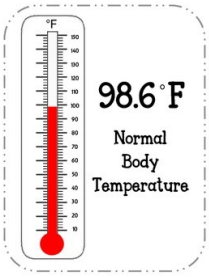


What Is Normal Body Temperature?

For many years, doctors have told people that "normal" body temperature is 98.6 °F. Today, we will find out if this is true. Record your body temperature at the front of the room (think of the class as an SRS of all high school students) and use statsmedic.com/applets to find: $\bar{x} = 98.237$ $s = 0.822$ $n = 32$

1. Is there convincing statistical evidence that the mean normal body temperature is different than the doctor's claim? Use $\alpha = 0.05$.

CHOOSE: Choose the inference procedure and set it up.

Choose procedure: one-sample t-test for μ

Significance level: $\alpha = 0.05$

Parameter: μ = true mean body temperature for all high school students

Statistic: $\bar{x} = 98.237$

Hypotheses: $H_0: \mu = 98.6$
$H_a: \mu \neq 98.6$

Evidence for H_a: $\bar{x} = 98.237 \neq 98.6$

CHECK: Check the appropriate conditions

Random: SRS of all high school students → so we can generalize to population

10%: $32 \leq 10\%$(all high school students) → so sampling without replacement is OK

Normal/Large Sample: $32 \geq 30$ CLT → so the sampling distribution of $\bar{x}$ is approximately normal

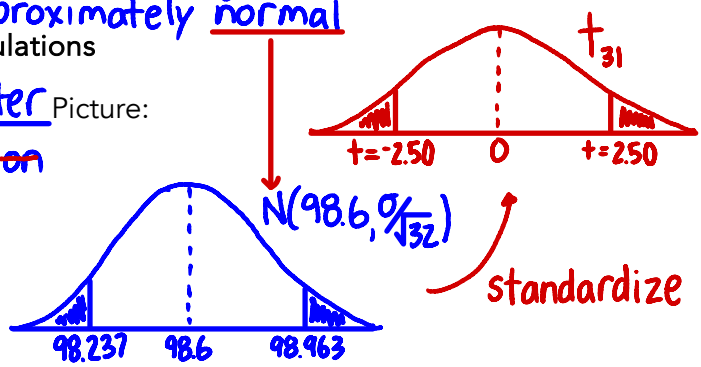
CALCULATE: If conditions are met, perform the calculations

General Formula: test statistic $=$ $\frac{\text{statistic} - \text{parameter}}{\text{standard deviation}}$ (standard error)

Specific Formula: $t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$

Plug in numbers: $t = \frac{98.237 - 98.6}{0.822/\sqrt{32}} = -2.50$

Picture:



Test statistic: $t = -2.50$

p-value (use T-Test on calculator): 0.018

tcdf(lower, upper, df) × 2 = tcdf(-9999, -2.50, 31) × 2 = 0.018

CONCLUDE: Make a conclusion in the context of the problem.

Interpret p-value: Assuming H_0 is true ($\mu = 98.6$) there is a 0.018 probability of getting an $\bar{x}$ of 98.237 or lower or 98.963 or greater purely by chance.

Decision Conclusion: Because $0.018 < 0.05$ we reject H_0 and we do have convincing evidence that the mean body temperature is different than the doctor's claim.

2. If we were to construct a 95% confidence interval, would the interval contain 98.6? Explain.

No, the significance test rejected H_0 ($\mu = 98.6$) so 98.6 is not a plausible value contained in the interval.

Lesson 11.2 – Significance Tests for a Mean

QuickNotes: **LT#1** The 4C Method

CHOOSE: Choose procedure, α, parameter, statistic, hypotheses, evidence

CHECK: Check conditions → so what?

CALCULATE: General & specific formulas, plug in numbers, Picture, test statistic, P-value

CONCLUDE: Interpret P-value. Decision + conclusion (context)

LT#2 Making Connections

If H_0 value in interval → H_0 value plausible, Fail to reject H_0

If H_0 value not in interval → H_0 value not plausible, Reject H_0

Check Your Understanding

Another class did the same body temperature activity with the following results:

$\bar{x} = 97.9$ $s = 1.6$ n = 30

1. Use T-Test on the calculator to find the *p*--value. *p*-value = 0.023

Reject H_0 at $\alpha = 0.10$? yes 0.023 < 0.10

Reject H_0 at $\alpha = 0.05$? yes 0.023 < 0.05

Reject H_0 at $\alpha = 0.01$? no 0.023 > 0.01

2. Use TInterval on the calculator to find the following confidence intervals.

90%: (97.404, 98.396) Reject H_0? yes 98.6 not plausible

95%: (97.303, 98.497) Reject H_0? yes 98.6 not plausible

99%: (97.095, 98.705) Reject H_0? no 98.6 is plausible

3. What connection do you notice between your answers to #1 and #2?

The decision of whether or not to reject H_0 is the same using a significance test or a confidence interval.

↳ must be two-sided

$\alpha = 0.10 \rightarrow$ 90% confidence

$\alpha = 0.05 \rightarrow$ 95% confidence

$\alpha = 0.01 \rightarrow$ 99% confidence