EATING BREAKFAST: EFFECTS OF THE SCHOOL BREAKFAST PROGRAM

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Started as a pilot in 1966, the School Breakfast Program (SBP) was designed to provide funding for meals served to children in poor areas and areas where children had to travel a great distance to school. On small farms in rural communities, many young children ate an early breakfast, performed their chores, and, after a lengthy school bus trip, arrived at school hungry. In 1975, Congress made the SBP permanent, with the stated objective that the program be made "available in all schools where it is needed to provide adequate nutrition for children in attendance."

In recent years, researchers have become interested in the question of whether the availability of SBP at school increased the likelihood of a child eating breakfast.

The answer to that question depends on how breakfast is defined and also upon family income. The 1992 School Nutrition Dietary Assessment Study (SNDA-1) defined breakfast as eating any food containing at least 50 calories. Using this very broad definition of breakfast, the SNDA-1 study found that the availability of a SBP at school did not increase the likelihood of a child eating breakfast. Commentors on this finding have expressed an interest in whether the finding would be the same if breakfast was defined more substantively, for example, as providing more than a minimum level of food energy. This study is a reanalysis of data from SNDA-1 and examines this and related questions.

A review of the literature on breakfast consumption shows that breakfast is defined in a variety of ways. Studies that examine the prevalence of eating (or skipping) breakfast typically use a simplistic definition of breakfast, based either on reports of whether breakfast was eaten or on dietary recall data on whether any food or beverage was consumed. In contrast, studies that assess the effects of eating breakfast on various performance measures usually define breakfast more substantively, (for example, providing some minimum level of food energy). The analysis conducted in this study builds on these two strands of the literature and uses three alternate definitions of breakfast:

1. Consumption of any food or beverage

2. Breakfast intake of food energy greater than 10 percent of the Recommended Dietary Allowance (RDA)

3. Consumption of foods from at least two of five main food groups and intake of food energy greater than 10 percent of the RDA

As the definition of breakfast becomes more robust, the percentage of students who eat breakfast declines. Almost 9 of 10 students consumed any food or beverage, but only 6 of 10 students consumed food from at least two of the main food groups and had breakfast intake of food energy greater than 10 percent of the RDA.

Three important findings from the analysis of the effects of the SBP are the following:

1. If breakfast is defined as any food or beverage consumed, the SBP is not associated with an increased likelihood of eating breakfast. These results are consistent with previous studies that found that the SPB had no effect on the likelihood of eating any food or food with a minimum number of calories.

2. For low-income students, as the definition of breakfast becomes more robust, the SBP is associated with an increased likelihood of eating breakfast.

   - When breakfast is defined as intake of food energy greater than 10 percent of the RDA, the likelihood of eating breakfast is significantly higher for low-income students attending schools with the SBP than for similar students attending schools without it (74 percent versus 63 percent).

   - When breakfast is defined as consumption of food from two or more food groups and intake of food energy greater than 10 percent of the RDA, the likelihood of eating breakfast is significantly higher for low-income students attending schools with the SBP than for similar students attending schools without it (67 percent versus 55 percent).

3. The estimated effects of SBP availability on the likelihood of eating breakfast are largest for low-income elementary students.

   - When breakfast is defined as intake of food energy greater than 10 percent of the RDA, the likelihood of eating breakfast is significantly higher for low-income elementary students attending schools with the SBP than for similar elementary students attending schools without it (82 percent versus 66 percent).

   - When breakfast is defined as consumption of food from two or more food groups and intake of food energy greater than 10 percent of the RDA, the likelihood of eating breakfast is significantly higher for low-income elementary students attending schools with the SBP than for similar elementary students attending schools without it (77 percent versus 62 percent).

I. INTRODUCTION

Authorized by the Child Nutrition Act of 1966, the School Breakfast Program (SBP) started as a pilot program to provide funding for breakfast in poor areas and areas where children had to travel a great distance to school. The intent was to provide a nutritious breakfast to children who might otherwise not receive one. The importance of breakfast is supported by several studies that have linked it to improved diet and enhanced school performance. To the extent that the SBP increases the percentage of children who eat breakfast, the program can be expected to improve their diet and school performance.

Previous studies of the impact of the SBP on the likelihood of eating breakfast, however, do not provide strong evidence that children attending schools with the SBP are more likely than other children to eat breakfast. Older studies of data from the first National Evaluation of School Nutrition Programs (NESNP-1) had mixed results. One study reported that children attending schools with the SBP were more likely to eat breakfast, although the statistical basis for this conclusion is not presented (Wellisch et al. 1983). In addition, a reanalysis of those data indicated that the availability of the SBP was not associated with the likelihood of eating breakfast on a given school day (Devaney and Fraker 1986 and 1989). Data from the 1992 School Nutrition Dietary Assessment study (SNDA-1) also suggest that the availability of the SBP does not affect whether a student eats breakfast: the percentage of students eating breakfast was the same in schools that participated in the SBP as in those that did not, even after controlling for other demographic and socioeconomic characteristics (Burghardt et al. 1993; and Gleason 1995).

An important issue to consider in these analyses is the definition of breakfast. Both NESNP-1 and SNDA-1 use 24-hour dietary recall data to define breakfast consumption. The reanalysis of the

NESNP-1 data defined breakfast as any breakfast and prebreakfast foods, based on self-reported meals consumed. Thus, the consumption of any calories at either prebreakfast or breakfast meals constituted having had breakfast. The analysis of data from SNDA-1 defined breakfast as the consumption of at least 50 calories between the time of waking and 45 minutes after the start of school.

Recently, what constitutes an adequate or substantive breakfast has been debated. Specifically, questions have arisen about the 50-calorie cutoff and whether "eating breakfast" ought to encompass a higher calorie cutoff or be based on foods or food groups. This report presents findings from a reanalysis of the SNDA-1 data that used alternate definitions of breakfast. For each of the alternate definitions of breakfast selected, the report presents findings from descriptive and multivariate analyses of the percentage of students eating breakfast and the effect of the availability of the SBP on the likelihood of eating breakfast.

The rest of this chapter provides brief background material on the SBP, presents an overview of SNDA-1, and describes the objective of the research. Chapter II examines previous research on breakfast consumption patterns and, based on this literature review, provides three alternate definitions of breakfast. Chapter III describes the SNDA-1 data and study methodology and presents findings from the analysis of the likelihood of eating breakfast.

A. OVERVIEW OF THE SCHOOL BREAKFAST PROGRAM

The SBP was originally a pilot program that targeted children from low-income school districts and was intended to provide a nutritious breakfast to children who might not otherwise receive one. With the 1975 amendments to the Child Nutrition Act of 1966, the SBP became permanent, with the objective of making the program "available in all schools where it is needed to provide adequate nutrition for children in attendance." To expand the availability of the program, the Child Nutrition

Act of 1989 required that the Secretary of Agriculture provide funds to states to support the costs of starting breakfast programs in schools in low-income areas.

All public and private elementary and secondary schools in the United States are eligible to participate in the SBP. To participate, schools must make breakfast available to all students. The U.S. Department of Agriculture (USDA) reimburses schools for each breakfast served that meets nutritional standards. The cash reimbursements vary according to whether students qualify for free, reduced-price, or full-price meals. To be eligible for free meals, students must have family income less than or equal to 130 percent of the poverty level. To be eligible for reduced-price meals, students must have family income between 130 and 185 percent of the poverty level. For the 1997-98 school year, the reimbursement was $1.045 for free breakfasts, $0.745 for reduced-price breakfasts, and $0.20 for full-price breakfasts. For schools with a large proportion of needy individuals ("severe needs" schools), reimbursements were $0.20 higher for free and reduced-price breakfasts.

SBP breakfasts are required to provide approximately one-fourth of the Recommended Dietary Allowance (RDA) for important nutrients over a period of time. At the time of SNDA-1, program regulations specified that each reimbursable breakfast include a serving of fluid milk, a serving of fruit or vegetable or a full-strength fruit or vegetable juice, and two servings of either bread or meat or their equivalent. In addition, recent legislation requires that schools offer meals that limit fat and saturated fats as recommended in the *Dietary Guidelines for Americans*. To achieve both the RDA and Dietary Guidelines standards, schools may use several methods for planning menus.

