

PROGRESS IN INTERNATIONAL READING LITERACY STUDY

PIRLS



TIMSS & PIRLS
International Study Center
Lynch School of Education, Boston College



PIRLS 2011 User Guide for the International Database

Edited by: Pierre Foy and Kathleen T. Drucker

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Contents

Chapter 1

Introduction1

Chapter 2

*Using the IEA IDB Analyzer to Analyze the
PIRLS 2011 International Database*5

Chapter 3

*Using SAS to Analyze the
PIRLS 2011 International Database*39

Chapter 4

The PIRLS 2011 International Database Files77

Appendix

Organizations and Individuals Responsible for PIRLS 2011103

Chapter 1

Introduction

1.1 Overview of the PIRLS 2011 User Guide and International Database

PIRLS provides international comparative data about students' reading achievement after four years of primary schooling, while also measuring trends over time, monitoring curricular implementation, and identifying promising instructional practices.¹ Conducted on a regular 5-year cycle, PIRLS has assessed reading achievement in 2001, 2006, and 2011. PIRLS, along with its sister study prePIRLS introduced in 2011, collects a rich array of background information to provide comparative perspectives on trends in reading achievement in the context of different educational systems, school organizational approaches, and instructional practices.

As a new initiative in 2011, IEA has developed the prePIRLS assessment in response to the needs of the growing population of countries requiring the kind of information provided by PIRLS, but whose students are earlier in the process of learning to read than is expected by the PIRLS assessment. The prePIRLS assessment has shorter and easier reading texts than PIRLS, and places less emphasis on higher-order reading skills. Three countries participated in the 2011 launch of prePIRLS.

To support and promote secondary analyses aimed at improving reading education in the primary grades, the PIRLS 2011 International Database makes available to researchers, analysts, and other users the data collected and processed by the PIRLS project, as well as the data from the prePIRLS assessment. This database comprises student achievement data as well as student, home, teacher, school, and curricular background data for 48 countries and 9 benchmarking participants. The database includes data from 334,446 students, 281,078 parents, 15,517 teachers, 11,449 school principals, and the National Research Coordinators of each country. All participating countries gave the IEA permission to release their national data.

For countries that participated in previous assessments, PIRLS 2011 (the third data collection in the PIRLS cycle of studies) provides trends for up to three cycles at the fourth grade—2001, 2006, and 2011. In countries new to the study, as well as the countries participating in the prePIRLS assessment, the 2011 results can help policy makers and practitioners assess their comparative standing and gauge the rigor and effectiveness of their reading programs. Details of the PIRLS and prePIRLS assessments conducted in 2011 can be found in *PIRLS 2011 International Results in Reading* (Mullis, Martin, Foy, & Drucker, 2012).

PIRLS 2011 was an ambitious and demanding study, involving complex procedures for drawing student samples, assessing students' reading achievement, analyzing the data, and reporting the

¹ The Progress in International Reading Literacy Study is a project of the International Association for the Evaluation of Educational Achievement (IEA); PIRLS together with TIMSS, the Trends in International Mathematics and Science Study, comprise IEA's core cycle of studies.

results. In order to work effectively with the PIRLS and prePIRLS data, it is necessary to have an understanding of the characteristics of the study, which are described fully in *Methods and Procedures in TIMSS and PIRLS 2011* (Martin & Mullis, 2012). It is intended, therefore, that this User Guide be used in conjunction with the *Methods and Procedures* documentation. Whereas the User Guide describes the organization and content of the database, the *Methods and Procedures* documentation provides the rationale for the techniques used and for the variables created in the process of data collection and compilation.

1.2 Overview of the PIRLS 2011 User Guide and International Database

This User Guide describes the content and format of the data in the PIRLS 2011 International Database. In addition to this introduction, the User Guide includes the following three chapters:

- Chapter 2—This chapter introduces the IEA International Database (IDB) Analyzer software (IEA, 2012) and presents examples of analyses with the PIRLS 2011 data using this software in conjunction with SPSS (IBM Corporation, 2012).
- Chapter 3—This chapter presents examples of analyses with the PIRLS 2011 data using the SAS (SAS Institute, 2011) statistical software system and the SAS programs and macros included with the database.
- Chapter 4—This chapter describes the structure and content of the database.

The User Guide is accompanied by the following four supplements:

- Supplement 1—This supplement comprises the international version of all PIRLS 2011 background questionnaires.
- Supplement 2—This supplement describes any adaptations to the questions in the background questionnaires made by individual PIRLS and prePIRLS participants.
- Supplement 3—This supplement describes how derived variables were constructed for reporting the PIRLS data.
- Supplement 4—This supplement describes the sampling stratification variables for each country.

The User Guide and its four supplements are available on the PIRLS 2011 International Database and User Guide webpage: <http://timssandpirls.bc.edu/pirls2011/international-database.html>.

1.3 Contents of the PIRLS 2011 International Database

The entire PIRLS 2011 International Database is available on the PIRLS 2011 International Database and User Guide webpage: <http://timssandpirls.bc.edu/pirls2011/international-database.html>. The Database contains the PIRLS and prePIRLS 2011 student achievement data files and student, home, teacher, and school background questionnaire data files, along with support materials. Exhibit 1.1 displays the general structure of the International Database and a brief description of the support materials available for download on the International Database and User Guide webpage.

The PIRLS 2011 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 materials through customizable queries from all recent IEA studies, including PIRLS and prePIRLS 2011.

Exhibit 1.1: Contents of the PIRLS 2011 International Database

User Guide	This User Guide with its four supplements
Items	The PIRLS and prePIRLS 2011 released passages and items, item information files, and IRT item parameters
International Database	SPSS Data PIRLS and prePIRLS 2011 student, home, teacher, and school data files in SPSS format
	SAS Data PIRLS and prePIRLS 2011 student, home, teacher, and school data files in SAS format
	Curriculum PIRLS 2011 curriculum questionnaires data files
	Codebooks Codebook files describing all variables in the PIRLS 2011 International Database
	Almanacs Data almanacs with summary statistics for all PIRLS and prePIRLS 2011 items and background variables
	Programs SAS and SPSS programs and macros

References

IBM Corporation. (2012). *IBM SPSS statistics* (version 20.0). Somers, NY: Author.

International Association for the Evaluation of Educational Achievement. (2012). *International database analyzer* (version 3.0). Hamburg, Germany: IEA Data Processing and Research Center.

Martin, M.O. & Mullis, I.V.S. (Eds.). (2012). *Methods and procedures in TIMSS and PIRLS 2011*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., Foy, P., & Drucker, K.T. (2012). *PIRLS 2011 international results in reading*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

SAS Institute. (2011). *SAS system for Windows* (version 9.3). Cary, NC: Author.

Chapter 2

Using the IEA IDB Analyzer to Analyze the PIRLS 2011 International Database

2.1 Overview

This chapter describes the use of the IEA International Database (IDB) Analyzer software (IEA, 2012) for analyzing the PIRLS 2011 data. Used in conjunction with SPSS (IBM Corporation, 2012), the IEA IDB Analyzer provides a user-friendly interface to easily merge the various data file types of the PIRLS 2011 database and seamlessly takes into account the sampling information and the multiple imputed achievement scores to produce accurate statistical results.

Example analyses will illustrate the capabilities of the IEA IDB Analyzer (version 3.0) to compute a variety of statistics, including percentages of students in specified subgroups, mean student achievement in those subgroups, correlations, regression coefficients, percentages of students reaching benchmark levels, and percentiles of achievement distributions. The examples use student, home, teacher, and school background data to replicate some of the PIRLS 2011 results included in *PIRLS 2011 International Results in Reading* (Mullis, Martin, Foy, & Drucker, 2012).

Users should be able to perform statistical analyses with the IEA IDB Analyzer with a basic knowledge of the PIRLS 2011 International Database. Chapter 4 provides a more detailed description of the data files contained in the International Database, including their structure and contents, along with a description of all the supporting documentation provided with the International Database.

2.2 The IEA IDB Analyzer

Developed by the IEA Data Processing and Research Center (IEA DPC), the IEA IDB Analyzer is a plug-in for SPSS, a well-known statistical analysis program. The IEA IDB Analyzer enables users to combine SPSS data files from IEA's large-scale assessments and conduct analyses using SPSS without actually writing programming code. The IEA IDB Analyzer generates SPSS syntax that takes into account information from the sample design in the computation of statistics and their standard errors. In addition, the generated SPSS syntax makes appropriate use of plausible values for calculating estimates of achievement scores and their standard errors, combining both sampling variance and imputation variance.

The IEA IDB Analyzer consists of two modules—the merge module and the analysis module—which are integrated and executed in one common application. The merge module is used to create analysis datasets by combining data files of different types and from different countries, and selecting subsets of variables for analysis. The analysis module provides procedures for computing

various statistics and their standard errors. The latest version (3.0) of the IEA IDB analyzer is available for download at the IEA website: <http://www.iea.nl/data.html>. Once installed, the IEA IDB Analyzer can be accessed by using the START menu in Windows:

Start ⇒ All Programs ⇒ IEA ⇒ IDB Analyzer V3 ⇒ IEA IDB Analyzer

2.3 Merging Files with the IEA IDB Analyzer

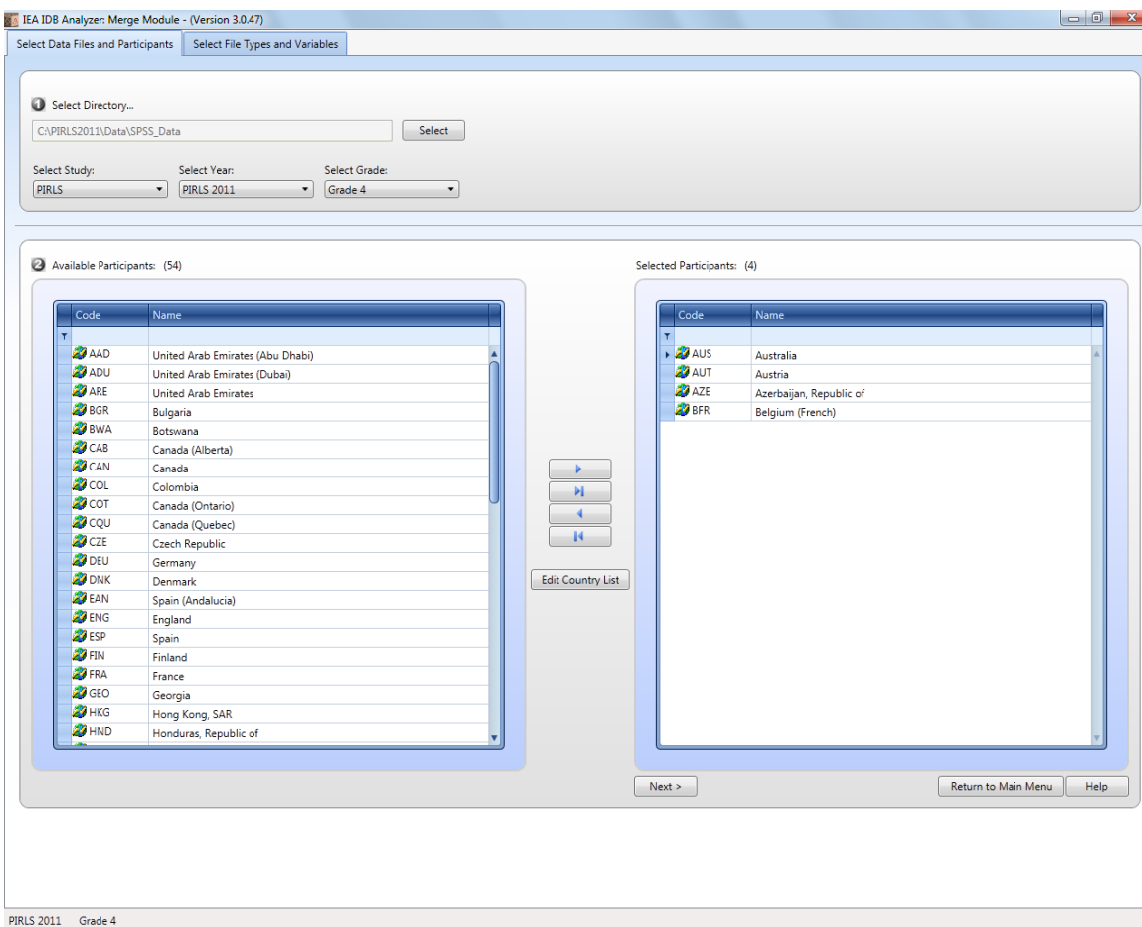
The IEA IDB Analyzer uses the SPSS data files available on the PIRLS 2011 International Database and User Guide webpage: <http://timssandpirls.bc.edu/pirls2011/international-database.html>.¹ The PIRLS and prePIRLS 2011 data files are disseminated separately by file type and for each country. In addition to allowing users to combine like datasets from more than one country for cross-country analyses, the merge module allows for the combination of data from different sources (e.g., student, home, teacher, and school) into one SPSS dataset for subsequent analyses. Before conducting any statistical analyses with the PIRLS 2011 International Database, users should download and copy the contents of the International Database either on their computer or on a server. For the purposes of this chapter, we will assume all files have been copied to the folder titled “C:\PIRLS2011\.”

The following steps will create an SPSS data file with data from multiple countries and/or multiple file types:

1. Start the IEA IDB Analyzer from the START menu and click the **Merge Module** button.
2. Under the **Select Data Files and Participants** tab, in the **Select Directory** field, browse to the folder where all SPSS data files are located. For example, in Exhibit 2.1, all SPSS data files are located in the folder titled “C:\PIRLS2011\Data\SPSS_Data.” The program will automatically recognize and complete the **Select Study**, **Select Year**, and **Select Grade** fields and list all countries available in this folder as possible candidates for merging. If the folder contains data from more than one IEA study, or from more than one grade, the IEA IDB Analyzer will prompt users to select files from the desired combination of study and grade for analyses. In Exhibit 2.1, PIRLS 2011 is selected.
3. Click a country of interest from the **Available Participants** list and click the **right arrow** button (▶) to move it to the **Selected Participants** panel. Individual countries can be moved directly to the **Selected Participants** panel by double-clicking on them. To select multiple countries, hold the CTRL key of the keyboard when clicking countries. Click the **tab-right arrow** button (▶|) to move all countries to the **Selected Participants** panel. In Exhibit 2.1, Australia, Austria, Azerbaijan, and the French-speaking community of Belgium are selected.

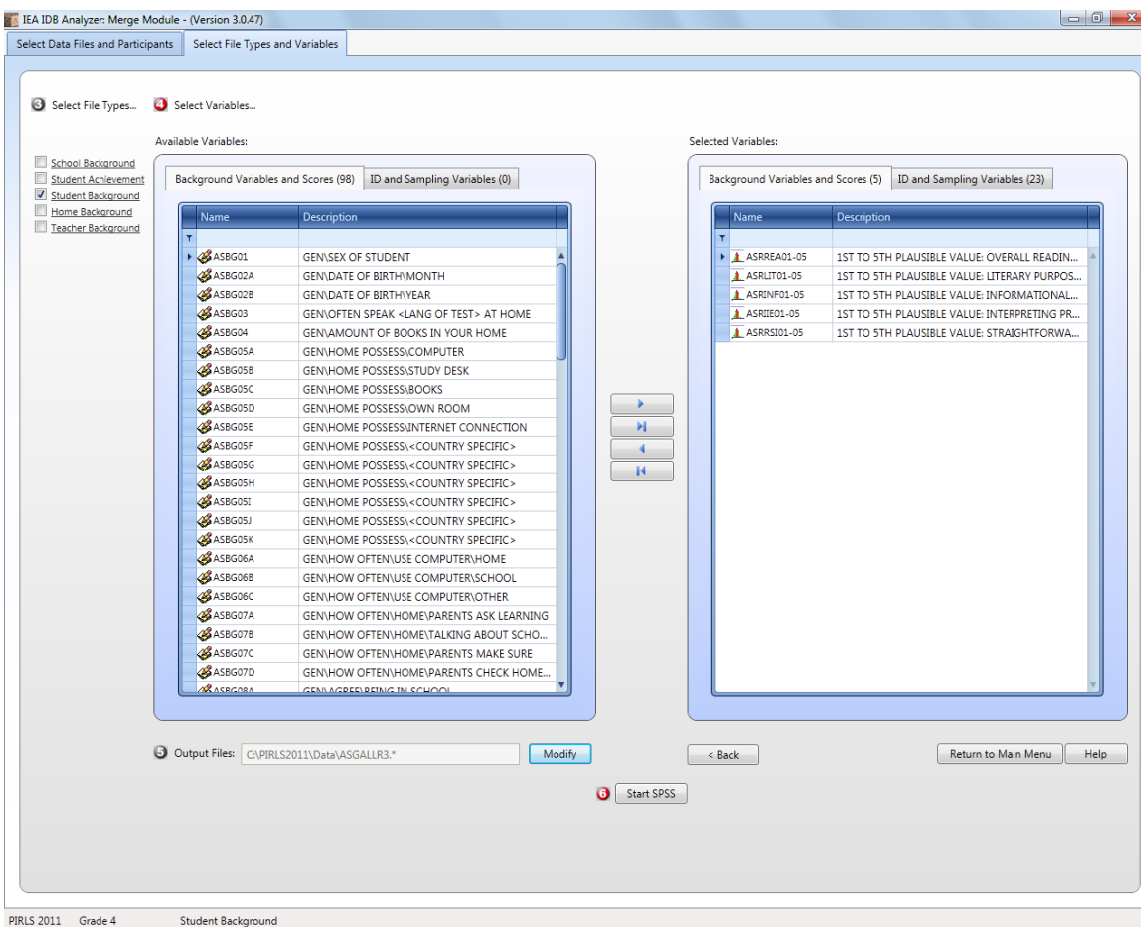
¹ The PIRLS 2011 International Database also is available for download on the IEA Study Data Repository website: <http://rms.iea-dpc.org/>.

Exhibit 2.1: IEA IDB Analyzer Merge Module—Select Data Files and Participants



4. Click the **Next >** button to proceed to the next step in the **Select File Types and Variables** tab. The software will open the second tab of the merge module, as shown in Exhibit 2.2, to select the file types and the variables to be included in the merged data file.
5. Select the files for merging by checking the appropriate boxes to the left of the window. For example, in Exhibit 2.2, the student background data files are selected.
6. Select the variables of interest from the **Available Variables** list in the left panel. Note that Supplement 1 provides the variable names for all questions in the background questionnaires. Variables are selected by clicking on them and then clicking the **right arrow** (▶) button. Clicking the **tab-right arrow** (▶ |) button selects all variables. Note that there are two tabs: “Background Variables and Scores” and “ID and Sampling Variables.” All achievement scores and all identification and sampling variables are selected automatically by the IEA IDB Analyzer.

Exhibit 2.2: IEA IDB Analyzer Merge Module—Select File Types and Variables



- Specify the desired name for the merged data file and the folder where it will be stored in the **Output Files** field by clicking the **Define/Modify** button. The IEA IDB Analyzer also will create an SPSS syntax file (*.SPS) of the same name and in the same folder with the code necessary to perform the merge. In the example shown in Exhibit 2.2, the merged file ASGALLR3.SAV and the syntax file ASGALLR3.SPS both will be created and stored in the folder titled “C:\PIRLS2011\Data.” The merged data file will contain all the variables listed in the **Selected Variables** panel to the right.
- Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window ready for execution. The syntax file can be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. The IEA IDB Analyzer will display a warning if it is about to overwrite an existing file in the specified folder.

Once SPSS has completed its execution, it is important to check the SPSS output window for possible warnings. If warnings appear, they should be examined carefully because they might indicate that the merge process was not performed properly and that the resulting merged data file might not be as expected.

Merging Student and Teacher Data Files

The teachers in the PIRLS 2011 International Database do not constitute representative samples of teachers in the participating countries. Rather, they are the teachers of nationally representative samples of students. Therefore, analyses with teacher data should be made with students as the units of analysis and reported in terms of students who are taught by teachers with a particular attribute.

Teacher data are analyzed by linking the students to their teachers. The student–teacher linkage data files (AST) are used for this purpose and the IEA IDB Analyzer will make use of them automatically. Thus, to analyze teacher data, it is sufficient to select the **Teacher Background** file types in the **Select File Types and Variables** tab of the IEA IDB Analyzer merge module. To analyze student and teacher background data simultaneously, however, both the **Student Background** and **Teacher Background** file types must be selected in the **Select File Types and Variables** tab of the IEA IDB Analyzer merge module. The variables of interest need to be selected separately for both file types, as follows:

1. Click the **Teacher Background** file type so that it appears checked and highlighted. The **Background Variables and Scores** listed in the left panel will include all available variables from the teacher background data files.
2. Select the variables of interest from the left panel and click the **right arrow (▶)** button to move these variables to the **Selected Variables** panel on the right. Click the **tab-right arrow (▶ |)** button to select all available variables.
3. If necessary, click the **Student Background** file type and selecting the variables of interest from the **Background Variables and Scores** panel on the left in the same manner.
4. Specify the folder and merged data file name in the **Output Files** field, as described earlier.
5. Click the **Start SPSS** button to create the SPSS syntax file that will produce the required merged data file, which can then be run by opening the **Run** menu of SPSS and selecting the **All** menu option.

Merging Student and School Data Files

Because PIRLS 2011 has representative samples of schools, it is possible to compute reasonable statistics with schools as units of analysis. However, the school samples were designed to optimize the student samples and the student-level estimates. For this reason, it is preferable to analyze school-level variables as attributes of the students, rather than as elements in their own right. Therefore, analyzing school data should be done by linking the students to their schools.

To merge the student and school background data files, select both the **Student Background** and **School Background** file types in the **Select File Types and Variables** tab of the IEA IDB Analyzer merge module. The variables of interest to be included in the merged data file are selected separately by file type, as described above in “Merging Student and Teacher Data Files” and using the same set of instructions.

Merging Student and Home Data Files

The parents of the students participating in PIRLS and prePIRLS 2011 responded to a Learning to Read survey, usually called the Home Questionnaire. Their responses are included in the home background data files (ASH). Although home background variables are located in separate files, they are in essence attributes of students and must be analyzed in the same manner as student background variables. This will require users to merge the home background data files with the student background data files by selecting both the **Home Background** and **Student Background** file types. Variables of interest to be included in the merged data file must be chosen separately by file type, as described above in “Merging Student and Teacher Data Files” and using the same set of instructions.

Merged Data Files for the Examples

To conduct the analysis examples presented in this chapter, the following merged data files should be created with all available background variables and achievement scores selected:

ASGALLR3.SAV—Merged PIRLS student background data files for all countries.

ASHALLR3.SAV—Merged PIRLS home and student background data files for all countries.

ATGALLR3.SAV—Merged PIRLS teacher background data files for all countries.

ACGALLR3.SAV—Merged PIRLS school and student background data files for all countries.

2.4 Performing Analyses with the IEA IDB Analyzer

The analysis module of the IEA IDB Analyzer can perform statistical analyses on any files created using the merge module. The following statistical procedures are available in the analysis module of the IEA IDB Analyzer.

Percentages and Means

Compute percentages, means, and standard deviations for selected variables by subgroups defined by grouping variable(s).

Percentages Only

Compute percentages by subgroups defined by grouping variable(s).

Regression

Compute regression coefficients for selected independent variables to predict a dependent variable by subgroups defined by grouping variable(s). Plausible values can be included as dependent or independent variables.

Correlations

Compute means, standard deviations, and correlation coefficients for selected variables by subgroups defined by grouping variable(s).

Benchmarks

Compute percentages of students meeting a set of user-specified achievement benchmarks, in particular the PIRLS International Benchmarks, by subgroups defined by grouping variable(s).

Percentiles

Compute the score points that separate a given proportion of the distribution of achievement scores, by subgroups defined by the grouping variable(s).

All statistical procedures offered in the analysis module of the IEA IDB Analyzer make appropriate use of sampling weights, and standard errors are computed using the jackknife repeated replication (JRR) method.² Percentages, means, regressions, and correlations may be specified with or without achievement scores. When achievement scores are used, the analyses are performed five times (once for each plausible value) and the results are aggregated to produce accurate estimates of achievement and standard errors that incorporate both sampling and imputation errors. To conduct analyses using achievement scores, select the **Use PVs** option from the **Plausible Value Option** drop-down menu. The various variables required to perform an analysis are input into specific variable fields according to their purpose.

Grouping Variables

This is a list of variables to define subgroups. The list must consist of at least one grouping variable. By default, the IEA IDB Analyzer includes the variable IDCNTRY used to distinguish the participating countries. Additional variables may be selected from the available list. If the **Exclude Missing from Analysis** option is checked, only cases that have non-missing values in the grouping variables will be used in the analysis. If it is not checked, missing values become reporting categories.

Analysis Variables

This is a list of variables for which means or percentages are to be computed. More than one analysis variable can be selected. To compute means for achievement scores, it is necessary to select the **Use PVs** option in the **Plausible Value Option** drop-down menu, and select the achievement scores of interest in the **Plausible Values** field.

Plausible Values

This section is used to identify the set of plausible values to be used when achievement scores are the analysis variable for computing percentages and means. Select the **Use PVs** option in the **Plausible Value Option** drop-down menu before specifying the achievement scores in the **Plausible Values** field.

² See *Methods and Procedures in TIMSS and PIRLS 2011* (Martin & Mullis, 2012).

Independent Variables

This is a list of variables to be treated as independent variables for a regression analysis. More than one independent variable can be selected. Achievement scores also can be included as an independent variable. To specify achievement scores as the independent variable, it is necessary to select the **Use PVs** option in the **Plausible Value Option** drop-down menu and select the achievement scores of interest in the **Plausible Values** field.

Dependent Variable

This is the variable to be used as the dependent variable when a regression analysis is specified. Only one dependent variable can be listed and can be either a background variable or the set of five scores associated with an achievement scale. To use achievement scores as the dependent variable, it is necessary to select the **Use PVs** option in the **Plausible Value Option** drop-down menu and select the achievement scores of interest in the **Plausible Values** field.

Weight Variable

This is the sampling weight variable that will be used in the analysis. The IEA IDB Analyzer automatically selects the appropriate weight variable for analysis based on the file types included in the merged data file. Generally, this will be TOTWGT, but SENWGT and HOUWGT also are available for student-level analyses with student, home, or school data. TCHWGT will be used when analyzing teacher data. Chapter 4 provides more information on the PIRLS sampling weights.

Achievement Benchmarks

These are the values that will be used as cut points on an achievement scale, selected in the **Plausible Values** section, for computing the percentages of students meeting the specified benchmarks. Multiple cut points can be specified, each separated by a blank space. It is necessary to select the **Use PVs** option in the **Plausible Value Option** drop-down menu and select the achievement scores of interest in the **Plausible Values** field.

Percentiles

These are the percentiles that will be calculated from the distribution of the achievement scores selected in the **Plausible Values** section. Multiple percentiles can be specified, each separated by a blank space. It is necessary to select the **Use PVs** option in the **Plausible Value Option** drop-down menu and select the achievement scores of interest in the **Plausible Values** field.

2.5 PIRLS/prePIRLS Analyses with Student-level Data

Many analyses of the PIRLS 2011 International Database can be undertaken using only student-level data. This section presents examples of actual analyses used to produce exhibits from *PIRLS 2011 International Results in Reading*. Examples of regression analyses and computing percentages of students reaching the PIRLS International Benchmarks also are included in this section.

A first example computes national average achievement, whereas a second example computes national average achievement by gender. In both cases, the IEA IDB Analyzer uses the sampling weights, implements the jackknife repeated replication method to compute appropriate sampling errors, effectively performs the computations five times (once for each plausible value), and aggregates the results to produce accurate estimates of average achievement and standard errors that incorporate both sampling and imputation errors. A third example expands on the second example by performing a test of significance on the gender difference using regression. A fourth example computes the percentages of students reaching the PIRLS International Benchmarks.

Student-level Analysis with Achievement

In our first example, we want to replicate the analysis of the overall distribution of reading achievement. These results are presented in Exhibit 1.1 of *PIRLS 2011 International Results in Reading* and are repeated here in Exhibit 2.3. Because the results in this exhibit are based on plausible values, we must ensure that we include them when we create the file using the merge module, and also indicate that our analysis will make use of achievement scores.

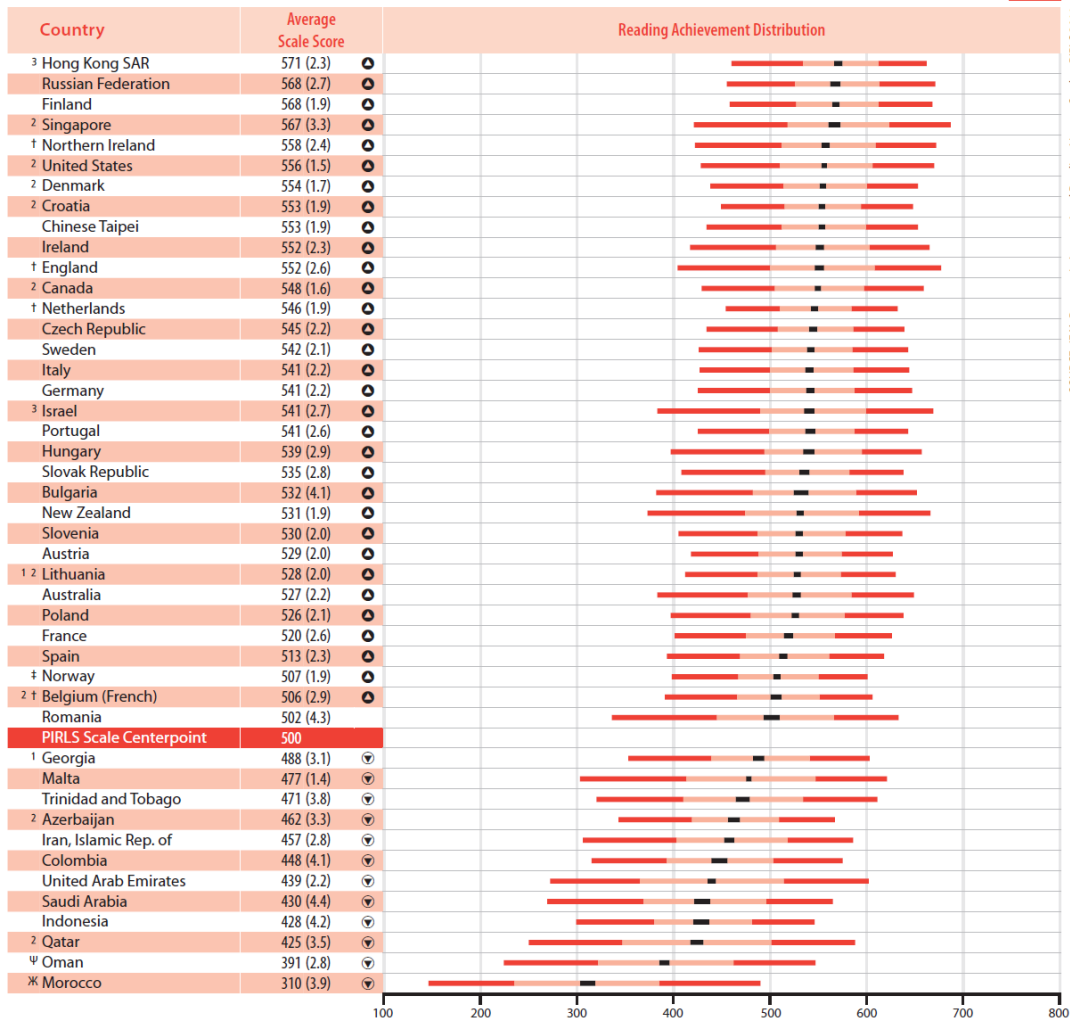
The **Percentages and Means** statistic type with the **Use PVs** option selected will compute percentages and average reading achievement based on plausible values and their respective standard errors. After creating the merged data file ASGALLR3, the analysis module of the IEA IDB Analyzer is used to perform the analysis using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.
2. Select the merged data file ASGALLR3 as the **Analysis File** by clicking the **Select** button.
3. Select **PIRLS (Using Student Weights)** as the **Analysis Type**.
4. Select **Percentages and Means** as the **Statistic Type**.
5. Select **Use PVs** as the **Plausible Value Option**.
6. The variable IDCNTY is selected automatically as **Grouping Variables**. No additional grouping variables are needed for this analysis.
7. Specify the achievement scores to be used for the analysis and activate them by clicking the **Plausible Values** field. Select ASRREA01–05 from the list of available variables and move it to the **Plausible Values** field by clicking the **right arrow** (▶) button in this section.
8. The **Weight Variable** is selected automatically by the software; TOTWGT is selected by default because this example analysis uses student background data.
9. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.

Exhibit 2.3: Exhibit of Example Student-level Analysis with Achievement, Taken from PIRLS 2011 International Results in Reading (Exhibit 1.1)

Exhibit 1.1: Distribution of Reading Achievement

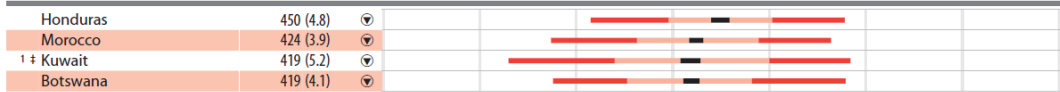
PIRLS 2011 4th Grade



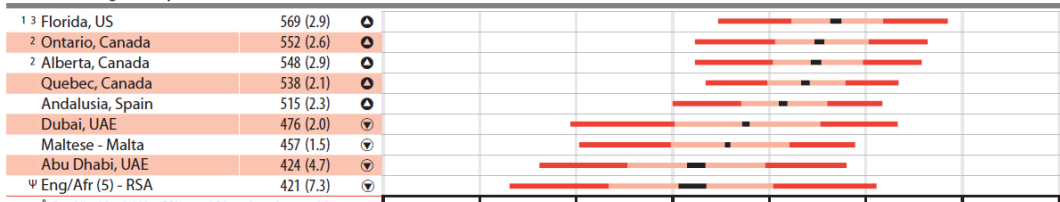
SOURCE: IEA's Progress in International Reading Literacy Study - PIRLS 2011

Country	Average Scale Score	Reading Achievement Distribution
---------	---------------------	----------------------------------

Sixth Grade Participants

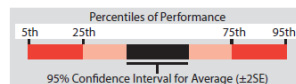


Benchmarking Participants[⊖]



[⊖] Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

- Country average significantly higher than the centerpoint of the PIRLS scale
- ⊖ Country average significantly lower than the centerpoint of the PIRLS scale



⊖ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
[⊖] Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%. See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.5 for sampling guidelines and sampling participation notes † and ‡.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

10. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file can be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

Exhibit 2.4 shows the completed analysis module for this example analysis, and Exhibit 2.5 displays the results with our four example countries.

