When should s / sqrt(n) be used in statistics?

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June 26, 2024

The expression "s / sqrt(n)" is often used in statistics when calculating the standard error of a sample mean. This formula takes into account the sample standard deviation (s) and the sample size (n) to estimate the variability of the sample mean. It is typically used when the sample size is relatively small and the population standard deviation is unknown. This formula is an important tool in statistical analysis as it helps to determine the precision of the sample mean and make inferences about the population mean. Therefore, "s / sqrt(n)" should be used in statistics when dealing with small sample sizes and unknown population standard deviation to accurately evaluate the variability of the sample mean.

When to Use s / sqrt(n) in Statistics

In statistics, you will encounter the formula s/√n in different scenarios.

This formula is used to calculate the standard error of a sample mean.

In the formula, s represents the sample standard deviation and n represents the sample size.

This formula appears in the calculation of two statistical tests:

1. One sample t-test

2. Confidence interval for a population mean

The following examples show how to use s/√n in both of these scenarios.

Example 1: Using s / sqrt(n) in a One Sample t-test

A one sample t-test is used to test whether or not the mean of a is equal to some value.

We use the following formula to calculate the test statistic t:

t = (x - μ) / (s/√n)

where:

x: sample meanμ0: hypothesized population means: sample standard deviationn: sample size

For example, suppose we want to test whether or not the mean weight of turtles in some population is equal to 300 pounds.

We collect a of turtles with the following information:

Sample size n = 40Sample mean weight x = 300Sample standard deviation s = 18.5

We will perform the one sample t-test with the following hypotheses:

H0: μ = 310 (population mean is equal to 310 pounds)HA: μ ? 310 (population mean is not equal to 310 pounds)

First, we'll calculate the test statistic:

t = (x - μ) / (s/√n) = (300-310) / (18.5/√40) = -3.4187

According to the , the p-value associated with t = -3.4817 and degrees of freedom = n-1 = 40-1 = 39 is 0.00149.

Since this p-value is less than 0.05, we reject the null hypothesis. We have sufficient evidence to say that the mean weight of this species of turtle is not equal to 310 pounds.

Example 2: Using s / sqrt(n) in a Confidence Interval for a Population Mean

A confidence interval for a population mean is a range of values that is likely to contain a population mean with a certain level of confidence.

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

Confidence Interval = x +/- tn-1, 1-α/2*(s/√n)

where:

x: sample meant: the t-critical values: sample standard deviationn: sample size

For example, suppose we want to calculate a confidence interval for the true mean weight of turtles in a certain population.

We collect a simple random sample of turtles with the following information:

Sample size n = 40Sample mean weight x = 300Sample standard deviation s = 18.5

We can use the following formula to calculate a 95% confidence interval for the true population mean weight of turtles:

95% C.I. = x +/- tn-1, 1-α/2*(s/√n)95% C.I. = 300 +/- (2.022691) * (18.5/√40)95% C.I. =

The 95% confidence interval for the true population mean weight of turtles is between 294.083 pounds and

305.917 pounds.

The following tutorials explain how to calculate a standard error of a mean in different software: