

Abstract: Kolloquium

Competing Risks Predictions on Two Time Scales

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In the standard analysis of competing risks data, proportional hazards models are fit to the cause-specific hazard functions for all causes on the same time scale. These regression analyses are the foundation for predictions of cause-specific cumulative incidence functions based on combining the estimated cause-specific hazard functions. However, in predictions arising from disease registries, where only subjects with disease enter the database, disease related mortality may be more naturally modelled on the time since diagnosis time scale while death from other causes may be more naturally modelled on the age time scale. The single time scale methodology may be biased if an incorrect time scale is employed for one of the causes and alternative methodology is not available. We propose inferences for the cumulative incidence function in which regression models for the cause-specific hazard functions may be specified on different time scales. Using the disease registry data, the analysis of other cause mortality on the age scale requires left truncating the event time at the age of disease diagnosis, complicating the analysis. In addition, standard martingale theory is not applicable when combining regression models on different time scales. We establish that the covariate conditional predictions are consistent and asymptotically normal using empirical process techniques and propose consistent variance estimators which may be used to construct confidence intervals. Simulation studies show that the proposed two time scale methods perform well, outperforming the single time scale predictions when the time scale is misspecified. The methods are illustrated with stage III colon cancer data obtained from the Surveillance, Epidemiology, and End Results (SEER) program of National Cancer Institute.