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A note on computing average state occupation times

By [Jan Beyersmann](#), [Hein Putter](#)

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Abstract

Objective: This review discusses how biometricians would probably compute or estimate expected waiting times, if they had the data.

Methods: Our framework is a time-inhomogeneous Markov multistate model, where all transition hazards are allowed to be time-varying. We assume that the cumulative transition hazards are given. That is, they are either known, as in a simulation, determined by expert guesses, or obtained via some method of statistical estimation. Our basic tool is product integration, which transforms the transition hazards into the matrix of transition probabilities. Product integration enjoys a rich mathematical theory, which has successfully been used to study probabilistic and statistical aspects of multistate models. Our emphasis will be on practical implementation of product integration, which allows us to numerically approximate the transition probabilities. Average state occupation times and other quantities of interest may then be derived from the transition probabilities.

Author's Affiliation

[Jan Beyersmann](#) - Universität Ulm, Germany [[Email](#)]

[Hein Putter](#) - Universiteit Leiden, Netherlands [[Email](#)]

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