

Type 1 error: calculating

When you do a hypothesis test, two types of errors are possible: type I and type II. The risks of these two errors are inversely related and determined by the level of significance and the power for the test. Therefore, you should determine which error has more severe consequences for your situation before you define their risks.

Type I error

When the null hypothesis is true and you reject it, you make a type I error. The probability of making a type I error is α , which is the level of significance you set for your hypothesis test. An α of 0.05 indicates that you are willing to accept a 5% chance that you are wrong when you reject the null hypothesis. To lower this risk, you must use a lower value for α . However, using a lower value for alpha means that you will be less likely to detect a true difference if one really exists.

Type II error

When the null hypothesis is false and you fail to reject it, you make a type II error. The probability of making a type II error is β , which depends on the power of the test. You can decrease your risk of committing a type II error by ensuring your test has enough power. You can do this by ensuring your sample size is large enough to detect a practical difference when one truly exists.

	Null hypothesis	Null hypothesis
Decision	True	False
Fail to reject	Correct decision (probability = $1 - \alpha$)	Type II error – fail to reject the null when it is false (probability = β)
Reject	Type I error – rejecting the null when it is true (probability = α)	Correct decision (probability = $1 - \beta$)

Question:

A medical researcher wants to compare the effectiveness of two medications. Null hypothesis = the 2 medications are equally effective. Alternate hypothesis = the 2 medications are not equally effective.

- A type I error occurs if the researcher rejects the null hypothesis and concludes that the two medications are different when, in fact, they are not.
- A type II error occurs if the researcher rejects the null hypothesis and concludes that the two medications are different when, in fact, they are not.
- A type II error occurs, if the researcher reject the null hypothesis when it should be rejected
- Cannot be determined with the provided information

Answer: A - When the null hypothesis is true and you reject it, you make a type I error