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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.

A note regarding Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

To date the Survey of Adult Skills has involved two rounds of data collection: the first involving 24 countries/economies and the second nine. The first round of the study extended from January 2008 to October 2013. The second extended from January 2012 until June 2016. Table 3.1 presents the dates of key phases of the two rounds as well as listing the countries/economies participating in each.

Table 3.1 List of participating countries and economies and dates of key phases

	Round 1	Round 2
Project start	January 2008	2011
Field test	April to June 2010	April to June 2013
Main study data collection	August 2011 to November 2012	April 2014 to March 2015
Report and data release	13 October 2013	28 June 2016
Participating countries and economies	Australia	Chile
	Austria	Greece
	Canada	Israel
	Cyprus ¹	Jakarta (Indonesia)
	Czech Republic	Lithuania
	Denmark	New Zealand
	England (United Kingdom)	Singapore
	Estonia	Slovenia
	Flanders (Belgium)	Turkey
	Finland	
	France	
	Germany	
	Ireland	
	Italy	
	Japan	
	Korea	
	Netherlands	
	Northern Ireland (United Kingdom)	
	Norway	
	Poland	
	Russian Federation ²	
	Slovak Republic	
	Spain	
	Sweden	
	United States	

1. *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.

2. See note at the end of this chapter.

Countries and economies are ranked in alphabetical order.

Both rounds of PIAAC were guided by the same set of technical standards and guidelines (PIAAC, 2014) 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/economies 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 3.2).

Table 3.2 Areas of activity covered by the PIAAC 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/economies 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/economies 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
- the outcomes of the adjudication of data quality.

ASSESSMENT DESIGN

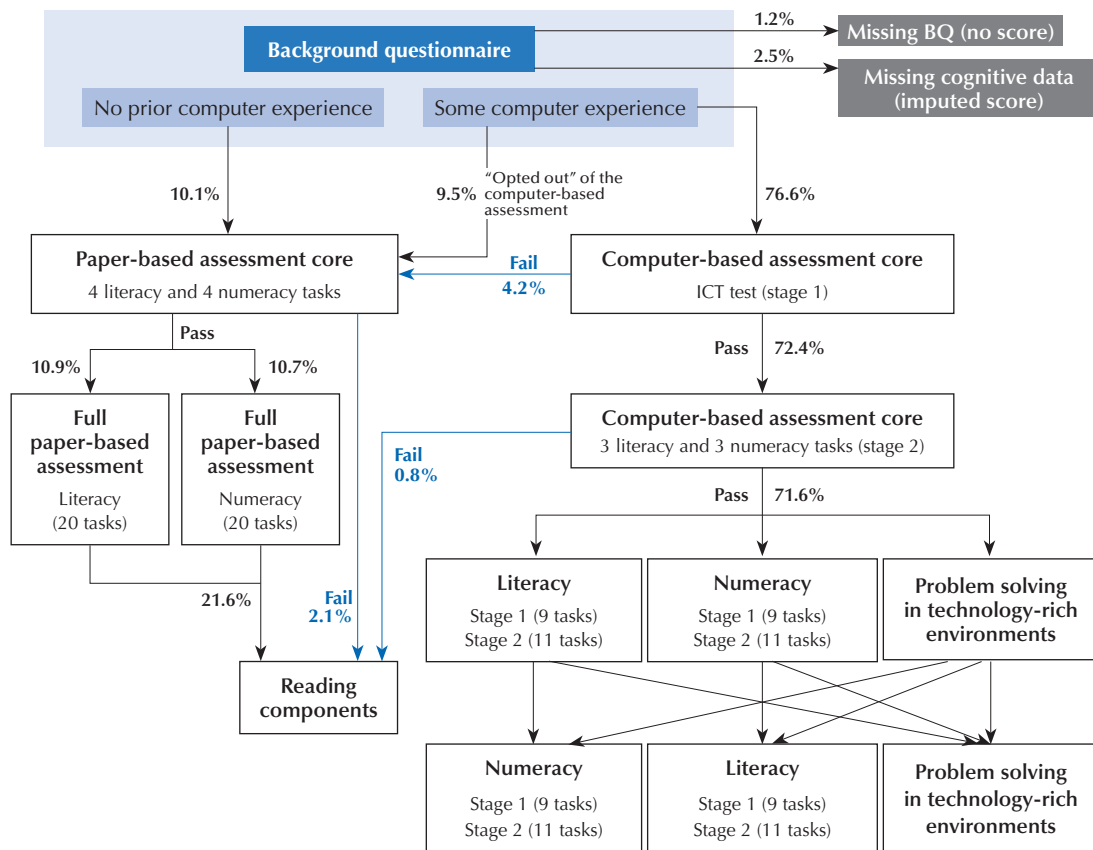
The Survey of Adult Skills involved the direct assessment of literacy, numeracy and problem solving in technology-rich environments. While conceived primarily as a computer-based assessment (CBA), the option of taking the literacy and numeracy components of the assessment in paper-based format (PBA) 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.

