

Unexpected results and challenges when using mixture priors for Bayesian borrowing

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Please provide a brief biography for the Presenting author(s)

I currently work in the statistical innovation group at AstraZeneca, helping to develop and implement modern statistical methods within clinical trials. I have a PhD in Bayesian statistics, applying variational inference for feature selection in hierarchical models to large datasets.

Single topic, multi-speaker session, Workshop or Single presentation submission

A single presentation/poster

Single presentation or poster submission

There is a focus on statistical methods which use historical trial information to accelerate the delivery of medicine. Borrowing external information is appealing due to improved efficiency from smaller and faster trials, increased statistical power and fewer patients assigned to the control. Models can be constructed so that borrowing is “dynamic”, the similarity of the data helps to determine how much information is used.

Using a mixture prior for borrowing information is well established in the literature. Implementing these priors for a clinical trial naturally leads to questions regarding the prior worth, type I error pattern and model structure in the presence of covariates. The mixture prior and dynamic nature of the model can lead to some surprising results. Quantifying how much information is in the prior through the effective sample size (ESS) will depend on your choice of approach. I explain why each ESS approach can give different results. The shape of the type I error over the range of possible drift values will vary widely depending on the number of elements in your informed mixture prior. I explore how the dynamic updating drives this shape. Finally, care needs to be taken with the construction of the design matrix when incorporating covariates in the model. I describe how to ensure the information on the historical control group is on the same scale as the target trial when incorporating categorical covariates, even if the groups are unbalanced.