, was abolished and replaced by the Temporary Assistance for Needy Families Program (TANF). TANF, which provides time-limited cash assistance for single mothers who fulfill work requirements, is funded as a block grant to states and is no longer an entitlement. The Food Stamp Program, which provides food assistance to low-income and low-asset families and individuals, was also affected by the 1996 welfare reforms—access was limited for recent immigrants to the United States and for able-bodied adults without children. Although the Food Stamp Program largely retained its entitlement status, the U.S. Congress has in recent years considered converting the program to a block grant to states much like TANF. These changes in the safety net are being made without the aid of research to suggest what the possible unintended consequences of reforming the programs might be on many dimensions of well-being, including mental health (Blank, 2003).

In this article we begin to fill this gap in the literature by examining the extent to which participation in the Food Stamp Program modifies the relationship between food insufficiency and mental health. Although one's first instinct might be to assume that food-insufficient individuals who participate in the Food Stamp Program are better off in terms of emotional distress than those who do not, on closer examination, the relationship is more complex. There are possible negative effects of food stamp partici-

[1]Survey researchers use various terms to describe food hardships. "Food insecurity" refers to the limited or uncertain availability of food, while "food insufficiency" refers to restricted household food stores or insufficient food intake (Scott and Wehler, 1998). "Hunger" refers narrowly to insufficient food intake. Food insecurity differs conceptually from food insufficiency and hunger, which can be considered roughly equivalent (Rose, 1999). The distinction between food insufficiency and food insecurity or hunger can best be understood from a temporal frame of reference: food insecurity can be experienced prior to the onset of food insufficiency or hunger, and may or may not result in food insufficiency or hunger (Scott and Wehler, 1998). Food insecurity with hunger is conceptually comparable to food insufficiency (Dixon, Winkelman, and Radimer, 2001).

pation on emotional distress as well, such as stigma, welfare culture, and "hassles" of meeting eligibility requirements. In this article we compare the mental well-being, as measured by the emotional distress scale, of food-insufficient individuals who choose to participate in the Food Stamp Program with food-insufficient individuals who do not choose to participate. Specifically, we use longitudinal data from the 2001 and 2003 waves of the Panel Study of Income Dynamics (PSID) to test whether the mental health consequences associated with food insufficiency vary by food stamp participation status and/or the value of the food stamp benefit received, controlling for other known risk factors for poor mental health. A key advantage of the PSID is that to our knowledge this is the first analysis of its kind to examine the effect of food insufficiency on mental health using data from a representative sample of the U.S. population, and the first analysis to examine the interaction of public policy on the links between unmet food need and mental distress.

Links Between Food Insufficiency and Mental Health

There are several potential pathways whereby household food insufficiency could have a detrimental effect on the mental health of the household head. We draw on two main theoretical traditions. The first is sometimes termed the neomaterial view. Here, food insufficiency could have a negative impact on mental health through a direct effect of nutritional shortfalls or reductions in positive health behaviors (Bhattacharya, Currie, and Haider, 2004; Lynch et al., 2000). For example, research has documented that even the early stages of nutrient deficiency can have adverse effects on behavior and mental performance. In an experimental study of 1,081 young men in good health, Heseker and his colleagues (1992) found that reduced vitamin intake over a two-month period was associated with negative changes in psychological disposition and functioning. Specifically, inadequate vitamin intake was associated with increased irritability, nervousness, depression, feelings of fear and decreased well-being, memory, and reaction performance. Importantly, providing the subjects with vitamin supplements reversed several of these adverse effects. Bhattacharya, Currie, and Haider (2004), using data from the National Health and Nutrition Examination Survey III, find that heightened food insecurity does exacerbate nutritional shortfalls among adults, but conditional on poverty status, does not help predict nutrition among children.

The second potential causal pathway is the psychosocial environment interpretation. Proponents of this view suggest that awareness of disadvantage in regard to relative social positioning creates feelings of shame and distrust that have negative biological consequences through the psycho-neuro-endocrine chain and through stress-induced behaviors such as smoking (Lynch et al., 2000). Likewise, the association between cumulative or

persistent stressful life events or conditions and the onset or chronicity of mental illness, particularly depression among single mothers with low self-esteem and lack of support, is well documented (Brown and Harris, 1978; Costello, 1982; Brown and Moran, 1997).

Prior work in this area suffers from three main limitations. First, research on the consequences of food hardship has tended to rely on community-based low-income samples of women or on children (Siefert et al., 2001; Heflin et al., 2005; Casey et al., 2004; Laraia et al., 2006; Jyoti et al., 2005). Second, with few exceptions (Siefert et al., 2001; Heflin et al., 2005), most work in this area has used cross-sectional data, which makes establishing causal links about the relationship between food insufficiency and mental health more difficult. Finally, prior work has not explored how participation in federal programs, such as the Food Stamp Program, might modify the relationship between food insufficiency and emotional distress.

