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QUADRATIC APPROXIMATION BASED CONFIDENCE INTERVAL FOR THE BETA-BINOMIAL INVERSE-DISPERSION PARAMETER FOR HIGHLY OVERDISPERSED BINOMIAL DATA

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The Beta-Binomial distribution is a commonly used Binomial mixture distribution in handling overdispersion in binomial outcome data. A re-parameterized form of the Beta-Binomial distribution characterized by number of trials, n , per-trial probability of success, π , and an inverse dispersion parameter, θ , is considered. The high overdispersion is defined as the binomial data with $\theta \leq 1$.

In this study, an alternative confidence interval estimate for θ based on quadratic approximation to the log likelihood profile is considered. Thousand data sets for each of the 135 different combinations of parameter settings are simulated, and the coverage accuracy of the confidence interval mentioned above is explored.

Based on these results it was found that the quadratic approximation based confidence interval for the Beta-Binomial inverse dispersion parameter has excellent coverage accuracy for highly overdispersed binomial data. Even though this method is computationally easier and simpler than previously proposed confidence interval methods, the assumption that the likelihood surface is quadratic must be satisfied in applications.