In Jakarta (Indonesia), the assessment was delivered in paper-based format only due to the low rate of familiarity with computers among the target population. This was a version of the paper-based assessment used in other countries that included additional items.

Pathways through the cognitive assessments in the Survey of Adult Skills (PIAAC): Computer-based assessment

As can be seen, there are several pathways through the computer-based 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.

Figure 3.1 ■ Pathways through the cognitive assessments in the Survey of Adult Skills (PIAAC): Computer-based assessment



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

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 9.5% of all respondents in Rounds 1 and 2.

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.

Some 76.6% of respondents attempted the CBA core Stage 1. In total, 72.4 % of respondents took the CBA core Stage 2 and 71.6% of the sample went on to the CBA literacy, numeracy or problem solving assessment with 0.8% being directed to the reading components assessment.

Some 23.8% of respondents took the PBA assessment core and 21.6% went on to complete the paper-based literacy and numeracy assessment modules and the reading components assessment. A total of 2.9% of respondents completed the reading components assessment only. There was a small proportion of respondents who did not complete the cognitive assessment.

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.

Table 3.3 Participation in the cognitive-assessment modules

OECD countries and economies	Literacy and numeracy	Problem solving in technology-rich environments	Reading components
Australia	Yes	Yes	Yes
Austria	Yes	Yes	Yes
Canada	Yes	Yes	Yes
Chile	Yes	Yes	Yes
Czech Republic	Yes	Yes	Yes
Denmark	Yes	Yes	Yes
England (UK)	Yes	Yes	Yes
Estonia	Yes	Yes	Yes
Finland	Yes	Yes	No
Flanders (Belgium)	Yes	Yes	Yes
France	Yes	No	No
Germany	Yes	Yes	Yes
Greece	Yes	Yes	Yes
Ireland	Yes	Yes	Yes
Israel	Yes	Yes	Yes
Italy	Yes	No	Yes
Japan	Yes	Yes	No
Korea	Yes	Yes	Yes
Netherlands	Yes	Yes	Yes
New Zealand	Yes	Yes	Yes
Northern Ireland (UK)	Yes	Yes	Yes
Norway	Yes	Yes	Yes
Poland	Yes	Yes	Yes
Slovak Republic	Yes	Yes	Yes
Slovenia	Yes	Yes	Yes
Spain	Yes	No	Yes
Sweden	Yes	Yes	Yes
Turkey	Yes	Yes	Yes
United States	Yes	Yes	Yes
Partners			
Cyprus ¹	Yes	No	Yes
Jakarta (Indonesia)	Yes	No	Yes
Lithuania	Yes	Yes	Yes
Russian Federation ²	Yes	Yes	No
Singapore	Yes	Yes	Yes

1. See note 1 under Table 3.1.

2. See note at the end of this chapter.

Countries and economies are ranked in alphabetical order.

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 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.³

All participating countries/economies 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 3.3 provides details of participation in each of the cognitive assessments.

SAMPLING

To maximise the comparability of results, countries/economies 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.

Table 3.4 Sampling frames for countries/economies with registry samples

OECD countries and economies	Sampling frame		
	Stage 1	Stage 2	Stage 3
Austria	Population registry, 2011		
Flanders (Belgium)	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		
Israel (small localities)	List of localities from Israeli Ministry of the Interior adjusted to the target population of the survey, 2013	Population registry, 2013	
Israel (big localities)	Population registry, 2013		
Singapore	Population registry, 2014		
Slovenia	Population registry, 2014		

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

Table 3.5 Sampling frames for countries using master samples

Country	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. No country/economy in Round 2 used a master sample as a sampling frame.

