

# Hiroshima and Nagasaki

Ingrid Dypvik Landmark  
DSA

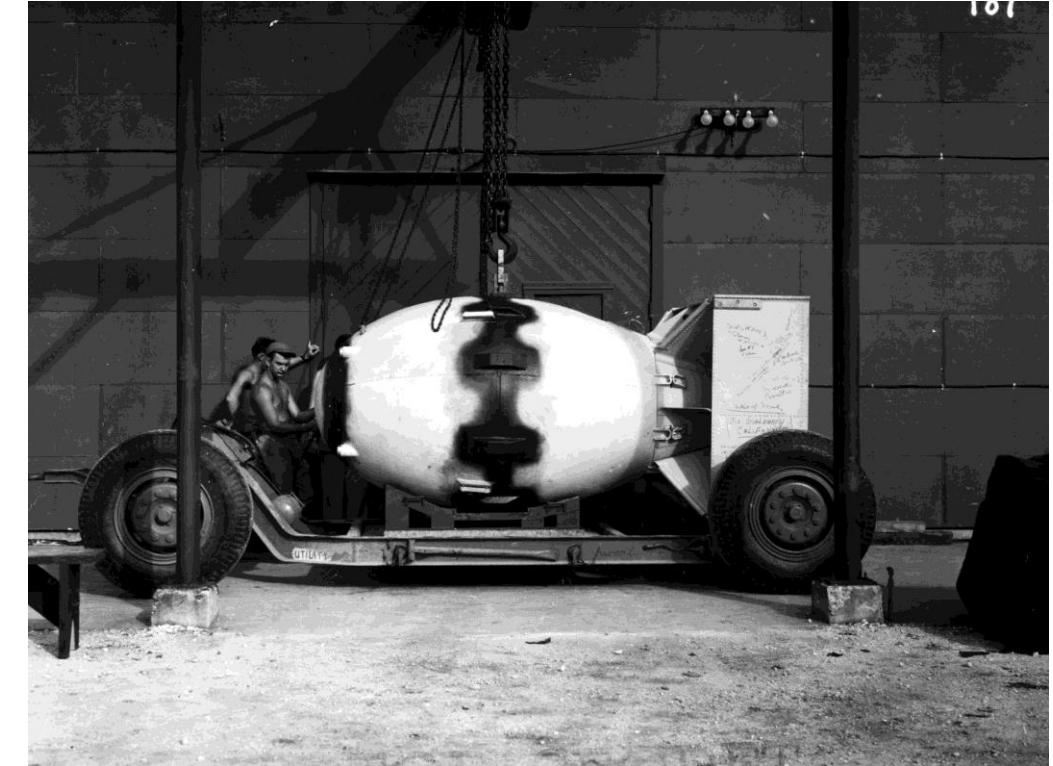
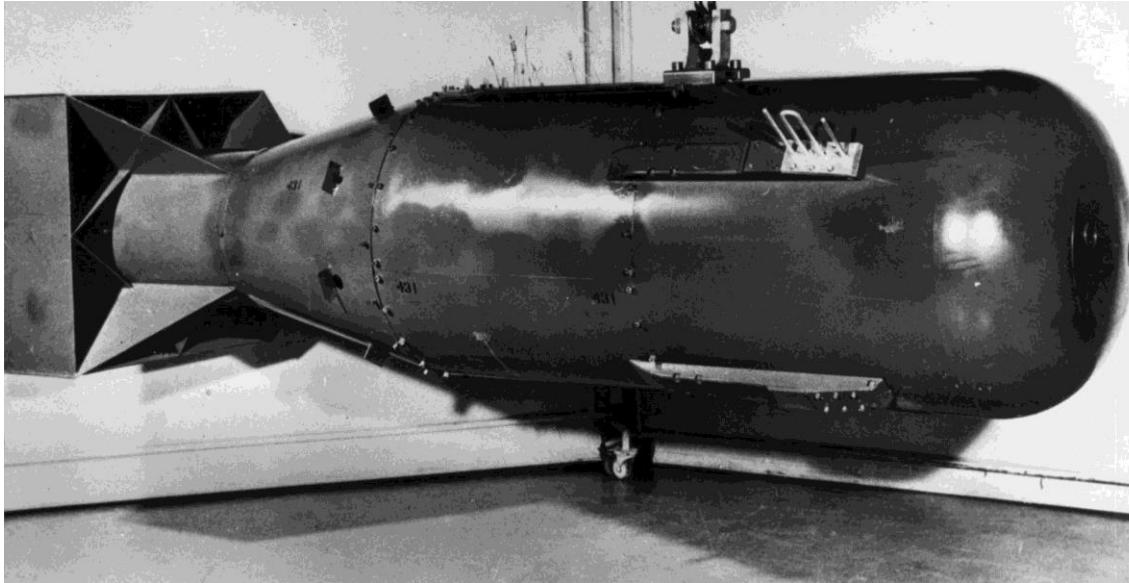


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Norwegian Radiation  
and Nuclear Safety Authority

# Manhattan project

- Little boy, 13 kT
- Enriched uranium gun-type fission weapon

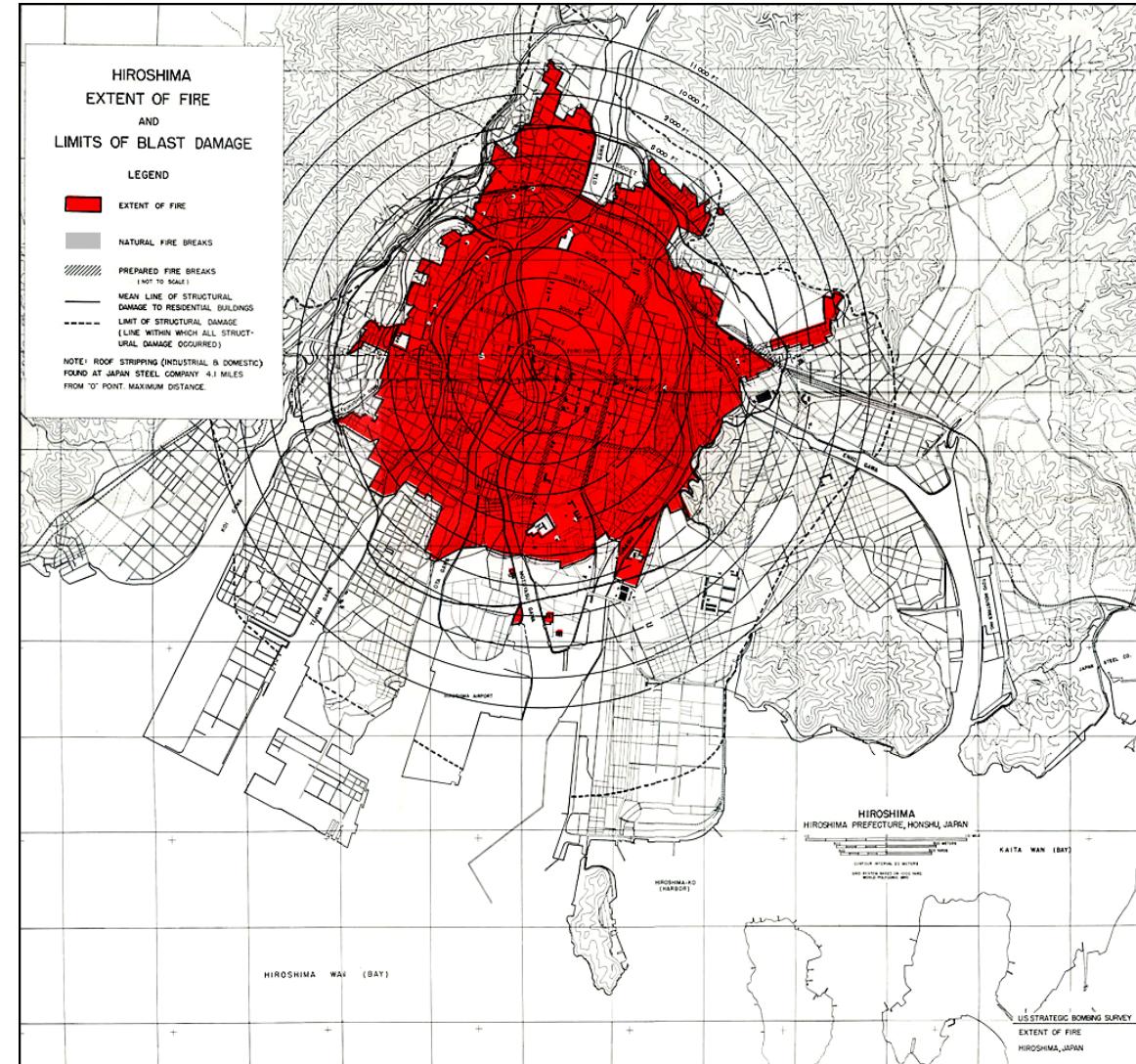


- Fat man, 21 kT
- Plutonium implosion type nuclear weapon

Hiroshima 6 August, 1945



80 000 directly killed  
90 000-166 000 killed by the end of the year



# Nagasaki

9 August 1945

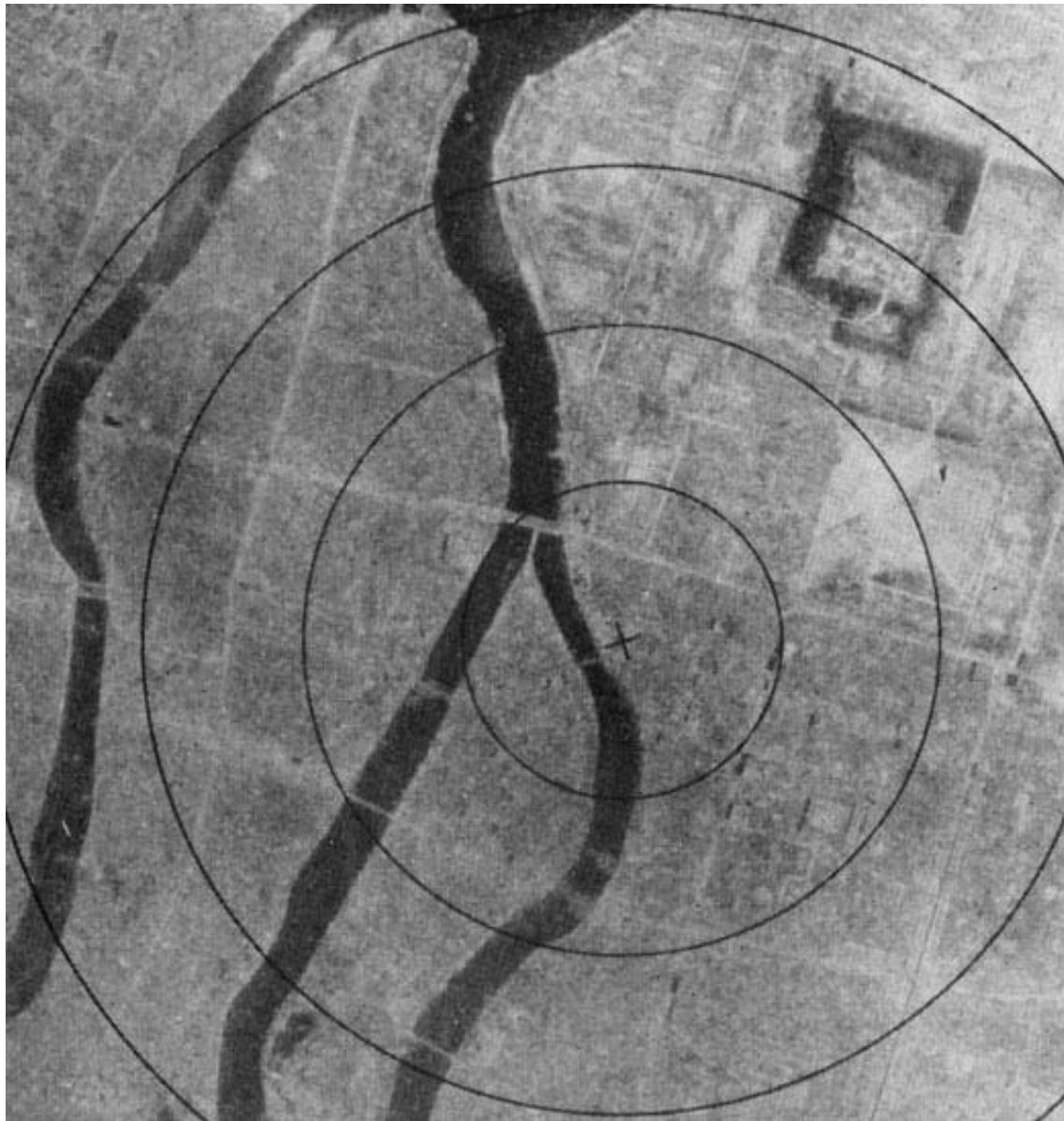
35000-40000  
directly killed

39000-80000 total  
deaths by the end  
of the year



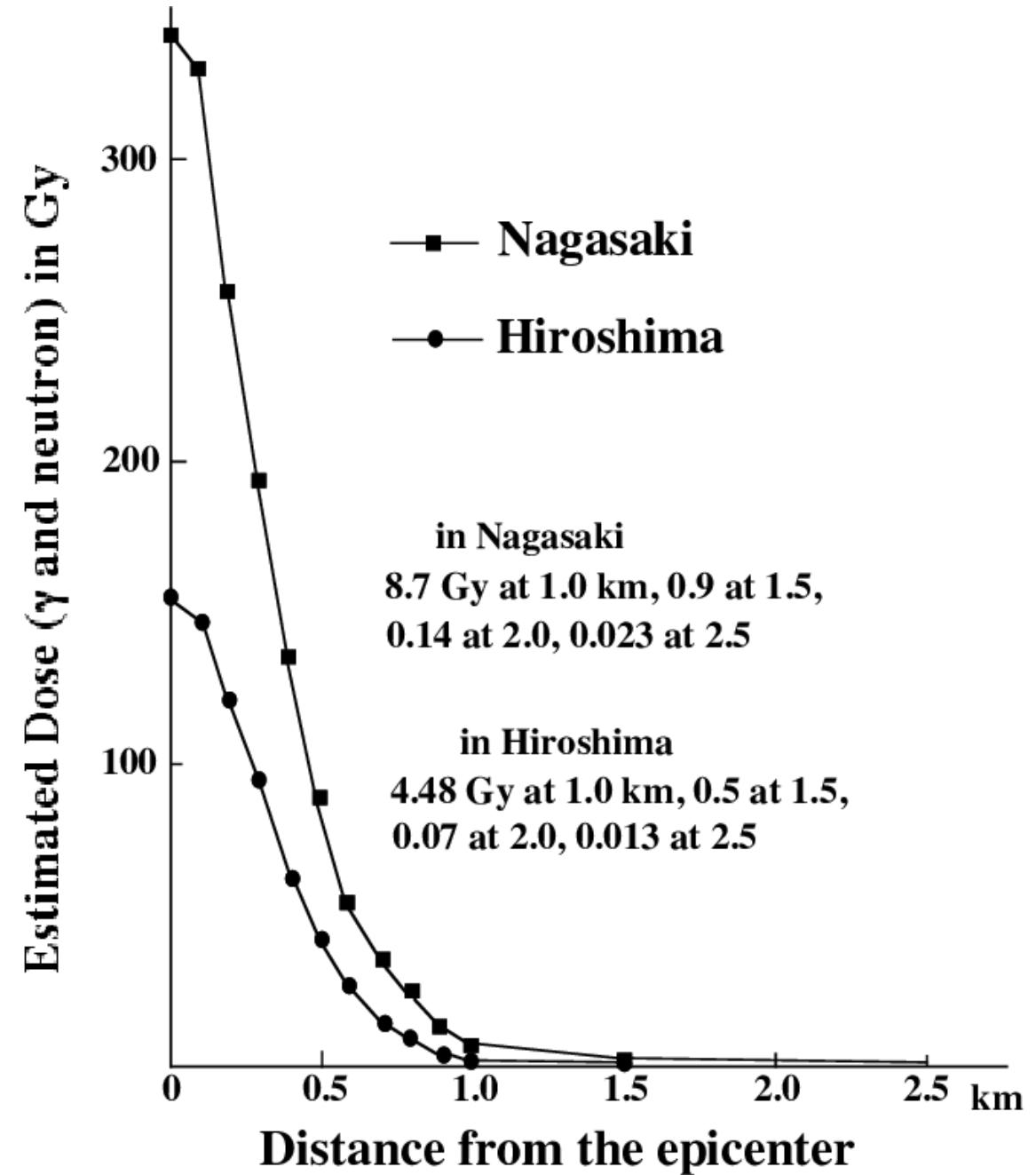
Normal  
and





# Radiation levels

- Gamma radiation
- Black rain
- Neutron activation



# ABCC, RERF and LSS

- The atomic bomb casualty comission, 1946
- Radiation effects research foundation, 1975
- Life span study
  - 120 0000 individuals
  - 94 000 survivors
  - 27 000 unexposed
  - Average dose 0,27 Sv
  - 6000 individuals > 0,1 Sv
  - 700 individuals >1 Sv



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# Immediate effects

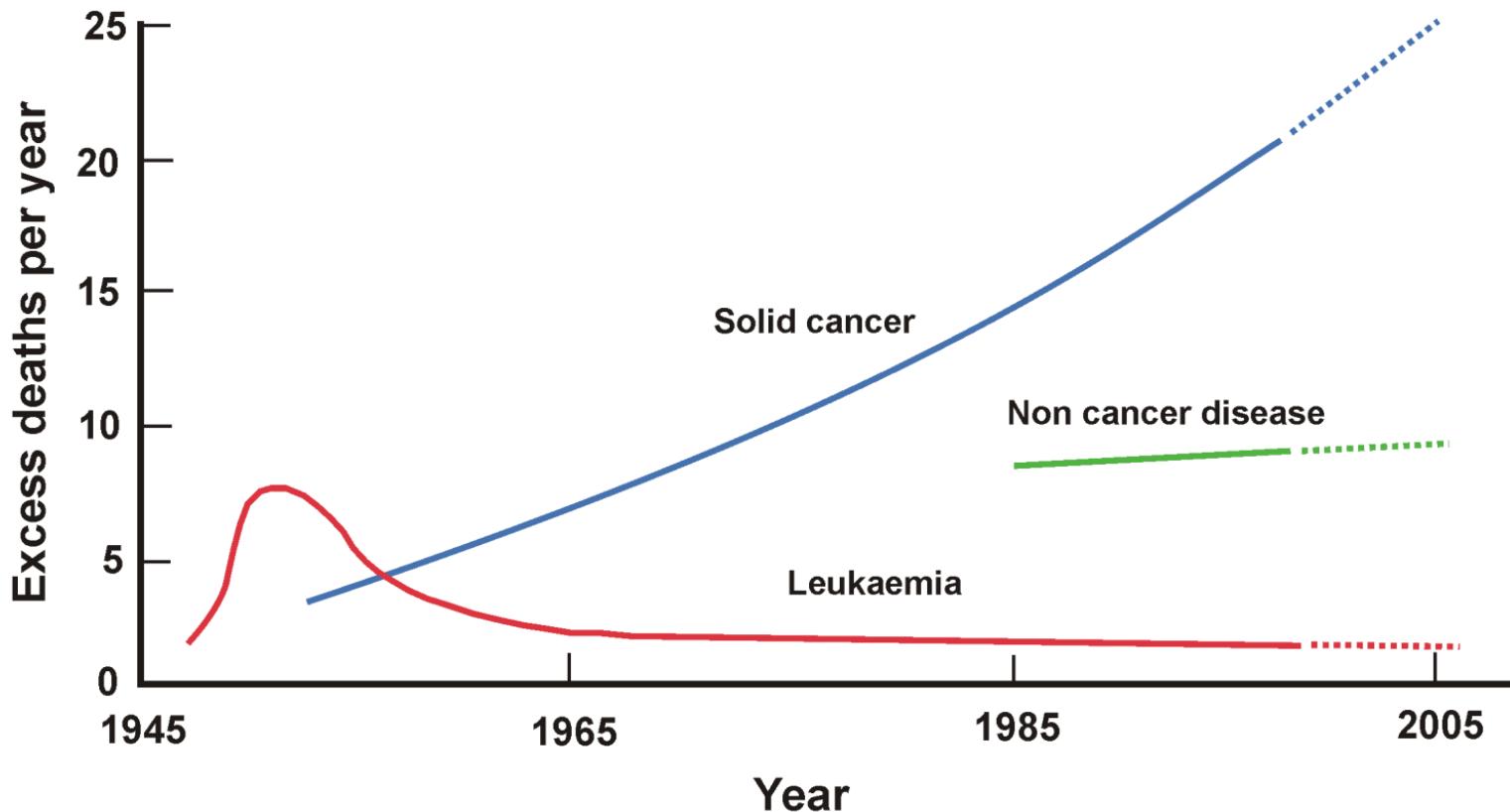
- Thermal injuries
- Mechanical blast injuries
- Acute radiation syndrome
  - 13500 died within 30 days
  - Epilation
  - Purpura
  - Bleeding from gums
  - Diarrhea
  - Fever
  - Vomiting and nausea



# Long term effects

- Leukemia
- Cancer
- Non-cancer diseases
  - Cataract
  - Benign thyroid tumor
  - Heart disease
  - Stroke
- In utero effects
- No heritable effects!

Radiation-associated mortality in the LSS cohort  
size ca 86 000  
(E Hall & AJ Giaccia 2012)



# Non-radiological effects

- PTSD
- Hibakusha





Thank you!

Sources  
RERF  
Wikipedia  
ICAN



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