

PISA SAMPLING MANUAL

Main Study Version 1

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Project Consortium:

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1. INTRODUCTION

1.1 Sampling in PISA

PISA is a survey of 15-year-old students in each participating country. To provide valid estimates of student achievement and characteristics, the sample of students must be selected using established and professionally recognised principles of scientific sampling, in a way that represents the full population of 15-year-old students. Thus the use of appropriate sampling procedures to identify the students who will participate in PISA is very important.

Since PISA is a survey of students, and as the sampled students must be given an assessment under standard conditions, in every PISA country it is clear that the sample of students should be selected by first selecting a sample of schools, and then selecting a sample of students within those schools. Thus the need for careful, rigorous, standardised, and documented sampling applies both to the selection of schools, and students within schools.

The successful conduct of a sampling plan for PISA can be viewed as having six key components:

1. The definition of the student population to be surveyed.
2. The development of a list of schools (more broadly, educational institutions) in which eligible students are, or most likely are, enrolled.
3. The selection of the sample of schools from this list.
4. The development of a list of eligible students within each sampled school.
5. The selection of the sample of students from within each sampled school.
6. The documentation of the sampling process, and the calculation of indicators of the effectiveness of the sampling and survey operations.

This manual describes procedures for achieving points 1, 2, 3, and, to some extent, 6. Points 4 and 5 are discussed in detail in the PISA National Project Managers Manual, and in the documentation for the student sampling and student tracking software.

1.2 Relationship of Field Trial Sampling Procedures to Main Study Sampling Procedures

It is very important to note the similarities and differences between the sampling procedures for the field trial and the main study, because while some aspects are very similar between the two, others are very different. Simply following the field trial procedures on a larger scale for the main study will, in most cases, result in a main study sample that is completely unacceptable.

The reasons for the differences are that the two components have very different purposes. The field trial had two main purposes:

- To collect data on the performance of test items and questionnaires, for developing instruments for the main study; and
- To test the operational procedures for sampling students and conducting assessments within schools.

The main study has the purpose of obtaining a data file that will permit analyses that give valid statistical inferences about the student population, and the schools that they are in. This purpose imposes more rigorous requirements on the sampling procedures than the field trial.

The definition of the student population is similar in nature between the field trial and the main study but must be much more rigorously applied for the main study than was the case in the field trial.

The development of a list of schools, and sampling from this list, requires much more care and preparation for the main study than it did for the field trial, in addition to requiring a larger sample of schools.

The procedures for listing and sampling students within schools will be very similar between the field trial and main study. The only changes will be enhancements that are developed in the procedures as a result of the field trial, or the introduction of some national requirements that did not exist for the field trial.

The documentation of the sampling process and the calculation of indicators of quality will be much more extensive for the main study than for the field trial. However, the documentation should largely be a by-product of the sampling procedures. The calculation of indicators will be the responsibility of the PISA Consortium. Thus these aspects should not represent much additional work for National Project Managers (NPMs) and their colleagues on national PISA teams.

1.3 The Responsibilities of National Project Managers and the Consortium in Sampling Schools

NPMs are responsible for the following tasks:

- Establishing the age definition, based on birth date, and the time of testing, according to PISA rules, so as to ensure that the correct student population is surveyed, and to ensure that the assessment can be completed in the designed time period.
- Determining the geographic, school, and student level exclusions that will apply in their country in PISA, ensuring that these exclusions are kept to a minimum, and documenting the nature and quantity of these exclusions.

- Obtaining, and where necessary enhancing, a list of schools and other educational institutions in the country that will contain the population of enrolled students that are to be covered by PISA. This list is referred to as the sampling frame.
- Identifying suitable stratification variables for the schools on the sampling frame, and ensuring that these variables are present and essentially correct for all schools.
- Determining the sample sizes of schools and students that are needed, to satisfy international PISA requirements and also additional national requirements.
- Selecting the sample of schools using appropriate scientific sample procedures, and documenting the sampling process, OR sending the sampling frame and sample size requirements to Westat, who will select the sample.
- Maintaining accurate records as to which sampled schools participate in PISA, the reason for non-participation for each school that does not participate, and the use of replacement schools in the sample.

The PISA Consortium, and Westat in particular, are responsible for the following tasks:

- Checking that each country has identified an appropriate age definition and time of testing.
- Checking that the exclusions in each country are clearly defined, necessary, and minimal.
- Assisting each country in determining the sample size and stratification that will meet both PISA and national objectives.
- Verifying that the NPM has selected the school sample correctly, OR selecting the school sample and returning it to the NPM, with documentation.
- Developing school and student sampling weights to permit valid inferences to be made from the sample to the population.
- Developing measures of school and student response and exclusion, and coverage of the target population, to assist in evaluating the comparability and quality of the achievement and other data from each country.

This sampling manual provides the mechanism by which the Consortium informs NPMs what they need to do to carry out their responsibilities. The sampling forms that are included with the manual provide a mechanism (or at least a template) for NPMs to forward information to Westat so that we can carry out our responsibilities for monitoring and quality assurance, and sample selection and weighting.

For some aspects the manual (especially in later versions, see below) may document the reason for certain procedures and requirements. But this is not the primary purpose of the manual, and NPMs may need to consult other PISA documents (such as minutes of various meetings) if they wish to

understand in detail the purpose of a particular requirement. The prime purpose of the manual is to provide instructions and checklists for completing the necessary tasks without mistakes.

One of the responsibilities of Westat is to assist countries in determining a suitable sample design. Unless a country has no extra national requirements for PISA, and no special circumstances in the student and school population, we cannot serve this role just through a manual. NPMs need to contact Westat for individual consultation to ensure that they develop a valid design that meets all the objectives in a cost effective way.

1.4 A Note About Versions

Before the PISA main study is completed, there are likely to be two or more versions of this manual produced. The expected difference between these versions is that later versions will include additional material to help inform NPMs about the sampling-related activities of the Consortium and to deal with special topics of interest to only some NPMs.

In cases where there is a correction, or other important change, from one version to the next, each NPM will be explicitly notified about this. We do not expect that NPMs should have to search through each version to find out if there are important differences that affect them.

However, please be sure to replace the manual with a new version when it arrives, and be sure that you are using the latest version of the manual at all times.

1.5 Special Acknowledgement

The text and forms in this document were heavily based on those developed for the TIMSS-R, conducted by the International Association for the Evaluation of Educational Achievement (IEA). Pierre Foy and his colleagues at Statistics Canada developed a very effective sampling manual for TIMSS-R, based on their experiences in the earlier TIMSS study. It seemed wise to use the successful TIMSS-R approach where possible, modifying it as needed for PISA purposes. This is especially so since many PISA NPMs and their national colleagues are familiar with TIMSS-R or TIMSS.

So the PISA consortium offers a big ‘thank you’ to Pierre Foy and Statistics Canada for allowing us to base our forms and manual so closely on those of the IEA TIMSS-R.

2. OVERVIEW OF SAMPLE DESIGN

2.1 Survey Goals

PISA will investigate the knowledge, skills, and competencies of 15-year-old students in the domains of reading, mathematics, and science. In addition, a representative of each sampled school will also supply information about the school itself and the practices implemented within. Countries will obtain data that will be comparable with all other countries participating in PISA. In addition, national options may be included in the study, provided that they do not interfere with the sampling of the PISA population or the administration of the PISA instrument. Such national options must be approved by the Consortium.

2.2 Sampling Goals and Expectations

Survey estimates will be required for students and schools. To obtain reliable estimates for each of these analytical units, quality standards must be maintained with respect to:

- Accuracy and precision: A minimum sample size of 4,500 assessed students must be selected from a minimum of 150 schools. Further, if a minimum sample size of students is obtained (4,500), the sample must not depart significantly from a self-weighting design. A self-weighting design is one in which each sample unit represents an equal proportion of the total population, when unbiased estimates are made from the sample. This means that if a country wishes to over-sample certain population subgroups, the total sample size will need to be somewhat larger than 4,500 students and 150 schools.
- Response rates: A response rate of 85 percent is required for initially selected schools as well as a rate of 80 percent of selected students. If the initial school response rate is below 85 percent, an acceptable school response rate may still be achieved through the use of replacement schools (see Section 4.4 for details).
- Sampling methodology: National sampling plans must be based on sound and well-documented scientific sampling methods (see Chapter 6).

2.3 Sample Design Overview

The sample design proposed for the PISA assessment is generally referred to as a two-stage stratified sample. The first-stage sampling units consist of individual schools having 15-year-old students. Schools are sampled systematically with probabilities proportional to a measure of size (PPS), with the measure of size being a function of the estimated number of eligible (15-year-old) students enrolled. The comprehensive national list of all eligible schools is called the school sampling frame. Prior to sampling, schools in the sampling frame can be assigned to a predetermined number of either implicitly or explicitly defined strata. A minimum of 150 schools will be selected in each country,

with the requirements of national options often requiring a somewhat larger sample. As the schools are sampled, replacement schools are simultaneously identified, should they be needed to replace nonparticipating sampled schools.

The second-stage sampling units are students within sampled schools. Once schools are selected to be in the sample, a list of each sampled school's 15-year-old students must be prepared. From each list, thirty-five students will be selected with equal probability (all 15-year-old students will be selected if fewer than 35 are enrolled). The number of students selected per school can be varied from the figure of 35, as a national option. However, if fewer than 35 students per school are to be selected, then: a) the sample size of schools must be increased beyond 150, so as to ensure that at least 4,500 students are assessed, and b) the number of students selected per school must be at least 17, so as to ensure adequate accuracy in estimating variance components within and between schools (an analytical objective of PISA).

3. STEP 1—TARGET POPULATION DEFINITION

3.1 International Desired Target Population

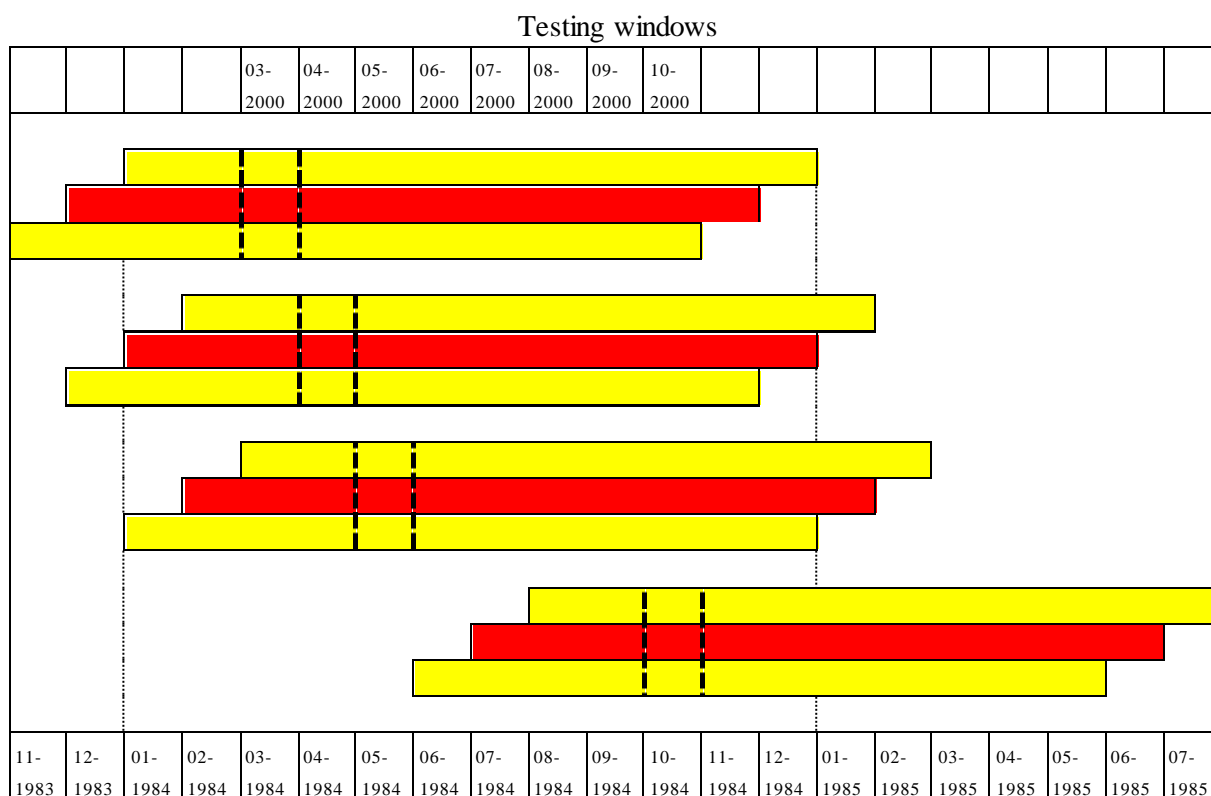
The base PISA international desired target population in each country consists of 15-year-old students attending educational institutions located within the country. In simple terms, the international desired target population is intended to provide full coverage of all eligible students in a country's education system. This means that countries are to include 15-year-olds enrolled in educational institutions who attend on only a part-time basis, are in vocational training types of programmes, or any other related type of educational programmes, or who are in foreign schools within the country. The desired target population does not include residents who attend school in a foreign country.

The definition of the population of 15-year-old students depends upon the time of testing within the country. The time of testing depends upon both the period of the academic year within the country, and the convenience of the NPM, taking into account the circumstances within the country that dictate a suitable testing time.

The assessment must be conducted during a one-month period (but not necessarily a specific calendar month) between March 1 and October 31, 2000. The assessment must not take place during the first three months of the academic year. Thus for many countries in the northern hemisphere, where the academic year begins in September and ends in June, the assessment must be conducted some time between March 1 and the end of the academic year. For countries in the southern hemisphere, that typically have an academic year extending from early February until December, the assessment must be conducted at some time between mid-May and the end of October.

As noted, the population of eligible students is defined by the time of testing, within limits. The standard definition is that the population consists of students who are aged from 15 years and 3 (completed) months to 16 years and 2 (completed) months at the beginning of the testing period. This means that if the assessment is to be conducted throughout the month of April 2000, the eligible population is defined as students born during 1984. If the testing is to take place in October, the population is students born between July 1984 and June 1985, inclusive.

Variation of up to one month in this age definition is permitted. In particular, if the testing period is any one-month period between March 1 and May 31, the population may be defined as students born in 1984 (see Table 1). If no local factors dictate to the contrary, countries are encouraged to test within this time period, and to use this population definition.

TABLE 1. SELECTED TESTING WINDOWS AND RELATED AGE DEFINITIONS.

Target Population

Note:

The red/dark bar shows the standard age definition for each framed test period.

Yellow/light bars show two optional age definitions for each framed test period.

Examples of other acceptable testing times and age definitions are:

- Testing from March 16 to April 15, students born 12/83 to 11/84
- Testing in April, students born 2/84 to 1/85
- Testing from May 16 to June 15, students born 3/84 to 2/85
- Testing in July, students born 4/84 to 3/85.

Examples of testing time and age definition combinations that are NOT acceptable are:

- Testing in April, students born 11/83 to 10/84 (the students are too old).
- Testing in April, students born 3/84 to 2/85 (the students are too young).
- Testing from May 16 to June 15, students born in 1984 (the students are too old).
- Testing in August, students born 7/84 to 6/85 (the students are too young).

NPMs must confirm their time of testing and age definition with the PISA Consortium, and the sampling referee, Keith Rust of Westat, in particular. Once the time of the assessment and age definition have been approved, NPMs must be alert to ensure that possible drift in the assessment period does not lead to an unapproved population definition. For example, an NPM might propose to test during the month of May, students born during 1984. This would be approved. But if in fact the testing period slips to become May 8 to June 7, the population must be changed to students born 2/84 to 1/85 (or 3/84 to 2/85 if preferred), as it is not acceptable to have testing in June with an age definition of students born in 1984. **Time of testing and age definition must be recorded on Sampling Form 1.**

Sampling Form 1

NPMs must describe their planned testing period, and definition of age-eligible (i.e., 15-year-old) students. On this form NPMs should also indicate any additional eligible students, included as a national option (e.g., students in grade 10).

Sampling Form 1- Example

In the following discussion, we show a fictitious example of a planned testing period and the subsequent age definition of eligible students using Australia.

Due to Australia's academic year beginning in early February, the NPM found testing in June to be the most feasible. This testing date met the PISA criterion that testing must be after the first three months of the academic year. To minimise the survey's complexity, the NPM chose not to assess students other than 15-year-olds. Using the start and end date of the testing period, the NPM defined the students to be assessed as those born from March, 1984 through February, 1985.

See the example of Sampling Form 1 in Appendix A-1.

Check Point 1

NPMs must submit Sampling Form 1 at least six months before the beginning of testing, and at least two months before planned selection of the school sample.

3.2 National Desired Target Population

Every NPM must define and describe their country's national desired target population. The national desired target population definition must address the requirements of the international desired target

population. It should provide the most exhaustive national coverage of eligible students as is feasible. Any hardships in accomplishing this must be specified and approved as such, in advance.

The Board of Participating Countries (BPC) and the PISA Consortium strongly encourages all NPMs to provide complete national coverage in their national desired target population. In cases where the national desired target population deviates from full national coverage of all eligible students, these deviations must be described and enrolment data provided to measure the extent of the reduced coverage. Such situations may occur if, when defining their national desired target population, NPMs find it necessary to reduce their national coverage by removing, for instance, a small, remote geographical region, or a language group, possibly due to political, organizational or operational reasons. Areas deemed by the BPC to be part of a country (for the purpose of PISA) but which are not included for sampling will be designated as noncovered areas, and must be documented.

If such situations occur, the national desired target population will differ from the international desired target population. If a significant proportion of students are excluded from the national desired target population, this will mean that survey results will not be deemed representative of the entire national school system.

The national desired target population must be described on Sampling Form 2. By defining the national desired target population on Sampling Form 2, and describing any limitations in national coverage, this information will be properly documented and can be formally and adequately presented in the international reports.

Sampling Form 2

NPMs must describe their national desired target population by specifying enrolment statistics for 15-year-olds. NPMs are requested to describe the extent of national coverage in their national desired target population. Any populations excluded in the national desired target population must be documented on this form.

Sampling Form 2- Example

The following example is based on Ireland's proposed plan for PISA. Using information from the *1995-96 Statistical Report of the Department of Education*, the NPM found the total national population of 15-year-olds to be 68,805. Of this total, 66,735 15-year-olds were noted as enrolled in educational institutions. No populations of enrolled 15-year-olds were to be omitted from the survey. This equated to 0 enrolment to be excluded from Ireland's desired target population. Therefore, total enrolment of Ireland's desired target population was all 66,735 15-year-old students. Finally, the NPM noted the source used to define the desired target population.

See the example of Sampling Form 2 in Appendix A-2.

3.3 National Defined Target Population

Using their national desired target population as a general framework, NPMs must then describe their national defined target population. The national defined target population is essentially the school sampling frame. Differences between the national desired and defined target populations will generally arise out of practical considerations and should be kept to a minimum.

3.3.1 Exclusions

The national defined target population may represent a subset of the national desired target population. All schools and students from the national desired target population excluded from the national defined target population are referred to as the excluded population.

Usually, practical reasons are invoked for excluding schools and students, such as increased survey costs, increased complexity in the sample design and/or difficult test conditions. Exclusions can occur at the school level, i.e., entire schools are excluded, or within schools, i.e., specific students within sampled schools are excluded. All such exclusions, at both the school level, and the within-school level, must be described and quantified in Sampling Form 3.

In PISA, exclusions from the national desired target population are to be kept to a minimum. Unlike some other international education studies, difficulties raised by the existence of small schools, (i.e., few 15-year-olds enrolled), or other schools where it is difficult or costly to conduct assessments, are mainly to be addressed by modifying the sample design to reduce the number of such schools selected, rather than by exclusion. Similarly, the exclusion of special education and language minority students is to be kept to a minimum.

3.3.2 School-Level Exclusions

NPMs may wish to exclude a very small fraction of eligible schools for the following reasons:

- the school is geographically inaccessible (but not part of a region that is omitted from the National Desired Target Population);
- the school is of extremely small size (see Sampling Form 6); or
- administration of the PISA assessment within the school would not be feasible.

The percentage of the target 15-year-old population enrolled in such excluded schools, in total, should be less than 0.5 percent of the total population of enrolled 15-year-olds.

In addition, a school may be excluded if it provides instruction only to students in the excluded categories defined under “within-school exclusions” (described in the next section), such as schools for the blind. The percentage of 15-year-olds enrolled in such schools should be less than 2 percent.

The magnitude, nature, and justification for school-level exclusions must be documented on Sampling Form 3. One of the quality indicators produced by PISA will be based on school-level exclusions.

Note: The target population is limited to schools that contain 15-year-old students. Schools that do not contain any students of this age, such as lower primary schools, for example, are therefore not considered part of the excluded school-level population.

3.3.3 Within-School Exclusions

Within-school, or student-level, exclusions will provide another indicator of the quality of PISA. Because definitions of within-school exclusions will vary from country to country, NPMs are asked to adapt the following rules so that they are workable in their country and coded according to the PISA international coding scheme.

Within schools, all eligible students (i.e., 15 years of age, regardless of their grade) should first be listed. Sampled students who are deemed as excluded must be retained, and a variable maintained to briefly describe the reason for exclusion (see PISA National Project Managers Manual -- forthcoming). Using this method, the size of the within school exclusions can be well estimated from the sample data.

International within-school exclusion rules are specified as follows:

- Educable mentally retarded students – These are students who are considered in the professional opinion of the school principal, or by other qualified staff members, to be educable mentally retarded or who have been tested psychologically as such. This includes students who are emotionally or mentally unable to follow even the general instructions of the test. Students should 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 perform in the PISA testing situation. Functionally disabled students who can respond should be included in the testing.
- Non-native language speakers – Only students who have received less than one year of instruction in the language(s) of the test should be excluded.

The exact extent of within-school exclusions will not be known until the within-school sampling frames have been returned from the participating schools and sampling weights computed. **Estimates of the extent of within-school exclusions are required from the NPMs to ensure that the national defined target population will cover at least 95 percent of the national desired target population. At the time of frame creation, NPMs are asked to provide their best estimate of the extent of within-school exclusions and report the estimate on Sampling Form 3.**

NPMs should note the distinction to be made between within-school exclusions and non-response. Students unable to perform the achievement tests because of a permanent condition should be excluded. Students with a temporary condition at the time of testing, such as a broken arm, will be treated as non-respondents along with other “absent” sampled students.

The sum of the school-level and within-school exclusions must be limited to 5 percent of the national desired target population. This value though, should not be treated as a limit below which anything is completely acceptable.

The extent of such exclusions will be quantified to produce one of the quality indicators produced from the study. This indicator will be the proportion of the National Desired Target Population that is covered by the study. The numerator of this proportion will be estimated unbiasedly from the sample (and will thus be subject to sampling error), while the denominator will be the count of the number of persons born in 1984, within the Desired Target Population, from official demographic statistics for each country. This proportion will fall below 1.0 in each country when there are out-of-school 15-year-olds, excluded schools, and/or excluded students. This provides a measure of the extent of deviations, in terms of reduced coverage, from the national desired target population, combined with the proportion of students not enrolled. This coverage measure will be accompanied by a measure of the size of the difference between the international and national desired populations.

Sampling Form 3

NPMs must describe their national defined target population by describing all types of school-level and within-school exclusions. The size of these excluded populations must also be reported.

Sampling Form 3 – Example

The following discussion is again based on Ireland’s proposed plans for PISA. The national desired target population was composed of 66,735 15-year-old students. After excluding 145 schools, the coverage of the national desired target population was reduced by 1.1 percent. Within-school exclusions were expected to be rare, and therefore deemed as negligible. After exclusions, the national defined target population covers 98.9 percent of the national desired target population.

See the example of Sampling Form 3 in Appendix A-3.

Check Point 2

NPMs must submit completed Sampling Forms 2 and 3 to Westat two months prior to the date that they wish to select the school sample.

4. STEP 2 – NATIONAL SAMPLING PLAN

4.1 Introduction

The development of a national sampling plan is the responsibility of every NPM. National sampling plans will need to be adapted to the particular requirements of national school systems. The staff at Westat can assist NPMs in developing their national sampling plans. The final national sampling plans will also need to be approved by Westat. This approval will be needed before the school samples are selected. Additionally, the selected samples also need to be approved, for those countries who select the sample themselves.

The Board of Participating Countries (BPC) has set very high standards for coverage, response rates (85% at school level and 80% at student level) and the quality implementation of sampling plans as noted in Section 2.2. These high standards are the assurance that the resulting samples will be of the highest quality thus yielding unbiased, accurate and internationally comparable survey estimates.

4.2 Sample Design Framework

The general sample design framework adopted for this study is a two-stage stratified sample design. (A preliminary extra first stage is discussed in Section 5.3, for those countries needing it). National sampling plans must be based on sound and defensible sampling methods. This sampling manual is intended to describe how to implement such methods. The key features are briefly described in the following points.

