

**Introduction to Biostatistics (BIOS 4120)**  
**Breheny**

Assignment 6  
Due Tuesday, March 6

1. In 1990, 23.5% of all babies delivered in the United States were delivered via cesarean section. Suppose that this is roughly the percentage of deliveries via C-section at the University of Iowa Hospitals & Clinics (UIHC) as well.
  - (a) What is the probability that two out of the next eight babies delivered at UIHC will be born via C-section?
  - (b) What is the probability that at least one out of the next eight babies delivered at UIHC will be born via C-section?
2. Would a crossover trial be a good idea for a study of the effectiveness of the polio vaccine? Why or why not?
3.  In a 2006 study published in *The New England Journal of Medicine*, 78 pairs of patients with Parkinson's disease were randomly assigned to receive treatment (which consisted of deep-brain stimulation of a region of the brain affected by the disease) or control (which consisted of taking a prescription drug). The researchers found that in 50 of 78 pairs, the patients who received deep-brain stimulation had improved more than their partner in the control group. We are interested in conducting a hypothesis test of these findings.
  - (a) What is the null hypothesis?
  - (b) Let  $X$  denote the number of pairs in which the treatment patient did better than the control patient. If the null hypothesis were true,  $X$  would follow a \_\_\_\_\_ distribution with  $n = \underline{\hspace{2cm}}$  and  $p = \underline{\hspace{2cm}}$ .
  - (c) Calculate a  $p$ -value for the above hypothesis.
  - (d) Does this hypothesis test provide strong evidence against the null hypothesis?
  - (e) Construct a 95% confidence interval for the percentage of patients with Parkinson's disease in the population who will do better with deep-brain stimulation than with the control drug.
  - (f) In the paper, the authors claimed that deep-brain stimulation "was more effective than medical management." Based on your analyses, would you agree or disagree with their findings?
4.  A crossover study published in the *American Journal of Clinical Nutrition* investigated whether oat bran cereal helps to lower serum cholesterol levels. Fourteen individuals with high cholesterol were placed on a diet that included either oat bran or corn flakes; after two weeks, their LDL cholesterol levels were measured. Each individual was then switched to the other diet; after two weeks, the LDL levels were recorded again. The data from the study are on the course website.
  - (a) If the investigators had decided to perform a study that consisted of randomizing two separate groups of men to the two diets, would the power of the study been (i) lower (ii) higher (iii) the same?

(b) Perform a test of the null hypothesis that eating oat bran cereal (vs. corn flakes) has no impact on LDL cholesterol levels.

(c) Construct a 95% confidence interval for the percentage of individuals with high cholesterol who would experience a reduction in cholesterol on an oat bran diet vs. a corn flake diet.

(d) Suppose we were interested in finding a confidence interval for the average difference in cholesterol levels between the two diets. We have not yet discussed how to do this. In which lecture from our course syllabus do you expect that we will cover how to do this?

5. Find the area under the normal curve

- (a) Below 0.8
- (b) Between -1.1 and -0.35
- (c) Outside -2 to 1

6. Fill in the blank:

- (a) The area under the normal curve below \_\_\_\_\_ equals 10%
- (b) The area under the normal curve above \_\_\_\_\_ equals 40%