ANNEX A

PISA 2018 technical background

All figures and tables in Annex A are available on line

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ANNEX A1
Construction of indices

EXPLANATION OF THE INDICES

This section explains the indices derived from the PISA 2018 parent, student, school and teacher questionnaires used in this volume.

Several PISA measures reflect indices that summarise responses from students, their parents, teachers or school representatives (typically principals) to a series of related questions. The questions were selected from a larger pool on the basis of theoretical considerations and previous research. The *PISA 2018 Assessment and Analytical Framework* (OECD, 2019[1]) provides an in-depth description of this conceptual framework. Item response theory modelling was used to confirm the theoretically expected behaviour of the indices and to validate their comparability across countries. For this purpose a joint model across all countries was estimated. Item fit (root mean square deviation) was evaluated separately for each item and each group (country/economy by language). This procedure is in line with the PISA 2015 scaling approach. For a detailed description of other PISA indices and details on the methods, see the *PISA 2015 Technical Report* (OECD; 2017) and the *PISA 2018 Technical Report* (OECD, forthcoming[2]).

There are three types of indices: simple indices, new scale indices and trend scale indices.

Simple indices are the variables that are constructed through the arithmetic transformation or recoding of one or more items in exactly the same way across assessments. Here, item responses are used to calculate meaningful variables, such as recoding of the four-digit ISCO-08 codes into "highest parents' socio-economic index" (HISEI) or teacher-student ratio, based on information from the school questionnaire.

Scale indices are the variables constructed through the scaling of multiple items. Unless otherwise indicated, the index was scaled using a two-parameter item-response model (a generalised partial-credit model was used in the case of items with more than two categories) and values of the index correspond to Warm likelihood estimates (Warm, 1989[3]).For details on how each scale index was constructed, see the *PISA 2018 Technical Report* (OECD, forthcoming[2]). In general, the scaling was done in two stages. The item parameters were estimated based on all students from equally-weighted countries and economies. Only cases with a minimum number of three valid responses to items that are part of the index were included. In the case of **trend scale indices**, a common calibration linking procedure was used: countries/economies that participated in both PISA 2009 and PISA 2018 contributed both samples to the calibration of item parameters; each cycle and, within each cycle, each country/economy contributed equally to the estimation.

For **new scale indices**, the Warm likelihood estimates were then standardised so that the mean of the index value for the OECD student population was zero and the standard deviation was one (countries/economies were given equal weight in the standardisation process).

Sequential codes were assigned to the different response categories of the questions in the sequence in which the response categories appeared in the student, school or parent questionnaire. Where indicated in this section, these codes were inverted for the purpose of constructing indices or scales. Negative values for an index do not necessarily imply that students responded negatively to the underlying questions. A negative value merely indicates that the respondents answered less positively than all respondents on average across OECD countries. Likewise, a positive value in an index indicates that the respondents answered more favourably, or more positively than all respondents on average across OECD countries. Terms enclosed in brackets < > in the following descriptions were replaced in the national versions of the student, school and parent questionnaires by the appropriate national equivalent. For example, the term <qualification at ISCED level 5A> was translated in the United States into "Bachelor's degree, post-graduate certificate program, Master's degree program or first professional degree program". Similarly the term <classes in the language of assessment> in Luxembourg was translated into "German classes" or "French classes", depending on whether students received the German or French version of the assessment instruments.

In addition to the simple and scaled indices described in this annex, there are a number of variables from the questionnaires that were used in this volume and correspond to single items not used to construct indices. These non-recoded variables have the prefix of "ST" for the questionnaire items in the student questionnaire, "SC" for the items in the school questionnaire, "TC" for the items in the teacher questionnaire and "PA" for the items in the parent questionnaire. All the context questionnaires, and the PISA international database, including all variables, are available through www.oecd.org/pisa.

STUDENT-LEVEL SIMPLE INDICES

Immigrant background

Information was also collected on the country of birth of students and their parents. Included in the database are three country-specific variables related to the country of birth of the student, and his or her mother and father (ST019). The variables are binary and indicate whether the student, mother and father were born in the country of assessment or elsewhere. The index on immigrant background (IMMIG) is calculated from these variables and has the following categories: 1) native students (those who had at least one parent born in the country); 2) second-generation students (those born in the country of assessment but whose parent[s] were born in another country); and 3) first-generation students (those born outside the country of assessment and whose parents were also born in another country). Students with missing responses for either the student or for both parents were given missing values for this variable.

Number of actions taken by students

PISA 2018 assessed students' willingness to take action using a series of eight yes-or-no statements (ST222). The statements covered topics related to environmental protection, gender equality and interest in international and social issues, such as poverty and human rights. The eight statements were: "I reduce the energy I use at home to protect the environment"; "I choose certain products for ethical or environmental reasons, even if they are a bit more expensive"; "I sign environmental or social petitions online"; "I keep myself informed about world events via Twitter or Facebook"; "I boycott products or companies for political, ethical or environmental reasons"; "I participate in activities promoting equality between men and women"; "I participate in activities in favour of environmental protection"; and "I regularly read websites on international social issues (e.g. poverty, human rights)". The total number of actions for collective well-being and sustainable development was constructed by summing answers on all eight questions.

Number of learning activities attended by students

Students who participated in PISA 2018 were asked ten questions about different learning activities to which they are exposed (ST221). The activities were: learning about different cultures at school; learning how to solve conflicts with other people in the classroom; learning how people from different cultures can have different perspectives on some issues; learning how to communicate with people from different backgrounds; participating in classroom discussions about world events; learning about the interconnectedness of countries' economies; analysing global issues together with classmates in small groups during class; giving and discussing personal opinions about international news; reading newspapers, looking for news on the Internet or watching the news together during classes; and participating in events celebrating cultural diversity throughout the school year. The total number of learning activities students are exposed to at school was constructed by summing students' answers to all ten questions.

STUDENT-LEVEL SCALE INDICES

Students' awareness of global issues

Students' awareness of global issues was assessed using one question in the PISA 2018 student questionnaire (ST197). Students were asked to report the extent to which they are aware of global issues. Answers were given on a four-point scale: "I have never heard of this"; "I have heard about this but I would not be able to explain what it is really about"; "I know something about this and could explain the general issue"; and "I am familiar with this and I would be able to explain this well". They responded to statements about seven issues: climate change and global warning; global health; migration; international conflicts; hunger or malnutrition in different parts of the world; causes of poverty; and equality between men and women in different parts of the world. Answers were used to construct the index of awareness of global issues (GCAWARE). Positive values in this index mean that students expressed a greater awareness about global issues than the average student across OECD countries.

Students' self-efficacy regarding global issues

Students in PISA 2018 were asked to report the extent to which they could do certain global competence-related tasks on their own (ST196). Answers were given on a four-point scale: "I could not do this"; "I would struggle to do this on my own"; "I could do this with a bit of effort"; and "I could do this easily". Students responded to the following prompts: "Explain how carbon-dioxide emissions affect global climate change"; "Establish a connection between prices of textiles and working conditions in the countries of production"; "Discuss the different reasons why people become refugees"; "Explain why some countries suffer from more global climate change than others"; and "Discuss the consequences of economic development on the environment". Answers were combined to create the index of self-efficacy regarding global competence (GCSELFEFF). Positive values in this index mean that students expressed greater self-efficacy than the average student across OECD countries.

Students' ability to understand the perspectives of others

PISA 2018 asked students to report on their ability to understand different perspectives by responding to five statements (ST215): "I try to look at everybody's side of a disagreement before I make a decision"; "I believe that there are two sides to every question and try to look at them both"; "I sometimes try to understand my friends better by imagining how things look from their perspective"; "Before criticising somebody, I try to imagine how I would feel if I were in their place"; and "When I'm upset at someone, I try to take the perspective of that person for a while". Responses were given on a five-point scale ("very much like me", "mostly like me", "somewhat like me", "not much like me" and "not at all like me") and were combined into an index of students' ability to understand the perspectives of others (PERSPECT). Positive values in this index indicate a greater ability to understand and take different perspectives than the average student across OECD countries.

Students' interest in learning about other cultures

PISA 2018 asked students about their interest in learning about other cultures (ST214). An index of students' interest in learning about other cultures (INTCULT) was derived from responses to the following four statements: "I want to learn how people live in different countries"; "I want to learn more about the religions of the world"; "I am interested in how people from various cultures see the world"; and "I am interested in finding out about the traditions of other cultures". The five response categories were "very much like me", "mostly like me", "somewhat like me", "not much like me" and "not at all like me". Positive values in the index indicate that students exhibit a greater interest in learning about other cultures than the average student across OECD countries.

Students' respect for people from other cultures

PISA 2018 asked students the extent to which they respect people from other countries (ST217). The five response categories were "very much like me", "mostly like me", "somewhat like me", "not much like me" and "not at all like me". The index of respect for people from other cultures (RESPECT) was derived from responses to the following statements: "I respect people from other cultures as equal human beings"; "I treat all people with respect regardless of their cultural background"; "I give space to people from other cultures to express themselves"; "I respect the values of people from different cultures"; and "I value the opinions of people from different cultures". Positive values in this index indicate that students reported greater respect for people from other cultures than the average student across OECD countries.

Students' cognitive adaptability

PISA 2018 asked students about their ability to adapt to new situations (ST216). Students were asked to respond to six statements: "I can deal with unusual situations"; "I can change my behaviour to meet the needs of new situations"; "I can adapt to different situations even when under stress or pressure"; "I can adapt easily to a new culture"; "When encountering difficult situations with people, I can think of a way to resolve the situation"; and "I am capable of overcoming my difficulties in interacting with people from other cultures". Responses were given on a five-point scale: "very much like me", "mostly like me", "somewhat like me", "not much like me" and "not at all like me". Positive values in the index of cognitive adaptability (COGFLEX) indicate that students have a greater ability to adapt than the average student across OECD countries.

Students' attitudes towards immigrants

PISA 2018 asked students to report their overall attitude towards immigrants (ST204). An index of attitudes towards immigrants was derived from responses to the following statements: "Immigrant children should have the same opportunities for education that other children in the country have"; "Immigrants who live in a country for several years should have the opportunity to vote in elections"; "Immigrants should have the opportunity to continue their own customs and lifestyle"; and "Immigrants should have all the same rights that everyone else in the country has". Responses were provided on a four-point scale: "strongly disagree", "disagree", "agree" and "strongly agree". A positive value in the index of attitudes towards immigrants (ATTIMM) indicates that students have more positive attitudes towards immigrants than the average student across OECD countries.

Students' awareness of intercultural communication

PISA 2018 asked students to describe their awareness of intercultural communications (ST218). They were asked to respond to seven statements related to the following hypothetical scenario: "Imagine you are talking in your native language to people whose native language is different from yours." The statements were: "I carefully observe their reactions"; "I frequently check that we are understanding each other correctly"; "I listen carefully to what they say"; "I choose my words carefully"; "I give concrete examples to explain my ideas"; "I explain things very carefully"; and "If there is a problem with communication I find ways around it". Answers were given on a four-point scale ("strongly disagree", "disagree", "agree" or "strongly agree") and were combined into the index of awareness of intercultural communication (AWACOM). A positive value in this index indicates that students have a greater awareness of intercultural communication than the average student across OECD countries.

Students' agency regarding global issues

PISA 2018 asked students the extent to which they agree ("strongly disagree", "disagree", "agree", "strongly agree") with the following six statements (ST219): "I think of myself as a citizen of the world"; "When I see the poor conditions that some people live under, I feel a responsibility to do something about it"; "I think my behaviour can impact people in other countries"; "It is right to boycott companies that are known to provide poor workplace conditions for their employees"; "I can do something about the problems of the world"; and "Looking after the global environment is important to me". Responses to these statements were combined to create the index of agency regarding global issues (GLOBMIND). Positive values in this index indicate that students have a greater sense of global-mindedness than the average student across OECD countries.

Enjoyment of reading

The index of enjoyment of reading (JOYREAD) was constructed based on a trend question (ST160) from PISA 2009 asking students the extent to which they agree ("strongly disagree", "disagree", "agree", "strongly agree") with the following statements: "I read only if I have to"; "Reading is one of my favourite hobbies"; "I like talking about books with other people"; "For me, reading is a waste of time"; and "I read only to get information that I need". Positive values in this scale mean that students enjoy reading to a greater extent than the average student across OECD countries. Scores of the index of enjoyment of reading are directly comparable between PISA 2009 and PISA 2018.

Students' resilience

Resilience in PISA was assessed by asking students to report the extent to which they agree ("strongly disagree", "disagree", "agree", "strongly agree") with the following statements (ST188) about themselves: "I usually manage one way or another"; "I feel proud that I have accomplished things"; "I feel that I can handle many things at a time"; "My belief in myself gets me through hard times"; and "When I'm in a difficult situation, I can usually find my way out of it". These statements were combined to create the index of resilience (RESILIENCE). Positive values in this index mean that students reported a greater capacity to deal with adversity than the average student across OECD countries.

Scaling of indices related to the PISA index of economic social and cultural status

As in previous cycles, the PISA index of economic, social and cultural status (ESCS) was derived from three variables related to family background: parents' highest level of education (PARED); parents' highest occupational status (HISEI); and home possessions (HOMEPOS), including books in the home. PARED and HISEI are simple indices, described above. HOMEPOS is a proxy measure for family wealth.

Household possessions

In PISA 2018, students reported the availability of 16 household items at home (ST011), including three country-specific household items that were seen as appropriate measures of family wealth within the country's context. In addition, students reported the amount of possessions and books at home (ST012, ST013). HOMEPOS is a summary index of all household and possession items (ST011, ST012 and ST013).

Computation of ESCS

For the purpose of computing the PISA index of economic, social and cultural status, values for students with missing PARED, HISEI or HOMEPOS were imputed with predicted values plus a random component based on a regression on the other two variables. If there were missing data on more than one of the three variables, ESCS was not computed and a missing value was assigned for ESCS.

In previous cycles, the PISA index of economic, social and cultural status was derived from a principal component analysis of standardised variables (each variable has an OECD mean of 0 and a standard deviation of 1), taking the factor scores for the first principal component as measures of ESCS. In PISA 2018, ESCS was computed by attributing equal weight to the three standardised components. As in PISA 2015, the three components were standardised across all countries and economies (both OECD and partner countries/economies), with each country/economy contributing equally (in cycles prior to 2015, the standardisation and principal component analysis was based on OECD countries only). As in every previous cycle, the final ESCS variable was transformed, with 0 the score of an average OECD student and 1 the standard deviation across equally weighted OECD countries.

SCHOOL-LEVEL SIMPLE INDICES

Socio-economic profile of schools

Advantaged and disadvantaged schools are defined in terms of the socio-economic profile of schools. All schools in each education system participating in PISA are ranked according to their average ESCS and then divided into four groups with an approximately equal number of students (quarters). Schools in the bottom quarter are referred to as "socio-economically disadvantaged schools" and schools in the top quarter are referred to as "socio-economically advantaged schools".

School type

Schools are classified as either public or private, according to whether a private entity or a public agency has the ultimate power to make decisions concerning its affairs (Question SC013). Public schools are managed directly or indirectly by a public education authority, government agency, or governing board appointed by government or elected by public franchise. Private schools are managed directly or indirectly by a non-government organisation, such as a church, trade union, business or other private institution. In some countries and economies, such as Ireland, the information from SC013 is combined with administrative data to determine whether the school is privately or publicly managed.

SCHOOL-LEVEL SCALE INDICES

Principals' views on teachers' multicultural beliefs

PISA 2018 asked school principals to report their views on their teachers' multicultural beliefs (SC166). Principals were asked to consider four statements and report whether these beliefs are widely shared among the teachers in their school. The statements were: "It is important for students to learn that people from other cultures can have different values"; "Respecting other cultures is something that students should learn as early as possible"; "In the classroom, it is important that students of different origins recognise the similarities that exist between them"; and "When there are conflicts between students of different origins, they should be encouraged to resolve the argument by finding common ground". Principals were given a choice of responses indicating how many of the teachers in their school shared these beliefs: "none or almost none", "some", "many" or "all or almost all". The responses to these statements were used to construct an index of principals' views on teachers' multicultural beliefs (SCMCEG). Positive values indicate greater multicultural and egalitarian beliefs than the average across OECD countries.

PARENT-LEVEL SCALE INDICES

Parents' awareness of global issues

In 14 countries/economies, parents were asked to fill out a questionnaire (PA170). One of the questions enquired about parents' awareness of global issues, using the same questions that were asked of their children. Parents had to respond to statements about: climate change and global warming; global health (e.g. epidemics); migration (movement of people); international conflicts; hunger or malnutrition in different parts of the world; causes of poverty; and equality between men and women in different parts of the world. Answers were given on a four-point scale: "I have never heard of this"; "I have heard about this but I would not be able to explain what it is really about"; "I know something about this and I could explain the general issue"; and "I am familiar with this and I would be able to explain this well". Answers to these statements were combined to construct the index of parents' awareness of global issues (GCAWAREP). Positive values in the index indicate that parents expressed a greater sense of awareness of global issues than the average parent across OECD countries.

Parents' interest in learning about other cultures

In 14 countries/economies, parents were asked to respond to the same four statements as their children about their interest in learning about other cultures (PA168). The five response categories were "very much like me", "mostly like me", "somewhat like me", "not much like me" and "not at all like me". The index of parents' interest in learning about other cultures was constructed by combining responses to those four statements using item response theory scaling (INTCULTP). A positive value in this index indicates that parents reported a greater interest in learning about other cultures than the average parent across OECD countries.

Parents' attitudes towards immigrants

PISA 2018 asked parents to report their overall attitude towards immigrants (PA167). An index of parents' attitudes towards immigrants (ATTIMMP) was derived from responses to the following statements: "Immigrant children should have the same opportunities for education that other children in the country have"; "Immigrants who live in a country for several years should have the opportunity to vote in elections"; "Immigrants should have the opportunity to continue their own customs and lifestyle"; and "Immigrants should have all the same rights that everyone else in the country has". Responses were provided on a four-point scale: "strongly disagree", "disagree", "agree" and "strongly agree". A positive value in this index indicates that parents have more positive attitudes towards immigrants than the average parent across OECD countries (14 countries/economies distributed the parent questionnaire).

TEACHER-LEVEL SIMPLE INDICES

Participation in professional development activities

In the 19 countries and economies that distributed an optional questionnaire for teachers, teachers were asked (TC193) whether, during the previous 12 months, they had participated in one of the following professional development activities: "Courses and workshops (e.g. on subject matter or methods and/or other education-related topics)"; "Education conferences or seminars (where teachers and/or researchers present their research results and discuss educational issues)"; "Observation visits to other schools"; "Observation visits to business premises, public organisations, non-governmental organisations"; and "In-service training courses in business premises, public organisations, non-governmental organisations". Answers to this question were used to measure the proportion of teachers who had participated in professional development activities (any of these five items) during the previous 12 months.

TEACHER-LEVEL SCALE INDICES

Teachers' multicultural and egalitarian beliefs

Teachers were asked about their multicultural and egalitarian beliefs, using four statements in the teacher questionnaire (TC208): "It is important for students to learn that people from other cultures can have different values"; "Respecting other cultures is something that students should learn as early as possible"; "In the classroom, it is important that students of different origins recognise the similarities that exist between them"; and "When there are conflicts between students of different origins, they should be encouraged to resolve the argument by finding common ground". Teachers reported whether these attitudes are: "shared amongst none or almost none of the teachers"; "shared amongst some of the teachers"; "shared amongst many of the teachers"; or "shared amongst all or almost all of the teachers." Responses were used to construct an index with positive values indicating stronger multicultural and egalitarian beliefs (TCMCEG) than the average teacher across OECD countries.

Teacher training on global competence

PISA 2018 asked teachers five yes-or-no questions about their professional development activities (TC206). The questions were: "Have you received training on intercultural communication?"; "Have you received training on conflict resolution strategies?"; "Have you received training on the role education can play in confronting discrimination in all its forms?"; "Have you studied culturally responsive teaching approaches and techniques?"; and "Have you received training on issues related to teaching in multicultural classrooms?". Responses were used to construct the index of teacher training on global competence (GCTRAIN), with positive values indicating higher levels of training than the average teacher across OECD countries.

Teachers' self-efficacy in multicultural environments

Teachers were asked five statements about their self-efficacy in multicultural environments (TC209). An index of teachers' self-efficacy in multicultural environments (GCSELF) was derived from responses to the following statements: "I can cope with the challenges of a multicultural classroom"; "I can adapt my teaching to the cultural diversity of students"; "I take care that students with and without migrant background work together"; "I can raise awareness for cultural differences amongst the students"; and "I can contribute to reducing ethnic stereotypes between the students". Responses were provided on a four-point scale: "strongly disagree", "disagree", "agree" and "strongly agree". A positive value in the index indicates that teachers reported greater self-efficacy in multicultural environments than the average teacher across OECD countries.

Teachers' attitudes towards immigrants

PISA 2018 asked teachers to report their overall attitude towards immigrants (TC196). An index of attitudes towards immigrants was derived from responses to the following statements: "Immigrant children should have the same opportunities for education that other children in the country have"; "Immigrants who live in a country for several years should have the opportunity to vote in elections"; "Immigrants should have the opportunity to continue their own customs and lifestyle"; and "Immigrants should have all the same rights that everyone else in the country has". Responses were provided on a four-point scale: "strongly disagree", "disagree", "agree" and "strongly agree". A positive value in the index of attitudes towards immigrants (TCATTIMM) indicates that teachers reported more positive attitudes towards immigrants than the average teacher across OECD countries.

SYSTEM LEVEL DATA

All system level data were obtained from the World Bank.

Annual percentage growth rate of GDP per capita

Annual percentage growth rate of per capita GDP is based on constant local currency. Aggregates are based on constant 2010 USD. Per capita GDP is gross domestic product divided by mid-year population. GDP at purchaser's prices is the sum of gross

value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Employment-to-population ratio

Employment-to-population ratio is the proportion of a country's population that is employed. Employment is defined as persons of working age who, during a short reference period, were engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period (i.e. who worked in a job for at least one hour) or not at work due to temporary absence from a job or due to working-time arrangements. People of age 15 and older are generally considered the working-age population.

International migrant stock (2010 and 2015)

International migrant stock is the number of people born in a country other than that in which they live. It also includes refugees. The data used to estimate the international migrant stock at a particular time are obtained mainly from population censuses. The estimates are derived from the data on foreign-born population (people who have residence in one country but were born in another country). When data on the foreign-born population are not available, data on foreign population (i.e. people who are citizens of a country other than the country in which they reside) are used as estimates. After the breakup of the Soviet Union in 1991, people living in one of the newly independent countries who were born in another were classified as international migrants. Estimates of migrant stock in the newly independent states from 1990 on are based on the 1989 census of the Soviet Union. For countries with information on the international migrant stock for at least two points in time, interpolation or extrapolation was used to estimate the international migrant stock on July 1 of the reference years. For countries with only one observation, estimates for the reference years were derived using rates of change in the migrant stock in the years preceding or following the single observation available. A model was used to estimate migrants for countries that had no data.

Per capita GDP 2018 – PPP adjusted

Per capita GDP based on purchasing power parity (PPP) is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the US dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current international dollars based on the 2011 ICP round.

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PISA target population, the PISA samples and the definition of schools
The PISA target population, exclusions and coverage ratios

WHO IS THE PISA TARGET POPULATION?

PISA 2018 assessed the cumulative outcomes of education and learning at a point at which most young people are still enrolled in formal education – when they are 15 years old.

Any international survey of education must guarantee the comparability of its target population across nations. One way to do this is to assess students at the same grade level. However, differences between countries in the nature and extent of pre-primary education and care, the age at entry into formal schooling and the institutional structure of education systems do not allow for a definition of internationally comparable grade levels.

Other international assessments have defined their target population by the grade level that provides maximum coverage of a particular age cohort. However, this method is particularly sensitive to the distribution of students across age and grade levels. Small changes in this distribution can lead to the selection of different target grades, even within the same country/economy over different PISA cycles. There also may be differences across countries/economies in whether students who are older or younger than the desired age cohort are represented in the modal grade, further rendering such grade level-based samples difficult to compare.

To overcome these problems, PISA uses an age-based definition of its target population, one that is not tied to the institutional structures of national education systems. PISA assesses students who were aged between 15 years and 3 complete months and 16 years and 3 complete months[1] at the beginning of the assessment period, plus or minus an allowed 1-month variation, and who were enrolled in an educational institution[2] at Grade 7 or higher.[3] All students who met these criteria were eligible to sit the PISA assessment, regardless of the type of educational institution in which they were enrolled and whether they were enrolled in full-time or part-time education. This also allows PISA to evaluate students shortly before they are faced with major life choices, such as whether to continue with education or enter the workforce.

Hence, PISA makes statements about the knowledge and skills of a group of individuals who were born within a comparable reference period, but who may have undergone different educational experiences both in and outside of school. These students may be distributed over different ranges of grades (both in terms of the specific grade levels and the spread in grade levels) in different countries/economies, or in different tracks or streams within countries/economies. It is important to consider these differences when comparing PISA results across countries/economies. In addition, differences in performance observed when students are 15 may disappear later on if students' experiences in education converge over time.

If mean scores in reading, mathematics or science in a country/economy are significantly higher than those of another country or economy, it cannot automatically be inferred that schools or particular parts of the education system in the first are more effective than those in the second. However, one can legitimately conclude that it is the cumulative impact of learning experiences in the first country/economy, starting in early childhood and up to the age of 15, and including all experiences, at school, home or elsewhere, that have resulted in the better outcomes of the first country/economy in the subjects that PISA assesses.[4]

The PISA target population does not include residents of a country/economy who attend school in another country/economy. It does, however, include foreign nationals who attend school in the country of assessment.

To accommodate countries/economies that requested grade-based results for the purpose of national analyses, PISA 2018 provided a sampling option to supplement age-based sampling with grade-based sampling.

HOW WERE STUDENTS CHOSEN?

The accuracy of the results from any survey depends on the quality of the information drawn from those surveyed as well as on the sampling procedures. Quality standards, procedures, instruments and verification mechanisms were developed for PISA that ensured that national samples yielded comparable data and that the results could be compared across countries/economies with confidence. Experts from the PISA Consortium selected the samples for most participating countries/economies and monitored the sample-selection process closely in those countries/economies that selected their own samples.

Most PISA samples were designed as two-stage stratified samples.[5] The first stage sampled schools in which 15-year-old students may be enrolled. Schools were sampled systematically, with probabilities proportional to the estimated size of their (eligible) 15-year-old population. At least 150 schools[6] were selected in each country/economy, although the requirements for national analyses often demanded a larger sample. Replacement schools for each sampled school were simultaneously identified, in case an originally sampled school chose not to participate in PISA 2018.

The second stage of the selection process sampled students within sampled schools. Once schools were selected, a list of each sampled school's 15-year-old students was prepared. From this list, 42 students were then selected with equal probability (all 15-year-old students were selected if fewer than 42 were enrolled). The number of students who were to be sampled in a school could deviate from 42 but could not fall below 20.

Data-quality standards in PISA required minimum participation rates for schools and for students. These standards were established to minimise the potential for bias resulting from non-response. Indeed, it was likely that any bias resulting from non-response would be negligible (i.e. typically smaller than the sampling error) in countries/economies that met these standards.

At least 85% of the schools initially selected to take part in the PISA assessment were required to agree to conduct the test. Where the initial response rate of schools was between 65% and 85%, however, an acceptable school-response rate could still be achieved through the use of replacement schools. Inherent in this procedure was a risk of introducing bias, if replacement schools differed from initially sampled schools along dimensions other than those considered for sampling. Participating countries/economies were therefore encouraged to persuade as many of the schools in the original sample as possible to participate.

Schools with a student participation rate of between 25% and 50% were not considered to be participating schools, but data (from both the cognitive assessment and questionnaire) from these schools were included in the database and contributed to the various estimates. Data from schools with a student participation rate of less than 25% were excluded from the database.

In PISA 2018, five countries and economies did not meet the 85% threshold among schools initially selected to take part in the PISA assessment: Hong Kong (China) (69%), Latvia (82%), New Zealand (83%), the United Kingdom (73%) and the United States (65%). But they did meet the 65% threshold. Upon replacement, Hong Kong (China) (79%), the United Kingdom (87%) and the United States (76%) still failed to reach an acceptable participation rate.[7] Among the schools initially selected before replacement, the Netherlands (61%) did not meet the 65% school response-rate threshold, but it reached a response rate of 87% upon replacement. However, these were not considered to be major issues as, for each of these countries/economies, additional non-response analyses showed that there were limited differences between schools that did participate and the full set of schools originally drawn in the sample.[8] Data from these jurisdictions were hence considered to be largely comparable with data from other countries/economies and were therefore reported together with that data.

PISA 2018 also required that at least 80% of the students chosen within participating schools actually participated. This threshold was calculated at the national level and did not have to be met in each participating school. Follow-up sessions were required in schools where too few students had participated in the original assessment sessions. Student-participation rates were calculated over all original schools and also over all schools, whether original or replacement schools. Students who participated in either the original or in any follow-up assessment sessions were counted in these participation rates. Those who attended only the questionnaire session were included in the international database and contributed to the statistics presented in this publication if they provided at least a description of their father's or mother's occupation.

This 80% threshold was met in every country/economy except Portugal, where only 76% of students who were sampled actually participated. The high level of non-responding students could lead to biased results (e.g. if students who did not respond were more likely to be low-performing students). This was indeed the case in Portugal, but a non-response analysis based on data from a national mathematics assessment in the country showed that the upward bias of Portugal's overall results was likely small enough to preserve comparability over time and with other countries/economies. Data from Portugal were therefore reported along with data from the countries/economies that met this 80% student-participation threshold.

Table I.A2.6 shows the response rate for students and schools, before and after replacement.

- **Column 1** shows the weighted participation rate of schools before replacement; it is equivalent to Column 2 divided by Column 3 (multiplied by 100 to obtain a percentage).

- **Column 2** shows the number of responding schools before school replacement, weighted by student enrolment.

- **Column 3** shows the number of sampled schools before school replacement, weighted by student enrolment. This includes both responding and non-responding schools.

- **Column 4** shows the unweighted number of responding schools before school replacement.

- **Column 5** shows the unweighted number of sampled schools before school replacement, including both responding and non-responding schools.

- **Columns 6 to 10** repeat Columns 1 to 5 for schools after school replacement (i.e. after non-responding schools were replaced by the replacement schools identified during the initial sampling procedure).

- **Columns 11 to 15** repeat Columns 6 to 10 but for students in schools after school replacement. Note that the weighted and unweighted numbers of students sampled (Columns 13 and 15) include students who were assessed and those who should have been assessed but who were absent on the day of assessment. Furthermore, as mentioned above, any students in schools where the student response rate was less than 50% were not considered to be attending participating schools and were thus excluded from Columns 14 and 15 (and, similarly, from Columns 4, 5, 9 and 10).

WHAT PROPORTION OF 15-YEAR-OLDS DOES PISA REPRESENT?

All countries and economies attempted to maximise the coverage of 15-year-olds enrolled in education in their national samples, including students enrolled in special-education institutions.

The sampling standards used in PISA only permitted countries to exclude up to a total of 5% of the relevant population (i.e. 15-year-old students enrolled in school at Grade 7 or higher) either by excluding schools or excluding students within schools. Only 16 countries did not achieve this standard: Sweden (11.09%), Israel (10.21%), Luxembourg (7.92%), Norway (7.88%), Canada (6.87%), New Zealand (6.78%), Switzerland (6.68%), the Netherlands (6.24%), Cyprus (5.99%), Iceland (5.99%), Kazakhstan (5.87%), Australia (5.72%), Denmark (5.70%), Turkey (5.66%), the United Kingdom (5.45%) and Estonia (5.03%), and the overall exclusion rate was less than 2% in 28 countries and economies (Table I.A2.1). When language exclusions[9] were accounted for (i.e. removed from the overall exclusion rate), Estonia and Iceland no longer had exclusion rates greater than 5%. More details can be found in the *PISA 2018 Technical Report* (OECD, forthcoming[1]).

Exclusions that should remain within the above limits include both at the school level and the student level:

- School level:

  - schools that were geographically inaccessible or where the administration of the PISA assessment was not considered feasible

  - schools that provided teaching only for students in the categories defined under "within-school exclusions", such as schools for the blind.

  The percentage of 15-year-olds enrolled in such schools had to be less than 2.5% of the nationally desired target population (0.5% maximum for schools that were geographically inaccessible or where administration of PISA was not feasible and 2% maximum for schools only for students in the categories defined under "within-school exclusions). The magnitude, nature and justification of school-level exclusions are documented in the *PISA 2018 Technical Report* (OECD, forthcoming[1]).

- Student level:

  - students with an intellectual disability (i.e. a mental or emotional disability resulting in the student being so cognitively delayed that he/she could not perform in the PISA testing environment)

  - students with a functional disability (i.e. a moderate to severe permanent physical disability resulting in the student being unable to perform in the PISA testing environment)

  - students with limited assessment-language proficiency (i.e. students unable to read or speak any of the languages of assessment in the country at a sufficient level and unable to overcome such a language barrier in the PISA testing environment, typically students who had received less than one year of instruction in the language of assessment)

  - other exclusions (a category defined by the PISA national centres in individual participating countries and approved by the PISA international consortium)

  - students taught in a language of instruction for the major domain for which no materials were available.

Students could not be excluded solely because of low proficiency or common disciplinary problems. The percentage of 15-year-olds excluded within schools had to be less than 2.5% of the national desired target population.

