This document provides high-level steers for content- and context-related issues that need to be taken into consideration in the analysis and reporting of the TALIS Starting Strong Survey 2018. It aims to inform the international analysis and reporting to be conducted with the TALIS Starting Strong Survey 2018 data by the OECD Secretariat and any external experts contracted by the OECD Secretariat. It also aims to serve as a guide to National Project Managers (NPM) in analysing and reporting national-level data.

This document has been prepared by Miriam Broeks, Megan P. Y. Sim (Rand Europe), Agnes Stancel-Piątak and Juliane Hencke (IEA Hamburg). It also draws on insights from the TALIS 2018 Draft Analysis Plan [EDU/TALIS/GB(2018)3/ANN1/REV1] and a forthcoming working paper on Situational Judgement Items in 3S.

Extended ECEC Network members are invited to:

• NOTE the draft TALIS Starting Strong Survey Analysis Principles

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JT03435800
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List of acronyms

CFA                   Confirmatory Factor Analysis
CNO                   Coordinated National Option
CQ                    Combined Centre Questionnaire
CQ+                   Combined Centre Questionnaire Plus
ECEC                  Early Childhood Education and Care
EFA                   Exploratory Factor Analysis
ILSAs                 International Large-Scale Assessments
ISCED                 International Standard Classification of Education
LQ                    Leader Questionnaire
MGCFA                 Multiple Group Confirmatory Factor Analysis
MLM                   Multilevel Modelling
QEG                   Questionnaire Expert Group
SQ                    Staff Questionnaire
TAG                   Technical Advisory Group
TALIS                 Teaching and Learning International Survey
Introduction to the TALIS Starting Strong Survey 2018 analysis principles document

1. The TALIS Starting Strong Survey 2018 is an international survey of early childhood education and care (ECEC) staff and centre leaders. The survey builds on the experience of the Teaching and Learning International Survey (TALIS) in primary and secondary education, to provide timely, relevant, accurate, comparable, and interpretable data regarding the conditions of learning and well-being environments in ECEC settings to participating countries. The data were collected during the 2017-2018 academic year.

2. This document provides high-level steers for content- and context-related issues that need to be taken into consideration in the analysis and reporting of the TALIS Starting Strong Survey 2018, as proposed in the draft OECD’s TALIS Starting Strong Survey 2018 Reporting Plan (OECD, forthcoming) [EDU/EDPC/ECEC[2017]3/REV1]; and upcoming analyses by participating countries. It aims to inform the international analysis and reporting to be conducted with the TALIS Starting Strong Survey 2018 data by the OECD Secretariat and any external experts contracted by the OECD Secretariat. It also aims to serve as a guide to National Project Managers (NPM) in analysing and reporting national-level data.

3. The guidelines presented in this document aim at enhancing the quality of the statistical outputs and inferences that can be derived from the TALIS Starting Strong Survey 2018 data. The expression “statistical outputs” covers a broad field ranging from basic charts and other displays to inferences on population model parameters. The idea of “quality” is a multi-faceted notion that comprises – in no specific order - accuracy, precision, comparability, relevance, interpretability, and utility.

4. This TALIS Starting Strong Survey 2018 Analysis Principles document was developed by the International Consortium, in consultation with the OECD Secretariat, the Questionnaire Expert Group (QEG), and the Technical Advisory Group (TAG). The TALIS Starting Strong Survey 2018 builds on the experience of TALIS. Therefore, the TALIS Starting Strong Survey 2018 Analysis Principles document is largely based on the TALIS 2018 Analysis Plan (Carstens & Price, forthcoming) and TALIS 2013 User Guide (OECD, 2014). When verbatim is included this is clearly referenced at the beginning of each section to emphasise the links between these documents.

5. It is important to highlight that this Analysis Principles document should be used in coordination with the TALIS Starting Strong Survey 2018 Conceptual Framework (Bélanger, Sim, Karoly, & Stancel-Piątak, forthcoming), Reporting Plan (OECD, forthcoming) [EDU/EDPC/ECEC[2017]3/REV2], and Technical Report (IEA, forthcoming). Finally, this draft of the Analysis Principles document is being presented at the Extended ECEC Network Meeting in October 2018. Feedback from this meeting will be incorporated and this Analysis Principles document will be revised accordingly.
1. Introduction to the specifics of the TALIS Starting Strong Survey 2018 data

6. This section provides an introduction of the specifics of the TALIS Starting Strong Survey 2018 that need to be considered when working with the data. It contains details on the population definitions, specifics on the different survey instruments and how this relates to implications for analysis. The section continues with outlining confidentiality measures that will be applied to public use database and finishes with an introduction to the missing values and how they should be handled when reporting estimates.

1.1. Population definitions and implications for analysis

7. The TALIS Starting Strong Survey 2018 investigated two target populations:
   - Staff and centre leaders working in centres belonging to International Standard Classification in Education (ISCED) 2011 Level 0.2 (UNESCO-UIS, 2012).
   - Staff and centre leaders working in centres providing services for children under the age of three years.

1.1.1. The “ECEC centre”

8. In the context of the study, ECEC centres are defined as institutional (officially registered) settings that provided ECEC programmes, i.e. formal education and care for young children from birth up to entry into primary education, also defined as ISCED 2011 Level 0 (UNESCO-UIS, 2012). Furthermore, settings had to provide educational activities for at least 2 hours per day and 100 days a year in order to be classified as a “centre”.

9. For the distinction between different centres, national definitions of participating countries were used. Usually a centre consists of one single building with assigned children, staff and leader. Additional decisions had to be made with regards to home-based settings. In Israel and Germany, every single home-based setting was defined as one centre, while in Denmark a centre might consist of different locations. In Denmark, there is significant interaction between the staff of different locations, and in their understanding they are one single institution.

10. ECEC centres accommodating children belonging to ISCED 2011 Level 0.2 were targeted for the TALIS Starting Strong Survey 2018 in that target population. They provided education and care designed to support early development in preparation for participation in school and society, and usually accommodated children from age three to the start of primary education, also often referred to as “pre-primary education”.

11. For the explorative survey of services for children under the age of three, ECEC centres were targeted that: i) accommodated children younger than three years of age; and ii) implemented early childhood educational development programmes. Facilities that provided childcare only (supervision, nutrition and health) were not covered by the ISCED definition, and therefore not included in the TALIS Starting Strong Survey 2018 sampling frames.

12. Centres that accommodated ISCED 2011 Level 0.2 and children under the age of three belonged to both target populations.

13. Settings that were not institutionalised or officially registered, family-based facilities or arrangements, and centres entirely devoted to children with special needs were not in scope of the TALIS Starting Strong Survey 2018.
14. Practicality and economy may have dictated that certain types of centres were excluded. Those national exclusions are documented in the TALIS Starting Strong Survey 2018 Technical Report (IEA, forthcoming).

15. When enhancing the TALIS Starting Strong Survey data with system-level data or other sources external to those collected within the TALIS Starting Strong Survey frame, it is important to ensure that the definition of ECEC centres are aligned between both sources.

1.1.2. The main TALIS Starting Strong Survey 2018 instruments

16. The TALIS Starting Strong Survey 2018 developed two main instruments: a Leader Questionnaire addressed to the ECEC centre leaders and a Staff Questionnaire addressed to the target ECEC staff members. Since the TALIS Starting Strong Survey 2018 included two target populations, ISCED 2011 Level 0.2 and centres serving children under the age of three, there was the need to introduce single questions or single items tailored to a specific target population.

17. Table 1 represents items that were used in one specific target population only or contain different content depending on the target population.

| Table 1: Overview of items unique to one target population |
|---------------------------------|---------------------------------|
| **U3** | **ISCED 2011 Level 0.2** |
| LQ-20 (L200D01) | LQ-09I (L110D17) |
| | LQ-26D (L311D03) |
| | LQ-28 |
| | LQ-30B, C, D, F, G, H, K |
| | LQ-35E (L410D10) |
| SQ-06C (S070D06) | SQ-12E (S160D26) |
| SQ-12E (S160D34) | SQ-31b, c |
| SQ-14E (S240D35) | (S640D49, S640D50) |
| SQ-16E (S300D34) | SQ-14E (S240D27) |
| SQ-41J (S470D19)* | SQ-16E (S300D26) |
| | SQ-21B, C, D, F, G, H, K |
| | (S360D13, S360D14, S360D28, S360D15, S360D27, S360D30, S360D32) |
| | SQ-24D (S350D05) |
| | SQ-28A, B, C |
| | (S730D01, S730D03, S730D02) |
| | SQ-29D, G |
| | (S381D01, S640D95) |
| | SQ-31B, C |
| | (S640D49, S640D50) |
| | SQ-41J (S470D19)* |
| | SQ-44I (S610D02) |

* Item wording variation
18. The instrument design with some items being unique to one of the two target populations needs to be considered when conducting analysis with the TALIS Starting Strong Survey 2018 data. While it provides more comprehensive insights into each sector of the ECEC system, the items which are asked differently between both target populations should not be used for comparisons across target populations.

1.1.3. The “ECEC centre leaders”

19. In order to be able to identify the right person that was asked to complete the Leader Questionnaire, the centre leader was defined as the person with the most responsibility for the administrative, managerial or pedagogical leadership at the ECEC centre. As part of the leadership role, centre leaders may have been responsible for the monitoring of children, the supervision of other staff, contact with parents and guardians, or the planning, preparation and carrying out of the pedagogical work in the centre. Centre leaders may also have spent part of their time working with children. With this approach, in every centre one person was identified to be the leader.

20. In the ECEC context centre leaders often also spend part of their time working with children. However, to avoid survey fatigue and keep burden on survey respondents at reasonable limits, it was decided that one person should not be asked to complete both the Leader and the Staff Questionnaire. Instead, all affected leaders (those with staff duties) were exempted from completing the Staff Questionnaire.

21. However, in difference to how such cases are for example handled in the TALIS 2018 procedures, in the context of the TALIS Starting Strong Survey 2018 it was decided (OECD, TAG and Consortium) that data from leaders who also have staff duties are added to the staff dataset, in addition to the leader dataset. Because certain questions are identical between the Leader Questionnaire and the Staff Questionnaire, the data resulting from these questions will be copied to the staff dataset. All other variables (questions unique to the Leader Questionnaire) are set to missing by design (not administered) in the staff dataset. The within-centre base weight of the leader within the staff dataset is always set to value 1 with the effect that the leader will always represent only themselves, not other staff members. Consequently, there will be no adjustment procedure needed to account for leaders with staff duties.

22. Adding up all final weight values of records (cases) in the resulting staff dataset will provide an unbiased estimate of the total number of staff in each country including the leaders with staff duties, which represent themselves at least regarding all variables where data is available. For all other variables, such records will have missing data (coded as not administered). When analysing the data it needs to be considered that questions that are only administered in the Staff Questionnaire (which applies to the majority of questions) represent the staff population without leaders with staff duties.

23. Annex C provides an overview of those questions in the Leader Questionnaire whose values are transferred to the corresponding variables in the staff dataset.

24. We recommend to either annotate affected tables in the international reports accordingly, e.g. with a note “Leaders with staff duties did not respond to this item”, or to cover the questions with data missing for leaders with staff duties separately.
1.1.4. The “target” ECEC staff member

25. The target population of ECEC centre staff comprised all persons working regularly in a pedagogical way with children within registered early education and care. ECEC centre staff members were defined as persons who, as part of their regular duties in the target centre, provided learning opportunities or care.

26. Short-time substitute staff members, volunteer persons that would occasionally come in for a special activity and auxiliary staff that do not interact regularly in a pedagogical manner with children were out of scope.

