

## **Assessing the relative effect in hierarchical binomial models for meta-analysis**

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Clinical trials that assess treatment effects often rely on hierarchical Bayesian models for meta-analysis, particularly when data are sparse or rare events are encountered. Preserving randomization integrity in relative effect analyses is crucial to ensure unbiased effect estimates and valid inference. This work introduces a stratified Beta-Binomial Hierarchical Model (BBHM) for the meta-analysis of clinical trials, designed to maintain randomization principles while handling rare events effectively. Unlike standard BBHMs, the stratified BBHM separates the effect estimation across treatment arms within each study, addressing inherent dependencies and ensuring the results that refer to the relative effect under various levels of between-study heterogeneity. The findings demonstrate that the stratified BBHM yields robust and reliable estimates, particularly in settings with limited or zero-event data in some study arms, supporting its application in clinical trial meta-analyses where data sparsity is a challenge.