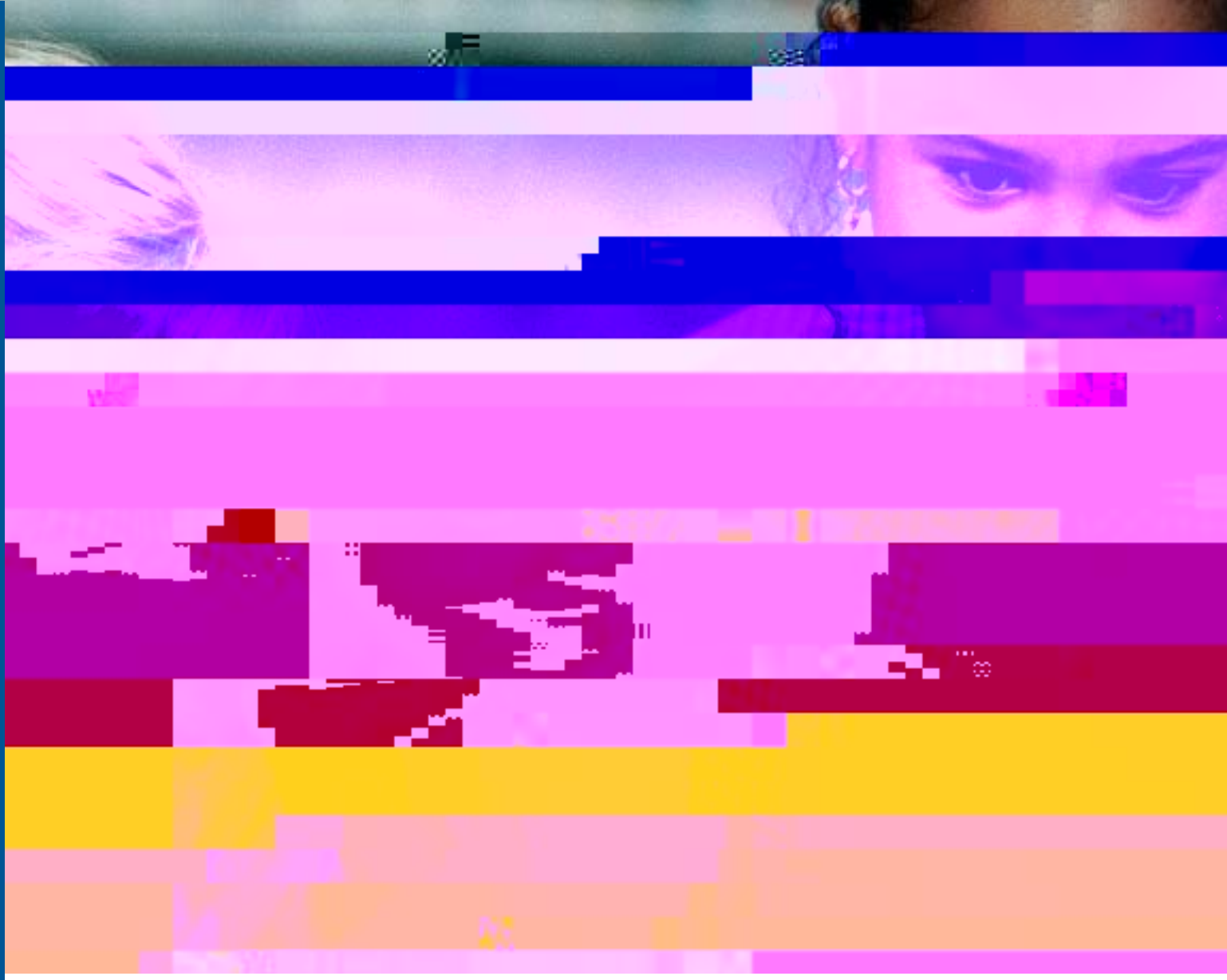


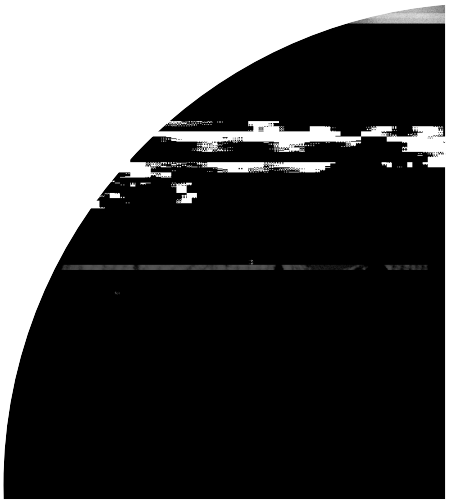
Edited by

E l I. l .

Al . ll .

BOSTON COLLEGE
LYNCH SCHOOL OF EDUCATION

Contributors
Jay Campbell
Pierre Foy
Eugenio J. Gonzalez
Dirk Hastedt
Ursula Itzlinger
Marc Joncas
Dana L. Kelly
Barbara Malak
Michael O. Martin
Ina V.S. Mullis
Marian Sainsbury
Knut Schwippert



Edited by
Eugenio J. Gonzalez
Ann M. Kennedy

2003

2001

: 2003109101

1-889938-31-9

02467

: +1-617-552-1600
: +1-617-552-1203

://

Table of Contents

1 Overview of User Guide

2 PIRLS Test Instruments and Booklet Design

3 PIRLS Background Questionnaires

4 PIRLS Survey Operations Procedures

7 Estimating Sampling and Imputation Variance

9

1 Overview of User Guide

1.1 Overview of User Guide

This User Guide accompanies the PIRLS 2001 International Database. The database comprises achievement data in addition to student, parent, teacher, and school background data for the 35 countries that participated in PIRLS 2001. The PIRLS 2001 International Database includes responses from over 150,000 students, 130,000 parents, about 7,000 teachers, and 6,000 school principals. All participating countries gave the IEA permission to release their national data.

The database also contains achievement data and student background data for the nine countries that participated in the Trends in IEA's Reading Literacy Study, in which countries that participated in the IEA's 1991 Reading Literacy Study administered the reading test and student questionnaire to measure trends in reading literacy.

The PIRLS 2001 International Database includes the following for each country for which internationally comparable data are available:

- Students' responses to cognitive reading items
- Students' responses to the background student questionnaire
- Parents' responses to the background home questionnaire
- Teachers' responses to the background teacher questionnaire
- Principals' responses to the background school questionnaire
- Data almanacs.

This user guide includes background information about the design, implementation, and reporting of the PIRLS 2001 assessment in addition to information specific to the data files contained in the international database. Chapters 1–3 describe the design of the PIRLS reading test and background questionnaires. Chapters 4–7 detail the sample design, data collection procedures, scaling, and analysis and reporting issues. Further details of the contents of Chapters 1–7 are available from the *PIRLS 2001 Technical Report* (Martin, Mullis, & Kennedy, 2003). Chapter 8 documents the content and format of the data files in the database, discusses the appropriate use of the files and variables, and draws attention to special considerations that arise from the complex design of the assessment. Example an

1.3 Participating Countries

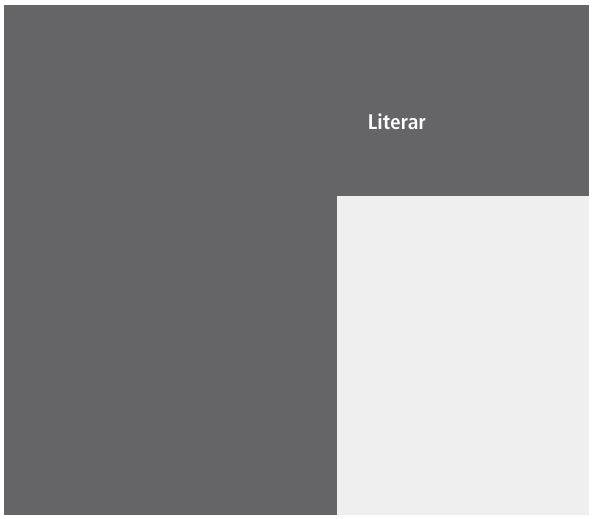
Thirty-five countries joined together to conduct the first PIRLS assessment in 2001:

Argentina
Belize
Bulgaria
Canada (O, Q)*
Colombia
Cyprus
Czech Republic
England
France
Germany
Greece
Hong Kong
Hungary
Iceland
Iran
Israel
Italy
Kuwait
Latvia
Lithuania
Macedonia
Moldova
Morocco
Netherlands
New Zealand
Norway
Romania
Russian Federation
Scotland
Singapore
Slovak Republic
Slovenia
Sweden
Turkey
United States

* Canada is represented by the provin

type) as stratification variables. At the second stage, one or two fourth-grade classes

Exhibit 1.1 Percentages of Reading Assessment Devoted to Reading Purposes and Processes[1]



Passages

The reading passages form the basis for the reading literacy test. In accordance with the framework, four of the assessment blocks contain literary texts and four contain informational texts, and the passages are authentic texts drawn from children's storybooks and informational sources. Submitted and reviewed by the PIRLS countries, the passages represent a range of types of literary and informational texts. The literary passages include realistic stories and traditional tales; while the informational texts include chronological and non-chronological articles, a biographical article, and an informational leaflet.

Items and Scoring Guides

Two item formats were used to assess children's reading literacy – multiple-choice and constructed-response. Each type of item was used to assess both reading purposes and all four reading processes. Multiple-choice items provided students with four possible answers, one of which was correct. Each multiple-choice item was worth one point. Constructed-response items required students to construct their answers rather than select from among possible answers. Short-answer constructed-response items were worth one or two points, and extended-response items were worth three points.

Scoring guides for constructed-response items were developed together with the items. Each scoring guide is unique to that item. It describes the essential features of appropriate and complete responses – including the kind of evidence of understanding required and example student responses to help scorers determine the score for a particular response. Actual student responses were used to develop the

is a set of questionnaires targeting factors related to reading literacy. PIRLS administered four questionnaires: to the tested students, to their parents, to their reading teachers, and to their school principals.

1.10 Translation and Verification of Instruments

1.12 Scoring the Constructed-Response Items

Because almost two-thirds of the score points came from constructed-response items, PIRLS needed to develop procedures for reliably evaluating student responses within and across countries. The International Study Center prepared detailed guides containing the PIRLS scoring rubrics, and explanations of how to implement them, together with example student responses for the various rubric categories. These guides, along with training packets containing extensive examples of student responses for practice in applying the rubrics, were used as a basis for intensive training of national scorers.

To gather and document empirical information about the within-country agreement among scorers, PIRLS arranged to have a sample of 200 students' responses to each item in each country scored independently by two readers. Scoring reliability within countries was high – the percentage of exact agreement, on average, across countries, was more than 90 percent. PIRLS also conducted a study of scoring reliability across countries, asking countries with scorers proficient in English to score a reference set of student responses chosen from students in English-speaking countries. This study revealed a high level of agreement between scorers also (85% on average).

1.13 Data Processing

To ensure the availability of comparable, high-quality data for analysis, PIRLS took rigorous quality control steps to create the international database. Countries used manuals and software provided by PIRLS to create and check their data files, so that the information would be in a standardized international format before being forwarded to the IEA Data Processing Center. Upon arrival at the DPC, the data underwent an exhaustive cleaning process involving several steps and procedures designed to identify, document, and correct deviations from the international instruments, file structures, and coding schemes. The process also emphasized consistency of information within national data sets, and appropriate linking among the student, parent, teacher, and school data files.

1.14 IRT Scaling

The general approach to reporting the PIRLS achievement data was based primarily on item response theory (IRT) scaling methods. Student reading achievement was summarized using a family of IRT models (2-parameter, 3-parameter, and generalized partial credit models). The IRT methodology was preferred for developing comparable estimates of performance for all students, since students responded to different passages and items depending upon which of the test

booklets they received (Booklet 1 through 9 or the PIRLS Reader). This

PIRLS 2001 collected a wide array of information about the home and school context in which students learned to read (from parents, students, teachers, and school principals). The *PIRLS 2001 International Report* (Mullis, et al., 2003) summarizes much of this information, combining data into composite indices, and showing an association with achievement where appropriate. In particular, student reading achievement is described in relation to literacy-related activities in the home, the school curriculum and organization for teaching reading, teachers and reading instruction, school contexts, and students' reading attitudes, self-concepts, and out-of-school activities.

