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2. SAMPLING

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2.1 OVERVIEW

The selection of valid and efficient samples is crucial to the quality and success of an international comparative study of student achievement. The accuracy of the survey results depends on the quality of the sampling information available, and particularly on the quality of the sampling itself. The procedures must therefore be explicit and practical and all steps must be documented fully. In a study as ambitious as TIMSS, the sample design and sampling procedures are complex, and the gathering of the required information about the national education systems places considerable demands on resources and expertise. Simplifying the sampling procedures to the extent possible, especially the sample selection within schools, was thus a major consideration in developing the sample design.

The sample design for TIMSS is described in detail in Foy, Rust, and Schleicher (1996). The basic design for Populations 1 (the pair of adjacent grades containing most 9-year-olds) and 2 (the pair of adjacent grades containing most 13-year-olds) consisted of a two-stage stratified probability sample of students, with schools stratified by nationally relevant variables and sampled with probability-proportional-to-size at the first stage, and a single intact class of students sampled from each of the two adjacent grade levels at the second stage. Countries were expected to sample at least 150 schools, although some of the larger countries chose to sample more, and some others

were able to achieve satisfactory precision with less. This design was expected to yield a representative sample of approximately 7,500 students per country, with approximately 3,750 students at each grade level. NRCs were allowed to adapt the TIMSS sample design for their educational system, using more sampling information and more sophisticated sample designs and procedures than the base design provided. However, these solutions had to be approved and monitored by the international project management (the International Coordinating Center at the University of British Columbia until August 1993, and the International Study Center at Boston College thereafter).

The international project management provided various resources in the form of manuals, software programs, training, and continuous support to help NRCs identify a sample design appropriate for their national system, and to guide them through the phases of sampling. The *Sampling Plan* (TIMSS, 1992) provided an overview of the sample design and described the survey design options offered. The *Sampling Manual* (TIMSS, 1994b) described how to implement the sampling plan and offered advice on initial planning, working within constraints, establishing appropriate sample selection procedures, and fieldwork. It provided an operational definition of the school sample and detailed the procedures for selecting it for Populations 1 and 2. The *Population 3 Sampling Guide* (TIMSS, 1994a) outlined the school sampling procedures for Population 3.

Included in the *Sampling Manual* (TIMSS, 1994b) were a number of forms that ensured that vital information at key stages was collected and recorded in a uniform manner for each country. Target population definitions, choice of stratifying variables, construction of school sampling frames, selection of school sample, and the like were therefore clearly documented. These forms were completed by NRCs and submitted to Statistics Canada for review and archiving. They are described in section 2.2 and displayed in Appendix C.

The *Survey Operations Manuals* (TIMSS, 1994e, 1994f) and *School Coordinators Manuals* (TIMSS, 1994c, 1994d) provided information on sampling of students within schools, the assignment of test booklets to sampled students, and administration and monitoring procedures used to identify and track respondents and nonrespondents. NRCs also received software designed to automate the sometimes complex within-school sampling procedures. This software was developed specially for TIMSS by the IEA Data Processing Center and Statistics Canada.

NRCs had several sources of expert support throughout all phases of sampling. Statistics Canada provided advice and support throughout the process. NRCs met with Statistics Canada staff during the semi-annual meetings of the National Research Coordinators and communicated regularly via fax, telephone, and e-mail. During consultation sessions, NRCs received training in how to select the school and student samples and in the use of the sampling software. In consultation with the TIMSS

sampling referee (Keith Rust, WESTAT, Inc.) and the TIMSS Technical Advisory Committee, Statistics Canada reviewed the national sampling plans, sampling data, sampling frames, and sampling operations.

2.2 DOCUMENTATION OF THE SAMPLING PROCEDURES

NRCs were required to submit their completed sampling forms, described below, as documentation of the steps completed and of the quality of their samples. Information collected through these forms was used to evaluate the quality of the national samples and to categorize and annotate countries in the international reports. The required sampling forms related to three different aspects of the sampling process: population definition, sample design, and sample execution.

Statistics Canada was responsible for monitoring the sampling activities in the participating countries and for ensuring that all necessary documentation was received. Based on this documentation, the status of the national samples could be evaluated by the TIMSS sampling referee, the Technical Advisory Committee, and the International Study Center.

2.2.1 POPULATION DEFINITION

In order to obtain national samples for which to make meaningful comparisons, some initial steps needed to be completed and information provided. Forms 1 and 2 were used to document the required information. These forms were important since they would define the target population in terms of coverage, target grades, and exclusions. Although Form 1 was not a critical component, its contents did prove useful as scheduling and diagnostic tools. Compliance with reporting this information was very good. Table 2.1 shows for each country the status of the forms required to define the target population for Population 2.

Form 1 - TIMSS Participation and Primary School Structure

This form requested basic descriptive information on a national school system, namely the school calendar and expected testing dates, age-of-entry requirements, and grade structure through primary and secondary schooling. Although none of this was critical to the successful implementation of the sampling procedures, the forms did nonetheless provide useful information for determining field schedules and validating, to some degree, the target grades selected for TIMSS. Compliance with the delivery of this information was generally good.

Form 2/ Part 1 - Describing the National Desired Population

This form requested information used to establish the coverage of the definition of the national population and the target grades for TIMSS. This was very important, since selecting suitable grades was vital to the successful implementation of sampling

procedures. Also, population coverage is an important piece of information to be reported for national school systems. Compliance with the delivery of these data was very good.

Form 2/Part 2 - Describing the National Defined Population

This form sought to identify all elements of the population that were to be excluded from the sampling process, at the school level as well as within schools. An important quality criterion for TIMSS was to limit all exclusions to less than 10% of the defined national coverage. Reporting this information was therefore important and compliance was very good.

