Unmeasured confounding, large datasets, and the role of Bayesian inference

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Bayesian sensitivity analysis for unmeasured confounding is a statistical method to model uncertainty from bias in observational studies. In this presentation, we examine the method in settings where the exposure effect and the effects of measured and unmeasured confounders follow a logistic regression model. We illustrate the surprising result there are scenarios where the data can influence Bayesian assessments of uncertainty about unmeasured confounding. We show that there are certain combinations of data and prior distributions that can result in prior-to-posterior changes in uncertainty about bias parameters. This occurs because the application of Bayes theorem in a non-identifiable model will sometimes rule out certain patterns of unmeasured confounding that are not compatible with the data. An immediate consequence is that Bayesian interval estimates may differ from the corresponding Monte Carlo sensitivity analysis intervals that are obtained by sampling bias parameters directly from the prior. To understand this result, we describe a reparametrization of the model for unmeasured confounding that isolates the flow of information into the posterior distribution of bias parameters. We develop a numerical procedure to calculate the large sample limiting posterior distribution for bias parameters under different assumptions about the priors and data generating mechanism.

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