

Empirical prior distributions for Bayesian meta-analyses of binary and time to event outcomes

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Bayesian model-averaged meta-analysis allows quantification of evidence for both treatment effectiveness μ and across-study heterogeneity τ . We use the Cochrane Database of Systematic Reviews to develop discipline-wide empirical prior distributions for μ and τ for meta-analyses of binary and time-to-event clinical trial outcomes. First, we use 50% of the database to estimate parameters of different required parametric families. Second, we use the remaining 50% of the database to select the best-performing parametric families and explore essential assumptions about the presence or absence of the treatment effectiveness and across-study heterogeneity in real data. We find that most meta-analyses of binary outcomes are more consistent with the absence of the meta-analytic effect or heterogeneity while meta-analyses of time-to-event outcomes are more consistent with the presence of the meta-analytic effect or heterogeneity. Finally, we use the complete database - with close to half a million trial outcomes - to propose specific empirical prior distributions, both for the field in general and for specific medical subdisciplines. An example from acute respiratory infections demonstrates how the proposed prior distributions can be used to conduct a Bayesian model-averaged meta-analysis in the open-source software R and JASP.