Risk of Cancer after Low Doses of Ionising Radiation: Retrospective Cohort Study in 15 Countries


ABSTRACT

Objectives To provide direct estimates of risk of cancer after protracted low doses of ionising radiation and to strengthen the scientific basis of radiation protection standards for environmental, occupational, and medical diagnostic exposures.

Design Multinational retrospective cohort study of cancer mortality.

Setting Cohorts of workers in the nuclear industry in 15 countries.

Participants 407,391 workers individually monitored for external radiation with a total follow-up of 5.2 million person years.

Main outcome measurements Estimates of excess relative risks per sievert (Sv) of radiation dose for mortality from cancers other than leukaemia and from leukaemia excluding chronic lymphocytic leukaemia, the main causes of death considered by radiation protection authorities.

Results The excess relative risk for cancers other than leukaemia was 0.97 per Sv, 95% confidence interval 0.14 to 1.97. Analyses of causes of death related or unrelated to smoking indicate that, although confounding by smoking may be present, it is unlikely to explain all of this increased risk. The excess relative for leukaemia excluding chronic lymphocytic leukaemia was 1.93 per Sv (<0 to 8.47). On the basis of these estimates, 1-2% of deaths from cancer among workers in this cohort may be attributable to radiation.

Conclusions These estimates, from the largest study of nuclear workers ever conducted, are higher than, but statistically compatible with, the risk estimates used for current radiation protection standards. The results suggest that there is a small excess risk of cancer, even at the low doses and dose rates typically received by nuclear workers in this study.