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Generalized inverse-Gaussian frailty models with application to TARGET neuroblastoma data

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Abstract

A new class of survival frailty models based on the generalized inverse-Gaussian (GIG) distributions is proposed. We show that the GIG frailty models are flexible and mathematically convenient like the popular gamma frailty model. A piecewise-exponential baseline hazard function is employed, yielding flexibility for the proposed class. Although a closed-form observed log-likelihood function is available, simulation studies show that employing an EM-algorithm is advantageous concerning the direct maximization of this function. Further simulated results address the comparison of different methods for obtaining standard errors of the estimates and confidence intervals for the parameters. Additionally, the finite-sample behavior of the EM-estimators is investigated and the performance of the GIG models under misspecification assessed. We apply our methodology to a TARGET (*Therapeutically Applicable Research to Generate Effective Treatments*) data about the survival time of patients with neuroblastoma cancer and show some advantages of the GIG frailties over existing models in the literature.

Keywords EM-algorithm · Frailty · Generalized inverse-Gaussian models · Neuroblastoma · Robustness

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