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Large sample randomization inference of causal effects in the presence of interference.
(English) [Zbl 1367.62239]

Summary: Recently, there has been increasing interest in making causal inference when interference is possible. In the presence of interference, treatment may have several types of effects. In this article, we consider inference about such effects when the population consists of groups of individuals where interference is possible within groups but not between groups. A two-stage randomization design is assumed where in the first stage groups are randomized to different treatment allocation strategies and in the second stage individuals are randomized to treatment or control conditional on the strategy assigned to their group in the first stage. For this design, the asymptotic distributions of estimators of the causal effects are derived when either the number of individuals per group or the number of groups grows large. Under certain homogeneity assumptions, the asymptotic distributions provide justification for Wald-type confidence intervals (CIs) and tests. Empirical results demonstrate that the Wald CIs have good coverage in finite samples and are narrower than CIs based on either the Chebyshev or Hoeffding inequalities provided the number of groups is not too small. The methods are illustrated by two examples which consider the effects of cholera vaccination and an intervention to encourage voting.

MSC:
62J99 Linear inference, regression
62E20 Asymptotic distribution theory in statistics
60E15 Inequalities; stochastic orderings
62F25 Parametric tolerance and confidence regions

Keywords:
causal inference; confidence interval; normal mixture; spillover

Full Text: DOI

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[1] DOI: 10.1016/S0140-6736(05)66550-6 · doi:10.1016/S0140-6736(05)66550-6
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