

TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY

PROGRESS IN INTERNATIONAL READING LITERACY STUDY

TIMSS & PIRLS



TIMSS and PIRLS 2011 User Guide for the Fourth Grade Combined International Database

Pierre Foy



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Publishers: TIMSS & PIRLS International Study Center,
Lynch School of Education, Boston College
and
International Association for the Evaluation of Educational Achievement (IEA)

Library of Congress Catalog Card Number: 2013949667
ISBN: 978-1-889938-21-9

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Printed and bound in the United States.

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Introduction

1 The TIMSS and PIRLS 2011 User Guide and Combined International Database

In 2011, 34 countries and 3 benchmarking entities administered the TIMSS and PIRLS assessments to the same samples of fourth grade students (Botswana and Honduras administered the assessments at the sixth grade). This provided a unique opportunity to analyze the relationships across reading, mathematics, and science achievement at the fourth grade. To that end, the TIMSS & PIRLS International Study Center created a special international database that includes all students who participated in both assessments, along with proper sampling weights and achievement scores. This database comprises student achievement data as well as student, home, teacher, and school data for these 34 countries and 3 benchmarking participants. In total, the database includes data from 185,475 students, 171,098 parents, 14,258 teachers, and 6,469 school principals. All participating countries gave the IEA permission to release their national data.

Because the TIMSS and PIRLS 2011 Fourth Grade Combined International Database integrates data from the TIMSS 2011 International Database (Foy, Arora, & Stanco, 2013) and the PIRLS 2011 International Database (Foy & Drucker, 2013), much of the relevant documentation also will be found in the individual TIMSS 2011 and PIRLS 2011 International Databases. In particular, no supplements are provided with this database; all relevant information can be found in the supplements that accompany the *TIMSS 2011 User Guide* and the *PIRLS 2011 User Guide*. This User Guide emphasizes the aspects of the TIMSS and PIRLS 2011 Combined International Database that differentiate it from the individual TIMSS 2011 and PIRLS 2011 International Databases.

All analyses presented in the *TIMSS and PIRLS 2011 Relationships Report* (Martin & Mullis, 2013) relied on the data in the TIMSS and PIRLS 2011 Combined International Database. Special statistical methods were used for most of these analyses, beyond the scope of the usual statistical tools described in past user guides. For this reason, this User Guide does not provide instruction on how to analyze the data using the IEA IDB Analyzer (IEA, 2012), nor using SAS macros (SAS Institute, 2011). Users interested in using these tools to analyze the data in the Combined International Database may refer to the instructions provided in the *TIMSS 2011 User Guide* and the *PIRLS 2011 User Guide*.

2 Contents of the TIMSS and PIRLS 2011 Combined International Database

The entire TIMSS and PIRLS 2011 Combined International Database is available on the TIMSS and PIRLS 2011 Combined International Database and User Guide webpage:

<http://timssandpirls.bc.edu/timsspirls2011/international-database.html>

Exhibit 1 presents the general structure of the Combined International Database and provides a brief description of the support materials available for download on the Combined International Database and User Guide webpage. All files and support materials in the Combined International

Database are described in the next chapter. All data files are available in SAS format and SPSS format (IBM Corporation, 2012). The TIMSS and PIRLS 2011 Combined International Database also is available for download at the IEA Study Data Repository website: <http://rms.iea-dpc.org/>. The repository allows users to download subsets of files and the corresponding support material through customizable queries from all recent IEA studies.

Exhibit 1: Contents of the TIMSS and PIRLS 2011 Combined International Database

User Guide	This User Guide	
Items	The TIMSS 2011 and PIRLS 2011 item information and IRT item parameters	
International Database	SPSS Data	TIMSS and PIRLS 2011 student, home, teacher, and school data files in SPSS format
	SAS Data	TIMSS and PIRLS 2011 student, home, teacher, and school data files in SAS format
	Reading Demands Data	Reading Demands classification data for the TIMSS 2011 items
	Codebooks	Codebooks describing all variables in the TIMSS and PIRLS 2011 Data Files
	Almanacs	Almanacs with summary statistics for TIMSS and PIRLS 2011 items and background variables
	Programs	SAS and SPSS programs

3 Features of the TIMSS and PIRLS 2011 Combined International Database

Because the TIMSS and PIRLS 2011 Combined International Database combines data from the individual TIMSS 2011 and PIRLS 2011 International Databases, it possesses many of the same attributes as these individual databases. However, the TIMSS and PIRLS 2011 Combined International Database does have a few distinctive features worthy of note.

Sampling Weights

The TIMSS and PIRLS 2011 Combined International Database includes data *only* for students that responded to *both* assessments. Consequently, appropriate sampling weights were computed for the Combined International Database to account for this marginal reduction in sample size.

Achievement Scores

The TIMSS and PIRLS 2011 achievement results were re-scaled to take advantage of having combined the PIRLS reading results with the TIMSS mathematics and science results. The item parameters estimated separately for PIRLS 2011 and TIMSS 2011, using concurrent item calibration, were taken as fixed and achievement results were scaled together in a multi-dimensional IRT model in order to preserve the correlation structure across the three achievement scales: reading, mathematics, and science. The achievement scores for reading, mathematics, and science then were placed on separate scales, all with an international mean of 500 points (based on the 32 countries that administered the TIMSS and PIRLS 2011 assessments at the fourth grade) and standard deviation of 100 points. As a result, national achievement means based on these achievement scores will not agree

with the achievement means presented in the TIMSS 2011 and PIRLS 2011 International Reports. Users interested in replicating the achievement means presented in the International Reports should analyze the data from the individual TIMSS 2011 and PIRLS 2011 International Databases. The achievement scores included in the TIMSS and PIRLS 2011 Combined International Database are optimal for analyzing the correlation structure across reading, mathematics, and science while conveying the same information about the student achievement distributions in the three subjects.

International Benchmarks

The international benchmark variables included in the TIMSS and PIRLS 2011 Combined International Database are taken directly from the individual TIMSS 2011 and PIRLS 2011 international database files, because their proper interpretation is tied directly to performance on the TIMSS trend scales of mathematics and science and the PIRLS trend scale of reading. The international benchmark variables for reading, mathematics, and science were used for analyzing the profiles of performance in the *TIMSS and PIRLS 2011 Relationships Report*.

Context Questionnaire Scales

The context questionnaire scales included in the TIMSS and PIRLS 2011 Combined International Database are the same scales found in the individual TIMSS 2011 and PIRLS 2011 International Databases. However, their numerical values are slightly different because they were re-scaled for reporting in the *TIMSS and PIRLS 2011 Relationships Report*. An additional contextual scale was created for the effective schools analysis presented in the *TIMSS and PIRLS 2011 Relationships Report* and added to the Combined International Database. One PIRLS 2011 scale—Instruction Affected by Reading Resource Shortages (ACBGRRS)—and two TIMSS 2011 scales—Instruction Affected by Mathematics Resource Shortages (ACBGMRs) and Instruction Affected by Science Resource Shortages (ACBGSRS)—were combined into a single unified contextual scale labeled Instruction Affected by Any Resource Shortages (ACBGARS).

Derived Variables

All derived variables found in the individual TIMSS 2011 and PIRLS 2011 International Databases also are available in the TIMSS and PIRLS 2011 Combined International Database. Although none of the derived variables were considered for analysis in the *TIMSS and PIRLS 2011 Relationships Report*, they were added in anticipation of further secondary analyses.

Reading Demands

The TIMSS 2011 item information spreadsheets include an additional column to indicate the reading demand level of each mathematics and science item. This information was used in the analysis of reading demands in the TIMSS 2011 mathematics and science items presented in the *TIMSS and PIRLS 2011 Relationships Report*. The Combined International Database also includes an Excel file with the classification data that were used to validate the Reading Demands categorization of the TIMSS 2011 mathematics and science items.

Reliability Data

Finally, the TIMSS and PIRLS 2011 Combined International Database does not include the reliability files typically found in the TIMSS and PIRLS international databases. Users interested in evaluating the reliability of the TIMSS 2011 and PIRLS 2011 constructed response items will find the reliability data in the individual TIMSS 2011 and PIRLS 2011 International Databases.

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Describing the TIMSS and PIRLS 2011 Combined International Database Files

1 Overview

The TIMSS and PIRLS 2011 Combined International Database contains achievement data in addition to student, home, teacher, and school background data collected in the 34 countries and the 3 benchmarking participants that administered the TIMSS 2011 and PIRLS 2011 assessments to the same samples of fourth grade students. Exhibit 2 lists all of the countries and benchmarking participants, along with identifying codes used in the Combined International Database. The database also contains materials that provide additional information on its structure and contents.

The data files included in the TIMSS and PIRLS 2011 Combined International Database are similar in contents and structure to the data files in the TIMSS 2011 International Database (Foy, Arora, & Stanco, 2013) and the PIRLS 2011 International Database (Foy & Drucker, 2013). Nevertheless, the Combined International Database does differ in many respects to the individual TIMSS 2011 and PIRLS 2011 International Databases, as was described in the Introduction.

2 TIMSS and PIRLS 2011 Achievement Items Documentation

A number of documents related to the TIMSS and PIRLS 2011 achievement items are available for download along with the TIMSS and PIRLS 2011 Combined International Database. They include summary information on the TIMSS 2011 items and PIRLS 2011 items, as well as the IRT item parameters estimated from the TIMSS 2011 concurrent item calibration and the PIRLS 2011 concurrent item calibration. Information on the TIMSS 2011 released items and the PIRLS 2011 released passages and items is available in the individual TIMSS 2011 and PIRLS 2011 International Databases, respectively.

Achievement item information files are provided to enable users of the combined database to readily produce summaries of item characteristics. There are separate achievement item information files for TIMSS and PIRLS. These files are available in Excel format and include the following information for each item in the TIMSS 2011 and PIRLS 2011 assessments:

- The item's permanent and unique identifier;
- The item's block and its sequential location within the block (for TIMSS items);
- The item's passage name and its sequential location (for PIRLS items);
- The item's label;
- The item's content domain and cognitive domain (for TIMSS items);

Exhibit 2: Countries Included in the TIMSS and PIRLS 2011 Combined International Database

Country	ISO Code	
	Alpha	Numeric
Australia	AUS	036
Austria	AUT	040
Azerbaijan	AZE	031
Chinese Taipei	TWN	158
Croatia	HRV	191
Czech Republic	CZE	203
Finland	FIN	246
Georgia	GEO	268
Germany	DEU	276
Hong Kong SAR	HKG	344
Hungary	HUN	348
Iran, Islamic Rep. of	IRN	364
Ireland	IRL	372
Italy	ITA	380
Lithuania	LTU	440
Malta	MLT	470
Morocco	MAR	504
Northern Ireland	NIR	928
Norway	NOR	578
Oman	OMN	512
Poland	POL	616
Portugal	PRT	620
Qatar	QAT	634
Romania	ROM	642
Russian Federation	RUS	643
Saudi Arabia	SAU	682
Singapore	SGP	702
Slovak Republic	SVK	703
Slovenia	SVN	705
Spain	ESP	724
Sweden	SWE	752
United Arab Emirates	ARE	784
Sixth Grade Countries		
Botswana	BWA	072
Honduras	HND	340
Benchmarking Participants		
Quebec, Canada	CQU	9133
Abu Dhabi, UAE	AAD	7842
Dubai, UAE	ADU	7841

- The item’s purpose for reading and process of comprehension (for PIRLS items);
- The item’s reading demand level (for TIMSS items);
- The item’s type, either multiple choice or constructed response;
- The number of options for a multiple choice item;
- The correct response key for a multiple choice item;
- The item’s point value;
- An indicator showing if the item was included in the IRT scaling; and
- An indicator showing if the item was released after the 2011 assessment.

