



3

The Methodology of the Survey of Adult Skills (PIAAC) and the Quality of Data

This chapter focuses on how the Survey of Adult Skills (PIAAC) was designed, managed and conducted. It discusses the target population, exclusions from the survey, sample size, response rates, and how the survey was scored.

The design and implementation of the Survey of Adult Skills (PIAAC) was guided by technical standards and guidelines (PIAAC, 2011) developed to ensure that the survey yielded high-quality and internationally comparable data. The *PIAAC Technical Standards and Guidelines* articulates the standards to which participating countries were expected to adhere in implementing the assessment, describes the steps that should be followed in order to meet the standards, and offers recommendations for actions relating to the standards that were not mandatory but that could help to produce high-quality data. Standards were established for 16 discrete aspects of the design and implementation of the survey (Table 3.1).

Table 3.1
Areas of activity covered by the PIAAC Technical Standards and Guidelines

Survey instruments	Data collection staff training
Translation and adaptation	Data collection
Information technology	Data capture
Field management	Data file creation
Quality assurance and quality control	Confidentiality and data security
Ethics	Weighting
Survey planning	Estimation
Sample design (including survey response and non-response bias)	Documentation

The *PIAAC Technical Standards and Guidelines* is one element of a comprehensive process of quality assurance and control that was put in place to reduce potential sources of error and maximise the quality of the data produced by the Survey of Adult Skills. Participating countries received assistance in meeting the standards in a variety of ways. Where relevant, manuals, training materials, testing plans and toolkits were produced. Training was provided to countries at appropriate stages of the project. In certain areas, such as sampling, translation and adaptation, and the operation of the computer-delivery platform, passage through the various stages of implementation was subject to a review of the steps completed, and sign-off was often required as a condition of moving to a subsequent stage. Regular consultations were held with countries at project meetings and through bilateral contact. Compliance with the technical standards was monitored throughout the development and implementation phases through direct contact, evidence that required activities were completed, and the ongoing collection of data from countries concerning key aspects of implementation.

The quality of each participating country's data was reviewed prior to publication. The review was based on the analysis of the psychometric characteristics of the data and evidence of compliance with the technical standards. An assessment of the quality of each country's data was prepared and recommendations were made regarding release and, if necessary, restrictions and/or qualifications that should apply to the release and publication. The approach to the review of data was validated by the project's Technical Advisory team; the project's steering body, the PIAAC Board of Participating Countries (BPC), made the final decision on release.

Box 3.1. **How the Survey of Adult Skills (PIAAC) was managed**

The development and implementation of the Survey of Adult Skills (PIAAC) was overseen by the PIAAC Board of Participating Countries (BPC). The Board consisted of representatives from each of the countries participating in the survey, with the exception of Cyprus¹ and the Russian Federation. The Board was responsible for making major decisions regarding budgets, the development and implementation of the survey, reporting of results, and for monitoring the progress of the project. The Board was supported in its work by the OECD Secretariat, which was responsible for providing advice to the Board and managing the project on behalf of the Board.

An international Consortium was contracted by the OECD to undertake a range of tasks relating to the design and development of the assessment, implementation and analysis. The Consortium was responsible for developing questionnaires, instruments, and the computer-delivery platform, supporting survey operations, quality control, and scaling, preparing the database, and providing support for analysis.

Participating countries were responsible for the national implementation of the assessment. This covered sampling, adaptation and translation of assessment materials, data collection and database production. In each country, national project teams were led by national project managers.



This chapter focuses on aspects of the design and the methodology of the Survey of Adult Skills that are essential for interpreting the results of the data-quality review. To this end, it describes:

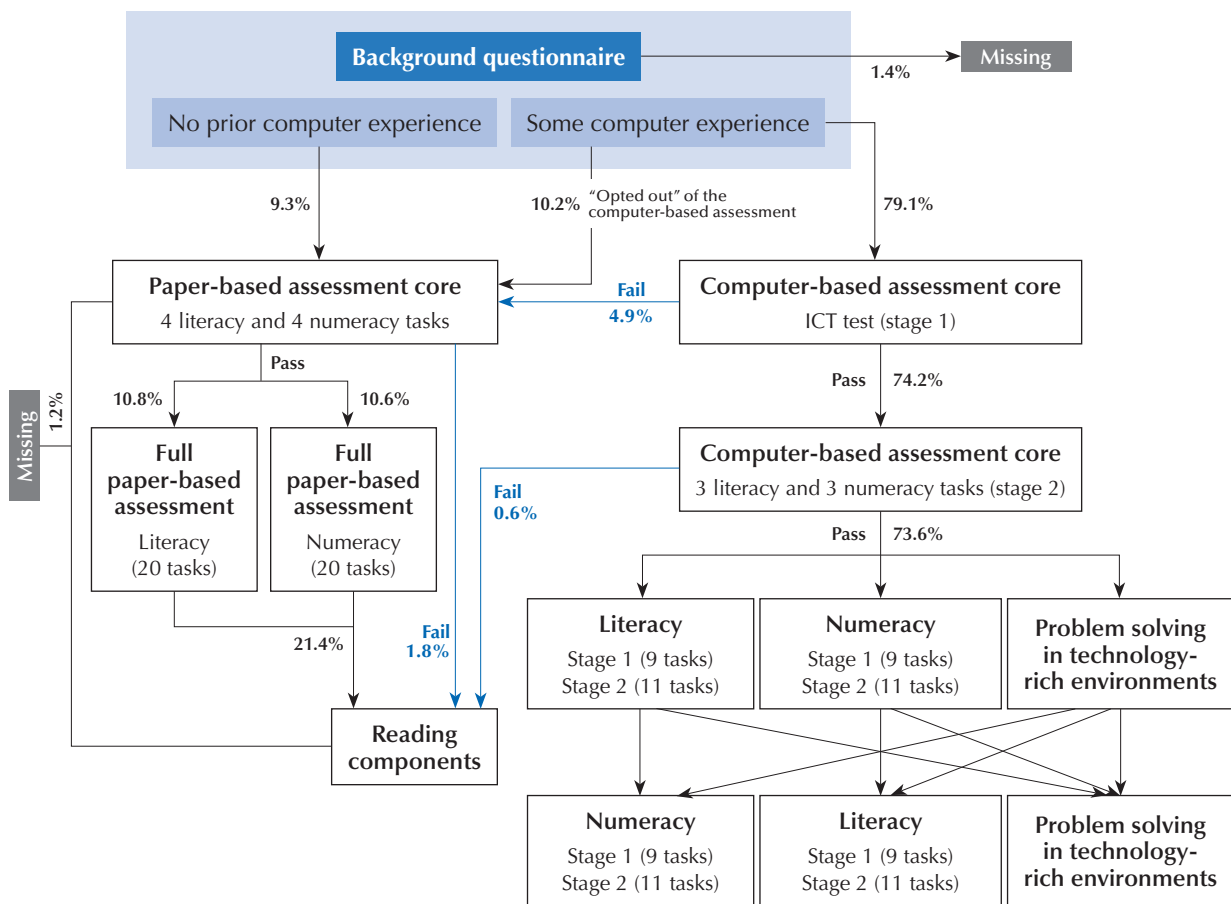
- the design of the assessment and administration of the survey;
- sampling;
- translation and adaptation of instruments;
- survey administration;
- survey response;
- scoring; and
- the outcomes of the adjudication of data quality.

ASSESSMENT DESIGN

The Survey of Adult Skills involved the direct assessment of literacy, numeracy and problem solving in technology-rich environments. While conceived primarily as a computer-based assessment (CBA), the option of taking the literacy and numeracy components of the assessment in paper-based format (PBA) had to be provided for those adults who had insufficient experience with computers to take the assessment in CBA mode. This necessitated a relatively complex design, which is presented graphically in Figure 3.1.

■ Figure 3.1 ■

Percentage of respondents taking different pathways in the Survey of Adult Skills (PIAAC)



Note: The figures presented in this diagram are based on the average of OECD countries participating in the Survey of Adult Skills (PIAAC).

As can be seen, there are several pathways through the assessment. Respondents with no experience in using computers, as indicated by their response to the relevant questions in the background questionnaire, were directed to the paper-based version of the assessment. Respondents with some experience of computer use were directed to the computer-based assessment where they took a short test of their ability to use the basic features of the test application (use of a mouse, typing, use of highlighting, and drag and drop functionality) – the CBA core Stage 1. Those who “failed” this component were directed to the paper pathway.

Respondents taking the computer path then took a short test (the CBA core Stage 2) composed of three literacy and three numeracy items of low difficulty to determine whether or not they should continue with the full assessment. Those who “failed” this module were directed to the reading components assessment. Respondents who passed this module continued on to take the full test and were randomly assigned to a first module of literacy, numeracy or problem-solving items. Following completion of the first module, respondents who had completed a literacy module were randomly assigned to a numeracy or problem-solving module, respondents who had completed a numeracy module were randomly assigned to a literacy or problem-solving module, and respondents who had completed a problem-solving module were randomly assigned to a literacy, a numeracy or a second problem-solving module.

The assessment design assumed that the respondents taking the PBA path would be either those who had no prior experience with computers (as assessed on the basis of responses to the relevant questions in the background questionnaire) or those who failed the ICT core. It was, however, possible for respondents with some computer experience to take the PBA pathway if they insisted. Respondents with some computer experience who opted to take the paper-based pathway without attempting the CBA core represented 10.2% of all respondents.

Respondents taking the paper path first took a “core” test of four simple literacy and four simple numeracy items. Those who passed this test were randomly assigned to a module of either 20 literacy tasks or 20 numeracy tasks. Once the module was completed, respondents were given the reading-components test. Respondents who failed the initial “core” test proceeded directly to the reading-components test.

The proportions of total respondents taking the different stages of the assessment are presented in Figure 3.1. Some 79.1% of respondents attempted the CBA core Stage 1. In total, 74.2% of respondents took the CBA core Stage 2 and 73.6% of the sample went on to the CBA literacy, numeracy or problem solving assessment with 0.6% being directed to the reading components assessment. Some 24.4% of respondents took the PBA assessment core, either the full assessment – i.e. a literacy or numeracy module plus reading components (21.4%) – or reading components only (1.8%). There was a small proportion of respondents (1.2%) for whom no assessment data are available, essentially because they were unable or unwilling to undertake the assessment in the test language or languages available.

