Lecture 4/Chapter 4

- Sampling Activity
- Study Designs; Focus on Sample Surveys
- Vocabulary
- Sampling Methods

CHOOSE 3 STATES

Alabama	Louisiana	Ohio
Alaska	Maine	Oklahoma
Arizona	Maryland	Oregon
Arkansas	Massachusetts	Pennsylvania
California	Michigan	Rhode Island
Colorado	Minnesota	South Carolina
Connecticut	Mississippi	South Dakota
Delaware	Missouri	Tennessee
Florida	Montana	Texas
Georgia	Nebraska	Utah
Hawaii	Nevada	Vermont
Idaho	New Hampshire	Virginia
Illinois	New Jersey	Washington
Indiana	New Mexico	West Virginia
Iowa	New York	Wisconsin
Kansas	North Carolina	Wyoming
Kentucky	North Dakota	Washington, D.C.

Various Research Study Designs

Ways to gather data:

- Sample surveys (covered in this chapter)
- Observational studies } (covered next)
- Experiments
- Meta analysis (covered in Ch. 25)
- Case studies, census (not covered in depth because our statistical methods won't apply)

Definitions *(Review)*

- **Observational study:** Researchers observe what happens naturally in terms of variables of interest.
- **Survey:** particular type of observational study in which data values tend to be self-reported, as in a questionnaire or opinion poll
- **Experiment:** Researchers take control of values of one variable to see how it affects values of another variable

Definitions

- **Unit:** single individual or object studied
- **Population:** entire collection of units about which we'd like information
- **Sample:** collection of units actually studied
- **Sampling frame:** list of units from which sample was chosen (should match population)
- **Census:** survey that includes entire population
- **Margin of error:** approximates how close our estimate (from the sample) is to the true value (for the entire population)

Margin of Error

Because it's almost never possible to survey the entire population, we typically use info from a sample to estimate what's true for the entire population.

Less than 5% of the time, our estimate differs from the true value by more than a margin of error.

If we take a sample of size n of categorical values, we are 95% sure that the true proportion is within about $\frac{1}{\sqrt{n}}$ of the sample proportion.

Example: *Details of Binge drinking article*

- **Background**: Article about binge drinking…
- **Question/Response:** In this context, what are
  - Type of study:
  - Units:
  - Population:
  - Sample:
  - Sampling frame:
  - Margin of error:

Example: *Interpreting the Margin of Error*

- **Background**: Article about binge drinking stated that "66% of respondents said they had engaged in binge drinking in 2001, compared to 62% in 2000…but the changes are not statistically significant because of the margin of error built into the study."
- **Question:** Why not statistically significant?
- **Response:**

Sampling Methods

- **systematic sampling plan** uses methodical but non-random approach, like picking individuals at regularly spaced intervals on a list
- **probability sampling plan:** makes planned use of chance/randomness in selections
- **simple random sample** (simplest prob. sampling plan): selections made at random without replacement, like picking names from a hat

More Probability Sampling Plans

- **stratified random sample** takes separate random samples from groups of similar individuals (strata) within the population
- **cluster sample** selects small groups (clusters) at random from within the population (all units in each cluster included)
- **multistage sample** stratifies in stages, randomly sampling from groups that are successively more specific

Flawed Sampling Plans

- **volunteer sample:** *all* individuals have been self-selected
- **volunteer response:** individuals have been selected by researchers, but only a subset choose to participate
- **Sampling frame different from population**: some individuals don't have a chance of being included in the sample (recent switch to cell phones reduced response rate in voters' polls from the usual 40% to just 25% in 2004)

Example: *Sampling Methods and Flaws*

- **Background**: A stats dept wants to assess the quality of an instructor's teaching via personal interviews with 10 of the 100 students enrolled. One possibility is to go to a lecture and ask for 10 volunteers willing to be interviewed about the instructor's teaching.
- **Questions:**What method is used? Is it flawed?
- **Response:**

Example: *Sampling Methods and Flaws*

- **Background**: A stats dept wants to assess the quality of an instructor's teaching via personal interviews with 10 of the 100 students enrolled. Go to a lecture, assign each student a number 1, 2, … as seated, pick every 10th student.
- **Questions:**What method is used? Is it flawed?
- **Response:**

Example: *Sampling Methods and Flaws*

- **Background**: A stats dept wants to assess the quality of an instructor's teaching via personal interviews with 10 of the class's 100 students. Go to a lecture, assign each student a number 1, 2, …; use a computer to pick 10 at random.
- **Questions:**What method is used? Is it flawed?
- **Response:**

Example: *Sampling Methods and Flaws*

- **Background**: A stats dept wants to assess the quality of an instructor's teaching via personal interviews with 10 of the 100 students enrolled. Obtain a roster of all 100 students, pick every 10th name.
- **Questions:**What method is used? Is it flawed?
- **Response:**

Example: *Sampling Methods and Flaws*

- **Background**: A stats dept wants to assess the quality of an instructor's teaching via personal interviews with 10 of the 100 students enrolled. Obtain a roster of all 100 students, use a computer to pick 10 at random.
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- **Background**: A stats dept wants to assess the quality of an instructor's teaching via personal interviews with 10 of the 100 students enrolled. Obtain a roster of all 100 students, use a computer to pick 10 at random.
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Read these articles before next lecture:

HELPING STROKE VICTIMS Lowering stroke victims' body temperature with cooling blankets and other means can significantly improve their chances of survival, researchers say. German researchers who took steps to reduce the temperature of 25 people who had suffered severe strokes found that 14 survived instead of the expected five…
And in a separate study, Spanish researchers found that people who suffer high fevers within 72 hours of a stroke have a higher death rate than those who do not.

REAL KNIFE, FAKE SURGERY George Doeschner had been suffering from Parkinson's disease for 12 years when his physician told him about an experimental surgery that might offer a cure. Researchers at the University of Colorado were taking cells from embryos and putting them in the brains of Parkinson's patients to replace cells killed by the disease. The 55-year-old electrician applied to be a part of the experiment and flew to Denver. He was prepped for surgery and sedated. A hole was drilled through his skull. Then his surgeons sewed him up and sent him home--without giving him those embryonic cells.Surgical error? Medicare fraud? No, a deliberate sham. Bizarre as it may seem, fake surgeries--otherwise known as placebo-controlled surgical trials--are entering mainstream medical research. The first of these trials wrapped up last week, and others are under way. "This is just the beginning," says Warren Olanow, chair of neurology at Mount Sinai Hospital. "Tomorrow if you have a [new] procedure, you will have to do a double-blind placebo trial."

(continued) Double-blind placebo trials, of course, are standard procedure for drug developers, who know from long experience that 1 out of 3 test subjects feel better with only a sugar pill. Scientists sidestep the placebo effect in drug trials by dividing patients into two groups--giving one the real drug and the other a fake.It turns out that the placebo effect is especially powerful in Parkinson's disease. That's why Curt Freed at the University of Colorado and Stanley Fahn at Columbia University decided to create a control group whose members could be fooled into thinking they were getting the full surgical treatment. "When you have something as major as surgery," says Fahn, in defense of his experiment, "wouldn't it be best to know there was some benefit?" The National Institutes of Health agreed. Indeed, the NIH believes so strongly in the value of placebo surgeries that it has begun rejecting experiments from university researchers that do not employ them. Today placebo trials are being mounted for a variety of procedures, from knee surgery to the treatment of pain in cancer.

(continued) Critics of these trials--and there are many--complain that they violate the first principle of medicine: do no harm. Surgery, even sham surgery, is never risk-free. Doeschner says his doctors told him that he might get the short end of the double-blind stick and warned him before asking for his consent that even a fake operation could leave him "a vegetable.” "Consent is irrelevant," objects Arthur Caplan, director of the bioethics center at the University of Pennsylvania. "When you're dealing with desperate illness, people will consent to anything.” That's true, but some research administrators have concluded that the scientific knowledge that may be gained justifies the risk. They find reassurance in the fact that the dangers have been reduced by advances in minimally invasive surgery. But they are also feeling pressure from HMOs that want proof that a new type of surgery works before approving it.

(continued) The biggest factor driving these experiments, however, may be that the easy questions--do patients survive or die with a new therapy?--have already been answered. Increasingly, scientists are looking for more subtle, and often more subjective benefits. Is there less pain? Is it easier to walk? These outcomes can be strongly influenced by wishful thinking.Sorting the real benefits from the fake seemed a worthy goal to patient Doeschner. "I wanted to do something that would help everybody who has Parkinson's," he says. Besides, once the experiment was over, he came back for another operation. This time he got the real thing.