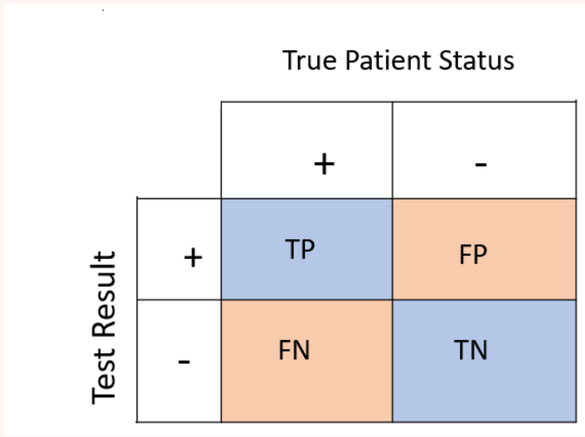
TSD 25: EVIDENCE SYNTHESIS OF DIAGNOSTIC TEST ACCURACY FOR DECISION MAKING

1. Diagnostic test accuracy (DTA)

- In a DTA study evaluating a single test against a perfect reference standard, results are summarised in a 2x2 table form as seen on the right.
- Test accuracy is usually measured in terms of sensitivity (or TPF) and specificity (or 1-FPF).
- DTA studies are typically heterogeneous, so meta analysis models by default should assume study-level random effects.
- TPF and FPF are often correlated across studies (e.g. due to threshold effects): this can be accommodated through a correlation structure on their respective random effects.



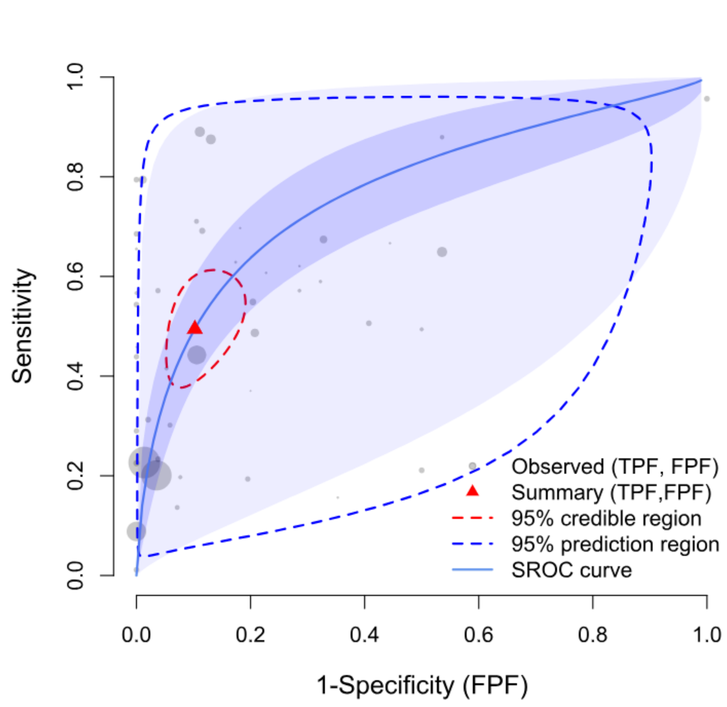
$$\widehat{TPF} = \frac{TP}{TP + FN}$$

$$\widehat{FPF} = \frac{FP}{FP + TN}$$

2. DTA Meta-analysis

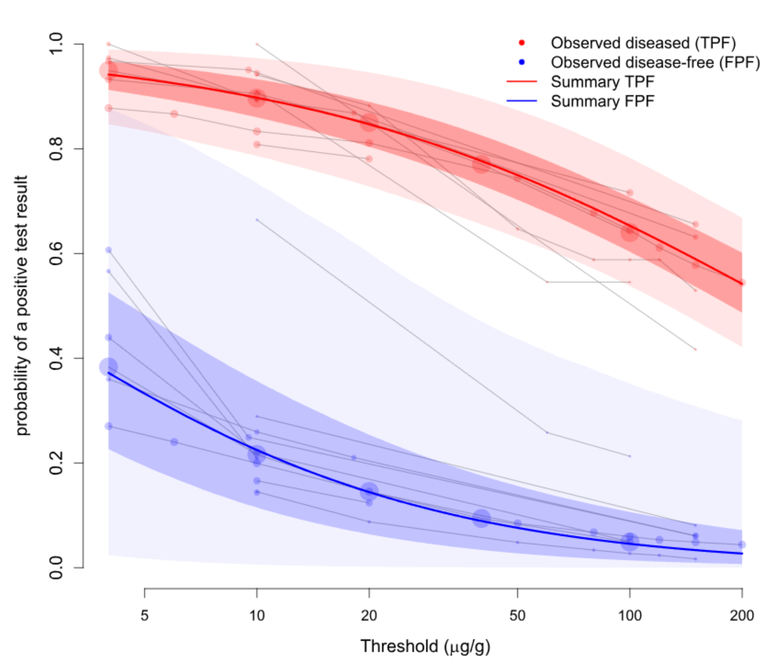
Where **only one 2x2 table** is available from each study:

- Bivariate random effects meta-analysis produces summary estimates with 95% credible and prediction regions.
- Include HSROC curve when **implicit threshold effects** are anticipated.



Where **multiple 2x2 tables** are available from some studies:

- Multiple thresholds model produces **summary estimates at each threshold**, with 95% CrIs and prediction intervals.
- Such synthesis should be carried out even when a single threshold is of interest for decision-making.



When the number of studies is small, informative/weakly informative priors for hyperparameters can be used. Some simplifications to the models can also be considered, based on knowledge of the test/data set and standard model fit tools.

3. Use in decision modeling

Results from a DTA meta-analysis can be used in a decision model:

- A probabilistic approach is required to propagate the joint uncertainty of the TPF and FPF estimates, and to correctly compute expected benefits in non-linear models.
- These uncertainties can relate to long-term consequences of each of the four outcomes of the 2x2 table (see Section 1).
- Careful consideration is required for selecting the appropriate synthesis output (e.g. predictive distribution, random effects mean etc) based on the relationship between the study populations/characteristics and the target population for the decision.
- If a meta-analysis reports results at multiple thresholds, it is possible to estimate the threshold that is optimal based on a certain criterion.

For further information: Technical Support Document 25 available from http://nicedsu.org.uk