**Table 3.6 Sampling frames for countries/economies using area samples**

OECD countries and economies	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
England (UK)	Royal Mail list of UK Postal Sectors, 2011	Royal Mail PAF residential file, 2011	Field enumeration	Field enumeration
Ireland	Small Area classifications, 2009	Geodirectory (national address database), 2011	Field enumeration	
Korea	2010 Census	2010 Census	Field enumeration	
Northern Ireland (UK)	NI(POINTER) database, 2011	Field enumeration	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
Chile	2002 Census of Population and Housing, updated with 2012 population growth models	List of blocks provided by the National Statistics Institute, 2002 (rural) or 2008 (urban)	Field enumeration	Field enumeration
Greece	2011 Census	Field enumeration	Field enumeration	
Jakarta (Indonesia)	2010 Census	Field enumeration	Field enumeration	
Lithuania	Address database from the Registry of Addresses of Lithuania, 2013/2014	Address database from the Registry of Addresses of Lithuania, 2013/2014	Field enumeration	
New Zealand	Statistics New Zealand's Household Survey Frame, 2013	2013 Census Meshblocks	Field enumeration	Field enumeration
Turkey	List of Provinces, 2013	List of household addresses provided by the Turkish Statistical Institute, 2012	Field enumeration	

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

1. See note 1 under Table 3.1.

No country/economy in Round 2 used a master sample as a sampling frame.

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 three countries the sample frame covered subunits of the national territory. In Round 1, only the Flemish region (Flanders) participated in the survey in Belgium and in the United Kingdom, only the autonomous administrative regions of England and Northern Ireland participated. In Round 2, in Indonesia, only the Jakarta municipal area participated in the survey. Following the tsunami of March 2011, Japan had to revise its sample design to exclude affected regions. In the case of the Russian Federation, the results relate to the territory of the Russian Federation *excluding* the Moscow municipal area. Moscow was excluded after the data collection had been completed due to problems with a data collection in this area.

The sampling frame used by participating countries/economies 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/economies 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/economies at different stages of the sample selection are described in Tables 3.4 to 3.6.

Table 3.7 Exclusions from target population

OECD countries and economies	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
Chile	The following areas of Chile: Ollague, Isla de Pascua, Juan Fernández, Cochamó, Futaleufú, Hualaihué, Palena, Guaitecas, O'Higgins Tortel, Cabo de Hornos and Antártica. Also, given the practice of only listing eligible dwelling units (DUs), there is some unknown level of noncoverage due to ineligible DUs becoming eligible by the time of data collection. However, given the vacancy and moving rates in Chile, this is expected to be minor	0.1+	N/A
Czech Republic	Professional armed forces; municipalities with < 200 habitants	1.8	N/A
Denmark	Illegal immigrants	<0.1	5.0
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
Estonia	Persons without a detailed address; illegal immigrants (no estimate provided)	2.8	0.6
Finland	Illegal immigrants; asylum-seekers	0.2	0.5
Flanders (Belgium)	Illegal immigrants	1.0	4.0
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
Greece	Persons residing in non-institutional group quarters	1.4	N/A
Ireland	Some mobile dwellings, such as the caravans of Irish travellers	0.4	N/A
Israel	Non-citizens	2.5	2.5
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
New Zealand	Persons living in off-shore islands; persons living in primary sample units (PSUs) with less than 9 occupied dwellings; persons in non-private dwellings and in private temporary dwellings	2.3	N/A
Northern Ireland (UK)	Individuals not listed on the NI(POINTER) database	2.0	N/A
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
Slovenia	1.7% of small PSUs; a third of people aged 16 and 65; ³ people in workers quarters; foreigners who have been in the country less than one year but plan to stay; illegal immigrants	1.7	3.3
Spain	None	0.0	5.0
Sweden	Illegal immigrants	<1.0	0.0
Turkey	People who move into vacant dwelling units after the dwelling lists were constructed and before data collection ends	2.0	N/A
United States	Some Hispanics and black males (and other hard-to-reach groups) as in other US household surveys	<1.0	0.0
Partners			
Cyprus ¹	Persons living in houses built after December 2010	<2.0	N/A
Jakarta (Indonesia)	Population in RT/RWs not listed in the 2010 census	Unknown	N/A
Lithuania	Undocumented immigrants; Neringa (hard-to-reach region separated from rest of Lithuania by sea); villages with less than 20 addresses (these villages are almost vacant in most cases). Also, when listing DUs to create the frame, the field staff identified and excluded the streets which were found to have no DUs.	2.7	N/A
Russian Federation ²	Chechnya region	1.5	N/A
Singapore	None ⁴	0.0	0.6

1. See note 1 under Table 3.1.

2. See note at the end of this chapter.

3. PIAAC Guideline 4.1.1C requires countries/economies to use age at the mid-point of data collection to define the sampling frame of age eligible persons. However, Slovenia included only persons who are of an eligible age throughout the whole 8-month data collection period. As a result, a third of people aged 16 and aged 65 were excluded from the frame.

4. Singapore modified the definition of the target population to be all non-institutionalised Singapore citizens and Singapore permanent residents between the ages of 16 and 65 (inclusive) residing in Singapore at the time of data collection. Contract/temporary foreign workers are not considered part of their target population. There are 1.3 million people (approximately 25% of the total population) who are working, studying or living in Singapore but not granted permanent residence, and although they are part of the work force, live in housing, purchase goods and travel freely within the country, they are excluded from the target population because of their transitory living status.

Countries and economies are ranked in alphabetical order.



Coverage of the target population

Countries'/economies' 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/economies 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 3.7 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.

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/economies had the choice of assessing all three domains (literacy, numeracy and problem solving) or assessing literacy and numeracy only.

Table 3.8 Sample size

OECD countries and economies	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
Chile	L, N, PS-TRE	Spanish		5 307
Czech Republic	L, N, PS-TRE	Czech	Persons aged 16-29	6 102
Denmark	L, N, PS-TRE	Danish	Persons aged 55-65, recent immigrants	7 328
England (UK)	L, N, PS-TRE	English		5 131
Estonia	L, N, PS-TRE	Estonian, Russian		7 632
Finland	L, N, PS-TRE	Finnish, Swedish		5 464
Flanders (Belgium)	L, N, PS-TRE	Dutch		5 463
France	L, N	French		6 993
Germany	L, N, PS-TRE	German		5 465
Greece	L, N, PS-TRE	Greek		4 925
Ireland	L, N, PS-TRE	English		5 983
Israel	L, N, PS-TRE	Hebrew, Arabic, Russian	The Arab population and Ultra-orthodox	5 538
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
New Zealand	L, N, PS-TRE	English	Persons of Maori and Pacific ethnicities; persons aged 16-25	6 177
Northern Ireland (UK)	L, N, PS-TRE	English		3 761
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
Slovenia	L, N, PS-TRE	Slovenian		5 331
Spain	L, N	Castilian, Catalan, Basque, Galician, Valencian		6 055
Sweden	L, N, PS-TRE	Swedish		4 469
Turkey	L, N, PS-TRE	Turkish		5 277
United States	L, N, PS-TRE	English		5 010
Partners				
Cyprus ¹	L, N	Greek		5 053
Jakarta (Indonesia)	L, N	Indonesian		7 229
Lithuania	L, N, PS-TRE	Lithuanian		5 093
Russian Federation ²	L, N, PS-TRE	Russian		3 892
Singapore	L, N, PS-TRE	English		5 468

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

1. See note 1 under Table 3.1.

2. See note at the end of this chapter.

Countries and economies are ranked in alphabetical order.

Assuming the assessment was administered in only one language, the minimum sample size required was 5 000 completed cases⁴ 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 (United Kingdom) to allow results to be reported separately from those of England (United Kingdom) for key variables.

Participating countries/economies 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. Chile also surveyed 15-year-olds. Denmark administered the assessment to individuals who had participated in PISA in 2000 and Singapore administered the assessment to individuals who had participated in PISA 2012. Results from individuals included in these national “supplemental samples” are not reported as part of the Survey of Adult Skills.

Table 3.8 provides information on the sample size by participating country, languages and oversampling.

Sample design

Participating countries/economies 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, Second Edition* (OECD, forthcoming).

TRANSLATION AND ADAPTATION OF INSTRUMENTS

Participating countries/economies 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.
- 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 in Round 1 of the Survey of Adult Skills took place from 1 August 2011 to 31 March 2012 in most participating countries/economies. In Canada, data collection took place from November 2011 to June 2012 and France collected data from September to November 2012. Data collection for Round 2 of the Survey of Adult Skills took place from 1 April 2014 to 31 March 2015.

