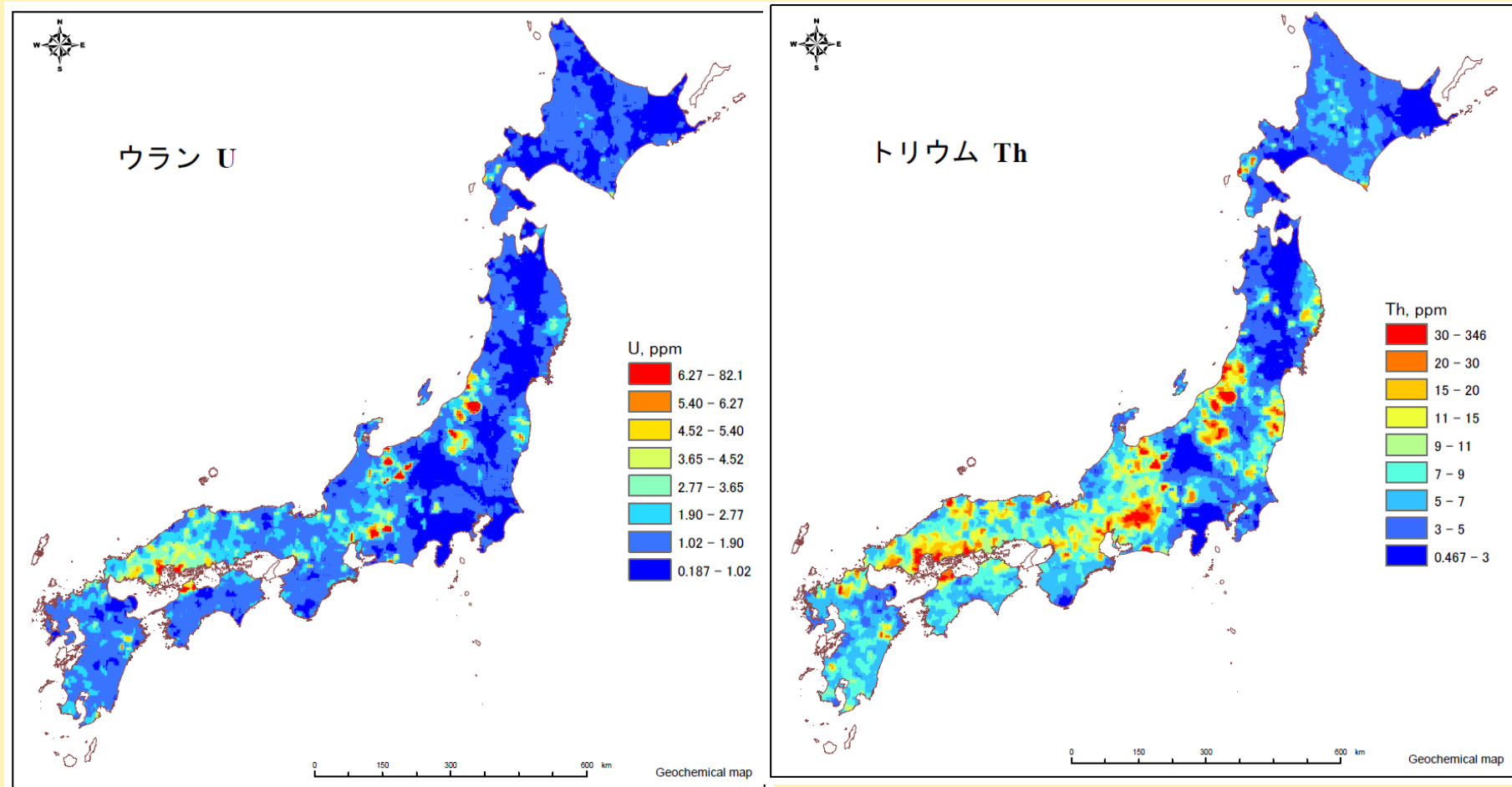


Terrestrial radiation and cancer mortality in Japan

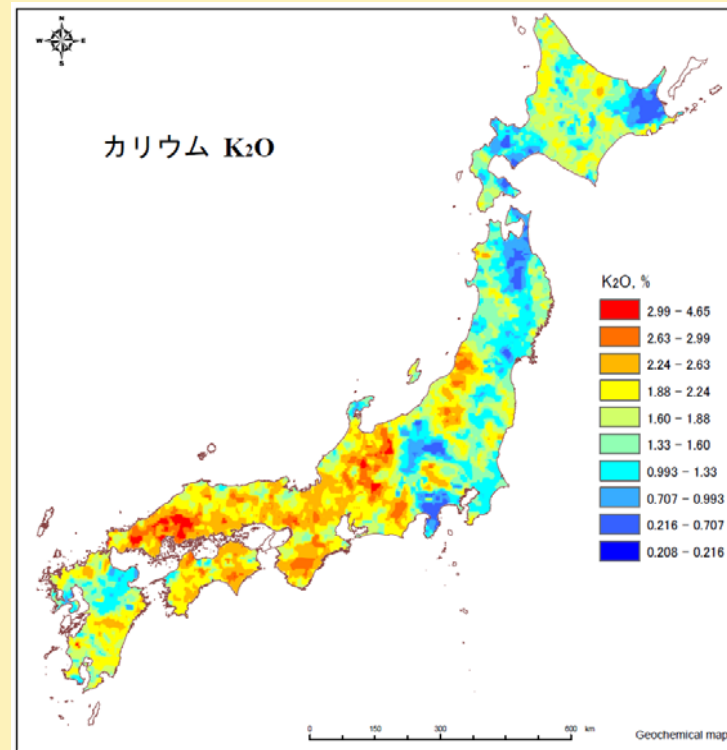
Imanaka T.

