StatisticalInferenceDMenin

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Assignment Part 2

In the second portion of the class, we're going to analyze the ToothGrowth data in the R datasets package.

1 and 2) Load the ToothGrowth data, perform some basic exploratory data analyses and Provide a basic summary of the data.

```
library(reshape2)
library(ggplot2)
library(plyr)

t <- ToothGrowth
t$dose <- factor(t$dose)
levels(t$supp) <- c("Orange Juice", "Ascorbic Acid")
```

The dataset we are working with is called "The Effect of Vitamin C on Tooth Growth in Guinea Pigs". and contains the response is the length of odontoblasts (teeth) in each of 10 guinea pigs at each of three dose levels of Vitamin C (0.5, 1, and 2 mg) with each of two delivery methods (orange juice or ascorbic acid).

The first conclusion we can get is that Vitamin C does affect the teeth length. If we ignore the delivery method for a moment and jusdt compare dosage with length, well see that Guinea Pigs that got 0.5 mg got an average of 10.61 mm increase (with a max of 21.5mm) and Pigs that got 2 dosages increased on average 26.10mm (with a max of 33.9mm)

```
ddply(t, 'dose', summarise, average_growth = mean(len), max_growth  = max(len))
```

```
##   dose average_growth max_growth
## 1  0.5          10.61       21.5
## 2    1          19.73       27.3
## 3    2          26.10       33.9
```

If we bring the delivery method into consideration, Oranje juice seems to be the best oprion when dosage is 0.5 or 1. On smaller doses (0,5mg), the average teeth growth was 65% better on orange juice than on ascorbic acid (13.23mm against 7.98mm) On medium doses the behaviour is the same with a 35% better performance on Orange Juice (22.7mm against 16.77)

When the dosage is higher on the other hand, on average, Ascorbic Acid seems to have a slitgly advantage over Orange juice 26.14 over 26.06

```
tapply(t$len, list(t$supp, t$dose), mean)
```

```
##                 0.5     1     2
## Orange Juice  13.23 22.70 26.06
## Ascorbic Acid  7.98 16.77 26.14
```

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

We are going to perfor 2 tests, 0.5mg dosage versus 1 mg dosage and 1mg dosage vs 2mg dosage

```
t1 <- subset(t, dose %in% c(0.5,1))
t.test(len ~ dose, paired=FALSE, var.equal=FALSE, data=t1)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by dose
## t = -6.477, df = 37.99, p-value = 1.268e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.984  -6.276
## sample estimates:
## mean in group 0.5   mean in group 1
##             10.61             19.73
```

```
t2 <- subset(t, dose %in% c(1,2))
t.test(len ~ dose, paired=FALSE, var.equal=FALSE, data=t2)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by dose
## t = -4.901, df = 37.1, p-value = 1.906e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -8.996 -3.734
## sample estimates:
## mean in group 1 mean in group 2
##           19.73           26.10
```

4) State your conclusions and the assumptions needed for your conclusions.

Conclusions: * Vitamin C DOES have an effect on teeth lenght * The delivery method of Vitamine C matters on small and medium dosages but doesnt seem to matter much as the dosage incrases

Assumptions: * Dosages are classified as small - medium and large, being 0.5mg, 1mg and 2mg respectively