Statistical Inference Project Assignment 2

Pete Schnettler

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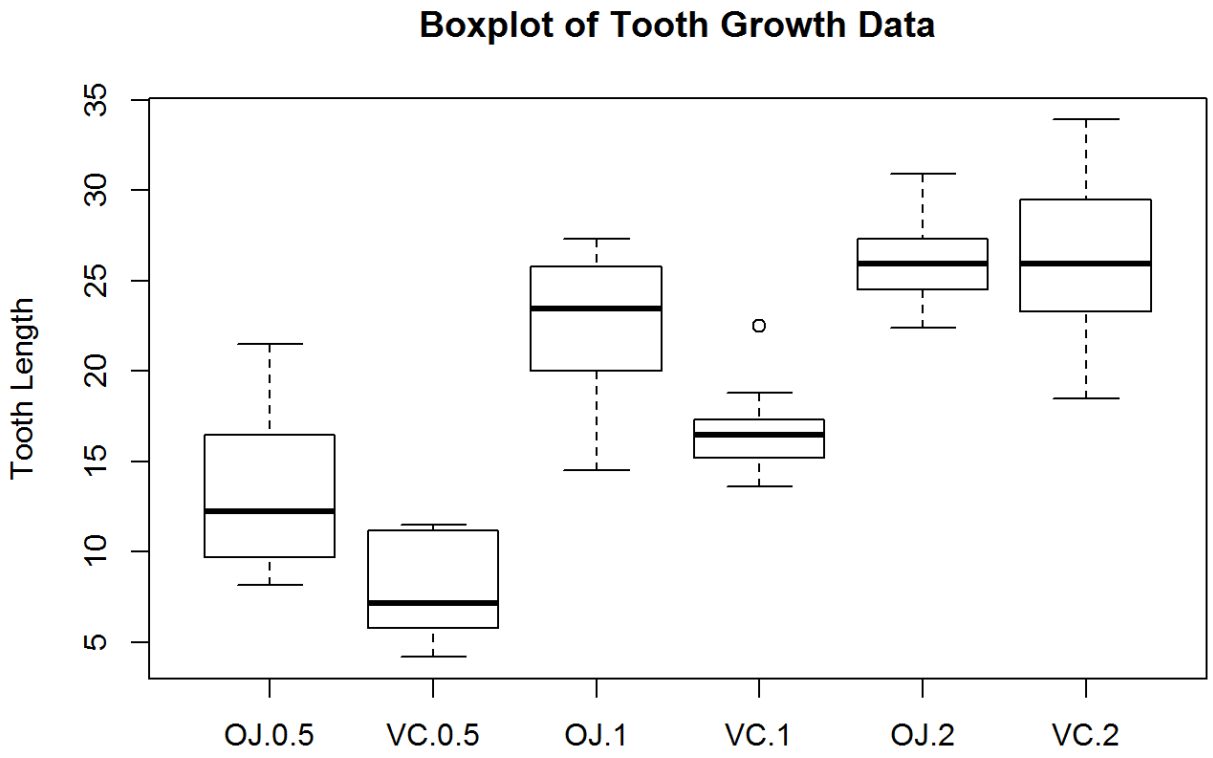
1. Load the ToothGrowth data and perform some basic exploratory data analy

```
data(ToothGrowth)
boxplot(len ~ supp * dose, data=ToothGrowth, ylab="Tooth Length", main="Boxplo
t of Tooth Growth Data")
```



It appears that tooth length increases as the dosage increases.

2. Provide a basic summary of the data

The `ToothGrowth` data set 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).* …" [Ref.; C. I. Bliss (1952) The Statistics of Bioassay. Academic Press]

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)

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

#for each of the three dosage levels calculate the test values
ts <- lapply(c(.5, 1, 2), function(x) {
    t.test(len ~ supp, data=subset(ToothGrowth, dose==x), paired=FALSE, var.equ
al=FALSE)
    })
pvals <- c(ts[[1]]$p.value, ts[[2]]$p.value, ts[[3]]$p.value)
stats <- c(ts[[1]]$statistic, ts[[2]]$statistic, ts[[3]]$statistic)
lls <- sapply(c(ts[[1]]$conf.int[1], ts[[2]]$conf.int[1], ts[[3]]$conf.int
[1]), round, 3)
uls <- sapply(c(ts[[1]]$conf.int[2], ts[[2]]$conf.int[2], ts[[3]]$conf.int
[2]), round, 3)
df <- data.frame(dose=c(0.5, 1, 2), t=stats, p=pvals,
                 ci=paste0("[",paste(lls, uls, sep=", "), "]"))
colnames(df) <- c("Dose", "t", "p-value", "conf. int.")

library(knitr)
```

```
## Warning: package 'knitr' was built under R version 3.2.3
```

```
kable(df)
```

Dose	t	p-value	conf. int.
0.5	3.1697328	0.0063586	[1.719, 8.781]

Dose	t	p-value	conf. int.
1.0	4.0327696	0.0010384	[2.802, 9.058]
2.0	-0.0461361	0.9638516	[-3.798, 3.638]

Conclusions

- At the 0.5 and 1 mg dose levels, when we have a p-value is less than .05 which would indicate strongly against the null hypothesis. Our p-values are .0064 and .0010 respectively, where we can say that there is a meaningful difference between the two methods.
- For the 2 mg dose level, with a p-value greater that .05, we fail to reject the null hypothesis, which would indicate no significant difference between the methods.
- From the boxplot above, the dosage does have an effect on tooth growth.