The Food Stamp Program as Modifier

Background on the Food Stamp Program

The Food Stamp Program is an integral component of the social safety net in the United States. This cornerstone of food assistance programs works under the principle that everyone has a right to food for themselves and their families and, hence, with few exceptions, the program is available to all citizens who meet income and asset tests. As of August 2003, over 95 percent of Food Stamp Program benefits were issued through an electronic benefit transfer (EBT) card for the purchase of food in authorized, privately run retail food outlets (Food and Nutrition Service, 2003).[2] Subject to passing the income and asset limits, which vary with family size, the program is an entitlement to needy families, and participation moves countercyclically with the state of the macroeconomy (Ziliak, Gundersen, and Figlio, 2003). At its peak in 1994, more than 27 million people received food stamp benefits at an expense of $25 billion to the federal government. In fiscal year 2003, the Food Stamp Program had more than 21 million participants and appropriations over $21 billion. In some states with low TANF benefit levels, food stamp benefits can constitute more than 50 percent of the disposable income of TANF recipients.

Households have to meet three financial criteria to qualify for the Food Stamp Program: the gross income, net income, and asset tests. A household's gross income before taxes in the previous month must be at or below 130 percent of the poverty line. Households with disabled persons or headed by someone over the age of 60 are exempt from this test (although they must pass the net income test). After passing the gross income test, a household

[2]The remaining 5 percent were still using paper stamps.

must have a net monthly income at or below the poverty line. Net income is obtained by applying a standard deduction and then itemized deductions for part of labor earnings, for childcare and/or care for disabled dependents, medical expenses, and excessive shelter expenses. Finally, net-income-eligible households must meet a liquid-asset test ($2,000 if the head is under 60 years old) and vehicle-value test ($4,650 in 2001, though certain exemptions are allowed such as a car for work-related purposes). The amount of food stamps a family receives is equal to the maximum food stamp benefit level minus 0.3 times its net income. So a family with zero net income will receive the maximum benefit level. Food stamp recipients must occasionally recertify their continuing eligibility and the proper amount of benefits. The frequency of recertification depends on the state of residence and the source of a household's income.

Relative to the TANF program, and its predecessor AFDC, there is comparatively little research on the Food Stamp Program (Currie, 2003). Much of the research has focused on the effect of food stamps on food spending, the results of which tend to indicate that the typical food stamp recipient is *infra-marginal*, implying that they spend more on food than their food stamp allotment, and that the marginal propensity to consume is higher out of a dollar of food stamps than out of cash (Fraker, 1990; Breunig et al., 2001). Whereas much research indicates that food stamp receipt is positively associated with nutrient intake, Butler and Raymond (1996) find that conditional on self-selection into the Food Stamp Program, the nutrition of the elderly is not improved by receipt of food stamps. Similarly, while prior research indicates that food stamp recipients have higher rates of food insufficiency than eligible nonrecipients, research that allows for the possibility of self-selection into food stamps finds mixed evidence on the links between food insufficiency and food stamp use (Gundersen and Oliveira, 2001; Jensen, 2002; Gibson-Davis and Foster, 2006).

Conceptual Model of Food Stamp Program as Modifier of Food Insufficiency

Whether food-insufficient individuals who participate in the Food Stamp Program are better off in terms of emotional distress than food-insufficient individuals who do not participate is an open question. A positive view of the role of social policy in the lives of the poor might lead one to predict that food-insufficient individuals who participate in the Food Stamp Program are better off in terms of emotional distress than other nonparticipating individuals. The most obvious possible mechanism for this hypothesis is that individuals who participate in the Food Stamp Program have greater financial resources at their disposal than do similar nonparticipating individuals. A pure economic model would suggest that shifting the budget constraint out would increase individual utility, all things being equal—even

if the individual remained food insufficient. Other possible mechanisms exist as well, however. It is possible that individuals who transition into the Food Stamp Program view the federal government social safety net as part of their social support system and, therefore, feel instrumentally supported and connected to society, which improves their emotional well-being (Turner, Taylor, and Van Gundy, 2004). Alternatively, participation may signal that individuals are able to navigate the social welfare bureaucracy. This ability to buffer their financial conditions through formal channels may improve emotional health by fostering feelings of self-efficacy (Rothbaum, Weisz, and Snyder, 1982; Gecas and Schwalbe, 1983; Rodin, 1986).

On the other hand, it is also quite possible that food-insufficient individuals who participate in the Food Stamp Program are made worse off in term of emotional health. Proponents of the culture of poverty theory suggest that participation in federal entitlement programs erodes feelings of self-efficacy and results in dependency (Meade, 1986; Kane, 1987). Others suggest that recipients face public censure for participating in entitlement programs (Goodban, 1985; Piven and Cloward, 1993) and stigma has been shown to be detrimental to mental health (Williams et al., 1997). Finally, studies of food stamp nonparticipation among eligible individuals often list factors such as ''too many hassles'' as reasons for nonparticipation (Daponte, Sanders, and Taylor, 1999). If limited office hours, frequent recertification meetings, transportation difficulties, and the like increase levels of chronic stress, then program participants may be worse off than similar nonparticipating food-insufficient individuals in terms of emotional distress (Serido, Almeida, and Wethington, 2004).

