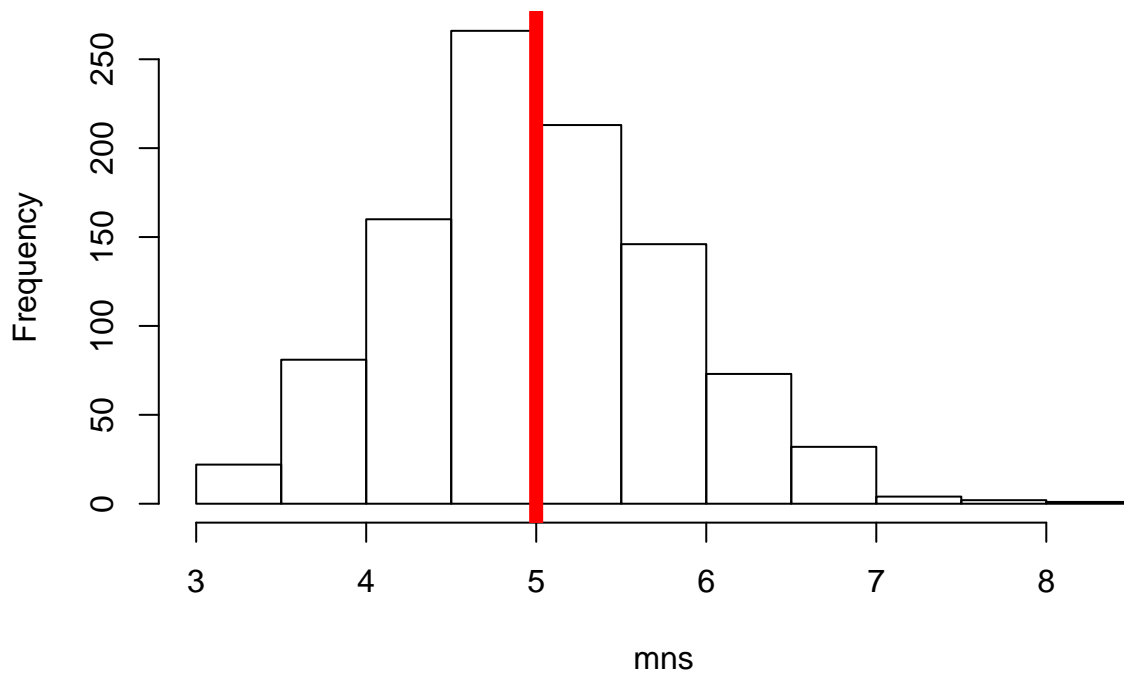# StatInference Assignment

JRB

August 24, 2016

PART 1: Simulation

Histogram of mns


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## [1] 4.999702
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PART 2: Basic Inference : The Effect of Vitamin C on Tooth Growth in Guinea Pigs

Introduction

We propose to analyze the length of odontoblasts for 60 guinea pigs that have received one of three dose levels of Vitamin C by of of two delivery methods (orange juice OJ) or ascorbic acid (VC). We will first perform some exploratory data analysis to generate some hypothesis that we will be statistically tested.

Exploratory Data Analysis

Graphical Aanlysis

We fill first plot the data set to represent the density of observations and some key statistics for each combination of delivery method at each dose level. The graph will compare side by side the tooth length for

dose level for both OJ and VC.

Tooth length by dose and supplement
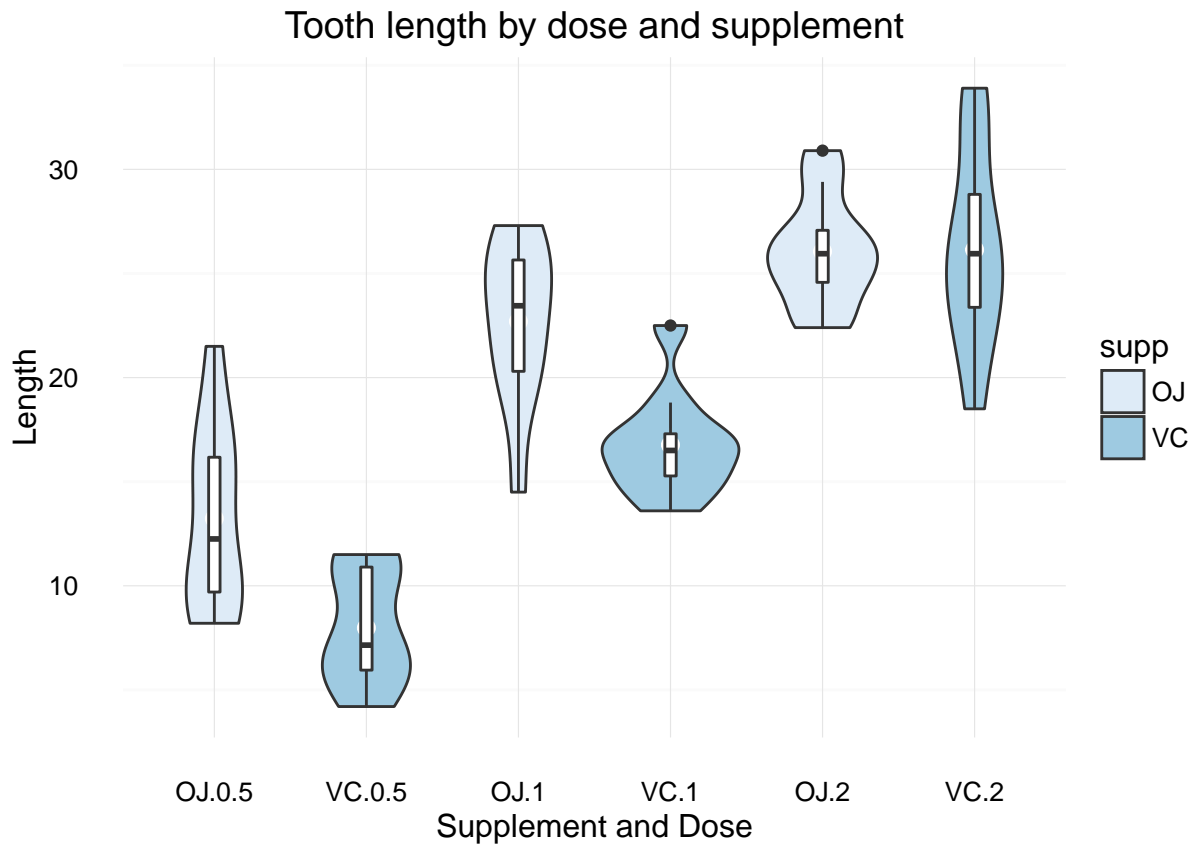
The figure illustrates that increasing doses of vitamin C would correspong to longer teeth and that the mean of admistration could impact tooth growth also. In the following section we will review some summary statitics that will help define hypothesis that would be statistically evaluated.

Summary statistics and hypothesis generations

From Table 1, we can make the observation that tooth length mean varies by supplement type, the mean is greater for OJ. We will test the hypothesis that the mean observed length of OJ is greater than the mean observed length for VC. So, our hypothesis testing should determine if there's a statiscally significant effect of supplement on tooth length.
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Table 1: Summary statistics for tooth length by supplement

supp	n	Mean	Std.Dev	Sample Error
OJ	30	20.66333	6.61	1.21
VC	30	16.96333	8.27	1.51

Table 2 shows that an increase in dose results in an increase in mean tooth lentgh (larger means as dose increases)

Table 2: Summary statistics for tooth length by dose

dose	n	Mean	Std.Dev	Sample Error
0.5	20	10.605	4.50	1.01
1.0	20	19.735	4.42	0.99
2.0	20	26.100	3.77	0.84

From Table 3 we can formulate the assumption that the mean tooth length is larger at dose levels 0.5 and 1 mg for Orange Juice (OJ) compared to ascorbic acid (VC) but about the same for OJ and VC at dose leve of 2mg

Table 3: Summary Statistics for tooth length by dose and supplement

dose	supp	n	Mean	Std.Dev	Sample Error
0.5	OJ	10	13.23	4.46	1.41
0.5	VC	10	7.98	2.75	0.87
1.0	OJ	10	22.70	3.91	1.24
1.0	VC	10	16.77	2.52	0.80
2.0	OJ	10	26.06	2.66	0.84
2.0	VC	10	26.14	4.80	1.52

Inference

We have generated three hypothesis that we would like to test againts the null hypothesis.

Hypothesis "Tooth length increases as dose increases"

To test this hypothesis, we will compare tooth length means at different dose levels (regardless of mean of administration).

Test 1: 0,5 mg vs 1 mg

$H_0 : \mu = \mu_0$
$H_3 : \mu > \mu_0$

Confidence interval for mean difference for lenght at dose 1mg (μ_1) and 0.5mg(μ_2) ($\mu_1 - \mu_2$) *6.3* and *12 13* and _18___3.7_ and *9*