**Introduction**

- Screen for disease by giving tests
- Evaluate the test for accuracy in predicting the disease.
- Use sensitivity, specificity, positive and negative predictive values to measure accuracy of a test.

**Sensitivity**

PSA ≥ 7 ng/ml Test +
PSA < 7 ng/ml Test −

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>D̃</th>
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<tbody>
<tr>
<td>Test +</td>
<td>⋅05</td>
<td>08</td>
</tr>
<tr>
<td>Test −</td>
<td>01</td>
<td>86</td>
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</tbody>
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P(D|+) = 06 .94
**Sensitivity**

- Proportion of people with the disease that test positive:
  
  \[ P(+|D) = \frac{P(+|D)}{P(D)} = \frac{.05}{.06} = .83 \]

  
  Sensitivity = .83

**Specificity**

- Proportion of people without the disease that test negative:
  
  \[ P(-|\neg D) = \frac{P(-|\neg D)}{P(\neg D)} = \frac{.96}{.94} = .91 \]

  
  Specificity = .91

**Positive Predictive Value**

- Proportion of people who test positive who have the disease:
  
  \[ P(D|+) = \frac{P(+|D)}{P(+)} = \frac{.05}{.13} = .38 \]

  
  Positive Predictive Value = .38
Negative Predictive Value

- Proportion of people who test negative who do not have the disease.

\[ P(\overline{D} | \overline{D}) = \frac{P(\overline{D})}{P(D)} = 0.86 \]

\[ P(D | \overline{D}) = 0.87 \]

Negative Predictive Value = 0.99

Prevalence

- Proportion of people with the disease

\[ P(D) = 0.05 \]

\[ P(\overline{D}) = 0.04 \]

Dependence on Prevalence

- Depend on prevalence:
  - Positive Predictive Values
  - Negative Predictive Values

- Independent of prevalence:
Dependence on Prevalence

Dependent on prevalence:
- Positive Predictive Values
- Negative Predictive Values

Independent of prevalence:
- Sensitivity
- Specificity

Test + | Test -
-----|-----
.05  | .01
.08  | .86

Example

Sensitivity: Proportion of people with the disease that test positive

Specificity: Proportion of people without disease that test negative.