

Week 6

Tutorial Exercise.

1. A certain drug is claimed to be effective in curing colds. In an experiment on 164 people with colds half were given the drug and half were given a placebo. The patients' reactions to the treatment are recorded in the following table:

	No effect	Helped/harmed
Drug	22	60
Placebo	28	54

Estimate the relative risk for drug to placebo and test for homogeneity of proportions in the two samples.

2. Consider the 2×2 table

a	b	(a+b)
c	d	(c+d)
(a+c)	(b+d)	n

Show that $(a - (a + b)(a + c)/n) = (ad - bc)/n$. Hence show that the Pearson statistic can be written as

$$X^2 = \frac{n(ad - bc)^2}{(a + b)(c + d)(a + c)(b + d)}.$$

3. Consider the following table from a study of women with breast cancer (Effery et al, 1986). The factor of interest was whether or not oral contraceptives were used before the first full-term pregnancy.

Factor	Cases	Controls
Yes	4	11
No	63	107

- (a) Is there any evidence of a relationship between breast cancer and the early use of oral contraceptives ?
- (b) Estimate the odds ratio for this situation. Construct an approximate 95% confidence interval for the log odds ratio and hence obtain an approximate confidence interval for the odds ratio.

4. The following data were collected in a study of single parent families and complete families in Sydney in 1980 looking at child growth and development. The following table refers to the classification of 2 year old children.

		Complete family	Single parent family
Growth and Development	Good	26	33
	Poor	1	8

Is there any evidence to support the claim that children from single parent families are more likely to have poor growth and development?

5. The following data refer to changes in audience attitude. Measures of agreement and disagreement were obtained for a random sample of 78 high school students following a talk by the Principal on regular sexually transmitted disease checkups. The results are shown below for observations made immediately after the talk and after a one month delay.

Immediately	After one month	
	Agree	Disagree
Agree	30	6
Disagree	18	24

Has there been any shift in attitude over the one month period?

Computer Exercise.

1. Bickel, Hammel and O'Connell (1975) in a study of possible sex bias in graduate admissions at the University of California, Berkeley, examined all 12,763 applications to the 101 graduate programs offered in 1973. The data were

Applicants	Admission	
	Yes	No
Male	3738	4704
Female	1494	2827

Is there any evidence of sex bias? Test for equality of the proportions of men and women admitted. Calculate Pearson's X^2 statistic. Calculate the proportions of male and female applicants within each gender categories who were successful.

2. To further understand the above problem the 6 largest graduate schools were considered separately.

School	Men		Women	
	Successful	Unsuccessful	Successful	Unsuccessful
A	512	313	87	21
B	353	207	17	8
C	120	205	202	391
D	138	279	131	244
E	53	138	94	299
F	22	351	24	317

- (a) For School A test for equality of proportions of men and women admitted. Calculate the proportions of male and female applicants within each gender categories who were successful.
- (b) Estimate the male and female proportions as well as the odds ratio for each of the six schools.
- (c) Calculate 95% confidence intervals for the log odds ratio for schools B and C. Observe that there is no evidence of sex bias in schools B, C, D, E and F.
- (d) Form the 2×2 marginal table for the above six schools and repeat question 1 for this aggregate table.
- (e) Note that the behaviour in the aggregate table does not reflect the relationships found in the individual tables. Reconcile your answers to the above parts.