

How can we calculate a confidence interval for relative risk?

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A confidence interval for relative risk is a statistical tool used to estimate the range of values within which the true relative risk lies with a certain degree of certainty. It is calculated by using data from a sample population and determining the upper and lower limits of the confidence interval based on a chosen confidence level. This can be achieved by using mathematical formulas and statistical software, taking into account the sample size, relative risk estimate, and the standard error. The resulting confidence interval can then be interpreted to make inferences about the true relative risk in the larger population. This method allows for a more accurate and reliable estimation of relative risk, providing valuable insights for decision making in various fields such as healthcare and public health.

Calculate a Confidence Interval for Relative Risk

We often calculate relative risk when analyzing a 2x2 table, which takes on the following format:

	Event	No Event
Treatment	A	B
Control	C	D

The relative risk tells us the probability of an event occurring in a treatment group compared to the probability of an event occurring in a control group.

It is calculated as:

Relative risk = /

We can then use the following formula to calculate a confidence interval for the relative risk (RR):

$$\text{Lower 95\% CI} = e^{\ln(\text{RR}) - 1.96\sqrt{1/a + 1/c - 1/(a+b) - 1/(c+d)}}$$

$$\text{Upper 95\% CI} = e^{\ln(\text{RR}) + 1.96\sqrt{1/a + 1/c - 1/(a+b) - 1/(c+d)}}$$

The following example shows how to calculate a relative risk and a corresponding confidence interval in practice.

Example: Calculating a Confidence Interval for Relative Risk

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 relative risk as:

Relative Risk = 0.8718 / Relative Risk = 0.8718 / Relative Risk = 0.8718

We would interpret this to mean that the probability that a player passes the test by using the new program are just 0.8718 times the probability that a player passes the test by using the old program.

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

We can then use the following formulas to calculate the 95% confidence interval for the relative risk:

$$\begin{aligned} \text{Lower 95\% CI} &= e^{\ln(.8718) - 1.96\sqrt{(1/34 + 1/39 - 1/(34+16)) - 1/(39+11)}} = 0.686 \\ \text{Upper 95\% CI} &= e^{\ln(.8718) + 1.96\sqrt{(1/34 + 1/39 + 1/(34+16)) - 1/(39+11)}} = 1.109 \end{aligned}$$

Thus, the 95% confidence interval for the relative risk is

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We are 95% confident that the true relative risk between the new and old training program is contained in this interval.

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

This should make sense if we consider the following:

A relative risk greater than 1 would mean that the probability that a player passes the test by using the new program is *higher* than the probability that a player passes the test by using the old program. A relative risk less than 1 would mean that the probability that a player passes the test by using the new program is *lower* than the probability that a player passes the test by using the old program.

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

The following tutorials provide additional information on odds ratios and relative risk: