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The School Breakfast Program

Participation and Impacts

By Judi Bartfeld, Myoung Kim, Jeong Hee Ryu, and Hong-Min Ahn, University of Wisconsin – Madison

ERS project representative: Katherine Ralston, kralston@ers.usda.gov, 202-694-5598

Abstract

Participation in the School Breakfast Program is much less common than participation in the National School Lunch Program, even among children with access to both programs. This report examines the determinants of participation in the School Breakfast Program among third grade public school students, as well as the impacts of the program on food insecurity and children's risk of skipping breakfast. Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort and from the Wisconsin Schools Food Security Survey. The study found that students are more likely to participate when breakfast is served in the classroom, when time available for breakfast in school is longer, and when they come from lower income or time-constrained households. Children with access to the School Breakfast Program are more likely to eat breakfast in the morning and that program access may enhance food security among families at the margin of food insecurity.

Food Assistance and Nutrition Research Program

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The School Breakfast Program: Participation and Impacts

by

Judi Bartfeld
Consumer Science Department, Institute for Research on Poverty, and Cooperative Extension
University of Wisconsin – Madison
bartfeld@wisc.edu

Myoung Kim
Graduate Student, Department of Consumer Science
University of Wisconsin – Madison
mkim5@wisc.edu

Jeong Hee Ryu
Graduate Student, School of Social Work
University of Wisconsin – Madison
ryu2@wisc.edu

and

Hong-Min Ahn
Graduate Student, School of Social Work
University of Wisconsin – Madison
ahn1@wisc.edu

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Executive Summary

The School Breakfast Program is an important component of the nutritional safety net, serving over 10 million children per day. Despite the scope of the program, it is less widely available and less consistently used than the National School Lunch Program. There remains substantial variability, both across and within states, in the extent to which it is available and the degree to which students participate, and the factors related to this variability are not well understood. And, while some benefits of the program have been well documented, the impact of the program on other outcomes, including food insecurity and breakfast-skipping, remains unclear.

What is the issue?

This report is intended to shed light both on the determinants of participation in the School Breakfast Program, and on some of the potential benefits of the program on children, using more recent data than has been available in most existing analyses. First, we focus on patterns and predictors of participation in the School Breakfast Program among third-grade students in public schools nationwide, contrasting participation patterns in school breakfast with those in school lunch, where the latter is much more widely available and utilized. Next, we explore the impact of the School Breakfast Program on food insecurity, focusing on differences between low-income children who do and do not have access to the program at their school. Finally, we examine the impact of the School Breakfast Program on the likelihood that children skip breakfast.

What Did the Study Find?

Our analysis confirms that school breakfast is much less widely used than school lunch, even among children with access to both programs. Furthermore, breakfast participation is almost entirely limited to a subset of the students who regularly eat school lunch. The program appears to serve as an expanded way of utilizing school meals for a subset of the students already predisposed to such meals; it receives only extremely limited use among other students. And, more so than school lunch, school breakfast appears to be used primarily by the subset of students who are most vulnerable. At the same time, there remains a substantial share of at-risk children who have access to the program yet do not participate—including 38 percent of those who are food insecure.

Multivariate analyses suggest that both economic vulnerability and time constraints are linked to participation, with low income and education, more children, and having two employed parents in the home emerging as significant predictors. We also find indirect evidence that local norms may be important in the participation decision, as evidenced by significantly higher participation in schools with a larger share of low-income students, as well as in neighborhoods with lower median incomes. Furthermore, it appears the normative nature of participation in low-income schools may have spillover effects on higher income children who might otherwise be less inclined to participate. Pronounced differences in participation according to race and ethnicity could also reflect differences in norms or preferences. On the other hand, and counter to our expectation, we found less likelihood of participation among children living in counties with more liberal political climates, suggesting that prevailing wisdom about political norms and attitudes towards public programs may not be reflected in school meal program decisions.

Of particular interest, we found that programmatic and logistical aspects of how breakfast is structured at the school are significantly linked to the likelihood of participation. Results strongly support the hypothesis that increasing the convenience of the School Breakfast Program leads to greater participation, with evidence of the importance of where breakfast is offered (classroom versus cafeteria), the duration of the breakfast period, and the arrival time of buses relative to the

start of classes. While smaller-scale local studies have found evidence that features such as in-class breakfast increase participation, this is the first evidence, to our knowledge, of its impact on a national scale.

Our findings suggest that school breakfast availability is linked to a lower probability of marginal food security among low-income children, though not to food insecurity at the standard threshold. That is, the program appears beneficial in offsetting food-related concerns among at-risk families, though not necessarily in alleviating food insecurity once hardships have crossed the food insecurity threshold. While it is possible that unmeasured differences between schools that do and do not offer the program could bias our results, we find it more plausible that any bias would result in underestimates, rather than overestimates, of the true impact, given that school breakfast is disproportionately offered in schools with higher-need populations, at least based on observable characteristics. On the other hand, we were unable to substantiate our findings with an instrumental variable model, despite the existence of a strong state policy instrument. We note the relatively small number of low-income students in our sample who do not have access to school breakfast, thus hampering our ability to obtain more precise estimates of program impact.

We also found that availability of the School Breakfast Program significantly reduces the probability of skipping at least one breakfast per week, and in particular, that offering breakfast at school serves to moderate the risk of breakfast-skipping associated with low income.

Taken as a whole, our findings indicate that access to the School Breakfast Program yields significant benefits in terms of enhancing food security among families at the margin of food insecurity, and increasing the probability that children—particularly low-income children—eat breakfast in the morning. Our findings suggest that making school breakfast more broadly available would be beneficial in ensuring that more children start their school day with a meal, and that fewer families are confronted with uncertain access to sufficient food. Furthermore, our findings on participation patterns suggest that these benefits could also be enhanced with greater participation among children who already have access to the program.

How Was the Study Conducted?

We used the third-grade wave of the Early Childhood Longitudinal Survey Kindergarten Cohort (ECLS-K) to estimate probit models of students' participation in SBP, as well as probit and instrumental variable models of food security of students' households. The ECLS-K is a national survey providing data on, among other things, the availability of and participation in school meal programs as well as food security status and a range of other child outcomes. In addition, we used data from the Wisconsin Schools Food Security Survey to estimate probit and instrumental variable models of breakfast-skipping.

The School Breakfast Program: Participation and Impacts

The School Breakfast Program is an important component of the nutritional safety net, serving over 10 million children per day (Food Research and Action Center 2007). Despite the scope of the program, it is less widely available and less consistently used than the National School Lunch Program. There remains substantial variability, both across and within states, in the extent to which it is available and the degree to which students participate, and the factors related to this variability are not well understood. Furthermore, the impact of the program on various measures of child wellbeing remains uncertain, due in part to hard-to-measure differences between localities that do and don't offer the program and between students who do and don't choose to participate (see, e.g., Fox, Hamilton, and Lin 2004).

This report is intended to shed light both on the determinants of participation in the School Breakfast Program, and on some of the potential benefits of the program on children, using more recent data than has been available in most existing analyses. First, we focus on patterns and predictors of participation in the School Breakfast Program among third-grade students in public schools nationwide, contrasting participation patterns in school breakfast with those in school lunch, where the latter is much more widely available and utilized. We use data from the Early Childhood Longitudinal Survey – Kindergarten Cohort (ECLS-K), third grade wave, a national survey providing data on, among other things, the availability of and participation in school meal programs as well as food security status and a range of other child outcomes. Next, we use the ECLS-K data to explore the impact of the School Breakfast Program on food insecurity, focusing on differences between low income children who do and do not have access to the program at their school. Finally, we examine the impact of the School Breakfast Program on the likelihood that children skip breakfast, using data from a self-administered survey of parents of elementary school children in Wisconsin, collected during 2003-2005.

BACKGROUND

The School Breakfast Program is an important part of the nutritional safety net. Funded by the federal government and administered locally by schools and school districts around the country, the program offers all children in participating schools an opportunity to eat a low-cost, or sometimes free, breakfast either prior to or during the school day. The School Breakfast Program operates in more than 85,000 public and nonprofit private schools and residential child care institutions. School districts and independent schools that choose to take part in the program receive cash subsidies from the U.S. Department of Agriculture (USDA) for each meal

they serve, and agree to serve breakfasts that meet federal program requirements. Children whose families have income below 130 percent of the federal poverty line receive free meals; children whose family incomes are between 130 percent and 185 percent of the poverty line receive reduced-price meals (costing no more than 30 cents); and children above this threshold pay full price. Schools are provided some federal reimbursement for all participating children, with higher reimbursement rates for children who are eligible for free or reduced price meals (U.S. Department of Agriculture 2008).

Participation in School Breakfast Program

Despite considerable evidence that eating breakfast has beneficial impacts on children (see Gleason and Suitor 2001, p18-19, for overview), availability of and participation in the School Breakfast Program continue to trail comparable indicators for the National School Lunch Program. Nationwide, approximately 85 percent of schools that offer school lunch also offer breakfast (Food Research and Action Center 2007), although this varies considerably among states – from a low of 52 percent to a high of 100 percent. When breakfast is available at school, past research suggests that only 18 percent of children participate on a given day, as compared to 62 percent participating in school lunch (Gordon and Fox 2007). And, past research has shown that participation is heavily tilted towards students who receive subsidized meals: students approved for free meals have participation rates of 39 percent, as compared to 20 percent for students approved for reduced-price meals and 8 percent among students who pay full price (Fox et al 2001). In fiscal year 2008, 80.6 percent of school breakfasts served were to students who received free or reduced price meals (Food and Nutrition Service).

The most recent information on characteristics of participants and nonparticipants, as well as determinants of participation, is from the School Nutrition and Dietary Assessment Survey-III (SNDA-III). Both descriptive and multivariate analyses suggest that, among students with access to the program, participation is more common among boys than girls, among elementary school children as compared to older children, and among nonwhite children as compared to white children. Students who are income eligible for free or reduced price meals are more likely to participate than are higher income students, and students in rural areas are more likely to participate than are their urban counterparts (Gordon et al 2007). Other research on School Breakfast Program participation examines perceived barriers rather than formal predictors of participation. Common themes from that body of research include stigma associated with the program, time conflicts associated with eating school breakfast prior to the start of the school day, and a belief that parents should be responsible for feeding their own

children in the morning (see, e.g. Kennedy and Davis 1998; Lent and Emerson 2007; Reddan, Wahlstrom, and Reicks 2002; Rosales and Janowski 2002). This work suggests that both community norms as well as details of how the program is implemented that could reduce stigma and time conflicts should have beneficial impacts on participation. Initial research is consistent with this expectation: Making school breakfast available at no cost (i.e. universal free breakfast) is strongly linked to higher participation rates, based on comparisons of schools with and without a universal program (Bernstein et al 2004; Lent and Emerson 2006). There is also suggestive evidence that universal breakfast is particularly beneficial to participation when breakfast is offered during the classroom as part of the school day rather than before school (Bernstein et al 2004; Wong and Emerson 2006), although this has not received careful research attention. Among students in the SNDA-III who did not usually eat school breakfast, more than half indicated they would be more likely to do so if it were served in the classroom (Gordon et al 2007).

Almost entirely absent from the literature on School Breakfast Program participation is any formal attention to the role of the local programmatic, economic or social/political climate. This absence is striking, considering the well documented impact of such factors on caseloads in other assistance programs (see, e.g., Figlio, Gundersen, and Ziliak 2000; Ziliak, Gundersen, and Figlio 2003 for examples of studies linking macroeconomic and political indicators to food stamp caseloads). Certainly perceptions about the role of stigma and community norms are consistent with a role for contextual factors in influencing participation. With regard to programmatic characteristics, Gordon et al (2007) do find evidence that the cost of school breakfast is linked to the likelihood of participation, with higher costs associated with lower participation. On the other hand, they found no evidence of a role for several other program attributes including the form of delivery (offer versus serve); the type of menu planning system (food-based versus nutrient standard); the percent of calories from fat; or whether meals were prepared onsite.

