Session 7: Contingency Tables

Exercise Solutions

Question 1

What does H_0 predict we would observe in the first 3 columns of the table below?

	Daily # cigarettes						
	None	**< 5**	**5-14**	**15-24**	**25-49**	**50+**	
Cancer	**17**	**46**	**264.75**				700
Control	**51**	**138**	**794.25**				2100
	68	184	1059	...			**2800**

Question 2

Compute the estimated risk ratio (RR) and a 95% CI for the Pauling dataset.

		Disease Status: Cold	Disease Status: no Cold	TOTAL
Exposure Status	Vitamin C	17	122	139
	Placebo	31	109	140
	TOTAL	48	231	279

```
                 |   Exposed   Unexposed  |      Total
-----------------+------------------------+----------
           Cases |        17          31  |        48
        Noncases |       122         109  |       231
-----------------+------------------------+----------
           Total |       139         140  |       279
                 |                        |
            Risk |   .1223022    .2214286  |    .172043
                 |                        |
                 |      Point estimate    |  [95% Conf. Interval]
                 |------------------------+----------------------
 Risk difference |        -.0991264       | -.1868592   -.0113937
      Risk ratio |         .5523323       |  .3209178    .9506203
 Prev. frac. ex. |         .4476677       |  .0493797    .6790822
 Prev. frac. pop |         .2230316       |
                 +-----------------------------------------------
                           chi2(1) =     4.81  Pr>chi2 = 0.0283
```

Exercises

There is a lot of R packages for computing risk ratios and odds ratios. Here is one option:

```
install.packages("epitools")
library(epitools)
RRtable<-matrix(c(109, 122, 31, 17),nrow = 2, ncol = 2)
rownames(RRtable) <- c("no cold", "cold")
colnames(RRtable) <- c("placebo", "vitamin C")
riskratio(RRtable)
chisq.test(RRtable, correct = F)
```

```
$data
        placebo vitamin C Total
no cold     109        31   140
cold        122        17   139
Total       231        48   279

$measure
                        NA
risk ratio with 95% C.I.  estimate     lower     upper
                 no cold 1.0000000        NA        NA
                 cold    0.5523323 0.3209178 0.9506203

$p.value
         NA
two-sided midp.exact fisher.exact chi.square
  no cold         NA           NA         NA
  cold    0.02951602   0.03849249 0.02827186


      Pearson's Chi-squared test

data:  RRtable
X-squared = 4.8114, df = 1, p-value = 0.02827
```

Question 3

Compute χ^2, the estimated odds ratio (OR), and a 95% CI for the Keller dataset.

		Disease Status: Case	Disease Status: Control	TOTAL
Exposure Status	Smoker	484	385	869
	Nonsmoker	27	90	117
	TOTAL	511	475	986

Exercises

```
                                                          Proportion
                 |   Exposed   Unexposed  |      Total     Exposed
-----------------+------------------------+------------------------
           Cases |       484          27  |        511      0.9472
        Controls |       385          90  |        475      0.8105
-----------------+------------------------+------------------------
           Total |       869         117  |        986      0.8813
                 |                        |
                 |      Point estimate    |  [95% Conf. Interval]
                 |------------------------+------------------------
      Odds ratio |          4.190476      |   2.633584    6.836229
 Attr. frac. ex. |          .7613636      |   .6202893    .8537205
 Attr. frac. pop |           .721135      |
                 +-----------------------------------------------
                             chi2(1) =    43.95  Pr>chi2 = 0.0000
```

R code:

```
ORtable<-matrix(c(90, 385, 27, 484),nrow = 2, ncol = 2)
colnames(ORtable) <- c("control", "case");
rownames(ORtable) <- c("non-smoker", "smoker")
oddsratio(ORtable)
chisq.test(ORtable, correct = F)
```

```
$data
                control case Total
non-smoker       90   27   117
smoker          385  484   869
Total           475  511   986

$measure
                           NA
odds ratio with 95% C.I. estimate    lower    upper
             non-smoker 1.000000       NA       NA
             smoker     4.190476 2.670856 6.574704

$p.value
                      NA
two-sided      midp.exact fisher.exact   chi.square
non-smoker             NA           NA           NA
smoker     1.720157e-11 2.502201e-11 3.376065e-11


     Pearson's Chi-squared test

data:  ORtable
X-squared = 43.946, df = 1, p-value = 3.376e-11
```

Exercises

Question 4

Compute χ^2 and the estimated odds ratio (OR) for the Drosophila dataset.

Eye Color	Male	Female	TOTAL
Red	165	300	465
White	176	81	257
TOTAL	341	381	722

```
                    male      female
-----------------+------------------------+------------
         redEyes |       165         300  |        465
       whiteEyes |       176          81  |        257
-----------------+------------------------+------------
           Total |       341         381  |        722
            Risk |   .483871    .7874016  |   .6440443
                 |                        |
                 |      Point estimate    |    [95% Conf. Interval]
                 |------------------------+------------------------
 Risk difference |        -.3035306       |   -.3706217   -.2364395
      Risk ratio |         .6145161       |     .544263    .6938375
 Prev. frac. ex. |         .3854839       |    .3061625     .455737
 Prev. frac. pop |         .1820637       |
      Odds ratio |          .253125       |    .1830613    .3500144
                 +-----------------------------------------------
                              chi2(1) =    72.32  Pr>chi2 = 0.0000
```

R code:

```
ORtable2<-matrix(c(165, 176, 300, 81),nrow = 2, ncol = 2)
colnames(ORtable2) <- c("male", "female");
rownames(ORtable2) <- c("red", "white")
oddsratio.wald(ORtable2)
chisq.test(ORtable2, correct = F)
```

```
$data
      male female Total
red    165    300   465
white  176     81   257
Total  341    381   722

$measure
                    NA
```

Exercises

```
odds ratio with 95% C.I. estimate     lower     upper
                    red   1.000000        NA        NA
                    white 0.253125 0.1829705 0.3501782

$p.value
         NA
two-sided midp.exact fisher.exact   chi.square
    red           NA           NA           NA
    white          0 1.802836e-17 1.833383e-17

      Pearson's Chi-squared test

data:  ORtable2
X-squared = 72.316, df = 1, p-value < 2.2e-16
```