Stat 13, Intro. to Statistical Methods for the Life and Health Sciences.

1. Syllabus, etc.
2. Textbook and hw.
3. Example with organ donations.
4. Rough interpretation of distribution and standard deviation.

Read preliminaries, chapter 1, and p592, the first page of Appendix A.

Hw1 is due Mon Jan22, 1159pm. 1.3.16 and 1.4.26. Also, on the bottom of your hw, print the names and emails of two other students in the class.

Homeworks must be submitted by email, to statgrader@stat.ucla.edu if you are in Section 2a or 2b, or to statgrader2@stat.ucla.edu if you are in Section 2c or 2d.

The course website is http://www.stat.ucla.edu/~frederic/13/W24

1. Syllabus, etc.

Read the syllabus, especially the hw policy, the gradegrubbing policy, and the 1 question not to ask me.
Here are things not on it but worth mentioning.

I am not maintaining the CCLE/Canvas website for this course.
The only course website I am using is http://www.stat.ucla.edu/~frederic/13/W24 .

I do not give hw hints in office hours. Conceptual questions only.

Attendance is not mandatory in lecture nor in section and lab.

You can only switch sections if we find someone to switch with you.

2. Textbook and hw.
Tintle N, Chance BL, Cobb GW, Rossman AJ, Roy S, Swanson T, and Vanderstoep J. (2016). Introduction to Statistical Investigations, Wiley, NY.

- Emphasizes concepts, not formulas.
- Emphasizes randomization tests and other nonparametric methods.
- Verbose, and some examples are phony or unimportant.

Optional reading, "Statistics for the Life Sciences", by Samuels and Witmer.

2. Textbook, continued.
If you have a different edition of the textbook than the 2016 edition, then make sure you are doing the correct hw problems.
Hw1 is 1.3.16, 1.4.26, and the names and emails of 2 students.

1.3.16 is on p84 and is about Rhesus monkeys, exercise 1.2.18, which is on p80. It starts "For this study: a. State the null hypothesis and the alternative hypothesis in the context of this study. b. Determine the standardized statistic from the data. (Hint: you will need to get the standard deviation of the simulated statistics from the null distribution in an applet.)" But you don't need an applet. You can use the theoretical value of $\sqrt{[\pi(1-\pi)/n]}$, where π is the probability of the monkey getting it right under the null hypothesis, or do simulations in *R.* For instance, in *R* you could do:

```
pi2 = ## insert your answer to the null hypothesis part of question a here.
a = rep(0,10000)
for(i in 1:10000){
      b = runif(40)
      c = (b < pi2)
      a[i] = mean(c)
}
sd(a)
## compare with
sqrt(pi2 * (1-pi2) / n)
```

Stat 13, Intro. to Statistical Methods for the Life and Health Sciences.

