

Extra exercises in STK4080 2019

Exercise E2.1

Consider the latent failure time approach to competing risks on p. 9/24 in Slides 9.

Assume that $k = 2$ and T_1, T_2 are independent and exponentially distributed with

$$f_{T_j}(t) = \lambda_j e^{-\lambda_j t}, \quad t \geq 0$$

Let $T = \min(T_1, T_2)$, $H = \operatorname{argmin}_j(T_j)$.

- a) Calculate the cumulative incidence functions

$$P(T \leq t, H = j) \quad \text{for } j = 1, 2$$

[Answer: $\frac{\lambda_j}{\lambda_1 + \lambda_2} (1 - e^{-(\lambda_1 + \lambda_2)t})$]

- b) Show that the cause-specific hazard rates are

$$\alpha_j(t) = \lambda_j \quad \text{for } j = 1, 2$$

- c) Discuss the property that cause specific hazards are not influenced by the corresponding one for the other risk, while this is the case for the cumulative incidence function. (This is a general property of competing risks which one should be aware of).
- d) Use the recipe for simulation and analysis in R given on p. 10-14/24 in Slides 9 to illustrate the above results. Choose reasonable values for λ_1, λ_2 and include also a censoring time C .