**Bayesian analysis of augmented mixed beta regression models for periodontal proportion data**

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Continuous (clustered) proportion data often arise in various domains of medicine and public health where the response variable of interest is a proportion (or percentage) quantifying disease status for the cluster units, ranging between zero and one. However, because of the presence of relatively disease-free as well as heavily diseased subjects in any study, the proportion values can lie in the interval $[0, 1]$. While beta regression can be adapted to assess covariate effects in these situations, its versatility is often challenged because of the presence/ excess of zeros and ones because the beta support lies in the interval $(0, 1)$. To circumvent this, we augment the probabilities of zero and one with the beta density, controlling for the clustering effect. Our approach is Bayesian with the ability to borrow information across various stages of the complex model hierarchy and produces a computationally convenient framework amenable to available freeware. The marginal likelihood is tractable and can be used to develop Bayesian case-deletion influence diagnostics based on $q$-divergence measures. Both simulation studies and application to a real dataset from a clinical periodontology study quantify the gain in model fit and parameter estimation over other ad hoc alternatives and provide quantitative insight into assessing the true covariate effects on the proportion responses.

**Keywords**: augmented beta; Bayesian; outliers; periodontal disease; q-divergence.