

USDA Summer Meals Study

Volume 5. Methodology

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1. Introduction and Background

The USDA Summer Meals Study provides a comprehensive assessment of the two summer meal programs operated by the U.S. Department of Agriculture (USDA), the Summer Food Service Program (SFSP), and the Seamless Summer Option (SSO). This study examines the characteristics of participating and nonparticipating children, including sociodemographic characteristics, household food security status, reasons for participation or nonparticipation, and satisfaction with the meals served to children in the summer of 2018. The USDA Summer Meals Study also describes the operational aspects of the programs at summer meal sites, characteristics of their food service environments, and the nutritional quality of the meals served to children.

This report, the fifth volume in the USDA Summer Meals Study report series, describes the methods employed in the study. Volume 1 focuses on the national estimates of program coverage, characteristics of participants and nonparticipants and their households, reasons for participation and nonparticipation, and satisfaction with the summer meal programs. Volume 2 examines the operational characteristics of summer meal program sponsors and sites, and program sponsor and site perspectives on children’s participation in the summer meal programs; Volume 3 focuses on the characteristics of food service environments at summer meal program sites; Volume 4 assesses the content and nutritional quality of summer menus; and Volume 6 contains all the study instruments.

Study Objectives

The USDA Summer Meals Study addresses six study objectives focused on participation, food quality, and implementation of the summer meal programs.

- 1. Identify reasons for participation and satisfaction levels with the summer meal programs;**
- 2. Assess how characteristics differ between participants and nonparticipants;**
- 3. Determine the reasons for nonparticipation;**
- 4. Determine the food service characteristics of the summer meal sites;**
- 5. Describe the characteristics and content of the summer meals; and**
- 6. Assess facilitators and barriers to preparing and serving summer meals.**

1.1 School Meal Programs

USDA’s Food and Nutrition Service (FNS) administers several programs that address food insecurity among families and children, including programs that provide benefits to

In 2018, the school meal programs delivered free and reduced-price lunches to more than 21.9 million children, and free and reduced-price breakfasts to more than 12.5 million children every day (FNS, 2019).

families to purchase food or to organizations that serve meals to children in congregate settings. The largest programs that provide meals directly to children are the school meal programs—the National School Lunch Program (NSLP) and the School Breakfast Program (SBP). These programs provide meals to children attending schools during the regular academic school year. The SFSP and SSO provide meals to children during the summer months when the NSLP and SBP are not operating.

The school meal programs are part of USDA’s overall effort to improve nutrition and reduce food insecurity among children in low-income households. In 2018, food insecurity—defined as not having consistent, dependable access to adequate food for active, healthy living—affected 13.9 percent of households with children at some time during the year (Coleman-Jensen et al., 2019).¹ Because families allocate food within the household to shield children from disrupted eating patterns, fewer children experience food insecurity themselves. Research also suggests that some children fear stigma around hunger and actively hide it (Popkin, Scott, and Galvez, 2016). Compared

Six million children experienced food insecurity in 2018 (Coleman-Jensen et al., 2019).

to food secure children, those who experience food insecurity are at risk of numerous negative physical, emotional, and educational outcomes, including higher rates

of obesity, more behavioral problems, poorer social skills, and poorer test scores and educational achievement (Jyoti, Frongillo, and Jones, 2005; Metallinos-Katsaras, Must, and Gorman, 2012; Winicki and Jemison, 2003).

Findings from multiple studies with varying methodologies and data sources consistently show that the school meal programs reduce food insecurity. Specifically, past research shows that food insecurity rises during the summer months, when the NSLP and SBP are not operating. Using data from the Current Population Survey, Nord and Romig (2006) compared household food security

¹ Program participation and household food security data for 2018 are displayed because this is the year in which study data were collected.

during the school year to food security during the summer and found higher rates of household food insecurity when school was out for the summer. Similar analyses using the National Health and Nutrition Examination Study and the Early Childhood Longitudinal Study-Birth Cohort confirm these findings (Arteaga and Heflin, 2014; Gundersen, Kreider, and Pepper, 2012). These consistent findings from three large-scale, national studies suggest that the school meal programs play an important role in alleviating food insecurity among households with children and highlight the struggle for families to find alternative sources of food for children during the summer.

1.2 Summer Meal Programs

The summer meal programs help children who rely on school meals during the school year access nutrition assistance during the summer months. The SFSP and SSO, authorized under section 13(a) of the Richard B. Russell National School Lunch Act (42 U.S.C. 1761(a)), provide free, nutritious meals and snacks to children ages 18 years and younger.² These programs serve meals at sites located in low-income areas and at sites in other areas serving a high proportion of low-income children, both in the summer when school is not in session and during long school breaks in communities with year-round school calendars. Children who participate in the summer meal programs receive meals free of charge, regardless of household income.³ Sponsors may receive reimbursement on behalf of sites for up to two meals (including snacks) per child per day, with the exception of migrant sites and camps that can receive reimbursement for up to three meals each day. Meal types include breakfast, lunch, supper, and snack (morning, afternoon, and evening).

The summer meal programs are federally funded and State administered. In both the SFSP and SSO, sponsors are approved by the State to operate one or more summer meal sites. Sites are located in a variety of settings, such as schools, parks, community centers, Boys and Girls clubs, apartment complexes, churches, and migrant centers. Sites can be open or have closed enrollment, and they can also be camps. Open sites are located in a low-income area where at least half of the children in the area are eligible for free or reduced-price school meals; any child aged 18 and under can receive free meals. Closed-enrollment sites may or may not be located in a low-income area; however, at

² Individuals over age 18 who are enrolled in school programs for persons with disabilities may also receive meals.

³ Except for children in camps, who must be individually eligible for free or reduced-price meals to receive free summer meals.

least half of the children enrolled at the program site (e.g., parks and recreation program, summer enrichment programs) must be eligible for free or reduced-price meals, and all children who are enrolled receive free meals. Residential or day camps only receive reimbursement for meals served to children who qualify for free and reduced-price meals.

In many ways, the SSO program is an extension of the school meal programs, while the SFSP differs in terms of management structure, meal pattern requirements, and reimbursements. First, SFSP program sponsors can include a variety of entities, including school food authorities (SFAs), private nonprofit organizations, and local governments. SSO program sponsors, in contrast, are exclusively SFAs. While all SSO sponsors are SFAs, SSOs can operate in a variety of settings. Second, the SFSP and SSO programs follow different meal patterns, with SSO sites required to follow the meal patterns set forth for the school meal programs. There are key differences between SFSP and school meal patterns for milk, grains, fruits and vegetables, and for calories, sodium, and saturated fat (see Table 1-1).

Table 1-1. Differences in the meal patterns used in SFSP and SSO in summer 2018

Meal component	SFSP	SSO
Milk	All varieties allowed	Only low-fat (1% milk fat or less, unflavored) or fat-free (unflavored or flavored) allowed
Grain	Whole grain-rich or enriched products allowed	All grain products must be whole grain-rich (unless the site has a waiver)
Fruits and vegetables	Single requirement for fruit and/or vegetable quantity	Requires separate quantities of fruits and vegetables at lunch
	No weekly quantity requirements for types of vegetables	Weekly quantity requirements for types of vegetables
Calories, sodium, and saturated fat	No limits	Limits

Finally, the federal per-meal reimbursement rates differ between the SFSP and SSO; SFSP reimbursement rates for meals are higher (the snack reimbursement rate is the same (see Table 1-2). With simplified meal patterns and higher reimbursement rates, many SFA sponsors choose to operate the SFSP over the SSO; however, the SSO offers continuity in operations over the entire year and requires less paperwork, making it easier and more attractive for many schools to feed children during the summer months.

Table 1-2. Federal reimbursement rates for meals served in SFSP and SSO, summer 2018¹

Meal type	SFSP rates for rural and self-prep sites	SFSP rates for all other types of sites	SSO ²
Breakfast	\$2.2325	\$2.1900	\$2.14
Lunch or supper	\$3.9225	\$3.8575	\$3.48
Snack	\$0.9300	\$0.9100	\$0.91

¹ Reimbursement rates are higher in Alaska, Hawaii, and Puerto Rico.

² SFSP reimbursement rates also differ for rural or self-prep sites. SSO reimbursement rates are the same as the free reimbursement rates for the NSLP and the SBP. SSO reimbursement rates also differ for SFAs that serve fewer than 60 percent free or reduced-price meals and severe need sites. In addition, for SSO sites, school food authorities certified as meeting the meal pattern and nutrition standard requirements set forth in 7 CFR 210 and 220 are eligible to receive performance-based cash assistance for each reimbursable lunch served (an additional six cents per lunch, adjusted annually).

Participation rates in the summer meal programs are much lower than in the school meal programs, suggesting that the programs may not reach everyone who may need food assistance. In July 2018, an average of 2.7 million children per day received meals through SFSP. An additional 1.0 million children received free and reduced-price lunches in NSLP⁴ that same month, some of which were lunches served through SSO (FNS, 2019). This is far below the school-year free and reduced-price lunch participation level of 21.9 million children per day in 2018 (FNS, 2019).

There are several fundamental differences between the summer meal programs and the school meal programs that likely account for the lower participation levels. First and foremost, USDA offers the school meal programs through schools where attendance is mandatory, thus ensuring access to all children. Provision of summer meals, in contrast, is through a variety of summer programs and delivery sites for which attendance is voluntary. Additionally, virtually every public school and many private schools make the school meal programs available and provide transportation, while the summer meal programs are primarily offered in areas or sites with high concentrations of low-income children and may or may not provide transportation.⁵ Furthermore, summer meal sites may serve different populations or subgroups of children, depending on the programs and activities of

⁴ FNS does not collect separate program data for the SSO but reports it as part of NSLP/SBP.

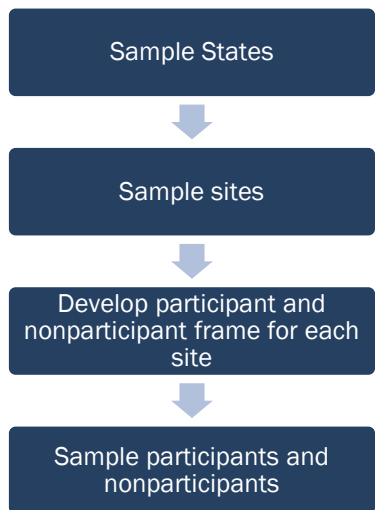
⁵ The Richard B Russell National School Lunch Act (NSLA) allows the use of school or census data to establish area eligibility in the Summer Food Service Program. When determining area eligibility using school data, the proposed meal site must be located in the attendance area of a school where at least 50 percent of the children are eligible for free or reduced price school meals. When using census data to determine eligibility, the proposed site must be located in a Census Block Group (CBG) or Census Tract in which 50 percent or more of the children are eligible for free or reduced price meals.

the site. Finally, while the school meal programs operate for the entire duration of the school year, summer meal programs are available for varying lengths of time, ranging from less than one week to the entire summer and at specific times during the day.

2. Sampling

For study purposes, a timely national list of summer meal program sites does not exist. Moreover, meal sites may change during the summer and from one summer to the next. Therefore, this study implemented a multi-stage sampling procedure to obtain a nationally representative sample of summer meal sites, sponsors, and program participants and nonparticipants. The study first sampled States, then sites active within those States during the summer of 2018, and finally participants and nonparticipants within those sites. Figure 2-1 illustrates the sampling approach employed.

Figure 2-1. Sampling approach



The study conducted several surveys with different sampling units. However, the main sampling unit was the summer meal program site, which operates in the forefront to implement the summer meal programs. Since a complete list of operating summer meal sites (sampling frame) during the survey year was not available in advance,⁶ the study team sampled States and obtained two site lists from the sampled States, as described below. Sites within the sampled States were selected using a stratified simple random sampling method.

Selection of sponsors, caregivers, and children/teens was anchored to the sampled sites that participated in the study. All sponsors associated with the sampled sites were invited to participate in the study. Caregivers of summer meal program participants and nonparticipants were selected by sampling caregivers of children attending sampled sites, and by administering a screener questionnaire that identified eligible households with children living within a pre-defined distance to the sampled sites. Additionally, for summer meal program participants, hard copies of the survey were provided to the sites to distribute to caregivers and children directly. Finally, the study provided instructions to sampled caregivers, to select a child/teen in their household for study participation. The remainder of this chapter describes the sampling methodology for all study groups.

2.1 States

Twenty-four States were selected by the systematic sampling method, with the intent to enroll 20 States into the study. To ensure an even spread of sites across the FNS regions, the 50 States and the District of Columbia (D.C.) were ordered by FNS region (see Table 2-1). Next, States within the FNS region were ordered by their measure of relative size – the number of operating SFSP and SSO sites in 2016 and count of meals served in July 2016.⁷ Based on State data provided by FNS,⁸ 30 States operated the SSO program in 2016; the number of SSO sites was available for all but two

⁶ Organizations (sponsors) have to apply to the State agency and be approved to operate summer meal sites every year. Each year, new sites are added and those that operated in the prior year may continue to operate or not. A complete list of approved sites is available from the State agency in late summer of each year.

⁷ At the time of sample selection, the latest available comprehensive national list of summer meal sites was for 2016.

⁸ The number of SFSP and SSO sites operating in 2016 was normalized by dividing each State's number of sites by the total number of sites, and the normalized number sums to be one. The number of summer meals served in July 2016 was also normalized in the same way, and then the two normalized numbers were added to define the measure of size. This normalization was used to put both number of sites and number of meals on equal footing in defining the final size measure because the number of meals was on a much larger scale compared to the number of sites.

of these States—Oregon and Vermont. The SSO counts for these two States were estimated and then used to calculate the measure of size.⁹

Table 2-1. FNS regions (as of summer 2018)

FNS region	States¹
Mid-Atlantic Regional Office (MARO)	Delaware, District of Columbia, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia
Midwest Regional Office (MWRO)	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
Mountain Plains Regional Office (MPRO)	Colorado, Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota, Utah, Wyoming
Northeast Regional Office (NERO)	Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont
Southeast Regional Office (SERO)	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
Southwest Regional Office (SWRO)	Arkansas, Louisiana, New Mexico, Oklahoma, Texas
Western Regional Office (WRO)	Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, Washington

¹ U.S. territories were excluded from the study.

All 24 sampled States agreed to participate in the study, but two States were unable to submit the SNAP caseload file in time to sample households. The study team replaced one sampled State with another State due to its size;¹⁰ summer meal sites were selected from these 23 States. Figure 2-2 displays the States that participated in the USDA Summer Meals Study (SUMS).

⁹ For Vermont, which had a SSO sponsor count (6) but not a site count, the average SSO site count per SSO sponsor (5.93) from States with both counts was used to estimate the missing SSO site count by multiplying the average with the State's known sponsor count; the estimate was 36 ($=6 \times 5.93$). For Oregon, which had neither SSO sponsor nor site counts, the school meals program data were used to estimate the SSO site count. First, the average school meals program (NSLP and SBP) count per SSO site (1,953.65) from States with non-missing SSO site counts was calculated, and then the missing SSO site count was estimated by dividing Oregon's NSLP and SBP counts (137,662) by the State's average school meals count per SSO site; the estimate was 70 ($=137,662/1,953.65$).

¹⁰ California was unable to provide the SNAP caseload data in time for sampling, and was replaced with Texas.

[illegible]

2.2 Sites and Sponsors

¹¹Obtaining site lists in two waves was done to allow the study to begin site recruitment in time for data collection to begin in June 2018. Many States did not finalize their 2018 site lists until the federal deadline of June 15th, so the list of sites new in 2018 were not available for sampling in many States until early July 2018. Therefore, the study team had to rely on incomplete lists of 2018 new sites.