The Survey of Adult Skills was designed to provide accurate estimates of proficiency in the three domains across the adult population and its major subgroups, rather than at the level of individuals. Each respondent was given a subset of the test items used in the assessment. No individual took modules from all the domains assessed. As can be seen from Figure 3.1, respondents following the CBA path took two assessment modules in either one or two of the three assessment domains.² Of the respondents following the CBA path, 56.0% took a combination of a literacy and a numeracy module, 29.3% took a combination of a problem-solving and a literacy or a numeracy module, and 14.5% took two problem-solving modules. Respondents following the PBA path took either a literacy or a numeracy module.

In the CBA mode, the literacy and numeracy assessments had an adaptive design. Respondents were directed to different blocks of items on the basis of their estimated ability. Individuals who were estimated to have greater proficiency were more likely to be directed to groups of more difficult items than those who were estimated to be less proficient. Each of the literacy and numeracy modules was composed of two stages containing testlets (groups of items) of varying difficulty. Stage 1 contained three testlets and Stage 2, four. Respondents’ chances of being assigned to testlets of a certain difficulty depended on their level of educational attainment, whether their native language was the same as the test language, their score on the literacy/numeracy core and, if relevant, their score on a Stage 1 testlet.⁴

All participating countries were required to administer the literacy and numeracy components of the assessments. Administration of the problem solving in technology-rich environments and the reading-components assessments was optional. All but four countries administered the problem-solving assessment, and all but three administered the reading-components assessment. Table 3.2 provides details of participation in each of the cognitive assessments.



Table 3.2
Participation in the cognitive-assessment modules

	Literacy and numeracy	Problem solving in technology-rich environments	Reading components
Australia	Yes	Yes	Yes
Austria	Yes	Yes	Yes
Canada	Yes	Yes	Yes
Cyprus ¹	Yes	No	Yes
Czech Republic	Yes	Yes	Yes
Denmark	Yes	Yes	Yes
Estonia	Yes	Yes	Yes
Finland	Yes	Yes	No
France	Yes	No	No
Germany	Yes	Yes	Yes
Ireland	Yes	Yes	Yes
Italy	Yes	No	Yes
Japan	Yes	Yes	No
Korea	Yes	Yes	Yes
Netherlands	Yes	Yes	Yes
Norway	Yes	Yes	Yes
Poland	Yes	Yes	Yes
Slovak Republic	Yes	Yes	Yes
Spain	Yes	No	Yes
Sweden	Yes	Yes	Yes
United States	Yes	Yes	Yes
Sub-national entities			
Flanders (Belgium)	Yes	Yes	Yes
England (UK)	Yes	Yes	Yes
Northern Ireland (UK)	Yes	Yes	Yes

1. See notes at the end of this chapter.

SAMPLING

To maximise the comparability of results, countries participating in the Survey of Adult Skills were expected to meet stringent standards relating to the target population, sample design, sample selection response rates, and non-response bias analysis.

The target population and sampling frame

The target population for the survey consisted of the non-institutionalised population, aged 16–65 years, residing in the country at the time of data collection, irrespective of nationality, citizenship or language status. The normal territorial unit covered by the survey was that of the country as a whole. However, in two countries the sample frame covered subunits of the national territory. In Belgium, only the Flemish region (Flanders) participated in the survey. In the United Kingdom, only the autonomous administrative regions of England and Northern Ireland participated in the study. Following the tsunami of March 2011, Japan had to revise its sample design to exclude affected regions.

The sampling frame used by participating countries at each stage of sample selection was required to be up-to-date and include only one record for each member of the target population. Multi-stage sample designs require a sampling frame for each stage of selection.

The sampling frames used by participating countries were of three broad types: population registers (administrative lists of residents maintained at either national or regional level); master samples (lists of dwelling units or primary sampling units maintained at national level for official surveys); or area frames (a frame of geographic clusters formed by combining adjacent geographic areas, respecting their population sizes and taking into consideration travel distances for interviewers). The frames used by countries at different stages of the sample selection are described in Tables 3.3 to 3.5.

Table 3.3
Sampling frames for countries with registry samples

	Sampling frame		
	Stage 1	Stage 2	Stage 3
Austria	Population registry, 2011		
Denmark	Population registry, 2011		
Estonia	Population registry, 2011		
Finland	Statistics Finland's population database (based on the Central Population Register), 2011		
Germany	German Census Bureau frame of communities, 2011	Local population registries, 2011	
Italy	National Statistical Institute of Italy, 2011	Household registries held by municipalities, 2011	Population registries, 2011; combined with field enumeration
Japan	Resident registry, 2011	Resident registry, 2011	
Netherlands	Population registry, 2011		
Norway	Population registry, 2011		
Poland	Population registry, 2011	Population registry, 2011	
Slovak Republic	Population registry, 2011	Population registry, 2011	
Spain	Population registry, 2011	Population registry, 2011	
Sweden	Population registry, 2011		

Sub-national entities

Flanders (Belgium)	Population registry, 2011		
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Note: The grey shading indicates that there is no such stage in the country's sample design.

Table 3.4
Sampling frames for countries using master samples

	Sampling frame			
	Stage 1	Stage 2	Stage 3	Stage 4
Australia	Bureau of Statistics population survey master sample, 2006	Bureau of Statistics population survey master sample, 2006	Bureau of Statistics population survey master sample, 2006	Field enumeration
France	Master sample from census data file, 2010	Individual taxation file, 2010		

Note: The grey shading indicates that there is no such stage in the country's sample design.

Table 3.5
Sampling frames for countries using area samples

	Sampling frame			
	Stage 1	Stage 2	Stage 3	Stage 4
Canada	Short-form census returns, 2011	Short-form census returns, 2011	Field enumeration	
Cyprus ¹	CYSTAT – Census of Population (2001) updated with Electricity Authority of Cyprus (EAC) registry (2010)	CYSTAT – Census of Population (2001) updated with Electricity Authority of Cyprus (EAC) registry (2010)		
Czech Republic	Territorial Identification Register of Buildings and Addresses (UIR-ADR), 2010	Territorial Identification Register of Buildings and Addresses (UIR-ADR), 2010	Field enumeration	Field enumeration
Ireland	Small Area classifications, 2009	Geodirectory (national address database), 2011	Field enumeration	
Korea	2010 Census	2010 Census	Field enumeration	
United States	Census Bureau Population Estimates, 2008	2000 Census Bureau Summary File 1 (SF1), 2000; updated with data from the United States Postal Service 2010	Field enumeration	Field enumeration

Sub-national entities

England (UK)	Royal Mail list of UK Postal Sectors, 2011	Royal Mail PAF residential file, 2011	Field enumeration	Field enumeration
Northern Ireland (UK)	NI (POINTER) database, 2011	Field enumeration	Field enumeration	

1. See notes at the end of this chapter.

Note: The grey shading indicates that there is no such stage in the country's sample design.



Coverage of the target population

Countries' sampling frames were required to cover at least 95% of the target population. The exclusion (non-coverage) of groups in the target population was expected to be limited to the greatest extent possible and to be based on operational or resource constraints, as in the case of populations located in remote and isolated regions. Countries using population registers as sample frames could also treat untraceable individuals (i.e. individuals selected in the sample but who were not living at the registered address and could not be traced after multiple attempts) as exclusions, provided that the 5% threshold was not exceeded. All exclusions were required to be approved by the international consortium. Table 3.6 provides details of groups excluded from the sampling frame by design and the estimated proportion of the target population in the two categories of exclusions.

Table 3.6
Exclusions from target population

National entities	Exclusions (frame)	Exclusions (frame) % of target population	Exclusions (data collection) % of target population
Australia	Persons living in very remote areas, discrete indigenous communities (DIC), or non-institutional special dwellings; non-Australian diplomats, their staff and household members of such; members (and their dependents) of non-Australian defence forces.	3.3	N/A
Austria	Illegal immigrants.	0.6	0.8
Canada	Residents of smallest communities in the northern territories; residents of remote and very low population density areas in provinces; and persons living in non-institutional collective dwellings, other than students in residences.	1.8	N/A
Czech Republic	Professional armed forces; municipalities with < 200 habitants.	1.8	N/A
Denmark	Illegal immigrants.	<0.1	5.0
Estonia	Persons without a detailed address; illegal immigrants (no estimate provided).	2.8	0.6
Finland	Illegal immigrants; asylum-seekers.	0.2	0.5
France	Young adults who have never claimed any income and are not attached to their parents households; some illegal immigrants.	≤2.6	1.4
Germany	Illegal immigrants; other people who are not in the register (e.g. recently moved).	0.5	2.0
Ireland	Some mobile dwellings, such as the caravans of Irish travellers.	0.4	N/A
Italy	Adults in non-institutional group quarters; illegal immigrants (no estimate provided).	0.8	1.9
Japan	Non-nationals; illegal immigrants.	2.2	2.8
Korea	Residents of small islands.	2.4	N/A
Netherlands	Illegal immigrants.	0.9	1.8
Norway	Illegal immigrants.	0.4	0.4
Poland	Foreigners staying in Poland less than three months; non-registered immigrants.	0.8	4.2
Slovak Republic	Illegal immigrants.	0.1	4.9
Spain	None.	0.0	5.0
Sweden	Illegal immigrants.	<1.0	0.0
United States	Some Hispanics and black males (and other hard-to-reach groups) as in other US household surveys.	<1.0	0.0
Sub-national entities			
Flanders (Belgium)	Illegal immigrants.	1.0	4.0
England (UK)	Individuals living in private residences that are not listed on the "residential" version of the Postal Address File (PAF).	2.0	N/A
Northern Ireland (UK)	Individuals not listed on the NI(POINTER) database.	2.0	N/A
Partner			
Cyprus ¹	Persons living in houses built after December 2010.	<2.0	N/A

1. See notes at the end of this chapter.

Sample size

The minimum sample size required for the Survey of Adult Skills depended on two variables: the number of cognitive domains assessed and the number of languages in which the assessment was administered. Participating countries had the choice of assessing all three domains (literacy, numeracy and problem solving) or assessing literacy and numeracy only. Assuming the assessment was administered in only one language, the minimum sample size required was 5 000 completed cases³ if all three domains were assessed and 4 500 if only literacy and numeracy were assessed. If a country wished to fully report results in more than one language, the required sample size was either 4 500 or 5 000 cases per reporting language (e.g. 9 000 or 10 000 cases for two languages, depending on the domains assessed). If a country administered the assessment in more than one language but did not wish to report results separately by language, the sample size required was determined as follows: at least 5 000 (or 4 500) completed cases had to be collected in the principal language. The minimum number of completed cases in each of the additional languages was calculated in proportion to the estimated number of adults using the language. In other words, if 10% of the target population spoke a test language other than the principal language, the minimum required sample size was increased by 10%. A reduced sample was agreed for Northern Ireland (UK) to allow results to be reported separately from those of England (UK) for key variables.

