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**THE SCHOOL NUTRITION  
DIETARY ASSESSMENT STUDY:  
DATA COLLECTION AND SAMPLING**

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## ACKNOWLEDGMENTS

The data collection and sampling for the School Nutrition Dietary Assessment study drew upon the skills of many individuals in three organizations. Assisting Mathematica Policy Research, Inc. (MPR), the prime contractor for the study, have been staff from the National Opinion Research Center (NORC) and the Nutrition Coordinating Center (NCC) at the University of Minnesota.

NORC selected the sample; secured the cooperation of state, district, and school officials at the schools selected for the sample; and provided first-line management for the field data collection effort. NORC's project director was Charlene Weiss; Gayle Hutchinson managed the field data collection effort on a day-to-day basis. Gayle's staff sent materials on the study to the school coordinator at each sampled school, received and processed rosters of students necessary for sampling, and sent materials on sampling to school district and project staff. NORC field managers Suzanne Bard, Anne Marie Barnhill, and Gloriette Johnston secured the cooperation of district officials and then provided first-line supervision to the three-person teams who visited districts to conduct in-person data collection. Martin Frankel, with Wendy Foran and, in the later stages of the project, Bruce Spencer, directed and conducted the sampling. They were assisted by Linda Christian, Roger Tourangeau and Robert Johnson, in NORC's Washington office, assisted in computing standard errors and design effects for the outcome measures used in the analysis.

NCC conducted training for the dietary data collection, performed nutrient coding, and generated estimates of the nutrients contained in each food item. Mary Stevens directed NCC's work on the project. Barbara Pickering and Roberta Zeug conducted training and certification, provided ongoing feedback to the interviewers on the quality of their work, and coordinated communications with MPR staff. The NCC staff who performed nutrient coding on the school menu data deserve special thanks for the care and thoroughness with which they performed a difficult task.

MPR staff also supported the collection and processing of the data. Todd Ensor managed data collection operations at MPR. In this capacity, he played a key role, along with Gayle Hutchinson and others at NORC, and with Barbara Pickering at NCC, in designing the data collection instruments. He supervised the MPR staff who were responsible for the travel arrangements of data collection team members, ensuring that materials moved to and from the field in a timely way. He also managed the data collection with the schools participating only in the school menu portion of the study, as well as the telephone follow-up survey with parents of students in grades 3 through 12. Mike Watts developed the CATI programs that were used to conduct the telephone follow-up survey with parents of students in grades 3 through 12. He also developed and maintained the tracking system that was used to track document completion.

John Burghardt  
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## I. INTRODUCTION

As a context for the detailed findings that are presented in companion reports on the School Nutrition Dietary Assessment study, it is important to describe the data collection and sampling procedures used to obtain data on the schools and children included in the study. Attention must also be given to the derivation of the analysis weights that make the analysis samples fully representative of the universes of U.S. schools and school children. This report provides information in these areas. Chapter II describes the data collection procedures used, while Chapter III discusses the sampling and weighting procedures.

Study findings are presented in three companion reports:

Burghardt, John, and Barbara Devaney. *The School Nutrition Dietary Assessment Study: Summary of Findings*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation, October 1993.

Burghardt, John, Anne Gordon, Nancy Chapman, Philip Gleason, and Thomas Fraker. *The School Nutrition Dietary Assessment Study: School Food Service, Meals Offered and Dietary Intakes*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation, October 1993.

Devaney, Barbara, Anne Gordon, and John Burghardt. *The School Nutrition Dietary Assessment Study: Dietary Intakes of Program Participants and Nonparticipants*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation, October 1993.





## **II. DESCRIPTION OF SAMPLE SELECTION AND DATA COLLECTION OPERATIONS**

This chapter describes the collection of data for the School Nutrition Dietary Assessment study. The first section provides a brief overview of data collection operations. Details are then presented in subsequent sections.

### **A. OVERVIEW OF DATA COLLECTION OPERATIONS**

The School Nutrition Dietary Assessment study uses data on a nationally representative sample of *schools* and a nationally representative sample of *students*. The analysis of U.S. Department of Agriculture (USDA) meals as offered is based on data about schools. The analyses of participation in the National School Lunch Program (NSLP) and School Breakfast Program (SBP), and of nutrient intakes are based on data about students. The sample was selected as a three-stage sample: (1) districts; (2) schools within districts; and (3) students within schools. Because of differing precision requirements and costs associated with different parts of the data collection, one group of districts was randomly selected for both school-level and student-level data collection, and a second group of districts was randomly selected for school-level data collection only.

#### **1. In-Person Districts**

In each district selected for in-person data collection, three schools were selected. Within each of the three schools, data collection was to be completed for 10 students. After securing the cooperation of district officials, school officials, and parents, three-person data collection teams visited each school for one day in order to interview students and complete other on-site data collection activities. Visits to the schools within a given district were coordinated to occur on Tuesday through Thursday of the same week. The data collection team was responsible for collecting both school-level and student-level information during the visit.

### **a. School-Level Data Collection**

Table II.1 summarizes school-level data collection, which included the following:

- Section A of the School Characteristics Questionnaire was completed with the principal, Sections B and C were completed with the cafeteria manager, and Section D was completed with the director of the School Food Authority (SFA).
- Detailed information was obtained on all foods served as part of a USDA meal (or all foods served if the school did not participate in the USDA meal programs) during each day of the week in which the in-person data collection visit took place. These materials were mailed to the person designated to provide the information approximately 10 days before the study team's visit. The leader of the data collection team reviewed the information assembled during the on-site visit.
- An A la Carte Checklist was completed on which a study team member recorded food items that the cafeteria offered a la carte at lunch on the day of the in-person visit (that is, priced individually and sold separately from the USDA lunch).
- A Vending Checklist was completed on which a study team member recorded food and beverage items in each vending machine that was available to students during the school day.

### **b. Student-Level Data Collection**

Table II.2 summarizes student-level data collection at each school, which included the following:

- Final selection of the student sample
- Completion of dietary intake interviews with 10 students. Students in grades 3 through 12 were asked to report on all foods and beverages consumed during the 24-hour period before the interview. Students in grades 1 and 2 were asked about foods consumed since arriving at school on the day of the interview.
- For students in grades 1 and 2, completion of dietary intake interviews with the student and his or her parent on the day of the student's in-school interview. Students and parents were asked to report on foods consumed during the balance of the 24-hour period not covered in the student interview.
- Completion of the Student Characteristics Questionnaire. Students in grades 3 through 12 completed the Student Characteristics Questionnaire as part of their in-school interview. Parents of students in grades 1 and 2 completed the Student Characteristics Questionnaire during the parent interview.
- Mailing of the Household Questionnaire to the parents of students in grades 3 through 12 who completed Dietary Intake Interviews. (Parents who did not return the

TABLE II.1  
SOURCES OF DATA ON SCHOOLS

Instrument	Type of School	Respondent/Mode of Data Collection	Information Collected
School Characteristics Questionnaire Section A School Characteristics	All in-person and meals-offered-only schools	Principal, by telephone	Characteristics of the school (enrollment, ethnicity of students, grades in school, school participation in NSLP and SBP)
School Characteristics Questionnaire Section B Characteristics of Lunch Program	All in-person and meals-offered-only schools	Cafeteria manager, by telephone or in-person	Characteristics of the school lunch program
School Characteristics Questionnaire Section C Characteristics of Breakfast Program	All in-person and meals-offered-only schools	Cafeteria manager, by telephone or in-person	Characteristics of the school breakfast program
School Characteristics Questionnaire Section D School Food Authority Questions	All in-person and meals-offered-only schools	Director of School Food Authority, by telephone	Organizational responsibility for meal planning, purchasing and preparation; district policies relating to school nutrition programs
Request for Information on Foods Offered in USDA Meals	All in-person and meals-offered-only schools with USDA meals program	Cafeteria manager, with assistance from study staff	Detailed lists of all foods served each day, by meal and day of the week; complete descriptions of foods, recipes, labels for pre-prepared items; estimates of quantity served
Request for Information on Foods Offered in School Meals - Schools with No USDA Meal Program	In-person and meals-offered-only schools with non-USDA meals program	Cafeteria manager, with assistance from study staff	Detailed lists of all foods served each day, by meal and day of the week; complete descriptions of foods, recipes, labels for pre-prepared items; estimates of quantity served
A la Carte Checklist	In-person schools	Data collection team member, by observation	Types of foods sold to students a la carte in the school cafeteria
Vending Machine Checklist	In-person schools	Data collection team member, by observation	Types of foods available to students in vending machines

