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Defining ratio effects in randomized controlled trials using a stochastic theory of causal effects

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Oral presentation

Defining ratio effects in randomized controlled trials using a stochastic theory of causal effects

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Abstract

In cases in which the outcome variable is binary (e.g., success/no success) or a count variable (e.g, number of depressive symptoms), the effect of a treatment or intervention is often expressed as ratio (e.g., risk ratio, odds ratio). While it is relatively straightforward to estimate some kind of ratio effect based on a logistic regression or Poisson regression, it is a non-trivial question whether ratio effect measures should be considered and if yes, how they can be interpreted and which assumptions need to be fulfilled in order for them to have a causal interpretation. For example, it is somewhat counter-intuitive in the context of ratio effects that an effect measure based on group averages does not necessarily resemble an average over individual effect measures, not even in randomized controlled trials. This phenomenon is known as (non-)collapsibility and has received quite a lot of attention in the biostatistics and epidemiology literature. In this talk, we discuss the usefulness of a stochastic theory of causal effects for defining different types of ratio effects and for clarifying the necessary assumptions for their identification. We briefly introduce the core aspects of the stochastic theory of causal effects before showing how to define ratio effects either as individual ratio effects or as average ratio effects. The different types of effects require different causality assumptions and have a different meaning, which only becomes clear when building on theories of causal effects. In addition, we present new features in the R package EffectLiteR that allow to estimate the various types of causally defined ratio effects based on the generalized linear model. The approach is illustrated by a simulated example from a psychological randomized controlled trial.

Keywords

causal effects, (odds) ratios, RCT

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