

Demo: Understanding the Confidence Level and Alpha Risk

In this video, we use a simulation to construct confidence intervals at different confidence levels, and we explore what it means to be statistically "confident."

We use the Confidence Interval for the Population Mean teaching module for illustration. This module is available from the Help menu under Sample Data, Teaching Scripts, and then Interactive Teaching Modules.

Suppose that the characteristic of interest is IQ, the intelligence quotient. The population mean is 100, and the standard deviation is 15. If we measure the IQ of 30 randomly selected students, and calculate a sample mean, how confident can we be that this sample value is close to the population mean?

We change the sample size to 30 and draw one sample. You can see the mean and the standard deviation for this one sample, along with a confidence interval. If the interval is green, the confidence interval captured the true mean. If it is red, the interval did not capture the true mean.

When we repeat this experiment with a second random sample of students, we get slightly different results. As we continue to draw samples, you can see that the sample means and the standard deviations are all different. As a result, the confidence intervals, and the width of the confidence intervals, are also different.

A 95% confidence interval implies that, if you collect 100 representative samples from the population and compute a confidence interval for the mean for each sample, on average, 95 out of 100 of these confidence intervals include the true mean.

We'll click Reset Samples, change the number of samples to 100, and click Draw Additional Samples. As we continue to draw samples, notice that the mean of the samples is close to the true mean. Also notice that close to 95% of the confidence intervals contain the true mean IQ value, and about 5% of the confidence intervals don't include the true mean.

This is what we mean by the term "confidence." On average, for a 95% confidence interval, 95% of the time this interval method is used, the interval captures the true parameter value.

When we change the confidence level to 90% and repeat this simulation, you see that approximately 90% of samples result in confidence intervals that capture the true mean, and approximately 10% of confidence intervals fail to capture the true mean.