PISA 2022 Technical Report

6 Sample Design

Target population and overview of the sampling design

The desired base PISA target population in each country/economy consisted of 15-year-old students attending educational institutions in grades 7 and higher. This meant that countries/economies were to include:

- 15-year-old students enrolled full-time in educational institutions
- 15-year-old students enrolled in educational institutions who attended only on a part-time basis
- students in vocational training programmes, or any other related type of educational programmes
- students attending foreign schools within the country/economy (as well as students from other countries/economies attending any of the programmes in the first three categories).

It was recognised that no testing of 15-year-old students schooled in the home, workplace or out of the country/economy would occur and therefore these 15-year-olds are not included in the international target population.

The operational definition of an age population directly depends on the testing dates. The international requirement was that the assessment had to be conducted during a 56-day period, referred to as the testing period, between March 1st, 2022 and October 31st, 2022, unless otherwise agreed.

Further, testing was not permitted during the first six weeks of the school year because of a concern that student performance levels may have been lower at the beginning of the academic year than at the end of the previous academic year, even after controlling for age.

The 15-year-old international target population was slightly adapted to better fit the age structure of most Northern Hemisphere countries/economies. As most of the testing was planned to occur in April, the international target population was consequently defined as all students aged from 15 years and 3 completed months to 16 years and 2 completed months at the beginning of the assessment period. This meant that in all countries/economies testing in April 2022, the target population could have been defined as all students born in 2006 who were attending an educational institution, as defined above.

A variation of up to one month in this age definition was permitted. This allowed a country/economy testing in March or in May to still define the national target population as all students born in 2006. If the testing took place between June and December, the birth date definition had to be adjusted so that in all countries/economies the target population always included students aged 15 years and 3 completed months to 16 years and 2 completed months at the time of testing, or a one-month variation of this.

The situation with the COVID-19 pandemic made it difficult for several countries to adhere strictly to the testing period and the age definition for the target population just discussed. Recognizing the challenges of conducting assessments in such an environment, it was proposed by the international consortium that certain minor violations of these standards be sanctioned in advance, so that countries did not face uncertainty as they incurred the cost and burden of conducting the assessments. Thus, for PISA 2022, the OECD and the PISA Technical Advisory Group accepted the following types of deviations from the standards:

a. Extension of the assessment period beyond 56 days, where students remain within the PISA-eligible age range, would be agreed to with the OECD's implicit approval.
b. Extension of the assessment period that would not exceed the allowed 56 days, but would result in some assessed students who are outside of the PISA-eligible age range **by less than a week,** would be agreed to with the OECD's implicit approval.
c. Extension of the assessment period that would **both** exceed 56 days AND result in assessed students who are outside of the PISA-eligible age range would require further consultation with the contractors and the OECD before approval of such a deviation would be granted.

In all countries/economies, the default sampling design used for the PISA assessment was a two-stage stratified sample design. The first-stage sampling units consisted of individual schools having 15-year-old students, or the possibility of having such students at the time of assessment. Schools were sampled systematically from a comprehensive national list of all PISA-eligible schools, known as the school sampling frame, with probabilities that were proportional to a measure of size. The measure of size was a function of the estimated number of PISA-eligible 15-year-old students enrolled in the school. This type of sampling is referred to as systematic with probability proportional to size (PPS) sampling. Prior to selecting them, schools in the sampling frame were assigned to mutually exclusive groups based on school characteristics called explicit strata. These were formed to improve the precision of sample-based estimates. Stratification variables for each country/economy are presented in Table 6.1.

The second-stage sampling units in countries/economies using the two-stage design were students within sampled schools. Once schools were selected to be in the sample, a complete list of each sampled school's 15-year-old students was prepared. Countries/economies participating in the computer-based assessment (CBA) had to set a target cluster size (TCS) of 42 students, while countries/economies participating in the paper-based assessment (PBA) had to set a TCS of 35 students. Variations to the TCS were allowed in consultation with the sampling contractors for factors such as expected student nonresponse.

The sample size within schools is prescribed, within limits, in the PISA Technical Standards (see Annex I). From each list of eligible students within a school that contained more than the target cluster size, a sample of around 42 (or 35 for the case noted above) students were selected with equal probability, and for lists with fewer than the target number, all students on the list were selected.

The target cluster size remained the same for countries participating in the international option of financial literacy (FL) in 2022, as the students selected for this assessment were a subsample of the students sampled for the regular PISA test. This was a change from 2018, where the TCS for countries/economies participating in FL was increased.

Population coverage, and school and student participation rate standards

To provide valid estimates of student achievement, the sample of students had to be selected using established and professionally recognised principles of scientific probabilistic sampling in a way that ensured representation of the full target population of 15-year-old students in the participating countries/economies.

Furthermore, quality standards had to be maintained with respect to (i) coverage of the PISA international target population, (ii) accuracy and precision, and (iii) school and student response rates.

Coverage of the PISA international target population

National Project Managers (NPMs) might have found it unavoidable to reduce their coverage of the target population by excluding, for instance, a small, remote geographical region due to inaccessibility, or language differences, possibly due to political, organisational or operational reasons, or presence of special education needs students. Areas deemed to be part of a country/economy that included students in the PISA target population, but which were not included for sampling, were designated as non-covered areas. Care was taken in this regard because, when such situations did occur, the national desired target population differed from the international desired target population. In an international survey in education, the types of exclusion must be defined consistently for all participating countries/economies and the exclusion rates have to be limited. Indeed, if a significant proportion of students were excluded, this would mean that survey results would not be representative of the entire national school system. Thus, efforts were made to ensure that exclusions, if they were necessary, were minimised according to the PISA 2022 Technical Standards (see Annex I).

Exclusion could also take place either at the school level (exclusion of entire schools) or at the within-school level (exclusion of individual students). These exclusions were often for special education needs or language differences.

International within-school exclusion of students was allowed for the following groups:

- Intellectually disabled students: these students who have a documented mental or emotional disability and who, in the professional opinion of qualified staff, are cognitively delayed such that they cannot be validly assessed in the PISA testing setting. This category includes students who are emotionally or mentally unable to follow even the general instructions of the test. Students could not be excluded solely because of poor academic performance or normal discipline problems.
- Functionally disabled students: these are students who are permanently physically disabled in such a way that they cannot be validly assessed in the PISA testing setting. However, functionally disabled students who could provide responses were to be included in the testing.
- Students with insufficient experience in the language of assessment: these are students who need to meet all of the following criteria: i) are not native speakers of the assessment language(s), ii) have limited proficiency in the assessment language(s), and iii) have received less than one year of instruction in the assessment language(s).
- Students taught in a language of instruction for the main domain for which no materials were available. PISA Technical Standard 2.1 notes that the PISA test is administered to a student in a language of instruction provided by the sampled school in the major domain of the test. Thus, if no test materials were available in the language in which the sampled student is taught, the student was excluded. For example, if a country/economy has testing materials in languages X, Y, and Z, but a sampled student is taught in language A, then the student can be excluded since there are no testing materials available in the student's language of instruction.
- Students not assessable for other reasons as agreed upon. A nationally-defined within-school exclusion category was permitted if agreed upon by the international contractor and the OECD. A specific subgroup of students (i.e., students with severe dyslexia, dysgraphia, or dyscalculia) could be identified for whom exclusion was necessary but for whom the first three within-school exclusion categories did not explicitly apply, so that a more specific within-school exclusion definition was needed.
- Students currently not attending in-person classes, receiving all their instruction online/virtually and not coming to schools for tests/assessments. This exclusion type was exceptionally added for PISA 2022 due to the coronavirus pandemic.

A school attended only by students who would be excluded from taking the assessment for intellectual, functional, or linguistic reasons was considered a school-level exclusion.

The overall exclusion rate within a country/economy (i.e., school-level and within-school exclusions combined) needed to be kept below 5% of the PISA desired target population.

Guidelines for restrictions on the level of exclusions of various types were as follows:

- School-level exclusions for inaccessibility, feasibility or other reasons were to cover less than 0.5% of the total number of students in the PISA desired target population. Schools in the school sampling frame which had only one or two PISA-eligible students were not allowed to be excluded from the frame. However, if based on the frame, it was clear that the percentage of students in these small schools would not cause a breach of the 0.5% allowable limit, then such schools could all be excluded in the field at the time of the assessment, if they still only had one or two PISA-eligible students.
- School-level exclusions for intellectually or functionally disabled students, or students with insufficient assessment language experience, were to cover fewer than 2% of the PISA desired target population of students.
- Within-school exclusions for intellectually disabled or functionally disabled students, or students with insufficient assessment language experience, or students nationally-defined and agreed upon for exclusion were expected to cover less than 2.5% of PISA student population. Initially, this could only be an estimate. If the actual percentage was ultimately greater than 2.5%, the exclusion percentage was re-calculated without considering students who were excluded because of insufficient familiarity with the assessment language as this is a largely unpredictable part of each country/economy's PISA-eligible population, not under the control of the education system. If the resulting percentage was below 2.5%, the exclusions were regarded as acceptable. Otherwise, the level of exclusion was given consideration during the data adjudication process, to determine whether there was any need to notate the results, or take other action in relation to reporting the data.

Accuracy and precision

A minimum of 150 schools was selected in each country/economy, but if a participating country/economy had fewer than 150 schools in existence, then all schools were selected for participation. Within each participating school, a predetermined number of students – the target cluster size, as defined earlier – was randomly selected with equal probability. In schools with fewer than number of target cluster size-eligible students, all students were selected. In total, a minimum sample size of 6 300 assessed students was needed in computer-based countries/economies, or 5 250 assessed students in paper-based countries/economies. In cases where the entire population had fewer students, all students were selected. It was possible to negotiate a target cluster size that differed from 42 students (or 35 as noted above). When this was the case, the sample size of schools was increased to more than 150 to ensure that at least the minimum sample size of assessed students would be reached. The target cluster size selected per school had to be at least 25 students to ensure adequate accuracy in estimating variance components within and between schools – a major analytical objective of PISA.