Although we have focused on the participation decision as a dichotomy, there also may be a dosage effect in that the emotional health benefits may be a function not just of the decision to participate or not, but also depend on the level of benefits received through the Food Stamp Program. In other words, a few months of food stamps may have only a negligible effect on mental health, while many months or years of food stamps may have a larger effect on mental health. The annual food stamp benefit level is a function of months of receipt, family size, and earned and other unearned income. Households may choose to participate for fewer or more months than other similar-size households based on income and preferences for transfer program benefits. To explore the possibility of a dosage effect, we will examine models that incorporate the annual food stamp benefit level.

Data and Methods

Sample and Procedures

To test whether and to what extent the Food Stamp Program modifies the link between food insufficiency and mental health we use data from the

Panel Study of Income Dynamics (PSID). The PSID is a longitudinal study of a representative sample of U.S. men and women drawn in 1968. Although there has been considerable attrition out of the PSID since its inception, the fact that it follows children from the original 5,000 families over time and that it refreshes the sample with "births," means that the PSID continues to be representative and thus an excellent source of data for social science research (Fitzgerald, Gottschalk, and Moffitt, 1998). The PSID emphasizes the dynamic aspects of economic and demographic behavior, but its content is broad, including sociological and psychological measures.

The focal sample of our analysis is male and female household heads age 18–65 at risk of experiencing food insufficiency. Although we are interested in understanding whether and how much participation in the Food Stamp Program modifies the impact of food insufficiency on emotional distress in the general population, previous research suggests that families at greatest risk for food hardships and emotional distress are low-educated and female-headed households (Nord, Andrews, and Carlson, 2006; Kessler et al., 1994; Beverly, 2001; Bauman, 1999). Likewise, Food Stamp Program rules dictate that incomes must be low in order to qualify for food stamps, and because of the strong links between education attainment and welfare participation, the relevant risk set for food stamp use is the low-education population and female-headed households. Consequently, in addition to a sample of the population ($N = 4{,}438$), we also examine subsamples selected on high school education or below ($N = 2{,}216$) and female-headed households ($N = 983$). Although there are some concerns about possible bias in a sample selected based on income levels because of the endogeneity between income and health (Smith, 1999), for completeness we also present results for the subsample of families that are income eligible for food stamps, which are those families whose before-tax income is less than 130 percent of the family-size adjusted poverty threshold ($N = 570$).[3] In the discussion that follows, we present results for all four groups.

Measures

For our outcome of interest, we use the measure of 30-day emotional distress from the National Health Interview Survey collected as part of supplemental health modules in the PSID in 2001 and 2003. Kessler et al. (2003) indicate that the scale provides a reliable measure of serious mental illness, defined as meeting criteria for at least one of the mental health

[3]We do not include the asset test here, but Ziliak (2003) reports that asset holding among the poor is quite low. Nonetheless, it is possible that our food-stamp-eligible sample may include some individuals who would fail the asset test, though the results of Gundersen and Ziliak (2003) indicate that this omission is likely to have a negligible impact on our estimates.

diagnoses other than a substance use disorder contained within the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, and a global assessment of functioning score of less than 60, indicating the person has at least moderate symptoms with or moderate difficulty in social, occupational, or school functioning.

Our measure of mental health records how often a respondent experienced certain symptoms of psychological distress during the past 30 days. These symptoms include feelings of sadness, nervousness, restlessness, hopelessness, worthlessness, and that everything was an effort. The response codes (0–4) of the six items are summed for each person to yield a scale with a 0–24 range. The average score out of 24 was 3.2 for the general population, 3.6 for the low-education sample, 4.1 for female heads, and 4.8 for food-stamp-eligible heads.

Many studies reduce the emotional distress scale to a binary dependent variable by defining a value of 13 or more as serious psychological distress (Kessler et al., 2003; National Center for Health Statistics, 2003). In the full sample, 3.0 percent of the sample meets the criteria for high emotional distress. This is comparable to the population estimates produced by the Center for Disease Control based on the same measure in the National Health Interview Survey. In the low-education sample, the prevalence rises to 4.0 percent and for the food-stamp-eligible population the prevalence is 8.6 percent. The comparable figure for the female-headed sample is 5.3 percent. This pattern is consistent with earlier evidence that severe emotional distress is more prevalent among disadvantaged populations, especially the poor and single female-headed families (Kessler et al., 1994).