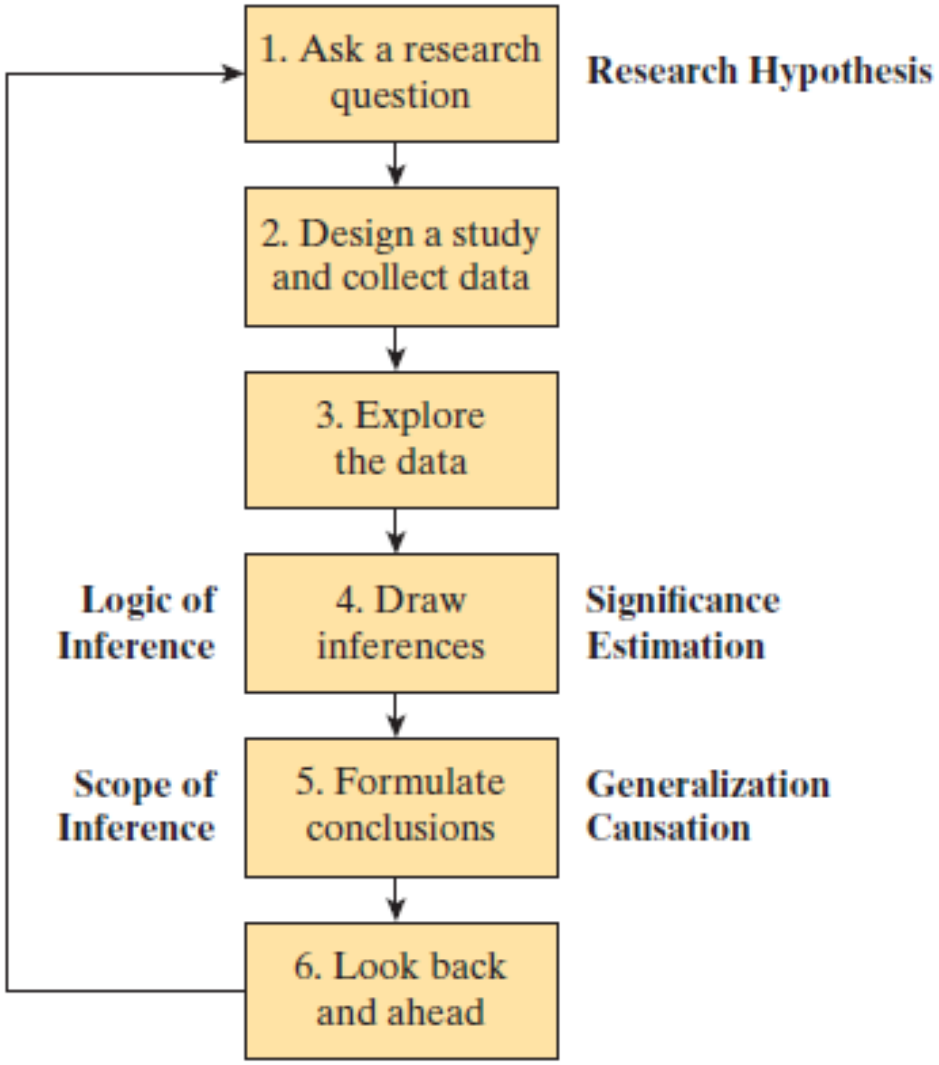
Hw1 is 1.3.16, 1.4.26, and the names and emails of 2 students.

1.4.26 is on p90. It starts "Researchers wanted to test the hypothesis that living in the country is better for your lungs than living in a city."
Be careful in part c. The table gives you P(# of heads = i), not P(# of heads ≥ i), for i = 0,1,2,3,..., 7.

3. Example P.1: Organ Donations

- While a majority of people approve of organ donation in principle, far less than that actually sign up when getting a driver's license.
- Different states (and different countries) have different recruiting methods.
- Do these different methods result in different sign-up rates?

Six-Step Statistical Investigation Method



Recruiting Organ Donors

Step 1. Ask a Research Question

- Does the default option presented to driver's license applicants influence the likelihood of someone becoming an organ donor?

Recruiting Organ Donors

Step 2: Design a study and collect data

- The researchers decided to recruit various participants and ask them to pretend to apply for a new driver's license.
- The participants did not know in advance that different options were given for the donor question, or even that this issue was the main focus of the study.

Recruiting Organ Donors

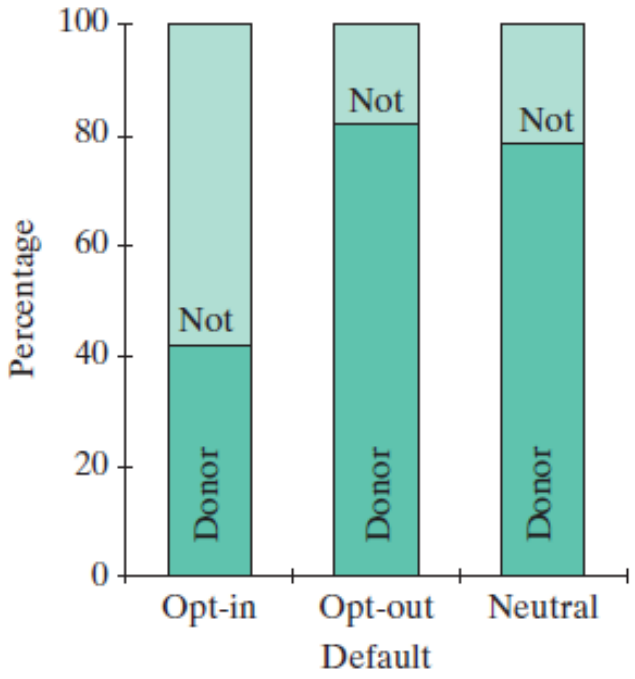
Step 2: Design a study and collect data

- Some of the participants were forced to make a choice of becoming a donor or not, without being given a default option (the "neutral" group, Michigan's current practice).
- Other participants were told that the default option was *not* to be a donor but that they could choose *to* become a donor if they wished (the "opt-in" group, Michigan's past practice).
- The remaining participants were told that the default option was to *be* a donor but that they could choose *not* to become a donor if they wished (the "opt-out" group, some countries use this practice).

