

Mediation studies investigating the mechanisms of interventions often lay the groundwork for the critical development and iterative improvement of programs/policies aiming to improve key outcomes. Despite growing interests in employing mediation studies, the literature has not developed accessible optimal design strategies for experimental studies investigating mediation effects. This study is to develop flexible optimal design frameworks for single-level and multisite experiments investigating mediation effects by maximizing the statistical power under a fixed budget or minimizing the budget to achieve a fixed power. Specifically, this project will (a) allow the costs of sampling to vary across treatment conditions (and levels of hierarchy in multisite experiments); (b) consider multiple inferential tests (i.e., Sobel test, joint significance test, Monte Carlo confidence interval test) across different optimization methods (multivariate derivative method, ant colony optimization algorithm); (c) investigate the robustness of the proposed frameworks against the misspecification of design parameters; and (d) implement the proposed frameworks in the R package odr. Preliminary results show that the proposed frameworks can identify the most efficient designs and/or designs with the greatest statistical power. Along with publications, presentations, and software development, this project has great potential to shift future mediation studies to more effective and efficient ones.