The top-level stratification was by sites that operated in 2017 and continued operation in 2018 (i.e., continuing sites) and sites that did not operate in 2017 and began operating in 2018 (i.e., new sites). Sites in the 2017 and 2018 site lists were matched on name and or/address. Within each of these strata, sites were stratified by program type (SFSP/SSO), site type (open/closed), and urbanicity (urban/rural). Table 2-2 displays the target number of complete survey responses for the strata.

Table 2-2. USDA Summer Meals Study site sample sizes

Stratification variable	Site category	Marginal sample size			Total sample size
		Sites operating in 2017 and 2018 ¹	Sites newly operating in 2018 ²	Total	
Site program type	SFSP	420	180	600	750
	SSO	105	45	150	
SFSP site type	Open	280	120	400	600
	Closed	140	60	200	
SFSP site location	Urban	315	135	450	600
	Rural	105	45	150	

¹ Sites that operated in 2017 and continued to operate in the summer of 2018 (called the continuing sites).

² Sites that did not operate in 2017 and began operating in the summer of 2018 (called the new sites).

The site sample size was determined to allow for comparisons between several subgroups of interest: program type (SFSP/SSO); SFA status (SFA/non-SFA); site type (open/closed); urbanicity (urban/rural); and site size as measured by average daily attendance (ADA). To compare findings by subgroups, the study team oversampled small subgroups such as SSO sites, closed sites, and rural sites by allocating a higher sampling rate to the small subgroups. Nearly half of summer meal sites were managed by SFAs, therefore oversampling the subgroups defined by the SFA-status was not necessary. Finally, although site size was an important subgroup, classification of sites by size was based on data from the Site Survey, and therefore not used in stratification at the design stage.

These sample size targets were set to achieve the precision requirements of the study for the overall population of summer meals sites and by program type, site type, and urbanicity. The precision requirements were as follows: 5 percent margin of error for overall estimates of SFSP sites to estimate a population proportion of 50 percent, and 10 percent for designated subgroups. SSO sites were considered a subgroup for the purposes of precision requirements. The study assumed a design effect of 1.5, which required a site sample of 150 for each subgroup and 600 for overall SFSP sites.

The expected response rate was 40 percent for the continuing sites and 63 percent for new sites.¹³ In addition to the nonresponse-adjusted sample size, a reserve sample (30 percent) was selected, resulting in a sample of 2,419 sites. To address the lower than expected site level response rate during data collection, the study team selected a supplemental sample of 930 sites to maintain precision requirements; the final sample size was 3,349 sites. Figure 2-3 displays the weighted and unweighted characteristics of sites that responded to the Site Survey.

The sponsor associated with each sampled site was also included in the study. A sponsor with more than one sampled site was selected multiple times, and for this reason, the sampling method is called multiplicity sampling. The ratio of sponsors to sites was almost 1:3; 1,377 sponsors were associated with 3,349 sampled sites.

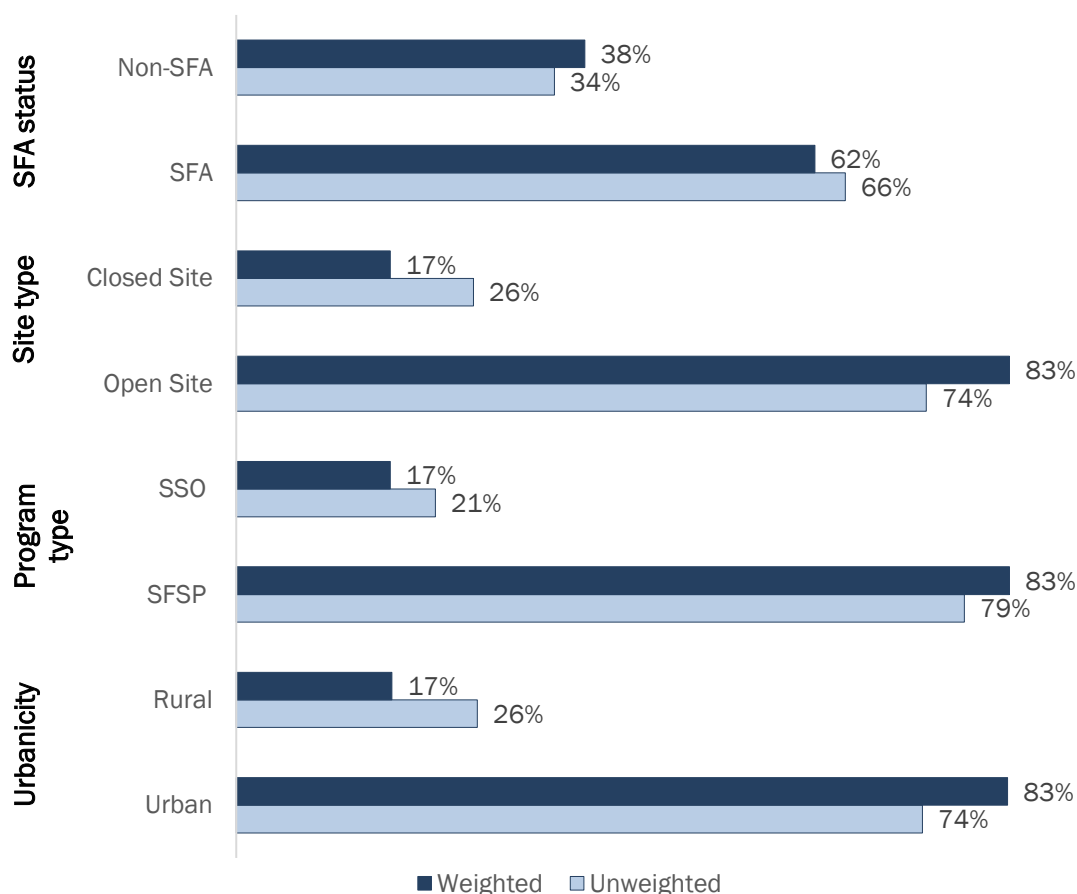
2.3 Caregivers

The summer meal programs serve children through age 18, targeting children who typically receive free and reduced-price meals during the school year. For this reason, the study excluded children under the age of five. In addition, the study sought to assess participant satisfaction with meals served, which could not be undertaken reliably with young children.

Since many summer meal sites (e.g., open sites) do not require registration for summer meal programs and children can drop in when sites are open, participant rosters were not available. A multipronged approach was used to develop the caregiver sample frame; separate sample frames were developed for open sites and for closed sites based on the availability of participant lists at the site, as described below.

¹³Based on a comparison of summer meal sites operating in 2016 and 2017 using the USDA Summer Meal Site Finder data (<https://www.fns.usda.gov/meals4kids>), the survival rate of the continuing sites was estimated at 64 percent. The response rate of those sites was assumed to be 70 percent. Furthermore, about 10 percent of surviving addresses were usually non-working addresses. Taking all these rates into account, the 40 percent overall response rate was derived (i.e., $0.4 = 0.64 \times 0.7 \times 0.9$). For new sites, only the latter two rates were applied (i.e., $0.63 = 0.7 \times 0.9$).

Figure 2-3. Characteristics of study sites (weighted and unweighted)



Source: USDA Summer Meals Study, Site Survey, Summer 2018. Tabulations are weighted to be nationally representative of all sites offering the summer meal programs. Unweighted n = 950; weighted n = 68,611.
 Note: Total may not add to 100 due to rounding.

2.3.1 Sampling Caregivers from Open Sites

Open sites operate in low-income communities, serve all children in the area on a first-come basis, and typically do not maintain lists of children who receive meals at the site. To develop the frame of participants and nonparticipants, the study team constructed catchment areas around sampled sites. For an urban site, the catchment area was a 0.75 mile radius around the site; for a rural site, the

catchment area was a 5-mile radius around the site.^{14,15} Next, the study team used the Marketing Systems Group (MSG) database¹⁶ and State SNAP caseload files¹⁷ to construct the household frame for each catchment area. Before constructing the caregiver sampling frame, de-duplication procedures were implemented to exclude SNAP records from the MSG database. This de-duplication ensured that only one household record was retained in the frame. Slightly more than one-third of the sample was selected from the SNAP caseload file. In instances when the catchment area for two sites overlapped, the study assigned sampled households to the closest site.

Information on the presence of children (between ages 5 and 18) and participation in the summer meal programs in the sampled households was not available. Therefore, the study team mailed a brief screener questionnaire to the sampled addresses in the catchment areas to gather this information. A sample of 915,048 households was selected for the screener; screeners were mailed until the expected number of caregivers was reached to build the sampling frame for the caregiver survey. Slightly less than half (46%; n=420,922) of the screener sample was released.

All caregivers who responded to the screener and indicated that their household included one or more children ages 5 through 18 that received free meals from the sampled program site were classified as caregivers of participants; those with children ages 5 through 18 who did not participate in the summer meal programs were classified as caregivers of nonparticipants.¹⁸ The screener included the State or local program name and address of the sampled site; however, some caregivers may not have recognized this and could have been misclassified as nonparticipants. All caregivers of participants and a subsample of caregivers of nonparticipants were invited to complete the Caregiver

¹⁴This study used the U.S. Census Bureau's definition of an urban area. Census defines an urban area as one that has at least 2,500 people. Rural includes all areas that are not included in an urban area.

¹⁵A catchment area was defined as a circular area with a fixed radius with the summer meals site location as the center. From a sampling standpoint, it is desirable to have similar area sizes because variable area sizes cause sampling inefficiency. The 0.75-mile urban catchment area and 5-mile rural catchment area achieved this goal and also reduced the overlap of catchment areas in densely populated areas with multiple summer meal sites.

¹⁶Marketing Systems Group is a private vendor which sells U.S. addresses. Their database is based on the Delivery Sequence File, which is a computerized file that contains all delivery point addresses serviced by the U.S. Postal Service.

¹⁷SNAP caseload data was obtained from SNAP State agencies.

¹⁸Screener respondents of 4,998 households answered that they had at least one eligible child but did not participate in the summer meals programs. Since fewer surveys were needed, the study team selected a subsample of these caregivers, who were invited to take the nonparticipant caregiver survey. Some respondents turned out to be participants (94) or ineligible (166).

Survey. In addition, the study provided 2,050 hard copies of the Caregiver Survey to 176 open sites to distribute directly to caregivers and children.¹⁹

2.3.2 Sampling of Caregivers from Closed Sites

Closed sites serve a defined group of children, and maintain lists of participants and their caregivers. The study intended to acquire these lists to build the sample frame of participant caregivers. However, only 17 closed sites²⁰ provided a roster, and the study team mailed 763 surveys to the caregivers of participants listed in the rosters. For the remaining 31 sites that did not provide a roster, the study team mailed 620 surveys to the site supervisors, for distribution to participating caregivers and children. By the time the site supervisor assented to participate in the study, the majority of closed sites had stopped operating the summer meal program and on-site survey distribution was not feasible. Table 2-3 summarizes sampling of caregivers from both open and closed SFSP sites and all SSO sites combined.

Table 2-3. Summary table for caregiver samples

Frame type	Program/site type			
	SFSP		SSO ¹	Total
	Open	Closed		
Addresses	262,022	52,296	107,454	421,772
On-site	1,730	580	360	2,670
Roster	N/A	591	172	763
Total	263,752	53,467	107,986	425,205

¹ SSO also has open and closed sites but no distinction is made in the table because it was treated as a single group in sampling.

Addresses=Addresses from State Supplemental Nutrition Assistance Program (SNAP) monthly caseload data and U.S. Postal Service mail delivery addresses obtained from the Marketing Services Group.

On-site=Surveys distributed to caregivers and children directly at the sampled site.

Roster=Sampled addresses provided by sites via a roster of children who attended the sampled sites.

¹⁹The original plan was to send hard copy surveys to all open sites. However, by the time the study team received site consent, a majority of sites had already stopped their operation.

²⁰Many closed sites did not respond to the request for a roster; others refused to provide the roster, citing privacy concerns.

2.4 Teens and Children

Sampling of teens and children was done within respondent caregivers in a nested way. Using the last birthday method, responding caregivers of participants were instructed to select a child (ages 5 through 12) or a teen (ages 13 through 18) and have them complete the Child/Teen Survey.²¹

Responding caregivers of nonparticipants were instructed to select a teen and have them complete the Teen Survey.²² In instances where there were multiple children in the household, the caregiver was instructed to select the child who had the most recent birthday in their household. The sample size for the participant Child/Teen Survey was the same as the size of the respondent sample of participant caregivers (1,722). The sample size for the nonparticipant teen survey (1,395) was smaller than the size of the respondent sample of nonparticipant caregivers (2,966) because some nonparticipant caregivers did not have a teen in the household; slightly less than half (47%) of the nonparticipant caregivers had at least one teen.

²¹The caregiver was instructed to select one child or teen, who had their birthday in the most recent past. This method is referred to as the last birthday method of selecting a person within the sampled household.

²²Nonparticipant teens were asked directly about their decision not to participate. These questions were not asked of children ages 5 through 12, but they were asked of the parents of children.

3. Recruitment and Survey Data Collection

The USDA Summer Meals Study collected data from multiple sources to gather information about summer meal program characteristics, program operations, meal characteristics, and caregiver perceptions as well as satisfaction with the program. Table 3-1 lists the study surveys and respondents.

Table 3-1. Surveys and respondents

Survey	Respondent
Site Operations Survey	Sponsor
Sponsor Survey	Sponsor
Site Survey	Site
Menu Planning Survey	Menu planner from either the sponsor or site organization
Caregiver Survey	Participant and nonparticipant caregivers of children living near and/or attending the sampled sites
Child Survey	Participant child ages 5–12 whose caregiver responded to the Caregiver Survey
Teen Survey	Teen ages 13–18 whose caregiver responded to the Caregiver Survey

3.1 Sponsor and Site Recruitment and Data Collection

The USDA Summer Meals Study implemented a multipronged approach to recruit and collect data from the sampled summer meal sites, their sponsors, and participant and nonparticipant caregivers. The study implemented a multimode approach to the data collection for the various surveys. The approach was designed to make survey completion as easy and convenient for the respondents as possible. All surveys were available at the study website for the respondent to complete at their convenience. Most surveys took less than 30 minutes to complete. Proven design principles such as adaptive design (survey display is adjusted automatically based on the size of the screen detected), interactive grids, and minimal open-ended questions were implemented to minimize burden and errors and maximize response rates. Phone follow-up was also implemented to enable survey completion by phone for participants who preferred that mode.

3.1.1 Sponsor Recruitment and Sponsor Survey Data Collection

Summer meal program sponsors were the first group of study participants recruited into the study, between April and August 2018. Recruitment began with sponsors, so that sponsors could assist with recruitment of their sampled sites. The study team worked with FNS headquarters to gain support at the FNS regional offices and the State Agencies responsible for administering the child nutrition programs to obtain contact information for the sampled sponsors. FNS headquarters staff initiated recruitment of sponsors of continuing sites, by sending them an informational study email and study brochure. The email included an overview of the study, informed the sponsors that Westat would be contacting them shortly, and encouraged them to participate in the study. About a week after the initial FNS email, Westat contacted the sponsors by email; the email included details about the study, a request to complete the brief web-based Site Operations Survey, and a unique number to access the survey.

Site Operations Survey

The Site Operations Survey was conducted between April and August 2018; the survey asked summer meal program sponsors to confirm whether their sites selected for the study would operate in 2018. For each site confirmed for operation in the summer of 2018, the survey asked the sponsor to confirm the contact information for the site supervisor, to provide dates of operation and contact information for the menu planner, and to indicate if site supervisors and families needed study materials in Spanish.

The study team emailed the sponsors requesting them to visit the study website and to complete the Site Operations Survey. One week after the initial email, the study sent a reminder email to nonresponding sponsors. Two weeks after the initial email, data collectors conducted telephone follow-up and administered the Site Operations Survey via phone.

