

StatisticalInferenceProjectPart2

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Part II Assignment Instructions

Analyze the ToothGrowth data in the R datasets package. (1) Load the ToothGrowth data and perform some basic exploratory data analyses (2) Provide a basic summary of the data. (3) Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose. (4) State your conclusions and the assumptions needed for your conclusions.

Step (1) Examine the data and using STR, HEAD and SUMMARY. To save space the results are hidden.

```
library(datasets)
library(ggplot2)
```

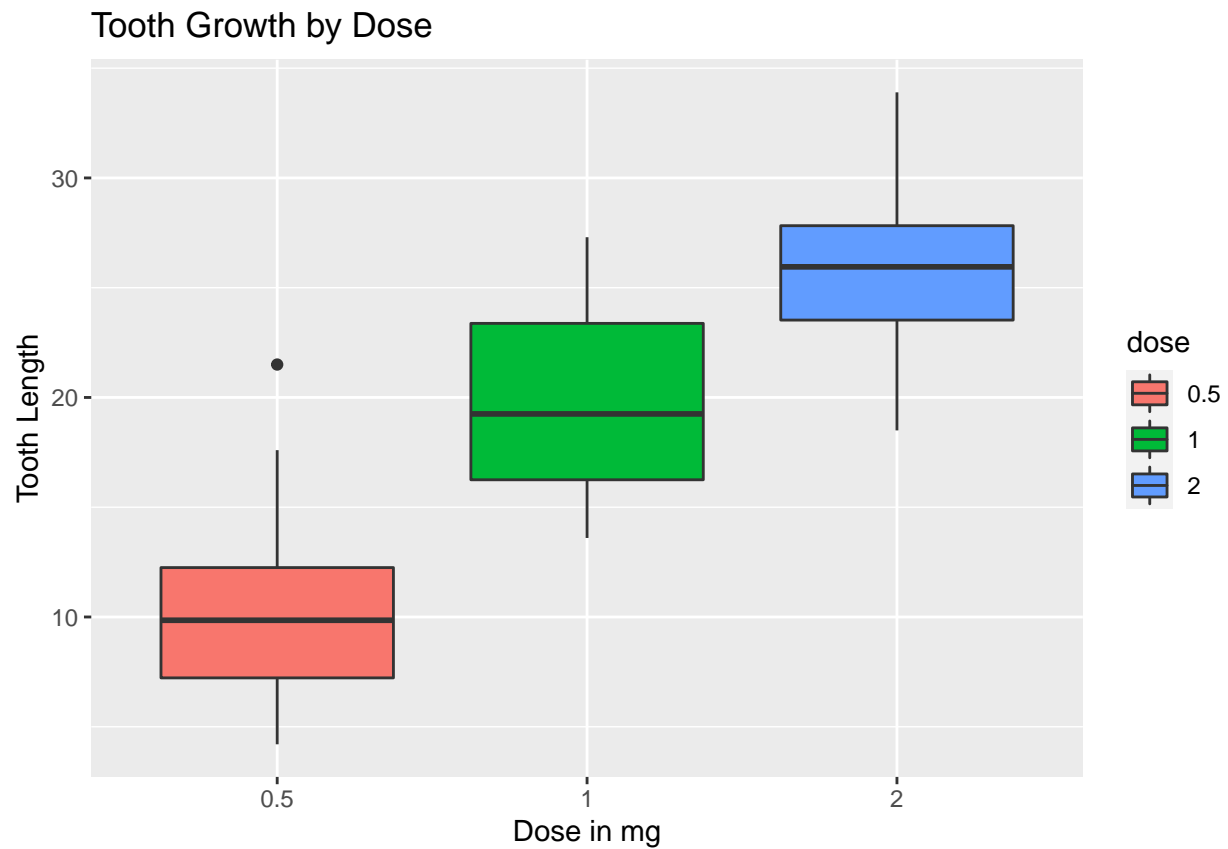
```
## Warning: package 'ggplot2' was built under R version 3.6.3
```

```
data(ToothGrowth)
str(ToothGrowth)
head(ToothGrowth)
summary(ToothGrowth)
```