TABLE II.2

## SOURCES OF DATA ON MEMBERS OF THE STUDENT SAMPLE

Instrument	Respondent/Mode of Data Collection	Type of Information
<b>Students Grades 1 - 2</b>		
Dietary Intake Interview - Student Interview	Student, in-person, at school	Dietary intake information on foods eaten in school on the day of the interview
Dietary Intake Interview - Parent Interview	Parent and student, in-person, usually at home on the same day as the student interview	Dietary intake information on foods eaten during the 24-hour period before the interview, except foods covered in the student interview
Student and Family Characteristics Questionnaire	Parents, in-person, after the parent part of the dietary intake interview	Student's and family characteristics; family income; parents' perceptions about the school lunch program
<b>Students Grades 3 - 12</b>		
Dietary Intake Interview - Student Interview	Student, in-person, at school	Dietary intake information on foods eaten during the 24-hour period before the interview
Student and Family Characteristics Questionnaire	Student, in-person, at school, immediately following the dietary intake interview	Student and family characteristics
Mail Household Questionnaire	Mailed to parents of students who completed dietary intake interview; telephone follow-up of parents who did not respond by mail	Family income and parents' perceptions about the school lunch program
<b>Students Grades 1 - 12</b>		
Roster Form	School staff	Whether student is certified for a free or reduced-price lunch or pays full price

Household Questionnaire within two weeks were contacted by telephone and asked to provide the information through a telephone interview.)

- Collection of information from school staff on whether each member of the student sample was certified to receive a free meal, a reduced-price meal, or paid full price.

## **2. Meals-Offered-Only Districts**

In each meals-offered-only district, one school per district was selected to participate in just the part of the study pertaining to USDA meals as offered. The School Characteristics Questionnaire was also completed in those districts, but no student-level data collection was conducted. Mathematica Policy Research, Inc. (MPR) administered the School Characteristics Questionnaire by telephone to the principal, the director of the SFA, and the cafeteria manager. The request for information about all foods served as part of a USDA meal was mailed to a person designated by the director of the SFA to complete the information. MPR also made telephone calls to answer questions about the request.

## **3. Organization of the Data Collection Effort**

The data collection effort drew upon the talents of many individuals from three organizations. MPR, as prime contractor for the study, retained responsibility for oversight of the sampling and data collection. The National Opinion Research Center (NORC) was directly responsible for selecting the samples of districts, schools, and students and for management oversight of the field effort. The Nutrition Coordinating Center (NCC) of the University of Minnesota School of Public Health coded the food data and calculated the nutrient content both of the meals-offered data and the 24-hour recall data.

Three-person data collection teams visited each district in which in-person data collection was completed. The team leader of the data collection team, a NORC field manager, was involved in recruiting selected districts, securing the cooperation of schools, scheduling visits, and serving as supervisor of the other two team members. The other two team members on each team were MPR

employees. After the field visit, the team leader mailed completed data collection materials to MPR's central office. After briefly reviewing each dietary intake interview and after reviewing and organizing the data on foods for nutrient coding, both sets of materials were mailed to the NCC, where food descriptions and estimates of amounts were converted to estimates of nutrients consumed or offered. All data that did not require nutrient coding were data entered at MPR's central office. In addition, MPR central office staff conducted all data collection operations in those districts participating in just the meals-offered part of the study, after NORC staff had secured the cooperation of the relevant district officials. MPR central office staff also conducted the telephone follow-up interviews with the parents of students in grades 3 through 12 who did not return the Mail Household Questionnaire.

The remainder of this chapter describes key aspects of the data collection operations in more detail.

- Section B describes sample selection; recruitment of districts, schools, and students; and overall field procedures.
- Section C describes training for in-person data collection.
- Section D describes the in-person interviewing protocols that were used.
- Section E describes the mail/telephone survey of parents of students in grades 3 through 12.
- Section F describes collection of data from schools participating in only the school-level data collection, as well as the editing and checking of materials received from the field.
- Section G describes nutrient coding.
- Section H presents the results of various components of the data collection.

## **B. SELECTION AND RECRUITMENT OF DISTRICTS, SCHOOLS, AND STUDENTS AND OVERALL FIELD PROCEDURES**

A nationally representative sample of 626 schools, in 350 public school districts, which were located in 45 states, was selected for the School Nutrition Dietary Assessment study.<sup>1</sup> Before data collection could begin, permission was obtained from state, district, and school officials, and the parents of participating students. The process of securing permission began with officials in the state departments of education. Next, permission was obtained from the superintendents of schools and the directors of the SFAs in the sampled school districts. Then, the cooperation of school principals and cafeteria managers was obtained. Lastly, before the school district was visited, the permission of the parents of sampled students was secured. This section of the report describes this cooperation effort. (See Section H, "Results of Sample Recruitment and Data Collection," for tables describing the cooperation results.)

### **1. Securing State Cooperation**

Introductory letters were mailed to the chief state school officers in the 45 states where sampled schools were located. The letter explained the study and listed the school districts selected in each state. The letter also requested the designation of a state official to serve as liaison for the study. At the same time, Food and Nutrition Service (FNS) staff contacted the individuals in the FNS regional offices responsible for the states in which sampled school districts were located.

The chief state school officers were then contacted by telephone to respond to questions, comments, or reservations they may have had about the study and to secure their permission to contact the superintendent in the selected districts. All 45 states agreed to participate, but some states agreed with limitations. Particular concern was expressed about releasing the meal-price eligibility status of students who were interviewed. In one state, no income data were collected from parents of sampled students.

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<sup>1</sup>Sampling procedures are described in Chapter III.

## **2. Securing District Cooperation**

The School Nutrition Dietary Assessment study was conducted in a nationally representative sample of 332 public school districts. This sample contained two data collection components: (1) the in-person component; and (2) the meals-offered-only component. School districts in the in-person component participated in both the meals-offered data collection and in the 24-hour dietary recall data collection with students. School districts in the meals-offered-only component provided meals-offered information only. The in-person component contained 122 school districts, and the meals-offered-only component contained 220 districts. Seven school districts, in large metropolitan areas were self-representing, and operationally referred to as "multiple-hit" districts. These districts contained both in-person and meals-offered-only data collection components. One multiple-hit district had two meals-offered-only schools. In some school districts, private or Catholic schools were also selected. (See Table II.3 in Section H for the results of school district cooperation.)

Materials explaining the purpose and data collection requirements of the study were mailed to the superintendents of the sampled public school districts before they were contacted by telephone. Similar material was also sent to officials of Catholic archdioceses in districts from which Catholic schools were selected. No district-level cooperation contacts were made for the private schools in the sample, because these schools do not have district-level officials.

Telephone calls were then placed to the district superintendents or officials of archdioceses to obtain their permission to conduct the study and schedule a week for school visits or meals-offered-only data collection. Once the superintendent's approval was secured, the director of the SFA was contacted to obtain permission to conduct the meals-offered data collection. Superintendents in all districts that initially declined to participate in the study were contacted directly by the MPR project director. In most cases, this contact began with a second letter, which was followed by a telephone call.



The cooperation rate of all schools districts was 89.5 percent. School districts in the in-person data collection component cooperated at an 84.0 percent rate, while school districts in the meals-offered-only component cooperated at a 93.0 percent rate. All eight of the multiple-hit districts agreed to participate in the study. (See Table II.3 in Section H for school district cooperation results according to type of school--public, Catholic, or private--and data collection component.) The request to obtain meal-price eligibility information was also an issue for school district officials. Several districts agreed to participate in the study, but refused to release student meal-price eligibility information.

### **3. Securing School Cooperation**

Samples of schools were selected within the sample of school districts. The school sample contained 626 schools; with 568 public, 35 Catholic, and 23 private schools. The sample was divided into two data collection components: (1) the in-person component; and (2) the meals-offered-only component. In school districts in the in-person data collection component, three schools were selected. In the meals-offered-only districts, one school was chosen. In the multiple-hit districts, the number of schools chosen ranged from 4 to 14 schools. Schools in the in-person component were visited by data collection teams who collected meals-offered information and conducted 24-hour dietary recalls with students. Schools in the meals-offered-only component provided meals-offered information through the mail. There were 388 schools in the in-person component and 238 school in the meals-offered-only component. Included in those totals are 30 in-person schools and 18 meals-offered-only schools from multiple-hit districts.

The field period for both in-person and meals-offered-only data collection began in January, 1992, and continued through May, 1992. During that period, weeks were targeted for data collection that spread the visits to facilitate scheduling and data processing.

After school district cooperation was obtained, a letter explaining the study and a brochure were sent to the school principals. The letter also requested that a person be appointed as study

coordinator at the school to help secure parental permission, to schedule student interviews, and to help with other logistical problems associated with completing the survey. School principals were then contacted by telephone and, if they agreed to participate, were given a short interview concerning basic information about their school and about their school meal programs. In addition to its research purpose, this information was useful for scheduling visits and interviewing times for students.

The cooperation rate for all schools, including schools in school districts that refused, was 88.0 percent. The cooperation rate for all in-person schools (including those from the multiple-hit districts) was 85.0 percent. The cooperation rate for all meals-offered-only schools was 93.1 percent. Tables II.4, II.4.A, and II.4.B in Section H provide the results of cooperation at the school level according to type of school (public, Catholic, or private) and data collection components.

#### **4. Processing Rosters and Selecting the Student Sample**

In order to select random samples of students within each school, it was necessary to secure a current, complete list of students (a roster). A letter outlining the procedures to follow in preparing and mailing the student roster was sent to the principal or school coordinator after permission to conduct the survey was secured. Schools that did not have machine-readable or written rosters were sent a form to use to compile a roster. The procedures stipulated that the roster should be current, that students who were ineligible for the study be deleted, and that the roster provide the full name and grade level of each eligible student. Students who transferred out of the school, were enrolled in kindergarten or preschool programs, drop outs, special education students, or part-time students, were ineligible for the survey.

The school rosters were mailed to the central office for sample selection and data processing. After reviewing the roster for legibility and completeness, project staff checked for complete student name and grade level information and for ineligible students. Students found to be enrolled in kindergarten or preschool or falling into the other ineligible categories were deleted from the roster.

The person who prepared the roster, the school coordinator, or the school principal was recontacted to clarify ambiguous, unclear, or unusual information.

Special review and sampling procedures were implemented when schools were unable to delete ineligible students from the rosters because their computer systems would not allow special student lists to be generated (to exclude ineligible students) or the student enrollment was too large for someone at the school to review the status of each student. For these schools, 30 students were usually selected, instead of the usual 20, to allow for ineligible students.

Samples of students were then selected from rosters by assigning a sequential number to each eligible student. The total number of eligible students was then entered into a sampling program that randomly selected the samples. In most schools, 20 students were selected, but in some schools, like the ones mentioned above, more than 20 were selected. In one district, 60 students were selected per school because district officials required that active consent be obtained from parents for their children to participate. Each selected student was then assigned a sequential number that was data entered along with the student's name and grade level.

Data entry clerks entered the sequential number, name, and grade of sampled students. At this point, an eight-digit identification number was assigned to sampled students that uniquely identified them, the school district, and the school they attended. This identification number was used on all data collection instruments to identify students while maintaining the confidentiality of the information the students and their parents provided.

Lists of sampled students and student identification labels were generated as the final step in roster processing. These materials were used by the study's central office staff to prepare parent mailings and other data collection materials. These materials are discussed in the next section, "In-School Data Collection."

## **5. In-School Data Collection**

There were two types of data collection in schools. Students were interviewed about the foods and beverages they had consumed during the preceding 24-hours, and school food program staff provided information about the foods offered to students during the week of the student data collection. The in-person data collection was conducted by 15 traveling teams, each composed of a team leader and 2 field interviewers. The teams were supervised by three field managers, who were responsible for large geographic areas of the country. The field managers reported to a central office data collection manager, who had front-line responsibility for all data collection activities.

The basic scheduling plan required the team leader to spend the entire week in the school district, and the interviewers to be there Tuesday through Thursday. In most districts, three schools were visited. The visits were scheduled for Tuesday, Wednesday, and Thursday, which allowed the team leader to use Monday to visit all of the schools to prepare for each school's survey day, and to use Friday to finish the meals-offered data collection and any remaining student-level data collection. During the Monday visits, meetings were held with the principals, school coordinators, and cafeteria managers of the SFA in each school district and with the director of the SFA for the district. One important task during the Monday visits was to review the student sample list with the school coordinator and make sure that the letters and consent forms had been sent to the parents of selected students. During the meetings with cafeteria managers, the meals-offered data collection materials were reviewed, and the process of collecting meals-offered information discussed.

## **6. Interviews with Students**

Before the data collection visit, parents of sampled students were informed about the study and given the opportunity to decline to have their child participate in the study. Materials for informing parents and securing their cooperation were mailed to the school principal or school coordinator for the study. Those materials included an introductory letter, a reference guide, a list of the students in the sample, parent consent materials, and reminder cards. The school coordinator mailed the

consent material to the parents one week before the school was visited. In most districts, parents were instructed to return the consent form to the school only if consent was withheld. If the consent form was not returned to the school, implied parental consent was assumed. One district required that parents return a form affirming their willingness for their child to participate. Reminder cards were given to selected students the day before the school visit.

The team leader received copies of the student sample lists and the school sampling roster. The student sample list listed the sample number, name, and grade level of each selected student. The sampling roster listed the selected students in sample number order. On the survey visit day, the team leader used the sampling roster to select students for interviewing and to record the outcome of each student who was not interviewed.

Students were listed on the sampling roster according to randomly assigned sampling numbers. The first 10 eligible students out of those listed on the roster were interviewed. They were identified by first crossing out absent or other ineligible students and then selecting the first 10 students remaining on the list. Final disposition codes were assigned to all students on the list, with the ones below the last eligible student interviewed given a disposition that they were eligible for interview but not selected.

On the survey day, the team leader met with the school coordinator to finalize and select the student sample. The interviewers, after being shown to the areas designated for their use, then conducted the 24-hour dietary intake interviews.

## **7. Collecting Meals-Offered Information**

Team leaders met with the persons responsible for the meals-offered data collection during their Monday visit to district schools. During those meetings, the materials used to collect the meals-offered information were reviewed with the cafeteria managers and director of the SFA, to answer questions and coordinate the collection of this information. The team leader returned to the schools

on Friday to pick up the meals-offered information and then checked it for completeness before leaving the school district.

### **C. TRAINING AND CERTIFICATION FOR IN-PERSON DATA COLLECTION**

The central feature of interviewer training was training in the collection of dietary intake interviews. NCC staff conducted the training. The broad objective of interviewer training was to ensure a standardized protocol for dietary data collection. This objective was achieved by acquainting interviewers with the nutrient coding process so that they would collect adequate data for accurate nutrient coding, and by teaching the use of aids designed to help respondents provide complete and accurate food descriptions and accurate estimates of food portion amounts. As a matter of NCC policy to ensure the quality of nutrient data that NCC processes, interviewers who submit dietary recalls to NCC for nutrient coding are required to demonstrate proficiency in collecting dietary information and to become certified. That process was followed in the School Nutrition Dietary Assessment study. Training and certification consisted of the following four steps: (1) completion of pretraining exercises; (2) successful participation in a three-day training session; (3) completion and review by NCC staff of a series of practice interviews; (4) and ongoing feedback on problem areas, if any.

***Pretraining Exercises.*** Trainees received instructional materials prior to the training session. These included a worksheet with interviewing questions and guidelines for evaluating dietary interviewing skills. These materials familiarized trainees with NCC's data entry and analysis system, so that time at the training session was used efficiently.

***Training.*** Three days of the four-day training session were used to familiarize interviewers with procedures for conducting 24-hour dietary intake interviews; the fourth day was devoted to procedures for collecting the meals offered and other school-level information. Following introductions and the study overview, most of the first day of training was spent covering general issues of dietary intake data collection, including the specificity of the nutrition database, food-specific

units of measure, use of food models to measure amounts eaten or drunk, and review of the dietary probing forms. Review of pretraining exercises and practice interviews were conducted at the end of the first training session.

The second day of training began with exercises in correctly documenting foods and beverages. Also covered was the use of the study-specific data collection forms, dietary recall periods, and target foods. The third day was devoted almost entirely to practice dietary interviews and feedback on the practice interviews by NCC trainers. On the fourth day, team leaders and one other member of each team received an overview of the meals-offered information being collected from cafeterias and an overview description of data collection forms and completed practice exercises.

***Practice Interviews.*** After training, interviewers completed six practice dietary intake interviews with children. One set of three interviews was completed and sent to NCC staff, who reviewed the interviews and provided feedback to the interviewers. After receiving feedback on the first set of three interviews, the interviewer completed a second set of three interviews, which was reviewed in the same manner. Upon successful completion of the second review, the interviewer was certified.

***Ongoing Review and Feedback.*** Continuing education was used to maintain high-quality dietary data collection and documentation. This process used a "Dietary Inquiry" process to provide feedback to interviewers by addressing individual problems with documentation sent to interviewers.

#### **D. IN-PERSON DATA COLLECTION**

The interviewing process used the following steps:

- Introducing the interview to respondents using a prepared protocol read verbatim
- Creating a list of all foods and beverages consumed over a 24-hour period, and acquiring information about when and where the food was eaten, and where it was obtained (home, school, restaurant, or some other place)
- Obtaining a complete description of each food and beverage listed, including the kind or type of food, preparation factors, and additions to the food during preparation or at service

- Obtaining the respondent's estimate of the amount of each item that was eaten or drunk
- For target foods (defined as foods and beverages eaten or drunk in school), obtaining an estimate of the proportion of the serving that the student consumed, for plate waste analysis<sup>2</sup>
- A thorough review of the information collected with the respondent and correction of errors before the end of the interviewing session
- Collecting and recording information about the typicality and reliability of the information provided by respondents
- Completing the Student and Family Characteristics Questionnaire, which asked about participation in the school food program and collected student and family demographic characteristics
- Sending the mail Household Questionnaire to parents of students in the third through twelfth grades. This instrument collected parents' perceptions of the school food programs, participation in the USDA free or reduced-price meal programs, student ethnicity, and household income.<sup>3</sup>
- Completing a final field edit of the information collected before leaving the school district

Four different versions of the dietary recall interview were administered, depending on the students' grade level: (1) students in grades 3 through 8; (2) students in grades 9 through 12; (3) students in grades 1 and 2; (4) combined student and parent interviews of first and second grade students.<sup>4</sup>

The major difference in the way dietary intake data collection was conducted was between students in grades 3 through 12 and students in grades 1 and 2. In recognition of the difficulties

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<sup>2</sup>Originally, target foods were defined as foods or beverages *eaten or drunk at school on the day of the interview*. However, well over half of the interviews were conducted in the morning before lunch, and as a consequence included relatively few items eaten for lunch. Consequently, the definition was changed so that target foods included *all foods eaten or drunk at school during the entire 24-hour recall period*.

<sup>3</sup>Parents of first and second graders provided this information at the end of their part of the in-person interview, in a version of the Student Family Characteristics Questionnaire designed specifically for parents of first and second graders.

<sup>4</sup>Introductions and interviewing instructions for these four types of dietary recall interviews were printed in the front section of the Dietary Intake Probing Form Booklet.



younger children may have in describing and quantifying the foods they have consumed, parents were asked to participate in the interview with first and second graders, while students in all other grades self-reported their 24-hour food consumption.

Information was acquired on all foods and beverages consumed during a 24-hour recall period. The periods covered in the interviews with students in grades 3 through 12 is straightforward. They were asked about the three following periods--always in this order:

1. From the time the student woke up on the morning of the interview until the time of the interview
2. From the time of the interview, projected to the preceding day, until the student went to bed
3. Between the time the student went to bed the day before the interview and woke up on the day of the interview (to collect "midnight snacks")

The process was slightly more complicated for students in grades 1 and 2. The complexity resulted from the fact that the student was asked to report about the period between arriving at school and the time of the student interview, and the parent and child were asked to report together on the balance of the 24-hour period, which started 24 hours before the interview with the student and parent. The rules were as follows:

A. Self-Reported, In-School Interviews with First and Second Graders:

1. From the time between arriving at school that day until the time of the interview

B. First and Second Graders Interviewed with their Parents:

1. From the time the student got up in the morning until the time of arrival at school
2. From the time of the student's interview at school until the time of the interview with the parent
3. From the time of the beginning of the parent and student interview, projected to the preceding day, until the student went to bed
4. Between the time the student went to bed on the day before the interview and woke up on the day of the interview (for "midnight snacks")

Interviewers were provided with two types of aids to assist them in securing complete descriptions of foods and accurate estimates of amounts. First, Dietary Intake Probing Forms provided a full guide to all information that was required to be asked in order to provide a complete food description. A Documentation Checklist provided a brief summary of the information. Second, each interviewer carried a set of study-approved food models. Each set consisted of two-dimensional printed food models, measuring cups, glasses, geometric shapes, spoons, a ruler, and a bag of beans (for estimating handfuls). Interviewers made the food models available to students who were completing interviews and encouraged each respondent to use the model for a particular food that the respondent found easiest to use.

**E. ADMINISTRATION OF MAIL/PHONE SURVEY OF PARENTS OF STUDENTS IN GRADES 3 THROUGH 12**

Students were not asked to describe their ethnicity or household income. These questions were deemed too difficult or sensitive for most students to answer. To collect this information, parents of students in third grade and above were mailed a four-page questionnaire.<sup>5</sup> This questionnaire measured parents' general attitudes about the school food program and participation in the free or reduced-price meal program, as well as obtaining information on the student's ethnicity and household income.

Parents were given two weeks to respond by mail before being assigned for telephone interviewing. The telephone follow-up was conducted with a Computer-Assisted Telephone Interviewing (CATI) system. This system interacted with the survey tracking system to identify and schedule cases for interviewing. The combined mail and telephone survey had an 87.7 completion rate (See Table II.8 in Section H). Forty six percent of the completed interviews were received through the mail.

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<sup>5</sup>As noted earlier, for first and second graders, this information was obtained during the joint student/parent interview conducted with this younger age group.

#### **F. COLLECTION OF DATA FROM SCHOOLS PARTICIPATING ONLY IN THE SCHOOL-LEVEL PART OF THE STUDY, AND EDITING, CODING, AND SHIPMENT TO NCC**

*School Cooperation.* The cooperation of schools in the mail data collection of meals-offered information began with letters to school principals and district directors of the SFA. Telephone calls were made to letter recipients to secure cooperation and conduct short interviews. After cooperation of both the principal and the director of the SFA was secured, letters were mailed to the person designated to respond by the SFA. A target week was established, and mailings of meals offered materials proceeded.

*Mailing Survey Materials.* Survey materials were mailed to arrive during the middle of the week before the targeted data collection week. The materials included a Cafeteria Manager's Instruction Booklet, and adequate numbers of Menu Summary Sheets, Recipe Forms, Pre-prepared Food Item Forms, and Milk Checklists. Also enclosed were pre-addressed return mail envelopes and daily, meal-specific envelopes for holding completed forms for each meal on each day of the target week.

*Follow-Up Telephone Calls.* Telephone calls were made to the person responsible for assembling the meals-offered information. The purpose of these calls was to help respondents through the data collection period. The materials as stacked up and mailed looked formidable. To overcome this problem and encourage participation, calls were placed on the Thursday before the target week. The purpose of this call was to make sure the survey materials had been received and to explain in simple terms what respondents would be asked to do. Another call was scheduled for Tuesday of the target week to ask respondents how they made out on the first day of data collection and to answer questions.

#### **G. NUTRIENT CODING**

The food data for the study were coded by the NCC. The coding and data entry process used NCC's highly standardized system for collecting and analyzing dietary data.

Data processing involved assigning numeric food codes and entering food information into the computer from the data collection form, followed by automated nutrient calculation. The software used was the Minnesota Nutrition Data System (NDS), maintained by NCC. For the School Nutrition Dietary Assessment study, NCC's standard system was adapted so that the information that was used in the analysis of plate waste could be entered. The system was also specially programmed so that codes describing the meal-pattern components to which foods offered by school cafeterias contributed could be entered.

The importance of accuracy and consistency in coding and data entry were stressed both in training and in the daily work of the data processing staff. Two statistical quality control systems were in operation to check on both the current and long-term quality and comparability of data entry. (Approximately 25 percent to 30 percent of the total NCC data entry effort is devoted to quality control measures.)