Additional information about the countries participating in PIRLS 2001 may be found in the *PIRLS 2001 Encyclopedia* (Mullis, Martin, Kennedy, & Flaherty, 2002), a

Countries sampled every other PIRLS school for the trend study, resulting in a sample size of at least 75 schools. In each school, one target-grade classroom was sampled and administered the 1991 test and student questionnaire. For some countries, the4 TD- studei arok0.1(st(sampy1(e)-0st(3-ꝑ)5.(2(thsuntriꝑTw[sok0.1it0vGRr(e)-wnister)5 n-ꝑ

2 PIRLS Test Instruments and Booklet Design

2.1 Overview

Processes and Strategies

3 PIRLS Background Questionnaires

Exhibit 3.1 Contexts for the Development of Reading Literacy

3.3 PIRLS Main Survey Questionnaires

Student Questionnaire

Exhibit 3.3 Content of the PIRLS Student Questionnaire

Student Questionnaire		
Item Number	Item Content	Description
1	Gender	Whether student is a boy or girl
2	Date of birth	Month and year of student's birth
3	Out-of-school	

Learning-to-Read Survey (Home)

Exhibit 3.4 Content of the PIRLS Learning-to-Read Survey (Home Questionnaire)

Learning-to-Read Survey

Exhibit 3.5 Content of the PIRLS Teacher Questionnaire (Continued)

Teacher Questionnaire		
Item Number	Item Content	Description

Exhibit 3.6 Content of the PIRLS School Questionnaire (Continued)

School Questionnaire

3.4 Reporting Questionnaire Data

Exhibit 3.7 Summary Indices from Background Data in the *PIRLS 2001 International Report*

Name of Index	Label	Exhibit[a]	Analysis Method
Index of Early Home Literacy Activities	EHLA	4.10	ndex based on parents' responses to the frequency of he following activities they engaged in with their child rior to entry into primary school: read books, tell tories, sing songs, play with alphabet toys (e.g., locks with letters of the alphabet), play word games, r read aloud signs and labels. Average is computed cross the 6 items based on a 3-point scale: Never or lmost never = 1, Sometimes = 2, and Often = 3. High evel indicates an average of greater than 2.33 through . Medium level indicates an average of 1.67 through .33. Low level indicates 0.949 8o8(r)8.3(ags)4.3(of 8(t)5.o)-10.ow les

Exhibit 3.7 Summary Indices from Background Data in the *PIRLS 2001 International Report* (Continued)

Name of Index	Label	Exhibit[a]	Analysis Method
Index of Reading for Homework	RFH	6.34	Index based on teachers' responses to two questions: How often do you assign rea RFrT.2(6 67946.3(3ngu a partx ofhHomework

Exhibit 3.7 Summary Indices from Background Data in the *PIRLS 2001 International Report* (Continued)

Name of Index	Label	Exhibit[a]	Analysis Method
Index of Principals' Perceptions of School Safety	PPSS	7.17	Index based on principals' responses about the degree each was a school problem: classroom disturbances, cheating, profanity, vandalism, theft, intimidation or verbal abuse of other students, and physical conflicts among students. Average is computed on a 4-point scale: Not a problem = 1, Minor problem = 2, Moderate problem = 3, and Serious problem = 4. High level indicates an average of 1 to less than 2. Medium level indicates an average of 2 through 3. Low level indicates an average of greater than 3 through 4.
Index of Availability of School Resources	ASR	7.18	Index based on principals' responses to how much the school's capacity to provide instruction is affected by a shortage or inadequacy of the following: instructional staff, teachers qualified to teach reading, instructional materials, supplies (e.g., paper, pencils), school buildings and grounds, heating/cooling and lighting systems, instructional space (e.g., classrooms), special equipment for physically disabled students, computers for instructional purposes, computer software for instructional purposes, computer support staff, library books, and audiovisual resources. Average is computed on a 4-point scale: Not at all = 1, A little = 2, Some = 3, and A lot = 4. High level indicates an average of 1 to less than 2. Medium level indicates an average of 2 through 3. Low level indicates an average of greater than 3 through 4.

cy5uw[(Stud)-H(ud)-9.5(en)-7.3(ts)-6d0 369.84 Tm0 0 0 b8.969.88d0008 Tc71lW*n20A l 369.84o20A l 369.84o

4 PIRLS Survey Operations Procedures

4.1 Overview

Assigning Instruments to Students and Teachers

4.4 Within-School Assessment Activities

School Coordinator Manual

Arranging the Testing Sessions

Distributing Materials

Test Administration

Test Administrator Manual

Timing of the Testing Sessions

-
-
-
-
-
-
-

4.6 Trends in IEA's Reading Literacy Study

Survey Operations Manual

. *The School*

Coordinator Manual *Test Administrator Manual*

The School Sampling Guide for the 10-Year Trend Study

-
-
-

5 Sampling and Sampling Weights

This chapter describes the PIRLS 2001 procedures for sampling from the student population in each participating country. To be acceptable for PIRLS, national

Where the local situation required it, NRCs were permitted to adapt the sample design for their educational systems, using more sampling information, and more sophisticated designs and procedures than the base design required. However, these solutions had to be approved by the International Study Center (ISC) at Boston College, and by Statistics Canada.

In IEA studies, the target population for all countries is known as the *international desired target population*. This is the grade or age level that each country should address in its sampling activities. The international desired target population for PIRLS was the following:

> *All students enrolled in the upper of the two adjacent grades that contain the largest proportion of 9-year-olds at the time of testing.*

The PIRLS target grade was usually the fourth grade of primary school. Because fourth grade generally signals the completion of formal reading instruction, countries for which the target grade would have been the third grade (based on the international desired target population) were permitted to retain the fourth grade as their target grade. The PIRLS target population was derived from that used by TIMSS in 1995, and identical to that used by TIMSS 2003 at the primary school level.

PIRLS expected all participating countries to define their *national desired population* to correspond as closely as possible to its definition of the international desired population. For example, if fourth grade was the upper of the two adjacent grades containing the greatest proportion of 9-year-olds in a particular country, then fourth grade should be the national desired population for that country. Although countries were expected to include all students in the target grade in their definition of the population, sometimes they had to reduce their coverage. Lithuania, for example, planned to collect data only about students in Lithuanian-speaking schools, so their national desired population fell short of the international desired population. The international report documents such deviations from the international definition of the PIRLS target population.

Using its national desired population as a basis, each participating country had to define its population in operational terms for sampling purposes. This definition, known in IEA terminology as the *national defined population*, is essentially the sampling frame from which the first stage of sampling takes place. Ideally, the national defined population should coincide with the national desired population, although in reality there may be some school types or regions that cannot be included;

consequently, the national defined population is usually a very large subset of the national desired population. All schools and students in the desired population not included in the defined population are referred to as the *excluded population*.

PIRLS participants were expected to ensure that the national defined population included at least 95 percent of the national desired population. Exclusions (which should be kept to a minimum) could occur at the school level, within the sampled schools, or both. Because the national desired population was restricted to schools that contained the required grade, schools not containing the target grade were considered to be outside the scope of the sample and therefore not part of the target population.

Although countries were expected to do everything possible to maximize coverage

•

Sampling sizes for the two stages of the PIRLS sampling had to be specified so as to meet the sampling precision requirements of the study. Since students were the

applied to each school-sampling frame, to select the sample of schools. In PIRLS, the main reason for considering explicit stratification was to ensure disproportionate allocation of the school sample across strata. For example, a country stratifying by school size might require a specific number of schools from each stratum, regardless of the relative size of the stratum.

- **Implicit stratification** makes use of a single school-sampling frame, but sorts the schools in this frame by a set of stratification variables. This type of stratification is a simple way of ensuring proportional sample allocaconsideJbshple.Gou.0001 9

Each student's sampling weight is a composite of five factors: the school weighting factor, the school weighting adjustment, the class weighting factor, the student

WGTADJ3 Student Weighting Adjustment

This is an adjustment applied to the variable WGTFAC3 to account for non-participating students in the selected school and/or classroom. Multiplying the variables WGTFAC2, WGTFAC3, and WGTADJ3 and adding them up within each school gives an estimate of the number of students within the sampled school.

The five variables listed above are combined to give a student's overall sampling weight. The probability of selecting an individual student is the product of three independent events: selecting the school, the classroom, and the student. To obtain the probability of selection for an individual student, multiply three selection probabilities – school, classroom, and student – and their respective adjustment factors. Inverting this probability gives the sampling weight for the student.

Three versions of the students' sampling weight are provided in the user database. All three give the same figures for statistics such as means and proportions, but vary for statistics such as totals and population sizes. Each one has particular advantages in certain circumstances. These three versions are as follows:

TOTWGT Total Student Weight

This is obtained by simply multiplying the variables WGTFAC1, WGTADJ1, WGTFAC2, WGTFAC3, and WGTADJ3 for the student. The sum of these weights within a sample provides an estimate of the size of the population. Although this is a commonly used sampling weight, it sometimes adds to a very large number, and to a different number within each country. This is not always desirable. For example, if you want to compute a weighted estimate of the mean achievement in the population across all countries, using the variable TOTWGT as your weight variable will lead each country to contribute proportionally to its population size, with the large countries counting more than small countries. Although this is desirable in some circumstances (e.g., when computing the 75th percentile for mathematics achievement for students around the world), in general TOTWGT is not the student weight of choice for cross-country analyses, since it does not treat countries equally, and gives inflated results in significance tests when the proper adjustments are not used.

A key property of the sampling weights is that the same population estimates for means and proportions will be obtained as long as you use a weight variable proportional to the original weights (TOTWGT). For example, you could take the sampling weights for a large country and divide them by a constant to make them smaller. You could also take the weights of a smaller country and multiply them by a constant to make them bigger. Regardless of which constant is used within a country, the weighted estimates obtained from each of these proportional

transformations of the weights will be exactly the same. Two other weight variables are computed and included in the student data files. Each of these is computed for a specific purpose and will yield exactly the same results within each country, but will have some desirable properties when estimates across countries are computed or significance tests are performed.

SENWGT Senate Weight

This variable is computed as

$$SENWGT_{g_i i} = TOTWGT_{g_i i}\left(\frac{500}{\sum_{i=1}^{II} TOTWGT_{g_i i}}\right)$$

for each student, by grade within each country, where *i* is the individual student and *g* is the grade of the student. The transformation of the weights will be different within each country, but in the end the sum of the variable SENWGT within each country will be 500 per grade or 1,000 for both grades. The variable SENWGT, within each country, is proportional to TOTWGT multiplied by the ratio of 500 divided by the sum of the weights over all students in the grade. These sampling weights can be used when international estimates are sought and you want to have each country contribute the same amount to the international estimate. When this variable is used as the sampling weight for international estimates, the contribution of each country is the same, regardless of the size of the population.

HOUWGT House Weight

This variable is computed as

HOUWGTmts

WGTADJ1 School Weighting Adjustment

This is an adjustment that is applied to WGTFAC1 to account for non-participating schools in the sample. If you were to multiply WGTFAC1 by WGTADJ1 you would obtain the sampling weight for the school, adjusted for non-participation.

SCHWGT School-level Weight

The school sampling weight is the inverse of the probability of selection for the school, multiplied by its corresponding adjustment factor. It is computed as the product of WGTADJ1 and WGTFAC1. Although this weight variable can be used to estimate the number of schools with certain characteristics, it is important to keep in mind that the sample selected for PIRLS is a good sample of students, but not necessarily an optimal sample of schools. Schools are selected with probability proportional to their size, so it is expected that there is a greater number of large schools in the sample. For countries that sampled by track within school, the SCHWGT is based on the track size rather than the total school size. This may lead to invalid school-weighted analyses.

With complex sampling designs that involve more than simple random sampling, as in the case of PIRLS where a multi-stage cluster design was used, there are several methods for estimating the sampling error of a statistic that avoid the assumption of simple random sampling. One such method is the jackknife repeated replication (JRR) technique (Wolter, 1985). The particular application of the JRR technique used in PIRLS is termed a paired selection model because it assumes that the sampled population can be partitioned into strata, with the sampling in each stratum consisting of two primary sampling units (PSU), selected independently.

The following variables capture the information necessary to estimate correct standard errors using the JRR technique:

JKZONE

The variable JKZONE indicates the sampling zone or stratum to which the student's school is assigned. The sampling zones can have values from 1 to 75 in

6 Scaling Methodology and Achievement Scores

6.2 PIRLS 2001 Scaling Methodology[3]

The scaling approach used by PIRLS was developed originally by Educational Testing Service for use in the U.S. National Assessment of Educational Progress. It is based on psychometric models that were first used in the field of educational measurement in the 1950s, and have become popular since the 1970s for use in large-scale surveys, test construction, and computer adaptive testing.[4]

Three distinct scaling models, depending on item type and scoring procedure, were used in the analysis of the PIRLS 2001 assessment data. Each is a "latent variable" model that describes the probability that a student will respond in a specific way to an item in terms of the respondent's proficiency, which is an unobserved or "latent"

where

x_i is the response to item *i*, 1 if correct and 0 if incorrect;

θ_k is the proficiency of a person on a scale *k* (note that a person with higher proficiency has a greater probability of responding correctly);

a_i is the slope parameter of item *i*, characterizing its discriminating power;

b_i is the location parameter for the item, characterizing its difficulty;

c_i is the lower asymptote parameter for the item, reflecting the chances of respondents of very low proficiency selecting the correct answer.

The probability of an incorrect response to the item is defined as:

(2)

$$P_{i0} \equiv P\left(x_i = 0 \middle| \theta_k, a_i, b_i, c_i\right) = 1 - P_{i1}\left(\theta_k\right)$$

The two-parameter (2PL) model was used for the short constructed-response items that were scored as correct or incorrect. The form of the 2PL model is the same as Equation 1, with the c_i parameter fixed at zero.

The IRT Model for Polytomous Items

In PIRLS 2001, constructed-response items requiring an extended response were scored for partial credit (with 0, 1, 2, and 3 as the possible score levels). These polytomous items were scaled using a generalized partial credit model (Muraki, 1992). The fundamental equation of this model gives the probability that a person with proficiency θ_k on scale *k* will have, for the *i*-th item, a response x_i that is scored in the *l*-th of m_i ordered score categories:

(3)

$$P\left(x_i = l \middle| \theta_k, a_i, b_i, d_{i,l}, \mathrm{K}\, d_{i,m_i-l}\right) = \frac{\exp\left[\sum_{v=0}^{l} 1.7a_i\left(\theta_k - b_i + d_{i,v}\right)\right]}{\sum_{c=0}^{m_i-1_j} \exp\left[\sum_{v=0}^{c} 1.7a_i\left(\theta_k - b_i + d_{i,v}\right)\right]} = P_{il}\left(\theta_k\right)$$

where:

m_i is the number of response categories for item *i*;

x_i is the response to item *i*, possibilities ranging between 0 and $mi - 1$;

θ_k is the proficiency of person on a scale *k*;

$$t^*(x, y) = E\left[t(\theta, y) \middle| x, y\right]$$

$$= \int t(\theta, y)\, p(\theta \mid x, y)\, d\theta$$

It is possible to approximate *t** using random draws from the conditional distribution of the scale proficiencies given the student's item responses x_j, the student's background variables y_j, and model parameters for the student. These values are referred to as imputations in the sampling literature, and as plausible values in large-scale surveys such as TIMSS, NAEP, NALS, and IALLS. The value of θ for any respondent that would enter into the computation of *t* is thus replaced by a randomly selected value from his or her conditional distribution. Rubin (1987) proposed repeating this process several times so that the uncertainty associated with imputation can be quantified. For example, the average of multiple estimates of *t*, each computed from a different set of plausible values, is a numerical approximation of *t** of Equation 4; the variance among them reflects uncertainty due to not observing θ

Conditioning

A multivariate normal distribution was assumed for $P(\theta_j \mid x_j, y_j, \Gamma, \Sigma)$, with a common variance, Σ, and with a mean given by a linear model with regression parameters, Γ. Since, in large-scale studies like PIRLS, there are many hundreds of background variables, it is customary to conduct a principal components analysis to reduce the number to be used in Γ. Typically, components representing 90 percent of the variance in the data are selected. These principal components are referred to as the conditioning variables, and denoted as y^c. The following model is then fit to the data:

(6)

$$\theta = \Gamma' y^c + \varepsilon$$

In Equation 6, ε is normally distributed with mean zero and variance Σ. As in a regression analysis, Γ is a matrix each of whose columns is the effects for each scale, and Σ is the matrix of residual variance between scales.

Note that, in order to be strictly correct for all functions Γ of θ, it is necessary that $P(\theta \mid y)$ be correctly specified for all background variables in the survey. Estimates of

For respondents with an insufficient number of responses, the Γ and Σs described in the previous paragraph are fixed. Hence, all respondents – regardless of the number of items attempted – are assigned a set of plausible values.

The plausible values can then be employed to evaluate an arbitrary statistic *T* as follows:

1. Using the first vector of plausible values for each respondent, evaluate *T* as if the plausible values were the true values of θ. Denote the result T_1.

2. As in step 1 above, evaluate the sampling variance of *T*, or $Var(T_1)$, with respect to respondents' first vectors of plausible values.

3. Carry out steps 1 and 2 for the second through fifth vectors of plausible values, thus obtaining T_u and Var_u for $u=2, \ldots, M$, where *M* is the number of imputed values.

4. The best estimate of *T* obtainable from the plausible values is the average of the five values obtained from the different sets of plausible values:

$$T_{\cdot} = \frac{\sum T_u}{5}$$

5.

If θ values were observed for all sampled respondents, the statistic $(t-T)/U^{1/2}$ would follow a *t*-distribution with *d* degrees of freedom. Then the incomplete-data statistic $(t^*-T)/(Var(t^*))^{1/2}$ is approximately t-distributed, with degrees of freedom (Johnson & Rust, 1993) given by:

$$v = \frac{1}{\frac{f_M}{M-1} + \frac{(1-f_M)}{}}$$

where *d* is the degrees of freedom for the complete-data statistic, and *f* is the proportion of total variance due to not observing θ values:

$$f_M = \frac{(1+M^{-})B_M}{V_M}$$

where B_M is the variance among *M* imputed values and V_M is the final 78333 -4.75.6 505.92 Tm0Tc6.553

6.3 Student Achievement Scores

The PIRLS international database contains several student-level achievement scores, including the plausible values described in this chapter. These scores were computed at different stages of the study to serve specific purposes. This chapter presents a description of these achievement scores, how they were derived, how they were used by PIRLS, and how users of the database can use them. For identification purposes, the first letter for the variable name identifies the population for which the score was computed. The scores computed for Population 1 (4th Grade) have the letter A as the first character. This convention has been followed with other background and derived variables and with the files included in the database.

Achievement Scores in the Student Files

Four types of achievement scores are included in the student data files: plausible values, raw scores, standardized raw scores, and national Rasch scores. Each type is described below.

Reading Scores: Plausible Values

As described earlier in this chapter, PIRLS made use of multiple imputation or plausible values methodology to provide estimates of student proficiency in reading. Because of the uncertainty involved in the imputation process, PIRLS produced not one but five imputed values for each student. The plausible values available for each of the PIRLS 2001 reading scales are listed in Exhibit 6.1; those for the trends in IEA's Reading Literacy Study reading scales are listed in Exhibit 6.2.

The need for plausible values arises from the fact that any student was administered only a fraction of the items in the assessment, as described in Chapter 2. Time constraints did not allow for all the items to be administered to each student. A plausible value is an estimate of how the individual student would have performed on a test that included all possible items in the assessment. Since no student responded to all items, this estimate is based on the responses to the items that were included in the test booklet that the student actually took, and the performance of students with similar characteristics based on their responses to the background questionnaire.

Overall reading plausible values were standardized so that the mean is equal to 500 and the standard deviation equals 100 when all countries are weighted equally. One set of plausible values can be considered as good as another. Each of these sets is equally well-designed to estimate population parameters, although the estimates will differ somewhat. This difference is attributable to imputation variance, which contributes to the uncertainty of the estimate. Five sets of plausible values are provided so that analyses can be replicated as many as five times. Results which vary

Exhibit 6.5 Standardized Scores Included in the PIRLS Data Files

Variable	Description
ASASTDR	Standardized raw score points on the Antarctica Block
ASCSTDR	Standardized raw score points on the Clay Block
ASFSTDR	Standardized raw score points on the Flowers Block
ASHSTDR	Standardized raw score points on the Hare Block
ASLSTDR	Standardized raw score points on the Leonardo Block
ASMSTDR	Standardized raw score points on the Mice Block
ASNSTDR	Standardized raw score points on the Pufflings Block
ASRSTDR	Standardized raw score points on the River Trail Block

Exhibit 6.6 Standardized Scores Included in the Reading Literacy Study Data Files

Variable	Description
ASASTDR	Standardized raw score points on all the items
ASDSTDR	Standardized raw score points on the document items
ASESTDR	Standardized raw score points on the expository items
ASNSTDR	Standardized raw score points on the narrative items

National Rasch Scores

The national Rasch scores were also computed for preliminary analyses. These provided a basic Rasch score for preliminary analyses within countries, but cannot be used for international comparisons, since each block within each country has been assigned the same mean score. The national Rasch scores were computed by standardizing block logit scores to have a weighted mean of 150 and a standard deviation of 10 within each country. The logit scores were computed using the Quest Rasch analysis software; Quest provides maximum likelihood (ML) estimates of a scaled score, based on the one-parameter Rasch model, for the performance of students on a set of items. These logit scores were obtained using item difficulties that were computed for each country using all available item responses for the country and centering the item difficulty around zero. When computing the item difficulties, responses marked as "not reached" were treated as items that were not administered. This avoided giving inflated item difficulties to the items located at the end of the test in cases where students systematically do not reach the end of the test. These item difficulties were then used to compute logit scores for each student.

6.4 International and National Benchmarks of Achievement

In order to provide more information about student achievement, PIRLS identified four points on the reading scales for use as international benchmarks. The Top 10 percent Benchmark was defined as the 90th percentile on the PIRLS scale, computed across all students in all participating countries, with countries weighted in proportion to the size of their fourth-grade population. This point on each scale is the point above which the top 10 percent of students in the PIRLS assessment scored. The Upper Quarter Benchmark is the 75th percentile on the scale, above which the top 25 percent of students scored. The Median Benchmark is the 50th percentile, above which the top half of students scored. Finally, the Lower Quarter Benchmark is the 25th percentile, the point reached by the top 75 percent of students.

If all countries had the same distribution of student achievement, approximately 10 percent of students in each country would be above the

Exhibit 6.10 PIRLS International Benchmarks of Reading for Literary Purposes Achievement

Proficiency Score	25th Percentile	50th Percentile	75th Percentile	90th Percentile
Plausible Value 1	434.335	509.255	571.206	622.816
Plausible Value 2	435.964	510.496	571.238	620.814
Plausible Value 3	435.295	509.981	571.043	622.122
Plausible Value 4	434.653	509.567	571.388	621.975
Plausible Value 5	434.424	509.711	571.775	620.954

Exhibit 6.11 PIRLS International Benchmarks of Reading to Acquire and Use Information Achievement

Proficiency Score	25th Percentile

7.1 Overview

When analyzing data from complex designs such as PIRLS, it is important to compute correct error variance estimates for the statistics of interest. In PIRLS this error variance comes from two sources: the sampling process and the imputation process. This chapter describes the methods used to estimate each of these error variance components.

7.2 Estimating Sampling Variance

With complex sampling designs that involve more than simple random sampling, as in the case of PIRLS where a multi-stage cluster design was used, there are several methods for estimating the sampling error of a statistic that avoid the assumption of simple random sampling. One such method is the jackknife repeated replication (JRR) technique (Wolter, 1985). The particular application of the JRR technique used in PIRLS is termed a paired selection model because it assumes that the sampled population can be partitioned into strata, with the sampling in each stratum consisting of two primary sampling units (PSU), selected independently. Following this first-stage sampling, there may be any number of subsequent stages of selection that may involve equal or unequal probability selection of the corresponding elements. The PIRLS design called for a total of 150 schools for the target population. These schools constituted the PSUs in most countries, and were paired sequentially after sorting by a set of implicit stratification variables. This resulted in the implicit creation of 75 strata, with two schools selected per stratum.

The jackknife repeated replication (JRR) method is suitable for estimating sampling errors in the PIRLS design because it provides approximately unbiased estimates of the sampling error arising from the complex sample selection procedure for estimates such as percentages, totals, and means. In addition, this method can also be readily adapted to the estimation of sampling errors for parameters estimated using other statistical modeling procedures, such as percent-correct technology. The general use of the JRR entails systematically assigning pairs of schools to sampling zones, and the random selection of one of these schools to have its contribution doubled, and the other zeroed, so as to construct a number of “pseudo-replicates” of the original sample. The statistic of interest is computed once for all of the original sample, and once more for each of the pseudo-replicate samples. The variation between the original sample estimate and the estimates from each of the replicate samples is the jackknife estimate of the sampling error of the statistic.

Computing Sampling Variance Using the JRR Method

When implementing the JRR method in PIRLS, for each country, it was assumed that there were up to 75 strata or zones (H) within each country, each one containing two sampled schools selected independently. When computing a statistic "*t*" from the sample for a country, the formula for the JRR variance estimate of the statistic *t* is then given by the following equation:

(1)

$$Var_{jrr}(t) = \sum_{h=1}^{H} \left[t(J_h - t(S)) \right]^2$$

where *H* is the number of pairs in the entire sample for the country. The term *t(S)* corresponds to the statistic computed for the whole sample (computed with any specific weights that may have been used to compensate for the unequal probability of selection of the different elements in the sample or any other post-stratification weight). The element $t(J_h)$ denotes the same statistic using the *h*th jackknife replicate, computed for all cases except those in the *h*th stratum of the sample, removing all cases associated with one of the randomly selected units of the pair within the *h*th stratum, and including, twice, the elements associated with the other unit in the *h*th stratum. In practice, this is effectively accomplished by recoding to zero the weights for the cases of the element of the pair to be excluded from the replication, and multiplying by two the weights of the remaining element within the *h*th pair. This results in a set of *H* replicate weights that may be used in computing the JRR variance estimate.

As can be seen from the above formula, the computation of the JRR variance estimate for any statistic from the PIRLS database requires the computation of any statistic up to 76 times for any given country: once to obtain the statistic for the full sample, and up to 75 times to obtain the statistics for each of the jackknife replicates (J_h). The number of times a statistic needs to be computed for a given country will depend on the number of implicit strata or sampling zones defined for the sample.

Note that when using the JRR technique for the estimation of sampling variability, the approach will appropriately reflect the combined effect of the between- and within-sampling zone contributions to the variance.

Doubling and zeroing the weights of the selected units within the strata or "zones" is accomplished effectively with the creation of replicate weights that ished 0ation onDoubling and zer3..1302 TD appr

7.5 Comparing Achievement with the International Mean

Many of the data exhibits in the *PIRLS 2001 International Report* (Mullis et al., 2003) show countries' mean achievement compared with the international mean, and you might be interested in replicating some of these analyses or doing some analysis of your own.

When comparing a country's mean with the international average, PIRLS took into account the fact that the country contributed to the international standard error. To correct for this contribution the sampling component of the standard error of the difference for country *j* was computed as follows:

(6)

$$se_{s\_dif\_j} = \frac{}{N - 1}$$

differences between boys and girls once for each of the 75 replicate samples, and five more times, once for each plausible value. These differences are then summarized into an error of the difference using the formula presented earlier in this chapter.

Chapters 9 and 10 include macros that can be easily used to compute these differences by using contrast variables and regression models.

8 Content and Format of Database Files

8.1 Overview

Data Files

Data Almanacs

Codebook Files

Program Files

-
-
-
-
-
-

Background Variable Naming Convention

-
-
-

-
-
-
-
-
-
-

Background Item Response Code Values

Achievement Item Response Code Values

Missing Code Values

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

Uninterpretable Response Codes (ASCII: 7; SAS: .N; SPSS: 7)

Not Administered Codes (ASCII: 8, 98, 998, ... ; SAS: .A ; SPSS: 8, 98, 998, ...)

-
-
-
-
-

IDCLASS

IDBOOK

IDTEACH

IDLINK

Linking and Tracking Variables

■ ■ ■

[4] Survey tracking forms are listings of students, teachers, or schools used for sampling and administration purposes.

Sampling and Weighting Variables

Achievement Variables

PIRLS Background Data Files

Student Background File

Home Background File

PIRLS Student-Teacher Linkage Files

Reading Literacy Student Background and Achievement Data Files

8.3 Data Almanacs

-
-
-

•

-

8.6 Item Information Files

-
-
-
-
-
-
-
-
-
-
-

9.1 Overview

This chapter presents some basic examples of analyses that can be performed with the PIRLS International Database using the sampling weights and scores discussed in previous chapters. It also provides details on selected SPSS programs to conduct such analyses, and the results of these analyses. The analyses presented here are simple in nature, and are designed primarily to familiarize you with the different files and their structure, as well as the relevant variables that need to be used in most analyses. The programs compute the percentage of students in specified subgroups, the mean reading achievement for those groups, and the corresponding standard errors for the percentage and mean statistics. Additionally, some examples of regression statistics are presented. These analyses, based on student, home, teacher and school data, replicate some of the analyses that are included in the *PIRLS 2001 International Report* (Mullis et al., 2003). You are encouraged to practice analyzing the PIRLS data by replicating the analyses used to produce the exhibits that are presented in the international report.

In our examples we use macros written for SPSS that can be used to perform any of the analyses that are described in this chapter. These are general procedures that can be used for many purposes, provided you have some basic knowledge of the SPSS

The following programs also can be found in this sub-directory:

ASASCRR1.SPS, ASASCRT1.SPS and ASASCRT2.SPS

These files contain SPSS programs that can be used to convert the response codes to the cognitive items to their corresponding correctness score levels. The use of these programs is described in this chapter.

