Statistical Inference: Project Part 2

Part 2: Basic Inferential Data Analysis Instructionsless Now in the second portion of the project, we're going to analyze the ToothGrowth data in the R datasets package.

Load the ToothGrowth data and perform some basic exploratory data analyses Provide a basic summary of the data.

Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose. (Only use the techniques from class, even if there's other approaches worth considering)

State your conclusions and the assumptions needed for your conclusions.

** Loading the libraries and dataset**

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
```

Head of the data (Simply a preview)

```
##     len supp dose
## 1   4.2   VC  0.5
## 2  11.5   VC  0.5
## 3   7.3   VC  0.5
## 4   5.8   VC  0.5
## 5   6.4   VC  0.5
## 6  10.0   VC  0.5
```
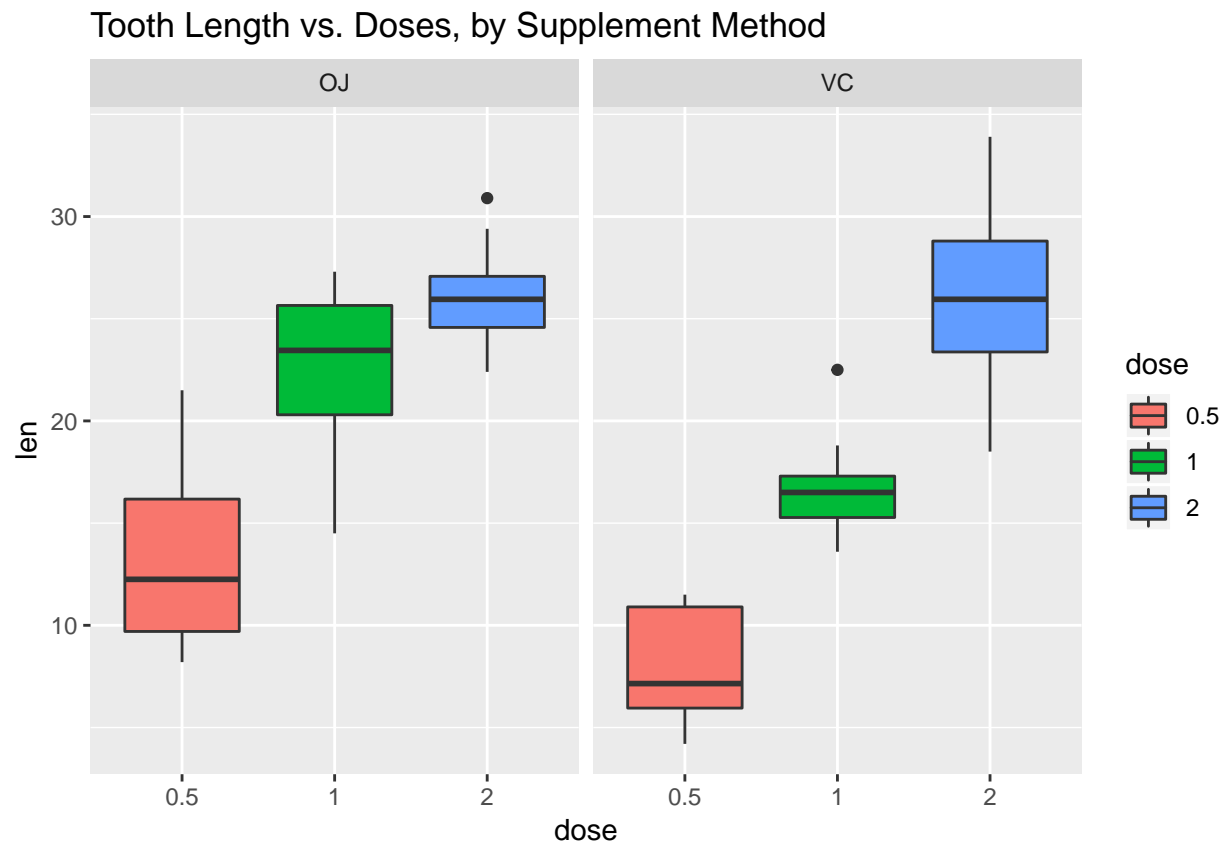
Basic Exploratory Analysis

```
# Convert dose to factor
ToothGrowth$dose = as.factor(ToothGrowth$dose)

#Plot tooth length  vs. the dose, separating by delivery method (supp)

