Announcements

- Homework #1 is due today by 5pm.
- I will post homework #2 tonight. It will be due Friday, February 7th, by 5pm.
Natural Experiments

- Observing an “experiment” run by nature.

- In a controlled randomized experiment (a “true” experiment) we have:
  - Treatment and control groups
  - Randomization
  - Control over the treatment

- In a natural experiment we have:
  - Treatment and control groups
  - “As-if” randomization
  - No control over the treatment
“As-if” Random Assignment

- Subjects do not self-select into treatment and control groups.
- Assignment to treatment and control groups is plausibly uncorrelated with alternative explanations.
- Lower on internal validity than if we had truly random assignment.
Natural Experiment Example #1: (John Snow and Cholera in London)

- Two water companies serve the same neighborhood. Next door houses can have different water sources ("as-if" random assignment).
- One company draws from a clean source (control), the other from a polluted source (treatment).
- Rate of cholera deaths 10 times higher in treatment group (treatment effect).
Snow’s Map

- Green and red indicate different water companies.
- Cholera rate higher in green and in homes in overlap served by green.
- Cholera rate lower in red and in homes in overlap served by red.
Natural Experiment Example #2: (Anti-Communism and reception of West German TV broadcasts in East Germany)

- Local geography determines if East German neighborhoods can receive West German TV signals ("as-if" random assignment).
- Some neighborhoods are blocked (control), some are not (treatment).
- People with access to West German TV turn out to be no more anti-Communist that those without access (treatment effect).
Natural Experiment Example #3: (Voting in the 2003 California Recall Election)

- Polling places in LA County consolidated from 5,231 to 1,885 (“as-if” random assignment”).

- Polling place the same as 2002 (control), or changed (treatment).

- Changing the polling place reduces the probability of voting by 12% (treatment effect).
Quasi-Experiments

- Observing similar groups with one or more of these groups receiving a “treatment.”

- In a controlled randomized experiment (a “true” experiment) we have:
  - Treatment and control groups
  - Randomization
  - Control over the treatment

- In a quasi-experiment we have:
  - Treatment and control groups
  - No randomization
  - No control over the treatment
Quasi-Experiment Example #1: (Traffic Deaths and Speeding in CT)

- In 1956 Connecticut begins suspending the driver’s licenses of speeders (treatment).
- Treatment group is CT drivers after 1956.
- Control group is CT drivers before 1956, drivers in other states. *Interrupted time series* design.
- Traffic fatalities dropped 12% in 1956 as compared to 1955.
- Was this drop due to the treatment?
Threats to Internal Validity
(Traffic Deaths and Speeding in CT)

- **History**: better weather in 1956?
- **Maturation**: long term downward trend in death rate due to improving roads, better medical care?
- **Testing**: Did the pretest (studying 1955 deaths) make people more careful?
- **Instrumentation**: Did we change the way we measure traffic fatalities (i.e., count/don’t count pedestrians)?
- **Instability**: Do fatalities vary widely across years?
- **Regression to the mean**: Was 1955 just an unlucky year?
Traffic Deaths Across States and Over Time

Traffic Deaths per 100,000 Persons in Connecticut, Massachusetts, Rhode Island, and New York, 1951–1959

New York
Massachusetts
Connecticut
Rhode Island


8 10 12 14 16

Rendered by AnyChart
Quasi-Experiment Example #2: (The Death Penalty and Crime)

- Some studies have compared murder rates in states with and without the death penalty.
- Can compare murder rates across states, and within states that adopt or drop the death penalty.
- Many studies find no relationship between the death penalty and murder rates.
- Threats to internal validity?
Threats to Internal Validity
(The Death Penalty and Crime)

- **History**: changes in the economy?
- **Maturation**: society changing, growing more or less violent?
- **Testing**: Does publicizing a high murder rate make people more vigilant/careful?
- **Instrumentation**: Are there differences in how states define and record murders?
- **Instability**: Waves of violence or gang wars?
- **Regression to the mean**: Did states adopt the death penalty in response to an unusually bad crime year?
Other Observational Studies

- Simply observing the world and trying to make causal inferences, without experimental control or special cases with treatment and control groups.

- In these observational studies we have:
  - No treatment and control groups
  - No randomization
  - No control over the treatment

- We use statistical controls (control variables) to rule out alternative explanations.
Control Variables

- Could our hypothesized relationship between A and B really be due to C?
- In an experimental setting we can randomize so that C is not systematically related to A and B.
- In observational studies we include C as a control variable.
Statistical controls to rule out alternative explanations

- We hypothesize that higher education leads to higher voter turnout, but income is an alternative explanation. Use income as a control variable. Does education still affect turnout once we control for income?

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<thead>
<tr>
<th></th>
<th>High education</th>
<th>Low education</th>
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<tbody>
<tr>
<td>High income</td>
<td>70% vote</td>
<td>50% vote</td>
</tr>
<tr>
<td>Low income</td>
<td>60% vote</td>
<td>30% vote</td>
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Observational Study Example #1: (Civil Liberties and Perceptions of Threat)

- A survey conducted in late 2001/early 2002 found that people who felt the most threatened by terrorists were the most likely to want restrictions on civil liberties.

- Are there alternative explanations for this finding?

- What control variables would you want to collect to try to rule out these alternative explanations?
Observational Study Example #2: (Racial Profiling in Traffic Stops)

- Data collected by the Richmond, VA police department over 6 weeks in 2000 showed that minority drivers were more likely to be pulled over than white drivers.

- Are there alternative explanations for this finding?

- What control variables would you want to collect to try to rule out these alternative explanations?
Qualitative vs. Quantitative Research

- A distinction is often made between “large N” experimental or observational studies and “small N” qualitative studies.

- Qualitative studies generally deal with only a few observations, so ruling out alternative explanations is much more difficult.

- However, the basic rules and strategies for causal inference still apply.