Exhibit 2.4: IEA IDB Analyzer Setup for Example Student-level Analysis with Achievement

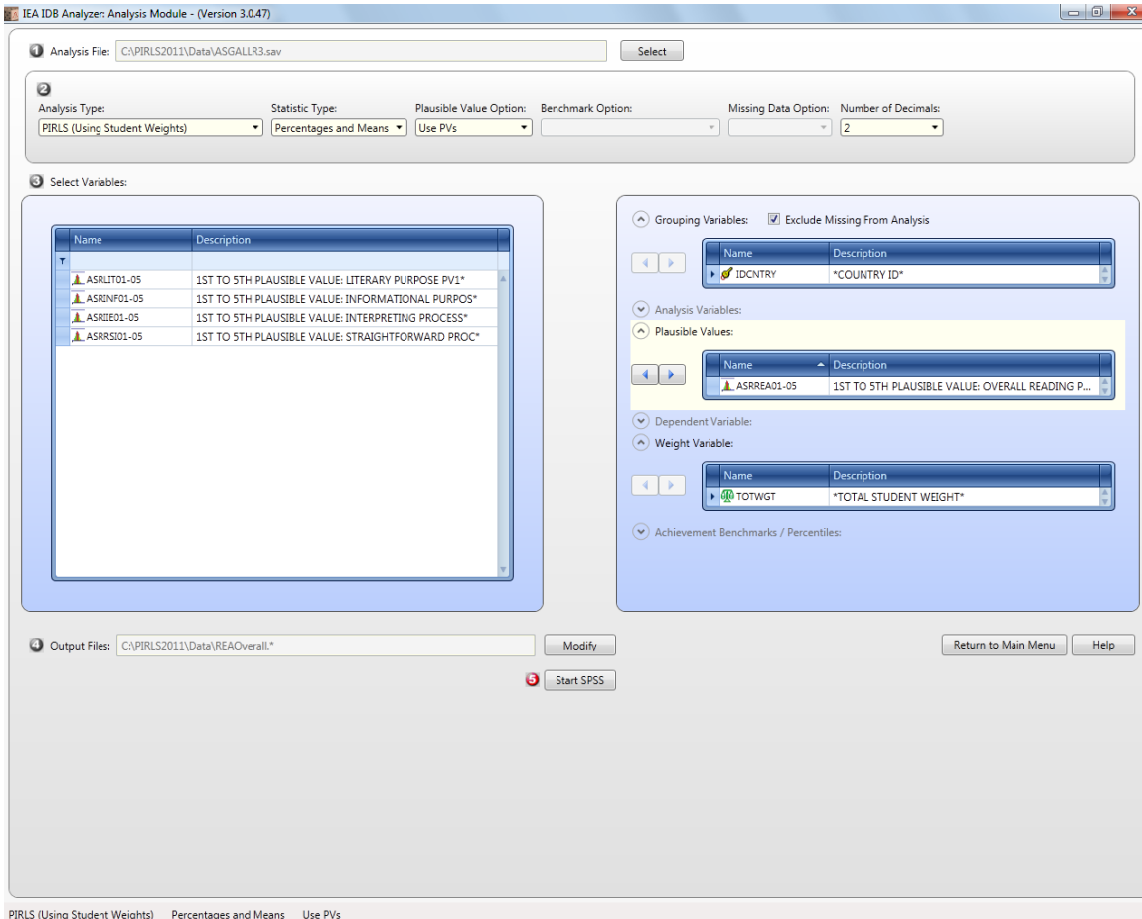


Exhibit 2.5: Output for Example Student-level Analysis with Achievement

Average for ASRREA0 by IDCNTY								
COUNTRY ID	N of Cases	Sum of TOTWGT	Percent	Percent (s.e.)	ASRREA0 (Mean)	ASRREA0 (s.e.)	Std.Dev	Std.Dev. (s.e.)
Australia	6126	251213	1.24	.03	527.37	2.21	80.22	1.31
Austria	4670	78333	.39	.01	528.88	1.95	63.38	.95
Azerbaijan, Republic of	4881	104014	.51	.02	462.30	3.33	67.83	1.68
Belgium (French)	3727	49879	.25	.01	506.12	2.88	64.67	1.57

Each country's results are presented on a single line. The countries are identified in the first column and the second column reports the number of valid cases. The third column identifies the sum of weights of the sampled students. The next four columns report the percentage of students in

each category (Country) and its standard error, followed by the estimated average reading achievement and its standard error. The last two columns report the standard deviation of the achievement scores and its standard error.

As shown in the first line in Exhibit 2.5, Australia had valid data for 6,126 students and these sampled students represented a population of 251,213 students. The average reading achievement in Australia was 527.37 (standard error of 2.21), and its standard deviation was 80.22 (standard error of 1.31).

Student-level Analysis with Achievement by Gender

In our second example, we want to replicate another set of results presented in *PIRLS 2011 International Results in Reading*. We are interested in investigating the relationship between student gender and reading achievement. These results, presented in Exhibit 1.5 of *PIRLS 2011 International Results in Reading*, are repeated here in Exhibit 2.6. Because the results in this exhibit are based on plausible values, we must ensure that these values are included when creating the input file, and also indicate that this analysis will make use of achievement scores.

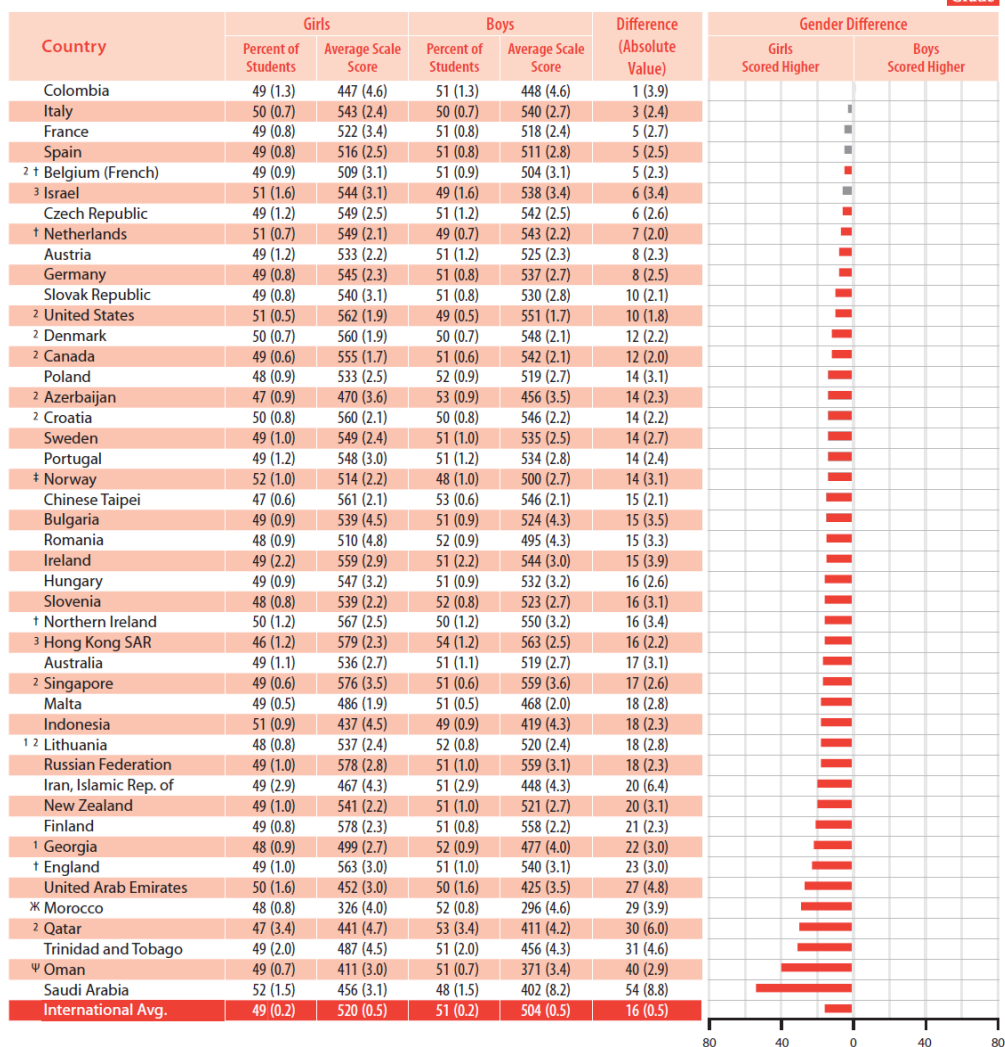
After reviewing the appropriate codebook, the variable ITSEX contains categorical information on the gender of students, and this variable is found in the student background data files. The **Percentages and Means** statistic type and the **Use PVs** plausible value option will compute the percentages and average achievement based on plausible values and their respective standard errors. The analysis module of the IEA IDB Analyzer is used to perform the analysis using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.
2. Select the merged data file ASGALLR3 as the **Analysis File** by clicking the **Select** button.
3. Select **PIRLS (Using Student Weights)** as the **Analysis Type**.
4. Select **Percentages and Means** as the **Statistic Type**.
5. Select **Use PVs** as the **Plausible Value Option**.
6. Specify the variable ITSEX as a second grouping variable and activate it by clicking the **Grouping Variables** field. Select ITSEX from the list of available variables and move it to the **Grouping Variables** field by clicking the **right arrow (▶)** button in this section.
7. Specify the achievement scores to be used for the analysis and activate them by clicking the **Plausible Values** field. Select ASRREA01–05 from the list of available variables and move it to the **Plausible Values** field by clicking the **right arrow (▶)** button in this section.
8. The **Weight Variable** is selected automatically by the software; TOTWGT is selected by default because this example analysis uses student background data.
9. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.

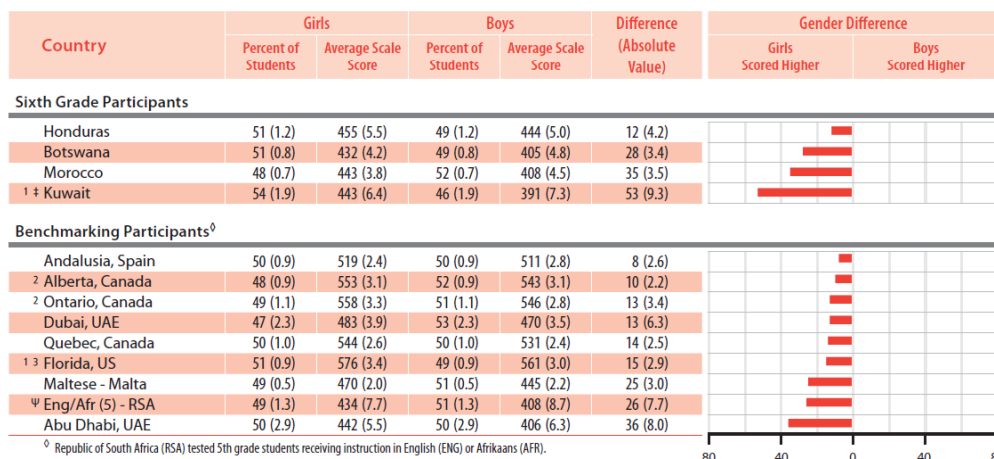
Exhibit 2.6: Exhibit of Example Student-level Analysis with Achievement by Gender, Taken from PIRLS 2011 International Results in Reading (Exhibit 1.5)

Exhibit 1.5: Average Reading Achievement by Gender

PIRLS 2011 ^{4th} Grade



SOURCE: IEA's Progress in International Reading Literacy Study – PIRLS 2011



[⊙] Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

■ Difference statistically significant
 ■ Difference not statistically significant

⌘ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
 ⊙ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
 See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.5 for sampling guidelines and sampling participation notes † and ‡.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

10. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file can be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

Exhibit 2.7 shows the completed analysis module for this example analysis and the results are presented in Exhibit 2.8.

Exhibit 2.7: IEA IDB Analyzer Setup for Example Student-level Analysis with Achievement by Gender

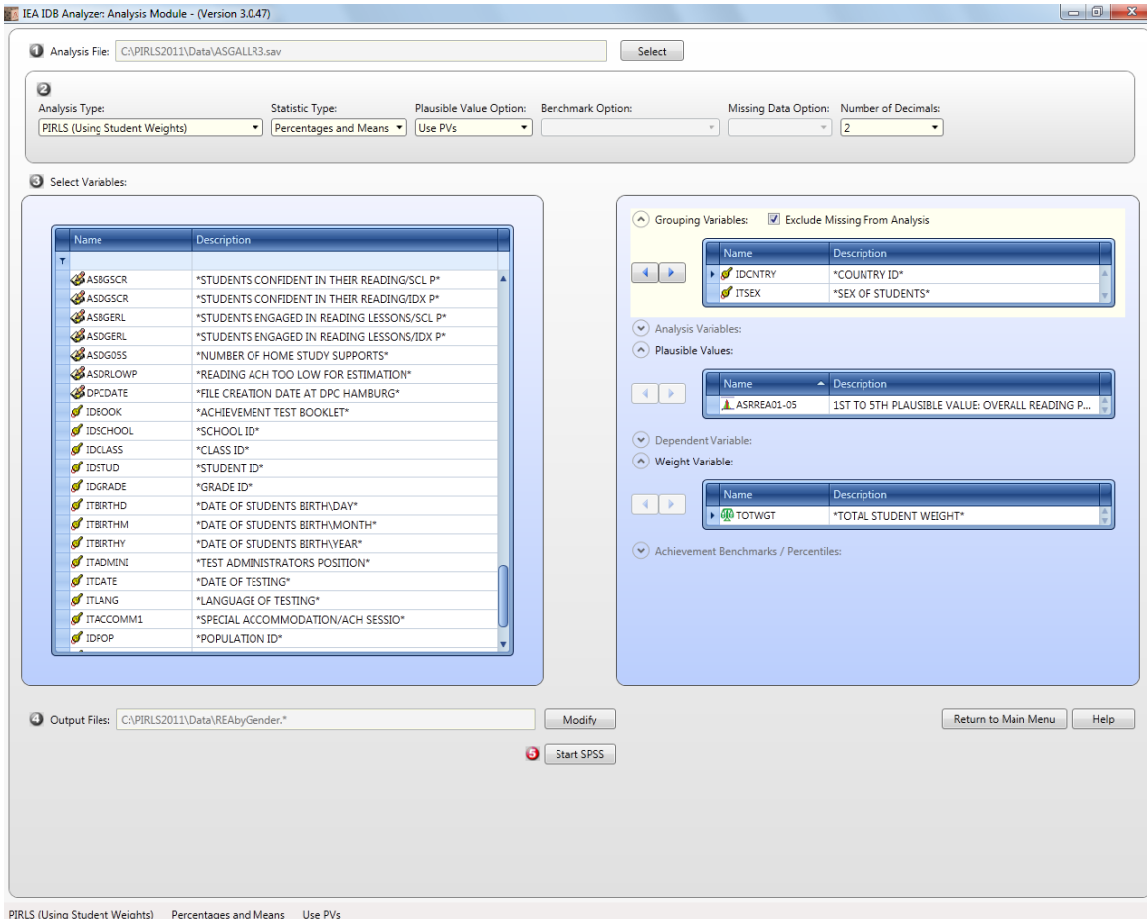


Exhibit 2.8: Output for Example Student-level Analysis with Achievement Scores by Gender

Average for ASRREA0 by IDCNTRY ITSEX									
COUNTRY ID	*SEX OF STUDENTS*	N of Cases	Sum of TOTWGT	Percent	Percent (s.e.)	ASRREA0 (Mean)	ASRREA0 (s.e.)	Std.Dev	std.Dev. (s.e.)
Australia	GIRL	3048	123760	49.26	1.06	535.79	2.67	78.20	1.62
	BOY	3078	127453	50.74	1.06	519.20	2.73	81.30	1.75
Austria	GIRL	2274	38141	48.69	1.18	532.76	2.18	62.00	1.21
	BOY	2396	40192	51.31	1.18	525.19	2.32	64.44	1.48
Azerbaijan, Republic of	GIRL	2241	49037	47.14	.85	469.57	3.56	67.31	1.94
	BOY	2640	54977	52.86	.85	455.82	3.47	67.63	1.85
Belgium (French)	GIRL	1815	24388	48.89	.93	508.85	3.11	63.11	2.01
	BOY	1912	25491	51.11	.93	503.51	3.11	66.02	1.62

Each country's results are displayed on two lines, one for each value of the ITSEX variable. The countries are identified in the first column and the second column describes the category of ITSEX being reported. The third column reports the number of valid cases and the fourth the sum of weights of the sampled students. The next four columns report the percentage of students in each category and its standard error, followed by the estimated average reading achievement and its standard error. The last two columns report the standard deviation of the achievement scores and its standard error. From the first two lines of results, 49.26 percent of students in Australia were girls, and 50.74 percent were boys. The average reading achievement was 535.79 for girls (standard error of 2.67) and 519.20 for boys (standard error of 2.73).

Student-level Regression Analysis

This example is an extension of the previous example (Student-level Analysis with Achievement by Gender), where we will examine the difference in reading achievement between girls and boys using regression and determine if it is statistically significant. The results of this example also are presented in Exhibit 1.5 of *PIRLS 2011 International Results in Reading* and shown in Exhibit 2.6, in the column labeled "Difference."

For this example, the values of the variable ITSEX are recoded into variable REGSEX by running the special SPSS syntax file SYNTAX_ASGALLR3.SPS shown in Exhibit 2.9 and provided in the International Database.

Exhibit 2.9: Example SPSS Program to Recode Variables for Student-level Regression Analysis

```
* Compute new variable REGSEX from ITSEX .
get file = "<datpath>\ASGALLR3.sav" .
compute REGSEX = ITSEX - 1 .
value labels
  REGSEX 0 "GIRL"
         1 "BOY" .
variable labels
  REGSEX "Recoded ITSEX (Girls = 0; Boys = 1)" .
save outfile = "<datpath>\ASGALLR3.sav" .
```

The parameter <datpath> in the SPSS syntax shown in Exhibit 2.9 needs to be edited to specify the location of the input and output data files.

REGSEX has a value of zero for girls and one for boys. By using REGSEX, the regression intercept (or constant) will be the estimated average reading achievement of girls, whereas the regression slope (called REGSEX in the SPSS output) will be the estimated increase in the average reading achievement of boys.³ This example of a regression analysis is performed by the analysis module of the IEA IDB Analyzer using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.

³ This form of variable recoding, known as "dummy coding," makes the interpretation of regression coefficients easier. It essentially transforms a regression analysis into an analysis of variance to test for differences among groups.

2. Specify the data file ASGALLR3 as the **Analysis File** by clicking the **Select** button, after having run the SPSS syntax file SYNTAX_ASGALLR3.SPS to create the variable REGSEX.
3. Select **PIRLS (Using Student Weights)** as the **Analysis Type**.
4. Select **Regression** as the **Statistic Type**.
5. Select **Use PVs** as the **Plausible Value Option**.
6. The variable IDCNTRY is selected automatically as **Grouping Variables**. No additional grouping variables are needed for this analysis.
7. Click the **Non-Plausible Values** field in the **Independent Variables** section to activate it and select the variable REGSEX as the analysis variable. This is done by selecting REGSEX from the list of available variables and moving it to the **Non-Plausible Values** field by clicking the **right arrow (▶)** button in this section.
8. Click the **Plausible Values** button in the **Dependent Variable** section and click the **Plausible Values** field to activate it. Select ASRREA01-05 as the analysis variable from the list of available variables and move it to the **Plausible Values** field by clicking the **right arrow (▶)** button in this section.
9. The **Weight Variable** is selected automatically by the software; TOTWGT is selected by default because this example analysis uses student background data.
10. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.
11. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

Exhibit 2.10 shows the completed analysis module for this example analysis, and Exhibit 2.11 displays the results.

Each country's results are displayed on two lines: the first for the intercept (CONSTANT), and the second for the REGSEX coefficient. Generally, there will be as many lines per country as there are regression coefficients including the intercept. The first line of results in Exhibit 2.11, labeled "(CONSTANT)," is the estimated average reading achievement of girls in Australia, which was 535.79, with a standard error of 2.67. This estimate concurs with the results obtained in the previous example (Exhibit 2.8). The boys in Australia had a negative average achievement difference of -16.58, with an estimated standard error of 3.11. Note that this achievement difference is statistically significant at the 95% confidence level. Adding the two regression coefficients together (535.79 - 16.58) yields the estimated average achievement of boys in Australia, 519.21, the same estimate (within rounding) from the previous example. As a note of interest, the IEA IDB Analyzer also computes standardized regression coefficients, whereby the independent variables are standardized to have a mean of zero and standard deviation of one (1).

Exhibit 2.10: IDB Analyzer Setup for Example Student-level Regression Analysis

IEA IDB Analyzer: Analysis Module - (Version 3.0.47)

Analysis File: C:\PIRLS2011\Data\ASGALLR3.sav

Analysis Type: PIRLS (Using Student Weights) | Statistic Type: Regression | Plausible Value Option: Use PVs | Benchmark Option: | Missing Data Option: Listwise | Number of Decimals: 2

Select Variables:

Name	Description
ASRLT01-05	1ST TO 5TH PLAUSIBLE VALUE: LITERARY PURPOSE PV1*
ASRNF01-05	1ST TO 5TH PLAUSIBLE VALUE: INFORMATIONAL PURPOS*
ASRIE01-05	1ST TO 5TH PLAUSIBLE VALUE: INTERPRETING PROCESS*
ASRRS01-05	1ST TO 5TH PLAUSIBLE VALUE: STRAIGHTFORWARD PROC*

Grouping Variables: Exclude Missing From Analysis

Independent Variables:

- Non-Plausible Values: REGSEX (Recoded ITSEX (Girls = 0; Boys = 1))
- Plausible Values: ASRREAD1-05 (:1ST TO 5TH PLAUSIBLE VALUE: OVERALL READ...)

Dependent Variable: Plausible Values

Weight Variable: TOTWGT (*TOTAL STUDENT WEIGHT*)

Output Files: C:\PIRLS2011\Data\REAGenderDiff.*

Buttons: Start SPSS, Return to Main Menu, Help

Exhibit 2.11: Output for Example Student-Level Regression Analysis

Regression Coefficients							
IDCNTRY	Variable	Regression Coefficient	Regression Coefficient (s.e.)	Regression Coefficient (t-value)	Stndrdzd. Coefficient	Stndrdzd. Coefficient (s.e.)	Stndrdzd. Coefficient (t-value)
Australia	(CONSTANT)	535.79	2.67	200.57	.	.	.
	REGSEX	-16.58	3.11	-5.33	-.10	.02	-5.42
Austria	(CONSTANT)	532.76	2.18	244.47	.	.	.
	REGSEX	-7.58	2.31	-3.28	-.06	.02	-3.28
Azerbaijan, Republic of	(CONSTANT)	469.57	3.56	131.76	.	.	.
	REGSEX	-13.75	2.34	-5.87	-.10	.02	-5.81
Belgium (French)	(CONSTANT)	508.85	3.11	163.70	.	.	.
	REGSEX	-5.34	2.34	-2.28	-.04	.02	-2.27

Percentages of Students Reaching the PIRLS International Benchmarks

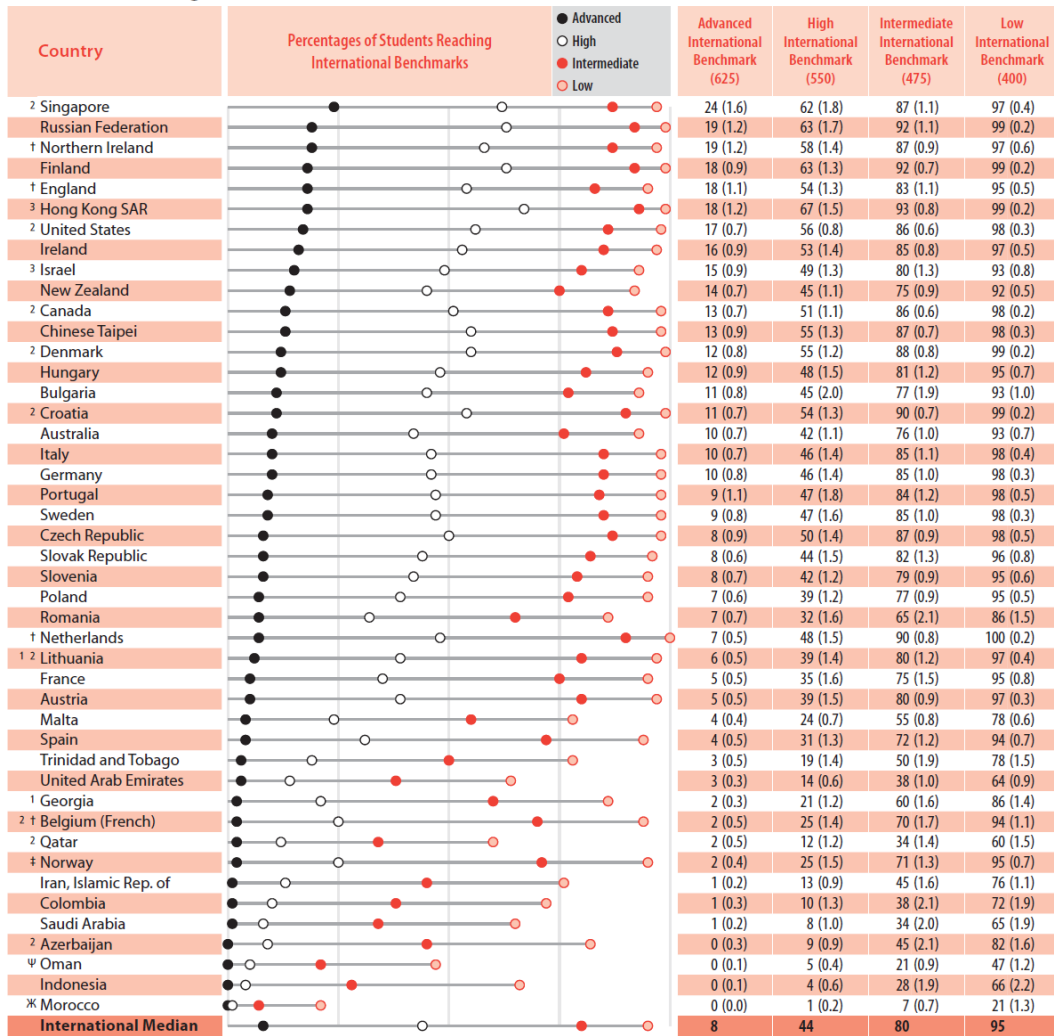
This section describes how to use the IEA IDB Analyzer to perform analyses of student achievement in relation to the PIRLS International Benchmarks. As an example, we will compute the percentages of PIRLS 2011 students reaching the four PIRLS International Benchmarks of reading achievement—Advanced, High, Intermediate, and Low—using the merged ASGALLR3 data file. These results, presented in Exhibit 2.2 of *PIRLS 2011 International Results in Reading*, are shown here in Exhibit 2.12. This example is performed by the analysis module of the IEA IDB Analyzer using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.
2. Specify the data file ASGALLR3 as the **Analysis File** by clicking the **Select** button.
3. Select **PIRLS (Using Student Weights)** as the **Analysis Type**.
4. Select **Benchmarks** as the **Statistic Type**.
5. Select the **Cumulative** option under the **Benchmark Option** drop-down menu to get cumulated percentages of students reaching the PIRLS international benchmarks.
6. The variable IDCNTY is selected automatically as **Grouping Variables**. No additional grouping variables are needed for this analysis.
7. Specify the achievement scores to be used for the analysis by clicking the **Plausible Values** field. Select ASRREA01–05 from the list of available variables and move it to the **Plausible Values** field by clicking the **right arrow** (▶) button in this section.
8. Specify the PIRLS International Benchmarks—400, 475, 550, and 625 (Low, Intermediate, High, and Advanced, respectively). Enter these four values in the **Achievement Benchmarks** field, each separated by a blank space.
9. The **Weight Variable** is selected automatically by the software; TOTWGT is selected by default because this example analysis uses student background data.
10. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.
11. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

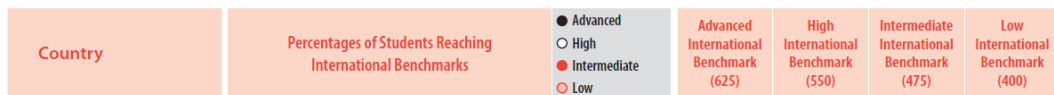
Exhibit 2.12: Example Exhibit of International Benchmark Analysis, Taken from PIRLS 2011 International Results in Reading (Exhibit 2.2)

Exhibit 2.2: Performance at the International Benchmarks of Reading Achievement

PIRLS 2011 ^{4th} Grade



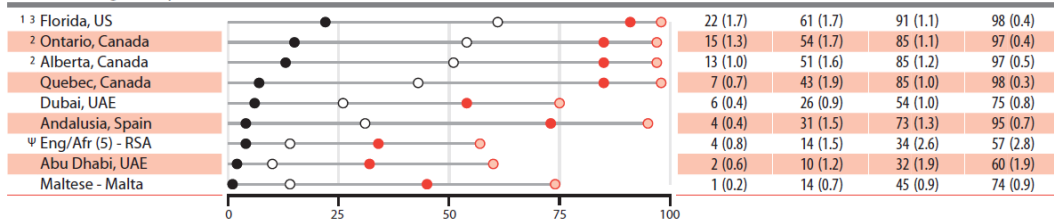
SOURCE: IEA's Progress in International Reading Literacy Study - PIRLS 2011



Sixth Grade Participants



Benchmarking Participants^φ



* Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

^ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.5 for sampling guidelines and sampling participation notes †, ‡, and §.

(1) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 2.13 shows the completed analysis module for this example analysis, and Exhibit 2.14 presents the results.

Exhibit 2.13: IDB Analyzer Setup for Example International Benchmark Analysis

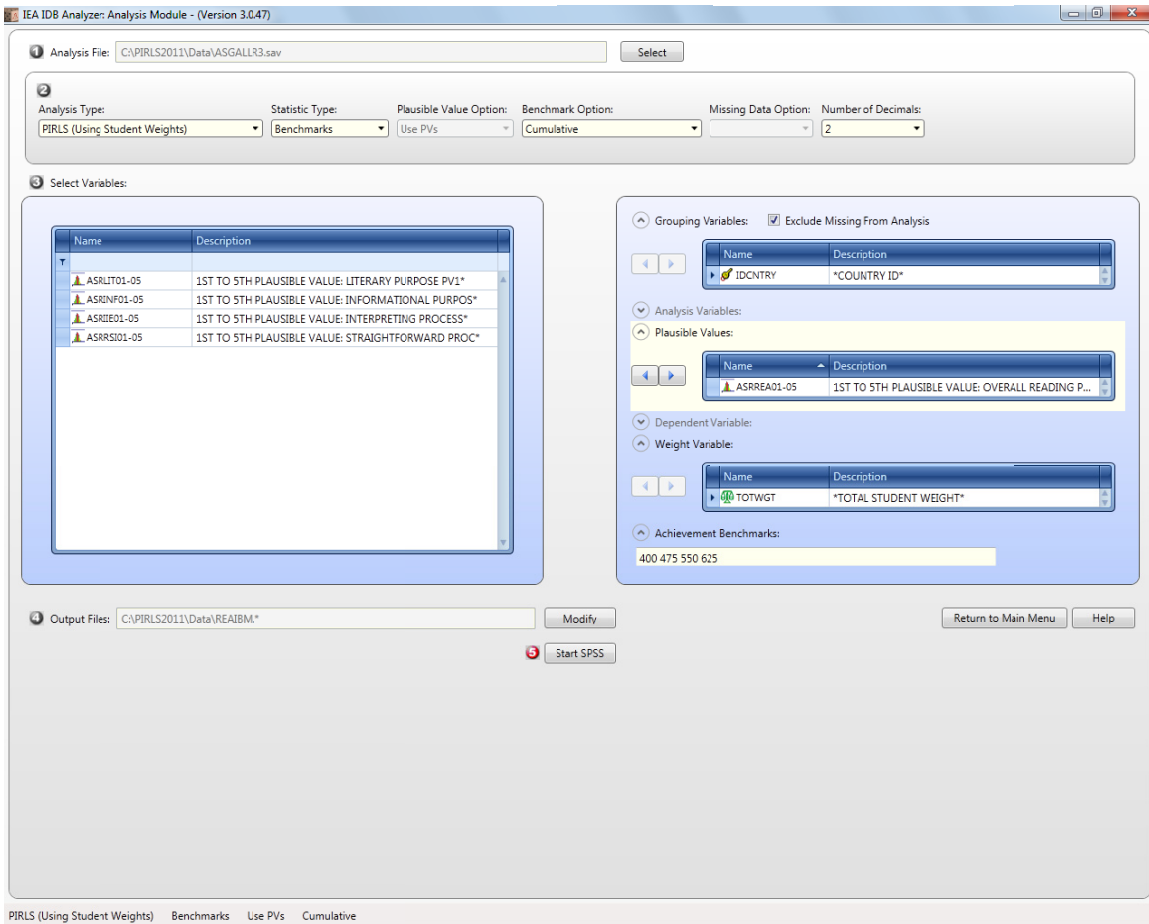


Exhibit 2.14: Output for Example International Benchmark Analysis

Percent reaching benchmarks (400 475 550 625) of ASRREA0

COUNTRY ID	Performance Group	N of Cases	Sum of TOTWGT	Percent	Percent (s.e.)
Australia	At or Above 400	5664	233459	92.93	.67
	At or Above 475	4591	189968	75.62	1.03
	At or Above 550	2514	105274	41.91	1.14
	At or Above 625	591	24945	9.93	.65
Austria	At or Above 400	4519	76065	97.10	.35
	At or Above 475	3710	62965	80.38	.94
	At or Above 550	1795	30590	39.05	1.50
	At or Above 625	261	4088	5.22	.54
Azerbaijan, Republic of	At or Above 400	4014	85145	81.86	1.60
	At or Above 475	2212	46977	45.16	2.10
	At or Above 550	389	9302	8.94	.93
	At or Above 625	11	459	.44	.28
Belgium (French)	At or Above 400	3527	46784	93.79	1.08
	As or Above 475	2664	35110	70.39	1.67
	At or Above 550	971	12719	25.50	1.39
	At or Above 625	91	1122	2.25	.49

As shown in the first few lines of results, 92.93 percent of the students in Australia performed at or above the Low International Benchmark of 400, with a standard error of 0.67; 75.62 percent of the students reached the Intermediate International Benchmark, with a standard error of 1.03; 41.91 percent of the students reached the High International Benchmark, with a standard error of 1.14; and 9.93 percent of the students reached the Advanced International Benchmark, with a standard error of 0.65.

Computing Correlations with Background Variables and Achievement Scores

In addition to the analyses described above, the IEA IDB Analyzer (version 3.0) is able to compute correlations among background variables as well as between background variables and achievement scores. While these types of analyses will not be demonstrated here, the steps for conducting them are the same as those described previously: select the grouping variables, the analysis variables, the achievement scores (if necessary), and confirm the weight variable. The output will display, for each group defined by the grouping variables, the correlation coefficients for each possible pair of variables. When using only background variables, the diagonal and elements above the diagonal of the correlation matrix are displayed with their corresponding standard errors. When using achievement scores, a single column is displayed containing the correlations between each of the background variables specified in the model and the achievement scores selected.

