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Review of the case for revision of ISCO-08

* This room document has not been formally edited

Review of the case for revision of the International Standard Classification of Occupations (ISCO-08)¹

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Abbreviations and acronyms

AMTC	Accelerated Medically Trained Clinicians
ANZSCO	Australian and New Zealand Standard Classification of Occupations
DO	Doctor of Osteopathic Medicine
ESCO	Classification of European Skills Competencies and Occupations
ICLS	International Conference of Labour Statisticians
ICT	Information and Communications Technology
ILO	International Labour Organization
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISCO-08	International Standard Classification of Occupations, 2008
ISCO-88	International Standard Classification of Occupations, 1988
NOC	National Occupational Classification (Canada)
OECD	Organisation for Economic Co-operation and Development
SASCO	South African Standard Classification of Occupations
SEO	Search Engine Optimization
SINCO	Sistema Nacional de Clasificación de Ocupaciones (National Occupation Classification System) (Mexico)
SOC	Standard Occupational Classification
TVET	Technical and Vocational Education and Training
UN	United Nations
UNESCO	United Nations Scientific, Educational and Cultural Organization
USA	United States of America
WHO	World Health Organisation

1. Introduction and Background

1. The current version of the International Standard Classification of Occupations (ISCO-08) was adopted through a resolution of a tripartite Meeting of Experts on Labour Statistics in December 2007, and subsequently endorsed by the ILO Governing Body in March 2008. Its adoption by a meeting of experts was mandated, exceptionally, by a resolution of the 17th International Conference of Labour Statisticians (ICLS).
2. The main purposes of ISCO-08 are to provide:
 - (a) A basis for the international reporting, comparison and exchange of statistical and administrative information about occupations;
 - (b) A model for the development of national and regional classifications of occupations;
 - (c) A system that can be used directly in countries that have not developed their own national classifications.
3. Many countries have now developed national classifications based on ISCO-08, adapted national occupation classifications to improve comparability with ISCO-08, or developed correspondence tables that will allow them to report data according to ISCO-08. ISCO-08 has been used in all relevant European Union data collections from 2011 onwards.
4. Feedback on the usefulness of the classification has generally been positive. There is an increasing number of cases, however, where a need has been identified for more detailed categories, or the treatment of particular occupational groups is inadequate due to technological change and the emergence of new occupations. In addition, there are concerns that the way in which the concept of skill level was applied to the design of both ISCO-88 and ISCO-08 imposes limitations on the usefulness of ISCO for the purposes of analysing and measuring the supply of skilled workers. These limitations could not be addressed in the development of ISCO-08 due to the constraint imposed by the mandate of the 17th ICLS to update ISCO which specified that ‘the basic principles and main structure of ISCO-88 should not be changed’².
5. In 2013 the 19th International Conference of Labour Statisticians (ICLS) discussed a paper which summarized the issues that could justify work to update or revise ISCO-08, in order to determine whether or not there was a need to undertake a minor update of ISCO-08 in the short term, or to start planning for a longer-term revision to be completed after the 20th ICLS. It was suggested that a useful approach might be for the ILO to establish a technical group and/or a knowledge-sharing platform to reflect the lessons learned in the implementation of ISCO-08 in order to identify common issues and document the

² International Labour Office (ILO). 2004. Report of the Conference: Seventeenth International Conference of Labour Statisticians, 24 November–3 December 2003, ICLS/17/2003/4 (Geneva).

improvements needed. A more thoroughly considered set of options for revision could then be developed in advance of the 20th ICLS.

6. Following the 19th ICLS, the United Nations (UN) Expert Group on International Statistical Classifications discussed the known issues and potential methods to address them. Skill level issues were seen as the primary concern. Due to the 5-year cycle of the ICLS, the Expert Group was concerned that if a revised ISCO was to be adopted by the ICLS, it would need to be ready for the 21st ICLS, which is expected to take place in 2023. It recommended that the 20th ICLS endorse a full revision of ISCO, to enable implementation in time for the 2030 global round of censuses. The creation of an expert group of occupation specialists as well as classification specialists was considered critical for any review. It was felt that a broad partnership of main national statistical offices and other international organizations with the ILO should be identified to resource such a group.
7. To gain a better understanding of the issues, the ILO engaged a consultant, Dr Debra Mair, an expert in occupation classification formerly employed at Statistics Canada, to review selected national and regional occupation classification systems developed since the adoption of ISCO-08 and to identify and document:
 - (a) Occupations that are not included or not appropriately classified in ISCO-08;
 - (b) Various approaches to the definition and application of skill level and skill specialization/type for the arrangement of occupational groups in classification systems.
8. The national classifications selected were the Australian and New Zealand Standard Classification of Occupations (ANZSCO), the Canadian National Occupation Classification (NOC), the Mexican National Occupation Classification System (SINCO), and the United States Standard Occupation Classification System (SOC).
9. The present report aims to provide detailed information on the issues that would need to be addressed in a review of ISCO and the various conceptual approaches that could be taken in the design of the classification system. It provides an outline of the known issues and problems with ISCO-08, discusses the previously proposed potential solutions to some of these issues, and summarizes the findings and main recommendations of Dr Mair's review.
10. Experts on occupation classification and labour statistics, identified through the UN Expert Group on International Statistical Classifications, and regional working groups on classifications were invited to provide comments on a preliminary version of this report. Comments were received from experts in 8 countries and one international agency and are reflected in this final version of the paper. A formal response from the UN Expert Group was also received.

Discussion at the 19th ICLS

11. The ILO paper presented to the 19th ICLS which summarized the issues that could justify work to update or revise ISCO-08, noted that some of the issues could only be addressed in the context of a full revision, whereas others could be addressed as part of a more limited update. This paper proposed two options for the update or revision of ISCO-08.

- i. The first option was a minor update that could be completed in a period of one to two years. Changes would have been restricted to the addition or deletion of categories at the unit group level, or the movement of some occupations from one unit group to another. This would have required a mandate from the 19th ICLS for the updated classification (effectively ISCO-08 version 2) to be adopted by a tripartite meeting of experts in 2015. The need for a full review could then have been considered by the 20th ICLS in 2018.
 - ii. The second option proposed was a wider review conducted over a longer timeframe and allowing more significant structural changes to be considered.
12. During the discussion of ISCO at the 19th ICLS there was a wide range of views on the relevance, timeframe and frequency of an eventual revision or update. Some delegates were in favour of an update in the short term in order to reflect economic and technological changes that had taken place over the last five years. They also saw the need, however, to consider broader issues such as those related to skill level, skills underutilization, business structures, and the identification of occupations associated with green jobs. All of these implied the need for a longer-term review. Many delegates felt that there had not been enough time to accumulate the experience in using ISCO-08 needed to make a deep revision, and that the costs of making changes (in terms of resources and breaks in series) were too high to justify frequent revisions. Some delegates were not yet in a position to adopt ISCO-08 and were still using earlier versions.
13. It was stressed that the revision or update of a national classification in line with a revised or updated ISCO was a long and complex process that required the involvement of a great number of partners, institutions and agencies. There was concern that minor changes tended to end up being more significant than expected. Some felt that it was too early for any kind of change, regardless of how minor, and that any change would cause comparability issues. The need to include regional aspects of occupational patterns and for regional consultations was also raised. While there was not a strong consensus on the need for a short-term update, there was also concern about the timing of a deeper revision in relation to the 2020 round of censuses.