Step (2) Basic Summary of data using a chart

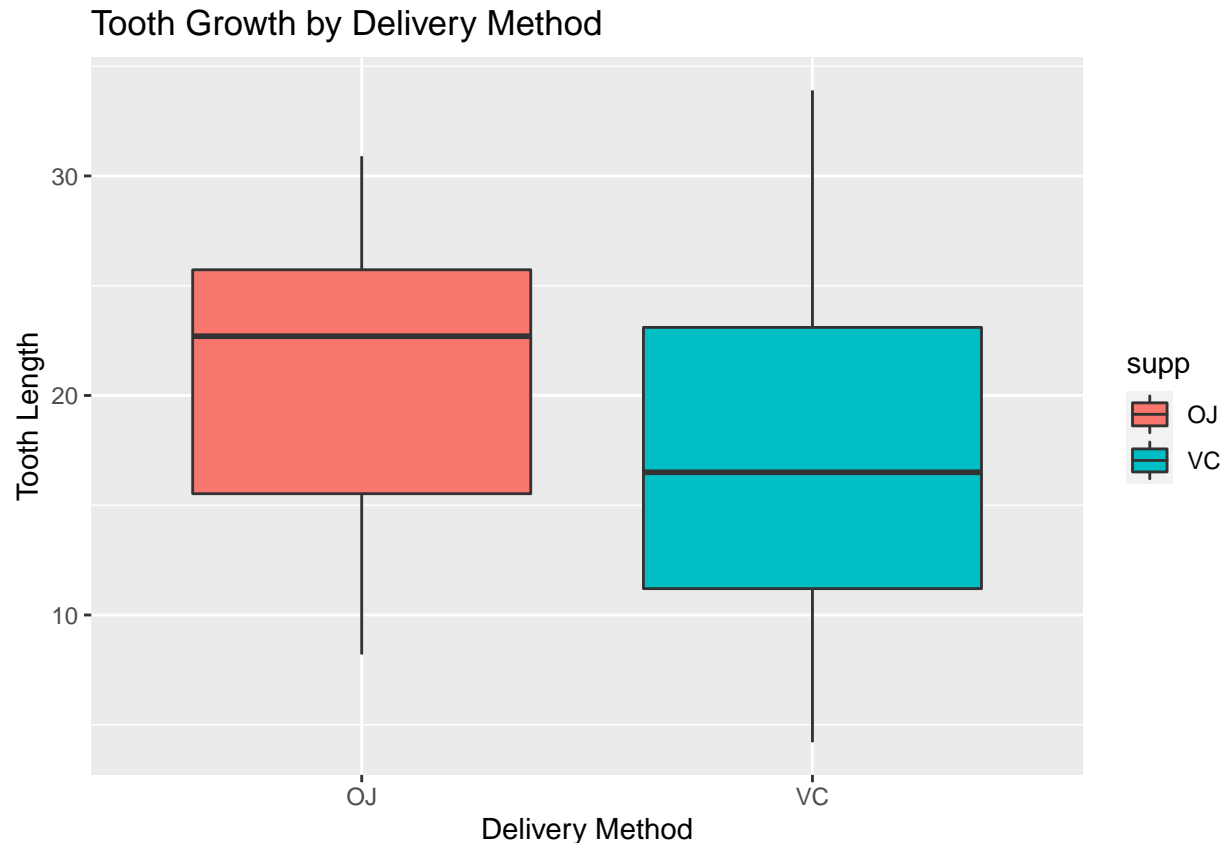
Using ggplot, the Tooth Length versus Dose is charted. The tooth length increases as the dose increases as shown below.

```
ToothGrowth$dose <- as.factor(ToothGrowth$dose)
MyGrowthPlot <- ggplot(ToothGrowth, aes(x=dose, y=len, fill=dose)) + geom_boxplot() + ggtitle("Tooth G
MyGrowthPlot
```



Using ggplot, the Tooth Length versus Delivery Method is higher for Orange Juice than for Vitamin C as shown below.

```
MyMethodPlot <- ggplot(ToothGrowth, aes(x=supp, y=len, fill=supp)) + geom_boxplot() + ggtitle("Tooth G")
MyMethodPlot
```



Step (3) Use Confidence Intervals and/or Hypothesis tests to compare Tooth Growth by Supp and Dose.

```
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
```

Step (3) Summary of Confidence Intervals part A

The p-value was 0.06 which is close to the significance level of 5%. The confidence interval of the test contains zero (0). The next test is for tooth length of the group with vitamin C dosage.

```
len<-ToothGrowth$len
dose<-ToothGrowth$dose
t.test(len[dose==2], len[dose==1], paired = FALSE, var.equal = TRUE)
```

```
##
## Two Sample t-test
##
## data: len[dose == 2] and len[dose == 1]
## t = 4.9005, df = 38, p-value = 1.811e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  3.735613 8.994387
## sample estimates:
## mean of x mean of y
##    26.100    19.735
```

Step (3) Summary of Confidence Intervals part b

The p-value is close to zero, and we can reject the null hypothesis. The confidence interval does not contain zero, and increasing the dosage increases tooth length.

Step (4) Conclusion and Assumptions

As a conclusion, the supplement type has no effect on tooth growth, and increasing the dosage leads to increased tooth length (growth). Assumptions are the simulation was done with random testing of Guinea Pigs in a sample size, and the t-tests variances are assumed to be different for the two groups.