Sponsors indicating that none of the sampled sites would be operational were ineligible to participate in the study. Westat sent an email to these sponsors, thanking them for their time and informing them that although they were not eligible to participate in the study at that time, that the study team may contact them if any of their sites were selected in the next few months. Particularly toward the beginning of recruitment, many sponsors expressed uncertainty regarding their sampled sites' operation or schedule and provided a date by which the decisions would be made. The study

team conducted telephone follow-up with the sponsor around that date to inquire about the final decision status and to obtain details for sites that would be operational. If the sponsor did not have the contact information for the site supervisor or the menu planner, the study staff followed up with the sponsor at a later date to obtain that information.

Sponsor Assent

Sponsors who indicated in the Site Operations Survey that one or more of the sampled sites would be operational were automatically linked to view a pre-recorded study informational video. The video included an overview of the study and data collection activities relevant to them, including: completing the Sponsor Survey, notifying their sampled sites of the study selection and encouraging their participation; completing the Menu Planning Survey and submitting site menus;²³ and encouraging open sites to distribute the Caregiver Surveys and closed sites to provide rosters of the program participants.

At the end of the video presentation, sponsors checked boxes indicating assent to participate in the study and agreement to encourage their sites to participate in the study. Sponsors declining study participation or unwilling to encourage sites to participate in the study were thanked for their time and informed that the study would not contact them going forward. Sponsors agreeing to participate in the study and willing to encourage their sites to participate were contacted via email, welcoming them to the study and urging them to notify their sites of their selection into the study. Sponsors were encouraged to use a template email (provided as an attachment to the welcome email) to contact their sites.

Recruited sponsors that had additional sites sampled later (either through the reserve sample or from the updated list of sites provided by State agencies that did not operate in 2017 but planned to operate in 2018) were re-contacted and asked to complete the Site Operations Survey for the new sites. Since these sponsors were previously enrolled into the study, they were exempted from watching the study informational video and providing assent. Previously ineligible sponsors with new sampled sites were asked to complete the Site Operations Survey, after which they were linked to the study informational video and asked for assent and willingness to encourage their sites to

²³Sponsors submitted site menus if they were responsible for menu planning.

participate in the study. About one week after completing the Site Operations Survey, the study sent a reminder email to eligible sponsors who had not provided assent. About two weeks after, a study recruiter contacted eligible sponsors by phone and obtained verbal assent.

Of the 1,372 sponsors that were invited to participate in the study, half agreed to participate; 8 percent were ineligible; 27 percent could not be contacted (nonresponse); and the remaining 15 percent either refused to complete the Site Operations Survey or to provide assent (see Table 3-2).

Table 3-2. Sponsor recruitment outcomes

Sponsor recruitment outcomes	Number	Percentage
Eligible - Agreed to participate	689	50
Eligible - Refused to participate	27	2
Ineligible	115	8
Refused study	77	6
Not locatable	60	4
Other	27	2
Nonresponse	377	27
Total	1372	100

Source: USDA Summer Meals Study, summer 2018.

Sponsor Survey

The Sponsor Survey was fielded between July and November 2018. Topics covered in the survey included characteristics of the sponsor; meal accommodations; food safety procedures; characteristics of sites under the sponsor's operation; use of SSO; and operating plans for the next summer. The survey questions were divided between those at the sponsor-level and those at the site-level. Site-level questions were asked for each sampled site operated by the sponsor. Respondents were also asked at the end of the survey to indicate their willingness to participate in a follow-up telephone interview. The estimated completion time for the Sponsor Survey was 20 minutes, with 5 additional minutes per sampled site.

The study used a multi-mode strategy to field the Sponsor Survey. Insight Policy Research administered the Sponsor Survey. Study staff emailed sampled sponsors²⁴ an invitation email

²⁴A link to the web-based survey was sent to all sponsors (regardless of their recruitment and assent status), except those who had refused participation.

containing a request to visit the study website and instructions to use the unique access code specified in the letter to complete the web-based Sponsor Survey. Two reminder emails (one week and two weeks after the initial email) were sent to nonresponding sponsors; telephone follow-up was initiated three weeks after the initial email, and data collectors administered the survey via phone. The response rate for the Sponsor Survey is presented in Table 3-4 on page 3-12.

3.1.2 Site Recruitment and Site Survey Data Collection

Eligible sponsors who agreed to take part in the study received a welcome email and an attachment that was a template email to send to their sampled sites. Within days of sponsor enrollment, the study contacted site supervisors by email; the email included details about the study, a study brochure, a request to view the online study informational video, and a unique PIN to access the video presentation.

Site Assent

The pre-recorded study informational video for site supervisors included an overview of the study and data collection activities relevant to them: completing the Site Survey; completing the Menu Planning Survey and providing site menus;²⁵ and distributing the hardcopy Caregiver Surveys mailed to them by the study if they were an open site, or providing a roster with contact information of their program participants if they were a closed site.

Similar to the approach used for sponsors, after the video recording, site supervisors checked a box indicating their assent to participate in the study. Follow-up protocols were implemented to contact and recruit nonresponding site supervisors; within one week of the initial email, the study team sent a follow-up email to nonresponding site supervisors, and two weeks after the initial email, telephone contact was initiated. Data collectors verbally presented the information contained in the study informational video and obtained assent from the site supervisors.

Of the 3,349 sampled sites, sponsors completed the Site Operations Survey for 2,056 (61.4%) of the sites; 1,574 (47.0%) sites were eligible and 482 (14.4%) were ineligible for the study. Of the 1,574 eligible sites, sponsors provided study assent for 1,162. Of the 1,162 sites with sponsor assent, about

²⁵Site supervisors submitted site menus if they were responsible for menu planning.

half (53%) of the sites were successfully recruited into the study; about one-third (37%) could not be contacted (nonresponse); six percent refused to take part in the study or to assent; and five percent were not locatable (see Table 3-3).

Table 3-3. Site recruitment outcomes

Site recruitment outcomes	Number	Percentage
Recruited	615	53
Refused assent	22	2
Refused study	44	4
Not locatable	42	4
Nonresponse	425	37
Other	14	1
TOTAL	1162	100

Notes: Total may not add to 100 due to rounding.

Site Survey

Site Surveys were fielded between May and September 2018. Fielding ended in September due to the end of most summer meal programs, with most sites no longer in operation. The Site Survey was developed in English and Spanish and included questions regarding site characteristics; services provided; details about the meal service, meals served, and foods offered; equipment and storage at the site; and sociodemographic characteristics of the children served. The survey also asked site supervisors their willingness to participate in a follow-up telephone interview. The estimated completion time for the Site Survey was 20 minutes.

The study team used a multi-mode strategy to field the Site Survey. The study team emailed the site supervisors an invitation email containing a request to visit the study website and instructions to use the unique PIN specified in the letter to complete the web-based Site Survey. One week after the initial email, a reminder email was sent to nonresponding site supervisors. Telephone follow-up was initiated within two weeks of the initial email, and data collectors encouraged respondents to complete the survey, either by phone or online.²⁶ The response rate for the Site Survey is presented in Table 3-4 on page 3-12.

²⁶The study team requested sponsors of nonresponding sites to encourage the sites to participate in the study. If the site supervisor was not available, the study team requested contact information for an alternate staff member who could complete the Site Survey. The study followed standard data collection procedures to collect data from the alternate site staff member.

3.1.3 Menu Planning Survey Data Collection

Menu Planning Surveys were fielded between May and September 2018. The Menu Planning Survey was developed in English and Spanish and included questions about the process of planning site menus and resources used and needed; the estimated completion time for the Menu Planning Survey was 20 minutes.

The study used a multi-mode strategy to field the Menu Planning Survey. The study sent an email to the menu planners identified by sponsors on the Site Operations Survey, requesting that they complete the web-based Menu Planning Survey and providing instructions to use the unique PIN specified in the email to access the Survey. In most cases, it was the sponsor that responded to the Menu Planning Survey. One week after the initial email, the study sent a reminder email to nonresponding menu planners; telephone follow-up was initiated within two weeks, and data collectors administered the survey by phone.

To reduce the burden on sponsors with three or more sampled sites, the study offered them a streamlined option of completing the Menu Planning Survey by phone, providing one response that could be applied to all sites, and then describing nuances relevant to each site, as appropriate. Table 3-4 on page 3-12 lists the outcomes for the Menu Planning Survey.

3.1.4 Modifications to Sponsor and Site Recruitment and Survey Data Collection Procedures

Due to the lower than expected number of sponsors and sites recruited into the study, initial data collection procedures were modified. Under the modified procedures, nonresponding sponsors and sites were invited to complete the surveys without viewing the study informational video; these sponsors and sites provided assent when they accessed the web survey or were contacted by phone.

3.2 Caregiver Recruitment and Data Collection

The caregiver screener and Caregiver Survey were fielded between June and November 2018. The screener included questions about the number and ages of children in the household and whether the child(ren) planned to attend the sampled summer meals site that summer. The primary purpose of the screener was to determine eligibility for the survey. The Caregiver Survey included questions

about the children in the household, experience with the summer meals program, program satisfaction for participants, reasons for non-participation for nonparticipants, household demographics, and household food security. The study used several recruitment and data collection strategies for caregivers, though the primary recruitment strategy was use of the screener.

3.2.1 Screener

The study team recruited caregivers of children residing at the sampled addresses. The study sent a FedEx envelope containing the introductory letter and a study brochure to 424,975 households. The introductory letter provided an overview of the study and urged an adult respondent to complete a screener by visiting the study website or calling a toll-free number. A unique PIN was included to access the web-based screener. The letter also alerted the respondent to the \$10 incentive if they were eligible, selected, and completed the Caregiver Survey. Caregivers had the option to complete the screener in English or Spanish. The screener was expected to be completed in 10 minutes.

The study team mailed two reminder postcards to nonrespondents, two and four weeks after the initial mailing. Finally, six weeks after the initial mailing, the study team conducted phone follow-up; valid phone numbers were available for most households sampled from SNAP caseload data, but few households sampled from postal data had a phone number available.²⁷

3.2.2 Caregiver Survey

Responses from the screener determined household eligibility for the study; 10,304 adults responded to the screener. Respondents were eligible if they confirmed they lived at the sampled address, were parents/legal guardians of children ages 5 through 18 in the household, and either participated at the sampled site or did not participate at any summer meal site that provided free meals. All caregivers of child/teen summer meal program participants were invited to complete the survey, and a subsample of caregivers of child/teen nonparticipants was invited to complete the survey; 6,126 caregivers were eligible to take the survey.

²⁷Phone numbers were available for most households who were included in the sample because they were in the SNAP caseload data used for sampling; phone numbers were obtained through the MSG database for some households who were not in the SNAP caseload data.

Respondents who completed the web screener were immediately prompted to continue on to the Caregiver Survey, if eligible. Respondents completing the screener by phone and determined to be eligible were offered the option to complete the survey by mail or on the web. Accordingly, the respondents were mailed either a letter containing their PIN to access the web survey or a packet with the survey booklet and a postage-paid return envelope. The packet also included a letter with their PIN to enable completion over the web.

Two weeks after the first mailing, the study mailed a reminder packet, including a hard copy survey booklet and postage paid envelope. Four weeks after the first mailing, the study sent a reminder postcard to nonresponding caregivers. Six weeks after the first mailing, telephone data collectors initiated phone follow up with caregivers for whom a phone number was available. The study mailed a \$10 Visa gift card to caregivers who completed the survey by mail or phone.

Onsite Survey Distribution

The study mailed 2,670 survey packets with instructions to site supervisors to randomly distribute to caregivers of children at their sites; 2,050 surveys were distributed at open sites and 620 were distributed at closed sites. Each survey packet included an introductory letter, a study brochure, a hardcopy survey booklet, and a postage paid envelope to return the completed survey. The introductory letter urged caregivers to complete and return the hardcopy survey or to visit the study website and complete the online version, using the unique PIN contained in the letter, and alerted them that the study would send \$10 after receiving their completed survey. The letter also listed a toll-free number and the study email address for the study team, in case caregivers had questions. Since the surveys were distributed anonymously, the study team did not have the ability to conduct follow-up with nonresponding caregivers.

Direct Mailing to Closed Site Participants

Seventeen closed sites provided contact information for caregivers of children attending their site. The study team mailed 763 survey packets containing an informational letter with a promised incentive of \$10, the study brochure, a hardcopy survey booklet similar to the one handed to the caregivers from open sites, and a postage paid envelope. The study mailed two reminder postcards to nonrespondents, two weeks and four weeks after the initial mailing. Finally, six weeks after the

initial mailing, the study conducted phone follow-up with nonresponding caregivers for whom phone numbers were available and provided them the option of completing the survey in a mode of their choice—hard copy, online, or by phone.

3.3 Child/Teen Data Collection

As described in Chapter 2, the study collected survey data from children and teens participating in the program, and teens in the area around the site not participating in the program. Caregivers of children who participated in the summer meal program were asked to select one child or teen participant in their household and to encourage their child/teen to complete the survey. Caregivers of nonparticipating children were instructed to select one teen nonparticipant from their household and encourage their teen to complete the survey.

3.3.1 Child Survey

The Child Survey was bundled with the Caregiver Survey in the booklet and respondents completing the caregiver portion of the survey were prompted to assist their children with completing the Child Survey, if applicable. The Child Survey included questions about the child’s opinions on the characteristics of the food they consumed at the site; the expected completion time was 10 minutes.

The study team conducted limited telephone follow-up with caregivers who had completed the survey, but the child had not. If the caregiver completed the survey and a phone number was available, Westat telephone data collectors followed up with the caregiver to obtain consent and administer the survey by phone, after ensuring that both the caregiver and the child were available.

3.3.2 Teen Survey

Similar to the Child Survey, the Teen Survey was also bundled with the Caregiver Survey in the booklet and respondents completing the caregiver portion of the survey were prompted to have their teen complete the Teen Survey, if applicable. The Teen Survey included questions about the teen’s experiences with the summer meals program if they attended the site, or the reasons for non-participation; the expected completion time was 10 minutes.

The study conducted limited follow-up for the teen portion of the Caregiver Survey. If the caregiver completed the survey and a phone number was available, Westat telephone data collectors followed up with the caregiver to obtain consent to speak to the teen and administer the survey.

3.4 Recruiter and Data Collector Training

The study trained experienced data collectors to recruit study participants and to follow up with survey nonrespondents. The trainings included information on study background, types of surveys and respondent groups, in-depth review of survey instruments, refusal avoidance, and probing techniques to administer the surveys by phone.

3.4.1 Sponsor and Site Recruiters and Data Collectors

In June 2018, Westat staff conducted a 12-hour training for sixteen telephone data collectors on procedures to recruit sponsors and sites. The team included bilingual data collectors for site recruitment. A self-paced training delivered through Westat's Learning Management System (LMS) covered topics including the study design, the Site Operations Survey, study informational videos for sites and sponsors, the telephone script for the study informational videos, and frequently asked questions. The training included quizzes to test the data collector's understanding of the material. The self-paced training was followed by a live one-day WebEx training. The trainers went through the study materials and the surveys. Role-plays were conducted for the trainees to practice administering the Site Operations Survey, the study informational videos, and assent.

In July 2018, Westat staff conducted a 15-hour training for 15 data collectors on procedures to administer the Site Survey and the Menu Planning Survey. The training followed the same pattern of initial LMS training followed by a WebEx training, role plays, and certification. In August 2018, Insight Policy Research staff conducted a two-hour training for four data collectors on procedures to conduct the Sponsor Survey. Topics included: background on the summer meals programs including a glossary of terms; the study purpose; walk-through of the Sponsor Survey; procedures for calling and tracking follow-ups; review of frequently asked questions; and conducting practice interviews.

