1. Introduction

This is the second sampling selection memo prepared under the APEC III contract. The first sampling memo, titled **Deliverable 25: SFA Sample Selection Memo**, was submitted to FNS on May 5, 2016. That report provided details of the procedures used to select the first-stage sample of SFAs. This memo describes the second-stage sampling procedures used to select schools within the sampled SFAs. Section 2 provides an overview of the APEC III sample design and a summary of the SFA study notification and school verification process. Section 3 provides details of the second-stage selection of schools.

2. Overview of Sample Design

The sampling plan for APEC III is designed to develop a sample of School Food Authorities (SFAs) and schools for data collection and analyses to produce nationally representative estimates of error rates, for National School Lunch Program (NSLP) and School Breakfast Program (SBP) separately, that are fully compliant with the Improper Payments Elimination and Recovery Act (IPERA) requirements. These NSLP and SBP estimates will be based on data collected in School Year 2017-2018. The primary statistical goal is to provide precise estimates of error rates for the program by source. To achieve this goal, a multistage stratified probability sampling design will be utilized to select households for the study (i.e., the household survey) where (a) the first-stage sampling units (FSUs) are composed of a nationally representative sample of SFAs; (b) the second-stage sampling units (SSUs) are composed of stratified samples of schools within SFAs; and (c) the third-stage sampling units (TSUs) are composed of samples of students (households) within schools. The sampling plan is similar to the general multistage sampling approach used in APEC I and II, but with an increased focus on Community Eligibility Provision (CEP) SFAs and schools to reflect the recent growth in the use of the CEP by SFAs.

2.1   SFA Sample

Because the process by which certification occurs differs between CEP and non-CEP schools, schools that have elected to participate in CEP will be sampled separately from non-CEP schools. For sampling purposes, we divided SFAs into those with no CEP schools and those with at least one CEP school based on data from two data sets provided by FNS (FY15 FNS-742_02222016.XLSX and CEP FY15-16 National Election Data – September 2015 3-25-16.XLSX). However, during SFA study notification (see Section 2.2) some SFAs that had been classified as "non-CEP" SFAs for sampling purposes were later determined to contain schools that elected the CEP option after 2015. Thus, both CEP schools and non-CEP schools will be selected from SFAs designated as CEP and non-CEP SFAs. There were also a few instances where a CEP SFA was found to contain no CEP schools based on data reported by the SFA.

In this memo, the terms "non-CEP SFA" and "CEP SFA" refer to status at the time of sampling, and not to current status. Note that for analysis purposes, SFAs will be classified according to the current CEP status. It is also possible that some of the sampled schools' CEP status may change for SY 2017-2018. If this occurs, the school status will be updated according to their current status. The appropriate data collection approach for CEP versus non-CEP school will be conducted. The sample sizes for each type of school are sufficient to accommodate such changes.

For both types of SFAs, the largest SFAs in terms of sampling measure of size[1] were included in the sample with certainty. There were six certainty SFAs among the non-CEP SFAs and 23 certainty SFAs among the CEP SFAs. For each of the two types of SFAs, the remaining (non-certainty) SFAs were selected with probabilities proportionate to the sampling measure of size (i.e., either (a) the number of students certified for free or reduced-price lunch in the non-CEP SFAs; or (b) a weighted sum of the number of students certified for free or reduced-price lunch in non-CEP schools and enrollment in CEP schools in the CEP SFAs). Note that while the sample of non-

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[1] The sampling measure of size (MOS) is either (a) the number of students certified for free or reduced-price meals as reported in the FNS-742 frame in the case of the non-CEP SFAs; or (b) a composite measure of size developed from the number of students certified for free or reduced-priced meals in CEP schools (i.e., enrollment of the school multiplied by the ISP multiplied by 1.6) and the number of students certified for free or reduced-price meals in non-CEP schools in the case of the CEP SFAs.

certainty SFAs included a reserve sample to be used in case some SFAs were ineligible or refused to confirm participation, it was not necessary to utilize the reserve sample for data collection. Table 2-1 summarizes the distribution of the SFA sample by type of SFA and FNS region. Additional details of the SFA sample selection procedures are provided in **Deliverable 25: SFA Sample Selection Memo.**

Table 2-1. Distribution of SFA sample by type of SFA and region

FNS Region	Non-CEP SFAs		CEP SFAs		ALL SFAs		
	Certainty	Non-Certainty	Certainty	Non-Certainty	Certainty	Non-Certainty	Total
1. Northeast	0	13	2	10	2	23	25
2. Mid Atlantic	0	18	2	14	2	32	34
3. Southeast	5	27	9	39	14	66	80
4. Midwest	0	29	3	21	3	50	53
5. Southwest	0	34	4	21	4	55	59
6. Mountain Plains	0	17	0	6	0	23	23
7. Western	1	48	3	10	4	58	62
Total	6	186	23	121	29	307	336

2.2 SFA Study Notification and School Verification Results

Of the 336 sampled SFAs, 323 (including all 29 certainty SFAs and 294 non-certainty SFAs) were successfully confirmed for participation in the study. This represents a response rate of 96 percent. Of the 192 SFAs that were originally selected as non-CEP SFAs, 10 were later found to have CEP schools. Similarly, of the 144 SFAs that were originally selected as CEP SFAs, three were later found to have no eligible CEP schools. The distribution of the sampled SFAs by response status and region are summarized in Table 2-2.

Table 2-2. Distribution of sample SFAs by type of SFA, response status, and region

FNS Region	Non-CEP SFAs*			CEP SFAs**			ALL SFAs		
	Resp. SFA	Non-Resp. SFA	Total	Resp. SFA	Non-Resp. SFA	Total	Resp. SFA	Non-Resp. SFA	Total
1. Northeast	13	0	13	12	0	12	25	0	25
2. Mid Atlantic	17	1	18	16	0	16	33	1	34
3. Southeast	31	1	32	46	2	48	77	3	80
4. Midwest	28	1	29	22	2	24	50	3	53
5. Southwest	34	0	34	25	0	25	59	0	59
6. Mountain Plains	17	0	17	6	0	6	23	0	23
7. Western	43	6	49	13	0	13	56	6	62
Total	183	9	192	140	4	144	323	13	336

* Ten SFAs (including one certainty SFA) that had been classified as non-CEP for sampling purposes were later found to have CEP schools.