Table 3.7
Sample size

National entities	Cognitive domains assessed	Assessment language(s)	Groups oversampled	Achieved sample
Australia	L, N, PS-TRE	English	Persons resident in certain states and territories	7 428
Austria	L, N, PS-TRE	German		5 130
Canada	L, N, PS-TRE	English, French	Persons aged 16-25, provinces/territories, linguistic minorities, aboriginal persons, and recent immigrants	27 285
Czech Republic	L, N, PS-TRE	Czech	Persons aged 16-29	6 102
Denmark	L, N, PS-TRE	Danish	Persons aged 55-65 years, recent immigrants	7 328
Estonia	L, N, PS-TRE	Estonian, Russian		7 632
Finland	L, N, PS-TRE	Finnish, Swedish		5 464
France	L, N	French		
Germany	L, N, PS-TRE	German		5 465
Ireland	L, N, PS-TRE	English		5 983
Italy	L, N	Italian		4 621
Japan	L, N, PS-TRE	Japanese		5 278
Korea	L, N, PS-TRE	Korean		6 667
Netherlands	L, N, PS-TRE	Dutch		5 170
Norway	L, N, PS-TRE	Norwegian		5 128
Poland	L, N, PS-TRE	Polish	Persons aged 19-26	9 366
Slovak Republic	L, N, PS-TRE	Slovak, Hungarian		5 723
Spain	L, N	Castilian, Basque, Catalan, Galician, Valencian		6 055
Sweden	L, N, PS-TRE	Swedish		4 469
United States	L, N, PS-TRE	English		5 010
Sub-national entities				
Flanders (Belgium)	L, N, PS-TRE	Dutch		5 463
England (UK)	L, N, PS-TRE	English		5 131
Northern Ireland (UK)	L, N, PS-TRE	English		3 761
Partner				
Cyprus ¹	L, N	Greek		5 053

1. See notes at the end of this chapter.

Note: L = Literacy, N = Numeracy and PS-TRE = Problem Solving in Technology-Rich Environments.



Participating countries were able to oversample particular subgroups of the target population if they wished to obtain more precise estimates of proficiency by geographical area (e.g. at the level of states or provinces) or for certain population groups (e.g. 16-24 year-olds or immigrants). A number of countries did so. Canada, for example, considerably increased the size of its sample to provide reliable estimates at the provincial and territorial level as well as oversampling persons aged 16-25, linguistic minorities, aboriginal population, and recent immigrants.

In addition, Australia and Denmark surveyed samples of individuals outside the survey target population. In the case of Australia, 15-year-olds and 66-74 year-olds were included as a supplemental sample. Denmark administered the assessment to individuals who had participated in PISA in 2000. Results from individuals included in these national “supplemental samples” are not reported as part of the Survey of Adult Skills.

Table 3.7 provides information on the sample size by participating country, languages and oversampling.

Sample design

Participating countries were required to use a probability sample representative of the target population. In other words, each individual in the target population had a calculable non-zero probability of being selected as part of the sample. In multi-stage sampling designs, each stage of the sampling process was required to be probability based. Non-probability designs, such as quota sampling and the random route approach, were not allowed at any sampling stage. Detailed information regarding sample designs can be found in the *Technical Report of the Survey of Adult Skills* (OECD, 2013, forthcoming).

TRANSLATION AND ADAPTATION OF INSTRUMENTS

Participating countries were responsible for translating the assessment instruments and the background questionnaire. Any national adaptations of either the instruments or the questionnaire was subject to strict guidelines, and to review and approval by the international consortium. The recommended translation procedure was for a double translation from the English source version by two independent translators, followed by reconciliation by a third translator.

All national versions of the instruments were subject to a full verification before the field test, which involved:

- a sentence-by-sentence check of linguistic correctness, equivalence to the source version, and appropriateness of national adaptations; and
- a final optical check to verify the final layout of the instruments, the equivalence of computer and paper forms, and the correct implementation of changes recommended by the verifiers.

All national version materials revised following the field test were subject to partial verification before the main study. Edits made between the field test and the main study were checked for their compliance with the PIAAC translation and adaptation guidelines and for correct implementation.

SURVEY ADMINISTRATION

The Survey of Adult Skills was administered under the supervision of trained interviewers either in the respondent’s home or in a location agreed between the respondent and the interviewer. After the sampled person was identified, the survey was administered in two stages: completion of the background questionnaire and completion of the cognitive assessment.

The background questionnaire, which was the first part of the assessment, was administered in Computer-Aided Personal Interview format by the interviewer. Respondents were able to seek assistance from others in the household in completing the questionnaire, for example, in translating questions and answers. Proxy respondents were not permitted.