3.4.2 Caregiver, Child, and Teen Data Collectors

In July 2018, Westat staff conducted an eight-hour training for 54 telephone data collectors, including bilingual staff, on caregiver recruitment and data collection. The initial LMS training included modules on gaining cooperation; the status of the study at that point; the contact script for the caregivers; the Screener and Caregiver, Child, and Teen Survey instruments; and frequently asked questions. The training included quizzes to test the trainees' understanding of the study materials. The LMS training was followed by a two-day live WebEx training. Trainers conducted four rounds of training, with about 15 data collectors in each group; they reviewed the instruments and conducted practice role-play interviews for the trainees. Special emphasis was placed on obtaining caregiver consent for teens, who were encouraged to take the surveys on their own; caregivers responded to the child survey together with their child.

3.5 Response Rates

Table 3-4 shows the initial sample size, number of respondents, and unweighted response rate for all surveys administered in the study. Response rates ranged from 38 percent to 58 percent; response rates were lower for sponsors and sites than for caregivers and children/teens.

Table 3-4. Unweighted survey response rates

Survey	Sample size ^a	Number of respondents	Unweighted response rate ^b
Sponsor Survey	1,378	453	39.1
Site Survey	2,480	950	38.3
Menu Planning Survey	2,480	1,036	41.8
Caregiver Survey ^c	9,559	4,688	51.6
Child/Teen Participant Survey	1,722	930	54.0 ^d
Teen Nonparticipant Survey	1,395	814	58.4 ^d

Source: USDA Summer Meals Study, summer 2018.

^a This includes ineligible.

^b This excludes ineligible.

^c The Caregiver Survey sample size reflects the number of caregivers invited to complete the Survey. This includes 673 caregivers from closed sites (roster); 2,670 caregivers from open sites (on-site survey distribution); and 6,126 caregivers sampled from the screener.

^d The response rate is computed as the number of respondents divided by the number of those eligible to respond to the child/teen survey.

4. Collecting and Processing of Menu Data

Menu data collection and processing was coordinated through Westat's Dietary Assessment Team (DAT), a team of nutritionists and dietary coders with extensive experience in applying standardized data collection and dietary coding procedures. The DAT includes two senior and one junior nutritionist as well as experienced dietary coders. The senior and junior nutritionists, who served as dietary coding managers (referred to as managers) for the menu data collection and processing, have advanced degrees in nutrition and previous research experience, including supervising numerous studies involving dietary data collection, processing, and analysis. All dietary coders have several years' experience working with Survey Net across a variety of studies. The sections below describe the menu data collection and processing procedures employed in this study.

4.1 Menu Data Collection

The Site Operations Survey contained each site's operating schedule. The operating schedule was used to randomly sample the week(s) of site menus to request from the sites. Two weeks of menus were collected from sites that operated for more than two weeks, and one week of site menus was collected from sites that operated for two weeks or less. One complete menu was coded per site per meal. In addition to actual menus, sites were asked to provide recipes, product sheets, and production records in order to provide as much information as possible about the foods offered.

4.1.1 Menu Data Collector Training

The managers developed standard data collection procedures and trained dietary coders to collect, review, conduct follow-up, and code menus. All coders completed a one-day training where they reviewed the study overview and research questions, completed self-study modules on the use of the reminder script, and completed role play sessions to practice administering the reminder script and collecting site menu data by telephone.

4.1.2 Menu Data Receipt and Initial Review

Menu data collection occurred in concurrence with the Sponsor Survey and the Site Survey, typically within one week of the launch of the summer meal program at a given site. Following the

recruitment of the site (as described in Chapter 3), Westat sent an introductory email to the menu planner. The instructions to submit menus for the sampled week were included in the introductory email that also requested completion of the Site Survey or the Sponsor Survey. The email also included a FAQ attachment that provided details regarding the menu data submission process and timeline. Menu planners were provided the flexibility to submit the menus via mail, email, or fax. For each week of menus requested, all sites received two automated reminder emails; the first email was sent on the last day of the sampled week and the second reminder email was sent two days later. Telephone follow-up was conducted with nonresponding menu planners; those sampled to provide one week's menu were contacted within one week of the second reminder, and those sampled to provide two week's menus were contacted within one week of the second reminder email for the second menu week.

Site menus were received by the DAT for review and processing. Coders conducted an initial review of all site menus to ensure the menu was for the specified week and provided sufficient food details to enable dietary coding. Coders conducted telephone follow-up with menu planners to obtain clarification or additional information as needed. Sites submitted a variety of documentation for the foods offered on the menus, including calendars listing the menu options (which often included details about the foods and portion sizes), production records, and output from menu planning software. These were supplemented with recipes, product information sheets, and additional information in emails and Word documents providing responses to questions. Approximately three-fourths of the sites provided a calendar of the menu offered, while one-half provided either the production menu or output from menu planning software. Approximately forty percent provided recipes, and twenty percent provided product information sheets. Coders compiled all available data to assist in coding the menus.

4.2 Menu Data Processing

Site menu data processing involved several steps, including data review and editing, coding in USDA's Survey Net system, conducting quality control review, and constructing raw data files.

4.2.1 Dietary Coder Training

All dietary coders had prior experience with dietary coding in Survey Net. Prior to coding the site menus, coders completed a 4.5 hour study training. The training provided an overview of the study and an in-depth review of the expected menu data, including types of menus, production records, certification worksheets, product information sheets, standardized recipes, and other types of documents that may be submitted by menu planners. Sample menus were coded by the coders; managers reviewed these and provided feedback as needed. Finally, dietary coders completed an independent review of menu coding procedures. After site menus were received, the coders participated in an eight-hour training session and coded actual site menus, completed guided practice sessions, and participated in discussions on how to resolve coding issues. The managers instructed coders on food codes for school foods, portion sizes, USDA Foods, use of modified food codes, types of menus, and incorporating data from the Site Survey and Menu Planning Survey, as needed. After the training session, managers provided individualized feedback on the coded menus. Managers also held periodic coder meetings to communicate updates to procedures and discuss coding issues and strategies with the team. The coding team utilized a SharePoint site with a list of coding decisions and guidelines to communicate updated procedures in real-time.

4.2.2 Menu Data Review and Editing

Managers reviewed the type of meal pattern followed by the site (i.e., school meal program, SFSP, CACFP) and identified all sampled sites for a given sponsor; coders were assigned menus for all sites for a given sponsor to allow efficient coding of menus that followed a specific meal pattern and offered generally the same food and beverage options. The dietary coders used a checklist approach to conduct a comprehensive review of the submitted menus and recipes prior to entering data in Survey Net. Coders used the checklist to identify data gaps and other potential issues related to dietary coding and discussed the approach to resolving these with the managers. When necessary, dietary coders emailed the menu planners and asked them to provide additional information via email or to schedule a telephone call to discuss the data gaps. After receiving responses (via email or telephone discussion), coders updated the checklist and menus to reflect the responses. When menu planners were not available to assist with the data retrieval efforts, menus were flagged as incomplete. Specific procedures (discussed in Section 4.2.3) were established for menus with missing data elements.

In addition to the review for missing data, dietary coders identified sponsors or menu planners who managed multiple sites in the study; sites under the same sponsor for which the menu was the same for all sites; sites that offered the same menu every day of operations; and menus that reflected different portion amounts for age or grade level groups. Menus for these sites were flagged and handled separately during the coding process, described in Section 4.2.3.

4.2.3 Coding Menu Data

After the menus were reviewed and missing data provided, the coders entered menu data into Survey Net using established procedures. Survey Net (version 4.2) is linked to USDA's Food and Nutrient Database for Dietary Studies 2015-2016 (FNDDS, version 2015-2016), which provides food codes, food descriptions, gram weights, and nutrient values for each food (USDA, ARS; 2018). Four Survey Net fields were adapted to best capture the menu data; instead of entering the data according to the field label, coders used the fields according to specific procedures for this study. For example, coders entered the food name (1% white milk) in the field that normally captures the name of the meal (breakfast), and used the 'Food eaten at home' field to indicate if the fruit or vegetable was peeled.

In Survey Net, coders entered times to reflect the meal occasion (i.e., breakfast, morning snack, lunch, afternoon snack, supper), and then proceeded to enter all food items listed on the menu. In instances when more than one option was provided for a meal component such as a fruit at breakfast or an entrée at lunch, dietary coders recorded the serving size information contained in the menu data, recipe, or production records as a proportion of the total number of items offered for that menu item. For example, for sites that offered two choices for milk, such as one eight-ounce carton each of 1% plain milk and fat-free chocolate milk, the coder entered 4 fluid ounces of 1% plain milk and 4 fluid ounces of fat-free chocolate milk. This method ensured that the nutritional information equally represented all options available on the menu.

Menu items may have been commercially prepared products or prepared locally by the site or a central kitchen. When the manufacturer or the recipe details were not provided with the menu, the DAT researched vended products and USDA websites to obtain data that allowed coders to identify the best match for the menu item. These same sources were later used to determine the amount of each food component provided by the menu item (see Section 4.4). Sources included the USDA

Foods Product Information Sheets,²⁸ Team Nutrition Recipes,²⁹ and the Food Buying Guide for Child Nutrition Programs.³⁰

Dietary coders selected and applied the most relevant food code to individual foods. Coders selected the FNDDS foods with *school* or *school lunch* in the description when searching for the best match, with attention to the form (fresh, canned, or frozen), preparation method (baked or fried), and fat content (regular, low-fat, or nonfat) of the reported menu item. Coders also assigned food codes for grains based on the presence or absence of whole grains. In instances when details on added fat were not specified, coders selected a food code without fat added in cooking. Food items that could not be matched with an existing item in Survey Net were flagged for supervisory review; managers then modified an existing Survey Net recipe by replacing ingredients in the Survey Net recipe to better match the menu item. When recipe modification was not sufficient to match the food item or was not possible because individual ingredients were not listed in the recipe, managers modified the food description and flagged the item for nutrient modification during the creation of the raw data set (described in Section 4.5).

To streamline coding and ensure consistent coding for sponsors with multiple sites in the study using the same menu, sites where a single menu repeated each day, and site menus with different portion amounts for multiple age or grade level groups, the dietary coder entered one menu and flagged it for managerial action. Managers copied the coded menu to the other sites or to the other days of the week using the same menu, or copied the menu and adjusted the portion sizes for the multiple age or grade level groups.

Sites With Different Menus for Each Age Group

If the menu planners submitted menus that reflected portion size adjustments for various age groups, the coder entered the menu data for one age group and logged the portion sizes for other age groups in the decision log. During the review process, managers copied the coded menu from the other age group with the same menu and transferred the portion sizes from the decision log.

²⁸<https://www.fns.usda.gov/usda-fis/usda-foods-product-information-sheets>

²⁹<https://www.fns.usda.gov/tn/team-nutrition-recipes>

³⁰<https://foodbuyingguide.fns.usda.gov/Appendix/DownloadFBG>

Recipe Modifications

All food codes in Survey Net have an underlying recipe that links the food code to items from the National Nutrient Database for Standard Reference (SR), which is the source of the nutrient data for FNNDDS and therefore the Survey Net analysis. The Survey Net recipes may be lists of multiple ingredients and quantities, much like a recipe in a cookbook, or they may be a single item, which may be a simple food (e.g., raw carrots) or a recipe itself (e.g., Lasagna with meat and sauce, frozen entrée). Managers modified recipes in the database as needed to best match the menu items contained in the menus. The guidelines for recipe modification were consistent with those used in SNMCS (Gearan, et al., 2019). As shown in Table 4-1, recipe modifications were primarily made to change the sugar, salt, fat, meat, cheese, grains, milk, mayonnaise, and salad dressing in existing Survey Net recipes.

Table 4-1. Examples of types of recipe modifications

Menu Item	Salt or sugar	Fat	Meat	Cheese	Bread/grain	Milk	Mayo/salad dressing
Multiple ingredient recipes in general	✓						
Vegetables, dry beans or peas	✓	✓					
Rice and pasta	✓	✓					
Eggs and omelets	✓	✓					
Whipped/mashed potatoes	✓	✓				✓	
Garlic bread	✓	✓				✓	
Cooked cereal	✓	✓				✓	
Macaroni and cheese, other mixed dishes with cheese and grain	✓	✓		✓	✓	✓	
Mixed dishes with meat and grain	✓		✓	✓	✓		
Pudding or cream soups	✓					✓	
Salads – not lettuce-based	✓						✓

Recipe modifications were also used to create whole grain-rich versions of grain-based items as needed, resolve non-specified ‘assorted’ food items, simplify the coding when menus included multiple choices within a meal component that repeated every day, and to document the use of USDA Foods. Although Survey Net includes many whole grain-rich varieties of grain and bread items, managers created additional recipe food codes when the needed whole grain-rich option could not be matched. When menus listed “assorted fruit” or “assorted juice” and provided no additional information about the fruits included, managers created a Survey Net recipe that included

the top five most commonly reported fruit and juice options in the study. When a menu reported multiple options for a food and repeated those options every day (e.g., the same six cereals offered at every breakfast for the entire week), managers created a modified food code for that site with all six cereals as ingredients in the recipe. This allowed coders to efficiently enter a single food code for each breakfast. Finally, managers created a modified Survey Net recipe to record the use of USDA Foods, either as a single food item or as an ingredient in a recipe.

In Survey Net, many food codes do not have a recipe listing multiple ingredients, and therefore cannot be modified. In these instances, coders flagged the item for nutrient adjustment in the output data, described in Section 4.5.

Commercially Prepared Items

Many summer menus included commercially prepared items only offered through child nutrition programs (i.e., not available in the public marketplace). A large number of the commercially prepared menu items were grain products such as bread, muffins, crackers, and cookies. In most cases, the menu data identified grain items as enriched, whole grain-rich, or 100% whole grain. Coders were given two options to code these foods. First, coders considered the food codes with the term *school* in the description. Second, they could flag the food item as needing a modified food code. Managers reviewed the flagged items and, if needed, created a modified food code. The modified food code noted the type of the grain in the modified food code description or a modified recipe was developed to match the manufacturer's product information sheet. Manufacturer's product information sheets were used to specify portion sizes and to modify recipes.

Self-serve Food Bars

Self-serve bars include salad bars, taco bars, and breakfast food bars from which students select their own portions. Coders identified standard ingredients for a single item and coded one serving of the standard item. Using a taco bar as an example, all ingredients on a taco bar were added to the single item: one soft taco shell, refried beans, cheese, tomatoes, and sour cream. If multiple options were offered within a meal component, coders entered an equal fraction of the standard portion for each item offered, in order to equally represent all choices.

Incomplete Menu Data

In instances when the menu data was incomplete, the study team assigned food codes and portion sizes after cross-referencing with other menus for the site or menu planner as follows:

- The portion size was missing for one day, but provided for the same food item another day;
- Condiments usually offered with a food item were missing, but were listed other days; or
- A brand or manufacturer name was missing for one day, but was provided other days.

When cross-referencing was not possible and food details were incomplete, coders applied the most relevant coding guidelines based on the data contained in the menus. For example, if food portions were incomplete or missing, they assigned default portion sizes, based on the meal pattern used.

4.3 Quality Control

Managers implemented quality control measures to ensure accurate data entry and documentation of decisions. During the first week of dietary coding, managers reviewed site menus coded by every coder and provided detailed feedback on any errors until the dietary coder was able to code menus with less than five percent of foods requiring correction. On an ongoing basis, managers reviewed the decision log linked to each coded menu and provided feedback to the coder, with particular attention to decisions made, requests for recipe modification, and unresolved issues. Coders received real-time feedback and attended weekly meetings to discuss coding progress, guidelines, and incomplete menus.

After all menus were coded, managers conducted several QC reviews of the coded data. A manager used Survey Net to process the coded menus and generate the food and nutrient data files. Survey Net generates two food and nutrient files: a file that includes all eating occasions and foods per meal per menu day, with nutrient data for each food entered (the individual nutrient file), and a file that includes the daily total for each nutrient (the total nutrient file) for each menu day. Any errors in the coded data result in missing nutrient values; managers reviewed and resolved all errors and regenerated the files.