27. Staff members were in scope regardless of the hours they worked with children of the respective target populations. Therefore, staff members working with children of both age groups belonged de facto to both target populations. The TALIS Starting Strong Survey 2018 never imposed a minimum number of hours, a minimum number of children or a specific area of work with children to consider a staff member eligible to sampling.

1.1.5. The “participating” ECEC staff member

28. Minimum acceptable participation rates were fixed at 75% of centres (after replacement of non-responding centres) and 75% of staff from participating centres. A centre was deemed to have participated if at least half of their sampled staff members returned the staff questionnaire (with at least one response) [this will be reconsidered after MS data is available (TAG recommendation)]. This is the same standard used for participating schools in TALIS 2018.

29. What constitutes a participating staff member is based on the standards set in OECD TALIS since 2008. A single response to the questionnaire qualified the respondent as a “participating staff”.

1.1.6. The combined Centre Questionnaire in settings with one person only

30. In the ECEC context, some sampled ECEC centres may consist of only one person that cares for a small number of children. The main Leader and Staff Questionnaire as developed for the TALIS Starting Strong Survey 2018 were considered as unsuitable in that context and a combined Centre Questionnaire was developed containing suitable questions from the Staff Questionnaire and selected questions from the Leader Questionnaire.

31. In the course of the international data processing, for each single staff member that was assigned a combined Centre Questionnaire, one record was created in the leader dataset and one record was created in the staff dataset. Responses from such single staff members to the combined Centre Questionnaires were distributed to the leader and staff dataset depending on the origin of the question in the questionnaire. That is, if a question in the combined Centre Questionnaire had its origin in the Leader Questionnaire, the response of the staff member was copied to the leader dataset. When a question’s origin was in the Staff Questionnaire, the response of the staff member was copied to the staff dataset. When a question existed in the Leader and the Staff Questionnaire (e.g. gender, age, education), the response of the staff member was copied to the leader and staff dataset. Questions from the Leader Questionnaire that were not included in the combined Centre Questionnaire received a special missing code in the leader dataset (not administered) in order to differentiate those missing per design cases from omitted responses. Questions from the Staff Questionnaire that were not included in the combined Centre Questionnaire were similarly coded.
32. Annex A provides an overview of the questions of the combined Centre Questionnaire and their distribution to the leader and staff datasets.

33. It is recommended to introduce a chapter in the international reports on specifics of the one-person settings and to annotate tables for those countries where this situation has occurred.

1.1.7. The combined Centre Questionnaire Plus in the Israel ISCED 2011 0.2 context

34. A specific situation had to be addressed in Israel’s ISCED 2011 Level 0.2. In their ECEC context, centres are very small, oftentimes consisting only of one main teacher and one teacher assistant. Although their main teachers fulfil the TALIS Starting Strong Survey 2018 centre leader definition, they all spend a big proportion of their time working with the children. If those main teachers would have completed the Leader Questionnaire and be exempted from completing the Staff Questionnaire, the responses to the Staff Questionnaire would have been collected from teaching assistants solely, which would not have represented the Israeli reality.

35. To address this situation, a combined Centre Questionnaire Plus was developed. This questionnaire contained the majority of the questions from the Staff Questionnaire and the most relevant questions from the Leader Questionnaire. Similar to the handling of the combined Centre Questionnaire, here for each main teacher that was assigned a combined Centre Questionnaire Plus, one record was created in the leader dataset and one record was created in the staff dataset. Then responses from main teachers to the combined Centre Questionnaire Plus were distributed to the leader and staff dataset depending on the origin of the question in the questionnaire.

36. Annex B provides an overview of the questions of the combined Centre Questionnaire Plus and their distribution to the leader and staff datasets.

37. It is recommended to introduce a chapter in the international reports on these Israeli specifics and to annotate tables, which make use of leader data for Israel ISCED 2011 Level 0.2, so the reader of the reports becomes aware of the specific situation.

1.1.8. Coordinated national options (CNOs)

38. The TALIS Starting Strong Survey questionnaires include a number of Coordinated National Options (CNOs). The CNOs are considered as optional for inclusion for countries in their national questionnaires. The CNOs undergo the same verification processes and international data processing as any international question. This ensures that CNOs are comparable at the international level for those countries that decided to include them. Table 2 provides an overview of the CNOs included in the questionnaires.
<table>
<thead>
<tr>
<th>Leader Questionnaire</th>
<th>Staff Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>LQ-07: “Please indicate at how many &lt;ECEC centres&gt; you currently work as an &lt;ECEC centre leader&gt;.”</td>
<td>SQ-03: “In what country were you born?”</td>
</tr>
<tr>
<td>LQ-16: “Is this &lt;ECEC centre&gt; a for-profit or a non-profit organisation?”</td>
<td>SQ-12P: “Working with &lt;dual/second language learners&gt;”</td>
</tr>
<tr>
<td>LQ-34J: “Shortage of &lt;ECEC staff&gt; with competence in working with children speaking another language than the language(s) used in the &lt;ECEC centre&gt;”</td>
<td>SQ-14P: “Working with &lt;dual/second language learners&gt;”</td>
</tr>
<tr>
<td></td>
<td>SQ-16P: “Working with &lt;dual/second language learners&gt;”</td>
</tr>
<tr>
<td></td>
<td>SQ-27: “Do you work with children who are &lt;dual/second language learners&gt;?”</td>
</tr>
<tr>
<td></td>
<td>SQ-28: “When interacting with children who are &lt;dual/second language learners&gt;, how often do you engage in the following activities?”</td>
</tr>
</tbody>
</table>
### 1.1.9. Overview of instruments administered in participating countries

39. As described before, the TALIS Starting Strong Survey 2018 developed a number of instruments in order to be able to address the diverse ECEC contexts across participating countries. Table 3 provides an overview of the questionnaires as used during the data collection in participating countries.

Table 3: Overview of administered TALIS Starting Strong Survey 2018 instruments

<table>
<thead>
<tr>
<th></th>
<th>U3</th>
<th>ISCED 0.2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leader Questionnaire</td>
<td>Staff Questionnaire</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Chile</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Denmark</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Germany</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Israel</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Korea</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Norway</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Turkey</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

* Israel makes use of the combined Centre Questionnaire Plus

* Korea makes use of the combined Centre Questionnaire in case a single person setting was sampled [to be confirmed after MS processing]
1.2. Confidentiality measures to be applied to the public-use international database and resulting limitations

40. Based on the confidentiality measures applied in TALIS 2013 (OECD, 2014) to protect the confidentiality of the respondents, certain disclosure avoidance measures will be applied at the international level which are consistent for all countries, and also at the national level which concern only specific national datasets. These measures will be implemented for all data versions and exports of the international database for use by all other participating countries and the public users.

1.2.1. International-level measures

41. The following set of international-level measures will be applied to each participating country’s dataset:

- The staff (IDSTAFF) and centre unique identifiers (IDCENTRE) will be scrambled and thus will not match those used during data collection; however, the structural link between the centre and staff level (the variable IDCENTRE in the staff file and the first four digits of any IDSTAFF) will be maintained for all countries. For each country, unique matching tables will be created and will be made available to authorised individuals.

- Variables used purely for the stratification of the staff sample, i.e. birth year (ITBIRTHY) and gender (GENDER) will be removed. Only the gender (SL1G01, SS1G01) and age (SL1G02, SS1G02) variables as collected in the questionnaires will be retained.

- Variables used purely for stratification of centres will be removed (IDSTRATE and IDSTRATI) to avoid the identification of geographical or organisational groups. It should be noted that the stratum information is mostly of interest for national-level analysis and will of course be made available to the country concerned. Experience shows that analysis by stratification may also be desired by researchers from other countries, in which case the stratification variables may be requested directly from the country.

- Information used in the calculation of final sample and replicate weights will be removed (for the centre level: WGTFAC1 and WGTADJ1; for the staff level: WGTFAC1, WGTADJ1, WGTFAC2, WGTADJ2, WGTADJ3, and WGTADJ4) as the information could allow the identification of stratification cells.

- Replication zone and unit variables (BRRSZONE, BRRSREP, BRRTZONE, and BRRTREP), which could cause indirect identification of centres, will also be dropped from the public-use micro-data.

1.2.2. Country-level measures

42. Most likely, Iceland will not authorise the release of its data as part of the TALIS Starting Strong Survey 2018 international database. To fully reproduce the results presented in the international report, the data will need to be requested directly from Iceland.
1.3. Missing data

43. The TALIS Starting Strong Survey 2018 data contain missing data that need to be considered when running analysis (i.e. data were not imputed during international data processing). The reasons for data being missing can be diverse, for example a question might have been excluded from the questionnaire, the respondent might have chosen not to respond to the question, or the question might have not applied to them. Implications for analyses depend on the reasons why data is missing.

44. These kinds of missing were inspected and handled differently during international data processing and were coded differently in data files. The codes used to represent each type of missing data depend on the file format – SAS or SPSS.

45. The four different types of missing values used in the TALIS Starting Strong Survey 2018 data are explained below. Depending on the reason of why a response is missing, data needs to be handled differently during conducting analyses. Using data imputation techniques\(^1\), the researcher has to carefully consider which missing data should be imputed or not. In particular the assumption of MAR (missing at random) might be violated in some instances. Presumably, this is the case for all missing data from the staff with leader responsibilities, of which only responses to questions overlapping between the leader and staff questionnaire are available in the staff data set. All other variables contain a missing value. Assuming that responses to questions from the staff questionnaire might be systematically correlated with the staff role (including leader responsibilities or not), the missing values are not MAR, and most of the imputation techniques cannot be simply implemented.

46. This section presents an adapted version of TALIS 2013 User Guide’s discussion on handling missing data (OECD, 2014, Section 2.5).

1.3.1. Not administered questions

47. A response to a question was coded as “not administered” in these cases:

- A questionnaire was returned completely empty, was not returned or was lost. All variables referring to that questionnaire and any derived variables were coded as “not administered”. While these records remain in the national data versions that are provided to the participating countries, they will be removed from the international database.

- A country might have chosen to not administer a question or question part in its national questionnaire, because they were not be applicable in its national or cultural context. Generally, countries were asked to administer all questions in the questionnaire except those, where the responses return a “structural zero” or where it is forbidden by law. However, CNO's are an example of questions where countries were ask to decide whether to include them in their questionnaires or not depending on their applicability to their context. The related variables to questions that were removed from national questionnaires are coded as “not administered”.

\(^1\) Please note that using the FIML (Full Information Maximum Likelihood) algorithm in Mplus analysis, all information from the data is used to estimate the model. The assumption of MAR has to be tested by the researcher in advance.
48. Variables corresponding to questions in the Leader and Staff Questionnaires that were not included in the two additional questionnaire types, combined Centre Questionnaire and combined Centre Questionnaire Plus, by design, were coded as “not administered”. For more details on these two questionnaire types, please refer to related sub-sections in Section 2.1.

49. The not administered codes were assigned at IEA Hamburg only after data collection. In SPSS files the codes used are “8”, “98”, “998”, and so on (depending on the field length of the variable). The code for not administered questions in the SAS files is “.A”.

50. When comparing results of analysis across countries, countries will need to be excluded from comparisons on certain variables if the related question was not administered. Data available from these countries will be used to estimate the model, however countries with completely missing data on a variable will not contribute to the parameter estimation of this specific scale indicator. It will still contribute to the parameter estimation of other scale indicators where data is available.

51. When running analyses with weighted data that still include records for non-respondents (data versions prior to the public use files), these records will not be included in the outputs of the analysis as their weights are set to “0”.

