

# Statistical Inference: Project 2-Part 2(ToothGrowth)

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## Overview

In Part 2 of the course project is analyzing the ToothGrowth data in the R datasets package. Toothgrowth is a data frame with 60 observations on 3 variables.

## 1.Load the ToothGrowth data and perform some basic exploratory data analyses

```
library(ggplot2)
library(datasets)
data(ToothGrowth)
dim(ToothGrowth)
```

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

```
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 ...
```

## 2.Provide a basic summary of the data.

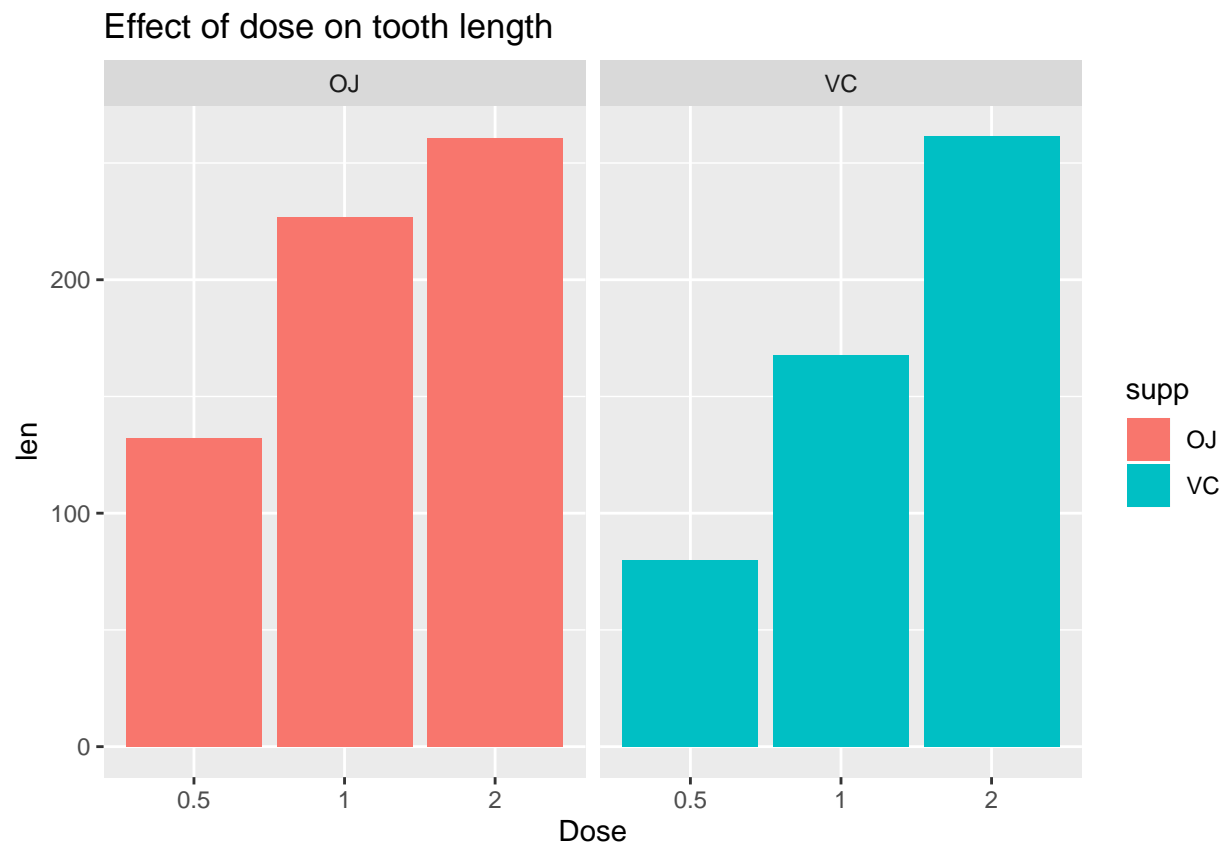
```
summary(ToothGrowth)
```

```
##      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(ToothGrowth)
```

```
##    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
```

```
ggplot(ToothGrowth,aes(x=as.factor(dose),y=len,fill=supp))+ geom_bar(stat="identity")+facet_grid(.~supp)
```



```
dev.copy(png, file="plot.png")
```

```
## png
## 3
```

```
dev.off()
```

```
## pdf
## 2
```

### 3. Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose.

Null hypothesis is there is no effect on tooth growth of different supp types

```
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
```

Here pvalue is 0.06063 The confidence interval contains zero. Hence we can not reject the null hypothesis that the different supplement types have no effect on tooth length.

```
doses_0.5 <- subset (ToothGrowth, dose == "0.5")
doses_1.0 <- subset (ToothGrowth, dose == "1")
doses_2.0 <- subset (ToothGrowth, dose == "2")
t.test(len ~ supp, data = doses_0.5)
```

```
##
## Welch Two Sample t-test
##
## data: len by supp
## 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 in group OJ mean in group VC
## 13.23 7.98
```

```
t.test(len ~ supp, data = doses_1.0)
```

```
##
## Welch Two Sample t-test
##
## data: len by supp
## 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 in group OJ mean in group VC
## 22.70 16.77
```

```
t.test(len ~ supp, data = doses_2.0)
```

```
##
## Welch Two Sample t-test
##
## data: len by supp
## 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 in group OJ mean in group VC
##          26.06          26.14
```

#### 4. Conclusion

Supplement types have no effect on tooth growth.

Inreasing dose level leads to increased tooth growth.