2. The use of skill level as a classification criterion

14. ISCO-08 arranges occupations into 436 unit groups, 130 minor groups, 42 sub-major groups and 10 major groups based on the concepts of *skill level* and *skill specialization*.
15. *Skill level* is defined as a function of the complexity and range of tasks and duties to be performed in an occupation and is measured operationally by considering one or more of:
- the nature of the work performed in an occupation in relation to the characteristic tasks and duties defined for each ISCO-08 skill level;
 - the level of formal education defined in terms of the International Standard Classification of Education (ISCED-97) (UNESCO, 1997) required for competent performance of the tasks and duties involved; and
 - the amount of informal on-the-job training and/or previous experience in a related occupation required for competent performance of these tasks and duties.

16. The concept of skill level is applied mainly at the top (major group) level of the classification, giving more emphasis to the first of these operational measures, the nature of the work performed, than to the formal and informal education and training requirements.
17. *Skill specialization* is considered in terms of four concepts:
- the field of knowledge required;
 - the tools and machinery used;
 - the materials worked on or with; and
 - the kinds of goods and services produced.
18. Bearing in mind the international character of the classification, only four broad skill levels are defined. As a result, eight of the ten major groups in ISCO-08 contain occupations only at one of four skill levels. For example, ISCO Major Group 2: Professionals includes only occupations at the highest ISCO skill level, Skill Level 4. All groups below the major group level contain occupations at only one skill level.
19. Within each major group, occupations are arranged into unit groups, minor groups and sub-major groups, primarily on the basis of aspects of skill specialization. In the case of ISCO-08 Major Group 1: Managers, and Major Group 0: Armed Forces Occupations, the concept of skill level is applied primarily at the second hierarchical level. Thus, Major Group 1 includes three sub-major groups at Skill level 4 and one sub-major group at Skill Level 3.
20. Several of the issues previously raised on the need for a revision of ISCO-08 were concerned with the measurement of skill level and its use as a classification criterion. This would require a significant change in the application of the ISCO conceptual model to the design of the classification, although the key underlying concepts would not need to change.
21. There are more recent developments that impact on the relevance of reviewing the application of skill level as a classification criterion in ISCO. These include further ILO work on the statistical measurement of mismatches between occupations and qualifications, as well as various policy-driven initiatives concerning skills mismatch. They also include initiatives undertaken in response to the invitation to UNESCO, in the 2012 Shanghai Consensus on technical and vocational education and training (TVET),³ “to identify a set of world reference levels, to facilitate the international comparison and recognition of TVET qualifications”. These developments are described briefly in the discussion below but further investigation would be required to fully assess potential consequences for ISCO.

³ Shanghai Consensus: Recommendations of the Third International Congress on Technical and Vocational Education and Training ‘Transforming TVET: Building skills for work and life’, Shanghai, People’s Republic of China, 14 to 16 May 2012:
<http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/ED/pdf/concensus-en.pdf>

Use of ISCO for the measurement of skills mismatch

22. In 2008, the 18th ICLS discussed the use of skills mismatch as a potential indicator or component of the measurement of labour underutilization. The concept of skills mismatch was seen in this context as a measure of persons whose skills were underutilized, defined as persons whose educational level exceeded the skill level required by their current job.⁴ Since the term 'skills-mismatch' could refer both to the oversupply and to the undersupply of workers with suitable skills, the term 'skills underutilization' has been used in subsequent papers discussing this issue. Educational level and skill level were to be considered in terms of the International Standard Classification of Education (ISCED) and ISCO respectively.⁵
23. The need for an internationally harmonized method for the measurement of skills underutilization remains a high priority that was emphasised during the 19th ICLS. Measurement is needed both as an indicator of labour underutilization and to support analysis of problems of supply and demand of skilled labour. Any work to review or update ISCO-08 would therefore need to take into consideration the suitability of the classification for the measurement of skills underutilization.
24. The other aspect of skills mismatch is related to shortages of skilled workers. Analysis of skill shortages is concerned with the number of workers who are not adequately qualified for the jobs in which they are employed, and with the number of job vacancies that cannot be filled due to the lack of appropriately qualified persons. At the macroeconomic level labour economists are concerned with potential bottlenecks that impose limitations on national capacities for economic development due to the unavailability of a suitably skilled and educated population. A number of recent international studies related to skill shortages suggest that there is a need for a more refined measurement of skill level in internationally comparable data classified by occupation.
25. Some experts in occupation classification have pointed out, however, that measuring skills mismatches is inherently difficult. It raises a number of problems beyond the need for data at a more detailed level, especially the need to determine who is overqualified for a certain position. Moreover, the basis for defining skill level lies in the nature of the tasks performed in relation to characteristic tasks defined for each skill level. There is not always a strong link between the occupational skills required and the formal educational level of the job holder. A further refinement of the four skill levels for use in studies on skills mismatches may therefore be difficult to operationalize on an empirical basis. There are doubts, therefore, that the comparability between countries of the currently used occupational skill levels would benefit from further refinement. A report on the

⁴ ILO. 2008.

⁵ See also Sengenberger, W and 18th ICLS Room document no 13.

measurement of qualifications and skills mismatches of persons in employment, together with draft guidelines on that topic will be considered at the 20th ICLS.⁶

Breadth of Skill level 2

26. The major groups in ISCO-08 are defined in terms of four broad skill levels as shown in Table 1. The first issue relates to the breadth of one of these skill levels - Skill Level 2. According to the ISCO-08 Introductory and Methodological Notes:

The knowledge and skills required for competent performance in occupations at Skill Level 2 are generally obtained through completion of the first stage of secondary education (ISCED-97 Level 2). Some occupations require the completion of the second stage of secondary education (ISCED-97 Level 3), which may include a significant component of specialized vocational education and on-the-job training. Some occupations require completion of vocation-specific education undertaken after completion of secondary education (ISCED-97 Level 4).⁷

27. As a result, the distinction between occupations that require completion of extensive vocational education and training, and those that require a short period of training plus basic literacy and numeracy is not made systematically.
28. Skill Level 2 has been identified as the most problematic of the four ISCO skill levels, incorporating a broad range of skill complexity, sometimes even within a unit group. Occupations that vary significantly in skill level but are similar in skill specialization, are frequently grouped together, sometimes at the most detailed level of the classification. This limits the usefulness of the classification for analysis of skill level requirements, of skill mismatch, of income as a return to education, of educational planning and for the measurement of socio-economic status. The problems with home improvements installers and vehicle accessory fitters discussed below are a reflection of this problem.
29. Occupations in Major groups 4 – 8 are all considered to be at Skill Level 2, as shown in Table 1 below.

