Source of the Data and Accuracy of the Estimates for the

School Pulse Panel: December 2023 Data Collection

National Center for Education Statistics’ Rapid Response Survey to Measure School-Related

Experiences on High-Priority, Education-Related Topics

# SOURCE OF THE DATA

The School Pulse Panel (SPP) is an Interagency Federal Statistical Rapid Response Survey to measure school-related experiences, conducted by the National Center for Education Statistics (NCES) within the Department of Education’s Institute of Education Sciences (IES) in partnership with the United States Census Bureau. NCES and the Census Bureau collaborated on the design and provided content for the SPP, which was also reviewed and approved by the Office of Management and Budget (OMB).[[1]](#footnote-2) Data are collected by the Census Bureau.

The 2021-22 SPP was administered in direct response to President Biden’s Executive Order 14000: Supporting the Reopening and Continuing Operation of Schools and Early Childhood Education Providers. American Rescue Plan funds provided to IES for COVID-19 research were directed to NCES to design and undertake the study. It was one of the nation’s few sources of reliable data on these topics and focused on schools’ learning mode offerings, virus spread mitigation strategies, services offered for students and staff, issues with staffing, and technology use, as reported by principals in U.S. public schools. Due to the success of the 2021-22 SPP, funds were provided directly to NCES from Congress that NCES used to start a new panel to collect data throughout the 2023-24 school year.

The SPP was designed as a sample panel of schools in the 50 states and the District of Columbia, as well as a separate census of public schools in the U.S. Outlying Island Areas that are surveyed monthly to track change over time. An initial data collection during July of 2023 introduced the SPP and recruited schools to participate by answering a short questionnaire on summer learning and school-year planning. Subsequent monthly questionnaires collect more detailed information, with content changing over time. This document describes the estimates produced from the monthly data collection in December 2023. Updated source and accuracy statements will be produced for each subsequent release of estimates until the end of the 2023-24 SPP. National estimates are planned for public primary, middle, and high schools along with locale, racial/ethnic enrollment categories, and poverty rates around schools.

**Sample Design**

The sampling frame for the SPP was derived from the National Teacher and Principal Survey (NTPS) 2023-24 frame, which itself was largely derived from the 2021-22 Common Core of Data (CCD), NCES’s database of public schools that is updated annually with information provided by state education agencies about themselves, their school districts, and each of their public schools. The sample described here included public schools in the 50 states and the District of Columbia. A census of public schools in the Outlying Island Areas of the U.S. Virgin Islands, Guam, American Samoa, and the **Commonwealth of the Northern Mariana Islands were also interviewed and are reported separately. Response rates for U.S. Outlying Island Area schools are given in Appendix A.**

Certain types of schools were excluded from the State sample, including newly closed schools, home schools, private schools, and schools with a highest grade of kindergarten or lower (e.g., preschools or early learning centers). Regular public schools, charter schools, alternative schools, special education schools, vocational schools, and schools that have partial or total magnet programs were included in the frame.

Stratification was used in sampling to ensure adequate representation of schools on key characteristics. For sample allocation purposes, explicit strata were defined by grade level, and the sampling frame was then sorted within grade level by implicit strata including geographic region, percentage of minority enrollment, locale, school district, school size, and charter status.

The sample size was 3,998 schools allocated proportionally across the strata and selected systematically within strata. Table 1 summarizes the sample selection process, including the initial sample and the sampled cases that ultimately responded to the December 2023 data collection.

**Table 1. Summary of School Pulse Panel (SPP) sample selection**

|  |  |
| --- | --- |
|  | Sample size |
| Eligible schools on SPP sampling frame  | 93,099 |
| Initial sample size | 3,998 |
| Respondents | 1,625 |

Source: National Center for Education Statistics and U.S. Census Bureau, School Pulse Panel, December 2023

Sample schools were contacted by email, mail, and phone and invited to participate in the 2023-24 SPP each month for one year. Due to the importance of this collection, participating schools allowed to receive outside funding per school district policies receive compensation for each monthly survey completed. The SPP data are collected using an online instrument in the Qualtrics platform. Qualtrics is currently used at the Census Bureau for research and development surveys, including the Household Pulse Survey, and provides the necessary agility to deploy the SPP quickly and securely. It operates in the Gov Cloud, is FedRAMP authorized at the moderate level, and has an Authority to Operate from the Census Bureau to collect personally identifiable and privacy-protected data.

**Estimation Procedure**

Survey weights were designed and applied to the data to produce national estimates of schools by various characteristics. The final SPP weights were created by adjusting the school-level sampling base weights by various factors to account for nonresponse and coverage.