1.3.2. Omitted questions and invalid responses

52. The response to a question was coded as “omitted or invalid” in the following cases:
   - The question was administered but no response was provided.
   - The respondent selected more than the expected number of checkboxes, for example ticked both checkboxes for the question related to the staff’s gender (SQ-01) or gave a response that was not interpretable, for example wrote an unreadable number in the question asking about the staff’s age (SQ-02).
   - A particular question (or a whole page) was misprinted or left out of a questionnaire or for other reasons was not available to the respondent.
   - A particular response or a set of responses was found to be implausible, for example if staff responded with an age that was considered impossible (for example, older than 80 years or younger than 14 years) and a forced cleaning action was defined for these variables.

53. The codes for “omitted or invalid” responses in SPSS files are “9”, “99”, “999”, and so on (depending on the field length of the variable). The code for “omitted or invalid” responses in SAS files is “.”.

54. This code was mostly assigned by the national study centre during data capture or by the IEA Hamburg during data cleaning and editing.

55. During analysis, omitted and invalid questions should be regarded as non-response. It should be carefully observed, if the percentage of non-response becomes substantial. It is recommended to clearly mark if this is the case (see guidance on this in Section 5 of this document) or to not report the estimates at all, if non-response becomes 50% or higher.
1.3.3. Not reached questions

56. A special missing code was temporarily assigned to questions that were deemed “not reached” to distinguish them from “omitted” responses. This was introduced in order to investigate drop-out rates of respondents. “Omitted” questions are those that a respondent most likely read, but either consciously decided not to answer or accidentally skipped. “Not reached” variables, in contrast, are the omitted responses towards the end of the questionnaire, possibly due to a lack of time or interest. “Not reached” values are therefore exclusively located towards the end of questionnaire.

57. Before assigning the “not reached” code, the last valid answer given in a questionnaire was identified. The first omitted response after this last answer was coded as “omitted”, but all following responses were then coded as “not reached.” For example and assuming the SPSS data file format, the response pattern “1 9 4 2 9 9 9 9 9 9” (where “9” represents “omitted”) was recoded to “1 9 4 2 9 7 7 7 7 7” (where “7” represents “not reached”). When recoding “omitted” values to “not reached”, all “not administered” values were ignored. For example the pattern “3 1 5 2 9 9 8 9 9” (where “8” represents “Not Administered”) would be recoded to “3 1 5 2 9 7 7 8 7 7.”

58. The codes for “not reached” responses in SPSS files are “7”, “97”, “997”, and so on (depending on the field length of the variable). The code for “not reached” responses in SAS files is “.R”.

59. This code was assigned by IEA Hamburg only after data collection.

60. When reporting results, not reached codes should be regarded the same way as omitted responses. When considering item non-response, omitted and not reached codes should be summed up. However, there are analysis types where it is useful to distinguish not reached from omitted responses (e.g., in IRT models). In addition, for analyses regarding drop outs and survey fatigue these codes should be considered as their own categories.

1.3.4. Logically not applicable questions

61. The response to a variable was coded as “logically not applicable” in the following case:

- The previous filter question was answered in a way that made a response to dependent questions logically impossible, and the dependent questions were validly skipped. For example, the staff was asked whether s/he works at more than one ECEC centre (SQ-07) and the dependent question then asks in how many other ECEC centres the person works as a staff (SQ-08).

62. This code was assigned by IEA Hamburg only after data collection.

63. “Logically not applicable” responses are coded in the SPSS files as “6”, “96”, “996”, and so on (depending on the field length of the variable). The code for responses “logically not applicable” in SAS files is “.B”.

64. When analysing dependent questions, special attention needs to be paid to “logically not applicable” responses. These codes should be distinguished from non-response and analysts need to decide whether to include them as a separate reporting category of the dependent question or whether to exclude them. For example, when reporting percentages of staff working in multiple centres, one should consider that records coded as “logically not applicable” in this question are actually staff working on one centre.
1. The TALIS Starting Strong Survey 2018 investigates two target populations: Staff and leaders working in ISCED 2011 Level 0.2 centres, and staff and leaders working in centres for children under the age of three years.

2. The TALIS Starting Strong Survey 2018 consists of six instrument variations:
   a. Two main instruments: a Leader Questionnaire and a Staff Questionnaire.
   b. Two adapted versions of the main instruments tailored to the two target populations included in the study (i.e., ISCED Level 0.2 and under 3s).
   c. A combined Centre Questionnaire that was developed for ECEC centres with only one staff member.
   d. A combined Centre Questionnaire Plus that was developed to address Israel’s ISCED 2011 Level 0.2 situation where centres are very small.

3. Relevant definitions for the 2018 TALIS Starting Strong Survey:
   a. ‘ECEC centres’ were defined as institutional (officially registered) settings that provide ECEC programmes.
   b. The ‘centre leader’ was defined as the person with the most responsibility for the administrative, managerial or pedagogical leadership at the ECEC centre.
   c. The ‘target’ ECEC staff member was defined as persons who, as part of their regular duties in the target centre, provide learning opportunities or care to children.

4. Relevant considerations pertaining the 2018 TALIS Starting Strong Survey datasets:
   a. A single response to the questionnaire qualified the respondent as a “participating staff”. Minimum acceptable participation rates were fixed at 75% of centres (after replacement of non-responding centres) and 75% of staff from participating centres.
   b. Data processing of combined Centre Questionnaires: responses to the combined Centre Questionnaires were distributed to the leader and staff datasets depending on the origin of the question in the questionnaire.
   c. All leaders with staff duties are exempted from completing the Staff Questionnaire. However, please note that data for these cases is also copied to the staff dataset since some questions are identical between the Leader Questionnaire and the Staff Questionnaire. Questions unique to the Leader Questionnaire are set to missing by design (not administered) in the staff dataset.

5. Disclosure avoidance measures will be applied to the datasets at the international level consistently for all countries and to specific national datasets when deemed necessary.

6. The Starting Strong Survey 2018 datasets include four types of missing values: ‘not administered questions’, ‘omitted questions and invalid responses’, ‘not reached questions’ and ‘logically not applicable questions’. Each is given a specific code in the data files. Depending on the type of missing data, different handling during analysis and reporting of results should be considered.
2. Overall guidance on data analysis in international comparative studies

65. This section briefly discusses overarching issues related to the analysis of international comparative survey data. Surveys are a common research method in social research because their data enable making statistical inferences about the populations being studied (De Leeuw, Hox, & Dillman, 2012). The type of inferences that can be drawn from survey data and their reliability rely on robust instrument and sampling designs, sufficient response rates, as well as, among other aspects, on the appropriate handling and analysis of the data. This section first discusses the production of sample statistics and population estimates and model parameters. It then briefly touches upon considerations when reporting significant differences and it explores issues surrounding self-report data, missing data and limitations of cross-sectional data. Please note that considerations specific to the Starting Strong Survey 2018 pertaining to population definitions and implications for analysis, and considerations about confidentiality are explored in Section 0.

2.1. Self-report data

66. As the Starting Strong Survey 2018 Conceptual Framework (Bélanger, Sim, Karoly, & Stancel-Piątak, forthcoming) explains, using self-report data in international studies has advantages and disadvantages. On the one hand, surveys such as the TALIS Starting Strong Survey 2018 collect data in a systematic manner and therefore have the potential to contribute to the international knowledge base on ECEC staff, ECEC staff beliefs, ECEC staff practices and working conditions on the ground – important areas that have been demonstrated as contributing to a good learning and well-being environment. Chapter 3 in the TALIS Starting Strong Survey 2018 Reporting Plan (OECD, forthcoming) [EDU/EDPC/ECEC[2017]3/REV2] provides examples of guiding policy questions that the TALIS Starting Strong 2018 data can help answer. Some of these are:

- What are quality ECEC environments, and how do centre structural characteristics link to ECEC staff beliefs, practices and interactions?
- Who are the ECEC staff in participating countries, what are their beliefs and motivations and how do they relate to working conditions and self-efficacy? What are the policy levers that help attract, retain and develop ECEC staff?
- What does quality look like in centres for children under the age of three? What are the qualifications and practices of staff that work in these centres and home-based settings, and how do they differ from ISCED 0.2?

67. On the other hand, it is important to note that positive child development, well-being and learning may be influenced by factors that cannot be examined through self-report surveys.

68. Similarly, because the TALIS Starting Strong Survey 2018 is a self-report survey and does not engage in direct observation by independent assessors of pedagogical and professional practices, inferences are also limited as staff responses may vary from what would be observed in practice. However, the innovation of using situational judgment questions (see Section 4.) to explore ECEC process quality provides an additional

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2 However, it should be noted that research is mixed as to whether any differences are genuine or arise because of measurement error (see for instance the work of Leonidas Kyriakides).
perspective on the validity of the self-reported data. Situational Judgement Items (SJIs) present concrete examples of real-life situations respondents are asked to reflect on and provide the respondent with several options on how to respond in these given situations. In this way, SJIs are expected to reduce the challenges pertaining to social desirability and cultural bias. Chapter 4 in this document provides further details on the use of SJIs in the context of the TALIS Starting Strong Survey 2018. Moreover, the survey method does provide information about issues (especially perceptions) that could not be obtained through other methods.

69. The TAG was also consulted by the international research consortium for their recommendation on addressing social desirability in the TALIS Starting Strong Survey 2018. Self-report survey responses are prone to ‘social desirability response bias’, which is the tendency of survey respondents to answer questions in a way so that the answers are viewed favourably by others. This means that respondents may under report what they consider to be undesirable behaviour or to over report expected good practice. The TAG conducted an analysis of social desirability using specific items designed to measure this type of bias with the Field Trial data. While there were large cross-cultural differences in responses, the correlations between responses corrected and uncorrected for social desirability (based on the aforementioned items) were very high. The TAG concluded that social desirability was not of high priority to be further investigated in the Main Survey and the social desirability items were dropped from the Main Survey. Furthermore, the TAG also concluded that the scoring of extremity and midpoint responding of items remaining in the main survey questionnaires may be used as an adequate approximation of the measurement of social desirability.

2.2. Producing sample statistics and estimating population and model parameters

70. The TALIS 2018 Analysis Plan (Carstens & Price, forthcoming, Section 4.2) includes a discussion on producing sample statistics and estimating population and model parameters, the text below presents an adapted version of it.

71. There are many software packages available that can compute averages and proportions, create cross-tables and a flurry of multivariate statistics. However, the proper handling of TALIS Starting Strong Survey 2018 data, like data from any complex design survey, requires software that is able to handle survey weights and replication techniques.

72. In order to obtain unbiased estimates of population or model parameters, data analysts have to make use of the survey weights for any analyses using TALIS Starting Strong Survey 2018 data. This applies also when computing sampling errors for those

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3 SJIs are a good tool to assess the validity of self-report data but have some limitations of their own that should be considered. For example, if the correlation between a SJIs and respective “basic” self-report process quality items is low, it is difficult to pinpoint whether this is due to 1) the quality of the SJIs (their formulation), 2) the quality of self-report items or 3) whether they measure different things. Therefore, the careful design of SJIs is crucial to ensure as much as possible that their data is reliable. In the TALIS Starting Strong Survey 2018, the formulation of SJIs underwent various rounds of revisions incorporating feedback from the TAG, OECD and research consortium.

4 These refer to response biases related to social desirability whereby respondents may be more likely to respond with extremity scores (e.g. selecting the “strongly agree” or “strongly disagree” response options) or may be more likely to respond more neutrally and avoid extreme responses (e.g. selecting the “agree” or “disagree” response options).
estimates. For that reason, the TALIS Starting Strong Survey 2018 national data versions, as well as the international database, contain the appropriate survey estimations and replication weights. Several software packages are available to produce these design-unbiased estimates of population values, including their correct design-based sampling errors, the IEA IDB Analyzer being one example of user-friendly software.

