

What does a p-value less than 0.01 indicate? Can you provide examples?

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A p-value less than 0.01 indicates strong statistical significance in a hypothesis test. This means that there is a very low probability of obtaining the observed results by chance alone, and supports the rejection of the null hypothesis. For example, if a study has a p-value of 0.005, it means that there is only a 0.5% chance that the results were due to chance and a 99.5% chance that the results are actually significant. This level of significance is commonly used in scientific research to confidently conclude that the observed results are not due to random chance.

Interpret a P-Value Less Than 0.01 (With Examples)

A is used to test whether or not some assumption about a is true.

Whenever we perform a hypothesis test, we always define a null and alternative hypothesis:

Null Hypothesis (H₀): The sample data occurs purely from chance. Alternative Hypothesis (H_A): The sample data is influenced by some non-random cause.

If the of the hypothesis test is less than some significance level (e.g. $\alpha = .01$), then we can reject the null hypothesis and conclude that we have sufficient evidence to say that the alternative hypothesis is true.

If the p-value is not less than .01, then we fail to reject the null hypothesis and conclude that we do not have sufficient evidence to say that the alternative hypothesis is true.

The following examples explain how to interpret a p-value less than .01 and how to interpret a p-value greater than .01 in practice.

Example: Interpret a P-Value Less Than 0.01

Suppose a factory claims that they produce batteries with an average weight of 2 ounces.

An auditor comes in and tests the null hypothesis that the mean weight of a battery is 2 ounces vs. the alternative hypothesis that the mean weight is not 2 ounces, using a 0.01 level of significance.

The null hypothesis (H₀): $\mu = 2$ ounces

The alternative hypothesis: (H_A): $\mu \neq 2$ ounces

The auditor conducts a hypothesis test for the mean and ends up with a p-value of 0.0046.

Since the p-value of 0.0046 is less than the significance level of 0.01, the auditor rejects the null hypothesis.

He concludes that there is sufficient evidence to say that the true average weight of a battery produced at this factory is not 2 ounces.

Example: Interpret a P-Value Greater Than 0.01

Suppose that some crop grows an average of 20 inches during a three-month growing season. However, an agricultural scientist believes that a certain fertilizer will cause this crop to grow more than 20 inches, on average.

To test this, she applies the fertilizer to every crop in a certain field during the three-month growing season.

The null hypothesis (H₀): $\mu = 20$ inches (fertilizer will have no effect on the mean growth)

The alternative hypothesis: (H_A): $\mu > 20$ inches (fertilizer will cause mean growth to increase)

Upon conducting a hypothesis test for the mean, the scientist gets a p-value of 0.3488.

Since the p-value of 0.3488 is greater than the significance level of 0.01, the scientist fails to reject the null hypothesis.

She concludes that there is not sufficient evidence to say that the fertilizer leads to an increase in mean crop

growth.

Additional Resources

The following tutorials provide additional information about p-values and hypothesis tests:

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