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, 2014) required that countries/economies 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/economies 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/economies 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/economies 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/economies 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/economies 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. Seven countries achieved this goal, five in Round 1 and two in Round 2. For the most part, response rates were in the range of 50%-60%. Response rates by country/economy are presented in Table 3.9.

Table 3.9 Achieved response rates and population coverage

OECD countries and economies	Response rate	Coverage rate ³
Australia	71	69
Austria	53	52
Canada	59	58
Chile	66	66
Czech Republic	66	65
Denmark	50	48
England (UK)	59	58
Estonia	63	61
Finland	66	66
Flanders (Belgium)	62	59
France	67	64
Germany	55	54
Greece	41	40
Ireland	72	72
Israel	61	58
Italy	55	54
Japan	50	47
Korea	75	73
Netherlands	51	50
New Zealand	63	61
Northern Ireland (UK)	65	64
Norway	62	62
Poland	56	53
Slovak Republic	66	63
Slovenia	62	59
Spain	48	46
Sweden	45	45
Turkey	80	79
United States	70	70
Partners		
Cyprus ¹	73	72
Jakarta (Indonesia)	82	unknown
Lithuania	54	53
Russian Federation ²	52	51
Singapore	63	63

1. See note 1 under Table 3.1.

2. See note at the end of this chapter.

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

Countries and economies are ranked in alphabetical order.

Countries/economies 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/economies 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, Indonesia (Jakarta) Korea, Turkey 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 3.10 PIAAC NRBA outcome summary for countries/economies with response rates less than 70%

OECD countries and economies	Outcome
Austria	Caution-Bias low
Canada	Caution-Bias minimal
Chile	Caution-Bias minimal
Czech Republic	Caution-Bias low
Denmark	Caution-Bias low
England (UK)	Caution-Bias unknown
Estonia	Caution-Bias low
Finland	Caution-Bias minimal
Flanders (Belgium)	Caution-Bias low
Germany	Caution-Bias low
Greece	Caution-Bias low
Israel	Caution-Bias minimal
Italy	Caution-Bias low
Japan	Caution-Bias low
Netherlands	Caution-Bias low
New Zealand	Caution-Bias minimal
Northern Ireland (UK)	Caution-Bias unknown
Norway	Caution-Bias low
Poland	Caution-Bias low
Slovak Republic	Caution-Bias low
Slovenia	Caution-Bias minimal
Spain	Caution-Bias low
Sweden	Caution-Bias low
Partners	
Lithuania	Caution-Bias low
Russian Federation ¹	Caution-Bias unknown
Singapore	Caution-Bias minimal

1. See note at the end of this chapter.

Countries and economies are ranked in alphabetical order.

Table 3.10 summarises the results of the NRBA for countries/economies 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 (United Kingdom) 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.

LITERACY-RELATED NON-RESPONSE

In most participating countries/economies 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.

Table 3.11 Literacy-related non-response to the assessment: Proportion of respondents

OECD countries and economies	Respondents with imputed scores (weighted %)	Respondents without imputed scores (literacy-related non response) (weighted %)
Australia	4.9	1.9
Austria	1.5	1.8
Canada	4.7	0.9
Chile	1.3	0.3
Czech Republic	0.3	0.6
Denmark	5.0	0.4
England/Northern Ireland (UK)	2.5	1.4
Estonia	1.7	0.4
Finland	6.1	0.0
Flanders (Belgium)	0.6	5.2
France	6.5	0.8
Germany	1.7	1.5
Greece	0.2	1.0
Ireland	3.3	0.5
Israel	1.7	2.4
Italy	3.9	0.7
Japan	0.1	1.2
Korea	2.2	0.3
Netherlands	1.7	2.3
New Zealand	0.2	1.9
Norway	4.6	2.2
Poland	1.1	0.0
Slovak Republic	1.6	0.3
Slovenia	0.3	0.6
Spain	2.0	0.8
Sweden	5.9	0.0
Turkey	2.4	2.0
United States	2.3	4.2
Partners		
Cyprus ¹	0.2	17.7
Jakarta (Indonesia)	0.5	0.0
Lithuania	0.1	4.5
Russian Federation ²	0.0	0.0
Singapore	5.1	1.0

1. See note 1 under Table 3.1.

2. See note at the end of this chapter.

Countries and economies are ranked in alphabetical order.



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) and *Skills Matter: Further Results from the Survey of Adult Skills* (OECD, 2016) 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 3.11. 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.

