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GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-271643

May 8, 1996

The Honorable William F. Goodling
Chairman, Committee on Economic
and Educational Opportunities
House of Representatives

Dear Mr. Chairman:

The U.S. Department of Agriculture reported in its School Nutrition Dietary Assessment Study that students participating in the National School Lunch Program wasted about 12 percent of the calories in the foods in their school lunch.[1] The Department's study was based on 1992 interview data from a nationwide sample of students in grades 1 through 12. The study presented nationwide estimates of the nutrients in the foods offered to, consumed by, and wasted by students on a typical school day. The Department analyzed the percent of waste for male participants age 11 and older, female participants age 11 and older, and all participants age 10 and under.

To provide more information on school lunch food wasted by students, we agreed to further analyze data collected for the Department's study to determine the percent of selected nutrients–calories, protein, saturated fat, and total fat–wasted by students with various characteristics. Specifically, we examined the percent of each of these nutrients wasted by program participants–students who eat a school lunch for which the school receives a

[1]The study consists of four volumes: The School Nutrition Dietary Assessment Study: Summary of Findings; The School Nutrition Dietary Assessment Study: School Food Service, Meals Offered, and Dietary Intakes; The School Nutrition Dietary Assessment Study: Data Collection and Sampling; and The School Nutrition Dietary Assessment Study: Dietary Intakes of Program Participants and Nonparticipants. Mathematica Policy Research, Inc.: Princeton, N.J., Oct. 1993. These volumes were prepared under contract with the Food and Nutrition Service (now the Food and Consumer Service), U.S. Department of Agriculture.

federal reimbursement under the National School Lunch Program[2]–and nonparticipants[3]–students who eat a lunch that does not qualify for federal reimbursement. For participants and nonparticipants, we analyzed the percent of each nutrient wasted, by students' age; gender; school location (rural, suburban, urban); and certification as eligible to receive free, reduced-price, or full-price lunch under the program. In performing this analysis, we recognized that providing information solely on the nutrients wasted provided an incomplete picture of the results of the school lunch program. We believe that it is important to also present information on the nutrients consumed. Accordingly, we reviewed the Department's findings on this issue as well.

In summary, we found the following with respect to waste:

- Students participating in the school lunch program wasted a higher percent of the nutrients in their lunch than nonparticipants.

- Regarding age, younger participants (those under 15) wasted a higher percent of the nutrients than older participants. Younger participants also wasted a higher percent of the nutrients than younger nonparticipants.

- Regarding gender, female participants wasted a higher percent of the nutrients than male participants. Furthermore, female participants wasted a higher percent of the nutrients than female nonparticipants.

- Regarding location, participants in urban schools wasted a higher percent of protein, saturated fat, and total fat than participants in suburban schools. We found no difference in the percent of calories wasted by participants on the basis of school location. Participants in urban schools wasted a higher percent of the nutrients than nonparticipants in urban schools.

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[2]To participate in the National School Lunch Program, schools must meet federal requirements. At the time of the Department's study, schools had to offer a lunch that included one serving of meat or "meat alternate," bread or "bread alternate," milk, and at least two servings of vegetables and/or fruits. Most schools require students to take at least three of the five items. Schools have to offer free and reduced-price lunches to children certified as eligible on the basis of household income.

[3]For the purposes of the Department's study and our analysis, nonparticipants eat a lunch at school that has been (1) brought from home, (2) purchased at school a la carte, or (3) purchased from school stores, vending machines, or snack bars.

- Regarding certification for participation, participants receiving a free school lunch wasted a higher percent of the nutrients than participants paying full price. We found no difference in the percent of the nutrients wasted by participants eligible to receive a free lunch and nonparticipants eligible to receive a free lunch.

Furthermore, the Department reported the following with respect to the nutrition of the lunches consumed:

- Participants consumed lunches that provided at least 33 percent of the recommended dietary allowances for calories and for all vitamins and minerals, whereas nonparticipants consumed less than 33 percent of the recommended dietary allowances for calories, vitamin A, vitamin B6, calcium, iron, and zinc.

- Participants' lunches were higher than nonparticipants' lunches in total fat, saturated fat, and sodium and were lower in carbohydrates, although neither participants nor nonparticipants met dietary recommendations for these components.

- Participants were more likely than nonparticipants to consume milk, meat, fruits, fruit juices, and vegetables, and nonparticipants were more likely than participants to eat sugar, sweets, sweetened beverages, crackers, and salty snack items.

SCOPE AND METHODOLOGY

To examine the percent of calories, protein, saturated fat, and total fat wasted, we used data that the Department had collected for its sample of students. We estimated, for each of the four nutrients, the percent of the nutrient wasted by students of various characteristics who were participating in the program. We performed the same analysis for nonparticipants. We calculated the 95-percent confidence intervals for each of the estimated percents. Enclosure I provides the estimated percents of nutrients wasted.

We then compared the percent of each nutrient wasted for various groups of students. For example, looking at the age of participants, we compared the percent of calories wasted by participants under 11 years of age with that wasted by participants age 11 through 14 and with that wasted by participants over 14 years of age. We made similar comparisons of participants by gender, school location, and program eligibility certification. Furthermore, we compared participants and nonparticipants by age, gender, location, and

program eligibility certification. We tested each comparison to see if it resulted in a statistically significant difference in the percent wasted.[4] Enclosure II provides the results of these comparisons. Enclosure III discusses our methodology in greater detail, including limitations of the data.

We also examined the Department's report on nutrients consumed by participants and nonparticipants. Enclosure IV presents the Department's findings.

We performed our work from July 1995 through April 1996 in accordance with generally accepted government auditing standards. However, we did not independently verify the data that the Department had collected.

AGENCY COMMENTS

We provided copies of a draft of this letter to the Department's Food and Consumer Service for its review and comment. We met with agency officials, including the Acting Director, Office of Analysis and Evaluation. Agency officials raised no methodological concerns with our analysis and statistical presentation of nutrients wasted by program participants and nonparticipants. However, agency officials said that our finding that students participating in the school lunch program wasted a higher percent of nutrients in their lunch than nonparticipants could be misinterpreted to mean that waste in the school lunch program is of an unacceptable level. More specifically, these officials said that there is no true standard to judge an acceptable level of waste from school lunches that provide adequate calories and nutrients. Furthermore, they said that it is possible that the maximum tolerance for the level of waste should be somewhat higher for participants than for nonparticipants. The agency officials explained that while our analysis shows that nonparticipants waste a lower percent of nutrients, these nonparticipants are not consuming the amount and variety of foods needed to meet one-third of their daily nutritional needs. In addition, lunch brought from home or purchased away from school is generally tailored to the individual student's preferences, and therefore a lower level of waste among nonparticipants might be expected. We agree that there is no true standard by which to judge an acceptable level of waste from school lunches that provide adequate calories and nutrients, and we agree that nonparticipants may have lower levels of waste because their lunch may be tailored to their individual preferences. Agency officials also

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[4]A statistically significant difference is one in which the difference observed in the sample is too large to be attributable to chance.

provided some clarifying comments that we have incorporated into the letter.

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As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 7 days after the date of this letter. At that time, we will send copies of this report to the appropriate congressional committees and the Secretary of Agriculture.

Major contributors to this letter were Karen Bracey, Rosellen McCarthy, and Thomas Slomba. Please contact me at (202) 512-5138 if you or your staff have any questions.

Sincerely yours,

Robert A. Robinson
Director, Food and
Agriculture Issues

Enclosures - 4

ENCLOSURE I

NUTRIENTS WASTED BY PROGRAM PARTICIPANTS AND NONPARTICIPANTS BY AGE, GENDER, LOCATION OF SCHOOL, AND PROGRAM ELIGIBILITY CERTIFICATION

This enclosure presents four tables, one for each of the four nutrients we reviewed. These tables show our best single estimate of the percent of the nutrient wasted as well as the range of waste based on the 95-percent confidence interval for participants and nonparticipants in the National School Lunch Program. The estimates and ranges are presented for participants and nonparticipants by age, gender, school location, and program eligibility certification.

Table I.1: Estimated Percent of Calories Wasted by Program Participants and Nonparticipants by Age, Gender, Location, and Program Eligibility Certification

Characteristic	Program participants		Nonparticipants	
	Percent wasted	.95 confidence interval	Percent wasted	.95 confidence interval
Age				
Under 11	14.8	13.2 to 16.4	9.4	7.1 to 11.8
11-14	11.9	9.6 to 14.3	6.4	4.8 to 8.1
Over 14	6.5	4.6 to 8.5	5.7	3.3 to 8.2
Gender				
Female	16.6	14.8 to 18.4	8.4	6.5 to 10.2
Male	9.0	7.6 to 10.3	6.8	4.9 to 8.6
Location				
Rural	12.2	9.6 to 14.8	9.2	4.5 to 13.9
Suburban	10.7	8.4 to 12.9	7.7	5.1 to 10.2
Urban	13.4	11.4 to 15.5	7.0	5.1 to 8.8
Program eligibility certification				
Free lunch	14.6	12.7 to 16.6	10.4	5.9 to 14.9
Reduced-price lunch	14.0	9.4 to 18.5	14.5	6.1 to 22.9
Full-price lunch	10.0	8.6 to 11.4	7.1	5.6 to 8.6
Overall	12.2	10.9 to 13.5	7.6	6.1 to 9.1

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

Table I.2: Estimated Percent of Protein Wasted by Program Participants and Nonparticipants by Age, Gender, Location, and Program Eligibility Certification

Characteristic	Program participants		Nonparticipants	
	Percent wasted	.95 confidence interval	Percent wasted	.95 confidence interval
Age				
Under 11	13.8	12.1 to 15.4	8.6	6.4 to 10.8
11-14	11.3	8.6 to 14.0	7.4	4.9 to 9.9
Over 14	6.1	4.1 to 8.2	5.1	0.8 to 9.5
Gender				
Female	15.9	13.9 to 17.9	9.1	6.6 to 11.6
Male	8.1	6.7 to 9.5	5.9	4.1 to 7.7
Location				
Rural	11.8	8.8 to 14.8	11.2	4.9 to 17.5
Suburban	9.4	7.1 to 11.7	7.1	4.5 to 9.7
Urban	12.8	10.6 to 15.0	6.9	4.6 to 9.2
Program eligibility certification				
Free lunch	13.5	11.5 to 15.6	10.4	5.5 to 15.3
Reduced-price lunch	14.2	9.5 to 19.0	17.8	7.1 to 28.4
Full-price lunch	9.2	7.7 to 10.7	7.1	5.3 to 9.0
Overall	11.4	10.0 to 12.8	7.5	5.8 to 9.2

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

Table I.3: Estimated Percent of Saturated Fat Wasted by Program Participants and Nonparticipants by Age, Gender, Location, and Program Eligibility Certification

Characteristic	Program participants		Nonparticipants	
	Percent wasted	.95 confidence interval	Percent wasted	.95 confidence interval
Age				
Under 11	13.6	11.9 to 15.3	8.7	6.4 to 11.1
11-14	10.4	8.0 to 12.7	6.4	4.6 to 8.2
Over 14	5.3	3.5 to 7.0	6.0	3.3 to 8.7
Gender				
Female	14.8	13.0 to 16.7	8.0	6.0 to 10.0
Male	7.9	6.4 to 9.4	6.6	4.6 to 8.6
Location				
Rural	10.7	8.4 to 13.0	9.8	4.4 to 15.2
Suburban	8.9	6.7 to 11.0	6.5	4.4 to 8.5
Urban	12.5	10.1 to 15.0	7.4	4.9 to 9.8
Program eligibility certification				
Free lunch	13.4	11.3 to 15.6	9.5	4.1 to 14.8
Reduced-price lunch	12.0	7.2 to 16.8	14.9	3.8 to 26.0
Full-price lunch	8.6	7.2 to 9.9	7.1	5.4 to 8.8
Overall	10.8	9.5 to 12.2	7.3	5.8 to 8.8

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

Table I.4: Estimated Percent of Total Fat Wasted by Program Participants and Nonparticipants by Age, Gender, Location, and Program Eligibility Certification

Characteristic	Program participants		Nonparticipants	
	Percent wasted	.95 confidence interval	Percent wasted	.95 confidence interval
Age				
Under 11	14.2	12.4 to 15.9	9.4	6.9 to 11.8
11-14	10.8	8.3 to 13.2	6.6	4.7 to 8.4
Over 14	5.8	4.0 to 7.7	6.1	3.2 to 8.9
Gender				
Female	15.3	13.4 to 17.2	8.5	6.4 to 10.6
Male	8.4	6.9 to 10.0	6.8	4.8 to 8.9
Location				
Rural	11.1	8.6 to 13.6	9.8	5.2 to 14.5
Suburban	9.6	7.4 to 11.8	7.4	4.9 to 10.0
Urban	12.9	10.5 to 15.3	7.2	4.9 to 9.6
Program eligibility certification				
Free lunch	14.0	11.8 to 16.2	10.2	5.0 to 15.5
Reduced-price lunch	12.0	7.3 to 16.8	16.7	6.0 to 27.4
Full-price lunch	9.1	7.7 to 10.4	7.3	5.6 to 9.0
Overall	11.3	10.0 to 12.7	7.7	6.1 to 9.2

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

COMPARISON OF THE PERCENT OF NUTRIENTS WASTED BY STUDENT CHARACTERISTICS

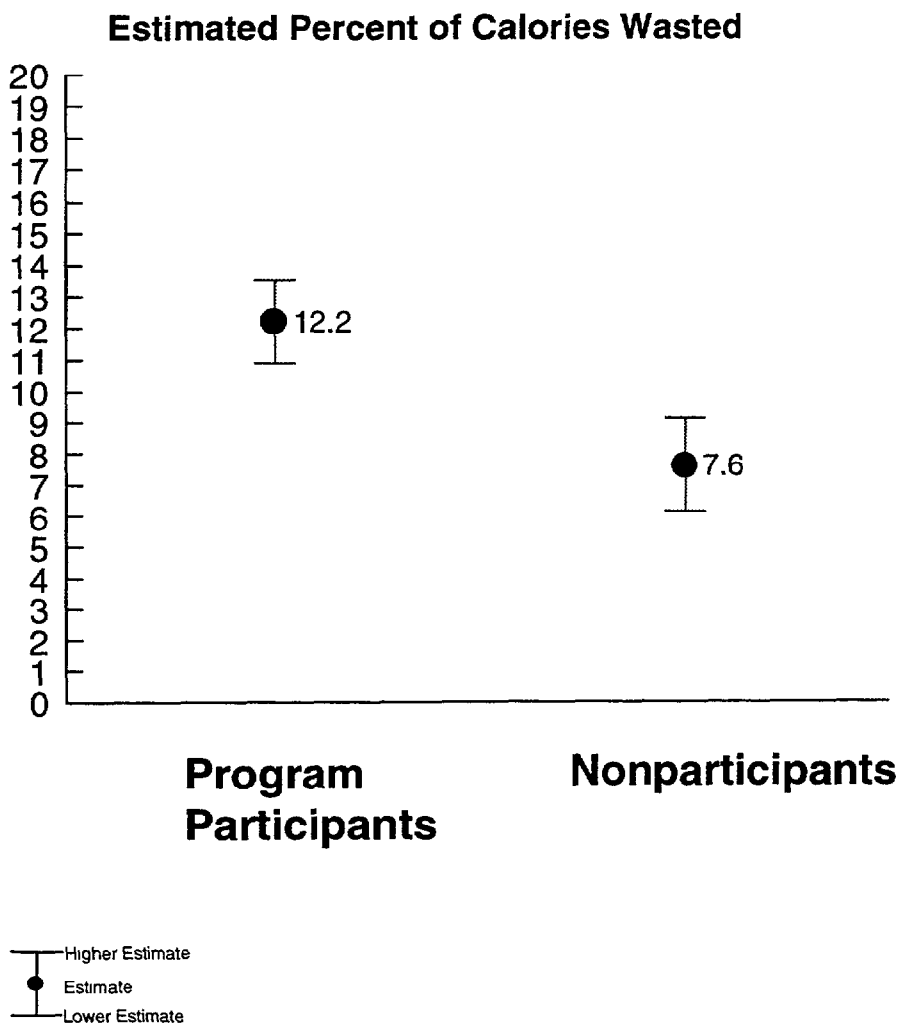
We compared the percent of nutrients wasted in a number of ways, such as participants versus nonparticipants and student characteristics within the participant and nonparticipant categories. Some of these comparisons identified statistically significant differences in the percent of waste, and others identified differences that were not statistically significant. If we identified a statistically significant difference, we reported that one group had a higher percent of waste than the other group. If the difference was not statistically significant, we reported no difference.

The figures in this enclosure present selected results of our comparisons for one of the nutrients–calories. The figures present our best single estimate of the percent wasted as well as the range of waste based on the 95-percent confidence interval. Generally, our results for the other three nutrients–protein, saturated fat, and total fat–parallel what we found for calories; that is, if we found a statistically significant difference for the comparison dealing with calories, we also found a statistically significant difference for that same comparison when dealing with the other three nutrients. However, the best single estimate of the percent wasted and the range of waste may differ from those of calories. (See tables I.2 through I.4 in enc. I for the percent of waste for the nutrients protein, saturated fat, and total fat.)

Figure II.1 illustrates the statistically significant difference between the percent of calories wasted by program participants and nonparticipants. Based on the sample of students studied, our best single estimate of the percent wasted by participants is 12.2, but the range of waste based on the 95-percent confidence interval is between 10.9 and 13.5 percent. For nonparticipants, our best single estimate of the percent wasted is 7.6, but the range of waste based on the 95-percent confidence interval is between 6.1 and 9.1 percent. Because these two ranges do not overlap, a statistically significant difference existed between the percent of calories wasted for the two groups of students. Thus, participants wasted a higher percent of calories than nonparticipants. Even when confidence intervals overlap, other, more powerful tests may reveal statistically significant differences. We performed these additional tests for statistically significant differences and reported the results in tables II.1 and II.2.

The remaining figures are based on our analysis of age, gender, school location, and program eligibility certification. For each of these, we present (1) comparisons among groups of participants, (2) differences between the participant group with the highest percent of waste and the corresponding nonparticipant group, and (3) comparisons between participants and nonparticipants for any other groups when we found statistically significant differences in percents of waste.

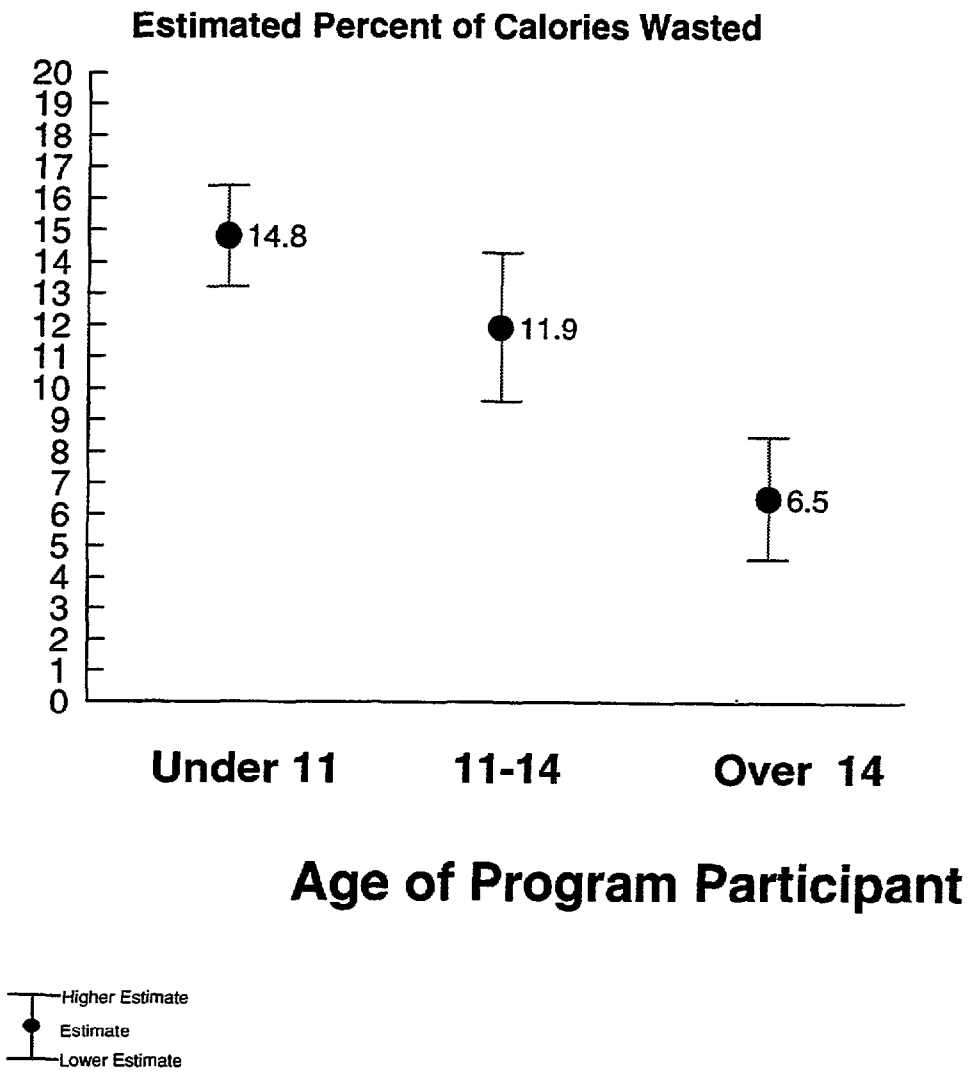
Figure II.1: Program Participants Wasted a Higher Percent of Calories Than Nonparticipants



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by participants and 73 percent of the calories consumed by nonparticipants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

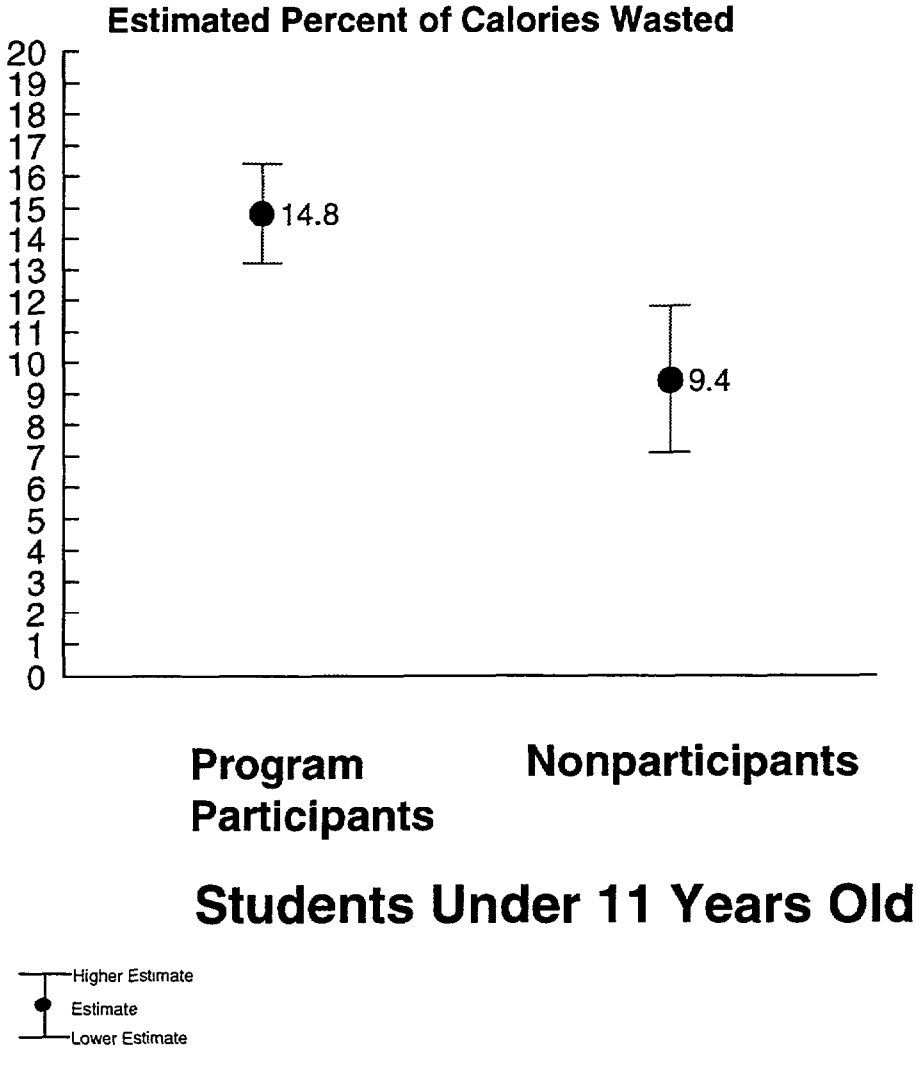
Figure II.2: Program Participants Age 14 Years or Younger Wasted a Higher Percent of Calories Than Older Participants



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

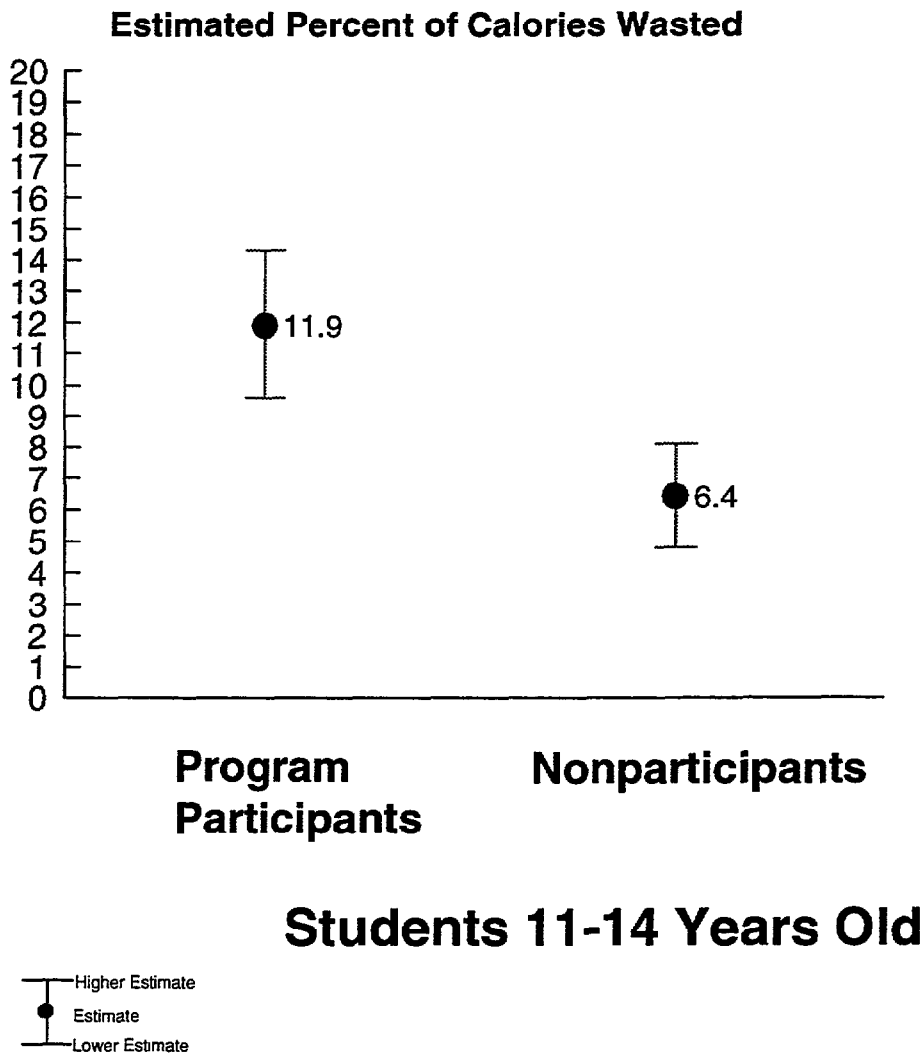
Figure II.3: Program Participants Under 11 Years Old Wasted a Higher Percent of Calories Than Nonparticipants in the Same Age Group



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants and 73 percent of the calories consumed by nonparticipants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

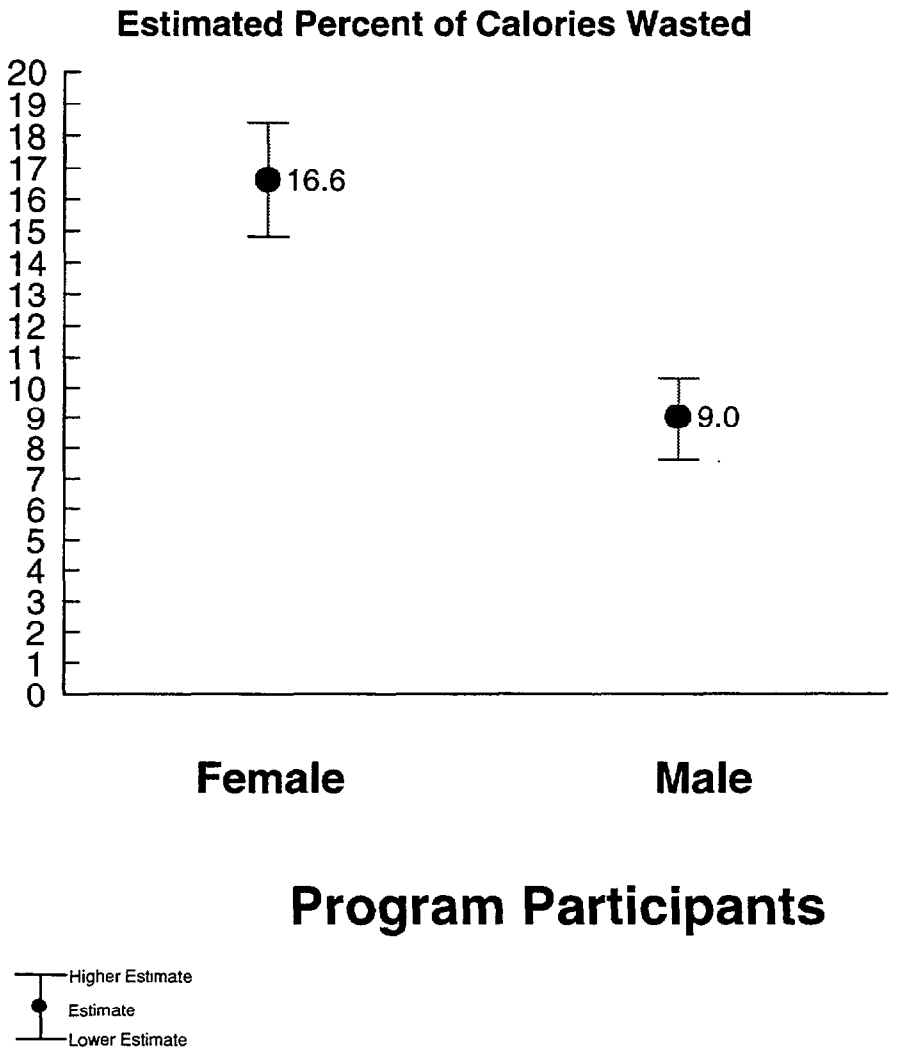
Figure II.4: Program Participants 11-14 Years Old Wasted a Higher Percent of Calories Than Nonparticipants in the Same Age Group



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants and 73 percent of the calories consumed by nonparticipants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

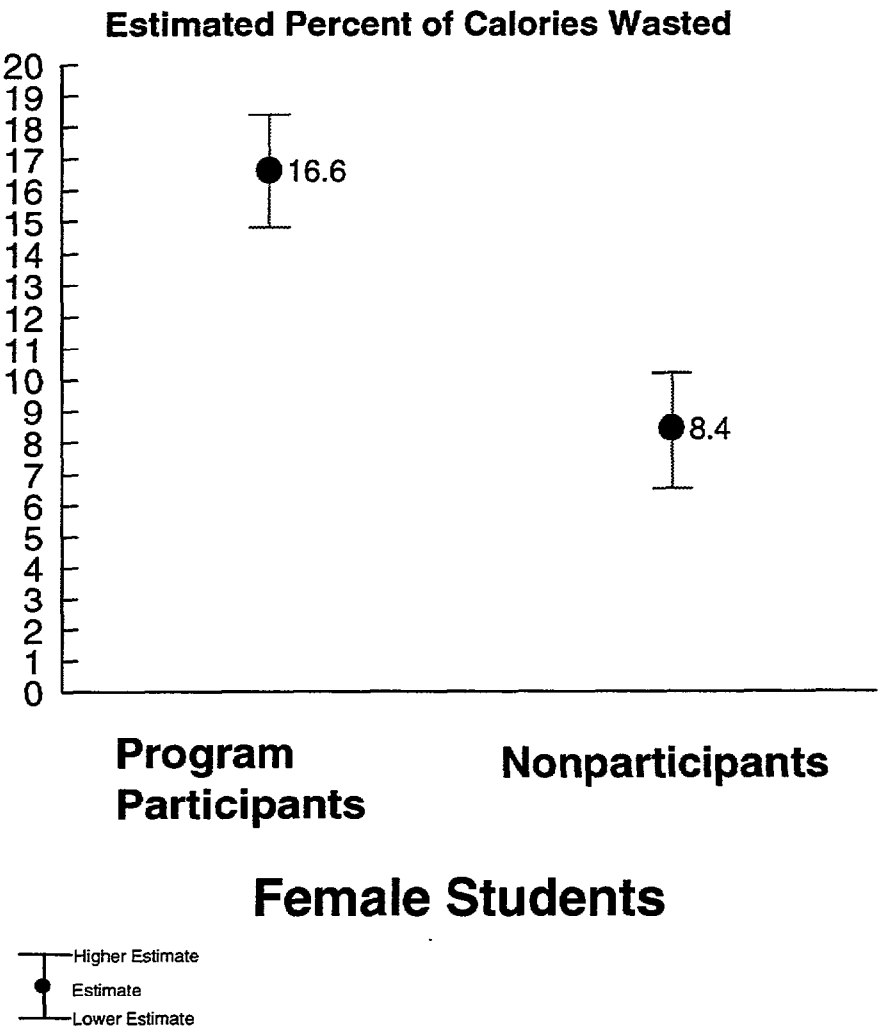
Figure II.5: Female Program Participants Wasted a Higher Percent of Calories Than Male Participants



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

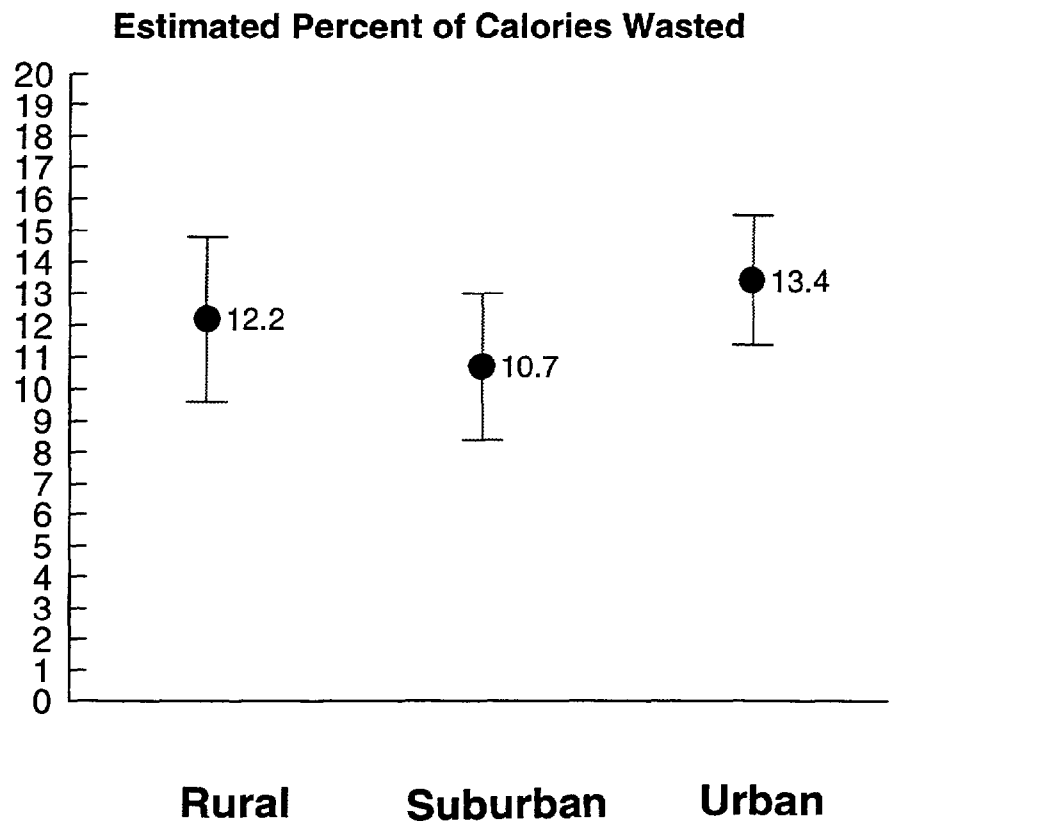
Figure II.6: Female Program Participants Wasted a Higher Percent of Calories Than Female Nonparticipants



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants and 73 percent of the calories consumed by nonparticipants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

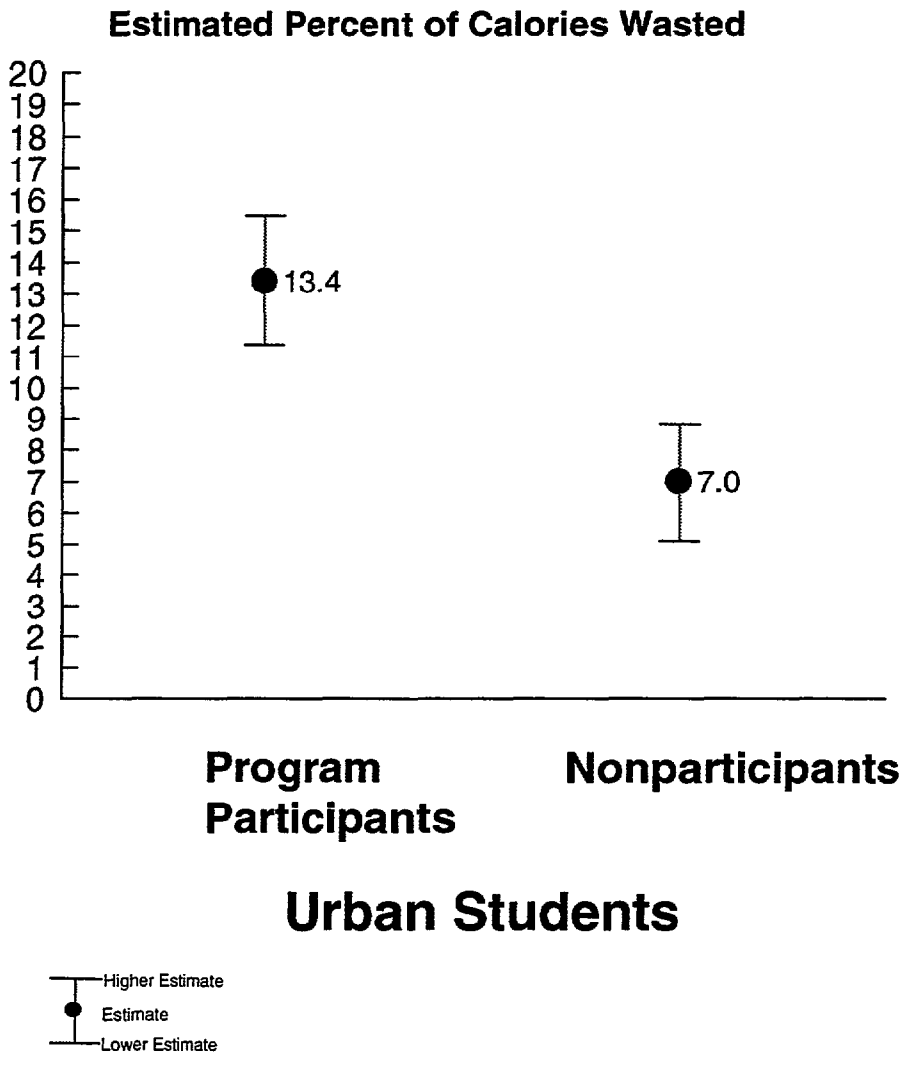
Figure II.7: No Statistically Significant Differences in the Percent of Calories Wasted by Program Participants in Rural, Suburban, and Urban Locations



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

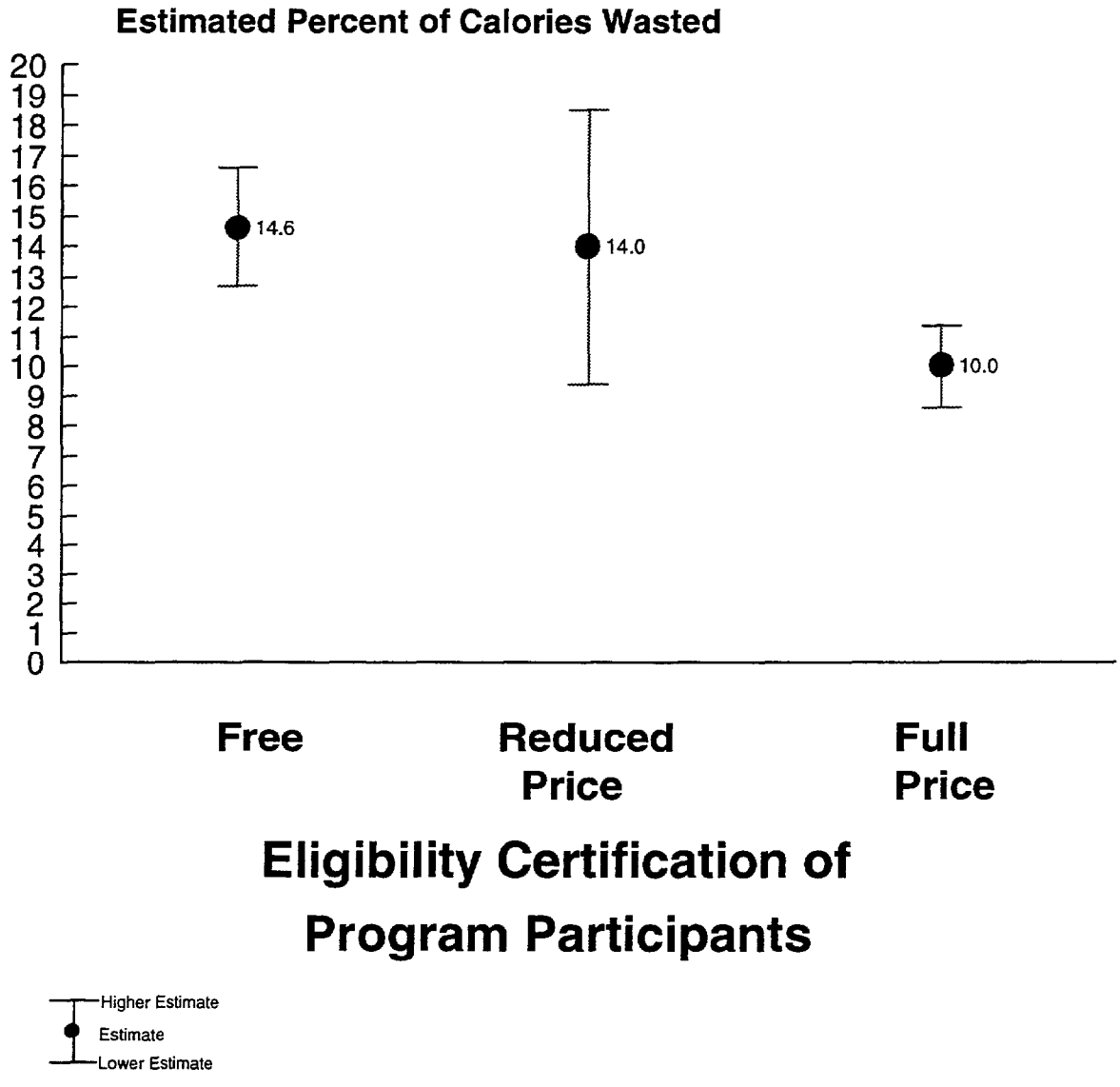
Figure II.8: Program Participants in Urban Schools Wasted a Higher Percent of Calories Than Nonparticipants in Urban Schools



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants and 73 percent of the calories consumed by nonparticipants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

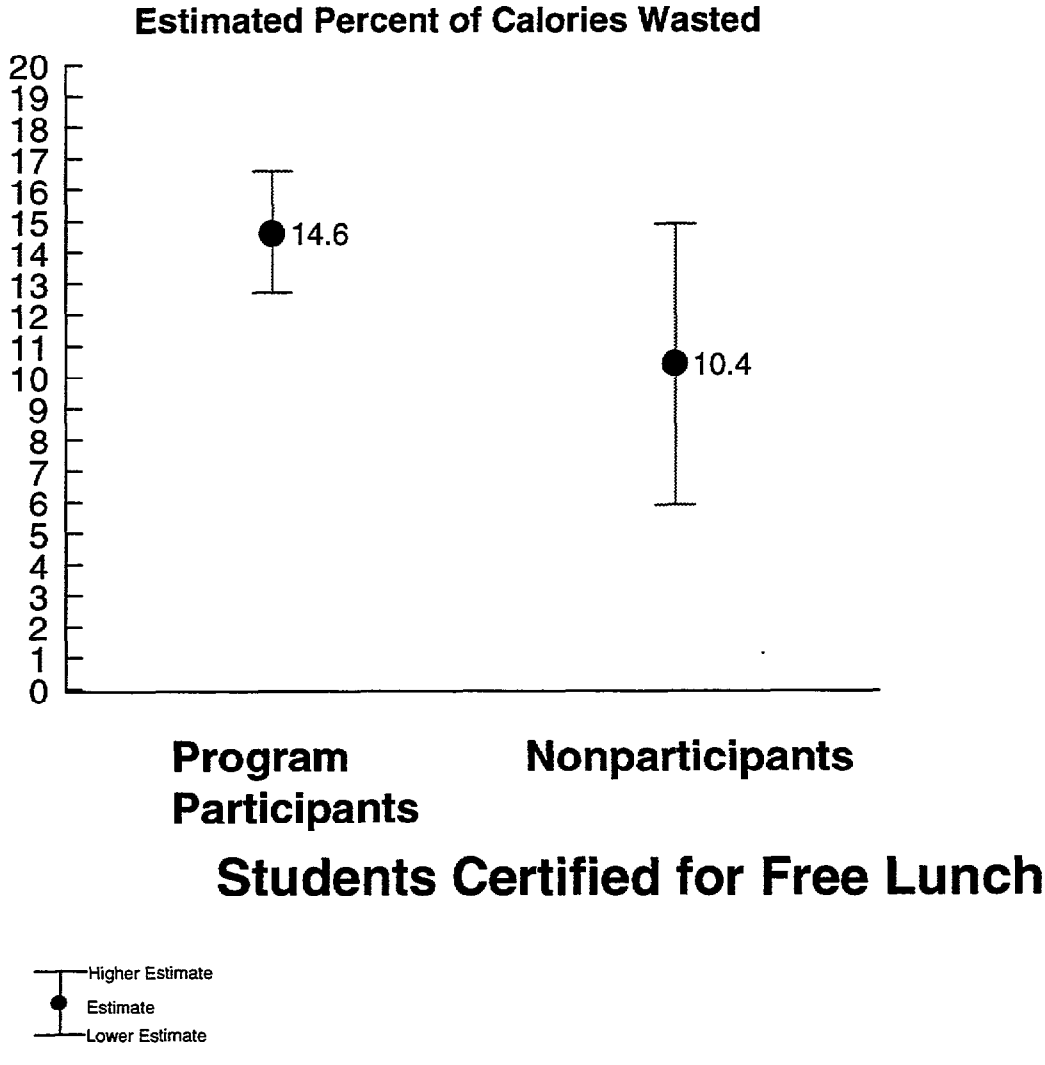
Figure II.9: Program Participants Obtaining a Free Lunch Wasted a Higher Percent of Calories Than Those Paying Full Price



