

Robust Best Linear Weighted Estimator with Missing Covariates in Survival Analysis

Ching-Yun Wang, Li Hsu, and Tabitha Harrison

Division of Public Health Sciences,
Fred Hutchinson Cancer Research Center

Abstract

Missing data in the covariates can result in biased estimates and loss of power to detect associations. We consider Cox regression in which some covariates are subject to missing. The inverse probability weighted approach is often applied to regression analysis with missing covariates. Inverse probability weighted estimators typically are less efficient than likelihood-based estimators, but in general are more robust against model misspecification. In this paper, we propose a robust best linear weighted estimator for Cox regression with missing covariates. Our proposed estimator is the projection of the simple inverse probability weighted estimator onto the orthogonal complement of the score space based on a working regression model of the observed data. The efficiency gain is from the use of the association between the survival outcome variable and the available covariates, which is the working regression model. The asymptotic distribution is derived, and the finite sample performance of the proposed estimator is examined via extensive simulation studies. The methods are applied to a colorectal cancer study to assess the association of the microsatellite instability status with colorectal cancer-specific mortality.

Key words: Inverse selection weighting; Missing at random, Survival analysis

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