- A sampling frame must be developed according to guidelines in Chapter 5.
- For the first stage of sampling, schools will be stratified, explicitly and/or implicitly. At least 150 schools will be sampled with a sampling method called probability proportional to size (PPS) systematic sampling. This sampling method is described in Section 6.3. If explicit stratification is used, the overall sample size will need to be allocated among the explicit strata. (See Section 6.2). Countries are permitted to sample more than 150 schools, to meet national requirements. In countries where a sizable proportion of 15-year-olds are in schools with only a few 15-year-olds and for countries with highly tracked school systems at this age (where track is not used in stratification), the school sample should be appropriately increased. In the latter case, this is to allow for the considerable school-to-school variation in achievement that can be anticipated. Such an increase is not required, however, in highly tracked school systems at this age, if the different tracks are included in distinct explicit or implicit strata. For this reason, stratification by school level and/or track is strongly encouraged. Another issue affecting the number of schools for selection is that of small schools. Small schools are a concern because fewer than the desired number of students are sampled from such schools. This leads to a reduction in student sample size. Therefore, small schools may require special treatment in terms of stratification,

and perhaps their selection probabilities, and an overall increase in the school sample size. This issue is discussed in more detail in Section 5.8.

- The second stage of sampling consists of selecting at least thirty-five 15-year-old students from each sampled school. If countries opt to select more than 150 schools (with no other changes in sample design), they will be able to select fewer students per school as long as the total student sample size of about 4500 assessed students is still obtained. If, however, NPMs wish to change the sampling plan so that they also select samples of 10th graders, for example, who are not 15 years of age, sample sizes of schools and students, and the sample design itself, will need to be modified so that the PISA international standards are not compromised. Westat will provide assistance for those countries wishing to do this. (See more in Section 4.3.2)

Country-Specific Issues in Sample Design

4.3.1 Coefficient of Intra-class Correlation

The coefficient of intra-class correlation (IC) provides a measure of the tendency of student characteristics to be more homogeneous within schools, or within classrooms, than would be the case if students were assigned randomly to schools or classrooms.

Multi-stage sample designs, such as the one for PISA, are affected by the IC. As the value of the IC increases, multi-stage sample designs become less efficient in producing reliable survey estimates, for a fixed sample size of students. In other words, sample sizes must increase as the IC increases to obtain equivalent levels of sampling precision. Depending on the value of the IC in a particular school system, either more schools with fewer students within schools, or fewer schools with more students within schools, are needed in the sample design to meet the data reliability requirements.

The value of the IC may be approximated from previous surveys which employed similar target populations, similar sample designs, and similar criterion variables. The values for the IC tend to be higher for designs where classrooms are sampled rather than for designs where students are directly sampled within schools. The difference is generally much larger in school systems where the students are streamed, or tracked, within schools.

For most countries who will follow the standard PISA two stage stratified cluster design, the IC has already been accounted for in determining a minimum school sample of 150 schools and a minimum student sample of about 4500 students. However, these points are relevant for PISA in the situations where countries may wish to oversample schools, and in countries who desire to sample students within grade 10, for example, who are not 15 years of age. In the latter case, a country may wish to use classrooms as the sampling units for the grades they are interested in (taking all students in the selected classrooms – 15-year-olds and others) and students as the sampling units for selecting 15-year-old students from all grades. The IC for the classroom sample is likely to be considerably higher

than has been assumed in the basic PISA design of 150 schools, and so an increase in sample size may be required if the objectives are to be met for the sample of modal grade students.

4.3.2 Samples of Students in a Particular Grade

[More to be added here about grade sampling.]

4.4 Participation Rates

The PISA data quality standards require minimum participation rates for schools, as well as for students. These standards exist to minimise the potential for response biases.

4.4.1 Schools

PISA requires a minimum participation rate of 85 percent of originally sampled schools. However, nonparticipating sampled schools may be substituted with “replacement schools” essentially to meet sample size requirements. A full discussion of the school response rate requirements is included in the document samp0598v1.doc, which can be downloaded from the PISA web site (www.pisa.oecd.org/NPM0598/samp0598v1.DOC).

The use of replacement schools does not guarantee that potential response biases have been reduced. NPMs are encouraged to persuade as many original sampled schools as possible to participate. Only a high participation rate will minimise the potential for response biases. The selection and use of replacement schools are described in Section 6.5 and Section 6.8.

4.4.2 Students

PISA also requires a minimum participation rate of 80 percent of students within participating schools (sampled and replacement). Make-up sessions may be required in schools where too few students participated in the originally scheduled test sessions. Guidelines for determining when make-up sessions are appropriate are found in the PISA National Project Managers Manual (forthcoming). The task of determining whether make-up sessions are required will be delegated to the School Coordinators and Test Administrators. As they oversee the actual test sessions, they will be able to promptly determine whether make-up sessions are required at each school.

Student participation rates are calculated over all participating schools, whether sampled schools or replacement schools, and from the participation of students at the originally scheduled session and any make-up session that may be required. The student participation rate requirement must be met at the national level, not necessarily for each participating school.

4.4.3 Reporting Participation Rates

National participation rates will be presented in the PISA analytical reports. They include:

- Weighted and unweighted school participation rates with and without replacement schools (minimum 85% required without replacement schools); and
- Weighted and unweighted student participation rates (minimum 80% required).

The PISA analytical results for each country will be annotated, based on whether or not the response rate requirements have been adequately met.

5. STEP 3 – THE SCHOOL SAMPLING FRAME

5.1 Introduction

This step requires all NPMs to construct a school sampling frame of their national defined target population. A well-constructed school sampling frame is one that provides complete coverage of the national defined target population without being contaminated by incorrect entries, duplicate entries or entries that refer to elements that are not part of the defined target population. Initially, this list should include any school that has 15-year-old students, even those that may later be excluded (see Sections 3.3.2). The quality of the sampling frame has a direct effect on the survey results, and thus frame construction should be treated with extreme care. As such, frame quality is one of the quality indicators that will be produced by PISA. The frame quality indicator will assess the presence of invalid or duplicate listings as an indication of possible noncoverage and duplication biases. Additionally, PISA will assess the extent of missing or inaccurate data used for stratification (Section 5.6) and for creating the measure of size (Section 5.7) as these will increase sampling error.

The construction of a school sampling frame depends to a great extent on the availability of appropriate information about schools and students. The main types of sampling frames that are likely to be used in this study are described below. **NPMs will be asked to describe their choice of a sampling frame on Sampling Form 4.**

5.2 School-Level Sampling Frame

School-level sampling frames are based on a comprehensive national list of schools. An approximate enrolment of 15-year-olds (ENR) is associated with each school listed in the sampling frame. The quality of a sampling frame will, to a large extent, depend on the accuracy of the ENR available. A suitable school ENR value is a critical component of a school sampling frame since school selection probabilities are based on this quantity. The ENR gives a more or less accurate indication of the number of eligible students in each listed school. The best school ENR for PISA would be the number of 15-year-old students currently enrolled. Current enrolment data, however, is rarely available at the time schools are sampled. If none of the types of ENR listed below are available, or if the available enrolment data are too out of date, schools may have to be selected with equal probabilities.

Each school entry on the frame should include at minimum:

- School identification information, such as a unique numerical national ID, and contact information such as name, address, phone number, etc.

- A suitable measure of the approximate enrolment of 15-year-olds (ENR). In order of suitability, examples of this are:
 1. Student enrolment in the target age category (15-year-olds);
 2. If 15-year-olds tend to be enrolled in two or more grades, and the proportions of students who are 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;
 3. The grade enrolment of the modal grade for 15-year-olds; and
 4. Total student enrolment, divided by the number of grades in the school.
- Coded information about the school, such as region of country, school type (public or private), urbanicity, etc. which may have some effect on the assessment outcomes, and can be used as stratification variables (variables used for dividing the population into mutually exclusive groups so as to improve the precision of sample-based estimates) (See Section 5.6.).

5.3 Area-Level Sampling Frame

Area-level sampling frames are used when a comprehensive national list of schools is not available or cannot be constructed without undue burden. As a consequence, area-level sampling frames introduce an additional stage of frame creation and sampling (called the first stage of sampling) before actually sampling schools (the second stage of sampling). This manual provides only an overview of how to implement this additional stage of sampling. However, the school sampling methods presented in the manual can be adapted for that purpose. Furthermore, Westat will provide support to NPMs that require the use of an area-level sampling frame.

The use of an area-level sampling frame increases the degree of clustering in the sample. This could be cost effective in countries where distances are great and/or travel costs are high. Area-level sampling frames, however, usually require a larger sample size because of this increased clustering. NPMs are encouraged to make every effort to locate a comprehensive national list of schools that could produce a school-level sampling frame.

5.3.1 Area-Level

Sampling units on this type of sampling frame are usually geographical areas (GAs), for which reliable information on student enrolment is known. The GAs are usually identifiable geographical units used during the taking of a national census, or administrative units for which basic education statistics are available.

The GAs become the primary sampling units (PSUs) at this first sampling stage. The area - level sampling frame then, consists of a list of all eligible PSUs. There needs to be a sufficiently large

number of PSUs to permit the random selection of a minimum number of PSUs in the sample. This minimum number will ensure that the sampled PSUs can effectively be considered as representative of all PSUs. The PISA guidelines on this matter require a minimum of 80 PSUs in the area-level sampling frame and a minimum of 40 PSUs sampled from that frame using PPS sampling with the size ideally being the number of 15-year-olds. (Exceptions regarding these minimums must be discussed with Westat.) NPMs will need to discuss the implementation of these guidelines with Westat, based on their specific circumstances. The inability to meet these guidelines will mean that the sampled PSUs can only be considered representative of themselves, rather than representative of all PSUs. The result would be a potentially low national coverage which would be reported as such in the analytical reports.

Each PSU in the list should include at minimum:

- Unique PSU identification information;
- Appropriate entries for any suitable stratification variables (see Section 5.6); and
- A suitable PSU measure of size.

Suitable PSU measures of size could be:

- 15-year-old student enrolment;
- Total student enrolment;
- Number of schools; or
- Population size.

5.3.2 School Level

The second level of this type of sampling frame consists of a comprehensive list of schools from all sampled PSUs. For each PSU selected from the area-level sampling frame, a comprehensive list of schools is prepared according to the guidelines in Section 5.2.

5.4 Other Types of Sampling Frames

In some special cases, NPMs may wish to use a sampling frame that is not related to either type described above. All such cases must be approved by Westat.

Sampling Form 4

NPMs must describe the type of sampling frame they intend to use.

If an area-level sampling frame, or any other type, is to be used, NPMs must provide a description of the information available to construct this frame. For an area-level sampling frame, this information should be a description of PSUs and their total number, the PSU measure of size available and how many PSUs they intend to sample.

NPMs should also describe the school estimate of enrolment they intend to use.

Sampling Form 4 – School-Level Sampling Frame Example

Consider a fictitious example using Canada. A comprehensive national list of schools is available and therefore a school-level sampling frame will be used. The school estimate of enrolment will consist of enrolment of 15-year-olds. Enrolment data from the 1998-1999 school year will be available.

This information is reported in the first of the examples of Sampling Form 4 in Appendix A-4.

Sampling Form 4 – Area-Level Sampling Frame Example

In the following discussion, we show a partially fictitious example of an area-level sampling frame using the Russian Federation.

Because a comprehensive national list of schools was not easily available, the Russian Federation had no alternative but to use an area-level sampling frame. The area-level sampling frame consisted of 79 regions, of which 40 were sampled. The NPM then proceeded to obtain comprehensive school lists from the sampled regions. Total student enrolment was available as a measure of size for the regions from the 1997 / 1998 academic year.

The school estimate of enrolment used was 15-year-old student enrolment from the 1998 / 1999 school year.

This information is reported in the second of the examples of Sampling Form 4 in Appendix A-4.

5.5 Excluding Schools From the Sampling Frame

Based on the National Defined Target Population information reported on Sampling Form 3, some schools may need to be excluded from the school sampling frame. **These schools must be identified on Sampling Form 5, along with the reason for their exclusion.**

NPMs should keep in mind that the proportion of eligible students in all excluded schools should not exceed 2.5 percent of the national desired target population. NPMs may have chosen to exclude extremely small or geographically remote schools. This choice may very well depend on being able to keep exclusions within the 2.5 percent limit. Excluding extremely small schools is not recommended (see Section 5.7).

Sampling Form 5

NPMs must list and describe all schools that will be excluded from their school sampling frame. This can be done by simply removing these excluded schools from the school sampling frame and recording them in a separate computer file.

For each excluded school the reason for exclusion and the number of eligible students enrolled (ENR) should be recorded.

Sampling Form 5 - Example

Using Ireland as an example, the (fictitious) school identifiers of the schools that are to be excluded because they are not aided by the Department of Education and Science, are listed, along with the approximate enrolment (ENR) for each. The complete list would also include the special schools for students with special needs, identified for exclusion in the example of Sampling Form 3.

This information is recorded in the example of Sampling Form 5 in Appendix A-5.

5.6 Stratification

5.6.1 Overview

Prior to sampling, schools can be ordered, or stratified, in the sampling frame. Stratification consists of classifying schools into groups according to some stratification variables. Stratification is generally used for the following reasons:

- To improve the efficiency of the sample design, thereby making survey estimates more reliable;
- To apply different sample designs, such as disproportionate sample allocations, to specific groups of schools, such as those in states, provinces, or other regions;
- To ensure that all parts of a population are included in the sample;
- To ensure adequate representation of specific groups of the target population in the sample; and
- To obtain reliable estimates for each stratum, if so required.

Examples of stratification variables include, but are not limited to:

- Regions (states, provinces);
- Urbanisation (rural areas, urban areas);
- Socio-economic status (low, medium or high income);

- School types (public, private);
- School size; and
- School programmes (academic, vocational).

5.6.2 Explicit Stratification

Explicit stratification consists of building separate school lists, or sampling frames, according to the set of explicit stratification variables under consideration. Explicit stratification of small schools is discussed in Section 5.7.1. As another example, if geographic region is an explicit stratification variable, then separate school sampling frames would be constructed for each geographic region. Possibly different sample designs, or simply a constant sample size, would then be applied to each school sampling frame to select the sample of schools. In practice, the major reason for considering explicit stratification in PISA is to implement a disproportionate allocation of the school sample to the explicit strata. For example, the same number of schools could be sampled from each explicit stratum, regardless of the relative size of each stratum. The objective would be to produce equally reliable estimates for each region. This differs from a proportional allocation where large strata would have more sampled schools than small strata. With a proportional allocation, the sample size is often too small in small strata to obtain estimates that are sufficiently reliable. (See a discussion of sample allocation in Section 6.2)

5.6.3 Implicit Stratification

Implicit stratification consists essentially of sorting the school sampling frame(s) by a set of implicit stratification variables. This sorting takes place within the explicit strata. This type of stratification is very effective for the school sample selection method proposed for PISA (see Section 6.3). It is a very simple way of ensuring a strictly proportional sample allocation of schools across all implicit strata. It can also lead to improved reliability of survey estimates, provided the implicit stratification variables being considered are correlated with PISA achievement (at the school level).

5.6.4 Stratification Guidelines

The selection of three to five stratification variables is usually sufficient. The following guidelines should be applied when selecting stratification variables:

- A classification variable must be available, with a valid entry, for every school on the frame in order to be considered as a stratification variable.
- The stratification variables used should be known or suspected to have relatively strong relationships with the variables of interest to be measured in the survey (school mean achievement in reading, mathematics, and/or science).

- Each school in the sampling frame should be classifiable to one and only one level of each stratification variable.
- Good measures of size should be known for the explicit strata. That is, for each explicit stratum, both the number of schools and the number of eligible students should be known.
- Defining very small strata, especially explicit strata, should be avoided because this is unlikely to improve the overall level of sampling precision. A few divisions of a continuous stratification variable usually provide all of the gains in sampling precision available from that variable.
- Preferably at least two schools should be selected in each explicit stratum to permit the computation of sampling error. This criterion usually sets an upper limit to the number of explicit strata that can be defined. In certain cases it is acceptable to select just one school from each of a few small strata, with most explicit strata providing two or more sample schools.

Stratification information must be recorded on Sampling Form 7.

5.7 Treatment of Small Schools

For PISA, we identify **small schools, moderately small schools, and very small schools**. A **small school** is defined as any school whose approximate enrolment of 15-year-olds (ENR) falls below the target cluster size (TCS). The target cluster size is the number of students that are to be sampled from schools with large enrolment. The TCS is to be 35 in most countries. In countries that plan to sample only 150 schools, the TCS must be at least 35. A **very small school** is a small school whose ENR is less than a half the TCS – 17 or less in most countries. A **moderately small school** is a small school whose ENR is in the range of TCS/2 to TCS. Small schools in the sample can result in a reduced sample size of students for the national sample, below the desired target. Alternatively, the sample may contain many small schools which is an administrative burden. In order to minimise these problems, the small schools in the sampling frame may require special treatment.

5.7.1 Stratification of Small Schools

Information on the importance of small schools must be reported on Sampling Form 6. This form also provides brief guidelines about the treatment of small schools. These guidelines are based on the following detailed guidelines that NPMs should consider in the treatment of small schools in their country.

To determine whether a stratum of small schools, a stratum of very small schools, or two strata, one of very small schools and one of moderately small schools, are needed, the following test should be applied:

1. If the percentage of students in small schools ($ENR < TCS$) is LESS than 5 percent AND the percentage in very small schools ($ENR < TCS/2$) is LESS than 1 percent, then no small school strata are needed.
2. If the percentage of students in small schools ($ENR < TCS$) is LESS than 5 percent BUT the percentage in very small schools ($ENR < TCS/2$) is 1 percent or MORE, a stratum for very small schools is needed, but no stratum for moderately small schools.
3. If the percentage of students in small schools ($ENR < TCS$) is 5 percent or MORE, BUT the percentage in very small schools ($ENR < TCS/2$) is LESS than 1 percent, a stratum for small schools is needed, but no special stratum for very small schools is required.
4. If the percentage of students in very small schools ($ENR < TCS/2$) is 1 percent or MORE, AND the percentage in moderately small schools ($TCS/2 < ENR < TCS$) is 4 percent or MORE, a stratum for very small schools is needed, and a separate stratum for moderately small schools is also needed.

In addition, if the percentage of students enrolled in very small schools is less than 0.5 percent, it may be permissible to exclude very small schools from the sampling frame. Such exclusion is not recommended, and is premissable only if the total extent of school level exclusions remains below 0.5 percent. Any exclusion of very small schools must be documented among the school level exclusions on Sampling Forms 3 and 5.

The small school strata can be further divided into additional explicit strata on the basis of other characteristics (e.g., region). Implicit stratification can also be used within the small school strata.

Sampling Form 6

NPMs must provide student enrolment data to determine the prevalence of small schools in their school system. Based on these enrolment data, specific sample design decisions may be required if the presence of small schools is important.

NPMs should be able to compute the enrolment data from the school sampling frame.

Sampling Form 6 - Example

Using data from Ireland's proposed sample design, there are less than 1 percent of eligible students in very small schools (enrolment of 15-year-olds less than 17). There are under 4 percent of eligible students in moderately small schools, and 4.26% of eligible students in small schools overall, leaving over 95 percent of eligible students in schools with at least 35 eligible students. Although not needed based on the criteria above, Ireland has one stratum for moderately small schools and another for very small schools because the stratification variable used was school size.

All of this information is reported in the example of Sampling Form 6 in Appendix A-6.

5.7.2 Sample Sizes for the Small School Strata

When small schools are explicitly stratified, great care is needed to ensure that an adequate sample of small schools is selected. At the same time, it is important to avoid selecting too many small schools, as they do not lead to many students in the assessment, which in turn means that the total school sample must be increased in order to meet the target student sample size. In particular, if there are many small schools in the sample, it will be necessary to have more than 150 schools in total, to meet the PISA requirement of 4,500 assessed students.

The following discussion gives a recommended approach to determining the minimum sample size of small schools (and of larger schools), that ensures that the resulting student sample is representative, yet gives some control to limit the total sample size of schools in extreme cases. Depending upon national circumstances, NPMs may wish to vary this approach somewhat, to meet the sampling objectives while limiting the school sample size somewhat. Such variations are acceptable, but must be approved by Westat early in the sampling process. It is important that NPMs avoid the possibility of having an unapproved design, as a result of not handling small schools in an appropriate manner. This discussion assumes that there are strata of very small and moderately small schools identified. When there is just a single small school stratum, this is modified by ignoring the parts relating to very small schools. The formulae below also require modification when TCS is other than 35 - contact Westat for information in this case.

- a. From the complete sampling frame, find the proportions of total ENR that come from very small schools (P), moderately small schools (Q), and larger schools (those with ENR of at least TCS) (R). Thus $P+Q+R=1$.
- b. Calculate the figure L, where

$$L = 1 - (P/2).$$

Thus L is a positive number, a little less than 1.0.

- c. The minimum sample size for larger schools is equal to $150 \times R/L$, rounded to the nearest integer. This minimum 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.
- d. Calculate the mean value of ENR for moderately small schools (MENR), and also for very small schools (VENR). Thus MENR is a number in the range of TCS/2 to TCS, and VENR is a number no greater than TCS/2.
- e. The number of schools that must be sampled from the stratum of moderately small schools is given by the formula:

$$(5250 \times Q) / (L \times \text{MENR}).$$

- f. The number of schools that must be sampled from the stratum of very small schools is given by the formula:

$$(2625 \times P) / (L \times \text{VENR}).$$

Consider the following example. Suppose that in Country X, the TCS is equal to 35, with 0.1 of the total enrolment of 15-year-olds in moderately small schools, and with 0.1 also in very small schools. Suppose that the average enrolment in moderately small schools is 25 students, while the average enrolment in very small schools is 10 students.

Thus $P = 0.1$, $Q = 0.1$, $R = 0.8$, $\text{MENR} = 25$, and $\text{VENR} = 10$.

From b, $L = 0.95$. Thus, from c, the sample size of larger schools must be at least $150 \times 0.8 / 0.95 = 126.3$. That is, there must be at least 126 of the larger schools sampled.

From e, the number of moderately small schools required is $(5250 \times 0.1) / (0.95 \times 25) = 22.1$; i.e., 22 schools.

From f, the number of very small schools required is $(2625 \times 0.1) / (0.95 \times 10) = 27.6$; i.e., 28 schools.

This gives a total sample size of $126 + 22 + 28 = 176$ schools, rather than just 150. The larger schools will yield an initial (i.e., before considering school and student nonresponse) sample of $126 \times 35 = 4410$ students. The moderately small schools will give an initial sample of approximately $22 \times 25 = 550$ students. The very small schools will give an initial sample size of approximately $28 \times 10 = 280$ students. Thus the total initial sample size of students is $4410 + 550 + 280 = 5240$. Recall that a sample of 150 schools, each school yielding an initial sample of 35 students, will give a total initial sample size of 5,250 students, so that our sample that has been modified to handle the small schools will yield approximately the target student sample size that we seek.

Sampling Form 7

NPMs must describe all variables they intend to use for stratification, both explicit and implicit. They should also indicate the total number of explicit strata that will be defined. They must include any small school and / or very small school strata that must be formed based on Sampling Form 6.

Sampling Form 7 – Example

In the following discussion, we show an example of stratification. This example is taken from Australia's participation in a previous survey of this type. Australia defined two stratification variables:

1. **State** – The eight levels of this variable correspond to the eight Australian states and territories. The main purpose for using this stratification variable was to ensure sufficient sampling precision for the five larger states. This variable, therefore, was used as an explicit stratification variable.
2. **School type** – This variable refers to the three major education sectors in Australia: Government,

Catholic, and Independent schools. In past such studies, this variable provided substantial gains in sampling precision and was therefore used as an implicit stratification variable, as it is in this example. It is also an efficient means of ensuring adequate representation of all three school types in the sample.

Urbanisation is also shown as an implicit stratification variable within the explicit strata.

All of this stratification information is reported in the example of Sampling Form 7 in Appendix A-7.

5.8 Assigning a Measure of Size (MOS) to each school

As indicated earlier, for each school on the frame an approximate enrolment of 15-year-olds in the school is needed. In some cases this will be an actual enrolment of 15-year-olds, based on administrative records for the current year. In many countries the number will be the enrolment in the grade containing the most 15-year-olds, either for the current year or the previous year. This enrolment measure is denoted as ENR.

For the probability proportional to size sampling method to be used for PISA, for each school we must establish a measure of size (MOS), derived from ENR. In cases where there is to be no required explicit stratification of very small schools, OR, if small schools (including very small schools) are separately stratified because school size was used as an explicit stratification variable, and they do not account for 5% or more of the target population (see Section 5.7), the MOS is given as:

$$\text{MOS} = \text{MAX}(\text{ENR}, \text{TCS}).$$

That is, the measure of size is equal to the enrolment estimate, unless the enrolment is less than the target cluster size (TCS), in which case the measure of size is set equal to the target cluster size. In most countries, TCS = 35, so that the MOS is equal to ENR or 35, whichever is the larger.

When an explicit stratum of very small schools (schools with ENR less than or equal to TCS/2) is required (see Section 5.7.1), the MOS for each very small school is set equal to TCS/2.

This ensures that the sample has a good representation of students from small and very small schools, but may result in a shortfall in the total student sample, unless the sample size of schools is increased to compensate.

5.9 Sampling Frame Statistics

NPMs are required to document the process of sampling frame construction. In addition to the descriptive information reported in Sampling Forms 4, 5, 6, and 7, **NPMs must record basic statistics by strata on Sampling Form 8**. These statistics should be easily tabulated from the school sampling frame. For each combination of explicit and implicit strata, the number of schools and enrolled students (both ENR and MOS -- see Section 5.8) should be reported. These statistics will be

very useful to finalise the sample allocation of schools to the explicit strata (Section 6.2) and as control totals to validate the computation of sampling weights.

Sampling Form 8

NPMs must list and describe all combinations of explicit and implicit strata in Sampling Form 8. For each entry, they should tabulate the number of schools, eligible students, and school MOS. These statistics should be readily available from the school sampling frame.

Sampling Form 8 – Examples

Appendix A-8 contains a series of completed examples of Sampling Form 8 based on fictitious scenarios taken from Australia.

- The first example form provides the information required when there is no explicit or implicit stratification.
- The second example form shows the statistics compiled if urbanisation is used as an implicit stratification.
- The third example form shows the Australian states as explicit strata.
- The fourth example form shows the Australian states as explicit strata and urbanisation as an implicit stratification variable.

5.10 Sorting the Sampling Frame

If explicit strata are used, what follows in this section, regarding sorting of the frame, should be done within each explicit stratum. Failing to sort the sampling frame prior to sample selection will not bias or invalidate the sample. However, it may increase unnecessarily the sampling variances of estimates obtained from the assessments, as the implicit stratification is implemented via this sort process.

In a previous section, NPMs defined a set of implicit stratification variables as well as a sequence from which they will be used to form implicit strata. Through this process, each school in the sampling frame will be assigned a value for each implicit stratification variable. For example, if urbanisation (rural or urban) and school type (public or private) are used, each school must be classified as either rural or urban and either as public or private.

The school sampling frame is then sorted by the implicit stratification variables. The schools are first sorted by the first implicit stratification variable, then by the second implicit stratification variable within the levels of the first sorting variable, and so on, until all implicit stratification variables have been exhausted. The result is a cross-classification structure of cells, where each cell represents one implicit stratum on the school sampling frame. The maximum number of implicit strata resulting

from this process is equal to the product of the number of different levels of each implicit stratification variable. It is the maximum number because some cross-classifications could contain no schools at all. In our earlier example, using urbanisation and school type, the cross-classification will yield a maximum of four cells ($2 \times 2 = 4$): rural-public, rural-private, urban-public, and urban-private. If private schools are only found in urban centres, then the rural-private cell will be empty, and there would only be three implicit strata.

Within each implicit stratum, the schools must be sorted by their enrolment (ENR). The sort order should alternate from high to low and then low to high, as indicated in the following table. For more than four implicit strata, the sort order pattern presented in the table below should simply be continued.

Implicit Stratum	Sort Order of ENR
1. Rural-Public	High to Low
2. Rural-Private	Low to High
3. Urban-Public	High to Low
4. Urban-Private	Low to High

Check Point 3

NPMs must submit Sampling Forms 4-8 inclusive to Westat one month before final approval of the school sample is required, or two months before data collection is to begin, whichever is the earlier.

6. STEP 4 – THE SAMPLE OF SCHOOLS

6.1 Overview

This chapter describes how to select the sample of schools using a PPS systematic sampling method, and is only relevant to those countries who will select their own school samples. It is presented as a series of operational steps leading to the selection and identification of all sampled schools.

The school selection probabilities are based on their measures of size (MOS). This sampling method can be applied to both school-level sampling frames as well as area-level sampling frames. With area-level sampling frames, the second level of sampling frame is very much like a school-level sampling frame, as noted previously.

For each sampled school, we will also identify two candidates as replacement schools. Although the replacement schools serve as possible substitutes for non-cooperating schools, NPMs should keep their use to a minimum by ensuring the highest possible participation rate for sampled schools.

Schools are selected once the school sampling frames have been compiled for each explicit stratum, with each explicit stratum being sorted by the variables defining the implicit strata within it. NPMs should note that the school samples will be selected separately for each explicit stratum. As noted previously, each school entry in each sampling frame should contain:

- A school identification number;
- Values for any implicit stratification variables;
- Enrolment (ENR); and
- A measure of size (MOS).

Although this sampling manual provides paper versions of the sampling forms to record all of the sampling results, we very much expect that NPMs will rely on computer software to perform the sample selection and to generate the required sampling forms. NPMs need not send the exact sampling forms provided in this manual. They may generate their own versions, either on paper or as computer files, as long as the forms or computer files include all of the information shown on the sampling forms included in this manual. The quality of this documentation will be used as one of the PISA quality indicators.

6.2 School Sample Allocation Over Explicit Strata

If there are explicit strata, the total number of schools to be sampled in each country must be allocated, among the explicit strata. NPMs must ensure that the overall sampling precision will meet PISA requirements. Based on a school sample size of 150 (or more) schools and using the information reported in columns 1, 3, and 4 of Sampling Form 8, NPMs should be able to allocate their sample of schools to the explicit strata. **This sample allocation must be reported on Sampling Form 9.**

NPMs are responsible for ensuring the quality execution of this school sample allocation. NPMs should consult with Westat for any assistance in the performance of this task. NPMs should pay particular attention to the following points in allocating their school sample.

- If separate estimates are required for explicit strata, then equal levels of sampling precision will usually be required for each explicit stratum. This generally means that there will be an equal number of schools sampled in each explicit stratum regardless of the size of each stratum.
- If different target cluster sizes are applied to the explicit strata, NPMs will need to adapt their sample allocation accordingly. Given the relative complexity in making this determination, NPMs should consult Westat for guidance.
- If an explicit stratum of small schools is required, NPMs will need to allocate their school sample accordingly (See Section 5.7.2).
- NPMs must ensure that at least one, and preferably two, schools are allocated for selection in each explicit stratum.

Sampling Form 9

NPMs must describe their school sample allocation on Sampling Form 9. The sample allocation should show the allocation of schools to the explicit strata.

Sampling Form 9 - Examples

The example depicted in Appendix A-9 involves some information from Ireland's proposed sample design.

The example of Sampling Form 9 shows what Ireland's proposed stratification and allocation would be like. Explicit strata are defined based on school size, and allocation is done proportionally so that the percentage of eligible students in the sample in each stratum is about the same as the percentage of eligible students in the population in each stratum. Note that the two small school strata were not required, but were formed as a result of using school size as the explicit stratification variable.

6.3 Determining Which Schools to Sample

Sampling Form 10 is used to identify which schools are selected in the sampling frame. **There must be one Sampling Form 10 for each explicit stratum.** Be sure to indicate the explicit stratum being considered on each Sampling Form 10. This form is used to perform the basic calculations that will enable the NPMs to select the sample of schools. It will be essentially used to generate a series of selection numbers which will be applied to the sampling frame to identify the sampled schools in Sampling Form 12.

6.3.1 Calculating the Sampling Interval

The PPS systematic sampling method requires the computation of a sampling interval for each explicit stratum. This calculation is performed based on information recorded in Sampling Form 10.

To calculate the sampling interval:

- Record the total measure of size “S” for all schools in the sampling frame for the specified explicit stratum. This number is obtained from column 5 of Sampling Form 8.
- Record this number in box[a] of Sampling Form 10.
- Record the number of schools “D” to be sampled from the specified explicit stratum. This will be the number allocated to the explicit stratum on Sampling Form 9. Record this number in box[b] of Sampling Form 10. Enter sequentially the numbers from 1 through “D” in column 1 (line numbers) of Sampling Form 10, for later use.
- Calculate the sampling interval “I” as follows: $I = S \div D$
- Record the sampling interval “I” to four decimal places in box[c] of Sampling Form 10.

6.3.2 Generating a Random Start

Select a random number for each explicit stratum. Random numbers are now easily generated by computer software, such as Excel, SAS or SPSS. NPMs may also rely on a table of random numbers found in some sampling books. NPMs who will generate these random numbers by computer software should be sure to use a “uniform random number generator” that generates numbers distributed uniformly between 0 and 1.

The generated random number “RN” should be recorded in box[d] of Sampling Form 10. The selected random number should be a number between 0 and 1 and should be recorded to four decimal places.

6.3.3 Calculating the Selection Numbers

Selection numbers must be calculated and recorded in column 2 of Sampling Form 10 for each line number specified, i.e., 1 through “D”.

- To obtain the first selection number, multiply the sampling interval “I” by the random number “RN”. Record this first selection number to four decimal places in column 2 of the first line, corresponding to line number 1, on Sampling Form 10. This first selection number will be used to identify the first sampled school in the specified explicit stratum.
- We obtain the second selection number by simply adding the sampling interval “I” to the first selection number. The second selection number will be used to identify the second sampled school. Record this number to four decimal places on the second line of column 2.
- Continue adding the sampling interval “I” to the previous selection number to obtain the next selection number. This is done until all specified line numbers (1 through “D”) have been assigned a selection number.

To summarise the calculation of selection numbers, the first selection number in an explicit stratum is $RN \times I$. The second selection number is $(RN \times I) + I$. The third selection number is $(RN \times I) + I + I$, and so on.

Selection numbers need to be generated independently for each explicit stratum. Be sure to select a new random number for each explicit stratum. For each explicit stratum, the first line number in column 1 of Sampling Form 10 should always be 1 (one).

Sampling Form 10

NPMs must complete Sampling Form 10 to demonstrate how the school sample is selected. Separate sampling forms are required for each explicit stratum.

Sampling Form 10 – Examples

Three examples are depicted for Sampling Form 10 – one for each of two of Ireland’s explicit strata, and an example based on a fictitious scenario for one of Australia’s four explicit strata from a previous example.

Ireland’s first explicit stratum consists of extremely small schools. This was not a requirement however, and these small schools will each get a MOS of 35 (see Section 5.8). Thus, the total measure of size for the 41 schools in this stratum will be $41 \times 35 = 1435$, which is recorded in box [a]. Four schools were allocated to be selected from this stratum, which is noted in box [b]. The sampling interval is calculated by dividing [a] by [b] ($1435 / 4$). The result, 358.75, is recorded in box [c]. Box [d] contains a random number generated from the Uniform (0,1) distribution. In the multi-row table, numbers from 1 to 4 are listed in column 1 since only 4 schools are to be selected in this stratum. The selection numbers are

generated by first multiplying the random number in [d] by the sampling interval in [c]. The result is the first selection number and appears in column 2 beside line number one. Adding the sampling interval, [c] to the first selection number, gives the second selection number, and so on.

The second example of Sampling Form 10 consists of an example of Ireland's second explicit stratum which consists of small schools (but again this was not a requirement). Thus, the total measure of size is $75 \times 35 = 2625$ from 75 schools, and an allocated sample size of 10.

In the third example in Appendix A-10, the completed Sampling Form 10 is based on a fictitious scenario from Australia. This scenario requires the selection of 40 schools. This example obviously consists of a single explicit stratum. In box [a] we have recorded the total MOS for that stratum (measure of size for the state of Victoria from column 5 of the earlier Australian example of Sampling Form 8). In box [b] we have recorded the allocated school sample required: 40. The resulting sampling interval is recorded in box [c] and is in fact 1490.3500. A random number is generated and recorded in box [d]. The example of Sampling Form 10 lists 40 line numbers with all the generated selection numbers needed to select the sample of 40 schools in the sampling frame for this explicit stratum.

All such information can be found in the examples of Sampling Form 10 in Appendix A-10.

6.4 Identifying the Sampled Schools

Based on the selection numbers recorded in Sampling Form 10, we are now able to identify the sampled schools in the school sampling frame. **Since selection numbers were selected separately for each explicit stratum, it is important to match the correct selection numbers to the corresponding explicit strata in each sampling frame.**

Our first task, however is to compile a cumulative measure of size in the school sampling frame. This cumulative MOS will determine which schools are sampled. The cumulative MOS is tabulated within explicit strata. This means the cumulative MOS must be reset when moving from one explicit stratum to the next.

All of the relevant school sampling frame information must be recorded on Sampling Form 11.

It is expected that the contents of Sampling Form 11 will actually exist in the form of a computer file, perhaps Excel, dBASE, SAS or SPSS. All of these formats are acceptable and NPMs are encouraged to send such files to Westat as a record of their sample selection activities, rather than paper versions of Sampling Form 11.

Sampled schools are identified as follows, once all schools within the explicit stratum have had columns 1-4 completed on Sampling Form 11:

Let "Z" denote the first selection number for a particular explicit stratum. We must find the first school in the sampling frame whose cumulative MOS equals or exceeds "Z". This will be the first sampled school. In other words, if C_s is the cumulative MOS of a particular school in the sampling frame and $C_{(s-1)}$ is the cumulative MOS of the school immediately preceding it, then the school in question is selected if:

- C_s is greater than or equal to Z , and
- $C_{(s-1)}$ is strictly less than Z .

Apply the above rule to all selection numbers for a given explicit stratum and enter a check-mark for each sampled school in column 5 of Sampling Form 11.

Note: If NPMs observe schools in their sampling frame whose MOS is greater than the computed sampling interval, they will encounter some sampling difficulties since such schools could be selected more than once. If this occurs, NPMs should notify Westat for advice on how to resolve this issue.

6.5 Identifying Replacement Schools

NPMs must make every effort to get as many of the sampled schools to participate as possible. However, it is not always possible to obtain the participation of all sampled schools. In order to avoid the resulting sample size losses, a mechanism to identify a priori replacement schools for non-participating sampled schools is needed. A second, perhaps more important, reason for identifying replacement schools a priori is to avoid the haphazard use of alternate schools as replacements, which may actually amplify response biases. Although our approach is no guarantee of avoiding non-response biases, it will at least tend to minimise the potential for bias. The technique of identifying replacements should lead to less non-response bias than the alternative of drawing a larger sample initially, in anticipation of non-response. Each sampled school in the main survey will be assigned two replacement schools in the sampling frame. **A sampled school can never be designated as the replacement school for another sampled school.**

Replacement schools are identified as follows. For each sampled school, identified by a check-mark in column 5 of Sampling Form 11, the schools immediately preceding and following it in Sampling Form 11 are designated as its replacement schools. The school immediately following the sampled school should be labeled “R1”, while the school immediately preceding the sampled school should be labeled “R2”, in column 5 of Sampling Form 11. The use of implicit stratification variables, and the subsequent ordering of the school sampling frame by size (ENR), ensures that any sampled school’s replacements will have similar characteristics. In small countries, there may be problems encountered when trying to identify two replacement schools for each sampled school. In such cases, a replacement school could be 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. NPMs may find it difficult to assign replacement schools to some very large sampled schools because the sampled schools appear very close to each other in the sampling frame. At times, NPMs may only be able to assign a single replacement school, and perhaps none when two consecutive schools in the sampling frame are sampled.

Should a sampled school happen to be the last school listed in an explicit stratum, then the two schools immediately above it are its designated replacement schools. Should a sampled school happen to be the first school listed in an explicit stratum, then the two schools immediately below it are its designated replacement schools.

6.6 Assigning School ID's

In order to keep track of sampled schools and replacement schools in the PISA database, all sampled schools and replacement schools must be assigned unique identification numbers. **The assigned school ID's must be assigned to all sampled schools and replacement schools and recorded in column 6 on Sampling Form 11.**

School ID's must be assigned according to these rules:

- Schools may be assigned a two-digit stratum code (corresponding to the explicit strata), and a three-digit school code.
- Sampled schools are sequentially numbered starting from 1(one), within each explicit stratum. For example, if 150 schools are sampled from a single explicit stratum, then they are assigned IDs from 001 through 150. This numbering should continue across all implicit strata.
- First replacement schools in the main survey are assigned the school ID of their corresponding sampled schools, but incremented by 200. For example, the first replacement school for sampled school 023 is assigned school ID 223.
- Second replacement schools in the main survey are assigned the school ID of their corresponding sampled schools, but incremented by 400. For example, the second replacement school for sampled school 136 is assigned school ID 536.

NPMs who will select especially large school samples may not be able to assign school IDs according to the above rules. They will need to consult with Westat and ACER to come up with an alternate method of assigning school IDs.

Sampling Form 11

NPMs must complete Sampling Form 11 as a written record of their sampling frame and school sample selection. Sampling Form 11 should preferably be submitted as a computer file with all the relevant information included. There must be as many Sampling 11 Forms as there are explicit strata.

NPMs should be particularly careful when assigning PISA school IDs since this will be the only method of recognising schools which are sampled. It is also how we will identify replacement schools from sampled schools.

Sampling Form 11 – Example

Appendix A-11 contains an example of Sampling Form 11, again based on the fictitious scenario presented in the previous examples. Only the first eight pages are presented for the sake of illustration.

Sampled schools are determined based on the selection numbers computed in Sampling Form 10. The eight pages of the example of Sampling Form 11 included in Appendix A-11 show the first 8 sampled schools. Two replacement schools are designated for each sampled school. The PISA school IDs allow us to make the correspondence between replacement schools and sampled schools.

All details about this example of Sampling Form 11 are found in Appendix A-11.

6.7 Creating a School Tracking Form

To help monitor the participation status of sampled schools, all sampled schools must be recorded on Sampling Form 12, the School Tracking Form. This form will contain all contact and scheduling information, along with basic sampling information. Replacement schools assigned to a sampled school should also be recorded in this Sampling Form. There is one form for each sampled school and its replacement schools.

NPMs can start the preparation of Sampling Form 12 once the sample of schools is selected. This form, however, will only be completed once data collection has ended since only then will NPMs know which sampled schools participated and which ones required replacement. School Tracking Forms should be submitted as soon as possible after data collection.

6.8 Confirming School Participation

NPMs must confirm and document the participation status of sampled schools. This is done using Sampling Form 12. In column 1, the PISA school ID is recorded. The corresponding school enrolment (ENR), as reported in the sampling frame, is recorded in column 2. Any contact information available is recorded in columns 3 and 4.

6.8.1 Sampled Schools

NPMs must make every effort to confirm the participation of as many sampled schools as possible. This is important in order to minimise the potential for non-response biases. Sampled schools are listed in the first row of Sampling Form 12.

Once a sampled school's participation has been confirmed, a check-mark should be entered in column 5 of the first row. If a sampled school is unwilling or unable to participate, then enter "N" in column 5.

6.8.2 Replacement Schools

After all contacts with sampled schools have been made, NPMs will need to contact replacement schools for those sampled schools that will not participate. Each sampled school that will not participate should be replaced if possible. Second replacement schools should only be used if both the corresponding first replacement school and sampled schools will not participate.

Sampling Form 12

NPMs must complete Sampling Form 12 to keep track of the participation status of all sampled schools and their replacement schools. NPMs should also use this form to record contact information and scheduling information.

Sampling Form 12 – Example

Appendix A-12 contains a completed Sampling Form 12, based on a fictitious trio of schools from Australia.

In this example, Sampling Form 12 is filled out for a sampled school and its two designated replacement schools from the state of Victoria, used as an explicit stratum.

The sampled school refused to participate, but its first replacement did participate. Contact and scheduling information is reported for that school.

Check Point 4

Sampling Form 11 must be submitted to Westat one month before the school sample must be approved or two months before the start of data collection (whichever is earlier) for those countries selecting their own samples.

A copy of Sampling Form 12 (the school tracking form) must be submitted to Westat for each sampled original school, and for each replacement school that is requested to participate. These tracking forms must be sent to Westat within one month of the end of the data collection period.

APPENDIX A

PISA Sampling Form 1**Time of Testing and Age Definition**

See Section 3.1 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

1. Beginning and ending dates of assessment June 1, 2000 to June 30, 2000

2. Please confirm that the assessment start date is after the first three months of the academic year.

☒ Yes

☐ No

3. Students who will be assessed were born between 1/3/84 and 29/2/85

DD MM YY DD MM YY

4. As part of of the PISA sampling process for your country, will you be selecting students other than those born between the dates in 3) above? (For example students in a particular grade, no matter what age.)

☒ No

☐ Yes (please describe the additional population): _____

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 2**National Desired Target Population**

See Section 3.2 of School Sampling Manual.

PISA Participant: **Ireland**

National Project Manager:

1. Total national population of 15 year olds: [a] **68,805**

2. Total national population of 15 year olds enrolled in educational institutions: [b] **66,735**

3. Describe the population(s) to be omitted from the national desired target population (if applicable).

None

4. Total enrolment excluded from the national desired target population (corresponding to the omissions listed in the previous item): [c] **0**

5. Total enrolment in the national desired target population: [d] **66,735**
 $\text{box [b]} - \text{box [c]}$

6. Percentage of coverage in the national desired target population: [e] **100%**
 $(\text{box [d]} / \text{box [b]}) \times 100$

7. Describe your data source (Provide copies of relevant tables):

1995/96 Statistical Report of the Department of Education, Dublin: Stationary Office

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 3**National Defined Target Population**

See Section 3.3 of School Sampling Manual.

PISA Participant: **Ireland**

National Project Manager:

1. Total enrolment in the national desired target population:

[a] **66,735**

From box [d] on Sampling Form 2

2. School-level exclusions:

Description of exclusions	# of schools	# of students
<i>Schools not aided by the Dept. of Education and Science</i>	29	40
<i>Special schools for students with special needs</i>	116	708
TOTAL.....	145	[b] 748

Percentage of students not covered due to school-level exclusions:

$(\text{box [b]} / \text{box [a]}) \times 100$

1.1%

3. Total enrolment in national defined target population before within-school exclusions: box [a] - box [b]

[c] **65,987**

4. Within-school exclusions:

Description of exclusions	Expected # of students
<i>Physical or mental disability and unable to cope with testing situation</i>	negligible
TOTAL.....	[d] negligible

Expected percentage of students not covered due to within-school exclusions:

$(\text{box [d]} / \text{box [a]}) \times 100$

0%

5. Total enrolment in national defined target population:

$\text{box [a]} - (\text{box [b]} + \text{box [d]})$

[e] **65,987**

6. Coverage of national desired target population:

$(\text{box [e]} / \text{box [a]}) \times 100$

[f] **98.9%**

7. Describe your data source (Provide copies of relevant tables):

1995/96 Statistical Report of the Department of Education, Dublin: Stationary Office

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com**

PISA Sampling Form 4**Sampling Frame Description**

See Sections 5.2 – 5.4 of School Sampling Manual.

PISA Participant: Canada

National Project Manager: _____

1. Will a sampling frame of geographic areas be used?

- ☐ Yes Go to 2
☒ No Go to 5

2. Specify the PSU Measure of Size to be used.

- ☐ 15-year-old student enrolment
☐ Total student enrolment
☐ Number of schools
☐ Population size
☐ Other (please describe): _____

3. Specify the school year for which enrolment data will be used for the PSU Measure of Size. _____

4. Please provide a preliminary description of the information available to construct the area frame,
**Please consult with Westat for support and advice in the construction and use of an area —
 level sampling frame.**

5. Specify the school estimate of enrolment (ENR) of 15-year-olds that will be used.

- ☒ 15-year-old student enrolment
☐ Applying known proportions of 15-year-olds to corresponding grade level enrolments
☐ Grade enrolment of the modal grade for 15-year-olds
☐ Total student enrolment, divided by number of grades

6. Specify the year for which enrolment data will be used for school ENR. 1998/1999

7. Please describe any other type of frame, if any, that will be used. None

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PISA Sampling Form 4**Sampling Frame Description**

See Sections 5.2 – 5.4 of School Sampling Manual.

PISA Participant: **Russian Federation**

National Project Manager:

1. Will a sampling frame of geographic area be used?

- ☒ Yes Go to 2
☐ No Go to 5

2. Specify the PSU Measure of Size to be used.

- ☐ 15-year-old student enrolment
☒ Total student enrolment
☐ Number of schools
☐ Population size
☐ Other (please describe): _____

3. Specify the school year for which enrolment data will be used for the PSU Measure of Size: **1997/1998**

4. Please provide a preliminary description of the information available to construct the area frame,
**Please consult with Westat for support and advice in the construction and use of an area —
 level sampling frame.** **79 Regions in Russia with total enrolment as Measure of Size. 40 regions will be
 sampled. Sampled regions will provide lists of schools containing 15-year-old students, along with the
 enrolment of 15-year-old students in each school.**

5. Specify the school estimate of enrolment (ENR) of 15-year-olds that will be used.

- ☒ 15-year-old student enrolment
☐ Applying known proportions of 15-year-olds to corresponding grade level enrolments
☐ Grade enrolment of the modal grade for 15-year-olds
☐ Total student enrolment, divided by number of grades
☐ Total student enrolment

6. Specify the year for which enrolment data will be used for school ENR. **1998/1999**

7. Please describe any other type of frame, if any, that will be used. **None**

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com**

See Section 5.5 of School Sampling Manual.

PISA Participant: *Ireland*

National Project Manager:

Use additional sheets if necessary

[illegible]

Please return completed form to: *Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA* — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 6**Treatment of Small Schools**

See Section 5.7 of School Sampling Manual.

PISA Participant: **Ireland**

National Project Manager:

1. Enrollment in small schools:

Type of school based on enrollment	# of schools	# of students	Percentage of total enrollment
Enrollment of 15-year-old students < 17	41	550	[a] 0.83%
Enrollment of 15-year-old students ≥ 17 and < 35	75	2,267	[b] 3.43%
Enrollment of 15-year-old students ≥ 35	629	63,170	[c] 95.7%
TOTAL.....			100%

2. If the sum of the percentages in boxes [a] and [b] is less than 5%, AND the percentage in box [a] is less than 1%, then all schools should be subject to normal school sampling, with no explicit stratification of small schools required.

(box [a] + box [b]) < 5% and box [a] < 1%?

☒ Yes or ☐ No

↓

Go to 6.

3. If the sum of the percentages in boxes [a] and [b] is less than 5%, BUT the percentage in box [a] is 1% or more, a stratum for very small schools is needed. Please see Section 5.7.2 to determine an appropriate school sample allocation for this stratum of very small schools.

(box [a] + box [b]) < 5% and box [a] ≥ 1%?

☐ Yes or ☐ No

↓

Form an explicit stratum of very small schools and record this on Sampling Form 7. Done.

4. If the sum of the percentages in boxes [a] and [b] is 5% or more, BUT the percentage in box [a] is less than 1%, an explicit stratum of small schools is required, but no special stratum for very small schools is required. Please see Section 5.7.2 to determine an appropriate school sample allocation for this stratum of small schools.

(box [a] + box [b]) ≥ 5% and box [a] < 1%?

☐ Yes or ☐ No

↓

Form an explicit stratum of small schools and record this on Sampling Form 7. Go to 6.

5. If the percentage in box [b] is 4% or more, AND the percentage in box [a] is 1% or more, an explicit stratum of moderately small schools is required, AND an explicit stratum for very small schools is required. Please see section 5.7.2 to determine an appropriate school sample allocation for these strata of moderately small and very small schools.

box [b] ≥ 4% and box [a] ≥ 1%?

☐ Yes or ☐ No

↓

Form an explicit stratum of moderately small schools and an explicit stratum of very small schools, and record this on Sampling Form 7. Done.

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

6. If the percentage in box [a] is less than 0.5%, then these very small schools can be excluded from the national defined target population only if the total extent of school level exclusions of the type mentioned in 3.3.2 remains below 0.5%. If these schools are excluded, be sure to record this exclusion on Sampling Form 3, item 2, and on Sampling Form 5.

box [a] < 0.5%?

☐ Yes *or* ☒ No

↓Excluding very small schools?

☐ Yes *or*

☐ No

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PISA Sampling Form 7**Stratification**

See Section 5.6 of School Sampling Manual.

PISA Participant: *Australia*

National Project Manager:

Explicit Stratification

1. List and describe the variables used for explicit stratification.

Explicit stratification variables		# of levels
1	<i>6 states and 2 territories</i>	<i>8</i>
2	<i>Government, Catholic, Independent</i>	<i>3</i>
3		
4		
5		

2. Total number of explicit strata:

24

(Note: if the number of explicit strata exceeds 99, the PISA school coding scheme will not work correctly. See Section 6.6. Consult Westat and ACER)

Implicit Stratification

3. List and describe the variables used for implicit stratification in the order in which they will be used (i.e., sorting of schools within explicit strata).

Implicit stratification variables		# of levels
1	<i>Urban/Rural</i>	<i>2</i>
2		
3		
4		
5		

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See Section 5.9 of School Sampling Manual.

PISA Participant: *Australia*

National Project Manager:

Use additional sheets if necessary

[illegible]

Please return completed form to: *Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com*

PISA Participant: *Australia*

National Project Manager:

[illegible]

A-57

See Section 5.9 of School Sampling Manual.

PISA Participant: *Australia*

National Project Manager:

Use additional sheets if necessary

[illegible]

Please return completed form to: *Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA* — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 8**Population Counts by Strata**

See Section 5.9 of School Sampling Manual.

PISA Participant: **Australia**

National Project Manager:

Use additional sheets if necessary

(1) Explicit Strata	(2) Implicit Strata	(3) Schools	(4) Population Counts		(5)
			ENR	Students	
New South Wales	Rural	745	24 623		24 733
	Urban	1 655	54 601		54 844
	Sub-total	2 400	79 224		79 577
Victoria	Rural	1 075	18 563		18 646
	Urban	1 044	40 786		40 968
	Sub-total	2 119	59 349		59 614
Queensland	Rural	428	12 329		12 384
	Urban	947	27 341		27 463
	Sub-total	1 375	39 670		39 847
South Australia	Rural	231	5 152		5 175
	Urban	513	11 426		11 477
	Sub-total	744	16 578		16 652
West Australia	Rural	245	7 049		7 080
	Urban	541	15 629		15 699
	Sub-total	786	22 678		22 779
Tasmania	Rural	80	2 081		2 090
	Urban	174	4 612		4 633
	Sub-total	254	6 693		6 723
TOTAL		7 678	224 192		225 192

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

See Section 6.2 of School Sampling Manual.

PISA Participant: *Ireland*

National Project Manager:

Use additional sheets if necessary

[illegible]

Please return completed form to: *Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com*

PISA Sampling Form 10**School Sample Selection**

See Section 6.3 of School Sampling Manual.

PISA Participant: **Ireland**

National Project Manager:

Explicit Stratum: **Small School Stratum I**

Stratum ID: **01**

S 41 x 35=1435 [a] Total Measure of Size	D 4 [b] Desired Sample Size	I 358.75 [c] Sampling Interval	RN 0.8247 [d] Random Number
---	--	---	--

Use additional sheets if necessary

(1) Line Numbers	(2) Selection Numbers
1	(358.75 x 0.8247=) 295.8611
2	(358.75 x 1.8247=) 654.6111
3	(358.75 x 2.8247=) 1013.3611
4	(358.75 x 3.8247=) 1372.1111

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 10**School Sample Selection**

See Section 6.3 of School Sampling Manual.

PISA Participant: **Ireland**

National Project Manager:

Explicit Stratum: **Small School Stratum II**

Stratum ID: **02**

S $75 \times 35 = 2625$ [a] Total Measure of Size	D 10 [b] Desired Sample Size	I 262.5 [c] Sampling Interval	RN 0.9762 [d] Random Number
---	--	---	---

Use additional sheets if necessary

(1) Line Numbers	(2) Selection Numbers
1	$(262.5 \times 0.9762 =) 256.2525$
2	$(262.5 \times 1.9762 =) 518.7525$
3	$(262.5 \times 2.9762 =) 781.2525$
4	$(262.5 \times 3.9762 =) 1043.7525$
5	$(262.5 \times 4.9762 =) 1306.2525$
6	$(262.5 \times 5.9762 =) 1568.7525$
7	$(262.5 \times 6.9762 =) 1831.2525$
8	$(262.5 \times 7.9762 =) 2093.7525$
9	$(262.5 \times 8.9762 =) 2356.2525$
10	$(262.5 \times 9.9762 =) 2618.7525$

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 10	School Sample Selection
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See Section 6.3 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

S 59 614 [a] Total Measure of Size	D 40 [b] Desired Sample Size	I 1 490.3500 [c] Sampling Interval	RN 0.6381 [d] Random Number
--	--	--	---------------------------------------

Use additional sheets if necessary

(1) Line Numbers	(2) Selection Numbers
1	950.9923
2	2441.3423
3	3931.6923
4	5422.0423
5	6912.3923
6	8402.7423
7	9893.0923
8	11383.4423
9	12873.7923
10	14364.1423
11	15854.4923
12	17344.8423
13	18835.1923
14	20325.5423
15	21815.8923
16	23306.2423
17	24796.5923
18	26286.9423
19	27777.2923
20	29267.6423
21	30757.9923

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 10**School Sample Selection**

See Section 6.3 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

S 59 614 [a] Total Measure of Size	D 40 [b] Desired Sample Size	I 1 490.3500 [c] Sampling Interval	RN 0.6381 [d] Random Number
---	---	---	--

Use additional sheets if necessary

(1) Line Numbers	(2) Selection Numbers
22	32248.3423
23	33738.6923
24	35229.0423
25	36719.3923
26	38209.7423
27	39700.0923
28	41190.4423
29	42680.7923
30	44171.1423
31	45661.4923
32	47151.8423
33	48642.1923
34	50132.5423
35	51622.8923
36	53113.2423
37	54603.5923
38	56093.9423
39	57584.2923
40	59074.6423

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11	School Sampling Frame
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See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
0829	Urban	110	110		
0552	Urban	101	211		
1802	Urban	98	309		
1288	Urban	98	407		
2043	Urban	95	502		
0974	Urban	94	596		
1718	Urban	94	690		
1807	Urban	93	783		
0457	Urban	93	876	R2	401
0244	Urban	93	969	✓	001
1817	Urban	91	1 060	R1	201
1741	Urban	90	1 150		
1652	Urban	89	1 239		
0121	Urban	89	1 328		
0309	Urban	89	1 417		
0032	Urban	89	1 506		
0021	Urban	89	1 595		
0609	Urban	88	1 683		
0399	Urban	86	1 769		
0067	Urban	86	1 855		
0202	Urban	86	1 941		
0063	Urban	86	2 027		
1467	Urban	86	2 113		

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11**School Sampling Frame**

See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
1381	Urban	86	2 199		
1043	Urban	84	2 283		
1318	Urban	84	2 367	R2	402
0659	Urban	84	2 451	✓	002
0612	Urban	83	2 534	R1	202
1696	Urban	82	2 616		
0867	Urban	82	2 698		
0537	Urban	81	2 779		
1794	Urban	80	2 859		
0695	Urban	80	2 939		
0031	Urban	80	3 019		
0333	Urban	79	3 098		
0051	Urban	79	3 177		
0384	Urban	79	3 256		
1391	Urban	79	3 335		
1189	Urban	79	3 414		
0731	Urban	78	3 492		
0634	Urban	78	3 570		
1230	Urban	77	3 647		
1478	Urban	76	3 723		
0741	Urban	76	3 799		
1388	Urban	76	3 875	R2	403
2110	Urban	76	3 951	✓	003

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11**School Sampling Frame**

See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
1813	Urban	75	4 026	R1	203
0597	Urban	75	4 101		
0724	Urban	74	4 175		
1672	Urban	74	4 249		
1535	Urban	73	4 322		
1932	Urban	73	4 395		
2108	Urban	73	4 468		
1898	Urban	73	4 541		
0697	Urban	73	4 614		
0175	Urban	72	4 686		
1584	Urban	72	4 758		
0026	Urban	72	4 830		
0577	Urban	72	4 902		
1729	Urban	71	4 973		
0004	Urban	71	5 044		
1521	Urban	70	5 114		
0373	Urban	70	5 184		
1377	Urban	70	5 254		
0643	Urban	70	5 324		
2114	Urban	70	5 394	R2	404
1079	Urban	70	5 464	✓	004
1452	Urban	70	5 534	R1	204
1168	Urban	70	5 604		

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11	School Sampling Frame
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See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
1591	Urban	69	5 673		
1309	Urban	69	5 742		
0661	Urban	69	5 811		
0017	Urban	69	5 880		
1174	Urban	69	5 949		
1983	Urban	69	6 018		
1766	Urban	69	6 087		
0236	Urban	69	6 156		
0412	Urban	68	6 224		
1032	Urban	68	6 292		
1676	Urban	68	6 360		
1030	Urban	68	6 428		
1085	Urban	68	6 496		
0158	Urban	67	6 563		
0834	Urban	67	6 630		
1135	Urban	67	6 697		
0154	Urban	67	6 764		
1279	Urban	67	6 831		
0504	Urban	67	6 898	R2	405
1858	Urban	67	6 965	✓	005
0084	Urban	67	7 032	R1	205
0406	Urban	66	7 098		
0273	Urban	66	7 164		

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11**School Sampling Frame**

See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
0450	Urban	66	7 230		
1669	Urban	66	7 296		
0307	Urban	66	7 362		
1261	Urban	66	7 428		
0265	Urban	65	7 493		
1112	Urban	65	7 558		
1315	Urban	65	7 623		
0726	Urban	65	7 688		
1495	Urban	65	7 753		
0144	Urban	65	7 818		
1345	Urban	65	7 883		
1996	Urban	64	7 947		
1383	Urban	64	8 011		
1322	Urban	64	8 075		
0827	Urban	64	8 139		
1829	Urban	64	8 203		
0713	Urban	64	8 267		
1339	Urban	64	8 331		
1038	Urban	63	8 394	R2	406
0869	Urban	63	8 457	✓	006
0740	Urban	63	8 520	R1	206
1784	Urban	63	8 583		
1157	Urban	63	8 646		

