

Propensity Score Matching for Multiple Treatments Comparison in Observational Studies

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A major limitation of making inference about treatment effect based on observational data from a non-randomized study designs is the treatment selection bias, in which the baseline characteristics of population under one treatment could dramatically differ from the other one. If not handle properly, such sources of heterogeneity will introduce confounding effect into causal-effect relationship and result in bias in the estimation of treatment effect. The Propensity Score (PS) method is one of the approaches that have been widely used in practice to correct this selection bias through balancing the observed patients' characteristics among treatment groups. Until recently, the PS method has been applied exclusively for 2 treatments comparison settings (e.g. treatment vs. control) despite it is frequently of interest to compare more than 2 treatments or interventions in many medical or cancer research. PS covariate adjustment, inverse probability weighting (IPW) estimator, and PS matching are the three PS approaches commonly seen in two treatments comparison, and among them, PS matching has been shown to have the greatest potential to eliminate the imbalance among covariates. However, not all of them are ready to be applied in the comparison of more than 2 treatments, especially for PS matching. To the best of our knowledge, we have not seen any such extension. In this study, we filled the gap and proposed an analytical approach to generalize PS matching for multiple (≥ 2) treatments comparisons. This study was motivated by the desire to address comparisons of Non-adjuvant therapy, Chemotherapy only therapy and Chemo-Radiation therapy in resected pancreatic adenocarcinoma (rPAC) patients in a recent data analysis based on National Cancer Data Base (NCDB). We will present the proposed method and illustrate it in the above case study along with comparison with other two PS approaches.

Key Words: propensity score, bias elimination, observational studies, matching