Although exceeding the exclusion rate limit of 5% (Table I.A2.1), data from the 16 countries listed above were all deemed to be acceptable for the reasons listed below. In particular, all of these reasons were accepted by a data-adjudication panel to allow for the reliable comparison of PISA results across countries/economies and across time. Thus the data from these countries were reported together with data from other countries/economies.

- In Australia, Canada, Denmark, Luxembourg, New Zealand and Norway, exclusion rates have consistently been above 5% across cycles. In the United Kingdom, exclusion rates were also above 5%, but they have decreased markedly across cycles.

- In Cyprus, Iceland, Kazakhstan, the Netherlands and Switzerland, this could be largely attributed to a marked increase in students who were excluded within schools due to intellectual or functional disabilities. Moreover, in the Netherlands, some 17% of students were not excluded but assigned to UH (*une heure*) booklets, which were intended for students with special education needs. As these booklets did not cover the domain of financial literacy (OECD, 2020[2]), the effective exclusion rate for the Netherlands in financial literacy was over 20%. This resulted in a strong upward bias in the country mean and other population statistics in that domain. Data from the Netherlands in financial literacy are not comparable with data from other education systems, but data from the Netherlands in the core PISA subjects were still deemed to be largely comparable.

- The higher exclusion rate in Turkey was likely the result of a higher school-level exclusion rate, due to a particular type of non-formal educational institution that was not listed (and hence not excluded) in 2015 but was listed and excluded in 2018. The global competence sample from Israel does not include students in ultra-Orthodox schools and, thus, is not nationally representative. See PISA 2018 Technical Report (OECD, forthcoming[1]) for details.

- The higher exclusion rate in Israel was the result of a higher school-level exclusion rate due to the lack of participation by a particular type of boys' school. These schools were considered to be non-responding schools in cycles up to 2015 but were treated as school-level exclusions in 2018.

- Sweden had the highest exclusion rate: 11.07%. It is believed that this increase in the exclusion rate was due to a large and temporary increase in immigrant and refugee inflows, although because of Swedish data-collection laws, this could not be explicitly stated in student-tracking forms. Instead, students confronted with language barriers were classified as being excluded "for other reasons", as were students with intellectual and functional disabilities. It is expected that the exclusion rate will decrease to previous levels in future cycles of PISA, as such inflows stabilise or shrink.[10]

Table I.A2.1 describes the target population of the countries/economies participating in PISA 2018. Further information on the target population and the implementation of PISA sampling standards can be found in the *PISA 2018 Technical Report* (OECD, forthcoming[1]).

- **Column 1** shows the total number of 15-year-olds according to the most recent available information, which in most countries and economies means from 2017, the year before the assessment.

- **Column 2** shows the number of 15-year-olds enrolled in school in Grade 7 or above, which is referred to as the "eligible population".

- **Column 3** shows the national desired target population. Countries were allowed to exclude up to 0.5% of students *a priori* from the eligible population, essentially for practical reasons. The following *a priori exclusions* exceed this limit but were agreed with the PISA Consortium:

  - Canada excluded 1.17% of its population: students living in the Yukon, Northwest Territories and Nunavut, and Indigenous students living on reserves.

  - Chile excluded 0.05% of its population: students living on Easter Island, the Juan Fernandez Archipelago and Antarctica.

  - Cyprus excluded 0.10% of its population: students attending schools on the northern part of the island.

  - The Philippines excluded 2.42% of its population: students living in the Autonomous Region in Muslim Mindanao.

  - Saudi Arabia excluded 7.59% of its population: students living in the regions of Najran and Jizan.

  - Ukraine excluded 0.37% of its population: some students attending schools in the Donetsk and Luhansk regions.

  - The United Arab Emirates excluded 0.04% of its population: home-schooled students.

- **Column 4** shows the number of students enrolled in schools that were excluded from the national desired target population, either from the sampling frame or later in the field during data collection. In other words, these are school-level exclusions.

- **Column 5** shows the size of the national desired target population after subtracting the students enrolled in excluded schools. This column is obtained by subtracting Column 4 from Column 3.

- **Column 6** shows the percentage of students enrolled in excluded schools. This is obtained by dividing Column 4 by Column 3 and multiplying by 100.

- **Column 7** shows the number of students who participated in PISA 2018. Note that, in some cases, this number does not account for 15-year-olds assessed as part of additional national options.

- **Column 8** shows the weighted number of participating students (i.e. the number of students in the nationally defined target population that the PISA sample represents).

- **Column 9** shows the total number of students excluded within schools. In each sampled school, all eligible students (i.e. those 15 years of age, regardless of grade) were listed, and a reason for the exclusion was provided for each student who was to be excluded from the sample. These reasons are further described and classified into specific categories in Table I.A2.4.

- **Column 10** shows the weighted number of students excluded within schools (i.e. the overall number of students in the national defined target population represented by the number of students from the sample excluded within schools). This weighted number is also described and classified by exclusion categories in Table I.A2.4.

- **Column 11** shows the percentage of students excluded within schools. This is equivalent to the weighted number of excluded students (Column 10) divided by the weighted number of excluded and participating students (the sum of Columns 8 and 10), multiplied by 100.

- **Column 12** shows the overall exclusion rate, which represents the weighted percentage of the national desired target population excluded from PISA, either through school-level exclusions or through the exclusion of students within schools. It is equivalent to the school-level exclusion rate (Column 6) plus the product of the within-school exclusion rate and 1 minus the school-level exclusion rate expressed as a decimal (Column 6 divided by 100).[11]

- **Column 13** shows an index of the extent to which the national desired target population was covered by the PISA sample. As mentioned above, 15 countries fell below the coverage of 95%. This is also known as Coverage Index 1.

- **Column 14** shows an index of the extent to which 15-year-olds enrolled in school were covered by the PISA sample. The index, also known as Coverage Index 2, measures the overall proportion of the national enrolled population that is covered by the non-excluded portion of the student sample and takes into account both school- and student-level exclusions. Values close to 100 indicate that the PISA sample represents the entire (Grade 7 and higher) education system as defined for PISA 2018. This is calculated in a similar manner to Column 13, but the total enrolled population of 15-year-olds in Grade 7 or above (Column 2) is used as a base instead of the national desired target population (Column 3).

- **Column 15** shows an index of the coverage of the 15-year-old population. The index is the weighted number of participating students (Column 8) divided by the total population of 15-year-old students (Column 1). This is also known as Coverage Index 3.

The high level of coverage contributes to the comparability of the assessment results. For example, even assuming that the excluded students would have systematically scored worse than those who participated and that this relationship is moderately strong, an exclusion rate on the order of 5% would likely lead to an overestimation of national mean scores of less than 5 score points on the PISA scale (where the standard deviation is 100 score points). [12]

DEFINITION OF SCHOOLS

In some countries, subunits within schools were sampled instead of schools, which may affect the estimate of the between-school variance. In Austria, the Czech Republic, Germany, Hungary, Japan, Romania and Slovenia, schools with more than one programme of study were split into the units delivering these programmes. In the Netherlands, locations were listed as sampling units. In the Flemish Community of Belgium, each campus (or implantation) of a multi-campus school was sampled independently while, in the French Community of Belgium the larger administrative unit of a multi-campus school was sampled as a whole.

In Argentina, Australia, Colombia and Croatia, each campus of a multi-campus school was sampled independently. Schools in the Basque Country of Spain that were divided into sections by language of instruction were split into these linguistic sections for sampling. International schools in Luxembourg were split into two sampling units: one for students who were instructed in a language for which testing material was available,[13] and one for students who were instructed in a language for which no testing material was available (and who were hence excluded).

Some schools in the United Arab Emirates were sampled as a whole unit, while others were split by curriculum and sometimes by gender. Due to reorganisation, some schools in Sweden were split into two parts, each part with its own principal. Some schools in Portugal were organised into clusters where all units in a cluster shared the same teachers and principal; each of these clusters constituted a single sampling unit.

THE DISTRIBUTION OF PISA STUDENTS ACROSS GRADES

Students assessed in PISA 2018 were enrolled in various grade levels. The percentage of students at each grade level is presented, by country, in Table I.A2.8 and Table I.A2.9, and by gender within each country/economy in Table I.A2.12 and Table I.A2.13.

Table VI.A2.1 [1/4] **PISA target populations and samples**

	Population and sample information					
	Total population of 15-year-olds	Total enrolled population of 15-year-olds at grade 7 or above	Total in national desired target population	Total school-level exclusions	Total in national desired target population after all school exclusions and before within-school exclusions	School-level exclusion rate (%)	Number of participating students
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Australia	288 195	284 687	284 687	5 610	279 077	1.97	14 273
Austria	84 473	80 108	80 108	603	79 505	0.75	6 802
Belgium	126 031	122 808	122 808	1 877	120 931	1.53	8 475
Canada	388 205	400 139	395 448	7 950	387 498	2.01	22 653
Chile	239 492	215 580	215 470	2 151	213 319	1.00	7 621
Colombia	856 081	645 339	645 339	950	644 389	0.15	7 522
Czech Republic	92 013	90 835	90 835	1 510	89 325	1.66	7 019
Denmark	68 313	67 414	67 414	653	66 761	0.97	7 657
Estonia	12 257	12 120	12 120	413	11 707	3.41	5 316
Finland	58 325	57 552	57 552	496	57 056	0.86	5 649
France	828 196	798 480	798 480	13 732	784 748	1.72	6 308
Germany	739 792	739 792	739 792	15 448	724 344	2.09	5 451
Greece	102 868	100 203	100 203	1 266	98 937	1.26	6 403
Hungary	96 838	91 297	91 297	1 992	89 305	2.18	5 132
Iceland	4 232	4 177	4 177	35	4 142	0.84	3 294
Ireland	61 999	61 188	61 188	59	61 129	0.10	5 577
Israel	136 848	128 419	128 419	10 613	117 806	8.26	6 623
Italy	616 185	544 279	544 279	748	543 531	0.14	11 785
Japan	1 186 849	1 159 226	1 159 226	27 743	1 131 483	2.39	6 109
Korea	517 040	517 040	517 040	2 489	514 551	0.48	6 650
Latvia	17 977	17 677	17 677	692	16 985	3.92	5 303
Lithuania	27 075	25 998	25 998	494	25 504	1.90	6 885
Luxembourg	6 291	5 952	5 952	156	5 796	2.62	5 230
Mexico	2 231 751	1 697 100	1 697 100	8 013	1 689 087	0.47	7 299
Netherlands	208 704	204 753	204 753	10 347	194 406	5.05	4 765
New Zealand	59 700	58 131	58 131	857	57 274	1.47	6 173
Norway	60 968	60 794	60 794	852	59 942	1.40	5 813
Poland	354 020	331 850	331 850	6 853	324 997	2.07	5 625
Portugal	112 977	110 732	110 732	709	110 023	0.64	5 932
Slovak Republic	51 526	50 100	50 100	587	49 513	1.17	5 965
Slovenia	17 501	18 236	18 236	337	17 899	1.85	6 401
Spain	454 168	436 560	436 560	2 368	434 192	0.54	35 943
Sweden	108 622	107 824	107 824	1 492	106 332	1.38	5 504
Switzerland	80 590	78 059	78 059	3 227	74 832	4.13	5 822
Turkey	1 218 693	1 038 993	1 038 993	43 928	995 065	4.23	6 890
United Kingdom	703 991	697 603	697 603	1 315	64 076	2.01	13 818
United States	4 133 719	4 058 637	4 058 637	24 757	4 033 880	0.61	4 838

Notes: For a full explanation of the details in this table, please refer to the PISA 2018 Technical Report (OECD, forthcoming).

The figure for total national population of 15-year-olds enrolled in Column 2 may occasionally be larger than the total number of 15-year-olds in Column 1, due to differing data sources.

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Table VI.A2.1 [2/4] **PISA target populations and samples**

	Population and sample information					
	Total population of 15-year-olds	Total enrolled population of 15-year-olds at grade 7 or above	Total in national desired target population	Total school-level exclusions	Total in national desired target population after all school exclusions and before within-school exclusions	School-level exclusion rate (%)	Number of participating students
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Albania	36 955	30 160	30 160	0	30 160	0.00	6 359
Argentina	702 788	678 151	678 151	5 597	672 554	0.83	11 975
Baku (Azerbaijan)	43 798	22 672	22 672	454	22 218	2.00	6 827
Belarus	89 440	82 580	82 580	1 440	81 140	1.74	5 803
Bosnia and Herzegovina	35 056	32 313	32 313	243	32 070	0.75	6 480
Brazil	3 132 463	2 980 084	2 980 084	74 772	2 905 312	2.51	10 691
Brunei Darussalam	7 081	7 384	7 384	0	7 384	0.00	6 828
B-S-J-Z (China)	1 221 746	1 097 296	1 097 296	33 279	1 064 017	3.03	12 058
Bulgaria	66 499	51 674	51 674	388	51 286	0.75	5 294
Costa Rica	72 444	58 789	58 789	0	58 789	0.00	7 221
Croatia	39 812	30 534	30 534	409	30 125	1.34	6 609
Cyprus	8 285	8 285	8 277	138	8 139	1.67	5 503
Dominican Republic	192 198	148 033	148 033	2 755	145 278	1.86	5 674
Georgia	46 605	41 750	41 750	1 018	40 732	2.44	5 572
Hong Kong (China)	51 935	51 328	51 328	643	50 685	1.25	6 037
Indonesia	4 439 086	3 684 980	3 684 980	3 892	3 681 088	0.11	12 098
Jordan	212 777	132 291	132 291	90	132 201	0.07	8 963
Kazakhstan	230 646	230 018	230 018	9 814	220 204	4.27	19 507
Kosovo	30 494	27 288	27 288	87	27 201	0.32	5 058
Lebanon	61 979	59 687	59 687	1 300	58 387	2.18	5 614
Macao (China)	4 300	3 845	3 845	14	3 831	0.36	3 775
Malaysia	537 800	455 358	455 358	3 503	451 855	0.77	6 111
Malta	4 039	4 056	4 056	37	4 019	0.91	3 363
Moldova	29 716	29 467	29 467	78	29 389	0.26	5 367
Montenegro	7 484	7 432	7 432	40	7 392	0.54	6 666
Morocco	601 250	415 806	415 806	8 292	407 514	1.99	6 814
North Macedonia	18 812	18 812	18 812	298	18 514	1.59	5 569
Panama	72 084	60 057	60 057	585	59 472	0.97	6 270
Peru	580 690	484 352	484 352	10 483	473 869	2.16	6 086
Philippines	2 063 564	1 734 997	1 692 950	42 290	1 650 660	2.50	7 233
Qatar	16 492	16 408	16 408	245	16 163	1.49	13 828
Romania	203 940	171 685	171 685	4 653	167 032	2.71	5 075
Russia	1 343 738	1 339 706	1 339 706	48 114	1 291 592	3.59	7 608
Saudi Arabia	418 788	406 768	375 914	8 940	366 974	2.38	6 136
Serbia	69 972	66 729	66 729	1 175	65 554	1.76	6 609
Singapore	46 229	45 178	45 178	552	44 626	1.22	6 676
Chinese Taipei	246 260	240 241	240 241	1 978	238 263	0.82	7 243
Thailand	795 130	696 833	696 833	10 014	686 819	1.44	8 633
Ukraine	351 424	321 833	320 636	8 352	312 284	2.60	5 998
United Arab Emirates	59 275	59 203	59 178	847	58 331	1.43	19 277
Uruguay	50 965	46 768	46 768	0	46 768	0.00	5 263
Viet Nam	1 332 000	1 251 842	1 251 842	6 169	1 245 673	0.49	5 377

Notes: For a full explanation of the details in this table, please refer to the PISA 2018 Technical Report (OECD, forthcoming).

The figure for total national population of 15-year-olds enrolled in Column 2 may occasionally be larger than the total number of 15-year-olds in Column 1, due to differing data sources.

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Table VI.A2.1 [3/4] **PISA target populations and samples**

	Population and sample information					Coverage indices		
	Weighted number of participating students	Number of excluded students	Weighted number of excluded students	Within-school exclusion rate (%)	Overall exclusion rate (%)	Coverage Index 1: Coverage of national desired population	Coverage Index 2: Coverage of national enrolled population	Coverage Index 3: Coverage of 15-year-old population
	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Australia	257 779	716	10 249	3.82	5.72	0.943	0.943	0.894
Austria	75 077	117	1 379	1.80	2.54	0.975	0.975	0.889
Belgium	118 025	45	494	0.42	1.94	0.981	0.981	0.936
Canada	335 197	1 481	17 496	4.96	6.87	0.931	0.920	0.863
Chile	213 832	68	2 029	0.94	1.93	0.981	0.980	0.893
Colombia	529 976	28	1 812	0.34	0.49	0.995	0.995	0.619
Czech Republic	87 808	1	11	0.01	1.67	0.983	0.983	0.954
Denmark	59 967	444	3 009	4.78	5.70	0.943	0.943	0.878
Estonia	11 414	96	195	1.68	5.03	0.950	0.950	0.931
Finland	56 172	157	1 491	2.59	3.42	0.966	0.966	0.963
France	756 477	56	6 644	0.87	2.58	0.974	0.974	0.913
Germany	734 915	42	4 847	0.66	2.73	0.973	0.973	0.993
Greece	95 370	52	798	0.83	2.08	0.979	0.979	0.927
Hungary	86 754	75	1 353	1.54	3.68	0.963	0.963	0.896
Iceland	3 875	209	212	5.19	5.99	0.940	0.940	0.916
Ireland	59 639	257	2 370	3.82	3.91	0.961	0.961	0.962
Israel	110 645	152	2 399	2.12	10.21	0.898	0.898	0.809
Italy	521 223	93	3 219	0.61	0.75	0.992	0.992	0.846
Japan	1 078 921	0	0	0.00	2.39	0.976	0.976	0.909
Korea	455 544	7	378	0.08	0.56	0.994	0.994	0.881
Latvia	15 932	23	62	0.38	4.29	0.957	0.957	0.886
Lithuania	24 453	95	360	1.45	3.32	0.967	0.967	0.903
Luxembourg	5 478	315	315	5.44	7.92	0.921	0.921	0.871
Mexico	1 480 904	44	11 457	0.77	1.24	0.988	0.988	0.664
Netherlands	190 281	78	2 407	1.25	6.24	0.938	0.938	0.912
New Zealand	53 000	443	3 016	5.38	6.78	0.932	0.932	0.888
Norway	55 566	452	3 906	6.57	7.88	0.921	0.921	0.911
Poland	318 724	116	5 635	1.74	3.77	0.962	0.962	0.900
Portugal	98 628	158	1 749	1.74	2.37	0.976	0.976	0.873
Slovak Republic	44 418	12	72	0.16	1.33	0.987	0.987	0.862
Slovenia	17 138	124	298	1.71	3.52	0.965	0.965	0.979
Spain	416 703	747	8 951	2.10	2.63	0.974	0.974	0.918
Sweden	93 129	681	10 163	9.84	11.09	0.889	0.889	0.857
Switzerland	71 683	152	1 955	2.66	6.68	0.933	0.933	0.889
Turkey	884 971	95	13 463	1.50	5.66	0.943	0.943	0.726
United Kingdom	597 240	688	20 562	3.33	5.45	0.945	0.945	0.848
United States	3 559 045	194	119 057	3.24	3.83	0.962	0.962	0.861

Notes: For a full explanation of the details in this table, please refer to the PISA 2018 Technical Report (OECD, forthcoming).

The figure for total national population of 15-year-olds enrolled in Column 2 may occasionally be larger than the total number of 15-year-olds in Column 1, due to differing data sources.

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Table VI.A2.1 [4/4] **PISA target populations and samples**

	Population and sample information					Coverage indices		
	Weighted number of participating students	Number of excluded students	Weighted number of excluded students	Within-school exclusion rate (%)	Overall exclusion rate (%)	Coverage Index 1: Coverage of national desired population	Coverage Index 2: Coverage of national enrolled population	Coverage Index 3: Coverage of 15-year-old population
	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Albania	27 963	0	0	0.00	0.00	1.000	1.000	0.757
Argentina	566 486	118	4 083	0.72	1.54	0.985	0.985	0.806
Baku (Azerbaijan)	20 271	0	0	0.00	2.00	0.980	0.980	0.463
Belarus	78 333	31	462	0.59	2.32	0.977	0.977	0.876
Bosnia and Herzegovina	28 843	24	106	0.36	1.11	0.989	0.989	0.823
Brazil	2 036 861	41	8 180	0.40	2.90	0.971	0.971	0.650
Brunei Darussalam	6 899	53	53	0.76	0.76	0.992	0.992	0.974
B-S-J-Z (China)	992 302	34	1 452	0.15	3.17	0.968	0.968	0.812
Bulgaria	47 851	80	685	1.41	2.15	0.978	0.978	0.720
Costa Rica	45 475	39	249	0.54	0.54	0.995	0.995	0.628
Croatia	35 462	135	637	1.76	3.08	0.969	0.969	0.891
Cyprus	7 639	201	351	4.40	5.99	0.940	0.939	0.922
Dominican Republic	140 330	0	0	0.00	1.86	0.981	0.981	0.730
Georgia	38 489	26	180	0.46	2.89	0.971	0.971	0.826
Hong Kong (China)	51 101	0	0	0.00	1.25	0.987	0.987	0.984
Indonesia	3 768 508	0	0	0.00	0.11	0.999	0.999	0.849
Jordan	114 901	44	550	0.48	0.54	0.995	0.995	0.540
Kazakhstan	212 229	300	3 624	1.68	5.87	0.941	0.941	0.920
Kosovo	25 739	26	132	0.51	0.83	0.992	0.992	0.844
Lebanon	53 726	1	8	0.02	2.19	0.978	0.978	0.867
Macao (China)	3 799	0	0	0.00	0.36	0.996	0.996	0.883
Malaysia	388 638	37	2 419	0.62	1.38	0.986	0.986	0.723
Malta	3 925	56	56	1.41	2.31	0.977	0.977	0.972
Moldova	28 252	35	207	0.73	0.99	0.990	0.990	0.951
Montenegro	7 087	4	12	0.18	0.71	0.993	0.993	0.947
Morocco	386 408	4	220	0.06	2.05	0.980	0.980	0.643
North Macedonia	17 820	18	85	0.48	2.05	0.979	0.979	0.947
Panama	38 540	24	106	0.27	1.24	0.988	0.988	0.535
Peru	424 586	20	1 360	0.32	2.48	0.975	0.975	0.731
Philippines	1 400 584	10	2 039	0.15	2.64	0.974	0.950	0.679
Qatar	15 228	192	192	1.25	2.72	0.973	0.973	0.923
Romania	148 098	24	930	0.62	3.32	0.967	0.967	0.726
Russia	1 257 388	96	14 905	1.17	4.72	0.953	0.953	0.936
Saudi Arabia	354 013	1	53	0.01	2.39	0.976	0.902	0.845
Serbia	61 895	42	409	0.66	2.41	0.976	0.976	0.885
Singapore	44 058	35	232	0.52	1.74	0.983	0.983	0.953
Chinese Taipei	226 698	38	1 297	0.57	1.39	0.986	0.986	0.921
Thailand	575 713	17	1 002	0.17	1.61	0.984	0.984	0.724
Ukraine	304 855	34	1 704	0.56	3.15	0.969	0.965	0.867
United Arab Emirates	54 403	166	331	0.60	2.03	0.980	0.979	0.918
Uruguay	39 746	25	164	0.41	0.41	0.996	0.996	0.780
Viet Nam	926 260	0	0	0.00	0.49	0.995	0.995	0.695

Notes: For a full explanation of the details in this table, please refer to the PISA 2018 Technical Report (OECD, forthcoming).

The figure for total national population of 15-year-olds enrolled in Column 2 may occasionally be larger than the total number of 15-year-olds in Column 1, due to differing data sources.

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Table VI.A2.2 [1/4] **Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2018)**

	PISA 2018				PISA 2015				PISA 2012			
	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population
OECD Australia	288 195	284 687	257 779	0.89	282 888	282 547	256 329	0.91	291 967	288 159	250 779	0.86
Austria	84 473	80 108	75 077	0.89	88 013	82 683	73 379	0.83	93 537	89 073	82 242	0.88
Belgium	126 031	122 808	118 025	0.94	123 630	121 954	114 902	0.93	123 469	121 493	117 912	0.95
Canada	388 205	400 139	335 197	0.86	396 966	381 660	331 546	0.84	417 873	409 453	348 070	0.83
Chile	239 492	215 580	213 832	0.89	255 440	245 947	203 782	0.80	274 803	252 733	229 199	0.83
Colombia	856 081	645 339	529 976	0.62	760 919	674 079	567 848	0.75	889 729	620 422	560 805	0.63
Czech Republic	92 013	90 835	87 808	0.95	90 391	90 076	84 519	0.94	96 946	93 214	82 101	0.85
Denmark	68 313	67 414	59 967	0.88	68 174	67 466	60 655	0.89	72 310	70 854	65 642	0.91
Estonia	12 257	12 120	11 414	0.93	11 676	11 491	10 834	0.93	12 649	12 438	11 634	0.92
Finland	58 325	57 552	56 172	0.96	58 526	58 955	56 934	0.97	62 523	62 195	60 047	0.96
France	828 196	798 480	756 477	0.91	807 867	778 679	734 944	0.91	792 983	755 447	701 399	0.88
Germany	739 792	739 792	734 915	0.99	774 149	774 149	743 969	0.96	798 136	798 136	756 907	0.95
Greece	102 868	100 203	95 370	0.93	105 530	105 253	96 157	0.91	110 521	105 096	96 640	0.87
Hungary	96 838	91 297	86 754	0.90	94 515	90 065	84 644	0.90	111 761	108 816	91 179	0.82
Iceland	4 232	4 177	3 875	0.92	4 250	4 195	3 966	0.93	4 505	4 491	4 169	0.93
Ireland	61 999	61 188	59 639	0.96	61 234	59 811	59 082	0.96	59 296	57 979	54 010	0.91
Israel	136 848	128 419	110 645	0.81	124 852	118 997	117 031	0.94	118 953	113 278	107 745	0.91
Italy	616 185	544 279	521 223	0.85	616 761	567 268	495 093	0.80	605 490	566 973	521 288	0.86
Japan	1 186 849	1 159 226	1 078 921	0.91	1 201 615	1 175 907	1 138 349	0.95	1 241 786	1 214 756	1 128 179	0.91
Korea	517 040	517 040	455 544	0.88	620 687	619 950	569 106	0.92	687 104	672 101	603 632	0.88
Latvia	17 977	17 677	15 932	0.89	17 255	16 955	15 320	0.89	18 789	18 389	16 054	0.85
Lithuania	27 075	25 998	24 453	0.90	33 163	32 097	29 915	0.90	38 524	35 567	33 042	0.86
Luxembourg	6 291	5 952	5 478	0.87	6 327	6 053	5 540	0.88	6 187	6 082	5 523	0.85
Mexico	2 231 751	1 697 100	1 480 904	0.66	2 257 399	1 401 247	1 392 995	0.62	2 114 745	1 472 875	1 326 025	0.63
Netherlands	208 704	204 753	190 281	0.91	203 234	200 976	191 817	0.94	194 000	193 190	196 262	1.01
New Zealand	59 700	58 131	53 000	0.89	60 162	57 448	54 274	0.90	60 940	59 118	53 414	0.88
Norway	60 968	60 794	55 566	0.91	63 642	63 491	58 083	0.91	64 917	64 777	59 432	0.92
Poland	354 020	331 850	318 724	0.90	380 366	361 600	345 709	0.91	425 597	410 700	379 275	0.89
Portugal	112 977	110 732	98 628	0.87	110 939	101 107	97 214	0.88	108 728	127 537	96 034	0.88
Slovak Republic	51 526	50 100	44 418	0.86	55 674	55 203	49 654	0.89	59 723	59 367	54 486	0.91
Slovenia	17 501	18 236	17 138	0.98	18 078	17 689	16 773	0.93	19 471	18 935	18 303	0.94
Spain	454 168	436 560	416 703	0.92	440 084	414 276	399 935	0.91	423 444	404 374	374 266	0.88
Sweden	108 622	107 824	93 129	0.86	97 749	97 210	91 491	0.94	102 087	102 027	94 988	0.93
Switzerland	80 590	78 059	71 683	0.89	85 495	83 655	82 223	0.96	87 200	85 239	79 679	0.91
Turkey	1 218 693	1 038 993	884 971	0.73	1 324 089	1 100 074	925 366	0.70	1 266 638	965 736	866 681	0.68
United Kingdom	703 991	697 603	597 240	0.85	747 593	746 328	627 703	0.84	738 066	745 581	688 236	0.93
United States	4 133 719	4 058 637	3 559 045	0.86	4 220 325	3 992 053	3 524 497	0.84	3 985 714	4 074 457	3 536 153	0.89

Notes: Costa Rica, Georgia, Malta and Moldova conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.

For Albania, Brazil, Chile, Jordan, the Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.

For Mexico, in 2015, the total population of 15-year-olds enrolled in Grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-olds students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

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Table VI.A2.2 [2/4] **Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2018)**

	PISA 2018				PISA 2015				PISA 2012			
	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population
Albania	36 955	30 160	27 963	0.76	45 667	45 163	40 896	0.90	55 099	50 157	42 466	0.77
Argentina	702 788	678 151	566 486	0.81	718 635	578 308	394 917	0.55	684 879	637 603	545 942	0.80
Baku (Azerbaijan)	43 798	22 672	20 271	0.46	m	m	m	m	m	m	m	m
Belarus	89 440	82 580	78 333	0.88	m	m	m	m	m	m	m	m
Bosnia and Herzegovina	35 056	32 313	28 843	0.82	m	m	m	m	m	m	m	m
Brazil	3 132 463	2 980 084	2 036 861	0.65	3 379 467	2 853 388	2 425 961	0.72	3 520 371	2 786 064	2 470 804	0.70
Brunei Darussalam	7 081	7 384	6 899	0.97	m	m	m	m	m	m	m	m
B-S-J-Z (China)	1 221 746	1 097 296	992 302	0.81	m	m	m	m	m	m	m	m
Bulgaria	66 499	51 674	47 851	0.72	66 601	59 397	53 685	0.81	70 188	59 684	54 255	0.77
Costa Rica	72 444	58 789	45 475	0.63	81 773	66 524	51 897	0.63	81 489	64 326	40 384	0.50
Croatia	39 812	30 534	35 462	0.89	45 031	35 920	40 899	0.91	48 155	46 550	45 502	0.94
Cyprus	8 285	8 285	7 639	0.92	9 255	9 255	8 785	0.95	9 956	9 956	9 650	0.97
Dominican Republic	192 198	148 033	140 330	0.73	193 153	139 555	132 300	0.68	m	m	m	m
Georgia	46 605	41 750	38 489	0.83	48 695	43 197	38 334	0.79	m	m	m	m
Hong Kong (China)	51 935	51 328	51 101	0.98	65 100	61 630	57 662	0.89	84 200	77 864	70 636	0.84
Indonesia	4 439 086	3 684 980	3 768 508	0.85	4 534 216	3 182 816	3 092 773	0.68	4 174 217	3 599 844	2 645 155	0.63
Jordan	212 777	132 291	114 901	0.54	196 734	121 729	108 669	0.55	153 293	125 333	111 098	0.72
Kazakhstan	230 646	230 018	212 229	0.92	211 407	209 555	192 909	0.91	258 716	247 048	208 411	0.81
Kosovo	30 494	27 288	25 739	0.84	31 546	28 229	22 333	0.71	m	m	m	m
Lebanon	61 979	59 687	53 726	0.87	64 044	62 281	42 331	0.66	m	m	m	m
Macao (China)	4 300	3 845	3 799	0.88	5 100	4 417	4 507	0.88	6 600	5 416	5 366	0.81
Malaysia	537 800	455 358	388 638	0.72	540 000	448 838	412 524	0.76	544 302	457 999	432 080	0.79
Malta	4 039	4 056	3 925	0.97	4 397	4 406	4 296	0.98	m	m	m	m
Moldova	29 716	29 467	28 252	0.95	31 576	30 601	29 341	0.93	m	m	m	m
Montenegro	7 484	7 432	7 087	0.95	7 524	7 506	6 777	0.90	8 600	8 600	7 714	0.90
Morocco	601 250	415 806	386 408	0.64	m	m	m	m	m	m	m	m
North Macedonia	18 812	18 812	17 820	0.95	16 719	16 717	15 847	0.95	m	m	m	m
Panama	72 084	60 057	38 540	0.53	m	m	m	m	m	m	m	m
Peru	580 690	484 352	424 586	0.73	580 371	478 229	431 738	0.74	584 294	508 969	419 945	0.72
Philippines	2 063 564	1 734 997	1 400 584	0.68	m	m	m	m	m	m	m	m
Qatar	16 492	16 408	15 228	0.92	13 871	13 850	12 951	0.93	11 667	11 532	11 003	0.94
Romania	203 940	171 685	148 098	0.73	218 846	176 334	164 216	0.75	212 694	146 243	140 915	0.66
Russia	1 343 738	1 339 706	1 257 388	0.94	1 176 473	1 172 943	1 120 932	0.95	1 272 632	1 268 814	1 172 539	0.92
Saudi Arabia	418 788	406 768	354 013	0.85	m	m	m	m	m	m	m	m
Serbia	69 972	66 729	61 895	0.88	m	m	m	m	85 121	75 870	67 934	0.80
Singapore	46 229	45 178	44 058	0.95	48 218	47 050	46 224	0.96	53 637	52 163	51 088	0.95
Chinese Taipei	246 260	240 241	226 698	0.92	m	m	m	m	m	m	m	m
Thailand	795 130	696 833	575 713	0.72	895 513	756 917	634 795	0.71	982 080	784 897	703 012	0.72
Ukraine	351 424	321 833	304 855	0.87	m	m	m	m	m	m	m	m
United Arab Emirates	59 275	59 203	54 403	0.92	51 687	51 518	46 950	0.91	48 824	48 446	40 612	0.83
Uruguay	50 965	46 768	39 746	0.78	53 533	43 865	38 287	0.72	54 638	46 442	39 771	0.73
Viet Nam	1 332 000	1 251 842	926 260	0.70	1 340 000	1 032 599	874 859	0.65	1 393 000	1 091 462	956 517	0.69

(Left margin label: Partners)

Notes: Costa Rica, Georgia, Malta and Moldova conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.

For Albania, Brazil, Chile, Jordan, the Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.

For Mexico, in 2015, the total population of 15-year-olds enrolled in Grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-olds students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

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Table VI.A2.2 [3/4] **Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2018)**

	PISA 2009				PISA 2006				PISA 2003			
	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population
Australia	286 334	269 669	240 851	0.84	270 115	256 754	234 940	0.87	268 164	250 635	235 591	0.88
Austria	99 818	94 192	87 326	0.87	97 337	92 149	89 925	0.92	94 515	89 049	85 931	0.91
Belgium	126 377	126 335	119 140	0.94	124 943	124 557	123 161	0.99	120 802	118 185	111 831	0.93
Canada	430 791	426 590	360 286	0.84	426 967	428 876	370 879	0.87	398 865	399 265	330 436	0.83
Chile	290 056	265 542	247 270	0.85	297 085	255 459	233 526	0.79	m	m	m	m
Colombia	893 057	582 640	522 388	0.58	897 477	543 630	537 262	0.60	m	m	m	m
Czech Republic	122 027	116 153	113 951	0.93	127 748	124 764	128 827	1.01	130 679	126 348	121 183	0.93
Denmark	70 522	68 897	60 855	0.86	66 989	65 984	57 013	0.85	59 156	58 188	51 741	0.87
Estonia	14 248	14 106	12 978	0.91	19 871	19 623	18 662	0.94	m	m	m	m
Finland	66 198	66 198	61 463	0.93	66 232	66 232	61 387	0.93	61 107	61 107	57 883	0.95
France	749 808	732 825	677 620	0.90	809 375	809 375	739 428	0.91	809 053	808 276	734 579	0.91
Germany	852 044	852 044	766 993	0.90	951 535	1 062 920	903 512	0.95	951 800	916 869	884 358	0.93
Greece	102 229	105 664	93 088	0.91	107 505	110 663	96 412	0.90	111 286	108 314	105 131	0.94
Hungary	121 155	118 387	105 611	0.87	124 444	120 061	106 010	0.85	129 138	123 762	107 044	0.83
Iceland	4 738	4 738	4 410	0.93	4 820	4 777	4 624	0.96	4 168	4 112	3 928	0.94
Ireland	56 635	55 464	52 794	0.93	58 667	57 648	55 114	0.94	61 535	58 997	54 850	0.89
Israel	122 701	112 254	103 184	0.84	122 626	109 370	93 347	0.76	m	m	m	m
Italy	586 904	573 542	506 733	0.86	578 131	639 971	520 055	0.90	561 304	574 611	481 521	0.86
Japan	1 211 642	1 189 263	1 113 403	0.92	1 246 207	1 222 171	1 113 701	0.89	1 365 471	1 328 498	1 240 054	0.91
Korea	717 164	700 226	630 030	0.88	660 812	627 868	576 669	0.87	606 722	606 370	533 504	0.88
Latvia	28 749	28 149	23 362	0.81	34 277	33 659	29 232	0.85	37 544	37 138	33 643	0.90
Lithuania	51 822	43 967	40 530	0.78	53 931	51 808	50 329	0.93	m	m	m	m
Luxembourg	5 864	5 623	5 124	0.87	4 595	4 595	4 733	1.03	4 204	4 204	4 080	0.97
Mexico	2 151 771	1 425 397	1 305 461	0.61	2 200 916	1 383 364	1 190 420	0.54	2 192 452	1 273 163	1 071 650	0.49
Netherlands	199 000	198 334	183 546	0.92	197 046	193 769	189 576	0.96	194 216	194 216	184 943	0.95
New Zealand	63 460	60 083	55 129	0.87	63 800	59 341	53 398	0.84	55 440	53 293	48 638	0.88
Norway	63 352	62 948	57 367	0.91	61 708	61 449	59 884	0.97	56 060	55 648	52 816	0.94
Poland	482 500	473 700	448 866	0.93	549 000	546 000	515 993	0.94	589 506	569 294	534 900	0.91
Portugal	115 669	107 583	96 820	0.84	115 426	100 816	90 079	0.78	109 149	99 216	96 857	0.89
Slovak Republic	72 826	72 454	69 274	0.95	79 989	78 427	76 201	0.95	84 242	81 945	77 067	0.91
Slovenia	20 314	19 571	18 773	0.92	23 431	23 018	20 595	0.88	m	m	m	m
Spain	433 224	425 336	387 054	0.89	439 415	436 885	381 686	0.87	454 064	418 005	344 372	0.76
Sweden	121 486	121 216	113 054	0.93	129 734	127 036	126 393	0.97	109 482	112 258	107 104	0.98
Switzerland	90 623	89 423	80 839	0.89	87 766	86 108	89 651	1.02	83 247	81 020	86 491	1.04
Turkey	1 336 842	859 172	757 298	0.57	1 423 514	800 968	665 477	0.47	1 351 492	725 030	481 279	0.36
United Kingdom	786 626	786 825	683 380	0.87	779 076	767 248	732 004	0.94	768 180	736 785	698 579	0.91
United States	4 103 738	4 210 475	3 373 264	0.82	4 192 939	4 192 939	3 578 040	0.85	3 979 116	3 979 116	3 147 089	0.79

Notes: Costa Rica, Georgia, Malta and Moldova conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.

For Albania, Brazil, Chile, Jordan, the Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.

For Mexico, in 2015, the total population of 15-year-olds enrolled in Grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-olds students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

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Table VI.A2.2 [4/4] **Change in the enrolment of 15-year-olds in grade 7 and above (PISA 2003 through PISA 2018)**

	PISA 2009				PISA 2006				PISA 2003			
	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population	Total population of 15-year-olds	Total population of 15-year-olds enrolled in grade 7 or above	Weighted number of participating students	Coverage Index 3: Coverage of the national 15-year-old population
Albania	55 587	42 767	34 134	0.61	m	m	m	m	m	m	m	m
Argentina	688 434	636 713	472 106	0.69	662 686	579 222	523 048	0.79	m	m	m	m
Baku (Azerbaijan)	m	m	m	m	m	m	m	m	m	m	m	m
Belarus	m	m	m	m	m	m	m	m	m	m	m	m
Bosnia and Herzegovina	m	m	m	m	m	m	m	m	m	m	m	m
Brazil	3 434 101	2 654 489	2 080 159	0.61	3 439 795	2 374 044	1 875 461	0.55	3 560 650	2 359 854	1 952 253	0.55
Brunei Darussalam	m	m	m	m	m	m	m	m	m	m	m	m
B-S-J-Z (China)	m	m	m	m	m	m	m	m	m	m	m	m
Bulgaria	80 226	70 688	57 833	0.72	89 751	88 071	74 326	0.83	m	m	m	m
Costa Rica	80 523	63 603	42 954	0.53	m	m	m	m	m	m	m	m
Croatia	48 491	46 256	43 065	0.89	54 500	51 318	46 523	0.85	m	m	m	m
Cyprus	m	m	m	m	m	m	m	m	m	m	m	m
Dominican Republic	m	m	m	m	m	m	m	m	m	m	m	m
Georgia	56 070	51 351	42 641	0.76	m	m	m	m	m	m	m	m
Hong Kong (China)	85 000	78 224	75 548	0.89	77 398	75 542	75 145	0.97	75 000	72 631	72 484	0.97
Indonesia	4 267 801	3 158 173	2 259 118	0.53	4 238 600	3 119 393	2 248 313	0.53	4 281 895	3 113 548	1 971 476	0.46
Jordan	133 953	107 254	104 056	0.78	122 354	126 708	90 267	0.74	m	m	m	m
Kazakhstan	281 659	263 206	250 657	0.89	m	m	m	m	m	m	m	m
Kosovo	m	m	m	m	m	m	m	m	m	m	m	m
Lebanon	m	m	m	m	m	m	m	m	m	m	m	m
Macao (China)	7 500	5 969	5 978	0.80	m	m	m	m	8 318	6 939	6 546	0.79
Malaysia	539 295	492 758	421 448	0.78	m	m	m	m	m	m	m	m
Malta	5 152	4 930	4 807	0.93	m	m	m	m	m	m	m	m
Moldova	47 873	44 069	43 195	0.90	m	m	m	m	m	m	m	m
Montenegro	8 500	8 493	7 728	0.91	9 190	8 973	7 734	0.84	m	m	m	m
Morocco	m	m	m	m	m	m	m	m	m	m	m	m
North Macedonia	m	m	m	m	m	m	m	m	m	m	m	m
Panama	57 919	43 623	30 510	0.53	m	m	m	m	m	m	m	m
Peru	585 567	491 514	427 607	0.73	m	m	m	m	m	m	m	m
Philippines	m	m	m	m	m	m	m	m	m	m	m	m
Qatar	10 974	10 665	9 806	0.89	8 053	7 865	7 271	0.90	m	m	m	m
Romania	220 264	152 084	151 130	0.69	312 483	241 890	223 887	0.72	m	m	m	m
Russia	1 673 085	1 667 460	1 290 047	0.77	2 243 924	2 077 231	1 810 856	0.81	2 496 216	2 366 285	2 153 373	0.86
Saudi Arabia	m	m	m	m	m	m	m	m	m	m	m	m
Serbia	85 121	75 128	70 796	0.83	88 584	80 692	73 907	0.83	m	m	m	m
Singapore	54 982	54 212	51 874	0.94	m	m	m	m	m	m	m	m
Chinese Taipei	m	m	m	m	m	m	m	m	m	m	m	m
Thailand	949 891	763 679	691 916	0.73	895 924	727 860	644 125	0.72	927 070	778 267	637 076	0.69
Ukraine	m	m	m	m	m	m	m	m	m	m	m	m
United Arab Emirates	41 564	40 447	38 707	0.93	m	m	m	m	m	m	m	m
Uruguay	53 801	43 281	33 971	0.63	52 119	40 815	36 011	0.69	53 948	40 023	33 775	0.63
Viet Nam	m	m	m	m	m	m	m	m	m	m	m	m

Notes: Costa Rica, Georgia, Malta and Moldova conducted the PISA 2009 assessment in 2010 as part of PISA 2009+.

For Albania, Brazil, Chile, Jordan, the Netherlands, Romania and Uruguay, estimates of the Total population of 15-year-olds across years have been updated to align data sources with those used in 2018. Therefore, the estimates reported in this table do not match those that appear in previous PISA reports.

For Mexico, in 2015, the total population of 15-year-olds enrolled in Grade 7 or above is an estimate of the target population size of the sample frame from which the 15-year-olds students were selected for the PISA test. At the time Mexico provided the information to PISA, the official figure for this population was 1 573 952.

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Table VI.A2.4 [1/2] **Exclusions**

	Student exclusions (unweighted)						Student exclusions (weighted)					
	Number of excluded students with functional disability	Number of excluded students with intellectual disability	Number of excluded students because of language	Number of excluded students for other reasons	Number of excluded students because of no materials available in the language of instruction	Total number of excluded students	Number of excluded students with functional disability	Number of excluded students with intellectual disability	Number of excluded students because of language	Number of excluded students for other reasons	Number of excluded students because of no materials available in the language of instruction	Total number of excluded students
	(Code 1)	(Code 2)	(Code 3)	(Code 4)	(Code 5)		(Code 1)	(Code 2)	(Code 3)	(Code 4)	(Code 5)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Australia	69	555	92	0	0	716	1 054	7 895	1 300	0	0	10 249
Austria	7	49	61	0	0	117	77	531	771	0	0	1 379
Belgium	8	19	18	0	0	45	87	211	196	0	0	494
Canada	125	1 040	316	0	0	1 481	1 611	11 744	4 141	0	0	17 496
Chile	6	58	4	0	0	68	173	1 727	129	0	0	2 029
Colombia	4	24	0	0	0	28	346	1 466	0	0	0	1 812
Czech Republic	1	0	0	0	0	1	11	0	0	0	0	11
Denmark	15	179	88	162	0	444	98	1 453	427	1 032	0	3 009
Estonia	3	85	8	0	0	96	8	174	13	0	0	195
Finland	6	100	22	17	12	157	55	966	204	155	111	1 491
France	8	28	20	0	0	56	776	3 397	2 471	0	0	6 644
Germany	2	18	22	0	0	42	199	1 859	2 789	0	0	4 847
Greece	2	39	11	0	0	52	29	590	179	0	0	798
Hungary	5	20	4	46	0	75	77	432	67	777	0	1 353
Iceland	5	133	61	10	0	209	5	135	62	10	0	212
Ireland	39	90	45	83	0	257	367	831	420	752	0	2 370
Israel	25	87	40	0	0	152	406	1 382	611	0	0	2 399
Italy	0	0	0	93	0	93	0	0	0	3 219	0	3 219
Japan	0	0	0	0	0	0	0	0	0	0	0	0
Korea	5	1	1	0	0	7	302	74	2	0	0	378
Latvia	2	20	1	0	0	23	5	54	2	0	0	62
Lithuania	4	91	0	0	0	95	16	344	0	0	0	360
Luxembourg	5	233	77	0	0	315	5	233	77	0	0	315
Mexico	13	28	3	0	0	44	2 609	7 301	1 547	0	0	11 457
Netherlands	7	58	9	4	0	78	236	1 813	224	134	0	2 407
New Zealand	42	279	119	0	3	443	278	1 905	812	0	21	3 016
Norway	17	327	108	0	0	452	147	2 814	944	0	0	3 906
Poland	21	87	8	0	0	116	964	4 190	481	0	0	5 635
Portugal	10	139	9	0	0	158	126	1 551	73	0	0	1 749
Slovak Republic	1	8	0	3	0	12	5	50	0	18	0	72
Slovenia	13	36	75	0	0	124	20	85	193	0	0	298
Spain	39	481	227	0	0	747	423	5 400	3 128	0	0	8 951
Sweden	0	0	0	681	0	681	0	0	0	10 163	0	10 163
Switzerland	8	71	73	0	0	152	86	813	1 056	0	0	1 955
Turkey	10	46	39	0	0	95	1 248	6 389	5 825	0	0	13 463
United Kingdom	75	573	40	0	0	688	2 448	16 592	1 522	0	0	20 562
United States	38	106	39	11	0	194	25 164	62 555	24 972	6 367	0	119 057

Note: For a full explanation of other details in this table please refer to the *PISA 2018 Technical Report* (OECD, forthcoming).

Exclusion codes:

   Code 1: Functional disability – student has a moderate to severe permanent physical disability.

   Code 2: Intellectual disability – student has a mental or emotional disability and has either been tested as cognitively delayed or is considered in the professional opinion of qualified staff to be cognitively delayed.

   Code 3: Limited assessment language proficiency – student is not a native speaker of any of the languages of the assessment in the country; he/she has limited proficiency in the assessment language, and he/she has received less than one year of instruction in the assessment language.

   Code 4: Other reasons defined by the national centres and approved by the international centre.

   Code 5: No materials available in the language of instruction.

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Table VI.A2.4 [2/2] **Exclusions**

	Student exclusions (unweighted)						Student exclusions (weighted)					
	Number of excluded students with functional disability	Number of excluded students with intellectual disability	Number of excluded students because of language	Number of excluded students for other reasons	Number of excluded students because of no materials available in the language of instruction	Total number of excluded students	Number of excluded students with functional disability	Number of excluded students with intellectual disability	Number of excluded students because of language	Number of excluded students for other reasons	Number of excluded students because of no materials available in the language of instruction	Total number of excluded students
	(Code 1)	(Code 2)	(Code 3)	(Code 4)	(Code 5)		(Code 1)	(Code 2)	(Code 3)	(Code 4)	(Code 5)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Albania	0	0	0	0	0	0	0	0	0	0	0	0
Argentina	21	96	1	0	0	118	871	3 199	13	0	0	4 083
Baku (Azerbaijan)	0	0	0	0	0	0	0	0	0	0	0	0
Belarus	30	1	0	0	0	31	449	13	0	0	0	462
Bosnia and Herzegovina	8	16	0	0	0	24	29	77	0	0	0	106
Brazil	4	36	1	0	0	41	693	7 100	386	0	0	8 180
Brunei Darussalam	9	44	0	0	0	53	9	44	0	0	0	53
B-S-J-Z (China)	2	24	8	0	0	34	49	1 194	209	0	0	1 452
Bulgaria	4	76	0	0	0	80	31	653	0	0	0	685
Costa Rica	22	12	5	0	0	39	139	78	31	0	0	249
Croatia	7	84	4	0	40	135	33	397	24	0	182	637
Cyprus	17	143	41	0	0	201	25	250	77	0	0	351
Dominican Republic	0	0	0	0	0	0	0	0	0	0	0	0
Georgia	6	20	0	0	0	26	46	134	0	0	0	180
Hong Kong (China)	0	0	0	0	0	0	0	0	0	0	0	0
Indonesia	0	0	0	0	0	0	0	0	0	0	0	0
Jordan	25	17	2	0	0	44	322	204	23	0	0	550
Kazakhstan	132	157	11	0	0	300	1 673	1 617	334	0	0	3 624
Kosovo	0	14	0	0	12	26	0	53	0	0	79	132
Lebanon	0	1	0	0	0	1	0	8	0	0	0	8
Macao (China)	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia	15	22	0	0	0	37	968	1 451	0	0	0	2 419
Malta	6	48	2	0	0	56	6	48	2	0	0	56
Moldova	4	29	2	0	0	35	25	164	18	0	0	207
Montenegro	0	4	0	0	0	4	0	12	0	0	0	12
Morocco	4	0	0	0	0	4	220	0	0	0	0	220
North Macedonia	2	3	0	0	13	18	4	8	0	0	73	85
Panama	5	18	1	0	0	24	12	91	3	0	0	106
Peru	11	9	0	0	0	20	756	603	0	0	0	1 360
Philippines	2	8	0	0	0	10	376	1 663	0	0	0	2 039
Qatar	30	150	12	0	0	192	30	150	12	0	0	192
Romania	2	19	3	0	0	24	58	700	172	0	0	930
Russia	14	81	1	0	0	96	2 126	12 620	159	0	0	14 905
Saudi Arabia	0	1	0	0	0	1	0	53	0	0	0	53
Serbia	8	11	2	0	21	42	71	148	16	0	174	409
Singapore	4	22	9	0	0	35	25	145	62	0	0	232
Chinese Taipei	9	28	1	0	0	38	320	957	20	0	0	1 297
Thailand	1	16	0	0	0	17	75	927	0	0	0	1 002
Ukraine	28	6	0	0	0	34	1 389	315	0	0	0	1 704
United Arab Emirates	16	124	26	0	0	166	26	256	49	0	0	331
Uruguay	4	20	1	0	0	25	29	131	5	0	0	164
Viet Nam	0	0	0	0	0	0	0	0	0	0	0	0

Note: For a full explanation of other details in this table please refer to the *PISA 2018 Technical Report* (OECD, forthcoming).

Exclusion codes:

Code 1: Functional disability – student has a moderate to severe permanent physical disability.

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Code 5: No materials available in the language of instruction.

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Table VI.A2.6 [1/2] **Response rates**

	Initial sample – before school replacement					Final sample – after school replacement					Final sample – students within schools after school replacement				
	Weighted school participation rate before replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted school participation rate before replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted student participation rate before replacement (%)	Number of students assessed (weighted)	Number of students sampled (assessed and absent) (weighted)	Number of students assessed (unweighted)	Number of students sampled (assessed and absent) (unweighted)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Australia	95	264 304	278 765	734	779	96	267 078	278 765	740	779	85	210 665	247 433	14 081	16 756
Austria	100	78 872	78 946	291	293	100	78 872	78 946	291	293	93	69 426	75 019	6 802	7 555
Belgium	87	103 631	119 744	256	308	95	113 259	119 719	285	308	91	101 504	111 421	8 431	9 271
Canada	86	328 935	383 699	782	914	89	339 896	383 738	804	914	84	251 025	298 737	22 440	26 252
Chile	90	190 060	210 669	224	258	100	209 953	210 666	255	258	93	197 940	212 625	7 601	8 156
Colombia	95	596 406	629 729	238	250	97	610 211	629 088	244	250	93	475 820	512 614	7 480	8 036
Czech Republic	99	86 650	87 689	330	334	99	86 650	87 689	330	334	92	79 903	86 943	6 996	7 628
Denmark	88	52 392	59 459	328	371	93	55 170	59 109	344	371	86	48 473	56 078	7 607	8 891
Estonia	100	11 684	11 684	231	231	100	11 684	11 684	231	231	92	10 532	11 436	5 316	5 786
Finland	99	57 420	57 710	213	214	100	57 710	57 710	214	214	93	52 102	56 124	5 649	6 084
France	98	769 117	784 728	244	252	100	783 049	784 728	250	252	93	698 721	754 842	6 295	6 817
Germany	96	739 666	773 082	215	226	98	759 094	773 040	221	226	90	652 025	721 258	5 431	6 036
Greece	85	83 158	97 793	212	256	96	94 540	98 005	240	256	96	88 019	91 991	6 371	6 664
Hungary	98	89 754	91 208	235	245	99	90 303	91 208	236	245	94	80 693	85 878	5 129	5 458
Iceland	98	4 178	4 282	140	160	98	4 178	4 282	140	160	87	3 285	3 791	3 285	3 791
Ireland	100	63 179	63 179	157	157	100	63 179	63 179	157	157	86	51 575	59 639	5 577	6 445
Israel	95	109 810	115 015	164	174	100	114 896	115 108	173	174	91	99 978	110 459	6 614	7 306
Italy	93	505 813	541 477	510	550	98	529 552	541 672	531	550	86	437 219	506 762	11 679	13 540
Japan	89	995 577	1 114 316	175	196	93	1 041 540	1 114 316	183	196	96	971 454	1 008 286	6 109	6 338
Korea	100	514 768	514 768	188	188	100	514 768	514 768	188	188	97	443 719	455 544	6 650	6 810
Latvia	82	14 020	17 049	274	349	89	15 219	17 021	308	349	89	12 752	14 282	5 303	5 923
Lithuania	100	25 370	25 467	363	364	100	25 370	25 467	363	364	93	22 614	24 405	6 885	7 421
Luxembourg	100	5 796	5 796	44	44	100	5 796	5 796	44	44	95	5 230	5 478	5 230	5 478
Mexico	89	1 494 409	1 670 484	268	302	96	1 599 670	1 670 484	286	302	96	1 357 446	1 412 604	7 299	7 612
Netherlands	61	118 705	194 486	106	175	87	169 033	194 397	150	175	83	138 134	165 739	4 668	5 617
New Zealand	83	47 335	57 316	170	208	91	52 085	57 292	189	208	83	39 801	48 214	6 128	7 450
Norway	98	58 521	59 889	247	254	99	59 128	59 889	250	254	91	50 009	54 862	5 802	6 368
Poland	92	302 200	329 827	222	253	99	325 266	329 756	239	253	86	267 756	311 300	5 603	6 540
Portugal	85	92 797	108 948	233	280	91	99 760	109 168	255	280	76	68 659	90 208	5 690	7 431
Slovak Republic	92	45 799	49 713	348	388	96	48 391	50 361	373	388	93	39 730	42 628	5 947	6 406
Slovenia	99	17 702	17 900	337	350	99	17 744	17 900	340	350	91	15 409	16 994	6 374	7 021
Spain	99	427 230	432 969	1 079	1 102	99	427 899	432 969	1 082	1 102	90	368 767	410 820	35 849	39 772
Sweden	99	101 591	102 873	218	227	99	102 075	102 873	219	227	86	79 604	92 069	5 487	6 356
Switzerland	86	68 579	79 671	201	231	99	78 808	79 213	228	231	94	67 261	71 290	5 822	6 157
Turkey	97	947 428	975 317	181	186	100	975 317	975 317	186	186	99	873 992	884 971	6 890	6 980
United Kingdom	73	496 742	681 510	399	538	87	590 558	682 212	461	538	83	427 944	514 975	13 668	16 443
United States	65	2 516 631	3 874 298	136	215	76	2 960 088	3 873 842	162	215	85	2 301 006	2 713 513	4 811	5 686

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Table VI.A2.6 [2/2] **Response rates**

	Initial sample – before school replacement					Final sample – after school replacement					Final sample – students within schools after school replacement				
	Weighted school participation rate before replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted school participation rate before replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted student participation rate before replacement (%)	Number of students assessed (weighted)	Number of students sampled (assessed and absent) (weighted)	Number of students assessed (unweighted)	Number of students sampled (assessed and absent) (unweighted)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Albania	97	29 234	30 163	322	336	97	29 260	30 163	323	336	98	26 611	27 081	6 333	6 438
Argentina	95	626 740	658 143	439	458	96	629 651	658 143	445	458	86	467 613	541 981	11 836	13 532
Baku (Azerbaijan)	93	18 730	20 040	181	197	100	20 249	20 249	197	197	89	18 049	20 312	6 827	7 607
Belarus	100	79 623	79 623	234	234	100	79 623	79 623	234	234	97	76 321	78 333	5 803	5 963
Bosnia and Herzegovina	100	31 025	31 058	212	213	100	31 051	31 051	213	213	96	27 562	28 843	6 480	6 781
Brazil	87	2 483 766	2 862 749	547	638	93	2 649 165	2 858 009	586	638	89	1 683 080	1 894 398	10 606	11 956
Brunei Darussalam	100	6 681	6 681	55	55	100	6 681	6 681	55	55	99	6 828	6 899	6 828	6 899
B-S-J-Z (China)	96	1 030 427	1 068 463	355	362	99	1 062 001	1 068 486	361	362	99	978 803	986 556	12 058	12 156
Bulgaria	96	48 095	50 164	191	199	99	49 568	50 145	197	199	93	44 003	47 275	5 294	5 673
Costa Rica	100	58 843	58 843	205	205	100	58 843	58 843	205	205	97	44 179	45 522	7 221	7 433
Croatia	97	28 382	29 188	178	183	100	29 177	29 177	183	183	92	32 632	35 462	6 609	7 190
Cyprus	98	7 946	8 122	90	99	98	7 946	8 122	90	99	93	6 975	7 472	5 503	5 890
Dominican Republic	96	138 500	143 842	225	235	100	143 816	143 816	235	235	90	126 090	140 330	5 674	6 328
Georgia	99	40 450	40 814	321	326	99	40 542	40 810	322	326	95	36 366	38 226	5 572	5 874
Hong Kong (China)	69	34 976	50 371	120	174	79	39 765	50 608	136	174	85	34 219	40 108	5 706	6 692
Indonesia	99	3 623 573	3 647 226	398	399	99	3 623 573	3 647 226	398	399	96	3 570 441	3 733 024	12 098	12 570
Jordan	100	123 056	123 056	313	313	100	123 056	123 056	313	313	98	112 213	114 901	8 963	9 172
Kazakhstan	100	220 344	220 344	616	616	100	220 344	220 344	616	616	99	210 226	212 229	19 507	19 721
Kosovo	94	25 768	27 304	203	224	97	26 324	27 269	211	224	96	23 902	24 845	5 058	5 259
Lebanon	94	54 392	58 119	302	320	98	56 652	58 093	313	320	91	47 855	52 453	5 614	6 154
Macao (China)	100	3 830	3 830	45	45	100	3 830	3 830	45	45	99	3 775	3 799	3 775	3 799
Malaysia	99	445 667	450 371	189	191	100	450 371	450 371	191	191	97	378 791	388 638	6 111	6 264
Malta	100	3 997	3 999	50	51	100	3 997	3 999	50	51	86	3 363	3 923	3 363	3 923
Moldova	100	29 054	29 054	236	236	100	29 054	29 054	236	236	98	27 700	28 252	5 367	5 474
Montenegro	99	7 242	7 299	60	61	100	7 280	7 280	61	61	96	6 822	7 087	6 666	6 912
Morocco	99	404 138	406 348	178	179	100	406 348	406 348	179	179	97	375 677	386 408	6 814	7 011
North Macedonia	100	18 489	18 502	117	120	100	18 489	18 502	117	120	92	16 467	17 808	5 569	5 999
Panama	94	54 475	57 873	241	260	97	56 455	58 002	251	260	90	34 060	37 944	6 256	7 058
Peru	99	455 964	460 276	336	342	100	460 276	460 276	342	342	99	419 329	425 036	6 086	6 170
Philippines	99	1 551 977	1 560 748	186	187	100	1 560 748	1 560 748	187	187	97	1 359 350	1 400 584	7 233	7 457
Qatar	100	16 163	16 163	188	188	100	16 163	16 163	188	188	91	13 828	15 228	13 828	15 228
Romania	98	157 747	160 607	167	170	100	160 607	160 607	170	170	98	144 688	148 098	5 075	5 184
Russia	100	1 354 843	1 355 318	264	265	100	1 354 843	1 355 318	264	265	96	1 209 339	1 257 352	7 608	7 911
Saudi Arabia	99	362 426	364 675	233	235	100	364 291	364 620	234	235	97	343 747	353 702	6 136	6 320
Serbia	97	62 037	63 877	183	190	99	63 448	63 877	187	190	94	57 342	61 233	6 609	7 062
Singapore	97	43 138	44 691	161	167	98	43 738	44 569	164	167	95	40 960	43 290	6 646	7 019
Chinese Taipei	97	232 563	238 821	186	193	99	236 227	239 027	189	193	95	211 796	223 812	7 196	7 584
Thailand	100	691 460	691 460	290	290	100	691 460	691 460	290	290	99	568 456	575 713	8 633	8 739
Ukraine	98	301 552	308 245	244	250	100	308 163	308 163	250	250	96	291 850	304 855	5 998	6 263
United Arab Emirates	99	57 891	58 234	754	760	99	57 891	58 234	754	760	96	51 517	53 904	19 265	20 191
Uruguay	97	44 528	46 032	183	189	99	45 745	46 018	188	189	87	34 333	39 459	5 247	6 026
Viet Nam	100	1 116 404	1 116 404	151	151	100	1 116 404	1 116 404	151	151	99	914 874	926 260	5 377	5 445

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Table VI.A2.8 [1/2] **Percentage of students at each grade level**

	All students												
	7th grade		8th grade		9th grade		10th grade		11th grade		12th grade and above		Information unavailable	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Australia	0.0	c	0.1	(0.0)	11.5	(0.4)	81.0	(0.5)	7.4	(0.4)	0.0	(0.0)	0.0	c
Austria	0.4	(0.1)	6.8	(0.4)	44.5	(0.7)	48.1	(0.8)	0.2	(0.1)	0.0	c	0.0	c
Belgium	0.3	(0.1)	6.1	(0.4)	26.7	(0.7)	63.3	(0.8)	1.3	(0.1)	0.0	c	2.3	(0.3)
Canada	0.3	(0.1)	1.0	(0.2)	9.7	(0.3)	87.7	(0.3)	1.1	(0.1)	0.1	(0.0)	0.0	c
Chile	1.0	(0.2)	4.4	(0.5)	20.6	(0.7)	68.5	(0.9)	5.6	(0.3)	0.0	c	0.0	c
Colombia	4.4	(0.4)	11.3	(0.5)	22.8	(0.6)	43.0	(0.8)	18.5	(0.7)	0.0	c	0.0	c
Czech Republic	0.6	(0.2)	3.3	(0.4)	48.5	(1.2)	47.5	(1.3)	0.0	c	0.0	c	0.0	c
Denmark	0.1	(0.0)	16.3	(0.5)	81.7	(0.5)	1.7	(0.3)	0.0	c	0.1	(0.1)	0.0	c
Estonia	0.4	(0.1)	21.8	(0.6)	76.4	(0.6)	1.3	(0.2)	0.0	(0.0)	0.0	c	0.0	c
Finland	0.3	(0.1)	13.9	(0.4)	85.6	(0.5)	0.2	(0.1)	0.0	c	0.0	c	0.0	c
France	0.0	(0.0)	0.5	(0.1)	16.9	(0.6)	79.2	(0.6)	3.2	(0.2)	0.1	(0.0)	0.0	c
Germany	0.4	(0.1)	8.1	(0.4)	46.4	(1.0)	44.0	(1.1)	1.1	(0.3)	0.0	(0.0)	0.0	c
Greece	0.1	(0.0)	0.7	(0.2)	3.7	(0.5)	95.5	(0.6)	0.0	c	0.0	c	0.0	c
Hungary	1.7	(0.3)	8.3	(0.5)	71.1	(0.7)	18.9	(0.6)	0.0	(0.0)	0.0	c	0.0	c
Iceland	0.0	c	0.0	c	0.0	c	99.2	(0.1)	0.8	(0.1)	0.0	c	0.0	c
Ireland	0.0	(0.0)	2.0	(0.2)	61.6	(0.7)	27.9	(0.9)	8.5	(0.7)	0.0	c	0.0	c
Israel	0.0	(0.0)	0.1	(0.1)	16.7	(0.9)	82.4	(0.9)	0.7	(0.2)	0.0	(0.0)	0.0	c
Italy	0.0	c	1.0	(0.2)	13.5	(0.5)	77.8	(0.5)	7.7	(0.3)	0.0	c	0.0	c
Japan	0.0	c	0.0	c	0.0	c	100.0	c	0.0	c	0.0	c	0.0	c
Korea	0.0	c	0.0	c	16.1	(0.7)	83.8	(0.7)	0.1	(0.0)	0.0	c	0.0	c
Latvia	0.7	(0.1)	9.8	(0.5)	86.0	(0.5)	2.5	(0.2)	0.0	(0.0)	0.0	c	1.1	(0.2)
Lithuania	0.1	(0.1)	2.4	(0.2)	90.2	(0.5)	7.3	(0.4)	0.0	c	0.0	c	0.0	c
Luxembourg	0.3	(0.1)	10.0	(0.1)	48.3	(0.1)	40.3	(0.1)	1.1	(0.1)	0.0	c	0.0	c
Mexico	0.9	(0.2)	2.9	(0.4)	17.6	(1.1)	77.8	(1.0)	0.6	(0.1)	0.1	(0.1)	0.0	c
Netherlands	0.1	(0.0)	2.6	(0.3)	36.8	(0.8)	59.3	(0.8)	1.2	(0.2)	0.0	(0.0)	0.0	c
New Zealand	0.0	c	0.0	c	0.1	(0.0)	6.6	(0.5)	89.0	(0.4)	4.2	(0.2)	0.0	c
Norway	0.0	c	0.0	c	0.3	(0.1)	99.3	(0.3)	0.4	(0.2)	0.0	c	0.0	c
Poland	0.3	(0.1)	3.1	(0.3)	95.1	(0.5)	1.4	(0.4)	0.0	c	0.0	c	0.0	c
Portugal	2.4	(0.2)	7.2	(0.4)	17.2	(0.9)	57.4	(1.3)	0.2	(0.1)	0.0	c	15.7	(1.5)
Slovak Republic	1.9	(0.2)	4.3	(0.4)	40.8	(1.1)	51.3	(1.0)	1.7	(0.5)	0.0	c	0.0	c
Slovenia	0.3	(0.0)	0.7	(0.2)	6.2	(0.4)	92.4	(0.4)	0.4	(0.1)	0.0	c	0.0	c
Spain	0.0	(0.0)	5.9	(0.2)	24.1	(0.4)	69.9	(0.5)	0.1	(0.0)	0.0	c	0.0	c
Sweden	0.0	c	2.1	(0.3)	96.3	(0.6)	1.6	(0.5)	0.0	c	0.0	c	0.0	c
Switzerland	0.5	(0.1)	10.2	(0.6)	60.8	(1.4)	27.8	(1.4)	0.7	(0.3)	0.0	(0.0)	0.0	c
Turkey	0.1	(0.1)	0.4	(0.2)	17.7	(1.1)	78.8	(1.1)	2.9	(0.3)	0.1	(0.0)	0.0	c
United Kingdom	0.0	c	0.0	c	0.0	(0.0)	1.0	(0.6)	93.4	(0.6)	5.6	(0.2)	0.0	c
United States	0.0	c	0.1	(0.1)	7.5	(0.5)	73.6	(0.8)	18.7	(0.7)	0.1	(0.1)	0.0	c

Note: The large number of students with missing grade-level information in Ukraine can be attributed to missing data from students in the first and second year of vocational colleges. Most of these 15-year-old students would have been in the first year of vocational college, which is equivalent to grade 10.

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Table VI.A2.8 [2/2] **Percentage of students at each grade level**

	All students													
	7th grade		8th grade		9th grade		10th grade		11th grade		12th grade and above		Information unavailable	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Albania	0.2	(0.1)	1.2	(0.3)	36.6	(1.4)	61.5	(1.4)	0.5	(0.1)	0.0	(0.0)	0.0	c
Argentina	2.1	(0.5)	9.8	(0.7)	22.1	(0.8)	63.8	(1.4)	1.8	(1.0)	0.0	(0.0)	0.4	(0.4)
Baku (Azerbaijan)	0.2	(0.1)	2.8	(0.9)	34.7	(0.7)	61.5	(1.2)	0.7	(0.1)	0.0	c	0.0	c
Belarus	0.1	(0.0)	0.9	(0.2)	42.8	(0.9)	56.2	(0.9)	0.0	c	0.0	c	0.0	c
Bosnia and Herzegovina	0.0	(0.0)	0.2	(0.1)	16.2	(1.1)	83.4	(1.1)	0.1	(0.1)	0.0	c	0.0	c
Brazil	4.1	(0.2)	8.1	(0.5)	13.5	(0.6)	33.5	(0.8)	39.3	(0.8)	1.5	(0.1)	0.0	c
Brunei Darussalam	0.0	(0.0)	0.5	(0.1)	6.5	(0.1)	59.7	(0.1)	29.2	(0.1)	4.1	(0.0)	0.0	c
B-S-J-Z (China)	0.3	(0.1)	1.5	(0.2)	38.7	(1.7)	58.2	(1.6)	1.3	(0.2)	0.0	(0.0)	0.0	c
Bulgaria	0.2	(0.1)	2.7	(0.4)	92.8	(0.5)	4.2	(0.3)	0.0	(0.0)	0.0	c	0.0	c
Costa Rica	4.8	(0.5)	13.8	(0.7)	36.5	(1.1)	44.7	(1.5)	0.2	(0.1)	0.0	c	0.0	c
Croatia	0.0	(0.0)	0.3	(0.2)	78.9	(0.4)	20.8	(0.4)	0.0	c	0.0	c	0.0	c
Cyprus	0.0	c	0.1	(0.1)	4.4	(0.4)	94.4	(0.4)	1.1	(0.1)	0.0	c	0.0	c
Dominican Republic	6.4	(0.6)	12.5	(0.8)	23.6	(0.8)	43.8	(1.2)	12.6	(0.7)	1.2	(0.1)	0.0	c
Georgia	0.1	(0.0)	0.5	(0.1)	14.3	(0.6)	84.2	(0.6)	1.0	(0.2)	0.0	c	0.0	c
Hong Kong (China)	1.2	(0.2)	5.9	(0.5)	26.1	(0.9)	66.0	(1.1)	0.8	(0.5)	0.0	c	0.0	c
Indonesia	3.4	(1.1)	8.1	(1.0)	33.7	(2.0)	49.2	(2.2)	4.2	(0.7)	1.4	(0.9)	0.0	c
Jordan	0.2	(0.1)	1.6	(0.2)	11.2	(0.6)	87.0	(0.7)	0.0	c	0.0	c	0.0	c
Kazakhstan	0.1	(0.0)	1.7	(0.1)	44.0	(0.7)	53.4	(0.7)	0.8	(0.1)	0.0	(0.0)	0.0	c
Kosovo	0.0	c	0.4	(0.1)	23.2	(0.9)	74.6	(0.9)	1.7	(0.2)	0.0	(0.0)	0.0	c
Lebanon	5.3	(0.5)	8.5	(0.5)	16.3	(0.9)	58.2	(1.0)	11.7	(0.5)	0.1	(0.1)	0.0	c
Macao (China)	1.9	(0.1)	9.4	(0.2)	29.7	(0.2)	57.9	(0.2)	1.0	(0.1)	0.0	(0.0)	0.0	c
Malaysia	0.0	c	0.0	c	5.5	(0.6)	94.2	(0.6)	0.3	(0.1)	0.0	c	0.0	c
Malta	0.0	c	0.0	c	0.1	(0.0)	5.4	(0.2)	94.4	(0.1)	0.1	(0.0)	0.0	c
Moldova	0.2	(0.1)	6.2	(0.5)	83.2	(0.8)	10.4	(0.8)	0.0	(0.0)	0.0	c	0.0	c
Montenegro	0.0	c	0.0	c	3.3	(0.3)	93.8	(0.3)	2.9	(0.1)	0.0	c	0.0	c
Morocco	8.0	(0.7)	13.9	(1.1)	32.1	(1.9)	38.4	(2.7)	7.7	(0.8)	0.0	c	0.0	c
North Macedonia	0.0	c	0.2	(0.1)	95.8	(0.1)	4.0	(0.1)	0.0	c	0.0	c	0.0	c
Panama	3.2	(0.5)	6.9	(0.6)	20.6	(1.0)	65.4	(1.4)	3.8	(0.4)	0.0	(0.0)	0.0	c
Peru	1.8	(0.3)	5.7	(0.4)	14.3	(0.5)	54.5	(0.7)	23.6	(0.6)	0.0	c	0.0	c
Philippines	4.5	(0.4)	12.8	(0.6)	51.1	(0.7)	30.9	(0.7)	0.6	(0.3)	0.0	(0.0)	0.0	c
Qatar	1.3	(0.1)	4.5	(0.1)	18.0	(0.1)	63.4	(0.1)	12.9	(0.1)	0.0	(0.0)	0.0	c
Romania	0.9	(0.3)	6.0	(0.9)	77.9	(0.9)	15.1	(0.5)	0.0	(0.0)	0.0	c	0.0	c
Russia	0.4	(0.0)	7.7	(0.4)	81.1	(0.9)	10.7	(1.1)	0.1	(0.0)	0.0	c	0.0	c
Saudi Arabia	1.2	(0.2)	3.6	(0.6)	14.0	(1.8)	77.5	(2.4)	3.6	(0.3)	0.1	(0.0)	0.0	c
Serbia	0.1	(0.1)	0.8	(0.2)	87.7	(0.4)	11.4	(0.4)	0.0	c	0.0	c	0.0	c
Singapore	0.0	(0.0)	1.1	(0.1)	7.6	(0.3)	90.8	(0.5)	0.4	(0.2)	0.0	c	0.0	c
Chinese Taipei	0.0	c	0.1	(0.0)	35.7	(0.9)	64.2	(0.9)	0.0	(0.0)	0.0	c	0.0	c
Thailand	0.2	(0.1)	0.7	(0.2)	19.9	(0.9)	76.6	(0.9)	2.5	(0.3)	0.0	c	0.0	c
Ukraine	0.0	c	0.4	(0.1)	29.8	(1.3)	41.3	(1.8)	0.5	(0.1)	0.0	c	28.0	(2.4)
United Arab Emirates	0.3	(0.1)	1.5	(0.1)	9.6	(0.3)	56.8	(0.6)	29.9	(0.5)	1.9	(0.2)	0.0	c
Uruguay	4.2	(0.5)	11.2	(0.5)	20.5	(0.7)	63.4	(1.1)	0.6	(0.1)	0.0	c	0.0	c
Viet Nam	0.2	(0.1)	0.8	(0.3)	4.0	(1.2)	92.3	(2.5)	0.0	(0.0)	0.0	c	2.7	(2.0)

Note: The large number of students with missing grade-level information in Ukraine can be attributed to missing data from students in the first and second year of vocational colleges. Most of these 15-year-old students would have been in the first year of vocational college, which is equivalent to grade 10.

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Tables available on line

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Note

1. More precisely, PISA assessed students who were at least 15 years and 3 complete months old and who were at most 16 years and 3 complete months old (i.e. younger than 16 years, 2 months and roughly 30 days old), with a tolerance of one month on each side of this age window. If the PISA assessment was conducted in April 2018, as was the case in most countries/economies, all students born in 2002 would have been eligible.

2. Educational institutions are generally referred to as schools in this publication, although some educational institutions (in particular, some types of vocational education establishments) may not be referred to as schools in certain countries/economies.

3. As might be expected from this definition, the average age of students across OECD countries was 15 years and 9 months. The range in country means was 2 months and 13 days (0.20 year), from the minimum country mean of 15 years and 8 months to the maximum country mean of 15 years and 10 months (OECD, 2019[3]).

4. Such a comparison is complicated by first-generation immigrant students, who received part of their education in a country/economy other than the one in which they were assessed. Mean scores in any country/economy should be interpreted in the context of student demographics within that country/economy.

5. Details for countries/economies that applied different sampling designs are documented in the *PISA 2018 Technical Report* (OECD, forthcoming[1]).

6. Due to the small size of their education systems, all schools and all eligible students within these schools were included in the samples of Brunei Darussalam, Cyprus (see Note 8), Iceland, Luxembourg, Macao (China), Malta, Montenegro and Qatar.

7. The threshold for an acceptable participation rate after replacement varies between 85% and 100%, depending on the participation rate before replacement.

8. In particular, in the case of the Netherlands and the United Kingdom, non-response bias analyses relied on direct measures of school performance external to PISA, typically from national assessments. More indirect correlates of school performance were analysed in Hong Kong (China) and the United States, due to the absence of national assessments. The non-response problem in Hong Kong (China) can be attributed to two causes: lack of initiative among schools and teachers to participate in PISA and a large number of schools that were considered to be non-responding schools, as less than 50% of sampled students in these schools sat the assessment.

9. These exclusions refer only to those students with limited proficiency in the language of instruction/assessment. Exclusions related to the unavailability of test material in the language of instruction are not considered in this analysis.

10. The preliminary attribution of school codes in the process of selecting and then excluding students and schools may have resulted in the double exclusion (at both school and student levels) of some of the students with special education needs in Sweden. As a result, the overall exclusion rate in Sweden may have been overestimated by at most 0.5 of a percentage point. In this scenario, the overall exclusion rate would still be over 10%, the highest among countries/economies participating in PISA.

11. The overall exclusion rate includes those students who were excluded at the school level (Column 6) and those students who were excluded within schools (Column 11). However, only students enrolled in non-excluded schools were affected by within-school exclusions, hence the presence of the term equivalent to 1 minus Column 6 (expressed as a decimal).

12. If the correlation between the propensy of exclusions and student performance were 0.3, then resulting mean scores would likely have been overestimated by: 1 score point if the exclusion rate were 1%; 3 score points if the exclusion rate were 5%; and 6 score points if the exclusion rate were 10%. If the correlation between the propensy of exclusions and student performance were 0.5, then resulting mean scores would likely have been overestimated by: 1 score point if the exclusion rate were 1%; 5 score points if the exclusion rate were 5%; and 10 score points if the exclusion rate were 10%. For this calculation, a model was used that assumed a bivariate normal distribution for performance and the propensy to participate.

13. Testing material was adapted to each country. Versions in the same language thus differed across countries/economies, and students in Luxembourg who were not instructed in one of the three languages in which testing material was available (English, French and German) were unable to sit the PISA assessment, even if such material was available in their language of instruction in a different country.

References

OECD (2020), *PISA 2018 Results (Volume IV): Are Students Smart about Money?*, PISA, OECD Publishing, Paris, [2]
https://dx.doi.org/10.1787/48ebd1ba-en.

OECD (2019), *PISA 2018 Results (Volume II): Where All Students Can Succeed*, OECD Publishing, Paris, https://doi.org/10.1787/b5fd1b8f-en. [3]

OECD (forthcoming), *PISA 2018 Technical Report,* OECD Publishing, Paris. [1]

STANDARD ERRORS, CONFIDENCE INTERVALS AND SIGNIFICANCE TESTS

The statistics in this report represent estimates based on samples of students, rather than values that could be calculated if every student in every country/economy had answered every question. Consequently, it is important to measure the degree of uncertainty of the estimates. In PISA, each estimate has an associated degree of uncertainty, which is expressed through a standard error. The use of confidence intervals provides a way to make inferences about the population parameters (e.g. means and proportions) in a manner that reflects the uncertainty associated with the sample estimates. If numerous different samples were drawn from the same population, according to the same procedures as the original sample, then in 95 out of 100 samples the calculated confidence interval would encompass the true population parameter. For many parameters, sample estimators follow a normal distribution, and the 95% confidence interval can be constructed as the estimated parameter, plus or minus 1.96 times the associated standard error.

In many cases, readers are primarily interested in whether a given value in a particular country/economy is different from a second value in the same or another country/economy (e.g. whether girls in a country/economy perform better than boys in the same country/economy). In the tables and figures used in this report, differences are labelled as statistically significant when a difference of that size or larger, in either direction, would be observed less than 5% of the time, if there were actually no difference in corresponding population values. Similarly, the risk of reporting an association as significant if there is, in fact, no correlation between two measures, is contained at 5%.

Throughout the report, significance tests were undertaken to assess the statistical significance of the comparisons made.

Statistical significance of gender differences and differences between subgroup means

Gender differences in student performance or other indices were tested for statistical significance. Positive differences indicate higher scores for girls, while negative differences indicate higher scores for boys. Generally, differences marked in bold in the tables in this volume are statistically significant at the 95% confidence level.

Similarly, differences between other groups of students (e.g. non-immigrant students and students with an immigrant background or socio-economically advantaged and disadvantaged students) were tested for statistical significance. The definitions of the subgroups can, in general, be found in the tables and text accompanying the analysis. All differences marked in bold in the tables presented in Annex B1 of this report are statistically significant at the 95% level.

Statistical significance of differences between subgroup means, after accounting for other variables

For many tables, subgroup comparisons were performed both on the observed difference ("before accounting for other variables") and after accounting for other variables, such as the PISA index of economic, social and cultural status of students. The adjusted differences were estimated using linear regression and tested for significance at the 95% confidence level. Significant differences are marked in bold.

ODDS RATIOS

The odds ratio is a measure of the relative likelihood of a particular outcome across two groups. The odds ratio for observing the outcome when an antecedent is present is simply

Equation VI.A3.1

$$OR = \left.\left(p_{11}/p_{12}\right)\middle/\left(p_{21}/p_{22}\right)\right.$$

where p_{11}/p_{12} represents the "odds" of observing the outcome when the antecedent is present, and p_{11}/p_{12} represents the "odds" of observing the outcome when the antecedent is not present.

Logistic regression can be used to estimate the log ratio: the exponentiated logit coefficient for a binary variable is equivalent to the odds ratio. A "generalised" odds ratio, after accounting for other differences across groups, can be estimated by introducing control variables in the logistic regression.

Statistical significance of odds ratios

Figures in bold in the data tables presented in Annex B1 of this report indicate that the odds ratio is statistically significantly different from 1 at the 95% confidence level. To construct a 95% confidence interval for the odds ratio, the estimator is assumed to follow a log-normal distribution, rather than a normal distribution.

In many tables, odds ratios after accounting for other variables are also presented. These odds ratios were estimated using logistic regression and tested for significance against the null hypothesis of an odds ratio equal to 1 (i.e. equal likelihoods, after accounting for other variables).

STATISTICS BASED ON MULTILEVEL MODELS

Statistics based on multilevel models include variance components (between-school and within-school variance). Multilevel models are generally specified as two-level regression models (student and school levels), with normally distributed residuals, and estimated with maximum likelihood procedure. Models were estimated using the Stata (version 15.1) "mixed" module. Components from those regressions are used to estimate the ratio of between-school variation to total variation on the indices derived from data in the student questionnaire.

Standard errors in statistics estimated from multilevel models

For statistics based on multilevel models (such as the estimates of variance components and regression coefficients from two-level regression models), the standard errors are not estimated with the usual replication method, which accounts for stratification and sampling rates from finite populations. Instead, standard errors are "model-based": their computation assumes that schools and students within schools are sampled at random (with sampling probabilities reflected in school and student weights) from a theoretical, infinite population of schools and students, which complies with the model's parametric assumptions.

MODAL GRADE SCHOOLS

Measures such as between-school variations are influenced by how schools are defined and organised within countries and economies and by the units that were chosen for sampling purposes. For example, in some countries, some of the schools in the PISA sample were defined as administrative units (even if they spanned several geographically separate institutions, as in Italy); in others, they were defined as those parts of larger educational institutions that serve 15-year-olds; in others they were defined as physical school buildings; and in others they were defined from a management perspective (e.g. entities having a principal).

The *PISA 2018 Technical Report* (OECD, forthcoming) and Annex A2 provide an overview of how schools are defined. In PISA 2018, the estimation of variance components was restricted to schools with the "modal ISCED level" for 15-year-old students. The "modal ISCED level" is defined here as the level attended by at least one-third of the PISA sample. As PISA students are sampled to represent all 15-year-old students, whatever type of schools they are enrolled in, they may not be representative of their schools. Restricting the sample to schools with the modal ISCED level for 15-year-old students ensures that the characteristics of students represent the profile of the typical student attending the school. Modal grade may be either lower secondary (ISCED level 2), upper secondary (ISCED level 3) or both, as in Albania, Argentina, Baku (Azerbaijan), Beijing, Shanghai, Jiangsu and Zhejiang (China), Belarus, Colombia, Costa Rica, the Czech Republic, the Dominican Republic, Indonesia, Ireland, Kazakhstan, Luxembourg, Macao [China], Morocco, the Slovak Republic, Chinese Taipei and Uruguay. In all other countries/economies, variance decomposition analyses are restricted to either lower secondary or upper secondary schools. In several countries/economies, lower and upper secondary education is provided in the same school. As the restriction is made at the school level, some students from a grade other than the modal grade in the country/economy may also be used in the analysis. Table VI.A3.1 (in the Excel file corresponding to Annex A3) shows the type of ISCED used for every country and economy, as well as the respective proportions of schools and students in the sample used in the analysis.

USE OF STUDENT, SCHOOL AND TEACHER WEIGHTS

The target population in PISA is 15-year-old students, but a two-stage sampling procedure was used. After the population was defined, school samples were selected with a probability proportional to the expected number of eligible students in each school. Only in a second sampling stage were students drawn from among the eligible students in each selected school.

Although the student samples were drawn from within a sample of schools, the school sample was designed to optimise the resulting sample of students, rather than to give an optimal sample of schools. It is therefore preferable to analyse the school-level variables as attributes of students (e.g. in terms of the share of 15-year-old students affected), rather than as elements in their own right.

Most analyses of student and school characteristics are therefore weighted by student final weights (or their sum, in the case of school characteristics) and use student replicate weights for estimating standard errors.

In PISA 2018, as in PISA 2012 and 2015, multilevel models weights are used at both the student and school levels. The purpose of these weights is to account for differences in the probabilities of students being selected in the sample. Since PISA applies a two-stage sampling procedure, these differences are due to factors at both the school and student levels. For the multilevel models, student final weights (W_FSTUWT) were used. Within-school weights correspond to student final weights, rescaled to amount to the sample size within each school. Between-school weights correspond to the sum of final student weights (W_FSTUWT) within each school.

Table VI.A3.1 [1/2] **Modal grade, by country/economy**

	Modal ISCED level	Students in the modal ISCED level in the sample	Students in a modal ISCED school in the sample
		%	%
Australia	2	92.6	99.2
Austria	m	m	m
Belgium	3	91.2	96.0
Canada	3	88.9	98.8
Chile	3	94.7	96.9
Colombia	2 3	38.5 61.5	100.0
Czech Republic	2 3	52.9 47.1	100.0
Denmark	2	99.0	99.0
Estonia	2	98.6	99.5
Finland	2	99.8	99.8
France	3	82.6	84.9
Germany	2	96.7	99.1
Greece	3	95.5	95.6
Hungary	3	89.8	90.2
Iceland	2	99.2	99.2
Ireland	2 3	63.6 36.4	100.0
Israel	3	87.8	97.6
Italy	3	99.0	99.0
Japan	3	100.0	100.0
Korea	3	83.9	83.9
Latvia	2	96.4	99.0
Lithuania	2	100.0	100.0
Luxembourg	2 3	55.9 44.1	100.0
Mexico	3	78.5	78.5
Netherlands	2	66.8	99.0
New Zealand	3	93.3	99.6
Norway	2	99.6	99.6
Poland	2	98.6	98.6
Portugal	3	69.4	88.5
Slovak Republic	2 3	46.5 53.5	100.0
Slovenia	3	92.9	92.9
Spain	2	99.9	100.0
Sweden	2	98.4	98.4
Switzerland	2	71.5	76.0
Turkey	3	99.5	99.5
United Kingdom	3	100.0	100.0
United States	3	92.4	100.0

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Table VI.A3.1 [2/2] **Modal grade, by country/economy**

		Modal ISCED level	Students in the modal ISCED level in the sample	Students in a modal ISCED school in the sample
			%	%
Partners	Albania	2 3	38.0 62.0	100.0
	Argentina	2 3	34.0 66.5	99.6
	Baku (Azerbaijan)	2 3	37.8 62.2	100.0
	Belarus	2 3	43.8 56.2	100.0
	Bosnia and Herzegovina	3	83.5	83.5
	Brazil	3	74.3	82.7
	Brunei Darussalam	3	99.4	100.0
	B-S-J-Z (China)	2 3	40.4 59.6	100.0
	Bulgaria	3	99.7	100.0
	Costa Rica	2 3	55.1 44.9	100.0
	Croatia	3	99.7	99.7
	Cyprus	3	95.5	96.0
	Dominican Republic	2 3	42.4 57.6	100.0
	Georgia	3	85.2	99.3
	Hong Kong (China)	3	66.8	98.4
	Indonesia	2 3	45.2 54.8	100.0
	Jordan	2	100.0	100.0
	Kazakhstan	2 3	45.8 34.6	80.4
	Kosovo	3	76.3	76.3
	Lebanon	3	70.0	80.2
	Macao (China)	2 3	41.0 59.0	100.0
	Malaysia	3	94.5	100.0
	Malta	3	99.9	100.0
	Moldova	2	89.5	94.7
	Montenegro	3	96.7	96.7
	Morocco	2 3	53.9 46.1	100.0
	North Macedonia	3	99.8	99.8
	Panama	3	69.3	84.8
	Peru	3	77.9	98.0
	Philippines	2	99.3	99.7
	Qatar	3	76.3	86.3
	Romania	3	93.1	93.1
	Russia	2	88.8	96.4
	Saudi Arabia	3	81.2	81.2
	Serbia	3	99.1	99.1
	Singapore	3	98.5	100.0
	Chinese Taipei	2 3	35.8 64.2	100.0
	Thailand	3	79.1	93.0
	Ukraine	3	100.0	100.0
	United Arab Emirates	3	88.6	97.4
	Uruguay	2 3	36.0 64.0	100.0
	Viet Nam	3	95.0	95.2

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ANNEX A4
Quality assurance

Quality assurance procedures were implemented in all parts of PISA 2018, as was done for all previous PISA surveys. The PISA 2018 Technical Standards (available on line at www.oecd.org/pisa/) specify the way in which PISA must be implemented in each country, economy and adjudicated region. International contractors monitor the implementation in each of these and adjudicate on their adherence to the standards.

The consistent quality and linguistic equivalence of the PISA 2018 assessment instruments were facilitated by assessing the ease with which the original English version could be translated. Two source versions of the assessment instruments, in English and French, were prepared (except for the financial literacy assessment and the operational manuals, which were provided only in English) in order for countries to conduct a double translation design, i.e. two independent translations from the source language(s), and reconciliation by a third person. Detailed instructions for the localisation (adaptation, translation and validation) of the instruments for the field trial and for their review for the main survey, and translation/adaptation guidelines were supplied. An independent team of expert verifiers, appointed and trained by the PISA Consortium, verified each national version against the English and/or French source versions. These translators' mother tongue was the language of instruction in the country concerned, and the translators were knowledgeable about education systems. For further information on PISA translation procedures, see the *PISA 2018 Technical Report* (OECD, forthcoming[1]).

The survey was implemented through standardised procedures. The PISA Consortium provided comprehensive manuals that explained the implementation of the survey, including precise instructions for the work of school co-ordinators and scripts for test administrators to use during the assessment sessions. Proposed adaptations to survey procedures, or proposed modifications to the assessment session script, were submitted to the PISA Consortium for approval prior to verification. The PISA Consortium then verified the national translation and adaptation of these manuals.

To establish the credibility of PISA as valid and unbiased and to encourage uniformity in conducting the assessment sessions, test administrators in participating countries were selected using the following criteria: it was required that the test administrator not be the reading, mathematics or science instructor of any student in the sessions he or she would conduct for PISA; and it was considered preferable that the test administrator not be a member of the staff of any school in the PISA sample. Participating countries organised an in-person training session for test administrators.

Participating countries and economies were required to ensure that test administrators worked with the school co-ordinator to prepare the assessment session, including reviewing and updating the Student Tracking Form; completing the Session Attendance Form, which is designed to record students' attendance and instruments allocation; completing the Session Report Form, which is designed to summarise session times, any disturbance to the session, etc.; ensuring that the number of test booklets and questionnaires collected from students tallied with the number sent to the school (for countries using the paper-based assessment) or ensuring that the number of USB sticks or external laptops used for the assessment were accounted for (for countries using the computer-based assessment); and sending or uploading the school questionnaire, student questionnaires, parent and teacher questionnaires (if applicable), and all test materials (both completed and not completed) to the national centre after the assessment.

The PISA Consortium responsible for overseeing survey operations implemented all phases of the PISA Quality Monitor (PQM) process: interviewing and hiring PQM candidates in each of the countries, organising their training, selecting the schools to visit, and collecting information from the PQM visits. PQMs are independent contractors located in participating countries who are hired by the international survey operations contractor. They visit a sample of schools to observe test administration and to record the implementation of the documented field-operations procedures in the main survey.

Typically, two or four PQMs were hired for each country, and they visited an average of 15 schools in each country. If there were adjudicated regions in a country, it was usually necessary to hire additional PQMs, as a minimum of five schools were observed in adjudicated regions.

Approximately one-third of test items are open-ended items in PISA. Reliable human coding is critical for ensuring the validity of assessment results within a country, as well as the comparability of assessment results across countries. Coder reliability in PISA 2018 was evaluated and reported at both within- and across-country levels. The evaluation of coder reliability was made possible by the design of multiple coding: a portion or all of the responses from each human-coded constructed-response item were coded by at least two human coders.

All quality-assurance data collected throughout the PISA 2018 assessment were entered and collated in a central data-adjudication database on the quality of field operations, printing, translation, school and student sampling, and coding. Comprehensive reports were then generated for the PISA Adjudication Group. This group was formed by the Technical Advisory Group and the Sampling Referee. Its role is to review the adjudication database and reports in order to recommend adequate treatment to preserve the quality of PISA data. For further information, see the *PISA 2018 Technical Report* (OECD, forthcoming[1]). Overall, the review suggests good adherence of national implementations of PISA to the technical standards. Despite the overall high quality of data, a few countries' data failed to meet critical standards or presented inexplicable anomalies, such that the Adjudication Group recommends a special treatment of these data in databases and/or reporting.

The major issues for adjudication discussed at the adjudication meeting that are relevant to the financial literacy assessment are listed below:

- The Netherlands missed the standard for overall exclusions by a small margin. At the same time, in the Netherlands UH booklets, intended for students with special education needs, were assigned to about 17% of the non-excluded students. Because UH booklets do not cover the domain of financial literacy, the effective exclusion rate for the financial literacy additional sample is above 20%. The fact that students that receive support for learning in school were systematically excluded from the financial literacy sample results in a strong upward bias for the country mean and other population statistics. Therefore, the Netherlands' results in financial literacy may not be comparable to those of other countries or to results for the Netherlands from previous years. The Netherlands also missed the school response rate (before replacement) by a large margin, and could only reach close to an acceptable response rate through the use of replacement schools. However, based on evidence provided in a non-response bias analysis, the Netherlands' results in reading, mathematics and science were accepted as largely comparable.

- Portugal did not meet the student-response rate standard. In Portugal, response rates dropped between 2015 and 2018. A student-non-response-bias analysis was submitted, investigating bias amongst students in grades 9 and above. Students in grades 7 and 8 represented about 11% of the total sample, but 20% of the non-respondents. A comparison of the linked responding and non-responding cases, using sampling weights, revealed that non-respondents tended to score about one-third of a standard deviation below respondents on the national mathematics examination (implying a "raw" upward bias of about 10% of a standard deviation on population statistics that are based on respondents only). At the same time, a significant proportion of the performance differences could be accounted for by variables considered in non-response adjustments (including grade level). Nevertheless, a residual upward bias in population statistics remained, even when using non-response adjusted weights. The non-response bias analysis therefore implies a small upward bias for PISA 2018 performance results in Portugal. The Adjudication Group also considered that trend comparisons and performance comparisons with other countries may not be particularly affected, because an upward bias of that size cannot be excluded even in countries that met the response-rate standard or for previous cycles of PISA. Therefore, Portugal's results are reported with an annotation.
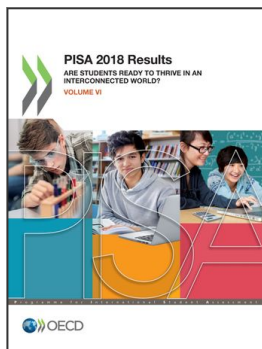
While the adjudication group did not consider the violation of response-rate standards by the United States (see Annex A2) as a major adjudication issue, they noted several limitations in the data used in non-response-bias analyses submitted by the United States. In consideration of the lower response rates, compared to other countries, the data for the United States are reported with an annotation.

In 2018, some regions in Spain conducted their high-stakes exams for tenth-grade students earlier in the year than in the past, which resulted in the testing period for these exams coinciding with the end of the PISA testing window. Because of this overlap, a number of students were negatively disposed towards the PISA test and did not try their best to demonstrate their proficiency. Although the data of only a minority of students show clear signs of lack of engagement, the comparability of PISA 2018 data for Spain with those from earlier PISA assessments cannot be fully ensured. See *PISA 2018 Results (Volume I): What Students Know and Can Do, Annex A9 (OECD, 2019)* for further details.

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Reference

OECD (2019), Annex A9A note about Spain in PISA 2018: Further analysis of Spain's data by testing date (updated on 23 July 2020), [1] *PISA 2018 Results (Volume I): What Students Know and Can Do*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/5f07c754-en.