- **Paired Entry.** Ten percent of all daily records were entered in duplicate. The two records were compared and any differences resolved by a staff nutritionist. An allowable number of errors in each batch was determined using statistical sampling theory. If fewer errors than the allowable number were found, the data entry was considered acceptable. If more errors were found, the data entry was considered unacceptable, and the entire batch was reviewed and corrected by a third data entry staff person.
- **Computerized Edit Checks.** Every food in the NCC database was associated with a maximum serving size, which served as an edit check for unreasonable amounts entered. During nutrient calculation, daily nutrient totals were compared with maximum threshold values to identify possible documentation or data entry errors.

Information for coding each 24-hour dietary recall food item was obtained only from the student's dietary intake form, even if information about a given item eaten in school might have been available from school menu information provided by cafeteria personnel. Cross-checking of information provided by students with the probably more accurate information provided by food service personnel might have enhanced the accuracy of food intakes of students who ate school-furnished meals. However, such cross-checking entailed unacceptable risks that the dietary intakes

of students who ate school lunches and breakfasts would not be fully comparable to the dietary intakes of students who ate USDA lunches and breakfasts from other sources for which information (such as that provided by food service personnel) was not available. Since a primary analytic objective was to compare the intakes of students who ate USDA meals with the intakes of students who ate meals from other sources, cross-checking of student-furnished information and school-furnished information on food items at lunch and breakfast was not permitted.

## **II. RESULTS OF SAMPLE RECRUITMENT AND DATA COLLECTION**

This section presents the results of the sample recruitment and data collection effort in a series of tables. Each table shows three types of districts, which are distinguished by the type of data collection for which the district was selected. Within each type of district, table entries show the number of sample points for which data collection was completed, several categories of noncompleters, and the total sample. Below, types of districts are explained, and each table is briefly discussed.

### **I. Types of Districts**

Districts were randomly selected for *in-person data collection* or *meals-offered-only data collection*. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interviews. In meals-offered-only districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; these are multiple-hit districts. Each "hit" was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

## 2. Description of Tables

*Table II.3* shows the results of district cooperation efforts. As discussed in Chapter III, the sampling entailed selecting public school districts at the first stage and then adding all private schools within the district at the second stage of selecting schools within districts. In public schools, district permission to conduct the study was sought from the public school district's chief school administrator. If a Catholic parochial school was selected in the district, permission to conduct the study was sought from archdiocesan officials. If a private school was selected, in most cases there was no higher administrative authority from whom permission was necessary.

*Table II.4* shows results of school cooperation, by type of district, and by whether the school was public, Catholic, or private. Table II.4.A shows the results separately for all in-person schools (including those in in-person districts and in multiple-hit districts). Table II.4.B shows the results separately for all meals-offered-only schools (including those in multiple-hit districts). Overall, 88 percent of schools participated in the study. The rate of school participation was slightly lower among in-person schools (85 percent), and slightly higher in meals-offered-only schools (93 percent). Private schools were less willing to participate than public and parochial schools--only 72 percent did so, compared with 89 percent of public and parochial schools. Private schools were also less likely to participate in USDA programs or to have meals programs.

*Table II.5* shows rates of completion of the School Characteristics Questionnaire. Tables II.5.A and II.5.B show the information for all in-person schools and all meals-offered-only schools, respectively.

*Table II.6* shows rates of completion of the data collection on meals offered by schools. Tables II.6.A and II.6.B show the information for all in-person schools and all meals-offered-only schools, respectively.

*Table II.7* shows the disposition of the student sample. Two points about the table should be noted. First, an interview was designated as "complete" if a complete 24-hour dietary recall was

TABLE II.3  
DISTRICT-LEVEL COOPERATION, BY TYPE OF DISTRICT

Type of School District/Cooperation Status	Number of Public School Districts Selected at Stage 1	Number of School Superintendents Whose Cooperation Was Required			Total
		Public School Districts <sup>a</sup>	Catholic Archdiocese <sup>b</sup>	Private Schools <sup>c</sup>	
<b>Districts with Schools Selected for In-Person Data Collection</b>					
Cooperated		102	18	6	126
Refused		19	2	3	24
Ineligible <sup>d</sup>		1	0	0	1
Total	122	122	20	9	151
Percent Cooperating		84.3 %	90.0 %	66.6 %	84.0 %
<b>Districts with Schools Selected for Meals-Offered-Only Data Collection</b>					
Cooperated		188	9	2	199
Refused		13	0	2	15
Ineligible <sup>d</sup>		0	0	2	2
No Meals <sup>e</sup>		1	0	3	4
Total	220	202	9	9	220
Percent Cooperating		93.5 %	100.0 %	50.0 %	93.0 %
<b>Multiple-Hit Districts</b>					
Cooperated		8	2	5	15
Refused		0	1	0	1
Total	8	8	3	5	16
Percent Cooperating		100.0 %	66.6 %	100.0 %	93.7 %
<b>All School Districts</b>					
Cooperated		298	29	13	340
Refused		32	3	5	40
Ineligible <sup>d</sup>		1	0	2	3
No Meals <sup>e</sup>		1	0	3	4
Total	350	332	32	23	387
Percent Cooperating		90.3%	90.6%	72.2%	89.5%

TABLE II.3 (continued)

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NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>In each public school district, permission to conduct the study was sought from the chief school administrator.

<sup>b</sup>In districts in which Catholic schools were selected, permission to conduct the study was sought from archdiocesan officials responsible for administration of the selected school.

<sup>c</sup>In no case were private schools part of a larger organization. "District cooperation" was the same as school cooperation.

<sup>d</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>e</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.



TABLE II.4

SCHOOL COOPERATION, BY TYPE OF DISTRICT AND  
TYPE OF SCHOOL

Type of District/ Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
<b>Schools in Districts Selected for In-Person Data Collection</b>				
Cooperated	274	19	6	299
District Refused	45	1	0	46
School Refused	7	1	3	11
Ineligible <sup>a</sup>	2	0	0	2
Total	328	21	9	358
Response Rate	84.0 %	90.5 %	66.6 %	84.0 %
<b>Schools in Districts Selected for Meals-Offered-Only Data Collection</b>				
Cooperated	188	9	2	199
District Refused	7	0	0	7
School Refused	6	0	2	8
Ineligible <sup>a</sup>	0	0	2	2
No Meals <sup>b</sup>	1	0	3	4
Total	202	9	9	220
Response Rate	93.5 %	100.0 %	50.0 %	93.0 %
<b>Schools in Multiple-Hit Districts</b>				
Cooperated	38	3	5	46
School Refused	0	2	0	2
Total	38	5	5	48
Response Rate	100.0 %	60.0 %	100.0 %	95.8 %
<b>All School Districts</b>				
Cooperated	500	31	13	544
District Refused	52	1	0	53
School Refused	13	3	5	21
Ineligible <sup>a</sup>	2	0	2	4
No Meals <sup>b</sup>	1	0	3	4
Total	568	35	23	626
Response Rate	88.5%	88.6%	72.2%	88.0%

TABLE II.4 (continued)

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NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>b</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.

TABLE II.4.A  
COOPERATION RESULTS, BY TYPE OF SCHOOL--  
ALL IN-PERSON SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Cooperated	299	21	9	329
District Refused	45	1	0	46
School Refused	7	2	3	12
Ineligible <sup>a</sup>	2	0	0	2
Total	353	24	12	389
Response Rate	85.2 %	87.5 %	75.0 %	85.0 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

TABLE II.4.B

COOPERATION RESULTS, BY TYPE OF SCHOOL--  
ALL MEALS-OFFERED-ONLY SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Cooperated	201	10	4	215
District Refused	7	0	0	7
School Refused	6	1	2	9
Ineligible <sup>a</sup>	1	0	5	6
Total	215	11	11	237
Response Rate	93.9 %	90.9 %	66.7 %	93.1 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

TABLE II.5

## SCHOOL CHARACTERISTICS QUESTIONNAIRE RESULTS, BY TYPE OF DISTRICT AND TYPE OF SCHOOL

Schools in District/ Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
<b>Schools in Districts Selected for In-Person Data Collection</b>				
Complete	275	19	6	300
District Refused	45	1	0	46
School Refused	6	1	3	10
Ineligible <sup>a</sup>	2	0	0	2
Total	328	21	9	358
Response Rate	84.4 %	90.5 %	66.6 %	84.3 %
<b>Schools in Districts Selected for Meals-Offered-Only Data</b>				
Complete	188	9	2	199
District Refused	7	0	0	7
School Refused	6	0	2	8
Ineligible <sup>a</sup>	0	0	2	2
No Meals <sup>b</sup>	1	0	3	4
Total	202	9	9	220
Response Rate	93.5 %	100.0 %	50.0 %	93.0 %
<b>Schools in Multiple-Hit Districts</b>				
Complete	38	3	5	46
School Refused	0	2	0	2
Total	38	5	5	48
Response Rate	100.0 %	60.0 %	100.0 %	95.8 %
<b>All School Districts</b>				
Complete	501	31	13	545
District Refused	52	1	0	53
School Refused	12	3	5	20
Ineligible <sup>a</sup>	2	0	2	4
No Meals <sup>b</sup>	1	0	3	4
Total	568	35	23	626
Response Rate	88.7%	88.6%	72.2%	88.2%

TABLE II.5 (continued)

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NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>b</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.