B. THE SCHOOL NUTRITION DIETARY ASSESSMENT (SNDA-1) STUDY

Conducted from 1990 through 1993, SNDA-1 addressed three key sets of questions: (1) What is the nutrient content of school meals *as offered* to children in schools? (2) What are the *nutrient intakes* of program participants? and (3) What are the dietary effects of the NSLP and SBP? The

detailed findings of SNDA-1 are presented in three major reports, as well as in several subsequent reports and publications.[1] The SNDA-1 data set consists of a nationally representative sample of 3,350 students in grades 1 through 12 from 329 schools. During a one-week period between February and May 1992, experienced interviewers administered a student survey, a student 24-hour recall of foods eaten, a parent survey, surveys of key school and food service officials, and an instrument to obtain information on foods offered for school breakfasts and lunches.

The data used in this analysis are the student characteristics data from the parent and student surveys and the dietary intake data from the student 24-hour recall. The data set contains information on the characteristics of students and their families; foods eaten at breakfast, at lunch, and over a 24-hour period; and information on the schools attended and meal service characteristics at the schools.

C. REANALYSIS OF THE SNDA-1 DATA

This study, a reanalysis of SNDA-1 data on the likelihood of eating breakfast, includes two main components:

1. Review of the literature on breakfast consumption patterns to identify alternate definitions of eating breakfast and, based on this review, recommend alternate definitions

2. Reanalysis of the data from SNDA-1 using the alternate definitions of breakfast

The literature review is a critical first component of the analysis. The objective is to identify studies of breakfast consumption, especially those using 24-hour dietary recall data, and summarize

[1]The three main project reports include one on school food service, meals offered, and dietary intakes (Burghardt et al. 1993); one on dietary intakes of program participants and nonparticipants (Devaney et al. 1993); and one on sampling and data collection operations for SNDA-1 (Burghardt, Ensor, et al. 1993).

the different ways in which breakfast has been defined and examined. For example, the definition of "eating breakfast" may range on a continuum from a loose definition, such as whether any food item is consumed in the morning, to a strict definition, such as whether foods with some specified amount of calories and/or from specific food groups are consumed.

The reanalysis of the SNDA-1 data includes the following:

- ***Descriptive Analysis.*** Descriptive tabulations are presented on the percentage of students eating breakfast, under alternate definitions, by school level and SBP availability. These tabulations are presented for all students and for students from low-income households.

- ***Multivariate Analysis.*** To investigate further the decision to eat breakfast, probit analysis is used to estimate the relationship between the availability of the SBP and the likelihood of eating breakfast for each alternate definition of breakfast.

Comparing the results for the alternate definitions of breakfast will indicate whether the findings regarding the availability of the SBP are sensitive to the definition of what constitutes breakfast and, if so, how.

II. REVIEW OF THE LITERATURE ON BREAKFAST CONSUMPTION

Previous studies of the effects of the SBP provide little evidence that it increases the likelihood that schoolchildren will eat breakfast. None of the previous studies, however, includes a careful and thorough discussion of what constitutes "eating breakfast." Both NESNP-1 and SNDA-1 define breakfast consumption simplistically: as either eating any breakfast food in the morning, or eating any prebreakfast or breakfast food, or eating any food or foods with more than 50 calories from the time of waking until 45 minutes after the start of school.

As discussed previously, questions have arisen about what constitutes an adequate breakfast. Should breakfast be defined as consuming any food item in the morning? Does a breakfast that includes only 50 calories meet the nutritional requirements of breakfast? In addition, do the findings on the lack of a relationship between the availability of the SBP and the likelihood of eating breakfast change under alternate definitions of breakfast?

This chapter summarizes findings from a review of the literature on breakfast consumption to identify alternate definitions of breakfast. In addition, descriptive tabulations from the SNDA-1 data provide important information on the percentage of children eating breakfast, using a wide range of alternate definitions. Based on the literature review and on the descriptive tabulations, the final section of the chapter provides three alternate definitions for the reanalysis of the decision to eat breakfast.

A. PREVIOUS RESEARCH ON BREAKFAST CONSUMPTION

The large body of literature on breakfast consumption encompasses a broad range of definitions. As Table II.1 shows, the studies examining breakfast consumption fall into two primary groups: (1) those that focus on whether or not breakfast is eaten; and (2) those that examine the effects of eating

TABLE II.1

REVIEW OF STUDIES USING ALTERNATE DEFINITIONS OF BREAKFAST

Authors	Study Design	Definitions of Breakfast	Comments/Findings
Studies That Examine Breakfast Consumption and Breakfast Skipping			
Siega-Riz, Popkin, and Carson (1998) Haines, Guilkey, and Popkin (1996)	Secondary data analysis to examine breakfast consumption patterns between 1965 and 1991 for children and adults in the United States Used 1965 NFCS, 1977-78 NFCS, and 1989-91 CSFII	Any food or beverage consumed between 5 A.M. and 10 A.M. for children and between 5 A.M. and 9 A.M. for adults	Breakfast consumption declined over time, especially among older adolescents and adults.
McIntyre and Horbul (1995) McIntyre (1993)	Breakfast survey of 4,079 children in grades 1 to 3 in 50 public and separate schools in northeastern Ontario during the fall of 1993	No breakfast: answered no to a question about whether they had anything to eat or drink before coming to school Adequate breakfast: consumption of foods from at least 2 food groups, one of which contains protein of high biologic value Vigorous breakfast: consumption of foods from at least 3 food groups, one of which contains protein of high biologic value	About 6 percent of children in grades 1 to 3 came to school without eating or drinking anything. 84 percent consumed an adequate breakfast, consuming foods from at least 2 food groups.
Morgan, Zabik, and Leveille (1981)	7-day food diaries from 657 American children ages 5 to 12 in 1977	Breakfast eaters: consumed at least 3 breakfasts during the 7-day period. Nonbreakfast eaters: consumed fewer than 3 breakfasts during 7-day period 5 groups: (1) 3 or more breakfasts containing presweetened ready-to-eat (RTE) cereal; (2) 3 or more breakfasts containing nonsweetened RTE cereal; (3) three or more breakfasts containing any RTE cereal; (4) consuming breakfasts with ready-to-eat cereal less than 3 times; and (5) no RTE cereal consumed	There is no explanation of how eating at least 3 breakfasts per week is defined. Few children skipped breakfast; non-breakfast eaters consisted of only 10 children, or 1.5 percent of the sample.
Nicklas, Weihang, Webber, and Berenson (1993)	24-hour recall for 6 cohorts of children 10 years of age (1973-1974 through 1987-1988) from the Bogalusa Heart Study, n=464	3 groups: (1) breakfast at home, (2) breakfast at school, and (3) no breakfast eaten. Breakfast skipping refers to no foods or liquids consumed.	After the School Breakfast Program was introduced, the percentage of students who skipped breakfast declined.
Sampson, Dixit, Meyers, and Houser (1995)	4-day eating behavior survey and 24-hour recall of 1,151 children in grades 2 though 5 in East Orange, New Jersey	Eating behavior survey: Did you have anything to eat before coming to school? Did you eat a snack on the way to school? 24-hour recall: reported all foods eaten from the time of waking up to the time of the interview. 4 groups: (1) breakfast eaters, (2) breakfast and snack eaters, (3) snack-only eaters, and (4) neither breakfast nor snack eaters.	On any given day, 12 to 26 percent of children attended school without having eaten anything.

TABLE II.1 *(continued)*

Authors	Study Design	Definitions of Breakfast	Comments/Findings
Studies That Examine the Effects of Eating Breakfast			
Lopez, de Andraca, Perales, Heresi, Castillo, and Colombo (1993)	Study of 279 children in Chile who were 8 to 11 years of age to determine the effects of breakfast skipping on cognitive performance Students were randomly assigned to 1 of 2 study conditions: breakfast or fasting	Breakfast included 2 cakes and 200 ml flavored milk; total calories were 394 Kcal	No consistent association appears between eating breakfast and cognitive performance for children with a low socioeconomic background from Santiago, Chile
Wyon, Abrahamsson, Jartelius, and Fletcher (1997)	Experimental design to determine the effects of energy intake at breakfast on test performance of 10-year-old children in school	Standard breakfast with low energy content - 147 Kcal for girls - 197 Kcal for boys Standard breakfast with high energy content - 567 Kcal for girls - 832 Kcal for boys	For boys, average energy intake was 25 percent and 8 percent of the RDA for the high and low energy breakfasts For girls, average energy intake was 22 percent and 6 percent of the RDA for the high and low energy breakfasts, respectively
Dickie and Bender (1982a)	Literature review on the effects of breakfast on performance: summarizes studies with different definitions of breakfast	Skipping breakfast defined as eating nothing more than a cup of tea or coffee Four breakfast classifications for adults: (1) heavy (800 Kcal), (2) light (400 Kcal), (3) no breakfast (no food between 18.3 and 12.00 the next day) and (4) coffee with 28 g of cream and no sugar (60 Kcal)	Literature review suggests mixed evidence on whether skipping breakfast is detrimental for school performance
Dickie and Bender (1982b)	2 studies of the effects on mental performance of omitting breakfast among schoolchildren in London, average age 12.5 years	Four breakfast classifications: (1) breakfast and midmorning snack; (2) breakfast, no midmorning snack; (3) no breakfast but midmorning snack; and (4) no breakfast and no midmorning snack Breakfast: any solid food taken on the morning before arriving at school Midmorning snack: any food or drink taken at break time	Breakfast typically eaten was substantial, usually providing more than 2.1 MJ. Neither study found differences in mental performance associated with eating or skipping breakfast
Michaud et al. (1991)	Clinical study to examine the effects of breakfast size on short-term memory, mood, and blood glucose 319 adolescents 13 to 20 years of age in 4 counties of Lorraine, France	Normal breakfast were supplemented by varying amounts: (1) 0-99 Kcal, (2) 100-199 Kcal, (3) 200-299 Kcal, (4) 300-399 Kcal, and (5) more than 400 Kcal	High energy intake had a beneficial effect on short-term memory. However, concentration was impaired by a high calorie breakfast.

breakfast on various performance measures. In general, studies that examine whether or not breakfast is eaten define breakfast through either self-reports of breakfast consumption or whether any food or beverage was consumed after waking in the morning. These studies typically do not use a definition that reflects any minimum calorie content or attempts to define an adequate breakfast. The exception is the analysis of SNDA-1 data, in which breakfast had to include at least 50 calories, but even this cutoff value still allows someone to be classified as a breakfast eater with only a minimal intake of food energy.

In contrast, studies that focus on the effects of eating breakfast on cognitive tests and performance measures typically define breakfast with some minimum calorie content. As Table II.1 shows, these calorie contents exceed the 50 Kcal cutoff value used in SNDA-1. For example, in the experimental study Wyon et al. (1997) conducted to determine the effects of energy intake at breakfast on test performance, a breakfast with low energy content was defined as 147 Kcal for girls 10 years of age and 197 Kcal for boys 10 years of age, and a breakfast with high energy content was defined as 567 Kcal for girls and 832 Kcal for boys.

B. DESCRIPTIVE ANALYSIS OF SNDA-1 DATA

Table II.2 provides tabulations on the percentage of students eating breakfast under several alternative definitions of breakfast, which include the following general categories:

- Whether any food or beverage is consumed between waking up and 45 minutes after the start of school
- Breakfast intake of food energy greater than various cutoffs
  - 50 Kcal, 100 Kcal, 150 Kcal, and 200 Kcal
  - 10 percent and 15 percent of the RDA

TABLE II.2

PERCENTAGE OF STUDENTS EATING BREAKFAST:
ALTERNATE DEFINITIONS

Alternate Definition	Percentage Eating Breakfast		
	Total Sample	Elementary School Students	Middle and High School Students
Any Food Item Consumed	88	93	84
Breakfast Intake of Food Energy > 50 Kcal	87	92	83
Breakfast Intake of Food Energy > 100 Kcal	84	90	79
Breakfast Intake of Food Energy > 150 Kcal	78	83	74
Breakfast Intake of Food Energy > 200 Kcal	72	77	68
Breakfast Intake of Food Energy > 10 Percent of the RDA	69	76	62
Breakfast Intake of Food Energy > 15 Percent of the RDA	50	54	45
Consuming Food from at Least 2 of the Main Food Groups [a]	71	81	62
Consuming Food from at Least 2 of the Main Food Groups and Breakfast Intake > 10 Percent of the RDA	61	71	53
Consuming Food from at Least 2 of the Main Food Groups and Breakfast Intake > 15 Percent of the RDA	45	51	40
Consuming Food from at Least 3 of the 4 SBP Food Groups and Breakfast Intake > 20 Percent of the RDA[b]	17	20	14
Consuming Food from at Least 3 of the 4 SBP Food Groups and Breakfast Intake > 25 Percent of the RDA[b]	11	12	9
Sample Size (Unweighted)	**3,381**	**1,611**	**1,770**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data, weighted.

[a]The main food groups are (1) milk and milk products, (2) meat and meat alternate, (3) grain products, (4) fruits and fruit juices, and (5) vegetable and vegetable juice.

[b]The SBP food groups are (1) milk and milk products, (2) meat and meat alternate, (3) grain products, and (4) fruits and vegetables or full-strength fruit or vegetable juices.

- Consuming food items from different food groups
  - At least two of the main food groups
  - At least two food groups and breakfast intake of food energy greater than either 10 percent or 15 percent of the RDA
  - Consuming food from at least three of the four SBP food groups and breakfast intake of food energy greater than either 20 percent or 25 percent of the RDA

As the definition of eating breakfast becomes more stringent, the percentage of students who eat breakfast declines. To illustrate, 88 percent of students consumed some food or beverage, but only 45 percent of students ate a breakfast that included food from at least two of the main food groups and had breakfast intake of food energy greater than 15 percent of the RDA (see Table II.2). About 11 percent of students had a breakfast that was equal to or exceeded what SBP breakfasts are designed to offer at breakfast: food from at least three of the four SBP food groups and breakfast intake of food energy greater than 25 percent of the RDA.

The likelihood of eating any breakfast, regardless of how defined, declines with age. Overall, about 88 percent of students consume some food or beverage in the morning, and 12 percent do not. For elementary school students, about 93 percent consume some food or beverage in the morning, compared with 84 percent of middle and high school students (Table II.2). As the definition of breakfast becomes more robust, the percentage of students eating it declines, but elementary students are more likely than middle and high school students to eat each type of breakfast.

The percentage of students eating the most robust breakfast--greater than or equal to the SBP meal pattern--is quite low. Only about one in 10 students consumed a breakfast with foods from at least three of the SBP food groups and had breakfast intake of food energy greater than 25 percent of the RDA. This result is not surprising nor does it imply that the SBP is not achieving its goal of providing one-fourth of the RDA, on average, for important nutrients. Using a cutoff of *consuming*

at least 20 or 25 percent of the RDA for food energy as a definition of breakfast does not have any support in the nutrition literature. In fact, there is a major problem with using this strict a definition of breakfast. If breakfast is defined such that an individual must have at least 25 percent of the RDA for food energy, then the average intake of breakfast eaters will far exceed the goal of 25 percent of the RDA. Put another way, the breakfast eaters will be a group of students who are, on average, consuming much more than either 25 percent of the RDA for food energy at breakfast and, most likely, more than 100 percent of the RDA for food energy over 24 hours.

Tabulations from the SNDA-1 data show that, among students who consumed three of four SBP food groups and had breakfast intake of food energy greater than 25 percent of the RDA, the mean breakfast intake of food energy is 39 percent of the RDA and the mean daily intake of food energy is 150 percent of the RDA. These intakes of food energy are significantly higher than recommended levels. Adopting such a strict rule for defining breakfast would implicitly be recommending food consumption levels that would contribute to the growing problem of obesity. For these reasons, the two most robust definitions of breakfast are not recommended as alternate definitions of breakfast.

C. ALTERNATE DEFINITIONS OF EATING BREAKFAST: RECOMMENDATION

As discussed above, the existing literature on breakfast consumption uses two very different approaches to defining breakfast: (1) a simple yes/no approach; and (2) more robust definitions that specify substantial calorie content. For the reanalysis of the SNDA-1 data on the likelihood of eating breakfast, it is useful to consider incorporating both approaches and including a series of alternate definitions in the multivariate analysis.

Based on the alternate definitions provided in Table II.2, three alternative definitions of breakfast are:

1. Consumption of any food or beverage
2. Breakfast intake of food energy greater than 10 percent of the RDA
3. Consumption of foods from at least two of the main food groups and breakfast intake of food energy greater than 10 percent of the RDA

There are two main advantages to using all three alternate definitions (or some other similar combination). First, using definitions that range from minimal to robust allows us to assess the effects of the program on the likelihood of eating any breakfast versus the effects on eating a substantial breakfast. Second, using the three alternate definitions allows us to synthesize and even reconcile the different approaches used in the existing literature. To date, the literature on breakfast consumption has generally not even recognized that studies of whether breakfast is eaten have taken approaches vastly different from those of studies of the effects of breakfast consumption. Presumably, however, these studies should be interrelated: studies of whether breakfast is eaten are likely to be motivated by evidence that breakfast is important, while studies that focus on the effects of eating breakfast are likely to be informed by evidence on breakfast consumption patterns.

The second and third alternate definitions discussed above use 10 percent of the RDA rather than 15 percent. The primary reason for this suggestion is that the intake data collected in SNDA-1 are based on 24-hour recall data, and it is widely known that single-day intake distributions are more dispersed than usual intake distributions (Nusser et al. 1996). Thus, the percentage of students with breakfast intakes of food energy less than a given percentage of the RDA on a certain day is higher than the percentage of students with usual breakfast intake of food energy less than the given percentages. To account for this, the recommendation includes the lower cutoff of 10 percent of the RDA.

III. EFFECTS OF THE SCHOOL BREAKFAST PROGRAM ON THE LIKELIHOOD OF EATING BREAKFAST

This chapter provides estimates of the effects of the availability of the SBP on the likelihood of eating breakfast, using data from the SNDA-1 study. It begins with a brief description of the data and methodology and continues with a presentation and discussion of the analysis results.

A. DATA AND METHODOLOGY

The SNDA-1 data set is a nationally representative sample of 3,350 students in grades 1 through 12 in 1992. The analysis reported here is based on student characteristics data from the parent and student surveys and dietary intake data of students from the 24-hour food recall. The main outcome measure is whether or not the student ate breakfast, based on students' dietary recall data on foods and beverages consumed.

To review, the analysis uses three alternate definitions of breakfast, ranging from a simple yes/no approach for whether any food or beverage is consumed to more robust definitions based on foods and food energy consumed at breakfast. The three alternate definitions are:

1. Consumption of any food or beverage from the time of waking until 45 minutes after the start of school

2. Breakfast intake of food energy greater than 10 percent of the RDA

3. Consumption of foods from at least two of five main food groups and breakfast intake of food energy greater than 10 percent of the RDA. The five food groups used are (1) milk and milk products, (2) meat and meat equivalents, (3) grain products, (4) fruits and fruit juices, and (5) vegetables and vegetable juices.[1]

[1]These five food groups are derived from the SBP food groups but separate fruits and fruit juices from vegetables and vegetable juices.

The explanatory variables used in the analysis include the availability of the SBP (or another breakfast program) in school and a variety of student and family characteristics. Student and family characteristics assumed to influence the likelihood of eating breakfast include the following: age, gender, race and ethnicity, whether the child is income-eligible for free or reduced-price school meals, family size and composition, mother's employment status, and residential location. Table III.1 presents descriptive data on the explanatory variables used in the analysis. Of particular importance is the fact that the SBP is available to slightly more than half of all students and to about two-thirds of all low-income students.

Because the decision to eat breakfast is a binary variable, probit analysis is used to examine the effect of the SBP on the likelihood of eating breakfast, while controlling for the student and family characteristics just discussed. To facilitate the interpretation of the empirical results, the analysis presents regression-adjusted or predicted values of the likelihood of eating breakfast under two conditions: (1) students attend schools with the SBP, and (2) students attend schools without the SBP. These predicted values are based upon the estimated coefficients from the probit analysis.[2]

B. EMPIRICAL RESULTS

The principal finding from the analysis of the likelihood of eating breakfast is that the availability of the SBP in schools is associated with a higher likelihood of eating a more robust breakfast for students from low-income households. As the definition of breakfast becomes more stringent, the difference in the predicted values of eating that breakfast between low-income students with and without the SBP available becomes larger and statistically significant (Figure III.1). Using the definition of breakfast as any food or beverage consumed, the difference in the predicted

[2]An appendix to this report includes a rigorous description of the methodology and presents the detailed analysis results from the probit analysis.

TABLE III.1

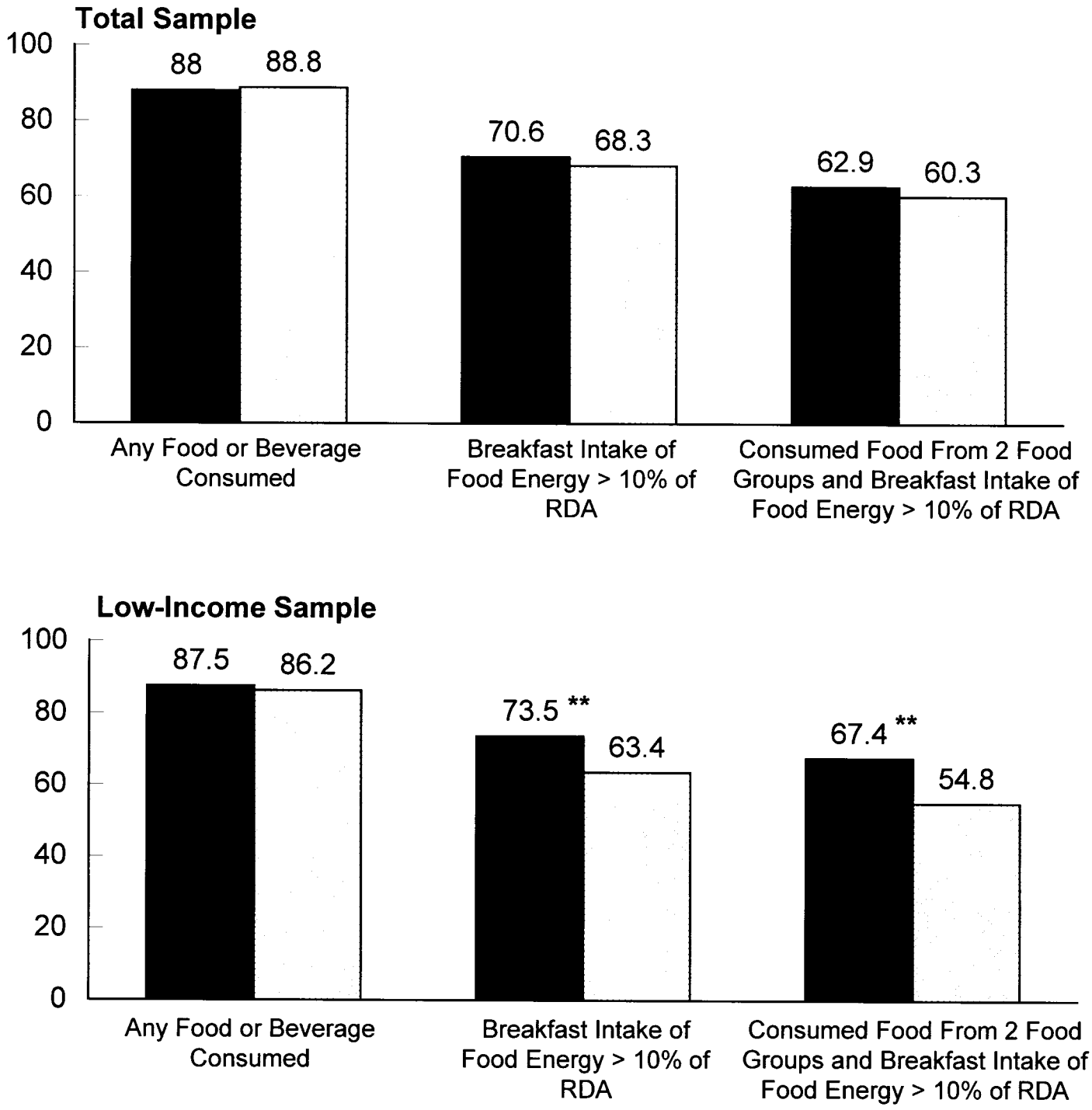
STUDENT AND FAMILY CHARACTERISTICS: MEAN VALUES

Characteristic	Total Sample	Low-Income Sample
School Has SBP	0.51	0.66
School Has Other Breakfast Program	0.05	0.03
Age	11.61	11.13
Female	0.50	0.50
Black	0.16	0.29
Hispanic	0.13	0.20
Other Race	0.03	0.03
Income-Eligible for Free or Reduced-Price Meal	0.42	1.00
Eligibility Data Missing	0.12	0.00
Mother in Household	0.92	0.90
Mother Employed	0.62	0.52
Family Size 3 or 4	0.53	0.43
Family Size 5 to 7	0.38	0.43
Family Size Larger than 7	0.03	0.06
Urban	0.39	0.46
Suburban	0.37	0.24
Mid-Atlantic	0.12	0.11
Southeast	0.21	0.27
Midwest	0.19	0.16
Southwest	0.15	0.18
Mountain Plains	0.09	0.11
West	0.15	0.12
Sample Size	**3,381**	**1,441**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data.

NOTE: Means are based upon weighted data.

Figure III.1
Predicted Percentage of Students Eating Breakfast: Total Sample and Low-Income Sample



* (**): $p < 0.05$ (0.01)

Source: SNDA-1 database

■ SBP Available □ SBP Not Available

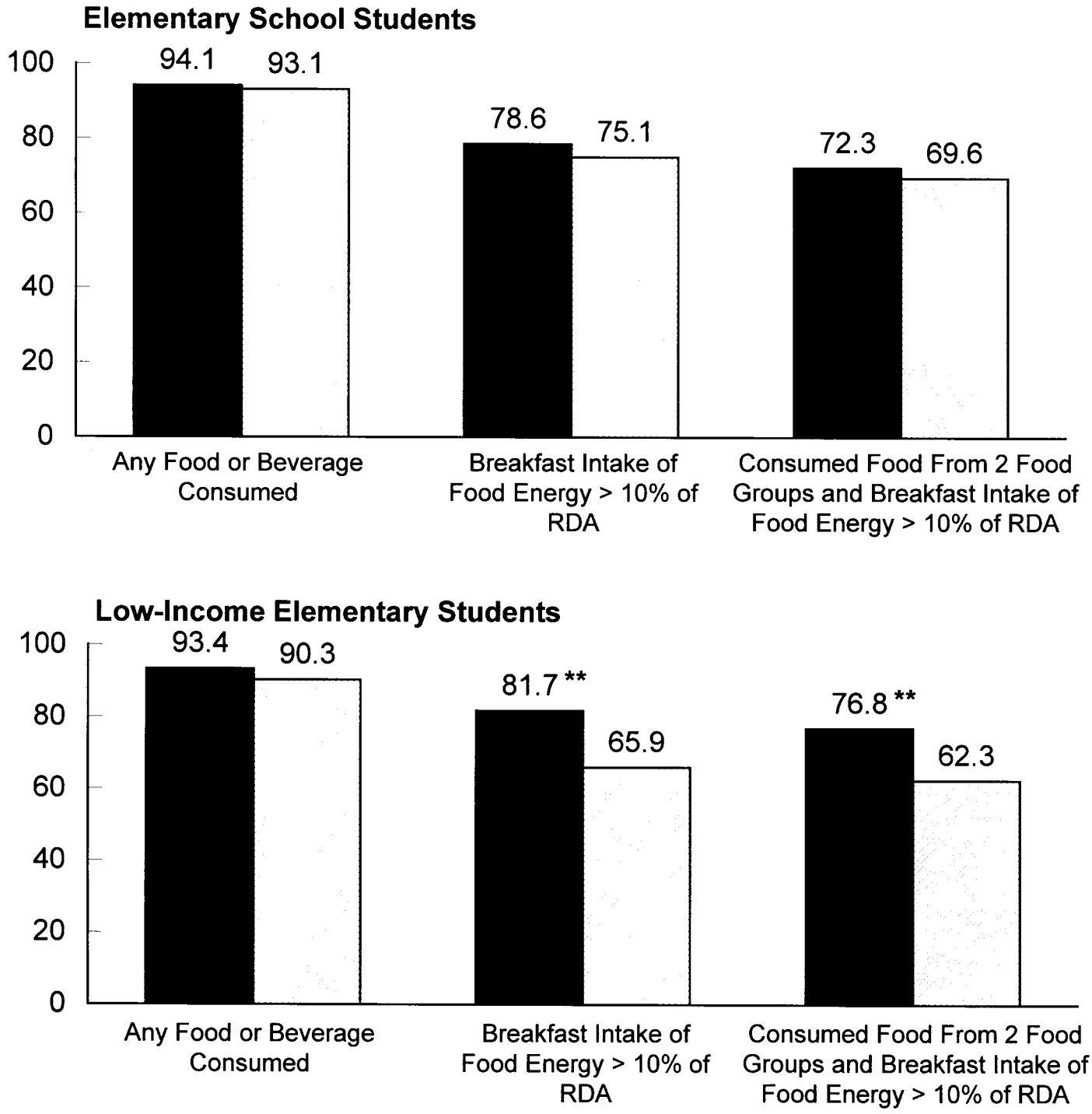
percentage of students eating breakfast with and without the SBP available is small and not statistically significant either for the total sample or for students from low-income households. These results are consistent with previous studies that found no effect of the SBP on the likelihood of eating any food or food containing a minium number of calories. However, when breakfast is defined as intake of food energy greater than 10 percent of the RDA, the likelihood of eating breakfast is significantly higher for low-income students attending schools with the SBP available than for comparable students attending schools without it (74 percent versus 63 percent). Similarly, when breakfast is defined as consumption of food from two or more food groups and intake of food energy greater than 10 percent of the RDA, the predicted percentage of students is significantly higher for low-income students attending schools with the SBP available than for comparable students attending schools without it (67 percent versus 55 percent).

The estimated effects of SBP availability on the likelihood of eating breakfast are largest for low-income elementary students (Figure III.2). For the two more robust definitions of breakfast, the predicted percentages of low-income elementary students with the SBP available are significantly higher for students than for students without it. In fact, for both of the more robust breakfast definitions, low-income elementary students with the SBP available are 23 percent more likely than similar students without the SBP to consume breakfast. Even for low-income middle and high school students, a group that is less likely than younger students to eat any kind of breakfast, the SBP is associated with a higher likelihood of eating the breakfast meeting the most robust definition (Figure III.3).

C. SUMMARY AND DISCUSSION

A primary goal of the SBP is to provide a nutritious breakfast to students who might otherwise not eat one. Previous studies of the SBP, however, provide little evidence that this goal is achieved

Figure III.2
Predicted Percentage of Students Eating Breakfast: Elementary School Students

