

**Table 21-20. NOMINAL PROBABILITY COEFFICIENTS AND TISSUE WEIGHTING FACTORS FOR INDIVIDUAL TISSUES AND ORGANS\***

TISSUE OR ORGAN	CANCER LETHALITY FRACTION <i>K</i>	NOMINAL PROBABILITY COEFFICIENT ( $10^{-2} \text{ Sv}^{-1}$ )				TISSUE WEIGHTING FACTOR <i>w<sub>T</sub></i>
		WHOLE POPULATION		WORKING POPULATION		
		<i>Fatality coeff F</i>	<i>Weighted effect coeff F (2-K)</i>	<i>Fatality coeff F</i>	<i>Weighted effect coeff F (2-K)</i>	
Bone marrow <sup>†</sup>	0.99	0.45	0.91	0.36	0.73	0.12
Bladder	0.50	0.20	0.30	0.16	0.24	0.04
Bone surface	0.70	0.05	0.07	0.04	0.05	0.01
Breast	0.50	0.25	0.38	0.20	0.30	0.05
Colon	0.55	0.95	1.38	0.76	1.10	0.18
Gonads	—	—	1.00	—	0.60	0.13
Liver	0.95	0.20	0.21	0.16	0.17	0.03
Lung	0.95	0.90	0.95	0.72	0.76	0.13
Oesophagus	0.95	0.35	0.37	0.28	0.29	0.05
Skin	0.01	0.02	0.04	0.016	0.03	0.01
Stomach	0.90	1.10	1.21	0.88	0.97	0.16
Thyroid	0.10	0.08	0.15	0.06	0.11	0.02
Remainder <sup>‡</sup>	0.80	0.45	0.54	0.36	0.43	0.07
Total (rounded)		5.00	7.49 7.5	4.00	5.79 6.0	1.0

\* From ICRP, 1990.

† The values of  $w_T$  relate to a population of equal numbers of both sexes and a wide range of ages. The coefficients relate only to adults.

‡ Relates to red bone marrow and includes extra weighting by a factor of 2 for short mean latency of leukaemia.

§ The dose equivalent in the remainder is the estimated mean dose equivalent over the whole body excluding the specified tissues and organs.

these tissues are developed from other epidemiological studies discussed in this chapter.

The overall risk per unit exposure for adult workers and the whole population given in the draft document are shown in Table 21-19. The risk of fatal cancer is adopted as 0.04 per Sievert (4 percent per Sievert) for adult workers and 0.05 per Sievert (5 percent per Sievert) for the whole adult population.

ICRP had been criticized for excluding the effects of nonfatal cancer in previous documents. An attempt to correct this omission is made in the present document. A cancer lethality fraction,  $K$  (the fraction of total cancer that is lethal), is used as a weighting factor for nonfatal cancers in deriving the total effect risk coefficient. The cancer risk per Sievert,  $F$ , and the total weighted risk per Sievert (weighted effect coefficient),  $F(2-K)$ , are shown in Table 21-20. The reasoning given for the weighted effect coefficient is given as follows.

The total number of cancers (fatal plus nonfatal)  $\text{Sv}^{-1}$  will be  $F/K$ . The total number of nonfatal cancers is  $(1-K)F/K$  and multiplying by the

weighting factor  $K$  yields a "health detriment" of  $(1-K)F$ . The total health detriment is then

$$F + F(1-K) = F(2-K).$$

The total risk including this weighting for nonfatal cancer is proposed as  $7.5 \text{ Sv}^{-1}$  for the whole adult population and  $6.0 \text{ Sv}^{-1}$  for the working population.

The tissue weighting factors corresponding to those derived formerly in ICRP (1977) and shown in Table 21-6, are the organ fraction of the total.

In assessing radiation risk from low-dose, low-dose rate, low LET radiation using risk coefficients such as in Table 21-20 derived from high dose, high-dose rate exposures, a dose rate reduction factor (DREF) needs to be applied. NCRP (1980) and UNSCEAR (1988) have shown that the human data cover a range for the DREF of 2 to 10. That is, the risk coefficients in Table 21-20 are conventionally divided by the DREF factor. ICRP has previously used 2.5 as the adopted DREF, however, the draft document proposes to adopt a DREF of 2.0.

The new occupational guidelines for radiation developed from this ICRP document are proposed as 100 mSv in 5 years with a limit of 50 mSv in any single year. This is compared with the 1977 limit of 50 mSv per year.

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