** Three SFAs (including one certainty SFA) that had been classified as CEP for sampling purposes were later found to have no eligible CEP schools.

2.3   Selection of Subsample of SFAs for School Sampling

As indicated above, 323 of the 336 sampled SFAs were confirmed for participation in the study, far exceeding the number expected under an assumed SFA response rate of 80 percent (the assumption used for design purposes). Because the number of responding SFAs was much greater than the minimum requirement, for data collection, a random sample of 302 of the 323 SFAs was selected for subsequent school sampling.[2] The remainder of this section provides a summary of how the 302 SFAs were selected.

First, all 29 certainty SFAs were retained for subsequent school sampling. Second, the remaining 294 responding SFAs were then sorted by CEP status and measure of size. Finally, from the sorted list, 273 SFAs were selected systematically with equal probability. Table 2-3 shows the distribution of the retained SFAs by SFA type and FNS region, and the corresponding numbers of eligible CEP and non-CEP schools that were reported by the SFAs.

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[2] The remaining 21 SFAs could potentially be used to provide a reserve sample of schools. However, we do not anticipate that this will be necessary.

Table 2-3. Distribution of retained SFAs by type of SFA and number of CEP and non-CEP schools, by FNS region

FNS Region	Non-CEP SFAs			CEP SFAs			All SFAs		
	No. of SFAs	No. of non-CEP schools	No. of CEP schools	No. of SFAs	No. of non-CEP schools	No. of CEP schools	No. of SFAs	No. of non-CEP schools	No. of CEP schools
1. Northeast	11	78	3	11	1,526	784	22	1,604	787
2. Mid Atlantic	14	403	1	15	294	726	29	697	727
3. Southeast	29	1,908	6	44	837	1,766	73	2,745	1,772
4. Midwest	25	185	-	20	147	1,381	45	332	1,381
5. Southwest	33	642	120	24	623	1,021	57	1,265	1,141
6. Mountain Plains	17	508	-	6	68	88	23	576	88
7. Western	41	1,155	93	12	1,158	635	53	2,313	728
Total	170	4,879	223	132	4,653	6,401	302	9,532	6,624

2.4   Preparation of School Sampling Frame

From the responding SFAs, we collected school data that were necessary for school sampling. The data were first obtained from public records and later verified by the SFAs. These data included school name, address, lowest and highest grades, CEP status, CEP group where applicable, total enrollment, number of students eligible for free or reduced-price meals, and other information. Quality control checks were conducted on the data reported by SFAs, and the data were updated when needed. For example, duplicate schools were removed from the list after verifying they were indeed duplicates. Missing data were retrieved from SFAs through follow-up, and inconsistent data (e.g., total enrollment was less than the number of students eligible for free or reduced-price meals) were investigated and corrected. Finally, schools that were pre-kindergarten only were removed from the school lists since they are not eligible for APEC III. The updated school list (i.e., school sampling frame) contained a total of 16,156 schools, of which 9,532 are non-CEP and 6,624 are CEP (Table 2-3).

3. School Sample

As described in the following subsections, the school sample was selected in the following steps. First, the sample size goals (targets) were revised to reflect changes in the CEP status of SFAs and the higher than anticipated SFA response rates. Next, the samples were allocated to SFAs in a

manner designed to select either one or three schools per non-certainty SFA as per the study design (discussed briefly below). The required numbers of schools were then selected with probabilities proportionate to measure of size within the SFA. To select the CEP school sample, an additional stage of sampling was implemented in some SFAs to maximize the number of schools to be selected from the same CEP group whenever possible.

As described in the APEC III Final Study Design, the school sample selection incorporates a requirement to sample one or three schools from each SFA. While the APEC III sampling plan preserves the APEC II sample design, it includes an increase in the number of SFAs sampled to facilitate a thorough exploration of the relationship between SFAs implementation strategies and error rates. These additional analyses are an enhancement for APEC III. To capture the relationship between SFA policies and error rates we need to sample at least one school per additional SFA. Sampling more than one school for the additional SFAs is unnecessary as the sample of schools already meets precision objectives. Sampling only one school from the additional sample of SFAs will (a) provide a school that is linked to the additional SFA; (b) add additional schools to the sample; and (c) avoid an exponential increase in costs by unnecessarily doubling the number of schools in the sample. The latter not only reduces the overall burden on SFAs and schools but also judiciously manages data collection operations and costs while augmenting the sample size and maintaining precision. Note that this restriction does not apply to the 29 certainty SFAs.

As an additional note, the sampling of schools follows the plan outlined in the APEC III Final Study Design. The study design provided estimates on number of schools, which have been finalized (and differ slightly) based on final school data verified by the SFAs.

3.1   Sample Size Goals

Table 3-1 summarizes the target sample size of 626 schools for APEC III (438 non-CEP schools and 188 CEP schools). The numbers shown in the table refer to the desired number of schools (participating schools) for subsequent household/application sampling. In order to ensure that these sample sizes can be achieved, a larger sample will initially be selected. For sampling purposes, we assume that the response rate among the selected schools will be at least 80 percent. Thus, a total of approximately 782 schools would have to be sampled to yield 626 participating

schools, of which approximately 548 will be non-CEP schools and 234 will be CEP schools. The numbers of schools to be selected assuming an 80 percent response rate are shown in Table 3-2. Note that the actual numbers to be selected will differ slightly from those shown in this table due to implementation of the one- or three- schools per SFA requirement described at the beginning of this section. Figure 3-1 provides a summary of the number of SFAs and schools sampled.

