

Sensitivitet, Specificitet og prædiktive værdier.

$$\text{sensitivitet} = P(T+ | \text{Syg})$$

$$\text{specificitet} = P(T- | \text{Rask})$$

Test	Syg	Rask	Total
T+	a	b	a+b
T-	c	d	c+d
Total	a+c	b+d	n

Estimation:

$$\widehat{Sens} = a/(a+c) \quad se(\widehat{Sens}) = \sqrt{\widehat{Sens} \cdot (1-\widehat{Sens})/(a+c)}$$

$$\widehat{Spec} = d/(b+d) \quad se(\widehat{Spec}) = \sqrt{\widehat{Spec} \cdot (1-\widehat{Spec})/(b+d)}$$

Positiv Prædiktiv Værdi:

$$PPV = P(\text{Syg} | T+)$$

$$= \frac{\text{sensitivitet} \cdot \text{prævalens}}{\text{sensitivitet} \cdot \text{prævalens} + (1 - \text{specificitet}) \cdot (1 - \text{prævalens})}$$

$$\text{odds}(\text{Syg} | T+) = \frac{PPV}{1 - PPV} = \frac{\text{sensitivitet}}{1 - \text{specificitet}} \cdot \text{odds}(\text{Syg})$$

$$\text{Estimation: } \widehat{præv} = \frac{N_{\text{Syg}}}{N_{\text{Syg}} + N_{\text{Rask}}}$$

$$\widehat{PPV} = \frac{\widehat{sens} \cdot \widehat{præv}}{\widehat{sens} \cdot \widehat{præv} + (1 - \widehat{spec}) \cdot (1 - \widehat{præv})}$$

$$se(\ln[\widehat{\text{odds}}(\text{Syg} | T+)]) = \sqrt{\left[\frac{1}{a} - \frac{1}{a+c}\right] + \left[\frac{1}{b} - \frac{1}{b+d}\right] + \left[\frac{1}{N_{\text{Syg}}} + \frac{1}{N_{\text{Rask}}}\right]}$$

Negativ Prædiktiv Værdi:

$$NPV = P(\text{Rask} | T-)$$

$$= \frac{\text{specificitet} \cdot (1 - \text{prævalens})}{\text{specificitet} \cdot (1 - \text{prævalens}) + (1 - \text{sensitivitet}) \cdot \text{prævalens}}$$

$$\text{odds}(\text{Rask} | T-) = \frac{NPV}{1 - NPV} = \frac{\text{specificitet}}{1 - \text{sensitivitet}} \cdot \text{odds}(\text{Rask})$$

$$\text{Estimation: } \widehat{præv} = \frac{N_{\text{Syg}}}{N_{\text{Syg}} + N_{\text{Rask}}}$$

$$\widehat{NPV} = \frac{\widehat{spec} \cdot (1 - \widehat{præv})}{\widehat{spec} \cdot (1 - \widehat{præv}) + (1 - \widehat{sens}) \cdot \widehat{præv}}$$

$$se(\ln[\widehat{\text{odds}}(\text{Rask} | T-)]) = \sqrt{\left[\frac{1}{d} - \frac{1}{b+d}\right] + \left[\frac{1}{c} - \frac{1}{a+c}\right] + \left[\frac{1}{N_{\text{Syg}}} + \frac{1}{N_{\text{Rask}}}\right]}$$

Test	Syg	Rask	Total
T+	36	7	43
T-	26	298	324
Total	62	305	367

$$\widehat{\text{Sensitivitet}} = 36/62 = 0.580$$

$$se(\widehat{\text{Sensitivitet}}) = \sqrt{0.580 \cdot (1 - 0.580)/62} = 0.063$$

$$CI \text{ Sensitivitet} : 0.580 \pm 1.96 \cdot 0.063 = (0.46; 0.70)$$

$$\widehat{\text{Specificitet}} = 298/305 = 0.977$$

$$se(\widehat{\text{Specificitet}}) = \sqrt{0.977 \cdot (1 - 0.977)/305} = 0.009$$

$$CI \text{ Specificitet} : 0.977 \pm 1.96 \cdot 0.009 = (0.96; 0.99)$$

Antag prævalensen er 0.002 (uden usikkerhed!)

$$\widehat{PPV} = \frac{0.580 \cdot 0.002}{0.580 \cdot 0.002 + (1 - 0.977) \cdot (1 - 0.002)} = 0.048$$

$$\widehat{\text{odds}}(\text{Syg} | T+) = 0.048/(1 - 0.048) = 0.0504 = \exp(-2.99)$$

$$se(\ln(\widehat{\text{odds}})) = \sqrt{\left[\frac{1}{36} - \frac{1}{62}\right] + \left[\frac{1}{7} - \frac{1}{305}\right] + \left[\frac{1}{\infty} + \frac{1}{\infty}\right]} = 0.39$$

$$CI : \ln(\text{odds}) : -2.99 \pm 1.96 \cdot 0.39 = (-3.75; -2.23)$$

$$CI : \text{odds} : (0.024; 0.11)$$

$$CI : PPV : (0.023; 0.099)$$

Den prædiktive værdi af en positiv test er et sted mellem 2.3% og 9.9%.

$$\widehat{NPV} = \frac{0.977 \cdot 0.998}{0.977 \cdot 0.998 + (1 - 0.588) \cdot (1 - 0.998)} = 0.9991$$

$$\widehat{\text{odds}}(\text{Rak} | T-) = 0.9991/(1 - 0.9991) = 1163 = \exp(7.06)$$

$$se(\ln(\widehat{\text{odds}})) = \sqrt{\left[\frac{1}{26} - \frac{1}{62}\right] + \left[\frac{1}{298} - \frac{1}{305}\right] + \left[\frac{1}{\infty} + \frac{1}{\infty}\right]} = 0.15$$

$$CI : \ln(\text{odds}) : -7.06 \pm 1.96 \cdot 0.15 = (6.77; 7.35)$$

$$CI : \text{odds} : (867; 1559)$$

$$CI : NPV : (0.9988; 0.9994)$$

Den prædiktive værdi af en negativ test er et sted mellem 99.88% og 99.94%.