Table 2.1
Status of Population Definition Documentation – Population 2

Country	Form 1	Form 2/P 1	Form 2/P 2	Notes
Argentina	C	C	C	Population coverage less than 100%
Australia	C	C	C	Target grades vary by state
Austria	C	C	C	
Belgium (Fl)	C	C	C	
Belgium (Fr)	C	C	C	
Bulgaria	C	C	C	
Canada	C	C	C	
Colombia	C	C	C	Students in selected grades older than expected
Cyprus	C	C	C	
Czech Republic	C	C	C	
Denmark	C	C	C	
England	C	C	C	Exclusion rate greater than 10%
France	C	C	C	
Germany	I	C	C	Population coverage less than 100%
Greece	C	C	C	
Hong Kong	P	C	C	
Hungary	I	P	C	
Iceland	I	P	P	
Indonesia	C	C	C	Population coverage less than 100%
Iran	C	C	C	
Ireland	C	C	C	
Israel	C	C	C	Population coverage less than 100% & only one target grade selected
Japan	C	C	C	
Korea	C	C	C	
Kuwait	I	C	C	Students in lone selected grade are older than expected
Latvia	C	C	C	Population coverage less than 100%
Lithuania	C	C	C	Population coverage less than 100%
Mexico	C	C	C	
Netherlands	C	C	C	
New Zealand	C	C	C	
Norway	C	C	C	
Philippines	C	C	P	Population coverage less than 100%
Portugal	C	C	C	
Romania	C	C	C	Students in selected grades older than expected
Russian Federation	C	C	C	
Scotland	C	C	C	
Singapore	C	C	C	
Slovak Republic	C	C	C	
Slovenia	I	C	C	Students in selected grades older than expected
South Africa	C	C	C	
Spain	C	C	C	
Sweden	C	C	C	
Switzerland	I	C	C	Population coverage less than 100%
Thailand	C	P	P	
United States	C	C	C	

C Complete information provided
P Partial information provided - adequate for monitoring
I Incomplete or no information provided

2.2.2 SAMPLE DESIGN

A number of forms of varying importance were used to document the national sample design for each country. The main purpose of these forms was to monitor the development of the sample designs. The importance of these forms varied depending on the complexity of the proposed sample designs. Compliance with reporting also varied, usually as a function of the complexity of the sample designs. As a general rule, countries that complied were successful in implementing their sample designs. Conversely, countries that had some difficulties in implementing their sample designs did not fully comply with the reporting requirements. Table 2.2 shows the status of the forms required for the sample design for Population 2.

Form 3 - Stratification Variables

On Form 3 NRCs were to report all variables used to stratify the school sampling frame. This information was not essential to the successful implementation of the sampling procedures, but advance knowledge was useful as a diagnostic tool to assist NRCs in developing their sample designs. Compliance with reporting was generally good, but this information could also be derived from the school sampling frames.

Form 4/Part 1 - Sample Design Structure

This form requested specific sample design details that would permit an evaluation of the adequacy of the planned sample size. Compliance with reporting this information was generally good but the quality was not always adequate. The quality was greatly improved through follow-up meetings with NRCs.

Form 4/Part 2 - Type of Sampling Frame

This form requested a description of the available school sampling frames. The form was not essential but proved useful to identify difficulties in finding adequate sampling frames and perhaps the need for more complex sample designs. Compliance with the delivery of this information was generally good.

Form 5/Part 1 - Schools Excluded From Sampling Frame

This form requested the list of all schools excluded from the school sampling frame. Compliance with the delivery of this information was not very good. However, given that Form 2 provided a description of all excluded schools as well as the number of students enrolled, the actual list of excluded schools was not considered an essential piece of information.

From 5/Part 2 - Recording the Formation of Pseudo-Schools

This form requested information on the construction of pseudo-schools. All countries that constructed pseudo-schools provided this form.

Form 6/Part 1 - Strata for Defined Population - Population Statistics

This form requested basic population counts of schools and students by strata for monitoring purposes. Although these data were not essential to the successful implementation of the sampling procedures, compliance with reporting was generally good.

Form 6/Part 2 - Strata for Defined Population - Sample Statistics

This form requested similar basic counts of schools and students, by strata, from the sample. Again, this information was not essential to the successful implementation of sampling procedures, since it could ultimately be derived from the data. It did nonetheless provide some indication of the total sample sizes. Compliance with the delivery of this information was generally good.

