The Effect of Vitamin C on Tooth Growth in Guinea Pigs

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August 22, 2015

Overiew

In this short report we are going to analyze the `TootGrowth` data of the R data sets package which describes the effect of vitamin C on tooth growth in guinea pigs. The `ToothGrowth` data set consists of 60 observations of 3 variables: `len`, `supp dose`

Exploratory Analysis

```
## [1] 60
```

```
# Viewing the object types in the data
str(ToothGrowth)
```

```
## 'data.frame':    60 obs. of  3 variables:
##  $ len : num  4.2 11.5 7.3 5.8 6.4 10 11.2 11.2 5.2 7 ...
##  $ supp: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 2 ...
##  $ dose: num  0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 ...
```

```
# Dimensions of the dataset
dim(ToothGrowth)
```

```
## [1] 60  3
```

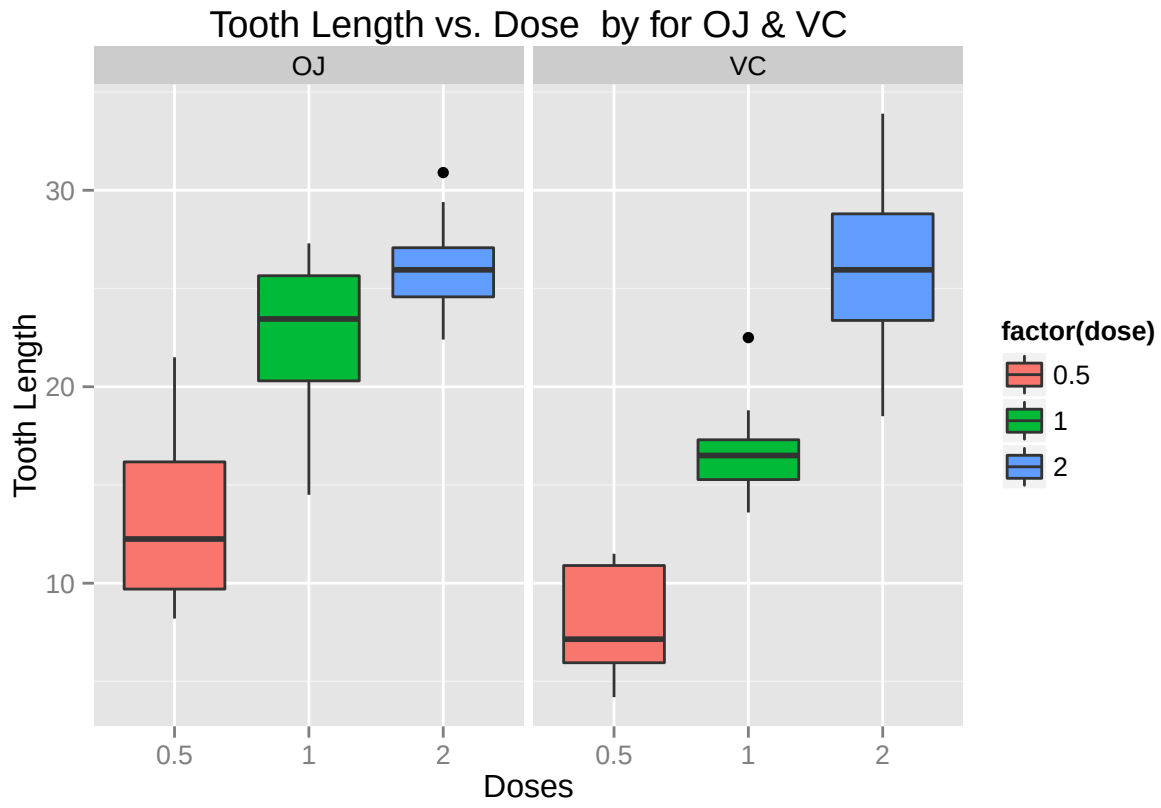
Summary of the data

```
summary(ToothGrowth)
```

```
##       len        supp         dose
##  Min.   : 4.20   OJ:30   Min.   :0.500
##  1st Qu.:13.07   VC:30   1st Qu.:0.500
##  Median :19.25           Median :1.000
##  Mean   :18.81           Mean   :1.167
##  3rd Qu.:25.27           3rd Qu.:2.000
##  Max.   :33.90           Max.   :2.000
```

```
# table view of the data
table(ToothGrowth$supp,ToothGrowth$dose)
```

```
##
##      0.5  1  2
##   OJ  10 10 10
##   VC  10 10 10
```



Hypothesis tests to compare tooth growth by dose and supp

Based on the box plot in the section above, it can be seen that OJ looks to be doing better with dose 0.5 and 1 effect on teeth growth than VC. To test this hypothesis we assume that the mean of OJ and VC does not cross zero.We will be testing on 3 dose levels: 0.5, 1, and 2

- 0.5mg Dose Level

```
##
##  Welch Two Sample t-test
##
## data:  ojdose0.5$len and vcdose0.5$len
## t = 3.1697, df = 14.969, p-value = 0.006359
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  1.719057 8.780943
## sample estimates:
## mean of x mean of y
##     13.23      7.98
```

From the results shown above we are 95% confident that the limits of 1.719057 and 8.780943 actually do contain the difference between the two population means. However because those limts do not contain zero, this confidence interval suggests that it is very possible that the two population means are not equal.

- 1mg Dose Level

```
##
##  Welch Two Sample t-test
##
## data:  ojdose1$len and vcdose1$len
## t = 4.0328, df = 15.358, p-value = 0.001038
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  2.802148 9.057852
## sample estimates:
## mean of x mean of y
##     22.70     16.77
```

From the results shown above we are 95% confident that the limits of 2.802148 and 9.057852 actually do contain the difference between the two population means. However because those limts do not contain zero,this confidence interval suggests that it is very possible that the two population means are not equal.

- 2mg Dose Level

```
##
##  Welch Two Sample t-test
##
## data:  ojdose2$len and vcdose2$len
## t = -0.046136, df = 14.04, p-value = 0.9639
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.79807  3.63807
## sample estimates:
## mean of x mean of y
##     26.06     26.14
```

From the results shown above we are 95% confident that the limits of -3.79807 and 3.63807 actually do contain the difference between the two population means. However, because those limts do contain zero, this confidence interval suggests that it is very possible that the two population means are equal.

Conclusion

We are 95% confident that dose 0.5 and dose 1 of OJ result in longer tooth length than dose 0.5 and dose 1 of VC. However, at the highest dose of 2, there is no statistically significant difference between the effects of OJ and VC.

Appendix

The full source code to this report and other files can be found here