

How to Interpret a Confidence Interval

A confidence interval places an estimate beside its statistical uncertainty. It is usually more informative than a point estimate alone because it shows not only what the sample suggests, but also which values remain reasonably compatible with the data and method.



StatReason

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Worked example

Imagine a study estimates that Group A scored 4 points higher than Group B. A 95 percent confidence interval from 1 to 7 points means the estimate is 4 points, and the interval reflects uncertainty around that estimate under the selected method and its assumptions. The interval is expressed in the original units, which makes it easier to consider whether a difference of 1, 4, or 7 points would matter in the real setting.

What the confidence level actually describes

The precise frequentist interpretation concerns the method rather than a probability assigned to a fixed unknown parameter. If the same sampling and interval method were repeated many times, about 95 percent of the resulting intervals would contain the fixed population value. Once one interval has been calculated, the population value is not randomly moving between its endpoints. This distinction sounds technical, but it prevents a common overstatement.

What interval width tells you

Interval width carries useful information. Wider intervals can result from a small sample, high variability, rare events, a high confidence level, or an imprecise model. Increasing the confidence level from 95 percent to 99 percent makes an otherwise identical interval wider. Increasing sample size usually makes an interval narrower when the design and variability stay comparable.

The null value depends on the scale

For a difference in means, a null value of zero represents no difference on the raw scale. For a risk ratio or odds ratio, the null value is one. When a standard two-sided 95 percent interval excludes the matching null value, the corresponding standard two-sided test at alpha .05 will have a p-value below .05. This connection is useful, but it does not make the p-value or interval a measure of practical importance; see [Effect Size and Why Magnitude Matters](#) for that separate question.

Reading an interval with your decision in mind

Read intervals with the decision context in mind. A narrow interval around a tiny effect may be precise but unimportant. A wide interval that crosses zero may still include differences that would matter. If you have defined a smallest meaningful effect before looking at results, compare the interval with that threshold without pretending the calculator can choose the threshold for you.

What a confidence interval does not mean

A 95 percent confidence interval does not mean there is a 95 percent probability the true value falls in this one specific computed interval. It also does not mean 95 percent of your data falls inside it, and it does not become a prediction interval for a new individual observation just because it looks similar; see [Confidence Interval vs Prediction Interval](#) for exactly how those two differ.

Source

This page follows the interpretation conventions in the Cochrane Handbook's treatment of confidence intervals and the shared statistical reasoning contract every StatReason engine is built against.

Limitations

This page covers the standard frequentist confidence interval used throughout this site. A bootstrap-based interval, covered separately in [Bootstrap Confidence Intervals Explained](#), is built differently and carries a related but distinct interpretation.

Next action: use the relevant confidence interval calculator for a mean, proportion, group difference, risk ratio, odds ratio, correlation, or regression prediction. Use the [sample size tools](#)

when you want to plan a target interval width. See also the [Mean Confidence Interval Calculator](#) and the [Confidence Interval Calculator](#) router.