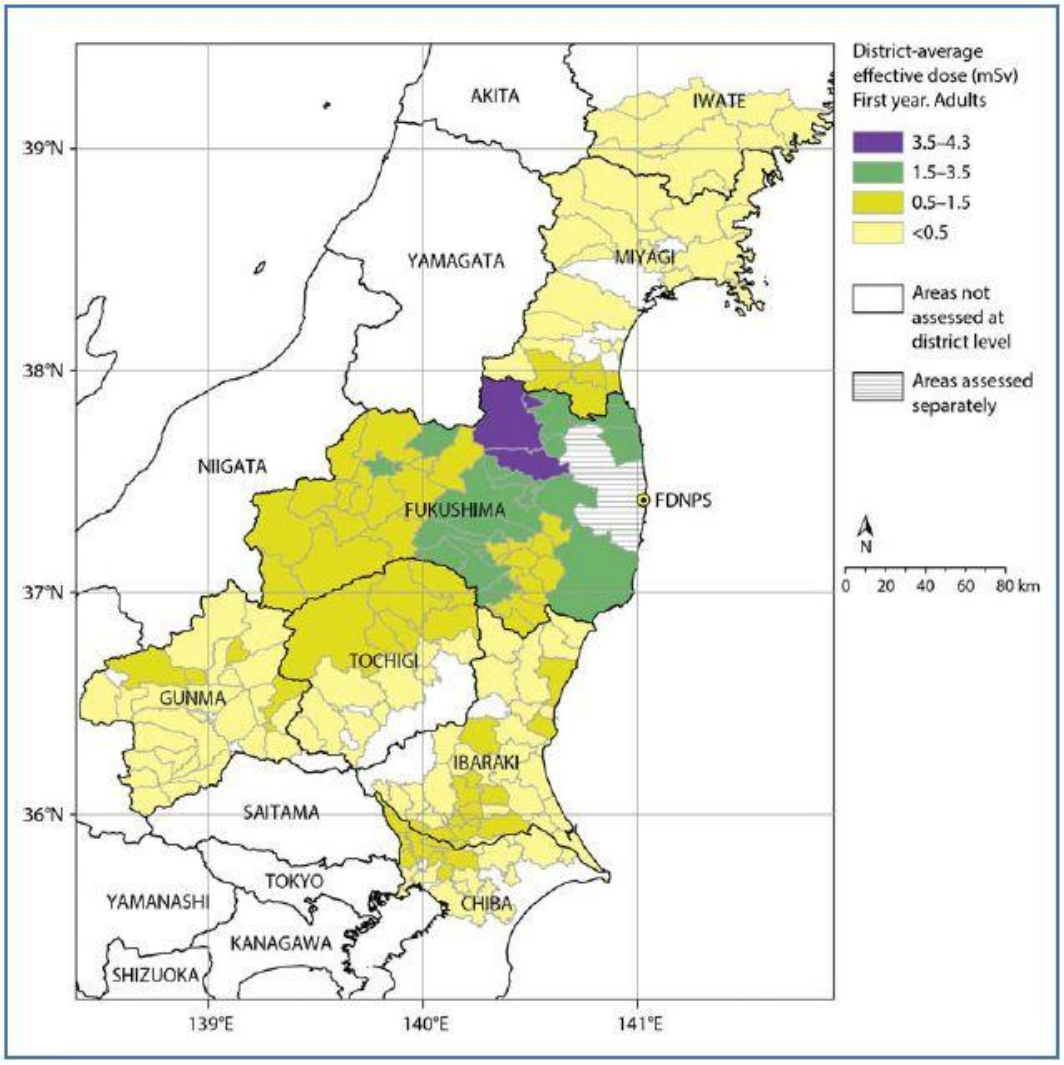
Perinatal mortality in Japan after Fukushima

Alfred Körblein

Nuremberg, Germany



District average effective dose (mSv) in the first year after the Fukushima accident

Study region:

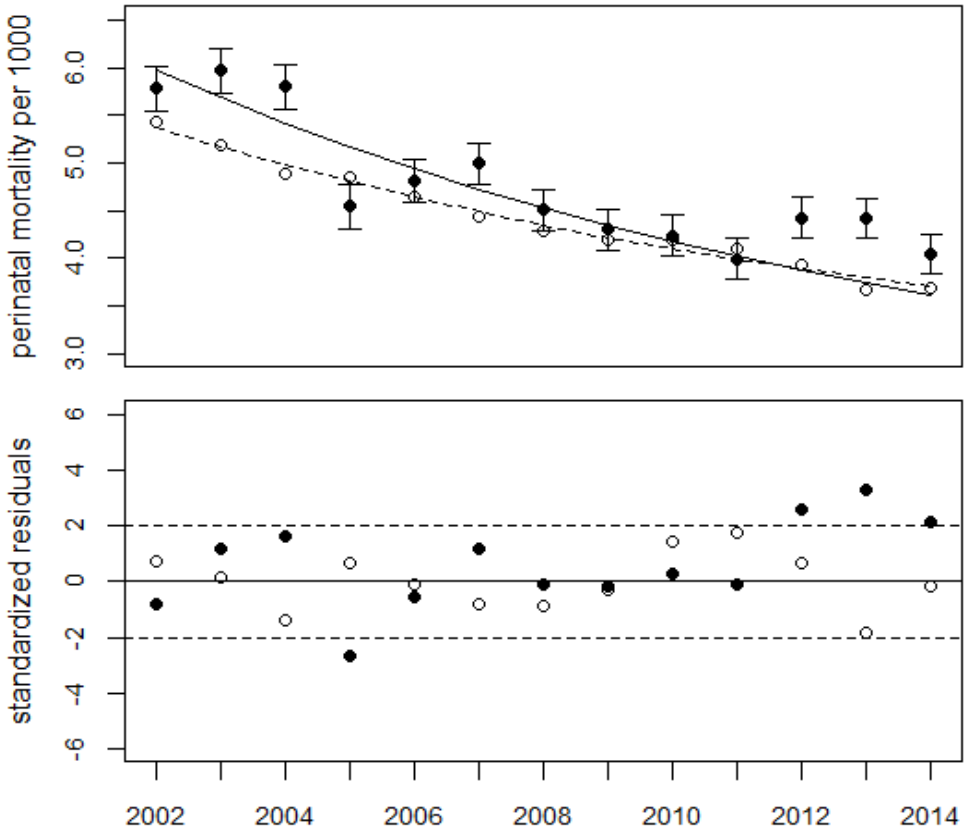
Prefectures Fukushima + Miyagi + Gunma + Tochigi + Ibaraki

Control region:

Rest of Japan

Source: UNSCEAR 2013

Objective of the study



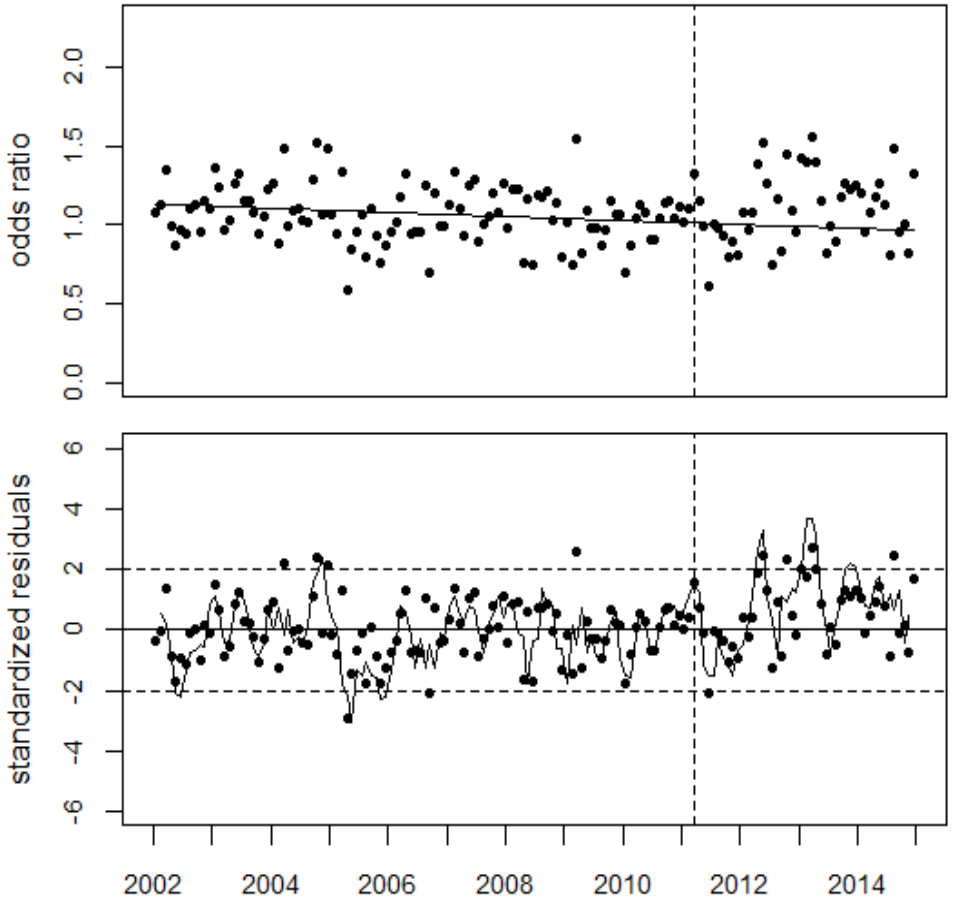
Objective:
To test whether there is an increase of perinatal mortality after Fukushima

Regression model:
Combined regression of data from the study region and the data from Japan without the study region

Results:
Significant increases in 2012 and 2013 relative to the trend in 2002-2011
143 excess perinatal deaths in 2012-14

Upper panel: Infant mortality rates in the study (black dots) and control region (open circles)
Lower panel: Deviations of observed from expected rates (standardized residuals)

