A MAP prior approach for piecewise constant hazards and competing risks

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Valuable information for the design of a new study or to improve the efficiency of a trial can be provided by leveraging historical information. To include historical information a meta analytic predictive (MAP) prior approach is used (Schmidli et al. 2014) for piecewise constant hazards (Roychoudhury and Neuenschwander 2020) of a time-to-event outcome.

We are interested in the incidence rates of adverse events in a clinical trial for a setting with piecewise constant hazards. Multiple causes for an adverse event can lead to inaccurate estimates for the hazards. To avoid such bias the MAP prior will be extended to competing risks and multiple cause-specific hazards.

Using counting process likelihood, we allow for general censoring schemes such as event driven trials (Rühl, Beyersmann, and Friedrich 2022), but do not require a common Poisson assumption (e.g. Chen et al. 2013) that conditions on follow-up times and cannot be justified in the presence of competing risks.

We simulate a dataset with staggered study entry and censoring after a fixed number of observed events. We look into a setting with two competing risks over three intervals. Different scenarios (e.g. Weibull and Exponential distributed event times) are chosen to demonstrate the approach.

References

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