This report explores School Breakfast Program participation among third-grade public school students in a national sample. We use recent data to examine participation patterns among a very specific age group, rather than looking collectively at multiple age groups that might have varying determinants of participation. We pay particular attention to the role of operational features of the program as well as contextual characteristics intended to proxy for local norms and economic conditions.

Impacts of School Breakfast Program on Selected Outcomes

The School Breakfast Program could potentially have a range of impacts on children and families. By offering a source of breakfast—school-based meals—that would not otherwise be available, it could alter eating patterns, affecting the likelihood of eating breakfast, the location of breakfast (home versus school), and/or the kinds of food eaten. Likewise, by providing children with access to subsidized breakfasts—for some children free or at very low cost—it could reduce the risk of food-related hardships. By altering eating patterns, it could, ultimately, affect affect nutritional, health, cognitive, and other kinds of outcomes. We provide a brief overview of what is currently known about the impacts of the School Breakfast Program on two outcomes that are the focus of this report—food insecurity and breakfast skipping. For a detailed discussion of the impact of the School Breakfast Program on other outcomes, see Fox, Hamilton and Lin (2004).

Impacts of School Breakfast Program on Food Insecurity

Efforts to identify the impact of food assistance programs on food insecurity are complicated by self-selection into programs on the basis of unobservable characteristics, with persons at greater risk of food insecurity more likely to participate. Indeed, bivariate statistics and many multivariate analyses typically reveal the counterintuitive finding that participants in food assistance programs have higher rates of food insecurity than do nonparticipants, even when limited to the low income, suggesting important underlying differences in risk of food insecurity between participants and nonparticipants (see, e.g., Wilde 2007, for discussion of the literature on food stamps and food insecurity).

Looking across food assistance programs, analyses that do not rely solely on individual measures of program participation have found some evidence of beneficial impacts on food security. For instance, Bartfeld and Dunifon (2006) found that near-poor households in states with higher food stamp participation rates have lower risk of food insecurity, and Bernell, Weber and Edwards (2004) found that higher county-level food stamp participation is linked to reduced risk of food insecurity among households in Oregon. Yen and colleagues (2007) documented a negative impact of food stamp participation on food insecurity, using an instrumental variable approach utilizing state policy differences including the length of the food stamp recertification period. Likewise, Bartfeld and Dunifon (2006) found that households in states with higher participation in summer food programs have lower risk of food insecurity, and Nord and Romig (2006) found that seasonal differences in food insecurity (higher in the summer than the spring) are smaller in states with more widespread participation in the Summer Food Service program,

providing suggestive evidence that the program helps ameliorate food insecurity among households with school-aged children.

Research on the relationship between the School Breakfast Program and food security lags behind such research on other food assistance programs. To date, no research has documented a link between the School Breakfast Program and household food security. Bartfeld and Dunifon (2006) found no significant relationship between the state participation rate of low-income children in the School Breakfast Program (benchmarked against participation of low-income children in the School Lunch Program) and food security, and likewise, Bartfeld and Wang (2006) found no evidence that the estimated participation rate among eligible children is linked to food insecurity, using data from Wisconsin. Comparing students in schools with universal-free school breakfast to a control group without universal-free breakfast, McLaughlin et al (2002) found no difference in the likelihood of food insecurity.

Because the School Breakfast Program is only available in a subset of schools, it is possible to look at program availability, and not merely program participation, to assess impacts on food insecurity. Research to date has not addressed this question. There are reasons, though, to hypothesize that access to the School Breakfast Program could reduce food insecurity. Participation is highly concentrated among the low income, where the greatest food insecurity risk is found, and among participating children, school breakfast is linked to clear changes in nutrition outcomes (see, e.g., Fox, Hamilton, and Lin 2004). Furthermore, Bhattacharya, Currie and Haider (2004) found some evidence that availability of the School Breakfast Program contributes to improved diet quality even among other family members, suggesting that participation affects broader patterns of food consumption in the household. In this report, we examine the relationship between the School Breakfast Program and food insecurity, using a national sample of third grade public school students. Our primary strategy is to compare household food insecurity among students with and without access to the program, controlling for observable attributes of students, households, and communities; we explore the use of instrumental variable models to further control for unmeasured differences in program availability.

Impacts of School Breakfast Program on Breakfast-Skipping

An important stream of research has considered whether the School Breakfast Program increases the likelihood that students eat breakfast on school days (or equivalently, whether it decreases the likelihood of skipping breakfast). Despite the importance of this question to policymakers interested in gauging the impacts of the program, the evidence here is mixed. The

continuing uncertainly appears to be due in part to variation in how breakfast is defined, and in part to difficulty in documenting program impacts in the absence of random assignment—a pervasive concern in the broader literature on impacts of nutrition assistance programs.

Initial research from the School Nutrition Dietary Assessment Study (SNDA) found no evidence that the availability of the School Breakfast Program is linked to greater likelihood of eating breakfast (Gleason 1995). However, a reanalysis of the SNDA using more rigorous definitions of breakfast and looking separately at impacts for children at different income levels found that, when a more stringent definition of breakfast is used, access to the School Breakfast Program does reduce the risk of skipping breakfast among low-income children, but not among higher income children (Devaney and Stuart 1998). On the other hand, Bhattacharya, Currie and Haider (2004) controlled for endogeneity by using a difference-in-differences approach based on changes in breakfast patterns during the school year and the summer, and found no evidence that children with access to the School Breakfast Program have a lower risk of skipping breakfast. Their approach, however, is potentially biased due to failure to account for the availability of summer food programs.

More recently, Waehrer (2007) used time use diary data from the Child Development Supplement of the Panel Study of Income Dynamics to estimate the impact of school breakfast participation on breakfast consumption, with the counter-intuitive finding that participation, as reported by parents, is linked to lower likelihood of children's breakfast consumption. However, results hinge on the assumption that breakfast consumption at schools is as accurately reported in time use diaries as is breakfast consumption at home—a problematic assumption given that fewer than 20 percent of the sample reported any meal consumption during the whole school day.

In short, existing research is inconclusive about whether access to the School Breakfast Program affects the likelihood that children eat breakfast, and if so, which children are most affected. The best evidence of a beneficial impact is from Devaney and Stuart (1998) and relies on data from 1992; the program has evolved considerably in size and form since that time. In this report, we examine the relationship between availability of the School Breakfast Program and the likelihood of skipping breakfast, using recent data collected from parents of elementary school children in Wisconsin. Our primary approach is to compare breakfast skipping among children with and without access to the program, controlling for other observable characteristics; we also consider instrumental variable models to control for unmeasured factors that may be correlated with program availability and breakfast skipping.

DATA

We use two primary sources of data in this report—the Early Childhood Longitudinal Survey—Kindergarten cohort (ECLS-K), and the Wisconsin Schools Food Security Survey. The former is used to examine School Breakfast Program participation patterns, as well as impacts on food insecurity; the latter is used to examine impacts on skipping breakfast, as the ECLS-K does not support that analysis.[1]

Early Childhood Longitudinal Survey-Kindergarten Cohort

Data are from the ECLS-K, wave 5 (third grade), restricted file. The ECLS-K is a nationally representative longitudinal survey providing information about children who entered kindergarten in the fall of 1998. A multistage probability sample design was employed to select the ECLS-K sample. Data were collected in the fall and the spring of kindergarten (1998-99), the fall and spring of 1st grade (1999-2000), the spring of 3rd grade (2002), 5th grade (2004), and 8th grade (2007). A wide variety of information was collected from children, caregivers, and schools. Of particular relevance to this study, data collected from school administrators indicates whether the School Breakfast Program is offered, as well as key attributes of the program including where and at what time breakfast is served, as well as information on the share of children in the school eligible for free or reduced price meals. Relevant data collected from parents indicate, among other things, whether children usually eat school breakfast and/or school lunch, as well as the household's food security status using the standard 18-item food security scale. We use the restricted access data, which includes geographical identifiers; selected contextual data at the county level have been appended to the data. The sample for these analyses is limited to public school students for whom parents and school administrators provided survey responses during wave 5. Because of regulations related to the use of the restricted access data, all sample sizes reported, including subsamples, are rounded to the nearest ten.

Wisconsin Schools Food Security Survey

The Wisconsin Schools Food Security Survey is a self-administered survey sent home with students to parents of elementary school children in Wisconsin. It is used in this report to explore the relationship between school breakfast availability and children's breakfast patterns.

[1] The ECLS-K does not directly ask about skipped meals. It does include information about the number of meals eaten at home and at school, but the information on meals at school is only asked of the subset of respondents who report that the child usually participates in the School Breakfast Program. As such, school breakfasts for occasional participants are not counted, and estimates of breakfast skipping are biased upward.

The survey includes a range questions about sources of food, participation in nutrition assistance programs, details about breakfast behavior including frequency of participating in school breakfast and skipping breakfast, reasons for not participating in school breakfast, food security based on the standard six-item scale, and demographic information. A variety of contextual data at the school, zipcode, and county levels have been appended to the data, including information on School Breakfast Program availability obtained from state records. Data were collected between fall of 2003 and fall of 2005.

Surveys were administered through a collaborative effort with University of Wisconsin – Extension. County Extension educators contacted local elementary schools regarding participation, worked with participating schools to ensure that surveys were disseminated using standard protocols, and coordinated local logistics. A total of 66 schools serving children in 26 counties participated during the primary survey period. For this report, we exclude 6 schools with ambiguous information about breakfast availability at school.[2] The sample size for this report consists of 7528 students. Note that the sample selection strategy was not designed to yield a fully representative sample of schools statewide, but rather, a sample of schools sufficiently diverse in terms of community attributes to allow identification of linkages between local attributes and outcomes of interest. Thus, overall prevalence rates of school meal participation should not be construed as representative of the state as a whole.

The mean response rate across schools was 69 percent, a high response rate for a self-administered survey. To assess the representativeness of the sample, we compared the share of surveys indicating that the child had received free or reduced price school meals in the past year with the official free and reduced price certification rate for the school, as provided by the Department of Public Instruction (DPI).[3] The average difference between the share reporting free or reduced-price meals and the official certification rate is minus two percentage points, and three-quarters of schools have reported rates within five percentage points of official rates, with official rates ranging from 9 percent to 80 percent of students.

DETERMINANTS OF PARTICIPATION IN THE SCHOOL BREAKFAST PROGRAM

In this section, we focus on participation in the School Breakfast Program, using the ECLS-K data. We introduce our analytic strategy, and present both descriptive and multivariate results.

[2] These are schools for which a non-trivial number of parents reported that their child eats breakfast at school, but the School Breakfast Program is not offered, according to official information. These appear to be schools that offer breakfast or morning snack programs that are not connected to the School Breakfast Program.

[3] We compare self-reported participation rates to official certification rates, rather than official participation rates, as the latter are not available at the school level.

Methods

Data are from the ECLS-K, as described above. For this analysis, the sample is limited to the subset of students who attend a school that participates in the School Breakfast Program, as our focus is on participation among students with access to the program. Information about whether the school participates in the program is available both from school administrators' and from parents' reports. Because there are some inconsistencies, we rely on administrators' reports, under the assumption that their information is most accurate, and that parents whose children do not participate may not, necessarily, know that the program is available. We exclude children for whom data from school administrators are not available.