Table 2.2
Status of Sample Design Documentation – Population 2

Country	Form 3	Form 4/P 1	Form 4/P 2	Form 5/P 1	Form 5/P 2	Form 6/P 1	Form 6/P 2	Comments
Argentina	C	C	C	I	–	C	C	
Australia	C	C	C	I	–	C	C	
Austria	C	C	C	I	–	C	C	Sampled science classrooms
Belgium (Fl)	C	C	C	I	–	C	C	School subsample for upper grade vocational track
Belgium (Fr)	C	C	C	I	–	C	C	School subsample for upper grade vocational track
Bulgaria	C	C	C	C	C	C	C	
Canada	C	C	C	P	–	C	C	
Colombia	C	C	C	C	C	C	C	
Cyprus	C	C	C	C	C	C	C	All schools in sample
Czech Republic	C	C	C	C	C	C	C	
Denmark	C	C	C	I	–	C	C	Stratified SRS for schools (equal probabilities)
England	C	C	C	C	–	C	C	Sample of students, rather than classrooms
France	C	C	C	I	–	P	P	
Germany	P	P	P	I	–	C	C	Upper grade classrooms sampled with PPS
Greece	I	I	I	I	–	I	P	
Hong Kong	C	C	C	I	–	C	C	
Hungary	I	I	C	C	–	C	C	Classrooms sampled with PPS
Iceland	I	I	I	P	–	P	P	All schools in sample
Indonesia	C	C	C	C	C	C	C	
Iran	C	C	C	I	–	C	P	
Ireland	C	C	C	C	C	C	C	
Israel	C	C	C	C	C	C	C	
Japan	C	C	C	C	C	C	C	Stratified SRS for schools (equal probabilities)
Korea	C	C	C	C	C	C	C	
Kuwait	C	C	C	I	–	C	C	All schools in sample
Latvia	C	C	C	I	C	C	P	
Lithuania	C	C	C	I	–	P	P	
Mexico	C	C	C	P	–	C	C	
Netherlands	C	C	C	I	–	I	P	
New Zealand	C	C	C	C	C	C	C	
Norway	C	C	C	I	–	P	P	
Philippines	C	I	I	I	–	P	P	
Portugal	C	C	C	C	C	C	C	
Romania	C	C	C	C	C	C	C	
Russian Federation	C	C	C	P	P	P	P	Preliminary sampling stage
Scotland	C	C	C	C	C	C	C	
Singapore	C	C	C	C	C	C	C	All schools in sample
Slovak Republic	C	C	C	P	–	P	P	
Slovenia	C	I	I	I	–	C	C	
South Africa	C	C	C	I	–	C	C	
Spain	C	C	C	C	C	C	C	
Sweden	C	C	C	I	–	I	P	
Switzerland	C	C	C	I	–	C	C	
Thailand	I	I	I	I	–	I	P	Stratified SRS for schools (equal probabilities)
United States	C	C	C	I	–	P	P	Preliminary sampling stage

C Complete information provided
P Partial information provided - adequate for monitoring
I Incomplete or no information provided
– Not applicable

2.2.3 SAMPLE EXECUTION

The forms used to document the sample execution were very important since they demonstrated its success. Compliance with reporting this information was very good and generally indicative of the quality of the sample execution. Delivery of Forms 8 and 9 was not critical since the same information could be retrieved from Form 7 and the actual data files. Table 2.3 shows the status of the forms required for the sample execution. This table also presents additional comments for some countries, related to the information provided on the forms.

Form 7 - Sampling Frame and Sample Selection

This form requested the full school sampling frame with the sampled schools identified. This was important to validate the school sampling process. Compliance with the delivery of this information was very good, with a few notable exceptions. Argentina did not deliver its sampling frame and this was indicative of a major problem with the school sample. Eventually, lack of resources caused Argentina to discontinue participation in the study. The sampling frame provided by the Philippines was not documented in a way that supported the computation of satisfactory sampling weights. Selected unweighted results for the Philippines were presented in an appendix to the international reports. Germany also did not deliver its school sampling frame, but all other documentation indicates strongly that this school sample was selected properly. Indonesia, Scotland, and the United States delivered only partial school sampling frames, but enough to verify that the school samples were selected properly.

Form 8 - Identifying the Sample of Schools - Selection Numbers

This form requested the list of all random numbers used to select the sampled schools. This information was not essential since it could generally be derived from Form 7. Compliance with reporting was very good. The handful of countries that used alternate school sampling methods generally could not provide a corresponding Form 8, but their school sampling frames and other supporting documentation were sufficient to validate their school samples.

Form 9 - School Tracking Form

This form requested the list of all sampled schools along with their assigned replacements. It also indicated the participation status of sampled schools. Compliance with the delivery of this information was very good. The information could also be derived from the data.

Class Tracking Form

This form requested information on the classroom sampling procedures. This was a critical piece of information and compliance with its delivery was very good. Some countries that did not deliver this form were able to provide sufficient information to compute sampling weights. In other cases, the inability to deliver the form was indicative of problems in sampling classrooms. This was the case for Denmark, Greece, and Thailand. Some countries that delivered only partial forms provided additional or alternate documentation, usually in the form of spreadsheets, to describe this aspect of the sampling process.

Table 2.3
Status of Sampling Execution Documentation – Population 2

Country	Form 7	Form 8	Form 9	CTF	Comments
Argentina	I	I	C	C	Unapproved school sampling procedure
Australia	C	C	C	C	
Austria	C	C	C	C	
Belgium (Fl)	C	C	C	C	
Belgium (Fr)	C	C	C	C	
Bulgaria	C	P	P	C	
Canada	C	C	C	C	
Colombia	C	C	C	C	
Cyprus	C	–	C	C	
Czech Republic	C	C	C	C	
Denmark	C	–	P	P	Unapproved classroom sampling procedure
England	C	C	P	–	
France	C	–	C	C	
Germany	I	C	C	P	School sampling frame not available
Greece	C	P	C	P	Unapprovided classroom sampling procedure
Hong Kong	C	P	C	C	
Hungary	C	C	C	P	Classroom selection probabilities not always correct
Iceland	P	–	P	C	
Indonesia	I	C	C	C	
Iran	C	C	C	C	
Ireland	C	C	C	C	
Israel	C	C	C	C	
Japan	C	–	C	C	
Korea	C	C	C	C	
Kuwait	C	–	P	C	Unapproved classroom sampling procedure
Latvia	C	C	C	P	
Lithuania	C	P	P	P	
Mexico	C	C	C	C	
Netherlands	C	C	C	C	
New Zealand	C	C	C	C	
Norway	C	P	P	C	
Philippines	C	I	P	C	Documentation inadequate to compute sampling weights
Portugal	C	C	C	C	
Romania	C	C	C	C	
Russian Federation	C	C	C	C	
Scotland	I	P	C	C	
Singapore	C	–	C	C	
Slovak Republic	C	C	C	C	
Slovenia	C	C	P	C	
South Africa	C	C	C	C	Non-participating students not recorded
Spain	C	C	C	C	
Sweden	C	–	P	C	
Switzerland	C	C	C	P	
Thailand	C	–	P	P	Unapproved classroom sampling procedure
United States	I	P	C	C	

C Complete information provided
P Partial information provided - adequate for monitoring
I Incomplete or no information provided
– Not applicable

2.3 POPULATION DEFINITIONS AND SAMPLE PARTICIPATION RATES

Tables 2.4 through 2.11 summarize the status of the TIMSS Population 2 samples as of September 25, 1996.

