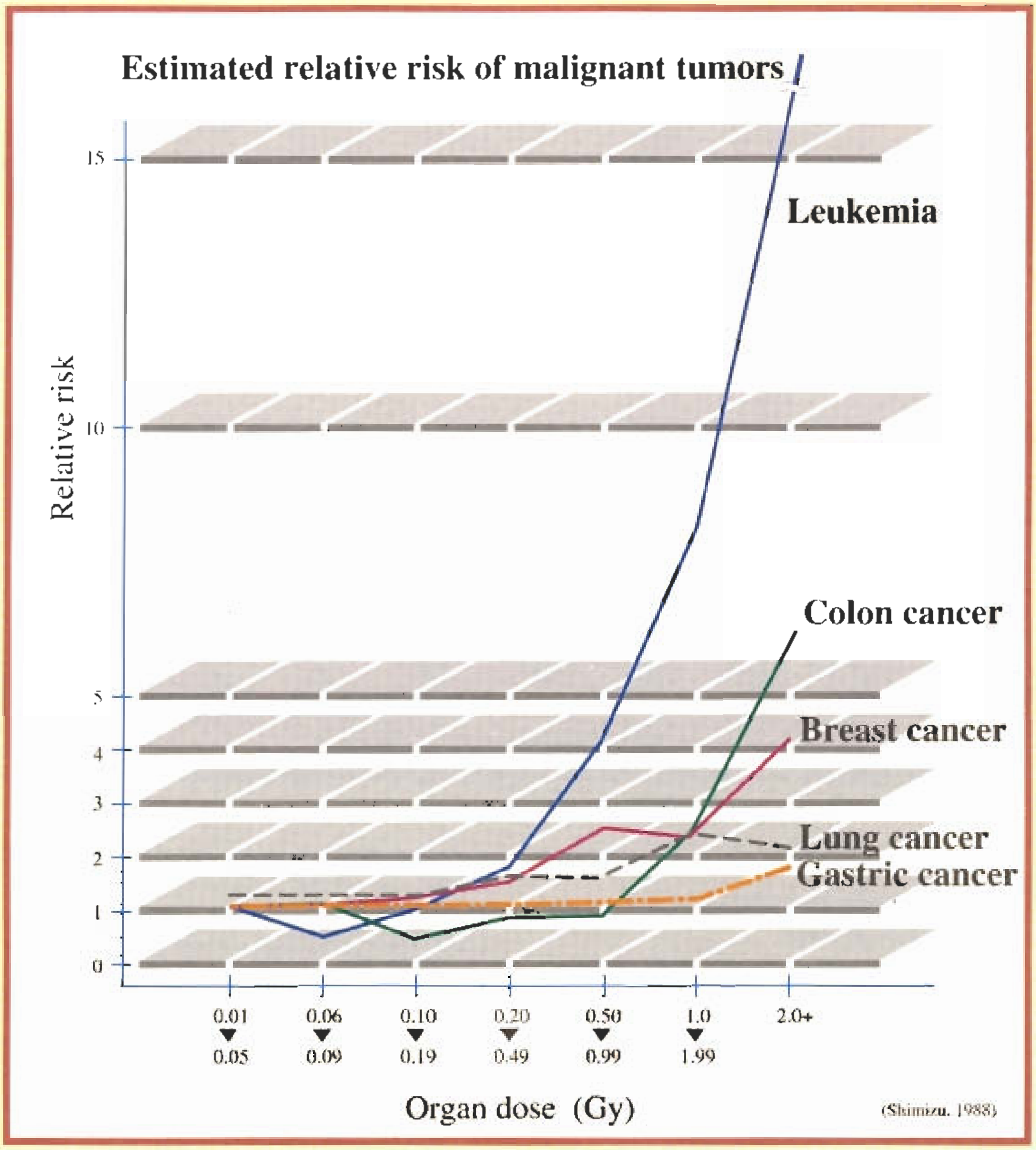
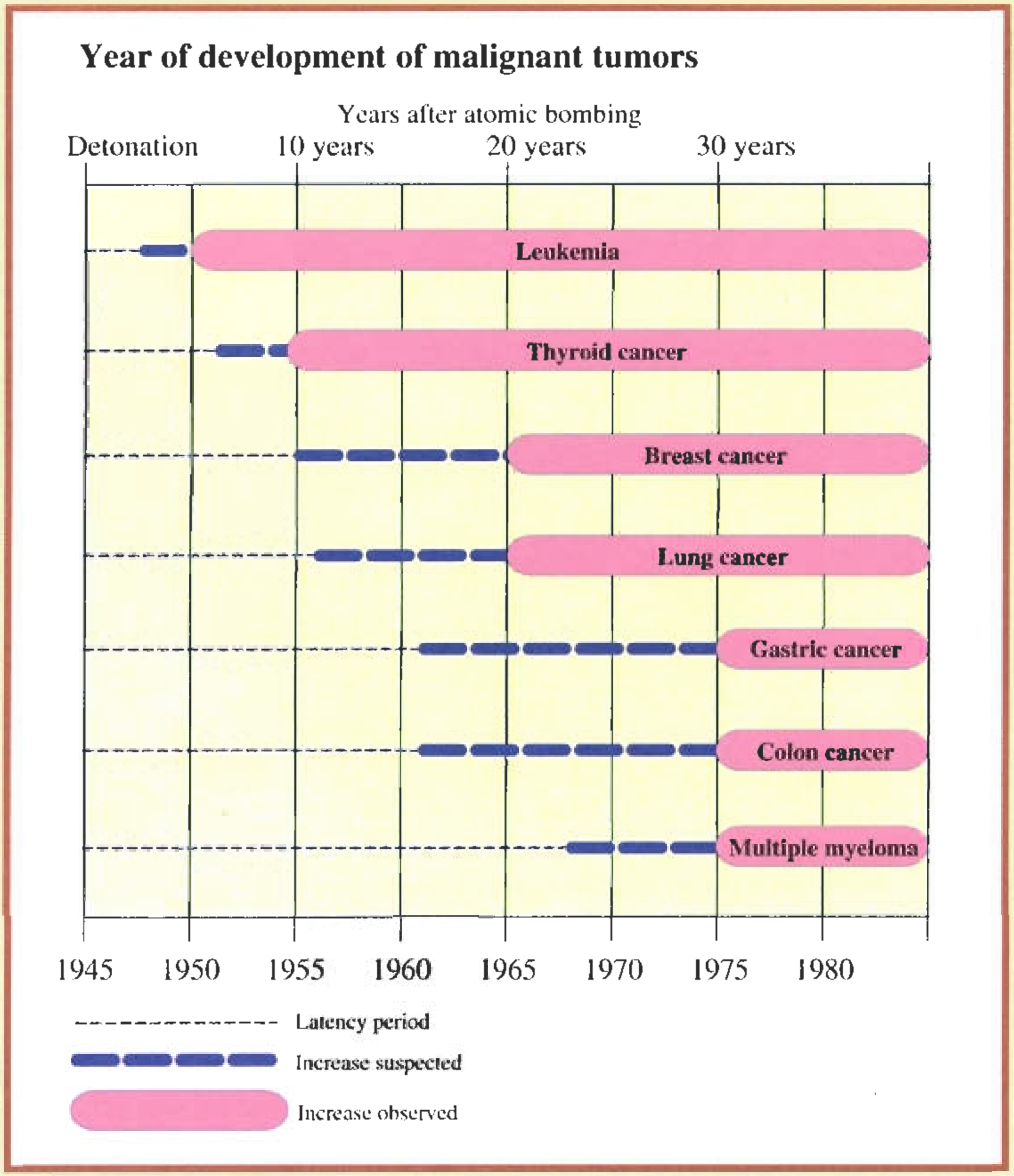
2 Malignant tumors



1. Malignant tumors and radiation dose

When an organ absorbs radiation, the relative risk of a malignant tumor developing as a result of that level of exposure is estimated by comparison with the non-exposed (0 Gy) population. For many cancers, the mortality risk increased with dose.

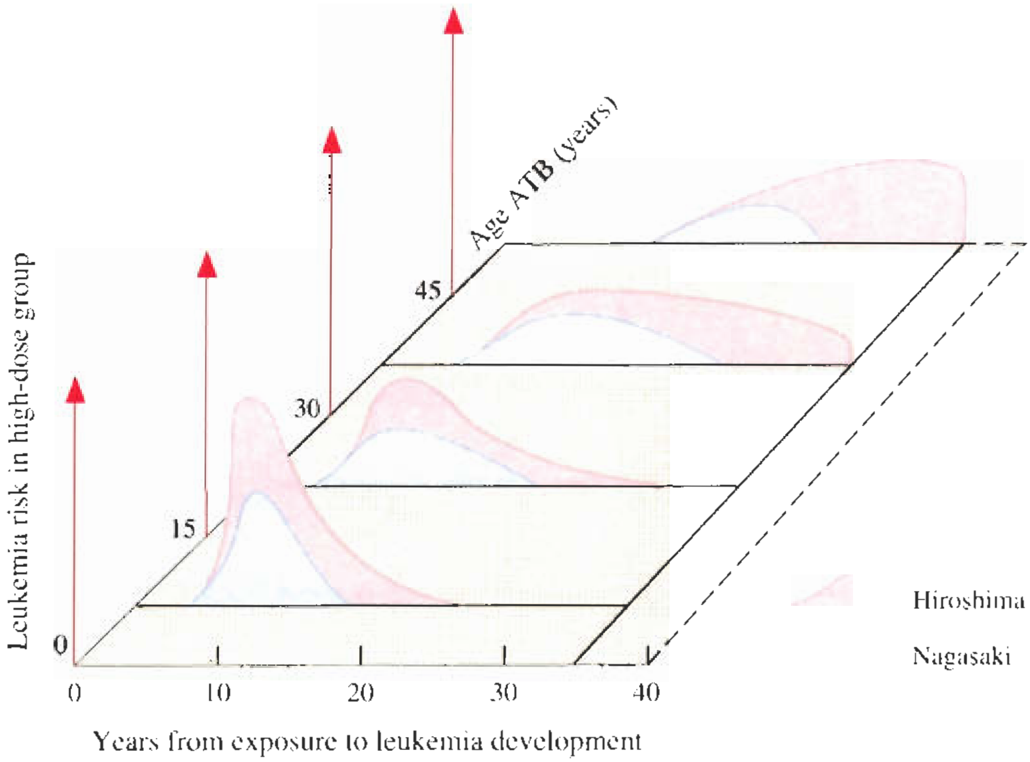


2. Latency period of malignant tumors

Although consideration of the latency period of malignant tumors in atomic bomb survivors requires scrutiny of age at the time of bombing, the diagram uses reported incidence and mortality rates to illustrate for various cancers the latency period (--------), and the times at which an increase relative to the the controls became suggestive ( ) and significant ( ).

Cancers observed and the approximate dates at which significant increases became evident were leukemia (1950); thyroid cancer (1955); breast and lung cancer (1965); and multiple myelomas, gastric and colon cancer (1975).

Excess leukemia risk due to radiation by age at the time of bombing (ATB) and years from exposure to leukemia development (latency period)



(Ichimaru, 1978)

3. Characteristics of atomic bomb-related leukemia

The characteristics of atomic bomb-related leukemia include:

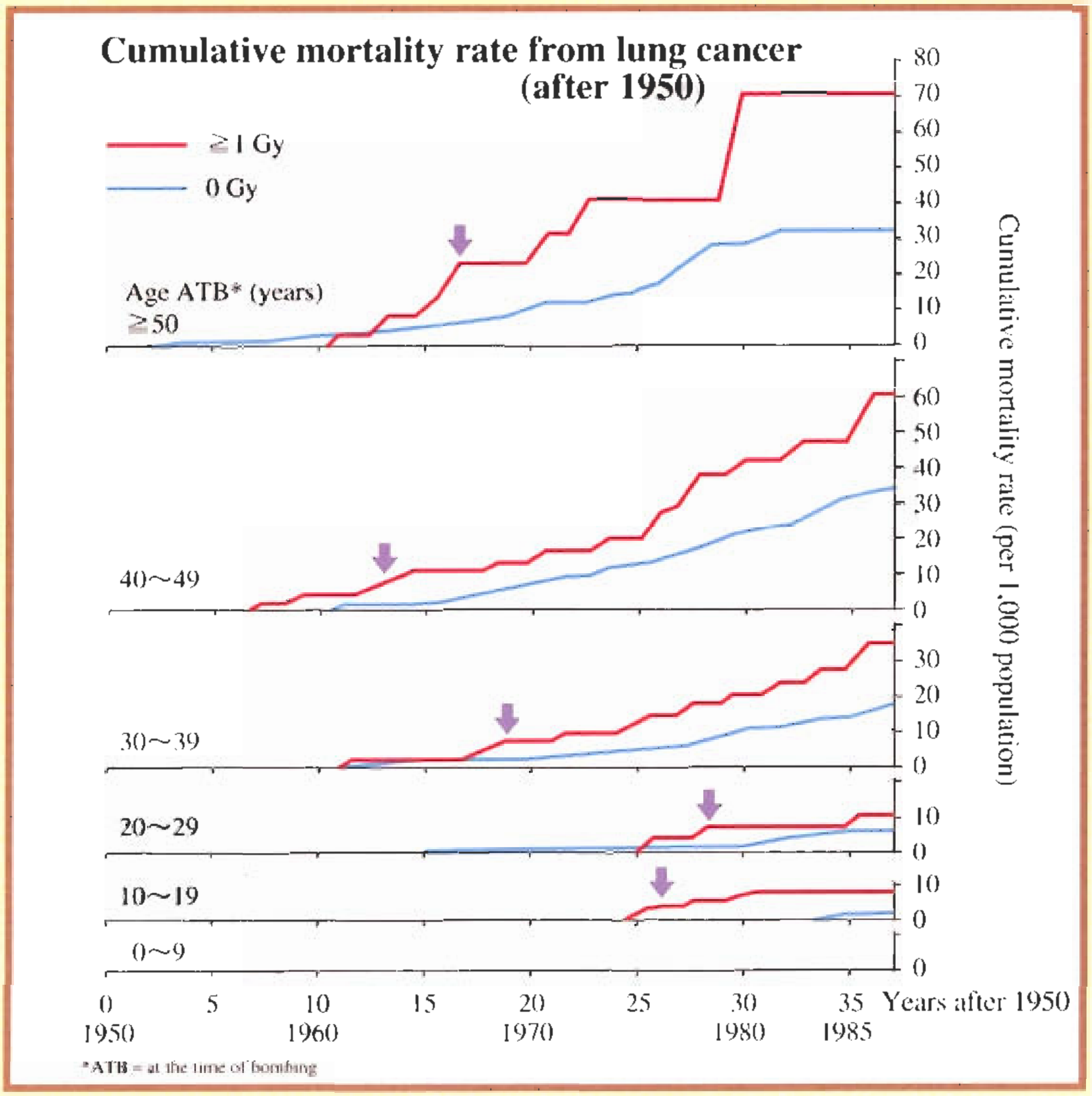
1. The incidence rose in direct proportion to radiation dose.

2. The incidence increased with decreasing age at the time of bombing.

3. The incidence peaked at 7 - 8 years after exposure.

4. The incidence of chronic myelocytic leukemia was clearly greater in Hiroshima than in Nagasaki.

For the leukemia cases that developed between 1950 and 1978, the diagram shows the leukemia risk among the heavily exposed population (≥1 Gy) by city, age at the time of bombing, and time after exposure. The leukemia risk at the time of maximum leukemia occurrence (5 to 10 years after exposure) increased with decreasing age at the time of bombing; thereafter, it declined rapidly. On the other hand, for people who were older at exposure, the increased excess leukemia risk was small in the early stages, and the subsequent decrease was gradual.



4. Characteristics of atomic bomb-related solid cancers

Atomic bomb-related solid cancers (tumors) exhibit the following characteristics:

1. The cancer risk increased with dose.

2. The cancer risk increased with decreasing age at the time of bombing.

3. Unlike leukemia, the latency period increased with decreasing age at the time of bombing (ATB), with a marked radiation effect evident when survivors reached the age level at which the cancers frequently occur.

The diagram shows the times at which a radiation effect became apparent in the case of lung cancer. The cumulative mortality rates since 1950 are compared for the heavily exposed (≥1 Gy) and control (0 Gy) populations by age ATB. The arrows in the diagram indicate the time at which the difference in mortality rates between the two groups first demonstrated a statistical significance (i.e. the time at which radiation-induced cancer clearly began to be manifested).

A radiation-related increase in mortality was observed in the 40 - 49 years ATB group at 15 to 20 years after exposure, and in the 10 - 19 years ATB group at 30 years after exposure.