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A BAYSIAN APPROACH TO MODEL SELECTION PROCEDURES WITHIN MIXED TREATMENT COMPARISON FRAMEWORK

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OBJECTIVES: Model fit in Bayesian mixed treatment comparisons (MTC) is often assessed by the deviance information criterion (DIC). In some cases DIC is not conclusive. Our aim was to compare DIC with an alternative approach: formal Bayesian model comparison by estimating the posterior distribution over the model space.

METHODS: DIC is a criterion which combines posterior mean of the deviance and deviance of posterior means. Models with lower DIC should be preferred, however if the difference in DICs is small the decision should not be based solely on DIC. Marginal data density (MDD) expresses probability of observing given dataset. Decision rule based on Bayesian model comparison is that the model with highest a posteriori probability should be chosen. Data from few systematic reviews indexed in Pubmed were extracted in order to find MTC datasets for which DICs for fixed (FEM) and random effects models (REM) are very similar. Two continuous variables datasets were chosen. Posterior distributions and DICs were estimated in WinBugs. The Newton-Raftery estimator of MDD was implemented in Java, together with the Gibbs sampler. In both cases, in which DIC was not conclusive, two a priori structures over the model space were assumed: an uniform distribution and one penalizing the models for the excessive number of parameters.

RESULTS: In the first dataset difference in DICs was 1.3 (in favor REM), in the second dataset this difference was 2,0 (in favor FEM). In both cases REM turned out to have a higher value of MDD. Although a priori odds ratio was around 100:1 for FEM, the posterior distribution was in every case close to have probability of one (~0.9999) for the REM.

CONCLUSION: Decision about model selection should include tools of formal model comparison, as conclusions coming from it are always interpretable and coherent within Bayesian inference.