

**Mortality among individuals exposed to atomic bomb radiation  
in utero\*; 1950–2012**

RERF examined the death rates of A-bomb radiation-associated solid cancers\*\*, noncancer diseases, and external causes (mainly accidents and suicides) among the in utero-exposed atomic bomb survivors in Hiroshima and Nagasaki.

The study method involved confirmation of cause of death during the period 1950–2012 for 2,463 individuals exposed or unexposed to A-bomb radiation in utero in Hiroshima or Nagasaki. For the analysis, RERF's dosimetry system was used to estimate radiation doses absorbed in the mother's womb. After considering conditions such as sex, city of exposure (Hiroshima/Nagasaki), age at death, and so on, the excess relative risk\*\*\* for each cause of death was estimated.

There were found to be 339 deaths (216 men and 123 women) in the study population due to solid cancers, noncancer diseases, and external causes. For males, the risk of death was increased in association with radiation dose only in the case of noncancer diseases. For females, the risk of death was increased in association with radiation dose for deaths from solid cancers, noncancer diseases, and external causes.

Radiation exposure, which is dependent on distance from hypocenter, was also associated with small head circumference, low birth weight, and the loss of a father by the age of 18. Those factors were also thought to have increased the risks of death from noncancer diseases and external causes.

The study suggested that when considering mortality among individuals exposed to the atomic bombings in utero, it is important to carefully consider direct effects from radiation, as well as indirect effects from malnutrition, poverty, communicable diseases, inadequate sanitation, lack of access to medical services, and other factors. Further follow-up is required to obtain a full picture of the lifetime risk of mortality among individuals exposed to the atomic bombings in utero.

\* In utero exposed individuals:

A-bomb survivors exposed in their mother's womb

\*\* Solid cancers:

Cancers (all malignancies) other than hematopoietic system cancers such as leukemia, lymphoma

\*\*\* Excess relative risk:

Excess relative risk is the increase or decrease of a certain health risk in an exposed group compared with a control group. An excess relative risk of 0 means that radiation exposure did not affect risk. An excess relative risk of 1 in the exposed group would indicate a rate of disease that is double the rate in the unexposed, or control, group.

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RERF's objective with this brief outline is to succinctly explain our research for the lay public. Much of the technical content of the original paper has been omitted. For further details about the study, please refer to the full paper published by the journal.