⁶ Stoevska 2018

⁷ ILO 2012

Table 1 Mapping of ISCO-08 major groups to skill levels

ISCO-08 major groups	Skill level
1 Managers	3 + 4
2 Professionals	4
3 Technicians and Associate Professionals	3
4 Clerical Support Workers 5 Services and Sales Workers 6 Skilled Agricultural, Forestry and Fishery Workers 7 Craft and Related Trades Workers 8 Plant and Machine Operators, and Assemblers	2
9 Elementary Occupations	1
0 Armed Forces Occupations	1 + 2 + 4

Experience

30. Though ISCO-08 identifies in the actual definitions of each skill level *previous experience in a related occupation required for competent performance of the tasks and duties*, as one of the dimensions of skill level, it speaks only of the possibility of experience substituting for education. Experience is not identified as a possible requirement in itself, potentially an additional requirement that could justify a higher skill level. This can have an impact on the skill level placement of occupations fed through internal job ladders, specifically, as an example, supervisors, who may require years of experience in the jobs of those they supervise.

Boundary between Skill Levels 2 and 3

31. Some experts have reported that there are problems with the boundary in skill level between some of the more skilled technical occupations classified at Skill Level 2, and occupations at Skill Level 3 included in Major Group 3, Technicians and Associate Professionals. This refers primarily to some of the more technical occupations in Major Group 7, Craft and Related Trades Workers, where technological changes are leading to higher knowledge and skill requirements. Occupations concerned with vehicle and aircraft maintenance or electrical, electronics and telecommunications installation and maintenance are good examples.

Approaches that could be taken to address problems with the application of skill level as a classification criterion

32. The ILO paper on ISCO at the 19th ICLS identified four possible approaches that could be taken to address the limitations of ISCO-08 arising from the way in which the concept of skill level has been applied to the design of the classification. None of these approaches

would require a fundamental change to the conceptual underpinnings of the classification. All would lead to significant structural changes, however, including at the top level of the classification. These four approaches are summarised below.

- i) The first approach would involve moving the boundary between Skill levels 1 and 2 so that basic clerical support occupations, sales assistants, accessory installers and most plant and machine operators and drivers would be classified at Skill level 1. Some of these occupations would be moved to Major Group 9, Elementary Occupations. The more skilled occupations in the current Major group 8 would have to be moved to Major group 7. All occupations in the new Major group 8 would be associated with the new Skill level 1.
 - ii) The second approach would involve the application of five (instead of four) skill levels at unit group level. This could be achieved by splitting the current Skill level 2 without changing the boundaries with other skill levels. Each unit group in Major groups 4, 5, 6, 7 and 8 could then be associated with a single skill level, within the framework of the current major and minor group structure. Some unit groups would have to be split, in the same way as we propose below for vehicle accessory fitters.
 - iii) The third option would also involve the creation of five skill levels as described above. In this case the skill level distinction would be applied primarily at major group level, so that data on skill level could be compiled on the basis of aggregate statistics. The occupations currently classified in Major groups 4 and 5 would be allocated to major groups according to skill level instead of skill specialisation. As with the second option the more skilled occupations in Major group 8 would have to be moved to Major group 7.
 - iv) The fourth option would involve moving the boundary between Skill Levels 2 and 3 so that the more highly skilled occupations within the current Skill Level 2 would be classified at the new Skill Level 3. For example, some of the occupations that typically require extensive vocation-specific training after the completion of secondary education might be classified at Skill Level 3. The main result of this would be that some occupational groups would be moved from Major Group 7 to Major Group 3. Some occupations in Major Group 4, Clerical Support Workers could also be affected. The movement in the boundary between Skill Levels 2 and 3 could be undertaken either independently of other changes or in combination with one of the other three options discussed above.
33. At the September 2017 meeting of the UN Expert Group on International Statistical Classifications concerns were expressed that the convergence issues that are occurring between occupations in ISCO major groups 3 and 7, and major groups 3 and 2, as well as general changes in skill levels across the major groups, were becoming increasingly apparent.⁸ More general occupational change driven by technological developments was also having an increasingly significant impact. UNESCO's work to identify a set of world reference levels to facilitate the international comparison and recognition of technical and vocational training qualifications would also need to be taken into consideration. These

⁸ United Nations 2017. Department of Economic and Social Affairs, Statistics Division. Meeting of the Expert Group on International Statistical Classifications, New York, 6-8 September 2017, *Final Report*

issues would therefore require a more comprehensive consideration of the concept of skill level and its use for the design of ISCO than had previously been contemplated. While elements of each of the four options discussed at the 19th ICLS would need to be taken into consideration, none of these options would allow the full range of issues to be addressed without first re-examining the concept of skill level.

3. Specific issues that should be addressed in the revision of ISCO-08

34. In addition to the general problems with the application of skill level as a classification criterion, there is a growing list of more specific issues that need to be addressed. This list has been compiled based on submissions from professional associations, issues raised by users of the classification and agencies that have adapted ISCO-08 for national use, and on the comparison of ISCO-08 with recently updated national classifications. These issues are described below.

Management, supervision and the operation of small businesses

35. There are ongoing and persistent concerns and difficulties in distinguishing between occupations in management, and workers who operate small businesses who mainly carry out the functions of a non-management occupation with limited management or supervisory responsibilities. Operators of small businesses for whom the management and supervision of staff are not significant components of the work performed are generally classified in the same unit group or minor group as other workers performing the line function of their business. The additional management and administrative responsibilities involved in running a business are thus not reflected in the skill level of the occupation.
36. The provision of separate categories for some but not all supervisory occupations adds further complication. ISCO-08 distinguishes supervisors from managers on the basis that supervisors are responsible only for the supervision of other workers, whereas managers have overall responsibility for the business or organizational unit. It includes six unit groups for supervisory occupations in specific sectors where supervisors do not mainly perform the same tasks as the workers they supervise. The supervisory unit groups in ISCO-08 are:
 - 3121 Mining Supervisors
 - 3122 Manufacturing Supervisors
 - 3123 Construction Supervisors
 - 3341 Office Supervisors
 - 5151 Cleaning and Housekeeping Supervisors in Offices, Hotels and Other Establishments
 - 5222 Shop Supervisors
37. With the exception of shop supervisors these unit groups are all classified at a higher skill level than the bulk of the occupations they supervise. All other supervisory occupations are classified in the same unit group as the most skilled occupation supervised. Some

experts consider that there is a need for a more systematic treatment of supervisory occupations and for additional supervisory unit groups, especially in the services sector.

