
Generalizable survival analysis of randomized controlled trials with observational studies

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Abstract

In the presence of heterogeneity between the randomized controlled trial (RCT) participants and the target population, evaluating the treatment effect solely based on the RCT often leads to biased quantification of the real-world treatment effect. To address the problem of lack of generalizability for the treatment effect estimated by the RCT sample, we leverage observational studies with large samples that are representative of the target population. This talk concerns evaluating treatment effects on survival outcomes for a target population and considers a broad class of estimands that are functionals of treatment-specific survival functions, including differences in survival probability and restricted mean survival times. Motivated by two intuitive but distinct approaches, i.e., imputation based on survival outcome regression and weighting based on inverse probability of sampling, censoring, and treatment assignment, we propose a semiparametric estimator through the guidance of the efficient influence function. The proposed estimator is doubly robust in the sense that it is consistent for the target population estimands if either the survival model or the weighting model is correctly specified, and is locally efficient when both are correct. Simulation studies confirm the theoretical properties of the proposed estimator and show it outperforms competitors. We apply the proposed method to estimate the effect of adjuvant chemotherapy on survival in patients with early-stage resected non-small lung cancer.

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