Instead of using the dichotomous measure of severe emotional distress, we chose to use the full 0–24 range in our analysis. A substantial fraction of the population has scores between 0 and 10, but the dichotomous dependent variable treats all observations with scores under 13 the same and thus suppresses important variation in the dependent variable. Moreover, our estimation techniques exploit changes over time in emotional distress, and over 70 percent of the sample report changes in emotional distress between 2001 and 2003;[4] however, only 4 percent of the sample falls into or out of the severe emotional distress category. Consequently, given the low prevalence of severe emotional distress in the general population, using the full scale allows us to model small changes in emotional health that may not rise to the level of changing a categorization of ''severe emotional distress.''

We have two key independent variables. The first is the single item food-insufficiency measure. The item asks households about the availability of food in the prior calendar year. Respondents who indicate they ''sometimes'' or ''often'' did not have enough to eat are coded as food insufficient. It is

[4]The average change for the full sample is 0.166 with a standard deviation of 3.185; 52 percent of the full sample has change scores greater than 1 point in absolute value and 25 percent has change scores greater than 3 points in absolute value.

important to note that we are not using a measure of food security, a measure whose validity has been questioned (Bhattacharya, Currie, and Haider, 2004; National Research Council, 2006). In contrast, our measure of food insufficiency has been shown to be related to food expenditures and nutritional intake (Basiotis, 1992; Cristofar and Basiotis, 1992). The second key independent variable is participation in the Food Stamp Program. We use a dichotomous measure indicating if the respondent received food stamps in the prior calendar year. Thus, both food insufficiency and food stamp participation are measured one year before emotional distress.

Finally, we include standard socioeconomic controls such as gender, age, race (white, African American, and other), education level (less than high school education, high school graduate, more than high school education), marital status (married, never married, divorce/separated/widowed), the number of children present in the household, and the age of youngest child. We include income in the results shown here but exclude it in sensitivity analyses (available from the author) because of possible concerns of endogeneity between income and mental health. Results are unchanged from those presented when income is excluded.

Methods

We are interested in formally modeling the relationship between emotional distress and food insufficiency, and the attendant role of the food stamps to possibly modify the link between unmet food need and mental health. The dependent variable reflects emotional health over the past 30 days, whereas both food insufficiency and food stamp participation refer to the previous year. This timing difference likely eliminates any direct simultaneity between emotional distress, unmet food need, and food stamp use (i.e., the possibility that distress in March 2003 (when the 2003 survey began) leads to food insufficiency in calendar year 2002), but does not rule out possible shared, persistent autocorrelation through time-invariant unobserved heterogeneity or possible "regression-to-the-mean" effects in emotional distress over time.

To address the possible role of time-invariant unobserved heterogeneity, such as shared characteristics that could result in increased emotional distress scores and lead to food insufficiency and/or food stamp participation, we include fixed effects for each individual. We then use the first difference estimator to eliminate person-specific and time-invariant unobserved heterogeneity and we estimate the following model:

$$\Delta Y_{it} = \beta(\Delta FDINSUF_{it-1}) + \mu(\Delta FSP_{it-1}) + \delta(\Delta FSP * FDINSUF_{it-1}) + \Delta X_{it}\gamma + \Delta\eta_{it}, \quad (1)$$

where Δ refers to the two-year difference operator such that $\Delta Y_{it} = Y_{i2003} - Y_{i2001}$ for our measure of emotional distress and because

food insufficiency refers to use in the previous year $\Delta FDINSUF_{it-1} = FDINSUF_{i2002} - FDINSUF_{i2000}$.

In Equation (1), *FSP* takes a value of 1 if the family receives food stamps in the prior year, and a value of 0 otherwise, and thus ΔFSP_{it-1} is the change in food stamp participation. For the dosage effect models, we will also append a variable for the change in the log dollar value of food stamps received in the prior year. The term $\Delta FSP^{*}FDINSF_{it-1}$ is constructed by first interacting the food insufficiency and food stamp variables prior to differencing, and allows for the possibility that food insufficiency may affect emotional distress for persons in the Food Stamp Program differently than for those not in the program.[5] X_{it} is the vector of socioeconomic factors assumed to affect mental health mentioned in the previous subsection, and η_{it} is a random error term. Of course, variables that do not change over time drop out of the regression model after first differencing. Finally, in order to control for regression to the mean in emotional distress—the fact that for some individuals emotional distress may be transitorily high in 2001 because of some negative event and that by 2003 mental health returns to a typical level for that person—we also include a measure of baseline emotional distress in the model. This should control for any additional autocorrelation in emotional distress not swept away by the first difference transformation.

Our discussions in the previous sections permit us to construct testable hypotheses in terms of the coefficients in Equation (1). Evidence from community-level studies suggests a positive link between food insufficiency and severe emotional distress; thus, we hypothesize that β will be positive. Specifically, we will conduct a one-tail test on this coefficient where the null is $\beta \leq 0$ and the alternative is $\beta > 0$. If food stamps are effective at modifying the potential deleterious effects of food insufficiency on mental health, then we expect a negative sign on the interaction term δ. Alternatively, if the "culture of poverty" and/or stigma view prevails, then the interaction term would have a positive sign. These considerations lead us to pose a two-tailed hypothesis test of $\delta = 0$ against the alternative of $\delta \neq 0$.