Once the individual and total nutrient files were cleaned, the DAT performed three rounds of reviews on the individual nutrient files and the daily total nutrient file as a means of identifying

coding errors: portion outlier review, nutrient outlier review, and component review. These reviews were done sequentially, with identified errors corrected prior to the start of the next review. The portion outlier review identified unusually high or low portions for key food items (based on standard portion sizes in Survey Net), while the nutrient outlier review identified meals with unusually high or low amounts of calories, saturated fat, or sodium (based on the dietary specifications from the school meals' meal pattern requirements). The component check identified meals that were missing one or more of the required food components for the meal. Menus flagged by these checks were reviewed by managers, and any coding errors were corrected. The DAT edited and finalized all dietary data files before re-running the Survey Net analysis to obtain corrected food and nutrient output files to be used in the creation of the raw data files.

4.4 Creating Raw Data Files

Using the updated Survey Net output data files, an analyst worked with the DAT to append additional variables required to address the research questions and edited nutrient and food group values as follows:

- **Major and Minor Food Groups.** The DAT assigned each FNDDS food code to one of the food groups developed in Gearan et al, 2019. Foods and beverages were categorized into eight major categories and more than eighty minor categories.
- **Food Pattern Equivalent Database (FPED) Variables.** The Food Pattern Equivalent Database (FPED) 2015-2016 (Bowman et al., 2018) links to FNDDS 2015-2016 food codes and provides standardized amounts of 37 food groups tied to the U.S. Meal Pattern from the Dietary Guidelines for Americans (USDA, HHS, 2015), enabling assessment of compliance with national dietary guidance. Managers identified food codes without a match in the FPED and imputed any needed food group values.
- **Child Nutrition (CN) Food Groups.** Although the FPED provides measures of food components used in the school meal program and SFSP meal patterns, the FPED equivalents are not defined the same way that meal components are defined in the school meal programs and SFSP. In order to more accurately compare the site menu data to the school meal program and SFSP meal patterns, the study team added CN variables linked to the meal pattern food components. Differences between the FPED and the CN variables include:
 - **Meats/Meat Alternates.** The FPED groups for cheese and yogurt were moved to the meats/meat alternates component. The definition of one ounce equivalent of nuts and nut butters; eggs; and yogurt were edited to reflect the definitions used for CN components.

- **Grains.** Grain products have multiple calculations of ounce equivalents in the SFSP meal pattern and they differ from the ounce equivalents used in the school meal programs and FPED; therefore, separate grain variables were added for the SFSP meal pattern and the school meal program meal patterns.
- **Fruits and Vegetables.** FPED cup equivalents did not accurately reflect the portion amounts listed on menus for fruits and vegetables when analyzed using Survey Net. The study team added CN components for fruits, vegetables, and all vegetable subgroups in order to better reflect menu entries.
- **Flags for Food Components and Extra Foods.** The food components listed in the school meal program and SFSP meal patterns include milk, fruit, vegetables, grains, and meat or meat alternates. The study team categorized each FNDDS food code for single foods into a component, and assigned mixed dishes to multiple components. Using guidance from the USDA meal patterns, food codes that did not fit into one of the meal components were categorized as *extra - possible component* and *extra - no component*. These included foods that are allowed, but do not meet the definition of a component food (e.g., pickles), as well as foods that are not allowed, such as whole milk.
- **Flags for Healthier and Less Healthy Foods.** Several variables were added to classify foods as “healthier” or “less healthy.” Healthier meal options include lean meat, whole grain-rich, low-fat cheese or yogurt, and low-fat or fat free milk. The less healthy meal items are those that are high in total sugar, saturated fat, or sodium.

Analyses also modified nutrient and food group variables as follows:

- **Recipe Modification.** FNDDS food codes have underlying recipes, but not all recipes list ingredients that enable modification. When required to match a menu item, managers modified the nutrients or food group equivalents to better reflect the menu item. Examples include:
 - **Whole Grain-rich Grain Items without a Match in FNDDS.** Ounce equivalents for the whole grain and enriched grain FPED variables were modified as needed to create 100% whole grain and whole grain-rich versions of grain products missing from FNDDS.
 - **Low-fat or Low-sodium Products.** Fat and sodium variables were edited to create low-fat or low-sodium versions of products missing from FNDDS.
- **Salt in Cooking.** Although FNDDS adds salt in cooking to most vegetables, this is not the default practice at meal program sites. The sodium variable was edited to remove the salt added in cooking.

5. Weighting

Survey weights were applied to analyses to account for survey nonresponse, and standard errors were adjusted to account for the complex survey design. This chapter describes the procedures used to calculate the survey weights and to conduct variance estimation.

Survey weighting of a randomly selected sample began with the calculation of the base weight, which is the inverse of the sampling probability. This base weight was modified to account for unit nonresponse.³¹ If there are external sources of data, which provide the known or estimated population totals, it is often beneficial to make the weighted sample conform to the population totals. This procedure is called calibration or benchmarking. Traditionally, the base weight is first nonresponse adjusted, and then in the second step, the nonresponse-adjusted weight is calibrated to the known or estimated population totals through an appropriate calibration procedure. This is the two-step weighting procedure, whereas sometimes the first step is skipped and the base weight is directly calibrated in one-step, whose procedure is named so.³² The two-step procedure is considered less prone to nonresponse bias, and it is preferable for weighting for most of the SUMS surveys. However, the one-step procedure was also used when deemed appropriate. For variance estimation, the jackknife method was used. Detailed discussion is subsequently presented for each of the following:

- Weighting of States,
- Weighting of sites,
- Weighting of sponsors,
- Weighting of caregivers, and
- Weighting of teens and children.

³¹There are two types of nonresponse: unit nonresponse, which is the case of an incomplete survey, and item nonresponse, which is a missing value case for an item in a complete survey. If a submitted survey has too many item nonresponses, it is treated as a unit nonresponse. It is customary to handle unit nonresponse by weighting adjustment.

³²For the one-step procedure, it is assumed that a large part of the nonresponse bias will be removed through calibration.

5.1 States

Because States were selected by the systematic sampling method from the sorted list of States by FNS Region, FNS Regions were treated as the strata,³³ and the base weight was calculated as the ratio of the number of States in the FNS Region to the number of sampled States in the Region.³⁴ Since Texas replaced California, the Western Region and the Southwest Region were combined into one stratum; these newly defined FNS Regions are referred to as the recoded FNS Regions in this report.³⁵ The strata defined by the recoded FNS Regions were also used as the variance strata, where jackknife replicates were independently formed.³⁶ Table 5-1 presents the counts of States in the population and the respondent sample, and the State weights by the variance stratum.

Table 5-1. Variance strata and State weights

Variance stratum	Recoded FNS region	Population size*	Respondent sample size	State weight
1	MARO	7	3	2.3333
2	MPRO	10	5	2
3	MWRO	6	2	3
4	NERO	7	3	2.3333
5	SERO	8	4	2
6	SWRO, WRO	13	6	2.1667

*Excludes U.S. Territories

MARO: Mid-Atlantic Regional Office

MPRO: Mountain Plains Regional Office

MWRO: Midwest Regional Office

NERO: Northeast Regional Office

SERO: Southeast Regional Office

SWRO: Southwest Regional Office

WRO: Western Regional Office

³³Systematic sampling defines implicit strata by the sort variables, which can or should be made explicit for weighting purposes. In the case of SUMS, FNS Regions are implicit strata which were made explicit. If implicit stratification is supposed to enhance sampling efficiency, this conversion of implicit strata into explicit strata is necessary to reflect the sampling efficiency in variance estimation.

³⁴This is a simple form of post-stratification weighting since the strata were created after sampling.

³⁵All recoded FNS Regions are the same as the original regions except the combined regions of the Southwest and Western Regions. Therefore, there are six recoded FNS Regions, one less than the number of the original FNS Regions.

³⁶The variance strata are strata which are formed for the purpose of variance estimation. The design strata naturally define the variance strata but sometimes they are defined differently, when it is reasonable to do so for variance estimation. In the case of SUMS, the implicit strata defined by systematic sampling was made explicit, and they became the variance strata. This was necessary to reflect the sampling efficiency that might have been realized by implicit stratification through systematic sampling.

5.2 Sites

The base weight for the site sample (of 3,349) was calculated as the inverse of the sampling probability. Since the frame for new sites that operated in 2018 was incomplete, the base weight for the new sites was raised by a factor of 2.1, to make up the undercoverage of the frame.³⁷

The selected sample included 2,480 eligible (74%) sites; this was considered as the base sample of sites for all site-level samples and its base weight was used repeatedly for nonresponse adjustment for all site-level samples. Several community-level variables from the 2017 five-year American Community Survey (ACS) and 2010 Census data were used to perform nonresponse adjustment using the propensity score method.³⁸ See Table 5-2 for the list and source, variable name, and brief description about these variables.

Table 5-2. Community-level variables from the 2017 five-year ACS and 2010 Census data used for nonresponse adjustment for sites

Source	Variable	Description
ACS2017_5yr	PctAge0to9	Percent population ages 0-9
ACS2017_5yr	Pct_minority	Percent minority (other than non-Hispanic White)
ACS2017_5yr	Pct_forborn	Percent foreign born
ACS2017_5yr	Pct_same_house	Percent in same house 1 year ago
ACS2017_5yr	PctChildWithParent	Percent children under 18 living with parents
ACS2017_5yr	PctFemHead	Percent female head of household
ACS2017_5yr	PctMarriedHHs	Percent households with children under 18 that are married couple HHs
ACS2017_5yr	Educ_LHS	Percent less than high school education
ACS2017_5yr	Educ_AvgYrs	Average years of schooling (estimated)
ACS2017_5yr	Pct_noEngl	Percent non-English speakers
ACS2017_5yr	PctPubAsst	Percent HHs on public assistance
ACS2017_5yr	Crowded	Percent HHs with more than 1 person per room
ACS2017_5yr	NoPhone	Percent HHs with no telephone
ACS2017_5yr	CarOwner	Percent HHs with a vehicle available
ACS2017_5yr	MedHousVal	Median home value (dollars)
ACS2017_5yr	WCIsK	Percent working class
ACS2017_5yr	Pct_lingiso	Percent linguistically isolated households

³⁷At the time of weighting, the full list of sites operating in 2018 including both continuing and new sites was available for the sampled States. The factor of 2.1 was estimated using these data, and it is a measure of undercoverage of the incomplete frame of new sites that was used to select new sites.

³⁸The propensity score method first estimates the propensity of response and uses the estimated response propensity to adjust the base weight for nonresponse.

Table 5-2. Community-level variables from the 2017 five-year ACS and 2010 Census data used for nonresponse adjustment for sites (continued)

Source	Variable	Description
ACS2017_5yr	Pct100Pov	Percent below poverty level
ACS2017_5yr	PctUnempl	Percent unemployed
ACS2017_5yr	PctRentOcc	Percent renter-occupied housing units
ACS2017_5yr	PctHomeOwn	Percent owner-occupied housing units
ACS2017_5yr	MedHHInc	Median household income (dollars)
Census_2010	PopDen	Population density (people per square mile)
Census_2010	PctPopUrban	Percent of population living in urban areas
Census_2010	PopUrbanRuralCat	Categorical variable based on PctPopUrban values
Census_2010	PctHisp	Percent Hispanic
Census_2010	PctWhite	Percent White (non-Hispanic)
Census_2010	PctBlack	Percent Black (non-Hispanic)

HH=Household

The nonresponse-adjusted weight was then calibrated using the raking method, to the national totals assembled from data provided by FNS (i.e., 2018 SFSP and 2016 SSO site counts).³⁹ These data did not have information on site type and urbanicity. The site frame data for the 23 sampled States, which had data on site type and urbanicity, were used to estimate the national totals by these detailed classifications, and the estimated national totals were used in the raking procedure as another dimension. The two raking dimensions and corresponding (national) control totals are shown in Table 5-3a and Table 5-3b.

The jackknife method was used for variance estimation; 65 jackknife replicates were formed by the random group method.⁴⁰ This replicate structure was used for any site-level samples, and any other lower-level samples that were selected in a nested way from the site sample, which include the caregiver samples and the teen and child samples. For each sample, the jackknife replicate weights reflect the original site base weight, nonresponse adjustment for the corresponding site sample, and if necessary, subsequent sampling weights and nonresponse adjustment. Furthermore, they also take

³⁹At the time of weighting, the 2016 data on SSO were the most recently available data.

⁴⁰The jackknife replicates are usually formed by dropping one primary sampling unit (PSU), which is the site for this study, at a time. If followed the usual way, the number of replicates would have been very large (950 for the Site Survey). As a remedy, the random group method is often employed to reduce the number of replicates (see Wolter, K.M. (2007). *Introduction to Variance Estimation*, 2nd Edition. New York: Springer). This method groups randomly PSUs within variance strata into a manageable number of random groups (65 altogether for the current study). The random group is called the variance unit, which is treated as a newly-formed PSU, to create a reduced set of replicates.

into account the weight modification by calibration. The choice of the jackknife method renders this useful flexibility of incorporating various weight adjustments to obtain valid variance estimation. Formation of jackknife replicates and their weights are omitted in the subsequent weighting discussion except for the Sponsor Survey, which deviates from the site replicate structure. The respondent samples for the Site Survey and the Menu Planning Survey were weighted as discussed below.

Table 5-3a. Control totals for the first raking dimension

Level	Site program type	Recoded FNS region ¹	Control total
1	SFSP	MARO	7,605
2	SFSP	MPRO	5,005
3	SFSP	MWRO	9,017
4	SFSP	NERO	5,445
5	SFSP	SERO	16,379
6	SFSP	SW_WRO	13,801
7	SSO	EAST_RO	5,620
8	SSO	WEST_RO	5,739
Total			68,611

Source: Program data provided by FNS.

¹ SW_WRO is the combined region of the FNS Southwest Region and the Western Region. EAST_RO includes the FNS Regions MARO, MPRO, MWRO, NERO and SERO; WEST_RO includes the FNS Regions SWRO and WRO.

MARO: Mid-Atlantic Regional Office

MPRO: Mountain Plains Regional Office

MWRO: Midwest Regional Office

NERO: Northeast Regional Office

SERO: Southeast Regional Office

SWRO: Southwest Regional Office

WRO: Western Regional Office

Table 5-3b. Control totals for the second raking dimension

Level	Site program type	Site type	Urban	Control total
1	SFSP	Closed	0	1,257
2	SFSP	Closed	1	8,534
3	SFSP	Open	0	7,281
4	SFSP	Open	1	40,180
5	SSO	Closed	0	464
6	SSO	Closed	1	1,120
7	SSO	Open	0	2,520
8	SSO	Open	1	7,255
Total				68,611

Source: Program data provided by FNS.

5.2.1 Weighting of the Site Survey

Among the sample of 2,480 sites, 950 sites completed the Site Survey. The site base weight was then modified by the two-step procedure, first for nonresponse adjustment and then for calibration.

Table 5-4 shows the frequency distribution of the final weight. As seen, the variation in the final weight was large but not excessive; this is not surprising because it was derived using multiple layers of adjustments.

Table 5-4. Statistical characteristics of the final Site Survey weight

Sample size	Mean	Minimum	Lower quartile	Median	Upper quartile	Maximum	Standard deviation	Coefficient of variation
950	72.2	8.4	35.8	61.4	90.5	430.2	55.6	76.9%

5.2.2 Weighting of the Menu Planning Survey

Out of the site sample of 2,480 sites, 1,036 sites completed the Menu Planning Survey. Consistent with the weighting of the Site Survey, the two-step weighting procedure was used, and the same base weight and the same community-level variables for nonresponse adjustment were used. The final weight was produced by running the raking procedure with the same control totals. Table 5-5 includes basic statistics of the final weight. The variation in the final weight is similar to that for the Site Survey.