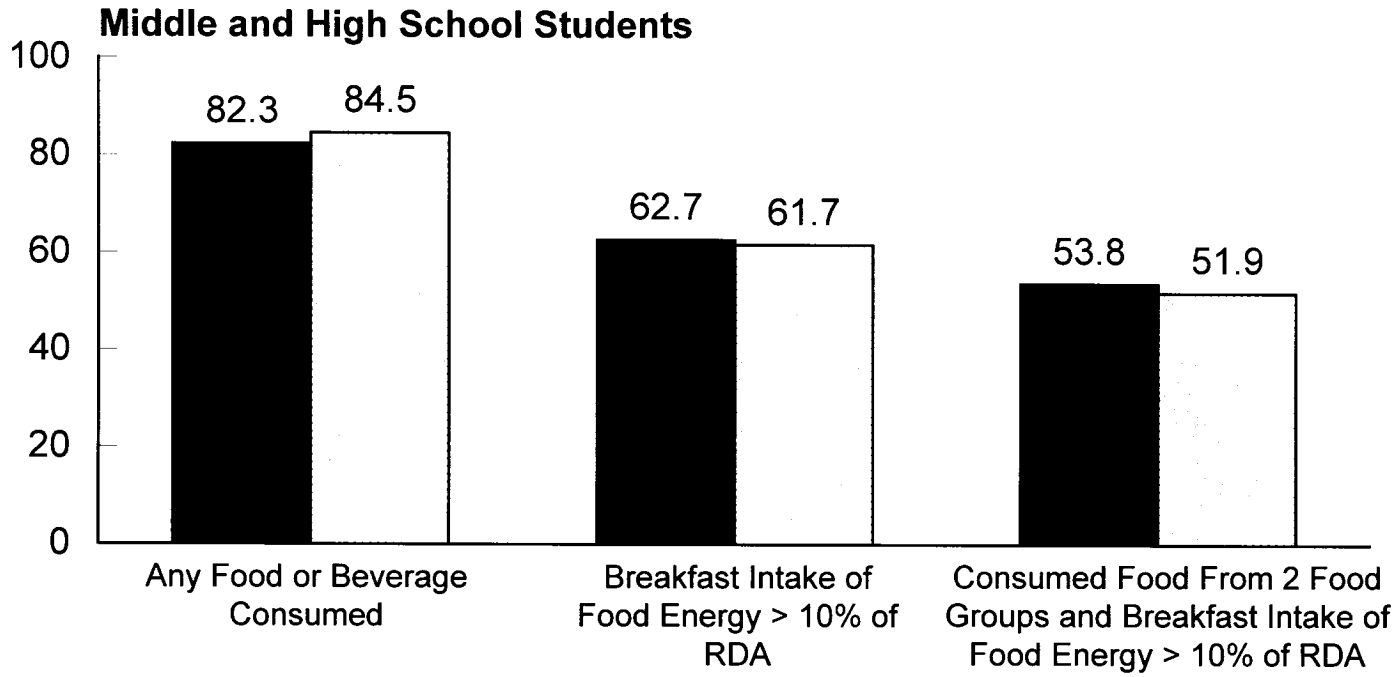


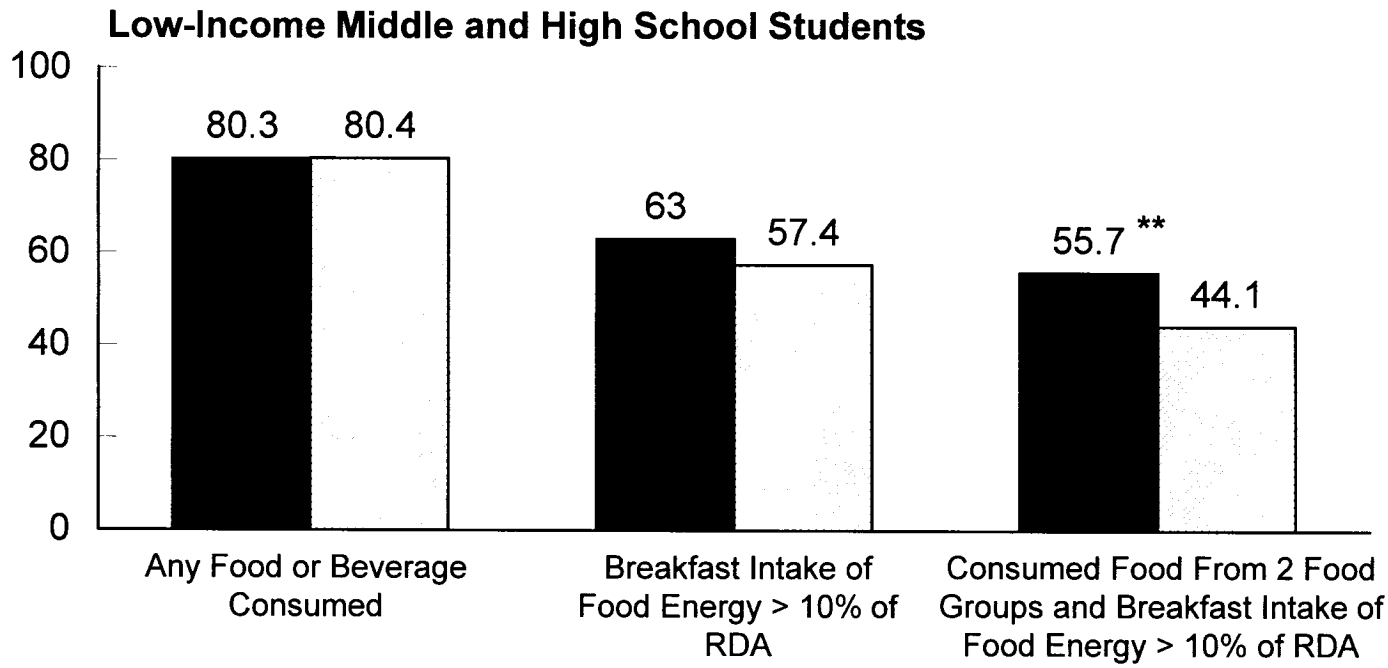
* (**): $p < 0.05$ (0.01)

Source: SNDA-1 database

■ SBP Available □ SBP Not Available

Figure III.3
Predicted Percentage of Students Eating Breakfast: Middle and High School Students





* (**): $p < 0.05$ (0.01)

Source: SNDA-1 database

■ SBP Available □ SBP Not Available

for any subgroup of students (Devaney and Fraker 1986 and 1989; Burghardt et al. 1993; and Gleason 1995). The reanalysis of data from SNDA-1 undertaken for this study suggests that the effect of the SBP on the likelihood of eating breakfast depends both on how breakfast is defined and on family income.

If breakfast is defined as any food or beverage consumed, the SBP is not associated with an increased likelihood of eating breakfast. About 12 percent of students do not consume any food or beverage for breakfast. This percentage is the same for students in schools with the SBP as without it, even after controlling for student and family characteristics. This percentage is roughly the same for the low-income sample as well. These results are consistent with previous studies that found that the SBP had no effect on the likelihood of eating any food or foods containing at least 50 calories.

When the definition of breakfast is more robust, the SBP is associated with an increased likelihood of eating breakfast among low-income students, especially those in elementary school. Low-income elementary students attending schools with the SBP available are significantly more likely than similar students attending schools without the SBP to consume a more robust breakfast. For the total sample, there are no significant differences associated with the SBP in the likelihood of eating any breakfast, suggesting that program effects vary by family income.

Expansion of the SBP is a policy issue currently being debated. The findings from this study suggest that expanding the program to low-income students would be associated with an increased likelihood of consuming a breakfast that included at least 10 percent of the RDA for food energy. At the time of SNDA-1, approximately two-thirds of low-income students attended schools with the SBP, suggesting that a significant proportion of low-income students would be affected by an expansion of the SBP.

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APPENDIX A

STUDY METHODOLOGY AND DETAILED PROBIT ANALYSIS RESULTS

The analysis presented in this report uses data from SNDA-1 to estimate the effects of the SBP and other student and family characteristics on the likelihood of eating breakfast, as defined in three different ways. The model underlying the statistical analysis assumes that the decision to eat breakfast is a nonlinear function of both SBP availability and student and family characteristics. Specifically, the model is depicted by the following:

$$B^* = X\beta + e$$

$$B = 1 \text{ if } B^* > 0$$

$$= 0 \text{ if } B^* \leq 0$$

where B^* is the student's propensity to eat breakfast and B is the student's actual breakfast consumption--equal to one if the student ate breakfast on the day interviewed and equal to zero if the student did not. It is not possible to estimate B^* directly; however, if a student eats breakfast, then B^* is greater than zero, while if a student does not eat breakfast, then B^* is less than or equal to zero. The vector X contains a set of variables hypothesized to influence the propensity to eat breakfast, β is a vector of coefficients relating the explanatory variables to the propensity of eating breakfast, and e is a random error term that represents random factors that affect the decision to eat breakfast. Because the observed dependent variable--the decision to eat breakfast (B)--is binary, probit analysis is used to estimate the model.

The probit equation for the likelihood of eating breakfast is estimated for the following subgroups: total sample, total low-income sample, elementary sample, low-income elementary sample, middle and high school sample, and low-income middle and high school sample. The probit models use unweighted data.

Tables A.1 through A.6 present the detailed results from the probit analyses. The coefficient estimates presented in these tables underlie the analysis findings presented in the report. Specifically, for each student, the predicted probability of eating breakfast is calculated given the values of the student's characteristics under two conditions: (1) the student attends a school with the SBP, and (2) the student does not attend a school with the SBP. These predicted probabilities are averaged across students. The difference between the average predicted probabilities of eating breakfast with and without the SBP is the estimated effect of SBP availability on the probability of eating breakfast.

TABLE A.1

PROBIT EQUATION FOR WHETHER A STUDENT CONSUMED ANY FOOD OR DRINK FOR BREAKFAST
(Standard Errors in Parentheses)

	Estimated Coefficients		
Explanatory Variables	Total Sample	Elementary School Students	Middle and High School Students
Intercept	2.744 **	1.336 **	3.375 **
	(0.250)	(0.490)	(0.391)
School Has SBP	**-0.042**	**0.082**	**-0.094**
	(0.069)	**(0.123)**	**(0.086)**
School Has Other Breakfast Program	0.169	-0.013	0.177
	(0.144)	(0.395)	(0.159)
Age	-0.100 **	-0.013	-0.123 **
	(0.009)	(0.034)	(0.019)
Female	-0.184 **	-0.044	-0.274 **
	(0.059)	(0.102)	(0.075)
Black	-0.010	0.138	-0.056
	(0.088)	(0.157)	(0.110)
Hispanic	-0.071	0.187	-0.183
	(0.096)	(0.171)	(0.121)
Other Race	0.126	-0.233	0.335
	(0.180)	(0.282)	(0.233)
Income Eligible for Free or Reduced Price Meal	-0.196 **	-0.238 *	-0.171
	(0.072)	(0.120)	(0.091)
Eligibility Data Missing	0.114	0.108	0.120
	(0.106)	(0.229)	(0.122)
Mother in Household	0.101	-0.038	0.185
	(0.128)	(0.230)	(0.159)
Mother Employed	-0.106	-0.015	-0.169
	(0.069)	(0.111)	(0.089)
Family Size 3 or 4	-0.204	0.228	-0.357 *
	(0.143)	(0.238)	(0.179)
Family Size 5 to 7	-0.229	0.394	-0.506 **
	(0.146)	(0.242)	(0.184)
Family Size Larger than 7	0.061	0.388	-0.045
	(0.228)	(0.363)	(0.294)
Urban	-0.005	0.136	-0.083
	(0.078)	(0.132)	(0.100)

TABLE A.1 *(continued)*

Explanatory Variables	Estimated Coefficients		
	Total Sample	Elementary School Students	Middle and High School Students
Suburban	0.029 (0.082)	0.193 (0.134)	-0.041 (0.105)
Mid-Atlantic	0.112 (0.136)	0.078 (0.251)	0.120 (0.167)
Southeast	0.050 (0.118)	-0.046 (0.222)	0.077 (0.143)
Midwest	-0.004 (0.117)	-0.011 (0.223)	-0.034 (0.141)
Southwest	0.013 (0.124)	0.021 (0.234)	0.005 (0.150)
Mountain Plains	0.088 (0.136)	-0.073 (0.242)	0.160 (0.169)
West	0.050 (0.126)	0.037 (0.238)	0.061 (0.154)
Sample Size	**3,381**	**1,611**	**1,770**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data.

NOTE: The coefficient and standard error estimates are from an unweighted probit equation of whether a student ate breakfast.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE A.2

PROBIT EQUATION FOR WHETHER A STUDENT HAD BREAKFAST INTAKE OF FOOD ENERGY GREATER THAN 10 PERCENT OF THE RDA
(Standard Errors in Parentheses)

	Estimated Coefficients		
Explanatory Variables	Total Sample	Elementary School Students	Middle and High School Students
Intercept	1.294 ** (0.191)	0.352 (0.353)	1.788 ** (0.313)
School Has SBP	**0.067** **(0.054)**	**0.116** **(0.087)**	**0.027** **(0.072)**
School Has Other Breakfast Program	-0.033 (0.109)	-0.478 (0.259)	0.044 (0.124)
Age	-0.071 ** (0.007)	0.006 (0.024)	-0.094 ** (0.016)
Female	-0.160 ** (0.046)	-0.096 (0.071)	-0.226 ** (0.062)
Black	0.031 (0.071)	-0.011 (0.111)	0.082 (0.094)
Hispanic	-0.043 (0.076)	0.104 (0.115)	-0.137 (0.105)
Other Race	0.180 (0.139)	-0.086 (0.219)	0.357 * (0.179)
Income Eligible for Free or Reduced Price Meal	-0.026 (0.057)	-0.049 (0.086)	-0.007 (0.076)
Eligibility Data Missing	0.100 (0.081)	-0.204 (0.139)	0.233 * (0.100)
Mother in Household	0.099 (0.103)	-0.046 (0.169)	0.174 (0.134)
Mother Employed	-0.072 (0.053)	-0.093 (0.079)	-0.066 (0.073)
Family Size 3 or 4	-0.032 (0.110)	0.239 (0.182)	-0.156 (0.139)
Family Size 5 to 7	-0.056 (0.112)	0.282 (0.183)	-0.258 (0.143)
Family Size Larger than 7	0.006 (0.169)	0.300 (0.261)	-0.180 (0.224)
Urban	0.005 (0.062)	0.120 (0.095)	-0.088 (0.084)

TABLE A.2 *(continued)*

Explanatory Variables	Estimated Coefficients		
	Total Sample	Elementary School Students	Middle and High School Students
Suburban	0.054 (0.064)	0.179 (0.096)	-0.034 (0.087)
Mid-Atlantic	0.080 (0.106)	0.033 (0.169)	0.157 (0.138)
Southeast	0.065 (0.093)	0.085 (0.153)	0.069 (0.119)
Midwest	0.044 (0.092)	0.149 (0.154)	-0.035 (0.117)
Southwest	0.132 (0.099)	0.149 (0.162)	0.157 (0.128)
Mountain Plains	0.069 (0.105)	0.123 (0.171)	0.031 (0.137)
West	0.063 (0.098)	0.042 (0.161)	0.115 (0.127)
Sample Size	**3,381**	**1,611**	**1,770**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data.

NOTE: The coefficient and standard error estimates are from an unweighted probit equation of whether a student ate breakfast.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE A.3

PROBIT EQUATION FOR WHETHER A STUDENT CONSUMED FOOD FROM AT LEAST TWO FOOD GROUPS AND BREAKFAST INTAKE OF FOOD ENERGY GREATER THAN 10 PERCENT OF THE RDA
(Standard Errors in Parentheses)

	Estimated Coefficients		
Explanatory Variables	Total Sample	Elementary School Students	Middle and High School Students
Intercept	1.214 ** (0.187)	0.396 (0.340)	1.487 ** (0.306)
School Has SBP	**0.073** **(0.053)**	**0.078** **(0.083)**	**0.050** **(0.071)**
School Has Other Breakfast Program	0.093 (0.108)	-0.451 (0.255)	0.180 (0.122)
Age	-0.078 ** (0.007)	-0.007 (0.023)	-0.088 ** (0.015)
Female	-0.220 ** (0.045)	-0.139 * (0.068)	-0.299 ** (0.061)
Black	0.033 (0.069)	0.045 (0.107)	0.065 (0.092)
Hispanic	-0.032 (0.074)	0.048 (0.109)	-0.077 (0.104)
Other Race	0.150 (0.133)	-0.026 (0.213)	0.279 (0.170)
Income Eligible for Free or Reduced Price Meal	-0.008 (0.055)	0.015 (0.082)	-0.039 (0.075)
Eligibility Data Missing	0.082 (0.078)	-0.232 (0.133)	0.212 * (0.097)
Mother in Household	0.065 (0.100)	0.071 (0.158)	0.058 (0.133)
Mother Employed	-0.049 (0.052)	-0.038 (0.075)	-0.060 (0.072)
Family Size 3 or 4	-0.004 (0.107)	0.099 (0.179)	-0.030 (0.135)
Family Size 5 to 7	0.010 (0.110)	0.141 (0.181)	-0.059 (0.140)
Family Size Larger than 7	0.148 (0.165)	0.222 (0.255)	0.132 (0.221)
Urban	0.060 (0.061)	0.155 (0.091)	-0.026 (0.082)

TABLE A.3 *(continued)*

Explanatory Variables	Estimated Coefficients		
	Total Sample	Elementary School Students	Middle and High School Students
Suburban	0.025 (0.062)	0.113 (0.091)	-0.045 (0.086)
Mid-Atlantic	0.029 (0.103)	-0.058 (0.164)	0.119 (0.136)
Southeast	-0.038 (0.091)	0.008 (0.150)	-0.066 (0.118)
Midwest	-0.038 (0.091)	0.004 (0.150)	-0.077 (0.116)
Southwest	0.035 (0.097)	0.030 (0.157)	0.065 (0.125)
Mountain Plains	0.002 (0.103)	-0.026 (0.165)	0.022 (0.135)
West	-0.016 (0.096)	-0.071 (0.157)	0.057 (0.125)
Sample Size	**3,381**	**1,611**	**1,770**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data.

NOTE: The coefficient and standard error estimates are from an unweighted probit equation of whether a student ate breakfast.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE A.4

PROBIT EQUATION FOR WHETHER A STUDENT CONSUMED ANY FOOD OR DRINK FOR BREAKFAST: LOW-INCOME SAMPLE
(Standard Errors in Parentheses)

	Estimated Coefficients		
Explanatory Variables	Low-Income Students	Low- Income Elementary School Students	Middle and High School Low-Income Students
Intercept	2.458**	0.887	3.440**
	(0.348)	(0.640)	(0.604)
School Has SBP	**0.069**	**0.212**	**-0.004**
	(0.107)	**(0.179)**	**(0.140)**
School Has Other Breakfast Program	0.049	-0.569	0.270
	(0.264)	(0.501)	(0.322)
Age	-0.097**	0.014	-0.138**
	(0.014)	(0.046)	(0.030)
Female	-0.242**	-0.143	-0.342**
	(0.089)	(0.142)	(0.119)
Black	0.013	0.285	-0.101
	(0.112)	(0.185)	(0.151)
Hispanic	-0.030	0.251	-0.152
	(0.130)	(0.212)	(0.178)
Other Race	0.018	-0.307	0.249
	(0.246)	(0.355)	(0.348)
Mother in Household	0.013	-0.129	0.151
	(0.169)	(0.265)	(0.226)
Mother Employed	-0.018	0.244	-0.185
	(0.095)	(0.149)	(0.130)
Family Size 3 or 4	-0.205	0.422	-0.523
	(0.194)	(0.289)	(0.271)
Family Size 5 to 7	-0.137	0.614*	-0.572*
	(0.198)	(0.293)	(0.277)
Family Size Larger than 7	0.083	0.487	-0.121
	(0.269)	(0.395)	(0.373)
Urban	-0.142	-0.091	-0.179
	(0.116)	(0.181)	(0.160)
Suburban	-0.023	0.050	-0.024
	(0.127)	(0.189)	(0.178)

TABLE A.4 *(continued)*

Explanatory Variables	Estimated Coefficients		
	Low-Income Students	Low- Income Elementary School Students	Middle and High School Low-Income Students
Mid-Atlantic	0.318 (0.224)	0.049 (0.396)	0.410 (0.293)
Southeast	0.151 (0.189)	-0.260 (0.347)	0.302 (0.244)
Midwest	0.060 (0.195)	-0.319 (0.352)	0.174 (0.248)
Southwest	-0.002 (0.202)	-0.290 (0.355)	0.073 (0.268)
Mountain Plains	0.199 (0.220)	-0.175 (0.381)	0.283 (0.287)
West	0.193 (0.207)	0.113 (0.384)	0.205 (0.263)
Sample Size	**1,441**	**777**	**664**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data.

NOTE: The coefficient and standard error estimates are from an unweighted probit equation of whether a student ate breakfast.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE A.5

PROBIT EQUATION FOR WHETHER A STUDENT HAD BREAKFAST INTAKE OF FOOD ENERGY GREATER THAN 10 PERCENT OF THE RDA: LOW-INCOME STUDENTS
(Standard Errors in Parentheses)

	Estimated Coefficients		
Explanatory Variables	Low-Income Students	Low- Income Elementary School Students	Middle and High School Low- Income Students
Intercept	1.525**	0.649	2.465**
	(0.284)	(0.483)	(0.510)
School Has SBP	**0.295****	**0.503****	**0.153**
	(0.087)	**(0.133)**	**(0.121)**
School Has Other Breakfast Program	0.070	-0.372	0.322
	(0.216)	(0.426)	(0.261)
Age	-0.079**	-0.046	-0.118**
	(0.011)	(0.034)	(0.026)
Female	-0.108	0.016	-0.260*
	(0.072)	(0.104)	(0.103)
Black	0.041	0.014	0.148
	(0.091)	(0.132)	(0.132)
Hispanic	0.010	0.161	-0.075
	(0.106)	(0.154)	(0.156)
Other Race	-0.027	-0.177	0.175
	(0.200)	(0.292)	(0.280)
Mother in Household	-0.028	-0.069	0.046
	(0.138)	(0.204)	(0.194)
Mother Employed	-0.019	0.073	-0.109
	(0.077)	(0.110)	(0.112)
Family Size 3 or 4	-0.162	0.230	-0.402
	(0.158)	(0.236)	(0.217)
Family Size 5 to 7	-0.057	0.422	-0.390
	(0.161)	(0.237)	(0.223)
Family Size Larger than 7	-0.111	0.352	-0.447
	(0.207)	(0.302)	(0.289)
Urban	-0.126	-0.079	-0.197
	(0.095)	(0.136)	(0.138)
Suburban	-0.091	0.068	-0.256
	(0.101)	(0.142)	(0.150)

TABLE A.5 *(continued)*

Explanatory Variables	Estimated Coefficients		
	Low-Income Students	Low- Income Elementary School Students	Middle and High School Low- Income Students
Mid-Atlantic	0.019 (0.183)	-0.263 (0.271)	0.301 (0.260)
Southeast	-0.034 (0.162)	-0.193 (0.250)	0.094 (0.221)
Midwest	0.001 (0.168)	0.065 (0.263)	-0.080 (0.225)
Southwest	-0.021 (0.174)	-0.171 (0.261)	0.096 (0.245)
Mountain Plains	-0.073 (0.183)	-0.160 (0.276)	-0.064 (0.252)
West	-0.085 (0.174)	-0.164 (0.267)	0.015 (0.236)
Sample Size	**1,441**	**777**	**664**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data.

NOTE: The coefficient and standard error estimates are from an unweighted probit equation of whether a student ate breakfast.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE A.6

PROBIT EQUATION FOR WHETHER A STUDENT CONSUMED FOOD FROM AT LEAST TWO FOOD GROUPS AND BREAKFAST INTAKE OF FOOD ENERGY GREATER THAN 10 PERCENT OF THE RDA: LOW-INCOME SAMPLE
(Standard Errors in Parentheses)

	Estimated Coefficients		
Explanatory Variables	Low-Income Students	Low-Income Elementary School Students	Middle and High School Low-Income Students
Intercept	1.489**	0.716	2.147**
	(0.278)	(0.469)	(0.500)
School Has SBP	**0.348****	**0.425****	**0.307****
	(0.086)	**(0.128)**	**(0.120)**
School Has Other Breakfast Program	0.124	-0.565	0.467
	(0.215)	(0.429)	(0.258)
Age	-0.093**	-0.058	-0.118**
	(0.011)	(0.033)	(0.026)
Female	-0.160*	-0.055	-0.295**
	(0.071)	(0.100)	(0.102)
Black	0.083	0.122	0.142
	(0.089)	(0.127)	(0.130)
Hispanic	0.052	0.152	0.018
	(0.104)	(0.147)	(0.155)
Other Race	0.111	0.033	0.269
	(0.199)	(0.294)	(0.276)
Mother in Household	0.051	0.095	0.041
	(0.135)	(0.193)	(0.191)
Mother Employed	-0.065	0.017	-0.150
	(0.076)	(0.106)	(0.110)
Family Size 3 or 4	-0.224	0.055	-0.336
	(0.155)	(0.234)	(0.210)
Family Size 5 to 7	-0.093	0.250	-0.286
	(0.157)	(0.235)	(0.216)
Family Size Larger than 7	-0.077	0.172	-0.190
	(0.204)	(0.297)	(0.283)
Urban	-0.116	-0.021	-0.250
	(0.093)	(0.130)	(0.135)
Suburban	-0.135	0.029	-0.331*
	(0.099)	(0.136)	(0.149)

TABLE A.6 *(continued)*

Explanatory Variables	Estimated Coefficients		
	Low-Income Students	Low-Income Elementary School Students	Middle and High School Low-Income Students
Mid-Atlantic	-0.070 (0.180)	-0.313 (0.264)	0.167 (0.255)
Southeast	-0.080 (0.159)	-0.195 (0.244)	-0.012 (0.219)
Midwest	0.002 (0.165)	0.031 (0.256)	-0.075 (0.224)
Southwest	-0.052 (0.171)	-0.196 (0.254)	0.043 (0.243)
Mountain Plains	-0.165 (0.179)	-0.358 (0.267)	-0.049 (0.251)
West	-0.069 (0.171)	-0.150 (0.261)	-0.013 (0.235)
Sample Size	**1,441**	**777**	**664**

SOURCE: School Nutrition Dietary Assessment (SNDA-1) data.

NOTE: The coefficient and standard error estimates are from an unweighted probit equation of whether a student ate breakfast.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.