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NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

National Assessment of Educational Progress (NAEP) 2024

Appendix G
NAEP 2018 Sample Design

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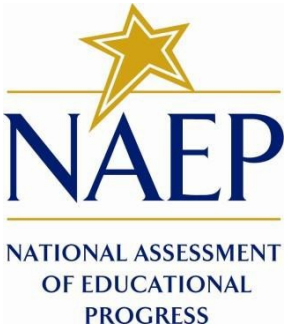

June 2023

The 2018 Weighting Procedures documentation is the most current version available to the public. At this time, there is not a timeline for when the details for later assessment years will be publicly available.

NAEP Technical Documentation Website

NAEP Technical Documentation NAEP 2018 Sample Design

The NAEP 2018 sample design consisted of a nationally representative sample of students for the following operational and pilot assessments:

- social sciences assessments in civics, geography, and U.S. history at grade 8;
- technology and engineering literacy (TEL) assessment at grade 8;
- a science pilot test at grades 4, 8, and 12;
- a reading pilot test at grade 12; and
- a mathematics pilot test at grade 12.

In addition to the operational and pilot assessments, special studies were conducted, including:

- reading scenario-based tasks (SBT) at grades 4, 8, and 12; and
- oral reading fluency (ORF) at grade 4.

Selection of Primary Sampling Units

2018 Public School Social Sciences Assessment

2018 Private School Social Sciences Assessment

2018 Public School TEL Assessment

2018 Private School TEL Assessment

School and Student Participation Results

This was accomplished by designing separate sample components for public and private schools. The selected samples were based on a three-stage sample design:

- selection of primary sampling units (PSUs)
- selection of schools within strata, and
- selection of students within schools

The samples of schools were selected with probability proportional to a measure of size based on the estimated enrollment in the schools at grades 4, 8, and 12.

The target population included all students in public and private schools, including Bureau of Indian Education (BIE) and Department of Defense Education Activity (DoDEA) schools, who were enrolled in grades 4, 8, and 12, respectively, at the time of assessment.

The figure below illustrates the various sample types and subjects. Assessments were either paper-based (PBA) or digitally based (DBA).

Components of the NAEP samples, by assessment subject, grade, and school type: 2018

<table>
<tr><th rowspan="3">School Type</th><th rowspan="3">Grade</th><th colspan="9">Assessment</th></tr>
<tr><th colspan="4">Operational</th><th colspan="3">Pilot</th><th colspan="2">Special Study</th></tr>
<tr><th>Civics</th><th>U.S. History</th><th>Geography</th><th>TEL</th><th>Science</th><th>Mathematics</th><th>Reading</th><th>Reading SBT</th><th>Reading ORF</th></tr>
<tr><td rowspan="3">Public/BIE/DoDEA</td><td>4</td><td colspan="4">N/A</td><td rowspan="3">DBA</td><td colspan="2" rowspan="2">N/A</td><td rowspan="3">DBA</td><td>DBA</td></tr>
<tr><td>8</td><td colspan="3">DBA/PBA</td><td>DBA</td><td rowspan="2">N/A</td></tr>
<tr><td>12</td><td colspan="4">N/A</td><td colspan="2">DBA</td></tr>
<tr><td>Private</td><td>8</td><td colspan="3">DBA/PBA</td><td>DBA</td><td colspan="3">N/A</td><td colspan="2">N/A</td></tr>
</table>

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessments.

The sample design for the operational assessments is described in more detail in subsequent pages.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/naep_2018_sample_design.aspx

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NAEP Technical Documentation 2018 Private School Social Sciences Assessment

The NAEP 2018 sample design yielded nationally representative samples of private school students in grade 8 for social sciences through a three-stage approach:

- selection of primary sampling units (PSUs),
- selection of schools within strata, and
- selection of students within schools.

The sample of schools was selected with probability proportional to a measure of size based on the estimated grade enrollment in the schools.

The 2018 sampling plan was designed to assess 5,200 eighth-graders in private schools for social sciences. These students were allocated among tests in civics, geography, and U.S. history. Target sample sizes were adjusted to reflect expected private school and student response and eligibility.

Schools on the sampling frame were explicitly stratified prior to sampling by private school affiliation (Catholic, non-Catholic, and unaffiliated). Within affiliation type, schools were implicitly stratified by PSU type (certainty/noncertainty). In certainty PSUs,

further stratification was by census region, urbanization classification, and estimated grade enrollment. In noncertainty PSUs, additional stratification was by PSU stratum, urbanization classification, and estimated grade enrollment.

From the stratified frame of private schools, systematic random samples of eighth-grade schools were drawn with probability proportional to a measure of size based on the estimated grade enrollment of the school in the relevant grade.

Each selected school in the private school sample provided a list of eligible enrolled students from which a systematic, equal probability sample of students was drawn.

NAEP Technical Documentation Ineligible Private Schools for the 2018 Social Sciences Assessment

The Private School Universe Survey (PSS) school file from which most of the sampled schools were drawn corresponds to the 2015–2016 school year, two years prior to the assessment school year. During the intervening period, some of these schools either closed, no longer offered the grade of interest, or were ineligible for other reasons. In such cases, the sampled schools were coded as ineligible.

The table below presents unweighted counts of sampled private schools by eligibility status, including the reason for ineligibility.

Number of sampled private schools, social sciences assessment, grade 8, by eligibility status: 2018

Eligibility status	Unweighted count of schools	Unweighted percentage
All eighth-grade sampled private schools	**330**	**100.00**
Eligible schools	270	81.82
No eligible students in grade	13	3.94
Does not have sampled grade	14	4.24
School closed	16	4.85
Not a regular school	16	4.85
Other ineligible school	1	0.30

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to total due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

Eligibility status	Unweighted count of schools	Unweighted percentage
Duplicate on sampling frame	0	0.00

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to total due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

The table below presents unweighted counts of sampled private schools by private school type and eligibility status.

Number of sampled private schools, social sciences assessment, grade 8, by private school type and eligibility status: 2018

Private school type	Eligibility status	Unweighted count of schools	Unweighted percentage
All Private	**Total**	**330**	**100.00**
	Eligible	270	81.82
	Ineligible	60	18.18
Catholic	**Total**	**80**	**100.00**
	Eligible	80	100.00
	Ineligible	4	5.00
Other Private	**Total**	**250**	**100.00**
	Eligible	190	76.00
	Ineligible	56	22.40

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to total due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

NAEP Technical Documentation Sampling Frame for the 2018 Private School Social Sciences Assessment

The primary sampling frames for private schools were developed from the Private School Universe Survey (PSS) corresponding to the 2015-2016 school year. The PSS file is the Department of Education's primary database of elementary and secondary private schools in the 50 states and the District of Columbia, and it is based on a survey conducted by the U.S. Census Bureau during the 2015-2016 school year. These sampling frames are referred to as the PSS-based sampling frames.

The sampling frame was restricted to schools located in the primary sampling units (PSUs) selected for the NAEP 2018 social sciences assessment. In addition, the sampling frame excluded ungraded schools, vocational schools with no enrollment, special-education-only schools, homeschool entities, prison and hospital schools, and juvenile correctional institutions. Vocational schools with no enrollment serve students who split their time between the vocational school and their home school.

The following table presents the number of schools and estimated enrollment for the private school frame for the social sciences assessment at grade 8. The unweighted estimated enrollment is restricted to the selected PSUs. The weighted estimated enrollment incorporates the PSU weight (inverse of the probability of selecting the PSU), and thus is a national estimate of the number of private school students in eighth grade.

Number of schools and enrollment in private school sampling frame, social sciences assessment, grade 8, by affiliation: 2018

Affiliation	Number of schools	Estimated enrollment (unweighted)	Estimated enrollment (weighted)
Total	**10,816**	**210,856**	**305,373**
Catholic	2,839	86,509	121,713
Non-Catholic	5,820	113,562	169,226
Unknown affiliation	2,157	10,785	14,435

NOTE: Detail may not sum to totals due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

For quality control purposes, school and student counts from the sampling frame were compared to school and student counts from previous private school frames for eighth grade. No major discrepancies were found.

NAEP Technical Documentation Sampling of Private Schools for the 2018 Social Sciences Assessment

In the design of each school sample, five objectives underlie the process of determining the probability of selection for each school and how many students are to be sampled from each selected school containing grade-eligible students. The five objectives are

- to meet the target student sample size;
- to select an equal-probability sample of students;
- to limit the number of students who are selected from a school;
- to ensure that the sample within a school does not include a very high percentage of the students in the school, unless all students are included; and
- to reduce the rate of sampling of small schools, in recognition of the greater cost and burden per student of conducting assessments in such schools.

The goal in determining the school's measure of size is to optimize across the last four objectives in terms of maintaining the accuracy of estimates and the cost-effectiveness of the sample design.

Therefore, to meet the target student sample size objective and achieve a reasonable compromise among the other four objectives, the following algorithm was used to assign a measure of size to each school based on its estimated grade enrollment as indicated on the sampling frame.

The measures of size vary by enrollment size. The initial measures of size (MOS) were set as follows:

For eighth grade:

$$MOS_{js} = PSCHWT_s * PSU\_WT_s * \begin{cases} X_{js}, & \text{if } 75 < X_{js} \\ 75, & \text{if } 20 < X_{js} \leq 75 \\ 3.75 * X_{js}, & \text{if } 10 < X_{js} \leq 20 \\ 37.5, & \text{if } X_{js} \leq 10 \end{cases}$$

where X_{js} is the estimated grade enrollment for grade *j* in school *s*, $PSCHWT_s$ = the Private School Universe Survey area frame weight for school *s*, computed by the U.S. Census Bureau, and PSU_WT_s = the PSU weight for school *s*.

The measures of size for schools in the Honolulu primary sampling unit (PSU) are doubled to increase their chances of selection:

$$M_{js} = \begin{cases} 2 \times MOS_{js}, & \text{if school is in the Honolulu PSU} \\ MOS_{js}, & \text{if school is not in the Honolulu PSU} \end{cases}$$

Schools in the Honolulu PSU have their measures of size doubled to ensure at least one sampled school from the PSU. The Honolulu PSU is a certainty not due to its size, but because it is unique.

The next task in this development is to describe b_j, the constant of proportionality for each grade. It is a sampling parameter that, when multiplied with a school's preliminary measure of size (M_{js}), yields the school's final measure of size. It is computed in such a way that, when used with the systematic sampling procedure, the target student sample size is achieved. For private schools, this parameter varied by private school affiliation (Catholic, non-Catholic, and unknown affiliation).

The final measure of size, E_{js}, is defined as:

$$E_{js} = \min\left(b_j \times M_{js}, u_j\right)$$

The quantity u_j (the maximum number of "hits" allowed) in this formula is designed to put an upper bound on the burden for the sampled schools. For private schools, u_j is 1 because by design a school could not be selected, or "hit," in the sampling process more than once within a grade.

Schools were ordered within each jurisdiction using the serpentine sort described under the stratification of private schools. A systematic sample was then drawn using this serpentine sorted list and the measures of size. The number of private schools selected for eighth-grade social sciences was approximately 330.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/sampling_of_private_schools_for_the_2018_social_sciences_assessment.aspx

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NAEP Technical Documentation Stratification of Private Schools for the 2018 Social Sciences Assessment

For the private school sampling frame file, schools were explicitly stratified by private school affiliation (Catholic, non-Catholic, and unknown affiliation). Private school affiliation was unknown for nonrespondents to the NCES Private School Universe Survey (PSS). Within private school type, separate implicit stratification schemes were used to sort schools in certainty primary sampling units (PSUs) and noncertainty PSUs. In all cases, the implicit stratification was achieved via a "serpentine sort".

Within each certainty PSU, the schools were hierarchically sorted by

- census region,
- urbanization classification (four categories based on urban-centric locale), and

- estimated grade enrollment.

Schools in noncertainty PSUs were hierarchically sorted by

- PSU stratum,
- urbanization classification (four categories based on urban-centric locale), and
- estimated grade enrollment.

NAEP Technical Documentation Student Sample Selection for the 2018 Private School Social Sciences Assessment

Students in private schools were selected in the same way as students in the public schools.

NAEP Technical Documentation Substitute Private Schools for the 2018 Social Sciences Assessment

Substitutes were preselected for the private school samples by sorting the school frame file according to the actual order used in the sampling process (the implicit stratification). For operational reasons, the original selection order was embedded within the sampled primary sampling unit (PSU) and state. Each sampled school had each of its nearest neighbors within the same sampling stratum on the school frame file identified as a potential substitute. Since grade enrollment was used as the last sort ordering variable, the nearest neighbors had grade enrollment values very close to that of the sampled school. This was done to facilitate the selection of about the same number of students within the substitute as would have been selected from the original sampled school.