The school-level sampling base weight is the inverse of the probability of selection within each stratum. This weight includes an adjustment, if necessary, to correct the probability of selection based on information learned about the school after the school was selected for sample. For example, if it was discovered that two schools had merged into one and both were listed on the sampling frame, that merged school would have a double chance of selection. To account for this, its weight would be cut in half.

A nonresponse adjustment allocates the weights for nonresponding schools to respondents within each stratum. A coverage adjustment is done by iteratively raking the responding school weights to control counts of schools from the SPP sampling frame. There were four dimensions used in the raking procedure to account for various school characteristics:

1. Census region:
	* Northeast
	* Midwest
	* South
	* West
2. Percentage of minority enrollment:
	* Greater than 75 percent White, Non-Hispanic
	* Greater than 25 percent and less than or equal to 75 percent White, Non-Hispanic
	* Less than or equal to 25 percent White, Non-Hispanic
3. Locale
	* City
	* Suburb
	* Town
	* Rural
4. Grade level:
	* Elementary
	* Middle/Combined/Other
	* High

The final sampling weight is the product of the base weight, the nonresponse adjustment factor, and raking adjustment factors. Note that out-of-scope schools are incorporated in the raking steps, although they are ultimately assigned final weights of zero.

# ACCURACY OF THE ESTIMATES

A sample survey estimate has two types of error: sampling and nonsampling. The accuracy of an estimate depends on both types of error. The nature of the sampling error is known given the survey design; the full extent of the nonsampling error is unknown.

**Sampling Error**

The sample of schools selected for the SPP is just one of many possible samples that could have been selected. Estimates produced from this sample may differ from estimates that would have been produced from other samples and from data collected from the entire population using the same questionnaires, instructions, and enumeration methods. For a given estimator, the expected difference between the sample estimate and what the estimate would be if a new sample were to be drawn from the same population is known as sampling error. Standard errors, as calculated by methods described below in “Standard Errors and Their Use,” are primarily measures of the magnitude of sampling error. However, the estimation of standard errors may include some nonsampling error.

**Nonsampling Error**

Nonsampling error is the term used to describe variations in the estimates that may be caused by factors other than the sample selected from the frame. For a given estimator, the difference between the estimate calculated from data collected from the entire population and the true population value is known as nonsampling error. There are several sources of nonsampling error that may occur during the development or execution of the survey. It can occur because of circumstances created by the respondent, the survey instrument, or the way the data are collected and processed. Some nonsampling errors that may be present in SSP data, and examples of each, include:

* Measurement error: The respondent provides incorrect information, the respondent estimates the requested information, or an unclear survey question is misunderstood by the respondent.
* Coverage error: Some individuals who should have been included in the sampling frame were missed.
* Nonresponse error: Responses are not collected from all those in the sample or the respondent is unwilling to provide information.

To minimize these errors, SPP methodologists apply quality control procedures during all stages of the production process including the design of the survey and the statistical review of reports.

Two types of nonsampling error that can be examined to a limited extent are nonresponse and undercoverage.

**Nonresponse**

The effect of nonresponse cannot be measured directly, but one indication of its potential effect is the nonresponse rate. Table 2 shows the weighted unit response rate for the SPP for the given data collection period.

**Table 2. National-level weighted response rates for the School Pulse Panel, December 2023 data collection**

| **Data collection period** | **Weighted response rate (Percent)** |
| --- | --- |
| December 2023 |  41.12 |

Source: National Center for Education Statistics and U.S. Census Bureau,

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This response rate was calculated using the following formula:

$WRR= \frac{\sum\_{i\in I}^{}SBASWGT\_{i}}{\sum\_{i\in I}^{}SBASWGT\_{i}+\sum\_{i\in NI}^{}SBASWGT\_{i}}$

where, for school *i*, *I* represents the set of interviewed schools, *NI* represents the set of noninterviewed schools, and *SBASWGT* is the school’s base weight.

Response rates can also be calculated for schools with specific characteristics, including those used in raking. Unweighted and weighted response rates by school characteristics are presented in Table 3 below. Unweighted response rates are the ratio of survey responses to the sum of survey responses plus eligible survey nonresponses, while weighted response rates are calculated as specified in the formula above.

