Methodological Note

1. Regression estimation of the annual average percentage change in deaths and serious injuries

To estimate the annual average percentage change in deaths or serious injuries occurring between 2001 and 2010 one should make use of the whole time series of counts, not just the counts in 2001 and 2010. We assume a priori a reduction in risk of deaths or serious injuries 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 risk of deaths in year n, then we wish to fit a model $y_n = y_0 \times (1 - p/100)^n$, where in this case year 0 is 2001 and $n = 9$ in 2010.

This is equivalent to $\ln(y_n/y_0) = n \times \ln(1 - p/100)$ 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 $100(1 - e^a)$.

2. Alternative method

The method used to calculate the average annual change for countries who had zero child road deaths for one year or more is the least squares method.

It is a statistical procedure to find the best fit for a set of data points by minimizing the sum of the squares of the residuals (a residual being the difference between an observed value and the fitted value provided by a model).

The objective consists of adjusting the parameters of a model function to best fit a data set.

In our case of finding the average annual change, we fitted a negative exponential function to the available data between 2011 and 2020. This negative exponential function is of the form $N(t) = \alpha e^{-\beta t}$, with $N(t)$ equal to the number of road deaths in year t. The least squares method finds the values of α and β that minimize the sum of the squared Differences between the function $N(t)$ and the actual numbers of road deaths N_t i.e. in minimizes the sum of all values of $(N(t) - N_t)^2$.

In order to find the function that fits the data best, we used the 'solver' function in excel.

From the 'best fit' parameters found by the 'solver' function we can derive the average annual change from the value of α.