

**KEEP
CALM
AND
TEST YOUR
HYPOTHESIS**



**"I've narrowed it to two hypotheses:
it grew or we shrunk."**

Hypothesis: Definition

- A hypothesis is a hunch, assumption, suspicion, assertion, or an idea about a phenomenon, relationship or situation, the reality or truth of which we do not know;
- The above become the basis for an inquiry for a researcher.
- In most studies, the hypothesis will be based upon either previous studies, or on your own or some one else's observation.

STATISTICAL HYPOTHESIS

a conjecture or
supposition about a
population parameter.

NULL HYPOTHESIS (H_0)

A statistical hypothesis that states that there is no difference between a parameter and a particular value.

ALTERNATIVE HYPOTHESIS (H_1)

A statistical hypothesis that states that a parameter and a particular value has a difference.

In equation

*Let us consider the population mean μ
and a particular value K .*

$$H_0: \mu = K$$

$$H_1: \mu \neq K$$

$$(\mu > K \text{ or } \mu < K)$$

ONE-TAILED TEST

A test of any statistical hypothesis is considered one – tailed if the alternative hypothesis is:

$$H_0: \mu = K$$

$$H_1: \mu > K$$

or

$$H_0: \mu = K$$

$$H_1: \mu < K$$

TWO-TAILED TEST

A test of any statistical hypothesis is considered two – tailed if the alternative hypothesis is:

$$H_0: \mu = K$$

$$H_1: \mu \neq K$$

In summary

TWO-TAILED	RIGHT-TAILED TEST	LEFT-TAILED TEST
$H_0: \mu = K$	$H_0: \mu = K$	$H_0: \mu = K$
$H_1: \mu \neq K$	$H_1: \mu > K$	$H_1: \mu < K$

EXERCISES

Write the null and alternative hypotheses for the following situations.

1. A parents' organization in a school is concerned about the proportion of fat content of the burgers sold in the school canteen. The canteen claims that the proportion is only about 18%. But some students believe that the fat content is higher than that.

EXERCISES

2. A maternity hospital claims that the mean birth weight of babies delivered in their charity ward is 2.5 kg. But that is not what a group of obstetricians believe.

TEST STATISTIC

The numerical value obtained from a statistical test.

In any hypothesis-testing situation, there are four possibilities, GOOD and BAD.

- GOOD
- H_0 is true and we decide not to reject it.
- H_1 is false and we decide to reject it.

Failure to satisfy these two cases results to an error in the decision.

Table 1. Types of Statistical Errors

	H_0 is actually:	
	True	False
Reject H_0	Type I error	Correct
Accept H_0	Correct	Type II error

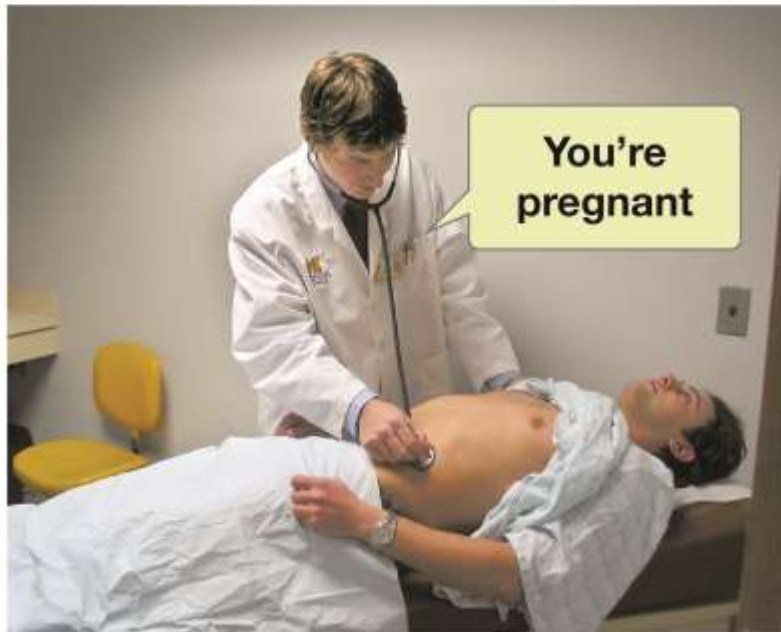
TYPE I ERROR

Rejecting the null hypothesis
when it is actually true.