73. Univariate statistics (e.g. means or averages, proportions, medians including their standard errors) will be estimated for each participating country and displayed as a table, one line per country, one column for each statistic. It is recommended to sort countries alphabetically to avoid the impression and misinterpretation of “league tables” and to simplify following one or many countries across tables and charts.

74. The TALIS Starting Strong Survey 2018 not only gathered responses to factual questions, such as, for example, gender and education of ECEC staff. It also included measures of ECEC staff’s and leaders’ self-reported beliefs, attitudes and practices across a range of topics in all participating countries, such as, for example, the perceived value of their profession in society. These beliefs, attitudes, and practices are influenced by individual characteristics, but also by the cultural background and the ECEC system context. Furthermore, cultural factors affect the interpretation of questions and the ways in which responses are given by staff members and centre leaders. These influences may produce differences in levels of endorsement or frequency in survey responses, but they may also affect the index structure used to compile responses and thus limit the comparability of the resulting scores. The extent of cross-cultural differences in response behaviour will be evaluated for items that are part of the latent constructs (scales). If the assumption of the cross-cultural bias cannot be rejected, it is recommended to carefully choose methods of cross-country comparisons. In particular, with regards to reporting on averages of responses to single items or averages of constructed scales it is recommended to focus on patterns of cross-cultural difference and refrain from direct country-by-country comparisons. More details on this can be found in Section 3. “Specifications for scale configuration”.

75. For both target populations of the ISCED 2011 Level 0.2 and of children under the age of three years, it is recommended to refrain from computing and displaying a survey average across all participating countries (i.e. a TALIS Starting Strong Survey 2018 Average), but rather compare the estimates from one country to another.

76. Since most likely the data from Iceland [TBC] will not be included at the country’s request into the public use database later on, no secondary analysis that includes Iceland can be performed unless the data files are obtained directly from the country. The TALIS and TALIS Starting Strong Survey 2018 User Guide (OECD, 2019) will contain a chapter on the exclusion of Iceland’s data from the public use file and the resulting limitations.

77. When data is fit to statistical models (e.g. independence, regression), the usual practice is to report the so-called p-value. Given the large sample sizes (staff members, centre leaders or centres) drawn in each participating country, even after adjusting for clustering of staff within centres, the p-values are bound to be small, making many, if not most, model specifications statistically significant. Then, the utility of the model has to be gauged using some other parameters. Thus, it is recommended to also report some measure of goodness-of-fit along the model parameters and the overall p-value (e.g. χ², R²) in order to evaluate the relevance of the contribution.

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5 Further software packages are for instance: SAS, Stata or WesVar.
2.3. Reporting significant differences

78. This section presents an adapted version of Chapter 5 from TALIS 2013 User Guide (OECD, 2014) that was tailored to the context of TALIS Starting Strong Survey 2018.

79. When comparing estimates, the comparison must be scaled using the appropriate estimates of sampling error. Given the complex nature of the sample data, specific methods need to be applied to yield unbiased estimates of sampling error. As for TALIS, the TALIS Starting Strong Survey 2018 will employ Balanced Repeated Replication (Fay, 1989; Judkins, 1990; Lohr, 1999) for estimating sampling errors. Software that can handle this method includes IEA’s IDB Analyser (IEA, 2014) and MPLUS (Muthén & Muthén, 2012) among other packages. The IEA IDB Analyzer also includes a tool for conducting statistical significance tests (e.g. t-tests) and is therefore recommend for this type of analysis, including the comparison of two characteristics or two subpopulations within a country, comparing across two countries, or comparing a country value to the average of a number of country values.

80. Where it is appropriate, statistics based on the TALIS Starting Strong Survey 2018 should meet standard tests of statistical significance, conducted at the nominal $\alpha = 5\%$ level.

2.4. Limitations of cross-sectional data

81. The TALIS 2018 Analysis Plan (Carstens & Price, forthcoming, Section 4.5) includes a discussion on the limitations of cross-sectional data, the text below presents an adapted version of it tailored to the context of the TALIS Starting Strong Survey 2018.

82. Bivariate correlations in survey data are often used to explain the direction and strength of simple associations between two measures that share a common foundation, such as the overlap of different practices used with the children within one group or two attitudes about interactions with children. However, the data collected in the TALIS Starting Strong Survey 2018 is of cross-sectional nature, meaning that relevant information (including causes and effects) is collected from staff and centre leaders at the one point of time (as opposite to longitudinal data, where information on the cause is collected at an earlier time point than the information on the effect). Such cross-sectional data provide a snapshot of the status quo at one particular point in time, which makes it impossible to draw direct causal inferences. However, in efforts to inform policy it is instructive to establish associations between variables. Correlational analysis (including regression analysis and complex comprehensive models such as structural equation modelling) can only provide an approximation of the possible causal effects. This approximation is assumed to be biased or, in other words, to have an unknown error which occurs due to lacking information on the change over time. Nevertheless, recommendations from such analysis can be useful for further investigations (e.g. through further longitudinal studies) and for policy makers, in particular if the results are aligned with prior research. However, any policy action that is based on cross-sectional data needs careful observation and evaluation of its long-term effectiveness.

83. When the goal of the analysis is to establish a complex, multivariate relationship, then regression modelling techniques are commonly used. Ordinary least squares and binary logistic were the predominant regressions used in prior TALIS reports due to their robustness to violations of assumptions and friendliness of interpretation to non-technical readers. Regression models declare one measure as a “dependent” variable and one or more variables as “independent” or “control” variables. With the cross-sectional data collection
design common in large scale assessments (including TALIS Starting Strong Survey 2018 and other studies such as TALIS, PISA, PIRLS, TIMSS), assumptions on causal relationships between variables are based on theoretical arguments that are not mirrored in the study design. In regression models, the goodness-of-fit index informs about the relevance of the underlying theoretical assumptions that guide the model specifications.

84. When the purpose of an analysis is to establish an “overall” relationship between focal variables – those relationships across the “average ECEC staff” that is independent of any particular system – model specifications need to adjust estimates in order to account for the differences in mean intercepts on the dependent variable for each country (Gustafsson & Johansson, 1999; Wooldridge, 2010). Fixed effects regression modelling is a technique commonly used to control for the independent country differences (e.g. intercepts) in order to focus on the central relationship (Gustafsson & Johansson, 1999; Wooldridge, 2010). Given the complex sampling employed by TALIS Starting Strong Survey 2018, these fixed effects can be modelled by simply adding country identifier variables (e.g. country dummy variables) to each model. This approach can be easily and accurately applied with the complex sampling weight and replicated with the public dataset. This method can be used with most dependent variables – item or scale constructs – but it cannot be used with scale constructs that do not demonstrate a minimum of metric invariance because the specification assumes that the association between the scale and the other measure is constant for all countries (‘parallel slopes’).

85. Multilevel modelling (MLM) with staff clustered within centres is not recommended in the context of TALIS Starting Strong Survey 2018 due to the small within-cluster sample sizes (Maas & Hox, 2005; Hox, 2010; Snijders & Bosker, 2012; Meinck & Vandenplas, 2012).

86. For information on recommended variables for thematic analyses please refer to the ‘Analytical potential and indicators’ chapters in Section II of the TALIS Starting Strong Survey 2018 Conceptual Framework (Bélanger, Sim, Karoly, & Stancel-Piątak, forthcoming) and the TALIS Starting Strong Survey Reporting Plan (OECD, forthcoming; EDU/EDPC/ECEC[2017]3/REV2).

87. With any analytic technique, it is imperative to combine complex modelling with the use of the TALIS Starting Strong Survey 2018 sampling weights to ensure accuracy of any population estimates. The design weights (also called final estimation weights) adjust for the complex sampling design of the TALIS Starting Strong Survey 2018, accounting for the unequal probability of sampling.

88. In addition to establishing complex relationships, regression modelling can be used when the purpose is to establish associations between two variables where at least one of the variables is a latent construct that did not reach scalar invariance (and therefore cannot accurately be used in cross-country comparisons). In the Field Trial, few latent variables in TALIS Starting Strong Survey 2018 reached scalar invariance (see Section 3.3); however many reached metric invariance. For these metric-invariant latent constructs, a country fixed effects regression specification accounts for differences in the mean intercepts for each country and focuses attention on the slope coefficient. The slope coefficient does well to establish direction and strength of the association with the dependent variable independently of differences in country means, assuming that the assumption of parallel slopes is reasonable.
1. The Starting Strong Survey 2018 collects self-report data. This survey method provides information about many issues (especially perceptions) that could not be obtained through other methods. Notwithstanding the abovementioned limitations, situational judgment questions that explore ECEC process quality are included in the survey to help gauge the validity of the self-report data.

2. The scoring of extremity and midpoint responding of scales may be an adequate approximation to assess social desirability in the main survey data.

3. To obtain unbiased estimates of population or model parameters, data analysts should use survey (sampling) weights for any analyses using TALIS Starting Strong Survey 2018 data.

4. When reporting the TALIS Starting Strong Survey data, it is recommended to refrain from reporting survey averages and instead compare estimates between individual countries using items (e.g. level of education) or scales which can be assumed to be culturally invariant (i.e. this scales that reached the scalar level of invariance).

5. If tests of independence or of distribution are conducted, the test statistics should be corrected for design effect using the adjustment suggested by Rao and Scott (1987).

6. It is recommended to also report some measure of goodness-of-fit along with the model parameters and the overall p-value (e.g. $\chi^2$, $R^2$) in order to evaluate the relevance of the contribution of each additional measure.

7. When comparing estimates, the comparison must be adjusted using the appropriate estimates of sampling error.

8. Where appropriate, analyses on TALIS Starting Strong Survey 2018 should meet standard tests of statistical significance conducted at the nominal $\alpha = 5\%$ level.

9. Regression modelling techniques can be used to establish complex multivariate relationships.

10. To establish an “overall” relationship between focal variables model specifications estimates should be adjusted to account for the differences in mean intercepts on the dependent variable for each country.

11. Multilevel modelling with staff clustered within centres is not recommended due to the small within-cluster sample sizes of the TALIS Starting Strong Survey 2018.
3. Specifications for scale configuration

Scale evaluation and creation of indexes was conducted in TALIS Starting Strong Survey 2018 using guidelines and experience from TALIS 2018 and prior cycles. Thus, the text below was adapted to the context of this study from the TALIS 2018 Analysis Plan (Carstens & Price, forthcoming, Section 4.4).

3.1. Scale identification and evaluation

Latent scales are composed of multiple items to reflect the underlying latent construct that cannot be directly observed (for instance, support for social skills). In order to make decisions on the use of scales (or latent constructs) for further analysis, it is crucial to consider the specific scale properties and their quality, that is, their reliability and validity in cross-cultural context. The scale development process starts by the theoretical identification of items for a latent construct. In TALIS Starting Strong Survey 2018 process the identification of items was based on i) research theories from the respective fields, ii) expert knowledge on item and scale construction, while considering iii) lessons learned from TALIS. The latent constructs were evaluated using the Field Trial data and modified for the following analysis with the Main Survey data. In some cases the decision was taken to remove the latent construct from the final analysis and to analyse the respective topic using single items. Also, to reduce the length of the questionnaire, some of the items were removed from the questionnaire after the Field Trial. This decision was taken considering the Field Trial results of the item performance and scale validation.

The constructs used to compute scale scores in the Main Survey will undergo extensive checks with regard to scale validity and reliability including item statistics to check the distribution of missing data, responses per category and skewness, as well as Cronbach’s alpha and item-total correlation to analyse the scale internal consistency. Moreover, the scale dimensionality will be analysed using Exploratory Factor Analysis (EFA). Finally, Confirmatory Factor Analysis (CFA) will be conducted to evaluate how well the theoretically defined latent construct mirrors the information in the actual empirical data. Using well-established model evaluation criteria, the model fit indices, the theoretically defined model (latent variable and its indicators/items) will be evaluated with respect to its match to the empirical data.

It is important to stress that these statistical criteria will be used for the decision making-process in addition to several other criteria such as policy relevance. If scales do not pass the above-mentioned statistical criteria they will not be reported. Policy-relevant items may be reported separately. The details on each scale will be reported in the TALIS Starting Strong Survey 2018 Technical Report (IEA, 2014).

3.2. Measurement invariance testing and model evaluation: cross-study, cross-ISCED-levels and cross-country comparability

The TALIS Starting Strong Survey 2018 scales are used to conduct analysis in a cross-national and cross-study perspective, i.e. comparing results among different countries.

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Question: How often do you do the following: 1. I help children to follow the rules; 2. I calm children who are upset; 3. When the activities begin, I ask children to quiet down; 4. I address children’s disruptive behaviour that slows down children’s learning; 5. I help children understand the consequences if they do not follow the rules.
and with TALIS 2018. When comparing scales across groups (such as nations, education systems, cultures, ISCED levels), it is crucial to make sure that the scales have an equivalent meaning in each of the group of comparison and between studies. Thus, in addition to the analysis of the overall scale reliability and validity, the TALIS Starting Strong Survey 2018 scales will be evaluated with respect to their equivalence across studies, ISCED levels and participating education systems (country level).

94. The cross-study comparability (between the TALIS Starting Strong Survey 2018 and TALIS 2018) of the scales encompasses measurement invariance testing using the main target population (ISCED 2011 Level 0.2) of all education systems pooled together for each study. The ISCED 2011 Level 0.2 parameters are used to model the ISCED 2011 Level 0.2 data. If a scale can be confirmed to be comparable across the ISCED 2011 Level 0.2 population of the TALIS Starting Strong Survey 2018 and TALIS 2018, the TALIS 2018 parameter will be used for further scale validation. If a scale fails this test, the TALIS Starting Strong Survey 2018 parameters will be used to proceed with further analysis, i.e. the cross-country and cross-ISCED-levels validation. The cross-study validation considers only scales to which a sufficient number of identical or almost identical items applies in both studies. It has to be noted that analysis using the pooled ISCED level data from the two studies does not provide information on the comparability of the scales on country level. Thus, this step is considered a preliminary analysis of the cross-study comparability. Only if a scale holds the across-study AND across-countries (described further below) comparability using the TALIS 2018 parameters, then it can be assumed to be comparable across studies and education systems.

95. The evaluation of scales for the cross-study comparisons considers that in the TALIS Starting Strong Survey 2018, higher priority is assigned to cross-country (and cross-ISCED-levels) analysis within the current study, whereas lower priority is given to the cross-study comparisons. Thus, a scale that cannot reach the scalar level of measurement invariance\(^7\) across-ISCED-levels of TALIS Starting Strong Survey 2018 and TALIS 2018 data (see further explanation below) will be excluded from the set of scales prepared for the cross-studies comparisons. In this case, the underlying model is calculated in the same way as for all study-specific TALIS 2018 scales, i.e. it is based on the 2018 data and does not permit cross-study comparisons.

96. To analyse the cross-ISCED-levels and cross-country comparability (including the cross-country comparability between the TALIS Starting Strong Survey 2018 and TALIS 2018), all scales will be evaluated using item statistics, Cronbach’s alpha, item total correlation and CFA at country level. Checks will carefully be performed to consider the results per country based on the country level sample sizes of each item. If a scale passes this validity and reliability check, it is assumed the overall model can be applied to create scales at the country level.

97. However, further validity checks are necessary to assume that the scales can be constructed using constant parameters across all participating education systems (i.e. the parameters are fixed to be equal across groups) in order to conduct statistical comparisons.

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\(^7\) Scalar level of measurement invariance is given when (i) the structure of the construct is the same across groups, (ii) the strength of the associations between the construct and the items (factor loadings) are equivalent, and (iii) the intercepts for all countries are equivalent (Cheung & Rensvold, 2002; 1999; Davidov, 2008; Steenkamp & Baumgartner, 1998; OECD, 2013). If the intercepts for all countries are equivalent, the expected value of the items is the same across countries when the value of the construct is zero, meaning that given a certain value of the observed item, we can claim equivalent value/degree of the construct across different countries. This allows for unbiased comparisons of scale means across education systems.
The statistical method to evaluate the statistical comparability of scales across different groups/sub-populations, such as studies, ISCED levels and education systems is called measurement invariance testing. This method assumes that the comparability of a latent construct among groups (e.g. education systems) can be reached to a varying extent. Latent (not directly observable) constructs are constructed based on associations between the construct and several indicators/items in a joint model, which is normally called the measurement model. The measurement model consists of several parameters (i.e. means, regression coefficients, variances) of which comparability across groups can be tested. The optimal level of comparability is given, if specific parameters of a model are fixed (explanation below) to be the same across groups (e.g. education systems). This level of invariance is called the scalar level of measurement invariance. In this case, cross-group comparisons of scale means are justified and the results can be assumed to be robust and reliable.

98. It is not easy to establish constructs that reach the scalar level of measurement invariance in large-scale assessments with a diverse range of education systems participating. For instance, many scales did not reach this level of invariance in the cross-country analysis of the TALIS Starting Strong Survey 2018 Field Trial data as well as TALIS 2013 or TALIS 2018 Field Trial data. Assuming that ECEC systems are more diverse than school systems, and considering that the TALIS Starting Strong Survey 2018 is implemented for the first time, it might seem reasonable to expect that the scale comparability across countries is lower than in other international large-scale assessments (ILSAs) that focus on the school system. However, the field trial results revealed that the scale performance was relatively satisfactory considering the above mentioned constrains. The cross-cultural comparability of the scales depends among others from the number of participating countries and their cultural diversity. These factors might have influenced the scale performance in TALIS Starting Strong Survey 2018.

99. Sound theoretical assumptions support the idea that measurement constructs of latent traits (such as self-beliefs) are not necessarily fully comparable across cultures and between studies, but they might be comparable to a certain degree. Thus, the degree to which the stricter model (i.e. a model that assumes equality of parameters across groups) suits the data comparing to the less strict model (i.e. a model that assumes some degree of flexibility of parameters between groups) will need to be evaluated. The underlying idea is that if the measurement models are not comparable across countries, ISCED levels, and/or between studies with respect to their levels (means), they might at least be comparable with respect to their specific meaning. The meaning of the latent scale is defined by the content of the questions participants were asked which are used to create the construct. If the magnitude of the associations between the latent construct and the indicators (factor loadings) is the same across groups, then the meaning of the latent construct can be assumed to be comparable. This level of measurement invariance is called the metric level of measurement invariance. If a scale has established the metric level of invariance, correlational analyses (such as correlation or regression analysis) are assumed to be free of

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8 Metric level of measurement invariance is given when (1) the structure of the construct is the same across groups, and (2) the strength of the associations between the construct and the items (factor loadings) is equivalent across groups. Metric invariance allows claiming that one unit change of the construct will lead to the same amount of change in the items that constitute the construct across different groups (i.e. education systems) equivalent (Cheung & Rensvold, 2002; 1999; Davidov, 2008; Steenkamp & Baumgartner, 1998; OECD, 2013).
the cross-cultural bias and stable in the cross-study analysis (please refer to Section 3.3 for examples).

100. If a scale cannot be assumed to be comparable across countries and/or between studies with respect to its meaning or content, it is still possible that there is at least comparability at the conceptual level. Using fit indices for model evaluation the analysis can reveal whether a latent construct can be specified by a particular configuration of items in all analysed countries in the same way. This level of measurement invariance is called the \textit{configural level of measurement invariance}\(^9\). It indicates that the configuration of items is the same in all groups of comparison. If a scale only reaches the configural level of measurement invariance, no statistical methods can be applied to compare the scale scores across education systems without violating the basic assumption of the comparability of the measurement construct. The comparability is only given at a conceptual level, where results from different countries can be discussed referring to the country level without referring to “differences” or “similarities across education systems” (please refer to Section 3.3 for examples).

101. The modelling method chosen for TALIS Starting Strong Survey 2018 (as for TALIS 2013 and TALIS 2018 Field Trial) is the Multiple Group Confirmatory Factor Analysis (MGCFA). To evaluate the cross-study, cross-ISCED-levels and cross-country comparability the following criteria will be used:

- To evaluate the configural level of invariance (no statistical comparisons across education systems and studies are permitted), the following model evaluation criteria will be used: $\text{CFI} \geq 0.90$, $\text{TLI} \geq 0.90$, $\text{TRMSEA} \leq 0.08$, $\text{SRMR} \leq 0.06$

- To evaluate the metric level of invariance (which enables for comparisons of associations between education systems and studies), we will use absolute changes ($\Delta$) in fit indices as follows: $\Delta\text{CFI} < 0.02$, $\Delta\text{TLI} < 0.02$, and $\Delta\text{SRMR} < 0.03$\(^10\) (Chen, 2007)

- To evaluate the scalar level of invariance (which enables for comparisons of the means of the scales across different education systems and studies), we will use absolute changes ($\Delta$) in fit indices as follows: $\Delta\text{CFI} < 0.02$, $\Delta\text{RMSEA} < 0.02$ and $\Delta\text{SRMR} < 0.01$ (Chen, 2007)

\textbf{3.3. Construction of the factor scores and recommendations for analysis}

102. An important consideration is that the results from the scale reliability and validity analysis as well as the cross-country comparability described above have major implications not only for (i) the construction of the factor scores but also for (ii) the use of the factor scores attached to the dataset for further analysis.

- Factor scores indicate each individual’s scoring on the scale or latent construct. To construct the factor scores the information on the measurement invariance of each scale is used to specify a suitable model. Since it is not obvious to users of the

\(^9\) \textit{Configural level of measurement invariance} is given when the construct is measured by the same items. It implies that structure of the construct indicated by the configuration of items is equivalent across countries (Cheung & Rensvold, 2002, 1999; Davidov, 2008; Steenkamp & Baumgartner, 1998; OECD, 2013).

\(^{10}\) According to Chen (2007) simulation study SRMR used for measurement invariance testing applied to big datasets can be less strict than in TALIS 2013 MS, where the cut-off criterion of absolute changes SRMR $\leq .005$. 

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TALIS Starting Strong Survey 2018 database, which scale fulfills which level of measurement invariance, the level of invariance will be included into the variable label of each scale constructed.

- Different levels of measurement invariance provide different potential for the analysis of data and reporting. The proposed analyses for each level of measurement invariance are:

  a. Cross-country, cross-study and cross-ISCED-levels analysis with scalar level of invariance

     • Limitation: If the scale reaches the highest level of invariance, the scalar invariance, the comparability of the measurement construct between countries (and between studies) is mirrored in the way the index is created. For these scales, the comparison of the mean score of the scale is meaningful across groups. There are no substantial limitations to statistical group comparisons.

     • Recommendation for analysis: Cross-country, cross-study and cross-ISCED-levels comparisons of scale means can be conducted (e.g. “Staff beliefs are significantly higher in Country A compared to Country B and Country C”). In addition all the kinds of analysis described below apply to this level of measurement invariance.

  b. Cross-country, cross-study and cross-ISCED-levels analysis with metric level of invariance

     • Limitation: If the scale reaches to metric level of invariance the index of the scale is created respectively with equivalent factor loadings but with non-equivalent means.

