

WEEK 9 REPORT – T-TESTS

Group Number: 25

Date and Time of Tutorial Session: Wednesday 4-5:30 pm

Group Members (First and Last name – no student numbers):

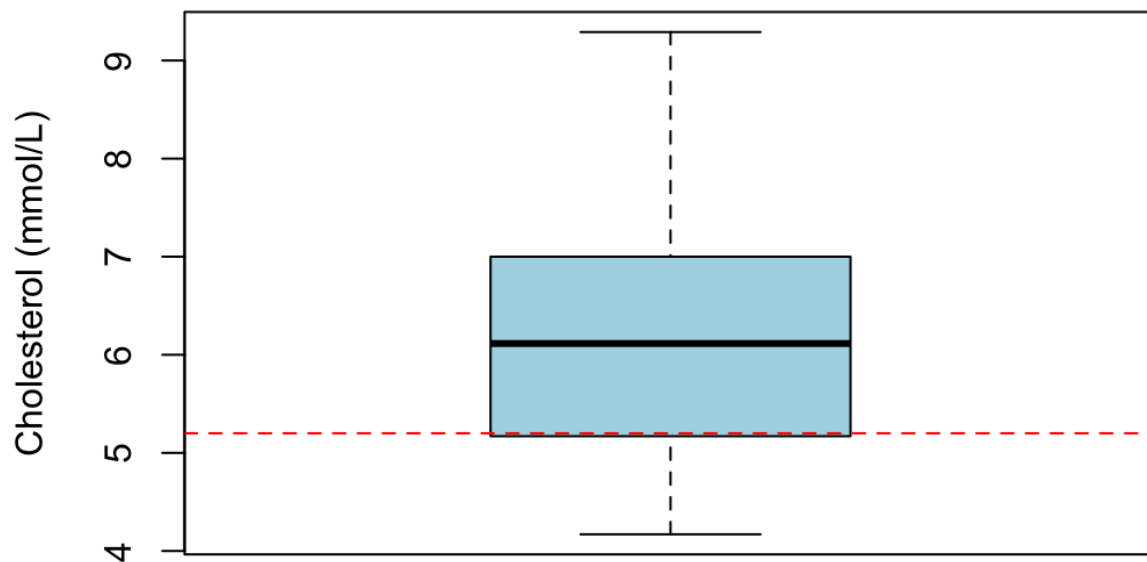
1. Katarzyna Fraser
2. Annika Tran
3. Ella Pustil
- 4.
- 5.

Graded out of 10 marks.

1. Create a boxplot showing the total cholesterol levels of community members. Include a dashed horizontal line representing the threshold cholesterol value of 5.2 mmol/L. Label the axes appropriately, and give the figure a descriptive caption. Give the box a different colour than the dashed threshold line.

(1 mark)

Total Cholesterol Levels of Community Members



58 Community Members

2. What type of test (single sample, paired-sample, or two-sample t-test) should be used to answer the hospital's question? Briefly explain why.
(1 mark)

A single sample t-test should be used. This is due to the design of the study and the research question being asked. The hospital's question revolves around comparing the mean cholesterol levels of the community to a known population value (5.2 mmol/L) rather than comparing two groups or paired observations. Therefore, a single sample t-test should be used.

3.a) What are the null and alternative hypotheses for this test?
(1 mark)

Null Hypothesis (H_0): The mean total cholesterol level of community members is equal to the national threshold of 5.2 ($\mu=5.2$)

Alternative Hypothesis (H_A): The mean total cholesterol level of community members is greater than 5.2 mmol/L ($\mu > 5.2$)

b) Is this a one-tailed or two-tailed test. Briefly explain why.
(1 mark)

This is a one-tailed test. Because the researchers are only interested in whether the mean cholesterol level is greater than the threshold value of 5.2 mmol/L.

4. What would the null and alternative hypotheses be if you were to perform the other type of test (either one-tailed or two tailed) in this case?
(1 mark)

Null Hypothesis (H_0): The mean total cholesterol level of community members is 5.2 mmol/L ($\mu=5.2$)

Alternative Hypothesis (H_A): The mean total cholesterol level of community members is not 5.2 mmol/L ($\mu \neq 5.2$)

5. What is the *statistical* conclusion of your test (i.e. do you reject or fail to reject the null hypothesis)? Explain why by reporting your statistical result in a descriptive sentence specifying

the type of test and the t-value, p-value and your alpha value reported in brackets.
(1 mark)

We used a one-sample t-test to determine whether the mean cholesterol level of the community is significantly greater than the threshold value of 5.2 mmol/L, (one-tailed t-test, $t = 6.3752$, $df = 57$, $p\text{-value} = 1.735e-08$, $\alpha = 0.05$). Given that the p-value is much smaller than the significance level ($\alpha=0.05$), we reject the null hypothesis.

