UNSCAR’s Global Survey on Radiation Exposure towards Better Understanding Exposure Levels and Further Improving Health Effects Assessment

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The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) was established by the United Nations General Assembly in 1955 to assess and report levels and effects of all sources of ionizing radiation for human and the environment.1) UNSCEAR conducts regular surveys of radiation exposure worldwide. Over the past 67 years, UNSCEAR has collected and analysed data relating to the sources, levels and trends of exposure of the public, workers and patients. These analyses have been reported to the United Nations General Assembly, and subsequently published in hard copy as well as electronic copy available on UNSCEAR website for free downloading.2) National and international organizations use and refer to these publications as scientific underpinning of radiation health effect assessment and management programmes. The publications are also widely used as reference material for researchers, students and government advisory bodies across the world. Interestingly, scientific annexes on sources of exposure appear to be more popular than those on effects of exposure (as indicated by numbers of downloads from the UNSCEAR website).

UNSCAR systematically collects information obtained through population-based surveys on the use of radiation in medicine, at workplaces and in the environment. With the UNSCEAR medical exposure survey data covering the period 2009–2018, the most recent evaluation of medical exposure to ionizing radiation was completed in 2020 as annex A of UNSCEAR 2020/2021 Report.3) In summary, medical exposure is the largest human made source, e.g. in the period 2009–2018, about 4.2 billion medical radiological examinations were performed annually. Conventional radiology (excluding dental examinations) accounts for 63 per cent of procedures and 23 per cent of the collective effective dose. Dental radiology accounts for 26 per cent of procedures, but only 0.2 per cent of the collective effective dose. Computed tomography makes the largest contribution (about 62 per cent) to the collective effective dose but accounts for only about 10 per cent of all procedures. Interventional radiology accounts for only 0.6 per cent of all procedures but contributes 8 per cent of the collective effective dose. Diagnostic nuclear medicine accounts for about 1 per cent of all procedures and about 7 per cent of the collective effective dose. The Committee underlined that the compilation of a global assessment of medical exposure was a complex task and relied on the collection of quality-assured data from Member States. It also pointed out that as of 30 September 2019, 58 countries had submitted data on medical exposures. As national surveys of medical exposure require adequate planning and significant time and resources, the Committee recommends the use of its survey questionnaires to collect such information on a regular basis.

The most recent evaluation of occupational exposure to ionizing radiation was completed in 2021 as annex D of UNSCEAR 2020/2021 Report.3) The associated survey data covered up to 2014. About 52 per cent of workers were employed in the sectors that involve exposure to natural sources of radiation and about 48 per cent were employed in sectors that involve exposure to human-made sources of radiation. The average annual effective dose for the period 2010–2014 for all human-made sources was about 0.5 mSv; a substantial decrease from 1.7 mSv some 40 years ago. The worldwide average annual effective dose for all

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workers during the period 2010–2014 was estimated to be around 1.2 mSv—about two thirds of the value estimated for the period 1995–1999. The annual effective dose was estimated to be around 2.0 mSv for workers exposed to natural sources and 0.5 mSv for workers exposed to human-made sources. The results clearly indicate that radiation protection is equally important in industries involving natural occurring radioactive materials as in nuclear industry. However, data for non-nuclear industries submitted to UNSCEAR survey are very limited\textsuperscript{4)} and require further attention in the future.

In addition to the data from the UNSCEAR Global Surveys, the analysis presented in the 2020/2021 Report on medical and occupational exposures was complemented by the literature review to more recent years. The report on occupational exposure reviewed a total of 692 articles while a total of 640 articles were reviewed when developing the report on medical exposures. Many of those identified and high-quality articles are research products of dedicated health physicists.

UNSCEAR regularly collects and analyses data, inter alia, on global and regional exposures of the public to ionizing radiation from natural and other sources. After publication of UNSCEAR 2008 Report,\textsuperscript{5)} at its 67th session in 2019, the Committee decided to update this evaluation of public exposures taking into account recent developments and to cover the period 2007 to 2020. The new Global Survey of Public Exposure to Ionizing Radiation launched in 2021 is aimed to identify and analyse latest scientific data, temporal trends, geographical patterns and environmental features worldwide. I am confident that health physicists will continue to play an important role in the new project on the evaluation of public exposure to radiation.

Radiation health physicists have made significant contribution in better understanding exposure levels and further improving health effect assessment. All of our work is of great public interests. It is the demands from the public that power our research and also direct where our research should focus on next. As health physicists, we are the professionals having the privilege to serve the public. Our success depends on carefully listening to the public and effectively communicating the findings to the public in the language of common understanding.

REFERENCES

4) The Committee noted that in total not more than 57 Member States had submitted data for the UNSCEAR Global Survey of Occupational Radiation Exposure.