# Basic Inferential Data Analysis

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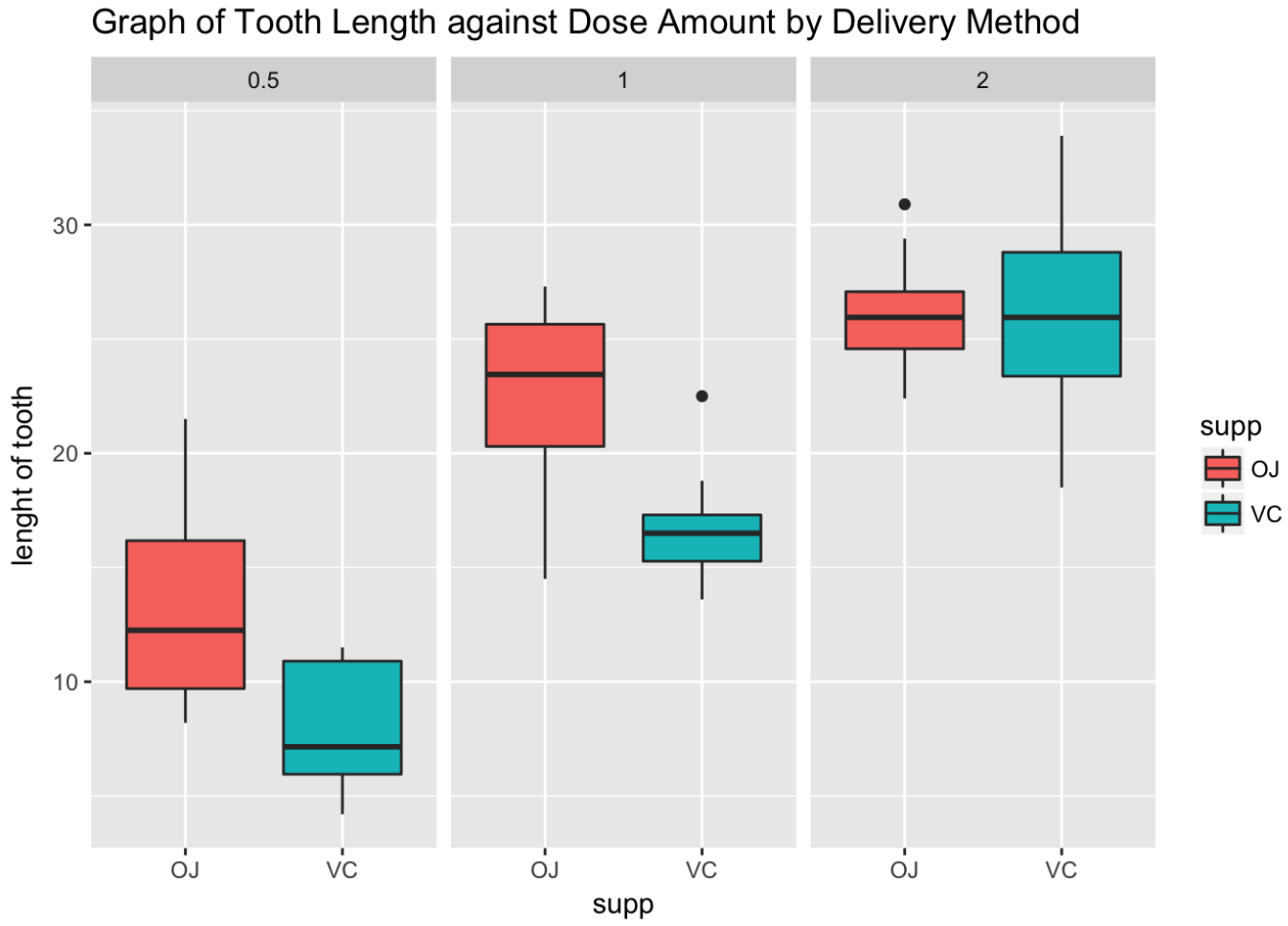
# Load Data and perform basic EDA

Basic EDA

```
ggplot(data = ToothGrowth, aes(x=supp, y=len, fill=supp, group=supp)) +
  geom_boxplot() +
  facet_grid(~ dose) +
  ggtitle("Graph of Tooth Length against Dose Amount by Delivery Method") +
  labs(y="lenght of tooth")
```




Graph of Tooth Length against Dose Amount by Delivery Method

# Basic Summary of Data

The study investigates the effect of Vitamin C on tooth growth in Guinea Pigs. Based on the box plot, the length of tooth growth increases as the dosage increase for both orange juice and ascorbic acid.

# Compare tooth growth by supp and dose

Perform 2 sample t-test for different Delivery Method for 0.5mg/day

```r
# Perform 2 sample t-test
## 0.5 dose
Tooth0.5 <- subset(ToothGrowth, dose==0.5)
t.test(data = Tooth0.5, len~supp,
       alternative = "two.sided",
       paired = FALSE, var.equal = FALSE,
       conf.level = 0.95)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## t = 3.1697, df = 14.969, p-value = 0.006359
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  1.719057 8.780943
## sample estimates:
## mean in group OJ mean in group VC
##            13.23             7.98
```

The p-value is less than 0.05, we can reject the null hypothesis that delivery by orange juice and ascorbic acid for dosage of 0.5mg/day has no effect on tooth length.

Perform 2 sample t-test for different Delivery Method for 1mg/day

```r
## 1 dose
Tooth1 <- subset(ToothGrowth, dose==1)
t.test(data = Tooth1, len~supp,
       alternative = "two.sided",
       paired = FALSE, var.equal = FALSE,
       conf.level = 0.95)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## t = 4.0328, df = 15.358, p-value = 0.001038
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  2.802148 9.057852
## sample estimates:
## mean in group OJ mean in group VC
##            22.70             16.77
```

The p-value is less than 0.05, we can reject the null hypothesis that delivery by orange juice and ascorbic acid for dosage of 1mg/day has no effect on tooth length.

Perform 2 sample t-test for different Delivery Method for 2mg/day

```r
## 2 dose
Tooth2 <- subset(ToothGrowth, dose==2)
t.test(data = Tooth2, len~supp,
       alternative = "two.sided",
       paired = FALSE, var.equal = FALSE,
       conf.level = 0.95)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## t = -0.046136, df = 14.04, p-value = 0.9639
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.79807  3.63807
## sample estimates:
## mean in group OJ mean in group VC
##            26.06            26.14
```

The p-value is more than 0.05, we cannot reject the null hypothesis that delivery by orange juice and ascorbic acid for dosage of 2mg/day has no effect on tooth length.

# Conclusion

The tooth length is positively correlated to Vitamin C dosage for the doses studied (0.5, 1, 2mg/day) for both delivery method by orange juice and ascorbic acid. Delivery by orange juice and ascorbic acid has effect on tooth length of guinea pigs in doses 0.5 and 1 mg/day, but no effect for 2mg/day.

# Assumptions

1. Test subjects (Guinea Pigs) are on similar diets with no additional intake of vitamin C throught their daily diets (e.g.vegetables/fruits).
2. Test subjects randomly selected for the different treatments.