

STAT 110: Practice Problem 17 Solutions

Fall 2017

A paper published in the *Journal of the American Medical Association* presented evidence that the normal body temperature may be less than 98.6 degrees Fahrenheit, the long-held standard (Mackowiak et al., 1992). The value 98.6 degrees seems to have come from determining the mean in degrees Celsius, rounding up to the nearest whole degree (37 degrees), and then converting that number to Fahrenheit using the formula $32 + (1.8)(37) = 98.6$. Rounding up may have produced a result higher than the actual average, which may therefore be lower than 98.6 degrees. Data for a random sample of 18 adults with “normal” body temperature is given in the file **BodyTemp.JMP**. Carry out a hypothesis test to determine whether the average body temperature is lower than 98.6 degrees Fahrenheit.

Step 1: Convert the research question into a null and alternative hypothesis.

$$H_0: \mu = 98.6$$

$$H_a: \mu < 98.6$$

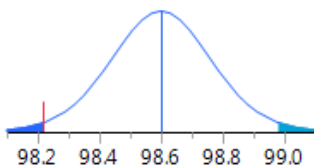
Step 2: Find the test statistic and p-value from the data.

Do this “by hand” and then verify using JMP.

$$\text{Test statistic: } t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{98.2167 - 98.6}{.6836/\sqrt{18}} = -2.38$$

p-value: .0147

Test Mean	
Hypothesized Value	98.6
Actual Estimate	98.2167
DF	17
Std Dev	0.68363
t Test	
Test Statistic	-2.3790
Prob > t	0.0293*
Prob > t	0.9853
Prob < t	0.0147*



Step 3: Write a conclusion in the context of the problem.

The study provides evidence that the mean body temperature is lower than 98.6 degrees Fahrenheit.

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Check the normality assumption to be sure that the t-test is valid.

Recall that for the t-test for a single mean to be valid, at least one of the following conditions must be met:

- The sample size is sufficiently large, or
- It is reasonable to assume the population is normally distributed based on the shape of the distribution of the sample.

The sample size is not large enough to assume that the t-test is automatically valid. However, based on the bell-shaped histogram and linear pattern observed in the normal quantile plot, it is reasonable to assume these data come from a population that follows the normal distribution. So, the t-test is a valid approach.

