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Semiparametric generalized exponential frailty model for clustered survival data

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Abstract In this paper, we propose a novel and mathematically tractable frailty model for clustered survival data by assuming a generalized exponential (GE) distribution for the latent frailty effect. Both parametric and semiparametric versions of the GE frailty model are studied with main focus for the semiparametric case, where an EM-algorithm is proposed. Our EM-based estimation for the GE frailty model is simpler, faster and immune to a flat likelihood issue affecting, for example, the semiparametric gamma model, as illustrated in this paper through simulated and real data. We also show that the GE model is at least competitive with respect to the gamma frailty model under misspecification. A broad analysis is developed, with simulation results explored via Monte Carlo replications, to evaluate and compare models. A real application using a clustered kidney catheter data is considered to demonstrate the potential for practice of the GE frailty model.

Keywords Censored data · EM-algorithm · Flat likelihood · Gamma frailty model · Partial likelihood · Proportional hazards

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