TYPE II ERROR

Not rejecting the null hypothesis
when it is actually false.

Type I error
(false positive)



Type II error
(false negative)



NOTE

Since you are basing your results from one sample and results may vary from one sample to another, you can possibly commit an error (Type I or Type II). You can minimize the probability of committing a Type I error by **decreasing the level of significance.**

LEVEL OF SIGNIFICANCE

- the maximum allowable probability of committing a type I error. The probability of a type II error is denoted β .
- three common values are 0.10, 0.05, and 0.01
- it is the researcher who decides on the level of significance, depending on the nature of research

LEVEL OF SIGNIFICANCE

- life and death situations (0.01)
- social research (0.05 or 0.10)
- educational research (0.05)
- By setting the level of significance at a small value, you are saying that the probability of rejecting a true hypothesis is SMALL.
- After deciding on the level of significance, the critical value is computed.

CRITICAL VALUE

- separates the critical region from the non-critical region

CRITICAL REGION

- rejection region
- the range of values that indicates that there is a significant difference between the actual value of the parameter and its hypothesized value.
- Reject H_0

NON-CRITICAL REGION

- Non-rejection region
- the range of values that indicates that the difference was probably due to the chance/factor
- Do not reject H_0

Two-Tailed Versus One-Tailed Hypothesis Tests

Figure A:
Two-Tailed Test

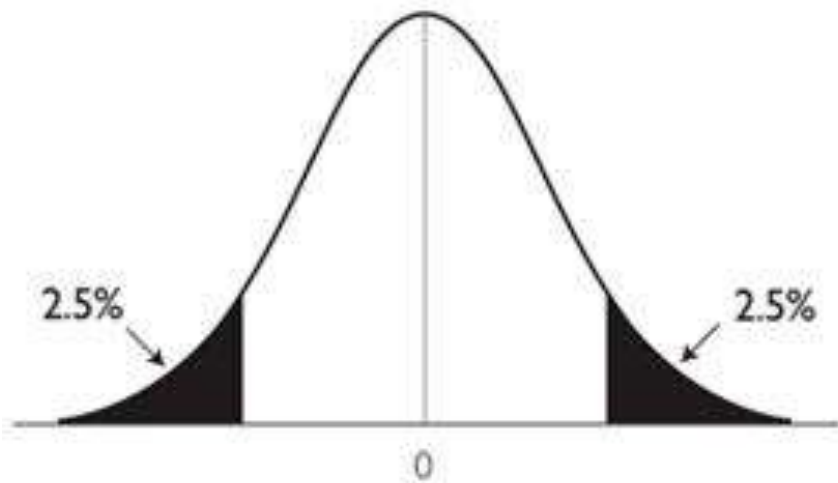
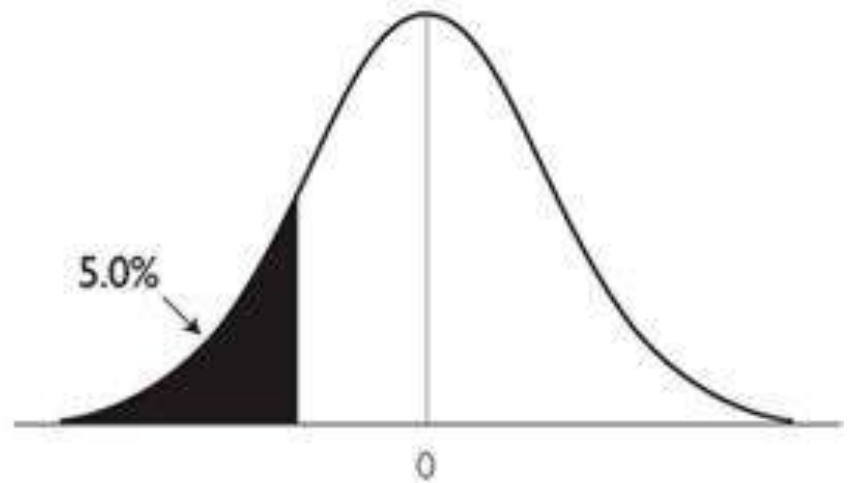


Figure B:
One-Tailed Test
(Left-Tailed Test)



Source: The Heritage Foundation.