Calculating Percentiles of Achievement

The **Percentiles** statistic type is an additional tool provided by the IEA IDB Analyzer (version 3.0) for analyzing the PIRLS 2011 data. This procedure will compute the percentiles of a student achievement distribution for a specified set of plausible values and within any specified subgroups of students, along with appropriate standard errors.

2.6 PIRLS/prePIRLS Analyses with Home Background Data

Analyzing home background data from the PIRLS 2011 International Database requires that the home background data files (ASH) be merged with the student background data files (ASG) in order to retrieve the achievement scores and the required sample design variables. To illustrate how to perform analyses based on home background data, we will use an example that computes the average scale score for one of the newly developed contextual scales, along with the percentages of students, with their average reading achievement, for the categories of the scale's corresponding index.

Analyses with a Contextual Scale

PIRLS 2011 has innovated in its reporting of contextual data by creating contextual scales based on Rasch modeling.⁴ A number of contextual scales were reported in *PIRLS 2011 International Results in Reading* and are available in the International Database for analysis. Each contextual scale variable is a Rasch score with an international mean of 10 and an international standard deviation of 2. An index was derived from each scale that divides the range of scores into usually three categories: the most desirable scores (high values), the least desirable scores (low values), and the remaining scores in between.

⁴ The contextual scales are described in the context questionnaire scales section of *Methods and Procedures in TIMSS and PIRLS 2011*.

These contextual scales and their corresponding indices were reported in *PIRLS 2011 International Results in Reading*. Exhibit 2.15 shows one such example, Exhibit 4.6 from *PIRLS 2011 International Results in Reading*, analyzing students' Early Literacy Activities Before Beginning Primary School as reported by their parents. Results on the Rasch scale are reported for each country as an "Average Scale Score" and its corresponding index is reported as the percentages of students in each category—Often, Sometimes, and Never or Almost Never—along with the average achievement in each category. The Rasch scores for this contextual scale are contained in the ASBHELA variable; the corresponding index is found in the ASDHELA variable.

This example will replicate both the average scale score of the Early Literacy Activities contextual scale and the percentages of students, with their average reading achievement, in each category of its index. This will be done in two steps, both using the merged ASHALLR3 data file that combines the home background data files and the student background data files.

The first step will compute the average scale score using the contextual scale variable ASBHELA. It is performed by the analysis module of the IEA IDB Analyzer using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.
2. Specify the data file ASHALLR3 as the **Analysis File**.
3. Select **PIRLS (Using Student Weights)** as the **Analysis Type**.
4. Select **Percentages and Means** as the **Statistic Type**.
5. Select **None Used** as the **Plausible Value Option**, because we will not use any achievement scores for this part of the analysis.
6. Specify the variable ASBHELA as the analysis variable and activate it by clicking the **Analysis Variables** field. Select ASBHELA from the list of available variables and move it to the **Analysis Variables** field by clicking the **right arrow (▶)** button in this section.
7. The **Weight Variable** is selected automatically by the software; TOTWGT is selected by default because this example analysis uses home background data linked to student background data.
8. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.
9. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file can be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

**Exhibit 2.15: Example Exhibit of a Contextual Scale, Taken from
PIRLS 2011 International Results in Reading (Exhibit 4.6)**

Exhibit 4.6: Early Literacy Activities Before Beginning Primary School

Reported by Parents

Students were scored according to their parents' frequency of doing the nine activities on the *Early Literacy Activities* scale. Students **Often** engaged in early literacy activities had a score on the scale of at least 10.7, which corresponds to their parents "often" doing five of the nine activities with them and "sometimes" doing the other four, on average. Students **Never or Almost Never** engaged in such activities had a score no higher than 6.2, which corresponds to parents "never or almost never" doing five of the nine activities with them and "sometimes" doing the other four, on average. All other students had parents who **Sometimes** engaged them in early literacy activities.

Country	Often		Sometimes		Never or Almost Never		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Russian Federation	61 (1.3)	576 (2.7)	38 (1.2)	558 (3.4)	1 (0.3)	~ ~	11.1 (0.06)
Northern Ireland s	59 (1.3)	582 (3.5)	41 (1.4)	559 (3.7)	0 (0.2)	~ ~	11.2 (0.06)
New Zealand s	55 (1.0)	567 (2.7)	44 (1.0)	529 (2.5)	1 (0.1)	~ ~	11.0 (0.05)
Australia s	52 (1.4)	555 (3.0)	46 (1.3)	528 (3.4)	1 (0.3)	~ ~	10.8 (0.06)
Georgia	52 (1.4)	498 (2.6)	47 (1.3)	479 (4.0)	1 (0.2)	~ ~	10.7 (0.06)
Canada r	51 (0.9)	566 (1.9)	48 (0.9)	541 (1.8)	1 (0.1)	~ ~	10.7 (0.04)
Ireland	50 (0.9)	569 (2.3)	49 (0.8)	542 (2.6)	1 (0.1)	~ ~	10.8 (0.04)
Croatia	50 (0.9)	562 (2.2)	49 (0.9)	544 (1.9)	0 (0.1)	~ ~	10.7 (0.03)
Slovenia	48 (1.2)	543 (2.3)	51 (1.2)	522 (2.6)	0 (0.1)	~ ~	10.6 (0.04)
Israel r	48 (1.0)	563 (3.0)	51 (1.0)	534 (3.5)	1 (0.2)	~ ~	10.6 (0.04)
Italy	48 (0.9)	553 (2.4)	51 (1.0)	537 (2.6)	1 (0.2)	~ ~	10.5 (0.03)
Slovak Republic	47 (0.9)	547 (2.9)	51 (0.9)	530 (2.5)	2 (0.6)	~ ~	10.5 (0.05)
Trinidad and Tobago	47 (1.1)	497 (4.0)	52 (1.1)	456 (4.1)	1 (0.3)	~ ~	10.5 (0.05)
Malta	45 (0.9)	507 (1.9)	54 (0.9)	463 (2.7)	1 (0.2)	~ ~	10.4 (0.04)
Spain	44 (1.0)	528 (2.7)	55 (1.0)	507 (2.7)	1 (0.2)	~ ~	10.4 (0.03)
Poland	43 (0.8)	544 (2.8)	56 (0.8)	514 (2.1)	1 (0.3)	~ ~	10.4 (0.03)
Hungary	43 (0.8)	553 (2.8)	56 (0.8)	535 (3.2)	1 (0.4)	~ ~	10.3 (0.04)
Czech Republic	40 (1.0)	555 (2.6)	60 (1.0)	542 (2.3)	1 (0.2)	~ ~	10.3 (0.03)
Netherlands s	40 (0.8)	559 (3.1)	60 (0.8)	551 (2.0)	1 (0.2)	~ ~	10.2 (0.03)
Bulgaria	39 (1.4)	559 (3.1)	51 (1.0)	529 (3.7)	9 (1.4)	455 (15.3)	9.7 (0.12)
Romania	38 (1.5)	529 (4.1)	54 (1.3)	494 (4.5)	8 (1.0)	423 (8.9)	9.9 (0.09)
Germany r	38 (0.9)	555 (2.8)	61 (0.9)	543 (2.2)	1 (0.2)	~ ~	10.2 (0.03)
Norway	37 (1.4)	524 (2.5)	63 (1.4)	500 (2.2)	1 (0.2)	~ ~	10.0 (0.06)
France	36 (0.7)	536 (2.6)	63 (0.7)	515 (2.7)	1 (0.2)	~ ~	10.0 (0.03)
Lithuania	36 (0.9)	541 (1.9)	63 (0.9)	524 (2.5)	2 (0.2)	~ ~	10.0 (0.03)
Austria	35 (1.0)	543 (2.1)	63 (1.1)	523 (2.5)	1 (0.2)	~ ~	10.0 (0.03)
Portugal	35 (1.1)	558 (2.8)	63 (1.1)	535 (2.6)	2 (0.4)	~ ~	10.0 (0.05)
Sweden	34 (1.0)	562 (2.9)	64 (1.0)	537 (2.2)	2 (0.2)	~ ~	9.9 (0.04)
Colombia	34 (1.1)	457 (5.7)	63 (1.0)	448 (3.8)	3 (0.4)	409 (11.0)	9.9 (0.06)
Denmark	32 (0.9)	567 (2.2)	67 (0.9)	550 (1.9)	1 (0.2)	~ ~	9.9 (0.03)
Belgium (French)	30 (0.8)	524 (2.9)	67 (0.7)	501 (3.2)	3 (0.4)	482 (10.3)	9.7 (0.04)
Qatar	28 (1.0)	458 (6.0)	69 (1.0)	420 (3.1)	3 (0.3)	390 (11.7)	9.7 (0.05)
Finland	27 (0.9)	583 (2.9)	72 (0.9)	564 (1.9)	1 (0.1)	~ ~	9.7 (0.03)
United Arab Emirates	27 (0.5)	480 (2.8)	71 (0.5)	430 (2.3)	3 (0.2)	392 (7.4)	9.6 (0.03)
Saudi Arabia	26 (1.3)	455 (5.2)	70 (1.4)	426 (4.2)	4 (0.8)	360 (16.2)	9.5 (0.06)
Singapore	26 (0.7)	595 (3.6)	69 (0.7)	561 (3.3)	5 (0.3)	543 (6.2)	9.4 (0.03)
Azerbaijan	23 (1.3)	467 (4.8)	72 (1.3)	463 (3.5)	4 (0.7)	439 (7.6)	9.5 (0.07)
Indonesia	23 (1.3)	445 (5.8)	72 (1.3)	427 (4.1)	4 (0.5)	409 (6.5)	9.4 (0.07)
Oman	19 (0.4)	429 (3.6)	76 (0.5)	385 (3.2)	5 (0.4)	354 (7.2)	9.2 (0.03)
Morocco	17 (0.9)	321 (5.6)	64 (1.5)	314 (4.5)	19 (1.9)	302 (13.6)	8.4 (0.13)
Iran, Islamic Rep. of	15 (0.6)	474 (3.6)	77 (0.8)	460 (3.0)	8 (0.8)	411 (8.0)	8.9 (0.05)
Chinese Taipei	14 (0.6)	577 (3.5)	76 (0.8)	553 (1.8)	10 (0.6)	526 (4.8)	8.7 (0.04)
Hong Kong SAR	12 (0.6)	588 (3.7)	80 (0.6)	571 (2.3)	8 (0.5)	560 (3.7)	8.7 (0.03)
International Avg.	37 (0.2)	529 (0.5)	60 (0.2)	506 (0.5)	3 (0.1)	430 (2.6)	

Sixth Grade Participants

Honduras	30 (1.5)	461 (8.3)	63 (1.3)	447 (4.2)	7 (0.7)	426 (12.2)	9.6 (0.08)
Kuwait s	23 (1.2)	448 (9.3)	73 (1.2)	420 (6.5)	4 (0.5)	378 (14.2)	9.4 (0.06)
Morocco	16 (0.7)	437 (6.7)	67 (1.2)	432 (4.2)	16 (1.3)	406 (7.5)	8.5 (0.08)
Botswana	15 (1.1)	464 (8.7)	74 (1.2)	420 (3.9)	11 (1.0)	388 (6.2)	8.6 (0.08)

Benchmarking Participants⁰

Ontario, Canada r	54 (1.3)	566 (3.1)	45 (1.3)	545 (3.2)	1 (0.2)	~ ~	10.9 (0.05)
Alberta, Canada r	52 (1.3)	568 (3.6)	47 (1.3)	542 (3.7)	1 (0.2)	~ ~	10.8 (0.05)
Maltese - Malta	45 (0.8)	481 (2.0)	54 (0.8)	447 (1.9)	1 (0.2)	~ ~	10.4 (0.03)
Andalusia, Spain	43 (0.9)	530 (2.5)	56 (0.9)	508 (2.7)	1 (0.2)	~ ~	10.3 (0.04)
Quebec, Canada	40 (1.0)	554 (3.0)	59 (1.0)	531 (2.4)	2 (0.3)	~ ~	10.2 (0.04)
Eng/Afr (5) - RSA r	34 (1.5)	465 (8.5)	61 (1.4)	405 (7.2)	4 (0.7)	358 (14.5)	9.8 (0.09)
Dubai, UAE	34 (0.8)	521 (2.4)	64 (0.8)	463 (2.6)	2 (0.2)	~ ~	9.9 (0.03)
Abu Dhabi, UAE	24 (1.1)	466 (6.4)	73 (1.0)	416 (4.4)	3 (0.4)	379 (9.6)	9.5 (0.05)

⁰ Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

England and the United States did not administer the Home Questionnaire.
Centerpoint of scale set at 10.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70% but less than 85% of the students. An "s" indicates data are available for at least 50% but less than 70% of the students.

SOURCE: IEA's Progress in International Reading Literacy Study - PIRLS 2011

Exhibit 2.16 shows the completed analysis module for this example analysis, and Exhibit 2.17 displays the results.

Exhibit 2.16: IDB Analyzer Setup for Example Home Background Analysis with a Contextual Scale (Step 1)

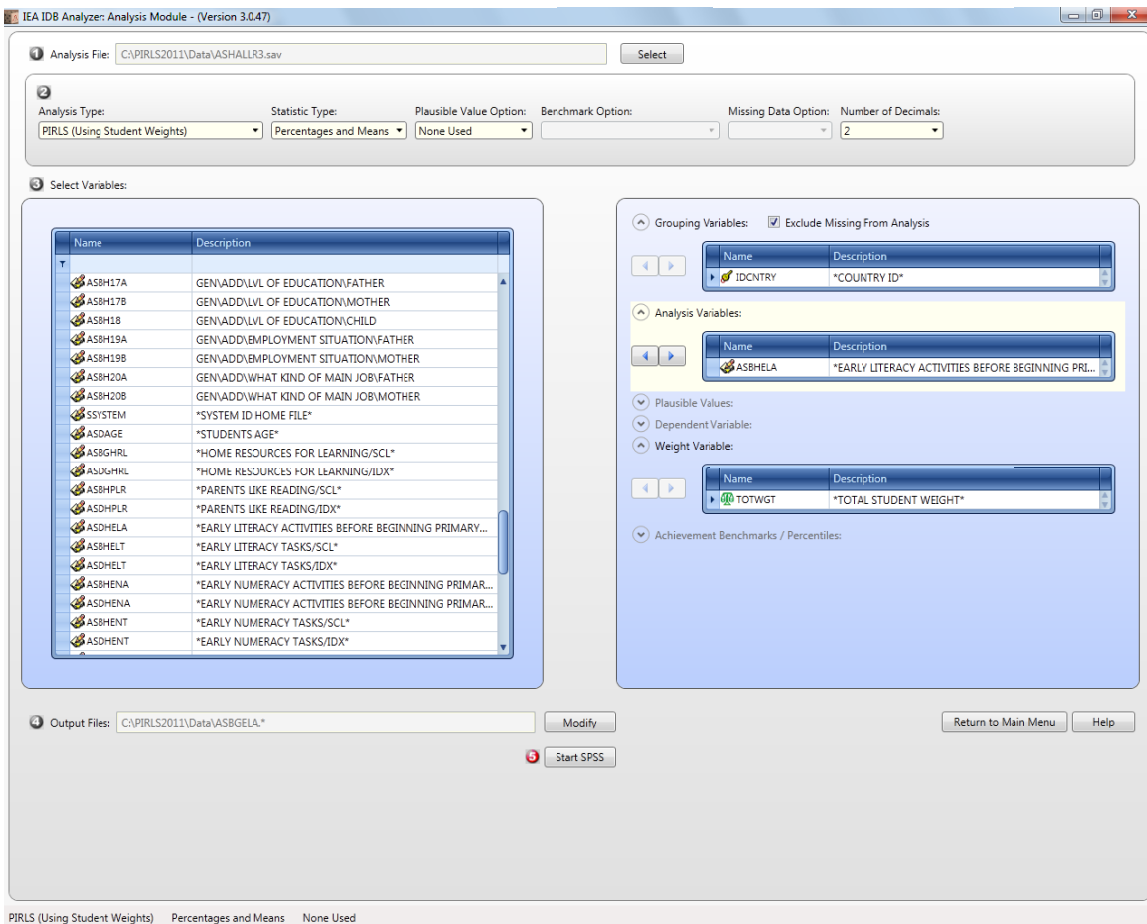


Exhibit 2.17: Output for Example Home Background Analysis with a Contextual Scale (Step 1)

Average for ASBHELA by (IDCNTRY)									
COUNTRY ID	N of Cases	Sum of TOTWGT	Percent	Percent (s.e.)	ASBHELA (Mean)	ASBHELA (s.e.)	Std.Dev	Std.Dev. (s.e.)	Percent Missing
Australia	3232	135420	.92	.03	10.84	.06	2.09	.03	46.09
Austria	4393	74088	.50	.02	9.98	.03	1.74	.03	5.42
Azerbaijan, Republic of	4509	96026	.65	.03	9.47	.07	1.82	.05	7.68
Belgium (French)	3383	44793	.30	.01	9.69	.04	1.74	.03	10.20

As shown in the first line of the results, students in Australia scored 10.84 on the Early Literacy Activities contextual scale, with a standard error of 0.06. Note that this is well above the international average of 10, the difference being statistically significant at the 95% confidence level. The IEA IDB Analyzer also computes the standard deviation of the contextual scale and its standard error.

In the second step, we will compute the percentages of students, with their average reading achievement, in each category of the index variable ASDHELA. This is performed by the analysis module of the IEA IDB Analyzer using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.
2. Specify the data file ASHALLR3 as the **Analysis File**.
3. Select **PIRLS (Using Student Weights)** as the **Analysis Type**.
4. Select **Percentages and Means** as the **Statistic Type**.
5. Select **Use PVs** as the **Plausible Value Option**, because we will be computing average reading achievement by the grouping variable ASDHELA.
6. Specify the variable ASDHELA as a second grouping variable and activate it by clicking the **Grouping Variables** field. Select ASDHELA from the list of available variables and move it to the **Grouping Variables** field by clicking the **right arrow (▶)** button in this section.
7. Specify the achievement scores to be used for the analysis and activate them by clicking the **Plausible Values** field. Select ASRREA01–05 from the list of available variables and move it to the **Plausible Values** field by clicking the **right arrow (▶)** button in this section.
8. The **Weight Variable** is selected automatically by the software; TOTWGT is selected by default because this example analysis uses home background data linked to student background data.
9. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.
10. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file can be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

Exhibit 2.18 shows the completed analysis module for this example analysis and the results are presented in Exhibit 2.19.

As shown in the first three lines of the results, 52.34 percent of students in Australia often experienced early literacy activities before beginning primary school (standard error of 1.39), and their average reading achievement was 554.83 (standard error of 3.01); 46.23 percent sometimes experienced early literacy activities (standard error of 1.31), and their average reading achievement was 527.72 (standard error of 3.37); and 1.44 percent of students never or almost never experienced early literacy activities (standard error of 0.32), and their average reading achievement was 490.46 (standard error of 23.75). The large standard error of this last estimated average achievement, based on a very small sample size and accounting for less than 2 percent of the target population, should be a note of caution as to the poor reliability of that estimate.

Exhibit 2.18: IDB Analyzer Setup for Example Home Background Analysis with a Contextual Scale (Step 2)

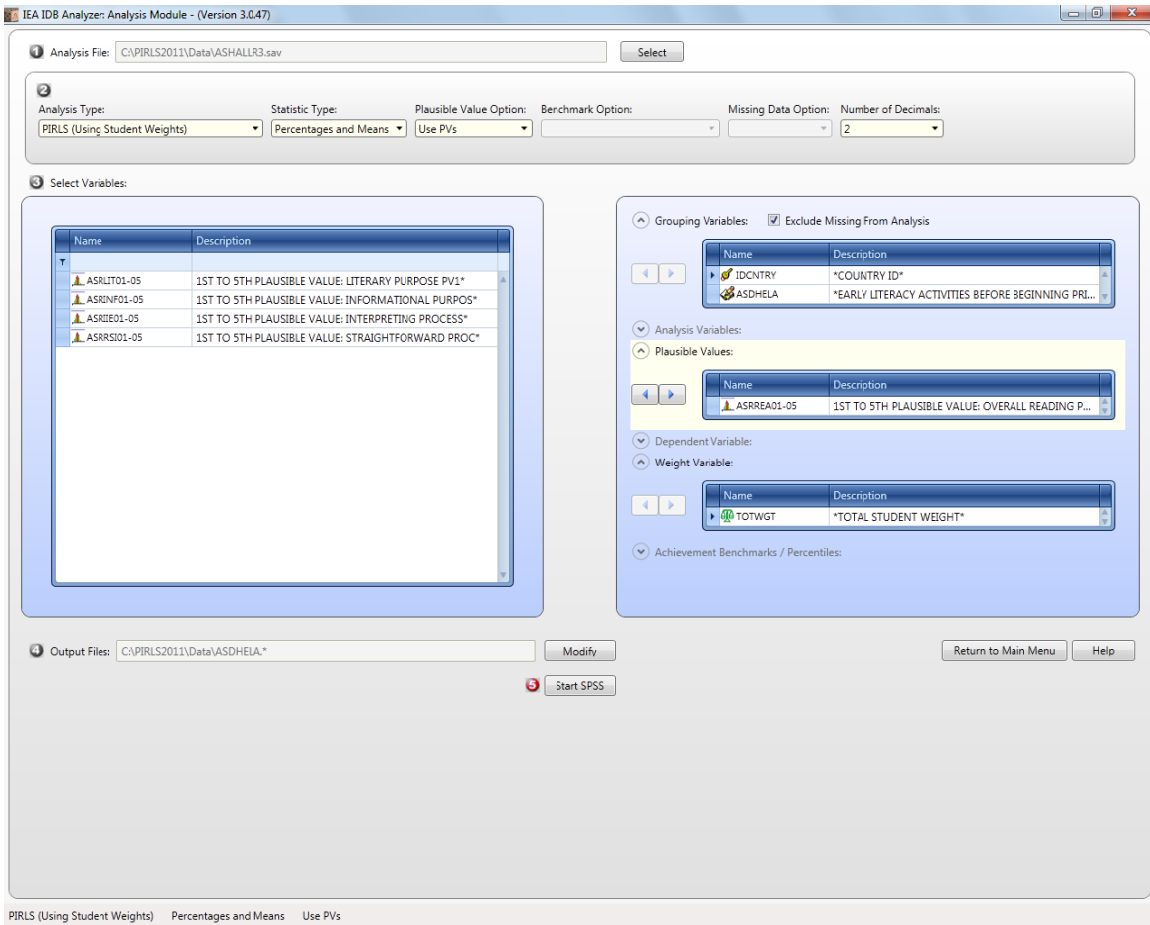


Exhibit 2.19: Output for Example Home Background Analysis with a Contextual Scale (Step 2)

Average for ASRREA0 by IDCNTY ASDHELA

COUNTRY ID	*EARLY LITERACY ACTIVITIES BEFORE BEGINNING PRIMARY SCHOOL/IDX*	N of Cases	Sum of TOTWGT	Percent	Percent (s.e.)	ASRREA0 (Mean)	ASRREA0 (s.e.)	Std.Dev	Std.Dev. (s.e.)
Australia	OPTEN	1745	70874	52.34	1.39	554.83	3.01	73.98	1.81
	SOMETIMES	1450	62600	46.23	1.31	527.72	3.37	79.08	2.59
	NEVER OR ALMOST NEVER	37	1947	1.44	.32	490.46	23.75	99.22	13.46
Austria	OPTEN	1592	26099	35.23	1.05	543.39	2.10	59.88	1.52
	SOMETIMES	2732	46913	63.32	1.07	523.49	2.50	63.66	1.29
	NEVER OR ALMOST NEVER	69	1077	1.45	.21	501.83	7.79	63.53	7.58
Azerbaijan, Republic of	OPTEN	1119	22528	23.46	1.33	466.95	4.84	67.88	2.61
	SOMETIMES	3206	69288	72.16	1.35	463.25	3.47	67.77	2.24
	NEVER OR ALMOST NEVER	184	4211	4.38	.69	439.24	7.56	62.70	4.18
Belgium (French)	OPTEN	1029	13472	30.08	.76	524.35	2.95	63.18	1.93
	SOMETIMES	2263	29978	66.93	.72	501.06	3.16	64.03	2.02
	NEVER OR ALMOST NEVER	91	1343	3.00	.39	482.03	10.29	65.78	5.48

2.7 PIRLS/prePIRLS Analyses with Teacher-level Data

Analyses with teacher background data seek to make statements about students whose teachers have a given characteristic, rather than about teachers with a given characteristic. As our example of an analysis using teacher background data, we will investigate the percentage of students according to the years of experience of their teachers. The results of such an analysis are presented in Exhibit 7.3 of *PIRLS 2011 International Results in Reading* and are reproduced here in Exhibit 2.20.

We will use the **Percentages and Means** statistic type and select the **Use PVs** option to estimate the percentages of students, with their average reading achievement, by reporting categories of teachers' years of experience.

As with the previous examples, we first proceed to identify the variables relevant to the analysis in the appropriate files, and review the documentation for any specific national adaptations to the questions of interest. Because we are using a teacher-level variable, we need to look in the teacher background data files for the variable that contains the information on the years of experience of teachers. The variable ATBG01 contains information on teachers' years of experience. That information was collapsed into reporting categories and stored in the derived variable ATDG01.⁵

The merged data file ATGALLR3 will be used for this example teacher-level analysis, which will be performed by the analysis module of the IEA IDB Analyzer using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.
2. Select the merged data file ATGALLR3 as the **Analysis File**.
3. Select **PIRLS (Using Teacher Weights)** as the **Analysis Type**.
4. Select **Percentages and Means** as the **Statistic Type**.
5. Select **Use PVs** as the **Plausible Value Option**.
6. Specify the variable ATDG01 as a second grouping variable and activate it by clicking the **Grouping Variables** field. Select ATDG01 from the list of available variables and move it to the **Grouping Variables** field by clicking the **right arrow (▶)** button in this section.
7. Specify the achievement scores to be used for the analysis and activate them by clicking the **Plausible Values** field. Select ASRREA01–05 from the list of available variables and move it to the **Plausible Values** field by clicking the **right arrow (▶)** button in this section.
8. The **Weight Variable** is selected automatically by the software; TCHWGT is selected by default because this example analysis uses teacher background data.
9. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.
10. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file can be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

⁵ Supplement 3 to this User Guide describes the construction of the teacher-level derived variable ATDG01.

**Exhibit 2.20: Exhibit of Example Teacher-level Analysis, Taken from
PIRLS 2011 International Results in Reading (Exhibit 7.3)**

Exhibit 7.3: Teachers' Years of Experience

PIRLS 2011 ^{4th} Grade

Reported by Teachers

Country	20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement		
Australia	r	42 (4.0)	530 (5.1)	22 (3.5)	533 (5.7)	19 (2.9)	529 (6.3)	17 (3.2)	534 (7.2)	17 (1.0)
Austria		55 (2.8)	532 (2.4)	25 (2.7)	526 (4.0)	11 (1.9)	532 (3.9)	10 (1.9)	513 (6.8)	21 (0.6)
Azerbaijan		60 (4.5)	466 (3.8)	26 (3.1)	456 (8.6)	11 (2.7)	440 (10.4)	4 (2.0)	484 (33.4)	23 (1.1)
Belgium (French)		40 (3.9)	516 (3.9)	32 (3.8)	502 (4.9)	16 (3.4)	504 (6.7)	12 (2.5)	498 (12.5)	16 (0.7)
Bulgaria		72 (3.3)	533 (5.2)	24 (3.0)	532 (7.8)	2 (1.0)	~ ~	2 (1.2)	~ ~	24 (0.6)
Canada		30 (2.2)	546 (2.5)	33 (2.6)	552 (3.7)	25 (1.9)	547 (3.4)	12 (1.3)	545 (4.3)	14 (0.4)
Chinese Taipei		26 (3.3)	558 (3.9)	50 (3.8)	551 (2.5)	17 (3.3)	559 (5.1)	7 (2.0)	536 (6.1)	15 (0.6)
Colombia		43 (4.5)	447 (6.0)	35 (4.4)	442 (5.9)	16 (3.3)	451 (15.8)	7 (1.6)	496 (19.4)	18 (0.7)
Croatia		56 (3.4)	557 (2.5)	30 (2.9)	545 (3.2)	9 (2.0)	559 (6.1)	5 (1.4)	552 (6.5)	21 (0.7)
Czech Republic		48 (4.0)	543 (3.3)	27 (3.6)	544 (3.5)	12 (2.4)	551 (5.4)	13 (2.9)	554 (7.7)	18 (0.8)
Denmark		35 (3.7)	557 (2.4)	25 (3.1)	552 (3.6)	22 (2.6)	554 (2.5)	18 (2.8)	553 (4.5)	16 (0.9)
England		14 (3.1)	566 (8.0)	27 (3.7)	550 (6.3)	29 (3.7)	558 (5.0)	30 (4.1)	538 (5.7)	10 (0.7)
Finland		40 (3.1)	567 (3.1)	35 (3.1)	570 (2.5)	12 (2.0)	571 (4.4)	13 (2.0)	564 (4.2)	17 (0.6)
France		34 (3.4)	530 (3.7)	36 (3.0)	516 (3.8)	19 (2.5)	520 (3.5)	11 (2.1)	506 (8.0)	16 (0.7)
Georgia		59 (3.4)	486 (3.3)	29 (3.5)	489 (6.2)	8 (1.9)	497 (18.8)	4 (1.6)	471 (16.4)	22 (0.7)
Germany		44 (3.8)	539 (3.6)	25 (3.2)	542 (4.8)	14 (2.7)	546 (6.4)	16 (2.6)	540 (5.4)	19 (0.9)
Hong Kong SAR		21 (3.5)	564 (6.4)	53 (4.0)	569 (3.8)	15 (3.3)	573 (5.9)	12 (2.5)	582 (5.1)	14 (0.7)
Hungary		73 (3.0)	544 (3.1)	16 (2.8)	525 (12.8)	7 (1.7)	537 (11.7)	4 (1.4)	505 (10.9)	24 (0.6)
Indonesia	r	52 (4.9)	438 (5.4)	16 (3.7)	432 (10.3)	19 (3.8)	429 (10.6)	12 (3.1)	395 (15.3)	18 (1.0)
Iran, Islamic Rep. of		41 (3.6)	476 (5.3)	41 (3.5)	449 (5.0)	10 (1.9)	447 (13.3)	9 (1.8)	421 (10.8)	17 (0.6)
Ireland		24 (3.0)	551 (4.5)	21 (3.1)	555 (5.7)	27 (3.3)	550 (4.0)	27 (2.9)	553 (4.6)	12 (0.7)
Israel		30 (3.8)	545 (5.7)	36 (3.9)	546 (7.0)	16 (2.7)	537 (9.6)	18 (3.0)	531 (11.3)	15 (0.8)
Italy		69 (3.6)	543 (2.8)	24 (3.4)	539 (3.4)	6 (1.7)	539 (7.4)	1 (0.8)	~ ~	24 (0.7)
Lithuania		71 (2.5)	527 (2.6)	26 (2.3)	534 (3.6)	2 (1.0)	~ ~	1 (0.5)	~ ~	24 (0.6)
Malta		18 (0.1)	491 (2.8)	38 (0.1)	475 (2.5)	29 (0.1)	472 (2.4)	15 (0.1)	477 (4.1)	12 (0.0)
Morocco		56 (4.2)	309 (5.3)	31 (4.4)	294 (8.9)	8 (1.6)	336 (17.4)	5 (1.4)	394 (16.4)	21 (0.6)
Netherlands		28 (3.1)	549 (3.0)	29 (3.4)	542 (3.2)	24 (3.2)	549 (3.4)	19 (3.0)	545 (5.3)	14 (0.8)
New Zealand		20 (2.5)	542 (5.3)	26 (2.6)	533 (5.1)	28 (2.5)	540 (4.6)	27 (2.5)	521 (5.4)	11 (0.6)
Northern Ireland	r	34 (4.7)	556 (3.8)	36 (4.0)	563 (4.8)	24 (4.2)	561 (6.2)	7 (2.3)	564 (20.2)	16 (1.0)
Norway		31 (4.4)	506 (4.1)	40 (4.6)	510 (2.7)	15 (3.3)	507 (4.9)	15 (2.4)	509 (5.9)	16 (1.0)
Oman		12 (1.9)	409 (6.7)	36 (2.8)	396 (4.6)	31 (2.9)	385 (5.2)	21 (2.1)	385 (6.4)	11 (0.4)
Poland		83 (2.2)	526 (2.4)	11 (2.1)	529 (7.4)	4 (1.5)	518 (10.7)	2 (0.9)	~ ~	23 (0.4)
Portugal		36 (3.2)	549 (3.4)	46 (3.6)	532 (4.2)	14 (2.5)	535 (6.5)	4 (1.6)	566 (11.9)	17 (0.6)
Qatar		20 (4.3)	450 (14.6)	25 (4.3)	447 (9.1)	30 (4.1)	422 (8.6)	25 (3.5)	388 (9.0)	11 (0.7)
Romania		57 (3.7)	511 (4.8)	31 (3.5)	487 (8.2)	9 (2.3)	478 (13.4)	2 (1.0)	~ ~	23 (0.8)
Russian Federation		73 (3.0)	571 (3.0)	22 (2.7)	567 (6.3)	3 (1.1)	526 (16.2)	3 (1.5)	559 (12.0)	24 (0.7)
Saudi Arabia		16 (3.1)	422 (14.5)	50 (4.5)	439 (5.3)	18 (3.0)	428 (15.2)	17 (3.5)	412 (12.9)	13 (0.7)
Singapore		17 (1.8)	570 (7.4)	27 (2.6)	563 (6.9)	24 (2.5)	575 (5.5)	32 (2.1)	564 (5.7)	11 (0.5)
Slovak Republic		55 (3.0)	536 (4.4)	28 (2.9)	531 (3.4)	10 (2.1)	546 (5.9)	7 (1.8)	530 (8.4)	20 (0.5)
Slovenia		57 (3.8)	532 (2.3)	27 (3.1)	532 (3.9)	10 (2.2)	517 (6.4)	6 (1.5)	523 (8.0)	21 (0.7)
Spain		59 (4.1)	519 (3.0)	19 (3.4)	502 (7.1)	8 (1.3)	510 (7.3)	14 (2.6)	502 (6.9)	21 (0.8)
Sweden		29 (4.2)	546 (3.8)	45 (4.0)	543 (3.8)	18 (2.7)	529 (4.3)	8 (1.9)	551 (6.3)	16 (0.9)
Trinidad and Tobago		43 (4.0)	487 (6.5)	35 (4.0)	459 (7.1)	9 (2.4)	459 (15.4)	12 (2.5)	452 (13.8)	18 (1.0)
United Arab Emirates		12 (1.6)	434 (9.1)	30 (2.3)	441 (7.3)	33 (2.3)	439 (6.2)	25 (2.0)	436 (6.0)	10 (0.3)
United States		28 (2.2)	569 (3.8)	38 (2.1)	553 (3.1)	19 (2.0)	550 (4.3)	15 (1.9)	552 (5.2)	14 (0.5)
International Avg.		41 (0.5)	517 (0.8)	31 (0.5)	511 (0.9)	16 (0.4)	510 (1.4)	12 (0.3)	507 (1.7)	17 (0.1)

SOURCE: IEA's Progress in International Reading Literacy Study - PIRLS 2011

Sixth Grade Participants

Botswana		29 (4.0)	434 (9.2)	32 (4.1)	421 (10.4)	23 (3.7)	401 (8.4)	16 (3.0)	420 (9.8)	14 (0.8)
Honduras		29 (4.2)	465 (6.4)	37 (4.6)	436 (7.9)	17 (3.7)	458 (7.2)	17 (4.0)	459 (20.6)	14 (0.9)
Kuwait	s	9 (2.9)	419 (7.2)	23 (4.5)	412 (16.5)	16 (3.8)	429 (21.7)	52 (4.9)	419 (12.8)	7 (0.7)
Morocco	r	53 (4.4)	422 (7.4)	38 (4.3)	407 (9.3)	7 (2.0)	468 (14.8)	2 (0.9)	~ ~	21 (0.7)

Benchmarking Participants^o

Alberta, Canada		33 (3.8)	544 (4.2)	23 (3.2)	560 (5.8)	23 (3.6)	554 (6.2)	21 (3.1)	533 (5.5)	14 (0.8)
Ontario, Canada		20 (2.9)	549 (6.3)	31 (4.0)	550 (5.1)	33 (3.5)	553 (4.9)	17 (2.7)	551 (7.3)	12 (0.5)
Quebec, Canada		33 (4.2)	538 (3.7)	40 (4.6)	539 (3.2)	20 (3.6)	533 (6.7)	7 (1.9)	537 (6.4)	16 (0.7)
Maltese - Malta	r	17 (0.1)	467 (3.7)	35 (0.1)	456 (2.3)	34 (0.1)	454 (2.6)	14 (0.1)	460 (3.7)	12 (0.0)
Eng/Afr (5) - RSA		43 (5.0)	415 (15.3)	24 (4.6)	420 (14.8)	15 (3.5)	450 (25.3)	17 (4.7)	455 (22.5)	17 (1.1)
Andalusia, Spain		58 (3.9)	521 (3.2)	16 (3.1)	520 (5.7)	11 (2.6)	501 (8.7)	15 (2.8)	498 (7.2)	21 (1.0)
Abu Dhabi, UAE		15 (3.2)	397 (12.8)	31 (4.4)	428 (13.5)	28 (4.1)	419 (10.4)	26 (3.7)	438 (9.7)	10 (0.6)
Dubai, UAE	r	13 (2.6)	492 (10.3)	28 (3.6)	477 (9.7)	38 (4.3)	482 (8.8)	21 (2.6)	470 (8.5)	11 (0.6)
Florida, US	r	26 (4.3)	572 (8.6)	33 (4.3)	576 (6.1)	30 (3.9)	566 (6.6)	11 (3.5)	563 (8.0)	15 (0.9)

^o Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70% but less than 85% of the students. An "s" indicates data are available for at least 50% but less than 70% of the students.