Schools were disqualified as potential substitutes if they were already selected in any of the original private school samples or assigned as a substitute for another private school (earlier in the sort ordering).

If both nearest neighbors were still eligible to be substitutes, the one with a closer grade enrollment was chosen. If both nearest neighbors were equally distant from the sampled school in their grade enrollment (an uncommon occurrence), one of the two was randomly selected.

Of the approximately 330 originally sampled private schools for the eighth-grade social sciences assessment, about 100 schools had substitutes activated when the original eligible schools did not participate. Ultimately, about 30 of the activated substitute private schools participated in a social sciences assessment.

NAEP Technical Documentation Target Population of the 2018 Private School Social Sciences Assessment

The target populations for the 2018 civics, geography, and U.S. history private school assessments included all students who were enrolled in eighth grade in private schools located in the 50 states and the District of Columbia.

NAEP Technical Documentation 2018 Private School Technology and Engineering Literacy (TEL) Assessment

The NAEP 2018 sample design yielded nationally representative samples of private school students in grade 8 for TEL through a three-stage approach:

- selection of primary sampling units (PSUs),
- selection of schools within strata, and
- selection of students within schools.

Sampling of Schools

The sample of schools was selected with probability proportional to a measure of size based on the estimated grade enrollment in the schools.

Substitute Schools

The 2018 sampling plan was designed to assess 1,600 eighth-graders in private schools for TEL. Target sample sizes were adjusted to reflect expected private school and student response and eligibility.

Ineligible Schools

Student Sample Selection

Schools on the sampling frame were explicitly stratified prior to sampling by private school affiliation (Catholic, non-Catholic, and unaffiliated). Within affiliation type, schools were implicitly stratified by PSU type (certainty/noncertainty). In certainty PSUs, further stratification was by census region, urbanization classification, and estimated grade enrollment. In noncertainty PSUs, additional stratification was by PSU stratum, urbanization classification, and estimated grade enrollment.

From the stratified frame of private schools, systematic random samples of eighth-grade schools were drawn with probability proportional to a measure of size based on the estimated grade enrollment of the school in the relevant grade.

Each selected school in the private school sample provided a list of eligible enrolled students from which a systematic, equal probability sample of students was drawn.

NAEP Technical Documentation Ineligible Private Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

The Private School Universe Survey (PSS) school file from which most of the sampled schools were drawn corresponds to the 2015–2016 school year, two years prior to the assessment school year. During the intervening period, some of these schools either closed, no longer offered the grade of interest, or were ineligible for other reasons. In such cases, the sampled schools were coded as ineligible.

The table below presents unweighted counts of sampled private schools by eligibility status, including the reason for ineligibility.

Number of sampled private schools, technology and engineering literacy (TEL) assessment, grade 8, by eligibility status: 2018

Eligibility status	Unweighted count of schools	Unweighted percentage
All eighth-grade sampled private schools	**140**	**100.00**

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to total due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Technology and Engineering Literacy (TEL) Assessment.

Eligibility status	Unweighted count of schools	Unweighted percentage
Eligible schools	120	85.71
No eligible students in grade	5	3.57
Does not have sampled grade	7	5.00
School closed	5	3.57
Not a regular school	5	3.57
Other ineligible school	0	0.00
Duplicate on sampling frame	0	0.00

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to total due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Technology and Engineering Literacy (TEL) Assessment.

The table below presents unweighted counts of sampled private schools by private school type and eligibility status.

Number of sampled private schools, technology and engineering literacy (TEL) assessment, grade 8, by private school type and eligibility status: 2018

Private school type	Eligibility status	Unweighted count of schools	Unweighted percentage
All Private	**Total**	**140**	**100.00**
	Eligible	120	85.71
	Ineligible	22	15.71
Catholic	**Total**	**30**	**100.00**
	Eligible	30	100.00
	Ineligible	1	3.33
Other Private	**Total**	**110**	**100.00**
	Eligible	90	81.82
	Ineligible	21	19.09

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to total due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Technology and Engineering Literacy (TEL) Assessment.

NAEP Technical Documentation Sampling Frame for the 2018 Private School Technology and Engineering Literacy (TEL) Assessment

The primary sampling frames for private schools were developed from the Private School Universe Survey (PSS) corresponding to the 2015-2016 school year. The PSS file is the Department of Education's primary database of elementary and secondary private schools in the 50 states and the District of Columbia, and it is based on a survey conducted by the U.S. Census Bureau during the 2015-2016 school year. These sampling frames are referred to as the PSS-based sampling frames.

The sampling frame was restricted to schools located in the primary sampling units (PSUs) selected for the NAEP 2018 TEL assessment. In addition, the sampling frame excluded ungraded schools, vocational schools with no enrollment, special-education-only schools, homeschool entities, prison and hospital schools, and juvenile correctional institutions. Vocational schools with no enrollment serve students who split their time between the vocational school and their home school.

The following table presents the number of schools and estimated enrollment for the private school frame for grade 8 for TEL. The unweighted estimated enrollment is restricted to the selected PSUs. The weighted estimated enrollment incorporates the PSU weight (inverse of the probability of selecting the PSU), and thus is a national estimate of the number of private school students in eighth grade.

Number of schools and enrollment in private school sampling frame, technology and engineering literacy (TEL) assessment, grade 8, by affiliation: 2018

Affiliation	Number of schools	Estimated enrollment (unweighted)	Estimated enrollment (weighted)
Total	**9,939**	**192,560**	**334,324**
Catholic	2,531	78,262	134,634
Non-Catholic	5,391	104,213	185,404
Unknown affiliation	2,017	10,085	14,286

NOTE: Detail may not sum to totals due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Technology and Engineering Literacy (TEL) Assessment.

For quality control purposes, school and student counts from the sampling frame were compared to school and student counts from previous private school frames for eighth grade. No major discrepancies were found.

NAEP Technical Documentation Sampling of Private Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

In the design of each school sample, five objectives underlie the process of determining the probability of selection for each school and how many students are to be sampled from each selected school containing grade-eligible students. The five objectives are

- to meet the target student sample size
- to select an equal-probability sample of students
- to limit the number of students who are selected from a school
- to ensure that the sample within a school does not include a very high percentage of the students in the school, unless all students are included; and
- to reduce the rate of sampling of small schools, in recognition of the greater cost and burden per student of conducting assessments in such schools

The goal in determining the school's measure of size is to optimize across the last four objectives in terms of maintaining the accuracy of estimates and the cost-effectiveness of the sample design.

Therefore, to meet the target student sample size objective and achieve a reasonable compromise among the other four objectives, the following algorithm was used to assign a measure of size to each school based on its estimated grade enrollment as indicated on the sampling frame.

The measures of size vary by enrollment size. The initial measures of size (MOS) were set as follows:

For eighth grade:

$$MOS_{js} = PSCHWT_s * PSU\_WT_s * \begin{cases} X_{js}, & \text{if } 30 < X_{js} \\ 30, & \text{if } 20 < X_{js} \leq 30 \\ 1.5 * X_{js}, & \text{if } 10 < X_{js} \leq 20 \\ 15, & \text{if } X_{js} \leq 10 \end{cases}$$

where X_{js} is the estimated grade enrollment for grade *j* in school *s*, $PSCHWT_s$ = the Private School Universe Survey area frame weight for school *s*, computed by the U.S. Census Bureau, and PSU_WT_s = the PSU weight for school *s*.

The measures of size for schools in the Honolulu primary sampling unit (PSU) are doubled to increase their chances of selection:

$$M_{js} = \begin{cases} 2 \times MOS_{js}, & \text{if school is in the Honolulu PSU} \\ MOS_{js}, & \text{if school is not in the Honolulu PSU} \end{cases}$$

Schools in the Honolulu PSU have their measures of size doubled to ensure at least one sampled school from the PSU. The Honolulu PSU is a certainty not due to its size, but because it is unique.

The next task in this development is to describe b_j, the constant of proportionality for each grade. It is a sampling parameter that, when multiplied with a school's preliminary measure of size (M_{js}), yields the school's final measure of size. It is computed in such a way that, when used with the systematic sampling procedure, the target student sample size is achieved. For private schools, this parameter varied by private school affiliation (Catholic, non-Catholic, and unknown affiliation).

The final measure of size, E_{js}, is defined as:

$$E_{js} = \min\left(b_j \times M_{js}, u_j\right)$$

The quantity u_j (the maximum number of "hits" allowed) in this formula is designed to put an upper bound on the burden for the sampled schools. For private schools, u_j is 1 because by design a school could not be selected, or "hit," in the sampling process more than once within a grade.

In addition, an adjustment was made to the measures of size in the TEL sample to attempt to reduce school burden by minimizing the number of schools selected for 1) both TEL and social sciences and 2) both TEL and the International Computer and Information Literacy Study (ICILS). For TEL, an adaptation of the Keyfitz process was used to compute conditional measures of size that, by their design, minimized the overlap of schools selected for both TEL and either of the other two samples.

Schools were ordered within each jurisdiction using the serpentine sort described under the stratification of private schools. A systematic sample was then drawn using this serpentine sorted list and the measures of size. The number of private schools selected for eighth-grade TEL was approximately 140.

NAEP Technical Documentation Stratification of Private Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

For the private school sampling frame file, schools were explicitly stratified by private school affiliation (Catholic, non-Catholic, and unknown affiliation). Private school affiliation was unknown for nonrespondents to the NCES Private School Universe Survey (PSS). Within private school type, separate implicit stratification

schemes were used to sort schools in certainty primary sampling units (PSUs) and noncertainty PSUs. In all cases, the implicit stratification was achieved via a "serpentine sort".

Within each certainty PSU, the schools were hierarchically sorted by

- census region
- urbanization classification (four categories based on urban-centric locale)
- estimated grade enrollment

Schools in noncertainty PSUs were hierarchically sorted by

- PSU stratum,
- urbanization classification (four categories based on urban-centric locale), and
- estimated grade enrollment.

NAEP Technical Documentation Student Sample Selection for the 2018 Private School Technology and Engineering Literacy (TEL) Assessment

Students in private schools were selected in the same way as students in the public schools.

NAEP Technical Documentation Substitute Private Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

Substitutes were preselected for the private school samples by sorting the school frame file according to the actual order used in the sampling process (the implicit stratification). For operational reasons, the original selection order was embedded within the sampled primary sampling unit (PSU) and state. Each sampled school

had each of its nearest neighbors within the same sampling stratum on the school frame file identified as a potential substitute. Since grade enrollment was used as the last sort ordering variable, the nearest neighbors had grade enrollment values very close to that of the sampled school. This was done to facilitate the selection of about the same number of students within the substitute as would have been selected from the original sampled school.

Schools were disqualified as potential substitutes if they were already selected in any of the original private school samples or assigned as a substitute for another private school (earlier in the sort ordering). Schools assigned as substitutes for eighth-grade social sciences were disqualified as potential substitutes for eighth-grade TEL schools.

If both nearest neighbors were still eligible to be substitutes, the one with a closer grade enrollment was chosen. If both nearest neighbors were equally distant from the sampled school in their grade enrollment (an uncommon occurrence), one of the two was randomly selected.

Of the approximately 140 originally sampled private schools for the eighth-grade TEL assessment, about 50 schools had substitutes activated when the original eligible schools did not participate. Ultimately, about 10 of the activated substitute private schools participated in the TEL assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/substitute_private_schools_for_the_2018_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation Target Population of the 2018 Private School Technology and Engineering Literacy (TEL) Assessment

The target population for the 2018 TEL private school assessment included all students who were enrolled in eighth grade in private schools located in the 50 states and the District of Columbia.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/target_population_of_the_2018_private_school_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation 2018 Public School Social Sciences Assessment

The NAEP 2018 sample design yielded nationally representative samples of public school students in grade 8 for social sciences through a three-stage approach:

Target Population

- selection of primary sampling units (PSUs),
- selection of schools within strata, and
- selection of students within schools.

Sampling Frame

Stratification of Schools

Sampling of Schools

Substitute Schools

Ineligible Schools

Student Sample Selection

The sample of schools was selected with probability proportional to a measure of size based on the estimated grade enrollment in the schools.

The 2018 sampling plan was designed to assess 46,800 eighth-graders in public schools for social sciences. These students were allocated among tests in civics, geography, and U.S. history. Target sample sizes were adjusted to reflect expected public school and student response and eligibility.

