

Humanitarian Impact of Nuclear Weapons

Oslo, Norway, March 4-5, 2013

Working Session I

Immediate Humanitarian impact of a nuclear weapon detonation

Medical Effects of a nuclear weapon detonation

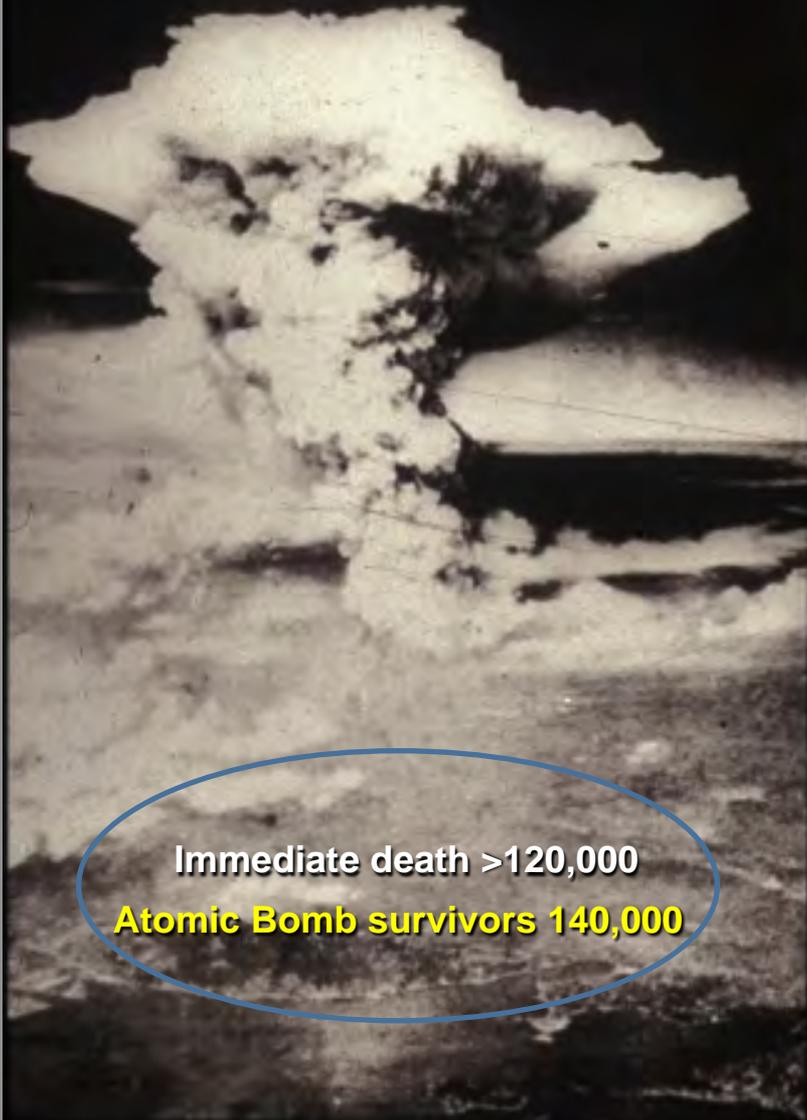
**“The Lifelong Health Effects of Atomic Bombs
by immediate DNA damage”**

Masao Tomonaga, M.D., Ph.D.

Director

Japanese Red Cross Nagasaki Atomic Bomb Hospital

Aug. 6 1945

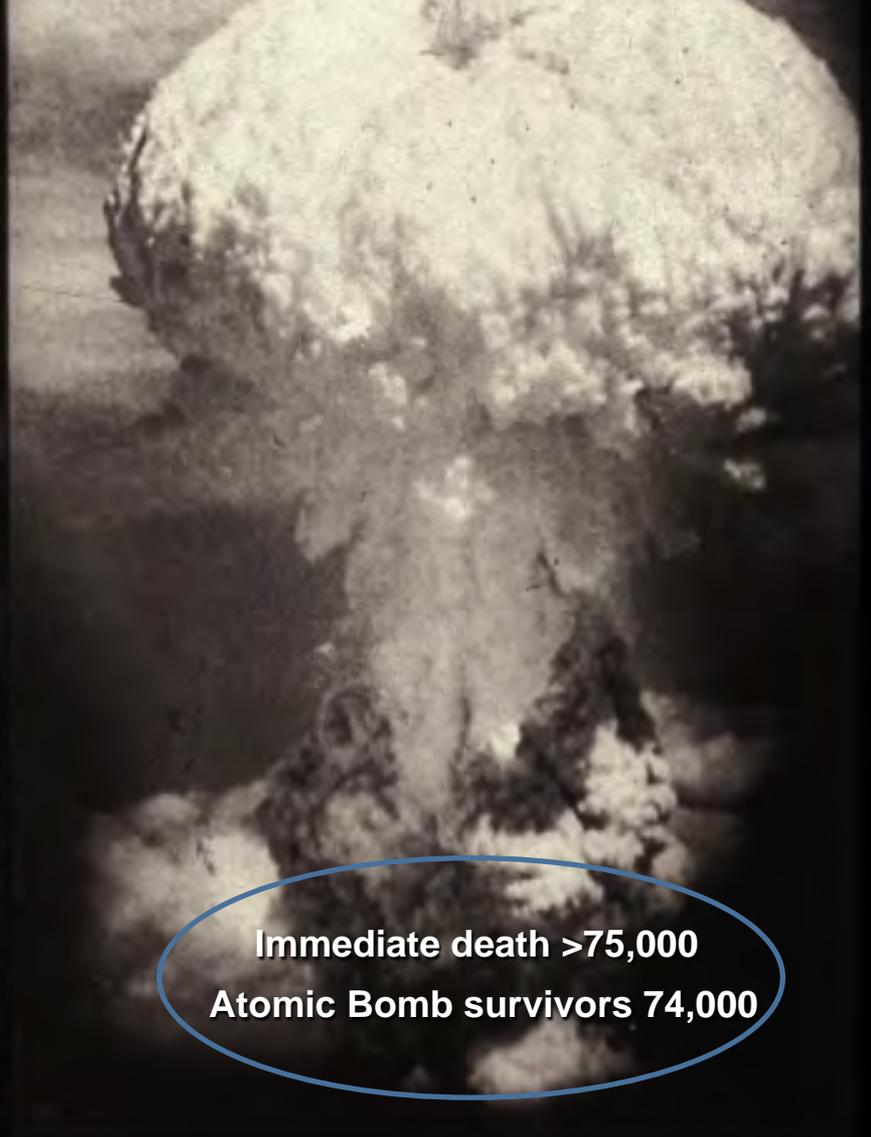


Immediate death >120,000

Atomic Bomb survivors 140,000

Hiroshima Bomb (Uranium)

