

Incorporation of frailties into a cure rate regression model and its diagnostics and application to melanoma data

Cure rate models have been widely studied to analyze time-to-event data with a cured fraction of patients. Our proposal consists of incorporating frailty into a cure rate model, as an alternative to the existing models to describe this type of data, based on the Birnbaum-Saunders distribution. Such a distribution has theoretical arguments to model medical data and has shown empirically to be a good option for their analysis. An advantage of the proposed model is the possibility to jointly consider the heterogeneity among patients by their frailties and the presence of a cured fraction of them. In addition, the number of competing causes is described by the negative binomial distribution, which absorbs several particular cases. We consider likelihood-based methods to estimate the model parameters and to derive influence diagnostics for this model. We assess local influence on the parameter estimates under different perturbation schemes. Deriving diagnostic tools is needed in all statistical modeling, which is another novel aspect of our proposal. Numerical evaluation of the considered model is performed by Monte Carlo simulations and by an illustration with melanoma data, both of which show its good performance and its potential applications. Particularly, the illustration confirms the importance of statistical diagnostics in the modeling.

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