Countries/economies doing the FL option needed an additional 1 650 assessed students for FL. This was typically achieved by increasing the number of schools sampled. For example, a CBA country/economy that would otherwise have had a sample of 150 schools with a TCS equal to 42 increased its school sample to 190 to accommodate the FL sample.

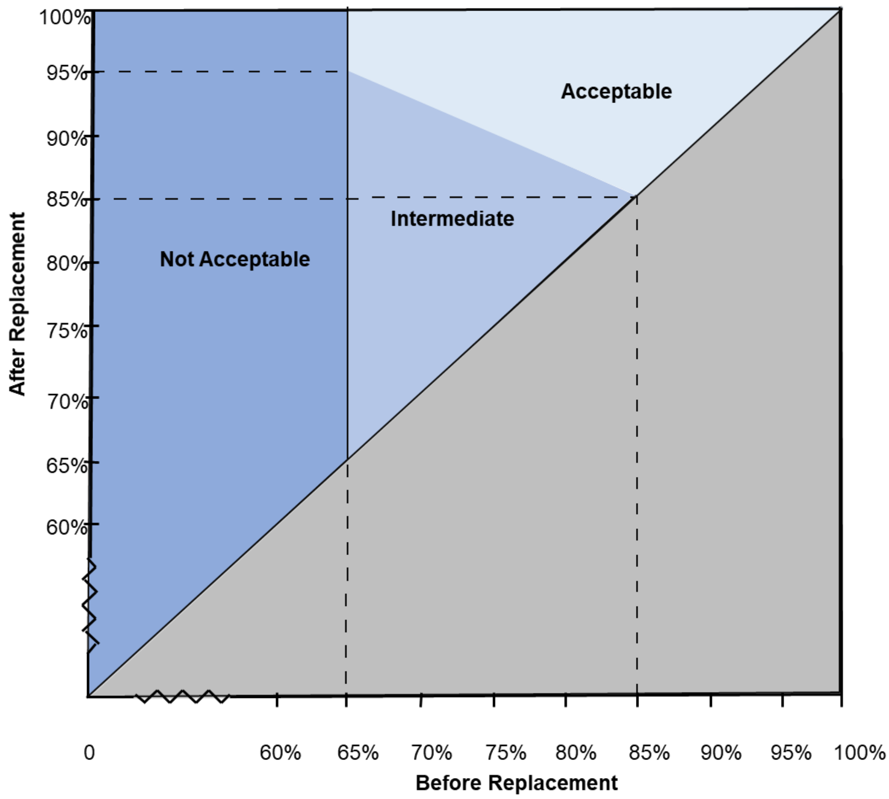
NPMs were strongly encouraged to identify available variables to use for defining the explicit and implicit strata for schools to reduce the sampling variance. See the section "Stratification", further on in this chapter for more details.

For countries/economies that had larger than anticipated sampling variances associated with their estimates in PISA 2018, recommendations were made regarding sample design changes that were expected to help reduce the sampling variances for PISA 2022. These included modifications to stratification variables and increases in the required school sample.

School response rates

A response rate of 85% was required for initially selected schools. If the initial school response rate fell between 65% and 85%, an acceptable school response rate could still be reached through the use of replacement schools. Figure 6.1 provides a summary of the international requirements for school response rates. To compensate for a sampled school that did not participate, where possible, two potential replacement schools were identified. The school replacement process is described in the section further on in this chapter “School sample selection”.

Figure 6.1. School response rate standards



Furthermore, a school with a student participation rate below 33% was not considered as a participating school and data from such schools were not considered for analysis. This was a change from 2018 where a school with a student participation rate between 25% and 50% was not considered as a participating school for the purposes of calculating and documenting response rates, but data from such schools were included in the database and contributed to the estimates included in the initial PISA international report, and data from schools with a student participation rate of less than 25% were not included in the database and such schools were regarded as non-respondents. The change from 2018 was implemented so that the minimum of 33% student participation would be the same for the purposes of calculating and documenting response rates and the data inclusion in the database. Students were deemed participants if they responded to at least half of the cognitive items or if they had responded to at least one cognitive item and had completed selected questions from the background questionnaire (see Annex I).

The rationale for this approach was as follows. There was concern that, in an effort to meet the requirements for school response rates, a national centre might allow schools to participate that would not make a concerted effort to ensure that students attended the assessment sessions. To avoid this, a standard for student participation was required for each individual school in order that the school be regarded as a participant. This standard was set at a minimum of 33% student participation. However, there were a few schools in many countries/economies that conducted the assessment without meeting that standard. Thus, it had to be decided if the data from students in such schools should be used in the analyses, given that the students had already been assessed. If the students from such schools were retained, non-response bias would possibly be introduced to the extent that the students who were absent could have achieved different results from those who attended the testing session, and such a bias is magnified by the relative sizes of these two groups. If one chose to delete all assessment data from such schools, then non-response bias would be introduced as the schools were different from others in the sample, and sampling variance would be increased because of sample size attrition.

It was decided that, for a school with a student response below 33%, treating the school as a non-respondent was likely to introduce less bias and error variance than was treating the students as non-respondents. Clearly the cut-off of 33% is arbitrary as one would need extensive studies to try to establish an optimal cut-off empirically. However, as the student response rate decreases within a school, the possibility of bias from using the assessed students in that school will increase, while the loss in sample size from dropping all of the students in the school will be small.

These PISA standards applied to weighted school response rates. The procedures for calculating weighted response rates are presented in Chapter 10. Weighted response rates weight each school by the number of students in the population that are represented by the students sampled from within that school. The weight consists primarily of the enrolment size of 15-year-old students in the school, divided by the selection probability of the school. Because the school samples were selected with probability proportional to size, in most countries/economies most schools contributed approximately equal weights. Therefore, the weighted and unweighted school response rates were similar. Exceptions could occur in countries/economies that had explicit strata that were sampled at very different rates. Details as to how each participating economy and adjudicated region performed relative to these school response rate standards are included in Chapters 13 and 16.

Student response rates

An overall response rate of 80% of selected students in participating schools was required. A student who had participated in the original or follow-up cognitive sessions was considered a participant. The overall student response rate was computed using only students from schools with at least a 33% student response rate. Again, weighted student response rates were used for assessing this standard. Each student was weighted by the reciprocal of his/her sample selection probability.

Main survey school sample

Definition of the national target population

NPMs were first required to confirm their dates of testing and age definition with the international contractor. Once these were approved, NPMs were notified to avoid having any possible drift in the assessment period that could lead to an unapproved definition of the national target population.

Every NPM was required to define and describe their country/economy's target population and explain how and why it might deviate from the international target population. Any hardships in accomplishing complete coverage were specified, discussed, and required approval in advance. Where the national target population deviated from full coverage of all PISA-eligible students, the deviations were described, and enrolment data provided to measure how much coverage was reduced. The population, after all exclusions, corresponded to the population of students recorded on each country/economy's school sampling frame. Exclusions were often proposed for practical reasons such as unreasonable increased survey costs or complexity in the sample design and/or difficult testing conditions. These difficulties were generally addressed by modifying the sample design to reduce the number of such schools selected rather than to exclude them. Schools with students that would all be excluded through the within-school exclusion categories could be excluded up to a maximum of 2% of the target population as previously noted. Otherwise, countries/economies were instructed to include the schools but to administer the PISA *Une Heure* (UH) form, consisting of a subset of the PISA assessment items, deemed more suitable for students with special needs. Sixteen countries/economies used the UH booklet for PISA 2022.

Within participating schools, all PISA-eligible students were to be listed. From this, either a sample of target cluster size students was randomly selected, or all students were selected if there were fewer than the number of target cluster size-eligible students (as described in the "Student Sampling" section). The lists had to include students deemed as meeting any of the categories for exclusion, and a variable maintained to briefly describe the reason for exclusion. This made it possible to estimate the size of the within-school exclusions from the sample data.

It was understood that the exact extent of within-school exclusions would not be known until the within-school sampling data were returned from participating schools and sampling weights computed. Participating country/economy projections for within-school exclusions provided before school sampling were known to be estimates.

NPMs were made aware of the distinction between within-school exclusions and non-response. Students who could not take the PISA achievement tests because of a permanent condition were to be excluded and those with a temporary impairment at the time of testing, such as a broken arm, were treated as non-respondents along with other absent sampled students. Exclusions by country/economy are documented in Chapter 13.

The sampling frame

All NPMs were required to construct a school sampling frame to correspond to their national defined target population. The school sampling frame as defined by the School Sampling Preparation Manual set of documents would provide complete coverage of the national defined target population without being contaminated by incorrect or duplicate entries or entries referring to elements that were not part of the defined target population. It was expected that the school sampling frame would include any school that could have 15-year-old students in grade 7 or higher, even those schools which might later be excluded or deemed ineligible because they had no PISA-eligible students at the time of data collection. The quality of the sampling frame directly affects the survey results through the schools' probabilities of selection and therefore their weights and the final survey estimates. NPMs were therefore advised to be diligent and thorough in constructing their school sampling frames and to use most recent information available.

All countries/economies used school-level sampling frames as their first stage of sample selection. The School Sampling Preparation Manual set of documents indicated that the quality of sampling frames would largely depend on the accuracy of the approximate enrolment of 15-year-olds available (ENR) for each first-stage sampling unit. A suitable ENR value was a critical component of the sampling frames since selection probabilities were based on it for two-stage designs. The best ENR for PISA was the number of currently enrolled 15-year-old students. Current enrolment data, however, were rarely available at the time of school sampling, which meant using alternatives. Most countries/economies used the first-listed available option from the following list of alternatives:

- student enrolment in the target age category (15-year-olds) from the most recent year of data available
- if 15-year-olds tend to be enrolled in two or more grades, and the proportions of students who are aged 15 in each grade are approximately known, the 15-year-old enrolment can be estimated by applying these proportions to the corresponding grade-level enrolments
- the grade enrolment of the modal grade for 15-year-olds

- total student enrolment, divided by the number of grades in the school.