Table 3-1. Target number of schools agreeing to participate in APEC III

SFA Type	Certainty status of SFA	Number of participating SFAs retained for school sampling	Non-CEP Schools	CEP Schools	Total Schools
Non-CEP	Certainty	6	18	1	19
	Non-certainty	164	331	12	343
	Subtotal	*170*	*349*	*13**	*362*
CEP	Certainty	23	33	47	80
	Non-certainty	109	56	128	184
	Subtotal	*132*	*89*	*175*	*264*
All Types	Certainty	29	51	48	99
	Non-certainty	273	387	140	527
	Grand total	*302*	*438*	*188*	*626*

* At the time the SFA sample was selected, the non-CEP SFAs by definition were not expected to have CEP schools. It was later determined during SFA recruitment that a small number of non-CEP schools had become CEP.

Table 3-2. Expected number of schools to be selected to achieve target sample sizes based on 80 percent response rate

SFA Type	Certainty status of SFA	Number of participating SFAs retained for school sampling	Non-CEP Schools	CEP Schools	Total Schools
Non-CEP	Certainty	6	23	1	24
	Non-certainty	164	414	15	429
	Subtotal	*170*	*437*	*16*	*453*
CEP	Certainty	23	41	58	99
	Non-certainty	109	70	160	230
	Subtotal	*132*	*111*	*218*	*329*
All Types	Certainty	29	64	59	124
	Non-certainty	273	484	175	658
	Grand total	*302*	*548*	*234*	*782*

Note: Table 3-2 shows the "target" numbers used to establish sampling rates. The final sample sizes differ slightly from these numbers due to the implementation of the one- or three- schools per SFA requirement described earlier. Figure 3-1 and Table 3-3 show the actual sample sizes.

Figure 3-1. Summary of SFAs and schools sampled
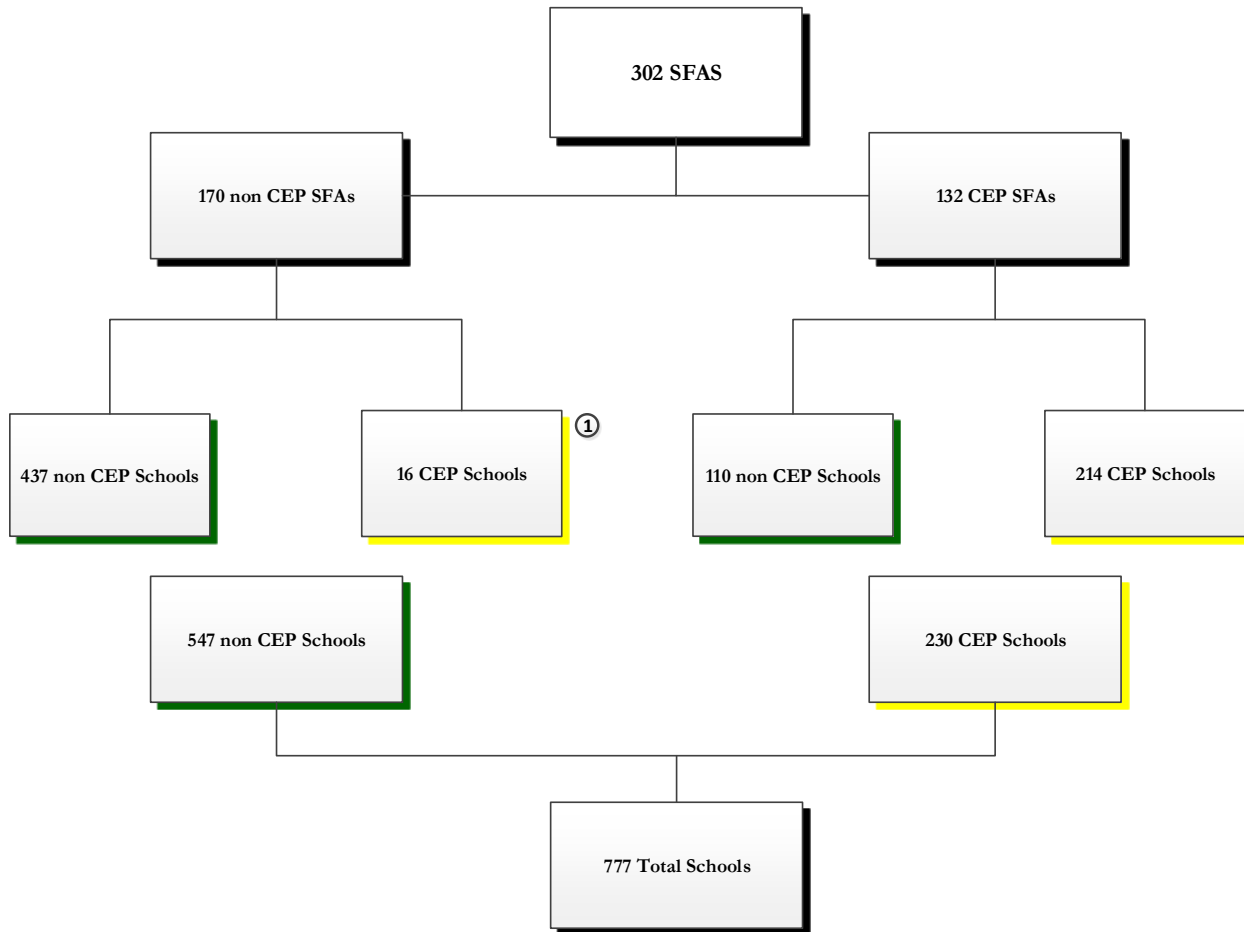
1. Note: These numbers reflect the original designation of the SFA type (non-CEP or CEP) during sampling. During the SFA Confirmation and Verification, some SFAs were found to fall into a different category. The original sampling status was maintained, but we sampled according to their true status. As a result, some CEP schools are sampled from SFAs originally designated as non-CEP.

3.2 Allocation of School Sample to SFAs

In general, the approximately optimum allocation of the school sample to the 302 SFAs retained for school sampling (see Section 2.3) depends on the number of eligible schools in the SFA, the measure of size of the eligible schools in the SFA, and the probability of selecting the SFA in which the schools are located. Specifically, for each of the categories of schools defined by (a) SFA type (non-CEP vs. CEP) and (b) school type (non-CEP vs. CEP) within SFA, let

m = the number of sample SFAs in a given category;

P_h^{SFA} = the probability of selecting SFA h;

N_h = the total number of eligible schools reported by SFA h during recruitment;

M_{hi} = the measure of size (MOS) of school i in SFA h based on information collected during SFA recruitment;

M_h = $\sum_{i=1}^{N_h} M_{hi}$ = the total MOS of all N_h schools in SFA h;

$\widehat{M}$ = $\sum_{h=1}^{m} M_h / P_h^{SFA}$ = the estimated total MOS based on the m sample SFAs;

n_s = the number of schools of a particular type (i.e., either non-CEP school or CEP school) to be sampled from the m sampled SFAs.

Note that the n_s's correspond to the sample sizes given in Table 3-2. Because we want to select the schools with overall probabilities proportionate to size (PPS), where the size measure for school i in SFA h is defined by M_{hi}, the optimum allocation of the n_s schools to SFA h is given by

$$n_h = n_s \, (M_h / P_h^{SFA}) / (\sum_{h=1}^{m} M_h / P_h^{SFA}) = n_s \, (M_h / P_h^{SFA}) / \widehat{M}, \tag{1}$$

and the corresponding within-SFA selection probability of selecting school i in SFA h is

$$P_{hi}^{within} = n_h \, (M_{hi} / M_h) = (1 / P_h^{SFA}) \, (n_s \, M_{hi} / \widehat{M}). \tag{2}$$

The within-SFA sampling rates given by equation (2) are approximately optimal because the resulting overall probability of selecting school i in SFA h is

$$P_{hi}^{overall} = P_h^{SFA} \, P_{hi}^{within} = n_s \, M_{hi} / \widehat{M}, \tag{3}$$

which is the desired probability of selection under a PPS sample design. The number of schools to be selected will vary from PSU to PSU but will average to be around n_s / m.

However, the study design specifies the selection of either one or three schools from an SFA whenever possible. This applies only to the non-certainty SFAs. Because of the relative importance of the certainty SFAs, there are no restrictions on the number of schools to be selected from them. Thus, where feasible, the non-certainty SFAs will be randomly assigned to one of two groups, A or B. If assigned to A, three schools will be selected. If assigned to B, one school will be selected. Note that if an SFA contains two or fewer eligible schools, then only one school will be sampled.

While this method of sample allocation is unbiased, it will increase sampling variances and thus reduce statistical precision. The reason for the reduced precision is that there will be an increased clustering effect due to the selection of three schools per SFA in a proportion of the SFAs. The reduction in precision will depend on the magnitude of the intraclass correlation between schools within SFAs of the characteristics being measured in the survey (e.g., error rates or improper dollar amounts). To illustrate, consider the simple case where the overall goal is to sample two schools per SFA. Let $\bar{y}$ denote an estimated mean based on the sample of $n = m\bar{n} = 2m$ schools, where $m =$ the number of sample SFAs and $\bar{n} = 2$ schools per SFA. Then the variance of $\bar{y}$ is approximately $V_1(\bar{y}) = \sigma^2[1 + (\bar{n}-1)\rho] / m\bar{n} = \sigma^2[1 + \rho] / 2m$, where σ^2 is the population variance of the y-characteristic and ρ is the intraclass correlation between schools within SFAs. However, under the proposed sample design, the goal will be to select either 1 or 3 schools per SFA. Suppose, for the sake of simplicity, that in one-half of the sampled SFAs we will select exactly 1 school per SFA, while in the remaining half we will select exactly 3 schools per SFA. Let A denote the set of SFAs where three schools per SFA will be selected, and let B denote the set where one school will be selected. Let $\bar{y}_A$ denote the estimated mean based on the $3m/2$ schools in the SFAs in A, and let $\bar{y}_B$ denote the estimated mean based on the $m/2$ schools in the SFAs in B.

The overall estimate obtained by combining the results of A and B is the average of the two sample estimates, i.e., $\bar{y}_{AB} = (\bar{y}_A + \bar{y}_B)/2$, and the variance of the combined estimate is given approximately by $V_2(\bar{y}_{AB}) = \sigma^2[1 + (1+2\rho)/3] / 2m$. The ratio $V_1(\bar{y}) / V_2(\bar{y}_{AB}) = 3(1+\rho)/(4+2\rho)$ is always less than 1 and provides a measure of how much smaller the variance of $\bar{y}$ is (under the traditional two-stage sampling approach) compared with the variance of $\bar{y}_{AB}$ from the proposed "three-or-one" sampling scheme. If $\rho = 0$, $V_1(\bar{y}) = 0.75\ V_2(\bar{y}_{AB})$ (i.e., in this case, the variance based on the proposed sampling scheme is about 33% greater than that from the traditional approach). If $\rho = 0.20$, $V_1(\bar{y}) = 0.82\ V_2(\bar{y}_{AB})$. The two methods have equal variance when $\rho = 1$. Despite the potentially larger sampling variances, the sampling method is unbiased and will yield statistically valid estimates from the survey.
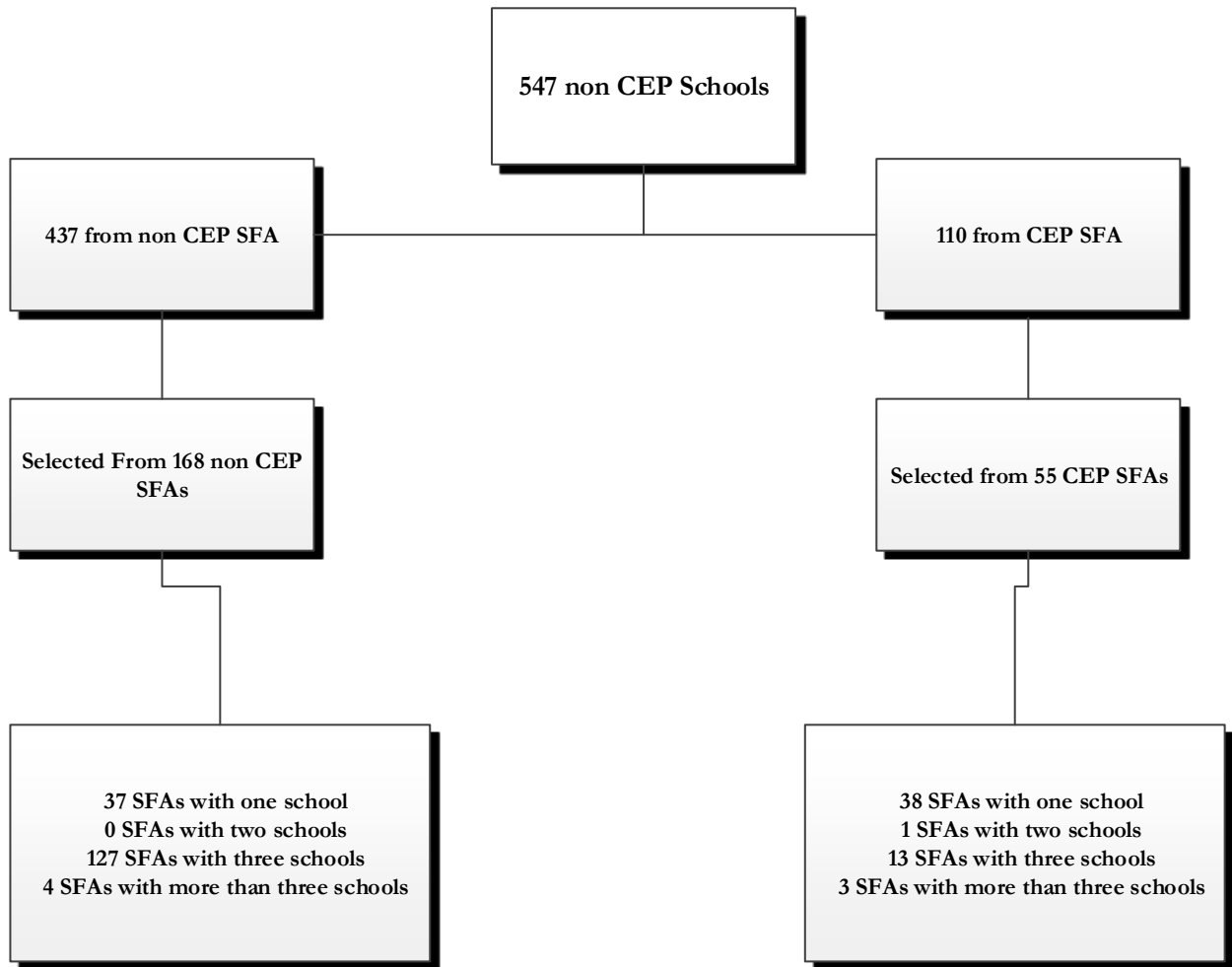
3.3   Clustering the Sample of CEP Schools by CEP Group

The way in which the identified student percentages (ISPs) are determined for the CEP schools varies from SFA to SFA. In some SFAs, the ISP is determined on a school-by-school basis. In others, the ISP is determined on a districtwide basis. Yet in other SFAs, the ISP is determined for specific groups (i.e., collections of schools) within the SFA such that all schools within a group receive the same ISP. Because the determination of error rates depends on how the schools are grouped, it is desirable to cluster the *sampled schools* by the ISP groups within the SFA. This can be accomplished by identifying the various groups of schools within the SFA, and then randomly selecting one group with probability proportionate to size (where the size of the cluster is the sum of the size measures of the CEP schools in the cluster). Within the selected group (cluster), up to three CEP schools will be sampled. In other words, an additional stage of sampling will be introduced in some SFAs where the CEP schools are grouped for ISP determination. The proposed approach will help ensure that multiple sampled schools are from the same ISP group to the extent feasible, but does not guarantee it because all schools in the SFA must be given appropriate chances of selection to avoid potential sampling biases. For example, if in a particular SFA there are ISP groups consisting of three or more schools as well as groups consisting of individual schools, it is possible that schools selected for the sample are from different ISP groups. However, when ISP groups do not contain the desired target numbers, schools will be selected from different ISP groups. Note that the clustering does not apply to SFAs in which each CEP school is its own group, nor those SFAs in which all CEP schools belong to the same group. Additional details about the selection of ISP groups are provided in Section 3.5.

3.4   Selection of the Non-CEP School Sample

A total of 547 non-CEP schools were selected for the study, including 437 in non-CEP SFAs and 110 in CEP SFAs. The samples were selected following the general guidelines outlined in Section 3.2. Additional details are provided below, separately for the non-CEP and CEP SFAs. Figure 3-2 provides a summary of the non-CEP schools.

Figure 3-2. Summary of non-CEP school sample

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                        ┌──────────────────────┐
                        │  547 non CEP Schools │
                        └──────────┬───────────┘
                    ┌──────────────┴──────────────┐
        ┌───────────────────┐              ┌──────────────────┐
        │ 437 from non CEP  │              │ 110 from CEP SFA │
        │      SFA          │              │                  │
        └─────────┬─────────┘              └────────┬─────────┘
        ┌───────────────────┐              ┌──────────────────┐
        │ Selected From 168 │              │ Selected from 55 │
        │   non CEP SFAs    │              │    CEP SFAs      │
        └─────────┬─────────┘              └────────┬─────────┘
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37 SFAs with one school	38 SFAs with one school
0 SFAs with two schools	1 SFAs with two schools
127 SFAs with three schools	13 SFAs with three schools
4 SFAs with more than three schools	3 SFAs with more than three schools

3.4.1 Non-CEP Schools in Non-CEP SFAs

A total of 437 non-CEP schools in non-CEP SFAs was selected for the study sample. Of these, 23 were in certainty SFAs, and 414 were in non-certainty SFAs. The 23 schools in the six certainty SFAs were selected as follows: First, all of the eligible schools in the certainty SFAs were sorted by SFA, three school levels (elementary, middle, secondary/combined)[3] within SFA, and measure of size (MOS) within school level. From the sorted list, a systematic sample of 23 schools was selected with probabilities proportionate to the MOS using standard algorithms (e.g., see Kish,[4] 1965, page 230). The number of schools sampled per certainty SFA varied from 3 to 7.

