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An empirical comparison of methods for meta-analysis of studies of diagnostic accuracy

XIII Cochrane Colloquium
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Outline

- Methods to be compared
- Nine example diagnostic meta-analyses
- Results
- Summary

Methods to compare

1. Separate random-effects meta-analysis of logit-transformed sensitivity and specificity, using:
   a) Empirical logit-transforms — Stata: `meta`
   b) Random-effects logistic regression — Stata: `xtlogit`
2. SROC curve by linear regression (Moses-Littenberg method)
3. Bivariate

   } SAS: `NLMIXED`
4. HSROC

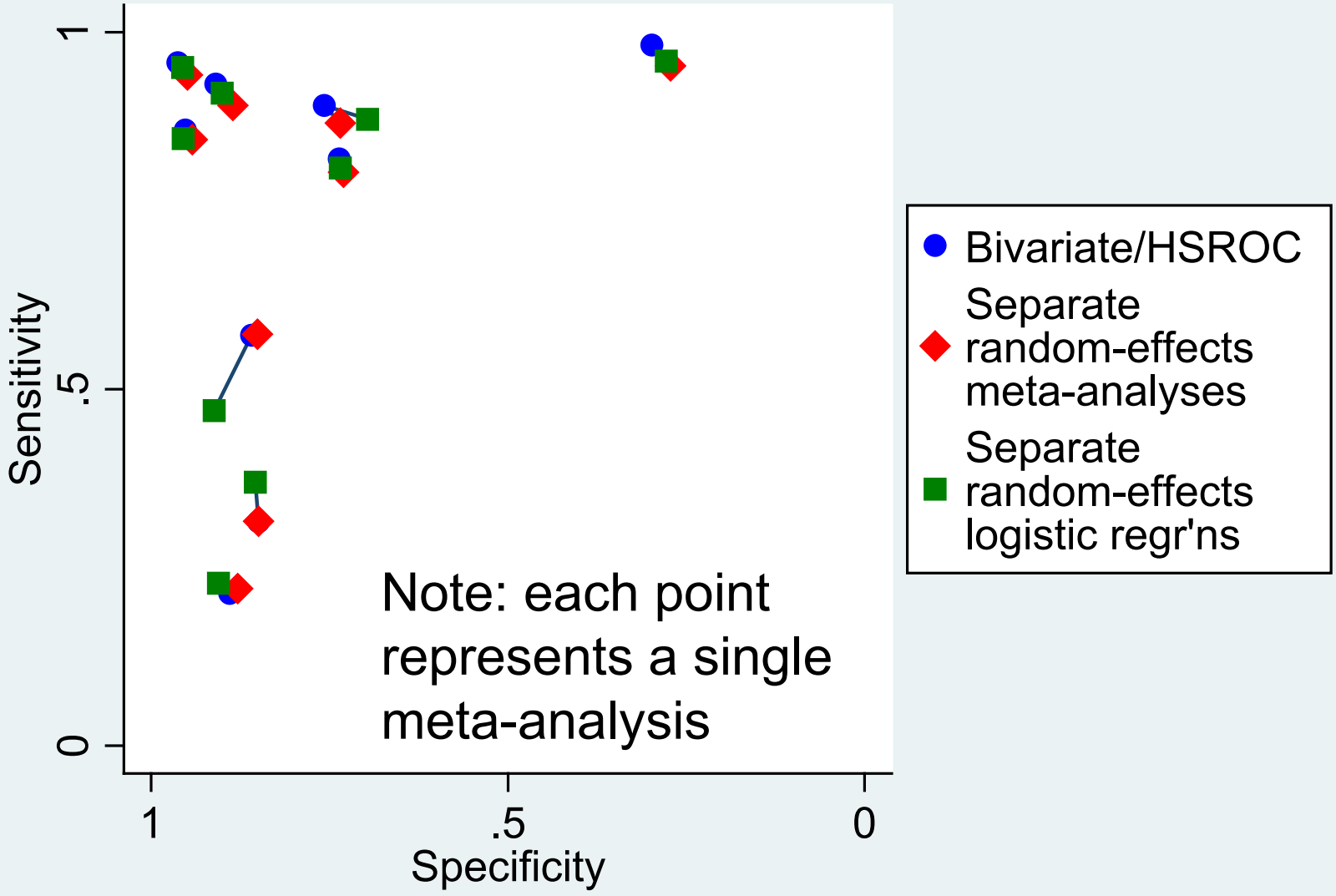
9 example meta-analyses

Test	Target Condition	No. of studies
Bacterial vaginitis	Pre-term birth	11
B-type natriuretic peptide	Heart failure	20
CT scan	Appendicitis	50
Electrocardiography	Left ventricular hypertrophy	17
Fetal fibronectin	Pre-term birth	21
Ottawa ankle rules	Fracture of the ankle / mid-foot	14
Alvarado prediction rules	Appendicitis	14
Scintigraphy	Appendicitis	28
Ultrasound	Appendicitis	141

