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Associations between Participation in the National School Lunch Program, Food Insecurity, and Child Well-Being

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Abstract

This paper examines the associations between food insecurity, participation in the National School Lunch Program (NSLP), and children's well-being. We address problems of selection by restricting our sample to children in families in which at least one child participates in the NSLP. Results suggest that food insecurity is associated with behavioral problems, but not health or cognitive difficulties, among children. Additionally, after adjusting for selection, participation in the NSLP does not significantly impact child outcomes; the exception is for children in families experiencing child hunger, for whom participation is associated with reduced behavioral problems.

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INTRODUCTION

A direct measure of food insecurity has recently become available in the United States, leading to a growing body of research on the determinants and consequences of food insecurity. Federal food assistance programs, such as the National School Lunch Program (NSLP), are believed to have the potential to reduce food insecurity among children and to have direct effects on children's well-being. Because food insecure children are likely to participate in food assistance programs, and because of the potential for such programs to influence both food insecurity and child well-being, it is important to consider the relative effects of both program participation and food insecurity on children's well-being. This paper examines these effects for a nationally representative sample of U.S. children.

Using data from the 1997 Child Development Supplement to the Panel Study of Income Dynamics (CDS-PSID), this paper examines two specific questions. First, what child- and family-specific factors predict food insecurity and participation in the NSLP? Second, what are the relative associations between food insecurity, participating in the NSLP, and the well-being of school-age children? The results of this analysis provide much-needed insight into the role of a widely used food assistance program in influencing the well-being of U.S. children.

We first describe research on the associations between food insecurity and child development. Next, we describe the existing body of research on the NSLP. We then present information on our sample and methods, and conclude with a presentation and discussion of our results.

FOOD INSECURITY AND CHILD DEVELOPMENT

Food security is defined by the U.S. Department of Agriculture (USDA) as "access…to enough food for an active, healthy life" (USDA, 2000a). Food insecurity for the entire population was measured directly for the first time with an 18-item measure included in the April 1995 Current Population Survey (CPS), creating four categories of security: food secure, food insecure without hunger, food insecure with moderate hunger (meaning that an adult in the family has gone hungry), and food insecure with severe hunger (meaning that at least one child in the family has gone hungry) (USDA, 1997). In 1999, 10 percent of U.S. households were food insecure, with 3 percent (3.1 million) experiencing hunger (USDA, 2000b). Food insecurity is highly correlated with poverty; in the April 1997 CPS, 33 percent of poor households were food insecure (USDA, 1997).

Measures of food insecurity are associated with deficits in nutritional consumption. Using a 24-hour diet recall, as well as a survey of household food supplies, Kendall, Olson, and Frongillo (1996) found that food insecure households have lower rates of consumption of fruits and vegetables and less food on hand than do food secure households, providing validation that the USDA measure of food insecurity is associated with actual food intake.

The effects of USDA-measured food insecurity on the development of U.S. children has not been widely researched, although rates of food insecurity are twice as high in households with children than in those without (Bickel, Carlson, and Nord, 1999). Research in developing countries finds that poor nutrition is related to cognitive delays and temperamental difficulties, among other long-term problems (see Gardner et al., 1999; Aboud and Alemu, 1995; Grantham-McGregor et al., 1994). Additionally, using the CDS-PSID, Reid (2000) found links between food insecurity and increased behavioral problems, as well as lower cognitive test scores. Food insecurity was not related to children's health.

Although research examining the effects of food insecurity on children is relatively limited, a larger body of research examines the influence of food insufficiency on child and family well-being. Food insufficiency is assessed in surveys with a single item indicating that a family "often or sometimes does

not have enough food to eat." In a series of studies, Alaimo, Olson, and Frongillo (2001) and Alaimo et al. (2001) found food insufficiency to be associated with adverse outcomes among children, including lower math scores, greater problems getting along with others, poor health status, and more frequent illness. Among low-income women, food insufficiency is correlated with depression, lack of a high school degree, alcohol or drug dependence, and experiences of domestic violence (Corcoran, Heflin, and Siefert, 1999).

Recent research by Gundersen and Oliveria (2001) investigates the relationship between food insufficiency and the Food Stamp Program, observing that food stamp participants have higher food insufficiency rates than eligible nonparticipants, even after controlling for other factors. Gundersen and Oliveria argue that this is due to the self-selection of food-insufficient households into the Food Stamp Program. Using simultaneous-equations models, they show that when selection is controlled, food stamp recipients have the same probability of food insufficiency as nonrecipients. These results underscore the importance of addressing the issue of potential selection bias in estimating the relationship between food insecurity, food assistance programs, and child outcomes.

Food assistance programs, such as the NSLP, have the potential to reduce levels of food insecurity among U.S. children. Thus, when examining the associations between food insecurity and child well-being, it is important also to examine the role of participation in such programs in determining child outcomes. We next describe and summarize the relevant research on the NSLP.

THE NATIONAL SCHOOL LUNCH PROGRAM

The NSLP is a federally sponsored nutrition program serving approximately 26 million children a day. The program's estimated expenditures were $5.8 billion in 1998 (Oliveira, 1999). Recent estimates indicate that the NSLP is available to 92 percent of U.S. students, and that 56 percent of these students participate in the program (Burghardt and Devaney, 1995). The aim of the program is to provide nutritious foods to school-age children at no, or reduced, cost. Eligibility for free NSLP lunches is limited

to families whose incomes are at or below 135 percent of the poverty line. Reduced-price lunches are available to families whose incomes are between 135 percent and 185 percent of the poverty line. Approximately 47 percent of all school lunches are served to children whose family incomes are less than 185 percent of the poverty level. The NSLP also subsidizes full-priced lunches in most schools, so virtually all school children may benefit from the NSLP (Devaney, Ellwood, and Love, 1997).

Lunches provided by this program are expected to enable students to consume at least one-third of the recommended daily allowance (RDA) of specific nutrients and to have the following core items: meat or meat alternative, two or more vegetables and fruits, whole-grain or enriched breads, and milk.

Many of the available evaluations of the NSLP document the relationship between participating in the program and increased nutrient intake (Burghardt and Devaney, 1995). There is some concern, however, that while the NSLP is effective in delivering on the promise of achieving RDA goals, the lunches are likely to be higher in fat and saturated fat than recommended by the *Dietary Guidelines for Americans* (Meyers et al., 1989). For example, Gleason and Suitor (2001) find that NSLP participation leads to increased intake of six vitamins and minerals and reduced intake of sugars over 24 hours but is also associated with an increased intake of fats.

Research examining the effects of the NSLP on child anthropometry has found that among children younger than 10, participation in the NSLP is linked to a lower likelihood of falling below the 25th percentile of weight-for-height (Vermeersch, Hanes, and Gale, 1984). One of the few studies on the links between participation in food assistance programs and performance outcomes for children examined the effects of the School Breakfast Program (SBP) on the school performance of children in Massachusetts (Meyers et al., 1989). This research compared children's achievement test scores before and after the SBP was implemented in the schools, finding evidence of higher scores among children who participated in the SBP. Meyers et al. also found beneficial effects of the SBP on school tardiness and absences. Although this study evaluated the effects of the SBP, not the NSLP, it does suggest some potential linkages between food assistance programs and child performance outcomes.

SAMPLE

We study the associations between NSLP participation, food insecurity and child outcomes using the 1997 CDS-PSID. The PSID is a longitudinal study of a representative sample of U.S. families. Since 1968 the PSID has followed and interviewed annually a nationally representative sample of about 5,000 families. Split-off families are followed when children leave home, when couples divorce, and when more complicated changes break families apart. Except for problems of immigration, this procedure produces an unbiased population sample each year (Fitzgerald, Gottschalk, and Moffitt, 1998).

In 1997, the PSID supplemented its core data collection with data on parents and a maximum of two of their children aged 12 or younger, a project known as the Child Development Supplement. The aim was to produce a comprehensive, nationally representative, longitudinal database of children and their families that researchers could use to study the dynamic process of early human capital formation (only the 1997 wave of data is currently available). The supplement includes reliable assessments of the cognitive, behavioral, and health status of 3,500 children obtained from the primary caregiver (usually the mother), an absent parent, teachers and school administrators, and the child. One of the strengths of the CDS-PSID is its link to multiple years of data on the children's parents.

Our analyses focus on children aged 6–12 in 1997, for whom we have measures of participation in the NSLP in 1997.

MEASUREMENT

NSLP Participation. We measure participation in the NSLP with a dichotomous variable asking the primary caregiver if his or her 6- to 12-year-old child currently receives a free or reduced-price lunch at school.

Food Insecurity. Food insecurity is measured using the 18-item scale developed by the USDA. Food insecurity is assessed at the household level and captures experiences (in the last 12 months) such as running out of food, perceptions that the food in a household is of inadequate quality or quantity, and

reduced food intake by adults or children, all due to financial constraints (USDA, 2000a). According to the coding scheme developed by the USDA (USDA, 2000a), families affirming three or more of the 18 items are classified as food insecure. In our analyses, we use three different measures of food insecurity.

First, we employ all 18 items in a continuous scale developed by the USDA through the use of a Rasch coding model. The Rasch coding model is a linear scale that depends on the number of affirmative responses to a series of increasingly severe food security items (for more information on the Rasch scale, see USDA, 2000a). The intervals of this scale are meaningful, and an increase in the scale indicates increased severity of food insecurity. In the Rasch scale, a household that has affirmed no items is given a score of zero. However, this is problematic because it assumes that the difference between affirming zero items and affirming one item is the same as any other interval (the difference between affirming five items and affirming six, for example). To address this, we followed a procedure suggested by researchers at the USDA (Mark Nord, personal communication, 2001). Specifically, we regressed each of our outcomes of interest on the Rasch score, including a dummy for a raw score of zero. We then calculated, from the regression coefficients, the "correct" score for those households that affirm no items (for all outcomes of interest, the score was -3.4 ± 0.01). We then recoded those households that affirmed no items to have a score of -3.4. Most of our analyses use this continuous measure of food insecurity.