It is possible that some of the schools in the sample offer universal free breakfast, whereby all children in the school are offered school breakfast at no cost regardless of income. We do not have an explicit indicator of this in the data; however, we identify 140 students who attend schools in which the free and reduced price eligibility rate for breakfast, as reported by school administrators, is 100 percent, and assume that this could be an indication of universal free breakfast, although we cannot be certain. Because availability of universal free breakfast would be expected to increase breakfast participation, and could potentially be correlated with other school-level variables of interest, we exclude these cases from the analysis, which does not significantly nor substantively affect the results.

We estimate probit models, where the dependent variable indicates whether the child usually eats a school breakfast, based on the parent's report.[4] This is coded as 1 if the parent responds in the affirmative to the question, "Does {Child} usually eat a breakfast provided by the school?". The conceptual model underlying this analysis reflects the expectation that participation in the School Breakfast Program is influenced by household characteristics that affect the perceived value of participating; programmatic and logistical factors that affect the ease of participating; and local norms regarding appropriate government roles and participation in assistance programs. As such, independent variables include household characteristics, programmatic characteristics, and contextual characteristics.

One set of independent variables includes household characteristics expected to reflect differences in need and/or preferences for participating. We include variables denoting household income, parental education, home ownership status, and number of children, as indicators of economic need; household structure cross-classified with employment, to capture the time constraints that may be present when parents work outside the home; estimated

[4] For this as well as the subsequent models, we also experimented with logit models; results are not sensitive to functional form.

eligibility for free or reduced price meals, as participation may be more attractive when costs are lower; race and ethnicity, as participation in food assistance programs often varies across racial and ethnic groups; and gender, as some past work has found gender differences in school breakfast participation patterns.

A second set of independent variables includes programmatic and logistical factors that affect the ease of participation. We include an indicator for having breakfast served in the classroom, as compared to the cafeteria or other central location, as this may facilitate participation; the duration of the breakfast period, as longer periods may make the program more convenient; and the length of time between arrival at school and the start of classes, interacted with a dummy variable denoting children who take the school bus to school. For students who ride the bus, and for whom arrival time is thus exogenous to desired breakfast participation, arriving with more time before class is expected to make participation more feasible.

A third set of indicators is intended to proxy for local norms regarding appropriate government roles and participation in assistance programs. We include two measures—one intended to proxy for school norms regarding breakfast participation, and one intended to capture general liberal versus conservative tendencies in the community, which may be correlated with attitudes towards participating in government-sponsored food programs. For the former, we include the share of students in the school who are officially certified for free or reduced price meals. Higher certification rates denote a higher prevalence of low-income families, which may reduce any stigma associated with school breakfast participation—even for children who are not themselves low income. For the latter, we include the share of voters in the county who voted for the Democratic candidate in the 2004 presidential election, where local preference for Democrats versus Republicans serves as a proxy for a more positive attitude towards public assistance programs and is hypothesized to coincide with more openness to schools (as opposed to exclusively families) being involved in feeding schoolchildren. Because of the correlation between political preferences and economic conditions (as evidenced in these data), we also include a variable for median income based on the 2000 Census, as well as unemployment rate in the 12 months prior to the survey, both measured at the county level.

Finally, we include two sets of geographic indicators. We differentiate among regions, to identify areas where participation is more or less common than expected based on household characteristics. And, we include a series of variables describing the urban, surburban or rural character of the community. The ECLS-K provide an 8-part categorization including large cities, mid-size cities, large suburban areas, mid-size suburban areas, large towns, small towns, rural areas located within metropolitan statistical areas (MSAs), and rural areas outside of MSA's.

Results

How common is participation in the School Breakfast Program?

Participation in the School Breakfast Program is much less common than participation in the School Lunch Program. This reflects both differences in availability, as well as differences in participation when offered. In our broadest sample—third grade public school students with nonmissing survey data (regardless of breakfast availability)—35 percent of students usually eat school breakfast, as compared to 84 percent of students who usually eat school lunch (Table 1). Limiting the sample to children in schools where breakfast is offered—83 percent of the third graders for whom breakfast information is available from school administrators—42 percent usually eat school breakfast, compared to 82 percent who usually eat school lunch.[5] Looking more closely at participation in the two programs reveals that, unless students eat school lunch regularly, they are extremely unlikely to have any involvement with the breakfast program; but even among regular lunch participants, fewer than half participate in school breakfast.

Not only is school breakfast less widely utilized than school lunch, its use appears more skewed towards families at greatest risk of food-related hardships. As shown in Table 2, the prevalence of breakfast participation is closely related to income, declining steadily from almost three-quarters of students in the lowest income group to fewer than 10 percent in the highest-income group. In contrast, participation in school lunch decreases much less dramatically with income, from 97 percent to 72 percent. Consistent with this pattern, 80 percent of all children who eat school breakfast have meals that are either free or reduced price; among children who eat school lunch, far fewer—55 percent—eat meals that are free or reduced-price (not shown).

Examining other potential indicators of economic need, participation in school breakfast declines from 70 percent of students whose parents have less than a high school education to fewer than one-fifth of those with college-educated parents. And, participation increases sharply as the number of children in the household increases, from 37 percent of third graders in one-child households to 58 percent of those in households with four or more children. Focusing on food security, 62 percent of children who are food insecure eat school breakfast when it is available, as do only 35 percent of those who are food secure. (Of course, to the extent that school breakfast reduces the risk of food insecurity, the true underlying association between food insecurity and breakfast participation would be even stronger). School lunch participation, on the other hand, shows much more modest differences according to any of the various measures examined. Unlike the School Lunch Program, then, the School Breakfast Program appears to

[5] Note that, for our original sample of 10350 children, 2050 are missing information from school administrators regarding availability of school breakfast. These children are excluded from the participation analysis.

serve mostly, although not entirely, as a means of providing free or very low-cost meals to low income or at-risk children, as opposed to serving more broadly as a nutrition program for a cross-section of families.

School meal participation also differs across geographic areas, with sizable regional differences as well as differences among urban, suburban and rural areas. Participation is most common in the South, where just under half (49 percent) of children who have access to the School Breakfast Program participate, as compared to 39 percent in the west, 34 percent in the Midwest, and 31 percent in the northeast. In terms of urban-rural patterns, participation is most common in rural areas located out of metropolitan statistical areas (57 percent), lower in cities and towns (41-47 percent), still lower in the suburbs (35 percent), and lowest in rural areas that are part of MSAs (31 percent). In the case of school lunch, in contrast, there is substantially less geographic variation.

Multivariate Analysis of School Breakfast Program Participation

To assess factors predictive of participation in the School Breakfast Program, we estimate probit models with participation as the dependent variable, coded one to denote students who usually eat school breakfasts (based on parental report), and zero otherwise. Results are shown in Table 3.

The first panel focuses on household characteristics. Not surprisingly, participation declines as household income increases, and increases when there are more children in the household. There is no further impact of estimated eligibility for free or reduced price meals. In terms of household structure and employment, relative to two-parent households with one employed parent, participation is more likely among children with two employed parents in the household, perhaps reflecting the greater time constraints facing 2-parent households when both are employed. It also appears more likely among children with a single not-employed parent—a finding inconsistent with the time constraints hypothesis, and perhaps instead reflecting unmeasured hardship among the single unemployed households. Participation also becomes less common as parents' education level increases; education could proxy for earnings capacity and/or could be associated with different attitudes towards participation. And, participation is much more common among renters as compared to homeowners. There are large differences by race and ethnicity, with the probability of participation much higher among blacks, and to a lesser extent other racial and ethnic minorities, relative to whites. There are no significant differences in participation by gender.

The second panel focuses on geographic variables. Consistent with bivariate results, we find geographic differences—by region and by urban versus rural status—that persist even after controlling for differences in household characteristics. In particular, participation is more common in the Midwest and South relative to the Northeast, and is less common in cities and suburbs than in rural areas, net of other factors controlled for in the model.

The third panel focuses on local characteristics intended to reflect local norms. Even after controlling for household income and other characteristics, participation is significantly more common among children in schools with a larger share of low-income children (based on certification rates for free and reduced price meals). As noted, previous and current research find greater participation among lower-income households; we speculate that this translates into differing norms that influence participation rates, with greater participation in schools and communities in which it is more normative. Results are consistent with this pattern. We also examine differences according to local political preferences, expecting, as discussed previously, that participation would be more common in areas with democratic versus republican voting preferences; the former may have greater acceptance of the legitimacy of a public role in providing meals for children. Counter to our expectations, we found that participation actually decreases as democratic voting preferences increase, and this pattern is robust across a variety of model specifications. Because political preferences are highly correlated with economic attributes of communities, the model includes controls for median income and unemployment rate. We find no link between unemployment rate and breakfast participation, but a significant negative relationship between county median income and participation.

The fourth panel focuses on logistical and programmatic features that affect the convenience of participating in the School Breakfast Program. Results suggest that, indeed, such features are significantly linked to participation. First, the probability of participation increases dramatically when breakfast is served in the classroom rather than in the cafeteria. Second, the probability of participation increases with the duration of the breakfast period. Third, among the subset of students who take the bus to school, participation is more common as the time between arrival and the start of classes increases, that is, students are more likely to participate the more time they have available at school.

In Model 2, we also include an interaction between the school-level free and reduced-price certification rate and the child's free and reduced price eligibility status. The coefficient on child's eligibility status is now positive and significant, as is the certification rate, while the interaction is negative and significant. Thus, in schools with a small share of low-income children, a child's own eligibility status is a strong predictor of breakfast participation; in the

context of a more sizable low-income student population, individual eligibility status becomes less important. To the extent that a higher certification rate proxies for reduced stigma, this suggests that, when participation is more normative due to a larger share of low-income children, children who themselves are not eligible for free or reduced price meals become increasingly likely to participate.

SCHOOL BREAKFAST PROGRAM AND FOOD INSECURITY

This section focuses on the relationship between the School Breakfast Program and food insecurity. As discussed earlier, the program could reduce food insecurity by providing children with a regular source of breakfast, in many cases free or at minimal cost, thereby both increasing the likelihood that children have food, and also freeing up family resources to feed others in the household.

Methods

We use the ECLS-K data, and limit the sample to low-income students, those below 185 percent of the poverty line. These are the students most at risk for food insecurity, and thus the group for which the program could potentially have a role in reducing food insecurity.

To estimate the impact of school breakfast on household food insecurity, we estimate a series of probit models with food insecurity as the dependent variable. We consider two measures of food insecurity: the official food security measure, based on an 18-item scale that classifies households as food secure or insecure based on the number of affirmative responses (with three or more affirmative responses required to be considered as food insecure); and a less restrictive measure, marginal food security, which we define as at least one affirmative response. This alternative measure has also been used in other research with the ECLS-K, and has been found to be a predictor of a variety of child outcomes (Jyoti, Frongillo, & Jones 2005; Winicki & Jemison 2003). We consider this less restrictive measure, in addition to the official measure, in part because of the unexpectedly low rate of food insecurity found in the ECLS-K sample relative to other national surveys (described below in our results). We also explored a measure of 'adult food insecurity'; results were quite similar to those for household food security and are not reported.

The key independent variable is the availability of the School Breakfast Program at the child's school. Other independent variables include a range of socioeconomic characteristics often predictive of food insecurity in past research, including income, parental education, race, household composition and employment, home ownership, and health status. We also include selected contextual characteristics including median rent (defined at the zipcode level), since higher housing costs have been linked to greater risk of food insecurity (Bartfeld and Dunifon 2006); as well as geographic region and indictors of urban, suburban, or rural character of the child's community, since past research reveals persistent geographic variation after controlling for household attributes. And, we control for the free and reduced price certification rate in the child's school, as the School Breakfast Program is more common in schools with larger share of

low income children, although we do not anticipate that the certification rate would be predictive of food security outcomes after controlling for household income. The primary purpose of our model is to adequately control for differences between students with and without access to the program, so as to obtain an unbiased estimate of the impact of the School Breakfast Program.

By focusing on availability of school breakfast, rather than participation of a particular child, we address the policy question of whether making the program available—such that students may choose to participate based on their own needs and preferences—reduces the prevalence of food insecurity among students with access to the program. This avoids inherent selection problems stemming from the tendency of higher-need students to select into the program, a problem endemic to efforts to link voluntary participation in food assistance programs to measures of food-related hardship. The coefficient on breakfast availability indicates the average association between program availability and food insecurity, across all students with access to the program; to the extent that this association is causal, the impact of school breakfast on the subset of students who actually participate would, presumably, be greater.

Although focusing on availability rather than participation mitigates biases stemming from self-selection of students, there remain potential problems due to self-selection of schools into the program. While some states mandate participation for elementary schools, others only require participation when eligibility for free or reduced price meals (set at 185 percent of the poverty line) exceeds a given threshold, and still others leave the decision entirely up to schools or school districts. To the extent that schools with higher-risk students are more likely to offer breakfast, as suggested by the disproportionate availability of the program in schools with more low-income students, estimates of the impact of program availability on food security will be biased downward, unless underlying differences between students with and without access to the program are fully controlled for in the model.

To address this, we consider an instrumental variable approach. We use state-level mandates regarding the School Breakfast Program as instruments, and construct a dummy variable denoting whether each child's school is covered by a state mandate requiring that the program be offered. Seven states required that all public elementary schools offer breakfast during 2001; 16 states required that breakfast be offered when the free and reduced price certification rate exceeded a threshold that varied from 15 percent to 80 percent; and the remaining states had no requirement (FRAC 2003). We compared the school-reported certification rate to the relevant state policy to determine whether each child attended a school mandated to offer breakfast. We use the 'mandate' variable as an identifying variable in a probit

model to predict breakfast availability, and use the predicted availability in our food security model. Implicit in this identification strategy is the assumption that the 'mandate' variable is uncorrelated with the error in the food security equation, that is, that the mandate variable is not associated with food security other than through its association with breakfast availability.

Although our main interest is in the impact of program availability on food insecurity, we also consider an alternative model that focuses on participation in the School Breakfast Program, as distinct from the availability of the program. For this analysis, we limit our sample to students in schools in which breakfast is offered (N=2620). Unfortunately, we do not have credible instruments for program participation that would allow us to control for unmeasured factors that may influence the participation decision.

Results

Descriptive results

Overall, 8.8 percent of children in our ECLS-K sample of third-graders who attend public schools live in households classified as food insecure, and 16.8 percent in households that are marginally food secure (Table 4). Note that the 'marginally food security' category also includes those classified as food insecure. The 8.8 percent food insecurity rate is considerably lower than expected, based on the official food security estimates generated by the Current Population Survey – Food Security Supplements. A Current Population Survey sample of children aged 7-9 during 2001-3, used as a comparison for the ECLS-K third grade sample used here, showed a household food insecurity rate of 19.3 percent--more than twice that in the ECLS-K sample.[6] The reason for this discrepancy is not apparent.

Food insecurity is strongly linked to income, in our sample and in other surveys. Here, we find that 16.6 percent of the low-income children (below 185 percent of the poverty line) in our sample are in households that are food insecure, as compared to 2.6 percent of higher income children. As a result, we limit our analysis to the low-income group; the extremely low rate of household food insecurity among higher income children makes it unlikely that the School Breakfast Program would have a meaningful or measurable impact. Note that a large majority of low-income children do have access to school breakfast; the relatively small number without access makes it more difficult to detect differences. Nonetheless, results show that the household food insecurity rate among low-income children with access to the School Breakfast Program is 16.1 percent, as compared to 24.5 percent among those without access; the analogous marginal food security rates are 29.2 percent and 42.2 percent.

[6] CPS results are based on analyses conducted by Mark Nord, Economic Research Service, U.S.D.A., August 2008.

Multivariate Analysis of School Breakfast Program and Food Insecurity

To assess the impact of school breakfast on household food insecurity, we estimate a probit model with food insecurity as the dependent variable (Table 5). We estimate an equivalent model for marginal food security, which uses a lower threshold to define food-related hardships. The key independent variable is a dummy variable denoting that the School Breakfast Program is available at the child's school. In the food insecurity model, the school breakfast coefficient is negative but not significant; in the marginal food security model, on the other hand, the coefficient is still negative, but larger in magnitude and highly significant ($p<.01$), suggesting reduced risk of marginal food security when the breakfast program is offered. Other variables in the model have coefficients largely in keeping with existing research on food security, with minor differences between the two models. The probability of household food insecurity declines as household income and education increase; is greater for renters as compared to homeowners; and increases with poorer health status and more children. In the standard food insecurity model we find no differences by race or ethnicity, net of other factors, other than a higher rate in the 'other race' category; however, blacks have significantly greater risk of marginal food security than do whites. We do not find significant differences according to household composition or employment status, with the exception of higher probability of marginal food security among children of single not-employed parents. Higher median rent is strongly associated with a heightened risk of food insecurity, though only weakly significant in the marginal food security model. Net of other factors we find little evidence of remaining regional differences in food insecurity, with the exception of a marginally significant higher probability of food insecurity in the West. Compared to rural areas, the risk of food insecurity is greater in small towns, mid-sized suburbs, and mid-sized cities, with only weak significance on any of these variables in the marginal food security model.

We use the coefficients from the marginal food security model to estimate the predicted probability of marginal household food security for a prototypical student, with and without access to the School Breakfast Program (Figure 1). Specifically, we consider a white student in the rural Midwest in a county with median rent of $600 per month, at a school with a 25 percent certification rate for free and reduced price meals; we assume the student is living with a single employed mother who is in good health, has a high school education, rents her home, has 2 children, and annual income of $15,001-$20,000. In this case, the predicted probability of marginal food security is 47 percent if the school does not off breakfast, decreasing to 33 percent if breakfast is offered.

To the extent that there are underlying differences between students with and without access to school breakfast, beyond those controlled for in our model, our estimates of program impact would be biased. To address this, we use an instrumental variable approach to estimate the impact of School Breakfast Program availability on food insecurity. As discussed earlier, we use state-level mandates regarding the program as instruments. Table 6 shows our first-stage model as well as the food insecurity models for both food security measures, including predicted probability of breakfast availability as the key independent variable.

Our first-stage model confirms that state policy mandates are indeed strong and significant predictors of School Breakfast Program availability. Not surprisingly, students whose school is covered by a state mandate to offer the program are significantly more likely to have the program available at school than are other students. Other predictors of breakfast availability include region (most common in the south, and least common in the Midwest); location (least common in surburban areas and large towns, and most common in rural areas that are located within metropolitan areas); share of low-income students in the school (with greater availability as share of low-income students increases, though at a decreasing rate); and median housing costs (less common in higher-rent areas). In the second-stage models, whether using the standard or marginal food security measures, the coefficients on predicted availability of the School Breakfast Program do not approach significance. We also considered an alternative operationalization of state mandates, by controlling for the level of the mandate rather than the applicability of the mandate to the particular child (that is, including separate variables to denote covering all elementary schools, elementary schools with at least a 75 percent free and reduced price meal certification rate, etc.). Results, not shown, are comparable to those reported.

Finally, we consider an alternative model in which student participation in the School Breakfast Program—as distinct from availability of the program at the school—is the key independent variable. As previously noted, our sample for this analysis is limited to the subset of students attending schools that offer breakfast. Results indicate that participation is associated with a significantly higher risk of food insecurity and marginal food security (Table 7), which we attribute to self-selection of higher risk children into the program. Unfortunately we do not have credible instruments that would allow us to control for unmeasured differences between participants and nonparticipants. The remaining variables in the model have similar associations with food insecurity and marginal security as found in our previous models.

SCHOOL BREAKFAST PROGRAM AND BREAKFAST SKIPPING: EVIDENCE FROM WISCONSIN

Methods

Our analysis relies on the Wisconsin Schools Food Security Survey, which asks parents, among other things, how many times their elementary school child skips breakfast in a typical school week. As with the food security analysis, we focus on availability of the School Breakfast Program, rather than on participation, thus examining how access to the program is linked to breakfast-skipping. We estimate a probit model with breakfast-skipping as the dependent variable, coded 1 if parents report that the child skips breakfast at least once in a typical week, otherwise coded 0. The key independent variable is the availability of the School Breakfast Program at the child's school, as reported by the Wisconsin Department of Public Instruction. Other independent variables include income, parental education, household composition and employment, home ownership, number of children, and degree of urbanicity (based on census data for the child's zipcode).

Breakfast-skipping differs from food insecurity in that it occurs at nontrivial levels in all income groups. As such, we do not limit our analysis to a low-income sample. We hypothesize that school breakfast may moderate the relationship between income and breakfast-skipping, however, and explore this by estimating a model with interactions between income and breakfast availability.

Finally, we consider an instrumental variable model. Unlike in our analysis of breakfast availability and food insecurity, we cannot rely on state policy variables as instruments, as our sample is limited to Wisconsin. Instead we use the free and reduced price meal certification rate (and rate squared), in the school, as well as median rent (from the 2000 Census, defined at the zipcode level), as identifying variables in a probit model of breakfast availability. Consistent with the ECLS-K analysis, we expect the availability of school breakfast to differ between low-income and higher-income schools, and between wealthier and less wealthy communities (as captured by differences in housing costs), yet we do not expect these school and community indicators to directly impact breakfast-skipping patterns after controlling for household characteristics.

Results

Breakfast-skipping among children with and without access to the School Breakfast Program

Overall, 24 percent of parents report that their child skips breakfast at least once in a typical school week, with 9 percent reporting 3 or more times. Breakfast skipping patterns are

similar in schools with and without the School Breakfast Program—23.7 vs 24.8 percent (Table 7). Direct comparisons between breakfast patterns in schools with and without breakfast are complicated by substantial differences among the students in the two groups of schools. In the Wisconsin Schools sample used here, 44 of 59 schools offer breakfast. The School Breakfast Program schools serve, on average, a disproportionately low income population: the average free and reduced price meal eligibility rate among breakfast-providing schools in the sample is .47, as compared to .26 among the non-breakfast schools (not shown). As such, comparisons of meal patterns are more informative when they differentiate between meal-skipping among higher-risk versus lower-risk students.

Figure 2 illustrates the prevalence of breakfast-skipping among various income groups, looking separately at students in schools that do and do not offer breakfast. The rate of skipping is much more strongly linked to income in the non-breakfast schools. In those schools, the prevalence of breakfast-skipping ranges from 38 to 41 percent in the three lowest income groups, from 26 to 33 percent in the three higher groups, and from 18 to 19 percent in the highest income groups. In the breakfast schools, on the other hand, breakfast skipping is much less variable across groups, and rates are sharply lower than in the non-breakfast schools at the lower income levels. Simple descriptive statistics, then, suggest that the availability of school breakfast may reduce the differential risk of skipping breakfast that is evident among lower income children.

Table 8 compares the prevalence of breakfast-skipping in breakfast and non-breakfast schools, according to a variety of other household attributes suggestive of economic need. Specifically, we look at breakfast-skipping in families classified as food insecure versus secure; who use food pantries versus who do not; and who receive food stamps versus not. When school breakfast isn't available, almost half of children in food insecure households skip breakfast at least once in a typical week (46.1 percent); this falls to 35.2 percent among children whose school participates in the program. Among children in food secure households, the rate of breakfast-skipping is approximately 20 percent regardless of school breakfast availability. A similar pattern holds when stratifying by use of food pantries: Among children without access to school breakfast, 45.7 percent of those who live in households that have received food from food pantries in the past year skip one or more breakfasts in a typical week, as compared to 30.2 percent of pantry users in schools that offer breakfast. Among children whose families have not used food pantries, the rate of breakfast skipping is approximately 23 percent regardless of breakfast availability. Stratifying by food stamp use also tells a similar story. In sum, the descriptive data provide preliminary evidence that availability of school breakfast is associated with lower likelihood of skipping breakfast among vulnerable subsets of elementary school

students, and thus reduces the gap in breakfast-skipping between more vulnerable and less vulnerable children.