September 7, 2010

Terrestrial radionuclides



Natural radiation: terrestrial origin



Geochemical map of Japan, AIST HP

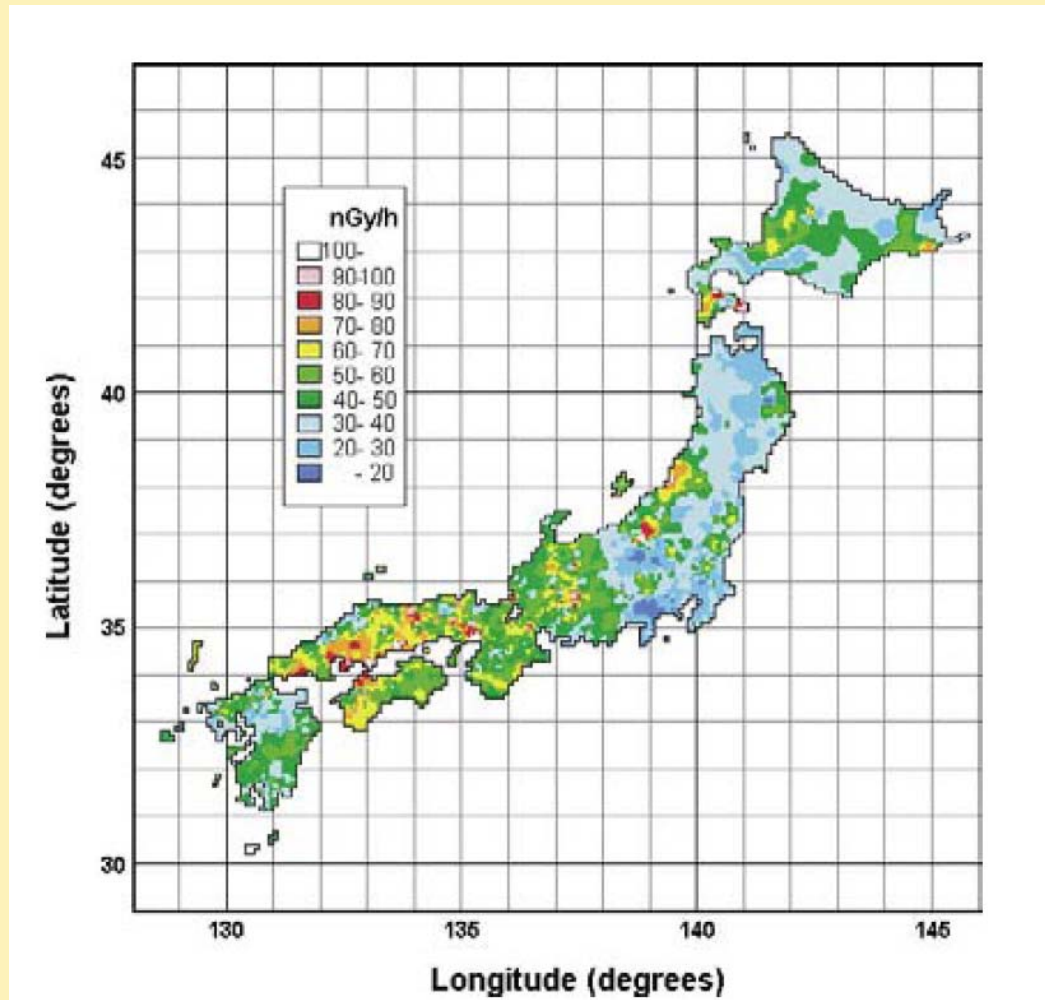
Gamma-ray radiation rate at 1 m above ground:

$$D(\mu\text{Gy/h}) = 5.4 \times U(\text{ppm}) + 2.7 \times \text{Th}(\text{ppm}) + 13.0 \times K(\%) \quad \text{HASL-258(1972)}$$

