

# Nonparametric Bayesian approach for modeling the mortality

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## Abstract

The mortality curves inherent complex and significant information to understand the dynamics of the population. For this reason, deep understanding of the mortality curves is very crucial for demographic problems. Besides, the complexity of mortality data is associated with the fact that they are functions that vary in space and time. Recently, there has been an increasing interest on modeling the mortality curve of by using non-parametric Bayesian methodology. Within this context, the use of Dirichlet Process (DP) is very active for modeling the mortality. Especially, stick-breaking and Chinese restaurant process (CRP) are two constructive definitions, beneficial to draw samples from DP. For modeling the correlation across ages, the stick-breaking definition is helpful enough. To gain more flexibility, the correlation across both the years and ages should be incorporated into the considered DP with certain assumptions. For this reason, it is necessary to work with CRP rather than the stick-breaking representation. In this regard, the primary goal is to investigate the potential benefits of DP with a suitable base measure (Gaussian distribution) for the age-at-death distribution. Specifically, the impact of both correlations among the ages and years are taken into account with a suitable covariance function. Main novelty of the proposed method is attached to the investigation of separable covariance function to identify the impact of age and year jointly. The use of the separable covariance function is showcased to model the mortality via CRP based posterior calculation, relying on a Gibbs sampling algorithm. To illustrate, the methods mentioned above are considered for modeling Turkey data across 7 years.

## Keywords

Non-parametric Bayesian; Dirichlet process; Chinese restaurant process(CRP); age-at-death distribution; separable covariance