ToothGrowth Dataset Analysis

Gabe Rudy

April 20, 2015

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).

```
library(datasets)
summary(ToothGrowth$len)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    4.20   13.08   19.25   18.81   25.28   33.90
```

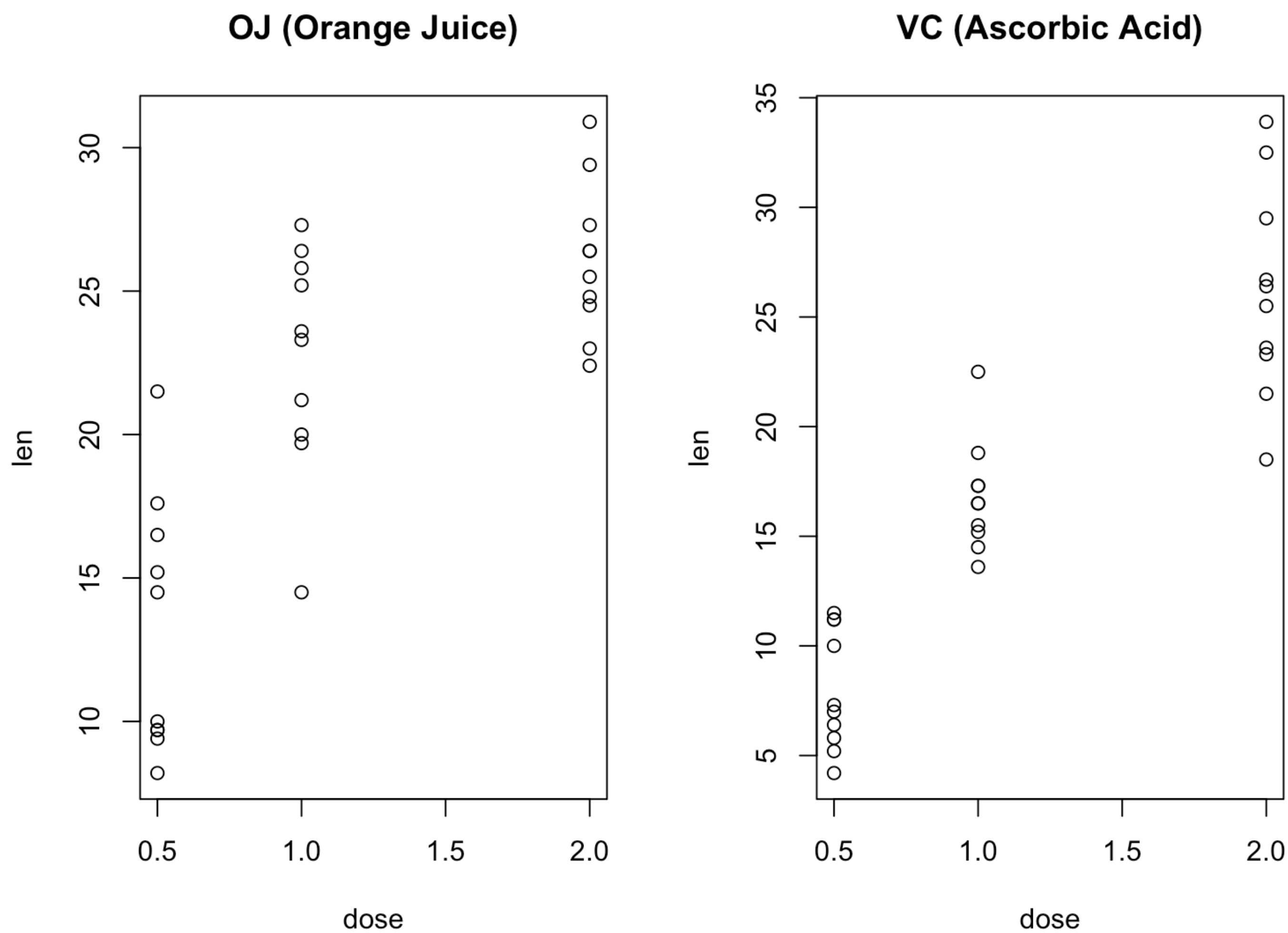
```
#Create a list by supplement type
by_supp <- split(ToothGrowth$len, ToothGrowth$supp)
summary(by_supp$OJ)
summary(by_supp$VC)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    8.20   15.52   22.70   20.66   25.72   30.90
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    4.20   11.20   16.50   16.96   23.10   33.90
```

```
#Create a list by dosage levels
by_dose <- split(ToothGrowth$len, ToothGrowth$dose)
summary(by_dose$`0.5`)
summary(by_dose$`1`)
summary(by_dose$`2`)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.200   7.225   9.850  10.600  12.250  21.500
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   13.60   16.25   19.25   19.74   23.38   27.30
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   18.50   23.52   25.95   26.10   27.83   33.90
```

We can see by the summary information that that *OJ* has a greater mean than *VC* (absorbic acid) delivery. Also, the mean length increases with dosage.



Plot of the data from the two supplement types. Length appears to increase with dosage and absorbic acid VC) has a greater max and min values than OJ (which we also saw in the summary statistics).

Confidence Interval and Tests for Supplement Type

Lets compare the observations in group OJ and VC.

We will use a Student's t-Test to compare the two groups with `0.95` confidence level.

```
t.test(by_supp$OJ, by_supp$VC, paired=FALSE, var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  by_supp$OJ and by_supp$VC
## t = 1.9153, df = 58, p-value = 0.06039
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1670064  7.5670064
## sample estimates:
## mean of x mean of y
##  20.66333  16.96333
```

Our T test statistic is `1.9` , meaning we estimate our difference of means is `1.9` standard error from the hypothosized mean. The P-value is `0.06` , meaning there is `0.06` probability of obtaining differences of means greather than the observed if the truely where no difference based on supplement type.

We are makeing the assumption that *the variance of the two groups is equal*. We are also making a two-sided test, saying the difference of the means could be either greater than or less than, not just strictly greater than or less than.

Confidence Interval and Tests for Dose

Lets compare the observations in dosage group `0.5` and `2` .

We will use a Student's t-Test to compare the two groups with a `0.95` confidence level.

```
t.test(by_dose$`0.5`, by_dose$`2`, paired=FALSE, var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  by_dose$`0.5` and by_dose$`2`
## t = -11.799, df = 38, p-value = 2.838e-14
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -18.15352 -12.83648
## sample estimates:
## mean of x mean of y
##    10.605    26.100
```

Our T test statistic is `11.8` , meaning we estimate our difference of means is `11.8` standard error from the hypothosized mean. The P-value is `2.8e-14` , meaning there is `2.8e-14` probability of obtaining differences of means greather than the observed if the truely where no difference based on supplement type. We are makeing the assumption that *the variance of the two groups is equal*. We are also making a two-sided test, saying the difference of the means could be either greater than or less than, not just strictly greater than or less than.