Group IV Problem 13.25

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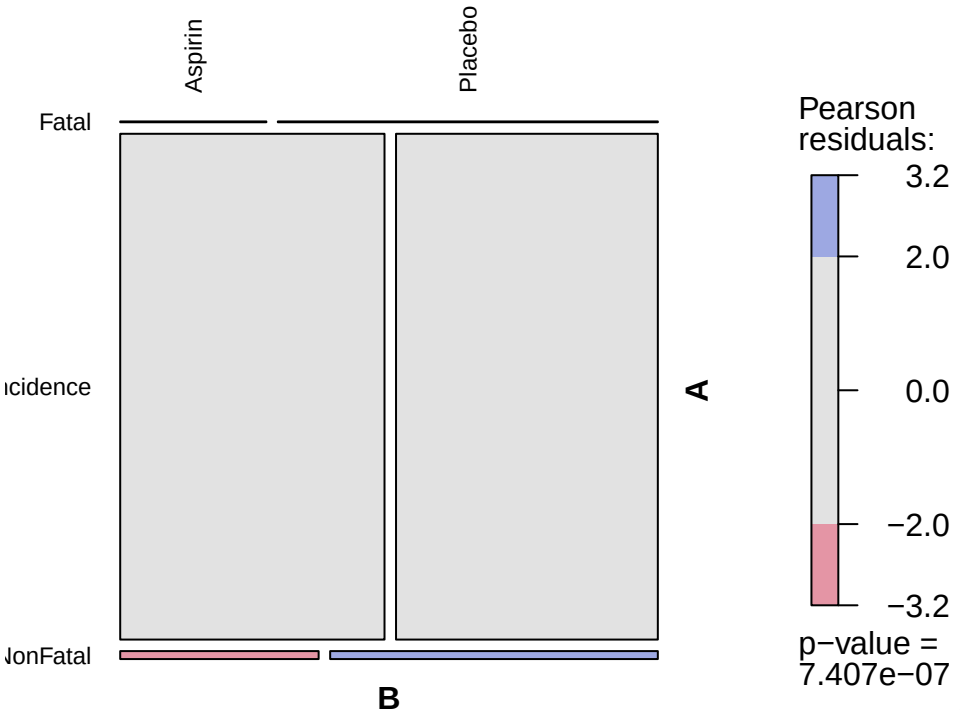
a. We look at a table and a mosaic plot to start off.

```
aspirin <- 11037 #total number in aspirin group
placebo <- 11034 #total number in placebo group
MI <- matrix(c(10,26,aspirin-139,placebo-239,129,213),ncol=2,byrow=T)
colnames(MI) <- c("Aspirin","Placebo")
rownames(MI) <- c("Fatal", "No Incidence", "NonFatal")
MI #table
```

```
##              Aspirin Placebo
## Fatal             10      26
## No Incidence   10898   10795
## NonFatal         129     213
```

```
mosaic(MI, shade=T, legend=T,labeling=labeling_border(rot_labels = c(90, 0, 90, 0),
just_labels=c("left","left","right","right"), tl_varnames = FALSE, gp_labels = gpar(fontsize = 9)))
```



From looking at the table, we see that there are more fatal and nonfatal incidences of heart attacks from the physicians who received the placebo. The mosaic plot also displays the discrepancy between in fatal and nonfatal incidences between the placebo and aspirin group. This leads us to suspect that aspirin may have an effect on the incidence of heart attacks, so we the run Chi-Square Test of Independence to confirm our suspicions.

```r
chisq.test(MI)
```

```
##
##  Pearson's Chi-squared test
##
## data:  MI
## X-squared = 28.231, df = 2, p-value = 7.407e-07
```

```r
odds1 <- ((10/aspirin)/(1-10/aspirin))/((26/placebo)/(1-26/placebo))
odds1 #odds ratio for fatal incidences
```

```
## [1] 0.3839527
```

```r
odds2 <- ((129/aspirin)/(1-129/aspirin))/((213/placebo)/(1-213/placebo))
odds2 #odds ratio for nonfatal incidences
```

```
## [1] 0.6008034
```