Schools on the sampling frame were explicitly stratified prior to sampling by PSU type (certainty/noncertainty). Within certainty PSUs, schools were implicitly stratified by census region, urbanization classification, race/ethnicity stratum, and estimated grade enrollment. Within noncertainty PSUs, schools were implicitly stratified by PSU stratum, urbanization classification, and race/ethnicity percentage.

From the stratified frame of public schools, systematic random samples of eighth-grade schools were drawn with probability proportional to a measure of size based on the estimated grade enrollment of the school in the relevant grade.

Additionally, American Indian, Alaska Native, Black, and Hispanic students were oversampled at moderate rates as follows. First, schools in a high American Indian/Alaska Native stratum (i.e., schools with more than five percent American Indian and Alaska Native students and at least five American Indian or Alaska Native students in the sample grade) were sampled at four times the rate (by quadrupling their measure of size) as schools not in a high American Indian/Alaska Native stratum to implement oversampling of American Indian and Alaska Native students. Second, schools not in a high American Indian/Alaska Native stratum but in a high Black/Hispanic stratum (i.e., schools that were not oversampled for American Indian and Alaska Native students and with more than 15 percent Black and Hispanic students and at least 10 Black or Hispanic students in the sample grade) were sampled at twice the rate (by doubling their measure of size) as schools not in a high Black/Hispanic stratum to implement oversampling of Black and Hispanic students.

Finally, schools in the Honolulu PSU were oversampled at twice the rate (by doubling their measure of size) as schools not in the Honolulu PSU. This was done to ensure at least one school was sampled from this PSU. The PSU was selected with certainty not due to its size, but because it is unique.

Each selected school in the public school sample provided a list of eligible enrolled students from which a systematic sample of students was drawn. Within each school, students were selected with equal probability.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/2018_public_school_social_sciences_assessment.aspx

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NAEP Technical Documentation Ineligible Public Schools for the 2018 Social Sciences Assessment

The Common Core of Data (CCD) public school file from which most of the sampled schools were drawn corresponds to the 2015-2016 school year, two years prior to the assessment school year. During the intervening period, some of these schools either closed, no longer offered the grade of interest, or became ineligible for other reasons. In such cases, the sampled schools were considered to be ineligible.

The table below presents unweighted counts of sampled public schools by eligibility status, including the reason for ineligibility.

Number of sampled public schools, social sciences assessment, grade 8, by eligibility status: 2018

Eligibility status	Unweighted count of schools	Unweighted percentage
All eighth-grade sampled public schools	**800**	**100.00**
Eligible schools	760	95.00
No eligible students in grade	4	0.50
Does not have sampled grade	14	1.75
School closed	5	0.63
Not a regular school	10	1.25
Other ineligible school	0	0.00
Duplicate on sampling frame	0	0.00

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/ineligible_public_schools_for_the_2018_social_sciences_assessment.aspx

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NAEP Technical Documentation Sampling Frame for the 2018 Public School Social Sciences Assessment

Drawing the school samples for the 2018 assessment required a comprehensive list of public schools in each jurisdiction containing information for stratification purposes. As in previous NAEP assessments, the Common Core of Data (CCD) file developed by NCES was used to construct the sampling frame. The CCD file corresponding to the 2015-2016 school year provided the frame for all regular public, state-operated public, Bureau of Indian Education (BIE), and Department of Defense Education Activity (DoDEA) schools in the 50 states and the District of Columbia.

New-School Sampling Frame

The sampling frame was restricted to schools located in the primary sampling units (PSUs) selected for the NAEP 2018 social sciences assessment. In addition, the sampling frame excluded ungraded schools, vocational schools with no enrollment, special-education-only schools, homeschool entities, prison or hospital schools, and juvenile correctional institutions. Vocational schools with no enrollment serve students who split their time between the vocational school and their home school.

The public school frame for the social sciences assessment contained approximately 13,200 schools. The estimated eighth-grade enrollment (unweighted) for these schools was 2.15 million and the estimated eighth-grade enrollment (weighted) was 3.71 million. The unweighted estimated enrollment is restricted to the selected PSUs for social sciences. The weighted estimated enrollment incorporates the PSU weight (inverse of the probability of selecting the PSU), and thus is a national estimate of the number of public school students in eighth grade.

For quality control purposes, school and student counts from the sampling frame were compared to school and student counts from previous public school frames for eighth grade. No major discrepancies were found.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/sampling_frame_for_the_2018_public_school_social_sciences_assessment.aspx

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NAEP Technical Documentation New-School Sampling Frame for the 2018 Public School Social Sciences Assessment

The most current Common Core of Data (CCD) file available was used to construct the public school frame for NAEP 2018. However, the information on that file was two years out of date by the time of the NAEP assessment. During that two-year period, some schools closed, others changed grade span, and still others came into existence.

One can improve coverage by asking districts to provide information on currently open schools that were not listed in the 2015–2016 CCD file used to create the NAEP public school frame, and also to report grade span changes that may have caused a CCD-listed school to become newly eligible for eighth grade. Asking all districts to do this would have imposed an undue burden, so instead, a random sample of districts was contacted to obtain lists of new and newly eligible schools. The goal was to allow every new or newly eligible school a chance of selection, thereby fully covering the target population of schools in operation during the 2017–2018 school year.

The first step in this process was the development of a new-school frame through the construction of a district-level file from the CCD school-level file. The new-school frames for both social sciences and technical engineering literacy (TEL) were constructed at the same time. Since the social sciences and TEL assessments were to be conducted within a total of 138 primary sampling units (PSUs), only districts that fell within the boundaries of those PSUs were eligible for sampling. Once the district-level file was subset to just the targeted PSUs, it was divided into three files: the first containing state-operated and charter school districts, the second containing small districts, and the third containing large districts.

State-operated districts and districts containing no schools other than charter schools require special handling. In survey years when state-level assessments are conducted, NAEP State Coordinators are asked to provide the names of all new charter-only and state-run schools. However, these types of school districts tend not to be geographically compact, and it is not feasible to link such a district to a single PSU, except at the individual school level. The smaller the proportion of a

state’s population falling within sampled PSUs, the less likely that a specific new school of this type will be added to the frame and the more likely that state personnel will have expended unnecessary effort in providing updated information that will not be used. For this reason, for the NAEP 2018 assessment, the charter-only and state-run district component of the new school procedure was implemented only in states where more than 60 percent of youth fell within sampled PSUs. This meant that this component of the new-school sampling frame procedure was implemented in 21 states plus the District of Columbia, which taken together contain about 67 percent of the nation's youth.

The remaining districts were classified as small or large. A small district usually contains no more than three schools on the frame in total, with no more than one school at each targeted grade (fourth, eighth, and twelfth). However, for NAEP 2018 new schools were only selected for grade 8 assessments. Therefore, for NAEP 2018, a small district contains no more than one school with grade 8 on the frame in total. New schools in small districts were identified during school recruitment and added to the sample if the frame school in the same district was sampled for eighth grade. From a sampling perspective, the new school was viewed as an “annex” to the sampled school that had a well-defined probability of selection equal to that of the frame school. Thus when the frame school was sampled in a small district for eighth grade, any new school was automatically sampled for eighth grade as well.

Large districts were divided into 77 strata based on the NAEP 2018 PSU sampling strata, with districts in certainty PSUs grouped together in a single stratum. The district sample was allocated to each of the 77 strata proportional to the percent of the U.S. population of eighth-graders contained in that stratum, with the caveat that each stratum had to be allocated at least one district. This allocation was then adjusted because it resulted in too many districts in the certainty strata and not enough in the noncertainty strata. Once the allocation to each stratum had been fixed, districts were sampled from a sorted list using systematic sampling with probability proportional to size and a random start, with the measure of size being the number of eighth-graders enrolled in the district. Within the certainty PSU stratum, districts were sorted in a serpentine manner by state and measure of size prior to sampling. In all other strata the districts were sorted by measure of size alone. District selection probabilities were retained and used in all subsequent stages of sampling and weighting.

The selected districts were then sent a listing of all their schools that appeared on the 2015–2016 CCD file and were asked to provide information about any schools missing from CCD, and grade span changes of existing schools. This information provided by the sampled districts was used to construct sampling frames for the selection of new or newly eligible public schools and also for updating the status of existing schools (e.g., school closings). This process was conducted through the NAEP State Coordinator in each jurisdiction. The coordinators were sent the information for all sampled districts in their respective states and were responsible for returning the completed updates.

The eligibility of a school was determined based on the grade span and whether it was located in a sampled PSU. A school was also classified as "newly eligible" if a change of grade span had occurred such that the school status changed from ineligible to eligible at eighth grade.

This process yielded 307 schools on the eighth-grade new school sampling frame for social sciences. These schools contained an estimated 19,143 eighth-grade students.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/new_school_sampling_frame_for_the_2018_public_school_social_sciences_assessment.aspx

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NAEP Technical Documentation Sampling of Public Schools for the 2018 Social Sciences Assessment

In the design of each school sample, six objectives underlie the process of determining the probability of selection for each school and the number of students to be sampled from each selected school containing grade-eligible students. The six objectives are

- to meet the overall target student sample size
- to select an equal-probability sample of students
- to limit the number of students selected from any one school
- to ensure that the sample within a school does not include a very high percentage of the students in the school, unless all students are included
- to reduce the rate of sampling of small schools, in recognition of the greater cost and burden per student of conducting assessments in such schools; and
- to increase the number of American Indian/Alaska Native (AIAN), Black, and Hispanic students in the sample

The goal in determining the school's measure of size is to optimize across the middle four objectives in terms of maintaining the accuracy of estimates and the cost-effectiveness of the sample design.

Therefore, to meet the target student sample size objective and achieve a reasonable compromise among the next four objectives, the following algorithm was used to assign a measure of size to each school based on its estimated grade enrollment as indicated on the sampling frame.

The measures of size vary by enrollment size. The initial measures of size (MOS) were set as follows:

For eighth grade

$$MOS_{js} = PSU\_WT_s * \begin{cases} X_{js}, & \text{if } 75 < X_{js} \\ 75, & \text{if } 20 < X_{js} \leq 75 \\ 3.75 * X_{js}, & \text{if } 10 < X_{js} \leq 20 \\ 37.5, & \text{if } X_{js} \leq 10 \end{cases}$$

where X_{js} is the estimated grade enrollment for grade j in school s, and PSU_WT_s is the PSU weight for school s.

A school with more than 5 percent AIAN students and at least 5 AIAN students in the sample grade is in the high AIAN stratum for NAEP. The measures of size for schools in the high AIAN stratum are quadrupled to increase their chances of selection. A school that is not in the high AIAN stratum and with more than 15 percent Black and Hispanic students and at least 10 Black or Hispanic students in the sample grade is in the high Black/Hispanic stratum for NAEP. The measures of size for schools in the high Black/Hispanic stratum or in the Honolulu primary sampling unit (PSU) are doubled to increase their chances of selection:

$$M_{js} = \begin{cases} 4 \times MOS_{js}, & \text{if school is high AIAN} \\ 2 \times MOS_{js}, & \text{if school is high Black/Hispanic or in the Honolulu PSU but not high AIAN} \\ MOS_{js}, & \text{if school is none of the above} \end{cases}$$

Schools in the Honolulu PSU have their measures of size doubled to ensure at least one sampled school from the PSU. The Honolulu PSU is a certainty not due to its size, but because it is unique.

The next task in this development is to describe b_j, the constant of proportionality for each grade. It is a sampling parameter that, when multiplied with a school's preliminary measure of size (M_{js}), yields the school's final measure of size. It is computed in such a way that, when used with the systematic sampling procedure, the target student sample size is achieved. For social sciences public schools, b_j is 0.000112622 for eighth grade.

The final measure of size is defined as:

$$E_{js} = \min\left(b_j \times M_{js}, u_j\right)$$

The quantity u_j (the maximum number of "hits" allowed) in this formula is designed to put an upper bound on the burden for the sampled schools. For public schools, u_j is 1 because by design a school could not be selected, or "hit," in the sampling process more than once within a grade.

In addition, new and newly-eligible schools were sampled from the new school frame. The final measure of size for these schools is defined as:

$$E_{js} = \min\left(b_j \times M_{js} \times \pi_{djs}^{-1}, u_j\right)$$

The variable π_{djs} is the probability of selection of the district d into the new-school district sample.

Schools were ordered within each jurisdiction using the serpentine sort described under the stratification of public schools. A systematic sample was then drawn using this serpentine-sorted list and the measures of size. The number of public schools selected for social sciences was approximately 800, including approximately 10 new or newly-eligible schools.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/sampling_of_public_schools_for_the_2018_social_sciences_assessment.aspx

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NAEP Technical Documentation Stratification of Public Schools for the 2018 Social Sciences Assessment

For the public school sampling frame file, separate implicit stratification schemes were used to sort schools in certainty primary sampling units (PSUs) and noncertainty PSUs. The implicit stratification was achieved via a "serpentine sort."

For certainty PSUs, the schools were hierarchically sorted by

- census region
- urbanization classification (four categories based on urban-centric locale),
- race/ethnicity stratum
- estimated grade enrollment

If there were less than six expected sampled schools for a particular urbanization classification cell (nested within the census region), the cell was collapsed with a neighboring urbanization classification cell. If the expected sampled schools exceeded 12, then the race/ethnicity strata were defined based on the total percentage of Black, Hispanic, and American Indian/Alaska Native students. The strata were defined so that there were at least six expected sampled schools for each race/ethnicity stratum. If the urbanization classification stratum had an expected sample size less than 12, no race/ethnicity strata were generated, and the final sort variable was total percentage of Black, Hispanic, and American Indian/Alaska Native students rather than estimated grade enrollment.

Schools in noncertainty PSUs were hierarchically sorted by

- PSU stratum
- urbanization classification (four categories based on urban-centric locale)
- percentage of Black, Hispanic, and American Indian/Alaska Native students

The collapsing of cells within the noncertainty PSUs was implemented in a fashion similar to that described for certainty PSUs.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_of_public_schools_for_the_2018_social_sciences_assessment.aspx

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NAEP Technical Documentation Student Sample Selection for the 2018 Public School Social Sciences Assessment

All eighth-grade students in the school were sampled if the school had 80 or fewer students in that grade. Otherwise, a sample of 75 students was selected without replacement.

The assessments were conducted in three session types: digitally-based (DBA) civics/geography/U.S. history, paper-based (PBA) geography/U.S. history, and PBA civics. No more than two session types were assigned to any one school. In schools with fewer than 24 eighth-graders, only one session type, assigned randomly, was conducted. In schools with 24 or more eighth-graders, the DBA session type plus one of the PBA session types, assigned randomly, were conducted. Assignment to subject within a given session type was done through spiraling of booklets (for PBA) or test forms (for DBA). Session type and subject assignment were carried out in a coordinated fashion, with approximately 4 in 13 selected students assigned to geography, 5 in 13 selected students assigned to U.S. history, and 4 in 13 selected students assigned to civics.

The process of list submission, sampling students from year-round schools, sampling newly identified students (including new enrollees), and determining student eligibility and exclusion status was the same as the process used for the NAEP 2017 state student samples.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/student_sample_selection_for_the_2018_public_school_social_sciences_assessment.aspx

NAEP Technical Documentation Substitute Public Schools for the 2018 Social Sciences Assessment

Substitutes were preselected for the public school samples by sorting the school frame file according to the actual order used in the sampling process (the implicit stratification). For operational reasons, the original selection order was embedded within the sampled primary sampling unit (PSU) and state. Each sampled school had each of its nearest neighbors within the same sampling stratum on the school frame file identified as a potential substitute. When grade enrollment was used as the last sort ordering variable, the nearest neighbors had grade enrollment values very close to that of the sampled school. This was done to facilitate the selection of about the same number of students within the substitute as would have been selected from the original sampled school.

Schools were disqualified as potential substitutes if they were already selected in any of the original public school samples or assigned as a substitute for another public school (earlier in the sort ordering).

If both nearest neighbors were still eligible to be substitutes, the one with a closer grade enrollment was chosen. If both nearest neighbors were equally distant from the sampled school in their grade enrollment (an uncommon occurrence), one of the two was randomly selected.

Of the approximately 800 originally sampled public schools for the eighth-grade social sciences assessments, about 80 schools had a substitute activated because the original eligible school did not participate. Ultimately, less than 10 of the activated substitute public schools participated in a social sciences assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/substitute_public_schools_for_the_2018_social_sciences_assessment.aspx

NAEP Technical Documentation Target Population of the 2018 Public School Social Sciences Assessment

The target populations for the 2018 civics, geography, and U.S. history public school assessments included all students who were enrolled in eighth grade in public schools, Bureau of Indian Education (BIE) schools, and Department of Defense Education Activity (DoDEA) schools located in the 50 states and the District of Columbia.

NAEP Technical Documentation 2018 Public School Technology and Engineering Literacy (TEL) Assessment

The NAEP 2018 sample design yielded nationally representative samples of public school students in grade 8 for TEL through a three-stage approach:

- selection of primary sampling units (PSUs),
- selection of schools within strata, and
- selection of students within schools.

The sample of schools was selected with probability proportional to a measure of size based on the estimated grade enrollment in the schools.

The 2018 sampling plan was designed to assess 14,400 eighth-graders in public schools for TEL. Target sample sizes were adjusted to reflect expected public school and student response and eligibility.

Schools on the sampling frame were explicitly stratified prior to sampling by PSU type (certainty/noncertainty). Within certainty PSUs, schools were implicitly stratified by census region, urbanization classification, race/ethnicity stratum, and estimated grade enrollment. Within noncertainty PSUs, schools were implicitly stratified by PSU stratum, urbanization classification, and race/ethnicity percentage.

From the stratified frame of public schools, systematic random samples of eighth-grade schools were drawn with probability proportional to a measure of size based on the estimated grade enrollment of the school in the relevant grade.

Additionally, American Indian, Alaska Native, Black, and Hispanic students were oversampled at moderate rates as follows. First, schools in a high American Indian/Alaska Native stratum (i.e., schools with more than five percent American Indian and Alaska Native students and at least five American Indian or Alaska Native students in the sample grade) were sampled at four times the rate (by quadrupling their measure of size) as schools not in a high American Indian/Alaska Native stratum to implement oversampling of American Indian and Alaska Native students. Second, schools not in a high American Indian/Alaska Native stratum but in a high Black/Hispanic stratum (i.e., schools that were not oversampled for American Indian and Alaska Native students and with more than 15 percent Black and Hispanic students and at least 10 Black or Hispanic students in the sample grade) were sampled at twice the rate (by doubling their measure of size) as schools not in a high Black/Hispanic stratum to implement oversampling of Black and Hispanic students.

Finally, schools in the Honolulu PSU were oversampled at twice the rate (by doubling their measure of size) as schools not in the Honolulu PSU. This was done to ensure at least one school was sampled from this PSU. The PSU was selected with certainty not due to its size, but because it is unique.

Each selected school in the public school sample provided a list of eligible enrolled students from which a systematic sample of students was drawn. Within each school, students were selected with equal probability.

NAEP Technical Documentation Ineligible Public Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

The Common Core of Data (CCD) public school file from which most of the sampled schools were drawn corresponds to the 2015–2016 school year, two years prior to the assessment school year. During the intervening period, some of these schools either closed, no longer offered the grade of interest, or became ineligible for other reasons. In such cases, the sampled schools were considered to be ineligible.

The table below presents unweighted counts of sampled public schools by eligibility status, including the reason for ineligibility.

Number of sampled public schools, technology and engineering literacy (TEL) assessment, grade 8, by eligibility status: 2018

Eligibility status	Unweighted count of schools	Unweighted percentage
All eighth-grade sampled public schools	**620**	**100.00**
Eligible schools	590	95.16
No eligible students in grade	2	0.32
Does not have sampled grade	10	1.61
School closed	4	0.65
Not a regular school	8	1.29
Other ineligible school	1	0.16
Duplicate on sampling frame	0	0.00

NOTE: Total and eligible school counts are rounded to nearest ten. Percentages are based on rounded counts. Detail may not sum to total due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Technology and Engineering Literacy (TEL) Assessment.

NAEP Technical Documentation Sampling Frame for the 2018 Public School Technology and Engineering Literacy (TEL) Assessment

New-School Sampling Frame

Drawing the school samples for the 2018 TEL assessment required a comprehensive list of public schools in each jurisdiction containing information for stratification purposes. As in previous NAEP assessments, the Common Core of Data (CCD) file developed by NCES was used to construct the sampling frame. The CCD file corresponding to the 2015–2016 school year provided the frame for all regular public, state-operated public, Bureau of Indian Education (BIE), and Department of Defense Education Activity (DoDEA) schools in the 50 states and the District of Columbia.

The sampling frame was restricted to schools located in the primary sampling units (PSUs) selected for the NAEP 2018 TEL assessment. In addition, the sampling frame excluded ungraded schools, vocational schools with no enrollment, special-education-only schools, homeschool entities, prison or hospital schools, and juvenile correctional institutions. Vocational schools with no enrollment serve students who split their time between the vocational school and their home school.

The public school frame for TEL contained approximately 11,400 schools. The estimated eighth-grade enrollment (unweighted) for these schools was 1.88 million and the estimated eighth-grade enrollment (weighted) was 3.70 million. The unweighted estimated enrollment is restricted to the selected PSUs for TEL. The weighted estimated enrollment incorporates the PSU weight (inverse of the probability of selecting the PSU), and thus is a national estimate of the number of public school students in eighth grade.

For quality control purposes, school and student counts from the sampling frame were compared to school and student counts from previous public school frames for eighth grade. No major discrepancies were found.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/sampling_frame_for_the_2018_public_school_technology_and_engineering_literacy_tel_assessment.aspx

NAEP Technical Documentation New School Sampling Frame for the 2018 Public School Technology and Engineering Literacy (TEL) Assessment

The new school sampling frame for NAEP 2018 was developed for both the social sciences and TEL assessments at the same time. Thus the details of the new school sampling frame for TEL are described in the new-school sampling frame for social sciences.

This process yielded 271 schools on the eighth-grade new school sampling frame for TEL. These schools contained an estimated 16,826 eighth-grade students.

NAEP Technical Documentation Sampling of Public Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

In the design of each school sample, five objectives underlie the process of determining the probability of selection for each school and the number of students to be sampled from each selected school containing grade-eligible students. The six objectives are

- to meet the target student sample size;
- to select an equal-probability sample of students;
- to limit the number of students that are selected from a school;
- to ensure that the sample within a school does not include a very high percentage of the students in the school, unless all students are included;
- to reduce the rate of sampling of small schools, in recognition of the greater cost and burden per student of conducting assessments in such schools; and
- to increase the number of American Indian/Alaska Native (AIAN), Black, and Hispanic students in the sample.

The goal in determining the school's measure of size is to optimize across the middle four objectives in terms of maintaining the accuracy of estimates and the cost-effectiveness of the sample design.

Therefore, to meet the target student sample size objective and achieve a reasonable compromise among the next four objectives, the following algorithm was used to assign a measure of size to each school based on its estimated grade enrollment as indicated on the sampling frame.

The measures of size vary by enrollment size. The initial measures of size (MOS) were set as follows:

For eighth grade

$$MOS_{js} = PSU\_WT_s * \begin{cases} X_{js}, & \text{if } 30 < X_{js} \\ 30, & \text{if } 20 < X_{js} \leq 30 \\ 1.5 * X_{js}, & \text{if } 10 < X_{js} \leq 20 \\ 15, & \text{if } X_{js} \leq 10 \end{cases}$$

where X_{js} is the estimated grade enrollment for grade j in school s, and PSU_WT_s is the PSU weight for school s.

A school with more than 5 percent AIAN students and at least 5 AIAN students in the sample grade is in the high AIAN stratum for NAEP. The measures of size for schools in the high AIAN stratum are quadrupled to increase their chances of selection. A school that is not in the high AIAN stratum and with more than 15 percent Black and Hispanic students and at least 10 Black or Hispanic students in the sample grade is in the high Black/Hispanic stratum for NAEP. The measures of size for schools in the high Black/Hispanic stratum or in the Honolulu primary sampling unit (PSU) are doubled to increase their chances of selection:

$$M_{js} = \begin{cases} 4 \times MOS_{js}, & \text{if school is high AIAN} \\ 2 \times MOS_{js}, & \text{if school is high Black/Hispanic or in the Honolulu PSU but not high AIAN} \\ MOS_{js}, & \text{if school is none of the above} \end{cases}$$

Schools in the Honolulu PSU have their measures of size doubled to ensure at least one sampled school from the PSU. The Honolulu PSU is a certainty not due to its size, but because it is unique.

The next task in this development is to describe b_j, the constant of proportionality for each grade. It is a sampling parameter that, when multiplied with a school's preliminary measure of size (M_{js}), yields the school's final measure of size. It is computed in such a way that, when used with the systematic sampling procedure, the target student sample size is achieved. For TEL public schools, b_j is 0.000099771 for eighth grade.

The final measure of size, E_{js}, is defined as:

$$E_{js} = \min\left(b_j \times M_{js}, u_j\right)$$

The quantity u_j (the maximum number of "hits" allowed) in this formula is designed to put an upper bound on the burden for the sampled schools. For public schools, u_j is 1 because by design a school could not be selected, or "hit," in the sampling process more than once within a grade.

In addition, new and newly-eligible schools were sampled from the new school frame. The final measure of size for these schools is defined as:

$$E_{js} = \min\left(b_j \times M_{js} \times \pi_{djs}^{-1}, u_j\right)$$

The variable π_{djs} is the probability of selection of the district *d* into the new-school district sample.

In addition, an adjustment was made to the measures of size in the TEL sample to attempt to reduce school burden by minimizing the number of schools selected for 1) both TEL and social sciences and 2) both TEL and the International Computer and Information Literacy Study (ICILS). For TEL, an adaptation of the Keyfitz process was used to compute conditional measures of size that, by their design, minimized the overlap of schools selected for both TEL and either of the other two samples.

Schools were ordered within each jurisdiction using the serpentine sort described under the stratification of public schools. A systematic sample was then drawn using this serpentine-sorted list and the measures of size. The number of public schools selected for TEL was approximately 620, including approximately 10 new or newly-eligible schools.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/sampling_of_public_schools_for_the_2018_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation Stratification of Public Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

For the public school sampling frame file, separate implicit stratification schemes were used to sort schools into certainty primary sampling units (PSUs) and noncertainty PSUs. The implicit stratification was achieved via a "serpentine sort."

For certainty PSUs, the schools were hierarchically sorted by

- census region,
- urbanization classification (four categories based on urban-centric locale),
- race/ethnicity stratum, and
- estimated grade enrollment.

If there were less than six expected sampled schools for a particular urbanization classification cell (nested within the census region), the cell was collapsed with a neighboring urbanization classification cell. If the expected number of sampled schools exceeded 12, then the race/ethnicity strata were defined based on the percentages of Black, Hispanic, and American Indian/Alaska Native students. The strata were defined so that there were at least six expected sampled schools for each race/ethnicity stratum. If the urbanization classification stratum had an expected sample size less than 12, no race/ethnicity strata were generated, and the final sort variable was the total percentage of Black, Hispanic, and American Indian/Alaska Native students rather than estimated grade enrollment.

Schools in noncertainty PSUs were hierarchically sorted by

- PSU stratum,
- urbanization classification (four categories based on urban-centric locale), and
- percentage of Black, Hispanic, and American Indian/Alaska Native students.

The collapsing of cells within the noncertainty PSUs was implemented in a fashion similar to that described for certainty PSUs.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_of_public_schools_for_the_2018_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation Student Sample Selection for the 2018 Public School Technology and Engineering Literacy (TEL) Assessment

All eighth-grade students in the school were sampled if the school had 30 or fewer students in that grade. Otherwise, a sample of 30 students was selected without replacement.

The process of list submission, sampling students from year-round schools, sampling newly identified students (including new enrollees), and determining student eligibility and exclusion status was the same as the process used for the NAEP 2017 state student samples.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/student_sample_selection_for_the_2018_public_school_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation Substitute Public Schools for the 2018 Technology and Engineering Literacy (TEL) Assessment

Substitutes were preselected for the public school samples by sorting the school frame file according to the actual order used in the sampling process (the implicit stratification). For operational reasons, the original selection order was embedded within the sampled primary sampling unit (PSU) and state. Each sampled school had each of its nearest neighbors within the same sampling stratum on the school frame file identified as a potential substitute. When grade enrollment was used as the last sort ordering variable, the nearest neighbors had grade enrollment values very close to that of the sampled school. This was done to facilitate the selection of about the same number of students within the substitute as would have been selected from the original sampled school.

Schools were disqualified as potential substitutes if they were already selected in any of the original public school samples or assigned as a substitute for another public school (earlier in the sort ordering). Schools assigned as substitutes for eighth-grade social sciences were disqualified as potential substitutes for eighth-grade TEL schools.

If both nearest neighbors were still eligible to be substitutes, the one with a closer grade enrollment was chosen. If both nearest neighbors were equally distant from the sampled school in their grade enrollment (an uncommon occurrence), one of the two was randomly selected.

Of the approximately 620 originally sampled public schools for the eighth-grade TEL assessment, about 50 schools had a substitute activated because the original eligible school did not participate. Ultimately, less than 10 of the activated substitute public schools participated in the TEL assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/substitute_public_schools_for_the_2018_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation Target Population of the 2018 Public School Technology and Engineering Literacy (TEL) Assessment

The target population for the 2018 TEL public school assessment included all students who were enrolled in eighth grade in public schools, Bureau of Indian Education (BIE) schools, and Department of Defense Education Activity (DoDEA) schools located in the 50 states and the District of Columbia.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/target_population_of_the_2018_public_school_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation School and Student Participation Results for the 2018 Assessment

Participation in NAEP is not mandatory. Although a portion of the participating school sample consisted of substitute schools, it is preferable to calculate school response rates on the basis of school participation before substitution.

In every NAEP survey, some of the sampled students are not assessed. Examples of such students are as follows:

- withdrawn students,

School response rates for the Civics assessment

School response rates for the Geography assessment

- excluded students with disabilities (SD),
- excluded English learner (EL) students, or
- students absent from both the original session and the makeup session (not excluded but not assessed).

Withdrawn students are those who have left the school before the original assessment. Excluded students were determined by their school to be unable to meaningfully take the NAEP assessment in their assigned subject, even with an accommodation. Excluded students must also be classified as SD and/or EL. Other students who were absent for the initial session are assessed in the makeup session. The last category includes students who were not excluded (i.e., were to be assessed) but were not assessed, either due to absence from both sessions or because of a refusal to participate. Assessed students are also classified as assessed without an accommodation or assessed with an accommodation. The latter group can be divided into SD students assessed with an accommodation, EL students assessed with an accommodation, or students who are both SD and EL and accommodated. Note that some SD and EL students are assessed without accommodations, and students who are neither SD nor EL can only be assessed without an accommodation.

The weighted student response rates utilize the student base weights and indicate the weighted percentage of assessed students among all students to be assessed. The exclusion rates, in contrast, provide the weighted percentage of excluded SD or EL students among all eligible students, i.e., absent, assessed, and excluded students.

School response rates for the U.S. History assessment

School response rates for the Technology and Engineering Literacy (TEL) assessment

Student response and exclusion rates for the Civics assessment

Student response and exclusion rates for the Geography assessment

Student response and exclusion rates for the U.S. History assessment

Student response and exclusion rates for the Technology and Engineering Literacy (TEL) assessment

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/school_and_student_participation_results_for_the_2018_assessment.aspx

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NAEP Technical Documentation School Response Rates for the 2018 Civics Assessment

The following table presents counts of eligible sampled schools and participating schools, as well as weighted school response rates, for the 2018 civics assessment. The weighted school response rates estimate the proportion of the student population that is represented by the participating school sample prior to substitution.

School response counts and rates for public and private schools before substitution, civics assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Number of eligible sampled schools	Number of participating schools	Weighted school response rate prior to substitution (percent)

School type and geographic region/affiliation	Number of eligible sampled schools	Number of participating schools	Weighted school response rate prior to substitution (percent)
National all[1]	**1,030**	**800**	**81.82**
National public	760	640	84.44
Northeast public	110	100	94.60
Midwest public	150	110	71.19
South public	310	260	86.13
West public	200	170	86.37
National private	270	150	48.66
Catholic	80	70	85.85
Non-Catholic	190	80	27.28

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. School counts are rounded to nearest ten. Detail may not sum to totals because of rounding. Percentages are based on unrounded counts.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/school_response_rates_for_the_2018_civics_assessment.aspx

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NAEP Technical Documentation School Response Rates for the 2018 Geography Assessment

The following table presents counts of eligible sampled schools and participating schools, as well as weighted school response rates, for the 2018 geography assessment. The weighted school response rates estimate the proportion of the student population that is represented by the participating school sample prior to substitution.

School response counts and rates for public and private schools before substitution, geography assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Number of eligible sampled schools	Number of participating schools	Weighted school response rate prior to substitution (percent)
National all[1]	**1,030**	**800**	**81.82**
National public	760	640	84.44
Northeast public	110	100	94.60
Midwest public	150	110	71.19
South public	310	260	86.13
West public	200	170	86.37
National private	270	150	48.66
Catholic	80	70	85.85
Non-Catholic	190	80	27.28

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. School counts are rounded to nearest ten. Detail may not sum to totals because of rounding. Percentages are based on unrounded counts.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/school_response_rates_for_the_2018_geography_assessment.aspx

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NAEP Technical Documentation School Response Rates for the 2018 Technology and Engineering Literacy (TEL) Assessment

The following table presents counts of eligible sampled schools and participating schools, as well as weighted school response rates, for the 2018 TEL assessment. The weighted school response rates estimate the proportion of the student population that is represented by the participating school sample prior to substitution.

School response counts and rates for public and private schools before substitution, technology and engineering literacy (TEL) assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Number of eligible sampled schools	Number of participating schools	Weighted school response rate prior to substitution (percent)

School type and geographic region/affiliation	Number of eligible sampled schools	Number of participating schools	Weighted school response rate prior to substitution (percent)
National all[1]	**710**	**580**	**86.42**
National public	590	520	88.79
Northeast public	90	80	96.29
Midwest public	110	90	80.96
South public	240	220	91.01
West public	150	130	86.80
National private	120	60	58.38
Catholic	30	30	89.82
Non-Catholic	90	30	36.19

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. School counts are rounded to nearest ten. Detail may not sum to totals because of rounding. Percentages are based on unrounded counts.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Technology and Engineering Literacy (TEL) Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/school_response_rates_for_the_2018_technology_and_engineering_literacy_tel_assessment.aspx

NAEP Technical Documentation School Response Rates for the 2018 U.S. History Assessment

The following table presents counts of eligible sampled schools and participating schools, as well as weighted school response rates, for the 2018 U.S. history assessment. The weighted school response rates estimate the proportion of the student population that is represented by the participating school sample prior to substitution.

School response counts and rates for public and private schools before substitution, U.S. history assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Number of eligible sampled schools	Number of participating schools	Weighted school response rate prior to substitution (percent)
National all[1]	**1,030**	**800**	**81.82**
National public	760	640	84.44
Northeast public	110	100	94.60
Midwest public	150	110	71.19
South public	310	260	86.13
West public	200	170	86.37
National private	270	150	48.66
Catholic	80	70	85.85
Non-Catholic	190	80	27.28

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. School counts are rounded to nearest ten. Detail may not sum to totals because of rounding. Percentages are based on unrounded counts.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/school_response_rates_for_the_2018_us_history_assessment.aspx

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NAEP Technical Documentation Student Response and Exclusion Rates for the 2018 Civics Assessment

The following table presents the weighted student response and exclusion rates for the 2018 civics assessment. The exclusion rates give the percentage excluded, among all eligible (i.e., assessed, absent, or excluded) students. Excluded students must necessarily be either students with disabilities (SD) or English learners (EL). The response rates indicate the percentage of students assessed among those who it was intended would take the assessment from within the participating schools. Thus, students who were excluded are not included in the denominators of the response rates.

Weighted student response and exclusion rates for public and private schools, civics assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Weighted student response rates (percent)	Weighted percent of all eligible students who are SD and excluded	Weighted percent of all eligible students who are EL and excluded
National all[1]	**92.01**	**1.42**	**0.56**
National public	91.96	1.54	0.60
Northeast public	89.34	1.30	0.95
Midwest public	92.44	1.30	0.41
South public	92.61	2.08	0.49
West public	92.50	1.07	0.70
National private	92.93	0.03	0.03
Catholic	94.64	0.08	0.08
Non-Catholic	90.60	0.00	0.00

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. SD = students with disabilities; EL = English learners.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/student_response_and_exclusion_rates_for_the_2018_civics_assessment.aspx

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NAEP Technical Documentation Student Response and Exclusion Rates for the 2018 Geography Assessment

The following table presents the weighted student response and exclusion rates for the 2018 geography assessment. The exclusion rates give the percentage excluded, among all eligible (i.e., assessed, absent, or excluded) students. Excluded students must necessarily be either students with disabilities (SD) or English learners (EL). The response rates indicate the percentage of students assessed among those who it was intended would take the assessment from within the participating schools. Thus, students who were excluded are not included in the denominators of the response rates.