Results

Table 1 presents descriptive statistics (means and standard deviations) for selected outcomes and demographics across the four separate samples for the pooled data from 2001 and 2003. Rates of food insufficiency are on the order of 1.9 percent in the general population, but they are closer to 3 percent among low-educated and female-headed families and 8 percent in food-stamp-eligible families. Likewise, food stamp participation rates are 6.8 percent overall, but upward of 11.2 percent among families whose head has

[5]In the language of Baron and Kenny (1986), we are testing the ability of the Food Stamp Program to moderate the relationship between food insufficiency and emotional distress.

TABLE 1

Selected Summary Statistics (Standard Errors in Parenthesis)

	Full Sample	Low Education	Female Head	Food Stamp Eligible
Average emotional distress	3.22	3.61	4.15	4.82
High emotional distress (>13)	3.01	3.99	5.29	8.60
Food insufficient	0.019	0.031	0.030	0.079
	(0.137)	(0.174)	(0.169)	(0.270)
Food stamp participation	0.068	0.112	0.198	0.372
	(0.251)	(0.315)	(0.399)	(0.484)
Food stamp benefit level	$273.56	$270.35	$247.70	$266.28
	(426.05)	(441.33)	(415.05)	(247.59)
Female head	0.222	0.259	1.000	0.544
	(0.416)	(0.438)	(0.000)	(0.498)
Less than high school	0.179	0.357	0.246	0.468
	(0.384)	(0.479)	(0.431)	(0.499)
High school graduate	0.322	0.643	0.338	0.347
	(0.467)	(0.479)	(0.473)	(0.476)
Some college	0.253	0.551	0.273	0.140
	(0.435)	(0.497)	(0.445)	(0.348)
College or more	0.246	0.239	0.143	0.023
	(0.431)	(0.427)	(0.351)	(0.151)
Married	0.599	0.203	0.552	0.257
	(0.490)	(0.402)	(0.497)	(0.437)
Ever married	0.219	0.511	0.447	0.355
	(0.414)	(0.450)	(0.497)	(0.479)
Never married	0.177	0.392	0.369	0.405
	(0.382)	(0.488)	(0.483)	(0.491)
White	0.616	0.097	0.578	0.270
	(0.486)	(0.295)	(0.494)	(0.444)
Black	0.305	42.492	0.053	0.595
	(0.460)	(10.190)	(0.224)	(0.491)
Other	0.079	1.114	42.360	0.135
	(0.269)	(1.296)	(10.605)	(0.342)
Age	43.209	4.224	1.080	40.789
	(10.178)	(5.345)	(1.313)	(10.327)
Number of children	1.014		4.356	1.735
	(1.210)		(5.416)	(1.630)
Age of youngest child	4.055			4.479
	(5.347)			(4.864)

a high school education or less and 19.8 percent among families with a female head. Among food-stamp-eligible households, rates of food stamp participation are 37.2 percent. The average annual benefit level of food stamps among participants is approximately $270 for the full sample, low-education sample, and the food-stamp-eligible sample and $248 for the female-headed sample. Examining the other variables in the table shows the

pattern to be quite consistent: low-educated and food-stamp-eligible families are less likely to be married (by construction this is true for female heads), less likely to be white, more likely to never have been married, and have more children.

In Table 2 we present first difference estimates of the effects of food insufficiency, food stamps, and the interaction of food stamps with food insufficiency on emotional distress. For parsimony we present coefficients only on the key variables but full results are available from the authors on request. The standard errors are robust to heteroskedasticity of unknown form.

Beginning with our baseline Model 1, we find that food insufficiency is associated with a statistically significant increase in emotional distress. Substantively, the increase is on the order of one-half of a standard deviation in the emotional distress score and the magnitude of the coefficient is quite similar across the four subsamples. These findings generalize to national samples the results of prior community-based studies that indicated a negative effect of food insufficiency on mental health (Siefert et al., 2001; Heflin et al., 2005; Casey et al., 2004; Laraia et al., 2006).

We extend beyond the prior literature in Model 2 by examining if individuals who are food insufficient and participate in the Food Stamp Program are better off than individuals who are food insufficient but who do not choose to participate in the Food Stamp Program. With the inclusion of food stamp participation in the model, we find that the direct effect of being food insufficient on emotional distress falls by about 30 percent relative to Model 1 in both the full sample and the low-education sample, but remains consistent with that shown for the female-headed sample. In the food-stamp-eligible sample, the direct effect of food insufficiency falls to zero when food stamp participation is included in the model. Both the base term for food stamp participation and its interaction term with food insufficiency are statistically insignificant in all four models, suggesting no moderating role of food stamps in this specification.

