LATENT CLASS MULTILEVEL MODELLING OF ORDINAL DENTAL DATA

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In oral health research clustered ordinal data often possess an excess of zeros and may suffer from over-dispersion. In some instances this can skew cluster means such that they no longer follow a standard distribution, e.g. normal. Therefore, assuming a zero-inflated and/or overdispersed Poisson or binomial outcome may give rise to poorly fitting models with no robust determination of zeros, distribution tails, and random effects. Varied strategies have been adopted to deal with clustering, but these often assume continuous latent variables, whereas latent class methodology has been proposed for both zero-inflated modelling and for multilevel modelling. A combined strategy was considered that addressed simultaneously the issues of zero-inflation, over-dispersion, and the determination of non-parametric random effects. Periodontal epidemiological survey data from Kenya formed a 3-level hierarchy: multiple site measurements nested within teeth, grouped by individual. Clinical attachment level and pocket probing depth were modelled in relation to both fixed and random effects for a host of socio-demographic and other clinical variables. The objective was to determine model fit and to contrast models using continuous latent variables with models using latent classes. Inherent data complexity was meaningfully revealed through features of the multilevel latent class structure. The latent class models fitted well and were superior to their continuous alternative.