Welcome to Counterfactuals
Housekeeping

- Second Jake Bowers talk this afternoon.
  - 3:30 PM in SOS B50
- Midterm study guide (part 1) will go out tomorrow
- Wanna work for me this summer?
Probabilistic Theories

• Deterministic vs. Probabilistic
  • If you get a 2400 on your SAT, you will get into USC.
  • If you score less than 1400 on your SAT, you will not get into USC.
  • The higher your SAT score, the more likely you are to be admitted to UCSD.

• Necessary conditions and sufficient conditions are deterministic
  • A single exception can disprove a deterministic theory

• Probabilistic theories often specify only direction of effect
  • Better theories/hypotheses make more specific predictions
    • Magnitude of effects, not just direction of effects
Nomothetic vs. Idiographic Causation

• Nomothetic causal explanation: All about the counterfactual
  • Probabilistic theories
  • Great for designing programs and policies
    • If I change X, what will happen to Y?

• Idiographic causal explanation: narrative reasoning, analytic narratives
  • Ex: The Black Hand, Archduke Franz Ferdinand, and WWI
  • Deterministic theories
  • Not so good for program design
  • “The prudent causal analyst remains open to alternative explanations.”
  • But very useful complement to other approaches (remember: triangulation)
Establishing Causation

• **Association:** Independent variable and dependent variable are correlated

• **Timing:** Changes in value in the independent variable precede change in value of the dependent variable
  - Cause must precede effect
  - Granger causality

• **Non-spuriousness**
  - extraneous variables (omitted variables)
  - Hard to prove a negative
Establishing Causation (cont)

• **Specifying Context**
  - A causal relationship that holds in one context may not hold in another
  - The population you sample from is the population you can make inferences about.

• **Causal Mechanism**
  - Should be clearly identified
  - There may be additional testable implications from this

• Theory that arms races increase the risk of war
  • Underpants gnomes theory of business profits
Causal Mechanisms
Establishing Causation: Research Design

• Cross-section: Multiple units, observed at a single point in time
  • Great for: establishing association
  • Can’t establish: time order

• Time-series: One unit, observed at multiple times
  • Great for: time order and association
  • Very low external validity (generalizability)

• Panel designs (repeated cross-sections, cohort studies, etc)
  • Establish association and time order
Establishing the Counterfactual

• What would the world look like if we changed the value of our independent variable of interest, but held everything else constant?
  • Introducing the planet Htrae!

• Independent variable of interest: Dummy variable for good or evil.
• We hold everything else constant, including super-hero powers.
Randomized Control Trials:
The next best thing to a parallel universe

• We need things *ceteris paribus*.

• With randomization, treatment group is identical to the control group.
  • Extraneous variables have the same value in each group.
  • The differences are random selection error.
  • We calculate the size of the errors.

• “No causation without manipulation”

• Observational data vs. Experimental data