To examine the potential moderating role of food stamps on emotional distress more closely, however, in Table 3 we present the partial effect of food insufficiency on emotional distress for the individual who does not participate in the Food Stamp Program (Column 1) and contrast that to the individual who does participate (Column 2). The coefficient on food insufficiency from Model 2 of Table 3 for the full sample indicates that the estimated change in emotional distress score for an individual who is food insufficient but not participating in the Food Stamp Program is 1.38 ($p = 0.026$), as also shown in Table 2. In contrast, the predicted change in the emotional distress score for someone who is both food insufficient and a food stamp participant is 3.02 ($p = 0.001$). This effect is nearly a standard deviation above the mean level of emotional distress (and double the base effect of 1.38) and clearly rejects the null of zero. However, based on the p values in Column 3 of Table 3, we cannot reject the null hypothesis of

TABLE 2

Fixed-Effect Models of Emotional Distress

	Model 1	Model 2	Model 3	Model 4
Full Sample (N = *4,438*)				
Food insufficiency	1.961	1.380	0.979	1.020
	(0.550)	(0.618)	(0.615)	(0.621)
Food stamp participation		0.419	0.191	0.001
		(0.306)	(0.352)	(0.347)
Food stamp benefit amount			0.112	0.118
			(0.060)	(0.060)
Food insufficiency * Food stamp participation		1.642	2.096	3.697
		(1.070)	(0.981)	(1.261)
Food insufficiency * Food stamp benefit amount			0.551	0.544
			(0.194)	(0.2000)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002				−3.610
				(1.730)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002 * Benefit amount				−0.088
				(0.591)
*Low-Education Sample (*N = *2,216)*				
Food insufficiency	1.930	1.363	1.063	1.107
	(0.617)	(0.712)	(0.701)	(0.708)
Food stamp participation		0.474	0.360	0.209
		(0.337)	(0.399)	(0.393)
Food stamp benefit amount			0.073	0.080
			(0.071)	(0.070)
Food insufficiency * Food stamp participation		1.610	1.804	3.051
		(1.134)	(1.109)	(1.349)
Food insufficiency * Food stamp benefit amount			0.555	0.533
			(0.207)	(0.222)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002				−2.519
				(1.875)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002 * Benefit amount				−0.037
				(0.350)
*Female-Head Sample (*N = *983)*				
Food insufficiency	1.879	2.031	1.736	1.909
	(0.874)	(1.118)	(1.203)	(1.213)
Food stamp participation		0.076	−0.121	−0.275
		(0.389)	(0.442)	(0.441)
Food stamp benefit amount			0.091	0.092
			(0.076)	(0.075)
Food insufficiency * Food stamp participation		−0.287	0.224	3.098
		(1.610)	(1.838)	(1.712)
Food insufficiency * Food stamp benefit amount			0.220	0.149
			(0.279)	(0.245)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002				−3.938
				(2.028)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002 * Benefit amount				1.179
				(1.135)

TABLE 2—continued

	Model 1	Model 2	Model 3	Model 4
Food-Stamp-Eligible Sample (N = 570)				
Food insufficiency	1.620	0.488	0.057	0.143
	(0.738)	(1.043)	(0.969)	(0.984)
Food stamp participation		0.105	−0.160	−0.396
		(0.448)	(0.530)	(0.525)
Food stamp benefit			0.150	0.160
			(0.089)	(0.088)
Food insufficiency * Food stamp participation		2.069	2.852	4.286
		(1.259)	(1.271)	(1.520)
Food insufficiency* Food stamp benefit amount			0.575	0.586
			(0.261)	(0.281)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002				−2.668
				(1.757)
Food insufficiency * Food stamp participation in 1998, 2000, and 2002 * Benefit amount				0.160
				(0.619)

NOTE: Standard errors are presented in parenthesis.

no difference between the two estimates in each of the four samples from Model 2. Although there is a qualitative distinction in the effect of food insufficiency on emotional distress between food stamp participants and nonparticipants in this model, the statistical evidence cannot reject that they are the same at usual tolerance levels.

In Model 3 of Table 3 we extend the specification further by testing for a dosage effect of food stamp benefit levels by controlling for the change in the log of the food stamp benefit amount both directly and through an interaction term with food insufficiency. Prior to interacting with food insufficiency, we de-mean the log food stamp benefit amount so that the direct coefficient on food stamp benefits reflects the effect at the mean level and the interaction term reflects deviations from the mean. We find that once we include the food stamp benefit level, the base term of food insufficiency is no longer statistically significant in any of the four samples at usual significance levels. However, in the full sample, the interaction term between participation and food insufficiency is large (two-thirds of a standard deviation in emotional distress) and statistically significant at the 5 percent level. Furthermore, in the full sample there is strong evidence of a negative dosage effect between food insufficiency and food stamp benefit levels. Table 3 suggests that for a food stamp recipient with benefits one standard deviation above the mean the effect of food insufficiency on emotional distress is about three times higher compared to those who do not participate in the Food Stamp Program. Similar results are obtained in the low-education sample. Additionally, once we control for food stamp benefit levels, we can reject the null hypothesis that the effect of food insufficiency on emotional distress is the same for both food stamp participants and nonparticipants in both the full sample and the low-education sample. This suggests that for