Hospitality and retail managers

38. There is concern that Minor Group 141, Hotel and Restaurant Managers and Minor Group 142, Retail and Wholesale Trade Managers, are too heterogeneous in terms of skill level. The managers of large establishments with hierarchies of managers, as well as the managers of relatively small retail and hospitality businesses, are classified in the same minor group. Occupation titles such as ‘Hotel Manager’ and ‘Shop Manager’ may frequently be used to describe both groups.
39. Operators of small shops for whom the management and supervision of staff is not a major component of the work are classified in Unit Group 5221, Shopkeepers, at the same skill level as Shop Supervisors and Shop Sales Assistants. Operators of small bars, cafés and restaurants, who do not have significant management responsibilities are currently classified as waiters, bartenders, cooks or chefs, depending on the main tasks or duties performed, as no separate unit group is provided. Similarly, operators of bed and breakfast establishments and guest houses are currently classified in Unit group 5152, Domestic Housekeepers.
40. It may be more appropriate to identify these small business operators in separate unit groups within the same minor groups as non-business operators performing the line function of the business. Alternatively, the two new unit groups envisaged could be moved to form a new minor group for Operators of small hospitality establishments.

Farmers, farm managers and farm supervisors

41. ISCO-08 Minor Group 131: Production Managers in Agriculture, Forestry and Fisheries is restricted to those who manage production in large-scale agricultural, horticultural, forestry, aquaculture and fishery operations. Such operations would include large plantations, large ranches, and cooperatives. Typically, such enterprises have a hierarchy of managers and the production manager reports to a managing director. “Farmers” who own and operate their own farm and who perform a range of management tasks, as well as tasks directly associated with agricultural production, are classified in the appropriate unit group in Major Group 6: Skilled Agricultural, Forestry and Fishery Workers, depending on the type of farm they operate. Whilst the distinction between these two groups is conceptually quite straightforward, it may be difficult, in practice, to determine whether a job with an occupation title like “Farm manager” should be classified in Major Group 1 or Major Group 6.
42. It is interesting to note that neither the Canadian NOC nor ANZSCO publish separate classes for farm managers and for growers/farmers/ranchers. In both cases, all farmers and farm managers are reported in management. It could be that the distinction made in ISCO-08 between farm managers and farmers is clearer and more relevant in countries with a significant proportion of small farms. The Mexican SINCO carries three classes or sets of classes: a class for farm, forestry and fishery managers (who plan); classes for supervisors; and classes for farmers and workers (who do the hands-on tasks). The supervisors and related farmers/workers are in the same major group, i.e., at the same skill level.

More comprehensive approach to the classification of business operators

43. The Canadian NOC also presents a third option for small business owners who are also performing the line function of the business. In this option, business owner-operators are included with supervisors or foremen/women. This approach is seen in the agricultural area where NOC has classes for Agricultural service contractors, farm supervisors and specialized livestock workers and for Contractors and supervisors, landscaping, grounds maintenance and horticulture services. This approach is also illustrated in the trades, where NOC has such classes as Contractors and supervisors, electrical trades and telecommunications occupations and Contractors and supervisors, heavy equipment operator crews.
44. This approach of putting owner-operators either in related supervisory groups or, separately, in the same minor groups as related supervisors, has the advantage of allowing for a cleaner, more consistent skill level within management, and of recognizing the additional level of skill required for running a business. It does, however, imply the use of information on status in employment to determine the occupation code, potentially impacting on the relationship between these two variables and would require careful consideration, especially in view of the increasing trend to replace employees with non-salaried contractors.
45. Alternatively, the approach referred to in paragraph 35 and described specifically in paragraph 39, where operators of small bars, cafés and restaurants, who do not have significant management responsibilities, are classified to non-management occupations based on their work performed, could be applied to other operators of small businesses or to the self-employed.

Greater detail in skill specialization

46. A skill specialization breakout observed in some national classifications or their approved variants separates sales and service into two specializations. Such division can be problematic, however. The placement of, for example, workers engaged in selling services, or those providing a rental service through what resembles a sales transaction, is unclear. Such problematic issues should not be brought up to the top level of the classification.

Subsistence Farmers, Fishers, Hunters and Gatherers

47. Sub-major group 63, Subsistence Farmers, Fishers, Hunters and Gatherers was created in the absence of any other international statistical instrument to allow measurement of subsistence activity. The resolution concerning statistics of work, employment and labour underutilization adopted by the 19th ICLS restricts the concept of employment to any activity to produce goods or provide services for pay or profit, and defines three separate forms of unpaid work, namely own-use production work, volunteer work and unpaid trainee work. It recommends the regular production of statistics on subsistence foodstuff producers where relevant in the national context. This calls into question the need for ongoing identification of subsistence farmers, fishers, hunters and gatherers as a sub-major group in ISCO-08.

48. A possible option would involve deleting Sub-major Group 63 and removing the restriction to market-oriented production of the remaining sub-major groups in Major Groups 6, Skilled Agricultural, Forestry and Fishery Workers. The ISCO groups would thus be used to classify jobs and work activities in all forms of work. This approach was supported in comments received from the Food and Agriculture Organization of the UN. The impact would be small for most countries as this group is not always used in national adaptations of ISCO, but full consideration of the options would be necessary as part of a review of ISCO-08.

Company secretaries and corporate governance specialists

49. The Institute of Chartered Secretaries and Administrators has suggested the need for a separate category for chartered or company secretaries and corporate governance professionals. Company secretaries are currently classified in Unit Group 1211, Finance Managers. A number of commentators have observed that this treatment may be problematic. If there is a need for a separate category, the potential options would appear to be to create an additional unit group either in Minor Group 121, Business Services and Administration Managers, or in Minor Group 242, Administration Professionals. Since a number of countries have reported the numbers employed in these occupations are relatively small, it may be difficult to justify the creation of a separate unit group, however.

Occupations in health services

50. There is strong demand for more detailed and internationally comparable statistics on the health work force. This demand is fuelled by persistent concerns about severe skills shortages in some regions. Technological and scientific advances have also led to increasing complexity in several health occupations, and the emergence of new skills and new occupations, such as those in bio-medical engineering. This has resulted in the need for significant revision of the health-related occupations in ISCO. The known issues are presented briefly below.

Medical Doctors (Minor group 221)

51. Some users have identified the need for a further breakdown of specialist medical practitioners by specialty. This could be achieved by splitting Unit Group 2212, Specialist Medical Practitioners into several groups in line with current practice in the adaptation of ISCO-08 used in the WHO/OECD/Eurostat health work force collection. The groups of specialist medical practitioners separately identified in this collection are:

- General paediatricians
- Obstetricians and gynaecologists
- Psychiatrists
- Medical group of specialists
- Surgical group of specialists

- Other specialists not elsewhere classified⁹
52. Another possibility that might avoid the creation of groups that may be difficult to measure in sample surveys, due to small numbers, would be to split specialist medical practitioners into two groups, based on whether they specialize in a specific disease category, such as cardiologists or psychiatrists, or in particular groups of patients, such as paediatricians or specialists in community health.
53. In addition, there is a need to provide clarification for certain cases when there is uncertainty about which occupations should be classified as medical doctors. For example, the American Osteopathic Association has expressed concern that osteopathic physicians, also known as doctors of osteopathic medicine (DOs), are sometimes confused with osteopaths and incorrectly classified in Unit Group 2269, Health Professionals Not Elsewhere Classified. Since DOs are fully licensed physicians they should be classified in Minor Group 221, Medical Doctors. This issue not only potentially impacts on statistics on the health work force, but is also leading to difficulties in recognition of foreign medical qualifications in some countries.

Oral and maxillofacial surgeons

54. Representatives of oral and maxillofacial surgeons in Europe are dissatisfied with their inclusion in Unit Group 2261 Dentists. This is inconsistent with EU regulation which recognizes them as medical specialists. In North America and many other regions they are grouped with dental practitioners. Several ways to resolve this problem could be envisaged. These could include: (1) separate identification within minor group 221 Medical Doctors; (2) renaming of unit group 2261 to reflect the inclusion of oral and maxillofacial surgeons; (3) creation of a new minor group of Dental and Related Medical Specialists including a separate unit group for oral and maxillofacial surgeons, possibly including some other specialised dental occupations; (4) inclusion of the group without separate identification in Unit group 2212, Specialist Medical Practitioners; or (5) separate identification within Minor group 226 other Health Professionals.

Paramedical practitioners (Minor group 224)

55. There are concerns that the frequently overlooked but growing group of ‘accelerated medically trained clinicians’ (AMTC) are not sufficiently visible in ISCO-08, since the term ‘paramedical practitioners’ tends to be confused with emergency paramedics who are actually classified in Unit Group 3258: Ambulance Workers. This group of workers, who have various job titles in different parts of the world (clinical officer, physician assistant, clinical associate) are not fully qualified as medical doctors and provide medical services more limited in scope than those provided by doctors. They are considered to be critical contributors to the provision of health services in many countries, especially where shortages of medical doctors are acute.¹⁰

⁹ OECD 2012

¹⁰ Buchan J, Dhillon IS, Campbell J, 2017, Page 324.

56. Both the name and content of Minor Group 224 and its single unit group should be reviewed to improve the visibility of these workers. One possibility would be to move emergency paramedics from the category for ambulance workers and create separate unit groups in Minor Group 224 for emergency paramedics and for accelerated medically trained clinicians (or 'primary care paramedics'). Additionally, consideration could be given to moving some other groups into this minor group, such as physiotherapists, who are considered at least in some countries to be paramedical.

Medical technology

57. Several professional associations have raised strong concerns about the inclusion in minor group 321, Medical and Pharmaceutical Technicians, of several occupations that involve the use of medical technology for diagnosis and therapy. The concern is that classification of these occupations in Major Group 3 among technicians does not reflect their skill level. Minor group 321 includes the following unit groups:

- 3211 Medical Imaging and Therapeutic Equipment Technicians
- 3212 Medical and Pathology Laboratory Technicians
- 3213 Pharmaceutical Technicians and Assistants
- 3214 Medical and Dental Prosthetic Technicians

58. Depending on the discipline, some medical technologists are already classified in Minor Group 226, Other Health Professionals. Based on the information provided by the professional associations, research undertaken by the ILO, and comparison with recently reviewed national classifications, there is a clear case to move several of the occupations currently classified as medical and pharmaceutical technicians to Major Group 2, Professionals. This is due to increases in skill levels and required qualifications as a result of advances in technology.

59. The occupations and job titles concerned include the following

- Diagnostic medical radiographer
- Magnetic resonance imaging technologist
- Mammographer
- Medical radiation therapist
- Nuclear medicine technologist
- Radiographer
- Radiotherapist
- Sonographer
- Orthotist
- Prosthetist

60. The term 'medical technologist' is also frequently used to refer to health professionals involved in analysis and testing of bodily fluids and tissues. They are responsible for operating and maintaining complex equipment used in laboratories and for ensuring the test results of each patient are accurate and timely. More precise terms such as 'medical laboratory scientist', 'biomedical scientist', 'clinical laboratory scientist' and 'medical

laboratory technologist' are also used for this relatively new and rapidly growing occupational group. Depending on the job title used these jobs may currently be classified in ISCO-08 either in Unit Group 2131, Biologists, Botanists, Zoologists and Related Professionals, or in 3212 Medical and Pathology Laboratory Technicians.

61. Based on the level of formal qualifications required and the nature of the work performed, there appears to be a clear need to differentiate this group from both laboratory technicians and life scientists involved in research. The work performed would appear to be significantly more complex than that performed traditionally by medical and pathology laboratory technicians. The term 'medical and pathology laboratory technologists' could potentially be used as the title of a new unit group that would include these workers.
62. Several possible ways of dealing with these issues could be envisaged. One approach would be to create a new minor group for medical technologists in Major Group 2 Professionals. If such a new minor group were added, the last two minor groups of Sub-major group 22, Health Professionals, might look something like the following:

226 Medical Technologists

- 2261 Radiographers and Related Medical Imaging and Therapeutic Technologists
- 2262 Medical and Pathology Laboratory Technologists
- 2263 Audiologists and Speech Therapists
- 2264 Optometrists and Ophthalmic Opticians
- 2266 Prosthetists and Orthotists
- 2269 Other Medical Technologists

227 Other Health Professionals

- 2271 Dentists
- 2272 Pharmacists
- 2273 Environmental and Occupational Health and Hygiene Professionals
- 2274 Physiotherapists
- 2275 Dieticians and Nutritionists
- 2279 Health Professionals Not Elsewhere Classified

63. If this approach were taken there would also be a need for revision of the unit groups in the current minor group 321, Medical and Pathology Technicians. It seems likely, however, that employment in less complex jobs classified in these groups will continue to exist in significant, although possibly reduced numbers. At the very least the definitions and lists of occupations included would need to be reviewed to exclude those occupations moved to the proposed new group.

Nursing and midwifery

64. There is a need to review the various categories in ISCO-08 related to nursing and midwifery in order to determine the need for additional detail to identify specialized nurses and the increasingly important group of advanced nurse practitioners. There is also a need to identify qualified associate professional midwives separately from uncertified traditional

midwives. The latter distinction is needed for several important analytical reasons, including to support the production information on qualified birth attendance.

Engineering Professionals (Excluding Electrotechnology) and Electrotechnology Engineers

65. In ISCO-08, the minor groups for engineers are split into 214 'Engineering Professionals (Excluding Electrotechnology)' and 215 'Electrotechnology Engineers'. This creates boundary issues for cross-discipline engineering occupations. In some national occupation classifications (for example the Canadian NOC 2016, United Kingdom SOC 2010, and the US SOC 2018) engineers are not delineated into such minor groups.