Results

- Summary points
- Summary ROC (SROC) curves

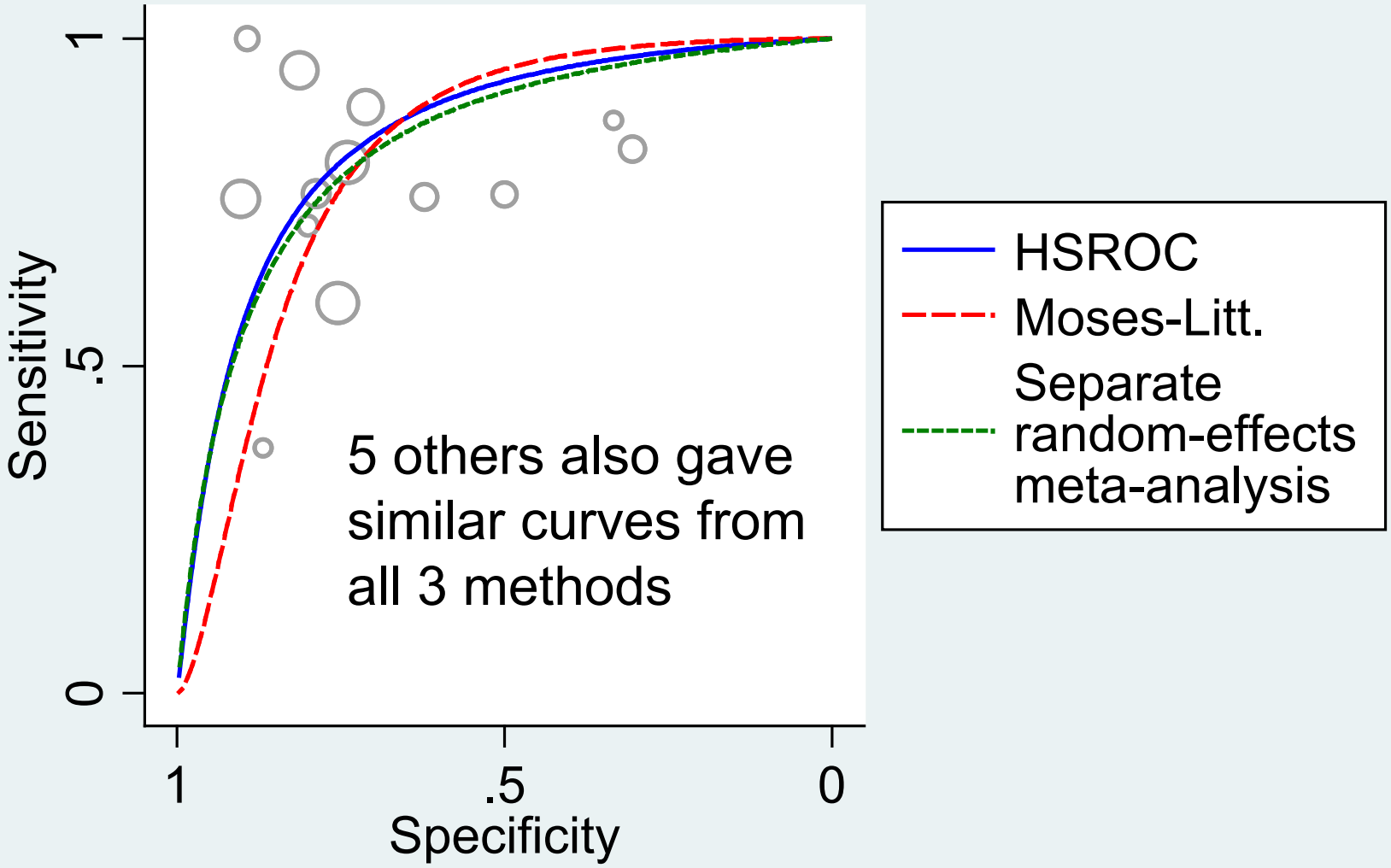
Comparison of summary points



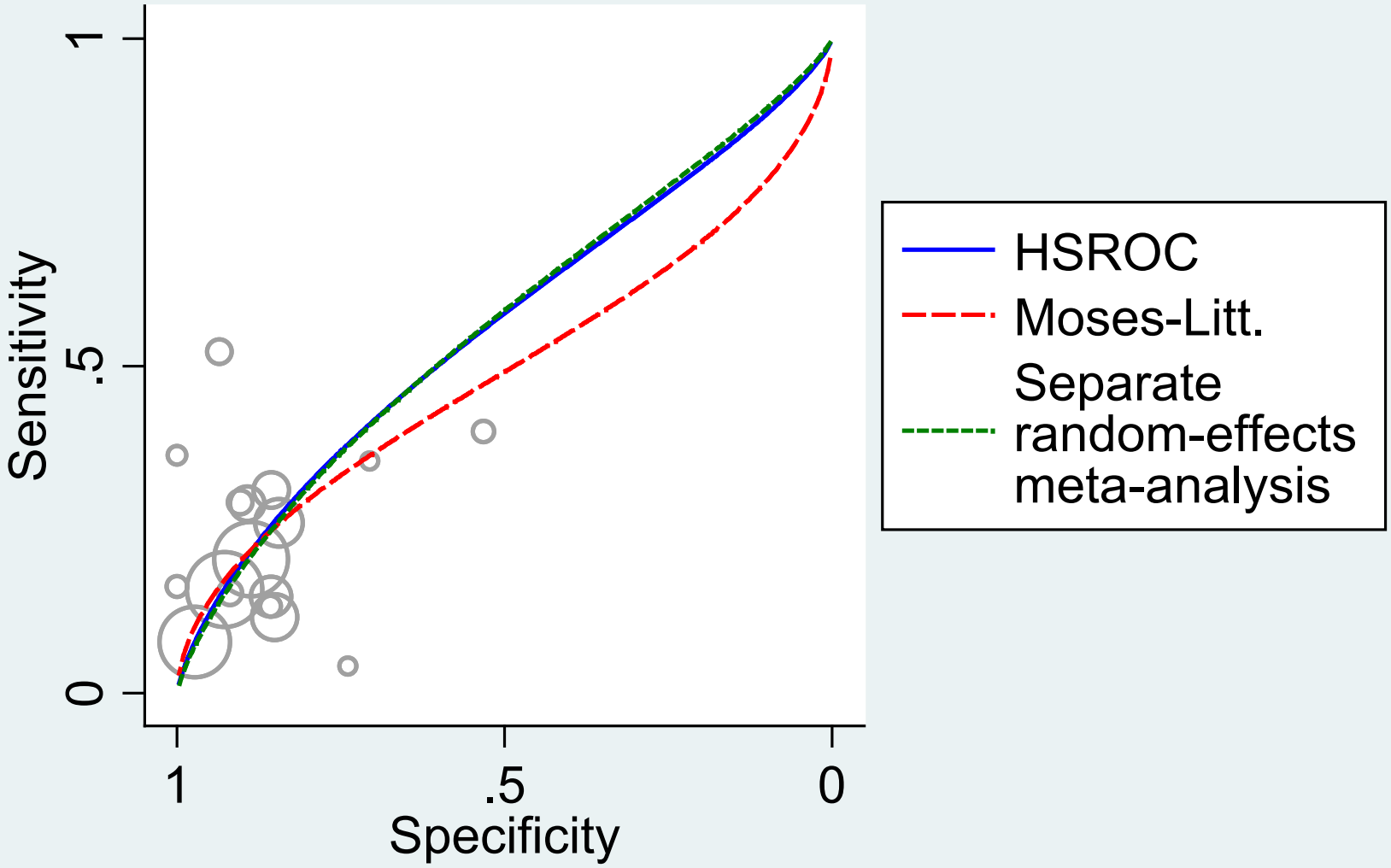
Summary curves

- Four examples:

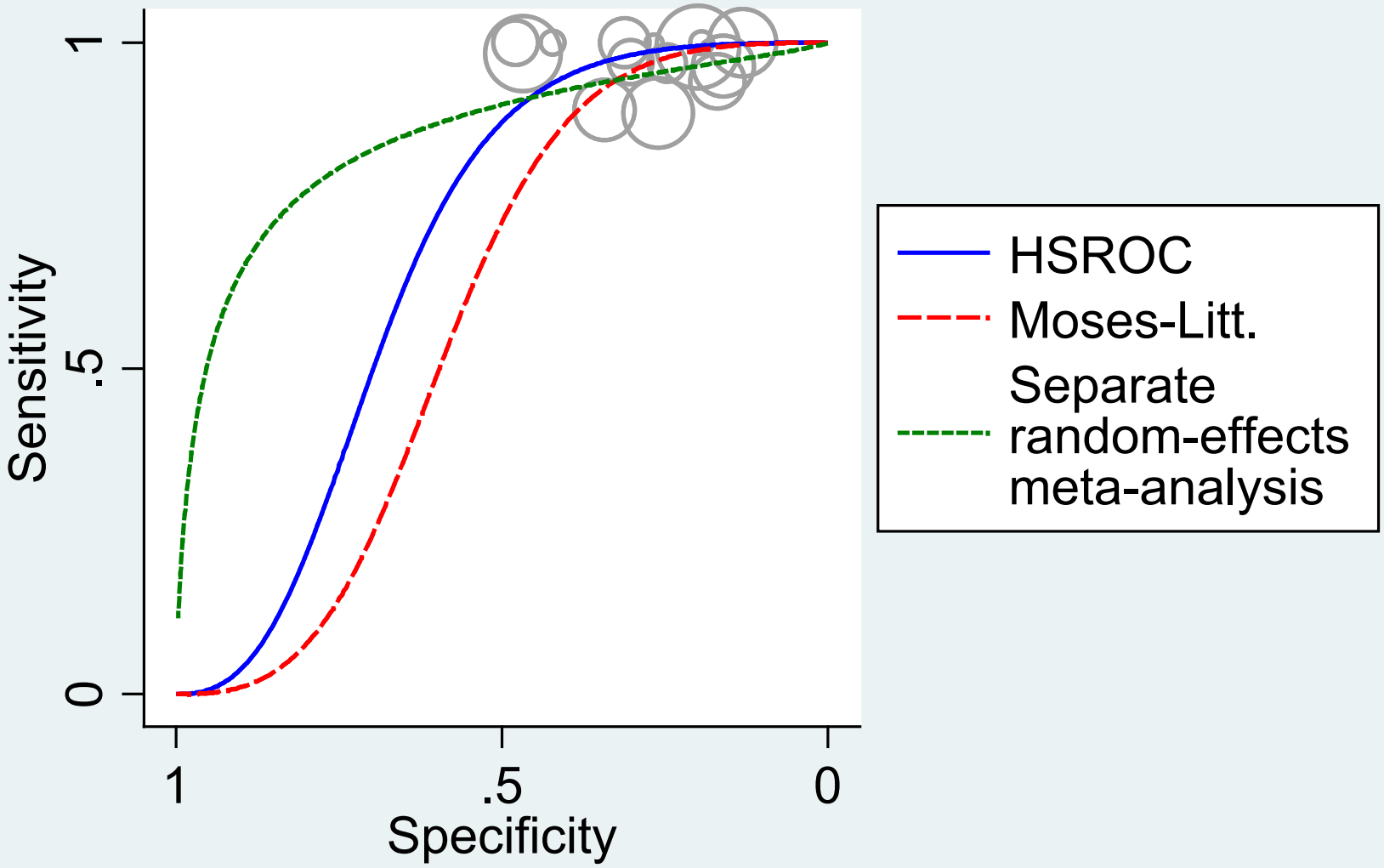
Alvarado prediction rules for appendicitis