Multivariate Analysis of School Breakfast Program and Breakfast-Skipping

To more formally estimate the impact of the School Breakfast Program on the probability that a child skips breakfast, we turn to a multivariate approach, considering several different models. First, we estimate a probit model with a dichotomous measure of breakfast-skipping as the dependent variable, and the key independent variable an indicator of the availability of the breakfast program (Table 9). Other variables include a variety of household characteristics broadly reflective of economic wellbeing, which may also be linked to breakfast patterns.

Results suggest that the availability of school breakfast significantly reduces the probability of breakfast-skipping ($p<.01$). Skipping breakfast is also more common among children from lower income households and those living in households that rent versus own their home, and less common among children with a college-educated parent. Education may proxy here for economic resources, or may be associated with greater awareness of the importance of breakfast for children. And, skipping breakfast is more common among children living with a single employed mother, relative to those living with both an employed and an at-home parent, perhaps reflecting time constraints that may make it more difficult for single employed parents to consistently feed children breakfast before school. There are no significant differences according to the number of children, and some evidence of less breakfast-skipping in mixed urban-rural communities (specifically, communities that are predominantly but not fully urban) as compared to fully urban communities.

In our next model, we look more closely at the role of the School Breakfast Program, allowing for different impacts among children at greater versus lesser risk. Specifically, we include, in addition to a breakfast program indicator, a series of interaction terms between breakfast program availability and income group. We expect that, rather than a constant impact, access to the School Breakfast Program may moderate the risk associated with low income. Results are consistent with this hypothesis. The income coefficients are highest for the lowest income group, and decline as income increases, indicating the relationship between income and breakfast-skipping in the absence of the program. The interaction terms on the several lowest income categories are negative and highly significant, suggesting that availability of school breakfast offsets the higher risk of breakfast-skipping found among the lower income groups. When breakfast is offered at school, then, income appears to be much less important an influence on breakfast consumption

In our third and final model, we use an instrumental variable strategy to control for unmeasured differences between children with and without access to breakfast at school. As discussed earlier, the identifying variables are the share of children in the school who are certified for free or reduced price meals (and the rate squared), as well as the median rent. Schools with a larger share of low-income students are much more likely to offer school breakfast, while the share of low-income children is not expected to be linked to breakfast patterns at the individual level, net of household income and other characteristics. Likewise, we expect wealthier areas, proxied by higher housing costs, to be less likely to offer school breakfast, but we do not posit any direct link between housing costs and breakfast skipping. The first-stage model, shown in Table 10, confirms that the certification rate is indeed a strong predictor of breakfast availability (at a decreasing rate, as evidenced by the negative coefficient on the squared term). Other predictors of access to school breakfast include lower median rent in the area, and living in a more urban area. In the second-stage model, the predicted probability of breakfast availability is negatively and significantly linked to breakfast skipping. Results are consistent with our earlier model, which controls for actual rather than predicted availability**.** We also examined whether results were sensitive to our choice of identifying variables, by alternately including one or the other of the potential identifying variables in the breakfast skipping model as well as in the prediction model. While the impact is most precisely estimated when certification rate and median rent are both used to identify the model, as in the results shown, we find a significant impact of school breakfast with either one serving as an identifying restriction. In general, results of the instrumental variable model appear robust to a variety of specifications.

To illustrate the magnitude of the estimated impact of school breakfast, we use the coefficients from Model 2 in Table 9 to estimate the predicted probability of skipping breakfast for prototypical students at varying income levels, with and without access to the School Breakfast Program (Table 11). Specifically, we consider a student in a rural area, who is living with a two employed parents with a high school education, in a household with 2 children and a rented home, at each of eight different income levels. In the absence of the School Breakfast Program, the predicted probability of skipping breakfast at least once per week is strongly linked to income, declining from a high of .42 at the lowest income level to a low of .25 at the highest income level. In contrast, when the School Breakfast Program is available, the additional risk associated with low income declines dramatically, with the predicted probabilities ranging from a high of .30 at the lowest income to a low of .24 at the highest income. Consistent with the earlier descriptive results (Figure 2), predictions derived from the multivariate analysis indicate

that access to the School Breakfast Program sharply reduces the negative relationship that otherwise exists between low income and breakfast-skipping.

CONCLUSION

This report provides an updated look at patterns and determinants of School Breakfast Program participation, as well as impacts of the program on food insecurity and on breakfast skipping. Past research clearly shows that school breakfast is inconsistently available, and when available, inconsistently implemented, with widely ranging participation patterns. This matters more, to the extent that offering the program, and encouraging participation, is in fact beneficial to children. In this report, we confirm that participation is inconsistent, even among children who appear to have unmet food-related needs, and we identify a range of factors at the household and school levels that appear important in influencing the decision to participate. And, we provide evidence that access to the program is beneficial in at least two ways—enhancing food security and reducing the likelihood that children skip breakfast on school days, with more robust findings for the latter outcome. Many would consider these outcomes desirable in their own right; they are particularly important in light of growing evidence of their links to both cognitive and health-related outcomes including, for instance, academic performance and obesity (see, e.g., Joyoti, Frongillo, and Jones 2005; Haines et al 2007).

Our analysis confirms that school breakfast is much less widely used than school lunch, even among children with access to both programs. Furthermore, breakfast participation is almost entirely limited to a subset of the students who regularly eat school lunch. The program appears to serve as an expanded way of utilizing school meals for a subset of the students already predisposed to such meals; it receives only extremely limited use among other students. And, in contrast to school lunch, school breakfast appears to be used primarily by the subset of students who are most vulnerable. At the same time, there remains a substantial share of at-risk children who have access to the program yet do not participate—including 38 percent of those who are food insecure.

Multivariate analyses suggest that both economic vulnerability and time constraints are linked to participation, with low income and education, more children, and having two employed parents in the home emerging as significant predictors. We also find indirect evidence that local norms may be important in the participation decision, as evidenced by significantly higher participation in schools with a larger share of low-income students, as well as in neighborhoods with lower median incomes. Furthermore, it appears the normative nature of participation in low-income schools may have spillover effects on higher income children who might otherwise

be less inclined to participate. Pronounced differences in participation according to race and ethnicity could also reflect differences in norms or preferences. On the other hand, and counter to our expectation, we found less likelihood of participation among children living in counties with more liberal political climates, suggesting that prevailing wisdom about political norms and attitudes towards public programs may not be reflected in school meal program decisions.

Of particular interest, we found that programmatic and logistical aspects of how breakfast is structured at the school are significantly linked to the likelihood of participation. Results strongly support the hypothesis that increasing the convenience of the School Breakfast Program leads to greater participation, with evidence of the importance of where breakfast is offered (classroom versus cafeteria), the duration of the breakfast period, and the arrival time of buses relative to the start of classes. While smaller-scale local studies have found evidence that features such as in-class breakfast increase participation (see, e.g., Lent and Emerson 2006; Wong and Emerson 2007), this is the first evidence, to our knowledge, of its impact on a national scale.

Understanding factors that facilitate or impede participation in the School Breakfast Program is particularly important to the extent that participation contributes to desirable outcomes for children. Our preferred analyses avoid an explicit focus on participation impacts, due to fairly intractable problems stemming from self-selection of more vulnerable children into the program, instead capitalizing on differences in program availability to assess program impacts.

Our findings suggest that school breakfast availability is linked to a lower probability of marginal household food security among low-income children, though not to food insecurity at the standard threshold. That is, the program appears beneficial in offsetting food-related concerns among at-risk families, though not necessarily in alleviating food insecurity once hardships have crossed the food insecurity threshold. The magnitude of the estimated impact is substantial, with availability of school breakfast reducing the predicted probability of marginal food security from 47 percent to 33 percent in the hypothetical case considered here. It is notable that food insecurity at this marginal threshold has also been linked to poor developmental trajectories for children (Jyoti, Frongillo, and Jones 2005). While it is possible that unmeasured differences between schools that do and do not offer the program could bias our results, we find it more plausible that any bias would result in underestimates, rather than overestimates, of the true impact, given that school breakfast is disproportionately offered in schools with higher-need populations, at least based on observable characteristics. On the other hand, we were unable to substantiate our findings with an instrumental variable model, despite the existence of a strong

state policy instrument. We note the relatively small number of low-income students in our sample who do not have access to school breakfast, thus hampering our ability to obtain more precise estimates of program impact.

In contrast to a negative association between School Breakfast Program availability and marginal food security, we found a positive association between actual participation in the program and both of the food insecurity outcomes. We attribute this relationship to self-selection of higher risk children into the program; that is, we expect that children with more immediate food security concerns would be more likely to eat a school breakfast when available, making it difficult to obtain valid impact estimates. This problem is pervasive in the literature on food assistance program participation and food insecurity. Overall, we find the analyses that focus on availability of the program, rather than participation, to have both greater policy relevance and greater statistical merit.

Evidence that availability of the School Breakfast Program reduces the risk of breakfast-skipping is robust. Results, which are based on Wisconsin data, suggest that offering breakfast significantly reduces the probability of skipping at least one breakfast per week, and that offering breakfast at school serves to moderate the risk of breakfast-skipping associated with low income. A beneficial impact is also evident when we use an instrumental variable approach, further strengthening our confidence in the findings. Our results are broadly consistent with those of Devaney & Stuart (1998), though we use much more recent data, look more formally at how impacts change across income levels, and use an instrumental variable approach as a robustness check. Note that these results are based on data for only one state; it is possible that the impact of the program on breakfast-skipping might differ elsewhere, particularly if patterns of program uptake vary across locations.

Taken as a whole, our findings indicate that access to the School Breakfast Program yields significant benefits in terms of enhancing food security among families at the margin of food insecurity, and increasing the probability that children—particularly low-income children—eat breakfast in the morning. Currently, the share of schools that offer the program ranges dramatically across states, from a low of 51.5 percent of schools offering lunch in Connecticut, to availability in more than 95 percent of schools in 13 states (FRAC 2007). Our findings suggest that making school breakfast more broadly available would be beneficial in ensuring that more children start their school day with a meal, and that fewer families are confronted with uncertain access to sufficient food.

Furthermore, our findings on participation patterns suggest that these benefits could also be enhanced with greater participation among children who already have access to the program.

On the one hand, the most vulnerable children are already the most likely to participate, suggesting that the program is generally well targeted. At the same time, there appears to be substantial unmet need, as evidenced by nontrivial amounts of nonparticipation among children who are food insecure and/or who don't consistently eat breakfast. As such, it seems likely that strengthening participation could yield further benefits, though likely at decreasing rates. To the extent that stigma, negative impressions of school breakfast, or logistical barriers are dampening participation among children who would find it beneficial to participate, identifying and taking steps to counter such barriers seems warranted.

Our results point to potential strategies to enhance participation through program design as well as outreach efforts. In particular, the relationship between program attributes and participation patterns suggest that there are policy levers that can be used to enhance participation by removing logistical barriers. For instance, Kansas mandates that all school buses arrive at school with adequate time for children to eat breakfast (FRAC 2007); in Milwaukee, all schools that participate in a Universal Free Breakfast program are required to make breakfast available in the classroom.

