

TITLE: Robust Bayesian Sequential Borrowing for Multi-Population Clinical Programmes

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ABSTRACT: Practical and ethical constraints limit the size of paediatric and adolescent trials, motivating extrapolation from larger adult programmes. Existing borrowing methods treat all historical sources symmetrically and do not reflect the gradient of similarity between adjacent populations in a sequential programme.

We introduce Robust Bayesian Sequential Borrowing (RBSB), a framework that encodes programme order through path-dependent borrowing. At each stage, a robust mixture prior combines an informative component aggregating evidence along admissible adjacent-only paths with a unit-information component that safeguards against prior-data conflict. Posterior mixture weights, derived in closed form from marginal likelihood ratios, automatically attenuate borrowing when heterogeneity arises between sequential populations. The framework supports prospective evaluation of Bayesian Type I error, power, and assurance at both the study and programme level, aligning naturally with sequential Go/No-Go decision rules. Simulations illustrating the operating characteristics of the method under a range of treatment-effect trajectories will be presented.

PRESENTING AUTHOR BIO: Erik Hermansson is a Statistical Science Director in Statistical Innovation at AstraZeneca and a PhD student at the Faculty of Informatics and Data Science at the University of Regensburg. He works on the design and analysis of clinical trials. His research focuses on the use of external information in clinical trials and decision-making, and on the estimation of treatment-effect heterogeneity.