MAIN SURVEY SCHOOL SAMPLING PREPARATION MANUAL

Overview

Doc.:
CY7_1702_SMP_MSSchoolSamplingPreparationManualOverview_1.docx

February 2017

Produced by Westat, Core C Contractor

TABLE OF CONTENTS

CHAPTERS

MAIN SURVEY SCHOOL SAMPLING PREPARATION - OVERVIEW

1. INTRODUCTION

This document provides **the overview** of the submission and background of sampling and population information required prior to and shortly after the PISA 2018 Main Survey (MS).

1.1. A Note about Changes from PISA 2015

Where chapters and appendices were contained within a single document for PISA 2015, these have been divided into separate documents for PISA 2018 for easier reading and faster reference for specific sampling tasks. As a whole though, and taken together, these are called the MS School Sampling Preparation Manual. The separate documents, together making up the full manual, follow. The remainder of this document has overview information.

MS School Sampling Preparation Manual - Overview

MS School Sampling Preparation Manual - Sampling Task 7AB

MS School Sampling Preparation Manual - Sampling Task 8A

MS School Sampling Preparation Manual - Sampling Task 8B

MS School Sampling Preparation Manual - Sampling Tasks 9-11

MS School Sampling Preparation Manual - Sampling Task 12

Where a change of consequence has been made from the 2015 manual, this is noted in the margin as “New for 2018”. Major differences between the FT and the MS, e.g., the treatment of small schools, are also highlighted in the margins.

1.2. A Note about Versions

Before the PISA MS is completed, there may be two or more versions produced for any part of this manual. The expected difference between versions is that later versions will include additional material to help inform NPMs about the sampling-related activities 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, NPMs 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 each manual with a new version when it is released, and **be sure that you are using the latest version of each manual at all times**.

1.3. A Note about Appendices

The MS School Sampling Preparation Manual documents generally limit non-Appendix sections to what needs to be done, how it needs to be done, when it needs to be done, and some overview material.

Countries participating in the Financial Literacy (FL) Option or the Teacher Questionnaire (TQ) Option, can read in Appendix A of this Overview document about how Westat, Core C will deal with these for MS school sampling.

Countries indicating in their PISA 2018 (approved) Sampling Plan (SP) on the Portal, that they desire school sample overlap control with another international survey can read about how Core C will accomplish this in Appendix B.

Countries selecting a grade-based sample or a sample of other national option non-PISA students can find discussion about how this will be accomplished in Appendix C.

Aside from these, additional appendices in this Overview document are:

Appendix D, about area-level sampling frames;
Appendix E, regarding how we try to define a school, and why; and
Appendix F, acronyms and abbreviations.

The appendices in the other documents which together comprise the MS School Sampling Preparation Manual include Appendix A in *CY7_1702_SMP_MSSchoolSamplingPreparationManual - SamplingTasks9-11* which contains information about the PISA 2018 treatment of small schools during MS school sampling. This should be reviewed since small schools affect most countries.

Since Core C selects the MS school sample, details about school sample selection can be found in Appendix B of the same *CY7_1702_SMP_MSSchoolSamplingPreparationManual - SamplingTasks9-11* document. Particular areas in Appendix B that should be reviewed are sections B.9 and B.10 so that replacement schools can be better understood.

Examples of completed sampling task forms can be found in the Appendix section of each MS School Sampling Preparation sampling task document.

Additionally, there is an Appendix in the ST7AB document which shows PISA weighted estimates of within-school exclusion categories for countries who participated in a previous PISA MS. These weighted estimates are from whichever PISA cycle was the most recent for the country participation and should only be used for sampling form ST7B within-school exclusions **IF** there are no national data available that are more current.

1.4. Relationship of Field Trial Sampling Procedures to Main Survey Sampling Procedures

It is very important to note the similarities and differences between the sampling procedures for the FT and the MS, because while some aspects are very similar between the two, others are

very different. Simply following the FT procedures on a larger scale for the MS will, in most cases, result in a MS sample that is completely unacceptable.

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

The reasons for the differences between the FT and the MS are that the two components have very different purposes. Recall the FT had three main purposes:

- To collect data to ensure that the instruments developed for the MS contain test and questionnaire items that are sound in all countries and that they are properly translated;
- To test the operational procedures for sampling students and conducting assessments within schools; and
- To study multistage adaptive testing, and in particular the effect of item ordering, for PISA assessment tasks (CBA-only).

New for 2018

The MS, on the other hand, has the purpose of obtaining a data file that will permit analyses which give valid statistical inferences about the PISA student population, and the characteristics of the schools that they are in. Countries will obtain data that will be comparable with all other countries participating in PISA. To provide valid and comparable estimates of student achievement and characteristics, the sample of students needs to be selected using established and professionally recognised principles of scientific sampling, in a way that represents the full population of PISA-eligible students. These purposes impose more rigorous requirements on the sampling procedures than those used in the FT. In particular, the development of a complete and up-to-date list of schools, and sampling from this list, requires much more care and preparation for the MS than was necessary for the FT. In addition, a larger sample of schools is required at the MS stage.

The Table below summarizes the main differences between the FT and the MS.

	FT	MS
Adaptive Testing **Stud**y	Yes	No
Small schools Included	No	**YES!**
School Sampling method	Convenience, by National Center	Probabilistic, by Core C
Assessment rates vs. response rates	assessment rate important	response rate and assessment rates important
Exclusion rate	limits not applied	no more than 5%
Weighting/ Extrapolation of results	No	Yes

1.5. The Responsibilities of National Project Managers (NPMs) and Core C in Sampling Schools

NPMs are responsible for the following tasks. Some of these have already been done at the FT stage but now need to be updated for the MS.

- 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[1].
- Determining the 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.
- Identifying, **at least three months before the time of MS school sample delivery**, any changes to national options that could have an impact on sampling. Such changes could be to those currently specified in the Sampling Plan file, or may include something not previously discussed.
- Determining the sample sizes of schools and students that are needed, in conjunction with Westat and ACER, to satisfy international PISA requirements and any additional national requirements.
- Re-examining the already proposed stratification variables on the CW ST2 for the schools on the sampling frame, and ensuring that these variables are present and correct for all schools.
- Submitting the school sampling frame and other sampling forms to the PISA Portal so that Core C can select the school sample. Detailed instructions for these MS sampling tasks may be found in their related documents (e.g., *CY7_1702_SMP_MSSchoolSamplingPreparationManual_ST7AB).*
- Maintaining accurate records as to which sampled schools participate in PISA, the reason for each school that does not participate, and the use of replacement schools in the sample where appropriate.

Core C is responsible for the following tasks:

- Checking, from the FT stage, 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.

[1] Westat, Core C will ask NPMs to review updated CW ST1 population birth dates and test dates for an MS version of the IPT data sheet, and to request corrections if necessary. Recall that the test **period** is the 56 (42 for PBA) consecutive days that countries have chosen for testing. The test window is the 3 month duration for which a set of population birthdates is valid for testing. The test **period** will always be contained *within* the test window.

- Assisting each country in determining the sample size and stratification that will meet both PISA and national objectives.
- Selecting the school sample and returning it to the NPM, with documentation.
- Developing school and student sampling and replicate 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.

1.6. The Main Purpose of this Manual

The prime purpose of the manual is to provide instructions for completing the necessary school sampling tasks for the MS. For some aspects the manual may document, usually in an appendix, the reason for certain procedures and requirements. This is not the primary purpose of the manual however, and NPMs may need to consult other PISA documents (such as minutes of various meetings, the Standards, etc.) if they wish to understand in detail the purpose of a particular requirement.

As noted, this school sampling preparation manual overview and the various parts of the manual provides the mechanism by which Core C informs NPMs what they need to do to carry out their responsibilities. MS Sampling Task information will be collected via the PISA Portal website (http://pisa.ets.org/portal/) as for the FT. The Excel files for each MS sampling task (ST7A/B, ST8A, and ST8B) will be located on the Portal for each country.

CY7_1702_SMP_MSSamplingTask7AB_CCC_1.xlsx

CY7_1702_SMP_MSSamplingTask8A_CCC_1.xlsx

CY7_1702_SMP_MSSamplingTask8B_CCC_1.xlsx

As for the FT, these files are to be downloaded, filled in and your completed form uploaded back to your country folder. We have the following guidelines:

1. Download the file from the Portal to your computer.
2. Fill in all required information. After the first version, all changes should be made in red font.

New for 2018

3. Save the updated file using the same file name.
4. Upload the updated file back to the Portal using the same file name. After the first version, add a brief comment describing the changes since the previous version.
5. Select “Finish Task” to complete the task submission.

Core C will use the submitted information to carry out their responsibilities for monitoring and quality assurance, school sample selection, and later weighting. Note that although ACER will select the school samples, **all school sampling enquiries should be directed to Westat, Core C**.

As will be explained in the task-specific documents, each sampling task form ST7A/B, ST8A, and ST8B need to be prepared by the NPM and sent to Core C via the PISA Portal for review. Sampling task forms ST9, ST10A, ST10B, and ST11 will be first prepared by Core C and sent to the NPM for review, possibly also via the PISA Portal. ST12, data submission to Westat, Core C needs to be submitted by the NPM as described in the Within-School Sampling Manual (WSSM) after data collection is complete.

The data from these forms will be used in assessing the quality of the PISA data, and therefore need to be as accurate as possible.

1.7. A Note about the MS Sampling Task Schedule

Different from the FT

The MS sampling task forms do not have scheduled "A" or "B" submission dates as was done for some of the FT sampling form submissions. Following the completion of discussion about the FT sampling forms, a proposed schedule for submitting the MS sampling forms, linked to the proposed MS testing dates, was negotiated with each national centre.

To meet all MS sample delivery dates, the information collected through the MS sampling task forms must be received by the due date of the negotiated sampling schedule. Late submissions of the set of sampling task forms (ST7A, ST7B, ST8A, and ST8B), or any part thereof, or poor quality completed forms, or non-prompt communication, means that the negotiated delivery date cannot be guaranteed. With any late submissions, you should expect the delivery date to be extended by one day for each day the submission is delayed. Similarly, if the sampling frame (ST8B) is of poor quality and it takes x days to improve it, x days will be added to the delivery date.

If any changes are required to the negotiated schedule, please inform Westat, Core C as soon as possible to assist with resource planning.

2. SUMMARY OF NPM SCHOOL SAMPLING MAIN TASKS

NPMs are expected to complete the following main tasks:

- Meet with Westat, Core C personnel at the October/November 2017 NPM meeting as needed or as requested;
- Attend any available KeyQuest (KQ) training session at the NPM and/or coder training meetings especially if a country or NPM is new and/or chooses to participate in optional components;
- Identify early to Westat, Core C any not-yet-discussed possible oversampling or other national options that could affect sampling;
- Review MS test and population dates (ST1) and update as needed;
- Submit, via sampling forms, MS sampling information on population size, and exclusions;
- Submit, via sampling forms, excluded schools and sampling frame;
- Finalise sample size requirements with Westat, Core C and check school frame processing;
- Receive and confirm receipt of the MS school sample, and check the sample;
- Review and approve the ST11/SFKQ;
- Collect and verify student lists;
- Review the KQ functions and operations required for within-school sampling, and implement within-school sampling;
- Submit as part of the ST12 data submission, school participation information and validity checks to Westat, Core C.

3. TIMELINE

Note: The numbering of sampling tasks for the MS starts from Sampling Task Seven, as a continuation of the sampling tasks from the FT. This is done because some FT forms (e.g. Sampling Task 1 and Sampling Task 2), as cycle-wide forms, collected information for both the FT and the MS and may also be referenced during the MS.

October 30 – November 3, 2017 (tentative) - At the NPM meeting you should meet with Core C sampling personnel as recommended or desired. You should also attend any available KeyQuest training especially if you are a new country or NPM and/or participate in any optional components.

Due three months before the negotiated MS school sample delivery date, you should let Westat, Core C know, via email, of any planned oversampling or other national options that could impact sampling, and that have not already been discussed with Westat, Core C or noted on the Approved Sampling Plan on the Portal. If your national option is not finalised by the time the MS school sample should be selected, **the standard MS school sample will be selected for PISA to meet the negotiated delivery date.** If the national option is later finalised and more sampling needs to be done by Core C, a new delivery date will be negotiated, and additional sampling costs may be incurred.

Also at this time, you will be asked to review your Sampling Task 1 MS test and population dates.

Due two months before the negotiated MS school sample delivery date you should complete the following sampling tasks:

> ***Sampling Task Seven A (ST7A)*** - you should submit MS sampling information on the initial (desired) target population;
> ***Sampling Task Seven B (ST7B)*** - you should submit MS sampling information on the final (defined) target population;
> ***Sampling Task Eight A (ST8A)*** - you should submit the description of the MS school sampling frame;
> ***Sampling Task Eight B (ST8B)*** - you should submit the MS school sampling frame and excluded schools.

By one month before the negotiated MS school sample delivery date (Sampling Task Nine (ST9)): you should receive your sample allocation and Small Schools Analysis from Westat, Core C. Set aside adequate time to check frame processing and to finalise sample size requirements with Westat, Core C.

At the negotiated MS school sample delivery date (Sampling Task Ten (ST10A and ST10B)), you should receive your MS school sample from Westat, Core C. You should confirm your receipt of the sample and should also check the sample to ensure you have a clear understanding of the various files you received. You should ask any questions that you have about the sample at this time.

Due one month after the negotiated MS school sample delivery date (Sampling Task Eleven (ST11)), you should review and agree to the ST11 which will become SFKQ for the MS. This form must be agreed prior to within-school sampling[2] with KQ.

About eight weeks prior to the first testing date, you should prepare for and collect the student (and teacher, if applicable) listings. You should also review the KQ functions and operations required for within-school sampling; and implement the within-school sampling in KQ once the lists are received and verified.

Due one month after the end of the data collection period (Sampling Task Twelve (ST12)), you should submit school and student participation information and validity checks to Westat, Core C - **reminder or not**.

[2] In addition, your manuals must have been verified. Refer to the Within-School Sampling Manual (WSSM).