JACKPV.SPS

This macro program in SPSS can be used to compute weighted percentages of students within defined groups, and their mean achievement scores on an achievement scale using plausible values. This macro makes use of the plausible values in computing the mean achievement scores. This macro also generates replicate weights and computes the jackknife repeated replication (JRR) sampling variances for the percentages of students within the group, and the JRR and imputation variances for the mean achievement scores. This macro should only be used when multiple plausible values are used in the analysis.

JACKGEN.SPS

This macro program in SPSS can be used to compute weighted percentages of students within defined groups, and their means on a specified continuous variable. This macro also generates replicate weights and computes JRR sampling variances for the percentages and mean estimates. The variable can be any continuous variable in the file. How to use each of these macro programs is described later in this chapter. If computing with plausible values, you will need to use the macro JACKPV.SPS.

JACKREG.SPS

This macro program in SPSS can be used to compute regression coefficients and their corresponding standard errors within defined groups. This macro can be used with any variable in the analysis but it does not make use of plausible values.

JACKREGP.SPS

This macro program in SPSS can be used to compute regression coefficients and their corresponding standard errors when using plausible values as the dependent variables within defined groups.

Each of the macros above has a corresponding sample program that calls the macro and prints out the results. These programs are discussed later in the chapter.

EXAMPLE1.SPS, EXAMPLE2.SPS, EXAMPLE3.SPS, EXAMPLE4.SPS, EXAMPLE5.SPS

These are the programs used in the samples presented later in this chapter.

5.

Code 6	Not reached
Code 7	Invalid response (e.g., a student chose more than one of the options available)
Code 8	Not administered
Code 9	No response although the item was administered and was reached (i.e., item was omitted).

The remaining items were constructed-response type, where the students were asked to construct a response to a question, rather than choosing an answer from a list of options. Responses were either short-answer or extended-response, depending upon the complexity of the task. Constructed-response items were worth a total of one, two, or three points. Scorers trained to use the scoring rubrics described in Chapter 2 of this guide scored the answers to these questions. The codes used to represent the responses to these items are the following:

Code 3	Three-point answer
Code 2	Two-point answer
Code 1	One-point answer
Code 0	Zero-point answer or uninterpretable response
Code 6	Not reached
Code 8	Not administered.

responses) for the purpose of calibrating the items. But these same responses were then recoded as incorrect when scoring the item for the individual countries, and for the purpose of calculating the scale scores for individuals. By default, the scoring program provided with the database recodes the items coded as not reached and those left blank as incorrect responses.

To use the SCOREIT macro you need to include it as part of the SPSS programs

```
         Item  =  <list items where option B is the correct one>  /
         RIGHT  = 2  /  nr  = 6  /  na  = 8  /  om  = 9  /  other  = 7.

SCOREIT  Type  = MC  /
         Item  =  <list items where option C is the correct one>  /
         RIGHT  = 3  /  nr  = 6  /  na  = 8  /  om  = 9  /  other  = 7.

SCOREIT  Type  = MC  /
         Item  =  <list items where option D is the correct one>  /
         RIGHT  = 4  /  nr  = 6  /  na  = 8  /  om  = 9  /  other  = 7.

SCOREIT  Type  = OE  /
         Item  =  <list open-ended items>  /
         RIGHT  =  0 /  nr  = 96 /  na  = 98 /  om  = 99 /  other  = 90.
```

9.5 Basic Analyses with the PIRLS Data: Means, Percentages, Regression Coefficients, and Their JRR Standard Errors

In this section, four macros that can be used to compute the correct standard errors of sampling and imputation are described – including examples in which these macros are used to replicate exhibits in the *PIRLS 2001 International Report* and almanacs.

Computing Sampling and Imputation Variance for Plausible Values Using SPSS (JACKPV.SPS)

This section presents example SPSS code that can be used to compute the JRR standard errors for mean plausible values and percentages. This code is provided in the form of an SPSS macro that computes the percentages of students within subgroups defined by a set of classification variables, the JRR standard errors of these percentages, the means for the groups on one of the achievement scales using plausible values, and the standard errors of these means including the sampling and imputation variance components.

When using this macro, you need to specify a set of classification variables, the name of the plausible values and how many there are, the number of replicate weights to be generated, the variables that contain the sampling information such as JKZONE and JKREP, and the sampling weight that is to be used for the analysis. You will also need to specify the data file that contains the data to be processed.

You need to know some basic SPSS macro language in order to use JACKPV.SPS. The macro should be included in the program file where it is going to be used. If you are operating in batch mode, then the macro should be called in every batch. If you are using SPSS interactively, then the macro should be called once at the beginning of the session and it will remain active throughout the session. If the session is terminated and restarted at a later time the macro should be called once again. Once the macro is included in a specific session the word “JACKPV” should not be used within that session because doing so will call the macro.

The macro is included in the program

JKR	The variable that captures whether the case is to be dropped or have its weight doubled for the corresponding replicate weight. The name of this variable in all PIRLS files is JKREP.
NJKZ	This indicates the number of replicate weights to be generated when computing the JRR error estimates. When conducting analyses using the data from all countries, the value of NJKZ should be set to 75, the maximum possible value. When you are working with the data for only one country, you should set the NJKZ argument to as many replicates as are needed in the country. If the data from two or more countries are being used for an analysis, then the largest number of jackknife zones should be used. When in doubt about what number to set the NJKZ parameter to, set it to 75. The error variance will always be estimated correctly if more replicate weights than necessary are computed, but will be underestimated if you specify fewer.
WGT	The sampling weight to be used in the analysis, generally TOTWGT when using the student files, or TCHWGT when using the teacher files.

The simplest and most straightforward way to call the macro is by using the conventional SPSS notation for calling macros. This involves listing the macro name followed by the corresponding list of arguments for the analysis, each separated by a slash. For example, if the macro is called using the following code

```
include “c:\pirls\programs\jackpv.sps”.

jackpv infile= “c:\pirls\data\asgallr1.sav”  /
       cvar  = idcntry itsex /
       pvs   = ASRREA01 to ASRREA05 /
       npv   = 5        /
       jkz   = JKZONE   /
       jkr   = JKREP    /
       njkz  = 75       /
```

The file that contains these results is then called FINAL and is saved to the default directory being used by SPSS. The variables that are contained in this file are:

Classification Variables

Each of the classification variables is kept in the resulting file. In the above example there are two classification variables in the FINAL data set, IDCNTRY and ITSEX. There is one unique occurrence for each combination of the categories for these variables.

Weight Variable

Contains the estimate of the population size of the groups defined by each specific combination of the classification variable categories. In our example this

MNPV

Contains the means of the plausible values used in the analysis.

MNPV_SE

Contains the standard errors for the means of the plausible values. These standard errors contain the sampling and the imputation components of the errors of the estimates.

The file resulting from using this macro can be printed using an SPSS procedure of choice. An example call to this macro and a printout of the resulting file is presented in Exhibit 9.3 . This code is included in the file SampleJackPV.SPS on the CD that accompanies the User Guide.

Exhibit 9.3 SPSS Control Code and Extract of Output File for Using the Macro JACKPV.SPS

```
get file = "c:\pirls\data\asgallr1.sav"
 / keep=idcntry idstud idgrader jkrep jkzone totwgt
        itsex asrrea01 to asrrea05 inprl01.

select if (itsex=1 or itsex=2) and inprl01=1.

save outfile = student.

include "c:\pirls\programs\jackpv.sps".

jackpv infile= student  /
       cvar  = idcntry itsex /
       pvs   = ASRREA01 TO ASRREA05 /
       npv   = 5        /
       jkz   = JKZONE   /
       jkr   = JKREP    /
       njkz  = 75       /
       WGT   = TOTWGT   .

print formats idcntry itsex n (F6.0) totwgt (f10.0)
      mnpv mnpv_se mnx mnx_se pct pct_se (f6.2).

report format=list
 / var = idcntry itsex n totwgt mnpv mnpv_se mnx mnx_se pct pct_se.
```

IDCNTRY	ITSEX	N	TOTWGT	MNPV	MNPV_SE	MNX	MNX_SE	PCT	PCT_SE
32	1	1647	358324	428.18	6.24	427.63	6.19	50.68	1.06
32	2	1645	348747	410.04	6.50	407.13	6.17	49.32	1.06
84	1	1415	3573	341.73	5.44	342.03	5.27	49.71	.93
84	2	1414	3615	314.56	5.37	312.68	5.20	50.29	.93
100	1	1783	49229	562.29	3.69	562.42	3.58	51.47	.91
100	2	1675	46418	538.06	4.67	537.63	4.63	48.53	.91
124	1	4121	109940	552.89	2.62	553.12	2.56	49.53	.67
124	2	4131	112039	535.58	2.55	535.67	2.52	50.47	.67
.									
.									
.									
705	1	1468	10551	512.34	2.52	511.39	2.44	50.09	.82
705	2	1484	10515	490.65	2.38	490.97	2.28	49.91	.82
752	1	2965	57583	572.27	2.62	572.06	2.53	48.74	.73
752	2	3079	60551	550.31	2.53	550.83	2.45	51.26	.73
792	1	2426	470383	459.37	3.96	458.57	3.90	48.13	.92
792	2	2699	506933	440.06	3.73	440.15	3.69	51.87	.92
807	1	1814	13392	452.24	5.14	452.15	5.06	48.94	.88
807	2	1897	13973	431.37	4.76	431.15	4.73	51.06	.88

840	1	1911	1927005	551.06	3.80	551.97	3.73	50.68	.82
840	2	1852	1875552	532.99	4.89	531.22	4.66	49.32	.82

In this example, the mean of all five plausible values and the mean of the first plausible value and their corresponding standard errors for reading achievement are calculated separately for boys and girls by country. In the listing of the results we can see that there are entries for each country corresponding to the results for females (ITSEX = 1) and males (ITSEX = 2). The first column has the country code, the second column indicates the gender of the students, the third column has the number of students in each sample, and the fourth column has the total weight of this sample in the population. This is followed by the mean of all five plausible values in reading achievement and the corresponding standard error. Following this is the mean of the first plausible value in reading achievement and its corresponding standard error. The last two columns indicate the percentage of girls and boys in each country's sample and their corresponding standard errors.

For example, Argentina (IDCNTRY=32) sampled 1,647 girls representing 358,324 students in the whole population. The mean of the five plausible values for these girls is 428.18 with a standard error of 6.24. Girls made up 50.68 percent of Argentina's sampled students. The mean of the first plausible value for the girls is 427.63 with a standard error of 6.19. Additionally, Argentina sampled 1,645 boys representing 348,747 students in the whole population. The mean of the five

plausible values for these boys is 410.04 with a standard error of 6.50. Boys made up 49.32 percent of Argentina's sampled students. The mean of the first plausible value for the boys is 407.13 with a standard error of 6.17.

Computing Sampling Variance for Variables Other Than Plausible Values Using SPSS (JACKGEN.SPS)

You need to know some basic SPSS macro language in order to use the macro. First, it needs to be included in the program file where it is going to be used. If you are operating in batch mode, then the macro needs to be called in every batch. If you are using SPSS interactively, then the macro needs to be called only once at the beginning of the session and it will remain active throughout the session. If the session is terminated and restarted at a later time the macro needs to be called once again. Once the macro is included in a specific session, the word "JACKGEN" should not be used within that program because doing so will call the macro.

The macro is included in the program file where it will be used by issuing the following command under SPSS:

```
include '<path>jackgen.sps'.
```

where <path> points to the specific drive and directory where the macro JACKGEN.SPS can be found. The macro requires that several parameters be specified when it is called. These parameters are:

INFILE	The name of the data file that contains the variables necessary for the analysis. If the path location is included as part of the file name the name of the file has to be enclosed in quotes. It is important to emphasize that this system file must include only those cases that are of interest in the analysis. If you want to have specific cases excluded from the analysis (e.g., students with missing variables or selected students from a specific grade), this should be done prior to calling the macro.
CVAR	This lists the variables that are to be used to classify the students in the data file. This can be a single variable, or a list of variables. The maximum number of variables will depend mostly on the computer resources available to you at the time. It is recommended to always include the variable that identifies the country. At least one variable has to be specified, usually IDCNTRY.
DVAR	This is the variable for which means are to be computed. Only one variable can be listed here. If you want to examine, for example, results in two different variables, then the macro needs to be called separately to generate each table.
NJKZ	This indicates the number of replicate weights to be generated when computing the JRR error estimates. When conducting analyses using the data from all countries, the value of NJKZ should be set to 75, the maximum possible value. When you are working with the data for only one country, you should set the

NJKZ argument to as many replicates as are needed in the country. If the data from two or more countries are being used for an analysis, then the largest number of jackknife zones should be used. When in doubt about what number to set the NJKZ parameter to, set it to 75. The error variance will always be estimated correctly if more replicate weights than necessary are computed, but will be underestimated if you specify fewer.

JKZ — The variable that captures the assignment of the student to a particular sampling zone. The name of this variable in all PIRLS and Reading Literacy Study files is JKZONE.

JKR — The variable that captures whether the case is to be dropped or have its weight doubled for the corresponding replicate weight. The name of this variable in all PIRLS and Reading Literacy Study files is JKREP.

WGT — The sampling weight to be used in the analysis, generally TOTWGT when using the student files, or TCHWGT when using the teacher files.

The simplest and most straightforward way to call the macro is by using the conventional SPSS notation for invoking macros. This involves listing the macro name followed by the corresponding list of arguments for the analysis, each separated by a slash. For example, if the macro is called using the following code:

```
include “c:\pirls\programs\jackgen.sps”.

jackgen
      infile = asgallr1         /
      cvar   = idcntry          /
      dvar   = asdgage          /
      njkz   = 75               /
      jkz    = jkzone           /
      jkr    = jkrep            /
      wgt    = totwgt           .
```

Weight Variable

Contains the estimate of the population size of the groups defined by each specific combination of the classification variable categories. In our example this variable is called TOTWGT.

MNX

Contains the means of the variable DVAR for the groups defined by the corresponding combinations of classification variable categories.

MNX_SE

Contains the standard errors of the MNX values computed using the JRR method for computing the standard error.