In terms of program outreach, the concentration of participants among the subset of students who regularly eat lunch suggests that outreach efforts may be most effective if they market school breakfast as an expansion of the school lunch concept, building on students' connection with that program. In addition, participation patterns suggest that expanding school breakfast to additional schools may be most effective as a means to increase participation in schools that already have relatively high rates of lunch participation, as students in those schools are most likely to be receptive to the breakfast program. Efforts to expand the reach of school breakfast to a broader cross-section of students may benefit by outreach/marketing strategies that focus on convenience or other potential benefits, in addition to the economic benefits of participating, to help broaden the appeal beyond the current primarily low-income clientele. To the extent that stigma associated with the program may discourage participation, successfully targeting a broader cross-section may also help to counter existing stereotypes. Social marketing efforts to present the program as normative would likely be effective.

A variety of extensions to this work would be of value. First, it would be useful to examine how individual participation in the School Breakfast Program changes over time; the ECLS-K is well suited to this given the longitudinal structure of the data. Likewise, it could be beneficial to examine the relationship between the School Breakfast Program and food security in a longitudinal framework, although the relatively low rates of food insecurity in the ECLS-K could create some challenges for such an analysis. Although not directly related to the School

Breakfast Program, the unexpectedly low rate of food insecurity found in these data is also a topic that warrants further attention, particularly given the potential value of the data to explore the relationship between food insecurity and a variety of child outcomes. In terms of the relationship between the School Breakfast Program and breakfast skipping, it would be useful to attempt to replicate these findings with data from a national sample; unfortunately, the ECLS-K are not well suited to this as breakfast skipping cannot be accurately identified.

Finally, we note some inherent limitations in our data. With regard to school breakfast participation, we only have information on parents' report of whether a child 'usually eats a breakfast provided by the school'. We do not know anything about occasional (rather than usual) participation, nor do we know about the accuracy of the parents' reports. Other research has found that parents report higher levels of school meal participation than do children (Gordon et all 2007), and parents' reports do not clearly distinguish between breakfasts obtained from the School Breakfast Program versus other food that may be available at the school. Our reports of usual participation are higher than usual participation among all public elementary school students as reported in the SNDA-III (Gordon et al 2007) (40.8 percent versus 31.2 percent), which could reflect our use of parent-reported participation as compared to the SNDA-III use of child-reported participation. Differences could also reflect different sample frames: our sample is limited to 3rd graders, who may or may not participate at rates comparable to all elementary school students. With regard to our breakfast-skipping analysis, we are likewise limited to parents' reports, which may or may not be an accurate reflection of children's behavior. And, we know from past research that analyses of the determinants of breakfast-skipping are sensitive to the specific definition of breakfast that is used (see, e.g., Devaney & Stuart 1998).

Table 1
Participation in School Meal Programs, Among Third Grade Public School Students

		Percent Participating[2]	
	N[1]	**School Breakfast**	**School Lunch**
All students[3]	10,350	35.3%	84.4%
Students in schools serving breakfast	6,680	41.8%	87.6%
Students who eat school lunch	5,610	43.0%	100%
Students who don't eat school lunch	890	6.8%	0%
Students who eat school breakfast	2,470	100%	97.6%
Students who don't eat school breakfast	4080	0%	79.5%

Note: Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort (ECLS-K), wave 5, restricted access file.
[1]Due to licensing requirements for ECLS-K restricted data, all sample sizes are rounded to the nearest 10.
[2]Percents are weighted.
[3]Full sample includes students with missing information on breakfast availability from school administrators.

Table 2
Participation in School Meal Programs, by Household Characteristics

		Percent Participating[2]	
	N[1]	**School Breakfast**	**School Lunch**
Total (limited to children in schools serving school breakfast)	6,680	41.8%	87.6%
Income			
$15,000 or less	750	73.3%	96.8%
$15,001 to $20,000	430	64.2%	94.9%
$20,001 to $25,000	480	54.5%	94.9%
$25,001 to $30,000	550	52.9%	92.9%
$30,001 to $35,000	390	42.6%	92.0%
$35,001 to $40,000	510	40.2%	87.2%
$40,001 to $50,000	700	30.0%	83.6%
$50,001 to $75,000	1,090	19.5%	81.0%
$75,001 or more	1,050	9.3%	72.2%
Eligible for free or reduced price meals			
Eligible	2,800	59.8%	94.3%
Not eligible	3,160	20.7%	79.8%
Highest education in household			
Less than high school	770	70.0%	96.0%
High school	1,720	52.2%	93.1%
Some college	2,430	38.8%	86.7%
College degree	1,040	20.0%	81.6%
Graduate degree	710	14.5%	70.7%
Number of children			
1	1,010	37.0%	88.0%
2	2,770	34.6%	84.4%
3	1,850	45.6%	89.5%
4 or more	1,060	58.4%	92.1%
Food security status			
Food secure	6,000	35.2%	85.4%
Food insecure	590	62.1%	95.7%
Region			
Northeast	980	30.5%	78.6%
Midwest	1,530	34.0%	89.6%
South	2,720	49.8%	89.4%
West	1,440	38.7%	87.6%
Urban vs. Rural Status			
Large city	1,030	43.2%	88.0%
Mid-size city	110	40.9%	87.3%
Large suburban area	1,400	35.3%	82.8%
Mid-size suburban area	440	35.0%	82.9%
Large town	250	46.6%	95.1%
Small town	530	45.1%	91.1%
Rural area in MSA	740	30.9%	84.0%
Rural area outside MSA	1,100	57.1%	94.7%

Note: Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort (ECLS-K), wave 5, restricted access file. Sample is limited to children in schools participating in School Breakfast Program.
[1]Due to licensing requirements for ECLS-K restricted data, all sample sizes are rounded to the nearest 10.
[2]Percents are weighted.

Table 3
Probit Models of Participation in School Breakfast Program, Among Children Attending Schools that Offer Breakfast

	Model 1		*Model 2*	
	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	0.164	0.237	0.056	0.240
Household Characteristics				
Income				
$15,000 or less	(omitted)		(omitted)	
$15,001 to $20,000	-0.170**	0.087	-0.169*	0.086
$20,001 to $25,000	-0.312***	0.085	-0.317***	0.085
$25,001 to $30,000	-0.320***	0.084	-0.333***	0.084
$30,001 to $35,000	-0.525***	0.094	-0.544***	0.094
$35,001 to $40,000	-0.388***	0.097	-0.409***	0.097
$40,001 to $50,000	-0.634***	0.104	-0.666***	0.104
$50,001 to $75,000	-0.716***	0.113	-0.731***	0.113
$75,001 or more	-0.957***	0.122	-0.961***	0.122
Eligible for free or reduced price meals				
Eligible	0.075	0.076	0.297***	0.103
Not eligible	(omitted)		(omitted)	
Number of children				
1	(omitted)		(omitted)	
2	0.032	0.057	0.037	0.057
3	0.192***	0.061	0.201***	0.062
4 or more	0.417***	0.071	0.423***	0.071
Household structure				
Single parent, not employed	0.198**	0.093	0.192**	0.093
Single parent, employed	0.062	0.063	0.058	0.063
2 parents, 1 employed	(omitted)		(omitted)	
2 parents, both employed	0.121**	0.048	0.123**	0.048
2 parents, neither employed	0.139	0.132	0.140	0.132
Other	0.252**	0.117	0.251**	0.118
Highest education in household				
Less than high school	(omitted)		(omitted)	
High school	-0.198***	0.066	-0.203***	0.066
Some college	-0.273***	0.066	-0.275***	0.066
College degree	-0.445***	0.082	-0.440***	0.082
Graduate degree	-0.639***	0.096	-0.629***	0.096
Housing arrangements				
Own home	(omitted)		(omitted)	
Rent home	0.214***	0.046	0.212***	0.046
Race				
White	(omitted)		(omitted)	
Black	0.639***	0.063	0.637***	0.063
Hispanic	0.350***	0.060	0.354***	0.060
Asian	0.192**	0.091	0.181*	0.092
Other	0.235***	0.083	0.228***	0.083
Gender				
Male	(omitted)		(omitted)	
Female	-0.056	0.037	-0.056	0.037
Geographic Variables				
Region				
Northeast	(omitted)		(omitted)	
Midwest	0.280***	0.084	0.282***	0.085
South	0.284***	0.081	0.284***	0.081
West	0.124	0.086	0.121	0.086
Urban vs. Rural Status				

Large city	-0.406***	0.080	-0.407***	0.079
Mid-size city	-0.318***	0.070	-0.308***	0.069
Large suburban area	-0.220***	0.070	-0.214***	0.069
Mid-size suburban area	-0.332***	0.089	-0.327***	0.089
Large town	-0.162	0.110	-0.159	0.108
Small town	-0.125	0.083	-0.134	0.082
Rural area in MSA	-0.271***	0.078	-0.282***	0.077
Rural area outside MSA	(omitted)		(omitted)	
Local Characteristics				
School free/reduced price meal certification rate	0.007***	0.001	0.010***	0.001
School certification rate*child eligibility			-0.005***	0.001
Percent of county voting democratic	-0.010***	0.002	-0.010***	0.002
Median income in county($100's)	-0.0012***	0.0003	-0.0012***	0.0003
Unemployment rate in county	0.006	0.014	0.005	0.014
Logistical & Programmatic Features				
Location of school breakfast served				
Cafeteria	(omitted)		(omitted)	
Classroom	0.504***	0.102	0.504***	0.102
Common areas	0.055	0.123	0.069	0.123
Other locations	-0.278	0.234	-0.268	0.234
Duration of school breakfast period(minutes)	0.004**	0.002	0.004**	0.002
Time between school arrival & start of class, for school bus riders				
Fewer than 10 minutes	(omitted)		(omitted)	
10 to 20 minutes	0.331***	0.072	0.325***	0.074
More than 20 minutes	0.938***	0.096	0.932***	0.096
Transportation to school				
School bus	(omitted)		(omitted)	
Parents drive	0.008	0.069	0.001	0.069
Carpool	0.051	0.149	0.044	0.149
Walk	0.138*	0.083	0.133	0.083
Someone else drives	-0.054	0.124	-0.060	0.124
Other	0.396**	0.190	0.400**	0.191
Log-likelihood	-3208.309		-3202.969	
N	6410		6410	

Notes: *=p<.1, **=p<.05, ***=p<.01;
Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort (ECLS-K), wave 5, restricted access file.
Due to licensing requirements for ECLS-K restricted data, all sample sizes are rounded to the nearest 10.
Dependent variable is school breakfast participation, coded 1 when the respondent indicates that the child usually eats a school breakfast.
Model also includes dummy variables denoting missing information on independent variables, wherever relevant, as well as variables for other housing arrangements.

Table 4
Household Food Insecurity Among Third Grade Public School Students

		Percent[2]	
	Total N[1]	***Standard Food Insecurity Measure***	***Marginal Food Security Measure***
All students[3]	8,120	8.8%	16.8%
Below 185% poverty line	3,010	16.6%	30.1%
Above 185% poverty line	4,340	2.6%	6.1%
Limited to households below 185% of poverty line			
School offers breakfast	2,800	16.1%	29.2%
School doesn't offer breakfast	210	24.5%	42.2%

Notes: Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort (ECLS-K), wave 5, restricted access file.
Households are considered marginally food secure if the respondent answers at least one of the questions on the food security scale in the affirmative; the standard food security measure requires at least three affirmative responses to be considered food insecure.

[1]Due to licensing requirements for ECLS-K restricted data, all sample sizes are rounded to the nearest 10.
[2]Percents are weighted.
[3]Students with missing information on School Breakfast Program availability from school administrators are excluded.

