Perinatal mortality in Japan after Fukushima

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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

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
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-control 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• An unpublished study of infant leukemia by Ivanov and Malko (2012) reported a highly significant increase of infant leukemia (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.
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 (<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 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, \( P=0.080 \)).