Table 2.4 describes the coverage of the population definitions in each country. In IEA studies, the *International Desired Population* is the population for which, ideally, results are required. For Population 2 in TIMSS, the international desired population consisted of all students in the country who were enrolled in one of the two adjacent grades containing the highest proportion of students aged 13 years at the time of testing. The *National Desired Population* for a country should correspond closely to this, and its coverage of the international desired population should ideally be 100%. In cases where it was not possible to implement the international desired population without modification, TIMSS permitted a country to define a national desired population that did not include part of the international desired population. Where this occurred it was the result of the exclusion of certain geographic or political units, language groups, or distinct school system components. The first column of figures in Table 2.4 gives the percentage coverage for each of the TIMSS participants. Just eight of the participants reported coverage less than 100%, and these are annotated in the international reports.

The *National Defined Population* consists of that portion of the country's national desired population that was covered by the school, classroom, and student sampling procedures and thus had a chance of being selected in the country's sample of students. Differences between the national desired populations and national defined populations could result from excluding schools (e.g., very small schools, or schools in remote areas), and from excluding certain kinds of students (e.g., students with physical and learning disabilities who were unable to take the assessment under TIMSS testing conditions). The remaining columns in Table 2.4 contain the percentages of the national desired population that were excluded by each participant. Countries where the overall exclusions exceed 10% are annotated in the international reports.

The two adjacent grades that the contained most 13-year-olds were the seventh and eighth grades in many countries. Table 2.5 records the grades tested in each country, with the names for those grades as provided by the participants. Table 2.6 presents the percentage of 13-year-olds in the grades tested in each country. The achievement results for countries not testing the two grades containing the most 13-year-olds are presented in a separate section of tables in the international reports.

Table 2.7 presents school participation rates and sample sizes for the eighth-grade sample. The table includes the weighted school participation rate before and after replacement of non-participating schools, the number of schools in the originally selected sample, the number of these schools that were in fact eligible for selection, the number of

schools in the originally selected sample that participated, the number of replacement schools that participated, and the total number of participating schools.

Table 2.8 presents student participation rates and sample sizes for the eighth-grade sample. The table includes the weighted student participation rate, the number of students in participating schools, the number of students withdrawn from sampled schools or classrooms before the test administration, the number of students excluded, the number of eligible and absent students in the sampled classrooms, and the total number of students assessed.

Tables 2.9 and 2.10 present the same information for the seventh-grade sample as Table 2.6 and 2.7 present for the eighth-grade.

Table 2.11 presents the overall weighted participation rates for the seventh-grade and eighth-grade samples both before and after the inclusion of replacement schools.

Table 2.4
Coverage of TIMSS Target Population

The International Desired Population is defined as follows:
Population 2 - All students enrolled in the two adjacent grades with the largest proportion of 13-year-old students at the time of testing.

Country	International Desired Population		National Desired Population		
	Coverage	Notes on Coverage	School-Level Exclusions	Within-Sample Exclusions	Overall Exclusions
Australia	100%		0.2%	0.7%	0.8%
Austria	100%		2.9%	0.2%	3.1%
Belgium (Fl)	100%		3.8%	0.0%	3.8%
Belgium (Fr)	100%		4.5%	0.0%	4.5%
Bulgaria	100%		0.6%	0.0%	0.6%
Canada	100%		2.4%	2.1%	4.5%
Colombia	100%		3.8%	0.0%	3.8%
Cyprus	100%		0.0%	0.0%	0.0%
Czech Republic	100%		4.9%	0.0%	4.9%
Denmark	100%		0.0%	0.0%	0.0%
[2] England	100%		8.4%	2.9%	11.3%
France	100%		2.0%	0.0%	2.0%
[1] Germany	88%	15 of 16 regions*	8.8%	0.9%	9.7%
Greece	100%		1.5%	1.3%	2.8%
Hong Kong	100%		2.0%	0.0%	2.0%
Hungary	100%		3.8%	0.0%	3.8%
Iceland	100%		1.7%	2.9%	4.5%
Iran, Islamic Rep.	100%		0.3%	0.0%	0.3%
Ireland	100%		0.0%	0.4%	0.4%
[1] Israel	74%	Hebrew Public Education System	3.1%	0.0%	3.1%
Japan	100%		0.6%	0.0%	0.6%
Korea	100%		2.2%	1.6%	3.8%
Kuwait	100%		0.0%	0.0%	0.0%
[1] Latvia (LSS)	51%	Latvian-speaking schools	2.9%	0.0%	2.9%
[1] Lithuania	84%	Lithuanian-speaking schools	6.6%	0.0%	6.6%
Netherlands	100%		1.2%	0.0%	1.2%
New Zealand	100%		1.3%	0.4%	1.7%
Norway	100%		0.3%	1.9%	2.2%
Philippines	91%	2 provinces and autonomous regions excluded	6.5%	0.0%	6.5%
Portugal	100%		0.0%	0.3%	0.3%
Romania	100%		2.8%	0.0%	2.8%
Russian Federation	100%		6.1%	0.2%	6.3%
Scotland	100%		0.3%	1.9%	2.2%
Singapore	100%		4.6%	0.0%	4.6%
Slovak Republic	100%		7.4%	0.1%	7.4%
Slovenia	100%		2.4%	0.2%	2.6%
South Africa	100%		9.6%	0.0%	9.6%
Spain	100%		6.0%	2.7%	8.7%
Sweden	100%		0.0%	0.9%	0.9%
[1] Switzerland	86%	22 of 26 cantons	4.4%	0.8%	5.3%
Thailand	100%		6.2%	0.0%	6.2%
United States	100%		0.4%	1.7%	2.1%