6. What is the *scientific* or *situational* conclusion of your test (i.e. what does this mean for cholesterol levels in the sample)?
(1 mark)

This result provides strong evidence that the true mean cholesterol level in the community is greater than 5.2 mmol/L

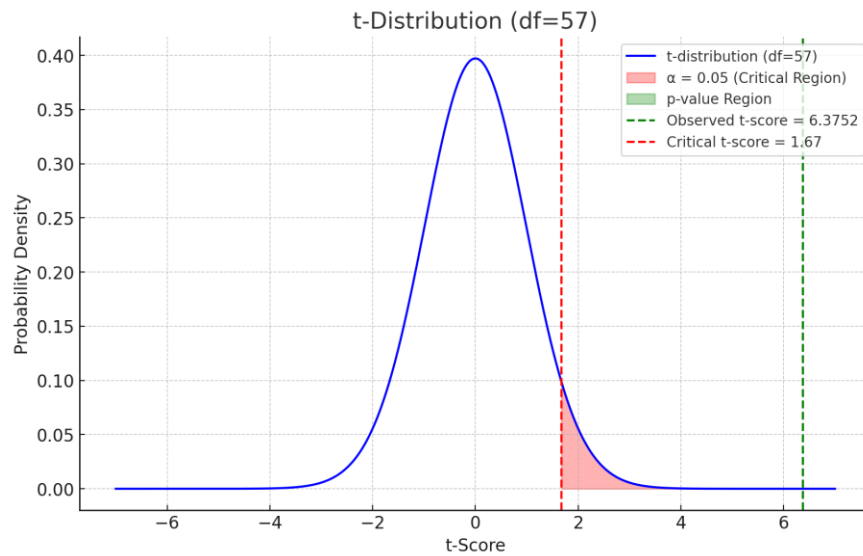
7a) Given the sampling strategy, why might this sample be / not be an accurate reflection of total cholesterol levels in the community?
(0.5 mark)

This sample may not be an accurate reflection of total cholesterol levels in the community if the sample not representative enough. For example, the sample size may be too small to accurately reflect the entire population of interest, which in this case is the community. Since the researchers only sampled 58 patients from a single hospital, it may be difficult to generalize these findings to the entire community as the findings are only the result from a small sample size at a single hospital.

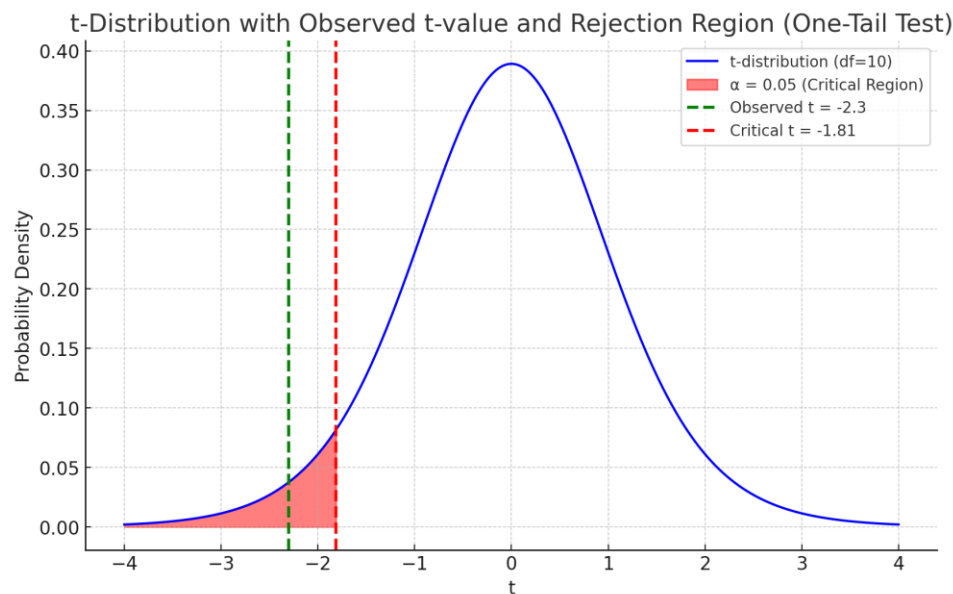
b) How might this study be improved?
(0.5 mark)

This study may be improved by increasing the sample size, additionally the researchers could improve this study by ensuring they are randomly selecting samples from multiple different hospitals in various locations of the community. By doing so, the sample would be more representative, and we would be able to draw a more accurate conclusion about the population of interest, which in this case is the entire community.

8. Include a photo of your sketched t-distribution here.
(1 mark)



9. Imagine that the observed t-value was -2.30. Sketch another t-distribution for this scenario, indicating the areas corresponding to alpha and the p-value. Would you reject or fail to reject the null hypothesis?
(1 mark)



In this case we would reject the null hypothesis, as the observed value of -2.3 falls within the rejected region ($\alpha=0.05$) which shows us that there is statistical evidence to conclude the mean of the sample is different than the mean of the null hypothesis.

Notes:

- Only **one** group member submits the report
- The report must be a **Word .DOC, .DOCX or .PDF** file
- Make sure everyone in the group has a copy of the report
- Double check what you have submitted!!
 - view it on OnQ to make sure everything is there and visible
- Lastly, everyone in the group needs to submit their own version of the **Rscript file**.