

Diagnostic Test Characteristics: Sensitivity, Specificity and Predictive Values

Diagnostic tests have test characteristics, which include sensitivity, specificity and predictive values (both positive and negative). The tables below illustrates these characteristics.

	Disease +	Disease -	Total
Test +	24	7	31
Test -	6	63	69
Total	30	70	100

Table 1

In Table 1, there are 30 patients with disease out of 100 total (prevalence of 30%). The sensitivity is the number who test positive out of those with disease, or $24/30$, which is 80%. The specificity is the number who test negative out of those without disease, or $63/70$, which is 90%.

Predictive values look at what we can say after a test result is obtained. Positive predictive value (PPV) is the number of patients with disease who test positive out of all those who test positive, or $24/31$, which is 77.4%. Another way to think of PPV is out of all the positive tests, how many are true positives? Negative predictive value (NPV) is the number of patients without disease who test negative out of all those who test negative, or $63/69$, which is 91.3%. Again, another way to rephrase this is, out of all of the negative tests, how many are true negatives?

Generally speaking, sensitivity and specificity do not depend on prevalence of disease. Predictive values, however, do depend on prevalence.

Contrast Table 2 with Table 1.

	Disease +	Disease -	Total
Test +	56	3	59
Test -	14	27	41
Total	70	30	100

Table 2

In Table 2, there are 70 patients with disease out of 100 total (prevalence of 70%). The sensitivity and specificity remain the same as in Table 1 (80% and 90%, respectively). However, now the PPV is $56/59$, or 94.9%, and the NPV is $27/41$, or 65.9%. Compared with Table 1, the increased prevalence results in a higher PPV (when there is more disease, a positive test is more likely to be a true positive). Similarly, with more disease, a negative test is less likely to be a true negative.