Survival Analysis of Two-Level Hierarchical Clustered Data

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Abstract: A new model is proposed for right-censored survival data with multilevel clustering based on the hierarchical Kendall copula model with Archimedean clusters. This model easily accommodates clusters of unequal size and multiple clustering levels, without any structural conditions on the parameters or on the copulas used at various levels of the hierarchy. A step-wise estimation procedure is proposed and shown to yield consistent and asymptotically Gaussian estimates under mild regularity conditions. The model fitting is based on multiple imputation, given that the censoring rate increases with the level of the hierarchy. To check the model assumption of Archimedean dependence, a goodness-of test is developed. The finite-sample performance of the proposed estimators and of the goodness-of-fit test is investigated through simulations. The new model is applied to data from the study of chronic granulomatous disease.