The School Sampling Preparation Manual set of documents noted that if reasonable estimates of *ENR* did not exist or if the available enrolment data were out of date, schools might have to be selected with equal probabilities which might require an increased school sample size. However, no countries/economies needed to use this option.

Besides ENR values, NPMs were instructed that each school entry on the frame should include at minimum:

- school identification information, such as a unique numerical national identification, and contact information such as name, address and phone number (the latter type of information was not needed by contractors—only by NPMs, thus there was no requirement for contractors to have this type of information on the school frame submitted by NPMs.)
- coded information about the school, such as region of country/economy, school type and extent of urbanisation, which would be used as stratification variables.

Stratification

Prior to sampling, schools were to be ordered, or stratified, in the sampling frame. Stratification consists of classifying schools into similar groups according to selected variables referred to as stratification variables. Stratification in PISA was used to:

- improve the efficiency of the sample design, thereby making the survey estimates more reliable;
- apply different sample designs, such as disproportionate sample allocations, to specific groups of schools in different strata;
- ensure all parts of a population were included in the sample; and
- ensure adequate representation of specific groups of the target population in the sample.

There were two types of stratification used: explicit and implicit. Explicit stratification consists of grouping schools into strata that will be treated independently, as if they were separate school sampling frames. Examples of explicit stratification variables could be states or regions within a country/economy. Implicit stratification consists essentially of sorting the schools within each explicit stratum using a set of designated implicit stratification variables. Examples of implicit stratification variables could be type of school, urbanisation, school size, or minority composition. Implicit stratification, with systematic sampling, is a way of ensuring a proportional sample allocation of schools across all the groups used for implicit stratification. It can also lead to improved reliability of survey estimates, provided that the implicit stratification variables being considered are correlated with PISA achievement at the school level (Jaeger, 1984[1]). Guidelines on choosing stratification variables that would possibly improve the sampling were provided in the Sampling in PISA manual (OECD, 2016[2]).

Table 6.1 provides the explicit stratification variables used by each country/economy, as well as the number of explicit strata found within each country/economy. For example, Australia had eight explicit strata using states/territories which were then further delineated by three school types (known as sectors). Australia also had one explicit stratum for certainty selections, so that there were 25 explicit strata in total. Variables used for implicit stratification and the respective number of levels can also be found in Table 6.1.

As the sampling frame was always sorted by school size within each stratum, school size was always implicit stratification variable, though it is not listed in Table 6.1. The use of school size as an implicit stratification variable provides a degree of control over the student sample size so as to possibly avoid the sampling of too many relatively large schools or too many relatively small schools.

Assigning a measure of size to each school

For the probability proportional to size sampling method used for PISA, a Measure of Size (*MOS*) derived from *ENR* was established for each school on the sampling frame. *MOS* was generally constructed as: *MOS* = max (*ENR, TCS*). This differed slightly in the case of the treatment of small schools, discussed later. Thus, the measure of size was equal to the enrolment estimate (*ENR*), unless enrolment was less than the *TCS*, in which case the measure of size was set equal to the target cluster size.

As schools were sampled with probability proportional to size, setting the measure of size of small schools to 42 students (or 35 for paper-based countries/economies) was equivalent to drawing a simple random sample of small schools. That is, each small school would have an equally likely chance of being selected to participate. However, please see the "Treatment of small schools" for details on how small schools were sampled.

School sample selection

School sample allocation over explicit strata

The total number of schools to be sampled in each country/economy needed to be allocated among the explicit strata so that the expected proportion of students in the sample from each explicit stratum was approximately the same as the population proportions of PISA-eligible students in each corresponding explicit stratum. There were two exceptions. If very small schools required under-sampling, students in them had smaller percentages in the sample than in the population. To compensate for the resulting loss of sample, the large schools had slightly higher percentages in the sample than the corresponding population percentages. The other exception occurred if only one school was allocated to any explicit stratum. In this case, two schools were allocated for selection in the stratum to aid with variance estimation. Similarly, if only three schools existed in any explicit stratum, instead of taking only two, all three were selected, to increase the efficiency of the sample design.

Sorting the sampling frame

The *School Sampling Preparation Manual* set of documents indicated that, prior to selecting the school sample, schools in each explicit stratum were to be sorted by a limited number of variables chosen for implicit stratification and finally by the *ENR* value within each implicit stratum. The schools were first to be sorted by the first implicit stratification variable, then by the second implicit stratification variable within the levels of the first implicit stratification variable, and so on, until all implicit stratification variables were used. This gave a cross-classification structure of cells, where each cell represented one implicit stratum on the school sampling frame. The sort order was alternated between implicit strata, from high to low and then low to high, etc., through all implicit strata within an explicit stratum.

Determining which schools to sample

The PPS-systematic sampling method used in PISA first required the computation of a sampling interval for each explicit stratum. This calculation involved the following steps:

- recording the total measure of size, *S*, for all schools in the sampling frame for each specified explicit stratum
- recording the number of schools, *D*, to be sampled from the specified explicit stratum, which was the number allocated to the explicit stratum
- calculating the sampling interval, *I*, as follows: $I = S/D$
- including in the sample all schools for which the school's size measure exceed *I* (known as certainty schools)

- removing certainty schools from the frame, recalculating *S*, *D*, and *I*
- recording the sampling interval, *I*, to four decimal places.

Next, a random number had to be generated for each explicit stratum. The generated random number (*RN*) was from a uniform distribution between zero and one and was to be recorded to four decimal places.

The next step in the PPS selection method in each explicit stratum was to calculate selection numbers – one for each of the *D* schools to be selected in the explicit stratum. Selection numbers were obtained using the following method:

- Obtaining the first selection number by multiplying the sampling interval, *I*, by the random number, *RN*. This first selection number was used to identify the first sampled school in the specified explicit stratum, as described in the section "Identifying the sampled schools".
- Obtaining the second selection number by adding the sampling interval, *I*, to the first selection number. The second selection number was used to identify the second sampled school.
- Continuing to add the sampling interval, *I*, to the previous selection number to obtain the next selection number. This was done until all specified line numbers (1 through *D*) had been assigned a selection number.

Thus, the first selection number in an explicit stratum was $RN \times I$, the second selection number was $(RN \times I) + I$, the third selection number was $(RN \times I) + I + I$, and so on.

Selection numbers were generated independently for each explicit stratum, using a new random number generated for each explicit stratum.

Identifying the sampled schools

The next task was to compile a cumulative measure of size in each explicit stratum of the school sampling frame that assisted in determining which schools were to be sampled. Sampled schools were identified as follows:

Let *Z* denote the first selection number for a particular explicit stratum. It was necessary to find the first school in the sampling frame where the cumulative *MOS* equalled or exceeded *Z*. This was the first sampled school. In other words, if C_s was the cumulative *MOS* of a particular school *S* in the sampling frame and $C_{(s-1)}$ was the cumulative *MOS* of the school immediately preceding it, then the school in question was selected if C_s was greater than or equal to *Z*, and $C_{(s-1)}$ was strictly less than *Z*. Applying this rule to all selection numbers for a given explicit stratum generated the original sample of schools for that stratum.

Box 6.1. Illustration of probability proportional to size (PPS) sampling

To illustrate these steps, suppose that in an explicit stratum in a participant country/economy, the PISA-eligible student population is 105 000, then:

- the total measure of size, *S*, for all schools is 105 000
- the number of schools, *D*, to be sampled is 150
- calculating the sampling interval, *I*, 105 000/150 = 700
- generate a random number, *RN*, 0.3230
- the first selection number is 700 × 0.3230 = 226 and it was used to identify the first sampled school in the specified explicit stratum
- the second selection number is 226 + 700 = 926 and it was used to identify the second sampled school

- the third selection number is 926 + 700 = 1 626 and it was used to identify the third sampled school, and so on until the end of the school list is reached.

This will result in a school sample size of 150 schools.

The table below also provides these example data. The school that contains the generated selection number within its cumulative enrolment is selected for participation.

School	*MOS*	Cumulative *MOS* (C_s)	Selection number	School selection
0001	550	550	226	Selected
0002	364	914		
0003	60	974	926	Selected
0004	93	1 067		
0005	88	1 155		
0006	200	1 355		
0007	750	2 105	1 626	Selected
0008	72	2 177		
0009	107	2 284		
0010	342	2 626	2 326	Selected
0011	144	2 770		
...	...	...	...	...

Identifying replacement schools

Each sampled school in the main survey was assigned two replacement schools from the school sampling frame, if possible, identified as follows: for each sampled school, the schools immediately preceding and following it in the explicit stratum, which was ordered within by the implicit stratification, were designated as its replacement schools. The school immediately following the sampled school was designated as the first replacement and labelled R_1, while the school immediately preceding the sampled school was designated as the second replacement and labelled R_2. The *School Sampling Preparation Manual* set of documents noted that in small countries/economies, there could be problems when trying to identify two replacement schools for each sampled school. In such cases, a replacement school was allowed to be the potential replacement for two sampled schools (a first replacement for the preceding school, and a second replacement for the following school), but an actual replacement for only one school. Additionally, it may have been difficult to assign replacement schools for some very large schools because the sampled schools appeared close to each other in the sampling frame. There were times when it was only possible to assign a single replacement school, or even none, when two consecutive schools in the sampling frame were sampled. That is, no unsampled schools existed between sampled schools.

Variations were allowed if a sampled school happened to be the last school listed in an explicit stratum. In this case the two schools immediately preceding it were designated as replacement schools. Similarly, for the first school listed in an explicit stratum, the two schools immediately following it were designated as replacement schools.

Assigning school identifiers

To keep track of sampled and replacement schools in the PISA database, each was assigned a unique, four-digit school code sequentially numbered starting with one within each explicit stratum (each explicit stratum was numbered with a separate two-digit stratum code). For example, if 150 schools are sampled from a single explicit stratum, they are assigned identifiers from 0001 to 0150. First replacement schools in the main survey are assigned the school identifier of their corresponding sampled schools, incremented by 1000. For example, the first replacement school for sampled school 0023 is assigned school identifier 1023. Second replacement schools in the main survey are assigned the school identifier of their corresponding sampled schools, but incremented by 2000. For example, the second replacement school for sampled school 0136 took the school identifier 2136.