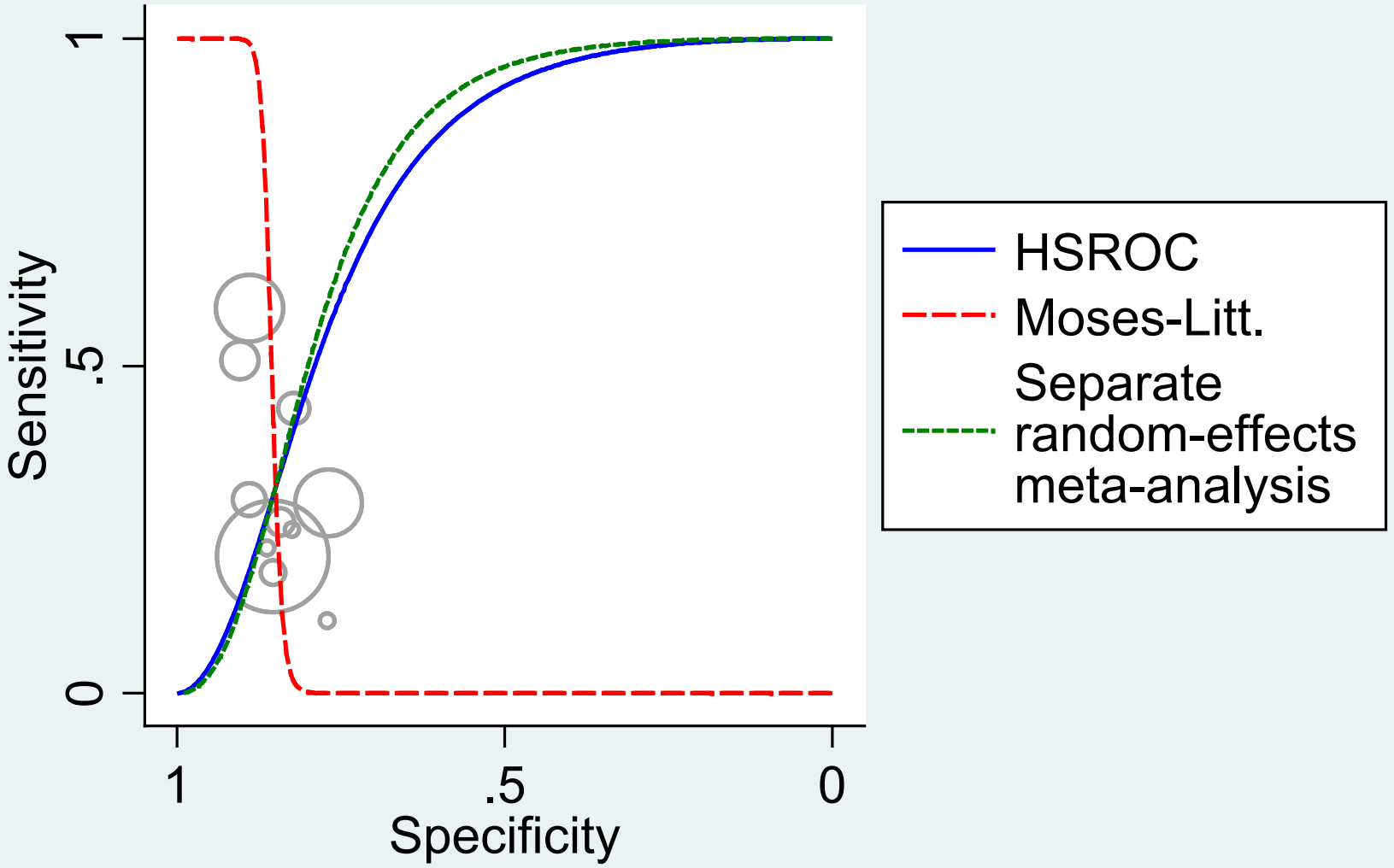
Electrocardiography for left ventricular hypertrophy



