

Resolution of Public Consultation Comments for

## ***ICRP Publication 152: Radiation Detriment Calculation Methodology***

Annals of the ICRP 51(3) 2022

### **Background**

ICRP is grateful for the time and effort taken to review and comment on the draft of this publication during the public consultation period. Active public consultations are a valuable part of developing high-quality publications. Comments are welcome from individuals and organisations, and all are considered in revising the draft prior to publication.

To ensure transparency, comments are submitted through the ICRP website and visible by visiting [www.icrp.org](http://www.icrp.org).

This document summarises the general themes of the comments and how they were considered during preparation of the final report for publication.

### **Public Consultation**

This draft report was available for public consultation from 30 January 2020 to 5 June 2020. The following individuals and organisations provided comments: Ashwini Sathnur; Department of Crisis Management PACR in Prague; Sukhi; German-Swiss Association for Radiation Protection; Jaiki Lee; Roger Coates; Aaron Datesman; German Commission on Radiation Protection; Global Research for Safety (GRS) CRIEPI, Japan; RIVM and ANVS; EuroSafe Imaging; German Federal Office for Radiation Protection; Swiss Federal Nuclear Safety Inspectorate ENSI; Beyond Nuclear, Nuclear Information and Resource Service; IRSN; ENISS; Graham Smith; Argentine Radiation Protection Society (SAR); Sneha Chandrasekhar; Federal Office of Public Health, Switzerland; SUBI; Shinichiro Miyazaki; American Association of Physicists in Medicine; Canadian Nuclear Safety Commission; Michael Boyd and Nuclear Energy Agency (NEA).

### **Resolution of Comments**

#### Scope and objective of publication

Some commented that the purpose of the document was not clear. There was even a comment questioning its necessity as an official ICRP document. Now the scope and objective have been explicitly stated in Section 1 to clarify that this publication constitutes part of the ongoing review of the system of radiological protection. It is intended to form the basis for open and transparent discussions towards the update of the Commission's Recommendations.

There were suggestions that a comprehensive review should be provided for the issues related to future improvement, such as the dose and dose-rate effectiveness factor (DDREF) and non-cancer effects. Although such a review is necessary and important, it is beyond the scope of this publication. The Commission has launched several Task Groups and Working Parties for in-depth discussions on these issues.

#### Caution against misuse of radiation detriment

A considerable number of comments pointed out the need to clarify how radiation detriment is intended to be used and what its limitations are. Behind these comments is a recognition that radiation detriment is not easy to understand and is often misunderstood or misused. In particular, there is a situation where the radiation detriment as well as the nominal risk is used to project the number of cases of cancer or heritable disease among a large number of people who are exposed to very small doses. It was requested to give a caution against this kind of use and to specify the dose range at which radiation detriment can be used. There were also comments that clear distinction should be made between the effect attribution at high doses and risk inference at low doses.

To address these comments, a paragraph has been added in Section 1, which emphasises that the calculated values of radiation detriment are inferences for radiological protection purposes. In addition, the applicable dose/dose-rate range of radiation detriment has been discussed more clearly in relation to the applicable range of the DDREF. The discussion also takes into account the applicability and limitations of effective dose from the viewpoint of risk assessment in the recently issued *Publication 147*.

#### Update of nominal risk calculation

The draft report was criticised for failing to elaborate the calculation of leukaemia risk, which had not been detailed in *Publication 103*. However, after a further look at available information, the issue has been resolved. The finalised document includes full details of leukaemia risk model and the calculation using it.

In parallel, it was found that the maximum age at exposure and the maximum attained age for risk calculation in the draft report were not the same as those in *Publication 103*. There was also a discrepancy in mathematical formulation of the risk model for female breast. Sections 3 and 4 have been updated to correct these points.

Furthermore, it was found out that there were programming errors in the nominal risk calculation for the working-age population in *Publication 103*. However, the Commission's recommendations are kept unchanged because the impact of the miscalculation is considered to be limited.

#### Significance of severity adjustment

There were comments that questioned the significance of severity adjustment. It was also proposed to use the mortality risk without adjustment, since it would be simple, robust and easily understood, and would increase comparability with risks from other hazards. This argument makes sense for cancers with high case fatality rates. However, mortality risk does not allow for non-fatal cases that are common in some cancer sites. As diagnostic and

therapeutic techniques advance, cancer survival rate will become higher, and it will be more important to take into account non-fatal cancers. The Commission considers that efforts should be continued to better quantify the overall burden from radiation exposure based on the original concept of detriment. This point has been explicitly stated in Section 5.

#### Other points

There were complaints that ambiguity still remained despite the detailed description of the procedure for radiation detriment calculation. To make it more understandable and reproducible, Section 3 has been totally revised, and additional data necessary for the calculation were provided in Annex A.

It was pointed out that the series of analyses in Section 4 should be called not a "sensitivity analysis", but a "selected sensitivity analysis". The reason for this was because the possible range of variation was not considered for each parameter. This suggestion was accepted, and it has been emphasised that the analysis is intended not to be a comprehensive uncertainty assessment, but to be illustrative of the potential impact of the various factors involved in the calculation of radiation detriment. The structure of Section 4 has also been revised to clarify the overall picture of the analysis and to highlight the points that will need to be discussed in the future.

In relation to the historical review of radiation detriment, it was suggested that the values of radiation detriment could be compared between Publications to discuss the causes of the difference. This suggestion was considered helpful, and the radiation detriments in past Recommendations have been tabulated together with key features of calculation methodology in an introductory part of Section 5.