World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:17, No:09, 2023

Parametric Modeling for Survival Data with Competing Risks Using the Generalized Gompertz Distribution

Authors : Noora Al-Shanfari, M. Mazharul Islam

Abstract : The cumulative incidence function (CIF) is a fundamental approach for analyzing survival data in the presence of competing risks, which estimates the marginal probability for each competing event. Parametric modeling of CIF has the advantage of fitting various shapes of CIF and estimates the impact of covariates with maximum efficiency. To calculate the total CIF's covariate influence using a parametric model., it is essential to parametrize the baseline of the CIF. As the CIF is an improper function by nature, it is necessary to utilize an improper distribution when applying parametric models. The Gompertz distribution, which is an improper distribution, is limited in its applicability as it only accounts for monotone hazard shapes. The generalized Gompertz distribution, however, can adapt to a wider range of hazard shapes, including unimodal, bathtub, and monotonic increasing or decreasing hazard shapes. In this paper, the generalized Gompertz distribution is used to parametrize the baseline of the CIF, and the parameters of the proposed model are estimated using the maximum likelihood approach. The proposed model is compared with the existing Gompertz model using the Akaike information criterion. Appropriate statistical test procedures and model-fitting criteria will be used to test the adequacy of the model. Both models are applied to the 'colon' dataset, which is available in the "biostat3" package in R.

Keywords : competing risks, cumulative incidence function, improper distribution, parametric modeling, survival analysis
Conference Title : ICASA 2023 : International Conference on Applied Statistics and Analysis
Conference Location : Istanbul, Türkiye
Conference Dates : September 25-26, 2023