Exhibit 2.21 shows the completed analysis module for this example analysis, and Exhibit 2.22 displays the results.

Exhibit 2.21: IDB Analyzer Setup for Example Teacher-level Analysis

IEA IDB Analyzer: Analysis Module - (Version 3.0.47)

Analysis File: C:\PIRLS2011\Data\ATGALLR3.sav

Analysis Type: PIRLS (Using Teacher Weights) | Statistic Type: Percentages and Means | Plausible Value Option: Use PVs | Benchmark Option: | Missing Data Option: | Number of Decimals: 2

Select Variables:

Name	Description
ASRLT01-05	1ST TO 5TH PLAUSIBLE VALUE: LITERARY PURPOSE PV1*
ASRINF01-05	1ST TO 5TH PLAUSIBLE VALUE: INFORMATIONAL PURPOS*
ASRIE01-05	1ST TO 5TH PLAUSIBLE VALUE: INTERPRETING PROCESS*
ASRRS01-05	1ST TO 5TH PLAUSIBLE VALUE: STRAIGHTFORWARD PROC*

Grouping Variables: Exclude Missing From Analysis

Name	Description
IDCNTRY	*COUNTRY ID*
ATDG01	*TEACHERS YEARS OF EXPERIENCE*

Analysis Variables:

Plausible Values:

Name	Description
ASRREA01-05	1ST TO 5TH PLAUSIBLE VALUE: OVERALL READING P...

Dependent Variable:

Weight Variable:

Name	Description
TCHWGT	*WEIGHT FOR RDG TEACHER DATA COMBINED*

Achievement Benchmarks / Percentiles:

Output Files: C:\PIRLS2011\Data\REAbby\ATDG01.*

Buttons: Return to Main Menu, Help, Start SPSS

Footer: PIRLS (Using Teacher Weights) Percentages and Means Use PVs

Exhibit 2.22: Output for Example Teacher-level Analysis

Average for ASRREA0 by IDCNTRY ATDG01

COUNTRY ID	*TEACHERS YEARS OF EXPERIENCE*	N of Cases	Sum of TCHWGT	Percent	Percent (s.e.)	ASRREA0 (Mean)	ASRREA0 (s.e.)	Std.Dev	Std.Dev. (s.e.)
Australia	20 YEARS OR MORE	1954	83004	41.50	3.98	529.67	5.13	81.03	2.71
	AT LEAST 10 BUT LESS THAN 20 YEARS	1066	44750	22.37	3.52	533.03	5.68	79.87	3.16
	AT LEAST 5 BUT LESS THAN 10 YEARS	1000	38063	19.03	2.88	529.09	6.32	80.79	4.08
	LESS THAN 5 YEARS	868	34188	17.09	3.25	533.76	7.24	77.44	3.34
Austria	20 YEARS OR MORE	2445	42361	54.79	2.83	532.39	2.42	62.01	1.22
	AT LEAST 10 BUT LESS THAN 20 YEARS	1161	19233	24.87	2.73	525.88	4.04	64.94	2.21
	AT LEAST 5 BUT LESS THAN 10 YEARS	523	8339	10.78	1.93	532.30	3.93	60.56	3.77
	LESS THAN 5 YEARS	558	7389	9.56	1.88	512.69	6.76	66.57	2.46
Azerbaijan, Republic of	20 YEARS OR MORE	2490	53345	59.79	4.51	466.47	3.77	63.09	1.70
	AT LEAST 10 BUT LESS THAN 20 YEARS	1139	23144	25.94	3.11	456.15	8.56	71.67	4.75
	AT LEAST 5 BUT LESS THAN 10 YEARS	349	9506	10.65	2.68	439.81	10.43	67.26	4.47
	LESS THAN 5 YEARS	121	3231	3.62	1.95	483.72	33.44	86.08	19.66
Belgium (French)	20 YEARS OR MORE	1445	19025	40.39	3.88	516.19	3.91	61.53	1.80
	AT LEAST 10 BUT LESS THAN 20 YEARS	1085	15154	32.17	3.83	501.83	4.95	63.61	2.54
	AT LEAST 5 BUT LESS THAN 10 YEARS	534	7413	15.74	3.45	503.82	6.72	61.75	3.05
	LESS THAN 5 YEARS	431	5507	11.69	2.53	498.39	12.47	75.68	6.43

Each country's results are displayed on four lines, one for each value of the ATDG01 variable. The results are presented in the same manner as in the previous examples, with countries identified in the first column and the second column describing the categories of the analysis variable ATDG01.

As shown in the first four lines of results, 41.50 percent of students in Australia were taught by teachers with 20 years or more of experience, 22.37 percent were taught by teachers with 10 to 19 years of experience, 19.03 percent by teachers with 5 to 9 years of experience, and 17.09 percent by teachers with less than 5 years of experience. Also, the estimated average reading achievement was 529.67 (standard error of 5.13) for students taught by teachers with 20 years or more of experience, 533.03 (standard error of 5.68) for students taught by teachers with 10 to 19 years of experience, 529.09 (standard error of 6.32) for students taught by teachers with 5 to 9 years of experience, and 533.76 (standard error of 7.24) for students taught by teachers with less than 5 years of experience. The IEA IDB Analyzer also produces the standard deviations of achievement for all subgroups of ATDG01.

2.8 PIRLS/prePIRLS Analyses with School-level Data

When performing analyses with school background data, the data are analyzed to make statements about students attending schools with a given characteristic, rather than about schools with a given characteristic. Our example of an analysis using school background data will compute the percentages of students, with their average reading achievement, who attended schools composed of students with different levels of economic background. The results of this analysis are presented in Exhibit 5.2 of *PIRLS 2011 International Results in Reading* and are replicated here in Exhibit 2.23.

We will use the **Percentages and Means** statistic type and select the **Use PVs** option to estimate the percentages of students, with their average reading achievement, by reporting categories of students' economic background as reported by school principals.

The information for this analysis is found in the school-level derived variable ACDG03, where schools are characterized as being composed of more affluent students than disadvantaged students, composed of more disadvantaged students than affluent students, or composed of neither more affluent students nor more disadvantaged students.⁶

The merged data file ACGALLR3 will be used for this example school-level analysis and it is performed by the analysis module of the IEA IDB Analyzer using the following steps:

1. Open the **Analysis Module** of the IEA IDB Analyzer.
2. Select the merged data file ACGALLR3 as the **Analysis File**.
3. Select **PIRLS (Using Student Weights)** as the **Analysis Type**.
4. Select **Percentages and Means** as the **Statistic Type**.
5. Select **Use PVs** as the **Plausible Value Option**.

⁶ Supplement 3 to this User Guide describes the construction of the school-level derived variable ACDG03 from responses to questions posed to the school principals.

**Exhibit 2.23: Exhibit of Example School-level Analysis, Taken from
PIRLS 2011 International Results in Reading (Exhibit 5.2)**

Exhibit 5.2: School Composition by Student Economic Background

Reported by Principals

Country	More Affluent – Schools Where More than 25% of Students Come from Economically Affluent Homes and Not More than 25% from Economically Disadvantaged Homes		Neither More Affluent nor More Disadvantaged		More Disadvantaged – Schools Where More than 25% of Students Come from Economically Disadvantaged Homes and Not More than 25% from Economically Affluent Homes	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	32 (3.9)	556 (3.9)	41 (4.0)	526 (3.6)	27 (3.4)	500 (5.7)
Austria	31 (4.0)	539 (2.9)	48 (3.8)	532 (2.4)	21 (3.9)	505 (4.4)
Azerbaijan	r 11 (2.5)	464 (10.5)	32 (4.7)	470 (8.1)	57 (4.9)	462 (6.1)
Belgium (French)	49 (5.5)	522 (3.1)	27 (4.5)	501 (6.4)	25 (4.5)	483 (4.6)
Bulgaria	15 (3.3)	561 (6.2)	43 (4.3)	549 (4.5)	42 (4.4)	506 (7.8)
Canada	39 (2.4)	557 (3.0)	34 (2.9)	549 (2.7)	28 (2.6)	533 (2.6)
Chinese Taipei	22 (3.3)	563 (4.5)	67 (3.5)	554 (2.4)	11 (2.0)	525 (6.8)
Colombia	r 7 (2.0)	521 (17.1)	15 (3.4)	471 (11.7)	78 (3.9)	432 (4.7)
Croatia	38 (4.0)	560 (3.1)	38 (4.2)	550 (2.3)	24 (3.2)	551 (4.9)
Czech Republic	37 (3.7)	551 (3.2)	46 (4.4)	548 (2.2)	17 (3.1)	524 (6.7)
Denmark	60 (3.6)	561 (2.1)	33 (3.3)	546 (3.0)	7 (1.8)	524 (7.7)
England	r 32 (4.8)	568 (4.9)	33 (4.9)	554 (4.0)	35 (4.0)	527 (4.7)
Finland	43 (4.2)	576 (2.4)	47 (4.3)	567 (2.7)	10 (2.6)	541 (4.0)
France	37 (4.3)	539 (3.5)	35 (3.9)	522 (4.6)	28 (3.7)	493 (4.7)
Georgia	16 (3.0)	496 (8.8)	41 (4.3)	494 (5.9)	43 (4.0)	480 (4.5)
Germany	21 (2.8)	555 (3.3)	53 (3.7)	549 (3.0)	26 (3.3)	512 (5.5)
Hong Kong SAR	20 (3.3)	580 (3.9)	30 (4.7)	569 (5.3)	50 (4.7)	568 (4.4)
Hungary	21 (3.6)	573 (6.3)	31 (4.3)	557 (4.2)	48 (4.0)	516 (5.2)
Indonesia	r 20 (4.1)	475 (5.6)	21 (3.9)	431 (7.7)	59 (4.6)	421 (6.0)
Iran, Islamic Rep. of	27 (3.6)	488 (7.6)	27 (4.1)	460 (6.7)	46 (4.2)	438 (4.8)
Ireland	r 39 (4.7)	568 (3.3)	30 (4.2)	554 (4.7)	31 (3.4)	523 (4.0)
Israel	r 35 (3.6)	566 (6.1)	28 (3.4)	559 (4.9)	37 (3.4)	500 (6.5)
Italy	37 (3.8)	541 (4.5)	43 (3.7)	545 (3.6)	20 (2.9)	531 (5.0)
Lithuania	19 (3.3)	552 (5.8)	43 (4.6)	529 (3.3)	38 (3.5)	518 (3.1)
Malta	47 (0.1)	482 (2.2)	43 (0.1)	478 (2.4)	10 (0.1)	421 (5.3)
Morocco	s 12 (2.1)	372 (16.7)	13 (2.8)	317 (11.6)	75 (3.3)	304 (6.1)
Netherlands	r 63 (4.9)	553 (2.3)	23 (3.9)	544 (2.6)	15 (3.8)	522 (8.2)
New Zealand	39 (3.4)	560 (3.2)	34 (3.6)	533 (3.7)	27 (2.5)	489 (4.2)
Northern Ireland	r 36 (4.7)	578 (4.9)	38 (4.3)	555 (3.3)	26 (3.8)	534 (5.8)
Norway	53 (5.3)	511 (3.3)	44 (5.3)	505 (2.9)	3 (1.2)	488 (16.9)
Oman	r 44 (3.4)	396 (4.3)	25 (2.9)	378 (6.7)	31 (2.9)	370 (5.1)
Poland	8 (2.1)	536 (10.2)	61 (3.8)	532 (2.9)	31 (3.7)	512 (3.5)
Portugal	30 (4.5)	552 (4.0)	39 (4.9)	547 (4.1)	31 (4.8)	522 (4.6)
Qatar	r 68 (3.0)	423 (5.0)	21 (2.3)	441 (10.6)	11 (1.9)	378 (7.5)
Romania	19 (3.1)	538 (9.2)	24 (4.0)	507 (8.8)	57 (4.8)	491 (6.5)
Russian Federation	58 (3.2)	576 (4.0)	29 (3.3)	562 (4.8)	13 (2.1)	549 (8.5)
Saudi Arabia	r 42 (4.7)	445 (8.5)	30 (4.3)	439 (6.0)	29 (4.0)	408 (10.0)
Singapore	40 (0.0)	590 (5.2)	50 (0.0)	556 (4.5)	10 (0.0)	541 (14.3)
Slovak Republic	24 (3.3)	551 (3.9)	56 (3.4)	542 (2.5)	20 (3.2)	499 (8.0)
Slovenia	42 (4.0)	533 (3.7)	40 (4.0)	531 (2.7)	18 (3.0)	521 (6.7)
Spain	51 (3.7)	527 (4.0)	31 (3.3)	511 (4.7)	18 (3.1)	482 (5.1)
Sweden	r 76 (4.2)	547 (2.8)	17 (4.1)	532 (7.2)	7 (1.5)	509 (8.5)
Trinidad and Tobago	20 (3.2)	508 (7.5)	26 (4.0)	464 (9.2)	54 (4.2)	460 (5.7)
United Arab Emirates	r 68 (2.2)	440 (3.6)	20 (1.6)	444 (6.2)	12 (1.7)	412 (5.5)
United States	r 18 (2.2)	591 (2.9)	31 (2.6)	570 (3.5)	51 (2.3)	537 (2.4)
International Avg.	35 (0.5)	530 (0.9)	35 (0.6)	515 (0.8)	30 (0.5)	490 (1.0)

SOURCE: IEA's Progress in International Reading Literacy Study – PIRLS 2011

Sixth Grade Participants

Botswana	32 (3.6)	454 (7.9)	25 (4.0)	403 (8.3)	43 (4.3)	390 (4.3)
Honduras	r 16 (4.0)	518 (14.5)	13 (3.8)	440 (14.3)	71 (4.9)	444 (5.7)
Kuwait	r 30 (4.5)	429 (13.9)	35 (4.9)	431 (14.1)	35 (5.3)	402 (11.2)
Morocco	s 12 (2.3)	465 (16.5)	12 (2.6)	456 (11.1)	76 (3.1)	415 (5.8)

Benchmarking Participants^o

Alberta, Canada	35 (3.7)	564 (4.8)	40 (4.3)	550 (4.3)	25 (3.8)	527 (5.5)
Ontario, Canada	r 32 (4.7)	557 (5.4)	34 (5.3)	555 (4.3)	34 (5.4)	537 (4.4)
Quebec, Canada	60 (4.1)	544 (2.6)	25 (4.0)	526 (5.2)	15 (2.7)	528 (4.9)
Maltese – Malta	47 (0.1)	459 (2.1)	43 (0.2)	467 (2.6)	10 (0.1)	419 (4.5)
Eng/Afr (5) – RSA	r 22 (4.1)	507 (15.1)	23 (6.1)	419 (20.4)	55 (6.7)	382 (13.5)
Andalusia, Spain	47 (4.3)	525 (3.9)	34 (3.5)	519 (3.2)	19 (3.7)	490 (5.9)
Abu Dhabi, UAE	s 75 (4.5)	423 (7.4)	12 (3.2)	422 (18.7)	13 (3.5)	402 (10.7)
Dubai, UAE	r 67 (0.4)	473 (2.8)	22 (0.3)	498 (4.3)	11 (0.2)	416 (5.0)
Florida, US	r 11 (4.6)	598 (5.1)	20 (4.7)	590 (9.1)	68 (4.7)	559 (4.5)

^o Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

An "r" indicates data are available for at least 70% but less than 85% of the students. An "s" indicates data are available for at least 50% but less than 70% of the students.

6. Specify the variable ACDG03 as a second grouping variable and activate it by clicking the **Grouping Variables** field. Select ACDG03 from the list of available variables and move it to the **Grouping Variables** field by clicking the **right arrow (▶)** button in this section.
7. Specify the achievement scores to be used for the analysis and activate them by clicking the **Plausible Values** field. Select ASRREA01–05 from the list of available variables and move it to the **Plausible Values** field by clicking the **right arrow (▶)** button in this section.
8. The **Weight Variable** is selected automatically by the software; TOTWGT is selected by default because this example analysis uses school background data linked to student background data.
9. Specify the name and the folder of the output files in the **Output Files** field by clicking the **Define/Modify** button.
10. Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file can be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will display a prompt to confirm the overwriting of existing files.

Exhibit 2.24 shows the completed analysis module for this example analysis and the results are presented in Exhibit 2.25.

Exhibit 2.24: IDB-Analyzer Setup for Example School-level Analysis

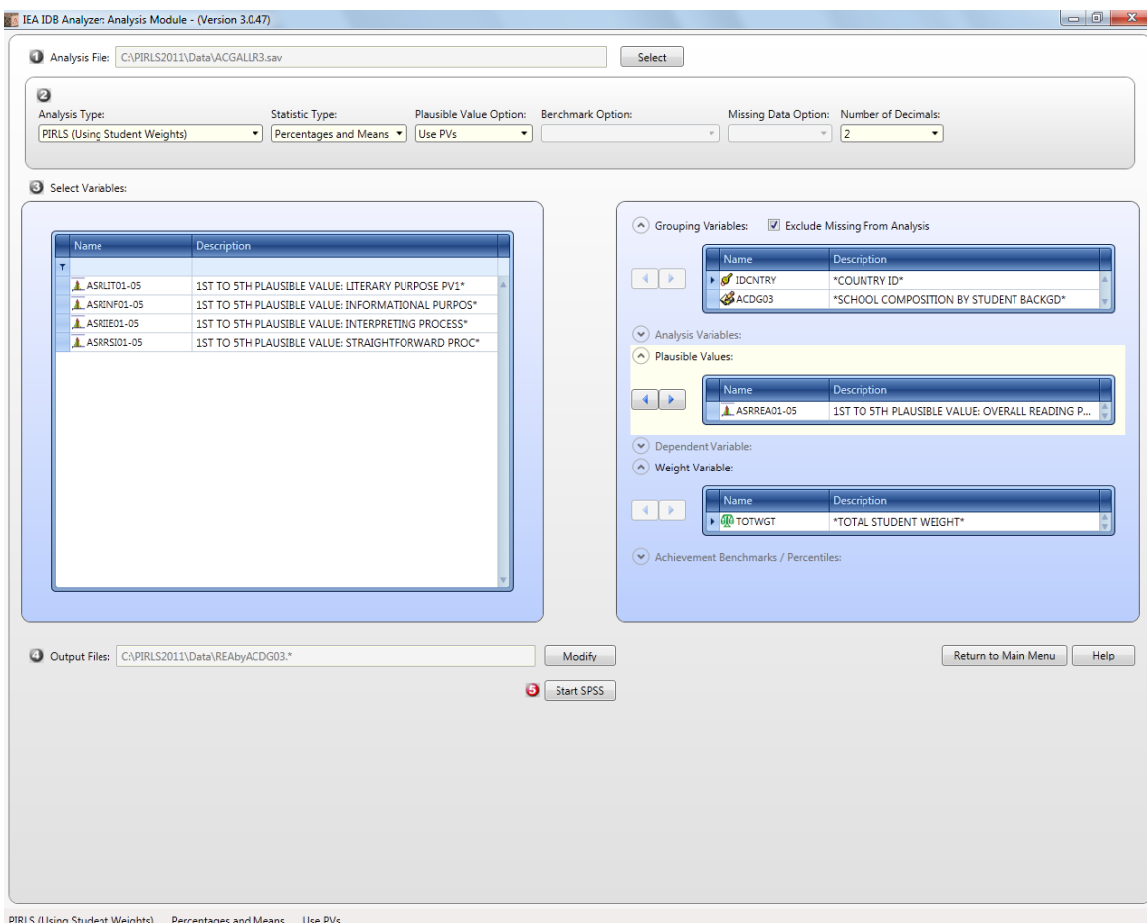


Exhibit 2.25: Output for Example School-Level Analysis

Average for ASRREA0 by IDCNTY ACDG03

COUNTRY ID	*SCHOOL COMPOSITION BY STUDENT BACKGD*	N of Cases	Sum of TOTWGT	Percent	Percent (s.e.)	ASRREA0 (Mean)	ASRREA0 (s.e.)	Std.Dev	std.Dev (s.e.)
Australia	MORE AFFLUENT	1759	71259	32.08	3.91	555.68	3.94	72.03	1.83
	NEITHER MORE AFFLUENT NOR MORE DISADVANTAGED	2425	90918	40.93	3.99	526.01	3.57	76.49	2.14
	MORE DISADVANTAGED	1162	59962	26.99	3.42	499.56	5.70	81.90	3.22
Austria	MORE AFFLUENT	1299	21774	30.53	4.04	539.43	2.91	60.44	1.28
	NEITHER MORE AFFLUENT NOR MORE DISADVANTAGED	1961	34354	48.16	3.79	531.63	2.40	61.31	1.55
	MORE DISADVANTAGED	1041	15199	21.31	3.91	505.26	4.44	66.37	2.78
Azerbaijan, Republic of	MORE AFFLUENT	458	9540	11.34	2.50	463.52	10.46	61.83	4.06
	NEITHER MORE AFFLUENT NOR MORE DISADVANTAGED	1271	26743	31.80	4.71	470.17	8.10	67.64	3.81
	MORE DISADVANTAGED	2368	47824	56.86	4.88	462.14	6.10	67.56	3.10
Belgium (French)	MORE AFFLUENT	1558	20853	48.55	5.48	522.40	3.06	59.89	1.46
	NEITHER MORE AFFLUENT NOR MORE DISADVANTAGED	871	11519	26.82	4.47	501.01	6.37	63.39	3.26
	MORE DISADVANTAGED	743	10577	24.63	4.49	483.24	4.60	61.37	1.92

In this example, each country’s results are presented on three lines, one for each value of the ACDG03 variable. The results are presented in the same manner as in previous examples, with countries identified in the first column and the second column describing the categories of ACDG03.

As shown in the first three lines of results, 32.08 percent of students in Australia attended schools with more affluent students than disadvantaged students (standard error of 3.91), 40.93 percent attended schools with neither more affluent students nor more disadvantaged students (standard error of 3.99), and 26.99 percent attended schools with more disadvantaged students than affluent students (standard error of 3.42). Also, the estimated average reading achievement was 555.68 (standard error of 3.94) for students in schools with more affluent students, 526.01 (standard error of 3.57) for students in schools with neither more affluent students nor more disadvantaged students, and 499.56 (standard error of 5.70) for students in schools with more disadvantaged students. The IEA IDB Analyzer also produces the standard deviations of achievement for all subgroups of ACDG03.

References

IBM Corporation. (2012). *IBM SPSS statistics* (version 20.0). Somers, NY: Author.

International Association for the Evaluation of Educational Achievement. (2012). *International database analyzer* (version 3.0). Hamburg, Germany: IEA Data Processing and Research Center.

Martin, M.O. & Mullis, I.V.S. (Eds.). (2012). *Methods and procedures in TIMSS and PIRLS 2011*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., Foy, P., & Drucker, K.T. (2012). *PIRLS 2011 international results in reading*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Chapter 3

Using SAS to Analyze the PIRLS 2011 International Database

3.1 Overview

This chapter presents some basic examples of analyses that can be performed with the PIRLS 2011 International Database using the SAS statistical analysis system (SAS Institute, 2012) and the SAS programs and macros provided. The SAS macros use sampling weights and the jackknifing algorithm to deal with the PIRLS complex sample design and take into account plausible values when analyzing student achievement.

Although some familiarity with the structure of the PIRLS 2011 database will be helpful, the analyses presented in this chapter are simple in nature and are designed primarily to familiarize users with the various data files and their structure, as well as the variables to be used in most analyses. Chapter 4 provides a more detailed description of the data files contained in the International Database, including their structure and contents, along with detailed information on all the supporting documentation provided with the International Database.

In general, the examples in this chapter compute percentages of students in specified subgroups, average reading achievement in those subgroups, and appropriate standard errors for these statistics. Additional examples compute regression coefficients and their standard errors. The example analyses, using student, home, teacher and school data, replicate some of the analyses that are included in *PIRLS 2011 International Results in Reading* (Mullis, Martin, Foy, & Drucker, 2012). Users are encouraged to practice analyzing the PIRLS 2011 data by replicating some of the exhibits presented in *PIRLS 2011 International Results in Reading*.

Before conducting any statistical analyses with the PIRLS 2011 International Database, users should download and copy the contents of the International Database either on their computer or on a server.¹ For the purposes of this chapter, we will assume all files have been copied to the folder titled “C:\PIRLS2011\.” All SAS programs presented in this chapter are available in the International Database. They can be adapted to perform a variety of analyses with some basic knowledge of the SAS language. With a little experience and some practice with these programs, users should be able to make the necessary modifications to obtain the desired results. The example SAS programs invoke SAS macros that will be described in this chapter. Although users will be expected to modify the example programs, there is no need to make any changes within the SAS macros.

¹ The PIRLS 2011 International Database is available on the PIRLS 2011 International Database and User Guide webpage (<http://timssandpirls.bc.edu/pirls2011/international-database.html>) and on the IEA Study Data Repository website (<http://rms.iea-dpc.org/>).

3.2 SAS Programs and Macros

The PIRLS 2011 International Database includes a number of SAS programs needed to process the SAS data files, compute survey results, and carry out example analyses. This chapter gives detailed instructions on how to adapt and make use of them. The following programs and macros are available:

CONVERT.SAS

This SAS program converts the SAS export files found in the International Database into SAS data files. All programs and macros described in this chapter require that the SAS export files be converted into SAS data files.

ASASCRR3.SAS, ASASCRL1.SAS

These two SAS programs can be used to convert the response codes to the PIRLS and prePIRLS 2011 achievement items to their corresponding score levels.

JOIN.SAS

This SAS program combines files of the same type from more than one country.

JACKGEN.SAS (and SAMPLEJACKGEN.SAS)

This SAS macro program is used to compute weighted percentages of students within defined subgroups, along with their means on a specified continuous variable. This macro generates replicate weights and computes standard errors using the jackknife repeated replication (JRR) methodology. The analysis variable can be any continuous variable. When computing average achievement scores with plausible values, the macro JACKPV.SAS should be used.

JACKPV.SAS (and SAMPLEJACKGPV.SAS)

This SAS macro program is used to compute weighted percentages of students within defined subgroups, along with their average achievement on an achievement scale using the available plausible values. This macro generates replicate weights and computes standard errors using the jackknife repeated replication (JRR) and multiple imputation methodologies. This macro should be used when achievement plausible values are used in an analysis.

JACKREG.SAS (and SAMPLEJACKREG.SAS)

This SAS macro program is used to compute regression coefficients and their standard errors within defined subgroups. This macro can be used with any analysis variable, but is not appropriate for analyzing achievement with plausible values.

JACKREGP.SAS (and SAMPLEJACKREGP.SAS)

This SAS macro program is used to compute regression coefficients and their standard errors within defined subgroups when using achievement plausible values as the dependent variable.

EXAMPLE1.SAS, EXAMPLE2.SAS, EXAMPLE3.SAS,
EXAMPLE4.SAS, EXAMPLE5.SAS, EXAMPLE6.SAS

These are the programs used in the example analyses presented in this chapter.

The four SAS macros—JACKGEN, JACKPV, JACKREG, and JACKREGP—have a corresponding sample program that calls the respective macro and prints out the results. These sample programs are discussed later in this chapter (See 3.6 SAS Macros to Compute Statistics and their Standard Errors).

3.3 Converting the SAS Export Files

The PIRLS 2011 International Database provides a program called CONVERT.SAS that converts the SAS export files provided in the International Database into SAS data files. This conversion is necessary because all of the SAS macros and SAS programs presented in this chapter require the use of SAS data files. To convert SAS export files into SAS data files, users should apply the following steps:

1. Open the SAS program file CONVERT.SAS.
2. At the beginning of the program, specify the study in the parameter “STUDY”—either “R3” for PIRLS, or “L1” for prePIRLS.
3. Specify the data file type in the parameter “TYPE.”
4. Specify the path where the SAS export files are located in the parameter “EXPPATH.”
5. Specify the folder where the converted SAS data files will be located in the parameter “DATPATH.”
6. List all of the countries of interest in the parameter “COUNTRY.” By default, all PIRLS 2011 countries are listed and the program will automatically select the appropriate list based on the study specified in step 2.
7. Submit the edited code for processing by SAS.

An example of the CONVERT program is presented in Exhibit 3.1. This example converts the SAS export files of type ASG for all PIRLS 2011 countries. For this example, all SAS export files are located in the folder titled “C:\PIRLS2011\Data\SAS_Data,” where the converted SAS data files also will be located.

Users are advised to run the CONVERT program for all countries and all file types. The file types are ACG, ASA, ASG, ASH, ASR, AST, and ATG. These file types are described in Chapter 4. In principle, this program needs to be run only once for each file type and should be one of the first things users do with the PIRLS 2011 International Database before undertaking any data analyses, particularly the data analysis examples in this User Guide.

Exhibit 3.1: Example of CONVERT Program

```
%LET STUDY = R3 ;
%LET TYPE = ASG ;
%LET EXPPATH = C:\PIRLS2011\Data\SAS_Data\ ;
%LET DATPATH = C:\PIRLS2011\Data\SAS_Data\ ;
%MACRO DOIT ;
  %LET COUNTRY = < List of PIRLS 2011 countries > ;
  %LET I = 1 ;
  %DO %WHILE(%LENGTH(%SCAN(&COUNTRY,&I))) ;
    %LET CTRY = %SCAN(&COUNTRY,&i) ;
    PROC CIMPORT FILE = "&EXPPATH&TYPE&CTRY&STUDY..EXP"
      DATA = "&DATPATH&TYPE&CTRY&STUDY" ;
    %LET I = %EVAL(&I + 1) ;
  %END ;
%MEND DOIT ;
%DOIT ;
```

3.4 Scores for the PIRLS/prePIRLS 2011 Items

Student achievement in PIRLS and prePIRLS 2011 is represented by sets of five plausible values for overall reading, its two purposes for reading, and its two processes of comprehension, and these are the preferred scores for any analysis of student achievement. However, analyzing performance on individual items may be of interest to some users. Carrying out such analyses may require that the individual items in the PIRLS 2011 International Database be assigned their correctness score levels, rather than the actual response options selected by students for multiple choice items or the codes given to students' responses to constructed response items. The International Database provides SAS programs to perform this task.

For multiple choice items, numbers 1 through 4 are used to represent response options A through D, respectively, in the PIRLS and prePIRLS 2011 achievement data files. These responses must be converted to their appropriate score level ("1" for correct and "0" for incorrect) based on each multiple choice item's correct response key. For constructed response items, worth a total of one, two, or three points, one-digit codes are used to represent the students' written responses in the achievement data files. These codes actually represent the point value of the students' response and thus do not require recoding.

For both types of items, special codes are set aside to represent missing data as either "Not Administered," "Omitted," or "Not Reached." These special missing codes also must be recoded in order to carry out specific item-level analyses. By default, the "Not Administered" response code is left as missing and the "Omitted" and "Not Reached" response codes are recoded as incorrect. These default settings can be modified within the programs, depending on the requirements of the item-level analyses. For example, "Not Reached" responses were treated as missing for the purpose of calibrating the PIRLS and prePIRLS 2011 items, whereas they were treated as incorrect when deriving achievement scores for students.

The PIRLS 2011 International Database includes two SAS programs—ASASCRR3.SAS for the PIRLS items, and ASASCRL1.SAS for the prePIRLS items—which will recode the responses to individual items from the achievement data files to their appropriate score levels. To score each individual PIRLS and prePIRLS 2011 item, the program code in the ASASCRR3 and ASASCRL1 programs must be adapted by doing the following steps:

1. Open the SAS program file ASASCRR3.SAS or ASASCRL1.SAS.
2. Specify the folder where the SAS data files are located in the “LIBNAME” statement.
3. List all of the countries of interest in the parameter “COUNTRY” (by default, all PIRLS or prePIRLS 2011 countries are listed).
4. Submit the edited code for processing by SAS.

Each program uses the student achievement data files as input (ASA), recodes the individual items, and saves the results in SAS data files that have “ASC” instead of “ASA” as the first three characters in their file names. Exhibit 3.2 shows a condensed version of the ASASCRR3 program to score the individual PIRLS 2011 items.