In other analyses, we classify families using a measure of "marginal" food insecurity, indicating families that responded affirmatively to one or two of the items in the food insecurity scale, but, because they did not affirm three or more items, are not classified as food insecure. Finally, other analyses use a simple indicator of whether a household is food insecure, which is indicated by an affirmative response to at least three of the 18 items in the overall scale (USDA, 2000a).

The USDA coding also allows a more refined classification of families into categories of food secure, food insecure without hunger, food insecure with moderate hunger (adults skipping meals), and food insecure with severe hunger (children skipping meals). We tested the predictive power of these four categories and did not find any additional predictive ability when compared with the simple indicator of

food insecurity. Very few children in the CDS-PSID live in households classified as insecure with hunger. Among our sample of 6- to 12-year-olds, only 2 percent of the sample lived in households experiencing moderate hunger, and only 0.5 percent lived in households experiencing severe hunger.

Child Outcomes. We measure child outcomes in three areas: health, behavioral adjustment, and achievement. We measure child health with a variable indicating whether the child has any health limitations that affect participation in childhood activities, school attendance, or the performance of school work. A child with a limitation in any area is given a score of 1, the rest are given scores of 0.

School-age children's behavioral adjustment is measured with the Behavior Problems Index (BPI), adapted from the Achenbach and Edlebrock behavioral checklist (Achenbach and Edlebrock, 1981) and measuring both externalizing behavior (20 items; examples include bullying other children or destroying things) and internalizing behavior (10 items; examples include moodiness or fearfulness). For each example of child behavior, mothers report whether it is never true (1), sometimes true (2), or often true (3), such that a higher score indicates greater behavioral problems. We also use a 10-item index of positive behavior, in which mothers report whether a specific behavior (examples include cooperating with others and sharing) is not at all like child (1), totally like child (5), or somewhere in between.

Children's achievement is assessed with two measures from the Woodcock-Johnson Achievement Tests–Revised (Mather, 1991): math achievement (a combination of scores on applied problems and calculation tests) and reading achievement (a combination of scores on letter-word and passage comprehension tests).

Control Measures. In all analyses, we also control for an extensive set of background characteristics of the child's family. Each of these controls is theorized to be associated both with child outcomes and with the measures of household food insecurity and children's participation in the NSLP. The control measures are average family income in 1996 dollars (over the years 1994 to 1997); number of siblings; the percentage of time a child's parents owned their own home between 1994 and 1997; maternal and paternal educational attainment; child gender, age, race, and ethnicity; maternal age; health

insurance status of the child; the percentage of time a child's family received food stamps between 1994 and 1997; the percentage of time spent in a married-couple family between 1994 and 1997; whether the primary caregiver smokes; whether the primary caregiver drinks; primary caregiver's score on an assessment of self-esteem (10 items); primary caregiver's score on an assessment of personal control, or efficacy (6 items); primary caregiver's score on a measure of depression (10 items); and primary caregiver's self-report of aggravation in parenting (4 items). Because of missing data on the last six of these items, all analyses include a missing-data dummy for each item. It is important to note that, although only one wave of CDS-PSID data is currently available, it is possible to control for characteristics of children's families spanning several years prior to 1997 by linking children to information on their families in the PSID main file.

METHOD

First, we examine the child- and family-specific factors associated with participation in the NSLP and with the various measures of food insecurity described above. Next, we examine the relative effects of food insecurity and NSLP participation on children's well-being in the area of health, behavioral adjustment, and test scores.

Our first set of analyses uses logistic regression and ordinary least squares (OLS) methods to estimate equations 1 and 2, in which various measures of household food insecurity for family *f* at time *t*, ($INSEC_{ft}$) and NLSP participation ($NSLP_{ift}$) for child *i* in family *f* at time *t* are a function of the child- (X_{ift}) and family-specific (X_{ft}) control measures detailed above. Each equation also contains a child-specific error term (e_{ift}) and a family-specific error term (e_{ft}).

$$\mathbf{INSEC_{ft} = \alpha_{ift} + \beta_2 X_{ift} + \beta_3 X_{ft} + e_{ift} + e_{ft}} \quad \textbf{(1)}$$

$$\mathbf{NSLP_{ift} = \alpha_{ift} + \beta_2 X_{ift} + \beta_3 X_{ft} + e_{ift} + e_{ft}} \quad \textbf{(2)}$$

In equation 3, using OLS (or logistic regression when predicting the indicator of health limitations), the outcomes of a child in 1997 ($CHILD_{ift}$) are a function of demographic controls at the

child and family level (X_{ift} and X_{ft}) and an indicator for participation in the NSLP ($NSLP_{ift}$) as well as the continuous measure of household food insecurity in 1997($INSEC_{ft}$).[1]

$$\mathbf{CHILD_{ift} = \alpha_{ift} + \beta_1 INSEC_{ft} + \beta_2 NSLP_{ift} + \beta_3 X_{ift} + \beta_4 X_{ft} + e_{ift} + e_{ft}} \qquad \mathbf{(3)}$$

We also address issues of selection that may bias estimates of the effects of food assistance programs on individual outcomes. This bias may be either positive or negative. Positive bias would occur if families that perform better on some unobservable measures, such as mental health or family functioning, are more likely to participate in the NSLP than families that are worse off on these measures. Negative bias would occur if families that are doing poorly in unobservable ways are more likely to participate in the NSLP. Despite the extensive set of control variables available in the PSID, we may not be able to account for all of the ways in which families that use the NSLP may differ from those that do not, leading to bias in the estimates of equations 1–3. Specifically, the family-specific error-term (e_{ft}) may be correlated with the likelihood that a specific child participates in the NSLP and with the measures of child well-being.

To deal with issues of selection on the basis of family-level unobservables, we perform analyses in which the sample is restricted to children in families in which at least one child is participating in the NSLP. In our sample of 1,854 children aged 6–12, 928 children lived in families in which at least one child was participating in the NSLP. Of these children, 73 did not participate in the NSLP themselves. This is the strategy used by Oliveira and Gunderson (2000) when estimating the impact of WIC participation on children's nutrient intake. This method attempts to control for the self-selection of certain families into NSLP participation on the basis of unobservable family-level characteristics.

One concern with this method is that, although family-level unobservable characteristics are controlled, it is still possible that child-level unobservable characteristics may differ between children participating in the NSLP and children not participating and that these differences may influence the child

[1]Analyses examining the other measures of food insecurity did not differ substantially from those using the continuous measure.

outcomes examined here. To test this, we examined the measures in our model that differ between siblings: child age, child sex, and whether a child has health insurance. A Chow test was used to examine whether the associations between these measures and child outcomes differ between children in the NSLP-receiving families that are not receiving the NSLP themselves and children in NSLP-receiving families that do receive the NSLP. The associations between the child-specific variables and the child outcomes did not differ significantly for children in these different groups. Thus, among children in families participating in the NSLP, the impact of observable child-specific variables on the child outcomes do not differ between children who participate in the NSLP and those who do not. These results give us some confidence that the impact of unobservable characteristics on our dependent variables will not differ for children in this sample either.

RESULTS

First, we examine the characteristics of our sample. Weighted means for all variables used are presented in Table 1 and indicate that about 13 percent of our CDS-PSID sample of children aged 6–12 lived in food insecure households in 1997. Seven percent of children are in marginally food insecure households, meaning that 20 percent of 6–12 year-old children in the CDS-PSID households live in families which affirmed at least one of the items on the food insecurity scale. Thirty-eight percent of children receive a free or reduced-price lunch through the NSLP. Analyses not shown here indicate that 20 percent of children participating in the NSLP are food insecure, versus 5 percent of those not

TABLE 1
Weighted Means for Children Aged 6–12

Variable	N	Mean	SD
Participates in National School Lunch Program	1,854	.38	.49
Household Is Food Insecure	1,870	.13	.34
Household Is Marginally Food Insecure	1,852	.07	.25
Recoded Rasch Food Insecurity Scale	1,852	-1.94	3.13
Average Family Income 1994–1996 (1996 dollars)	1,713	56,041	54,364
Number of Siblings	1,878	1.71	1.21
% Years Parents Owned Home 1994–1997	1,878	.59	.44
Child Is Black	1,878	.17	.38
Child Is Male	1,878	.50	.50
Child Is Hispanic	1,878	.13	.34
Age of Child	1,878	9.00	2.02
Age of Primary Caregiver	1,810	37.16	6.69
Child Is Insured	1,874	.91	.29
% Time Received Food Stamps 1994–1997	1,878	.15	.30
% Years in a Married-Parent Family 1994–1997	1,878	.63	.45
Internalizing Behavioral Problems	1,844	16.77	4.53
Externalizing Behavioral Problems	1,840	22.98	5.81
Positive Behavior	1,870	42.27	5.67
Whether Any Health Limitations (%)	1,878	.09	.38
Math Test Score	1,471	49.76	16.60
Reading Test Score	1,478	58.35	19.32
Primary Caregiver (PCG) Smokes	1,159	.22	.41
PCG Drinks	1,163	.42	.49
PCG Efficacy	1,154	21.94	3.38
PCG Self-Esteem	1,109	34.19	4.35
PCG Depression	1,133	16.26	5.62
PCG Aggravation in Parenting	1,160	9.20	2.61

participating in the NSLP. Additionally, food insecure children are more likely to be African American or Hispanic, to live in a household with an unemployed head, and to live in poverty.

We next examine the multivariate relationships between food insecurity, participation in the NSLP, and children's developmental outcomes. All analyses control for the covariates described above. Because our data consist of some children with the same family of origin, all analyses are estimated with Huber-White robust standard errors, clustered by the family of origin (in 1968).