Example : Hiroshima U:2.4ppm、Th:14.3ppm、K:2.4%

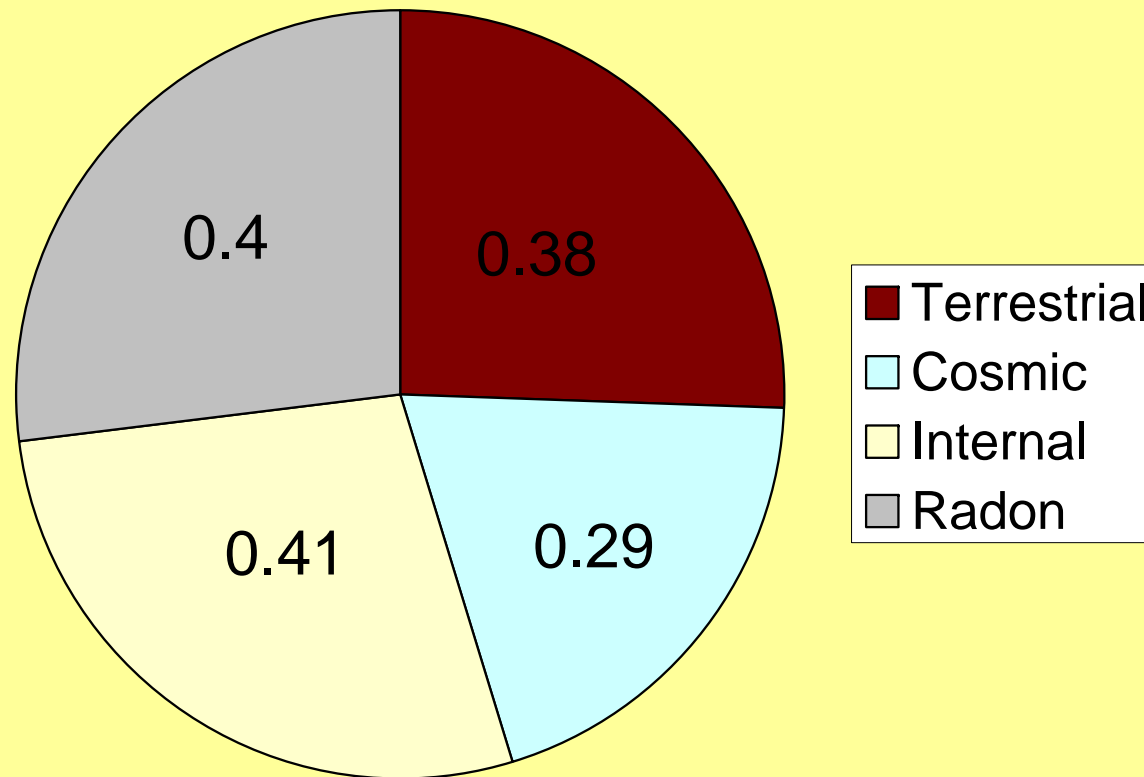
$$13 \mu\text{Gy/h (U)} + 39 \mu\text{Gy/h (Th)} + 30 \mu\text{Gy/h (K)} \rightarrow 83 \mu\text{Gy/h}$$

Terrestrial γ -radiation in Japan



Minato, J Geography, 2006

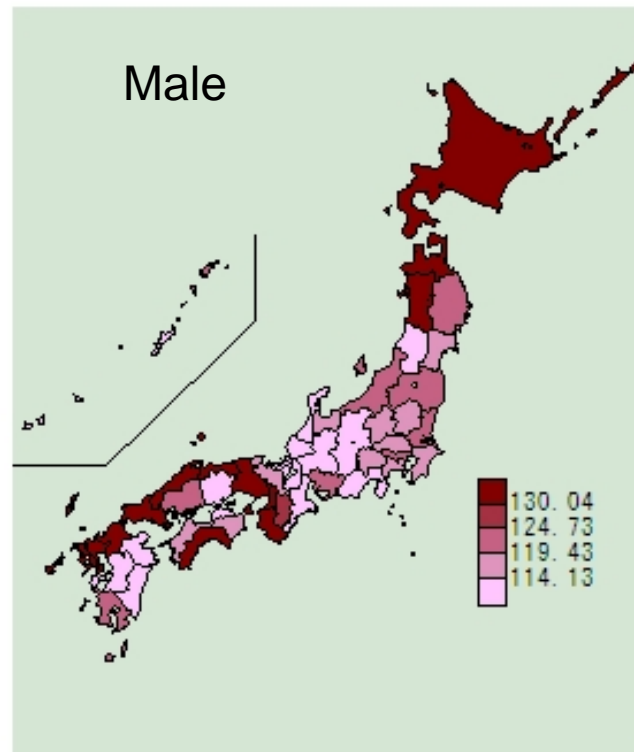
Natural radiation other than terrestrial



Natural radiation in Japan: 1.5 mSv/year

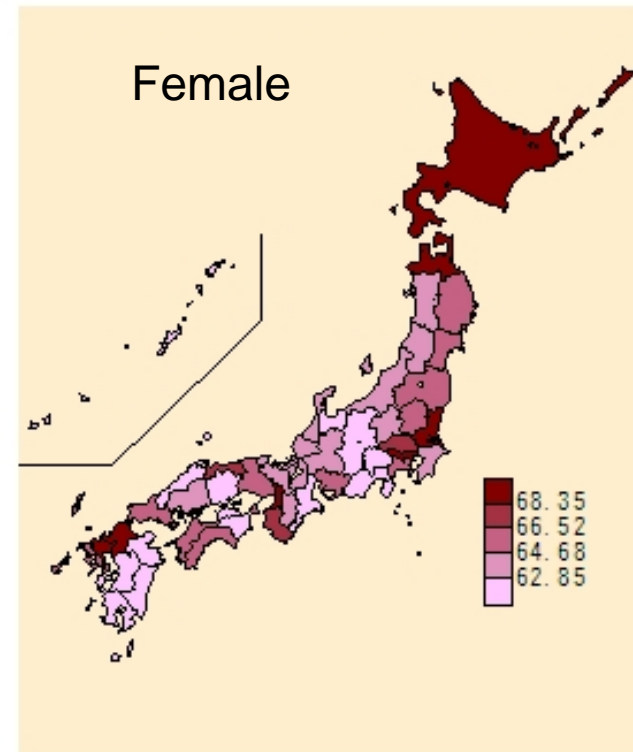
Cancer mortality in Japan: total cancer

都道府県別75歳未満年齢調整死亡率
(男性)
[全部位 2005年]



