Bayesian Borrowing Methods for Count Data: Analysis of Incontinence Episodes in Patients with Overactive Bladder

Authors : Akalu Banbeta, Emmanuel Lesaffre, Reynaldo Martina, Joost Van Rosmalen

Abstract : Including data from previous studies (historical data) in the analysis of the current study may reduce the sample size requirement and/or increase the power of analysis. The most common example is incorporating historical control data in the analysis of a current clinical trial. However, this only applies when the historical control dataare similar enough to the current control data. Recently, several Bayesian approaches for incorporating historical data have been proposed, such as the meta-analytic-predictive (MAP) prior and the modified power prior (MPP) both for single control as well as for multiple historical control arms. Here, we examine the performance of the MAP and the MPP approaches for the analysis of (over-dispersed) count data. To this end, we propose a computational method for the MPP approach for the Poisson and the negative binomial models. We conducted an extensive simulation study to assess the performance of Bayesian approaches. Additionally, we illustrate our approaches on an overactive bladder data set. For similar data across the control arms, the MPP approach outperformed the MAP approach with respect to thestatistical power. When the means across the control arms are different, the MPP yielded a slightly inflated type I error (TIE) rate, whereas the MAP did not. In contrast, when the dispersion parameters are different, the MAP gave an inflated TIE rate, whereas the MPP did not.We conclude that the MPP approach is more promising than the MAP approach for incorporating historical count data.

Keywords : count data, meta-analytic prior, negative binomial, poisson

Conference Title : ICSDS 2022 : International Conference on Statistics and Data Science

Conference Location : Toronto, Canada

Conference Dates : June 16-17, 2022