SEMI-PARAMETRIC ESTIMATION FOR THE DISPERSION PARAMETER IN THE ANALYSIS OF OVER OR UNDER DISPERSED COUNT DATA

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In the analysis of over or under dispersed count data, we investigate estimators, based on the models which assume only the first two moments of counts, for the dispersion parameter when maximum likelihood estimator of this parameter obtained based on the negative binomial model may suffer from lack of robustness within the class of models having the same mean-variance relationship as the negative binomial. In this paper, estimators, based on double extended quasi-likelihood (Lee and Nelder, Biometrika, 88, 987-1006), pseudo-likelihood, and optimal quadratic estimating equations of Crowder (1987, Biometrika, 74, 591-597) are obtained and compare these, by simulation, in terms of bias and efficiency, with the maximum likelihood estimator discussed by Piegorsch (1990, Biometrics, 46, 863-867) and the method of moments estimator and the extended quasi-likelihood estimator investigated by Clark and Perry (1989, Biometrics, 45, 309-316). These comparisons show that the estimator obtained based on double extended quasi-likelihood has superior bias and efficiency properties except for small sample size $n = 10$ in which case the estimator using optimal quadratic estimating equations of Crowder has superior efficiency property. Three real life data sets arising biostatistical practices are analyzed and findings from these analyses are quite similar to what are found from the simulation study.