Table 5-5. Statistical characteristics of the final Menu Planning Survey weight

Sample size	Mean	Minimum	Lower quartile	Median	Upper quartile	Maximum	Standard deviation	Coefficient of variation
1036	66.2	8.9	33.2	52.0	82.4	372.8	51.0	77.0%

5.3 Sponsors

As discussed in Chapter 2, all sponsors associated with sampled sites were selected for the study; sponsors associated with multiple sites were selected multiple times. To adjust for multiple chances of selection, the following multiplicity base weight formula was used:

$$\text{Sponsor Base Weight} = \frac{\text{Sum of Base Weights of Sampled Sites Associated with the Sponsor}}{\text{Total Number of Sites Associated with the Sponsor}}$$

All sponsors associated with sites (of 2,480) were selected for the Sponsor Survey, resulting in a sample of 1,378 sponsors. Of these, 453 sponsors completed the survey. In some instances, the sponsor completed the survey but the site through which the sponsor was selected did not, and vice versa. To compensate for the nonrespondent sponsors, the sponsor base weight was adjusted using some variables available for the entire sponsor sample. A limited set of sponsor-level variables was available and these included: sponsor type (SFA/non-SFA), site program type (SFSP/SSO), FNS Region, total number of sites associated with the sponsor, and sum of site base weight used in the multiplicity weighting.⁴¹ The nonresponse adjusted weight was modified to produce the final weight through post-stratification (one of calibration techniques) using estimated population control totals. These totals were estimated by combining the 2016 sponsor population data provided by FNS and lists of 2018 sponsors submitted by 23 sampled States.⁴² The post-strata were defined by the recoded FNS Region (the Southwest and Western Regions were combined). Table 5-6 presents the post-strata and their control totals for post-stratification.

Table 5-6. Control totals for post-stratification for the Sponsor Survey

Post stratum	FNS region	Control total
1	MARO	727
2	MPRO	985
3	MWRO	1,447
4	NERO	664
5	SERO	1,195
6	SWRO and WRO	2,362
Total		7,380

Source: Program data provided by FNS.

MARO: Mid-Atlantic Regional Office

MPRO: Mountain Plains Regional Office

MWRO: Midwest Regional Office

NERO: Northeast Regional Office

SERO: Southeast Regional Office

SWRO: Southwest Regional Office

WRO: Western Regional Office

For variance estimation, 65 jackknife replicates were defined using the random group method. The same number of replicates as used for the site samples were defined but there was no direct connection with the replicate structure for the Site Survey. Sponsors were asked to provide

⁴¹Most sponsors had one type of site but some sponsors had both SFSP and SSO, for which the dominant type was assigned.

⁴²To estimate the 2018 population counts of sponsors, the 2016 counts were trend-adjusted using the 2018 counts submitted by the 23 sampled States through regression modeling.

information about the sampled sites under their sponsorship. To analyze these variables, a site-level weight was developed for 900 sites. The site base weight (of the base site sample) was attached to the sites for which the sponsors answered site questions, and the site base weight was calibrated, skipping the nonresponse adjustment step and running the raking procedure with the population control totals which were used for the Site Survey. There was no nonresponse adjustment since there were no appropriate auxiliary variables. The auxiliary variables used for nonresponse adjustment for the Site Survey were not considered appropriate for this adjustment, because they reflected sponsor (not site) nonresponse behavior. Moreover, using the one-step procedure without the nonresponse adjustment step does not necessarily introduce much bias if calibration is effective in removing the nonresponse bias (Särndal and Lundström, 2005). Basic statistics of the final sponsor weight are presented in Table 5-7.

Table 5-7. Statistical characteristics of the final Sponsor Survey weight

Sample size	Mean	Minimum	Lower quartile	Median	Upper quartile	Maximum	Standard deviation	Coefficient of variation
453	16.3	0.9	4.7	9.1	19.6	184.7	20.3	124.6%

The variation in the final weight was larger than that for the Site Survey – 62 percent larger in terms of the coefficient of variation. This was mainly due to multiplicity weighting, resulting from multiplicity sampling wherein sponsors with many sites were selected with a much higher probability.

5.4 Caregivers

Because caregivers were selected within each sampled site, the site weight was a primary weighting factor for the caregiver weight. Since the respondent sample for the Site Survey was not the same as the site sample that was associated with the respondent caregivers, a new set of site weights were developed. There were 1,288 sites with some respondent caregivers, which were regarded as a respondent sample of sites from the site sample of 2,480 for the purpose of caregiver weighting.

Separate weights were developed for caregivers of participants and nonparticipants, for two reasons: first, there were two samples for caregivers (participant caregivers and nonparticipant caregivers) and second, sampling for the Child/Teen Survey was done differently for participant and nonparticipant

caregivers (see Chapter 2). There were 820 sites associated with the respondent participant caregivers, and 1,147 sites associated with the respondent nonparticipant caregivers.

The sample of 820 sites associated with the respondent participant caregivers was weighted through calibration with the estimated population totals of the site population; the same estimated site population totals were used for weighting the sample data for the Site Survey and other site-level samples. This calibrated site weight was given to the respondent participant caregivers as the primary weighting factor for the participant caregiver weight. Identical procedures were used for the sample of 1,147 sites associated with the nonparticipant caregivers.

The participant caregiver weight within a site where the caregiver was selected was determined by the ratio of the ADA reported by the site to the total number of participants ages 5 through 18 from the respondent caregivers from the site.⁴³ This within-site participant caregiver weight was then multiplied by the calibrated site weight described above to obtain the participant caregiver base weight. This weight was then calibrated using the post-stratification weighting method.

The control totals for the post-stratification were compiled using FNS provided national ADA data for July 2018 and the responses to the question in the Caregiver Survey about the number of participating children and teens. Table 5-8a shows the estimated control totals and the data used for estimation. The estimates for the control totals were derived by dividing the total ADA from the FNS data aggregated at the post-stratum by the average number of participating children and teens. It was estimated that there were nearly 2 million participant caregivers in summer 2018.

⁴³The site sample associated with the participant caregiver sample was different from the respondent Site sample. Therefore, the daily attendance number for those sites not in the Site sample was estimated using the meal counts and daily attendance data submitted by the sampled States.

Table 5-8a. Estimated control totals for the Participant Caregiver Survey

Post stratum	Site program type	Recoded FNS region ¹	Total average daily attendance	Average number of children ages 5 - 18	Estimated control total
1	SFSP	MARO	336,075	1.68750	199,156
2	SFSP	MPRO	159,596	1.82375	87,510
3	SFSP	MWRO	408,920	1.81707	225,043
4	SFSP	NERO	560,358	1.73684	322,630
5	SFSP	SERO	689,516	1.76941	389,687
6	SFSP	SW_WRO	510,982	1.91575	266,727
7	SSO	EAST_RO	361,069	1.67105	216,073
8	SSO	WEST_RO	511,778	1.76652	289,710
Total/Overall			3,538,294	1.78800	1,996,535

Source: Program data provided by FNS.

¹ SW_WRO is the combined region of the FNS Southwest Region and the Western Region. EAST_RO includes the FNS Regions MARO, MPRO, MWRO, NERO, and SERO; WEST_RO includes the FNS Regions SWRO and WRO

MARO: Mid-Atlantic Regional Office

MPRO: Mountain Plains Regional Office

MWRO: Midwest Regional Office

NERO: Northeast Regional Office

SERO: Southeast Regional Office

SWRO: Southwest Regional Office

Given the nature of the Summer Meals Programs, the estimates on number of nonparticipant caregivers within each respondent site were not available, and the following data and assumptions were used to calculate the within-site nonparticipant caregiver weight:

1. The March 2018 ADA in the National School Lunch Program (NSLP) was taken as a hypothetical ADA. This assumed that the entire eligible population would have participated in the summer meals program. If A represented the number of eligible children and B represented the July 2018 ADA in the summer meal programs, then the difference between A and B, i.e., C ($C = A - B$) could be considered the ADA portion that could be attributed to the nonparticipant caregiver (NPCG) population. Using this approach, the study defined the ratio $R = C/B$, which made it feasible to calculate R at the State-level and at any aggregated group of States (e.g., recoded FNS region level).
2. Using the same method used for the participant caregiver (PCG) sample, the within-site PCG weight was calculated and taken as the number of PCGs in a given site. This number was multiplied by the State-level ratio (R) described in Point 1 above to estimate the number of NPCGs for the site. For example, the ratio for Maryland was 4.5 (i.e., there were 4.5 times more nonparticipant caregivers than the number of participant caregivers on average in Maryland). If a site in Maryland had an estimated number of PCGs of 200, then the estimated number of NPCGs in the site was 900 ($= 4.5 \times 200$). Note that the same R was used for all sites within the State.

3. The within-site NPCG weight was then calculated by dividing the estimated number of NPCGs (defined in Point 2 above) by the number of respondent NPCGs from the site.
4. Finally, the NPCG weight calculated in Point 3 above was calibrated through post-stratification using the control totals compiled at the recoded FNS Region level, which are simply the inflated control totals in Table 5-8a by the ratio (R) at the recoded FNS Region level, as presented in Table 5-8b.

Table 5-8b. Estimated control totals for the Nonparticipant Caregiver Survey

Post stratum	Site program type	Recoded FNS region	Estimated control total	Ratio: NPCG to PCG	Estimated control total for NPCG
1	SFSP	MARO	199,156	4.3560	867,531
2	SFSP	MPRO	87,510	6.2888	550,329
3	SFSP	MWRO	225,043	5.2363	1,178,401
4	SFSP	NERO	322,630	2.1905	706,738
5	SFSP	SERO	389,687	4.6788	1,823,268
6	SFSP	SW_WRO	266,727	6.6752	1,780,444
7	SSO	EAST_RO	216,073	4.2423	916,641
8	SSO	WEST_RO	289,710	6.6752	1,933,859
Total/Overall			1,996,535	4.9209	9,757,211

Source: Program data provided by FNS.

NPCP=Nonparticipant caregiver

PCG=Participant caregiver

MARO: Mid-Atlantic Regional Office

MPRO: Mountain Plains Regional Office

MWRO: Midwest Regional Office

NERO: Northeast Regional Office

SERO: Southeast Regional Office

SWRO: Southwest Regional Office

SW_WRO is the combined region of the FNS Southwest Region and the Western Region.

EAST_RO includes the FNS Regions MARO, MPRO, MWRO, NERO, and SERO

WEST_RO includes the FNS Regions SWRO and WRO.

Summary statistics of the final weights of the Caregiver Surveys are shown in Table 5-9.

Table 5-9. Statistical characteristics of the final Caregiver Survey weights

Survey	Sample size	Mean	Minimum	Lower quartile	Median	Upper quartile	Maximum	Standard deviation	Coefficient of variation
PCG	1,722	1,159.4	8.9	154.5	444.2	1,330.0	9,560.6	1,705.1	147.1%
NPCG	2,966	3,289.7	15.4	605.5	1,635.7	3,898.1	17,388.7	4,179.3	127.0%

PCG=Participant caregiver

NPCP=Nonparticipant caregiver

5.5 Teens and Children

Respondent participant caregivers were asked to select a child or teen (ages 5 through 18) from their household. Within households that were instructed to select a child between 5 and 12 years of age, the selected child was asked to complete a Child Survey with their caregiver; if they were instructed to select a child ages 13 through 18, the selected teen completed the Teen Survey. The within-caregiver weight for such a person was easily determined, as the survey responses included data on the number of participant children and teens. However, not every selected child or teen responded to the Child/Teen Survey, and nonresponse adjustment was performed using data from the Caregiver Survey. This within-caregiver weight was then multiplied by the caregiver weight, and the resulting weight was calibrated (post-stratification) using the population totals of participants based on the 2018 July ADA data provided by FNS. Note that this weight was given to the respondent child or teen. Table 5-10 shows the control totals.

Table 5-10. Control totals for the Participant Child/Teen Survey

Post stratum	Site program type	Recoded FNS region	Control total
1	SFSP	MARO	336,075
2	SFSP	MPRO	159,596
3	SFSP	MWRO	408,920
4	SFSP	NERO	560,358
5	SFSP	SERO	689,516
6	SFSP	SW_WRO	510,982
7	SSO	EAST_RO	361,069
8	SSO	WEST_RO	511,778
Total			3,538,294

Source: Program data provided by FNS.

MARO: Mid-Atlantic Regional Office

MPRO: Mountain Plains Regional Office

MWRO: Midwest Regional Office

NERO: Northeast Regional Office

SERO: Southeast Regional Office

SWRO: Southwest Regional Office

WRO: Western Regional Office

SW_WRO is the combined region of the FNS Southwest Region and the Western Region.

EAST_RO includes the FNS Regions MARO, MPRO, MWRO, NERO, and SERO

WEST_RO includes the FNS Regions SWRO and WRO.

The Nonparticipant Teen Survey was conducted with a sample of nonparticipant teens selected from the respondent nonparticipant caregivers. The within-caregiver weight was determined by the number of nonparticipant teens in the caregiver household – the weight is this number divided by

one, which is the same as the number, since only one teen was selected. This weight was nonresponse adjusted using data from the Nonparticipant Caregiver Survey. At the last step, the nonresponse-adjusted weight was multiplied by the caregiver weight and further modified through a calibration (post-stratification method) procedure. The control totals used for the calibration procedure were obtained by the multiple of the control total for the Participant Child/Teen Survey (given in Table 5-10) and the ratio R (given in Table 5-8b) and the percentage of teens estimated from the Nonparticipant Caregiver Survey data. Table 5-11 provides those control totals obtained as the multiple of the three factors, which are also shown in the table.

Table 5-11. Estimated control totals for the Nonparticipant Teen Survey

Post stratum	Site program type	Recoded FNS region	Estimated control total for PCG	Ratio: NPCG to PCG	Teen percentage	Estimated control total for NPCG
1	SFSP	MARO	336,075	4.3560	0.3704	542,252
2	SFSP	MPRO	159,596	6.2888	0.3801	381,448
3	SFSP	MWRO	408,920	5.2363	0.3690	790,215
4	SFSP	NERO	560,358	2.1905	0.4211	516,848
5	SFSP	SERO	689,516	4.6788	0.3681	1,187,617
6	SFSP	SW_WRO	510,982	6.6752	0.3422	1,167,121
7	SSO	EAST_RO	361,069	4.2423	0.3302	505,802
8	SSO	WEST_RO	511,778	6.6752	0.3353	1,145,428
Total/Overall			3,538,294	4.9209	0.3577	6,236,731

Source: Program data provided by FNS.

PCG=Participant caregiver

NPCG=Nonparticipant caregiver

MARO: Mid-Atlantic Regional Office

MPRO: Mountain Plains Regional Office

MWRO: Midwest Regional Office

NERO: Northeast Regional Office

SERO: Southeast Regional Office

SWRO: Southwest Regional Office

SW_WRO is the combined region of the FNS Southwest Region and the Western Region.

EAST_RO includes the FNS Regions MARO, MPRO, MWRO, NERO, and SERO

WEST_RO includes the FNS Regions SWRO and WRO.

Many layers of weighting applied to the Participant Child/Teen Survey and the Nonparticipant Teen Survey rendered highly variable weights, which in turn make the survey weighted estimates inefficient. To reduce this effect, the top fifth percentile weights were truncated, and then the weights were re-calibrated to obtain the final weights. Table 5-12 presents summary statistics of the final weights.

Table 5-12. Statistical characteristics of the final Participant Child/Teen Survey and Nonparticipant Teen Survey weights

Survey	Sample size	Mean	Minimum	Lower quartile	Median	Upper quartile	Maximum	Standard deviation	Coefficient of variation
PCT	930	3,804.6	14.7	473.1	1,339.3	4,692.6	19,370.8	5,190.8	136.4%
NPT	814	7,661.8	23.6	1,245.1	3,514.4	10,141.8	40,435.6	9,507.2	124.1%

PCT=Participant Child/Teen Survey

NPT=Nonparticipant Teen Survey

6. Survey Nonresponse Bias Analysis

Nonresponse bias analysis (NRBA) was conducted for two site-level surveys (the Site Survey and the Menu Planning Survey), the Sponsor Survey, the Caregiver Survey, and the Teen and Child Surveys. The goal of the NRBA was to assess potential bias due to survey nonresponse. Results from the NRBA do not find evidence of significant bias.

