

False Positives/False Negatives

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WHAT'S COVERED

This tutorial will cover false positives and false negatives. Our discussion breaks down as follows:

1. False Positives and False Negatives

1. False Positives and False Negatives

When tests are performed in medical scenarios, as well as many other everyday tests, the results are not always 100% accurate. Occasionally, tests will determine one thing when, in fact, the reality is that the opposite is true. This will result in either **false positives** and **false negatives**.

Error	Description	Example
False Positive	When the thing being tested for is mistakenly shown to be present when, in fact, it's not present.	A person is told that they have cancer when, in fact, they do NOT have cancer.
False Negative	When the thing being tested for is mistakenly shown to be absent and, in fact, it is present.	A home pregnancy test could tell a woman that she's NOT pregnant when, in fact, she actually is pregnant.

How common are errors like this? It depends largely on the tests because different tests have varying levels of accuracy and sensitivity.

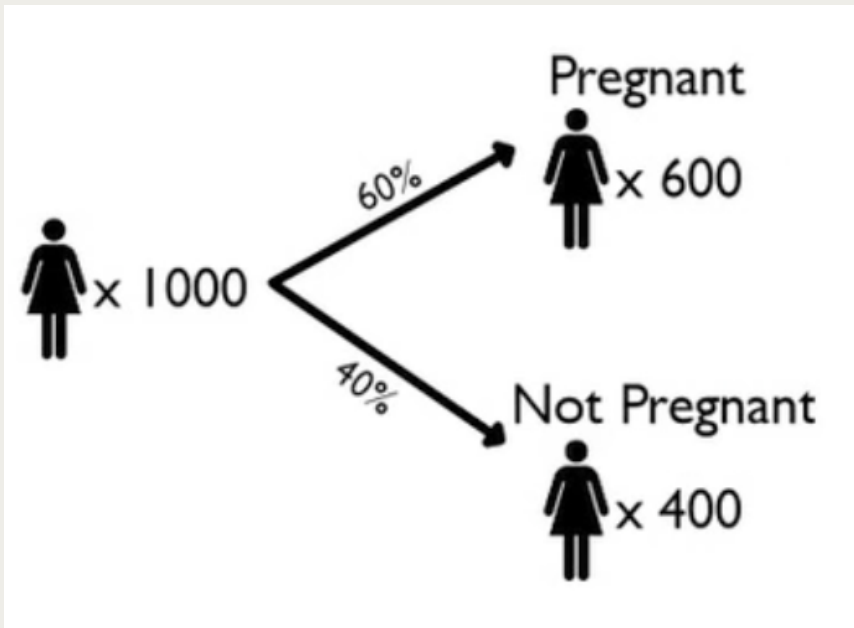
Most home pregnancy tests claim to be 99% effective at detecting pregnancy, which means that 99% of the time, these tests accurately detect a pregnancy when it's present and when the test has been conducted properly.

However, what if the woman does the test too early? Tests done too soon can reduce the effectiveness to around 90%, which means that the probability of a false negative--where the test says that she's not pregnant when really she is--raises to about a 10% likelihood, which is a significant amount. It would be better to have the false negative be closer to something like 1%, as the test claims.

False positives are typically more rare. Because these home pregnancy tests detect particular hormones, it's tough for the test to detect those hormones when they aren't really there. Therefore, when a woman is not pregnant, a test will show this in about 98% of those cases, which means the false positive rate (a not-pregnant woman getting a positive pregnancy test result) is about 2%.

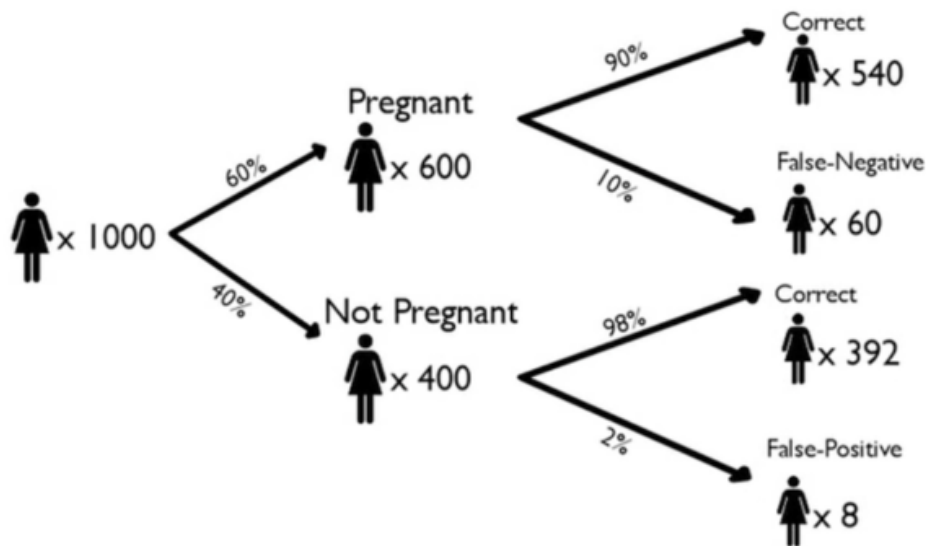
IN CONTEXT

Suppose that there are 1000 women, 60% of whom are pregnant and 40% of whom are not. That would mean that there are 400 not-pregnant women and 600 pregnant women. Suppose that all 1000 women took these pregnancy tests.



Of those 600 women, 90% would be correctly told that they were pregnant. These would be women who are going to have a baby and know it. The false negatives would be women who are pregnant and don't know it, so that's 60 out of 1000.

Of the 400 women who aren't pregnant, 98% will be correctly told, making 392 who will be correctly told that they're not pregnant and eight who will be incorrectly told that they are pregnant.



Combined, that's 68 out of 1,000 women here that have the incorrect result.



TERMS TO KNOW

False Positive

A test states that some condition is present when, in fact, the condition is absent.

False Negative

A test states that some condition is absent when, in fact, the condition is present.



SUMMARY

False positives and false negatives are an inevitable part of a testing process. When something's not 100% effective, errors are inevitable. The goal is to try to reduce the frequency of error rates if we can. Both types of errors are fairly rare in most cases, although when tests are conducted properly, likelihood of those errors will decrease.

Good luck!

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TERMS TO KNOW

False-Negative

A test states that some condition is absent when, in fact, the condition is present.

False-Positive

A test states that some condition is present when, in fact, the condition is absent.