Homework

1. Choose a topic to write a survey question about. This can be something political, something related to your class work, or just something that is in the news. Write the survey question three ways: neutral, leaning toward one viewpoint, and leaning toward the opposite viewpoint. Label which is which.

2. Find a graph in a newspaper or magazine and critique it. Does it communicate its message well? Is it misleading in any way?

3. As part of its twenty-fifth reunion celebration, the Class of 1980 at State University mailed a questionnaire to its members. One of the questions asked the respondent to give his or her total income last year. Of the 820 members of the class of 1980, the university alumni office had addresses for 583. Of these, 421 returned the questionnaire. The reunion committee computed the mean income given in the responses and announced, "The members of the class of 1980 have enjoyed resounding success. The average income of class members is $120,000". Identify two distinct sources of bias or misleading information in this result, being explicit about the direction of bias you expect. Explain how you might fix each of these problems.

4. Students in a statistics class designed a survey about spending habits and gave it to a random sample of 300 students, 282 responded. Please read and evaluate the following statement. There are over 4000 students at the college. Therefore, the results of the survey may not be valid for drawing conclusions about how all students at the college spend money.

   a. Agree, 282 is too small a percentage of 4000 (7%) to allow us to draw conclusions about the population.

   b. Agree, you should have a sample that is at least 50% of the population in order to make inferences.

   c. Disagree, 282 is a large enough number to use for these purposes if the sample of students is random.

   d. Disagree, if the sample is random, the size of the sample does not matter.

5. Imagine you determine there is a positive correlation between the number of times individuals visit doctors (over the course of their life span) and longevity (how many years the individuals live). Would it be appropriate to conclude that frequent visits to the doctor lead to a longer life span? Why or why not?

6. Suppose that you want to study whether the death penalty acts as a deterrent against homicide, so you compare the homicide rates between states that have the death penalty and states that do not.

   a. Is this a survey, an observational study, or a controlled experiment? Explain.

   b. If you find a large difference in the homicide rates between these two types of states, can you attribute that difference to the deterrent effect of the death penalty? Explain.
7. Most people are right-handed and even the right eye is dominant for most people. In a study reported in Nature (2003), German biopsychologist Onur Güntürkün conjectured that this tendency to turn to the right manifests itself in other ways as well, so he studied kissing couples to see if they tended to lean their heads to the right while kissing. He and his researchers observed couples in public places such as airports, train stations, beaches, and parks. They were careful not to include couples who were holding objects such as luggage that might have affected which direction they turned. For each couple observed, the researchers noted whether the couple leaned their heads to the right or to the left. Suppose they found that 8 of 12 kissing couples leaned to the right.

a. Describe how you would use a coin to conduct a simulation analysis to determine whether these data provide strong evidence that in general kissing couples really do tend to lean right.

b. An actual simulation found that in 204 of 1000 simulations, 8 or more couples leaned right. What does this mean in terms of whether these data provide strong evidence that in general kissing couples really do tend to lean right? State your conclusion and your reasoning.

c. Define a p-value in general, and then specifically for this problem.