6.1 Site-level Surveys

The site-level surveys include two surveys: the Site Survey and Menu Planning Survey. Nonresponse bias analyses was conducted to estimate the extent of potential bias due to unit nonresponse; this involved a comparison of community-level characteristics available in the sample frame, which were used as auxiliary variables for nonresponse weighting adjustment with their weighted mean values. Findings from the analysis revealed significant differences. This means that the nonresponse weight adjustment might not have eliminated the potential bias for the survey variables that are correlated with the auxiliary variables with significant differences; these variables are referred to as the misrepresented variables (i.e., the weighted sample estimates do not properly represent the frame values). Further investigation was then performed to gauge the potential bias that might be remaining by the failure of the nonresponse weighting adjustment to eliminate the potential bias. This was done through regression modeling, with the key survey variables as dependent variables and the misrepresented variables as independent variables. If the model is strongly predictive, it indicates potential bias for the key variables.

Twenty-seven auxiliary variables were included in the analysis; these included community-level characteristics at the Census-tract or county levels from secondary data sources, such as Census 2010 and the American Community Survey, at the location of sites. There were small numbers of cases with missing values; these cases were excluded from the analysis. The frame data at the national-level were not available, but the complete frame for the sampled States was available. This is referred to as the frame for the sampled States, or simply, the frame. However, since the frame itself was a sample, it was weighted by the State sampling weight when compared with the sample weighted estimates.

After identifying significantly misrepresented auxiliary variables through comparison of the frame and sample estimates, a logistic or linear regression model was employed depending on whether the key variables were categorical or continuous to examine the predictive power of the regression model using the likelihood ratio test. If the model was significant, its predictive power was discriminated using the R-square statistic for the continuous key variable. For categorical key variables, the Max-rescaled R-square (Nagelkerke, 1991) were used to determine where the potential bias could be serious or not. A criterion was established to determine seriousness of the potential bias as follows: if the R-square statistic or the Max-rescaled R-square is less than 10 percent, the potential bias is small and negligible, and if it is between 11 and 30 percent, then the potential bias is not negligible but not serious. If it is between 31 and 60 percent, the potential bias is somewhat serious, and if it is higher than 60 percent, the potential bias is very serious. The key variables for the Site Survey and the Menu Planning Survey are presented in Table 6-1 and Table 6-2, respectively.

Table 6-1. Key variables of the Site Survey

Variable name	Variable description	Type of variable
Site size	Four-level category of size of site in average daily attendance: 1=1-50, 2=51-100, 3=101-250, 4=250+	Ordered Categorical
Operates other child nutrition programs	Indicator whether site receives federal funding to operate other child nutrition programs at times other than summer: 1=Yes, 0=No	Binomial
Site setting	Setting of site location (23 categories collapsed into 7)	Unordered Categorical
Site operating days	Duration of site operations in days	Continuous

Source: USDA Summer Meals Study, Site Survey, summer 2018.

Table 6-2. Key variables of the Menu Planning Survey

Variable name	Variable description	Type of variable
Site size	Size of site in average daily attendance: 1=1-50, 2=51-100, 3=101-250, 4=250+	Ordered Categorical
Operates other child nutrition programs	Indicator whether site receives federal funding to operate other child nutrition programs at times other than summer: 1=Yes, 0=No	Binomial
Meal preparation or procurement	How site provides summer meals and/or snacks (e.g., onsite/central kitchen, commercial vendor, SFA)	Unordered Categorical
Meal pattern followed	SFSP, CACFP, NSLP/SBP	Unordered Categorical
Local foods	How often site uses local foods	Ordered Categorical
Fresh fruits and vegetables	How often the summer meals and snacks include fresh fruits and vegetables	Ordered Categorical

USDA Summer Meals Study, Menu Planning Survey, summer 2018.

Results for the Site Survey

Results of comparison between the frame estimates and sample estimates for 27 auxiliary variables are shown in Table 6-3. The table also shows which variables are of significant difference, suggesting the potential bias. There were eight misrepresented variables with a significant difference. Three logistic regression models for the three categorical key variables, and one linear regression model for the continuous key variable with the eight identified auxiliary variables as independent variables were run, and the run results are summarized in Table 6-4. According to the criteria described above, none of the key variables would suffer a serious bias problem.

Table 6-3. Comparison of the frame means with the weighted sample means for the auxiliary variables for the Site Survey

Description	Frame N	Frame mean	Sample N	Weighted sample mean	Confidence Interval of difference		P-value
					Lower	Upper	
Percent HHs with a vehicle available	32,726	87.0	949	87.6	-1.35	0.19	0.139
Percent HHs with more than 1 person per room	32,726	4.4	949	4.4	-0.33	0.36	0.934
Average years of schooling (estimated)	32,753	13.4	949	13.5	-0.08	0.05	0.611
Percent less than high school education	32,753	19.0	949	18.4	-0.15	1.32	0.116
Median household income (dollars)	32,700	44,710	948	45,902	-2,327	-57	0.040*
Median home value (dollars)	32,332	148,639	939	153,7010	-11,280	1,138	0.109
Percent HHs with no telephone	31,916	3.0	931	3.0	-0.13	0.27	0.500
Percent foreign born	32,753	13.2	949	13.5	-1.18	0.57	0.494
Percent linguistically isolated households	32,726	6.6	949	6.4	-0.36	0.76	0.476
Percent minority (other than non-Hispanic White)	32,753	56.1	949	53.5	0.65	4.63	0.009**
Percent non-English speakers	32,753	2.1	949	2.1	-0.20	0.32	0.654
Percent in same house 1 year ago	32,753	84.0	949	84.5	-1.08	0.20	0.178
Percent below poverty level	32,730	23.1	949	22.0	0.17	2.01	0.020*
Percent population ages 0-9	32,753	13.5	949	13.4	-0.11	0.42	0.263
Percent Black (non-Hispanic)	32,765	28.0	949	25.2	1.01	4.50	0.002**
Percent children under 18 living with parents	32,714	84.6	949	85.0	-1.18	0.23	0.189
Percent female head of household	32,726	18.7	949	18.1	-0.07	1.34	0.078
Percent Hispanic	32,765	21.5	949	21.3	-1.50	1.92	0.808
Percent owner-occupied housing units	32,726	55.2	949	55.5	-1.85	1.15	0.645
Percent HHs with children under 18 that are married couple HHs	32,714	51.5	949	53.3	-3.19	-0.32	0.016*
Percent pop living in urban areas	32,765	84.4	949	82.5	0.22	3.58	0.027*
Percent HHs on public assistance	32,726	23.1	949	22.2	-0.12	1.75	0.087
Percent renter-occupied housing units	32,726	44.8	949	44.5	-1.15	1.85	0.645
Percent unemployed	32,745	9.4	949	8.9	0.13	0.84	0.008**
Percent White (non-Hispanic)	32,765	45.2	949	48.2	-5.00	-0.96	0.004**
Population density (people per square mi)	32,773	4,240	950	4,327	-455	282	0.646
Percent working class	32,745	69.2	949	68.9	-0.65	1.40	0.476

Source: American Community Survey, 2013-2017.

HH=Household

* P-value is less than 0.05 but greater than or equal to 0.01

** P-value is less than 0.01

Table 6-4. R-square statistics for the four regression models for the Site Survey

Key variable	Model significance		Max-rescaled R-square ¹	Potential bias
	Test statistic	P-value		
Site size	Chi-square = 44.6	< 0.0001	0.058	Small
Operates other child nutrition programs	Chi-square = 25.0	< 0.0001	0.042	Small
Meal preparation or procurement	Chi-square = 46.5	< 0.0001	0.051	Small
Site operating days	F = 4.49	< 0.0001	0.029	Small

Source: USDA Summer Meals Study, Site Survey, summer 2018.

¹ The Max-rescaled R-square becomes the R-square for linear regression for a continuous dependent variable.

Results for the Menu Planning Survey

Results of comparisons between the frame estimates and sample estimates for 27 auxiliary variables are shown in Table 6-5. The table also shows several variables which are of significant difference, suggesting the potential for bias. Six logistic regression models were run to examine the predictive power, and the results are summarized in Table 6-6. According to the established criteria, it appears that the potential bias for all key variables is small.

Table 6-5. Comparison of the frame means with the sample means for the auxiliary variables for the Menu Planning Survey

Variable	Frame N	Frame mean	Sample N	Weighted sample mean	Confidence Interval of difference		P-value
					Lower	Upper	
Percent HHs with a vehicle available	32,726	87.0	1,035	87.6	-1.35	0.11	0.098
Percent HHs with more than 1 person per room	32,726	4.4	1,035	4.5	-0.35	0.26	0.791
Average years of schooling (estimated)	32,753	13.4	1,035	13.5	-0.13	0.03	0.229
Percent less than high school education	32,753	19.0	1,035	18.3	-0.11	1.56	0.088
Median household income (dollars)	32,700	44,710	1,034	46,551	-3,422	-260	0.022*
Median home value (dollars)	32,332	148,639	1,024	155,083	-12,762	-127	0.046*
Percent HHs with no telephone	31,916	3.0	1,009	3.0	-0.16	0.22	0.774
Percent below poverty level	32,730	23.1	1,035	22.1	-0.11	2.16	0.076
Percent population ages 0-9	32,753	13.5	1,035	13.6	-0.40	0.21	0.556
Percent Black (non-Hispanic)	32,765	28.0	1,035	26.1	-0.06	3.92	0.057
Percent children under 18 living with parents	32,714	84.6	1,035	85.1	-1.21	0.06	0.078
Percent female head of household	32,726	18.7	1,035	18.4	-0.52	1.19	0.444
Percent Hispanic	32,765	21.5	1,035	21.0	-1.32	2.43	0.561
Percent owner-occupied housing units	32,726	55.2	1,035	55.1	-1.50	1.58	0.957
Percent HHs with children under 18 that are married couple HHs	32,714	51.5	1,035	52.6	-2.87	0.66	0.220
Percent population living in urban areas	32,765	84.4	1,035	83.9	-1.11	2.02	0.568
Percent HHs on public assistance	32,726	23.1	1,035	22.4	-0.50	1.87	0.259
Percent renter-occupied housing units	32,726	44.8	1,035	44.9	-1.58	1.50	0.957
Percent unemployed	32,745	9.4	1,035	9.0	0.01	0.87	0.045*
Percent White (non-Hispanic)	32,765	45.2	1,035	47.3	-4.41	0.15	0.067
Percent foreign-born	32,753	13.2	1,035	13.3	-1.03	0.85	0.850
Percent linguistically isolated households	32,726	6.6	1,035	6.2	-0.15	0.93	0.157
Percent minority (other than non-Hispanic White)	32,753	56.1	1,035	54.0	-0.14	4.40	0.066
Percent non-English speakers	32,753	2.1	1,035	2.0	-0.12	0.40	0.285
Percent in same house 1 year ago	32,753	84.0	1,035	84.5	-1.01	0.12	0.121
Population density (people per square mi)	32,773	4,240	1,036	4,189	-342	446	0.797
Percent working class	32,745	69.2	1,035	68.5	-0.43	1.93	0.211

Source: American Community Survey, 2013-2017.

HH=Household

* P-value is less than 0.05 but greater than or equal to 0.01

Table 6-6. R-square statistics for the six regression models of the Menu Planning Survey

Variable name	Model significance		Max-rescaled R-square ¹	Potential bias
	Chi-square value	P-value		
Site size	12.3	0.0004	0.018	Small
Operates other child nutrition programs	7.3	0.0070	0.014	Small
Meal preparation or procurement	89.3	<0.0001	0.072	Small
Meal pattern followed	5.4	0.0200	0.007	Small
Local foods	10.3	0.0013	0.014	Small
Fresh fruits and vegetables	5.9	0.0319	0.009	Small

Source: USDA Summer Meals Study, Menu Planning Survey, summer 2018. American Community Survey, 2013-2017

¹ The Max-rescaled R-square becomes the R-square for linear regression for a continuous dependent variable.

6.2 Sponsor Survey

The sample of the Sponsor Survey was selected through the site sample for the Site Survey, and its base weight was calculated by the multiplicity principle based on the site selection probabilities. The base weight was then modified to adjust for sponsor nonresponse. There was a very limited set of auxiliary variables that could be used for nonresponse adjustment. Those available auxiliary variables are listed in Table 6-7. Although limited, it was assumed that these variables would substantially reduce the bias caused by nonresponse.

Table 6-7. Variables used for nonresponse adjustment for the Sponsor Survey

Variable name	Description
Sponsor type	SFA and non-SFA
Program type	SFSP and SSO
FNS region ¹	FNS regions from 2018
Number of sites	Number of sites under the sponsor in the sampled States
Site weights	Sum of the multiplicity base weights associated with the sponsor

Source: State Child Nutrition Program Administrative Data from 2018.

¹ The Southwest Regional Office and Western Regional Office were combined into one region.

For these variables, the frame estimates (weighted by the State weight) and the sample estimates (weighted by the final survey weight) were compared. The first three variables are categorical, and they were compared using the Chi-square test, whereas for the last two continuous variables, the t-test was used. The results of comparison are shown in Table 6-8a and Table 6-8b.

Table 6-8a. Comparison of frame and sample estimates for categorical auxiliary variables for the Sponsor Survey

Variable	Frame N	Sample N	Chi-square	P-value
Sponsor type	1,112	453	0.30	0.5842
Program type	1,158	453	0.11	0.7443
FNS region	1,158	453	31.38	<0.0001**

Source: State Child Nutrition Program Administrative Data from 2018.

** P-value is less than 0.01

Table 6-8b. Comparison of frame and sample estimates for continuous auxiliary variables for the Sponsor Survey

Variable	Frame N	Sample N	Mean difference	Standard error	T-value	P-value
Number of sites	1,158	453	-1.90	0.91	-2.08	0.0414*
Site weights	1,158	453	-0.60	2.26	-0.27	0.7914

Source: State Child Nutrition Program Administrative Data from 2018.

* P-value is less than 0.05 but greater than or equal to 0.01

Among the categorical auxiliary variables, the distribution of FNS region is found to be significantly different from that of the sample, even with the nonresponse adjusted weight. For other variables, the difference is not significant. Among the continuous variables, the number of sites variable is only marginally significant at the 5 percent level.

With the two variables identified to be misrepresented even after nonresponse adjustment, survey key variables were examined using regression models as done before to search for non-negligible potential bias. Table 6-9 presents the key variables and the results of the exercise.

Table 6-9. R-square statistics for the three regression models of the Sponsor Survey

Key variable	Model significance		Max-rescaled R-square ¹	Potential bias
	Test statistic	P-value		
Categorical				
Sponsor type	Chi-sq = 34.7	< 0.001	0.102	Non-negligible, but not serious
Continuous				
Number of summers in operation	F = 10.6	< 0.001	0.130	Non-negligible, but not serious
Number of meals and/or snacks served	F = 2.6	0.026	0.146	Non-negligible, but not serious

Source: USDA Summer Meals Study, Sponsor Survey, summer 2018.

¹ The Max-rescaled R-square becomes the R-square for linear regression for a continuous dependent variable.

All models are significant, and their R-square or Max-rescaled R-square is greater than 0.1 but less than 0.3, which indicates that the potential bias is non-negligible, but not serious according to the criterion.

6.3 Caregiver, Teen, and Child Surveys

To understand the NRBA for these surveys, it is necessary to know their weighting procedure. Nested sampling was used for these surveys by selecting the caregiver sample from sampled sites and teens and children from the sampled caregivers. Weighting was done based on this sampling feature. However, the respondent sites to the Site Survey are different from the sample of sites associated with the respondents of the Caregiver Survey, and therefore, they were independently weighted from the respondent sample of the Site Survey.