Following completion of the background questionnaire, the respondent undertook the cognitive assessment either using the computer provided by the interviewer or, by completing printed test booklets in the event that the respondent had limited computer skills, was estimated to have very low proficiency in literacy and numeracy, or opted not to take the test on the computer. Respondents were permitted to use technical aids such as an electronic calculator, a ruler (which were provided by interviewers) and to take notes or undertake calculations using a pen and pad during the assessment. Respondents were not allowed to seek assistance from others in completing the cognitive assessment. However, the interviewer could intervene if the respondent had problems with the computer application or had questions on how to proceed with the assessment.

The direct-assessment component of the survey was not designed as a timed test; respondents could take as much or as little time as needed to complete it. However, interviewers were trained to encourage respondents to move to another section of the assessment if they were having difficulties. Respondents who started the cognitive assessment tended to finish it. The time taken to complete the cognitive assessment varied between 41 and 50 minutes on average depending on the country/language version.

The survey (background questionnaire plus cognitive assessment) was normally undertaken in one session. However, in exceptional circumstances, a respondent could take the questionnaire in one session and the cognitive assessment in another. The cognitive assessment was required to be completed in one session. Respondents who did not complete the assessment within a single session for whatever reason were not permitted to finish it at a later time.

Data collection for the Survey of Adult Skills took place from 1 August 2011 to 31 March 2012 in most participating countries. In Canada, data collection took place from November 2011 to June 2012 and France collected data from September to November 2012.

Interviewers administering the survey were required to be trained according to common standards. These covered the timing and duration of training, its format and its content. A full set of training materials was provided to countries. The persons responsible for organising training nationally attended training sessions organised by the international consortium.

RESPONSE RATES AND NON-RESPONSE BIAS ANALYSIS

A major threat to the quality of the data produced by the Survey of Adult Skills was low response rates. The *PIAAC Technical Standards and Guidelines* (PIAAC, 2011) required that countries put in place a range of strategies to reduce the incidence and effects of non-response, to adjust for it when it occurred, and to evaluate the effectiveness of any weighting adjustments implemented to reduce non-response bias.

In particular, countries were expected to establish procedures during data collection to minimise non-response. These included pre-collection publicity, selecting high-quality interviewers, delivering training on methods to reduce and convert refusals, and monitoring data collection closely to identify problem areas or groups and directing resources to these particular groups. At least seven attempts were to be made to contact a selected individual or household before it could be classed as a non-contact. The overall rate of non-contact was to be kept below 3%.

Response rates were calculated for each stage of the assessment: screener (only for countries that need to sample households before selecting respondents); background questionnaire and Job Requirement Approach module; assessment (without reading components); and reading components.

The overall response rate was calculated as the product of the response rates (complete cases/eligible cases) for the relevant stages of the assessment. For countries with a screener questionnaire, the overall response rate was the product of the response rates for the screener, background questionnaire/Job Requirement Approach module and assessment; for countries without a screener, it was the product of the response rates for the questionnaire/module and the assessment.

The computations at each stage are hierarchical in that they depend on the response status from the previous data-collection stage. A completed case thus involved completing the screener (if applicable), the background questionnaire, and the cognitive assessment. In the case of the questionnaire, a completed case was defined as having provided responses to key background questions, including age, gender, highest level of schooling and employment status or responses to age and gender for literacy-related non-respondents. For the cognitive assessment, a completed case was defined as having completed the “core” module, and a literacy/numeracy core module, or a case in which the core module was not completed for a literacy-related reason, for example, because of a language difficulty or because the respondent was unable to read or write in any of a country’s test languages or because of learning or mental disability.

As noted above, countries using population register-based sampling frames were able to treat some or all of the individuals in their samples who were untraceable as exclusions (i.e. as outside the target population) and exclude them from the numerator and denominator of the response-rate calculation (provided that the 5% threshold for exclusions was not exceeded).

The survey’s *Technical Standards and Guidelines* set a goal of a 70% unit response rate. Five countries achieved this goal. For the most part, response rates were in the range of 50%-60%. Response rates by country are presented in Table 3.8.



Table 3.8
Achieved response rates and population coverage

National entities	Response rate (%)	Coverage rate¹ (%)
Australia	71	69
Austria	53	52
Canada	59	58
Czech Republic	66	65
Denmark	50	48
Estonia	63	61
Finland	66	66
France	67	64
Germany	55	54
Ireland	72	72
Italy	55	54
Japan	50	47
Korea	75	73
Netherlands	51	50
Norway	62	62
Poland	56	53
Slovak Republic	66	63
Spain	48	46
Sweden	45	45
United States	70	70
Sub-national entities		
Flanders (Belgium)	62	59
England (UK)	59	58
Northern Ireland (UK)	65	64
Partner		
Cyprus ²	73	72

1. The coverage rate = response rate * (1 – rate of exclusions).

2. See notes at the end of this chapter.

Countries worked to reduce non-response bias to the greatest extent possible before, during, and after data collection. Before data collection, countries implemented field procedures with the goal of obtaining a high level of co-operation. Most countries followed the PIAAC required sample monitoring activities to reduce bias to the lowest level possible during data collection. Finally, countries gathered and used auxiliary data to reduce bias in the outcome statistics through non-response adjustment weighting.

