Study designs and statistical methods for current observational studies

5. Propensity score analysis

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Study designs and statistical analysis in current observational studies

1. Difference-in-Differences
2. Instrumental Variable Analysis
3. Regression Discontinuity

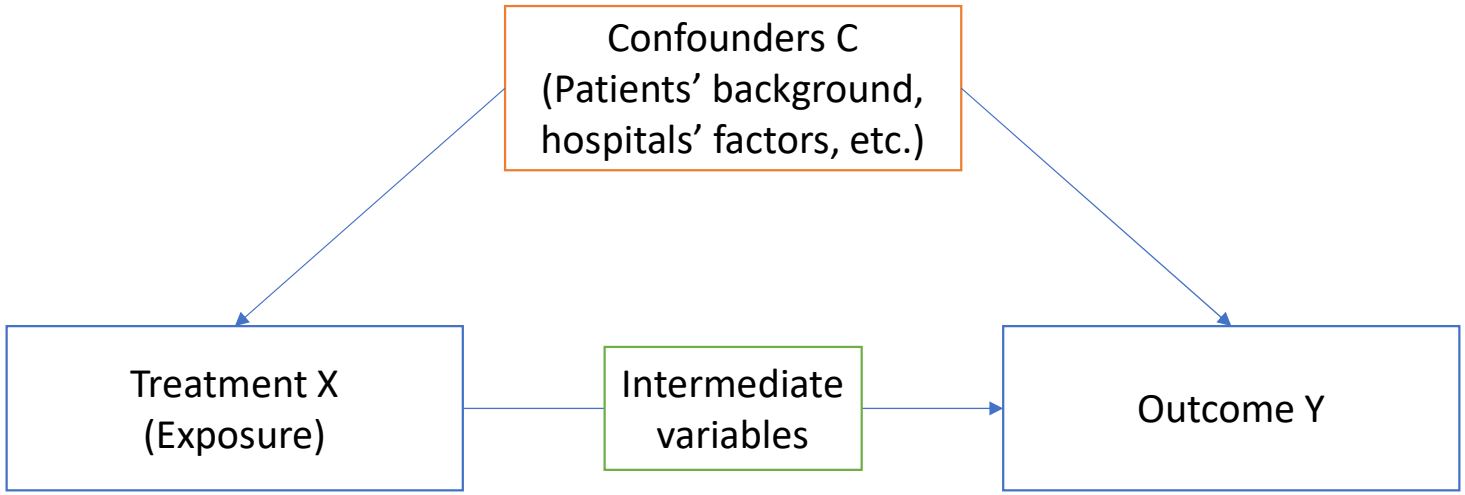
Natural experimental methods (Quasi-experimental methods)

4. Panel Data Analysis / Interrupted Time-Series

5. Propensity Score Analysis (matching, weighting, and adjustment using propensity scores)
6. Adjustment(regression), weighting, stratification, and matching

Propensity Score Analysis

Confounding



- Confounders associate with the outcome and treatment. They are not intermediate variables between treatment and outcome.
- We often use the adjustment (regression), stratification, matching, and weighting to deal with confounders.

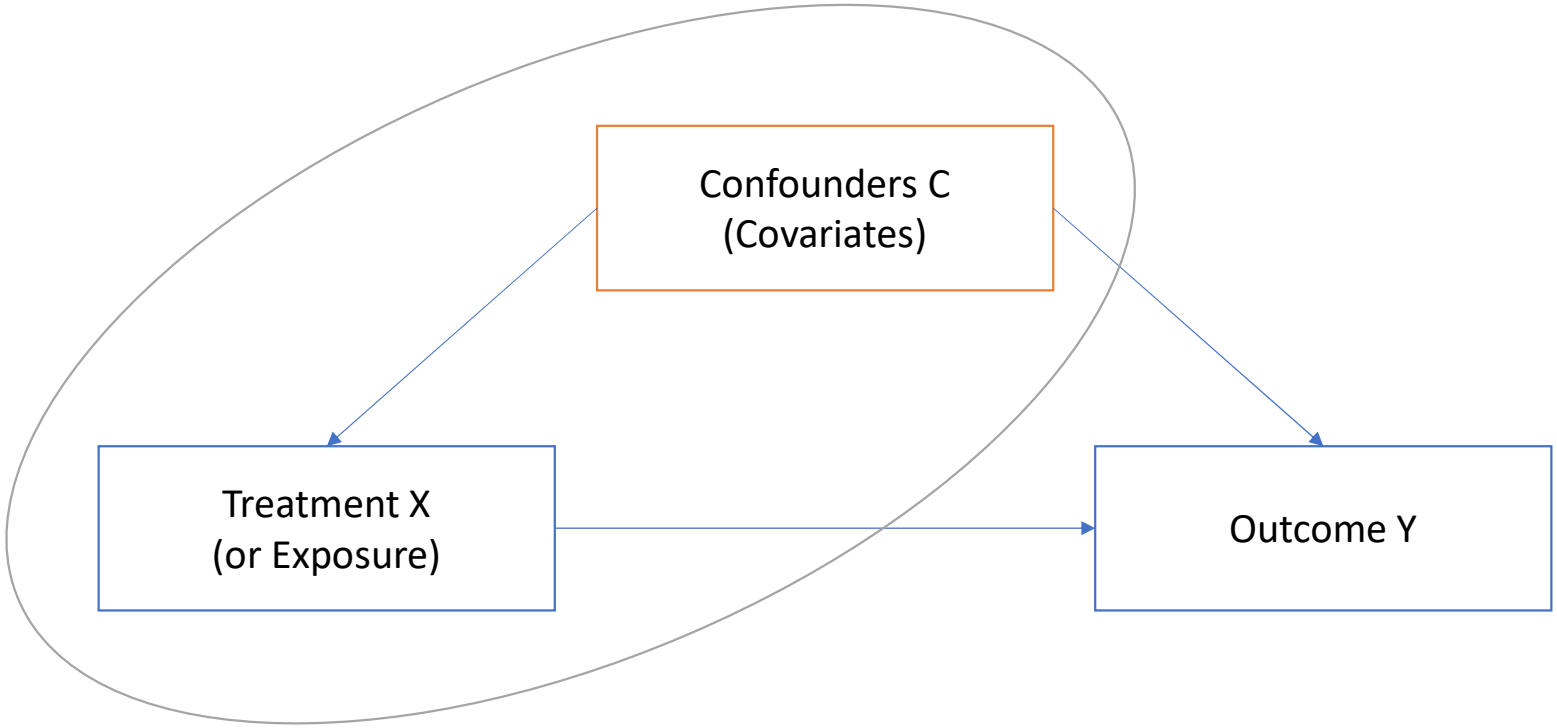
Issues on the regression analysis

- If there are many confounders and unobserved confounders, the following issues would occur.
  - Misconfiguration of the model
  - If too many variables need to be included in a model relative to the number of events, the estimates from these models can be incorrect.

Am J Epidemiol 2003; 158. 280-7

Propensity Score (PS)

The probability that each patient will be assigned to a treatment group, estimated by measured confounders (covariates).



Assumptions for PS analysis

1. Strongly ignorable treatment assignment
   - Treatment assignment should be dependent on C, and should not be dependent on Y.
   - C should be observed before the treatment assignment.
   - Unmeasured confounders do not affect the treatment assignment.

2. Overlap assumption
   - Existence of PS overlap between the treatment group and control group

Steps of PS analysis

1. Estimate the PS for each patient
2. Estimate the c-statistics and check the overlap of PS distribution
3. Analysis using PS
    a. Matching
    b. Inverse-probability weighting (IPW)
    c. Adjustment

Continued only for students