[1] National Desired Population does not cover all of International Desired Population. Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2] National Defined Population covers less than 90 percent of National Desired Population.
* One region (Baden-Wuerttemberg) did not participate.
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 2.5
Information About the Grades Tested

Country	Lower Grade		Upper Grade	
	Country's Name for Lower Grade	Years of Formal Schooling Including Lower Grade[1]	Country's Name for Upper Grade	Years of Formal Schooling Including Upper Grade[1]
[2] Australia	7 or 8	7 or 8	8 or 9	8 or 9
Austria	3. Klasse	7	4. Klasse	8
Belgium (Fl)	1A	7	2A & 2P	8
Belgium (Fr)	1A	7	2A & 2P	8
Bulgaria	7	7	8	8
Canada	7	7	8	8
Colombia	7	7	8	8
Cyprus	7	7	8	8
Czech Republic	7	7	8	8
Denmark	6	6	7	7
England	Year 8	8	Year 9	9
France	5ème	7	4ème (90%) or 4ème Technologique (10%)	8
Germany	7	7	8	8
Greece	Secondary 1	7	Secondary 2	8
Hong Kong	Secondary 1	7	Secondary 2	8
Hungary	7	7	8	8
Iceland	7	7	8	8
Iran, Islamic Rep.	7	7	8	8
Ireland	1st Year	7	2nd Year	8
Israel	–	–	8	8
Japan	1st Grade Lower Secondary	7	2nd Grade Lower Secondary	8
Korea, Republic of	1st Grade Middle School	7	2nd Grade Middle School	8
Kuwait	–	–	9	9
Latvia	7	7	8	8
Lithuania	7	7	8	8
Netherlands	Secondary 1	7	Secondary 2	8
[3,4] New Zealand	Form 2	7.5 - 8.5	Form 3	8.5 - 9.5
[3] Norway	6	6	7	7
[3] Philippines	Grade 6 Elementary	6	1st Year High School	7
Portugal	Grade 7	7	Grade 8	8
Romania	7	7	8	8
[5] Russian Federation	7	6 or 7	8	7 or 8
Scotland	Secondary 1	8	Secondary 2	9
Singapore	Secondary 1	7	Secondary 2	8
Slovak Republic	7	7	8	8
Slovenia	7	7	8	8
Spain	7 EGB	7	8 EGB	8
[3] South Africa	Standard 5	7	Standard 6	8
[3] Sweden	6	6	7	7
[3] Switzerland				
(German)	6	6	7	7
(French and Italian)	7	7	8	8
Thailand	Secondary 1	7	Secondary 2	8
United States	7	7	8	8

[1]Years of schooling based on the number of years children in the grade level have been in formal schooling, beginning with primary education (International Standard Classification of Education Level 1). Does not include preprimary education.

[2]Australia: Each state/territory has its own policy regarding age of entry to primary school. In 4 of the 8 states/territories students were sampled from grades 7 and 8; in the other four states/territories students were sampled from grades 8 and 9.

[3] Indicates that there is a system-split between the lower and upper grades. In Switzerland there is a system-split in 14 of 26 cantons.

[4]New Zealand: The majority of students begin primary school on or near their 5th birthday so the "years of formal schooling" vary.

[5]Russian Federation: 70% of students in the seventh grade have had 6 years of formal schooling; 70% in the eighth grade have had 7 years of formal schooling.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95. Information provided by TIMSS National Research Coordinators

Table 2.6
Coverage of 13-Year-Old Students

Country	Percent of 13-Year-Olds in Lower Grade (Seventh Grade*)	Percent of 13-Year-Olds in Upper Grade (Eighth Grade*)	Percent of 13-Year-Olds in Both Grades
Australia	64%	28%	92%
Austria	62%	27%	89%
Belgium (Fl)	46%	49%	94%
Belgium (Fr)	41%	46%	87%
Bulgaria	58%	37%	95%
Canada	48%	43%	91%
Colombia	30%	15%	45%
Cyprus	28%	70%	98%
Czech Republic	73%	17%	90%
Denmark	35%	64%	98%
England	57%	42%	99%
France	44%	35%	78%
Germany	71%	2%	73%
Greece	11%	85%	96%
Hong Kong	44%	46%	90%
Hungary	65%	24%	89%
Iceland	16%	83%	100%
Iran, Islamic Rep.	47%	25%	72%
Ireland	69%	17%	86%
Israel	–	–	–
Japan	91%	9%	100%
Korea	70%	28%	98%
Kuwait	–	–	–
Latvia (LSS)	60%	26%	86%
Lithuania	64%	26%	90%
Netherlands	59%	31%	90%
New Zealand	52%	47%	99%
Norway	43%	57%	100%
Philippines	–	–	–
Portugal	44%	32%	76%
Romania	67%	9%	76%
Russian Federation	50%	44%	95%
Scotland	24%	75%	99%
Singapore	82%	15%	97%
Slovak Republic	73%	22%	95%
Slovenia	65%	2%	67%
South Africa	36%	20%	55%
Spain	46%	39%	85%
Sweden	45%	54%	99%
Switzerland	48%	44%	92%
Thailand	58%	20%	78%
United States	58%	33%	91%

*Seventh and eighth grades in most countries; see Table 2.5 for more information about the grades tested in each country.
A dash (–) indicates data are unavailable. Israel and Kuwait did not test the lower (seventh) grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 2.7
School Participation Rates and Sample Sizes
Upper Grade (Eighth Grade*)

