

Assignment #1

Due Wednesday 6/10/10 by 6 p.m. in the Econ 300/QAC201 slot in the Economics Alcove

Please show the calculations used to arrive at your answers. Round final answers to the second decimal place if necessary.

A. A study (see Science News, 6/4/94, p. 359; I am simplifying the results) attempted to find out how well the new supposed miracle drug Prozac worked in reducing depression. The study divided volunteers into three groups. Group A of 30 people received a placebo. Group B of 30 people received a standard antidepressant drug. Group C of 90 people received Prozac. The volunteers took a written test designed to measure their degree of depression before and after receiving treatment for twelve weeks. One-fifth of Group A and two-thirds of both Groups B and C were measured as being less depressed after receiving treatment.

- 1) What was the purpose of the placebo?
- 2) It is customary to imagine that the subjects in the study represent a random sample from a large hypothetical population of depressed people, for which we can construct a 95% confidence interval.
 - a. For the proportion of people treated with Prozac who experienced a reduction in depression, construct this interval.
 - b. Repeat part **a** for the people treated with the standard antidepressant.
 - c. Repeat part **a** for the people treated with the placebo.
- 3) Based on these results, what is your conclusion about the relative efficacy of Prozac, compared both to the other drug and compared to the placebo?
- 4) What else might you want to know about how the study was conducted, in order to gauge the reliability of its findings? Based on what you do know about the study, is there anything you would have done differently if you were attempting to gauge the efficacy of Prozac?

B. How could we determine if air bags in cars reduce injury rates? One method is to run experiments of smashing up cars and assessing the damage to dummy (or dumb) drivers and passengers. Another method is to analyze data from observational studies.

- 1) For example, we could collect data on accidents and see what the injury rates were like for cars with air bags versus cars without air bags. In order to keep confounding factors to a minimum, indicate which of the two alternatives in each case below is preferred, and why:
 - a. Using data from all accidents, or from just those involving cars where air bags are available as an option (that not all people chose)?
 - b. Using data on all car occupants, or just on drivers?
 - c. Using data that includes all injuries, or using data that categorizes injuries by level of severity?

B. d. Having the doctor who evaluates the injury be informed, or not informed, of whether the patient had been cushioned by an air bag?

2) A study (see Wall Street Journal, 3/17/94, p. 1) compared similar car models, with and without airbags. Using insurance data collected between 1989 and 1992 on 31 car models, the researchers found that for 18 of the 31 models, the relative frequency of personal-injury claims (measured as claims per 10,000 cars) rose after air bags became standard equipment.

a. Can you offer one or more plausible interpretations of these data?

b. What are some confounding factors which would need to be controlled for in such a study?

c. Is the relative frequency of personal-injury claims per car the best way to measure the effect of airbags? Why or why not? Can you suggest an alternative measure that might be better?

C. U.S. unemployment statistics are collected through the monthly Current Population Survey, which is a (essentially) random sample of the U.S. adult population. For May 2010 the sample (n=60,000) gave the following (seasonally adjusted) figures for the noninstitutional population ages 16 and over:

employed	139,497
unemployed	14,369
<u>not in the labor force</u>	<u>83,633</u>
total (in thousands)	237,499

1) Construct a 95% confidence interval for the labor force participation rate.

2) Construct a 95% confidence interval for the unemployment rate.

3) The reported unemployment rate for May 2009 was 9.1%. Can we be relatively sure that the unemployment rate in May 2010 is higher than the unemployment rate in May 2009? Why or why not?

D. For the Wesleyan Class of 2010, 2941 men applied and 968 were admitted, while 4300 women applied and 1044 were admitted.

1) a. What is the difference in admission rates between men and women?

b. Is this evidence of sex discrimination? What mitigating factors might exist?

2) Of the 968 men admitted, 367 matriculated. Of the 1044 women admitted, 359 matriculated.

a. Construct a 95% confidence interval for the proportion of matriculating men out of the group of accepted men. Do the same for women.

b. If the admissions office's goal is to have equal numbers of men and women in each entering class, can they equalize the admission rates for men and women and still have a "good chance" of achieving this goal? Alternatively, could they admit equal numbers of men and women and have a good chance at achieving this goal?