Tracking sampled schools

NPMs were encouraged to make every effort to confirm the participation of as many sampled schools as possible to minimise the potential for non-response biases. Each sampled school that did not participate was replaced if possible. NPMs contacted replacement schools only after all contacts with sampled schools were made (the first replacement was contacted first, followed by the second replacement if needed). If the unusual circumstance arose whereby both an original school and a replacement participated, only the data from the original school were included in the weighted data, provided that at least 33% of the PISA-eligible, non-excluded students had participated. If this was not the case, it was permissible for the original school to be labelled as a non-respondent and the replacement school as the respondent, provided that the replacement school had at least 33% of the PISA-eligible, non-excluded students as participants.

Special school sampling situations

Treatment of small schools

In PISA, schools were classified as very small, moderately small or large. A school was classified as large if it had an *ENR* equal to or above the *TCS* (42 students in most countries/economies). A moderately small school had an *ENR* in the range of one-half the *TCS* to *TCS* (21 to 41 students in most countries/economies). A very small school had an *ENR* less than one-half the *TCS* (20 students or fewer in most countries/economies). Schools with especially few students were further classified as either very small schools with an *ENR* of zero, one, or two students or very small schools with an *ENR* greater than two students but less than one-half the *TCS*. Unless they received special treatment in the sampling, the occurrence of small schools in the sample will reduce the sample size of students for the national sample to below the desired target because the within-school sample size would fall short of expectations. A sample with many small schools could also be an administrative burden with many testing sessions yielding few students. To minimise these problems, procedures were devised for managing small schools in the sampling frame.

To balance the two objectives of selecting an adequate sample of small schools but not too many small schools so as to hurt student yield, a procedure was recommended that assumed the underlying idea of under-sampling the very small schools by a factor of two (those with an *ENR* greater than two but less than one-half the *TCS*) and under-sampling the very small schools with zero, one, or two students by a factor of four, and proportionally increasing the number of large schools to sample. To determine whether very small schools should be under-sampled and if the sample size needed to be increased to compensate for small schools, the following test was applied.

- If the percentage of students in very small schools (*ENR* < *TCS*/2) was 1 percent or more, then very small schools were under-sampled and the school sample size increased, sufficiently to maintain the required overall yield.
- If the percentage of students in very small schools (ENR < TCS/2) was less than 1 percent, and the percentage of schools that are the very smallest schools (ENR of 0, 1, or 2) was 20 percent or more of total schools on the frame, and the percentage of students in moderately small schools (TCS/2 < ENR < TCS) was 4 percent or more, then very small schools were under-sampled and the school sample size increased.

- If the percentage of students in very small schools (ENR < TCS/2) was LESS than 1 percent, and the percentage of schools that are the very smallest schools (ENR of 0, 1, or 2) was LESS than 20 percent of total schools on the frame, and the percentage of students in moderately small schools (TCS/2 < ENR < TCS) was 4 percent or more, then there was no under-sampling of very small schools needed but the school sample size was increased.
- If the percentage of students in very small schools (ENR < TCS/2) was less than 1 percent, and the percentage of schools that are the very smallest schools (ENR of 0, 1, or 2) was 20 percent or more of total schools on the frame, and the percentage of students in moderately small schools (TCS/2 < ENR < TCS) was less than 4 percent, then very small schools were under-sampled and the school sample size may have needed to be increased, with the extent to be determined.

If none of these conditions were true, then the small schools contained such a small proportion of the PISA population that they were unlikely to reduce the sample below the desired target. In this case, no under-sampling of very small schools was needed nor an increase to the school sample size to compensate for small schools.

The condition included in the second, third, and fourth points above, where the percentage of schools on the frame that are the very smallest (*ENR* of 0, 1, or 2) is 20 percent or more, was added in the PISA 2015 cycle and also applied in 2018 and 2022. This modification from earlier cycles was for the infrequent situation where very small schools (*ENR* < *TCS*/2) overall contain less than 1 percent of total frame enrolment while at the same time these very smallest schools account for a large percentage of total schools on the frame. If this condition was met and no under-sampling was otherwise required based on the percentage of enrolment in very small schools, very small schools were under-sampled to avoid having too many of these in the school sample. Even though under-sampling can reduce the number of these in the sample from what could be expected without under-sampling, when very small schools account for such a large percentage of schools on the frame it is likely that a relatively large number of them (but not a large proportion) will be selected. A minor increase to the sample size was needed in this case to safeguard the needed student sample size.

If the number of very small schools was to be controlled in the sample without creating explicit strata for these small schools, this was accomplished by assigning a measure of size (*MOS*) of *TCS*/2 to those very small schools with an *ENR* greater than two but less than *TCS*/2 and a measure of size equal to the *TCS*/4 for the very small schools with an *ENR* of zero, one, or two. In effect, very small schools with a measure of size equal to *TCS*/2 were under-sampled by a factor of two (school probability of selection reduced by half), and the very small schools with a measure of size equal to *TCS*/4 were under-sampled by a factor of four (school probability of selection reduced by three-fourths). This was accomplished as follows and was a standard procedure followed in all countries/economies.

The formulae below assume an initial target school sample size of 150 and a target student sample size of 6 300.

- Step 1: From the complete sampling frame, find the proportions of total *ENR* that come from very small schools with *ENR* of zero, one or two (*P1*), very small schools with ENR greater than two but fewer than *TCS*/2 (*P2*), moderately small schools (*Q*) and large schools (*R*). Thus, $P1 + P2 + Q + R = 1$.
- Step 2: Calculate the value *L*, where $L = 1.0 + 3(P1)/4 + (P2)/2$. Thus, L is a positive number slightly more than 1.0.
- Step 3: The minimum sample size for large schools is equal to $150 \times R \times L$, rounded up to the nearest integer. It may need to be enlarged because of national considerations, such as the need to achieve minimum sample sizes for geographic regions or certain school types.
- Step 4: Calculate the mean value of *ENR* for moderately small schools (*MENR*), and for very small schools (*V1ENR* and *V2ENR*). *MENR* is a number in the range of *TCS*/2 to *TCS*, *V2ENR* is a

number larger than two but no greater than *TCS*/2, and *V1ENR* is a number in the range of zero to two.

- Step 5: The number of schools that must be sampled from the moderately small schools is given by: (6 300 × *Q* × *L*)/(*MENR*).
- Step 6: The number of schools that must be sampled from the very small schools (type *P2*) is given by: (3 150 × *P2* × *L*)/(*V2ENR*).
- Step 7: The number of schools that must be sampled from the very small schools (type *P1*) is given by: (1 575 × *P1* × *L*)/(*V1ENR*).

To illustrate the steps, suppose that in a participant country/economy, the *TCS* is equal to 42 students, with 10% of the total enrolment of 15-year-olds in moderately small schools, and 5% in each type of very small schools, *P1* and *P2*. Suppose that the average enrolment in moderately small schools is 25 students, in very small schools (type *P2*) it is 12 students, and in very small schools (type *P1*) it is 1.5 students.

- Step 1: The proportions of total *ENR* from very small schools is *P1* = 0.05 and *P2* = 0.05, from moderately small schools is *Q* = 0.1, and from large schools is *R* = 0.8. The proportion of the very smallest schools on the frame was not more than 20%. It can be shown that 0.05 + 0.05 + 0.1 + 0.8 = 1.0.
- Step 2: Calculate the value *L*. *L* = 1.0 + 3(0.05)/4 + (0.05/2). Thus *L* = 1.0625.
- Step 3: The minimum sample size for large schools is equal to 150 × 0.8 × 1.0625 = 127.5. That is, at least 128 (rounded up to the nearest integer) of the large schools must be sampled.
- Step 4: The mean value of *ENR* for moderately small schools (*MENR*) is given in this example as 25, very small schools of type *P2* (*V2ENR*) as 12, and very small schools of type *P1* (*V1ENR*) as 1.5.
- Step 5: The number of schools that must be sampled from the moderately small schools is given by:
- (6 300 × 0.1 × 1.0625)/25 = 26.8. At least 27 (rounded up to the nearest integer) moderately small schools must be sampled.
- Step 6: The number of schools that must be sampled from the very small schools (type *P2*) is given by:
- (3 150 × 0.05 × 1.0625)/12 = 13.9. At least 14 (rounded up to the nearest integer) very small schools of type *P2* must be sampled.
- Step 7: The number of schools that must be sampled from the very small schools (type *P1*) is given by:
- (1 575 × 0.05 × 1.0625)/1.5 = 55.8. At least 56 (rounded up to the nearest integer) very small schools of type *P1* must be sampled.

Combining these different sized school samples gives a total sample size of 128 + 27 + 14 + 56 = 225 schools. Before considering school and student non-response, the larger schools will yield an initial sample of approximately 128 × 42 = 5 376 students. The moderately small schools will give an initial sample of approximately 27 × 25 = 675 students, very small schools of type *P2* will give an initial sample size of approximately 14 × 12 = 168 students, and very small schools of type *P1* will give an initial sample size of approximately 56 × 1.5 = 84 students. The total expected sample size of students is therefore 5 376 + 675 + 168 + 84 = 6 303.

This procedure, called small-school analysis, was done not just for the entire school sampling frame, but for each individual explicit stratum. An initial allocation of schools to explicit strata provided the starting number of schools and students to project for sampling in each explicit stratum. The small-school analysis for a single unique explicit stratum indicated how many very small schools of each type (assuming under-sampling, if needed), moderately small schools and large schools would be sampled in that stratum.