TABLE 3

Partial Effect of Food Insufficiency on Emotional Distress by Food Stamp Program Status

	Food Insufficient & No Food Stamp Participation (A)	Food Insufficient & Food Stamp Participation (B)	Probability A≠B
*Full Sample (*N = *4,438)*			
Model 2: Food stamp participation effect	1.38 [0.026]	3.022 [0.001]	[0.120]
Model 3: Food stamp participation & dosage effect	0.979 [0.112]	3.536 [0.001]	[0.022]
Model 4: Long-term food stamp participation & dosage effect	1.020 [0.101]	1.563 [0.349]	[0.760]
Short-term food stamp Participation & dosage effect	1.020 [0.101]	5.261 [0.000]	[0.001]
*Low-Education Sample (*N = *2,216)*			
Model 2: Food stamp participation effect	1.363 [0.056]	2.972 [0.002]	[0.156]
Model 3: Food stamp participation & dosage effect	1.063 [0.129]	3.423 [0.001]	[0.043]
Model 4: Long-term food stamp participation & dosage effect	1.107 [0.118]	2.135 [0.229]	[0.590]
Short-term food stamp participation & dosage effect	1.107 [0.118]	4.691 [0.000]	[0.001]
*Female-Headed Sample (*N = *983)*			
Model 2: Food stamp participation effect	2.031 [0.070]	1.744 [0.893]	[0.859]
Model 3: Food stamp participation & dosage effect	1.736 [0.149]	2.179 [0.135]	[0.825]
Model 4: Long-term food stamp participation & dosage effect	1.901 [0.116]	2.398 [0.305]	[0.852]
Short-term food stamp participation & dosage effect	1.901 [0.116]	5.157 [0.000]	[0.071]
*Food-Stamp-Eligible Sample (*N = *570)*			
Model 2: Food stamp participation effect	0.488 [0.640]	2.558 [0.004]	0.101
Model 3: Food stamp participation & dosage effect	0.057 [0.953]	1.744 [0.162]	0.071
Model 4: Long-term food stamp participation & dosage effect	0.143 [0.885]	2.508 [0.114]	0.206
Short-term food stamp participation & dosage effect	0.143 [0.885]	5.015 [0.000]	0.003

NOTE: In the first two columns, the first number represents the additive effect of experiencing a change in food insufficiency status and food stamp participation. The dosage effect for food stamps is evaluated as a one standard deviation change from average annual food stamp benefit. The second number, in brackets, provides the probability that the effect differs from zero.

these two groups, among food-insufficient individuals, the negative mental health aspects of food stamp participation dominate the positive mental health aspects.

In the female-headed sample, there is no relationship between food stamp participation or food stamp benefit level and mental health. In fact, in Model 3, food insufficiency is no longer found to be deleterious for mental health among female-headed households. Although this finding is at odds with prior work on narrower community-level samples, our model controls for both time-invariant unmeasured heterogeneity and regression to the mean. Additionally, we include measures of both participation and benefit level of the Food Stamp Program. Sensitivity analyses for these results are available in an appendix from the authors.[6]

Examining the food-stamp-eligible sample, results are mixed. When controlling for the food stamp benefit amount, the interaction term between participation and food insufficiency is large and statistically significant at the 5 percent level. Furthermore, once again in the food-stamp-eligible sample there is strong evidence of a negative dosage effect between food insufficiency and food stamp benefit levels. Table 3 suggests that for a food stamp recipient with benefits one standard deviation above the mean, the effect of food insufficiency on emotional distress is about two times higher compared to those who do not participate in the Food Stamp Program.

The other covariates used in the models in Table 2 are consistent with prior research on mental health. Being either currently married or never married is protective for mental health compared to those who are divorced, separated, or widowed. Mental health is positively associated with the number of children in the household but negatively associated with the age of youngest child. Emotional distress is not related to the change in age or family income.

The results to this point indicate that among the general population the negative effects of food stamp participation on emotional distress outweigh the positive and this effect is intensified for food-insufficient individuals. To explore further the finding of a potential detrimental effect on mental health of food stamps among the food-insufficient population, we investigated whether there might be so-called heterogeneous treatment effects based on the length of time in the Food Stamp Program. We created an indicator variable that equaled 1 if the family reported receiving food stamps in each of the 1999, 2001, and 2003 waves of the PSID, and interacted this variable with food insufficiency and added the extra regressor to our estimating equation (note that the dummy variable for persistent food stamp participation drops out of the model with first differencing). The addition of this

[6]A further check into the functional form of the dependent variable was conducted by using a conditional fixed-effect negative binomial estimator, which treats the outcome variable like a nonnegative count variable generated by a Poisson process with overdispersion. We find results that are consistent with those presented in Table 2.

interaction term will permit us to identify whether persistent food stamp use modifies the effect of food insufficiency on mental health differently than periods of transition into and out of the program. We also created a second term that captures the change in the (de-meaned) food stamp benefit level for households consistently on food stamps in 1999, 2001, and 2003 but who experienced a change in food insufficiency.