TABLE II.5.A

SCHOOL CHARACTERISTICS SURVEY RESULTS, BY TYPE OF SCHOOL--  
ALL IN-PERSON SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Complete	300	21	9	330
District Refused	45	1	0	46
School Refused	6	2	3	11
Ineligible <sup>a</sup>	2	0	0	2
Total	353	24	12	389
Response Rate	85.5 %	87.5 %	75.0 %	85.3 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

TABLE II.5.B

SCHOOL CHARACTERISTICS SURVEY RESULTS, BY TYPE OF SCHOOL--  
ALL MEALS-OFFERED-ONLY SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Complete	201	10	4	215
District Refused	7	0	0	7
School Refused	6	1	2	9
Ineligible <sup>a</sup>	0	0	2	2
No Meals <sup>b</sup>	1	0	3	4
Total	215	11	11	237
Response Rate	93.9 %	90.9 %	60.0 %	93.0 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>b</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.



TABLE II.6

## MEALS-OFFERED DATA COLLECTION RESULTS, BY TYPE OF SCHOOL

Schools in District/ Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
<b>Schools in Districts Selected for In-Person Data Collection</b>				
Complete	273	14	1	288
District Refused	45	1	0	46
School Refused	7	1	4	12
Ineligible <sup>a</sup>	2	0	0	2
No Meals <sup>b</sup>	1	5	4	10
Total	328	21	9	358
Response Rate	84.0 %	87.5 %	20.0 %	83.2 %
<b>Schools in Districts Selected for Meals-Offered-Only Data</b>				
Complete	188	9	2	199
District Refused	7	0	0	7
School Refused	6	0	2	8
Ineligible <sup>a</sup>	0	0	2	2
No Meals <sup>b</sup>	1	0	3	4
Total	202	9	9	220
Response Rate	93.5 %	100.0 %	50.0 %	93.0 %
<b>Schools in Multiple-Hit Districts</b>				
Complete	38	3	4	45
School Refused	0	2	0	2
No Meals <sup>b</sup>	0	0	1	1
Total	38	5	5	48
Response Rate	100.0 %	60.0 %	100.0 %	95.7 %
<b>All School Districts</b>				
Complete	499	26	7	532
District Refused	52	1	0	53
School Refused	13	3	6	22
Ineligible <sup>a</sup>	2	0	0	2

TABLE II.6 (continued)

Schools in District/ Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
No Meals <sup>b</sup>	2	5	10	17
Total	568	35	23	626
Response Rate	88.5 %	86.7 %	53.8 %	87.6 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>b</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.

TABLE II.6.A

MEALS-OFFERED DATA COLLECTION RESULTS, BY TYPE OF SCHOOL--  
ALL IN-PERSON SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Complete	298	16	4	318
District Refused	45	1	0	46
School Refused	7	2	4	13
Ineligible <sup>a</sup>	2	0	0	2
No Meals <sup>b</sup>	1	5	4	10
Total	353	24	12	389
Response Rate	85.1 %	84.2 %	50.0 %	84.3 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>b</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.

TABLE II.6.B

MEALS-OFFERED DATA COLLECTION RESULTS, BY TYPE  
OF SCHOOL--ALL MEALS-OFFERED-ONLY SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Complete	201	10	3	214
District Refused	7	0	0	7
School Refused	6	1	2	9
No Meals <sup>a</sup>	1	0	6	7
Total	215	11	11	237
Response Rate	93.9 %	90.9 %	60.0 %	93.0 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.

TABLE II.7  
FINAL DISPOSITION OF STUDENT SAMPLE

Disposition	Number	Percentage
Complete <sup>a</sup>	3,349	47.7
Absent	348	5.0
Ineligible <sup>b</sup>	263	3.7
Parent Refused (District Required Passive Consent)	512	7.3
Consent Form Not Returned (District Required Active Consent)	260	3.7
Student Refused	37	0.5
Student Selected but Not Available for Interview	143	2.0
Student Interviewed but Parent Not Interviewed (1st and 2nd grades only)	46	0.7
School Refused After Student Sample Was Selected	40	0.7
Student Selected but Not Interviewed	102	1.5
Student Not Selected to Be Interviewed <sup>c</sup>	1,919	27.3
Total	7,019	---
Response Rate <sup>d</sup>	--	74.6

SOURCE: School Nutrition Dietary Assessment Study survey tracking system.

<sup>a</sup>For a student in grades 3-12, an interview is "complete" if a Dietary Intake Interview and a Student and Family Characteristics Questionnaire were completed. For students in grades 1-2, an interview is complete if a student dietary intake interview, parent dietary intake interview, and a Student and Family Characteristics Questionnaire were all completed.

<sup>b</sup>A student was ineligible to be interviewed if he or she was (1) no longer enrolled or had been absent for 25 days; (2) in kindergarten or other pre-first-grade class; or (3) enrolled in a self-contained special education classroom.

<sup>c</sup>Includes students for whom parental consent was obtained but who were not interviewed because the target number of interviews was completed.

<sup>d</sup>Base for response rate calculation is: total number of students (7,019) minus number absent (348) minus student ineligible (263) minus number not selected to be interviewed (1,919).

obtained. For a student in grades 3 through 12, this required that the Dietary Intake interview was completed. For a student in grades 1 and 2, it required both a completed student Dietary Intake Interview and a completed parent Dietary Intake Interview. Second, in nearly all cases in which the dietary intake information was complete, a Student and Family Characteristics Questionnaire was also completed. The most important exception to this is that one district did not grant permission to collect student and family characteristics information or income information, although it did grant permission to conduct dietary recall interviews with all selected students.

*Table II.8* shows response rates to the Mail/Phone Household Questionnaire by parents of students in grades 3 through 12.

*Tables II.9 - II.9B* show the disposition of SFA questionnaires.

TABLE II.8  
HOUSEHOLD SURVEY RESPONSE RATES

Final Status	Number	Percentage
Complete	2,478	87.7
Refused	49	1.7
Unlocatable	227	8.0
Unavailable	2	0.1
Language Barrier	2	0.1
Other	67	2.4
Total	2,825	100.0

TABLE II.9

## SCHOOL FOOD AUTHORITY SURVEY RESULTS, BY TYPE OF SCHOOL

Schools in District/ Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
<b>Schools in Districts Selected for In-Person Data Collection</b>				
Complete	102	13	1	116
In Other School	171	1	0	172
District Refused	45	1	0	46
School Refused	7	1	4	12
School Ineligible <sup>a</sup>	2	0	0	2
No Meals <sup>b</sup>	1	5	4	10
Total	328	21	9	358
Response Rate	84.0 %	87.5 %	20.0 %	83.2 %
<b>Schools in Districts Selected for Meals-Offered-Only Data</b>				
Complete	188	9	2	199
District Refused	7	0	0	7
School Refused	6	0	2	8
School Ineligible <sup>a</sup>	0	0	2	2
No Meals <sup>b</sup>	1	0	3	4
Total	202	9	9	220
Response Rate	93.5 %	100.0 %	50.0 %	93.0 %
<b>Schools in Multiple-Hit Districts</b>				
Complete	8	3	4	15
In Other School	30	0	0	30
School Refused <sup>a</sup>	0	2	0	2
No Meals <sup>b</sup>	0	0	1	1
Total	38	5	5	48
Response Rate	100.0 %	60.0 %	100.0 %	95.7 %
<b>All School Districts</b>				
Complete	298	25	7	330
In Other School	201	1	0	202



TABLE II.9 (continued)

Schools in District/ Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
District Refused	52	1	0	53
School Refused	13	3	6	22
School Ineligible <sup>a</sup>	2	0	2	4
No Meals <sup>b</sup>	2	5	8	15
Total	568	35	23	626
Response Rate	88.4 %	86.7 %	53.8 %	87.6 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>b</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.

