

Causal mediation analysis with multiple causally non-ordered mediators

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Abstract: In many health studies, researchers are often interested in estimating the treatment effects on the outcome around and through an intermediate variable, where the two effects are called direct and indirect effects respectively and add to the total treatment effect. Such causal mediation analyses aim to understand the mechanisms that explain the treatment effect. Although multiple mediators are often involved in real studies, most of the literature considered mediation analyses with one mediator at a time. In this presentation, we consider mediation analyses when there are causally non-ordered multiple mediators. Even if the mediators do not affect each other, the sum of two indirect effects through the two mediators considered separately may diverge from the joint natural indirect effect of them when there are additive interactions between the effects of the two mediators on the outcome. Therefore, we derive an equation for the joint natural indirect effect based on the individual mediation effects and their interactive effect, which helps us understand how the mediation effect works through the two mediators. We also discuss an extension for three mediators. The proposed method is illustrated using data from a randomized trial on the prevention of dental caries.