

What is Slovin's Formula?

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Slovin's Formula is a mathematical tool used to determine the appropriate sample size for a given population in order to effectively capture the characteristics of the entire population. It takes into consideration factors such as desired precision, confidence level, and population size to calculate the minimum sample size needed. This formula is commonly used in research studies and surveys to ensure accurate and reliable results. By using Slovin's Formula, researchers can confidently draw conclusions about a population based on a representative sample.

What is Slovin's Formula? (Definition & Example)

In statistics, Slovin's formula is used to calculate the minimum sample sized needed to estimate a statistic based on an acceptable margin of error.

Slovin's formula is calculated as:

$$n = N / (1 + Ne^2)$$

where:

n: Sample size needed

N: Population size

e: Acceptable margin of error

The following examples show how to use Slovin's formula in practice.

Example 1: Using Slovin's Formula to Estimate Population Proportion

Suppose a lawyer wants to estimate the proportion of

individuals in a certain neighborhood that are in favor of a new law.

Suppose he knows there are 10,000 individuals in this neighborhood and it would take far too long to survey each individual, so he would instead like to take a random sample of individuals.

Assume that he would like to estimate this proportion with a margin of error of .05 or less.

He can use Slovin's formula to figure out the minimum number of individuals he must include in his sample:

$$n = N / (1 + Ne^2)$$

$$n = 10,000 / (1 + 10,000(.05)^2)$$

$$n = 384.615$$

To be conservative, the lawyer should round up to the nearest integer and include 385 individuals in his sample.

Example 2: Using Slovin's Formula to Estimate Population Mean

Suppose a botanist wants to estimate the mean height of a certain species of plant in some region.

Suppose she knows there are 500 of these plants in the region and it would take far too long to measure each individual plant, so she would instead like to take a random sample of plants.

Assume that she would like to estimate this mean with a margin of error of .02 or less.

$$n = N / (1 + Ne^2)$$

$$n = 500 / (1 + 500(.02)^2)$$

$$n = 416.667$$

To be conservative, the botanist should round up to the nearest integer and include 417 plants in her sample.

Slovin's Formula: The Relationship Between Sample Size & Margin of Error

There is a simple relationship between sample size and margin of error: The lower the margin of error, the larger the sample size needed.

To illustrate this, consider the example from earlier when the lawyer wanted to estimate the proportion of individuals in a neighborhood who were in favor of a new law using a margin of error of 0.05.

Since the total number of individuals in the neighborhood was 10,000, he used the following formula to calculate the minimum sample size needed for his survey:

$$n = N / (1 + Ne^2)$$

$$n = 10,000 / (1 + 10,000(.05)^2)$$

$$n = 384.615$$

However, suppose the lawyer instead wanted a margin of error of 0.01.

Here is how he would use Slovin's formula to calculate the minimum sample size for this survey:

$$n = N / (1 + Ne^2)$$

$$n = 10,000 / (1 + 10,000(.01)^2)$$

$$n = 5,000$$

Since the lawyer decreased his margin of error, his sample size increased.

This should make sense intuitively.

If you want a lower margin of error (i.e. a more accurate estimate) then you must include far more individuals in

your sample.

Bonus: Feel free to use this to automatically calculate a minimum sample size based on a population size and acceptable margin of error.

The following tutorials provide additional information about sampling in statistics:

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