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11**School Sampling Frame**

See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
0039	Urban	63	8 709		
1578	Urban	63	8 772		
0818	Urban	62	8 834		
1194	Urban	62	8 896		
1723	Urban	62	8 958		
0079	Urban	62	9 020		
0172	Urban	62	9 082		
0394	Urban	62	9 144		
0005	Urban	62	9 206		
1987	Urban	61	9 267		
1017	Urban	61	9 328		
1355	Urban	61	9 389		
1018	Urban	61	9 450		
1680	Urban	61	9 511		
1547	Urban	60	9 571		
1707	Urban	60	9 631		
0095	Urban	60	9 691		
0012	Urban	60	9 751		
1730	Urban	60	9 811		
1726	Urban	60	9 871	R2	407
0542	Urban	60	9 931	✓	007
0033	Urban	60	9 991	R1	207
0326	Urban	60	10 051		

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11**School Sampling Frame**

See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
0887	Urban	60	10 111		
0925	Urban	59	10 170		
0686	Urban	59	10 229		
0291	Urban	59	10 288		
1500	Urban	59	10 347		
1664	Urban	59	10 406		
1418	Urban	59	10 465		
1191	Urban	59	10 524		
1608	Urban	59	10 583		
0747	Urban	59	10 642		
1240	Urban	58	10 700		
0052	Urban	58	10 758		
1658	Urban	58	10 816		
2070	Urban	58	10 874		
0857	Urban	58	10 932		
0472	Urban	58	10 990		
0098	Urban	58	11 048		
0349	Urban	58	11 106		
1733	Urban	58	11 164		
1243	Urban	58	11 222		
0372	Urban	58	11 280		
1172	Urban	58	11 338	R2	408
0167	Urban	57	11 395	✓	008

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 11	School Sampling Frame
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See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) MOS	(4) Cumulative MOS	(5) Sample Status	(6) PISA School ID
1346	Urban	57	11 452	R1	208
1639	Urban	57	11 509		
1732	Urban	57	11 566		
0380	Urban	57	11 623		
0986	Urban	57	11 680		
1372	Urban	56	11 736		
1458	Urban	56	11 792		
1259	Urban	56	11 848		
1008	Urban	56	11 904		
1087	Urban	56	11 960		
0162	Urban	56	12 016		
0717	Urban	56	12 072		
0047	Urban	56	12 128		
0718	Urban	56	12 184		
0567	Urban	56	12 240		
1041	Urban	55	12 295		
1286	Urban	55	12 350		
0617	Urban	55	12 405		
2053	Urban	55	12 460		
0328	Urban	55	12 515		
1013	Urban	55	12 570		
1781	Urban	55	12 625		
0135	Urban	55	12 680		

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 12**School Tracking Form**

Use one form for each sampled school. See Sections 6.7 and 6.8 of School Sampling Manual.

PISA Participant: Australia

National Project Manager: _____

Explicit Stratum: Victoria

Stratum ID: 02

	(1) PISA School ID	(2) School ENR	(3) Name, Address and Phone # of School	(4) Name and Phone # of School Coordinator	(5) Status*	(6) Date Materials Sent	(7) Date of Testing
						... Materials Returned	
Sampled School	030	39	(1065) Seventh Day Adventist		N		
			123 Main St.				
			Townsville, Victoria				
			9555-1212				
First Replacement School	230	39	(2074) Rudolf Steiner School	Andrea Gilford	✓		2000-06-01
			101 John St.	9359-9809		2000-05-01	
			Hawthorne, Victoria				
			9359-9809			2000-07-10	
Second Replacement School	430	40	(0553) St. Paul's School				
			100 Brighton Rd.				
			Hawthorne, Victoria				
			9359-1107				

* Enter (N) for non-participating schools. A check-mark (✓) indicates the participating school.

Please return completed form to: Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com

APPENDIX B

See Section 3.1 of School Sampling Manual.

PISA Participant:

National Project Manager:

1. Beginning and ending dates of assessment 2000 to 2000
2. Please confirm that the assessment start date is after the first three months of the academic year.

☐ Yes☐ No

3. Students who will be assessed were born between DD MM YY and DD MM YY

4. As part of the PISA sampling process for your country, will you be selecting students other than those born between the dates in 3) above? (For example students in a particular grade, no matter what age.)

☐ No

☐ Yes (please describe the additional population):

Please return completed form to: *Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA* — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 2**National Desired Target Population**

See Section 3.2 of School Sampling Manual.

PISA Participant: _____

National Project Manager: _____

1. Total national population of 15 year olds:

[a]

2. Total national population of 15 year olds enrolled in educational institutions:

[b]

3. Describe the population(s) to be omitted from the national desired target population *(if applicable)*.

4. Total enrolment omitted from the national desired target population
(corresponding to the omissions listed in the previous item):

[c]

5. Total enrolment in the national desired target population:

$\text{box [b]} - \text{box [c]}$

[d]

6. Percentage of coverage in the national desired target population:

$(\text{box [d]} / \text{box [b]}) \times 100$

[e]

7. Describe your data source *(Provide copies of relevant tables)*:

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 3**National Defined Target Population**

See Section 3.3 of School Sampling Manual.

PISA Participant: _____

National Project Manager: _____

1. Total enrolment in the national desired target population:

From box [d] on Sampling Form 2

[a] _____

2. School-level exclusions:

Description of exclusions	# of schools	# of students
TOTAL.....		[b]

Percentage of students not covered due to school-level exclusions:

$(\text{box } [b] / \text{box } [a]) \times 100$

_____ %

3. Total enrolment in national defined target population before within-school exclusions: $\text{box } [a] - \text{box } [b]$

[c] _____

4. Within-school exclusions:

Description of exclusions	Expected # of students
TOTAL.....	[d]

Expected percentage of students not covered due to within-school exclusions:

$(\text{box } [d] / \text{box } [a]) \times 100$

_____ %

5. Total enrolment in national defined target population:

$\text{box } [a] - (\text{box } [b] + \text{box } [d])$

[e] _____

6. Coverage of national desired target population:

$(\text{box } [e] / \text{box } [a]) \times 100$

[f] _____

7. Describe your data source (Provide copies of relevant tables): _____

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 4**Sampling Frame Description**

See Sections 5.2 – 5.4 of *School Sampling Manual*.

PISA Participant: _____

National Project Manager: _____

8. Will a sampling frame of geographic areas be used?

- ☐ Yes Go to 2
☐ No Go to 5

2. Specify the PSU Measure of Size to be used.

- ☐ 15-year-old student enrolment
☐ Total student enrolment
☐ Number of schools
☐ Population size
☐ Other (please describe): _____

3. Specify the school year for which enrolment data will be used for the PSU Measure of Size: _____

4. Please provide a preliminary description of the information available to construct the area frame, Please consult with Westat for support and advice in the construction and use of an area — level sampling frame.

5. Specify the school estimate of enrolment (ENR) of 15-year-olds that will be used.

- ☐ 15-year-old student enrolment
☐ Applying known proportions of 15-year-olds to corresponding grade level enrolments
☐ Grade enrolment of the modal grade for 15-year-olds
☐ Total student enrolment, divided by number of grades

6. Specify the year for which enrolment data will be used for school ENR. _____

7. Please describe any other type of frame, if any, that will be used. _____

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

See Section 5.5 of School Sampling Manual.

PISA Participant:

National Project Manager:

Use additional sheets if necessary

[illegible]

Please return completed form to: *Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com*

PISA Sampling Form 6**Treatment of Small Schools**

See Section 5.7 of School Sampling Manual.

PISA Participant: _____

National Project Manager: _____

1. Enrollment in small schools:

Type of school based on enrollment	# of schools	# of students	Percentage of total enrollment
Enrollment of 15-year-old students < 17			[a]
Enrollment of 15-year-old students ≥ 17 and < 35			[b]
Enrollment of 15-year-old students ≥ 35			[c]
TOTAL.....			100%

2. If the sum of the percentages in boxes [a] and [b] is less than 5%, AND the percentage in box [a] is less than 1%, then all schools should be subject to normal school sampling, with no explicit stratification of small schools required or recommended.

(box [a] + box [b]) < 5% and box [a] < 1%?

☐ Yes or ☐ No

↓

Go to 6.

3. If the sum of the percentages in boxes [a] and [b] is less than 5%, BUT the percentage in box [a] is 1% or more, a stratum for very small schools is needed. Please see section 5.7.2 to determine an appropriate school sample allocation for this stratum of very small schools.

(box [a] + box [b]) < 5% and box [a] ≥ 1%?

☐ Yes or ☐ No

↓

Form an explicit stratum of very small schools and record this on Sampling Form 7. Done.

4. If the sum of the percentages in boxes [a] and [b] is 5% or more, BUT the percentage in box [a] is less than 1%, an explicit stratum of small schools is required, but no special stratum for very small schools is required. Please see Section 5.7.2 to determine an appropriate school sample allocation for this stratum of small schools.

(box [a] + box [b]) ≥ 5% and box [a] < 1%?

☐ Yes or ☐ No

↓

Form an explicit stratum of small schools and record this on Sampling Form 7. Go to 6.

5. If the percentage in box [b] is 4% or more, AND the percentage in box [a] is 1% or more, an explicit stratum of moderately small schools is required, AND an explicit stratum for very small schools is required. Please see section 5.7.2 to determine an appropriate school sample allocation for these strata of moderately small and very small schools.

box [a] ≥ 5% and box [a] ≥ 1%?

☐ Yes or ☐ No

↓

Form an explicit stratum of moderately small schools and an explicit stratum of very small schools, and record this on Sampling Form 7. Done.

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

6. If the percentage in box [a] is less than 0.5%, then these very small schools can be excluded from the national defined target population only if the total extent of school level exclusions of the type mentioned in 3.3.2 remains below 0.5%. If these schools are excluded, be sure to record this exclusion on Sampling Form 3, item 2.

box [a] < 0.5%?

☐ Yes *or* ☐ No

↓ Excluding very small schools?

☐ Yes *or*

☐ No

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 7**Stratification**

See Section 5.6 of *School Sampling Manual*.

PISA Participant: _____

National Project Manager: _____

Explicit Stratification

1. List and describe the variables used for explicit stratification.

Explicit stratification variables		# of levels
1		
2		
3		
4		
5		

2. Total number of explicit strata:

(Note: if the number of explicit strata exceeds 99, the PISA school coding scheme will not work correctly. See Section 6.6. Consult Westat and ACER)

Implicit Stratification

3. List and describe the variables used for implicit stratification in the order in which they will be used (i.e., sorting of schools within explicit strata).

Implicit stratification variables		# of levels
1		
2		
3		
4		
5		

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Participant:

National Project Manager:

[illegible]

B-85

See Section 6.2 of School Sampling Manual.

PISA Participant:

National Project Manager:

Use additional sheets if necessary

[illegible]

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** —
Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 10**School Sample Selection**

See Section 6.3 of School Sampling Manual.

PISA Participant: _____

National Project Manager: _____

Explicit Stratum: _____

Stratum ID: _____

S [a] Total Measure of Size	D [b] Desired Sample Size	I [c] Sampling Interval	RN [d] Random Number
---------------------------------------	-------------------------------------	-----------------------------------	--------------------------------

Use additional sheets if necessary

(1) Line Numbers	(2) Selection Numbers

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA** —
Fax: 301-294-2034, E-mail: RustK1@Westat.com

See Sections 6.4 - 6.6 of School Sampling Manual.

PISA Participant:

National Project Manager:

Explicit Stratum:

Stratum ID:

Use additional sheets if necessary

[illegible]

Please return completed form to: Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com

PISA Sampling Form 12**School Tracking Form**

Use one form for each sampled school. See Sections 6.7 and 6.8 of School Sampling Manual.

PISA Participant: _____

National Project Manager: _____

Explicit Stratum: _____ Stratum ID: _____

	(1) PISA School ID	(2) School ENR	(3) Name, Address and Phone # of School	(4) Name and Phone # of School Coordinator	(5) Status*	(6) Date Materials Sent	(7) Date of Testing
						... Materials Returned	
Sampled School							
First Replacement School							
Second Replacement School							

* Enter *N* for non-participating schools. A check-mark (✓) indicates the participating school.

Please return completed form to: **Keith Rust, Westat, 1650 Research Blvd., Rockville, MD 20850, USA — Fax: 301-294-2034, E-mail: RustK1@Westat.com**