The Combined International Database also includes Excel files with the IRT item parameters estimated for all 2007 and 2011 items from the TIMSS 2011 concurrent item calibrations, as well as for all 2006 and 2011 items from the PIRLS 2011 concurrent item calibration. These same item parameters are presented in the scaling section of *Methods and Procedures in TIMSS and PIRLS 2011* (Martin & Mullis, 2012). Users should note that the TIMSS items released in 2007 and the PIRLS items released in 2006, included in the respective concurrent calibrations, were not used for the multi-dimensional scaling of the three subjects—reading, mathematics, and science.

3 The TIMSS and PIRLS 2011 Data Files

The TIMSS and PIRLS 2011 Combined International Database includes the actual data from all instruments administered to the students, their parents, their teachers, and their school principals for both TIMSS 2011 and PIRLS 2011. This includes the student responses to the achievement items—PIRLS reading, and TIMSS mathematics and science—and the responses to the student, home, teacher, and school background questionnaires. These data files also include the achievement scores estimated for participating students as well as background variables derived for reporting in the *TIMSS 2011 International Reports* (Mullis, Martin, Foy, & Arora, 2012; Martin, Mullis, Foy, & Stanco, 2012) and the *PIRLS 2011 International Results in Reading* (Mullis, Martin, Foy, & Drucker, 2012).

This section describes the contents of the TIMSS and PIRLS 2011 data files. The data files are nearly identical to the PIRLS 2011 data files and a more thorough description is available in the *PIRLS 2011 User Guide*. This section emphasizes the differences between the TIMSS and PIRLS 2011 data files and the PIRLS 2011 data files.

The TIMSS and PIRLS 2011 data files are provided in SAS (SAS Institute, 2011) export format (.EXP) and SPSS (IBM Corporation, 2012) format (.SAV). Data files are provided for each country that administered the TIMSS 2011 and PIRLS 2011 assessments to the same samples of fourth grade students. The file names given to the various data file types are shown in Exhibit 3. For example, ASGNORB1.SAV is an SPSS file that contains Norway’s TIMSS and PIRLS 2011 student background data. For each file type, a separate data file is provided for each participating country.

Exhibit 3: TIMSS and PIRLS 2011 Data File Names

File Names	Descriptions
ACG●●●B1	TIMSS and PIRLS 2011 school background data files
ASA●●● B1	TIMSS and PIRLS 2011 student achievement data files
ASG●●● B1	TIMSS and PIRLS 2011 student background data files
ASH●●● B1	TIMSS and PIRLS 2011 home background data files
AST●●● B1	TIMSS and PIRLS 2011 student–teacher linkage files
ATG●●● B1	TIMSS and PIRLS 2011 teacher background data files

●●● = 3-character country abbreviation based on the ISO 3166 coding scheme (see Exhibit 2).

3.1 TIMSS and PIRLS 2011 Student Achievement Data Files (ASA)

The TIMSS and PIRLS 2011 student achievement data files contain the student responses to the individual achievement items in the TIMSS 2011 and PIRLS 2011 assessments. These data files combine the item responses from the TIMSS 2011 achievement data files and from the PIRLS 2011 achievement data files. Achievement scores (plausible values) for the overall reading, mathematics, and science achievement scales are available in the student achievement data files, as well as in the student background data files and student–teacher linkage data files. These achievement scores, however, are not identical to the achievement scores available in the individual TIMSS 2011 and PIRLS 2011 achievement data files (see Introduction, Section 3). Achievement scores by sub-domain—the content and cognitive domains of mathematics and science in TIMSS, and the purposes and processes of reading in PIRLS—are not present in the TIMSS and PIRLS 2011 achievement data files.

Students were administered one of 13 PIRLS 2011 booklets, each with two reading passages and their accompanying items, as well as one of 14 TIMSS 2011 assessment booklets, each with a series of mathematics and science items.^{1,2} Some of these items were multiple choice items and some were constructed response items. The student achievement data files contain the actual responses to the multiple choice questions and the codes assigned to the constructed response items through the scoring guides.

The TIMSS 2011 and PIRLS 2011 achievement item variable names are based on an 8-character alphanumeric code described in the *TIMSS 2011 User Guide* and the *PIRLS 2011 User Guide*, respectively. The response code values assigned in the TIMSS 2011 and PIRLS 2011 achievement item variables, including codes for missing values, also are described in their respective *User Guides*.

¹ The PIRLS 2011 booklet design is described in Chapter 4 of the *PIRLS 2011 Assessment Framework* (Mullis, I.V.S., Martin, M.O., Kennedy, A.M., Trong, K.L., & Sainsbury, M., 2009).

² The TIMSS 2011 booklet design is described in Chapter 4 of the *TIMSS 2011 Assessment Frameworks* (Mullis, I.V.S., Martin, M. O., Ruddock, G. J., O'Sullivan, C.Y., & Preuschoff, C., 2009).

Achievement Scores

Achievement scales were produced for overall reading achievement, mathematics achievement, and science achievement. Each scale has an international mean of 500 points (based on the 32 countries that administered the TIMSS 2011 and PIRLS 2011 assessments at the fourth grade) and standard deviation of 100 points. For each achievement scale, the TIMSS and PIRLS 2011 Combined International Database provides five separate estimates of each student’s score on that scale. The five estimated scores are known as “plausible values” and the variability between them encapsulates the uncertainty inherent in the scale estimation process. The reading plausible values are labeled ASRREA01 through ASRREA05, the mathematics plausible values are labeled ASMMAT01 through ASMMAT05, and the science plausible values are labeled ASSSCI01 through ASSSCI05.

Users should note that these achievement scores will not replicate the results presented in the *TIMSS 2011* and *PIRLS 2011 International Reports*. Rather, these achievement scores were estimated together in order to preserve the correlation structure across the three subjects, a requirement for the analyses presented in the *TIMSS and PIRLS 2011 Relationships Report* (Martin & Mullis, 2013). Users should use the achievement scores in the individual databases if their intention is to replicate the achievement results from the *TIMSS 2011* and *PIRLS 2011 International Reports*.

