

Introduction to Biostatistics (BIOS:4120)
Breheny

Assignment 7

Due: Tuesday, March 24

1. We saw in class that the heights of adult women in the United States are roughly normally distributed with a mean of 63.5 inches and a standard deviation of 2.75 inches. What is the probability that a randomly selected adult woman in the United States will be exactly 66 inches tall (i.e., not 66.1 or 65.9, but *exactly* 66 inches tall)?
2. 🎲 This question is based on the NHANES sample of adult males available on the course website. For each of the following, **provide two answers**: the answer based on the normal approximation and the answer calculated directly from the data.
 - (a) What percent of men weigh between 150 and 200 pounds?
 - (b) What is the 25th percentile of weight?
 - (c) How many men in the sample weigh above 300 pounds?
 - (d) These approximations do not seem to be as good as those we saw in class. Why?
3. A study at Boston University found that for men who will develop coronary artery disease, cholesterol levels are normally distributed with a mean of 244 mg/dl and a standard deviation of 51 mg/dl. They also found that for men who do not develop the disease, cholesterol levels are normally distributed with a mean of 219 mg/dl and standard deviation 41 mg/dl. Consider the following “test” for coronary artery disease: if a man has cholesterol level above 240, we predict that he will develop coronary artery disease (*i.e.*, he tests positive).
 - (a) What is the sensitivity of this screening tool?
 - (b) What is the specificity of this screening tool?
 - (c) If ten individuals who will not develop coronary artery disease take this test, what is the probability of obtaining at least 2 false positives?
4.
 - (a) A coin is tossed several times. You win a dollar if the number of heads is equal to the number of tails. Which is better for you: 10 tosses or 100 tosses?
 - (b) A coin is tossed several times. You win a dollar if the percentage of heads is between 45% and 55%. Which is better for you: 10 tosses or 100 tosses?
5. A hundred draws will be made at random with replacement from one of the following urns, each of which contain two numbered balls. Urn A contains a 1 and a 9. Urn B contains a 4 and a 6. The value of each draw will be recorded and the mean of the 100 draws calculated. Someone offers you a dollar if you can predict the value of the sample mean to within 0.1. Which urn offers you the best chance of winning the dollar?
6. A researcher wants her sample mean to be twice as accurate; how much does she have to increase her sample size by?

7. An article in the *New England Journal of Medicine* reported that among adults living in the United States, the average level of albumin in cerebrospinal fluid is 29.5 mg/dl, with a standard deviation of 9.25 mg/dl. We are going to select a sample of size 20 from this population.
- (a) How does the variability of our sample mean compare with the variability of albumin levels of individuals in the population?
 - (b) What is the probability that our sample mean will be greater than 33 mg/dl?
 - (c) What is the probability that our sample mean will lie between 29 and 31 mg/dl?
 - (d) What two values will contain the middle 50% of our sample means?