

What is the interpretation of the margin of error and can you provide examples?

Authored by
stats writer

June 28, 2024

RECOMMENDED CITATION

stats writer (2024). *What is the interpretation of the margin of error and can you provide examples?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=156354>

The margin of error is a statistical measure that indicates the level of uncertainty or potential error in the results of a survey or study. It is typically represented as a percentage and is calculated based on the sample size and confidence level. The margin of error reflects the range of values within which the true population value is likely to fall. For example, if a survey has a margin of error of +/- 3%, it means that the reported results could be off by up to 3% in either direction.

To better understand the concept of margin of error, consider a political poll that shows a candidate with a 50% approval rating and a margin of error of +/- 5%. This means that the candidate's true approval rating could be anywhere between 45% and 55%. Therefore, the margin of error helps us understand the reliability and accuracy of survey results and reminds us that there is always a degree of uncertainty in statistical data.

Interpret Margin of Error (With Examples)

In statistics, margin of error is used to assess how precise some estimate is of a population proportion or a population mean.

We use typically use margin of error when calculating confidence intervals for .

The following examples show how to calculate and interpret margin of error for a population proportion and a population mean.

Example 1: Interpret Margin of Error for Population Proportion

We use the following formula to calculate a confidence interval for a population proportion:

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

where:

p: sample proportion
z: the chosen z-value
n: sample size

The portion of the equation that comes after the +/- sign represents the margin of error:

$$\text{Margin of Error} = z * (\sqrt{p(1-p)} / n)$$

For example, suppose we want to estimate the proportion of residents in a county that are in favor of a certain law. We select a random sample of 100 residents and ask them about their stance on the law.

Here are the results:

Sample size $n = 100$
Proportion in favor of law $p = 0.56$

Suppose we would like to calculate a 95% confidence interval for the true proportion of residents in the county that are in favor of the law.

Using the formula above, we calculate the margin of error to be:

$$\text{Margin of Error} = z * (\sqrt{p(1-p)} / n)$$

$$1.96 * (\sqrt{.56(1-.56) / 100}) \text{Margin of Error} = .0973$$

We can then calculate the 95% confidence interval to be:

$$\text{Confidence Interval} = p \pm z * (\sqrt{p(1-p) / n})$$
$$\text{Confidence Interval} = .56 \pm .0973$$

The 95% confidence interval for the proportion of residents in the county who are in favor of the law turns out to be .

This means we're 95% confident that the true proportion of residents who support the law is between 46.27% and 65.73%.

The proportion of residents in the sample who were in favor of the law was 56%, but by subtracting and adding the margin of error to this sample proportion we're able to construct a confidence interval.

This confidence interval represents a range of values that are highly likely to contain the true proportion of residents in the county who are in favor of the law.

Example 2: Interpret Margin of Error for Population Mean

We use the following formula to calculate a confidence interval for a population mean:

$$\text{Confidence Interval} = \bar{x} \pm z^*(s/\sqrt{n})$$

where:

\bar{x} : sample mean
 z^* : the z-critical values
 s : sample standard deviation
 n : sample size

The portion of the equation that comes after the \pm sign represents the margin of error:

$$\text{Margin of Error} = z^*(s/\sqrt{n})$$

For example, suppose we want to estimate the mean weight of a population of dolphins. We collect a of dolphins with the following information:

Sample size $n = 40$
Sample mean weight $\bar{x} = 300$
Sample standard deviation $s = 18.5$

Using the formula above, we calculate the margin of error to be:

$$\text{Margin of Error} = z^*(s/\sqrt{n})$$
$$\text{Margin of Error} = 1.96*(18.5/\sqrt{40})$$
$$\text{Margin of Error} = 5.733$$

We can then calculate the 95% confidence interval to be:

$$\text{Confidence Interval} = x \pm z^*(s/\sqrt{n})$$
$$\text{Confidence Interval} = 300 \pm 5.733$$

The 95% confidence interval for the mean weight of dolphins in this population turns out to be .

This means we're 95% confident that the true mean weight of dolphins in this population is between 294.267 pounds and 305.733 pounds.

The mean weight of dolphins in the sample was 300 pounds, but by subtracting and adding the margin of error to this sample mean we're able to construct a confidence interval.

This confidence interval represents a range of values that are highly likely to contain the true mean weight of dolphins in this population.

Additional Resources

The following tutorials provide additional information about margin of error:

ARABPSYCHOLOGY.COM