Exercises

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Exercise 15.6.4

4. The *New York Times* (January 8, 2003, page A12) reported the following
data on death sentencing and race, from a study in Maryland: [2]

	Death Sentence	No Death Sentence
Black Victim	14	641
White Victim	62	594

Analyze the data using the tools from this chapter. Interpret the results.
Explain why, based only on this information, you can't make causal
conclusions. (The authors of the study did use much more information
in their full report.)

Using the data in the exercise I want to investigate hypothesis if death sentence and victims skin color are
related:

H0: Death Sentence and Victims Colour are indeperdent

H1: Death Sentence and Victims Colour are deperdent. Null hypothesis is rejected

To test the hyposesis we need to calculate p-value, which is a measure of the evidence against H0. The
smaller the p-value, the stronger the evidence against H0.

There are many ways to test hypothesis above. I will try several of them. Firstly, I will do Pearsons X2 test
to check independence between the features

```
## U statistic: 32.103709343626
```

```
## p-value 1.5e-08
```

```
## [1] "Dependent: Null hypothesis is rejected"
```

Other way is to check the likelihood ratio test statistic:

```
## LRT statistics: 34.5335058946819
```

```
## p-value: 4.1897680880254e-09
```

```
## [1] "Dependent: Null hypothesis is rejected"
```

Hence both Pearson's statistic and LRT leads to the refutal of unassosiation of the victim's skin color and
death sentence.

It can be concluded that Victims' Colour of the skin is associated with Death Sentence (reject H0). However,
I would like to know how strong or weak dependency is. To investigate this odds ration needs to be calculated.

```
## odds ratio: 0.209249660308993
```

In cases where victim was white skined the desicion of Death Sentense where 5 times as likely

```
## Log odds ratio: -1.56422719298786
```

```
## standard error of estimation of log-odds ratio is: 0.301332321154956
```

```
## Odds ratio confidence interval: 0.1145330518385060.382295063622048
```

```
## with a certainty of 95%,
## death sentence is sentenced from 3 to 9
## times more often if the victims skin color was white.
```

This means that, with a certainty of 95%, death sentence is sentenced from 2.5 to 9 times more often if the victims' skin color was white. We can see that the skin colour of the victim is assotiated to the death sentence, however we can't state that it is a cause of the decision because of the lack of information. There can be other factors contributing to both - maybe the death sentence is given to people killing rich victims. Being white and and rich might be more likely than being black and rich, hence the weight is more on the white victim side.

Exercise 15.6.5