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Learn By Doing Activity

Scenario: College Student Drinking Habits

The purpose of this activity is to give you guided practice in the process of a t-test for the population mean.

Background:

A group of 75 college students from a certain liberal arts college were randomly sampled and asked about the number of alcoholic drinks they have in a typical week. The file containing the data is linked below. The purpose of this study was to compare the drinking habits of the students at the college to the drinking habits of college students in general. In particular, the dean of students, who initiated this study, would like to check whether the mean number of alcoholic drinks that students at his college have in a typical week differs from the mean of U.S. college students in general, which is estimated to be 4.73.

Learn By Doing (1/1 point)

Let μ be the mean number of alcoholic beverages that students in the college drink in a typical week. State the hypotheses that are being tested in this problem.

Your Answer:

Ho: $\mu = 4.73$
Ha: $\mu \neq 4.73$

Our Answer:

We would like to test whether or not μ is the same as the national mean (4.73) and therefore we are testing: $H_0: \mu = 4.73$ $H_a: \mu \neq 4.73$

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Learn By Doing (1/1 point)

Below is a histogram of the data. Have the conditions that allow us to safely use the t-test been met?

Your Answer:

No histogram was given to me ahuhu but essentially, check for either a large enough sample size, or a normally distributed sample.

Our Answer:

The conditions are met since: (i) The sample is random and (ii) The sample size is large enough ($n = 75$) for the Central Limit Theorem to kick in and ensure that sample means vary normally, despite the fact that the distribution of the variable of interest (number of alcoholic drinks per week) is extremely skewed to the right, with high outliers.

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Learn By Doing

1/1 point (graded)

Given that we know that $n = 75$, $\mu = 4.73$ we calculate the sample mean drinks per week for the 75 college students to be 3.93 and the sample standard deviation (s) to be 3.78. What is the value of the t statistic? Report your answer to TWO decimal places.



Answer

Correct: The t-test is calculated by: $(3.93 - 4.73) / (3.78 / \sqrt{75}) = -1.98$

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Given that the p-value for the t test statistic above is 0.072, what conclusion would you draw?

Your Answer:

at a 0.05 level of significance, we do not have enough evidence to reject H_0 .

Our Answer:

The p-value is 0.072, which at the 0.05 significance level indicates that the results are not significant. The data, therefore, do not provide enough evidence to reject H_0 and conclude that the mean number of alcoholic drinks that students at the college consume in a typical week is different from 4.73, the mean of college students in general.

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Learn By Doing (1/1 point)

What would your conclusions be if the dean of students suspected that the mean number of alcoholic drinks that students in the college consume in a typical week is lower than the mean of U.S. college students in general? In other words, if this were a test of the hypotheses: $H_0: \mu = 4.73$ drinks per week
 $H_a: \mu < 4.73$ drinks per week

Your Answer:

p-value will be half so enough evidence to reject H_0 and accept H_a

Our Answer:

The p-value for this test would be $0.072/2 = 0.036$ (half that of the two-sided test). At the 0.05 significance level we would therefore reject H_0 and conclude that the data provide evidence that the mean number of alcoholic drinks that students in the college consume in a typical week is indeed lower than the mean of U.S. college students in general (as the dean suspected).

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Learn By Doing (1/1 point)

Now suppose that instead of the 75 students having been randomly selected from the entire student body, the 75 students had been randomly selected only from the engineering classes at the college (for the sake of convenience). Address the following two issues regarding the effect of such a change in the study design: a. Would we still be mathematically justified in using the t-test for obtaining conclusions, as we did previously? b. Would the resulting conclusions still address the question of interest (which, remember, was to investigate the drinking habits of the students at the college as whole)?

Your Answer:

- a. I think technically, t-test would've still been okay because a.) still randomly sampled, and b.) large enough sample size.
- b. Resulting conclusion will however not be representative of the whole

Our Answer:

a. Yes, the t-procedure is still mathematically justified, since the sample size is still 75 (and inference is still justified because the sample is still random). b. No, the resulting conclusion would no longer address the question of interest, because the sampling frame (all students in the engineering classes) no longer matches the population of interest (all students in the entire college). The inferential conclusion from the t-test would only allow us to make conclusions about students in the engineering classes (i.e., about the group from which the sample was randomly selected). Art majors or humanities majors, for instance, probably don't take engineering and therefore would not have been represented in the (altered) study. So the conclusions from this (altered) study design would not be valid for the college as a whole.

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