PCT

Contains the percentages of people in the groups for the classification variable listed last, within the specific combination of the categories defined by the groups initially. In our example, we would obtain the percentage of students by grade for each country.

PCT_SE

Contains the standard errors of PCT computed using the JRR method for computing the standard error.

The file resulting from using this macro can then be printed using the SPSS procedure of choice. An example call to this macro, and a subset of the resulting file, is presented in Exhibit 9.4. In this example, the macro will compute the percentages

Exhibit 9.4 SPSS Control Code and Extract of Output File for Using the Macro JACKGEN.SPS

```
get file = "c:\pirls\data\asgallr1.sav"
   / keep=idcntry idstud inprl01 jkrep jkzone totwgt
          asdgage.

select if not(missing(asdgage)) and inprl01=1.

save outfile = student.

include "c:\PIRLS\programs\jackgen.sps".

jackgen
      infile = student  /
      cvar   = idcntry  /
      dvar   = asdgage  /
      njkz   = 75       /
      jkz    = jkzone   /
      jkr    = jkrep    /
      wgt    = totwgt   .

print formats idcntry n (f6.0) totwgt (f10.0) mnx mnx_se pct pct_se (F6.2).
```

Computing Regression Coefficients and Their JRR Standard Errors for Variables Other Than Plausible Values (JACKREG.SPS)

In this section, example SPSS code that may be used to compute regression coefficients and their JRR standard errors is described. The CD containing the PIRLS International Database contains the SPSS macro program called JACKREG.SPS. The macro computes the multiple correlation between the specified dependent and independent variables within a subgroup defined by a set of classification variables, as well as the regression coefficients and the JRR standard error of the regression coefficients.

If you wish to conduct regression analyses using plausible values as the dependent variable, please refer to the macro JACKREGP.SPS described in the next section.

When using this macro, you need to specify a set of classification variables, the dependent and independent variable, the number of replicate weights to be generated, the variables that contain the sampling information such as JKZONE and JKREP, and the sampling weight that is to be used for the analysis. You will also need to specify the data file that contains the data that is to be processed.

You need to know some basic SPSS macro language in order to use the macro. First, it needs to be included in the program file where it is going to be used. If you are operating in batch mode, then the macro needs to be called in every batch. If you are using SPSS interactively, then the macro needs to be called once at the beginning of the session and it will remain active throughout the session. If the session is terminated and restarted at a later time the macro needs to be called once again. Once the macro is included in a specific session the word “JACKREG” should not be used within that program because doing so will call the macro.

The macro is included in the program file where it will be used by issuing the following command under SPSS:

```
include ‘<path>jackreg.sps’.
```

where <path> points to the specific drive and directory where the macro JACKREG.SPS can be found. The macro requires that several parameters be specified when it is called. These parameters are:

INFILE The name of the data f5.1(ii6ac)5.14tf527.4cTsto te is cals mmand ero

CVAR — This lists the variables that are to be used to classify the students in the data file. This can be a single variable, or a list of variables. The maximum number of variables will depend mostly on the computer resources available to you at the time. It is recommended to always include the variable that identifies the

The simplest and most straightforward way to call the macro is by using the conventional SPSS notation for calling macros. This involves listing the macro name followed by the corresponding list of arguments for the analysis, each separated by a slash. For example, if the macro is called using

```
include “c:\pirls\programs\jackreg.sps”.

jackreg  infile  = asgallr1   /
   cvar    = idcntry idgrader /
   xvar    = regsex    /
```

of the estimate. The first regression coefficient (B01) is the difference in the average value of the variable ASBGTVDY between the boys and the girls, and the standard error of this coefficient (B01_SE) is the jackknifed standard error of this difference.

For example, from the fourth line in the output we can say that in Canada (IDCNTRY = 124), data is available for 8,185 cases. The coefficient of determination between gender and hours of watching TV or video is .022 with girls, on average, reporting watching less TV or videos every day (difference in average score of 0.35). This difference is statistically significant (0.35 / .04 = 8.75). Overall, we can say that on average, and across most countries (except Argentina), girls report watching less TV or videos than boys. This difference is significant in most cases, which can be determined by dividing the value of B01 by its standard error and comparing it to the appropriate critical value.

Computing Regression Coefficients and Their JRR Standard Errors with Plausible Values (JACKREGP.SPS)

In this section, example SPSS code that can be used to compute the JRR standard errors for regression coefficients using plausible values as the dependent variable is described. This code is provided in the form of an SPSS macro called JACKREGP.S monhe JRmacro computes the average multiple correlation coefficient

between the specified plausible values and independent variables within subgroups defined by a set of classification variables, as well as the regression coefficients and their JRR standard errors.

When using th JRmacro, you need to specify a set of classification variables, the independent and dependent variables, the number of replicate weights to be generated, the variables that contain the sampling information such as JKZONE and JKREP, and the sampling weight that is to be used for the analysis. You will also need to specify the data file that contains the data that is to be processed.

You need to know some basic S mSRmacro language in order to use the macro. First, it needs to be included in the program file where it JRgoing to be used. If you are operating in batch mode, then the macro needs to be called in every batch. If you are using S mS nteractively, then the macro needs to be called once at the beg nning of the session, and will remain active thrn3(c3t)5.3(mpa.5(uiy2eSR)5.2(in t)5.1s som)5.5(e)-.3(ess1(e is)]TJ0 -

for an analysis, then the largest number of jackknife zones should be used. When in doubt about what number to set the NJKZ parameter to, set it to 75. The error variance will always be estimated correctly if more replicate weights than necessary are computed, but will be underestimated if you specify fewer.

JKZ — The variable that captures the assignment of the student to a particular sampling zone. The name of this variable in all PIRLS files is JKZONE.

JKR — The variable that captures whether the case is to be dropped or have its weight doubled for the corresponding replicate weight. The name of this variable in all PIRLS files is JKREP.

WGT — The sampling weight to be used in the analysis, generally TOTWGT when using the student files, or TCHWGT when using the teacher files.

The simplest and most straightforward way to call the macro is by using the conventional SPSS notation for invoking macros. This involves listing the macro name followed by the corresponding list of arguments for the analysis, each separated by a slash. For example, if the macro is called using

```
include “c:\pirls\programs\jackregP.sps”.

jackregp  infile  = asgallr1  /
   cvar     = idcntry idgrader  /
   xvar     = regsex    /
   rootpv   = asrrea0   /
   npv      = 5         /
   njkz     = 75        /
   jkz      = jkzone    /
   jkr      = jkrep     /
   wgt      = totwgt    .
```

it will compute the regression equation for the variable REGSEX as a predictor of the plausible values in reading. The data will be read from the data set ASGALLR1 and the standard error of the statistics will be computed based on 75 replicate weights.

The file that contains these results is then called REG and is saved to the default directory being used by SPSS. The variables that are contained in this file are:

Classification Variables

Each of the classification variables is kept in the resulting file. In our example above there would be two variables in the resulting system file, IDCNTRY and IDGRADER. There is one unique occurrence for each combination of the categories for these variables.

- Use the macro JACKGEN with the corresponding arguments and parameters.
- Print out the result file.

Exhibit 9.7 SPSS Control Statements for Performing Analyses with Student-Level Variables NOT Using Plausible Values (EXAMPLE1.SPS)

```
title “Example 1: PIRLS 2001 User Guide”.
add files
 / file = “c:\pirls\data\asgargr1.sav”
 / file = “c:\pirls\data\asgbgrr1.sav”
 / file = “c:\pirls\data\asgswer1.sav”
 / file = “c:\pirls\data\asgturr1.sav”
 / file = “c:\pirls\data\asgusar1.sav”.

select if not(missing(asbgtvdy)).

value labels
 idcntry  32 ‘Argentina’ 100 ‘Bulgaria’ 752 ‘Sweden’ 792 ‘Turkey’ 840 ‘United
States’.

recode asbgtvdy (1=0.0) (2=0.5) (3=2.0) (4=4.0) (5=7.0) (else=copy) into
tvwatch.

save outfile = student.

* Now use the macro to get the results.
include “c:\pirls\programs\jackgen.sps”.

jackgen
      infile = student          /
      cvar   = idcntry          /
      dvar   = tvwatch          /
      njkz   = 75               /
      jkz    = jkzone           /
      jkr    = jkrep            /
      wgt    = totwgt    .

sort cases by idcntry .

print format n (f6.0) totwgt (f10.0) mnx mnx_se pct pct_se (f6.2).

report format=list automatic
 / var   = n totwgt mnx mnx_se pct pct_se
 / break = idcntry .
```

```
sort cases by idcntry.

print formats n (f6.0) totwgt (f10.0) mnpv mnpv_se pct pct_se (f6.2).

report format=list automatic
  / var   = asbgbook (label) n totwgt mnpv mnpv_se pct pct_se
  / break = idcntry .
```

Exhibit 9.11 Extract of SPSS Computer Output for Performing Analyses

while the 144 students (5.93 percent of the sampled students) who reported having "More than 200 books" have a mean reading achievement of 473.98 with a standard error of 12.58.

9.7 Performing Analyses with Teacher-Level Variables

The PIRLS teacher files do not contain representative samples of teachers within a country. Rather, these are the teachers for a representative sample of students within a country. Therefore, it is appropriate that statements about the teachers be made only in terms of how many students are taught by teachers of one kind or another, and not in terms of how many teachers in the country do one thing or another.

To analyze the information provided by the students' teachers, it is first necessary to link it with the student information. Each student record in the Student Background data file can be linked to one or more different teachers in the Teacher Background data file. To facilitate the linking between students and their teachers in the teacher file, the Student-Teacher Linkage file was created and is part of the International Database. These files are called AST<COUNTRY>R1. The Student-Teacher Linkage file contains one record for each student-by-teacher combination, with the corresponding identification variables.

Each record also contains the number of teachers for the student and a set of weights that can be used when conducting analyses with these data. Student achievement plausible values, sampling weights, and JRR replication information have been added to the Student-Teacher Linkage file in order to simplify the merging process for analyses that link teacher variables to student achievement. For such analyses it is necessary to merge only the Teacher Background file with the Student-Teacher Linkage file. For analyses linking teacher variables to other student variables, it is necessary also to merge the Student Background files with the Teacher Background file after it has been combined with the Student-Teacher Linkage file.

Conducting analyses with the teacher data requires some extra steps that are not required when analyzing the student or school background data.

For our example, we want to find out about the frequency of reading instruction reported by the teachers who teach the fourth-grade students in the PIRLS countries. In particular, we want to find out what percentage of fourth-grade students are taught by teachers who report having reading instruction "Every day," "3-4 days per week," or "Fewer than 3 days per week." We are also interested in the mean reading achievement of the students taught by these teachers. These results are reported in Exhibit 5.14 of the international report (replicated results are presented in Exhibit 9.12).

Exhibit 9.12 Sample Exhibit for Teacher-Level Analysis Involving Plausible Values Taken From *the PIRLS 2001 International Report*

Arge

As before, we first proceed to identify the variables relevant to the analysis in the corresponding files, and review the documentation on the specific national adaptations to the questions of interest (on the CD). Since we are using teacher-level variables, we need to look into the teacher file and the Student-Teacher Linkage files to find the variables.

In our example, our teacher variable of interest (ATBGRACT) is a categorical variable with three categories.

We then proceed to read the necessary information from the Student-Teacher Linkage file and the Teacher Background file.

The two files are then merged or matched into one file that will then be used with the JACKPV macro. These two files will be merged using the variables IDCNTRY, IDTEACH, and IDLINK. The combination of values for these three variables is unique within the teacher data, but is repeated in the Student-Teacher Linkage file as many times as the specific teacher teaches students in a class. After the files are merged, the macro JACKPV is used and the results can be printed. The code in SPSS for this example is presented in Exhibit 9.13. Selections of the results obtained from this program are displayed in Exhibit 9.14.

Exhibit 9.13 SPSS Control Statement for Performing Teacher Level Analysis Using Plausible Values

```
title “Example 3: PIRLS 2001 User Guide”.

add files
 / file = “c:\pirls\data\astargr1.sav”
 / file = “c:\pirls\data\astbgrr1.sav”
 / file = “c:\pirls\data\astswer1.sav”
 / file = “c:\pirls\data\astturr1.sav”
 / file = “c:\pirls\data\astusar1.sav” .

sort cases by idcntry idteach idlink.
save outfile = studteac.

add files
 / file = “c:\pirls\data\atgargr1.sav”
 / file = “c:\pirls\data\atgbgrr1.sav”
 / file = “c:\pirls\data\atgswer1.sav”
 / file = “c:\pirls\data\atgturr1.sav”
 / file = “c:\pirls\data\atgusar1.sav”.

sort cases by idcntry idteach idlink atbgract.

save outfile = teacher.

* Now merge the two files.
match files
  / file=studteac
  / table=teacher
  / by idcntry idteach idlink.

select if not(missing(atbgract)) and inprl01=1.

* Define the format for the variables used.
value labels
```

```
 idcntry  32 ‘Argentina’ 100 ‘Bulgaria’ 752 ‘Sweden’ 792 ‘Turkey’ 840 ‘United
States’ /
 atbgract  1 ‘Every Day’ 2 ‘3-4 Days per week’ 3 ‘Fewer than 3 days per week’.
save outfile = merged.

* Now use the macro to get the results.
include “c:\pirls\programs\jackpv.sps”.

jackpv infile= merged          /
       cvar  = idcntry atbgract /
       pvs   = asrrea01 to asrrea05 /
       npv   = 5        /
       jkz   = JKZONE   /
       jkr   = JKREP    /
       njkz  = 75       /
       WGT   = TCHWGT   .

sort cases by idcntry.

print formats n (f6.0) tchwgt (f10.0) mnpv mnpv_se pct pct_se (f6.2).

report format=list automatic
  / var   = atbgract (label) n tchwgt mnpv mnpv_se pct pct_se
  / break = idcntry .
```

Exhibit 9.14 Extract of SPSS Output for Performing Teacher Level Analysis Using Plausible Values (EXAMPLE 3)

```
Example 3: PIRLS 2001 User Guide
PAGE    1

               GEN/RDG INSTR WITH STD/HOW
*                0.o0 rg3 0./ rgT.98 0 0 7.98 144 544.86 TmHOW
```

For example, we can say that in Argentina the 931 students (27.90 percent of the sampled students) with a teachers who report having reading instruction “Every day” have a mean reading achievement of 414.82 with a standard error of 11.36, while the 471 students (19.10 percent of the sampled students) with a teacher holding reading instruction “Fewer than 3 days per week” have a mean reading achievement of 431.83 with a standard error of 13.63. Perhaps these results might point to the fact that more instruction is taking place for students who are not reading as well.

In summary, to perform analyses such as those using the Student and Teacher Background data files you need to do the following:

- Identify the variable or variables of interest in the corresponding teacher file and find out about any specific national adaptations to the variable.
- Retrieve the relevant variable or variables from the corresponding teacher data files.
- Retrieve the relevant variables from the Student-Teacher Linkage file. This includes the identification information for the country and teacher (IDCNTRY, IDTEACH, and IDLINK), the achievement score, JRR replication information, and the sampling weight.
- Merge the variables from the teacher data files into the Student-Teacher Linkage files using the variables IDCNTRY, IDTEACH, and IDLINK.
- Use the macro JACKPV or JACKGEN with the corresponding arguments and parameters.
- Print out the result file.

```
jackpv infile= merged           /
       cvar  = idcntry acbgcomm /
       pvs   = asrrea01 to asrrea05 /
       npv   = 5        /
       jkz   = JKZONE   /
       jkr   = JKREP    /
       njkz  = 75       /
       WGT   = TOTWGT   .

sort cases by idcntry.

print formats n (f6.0) totwgt (f10.0) mnpv mnpv_se pct pct_se (f6.2).

report format=list automatic
  / var   = acbgcomm (label) n totwgt mnpv mnpv_se pct pct_se
  / break = idcntry .
```

Exhibit 9.17 Extract of SPSS Computer Output for Performing Student-Weighted Analyses with School-Level Variables(EXAMPLE 4)

Example 4: PIRLS 2001 User Guide
PAGE 1

COUNTRY ID	GEN/CHARACTER OF SCH LOCATION AREA	N	TOTWGT	MNPV	MNPV_SE	PCT	PCT_SE
Argentina	Urban	2498	508261	427.13	6.46	75.42	4.50
	Suburban	472	129481	395.02	15.18	19.21	4.04
	Rural	156	36134	412.00	15.75	5.36	2.03
Bulgaria	Urban	2382	59461	566.33	4.15	64.12	2.77
	Suburban	384	10742	542.38	17.14	11.58	2.59
	Rural	594	22529	515.61	9.14	24.29	2.29
Sweden	Urban	1276	17377	567.15	5.39	15.17	3.02
	Suburban	3962	76118	560.33	2.84	66.47	3.76
	Rural	695	21021	560.23	5.41	18.36	3.51
Turkey	Urban	1887	341684	464.38	5.96	36.18	4.24

Suburban 3962

As in the previous example, the first step in our analysis is to locate the variables of interest in the specific codebook and file. We find the variable ASDHPART in the Home Background file, and the student weights and plausible values in the Student Background file. We then proceed to read the Home Background file that has the variables that are relevant to our analysis. We then read the variables of interest from the student data file. Next, we proceed to merge the home information with the student information using the variables IDCNTRY and IDSTUD as merge variables, and then use the macro JACKPV to obtain the corresponding percentages of students within each group, and their mean reading achievement scores. The computer code used to run this analysis in SPSS can be found in Exhibit 9.19 and an extract of the results is shown in Exhibit 9.20.

```
       npv   = 5        /
       jkz   = JKZONE   /
       jkr   = JKREP    /
       njkz  = 75       /
       WGT   = TOTWGT   .

sort cases by idcntry.

print formats n (f6.0) totwgt (f10.0) mnpv mnpv_se pct pct_se (f6.2).

report format=list automatic
  / var   = asdhpatr (label) n totwgt mnpv mnpv_se pct pct_se
  / break = idcntry .
```

Exhibit 9.20 Extract of SPSS Computer Output for Performing Home Background Variables (EXAMPLE 5)

```
Example 5: PIRLS 2001 User Guide
PAGE    1
```

COUNTRY ID	INDEX/PARENTS ATTITUDE TO READING (PATR)	N	TOTWGT	MNPV	MNPV_SE	PCT	PCT_SE
Argentina	High	689	138668	462.12	7.11	32.87	1.59
	Medium	1234	263009	416.76	6.81	62.35	1.66
	Low	99	20151	409.70	11.05	4.78	.50
Bulgaria	High	1776	47355	574.10	3.73	54.34	1.77
	Medium	1136	32371	538.07	4.99	37.15	1.37
	Low	230	7417	496.82	11.58	8.51	1.24
Sweden	High	4022	76513	571.35	2.13	71.24	.83
	Medium	1204	25579	546.77	3.40	23.82	.85
	Low	237	5303	536.14	4.53	4.94	.40
Turkey	High	1351	256311	482.51	4.99	29.34	1.42
	Medium	2854	552066	439.75	3.48	63.20	1.26
	Low	323	65102	436.43	6.84	7.45	.76

The results are then presented by country for each value of the variable IDCNTRY after selecting only those cases with IDGRADER=2. The country and the three levels of attitude towards reading are presented in the first two columns. The third column has the number of students sampled in each category. The fourth column corresponds to the weight given these sampled students in the whole population, followed by the mean plausible value for reading achievement and its corresponding

10.2 Contents of the CD

A CD accompanies this User Guide, containing the data from both the PIRLS and Reading Literacy Studies. The CD has the following internal file structure:

- A main directory identifying the study and year (PIRLS2001)
- Within the main directory, there are six sub-directories:

DATA:	Contains data files in ASCII format
PROGRAMS:	Contains SAS and SPSS programs
CODEBOOK:	Contains Codebook files with a description of each

The following programs also can be found in this sub-directory:

ASASCRR1.SAS, ASASCRT1.SAS and ASASCRT2.SAS

These files contain SAS programs that can be used to convert the response codes to the cognitive items and to their corresponding correctness score levels. The use of these programs is described in this chapter.

JACKPV.SAS

This macro program in SAS can be used to compute weighted percentages of students within defined groups, and their mean achievement scores on an achievement scale using plausible values. This macro makes use of the plausible values in computing the mean achievement scores. This macro also generates replicate weights and computes the jacknife repeated replication (JRR) sampling variances for the percentages of students within the group, and the JRR and imputation variances for the mean achievement scores. This macro should only be used when multiple plausible values are used in the analysis.

JACKGEN.SAS

This macro program in SAS can be used to compute weighted percentages of students within defined groups, and their means on a specified continuous variable. This macro also generates replicate weights and computes JRR

10.4 Scoring the Items

There were two types of items administered as part of the PIRLS and Reading Literacy Study achievement tests. About half the items were multiple-choice type, in which the student was asked to select one of four options as the correct response. The responses to these items are coded with one digit. The codes used to represent the responses to these items are as follows:

Code 1	Option A
Code 2	Option B
Code 3	Option C
Code 4	Option D
Code 6	Not reached
Code 7	Invalid response (e.g., a student chose more than one

```
     IF &ITEM = &OM    THEN SCORE = 0 ;
     IF &ITEM = &OTHER THEN SCORE = 0 ;
   &ITEM = SCORE;
 %END;
%MEND SCOREIT;

%LET ARIGHT  = <list items where option A is the correct one>;
%LET BRIGHT  = <list items where option B is the correct one>;
%LET CRIGHT  = <list items where option C is the correct one>;
%LET DRIGHT  = <list items where option D is the correct one>;
%LET OPENEND = <list open-ended items>;

ARRAY ARIGHT  &ARIGHT;
ARRAY BRIGHT  &BRIGHT;
ARRAY CRIGHT  &CRIGHT;
ARRAY DRIGHT  &DRIGHT;
ARRAY OPENEND &OPENEND;

DO OVER ARIGHT ; %SCOREIT(ARIGHT,"MC",1, 6, 8, 9, 7); END;
DO OVER BRIGHT ; %SCOREIT(BRIGHT,"MC",2, 6, 8, 9, 7); END;
DO OVER CRIGHT ; %SCOREIT(CRIGHT,"MC",3, 6, 8, 9, 7); END;
DO OVER DRIGHT ; %SCOREIT(DRIGHT,"MC",4, 6, 8, 9, 7); END;
DO OVER OPENEND; %SCOREIT(OPENEND,"OE", ,96,98,99,90); END;
```

10.5 Basic Analyses with the PIRLS Data: Means, Percentages, Regression Coefficients, and Their JRR Standard Errors

In this section four macros that can be used to compute the correct standard errors of sampling and imputation are described, including examples in which these macros are used to replicate exhibits in the *PIRLS 2001 International Report* and almanacs.

Computing Sampling and Imputation Variance for Plausible Values Using SAS (JACKPV.SAS)

This section presents example SAS code that can be used to compute the JRR standard errors for mean plausible values and percentages. This code is provided in psJR pluitag -1dc 1 T

you are using SAS interactively, then the macro should be called once at the

JKZ	The variable that captures the assignment of the student to a particular sampling zone. The name of this variable in all PIRLS files is JKZONE.
JKR	The variable that captures whether the case is to be dropped or have its weight doubled for the corresponding replicate weight. The name of this variable in all PIRLS files is JKREP.
NJKZ	This indicates the number of replicate weights to be generated when computing the JRR error estimates. When conducting analyses using the data from all countries, the value of NJKZ should be set to 75, the maximum possible value. When you are working with the data for only one country, you should set the NJKZ argument to as many replicates as are needed in the country. If the data from two or more countries are being used for an analysis, then the largest number of jackknife zones should be used. When in doubt about what number to set the NJKZ paod-ebtr to ,set t[TJT0 0.0001 Tc-0.000

MNPV

Contains the means of the plausible values used in the analysis.

MNPV_SE

Contains the standard errors for the means of the plausible values. These standard errors contain the sampling and the imputation components of the errors of the estimates.

The file resulting from using this macro can be printed using an SAS procedure of choice. An example call to this macro and a printout of the resulting file is presented in Exhibit 10.3 below. This code is included in the file SampleJackPV.SAS on the CD that accompanies the User Guide.

Exhibit 10.3 SAS Control Code and Extract of Output File for Using the Macro JACKPV.SAS

```
libname ar1 "c:\pirls\data";

data student;
 set ar1.asgallr1;
  where itsex in(1,2);

%include "c:\pirls\programs\jackpv.sas";
%jackpv (totwgt , jkzone, jkrep, 75, idcntry itsex, asrrea0, 5, student);

proc print data=final noobs;
     var idcntry itsex N totwgt mnpv mnpv_se mnx mnx_se pct pct_se;
     format idcntry itsex N 6.0 totwgt 10.0 mnpv mnpv_se mnx mnx_se pct pct_se
6.2;

run;
```

```
IDCNTRY    ITSEX    N     TOTWGT    mnpv   mnpv_se      mnx   mnx_se      pct
pct_se

    32       1    1647    358324   428.18     6.24    427.63     6.19    50.68     1.06
    32       2    1645    348747   410.04     6.50    407.13     6.17    49.32     1.06
    84       1    1415      3573   341.73     5.44    342.03     5.27    49.71     0.93
    84       2    1414      3615   314.56     5.37    312.68     5.20    50.29     0.93
   100       1    1783     49229   562.29     3.69    562.42     3.58    51.47     0.91
   100       2    1675     46418   538.06     4.67    537.63     4.63    48.53     0.91
   124       1    4121    109940   552.89     2.62    553.12     2.56    49.53     0.67
```

see that there are entries for each country corresponding to the results for females (ITSEX = 1) and males (ITSEX = 2). The first column has the country code, the second column indicates the gender of the students, the third column has the number of students in each sample, and the fourth column has the total weight of this sample in the population. This is followed by the mean of all five plausible values in reading achievement and the corresponding standard error. Following this is the mean of the first plausible value in reading achievement and its corresponding standard error. The last two columns indicate the percentage of girls and boys in each country's sample and their corresponding standard errors.

For example, Argentina (IDCNTRY=32) sampled 1,647 girls representing 358,324 students in the whole population. The mean of the five plausible values for these Use5.2(rd e0.1)5.4(A 3(n2SsE7b5.1rife0 Tc0 Tw0on()5.1(e)s)40.1a)5..5(e)sfd49004sto t,lsan of 18 (n)-0rahe 1(e who1(

terminated and restarted at a later time the macro needs to be called once again. Once the macro is included in a specific session, the string “%JACKGEN” should not be used within that program because doing so will call the macro.

The macro is included in the program file where it will be used by issuing the following command under SAS:

```
%include ‘<path>jackgen.sas’.
```

where <path> points to the specific drive and directory where the macro JACKGEN.SAS can be found. The macro requires that several parameters be specified when it is called. These parameters are:

INFILE	The name of the data file that contains the variables necessary for the analysis. If the path location is included as part of the file name the name of the file has to be enclosed in quotes. It is important to emphasize that this dataset must include only those cases that are of interest in the analysis. If you want to have specific cases excluded from the analysis (e.g., students with missing variables or selected students from a specific grade), this should be done prior to calling the macro.

Weight Variable

Contains the estimate of the population size of the groups defined by each specific combination of the classification variable categories. In our example this variable is called TOTWGT.

Exhibit 10.4 SAS Control Code and Extract of Output File for Using the Macro JACKGEN.SAS

```
libname ar1 "c:\pirls\data";

data student;
 set ar1.asgallr1;
  where inprl01=1 and asdgage > 0;

%include "c:\pirls\programs\jackgen.sas";
%jackgen (totwgt , jkzone, jkrep, 75, idcntry idgrader, asdgage, student);

proc print data=final noobs;
     var idcntry N totwgt mnx mnx_se pct pct_se;
     format idcntry n 6.0 totwgt 10.0 mnx mnx_se pct pct_se 6.2;

run;
```

IDCNTRY	N	TOTWGT	mnx	mnx_se	pct	pct_se
32	3284	705891	10.18	0.03	100.00	0.00
84	2853	7255	9.79	0.06	100.00	0.00
100	3450	95447	10.93	0.02	100.00	0.00
124	8253	222012	10.02	0.01	100.00	0.00
.						
.						
.						
705	2952	21066	9.80	0.01	100.00	0.00
752	6043	118083	10.80	0.01	100.00	0.00
792	5125	977316	10.23	0.02	100.00	0.00
807	3711	27365	10.65	0.01	100.00	0.00
840	3763	3802557	10.22	0.02	100.00	0.00
926	3155	592507	10.21	0.01	100.00	0.00
927	2717	64375	9.78	0.01	100.00	0.00

In this example, ASDGAGE is used to calculate the mean age of the sampled students in each country. In the listing of the results we can see that there is one entrF-0.48on(ts)5ine,ch co feauntof the samplvaluestof the samplvariable Im001 Tw5 In [Compu1(n6.1(ea7(g Reg)5.s(n6.on Coefficie)4.9.1(ea7(.2(and)3TJT(at 3(eir JRR n6.Stn6.andardlE(y.