資料: 国立がんセンターがん対策情報センター
Source: Center for Cancer Control and Information Services,
National Cancer Center, Japan

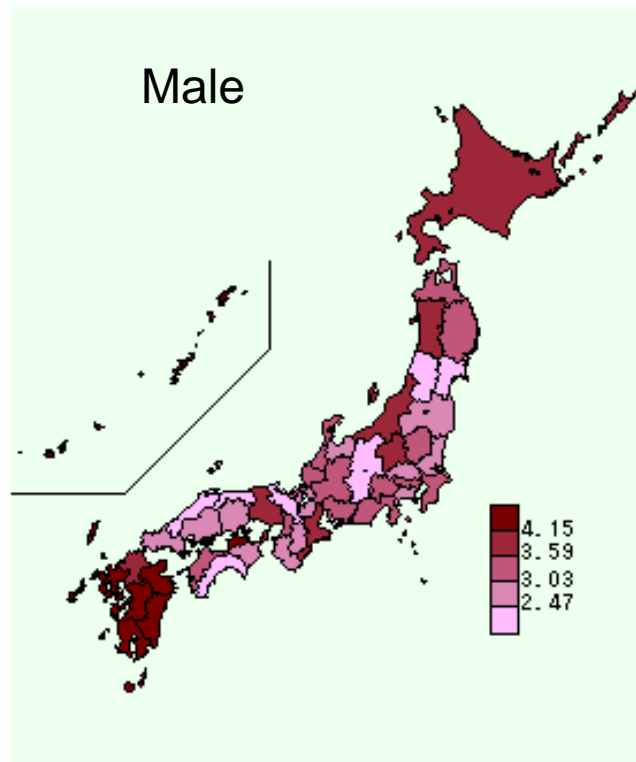
都道府県別75歳未満年齢調整死亡率
(女性)
[全部位 2005年]



資料: 国立がんセンターがん対策情報センター
Source: Center for Cancer Control and Information Services,
National Cancer Center, Japan

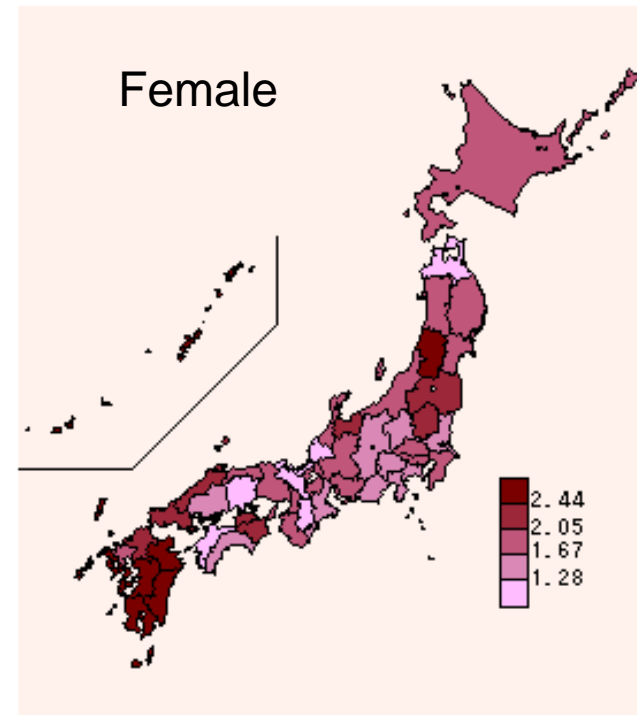
Cancer mortality in Japan: leukemia

都道府県別75歳未満年齢調整死亡率
(男性)
[白血病 2008年]



資料: 国立がんセンターがん対策情報センター
Source: Center for Cancer Control and Information Services,
National Cancer Center, Japan

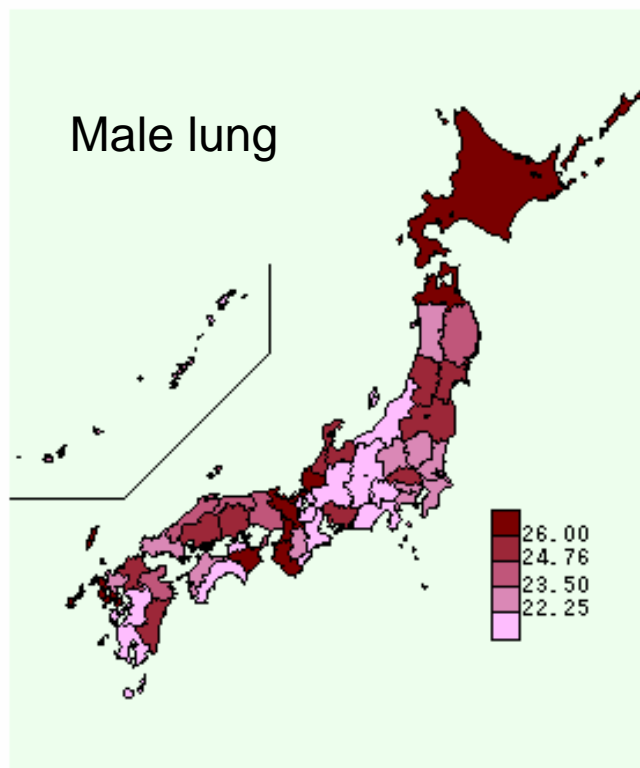
都道府県別75歳未満年齢調整死亡率
(女性)
[白血病 2008年]