Exhibit 3.2: Example of ASASCRM5/BSASCRM5 Programs

```
LIBNAME LIBDAT "C:\PIRLS2011\Data\SAS_Data\" ;

%LET COUNTRY = < List of PIRLS 2011 countries > ;

%LET ARIGHT = < List of multiple-choice items where A is correct > ;
%LET BRIGHT = < List of multiple-choice items where B is correct > ;
%LET CRIGHT = < List of multiple-choice items where C is correct > ;
%LET DRIGHT = < List of multiple-choice items where D is correct > ;
%LET CONSTR = < List of constructed-response items > ;

%MACRO SCOREIT (ITEM, TYPE, RIGHT, NR, NA, OM, OTHER) ;

. . .

%MEND SCOREIT ;

%MACRO DOIT ;

. . .

DO OVER ARIGHT ; %SCOREIT (ARIGHT, "MC", 1, .R, .A, ., .I) ; END ;
DO OVER BRIGHT ; %SCOREIT (BRIGHT, "MC", 2, .R, .A, ., .I) ; END ;
DO OVER CRIGHT ; %SCOREIT (CRIGHT, "MC", 3, .R, .A, ., .I) ; END ;
DO OVER DRIGHT ; %SCOREIT (DRIGHT, "MC", 4, .R, .A, ., .I) ; END ;
DO OVER CONSTR ; %SCOREIT (CONSTR, "CR", , .R, .A, ., .I) ; END ;

. . .

%MEND DOIT ;

%DOIT ;
```

If “Not Reached” responses are to be treated as missing rather than incorrect, users should replace the following statement (which appears twice in the programs):

```
IF &ITEM = &NR THEN SCORE = 0 ;
```

with this statement:

```
IF &ITEM = &NR THEN SCORE = . ;
```

3.5 Joining the PIRLS/prePIRLS 2011 Data Files

The PIRLS 2011 International Database contains separate data files for each country. The International Database provides a SAS program called JOIN.SAS that joins individual country data files of a particular type into a single aggregated data file, facilitating joint analyses involving more than one country. The JOIN program, however, can only join SAS data files of the same type, and thus can be used for the following data file types: ACG, ASA, ASC, ASG, ASH, ASR, AST, and ATG. To create a SAS data file with more than one country's data, users should do the following:

1. Open the SAS program file JOIN.SAS.
2. At the beginning of the program, specify the study in the parameter "STUDY"—either "R3" for PIRLS, or "L1" for prePIRLS.
3. Specify the data file type in the parameter "TYPE."
4. Specify the folder where the SAS data files are located in the LIBDAT statement.
5. List all of the countries of interest in the parameter "COUNTRY" (by default, all PIRLS and prePIRLS 2011 countries are listed).
6. Submit the edited code for processing by SAS.

An example of the JOIN program is displayed in Exhibit 3.3. It joins the PIRLS 2011 student background data files (ASG) of all countries. All country data files are located in the folder titled "C:\PIRLS2011\Data\SAS_Data" and the resulting data file ASGALLR3 will be saved in this folder.

Exhibit 3.3: Example of JOIN Program

```
%LET STUDY = R3 ;
%LET TYPE = ASG ;
LIBNAME LIBDAT "C:\PIRLS2011\Data\SAS_Data\" ;
%MACRO DOIT ;
  %LET COUNTRY = < List of PIRLS 2011 countries > ;
  DATA &TYPE.ALL&STUDY ;
    SET %LET I = 1 ;
        %DO %WHILE(%LENGTH(%SCAN(&COUNTRY,&I))) ;
          %LET CTRY = %SCAN(&COUNTRY,&I) ;
          LIBDAT.&TYPE&CTRY&STUDY
          %LET I = %EVAL(&I + 1) ;
        %END ;
  PROC SORT DATA = &TYPE.ALL&STUDY OUT = LIBDAT.&TYPE.ALL&STUDY ;
    BY &SORTVARS ;
%MEND DOIT ;
%DOIT ;
```

3.6 SAS Macros to Compute Statistics and their Standard Errors

This section describes the four SAS macros—JACKGEN, JACKPV, JACKREG, and JACKREGP—needed to compute specific statistics with their correct standard errors, along with sample SAS programs to demonstrate their use. Users are encouraged to modify the sample SAS programs and familiarize themselves with their functioning. The four SAS macros, however, do not require any modifications.

Each SAS macro serves a specific analytical purpose. These macros ensure that analyses of the PIRLS and prePIRLS 2011 data are done properly. Sampling weights are used and standard errors are computed using the jackknife repeated replication (JRR) method. Furthermore, achievement scores are based on sets of five plausible values that take into account the measurement error arising from the test design and the IRT scaling methodology. The macros that make use of these plausible values effectively perform five analyses—one for each plausible value—and aggregate the results to produce accurate estimates of achievement and standard errors that incorporate both sampling and imputation errors.

The sample SAS programs presented in this section all use as input the SAS data file ASGALLR3, which contains the PIRLS 2011 student background data files of all participating countries. In all sample programs, <datpath> must be edited to specify the folder where the ASGALLR3 file is located, as well as <macpath> to indicate the folder where the SAS macros are located.

Computing Means and their Standard Errors—JACKGEN

The JACKGEN macro is used to compute percentages and means of continuous variables with their standard errors. We will demonstrate its use with a sample SAS program that calls the macro JACKGEN to compute the percentages of students within specified subgroups and their mean on a variable of choice. The macro also computes the appropriate standard errors for the percentages and means. However, this macro is not appropriate for analyzing achievement scores based on plausible values; the JACKPV macro should be used for this purpose.

The JACKGEN macro is a self-contained program, located in the program file JACKGEN.SAS, and should not be modified. It essentially computes sets of replicate weights using the sampling and weighting variables, aggregates the data by subgroups using the replicate weights, and then computes and stores the desired statistics in a SAS working file called FINAL.

The macro JACKGEN is included in a SAS program by issuing the following command:

```
%INCLUDE "<macpath>JACKGEN.SAS" ;
```

where <macpath> points to the folder in which the SAS macro JACKGEN.SAS is located. This macro requires that the following several parameters be specified as input when it is invoked:

- WGT The sampling weight to be used in the analysis. Generally, TOTWGT should be used. TCHWGT should be used when analyzing teacher data.

- JKZ** The variable that captures the assignment of cases (typically students) to sampling zones. The name of this variable in the PIRLS and prePIRLS data files is JKZONE.
- JKR** The variable that captures whether the case is to be dropped or have its weight doubled for each set of replicate weights. The name of this variable in the PIRLS and prePIRLS data files is JKREP.
- NJKZ** The number of replicate weights to be generated when computing the standard errors. The value of NJKZ should be set to 75, the maximum possible value across all participating countries.
- CVAR** The list of variables that are to be used to define the subgroups. The list can consist of one or more variables. We recommend that users always include IDCNTRY as the first classification variable.
- DVAR** The variable for which averages are to be computed. Only one variable can be listed and it should be a continuous variable. Plausible values of achievement scores should not be specified here.
- INFILE** The name of the SAS data file that contains the data being analyzed. It is important to emphasize that this SAS data file must include only those cases that are of interest in the analysis. If users want to have specific cases excluded from the analysis (e.g., students with missing data), this should be done prior to invoking the macro.

The JACKGEN macro is invoked by a SAS program using the conventional SAS notation for invoking macros. This involves listing the macro name followed by the list of parameters in parenthesis, each separated by a comma. For example, the JACKGEN macro invoked using the following statement:

```
%JACKGEN (TOTWGT, JKZONE, JKREP, 75, IDCNTRY ITSEX, ASDAGE, ASGALLR3) ;
```

will compute the average age (ASDAGE) of PIRLS 2011 students by gender (ITSEX) and their standard errors within each country (IDCNTRY), using the weighting variable TOTWGT. It also will compute the percentages of girls and boys and their standard errors within each country. The data will be read from the data file ASGALLR3 and the standard errors will be computed based on 75 sets of replicate weights.

The results of the JACKGEN macro are stored in a SAS working file called FINAL, which is stored in the default folder used by SAS. The following variables are contained in this results file:

Classification Variables

All classification variables are kept in the results file. In the example invocation above, there are two classification variables: IDCNTRY and ITSEX. There is one record in the results file for each subgroup defined by the categories of the classification variables.

N

This variable contains the number of valid cases for each subgroup defined by the classification variables. In the example, it is the number of girls and boys with valid data in each country's sample.

Weight Variable

The weight variable contains the sum of weights within each subgroup defined by the classification variables. In the example, this variable is TOTWGT, because TOTWGT was specified as the weighting variable. This variable will be an estimate of the total population within each subgroup.

MNX

This variable contains the estimated averages of the specified analysis variable by subgroup.

MNX_SE

This variable contains the standard errors of the estimated averages by subgroup.

PCT

This variable contains the estimated percentages of students in each subgroup for the last classification variable listed. In the example, it is the percentage of girls and boys within each country.

PCT_SE

This variable contains the standard errors of the estimated percentages.

The contents of the FINAL file can be printed using the SAS PRINT procedure. The sample SAS program that invokes the JACKGEN macro is presented in Exhibit 3.4, along with a printout of the results. This program is available in the International Database as the file called SAMPLEJACKGEN.SAS. It produces the average age of fourth grade girls and boys in all countries, although the exhibit shows the results only for the first four countries.

As shown in the first two lines of the results in Exhibit 3.4, there were 3,048 girls in Australia's PIRLS sample, representing 123,760 girls in the entire population. The average age of fourth grade girls in Australia was estimated to be 9.96, with a standard error of 0.01. Girls constituted 49.26 percent of Australia's fourth grade student population (standard error of 1.06). Conversely, Australia sampled 3,078 boys, representing 127,453 boys in the entire population. The estimated average age of fourth grade boys in Australia was 10.03, with a standard error of 0.01. Boys constituted 50.74 percent of Australia's fourth grade student population (standard error of 1.06).

Exhibit 3.4: Sample SAS Program Invoking the SAS Macro JACKGEN with Results

```

%LET STUDY = R3 ;

LIBNAME P11 "<datpath>" ;

%INCLUDE "<macpath>JACKGEN.SAS" ;

DATA ASGALL&STUDY ;
  SET P11.ASGALL&STUDY ;

  WHERE NMIS (ITSEX, ASDAGE) = 0 ;

PROC FORMAT LIBRARY = WORK ;

  VALUE COUNTRY
    < list PIRLS 2011 country formats > ;

  VALUE SEX
    1 = "GIRL"
    2 = "BOY" ;

%JACKGEN (TOTWGT, JKZONE, JKREP, 75, IDCNTY ITSEX, ASDAGE, ASGALL&STUDY) ;

PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTY ITSEX N TOTWGT MNX MNX_SE PCT PCT_SE ;
  FORMAT IDCNTY COUNTRY. ITSEX SEX. N 6.0 TOTWGT 10.0
    MNX MNX_SE PCT PCT_SE 6.2 ;

```

IDCNTY	ITSEX	N	TOTWGT	MNX	MNX_SE	PCT	PCT_SE
AUSTRALIA	GIRL	3048	123760	9.96	0.01	49.26	1.06
AUSTRALIA	BOY	3078	127453	10.03	0.01	50.74	1.06
AUSTRIA	GIRL	2274	38141	10.21	0.01	48.69	1.18
AUSTRIA	BOY	2396	40192	10.30	0.01	51.31	1.18
AZERBAIJAN	GIRL	2241	49037	10.24	0.03	47.14	0.85
AZERBAIJAN	BOY	2640	54977	10.19	0.02	52.86	0.85
BELGIUM (FRENCH)	GIRL	1814	24380	10.05	0.02	48.91	0.93
BELGIUM (FRENCH)	BOY	1909	25464	10.12	0.03	51.09	0.93

Computing Achievement Means and their Standard Errors—JACKPV

The JACKPV macro computes percentages and average achievement scores using plausible values. It makes use of the sampling weights, the jackknifing algorithm to compute sampling variances, and the five plausible values to compute imputation variances. It effectively performs five analyses—one for each plausible value—and aggregates the results to produce accurate estimates of average achievement and standard errors that incorporate both sampling and imputation errors.

A second sample program demonstrates the use of the JACKPV macro, which computes the percentages of students within specified subgroups and their average achievement scores. This SAS macro also computes the appropriate standard errors for those percentages and achievement averages.

The JACKPV macro is a self-contained program, located in the program file JACKPV.SAS, and should not be modified. It essentially computes sets of replicate weights using the sampling and weighting variables, aggregates the data by subgroups using the replicate weights, and then computes and stores the desired statistics in a SAS working file called FINAL. The macro aggregates data across all plausible values to obtain the correct results.

The SAS macro JACKPV is included in a SAS program by issuing the following command:

```

%INCLUDE "<macpath>JACKPV.SAS" ;

```

where <macpath> points to the folder in which the SAS macro program JACKPV.SAS is located. This macro requires that the following several parameters be specified as input when it is invoked:

- WGT** The sampling weight to be used in the analysis. Generally, TOTWGT should be used. TCHWGT should be used when analyzing teacher data.
- JKZ** The variable that captures the assignment of cases to sampling zones. The name of this variable in the PIRLS and prePIRLS data files is JKZONE.
- JKR** The variable that captures whether the case is to be dropped or have its weight doubled for each set of replicate weights. The name of this variable in the PIRLS and prePIRLS data files is JKREP.
- NJKZ** The number of replicate weights to be generated when computing the standard errors. The value of NJKZ should be set to 75, the maximum possible value across all participating countries.
- CVAR** The list of variables that are to be used to define the subgroups. The list can consist of one or more variables. We recommend that users always include IDCNTRY as the first classification variable.
- ROOTPV** The variable root used to identify the set of plausible values for the achievement score of interest. It corresponds to the first seven characters of the plausible values variable name. For example, the root of the fourth grade overall reading plausible values is ASRREA0.
- NPV** The number of plausible values that will be used for the analysis. Generally, it is set to five in order to use all five available plausible values for analysis.
- INFILE** The name of the SAS data file that contains the data being analyzed. It is important to emphasize that this SAS data file must include only those cases that are of interest in the analysis. If users want to have specific cases excluded from the analysis (e.g., students with missing data), this should be done prior to invoking the macro.

The JACKPV macro is invoked by a SAS program using the conventional SAS notation for invoking macros. This involves listing the macro name followed by the list of parameters in parenthesis, each separated by a comma. For example, the JACKPV macro invoked using the following statement:

```
%JACKPV (TOTWGT, JKZONE, JKREP, 75, IDCNTRY ITSEX, ASRREA0, 5, ASGALLR3) ;
```

will compute the average reading achievement (ASRREA01 through ASRREA05) by gender (ITSEX) within each country (IDCNTRY) and their standard errors, using the weighting variable TOTWGT. The macro uses all five plausible values to compute these statistics. It also will compute the percentages of girls and boys within each country, along with their standard errors. The data will be read from the data file ASGALLR3 and the standard errors will be computed based on 75 sets of replicate weights.

The results of the JACKPV macro are stored in a SAS working file called FINAL, which is stored in the default folder used by SAS. The following variables are contained in this results file:

Classification Variables

All classification variables are kept in the results file. In this example, there are two classification variables: IDCNTRY and ITSEX. There is one record in the results file for each subgroup defined by the categories of the classification variables.

N

This variable contains the number of valid cases for each subgroup defined by the classification variables. In the example, it is the number of girls and boys with valid data in each country's sample.

Weight Variable

The weight variable contains the sum of weights within each subgroup defined by the classification variables. In the example, this variable is called TOTWGT, because TOTWGT was specified as the weighting variable. This variable will be an estimate of the total population within each subgroup.

MNPV

This variable contains the estimated average achievement by subgroup, based on the plausible values.

MNPV_SE

This variable contains the standard errors of the estimated average achievement by subgroup, based on the plausible values.

PCT

This variable contains the estimated percentages of students in each subgroup for the last classification variable listed. In the example, it is the percentage of girls and boys within each country.

PCT_SE

This variable contains the standard errors of the estimated percentages.

The contents of the FINAL file can be printed using the SAS PRINT procedure. The sample SAS program that invokes the JACKPV macro is shown in Exhibit 3.5, along with a printout of the results. This program is available in the International Database as the file called SAMPLEJACKPV.SAS. It produces the average reading achievement for girls and boys in all countries, although Exhibit 3.5 gives the results only for the first four countries.

Exhibit 3.5: Sample SAS Program Invoking the SAS Macro JACKPV with Results

```

%LET STUDY = R3 ;

LIBNAME P11 "<datpath>" ;

%INCLUDE "<macpath>JACKPV.SAS" ;

DATA ASGALL&STUDY ;
  SET P11.ASGALL&STUDY ;

  WHERE NMISS (ITSEX) = 0 ;

PROC FORMAT LIBRARY = WORK ;

  VALUE COUNTRY
    < list PIRLS 2011 country formats > ;

  VALUE SEX
    1 = "GIRL"
    2 = "BOY" ;

%JACKPV (TOTWGT, JKZONE, JKREP, 75, IDCNTY ITSEX, ASRREA0, 5, ASGALL&STUDY) ;

PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTY ITSEX N TOTWGT MNPV MNPV_SE PCT PCT_SE ;
  FORMAT IDCNTY COUNTRY. ITSEX SEX. N 6.0 TOTWGT 10.0
  MNPV MNPV_SE PCT PCT_SE 6.2 ;

```

IDCNTY	ITSEX	N	TOTWGT	MNPV	MNPV_SE	PCT	PCT_SE
AUSTRALIA	GIRL	3048	123760	535.79	2.67	49.26	1.06
AUSTRALIA	BOY	3078	127453	519.20	2.73	50.74	1.06
AUSTRIA	GIRL	2274	38141	532.76	2.18	48.69	1.18
AUSTRIA	BOY	2396	40192	525.19	2.32	51.31	1.18
AZERBAIJAN	GIRL	2241	49037	469.57	3.56	47.14	0.85
AZERBAIJAN	BOY	2640	54977	455.82	3.47	52.86	0.85
BELGIUM (FRENCH)	GIRL	1815	24388	508.85	3.11	48.89	0.93
BELGIUM (FRENCH)	BOY	1912	25491	503.51	3.11	51.11	0.93

As shown in the first two lines of the results in Exhibit 3.5, the average reading achievement of fourth grade girls in Australia was estimated at 535.79, with a standard error of 2.67. The average reading achievement of fourth grade boys in Australia was estimated at 519.20, with a standard error of 2.73.

Computing Regression Coefficients and their Standard Errors—JACKREG

The JACKREG macro performs a multiple linear regression between a dependent variable and a set of independent variables. A third sample program demonstrates the use of the JACKREG macro, which computes the regression coefficients and their standard errors. This macro is not appropriate for regression analyses using achievement scores as the dependent variable. The JACKREGP macro should be used for this purpose.

The JACKREG macro is a self-contained program, located in the program file JACKREG.SAS, and should not be modified. It computes sets of replicate weights using the sampling and weighting variables, performs a linear regression by subgroup using the replicate weights, and then computes and stores the desired statistics in a SAS working file called REG.

The SAS macro JACKREG is included in a SAS program by issuing the following command:

```

%INCLUDE "<macpath>JACKREG.SAS" ;

```


where <macpath> points to the specific folder in which the SAS macro program JACKREG.SAS is located. This macro requires that the following several parameters be specified as input when it is invoked:

- WGT** The sampling weight to be used in the analysis. Generally, TOTWGT should be used. TCHWGT should be used when analyzing teacher data.
- JKZ** The variable that captures the assignment of cases to sampling zones. The name of this variable in the PIRLS and prePIRLS data files is JKZONE.
- JKR** The variable that captures whether the case is to be dropped or have its weight doubled for each set of replicate weights. The name of this variable in the PIRLS and prePIRLS data files is JKREP.
- NJKZ** The number of replicate weights to be generated when computing the standard errors. The value of NJKZ should be set to 75, the maximum possible value across all participating countries.
- CVAR** The list of variables that are to be used to define the subgroups. The list can consist of one or more variables. We recommend that users always include IDCNTRY as the first classification variable.
- XVAR** The list of independent variables used as predictors in the regression model. The independent variables can be either continuous or categorical (e.g., ITSEX).
- DVAR** The dependent variable to be predicted by the list of independent variables specified in XVAR. Only one variable can be listed, and plausible values of achievement scores should not be specified here.
- INFILE** The name of the SAS data file that contains the data being analyzed. It is important to emphasize that this SAS data file must include only those cases that are of interest in the analysis. If users want to have specific cases excluded from the analysis, for example students with missing data, this should be done prior to invoking the macro.

The JACKREG macro is invoked by a SAS program using the conventional SAS notation for invoking macros. This involves listing the macro name followed by the list of parameters in parenthesis, each separated by a comma. For example, the JACKREG macro invoked using the following statement:

```
%JACKREG (TOTWGT, JKZONE, JKREP, 75, IDCNTRY, REGSEX, ASBGSLR, ASGALLR3) ;
```

will perform a linear regression with gender (REGSEX) as a predictor of the students' score on the Students Like Reading contextual scale (ASBGSLR), using the weighting variable TOTWGT.² It will compute the regression coefficients and their standard errors. The data will be read from the data file ASGALLR3 and the standard errors will be computed based on 75 replicate weights.

² The Students Like Reading contextual scale is described in *Methods and Procedures in TIMSS and PIRLS 2011* (Martin & Mullis, 2012).

The results of the JACKREG macro are stored in a SAS working file called REG, which is stored in the default folder used by SAS. The following variables are contained in this results file:

Classification Variables

All classification variables are kept in the results file. In this example, there is a single classification variable IDCNTY. There is one record in the results file for each subgroup defined by the categories of the classification variables.

N

This variable contains the number of valid cases for each subgroup defined by the classification variables. In the example, it is the number of students with valid data in each country's sample.

MULT_RSQ

The squared multiple correlation coefficient (R^2) for the regression model applied in each subgroup.

SS_RES, SS_REG, SS_TOTAL

The residual, regression, and total weighted sums of squares for the regression model applied in each subgroup.

Regression Coefficients and Standard Errors (B## and B##.SE)

The regression coefficients for the intercept and the predictor variables with their respective standard errors. The regression coefficients are numbered sequentially, starting with zero (B00) for the intercept, and based on the order of the predictor variables as specified in the parameter XVAR.

The contents of the REG file can be printed using the SAS PRINT procedure. The sample SAS program that invokes the JACKREG macro is displayed in Exhibit 3.6, along with a printout of the results. This program is available in the International Database as the file called SAMPLEJACKREG.SAS. It performs a linear regression in each country, with the variable REGSEX as a predictor of the fourth grade students' score on the Students Like Reading contextual scale (ASBGSLR). The exhibit displays the results for the first four countries.

The regression performed by the sample program uses the independent variable REGSEX, which is a "dummy-coded" version of ITSEX, such that the value "0" represents the girls and the value "1" represents the boys. By performing this recoding, the intercept B00 will be the estimated average score of fourth grade girls, whereas the regression coefficient B01 will be the estimated increase in average score for boys. This will allow us to determine if the difference in average score between girls and boys is statistically significant.

As shown in the first line of the results in Exhibit 3.6, the estimated average score of girls in Australia on the ASBGSLR scale (B00) was 10.34, with a standard error of 0.06. The boys in Australia were an estimated 0.82 points lower (B01) than the girls on that scale (the sign of this coefficient being negative), with an estimated standard error of 0.07. Note that this difference is statistically significant at the 95% confidence level.

Exhibit 3.6: Sample SAS Program Invoking the SAS Macro JACKREG with Results

```

%LET STUDY = R3 ;

LIBNAME P11 "<datpath>" ;

%INCLUDE "<macpath>JACKREG.SAS" ;

DATA ASGALL&STUDY ;
  SET P11.ASGALL&STUDY ;

  WHERE NMISS (ITSEX, ASBGSLR) = 0 ;

  SELECT (ITSEX) ;
    WHEN (1)  REGSEX = 0 ; * GIRLS ;
    WHEN (2)  REGSEX = 1 ; * BOYS ;
    OTHERWISE REGSEX = . ;
  END ;

PROC FORMAT LIBRARY = WORK ;

  VALUE COUNTRY
    < list PIRLS 2011 country formats > ;

%JACKREG (TOTWGT, JKZONE, JKREP, 75, IDCNTY, REGSEX, ASBGSLR, ASGALL&STUDY) ;

PROC PRINT DATA = REG NOOBS ;
  VAR IDCNTY N MULT_RSQ SS_TOTAL SS_REG B00 B00_SE B01 B01_SE ;
  FORMAT IDCNTY COUNTRY. N 6.0 MULT_RSQ 5.3 SS_TOTAL SS_REG 10.0
    B00 B00_SE B01 B01_SE 6.2 ;

```

IDCNTY	N	MULT_RSQ	SS_TOTAL	SS_REG	B00	B00_SE	B01	B01_SE
AUSTRALIA	6022	0.038	1092334	41737	10.34	0.06	-0.82	0.07
AUSTRIA	4657	0.059	365610	21536	10.51	0.06	-1.05	0.08
AZERBAIJAN	4533	0.002	246599	522	10.45	0.06	-0.15	0.06
BELGIUM (FRENCH)	3709	0.022	202774	4432	10.41	0.06	-0.60	0.08

Computing Regression Coefficients and their Standard Errors with Achievement—JACKREGP

The JACKREGP macro is used to perform a multiple linear regression between a set of plausible values as the dependent variable and a set of independent variables. It computes the regression coefficients and their standard errors, making use of the sampling weights, the jackknifing algorithm to compute sampling variances, and the five plausible values to compute imputation variances. It effectively performs five regression analyses—one for each plausible value—and aggregates the results to produce accurate estimates of the regression coefficients and standard errors that incorporate both sampling and imputation errors. Below, we present a fourth sample program to demonstrate the use of the JACKREGP macro.

The JACKREGP macro is a self-contained program, located in the program file JACKREGP.SAS, and should not be modified. It computes sets of replicate weights using the sampling and weighting variables, performs a multiple linear regression by subgroups using the replicate weights, and then computes and stores the desired statistics in a SAS working file called REG.

The SAS macro JACKREGP is included in a SAS program by issuing the following command:

```

%INCLUDE "<macpath>JACKREGP.SAS" ;

```

where <macpath> points to the specific folder in which the SAS macro program JACKREGP.SAS is located. This macro requires that the following several parameters be specified as input when it is invoked:

- WGT** The sampling weight to be used in the analysis. Generally, TOTWGT should be used. TCHWGT should be used when analyzing teacher data.
- JKZ** The variable that captures the assignment of cases to sampling zones. The name of this variable in the PIRLS and prePIRLS data files is JKZONE.
- JKR** The variable that captures whether the case is to be dropped or have its weight doubled for each set of replicate weights. The name of this variable in the PIRLS and prePIRLS data files is JKREP.
- NJKZ** The number of replicate weights to be generated when computing the standard errors. The value of NJKZ should be set to 75, the maximum possible value across all participating countries.
- CVAR** The list of variables that are to be used to define the subgroups. The list can consist of one or more variables. We recommend that users always include IDCNTY as the first classification variable.
- XVAR** The list of independent variables used as predictors in the regression model. The independent variables can be either continuous or categorical, such as ITSEX for example.
- ROOTPV** The variable root used to identify the set of plausible values for the achievement score of interest. It corresponds to the first seven characters of the plausible values variable name. For example, the root of the fourth grade overall reading plausible values is ASRREA0.
- NPV** The number of plausible values that will be used for the analysis. Generally, it is set to five to use all five available plausible values for analysis.
- INFILE** The name of the SAS data file that contains the data being analyzed. this number is important to emphasize that this SAS data file must include only those cases that are of interest in the analysis. If users want to have specific cases excluded from the analysis, for example students with missing data, this should be done prior to invoking the macro.

The JACKREGP macro is invoked by a SAS program using the conventional SAS notation for invoking macros. This involves listing the macro name followed by the list of parameters in parenthesis, each separated by a comma. For example, the JACKREGP macro invoked using the following statement:

```
%JACKREGP (TOTWGT, JKZONE, JKREP, 75, IDCNTY, REGSEX, ASRREA0, 5, ASGALLR3) ;
```

will perform a linear regression with gender (REGSEX) as a predictor of reading achievement based on its five plausible values (ASRREA01 through ASRREA05), using the weighting variable TOTWGT. It will compute the regression coefficients and their standard errors. The data will be read from the data file ASGALLR3 and the standard errors will be computed based on 75 replicate weights.

The results of the JACKREGP macro are stored in a SAS working file called REG, which is stored in the default folder used by SAS. The following variables are contained in this results file:

Classification Variables

All classification variables are kept in the results file. In this example, there is a single classification variable IDCNTRY. There is one record in the results file for each subgroup defined by the categories of the classification variables.

N

This variable contains the number of valid cases for each subgroup defined by the classification variables. In the example, it is the number of students with valid data in each country's sample.

MULT_RSQ

The squared multiple correlation coefficient (R^2) for the regression model applied in each subgroup.

SS_RES, SS_REG, SS_TOTAL

The residual, regression, and total weighted sums of squares for the regression model applied in each subgroup.

Regression Coefficients and Standard Errors (B## and B##.SE)

The regression coefficients for the predictor variables and the intercept with their respective standard errors. The regression coefficients are numbered sequentially, starting with zero (B00) for the intercept, and based on the order of the predictor variables as specified in the parameter XVAR.

The contents of the REG file can be printed using the SAS PRINT procedure. The sample SAS program invoking the JACKREGP macro is presented in Exhibit 3.7, along with a printout of the results. This program is available in the International Database as the file called SAMPLEJACKREGP.SAS. It performs a linear regression in each country, with the variable REGSEX as a predictor of fourth grade reading achievement. The exhibit displays the results for the first four countries.

The regression performed by our sample program uses the variable REGSEX that was defined in our previous example. By using REGSEX, the intercept B00 will be the estimated average reading achievement of fourth grade girls, whereas the regression coefficient B01 will be the estimated difference in the average reading achievement of boys. This will allow us to determine if fourth grade reading achievement is significantly different between girls and boys.

Exhibit 3.7: Sample SAS Program Invoking the SAS Macro JACKREGP with Results

```

%LET STUDY = R3 ;

LIBNAME P11 "<datpath>" ;

%INCLUDE "<macpath>JACKREGP.SAS" ;

DATA ASGALL&STUDY ;
  SET P11.ASGALL&STUDY ;

  WHERE NMIS (ITSEX) = 0 ;

  SELECT (ITSEX) ;
    WHEN (1) REGSEX = 0 ; * GIRLS ;
    WHEN (2) REGSEX = 1 ; * BOYS ;
    OTHERWISE REGSEX = . ;
  END ;

PROC FORMAT LIBRARY = WORK ;

  VALUE COUNTRY
    < list PIRLS 2011 country formats > ;

%JACKREGP (TOTWGT, JKZONE, JKREP, 75, IDCNTY, REGSEX, ASRREA0, 5, ASGALL&STUDY) ;

PROC PRINT DATA = REG NOOBS ;
  VAR IDCNTY N MULT_RSQ SS_TOTAL SS_REG B00 B00_SE B01 B01_SE ;
  FORMAT IDCNTY COUNTRY. N 6.0 MULT_RSQ 5.3 SS_TOTAL SS_REG 10.0
    B00 B00_SE B01 B01_SE 6.2 ;

```

IDCNTY	N	MULT_RSQ	SS_TOTAL	SS_REG	B00	B00_SE	B01	B01_SE
AUSTRALIA	6126	0.011	1616645052	17292861	535.79	2.67	-16.58	3.11
AUSTRIA	4670	0.004	314632633	1125018	532.76	2.18	-7.58	2.31
AZERBAIJAN	4881	0.010	478571881	4903272	469.57	3.56	-13.75	2.34
BELGIUM (FRENCH)	3727	0.002	208632870	371149	508.85	3.11	-5.34	2.34

From the first line of the results shown in Exhibit 3.7, the estimated average reading achievement of fourth grade girls in Australia (B00) was 535.79, with a standard error of 2.67. Note that these are the same results obtained from the JACKPV sample program (Exhibit 3.5). The fourth grade boys had an estimated average reading achievement 16.58 points (B01) lower than girls (the sign of this coefficient being negative), with an estimated standard error of 3.11. Note that this difference is statistically significant at the 95% confidence level.

3.7 PIRLS/prePIRLS Analyses with Student-level Variables

Many analyses of the PIRLS and prePIRLS 2011 data can be undertaken using only student-level data. Examples in the previous section illustrated the functioning of the SAS macros. This section presents examples of actual analyses reported in *PIRLS 2011 International Results in Reading*, using SAS programs provided in the PIRLS 2011 International Database.

A first example computes national average achievement, whereas a second example computes national average achievement by gender. In both cases, the SAS macros use the sampling weights, implement the jackknife repeated replication method to compute appropriate sampling errors, effectively perform the computations five times (once for each plausible value), and aggregate the results to produce accurate estimates of average achievement and standard errors that incorporate both sampling and imputation errors. A third example expands on the second example by performing a test of significance on the gender difference using regression.

In general, to perform student-level analyses using the student background data files, users should do the following:

1. Identify the variables of interest in the student background data files and note any specific national adaptations to the variables.
2. Retrieve the relevant variables from the student background data files, including the plausible values of achievement if required, classification variables, identification variables, sampling and weighting variables, and any other variables used in the selection of cases.
3. Perform any necessary variable transformations or recodes.
4. Use the macros JACKGEN and JACKREG, or JACKPV and JACKREGP if plausible values are involved, with the appropriate parameters.
5. Specify the location of the data files (<datpath>) and the macros (<macpath>).
6. Print the results file.

Student-level Analysis with Achievement

In our first example, we want to replicate the analysis of the overall distribution of reading achievement. These results are presented in Exhibit 1.1 of *PIRLS 2011 International Results in Reading* and are repeated here in Exhibit 3.8. Because the results in this exhibit are based on plausible values, we need to make sure that we include them when we create the file using the merge module, and also to indicate that our analysis will make use of achievement scores.

We will find all of the variables we need for this analysis in the student background data files, including the five plausible values of fourth grade reading achievement (ASRREA01 through ASRREA05), the student sampling weight (TOTWGT), the variables that contain the jackknife replication information (JKZONE and JKREP), and the variable containing the country identification code (IDCNTRY). In this analysis, we will use the data for all available countries. We used the JOIN program, described earlier in this chapter, to join the student background data files for all countries into a single file called ASGALLR3.

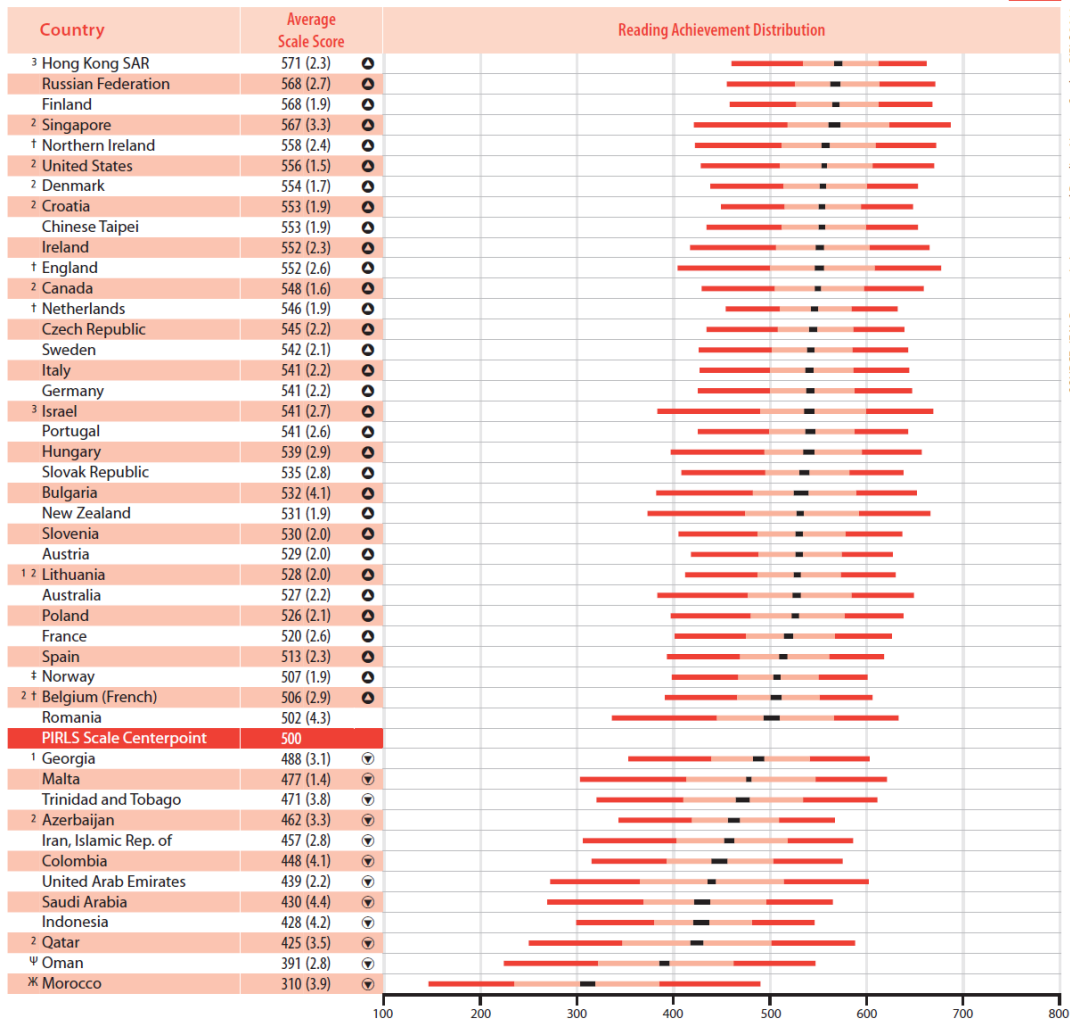
The SAS program used to perform this first example is presented in Exhibit 3.9 and is included in the International Database under the name EXAMPLE1.SAS. The results obtained from this program are displayed in Exhibit 3.10, although only the results of first four countries are shown for the sake of brevity.

In Exhibit 3.10, the results are displayed one line per country, with the countries identified in the first column. The second column reports the number of valid cases, and the third the sum of weights of the sampled students. The next four columns report the estimated average reading achievement and its standard error, followed by the percentage of students in each category and its standard error. As shown in the first line, the average reading achievement of fourth grade students in Australia was 527.37, with a standard error of 2.21. In this example, only IDCNTRY was used as a classification variable; thus, the estimated percentages are of little value because they represent the proportion of the TOTWGT column for each country.

Exhibit 3.8: Exhibit of Example Student-level Analysis with Achievement, Taken from PIRLS 2011 International Results in Reading (Exhibit 1.1)

Exhibit 1.1: Distribution of Reading Achievement

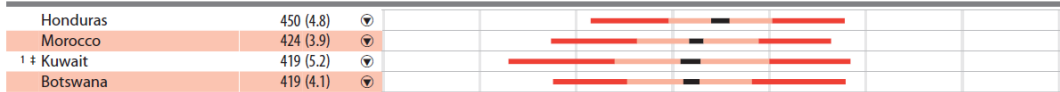
PIRLS 2011 4th Grade



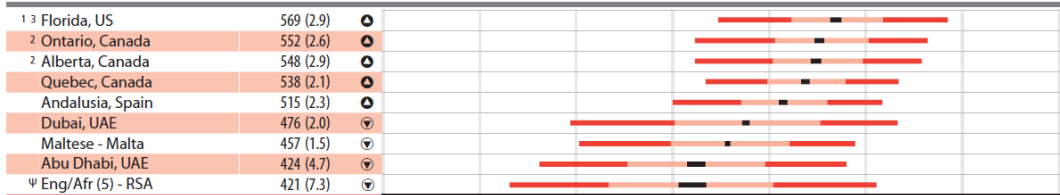
SOURCE: IEA's Progress in International Reading Literacy Study – PIRLS 2011

Country	Average Scale Score	Reading Achievement Distribution
---------	---------------------	----------------------------------

Sixth Grade Participants

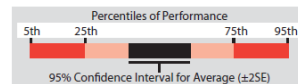


Benchmarking Participants[⊖]



[⊖] Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

- Country average significantly higher than the centerpoint of the PIRLS scale
- ⊕ Country average significantly lower than the centerpoint of the PIRLS scale



⊗ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
 ⊕ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
 See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.5 for sampling guidelines and sampling participation notes † and ‡.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.9: Example SAS Program for Student-level Analysis with Achievement (EXAMPLE1.SAS)

```
LIBNAME P11 "<datpath>" ;
%INCLUDE "<macpath>JACKPV.SAS" ;
DATA ASGALLR3 ;
  SET P11.ASGALLR3 ;
PROC FORMAT LIBRARY = WORK ;
  VALUE COUNTRY
    < list PIRLS 2011 country formats > ;
%JACKPV (TOTWGT, JKZONE, JKREP, 75, IDCNTRY ITSEX, ASRREA0, 5, ASGALLR3) ;
PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTRY N TOTWGT MNPV MNPV_SE PCT PCT_SE ;
  FORMAT IDCNTRY COUNTRY. N 6.0 TOTWGT 10.0
    MNPV MNPV_SE PCT PCT_SE 6.2 ;
```

Exhibit 3.10: Output for Example Student-level Analysis with Achievement (EXAMPLE 1)

IDCNTRY	N	TOTWGT	MNPV	MNPV_SE	PCT	PCT_SE
AUSTRALIA	6126	251213	527.37	2.21	1.24	0.03
AUSTRIA	4670	78333	528.88	1.95	0.39	0.01
AZERBAIJAN	4881	104014	462.30	3.33	0.51	0.02
BELGIUM (FRENCH)	3727	49879	506.12	2.88	0.25	0.01

Student-level Analysis with Achievement by Gender

In our second example, we want to replicate another set of results presented in *PIRLS 2011 International Results in Reading*. We are interested in investigating the relationship between fourth grade students’ gender and reading achievement. These results are presented in Exhibit 1.5 of *PIRLS 2011 International Results in Reading* and repeated here in Exhibit 3.11. Because the results in this exhibit are based on plausible values, we must make sure they are included when creating the input file, and also indicate that this analysis will make use of achievement scores.

After reviewing the appropriate codebook, the variable ITSEX in the student background data files contains information on the gender of students. We then proceed to read from the student background data files our variable of interest (ITSEX), the five plausible values of reading achievement (ASRREA01 through ASRREA05), the student sampling weight (TOTWGT), the variables that contain the jackknifing information (JKZONE and JKREP), and the country identification variable (IDCNTRY). Again, we will use the data of all available countries contained in the file ASGALLR3.

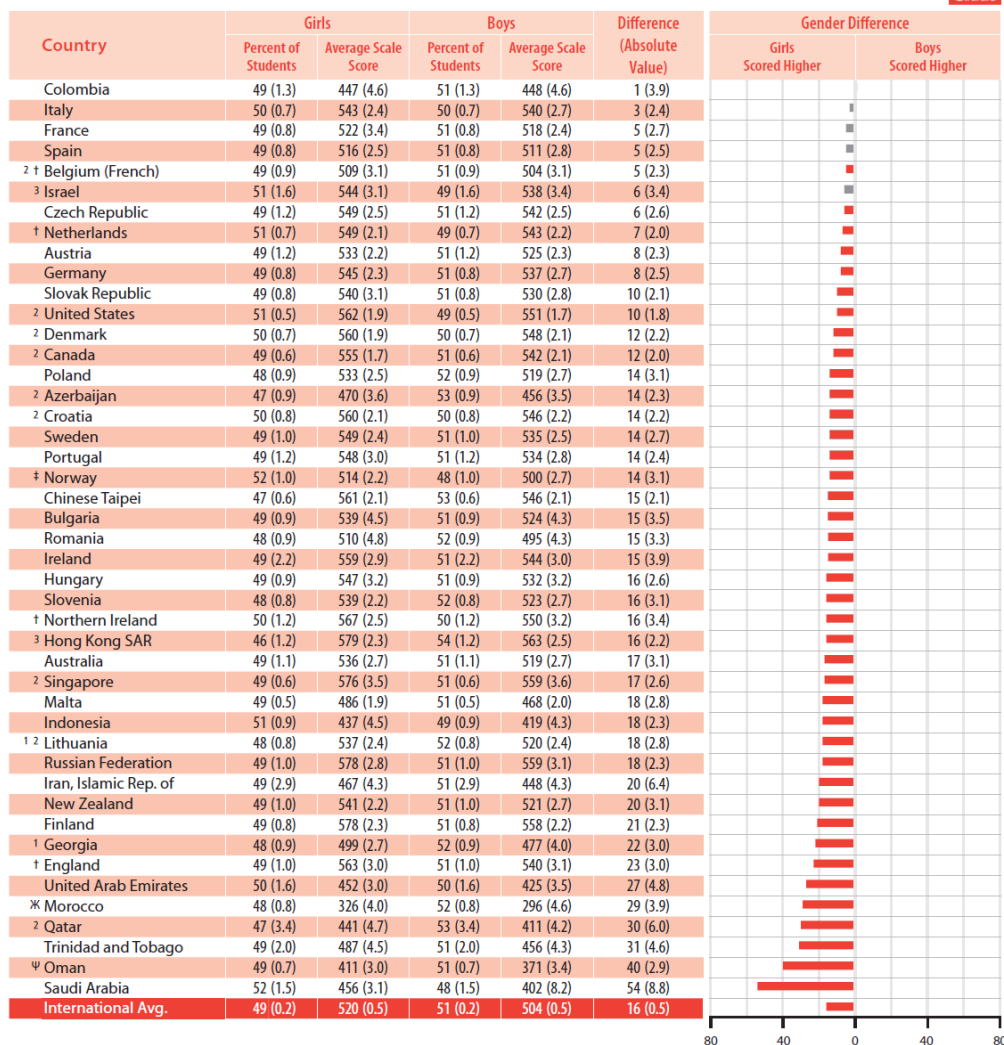
The SAS program that implements this second example is presented in Exhibit 3.12 and is included in the International Database under the name EXAMPLE2.SAS. Note that one of the steps in this program is to select only those students who have non-missing data in our variable of interest ITSEX.

The results obtained from this program are shown in Exhibit 3.13. For the sake of brevity, only the results of the first four countries are shown. The very same set of steps used in our first example apply here, adding ITSEX as a classification variable along with IDCNTRY.

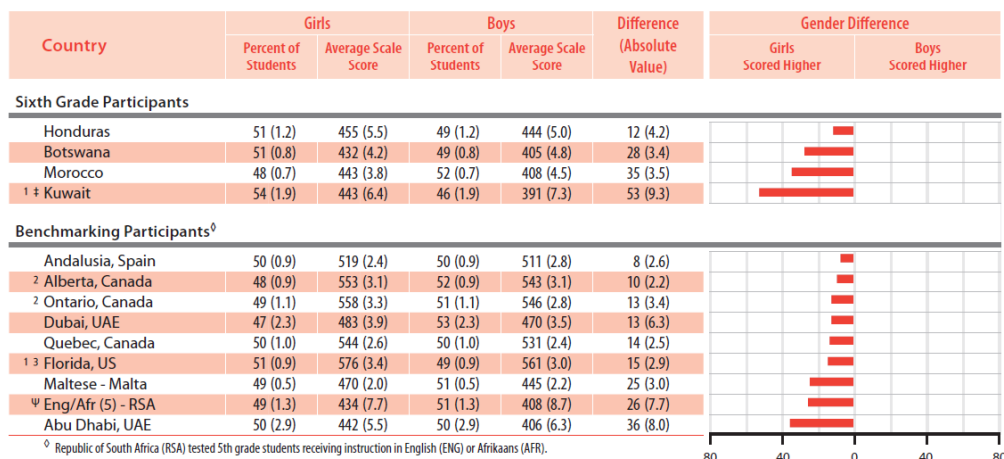
Exhibit 3.11: Exhibit of Example Student-level Analysis with Achievement by Gender, Taken from PIRLS 2011 International Results in Reading (Exhibit 1.5)

Exhibit 1.5: Average Reading Achievement by Gender

PIRLS 2011 4th Grade



SOURCE: IEA's Progress in International Reading Literacy Study – PIRLS 2011



^o Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

■ Difference statistically significant
 ■ Difference not statistically significant

⊗ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
 ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
 See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.5 for sampling guidelines and sampling participation notes † and ‡.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.12: Example SAS Program for Student-level Analysis with Achievement by Gender (EXAMPLE2.SAS)

```
LIBNAME P11 "<datpath>" ;
%INCLUDE "<macpath>JACKPV.SAS" ;
DATA ASGALLR3 ;
  SET P11.ASGALLR3 ;
  WHERE NMISS (ITSEX) = 0 ;
PROC FORMAT LIBRARY = WORK ;
VALUE COUNTRY
  < list PIRLS 2011 country formats > ;
VALUE SEX
  1 = "GIRL"
  2 = "BOY" ;
%JACKPV (TOTWGT, JKZONE, JKREP, 75, IDCNTY ITSEX, ASRREA0, 5, ASGALLR3) ;
PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTY ITSEX N TOTWGT MNPV MNPV_SE PCT PCT_SE ;
  FORMAT IDCNTY COUNTRY. ITSEX SEX. N 6.0 TOTWGT 10.0
  MNPV MNPV_SE PCT PCT_SE 6.2 ;
```

Exhibit 3.13: Output for Example Student-level Analysis with Achievement by Gender (EXAMPLE 2)

IDCNTY	ITSEX	N	TOTWGT	MNPV	MNPV_SE	PCT	PCT_SE
AUSTRALIA	GIRL	3048	123760	535.79	2.67	49.26	1.06
AUSTRALIA	BOY	3078	127453	519.20	2.73	50.74	1.06
AUSTRIA	GIRL	2274	38141	532.76	2.18	48.69	1.18
AUSTRIA	BOY	2396	40192	525.19	2.32	51.31	1.18
AZERBAIJAN	GIRL	2241	49037	469.57	3.56	47.14	0.85
AZERBAIJAN	BOY	2640	54977	455.82	3.47	52.86	0.85
BELGIUM (FRENCH)	GIRL	1815	24388	508.85	3.11	48.89	0.93
BELGIUM (FRENCH)	BOY	1912	25491	503.51	3.11	51.11	0.93

In Exhibit 3.13, each country’s results are displayed on two lines, one for each value of the variable ITSEX. The countries are identified in the first column and the second column describes the category of ITSEX being reported. The third column reports the number of valid cases and the fourth the sum of weights of the sampled students. The next four columns report the estimated average reading achievement and its standard error, followed by the percentage of students in each category and its standard error. As shown in the first two lines, the average reading achievement was 535.79 for fourth grade girls in Australia (standard error of 2.67) and 519.20 for fourth grade boys (standard error of 2.73). An estimated 49.26 percent (standard error of 1.06) of fourth grade students in Australia were girls, and 50.74 percent were boys (standard error of 1.06).

3.8 PIRLS/prePIRLS Analyses with Home Background Data

Analyzing home background data from the PIRLS 2011 International Database requires that the home background data files (ASH) be merged with the student background data files (ASG) in order to retrieve the achievement scores and the required sample design variables. To illustrate how to perform analyses based on home background data, we will use an example that computes the average

scale score for one of the newly developed contextual scales, along with the percentages of students, with their average reading achievement, for the categories of the scale's corresponding index.

In general, to perform analyses with home background variables using the home background data files, you should do the following:

1. Identify the variables of interest in the home background data files and note any specific national adaptations to the variables.
2. Retrieve the relevant variables from the home background data files, including analysis and classification variables, identification variables (IDCOUNTRY and IDSTUD), and any other variables used in the selection of cases.
3. Retrieve the relevant variables from the student background data files, including plausible values for achievement, classification variables, identification variables (IDCOUNTRY and IDSTUD), sampling (JKZONE and JKREP) and weighting (TOTWGT) variables, and any other variables used in the selection of cases.
4. Merge the home background data files with the student background data files using the variables IDCOUNTRY and IDSTUD.
5. Perform any necessary variable transformations or recodes.
6. Use the macros JACKGEN and JACKREG, or JACKPV and JACKREGP if plausible values are involved, with the appropriate parameters.
7. Specify the location of the data files (<datapath>) and the macros (<macpath>).
8. Print out the results file.

Analyses with a Contextual Scale

PIRLS 2011 has innovated in its reporting of contextual data by creating contextual scales based on Rasch modeling.³ A number of contextual scales were reported in *PIRLS 2011 International Results in Reading* and are available in the International Database for analysis. Each contextual scale variable is a Rasch scale with an international mean of 10 and an international standard deviation of 2. An index was derived from each scale that divides the range of scores into usually three categories: the most desirable scores (high values), the least desirable scores (low values), and the remaining scores in between.

These contextual scales and their corresponding indices were reported in *PIRLS 2011 International Results in Reading*. Exhibit 3.14 shows one such example, Exhibit 4.6 from *PIRLS 2011 International Results in Reading*, analyzing students' Early Literacy Activities Before Beginning Primary School as reported by their parents. Results on the Rasch scale are reported for each country as an "Average Scale Score" and its corresponding index is reported as the percentages of students in each category—Often, Sometimes, and Never or Almost Never—along with the average achievement in each category. The Rasch scores for this contextual scale are contained in the ASBHELA variable; the corresponding index is found in the ASDHELA variable.

³ The contextual scales are described in the context questionnaire scales section of *Methods and Procedures in TIMSS and PIRLS 2011*.

**Exhibit 3.14: Example Exhibit of a Contextual Scale, Taken from
PIRLS 2011 International Results in Reading (Exhibit 4.6)**

Exhibit 4.6: Early Literacy Activities Before Beginning Primary School

PIRLS 2011 **4th**
Grade

Reported by Parents

Students were scored according to their parents' frequency of doing the nine activities on the *Early Literacy Activities* scale. Students **Often** engaged in early literacy activities had a score on the scale of at least 10.7, which corresponds to their parents "often" doing five of the nine activities with them and "sometimes" doing the other four, on average. Students **Never or Almost Never** engaged in such activities had a score no higher than 6.2, which corresponds to parents "never or almost never" doing five of the nine activities with them and "sometimes" doing the other four, on average. All other students had parents who **Sometimes** engaged them in early literacy activities.

Country	Often		Sometimes		Never or Almost Never		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Russian Federation	61 (1.3)	576 (2.7)	38 (1.2)	558 (3.4)	1 (0.3)	~ ~	11.1 (0.06)
Northern Ireland	s 59 (1.3)	582 (3.5)	41 (1.4)	559 (3.7)	0 (0.2)	~ ~	11.2 (0.06)
New Zealand	s 55 (1.0)	567 (2.7)	44 (1.0)	529 (2.5)	1 (0.1)	~ ~	11.0 (0.05)
Australia	s 52 (1.4)	555 (3.0)	46 (1.3)	528 (3.4)	1 (0.3)	~ ~	10.8 (0.06)
Georgia	52 (1.4)	498 (2.6)	47 (1.3)	479 (4.0)	1 (0.2)	~ ~	10.7 (0.06)
Canada	r 51 (0.9)	566 (1.9)	48 (0.9)	541 (1.8)	1 (0.1)	~ ~	10.7 (0.04)
Ireland	50 (0.9)	569 (2.3)	49 (0.8)	542 (2.6)	1 (0.1)	~ ~	10.8 (0.04)
Croatia	50 (0.9)	562 (2.2)	49 (0.9)	544 (1.9)	0 (0.1)	~ ~	10.7 (0.03)
Slovenia	48 (1.2)	543 (2.3)	51 (1.2)	522 (2.6)	0 (0.1)	~ ~	10.6 (0.04)
Israel	r 48 (1.0)	563 (3.0)	51 (1.0)	534 (3.5)	1 (0.2)	~ ~	10.6 (0.04)
Italy	48 (0.9)	553 (2.4)	51 (1.0)	537 (2.6)	1 (0.2)	~ ~	10.5 (0.03)
Slovak Republic	47 (0.9)	547 (2.9)	51 (0.9)	530 (2.5)	2 (0.6)	~ ~	10.5 (0.05)
Trinidad and Tobago	47 (1.1)	497 (4.0)	52 (1.1)	456 (4.1)	1 (0.3)	~ ~	10.5 (0.05)
Malta	45 (0.9)	507 (1.9)	54 (0.9)	463 (2.7)	1 (0.2)	~ ~	10.4 (0.04)
Spain	44 (1.0)	528 (2.7)	55 (1.0)	507 (2.7)	1 (0.2)	~ ~	10.4 (0.03)
Poland	43 (0.8)	544 (2.8)	56 (0.8)	514 (2.1)	1 (0.3)	~ ~	10.4 (0.03)
Hungary	43 (0.8)	553 (2.8)	56 (0.8)	535 (3.2)	1 (0.4)	~ ~	10.3 (0.04)
Czech Republic	40 (1.0)	555 (2.6)	60 (1.0)	542 (2.3)	1 (0.2)	~ ~	10.3 (0.03)
Netherlands	s 40 (0.8)	559 (3.1)	60 (0.8)	551 (2.0)	1 (0.2)	~ ~	10.2 (0.03)
Bulgaria	39 (1.4)	559 (3.1)	51 (1.0)	529 (3.7)	9 (1.4)	455 (15.3)	9.7 (0.12)
Romania	38 (1.5)	529 (4.1)	54 (1.3)	494 (4.5)	8 (1.0)	423 (8.9)	9.9 (0.09)
Germany	r 38 (0.9)	555 (2.8)	61 (0.9)	543 (2.2)	1 (0.2)	~ ~	10.2 (0.03)
Norway	37 (1.4)	524 (2.5)	63 (1.4)	500 (2.2)	1 (0.2)	~ ~	10.0 (0.06)
France	36 (0.7)	536 (2.6)	63 (0.7)	515 (2.7)	1 (0.2)	~ ~	10.0 (0.03)
Lithuania	36 (0.9)	541 (1.9)	63 (0.9)	524 (2.5)	2 (0.2)	~ ~	10.0 (0.03)
Austria	35 (1.0)	543 (2.1)	63 (1.1)	523 (2.5)	1 (0.2)	~ ~	10.0 (0.03)
Portugal	35 (1.1)	558 (2.8)	63 (1.1)	535 (2.6)	2 (0.4)	~ ~	10.0 (0.05)
Sweden	34 (1.0)	562 (2.9)	64 (1.0)	537 (2.2)	2 (0.2)	~ ~	9.9 (0.04)
Colombia	34 (1.1)	457 (5.7)	63 (1.0)	448 (3.8)	3 (0.4)	409 (11.0)	9.9 (0.06)
Denmark	32 (0.9)	567 (2.2)	67 (0.9)	550 (1.9)	1 (0.2)	~ ~	9.9 (0.03)
Belgium (French)	30 (0.8)	524 (2.9)	67 (0.7)	501 (3.2)	3 (0.4)	482 (10.3)	9.7 (0.04)
Qatar	28 (1.0)	458 (6.0)	69 (1.0)	420 (3.1)	3 (0.3)	390 (11.7)	9.7 (0.05)
Finland	27 (0.9)	583 (2.9)	72 (0.9)	564 (1.9)	1 (0.1)	~ ~	9.7 (0.03)
United Arab Emirates	27 (0.5)	480 (2.8)	71 (0.5)	430 (2.3)	3 (0.2)	392 (7.4)	9.6 (0.03)
Saudi Arabia	26 (1.3)	455 (5.2)	70 (1.4)	426 (4.2)	4 (0.8)	360 (16.2)	9.5 (0.06)
Singapore	26 (0.7)	595 (3.6)	69 (0.7)	561 (3.3)	5 (0.3)	543 (6.2)	9.4 (0.03)
Azerbaijan	23 (1.3)	467 (4.8)	72 (1.3)	463 (3.5)	4 (0.7)	439 (7.6)	9.5 (0.07)
Indonesia	23 (1.3)	445 (5.8)	72 (1.3)	427 (4.1)	4 (0.5)	409 (6.5)	9.4 (0.07)
Oman	19 (0.4)	429 (3.6)	76 (0.5)	385 (3.2)	5 (0.4)	354 (7.2)	9.2 (0.03)
Morocco	17 (0.9)	321 (5.6)	64 (1.5)	314 (4.5)	19 (1.9)	302 (13.6)	8.4 (0.13)
Iran, Islamic Rep. of	15 (0.6)	474 (3.6)	77 (0.8)	460 (3.0)	8 (0.8)	411 (8.0)	8.9 (0.05)
Chinese Taipei	14 (0.6)	577 (3.5)	76 (0.8)	553 (1.8)	10 (0.6)	526 (4.8)	8.7 (0.04)
Hong Kong SAR	12 (0.6)	588 (3.7)	80 (0.6)	571 (2.3)	8 (0.5)	560 (3.7)	8.7 (0.03)
International Avg.	37 (0.2)	529 (0.5)	60 (0.2)	506 (0.5)	3 (0.1)	430 (2.6)	

Sixth Grade Participants

Honduras	30 (1.5)	461 (8.3)	63 (1.3)	447 (4.2)	7 (0.7)	426 (12.2)	9.6 (0.08)
Kuwait	s 23 (1.2)	448 (9.3)	73 (1.2)	420 (6.5)	4 (0.5)	378 (14.2)	9.4 (0.06)
Morocco	16 (0.7)	437 (6.7)	67 (1.2)	432 (4.2)	16 (1.3)	406 (7.5)	8.5 (0.08)
Botswana	15 (1.1)	464 (8.7)	74 (1.2)	420 (3.9)	11 (1.0)	388 (6.2)	8.6 (0.08)

Benchmarking Participants^o

Ontario, Canada	r 54 (1.3)	566 (3.1)	45 (1.3)	545 (3.2)	1 (0.2)	~ ~	10.9 (0.05)
Alberta, Canada	r 52 (1.3)	568 (3.6)	47 (1.3)	542 (3.7)	1 (0.2)	~ ~	10.8 (0.05)
Maltese - Malta	45 (0.8)	481 (2.0)	54 (0.8)	447 (1.9)	1 (0.2)	~ ~	10.4 (0.03)
Andalusia, Spain	43 (0.9)	530 (2.5)	56 (0.9)	508 (2.7)	1 (0.2)	~ ~	10.3 (0.04)
Quebec, Canada	40 (1.0)	554 (3.0)	59 (1.0)	531 (2.4)	2 (0.3)	~ ~	10.2 (0.04)
Eng/Afr (5) - RSA	r 34 (1.5)	465 (8.5)	61 (1.4)	405 (7.2)	4 (0.7)	358 (14.5)	9.8 (0.09)
Dubai, UAE	34 (0.8)	521 (2.4)	64 (0.8)	463 (2.6)	2 (0.2)	~ ~	9.9 (0.03)
Abu Dhabi, UAE	24 (1.1)	466 (6.4)	73 (1.0)	416 (4.4)	3 (0.4)	379 (9.6)	9.5 (0.05)

^o Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

England and the United States did not administer the Home Questionnaire. Centerpoint of scale set at 10.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70% but less than 85% of the students. An "s" indicates data are available for at least 50% but less than 70% of the students.

SOURCE: IEA Progress in International Reading Literacy Study - PIRLS 2011

This example will replicate both the average scale score of the Early Literacy Activities contextual scale and the percentages of students, with their average reading achievement, in each category of its index. This will be done in two steps, both using the merged ASHALLR3 data file that combines the home background data files and the student background data files.

The first step, our third example, will compute the average scale score using the contextual scale variable ASBHELA. After reviewing the appropriate codebook, the variable ASBHELA in the home background data files contains information on the Early Literacy Activities Before Beginning Primary School contextual scale. We then proceed to read from the student background data files our variable of interest (ASBHELA), the student sampling weight (TOTWGT), the variables that contain the jackknifing information (JKZONE and JKREP), and the country identification variable (IDCNTRY). We will use the data of all available countries contained in the merged file ASHALLR3.

The SAS program that implements our third example is presented in Exhibit 3.15 and is included in the International Database under the name EXAMPLE3.SAS. Note that one of the steps in this program is to select only those students who have non-missing data in our variable of interest ASBHELA.

Exhibit 3.15: Example SAS Program for Student-level Analysis with a Contextual Scale (EXAMPLE3.SAS)

```
LIBNAME P11 "<datpath>" ;

%INCLUDE "<macpath>JACKGEN.SAS" ;

PROC SORT DATA = P11.ASHALLR3 OUT = ASHALLR3 ;
  BY IDCNTRY IDSTUD ;

PROC SORT DATA = P11.ASGALLR3 OUT = ASGALLR3 ;
  BY IDCNTRY IDSTUD ;

DATA ASHMERGED ;
  MERGE ASHALLR3 (IN = INASH)
        ASGALLR3 (IN = INASG) ;
  BY IDCNTRY IDSTUD ;
  IF INASH AND INASG ;

DATA ASHMERGED ;
  SET ASHMERGED ;

  WHERE NMISS (ASBHELA) = 0 ;

PROC FORMAT LIBRARY = WORK ;

  VALUE COUNTRY
    < list PIRLS 2011 country formats > ;

%JACKGEN (TOTWGT, JKZONE, JKREP, 75, IDCNTRY, ASBHELA, ASHMERGED) ;

PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTRY N TOTWGT MNX MNX_SE PCT PCT_SE ;
  FORMAT IDCNTRY COUNTRY. N 6.0 TOTWGT 10.0
         MNX MNX_SE PCT PCT_SE 6.2 ;
```

The results obtained from this program are shown in Exhibit 3.16. For the sake of brevity, only the results of the first four countries are shown. In the first line of the results in Exhibit 3.16, we see that students in Australia scored 10.84, with a standard error of 0.06, on the Early Literacy Activities contextual scale. Note that this is well above the international average of 10, the difference being statistically significant at the 95% confidence level.

Exhibit 3.16: Output for Example Student-level Analysis with a Contextual Scale (EXAMPLE 3)

IDCNTRY	N	TOTWGT	MXN	MXN_SE	PCT	PCT_SE
AUSTRALIA	3232	135420	10.84	0.06	0.92	0.03
AUSTRIA	4393	74088	9.98	0.03	0.50	0.02
AZERBAIJAN	4509	96026	9.47	0.07	0.65	0.03
BELGIUM (FRENCH)	3383	44793	9.69	0.04	0.30	0.01

In the second step, our fourth example, we will compute the percentage of fourth grade students, with their average reading achievement, in each category of the index variable ASDHELA. This analysis is similar to our earlier example of a student-level analysis with achievement by gender. Our variable of interest here is the ASDHELA index variable of our contextual scale and it will be used to measure average reading achievement using the five plausible values ASRREA01 through ASRREA05.

The SAS program that implements this fourth example is presented in Exhibit 3.17 and is included in the International Database under the name EXAMPLE4.SAS. Note that one of the steps in this program is to select only those students who have non-missing data in our variable of interest ASDHELA. The results obtained from this program are shown in Exhibit 3.18. For the sake of brevity, only the results of the first four countries are shown.

Exhibit 3.17: Example SAS Program for Student-level Analysis with a Contextual Scale (EXAMPLE4.SAS)

```
LIBNAME P11 "<datpath>" ;
%INCLUDE "<macpath>JACKPV.SAS" ;
PROC SORT DATA = P11.ASHALLR3 OUT = ASHALLR3 ;
  BY IDCNTRY IDSTUD ;
PROC SORT DATA = P11.ASGALLR3 OUT = ASGALLR3 ;
  BY IDCNTRY IDSTUD ;
DATA ASHMERGED ;
  MERGE ASHALLR3 (IN = INASH)
        ASGALLR3 (IN = INASG) ;
  BY IDCNTRY IDSTUD ;
  IF INASH AND INASG ;
DATA ASHMERGED ;
  SET ASHMERGED ;
  WHERE NMISS (ASDHELA) = 0 ;
PROC FORMAT LIBRARY = WORK ;
VALUE COUNTRY
  < list PIRLS 2011 country formats > ;
VALUE ELA
  1 = "OFTEN"
  2 = "SOMETIMES"
  3 = "NEVER OR ALMOST NEVER" ;
%JACKPV (TOTWGT, JKZONE, JKREP, 75, IDCNTRY ASDHELA, ASRREA0, 5, ASHMERGED) ;
PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTRY ASDHELA N TOTWGT MNPV MNPV_SE PCT PCT_SE ;
  FORMAT IDCNTRY COUNTRY. ASDHELA ELA. N 6.0 TOTWGT 10.0
         MNPV MNPV_SE PCT PCT_SE 6.2 ;
```

As shown in the first three lines of the results, 52.34 percent of students in Australia often experienced early literacy activities before beginning primary school (standard error of 1.39), and their average reading achievement was 554.83 (standard error of 3.01); 46.23 percent sometimes experienced early literacy activities (standard error of 1.31), and their average reading achievement was 527.72 (standard error of 3.37); and 1.44 percent of students never or almost never experienced early literacy activities (standard error of 0.32), and their average reading achievement was 490.46 (standard error of 23.75). The large standard error of this last estimated average achievement, based on a very small sample and accounting for less than 2 percent of the target population, should be a note of caution as to the poor reliability of that estimate.

Exhibit 3.18: Output for Example Student-level Analysis with a Contextual Scale (EXAMPLE 4)

IDCNTRY	ASDHELA	N	TOTWGT	MNPV	MNPV_SE	PCT	PCT_SE
AUSTRALIA	OFTEN	1745	70874	554.83	3.01	52.34	1.39
AUSTRALIA	SOMETIMES	1450	62600	527.72	3.37	46.23	1.31
AUSTRALIA	NEVER OR ALMOST NEVER	37	1947	490.46	23.75	1.44	0.32
AUSTRIA	OFTEN	1592	26099	543.39	2.10	35.23	1.05
AUSTRIA	SOMETIMES	2732	46913	523.49	2.50	63.32	1.07
AUSTRIA	NEVER OR ALMOST NEVER	69	1077	501.83	7.79	1.45	0.21
AZERBAIJAN	OFTEN	1119	22528	466.95	4.84	23.46	1.33
AZERBAIJAN	SOMETIMES	3206	69288	463.25	3.47	72.16	1.35
AZERBAIJAN	NEVER OR ALMOST NEVER	184	4211	439.24	7.56	4.38	0.69
BELGIUM (FRENCH)	OFTEN	1029	13472	524.35	2.95	30.08	0.76
BELGIUM (FRENCH)	SOMETIMES	2263	29978	501.06	3.16	66.93	0.72
BELGIUM (FRENCH)	NEVER OR ALMOST NEVER	91	1343	482.03	10.29	3.00	0.39

3.9 PIRLS/prePIRLS Analyses with Teacher-level Variables

The teachers in the PIRLS 2011 International Database do not constitute representative samples of teachers in the participating countries. Rather, they are the teachers of nationally representative samples of students. Therefore, analyses with teacher data should be made with students as the units of analysis and reported in terms of students who are taught by teachers with a particular attribute.

When analyzing teacher data, it is first necessary to link the students to their respective teachers. The student–teacher linkage data files (AST) were created for this purpose. Student achievement scores (plausible values), jackknife replication information, and teacher weighting variables appropriate for conducting analyses with teacher variables are found in the student–teacher linkage data files in order to simplify the merging process for analyses that link teacher background variables to student achievement. For such analyses, it only is necessary to merge the teacher background data files (ATG) with the student–teacher linkage data files. For analyses linking teacher variables to student background variables, it also is necessary to merge the student background data files (ASG) with the teacher background data files, after combining the latter with the student–teacher linkage data files.

In general, to perform analyses using the teacher background data files, users should do the following:

1. Identify the variables of interest in the teacher background data files and note any specific national adaptations to the variables.
2. Retrieve the relevant variables from the teacher background data files, including analysis variables, classification variables, identification variables (IDCNTRY, IDTEACH, and IDLINK), and any other variables used in the selection of cases.
3. Retrieve the relevant variables from the student–teacher linkage data files, including plausible values of achievement, identification variables (IDCNTRY, IDSTUD, IDTEACH, and IDLINK), sampling (JKZONE and JKREP) and weighting (TCHWGT) variables, and any other variables used in the selection of cases.
4. Merge the teacher background data files with the student–teacher linkage data files using the variables IDCNTRY, IDTEACH, and IDLINK.
5. If student background variables also are needed, merge the student background data files with the merged student–teacher data files from the previous step using the variables IDCNTRY and IDSTUD.
6. Perform any necessary variable transformations or recodes.
7. Use the macros JACKGEN and JACKREG, or JACKPV and JACKREGP if plausible values are involved, with the appropriate parameters.
8. Specify the location of the data files (<datapath>) and the macros (<macpath>).
9. Print the results file.

As our example of an analysis using teacher background data, we will investigate the years of experience of the PIRLS 2011 teachers. The results of such an analysis are presented in Exhibit 7.3 of *PIRLS 2011 International Results in Reading* and are reproduced here in Exhibit 3.19.

Conducting analyses with teacher data requires a few extra steps. As before, we first proceed to identify the variables relevant to the analysis in the appropriate files, and review the documentation for any specific national adaptations to the questions of interest (see Supplements 1 and 2 to this User Guide). Because we are using a teacher-level variable, we must use the teacher background data files and the student–teacher linkage data files to find the variables. From the teacher background data files, we need the variable that contains the information on the teachers’ years of experience (ATDG01), the variable that identifies the country (IDCNTRY), and the two teacher identification variables (IDTEACH and IDLINK) that will allow us to link the teacher data to the student data.⁴

We then proceed to retrieve the necessary information from the student–teacher linkage data files. From these files, we need the country identification (IDCNTRY) and the two teacher identification variables (IDTEACH and IDLINK) to link the teacher data to the student data. We also need the jackknife replication variables (JKZONE and JKREP), the teacher weighting variable (TCHWGT), and the reading achievement plausible values (ASRREA01 through ASRREA05).

⁴ The information about teachers’ years of experience found in the ATBG01 variable was collapsed into reporting categories and stored in the derived variable ATDG01 (see Supplement 3 to this User Guide).

**Exhibit 3.19: Exhibit of Example Teacher-level Analysis, Taken from
PIRLS 2011 International Results in Reading (Exhibit 7.3)**

Exhibit 7.3: Teachers' Years of Experience

PIRLS 2011 **4th**
Grade

Reported by Teachers

Country	20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement		
Australia	r	42 (4.0)	530 (5.1)	22 (3.5)	533 (5.7)	19 (2.9)	529 (6.3)	17 (3.2)	534 (7.2)	17 (1.0)
Austria		55 (2.8)	532 (2.4)	25 (2.7)	526 (4.0)	11 (1.9)	532 (3.9)	10 (1.9)	513 (6.8)	21 (0.6)
Azerbaijan		60 (4.5)	466 (3.8)	26 (3.1)	456 (8.6)	11 (2.7)	440 (10.4)	4 (2.0)	484 (33.4)	23 (1.1)
Belgium (French)		40 (3.9)	516 (3.9)	32 (3.8)	502 (4.9)	16 (3.4)	504 (6.7)	12 (2.5)	498 (12.5)	16 (0.7)
Bulgaria		72 (3.3)	533 (5.2)	24 (3.0)	532 (7.8)	2 (1.0)	~ ~	2 (1.2)	~ ~	24 (0.6)
Canada		30 (2.2)	546 (2.5)	33 (2.6)	552 (3.7)	25 (1.9)	547 (3.4)	12 (1.3)	545 (4.3)	14 (0.4)
Chinese Taipei		26 (3.3)	558 (3.9)	50 (3.8)	551 (2.5)	17 (3.3)	559 (5.1)	7 (2.0)	536 (6.1)	15 (0.6)
Colombia		43 (4.5)	447 (6.0)	35 (4.4)	442 (5.9)	16 (3.3)	451 (15.8)	7 (1.6)	496 (19.4)	18 (0.7)
Croatia		56 (3.4)	557 (2.5)	30 (2.9)	545 (3.2)	9 (2.0)	559 (6.1)	5 (1.4)	552 (6.5)	21 (0.7)
Czech Republic		48 (4.0)	543 (3.3)	27 (3.6)	544 (3.5)	12 (2.4)	551 (5.4)	13 (2.9)	554 (7.7)	18 (0.8)
Denmark		35 (3.7)	557 (2.4)	25 (3.1)	552 (3.6)	22 (2.6)	554 (2.5)	18 (2.8)	553 (4.5)	16 (0.9)
England		14 (3.1)	566 (8.0)	27 (3.7)	550 (6.3)	29 (3.7)	558 (5.0)	30 (4.1)	538 (5.7)	10 (0.7)
Finland		40 (3.1)	567 (3.1)	35 (3.1)	570 (2.5)	12 (2.0)	571 (4.4)	13 (2.0)	564 (4.2)	17 (0.6)
France		34 (3.4)	530 (3.7)	36 (3.0)	516 (3.8)	19 (2.5)	520 (3.5)	11 (2.1)	506 (8.0)	16 (0.7)
Georgia		59 (3.4)	486 (3.3)	29 (3.5)	489 (6.2)	8 (1.9)	497 (18.8)	4 (1.6)	471 (16.4)	22 (0.7)
Germany		44 (3.8)	539 (3.6)	25 (3.2)	542 (4.8)	14 (2.7)	546 (6.4)	16 (2.6)	540 (5.4)	19 (0.9)
Hong Kong SAR		21 (3.5)	564 (6.4)	53 (4.0)	569 (3.8)	15 (3.3)	573 (5.9)	12 (2.5)	582 (5.1)	14 (0.7)
Hungary		73 (3.0)	544 (3.1)	16 (2.8)	525 (12.8)	7 (1.7)	537 (11.7)	4 (1.4)	505 (10.9)	24 (0.6)
Indonesia	r	52 (4.9)	438 (5.4)	16 (3.7)	432 (10.3)	19 (3.8)	429 (10.6)	12 (3.1)	395 (15.3)	18 (1.0)
Iran, Islamic Rep. of		41 (3.6)	476 (5.3)	41 (3.5)	449 (5.0)	10 (1.9)	447 (13.3)	9 (1.8)	421 (10.8)	17 (0.6)
Ireland		24 (3.0)	551 (4.5)	21 (3.1)	555 (5.7)	27 (3.3)	550 (4.0)	27 (2.9)	553 (4.6)	12 (0.7)
Israel		30 (3.8)	545 (5.7)	36 (3.9)	546 (7.0)	16 (2.7)	537 (9.6)	18 (3.0)	531 (11.3)	15 (0.8)
Italy		69 (3.6)	543 (2.8)	24 (3.4)	539 (3.4)	6 (1.7)	539 (7.4)	1 (0.8)	~ ~	24 (0.7)
Lithuania		71 (2.5)	527 (2.6)	26 (2.3)	534 (3.6)	2 (1.0)	~ ~	1 (0.5)	~ ~	24 (0.6)
Malta		18 (0.1)	491 (2.8)	38 (0.1)	475 (2.5)	29 (0.1)	472 (2.4)	15 (0.1)	477 (4.1)	12 (0.0)
Morocco		56 (4.2)	309 (5.3)	31 (4.4)	294 (8.9)	8 (1.6)	336 (17.4)	5 (1.4)	394 (16.4)	21 (0.6)
Netherlands		28 (3.1)	549 (3.0)	29 (3.4)	542 (3.2)	24 (3.2)	549 (3.4)	19 (3.0)	545 (5.3)	14 (0.8)
New Zealand		20 (2.5)	542 (5.3)	26 (2.6)	533 (5.1)	28 (2.5)	540 (4.6)	27 (2.5)	521 (5.4)	11 (0.6)
Northern Ireland	r	34 (4.7)	556 (3.8)	36 (4.0)	563 (4.8)	24 (4.2)	561 (6.2)	7 (2.3)	564 (20.2)	16 (1.0)
Norway		31 (4.4)	506 (4.1)	40 (4.6)	510 (2.7)	15 (3.3)	507 (4.9)	15 (2.4)	509 (5.9)	16 (1.0)
Oman		12 (1.9)	409 (6.7)	36 (2.8)	396 (4.6)	31 (2.9)	385 (5.2)	21 (2.1)	385 (6.4)	11 (0.4)
Poland		83 (2.2)	526 (2.4)	11 (2.1)	529 (7.4)	4 (1.5)	518 (10.7)	2 (0.9)	~ ~	23 (0.4)
Portugal		36 (3.2)	549 (3.4)	46 (3.6)	532 (4.2)	14 (2.5)	535 (6.5)	4 (1.6)	566 (11.9)	17 (0.6)
Qatar		20 (4.3)	450 (14.6)	25 (4.3)	447 (9.1)	30 (4.1)	422 (8.6)	25 (3.5)	388 (9.0)	11 (0.7)
Romania		57 (3.7)	511 (4.8)	31 (3.5)	487 (8.2)	9 (2.3)	478 (13.4)	2 (1.0)	~ ~	23 (0.8)
Russian Federation		73 (3.0)	571 (3.0)	22 (2.7)	567 (6.3)	3 (1.1)	526 (16.2)	3 (1.5)	559 (12.0)	24 (0.7)
Saudi Arabia		16 (3.1)	422 (14.5)	50 (4.5)	439 (5.3)	18 (3.0)	428 (15.2)	17 (3.5)	412 (12.9)	13 (0.7)
Singapore		17 (1.8)	570 (7.4)	27 (2.6)	563 (6.9)	24 (2.5)	575 (5.5)	32 (2.1)	564 (5.7)	11 (0.5)
Slovak Republic		55 (3.0)	536 (4.4)	28 (2.9)	531 (3.4)	10 (2.1)	546 (5.9)	7 (1.8)	530 (8.4)	20 (0.5)
Slovenia		57 (3.8)	532 (2.3)	27 (3.1)	532 (3.9)	10 (2.2)	517 (6.4)	6 (1.5)	523 (8.0)	21 (0.7)
Spain		59 (4.1)	519 (3.0)	19 (3.4)	502 (7.1)	8 (1.3)	510 (7.3)	14 (2.6)	502 (6.9)	21 (0.8)
Sweden		29 (4.2)	546 (3.8)	45 (4.0)	543 (3.8)	18 (2.7)	529 (4.3)	8 (1.9)	551 (6.3)	16 (0.9)
Trinidad and Tobago		43 (4.0)	487 (6.5)	35 (4.0)	459 (7.1)	9 (2.4)	459 (15.4)	12 (2.5)	452 (13.8)	18 (1.0)
United Arab Emirates		12 (1.6)	434 (9.1)	30 (2.3)	441 (7.3)	33 (2.3)	439 (6.2)	25 (2.0)	436 (6.0)	10 (0.3)
United States		28 (2.2)	569 (3.8)	38 (2.1)	553 (3.1)	19 (2.0)	550 (4.3)	15 (1.9)	552 (5.2)	14 (0.5)
International Avg.		41 (0.5)	517 (0.8)	31 (0.5)	511 (0.9)	16 (0.4)	510 (1.4)	12 (0.3)	507 (1.7)	17 (0.1)

SOURCE: IEA's Progress in International Reading Literacy Study - PIRLS 2011

Sixth Grade Participants

Botswana		29 (4.0)	434 (9.2)	32 (4.1)	421 (10.4)	23 (3.7)	401 (8.4)	16 (3.0)	420 (9.8)	14 (0.8)
Honduras		29 (4.2)	465 (6.4)	37 (4.6)	436 (7.9)	17 (3.7)	458 (7.2)	17 (4.0)	459 (20.6)	14 (0.9)
Kuwait	s	9 (2.9)	419 (7.2)	23 (4.5)	412 (16.5)	16 (3.8)	429 (21.7)	52 (4.9)	419 (12.8)	7 (0.7)
Morocco	r	53 (4.4)	422 (7.4)	38 (4.3)	407 (9.3)	7 (2.0)	468 (14.8)	2 (0.9)	~ ~	21 (0.7)

Benchmarking Participants^o

Alberta, Canada		33 (3.8)	544 (4.2)	23 (3.2)	560 (5.8)	23 (3.6)	554 (6.2)	21 (3.1)	533 (5.5)	14 (0.8)
Ontario, Canada		20 (2.9)	549 (6.3)	31 (4.0)	550 (5.1)	33 (3.5)	553 (4.9)	17 (2.7)	551 (7.3)	12 (0.5)
Quebec, Canada		33 (4.2)	538 (3.7)	40 (4.6)	539 (3.2)	20 (3.6)	533 (6.7)	7 (1.9)	537 (6.4)	16 (0.7)
Maltese - Malta	r	17 (0.1)	467 (3.7)	35 (0.1)	456 (2.3)	34 (0.1)	454 (2.6)	14 (0.1)	460 (3.7)	12 (0.0)
Eng/Afr (5) - RSA		43 (5.0)	415 (15.3)	24 (4.6)	420 (14.8)	15 (3.5)	450 (25.3)	17 (4.7)	455 (22.5)	11 (1.1)
Andalusia, Spain		58 (3.9)	521 (3.2)	16 (3.1)	520 (5.7)	11 (2.6)	501 (8.7)	15 (2.8)	498 (7.2)	21 (1.0)
Abu Dhabi, UAE		15 (3.2)	397 (12.8)	31 (4.4)	428 (13.5)	28 (4.1)	419 (10.4)	26 (3.7)	438 (9.7)	10 (0.6)
Dubai, UAE	r	13 (2.6)	492 (10.3)	28 (3.6)	477 (9.7)	38 (4.3)	482 (8.8)	21 (2.6)	470 (8.5)	11 (0.6)
Florida, US	r	26 (4.3)	572 (8.6)	33 (4.3)	576 (6.1)	30 (3.9)	566 (6.6)	11 (3.5)	563 (8.0)	15 (0.9)

^o Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70% but less than 85% of the students. An "s" indicates data are available for at least 50% but less than 70% of the students.



The two file types are merged and the resulting merged file is then input to the JACKPV macro. The merging is done using the combination of identification variables IDCNTRY, IDTEACH, and IDLINK. The combination of values for these three variables is unique within the teacher background data files, but is repeated in the student–teacher linkage data files as many times as needed to link a teacher to all students in a classroom. After the files are merged, the JACKPV macro is invoked and the results can be printed.

For this analysis, we will again use the data for all available countries, making use of an aggregated teacher background data file, ATGALLR3, and an aggregated student–teacher linkage data file, ASTALLR3. These aggregated files were created with the JOIN macro.

The SAS program that executes this example is presented in Exhibit 3.20 and is included in the International Database under the name EXAMPLE5.SAS. Note that one of the steps in this program is to select only those students who have non-missing data in our variable of interest ATDG01. The results obtained from this program are displayed in Exhibit 3.21, edited to show only the first four countries for the sake of brevity.

Exhibit 3.20: Example SAS Program for Teacher-level Analysis (EXAMPLE5.SAS)

```
LIBNAME P11 "<datpath>" ;

%INCLUDE "<macpath>JACKPV.SAS" ;

PROC SORT DATA = P11.ATGALLR3 OUT = ATGALLR3 ;
  BY IDCNTRY IDTEACH IDLINK ;

PROC SORT DATA = P11.ASTALLR3 OUT = ASTALLR3 ;
  BY IDCNTRY IDTEACH IDLINK ;

DATA ATGMERGED ;
  MERGE ATGALLR3 (IN = INATG)
        ASTALLR3 (IN = INAST) ;
  BY IDCNTRY IDTEACH IDLINK ;
  IF INATG AND INAST ;

DATA ATGMERGED ;
  SET ATGMERGED ;

  WHERE NMISS (ATDG01) = 0 ;

PROC FORMAT LIBRARY = WORK ;

  VALUE COUNTRY
    < list PIRLS 2011 country formats > ;

  VALUE ATDG
    1 = "20 YEARS OR MORE"
    2 = "AT LEAST 10 BUT LESS THAN 20 YEARS"
    3 = "AT LEAST 5 BUT LESS THAN 10 YEARS"
    4 = "LESS THAN 5 YEARS" ;

%JACKPV (MATWGT, JKZONE, JKREP, 75, IDCNTRY ATDG01, ASRREA0, 5, ATGMERGED) ;

PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTRY ATDG01N MATWGT MNPV MNPV_SE PCT PCT_SE ;
  FORMAT IDCNTRY COUNTRY. ATDG01 ATDG. N 6.0 MATWGT 10.0
         MNPV MNPV_SE PCT PCT_SE 6.2 ;
```

Each country’s results are displayed on four lines, one for each value of the ATDG01 variable. The results are presented in the same manner as in the previous examples, with countries identified in the first column, and the second column describing the categories of the analysis variable. As shown in the first four lines of results, 41.50 percent (standard error of 3.98) of fourth grade students in Australia were taught by teachers with 20 years or more of experience, 22.37 percent (standard

error of 3.52) by teachers with 10 to 20 years of experience, 19.03 percent (standard error of 2.88) by teachers with 5 to 9 years of experience, and 17.09 percent (standard error of 3.25) by teachers with less than 5 years of experience. Also, the estimated average reading achievement was 529.67 (standard error of 5.13) for fourth grade students taught by teachers with 20 years or more of experience, 533.03 (standard error of 5.68) for students taught by teachers with 10 to 20 years of experience, 529.09 (standard error of 6.32) for students taught by teachers with 5 to 9 years of experience, and 533.76 (standard error of 7.24) for students taught by teachers with less than 5 years of experience.

Exhibit 3.21: Output for Example Teacher-level Analysis (EXAMPLE 5)

IDCNTRY	ATDG01	N	TCHWGT	MNPV	MNPV_SE	PCT	PCT_SE
AUSTRALIA	20 YEARS OR MORE	1954	83004	529.67	5.13	41.50	3.98
AUSTRALIA	AT LEAST 10 BUT LESS THAN 20 YEARS	1066	44750	533.03	5.68	22.37	3.52
AUSTRALIA	AT LEAST 5 BUT LESS THAN 10 YEARS	1000	38063	529.09	6.32	19.03	2.88
AUSTRALIA	LESS THAN 5 YEARS	868	34188	533.76	7.24	17.09	3.25
AUSTRIA	20 YEARS OR MORE	2445	42361	532.39	2.42	54.79	2.83
AUSTRIA	AT LEAST 10 BUT LESS THAN 20 YEARS	1161	19233	525.88	4.04	24.87	2.73
AUSTRIA	AT LEAST 5 BUT LESS THAN 10 YEARS	523	8339	532.30	3.93	10.78	1.93
AUSTRIA	LESS THAN 5 YEARS	558	7389	512.69	6.76	9.56	1.88
AZERBAIJAN	20 YEARS OR MORE	2490	53345	466.47	3.77	59.79	4.51
AZERBAIJAN	AT LEAST 10 BUT LESS THAN 20 YEARS	1139	23144	456.15	8.56	25.94	3.11
AZERBAIJAN	AT LEAST 5 BUT LESS THAN 10 YEARS	349	9506	439.81	10.43	10.65	2.68
AZERBAIJAN	LESS THAN 5 YEARS	121	3231	483.72	33.44	3.62	1.95
BELGIUM (FRENCH)	20 YEARS OR MORE	1445	19025	516.19	3.91	40.39	3.88
BELGIUM (FRENCH)	AT LEAST 10 BUT LESS THAN 20 YEARS	1085	15154	501.83	4.95	32.17	3.83
BELGIUM (FRENCH)	AT LEAST 5 BUT LESS THAN 10 YEARS	534	7413	503.82	6.72	15.74	3.45
BELGIUM (FRENCH)	LESS THAN 5 YEARS	431	5507	498.39	12.47	11.69	2.53

3.10 PIRLS/prePIRLS Analyses with School-level Variables

Because PIRLS 2011 has representative samples of schools, it is possible to compute reasonable statistics with schools as units of analysis. However, the school samples were designed to optimize the student samples and the student-level estimates. For this reason, it is preferable to analyze school-level variables as attributes of students, rather than as elements in their own right. Therefore, analyzing school data should be done by linking the students to their schools.

In general, to perform analyses using the school background data files, users should do the following:

1. Identify the variables of interest in the school and student background data files and note any specific national adaptations to the variables.
2. Retrieve the relevant variables from the school background data files, including analysis variables, classification variables, identification variables (IDCNTRY and IDSCHOOL), and any other variables used in the selection of cases.

3. Retrieve the relevant variables from the student background data files, including plausible values of achievement, classification variables, identification variables (IDCNTRY and IDSCHOOL), sampling (JKZONE and JKREP) and weighting (TOTWGT) variables, and any other variables used in the selection of cases.
4. Merge the school background data files with the student background data files using the variables IDCNTRY and IDSCHOOL.
5. Perform any necessary variable transformations or recodes.
6. Use the macros JACKGEN and JACKREG, or JACKPV and JACKREGP if plausible values are involved, with the appropriate parameters.
7. Specify the location of the data files (<datapath>) and the macros (<macpath>).
8. Print the results file.

Our example of an analysis using school background data will compute the percentages of fourth grade students, with their average reading achievement, who attended schools composed of students with different levels of economic background. The results of this analysis are presented in Exhibit 5.2 of *PIRLS 2011 International Results in Reading* and are replicated here in Exhibit 3.22.

The information for this analysis is found in the school-level derived variable ACDG03, where schools are characterized as being composed of more affluent students than disadvantaged students, composed of more disadvantaged students than affluent students, or composed of neither more affluent students nor more disadvantaged students.⁵

Because we are using a school-level variable, we need to use the school background data files and the student background data files to find the variables. From the school background data files, we need the variable that contains the information on the schools' composition of students based on their economic background (ACDG03) and the identification variables IDCNTRY and IDSCHOOL that will allow us to link the school data to the student data.

Next, we retrieve the variables of interest from the student background data files. We need the country and school identification variables (IDCNTRY and IDSCHOOL) necessary to merge the school data to the student data. We also need the jackknife replication variables (JKZONE and JKREP), the student weighting variable (TOTWGT), and the fourth grade reading achievement plausible values (ASRREA01 through ASRREA05).

We then proceed to merge the school data with the student data using the variables IDCNTRY and IDSCHOOL and use the macro JACKPV to obtain the percentages of students, with their average achievement, in each category of the variable ACDG03 for each country. For this analysis, we will use the data for all available countries, making use of an aggregated school file ACGALLR3 and an aggregated student file ASGALLR3. These aggregated files were created with the JOIN macro.

⁵ Supplement 3 to this User Guide describes the construction of the school-level derived variable ACDG03 from responses to questions posed to the school principals.

**Exhibit 3.22: Exhibit of Example School-level Analysis, Taken from
PIRLS 2011 International Results in Reading (Exhibit 5.2)**

Exhibit 5.2: School Composition by Student Economic Background

PIRLS 2011 **4th Grade**

Reported by Principals

Country	More Affluent – Schools Where More than 25% of Students Come from Economically Affluent Homes and Not More than 25% from Economically Disadvantaged Homes		Neither More Affluent nor More Disadvantaged		More Disadvantaged – Schools Where More than 25% of Students Come from Economically Disadvantaged Homes and Not More than 25% from Economically Affluent Homes	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	32 (3.9)	556 (3.9)	41 (4.0)	526 (3.6)	27 (3.4)	500 (5.7)
Austria	31 (4.0)	539 (2.9)	48 (3.8)	532 (2.4)	21 (3.9)	505 (4.4)
Azerbaijan	r 11 (2.5)	464 (10.5)	32 (4.7)	470 (8.1)	57 (4.9)	462 (6.1)
Belgium (French)	49 (5.5)	522 (3.1)	27 (4.5)	501 (6.4)	25 (4.5)	483 (4.6)
Bulgaria	15 (3.3)	561 (6.2)	43 (4.3)	549 (4.5)	42 (4.4)	506 (7.8)
Canada	39 (2.4)	557 (3.0)	34 (2.9)	549 (2.7)	28 (2.6)	533 (2.6)
Chinese Taipei	22 (3.3)	563 (4.5)	67 (3.5)	554 (2.4)	11 (2.0)	525 (6.8)
Colombia	r 7 (2.0)	521 (17.1)	15 (3.4)	471 (11.7)	78 (3.9)	432 (4.7)
Croatia	38 (4.0)	560 (3.1)	38 (4.2)	550 (2.3)	24 (3.2)	551 (4.9)
Czech Republic	37 (3.7)	551 (3.2)	46 (4.4)	548 (2.2)	17 (3.1)	524 (6.7)
Denmark	60 (3.6)	561 (2.1)	33 (3.3)	546 (3.0)	7 (1.8)	524 (7.7)
England	r 32 (4.8)	568 (4.9)	33 (4.9)	554 (4.0)	35 (4.0)	527 (4.7)
Finland	43 (4.2)	576 (2.4)	47 (4.3)	567 (2.7)	10 (2.6)	541 (4.0)
France	37 (4.3)	539 (3.5)	35 (3.9)	522 (4.6)	28 (3.7)	493 (4.7)
Georgia	16 (3.0)	496 (8.8)	41 (4.3)	494 (5.9)	43 (4.0)	480 (4.5)
Germany	21 (2.8)	555 (3.3)	53 (3.7)	549 (3.0)	26 (3.3)	512 (5.5)
Hong Kong SAR	20 (3.3)	580 (3.9)	30 (4.7)	569 (5.3)	50 (4.7)	568 (4.4)
Hungary	21 (3.6)	573 (6.3)	31 (4.3)	557 (4.2)	48 (4.0)	516 (5.2)
Indonesia	r 20 (4.1)	475 (5.6)	21 (3.9)	431 (7.7)	59 (4.6)	421 (6.0)
Iran, Islamic Rep. of	27 (3.6)	488 (7.6)	27 (4.1)	460 (6.7)	46 (4.2)	438 (4.8)
Ireland	r 39 (4.7)	568 (3.3)	30 (4.2)	554 (4.7)	31 (3.4)	523 (4.0)
Israel	r 35 (3.6)	566 (6.1)	28 (3.4)	559 (4.9)	37 (3.4)	500 (6.5)
Italy	37 (3.8)	541 (4.5)	43 (3.7)	545 (3.6)	20 (2.9)	531 (5.0)
Lithuania	19 (3.3)	552 (5.8)	43 (4.6)	529 (3.3)	38 (3.5)	518 (3.1)
Malta	47 (0.1)	482 (2.2)	43 (0.1)	478 (2.4)	10 (0.1)	421 (5.3)
Morocco	s 12 (2.1)	372 (16.7)	13 (2.8)	317 (11.6)	75 (3.3)	304 (6.1)
Netherlands	r 63 (4.9)	553 (2.3)	23 (3.9)	544 (2.6)	15 (3.8)	522 (8.2)
New Zealand	39 (3.4)	560 (3.2)	34 (3.6)	533 (3.7)	27 (2.5)	489 (4.2)
Northern Ireland	r 36 (4.7)	578 (4.9)	38 (4.3)	555 (3.3)	26 (3.8)	534 (5.8)
Norway	53 (5.3)	511 (3.3)	44 (5.3)	505 (2.9)	3 (1.2)	488 (16.9)
Oman	r 44 (3.4)	396 (4.3)	25 (2.9)	378 (6.7)	31 (2.9)	370 (5.1)
Poland	8 (2.1)	536 (10.2)	61 (3.8)	532 (2.9)	31 (3.7)	512 (3.5)
Portugal	30 (4.5)	552 (4.0)	39 (4.9)	547 (4.1)	31 (4.8)	522 (4.6)
Qatar	r 68 (3.0)	423 (5.0)	21 (2.3)	441 (10.6)	11 (1.9)	378 (7.5)
Romania	19 (3.1)	538 (9.2)	24 (4.0)	507 (8.8)	57 (4.8)	491 (6.5)
Russian Federation	58 (3.2)	576 (4.0)	29 (3.3)	562 (4.8)	13 (2.1)	549 (8.5)
Saudi Arabia	r 42 (4.7)	445 (8.5)	30 (4.3)	439 (6.0)	29 (4.0)	408 (10.0)
Singapore	40 (0.0)	590 (5.2)	50 (0.0)	556 (4.5)	10 (0.0)	541 (14.3)
Slovak Republic	24 (3.3)	551 (3.9)	56 (3.4)	542 (2.5)	20 (3.2)	499 (8.0)
Slovenia	42 (4.0)	533 (3.7)	40 (4.0)	531 (2.7)	18 (3.0)	521 (6.7)
Spain	51 (3.7)	527 (4.0)	31 (3.3)	511 (4.7)	18 (3.1)	482 (5.1)
Sweden	r 76 (4.2)	547 (2.8)	17 (4.1)	532 (7.2)	7 (1.5)	509 (8.5)
Trinidad and Tobago	20 (3.2)	508 (7.5)	26 (4.0)	464 (9.2)	54 (4.2)	460 (5.7)
United Arab Emirates	r 68 (2.2)	440 (3.6)	20 (1.6)	444 (6.2)	12 (1.7)	412 (5.5)
United States	18 (2.2)	591 (2.9)	31 (2.6)	570 (3.5)	51 (2.3)	537 (2.4)
International Avg.	35 (0.5)	530 (0.9)	35 (0.6)	515 (0.8)	30 (0.5)	490 (1.0)

SOURCE: IEA's Progress in International Reading Literacy Study – PIRLS 2011

Sixth Grade Participants

Botswana	32 (3.6)	454 (7.9)	25 (4.0)	403 (8.3)	43 (4.3)	390 (4.3)
Honduras	r 16 (4.0)	518 (14.5)	13 (3.8)	440 (14.3)	71 (4.9)	444 (5.7)
Kuwait	r 30 (4.5)	429 (13.9)	35 (4.9)	431 (14.1)	35 (5.3)	402 (11.2)
Morocco	s 12 (2.3)	465 (16.5)	12 (2.6)	456 (11.1)	76 (3.1)	415 (5.8)

Benchmarking Participants^o

Alberta, Canada	35 (3.7)	564 (4.8)	40 (4.3)	550 (4.3)	25 (3.8)	527 (5.5)
Ontario, Canada	r 32 (4.7)	557 (5.4)	34 (5.3)	555 (4.3)	34 (5.4)	537 (4.4)
Quebec, Canada	60 (4.1)	544 (2.6)	25 (4.0)	526 (5.2)	15 (2.7)	528 (4.9)
Maltese – Malta	47 (0.1)	459 (2.1)	43 (0.2)	467 (2.6)	10 (0.1)	419 (4.5)
Eng/Afr (5) – RSA	r 22 (4.1)	507 (15.1)	23 (6.1)	419 (20.4)	55 (6.7)	382 (13.5)
Andalusia, Spain	47 (4.3)	525 (3.9)	34 (3.5)	519 (3.2)	19 (3.7)	490 (5.9)
Abu Dhabi, UAE	s 75 (4.5)	423 (7.4)	12 (3.2)	422 (18.7)	13 (3.5)	402 (10.7)
Dubai, UAE	r 67 (0.4)	473 (2.8)	22 (0.3)	498 (4.3)	11 (0.2)	416 (5.0)
Florida, US	r 11 (4.6)	598 (5.1)	20 (4.7)	590 (9.1)	68 (4.7)	559 (4.5)

^o Republic of South Africa (RSA) tested 5th grade students receiving instruction in English (ENG) or Afrikaans (AFR).

(.) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

An "r" indicates data are available for at least 70% but less than 85% of the students. An "s" indicates data are available for at least 50% but less than 70% of the students.

The SAS program that implements this example is presented in Exhibit 3.23 and is included in the International Database under the name EXAMPLE6.SAS. The results of this program are displayed in Exhibit 3.24, edited to show only the first four countries for the sake of brevity. Note that one of the steps in this program is to select only those students who have non-missing data in our variable of interest ACDG03.

Exhibit 3.23: Example SAS Program for School-level Analysis (EXAMPLE6.SAS)

```
LIBNAME P11 "<datpath>" ;

%INCLUDE "<macpath>JACKPV.SAS" ;

PROC SORT DATA = P11.ACGALLR3 OUT = ACGALLR3;
  BY IDCNTRY IDSCHOOL ;

PROC SORT DATA = P11.ASGALLR3 OUT = ASGALLR3;
  BY IDCNTRY IDSCHOOL ;

DATA ACGMERGED ;
  MERGE ACGALLR3 (IN = INACG)
        ASGALLR3 (IN = INASG) ;
  BY IDCNTRY IDSCHOOL ;
  IF INACG AND INASG ;

DATA ACGMERGED ;
  SET ACGMERGED ;

  WHERE NMISS (ACDG03) = 0 ;

PROC FORMAT LIBRARY = WORK ;

  VALUE COUNTRY
    < list 2011 country formats >

  VALUE ACDG
    1 = "MORE AFFLUENT LESS DISADVANTAGED"
    2 = "NEITHER"
    3 = "MORE DISADVANTAGED LESS AFFLUENT" ;

%JACKPV (TOTWGT, JKZONE, JKREP, 75, IDCNTRY ACDG03, ASRREA0, 5, ACGMERGED) ;

PROC PRINT DATA = FINAL NOOBS ;
  VAR IDCNTRY ACDG03N TOTWGT MNPV MNPV_SE PCT PCT_SE ;
  FORMAT IDCNTRY COUNTRY. ACDG03 ACDG. N 6.0 TOTWGT 10.0
         MNPV MNPV_SE PCT PCT_SE 6.2 ;
```

Exhibit 3.24: Output for Example School-level Analysis (EXAMPLE 6)

IDCNTRY	ACDG03	N	TOTWGT	MNPV	MNPV_SE	PCT	PCT_SE
AUSTRALIA	MORE AFFLUENT LESS DISADVANTAGED	1759	71259	555.68	3.94	32.08	3.91
AUSTRALIA	NEITHER	2425	90918	526.01	3.57	40.93	3.99
AUSTRALIA	MORE DISADVANTAGED LESS AFFLUENT	1162	59962	499.56	5.70	26.99	3.42
AUSTRIA	MORE AFFLUENT LESS DISADVANTAGED	1299	21774	539.43	2.91	30.53	4.04
AUSTRIA	NEITHER	1961	34354	531.63	2.40	48.16	3.79
AUSTRIA	MORE DISADVANTAGED LESS AFFLUENT	1041	15199	505.26	4.44	21.31	3.91
AZERBAIJAN	MORE AFFLUENT LESS DISADVANTAGED	458	9540	463.52	10.46	11.34	2.50
AZERBAIJAN	NEITHER	1271	26743	470.17	8.10	31.80	4.71
AZERBAIJAN	MORE DISADVANTAGED LESS AFFLUENT	2368	47824	462.14	6.10	56.86	4.88
BELGIUM (FRENCH)	MORE AFFLUENT LESS DISADVANTAGED	1558	20853	522.40	3.06	48.55	5.48
BELGIUM (FRENCH)	NEITHER	871	11519	501.01	6.37	26.82	4.47
BELGIUM (FRENCH)	MORE DISADVANTAGED LESS AFFLUENT	743	10577	483.24	4.60	24.63	4.49

In Exhibit 3.24, each country's results are presented on three lines, one for each value of the ACDG03 variable. The results are presented much in the same manner as in previous examples,

where the first column identifies the countries and the second column describes the category of ACDG03 being reported.

As shown in the first three lines of results, 32.08 percent of fourth grade students in Australia attended schools with more affluent students than disadvantaged students (standard error of 3.91), 40.93 percent attended schools with neither more affluent students nor more disadvantaged students (standard error of 3.99), and 26.99 percent attended schools with more disadvantaged students than affluent students (standard error of 3.42). Also, the estimated average reading achievement was 555.68 (standard error of 3.94) for students in schools with more affluent students, 526.01 (standard error of 3.57) for students in schools with neither more affluent students nor more disadvantaged students, and it was 499.56 (standard error of 5.70) for students in schools with more disadvantaged students.

References

Martin, M.O. & Mullis, I.V.S. (Eds.). (2012). *Methods and procedures in TIMSS and PIRLS 2011*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., Foy, P., & Drucker, K.T. (2012). *PIRLS 2011 international results in reading*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

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Chapter 4

The PIRLS 2011 International Database Files

4.1 Overview

The PIRLS 2011 International Database contains achievement data and student, home, teacher, and school background data collected in the 48 countries and 9 benchmarking participants that took part in PIRLS 2011 and prePIRLS 2011. Exhibit 4.1 lists all of the PIRLS and prePIRLS 2011 countries and benchmarking participants, along with identifying codes used in the International Database. The database also contains materials that provide additional information on its structure and contents. This chapter describes the contents of the database with a special emphasis on the actual data files used in Chapters 2 and 3 of this User Guide to analyze the PIRLS 2011 assessment results. The next section introduces this User Guide and its supplements. The following section describes the item-related materials included in the international database. The final four sections present the different data files and related materials included in the database, as described in Exhibit 1.1 of Chapter 1.

4.2 The PIRLS 2011 User Guide

The *PIRLS 2011 User Guide* is an important resource to the PIRLS 2011 International Database because it provides a detailed description of its structure and contents, as well as instructions to make the best use of its data. The User Guide also includes a series of four supplements in printable PDF format:

- Supplement 1: International Version of the PIRLS 2011 Background Questionnaires and Curriculum Questionnaire—Supplement 1 includes the international version of all background questionnaires and the curriculum questionnaire administered in PIRLS and prePIRLS 2011.¹ It is a good reference guide to understand what questions were asked and the variable names under which the responses are recorded in the International Database.
- Supplement 2: National Adaptations of International Background Questionnaires—Supplement 2 provides details on all national adaptations that were applied to the national version of all PIRLS 2011 background questionnaires. Users should refer to this supplement for any special national adaptations to background variables that could potentially affect the results of analyses.

¹ The prePIRLS 2011 participants administered the same background questionnaires as the PIRLS 2011 participants.

Exhibit 4.1: Countries Participating in PIRLS and prePIRLS 2011

Country	ISO Code		Assessment		
	Alpha	Numeric	2011	2006	2001
Australia	AUS	036	●		
Austria	AUT	040	●	●	
Azerbaijan	AZE	031	●		
Belgium (French)	BFR	957	●	●	
Bulgaria	BGR	100	●	●	●
Canada	CAN	124	●		
Chinese Taipei	TWN	158	●	●	
Colombia	COL	170	●		●
Croatia	HRV	191	●		
Czech Republic	CZE	203	●		●
Denmark	DNK	208	●	●	
England	ENG	926	●	●	●
Finland	FIN	246	●		
France	FRA	250	●	●	●
Georgia	GEO	268	●	●	
Germany	DEU	276	●	●	●
Hong Kong SAR	HKG	344	●	●	●
Hungary	HUN	348	●	●	●
Indonesia	IDN	360	●	●	
Iran, Islamic Rep. of	IRN	364	●	●	●
Ireland	IRL	372	●		
Israel	ISR	376	●	○	○
Italy	ITA	380	●	●	●
Kuwait	KWT	414		●	●
Lithuania	LTU	440	●	●	●
Malta	MLT	470	●		
Morocco	MAR	504	●	○	○
Netherlands	NLD	528	●	●	●
New Zealand	NZL	554	●	●	●
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	●	●	●
South Africa	ZAF	710		●	
Spain	ESP	724	●	●	

Exhibit 4.1: Countries Participating in PIRLS and prePIRLS 2011 (Continued)

Country	ISO Code		Assessment		
	Alpha	Numeric	2011	2006	2001
Sweden	SWE	752	●	●	●
Trinidad and Tobago	TTO	780	●	●	
United Arab Emirates	ARE	784	●		
United States	USA	840	●	●	●
Sixth Grade Countries					
Botswana	BWA	072	●		
Honduras	HND	340	●		
Kuwait	KWT	414	●		
Morocco	MA6	6504	●		
Benchmarking Participants					
Alberta, Canada	CAB	9134	●	●	
Ontario, Canada	COT	9132	●	●	●
Quebec, Canada	CQU	9133	●	●	●
Maltese – Malta	MLN	9470	●		
Eng/Afr (5) – RSA	ZAF	710	●	●	
Andalusia, Spain	EAN	72401	●		
Abu Dhabi, UAE	AAD	7842	●		
Dubai, UAE	ADU	7841	●		
Florida, US	UFL	11200	●		
prePIRLS Countries					
Botswana	BWA	072	●		
Colombia	COL	170	●		
South Africa	ZAF	710	●		

- Indicates participation in a testing cycle.
- Indicates participation but data not comparable for measuring trends to 2011.

- Supplement 3: Variables Derived from the Student, Home, Teacher, and School Questionnaire Data—Supplement 3 describes how the derived background variables were computed to produce exhibits in *PIRLS 2011 International Results in Reading* (Mullis, Martin, Foy, & Drucker, 2012).
- Supplement 4: PIRLS 2011 Sampling Stratification Information—Supplement 4 provides the labels assigned to the national explicit and implicit strata defined during the sampling process.

4.3 PIRLS/prePIRLS 2011 Achievement Items Documentation

A number of documents related to the PIRLS and prePIRLS 2011 achievement items are available for download along with the International Database. They include detailed information on the PIRLS and prePIRLS 2011 released passages and items, summary information on all PIRLS and prePIRLS 2011 items, as well as the IRT item parameters estimated from the PIRLS 2011 concurrent item calibration and the prePIRLS 2011 scaling.

The International Database includes PDF documents of the PIRLS and prePIRLS 2011 released passages and achievement items. The documents include the items themselves with descriptive information and the scoring guides for the constructed response items. The International Database also includes percent correct statistics for all released items in Excel and PDF format. There are separate files for PIRLS and prePIRLS.

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

- The item's permanent and unique identifier;
- The item's passage name and its sequential location;
- The item's label;
- The item's purpose for reading and process of comprehension;
- 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 International Database also includes Excel files with the IRT item parameters estimated for all 2006 and 2011 items from the PIRLS 2011 concurrent item calibrations, as well as for the prePIRLS 2011 scaling. These same item parameters are presented in the scaling section of *Methods and Procedures in TIMSS and PIRLS 2011* (Martin & Mullis, 2012). Finally, the database also includes Excel tables with the scale transformations that were applied to the PIRLS and prePIRLS 2011 reading scales.

4.4 The PIRLS/prePIRLS 2011 Data Files

The PIRLS 2011 International Database includes the actual data from all instruments administered to the students, their parents, their teachers, and their school principals for both PIRLS 2011 and prePIRLS 2011. This includes the student responses to the achievement items 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 *PIRLS 2011 International Results in Reading*. National Research Coordinators' responses to the curriculum questionnaire also are part of the International Database and are described later in this chapter.

This section describes the contents and format of the PIRLS and prePIRLS 2011 data files. With the exception of the curriculum data file, the PIRLS 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 participated in PIRLS and prePIRLS 2011 and for which internationally comparable data are available. The file names given to the various data file types are shown in Exhibit 4.2. For example, ASGNORR3.SAV is an SPSS file that contains Norway’s PIRLS 2011 student background data. For each file type, a separate data file is provided for each participating country. All data files and the variables they contain are described in the following sections.

Exhibit 4.2: PIRLS/prePIRLS 2011 Data File Names

File Names	Descriptions
ACG●●●R3	PIRLS 2011 school background data files
ASA●●● R3	PIRLS 2011 student achievement data files
ASG●●● R3	PIRLS 2011 student background data files
ASH●●● R3	PIRLS 2011 home background data files
ASR●●● R3	PIRLS 2011 within-country scoring reliability data files
AST●●● R3	PIRLS 2011 student–teacher linkage files
ATG●●● R3	PIRLS 2011 teacher background data files
ACG●●●L1	prePIRLS 2011 school background data files
ASA●●● L1	prePIRLS 2011 student achievement data files
ASG●●● L1	prePIRLS 2011 student background data files
ASH●●● L1	prePIRLS 2011 home background data files
ASR●●● L1	prePIRLS 2011 within-country scoring reliability data files
AST●●● L1	prePIRLS 2011 student–teacher linkage files
ATG●●● L1	prePIRLS 2011 teacher background data files

●●● = 3-character country abbreviation based on the ISO 3166 coding scheme (see Exhibit 4.1).

4.4.1 PIRLS/prePIRLS 2011 Student Achievement Data Files (ASA)

The PIRLS and prePIRLS 2011 student achievement data files contain the student responses to the individual achievement items in the PIRLS and prePIRLS 2011 assessments. The student achievement data files are best suited for performing item-level analyses. Achievement scores (plausible values) for all of the PIRLS and prePIRLS 2011 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.

Students who participated in PIRLS 2011 were administered one of 13 booklets and students in prePIRLS 2011 were administered one of 12 assessment booklets, each with two reading passages

and their accompanying items.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.

Item Variable Naming Convention

The achievement item variable names are based on an 8-character alphanumeric code (e.g., R31M17CA), which adheres to the following rules:

- The first character is either “R” for PIRLS items, or “L” for prePIRLS items.
- The second character indicates the assessment cycle when the item was first used in PIRLS or prePIRLS. The items in the PIRLS 2011 assessment have either “1” for items produced in 2001, “2” for items produced in 2006, or “3” for new items in 2011. All prePIRLS items have the code “1” because 2011 was its first administration.
- The third character is always “1,” to denote the fourth grade.
- The fourth character indicates the passage to which the item belongs. The following letters were used for PIRLS 2011:

E—Fly, Eagle, Fly;
F—Flowers on the Roof;
G—The Giant Tooth Mystery;
K—Sharks;
L—Leonardo da Vinci;
M—Empty Pot;
N—Day Hiking;
P—Enemy Pie;
W—Where’s the Honey; and
Y—Shiny Straw.

- The following letters were used for prePIRLS 2011:

A—Ants;
B—Brave Charlotte;
C—Caterpillar to Butterfly;
D—Two Giant Dinosaurs;
L—Lonely Giraffe;
O—Baghita’s Perfect Orange;
P—Training a Deaf Polar Bear; and
U—Summer My Father Was Ten.

² The PIRLS and prePIRLS 2011 booklet design is described in Chapter 4 of the *PIRLS 2011 Assessment Framework* (Mullis, Martin, Kennedy, Trong, & Sainsbury, 2009).

- The fifth and sixth characters are a two-digit sequential number that identifies the sequential position of the item within the passage.
- The seventh character indicates the item type. The letter “C” is used for constructed response items and the letter “M” for multiple choice items.
- The eighth character indicates the item part, and appears only when required. Generally, it is a letter from “A” to “E,” depending how many parts there are to a particular item. The letter “Z” is used to represent a derived item where the scores of its item parts are combined into a single score for the derived item.

For example, R31M17CA is the first part of a constructed response PIRLS reading item produced in 2011 and that is the 17th item in the passage “Empty Pot.”

Item Response Code Values

A series of conventions were adopted to code the data included in the PIRLS and prePIRLS data files. This section describes these conventions for the achievement items.

The values assigned to each of the achievement item variables depend on the item format. For multiple choice items, numerical values from 1 through 4 were used to correspond to the response options A through D, respectively. For these items, the correct response code is included as part of the variable label in the achievement codebook files, and SAS and SPSS programs are included as part of the International Database to score these items.³ For the constructed response items, numerical values ranging from 0 to 3 are used to correspond to the score points obtained from the students’ responses.

For some items, students were asked to provide more than one answer, each one being scored separately. The pattern of responses across these item parts determined the score on the item as a whole. Generally, students provided answers to either two or three parts and the score on the item was the number of correct responses. For all of these items, each item part was worth one point, and the derived items were given the code values shown in Exhibit 4.3. The total score for a multi-part item is contained in a derived variable, indicated by a final character of Z in its item variable name. For example, derived variable R31M17CZ contains the combined score for its three parts labeled R31M17CA, R31M17CB, and R31M17CC.

prePIRLS included a special four-part item—L11A13CZ—whereby a student was given two points (full credit) if all four parts were answered correctly, only one point (partial credit) if only three parts were answered correctly, and zero points otherwise.

³ The SPSS version of these programs function much like their SAS counterparts, described in Section 3.4 of Chapter 3.

Exhibit 4.3: PIRLS/prePIRLS 2011 Derived Item Variable Codes

Codes	Descriptions
For 3-point Derived Items:	
3	Full credit (all three parts answered correctly)
2	Partial credit (only two parts answered correctly)
1	Partial credit (only one part answered correctly)
0	No credit (no points on any of the parts)
For 2-point Derived Items:	
2	Full credit (both parts answered correctly)
1	Partial credit (only one part answered correctly)
0	No credit (no points on any of the parts)

Codes for Missing Values

A subset of the values for each variable type was reserved for specific codes related to different categories of missing data. We recommend that the user read the following section with particular care, because the way in which these missing codes are used may have major consequences for analyses.

Omitted Response Codes (SAS: . ; SPSS: 9)

“Omitted” response codes were used for items that a student should have answered but did not. An omitted response code was given when an item was left blank or when two or more response options were checked for a multiple choice item.

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 item was not administered, either by design arising from the rotation of items across the assessment booklets, or unintentionally when an item was misprinted or otherwise unavailable for a student to respond. The “Not Administered” code was used in the following cases:

- Achievement item not assigned to the student—All students participating in PIRLS 2011 received only one of the 13 test booklets; students in prePIRLS 2011 received one of 12 booklets. All variables corresponding to items that were not present in a student’s assigned booklet were coded as “Not Administered.”
- Student absent from session—When a student was not present for a particular testing session, all variables relevant to that session were coded as “Not Administered.”
- Item left out or misprinted—When a particular item (or a whole page) was misprinted or otherwise not available to the student, the corresponding variable was coded as “Not Administered.”

- Item deleted or mistranslated—An item identified during translation verification or item review as having a translation error such that the nature of the question was altered, or as having poor psychometric properties, was coded as “Not Administered.”

Not Reached Response Codes (SAS: .R ; SPSS: 6)

An item was considered not reached when, within passage 1 or passage 2 of a booklet, the item itself and the item immediately preceding it were not answered, and there were no other items completed in the remainder of that passage. For most purposes, PIRLS and prePIRLS 2011 treated the not-reached items as incorrect responses, except during the item calibration step of the IRT scaling, when not-reached items were considered to have not been administered (see the scaling section in *Methods and Procedures in TIMSS and PIRLS 2011*).

PIRLS/prePIRLS Achievement Scores

Achievement scales were produced for overall reading achievement, its two purposes for reading, and its two processes of comprehension, as shown in Exhibit 4.4. A total of five achievement scales were produced in PIRLS 2011 and in prePIRLS 2011. A detailed description of the PIRLS and prePIRLS 2011 scaling approaches and how these achievement scales were created is available in the scaling section of *Methods and Procedures in TIMSS and PIRLS 2011*. For each achievement scale, the PIRLS 2011 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.

Exhibit 4.4: PIRLS/prePIRLS 2011 Achievement Scales

PIRLS/prePIRLS 2011 Achievement Scales			
PIRLS	Reading	REA	Overall Reading
	Purposes for Reading	INF	Reading to Acquire and Use Information
		LIT	Reading for Literary Experience
	Processes of Comprehension	RSI	Retrieving and Straightforward Inferencing
		IIE	Interpreting, Integrating, and Evaluating
prePIRLS	Reading	REA	Overall Reading
	Purposes for Reading	INF	Reading to Acquire and Use Information
		LIT	Reading for Literary Experience
	Processes of Comprehension	RSI	Retrieving
		IIE	Inferencing and Integrating

The plausible values for any given scale are the best available measures of student achievement on that scale in the PIRLS 2011 International Database, and should be used as the outcome measure in any study of student achievement. Plausible values can be readily analyzed using the IEA International Database (IDB) Analyzer (2012) and the SAS programs described in this User Guide.

The achievement score variable names are based on an eight-character alphanumeric code (e.g., ASRINF01), which adheres to the following rules:

- The first character is always “A,” corresponding to a fourth grade score;
- The second character is always “S,” to indicate it is a student score variable;
- The third character is always “R,” to indicate a reading score, whether it is an overall score, a purpose score, or process score;
- The fourth through sixth characters are a three-character code describing the achievement scale, as shown in Exhibit 4.4; and
- The seventh and eighth characters are a two-digit number indicating the plausible value—”01,” “02,” “03,” “04,” or “05.”

For example, ASRINF01 is the first plausible value on the PIRLS or prePIRLS informational purpose achievement scale.

PIRLS International Benchmarks of Achievement

To help users of the PIRLS 2011 achievement results understand what performance on the overall reading achievement scale signifies in terms of the types of items students could answer successfully, PIRLS identified four points on the overall reading scale to serve as International Benchmarks. As shown in Exhibit 4.5, the PIRLS 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. PIRLS used a technique known as scale anchoring to summarize and describe student achievement at these four points on the scale.⁴ The *PIRLS 2011 International Results in Reading* presents the results of this scale anchoring, and reports the percentage of students in each country reaching each of the PIRLS International Benchmarks.

Exhibit 4.5: PIRLS 2011 International Benchmarks of Reading Achievement

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

To assist analysts in using the PIRLS International Benchmarks in secondary analyses, the PIRLS 2011 International Database contains a set of variables indicating which International Benchmark the students reached. There is a benchmark variable for each plausible value of the overall reading scale. The International Benchmark variables follow the achievement score variable naming convention, where the fourth through sixth positions have the letters “IBM.” Thus,

⁴ The scale anchoring procedure is described in the scale anchoring section of the *Methods and Procedures in TIMSS and PIRLS 2011*.

ASRIBM01–05 are the five benchmark variables for overall reading. The codes used for the benchmark variables are described in Exhibit 4.6.

Exhibit 4.6: 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

4.4.2 PIRLS/prePIRLS 2011 Within-country Scoring Reliability Data Files (ASR)

The PIRLS and prePIRLS 2011 within-country scoring reliability data files contain data that can be used to investigate the reliability of the PIRLS and prePIRLS constructed response item scoring. The scoring reliability data files contain one record for each assessment booklet that was double scored during the within-country scoring reliability exercise (see Operations and Quality Assurance in *Methods and Procedures in TIMSS and PIRLS 2011*). For each constructed response item in the PIRLS and prePIRLS assessments, the following three variables are included in the scoring reliability data files:

- Original Score (score assigned by the first scorer);
- Second Score (score assigned by the second scorer); and
- Score Agreement (agreement between the two scorers).

It should be noted that the second score data were used only to evaluate within-country scoring reliability and were not used in computing the achievement scores included in the International Database and presented in *PIRLS 2011 International Results in Reading*.

Scoring Reliability Variable Naming Convention

The variable names for the Original Score, Second Score, and Score Agreement variables are based on the same naming convention as that for the achievement item variables discussed above. The third character in the variable name differentiates between the three reliability variables:

- The Original Score variable has the number “1” as the third character, in accordance with the achievement item naming convention (e.g., R31M17CA);
- The Second Score variable has the letter “R” as the third character (e.g., R3RM17CA); and
- The Score Agreement variable has the letter “I” as the third character (e.g., R3IM17CA).

Scoring Reliability Variable Score Values

The values contained in both the Original Score and Second Score variables are the scores assigned using the PIRLS and prePIRLS scoring guides. The Score Agreement variable may have one of two values, denoting either agreement or disagreement between the two scorers, as described in Exhibit 4.7.

Exhibit 4.7: PIRLS/prePIRLS 2011 Score Agreement Variable Codes

Code	Description
1	Agreement—Identical scores from both scorers
0	Disagreement—Different scores from both scorers

In general, the data in the Original Score variables are identical to those contained in the student achievement data files. In some cases, however, the response scores for specific items were recoded after a review of the international item statistics revealed inconsistencies in the original scoring guides, or showed that the original scores were not functioning as desired. The recoded score values were used in computing the achievement scores reflected in the International Report and are present in the student achievement data files. In contrast, the Original Score variables in the scoring reliability data files contain the original unrecoded response scores. This was done so that the scoring reliability measures indicated in the Score Agreement variables were based on the original scoring guides used during the constructed response scoring sessions conducted in each country.

4.4.3 PIRLS/prePIRLS 2011 Background Questionnaire Data Files

There are six usual types of PIRLS 2011 background questionnaire data files: five data files (student, home, teacher, school, and curriculum) correspond to the five types of background questionnaires administered in PIRLS and prePIRLS 2011, and the sixth links the student and teacher background data. The first five types of data files contain the responses to the questions asked in their respective background questionnaires.

PIRLS/prePIRLS 2011 Student Background Data Files (ASG)

Students who participated in PIRLS 2011 and prePIRLS 2011 were administered a background questionnaire with questions related to their home background, school experiences, and attitudes toward reading. The student background data files contain students' responses to these questions. They also contain students' reading achievement scores (plausible values) to facilitate analyses of relationships between student background characteristics and achievement.

The student background data files also contain a number of identification variables, tracking variables, sampling and weighting variables, and derived variables that were used for producing exhibits in the international reports. These variables are described later in this chapter.

PIRLS/prePIRLS 2011 Home Background Data Files (ASH)

Countries that participated in the PIRLS 2011 and prePIRLS 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-centered activities in the home before the child began school, such as reading books, singing songs, or writing letters or words. Parents answered questions about home resources in addition to information about their highest level of education and employment situations.

PIRLS/prePIRLS 2011 Teacher Background Data Files (ATG)

The teachers of the students who were sampled for PIRLS 2011 and prePIRLS 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 and class combination.

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. Chapters 2 and 3 of this User Guide describe student-level analyses combining the teacher data and the student–teacher linkage data files with the IEA IDB Analyzer software, as well as with SAS programs.

PIRLS/prePIRLS 2011 School Background Data Files (ACG)

The school background data files contain school principals' responses to the questions in the 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. Details of the merging procedure with the IEA IDB Analyzer, or SAS programs, are described in Chapters 2 and 3 of this User Guide, respectively.

PIRLS/prePIRLS 2011 Student–Teacher Linkage Data Files (AST)

The PIRLS and prePIRLS 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, 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 to perform

appropriate student-level analyses where teacher characteristics are considered as attributes of the students.

PIRLS 2011 Curriculum Data File

The PIRLS 2011 curriculum questionnaire data file contains the responses provided by the National Research Coordinators of the participating countries to the PIRLS 2011 curriculum questionnaire. There is a single PIRLS 2011 curriculum questionnaire data file because all prePIRLS 2011 participants also took part in the PIRLS assessment. This file is available in Excel in the PIRLS 2011 International Database.

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, and the Rasch scores to contextual scales constructed from these data. The letter “D” is used for all variables derived from responses in the background questionnaires and the index variables derived 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; and
R—Questions related to reading.

- The fifth through eighth characters of all background questionnaire variables represent the sequential numbering of the questions as presented in their respective questionnaires.⁵

The curriculum questionnaire uses a different variable naming convention. The first three characters are either “GEN” for general questions, or “REA” for questions related to reading instruction. The remaining characters indicate the sequential location of the questions in the curriculum questionnaire.

Background Variable Location Convention

Although the background variable naming convention was modified in 2011 to show explicitly the ordering of questions in the background questionnaires, each question also was assigned a unique

⁵ Because of the modular structure of the background questionnaires, the sequential numbering can be specific to each module.

location code as shown in Exhibit 4.8. 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 this User Guide.

Exhibit 4.8: Background Questionnaire Variable Location Convention

Questionnaire	Location Variable	
Student Questionnaire	SQG-●●●	General questions
	SQR-●●●	Reading questions
Home Questionnaire	HQ-●●●	All questions
Teacher Questionnaire	TQG-●●●	General questions
	TQR-●●●	Reading questions
School Questionnaire	SCQ-●●●	All questions
Curriculum Questionnaire	CQG-●●●	General questions
	CQR-●●●	Reading 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, etcetera. 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. 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 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 contextual 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 included in the International Database and described in the contextual questionnaire scaling section of *Methods and Procedures in TIMSS and PIRLS 2011*.

Additional variables were derived from responses to multiple questions 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. Generally, records (whether students, parents, teachers, or schools) were included in the calculation 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. Supplement 3 to the User Guide provides a description of the derived variables included in the International Database.

Sampling and Weighting Variables

Several sampling and weighting variables are included in the PIRLS and prePIRLS 2011 data files. They are listed and described in Exhibit 4.9 and Exhibit 4.10 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.

Exhibit 4.9: PIRLS/prePIRLS 2011 Sampling and Weighting Variables

Variable Name	Description
JKZONE	The sampling zone, or stratum, to which the student’s school is assigned
JKREP	The sampling replicate, or primary sampling unit, to which the student’s school is assigned
JKCZONE	The sampling zone, or stratum, to which the school is assigned
JKCREP	The sampling replicate, or primary sampling unit, to which the school is assigned
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
SCHWGT	School weight
TCHWGT	Teacher weight
WGTFAC1	School weighting factor
WGTADJ1	School weighting adjustment
WGTFAC2	Class weighting factor
WGTADJ2	Class weighting adjustment
WGTFAC3	Student weighting factor
WGTADJ3	Student weighting adjustment

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, PIRLS 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.

Exhibit 4.10: Location of Sampling and Weighting Variables in the PIRLS/prePIRLS 2011 Data Files

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

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

The weight variable TCHWGT is specifically designed for using teacher background data in student-level analyses and is based on TOTWGT. The teacher weight is 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 PIRLS and prePIRLS 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 PIRLS and prePIRLS 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 PIRLS and prePIRLS 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.

IDCNTRY

IDCNTRY is a five-digit country identification code based on the ISO 3166 classification as shown in Exhibit 4.1. 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 PIRLS and prePIRLS 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 IDCNTRY 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 IDCNTRY 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

IDBOOK identifies the specific assessment booklet that was administered to each student. In PIRLS, the booklets are given a numerical value from “1” through “13.” In prePIRLS, the booklets are numbered from “1” to “12.”

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 User Guide.

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 the concatenation of 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 4.11 shows in which data files the various identification variables are located. It also highlights 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 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 4.11: Location of Identification Variables in the PIRLS/prePIRLS 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.⁶ 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.

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 User Guide.

⁶ Survey tracking forms are lists of students, teachers, and schools used for sampling and administrative purposes.

4.5 PIRLS/prePIRLS 2011 Codebook Files

All information related to the structure of the PIRLS and prePIRLS 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 International Database is accompanied by a codebook file, with the exception of the curriculum data files. 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 4.2;
- The next three characters identify the files as PIRLS or prePIRLS codebooks and are always “PRL”;
- The seventh and eighth characters are either “R3,” to indicate the PIRLS 2011 study cycle, or “L1,” to indicate the prePIRLS 2011 study cycle; and
- The three-character file extension is either .XLS for the Excel format, or .PDF for the printable format.

Codebook files can be read using Excel, or printed directly from PDF format using Acrobat Reader. They describe the contents and structure of the PIRLS and prePIRLS data files. Important codebook fields include FIELD_LABL, 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.

4.6 PIRLS/prePIRLS 2011 Data Almanac Files

Data almanacs provide weighted summary statistics for all variables in the PIRLS and prePIRLS 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 PIRLS 2011 and prePIRLS 2011 assessments. There are separate achievement data almanacs for PIRLS and prePIRLS and by purposes for reading (INF and LIT). The achievement data almanacs display for each item its classification in the purposes for reading and the processes of comprehension, the 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 trend item almanacs, available only for PIRLS, provide summary statistics for achievement items used in both the 2006 and 2011 assessments. The achievement data almanac files available in the International Database are listed in Exhibit 4.12.

Exhibit 4.12: PIRLS/prePIRLS 2011 Achievement Data Almanacs

Achievement Data Almanac	Contents
P11_INF_ItemAlmanac	PIRLS Almanac for informational items
P11_LIT_ItemAlmanac	PIRLS Almanac for literary items
P11_INF_TrendItemAlmanac	PIRLS Trend almanac for informational items
P11_LIT_TrendItemAlmanac	PIRLS Trend almanac for literary items
pP11_INF_ItemAlmanac	prePIRLS Almanac for informational items
pP11_LIT_ItemAlmanac	prePIRLS Almanac for literary items

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

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., 0, 1, 2, 3)—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).
- 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 reading achievement 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 PIRLS 2011 International Database are listed in Exhibit 4.13.

Exhibit 4.13: PIRLS/prePIRLS 2011 Background Data Almanacs

Background Data Almanac	Contents
P11_StudentAlmanac	PIRLS student background almanac with reading achievement
P11_HomeAlmanac	PIRLS home background almanac with reading achievement
P11_TeacherAlmanac	PIRLS teacher background almanac with reading achievement
P11_SchoolAlmanac	PIRLS school background almanac with reading achievement
pP11_StudentAlmanac	prePIRLS student background almanac with reading achievement
pP11_HomeAlmanac	prePIRLS home background almanac with reading achievement
pP11_TeacherAlmanac	prePIRLS teacher background almanac with reading achievement
pP11_SchoolAlmanac	prePIRLS school background almanac with reading achievement

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

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 are always 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 were analyzed as student attributes.

4.7 PIRLS/prePIRLS 2011 Program Files

The PIRLS 2011 International Database includes a number of SAS programs and macros designed to facilitate the manipulation of the PIRLS and prePIRLS 2011 data files and conduct proper statistical analyses taking into account the jackknife algorithm and the presence of plausible values. These programs are described in Chapter 3 of this User Guide.

The International Database contains two SPSS syntax files—ASASCRR3.SPS and ASASCRL1.SPS—which will recode the responses to the individual items from the PIRLS and prePIRLS 2011 achievement data files to their appropriate score levels. The files function much the same way as their SAS counterparts described in Chapter 3 of this User Guide (see Section 3.4). The International Database also includes a third SPSS syntax file to perform a variable recode required for the proper execution of the third example in Chapter 2 of this User Guide (see Section 2.5).

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Appendix

Organizations and Individuals Responsible for PIRLS 2011

PIRLS 2011 was a collaborative effort involving hundreds of individuals around the world. This appendix acknowledges the individuals and organizations for their contributions. Given that work on PIRLS 2011 has spanned approximately five years and has involved so many people and organizations, this list may not include all who contributed. Any omission is inadvertent. PIRLS 2011 also acknowledges the students, parents, teachers, and school principals who contributed their time and effort to the study. This report would not be possible without them.

Management and Coordination

PIRLS is a major undertaking of IEA, and together with the Trends in International Mathematics and Science Study (TIMSS) comprises the core of IEA's regular cycles of studies. The PIRLS assessment at the fourth grade complements TIMSS, which regularly assesses mathematics and science achievement at fourth and eighth grades.

The TIMSS & PIRLS International Study Center at Boston College has responsibility for the overall direction and management of the TIMSS and PIRLS projects. Headed by Executive Directors Drs. Ina V.S. Mullis and Michael O. Martin, the study center is located in the Lynch School of Education. In carrying out the project, the TIMSS & PIRLS International Study Center worked closely with the IEA Secretariat in Amsterdam, which managed country participation, was responsible for verification of all translations produced by the participating countries, and coordinated the school visits by International Quality Control Monitors. The IEA Data Processing and Research Center in Hamburg was responsible for processing and verifying the data submitted by the participants; Statistics Canada in Ottawa was responsible for school and student sampling activities; and Educational Testing Service in Princeton, New Jersey consulted on psychometric methodology, provided software for scaling the achievement data, and replicated the achievement scaling for quality assurance.

The Project Management Team, comprising the study directors and representatives from the TIMSS & PIRLS International Study Center, IEA Secretariat and IEA Data Processing and Research Center, Statistics Canada, and ETS met twice a year throughout the study to discuss the study's progress, procedures, and schedule. In addition, the study directors met with members of IEA's Technical Executive Group twice yearly to review technical issues.

To work with the international team and coordinate within-country activities, each participating country designates an individual to be the PIRLS National Research Coordinator (NRC). The NRCs have the challenging task of implementing the PIRLS study in their countries in accordance with the PIRLS guidelines and procedures. In addition, the NRCs provide feedback and contributions throughout the development of the PIRLS assessment. The quality of the PIRLS assessment and data depends on the work of the NRCs and their colleagues in carrying out the complex sampling, data collection, and scoring tasks involved. Continuing the tradition of exemplary work established in previous cycles of PIRLS, the PIRLS 2011 NRCs performed their many tasks with dedication, competence, energy, and goodwill, and have been commended by the IEA Secretariat, the TIMSS & PIRLS International Study Center, the IEA Data Processing and Research Center, and Statistics Canada for their commitment to the project and the high quality of their work.

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