All countries were required to conduct a basic non-response bias analysis (NRBA) and report the results. The basic analysis was used to evaluate the potential for bias and to select variables for non-response adjustment weighting. In addition, countries were required to conduct and report the results of a more extensive NRBA if the overall response rate was below 70%, or if any stage of data collection (screener, background questionnaire, or the assessment) response rate was below 80%. A NRBA was required for any BQ item with response rate below 85%.

Australia, Korea, and the United States achieved an overall response rate of 70% or greater. As their response rates for each stage were greater than 80%, they did not require the extended NRBA. Cyprus¹ and Ireland also achieved overall response rates of 70% or greater, but they achieved a lower than 80% response rate for one stage of their sample. The remaining countries achieved response rates lower than 70%.

The main purpose of the extended analysis was to assess the potential for remaining bias in the final weighted proficiency estimates after adjusting for non-response. As the proficiency levels of non-respondents are unknown, the NRBA is carried out by making assumptions about non-respondents. Multiple analyses were, therefore, undertaken to assess the potential for bias as each individual analysis has limitations due to the particular assumptions made about non-respondents. The extended NRBA included seven analyses (as listed below). Together, they were used to assess the patterns and potential for bias in each country data.

1. Comparison of estimates before and after weighting adjustments
2. Comparison of weighted estimates to external totals
3. Correlations of auxiliary variables and proficiency estimates
4. Comparison of estimates from alternative weighting adjustments
5. Analysis of variables collected during data collection
6. Level-of-effort analysis
7. Calculation of the range of potential bias

Cyprus¹ and Ireland were required to do only a subset of the analyses since their overall response rate was higher than 70%.

Table 3.9 summarises the results of the NRBA for countries with response rates lower than 70%. The overall conclusion was that, on the balance of evidence, the level of non-response bias was in the range of minimal to low in countries required to undertake the extended analysis available. The results for England/Northern Ireland (UK) were, however, inconclusive because many of the analyses were either incomplete or not conducted. Data users should be aware that the analyses are all based on various assumptions about non-respondents. Multiple analyses, with different assumptions, were included in the NRBA to protect against misleading results. However, the lower the response rate, the higher is the risk of hidden biases that are undetectable through non-response bias analysis even when multiple analyses are involved.

Table 3.9
PIAAC NRBA outcome summary for countries with response rates less than 70%

National entities	Outcome
Austria	Caution-Bias low
Canada	Caution-Bias minimal
Czech Republic	Caution-Bias low
Denmark	Caution-Bias low
Estonia	Caution-Bias low
Finland	Caution-Bias minimal
Germany	Caution-Bias low
Italy	Caution-Bias low
Japan	Caution-Bias low
Netherlands	Caution-Bias low
Norway	Caution-Bias low
Poland	Caution-Bias low
Slovak Republic	Caution-Bias low
Spain	Caution-Bias low
Sweden	Caution-Bias low
Sub-national entities	
Flanders (Belgium)	Caution-Bias low
England (UK)	Caution-Bias unknown
Northern Ireland (UK)	Caution-Bias unknown

LITERACY-RELATED NON-RESPONSE

In most participating countries a proportion of respondents were unable to undertake the assessment for literacy-related reasons, such as being unable to speak or read the test language(s), having difficulty reading or writing, or having a learning or mental disability. Some of these respondents completed the background questionnaire, or key parts of it, presumably with the assistance of an interviewer who spoke the respondent's language, a family member or another person. The available background information regarding these respondents was used to impute proficiency scores in literacy and numeracy. Scores were not, however, imputed in problem solving in technology-rich environments domain,



as these respondents did not undertake the ICT core assessment. Other respondents were able to provide only very limited background information as there was no one present (either the interviewer or another person) to translate into the language of the respondent or answer on behalf of the respondent. For most of these respondents, the only information collected was their age, gender and, in some cases, highest educational attainment. As a result, proficiency scores were not estimated for these respondents in any domain; however, they have been included as part of the weighted population totals and are included in the charts and tables in *OECD Skills Outlook 2013* (OECD, 2013) of this report under the category of literacy-related non-response (missing). The proportions of respondents who did not undertake the cognitive assessment and (a) received imputed scores and (b) did not receive imputed scores are presented in Table 3.10. Flanders (Belgium) and Cyprus¹ each stand out as having a high proportion of respondents who did not receive imputed scores due to having relatively high proportions of respondents for whom limited background information was available.

Table 3.10
Literacy-related non-response to the assessment: Proportion of respondents

	Respondents with imputed scores (weighted %)	Respondents without imputed scores (literacy-related non-response) (weighted %)
National entities		
Australia	4.9	1.9
Austria	1.5	1.8
Canada	4.7	0.9
Czech Republic	0.3	0.6
Denmark	5.0	0.4
Estonia	1.7	0.4
Finland	6.1	0.0
France	6.5	0.8
Germany	1.7	1.5
Ireland	3.3	0.5
Italy	3.9	0.7
Japan	0.1	1.2
Korea	2.2	0.3
Netherlands	1.7	2.3
Norway	4.6	2.2
Poland	1.1	0.0
Slovak Republic	1.6	0.3
Spain	2.0	0.8
Sweden	5.9	0.0
United States	2.3	4.2
Sub-national entities		
Flanders (Belgium)	0.6	5.2
England and Northern Ireland (UK)	2.5	1.4
Partner		
Cyprus ¹	0.2	17.7

1. See notes at the end of this chapter.

SCORING

For the large majority of respondents who took the assessment in its CBA format, scoring was done automatically. Manual scoring was necessary in the case of respondents taking the PBA version.

