

Example 6.1

Research Hypothesis: whether the mean phosphate level is greater than 5 mg / dl

Hypothesis Test :

assuming underlying distribution of phosphate levels is normal with unknown standard deviation, we are comparing a true population mean against a specified value so the hypothesis test to use is one-sample t-test (one-tailed).

Hypotheses:

$$H_0 : \mu_0 = 5 \quad \begin{matrix} \mu_0 \text{ population mean phosphate} \\ \text{level} \end{matrix}$$

$$H_1 : \mu > 5$$

Significance Level: 5%

Test statistic:

$$T = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \sim t(n-1)$$

Observed test statistic: $n = 6$

$$\bar{x} = \frac{\sum x}{n} = \frac{32.1}{6} = 5.35$$

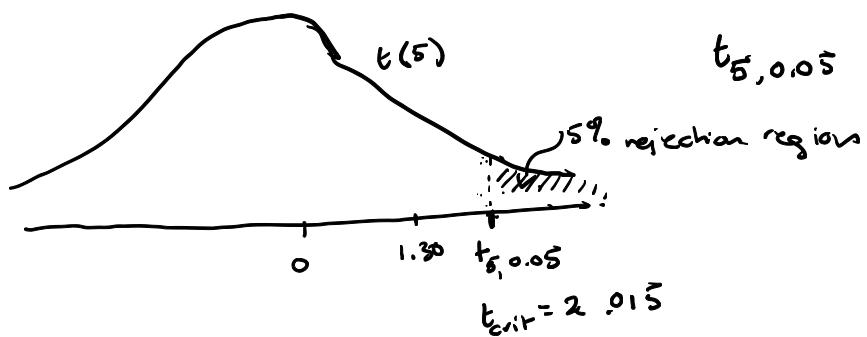
$$s = \sqrt{\frac{1}{(n-1)} \left(\sum x^2 - \frac{(\sum x)^2}{n} \right)}$$

$$= \sqrt{\frac{1}{5} \left[178.91 - \frac{(32.1)^2}{6} \right]}$$

$$= 0.660$$

$$t_{\text{obs}} = \frac{5.35 - 5}{0.660/\sqrt{6}} = 1.300$$

for significance level 5%



$$p\text{-value} = \text{probability}(t(5) > 1.30) \approx 0.125$$

Test decision: $t_{obs} = 1.30 < t_{crit} = 2.015$

$$p\text{-value} = 0.125 > 0.05$$

so we cannot reject H_0 in favour of H_1 at the 5% significance level.

Test conclusion: There is insufficient evidence to suggest that the mean phosphate level is greater than 5mg/dl

Confidence interval?

This is a one-tailed test so can't define confidence interval, but can define a confidence limit for true mean phosphate level

$$(\bar{x} - t(n-1; 0.05)^{\frac{s}{\sqrt{n}}}, \infty)$$

$$(5.35 - 2.015 \times 0.660/\sqrt{16}, \infty)$$

$$(4.807, \infty)$$

95% confident that the true mean phosphate level lies within this confidence limit.

so, \bar{s} is a plausible value for this 95% CL and \bar{s} . It is possible that the true population mean value of phosphate level can be equal to \bar{s} .