# Homework 2.2 Report

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The tables for each traffic condition are presented below:

```
## , , Traffic = Low
##
##           Vehicle
## Action     Car Truck
##   Crossing 287    40
##   Retreat   57    42
##
## , , Traffic = High
##
##           Vehicle
## Action     Car Truck
##   Crossing 237    57
##   Retreat   52    12
```

We perform chi square independency test between Action and Car, controlling Traffic.

```
##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  partial.low
## X-squared = 42.644, df = 1, p-value = 6.566e-11
```

```
##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  partial.high
## X-squared = 2.8914e-30, df = 1, p-value = 1
```

In low Traffic conditions we we reject the null hypothesis of independency between Action and Car, whereas in High traffic conditions we can accept the hypothesis for sure. Next, we check the odds ratio and the confidence interval.

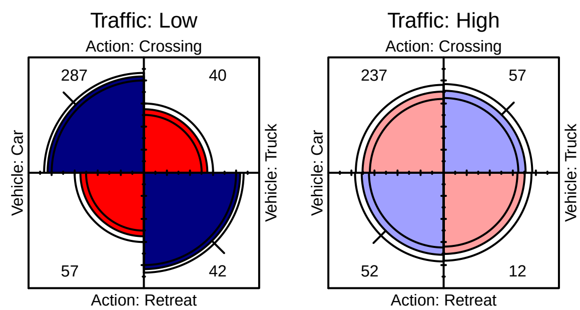
```
##  odds ratios for Action and Vehicle
##
## [1] 5.286842
```

```
##  odds ratios for Action and Vehicle
##
## [1] 0.9595142
```

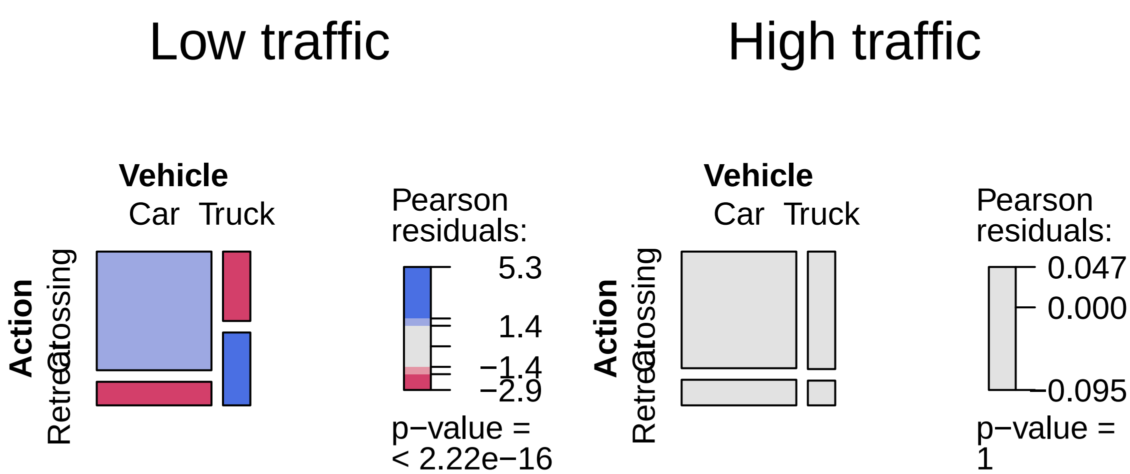
```
##                                2.5 %   97.5 %
## Crossing:Retreat/Car:Truck 3.149567 8.874459
```

```
##                                 2.5 %   97.5 %
## Crossing:Retreat/Car:Truck 0.4807475 1.915075
```

The odds of an elk crossing the street when approaching a car instead of truck (in low traffic conditions) are definitely higher (greater than 1). In high Traffic conditions the odds of an elk crossing a street given a car are 0.96 times the odds of if truck approaching.




To help us to conclude what we said before we can check the two fourfold display. It's easy to analyze that there are much more elks crossing the highway when they spot a car than when they see a truck.



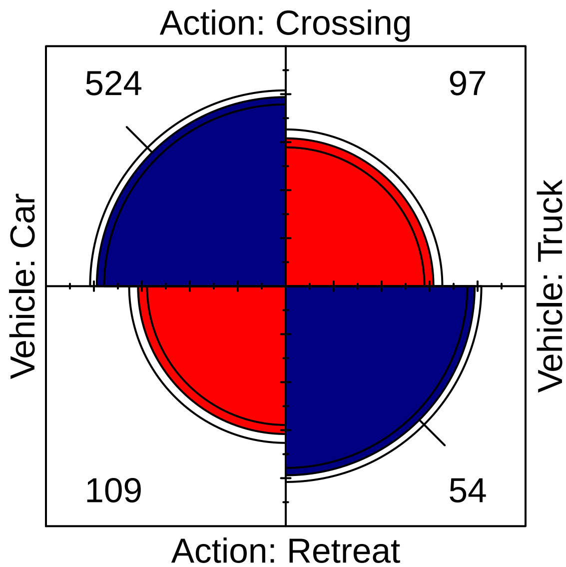

Given trucks, an elk is more likely to think twice when the traffic is low, as the probability is lower than when the traffic is high.

First, we worked the data to analyze the problem without taking account the third variable (traffic).

When we computed the odds ration we have got the following result:

```
##  odds ratios for Action and Vehicle
##
## [1] 2.676251
```

We executed once again the fourfold command to get a better understanding of the result when we change the number of variables involved in this problem. When the control variable is taken off (traffic) we get the following result in the fourfold command:




We see that actions and vehicles are not independent, and the odds of an elk crossing when given a car is over 2 times the odds of an elk crossing when truck approaching, regardless traffic.

Since we already checked that elks are prone to cross regardless the car when the traffic is high we would decide to keep distinction between traffic in further analysis.

```
##
##  Woolf-test on Homogeneity of Odds Ratios (no 3-Way assoc.)
##
## data:  Elks.table.pa
## X-squared = 14.999, df = 1, p-value = 0.0001076
```

We can reject the hypothesis of homogeneous association. This means that the probability of the elks perform some action with a vehicle is never equal regardless of the conditions of the traffic.

Next, we want to know if the type of vehicle (X) and the Action (Y) are conditional independent given the traffic (Z). For this, we used the Mantel-Haenszel estimate to get some information about the relation between the three variables. So, we've got the following results:

```
##
##  Mantel-Haenszel chi-squared test with continuity correction
##
## data:  Elks.table.partial
## Mantel-Haenszel X-squared = 24.39, df = 1, p-value = 7.868e-07
## alternative hypothesis: true common odds ratio is not equal to 1
## 95 percent confidence interval:
##  1.801123 3.924165
## sample estimates:
## common odds ratio
##          2.658553
```

The Common Odds Ratio as the value of 2.658553, we say that the odds of the action of crossing when the type of vehicle is car is equal to almost about triple (approx. 2.7) of the odds for the type truck. Given p-value for this test we reject the hypothesis of conditional independence between crossing between type of vehicle and traffic conditions.