title: "Effect of Vitamin C on Tooth Growth in Guinea Pigs" author: "Thimmaraju Rudrappa" date: "July 13, 2019"

output: html_document

Overview

Objective of this analysis is to analyze the effect og Vitamin C on tooth growth in guinea pigs by using ToothGrowth dataset.

Load the data and perform exploratory data analyses

```{r results='hide'} library(datasets) data(ToothGrowth) str(ToothGrowth) head(ToothGrowth) summary(ToothGrowth)

```{r}
library(ggplot2)
t = ToothGrowth
levels(t$supp) <- c("Orange Juice", "Ascorbic Acid")
ggplot(t, aes(x=factor(dose), y=len)) +
  facet_grid(.~supp) +
  geom_boxplot(aes(fill = supp), show_guide = FALSE) +
  labs(title="Guinea pig tooth length by dosage for each type of supplement",
    x="Dose (mg/day)",
    y="Tooth Length")
```

Basic summary

The plot shows increased vitamin C increases tooth growth and orange juice is more effective ascorbic acid.

confidence intervals & hypothesis tests to compare tooth growth by supplement and dose

Hypothesis #1

Orange juice & ascorbic acid deliver the same tooth growth across the data set. ```{r} hypoth1<-t.test(len ~ supp, data = t) hypoth1$conf.int hypoth1$p.value
```

```
 The confidence intervals includes 0 and the p-value is greater than the
threshold of 0.05.  The null hypothesis cannot be rejected.

#### Hypothesis #2
For the dosage of 0.5 mg/day, the two supplements caused the same tooth growth.
```{r}
hypoth2<-t.test(len ~ supp, data = subset(t, dose == 0.5))
hypoth2$conf.int
hypoth2$p.value
```

The confidence interval does not include 0 and the p-value is below the 0.05 threshold. The null hypothesis can be rejected. The alternative hypothesis that 0.5 mg/day dosage of orange juice delivers more tooth growth than ascorbic acid is accepted.

Hypothesis #3

For the dosage of 1 mg/day, the two supplements deliver the same tooth growth ```{r} hypoth3<-t.test(len ~ supp, data = subset(t, dose == 1)) hypoth3$conf.int hypoth3$p.value

```
 The confidence interval does not include 0 and the p-value is smaller than the
0.05 threshold. The null hypothesis can be rejected. The alternative hypothesis
that 1 mg/day dosage of orange juice delivers more tooth growth than ascorbic
acid is accepted.

#### Hypothesis #4
For the dosage of 2 mg/day, the two supplements deliver the same tooth growth
```{r}
hypoth4<-t.test(len ~ supp, data = subset(t, dose == 2))
hypoth4$conf.int
hypoth4$p.value
```

The confidence interval does include 0 and the p-value is larger than the 0.05 threshold. The null hypothesis cannot be rejected.

Conclusions & assumptions

Orange juice delivers more tooth growth than ascorbic acid for dosages 0.5 & 1.0. Orange juice and ascorbic acid deliver the same amount of tooth growth for dose amount 2.0 mg/day. For the entire data set we cannot conclude orange juice is more effective that ascorbic acid.

Assumptions

- Normal distribution of the tooth lengths
- No other unmeasured factors are affecting tooth length