Analysis of monthly odds ratios



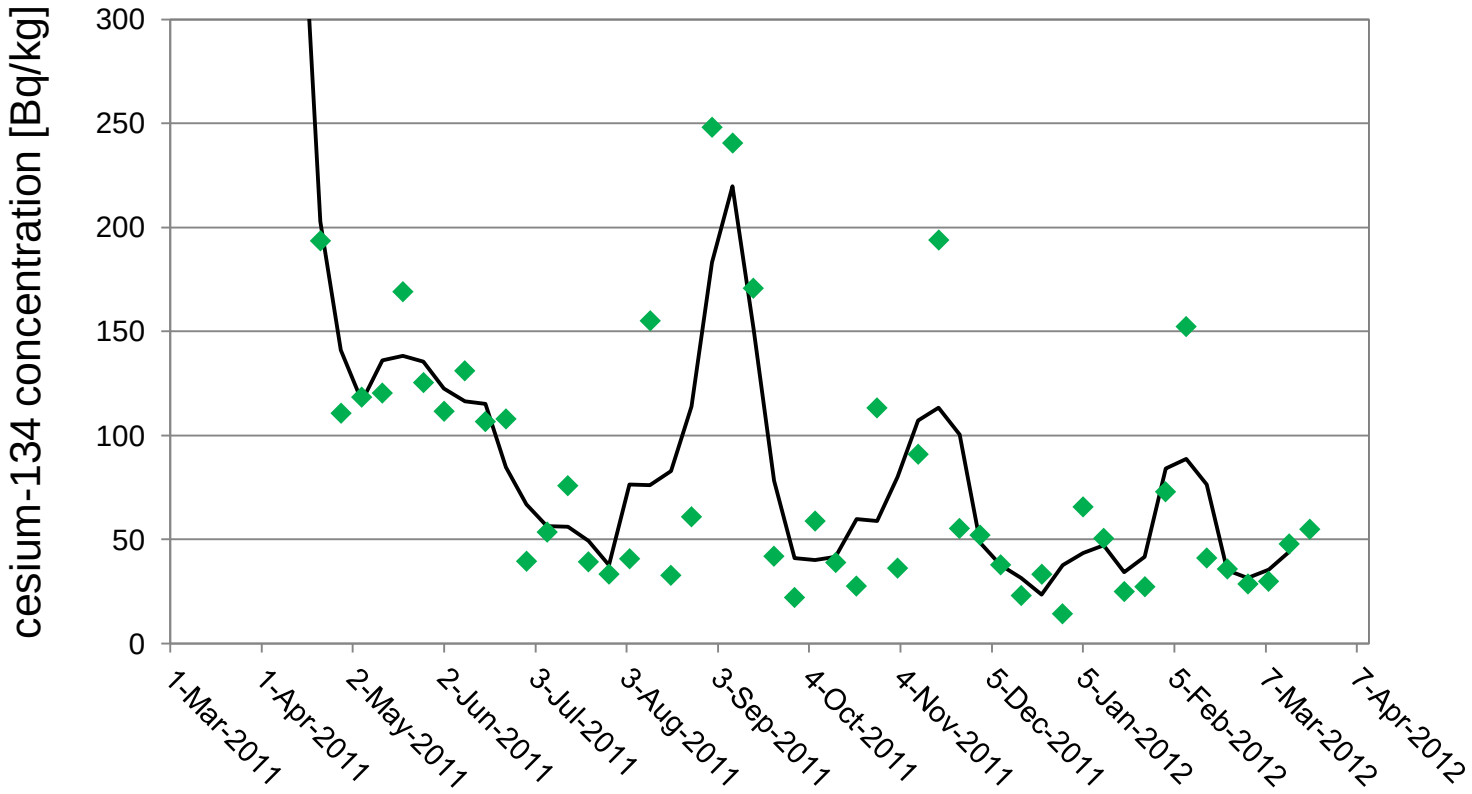
Objective:
To test whether perinatal mortality rates after Fukushima are higher in the study region than expected from the trend in the rest of Japan

Method:
Linear regression of the logarithms of the odds ratios
(ratios of perinatal mortality rates in the study region to rates the control region).

Result:
Significant peaks in May 2012 and March 2013

Upper panel: Ratio of infant mortality rates in the study and control region (odds ratio)
Lower panel: Deviations of observed from expected odds ratios (standardized residuals)

