

# **Prediction of the modal age at death by means of Lee – Carter model. Application to Slovak data.**

(Extended abstract of a paper or a poster)

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The modal age at death is the mode of random variable, which indicates the length of life of an individual. It represents the age at which people die most likely and it is estimated from the life tables. It belongs among the most important indicators of longevity, particularly in the low-mortality populations (see Horiuchi et al. 2013, Canudas-Romo 2008). In these populations, if the life expectancy at birth is growing, the modal age at death usually grows, as well. However, temporal exceptions are possible, for example because of non-uniform decrease in age specific death rates. One of those exceptions poses the population of Slovak males in early 1990's.

In the literature, the time development of modal age at death is studied namely for dynamic Gompertz mortality change model (e.g. Canudas-Romo 2008). It supposes the uniform change of mortality. As a suitable model for non-uniform changes, the Lee-Carter model (1992) is suggested in this paper. The dependence of mortality changes on age is then expressed by related parameters beta.

In the presented paper, the time development of the (adult) modal age at death during the recent decades in Slovakia and Czech Republic is examined, using data from POPIN and Human Mortality Database. Then, by means of the Lee-Carter model, predictions of the mortality rates, life expectancy, and modal age at death are calculated in the both populations. The results indicate that, despite of many common features, this development differs to a certain extent between counties, and similarly between men and women. While the life expectancy stepwise increases in all of the examined datasets, for the modal age at death the same needn't be true. The anomalies occurring at Slovak men at the end of the twentieth century will persist in the predicted development, as well. Because of improvement mainly in premature mortality in this case, the forecasted modal age at death changes only modestly, while the number of deaths at modal age is increasing.

The results are visualized on graphs of age distribution of death for each dataset.

It is also shown that the calculation of the modal age at death is very sensitive especially to the quality of input data, the smoothing procedure at the end of the table (i.e. for higher ages), and the calculation method for the mode.

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