Together, these provided the final sample size, *n*, of schools to select in the stratum. Based on the stratum sampling interval and random start, large, moderately small, and very small schools were sampled in the stratum, to a total of *n* sampled schools. Because of the random start, it was possible to have more or less than expected of the very small schools of either type, *P1* or *P2*, of the moderately small schools, and of the large schools. The total number of sampled schools however was fixed at *n*, and the number of expected students to be sampled was always approximate to what had been projected from the unique stratum small school analysis.

PISA and national survey overlap control

Within a given country/economy the main survey for PISA 2022 could occur at approximately the same time as another survey of schools. Because of the potential for increased burden, an overlap control procedure for school sampling was offered. This was used for one country/economy, Norway (to avoid overlap with the ICCS 2022 sample)[1]. This overlap control procedure for each country/economy required that the same school identifiers be used on the PISA and the other study school frames for the schools in common.

PISA implements the sample overlap control procedure in cases where the other study sample is selected before the PISA sample. Thus, for a country/economy requesting overlap control, the national study centre supplied the international contractor with their school frame, national school IDs, each school's probability of selection, and an indicator showing which schools had been sampled for the national study.

Sample selections for PISA and the national study could totally avoid overlap of schools if schools which would have been selected with high probability for either study had their selection probabilities capped at 0.5. Such an action would make each study's sample slightly less than optimal, but this might be deemed acceptable when weighed against the possibility of low response rates due to the burden of participating in two assessments. Norway did not request this for PISA 2022.

To control overlap of schools between PISA and another sample, the sample selection of schools for PISA adopted a modification of an approach described by Keyfitz (1951[3]) based on Bayes' Theorem. To use PISA and ICCS in an example of the overlap control approach to minimise overlap, suppose that *PROBP* is the PISA probability of selection and *PROBI* is the ICCS probability of selection. Then a conditional probability of a school's selection into PISA (*CPROB*) is determined as follows, using Norway and overlap with the ICCS as examples for brevity:

$$CPROB = \begin{cases} max\left[0, \left(\frac{PROBI + PROBP - 1}{PROBI}\right)\right] if\ the\ school\ was\ a\ ICCS\ school \\ min\left[1, \frac{PROBP}{(1 - PROBI)}\right] if\ the\ school\ was\ not\ a\ ICCS\ school \\ PROBP\ if\ the\ school\ was\ not\ a\ ICCS\ eligible\ school \end{cases}$$

Then a conditional *CMOS* variable was created to coincide with these conditional probabilities as follows:

CMOS = *CPROB* × stratum sampling interval

The PISA school sample was then selected using the line numbers created as usual, as described in an earlier section of this chapter, but applied to the cumulated *CMOS* values (as opposed to the cumulated *MOS* values). Note that it was possible that the resulting PISA sample size could be slightly lower or higher than the originally assigned PISA sample size, but this was deemed acceptable.

Monitoring school sampling

PISA 2022 Technical Standard 1.16 (see Annex I) states that, as in the previous cycles, the international contractor should select the school samples unless otherwise agreed upon. Japan was the only participant that selected their own school sample, doing so for reasons of confidentiality.

Sample selection for Japan was replicated by the international contractor using the same random numbers as used by the Japanese national centre, to ensure quality in this case. All other participating countries/economies' school samples were selected by, and checked in detail by, the international contractor. To enable this, all countries/economies were required to submit sampling information on forms associated with the following various activities and Sampling Tasks (STs) described in Table 6.2.

The international contractor completed school sampling and, along with the school sample, returned other information (small school analyses, school allocation, and a spreadsheet that countries/economies could use for tracking school participation). Table 6.2 provides a comprehensive summary of the information required for each sampling task and the timetables (which depended on national assessment periods). Note that forms or data associated with Sampling Tasks 3, 4, 5 and 6 were all for the field trial, so they are not included in Table 6.2. Sampling Tasks are also described in detail in further sections of this chapter.

Once received from each participating country/economy, each set of information was reviewed and feedback was provided to the country/economy. Forms were only approved after all criteria were met. Approval of deviations was only given after discussion and agreement by the international contractors. In cases where approval could not be granted, countries/economies were asked to make revisions to their sample design and sampling forms and resubmit.

Checks that were performed when monitoring each sampling task follow. Although all sampling tasks were checked in their entirety, the below paragraphs contain matters that were explicitly examined.

Just after countries/economies submitted their main survey sampling tasks, the international contractor verified all special situations known in each participating country/economy. Such special situations included whether or not: the TCS value differed from 42 or 35 students; the Financial Literacy Assessment was being conducted; the Teacher Questionnaire was being administered; the Creative Thinking assessment was being omitted; overlap control procedures with a national or international (non-PISA) survey were required; there was any regional or other type of oversampling; the UH booklet would be used; and any grade or other type of student sampling would be used.

Additionally, any countries/economies with fewer or only slightly over their target number of assessed students in PISA 2018 had increased school sample sizes discussed and agreed upon. Additionally, countries/economies which had too many PISA 2018 exclusions were warned about not being able to exclude any schools in the field for PISA 2022. Finally, any countries/economies with effective student sample sizes less than 400 in PISA 2018 also had increased school sample sizes discussed and agreed upon.

Sampling Tasks

School samples

The school sampling procedure was carried out according to the completion of a series of tasks. During each of these tasks, several checks were performed with the data to ensure the quality of the resulting sample. These sampling tasks are the following:

Sampling task 0: Languages of instruction

- Language distributions were compared with those of PISA 2018 for countries/economies which had participated in PISA 2018. Differences in languages and/or the percentage distribution were queried.
- The existence of international/foreign schools was asked about.
- Checks were done on the appropriate inclusion of languages in the FT along with proper verification plans.

- Languages which were planned for MS exclusion were scrutinised.

Sampling task 1: Time of testing and age definition

- Assessment dates had to be appropriate for the selected target population dates.
- Assessment dates could not cover more than a 56-day period unless agreed upon.
- Assessment dates could not be within the first six weeks of the academic year.
- If assessment end dates were close to the end of the target population birth date period, NPMs were alerted not to conduct any make-up sessions beyond the date when the population birth dates were valid.

Sampling task 2: Stratification (and other information)

- Each participating country/economy used explicit strata to group similar schools together to reduce sampling variance and to ensure representativeness of students in various school types using variables that might be related to outcomes. The international contractor assessed each country/economy's choice of explicit stratification variables. If a country/economy was known to have school tracking or distinct school programmes and these were not among the explicit stratification variables, a suggestion was made to include this type of variable.
- Dropping variables or reducing levels of stratification variables used in the past was discouraged and only accepted if the national centre could provide strong reasons for doing so.
- Adding variables for explicit stratification was encouraged if the new variables were particularly related to outcomes. Care was taken not to have too many explicit strata though.
- Levels of variables and their codes were checked for completeness.
- If no implicit stratification variables were noted, suggestions were made about ones that might be used. In particular, if a country/economy had single gender schools and school gender was not among the implicit stratification variables, a suggestion was made to include this type of variable to ensure no sample gender imbalances. Similarly, if there were ISCED school level splits, the ISCED school level was also suggested as an explicit or implicit stratification variable.[2]
- Without overlap control there is nearly as good control over sample characteristics compared to population characteristics whether explicit or implicit strata are used. With overlap control some control is lost when using implicit strata, but not when using explicit strata. Therefore, in the case of overlap control with a non-PISA survey, as many as possible implicit stratification variables should become explicit stratification variables.
- If grade or other national option sampling, or special oversampling of subpopulations of PISA students were chosen as national options, checks were done to ensure that each explicit stratum had only one student sampling method applied.

Sampling task 7a: National desired target population

- The total national number of 15-year-olds was compared with those from previous cycles. Differences, and any kind of trend, were queried.
- Large deviations between the total national number of 15-year-olds and the enrolled number of 15-year-olds were questioned.
- Large increases or decreases in enrolled population numbers compared to those from previous PISA cycles were queried, as were increasing or decreasing trends in population numbers since PISA 2000.

- Any population to be omitted from the international desired population was noted and discussed, especially if the percentage of 15-year-olds to be excluded was more than 0.5% or if it was substantially different or not noted for previous PISA cycles.
- For countries/economies having adjudicated regions, a Sampling Task 7a form was needed for each region.
- Data sources and the year of the data were required. If websites were provided with an English page option, the submitted data was verified against those sources.

Sampling task 7b: National defined target population

- The population value in the first question needed to correspond with the final population value on the form for Sampling Task 7a. This was accomplished through built-in data checks.
- Reasons for excluding schools other than special education needs were checked for appropriateness (i.e. some operational difficulty in assessing the school). In particular, school-level language exclusions were closely examined to check correspondence with what had been noted about language exclusions on Sampling Task 0.
- Exclusion types and extents were compared to those recorded for PISA 2018 and previous cycles. Differences were queried.
- The number and percentage of students to be excluded at the school level were checked and the percentage was checked to confirm that it was less than the guideline maximum allowed for such exclusions.
- Reasonableness of assumptions about within-school exclusions was assessed by checking previous PISA coverage tables. If there was an estimate noted for “other”, the country/economy was queried for reasonableness about what the “other” category represented. If it was known the country/economy had schools where some of the students received instruction in minority languages not being tested, an estimate for the within-school exclusion category for “no materials available in the student’s language of instruction” was necessary.
- Form calculations were verified through built-in data checks, and the overall coverage figures were assessed.
- If it was noted that there was a desire to exclude schools with only one or two PISA-eligible students at the time of contact, then the school sampling frame was checked for the percentage of population that would be excluded. If countries/economies had not met the 2.5% school-exclusion guideline and if these schools would account for not more than 0.5% and if within-school exclusions looked similar to the past and were within 2.5%, then the exclusion of these schools at the time of contact was agreed upon with the understanding that such exclusion would not cause entire strata to be missing from the student data.
- The population figures on this form after school-level exclusions were compared against the aggregated school sampling frame enrolment. School-level exclusion totals also were compared to those tabulated from the excluded school sheet of the sampling frame, ST8b. Differences were queried.
- For any countries/economies using a three-stage design, a Sampling Task 7b form also needed to be completed for the full national defined population as well as for the population in the sampled regions (not applicable for PISA 2022 as there were no three-stage designs). For countries/economies having adjudicated regions, a Sampling Task 7b form was needed for each region.
- Data sources and the year of the data were required. If websites were provided with an English page option, the submitted data was verified against those sources.

