

Bayesian meta-analysis

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⇒ a single quantitative summary of studies answering the *same research question*

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⇒ pool individual observations from multiple studies ?

- ⚠ potential differences in the pooled experiments
- ⚠ only aggregated summary statistics estimates (“effect sizes”) available
 - alongside uncertainty (e.g. standard errors)

Study Heterogeneity

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Often, different studies used different populations

⇒ potential extra-variability

+ different sample sizes ⇒ also impact the estimate and its variability

Meta-analysis random effects model

Common approach for meta-analysis:

$$y_i \sim \mathcal{N}(\theta_i, \sigma_i^2)$$

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⇒ between study variability: $y_i \sim \mathcal{N}(\mu, \sigma_i^2 + \tau)$

Hierarchical generalization of the fixed effect model:

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⇒ assume same average effect for each study

Bayesian meta-analysis in practice

Meta-analysis: a perfect usecase for Bayesian analysis ?

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Meta-analysis: a perfect usecase for Bayesian analysis ?

- few observations
- informative *prior*
- sequential

Going further

Scientific literature search

⚠ FIRST (!) exhaustive search of the scientific literature

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Evidence synthesis

Meta-analysis \in evidence synthesis

e.g. meta-regression, mechanistic modeling, ...

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Still active research domains:

- random effects model will down-weight studies with larger sample sizes
 - Serghiou & Goodman, *JAMA*, 2018

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- a bug or a feature ?*

Your turn !



Practical: exercise 6