**Table 3. Weighted and unweighted response rates, by selected school characteristics: December 2023 data collection**

| **School characteristic** | **Unweighted RR** | **Weighted RR** |
| --- | --- | --- |
|  All schools | 41.11 | 41.12 |
| Percentage of minority enrollment |  |  |
|  > 75 percent White Non-Hispanic | 53.63 | 53.63 |
|  >25 and <=75 percent White Non-  Hispanic | 40.18 | 40.19 |
|  <=25 percent White Non-Hispanic | 31.62 | 31.63 |
| Locale |  |  |
|  City | 33.27 | 33.30 |
|  Suburb | 37.52 | 37.52 |
|  Town | 49.51 | 49.51 |
|  Rural | 49.53 | 49.53 |
| Grade level |  |  |
|  Elementary | 40.70 | 40.71 |
|  Middle/Combined/Other | 41.18 | 41.18 |
|  High | 41.98 | 42.00 |
| Census region |  |  |
|  Northeast | 39.41 | 39.41 |
|  Midwest | 48.60 | 48.65 |
|  South | 38.22 | 38.22 |
|  West | 39.95 | 38.95 |

Source: National Center for Education Statistics and U.S. Census Bureau, School

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A school is considered a respondent if it has a complete survey. A partially complete survey for which not all questions were answered is considered complete when calculating response rates if the school answered enough of the questionnaire to be considered a complete. Schools with insufficient partial surveys are considered to be nonrespondents.

**Undercoverage**

The concept of coverage with a survey sampling process is defined as the extent to which the entire group of entities (i.e., the sampling frame) from which the sample is selected “covers” the survey’s target population. Schools missing from the sampling frame, such that they had no chance of being included in the survey, create undercoverage in the SPP. A common measure of survey coverage is the coverage ratio, calculated as the estimated weighted population before poststratification procedures are applied divided by the population control counts (tallied from the SPP sample frame after ineligible schools had been removed). The national school-level coverage ratio is 0.988.

Table 4 shows the coverage ratios for the characteristics of schools that were used in the raking procedure: percentage of minority enrollment, locale grade level, and Census region.

**Table 4. School-level coverage ratios at the national level for School Pulse Panel before and after raking: December 2023 data collection**

| **School characteristic** | **Before raking** | **After raking** |
| --- | --- | --- |
|  All Schools | 0.999 | 0.988 |
| Percentage of minority enrollment |  |  |
|  > 75 percent White Non-Hispanic | 1.299 | 0.993 |
|  >25 and <=75 percent White Non-  Hispanic | 0.976 | 0.993 |
|  <=25 percent White Non-Hispanic | 0.774 | 0.978 |
| Locale |  |  |
|  City | 0.811 | 0.984 |
|  Suburb | 0.913 | 0.990 |
|  Town | 1.201 | 0.988 |
|  Rural | 1.202 | 0.988 |
| Grade level |  |  |
|  Elementary | 1.000 | 0.989 |
|  Middle/Combined/Other | 1.000 | 0.986 |
|  High | 0.997 | 0.987 |
| Census region |  |  |
|  Northeast | 0.958 | 0.987 |
|  Midwest | 1.178 | 0.987 |
|  South | 0.931 | 0.990 |
|  West | 0.946 | 0.987 |

NOTE: Ratios calculated using estimated weighted population counts.

Source: National Center for Education Statistics and U.S. Census Bureau, School Pulse Panel

Biases may be present in the data when schools missed by the survey differ from those that responded in ways not accounted for with nonresponse and raking adjustments.

**Comparability of Data**

Data obtained from the SPP and other sources are not entirely comparable. This is due to differences in data collection processes and data editing procedures. These differences are examples of nonsampling variability not reflected in the standard errors. Therefore, caution should be used when comparing results from different sources.

**A Nonsampling Error Warning**

Because the full extent of the nonsampling error is unknown, one should be particularly careful when interpreting results based on small differences between estimates.

**Standard Errors and Their Use**

The standard error is a measure of the variability due to sampling when estimating a sample-based statistic. A sample estimate and its standard error enable one to construct a confidence interval. A confidence interval is a range about a given estimate that has a specified probability of containing the average result of all possible samples. For example, if all possible samples were surveyed under essentially the same general conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then approximately 90 percent of the confidence intervals calculated for each sample as ranging from 1.645 standard errors below the estimate to 1.645 standard errors above the estimate would include the average result of all possible samples. NCES typically reports using 95 percent confidence intervals. In this instance, approximately 95 percent of the samples would have confidence intervals, calculated as the range from 1.96 standard errors above and below the estimate, that include the average result of all possible samples.

The context and meaning of the estimate must be kept in mind when creating the confidence intervals. Users should be aware of any “natural” limits on the bounds of the confidence interval for a characteristic of the population when the estimate is near zero – the calculated value of the lower bound of the confidence interval may be negative. For some estimates, a negative lower bound for the confidence interval does not make sense, for example, an estimate of the number of schools with a certain characteristic. In this case, the lower confidence bound should be reported as zero. For other estimates such as income, negative confidence bounds can make sense; in these cases, the lower confidence interval should not be adjusted. Another example of a natural limit is 100 percent as the upper bound of a percent estimate.

Standard errors may also be used when performing hypothesis tests, a procedure for comparing population parameters using sample estimates. The most common type of hypothesis is that the population parameters are different. An example of this would be comparing the percentage of charter schools that offered in-person instruction during a particular month to the percentage of non-charter schools that did the same.

