

On evaluating the performance of model fit and selection indices for Bayesian piecewise growth modeling: The effect of model misspecification and missing data

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The way social and behavioral phenomena change over time is a central question to latent growth modeling. The piecewise growth model (PGM) is an extension of the latent growth model and analyzes nonlinear change processes consisting of distinct growth phases by introducing knots. The Bayesian framework offers additional advantages to PGMs by estimating complex growth phases and incorporating prior information. Applications of Bayesian PGMs pose three important issues. First, researchers should consider knot placement to determine specific time points in which growth patterns change. This issue should be addressed through the use of model fit and selection indices to detect model misspecification in Bayesian PGMs. Second, it is common to encounter missing data in longitudinal data analysis, and the presence of missing data will negatively impact the performance of those indices. Third, the performance of model fit and selection indices can depend on how prior distributions are specified. Here we conducted a simulation study to examine the impact of model misspecification and missing data on the performance of Bayesian model fit and selection indices (PPP-value, BCFI, BTLI, BRMSEA, BIC, and DIC), with an additional focus on prior sensitivity. The factors manipulated were sample size, missing data, knot placement, and specification of prior distributions. Results indicated that the performance of model fit and selection indices was exacerbated as the degree of model misspecification and amount of missing data increased. In addition, we found advantages of different prior specifications for certain conditions in model selection. We recommend researchers use available model fit and selection indices as a model comparison toolbox. Detailed guidelines for researchers and future research directions are provided. We are hopeful that this research can facilitate wiser implementation of Bayesian PGMs.