Session 8: Stratified Contingency Tables

Exercise Solutions

Question 1

Compute χ^2 and the estimated odds ratio (OR) for the AMI paired binary data dataset.

		Disease Status: AMI	Disease Status: no AMI	TOTAL
Exposure Status	Carrier	96	87	183
	Noncarrier	117	126	243
	TOTAL	213	213	426

```
                |          Controls      |
Cases           |   Exposed   Unexposed  |      Total
----------------+------------------------+------------
        Exposed |        73          23  |         96
      Unexposed |        14         103  |        117
----------------+------------------------+------------
          Total |        87         126  |        213

McNemar's chi2(1) =      2.19    Prob > chi2 = 0.1390
Exact McNemar significance probability       = 0.1877

Proportion with factor
       Cases         .4507042
       Controls      .4084507     [95% Conf. Interval]
                    ---------     --------------------
       difference    .0422535     -.0181247   .1026318
       ratio         1.103448      .9684942   1.257207
       rel. diff.    .0714286     -.0197486   .1626057

       odds ratio    1.642857      .8101776   3.452833   (exact)
```

R code:

```
install.packages("exact2x2")
library(exact2x2)
x <- matrix(c(73, 14, 23, 103), nrow = 2, ncol = 2)
mcnemar.exact(x)
mcnemar.test(x, correct = F)
```

Exercises

```
Exact McNemar test (with central confidence intervals)

data:  x
b = 23, c = 14, p-value = 0.1877
alternative hypothesis: true odds ratio is not equal to 1
95 percent confidence interval:
 0.8101776 3.4528327
sample estimates:
odds ratio
  1.642857

McNemar's Chi-squared test

data:  x
McNemar's chi-squared = 2.1892, df = 1, p-value = 0.139
```

Question 2

For each situation below, decide whether the indicated variable is an example of *confounding* or *effect modification*.

a) Two hospitals are compared using the rate of deaths following a particular type of surgery. In the data below, we've stratified the death rate by *risk group.*
Is *risk group* a confounder or effect modifier? **Confounder**

		Death rate
High risk		
Hospital	A	57/1500 (3.8%)
	B	8/20 (4.0%)

Low risk		
Hospital	A	6/600 (1.0%)
	B	8/600 (1.3%)

b) "Researchers at the International Agency for Research on Cancer in France found that women infected with both HPV and HSV-2 were nearly three times more likely to get cervical cancer compared to women with only HPV infection."
Does HSV-2 confound or modify the effect of HPV on cervical cancer?
Effect Modifier

c) "If the mother took antidepressant medication during the first trimester, without accounting for other possible influences, children had roughly twice the risk of having

autism. The researchers then compared siblings in families where the mother used antidepressants in one pregnancy but not the other. This helped account for all of the factors that make siblings similar — their shared genetics and environment. In the sibling matchup, the children had essentially the same risk for autism, ADHD and poor fetal growth whether they were exposed to antidepressants in the womb or not."
Do genetic factors confound or modify the effect of antidepressants on autism?
Confounder

Question 3

Based on the abundance of specific bacterial genera, the human gut microbiota can be divided into two relatively stable groups (enterotypes) that might play a role in personalized nutrition. These simplified enterotypes were studied as prognostic markers for successful body fat loss on two different diets.

A total of 62 participants with increased waist circumference were randomly assigned to receive a New Nordic Diet (NND) high in fiber/wholegrain or an Average Danish Diet (ADD) for 26 weeks.

- At enrollment, participants were grouped into two discrete enterotypes by their relative abundance of *Prevotella* spp[1] divided by Bacteroides spp. (P/B ratio) obtained by quantitative PCR analysis.
- Among individuals with high P/B the NND resulted in a 3.15 kg larger body fat loss compared to ADD whereas virtually no difference (0.88 kg) was observed among individuals with low P/B. Consequently, a 2.27 kg difference in responsiveness to the diets were found between the high and low P/B groups.

In summary, subjects with high P/B-ratio appeared more susceptible to lose body fat on diets high in fiber and wholegrain than subjects with a low P/B-ratio.

a) Which of the following best describes the design of this study?
Cross-sectional survey
Case-control study
Prospective cohort

b) For each of the following variables, identify its role in the above research study. The role should be chosen from amongst the following terms: *Outcome, Exposure, Effect modifier, Confounder*

- ➢ diet **Exposure**
- ➢ weight loss **Outcome**
- ➢ P/B ratio **Effect Modifier**

[1] spp. stands for *species pluralis*, the Latin for "multiple species".