Stats 314, Data Analysis #3

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Part I

Scenario 1

C. One sample t test
We want to use a one sample t test because we know the population average of 38 hours. Because we know the population average, we can compare the sample mean with the population mean to make a decision as to whether or not the sample mean if better or worse than the population mean.

Scenario 2

D. Matched pairs t test We have two sets of sample means, before and after, and we want to determine if there was an improvement or not. This is perfect for a matched pair t test.

Scenario 3

B. Two sample t test The two sample t test is used to see if two sets of averages are equal, or if one is better than the other.

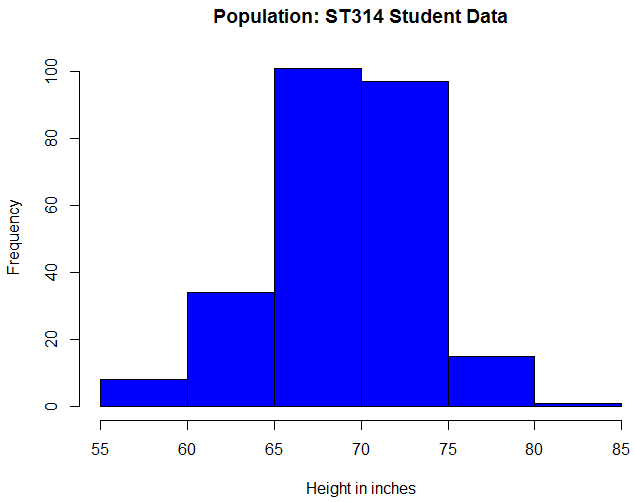
Scenario 4

A. One sample z test for a mean Given the information we have, we can see that the sample mean is relatively close to the population mean, with a low standard deviation. This is usually indictive of a normal distribution. But we want to use this test to see if a given null hypothesis holds or is rejected. In this case, the null hypothesis would be weight = 77 lbs.

Part II

a

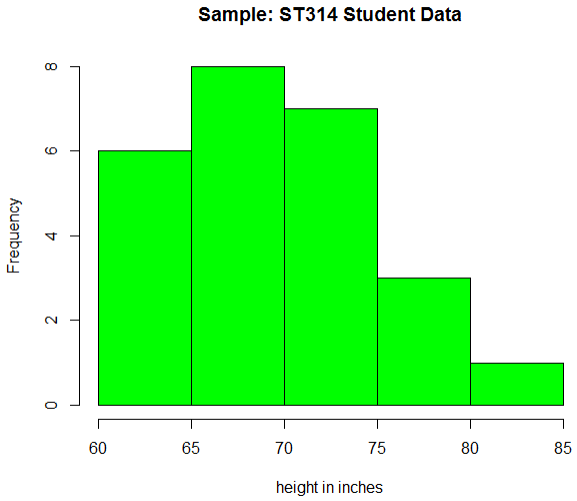
$\mu = 69.63938$
$\sigma = 4.066723$
The population is 256



The majority of the population falls between 65 inches and 75 inches in height.

b

$\bar{x} = 69.88$
$s = 5.325411$



The sample distribution isn't as radical as the population distribution was. Most members of the sample lie in the 60-75 range, as our population sample did. The sample mean was almost exactly the same as the population mean, and the sample standard deviation was a little bit higher.

c

$CI = 69.88 \pm 1.96 * \frac{4.066723}{\sqrt{25}}$

$= 71.47416$ and $= 68.285844$

The 95% confidence interval for the height of the class is estimated to be between 68.2858 and 71.4742 inches, with a point estimate of 69.88.

d

To calculate the t confidence interval for mean height, we do use the following formua:
$CI = \bar{x} \pm t^* * \frac{s}{\sqrt{n}}$

$69.88 \pm 2.064 * \frac{5.3254}{\sqrt{25}}$

$= 72.0783$ and $= 67.6817$

The 95% confidence interval for the height of the sample from class is estimated to be between 67.6817 and 72.0783 inches, with a point estimate of 69.88.
This interval does include the true population mean of 69.6394.

e

The difference between parts c and d are that, in one, we're taking the CI of the sample knowing what the population standard deviation is, while in part d, we're taking the CI not known the population SD. The two answers we got are not that different from each other.

Part III

a

I would anticipate that we would not reject the null hypothesis as our sampled data from our previous measurements had a slightly different mean. The mean difference was small enough that I suspect it's not enough to reject.

b

To find the t statistic with the formula:

$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$

Using the values we found in part II:

$t = \frac{69.88 - 69.639}{\frac{5.325}{\sqrt{256}}}$

$t = \frac{.241}{\frac{5.325}{16}}$

$t = .7241$

Using this test statistic, we can find our t-value with a $DF = n - 1 = 255$, with a confidence interval of 95%, and a significance level of .05. From this information, we know that if our p-value (t in this case) is greater than the degrees of freedom at 95% then we should reject. In this case:
$DF = 255$

The value at that value is: $critical(100) < p < critical(1000) = 1.962 < p < 1.984$

Knowing this, we can say that in order to reject the null hypothesis, the value would have to be less than -1.984 or greater than 1.984. We can see that the value of .7241 falls in the normal bounds, so we should not reject the null hypothesis.

c

There is not convincing evidence the average height of the students in the class differ from 69.6393. The sample estimates the average time to be be 69.88 with a 95% confidence interval of 67.6817 to 72.0783 inches. The null hypothesis is not rejected at a significance level of .05. The average height of the students in the class is 69.6393 inches.

Part IV

a

b

c

Part V

a

b

c

d

e

f

g

h

i

j