資料: 国立がんセンターがん対策情報センター
Source: Center for Cancer Control and Information Services,
National Cancer Center, Japan

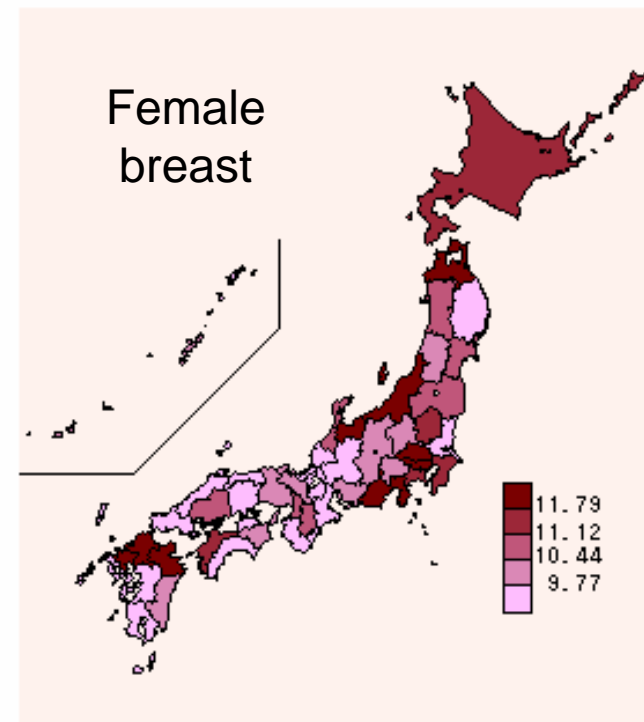
Cancer mortality in Japan: lung, breast

都道府県別75歳未満年齢調整死亡率
(男性)
[肺 2008年]



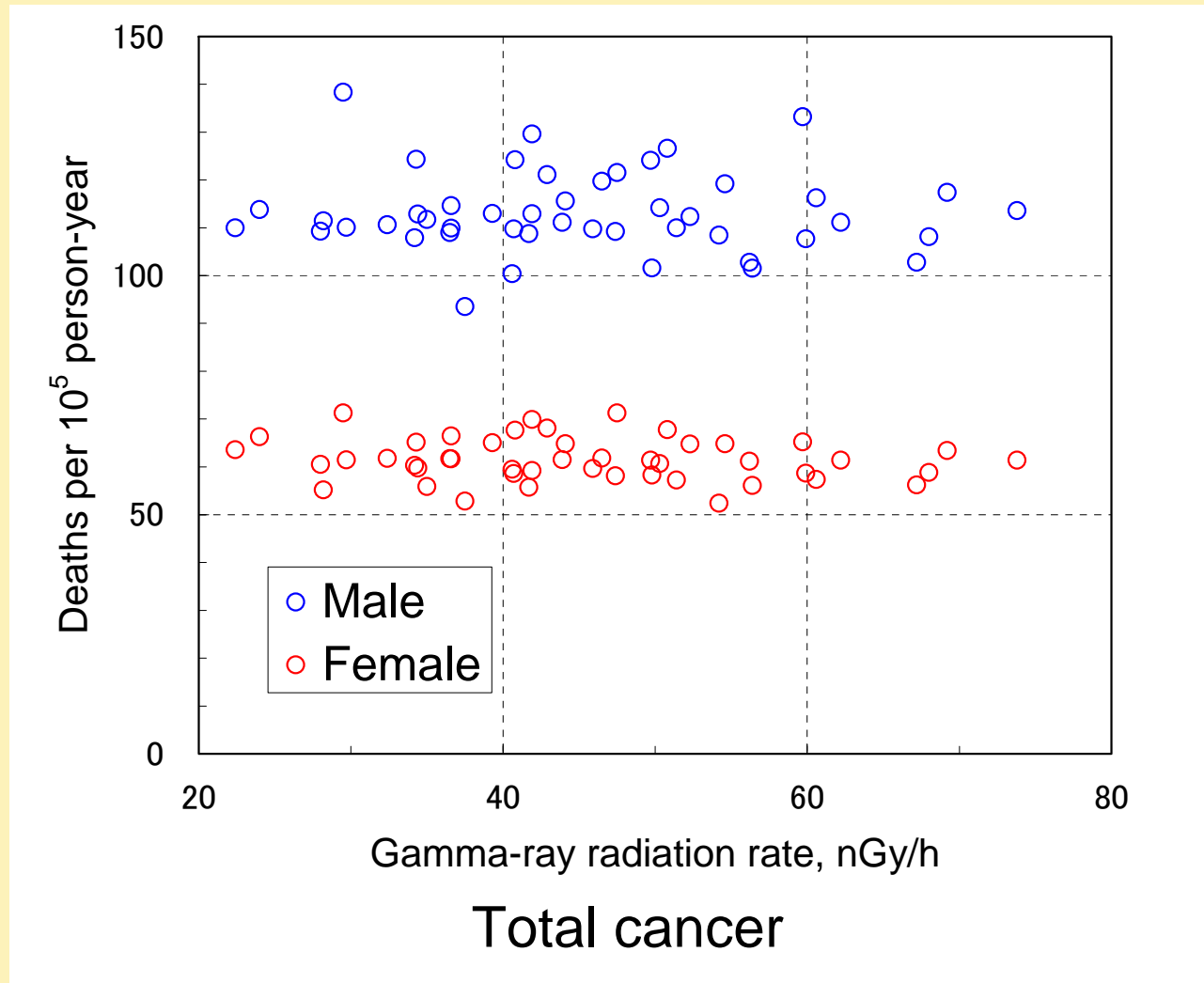
資料: 国立がんセンターがん対策情報センター
Source: Center for Cancer Control and Information Services,
National Cancer Center, Japan