Weighted student response and exclusion rates for public and private schools, geography assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Weighted student response rates (percent)	Weighted percent of all eligible students who are SD and excluded	Weighted percent of all eligible students who are EL and excluded
National all[1]	**92.03**	**1.30**	**0.68**
National public	91.95	1.39	0.72
Northeast public	90.04	1.20	1.53
Midwest public	92.84	1.50	0.36
South public	92.49	1.61	0.67
West public	91.83	1.07	0.59
National private	93.41	0.21	0.11
Catholic	94.22	0.00	0.00
Non-Catholic	92.08	0.35	0.17

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. SD = students with disabilities; EL = English learners.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/student_response_and_exclusion_rates_for_the_2018_geography_assessment.aspx

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NAEP Technical Documentation Student Response and Exclusion Rates for the 2018 Technology and Engineering Literacy (TEL) Assessment

The following table presents the weighted student response and exclusion rates for the 2018 TEL assessment. The exclusion rates give the percentage excluded, among all eligible (i.e., assessed, absent, or excluded) students. Excluded students must necessarily be either students with disabilities (SD) or English learners (EL). The response rates indicate the percentage of students assessed among those who it was intended would take the assessment from within the participating schools. Thus, students who were excluded are not included in the denominators of the response rates.

Weighted student response and exclusion rates for public and private schools, technology and engineering literacy (TEL) assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Weighted student response rates (percent)	Weighted percent of all eligible students who are SD and excluded	Weighted percent of all eligible students who are EL and excluded
National all[1]	**93.16**	**1.05**	**0.59**
National public	93.15	1.14	0.64
Northeast public	91.37	1.42	1.30
Midwest public	93.36	0.81	0.49
South public	93.50	1.11	0.51
West public	93.69	1.24	0.52
National private	93.38	0.00	0.00
Catholic	94.54	0.00	0.00
Non-Catholic	91.70	0.00	0.00

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. SD = students with disabilities; EL = English learners.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Technology and Engineering Literacy (TEL) Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/student_response_and_exclusion_rates_for_the_2018_technology_and_engineering_literacy_tel_assessment.aspx

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NAEP Technical Documentation Student Response and Exclusion Rates for the 2018 U.S. History Assessment

The following table presents the weighted student response and exclusion rates for the 2018 U.S. history assessment. The exclusion rates give the percentage excluded, among all eligible (i.e., assessed, absent, or excluded) students. Excluded students must necessarily be either students with disabilities (SD) or English learners (EL). The response rates indicate the percentage of students assessed among those who it was intended would take the assessment from within the participating schools. Thus, students who were excluded are not included in the denominators of the response rates.

Weighted student response and exclusion rates for public and private schools, U.S. history assessment at grade 8, by school type, geographic region, and affiliation: 2018

School type and geographic region/affiliation	Weighted student response rates (percent)	Weighted percent of all eligible students who are SD and excluded	Weighted percent of all eligible students who are EL and excluded
National all[1]	**92.20**	**1.29**	**0.64**
National public	92.21	1.39	0.68
Northeast public	89.66	1.28	1.04
Midwest public	93.05	1.05	0.18
South public	92.70	1.55	0.55
West public	92.67	1.48	1.07
National private	92.02	0.08	0.11
Catholic	92.60	0.00	0.09
Non-Catholic	91.09	0.13	0.13

[1]Includes national public, national private, Bureau of Indian Education, and Department of Defense Education Activity schools located in the United States.
NOTE: National public includes students from public schools only. It includes charter schools, but excludes Bureau of Indian Education schools and Department of Defense Education Activity schools. It is used when comparing national data to those of states, urban districts, or regions. SD = students with disabilities; EL = English learners.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Social Sciences Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/student_response_and_exclusion_rates_for_the_2018_us_history_assessment.aspx

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NAEP Technical Documentation Selection of Primary Sampling Units (PSUs) for the 2018 Assessment

The first stage of sampling for the 2018 assessment was the selection of primary sampling units (PSUs). A PSU is a geographic area comprising an individual county or a group of contiguous counties. Three sets of sample PSUs were selected for the 2018 assessments: one for the social sciences assessments, one for the technology and engineering literacy (TEL) assessment, and one for the pilot and special studies assessments. For social sciences, 105 PSUs were selected. For TEL and pilot/special studies, two sets of 67 PSUs were selected.

The PSU samples were drawn using a stratified sample design with one PSU selected per stratum or stratum pair with probability proportional to population size. The size measure used for PSU sampling was persons 17 years of age and younger from 2015 U.S. Census Bureau population estimates.

PSU Generation: Metropolitan Statistical Areas

PSU Generation: Certainty PSUs

PSU Generation: Non-Metropolitan Statistical Areas

The PSU sampling frame was constructed by partitioning all counties in the entire United States (the 50 states and the District of Columbia) into 1,001 non-overlapping PSUs as follows:

PSU Frame Stratification

Final PSU Samples

- Each metropolitan statistical area (metro area) was considered a separate PSU, unless it crossed census region boundaries. When this happened, the part within each region was made a separate PSU; and

- Non-metro area PSUs were constructed from contiguous non-metro area counties within the same state that had minimum populations of 15,000 youths in the Northeast and South census regions and 10,000 youths in the Midwest and West census regions.

Measures of size for constructing the PSUs were based on youth population data obtained from the 2010 Decennial Census summary files.

For all three PSU samples, 29 PSUs on the PSU sampling frame were included in the sample with certainty (selected with a probability of 1). The inclusion of these PSUs in the sample with certainty provided the approximate optimum, cost-efficient sample of schools and students when samples were drawn within them at the required national sampling rate.

The remaining PSUs were grouped into noncertainty PSU sampling strata within eight primary strata, which were defined by census region and metropolitan status. The stratification of PSUs within the eight primary strata was based on characteristics shown to be highly correlated with student performance such as minority status, income, education, renter status, and percentage of female-headed households. These data were obtained at the county level from the 2006–10 American Community Survey (ACS) and then aggregated to the PSU level. Seventy-six noncertainty PSU strata were formed. These PSU strata were then paired to form 38 stratum pairs.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/selection_of_primary_sampling_units_for_the_2018_assessment.aspx

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NAEP Technical Documentation Final Primary Sampling Unit (PSU) Samples for the 2018 Assessment

There were three sets of primary sampling unit (PSU) samples for the 2018 assessment: one for the social sciences assessments, one for the technology and engineering literacy (TEL) assessment, and one for the pilot and special studies assessments. The first set (for social sciences) had 105 sample PSUs of which 29 were certainty and 76 were noncertainty. The other two sets (for TEL and pilot/special studies, respectively) each had 67 sample PSUs of which 29 were certainty and 38 were noncertainty. All three sets had the exact same 29 certainty PSUs. The noncertainty PSUs were distinct from each other to the extent possible; however, ten noncertainty PSUs were in more than one PSU sample. In particular, five noncertainty PSUs were selected for both the social sciences and TEL samples, and a different five noncertainty PSUs were selected for both the social sciences and pilot/special studies samples.

To select the noncertainty PSUs for the social sciences assessments, one PSU was selected from each of the 76 noncertainty strata defined in Final Primary Sampling Unit Strata. Each PSU was selected with probability proportionate to size, where the size measure was the number of persons 17 years of age and younger from the 2015 Census Bureau population estimates.

To select the noncertainty PSUs for the TEL assessment, the 76 noncertainty strata were paired and one noncertainty stratum was randomly sampled from each of the 38 pairs. Then one PSU was selected from each of the 38 sampled strata with probability proportionate to size, where the size measure was the number of persons 17 years of age and younger from the 2015 Census Bureau population estimates.

The noncertainty PSUs for the pilot and special studies assessments were selected using a procedure similar to that used for TEL, but the noncertainty PSUs were drawn from the 38 noncertainty strata that were not sampled for the TEL assessment.

In addition, to reduce the burden of any particular school when selecting the 2018 sample PSUs, efforts were made to minimize overlap with the 2013, 2014, 2015, and 2016 PSU samples. There was a small PSU sample that included 32 noncertainty PSUs in 2017, with which overlap control was not attempted.

The table below shows the distribution of the 2018 sample PSUs for each assessment by metropolitan status (metropolitan/non-metropolitan), census region, and PSU type (certainty/noncertainty) by metropolitan status.

Distribution of sampled primary sampling units (PSUs) for the social sciences, TEL, and pilot/special studies assessments, by PSU type: 2018

PSU type	Number of sampled PSUs social sciences	Number of sampled PSUs TEL	Number of sampled PSUs pilot/special studies
Total	**105**	**67**	**67**
Metropolitan status			
Metropolitan	85	57	57
Non-metropolitan	20	10	10
Census region			
Northeast	13	8	8
Midwest	23	14	14
South	41	25	25
West	28	20	20
Certainty/metropolitan status			
Certainty	29	29	29
Non-certainty metropolitan	56	28	28
Non-certainty non-metropolitan	20	10	10

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/final_primary_sampling_unit_samples_for_the_2018_assessment.aspx

NAEP Technical Documentation Primary Sampling Unit (PSU) Frame Stratification for the 2018 Assessment

The primary sampling unit (PSU) strata were determined by census region and metropolitan status (metropolitan or non-metropolitan) for a total of eight "primary" strata. Measures of size were defined for each of these strata, determined by the relative share of the eventual PSU sample (the sample size is designed to be proportional to the number of youths). The PSU stratum measure of size then is the total number of youths (persons 17 years of age and younger) in the stratum. The table below presents these counts for each of the eight primary strata. The relative share of the PSU sample size for each stratum is the number of youths in the stratum divided by the total number of youths, multiplied by 76 (the total number of noncertainty PSU strata). This is shown in the fifth column of the table below. The resulting number is then rounded to the nearest even integer (the integer needs to be even to facilitate variance estimation). Some manual tweaking to the rounding is needed such that the total number of final PSU strata sums to 76. The results of these calculations are given in the table below.

Stepwise Regression Analysis Results for PSU Stratification

Final PSU Strata

Noncertainty primary sampling unit frame size statistics, by primary stratum: 2018

Primary stratum	PSUs	Counties	Youths	Target number of final PSU strata	Set number of final PSU strata	Youths per final PSU stratum
Total noncertainty PSUs	**972**	**2,902**	**41,202,551**	**76**	**76**	**542,139**
Northeast region metropolitan	43	84	4,422,552	8.2	8	552,819
Northeast region non-metropolitan	48	94	1,046,020	1.9	2	523,010
Midwest region metropolitan	91	229	7,009,814	12.9	12	584,151
Midwest region non-metropolitan	228	762	3,423,867	6.3	6	570,645
South region metropolitan	141	454	13,076,698	24.1	24	544,862
South region non-metropolitan	250	871	5,056,398	9.3	8	632,050
West region metropolitan	68	92	5,508,264	10.2	12	459,022
West region non-metropolitan	103	316	1,658,938	3.1	4	414,735

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

The division of the primary strata into the final strata was done on a stratum-by-stratum basis. The criteria for good PSU strata were 1) the strata should have as nearly equal measures of size as possible (to reduce sampling variance), and 2) the strata should be as heterogeneous in measured achievement as possible (i.e., there should be strata with low mean achievement, strata with mid-level mean achievement, and strata with high mean achievement). This second criterion will also ultimately reduce the variance of the assessment estimates since the final PSU sample will be balanced in terms of assessment means.

PSU assessment means from the current year cannot be used as assessments are only conducted after sampling is completed. Information is available about PSU sociodemographic characteristics in advance, however. An analysis was done within each primary stratum to find sociodemographic variables that were good predictors of performance on the eighth-grade reading assessments conducted in five previous NAEP cycles (2002, 2003, 2005, 2007, and 2009). Using these sociodemographic variables to define final strata should increase the chance of having efficient stratum definitions. Stepwise Regression Analysis Results for PSU Stratification describes this analysis for each primary stratum.

The final step in stratification was to define the desired number of final strata using the selected stratifiers, while constructing final strata that were as close to equal size as possible (with size defined by number of youth). The objective was to establish final strata that had a high between-stratum variance for the stratifiers (i.e., which "spread out" the stratifiers as much as possible). This was accomplished through the use of proprietary software developed for this purpose. Adjustments were then done manually. These strata are given in Final PSU Strata.