JACKREG.SAS. The macro computes the multiple correlation between the

of variables will depend mostly on the computer resources available to you at the time. It is recommended to always include the variable that identifies the country. At least one variable has to be specified, usually IDCNTRY.

The file resulting from using this macro can then be printed using the SAS procedure of choice. An example call to this macro, and a subset of the resulting file is presented in Exhibit 10.5. This code is included in the file SampleJackREG.SAS.

Exhibit 10.5 SAS Control Code and Extract of Output File for Using the Macro JACKREG.SAS

```
libname ar1 "c:\pirls\data";

data student;
 set ar1.asgallr1;
  where itsex in(1,2) and inprl01=1;
   regsex = itsex - 1;

%include "c:\pirls\programs\jackreg.sas";
%jackreg (totwgt , jkzone, jkrep, 75, idcntry, regsex, asbgtvdy, student);

proc print data=reg noobs;
     var idcntry N Mult_RSQ SS_Res SS_Reg SS_Total b00 b00_se b01 b01_se;
     format idcntry n 6.0 Mult_RSQ 5.3
            SS_Total SS_Reg SS_Res 10.0 B00 B00_SE B01 B01_SE 6.2;
run;

IDCNTRY     N  Mult_RSQ    SS_Res    SS_Reg    SS_Total     b00  b00_se     b01  b01_se

    32    3054   0.000    1144576       249     1144825    3.21    0.05   -0.04    0.05
    84    2695   0.004      12940        58       12998    2.51    0.07    0.18    0.07
   100    3413   0.007     109164       781      109945    3.04    0.03    0.18    0.04
   124    8185   0.022     293554      6635      300190    2.67    0.03    0.35    0.04
.
.
.
   705    2939   0.037      20786       792       21578    2.68    0.04    0.39    0.04
   752    5891   0.008      84716       693       85409    2.96    0.02    0.15    0.02
   792    5046   0.004     947853      3744      951597    2.44    0.03    0.12    0.03
   807    3559   0.008      26911       230       27141    2.61    0.04    0.19    0.04
   840    3740   0.014    5733356     83710     5817066    2.83    0.05    0.30    0.04
```

In this example, the variable REGSEX is created by subtracting one from the variable ITSEX. As a result, the girls receive a code of 0 and the boys receive a code of 1 on this variable. In this particular model the variable REGSEX is used to predict the values of the variable ASBGTVDY (the number of hours spent watcg.b8m

For example, from the fourth line in the output we can say that in Canada (IDCNTRY = 124), data is available for 8,185 cases. The coefficient of

	NJKZ argument to as many replicates as are needed in the country. If the data from two or more countries are being used for an analysis, then the largest number of jackknife zones should be used. When in doubt about what number to set the NJKZ parameter to, set it to 75. The error variance will always be estimated correctly if more replicate weights than necessary are computed, but will be underestimated if you specify fewer.
JKZ	The variable that captures the assignment of the student to a particular sampling zone. The name of this variable in all PIRLS files is JKZONE.
JKR	The variable that captures whether the case is to be dropped or have its weight doubled for the corresponding replicate weight. The name of this variable in all PIRLS files is JKREP.
WGT	The sampling weight to be used in the analysis, generally TOTWGT when using the student files, or TCHWGT when using the teacher files.

The simplest and most straightforward way to call the macro is by using the conventional SAS notation for invoking macros. This involves listing the macro name followed by the corresponding list of arguments for the analysis, each separated by a slash. For example, if the macro is called using:

```
%jackregP(totwgt,jkzone,jkrep,75,idcntry idgrader,regsex,asrrea0,5,asgallr1);
```

it will compute the regression equation for the variable REGSEX as a predictor of the plausible values in reading. The data will be read from the data set ASGALLR1 and the standard error of the statistics will be computed based on 75 replicate weights.

The file that contains these results is then called REG and is saved to the default directory being used by SAS. The variables that are contained in this file are:

Classification Variables

Each of the classification variables is kept in the resulting file. In our example above there would be two variables in the resulting dataset, IDCNTRY and IDGRADER. There is one unique occurrence for each combination of the categories for these variables.

Mult_RSQ

The squared multiple correlation coefficient for the model.

SS_Res, SS_Reg, SS_Total

The residual, regression, and total sum of squares for the model within each group as defined by the classification variables.

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

These are the regression coefficients for each of the predictor variables in the

Exhibit 10.9 Sample Exhibit for Student-Level Analysis Involving Plausible Values Taken From *the PIRLS 2001 International Report*

Exhibit 10.11 Extract of SAS Computer Output for Performing Analyses with Student-Level Variables Involving Plausible Values (EXAMPLE 2)

Example 2: PIRLS 2001 User Guide

COUNTRY ID=Argentina

ASBGBOOK	N	TOTWGT	mnpv	mnpv_se	pct	pct_se
0 -10 BOOKS	964	213557	416.09	5.52	42.23	2.48
11-25 BOOKS	610	121633	445.83	6.79	24.05	1.16
26-100 BOOKS	499	107115	465.93	9.13	21.18	1.61
101-200 BOOKS	181	33400	483.59	11.11	6.60	0.67
MORE THAN 200 BOOKS	144	29995	473.98	12.58	5.93	0.73

COUNTRY ID=Bulgaria

ASBGBOOK	N	TOTWGT	mnpv	mnpv_se	pct	pct_se
0 -10 BOOKS	583	18440	498.15	8.11	20.06	1.78
11-25 BOOKS	412	11986	537.18	5.67	13.04	1.01
26-100 BOOKS	821	21738	565.01	3.76	23.64	1.09
101-200 BOOKS	561	14772	579.21	4.94	16.07	0.86
MORE THAN 200 BOOKS	962	25005	582.60	3.79	27.20	1.44

COUNTRY ID=Sweden

ASBGBOOK	N	TOTWGT	mnpv	mnpv_se	pct	pct_se
0 -10 BOOKS	163	3794	503.47	6.92	3.29	0.51
11-25 BOOKS	505	10812	530.15	4.05	9.39	0.66
26-100 BOOKS	1704	35470	552.30	2.27	30.80	1.10
101-200 BOOKS	1527	29900	572.06	2.54	25.96	0.68
MORE THAN 200 BOOKS	1970	35198	576.76	2.68	30.56	1.46

COUNTRY ID=Turkey

ASBGBOOK	N	TOTWGT	mnpv	mnpv_se	pct	pct_se
0 -10 BOOKS	1976	376947	421.68	3.84	39.73	1.95
11-25 BOOKS	1482	284996	455.46	3.66	30.04	1.08
26-100 BOOKS	996	190694	478.28	4.25	20.10	1.07
101-200 BOOKS	264	50261	498.85	8.29	5.30	0.54
MORE THAN 200 BOOKS	223	45775	494.30	10.81	4.83	0.64

COUNTRY ID=United States

ASBGBOOK	N	TOTWGT	mnpv	mnpv_se	pct	pct_se
0 -10 BOOKS	314	334096	476.66	6.98	8.93	0.95
11-25 BOOKS	654	653582	521.51	4.23	17.47	0.96
26-100 BOOKS	1167	1171921	551.13	3.84	31.33	1.06
101-200 BOOKS	799	804711	568.38	4.29	21.51	1.10
MORE THAN 200 BOOKS	767	776508	555.70	5.82	20.76	1.24

In this example, each country's mean plausible value for reading achievement is reported for each response category in the variable ASBGBOOK. The results are presented by country for each value of the variable IDCNTRY after selecting only those cases with IDGRADER=2. The country and the five response options are presented in the first two columns. The third column has the number of students sampled in each category. The fourth column corresponds to the sum of the weights given these sampled students in the whole population, followed by their mean plausible values for reading achievement and the corresponding standard errors. The

last two columns represent the percentages of students sampled responding within each category and the corresponding standard errors.

For example, from the first line of the report, we can say that in Argentina the 964 students (42.23 percent of the sampled students) who reported having more than "0-10 Books" have a mean reading achievement of 416.09 with a standard error of 5.52, while the 144 students (5.93 percent of the sampled students) who reported having "More than 200 books" have a mean reading achievement of 473.98 with a standard error of 12.58.

10.7 Performing Analyses with Teacher-Level Variables

The PIRLS teacher files do not contain representative samples of teachers within a country. Rather, these are the teachers for a representative sample of students within a country. Therefore, it is appropriate that statements about the teachers be made only in terms of how many students are taught by teachers of one kind or another, and not in terms of how many teachers in the country do one thing or another.

To analyze the information provided by the students' teachers, it is first necessary to link it with the student information. Each student record in the Student Background data file can be linked to one or more different teachers in the Teacher Background data file. To facilitate the linking between students and their teachers in the teacher file, the Student-Teacher Linkage filed errr"as created and is part of the International Database. These files are called AST<COUNTRY>R1. The Student-Teacher Linkage file contains one record for each student-by-teacher combination, with the corresponding identification variables.

Each record also contains the number of teachers for the student and a set of weights that can be used when conducting analyses with these data. Student achievement plausible values, sampling weights, and JRR replication information have been added to the Student-Teacher Linkage file in order to simplify the merging process for analyses that link teacher variabled errs to student achievement. For such analyses it is necessary to merge only the Teacher Background file with the Student-Teacher Linkage file. For analyses linking teacher variables to other student variables, it is necessary also to merge the Student Background files with the Teacher Background file after it has been combined with the Student-Teacher Linkage file.

Conducting analyses with the teacher data requires some extra stepd errs that are not required when analyzing the student or school background data.

For our example, we want to find out about the frequency of reading instruction reported by the teachers who teach the fourth-grade students in the PIRLS

n 3 days per week." We are also interested in the
udents taught by these teachers. These results are
LS International Report (replicated results are

or Teacher-Level Analysis Involving
Taken From *the PIRLS 2001*
port

In our example, our teacher variable of interest (ATBGRACT) is a categorical variable with three categories.

We then proceed to read the necessary information from the Student-Teacher Linkage file and the Teacher Background file.

The two files are then merged or matched into one file that will then be used with the JACKPV macro. These two files will be merged using the variables IDCNTRY, IDTEACH, and IDLINK. The combination of values for these three variables is unique within the teacher data, but is repeated in the Student-Teacher Linkage file as many times as the specific teacher teaches students in a class. After the files are merged, the macro JACKPV is used and the results can be printed. The code in SAS for this example is presented in Exhibit 10.13. Selections of the results obtained from this program are displayed in Exhibit 10.14.

Exhibit 10.13 SAS Control Statement for Performing Teacher-Level Analysis Using Plausible Values

```
title "Example 3: PIRLS 2001 User Guide";

libname ar1 "c:\pirls\data";
%include "c:\pirls\Programs\jackpv.sas";

data studteac;
 set ar1.astargr1
     ar1.astbgrr1
     ar1.astswer1
     ar1.astturr1
     ar1.astusar1;

proc sort data=studteac;
     by idcntry idteach idlink;

data teacher;
 set ar1.atgargr1
     ar1.atgbgrr1
     ar1.atgswer1
     ar1.atgturr1
     ar1.atgusar1;

proc sort data=teacher;
     by idcntry idteach idlink;

* Now merge the two files;
data merged;
     merge studteac teacher;
     by idcntry idteach idlink;
      if nmiss(atbgract) = 0 and inprl01 = 1;

* Define the format for the variables used;
proc format
```

```
     by idcntry ;
     var atbgract N tchwgt mnpv mnpv_se pct pct_se;
     format idcntry country. atbgract ract.
            N 6.0 tchwgt 10.0 mnpv mnpv_se pct pct_se 6.2;

run;
```

Exhibit 10.14 Extract of SAS Output for Performing Teacher-Level Analysis Using Plausible Values (EXAMPLE 3)

Example 3: PIRLS 2001 User Guide

COUNTRY ID=Argentina

ATBGRACT	N	TCHWGT	mnpv	mnpv_se	pct	pct_se
Every Day	931	180294	414.82	11.36	27.90	4.10
3-4 Days per week	1535	342494	415.79	9.18	53.00	4.80
Fewer than 3 days per week	471	123414	431.83	13.63	19.10	3.64

COUNTRY ID=Bulgaria

ATBGRACT	N	TCHWGT	mnpv	mnpv_se	pct	pct_se
Every Day	1071	28227	550.79	8.22	30.75	4.37
3-4 Days per week	1942	55286	553.90	5.03	60.22	4.45
Fewer than 3 days per week	309	8288	542.86	10.44	9.03	2.27

COUNTRY ID=Sweden

ATBGRACT	N	TCHWGT	mnpv	mnpv_se	pct	pct_se
Every Day	3486	60112	562.50	3.28	56.97	3.56
3-4 Days per week	2154	31905	555.74	3.55	30.24	3.36
Fewer than 3 days per week	841	13504	568.21	3.41	12.80	2.22

COUNTRY ID=Turkey

ATBGRACT	N	TCHWGT	mnpv	mnpv_se	pct	pct_se
Every Day	2600	487931	453.83	5.20	53.62	4.97
3-4 Days per week	1748	335216	439.26	6.67	36.84	4.47
Fewer than 3 days per week	388	86759	459.33	9.93	9.53	2.70

COUNTRY ID=United States

ATBGRACT	N	TCHWGT	mnpv	mnpv_se	pct	pct_se
Every Day	3323	3340658	541.37	4.23	93.20	2.05
3-4 Days per week	264	225928	555.06	7.54	6.30	2.01
Fewer than 3 days per week	3	18002	539.93	13.98	0.50	0.50

The results are presented by country for each value of the variable IDCNTRY. The country and the three categories are presented in the first two columns. The third column has the number of students sampled in each category. The fourth column corresponds to the weight given these sampled students in the whole population, followed by the mean plausible value for reading achievement and its corresponding standard error. The last two columns represent the percentage of students sampled within each category and its corresponding standard error.

