BOUNDS ON CAUSAL EFFECTS UNDER ASSUMPTIONS OF BIAS DUE TO CONFOUNDING

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We discuss the bounds on causal effects. First, we propose bounds for observational studies. These bounds are made narrower than existing nonparametric bounds by adding assumptions regarding the bias due to confounding. This bias is defined as the difference between the expectations of potential outcomes when the target population is an exposed group and an unexposed group. It is shown that the upper bound on causal effects is given by crude effect measures, under the assumption that the exposed subjects tend to experience the event more frequently than the unexposed subjects. Next, we propose bounds for randomized studies with noncompliance by adding the similar assumptions to those for observational studies. It is shown that the lower bound on causal effects is given by the effect measures derived under per protocol set, under the assumption that subjects taking the standard treatment or placebo tend to experience the event more frequently than subjects taking the experimental treatment in both randomized groups. In addition, it is shown that we can know whether subjects taking the standard treatment or placebo tend to experience the event more frequently than subjects taking the experimental treatment, when the probability of compliance is 100% in a randomized group. Although whether the given assumptions hold in practice cannot be determined using data, the assumptions may nonetheless be reasonable in some situations.