4. MAIN SURVEY SAMPLING AND PISA STANDARDS

4.1. Target Population and Sampling

A number of definitions and standards are listed in the Technical Standards for PISA 2018 (*CY7_GEN_PISA2018TechnicalStandards_Approved_1.pdf*). Meeting the standards specified in this section will ensure that the students tested come from a comparable target population in every country, and are in an equivalent age range. Thus the results obtained will not be confounded by potential age effects. Furthermore, to be able to draw conclusions that are valid for the entire population of PISA students, a representative sample needs to be selected for participation in the test. The size of this representative sample should not be too small, in order to achieve a certain precision of measurement in all countries. For this reason, minimum numbers of participating students and schools are specified.

Standard 1.1 The *PISA Desired Target Population* is *agreed upon* through negotiation between the National Project Manager and the international contractors within the constraints imposed by the definition of the *PISA Target Population*.

Standard 1.2 Unless *otherwise agreed upon* only *PISA-Eligible students* participate in the test.

Standard 1.3 Unless *otherwise agreed upon,* the *testing period*:

- is no longer than eight consecutive weeks in duration for computer-based testing participants,
- is no longer than six consecutive weeks in duration for paper-based testing participants,
- does not coincide with the first six weeks of the academic year, and
- begins exactly three years from the beginning of the *testing period* in the previous PISA cycle

Standard 1.4 Schools are sampled using *agreed upon*, established and professionally recognised principles of scientific sampling.

Standard 1.5 Student lists should not be collected more than 8 weeks prior to the start of data collection, unless otherwise *agreed upon*.

Standard 1.6 Students are sampled using *agreed upon*, established and professionally recognised principles of scientific sampling and in a way that represents the full population of *PISA-Eligible students*.

Standard 1.7 The *PISA Defined Target Population* covers 95% or more of the *PISA Desired Target Population*. That is, *school-level exclusions* and *within-school exclusions* combined do not exceed 5%.

Standard 1.8 The student sample size for the **computer-based mode** is a minimum of 6300 assessed students, and 2100 for *additional adjudicated entities*, or the entire *PISA Defined Target Population* where the *PISA Defined Target Population* is below 6300 and 2100 respectively. The student sample size of assessed students for the **paper-based mode** is a minimum of 5250.

Standard 1.9 The school sample size needs to result in a minimum of 150 participating schools, and 50 participating schools for *additional adjudicated entities*, or all schools that have students in the *PISA Defined Target Population* where the number of schools with students in the *PISA Defined Target Population* is below 150 and 50 respectively. Countries not having at least 150 schools, but which have more students than the required minimum student sample size, can be permitted, *if agreed upon* , to take a smaller sample of schools while still ensuring enough sampled PISA students overall.

Standard 1.10 The final weighted school response rate is at least 85% of sampled eligible and non-excluded schools. If a response rate is below 85% then an acceptable response rate can still be achieved through *agreed upon* use of replacement schools.

Standard 1.11 The final weighted student response rate is at least 80% of all sampled students across responding schools.

Standard 1.12 The final weighted sampling unit response rate for any optional cognitive assessment is at least 80% of all sampled students across responding schools.

Standard 1.13 Unless *otherwise agreed upon*, the international contractors will draw the school sample for the Main Survey.

Standard 1.14 Unless *otherwise agreed upon*, the National Centre will use KeyQuest to draw the student sample, using the list of eligible students provided for each school.

Note 1.1 Standards 1.1 through 1.14 apply to the Main Survey but not the Field Trial.

Note 1.2 Data from schools where the student response rate is greater than 25% will be included in the PISA dataset.

Note 1.3 For the purpose of calculating school response rates, a participating school is defined as a sampled school in which more than 50% of sampled eligible, non-excluded students respond.

Note 1.4 Acceptable response rates obtained through the use of replacement schools are described in detail in the School Sampling Preparation Manual.

Note 1.5:

Guidelines for acceptable exclusions that do not affect standard adherence, are as follows:

- School level exclusions that are exclusions due to geographical inaccessibility, extremely small school size, administration of PISA would be not feasible within the school, and other agreed upon reasons and whose students total to less than 0.5 % of the PISA Desired Target Population,
- School level exclusions that are due to a school containing only students that would be within-school exclusions and that total to less than 2.0 % of the PISA Desired Target Population, and
- Within-school exclusions that total to less than 2.5 % of the PISA Desired Target Population – these exclusions could include, for example, students not able to do the test because of a functional disability.

- Note 1.6 Principles of scientific sampling include, but are not limited to:

- The identification of appropriate stratification variables to reduce sampling variance and facilitate the computation of non-response adjustments.
- The incorporation of an agreed target cluster size of PISA-Eligible students: The minimum acceptable target cluster size is 25 students. In determining the target cluster size for a given country, or stratum within a country, it is necessary to ensure that the minimum sample size requirements for both schools and students will be met.

Note 1.7 Any exceptional costs associated with verifying a school sample taken by the National Centre, or a student sample selected other than by using KeyQuest will be borne by the National Centre.

Note 1.8 Agreement with the international contractor on alternative methods of drawing samples will be subject to the principle that the sampling methods used are scientifically valid and consistent with PISA's documented sampling methods. Where a PISA participating country chooses to draw the school sample, the National Centre provides the international contractor with the data and documentation required for it to verify the correctness of the sampling procedures applied. Where a PISA participating country chooses not to use KeyQuest to draw the student sample, the National Centre provides the international contractor with the data and documentation required for it to verify the correctness of the sampling procedures applied.

Work towards satisfying standards 1.1, 1.2, and 1.3 was started at the FT stage and will continue through the MS stage. Standards 1.4, 1.8 and 1.9 are the main topics of this manual. Standards 1.6 and 1.14 are the main topics of the Within-School Sampling Manual (WSSM) and also briefly discussed in this Overview document. Standard 1.7 will be discussed in the context of Sampling Task 7AB in the relevant document. Standard 1.12 refers to participation minimums for FL and TQ options described in Appendix A of this Overview document. Standards 1.10 and 1.11 are discussed next.

4.2. Participation Rates

Different from the FT

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

4.2.1 School Participation

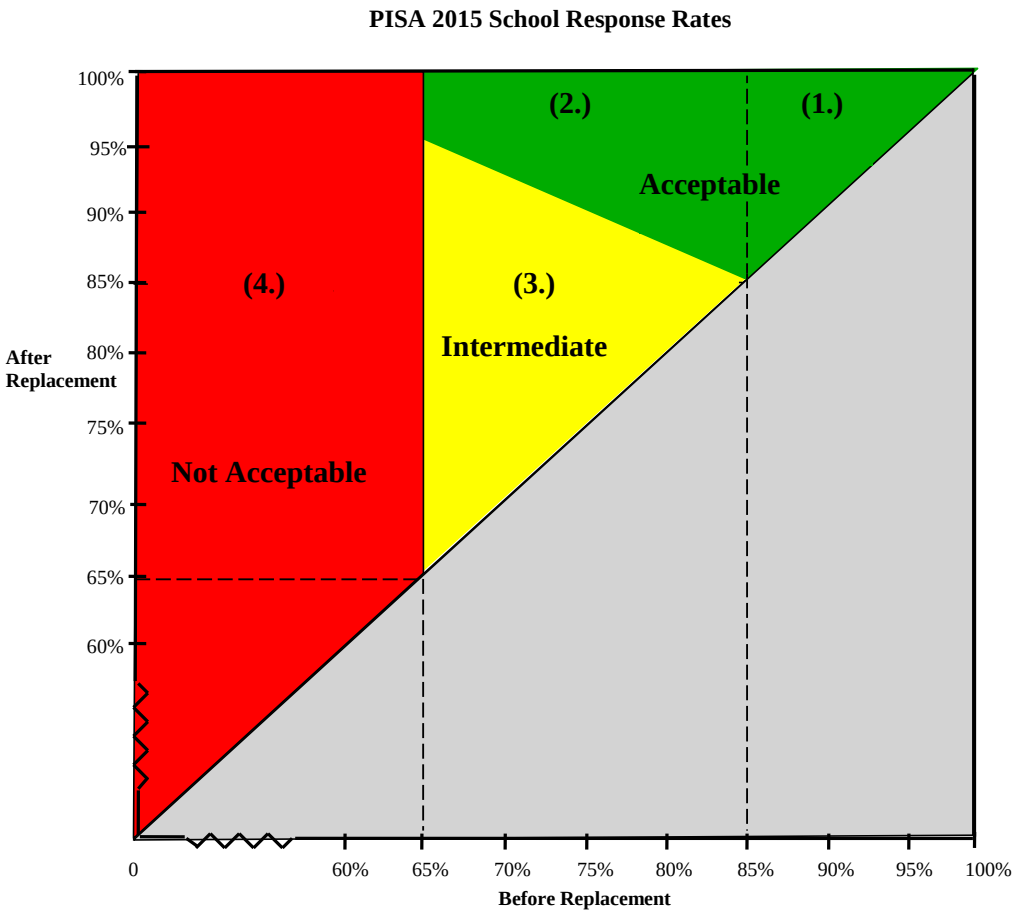
PISA requires a minimum weighted participation rate of 85% of **originally sampled schools**. However, nonparticipating sampled schools may be substituted with "replacement schools" to meet sample size and response rate requirements. The use of replacement schools does not guarantee that potential biases have been reduced. Therefore, NPMs are encouraged to persuade as many original sampled schools as possible to participate; only a high participation rate among originally sampled schools will minimise the potential for nonresponse bias. The identification and use of replacement schools are described in Appendix B of the *CY7_1702_SMP_MSSchoolSamplingPreparationManual - SamplingTasks9-11* document, and in section 1.2 in the MS school sampling preparation manual document for Sampling Task 12. 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 school 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.

Three response rate zones -- acceptable, intermediate and not acceptable –- are defined. "Acceptable" means that the country's data will be included in international comparisons (as long as other non-sampling standards are also met). "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 will 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 criterion, even before any school level replacements were used.
- A country with a before replacement response rate of 60% would have its data considered "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 these 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 results from a nonresponse bias analysis, 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 figure. Note that the "acceptable" region has part of its region bounded by the Before Replacement Rate > 85% vertical line, and another part consisting of the After Replacement Rate > 95% horizontal line for Before Replacement Rates between 65% and 85%. 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.
- Note that a school with less than 50% participation among the selected eligible and non-excluded students will not be considered as a participating school for school response rates. If such a school has less than 25% participation among the selected eligible and non-excluded 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 non-participant for the purposes of monitoring response rates.
- Note that "selected eligible students" are those in the PISA target population, and therefore participation measures are relative to only those students in the target population. For example, participation will be determined separately for the PISA-eligible portion and the grade-eligible portion of a national grade option sample in the same school. This could result in the school deemed as participating (50% or more of selected grade-eligible students participated) for the grade sample, but as a nonparticipating school for PISA if less than 50% of the selected PISA-eligible non-excluded students participate.
- Also note that a PISA-eligible student recorded in the database as not doing the minimum required number of questions of the main cognitive part of the PISA assessment will be counted as a nonparticipant.



4.2.2 Student Participation

PISA also requires a minimum participation rate of 80 % (weighted) of students within participating schools (sampled and replacement). This applies in aggregate, not to each individual school. Follow-up sessions may be required in schools where too few students participated in the originally scheduled test sessions so as to ensure a high overall student response rate. Guidelines for determining when follow-up sessions are appropriate are found in the school-level operational manuals (e.g., see discussion in section 3.6 in either *CY7_1610_OPS_FTCBATestAdministratorManual_1.docx* located on the Portal under Documents > Materials > 2018 Field Trial Resources > School Level Materials > CBA Countries > Manuals, or *CY7_1610_OPS_FTPBATestAdministratorManual_1.pdf* located on the Portal under Documents > Materials > 2018 Field Trial Resources > School Level Materials > PBA Countries > Manuals). NPMs are responsible for determining whether follow-up sessions are required, but may delegate the task of determining when they are needed to School Coordinators and Test Administrators. As they oversee the actual test sessions, Test Administrators 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 sessions and any follow-up sessions that may be required. The student participation

rate requirement needs to be met at the national level, not necessarily for each participating school.

Replacement students are not utilised in PISA.

4.2.3 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 (see 4.2.1 for a discussion of the minimum weighted response rates required); and
- Weighted and unweighted student participation rates (minimum 80% required, weighted).

If the response rate standards are not met the OECD will consider whether the PISA results for the country should be published.

4.3. Strategies for Improving Participation

Various means for improving PISA participation have been innovated and developed by NPMs through the history of PISA. A specific tactic may not work for every country, but two general strategies have emerged as the most widely used: campaigns to disseminate information about PISA and the importance of the survey to the country's education system, and gaining the support and involvement of local and national education authorities or high-level government officials. For example,

- Informational/promotional meetings, seminars, brochures/leaflets, websites, CDs, and within-school presentations have been prepared and organised by NPMs for principals, school coordinators, teachers, and parents; and
- High-level education authorities in many countries, as well as regional education authorities in some countries, have assisted with contacting school principals, most often through an invitational letter sent to the principal, or by contacting some school principals directly, and sometimes by even visiting schools personally.

Another successful method for some countries has involved incentives for students, for Test Administrators or for schools. Other methods have involved indicating clearly that PISA is not a high stakes assessment, reminding schools that they are representing not just themselves but the nation. Some countries also allow schools to be exempt from national monitoring tests. Promotional videos by national celebrities respected by 15-year-olds has also been used effectively in some places. Ensuring good TA training so that assessment sessions are well run and organised is another helpful method. Frequent contact with schools to answer all their questions and to offer support has also helped in many countries.

PISA Survey Operations (Westat, Core A) conducts frequent webinars related to this topic and has assembled a substantial variety of materials from many countries and located these on the Portal under Documents > Materials > 2018 Field Trial Resources > School Level Materials > Resource Materials. Additionally, this location on the Portal supplies further information

Documents > Meetings > 2017_02_WebinarImprovingParticipationRates . NPMs are encouraged to explore these resources and to discuss their unique situations with PISA Survey Operations staff (PISA-SurveyOperations@westat.com).

5. OVERVIEW OF PISA MAIN SURVEY SAMPLE DESIGN

The overall sampling plan for PISA 2018 for the MS is similar to that used in previous PISA cycles. That sampling plan begins with the definition of the PISA Target Population.

- The Target Population for PISA starts with students attending ALL educational institutions located within the country, and in grade 7 or higher. The "standard" PISA target population is further refined to its age basis: students between 15 years and 3 (completed) months and 16 years and 2 (completed) months at the beginning of the testing period.
- Aside from the "standard" population definition, and because of the allowed one month variation, the population could be slightly younger or slightly older. The slightly younger definition includes students between 15 years and 2 (completed) months and 16 years and 1 (completed) months at the beginning of the chosen testing period. The slightly older definition includes students between 15 years and 4 (completed) months and 16 years and 3 (completed) months at the beginning of the chosen testing period.
- When the PISA Target Population is henceforth referenced, it needs to be understood that any one of the possible birth date definitions for the specified testing period could define the population.

The international desired target population (i.e., the PISA Target Population) is intended to provide full coverage of all PISA-eligible students (defined by the birth date definition) in a country's education system. This means that countries need to include ALL PISA students. This means including any PISA-eligible students attending regular programmes, PISA-eligible students who attend school on a part-time basis, are in vocational training or other non-general types of programmes, or any other related type of educational programme, or who are in foreign schools within the country, **even if they are not included in other international or national studies**. The desired target population does not include residents who attend school in a foreign country. **Therefore, all schools located within a country with the potential to have PISA-eligible students in grades 7 or above at the time of assessment need to be made available for sampling from a complete listing of such schools.**

The population of PISA schools is limited to schools that could contain PISA-eligible students at the time of the assessment. Schools that could not contain any such students, such as lower primary schools in some countries, for example, are therefore not considered part of the school-level population.

To limit the potential for double-counting PISA-eligible students, establishments that provide only supplemental coursework (e.g., driver training courses, etc.) are not considered part of the school-level population only if all students connected to these are enrolled in other schools on the frame for their main academic tuition.

As a reminder from the FT, recall that since the largest part of the PISA target population is made up of 15-year-olds, then "15-year-olds" is the term often used when referring to the PISA target population **even though the PISA population actually includes one to three months of age 16**.

Since PISA is a survey of students, and as the sampled students have to 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 sample design proposed for the PISA assessment is generally referred to as a two-stage stratified design. The first-stage sampling units consist of individual schools having any possibility of having PISA-eligible students at the time of assessment. 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 PISA-eligible students enrolled (ENR). Sampling with PPS provides a practical technique when sampling from schools that vary in size, but from which we wish to select student samples of similar size.

PPS sampling of schools followed by equal probability sampling of students within sampled schools has desirable design qualities. This design results in student weights that are approximately equal (within each stratum). Low variability in student weights leads to more precise sample estimates compared to highly variable student weights.

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 explicit strata (mutually exclusive groups of schools which together cover the whole school sampling frame) and/or implicit strata (variables for sorting schools in the explicit strata, or the whole school frame if no explicit strata are used). Refer to the FT Sampling Guidelines for a review about stratification [Doc. Ref: *CY7_NPM(1603)13_SMP_FTSamplingGuidelinesSamplingTask2_2.docx*]. If explicit strata are used, the school sample is allocated over the explicit strata in proportion to the PISA students in each stratum.

A minimum of 150 schools will be selected in each country having this many schools, with the requirements of national options often requiring a somewhat larger sample. Note that the minimum of 150 schools is selected with the expectation that there will be at least 150 **participating** schools, once field exclusions, ineligibility and nonparticipation are accounted for. As the schools are sampled, replacement schools are simultaneously identified, should they be needed to replace eligible, non-excluded and non-participating sampled schools.

More than 150 schools usually need to be selected because of small schools. Small schools are a special issue because fewer than the desired number of students are sampled from such schools. Note that unlike the FT where small schools were excluded, for the MS, every school, including schools with only one PISA student, or even no PISA students (but which could possibly have them at the time of the assessment), must be listed on the school sampling frame. If sampled, such small schools lead to a reduction in student sample size. Therefore, small schools may require special treatment as well as an overall increase in the school sample size. This issue is discussed in more detail in Appendix A of the MS School Sampling Preparation Manual for Sampling Tasks 9 through 11 document.

Countries may need to sample more than the minimum number of required schools, to meet national requirements. For example, in countries with highly tracked school systems at this age

(where track is not used in stratification), the school sample needs to be appropriately increased. 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 (e.g., ISCED level) and/or track is strongly encouraged.

Countries may also wish to increase their samples for regional or other comparisons (non-adjudicated). If so, a minimum of 25 large schools and 1050 assessed students is recommended for each group in the analysis. As this oversampling is one form of a national option, sample sizes for regions or other school types need to be discussed and negotiated with Westat, Core C, at least three months before the MS school sample is to be delivered. When oversampling for regional or other comparisons, it is even more important that the school ENR values for schools in each oversampled region or school type are as accurate as possible. This is partly because oversampling moves the national sample away from proportional allocation and equal student weights, and therefore increases final weight variability. This added weight variability is a disadvantage of oversampling but deemed acceptable in order to satisfy country requirements. If there is doubt about the accuracy of the ENR variable, then the school sample size should be increased from the initial negotiated size to compensate for the uncertainty in the ENR measures.

Some small countries may not have 150 schools that could contain PISA students. In such cases, a census of the PISA schools will be taken. Care must be taken to ensure that all schools that could have PISA students are included on the school frame (ST8B) when it is submitted to the PISA Portal. **Schools later discovered cannot be added to the sample.** This applies also to strata in any country where a school census will be conducted.

The second-stage sampling units are students within sampled schools, and are to be sampled using Core C software, KeyQuest (KQ). Once schools are selected to be in the sample, a list of each sampled school's PISA-eligible students needs to be prepared. A within-school sample size, the 'target cluster size' (TCS), is specified for each PISA school participant through Sampling Task 2 (ST2). The TCS is the number of students that are to be sampled from schools with large PISA enrolment. This number of eligible students is sampled with equal probability from each of the schools sampled for PISA[3], assuming there is at least this number of eligible students at the school. **In sampled schools where there are fewer eligible students than the TCS, all of these students are sampled. An assessment needs to be done at such schools, even if there are only a few PISA students.** The usual TCS is 42 students for the computer-based assessment (CBA) with Global Competence (GC). For either the paper-based (PBA) mode or the CBA without Global Competence, the usual TCS is 35 students. Countries who are doing the 2018 Financial Literacy option will generally need a larger TCS due to a certain percentage of the TCS being sampled to do PISA while the remainder of the TCS are sampled to do the FL assessment (see discussion in section A.1.1 of Appendix A of this Overview document).

New for 2018

[3] For different explicit strata, it is possible to vary the target cluster size.

New for 2018

In total, a minimum sample size of 6300 (assessed) students for CBA with GC, or 5250 (assessed) students for either the PBA or for the CBA without GC, is to be **achieved**[4]. Note that it is possible for countries to negotiate a different TCS as a national option, but if it is reduced from 42 (or 35) then the sample size of schools has to correspondingly be increased beyond 150, so as to ensure that at least 6300 (or 5250) students in total will be sampled and assessed. Countries doing the FL option need an additional 1650 assessed students for FL.

Different from the FT

The TCS has to be at least 25 (PISA) so as to ensure adequate accuracy in estimating variance components within and between schools—an important analytical objective of PISA. If using a TCS of 25, **schools with fewer than 25 PISA students must be included on the frame and if sampled, need to have their PISA students assessed.** This applies also for any TCS value -- schools with fewer than TCS PISA students must be included on the frame and if sampled, need to have their PISA students assessed.

