

What is the formula and example for calculating the standard error of the proportion?

Authored by
stats writer

April 28, 2024

RECOMMENDED CITATION

stats writer (2024). *What is the formula and example for calculating the standard error of the proportion?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=140543>

The standard error of the proportion is a statistical measure that indicates the variability or uncertainty in the estimated proportion of a population. It is a key component in determining the accuracy of a sample proportion and is typically used in hypothesis testing and confidence interval calculations. The formula for calculating the standard error of the proportion is:

$$SEp = \sqrt{p(1-p)/n}$$

Where p is the sample proportion and n is the sample size.

For example, if a sample of 200 students is taken to determine the proportion of students who prefer online learning, and 120 students indicate a preference for online learning, then the sample proportion can be calculated as $120/200 = 0.6$. The standard error of the proportion would then be calculated as:

$$SEp = \sqrt{(0.6(1-0.6)/200)} = 0.0245$$

This means that there is a 95% chance that the true proportion of students who prefer online learning falls within the range of 0.6 ± 0.0245 , or between 0.5755 and 0.6245.

Standard Error of the Proportion: Formula & Example

Often in statistics we're interested in estimating the proportion of individuals in a with a certain characteristic.

For example, we might be interested in estimating the proportion of residents in a certain city who support a new law.

Instead of going around and asking every individual resident if they support the law, we would instead collect a and find out how many residents in the sample support the law.

We would then calculate the sample proportion ($p?$) as:

Sample Proportion Formula:

$$p? = x / n$$

where:

x: The count of individuals in the sample with a certain characteristic.
n: The total number of individuals in the sample.

We would then use this sample proportion to *estimate* the population proportion. For example, if 47 of the 300 residents in the sample supported the new law, the sample proportion would be calculated as $47 / 300 = 0.157$.

This means our best estimate for the proportion of residents in the population who supported the law would be 0.157.

However, there's no guarantee that this estimate will exactly match the true population proportion so we typically calculate the standard error of the proportion as well.

This is calculated as:

Standard Error of the Proportion Formula:

$$\text{Standard Error} = \sqrt{p(1-p) / n}$$

For example, if $p = 0.157$ and $n = 300$, then we would calculate the standard error of the proportion as:

$$\text{Standard error of the proportion} = \sqrt{.157(1-.157) / 300} = 0.021$$

We then typically use this standard error to calculate a confidence interval for the true proportion of residents who support the law.

This is calculated as:

Confidence Interval for a Population Proportion Formula:

$$\text{Confidence Interval} = p \pm z \sqrt{p(1-p) / n}$$

Note that the z in the formula is the z -value that corresponds to popular confidence level choices:

Confidence Level	z-value
0.90	1.645
0.95	1.96
0.99	2.58

For example, here's how to calculate a 95% confidence interval for the true proportion of residents in the city who support the new law:

$$95\% \text{ C.I.} = p \pm z \sqrt{p(1-p) / n}$$

$$95\% \text{ C.I.} = .157 \pm 1.96 \sqrt{.157(1-.157) / 300}$$

$$95\% \text{ C.I.} = .157 \pm 1.96 * (.021)$$

$$95\% \text{ C.I.} =$$

Thus, we would say with 95% confidence that the true proportion of residents in the city who support the new law is between 10.884% and 19.816%.