Methodological note (PIN Flash 7)
Regression estimation of average annual percentage change in number of PTW rider deaths over the past 10 years

To estimate the average yearly percentage change in deaths achieved by a country between 1996 and 2006 one should make use of the whole time series of numbers of deaths, not just the numbers in 1996 and 2008.

Since the numbers of PTW rider deaths are small numbers subjected to randomness, it is preferred to take as a baseline dated 1997 the mean of the numbers of deaths in the three years (1996-1998) instead of using the single value registered in 1997.

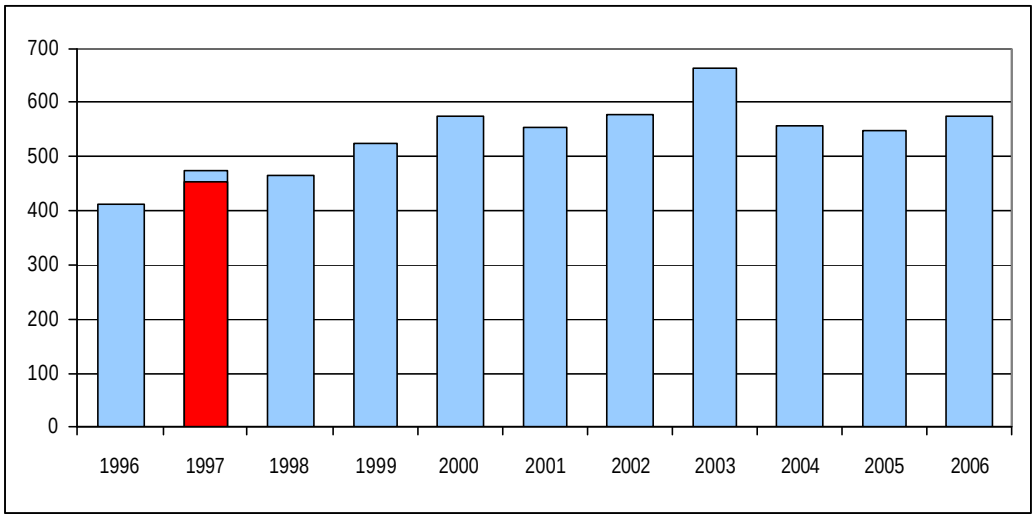

Fig.1: Number of PTW rider deaths in Great Britain with the baseline in 1997

The task is now to estimate the average annual change in the period 1997-2006, while taking the mean of 1996-1998 numbers as the reference (baseline).

We assume a priori a reduction in PTW rider deaths 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 Y_n is the number of deaths in year n, then we wish to fit a model $Y_n = Y_0(1 - p/100)^n$, where in this case year 0 is 1997 and $n = 9$ in 2006.

This is equivalent to $\ln(Y_n/Y_0) = n\ln(1-p/100)$ so if we fit $\ln(Y_n/Y_0) = an$ by linear regression, then a is the estimate of $\ln(1 - p/100)$ and p is estimated by $100(1 - e^a)$.

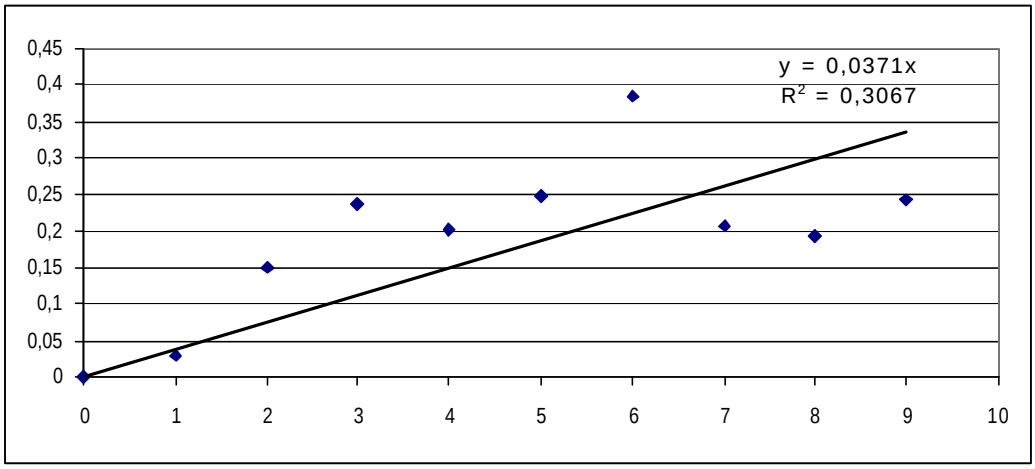

Fig.2: Linear regression function for logarithmically transformed changes since 1997 as baseline

In this figure illustrating the use of the method and constructed for Great Britain, the function $\ln(Y_n/Y_0) = an$ corresponds to the function $y=ax$, so the a is equal 0.0371. The p can now be estimated as $100(1 - e^{a}) = 100(1 - e^{0.0371})= -3.78$. Average yearly reduction in PTW rider deaths is thus estimated as -3.78%. The negative value for the reduction indicates an increase; therefore one can conclude that over the last 10 years, the number of PTW rider deaths has increased annually by almost 4% in GB.