Country	School Participation Before Replacement (Weighted Percentage)	School Participation After Replacement (Weighted Percentage)	Number of Schools in Original Sample	Number of Eligible Schools in Original Sample	Number of Schools in Original Sample That Participated	Number of Replacement Schools That Participated	Total Number of Schools That Participated
Australia	75%	77%	214	214	158	3	161
Austria	41%	84%	159	159	62	62	124
Belgium (Fl)	61%	94%	150	150	92	49	141
Belgium (Fr)	57%	79%	150	150	85	34	119
Bulgaria	72%	74%	167	167	111	4	115
Canada	90%	91%	413	388	363	1	364
Colombia	91%	93%	150	150	136	4	140
Cyprus	100%	100%	55	55	55	0	55
Czech Republic	96%	100%	150	149	143	6	149
Denmark	93%	93%	158	157	144	0	144
England	56%	85%	150	144	80	41	121
France	86%	86%	151	151	127	0	127
Germany	72%	93%	153	150	102	32	134
Greece	87%	87%	180	180	156	0	156
Hong Kong	82%	82%	105	104	85	0	85
Hungary	100%	100%	150	150	150	0	150
Iceland	98%	98%	161	132	129	0	129
Iran, Islamic Rep.	100%	100%	192	191	191	0	191
Ireland	84%	89%	150	149	125	7	132
Israel	45%	46%	100	100	45	1	46
Japan	92%	95%	158	158	146	5	151
Korea	100%	100%	150	150	150	0	150
Kuwait	100%	100%	69	69	69	0	69
Latvia (LSS)	83%	83%	170	169	140	1	141
Lithuania	96%	96%	151	151	145	0	145
Netherlands	24%	63%	150	150	36	59	95
New Zealand	91%	99%	150	150	137	12	149
Norway	91%	97%	150	150	136	10	146
Philippines	96% **	97% **	200	200	192	1	193
Portugal	95%	95%	150	150	142	0	142
Romania	94%	94%	176	176	163	0	163
Russian Federation	97%	100%	175	175	170	4	174
Scotland	79%	83%	153	153	119	8	127
Singapore	100%	100%	137	137	137	0	137
Slovak Republic	91%	97%	150	150	136	9	145
Slovenia	81%	81%	150	150	121	0	121
South Africa	60%	64%	180	180	107	7	114
Spain	96%	100%	155	154	147	6	153
Sweden	97%	97%	120	120	116	0	116
Switzerland	93%	95%	259	258	247	3	250
Thailand	99%	99%	150	150	147	0	147
United States	77%	85%	220	217	169	14	183

*Eighth grade in most countries; see Table 2.5 for more information about the grades tested in each country.

**Participation rates for the Philippines are unweighted.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 2.8

Student Participation Rates and Sample Sizes Upper Grade (Eighth Grade*)

Country	Within School Student Participation (Weighted Percentage)	Number of Sampled Students in Participating Schools	Number of Students Withdrawn from Class/School	Number of Students Excluded	Number of Students Eligible	Number of Students Absent	Total Number of Students Assessed
Australia	92%	8027	63	61	7903	650	7253
Austria	95%	2969	14	4	2951	178	2773
Belgium (Fl)	97%	2979	1	0	2978	84	2894
Belgium (Fr)	91%	2824	0	1	2823	232	2591
Bulgaria	86%	2300	0	0	2300	327	1973
Canada	93%	9240	134	206	8900	538	8362
Colombia	94%	2843	6	0	2837	188	2649
Cyprus	97%	3045	15	0	3030	107	2923
Czech Republic	92%	3608	6	0	3602	275	3327
Denmark	93%	2487	0	0	2487	190	2297
England	91%	2015	37	60	1918	142	1776
France	95%	3141	0	0	3141	143	2998
Germany	87%	3318	0	35	3283	413	2870
Greece	97%	4154	27	23	4104	114	3990
Hong Kong	98%	3415	12	0	3403	64	3339
Hungary	87%	3339	0	0	3339	427	2912
Iceland	90%	2025	10	65	1950	177	1773
Iran, Islamic Rep.	98%	3770	20	0	3750	56	3694
Ireland	91%	3411	28	10	3373	297	3076
Israel	98%	1453	6	0	1447	32	1415
Japan	95%	5441	0	0	5441	300	5141
Korea	95%	2998	31	0	2967	47	2920
Kuwait	83%	1980	3	0	1977	322	1655
Latvia (LSS)	90%	2705	19	0	2686	277	2409
Lithuania	87%	2915	2	0	2913	388	2525
Netherlands	95%	2112	14	1	2097	110	1987
New Zealand	94%	4038	121	12	3905	222	3683
Norway	96%	3482	26	49	3407	140	3267
Philippines	91% **	6586	93	0	6493	492	6001
Portugal	97%	3589	70	13	3506	115	3391
Romania	96%	3899	0	0	3899	174	3725
Russian Federation	95%	4311	42	10	4259	237	4022
Scotland	88%	3289	0	46	3243	380	2863
Singapore	95%	4910	18	0	4892	248	4644
Slovak Republic	95%	3718	5	3	3710	209	3501
Slovenia	95%	2869	15	8	2846	138	2708
South Africa	97%	4793	0	0	4793	302	4491
Spain	95%	4198	27	102	4069	214	3855
Sweden	93%	4483	71	28	4384	309	4075
Switzerland	98%	4989	16	24	4949	94	4855
Thailand	100%	5850	0	0	5850	0	5850
United States	92%	8026	104	108	7814	727	7087

*Eighth grade in most countries; see Table 2.5 for more information about the grades tested in each country.
**Participation rates for the Philippines are unweighted.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 2.9

School Participation Rates and Sample Sizes Lower Grade (Seventh Grade*)

