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Biostatistics

Publication Bias in Cochrane Meta-Analyses

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Publication Bias

– Preference of journal editors to publish significant study results

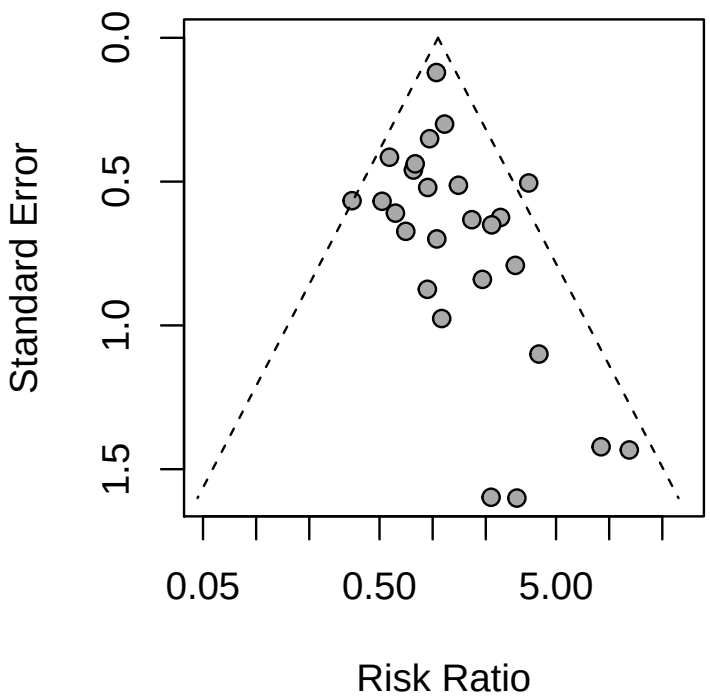
→ non-significant results remain in file-drawer

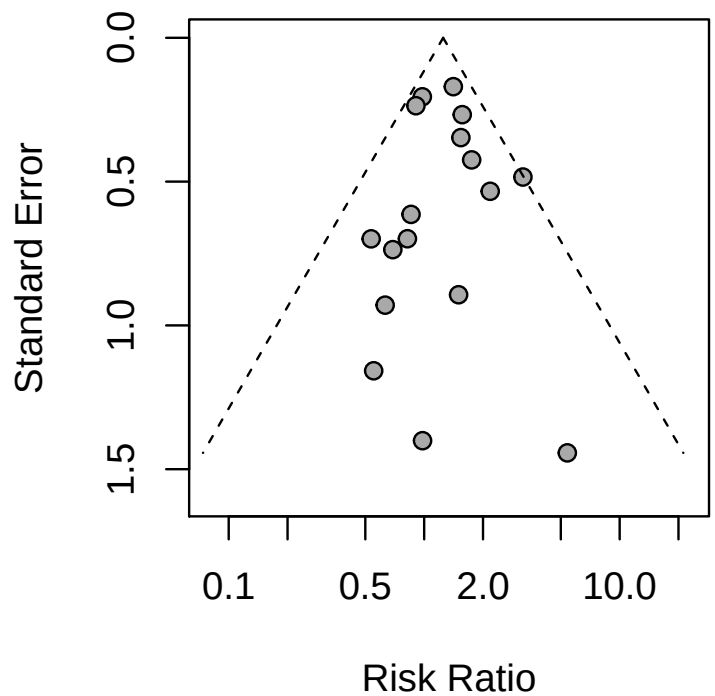
Systematic Reviews

- Summarise all evidence with regard to treatment with meta-analysis
- Biased if non-significant results are not available and included

Funnel Plot

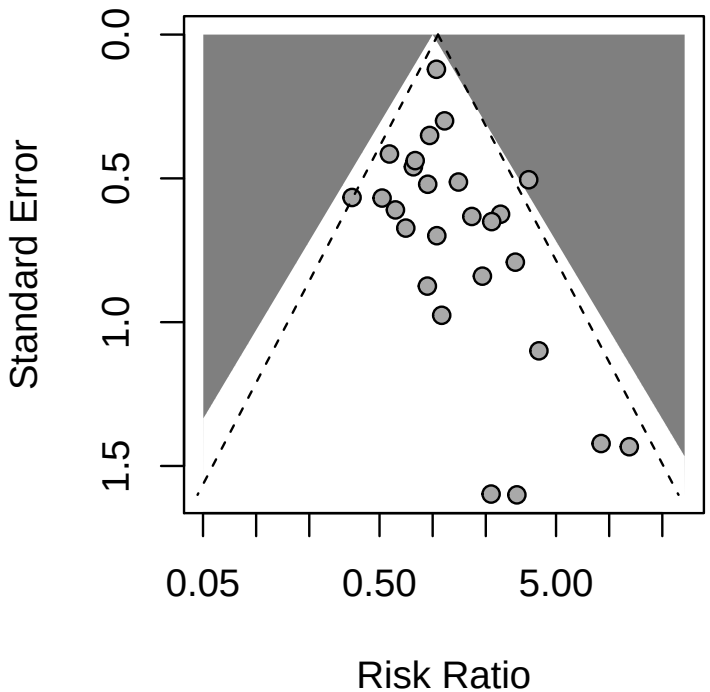
Look for funnel plot asymmetry:

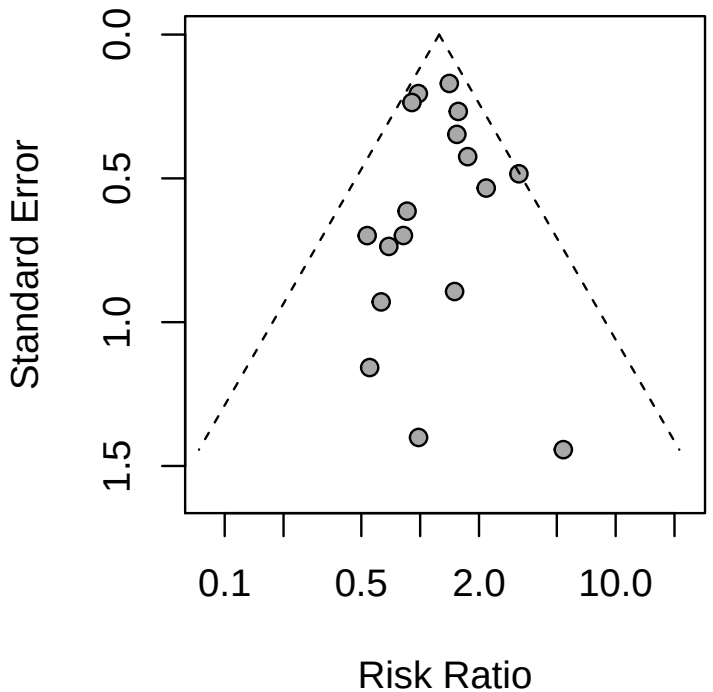




Funnel Plot

Effects with large standard errors have larger effect sizes (because they are only published if significant)





Detect Publication Bias

- Small study effect tests (funnel plot asymmetry)
- Excess significance tests

Excess Significance Test

Calculate power of each study, given that true effect size is fixed effects meta-analysis estimate.

Calculate:

$$p = \sum_{i=O}^{n} \left(\binom{n}{i} p^i (1-p)^{n-i} \right)$$

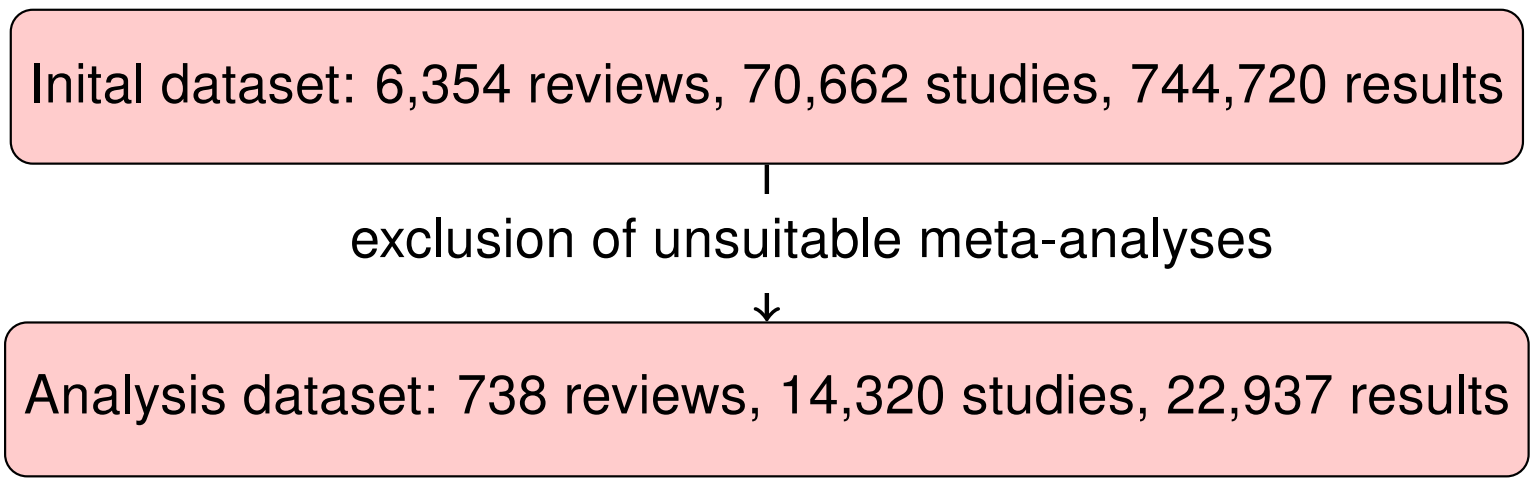
$O =$ observed no. of significant results, E expected based on power of studies.

Analysis

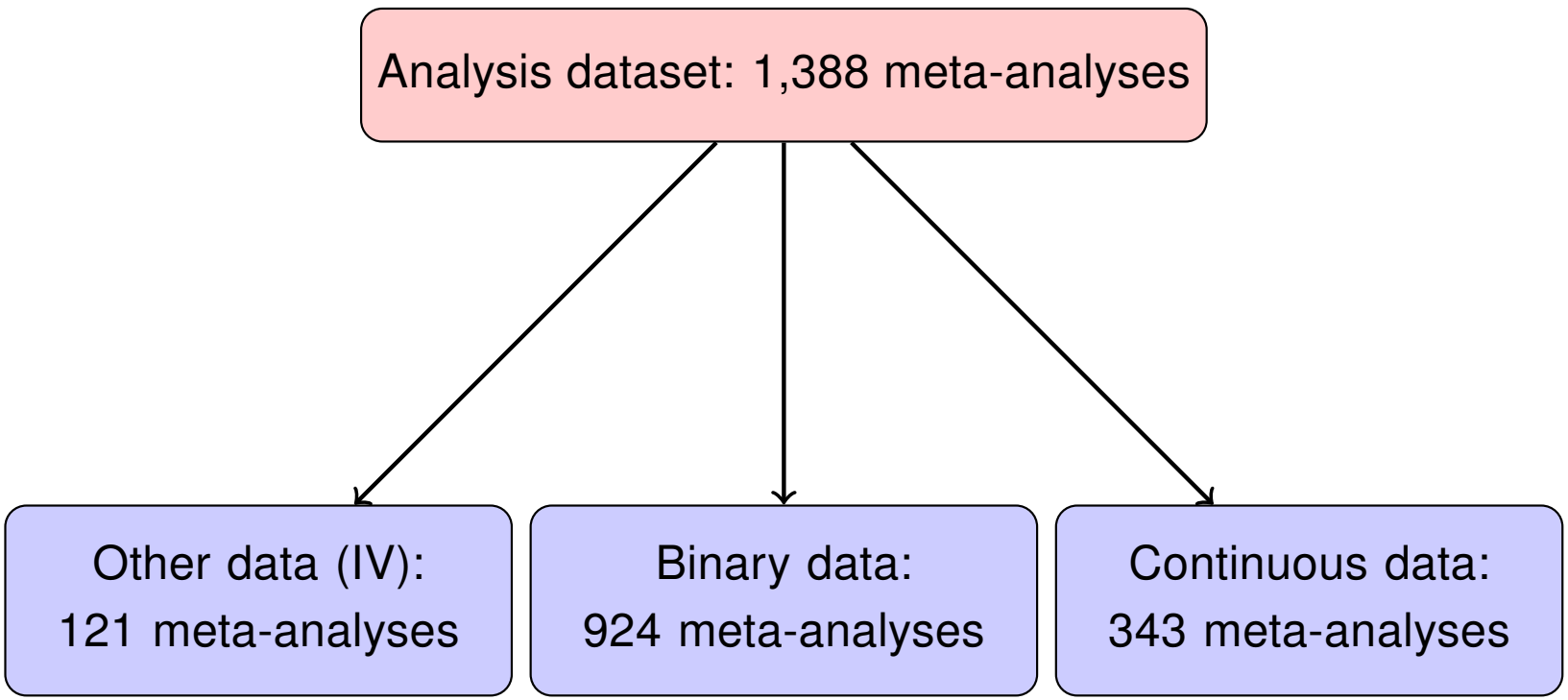
- Use meta-analyses from Cochrane.
- “The single most reliable source of evidence in clinical science

Analyse meta-analyses with publication bias tests.

The Cochrane Dataset



The Analysis dataset



Small Study Effect Tests

Weighted linear regression with std. error x_i and effect size y_i:

$$y_i = \beta_0 + \beta_1 x_i + \epsilon, \qquad \epsilon \sim N(0, x_i \sigma^2)$$

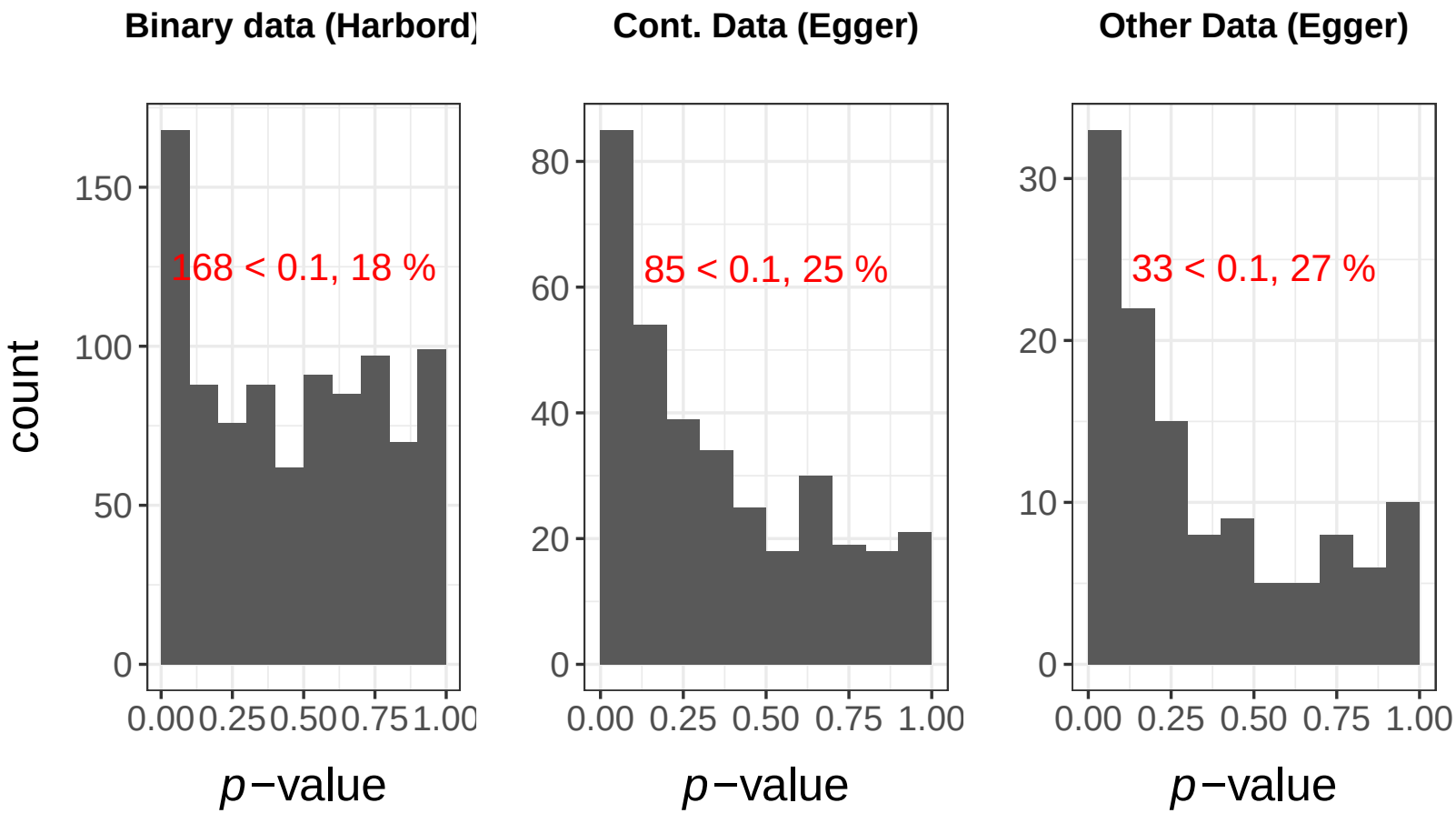
Test for $H0 : \beta_1 = 0$, no funnel plot asymmetry

Adjustments for Binary Data

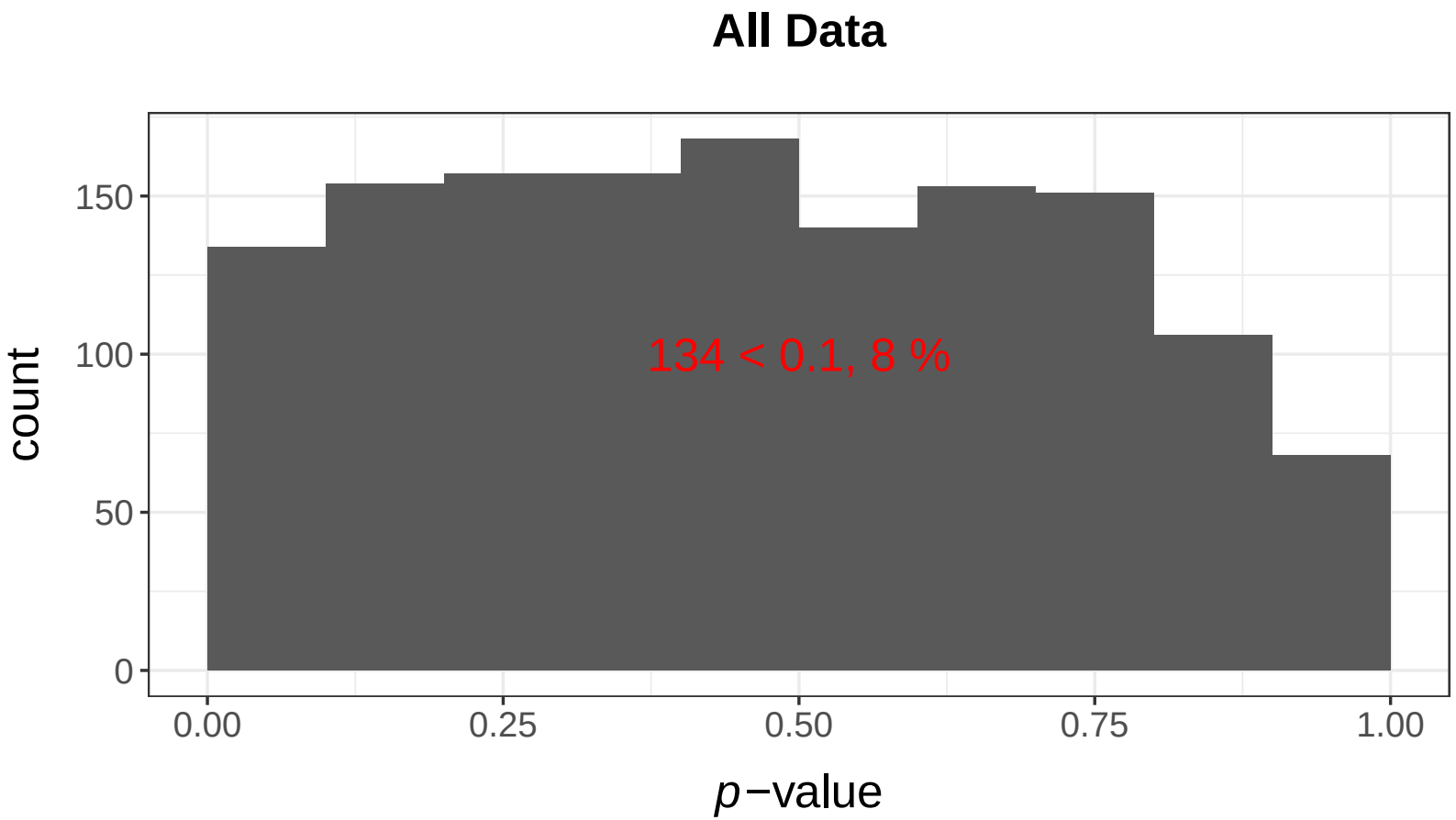
As recommended by Sterne et al. (2001)

- Log odds ratio and risk ratio θ and standard error se_θ are not independent
- Use score of binomial likelihood at log odds ratio $\theta_{\text{H0}} = 0$ instead of log odds ratio and the inverse Fisher information instead of se_θ

Small Study Effect Tests



Excess Significance Test



References

Sterne, J. A. C., Egger, M., and Smith, G. D. (2001). Investigating and dealing with publication and other biases in meta-analysis. *BMJ*, 323(7304):101–105.