# Statistics 1510: Statistical Thinking and Concepts: Winter 2012

1. A class survey in a large class for first-year college students asked, "About how many minutes do you study on a typical weeknight¿' The mean response of the 269 students was $\bar{x} = 137$ minutes. Suppose that we know that the study time follows a Normal distribution with standard deviation $\sigma = 65$ minutes in the population of all first-year students at this university.

   (a) Use the survey result to give a 99% confidence interval for the mean study time of all first-year students.

   (b) What condition not yet mentioned must be met for your confidence interval to be valid?

   **solution:**

   (a) The margin of error for 99% confidence is $z^* \left( \frac{s}{\sqrt{n}} \right) = 2.576 \left( \frac{65}{\sqrt{269}} \right) = 10.2090$ minutes, so the interval is $137 \pm 10.2090 = 126.8$ to $147.2$ minutes.

   (b) We need to know if this sample can be considered an SRS of the population of all first-year students at this university.

2. (a) Data on the blood cholesterol levels of 24 rats (milligrams per deciliter of blood) give $\bar{x} = 85$ and $s = 12$. Find the 95% confidence interval for the mean blood cholesterol of rats under this condition?

   (b) Is there significant evidence at the 5% level that the mean of blood cholesterol level is 82?

   **solution:**

   (a) We have df=23 and table value $(t^*)$=2.069, so the 95% confidence interval for $\mu$ is
   $$\bar{x} \pm t^* \left( \frac{s}{\sqrt{n}} \right) = 85 \pm 2.069 \left( \frac{12}{\sqrt{24}} \right) = 85 \pm 5.0680 = 79.9 \text{ to } 90.1 \text{ mg/dl}$$

   (b) This interval does include 82, we don't reject $H_0 : \mu = 82$ in favor of the two-sided alternative.

3. A class survey in which students claimed to study an average of $\bar{x} = 137$ minutes on a typical weeknight. Regard these students as an SRS from the population of

all first-year students at this university. Does the study give good evidence that students claim to study more than 2 hours per night on the average?

(a) State null and alternative hypotheses in terms of the mean study time in minutes for the population.

(b) What is the value of the test statistic $z$?

(c) What is the P-value of the test? Can you conclude that students do claim to study more than two hours per weeknight on the average?

**solution:**

(a) We test $H_0 : \mu = 120$ min vs $H_a : \mu > 120$ min.

(b) $z = \dfrac{137 - 120}{\frac{65}{\sqrt{269}}} = 4.29$

(c) The P-value is very small (less than 0.0001), so we have very strong evidence that students claim to study more than two hours per night.