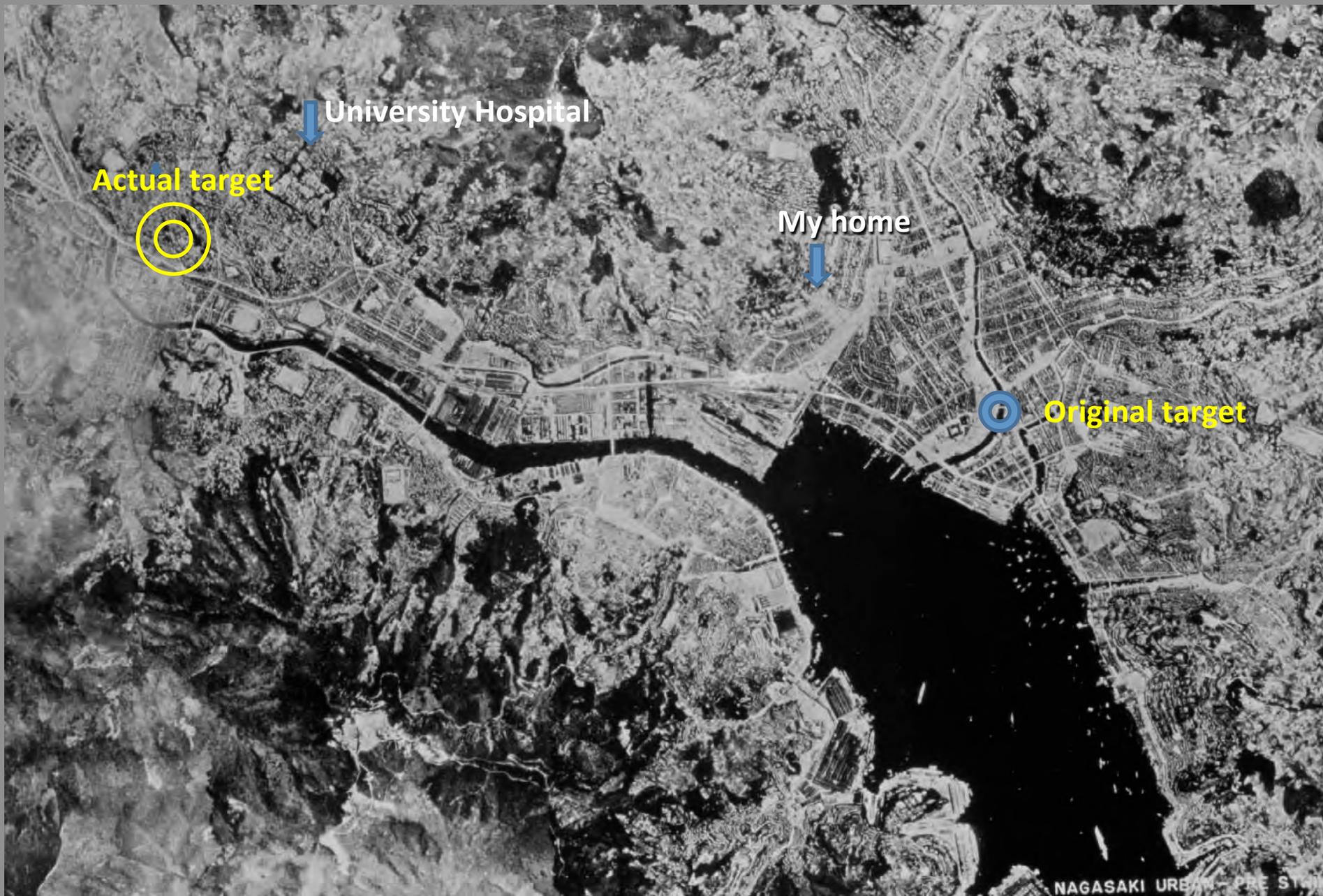
Aug. 9, 1945



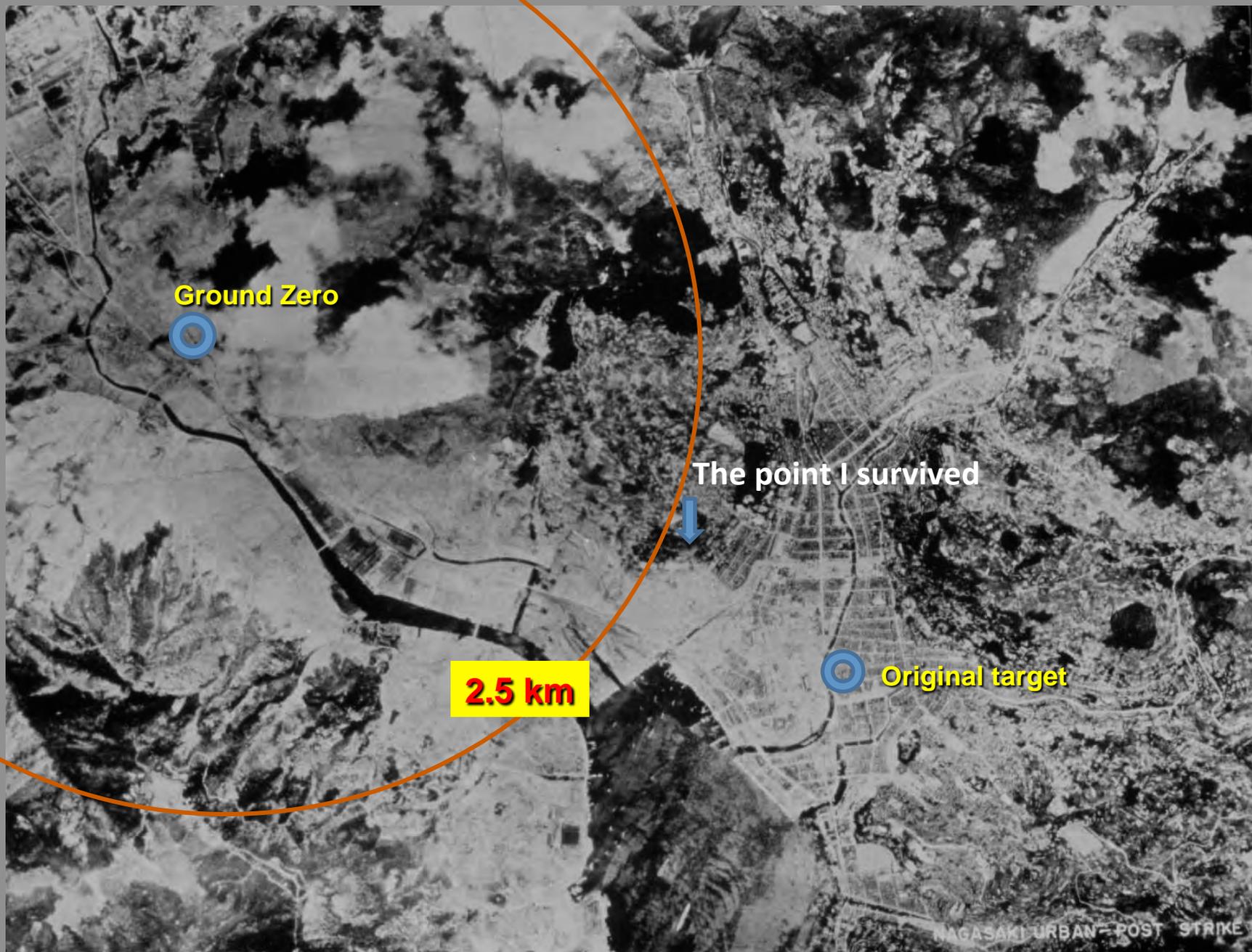
Immediate death >75,000

Atomic Bomb survivors 74,000

Nagasaki Bomb (Plutonium)



Nagasaki City from above : a few days before Atomic Bombing (US Air Force)



Ground Zero

The point I survived

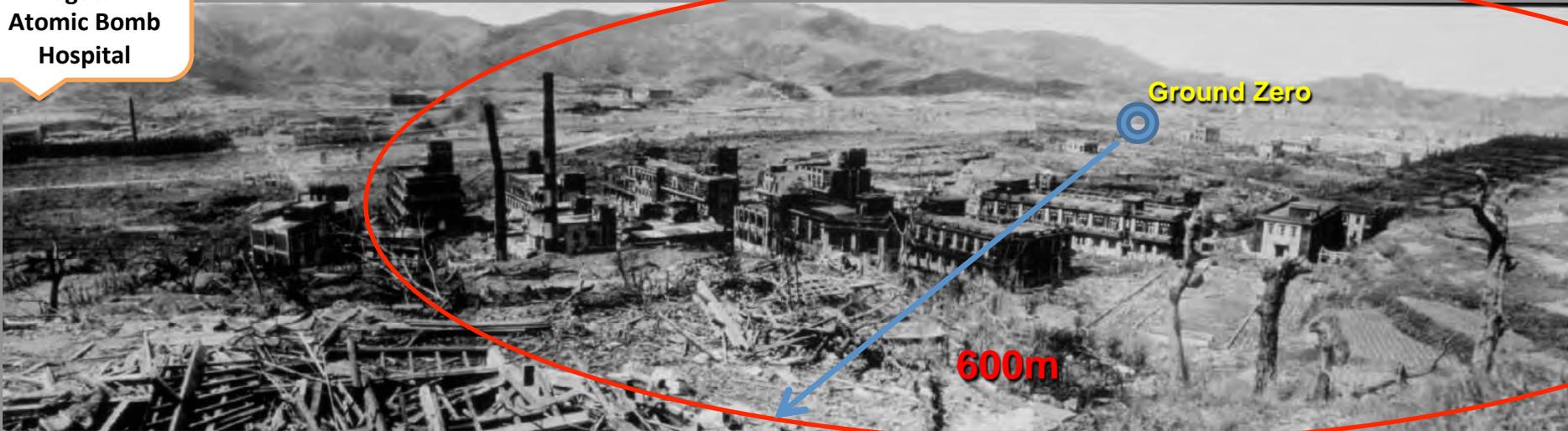
Original target

2.5 km

NAGASAKI URBAN - POST STRIKE

Just after Bombing

Red Cross
Nagasaki
Atomic Bomb
Hospital

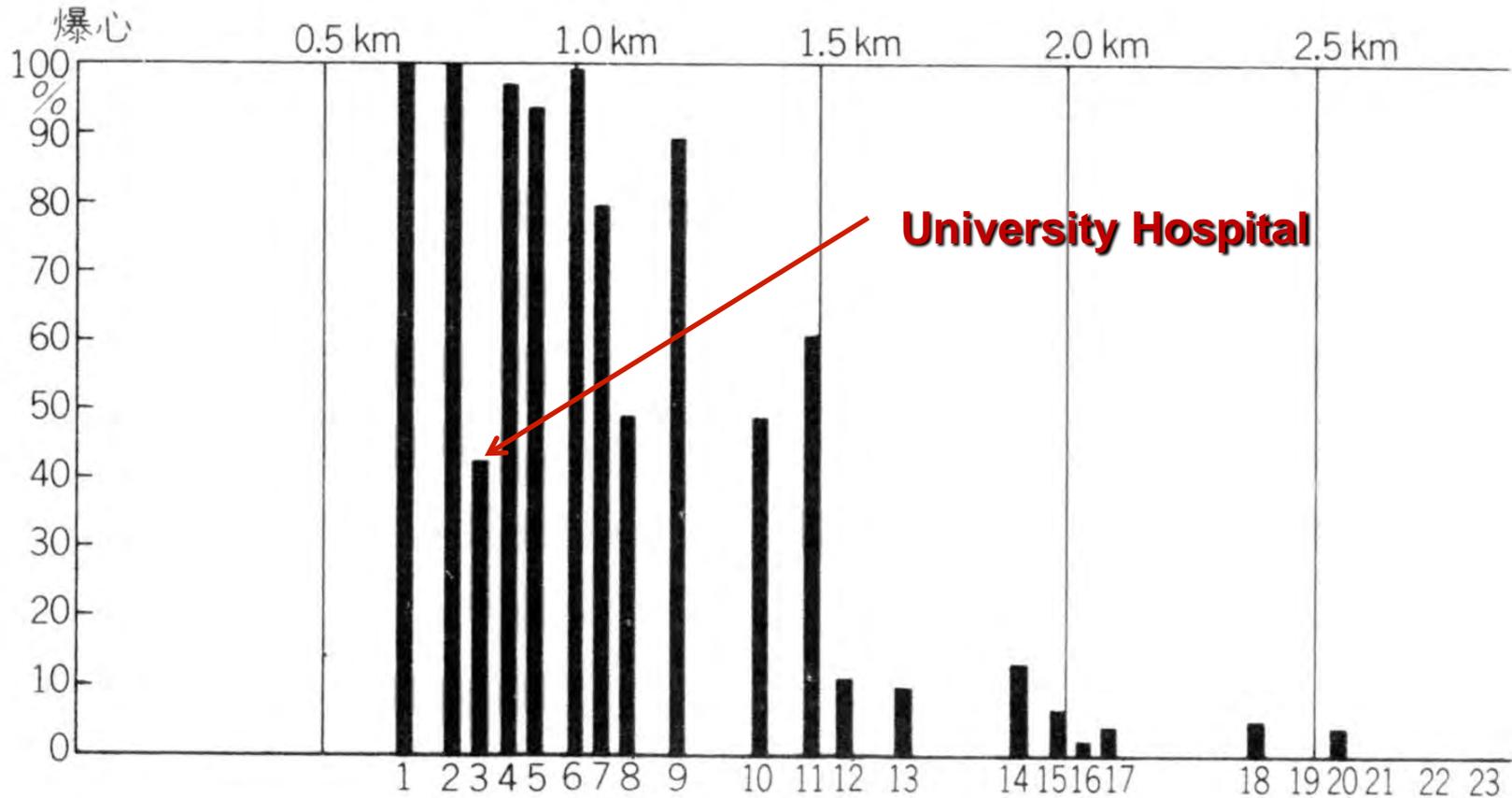


Nagasaki Medical University Hospital

(旧) 長崎医科大学付属醫院

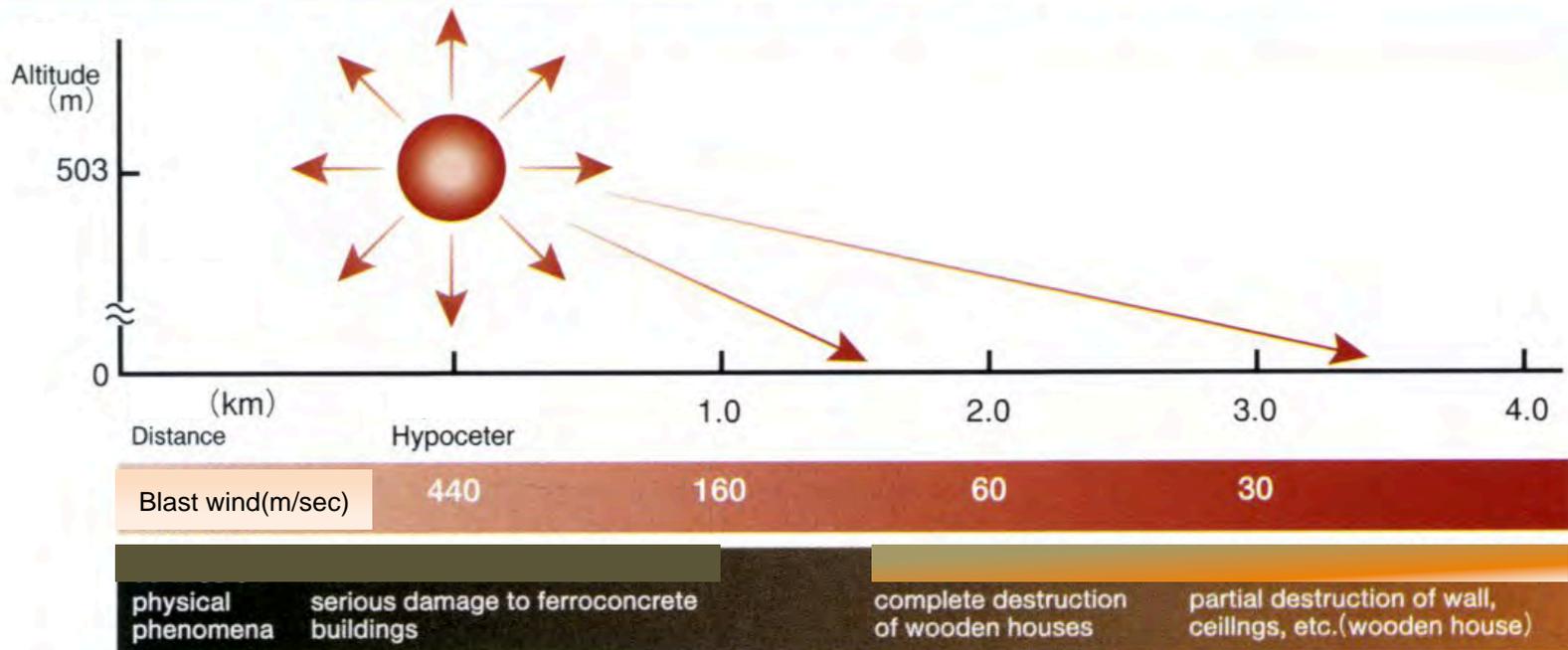
900 Medical Students and Professors died

Death rate according to the distance from ground zero

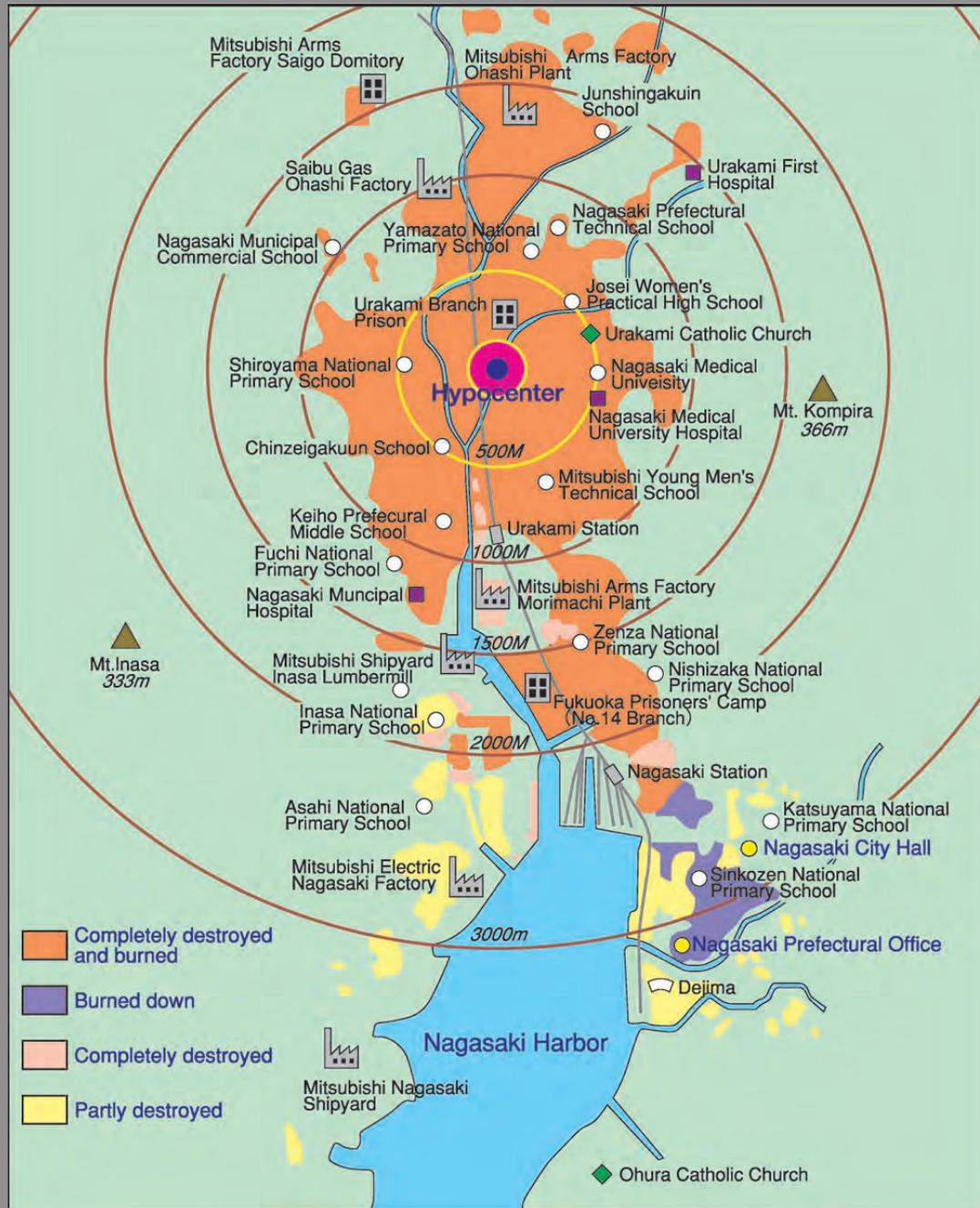


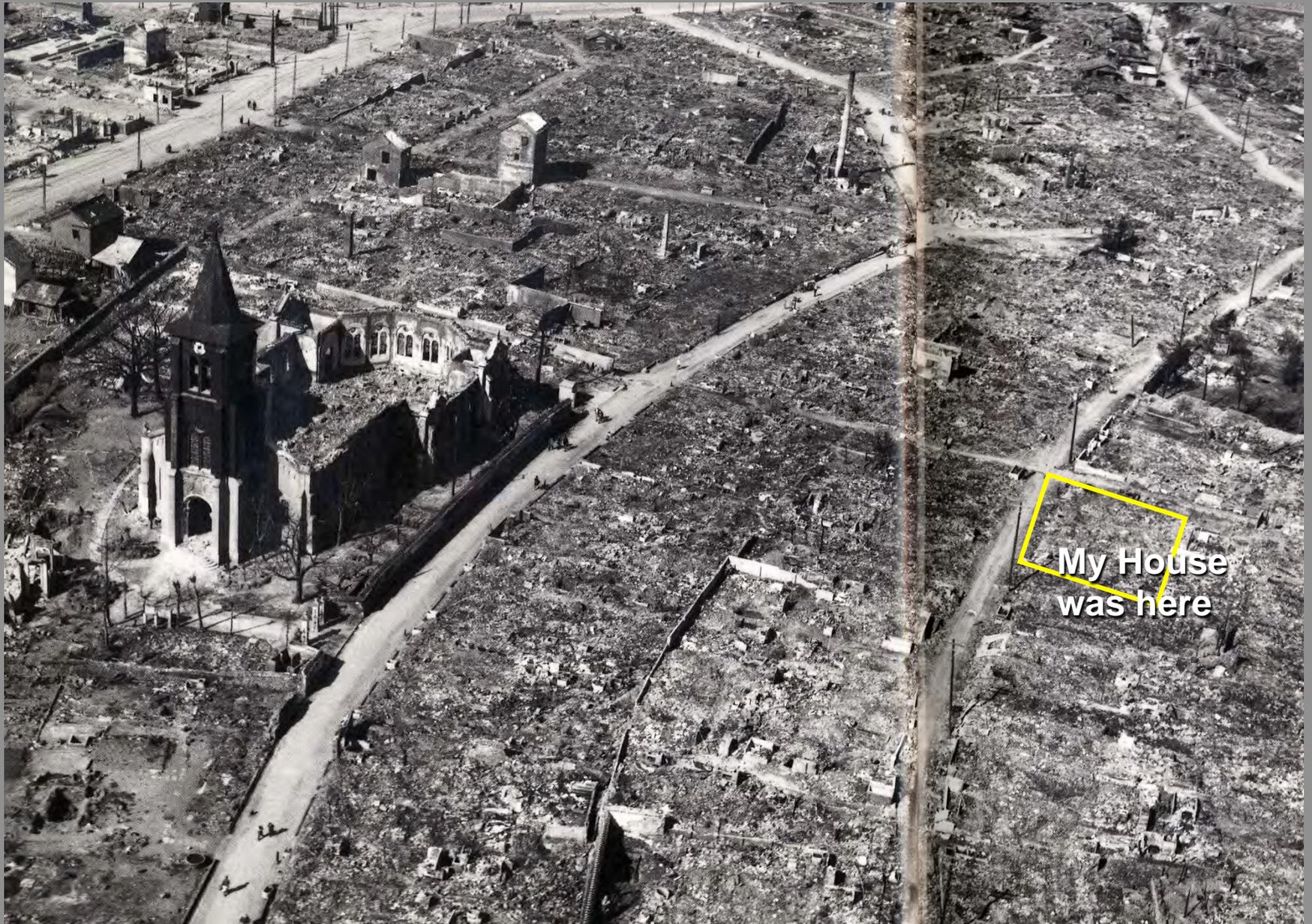
Survivor professors and students surveyed for death rate within two months.

Blast wind



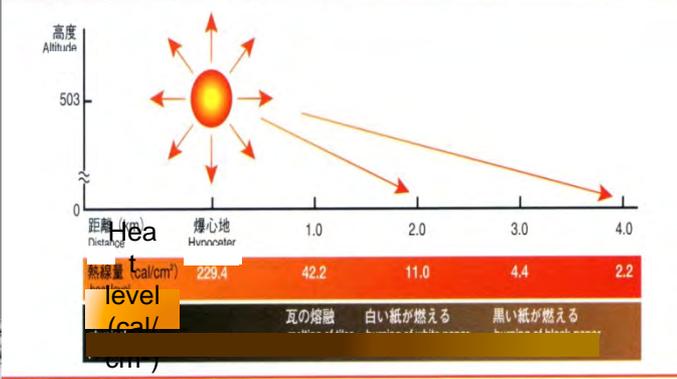
Physical Damages Caused by the Nagasaki Atomic Bombing





By Joe O'Donnell, U.S. Army

熱線 (Heat rays)



Burned to bone
Carbonization
Severe burns
immediate death
skin tear-off



By Yamahata

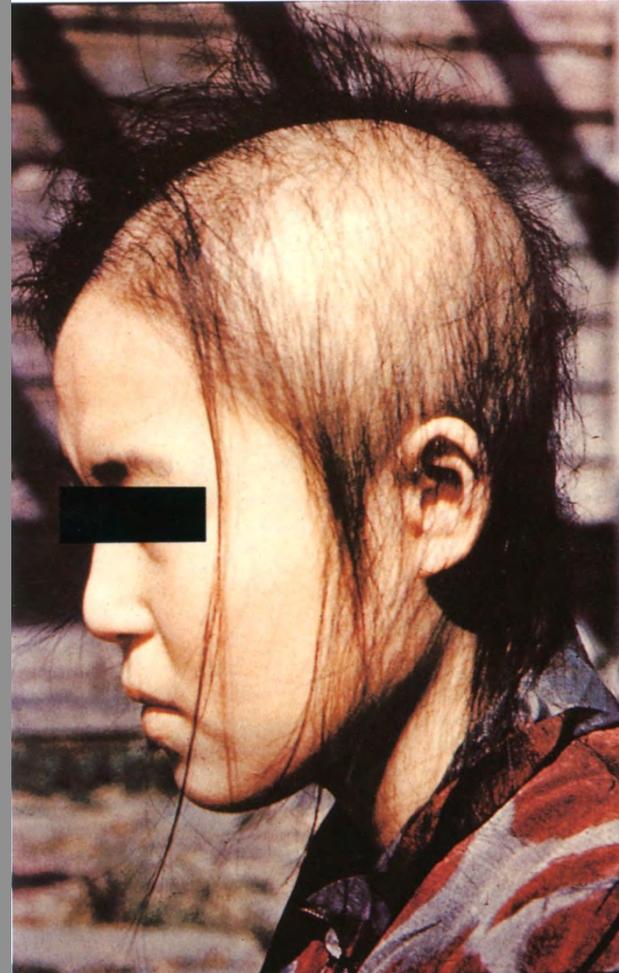
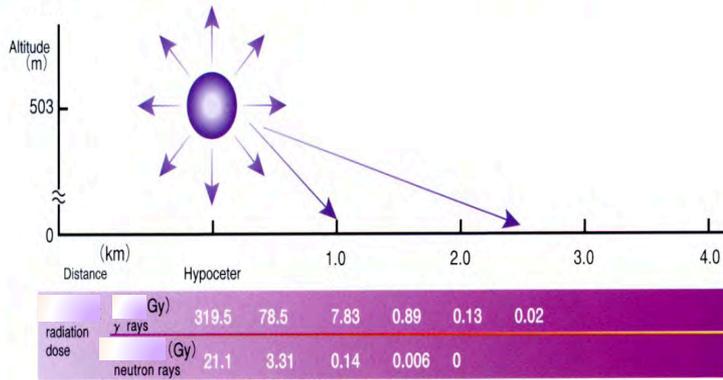
He recovered after 1.5 years' bed life in this position



Mr. Taniguchi gave a speech at NPT Conference
In 2010 at New York by showing his photo.

Acute Radiation Sickness(ARS): First sign is hair loss

放射線 (Radiation)



Radiation and Burn combined usually led death

Radiation during early pregnancy



Control

Microcephaly

No medical aid but waiting for death



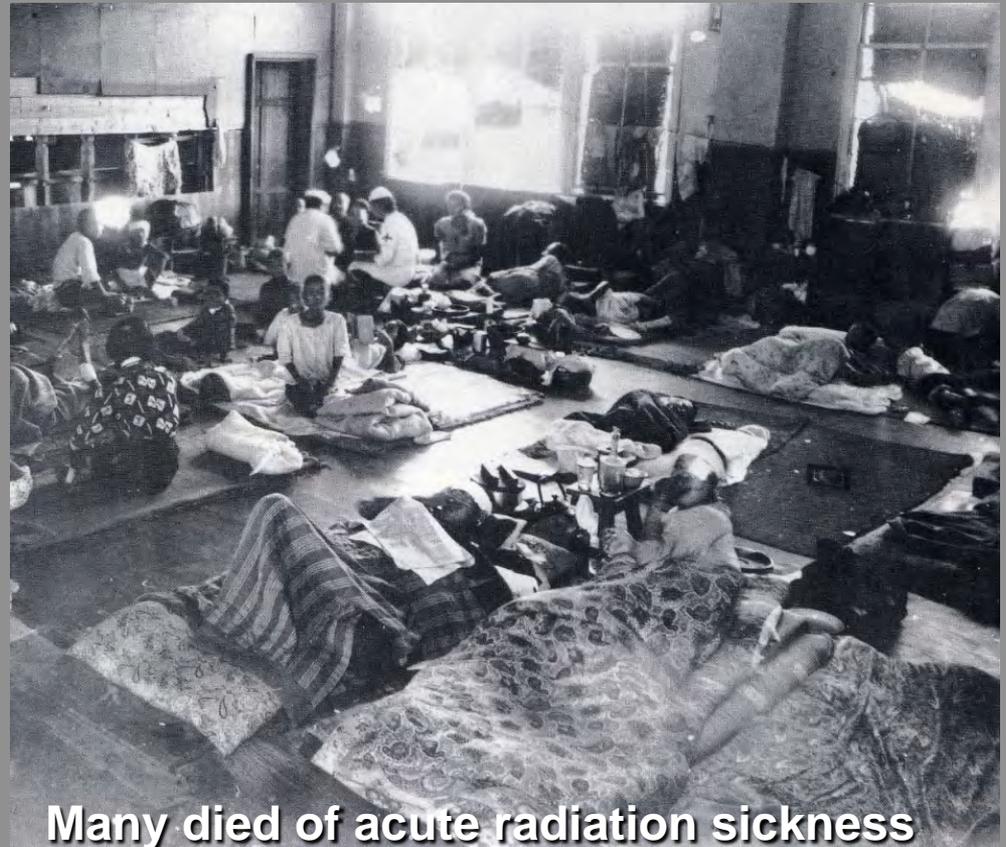
By Yamahata

All Hospitals were destroyed in Nagasaki City

Sin-kozen Elementary School

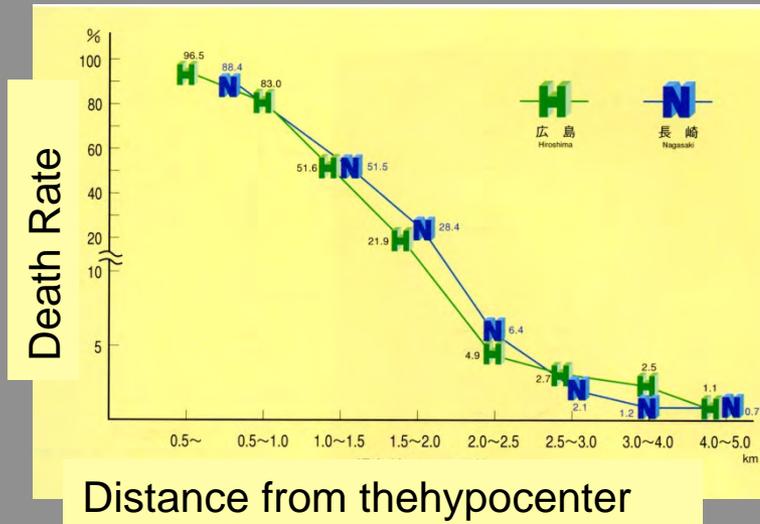


Only one ambulance at an elementary school with some doctors and nurses but no drug, no blood transfusion, no antibiotics.

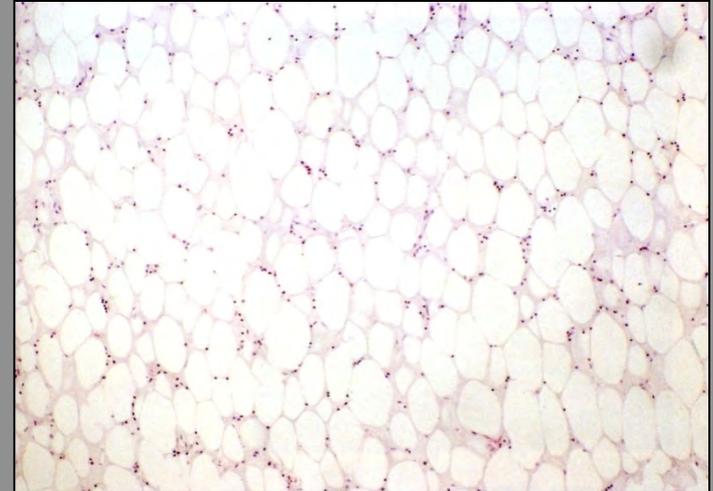


Many died of acute radiation sickness

Death rate in the first three months due to injuries and Acute radiation sickness (ARS)

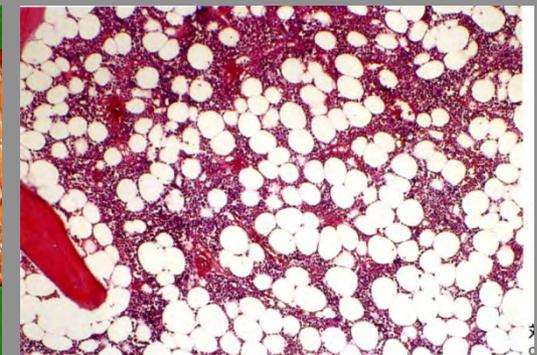


Bone marrow damage

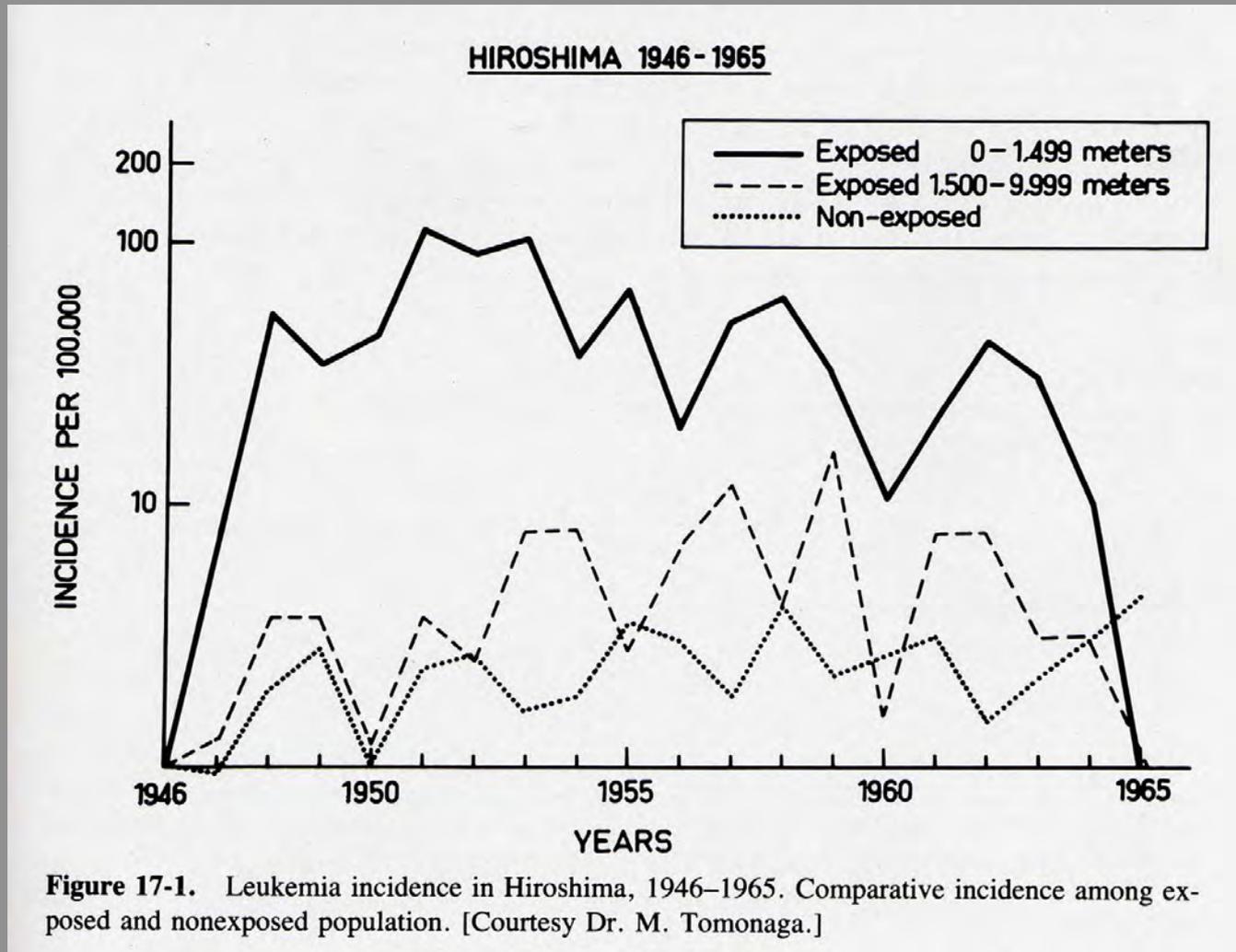


Colon damage

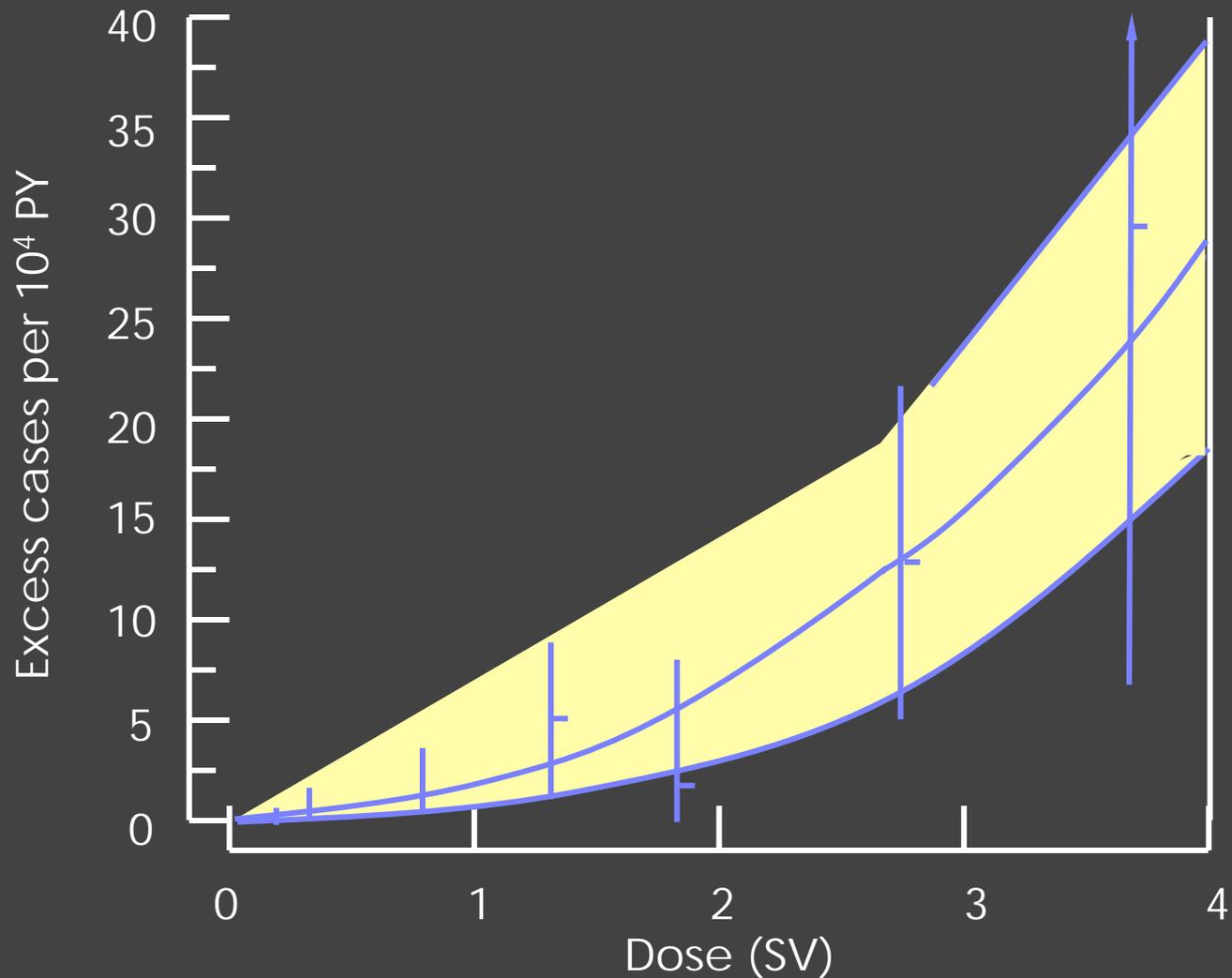
Normal controls



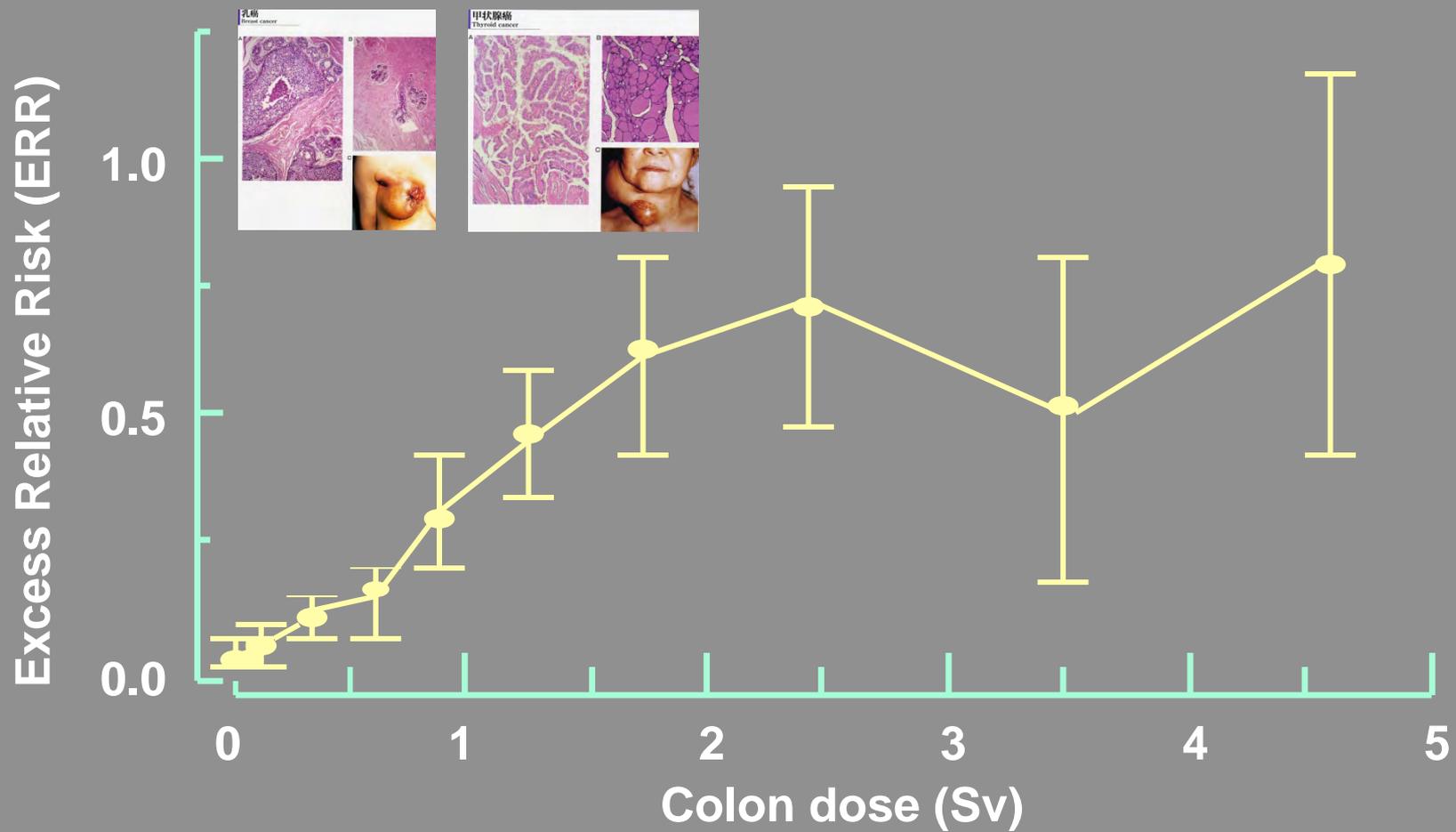
Initial observation of increased rate of leukemia among atomic bomb survivors



From [Leukemia: Dameshek & Gunz 1974]



Leukemia dose response based on a quadratic excess absolute risk (EAR) model



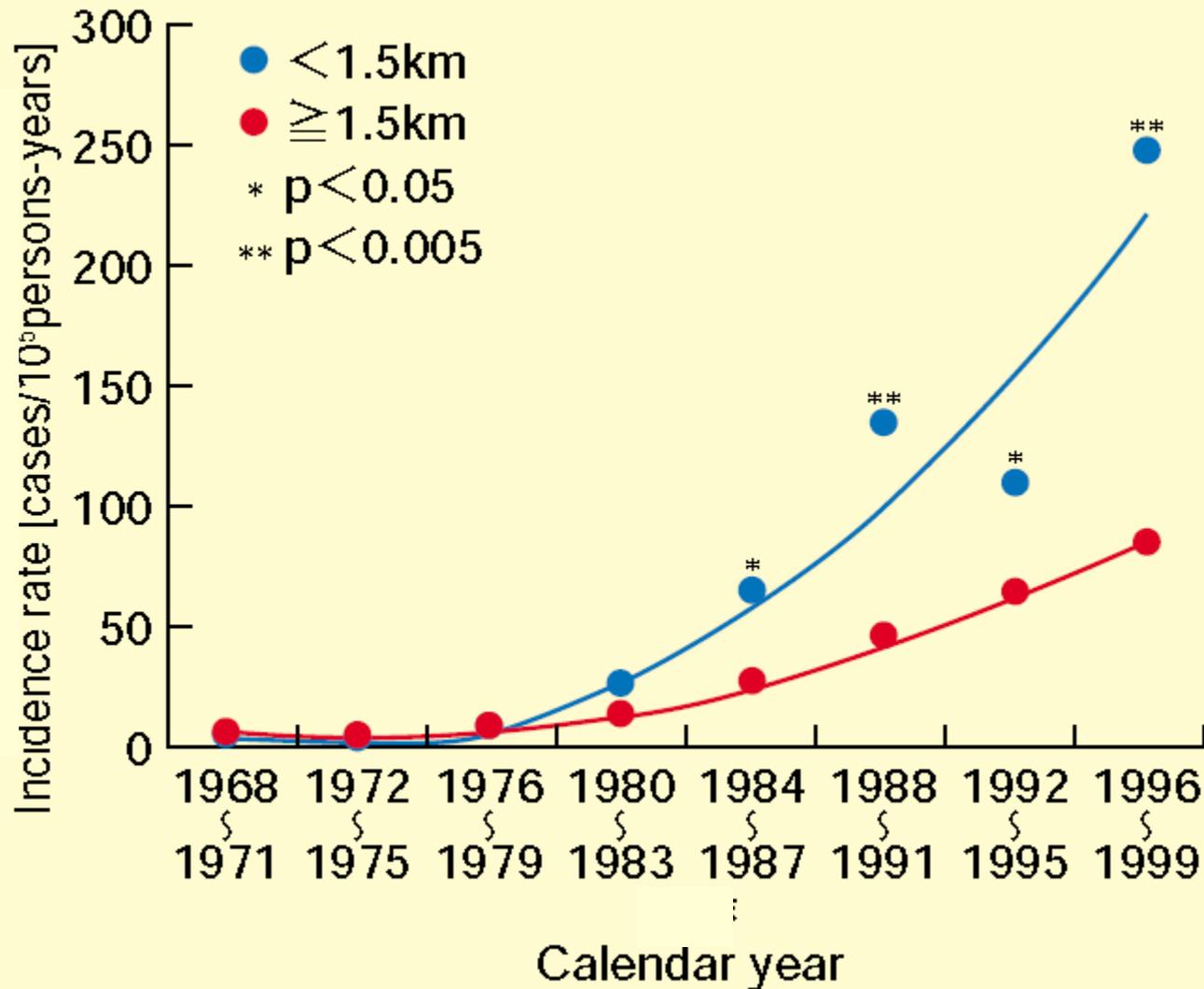
Pierce AD, Shimizu Y, Preston DL, Vaeth M, Mabuchi K: Studies of the Mortality of atomic bomb survivors. Report 12, Part 1. Cancer: 1950-1990. Radiation Research, 146, 1-27, 1996

Excess Relative Risk (ERR): Ratio of death rate (or rate of incidence) for the exposed population and the death rate (or rate of incidence) in the control group. An ERR = 0.5 means an increase of 50%.

Solid cancer dose-response for a male of 30 years of age at the time of exposure

Multiple Cancer Study in Atomic Bomb Survivors in Nagasaki

Ichiro Sekine et al



Recent MDS (myelodysplastic syndromes) Survey in Nagasaki “Second wave of leukemia”

MDS: Leukemia-related Blood Malignancy

Frequently occur among elderly population (over 60 yrs)

Clinical Feature

Morphological dysplasia as shown in photographs

Anemia and low White Blood Cell counts

Ineffective hematopoiesis

20–30% of patients with MDS eventually transform to AML

Chromosome abnormality in 50%

Several subtypes with low to high AML transformation

Diagnosis is difficult

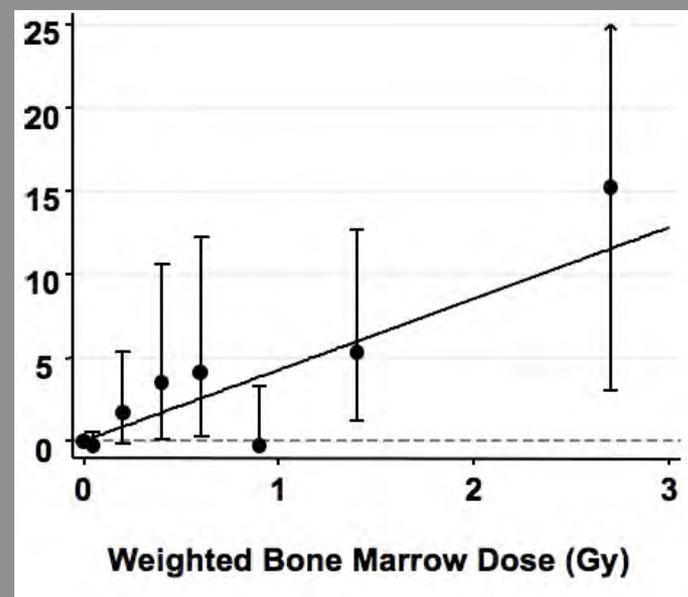
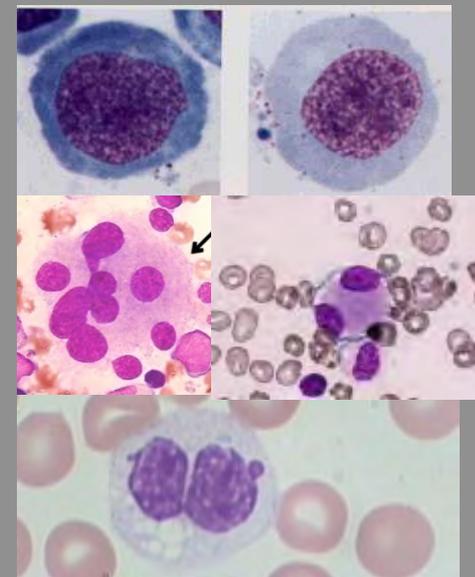
Treatment is difficult, very resistant to drugs

Increasing in the developed countries

Almost equal to AML incidence in developed countries

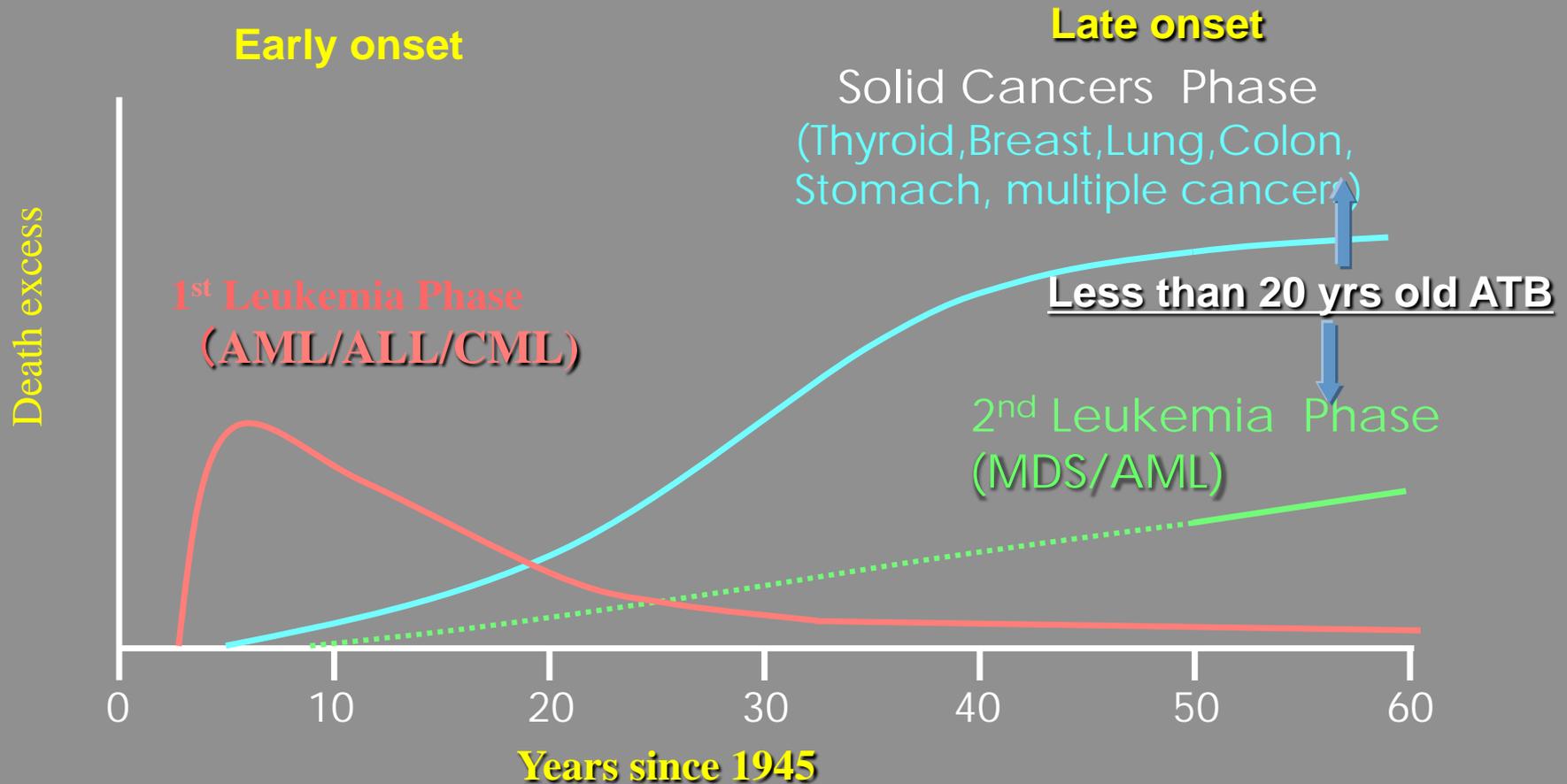
Masako Iwanaga et al:

International J. of Oncology 2011



Excess risk of MDS

Time trend of Atomic Bomb-related Cancers



Why Atomic Bomb Health Effects are long-lasting?

Hypothesis: Organ stem cell hit theory

High dose exposure

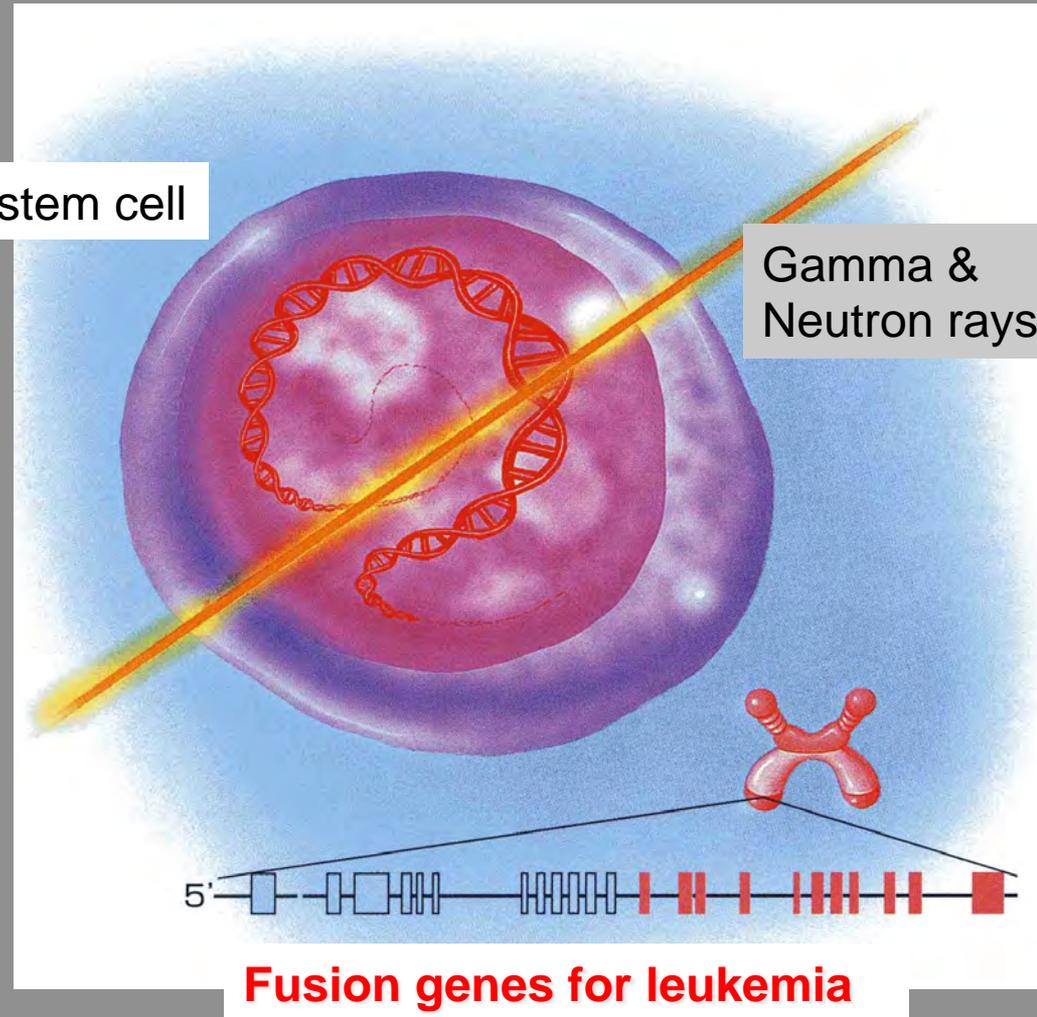
causes massive DNA destruction and cell death

Organ failure and eventual early death (Bone Marrow, Intestines etc.) due to Acute Radiation Sickness(ARS)

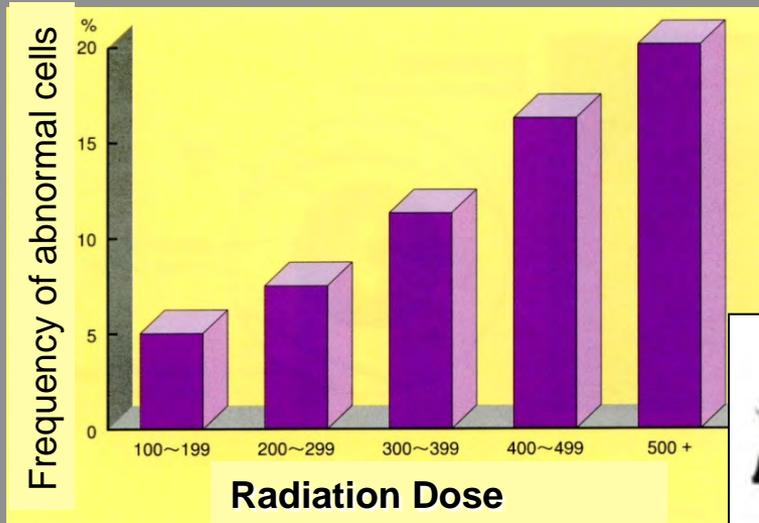
Low/moderate dose exposure

causes DNA damage and long-lasting genetic instability, finally leading to the development of leukemia/cancer.

Germ cells(sperm or ova) DNA damage may cause trans-generation effects to Hibakushas' children (F1)

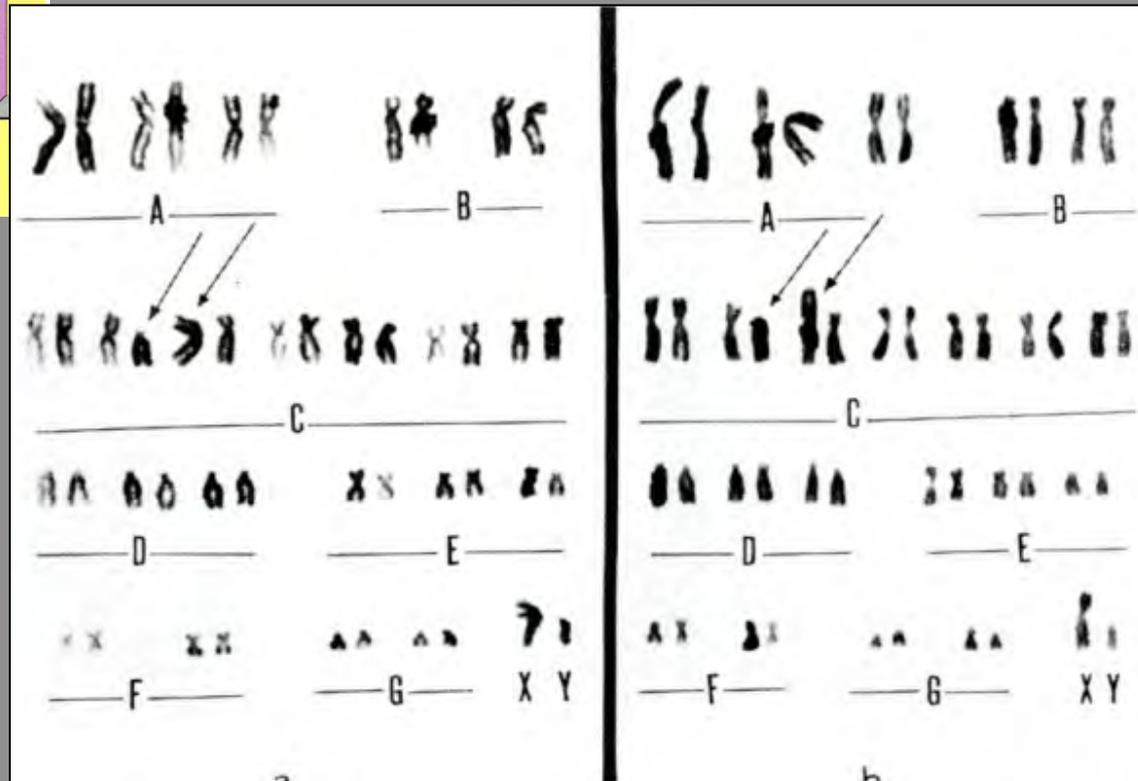


An evidence: Chromosome aberrations in short-distance survivors



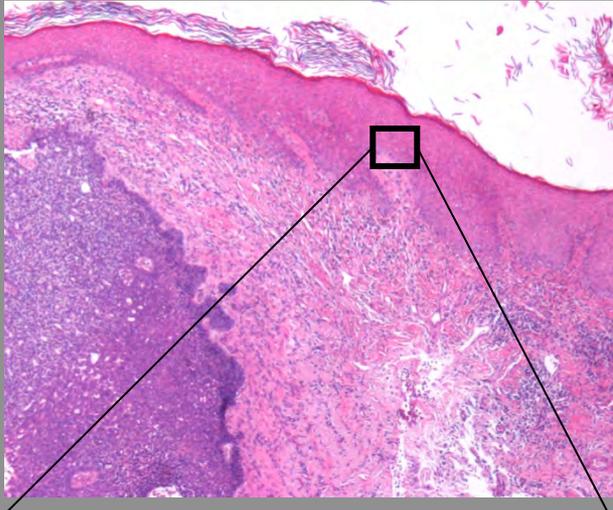
White cells

Red cells

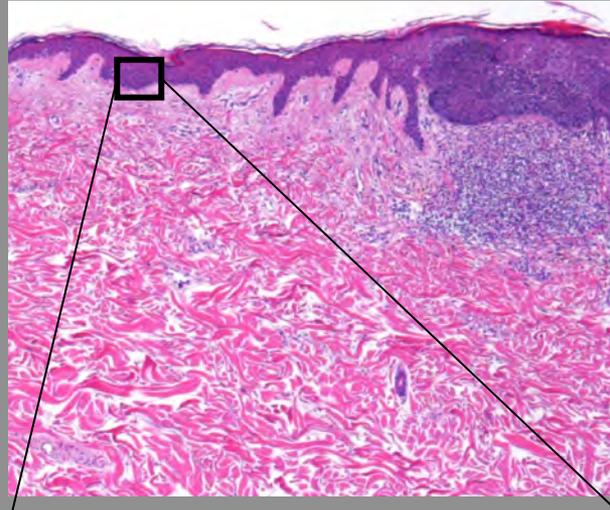


Another evidence: 53BP1 Focus formation in normal looking skin cells adjacent to Skin Cancer of Short distance survivors

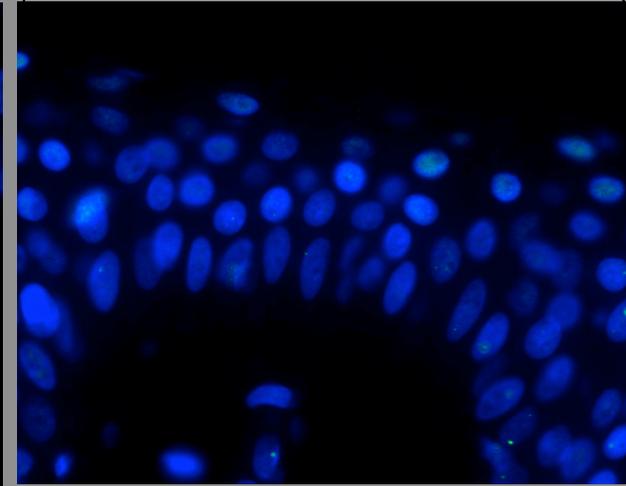
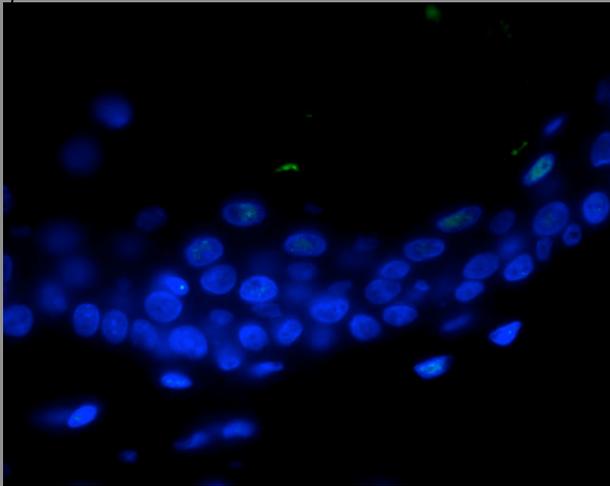
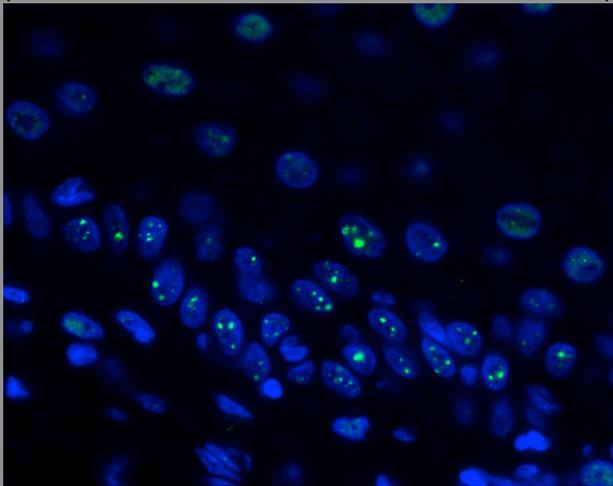
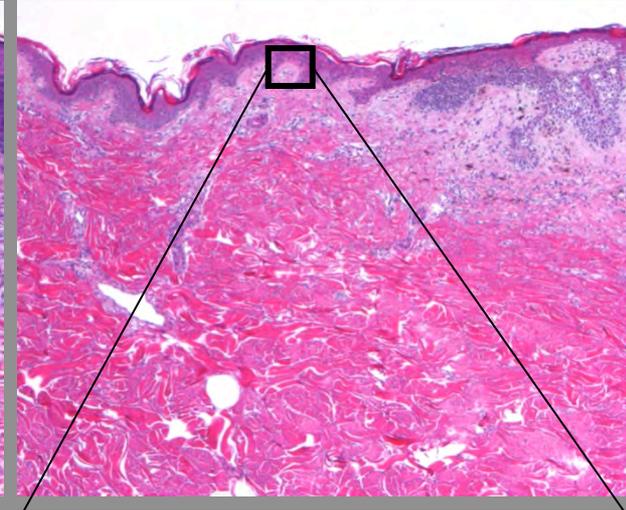
Survivor A: 1.1km



Survivor B: 3.6km



(control)



Dealted genetic instability !!

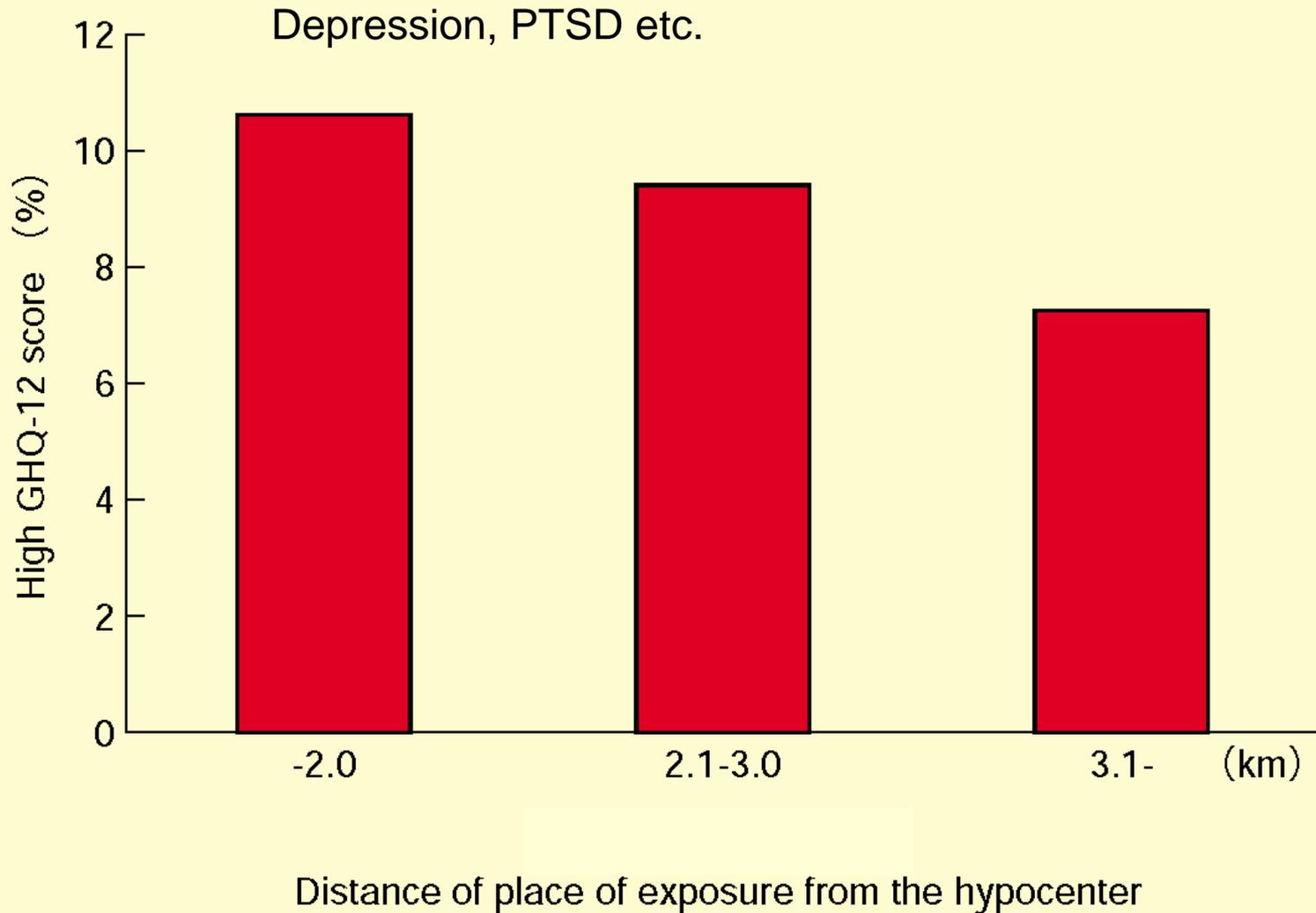
By Noriyuki Aida



**Many girls with face burn eventually lost chance of marriage.
Her lonely life was further enhanced by loss of many family members.**

Psychological Damage Study for Survivors after a half century(1995) by WHO General Health Questionnaire (GHQ)

By Sumihisa Honda



Conclusion

The atomic bombs are “Gene-targeting weapon”.

**The radiation immediately causes DNA damage,
that induces leukemia/cancers during
survivors’ entire life.**

“Psychological effect” is also long-lasting and profound.