g <- ggplot(ToothGrowth, aes(x=dose, y= len))
g + geom_boxplot(aes(fill=dose)) +facet_grid(.~supp) + ggtitle("Tooth Length vs. Doses, by Supplement M
```
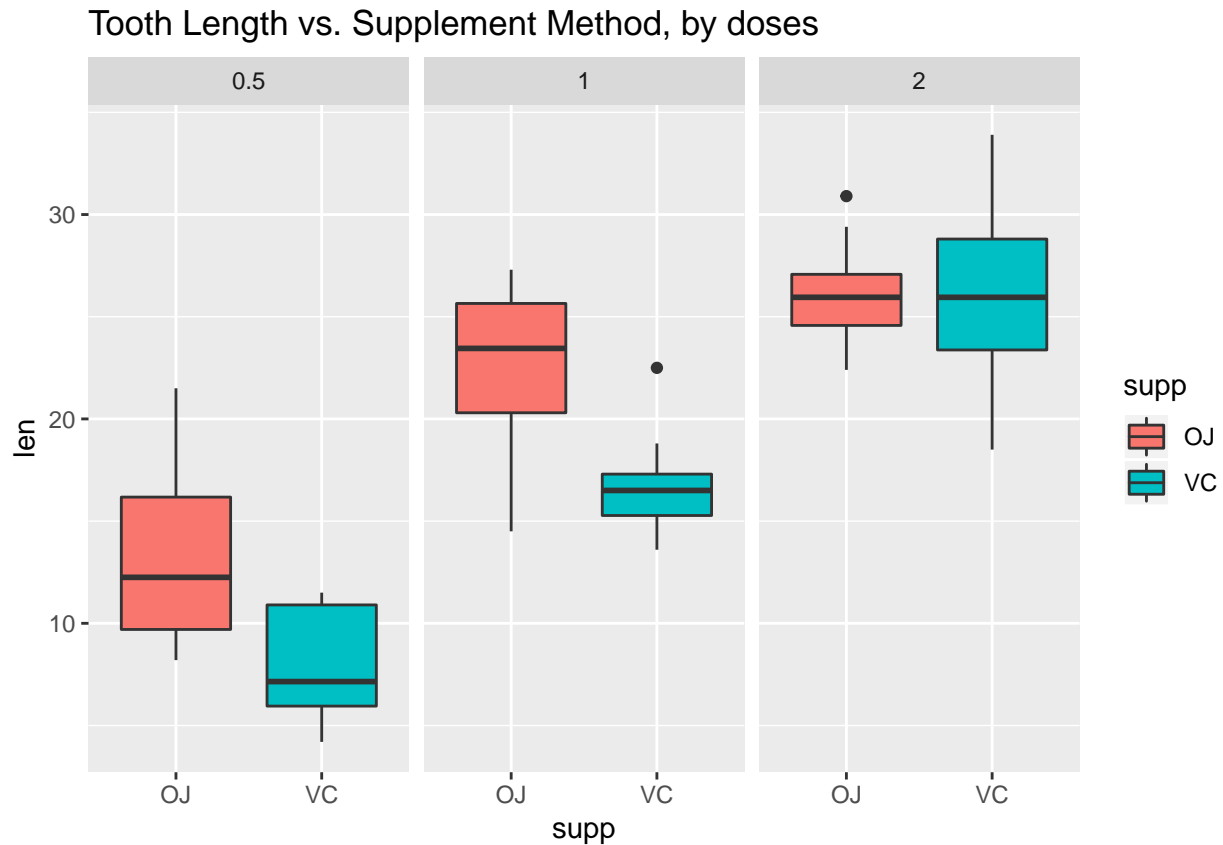
Tooth Length vs. Doses, by Supplement Method


```
#Plot tooth length vs. supplement method, separating by different doses

g<- ggplot(ToothGrowth, aes(x=supp, y= len))
g + geom_boxplot(aes(fill=supp)) + facet_grid(.~dose) + ggtitle("Tooth Length vs. Supplement Method, by
```

Tooth Length vs. Supplement Method, by doses

Hypothesis T-test

** Compare tooth length and doses **

```
#Compare dose with 0.5, 1.0
t.test(len~dose,data= subset(ToothGrowth, dose %in% c(0.5, 1.0)))
```

```
##
##   Welch Two Sample t-test
##
## data:  len by dose
## t = -6.4766, df = 37.986, p-value = 1.268e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.983781  -6.276219
## sample estimates:
## mean in group 0.5   mean in group 1
##          10.605            19.735
```

```
#Compare dose with 1.0, 2.0
t.test(len~dose,data= subset(ToothGrowth, dose %in% c(1.0, 2)))
```

```
##
##   Welch Two Sample t-test
##
## data:  len by dose
## t = -4.9005, df = 37.101, p-value = 1.906e-05
```

```
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -8.996481 -3.733519
## sample estimates:
## mean in group 1 mean in group 2
##          19.735          26.100
```

```r
#Compare dose with 0.5 2.0
t.test(len~dose,data= subset(ToothGrowth, dose %in% c(0.5, 2)))
```

```
##
##  Welch Two Sample t-test
##
## data:  len by dose
## t = -11.799, df = 36.883, p-value = 4.398e-14
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -18.15617 -12.83383
## sample estimates:
## mean in group 0.5   mean in group 2
##          10.605             26.100
```

Conclusion We can reject the Null hypothesis.

Reason:

P-Values from all of the above T-test are <0.05.

Hence, given the 95% confidence interval, the result is significant. This indicates that as the doses change(increase), the length of the tooth will also change(increase).

** Compare tooth length and Supplement Method **

```r
t.test(len~supp, data=ToothGrowth)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## t = 1.9153, df = 55.309, p-value = 0.06063
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1710156  7.5710156
## sample estimates:
## mean in group OJ mean in group VC
##          20.66333          16.96333
```

Conclusion We cannot rejuect the Null hypothesis.

Reason:

P-Values from the t-test is >0.05.

Hence, given the 95% confidence interval, which covers 0 within the range, the result indicates that it is not significant. To sum up, as the supplement method changes, the tooth length might not be changed. The supplement method has no effect on the growth of teeth length.