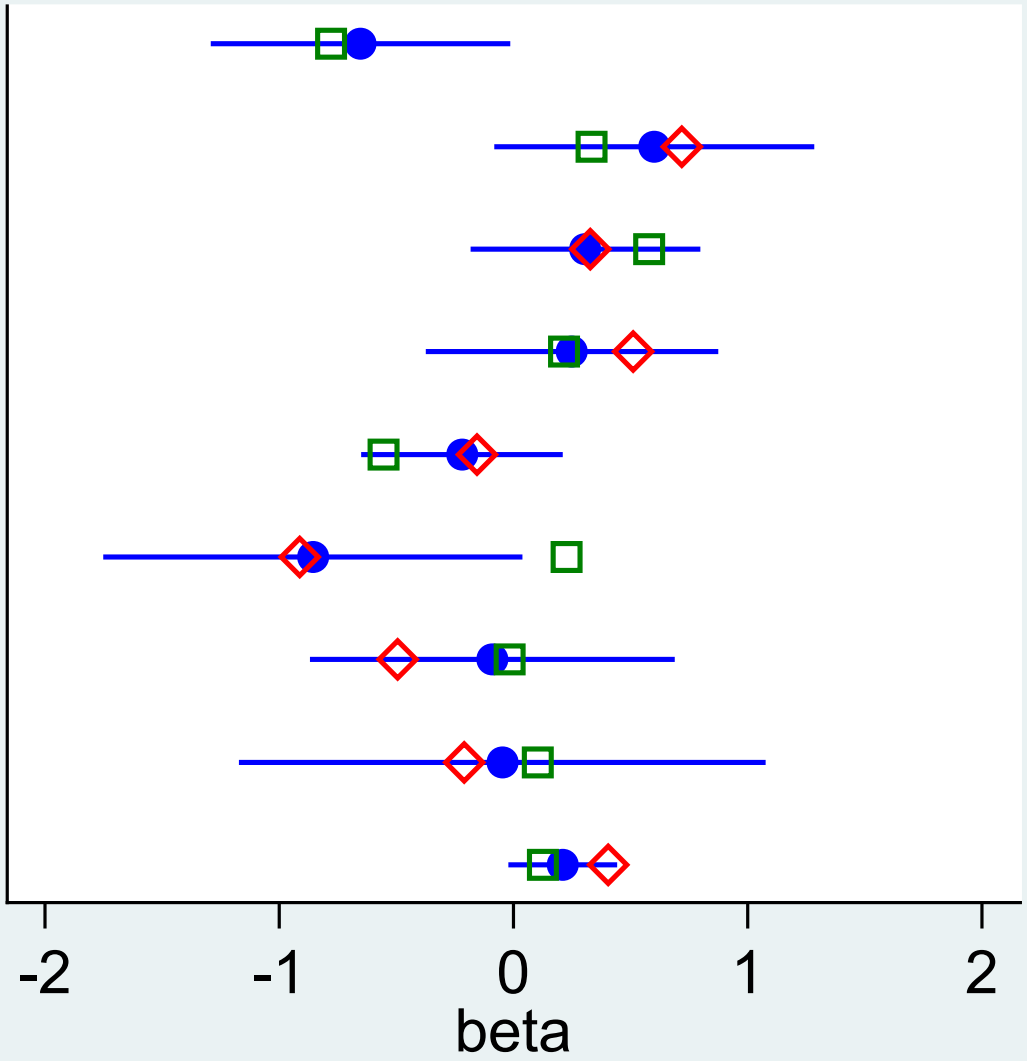
Ottawa ankle rules for fracture of ankle or mid-foot



Bacterial vaginitis for pre-term birth



Comparison of shape parameter (beta of HSROC model)



- HSROC/bivariate
- Moses-Litt.
- separate random-effects meta-analysis

Summary: comparing non-iterative methods to HSROC/bivariate model

Method	Summary operating point	SROC curve
Moses-Littenberg	N/A	OK if don't extrapolate
Separate random-effects meta-analyses	Good	OK if don't extrapolate

Results from random-effects logistic regression appear less consistent

Final thoughts

- Often little information on shape (scale / asymmetry) parameter even with many studies
- Heterogeneity widespread in *all* dimensions – a prediction region may be more appropriate than a confidence interval/region for the summary point

- More experience with methods is needed

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