

Sam Tenney

Homework 11

Section 2

2. Randomized Trial of Peanut Consumption in Infants at Risk for Peanut Allergy

- a) The response variable is the outcome of each child's oral food challenge (OFC).
- b) The response variable is a categorical variable because it is a yes or no, pass or fail response. It can only be measured in counts.
- c) The factor is the Treatment (Peanut Consumption, Peanut Avoidance).
- d) The experimental design is a 2-sample test for difference in proportions. This is because we have two different treatment groups, those children who avoided peanut consumption for 60 months, and those who consumed peanuts for their first 60 months. We are testing to see if whether you consume peanuts in your developmental years makes a difference in becoming allergic to peanuts or not, hence we are testing for a difference in proportions. The proportions part comes from having a categorical response variable that has a pass or fail outcome that we count and find percentages, or proportions, to help us test for the difference in the two treatments.

e) *# Read in the data*

```
peanut <- read.table(text = "treatment,outcome
Peanut Consumption,PASS OFC
Peanut Avoidance,PASS OFC
Peanut Consumption,PASS OFC
Peanut Avoidance,PASS OFC
Peanut Consumption,PASS OFC
...
Peanut Avoidance,PASS OFC
Peanut Consumption,PASS OFC
Peanut Consumption,PASS OFC
Peanut Avoidance,PASS OFC
Peanut Avoidance,PASS OFC", header = TRUE, sep = ",")
```

f)

Table 2.f: Peanut Table Counts

Treatment Group		Fail OFC	Pass OFC	Sum
	Peanut Avoidance	52	228	280
	Peanut Consumption	13	257	270
	Sum	65	485	560

g)

```
# Calculate proportions with peanut allergy in each group
prop.table(peanutTab, margin = 1)

##
##              FAIL OFC    PASS OFC
## Peanut Avoidance  0.18571429 0.81428571
## Peanut Consumption 0.04814815 0.95185185
```

From the table output we can see that those who were told to avoid peanut consumption had 18.5% (52/280) allergic to peanuts while those who did consume peanuts had only 4.8% (13/270) that were allergic to peanuts.

h) Our hypotheses we are testing for are $H_0 : p_{\text{Avoid}} = p_{\text{Consume}}$ and $H_a : p_{\text{Avoid}} \neq p_{\text{Consume}}$

```
# Perform a chi squared test
chisq.test(peanutTab, correct=FALSE)

##
## Pearson's Chi-squared test
##
## data:  peanutTab
## X-squared = 24.96, df = 1, p-value = 5.852e-07
```

```
# Perform a Fisher's Exact Test
fisher.test(peanutTab)

##
## Fisher's Exact Test for Count Data
##
## data:  peanutTab
## p-value = 5.29e-07
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  2.340649 9.245221
## sample estimates:
## odds ratio
##  4.497453
```

The p-values are both very small and nearly equal because the Fisher's Exact Test will only make a difference if we have a very small sample size, which in this case, we have a large sample so its results won't differ much from the Chi-squared test. Since the p-values are small, we will reject the null. See summary of results in part j.

i) 95% Confidence Interval

```
# Calculate a 95% confidence interval for the diff in proportions
prop.test(peanutTab, correct = FALSE)

##
## 2-sample test for equality of proportions without continuity
## correction
##
## data:  peanutTab
## X-squared = 24.96, df = 1, p-value = 5.852e-07
## alternative hypothesis: two.sided
## 95 percent confidence interval:
##  0.08534761 0.18978466
## sample estimates:
##      prop 1      prop 2
## 0.18571429 0.04814815
```

The 95% confidence interval is about 8.5% to 19%. See interpretation in part j.

- j) Based from our calculations in part h, we can reject the null hypothesis since we have such low p-values (< 0.001) and we can conclude that there is a difference in allergies to peanuts occurring based on whether someone consumes or avoids peanuts in their developmental years. Of those who avoided peanuts, 18.5% of them become allergic and only 4.8% of those who consumed peanuts become allergic (95% CI: 8% to 19%). Because the 4.8% is outside of our confidence interval, this confirms our conclusion that there is a significant difference in peanut consumption and peanut avoidance leading to allergies in peanuts.