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

Figure II.10: No Statistically Significant Difference in the Percent of Calories Wasted by Participants Eligible to Receive a Free Lunch and Nonparticipants Eligible to Receive a Free Lunch



Note: Data were available to make nationwide estimates for 84 percent of the calories consumed by program participants and 73 percent of the calories consumed by nonparticipants. The higher and lower estimates are the upper and lower bounds of the .95 confidence interval.

Source: GAO's analysis of data from the School Nutrition Dietary Assessment Study.

Table II.1: Results of Test to Determine if Statistically Significant Differences Exist in the Percent of Nutrients Wasted by Program Participants

Characteristic	Calories	Protein	Saturated fat	Total fat
Age				
Under 11 wasted more than over 14	Yes	Yes	Yes	Yes
11-14 wasted more than over 14	Yes	Yes	Yes	Yes
Under 11 wasted more than 11-14	Yes	No	Yes	Yes
Gender				
Females wasted more than males	Yes	Yes	Yes	Yes
Location				
Urban wasted more than suburban	No	Yes	Yes	Yes
Program eligibility				
Free wasted more than full price	Yes	Yes	Yes	Yes
Reduced price wasted more than full price	No	Yes	No	No

Note: "Yes" or "No" indicates whether the difference is significant at the .95 level of confidence. Shaded rows indicate that a statistically significant difference was found for all of the nutrients.

Table II.2: Results of Test to Determine if Statistically Significant Differences Exist in the Percent of Nutrients Wasted Between Program Participants and Nonparticipants

Characteristic	Calories	Protein	Saturated fat	Total fat
Age				
Under 11	Yes	Yes	Yes	Yes
11-14	Yes	Yes	Yes	Yes
Over 14	No	No	No	No
Gender				
Female	Yes	Yes	Yes	Yes
Male	No	No	No	No
Location				
Rural	No	No	No	No
Suburban	No	No	No	No
Urban	Yes	Yes	Yes	Yes
Program eligibility				
Free lunch	No	No	No	No
Reduced-price lunch	No	No	No	No
Full-price lunch	Yes	No	No	No

Note: "Yes" or "No" indicates whether the difference was significant at the .95 level of confidence. Shaded rows indicate that a statistically significant difference was found for all of the nutrients.

SCOPE AND METHODOLOGY FOR GAO'S ANALYSIS OF NUTRIENTS WASTED

To provide information on food selected for lunch but not consumed (plate waste), we agreed to analyze data collected for the U.S. Department of Agriculture's School Nutrition Dietary Assessment Study. Specifically, we examined the percent of calories, protein, saturated fat, and total fat wasted by program participants and nonparticipants in the National School Lunch Program. For each of these groups, we analyzed the percent of each nutrient wasted by students' age; gender; school location (rural, suburban, urban); and certification of students as eligible to receive free, reduced-price, or full-price lunch under the program.

Collection and Preparation of Data

We obtained the data that the Department collected for its School Nutrition Dietary Assessment Study. These data were on food and beverage consumption on a typical school day from a nationwide probability sample of students. The Department selected a sample of school districts, then a sample of public and private schools within the selected districts, and finally, a sample of students from these schools.[1] Data were collected from about 3,350 students in grades 1 through 12.

Each student selected for participation in the Department's study was asked to recall the type and amount of the food and drink the student had consumed during the 24-hour period prior to the interview. For students eating lunch at school, information was also collected on what portion of the food served/purchased/brought from home was eaten. In addition to the interview data, the Department's study provided information on the student's age and gender, location of the student's school,[2] and whether the student was certified as eligible for free or reduced-priced school meals.[3]

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[1]Districts were selected with probability proportional to the estimated average number of students per grade in the district. Schools were selected with probability proportional to the estimated average number of students per grade in the school.

[2]School location was classified as rural, suburban, or rural. Rural schools were those not in a metropolitan statistical area. Suburban schools were those in metropolitan statistical areas with city populations under 50,000. Urban schools were those in metropolitan statistical areas with city populations of 50,000 or more.

[3]For more detailed information on sampling and data collection, see the U.S. Department of Agriculture's The School Nutrition Dietary Assessment Study: School Food Service, Meals Offered, and Dietary Intakes, pp. 11-25 and The School Nutrition Dietary Assessment Study: Data Collection and Sampling. Mathematica Policy Research, Inc.: Princeton, N.J., Oct. 1993. These volumes were prepared under contract with the Food

About 85 percent of the 130 school districts and about 85 percent of the 406 schools selected for review participated in the study. About 75 percent of the 4,489 students eligible for data collection participated. The Department developed a weight for each student participating in the study. Weighting adjusts for differences between the participating sample of students and the entire population of students of interest. Differences arose because students had different chances of being selected for the sample and because not everyone selected for the sample participated.

In general, we used the definitions for the student characteristics that the Department used in its study. For example, we used the Department's definition for urban, suburban, and rural school location, and for program lunch eligibility certification status. We also used the definition that the Department generally used to identify a National School Lunch Program participant[4]–any student selecting at least three of the five program meal components (meat, bread, milk, fruit, and vegetable). Furthermore, our analysis used a weight that the Department developed for each student participating in the study.[5]

Like the Department, we used the following formula to calculate the percent of the nutrient wasted.

$$\text{Percent of nutrient wasted} = 1 - \frac{\text{(Amount of nutrient consumed)}}{\text{(Amount of nutrient selected)}}$$

Students provided information on the amount of each food item that they consumed, from which the "amount of nutrients consumed" for each food item was calculated directly. In addition, for those food items eaten in school, students were asked to provide information on the portion of the serving that they ate. The information on the portion of the serving eaten, in conjunction with information on nutrients consumed, was used to calculate "amount of nutrient selected" for each food item eaten for lunch in school. To calculate the amount selected, both we and the Department converted the data on portion eaten to percent of food item eaten. We used the same conversion assumptions the Department used, as table III.1 shows.

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and Nutrition Service (now the Food and Consumer Service), U.S. Department of Agriculture.

[4]"NSLP2" is the name of the variable.

[5]"STUDWT1" is the weight for analyzing data for the group of students who had completed an interview and a questionnaire about student and family characteristics. This group was used for most of the Department's analysis.

Table III.1: Conversion Assumptions for Portion Eaten to Percent of Food Item Eaten

Portion eaten	Percent eaten
All of it	100
Most of it	75
Half of it	50
Some of it	25
None of it	0

Once we made the conversion, we calculated the amount selected by dividing the amount consumed by the percent eaten.

Although we used the same formula as the Department to calculate the percent of nutrient wasted, our analysis did not include the same food items. For program participants, we included only those food items that counted toward the Department's required program meal components. For nonparticipants, we included all lunch items eaten at school.[6]

Data were missing on the portion eaten for many of the lunch food items. Some students were not asked to provide the portion of the serving eaten for any food item eaten. The Department's analysis excluded these students as well as students who reported a portion eaten for less than 50 percent of their food items. When the portion eaten was missing for food items consumed by students included in the Department's analysis, the Department assumed that the student ate all of the food item. According to the Department, this assumption was made for only a few of the sampled students. We did not follow the Department's approach for these missing data. Instead, we included all food items for which the portion eaten was given.[7] We did not assume the portion eaten for any food item. Consequently, our estimates do not represent all the foods selected by students. For example, our estimates of the percent of calories wasted by participants are based on about 84 percent of the total calories consumed, while our estimates for nonparticipants are based on about 73 percent.

[6]We used the Department's definition of lunch items–all those items eaten from 45 minutes before the start of the first lunch period until 45 minutes after the end of the last lunch period at the student's school.

[7]Therefore, we included some information for all students who provided the portion eaten for at least one food item.

Data were sometimes missing on the program eligibility certification of students. We do not treat these students as a separate category in our analyses of eligibility certification.[8]

Analysis of Percent of Nutrients Wasted for Various Student Groups

We estimated, for each of the four nutrients, the percent of the nutrient wasted by various student characteristics for students participating in the program. We performed the same analysis for students not participating in the program. The student characteristics were age; gender; location of the school (rural, suburban, urban); and eligibility certification of students for free, reduced-price, or full-price lunch under the program. We calculated the 95-percent confidence intervals for each of the estimated percents.

Testing for Differences

To determine if the percent of the nutrient wasted varied among different groups of students, we made several comparisons. For program participants, we determined if the percent wasted varied by the student characteristics of age, gender, location of the school, and program eligibility certification. For example, we compared the percent wasted by participants under 11 years of age with the percent wasted by participants age 11 through 14 years old and with the percent wasted by participants over 14 years of age. We also compared the percent wasted by participants in the 11 to 14 years age group with that of participants over age 14. The same types of comparisons were made of program participants by gender, school location, and program eligibility certification. Furthermore, we compared the percent wasted by participants with the percent wasted by nonparticipants. This type of comparison was made for each student characteristic. For example, we compared the percent wasted by participants under 11 years of age to that of nonparticipants under age 11, and we compared the percent wasted by participants in urban locations with that of nonparticipants in urban locations. Each comparison was made for the four nutrients. We tested each comparison to see if it resulted in a statistically significant difference in the percent of the nutrient wasted. We tested the hypothesis that the two percents were equal.

[8]These students contributed only a small amount to the total amount of nutrients selected for lunch–the denominator in our estimated percent of nutrient wasted. Less than 10 percent of the total amount of the nutrient selected for lunch was selected by students with unknown eligibility certification, for each of the four nutrients we reviewed.

Software Used

We used the software SUDAAN to make the estimates needed to develop our confidence intervals and to test for statistically significant differences. We used SUDAAN's regression analysis procedure to confirm that the statistical significance of the relationships of eligibility certification status and school location did not change for program participants after controlling for age and gender.

Summary of Limitations on the Data

Any study based on sample data may be subject to error. The results of our analysis may be subject to error because we used data from the Department's sample of students rather than the universe of students. Furthermore, for the Department's study, some sampled students did not participate, some data were missing for those participating, and the percents of nutrients wasted were not precisely measured. We, like the Department, attempted to compensate for the potential bias that can be caused when not everyone sampled participates. Because of missing data on food items for some study participants, we could not make nationwide estimates of the percent of a nutrient wasted for 100 percent of the lunch foods that students consumed. For example, data were available to make nationwide estimates for only 84 percent of the calories consumed by program participants and 73 percent of the calories consumed by nonparticipants. Finally, the Department relied on data that students provided to interviewers rather than a precise measurement of food wasted.

THE NUTRITIONAL CONTENT OF DIETS OF SCHOOL LUNCH PROGRAM PARTICIPANTS AND NONPARTICIPANTS–FINDINGS FROM THE U.S. DEPARTMENT OF AGRICULTURE'S DIETARY ASSESSMENT STUDY

This enclosure presents findings from The School Nutrition Dietary Assessment Study: Dietary Intakes of Program Participants and Nonparticipants.[9]

1. Program participation is associated with increased intakes at lunch of some, but not all, dietary components. Relative to nonparticipants who eat lunch, program participants have higher lunch intakes of vitamin A, calcium, magnesium, and zinc, and have lower intakes of vitamin C. Their lunchtime intakes of vitamin C, however, average 60 percent of the recommended dietary allowance (RDA). Program participants' lunches derive a higher percent of calories from total fat and saturated fat and a lower percent from carbohydrates than do nonparticipants' lunches.

Participants consume lunches that provide at least 33 percent of the RDA for calories and for all vitamins and minerals, whereas nonparticipants consume less than 33 percent of the RDA for calories, vitamin A, vitamin B6, calcium, iron, and zinc. However, program participants' lunches are higher than nonparticipants' lunches in total fat, saturated fat, and sodium and are lower in carbohydrates, although both groups fail to meet dietary recommendations for these components.

2. Differences in the consumption of specific foods explain differences in the nutrient intakes of program participants and nonparticipants. Program participants are more than twice as likely as nonparticipants to consume milk and milk products at lunch, which largely explains their higher intakes of calcium and vitamin A. Program participants also consume more meat, poultry, fish, and meat mixtures than do nonparticipants. Program participants' greater consumption of foods from these two food groups contributes to their higher percent of calories derived from fat and saturated fat. Participants are almost twice as likely as nonparticipants to eat vegetables and are one and one-half times as likely to eat fruits and fruit juices than nonparticipants. Nonparticipants are about three times as likely as participants to eat sugar, sweets, sweetened beverages, crackers, and salty snack items.

3. Calories and nutrients in lunches consumed by nonparticipants vary according to the source of the lunch. Nonparticipants who obtain lunch at school (food purchased from a vending machine, school store, or a la carte from the cafeteria) consume 23

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[9]Mathematica Policy Research, Inc.: Princeton, N.J., Oct. 1993, prepared under contract with the Food and Nutrition Service (now the Food and Consumer Service), U.S. Department of Agriculture.

percent of the RDA for calories at lunch. These students also consume less than 20 percent of the RDA for several nutrients (vitamin A, vitamin B6, calcium, iron, and zinc), and less than one-third of the RDA for many others. Nonparticipants who obtain lunch from home consume 31 percent of the RDA for calories, and nonparticipants who obtain lunch off campus consume 34 percent of the RDA for calories. Both groups consume less than one-third of the RDA for several vitamins and minerals–vitamin A, vitamin B6, calcium, and zinc.

4. Nonparticipants' lunches from home and from school have less total fat, saturated fat, sodium, and cholesterol than do those obtained off campus. Nonparticipants' lunches brought from home or obtained at school derive less of their lunchtime intake of calories from fat and more from carbohydrates than do nonparticipants' lunches obtained off campus. The sodium and fat content of off-campus lunches and of program lunches are quite similar, although off-campus lunches provide lower levels of vitamins and minerals.

5. Some, but not all, of the differences between the intakes of program participants and nonparticipants at lunch persist over 24 hours. Program participation is associated with increases in the percent of calories from fat and saturated fat and with decreases in the percent of calories from carbohydrates both at lunch and over 24 hours. Program participation is also associated with higher intakes of vitamin A and lower intakes of vitamin C both at lunch and over 24 hours. The relationship between program participation and higher calcium intake at lunch diminishes over 24 hours.

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