NAEP Technical Documentation Final Primary Sampling Unit (PSU) Strata for the 2018 Assessment

The strata were defined using the selected stratifiers from the stepwise regression analysis (see Stepwise Regression Analysis Results for PSU Stratification). The cutoffs were selected so that roughly equal measures of size were represented by each stratum.

The number of stratifiers used to define the noncertainty PSU strata within each primary stratum ranged from 1 to 5 stratifiers depending on the size of the primary stratum. For instance, the Northeast non-metropolitan primary stratum, which had about 1 million youths in noncertainty PSUs, used only one stratifier; whereas the South metropolitan primary stratum had about 13 million youths in noncertainty PSUs and used five stratifiers.

The final noncertainty PSU strata are presented in summary tables for each primary PSU stratum. The tables show the definition, number of PSUs, and size of each stratum.

Stratification for Northeast metropolitan noncertainty primary sampling units

Stratification for Northeast non-metropolitan noncertainty primary sampling units

Stratification for Midwest metropolitan noncertainty primary sampling units

Stratification for Midwest non-metropolitan noncertainty primary sampling units

Stratification for South metropolitan noncertainty primary sampling units

Stratification for South non-metropolitan noncertainty primary sampling units

Stratification for West metropolitan noncertainty primary sampling units

Stratification for West non-metropolitan noncertainty primary sampling units

NAEP Technical Documentation Stratification for Midwest Metropolitan Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the Midwest metropolitan primary stratum. Columns 2 through 5 show the characteristics used to define the strata along with their respective cutoffs. The size of each stratum is given in the last column and is in terms of the number of youths (persons 17 years of age and younger).

Stratification for Midwest metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	Quaternary stratifier	PSUs	Measure of size
Total	†	†	†	†	**91**	**7,009,814**
1	Percentage of female-headed households <= 9.6	Percentage of female-headed households <= 8.4	†	†	14	605,685
2	Percentage of female-headed households <= 9.6	Percentage of female-headed households > 8.4	†	†	15	598,683
3	Percentage of female-headed households > 9.6	Percentage of renters <= 30.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 14.2	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 10.1	14	554,591
4	Percentage of female-headed households > 9.6	Percentage of renters <= 30.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 14.2	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 10.1	10	567,774
5	Percentage of female-headed	Percentage of renters <= 30.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or	Percentage of Black, Hispanic, American Indian/Alaska Native, or	8	553,670

† Not applicable.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	Quaternary stratifier	PSUs	Measure of size
	households > 9.6		Native Hawaiian/Other Pacific Islander youth > 14.2	Native Hawaiian/Other Pacific Islander youth <= 17.6		
6	Percentage of female-headed households > 9.6	Percentage of renters <= 30.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 14.2	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 17.6	11	561,298
7	Percentage of female-headed households > 9.6	Percentage of renters (30.6-32.2]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 16.6	Percentage of female-headed households <= 12.1	7	579,377
8	Percentage of female-headed households > 9.6	Percentage of renters (30.6-32.2]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 16.6	Percentage of female-headed households > 12.1	2	560,007
9	Percentage of female-headed households > 9.6	Percentage of renters (30.6-32.2]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 16.6	Percentage of renters <= 31.8	2	637,089
10	Percentage of female-headed households > 9.6	Percentage of renters (30.6-32.2]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 16.6	Percentage of renters > 31.8	2	593,316
11	Percentage of female-headed households > 9.6	Percentage of renters > 32.2	Percentage of female-headed households <= 12.2	†	4	641,186
12	Percentage of female-headed households > 9.6	Percentage of renters > 32.2	Percentage of female-headed households > 12.2	†	2	557,138
Mean	†	†	†	†	†	584,151

† Not applicable.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational

Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_midwest_metropolitan_noncertainty_primary_sampling_units.aspx

NAEP Technical Documentation Stratification for Midwest Non-Metropolitan Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the Midwest non-metropolitan primary stratum. Columns 2 and 3 show the primary and secondary characteristics used to define the strata along with their respective cutoffs. The size of each stratum is given in the last column and is in terms of the number of youths (persons 17 years of age and younger).

Stratification for Midwest non-metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	Secondary stratifier	PSUs	Measure of size
Total	†	†	**228**	**3,423,867**
1	Percentage of children below the poverty line <= 16.1	Percentage of children below the poverty line <= 13.7	41	578,068
2	Percentage of children below the poverty line <= 16.1	Percentage of children below the poverty line > 13.7	36	584,857
3	Percentage of children below the poverty line (16.1-20.7]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 5.4	38	562,740
4	Percentage of children below the poverty line (16.1-20.7]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 5.4	37	566,454
5	Percentage of children below the poverty line > 20.7	Percentage of children below the poverty line <= 24	38	561,298
6	Percentage of children below the poverty line > 20.7	Percentage of children below the poverty line > 24	38	570,450
Mean	†	†	†	570,645

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_midwest_nonmetropolitan_noncertainty_primary_sampling_units.aspx

NAEP Technical Documentation Stratification for Northeast Metropolitan Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the Northeast metropolitan primary stratum. Columns 2 and 3 show the primary and secondary characteristics, respectively, used to define the strata along with their respective cutoffs. The size of each stratum is given in the last column and is in terms of the number of youths (persons 17 years of age and younger).

Stratification for Northeast metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	Secondary stratifier	PSUs	Measure of size
Total	†	†	**43**	**4,422,552**
1	Percentage of female-headed households <= 11	Percentage of female-headed households <= 10.3	10	530,198
2	Percentage of female-headed households <= 11	Percentage of female-headed households > 10.3	7	607,551
3	Percentage of female-headed households (11-11.6]	Percentage of persons aged 25+ who completed high school <= 89.7	7	554,849
4	Percentage of female-headed households (11-11.6]	Percentage of persons aged 25+ who completed high school > 89.7	3	529,360
5	Percentage of female-headed households (11.6-12.7]	Percentage of female-headed households <= 12.5	5	588,464
6	Percentage of female-headed households (11.6-12.7]	Percentage of female-headed households > 12.5	3	533,891
7	Percentage of female-headed households > 12.7	Percentage of female-headed households <= 13.5	2	560,747
8	Percentage of female-headed households > 12.7	Percentage of female-headed households > 13.5	6	517,492
Mean	†	†	†	552,819

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_northeast_metropolitan_noncertainty_primary_sampling_units.aspx

NAEP Technical Documentation Stratification for Northeast Non-Metropolitan Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the Northeast non-metropolitan primary stratum. Column 2 shows the primary characteristic used to define the strata along with the cutoffs. The size of each stratum is given in the last column and is in terms of the number of youths (persons 17 years of age and younger).

Stratification for Northeast non-metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	PSUs	Measure of size
Total	†	**48**	**1,046,020**
1	Percentage of persons aged 25+ with a college degree <= 19.1	23	517,103
2	Percentage of persons aged 25+ with a college degree > 19.1	25	528,917
Mean	†	†	523,010

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_northeast_nonmetropolitan_noncertainty_primary_sampling_units.aspx

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NAEP Technical Documentation Stratification for South Metropolitan Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the South metropolitan primary stratum. Columns 2 through 6 show the characteristics used to define the strata along with their respective cutoffs. The size of each stratum is given in the last column and is in terms of the number of youths (persons 17 years of age and younger).

Stratification for South metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	Quaternary stratifier	Quinary stratifier	PSUs	Measure of size

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	Quaternary stratifier	Quinary stratifier	PSUs	Measure of size
Total	†	†	†	†	†	**141**	**13,076,698**
1	Percentage of female-headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 28.2	Per capita household income <= $23,025	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 14.9	13	509,921
2	Percentage of female-headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 28.2	Per capita household income <= $23,025	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 14.9	13	537,563
3	Percentage of female-headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 28.2	Per capita household income ($23,025-$25,326]	Percentage of female-headed households <= 12.1	6	535,903
4	Percentage of female-headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 28.2	Per capita household income ($23,025-$25,326]	Percentage of female-headed households > 12.1	6	535,677
5	Percentage of female-headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 28.2	Per capita household income ($25,326-$27,540]	Percentage of female-headed households <= 11.8	6	453,396
6	Percentage of female-headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 28.2	Per capita household income ($25,326-$27,540]	Percentage of female-headed households > 11.8	3	649,016
7	Percentage of female-headed	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or	Per capita household income ($27,540-$28,621]	†	3	560,145

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	Quaternary stratifier	Quinary stratifier	PSUs	Measure of size
	households <= 16.9		Native Hawaiian/Other Pacific Islander youth <= 28.2				
8	Percentage of female - headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 28.2	Per capita household income > $28,621	†	5	530,358
9	Percentage of female - headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (28.2-30.6]	Percentage of female-headed households <= 13	†	4	555,172
10	Percentage of female - headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (28.2-30.6]	Percentage of female-headed households > 13	†	6	534,928
11	Percentage of female - headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (30.6-33.2]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 32.2	†	4	531,798
12	Percentage of female - headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (30.6-33.2]	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 32.2	†	3	570,040
13	Percentage of female - headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 33.2	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <=	†	6	528,166

36.9

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	Quaternary stratifier	Quinary stratifier	PSUs	Measure of size
14	Percentage of female-headed households <= 16.9	Percentage of renters <= 33.5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 33.2	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 36.9	†	6	531,294
15	Percentage of female-headed households <= 16.9	Percentage of renters > 33.5	Per capita household income <= $23,655	Percentage of renters <= 36.9	†	10	559,491
16	Percentage of female-headed households <= 16.9	Percentage of renters > 33.5	Per capita household income <= $23,655	Percentage of renters > 36.9	†	11	549,737
17	Percentage of female-headed households <= 16.9	Percentage of renters > 33.5	Per capita household income ($23,655-$26,682]	Percentage of female-headed households <= 14.2	†	6	574,570
18	Percentage of female-headed households <= 16.9	Percentage of renters > 33.5	Per capita household income ($23,655-$26,682]	Percentage of female-headed households > 14.2	†	4	559,664
19	Percentage of female-headed households <= 16.9	Percentage of renters > 33.5	Per capita household income > $26,682	Percentage of renters <= 38.7	†	3	542,958
20	Percentage of female-headed households <= 16.9	Percentage of renters > 33.5	Per capita household income > $26,682	Percentage of renters > 38.7	†	2	590,223
21	Percentage of female-headed	Per capita household income <= $21,548	Percentage of renters <= 31.7	†	†	4	561,295

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	Quaternary stratifier	Quinary stratifier	PSUs	Measure of size
	households > 16.9						
22	Percentage of female - headed households > 16.9	Per capita household income <= $21,548	Percentage of renters > 31.7	†	†	9	556,241
23	Percentage of female - headed households > 16.9	Per capita household income > $21,548	Percentage of female-headed households <= 18.7	†	†	5	507,084
24	Percentage of female - headed households > 16.9	Per capita household income > $21,548	Percentage of female-headed households > 18.7	†	†	3	512,058
Mean	†	†	†	†	†	†	544,862

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_south_metropolitan_noncertainty_primary_sampling_units.aspx

NAEP Technical Documentation Stratification for South Non-Metropolitan Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the South non-metropolitan primary stratum. Columns 2 through 4 show the characteristics used to define the strata along with their respective cutoffs. The size of each stratum is given in the last column and is in terms of the number of youths (persons 17 years of age and younger).

Stratification for South non-metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	PSUs	Measure of size
Total	†	†	†	**250**	**5,056,398**
1	Percentage of female-headed households <= 12.6	Per capita household income <= $20,111	Percentage of female-headed households <= 11.3	33	637,694
2	Percentage of female-headed households <= 12.6	Per capita household income <= $20,111	Percentage of female-headed households > 11.3	33	632,174
3	Percentage of female-headed households <= 12.6	Per capita household income ($20,111-$22,659)	†	32	646,216
4	Percentage of female-headed households <= 12.6	Per capita household income > $22,659	†	28	639,839
5	Percentage of female-headed households (12.6-16.2)	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 29.2	†	32	629,483
6	Percentage of female-headed households (12.6-16.2)	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 29.2	†	32	637,564
7	Percentage of female-headed households > 16.2	Per capita household income <= $17,691	†	31	614,601
8	Percentage of female-headed households > 16.2	Per capita household income > $17,691	†	29	618,827
Mean	†	†	†	†	632,050

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_south_nonmetropolitan_noncertainty_primary_sampling_units.aspx

NAEP Technical Documentation Stratification for West Metropolitan

Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the West metropolitan primary stratum. Columns 2 through 4 show the characteristics used to define the strata along with their respective cutoffs. The size of each stratum is given in the last column and is in terms of the number of youths (persons 17 years of age and younger).

