Pretest probability of having the disease (p): is the prevalence of disease in the investigated population
Pretest probability of not having the disease (1-p): is the prevalence of healthy subjects in the investigated population
Sensitivity (sens): is the proportion of people with disease who have a positive test
Specificity (spec): is the proportion of people free of a disease who have a negative test
Positive predictive value (PPV): probability that a patient with a positive test has got really the disease
Negative predictive value (NPV): probability that a patient with a negative test is really healthy

<table>
<thead>
<tr>
<th>Test</th>
<th>Disease</th>
<th>No Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>positive</td>
<td>Right positive</td>
<td>False positive</td>
</tr>
<tr>
<td>negative</td>
<td>False negative</td>
<td>Right negative</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>180</td>
</tr>
</tbody>
</table>

Pretest probability (p) = \( \frac{a+c}{a+b+c+d} = 40\% \)
1-p = \( \frac{b+d}{a+b+c+d} = 60\% \)
sens = \( \frac{a}{a+c} = 60\% \)
spec = \( \frac{d}{b+d} = 95\% \)
PPV = \( \frac{a+b}{a+b+c+d} = 89\% \)
NPV = \( \frac{d}{c+d} = 78\% \)

This example illustrates, that a test is useful when the pretest probability is increased up to a reasonable PPV (rule in the disease) or when NPV is increased reasonably (rule out). The figures illustrate that specificity is more important to rule in (spin = specificity rule in); and that sensitivity is more important to rule out (snout = sensitivity rule out). The relation between p, sens, spec, PPV and NPV is described by the Bayes’ Theorem. Indeed a test is only useful, if the pretest probability (p) is out of the range of 95%CI of PPV (in this example 95%CI = 80%-94%); and/or if the pretest probability of not having the disease (1-p) is out of the range of the 95%CI of NPV (in this example 95% CI = 72%-83%). The 95%CI is calculated using Wilson’s method.28
In this example p is increased up to a meaningful PPV. NPV seems not to be increased reasonably if compared with 1-p.