

What is the method for calculating a confidence interval for an odds ratio?

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The method for calculating a confidence interval for an odds ratio involves using a statistical technique to estimate the range of values within which the true odds ratio is likely to fall. This is based on a sample of data and takes into account the margin of error and level of confidence desired. The calculation involves using the odds ratio, sample size, and standard error to determine the upper and lower bounds of the confidence interval. This method is commonly used in statistical analysis to assess the reliability and precision of odds ratio estimates.

Calculate a Confidence Interval for an Odds Ratio

We often calculate an odds ratio when analyzing a 2x2 table, which takes on the following format:

	Event	No Event
Treatment	A	B
Control	C	D

The odds ratio tells us the ratio of the odds of an event occurring in a treatment group to the odds of an event occurring in a control group. It is calculated as:

$$\text{Odds ratio} = (A * D) / (B * C)$$

We can then use the following formula to calculate a confidence interval for the odds ratio:

$$\begin{aligned} \text{Lower 95\% CI} &= e^{\ln(\text{OR}) - 1.96\sqrt{(1/a + 1/b + 1/c + 1/d)}} \\ \text{Upper 95\% CI} &= e^{\ln(\text{OR}) + 1.96\sqrt{(1/a + 1/b + 1/c + 1/d)}} \end{aligned}$$

The following example shows how to calculate an odds ratio and a corresponding confidence interval in practice.

Example: Calculating a Confidence Interval for an Odds Ratio

Suppose a basketball coach uses a new training program to see if it increases the number of players who are able to pass a certain skills test, compared to an old training program.

The coach recruits 50 players to use each program. The following table shows the number of players who passed and failed the skills test, based on the program they used:

	Passed	Failed
New Program	34	16
Old Program	39	11

We can calculate the odds ratio as $(34 \cdot 11) / (16 \cdot 39) = 0.599$

We would interpret this to mean that the odds that a player passes the test by using the new program are

just 0.599 times the odds that a player passes the test by using the old program.

In other words, the odds that a player passes the test are actually lowered by 40.1% by using the new program.

We can then use the following formulas to calculate the 95% confidence interval for the odds ratio:

$$\begin{aligned} \text{Lower 95\% CI} &= e^{\ln(.599) - 1.96\sqrt{(1/34 + 1/16 + 1/39 + 1/11)}} = 0.245 \\ \text{Upper 95\% CI} &= e^{\ln(.599) + 1.96\sqrt{(1/34 + 1/16 + 1/39 + 1/11)}} = 1.467 \end{aligned}$$

Thus, the 95% confidence interval for the odds ratio is .

Since this confidence interval contains the value 1, it is not statistically significant.

This should make sense if we consider the following:

An odds ratio greater than 1 would mean that the odds that a player passes the test by using the new program are *higher* than the odds that a player passes the test by using the old program. An odds ratio less than 1 would mean that the odds that a player passes the test

by using the new program are *lower* than the odds that a player passes the test by using the old program.

So, since our 95% confidence interval for the odds ratio contains the value 1, it means the odds of a player passing the skills test using the new program may or may not be higher than the odds of the same player passing the test using the old program.

The following tutorials provide more information on interpreting odds ratios: