



UNDERSTANDING SENSITIVITY AND SPECIFICITY IN DIAGNOSTIC TESTING

Diagnostic tests play an important role in identifying diseases and other individual and community health concerns. While no test is perfect, understanding specific performance measures helps us to select the right test and interpret the results correctly.

MEASURING TEST PERFORMANCE AND INTERPRETING RESULTS

A diagnostic test may yield four possible outcomes:

Key	The person HAS the condition	The person DOES NOT HAVE the condition
POSITIVE test result	+ TRUE positive	+ FALSE positive
NEGATIVE test result	- FALSE negative	- TRUE negative

HOW DOES TEST PERFORMANCE AFFECT HOW WE INTERPRET RESULTS?

Sensitivity

A test's ability to correctly identify people who **do have** a medical condition

90% sensitivity will detect **90** out of **100** people who have a condition



Specificity

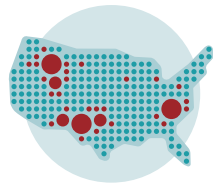
A test's accuracy in identifying people who **do not have** a medical condition

90% specificity will correctly identify **90** out of **100** people who **do not** have a condition

GIVEN A TEST'S SENSITIVITY AND SPECIFICITY MEASURES, TEST RESULTS SHOULD BE UNDERSTOOD WITHIN THE CONTEXT OF THEIR ENVIRONMENTS.



Signs and symptoms of the individual



Amount of disease in the population



Time of year



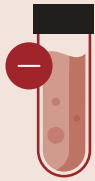
Risk of exposure to an infectious disease or environmental hazard

UNDERSTANDING TEST RESULTS THROUGH PREDICTIVE VALUES



Positive predictive value improves as the prevalence of a condition in a population increases.

Prevalence: Proportion of the population affected by a disease at a specified time.



Negative predictive value (NPV) is the **probability** that a person who tests negative **does not** have a condition, based on the frequency of a disease in a population.



Positive predictive value (PPV) is the **probability** that a person who tests positive **does** have a condition, based on the frequency of a disease in a population.

$$\text{NPV} = \frac{\text{True negative cases}}{\text{All negative test results}}$$

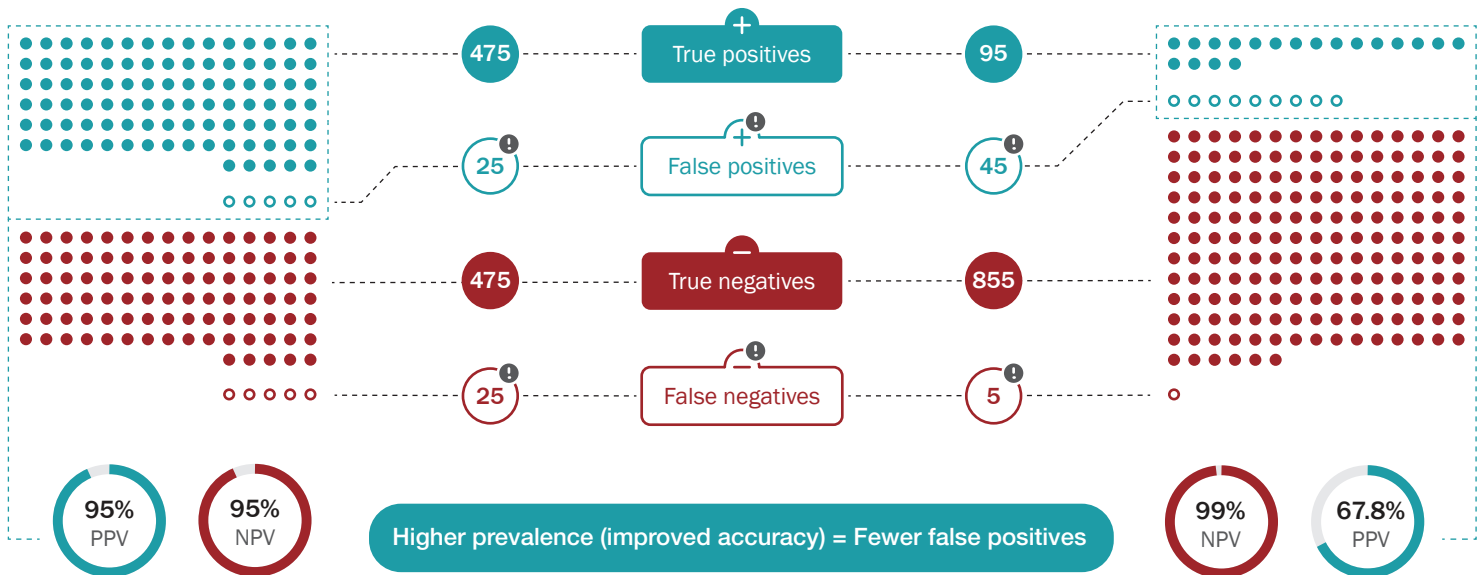
$$\text{PPV} = \frac{\text{True positive cases}}{\text{All positive test results}}$$

THE NPV AND PPV OF A DIAGNOSTIC TEST WITH 95% SENSITIVITY AND 95% SPECIFICITY CHANGE DRAMATICALLY DEPENDING ON THE PREVALENCE OF THE CONDITION WITHIN A POPULATION.

In a population with **50% prevalence**, **500 people** would truly have the condition and yield the following test results:

1,000 people tested
● = 5 people

In a population with **10% prevalence**, **100 people** would truly have the condition and yield the following test results:



Positive predictive value improves as the **prevalence** with a condition in a population increases.
Prevalence: Proportion of the population affected by a disease at a specified time.



ASSOCIATION OF PUBLIC HEALTH LABORATORIES

The Association of Public Health Laboratories (APHL) works to strengthen laboratory systems serving the public's health in the US and globally. APHL's member laboratories protect the public's health by monitoring and detecting infectious and foodborne diseases, environmental contaminants, terrorist agents, genetic disorders in newborns and other diverse health threats.

Contact us at: 7700 Wisconsin Avenue, Suite 1000 Bethesda, MD 20814 | 240.485.2745 | www.aphl.org

- Sources:**
- Frontiers in Public Health: www.frontiersin.org/articles/10.3389/fpubh.2017.00307/full
 - Inhalation Toxicology: www.ncbi.nlm.nih.gov/pmc/articles/PMC4389712/
 - Health News Review: www.healthnewsreview.org/toolkit/tips-for-understanding-studies/understanding-medical-tests-sensitivity-specificity-and-positive-predictive-value/
 - BMJ Journals: ebs.bmj.com/content/23/1/2

© Copyright 2025, Association of Public Health Laboratories. All Rights Reserved.

This project was 100% funded with federal funds from a federal program of \$442,934, supported by Cooperative Agreement number NU600E000104, funded by the US Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC or the US Department of Health and Human Services.