

Colloquium
Michigan State University
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Beyond the Generalized Linear Mixed Model: a Hierarchical
Bayesian Perspective

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Abstract

Analyses based on the generalized linear mixed model (GLMM) has become increasingly important in the agricultural and natural resource sciences, particularly for those studying measures of fitness, health, and/or fertility where responses are typically non-normal. Researchers conducting these analyses typically concentrate their attention on fixed treatment effects, whereas the existence of any design structure is hopefully respected by proper random effects specifications. Nevertheless, there may be substantial issues raised with the standard inferential procedures in some cases, particularly for binary responses, as GLMM inferences are often justified using asymptotic arguments. I'll share my perspective on these issues as both a consulting statistician in the agricultural sciences and as a researcher in quantitative genetics and genomics. Our group has embraced hierarchical Bayesian analyses in quantitative genetics research because of a "large p , small n " problem that typically nullifies the use of statistical procedures based on asymptotics. At first glance, this problem may not seem to be emblematic of agricultural/natural resource research data. However, it can be particularly acute in GLMM analyses of typical agricultural experiments, depending upon the distribution of the data and the complexity of the experimental design. Hierarchical Bayesian model constructions also allow investigators to explore other phenomena that could not be otherwise addressed using current GLMM approaches. Substantially enhanced computing resources and algorithmic developments allow Bayesian analyses to be far more tractable than they were just a couple of decades ago.