Country	School Participation Before Replacement (Weighted Percentage)	School Participation After Replacement (Weighted Percentage)	Number of Schools in Original Sample	Number of Eligible Schools in Original Sample	Number of Schools in Original Sample That Participated	Number of Replacement Schools That Participated	Total Number of Schools That Participated
Australia	75%	76%	214	213	156	3	159
Austria	43%	86%	159	159	63	62	125
Belgium (Fl)	61%	93%	150	150	91	49	140
Belgium (Fr)	57%	80%	150	150	85	35	120
Bulgaria	75%	77%	150	150	101	3	104
Canada	90%	90%	413	390	366	1	367
Colombia	91%	93%	150	150	136	4	140
Cyprus	100%	100%	55	55	55	0	55
Czech Republic	96%	100%	150	150	144	6	150
Denmark	88%	88%	158	154	137	0	137
England	57%	85%	150	145	81	41	122
France	87%	87%	151	151	126	0	126
Germany	70%	90%	153	153	101	31	132
Greece	87%	87%	180	180	156	0	156
Hong Kong	83%	83%	105	104	86	0	86
Hungary	99%	99%	150	150	149	0	149
Iceland	97%	97%	161	149	144	0	144
Iran, Islamic Rep.	100%	100%	192	192	192	0	192
Ireland	82%	87%	150	148	122	7	129
Israel	–	–	–	–	–	–	–
Japan	92%	95%	158	158	146	5	151
Korea	100%	100%	150	150	150	0	150
Kuwait	–	–	–	–	–	–	–
Latvia (LSS)	83%	84%	170	169	141	1	142
Lithuania	96%	96%	151	151	145	0	145
Netherlands	23%	61%	150	150	34	58	92
New Zealand	90%	99%	150	150	135	13	148
Norway	84%	96%	150	147	124	17	141
Philippines	97% **	97% **	200	200	194	0	194
Portugal	94%	94%	150	150	141	0	141
Romania	94%	94%	176	175	162	0	162
Russian Federation	97%	100%	175	175	170	4	174
Scotland	79%	85%	153	153	120	9	129
Singapore	100%	100%	137	137	137	0	137
Slovak Republic	91%	97%	150	150	136	9	145
Slovenia	81%	81%	150	150	122	0	122
South Africa	83%	85%	161	161	133	4	137
Spain	96%	100%	155	154	147	6	153
Sweden	96%	96%	160	160	154	0	154
Switzerland	90%	94%	217	217	200	6	206
Thailand	99%	99%	150	150	146	0	146
United States	77%	84%	220	214	165	14	179

*Seventh grade in most countries; see Table 2.5 for more information about the grades tested in each country.
**Participation rates for the Philippines are unweighted.
A dash (–) indicates data are unavailable. Israel and Kuwait did not test the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 2.10
Student Participation Rates and Sample Sizes
Lower Grade (Seventh Grade*)

Country	Within School Student Participation (Weighted Percentage)	Number of Sampled Students in Participating Schools	Number of Students Withdrawn from Class/School	Number of Students Excluded	Number of Students Eligible	Number of Students Absent	Total Number of Students Assessed
Australia	93%	6067	26	21	6020	421	5599
Austria	95%	3196	22	5	3169	156	3013
Belgium (Fl)	97%	2857	3	0	2854	86	2768
Belgium (Fr)	95%	2418	0	1	2417	125	2292
Bulgaria	87%	2080	0	0	2080	282	1798
Canada	95%	8962	89	248	8625	406	8219
Colombia	93%	2840	2	0	2838	183	2655
Cyprus	98%	3028	17	0	3011	82	2929
Czech Republic	92%	3641	11	0	3630	285	3345
Denmark	86%	2408	0	0	2408	335	2073
England	92%	2031	31	67	1933	130	1803
France	95%	3164	0	0	3164	148	3016
Germany	87%	3388	0	37	3351	458	2893
Greece	97%	4166	30	78	4058	127	3931
Hong Kong	98%	3507	11	0	3496	83	3413
Hungary	94%	3266	0	0	3266	200	3066
Iceland	92%	2243	11	72	2160	203	1957
Iran, Islamic Rep.	99%	3789	18	0	3771	36	3735
Ireland	91%	3480	23	17	3440	313	3127
Israel	–	–	–	–	–	–	–
Japan	96%	5337	0	0	5337	207	5130
Korea	94%	2996	51	0	2945	38	2907
Kuwait	–	–	–	–	–	–	–
Latvia (LSS)	91%	2853	7	0	2846	279	2567
Lithuania	89%	2852	3	0	2849	318	2531
Netherlands	95%	2220	23	0	2197	100	2097
New Zealand	95%	3471	98	17	3356	172	3184
Norway	96%	2629	8	53	2568	99	2469
Philippines	93% **	6283	29	1	6253	401	5852
Portugal	96%	3594	80	4	3510	148	3362
Romania	95%	3938	0	0	3938	192	3746
Russian Federation	96%	4408	39	11	4358	220	4138
Scotland	90%	3313	0	81	3232	319	2913
Singapore	98%	3744	19	0	3725	84	3641
Slovak Republic	95%	3797	10	3	3784	184	3600
Slovenia	95%	3058	12	4	3042	144	2898
South Africa	96%	5532	0	0	5532	231	5301
Spain	95%	4087	38	116	3933	192	3741
Sweden	95%	3055	27	36	2992	161	2831
Switzerland	99%	4199	14	44	4141	56	4085
Thailand	100%	5845	0	0	5845	0	5845
United States	94%	4295	42	85	4168	282	3886

*Seventh grade in most countries; see Table 2.5 for more information about the grades tested in each country.