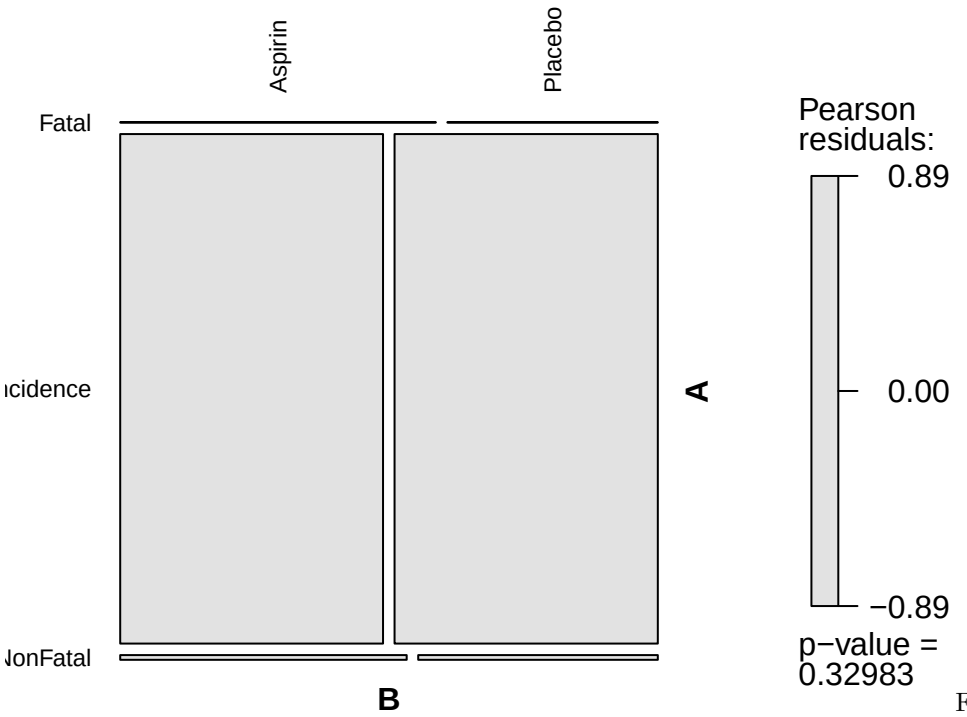
The null hypothesis for this test is that there is no relationship between aspirin and the incidence of heart attacks. Running the chi-square test we get a test statistic of 28.231 with 2 degrees of freedom which gives us a p-value of 7.407e-07. At a significance level of .05 we would fail to reject the null hypothesis. There is evidence to suggest that there is a relationship between aspirin use and the incidence of heart attacks. The odds ratio is .384 for fatal incidences and .601 for nonfatal incidences which show a considerable reduction in risk of heart attacks due to aspirin.

We run the same procedure for strokes.

```r
Stroke <- matrix(c(9,6,aspirin-119,placebo-98,110,92),ncol=2,byrow=T)
colnames(Stroke) <- c("Aspirin","Placebo")
rownames(Stroke) <- c("Fatal" , "No Incidence", "NonFatal")
Stroke #table
```

```
##              Aspirin Placebo
## Fatal              9       6
## No Incidence   10918   10936
## NonFatal         110      92
```

```r
mosaic(Stroke, shade=T, legend=T,labeling=labeling_border(rot_labels = c(90, 0, 90, 0),
just_labels=c("left","left","right","right"), tl_varnames = FALSE, gp_labels = gpar(fontsize = 9)))
```



From the table and mosaic plot, we see that there is a difference in fatal and nonfatal incidences of strokes between the aspirin and placebo group, but the difference looks to be pretty small. It is unclear as to whether this difference is significant.

```
chisq.test(Stroke)
```

```
##
##  Pearson's Chi-squared test
##
## data:  Stroke
## X-squared = 2.2184, df = 2, p-value = 0.3298
```

The null hypothesis for this test is that there is no relationship between aspirin and the incidence of strokes. Running the chi-square test we get a test statistic of 2.2184 with 2 degrees of freedom which gives us a p-value of .3298. At any reasonable significance level we would fail to reject the null hypothesis. The data gives us no reason to believe that there is a relationship between aspirin use and the incidence of strokes.

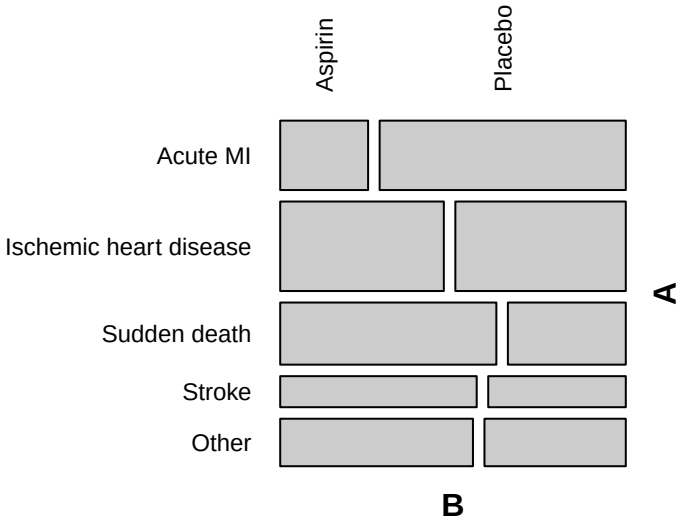
b.

```
Cause <- matrix(c(10,28,24,25,22,12,10,7,15,11),ncol=2,byrow=T)
colnames(Cause) <- c("Aspirin","Placebo")
rownames(Cause) <- c("Acute MI", "Ischemic heart disease", "Sudden death", "Stroke",
                     "Other")
total <- as.table(colSums(Cause)) #summing the death counts
chisq.test(total)
```

```
##
##  Chi-squared test for given probabilities
##
## data:  total
## X-squared = 0.02439, df = 1, p-value = 0.8759
```

The null hypothesis is there is no relationship between aspirin and cardiovascular mortality. Running the chi-square test we get a test statistic of .02439 with 1 degree of freedom which gives us a p-value of .8759. At any reasonable significance level we would fail to reject the null hypothesis. There is no evidence to suggest that aspirin has an effect on cardiovascular mortality.

```
mosaic(Cause,labeling=labeling_border(rot_labels = c(90, 0, 90, 0),
just_labels=c("left","left","right","right"), tl_varnames = FALSE, gp_labels = gpar(fontsize = 9)))
```



Looking at the mosaic plot, if you breakdown the cardiovascular mortalities into different categories, it seems that there maybe a significant difference in acute myocardial infarctions between the aspirin and placebo group. From our first test result we know this to be the case.