OECD
PISA

Learning
for Living

SCHOOL SAMPLING

PREPARATION MANUAL

PISA 2003 MAIN STUDY

Version One: June 2002

TABLE OF CONTENTS

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.

New for
PISA
2003

This manual describes procedures for achieving points 1, and 2, and, to some extent, 6. Point 3 will be addressed by ACER and Westat. Note that although ACER will select the school samples, all inquires about sampling must be directed to Westat. Points 4 and 5 are discussed in detail in the PISA National Project Managers Manual, and in the documentation for KeyQuest, the Data Entry 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 to ensure that the instrument developed for the main study contains test items that are sound in all countries and that they are properly translated; 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 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 frame preparation and 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 designated 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, in conjunction with Westat and ACER, to satisfy international PISA requirements and also additional national requirements.

New for
PISA
2003

– Sending the sampling frame and sample size requirements to Westat and ACER, 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 and ACER 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.

New for
PISA
2003

– 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 and ACER so that we can carry out our responsibilities for monitoring and quality assurance, and sample selection and weighting.

For some aspects the manual 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 may 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 Changes from PISA 2000

Most aspects of this manual are similar to those of the PISA 2000 manual. Where a change of consequence has been made from the 2000 manual, this is noted in the margin as "New for PISA 2003".

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, science, and problem solving. 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.

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, 35 students will be selected with equal probability (all 15-year-old students will be selected if fewer than 35 are enrolled). Note that 30 students (150 schools x 30 students = 4500 students) has been inflated to 35 to account for an anticipated combined nonresponse and exclusion rate of 15% among students within schools. 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 20, so as to ensure adequate accuracy in estimating variance components within and between schools (an analytical objective of PISA).

Please Note

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 grades 5 and higher*. 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 period not to exceed 42 consecutive calendar days between March 1, 2003 and August 31, 2003. The assessment should 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 should be conducted at some time between mid-May and the end of August.

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 2003, for example, the eligible population is defined as students born during 1987. If the testing is to take place in July 2003, the population is students born between April 1987 and March 1988 inclusive.

Variation of up to one month in this age definition is permitted.   In particular, if the testing period is any 6 week period between March 1, 2003 and May 31, 2003, the population may be defined as students born in 1987. (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.

MAIN STUDY

Testing windows

11-2002	12-2002	01-2003	02-2003	03-2003	04-2003	05-2003	06-2003	07-2003	08-2003	09-2003	10-2003	11-2003	12-2003	01-2004	02-2004	03-2004	04-2004	05-2004	06-2004

11-1986	12-1986	01-1987	02-1987	03-1987	04-1987	05-1987	06-1987	07-1987	08-1987	09-1987	10-1987	11-1987	12-1987	01-1988	02-1988	03-1988	04-1988	05-1988	06-1988
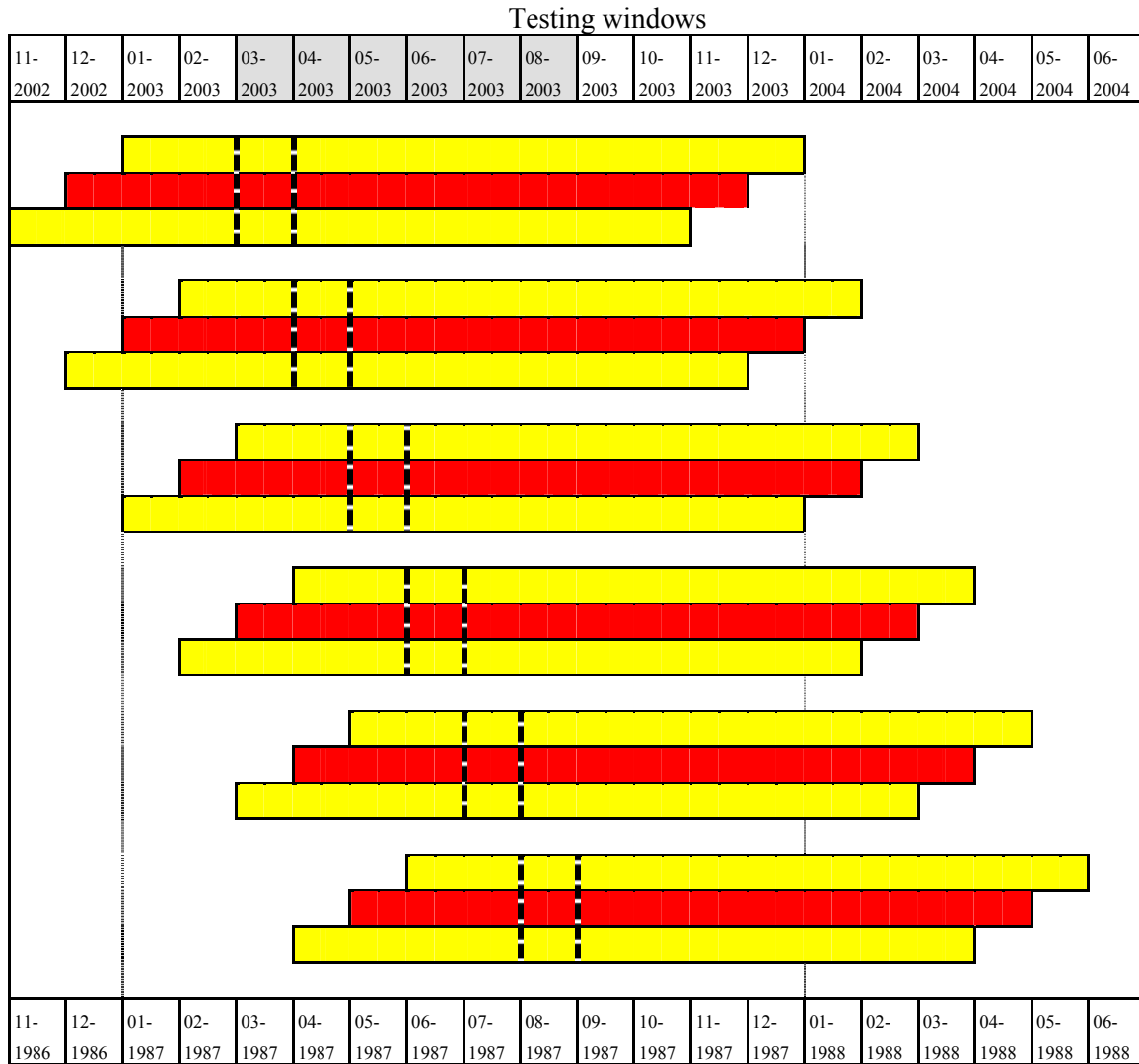
Target Population

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 12/86 to 11/87

- ▪ Testing in April, students born 2/87 to 1/88

- ▪ Testing from May 16 to June 15, students born 3/87 to 2/88

- Testing in July, students born 4/87 to 3/88.

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

- Testing in April 2003, students born 11/86 to 10/87 (the students are too old).

- Testing in April 2003, students born 3/87 to 2/88 (the students are too young).

- Testing from May 16 to June 15, students born in 1987 (the students are too old).

- Testing in August, students born 7/87 to 6/88 (the students are too young).

NPMs must confirm their time of testing and age definition with the PISA Consortium, and 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 1987. This would be approved. But if in fact the testing period slips to become May to mid June, the population must be changed to students born February 1987 to January 1988 (or March 1987 to February 1988 if preferred), as it is not acceptable to have testing in June with an age definition of students born in 1987. Any changes in the planned time of assessment should be approved by Westat.

Note that even though testing is allowed to be conducted over a six week period, Table 1 shows the testing windows as one month periods. If the testing covers parts of two months as opposed to just one month, the example just discussed illustrates how to choose the appropriate age definition.

One way to minimise the chance of assessment period drift leading to an unapproved population definition is to choose the age definition that will provide flexibility for moderate drift in the test period. Table 1 illustrates how this may be done for an originally scheduled assessment period of April 2003 and an age definition of all students born in 1987 -- the dark bar for the April 2003 testing window. If the testing period shifts to March 2003, the age definition is still valid and is graphically represented by the light-shaded bar at the top of the March 2003 testing window. If the April 2003 assessment period shifts to May 2003, the age definition of all students born in 1987 is also still valid. Graphically, this is represented by the light-shaded bar at the bottom of the May 2003 testing window. Notice, too, that by scheduling a March 2003 test period originally, the age definition of all students born during 1987 will remain an approved population definition even if the testing window is moved to May 2003, and thus provides two months of scheduling flexibility for unexpected delays. This type of approach is recommended.

Time of testing and age definition must be recorded on Sampling Form 1 and submitted to Westat who will forward the form to ACER. NPMs must submit Sampling Form 1 at least six months before the beginning of testing.

<div style="border: 1px solid black;">

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).

</div>

<div style="border: 1px solid black;">

Sampling Form 1- Example

In the following discussion, we show a fictitious example for PISA 2003 of a planned testing period and the subsequent age definition of eligible students using the Czech Republic.

Due to the Czech Republic's academic year beginning in September, the NPM found testing between 15 April, 2003 and 15 May, 2003 to be the most feasible. This testing date met the PISA criteria that testing must be after the first three months of the academic year and within a maximum 6-week testing period. Using the start and end dates of the testing period, the NPM defined the 15-year-old PISA main study students to be assessed as those born in 1987. As a national option, the Czech Republic planned to also assess students in grade 12 who were born in 1985, and reported this in question 4. The NPM completed the next three items pertaining to the TIMSS Population 2 study for 2003, indicating that they intended to participate in the study and that the same institution would administer both PISA and TIMSS. The NPM stated that there was no concern if some schools participated in both PISA and TIMSS.

New for PISA 2003, the date this version of Sampling Form 1 was completed was entered on the line below the NPM's name.

See the example of Sampling Form 1 in Appendix A.

</div>

<div style="border: 1px solid black;">

Check Point 1

NPMs must submit Sampling Form 1 at least six months before the beginning of testing.

</div>

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.

Please Note

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 full national population of 15-year-olds in grades 5 and higher, this will mean that survey results will not be deemed representative of the entire national school system.

Please Note

The national desired target population must be described on Sampling Form 2 and submitted to Westat who will forward the form to ACER. 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 from the full national population of 15-year-olds in grades 5 and higher must be documented on this form.

Sampling Form 2- Example

The following example is based on a fictitious Czech Republic plan for PISA for the year 2003 main study. Using information from the *2001 Database of the Statistical Yearbook of the Czech Republic (school year 2001/2002)*, the NPM found the total national population of 15-year-olds to be 134,627. Of this total, 132,508 15-year-olds in grades 5 and higher were noted as enrolled in educational institutions.

Question 2.2 is **new for PISA 2003**. The NPM reported in question 2.2 that no 15-year-olds were enrolled in grades 4 and below. Of those students in grades 5 and above, 0 enrolment was to be excluded. Therefore, total enrolment of the Czech Republic's desired target population was all 132,508 15-year-old students. Finally, the NPM noted the source used to define the desired target population.

New for PISA 2003, the date this version of Sampling Form 2 was completed was entered on the line below the NPM's name.

See the example of Sampling Form 2 in Appendix A.

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 students and students with limited proficiency in <test language>, instructed by the educational system for less than one year in the language of the test 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.

Please Note

The magnitude, nature, and justification for school-level exclusions must be documented on Sampling Form 3 and submitted to Westat who will forward the form to ACER. 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 the national PISA samples. 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, *in grades 5 and higher*) 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 -- Section 5.4). 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:

- Functionally disabled students – These are students who are permanently physically disabled is such a way that they cannot perform in the PISA testing situation. Functionally disabled students who can respond should be included in the testing.

- Intellectually disabled students – These are students who are considered in the professional opinion of the school principal, or by other qualified staff members, to be intellectually disabled 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.

- Students with limited proficiency in <test language> – 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 by type of exclusion and report the estimates on Sampling Form 3.** Only a single within-school exclusion category for type "Other" should be needed within a country, and this exclusion category must be defined. Although it is expected that the three defined categories should cover all types of within-school exclusions, it may be the case that a particular country has an additional category. Use of such a category is described in Section 5.3 of the NPM manual, but must be limited to special circumstances as defined by the NPM and approved by the Consortium.

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 between the target population birth dates, 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.

Table 2 presents a summary of exclusion limits.

TABLE 2.   **EXCLUSION LIMITS SUMMARY.**

Exclusion Type	Reason	Upper Limit
From the International Desired Target Population	Political, organizational, operational	Not specified – must be discussion with Consortium. **Specify on Sampling Form 2.**
From the National Desired Target Population : School-Level:	Geographical inaccessibility; Extremely small size; Administration of PISA not feasible;	0.5% of National Desired Target Population. **Specify on Sampling Form 3.**
	All students of types allowed for within-school exclusions if whole school contains only such students	2% of National Desired Target Population. **Specify on Sampling Form 3.**
Within-School Level:	Functionally disabled students; Intellectually disabled students; Students with limited proficiency in \<test language\>	Estimate expected to be within 2.5% of National Desired Target Population **Specify on Sampling Form 3.**
TOTAL	-	5% - National Defined Target Population should cover 95% or more of the National Desired Target Population

---

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 fictitious discussion uses Ireland as an example. 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.

In this example, within-school exclusions of all types 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.

New for PISA 2003, each type of school-level exclusion is numbered. In this example, school-level exclusion type 1 corresponds to "Special schools for students with special education needs." The example for Sampling Form 12 illustrates how this exclusion type number is to be used for sample participation status coding.

New for PISA 2003, the date this version of Sampling Form 3 was completed was entered on the line below the NPM's name.

See the example of Sampling Form 3 in Appendix A.

Check Point 2

NPMs must submit completed Sampling Forms 2 and 3 to Westat six months prior to the date that they wish to start testing.

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 by ACER.

The Board of Participating Countries (BPC) has set 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. Although most countries will not need this, a description of this sampling method can be found in Appendix C. If explicit stratification is used, the overall sample size will need to be allocated among the explicit strata. *Westat and ACER will perform this function in close consultation with the NPM.* Countries are permitted to sample more than 150 schools, to meet national requirements. In countries where a sizeable 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 must 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

New for PISA 2003

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 5.7.

– The second stage of sampling consists of selecting at least 35   15-year-old students from each sampled school. Recall that 35 was the inflated number from 30 per school to compensate for an expected 15% within school nonresponse and exclusion rate. 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)

– For countries that participated in PISA 2000 which had larger than anticipated sampling variances associated with their estimates, recommendations will be made about sample design changes that will help to reduce the sampling variances for PISA 2003.

4.3   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.

4.3.2 Samples of Students in a Particular Grade

Countries have the option of selecting a grade sample from the same set of sampled schools that have 15-year-olds. This can be done in one of two ways.

1) The "grade-class" method can be accomplished by first selecting the PISA student sample from a list of all eligible 15-year-olds within the sampled school. Then, completely separate from the first operation but within the same school, one class is randomly selected from all the classes in the grade from which a grade sample is desired. These two samples, the PISA sample and the grade-class sample, will be in two different data files and will be weighted and analyzed separately. There may be some students who may be in both samples. Such students need to be tested only once but their data will be duplicated so that such students appear in each of the two data files created for analysis.

2) The "grade-list" option lists all PISA 15-year-old students first in the school list of students for sampling, followed by all other non-15-year-old students in the grade for which a grade sample is desired. The sampling interval is determined based on the total number of 15-year-olds in the school and the PISA target sample size of 15-year-olds required in each sampled school. After determining a random start, this sampling interval is then applied through the whole list of PISA eligible and grade eligible students. This will result in the required number of sampled PISA students and an extra sample of grade-list students. The two samples, the PISA sample and the grade-list sample, will be weighted together. For analysis purposes, the students can be separated into PISA students or grade students as desired. Students who are eligible for PISA and the grade sample can be used in both analyses, and will have the same weights in each.

Countries wishing to have a grade sample in a sample of schools that is different than the PISA sample of schools should handle this independently of PISA.

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% of originally sampled schools. However, nonparticipating sampled schools may be substituted with "replacement schools" to meet sample size and response rate requirements. The use of replacement schools does not guarantee that potential biases have been reduced. Therefore, NPMs are encouraged to persuade as many original sampled schools as possible to participate; only a high participation rate will minimize the potential for response bias. The identification and use of replacement schools are described in sections 6.2 and 6.3. Note that raising participation rates, also known as response rates, through the use of replacements improves quality, but that a given response rate achieved through the use of replacements is not as good as that same rate achieved without replacements. That is, a school participation rate of x% before replacement has less potential for biases than the same response rate of x% achieved only after replacement.   Therefore, all other factors being equal, acceptability of the country's data in international comparisons will be relative to both the school participation rate of originally sampled schools and the response rate achieved with the use of replacements.

Please
Note
> Three response rate zones -- acceptable, intermediate and not acceptable –- are defined. "Acceptable" means that the country's data will be included in international comparisons. "Not Acceptable" means that the country's data will be a candidate for not being reported in international comparisons, and will be included only if the NPM provides considerable evidence that nonresponse bias is likely to be minor. Finally, the "Intermediate" zone means that a decision on whether or not to include the country's data in international comparisons must be made while taking into account various other factors. These zones are a function of the response rate before replacement, and the response rate after replacement. There are three sets of combinations of before and after response rates that are noted as being in the "acceptable" zone.

Consider some examples.

A country with a before replacement response rate of 87% would have its data considered "acceptable" according to this criteria , even before any school level replacements were used.

A country with a before replacement response rate of 60% would have its data "not acceptable" no matter what the after replacement response rate was.

A country with a before replacement response rate of 70%, and an after replacement response rate of 96% would have its data considered "acceptable" according to this criteria.

A country with a before replacement response rate of 75% and an after replacement response rate of 91% would have its data considered "acceptable" according to this criteria.

A country with a before replacement response rate of 70%, and an after replacement response rate of 90% falls into the intermediate zone. Such a set of conditions requires a decision on whether or not to accept the data from the country. Other factors that will be considered in such a situation include student-level response rates, exclusion rates, quality control data, and closeness of the response rates to the acceptable level.

The response rate zones are shown diagrammatically in the following graph. Note that the "acceptable" region has part of its region bounded by the Before Replacement Rate > 85% vertical line, another part consisting of the After Replacement Rate > 95% horizontal line for Before Replacement Rates between 65% and 85%, and that the final part of the acceptable region is defined by the Before Replacement Rate between 65% and 85% and After Replacement Rate > (255%-Before Replacement Rate)/2 .

Please
Note

Note that a school with less than 50% participation among the selected eligible students, will not be considered as a participating school. If such a school has less than 25% participation among the selected eligible students, then the students in such schools will not be included in analysis. If such a school has more than 25% and less than 50% participation among the selected eligible students, the students in these schools will be retained for analysis, even though the school is considered a nonparticipant for the purposes of monitoring response rates.

PISA 2003 School Response Rates
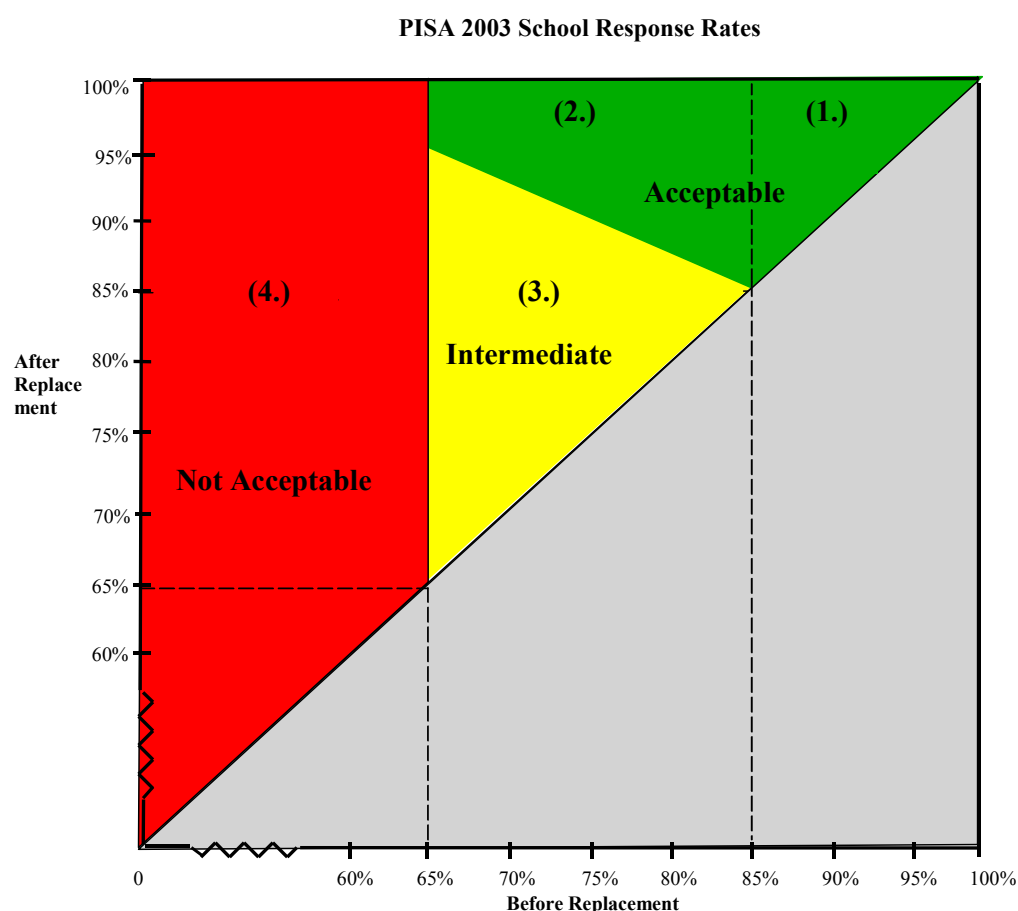
4.4.2 Students

PISA also requires a minimum participation rate of 80 percent of students within participating schools (sampled and replacement). Follow-up sessions may be required in schools where too few students participated in the originally scheduled test sessions. Guidelines for determining when follow-up sessions are appropriate are found in the PISA National Project Managers Manual. The task of determining whether follow-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 follow-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 follow-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 in grades 5 and higher, even those that may later be excluded (see Section 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. PISA will assess the extent of missing or inaccurate data used for stratification (Section 5.6) and for creating the measure of size (Section 5.8) 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 and to submit this form to Westat who will forward the form to ACER.**

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), urban/rural classification, 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. NPMs using an area-level sampling frame should submit to Westat, a sampling form 3 for the full national defined population as well as one for the population numbers corresponding to the sampled first-stage units.

New for PISA 2003

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 was available and therefore a school-level sampling frame was used. The school estimate of enrolment consisted of enrolment of 15-year-olds. Enrolment data from the 2001-2002 school year was available for conducting PISA in the year 2003.

New for PISA 2003, the date this version of the sampling form was completed was entered.

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

Sampling Form 4 – Area-Level Sampling Frame Example

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

Because a comprehensive national list of schools was not easily available, Russia 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 2000 / 2001 academic year.

The school estimate of enrolment used was 15-year-old student enrolment from the 2001 / 2002 school year.

And finally, **new for PISA 2003**, the date this version of the sampling form was completed was entered.

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

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 and their enrolment sizes of 15-year-olds must be identified on Sampling Form 5, along with the reason for their exclusion, and this form must be sent to Westat who will forward the form to ACER.**

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, contain only students with special needs, are listed, along with the approximate enrolment (ENR) for each.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

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

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 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 stratum. 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.

5.6.3   Implicit Stratification

Implicit stratification consists essentially of sorting the school sampling frame 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 . 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, science and/or problem solving).

– 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.

Please Note

Stratification information must be recorded on Sampling Form 7 and sent to Westat who will forward the form to ACER.

5.7   Treatment of Small Schools

New for PISA 2003

The information in this section is provided for information purposes only. The NPM is not required to deal with the treatment of small schools, except to discuss the issue with Westat and ACER.

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 for all schools in most countries although it can vary among explicit strata within a country if desired. All schools though, within each explicit stratum must have the same TCS. 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

New for
PISA
2003

Information on the importance of small schools will be reported on Sampling Form 6 by Westat and ACER and sent back to the NPM. This form also provides brief guidelines about the treatment of small schools. These guidelines are based on the following detailed guidelines that will be considered in the treatment of small schools in each country. Once the sampling frame is sent to Westat who will forward it to ACER, this issue will be decided upon in consultation with the NPM. The following explains the guidelines that Westat and ACER will generally follow to determine whether small school strata are needed.

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 will be applied. If none of the following conditions are true, then no small school strata are needed.

New for
PISA
2003

1. If the percentage of students in very small schools (ENR<TCS/2) is 1 percent or MORE and the percentage of students in moderately small schools (TCS/2<ENR<TCS) is 4 percent or MORE, then form a stratum of very small schools and a separate stratum of moderately small schools. STOP.

2. If the percentage of students 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. STOP.

3. If the percentage of students in very small schools (ENR<TCS/2) is LESS than 1 percent, and the percentage of students in moderately small schools (TCS/2<ENR<TCS) is 4 percent or MORE, a combined stratum for small schools is needed which includes all very small and moderately small schools. STOP.

In addition, if the percentage of students enrolled in very small schools *which have only one or two eligible students* is less than 0.5 percent, it may be permissible to exclude these particular very small schools from the sampling frame. Such exclusion is not recommended, and is permissable only if the total extent of school-level exclusions for reasons other than special education 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

 Westat and ACER will use student enrolment data provided by the NPM on the sampling frame 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.

Sampling Form 6 – Example

Using an hypothetical scenario for France's PISA 2003 main study, there are more than 1 percent eligible students in very small schools (enrolment of 15-year-olds less than 18). There are almost 8 percent of eligible students in moderately small schools, and 9.7% of eligible students in small schools overall, leaving about 90 percent of eligible students in schools with at least 35 eligible students. Therefore, France has one stratum for moderately small schools and another for very small schools.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

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

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 the approach that will be used by Westat and ACER to determine 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, there may be variations to this approach, to meet the national sampling objectives while limiting the school sample size somewhat. 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. The ensuing 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.

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 more than 1.0.

c. The minimum sample size for larger schools is equal to 150 x R x 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:

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

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

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

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, MENR = 25, and VENR = 10.

From b, L = 1.05. Thus, from c, the sample size of larger schools must be at least 150 x 0.8 x 1.05 = 126. That is, there must be at least 126 of the larger schools sampled.

From e, the number of moderately small schools required is (5250 x 0.1 x 1.05) / (25) = 22.05; i.e., 22 schools.

From f, the number of very small schools required is (2625 x 0.1 x 1.05) / (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 x 35 = 4410 students. The moderately small schools will give an initial sample of approximately 22 x 25 = 550 students. The very small schools will give an initial sample size of approximately 28 x 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 and prioritise 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.

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 explicit stratification variable in this example. The use of school type for stratification is also an efficient means of ensuring adequate representation of all three school types in the sample.

In the example, urbanisation is shown as an implicit stratification variable within the explicit strata.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

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

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.

<div style="float:left">

New for
PISA
2003

</div>

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. This will be done by Westat and ACER, so what follows is for information purposes only. The MOS is given as: MOS = MAX (ENR, 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.

This, and the proper allocation of schools to the small school strata if they are necessary, 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

<div style="float:left">

New for
PISA
2003

</div>

NPMs are required to complete Sampling Forms 4, 5 and 7 to document the process of sampling frame construction. In addition, Westat and ACER will tabulate basic statistics by strata from the school sampling frame and send this back to the NPM as Sampling Form 8. For each combination of explicit and implicit strata, the number of schools and enrolled students (both ENR and MOS -- see Section 5.8) will be reported. These statistics will be very useful to finalise the sample allocation of schools to the explicit strata (Sampling Form 9) and as control totals to validate the computation of

<div style="float:left">

New for
PISA
2003

</div>

sampling weights. Sampling Form 9 (sample allocation across explicit strata) will also be completed by Westat and ACER and sent back to the NPM, as well as Sampling Form 10. Sampling Form 10 shows the information that was used by ACER to select the school sample.

Sampling Form 8

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

<div style="border: 1px solid black; padding: 10px;">

Sampling Form 8 – Examples

Appendix A contains a completed example of Sampling Form 8 based on a fictitious scenario taken from Australia. The example form shows the Australian states as explicit strata and urbanisation as an implicit stratification variable.

New for PISA 2003, the date this version of the sampling form is completed is recorded on the line beneath the NPM's name.

</div>

<div style="border: 1px solid black; padding: 10px;">

Sampling Form 9

Westat and ACER will describe the country's school sample allocation on Sampling Form 9. The sample allocation will show the allocation of schools to the explicit strata.

</div>

<div style="border: 1px solid black; padding: 10px;">

Sampling Form 9 - Example

The example depicted in Appendix A involves fictitious information for Ireland's 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.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

</div>

<div style="border: 1px solid black; padding: 10px;">

Sampling Form 10

ACER will complete Sampling Form 10 to demonstrate how the school sample was selected.

</div>

Sampling Form 10 – Examples

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

Ireland's first explicit stratum consists of extremely small schools. Since the ENR for each of these schools is less than the TCS of 35, 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 × 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, 358.7500, 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 moderately small schools. The total measure of size is 75 × 35=2625 from 75 schools, and an allocated sample size of 10.

In the third example of Sampling Form 10 in Appendix A, the completed form 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.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

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

Sampling Form 11

NPMs must send Sampling Form 11 as a written record of their sampling frame. It should preferably be submitted as a single computer file with all the relevant information included. Once the school sample is selected by ACER, Sampling Form 11 will be sent back to the NPM with sampled and replacement schools identified and PISA IDs assigned. (See Sections 6.2 and 6.3).

Sampling Form 11 – Example

Appendix A 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 show the first nine 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.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

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

Check Point 3

NPMs must submit Sampling Forms 4, 5, 7, and 11 to Westat five months before data collection is to begin.

---

6. STEP 4 – THE SAMPLE OF SCHOOLS

6.1   The School Sample

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 the sampling frame should contain at least:

- A school identification number;

- Values for any implicit stratification variables;

- Enrolment (ENR); and

- A measure of size (MOS) (assigned by Westat and ACER).

Although this sampling manual provides paper versions of the sampling forms to record all of the sampling information, NPMs need not send the exact sampling forms provided in this manual. They may generate their own versions as long as the files include all of the information shown on the sampling forms included in this manual. These data will be used in assessing the quality of the PISA data, and therefore must be as accurate as possible.

If, due to the complexity of its school sample design, a country will select its own school sample, appendix C must be read at this point.

6.2   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 by ACER. **A sampled school can never be designated as the replacement school for another sampled school.**

Please
Note

The following information is provided for information purposes only. Replacement schools are identified as follows. For each sampled school, the schools immediately preceding and following it in Sampling Form 11 are designated as its replacement schools. The school immediately following the sampled school will be labeled "R1" (i.e. first replacement), while the school immediately preceding the sampled school will be labeled "R2" (i.e. second replacement). The ordering of the school sampling frame by the stratification variables and 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. It may be 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, it may only be possible 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.

6.3   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 will be assigned by ACER to all sampled schools and replacement schools and recorded on Sampling Form 11.

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

- Schools will be assigned a two-digit stratum code (corresponding to the explicit strata), and a three-digit school code.

- Sampled schools will be 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 will continue across all implicit strata.

New for PISA 2003
- First replacement schools in the main survey will be assigned the school ID of their corresponding sampled schools, but incremented by 300. For example, the first replacement school for sampled school 023 is assigned school ID 323.

New for PISA 2003
- Second replacement schools in the main survey will be assigned the school ID of their corresponding sampled schools, but incremented by 600. For example, the

second replacement school for sampled school 036 is assigned school ID 636, and the second replacement school for sampled school 112 is assigned school ID 712.

For an especially large school sample, it may not be possible to assign school IDs according to the above rules. In such a case, Westat and ACER will come up with an alternate method of assigning school IDs.

6.4 The School Tracking Form

The School Tracking Form (Sampling Form 12) will be prepared by Westat/ACER and sent back to NPMs with the school sample. The form will help NPMs to monitor the participation status of sampled schools. It contains basic sampling information (stratum (necessary), PISAID (necessary), and national school ID (optional, but desired)) along with the necessary school participation status as described in section 6.4.1. All sampled schools, as well as replacement schools assigned to a sampled school, should be recorded in Sampling Form 12, with sampled schools in the first set of columns denoted by "Original Sample", first replacement schools in the second set of columns denoted by "First Replacement", and second replacement schools in the third set of columns denoted by "Second Replacement". For each set of three schools (original, first replacement, and second replacement), note in the first column of Sampling Form 12 which school participated: "O" if the originally sampled school participated, "R1" if the first replacement participated, "R2" if the second replacement participated, or "None" if none of the three schools participated.

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. Additionally, the school participation status information should also be recorded into KeyQuest.

6.4.1 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. As already noted, sampled schools are listed in the first set of columns of Sampling Form 12.

Once a sampled school's participation has been confirmed, a "P" should be entered in column 5 of the first row. If a sampled school is unwilling or unable to participate, then enter N1 for refusal, or N2 for non-participation due to other reasons. If the sampled school is ineligible, then record an E1 for a school with no age eligible students, E3 for a school closure, and E4 for ineligible for other reasons (this latter must be explained in detail). Furthermore, enter EX for a school that belongs to one of the

school-level exclusion categories recorded on Sampling Form 3 Question 2, or a school where all age-eligible students are otherwise excluded. Note that a school participation status of EX requires the school-level exclusion *type* as indicated on Sampling Form 3 Question 2 to be noted in the Remarks column on Sampling Form 12. Thus, if a sampled school is found to be a school for students with special needs and these schools have been listed as school-level exclusions in Question 2 of Sampling Form 3 on the line beginning with "1-", then the school participation status on Sampling Form 12 will be EX and "EX-1" should be recorded in the Remarks column. If a school in the sample is found to have all age-eligible students otherwise excluded and no specific school-level exclusion of this type has been previously listed on Sampling Form 3 (e.g., a school for the blind or more generally a special education school), then use EX as instructed and give the reason for exclusion in the Remarks column. For this additional exclusion type, include an exclusion type number in the Remarks column, "EX-3" for example, that does not duplicate an exclusion type number already listed in Question 2 of Sampling Form 3. Use the same exclusion type number for sampled schools that are excluded for the same reason. Note also that there is no E2 code as there was in PISA 2000. This school code confused the ideas of ineligible and excluded schools and therefore is replaced for PISA 2003 by the new EX code.

New
for
PISA
2003

6.4.2   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. If the original sampled school is ineligible or is a type of school belonging to defined school level exclusions, do not use any replacement schools for it. Additionally, an original school with any eligible students should not be replaced, even though the number of eligible students might be smaller than expected. As for sampled schools, the participation status of approached replacement schools should be coded as described in section 6.4.1.

Sampling Form 12

NPMs must complete the Sampling Form 12 that was sent with the school sample to keep track of the participation status of all sampled schools and their replacement schools, and must send the completed form to Westat. Countries that conduct their own sampling must create as well as complete the Sampling Form 12 and send the completed form to Westat.

┌───┐
│   │
│   **Check Point 4**   │
│   │
│ **A copy of Sampling Form 12 (the school tracking form) with the school   │
│ participation status codes completed for each sampled original school and │
│ for each replacement school requested to participate must be submitted to │
│ Westat within one month of the end of the data collection period.**   │
│   │
└───┘

CHECKLIST OF SCHOOL SAMPLING ACTIVITIES

Activity	School Sampling Manual Chapter/Section reference	Submit to IPC	Due Date
Specify time of testing and age definition of population to be tested	Chapter 3, Section 1	Sampling Form 1 - Time of Testing and Age Definition	**Submit six months before data collection is to begin.**
Define National Desired Target Population	Chapter 3, Section 2	Sampling Form 2 - National Desired Target Population	**Submit six months before data collection is to begin.**
Define National Defined Target Population	Chapter 3, Section 3	Sampling Form 3 - National Defined Target Population	**Submit six months before data collection is to begin.**
Create and describe sampling frame	Chapter 5, Sections 1-4	Sampling Form 4 - Sampling Frame Description	**Submit five months before data collection is to begin.**
Decide on schools to be excluded from sampling frame	Chapter 3, Section 3.3.2 Chapter 5, Section 5	Sampling Form 5 – Excluded Schools	**Submit five months before data collection is to begin.**
Decide how to treat small schools	Chapter 5, Section 7	Sampling Form 6 – Treatment of Small Schools	Westat and ACER will complete and return this form to the NPM about four months before data collection is to begin.
Decide on explicit and implicit stratification variables	Chapter 5, Section 6	Sampling Form 7 – Stratification	**Submit five months before data collection is to begin.**
Describe population within strata	Chapter 5, Section 9	Sampling Form 8 - Population Counts by Strata	Westat and ACER will complete and return this form to the NPM about three months before data collection is to begin.
Allocate sample over explicit strata	Chapter 5, Section 9	Sampling Form 9 - Sample Allocation by Explicit Strata	Westat and ACER will complete and return this form to the NPM about four months before data collection is to begin.
Select the school sample	Chapter 5, Section 9	Sampling Form 10 - School Sample Selection	Westat and ACER will complete and return this form to the NPM about three months before data collection is to begin.
Identify sampled schools, replacement schools and assign PISA school IDs	Chapter 5, Section 9	Sampling Form 11 - School Sampling Frame	**Submit five months before data collection is to begin.** ACER will return this form to the NPM with sampled schools and their replacement schools identified and with PISA IDs assigned about three months before data collection is to begin.
Create a school tracking form	Chapter 5, Section 9	Sampling Form 12 - School Tracking Form	**Submit within one month of the end of the data collection period.**

APPENDIX A

PISA 2003 Sampling Form 1 (Example) Main Study Time of Testing and Age Definition

See Section 3.1 of School Sampling Preparation Manual.

PISA Participant: **CZECH REPUBLIC**

National Project Manager:

Date this version of this form was completed: **7 October, 2002**

1. Beginning and ending dates of assessment **15 April** 2003 to **15 May** 2003

   The main study testing period must be no more than six weeks long, and between 1 March 2003 and 31 August 2003.

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 January, 1987** and **31 December, 1987**
   D D M M Y Y   D D M M Y Y

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): **Students in grade 12 born in 1985**.

   Relationship to TIMSS Population 2:

   5. Is your country, or any part of your country, a participant in TIMSS 2003 for Population 2?

      ☐ No (You may skip questions 6. and 7. Done.)
      ☒ Yes

   6. Is your institute responsible for conducting TIMSS in your country?

      ☒ Yes
      ☐ No

   New for PISA 2003

   7. Are you concerned about the possible overlap between the TIMSS and PISA main study school samples in 2003? You may choose more than one reply below.

      ☐ No, not concerned because mostly the student populations are in different schools.
      ☐ No, not concerned because we are a big country and very few schools will be in both studies if the two samples are drawn independently.
      ☒ No, not concerned because we think it is acceptable for some schools to be in both studies, and we want the best possible sample for each study.
      ☐ Yes, it is important that as **few** schools as possible be in both studies.
      ☐ Yes, it is important that as **many** schools as possible be in both studies (so that the total number of schools from the two studies is as small as possible).

PISA 2003 Sampling Form 2 (Example)　　　National Desired Target Population

See Section 3.2 of School Sampling Preparation Manual.

PISA Participant:　　　　**CZECH REPUBLIC**

National Project Manager:

Date this version of this form was completed:　　**7 October, 2002**

1.　Total national population of 15-year-olds:　　　　　　　　　　　　[a] **134 627**

New for PISA 2003

    2.1.　Total national population of 15-year-olds enrolled in educational institutions and who are in grades 5 and higher:　　　　[b] **132 508**

    2.2.　Total number of 15-year-olds enrolled in grades 4 and below:　　**None**

3.　If the national desired target population for your country differs from the total national population of enrolled 15-year-olds in grades 5 and higher, describe the population(s) to be omitted from the total national population of enrolled 15-year-olds in grades 5 and higher. These include distinct geographic regions of the country, or specific language groups:
　　None

　Total enrolment omitted from the total national population of enrolled 15-year-olds in grades 5 and higher *(corresponding to the omissions listed above)*:　　[c] **0**

4.　Total enrolment in the national desired target population:　　　　[d] **132 508**
　box [b] - box [c]

5.　Percentage of coverage of nationally enrolled 15-year-olds, in the national desired target population:　　　　[e] **100%**
　(box [d] / box [b]) x 100

6.　Describe your data source *(Provide copies of relevant tables)*:
　　Statistical Yearbook of the Czech Republic 2001
　　Database of Statistical Yearbook (school year 2001/2002)

PISA 2003 Sampling Form 3 (Example)	National Defined Target Population

See Section 3.3 of School Sampling Preparation Manual.

PISA Participant:	**Ireland**

National Project Manager:

Date this version of this form was completed: **7 September, 2002**

1. Total enrolment in the national desired target population:
   From box [d] on Sampling Form 2

   [a] **66 735**

2. School-level exclusions (*see Section 3.3.2*):

Description of exclusions	# of schools	# of students
1- *Special schools for students with special needs*	**145**	**748**
2-		
3-		
4-		
TOTAL	**145**	[b] **748**

   Percentage of students not covered due to school-level exclusions:
   (box [b] / box [a]) x 100

   1.1%

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

   [c] **65 987**

4. Anticipated within-school exclusions (students who could not be included in the PISA assessment, from schools where some students could be included):

Description of exclusions	Expected # of students
Functionally disabled students	**negligible**
Intellectually disabled students	**negligible**
Students with limited proficiency in test language	**negligible**
Other	**none**
TOTAL..	[d] **negligible**

   Expected percentage of students not covered due to within-school exclusions:
   (box [d] / box [a]) x 100

   0 %

5. Total enrolment in national defined target population:
   box [a] – (box [b] + box [d])

   [e]   **65 987**

6. Coverage of national desired target population:
   (box [e] / box [a]) x 100

   [f]   **98.9%**

7. Describe your data source *(Provide copies of relevant tables)*:
     2001/2002Statistical Report of the Department of Education, Dublin: Stationary Office

| **PISA 2003 Sampling Form 4 (Example 1)** | **Sampling Frame Description** |

See Sections 5.2 – 5.4 of School Sampling Preparation Manual.

PISA Participant: **Canada**

National Project Manager:

Date this version of this form was completed: **2 November, 2002**

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.   **2001/2002**

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

PISA 2003 Sampling Form 4 (Example 2)	**Sampling Frame Description**

See Sections 5.2 – 5.4 of School Sampling Preparation Manual.

PISA Participant: **Russia**

National Project Manager:

Date this version of this form was completed: **2 November, 2002**

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: **2000/2001**

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 enrollment as Measure of Size. 40 Regions will be sampled. Sampled Regions will provide lists of schools containing 15-year-old students, along with the enrollment 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

6. Specify the year for which enrolment data will be used for school ENR.   **2001/2002**

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

PISA 2003 Sampling Form 5 (Example)   Excluded Schools

See Section 5.5 of School Sampling Preparation Manual.

PISA Participant: **Ireland**

National Project Manager:

Date this version of this form was completed: **15 October, 2002**

Use additional sheets if necessary

School ID	Reason for exclusion	School ENR
005	*Special school for students with special needs*	*4*
011	Special school for students with special needs	*2*
020	*Special school for students with special needs*	*3*
⋮	⋮	⋮
⋮	⋮	⋮

PISA 2003 Sampling Form 6 (Example)   Treatment of Small Schools

See Section 5.7 of School Sampling Preparation Manual.

PISA Participant: **France**

National Project Manager:

Date this version of this form was completed: **12 November, 2002**

1. Enrolment in small schools:

Type of school based on enrolment	# of schools	# of students	Percentage of total enrolment
Enrolment of 15-year-old students < 18	**1511**	**13718**	[a] **1.9%**
Enrolment of 15-year-old students ≥ 18 and < 35	**2428**	**56959**	[b] **7.8%**
Enrolment of 15-year-old students ≥ 35	**7582**	**662055**	[c] **90.3%**
TOTAL	**11521**	**732732**	100%

2. If the percentage in box [a] is 1 percent or more and the percentage in box [b] is 4 percent or more then 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] >= 1% and box [b] >= 4%?   x 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.

3. If the percentage in box [a] is 1 percent 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] ≥ 1%?   ☐ Yes *or*   ☐ No
                                     ⇓
                                    Form an explicit stratum of very small schools and
                                    record this on Sampling Form 7. Done.

4. If the percentage in box [a] is less than 1%, and the percentage in box [b] is 4 percent or more, 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] < 1% and box [b] >= 4%?   ☐ Yes *or*   ☐ No
                                          ⇓
                                         Form an explicit stratum of small schools including moderately small
                                         schools and very small schools and record this on Sampling Form 7.
                                         Go to 5.

5. **New for PISA 2003**: If the percentage of students in very small schools that have only one or two eligible students, x, 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

   x < 0.5%?   ☐ Yes *or*   ☒ No
                            ⇓ Excluding very small schools   ☐ Yes *or*   ☐ No
                              with only one or two students?

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat,* **—** *Fax:* **+1-301-294-2034**, *E-mail:* KeithRust@Westat.com

PISA 2003 Sampling Form 7 (Example)	Stratification

See Section 5.6 of School Sampling Preparation Manual.

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **7 February, 2002**

Explicit Stratification

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

	Explicit stratification variables	# of levels
1	*6 states and 2 territories*	**8**
2	*Government, Catholic, Independent*	**3**
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.. 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	*Urban/Rural*	**2**
2		
3		
4		
5		

See Section 5.9 of School Sampling Preparation Manual.

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **2 April, 2003**

Use additional sheets if necessary

(1)	(2)	(3)	(4)	(5)
			Population Counts	
		Schools	Students	
Explicit Strata	Implicit Strata		ENR	MOS
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*

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-57

See Section 5.9 and Appendix C Section C.2 of School Sampling Preparation Manual

PISA Participant: **Ireland**

National Project Manager:

Date this version of this form was completed: **12 November, 2002**

Use additional sheets if necessary

(1) Explicit Strata	(2) Stratum ID	(3) % of eligible students in population	(4) No. of schools in population	(5) Sample Allocation Schools	(6) Students	(7) % of eligible students expected in sample
Small School Stratum I	*01*	*0.83*	*41*	*4*	*50*	*0.93*
Small School Stratum II	*02*	*3.43*	*75*	*10*	*200*	*3.73*
Medium School Stratum	*03*	*20.89*	*250*	*32*	*1,120*	*20.89*
Large School Stratum	*04*	*74.84*	*379*	*114*	*3,990*	*74.44*
Total		*100.00*		*160*	*5,360*	

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-58

PISA 2003 Sampling Form 10 (Example 1)   School Sample Selection

See Section 5.9 and Appendix C Section C.4 of School Sampling Preparation Manual

PISA Participant: **Ireland**

National Project Manager:

Date this version of this form was completed: **2 December, 2003**

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*

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-59

See Section 5.9 and Appendix C Section C.4 of School Sampling Preparation Manual

PISA Participant: **Ireland**

National Project Manager:

Date this version of this form was completed: **2 December, 2003**

Explicit Stratum: ***Small School Stratum II***   Stratum ID: ***02***

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

Use additional sheets if necessary

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

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-60

See Section 5.9 and Appendix C Section C.4 of School Sampling Preparation Manual

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 April, 2003**

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*

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-61

See Section 5.9 and Appendix C Section C.4 of School Sampling Preparation Manual

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 April, 2003**

Explicit Stratum: ***Victoria***   Stratum ID: ***02***

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

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-62

See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual.

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed (NPM): **14 February, 2003**

Date this version of this form was completed (ACER): **14 April, 2003**

Explicit Stratum: *Victoria* Stratum ID: *02*

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
0829	*Urban*	*110*	*110*	*110*		
0552	*Urban*	*101*	*101*	*211*		
1802	*Urban*	*98*	*98*	*309*		
1288	*Urban*	*98*	*98*	*407*		
2043	*Urban*	*95*	*95*	*502*		
0974	*Urban*	*94*	*94*	*596*		
1718	*Urban*	*94*	*94*	*690*		
1807	*Urban*	*93*	*93*	*783*		
0457	*Urban*	*93*	*93*	*876*	*R2*	*601*
0244	*Urban*	*93*	*93*	*969*	*S*	*001*
1817	*Urban*	*91*	*91*	*1 060*	*R1*	*301*
1741	*Urban*	*90*	*90*	*1 150*		
1652	*Urban*	*89*	*89*	*1 239*		
0121	*Urban*	*89*	*89*	*1 328*		
0309	*Urban*	*89*	*89*	*1 417*		
0032	*Urban*	*89*	*89*	*1 506*		
0021	*Urban*	*89*	*89*	*1 595*		
0609	*Urban*	*88*	*88*	*1 683*		
0399	*Urban*	*86*	*86*	*1 769*		
0067	*Urban*	*86*	*86*	*1 855*		
0202	*Urban*	*86*	*86*	*1 941*		
0063	*Urban*	*86*	*86*	*2 027*		
1467	*Urban*	*86*	*86*	*2 113*		

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-63

PISA 2003 Sampling Form 11 (Example)   School Sampling Frame

.See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual..

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 February, 2003**

Explicit Stratum: ***Victoria***   Stratum ID: ***02***

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
1381	*Urban*	*86*	*86*	*2 199*		
1043	*Urban*	*84*	*84*	*2 283*		
1318	*Urban*	*84*	*84*	*2 367*	*R2*	*602*
0659	*Urban*	*84*	*84*	*2 451*	*S*	*002*
0612	*Urban*	*83*	*83*	*2 534*	*R1*	*302*
1696	*Urban*	*82*	*82*	*2 616*		
0867	*Urban*	*82*	*82*	*2 698*		
0537	*Urban*	*81*	*81*	*2 779*		
1794	*Urban*	*80*	*80*	*2 859*		
0695	*Urban*	*80*	*80*	*2 939*		
0031	*Urban*	*80*	*80*	*3 019*		
0333	*Urban*	*79*	*79*	*3 098*		
0051	*Urban*	*79*	*79*	*3 177*		
0384	*Urban*	*79*	*79*	*3 256*		
1391	*Urban*	*79*	*79*	*3 335*		
1189	*Urban*	*79*	*79*	*3 414*		
0731	*Urban*	*78*	*78*	*3 492*		
0634	*Urban*	*78*	*78*	*3 570*		
1230	*Urban*	*77*	*77*	*3 647*		
1478	*Urban*	*76*	*76*	*3 723*		
0741	*Urban*	*76*	*76*	*3 799*		
1388	*Urban*	*76*	*76*	*3 875*	*R2*	*603*
2110	*Urban*	*76*	*76*	*3 951*	*S*	*003*

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-64

PISA 2003 Sampling Form 11 (Example)   School Sampling Frame

.See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual.

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 February, 2003**

Explicit Stratum: *Victoria*   Stratum ID: *02*

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
1813	*Urban*	*75*	*75*	*4 026*	*R1*	*303*
0597	*Urban*	*75*	*75*	*4 101*		
0724	*Urban*	*74*	*74*	*4 175*		
1672	*Urban*	*74*	*74*	*4 249*		
1535	*Urban*	*73*	*73*	*4 322*		
1932	*Urban*	*73*	*73*	*4 395*		
2108	*Urban*	*73*	*73*	*4 468*		
1898	*Urban*	*73*	*73*	*4 541*		
0697	*Urban*	*73*	*73*	*4 614*		
0175	*Urban*	*72*	*72*	*4 686*		
1584	*Urban*	*72*	*72*	*4 758*		
0026	*Urban*	*72*	*72*	*4 830*		
0577	*Urban*	*72*	*72*	*4 902*		
1729	*Urban*	*71*	*71*	*4 973*		
0004	*Urban*	*71*	*71*	*5 044*		
1521	*Urban*	*70*	*70*	*5 114*		
0373	*Urban*	*70*	*70*	*5 184*		
1377	*Urban*	*70*	*70*	*5 254*		
0643	*Urban*	*70*	*70*	*5 324*		
2114	*Urban*	*70*	*70*	*5 394*	*R2*	*604*
1079	*Urban*	*70*	*70*	*5 464*	*S*	*004*
1452	*Urban*	*70*	*70*	*5 534*	*R1*	*304*
1168	*Urban*	*70*	*70*	*5 604*		

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-65

.See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual.

PISA Participant:　　　　　　　　　　　**Australia**

National Project Manager:

Date this version of this form was completed:　　**14 February, 2003**

Explicit Stratum:　　　　　***Victoria***　　　　　　　　Stratum ID:　　***02***

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
1591	*Urban*	*69*	*69*	*5 673*		
1309	*Urban*	*69*	*69*	*5 742*		
0661	*Urban*	*69*	*69*	*5 811*		
0017	*Urban*	*69*	*69*	*5 880*		
1174	*Urban*	*69*	*69*	*5 949*		
1983	*Urban*	*69*	*69*	*6 018*		
1766	*Urban*	*69*	*69*	*6 087*		
0236	*Urban*	*69*	*69*	*6 156*		
0412	*Urban*	*68*	*68*	*6 224*		
1032	*Urban*	*68*	*68*	*6 292*		
1676	*Urban*	*68*	*68*	*6 360*		
1030	*Urban*	*68*	*68*	*6 428*		
1085	*Urban*	*68*	*68*	*6 496*		
0158	*Urban*	*67*	*67*	*6 563*		
0834	*Urban*	*67*	*67*	*6 630*		
1135	*Urban*	*67*	*67*	*6 697*		
0154	*Urban*	*67*	*67*	*6 764*		
1279	*Urban*	*67*	*67*	*6 831*		
0504	*Urban*	*67*	*67*	*6 898*	*R2*	*605*
1858	*Urban*	*67*	*67*	*6 965*	*S*	*005*
0084	*Urban*	*67*	*67*	*7 032*	*R1*	*305*
0406	*Urban*	*66*	*66*	*7 098*		
0273	*Urban*	*66*	*66*	*7 164*		

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-66

PISA 2003 Sampling Form 11 (Example)   School Sampling Frame

.See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual.

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 February, 2003**

Explicit Stratum: *Victoria*   Stratum ID: *02*

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
0450	*Urban*	*66*	*66*	*7 230*		
1669	*Urban*	*66*	*66*	*7 296*		
0307	*Urban*	*66*	*66*	*7 362*		
1261	*Urban*	*66*	*66*	*7 428*		
0265	*Urban*	*65*	*65*	*7 493*		
1112	*Urban*	*65*	*65*	*7 558*		
1315	*Urban*	*65*	*65*	*7 623*		
0726	*Urban*	*65*	*65*	*7 688*		
1495	*Urban*	*65*	*65*	*7 753*		
0144	*Urban*	*65*	*65*	*7 818*		
1345	*Urban*	*65*	*65*	*7 883*		
1996	*Urban*	*64*	*64*	*7 947*		
1383	*Urban*	*64*	*64*	*8 011*		
1322	*Urban*	*64*	*64*	*8 075*		
0827	*Urban*	*64*	*64*	*8 139*		
1829	*Urban*	*64*	*64*	*8 203*		
0713	*Urban*	*64*	*64*	*8 267*		
1339	*Urban*	*64*	*64*	*8 331*		
1038	*Urban*	*63*	*63*	*8 394*	*R2*	*606*
0869	*Urban*	*63*	*63*	*8 457*	*S*	*006*
0740	*Urban*	*63*	*63*	*8 520*	*R1*	*306*
1784	*Urban*	*63*	*63*	*8 583*		
1157	*Urban*	*63*	*63*	*8 646*		

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-67

PISA 2003 Sampling Form 11 (Example)   School Sampling Frame

.See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual.

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 February, 2003**

Explicit Stratum: *Victoria*   Stratum ID: *02*

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
0039	*Urban*	*63*	*63*	*8 709*		
1578	*Urban*	*63*	*63*	*8 772*		
0818	*Urban*	*62*	*62*	*8 834*		
1194	*Urban*	*62*	*62*	*8 896*		
1723	*Urban*	*62*	*62*	*8 958*		
0079	*Urban*	*62*	*62*	*9 020*		
0172	*Urban*	*62*	*62*	*9 082*		
0394	*Urban*	*62*	*62*	*9 144*		
0005	*Urban*	*62*	*62*	*9 206*		
1987	*Urban*	*61*	*61*	*9 267*		
1017	*Urban*	*61*	*61*	*9 328*		
1355	*Urban*	*61*	*61*	*9 389*		
1018	*Urban*	*61*	*61*	*9 450*		
1680	*Urban*	*61*	*61*	*9 511*		
1547	*Urban*	*60*	*60*	*9 571*		
1707	*Urban*	*60*	*60*	*9 631*		
0095	*Urban*	*60*	*60*	*9 691*		
0012	*Urban*	*60*	*60*	*9 751*		
1730	*Urban*	*60*	*60*	*9 811*		
1726	*Urban*	*60*	*60*	*9 871*	*R2*	*607*
0542	*Urban*	*60*	*60*	*9 931*	*S*	*007*
0033	*Urban*	*60*	*60*	*9 991*	*R1*	*307*
0326	*Urban*	*60*	*60*	*10 051*		

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-68

.See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual.

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 February, 2003**

Explicit Stratum: ***Victoria***　　　　　　　　　　Stratum ID: ***02***

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
0887	*Urban*	*60*	*60*	*10 111*		
0925	*Urban*	*59*	*59*	*10 170*		
0686	*Urban*	*59*	*59*	*10 229*		
0291	*Urban*	*59*	*59*	*10 288*		
1500	*Urban*	*59*	*59*	*10 347*		
1664	*Urban*	*59*	*59*	*10 406*		
1418	*Urban*	*59*	*59*	*10 465*		
1191	*Urban*	*59*	*59*	*10 524*		
1608	*Urban*	*59*	*59*	*10 583*		
0747	*Urban*	*59*	*59*	*10 642*		
1240	*Urban*	*58*	*58*	*10 700*		
0052	*Urban*	*58*	*58*	*10 758*		
1658	*Urban*	*58*	*58*	*10 816*		
2070	*Urban*	*58*	*58*	*10 874*		
0857	*Urban*	*58*	*58*	*10 932*		
0472	*Urban*	*58*	*58*	*10 990*		
0098	*Urban*	*58*	*58*	*11 048*		
0349	*Urban*	*58*	*58*	*11 106*		
1733	*Urban*	*58*	*58*	*11 164*		
1243	*Urban*	*58*	*58*	*11 222*		
0372	*Urban*	*58*	*58*	*11 280*		
1172	*Urban*	*58*	*58*	*11 338*	*R2*	*608*
0167	*Urban*	*57*	*57*	*11 395*	*S*	*008*

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-69

PISA 2003 Sampling Form 11 (Example)   School Sampling Frame

.See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual..

PISA Participant: **Australia**

National Project Manager:

Date this version of this form was completed: **14 February, 2003**

Explicit Stratum: ***Victoria***   Stratum ID: ***02***

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID
1346	*Urban*	*57*	*57*	*11 452*	*R1*	*308*
1639	*Urban*	*57*	*57*	*11 509*		
1732	*Urban*	*57*	*57*	*11 566*		
0380	*Urban*	*57*	*57*	*11 623*		
0986	*Urban*	*57*	*57*	*11 680*		
1372	*Urban*	*56*	*56*	*11 736*		
1458	*Urban*	*56*	*56*	*11 792*		
1259	*Urban*	*56*	*56*	*11 848*		
1008	*Rural*	*56*	*56*	*11 904*		
1087	*Rural*	*60*	*60*	*11 964*		
0162	*Rural*	*64*	*64*	*12 028*		
0717	*Rural*	*65*	*65*	*12 093*		
0047	*Rural*	*66*	*66*	*12 159*		
0718	*Rural*	*70*	*70*	*12 229*		
0567	*Rural*	*93*	*93*	*12 322*		
1041	*Rural*	*150*	*150*	*12 472*		
1286	*Rural*	*165*	*165*	*12 637*		
0617	*Rural*	*170*	*170*	*12 807*	*R2*	*609*
2053	*Rural*	*170*	*170*	*12 977*	*S*	*009*
0328	*Rural*	*170*	*170*	*13 147*	*R1*	*309*
1013	*Rural*	*190*	*190*	*13 337*		
1781	*Rural*	*200*	*200*	*13 537*		
0135	*Rural*	*255*	*255*	*13 792*		
...	*...*	*...*	*...*	*...*	*...*	*...*

Please return form with completed columns 1-5 to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com **If a country selects its own sample, please return form with completed columns 1-7 to:** *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

A-70

PISA 2003 Sampling Form 12 (Example)   School Tracking Form

See Section 6.4 of School Sampling Preparation Manual

PISA Participant: **Ireland**

National Project Manager:

Date this version of this form was completed: **15 May, 2003**

Country:													
Participant	**Original Sample**				**First Replacement**				**Second Replacement**				
Sample Status	**Stratum**	**PISA ID**	**School ID**	**Participation Status**	**Stratum**	**PISA ID**	**School ID**	**Participation Status**	**Stratum**	**PISA ID**	**School ID**	**Participation Status**	**Remarks**
R1	01	001	W4627	**N1**	01	301	S4598	**P**	01	601	K4433		
O	01	002	A3971	**P**	01	302	K8324		01	602	X3409		
O	01	003	T7834	**P**	01	303	R6194		01	603	F2111		
O	01	004	R5610	**P**	01	304	G8103		01	604	D4398		
None	01	005	U8320	**N1**	01	305	M8215	**E1**	01	605	F6290	**N1**	
O	01	006	G6784	**P**	01	306	K8111		01	606	J8743		
O	01	007	A2239	**P**	01	307	F5550		01	607	K9911		
None	01	008	K0098	**N2**	01	308	V6723		01	608	M8754		Completed test booklets never received
None	01	009	L9823	**E3**	01	309	P0098		01	609	B5600		
R2	01	010	Q3498	**N1**	01	310	D3495	**N2**	01	610	F0088	**P**	R1 failed to reply in time
O	01	011	W9221	**P**	01	311	S3337		01	611	V6021		
None	01	012	H6510	**N1**	01	312	A2008	**N1**					No schools available for 2nd replacement
O	01	013	J7622	**P**	01	313	Z3087		01	613	K0189		
None	01	014	K1784	**EX**	01	314	L0012		01	614	A2233		EX-1 [school for students with special needs]

Please return completed form with completed to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

APPENDIX B

PISA 2003 Sampling Form 1	Main Study Time of Testing and Age Definition

See Section 3.1 of School Sampling Preparation Manual.

PISA Participant:
_____

National Project Manager:
_____

Date this version of this form was completed:
_____

1. Beginning and ending dates of assessment   _____2003_   to _____2003_____

    The main study testing period must be no more than six weeks long, and between 1 March 2003 and 31 August 2003.

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 _____ and _____
                                                        D D M M Y Y   D D M M Y Y

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): _____

Relationship to TIMSS Population 2:

5. Is your country, or any part of your country, a participant in TIMSS 2003 for Population 2?

    ☐ No (You may skip questions 6. and 7. Done.)
    ☐ Yes

6. Is your institute responsible for conducting TIMSS in your country?

    ☐ Yes
    ☐ No

New for PISA 2003

7. Are you concerned about the possible overlap between the TIMSS and PISA main study school samples in 2003? You may choose more than one reply below.

    ☐ No, not concerned because mostly the student populations are in different schools.
    ☐ No, not concerned because we are a big country and very few schools will be in both studies if the two samples are drawn independently.
    ☐ No, not concerned because we think it is acceptable for some schools to be in both studies, and we want the best possible sample for each study.
    ☐ Yes, it is important that as **few** schools as possible be in both studies.
    ☐ Yes, it is important that as **many** schools as possible be in both studies (so that the total number of schools from the two studies is as small as possible).

See Section 3.2 of School Sampling Preparation Manual.

