ToothGrowth

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Introduction

We will be running some exploratory analysis on the toothGrowth dataset provided by R. After summarizing and describing we will run tests to compare the tooth growth by supp and dose.

Data Processing

According to the source of the data the set contains information about guinea pigs, their cells responsible for tooth growth, and a dosage of vitamin c that was given to each animal. The first step I took was to take a look at the structure. I imediatly noticed this data set lacks a control group a animals that recieved no Vitamin C suppliment. Taking not of that I moved on.

```
data("ToothGrowth")
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
```

```
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 ...
```

I wanted to breifly examine the means to see if there was any trend that seemed obvious. The initial results seem to indicate that as the dose of vitamin c increases the length of the odontoblasts also increases. It also seems to indicate that at smaller doses OJ is more effective, but later the delivery method does not.

```
oj0.5mean = mean(subset(ToothGrowth,supp == "OJ" & dose == 0.5)$len)
oj1.0mean = mean(subset(ToothGrowth,supp == "OJ" & dose == 1.0)$len)
oj2.0mean = mean(subset(ToothGrowth,supp == "OJ" & dose == 2.0)$len)
ojMeans = c(oj0.5mean,oj1.0mean, oj2.0mean)
```

```
vc0.5mean = mean(subset(ToothGrowth,supp == "VC" & dose == 0.5)$len)
vc1.0mean = mean(subset(ToothGrowth,supp == "VC" & dose == 1.0)$len)
vc2.0mean = mean(subset(ToothGrowth,supp == "VC" & dose == 2.0)$len)
vcMeans = c(vc0.5mean,vc1.0mean,vc2.0mean)

dose = c(.5,1,2)

toothMeans = data.frame(dose,ojMeans,vcMeans)
toothMeans
```

```
##   dose ojMeans vcMeans
## 1  0.5   13.23    7.98
## 2  1.0   22.70   16.77
## 3  2.0   26.06   26.14
```

Analysis

The first analysis we can perform is a comparison of the supplement. Is there evidence that implies one of the supplements has a greater affect than the other. In order to do this I used a two group T-test, where the null hypothesis is that the mean of change between the two supplements is equal.

```
t.test(len ~ supp, paired = FALSE,var.equal = FALSE, 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
```

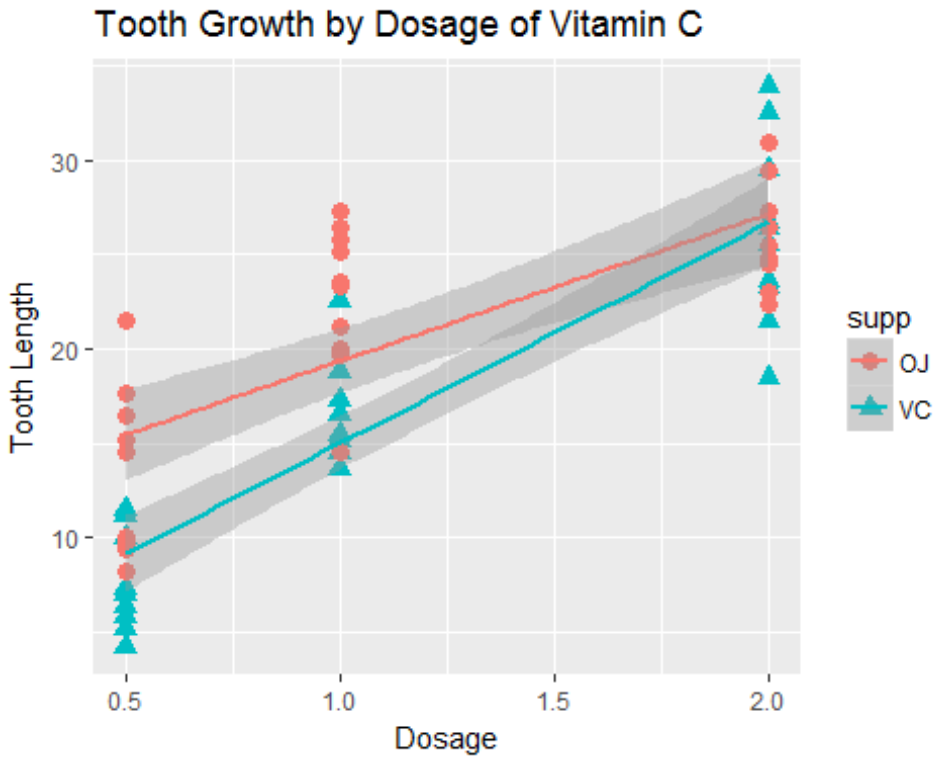
```
pt(1.91,55, lower.tail = FALSE)
```

```
## [1] 0.03067668
```

The T-test shows that while there is a possibility that the population means would be the same, since the confidence interval contains 0, it is unlikely. By analysing the probability of the t value we see that there is only a 'r pt(1.91,55, lower.tail = FALSE)' probability that we are incorectly rejecting the null hypothesis.

Next we cal take a look at how dosage affects the tooth growth. In this case the null hypothesis would be that any amount of vitamin c will have the same affect. We can initially just look at the ploted data to see what the growth looks like.

```
qplot(dose,len,data = ToothGrowth, shape = supp, color = supp, size =
I(3),xlab = "Dosage", ylab = "Tooth Length",main = "Tooth Growth by Dosage of
Vitamin C")+geom_smooth(method = "lm")
```



This plot tells a pretty convincing story of the way dosage increases the tooth growth.

Results

The two conclusions we can draw here is that OJ has a more significant effect on the growth of ondontoblasts, and as the dosage of the supplement increases the growth also increases.