In Table 2, we first examine the association between child- and family-specific factors and three different measures of food insecurity (the continuous Rasch food insecurity scale, the food insecurity dummy, and the indicator of marginal food insecurity) as well as the indicator for participation in the NSLP. The associations operate in the expected direction. Family income is significantly and negatively associated with the continuous food insecurity measure, as is the percentage of time a child's parents owned their own home, paternal education, and whether the child is insured. The percentage of time a child received food stamps is significantly and positively associated with the continuous food insecurity measure. Similar associations are found when predicting the food insecurity dummy. Considering the indicator of marginal food insecurity, results indicate that black children are more likely to be marginally food insecure and that paternal education is associated with a reduced likelihood of marginal food insecurity.

Turning to the determinants of participation in the NSLP, family income, parental home ownership, paternal education, and whether the caregiver drinks are all significantly and negatively associated with participation. The number of siblings a child has, whether the child is black, average number of years a child received food stamps, and percentage of time in a married-parent family are all positively and significantly associated with participation in the NSLP. Noteworthy is the large odds ratio on the indicator that a child is black; black children are almost five times more likely to participate in the NSLP than other children, controlling for the other factors in the model.

TABLE 2
Factors Affecting Food Insecurity and NSLP Participation

	Continuous Food Insecurity Measure			Food Insecurity Indicator (logistic regression)			Marginal Food Insecurity Indicator (logistic regression)			NSLP Participation (logistic regression)		
	Coeff.	SE	Sig.	Odds Ratio	Z-Score	Sig.	Odds Ratio	Z-Score	Sig.	Odds Ratio	Z-Score	Sig.
Family Income ($10,000s)	-0.03	0.01	**	1.00	-2.63	***	1.00	-1.84		1.00	-3.9	***
Number of Siblings	0.13	0.09		1.19	2.26	**	0.99	-0.14		1.39	4.05	***
% Years Parents Owned Home	-0.71	0.27	**	0.47	-2.63	***	1.03	0.08		0.59	-2.47	**
Maternal Education	0.04	0.05		1.07	1.06		1.04	0.61		0.90	-1.77	
Paternal Education	-0.14	0.05	***	0.90	-1.65		0.81	-2.87	***	0.86	-2.74	***
Child Is Black	0.06	0.22		0.78	-0.98		1.72	2.08	**	4.80	9.06	***
Child Is Hispanic	0.46	0.81		0.77	-0.36		1.37	0.41		0.73	-0.62	
Child Is Male	0.08	0.14		1.02	0.09		1.10	0.54		0.95	-0.36	
Age of Child	0.03	0.04		1.05	1.06		1.01	0.2		1.00	0.09	
Age of Mother	0.00	0.01		1.00	-0.1		0.98	-1.25		0.99	-1.3	
Child Is Insured	-1.44	0.44	***	0.51	-2.14	**	0.61	-1.58		0.64	-1.31	
Avg. Years of Food Stamps 1994–1997	1.79	0.40	***	1.81	1.79		1.29	0.71		2.87	2.76	***
% Years in a Married-Parent Family 1994–1997	-0.38	0.40		0.87	-0.34		0.93	-0.17		2.01	2.05	**
PCG Drinks	0.12	0.20		0.92	-0.3		1.36	1.03		0.51	-2.87	***
PCG Smokes	0.14	0.25		1.44	1.36		0.82	-0.62		1.13	0.51	
PCG Self-Esteem	-0.01	0.03		0.99	-0.38		1.04	0.93		1.00	-0.09	
PCG Self-Efficacy	-0.03	0.05		0.99	-0.12		0.93	-1.34		0.98	-0.36	
PCG Aggravation in Parenting	0.04	0.04		1.08	1.88		0.90	-1.92		1.02	0.47	
PCG Depression	0.05	0.02	**	1.03	1.12		1.04	1.63		0.99	-0.6	
N	1631			1631			1631			1633		
R^2	.19			.18			.10			.47		

** p<.05; *** p<.01.

In Table 3, we examine the associations between both food insecurity and participation in the NSLP with the developmental outcomes of children aged 6–12. We use the continuous food insecurity scale as the preferred measure of food insecurity (see footnote 1). The results show that participating in the NSLP is associated with increased externalizing behavior, increased odds of health limitations, and lower math test scores among children. Additionally, an increase in the food insecurity scale is associated with decreased levels of positive behavior and increased odds of health limitations. The other variables in the model operate in the expected direction; male children have greater behavioral problems, parental education is highly associated with test scores, and parental aggravation in parenting is associated with increased reports of children's behavioral problems.

It is unlikely that participating in the NSLP is actually detrimental for children. Thus, the pattern of negative associations between NSLP participation and children's outcomes suggests that omitted variables may be biasing the results presented in Table 3. Specifically, children participating in the NSLP may be different from those not participating in unmeasured ways, and these unmeasured variables may be associated with detrimental outcomes observed among children participating in NSLP.