**Participation rates for the Philippines are unweighted.

A dash (–) indicates data are unavailable. Israel and Kuwait did not test the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 2.11

Overall Participation Rates
Upper and Lower Grades (Seventh and Eighth Grades*)

Country	Upper Grade		Lower Grade	
	Overall Participation Before Replacement (Weighted Percentage)	Overall Participation After Replacement (Weighted Percentage)	Overall Participation Before Replacement (Weighted Percentage)	Overall Participation After Replacement (Weighted Percentage)
Australia	69%	70%	69%	71%
Austria	39%	80%	41%	82%
Belgium (Fl)	59%	91%	59%	91%
Belgium (Fr)	52%	72%	54%	76%
Bulgaria	62%	63%	65%	67%
Canada	84%	84%	86%	86%
Colombia	85%	87%	84%	86%
Cyprus	97%	97%	98%	98%
Czech Republic	89%	92%	88%	92%
Denmark	86%	86%	76%	76%
England	51%	77%	52%	78%
France	82%	82%	82%	82%
Germany	63%	81%	61%	78%
Greece	84%	84%	84%	84%
Hong Kong	81%	81%	81%	81%
Hungary	87%	87%	93%	93%
Iceland	88%	88%	89%	89%
Iran, Islamic Rep.	98%	98%	99%	99%
Ireland	76%	81%	75%	79%
Israel	44%	45%	–	–
Japan	87%	90%	88%	91%
Korea	95%	95%	94%	94%
Kuwait	83%	83%	–	–
Latvia (LSS)	75%	75%	75%	76%
Lithuania	83%	83%	86%	86%
Netherlands	23%	60%	22%	58%
New Zealand	86%	94%	85%	94%
Norway	87%	93%	81%	92%
Philippines	87% **	88% **	90% **	90% **
Portugal	92%	92%	90%	90%
Romania	89%	89%	89%	89%
Russian Federation	93%	95%	93%	95%
Scotland	69%	73%	71%	76%
Singapore	95%	95%	98%	98%
Slovak Republic	86%	91%	86%	92%
Slovenia	77%	77%	77%	77%
South Africa	58%	62%	79%	82%
Spain	91%	94%	91%	95%
Sweden	90%	90%	91%	91%
Switzerland	92%	94%	89%	93%
Thailand	99%	99%	99%	99%
United States	71%	78%	72%	79%

*Seventh and eighth grades in most countries; see Table 2.5 for information about the grades tested in each country.
** Participation rates for the Philippines are unweighted.
A dash (–) indicates data are unavailable. Israel and Kuwait did not test the lower grade.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

2.4 REPORTING ACHIEVEMENT RESULTS

The manner in which the achievement results for participants are presented in international reports was influenced by their sampling participation rates. Countries were assigned to one of three categories on the basis of their sampling participation.

Category 1 Acceptable sampling participation rate **without** the use of replacement schools.

Countries in this category will appear in the tables and figures in international reports without annotation, and will be ordered by achievement as appropriate.

Category 2 Acceptable sampling participation rate **only when replacement schools are included**.

Countries in this category will be annotated with a "dagger" in the tables and figures in international reports, and will be ordered by achievement as appropriate.

Category 3 Unacceptable sampling response rate even when replacement schools are included.

Countries in this category will appear in a separate section of the achievement tables, below the other countries, in international reports. These countries will be presented in alphabetical order.

In order to be placed in Category 1, a country had to have:

- An **unweighted** school response rate **without** replacement of at least 85% (after rounding to nearest whole percent) AND an **unweighted** student response rate (after rounding) of at least 85%

OR

- A **weighted** school response rate **without** replacement of at least 85% (after rounding to nearest whole percent) AND a **weighted** student response rate (after rounding) of at least 85%

OR

- The product of the (unrounded) **weighted** school response rate **without** replacement and the (unrounded) **weighted** student response rate of at least 75% (after rounding to the nearest whole percent).

A country was placed in Category 2 if:

- It failed to meet the requirements for Category 1 but had a weighted school response rate **without** replacement of at least 50% (after rounding to the nearest percent)

AND EITHER

- A **weighted** school response rate **with** replacement of at least 85% (after rounding to nearest whole percent) AND a **weighted** student response rate (after rounding) of at least 85%

OR

- The product of the (unrounded) **weighted** school response rate **with** replacement and the (unrounded) **weighted** student response rate of at least 75% (after rounding to the nearest whole percent).

Countries that could provide documentation to show that they complied with TIMSS sampling procedures and requirements but did not meet the requirements for Category 1 or Category 2 were placed in Category 3.

2.5 SUMMARY

An enormous amount of time and effort was devoted to sampling issues and activities in TIMSS. The study is by far the largest comparative international survey of student achievement conducted to date, and by far the most demanding in terms of sampling requirements. The TIMSS data collection was conducted simultaneously in 45 countries, with three student populations incorporating five grade levels and two school subjects. In Population 2 alone, more than 300,000 students in more than 7,500 schools were sampled to take part in the study.

The study broke new ground, not only by the scale of its sampling operations and the care and attention that was paid to all aspects of the process, but also by the extent to which each stage of the procedure was documented and verified by the National Research Coordinators, the TIMSS sampling consultants, and the sampling referee. This emphasis on documentation was carried through to the reporting of results, where countries with irregularities in their sampling are clearly labeled, annotated, or presented in separate sections of tables, depending on the nature of the irregularity.

As documented in this report, the majority of participants in TIMSS did an excellent job in discharging their sampling responsibilities, and readers and reviewers of international reports may be assured that the results are based on accurate and well-documented samples. Perhaps inevitably for a cooperative venture on such a scale, there were some participants who found it difficult to complete all of their tasks in a satisfactory manner, but all such deficiencies are clearly labeled when data are reported, and should not be allowed to detract from the high professional standard achieved by most participants.

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