Information and communications technology specialists

66. An updated and expanded set of categories was provided in ISCO-08 for occupations involved in the provision of goods and services in information and communications technology (ICT). These categories reflected the rapidly evolving occupational structures that emerged during the revolution in ICT that occurred during the twenty years following the development of ISCO-88. There is concern, however, that the boundaries between some of the categories are blurred and that jobs may frequently be classifiable to several different groups, in a sector whose occupational structures and skill requirements remain fluid.
67. There may, for example, be a need to determine whether an increasing number of jobs in ICT referred to as "architects" (enterprise architect, solutions architect, software architect, network architect, systems architect ...) are adequately covered by the existing unit groups or reflect new or emerging occupations.
68. ICT security occupations are also increasingly common due to the rise in cyber security incidents. There may be a need to create a unit group for ICT Technology Security Specialists to accommodate jobs such as Cyber Risk/Compliance Analyst/Manager, Penetration Tester/ Manager, Security Operations Analyst/ Manager, Cybersecurity Investigator/ Manager, Security Engineer/Architect.
69. Several other occupations involving the use of ICT to extract or structure information, such as data scientists, data engineers and data miners are not adequately dealt with in ISCO-08, and are classified inconsistently elsewhere. The US SOC 2018 classifies 'Data scientist' under 15-2000 'Mathematical Science Occupations', Whereas the classification of European Skills/Competences, Qualifications and Occupations (ESCO) classifies 'Data scientist' under ISCO-08 unit group 2511 'Systems Analysts'. There is therefore a need for consistent definitions of data scientist and data engineer and also a discussion and agreement on whether they differ from existing occupations (e.g. Statisticians, Data Analysts, Systems Analysts), and therefore require separate unit group codes.

Social media and e-commerce

70. There may be a need to determine whether new social media occupations are emerging at the boundary between ICT and the world of marketing and advertising (search engine optimization (SEO) specialist, SEO strategist, on-line community manager, blogger,

vlogger, growth hacker) and in e-commerce, or whether these are specializations of existing occupations.

Delivery workers and mail carriers

71. There are increasing numbers of workers, many of whom may be self-employed, who delivering goods for intermediary companies utilizing various transportation equipment (cars, motorcycles, bicycles, e-scooters or other personal mobility devices).
72. With greater automation, the tasks listed for ISCO-08 4412 'Mail Carriers and Sorting clerks' can also be carried out by delivery workers. Hence, there are not many differences in terms of the tasks and duties between workers that deliver for postal offices (which are coded to major group 4) and workers that deliver goods on bicycles or motorized vehicles (which are classified under major groups 8 or 9). Both mail carriers and delivery workers could utilise different modes of transport to deliver their mail and goods depending on traffic conditions. There is therefore a need to review the categories for these groups of workers.

Home improvements installers

73. Jobs that involve installation of things like blinds, curtains, awnings, prefabricated doors and windows currently have to be included either (1) with the closest trade occupation (for example door installers could be included in Unit Group 7115, Carpenters and Joiners), (2) in the residual Unit group 7119, Building Frame and Related Trades Workers Not Elsewhere Classified, or (3) in Unit Group 9313, Construction labourers. None of these options is satisfactory. Grouping of these jobs with specific trades is misleading as they do not perform the full range of tasks, although generally falling within the very broad Skill Level 2. Inclusion of these jobs in Unit Group 7119 is problematical as these workers are not concerned with building frames. Including them in Unit Group 9313 does not appropriately reflect their skill level.
74. Within the current skill level framework, the problem could be resolved by the creation of either a specific unit group or a residual category in Minor group 712, Building Finishers and Related Trades Workers. A global resolution of the problem with the breadth of Skill Level 2, as discussed above, would offer more satisfactory options.

Vehicle mechanics and accessory fitters

75. Occupations such as tyre fitter that do not require full trade qualifications have to be classified in Unit group 7231 Motor Vehicle Mechanics and Repairers. This is a similar problem to the one described above for home improvements installers. It could be resolved by the creation of a separate unit group in Minor group 723, Machinery Mechanics and Repairers. Some national classifications already provide a category for this group. For example, the United Kingdom Standard Occupational Classification has a category entitled 'Tyre, exhaust and windscreen fitters'

Trades Assistants

76. Trades assistants are workers who provide assistance to and work under the direction of printers, mechanics, telecommunications technicians and electrical tradespersons. They are currently likely to be included either in Unit group 9329, Manufacturing Labourers Not Elsewhere Classified, or in Unit group 9629, Elementary Workers Not Elsewhere Classified. Neither of these solutions is satisfactory. Depending on national practices, some of these occupations may currently be classified with the relevant trade or craft in Major group 7, however. The problem could be addressed by expanding the scope of Minor Group 932 Manufacturing Labourers, changing its name, and adding one or more new unit groups.
77. It would be important, however, to clarify the distinction between apprentices, who may frequently perform similar tasks to trades assistants, and those not undertaking the work as part of a training programme. In ISCO-08 apprentices are generally classified in the occupation for which they are training.

Armed forces

78. The scope of Major Group 0, Armed Forces Occupations, was discussed during the development of ISCO-08 and remains problematical. There is a range of national practices with respect to the classification of occupations that are specific to the military and jobs in the armed forces that are similar to civilian jobs. In many countries, it is not possible to collect information on the nature of the work performed by members of the armed forces and all have to be classified together.
79. In view of the significant variations in national practice there would be a need to re-open the discussion on the treatment of jobs in the armed forces in the context of a review of ISCO-08, including the ongoing need for a separate major group for the armed forces. For example, should Major Group 0 only include core military staff who perform typically military tasks, or also other jobs undertaken by members of the armed forces such as medical doctors, kitchen staff, truck drivers, human resource officers, operators of electronic military equipment; or should those occupations that have equivalents in civil life be classified together with the civilian equivalent, outside Major Group 0? Should military personnel who are mainly engaged directly in combat, or readiness for combat, be classified in a separate unit group along with other protective services workers, with whom they have skills in common? It is interesting to note here that Statistics South Africa has placed military occupations with service workers in their adaptation of ISCO, SASCO-08.

Occupations likely to be classified at the wrong skill level

80. Comparison of ISCO-08 with recently reviewed national classifications that use skill level as a classification criterion suggests that a significant number of occupations are no longer classified at the appropriate ISCO-08 skill level. In all cases further investigation would be needed to determine the most appropriate skill level of each occupation for international purposes.

Skill level too low

81. This comparison suggests that, in addition to those mentioned above, at least the following occupations *may* be classified at too low a skill level in ISCO-08:

Major group 3

- Marine surveyors
- Ship's engineers
- Ships deck officers and pilots
- Aircraft pilots
- Health records managers
- Securities and finance dealers and brokers
- Valuers
- Trade brokers
- Casting and literary agents
- Interior designers
- Stage managers
- Webmasters
- Cinematographers

Major group 4, Clerical Support Workers

- Accounting and bookkeeping clerks
- Statistical, finance and insurance clerks
- Payroll clerks
- Library clerks
-

Major Group 5, Services and sales workers

- Museum interpreters (guides), museum educators and historic site interpreters (guides)
- Cooks
- Embalmers
- Horse trainers
- Driving instructors
- Shop supervisors
- Fashion and other models
- Merchandisers
- Exam invigilators
- Firefighters
- Game wardens
- Lifeguards
- Day-care workers

Major Group 8, Plant and machine operators, and assemblers

- Miners and quarriers
- Well drillers and borers
- Stationary engineers, boiler operators and steam plant operators
- Locomotive engine drivers
- Logging machinery operators
- Crane operators

Skill level too high

82. The comparison also suggests that, in addition to those already discussed, the following occupations may be classified at too high a skill level in ISCO-08:

Major group 4, Clerical Support Workers

- Telephone switchboard operators
- Survey and market research interviewers
- Mail carriers and sorting clerks
- Filing and copying clerks

Major Group 5, Services and sales workers

- Domestic housekeepers
- Street food salespersons
- Door-to-door salespersons
- Security guards

Major Group 8, Plant and machine operators, and assemblers

- Laundry machine operators
- Wrapping, packing and labelling machine tenders
- Car park attendants and parking valets
- Cable car operators, ski lift operators, merry-go-round operators and roller coaster operators

Outdated group definitions

83. Many of the definitions of occupational groups in ISCO-08 have become outdated due to technological change and other factors. The ILO has received requests from a number of professional associations to update the definitions for certain occupational groups. For example, the International Federation of Landscape Architects has advised the ILO that the definition of Unit Group, 2162 Landscape Architects does not reflect everyday occupations of landscape architects across the world and has proposed a revised definition for this unit group.

Green economy

84. There is a need to investigate the possible emergence of new skills and new occupations or specializations related to climate change and the 'green' economy, such as those related to the use of renewable energy.

4 Recommendations

85. Taking the known specific issues into consideration, each of the approaches that could be taken to address the problems with the application of skill level that were presented to the 19th ICLS has some advantages and disadvantages.

86. The first option, moving the boundary up between Skill Levels 1 and 2, would allow the occupations listed in paragraph 82, as well as those such as vehicle accessory fitters, home improvements installers and trades assistants and possibly a number of others, to be

classified at Skill Level 1. It would address some but not all of the concerns about the breadth of Skill Level 2 and the heterogeneity of classes in Major Groups 4, 5, 6, 7 and 8.

87. The boundary between Skill Levels 1 and 2 was originally set low for a reason, however. For many of the occupations at Skill Level 1, basic literacy and numeracy skills may not be essential, and at least in many developing countries can provide employment for those who have not completed the first stage of basic education. The consequences of moving this boundary would be that occupations that do require basic numeracy and literacy (e.g. basic sales, clerical and accessory installation occupations) would be classified at Skill Level 1. There would therefore need to be further investigation of the implications in some countries for things like analysis of occupational outcomes as a return to education.
88. The second and third options, which both involved splitting Skill Level 2 to create 5 skill levels, would allow the upper boundary of Skill Level 1 to remain low. The second approach, which applied the skill level criterion only at unit group level, would allow the existing familiar and relatively intuitive major group structure to be retained if desired. Aggregate groups could remain relatively homogeneous in terms of skill specialization but would continue to be heterogenous in skill level. However, compilation and analysis of statistics by skill level would require reaggregation of unit group data.
89. Option 3 has the advantage that each major group would only be at one of the 5 skill levels, but the existing familiar major group structure would have to change. There would need either to be an increase in the number of major groups, which could be problematic for the publication of summary data from household surveys with small samples, or else some of the major groups would be relatively heterogenous in terms of skill specialization.
90. Skill level is also a difficult concept to measure and implement consistently at the international level, since educational requirements may vary between countries for the same occupational groups, and the pathways for the acquisition of skills vary greatly. In adapting ISCO-08 for national use, some countries already need to make adjustments to ISCO skill levels to better align them with national qualifications frameworks, especially in relation to vocational education and training. The larger the number of skill levels, the more complex this would become in terms of both the design of the classification, and implementation at national level. For all of these reasons there may be significant difficulties with the creation of a fifth skill level.
91. The fourth option of moving the boundary between Skill Levels 2 and 3 would allow many of the problems of convergence between technical occupations and installation and repair occupations to be addressed. Even without moving the boundary between Skill Levels 1 and 2, the excessive heterogeneity in skill level within classes classified at Skill Level 2 could be addressed at least in part. Without a more thorough consideration of the concept of skill level itself, however, it would be difficult to address the problems with skills associated with supervision and the operation of businesses discussed in the previous section.
92. Based on these observations and the review and comparison made between ISCO-08 and selected national classifications, conducted by Dr Mair, the following recommendations can be made concerning the specific known issues that need to be addressed:

- (a) **ISCO unit groups should be reviewed to address gaps and reduce internal skill level heterogeneity.** Further analysis of national classifications, particularly from developing countries, should be undertaken to identify any additional gaps.
- (b) **The skill level placement of classes should be reviewed.** Comparisons to national classifications suggest that there is significant scope for moving individual classes between skill levels, as they are currently defined. This will become even more true when problems of internal skill level heterogeneity are reduced and the resulting new classes can be placed at the appropriate skill level. The review of skill level placement should take into consideration changes in both job content and formal educational requirements.
- (c) **Four skill levels should be maintained; a fifth level should not be defined.** If the skill level dimension of an occupation classification is not developed clearly, relevant to contemporary circumstances in all parts of the world and applied consistently, data based on the classification will be less useful. It is also the more difficult dimension to implement consistently. It is with that in mind that the recommendation is to limit the number of skill levels and focus on their conceptual clarity, their analytical utility and their potential for consistent application in both the defining of occupational classes and in the coding of survey responses.
- (d) **The breadth of skill level 2 should be addressed by adjusting the boundary between skill levels 2 and 3.** Extensive vocation-specific training undertaken after secondary education completion is more appropriately placed in skill level 3, as exemplified in the Canadian NOC. In addition to consideration of changes in formal educational requirements, a more consistent focus on amount of learning rather than location of learning is recommended. Consideration of experience required, structured post-employment training, and possibly other criteria in defining levels 2 and 3 could also narrow the range of coverage of skill level two. The definitions used for related skill levels in the Canadian NOC could be considered for adaptation.
- (e) **Skill level should be given primacy over skill specialization.** Classes should first be homogeneous on skill level; skill specialization should then be as homogeneous as possible given that constraint and the need for classes to have an adequate minimum size to support their implementation in published data.
- (f) **Skill specialization should be recognized as a separate dimension.** Since many occupations at different skill levels have similarities in skill specialization, options for flexible or polyhierarchical aggregation of data based on skill specialization, or other characteristics of skills, should also be taken into consideration.
- (g) **It would be desirable to have only one skill level within each major group.** Given that skill level alone would define only four classes at the highest level of aggregation, additional breakout within skill level by broad categories of skill specialization would be appropriate to provide greater detail for the analysis of highly aggregated data. Not all skill levels would require or support such breakout.

- (h) **More highly aggregated data should be homogeneous on skill level** so that it may be maximally useful for analysis.
- (i) **Experience should be considered as an independent dimension of skill level** as part of the redefinition of ISCO's skill levels in order to reduce the skill range within certain levels. Emphasis should be on the nature and complexity of the tasks a person is capable of performing after having gained a sufficient amount of experience. This could also provide a basis for the identification and placement of additional supervisory classes.
- (j) **Recognition of structured post-hiring training periods should be expanded** in order to more accurately reflect skill levels in certain occupations, where tasks with a higher degree of complexity can be performed as a result of the training.
- (k) **Skill level definitions should include alternative sets of criteria** for an occupation's inclusion to incorporate experience and post-hiring training, as well as level of formal education aligned with ISCED 2011, where appropriate.
- (l) **Supervisors should be consistently identified and placed at an appropriate skill level.** Supervisors of lower skill occupations may well be placed at a higher skill level than that of the workers they supervise due to the additional experience required and the performance of additional tasks that may be more complex. A description of tasks characteristic of the supervisor is needed for each skill level at which they are found, in order to determine the appropriate skill level for specific supervisory groups based on the tasks performed.
- (m) **Splitting sales and service occupations at the major group level is not recommended.** The placement of, for example, workers engaged in selling services, or those providing a rental service through what resembles a sales transaction, is problematic. Such issues should not be brought up to the top level of the classification.
- (n) **The treatment of owner-operators of businesses should be reviewed,** especially for those who perform management functions as well as line tasks. This could provide a basis for consistently extracting from Major Group 1, Managers, those whose presence there currently requires the use of both skill levels 3 and 4 for Management. Variation internationally in the handling of shopkeepers, bed and breakfast operators and small farmers illustrates this problem.

93. In its formal response to the preliminary draft of this document, the UN Expert Group on International Statistical Classifications stated that it:

- *reaffirms its recommendation that a full revision of ISCO take place, as documented in the Final Report, Meeting of the Expert Group on International Statistical Classifications, September 2017;*
- *reaffirms its recommendation that a working group of experts on occupation and classifications be set up as soon as practicable following the 20th ICLS to commence the revision of ISCO, as documented in the Final Report, Meeting of the Expert Group on International Statistical Classifications, September 2017;*

- *agrees in principle to the specific recommendations made in the preliminary consultation document for the 20th ICLS;*
- *endorses the conclusions presented in the preliminary consultation document for the 20th ICLS;*
- *notes that whilst the preliminary consultation document for the 20th ICLS lists specific issues that should be addressed in the revision of ISCO-08, that the revision is not limited to addressing just those issues as there are wider problems facing ISCO, including but not limited to skill level mismatches;*
- *encourages the ILO to ensure that the revision and implementation of ISCO is completed well in advance for the 2030 global round of censuses;*
- *encourages the ILO to explore new and innovative methods for classifying occupations such as a skills framework, or similar approaches as proposed for the review of the ICSE*

5 Conclusions

94. In the ten years since ISCO-08 was adopted it has served the international community well and has been widely adopted. Issues related to the definition of skill level used in ISCO-08 and its application as a classification criterion are increasingly impacting the usefulness of the classification for some of its main analytical purposes, however.
95. Skill level is a key dimension of occupational classification. It provides the basis for production of data that can be used to address a myriad of important analytical and policy questions, including those concerning skill mismatch. The following specific issues with the definition of skill level and its application in ISCO-08 have been identified:
- (a) convergence between occupations in Major Group 3, Technicians and Associate Professionals and Major Group 7, Craft and Related Trades Workers;
 - (b) convergence between occupations in Major Group 3, and Major Group 2 Professionals;
 - (c) excessively high internal skill level heterogeneity for many unit groups at Skill Level 2 and for some at Skill Level 3;
 - (d) inadequate recognition of skill obtained through experience, especially in relation to supervisory occupations and the operation of small businesses;
 - (e) general changes in skill levels across the major groups due mainly to technological change;
96. These issues require a comprehensive consideration of the concept of skill level and its use for the design of the classification. While elements of the four options discussed at the 19th ICLS would need to be taken into consideration, none of these options would allow the full range of issues to be addressed.

97. More general occupational change driven by technological developments is also having an increasingly significant impact. As a result, there is a significant and growing number of cases where:
- (a) a need has been identified for more detailed categories;
 - (b) the treatment of particular occupational groups is inadequate due to technological change and the emergence of new occupations;
 - (c) specific occupations are classified at an inappropriate skill level;
 - (d) occupation descriptions are out of date and need to be updated.
98. Taken together the issues summarized above are already having a significant impact on the relevance of ISCO-08 for measurement and analysis of at least the following:
- (a) the supply of skilled workers and skill mismatch;
 - (b) the health work force;
 - (c) occupations related to ICT;
 - (d) maintenance and repair of machinery.
99. These issues also have significant consequences when national classifications based on ISCO are used in non-statistical applications such as matching job-seekers with job vacancies, career guidance, management of employment-related migration, establishing rates of pay, and educational planning. In all of these types of application, the classifications used for these purposes need to be aligned with the classification system used for statistical purposes as part of an integrated occupational information system.
100. The Office is aware of the costs that would be entailed by a major revision, in terms of time-series breaks, and investment in updating national data systems and classifications, as well as the costs and time required for completion of a major revision. This fact should be considered in the forthcoming activities towards a revision of ISCO.
101. In reviewing a preliminary draft of this paper, experts on occupational classification from around the world were strongly supportive of the need for revision of ISCO-08 to start as soon as possible and to be completed in time to allow implementation to coincide with the 2030 global round of censuses.
102. There was broad agreement with the recommendations on specific issues listed in the previous section. It was stressed, however, that work to revise ISCO should not be limited to these issues, and that a broader conceptual framework for skills and jobs might provide a range of options for the aggregation and analysis of occupational data. Alternative classification hierarchies, as used in the Canadian NOC and in the revision of the International Classification of Status in Employment, or other innovative approaches should therefore be explored
103. There was also a concern that rapid technology-driven changes in the skill requirements for particular occupations and jobs, might mean that there could quickly be a perception

that some occupations are at the wrong skill level, as has been the case with ISCO-08. Some of the comments suggested that there is a need for a fundamental rethink of the way skill is applied in the design of the classification. It was noted that several countries apply skill level in their national occupation classifications in a more granular or flexible manner than in ISCO-08. Some experts therefore questioned the relevance of skill level, at least as it is currently conceived, as the overriding criterion at the top level of the classification.

104. In conclusion we make the following key recommendations:

- (a) Work should start on a revision of ISCO-08 as soon as practicable and pending resources following the 20th ICLS,
- (b) The revision work should not be restricted to the existing conceptual model and classification structure, while respecting, to the extent possible, the need for continuity in time series statistics.
- (c) The ILO should be supported in the revision by a working group made up of experts on occupations and classification from all regions of the world, as recommended by the United Nations Expert Group on International Statistical Classifications.
- (d) The working group should give detailed consideration to each of the recommendations listed above in paragraph 92 but should not be constrained to consider only these issues, and should consult with a wider group of experts and countries.
- (e) The work, for which dedicated resources should be identified by the ILO and main partners, should be completed within a timeframe that would enable implementation of a revised ISCO to begin in time for the 2030 global round of censuses.

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