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Handout #23: Mediation Part 2

1. Review: Directed Acyclic Graph (DAG) for the simplest mediator model:

$$T \rightarrow M \rightarrow Y$$

where T is treatment, M is the mediator and Y is the outcome.

2. Analysis usually starts by fitting two models:

$$\text{Model M: } M_i = \beta_{0M} + T_i\beta_1 + \epsilon_{i1}$$
$$\text{Model Y: } Y_i = \beta_{0Y} + T_i\beta_2 + M_i\theta + \epsilon_{i2}$$

3. Mediation is claimed according to the Causal Steps Approach if we have evidence that $\beta_1 \neq 0$, $\theta \neq 0$, and $\beta_2 = 0$ (complete mediation) or $\beta_2 < \beta_1$ (partial mediation). These steps vary a bit from author to author.

4. Mediation is claimed in a more principled way if a test of $H_0 : ab = 0$ is rejected where a is β_1 above and b is θ above. The Sobel test is based on the first order Taylor expansion of ab and the (shaky) assumption of a normal sampling distribution for ab.

5. Bootstrap methods do not require the assumption of a normal sampling distributions. The do have the minor disadvantages that usually no p-value is produced (only a CI) and the exact CI values vary somewhat each time the CI is recalculated.

   The bootstrap algorithm, which applies far beyond mediation, is

   (a) Calculate the statistic of interest from the data

   (b) Re-sample the data *with replacement* and recalculate the statistic

   (c) Repeat step b, say, 1000 times.

   (d) Use the average and 2.5 and 97.5 % quantiles of the resampled statistics as the mean and 95% CI.

6. Causality is a reasonable conclusion if T is randomized and if the errors ϵ_{i1} and ϵ_{i2} from above are uncorrelated.

   Often this assumption can be made more reasonable by including pre-treatment covariates (X) in both models.

7. Breakout and Discussion
8. Multiple mediation
9. Moderated mediation