For example, we can say that in Argentina the 931 students (27.90 percent of the sampled students) with a teachers who report having reading instruction “Every day” have a mean reading achievement of 414.82 with a standard error of 11.36, while the 471 students (19.10 percent of the sampled students) with a teacher holding reading instruction “Fewer than 3 days per week” have a mean reading

achievement of 431.83 with a standard error of 13.63. Perhaps these results might point to the fact that more instruction is taking place for students who are not reading as well.

In summary, to perform analyses such as those using the Student and Teacher Background data files you need to do the following:

- Identify the variable or variables of interest in the corresponding teacher file and find out about any specific national adaptations to the variable.
- Retrieve the relevant variable or variables from the corresponding teacher data files.
- Retrieve the relevant variables from the Student-Teacher Linkage file. This includes the identification information for the country and teacher (IDCNTRY, IDTEACH, and IDLINK), the achievement score, JRR replication information, and the sampling weight.
- Merge the variables from the teacher data files into the Student-Teacher Linkage files using the variables IDCNTRY, IDTEACH, and IDLINK.
- Use the macro JACKPV or JACKGEN with the corresponding arguments and parameters.
- Print out the result file.

10.8 Performing Analyses with School-Level Variables

Although the students in the PIRLS samples were selected from within a sample of schools, the school sample was designed to optimize the resulting sample of students, rather than to give an optimal sample of schools. For this reason, it is

information contained in the student-level file to make the desired statements. The examples presented in this section describe how this can be accomplished using SAS.

Let us say that we want to find out the percentage of fourth graders who attend schools located in a certain area of the country as captured by the question asked of the school principals: “How would you characterize the area in which your school is

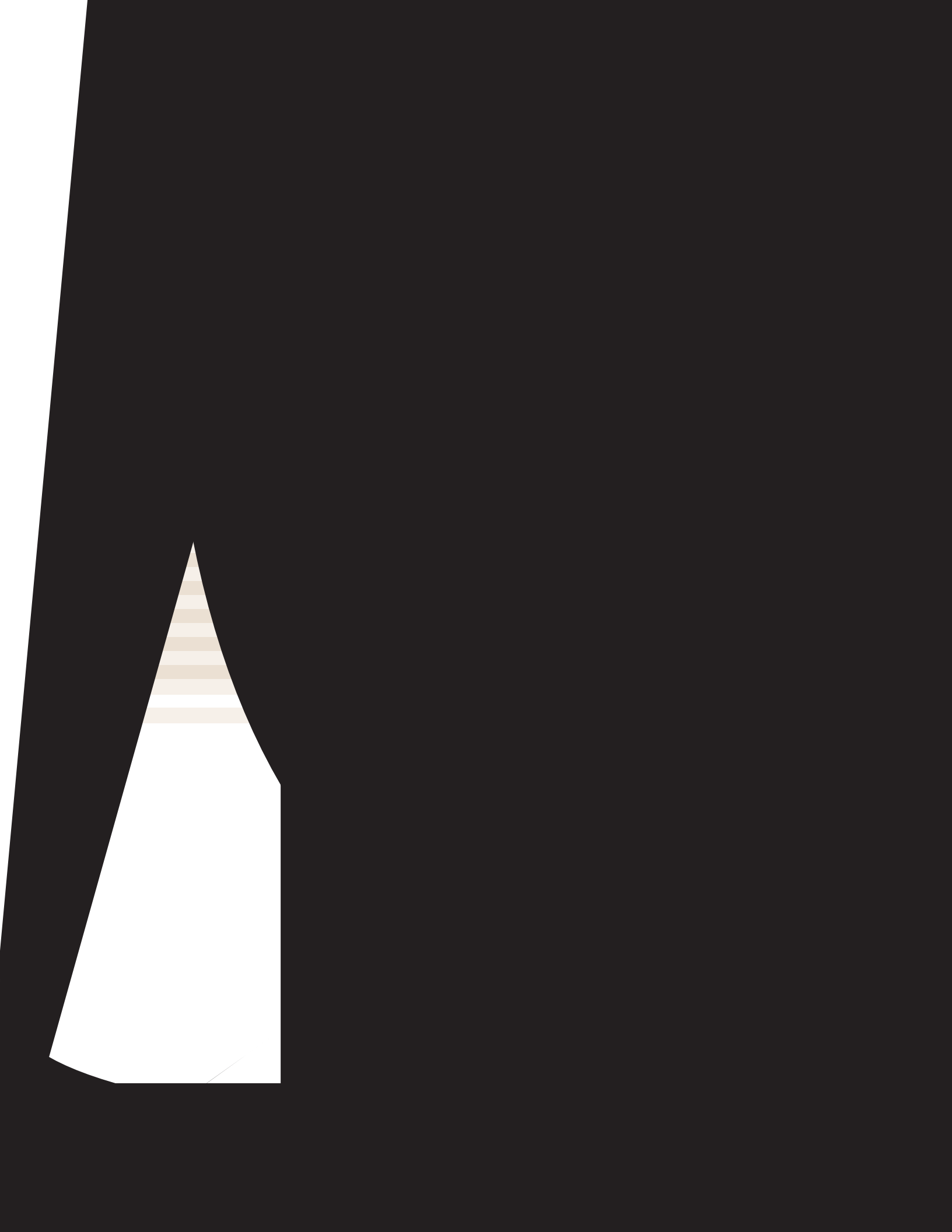


Exhibit 10.16 SAS Control Statements for Performing Student-Weighted Analyses with School-Level Variables (EXAMPLE4.SAS)

```
title "Example 4: PIRLS 2001 User Guide";
```

- Merge the variables from the school database onto the student database using the variables IDCNTRY and IDSCHOOL.
- Use the macro JACKGEN or JACKPV with the corresponding arguments and parameters.
- Print out the result file.

10.9 Performing Analyses with Home Background Variables

Students in the PIRLS samples were also given questionnaires to be completed by their parents or guardian. The responses to these questionnaires are included in the home background questionnaire file. Like any other variable in the PIRLS database, home background variables need to be analyzed as attributes of students, rather than as elements in their own right.

Let us say that we want to find out the percentage of fourth graders who's parents have a high, medium, or low attitude towards reading. These results, presented in Exhibit 10.18, also can be found in Exhibit 4.17 of the *PIRLS International Report*. This exhibit reports the results for the Index of Parents Attitude Towards Reading (ASDHPATR). The options for this question were "High," "Medium," and "Low."

Exhi Exhibit for Home Background Analysis Involving sible Values Taken From the *PIRLS 2001 ternational Report*

Hun y	74 (1.0)	556 (2.2)	23 (0.9)	518 (2.5)	3 (0.4)	509 (8.3)
No						

the student data file. Next, we proceed to merge the home information with the student information using the variables IDCNTRY and IDSTUD as merge variables, and then use the macro JACKPV to obtain the corresponding percentages of students within each group, and their mean reading achievement scores. The computer code used to run this analysis in SAS can be found in Exhibit 10.19 and an extract of the results is shown in Exhibit 10.20.

Exhibit 10.19 SAS Control Statements for Performing Home Background Analyses (EXAMPLE5.SAS)

```
title "Example 5: PIRLS 2001 User Guide";
```

A Acknowledgements

The design and development of PIRLS 2001 was achieved through the collaborative efforts of individuals around the world. Staff from the national research centers in each participating country, members of advisory committees, the International Association for the Evaluation for Educational Achievement (IEA), funding agencies, and the International Study Center (ISC) at Boston College worked together to develop and implement the PIRLS 2001 assessment. This appendix acknowledges the individuals and organizations for their contributions. Given that the development and implementation of PIRLS 2001 has spanned approximately four years and has involved so many people and organizations, this list may not include all who contributed. Any omission is inadvertent. PIRLS 2001 also acknowledges the students, teachers, and school principals who contributed their time and effort to the study. This report would not be possible without them.

A.1 Funding Agencies

Funding for the development of PIRLS 2001 was provided by the National Center for Education Statistics of the U.S. Department of Education (NCES), The World Bank, and the participating countries. Valena Plisko, Eugene Owen, Dawn Nelson and Lawrence Ogle of NCES and Vincent Greaney of the World Bank were instrumental in making PIRLS 2001 possible and for ensuring the quality of the study. Each participating country was responsible for funding national project costs and implementing PIRLS in accordance with the international procedures.

A.2 Management and Operations

PIRLS 2001 was conducted under the auspices of the IEA. The study is directed by Ina V.S. Mullis and Michael O. Martin, and managed centrally by the staff of the International Study Center at Boston College, Lynch School of Education. The PIRLS International Study Center worked closely with organizations that were responsible for particular aspects of the study, the PIRLS advisory committees, and representatives of the participating countries.

In the IEA Secretariat, Hans Wagemaker was responsible for overseeing fundraising and country participation. Barbara Malak, also of the IEA Secretariat, was responsible for managing the ambitious translation verification effort and for recruiting international quality control monitors. Statistics Canada worked with countries to ensure that the international sampling procedures were followed, adapted the international design to national conditions, documented the national samples, and computed sampling weights. The National Foundation for Educational Research in England and Wales had major responsibility for developing the reading test, including collecting reading passages, developing items and scoring guides, and conducting scoring training. The IEA Data Processing Center was responsible for processing and verifying the data from the 35 countries, and for constructing the international database.

IEA Secretariat

Alejandro Tiana, IEA Chair

Hans Wagemaker, Executive Director

Barbara Malak, Manager Membership Relations

Juriaan Hartenberg, Financial Manager

PIRLS and TIMSS International Study Ce Tm1(ecre. 1 Tf3(na)3H(5)(niGtabase. 5(1Lct

PIRta pllase. 5r1(aalor.6T01.8Tc00 TD01 TwChente(y(halahn9)5(nte(y))5(1(u34.2Re))earAsso

Christine Hoage, Manager, Finance

Rita Holmes, Administrative Coordinator

Laura Misas, Administrative Coordinator

IEA Data Processing Center

Pierre Foy, Senior Researcher

Ursula Itzlinger, Senior Researcher

Juliane Barth, Research Assistant

Statistics Canada

Marc Joncas, Senior Methodologist

National Foundation for Educational Research in England and Wales

Chris Whetton, Assistant Director

Marian Sainsbury, Principal Research Officer

Jenny Bradshaw, Senior Research Officer

Anne Kispal, Senior Research Officer

Jane Sowerby, Senior Research Officer

Jenny Phillips, Research Officer

Educational Testing Services

Jay Campbell, PIRLS Reading Coordinator

Ed Kulick, Psychometric Scaling Consultant

Matthias von Davier, Psychometric Scaling Consultant

Westat

Keith Rust, Sampling Referee

American Institutes for Research

Eugene Johnson, Psychometric Design Consultant

PIRLS Questionnaire Development Group

Annette Lafontaine
Université de Liège
Belgium

Michael Marshall
University of British Columbia
Canada

Ivana Prochazkova
Institute for Information on Education
Czech Republic

Monica Rosén
Göteborg University
Sweden

Graham Ruddock
National Foundation for Educational Research
in England and Wales
England

Maurice Walker
Ministry of Education
New Zealand

National Research Coordinators

The PIRLS 2001 National Research Coordinators (NRCs) were responsible for the crucial task of implementing the study in their countries. They participated in every aspect of the work to ensure that the study was of high quality. All the PIRLS 2001 NRCs and their staff members are to be commended for their professionalism and their dedication in conducting all aspects of the project.

Argentina

Lilia Toranzos
Ministerio de Educación

Belize

Rosalind Bradley
Denise Robateau
Belize Teachers' Training College

Bulgaria

Georgi Bishkov
Felyanka Kaftandjieva
University of Sofia

Canada

Francine Jaques
Robert Deschênes
Education Quality & Accountability Office (EQAO)

Louis-Philippe Gaudreault
Jean-Louis Lebel
Ministère de l'Éducation

Michael Marshall
University of British Columbia

Colombia

Martha Rocha
Claudia Saenz
Servicio Nacional de Pruebas

Cyprus

Mary Koutselini
Constantinos Papanastasiou
University of Cyprus

Czech Republic

Iveta Kramplova
Ivana Prochazkova
Institute for Information on Education

England

Liz Twist
National Foundation for Educational
Research (NFER)

France

Marc Colmant
Ministère de l'Éducation Nationale

Germany

Wilfried Bos

Knut Schwippert

Eva-Maria Lankes

Kuwait
Mansour Hussein
Ministry of Education

Latvia
Ieva Johansone
University of Latvia

Lithuania
Aiste Mackeviciute
Ministry of Education and Science

Republic of Macedonia
Bojana Naceva
Pedagogical Institute of Macedonia

Moldova
Ilie Nasu
Ministry of Education & Science

Morocco
Abdellah Belachkar
Ministère de L'Education Nationale

The Netherlands
Mieke Van Diepen
University of Nijmegen

New Zealand
Megan Chamberlain
Maurice Walker
Ministry of Education

Norway
Finn Egil Tønnessen
Ragnar Gees Solheim
Stavanger College

Romania
Gabriela Noveanu
Institute for Educational Sciences

Russian Federation

Galina Kovalyova

Institute of General Secondary Education

Scotland

Liz Levy

Brian Semple

Scottish Office Education and Industry Department

Singapore

Siow-Chin Ng

Ministry of Education

Slovak Republic

Zuzana Lukacková

SPU–National Institute for Education

Slovenia

Marjeta Doupona-Horvat

Center for IEA Studies

Educational Research Institute

Sweden

Monica Rosén

Göteborg University

Turkey

Yurdanur Atlioglu

Educational Research and Development Directorate (ERDD)

United States of America

Laurence Ogle

Dawn Nelson

National Center for Education Statistics (NCES)