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/economies 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%.

Table 3.12 Scoring of paper-based instruments: Within- and between-country agreement

OECD countries and economies	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
Chile	99.4	98.6	99.4	98.5	97.8	95.7
Czech Republic	100.0	99.6	100.0	98.3	97.2	96.5
Denmark	100.0	99.9	100.0	97.1	97.3	95.9
England/Northern Ireland (UK)	99.6	99.2	99.3	98.4	98.8	96.6
Estonia	99.8	96.4	98.9	95.5	95.5	95.5
Finland	99.3	98.4	98.8	97.5	98.4	96.1
Flanders (Belgium)	99.7	99.4	99.4	99.0	97.8	95.8
France	100.0	100.0	100.0	96.5	87.5	92.2
Germany	99.7	98.9	99.3	96.0	97.9	95.8
Greece	99.9	99.6	99.9	98.8	97.8	96.7
Ireland	99.4	96.2	96.7	97.1	96.7	95.0
Israel	99.4	98.7	98.9	98.8	98.2	96.8
Italy	99.9	99.8	99.7	97.9	97.0	96.2
Japan	100.0	100.0	100.0	99.2	97.9	97.0
Korea	99.5	99.9	99.9	98.8	99.1	96.7
Netherlands	99.0	97.5	98.5	95.6	92.1	95.5
New Zealand	99.7	98.9	99.4	98.6	97.8	96.6
Norway	99.6	98.2	98.7	96.6	96.5	95.9
Poland	100.0	100.0	100.0	99.0	97.3	96.0
Slovak Republic	99.9	99.8	99.9	99.6	95.0	96.1
Slovenia	99.5	97.4	99.1	98.3	97.8	96.6
Spain	99.5	97.9	98.7	97.7	96.3	95.7
Sweden	99.1	97.2	98.9	96.5	98.7	96.8
Turkey	98.9	96.8	98.4	98.3	95.6	96.1
United States	99.4	98.9	99.0	99.1	99.5	97.3
Partners						
Cyprus ¹	99.5	99.2	98.2	98.3	98.8	96.9
Jakarta (Indonesia)	99.3	96.3	98.3	97.1	92.9	94.9
Lithuania	99.7	98.7	99.6	97.9	97.3	96.1
Russian Federation ²	100.0	100.0	100.0	94.0	86.7	91.5
Singapore	99.4	97.9	98.7	96.6	97.1	94.6

1. See note 1 under Table 3.1.

2. See note at the end of this chapter.

Countries and economies are ranked in alphabetical order.



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 3.12.

OVERALL ASSESSMENT OF DATA QUALITY

The data from participating countries/economies 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* (PIAAC, 2014) 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
- instrumentation.

In each of the domains identified above, countries/economies were assessed against a set of quality indicators. These indicators reflected the major requirements of the survey’s *Technical Standards and Guidelines* (PIAAC, 2014) in the domains concerned. All countries/economies 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/economies 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.

In two countries, there were specific concerns about some aspects of the quality of data. These concerns and the action taken to rectify them are described below. In the Russian Federation, concerns regarding the process of data collection in the Moscow municipal area led to data from this area to be removed from the Russian data file. Thus, the sample for the Russian Federation covers the population of the Russian Federation with the exception of the population of the Moscow municipal area. In Greece, a large number of cases (1 032 in total) were collected without complete cognitive data. Proficiency scores in literacy and numeracy have been imputed for these cases. Further information can be found in the *Technical Report of the Survey of Adult Skills, Second Edition* (OECD, forthcoming).



Notes

1. See note regarding Cyprus under Table 3.1.
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.

A note regarding the Russian Federation

The sample for the Russian Federation does not include the population of the Moscow municipal area. The data published, therefore, do not represent the entire resident population aged 16-65 in the Russian Federation but rather the population of the Russian Federation *excluding* the population residing in the Moscow municipal area.

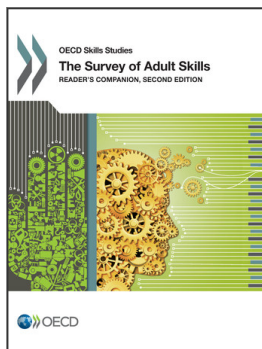
More detailed information regarding the data from the Russian Federation as well as that of other countries can be found in the *Technical Report of the Survey of Adult Skills, Second Edition* (OECD, forthcoming).

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