     • Recommendation for analysis: For such a scale, the strength of the association between the scale and items are comparable across countries (and between studies), and statistical methods such as correlation and regression are applicable. Cross-country, cross-study and cross-ISCED-levels analysis can encompass scales comparisons of associations between countries (e.g. using the standardized Beta coefficient it is appropriate to say “The association of staff beliefs and level of education are stronger in Country A and B than in Country C”)

  c. Cross-country, cross-study and cross-ISCED-levels analysis with configural level of invariance

     • Limitation: If the scale only reaches configural invariance, the scale index is constructed in such a way that the factor loadings and means are allowed to vary across countries (and between studies). Further analysis aiming at cross-country or cross-study comparisons can only be conducted at the conceptual level meaning that no statistical methods of comparison (such as t-test) are applicable in such cases.

     • Recommendation for analysis: Cross-country, cross-study and cross-ISCED-levels analysis using scales should be conducted within each country. At the cross-national level (as well as cross-
study), only qualitative (descriptive) comparisons are statistically justified (e.g. “Associations of staff beliefs and staff education is positive in Country A and B, whereas there is no significant association in Country C”), which should be presented together with the limitations concerning the interpretation of the results, in particular concerning the differences between countries of the meaning of the construct. Alternatively, analysis at item level could be carefully considered, if there are strong theoretical assumptions that specific items are less impacted by the cross-cultural bias.

103. Violating these assumptions leads to biased results. For instance, if scale scores created based on the assumption of metric invariance are used to compare country means of a scale, the differences between countries will likely be biased. Thinking for example of staff self-beliefs: if this construct did not reach the scalar level of measurement invariance, this would mean that country differences in average staff beliefs can also be due to cross-cultural differences with regards to the way how response patterns (agreement and disagreement) are reflected in the latent construct. In case the construct would not reach even the metric level of invariance but it would reach the configural level of invariance, statistical comparisons would be biased even to a greater extent. Differences between countries could be due to differences in the meaning of the constructs (indicated by varying associations of the items with the scale) and due to differences in how the level of agreement or disagreement is mirrored in the scale.

104. The use of scale scores for regression-based analysis (such as multiple regression, structural equation modelling or path modelling) is justified for all scales that reach the metric level of measurement invariance. For instance, path models with manifest or latent variables (the latter called also structural equation models) can be conducted to compare the strength of the associations between countries. In such analysis, the standardised beta parameters are comparable across variables and groups. If the analysis should use the latent models, the variables of the respective scale have to be included into the model instead of the created scale score. In such case, the model uses the indicator variables to create latent constructs and estimates associations between them. To compare across countries, the analysis is usually based on MG-SEM (Multiple Groups Structural Equation Modelling), an approach, which allows to use latent constructs for defined groups (such as countries) which are estimated with fixed parameters, i.e. they are programmed to be comparable across groups. Yet, at the same time, the associations are specified in a flexible way for each group (e.g. country) meaning that the associations between the constructs are group-specific, but the latent constructs themselves are the same for all groups in the analysis. Please note, that such analysis pre-assumes that the comparability of the constructs across groups is justified, i.e. is validated for instance by the means of measurement invariance testing.
Box 3. Chapter 3 key messages

**Section 3.1**
1. TALIS Starting Strong Survey scale data will include information on checks on scale validity and reliability to aid data analysts establish the scale properties and their quality (their reliability and validity in cross-cultural contexts).
2. The latent constructs that will be used to create the scale indexes will be revised according to the results of the scale evaluation (with respect to the items and the dimensionality of the scales). This revision will be performed in agreement with the experts and considering content related arguments and the aims of the Starting Strong Survey.

**Section 3.2**
3. Measurement invariance testing is the statistical method used to evaluate the statistical comparability of scales across different groups or sub-populations, such as studies, ISCED levels and education systems. The measurement model consists of several parameters (i.e. means, regression coefficients, variances). There are different levels of comparability of measurement constructs (latent constructs) across groups determined by the parameters which can be assumed to be comparable.
4. There are three levels of measurement invariance that scales can reach which serve as an indication of the scales’ comparability across different groups.
   a. **Scalar level of measurement invariance** – is the optimal level of comparability and is awarded if specific parameters of a model are fixed to be the same across groups.
   b. **Metric level of measurement invariance** – specifies that scales might at least be comparable with respect to their meaning. More specifically, it indicates whether the magnitude of the associations between the latent construct and the indicators (factor loadings) is the same across groups, and therefore the meaning of the latent construct can be assumed to be comparable. However, the measurement model parameters (means) are not comparable.
   c. **Configural level of measurement invariance** – indicates that scales are at least comparable at the conceptual level. This means that the configuration of items is the same in all groups of comparison even if the scale is not comparable across countries and/or between studies with respect to its meaning or content.
5. Multiple Group Confirmatory Factor Analysis (MGCFA) should be used to assess the different levels of invariance of TALIS Starting Strong Survey 2018 scales.

**Section 3.3**
6. Scale analyses recommendations:
   a. For scales that reach scalar invariance, the comparison of the mean score of the scale is meaningful across groups.
   b. Correlation and regression-based analyses are applicable for scales reaching metric invariance.
   c. Only conceptual level comparisons (cross-country or cross-study) can be conducted using scales that only reached configural invariance. No statistical methods of comparison (such as t-test) should be conducted.
   d. Violating the statistical assumptions outlined above leads to biased results.
7. The level of invariance of each scale will be included in the variable label of each constructed scale in the TALIS Starting Strong Survey 2018 database.
4. Measuring process quality in early childhood: Considerations pertaining Situational Judgment Items in the TALIS Starting Strong Survey 2018

105. As described in Section 1, the TALIS Starting Strong Survey uses situational judgment items as an innovative means to explore ECEC process quality and to gain an additional perspective on the validity of the self-reported data provided by ECEC staff. The present section, authored by Pauline Slot, Trude Nilsen and Hynek Cigler, discusses issues related to the reliability and validity of the situational judgment items.

106. Process quality is a key driver of children’s development and learning in ECEC settings. The social, emotional, physical and instructional aspects of staff-child interactions lie at the heart of this concept. In order to inform policy and ECEC staff, and to enable generalizable inferences, it is important to measure process quality with representative samples at the national level and in an internationally comparative perspective.

107. Measuring process quality across a number of different countries is, however, challenging. Self-reported responses among participants in ILSAs and other studies are often threatened by cultural bias and social desirability. Situational Judgement Items (SJIs) are expected to reduce these challenges by trying to imitate a real-life situation and measure the respondent’s reaction to the situation. SJIs include a context describing concrete examples reflecting real-life situations and provide the respondent with several options on how to respond in these given situations. These are the reasons why SJIs have been included in TALIS Starting Strong Survey 2018 to measure process quality.

108. The overarching aim of this section is to contribute to enhancing the validity of self-reports by investigating the psychometric properties and usefulness of SJI’s in TALIS Starting Strong Survey 2018. Specifically the reliability and validity of the SJIs are compared in terms of: 1) different types of response formats (i.e. Likert scale and Forced Choice), and 2) scoring processes. Furthermore, comparability across countries and age groups are examined.

4.1. Methodology

109. Field trial data from TALIS Starting Strong Survey 2018 was used to examine three SJI constructs. The sample included staff for two child groups (ISCED 2011 level 0.2 with 9 countries and ISCED 2011 level 0.1 with 4 countries). The three SJI constructs measure key aspects of process quality such as facilitating pro-social behaviour or discipline management. Each of the three SJIs includes a context and four to seven response options. Both response formats (i.e. Likert scale and forced choice) included response options that would indicate different levels of process quality from low to high quality (please refer to the back of this document for more information on the SJI formats). If the results showed that the items together measure the same latent trait, then the mean of the construct would reflect the level of an aspect of process quality.

110. Using SPSS, frequencies, modal responses, means, and Cronbach alphas per country were calculated for both formats. The SJIs were scored according to 1) ranking based on theory, 2) nominal response models, and 3) expert scoring. Item response theory (two-parameter logistic) was used to estimate the discrimination, the item difficulty of the items, the model fit and reliability statistics. Also, measurement invariance analysis was undertaken to check the comparability between the two age groups. Construct validity (relation to other non-SJIs with considerable conceptual overlap) and convergent validity (relation to constructs on staff education and self-efficacy) were also examined.
4.2. Results

111. Throughout developing the items and implementing the methodology, the consultation with the TALIS Starting Strong Survey 2018 TAG, NPMs and experts in ECEC contributed to enhancing the content validity. The descriptive statistics (frequencies and modal responses) provided a useful tool to create profiles of items. These profiles showed that most items exhibited some variation, yet agreement between countries (Figure 1 provides an example of country profiles). They also provided first evidence of differences between the Likert scale and Forced choice format, where Likert scales items showed clearer patterns and higher agreement within and across countries.

![Figure 1: Country profiles for item SJT 30b](image)

*Note:* This is a Likert scale item, and the profile shows high agreement across countries.

112. Regarding the scoring, the expert opinions were in line with the ranking based on theory. The reliability was higher for the nominal response model though, and so this was used to evaluate the reliability and validity of the two formats. The results showed that the factor loadings were larger, the items were better at discriminating between low and high ability respondents, and the reliability was better for the Likert scale format than for the Forced choice. Trace line diagrams (the probability of choosing each response as a function of ability) were also used and proved helpful in determining the reliability and usefulness of each item (see Figure 2 for an example of a trace line diagram).
Figure 2: Country profiles for item SJT 30b

Trace lines for item 2

Note: The y-axis shows the probability of choosing one of the four options, while the x-axis reflects the ability of the scorers. P1 is the probability of choosing the first response option, P2 is the probability of choosing the second, etc. The item exhibits good psychometric properties as low ability respondents have a higher chance of choosing an item reflecting low level of process quality than high ability respondents and vice versa.

113. While measurement invariance was not possible to assess across countries (because there were too few respondents), this was possible for two ISCED-levels (pooled country samples). The results showed that scalar invariance was met for all Likert format SJIs but one, which showed metric invariance. In other words, for the two age groups it is possible to compare the means of all SJIS (but one), and for all SJIs it is possible to compare relationships to other constructs. The Forced choice items showed poorer results from the measurement invariance analysis and poorer fit than the Likert items. The construct validity (correlations with other non-SJIs with considerable conceptual overlap) and the convergent validity showed low to moderate correlation estimates, which was as expected.

4.3. Discussion

114. In conclusion, the SJIs showed overall indications of acceptable reliability and validity. Most items worked well, and the Likert format seemed to be the better choice over Forced choice format, just like the nominal response scoring showed better psychometric properties than rankings. The main study will include much larger sample sizes, enabling investigations of measurement invariance across countries for the two ISCED-levels. From the psychometric properties found in the field trial, the hypothesis is that the SJIs will be comparable across countries as well as across age groups. It would hence be possible to identify countries with, for instance, higher levels of pro-social support than other countries, or investigate which aspects of staffs’ formal qualifications that foster pro-social support and in which countries. The SJIs worked well in the field trial, and they should, according to previous research, hence be less prone to cultural bias and especially social desirability. They are a closer measure to ECEC staff’s actual behaviour, and should be a more accurate measure compared with other non-SJI measures with conceptual overlaps. Each SJI represents a construct, and higher levels of this construct reflects higher levels of aspects of process quality, such as ability to facilitate pro-social behaviour.
Box 4. Chapter 4 key messages

1. Situational Judgement Items (SJIs) include a context describing concrete examples reflecting real-life situations and providing the respondent with several options on how to respond in these given situations. In this way, SJIs are expected to reduce the challenges pertaining to social desirability and cultural bias.

2. Field trial data from TALIS Starting Strong Survey 2018 was used to examine three SJI constructs. The SJIs were scored according to 1) ranking based on theory, 2) nominal response models, and 3) expert scoring.

3. The SJIs showed overall indications of acceptable reliability and validity. Most items worked well, and the Likert format seemed to be the better choice over Forced choice format, just like the nominal response scoring showed better psychometric properties than rankings.