Note that the TCS and the actual PISA student sample size are not necessarily the same thing. All schools in the country usually have the same TCS value. At the time when school lists of PISA students are collected, some schools thought to be large may have fewer than TCS PISA students. In such cases, the actual PISA student sample size will include all PISA students, and this will be smaller than the TCS.

For countries that participated in previous cycles of PISA and which had larger than anticipated sampling variances associated with their estimates, or had fewer assessed students than the planned target (e.g., fewer than 6300 (or 5250) assessed), recommendations will be made about sample design changes that will help to rectify these problems for PISA 2018. Additionally, although information was supplied on FT sampling forms, new countries will be asked through email exchanges about anticipated school and student response rates, as well as about rates of both school and student ineligibility based on their FT experience. Westat, Core C can take this information into account when determining school sample sizes to guard against low student yield.

[4] Doc. Ref.: *CY7_NPM(1603)02b_GEN_IntegratedDesign_1.pdf* or *CY7_NPM(1603)02b_GEN_IntegratedDesign_WithoutGC_2.pdf.* The sample counts in these two documents are for *assessed* students.

APPENDIX A – INTERNATIONAL OPTIONS: FINANCIAL LITERACY AND TEACHER QUESTIONNAIRE

A.1 Financial Literacy (FL)

Financial Literacy (FL) is a computer-based International Option for PISA 2018. Sampling for FL is based on the Main Survey FL design described in *CY7_NPM(1603)02b_GEN_IntegratedDesign_1.docx* located on the Portal. Students sampled for FL will take a combination of Reading, Mathematical and Financial Literacy tasks. All sampled students (PISA or FL) in countries doing the FL option will be expected to do a short FL Questionnaire. An exception to this is for countries doing the FL and that also have a UH option -- SEN students doing the UH assessment will not be expected to do the optional FL Questionnaire.

A.1.1 Student Sample Size

For the Main Survey, a minimum of 1,650 **assessed** FL students is required by the design. For an adjudicated region, the minimum is 550 assessed FL students.

For PISA 2018, sampling for FL will be different from that for PISA 2015. In PISA 2015, FL students were a subsample of the PISA students sampled in each school. For PISA 2018, the FL sampling will be more like the FL sampling approach used for the PISA 2012 MS. For PISA 2018, FL students will be an additional sample of students above and beyond those needed for PISA. No extra session will be needed specifically for FL students. **The FL sample will be accomplished for FL countries by having an increased TCS per school for the MS.** The FL forms will be rotated through the sampled students like any other form. This increased TCS will need to be specified on your Sampling Task 2.

It is assumed that if a country is participating in the FL option, the FL assessments will occur in every PISA sampled and participating school. This means that if a base school sample size of 150 schools and the usual 42 students selected per school for PISA with GC is assumed, then the TCS needs to be increased to 53 so that there will be 42 students in each school selected for PISA plus 11 additional students selected for the FL assessment.

As stated in C*Y7_NPM(1603)02b_GEN_IntegratedDesign_WithoutGC_2.pdf* , the FL option requires 1650 assessed students, so for countries doing FL but opting out of Global Competence, it is assumed the TCS will need to be increased from the usual 35 students in each school to 46 in order to obtain 11 FL students per school from the base school sample size of 150 schools.

A.1.2 FL Non-Participation

FL students and PISA students do different assessments, but they may be tested in the same sessions. The same student non-participation codes should be used regardless of the assessment the students are sampled for. Overall, at least 80% (weighted) of eligible non-excluded students sampled to do FL forms are required to participate.

Not all assessed students will receive FL PVs. There will be an International FL database, and an International PISA database.

A.1.3 SEN Students

As for PISA 2015, excluded SEN students and SEN students assessed with the UH instrument, will not be part of the FL population of inference.

A.2 Teacher Questionnaire (TQ)

For PISA 2018, an international option questionnaire for teachers (TQ) is being administered to a sample of teachers through computer-based questionnaires. The PISA 2018 TQ intends to describe the learning environment of typical PISA students in each country participating in this option. Therefore, the TQ focuses on that grade level that most PISA students in a country attend. In order to cover a broader variety of perspectives, and guarantee samples that are large enough, teachers who are eligible to teach the PISA modal grade, whether or not they are doing so currently, are considered as belonging to the teacher target population. Note also that in the context of the TQ, the target teacher population could teach any PISA grade containing the majority of the PISA student population. For some countries, the TQ teacher population may be expanded to include those eligible to teach the next largest PISA grade when this grade also contains a significant percentage (e.g., >30%) of the PISA student population. If there are two grades with at least 30% of PISA students enrolled in each grade, then there are two modal grades).

There are separate teacher questionnaires that will be administered to reading/language arts teachers and to teachers of other subjects. The overall TQ target population will therefore be divided into two non-overlapping population subgroups, reading/language arts teachers (population 4) and teachers of other subjects (population 5), for listing, sampling, and assigning the relevant instrument to a selected teacher.

A.2.1 Teacher Sample Size

Within each sampled school, from lists composed of all teachers eligible to teach the modal grade or grades (even if not doing so at the time of listing), a sample of up to 10 reading/language teachers and 15 teachers of other subjects will be selected from schools having this many teachers of each type. If there are not 10 reading/language teachers or 15 teachers of other subjects, all are taken into the teacher sample.

A.2.2 School Sample Size

All schools selected for PISA and that have teachers who are eligible to teach the modal PISA grade(s) are eligible for the TQ. No increase in school sample size should be needed for the TQ since TQ data is not used on its own, but instead as student contextual data for each school.

A.2.3 School Stratification

New for 2018

No special stratification will be needed for the 2018 TQ option. All schools will be set up for teacher sampling regardless of whether the school contains the country's PISA modal grades. This change from 2015 is intended to avoid such situations that arose from mis-stratified schools where, for example, a school thought to not have the PISA modal grades in fact did and was then not able to sample teachers. This change also ensures eligible teachers who happen to be working in schools which do not teach PISA modal grades will also be able to be listed for TQ sampling.

If a school has no eligible teachers, then none will be listed and therefore none sampled. Since the TQ is an International option and intended for all sampled schools, there will be a warning in KQ about there being no teachers in such a situation. If this is correct for the school, sampling may proceed and the warning will just need to be explained before data is submitted as part of the ST12.

A.2.4 TQ Non-Participation

The TQ instruments are self-administered. An 80% overall response rate (unweighted) is expected for TQ participation.

New for 2018

Teacher participation tracking information will not be updated in KQ for 2018. Instead, teacher participation information for ineligible teachers ONLY, will be updated directly on the Student Tracking File (STF) exported from KQ and then imported into the DME. The ONLY TFNPPOP4 (Language teachers) and TFNPPOP5 (Other teachers) non-participation codes that are needed for STF update on the exported STF are as follows:

'5'-'Left school'

'7'-'Otherwise ineligible (i.e. not in target population)'.

(Each should have a single quotation mark in front of each value to ensure they are stored in the Excel file as character values.)

No sample weights will be derived for the TQ. An unweighted estimate of participation will be calculated from the online TQ monitoring files to assess data quality, and 80% teacher participation from each teacher population is expected (Standard 1.12).

APPENDIX B – SAMPLE OVERLAP CONTROL

B.1 Overview

It may be the case that another international education study will occur within a country at approximately the same time as the PISA assessment. An overlap control procedure can be used for countries who wish for there to be a minimum (or a maximum) of the same schools to be sampled for each study, at an additional charge. This procedure can only be done if the same national school identifiers are used on the other international education study and PISA school frames and if the schools used on each frame are the same.

For countries requesting overlap control (i.e., have "yes" in question 13 of their Sampling Plan on the Portal) and where the other study has selected their sample first, the other International Study Centre (e.g., Statistics Canada for the TALIS study), will need to supply their school frames, with the national school IDs, the school probability of selection, and an indicator showing which schools have been sampled. This information will be used to make adjustments to PISA school probabilities as discussed in B.2. In the case when PISA selects the school samples first, schools are sampled as usual (see discussion below).

B.2 The Overlap Control Method

To control overlap, the sample selection of schools for PISA adopts a modification of the approach due to Keyfitz (1951), based on Bayes Theorem.

In the following discussion, we use the ICCS as an example of such a study for illustrative purposes. Suppose that PROBI is the ICCS school probability of selection, and PROBP is the usual PISA probability of selection (where PROBP=MOS/stratum sampling interval), then a conditional probability of selection into PISA, CPROB is determined, based upon whether there is a desire to minimise or maximise the overlap between the ICCS and PISA samples.

If the desire is to minimise the overlap then CPROB is defined as follows:

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

If the desire is to maximise the overlap then CPROB is defined as follows:

$$CPROB = \begin{cases} \min\left[1, \left(\dfrac{PROBP}{PROBI}\right)\right] & \text{if the school was an ICCS school} \\ \max\left[0, \dfrac{\left(PROBP - PROBI\right)}{\left(1 - PROBI\right)}\right] & \text{if the school was not an ICCS school} \\ PROBP & \text{if the school was not an ICCS eligible school} \end{cases} \quad (2)$$

Then a conditional MOS variable is created to coincide with these conditional probabilities as follows:

$$\text{CMOS=CPROB} \times \text{stratum sampling interval (rounded to 4 decimal places).} \quad (3)$$

The PISA school sample is then selected using the line numbers created as usual (see the other MS school sampling preparation manual where Sampling Tasks 9 through 11 are discussed), but applied to the cumulated CMOS values (as opposed to the cumulated MOS values). Note that it is possible that the resulting PISA sample size could be a bit lower or higher than the originally assigned sample size, but this is deemed acceptable.

APPENDIX C – PARTICIPATION IN GRADE OR OTHER NATIONAL OPTION SAMPLING AND SAMPLE SIZE

C.1 Samples of Students in a Particular Grade

The proposal put forth by Core C for PISA 2018 responded to a discussion in the Call for Tender about a grade-based sampling option. The grade identified for each country should generally be the one with the greatest proportion of PISA-eligible students. In countries where two grades each have more than 40% of these students, the NPM can indicate which of the two grades they wish to include. In such cases, if a country elects to include both grades, the second grade becomes a second national option. In fact, any country can elect to add an additional grade of its own choosing, as a national option.

If direct student sampling is used, the results from this grade sample will be of comparable precision to the PISA age-based results, with perhaps some increase in precision as the population is somewhat more homogeneous in some countries, if about the same sample size of schools and grade students is assumed as that used for PISA students.

For each country considering this type of an option, the increase in the sample size depends upon whether or not direct student sampling is used. If direct student sampling is used, the increase in sample size then depends on the overlap between PISA-eligible students and the grade students as well as on whether more students will be selected per school, and/or more schools selected.

To distinguish between the sampling of PISA-eligible students and the grade-based students, the term grade-based is sometimes used. Note that some students may be both PISA-eligible and grade-eligible. However, grade-eligible students are not necessarily PISA-eligible. For example, if the grade-based option relates to students in grade 10, all grade 10 students are grade-eligible, but only those grade 10 students that fall within the ages defined in the PISA Target Population are also PISA-eligible.

With the direct student sample, the sample of grade-eligible students would be sampled directly from a list of all such eligible students within the school. This sample selection could, and most likely would, be fully integrated with the selection of the PISA-eligible sample. Thus, participating schools would be asked to provide a student list containing all PISA-eligible students, plus all other students enrolled in grade 10, for example. A sample would be selected from this combined student list, where the total sample size would be determined in part by the extent of overlap between the PISA-eligible and grade-eligible populations. The two samples, the PISA-eligible sample and the grade-eligible 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 both PISA and the grade sample can be used in both analyses, and will have the same initial student base weights in each.

Although direct student sampling is generally preferable, a classroom-level option is another way for the grade option to be achieved. In the case of classroom sampling, the selection of one or more classrooms from within the selected schools would be appropriate. Thus, the sample selection within a school would consist of two components. First a sample of PISA-eligible students would be selected from a list of PISA-eligible students enrolled in school. Next, a sample of grade 10 reading/language classes (for example) would be selected from a list of grade 10 reading/language classes that include all grade 10 students in the school. All students from the selected classes would be in the sample. Some students, who are both PISA-eligible and grade-eligible, would no doubt be selected twice. Such students would not need to be assessed twice, but the data they provide from a single assessment could be used in analyses of both the grade- and age- eligible populations, with different student weights (because of different sampling methods) for each type of analysis.

The classroom-based approach will present challenges in many cases, in the preparation of a suitable list of classrooms from which to select the sample. Also the best approach will depend upon whether classroom-based sampling is being used purely for operational convenience, as the easiest way to administer the assessment to a sample of grade 10 students (although this is unlikely to be the case) or whether the aim is to gather information about classrooms of students, either in association with a teacher questionnaire, or just as a means to provide good data for use in variance decomposition and mixed effects linear models (i.e., HLM).

Countries interested in having a national grade option are required to alert Westat, Core C to this fact when discussing the school sample. **This should not be a new option at the time of the MS as any national options, including grade sampling, were required to be field trialed.**

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, although such a national option is still subject to Core C approval as described below.

There are two ways to accomplish a direct-student sampled grade sample in KQ.

WSMOP=1: This option assumes that the sampling interval calculated for just the PISA-eligible students is then applied to the full student list containing both PISA students and non-PISA grade students. The total sample size within schools having the grade of interest is variable and depends on the extent of overlap between the PISA students and the grade students.

WSMOP=2: In the second direct-student sampled grade sampling option, the sampling interval is calculated over the full student list and is not variable by school (unless the school is a small PISA school). This option requires additional schools to be sampled for PISA since not all sampled students in this sampling option will be PISA-eligible students.

For both of these sampling options to function properly in KQ, the student lists need to have three sets of students identified using two student list variables, TFPOPELIG0, and TFPOPELIG1. TFPOPELIG0 needs to take value 1 for all students on the list which are PISA-eligible, and 0 otherwise. TFPOPELIG1 needs to take value 1 for all students on the list which

are grade-eligible, and 0 otherwise. Students which have TFPOPELIG0=1 and TFPOPELIG1=0 are students eligible for PISA only. Students which have TFPOPELIG0=0 and TFPOPELIG1=1 are students which are grade-eligible only. Students which have TFPOPELIG0=1 and TFPOPELIG1=1 are both PISA-eligible and grade-eligible students.

Consider a school with 175 PISA-eligible students, 30 of which are also grade-eligible students. This school has an additional 50 grade-only students. In this school then, there would be 145 students with TFPOPELIG0=1 and TFPOPELIG1=0. There would be 30 students with TFPOPELIG0=1 and TFPOPELIG1=1. There would also be 50 students with TFPOPELIG0=0 and TFPOPELIG1=1.

Assume that the TCS=42. With WSMOP=1, the sampling interval is calculated as 175 / 42 = 4.1667. This means that out of the 145 students with TFPOPELIG0=1 and TFPOPELIG1=0, there would be 34 or 35 sampled students. Out of the TFPOPELIG0=1 and TFPOPELIG1=1 students (30), there would be 7 or 8 sampled students. Out of 50 students with TFPOPELIG0=0 and TFPOPELIG1=1, there would be 12 students sampled. There would be a total of 54 students sampled from this school using WSMOP=1. There are 42 sampled students who are PISA-eligible. There are 19 or 20 sampled students who are grade-eligible.

With WSMOP=2, the sampling interval is calculated as 225 / 42 = 5.3571. This means that out of the 145 students with TFPOPELIG0=1 and TFPOPELIG1=0, there would be 27 or 28 sampled students. Out of TFPOPELIG0=1 and TFPOPELIG1=1 students (30), there would be 5 or 6 sampled students. Out of 50 students with TFPOPELIG0=0 and TFPOPELIG1=1, there would be 9 or 10 students sampled. There would be a total of 42 students sampled from this school using WSMOP=2. There would be between 32 and 34 sampled students who are PISA-eligible. There would be between 14 and 16 students who are grade-eligible.

Note that with WSMOP=1, the total student sample size in a school increases as the number of grade-only students increases from the number of PISA students. For example, if the school in question had 175 PISA-eligible students, 30 of which are also grade-eligible students and 200 grade-only students, then the total student sample size would be 90 students.

If class sampling is desired rather than direct student sampling, then the sampling option to use in KQ is WSMOP=3.

WSMOP=3: For this option, it is assumed that *classes are sampled in a school first in KQ before the PISA sample is selected in the school*. The school's student list is then defined with TFPOPELIG0 and TFPOPELIG1 values as follows.

- If a student is PISA-eligible only, then TFPOPELIG0=1 and TFPOPELIG1=0.
- If a student is PISA-eligible and also in the sampled class(es), then TFPOPELIG0=1 and TFPOPELIG1=1.
- If a student is not eligible for PISA but in the sampled class(es), then TFPOPELIG0=0 and TFPOPELIG1=1.

If the TCS=42 and the school has at least 42 PISA-eligible students, then KQ will sample 42 PISA students from the students having either (TFPOPELIG0=1 and TFPOPELIG1=0) or (TFPOPELIG0=1 and TFPOPELIG1=1). KQ will then additionally take into the school's student sample, all students with TFPOPELIG0=1 and TFPOPELIG1=1 which were not sampled in the first sample selection of 42 PISA students, as well as all students with TFPOPELIG0=0 and TFPOPELIG1=1.

There are additional WSMOPs available in KQ for grade sampling but these are only used when suggested to a country by Core C after hearing about particular country circumstances. They are therefore not discussed here since only used in rare cases.

See the WSSM for further specifics about these WSMOP=1, 2, or 3 cases.

Countries having a class based grade sample need to include extra information on student lists. The variable, TFCLName, should contain the class name. After class sampling in KQ, the variable, TFCLID, will have a class ID, and this variable also needs to be on the list of students.

Note that for the MS, only one WSMOP value can be used in an explicit stratum. This restriction may require the stratification plan on ST2 to be revised before MS school sampling.

The WSMOP assigned to original sampled schools will also be assigned to their assigned replacements.

C.2 Other National Options

All other national options requiring the sampling of students other than PISA or grade-eligible students are required to be approved by Westat, Core C and to have been field trialed, before they can be used in the MS. (See also *CY7_NPM(1603)AB_SMP_SamplinginPISA_1.pdf* and *CY7_NPM(1603)13_SMP_FTSamplingGuidelinesOverview_2.docx*)

APPENDIX D – AREA-LEVEL SAMPLING FRAMES

Sampling units on this type of sampling frame are usually geographical areas (GAs), for which reliable information on PISA 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 should be discussed with Westat, Core C.) NPMs will need to discuss the implementation of these guidelines with Westat, Core C 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.

If you choose to use an area-level sampling frame, each PSU in the list should include at minimum:

- Unique PSU identification information;
- Appropriate entries for any suitable stratification variables (see ST2); 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.

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 the document discussing Sampling Task 8b.

The school frame containing all schools that could contain PISA students at the time of the assessment for all sampled PSUs, needs to be submitted to the PISA Portal as Sampling Task 8b form and as one Excel file, with at least two data sheets.

APPENDIX E - WHAT IS A SCHOOL?

As noted earlier, we generally wish to sample whole schools as the first stage unit of selection, rather than programmes or tracks within schools, or shifts within schools, so that the meaning of "between school variance" is more comparable across countries.

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

APPENDIX F – ACRONYMS

CBA	Computer-based assessment
CMOS	Conditional MOS used in overlap control procedures
CPROB	Conditional probability used in overlap control procedures
CW	Cycle-wide
DME	Data Management Expert system
ENR	Approximate enrolment of PISA eligible students in each school
FL	Financial Literacy option
FT	Field Trial
GC	Global Competence, a core domain for the 2018 PISA
GAs	Geographical Areas used as first-stage sampling units
HLM	Hierarchical Linear Modelling
ISCED	International Standard Classification of Education (level, programme, orientation, etc.)
KQ	KeyQuest within-school sampling software
MOS	Measure of Size used in PPS sampling
MS	Main Survey
PBA	Paper-based assessment
PPS	Probability Proportional to Size
PROBP	PISA probability of Selection
PROBI	Probability of selection for the other survey involved in overlap control
PSU	Primary Sampling Unit
SEN	Special Education Needs student
SFKQ	Created from ST11, the sampling form for KeyQuest
SP	Cyclewide Sampling Plan
STF	Student Tracking Form
ST2	Cyclewide Sampling Task 2
ST7A	MS Sampling Task 7A; information on the Initial (desired) Target Population
ST7B	MS Sampling Task 7B; information on the Final (defined) Target Population
ST8A	MS Sampling Task 8A; information about the school sampling frame
ST8B	MS Sampling Task 8B; the school sampling frame and school exclusions
ST9	MS Sampling Task 9; small school analysis, finalising sample size and allocation
ST10A	MS Sampling Task 10A; sampling intervals and line selection numbers from school sample selection process
ST10B	MS Sampling Task 10B; school sample selection by ACER and Westat, Core C
ST11	MS Sampling Task 11; reviewing the form that will become SFKQ
ST12	MS Sampling Task 12; submitting school and student participation and validity checks to Westat, Core C
TCS	Target Cluster Size for within-school sampling
TQ	Teacher Questionnaire option
UH	The “Une-Heure” (One-Hour) form option for SEN students
WSSM	Within-School Sampling Manual (KeyQuest manual)