

Analysis of mortality curves: non parametric density estimation using bayesian approach

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The main sources of mortality are three: infant, young-adult and old age mortality. These change substantially across years and according to countries and gender. Traditional models proposed by Siler (1983) and Heligman and Pollard (1980) follow a fully parametric approach. This work has the aim to propose a new model for mortality curves by age based on bayesian nonparametrics. The fundamental idea underlying this project is to consider the deaths distribution by age as a realization from a random variable with multinomial distribution. This allows (Gelman et al., 2013) to set as prior distribution for the parameter of this distribution a probability measure induced by a Dirichlet process with base measure chosen following Aliverti et al. (2021), giving the model a great flexibility. An extension for multiple curves permits to specify a model-base clustering procedure which can identify and group together curves with same features. The estimation of the corresponding posterior distribution results from an MCMC algorithm. The model is then tested with mortality curves of two different situations: Italian male population since 1872 and Italian male population by county in 2020. In both cases the model works well. In the first situation groups corresponds to distinct time periods and in each one the model fits very well, in the latter the results are good in terms of fit and clustering but there is no evidence of a strong spacial correlation except for the area around Naples.

References

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