

Diagnostic test evaluation with perfect reference test

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16/09/2021

Four phases in architecture of diagnostic research

- **Phase I** Do test results in patients with the target disorder differ from those in normal people? Table 1 shows the architecture of this question.
- **Phase II** Are patients with certain test results more likely to have the target disorder than patients with other test results?
- **Phase III** Does the test result distinguish patients with and without the target disorder among patients in whom it is clinically reasonable to suspect that the disease is present?
- **Phase IV** Do patients who undergo this diagnostic test fare better (in their ultimate health outcomes) than similar patients who are not tested?

Measures of diagnostic accuracy

| | D+ | D- |
|----|----|----|
| T+ | TP | FP |
| T- | FN | TN |

Measures of diagnostic accuracy

| | D+ | D- |
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| T+ | TP | FP |
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- Sensitivity = $TP/D+$
- Specificity = $TN/D-$
- PPV = $TP/T+$
- NPV = $TN/T-$

Measures of diagnostic accuracy

- Frequencies

| | D+ | D- |
|----|------|------|
| T+ | y[1] | y[3] |
| T- | y[2] | y[4] |

- Probabilities

| | D+ | D- |
|----|------|------|
| T+ | p[1] | p[3] |
| T- | p[2] | p[4] |

Bayesian model

```
"model {  
  
  # likelihood  
  
  y[1:4] ~ dmulti(prob[1:4], n)  
  
  prob[1] <- p * Se  
  prob[2] <- p * (1 - Se)  
  prob[3] <- (1 - p) * (1 - Sp)  
  prob[4] <- (1 - p) * Sp  
  
  # priors  
  
  p ~ dbeta(1, 1)  
  Se ~ dbeta(1,1)
```