To address this, Table 4 presents the results of analyses using the restricted sample of children aged 6–12 who live in a family in which at least one child is participating in the NSLP. Here, the NSLP indicator is not a significant predictor of any of the child outcomes. Additionally, in most cases, the sign on the NSLP coefficient is opposite from the coefficients in Table 3. In the restricted sample, an increase in the food insecurity scale is associated with decreased levels of positive behavior, as in Table 3. The remaining variables in the model operate in the expected direction, and their coefficients are consistent with those in Table 3.

The restricted-sample and full-sample results do not support the hypothesis that participation in the NSLP is associated with improvements in child well-being. However, it is possible that the NSLP may benefit subgroups of especially disadvantaged children. To test this, we examined whether the impact of participation in the NSLP on children differs for children living in single-parent families and

TABLE 3
Associations between NSLP Participation, Food Insecurity, and Child Outcomes

	Internalizing Behavior			Externalizing Behavior			Positive Behavior			Health Limitations (logistic regression)			Math Test Score			Reading Test Score		
	Coeff.	SE	Sig.	Coeff.	SE	Sig.	Coeff.	SE	Sig.	Odds Ratio	Z-score	Sig.	Coeff.	SE	Sig.	Coeff.	SE	Sig.
Food Insecurity	0.05	0.05		0.07	0.06		-0.17	0.06	***	1.08	1.98	**	-0.08	0.10		-0.08	0.13	
NSLP Participation	0.45	0.27		1.05	0.41	**	-0.19	0.41		1.88	2.05	**	-1.98	0.78	**	-1.26	0.98	
Family Income ($10,000s)	-0.02	0.02		-0.03	0.03		-0.01	0.04		1.00	-0.83		0.12	0.06		0.19	0.07	**
Number of Siblings	-0.15	0.10		0.03	0.15		0.00	0.15		0.88	-1.41		-0.36	0.22		-0.93	0.30	***
% Years Parents Owned Home	-0.28	0.31		-0.81	0.44		0.62	0.46		1.13	0.38		1.30	0.73		0.52	1.03	
Maternal Education	0.08	0.08		0.02	0.10		-0.03	0.10		1.00	0.03		0.54	0.16	***	0.48	0.21	**
Paternal Education	-0.06	0.08		-0.16	0.09		-0.02	0.10		0.94	-0.81		0.56	0.17	***	0.56	0.22	**
Child Is Black	-1.21	0.26	***	-1.01	0.37	***	1.40	0.37	***	0.46	-2.9	***	-1.99	0.68	***	-1.71	0.94	
Child Is Hispanic	-0.39	1.53		-1.12	1.49		2.12	1.28		1.02	0.01		-0.81	1.40		-1.00	2.55	
Child Is Male	0.54	0.21	***	1.48	0.28	***	-1.84	0.28	***	1.45	1.88		0.88	0.49		-1.67	0.67	**
Age of Child	0.11	0.06		0.08	0.07		-0.11	0.07		1.09	1.7		6.31	0.14	***	6.70	0.18	***
Age of Mother	0.03	0.02		0.02	0.02		0.02	0.02		1.01	0.66		0.04	0.04		0.05	0.05	
Child Is Insured	0.65	0.42		0.44	0.61		-0.17	0.54		2.11	1.71		0.27	1.00		-0.02	1.35	
Avg. Years of Food Stamps 1994–1997	1.36	0.52	***	0.97	0.62		0.55	0.59		1.76	1.67		-0.51	1.01		-5.11	1.36	***
% Years in a Married-Parent Family 1994–1997	0.61	0.49		-0.19	0.67		-0.69	0.67		1.20	0.35		-1.06	1.19		-0.93	1.69	
PCG Drinks	-0.25	0.29		-0.08	0.38		0.39	0.37		0.79	-0.77		0.60	0.64		1.58	0.87	
PCG Smokes	0.16	0.37		0.12	0.48		0.19	0.43		0.87	-0.43		-0.71	0.64		-0.73	0.95	
PCG Self-Esteem	-0.04	0.04		-0.07	0.05		0.16	0.06	***	1.01	0.23		-0.06	0.10		0.06	0.12	
PCG Self-Efficacy	-0.09	0.05		-0.08	0.07		0.16	0.07	**	0.92	-1.67		0.15	0.12		0.16	0.15	
PCG Aggravation in Parenting	0.19	0.06	***	0.37	0.08	***	-0.21	0.08	***	1.09	1.63		-0.06	0.13		0.01	0.17	
PCG Depression	0.12	0.03	***	0.19	0.04	***	-0.05	0.04		0.96	-1.33		-0.10	0.06		-0.02	0.09	
N	1613			1605			1629			1631			1302			1310		
R^2	.09			.14			.09			.07			.71			.61		

** p<.05; *** p<.01.

TABLE 4
Associations between NSLP Participation, Food Insecurity, and Child Outcomes—Restricted Sample

	Internalizing Behavior			Externalizing Behavior			Positive Behavior			Health Limitations (Logistic Regression)			Math Test Score			Reading Test Score		
	Coeff.	SE	Sig.	Coeff.	SE	Sig.	Coeff.	SE	Sig.	Odds Ratio	Z-score	Sig.	Coeff.	SE	Sig.	Coeff.	SE	Sig.
Food Insecurity	0.06	0.06		0.08	0.07		-0.18	0.07	**	1.07	1.58		-0.02	0.12		0.06	0.15	
NSLP Participation	-0.20	0.62		0.20	0.96		-0.08	0.74		5.03	1.56		1.26	2.23		2.91	2.56	
Family Income ($10,000s)	-0.02	0.10		-0.08	0.18		0.30	0.17		1.00	1.5		-0.22	0.40		-0.20	0.46	
Number of Siblings	-0.15	0.15		-0.04	0.21		-0.13	0.19		0.89	-0.93		-0.38	0.28		-0.70	0.40	
% Years Parents Owned Home	-0.16	0.41		-0.65	0.63		0.93	0.64		1.47	0.96		1.51	1.02		0.96	1.38	
Maternal Education	0.19	0.15		0.21	0.17		-0.14	0.17		0.97	-0.35		0.31	0.25		0.46	0.31	
Paternal Education	-0.26	0.14		-0.30	0.19		-0.13	0.21		0.83	-1.86		0.92	0.31	***	0.96	0.36	***
Child Is Black	-0.99	0.42	**	-0.33	0.63		1.87	0.63	***	0.37	-2.91	***	-1.44	1.00		-0.26	1.43	
Child Is Hispanic	-2.75	0.87	***	-1.30	1.60		2.31	1.95		2.60	0.85		-1.11	3.06		-1.52	5.45	
Child Is Male	0.60	0.33		1.82	0.48	***	-1.96	0.45	***	1.63	1.86		-0.17	0.73		-2.11	1.04	**
Age of Child	0.11	0.09		0.05	0.12		-0.20	0.11		1.05	0.71		5.90	0.19	***	7.01	0.24	***
Age of Mother	0.05	0.03		0.02	0.03		0.03	0.03		0.98	-0.98		0.00	0.05		0.01	0.06	
Child Is Insured	1.14	0.49	**	1.03	0.73		-0.67	0.69		2.22	1.5		0.25	1.18		0.34	1.48	
Avg. Years of Food Stamps 1994–1997	1.84	0.62	***	1.49	0.79		1.12	0.77		2.41	2.04	**	-0.66	1.33		-5.28	1.68	***
% Years in a Married-Parent Family 1994–1997	1.07	0.76		0.87	0.92		-1.57	0.94		1.28	0.37		-1.51	1.60		-2.28	2.15	
PCG Drinks	0.52	3.05		-0.25	0.75		-0.84	0.72		1.11	0.22		1.73	1.15		3.61	1.61	**
PCG Smokes	0.24	0.57		0.04	0.79		0.87	0.66		0.73	-0.7		0.95	0.91		-0.22	1.37	
PCG Self-Esteem	-0.37	0.54		-0.07	0.09		0.24	0.09	***	1.08	1.46		-0.10	0.14		-0.00	0.20	
PCG Self-Efficacy	-0.03	0.06		-0.13	0.15		0.18	0.13		0.94	-0.78		0.44	0.20	**	0.60	0.27	**
PCG Aggravation in Parenting	-0.15	0.11		0.36	0.11	***	-0.11	0.10		1.06	0.95		-0.16	0.17		-0.20	0.23	
PCG Depression	0.18	0.08	**	0.17	0.06	***	-0.04	0.05		0.96	-1.03		-0.09	0.08		-0.08	0.11	
N	729			728			738			738			594			597		
R^2	.12			.11			.13			.10			.68			.63		

** p<.05; *** p<.01.

children whose family income-to-needs ratio in 1996 was below the federal poverty line. The impact of participation in the NSLP did not differ for these subgroups.

We also examined whether participation in the NSLP benefits children in households reporting child hunger. Eight items in the USDA food insecurity scale refer specifically to children. These items range in severity from "We relied on only a few kinds of low cost food to feed the children" to "Did any of the children ever not eat for a whole day because there wasn't enough money for food?" Consistent with coding developed by the USDA (Nord and Bickel, 2001), families affirming at least five of these eight items were classified as experiencing child hunger. In our sample, 0.3 percent of the children were in families classified as experiencing child hunger.

For all child outcomes examined, we tested whether the association between participation in the NSLP and child well-being was significantly different for children in families experiencing child hunger. When predicting both internalizing behavior and externalizing behavior, results indicate that, for children in the child hunger sample, participation in the NSLP is significantly associated with a reduction in behavioral problems (total effect of !4.5, SE of 1.01, and total effect of !6.14, SE of 1.36, for internalizing and externalizing problems, respectively). Because of sample-size problems, these analyses were performed on the entire sample of children aged 6–12, not the restricted sample. Despite this limitation, however, the results suggest that participation in the NSLP may benefit the subgroup of children at risk for experiencing hunger.

DISCUSSION

This study examines two research questions. First, what child- and family-specific factors predict food insecurity and participation in the National School Lunch Program? Second, what are the effects of food insecurity and participating in the NSLP on the well-being of school-age children? The results from this analysis provide much-needed insight into the role of a widely used food assistance program in influencing the well-being of U.S. children.