Table 5.
Probit Models of Household Food Insecurity, Among Low Income Third Grade Public School Students

	Standard Food Insecurity		*Marginal Food Security*	
	Coeff.	SE	Coeff.	SE
Intercept	-1.199***	0.257	-0.394*	0.223
School breakfast available	-0.113	0.123	-0.369***	0.107
Income				
$15,000 or less	(omitted)		(omitted)	
$15,001 to $20,000	-0.037	0.090	0.039	0.081
$20,001 to $25,000	-0.117	0.093	-0.164**	0.084
$25,001 to $30,000	-0.467***	0.107	-0.437***	0.091
$30,001 to $35,000	-0.358***	0.121	-0.411***	0.103
$35,001 to $40,000	-0.436***	0.139	-0.377***	0.115
$40,001 to $50,000	-0.526***	0.171	-0.531***	0.142
$50,001 to $75,000	-0.713	0.596	-0.697	0.465
	0	0	0	0
Highest education in household				
Less than high school	(omitted)		(omitted)	
High school	-0.156*	0.083	-0.127*	0.075
Some college	-0.187**	0.086	-0.123	0.076
College degree	-0.400***	0.145	-0.192*	0.118
Graduate degree	-0.675***	0.244	-0.452***	0.181
Housing arrangements				
Own	(omitted)		(omitted)	
Rent	0.169***	0.067	0.183***	0.059
Temporary	0.859**	0.414	0.342	0.409
Parent's health status				
Excellent	-0.186***	0.070	-0.153***	0.060
Good	(omitted)		(omitted)	
Poor	0.505***	0.077	0.401***	0.071
Number of children				
1	(omitted)		(omitted)	
2	0.045	0.112	0.064	0.098
3	0.155	0.112	0.164*	0.098
4 or more	0.247**	0.116	0.301***	0.102
Race of children				
White	(omitted)		(omitted)	
Black	0.073	0.094	0.234***	0.082
Hispanic	-0.076	0.091	0.024	0.080
Asian	0.015	0.139	0.021	0.122
Other	0.211*	0.120	0.234**	0.105
Household structure & employment				
Single parent, not employed	0.089	0.114	0.200**	0.103
Single parent, employed	-0.001	0.088	-0.076	0.078
2 parents, 1 employed	(omitted)		(omitted)	
2 parents, both employed	-0.113	0.081	-0.061	0.070
2 parents, neither employed	0.124	0.156	0.110	0.142
Other	-0.291	0.183	-0.225	0.158
Median rent	0.001**	0.0002	0.0003*	0.0002
Region				
Northeast	(omitted)		(omitted)	
Midwest	0.167	0.113	0.102	0.096
South	0.062	0.106	0.022	0.090
West	0.196*	0.108	0.139	0.094
Urban vs. Rural Status				
Large city	0.043	0.121	-0.103	0.102
Mid-size city	0.245**	0.113	0.164*	0.095
Large suburban	0.102	0.115	-0.029	0.097

Mid-size suburban	0.399***	0.137	0.184	0.121
Large town	0.238	0.175	-0.019	0.155
Small town	0.433***	0.126	0.183*	0.111
Rural area in MSA	0.159	0.137	0.086	0.115
Rural area outside MSA	(omitted)		(omitted)	
School free/reduced price meal certification rate	-0.001	0.001	-0.002	0.001
Log-likelihood	-1179.211		-1628.923	
N	2,960		2,960	

Notes: *=p<.1, **=p<.05, ***=p<.01

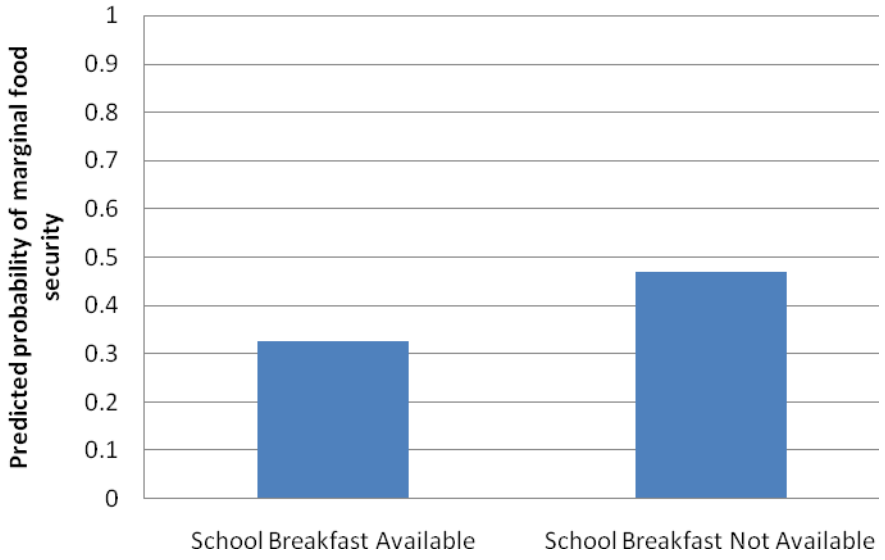
Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort (ECLS-K), wave 5, restricted access file.

Due to licensing requirements for ECLS-K restricted data, all sample sizes are rounded to the nearest 10.

Households are considered marginally food secure if the respondent answers at least one of the questions on the food security scale in the affirmative; the standard food security measure requires at least three affirmative responses to be considered food insecure.

Model also includes dummy variables denoting missing information on independent variables, wherever relevant, as well as variables for other housing arrangements.

Figure 1
Predicted Probability of Marginal Household Food Security Among Low Income Third Grade Public School Students, Based on Probit Model



Predicted probabilities are based on probit model of marginal food security among children below 185% of poverty line, using data from Early Childhood Longitudinal Survey—Kindergarten Cohort, wave 5, restricted access files (see Table 5). Predictions assume the following characteristics: household is in rural Midwest in county with median rent of $600/month; school has free and reduced price meal certification rate of 25%; student is white and lives with single employed mother who rents home and is in good health with high school education, two children, and annual income of $15,001-$20,000.

Table 6.
Instrumental Variable Models of Household Food Insecurity, Among Low Income Third Grade Public School Students

	1st Stage		*2nd Stage*			
	Prediction Model		**Standard Food Insecurity**		**Marginal Food Security**	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Intercept	1.730 ***	0.310	-1.370***	0.348	-0.669**	0.300
Predicted probability of school breakfast availability			0.085	0.296	-0.133	0.254
Covered by State Policy Mandate	1.149***	0.159				
Region						
Northeast	(omitted)		(omitted)		(omitted)	
Midwest	-0.665***	0.140	0.185(p=0.109)	0.115	0.121	0.098
South	1.108***	0.221	0.055	0.106	0.002	0.090
West	0.594***	0.159	0.193*	0.108	0.124	0.094
Urban vs. Rural Status						
Large city	0.135	0.217	0.043	0.121	-0.101	0.102
Mid-size city	0.088	0.206	0.244**	0.113	0.158*	0.095
Large suburban	-0.346**	0.171	0.118	0.116	-0.003	0.098
Mid-size suburban	-0.453**	0.203	0.406***	0.137	0.193(p=0.109)	0.121
Large town	-0.833***	0.266	0.249	0.175	-0.006	0.154
Small town	0.101	0.223	0.433***	0.126	0.180(p=0.106)	0.111
Rural area in MSA	0.396*	0.233	0.151	0.137	0.082	0.116
Rural area outside MSA	(omitted)		(omitted)		(omitted)	
School free/reduced price meal certification rate	0.038***	0.004	-0.003	0.003	-0.0002	0.003
Certification rate squared	-0.0002***	0.000	0.0000	0.0000	-0.0000	0.0000
Median rent in county	-0.003***	0.0004	0.001**	0.0003	0.0004**	0.0002
Highest education in household						
Less than high school	(omitted)		(omitted)		(omitted)	
High school	-0.193	0.182	-0.156*	0.083	-0.125*	0.075
Some college	-0.438***	0.174	-0.181**	0.086	-0.117	0.077
College degree	-0.396*	0.211	-0.391***	0.145	-0.182	0.118
Graduate degree	-0.267	0.281	-0.673***	0.244	-0.442***	0.180
Income						
$15,000 or less			(omitted)		(omitted)	
$15,001 to $20,000			-0.038	0.090	0.036	0.081
$20,001 to $25,000			-0.117	0.093	-0.163**	0.084
$25,001 to $30,000			-0.471***	0.107	-0.443***	0.091
$30,001 to $35,000			-0.363***	0.121	-0.419***	0.103
$35,001 to $40,000			-0.435***	0.139	-0.370***	0.115
$40,001 to $50,000			-0.525***	0.171	-0.529***	0.142
$50,001 to $75,000			-0.723	0.598	-0.735	0.465
$75,001 or more			0	0	0	0
Housing ownership						
Own			(omitted)		(omitted)	
Rent			0.167***	0.067	0.174***	0.058
Temporary			0.870**	0.415	0.374	0.412
Parent's health status						
Excellent			-0.187***	0.070	-0.154***	0.060
Good			(omitted)		(omitted)	
Poor			0.506***	0.077	0.403***	0.071
Number of children						
1			(omitted)		(omitted)	

2		0.047	0.112	0.068	0.097
3		0.157	0.112	0.167*	0.098
4 or more		0.247**	0.116	0.303***	0.102
Race of children					
White		(omitted)		(omitted)	
Black		0.073	0.094	0.232***	0.082
Hispanic		-0.079	0.091	0.021	0.080
Asian		0.014	0.139	0.015	0.122
Other		0.212*	0.120	0.227**	0.105
Household structure & employment					
Single parent, not employed		0.090	0.114	0.204**	0.103
Single parent, employed		0.002	0.088	-0.064	0.078
2 parents, 1 employed		(omitted)		(omitted)	
2 parents, both employed		-0.110	0.081	-0.050	0.069
2 parents, neither employed		0.128	0.156	0.117	0.142
Other		-0.290	0.184	-0.211	0.158
Log-likelihood	-408.939	-1179.572		-1634.612	
N	2,960	2,960		2,960	

Notes: *=p<.1, **=p<.05, ***=p<.01

Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort (ECLS-K), wave 5, restricted access file.

Due to licensing requirements for ECLS-K restricted data, all sample sizes are rounded to the nearest 10.

Households are considered marginally food secure if the respondent answers at least one of the questions on the food security scale in the affirmative; the standard food security measure requires at least three affirmative responses to be considered food insecure.

Model also includes dummy variables denoting missing information on independent variables, wherever relevant, as well as variables for other housing arrangements.