Recruiting Organ Donors

Step 3: Explore the data.

- 23 of 55 (41.8%) participants in the opt-in group agreed to become organ donors
- 41 of 50 (82.0%) participants in the opt-out group agreed to become organ donors
- 44 of the 56 (78.6%) participants in the neutral group agreed to become organ donors



Recruiting Organ Donors

Step 4: Draw inferences beyond the data.

- Using methods that you will learn in this course, the researchers analyzed whether the observed differences between the groups was large enough to indicate that the default option had a genuine effect.
- In particular, they reported strong evidence that the neutral and opt-out versions do lead to a higher chance of agreeing to become a donor, as compared to the opt-in version currently used in many states.
- In fact, they could be quite confident that the neutral version increases the chances that a person agrees to become a donor by between 20 and 54 percentage points, a difference large enough to save thousands of lives per year in the United States.

Recruiting Organ Donors

Step 5: Formulate conclusions.

- Based on the analysis of the data and the design of the study, the researchers concluded that the neutral version *causes* an increase in the proportion who agree to become donors over the opt-in.
- But because the participants in the study were volunteers recruited from various general interest Internet bulletin boards, generalizing conclusions beyond these participants is only legitimate if they are representative of a larger group of people. (The authors believed their sample included a “broad range of demographics.”)

Recruiting Organ Donors

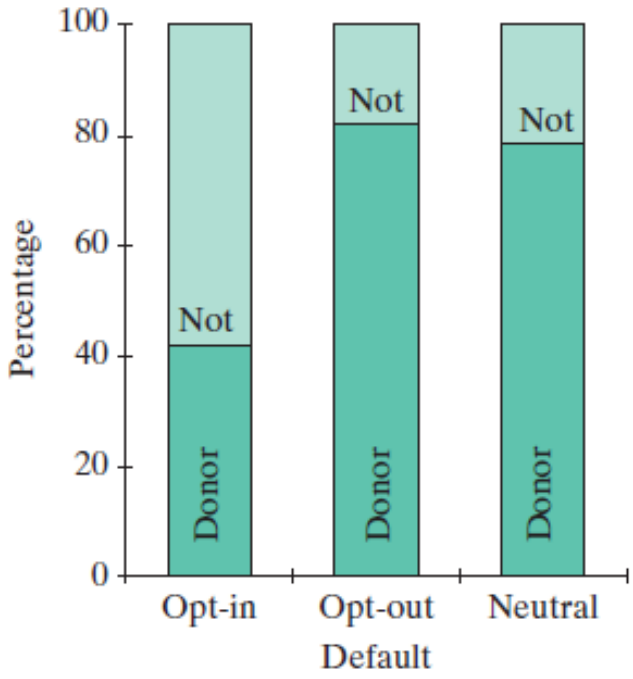
Step 6: Look back and ahead.

- One limitation of the study is that participants were asked to imagine how they would respond, which might not mirror how people would actually respond in such a situation.
- A new study might look at people's actual responses to questions about organ donation or could monitor donor rates for states that adopt a new policy.

- The individual entities on which data are recorded are called **o*bservational units***.
- The recorded characteristics of the observational units are the ***variables*** of interest.
- What are the observational units and variables in the Organ Donation Study?

4. Distribution and SD (rough definitions)

- The ***distribution*** of variable describes the pattern of value/category outcomes.
- For the organ donation study the bar chart shown displays the distribution of responses.



- One way to measure the center of a distribution is with the average, also called the mean.
  Sample mean $\bar{x} = \sum x_i/n$.
- One way to measure variability is with the ***standard deviation***, which is roughly the average distance between a data value in the distribution and the mean of the distribution.
  The sample std deviation, $s = \sqrt{\ } [\sum (x_i - \bar{x})^2/(n-1)]$
  - What is the standard deviation of the data set {7,7,7,7,7}?
  - Which data set has the largest standard deviation?
    - A {1, 3, 3, 3, 3, 3, 7}
    - B {1, 2, 3, 4, 5, 6, 7}
    - C {1, 1, 1, 4, 7, 7, 7}