5. Tabular presentation of data

115. This section provides guidance on the tabular representation of TALIS Starting Strong Survey 2018 data based on guidelines developed by the OECD Secretariat team and on Section 4.2 of the TALIS 2018 Analysis Plan (Carstens & Price, forthcoming). It provides high-level recommendations on how to organise or phrase information in headers and footnotes, and how to report cases with substantial non-response rates. At the end of the section two table examples are presented.

116. When specifying column headers it is advised to use the third person over the first person and to use the present principle of verbs (i.e. verb form ending in ‘–ing’) rather than their infinitive form. For example, it is preferred to label a header as “Administering own assessment” rather than “I administer my own assessment”. However, using the present participle of verbs may not always be possible such as with agreement Likert-scales. In terms of punctuation, main table headers should never include colons ( : ) at the end of the header.

117. When presenting data by country, countries should be organised in alphabetical order. Tables may include all participating TALIS Starting Strong Survey 2018 countries.

118. Information in footnotes should be organised in the following order: first ‘table-specific’ notes should be presented, then ‘general’ notes, followed by ‘country-specific’ notes. Table-specific notes comprise definitions of the terminology or index used in the table. For example, if the table includes a heading “Socio-economically disadvantaged children”, the table-specific note can include the glossary definition (or adapted form of it) of what socio-economically disadvantaged children refers to in the TALIS Starting Strong Survey 2018. General notes are introduced in the table footnote by ‘Note’ or ‘Notes’. General notes provide information on, for example, slight differences in the wording of questions between CNOs or populations, or flag differences in at least one column (e.g. statistically significant values are indicated in bold). Country-specific notes are marked with an asterisk (*).
119. Lines, cells, or countries where item non-response is substantial (i.e. above 25% up to 50%) should be clearly marked. Where it is high (i.e. at or above 50%) estimates should not be reported at all. In instances of 100% non-response, a practice in PISA is to identify this cell of data with an “(m)” if the country data were removed for technical reasons and “(w)” if the country data have been withdrawn or not collected by request of the country (OECD, 2017a). This convention should be adopted for the TALIS Starting Strong Survey 2018 as well.

120. There should be a minimum number of responses in a cell to display it; otherwise the OECD’s standard “(c)” notation should be displayed in the table to identify there are too few observations to provide reliable estimates (OECD, 2017b). For consistency with other OECD programmes, most significantly PISA, the TALIS Starting Strong Survey 2018 should suppress estimates based on fewer than 30 staff members or 5 centres with valid data respectively. Proportions under 0.05 (i.e. 5%) should be clearly marked, e.g. greyed out (or cell shaded), as was the standard when reporting data in previous TALIS cycles. As in PISA, it is suggested to leave cells blank where no significant relationships are found. In addition, it would be informative to use “(a)”, as in PISA, to identify if an item category does not apply to the country (i.e. a structural zero instead of a sample zero). Furthermore, it needs to be clearly highlighted if such sub-groups exist across all participating countries or whether they do not exist due to specific ECEC situations. The rule of identifying estimates that are too small becomes especially important when considering sub-groups of populations within countries. Since there is strong interest in profiling staff members according to their staff role for example in relation to pedagogical activities or contrasting different profiles of centres (e.g. public versus private, centre- versus home-based, urban versus rural, small versus large centres), one should carefully consider if each group fulfils these minimum cell size requirements.

121. Given the interest in profiling staff members and centres across breakdown variables it is also paramount to ensure the anonymity of individuals and centres when presenting proportions in data tables. When there is a risk of identity disclosure, it is recommended to cap variables (exclude outliers or round values) of potential disclosure variables to ensure data anonymization. Variables that are capped should be clearly marked, for example with a dagger symbol (†) in the table. Furthermore, if deemed necessary to suppress cell values to ensure anonymity, these cells should be clearly identified using a specific marker to distinguish them from cells left blank due to no significant relationships being found.
### Box 5. Examples: tabular representation of TALIS Starting Strong 2018 data

**Scenario 1** - You are preparing a table to present the results of country-level logistic regressions between two variables, for example, whether ECEC staff’ feelings of preparedness to work with the target group (variable 1) is dependent on the content of their formal education (variable 2). Your results show the following:

(a). No significant relationship was found for one of the estimates of country A.

(b). There are two estimates from country B for which a significant relationship was identified, however, one of the estimates is based on fewer than 30 staff members while the other represents less than 5% of the cases.

**Suggested approach:** The table cell with estimates from case (a) should be left blank. In the case of (b) where the estimate is based on fewer than 30 staff, the value should be suppressed and marked by OECD’s standard “(c)” notation. The cell with the estimate that represents less than 5% of the cases should be marked with grey shading.

**Scenario 2** – You are preparing a table to present the gender and age distribution of ECEC centre leaders across nine countries. The age variable is broken down into six categories. The proportion of ECEC centre leaders in the oldest age category (60 or more years) for country C is below 0.1%. After looking more closely at the data you realise this represents only 3 individuals. Also, in an earlier table the number of ECEC centres is presented and country C has the fewest number of ECEC centres.

**Suggested approach:** There is a high risk of identity disclosure in presenting the proportion under the oldest age category for country C. It is suggested to suppress the proportion and mark the cell with, for example, a double dagger (‡). Given that the proportion is very small and that there are few ECEC centres in the country, someone with good knowledge about the country C’s ECEC context may be able to infer the identity of the ECEC centre leaders aged 60 or more year in the country.

**Scenario 3** – You are preparing a table to present the proportions of ECEC staff by highest level of qualification completed. There are three countries with only 3 to 6 data points for the ‘<ISCED 2011 Level 1>’ and ‘<ISCED 2011 Level 8>’ categories.

**Suggested approach:** It is recommended to cap the educational level variable to exclude the two response categories (‘<ISCED 2011 Level 1>’ and ‘<ISCED 2011 Level 8>’) under which few cases are represented given the risk of identity disclosure of these outliers.

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122. While some indication of the quality of the estimates should be readily visible in the tables, it may not be necessary to print all sampling errors in the body of the document. The tables could gain in legibility if only the cells with largest sampling errors were highlighted, for example using the OECD’s standard “(r)” notation (OECD, 2017b).

123. Below we present two table examples to display TALIS Starting Strong Survey 2018 results. The first table can be used for reporting information for a single variable. In this case we use a binary question with multiple items (types of professional development received). The second table provides an example to display data using breakdown variables. This example uses a continuous variable with multiple items (time spent on tasks related to job) which is broken down by another variable (years of experience). The text in blue in both tables should be adapted to the reported variable(s) that will be used.
Table 4: Example 1 of tabular representation of survey data

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage of ECEC staff who participated in any of the following professional development activities during the previous 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Any type</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

[Table-specific note(s). E.g. include meaning of symbols used if applicable: † - Capped variable(s); ‡ - Suppressed value(s). Include explanatory notes on table formatting, e.g.: Cells with data presenting less than 5% of the cases are shaded grey and should be interpreted with caution; Cells are left blank where no significant relationship was found.]

Note(s): [General note(s)]

*[Country-specific note(s)]
Table 5: Example 2 of tabular representation of survey data based using breakdown variable

<table>
<thead>
<tr>
<th>Country</th>
<th>Administrative tasks</th>
<th>Individual planning or preparing play and/or learning activities</th>
<th>Documenting children’s development, well-being and learning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less than or 5 years</td>
<td>More than 5 years</td>
<td>More - less than 5 years</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>S.E.</td>
<td>Mean</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Table-specific note(s). E.g. include meaning of symbols used if applicable: † - Capped variable(s); ‡ - Suppressed value(s). Include explanatory notes on table formatting, e.g.: Cells with data presenting less than 5% of the cases are shaded grey and should be interpreted with caution; Cells are left blank where no significant relationship was found.]

Note(s): [General note(s)]

*[Country-specific note(s)]
Box 6. Chapter 5 key messages

1. Table headers guidelines:
   a. It is advised to use the third person over the first person in table header titles and to use the present principle of verbs rather than their infinitive form.
   b. Colons (:) should never be included at the end of table headers.

2. Countries should be organised in alphabetical order when presenting data by country.

3. Information in footnotes should be organised in the following order: (1) ‘table-specific’ notes, (2) ‘general’ notes and (3) ‘country-specific’ notes.

4. Lines, cells, or countries where item non-response is substantial (i.e. above 25% up to 50%) should be clearly marked. In cases of non-response above 50% data should not be reported at all. Instances with 100% non-response should be marked by an “(m)” or “(w)”.

5. Pre-specified table notation:
   a. Cells displaying too few observations to provide reliable estimates should be clearly marked using OECD’s standard “(c)” notation.
   b. Estimates that are based on fewer than 30 staff members or 5 centres with valid data respectively should be clearly marked in tables.
   c. Cells displaying values based on proportions under 0.05 (i.e. 5%) should be clearly marked, e.g. greyed out (or cell shaded).
   d. The anonymity of staff members and centres should be ensured when presenting proportions on tables by capping or suppressing variables. These instances should be clearly identified in the table using markers.
   e. If an item category does not apply to a country (i.e. a structural zero instead of a sample zero) the notation “(a)” should be displayed in the cell.
6. Pictorial presentation of data: charts and graphs

124. The TALIS 2018 Analysis Plan (Carstens & Price, forthcoming), Section 4.3) includes a discussion on pictorial representation of data, an adapted version of which is included here.

125. There are many ways to display statistical information and even basic desktop software packages propose a number of graph and chart options. If, as the saying goes, “a picture is worth a thousand words”, then the picture should be selected with care. The following guidelines come from best practices.

126. Firstly, to avoid giving an artificial impression of « growth », all charts and graphs that have countries on X-axis should generally display countries in a fixed order throughout the report; alphabetical order is arbitrary enough to make reference easier when one tries to follow a few countries throughout the report or several tables and charts. This may be contrary to advice given elsewhere (UNECE, 2009) but may be preferable given the potentially large number of tables and charts where the list of participating countries will appear. A fixed order would also reduce the misinterpretation of the results as cross-comparative league ratings. When some other unordered categorical variable is used as the horizontal axis, then its modalities should appear in the order in which they appear in the questionnaire. If a “refused / don’t know” category is also reported on the graph, then it should be to the right of the response categories as it hardly constitutes an intermediary stance between agreement and disagreement, satisfaction and dissatisfaction.

127. In monochromatic bar charts, the darkest shade should be associated with the highest value of the X variable and the lightest shade with smallest value of the X variable. This is especially intuitive and easy to read when displaying, say, a 4-point Likert scale as stacked bars for each country.

128. The use of pie charts is strongly discouraged to graphically present data since they tend to be less informative than other graphical displays and can be difficult to interpret (e.g. when including more than 8 slices). The use of tables, curves, histograms or other graphical displays is preferred since these allow for clearer and more detailed information to be presented than in pie charts.

129. The use of “3D effects” is strongly discouraged: Y-scales are hard to read and it becomes difficult to compare bar heights or the surface of pie wedges that are a bit distant.

130. “Line charts” or connecting points on a graph should only be used if X is ordinal (at the very least) or an actual numerical variable (discrete or continuous).

131. When displaying two continuous variables using scatter plots, one might prefer to use “bubble plots” where each point of the scatter plot is replaced by a disk whose area is proportional to the sampling variance associated to the point displayed. This avoids confusing confidence interval overlays on traditional scatterplots.

132. Finally, when presenting multifaceted data it is important to strike the right balance in the level of detail that is reported (i.e. start from a global view followed by more detailed reports). This is particularly important when reporting results of measures composed of various scales and or sub-scales. It is advised to start with a higher level overview of the results (e.g. how domains are related) to then give way to more detailed analyses and presentation of results per domain.
Box 7. Chapter 6 key messages

1. Charts and graphs displaying countries on their X-axis should generally display countries in a fixed order throughout the report; using alphabetical order is advised.

2. In monochromatic bar charts, the darkest shade should be associated with the highest value of the X variable and the lightest shade with smallest value of the X variable.

3. The use of pie charts and “3D effects” is strongly discouraged.
Part I. References


Annex A. Glossary of selected technical and/or statistical terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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<tbody>
<tr>
<td>Estimation</td>
<td>Estimation is concerned with inference about the numerical value of unknown population values from incomplete data such as a sample.</td>
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<tr>
<td>Context:</td>
<td>If a single figure is calculated for each unknown parameter the process is called point estimation. If an interval is calculated within which the parameter is likely, in some sense, to lie, the process is called interval estimation.</td>
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</table>
| Sample survey data only relates to the units in the sample. Therefore the sample estimates need to be inflated to represent the whole population of interest. Estimation is the means by which this inflation occurs. The estimation process is also referred to as “grossing up”.
| Under the SDDS, estimation is of particular relevance to deriving missing data in the compilation of national accounts and consumer and producer aggregates (e.g., extrapolation of annual benchmark using value or volume changes from industrial surveys, use of fixed input/output ratios, etc, for current price for national accounts, and price imputations for consumer and producer prices) and the techniques applied in updating the ancillary information used in the estimation process. |
| Item            | An item is a prompt or question on a survey written to elicit some response from a participant to gather data.                                                                                                     |
| Context:        | An item may be an open ended, written response or a selection from several possible response options, for example, a single selection from “Strongly Agree,” “Agree,” “Disagree,” or “Strongly Disagree.”                               |
| Item response rate | The ratio of the number of eligible units responding to an item to the number of responding units eligible to have responded to the item.                                                                     |
| Missing data    | Observations which were planned and are missing.                                                                                                                                                             |
| Context:        | Missing data in a survey may occur when there are no data whatsoever for a respondent (non-response) or when some variables for a respondent are unknown (item non-response) because of refusal to provide or failure to collect the response (ISI). |
| Non-response    | A form of nonobservation present in most surveys. Nonresponse means failure to obtain a measurement on one or more study variables for one or more elements selected for the survey.                              |
The term encompasses a wide variety of reasons for nonobservation: "impossible to contact", "not at home", "unable to answer", "incapacity", "hard core refusal", "inaccessible", "unreturned questionnaire", and others. In the first two cases contact with the selected element is never established.

*Context:* Non-response leads to an increase in variance as a result of a reduction in the actual size of the sample and the recourse to imputation. This produces a bias if the non-respondents have characteristics of interest that are different from those of the respondents. Furthermore, there is a risk of significantly underestimating the sampling error, if imputed data are treated as though they were observed data. (Statistics Canada, "Statistics Canada Quality Guidelines", 4th edition, October 2003, page 59, available at http://www.statcan.ca:8096/bsolc/english/bsolc?catno=12-539-X&CHROPG=1)

There are two types of non-response:

First, a sampled unit that is contacted may fail to respond. This represents "unit non-response".

Second, the unit may respond to the questionnaire incompletely. This is referred to as "item non-response".


**Non-response bias**

This is the bias resulting from limiting the survey analysis to the available data.

*Context:* The bias that arises when those who do not respond have different price experiences than those who do respond.


*Source:* Quality Glossary, Eurostat

**Reliability**

Reliability refers to the closeness of the initial estimated value(s) to the subsequent estimated values.

*Context:* The third element of the IMF’s definition of quality is "accuracy and reliability".

*Source:* International Monetary Found, "Data Quality Assessment Framework (DQAF) Glossary"

**Sample**

A sample is a subset of a frame where elements are selected based on a randomised process with a known probability of selection.

Sampling error
That part of the difference between a population value and an estimate thereof, derived from a random sample, which is due to the fact that only a sample of values is observed; as distinct from errors due to imperfect selection, bias in response or estimation, errors of observation and recording, etc.

The totality of sampling errors in all possible samples of the same size generates the sampling distribution of the statistic which is being used to estimate the parent value.

Context: Sampling errors arise from the fact that not all units of the targeted population are enumerated, but only a sample of them. Therefore, the information collected on the units in the sample may not perfectly reflect the information which could have been collected on the whole population. The difference is the sampling error (Eurostat, Quality Glossary).


Scale
A scale is a composite measure of several items. (See also Scale Index)

Context: Scales are typically quantitative representations of some sociological (e.g. socio-economic status of a family) or psychological phenomenon (e.g. teacher self-efficacy). The purpose of a scale is to estimate a trait that cannot be directly measured. Using quantitative analysis of responses to several items, scale characteristics are calculated and used to create a scale index.

Scale Index
A scale index assigns a value to each study participant on a given composite measure of several items. (See also Scale)

Context: Once the scaling procedure is complete, numeric values are used to weight the contribution of several items to a scale resulting in a final numeric measure, the scale index.

Significance
An effect is said to be significant if the value of the statistic used to test it lies outside acceptable limits, that is to say, if the hypothesis that the effect is not present is rejected. A test of significance is one which, by use of a test statistic, purports to provide a test of the hypothesis that the effect is absent. By extension the critical values of the statistics are themselves called significant.


Standard error
The positive square root of the variance of the sampling distribution of a statistic.

Context: It includes the precision with which the statistics estimates the relevant parameter as contrasted with the standard deviation that describes the variability of primary observations.

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<tr>
<th><strong>Target population</strong></th>
<th>The set of elements about which information is wanted and estimates are required. Practical considerations may dictate that some units are excluded (e.g., institutionalized individuals, the homeless, or those that are not possible to access without incurring excessive cost).</th>
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Annex B. Overview of combined Centre Questionnaire questions and their distribution to the leader and staff datasets

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## Annex C. Overview of combined Centre Questionnaire Plus questions and their distribution to the leader and staff datasets

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*Variable cannot be copied 1:1 to the other dataset, but needs to be recoded prior to the transfer.
Annex D. Overview of questions whose values were transferred to the staff dataset for leaders with staff duties

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*Variable cannot be copied 1:1 to the other dataset, but needs to be recoded prior to the transfer.

**Variable cannot be copied as is to the staff data set. A new variable will be created in the staff dataset to be able to transfer the information.
Annex E. Overview of formats for the Situational Judgment Items

**Likert scale alternative:**

Suppose that you notice that two three-year old children are independently playing with building blocks. Child A has taken almost all the building blocks and is building things. Child B is shy, looks a bit sad and is struggling with his/her construction.

**What would you do?**

*For each suggestion, mark the option that best describes what you would do.*

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<th>Suggestion</th>
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<th>I would probably do this</th>
<th>I would probably not do this</th>
<th>I would definitely not do this</th>
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<td>a) I would divide the building blocks in two equal piles, so that both children have an equal number of building blocks.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
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<td>b) I would help child B in building a construction.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
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<tr>
<td>c) I would encourage them to build something together.</td>
<td>☐ 1</td>
<td>☐ 2</td>
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<td>d) I would talk to child A to try to make him/her aware of child B’s feelings.</td>
<td>☐ 1</td>
<td>☐ 2</td>
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<td>☐ 4</td>
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<td>e) I would encourage child A to share with child B.</td>
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**Forced choice alternative:**

Suppose that you notice that two three-year old children are independently playing with building blocks. Child A has taken almost all the building blocks and is building things. Child B is shy, looks a bit sad and is struggling with his/her construction.

**What would you most likely do?**

Please select your first and second choice. Please mark two choices in total, one in each column.

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<th>Second choice</th>
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<td>b) I would encourage child A to share with child B.</td>
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<td>☐ 2</td>
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<tr>
<td>c) I would help child B in building a construction.</td>
<td>☐ 3</td>
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<tr>
<td>d) I would encourage them to build something together.</td>
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**Likert scale alternative:**

Suppose that you see two children of the same age (three years) and size quarrelling, and one child (child A) hits the other (child B). Child B is crying. Child A has previously regularly hit other children. Several other children are watching. What would you do? *For each suggestion, mark the option that best describes what you would do.*

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<tr>
<td>a)</td>
<td>I would speak firmly to child A while the other children are listening.</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
<td>[ ] 3</td>
</tr>
<tr>
<td>b)</td>
<td>I would ask child A and B what happened.</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
<td>[ ] 3</td>
</tr>
<tr>
<td>c)</td>
<td>I would warn child A that if he/she hits again he/she will face negative consequences.</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
<td>[ ] 3</td>
</tr>
<tr>
<td>d)</td>
<td>I would tell child A what he/she should have done differently in this situation.</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
<td>[ ] 3</td>
</tr>
<tr>
<td>e)</td>
<td>I would ask child A to apologise to child B.</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
<td>[ ] 3</td>
</tr>
<tr>
<td>f)</td>
<td>I would remind child A of our rules, that hitting is not allowed.</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
<td>[ ] 3</td>
</tr>
<tr>
<td>g)</td>
<td>I would include the other children in the discussion after the conflict.</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
<td>[ ] 3</td>
</tr>
</tbody>
</table>

**Forced choice alternative:**

Suppose that you see two children of the same age (three years) and size quarrelling, and one child (child A) hits the other (child B). Child B is crying. Child A has previously regularly hit other children. Several other children are watching. What would you most likely do? Please select your first and second choice. Please mark two choices in total, one in each column.

<table>
<thead>
<tr>
<th></th>
<th>First choice</th>
<th>Second choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>I would speak firmly to child A while the other children are listening.</td>
<td>[ ] 1</td>
</tr>
<tr>
<td>b)</td>
<td>I would focus on child B and comfort him/her.</td>
<td>[ ] 2</td>
</tr>
<tr>
<td>c)</td>
<td>I would tell the children who was wrong and who was right.</td>
<td>[ ] 3</td>
</tr>
<tr>
<td>d)</td>
<td>I would resolve the conflict together with child A and B.</td>
<td>[ ] 4</td>
</tr>
</tbody>
</table>
**Likert scale alternative:**

31 Suppose that five three-year old children are playing with different toys of their choosing. In an ideal situation where you could choose what to do during this time, what would you do?

*For each suggestion, mark the option that best describes what you would do.*

<table>
<thead>
<tr>
<th></th>
<th>I would definitely do this</th>
<th>I would probably do this</th>
<th>I would probably not do this</th>
<th>I would definitely not do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>I would play with the children by following their lead.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
</tr>
<tr>
<td>b)</td>
<td>I would let children play by themselves and only intervene when they request it.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
</tr>
<tr>
<td>c)</td>
<td>I would contribute to children’s play by asking questions or providing explanations.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
</tr>
<tr>
<td>d)</td>
<td>I would encourage children to play together rather than joining in their play.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
</tr>
<tr>
<td>e)</td>
<td>I would contribute to children’s play by providing new ideas or materials.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
</tr>
</tbody>
</table>

**Forced choice alternative:**

A31 Suppose that five three-year old children are playing with different toys of their choosing. In an ideal situation where you could choose what to do during this time, what would you most likely do?

Please select your first and second choice.

*Please mark two choices in total, one in each column.*

<table>
<thead>
<tr>
<th></th>
<th>First choice</th>
<th>Second choice</th>
<th>S772D01</th>
<th>S772D02</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>I would let children play by themselves without intervening.</td>
<td>☐ 1</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>I would let children play by themselves and only intervene when they request it.</td>
<td>☐ 1</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>I would contribute to children’s play, for instance by asking questions or providing new ideas or materials.</td>
<td>☐ 1</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>I would play along with the children and follow their lead.</td>
<td>☐ 1</td>
<td>☐ 1</td>
<td></td>
</tr>
</tbody>
</table>