(1) UC Berkley and Gender Discrimination in College Admissions In 1973, the University of California-Berkeley was sued for sex discrimination. The numbers looked pretty incriminating: the graduate schools had just accepted 44% of male applicants but only 35% of female applicants. Let's check it out!

Data below are from the 6 largest departments on campus at the time.

| Department | Gender | Accept | Reject | % Accept |
|---|---|---|---|---|
| A | Men | 512 | 313 | 62 |
| | Women | 89 | 19 | 82 |
| B | Men | 353 | 207 | 63 |
| | Women | 17 | 8 | 68 |
| C | Men | 120 | 205 | 37 |
| | Women | 202 | 391 | 34 |
| D | Men | 138 | 279 | 33 |
| | Women | 131 | 244 | 35 |
| E | Men | 53 | 138 | 28 |
| | Women | 94 | 299 | 24 |
| F | Men | 22 | 351 | 6 |
| | Women | 24 | 317 | 7 |
| Total | Men | 1198 | 1493 | 41 |
| | Women | 557 | 1278 | 30 |

(a) You are given the marginal table. The control variable is the "Department". What is the marginal OR of a woman being admitted to graduate school compared to a man being admitted to graduate school?

(b) Interpret the meaning of your numerical answer to part (b).

(c) Are admissions and gender marginally dependent? Use a $\chi^2$ test with $\alpha = 0.05$.

(d) Write down the partial tables for each department.

(e) Compute the conditional ORs of a woman being admitted to graduate school compared to a man admitted to graduate school?

(f) Are gender and admission status conditionally independent given department?

(g) Compare the marginal OR and conditional ORs. Does the association appear to reverse direction?

(2) Suppose that we have two drug treatments, $A$ and $B$ (variable $X$), and we define a response variable, $Y$, in terms of success and failure of the treatment. The treatments are taking place at two clinics which we'll label by $Z = 1, 2$.

| Clinic (Z) | Treatment (X) | Success | Failure |
|---|---|---|---|
| 1 | A | 18 | 12 |
| | B | 12 | 8 |
| 2 | A | 2 | 8 |
| | B | 8 | 32 |
| Overall | A | 20 | 20 |
| | B | 20 | 40 |

(a) Calculate the conditional OR for treatment $A$ compared to treatment $B$.

(b) Are treatment and response independent for a given clinic?

(c) Calculate marginal OR.

(d) Are treatment and response marginally independent?

(e) Compute $\hat{\theta}_{XZ(Y=S)}$ and $\hat{\theta}_{XZ(Y=F)}$.

(f) Interpret the meaning of your answer to part (e).

(g) Compute $\hat{\theta}_{YZ(X=A)}$ and $\hat{\theta}_{YZ(X=B)}$.

(h) Interpret the meaning of your answer to part (g).