Participating countries were required to undertake within-country reliability studies during both the field test and main survey to check the consistency of scoring. This required a second scorer to re-score a pre-defined number of cognitive paper-and-pencil assessments.⁵ The level of agreement between the two scorers was expected to be at least 95%.

In addition, a cross-country reliability study was conducted to identify the presence of systematic scoring bias across countries. At least two bilingual scorers (fluent in the national language and English) scored English-language international anchor booklets to ensure the equivalence of scoring across countries. These scores were compared and evaluated against the master scores for accuracy.

The levels of agreement achieved in the within-country and between-country studies of scoring reliability are presented in Table 3.11.

Table 3.11
Scoring of paper-based instruments: Within- and between-country agreement

National entities	Within-country agreement			Cross-country (anchor booklet) agreement		
	Core (%)	Literacy (%)	Numeracy (%)	Core (%)	Literacy (%)	Numeracy (%)
Australia	99.7	98.1	99.2	98.3	98.8	96.3
Austria	99.1	98.2	98.4	96.0	97.9	95.8
Canada	99.4	96.9	98.3	98.3	98.3	96.4
Czech Republic	100.0	99.6	100.0	98.3	97.2	96.5
Denmark	99.7	98.9	99.3	97.1	97.3	95.9
Estonia	99.5	97.9	98.7	95.5	95.5	95.5
Finland	99.8	96.4	98.9	97.5	98.4	96.1
France				96.5	87.5	92.2
Germany	99.9	99.4	99.1	96.0	97.9	95.8
Ireland	99.6	99.2	99.3	97.1	96.7	95.0
Italy	99.4	96.2	96.7	97.9	97.0	96.2
Japan	99.9	99.8	99.7	99.2	97.9	97.0
Korea	100.0	100.0	100.0	98.8	99.1	96.7
Netherlands	99.5	99.9	99.9	95.6	92.1	95.5
Norway	99.0	97.5	98.5	96.6	96.5	95.9
Poland	99.6	98.2	98.7	99.0	97.3	96.0
Slovak Republic	100.0	100.0	100.0	99.6	95.0	96.1
Spain	100.0	99.9	100.0	97.7	96.3	95.7
Sweden	99.9	99.8	99.9	96.5	98.7	96.8
United States	99.1	97.2	98.9	99.1	99.5	97.3
Sub-national entities						
Flanders (Belgium)	99.7	99.4	99.4	99.0	97.8	95.8
England and Northern Ireland (UK)	100.0	100.0	100.0	98.4	98.8	96.6
Partner						
Cyprus ¹	99.5	99.2	98.2	98.3	98.8	96.9

1. See notes at the end of this chapter.

OVERALL ASSESSMENT OF DATA QUALITY

The data from participating countries was subject to a process of “adjudication” to determine whether it was of sufficient quality to be reported and released to the public. The adjudication process used a broad definition of quality – that of “fitness for use”. While countries’ compliance with the requirements of the *PIAAC Technical Standards and Guidelines* was an important component of the quality assessment, the goal was to go beyond compliance to assess whether the data produced were of sufficient quality in terms of their intended uses or applications. In assessing overall quality, the focus was on four key areas:

- sampling;
- coverage and non-response bias;
- data collection; and
- instrumentation.

In each of the domains identified above, countries were assessed against a set of quality indicators. These indicators reflected the major requirements of the survey’s *Technical Standards and Guidelines* (PIAAC, 2011) in the domains concerned. All countries either fully met the required quality standards or, if they did not fully meet them, they met them to a degree that was believed not to compromise the overall quality of the data. The data from all participating countries were determined to have met the quality standards required for reporting and public release. The assessments of the quality of participating countries’ data were reviewed by the project’s Technical Advisory Group before being submitted to the Board of Participating Countries.



Notes

1. See notes regarding Cyprus below.
2. The exception was countries in which problem solving in technology-rich environments was not tested. In these cases, some respondents would take both a literacy and a numeracy module in CBA mode.
3. However, all respondents, whatever their characteristics and score on the core or the Stage 1 testlet, had some chance of being assigned to a testlet of a certain difficulty.
4. A completed case is defined as an interview in which the respondent provided answers to key background questions, including age, gender, highest level of schooling and employment status, and completed the “core” cognitive instrument (except in cases in which the respondent did not read the language[s] of the assessment).
5. In the main study, at least 600 cases (or 100% of cases if the number of respondents was less than 600) in each of the test languages had to be re-scored.

Notes regarding Cyprus

Note by Turkey: The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

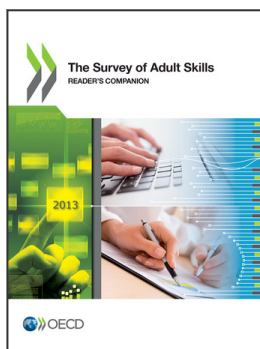
Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

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