
Bayesian Meta-Analysis of Observational Studies

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Abstract

Meta-analysis is a statistical method that is used to combine the results of different studies in order draw conclusions about a body of research. For example, one might imagine extracting hazard ratios and odds ratio from a collection of different health research papers looking at the effectiveness and safety of a drug (e.g. antidepressants). An emerging area of innovation in statistics involves meta-analysis of observational studies. Unlike randomized controlled trials, which are the gold standard for proving causation, observational studies are prone to biases such as confounding.

This project illustrates a Bayesian approach to meta-analysis of observational studies with unmeasured confounding. We combine meta-analysis with Bayesian sensitivity analysis techniques. There are several methodological challenges. First, bias varies from one study to the next, and this complicates the process of eliciting sensible prior distributions. The priors become high dimensional and simplifying assumptions are needed. Additionally, the model for unmeasured confounding is nonidentifiable. This creates strong correlations in the posterior distribution that inhibit MCMC mixing. I will present a new approach to meta-analysis of observational data, and motivate the discussion with a data example investigating oral contraceptive use and risk of endometriosis in women.