Half a century ago, Alice Stewart and her colleagues published the preliminary findings of a case-control study of childhood cancer mortality in Great Britain, undertaken to investigate the reasons behind a notable rise in childhood leukaemia mortality over several decades. They found a statistically significant twofold raised risk for both leukaemia and other childhood cancers associated with a radiographic examination of the abdomen of the pregnant mother. Initially, the findings were received with some scepticism, but they were confirmed by further data from the study and also by other studies carried out around the world. The statistical association between childhood cancer and exposure in utero to diagnostic x-rays is not in doubt, but its interpretation has been a matter for dispute over the years. Despite extensive searches, no confounding factor that might explain the association has been found, although a direct cause-and-effect interpretation continues to be doubted by some scientists. Cohort studies of antenatal radiography are either unreliable or have insufficient power to detect the increased risk predicted by case-control studies, but evidence from the Japanese atomic bomb survivors offers support to a causal relationship. The cohort of survivors irradiated in utero, although limited in number, exhibits an excess of childhood cancer that is compatible with the findings of the case-control studies of antenatal x-ray examinations, while the cohort of survivors irradiated as children provides evidence of an excess risk of childhood leukaemia comparable with that following exposure in utero to diagnostic x-rays. The absence of an excess risk of the solid tumours typical of childhood after postnatal irradiation might be due to the absence of the cells sensitive to their induction after birth. The data from the Oxford Survey of Childhood Cancers (OSCC), as the study of Stewart and her colleagues came to be called, in combination with appropriate fetal dose estimates lead to an excess relative risk coefficient of $50 \text{ Gy}^{-1}$, which when applied to the background rate of childhood cancer in developed countries gives an excess absolute risk coefficient of $8\% \text{ Gy}^{-1}$ for cancer occurring before the age of 15 years, although material uncertainty surrounds these risk estimates and there are reasons to believe that they may overestimate the true risk. Some evidence from the OSCC suggests that the risk of childhood cancer is greater after exposure during the
first trimester, although limited data and uncertainty in the doses received imply that this should be treated with caution. The Japanese atomic bomb survivors irradiated in utero exhibit an excess risk of adult cancers that is consistent with the risk following exposure in childhood, although this cohort is the only source of such information. Some suggestive evidence exists that the risk of infant (<1 year of age) leukaemia, but not childhood leukaemia, was raised following exposure in utero to fallout from the Chernobyl accident; but the data are not consistent with a direct effect of radioactive contamination, and further evidence is required before reliable conclusions can be drawn.