# Childhood leukaemia incidence in Belarus before and after Chernobyl

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## Objective

To study whether the incidence of childhood leukaemia in Belarus is increased following the Chernobyl disaster in 1986.

## Data and Methods

Annual data of childhood leukaemia in Belarus, 1980-2004, were obtained from Mikhail Malko from Minsk.

A trend analysis of the population weighted leukaemia rates is performed using a logistic regression model p=G(y) where G(y) is the logistic function exp(y)/(1+exp(y) with

y = ß0 + ß1*(t-1980) + ß2*d87 + ß3/exp(((ln(t)-ln(ß4))/ß5)^2)

Parameter ß0 is an intercept, ß1 estimates the time trend where time t is calendar year minus 1980, ß2 estimates the excess in 1987 (dummy variable d87), and ß3-ß5 are parameters that characterise a lognormal distribution function for the possible delayed effect from Chernobyl on leukaemia incidence (ß3 is effect size, ß4 is the median value, and ß5 is related to the width of the distribution). The function nls () of the statistical package R is used for the data analysis.

## Results

The results of the regression are given in the following table.

| parameter | estimate | SE | t-value | p-value |
|---|---|---|---|---|
| ß0 | -10.1079 | 0.0461 | -219.09 | <0.0001 |
| ß1 | -0.0097 | 0.0039 | -2.521 | 0.0208 |
| ß2 | 0.2658 | 0.1028 | 2.585 | 0.0181 |
| ß3 | 0.1644 | 0.0623 | 2.640 | 0.0161 |
| ß4 | 11.3067 | 1.2492 | 9.051 | <0.0001 |
| ß5 | 0.3452 | 0.1991 | 1.734 | 0.0992 |

1. Leukaemia rates show a significant falling temporal trend (ß1 = -0.010, p=0.0208).
2. A significant 34% increase, relative to the undisturbed trend, is found in 1987 (p=0.018).
3. The delayed effect peaks in 1991 (ß4=11.30 ± 1.25) with a 18% relative increase (ß3=0.1644, p=0.016).
4. From a comparison of observed and expected rates, a number of 146 excess cases is determined.

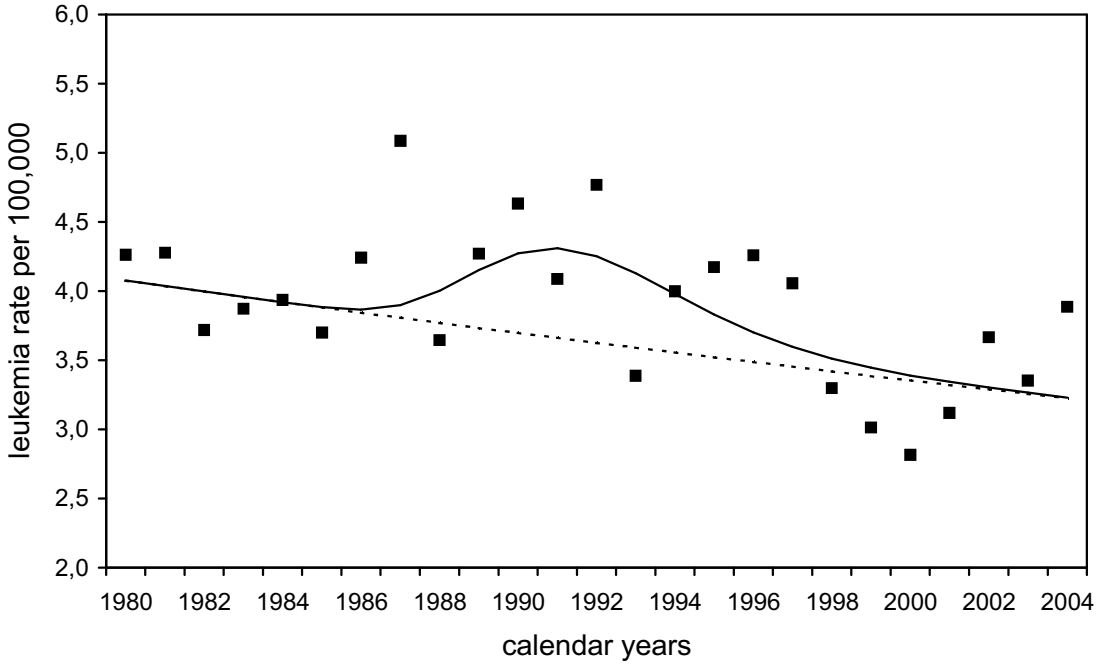


*Fig.2: Leukaemia incidence rates in Belarus and trend line. The dotted line is the expected undisturbed trend.*

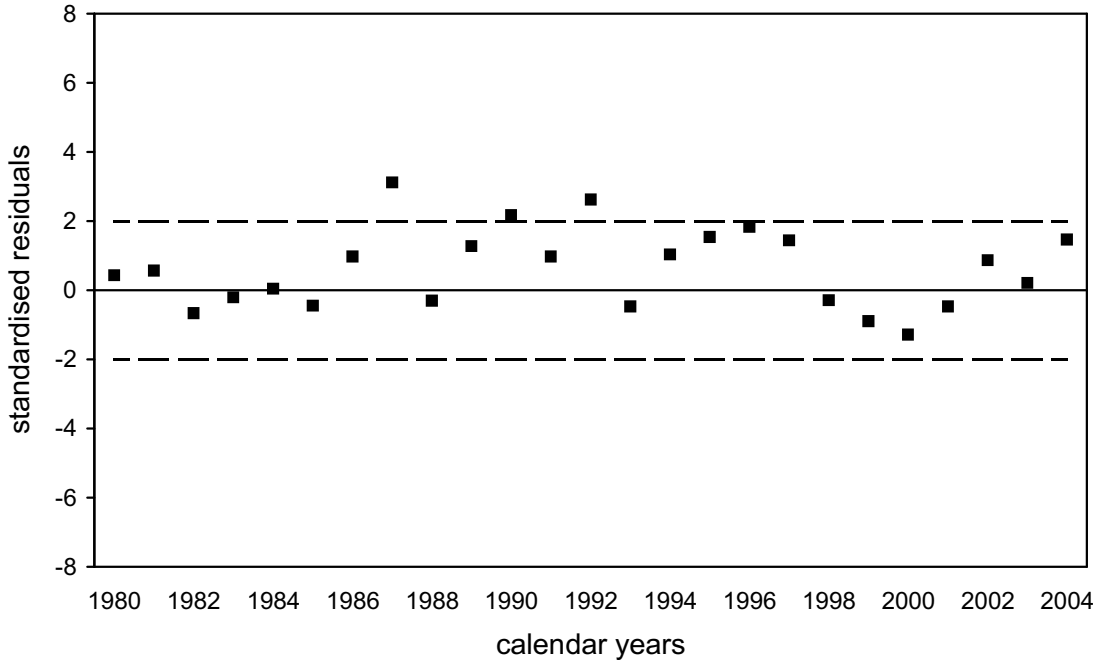


*Fig.3: Deviation of leukaemia rates in Belarus from the expected undisturbed trend, in units of standard deviations (standardised residuals).*