Statistical Inference Project Part 2

Damien Edwards

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This is an analysis of the ToothGrowth data in the R datasets package. The analysis will provide a basic summary of the data and use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose.The analysis will show the effect of Vitamin C on tooth growth in guinea pigs. The difference in means of different dosages and supplements given.

```
## Load ToothGrowth data
library(datasets)
data(ToothGrowth)
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 ...
```

Summary of ToothGrowth dataset

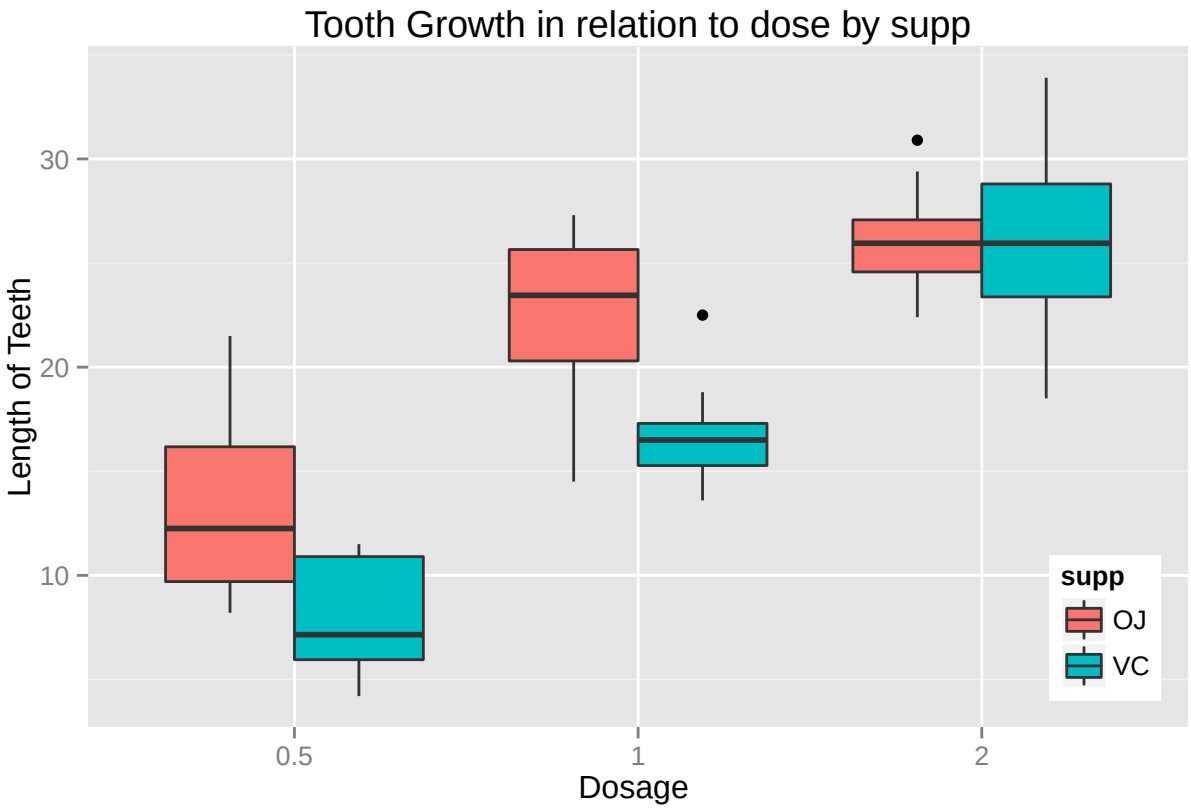
```
ToothGrowth$dose <- as.factor(ToothGrowth$dose)
summary(ToothGrowth)
```

```
##       len        supp     dose
##  Min.   : 4.20   OJ:30   0.5:20
##  1st Qu.:13.07   VC:30   1  :20
##  Median :19.25           2  :20
##  Mean   :18.81
##  3rd Qu.:25.27
##  Max.   :33.90
```

```
table(ToothGrowth$supp, ToothGrowth$dose)
```

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

Boxplot of ToothGrowth Dose Summary



The figure above shows a box plot of the length of tooth by supplement and dosage.The higher the dosage the longer the tooth grows. The graph shows the dosages are similar for both supplements at 2mg.It seems OJ has a better effect on teeth growth than VC looking at the plot.

Confidence intervals to compare tooth growth by supp and dose.

```
data(ToothGrowth)
t1 <- t.test(len~supp, paired=F, var.equal=T, data=ToothGrowth)
t2 <- t.test(len~supp, paired=F, var.equal=F, data=ToothGrowth)
show_values<- data.frame("p-value"=c(t1$p.value, t2$p.value),
                         "Conf Low"=c(t1$conf[1],t2$conf[1]),
                         "Conf High"=c(t1$conf[2],t2$conf[2]),
                         row.names=c("Equal Var","Unequal Var"))
show_values
```

```
##                p.value   Conf.Low Conf.High
## Equal Var   0.06039337 -0.1670064  7.567006
## Unequal Var 0.06063451 -0.1710156  7.571016
```

Conclusion

The pvalue was 0.0604 and the 95% confidence interval was -0.167, 7.567. The results show no significant difference between the tooth length for OJ and VC. We will test this hypothesis by having a H0 as the mean of OJ and VC be the same. We will compare the dose effect:

```
t.test(len~dose, ToothGrowth, dose %in% c(1.0,0.5), paired = F, var.equal = T, alternative ="two.sided
```

```
##
##  Two Sample t-test
##
## data:  len by dose
## t = -6.4766, df = 38, p-value = 1.266e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.983748  -6.276252
## sample estimates:
## mean in group 0.5   mean in group 1
##            10.605            19.735
```

```
t.test(len~dose, ToothGrowth, dose %in% c(2.0,1.0), paired = F, var.equal = T, alternative ="two.sided
```

```
##
##  Two Sample t-test
##
## data:  len by dose
## 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:
##  -8.994387 -3.735613
## sample estimates:
## mean in group 1 mean in group 2
##          19.735          26.100
```

The increase of of dose level has a large impact on tooth growth.Orange juice and vitamin C have obvious different impact on tooth growth. The OJ mean 20.66333 is narrowly inside of our 95% confidence interval [16.96333, 20.66333]. We can reject the hypothesis H0.