

objectives

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In survival analysis, which aims to investigate the efficacy of a treatment X on a survival time T , the three most important models are proportional hazards model of Exponential, Weibull and Cox.

In proportional hazard models, the hazard ratio, which refers to the instantaneous risk of failure at time t giving that a patient has survived until time t , is defined as:

$$h_i(t) = h_0(t) \exp(x_i \theta)$$

The formula suggests that the hazard ratio is dominated by the baseline hazard function $h_0(t)$, a binary treatment indicator x_i which coded 0 for control and 1 for the treatment, and our parameter of interest, θ , which is the log hazard ratio for the treatment effect and measures the relative hazard reduction due to treatment in comparison to the control.

The three proportional hazard models have different assumptions on the baseline hazard function, which makes them differ in flexibility and performance. To examine their accuracy and efficiency in a series of scenarios and their robustness against misspecified distribution, we conducted this simulation study.