Ordinarily, the sample of schools in the non-certainty SFAs would be selected with the optimal probabilities given by equation (2) (see Section 3.2). However, because of the requirement to restrict the number of sample schools to either 1 or 3 schools per SFA to the extent feasible, the optimal probabilities of selection had to be modified to meet these conditions. The modifications were made in a manner designed to minimize the adverse impact on design effects. Thus, the 414 schools in the non-certainty SFAs were selected using the procedures outlined below. The set number given below is simply a label to group SFAs that meet the criteria for that set.

- Set 11: If the non-CEP SFA contained two or fewer non-CEP schools, or the *expected* sample size for the non-CEP SFA was less than 1.5 non-CEP schools and there were no CEP schools in the SFA, exactly one non-CEP school was sampled.

- Set 12: If the non-CEP SFA contained both CEP and non-CEP schools, and the expected number of non-CEP schools to be sampled was less than 1.5, then exactly one non-CEP school was sampled. In addition, up to three CEP schools were sampled and set aside for further processing as described in Section 3.5.

- Set 21: If the non-CEP SFA contained three or more non-CEP schools and no CEP schools, and the expected number of non-CEP schools to be sampled was between 1.5 and 2.5, the SFA was randomly assigned with appropriate probabilities to one of two sampling groups, A or B. If assigned to B, exactly one school was sampled. If assigned to group A, three schools were sampled.

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[3] School level was as an implicit rather than an explicit stratifier to help ensure that schools of the three grade levels were appropriately represented in across the entire sample of SFAs.

[4] Kish, L. (1965). *Survey Sampling.* John Wiley & Sons: New York.

- Set 22: If the non-CEP SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to be sampled was 1 or 2, while the expected number of non-CEP schools to be sampled was more than 1.5, then (a) 1 or 2 CEP schools were sampled according to the expected number to be sampled; and (b) the SFA was randomly assigned to sampling group A or B, and if assigned to B, one non-CEP school was sampled, but if assigned to A, three non-CEP schools were sampled.

- Set 32: If the non-CEP SFA contained only non-CEP schools and the expected number of non-CEP schools to be sampled was greater than 2.5, the SFA was randomly assigned with appropriate probabilities to one of two sampling groups, A or B. If assigned to B, exactly one school was sampled. If assigned to group A, three schools were sampled.

The distribution of the sample of non-CEP schools in the non-CEP SFAs is summarized in Table 3-3 (on page 24). A list of the selected schools is provided in an Excel file accompanying this memo.

3.4.2 Non-CEP Schools in CEP SFAs

A total of 110 non-CEP schools in CEP SFAs were selected for the study sample. Of these, 41 were in certainty CEP SFAs, and 69 were in non-certainty CEP SFAs. The 41 schools in the 23 certainty CEP SFAs were selected. First, all of the eligible schools in the certainty SFAs were sorted by SFA, three school levels (elementary, middle, and secondary/combined) within SFA, and MOS within school level. Next, from the sorted list, a systematic sample of 41 schools was selected with probabilities proportionate to the MOS using standard algorithms (e.g., see Kish, 1965, page 230). The number of non-CEP schools selected per certainty SFA varied from 0 to 19.

Similar to the selection of schools in the non-CEP SFAs, the sample of schools in the non-certainty CEP SFAs ordinarily would be selected with the optimal probabilities given by equation (2). However, because of the requirement to restrict the number of sampled schools to either 1 or 3 CEP schools per SFA to the extent feasible, the optimal probabilities of selection were adjusted to meet these conditions in a manner designed to minimize the adverse impact on design effects. Thus, the 69 non-CEP schools in the non-certainty CEP SFAs were selected using the procedures outlined below. Again, the set number given below is simply a label to group SFAs that meet the criteria for that set.

- Set 11: If there were fewer than three CEP schools and no non-CEP schools in the SFA, then exactly one CEP school was selected from the SFA.

- Set 12: If there were fewer than three CEP schools and fewer than three non-CEP schools in the SFA, then one CEP school and one non-CEP school was selected from the SFA.

- Set 13: If there were fewer than three CEP schools in the SFA and the expected number of non-CEP schools to be sampled in the SFA was between 1.5 and 2.5, then one CEP school and one or three non-CEP schools were selected from the SFA depending on the expected sample size.

- Set 14: If there were fewer than three CEP schools in the SFA and the expected number of non-CEP schools to be sample was greater than 2.5, then one CEP school and three non-CEP schools were selected from the SFA.

- Set 21: If there were only CEP schools in the SFA and the expected number of CEP schools to be sampled in the SFA was between 1.5 and 2.5, then the SFA was randomly assigned with appropriate probabilities to one of two sampling groups, A or B. If assigned to B, exactly one CEP school was sampled from the SFA. If assigned to group A, three CEP schools were sampled from the SFA.

- Set 22: If the SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to sample was less than 1.0 but the expected number of non-CEP schools to sample was 2.0 or greater, then one CEP school was selected with probability equal to the expected number of CEP schools, and three non-CEP schools were selected from the SFA.

- Set 23.1: If the SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to sample was between 1.5 and 2.5, but the expected number of non-CEP schools to sample was less than 0.4, then (a) the SFA was randomly assigned with appropriate probabilities to one of two sampling groups, A or B, and if assigned to B, exactly one CEP school was sampled from the SFA, or if assigned to group A, three CEP schools were sampled from the SFA; and (b) one non-CEP school was selected from the SFA with probability 0.10 or 0.50, depending on the expected number of schools to be sampled.

- Set 23.2: If the SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to sample was greater than 1.5 and the expected number of non-CEP schools to sample was less than 2.2, then the SFA was randomly assigned with appropriate probabilities to one of two sampling groups, A or B, and if assigned to B, exactly one CEP school and one non-CEP school were sampled from the SFA, or if assigned to group A, three CEP

schools and one non-CEP schools were sampled from the SFA.