NOTE

- The position of the critical value depends on the inequality sign of the H_1
- If the null hypothesis is $H_1: \mu > K$, the critical value is on the right side.
- If the null hypothesis is $H_1: \mu < K$, the critical value is on the left side.

NOTE

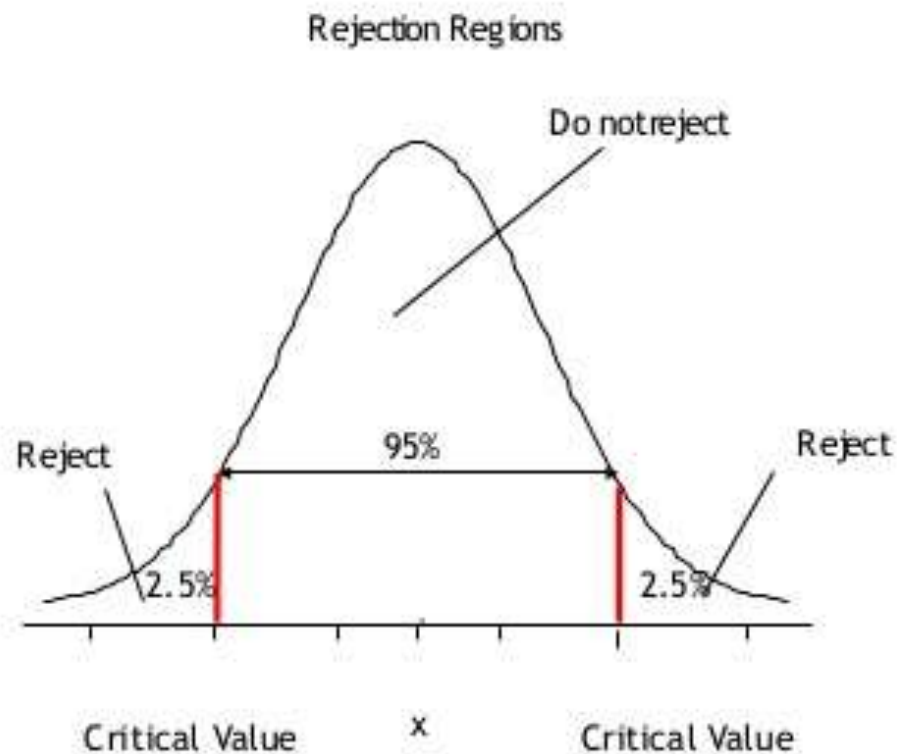
- A one-tailed test indicates the rejection of the null hypothesis when the test value is in the critical region on one side of the mean.
- A one-tailed test is right-tailed if the alternative hypothesis has the inequality sign $>$.
- A one-tailed test is left-tailed if the alternative hypothesis has the inequality sign $<$.

NOTE

- In a two-tailed test, the null hypothesis is rejected when the test value is in either of the two critical regions. The alternative hypothesis has the sign \neq .

Step 3

5% Significance Levels for Two-Tailed Tests



SUMMARY

1. Identify the null and alternative hypotheses.
2. Decide on the level of significance.
3. Find the critical value(s) from the appropriate table.
4. Compute the test statistic.
5. Make the decision.
6. Interpret the results.

ANOTHER EXERCISE

DIRECTIONS: Write the null and alternative hypotheses for each situation.

1. A pharmaceutical company claims that their pain reliever capsule is 70% effective. But a clinical test on this capsule showed 65 out of 100 effectiveness.