PISA Participant: _____

National Project Manager: _____

Date this version of this form was completed: _____

1. Total national population of 15-year-olds: [a] _____

New for PISA 2003

2.1. Total national population of 15-year-olds enrolled in educational institutions and who are in grades 5 and higher: [b] _____

2.2. Total number of 15-year-olds enrolled in grades 4 and below: _____

3. If the national desired target population for your country differs from the total national population of enrolled 15-year-olds in grades 5 and higher, describe the population(s) to be omitted from the total national population of enrolled 15-year-olds in grades 5 and higher. These include distinct geographic regions of the country, or specific language groups:

    _____

    _____

    Total enrolment omitted from the total national population of enrolled 15-year-olds in grades 5 and higher *(corresponding to the omissions listed above)*:   [c] _____

4. Total enrolment in the national desired target population: [d] _____
    box [b] - box [c]

5. Percentage of coverage of nationally enrolled 15-year-olds, in the national desired target population: [e] _____
    (box [d] / box [b]) x 100

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

    _____

    _____

See Section 3.3 of School Sampling Preparation Manual.

PISA Participant: _____

National Project Manager: _____

Date this version of this form was completed: _____

1.   Total enrolment in the national desired target population: [a]
     From box [d] on Sampling Form 2

2.   School-level exclusions (see Section 3.3.2):

Description of exclusions	# of schools	# of students
1 -		
2 -		
3 -		
4 -		
TOTAL		[b]

     Percentage of students not covered due to school-level exclusions: %
     (box [b] / box [a]) x 100

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

4.   Anticipated within-school exclusions (students who could not be included in the PISA assessment, from
     schools where some students could be included):

Description of exclusions	Expected # of students
Functionally disabled students	
Intellectually disabled students	
Students with limited proficiency in test language	
Other	
TOTAL..	[d]

     Expected percentage of students not covered due to within-school exclusions: %
     (box [d] / box [a]) x 100

5.   Total enrolment in national defined target population: [e]
     box [a] – (box [b] + box [d])

6.   Coverage of national desired target population: [f]
     (box [e] / box [a]) x 100

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

Please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

See Sections 5.2 – 5.4 of School Sampling Preparation Manual.

PISA Participant: _____

National Project Manager: _____

Date this version of this form was completed: _____

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. _____

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

    _____

PISA 2003 Sampling Form 5

<div align="right">

Excluded Schools

</div>

See Section 5.5 of School Sampling Preparation Manual.

PISA Participant: _____

National Project Manager: _____

Date this version of this form was completed: _____

Use additional sheets if necessary

School ID	Reason for exclusion	School ENR

See Section 5.7 of School Sampling Preparation Manual.

PISA Participant: _____

National Project Manager: _____

Date this version of this form was completed: _____

1.   Enrolment in small schools:

Type of school based on enrolment	# of schools	# of students	Percentage of total enrolment
Enrolment of 15-year-old students < 18			[a]
Enrolment of 15-year-old students ≥ 18 and < 35			[b]
Enrolment of 15-year-old students ≥ 35			[c]
TOTAL..			100%

2.   If the the percentage in box [a] is 1 percent or more and the percentage in box [b] is 4 percent or more, then 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] >= 1% and box [b] >= 4%?   ☐ 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.

3.   If 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] ≥ 1%?   ☐ Yes *or*   ☐ No
         ⇓
         Form an explicit stratum of very small schools and record this on Sampling Form 7. Done.

4.   If the percentage in box [a] is less than 1 percent and the percentage in box [b] is 4 percent or more, 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] < 1% and box [b] >= 4%?   ☐ Yes *or*   ☐ No
         ⇓
         Form an explicit stratum of small schools including moderately small schools and very small schools and record this on Sampling Form 7. Go to 5.

5.   **New for PISA 2003**: If the percentage of students in very small schools that have only one or two eligible students, x, 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

     x < 0.5%?   ☐ Yes *or*   ☐ No
         ⇓ Excluding very small schools   ☐ Yes *or*   ☐ No
           with only one or two students?

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

B-80

See Section 5.6 of School Sampling Preparation Manual.

PISA Participant:

National Project Manager:

Date this version of this form was completed:

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.. 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		

See Section 5.9 of School Sampling Preparation Manual.

PISA Participant: _____

National Project Manager: _____

Date this version of this form was completed: _____

Use additional sheets if necessary

(1) Explicit Strata	(2) Implicit Strata	(3) Schools	(4) Population Counts Students ENR	(5) MOS

This form will be returned to the NPM. If a country selects its own sample, please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

See Section 5.9 and Appendix C Section C.2 of School Sampling Preparation Manual

PISA Participant:

National Project Manager:

Date this version of this form was completed:

Use additional sheets if necessary

(1) Explicit Strata	(2) Stratum ID	(3) % of eligible students in population	(4) No. of schools in population	(5) Sample Allocation Schools	(6) Students	(7) % of eligible students expected in sample

PISA 2003 Sampling Form 10

School Sample Selection

See Section 5.9 and Appendix C Section C.4 of School Sampling Preparation Manual

PISA Participant:

National Project Manager:

Date this version of this form was completed:

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

PISA 2003 Sampling Form 11   School Sampling Frame

See Chapter 5 and Appendix C Sections C.5 and C.6 of the School Sampling Preparation Manual.

PISA Participant:

National Project Manager:

Date this version of this form was completed:

Explicit Stratum: Stratum ID:

Use additional sheets if necessary

(1) School List ID	(2) Implicit Stratum	(3) ENR	(4) MOS	(5) Cumulative MOS	(6) Sample Status	(7) PISA School ID

See Section 6.4 of School Sampling Preparation Manual

PISA Participant: _____

National Project Manager: _____

Date this version of this form was completed: _____

Country:															
Participant	**Original Sample**				**First Replacement**				**Second Replacement**				
Sample	Stratum	PISA	School	Participation	Stratum	PISA	School	Participation	Stratum	PISA	School	Participation	
Status		ID	ID	Status		ID	ID	Status		ID	ID	Status	**Remarks**

Please return completed form to: *Keith Rust, at Westat, — Fax: +1-301-294-2034, E-mail:* KeithRust@Westat.com

APPENDIX C

C.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.

C.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 so that the percentage of students in the sample in each stratum is approximately the same as the percentage of students in the population in each stratum. The possibility exists that there may be some schools having a value of zero for the ENR value. Such schools are retained on the frame because they may have 15-year-old students during the testing

New for PISA 2003

period. For such schools, change the ENR value to a value of one and communicate this change to Westat. The value of one should be counted towards the stratum student population percentage. 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

Please Note

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. Countries wishing to explore this option must have their sample allocation approved by Westat.

–   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 one or more explicit strata of small schools are 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 - Example

The example depicted in Appendix A involves fictitious information for Ireland's 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.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

C.3   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 original sample. This could increase nonresponse bias though, since replacement

schools will not be as similar as possible to their originally sampled nonparticipating schools. Additionally, not sorting by the implicit stratifiers may increase unnecessarily the sampling variances of estimates obtained from the assessments, as the implicit stratification is implemented via this sort process.

On Sampling Form 7, 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 urbanization (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 urbanization and school type, the cross–classification will yield a maximum of four cells (2×2=4): rural-public, rural-private, urban-public, and urban-private. If private schools are only found in urban centers, then the rural-private cell will be empty, and there would only be three implicit strata.

Please Note ⊳ Within each implicit stratum, the schools must be sorted by their enrollment (ENR) - <u>NOT their MOS values</u>. 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-Private	High to Low
4. Urban-Public	Low to High

New for PISA 2003

C.4 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.

C.4.1 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.

C.4.2　　　　　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.

C.4.3　　　　　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 summarize the calculation of selection numbers, the first selection number in an explicit stratum is RN×I. The second selection number is (RN×I)+I. The third selection number is (RN×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 – examples for each of two explicit strata from an earlier fictitious example using Ireland, and a third example based on a fictitious scenario for one of Australia's four explicit strata also from a previous example.

Ireland's first explicit stratum consists of extremely small schools. Since the ENR for each of these schools is less than the TCS of 35, 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 x 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, 358.7500, 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. The total measure of size is 75 x 35=2625 from 75 schools, and an allocated sample size of 10.

In the third example in Appendix A, 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.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

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

C.5   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 1-5 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 "S" for each sampled school in column 6 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.

C.6   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 minimize the potential for bias. The technique of identifying replacements should lead to less nonresponse bias than the alternative of drawing a larger sample initially, in anticipation of nonresponse. Each sampled school in the main survey will be assigned two

Please Note ▷ 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 an S in column 6 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" (i.e. first replacement), while the school immediately preceding the sampled school should be labeled "R2" (i.e. second replacement), in column 6 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.

C.7   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 7 on Sampling Form 11.**

Please Note

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.

New for PISA 2003

–   First replacement schools in the main survey are assigned the school ID of their corresponding sampled schools, but incremented by 300. For example, the first replacement school for sampled school 023 is assigned school ID 323.

New for PISA 2003

–   Second replacement schools in the main survey are assigned the school ID of their corresponding sampled schools, but incremented by 600. For example, the second replacement school for sampled school 136 is assigned school ID 736.

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.

<div style="border:1px solid black; padding:10px;">

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 recognizing schools which are sampled. It is also how we will identify replacement schools from sampled schools.

</div>

<div style="border:1px solid black; padding:10px;">

Sampling Form 11 – Example

Appendix A 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 show the first nine 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.

New for PISA 2003, the date this version of the sampling form was completed is recorded on the line beneath the NPM's name.

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

</div>

<div style="border:1px solid black; padding:10px;">

Check Point

Sampling Form 11 must be submitted to Westat three months before the before the start of data collection for those countries selecting their own samples.

</div>