Statistical tests may be performed at various levels of significance. A significance level is the probability of concluding that a difference, relationship, or effect exists when, in fact, one does not. For example, to conclude that two characteristics are different at the 0.10 level of significance, the absolute value of the estimated difference between characteristics must be greater than or equal to 1.645 times the standard error of the difference. To conclude that two characteristics are different at the 0.05 level of significance, the absolute value of the estimated differences between characteristics must be greater than or equal to 1.96 times the standard error of the difference.

**Estimating Standard Errors**

The SPP uses a complex sample design, which results in data that violate some of the assumptions that are normally made when assessing the statistical significance of results from a survey conducted with a simple random sample. Special procedures are needed to adjust the standard errors to account for the complex sample design. The SPP uses jackknife replication to estimate the standard errors of survey estimates. These methods primarily measure the magnitude of sampling error. However, they do measure some effects of nonsampling error as well. They do not measure systematic biases in the data associated with nonsampling error. Bias is the average over all possible samples of the differences between the sample estimates and the true population values.

Fifty replicate weights were created for the SPP. Using these replicate weights, the variance of an estimate (the standard error is the square root of the variance) can be calculated as follows:

$$Var\left(\hat{θ}\right)= \frac{49}{50}\sum\_{i=1}^{50}\left(θ\_{i}-\hat{θ}\right)^{2} (1)$$

where $\hat{θ}$is the estimate of the statistic of interest, such as a point estimate, ratio of domain means, regression coefficient, or log-odds ratio, using the weight for the full sample and $θ\_{i}$are the replicate estimates of the same statistic using the replicate weights. See reference Shao and Wu (1989).

**Creating Replicate Estimates**

Replicate estimates are created using each of the 50 weights independently to create 50 replicate estimates. For point estimates, the replicate weights are multiplied by the item of interest to create the 50 replicate estimates. The replicate estimates are used to calculate the total variance for the item of interest. For example, say that the item of interest is the difference between the percentage of city schools and the percentage of rural schools planning to offer in-person instruction. The difference in the two estimates would be calculated using the sample weight, $\hat{x}\_{0}$, and the 50 replicate differences, $x\_{i}$, using the 50 replicate weights. These estimates would then be used to calculate the total variance for the difference as shown in the formula below.

$$Var\left(\hat{x}\_{0}\right)= \frac{49}{50}\sum\_{i=1}^{50}\left(x\_{i}-\hat{x}\_{0}\right)^{2}$$

where $x\_{i}$ is the ith replicate estimate of the difference and $\hat{x}\_{0}$ is the full estimate of the difference using the sample weight.

# TECHNICAL ASSISTANCE

If you require assistance or additional information, please contact the Demographic Statistical Methods Division via e-mail at dsmd.source.and.accuracy@census.gov.

# REFERENCES

Shao, J., and C. F. J. Wu (1989). “A General Theory for Jackknife Variance Estimation”, The Annals of Statistics, Vol. 17, No. 3, pp. 1176-1197.

 Appendix A – Supplemental Island Area Sample

Schools from the Outlying Island Areas of the U.S. Virgin Islands, Guam, American Samoa, and the **Commonwealth of the Northern Mariana Islands were interviewed as part of the 2023-24 SPP. An interview was attempted at all 115 schools currently operating in those areas.**[[2]](#footnote-3)

**Data from those schools was tabulated and weighted separately from the main SPP sample. A simplified weighting procedure was used which included only a nonresponse adjustment within the three grade level categories. Unweighted response rates are shown in Table A-1.**

**Table A-1. Unweighted response rates for island area sample: December 2023 data collection**

| **School characteristic** | **Number of Schools** | **Number of Responses** | **Response Rate** |
| --- | --- | --- | --- |
|  All schools | 115 | 100 | 86.96 |
| Grade level |  |  |  |
|  Elementary | 73 | 65 | 89.04 |
|  Middle/Combined/Other | 18 | 16 | 88.89 |
|  High | 24 | 19 | 79.17 |
| Island Area |  |  |  |
|  American Samoa | 29 | 28 | 96.55 |
|  Guam | 44 | 41 | 93.18 |
|  Northern Mariana Islands | 21 | 17 | 80.95 |
|  U.S. Virgin Islands | 21 | 14 | 66.67 |

Source: National Center for Education Statistics and U.S. Census Bureau, School

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1. OMB# 1850-0975; expires 07/31/2026. [↑](#footnote-ref-2)
2. Between the September 2023 and October 2023 collections, one school in the U.S. Virgin Islands merged with another school, bringing the total number of eligible OA schools down from 116 to 115. [↑](#footnote-ref-3)