A doubly robust estimator for indirect standardization

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Routinely collected administrative and clinical data are increasingly being utilized for comparing quality of care outcomes between hospitals. This problem can be considered in a causal inference framework, as such comparisons have to be adjusted for hospital-specific patient case-mix, which can be done using either an outcome or assignment model. It is often of interest to compare the performance of the hospitals against the average level of care in the health care system, using indirectly standardized mortality ratios, calculated as a ratio of observed to expected quality outcome. A doubly robust estimator makes use of both outcome and assignment model in the case-mix adjustment, requiring only one of these to be correctly specified for valid inferences. Doubly robust estimators have been proposed for direct standardization in the quality comparison context, and for standardized risk differences and ratios in exposed population, but as far as we know, not for indirect standardization. We present the causal estimand in indirect standardization in terms of potential outcome variables, propose a doubly robust estimator for this, and study its properties. We also consider the practicality of doubly robust case-mix adjustment in settings where very large number of hospitals of varying volume are being compared.

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