Lab 7

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Section: 91973 Friday 9am

Question 1

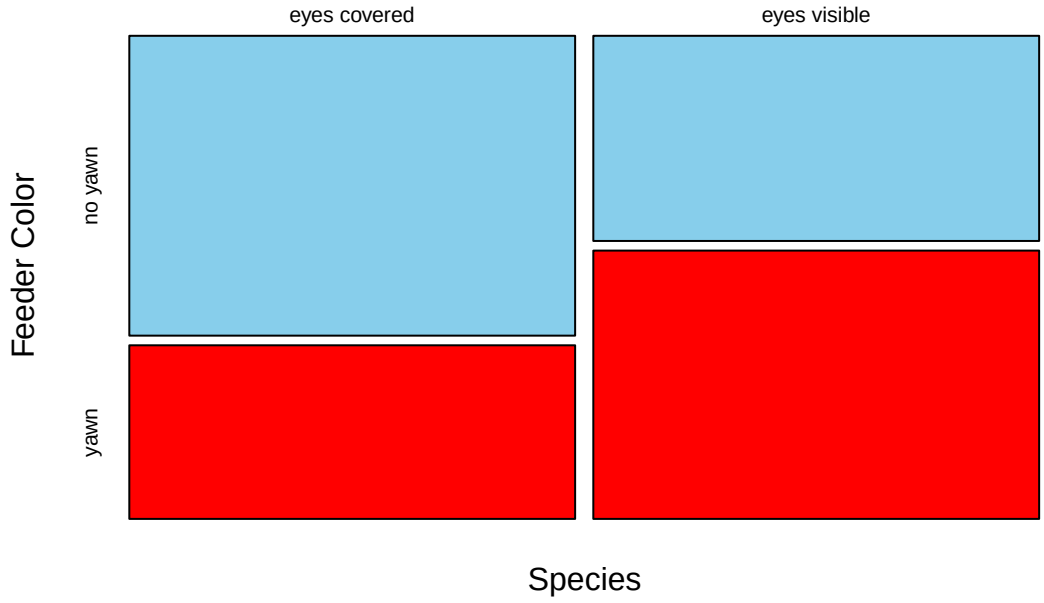
Script

```
setwd("~/code/biometry-lab/lab7")

#a. Read the data into R and convert them into a table
yawns <- read.csv('yawn.csv')
obs <- table(yawns)

# b. Make a mosaic plot of the results. Inspect the plot for evidence of an
# association between eye visibility and yawning contagion.
mosaicplot(obs,
           col = c("skyblue","red"),
           xlab = "Species",
           ylab = "Feeder Color",
           main = "")
#From the plot, it appears there may be an association.
#When the eyes are covered, there are slightly less people yawning.

# c. Test for an association between eye visibility and yawning contagion. Use
# an appropriate test and clearly state the conclusions of the test. Do this
# test "by hand" in R.

#compute marginals
covered <- sum(obs[1,])
uncovered <- sum(obs[2,])
noyawn <- sum(obs[,1])
yawn <- sum(obs[,2])
grand <-sum(obs)

#compute expected values
exp_covered_noyawn <- covered * noyawn / grand
exp_covered_yawn <- covered * yawn / grand
exp_uncovered_noyawn <- uncovered * noyawn / grand
exp_uncovered_yawn <- uncovered * yawn / grand

#put expected values into table
exp <- obs
exp[1,1] <- exp_covered_noyawn
exp[1,2] <- exp_covered_yawn
exp[2,1] <- exp_uncovered_noyawn
exp[2,2] <- exp_uncovered_yawn
```

```r
#calculate chi-sq
alpha <- 0.05
x2 <- sum((obs - exp)^2/exp)
df <- 1
(p <- 1 - pchisq(x2, 1))

# We fail to reject the null hypothesis that eye visibility is independent of
# yawning contagion with an alpha of 0.05 (Chi-square: X2 = 2.4107, df = 1, p =
# 0.1205)

# A chi-squared test was performed because the data satisfies Cochran's rules

# d. Repeat the test using an appropriate R function.
chisq.test(obs, correct = F)
```

Output

```r
#a. Read the data into R and convert them into a table
# b. Make a mosaic plot of the results. Inspect the plot for evidence of an
# association between eye visibility and yawning contagion.
```




```r
#From the plot, it appears there may be an association.
#When the eyes are covered, there are slightly less people yawning.

# c. Test for an association between eye visibility and yawning contagion. Use
# an appropriate test and clearly state the conclusions of the test. Do this
# test "by hand" in R.
(p <- 1 - pchisq(x2, 1))
```

```
## [1] 0.1205074
```

```r
# We fail to reject the null hypothesis that eye visibility is independent of
# yawning contagion with an alpha of 0.05 (Chi-square: X2 = 2.4107, df = 1, p =
```

```r
# 0.1205)

# A chi-squared test was performed because the data satisfies Cochran's rules

# d. Repeat the test using an appropriate R function.
```

```
##
##  Pearson's Chi-squared test
##
## data:  obs
## X-squared = 2.4107, df = 1, p-value = 0.1205
```

Answers

Question 2

Script

```r
# create data frame of data
obs <- data.frame(fed = c(0,5), unfed = c(6,3),
                  row.names = c('full','hungry'))

# calculate marginals
full <- sum(obs[1,])
hungry <- sum(obs[2,])
fed <- sum(obs[,1])
unfed <- sum(obs[,2])
total <- sum(obs)

# calculate expected values
exp_full_fed <- full * fed / total
exp_hungry_fed <- hungry * fed / total
exp_full_unfed <- full * unfed / total
exp_hungry_unfed <- hungry * unfed / total

# create expected table
exp <- obs
exp[1,1] <- exp_full_fed
exp[1,2] <- exp_full_unfed
exp[2,1] <- exp_hungry_fed
exp[2,2] <- exp_hungry_unfed

# check whether Cochran's rules are satisfied by inspecting the expected values
exp
# Since Cochran's rules are unsatisfied, a Fisher's Exact Test will be better
# than a Chi-squared test for this data.

fisher.test(obs)

# We reject the null hypothesis that regurgitative feeding is independent of
# hunger with an alpha of 0.05 (Fisher's Exact Test: p = .03097)
```

Output

```
# check whether Cochran's rules are satisfied by inspecting the expected values
```

```
##             fed    unfed
## full   2.142857 3.857143
## hungry 2.857143 5.142857
```

```
# Since Cochran's rules are unsatisfied, a Fisher's Exact Test will be better
# than a Chi-squared test for this data.
```

```
##
##  Fisher's Exact Test for Count Data
##
## data:  obs
## p-value = 0.03097
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.000000 1.053284
## sample estimates:
## odds ratio
##          0
```

```
# We reject the null hypothesis that regurgitative feeding is independent of
# hunger with an alpha of 0.05 (Fisher's Exact Test: p = .03097)
```

Answers