Consistent with Model 3 for the full sample, in Model 4 of Table 2 the direct effect of food insufficiency is not found to be related to emotional distress. The effect of the Food Stamp Program, however, depends on the timing of receipt. As Table 2 indicates, for individuals who are persistently in the program and report food insufficiency, there is no evidence of an additional harmful effect on mental health of being in the program and food insufficient (the positive coefficient of 3.697 on current food stamp use is negated by the negative coefficient of –3.610 on persistent food stamp use). See also Table 3. In each of the four samples, the estimated change in emotional distress associated with the additive effect of long-term food stamp participation is not different from zero or different from estimated change in emotional distress from reporting food insufficiency and not participating in the Food Stamp Program. This suggests that among food-insufficient individuals who participate in the Food Stamp Program, the negative mental health aspects of program participation are balanced by the positive mental health aspects.[7]

For individuals who are transitioning into the program at the same time in which they also report food insufficiency, there is a positive, large, and significant relationship with emotional distress. The magnitude is robust across the four samples and indicates that for an individual who reports a change in food-insufficient status and experiences a change in his or her food stamp participation status and benefits of one standard deviation from the mean, the estimated change in emotional distress score is approximately five points, or about 1.5 standard deviations above the mean of emotional distress. Tests of significance indicate that the short-term effect is both different from zero and from the food-insufficient coefficient alone in all four samples. This suggests that stigma, ''hassles,'' and welfare culture associated with program participation may be detrimental to food-insufficient families. Model 4 shows that the base case overstated the harmful effects of food insufficiency among the long-term food stamp population, and understated the harmful effects among those transitioning into the program.

The differential effects between long-term food stamp use and transitional periods of use could be explained by the fact that long-term participants have acquired certain adaptive skills—the ability to navigate the welfare system and to cope with scarce financial resources—that lessen the harmful

[7]An additional interpretation of this result is that there are no effects—either positive or negative—for food-insufficient families of participation in the Food Stamp Program on emotional distress.

effects of food insufficiency on emotional health. Alternatively, periods of transition into the program, coupled with transitions into food insufficiency, are suggestive of large negative shocks that are not easily negotiated. One implication is that our findings are inconsistent with the existence of a cumulative negative effect of food stamp use on emotional distress among the food-insufficient population.

Conclusion

Using data from the Panel Study for Income Dynamics and methods that address unobserved heterogeneity, we generalize a recurring finding from community-based studies to national samples that food insufficiency is detrimental to emotional health. We then examined the possibility that participation in the Food Stamp Program may modify the negative health effects of being food insufficient. We find that, conditional on the food stamp benefit amount, the emotional distress associated with food insufficiency is higher among food stamp participants. Moreover, we find evidence of a dosage effect such that food-insufficient individuals who receive higher amounts of food stamp benefits suffer greater emotional distress than food-insufficient individuals who receive lower levels of food stamp benefits. However, the negative mental health effects of food insufficiency and food stamp participation are driven primarily by periods of transition into the Food Stamp Program and into food insufficiency.

We have attempted to be cautious in how far we push causal links between food stamp use and emotional distress. Our empirical model did control for time-invariant unobserved heterogeneity and regression to the mean in emotional distress, and thus netted out a significant share of possible endogeneity between food insufficiency, food stamp use, and mental health. However, we do not have information on specific mechanisms that might lead to our negative finding that the effect of food insufficiency on emotional distress is worse among food stamp participants, at least during the period of transition. Our results do suggest that further implementation evaluation analysis is necessary to pinpoint the causal mechanisms at work that affect the emotional distress of new participants in the Food Stamp Program. For example, are certain eligibility and certification procedures and office cultures associated with more distress than others? Is the length of participation or the size of the monthly benefit related to experiences of stigma or feelings of dependency? It is critical to further our understanding of how a public safety net program designed to improve the well-being of eligible populations appears to make them worse off, at least temporarily, in the area mental health.

Nonetheless, the policy implications of this research are clear. Efforts must be made to modify the Food Stamp Program to lessen the burden of participation on mental health. One policy innovation with promise is the

web-based application system, currently introduced in at least five states, that removes the need for a face-to-face interview during a lengthy office visit within usual workday hours. Instead, applications can be made at the time and place of the client's choosing. Web systems have the potential to reduce stigma as well as make it easier for working individuals to obtain benefits. Other avenues to reduce client burden must be explored as well. The value of the Food Stamp Program has been demonstrated in terms of supporting child and adult nutrition. However, reform is needed to address the negative unintended consequences in terms of mental health of program participation.

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