The Caregiver Survey has two components: participant caregivers and nonparticipant caregivers. The set of sites associated with the Participant Caregiver (PCG) Survey is referred to as the PCG site sample, and that for the Nonparticipant Caregiver (NPCG) Survey as the NPCG site sample. Weighting of these site samples was done in the same way as for the Site Survey; the same set of auxiliary variables in the site frame was used for nonresponse adjustment for the PCG and NPCG samples. Subsequent within-site weighting of caregivers was performed using information collected by the Site Survey assuming that the respondent caregivers from a given site were a simple random sample of households around the site. This approach was taken because there were not appropriate auxiliary variables for more elaborate nonresponse adjustment within the site. Therefore, nonresponse bias analysis at the household-level was infeasible. It was conjectured that since the PCG and NPCG site samples were identified from the respondent caregivers, the nonresponse behavior of caregivers could be predicted using the rich site-level auxiliary variables.

Based on this premise, misrepresented site-level auxiliary variables were identified exactly the same way as done for the Site Survey. That is, 27 auxiliary variables were compared in their weighted means between the site frame data from the sampled States and the PCG site sample or the NPCG site sample. The results of the comparison are presented in Table 6-10 for the PCG site sample and Table 6-11 for the NPCG site sample. None of the auxiliary variables was significantly different between the frame and both samples, and hence no further investigation was made. The results indicate that up to the site sample, any bias that is related to the community-level auxiliary variables does not exist. Moreover, both participant and nonparticipant caregiver samples were benchmarked to some known national totals, which is expected to help reduce some bias, should it exist.

Table 6-10. Comparison of the frame means with the sample means for the auxiliary variables for the Participant Caregiver Survey

Description	Frame N	Weighted frame mean	Sample N	Weighted sample mean	Confidence Interval of difference		P- value
					Lower	Upper	
Percent HHs with a vehicle available	32,726	87.0	819	87.3	-1.28	0.68	0.548
Percent HHs with more than 1 person per room	32,726	4.4	819	4.5	-0.36	0.26	0.750
Average years of schooling (estimated)	32,753	13.4	819	13.4	-0.07	0.09	0.851
Percent less than high school education	32,753	19.0	819	18.7	-0.56	1.21	0.476
Median household income (dollars)	32,700	44,710	819	44,015	-903	2,293	0.394
Median home value (dollars)	32,332	148,639	808	144,969	-4,081	11,421	0.353
Percent HHs with no telephone	31,916	3.0	802	3.0	-0.15	0.19	0.825
Percent below poverty level	32,730	23.1	819	23.0	-1.18	1.43	0.853
Percent population ages 0-9	32,753	13.5	819	13.6	-0.44	0.23	0.549
Percent Black (non-Hispanic)	32,765	28.0	819	27.3	-1.49	2.93	0.523
Percent children under 18 living with parents	32,714	84.6	819	84.6	-0.87	0.68	0.811
Percent female head of household	32,726	18.7	819	18.7	-0.95	0.97	0.984
Percent Hispanic	32,765	21.5	819	20.6	-0.90	2.80	0.313
Percent owner-occupied housing units	32,726	55.2	819	55.0	-1.43	1.77	0.839
Percent HHs with children under 18 that are married couple HHs	32,714	51.5	819	51.7	-2.12	1.77	0.858
Percent pop living in urban areas	32,765	84.4	819	83.6	-0.54	2.15	0.242
Percent HHs on public assistance	32,726	23.1	819	22.9	-1.36	1.60	0.869
Percent renter-occupied housing units	32,726	44.8	819	45.0	-1.77	1.43	0.839
Percent unemployed	32,745	9.4	819	9.1	-0.21	0.76	0.262
Percent White (non-Hispanic)	32,765	45.2	819	46.8	-4.34	1.06	0.234
Percent foreign-born	32,753	13.2	819	12.8	-0.54	1.37	0.397
Percent linguistically isolated households	32,726	6.6	819	6.3	-0.23	0.96	0.228
Percent minority (other than non-Hispanic White)	32,753	56.1	819	54.4	-0.96	4.33	0.213
Percent non-English speakers	32,753	2.1	819	2.0	-0.12	0.43	0.276
Percent in same house 1 year ago	32,753	84.0	819	84.3	-5	-0.96	0.411
Population density (people per square mi)	32,773	4,240	820	4,145	-455	282	0.739
Percent working class	32,745	69.2	819	69.6	-0.65	1.4	0.530

Source: American Community Survey, 2013-2017.

HH=Household

Table 6-11. Comparison of the frame means with the sample means for the auxiliary variables for the Nonparticipant Caregiver Survey

Description	Frame N	Weighted frame mean	Sample N	Weighted sample mean	Confidence Interval of difference		P- value
					Lower	Upper	
Percent HHs with a vehicle available	32,726	87.0	1,147	87.0	-0.82	0.85	0.972
Percent HHs with more than 1 person per room	32,726	4.4	1,147	4.5	-0.42	0.30	0.734
Average years of schooling (estimated)	32,753	13.4	1,147	13.4	-0.07	0.07	0.980
Percent less than high school education	32,753	19.0	1,147	18.8	-0.58	0.94	0.646
Median household income (dollars)	32,700	44,710	1,146	45,135	-17,973	948	0.544
Median home value (dollars)	32,332	148,639	1,134	150,792	-8,674	4,367	0.517
Percent HHs with no telephone	31,916	3.0	1,124	3.0	-0.10	0.23	0.425
Percent below poverty level	32,730	23.1	1,147	22.9	-0.90	1.30	0.722
Percent population ages 0-9	32,753	13.5	1,147	13.6	-0.33	0.29	0.897
Percent Black (non-Hispanic)	32,765	28.0	1,147	26.9	-0.82	3.01	0.262
Percent children under 18 living with parents	32,714	84.6	1,147	84.8	-0.84	0.30	0.356
Percent female head of household	32,726	18.7	1,147	18.9	-0.93	0.63	0.706
Percent Hispanic	32,765	21.5	1,147	21.7	-2.00	1.74	0.894
Percent owner-occupied housing units	32,726	55.2	1,147	54.8	-0.76	1.44	0.545
Percent HHs with children under 18 that are married couple HHs	32,714	51.5	1,147	51.5	-1.39	1.38	0.991
Percent pop living in urban areas	32,765	84.4	1,147	84.4	-1.51	1.59	0.961
Percent HHs on public assistance	32,726	23.1	1,147	23.2	-1.22	1.01	0.854
Percent renter-occupied housing units	32,726	44.8	1,147	45.2	-1.44	0.76	0.545
Percent unemployed	32,745	9.4	1,147	9.2	-0.25	0.69	0.367
Percent White (non-Hispanic)	32,765	45.2	1,147	46.0	-2.73	1.22	0.454
Percent foreign born	32,753	13.2	1,147	13.4	-1.07	0.63	0.617
Percent linguistically isolated households	32,726	6.6	1,147	6.6	-0.50	0.61	0.839
Percent minority (other than non-Hispanic White)	32,753	56.1	1,147	55.3	-1.07	2.74	0.389
Percent non-English speakers	32,753	2.1	1,147	2.2	-0.32	0.27	0.856
Percent in same house 1 year ago	32,753	84.0	1,147	84.4	-1.00	0.32	0.312
Population density (people per square mi)	32,773	4,240	1,147	4,457	-580	147	0.243
Percent working class	32,745	69.2	1,147	69.0	-0.82	1.28	0.665

Source: American Community Survey, 2013-2017.

HH=Household

The Teen and Child Survey samples were selected from respondent caregivers, and their base weights within caregivers were calculated based on the number of eligible children and teens reported by the caregivers. However, not all selected children and teens responded. Nonresponse adjustment within caregivers was performed using the caregiver data as auxiliary variables.

The NRBA for the Teen and Child Surveys was focused on this nonresponse adjustment using the same methodology used for the site-level samples. Namely, the auxiliary data in the sampling frame (i.e., the caregiver data) from which the sample was taken, are compared with weighted estimates of the same auxiliary variables using the within-caregiver nonresponse adjusted weights. The results of this comparison are presented in Table 6-12 for the Participant Child/Teen Survey and Table 6-13 for the Nonparticipant Teen Survey. Each table has two parts; part A for categorical variables, which shows the Chi-square statistics for comparison of the distribution between the frame and the sample; and part B for continuous variables, which provides comparison of the means.

Dichotomous variables with 0 and 1 answers were treated as continuous variables, of which the mean is the proportion, where those coded as character variables other than numerical 0/1 were treated as categorical variables.

Table 6-12a. Comparison of the frame and sample distribution for the categorical auxiliary variables for the Participant Child/Teen Survey

Variable	Frame N	Sample N	Chi-square	P-value
When did respondent first find out about program (i.e., this year, last year, a few years ago, not sure)	1609	897	7.2	0.0657
Month that respondent found out about the program	1509	832	53.1	<0.0001**
Child sex	1700	918	0.6	0.4477
Relationship to child	1712	924	2.3	0.7997
Respondent age	1710	923	4.5	0.3412
Respondent sex	1713	922	0.2	0.6622
Respondent highest level of school completed	1712	923	12.2	0.2035
Household income category	1677	910	5.1	0.6501
Household financial condition	1687	907	2.0	0.7318
Preferred method of incentive payment (cash or gift card)	1692	910	3.4	0.0633
Age group of child selected for the Child Survey	1708	927	0.2	0.6378
Recoded FNS region	1722	930	5.6	0.5823
Language used for data collection	1722	930	0.1	0.7881
Interview mode for data collection	1722	930	9.2	0.0102*
Race/ethnicity	1709	922	5.5	0.1388
Distance between household and site	1710	922	2.1	0.5438
Respondent willing to be contacted with any follow-up questions to the survey	1515	817	2.7	0.1009
Respondent willing to be contacted for a follow-up interview	1651	877	1.8	0.1813
Site type: Open/closed	1722	930	0.6	0.4520
Program type: SFSP/SSO	1722	930	0.7	0.4150
Sponsor type: SFA/Non-SFA	1722	930	3.3	0.0695
Household food security scale	1722	930	4.1	0.3955
Child food security scale	1722	930	2.9	0.4063
Caregiver type code (selected from postal frame, onsite survey distribution, or closed site roster frame)	1722	930	18.0	0.0001**

Source: USDA Summer Meals Study, Participant Child Survey, summer 2018.

* P-value is less than 0.05 but greater than or equal to 0.01

** P-value is less than 0.01

Table 6-12b. Comparison of the frame and sample means for the continuous auxiliary variables for the Participant Child/Teen Survey

Variable	Frame N	Weighted frame mean	Sample N	Weighted sample mean	Confidence interval of difference		P-value
					Lower	Upper	
Number of children in the HH	1,722	2.5	930	2.5	-0.04	0.07	0.543
Number of children less than age 5 in the HH	810	1.0	462	0.9	-0.03	0.07	0.487
Number of children between ages 5 and 12 in the HH	1,507	1.6	835	1.6	-0.02	0.09	0.170
Number of children ages 13 through 18 in the HH	951	1.2	493	1.2	-0.04	0.06	0.706
Number of children who will attend summer programs	1,187	1.8	690	1.8	-0.08	0.06	0.781
Summer programs attended offer meals and snacks	1,097	2.8	662	2.8	-0.03	0.04	0.772
Heard of programs in the area that provide free meals and snacks	1,698	0.8	915	0.8	-0.05	0.01	0.197
Know that sampled site provides free meals and snacks	1,652	0.8	907	0.9	-0.10	-0.03	0.001**
Information about the program included all the details needed to make a decision about sending child/children to the program the sampled site	1,364	0.9	796	0.9	-0.04	0.01	0.152
Number of children ages 5 through 18 who will attend the sampled	1,722	1.8	930	1.8	-0.04	0.07	0.553
Age of sampled child	1,699	10.0	918	10.0	-0.16	0.27	0.619
Site is urban	1,722	0.8	930	0.7	0.01	0.05	0.016*

Source: USDA Summer Meals Study, Participant Child Survey, summer 2018.

HH=Household

* P-value is less than 0.05 but greater than or equal to 0.01

** P-value is less than 0.01

Table 6-13a. Comparison of the frame and sample distribution for the categorical auxiliary variables for the Nonparticipant Teen Survey

Variable	Frame N	Sample N	Chi-square	P-value
Respondent age	1389	811	2.4	0.6634
Respondent sex	1392	812	0.6	0.4462
Respondent highest level of education	1385	808	15.4	0.0805
HH income category	1343	799	2.4	0.9378
HH financial condition	1389	803	7.5	0.1130
Preferred method of incentive payment (cash or gift card)	1377	808	0.0	0.8528
Recoded FNS region	1395	814	2.6	0.9192
Language used for data collection	1395	814	0.2	0.6485
Interview mode for data collection	1395	814	5.4	0.0685
Distance between household and site	1392	814	0.1	0.9961
Responding willing to be contacted with any follow-up questions to the survey	1171	742	0.2	0.6808
Respondent willing to be contacted for a follow-up interview	1369	799	1.4	0.2425
Site type: Open/closed	1395	814	0.8	0.3577
Program type: SFSP/SSO	1395	814	1.9	0.1626
Sponsor type: SFA/Non-SFA	1395	814	0.8	0.3767
Household food security scale	1395	814	1.8	0.7721
Child food security scale	1395	814	2.1	0.5534
Caregiver type code (selected from postal frame, onsite survey distribution, or closed site roster frame)	1395	814	2.0	0.3698

Source: USDA Summer Meals Study, Nonparticipant Teen Survey, summer 2018.
HH=Household

Table 6-13b. Comparison of the frame and sample means for the continuous auxiliary variables for the Nonparticipant Teen Survey

Variable	Frame N	Weighted frame mean	Sample N	Weighted sample mean	Confidence Interval of difference		P-value
					Lower	Upper	
Number of children less than age 5 in the HH	564	0.67	316	0.60	0.00	0.13	0.055
Number of children between ages 5 and 12 in the HH	835	1.43	476	1.43	-0.05	0.06	0.933
Number of children ages 13 through 18 in the HH	1395	1.36	814	1.36	-0.03	0.03	0.940
Heard of programs in the area that provide free meals and snacks	1391	0.49	813	0.48	-0.02	0.02	0.970
Know that sampled site provides free meals and snacks	1311	0.26	763	0.26	-0.02	0.03	0.786
Site is urban	1395	0.70	814	0.69	-0.01	0.04	0.208

Source: USDA Summer Meals Study, Nonparticipant Teen Survey, summer 2018.

HH=Household

Several variables were identified as misrepresented between the frame and the sample even after nonresponse adjustment. Therefore, as done before, it was examined whether there could be serious bias issue in the key variables of the survey, which are shown in Table 6-14. The table also shows the results of two regression models with the key variables as the dependent variables and the misrepresented auxiliary variables as predictors.

For the key variable gender, the regression model was not significant, and the R-square was low (< 0.1). For the key variable age, the regression model was significant, but the R-square was low (< 0.1). Therefore, it appears that the potential bias indicated by misrepresented auxiliary variables used for nonresponse adjustment is small.

Table 6-14. R-square statistics for the regression models of the Participant Child/Teen Survey

Key variable	Model significance		Max-rescaled R-square	Potential bias
	Test statistic	P-value		
Categorical				
Gender	Chi-square = 0.1	0.8678	0.0641	Small
Continuous				
Age	F = 63.7	< 0.0001	0.0574	Small

Source: USDA Summer Meals Study, Participant Child/Teen Survey, summer 2018.

For the Nonparticipant Teen Survey, none of the auxiliary variables was significantly misrepresented, and therefore, no further examination was made as it points to no serious bias issue due to nonresponse.

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