Stratification for West metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	PSUs	Measure of size
Total	†	†	†	**68**	**5,508,264**
1	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 18.4	Percentage of renters <= 29.3	†	8	440,377
2	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 18.4	Percentage of renters (29.3-31]	†	6	488,282
3	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 18.4	Percentage of renters > 31	Percentage of persons aged 25+ with a college degree <= 28.1	10	440,238
4	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 18.4	Percentage of renters > 31	Percentage of persons aged 25+ with a college degree > 28.1	9	448,976
5	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (18.4-44.3]	Percentage of renters <= 33.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 21	2	514,753
6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (18.4-44.3]	Percentage of renters <= 33.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 21	5	426,090
7	Percentage of Black, Hispanic, American Indian/Alaska Native, or	Percentage of renters > 33.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native	7	465,236

	Native Hawaiian/Other Pacific Islander youth (18.4-44.3]		Hawaiian/Other Pacific Islander youth <= 32.4		

† Not applicable.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

Stratum	Primary stratifier	Secondary stratifier	Tertiary stratifier	PSUs	Measure of size
8	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (18.4-44.3]	Percentage of renters > 33.6	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 32.4	5	477,876
9	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (44.3-54.4]	Percentage of renters <= 37.9	†	4	457,572
10	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth (44.3-54.4]	Percentage of renters > 37.9	†	2	457,621
11	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 54.4	Percentage of persons aged 25+ with a college degree <= 15.1	†	7	443,193
12	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 54.4	Percentage of persons aged 25+ with a college degree > 15.1	†	3	448,050
Mean	†	†	†	†	459,022

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_west_metropolitan_noncertainty_primary_sampling_units.aspx

NAEP Technical Documentation Stratification for West Non-Metropolitan Noncertainty Primary Sampling Units

The following table provides the definition, number of PSUs, and size of each noncertainty PSU stratum in the West non-metropolitan primary stratum. Columns 2 and 3 show the primary and secondary characteristics, respectively, used to define the strata along with their respective cutoffs. The size of each stratum is given in

the last column and is in terms of the number of youths (person 17 years of age and younger).

Stratification for West non-metropolitan noncertainty primary sampling units (PSUs), by stratum: 2018

Stratum	Primary stratifier	Secondary stratifier	PSUs	Measure of size
Total	†	†	**103**	**1,658,938**
1	Percentage of female-headed households <= 9.7	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth <= 12	27	417,593
2	Percentage of female-headed households <= 9.7	Percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander youth > 12	28	404,250
3	Percentage of female-headed households > 9.7	Percentage of female-headed households <= 11.9	26	412,860
4	Percentage of female-headed households > 9.7	Percentage of female-headed households > 11.9	22	424,235
Mean	†	†	†	414,735

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stratification_for_west_nonmetropolitan_noncertainty_primary_sampling_units.aspx

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NAEP Technical Documentation Stepwise Regression Analysis Results for Primary Sampling Unit (PSU) Stratification for the 2018 Assessment

The objective was to find the optimum set of primary sampling unit (PSU)-level sociodemographic characteristics in terms of strength of relationship to achievement. The PSU-level values of these characteristics were derived from the 2010 Decennial Census summary files and the 2006–10 American Community Survey (ACS) estimates, computed by combining the county-level data (using county youth estimates as the relative weighting factor for each county within the PSU). The characteristics used and their abbreviations as used in the tables, were as follows:

- aggregate minority group percentages (percentage of Black, Hispanic, American Indian/Alaska Native, or Native Hawaiian/Other Pacific Islander students);
- income levels (per capita household income, percentage of children below the poverty line);

- education levels in the population (i.e., percentage of persons aged 25+ who completed high school, percentage of persons aged 25+ with a college degree);
- percentage of renters (i.e., percentage of householders who rent rather than own their place of residence); and
- percentage of female-headed households.

These PSU-level census characteristics were analyzed with the eighth-grade reading assessment scores from five previous NAEP cycles (2002, 2003, 2005, 2007, and 2009). The criterion was that good strata should be heterogeneous for each of the five characteristics (i.e., within-stratum variance for each assessment value should be low and between-stratum variance high).

The analysis was done separately within each of the eight primary strata (census region by metro status), using a forward stepwise regression approach, with a *p*-value of 20 percent. The results of the regression model were used to generate the final PSU strata.

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/stepwise_regression_analysis_results_for_primary_sampling_unit_stratification_for_the_2018_assessment.aspx

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NAEP Technical Documentation Primary Sampling Unit (PSU) Generation: Certainty PSUs for the 2018 Assessment

Any primary sampling unit (PSU) was defined as a certainty PSU if it had 500,000 or more youths or if it represented more than 80 percent of its assigned stratum. The estimated number of youths used to designate certainty PSUs was the number of persons aged 17 or under from the 2010 Decennial Census. These PSUs were so large that a sample of schools was taken from all of them (rather than from only a subsample of them, as with noncertainty PSUs). The Honolulu, Hawaii PSU was included as a certainty by design in order to reduce the variances of estimates for Asian and Native Hawaiian/Other Pacific Islander students. A total of 29 PSUs were classified as certainties in the 2018 frame. The table below provides a listing of the certainty PSUs by census region. Note that the names of the metropolitan statistical areas do not represent the cities proper. Rather they can and do cross jurisdiction and county boundaries (for example, the Boston-Cambridge-Quincy metropolitan statistical area includes Massachusetts and New Hampshire). The "Number of youths" column in the table reflects updated 2015 U.S. Census Bureau population estimates.

Metropolitan statistical area definitions for certainty PSUs, by census region: 2018

Census region/Metropolitan statistical area	Jurisdiction	Number of counties	Number of youths
Total	†	**241**	**32,442,560**

† Not applicable.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

Census region/Metropolitan statistical area	Jurisdiction	Number of counties	Number of youths
Northeast	†	**39**	**6,433,831**
Boston-Cambridge-Quincy	MA-NH	7	974,107
New York-Northern New Jersey-Long Island	NY-NJ-PA	23	4,261,793
Philadelphia-Camden-Wilmington (Northeast part)	PA-NJ	9	1,197,931
Midwest	†	**64**	**5,214,658**
Chicago-Joliet-Naperville	IL-IN-WI	14	2,243,956
Detroit-Warren-Livonia	MI	6	977,193
Kansas City	MO-KS	15	522,649
Minneapolis-St. Paul-Bloomington	MN-WI	13	829,194
St. Louis	MO-IL	16	641,666
South	†	**98**	**10,111,925**
Atlanta-Sandy Springs-Marietta	GA	28	1,436,804
Baltimore-Towson	MD	7	618,770
Dallas-Fort Worth-Arlington	TX	12	1,875,641
Houston-Sugar Land-Baytown	TX	10	1,794,208
Miami-Fort Lauderdale-Pompano Beach	FL	3	1,236,681
Orlando-Kissimmee-Sanford	FL	4	531,519
San Antonio-New Braunfels	TX	8	612,614
Tampa-St. Petersburg-Clearwater	FL	4	605,816
Washington-Arlington-Alexandria	DC-VA-MD-WV	22	1,399,872
West	†	**40**	**10,682,146**
Denver-Aurora-Broomfield	CO	10	661,775
Honolulu	HI	1	214,852
Las Vegas-Paradise	NV	1	498,564
Los Angeles-Long Beach-Santa Ana	CA	2	2,995,992
Phoenix-Mesa-Glendale	AZ	2	1,127,596
Portland-Vancouver-Hillsboro	OR-WA	7	531,629
Riverside-San Bernardino-Ontario	CA	2	1,185,021
Sacramento--Arden-Arcade--Roseville	CA	4	530,234
San Diego-Carlsbad-San Marcos	CA	1	728,037
San Francisco-Oakland-Fremont	CA	5	939,388
San Jose-Sunnyvale-Santa Clara	CA	2	452,028

† Not applicable.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

Census region/Metropolitan statistical area	Jurisdiction	Number of counties	Number of youths
Seattle-Tacoma-Bellevue	WA	3	817,030

† Not applicable.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

NAEP Technical Documentation Primary Sampling Unit (PSU) Generation: Metropolitan Statistical Areas for the 2018 Assessment

Primary Sampling Units (PSUs) for NAEP are classified as either metropolitan statistical areas[1] (metro areas) or non-metro areas. Metro area PSUs are those that are made up of counties in metro areas.

Each metro area constitutes a separate PSU, except when it crosses census region boundaries. Such metro areas are split along regional boundaries with each regional part considered its own distinct PSU. For example, the Louisville-Jefferson County, KY-IN metro area was partitioned into two PSUs, one for the counties in Kentucky which are part of the South region and the other for counties in Indiana which are part of the Midwest region.

In total, there were 372 metro area PSUs, 29 of which were defined as certainty PSUs. The remaining 343 metro area PSUs, covering a total of 859 counties, constituted the noncertainty portion of the metro area PSU sampling frame. The table below presents the number of PSUs, the number of counties represented, and the estimated number of youths (total and mean per PSU) in noncertainty metro area PSUs by census region. These estimates come from the county-level estimates of numbers of persons aged 0 to 17 from the 2015 U.S. Census Bureau population estimates.

Noncertainty metropolitan primary sampling unit (PSU) frame, by census region: 2018

Census region	PSUs	Counties	Youths	Mean number of youths per PSU
Total	**343**	**859**	**30,017,328**	**87,514**
Northeast	43	84	4,422,552	102,850

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

[1]Based on the 2009 metro area definitions, the most recent available metro area definitions at the time of PSU construction, from the U.S. Office of Management and Budget (OMB Bulletin No. 10-02).

Census region	PSUs	Counties	Youths	Mean number of youths per PSU
Midwest	91	229	7,009,814	77,031
South	141	454	13,076,698	92,743
West	68	92	5,508,264	81,004

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

[1]Based on the 2009 metro area definitions, the most recent available metro area definitions at the time of PSU construction, from the U.S. Office of Management and Budget (OMB Bulletin No. 10-02).

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/primary_sampling_unit_generation_metro_statistical_areas_for_the_2018_assessment.aspx

NAEP Technical Documentation Primary Sampling Unit (PSU) Generation: Non-Metropolitan Statistical Areas for the 2018 Assessment

Primary sampling units (PSUs) for NAEP are classified as either metro area or non-metro area. Non-metro area PSUs are PSUs that are made up of counties that are not part of any metropolitan statistical areas[1].

An algorithm was used to define a preliminary set of non-metro area PSUs satisfying specific design constraints. The algorithm attempted to form PSUs that were geographically compact, of a minimum population size (15,000 youths in the Northeast and South census regions, and 10,000 youths in the Midwest and West census regions) and that also did not cross state boundaries. The input set consisted of all non-metro area counties. The county which had the largest maximum point-to-point distance was addressed first. It was grouped with adjacent non-metro area counties until the minimum PSU size was met. The algorithm was then run on the remaining non-metro area counties not yet assigned to a PSU to combine the county with the largest maximum point-to-point distance among the remaining counties with its adjacent non-metro area counties until the minimum PSU size was met. This process was repeated until all counties were grouped into PSUs.

When the algorithm was unable to create PSUs that conformed to the specific design constraints, manual adjustments were made. The end result of this procedure was that all non-metro area PSUs were contained within state boundaries, but in some cases the PSU size fell slightly below the pre-specified minimum.

In total, there were 629 non-metro area PSUs covering a total of 2,043 counties, all of which constitute the non-metro area PSU sampling frame. The table below presents the number of PSUs, the number of counties represented, and the estimated number of youths (total and mean per PSU) in the non-metro area PSU sampling frame by census region. The estimated number of youths (persons aged 0 to 17) for each county comes from the 2015 U.S. Census Bureau population estimates.

Non-metropolitan statistical area primary sampling unit (PSU) frame, by census region: 2018

Census region	PSUs	Counties	Youths	Mean number of youths per PSU
Total	**629**	**2,043**	**11,185,223**	**17,783**
Northeast	48	94	1,046,020	21,792
Midwest	228	762	3,423,867	15,017
South	250	871	5,056,398	20,226
West	103	316	1,658,938	16,106

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2018 Assessment.

[1] Based on the 2009 metro area definitions, the most recent available metro area definitions at the time of PSU construction, from the U.S. Office of Management and Budget (OMB Bulletin No. 10-02).

http://nces.ed.gov/nationsreportcard/tdw/sample_design/2018/primary_sampling_unit_generation_non_metropolitan_statistical_areas_for_the_2018_assessment.aspx