**P-value**

The **p value**, or probability value, tells you how likely it is that your data could have occurred under the null hypothesis. It does this by calculating the likelihood of your [**test statistic**](https://www.scribbr.com/statistics/test-statistic/), which is the number calculated by a [statistical test](https://www.scribbr.com/statistics/statistical-tests/) using your data.

The p value tells you how often you would expect to see a test statistic as extreme or more extreme than the one calculated by your statistical test if the null hypothesis of that test was true. The p value gets smaller as the test statistic calculated from your data gets further away from the [range](https://www.scribbr.com/statistics/range/) of test statistics predicted by the null hypothesis.

The p value is a proportion: if your p value is 0.05, that means that 5% of the time you would see a test statistic at least as extreme as the one you found if the null hypothesis was true.

**How do you calculate the *p*value?**

*P*values are usually automatically calculated by your statistical program (R, SPSS, etc.).

You can also find tables for estimating the *p*value of your test statistic online. These tables show, based on the test statistic and [**degrees of freedom**](https://www.scribbr.com/statistics/degrees-of-freedom/) (number of observations minus number of independent variables) of your test, how [frequently](https://www.scribbr.com/frequently-asked-questions/main-types-of-descriptive-statistics/)you would expect to see that test statistic under the null hypothesis.

The calculation of the *p*value depends on the statistical test you are using to test your [hypothesis](https://www.scribbr.com/methodology/hypothesis/):

* Different statistical tests have different assumptions and generate different test statistics. You should choose the [statistical test](https://www.scribbr.com/statistics/statistical-tests/) that best fits your data and matches the effect or relationship you want to test.
* The number of [independent variables](https://www.scribbr.com/methodology/independent-and-dependent-variables/) you include in your test changes how large or small the test statistic needs to be to generate the same *p*value.

## P values and statistical significance:

P values are most often used by researchers to say whether a certain pattern they have measured is statistically significant.

[**Statistical significance**](https://www.scribbr.com/statistics/statistical-significance/) is another way of saying that the p value of a statistical test is small enough to reject the null hypothesis of the test.

How small is small enough? The most common threshold is p < 0.05; that is, when you would expect to find a test statistic as extreme as the one calculated by your test only 5% of the time. But the threshold depends on your field of study – some fields prefer thresholds of 0.01, or even 0.001.

## Caution when using p values

P values are often interpreted as your risk of rejecting the [null hypothesis](https://www.scribbr.com/statistics/null-and-alternative-hypotheses/) of your test when the null hypothesis is actually true.

In reality, the risk of rejecting the null hypothesis is often higher than the p value, especially when looking at a single study or when using small sample sizes. This is because the smaller your frame of reference, the greater the chance that you stumble across a statistically significant pattern completely by accident.

P values are also often interpreted as supporting or refuting the alternative hypothesis. This is not the case.**The p value can only tell you whether or not the null hypothesis is supported.** It cannot tell you whether your alternative hypothesis is true, or why.