都道府県別75歳未満年齢調整死亡率
(女性)
[乳房 2008年]

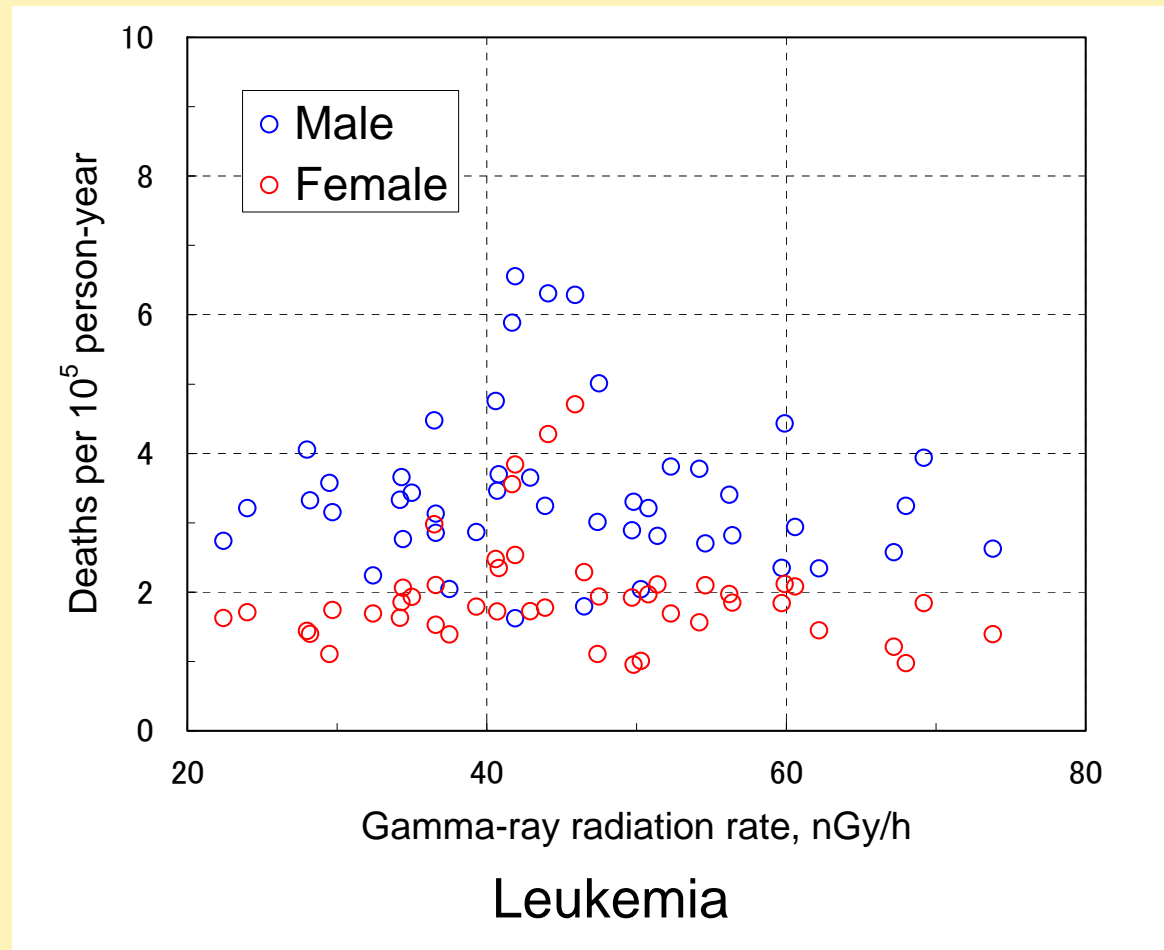


資料: 国立がんセンターがん対策情報センター
Source: Center for Cancer Control and Information Services,
National Cancer Center, Japan

