

<b>Internal exposure</b>	Exposure received from radioactive material taken into the body by inhalation or oral ingestion and concentrating in various sites in the body, leading to radiation exposure of internal tissues (such as thyroid gland, lungs, bone, gastrointestinal tract).
<b>External exposure</b>	Exposure to radiation received from outside of the body.
<b>In-utero exposure</b>	When an embryo or fetus is exposed to A-bomb and its radiation in the mother's womb.
<b>Directly exposed</b>	When the atomic bombs were dropped, persons who were exposed in the cities of Hiroshima and Nagasaki or in the surrounding areas, including fetuses exposed in utero (refer to the above definition of in-utero exposure). Even individuals not directly exposed to radiation or heat rays due to protection from buildings and other shielding are included in this category because radiation can pass through such structures.
<b>In-utero survivors</b>	The Radiation Effects Research Foundation defines in-utero survivors in Hiroshima as persons who were born between August 6, 1945 and May 31, 1946, and in Nagasaki as those born between August 9, 1945 and May 31, 1946. The Atomic Bomb Survivors' Support Law, however, defines in-utero survivors in Nagasaki as persons who were born between August 9, 1945 and June 3, 1946.
<b>Proximally exposed</b>	This term originally referred to persons exposed to the atomic bombings within 2,000 meters of the hypocenters. However, more recent RERF publications use the term to refer to survivors who have estimated doses of 0.005 Gy or above, which approximately corresponds to persons exposed within 2,500 meters of the hypocenter in Hiroshima and 2,700 meters in Nagasaki.
<b>Distally exposed</b>	This term refers to persons exposed to the bombings at distances of 2,500 to 10,000 meters of the hypocenter in Hiroshima and 2,700 to 10,000 meters in Nagasaki. Their estimated radiation doses are less than 0.005 Gy.
<b>The persons who were not in the city (not in city: NIC)</b>	The persons who were not in the city of Hiroshima, Nagasaki at that time, nor within 10km from epicenter at time of bombing.

The persons who entered the city (according to the Atomic Bomb Survivors Support Law)

The persons exposed indirectly who entered the city of Hiroshima and Nagasaki (the area within about 2km from the hypocenter) in two weeks after the atomic bombings.

Thorotrast

The trade name of an X-ray contrast agent that utilizes thorium dioxide as its principal component. Thorotrast was used throughout the world—but mainly in Germany—during the period 1930-'50. After circulating in the bloodstream following intravenous injection, the agent is taken up by reticuloendothelial cells, concentrating in the liver, spleen, bone marrow, and lymph nodes. Because Thorotrast is not excreted, most of the agent remains in the body for many years, leading to long-term chronic internal exposure to  $\alpha$ -ray irradiation from thorium and thereby causing health problems such as liver cirrhosis, liver angiosarcoma, and leukemia.

Relative risk, Excess relative risk

Relative risk (RR) is the measure of how much higher risk is for an exposed group compared with an unexposed group. It represents the ratio of incidence of a certain result in the exposed group to that in the unexposed group. A relative risk of 1 means there is no effect of exposure. Excess relative risk (ERR) focuses on the excess of RR and is obtained by subtracting 1 from the RR value. Both measures are representative of the level of increased risk due to exposure and the strength of association with exposure, using the level of risk in the unexposed group as the standard for comparison.

Excess absolute risk (EAR)

Expressed as the difference in risk between an exposed group and an unexposed group. In other words, the difference in incidence of a given result between the exposed group and the unexposed group, and typically expressed in terms of per person-year or per person-year-Gy. Here, person-years used in the analysis is the sum of the observed length of follow up for each person during the observation period. For example, observation of 1,000 persons for 10 years indicates 10,000 person-years. Person-year-Gy expresses person-years of persons who were assumed to be exposed to 1 Gy. EAR represents the absolute magnitude of effects of exposure in the study population.

Modifying effect (Interaction effect)

A phenomenon in which the dose-response relationship due to a specific risk factor is affected by a third factor. For example, cancer risk due to radiation exposure is generally higher in persons exposed at younger ages than in persons exposed when older. In this case, carcinogenic effects of radiation exposure are modified by age at exposure, or there is said to be a modifying effect (interaction effect) from age at

exposure on the radiation effect, with age at exposure called an effect modifier.

Conversely, when the incidence of cancer or mortality risk due to radiation remains constant no matter what the age was at the time of exposure or even how old the persons studied become, there is said to be no modifying effect (interaction effect) on radiation risk by age at exposure or by aging.

When considering modifying effects, it is necessary to indicate the values of age at exposure and attained age of the persons for whom the incidence of disease or mortality risk results are calculated. Age at exposure of 30 years and attained age of 70 years are frequently used.

In general, for all solid cancers, both mortality and morbidity display larger excess relative risk (ERR) and excess mortality or incidence rate (excess absolute risk: EAR) with younger age at exposure, whereas with increased attained age, ERR decreases and EAR increases. The above cases are examples of modifying effects of age at exposure and aging.

Nevertheless, looking at specific cancer sites, modifying effects by age at exposure and aging are varied, and statistical uncertainty increases due to a smaller number of cases when analyzing individual cancers, leading to greater variation and reduced statistical significance in the results. For cancer at specific sites, therefore, any interpretation must take this situation into consideration.