Methodological note
PIN Flash 12 - Safety of children

1. Regression estimation of the average annual percentage change in deaths/mortality rates among children over the period 1998-2007 (PIN Flash Fig.1)

To estimate the average yearly percentage change in deaths/mortality rate for children occurring between 1998 and 2007 one should make use of the whole time series of counts/mortality rates, not just the counts/death rates in 1998 and 2007.

Since the death rates are based on numbers of deaths, which are for certain countries small numbers subject to substantial random variation, it is preferred to take as a baseline dated 1998 the mean of the death rates in the three years (1997-1999) instead of using the single value registered in 1998.

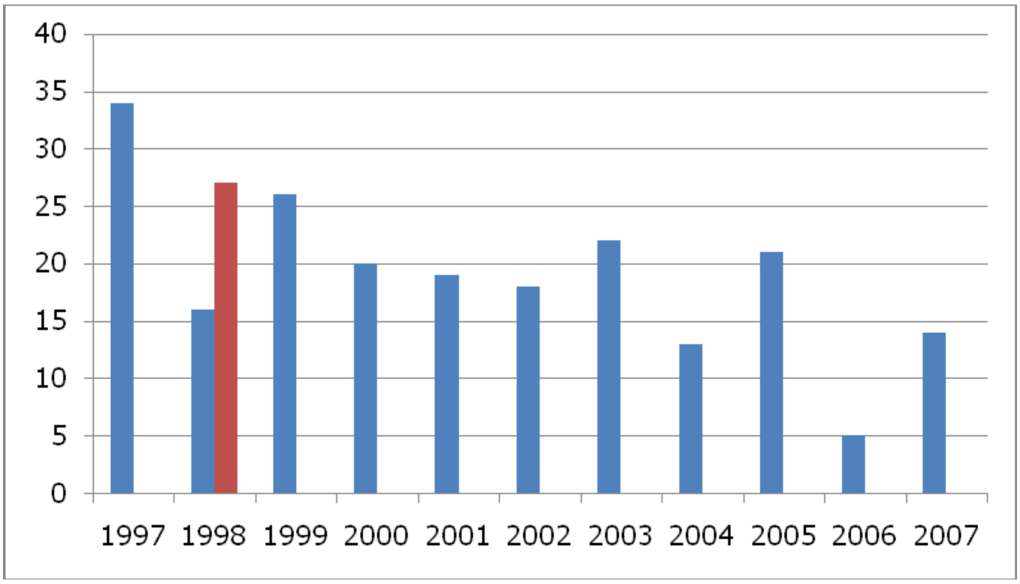

Fig. a: Mortality rate of children population in Finland with the baseline in 1998

The task is now to estimate the average annual change in the period 1998-2007, while taking the mean of 1997-1999 rates as the reference (baseline).

In order to take account of randomness in data, the three-years moving average method is applied, consisting of the application of three-year averages to each single year. The recorded number of deaths in each year N is thus replaced by an average value of the previous, the given and the following year.

$N^* = ((N-1)+N+(N+1))/3$

The regression estimation is then done for those values. We assume a priori a reduction in risk of mortality rate over time, so to fix the sign of a change; we will assume reduction, so that a minus sign indicates an increase. Let the average reduction per year as a percentage of the previous year be *p*. If λ_n is the risk of deaths in year *n*, then we wish to fit a model $\lambda_n = \lambda_0 \times (1 - p/100)^n$, where in this case year 0 is 1998 and $n = 9$ in 2007.

This is equivalent to $\ln(\lambda_n/\lambda_0) = n \times \ln(1-p/100)$ so if we fit $\ln(\lambda_n/\lambda_0) = an$ by linear regression, then *a* is the estimate of $\ln(1 - p/100)$ and *p* is estimated by $100(1 - e^a)$.

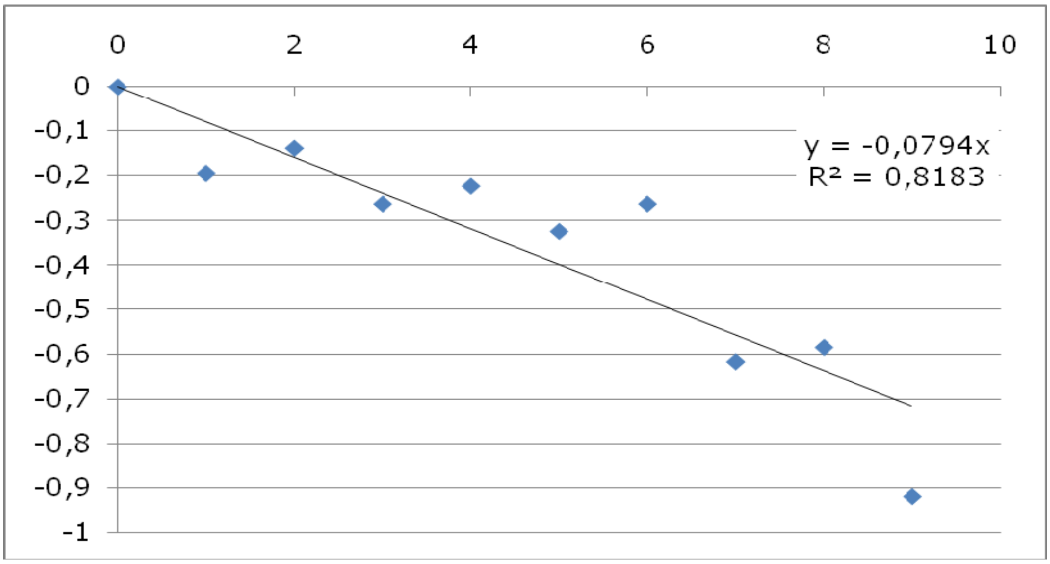

Fig. b: Linear regression function for logarithmically transformed changes in death rate since 1998 as baseline

In this figure illustrating the use of the method and constructed for Hungary, the function $\ln(\lambda_n/\lambda_0) = an$ corresponds to the function $y=ax$, so the *a* is equal -0.0794. The *p* can now be estimated as $100(1 - e^a) = 100(1 - e^{-0.0794}) = 7.64$. Average yearly reduction in children mortality is thus estimated as 7.64%. One can conclude that over the last 10 years, the mortality rate of children has decreased annually by just over 7.5%.

2. Road mortality estimation (PIN Flash Fig.2)

Road mortality is defined as the number of road deaths per million registered population. Deaths resulting from road accidents in a given year and deemed to have occurred within 30 days are taken into account. The registered population of January 1 is used as denominator in mortality rate calculation formula. In order to get more robust estimate, the mortality rate is estimated from the sum of deaths and population counts in the three most recent years (2005, 2006, 2007).

$\lambda_{A,i} = Y_{A,i} / N_{A,i}$

As for the age of accident victims, this is rounded down to the nearest whole number of years in national statistics. In case of Greece, Italy and the Netherlands, the age is rounded to the nearest year.

We consider two age groups: (1) 0-14 including all accident victims of age under 15 and (2) 15+ including all accident victims 15 years and older.

3. Mortality from all causes of deaths excluding road deaths (PIN Flash Fig.5)

Children under 1 year old have much higher mortality than older children, thus this age group was excluded from the comparison made in Fig.5 of the Flash. Also, the data for 2007 was not available in EUROSTAT, thus the average values of 2004-2006 were applied to produce the estimations.