International Benchmarks of Achievement

In order to help users of the TIMSS 2011 and PIRLS 2011 achievement results understand what performance on the overall reading, mathematics, and science achievement scales signifies in terms of the types of items that students can successfully answer, TIMSS and PIRLS identified four points on the overall scales to serve as International Benchmarks. As shown in Exhibit 4, the International Benchmark scores are 625, 550, 475, and 400, which correspond to the Advanced International Benchmark, the High International Benchmark, the Intermediate International Benchmark, and the Low International Benchmark, respectively. These International benchmarks are described in the *TIMSS 2011* and *PIRLS 2011 International Reports*, and the technique used to summarize and describe student achievement at the points on the scales is described in the scale anchoring section of the *Methods and Procedures in TIMSS and PIRLS 2011*.

Exhibit 4: TIMSS 2011 and PIRLS 2011 International Benchmarks of Achievement

Scale Score	International Benchmark
625	Advanced International Benchmark
550	High International Benchmark
475	Intermediate International Benchmark
400	Low International Benchmark

The international benchmark variables included in the TIMSS and PIRLS 2011 Combined International Database are taken directly from the individual TIMSS 2011 and PIRLS 2011 International Databases because their proper interpretation is tied directly to performance on the

trend scales of TIMSS mathematics and science and the trend scale of PIRLS reading. The international benchmark variables for reading, mathematics, and science were used for analyzing the profiles of performance in the *TIMSS and PIRLS 2011 Relationships Report*.

The TIMSS and PIRLS 2011 Combined International Database contains a set of variables indicating which International Benchmark the students reached in reading, mathematics, and science. There is a benchmark variable for each plausible value of the overall reading, mathematics, and science scales. The International Benchmark variables follow the achievement score variable naming convention, where the fourth through sixth positions have the letters “IBM.” Thus, ASRIBM01 through ASRIBM05 are the five benchmark variables for overall reading, ASMIBM01 through ASMIBM05 are the five benchmark variables for overall mathematics, and ASSIBM01 through ASSIBM05 are the five benchmark variables for overall science. The codes used for the benchmark variables are described in Exhibit 5.

Exhibit 5: TIMSS 2011 and PIRLS 2011 International Benchmark Variable Codes

Code	Description
1	Student performed below the Low International Benchmark
2	Student performed at or above the Low International Benchmark, but below the Intermediate International Benchmark
3	Student performed at or above the Intermediate International Benchmark, but below the High International Benchmark
4	Student performed at or above the High International Benchmark, but below the Advanced International Benchmark
5	Student performed at or above the Advanced International Benchmark

3.2 TIMSS and PIRLS 2011 Background Questionnaire Data Files

There are five types of TIMSS and PIRLS 2011 background questionnaire data files. Four data files (student, home, teacher, and school) correspond to the four types of background questionnaires administered in TIMSS 2011 and PIRLS 2011, and the fifth links the student and teacher background data. The first four types of data files contain the responses to the questions asked in their respective background questionnaires.

Student Background Data Files (ASG)

Students who participated in both TIMSS 2011 and PIRLS 2011 assessments were administered a background questionnaire with questions related to their home background, school experiences, and attitudes toward reading, mathematics, and science. The student background data files contain students’ responses to these questions. They also contain students’ reading, mathematics, and science achievement scores (plausible values) in order to facilitate analyses of relationships between student background characteristics and achievement in the three subjects.

The student background data files also contain a number of identification variables, tracking variables, sampling and weighting variables, and derived variables that are required for appropriate data analyses. These variables are described later in this chapter.

Home Background Data Files (ASH)

Countries that participated in the TIMSS 2011 and PIRLS 2011 assessments administered a “Learning to Read Survey,” which was completed by the students’ parents or guardians. This survey usually is called the Home Questionnaire. It asked questions about preparations for primary schooling, including attendance in preschool and literacy/numeracy activities in the home before the child began school, such as reading books, writing letters or words, and counting numbers. Parents answered questions about home resources in addition to information about their highest level of education and employment situations.

School Background Data Files (ACG)

The school background data files contain school principals’ responses to the questions in the TIMSS 2011 and PIRLS 2011 school background questionnaires. Although school-level analyses where the schools are the units of analysis can be performed, it is preferable to analyze school-level variables as attributes of students. To perform student-level analyses with school data, the school background data files must be merged with the student background data files using the country and school identification variables.

The school background data files in the TIMSS and PIRLS 2011 Combined International Database are in every way identical to the school background data files present in the individual TIMSS 2011 and PIRLS 2011 International Databases.

Teacher Background Data Files (ATG)

The reading, mathematics, and science teachers of the students who were sampled for TIMSS 2011 and PIRLS 2011 were administered a questionnaire with questions pertaining to their background and their teaching practices in the classes of the sampled students. Each teacher was asked to respond to a questionnaire for each class taught that contained sampled students. The teacher background data files contain one record for each teacher who taught the sampled students. If a teacher taught more than one sampled class, he or she was expected to complete only one part A (general background questions) and a separate part B (class-specific questions) for each sampled class they taught. A single teacher questionnaire was used to collect information on reading, mathematics, and science. Teachers were asked to complete all relevant portions, and all teachers’ responses are found in the ATG files.

In the teacher background data files, each teacher has a unique identification number (IDTEACH) and a link number (IDLINK) that is specific to the class taught by the teacher and to which the information in the data record corresponds. The IDTEACH and IDLINK combination uniquely identifies, within a country, a teacher teaching a specific class. Thus, students linked to teachers identified by the same IDTEACH but different IDLINK are taught by the same teacher but in different classes. The teacher background data files cannot be merged directly with the student

data files, and they do not contain sampling and weighting information, nor achievement scores.

It is important to note that the teachers in the teacher background data files do not constitute a representative sample of teachers in a country, but rather are the teachers who taught a representative sample of students. The teacher data, therefore, should be thought of as attributes of the students to which they are linked, and should be analyzed only in conjunction with the student–teacher linkage data files.

Student–Teacher Linkage Data Files (AST)

The TIMSS and PIRLS 2011 student–teacher linkage data files contain information required to link the student and teacher data files. The student–teacher linkage data files contain one entry per student–teacher linkage combination in the data. For instance, if three teachers are linked to a student, which would be the case if a different teacher taught each of the three subjects, there are three entries in the file corresponding to that student. The sole purpose of the student–teacher linkage data files is to link teacher-level data with student-level data in order to perform appropriate student-level analyses where teacher characteristics are considered as attributes of the students.

Background Variable Naming Convention

The background variable naming convention is based on a 7- or 8-character string. The following rules are applied in naming the background variables:

- The first character is always “A.”
- The second character indicates the type of respondent. The letter “C” is used to identify data from the school principals, the letter “T” is used for teacher data, and the letter “S” for student and parent data.
- The third character is used to indicate the source of the data. The letter “B” is used for all background variables associated with questions in the background questionnaires, as well as the Rasch scores to contextual scales derived from these data. The letter “D” is used for all variables derived from responses in the background questionnaires, in addition to the index variables constructed from the background Rasch scores (see the Context Questionnaire Scales in *Methods and Procedures in TIMSS and PIRLS 2011*).
- The fourth character is used to indicate the subject or topic to which a background question refers. The following letters are used:
 - G—General questions;
 - H—Home questionnaire questions;
 - R—Questions related to reading;
 - M—Questions related to mathematics; and
 - S—Questions related to science.
- The fifth through eighth characters of all background questionnaire variables represent the sequential numbering of the questions as presented in their respective questionnaires.³

³ Because of the modular structure of the background questionnaires, the sequential numbering can be specific to each module.

Background Variable Location Convention

Although the background variable naming convention was modified in 2011 in order to show explicitly the ordering of questions in the background questionnaires, each question also was assigned a unique location code as shown in Exhibit 6. This unique code includes the sequence number of the question within the questionnaire, the same sequence number now found in the question's variable name. For example, if the location variable is given as SQG-06, it refers to general question 6 in the student background questionnaire. This convention is followed in the data almanacs and in the description of the variables included in Supplements 1 and 2 to the *TIMSS 2011* and *PIRLS 2011 User Guides*.

Exhibit 6: Background Questionnaire Variable Location Convention

Questionnaire	Location Variable	
Student Questionnaire	SQG-●●●	General questions
	SQR-●●●	Reading questions
	SQMS-●●●	Mathematics and science questions
Home Questionnaire	HQ-●●●	All questions
Teacher Questionnaire	TQG-●●●	General questions
	TQR-●●●	Reading questions
	TQM-●●●	Mathematics questions
	TQS-●●●	Science questions
School Questionnaire	SCQ-●●●	All questions

●●● = sequential numbering of the question location in the questionnaire

Data Coding Conventions

A series of conventions also were adopted to code the data included in the background data files. This section describes these conventions.

Background Question Response Code Values—The values assigned to each of the background variables depend on the item format and the number of options available. For categorical questions, sequential numerical values were used to correspond to the response options available. The numbers correspond to the sequence of appearance of the response options. For example, the first response option was represented with a 1, the second response option with a 2, et cetera. Open-ended questions, such as “the number of students in a class,” were coded with the actual number given as a response.

Codes for Missing Values—A subset of values is reserved for specific codes related to various categories of missing data.

Omitted Response Codes (SAS: . ; SPSS: 9, 99, 999, ...)

“Omitted” response codes were used for questions that a student, parent, teacher, or school principal should have answered but did not. The length of the omitted response code given to a variable in the SPSS data files depends on the number of characters needed to represent the variable. In all cases, the space necessary to represent the variable is filled with 9’s. For questionnaire data, no distinction was made between items left blank and items with invalid answers, such as checking two or more response options in a categorical question, or unreadable or uninterpretable responses to open-ended questions. In a small number of cases, data received from a country in an invalid or inconsistent manner also were coded as “Omitted.”

Not Administered Response Codes (SAS: .A ; SPSS: sysmis)

Special codes were given to items that were “Not Administered,” to distinguish these cases from data that were missing due to non-response. In general, the “Not Administered” code was used when an entire questionnaire was not completed or a specific question was not administered, such as when a question was left out of the instrument or misprinted. Specifically, the “Not Administered” code was used in the following cases:

- Background question left out or misprinted—When a particular question (or a whole page) was misprinted, or otherwise not available to the respondent, the corresponding variables were coded as “Not Administered.”
- Background questions removed—Variables corresponding to questions in the student, home, teacher, or school background questionnaires that were considered not applicable in some countries were not included in the national versions of the questionnaires. These questions were coded as “Not Administered.”
- Background questions mistranslated or not internationally comparable—In some cases, questions in the international version of the questionnaires were mistranslated or modified to fit the national context. Whenever possible, modified questions were recoded to match as closely as possible the international version. When this was not possible, modified questions were coded as “Not Administered.”

Not Applicable Response Codes (SAS: .B ; SPSS: 6, 96, 996, ...)

“Not Applicable” response codes were used for the background questionnaire items for which responses were dependent upon a filter question. Generally, a “No” response to a filter question lead to any follow-up questions being coded as “Not Applicable” because there were no appropriate responses to these follow-up questions.

Contextual Scales and Derived Variables

In the TIMSS 2011 and PIRLS 2011 questionnaires, often several questions were asked about various aspects of a single contextual construct. In these cases, responses to the individual items were combined to create a score, using Rasch scaling, which provided a more comprehensive picture of the construct of interest than the individual variables could on their own. These Rasch scores also were

categorized, usually into three groups, to create an index. The Rasch scores and their indices are described in the contextual questionnaire scaling section of *Methods and Procedures in TIMSS and PIRLS 2011*. All contextual scales found in the individual TIMSS 2011 and PIRLS 2011 International Databases are present in the combined international database. However, the numerical values of the scales will differ slightly because they were re-scaled for use in the *TIMSS and PIRLS 2011 Relationships Report*. The index variables in the Combined International Database have near identical values as the corresponding index variables in the individual databases, with a very small number of differences due to the rounding of the computed cutpoints used to define the index categories.

An additional contextual scale was created for the effective schools analysis presented in the *TIMSS and PIRLS 2011 Relationships Report* and added to the Combined International Database. One PIRLS 2011 scale—Instruction Affected by Reading Resource Shortages (ACBGRRS)—and two TIMSS 2011 scales—Instruction Affected by Mathematics Resource Shortages (ACBGMRS) and Instruction Affected by Science Resource Shortages (ACBGSRS)—were combined into a single unified contextual scale labeled Instruction Affected by Any Resource Shortages (ACBGARS).

In the individual TIMSS 2011 and PIRLS 2011 International Databases, additional variables were derived from responses to multiple questions in order to provide more pertinent information for reporting. Parents' education is an example where responses from both parents were combined into a single variable in order to report a single educational level. Although these derived variables were not analyzed directly in the *TIMSS and PIRLS 2011 Relationships Report*, they all were added to the TIMSS and PIRLS 2011 Combined International Database for possible further secondary analyses of these data. Generally, records (whether students, parents, teachers, or schools) were included in the calculation of a derived variable only if data were available for at least two-thirds of the variables involved. For example, if a derived variable was based on six component variables, records that were missing responses to more than two of these were counted as missing on the derived variable. The *TIMSS 2011* and *PIRLS 2011 User Guides* and their Supplement 3 provide a description of the derived variables included in the Combined International Database.

Sampling and Weighting Variables

Several sampling and weighting variables are included in the TIMSS and PIRLS 2011 data files. These are listed and described in Exhibit 7, while Exhibit 8 illustrates the location of the various sampling and weighting variables among the different types of data files. It is important to note that the teacher background data files do not have any sampling and weighting variables, nor do the home background data files.

Users should note that the sampling weights included in the TIMSS and PIRLS 2011 Combined International Database are not identical to the sampling weights in the individual TIMSS 2011 and PIRLS 2011 International Databases. They were re-computed in order to take into account the fact that only students who responded to both TIMSS 2011 and PIRLS 2011 assessments were retained in the combined international database.

Exhibit 7: TIMSS and PIRLS 2011 Sampling and Weighting Variables

Variable Name	Description
TOTWGT	Total student weight—sums to the national population
SENWGT	Student senate weight—sums to 500 in each country
HOUWGT	Student house weight—sums to the national student sample size
TCHWGT	Overall teacher weight
REAWGT	Reading teacher weight
MATWGT	Mathematics teacher weight
SCIWGT	Science teacher weight
JKZONE	The sampling zone, or stratum, to which the school is assigned in the student level files
JKREP	The sampling replicate, or primary sampling unit, to which the school is assigned in the student level files
JKCZONE	The sampling zone, or stratum, to which the school is assigned in the school file
JKCREP	The sampling replicate, or primary sampling unit, to which the school is assigned in the school file
WGTFAC1	School weighting factor
WGTADJ1	School weighting adjustment
WGTFAC2	Class weighting factor
WGTADJ2	Class weighting adjustment
WGTFAC3	Student weighting factor
WGTADJ3	Student weighting adjustment

The primary student-level sampling weight is TOTWGT. Although TOTWGT has desirable properties, it also has drawbacks for some analyses. Because TOTWGT sums to the student population size in each country, analyses using TOTWGT that combine countries will have proportionately more students from larger countries and fewer from smaller countries, which may not be desirable for some purposes. For cross-country analyses in which countries should be treated equally, the Combined International Database provides SENWGT, a transformation of TOTWGT that results in a weighted sample size of 500 in each country. Additionally, because TOTWGT inflates sample sizes to estimate the population size, software systems that use the actual sample size to compute significance tests will give misleading results for analyses weighted by TOTWGT. HOUWGT, another transformation of TOTWGT, ensures that the weighted sample corresponds to the actual sample size in each country.

The weight variables TOTWGT, SENWGT, and HOUWGT are designed for use in student-level analyses from all student-level and school-level files. The weight variable SCHWGT is designed for use in school-level analyses where the schools are the units of analysis.

Exhibit 8: Location of Sampling and Weighting Variables in the TIMSS and PIRLS 2011 Data Files

Sampling and Weighting Variable	Data File Type			
	ASG	ASA	AST	ACG
JKREP	●	●	●	
JKZONE	●	●	●	
JKCREP				●
JKCZONE				●
TOTWGT	●	●	●	
SENWGT	●	●		
HOUWGT	●	●		
TCHWGT			●	
REAWGT			●	
MATWGT			●	
SCIWGT			●	
SCHWGT				●
WGTFAC1	●			●
WGTADJ1	●			●
WGTFAC2	●			
WGTADJ2	●			
WGTFAC3	●			
WGTADJ3	●			

The weight variables TCHWGT, REAWGT, MATWGT, and SCIWGT are designed specifically for using teacher background data in student-level analyses and are based on TOTWGT. Whereas TCHWGT is used for analyses using all teachers, REAWGT, MATWGT, and SCIWGT are used for analyses of reading, mathematics, and science teachers, respectively. The teacher weights are located in the student-teacher linkage files (AST), not in the actual teacher background data files (ATG). Analyses with teacher data will be properly weighted by merging the teacher files with the student-teacher linkage files.

The sampling variables beginning with the letters “JK” are used to compute standard errors based on the jackknife repeated replication methodology. All weighting variables beginning with the letters

“WGT” are included to provide insight into the multi-stage sampling and weighting methodology applied to the TIMSS and PIRLS 2011 data. All weighting variables are described in the sampling section of *Methods and Procedures in TIMSS and PIRLS 2011*.

Structure and Design Variables

Besides the variables used to store responses to the background questionnaires and achievement booklets, the TIMSS and PIRLS 2011 data files also contain variables meant to store information that identify and describe the respondents and design information required to properly analyze the data.

Identification Variables—In all TIMSS and PIRLS data files, several identification variables are included that provide information to identify countries, students, teachers, or schools. These variables also are used to link cases between the different data file types. The identification variables have the prefix “ID” and are described below.

IDCOUNTRY

IDCOUNTRY is a five-digit country identification code based on the ISO 3166 classification presented in Exhibit 2. This variable should always be used as the first linking variable whenever files are linked within and across countries.

IDPOP

IDPOP identifies the target grade and is set to “1,” to indicate primary schooling.

IDGRADE

IDGRADE identifies the target grade of the participating students. In TIMSS 2011 and PIRLS 2011, the usual value is “4” for most countries.

IDSCHOOL

IDSCHOOL is a four-digit identification code that uniquely identifies the participating schools within each country. The school codes are not unique across countries. Schools across countries can be uniquely identified only with the IDCOUNTRY and IDSCHOOL combination of linking variables.

IDCLASS

IDCLASS is a six-digit identification code that uniquely identifies the sampled classrooms within a country. The variable IDCLASS has a hierarchical structure and is formed by concatenating the IDSCHOOL variable and a two-digit sequential number identifying the sampled classrooms within a school. Classrooms can be uniquely identified in the database by the combination of IDCOUNTRY and IDCLASS as linking variables.

IDSTUD

IDSTUD is an eight-digit identification code that uniquely identifies each sampled student in a country. The variable IDSTUD also has a hierarchical structure and is formed by concatenating the IDCLASS variable and a two-digit sequential number identifying all students within each classroom. Students can be uniquely identified in the database by the combination of IDCNTRY and IDSTUD as linking variables.

IDBOOK_T

IDBOOK_T identifies the specific TIMSS assessment booklet that was administered to each student. In TIMSS 2011, the booklets were given a numerical value from “1” through “14.”

IDBOOK_P

IDBOOK_P identifies the specific PIRLS assessment booklet that was administered to each student. In PIRLS 2011, the booklets were given a numerical value from “1” through “13.”

IDSTRATE & IDSTRATI

IDSTRATE and IDSTRATI are identification variables generated by the school sampling process. IDSTRATE identifies the explicit strata and IDSTRATI the implicit strata from which the participating schools were sampled. The codes assigned to these two variables vary from country to country and are documented in Supplement 4 to the *TIMSS 2011* and *PIRLS 2011 User Guides*.

IDTEACH

IDTEACH is a six-digit identification code that uniquely identifies a teacher within a school. It has a hierarchical structure and is formed by concatenating IDSCHOOL and a two-digit sequential number within each school.

IDLINK

IDLINK uniquely identifies the class for which a teacher answered a questionnaire. The combination of linking variables IDCNTRY, IDTEACH, and IDLINK uniquely identifies all teacher–class combinations in the database.

Exhibit 9 shows in which data files the various identification variables are located. Shaded regions also highlight the combinations of variables used to uniquely identify the records contained in the different data file types. In the student background, home background, and achievement data files, the variables IDCNTRY and IDSTUD provide a unique identification number to identify all students in the database.

Because teachers may teach more than one class, the combination of the IDCNTRY, IDTEACH, and IDLINK variables in the teacher background data files is needed in order to uniquely identify all teachers and the classes they teach. Teacher background variables are linked to the appropriate

students using the student–teacher linkage data files. The variable IDSCHOOL, contained in all files, is a unique identification number for each school within a country. Combined with IDCNTRY, it can be used to link school background data to corresponding students or teachers.

Exhibit 9: Location of Identification Variables in the TIMSS and PIRLS 2011 Data Files

Identification Variable	Data File Type					
	ASA	ASG	AST	ATG	ACG	ASH
IDCNTRY	●	●	●	●	●	●
IDGRADE	●	●	●	●	●	●
IDPOP	●	●	●	●	●	●
IDSCHOOL	●	●	●	●	●	●
IDCLASS	●	●	●	●		●
IDSTUD	●	●	●			●
IDBOOK	●	●				
IDSTRATE	●	●				
IDSTRATI	●	●				
IDTEACH			●	●		
IDLINK			●	●		

Tracking Variables—Information about students, teachers, and schools provided by the survey tracking forms is stored in the tracking variables.⁴ These variables have the prefix “IT.” All tracking variables are included in the student background data files. ITLANG is included in the student achievement data files, student background data files, and home background data files.

ITSEX

Gender of each student as stated in the Student Tracking Forms.

ITBIRTHM and ITBIRTHY

Month and year of birth of each student as stated in the Student Tracking Forms.

ITDATEM and ITDATEY

Month and year of testing for each student.

⁴ Survey tracking forms are lists of students, teachers, and schools used for sampling and administrative purposes.

ITLANG

Language of testing for each student. It is set to “1” for all countries that tested in a single language. For countries that administered the test in more than one language, additional numerical codes are used that correspond to the order of the testing languages as shown in Supplement 2 to the *TIMSS 2011* and *PIRLS 2011 User Guides*.

4 TIMSS and PIRLS 2011 Codebook Files

All information related to the structure of the TIMSS and PIRLS 2011 data files, as well as the source, format, descriptive labels, and response option codes for all variables, is contained in codebook files. Each data file type in the TIMSS and PIRLS 2011 Combined International Database is accompanied by a codebook file. The naming convention for codebook files is as follows:

- The first three characters of the filename are in every respect identical to those in the file names shown in Exhibit 3;
- The next three characters identify the files as TIMSS and PIRLS 2011 codebooks and are always “TPS”;
- The sixth and seventh characters are “B1,” to indicate the first co-occurrence of the TIMSS 2011 and PIRLS 2011 study cycles; and
- The three-character file extension is either .XLS for the Excel format, or .PDF for the Adobe Acrobat Reader printable format.

Codebook files can be read using Excel, or printed directly from PDF format using Adobe Acrobat Reader. These files describe the contents and structure of the TIMSS and PIRLS 2011 data files. Important codebook fields include FIELD_LABEL, which contains extended textual information for all variables, QUEST_LOC, which provides the location of questions and achievement items within their respective survey instruments, and FIELD_CODE, which lists all acceptable responses allowed in the database.

5 TIMSS and PIRLS 2011 Data Almanac Files

Data almanacs provide weighted summary statistics for all variables in the TIMSS and PIRLS 2011 data files. There are two basic types of data almanacs: achievement data almanacs for the achievement items, and background data almanacs for the background variables. All data almanac files are provided in Word format and printable PDF format.