TABLE II.9.A

SCHOOL FOOD AUTHORITY SURVEY RESULTS, BY TYPE OF SCHOOL--  
ALL IN-PERSON SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Complete	106	15	4	125
In Other School	191	1	0	192
District Refused	45	1	0	46
School Refused	7	2	4	13
School Ineligible <sup>a</sup>	2	0	0	2
No Meals <sup>b</sup>	1	5	4	10
Total	352	24	12	388
Response Rate	85.1 %	84.2 %	50.0 %	84.3 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.

<sup>b</sup>Districts (schools) were ineligible for meals-offered-only data collection if they had no meals program.

TABLE II.9.B

SCHOOL FOOD AUTHORITY SURVEY RESULTS, BY TYPE OF SCHOOL--  
ALL MEALS-OFFERED-ONLY SCHOOLS

Cooperation Status	Public Schools	Catholic Schools	Private Schools	Total
Complete	192	10	3	205
In Other School	10	0	0	10
District Refused	7	0	0	7
School Refused	6	1	2	9
School Ineligible <sup>a</sup>	0	0	2	2
No Meals	1	0	4	5
Total	216	11	11	238
Response Rate	93.9 %	90.9 %	60.0 %	93.1 %

NOTE: Districts were randomly selected for in-person data collection or meals-offered-only data collection. In districts selected for in-person data collection, three schools were selected, and students within the schools were selected for interview. In meals-offered-only-districts, only one school per district was selected, and only school-level data were collected at the school. Some large districts were selected several times; they were multiple hits. Each hit was for either in-person or meals-offered-only data collection. Three schools were selected for each in-person hit, and one school was selected for each meals-offered-only hit. Thus, multiple-hit districts have schools with one or both types of data collection.

<sup>a</sup>Districts (schools) were ineligible for the study if they had no school with at least 10 students per grade.



### **III. DESCRIPTION OF SAMPLE DESIGN AND CALCULATION OF SAMPLE WEIGHTS**

This chapter describes, in Section A, the multi-stage sampling plan that was used to select school districts, schools, and children for inclusion in the study. Chapter B then describes the derivation of the sample weights that were used to make the samples fully representative of the universes from which they were drawn.

#### **A. SAMPLING**

The sample is a multistage, stratified sample of districts, schools within sampled districts, and students within a subsample of the schools. The sample of schools is designed to be representative of all schools in the 48 contiguous states plus the District of Columbia. For cost reasons, the sample excluded schools in Alaska and Hawaii, state-operated schools, special ungraded schools, and schools and districts averaging fewer than 10 students per grade. The sample of students is designed to be representative of all students in grades 1 through 12 who were attending school on a typical school day in the winter and spring of 1992. Students in kindergarten, pre-kindergarten, or reading readiness (pre-first grade) classes, as well as students enrolled in special education programs with self-contained classrooms were excluded from the sample.

##### **1. District and School Sample**

The school sampling occurred in two stages. First, a sample of districts was selected, and then schools within those districts were sampled. To select the school district sample, a list of school districts was obtained from a vendor, Quality Education Data, Inc. (QED), and was sorted by district type (all grades; primary grades only; secondary only; and "supervisory unions," which are districts that share school food service and other facilities). Within district type, the list was sorted into 10 census

regions, and within region by school size.<sup>1</sup> The districts were selected from the list using systematic sampling with unequal probabilities, to obtain an implicit stratification by district type, region, and size. The selection probability for a district was proportional to the estimated average number of students per grade in the district. Very large districts were selected multiple times. Let  $SCH\_PROB_i$  denote the expected number of times that a district was selected into the sample.

Each sampled district was randomly assigned to one of two types of data collection: (1) in-person visits (IP); or (2) meals offered (MO). These assignments were made systematically as well, from the same sorted list of districts. If a district was selected multiple times, some of its selections could be IP, and some could be MO. The in-person surveys in any district were conducted within the same week, and the weeks were randomly assigned to districts. Schools within each district were asked to allow the data collection to be conducted during the randomly selected week. However, if one or more of the selected schools could not accommodate the visit during the selected week, the team leader (in consultation with her supervisor) and officials of the selected schools selected a mutually agreeable date for the visit.

Within each selected district, a sample of schools was selected. Generally, in the IP district selections, three schools were targeted, and in the MO district selections, one school was targeted. Exceptions to this rule occurred in some small districts, where there were insufficient numbers of schools in the districts.

Although the data from QED included the private schools in the district, special efforts were undertaken to list all private schools "within" the area comprising the district. After the districts were selected, lists were developed of all private schools in the same county (or counties) as the sampled district. Telephone calls were then made to ascertain which of the private schools fell within the school district boundaries, and which of those schools matched the district type. That is, if the district

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<sup>1</sup>The sorting by size was "serpentine," in that the first region was sorted in ascending order of size, the second region was sorted in descending order of size, the third in ascending, etc. The measure of size was an estimate of the average number of students per grade.

were a secondary school district, only the corresponding grades from the private schools were included. In this way, a combined list was developed of public and private schools within each sampled district.

Schools (public or private) within a selected district were selected with systematic sampling with probabilities proportional to size--given that the district was selected, the selection probability for a school within the district was proportional to the estimated average number of students per grade in the school. Denote the conditional probability of selection for a school, given that the district was selected, by  $SCH\_PROB_{2|1}$ . Thus, letting  $MOS_{ij}$  denote the measure of size for school  $j$  in district  $i$ , letting  $MOS_i$  denote the sum of  $MOS_{ij}$  for all eligible schools in district  $i$ , and letting  $n_i$  denote the number of schools sampled from district  $i$ , we have:

$$SCH\_PROB_{2|1, ij} = n_i MOS_{ij} / MOS_i.$$

In the equation,  $MOS_i$  differs from the size measures used in stage 1 as a result of the adjustment for private schools. The unconditional probability of selection for a school is  $SCH\_PROB_2 = SCH\_PROB_1 \times SCH\_PROB_{2|1}$ . The first- and second-stage selection probabilities did not give an equal probability sample of schools. Larger schools had a greater chance of being selected into the sample than did smaller schools. However, a school of any size in a small district had the same chance of being selected as did a school of the same size in a larger district.

Not all selected schools agreed to participate in the survey. Ten of the nonparticipating schools were purposively replaced by similar schools within the same district. The selection probability of the replacement school is, by convention, the same as the probability for the replaced school. The remaining 70 nonparticipating schools were not replaced, owing to cost considerations.<sup>2</sup>

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<sup>2</sup>Details on the number of responding schools are provided in Chapter II.

## **2. Student Sample**

The sampling plan called for choosing 10 students at random from each sampled school. The basic procedure, used for most districts, was to select 20 students' names from a school roster, randomize the order of the 20 students, and then take the first 10 students who were available for the survey (i.e., those who were not absent from school on the survey day, whose parents implicitly or explicitly consented to survey participation, whose teachers permitted participation, etc.). In very small districts with only one eligible school, 60 students were selected, and 30 were interviewed. In districts with two selected schools, 30 students per school were selected, and 15 per school were interviewed. In districts in which explicit parental consent was requested, more than 60 students were initially chosen for possible participation.

If all students were equally likely to participate, the sample design as a whole would give all students in the survey population a roughly equal chance of being selected into the sample.

### **B. WEIGHTING**

The purpose of weighting survey data is to adjust for differences between the composition of the sample and the composition of the population of interest. In this study, these differences arose partly by design (e.g., differential sampling rates for schools of different size and different sampling rates for students in schools whose size was not perfectly predicted at the time the sample was selected). However, differences between the compositions of the sample and the population also arose because of the differences in cooperation rates. Not everyone (not all districts, not all schools, and not all students) agreed to participate in the survey, and members of some groups were more likely to cooperate than members of other groups. Weights are used to compensate for both types of differences between the sample and the population.