- Set 24: If the SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to sample was less than 1.5 and the expected number of non-CEP schools to sample was less than 2.2, then one CEP school and one non-CEP school were selected from the SFA.

The distribution of the sample of non-CEP schools in the CEP SFAs is summarized in Table 3-3 (on page 24). A list of the selected schools is provided in an Excel file accompanying this memo.

3.5   Selection of the CEP School Sample

As noted in Table 3-3 (see page 24), a total of 230 CEP schools were selected for the study, including 16 in non-CEP SFAs and 214 in CEP SFAs. The samples were selected following the general guidelines outlined in Section 3.2. Additional details are provided below, separately for the non-CEP and CEP SFAs. Figure 3-3 provides a summary of the CEP school sample.

Unlike the non-CEP school sample, the way in which CEP schools were selected depended on whether one or two or more schools were to be selected from the SFA. If a single school was to be selected from the SFA, the school was selected randomly from the eligible schools in the SFA. If two or more schools were to be selected from the SFA, then an additional stage of selection was introduced for some SFAs. In this case, an ISP group (i.e., a "sample cluster") was selected in the first stage with probability proportionate to size, and then schools within the selected clusters were randomly selected in the second stage. Some ISP groups contained fewer schools than the target sample size, and those groups were combined into clusters so that each cluster contained at least the target number of schools. When those clusters are selected, the sample schools within them may come from different ISP groups. There are a few exceptions where the combining of small ISP groups was not conducted and schools were selected in a single stage without the initial selection of clusters: (1) SFAs in which each school uniquely represented an ISP group; (2) SFAs in which the vast majority of ISP groups contained a single school, but a few groups had three or more schools; (3) SFAs in which most schools were in one group, but there were several smaller groups with fewer

CEP schools than the target number; or (4) SFAs in which all schools belonged to only one ISP group. For the first three scenarios, the sampled schools may come from different ISP groups, although the chances for this to happen in the third scenario are very small. Additional details about the selection of the CEP schools are described in Sections 3.5.1 and 3.5.2

Figure 3-3. Summary of CEP school sample
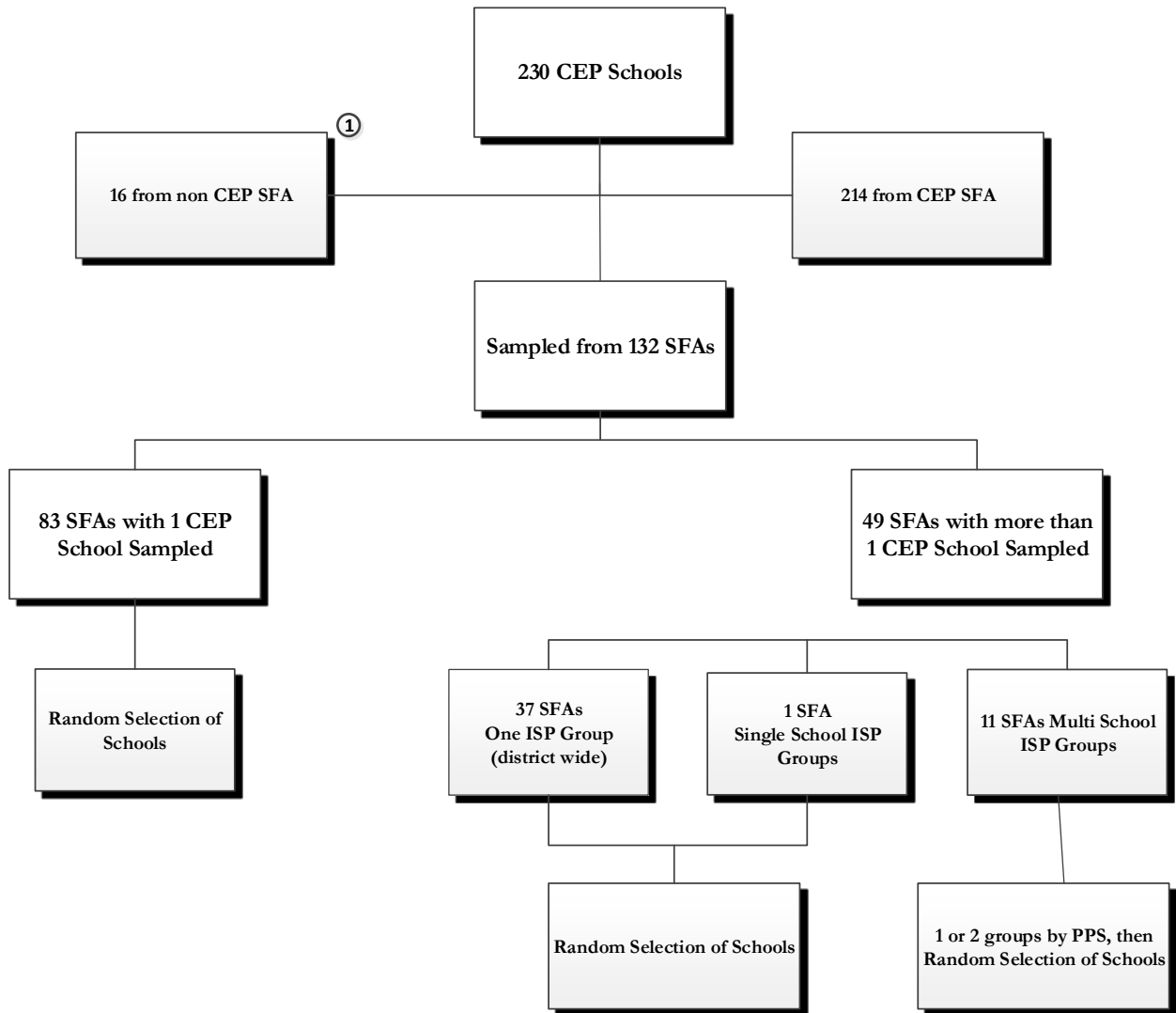
3.5.1 CEP Schools in Non-CEP SFAs

As indicated previously, there were a small number of non-CEP SFAs containing both CEP and non-CEP schools. In these SFAs, one to three CEP schools were sampled as described below.

First, all of the CEP schools in the non-CEP SFAs were sorted by SFA, three school levels (elementary, middle, secondary/combined) within SFA, and MOS within school level. Next, from the sorted list, a target number (see Section 3.4.1 for the assignment of target number) of schools were selected with probabilities proportionate to the MOS. It was not necessary to select an ISP group first, since all schools belonged to only one ISP group in the SFAs where more than one CEP schools were to be selected.

The distribution of the sample of CEP schools in the non-CEP SFAs is summarized in Table 3-3 (see page 24). A list of the selected schools is provided in Attachment A.

3.5.2 CEP Schools in CEP SFAs

Selecting CEP Schools in Certainty CEP SFAs

A total of 214 CEP schools in the CEP SFAs was selected for the study sample. Of these, 58 were in certainty CEP SFAs, and 156 were in non-certainty CEP SFAs. The 58 schools in the 23 certainty CEP SFAs were selected as described below.

First, we determined the number of CEP schools to be selected from each SFA by allocating the 58 sample schools in proportion to the measure of size of the SFA. For those SFAs with an allocation of one sample school, exactly one school was selected randomly from the eligible schools in the SFA.

For those SFAs with an allocation of two or more schools, we identified three types of SFAs as follows:

- Type 1: SFAs with only one ISP group across the entire SFA;

- Type 2: SFAs in which all ISP groups consisted of only one school; and

- Type 3: SFAs with multiple ISP groups, most of which contained 2 or more schools.

From the Type 1 and 2 SFAs, the specified number of CEP schools were selected randomly and systematically from a list of the eligible schools in the SFA that been ordered by grade level (elementary, middle, secondary/combined). From the Type 3 SFAs, one or two ISP groups (i.e., clusters) were initially selected with probability proportionate to size, and the specified number of schools were randomly selected from the selected clusters. In general, the aim was to sample no more than three CEP schools per cluster. However, there was one SFA (City of Chicago) where all of the CEP schools were in the same ISP group and the target sample size was 9 CEP schools. Therefore, 9 CEP schools were selected from the same ISP group for that SFA. The number of CEP schools selected per certainty SFA varied from 0 to 9. Because the schools were selected across the entire set of certainty SFAs using a single random starting point, it was possible by chance to skip over (i.e., not select) the schools in some SFAs.

Selecting CEP Schools in Non-Certainty CEP SFAs

Similar to the selection of schools in the non-CEP SFAs, the sample of CEP schools in the non-certainty CEP SFAs ordinarily would be selected with the optimal probabilities given by equation (2) in Section 3.2. However, because of the requirement to restrict the number of sampled schools to either 1 or 3 CEP schools per SFA to the extent feasible, the optimal probabilities of selection were adjusted to meet these conditions in a manner designed to minimize the adverse impact on design effects. Thus, the 156 CEP schools in the non-certainty CEP SFAs were selected using the procedures outlined below. Again, the set number given below is simply a label to group SFAs that meet the criteria for that set.

- Set 11: If there were fewer than three CEP schools and no non-CEP schools in the SFA, then one CEP school was selected from the SFA.

- Set 12: If there were fewer than three CEP schools and fewer than three non-

CEP schools in the SFA, then one CEP school was selected from the SFA.

- Set 13: If there were fewer than three CEP schools in the SFA and the expected number of non-CEP schools to be sampled in the SFA was between 1.5 and 2.5, then one CEP school was selected from the SFA.

- Set 14: If there were fewer than three CEP schools in the SFA and the expected number of non-CEP schools to be sampled was greater than 2.5, then one CEP school was selected from the SFA.

- Set 21: If there were only CEP schools in the SFA and the expected number of CEP schools to be sampled in the SFA was between 1.5 and 2.5, then the SFA was randomly assigned with appropriate probabilities to one of two sampling groups, A or B. If assigned to group B, exactly one CEP school would be sampled from the SFA. If assigned to group A, three CEP schools would be sampled from the SFA according to whether the SFA was Type 1, 2, or 3 as indicated above.

- Set 22: If the SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to sample was less than 1.0 but the expected number of non-CEP schools to sample was 2.0 or greater, then one CEP school was selected from the SFA with probability equal to the expected number of CEP schools.

- Set 23: If the SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to sample was between 1.5 and 2.5, the SFA was randomly assigned with appropriate probabilities to one of two sampling groups, A or B. If assigned to group B, one CEP school would be sampled from the SFA. If assigned to group A, three CEP schools would sampled from the SFA according to whether the SFA was Type 1, 2, or 3 as indicated above.

- Set 24: If the SFA contained both CEP and non-CEP schools, and the expected number of CEP schools to sample was less than 1.5 and the expected number of non-CEP schools to sample was less than 2.2, then one CEP school and one non-CEP school were selected from the SFA.

The distribution of the sample of CEP schools in the CEP SFAs is summarized in Table 3-3 (on page 24). A list of the selected schools is provided in a separate Excel file accompanying this memo (Attachment A).

Table 3-3. Distribution of the school sample by type of SFA, FNS region, and SFA certainty status

FNS Region / SFA certainty status	Non-CEP SFAs			CEP SFAs			ALL SFAs		
	Non-CEP Schools	CEP Schools	Total	Non-CEP Schools	CEP Schools	Total	Non-CEP Schools	CEP Schools	Total
FNS Region:									
1. Northeast	27	1	28	21	22	43	48	23	71
2. Mid Atlantic	35	1	36	10	25	35	45	26	71
3. Southeast	84	2	86	26	72	98	110	74	184
4. Midwest	63	0	63	4	34	38	67	34	101
5. Southwest	80	7	87	19	35	54	99	42	141
6. Mountain Plains	45	0	45	6	9	15	51	9	60
7. Western	103	5	108	24	17	41	127	6	133
SFA Certainty Status:									
Certainty	23	1	24	41	58	99	64	59	123
Non-certainty	414	15	429	69	156	225	483	171	654
Total	437	16	453	110	214	324	547	230	777

Attachment A

List of Sampled Schools

TO BE PROVIDED IN AN EXCEL FILE

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