Comment on the ICRP draft document on "Radiation Detriment Calculation Methodology"

by the German Federal Office for Radiation Protection

We greatly appreciate the draft on „Radiation Detriment Calculation Methodology" and regard it as a very helpful explanation of the Detriment concept. However, in our opinion some aspects of the explanation could be improved.

General aspects

1.) (81) Basic formula of the calculation of radiation detriment:
D = [R x k + R x (1-k) x q] x l

The non-lethal risk R x (1-k) is multiplied by the factor l (factor for adjustment for years of life lost) as well as the lethal risk R x k. Further explanation is needed why you adjust for years of life lost also for people who do not die from this cancer.

2.) (81) Basic formula of the calculation of radiation detriment:
D = [R x k + R x (1-k) x q] x l

Only the non-lethal risk R x (1-k) is multiplied by the factor q (adjustment for quality of life). The lethal risk R x k is not multiplied by q. This can be understood that pain, suffering and any adverse effects of cancer treatment can only occur to people who do not die from this cancer. Further explanation for this assumption is needed.

3.) Section 3.1. Nominal risk calculation
It would be helpful, if the subsections 3.1.1 - 3.1.7 correspond exactly to the steps of the nominal risk calculation in Fig. 3.1 and to the steps in the executive summary (d).

4.) Section 3.1. Nominal risk calculation
It is not always clear in which step which reference population is used to calculate the specific rates/risks/functions (e.g. baseline cancer rates, LBR, ERR, lifetime excess risk, …). Example: (30) „An unweighted average of the Asian and the Euro-American data was calculated to form a composite **population.** The aim was to compile rates for representative **populations** in different parts of the world." Do you calculate an average for the Asian data and an average for the Euro-American data? Or one average of all data (Asian and the Euro-American data together)? This average seems to be an average for men and women together. But the following risks/functions are calculated separated by sex. Is this correct?

5.) Executive summary (d), 4th bullet point:
„The risk of exposure-induced cancer incidence (REIC) is calculated for an acute exposure of 0.1 Gy and multiplied by 10 to obtain the lifetime risk at 1 Gy for each cancer site." This calculation is based on the linear no threshold assumption. This is assumed only for solid cancers but not for leukemia (linear-quadratic model). How do you calculate the REIC at 1 Gy for leukemia?

6.) (62) „**Empirical studies** show that biological effectiveness of radiation exposure at low doses and low dose rates is usually lower compared with exposures at high doses and high dose rates, suggesting that dose-specific estimates based on high-dose, acute exposure data should be divided by a DDREF for applications to low-dose, continuous, or fractionated exposures."
Please add source information for „empirical studies".

7.) (73) Lethality fractions: „They were updated in Publication 103 (ICRP, 2007)". Please add some information which data have been used for this update.

8.) (75) Formula $q = k + q_{min} \times (1-k)$
Further explanation for this assumption is needed.

9.) (76) The value of q_{min} was set equal to 0.1
Further explanation for this assumption is needed.

Formal aspects

10.) (30)+(31): Section 3.1.1.1 deals with the computation of baseline incidence risks as well as section 3.1.1.2. Could these paragraphs be merged?

11.) Table 3.2 and Table 3.3: What is „x"?

12.) (113) Please substitute „XXX" by the corresponding number.