The basic sample weights are determined as the reciprocals of the multistage selection probabilities of units selected in the sample. For schools, these probabilities may be viewed as the product of the first-stage sampling rate for the district and the within-district sampling probability for



the school. For students in a school, these probabilities are the product of the school's selection probability and the sampling rate for students in the school.

Statistics calculated from the survey may be biased estimates of the population characteristics (i.e., the statistics that would be calculated if the whole population responded to the survey) if the nonrespondents and respondents differ on educational, demographic, or other characteristics. Furthermore, estimates of population totals will tend to be too small if no allowance is made for data that are missing because some sample members failed to respond. The basic sample weights do not reflect nonresponse to the survey. Therefore, for each sample member on the file, a final weight was produced that also adjusts for nonresponse. The final weights are based on weighting classes. Sampled schools and sampled students who did not respond to the survey receive a final weight of zero; the sums of the final weights for the responding, sampled schools and students add up to estimates of the size of the relevant populations.

### **1. School Weights**

The weights were constructed in steps. First, raw sampling weights were derived to reflect the unequal probabilities of selection  $SCH\_PROB_2$  among the schools. Denoting the raw sampling weight of a school by  $RAW\_WT$ , we have  $RAW\_WT = 1/SCH\_PROB_2$ . The next step was to develop nonresponse adjustment factors to attempt to adjust for differential nonresponse at the district level and at the school level.

Participation of a selected public school could fail to occur if either the school district declined to participate in the survey or, despite district agreement to cooperate, the school itself declined. Participation of nonpublic schools failed to occur only when the individual schools opted not to participate. In light of this fact, the nonresponse adjustment factors for (public) schools were derived in two steps, corresponding to the two possible stages of nonparticipation.

District participation rates varied most strongly by assignment to IP or MO. Of all selected public schools, 13 percent of the IP schools and 3% of the MO schools did not participate because

of district refusal (weighted rates and unweighted rates were the same). Other sources of variation in the district refusal rates did not appear to be systematic. Thus, to derive the first-stage non-response adjustment factor for each school, say DIS\_NRF, one sets:

$$\begin{aligned} \text{DIS\_NRF} &= 1 && \text{for all nonpublic schools} \\ \text{DIS\_NRF} &= \text{SUMWT\_DISTSEL}_{\text{MO}} / \text{SUMWT\_DISTPAR}_{\text{MO}} && \text{for MO public schools} \\ \text{DIS\_NRF} &= \text{SUMWT\_DISTSEL}_{\text{IP}} / \text{SUMWT\_DISTPAR}_{\text{IP}} && \text{for IP public schools} \end{aligned}$$

with  $\text{SUMWT\_DISTSEL}_{\text{MO}}$  equal to the sum of  $\text{RAW\_WT}$  for all selected MO public schools, and  $\text{SUMWT\_DISTPAR}_{\text{MO}}$  equal to the sum of  $\text{RAW\_WT}$  for all selected MO public schools in participating districts. (Similarly,  $\text{SUMWT\_DISTSEL}_{\text{IP}}$  equals the sum of  $\text{RAW\_WT}$  for all selected IP public schools, and  $\text{SUMWT\_DISTPAR}_{\text{IP}}$  equals the sum of  $\text{RAW\_WT}$  for all selected IP public schools in participating districts.) The adjustment factors were 1.03 for MO public schools and 1.14 for IP public schools. To reduce sampling variance, the 2 percent (11 of 626) of the schools with the largest values of the weights at this point (i.e.,  $\text{DIS\_NRF} \times \text{RAW\_WT}$ ) had their weights truncated to the (approximately) 98th percentile. The resulting weights were all multiplied by a factor to preserve the sum of the weights. Although weight truncation might contribute a small bias to the estimates, mean square error is expected to be reduced. Denote the resulting truncated weights by  $\text{TRUN\_WT}$ .

Once districts agreed to cooperate, school nonparticipation was relatively minor, with only 15 schools (out of 626 selections) refusing to cooperate (in addition to the 10 replaced schools). A factor to adjust for school nonresponse, say  $\text{SCH\_NRF}$ , was defined as:

SCH_NRF	=	0	for all ineligible schools
	=	0	for all public schools in noncooperating districts
	=	1.03	for all public IP schools in cooperating districts in region 2
	=	1.01	for all public IP schools in cooperating districts not in region 2
	=	1.29	for all public MO schools in cooperating districts in region 2
	=	1.03	for all public MO schools in cooperating districts not in region 2
	=	1.04	for all Catholic schools
	=	1.76	for all other private schools.

The final school weights were then calculated as  $FIN\_WT = TRUN\_WT \times SCH\_NRF$ . These weights reflect selection and participation of schools into the study as a whole. Separate school weights, say  $IP\_WT$ , were then developed to reflect selection into the in-person sample. To derive them,  $IP\_WT$  was simply set to equal  $FIN\_WT \times F$ , with  $F$  being the ratio of the sum of  $FIN\_WT$  over all participating schools to the sum of  $FIN\_WT$  over all participating IP schools.<sup>3</sup>

## 2. Student Weights

To derive student weights, several steps were used. First, raw sampling weights were derived to reflect the multiple stages of selection for students: student sampling within school, schools within districts, and districts across the United States. Then, nonresponse adjustment factors were developed to attempt to reduce the impact of differential nonresponse by students.

To calculate the raw sampling weight for a student, say  $STU\_RAW$ , the raw school weight was divided by the fraction of students in the school who were contacted for the survey. Thus, letting  $NROSTER$  denote the number of students on the school's sampling roster, and letting  $NSEL$  denote the number who were contacted to potentially participate in the survey, one sets:

$$STU\_RAW = IP\_WT / (NSEL / NROSTER).$$

Next, nonresponse adjustment factors were calculated to reflect student-level nonresponse. Two factors were calculated, one to reflect nonresponse to the main questionnaire, and the other to reflect

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<sup>3</sup>The reciprocal of  $F$  may be interpreted as a weighted rate of assignment of schools to the IP component.

nonresponse to the food part of the questionnaire. For weighting purposes, it is appropriate at this point to include among the respondents any selected student who was not eligible for the study, since such a student's status is known. Ineligibles include students who were absent. Thus, a nonrespondent to the main questionnaire was any student (1) who refused; (2) whose parent refused; (3) who was not available; (4) who was selected, but not interviewed; (5) whose parent was not interviewed (1st and 2nd grade only); or (6) whose consent form was not returned. All other selected students were classified as respondents for the main questionnaire. Classification of nonrespondents and respondents to the food part of the questionnaire was similar, with the exception that the respondent group was allowed to include students whose parents were not interviewed.

Following these classifications of respondents and nonrespondents, the selected students were partitioned into nine weighting cells. Several criteria were used to construct the weighting cells. First, assignment to a weighting cell had to be based on data that were uniformly available for respondents and nonrespondents alike. Second, the probabilities of response should vary across weighting cells and should be relatively homogeneous within. Third, because the sample of students within each weighting cell is used to estimate the average response probability for the cell, the sample size for each cell should not be too small. These criteria led to the following cells.

1. Gender unknown
2. Gender known, team leader 813730 or 743831, grade 1-2, language known
3. Gender known, team leader 813730 or 743831, grade 1-2, language unknown
4. Gender known, team leader 813730 or 743831, grade 3 or higher, language known
5. Gender known, team leader 813730 or 743831, grade 3 or higher, language unknown
6. Gender known, team leader not 813730 or 743831, grade 1-2, language known
7. Gender known, team leader not 813730 or 743831, grade 1-2, language unknown
8. Gender known, team leader not 813730 or 743831, grade 3 or higher, language known
9. Gender known, team leader not 813730 or 743831, grade 3 or higher, language unknown

More cells could have been used, but the possible decrease in bias was not judged to offset the increase in variance due to smaller sample sizes of the cells.

Within each cell, a nonresponse adjustment factor was calculated, say  $STU\_NRF$ , equal to the ratio of the sum of  $STU\_RAW$  for all students in the cell to the sum of  $STU\_RAW$  for the responding students in the cell.  $STU\_NRF$  was calculated twice, once for respondents to the main questionnaire, and once for respondents to the food part of the questionnaire. The final weight for a student, say  $STU\_FIN$ , was set equal to the product of  $STU\_RAW$  and  $STU\_NRF$ :

$$STU\_FIN = STU\_RAW \times STU\_NRF.$$