

Case-based Social Statistics II

CSSS 322

Professor: Mark S. Handcock

Homework 5

Due Thursday, May 16, 2002

Problems to be handed in:

- 1) In an article on crime in the United States, *Newsweek* magazine (January 10, 1994) quoted FBI statistics stating that of all blacks slain in 1992, 94% were slain by blacks, and of all whites slain in 1992, 83% were slain by whites. Let Y denote race of victim and X denote race of murderer.
 - a) What conditional distributions do these statistics refer to, those of Y at given levels of X , or those of X at given levels of Y ? Set up a table with race of murderer as rows and race of victim as columns, showing these conditional distributions.
 - b) Are X and Y independent random variable or dependent? Explain conceptually what you mean (You need not do a test).
- 2) The table below is from the 1991 General Social Survey. White subjects were asked: "If your party nominated a (Negro/Black) fro President, would you vote for him or her if he/she were qualified for the job?" and "During the last few years, has anyone in your family brought a friend who was a (Negro/Black) home for dinner?"

Black for President	Yes	Home For Dinner		Total
		No	Don't Know	
Yes	113	239	1	353
No	6	49	0	55
Don't Know	0	13	2	15
Total	119	301	3	423

- a) Conduct a χ^2 test of the hypothesis that these two responses are independent. What is the p -value of the test and your decision.
- b) Some of the expected frequencies are small so the Normal approximation to the binomial may not hold. Hence the χ^2 test that is based on this approximation might not be valid. It is possible to conduct a small-sample exact test for testing the null hypothesis of independence between the two responses given the marginal totals. This can be done by many statistical software packages and gives a p -value of 0.0000035.
- c) Given the results of the test, interpret the nature of the deviations from the independence assumption. What categories are higher and lower than would be expected if the factors were independent?

- d) Using “Yes” and “No” categories of each response, estimate the odds ratio. What does it tell us in this case?

Extra Credit Problem:

- 3) According to the U.S. Department of Justice, in 1994 the incarceration rate in the nation’s prisons was 646 per 100,000 male residents, 45 per 100,000 female residents, 1471 per 100,000 black residents, and 207 per 100,000 white residents (*Bureau of Justice Statistics Bulletin: Prisoners in 1994*).
- a) Find the odds ratio between gender and being incarcerated. Give an interpretation of it.
- b) Find the odds ratio between race and being incarcerated. Give an interpretation of it.
- c) According to the odds ratio, which has the stronger association with whether incarcerated, gender or race?
- d) Conduct a χ^2 test of independence between the incarceration and race, and incarceration and gender. For these assume that we have samples of 100,000 from each race and gender category.