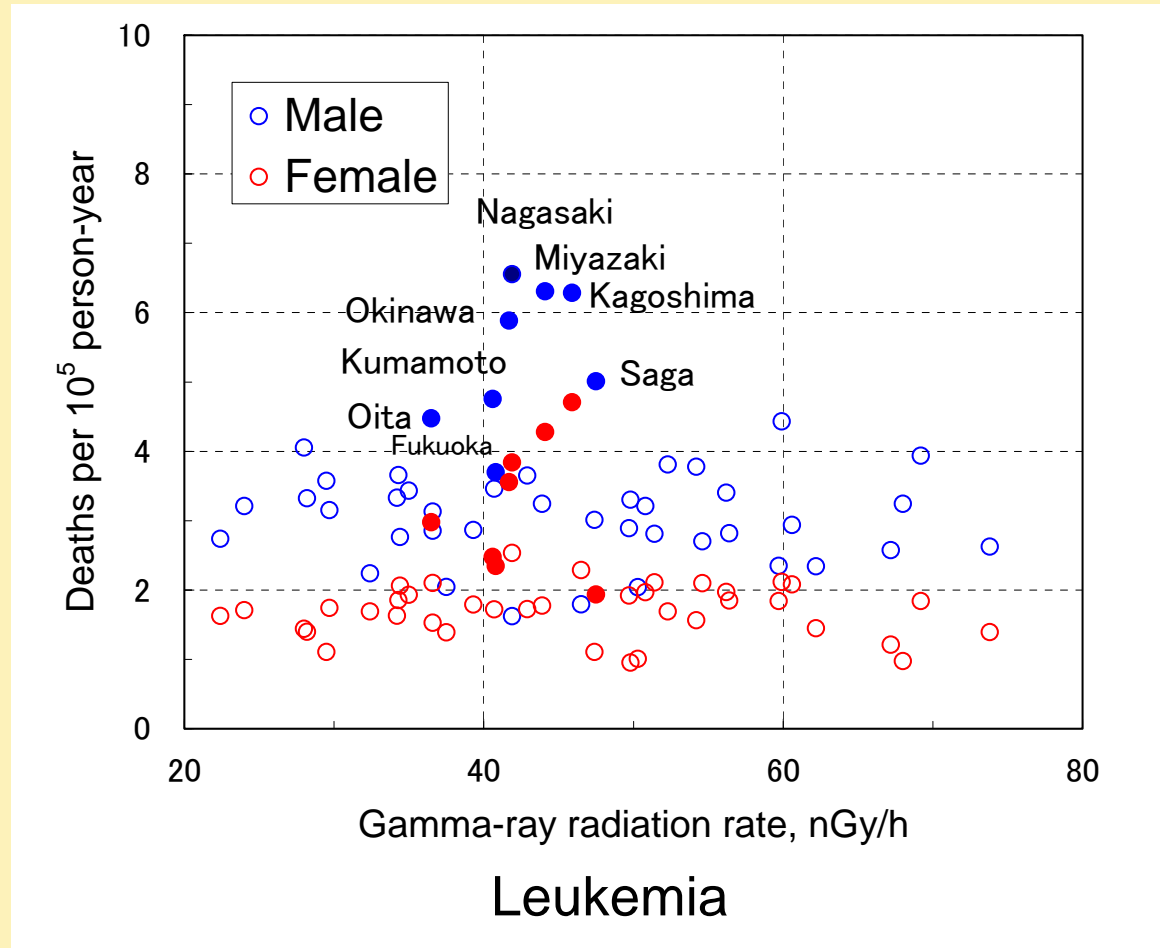
Relation between terrestrial- γ and cancer mortality



Relation between terrestrial- γ and cancer mortality

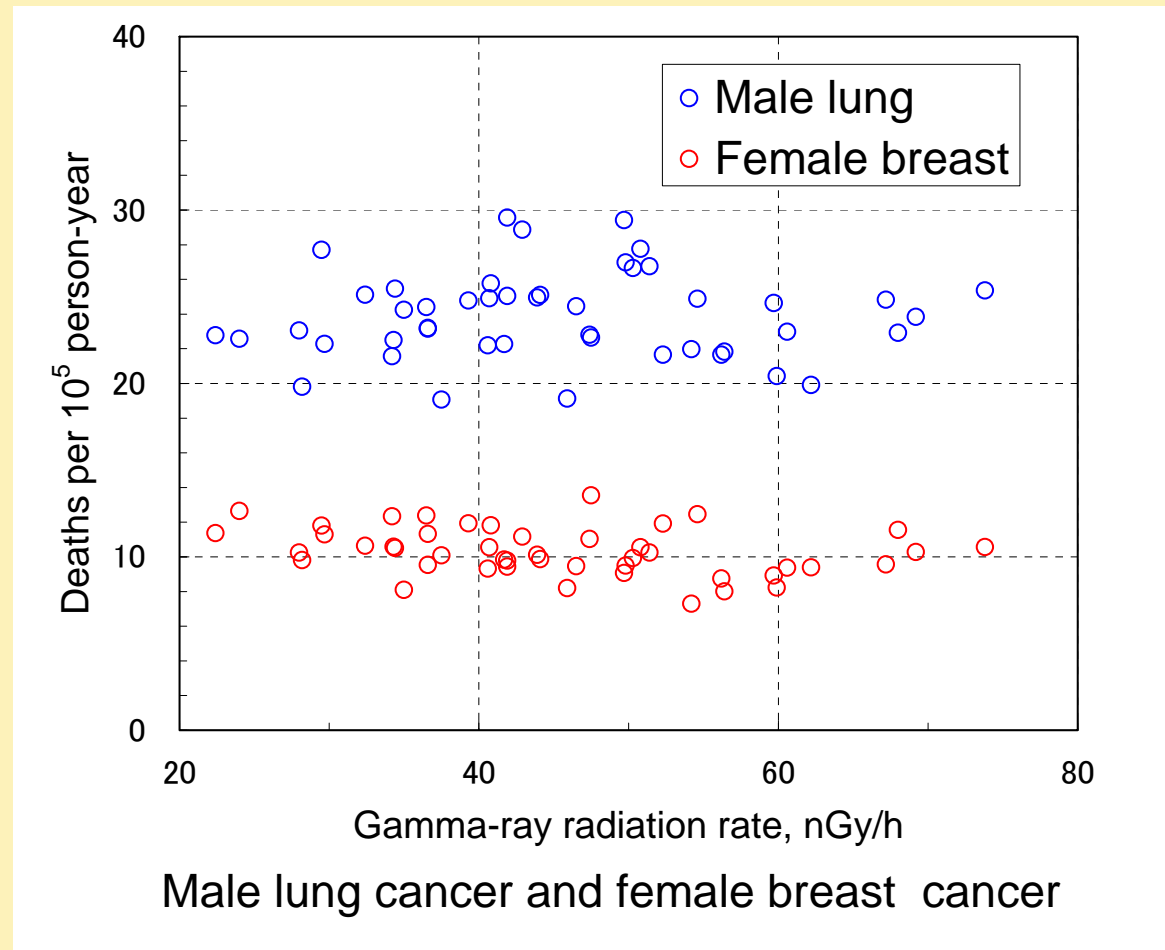


Relation between terrestrial- γ and cancer mortality

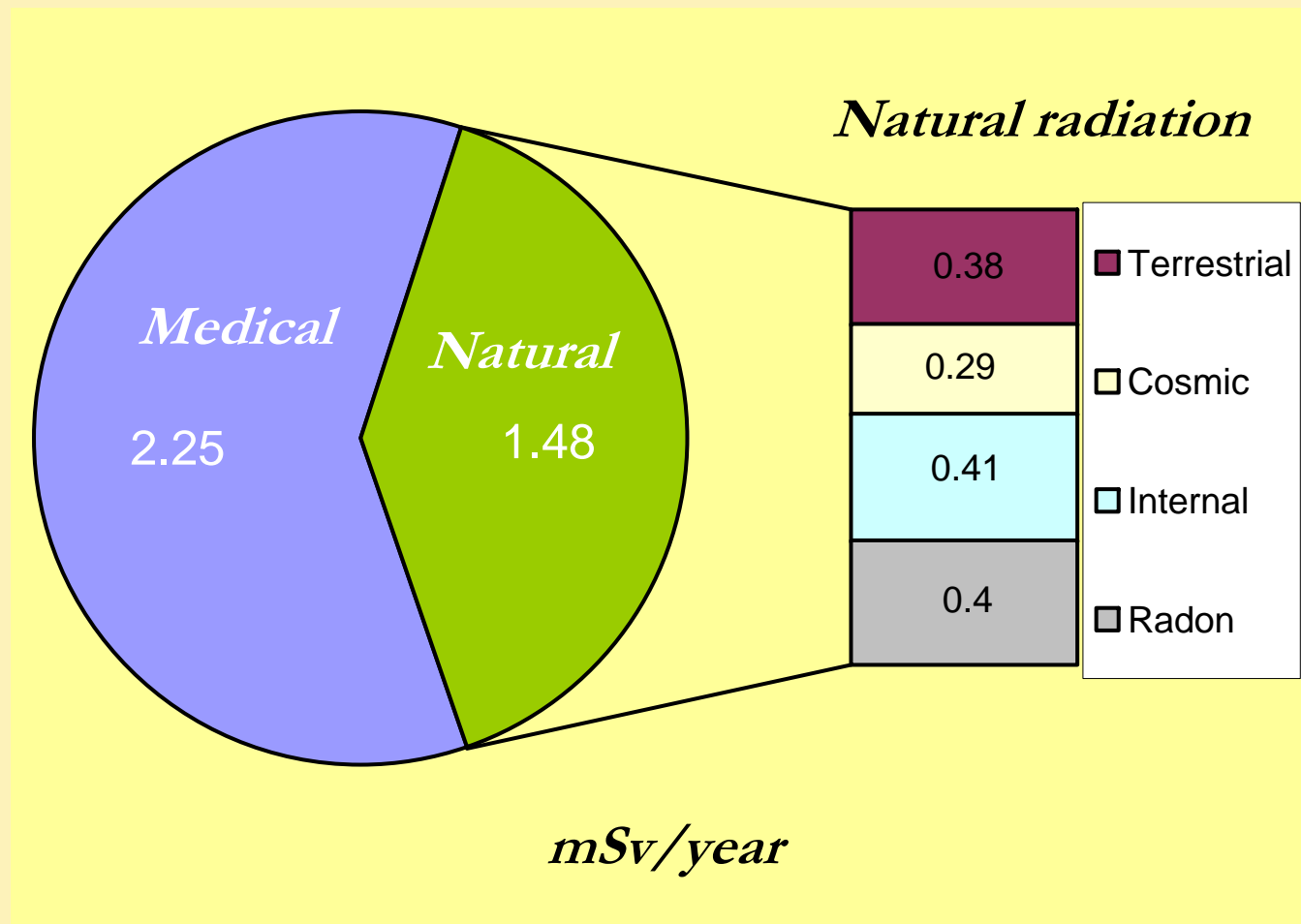


Closed circles are prefectures in Kyushu island and Okinawa.

Relation between terrestrial- γ and cancer mortality



Natural and medical radiation in Japan



Data by Radiation Effects Foundation

Summary

- Preliminary analysis by Imanaka failed to indicate a relationship between terrestrial radiation and cancer mortality in Japan.
- Considering the natural radiation of 1.5 mSv/yr for 130 million population and the cancer risk factor of 0.05 /Sv, about 10,000 cancer deaths are expected annually due to natural radiation, which corresponds to 3 % of total cancer deaths in Japan.
- If the real risk factor is 10 times larger than the above, 30 % will be due to natural radiation.
- The study by Tondel is interesting and worthy to be challenged.