

# Phase-type law of mortality and a stochastic Expectation–Maximisation (EM) algorithm for construction of mortality tables

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## Resumen

We present use the concept of physiological age to model the ageing process by using phase-type distributions to calculate the probability of death. We propose a finite-state Markov jump process to model the hypothetical ageing process in which it is possible the transition rates between non-consecutive physiological ages. Since the Markov process has only a single absorbing state, the death time follows a phase-type distribution. Thus, to build a mortality table the challenge is to estimate this matrix based on the records of the ageing process. Considering the nature of the data, we consider two cases: having continuous time information of the ageing process, and the more interesting and realistic case, having reports of the process just in determined times. If the ageing process is only observed at discrete time points we have a missing data problem, thus, we use a stochastic Expectation–Maximisation (SEM) algorithm to find the maximum likelihood estimator of the intensity matrix. And in order to do that, we build Markov bridges which are sampled using the Bisection method. The theory is illustrated by a simulation study and used to fit real data.