

Agenda for Wednesday, Nov 6th 2024		
Finish talking about sampling distributions		1
Introduction to Confidence Intervals		1
Individual Quiz		4

Coming up

- Student Hours Thursday 2:15-3:30pm in C162
- HW 15 due today
- Excel Assignment 4 posted
- Priority Spring Registration open

Estimating population parameters using sample statistics

What is a confidence interval

A **confidence interval** for a mean provides a range of values that likely contains the true population mean, μ , along with a **confidence level**.

Confidence level (CL): it is usually expressed as a percentage. The most common used confidence levels are 90%, 95%, 99%. Their corresponding critical values are:

- For 90% CI: $z_{\alpha/2} = 1.645$
- For 95% CI: $z_{\alpha/2} = 1.96$
- For 99% CI: $z_{\alpha/2} = 2.576$

Interpretation of the confidence interval

”If we repeated this sampling process many times and calculated the confidence interval each time, about 95% of these intervals would contain the true population mean”

Confidence interval for mean when σ is known

Formula for a confidence interval for a population mean when σ is known, is:

$$CI = \bar{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

where

How to calculate a confidence interval

Step 1: Decide what confidence level you are asked to use

Step 2: Find the corresponding critical value $z_{\alpha/2}$:

For 90% CI: use $z_{\alpha/2} = 1.645$

For 95% CI: use $z_{\alpha/2} = 1.96$

For 99% CI: use $z_{\alpha/2} = 2.576$

Step 3: Calculate standard error (SE):

$$SE = \frac{\sigma}{\sqrt{n}}$$

Step 4: Calculate margin of error (ME):

$$ME = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

Step 5: Calculate interval bounds:

$$\text{Lower bound} = \bar{x} - z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$$\text{Upper bound} = \bar{x} + z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

Step 6: Interpret the confidence interval

Example 1. A company claims their batteries last 100 hours on average. In a sample of 36 batteries, the mean lifetime was 95 hours. The population standard deviation is known to be 12 hours. Calculate a 95% confidence interval for the mean battery life.

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