Notes introduction

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Spurious correlation:

- when causally unrelated variables are highly correlated w/ each other
  - ↳ e.g. divorce rate in Maine and per capita consumption of margarine

Reverse causality:

- direction of causality is unclear, even when we know that a causality exists
  - ↳ e.g. option 1: are physically active people more likely to prioritize living near green spaces?
    option 2: do green spaces in urban env. cause people to exercise more?

How to infer causality?

- (1) formal Def. of causal effects
- (2) assumptions needed/necessary to identify causal effects from data

oftentimes untestable from the data !!!

- (3) rules about what variables to control for to be able to estimate causal effects
- (4) sensitivity analysis w.r.t. possible violations of causal assumptions in (2)

HISTORY CAUSALITY: (started to be an own research area from 1970s onwards)

- 1974: Rubin causal model: potential outcomes
- 2000: Pearl & Greenland: causal diagrams
- 1983: Rosenbaum & Rubin: Propensity scores
- 1997: Robins: Time-dependent confounding (feedback loops btw. treatment & exposures)
  - ↳ G-methods
- 2004: Robins: Optimal dynamic treatment strategies (personalized ≡ dynamic)
- 2009: van der Laan: Targeted learning (ML approach, semi-parametric)

This course:

- causal inference from observational studies & natural experiments

NOTE:

« CI requires making untestable assumptions (→ causal assumptions)