Statistical Hypotheses

4/9/2020

Objective

Students will be able to…

1. Identify the parameter to be tested
2. State the null and alternative hypotheses

Review Question #1

Suppose (48,65) is a 95% confidence interval estimate for a population mean μ. Which of the following are true statements?

1. There is a 95% probability that μ is between 48 and 65
2. If 100 random samples of the given size are picked and a 95% confidence interval is calculated for each, then μ will be in 95 of the intervals.
3. If 95% confidence intervals are calculated from all possible samples of the given size, μ will be in 95% of there intervals.

Review #2

Two 95% confidence interval estimates are obtained: I: (78.5, 84.5) and II: (80.3, 88.2).

1. If the sample sizes are the same, which has the larger sample standard deviation?
2. If the sample standard deviations are the same, which has the larger sample size?

Answers

Review 1: Only #3 is correct. The first one is wrong because the 95% is confidence in our methods not a particular interval. The second one is wrong because nothing guarantees a certain set of 100 will exactly follow the confidence level.

Review 2: part 1: interval 2, narrower intervals result from smaller standard deviations. Part 2: interval 1, narrower intervals result from larger sample sizes.

Identifying the parameter we are testing

When we are testing a hypothesis, we have to identify the parameter that is being tested and what its default value is.

At this level we are going to only identify population means and population proportions. These can be written about any type of parameter.

With intervals we only need to identify the parameter. On tests, there is also a value we are assuming this parameter takes.

Hypotheses

In statistics, hypotheses come in pairs.

There is one hypothesis that says nothing has changed from the expected value. We call this the null hypothesis (H_o). This is always going to say the parameter is equal to the expected value

There is a second hypothesis that says something has changed. This is called the alternative hypothesis (H_a). This hypothesis can state the parameter is greater than, less than, or not equal to the expected value.

Example #1

A school publicizes that the proportion of its students who are involved in at least one extracurricular activity is 61%.

Parameter of interest:

p: the true proportion of students involved in at least on extracurricular activity

Hypotheses:

H_0: $p = 0.61$

H_a: $p \neq 0.61$

Example #2

A car dealership announces that the mean time for an oil change is less than 15 minutes.

Parameter:

μ: The mean time for an oil change at the dealership

Hypotheses:

$H_0: \mu = 15$

$H_a: \mu > 15$

You try #1

Researchers have postulated that, due to differences in diet, Japanese children have a lower mean blood cholesterol level than U.S. children. Suppose that the mean level of U.S. children is known to be 170.

You try #2

A company advertises that the mean life of its furnaces is more than 18 years.

You try #3

A water quality control board reports that water is unsafe for drinking if the mean nitrate concentration exceeds 30 ppm. Water specimens are taken from a well.

Answer #1

Parameter:

μ: the true mean blood cholesterol of japanese children

Hypotheses:

$H_0: \mu = 170$

$H_a: \mu < 170$

Answer #2

Parameter:

μ: the true mean life of the furnaces from the company

Hypotheses:

$H_0: \mu = 18$

$H_a: \mu < 18$

Answer #3

Parameter:

μ: the true mean nitrate concentration in the water

Hypotheses:

$H_0: \mu = 30$

$H_a: \mu < 30$