Achievement Data Almanacs

The achievement data almanacs provide weighted summary statistics for each participating country on each individual achievement item included in the TIMSS 2011 and PIRLS 2011 assessments. There are separate achievement data almanacs by subject, for TIMSS mathematics and science and for PIRLS reading. The achievement data almanacs display for each item its classification in the TIMSS content and cognitive domain, or the PIRLS purposes and processes, the TIMSS item block or

PIRLS passage to which it belongs, a brief description of the item, its variable name, whether it is a multiple choice or constructed response item, the correct response key if it is a multiple choice item, and its point value if it is a constructed response item. The achievement data almanac files available in the Combined International Database are listed in Exhibit 10.

The achievement data almanacs also display the international averages for each item, with each country weighted equally. The sixth grade countries and benchmark participants, listed below the international averages, are not included in the calculation of international averages.

Exhibit 10: TIMSS and PIRLS 2011 Achievement Data Almanacs

Achievement Data Almanac	Contents
TP11_REA_ItemAlmanac	Almanac for PIRLS reading items
TP11_MAT_ItemAlmanac	Almanac for TIMSS mathematics items
TP11_SCI_ItemAlmanac	Almanac for TIMSS science items

There are two types of displays in the achievement data almanacs, depending on whether an item is a multiple choice item or a constructed response item. The statistics displayed in these almanacs are as follows:

- N—The number of students to whom the item was administered;
- DIFF—Percent of students that responded correctly to a multiple choice item;
- A, B, C, and D—The percent of students choosing each one of the response options for a multiple choice item;
- Scoring Guide Codes (e.g., 10, 11, 70, 71 for TIMSS; 0, 1, 2, 3 for PIRLS)—The percent of student responses assigned each of the codes in the scoring guide for a constructed response item;
- OMITTED—The percent of students that omitted, or did not respond to, the item;
- NOT REACHED—The percent of students that did not reach the item;
- V1, V2, and V3—The percent of students that scored 1 point or better on the item (V1), 2 points or better on the item (V2), or 3 points (V3); and
- 1.GIRL %RIGHT and 2.BOY %RIGHT—The percent of girls and boys that either got a multiple choice item correct, or obtained the maximum score on a constructed response item.

Background Data Almanacs

Background data almanac files contain weighted summary statistics for each participating country on each variable in the student, home, teacher, and school background questionnaires, including the contextual scales and their indices and the derived variables based on these background variables. Among the statistics reported is mean achievement—reading, mathematics, or science—by response category. The background data almanacs also display for each variable the question as it was asked, its location in the corresponding questionnaire, and its variable name in the data files. The

background data almanac files available in the TIMSS and PIRLS 2011 Combined International Database are listed in Exhibit 11.

The background data almanacs also display the international averages for each variable, with each country weighted equally. The sixth grade countries and benchmark participants, listed below the international averages, are not included in the calculation of international averages.

Exhibit 11: TIMSS and PIRLS 2011 Background Data Almanacs

Background Data Almanac	Contents
TP11_REA_StudentAlmanac	Student background almanac with reading achievement
TP11_REA_SchoolAlmanac	School background almanac with reading achievement
TP11_REA_TeacherAlmanac	Teacher background almanac with reading achievement
TP11_REA_HomeAlmanac	Home background almanac with reading achievement
TP11_MAT_StudentAlmanac	Student background almanac with mathematics achievement
TP11_MAT_SchoolAlmanac	School background almanac with mathematics achievement
TP11_MAT_TeacherAlmanac	Teacher background almanac with mathematics achievement
TP11_MAT_HomeAlmanac	Home background almanac with mathematics achievement
TP11_SCI_StudentAlmanac	Student background almanac with science achievement
TP11_SCI_SchoolAlmanac	School background almanac with science achievement
TP11_SCI_TeacherAlmanac	Teacher background almanac with science achievement
TP11_SCI_HomeAlmanac	Home background almanac with science achievement

There are two types of displays in the background data almanacs, depending on whether the data are categorical (i.e., have a small number of discrete values) or continuous. The almanac display for categorical variables includes the following:

- The sample size (number of students, parents, teachers, or schools included in the sample);
- The number of valid cases (number of students, parents, teachers, or schools for whom valid data were obtained);
- The weighted percentages of students corresponding to each valid response option (percentages based only on the students with valid data, as well as “Not Applicable” codes, when used);
- The weighted percentages of students for whom none of the valid response options were selected, coded as “Not Administered” or “Omitted” (percentages based on the sample size);
- The weighted mean achievement values of students corresponding to each valid response option, as well as the “Not Administered” and “Omitted” codes; and
- In cases where a variable can be coded as “Not Applicable” because of an earlier filter question, the weighted percentage of students for whom the variable is coded as “Not Applicable” also is displayed, along with the corresponding weighted mean achievement.

The almanac display for continuous variables includes the following:

- The sample size (number of students, parents, teachers, or schools included in the sample);
- The number of valid cases (number of students, parents, teachers, or schools for whom valid data were obtained);
- The weighted percentages of students for whom the variable is coded as “Not Administered” or “Omitted” (percentages based on the sample size);
- The weighted mean, mode, minimum, maximum, and the 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles across students (based only on the students with valid data, as well as “Not Applicable” codes, when used); and
- In cases where a variable can be coded as “Not Applicable” because of an earlier filter question, the weighted percentage of students for whom the variable is coded as “Not Applicable” also is displayed.

It is important to note that all percentages, and distributional statistics of continuous variables, reported in the background data almanacs always are based on student-level calculations—for example, the percentage of students whose teachers or schools gave a particular response to a question, because teacher data and school data usually are analyzed as student attributes.

6 TIMSS and PIRLS 2011 Program Files

The TIMSS and PIRLS 2011 Combined International Database includes a number of SAS programs designed to facilitate the manipulation of the TIMSS and PIRLS 2011 data files. The program CONVERT.SAS is used to convert the SAS export files into SAS data files. The program JOIN.SAS is used to combine files of a specific type for all, or a subset of, countries. The ASASCRB1.SAS program is used to score the responses to the items in the ASA files according to their actual point value. All of these programs are described in Chapter 3 of the *TIMSS 2011* and *PIRLS 2011 User Guides*. The Combined International Database also contains the SPSS syntax file ASASCRB1.SPS, which serves the same purpose as its SAS counterpart ASASCRB1.SAS.

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ISBN: 978-1-889938-21-9



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