



THE UNIVERSITY OF
CHICAGO

DEPARTMENT OF STATISTICS

Statistics Colloquium

PENG DING

Department of Statistics
University of California Berkeley

“Interpretable sensitivity analysis for the Baron–Kenny approach to mediation with unmeasured confounding”

MONDAY, MAY 15, 2023, at 4:30 PM

Jones 303, 5747 S. Ellis Avenue

Refreshments before the seminar at 4:00 PM in Jones 303.

ABSTRACT

Mediation analysis assesses the extent to which the treatment affects the outcome indirectly through a mediator and the extent to which it operates directly through other pathways. As the most popular method in empirical mediation analysis, the Baron–Kenny approach estimates the indirect and direct effects of the treatment on the outcome based on linear structural equation models. However, when the treatment and the mediator are not randomized, the estimates may be biased due to unmeasured confounding among the treatment, mediator, and outcome. Building on Cinelli and Hazlett (2020a), we propose a sharp and interpretable sensitivity analysis method for the Baron–Kenny approach to mediation in the presence of unmeasured confounding. We first modify their omitted-variable bias formula to facilitate the discussion with heteroskedasticity and model misspecification. We then apply the result to develop a sensitivity analysis method for the Baron–Kenny approach. To ensure interpretability, we express the sensitivity parameters in terms of the partial R^2 's that correspond to the natural factorization of the joint distribution of the direct acyclic graph for mediation analysis. They measure the proportions of variability explained by unmeasured confounding given the observed variables. Moreover, we extend the method to deal with multiple mediators, based on a novel matrix version of the partial R^2 and a general form of the omitted-variable bias formula. Importantly, we prove that all our sensitivity bounds are attainable and thus sharp.