Sampling task 8a: Sampling frame description

- The type of school-level enrolment estimate, and the year of data availability were assessed for reasonableness.
- Countries/economies were asked to provide information for each of various school types, whether those schools were included on or excluded from the sampling frame, or the country/economy did not have any such schools. The information was matched to the different types of schools containing PISA students noted on Sampling Task 2. Any discrepancies were queried.
- Any school types noted as being excluded were verified as school-level exclusions on the Sampling Task 7b form. Any discrepancies were queried.

Sampling Task 8b: Sampling frame

- On the spreadsheet for school-level exclusions, the number of schools and the total enrolment figures, as well as the reasons for exclusion, were checked to ensure correspondence with values reported on the Sampling Task 7b form detailing school-level exclusions. It was verified that this list of excluded schools did not have any schools which were excluded for having only one or two PISA-eligible students, as these schools were not to be excluded from the school sampling frame. Checks were done to ensure that excluded schools did not still appear on the other spreadsheet containing the school sampling frame.
- All units on the school sampling frame were confirmed to be those reported on the Sampling Task 2 as sampling frame units. The sampling unit frame number was compared to the corresponding frame for PISA 2018 as well as previous cycles. Differences were queried.
- NPMs were queried about whether they had included schools with grades 7 or 8, or in some cases those with grades 10 or higher, which could potentially have PISA-eligible students at the time of assessment even if the school currently did not have any.
- NPMs were queried about whether they had included vocational or apprenticeship schools, schools with only part-time students, international or foreign schools, schools not under the control of national education authorities, or any other irregular schools that could contain PISA-eligible students at the time of the assessment, even if such schools were not usually included in other national surveys.
- The frame was checked for all required variables: a national school identifier with no duplicate values, a variable containing the school enrolment of PISA-eligible students, and all the explicit and implicit stratification variables. Stratification variables were checked to make sure none had missing values and only had levels as noted on Sampling Task 2.
- Any additional school sampling frame variables were assessed for usefulness. In some instances, other variables were noted on the school frame that might also have been useful for stratification.
- The frame was checked for schools with only one or two PISA-eligible students. If no schools were found with extremely low counts, but the country/economy's previous sampling frames had some, this was queried.
- The frame was checked for schools with zero enrolment. If there were none, this was assessed for reasonableness. If some existed, it was verified with the NPM that these schools could possibly have PISA-eligible students at the time of the assessment.

Sampling Task 9: Treatment of small schools and the sample allocation by explicit strata

- All explicit strata had to be accounted for on the form for Sampling Task 9.
- All explicit strata population entries were compared to those determined from the sampling frame.
- All small-school analysis calculations were verified.

- It was verified that separate small-school analyses were done for adjudicated or non-adjudicated oversampled regions (if these were different from explicit strata).
- Country/economy specified sample sizes were monitored, and revised if necessary, to be sure minimum sample sizes were being met.
- The calculations for school allocation were checked to ensure that schools were allocated to explicit strata based on explicit stratum student percentages and not explicit stratum school percentages, that all explicit strata had at least two allocated schools, and that no explicit stratum had only one remaining non-sampled school.
- It was verified that the allocation matched the results of the explicit strata small school analyses, with allowances for random deviations in the numbers of very small, moderately small, and large schools to be sampled in each explicit stratum.
- The percentage of students in the sample for each explicit stratum had to be approximate to the percentage in the population for each stratum (except in the case of oversampling).
- The overall number of schools to be sampled was checked to ensure that at least 150 schools would be sampled.
- The overall expected number of assessed students was checked to ensure that at least 6 300 assessed students in CBA countries/economies, and 5 250 assessed students in PBA countries/economies, were expected.
- Previous PISA response rates were reviewed and if deemed necessary, sample size increases were suggested.

Sampling Task 10: School sample selection

- All calculations were verified, including those needed for national survey overlap control if applicable.
- Particular attention was paid to the required four decimal places for the sampling interval and the generated random number.
- The frame was checked for proper sorting according to the implicit stratification scheme, for enrolment values, and the proper assignment of the measure of size value, especially for very small and moderately small schools. The assignment of replacement schools and PISA identification numbers were checked to ensure that all rules established in the *Sampling Preparation Manual* set of documents were adhered to.

Sampling Task 11a/b: Reviewing and agreeing to the sampling forms

- The forms for Sampling Tasks 11a/b were prepared as part of the sample selection process. After the international contractor verified that all entries were correct, NPMs had to perform the same checks and to agree to the content in these forms as quickly as possible.

Sampling task 12: School participation and data validity checks

- Extensive checks were completed on Sampling Task 12 data since it would inform the weighting process. Checks were done to ensure that school participation statuses were valid, student participation statuses had been correctly assigned, and all student sampling data required for weighting were available and correct for all student sampling options. Quality checks also highlighted schools having only one grade with PISA-eligible students, only one gender of PISA-eligible students, or schools which had noticeable differences in enrolled student counts larger than expected based on sampling frame enrolment information. Such situations were queried.

- Large differences in overall grade and gender distributions compared to unweighted 2015 and 2018 data were queried.
- Uneven distributions of student birth months were queried when such distributions differed from unweighted 2015 and 2018 data.
- These data also provided initial unweighted school and student response rates. Any potential response rate issues were discussed with NPMs if it seemed likely that a non-response bias report might be needed.

Student samples

Student sampling was undertaken using the international contractor software, ACER Maple, at the national centres from lists of all PISA-eligible students in each school that had agreed to participate. These lists could have been prepared at the national, regional, or local levels as data files, computer-generated listings, or by hand, depending on who had the most accurate information. Since it was important that the student sample be selected from accurate, complete lists, the lists needed to be prepared slightly in advance of the testing period and had to list all PISA-eligible students. It was suggested that the lists be received one to two months before the testing period so that the NPM would have adequate time to select the student samples.

Two countries (Germany and Iceland) chose student samples that included students aged 15 and/or enrolled in a specific grade (e.g., grade 10). Thus, a larger overall sample, including 15-year-old students and students in the designated grade (who may or may not have been aged 15) was selected. The necessary steps in selecting larger samples are noted where appropriate in the following details:

- Germany supplemented the standard sampling method with an additional sample of grade-eligible students which was selected by first selecting two grade 9 classes within PISA-sampled non-SEN schools (except for vocational schools) and all grade 9 classes within PISA-sampled SEN schools that had this grade. Prior to PISA 2015, Germany assessed all the class-sampled students. For PISA 2022, similar to PISA 2018, to reduce the number of students needing to be assessed for their grade sample from the sampled classes, Germany randomly subsampled 15 students in each sampled class only to participate; the non-selected students in each sampled class were dropped in weighting after applying a ratio adjustment to student base weight for sub-sampled students within each sampled class.
- Iceland had a school census and a student census of PISA-eligible students, as well as a census of grade 10 students.

Two countries (Denmark and France) selected, in addition to PISA students, national-option-eligible-only students to also do the PISA assessments.

Preparing a list of age-eligible students

Each school participating in PISA had to prepare a list of age-eligible students that included all 15-year-olds (using the appropriate 12-month age span agreed upon for each participating country/economy) in international grades 7 or higher. In addition, each school drawing an additional grade sample also had to include grade-eligible students that included all PISA-eligible students in the designated grade (e.g., grade 10). This form was referred to as a student listing form. The following were considered important:

- Age-eligible students were all students born in 2006 (or the appropriate 12-month age span agreed upon for the participating country/economy). With additional grade samples, including all grade-eligible students was also important.

- The list was to include students who might not be tested due to a disability or limited language proficiency.
- Students who could not be tested were to be excluded from the assessment after the student listing form was created and after the student sample was selected. It was stressed to national centres that students were to be excluded after the student sample was drawn, not prior.
- It was suggested that schools retain a copy of the student list in case the NPM had to contact the school with questions.
- Student lists were to be up-to-date close to the time of student sampling rather than a list prepared at the beginning of the school year.

Selecting the student sample

Once NPMs received the list of PISA-eligible students from a school, the student sample was to be selected and the list of selected students returned to the school via a student tracking form. An equal probability sample of PISA students was selected within each school, using systematic sampling, where the lists of students were first sorted by grade and gender. NPMs were required to use ACER Maple, to select the student samples unless otherwise agreed upon. For PISA 2022, all countries/economies used ACER Maple. The same procedures were used to select the student samples for the Field Trial.

Preparing instructions for excluding students

PISA was a timed assessment administered in the instructional language(s) of each participating country/economy and designed to be as inclusive as possible. For students with limited assessment language(s) experience or with physical, mental, or emotional disabilities who could not participate, PISA developed guidelines in cases of doubt about whether a selected student should be assessed. NPMs used the guidelines to develop any additional instructions; school co-ordinators and test administrators needed precise instructions for exclusions. The national operational definitions for within-school exclusions were to be clearly documented and submitted to the international contractor for review before testing.

Sending the student tracking form to the school co-ordinator and test administrator

The school co-ordinator needed to know which students were sampled in order to notify students, parents, and teachers, and in order to update information and to identify students to be excluded. The student tracking form was therefore sent approximately two weeks before the testing period. It was recommended that a copy of the tracking form be kept at the national centre and the NPM send a copy of the form to the test administrator in case the school copy was misplaced before the assessment day. The test administrator and school co-ordinator manuals (see Chapter 8) both assumed that each would have a copy.

In the interest of ensuring that PISA was as inclusive as possible, student participation and reasons for exclusion were separately coded in the student tracking form. This allowed for special education needs (SEN) students to be included when their needs were not serious enough to be an impediment to their participation. The participation status could therefore detail, for example, that a student participated and was not excluded for special education needs reasons even though the student was noted with a special education need. Any student whose participation status indicated they were excluded for special education needs reasons had to have an SEN code that explained the reason for exclusion. It was important that these criteria were followed strictly for the survey to be comparable within and across participating countries/economies. School co-ordinators and test administrators were told to include students when in doubt. The instructions for excluding students are provided in the PISA Technical Standards (Annex I).

Teacher samples

For PISA 2022, as in PISA 2018, a limited number of countries/economies elected to participate in an international option in which teachers were sampled in each sampled school. Data from the teacher questionnaire (TQ) was intended to be used to add context to student data from the same school, that is, to describe the learning environment of typical 15-year-old students in the country/economy. Therefore, the TQ focused on the grade level that most 15-year-old students in the country/economy attend, or in other words, the national modal grade for 15-year-old students. If an adjacent grade level was attended by 30% or more of 15-year-old students in the country/economy, both grade levels were used as modal grades.

A teacher was defined as “one whose primary or major activity in the school is student instruction, involving the delivery of lessons to students. Teachers may work with students as an intact class in a classroom, in small groups in a resource room or one-to-one inside or outside regular classrooms.” Sampling for teachers included all teachers who were currently teaching the modal grade.

Teachers were listed and sampled in ACER Maple as either part of Population ID 1 (mathematics teachers) or Population ID 2 (teachers of other subjects). The distinction between Population IDs 1 and 2 is determined by the meaning of mathematics. Mathematics lessons are the lessons in which algebra, geometry, trigonometry, pre-calculus, and calculus are taught in a curriculum as separate mathematics subjects or taught within a single ‘integrated mathematics’ subject, according to the national/state curriculum. Teachers who teach mathematics lessons were included in Population ID 1, while other eligible teachers are included in Population ID 2.

Ten mathematics teachers were sampled in schools having at least that many listed, or all such teachers, if there were fewer than 10. Fifteen teachers of other subjects were sampled in schools having at least that many listed, or all such teachers, if there were fewer than 15. Within each teacher population (mathematics and non-mathematics), simple random samples of teachers were selected.

Definition of school

Although the definition of a “school” is not always straight forward and uniform across all countries/economies, PISA generally aims to sample whole schools as the first stage units of selection, rather than programmes or tracks or shifts within schools, so that the meaning of “between school variance” is more comparable across countries/economies.

There are exceptions to this, such as when school shifts are more like separate schools than part of the same overall school. However, in some countries/economies with school shifts, this is not the case, and therefore whole schools are used as the primary sampling unit. Similarly, many countries/economies have schools with different tracks/programmes, but generally it is recommended again that the school as a whole should be used as the primary sampling unit. There are some exceptions, such as the schools being split for sampling in previous PISA cycles (trends might be affected if the same practice was not continued), or if there is a good reason for doing so (such as to improve previously poor response rates, if differential sampling of certain tracks or programmes is desired, etc.).

Sampling units to be used on school-level frames were discussed with each country/economy before the field trial. Table 6.3 presents the comments from NPMs, in cases where “school” was not the unit of sampling. Where the Sampling Unit column indicates School, this means that the school was the sampling unit. Where it shows other then something else was used, as described in the comments. Table 6.3 shows the extent to which countries/economies do not select schools in PISA, but rather something else.

References

Jaeger, R. (1984), *Sampling in Education and the Social Sciences*, Longman, New York. [1]

Keyfitz, N. (1951), "Sampling with probabilities proportional to size", *Journal of the American Statistical Association*, Vol. 46, pp. 105-109. [3]

OECD (2016), *Sampling in PISA*, OECD and Westat, http://www.oecd.org/pisa/pisaproducts/SAMPLING-IN-PISA.pdf. [2]

Notes

1. The International Civic and Citizenship Education Study (ICCS) is an international comparative study collecting data on democracy and civic education from students around 14 years of age, teachers and school leaders from a representative sample of schools.

2. ISCED stands for International Standard Classification of Education, an international statistical framework for organising information related to education systems.

Chapter 6 tables

Tables	Title
Table 6.1	Stratification variables used in PISA 2022
Table 6.2	Schedule of school sampling activities
Table 6.3	Sampling frame units

Table 6.1. Stratification variables used in PISA 2022

Country/Economy	Explicit stratification variables	Number of explicit strata	Implicit stratification variables
Albania	Locations (2); Geographical division (3); Funding (2); Certainty selections	12	ISCED level (3), Gender (5)
Argentina	Region (10); Sector (2); Certainty selections	21	Department (19); Location (2); Level (8); Performance (5)
Australia	State/Territory (8); Sector (3); Certainty selections	25	Geographic Location (3); School gender composition (3); School socioeconomic level (11); ISCED level (3)
Austria	Programme (17); Certainty selections	18	Region (9); Percentage of girls (5); Programme for Statut schools (3)
Baku (Azerbaijan)	Urbanicity (2); Language (2); Status/Funding (2); Certainty selections	5	None
Belgium	Region (3); Form of education – Flanders (5),French Community (3), German Community (2); Funding – for Flanders only (3); ISCED level (4), Educational tracks – for French Community only (4)	31	Type of school--for French Community only (5); Grade repetition (6); Percentage of girls (5)
Brazil	Region (5); Public/Private (4)	20	State (27); ISCED level (5); Urbanisation (2); Capital/Country (2); IDH Quintiles (5); School gender composition (3)
Brunei	School Governance (4); School Composition (3);	7	Sixth Form (3); District (4)
Bulgaria	Type of location (3)	3	Type of school (3)
Cambodia	Location (2); School Type (3); School Zones (5)	18	School management (2); Shifts (2)
Canada	Province (10); Language (2); School size (4); Certainty selections	67	Urbanicity (2); Funding (2); ISCED level (3)
Chile	School Type (4); School level (3); School track (4);	14	School Type (4); National test score level (4); Percentage of girls (6); Urbanicity (2); Geographic zone (4)
Chinese Taipei	School type (6); Location (3); Certainty selections	19	Funding (2); Region (6); School gender composition (3); Municipality (2); Shift offerings (2)
Colombia	Region (2); Urbanicity/School Type (3)	6	Regional entities (96); Main shift (2); School gender composition (5)
Costa Rica	School groups (5)	6	Zone (2); Track (2); Shift (2); Education regions (27); ISCED level (3)
Croatia	Dominant programme type (6); Certainty selections	7	Region (6); School gender composition (3)
Cyprus	ISCED level (3); ISCED programme orientation (3); Funding (2);	8	Urbanisation (2); Language (2)
Czech Republic	School Type (6); Region for school types 1 and 2 (14)	32	Region for school types 3, 4, 5 (14); Gender (3)
Denmark	Immigrant levels and Faroes (5); Certainty selections	6	School type (7); ISCED level (3); Urbanisation (5); Region (5); FO group (3)
Dominican Republic	Funding (2); Urbanisation (2); ISCED level (3)	10	Shift (6); School size (4); Programme (4)

Country/Economy	Explicit stratification variables	Number of explicit strata	Implicit stratification variables
El Salvador	Departamento (14); Location (2);	28	Founding (2); ISCED level (3); Study Commitment (3)
Estonia	Language (3); Certainty selections	4	School type (3); Urbanicity (2); County (15); Funding (2)
Finland	Region (5); Urbanisation (2); Immigrant cluster (6); Certainty selections	30	Immigrant cluster (6); Regional state administrative agencies – for major regions of Northern & Eastern Finland and Swedish-speaking regions only (7); School type (5)
France	Territoire (4); Type (4); Taille (3)	22	Secteur (2)
Georgia	Urbanicity (5); Ownership (2)	9	Language (9)
Germany	School category (3); State – for normal schools only (16)	18	State for SEN and vocational schools only (16); School type – for normal schools only (6)
Greece	Urbanisation (3)	3	Funding and region (15); School type (4)
Guatemala	Urbanicity (2); Funding (4); Certainty selections	9	ISCED (2); Modality of teaching (4)
Hong Kong (China)	School type (5)	5	Student academic intake (4); School gender composition (3)
Hungary	School type (6)	6	Geographical region of Hungary (7); Average mathematics performance in the National ABC 2020 (6)
Iceland	Region (6); School size (4)	24	Urbanicity (2)
Indonesia	Region (4)	4	School type (5); Funding (2); Region (8)
Ireland	School sector (3); School Size (3)	9	School gender composition (4); Socioeconomic quartile (4);
Israel	School orientation (12); Certainty selections	13	ISCED level (3); Group size (2); Socio-Economic status (3); Geographic/Administrative District (2)
Italy	Region (7); Study programme (5); Certainty selections	36	IRegion (20); Types of school (2)
Jamaica	Regions (8); Urbanicity (3); Certainty selections	15	Gender (3); School types (5)
Japan	Funding (2); Orientation (2)	4	Levels of proportion of students taking university/college entrance exams (4)
Jordan	School type / Funding (7); Certainty selections	8	Region (3); Urbanisation (2); School gender composition (3); Level (2); Shift (2)
Kazakhstan	School type (2); Region (17); Certainty selections	19	ISCED Level (2); Location (2); Language (3); Funding (2); Shifts (2)
Korea	School level (3); Orientation (2); Certainty selections	6	Urbanisation (3); School gender composition (3)
Kosovo	Region (7); Certainty selections (Large schools)	8	Urbanisation (2); ISCED (3)
Latvia	Urbanisation (4)	4	School type/level (4)
Lithuania	School language (5); School location – for Lithuanian language (4), for other languages (1); School type – for Lithuanian language (4), for other languages (1); Certainty selections	21	School language 2 (4); School location (5); School type (5); School type 2 (2)
Macao (China)	School type (3); Study programme (2); Language (5)	10	School gender composition (3); Secular or religious (2)
Malaysia	School category (9); Certainty selections	10	School type (18); Location (2); Gender (3); ISCED level (2)
Malta	School orientation/management (3);	3	None
Mexico	School level (2); School type funding(2); School size (3)	12	School program (8); Urbanisation (2)
Mongolia	Location (6); Settlement (4); Certainty selections	16	Property type (3); ISCED orientation (2); ISCED level (3)
Montenegro	Programme (4); Region (3)	12	School gender composition (3)

Country/Economy	Explicit stratification variables	Number of explicit strata	Implicit stratification variables
Morocco	Region (12)	12	Milieu (2); Type (2)
Netherlands	School track (10)	10	None
New Zealand	School size (3); Certainty selections	4	School decile (4); School authority (2); School gender composition (3); Urbanicity (2)
North Macedonia	Language (3); ISCED programme (3)	9	Urbanisation (2)
Norway	School type (2)	2	None
Palestinian Authority	Authority (2); Interventions (3); Certainty selections	7	Region (2); Gender (3); District (25)
Panama	Sub-system of education (3); Urbanicity (2); Funding (2); Certainty selections	16	Educational region (16); ISCED level (3); Programme orientation (4); Language of test (3)
Paraguay	School sector (3); School area (2); School size (3); Certainty selections	19	Region (5)
Peru	Funding (2); Urbanisation (2)	4	Region (26); School gender composition (3); School type (4)
Philippines	Administrative Region (16)	16	School Management (2); Type of Community (3); ISCED Level (3); Gender Composition (5)
Poland	School type (4)	4	Private/Public (2); Locality size (4); School gender composition (3)
Portugal	Geographic region (25); Certainty selections	26	ISCED (3); Funding (2); Urbanisation (3); Curriculum (3)
Qatar	School type (4)	4	Level (5); School gender composition (3); Language (2); Programme orientation (3)
Republic of Moldova	Language (3); Urbanisation (3); ISCED level (3); Certainty selections	28	Funding (2); Study programme (6)
Romania	Programme- ISCED Level (2); Language (3)	6	School location area (2); Development regions (8)
Saudi Arabia	School type (3); Gender (2); Region (5)	30	District (47); School level (2)
Serbia	School type primary (2); Region - for non-primary schools only (5), for primary schools (1); School type - for non-primary schools only (4), for primary schools (1); Certainty selections	22	Region implicit (5); School type implicit (7); Language (2)
Singapore	Public/Private (2); School level (2); Certainty selections	4	School Gender composition (3)
Slovak Republic	School type (3); Region (8)	24	T9 - Three-year average of scores in national testing in math and Slovak (Hungarian) language (7); School type (6); Language (3); Funding (3)
Slovenia	Programme/Level (7)	7	Location/Urbanisation (5); School gender composition (3)
Spain	Region (19); Funding (2); Linguistic model – for the Basque region only (2); Certainty selections	40	Linguistic model - for Basque Country only (3), other regions (1)
Sweden	Funding (2); ISCED level (3); Urbanisation for lower secondary only (3)	8	Geographic LAN – for upper secondary only (21); Responsible authority – for upper secondary only (3); Level of immigrants (3); Income Quartiles – for lower secondary/mixed only (4)
Switzerland	Language (3); ISCED level (3); Urbanisation (2)	15	Sponsorship (2); School type (41); Canton (26); Foreign speaking student share (3)
Thailand	Educational administration (7); ISCED level (3); Certainty selections	15	Public/Private (2); Region (9); Urbanisation (2); School gender composition (3)
Turkey	School Type by Percentile of Performance (36)	36	Statistical Region Unit (12); Location (2); Gender (3)
Ukraine (18 of 27 Regions)	Urbanicity (2); Region (25)	49	ISCED Orientation (3); Language (3)

Country/Economy	Explicit stratification variables	Number of explicit strata	Implicit stratification variables
United Arab Emirates	Emirate (7); Funding (2); Curriculum (5)	47	School gender composition (3); Language (3); ISCED level (3); ISCED programme orientation (2)
United Kingdom (excl. Scotland)	Country (3); School type (6); Region (13), Certainty selections	34	School gender composition (3); School performance – England (6) and Wales (5) only; Local authority (7)
United Kingdom (Scotland)	Funding type (3); School attainment (6)	8	Gender (3); Area type (6)
United States of America	Region (4); Funding (2)	8	Grade span (5); Urbanisation (4); Minority Status (2); School gender composition (3); State (51)
Uruguay	Institutional sector (4); School level (3); Certainty selections	11	Location/Urbanisation (4); School gender composition (4)
Uzbekistan	Region (14); Urbanicity (2)	27	Specialization (2)
VietNam	Zone (3); Funding (2); Location (3)	15	Region (6); Province (63); School type (4); Study commitment (2)

Table 6.2. Schedule of school sampling activities

Activity	Submit to Consortium	Due Date
Update time of testing and age definition of population to be tested	Sampling Task 1 – time of testing and age definition	Update what was submitted at the time of the FT, two months before the school sample is to be selected
Finalise explicit and implicit stratification variables	Sampling Task 2 – stratification and other information	Update what was submitted at the time of the FT, two months before the school sample is to be selected
Define national desired target population	Sampling Task 7a – national desired target population	Submit two months before the school sample is to be selected
Define national defined target population	Sampling Task 7b – national defined target population	Submit two months before the school sample is to be selected
Create and describe sampling frame	Sampling Task 8a – sampling frame description	Submit two months before the school sample is to be selected
Submit sampling frame	Sampling Task 8b – sampling frame (in one Excel® sheet), and excluded schools (in another Excel® sheet)	Submit two months before the school sample is to be selected
Decide how to treat small schools	Treatment of small schools	The international contractor will complete and return this information to the NPM about one month before the school sample is to be selected
Finalise sample size requirements	Sampling Task 9 – sample allocation by explicit strata	The international contractor will complete and return this information to the NPM about one month before the school sample is to be selected
Describe population within strata	Population counts by strata	The international contractor will complete and return this information to the NPM when the school sample is sent to the NPM
Select the school sample	Sampling Task 10 – school sample selection	The international contractor will return the sampling frame to the NPM with sampled schools and their replacement schools identified and with PISA IDs assigned when the school sample is selected
Review and agree to the sampling form required as input to ACER Maple	Sampling Task 11a – reviewing and agreeing to the sampling form containing sample design specifics for ACER Maple	Countries/economies had one week to agree to their Sampling Task 11a after TCS was finalized
Review and agree to the sampling form required as input to ACER Maple	Sampling Task 11b – reviewing and agreeing to the sampling form containing records for all of the sampled original and replacement schools and within-school sampling information for ACER Maple	Countries/economies had one week to agree to their Sampling Task 11b after Sampling Tasks 10 and 11a were approved
Submit sampling data	Sampling Task 12 – school participation information and data validity checks	Submit within one month of the end of the data collection period

Table 6.3. Sampling frame units

Country/Jurisdiction	Sampling unit school/other	Sampling frame units comment
Albania	School	
Argentina	Other	Location of schools
Australia	Other	Schools with more than one campus listed as separate entries
Austria	Other	Either whole schools or programmes within schools
Baku (Azerbaijan)	School	
Belgium	Other	French and German speaking communities: a combination of whole schools, or pedagogical-administrative units, which may include different tracks and programmes, and which may also include distinct geographical units. Flanders: implantations, which are tracks/programmes taught on a single address/location (administrative address)
Brazil	School	
Brunei	School	
Bulgaria	School	
Cambodia	School	
Canada	School	
Chile	School	
Chinese Taipei	School	
Colombia	Other	“Sedes,” or physical location
Costa Rica	School	
Croatia	School	
Cyprus	School	
Czech Republic	Other	Basic school – whole school special and practical school – whole school gymnasium – pseudo schools according to the length of study (4-year gymnasium and 6- or 8-year gymnasium) upper-secondary vocational – pseudo schools (schools with maturate, schools without maturate)
Denmark	School	
Dominican Republic	School	
El Salvador	School	
Estonia	School	
Finland	School	
France	School	
Georgia	School	
Germany	School	Exceptions in SEN schools
Greece	School	
Guatemala	School	
Hong Kong (China)	School	
Hungary	Other	Tracks in parts of schools on different settlements
Iceland	School	
Indonesia	School	
Ireland	School	
Israel	School	
Italy	School	
Jamaica	School	
Japan	Other	Programme
Jordan	School	
Kazakhstan	School	
Korea	School	
Kosovo	School	
Latvia	School	
Lithuania	School	If schools have a main building in one place and another building located in a different area, those separate buildings are listed as separate frame units, and if schools do not have that situation, the whole schools are used as frame units.
Macao (China)	School	

Country/Jurisdiction	Sampling unit school/other	Sampling frame units comment
Malaysia	School	
Malta	School	
Mexico	School	
Mongolia	School	
Montenegro	School	
Morocco	School	
Netherlands	Other	Locations of (parts of) schools, often parts of a larger managerial unit
New Zealand	School	
North Macedonia	School	
Norway	School	
Palestinian Authority	School	
Panama	School	
Paraguay	School	
Peru	School	
Philippines	School	
Poland	School	
Portugal	Other	Cluster of schools; almost all schools are organised in clusters with a unique principal and teachers belonging to each cluster
Qatar	School	
Republic of Moldova	School	
Romania	Other	School programmes
Saudi Arabia	Other	Some schools have two units such SEN programs and regular programs
Serbia	School	
Singapore	School	For public schools, sampling units were whole schools. For private schools, different campuses of private schools were reated as separate sampling units.
Slovak Republic	School	There is type of school, which has the name United school: one individual school with 2 organisation units. Each of the organisation units is separate.
Slovenia	Other	Study programme within ISCED3 schools and whole ISCED2 schools
Spain	School	
Sweden	Other	"School units", some schools have been divided horizontally or vertically so that each part has only one principal
Switzerland	School	
Thailand	School	
Turkey	School	Level of organisation in Multi Programme Anatolian High Schools will be at programme level and the whole school.
Ukraine (18 of 27 Regions)	School	
United Arab Emirates	Other	Separate curricula and also by gender. Whole schools sometimes.
United Kingdom (excl. Scotland)	School	
United Kingdom (Scotland)	School	
United States of America	School	
Uruguay	Other	Night shift is considered a different school
Uzbekistan	School	
Vietnam	School	