Table 7.
Probit Models of Household Food Insecurity, Among Low Income Third Grade Public School Students With Access to School Breakfast Program

	Standard Food Insecurity		***Marginal Food Security***	
	Coeff.	SE	Coeff.	SE
Intercept	-1.438***	0.249	-0.935***	0.215
Participates in School Breakfast	0.144**	0.070	0.197***	0.061
Income				
$15,000 or less	(omitted)		(omitted)	
$15,001 to $20,000	-0.019	0.095	0.081	0.085
$20,001 to $25,000	-0.084	0.100	-0.099	0.089
$25,001 to $30,000	-0.484***	0.116	-0.479***	0.099
$30,001 to $35,000	-0.331***	0.132	-0.406***	0.114
$35,001 to $40,000	-0.461***	0.155	-0.444***	0.128
$40,001 to $50,000	-0.448**	0.200	-0.699***	0.175
$50,001 to $75,000	-5.412	4830.308	-0.694	0.557
$75,001 or more	0	0	0	0
Highest education in household				
Less than high school	(omitted)		(omitted)	
High school	-0.156*	0.087	-0.110	0.078
Some college	-0.189**	0.091	-0.116	0.081
College degree	-0.477***	0.169	-0.227*	0.135
Graduate	-0.621**	0.273	-0.402**	0.207
Housing ownership				
Own	(omitted)		(omitted)	
Rent	0.145**	0.072	0.120*	0.063
Temporary	1.035**	0.443	0.460	0.437
Parent's health status				
Excellent	-0.155**	0.076	-0.130**	0.065
Good	(omitted)		(omitted)	
Poor	0.498***	0.082	0.386***	0.075
Number of children				
1	(omitted)		(omitted)	
2	-0.009	0.119	0.043	0.104
3	0.125	0.118	0.186*	0.104
4 or more	0.245**	0.124	0.330***	0.109
Race of children				
White	(omitted)		(omitted)	
Black	0.035	0.100	0.196**	0.087
Hispanic	-0.059	0.098	0.047	0.086
Asian	-0.119	0.169	-0.004	0.144
Other	0.025*	0.140	0.045	0.120
Household structure & employment				
Single parent, not employed	0.077	0.119	0.176*	0.108
Single parent, employed	-0.006	0.095	-0.088	0.084
2 parents, 1 employed	(omitted)		(omitted)	
2 parents, both employed	-0.101	0.088	-0.092	0.075
2 parents, neither employed	0.175	0.165	0.099	0.152
Other	-0.295	0.192	-0.194	0.165
Median rent	0.001*	0.0003	0.0004	0.0002
Region				
Northeast	(omitted)		(omitted)	
Midwest	0.201 (p=108)	0.125	0.131	0.107
South	0.072	0.114	-0.003	0.098
West	0.142	0.119	0.027	0.104
Urban vs. Rural Status				
Large city	0.158	0.132	-0.065	0.112
Mid-size city	0.319***	0.123	0.207**	0.103

Large suburban	0.161	0.128	0.012	0.107
Mid-size suburban	0.485***	0.151	0.269**	0.133
Large town	0.271	0.187	-0.048	0.166
Small town	0.530***	0.136	0.259**	0.119
Rural area in MSA	0.211	0.147	0.128	0.124
Rural area outside MSA	(omitted)		(omitted)	
School free/reduced price meal certification rate	-0.001	0.001	-0.001	0.001
Log-likelihood	-1016.068		-1392.186	
N	2,620		2,620	

Notes: *=p<.1, **=p<.05, ***=p<.01

Data are from the Early Childhood Longitudinal Survey—Kindergarten Cohort (ECLS-K), wave 5, restricted access file.

Due to licensing requirements for ECLS-K restricted data, all sample sizes are rounded to the nearest 10.

Households are considered marginally food secure if the respondent answers at least one of the questions on the food security scale in the affirmative; the standard food security measure requires at least three affirmative responses to be considered food insecure.

Model also includes dummy variables denoting missing information on independent variables, wherever relevant, as well as variables for other housing arrangements.

Table 8
Breakfast-Skipping Among Wisconsin Elementary School Students

	N	*Percent skipping breakfast*	
		Children with School Breakfast Available	**Children without School Breakfast Available**
Total	7,428	23.7%	24.8%
Food security status			
Food insecure	1,630	35.2%	46.1%
Food secure	5,898	20.3%	20.1%
Food pantry use			
Yes	905	30.2%	45.7%
No	6,524	22.6%	22.7%
Food stamp participation			
Yes	1,101	28.6%	37.2%
No	6,335	22.6%	23.4%

Note: Data are from the Wisconsin Schools Food Security Survey.
Students are considered to skip breakfast if the respondent indicates that the child skips breakfast at least once in a typical week.

Figure 2
Breakfast-Skipping among Elementary School Children in Wisconsin, by Income Level and School Breakfast Program Availability

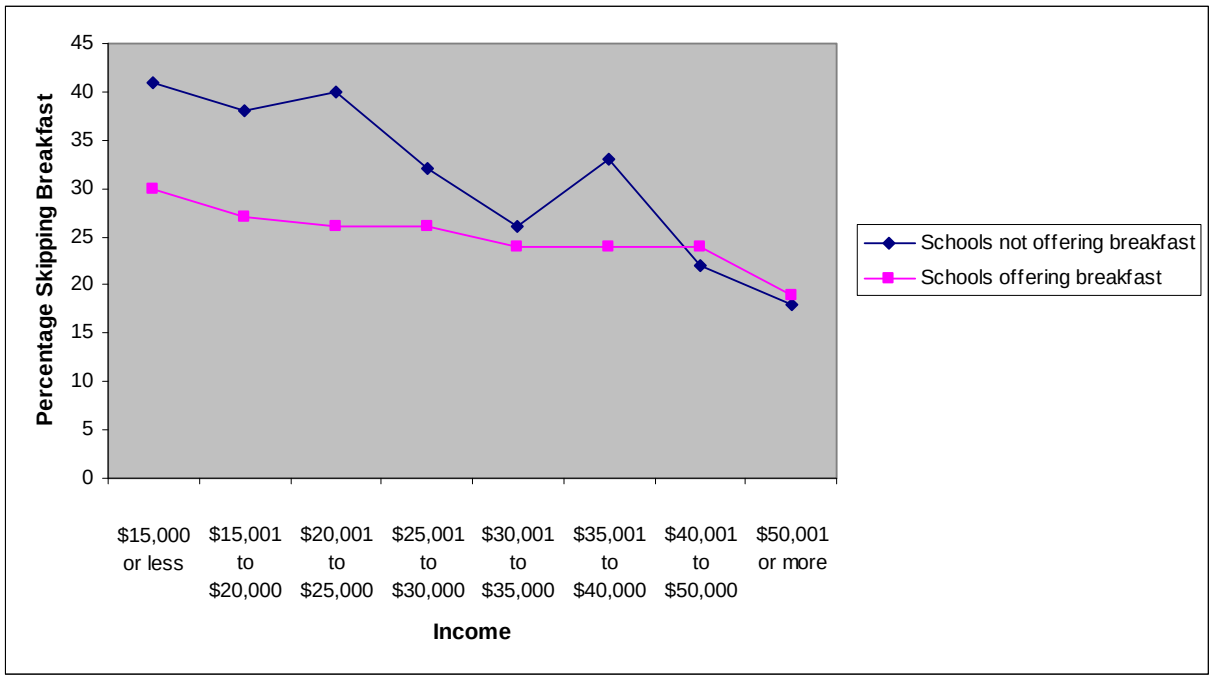


Table 9
Probit Models of Breakfast-Skipping Among Elementary School Children in Wisconsin

	Model 1		***Model 2***		***Model 3***	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Intercept	-0.367**	0.186	-0.444**	0.188	-0.301	0.190
School breakfast available	-0.105***	0.038	0.031	0.054		
Predicted probability of school breakfast availability[1]					-0.153***	0.057
Income						
$15,000 or less	0.242***	0.066	0.509***	0.119	0.249***	0.067
$15,001 to $20,000	0.183***	0.069	0.453***	0.123	0.191***	0.070
$20,001 to $25,000	0.190***	0.074	0.517***	0.142	0.182**	0.075
$25,001 to $30,000	0.164**	0.079	0.301*	0.167	0.195**	0.081
$30,001 to $35,000	0.103	0.065	0.167	0.114	0.101	0.066
$35,001 to $40,000	0.184***	0.062	0.385***	0.110	0.191***	0.063
$40,001 to $50,000	0.112*	0.067	0.091	0.124	0.121*	0.068
$50,001 or more	(omitted)		(omitted)		(omitted)	
Breakfast availability*Income						
Available*$15,000 or less			-0.349***	-0.349		
Available*$15,001 to $20,000			-0.374***	-0.374		
Available*$20,001 to $25,000			-0.443***	-0.443		
Available*$25,001 to $30,000			-0.197	-0.197		
Available*$30,001 to $35,000			-0.104	-0.104		
Available*$35,001 to $40,000			-0.297**	-0.297		
Available*$40,001 to $50,000			0.015	0.015		
Available*$50,001 or more			(omitted)			
Housing arrangements						
Own	(omitted)		(omitted)		(omitted)	
Rent	0.083*	0.043	0.083*	0.043	0.076*	0.044
Homeless	-0.033	0.156	-0.023	0.156	-0.070	0.168
Highest education in household						
Less than high school	(omitted)		(omitted)		(omitted)	
High school	-0.054	0.082	-0.052	0.082	-0.053	0.084
Some college	-0.122	0.082	-0.119	0.082	-0.128	0.084
College degree	-0.312***	0.086	-0.312***	0.086	-0.322***	0.087
Household structure						
Single mother, not employed	-0.045	0.106	-0.051	0.107	-0.028	0.108
Single mother, employed	0.149**	0.060	0.142**	0.060	0.144**	0.061
Single father	0.013	0.103	0.011	0.103	0.014	0.104
2 parents, 1 employed	(omitted)		(omitted)		(omitted)	
2 parents, both employed	0.038	0.047	0.038	0.047	0.025	0.047
2 parents, neither employed	0.008	0.131	0.010	0.131	0.010	0.133
Grandparents	0.006	0.151	0.000	0.151	0.042	0.156
Other	0.138*	0.077	0.141*	0.077	0.108	0.078

Number of children						
1	(omitted)		(omitted)		(omitted)	
2	-0.032	0.045	-0.038	-0.038	-0.04	.045
3	-0.006	0.050	-0.005	-0.005	-0.011	.050
4 or more	0.034	0.061	0.031	0.031	0.027	.062
Urban vs. Rural Status of zipcode						
All urban	(omitted)		(omitted)		(omitted)	
Mostly urban	-0.326**	0.155	-0.330**	0.155	-0.339**	0.156
Mostly rural	-0.201	0.158	-0.208	0.158	-0.215	0.158
All rural	-0.251	0.155	-0.260*	0.155	-0.252	0.155
Log-likelihood	-4059.274		-4048.727		-3938.127	
N	7528		7528		7299	

Notes: *=p<.1, **=p<.05, ***=p<.01
Data are from the Wisconsin Schools Food Security Survey.
The dependent variable, breakfast-skipping, is coded as 1 if the respondent indicates that the child skips breakfast at least once in a typical week,Model also includes dummy variables denoting missing information on independent variables, wherever relevant.

[1]Predictions generated by probit model of School Breakfast Program availability; model shown in Table 10.

Table 10
Probit Model of School Breakfast Availability Among Elementary School Children in Wisconsin[1]

	Coeff.	SE
Intercept	0.931***	0.062
School free/reduced price certification rate	3.101***	0.132
School certification rate squared	-1.972***	0.154
Median rent($100's)	-0.179***	0.006
Urban vs. Rural Status		
All urban	(omitted)	
Mostly urban	-0.253***	0.038
Mostly rural	-0.260***	0.039
All rural	-0.259***	0.039
Log-likelihood	-1992.428	
N	7553	

Notes: *=p<.1, **=p<.05, ***=p<.01
Data are from the Wisconsin Schools Food Security Survey.
Model also includes dummy variables denoting missing information on independent variables, wherever relevant.

[1]Model is used to estimate the predicted probability of school breakfast availability in Model 3, Table 9.

Table 11
Predicted Probability of Breakfast-Skipping Among Wisconsin Elementary School Students With and Without Access to School Breakfast Program

	N	*Predicted probability of skipping breakfast*	
		Children with School Breakfast Available	**Children without School Breakfast Available**
Income			
$15,000 or less		.30	.42
$15,001 to $20,000		.27	.40
$20,001 to $25,000		.27	.42
$25,001 to $30,000		.28	.34
$30,001 to $35,000		.27	.29
$35,001 to $40,000		.28	.37
$40,001 to $50,000		.28	.27
$50,000 or more		.25	.24

Note: Predicted probabilities are based on probit model of breakfast skipping, using data from the Wisconsin Schools Food Security Survey (see Table 9, Model 2). Predictions assume the student's household has 2 children and 2 employed parents, with high school education, rents their home, and lives in rural area in Wisconsin.

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