Results indicate that factors representing families' economic status are significantly associated with both the continuous measure of food insecurity and the dummy indicator of insecurity. When predicting marginal insecurity, however, only paternal education and whether a child is black are significant predictors. This suggests that while food insecurity itself is mostly a product of financial constraints, marginal food insecurity may be more attributable to a broader range of socioeconomic and cultural factors. This provides validation for the USDA-developed measure of food insecurity, which was designed to capture food insecurity due to financial constraints, not other household factors.

Additionally, as expected, measures of families' economic status are highly associated with children's participation in the NSLP. One unique finding is the dramatically increased likelihood of participation in the NSLP among black children compared with other children, even after controlling for a wide range of economic measures. This may represent a difference in school-level prevalence of participation in the program among children from different racial groups. For example, black children may attend schools in which a high percentage of students participate in the NSLP, thus reducing the stigma associated with participating compared with that felt by white children, and increasing the odds that a specific child is likely to participate. Future work should examine this association further.

It is also surprising that living in a married-parent family is associated with increased odds of participating in the NSLP compared with living in a single-parent family. Perhaps, after adjusting for the wide range of socioeconomic factors in these data, married parents have more time or energy to devote to learning about programs such as the NSLP, or have more information about the program itself, leading to increased participation among their children.

When examining the ways in which participation in the NSLP and food insecurity may influence child outcomes, results indicate that participation in the NSLP is associated with increased externalizing behavior, increased odds of health limitations, and decreased math test scores among children. Additionally, increases in food insecurity are associated with lower levels of positive behavior and increased odds of health limitations. The detrimental associations between NSLP participation and child

outcomes were eliminated after adjusting for family-level factors that may influence the selection of children into participating in the program. The dramatic difference between the whole-sample and restricted-sample results highlights the importance of addressing issues of selection into participating in the NSLP.

Our results also suggest that food insecurity is associated with behavioral (and, in some cases, health) outcomes among children, but not cognitive outcomes. The lack of impact of food insecurity on cognitive outcomes may be due to the fact that very few children in our sample experience hunger due to food insecurity. Instead, food insecurity may represent a level of stress or strain in a household that is translated most reliably into children's behavioral adjustment, rather than their cognitive achievement.

It is noteworthy that even the restricted-sample analyses do not show significant evidence that participation in the NSLP is associated with *improvements* in child outcomes. The exception is that, for the subgroup of children in households experiencing child hunger, participation in the NSLP is associated with reductions in internalizing and externalizing behavior. Several explanations are possible for these findings. First, since previous research has documented associations between participating in the NSLP and improvements in children's nutrient intake (Burghardt and Devaney, 1995), we believed that NSLP participation may also translate into improvements in children's behavioral, health, and cognitive well-being. However, it is possible that additional nutrients in a child's diet do not lead to overall improvements in child well-being because most children are already receiving an adequate nutritional intake. As noted by Butler and Raymond (1996), "above some level, extra nutrients [may be] superfluous" (p. 782). Thus, because very few children in our sample experienced hunger, the impact of the NSLP on child well-being may be extremely difficult to discern. This is supported by the fact that, for some outcomes, participation in the NSLP was beneficial only for children in households experiencing child hunger.

Second, the likelihood exists that families in which children participate in the NSLP may use the program to *replace* food the child would have eaten anyway, rather than to add to the child's overall diet

(discussed in Besharov and Germanis, 2001, with respect to the WIC program). Thus, participation in the NSLP may not have an impact on children because it does not significantly improve their overall nutritional intake.

Overall, the NSLP represents a major federal policy effort to alleviate the problems associated with hunger and a lack of adequate nutrition among low-income children. Given this, it is important to evaluate the effectiveness of these programs in producing discernible effects on relevant child outcomes. This paper takes an important first step in this direction and opens the door for further research in this understudied area.

Important limitations must be kept in mind when interpreting the results from this paper. First, as noted above, we measure most of our key independent and dependent variables in 1997, leading to concerns about simultaneity. Future work in this area would benefit from additional modeling using a simultaneous-equations approach, similar to that used by Gunderson and Oliveria (2001). To do so, however, would require the identification of exogenous variables for both NSLP participation and for measures of food insecurity—a daunting task in our data.

The links between NSLP participation and the achievement and social development of children has been understudied in the program evaluation literature. Because of this, the results of this study yield an important first step in better understanding the linkages between food assistance programs and children's development. One of the main contributions of this study is to emphasize the need to address selection effects. We observe dramatic differences in the pattern of results once selection issues are addressed in our models. Future evaluations of the NSLP should seriously consider this issue. Additionally, our results suggest that the benefits of participation in the NSLP on the types of child outcomes examined here may be limited to subgroups of particularly at-risk children. Overall, these results shed some light on the understudied relationships between food insecurity, participation in the NSLP, and the development of preschool and school-age children, and pave the way for future research in this area.

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