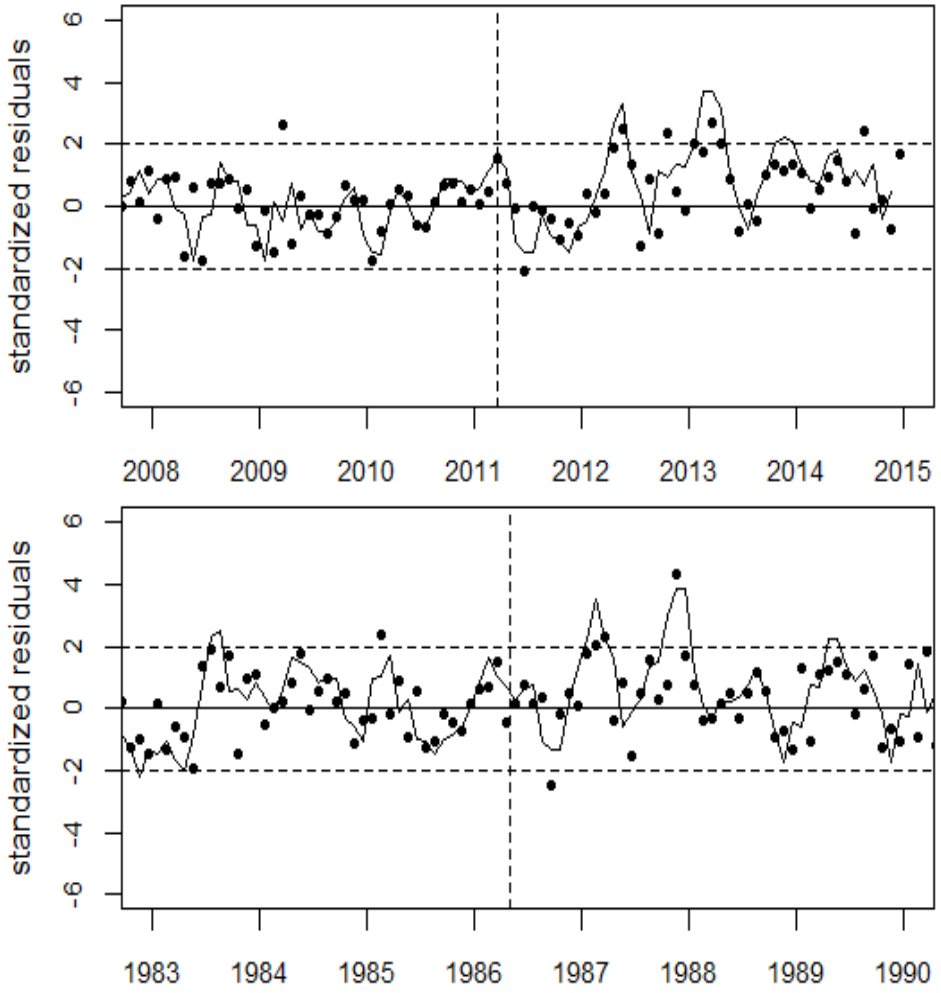
Cesium-134 concentration in vegetables



Weekly averages and 3-week moving average of cesium-134 concentration in vegetables from Fukushima, March 2011 to March 2012

From: Merz S, Shozugawa K, Steinhauser G. Analysis of Japanese radionuclide monitoring data of food before and after the Fukushima nuclear accident. Environ Sci Technol. 2015 Mar 3;49(5):2875-85.

Perinatal mortality in Fukushima vs. Chernobyl



Upper panel:
Perinatal mortality in the Fukushima study region.
Residuals and 3-month moving average
Significant peaks in
May 2012 and March 2013

Lower panel:
Perinatal mortality in Germany
Lower panel: Residuals of perinatal mortality in Germany and 3-month moving average
Significant peaks in
February 1987 and November 1987

Childhood leukemia

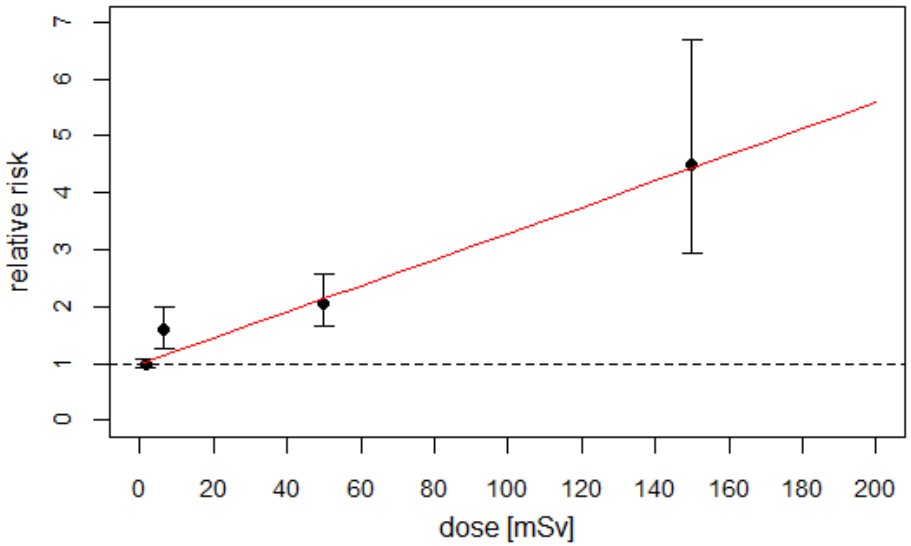
- Position of UNSCEAR in its 2008 report (D171):
  [There is] „little convincing evidence to suggest a measurable increase in the risk of leukaemia among those exposed as children to radiation" [from Chernobyl]
  But:

- A case-contral study by Noshchenko (2010) found a significant dose dependency of childhood leukemia incidence in children from contaminated regions of Ukraine

- An unpublished study of infant leukemia by Ivanov and Malko (2012) reported a highly significant increase of infant leukemia (<1 year) in 1987. No significant increase was found in 1-14 years old children

- A possible study of childhood leukemia in the Fukushima region should focus on children age <1, as a much larger effect is expected in infants than in all children.

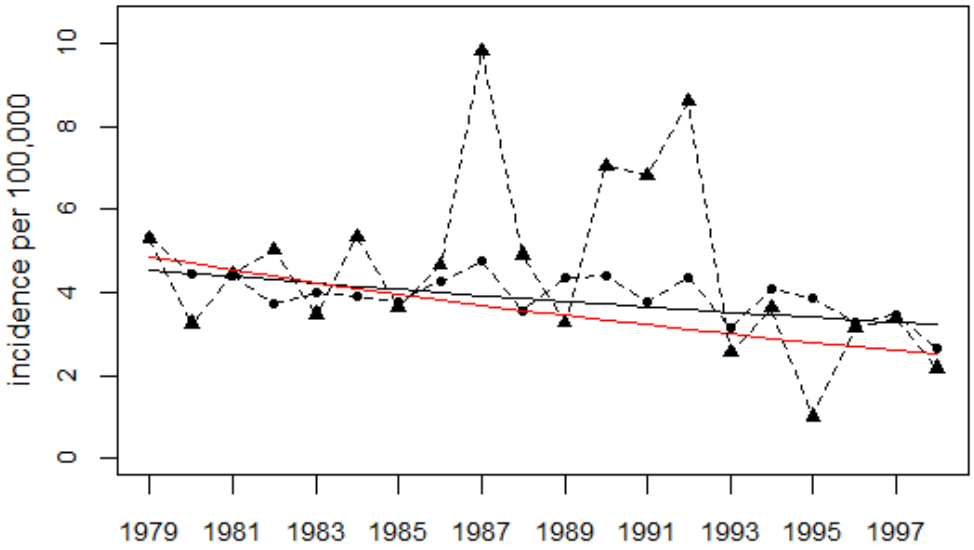
Acute leukemia in Ukraine after Chernobyl



Noshchenko et al (2010) studied **acute leukemia** during 1987-1997 among **children 0–5 years** old at the time of the Chernobyl accident in the most radioactively contaminated territories of the Ukraine (Rivno, Zhytomyr, Chernihiv and Cherkasy regions. Four dose-groups were selected (0–2.9, 3–9.9, 10–99.9, and 100–313.3 mGy).

For doses >10 mGy, the association between radiation exposure and risk was stronger among males (OR=2.8, [1.4–5.5], $p < 0.01$), and for acute leukemia diagnosed in 1987-1992 (OR=2.5 [1.2–5.1], $p < 0.05$), particularly acute myeloid leukemia (OR=5.8 [1.4–24.6], $p < 0.05$).

Infant leukemia in Belarus after Chernobyl



Infant leukemia (<1 year, black triangles) after the Chernobyl disaster in 1986.
Highly significant peaks in 1987 (RR=2.7, *P*=0.0004) and 1992 (RR=2.8, *P*=0.0036).
For comparison, leukemia in children age 1-14 is shown (full circles).
The solid lines are the regression lines for infants (red) and children age 1-14 (black).

To estimate the increase after Chernobyl, the rates in in 1987-1992 are compared with the trend in the remaining years. The effect is much smaller and not statistically significant in 1-14 years old children (1987: RR=1.21, 0.069 and 1992: RR=1.21, P=0.080).