Tooth Growth Analysis

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Synopsis:

This report analyzes experimental data reported on tooth growth with increasing doses of vitamin C and orange joice administered to a set of 60 guinea pigs. It uses T confidence intervals and hypothesis testing to conclude that both VC and OJ help improve tooth growth with increasing doses.

Data Description:

Each of 60 guinea pigs were given one of three dose levels of vitamin C (0.5, 1, and 2 mg/day) by one of two delivery methods, (orange juice or ascorbic acid, a form of vitamin C and coded as VC).
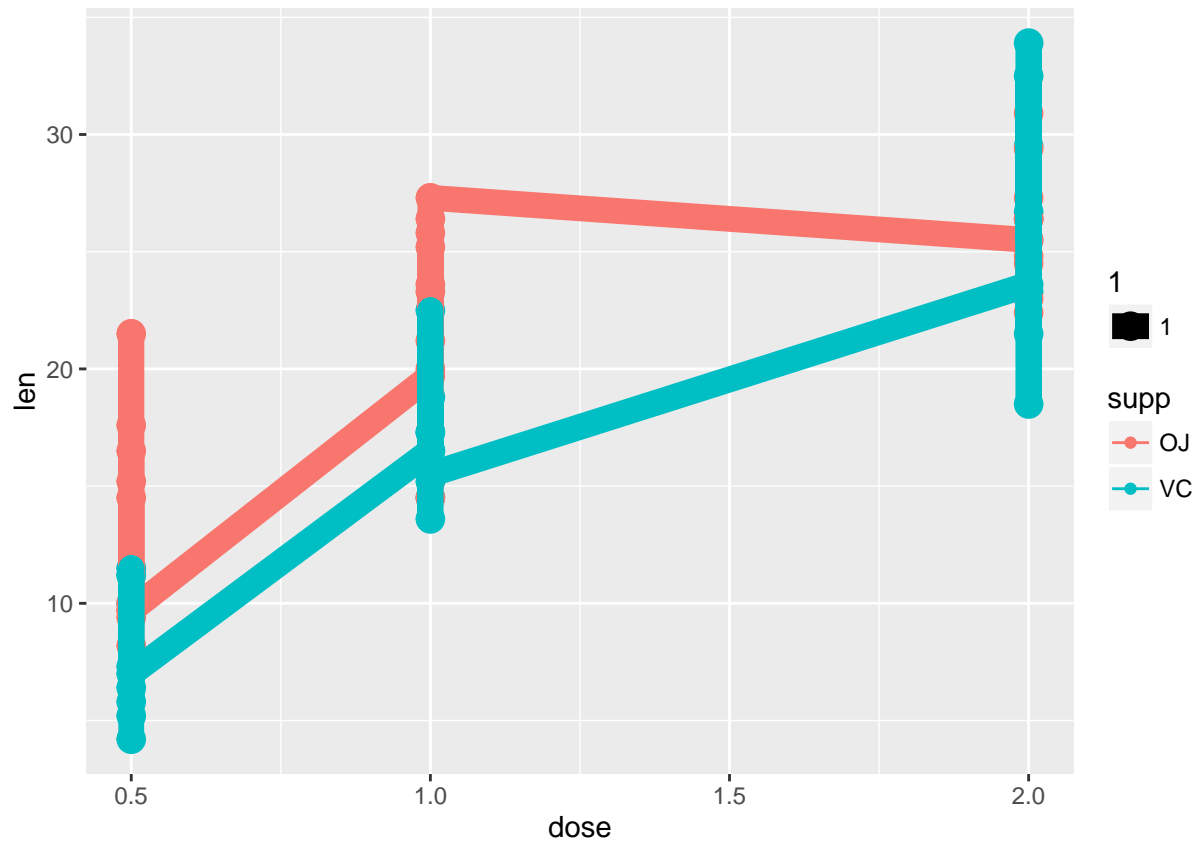
Exploratory Data Analysis:

Load the ToothGrowth data and perform some basic exploratory data analyses

```
## Loading required package: grid
```

```
##     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
```

```
## '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 ...
```

Confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose:

Hypothesis Testing for VC:

Null Hypothesis HO: VC has no effect on tooth growth

Alternative Hypothesis Ha: Tooth growth increases with increasing levels of VC.

```
t.test(vctg10, vctg05, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  vctg10 and vctg05
## t = 7.4634, df = 17.862, p-value = 6.811e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   6.314288 11.265712
## sample estimates:
## mean of x mean of y
##     16.77      7.98
```

```
t.test(vctg20, vctg05, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  vctg20 and vctg05
```

```
## t = 10.388, df = 14.327, p-value = 4.682e-08
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  14.41849 21.90151
## sample estimates:
## mean of x mean of y
##     26.14     7.98
```

Hypothesis Testing for OJ:

Null Hypothesis HO: OJ has no effect on tooth growth

Alternative Hypothesis Ha: Tooth growth increases with increasing levels of OJ.

```r
t.test(ojtg10, ojtg05, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  ojtg10 and ojtg05
## t = 5.0486, df = 17.698, p-value = 8.785e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   5.524366 13.415634
## sample estimates:
## mean of x mean of y
##     22.70     13.23
```

```r
t.test(ojtg20, ojtg05, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  ojtg20 and ojtg05
## t = 7.817, df = 14.668, p-value = 1.324e-06
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   9.324759 16.335241
## sample estimates:
## mean of x mean of y
##     26.06     13.23
```

Conclusion:

For both VC and Oj, null hypothesis has been rejected as the t-test results show that the sample mean corrsponding to higher dose falls outside of 95% confidence intrval.