Recitation: DAGs and data analysis

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Recall we are interested in causal questions

What is the impact of D (your independent variable, the treatment) on Y (the outcome of interest or dependent variable)?

or...

Does D (your independent variable, the treatment) cause Y (the outcome of interest or dependent variable)?

Directed Acyclic Graphs (DAGs)

- Arrows connect the elements of your design.
  - Treatment and outcome.
  - Observable variables.
  - Unobservable variables.

- There should not be circularities (thus acyclic).

- If you can construct your DAG you can:
  - Identify problems of selection.
  - Define what is a confounder (pre-treatment).
  - Define what is a control but not a confounnder (pre-treatment).
  - Define what is post-treatment (mechanism).

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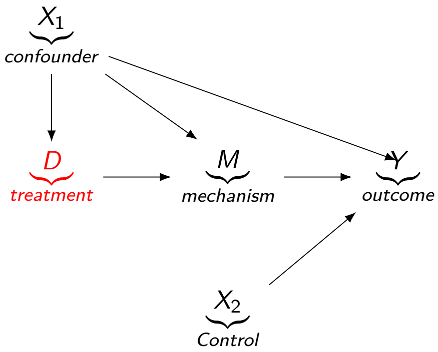
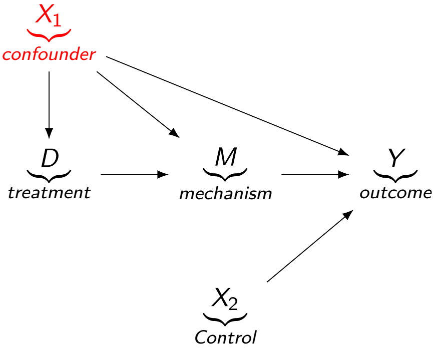


- Treatment: explanatory variable of interest.
- Control and confounder: affects treatment and outcome.
- Mechanism: it is a consequence of the treatment.
- Control but not confounder: affects only the outcome.



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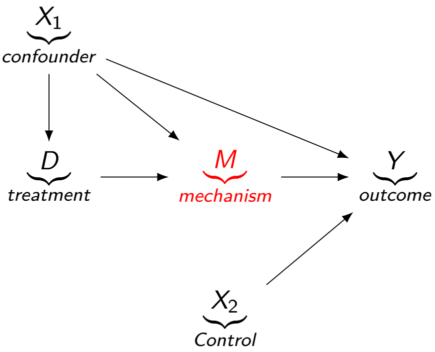

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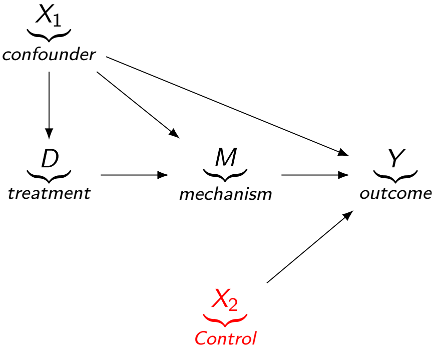

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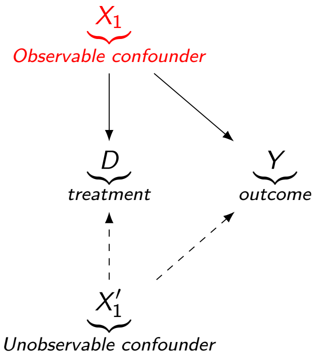
- Controls that are confounders (X_1) are problematic!
    - Particularly if they are unobservable (X_1') !



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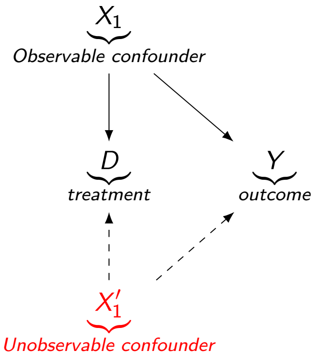

Example 1: Health insurance and health outcomes

$$\text{Insurance} \longrightarrow \text{Health}$$

- We ask whether insurance causes health status.

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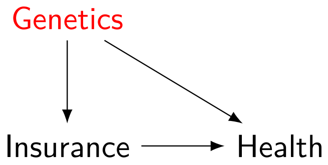
$$\begin{tikzcd} \text{Education} \arrow[d] \arrow[dr] & \\ \text{Insurance} \arrow[r] & \text{Health} \end{tikzcd}$$

- We ask whether insurance causes health status.
- But education affects both.



- We ask whether insurance causes health status.
- But education affects both.
- Genetics can also affect both—but hard to measure.

Example 2: Democracy and economic growth

$$\text{Democracy} \longrightarrow \text{GDP growth}$$

- We ask whether democracy causes growth.

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$$
\begin{tikzcd}
\text{Extractive institutions} \arrow[d] \arrow[dr] & \\
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\end{tikzcd}
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- We ask whether democracy causes growth.
- But extractive institutions from colonial legacies affect both.

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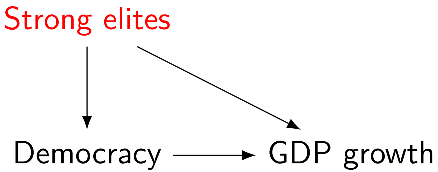

- We ask whether democracy causes growth.
- But extractive institutions from colonial legacies affect both.
- ... having strong elites is hard to measure.

Example 3: Tariffs on chinese imports and export competition

$$\text{Lobby} \longrightarrow \text{Tariffs}$$

- We ask whether lobbying increases tariffs on imports.

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\text{Import competing/exporter} \arrow[d] \arrow[dr] & \\
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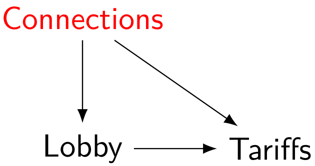

- We ask whether lobbying increases tariffs on imports.
- Import competing (export) sectors has incentives to protect (liberalize).
- Political connections in Washingtonis hard to measure.

- A DAG for your question will provide clarity.
- Identify the observable confounders (measurable; data exists).
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Lessons

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