Statistical appendix

For a given child on a given measurement occasion t, write Y_t for the pair of integers representing the number of bruises recorded in TEN and non-TEN locations. For example, a child who, on a particular day t, had no TEN-sited bruises but two bruises elsewhere, would have $Y_t = (0,2)$. Multilevel Poisson regression was used to analyse this bivariate count data, quantifying how the average number of bruises in the two locations varied with study group (PA, IBD or control) and with the child's developmental group. Using the statistical software R, generalised linear mixed models with a log link function were fitted. Interactions between study group and developmental group, and between study group and bruise location were allowed for, additionally including a random effect for each child's general tendency to bruise. Mathematically, the following model was fitted

$$\log E(Y_t \mid x_t, b) = x_t\beta + b,$$

where the matrix x_t included columns relating to study group, age group on occasion t and bruise location, β was the fixed effects to be estimated, and b was the (assumed normally-distributed) child-specific random effect whose variance is to be estimated.

Likelihood ratios were used to summarise the results of each model fit. These likelihood ratios compare the relative chance of a particular pattern of bruising A arising from different study groups. Writing x_t for the covariate matrix of a particular child and x_t' for an otherwise identical child from a *different* study group,

$$\frac{P(Y_t \in A \mid x_t, b = 0)}{P(Y_t \in A \mid x_t', b = 0)}$$

was computed for all possible values of x_t, for all pairs of study groups, and for all events A of the form $B \times C$, where $B, C \in \{\{0\}, \{1\}, \{2,3,4, \dots\}\}$. This allowed us to weigh up the relative likelihood of, for example, the evidence $A = \{0\} \times \{2,3,4, \dots\} = \{(0,2), (0,3), (0,4), \dots\}$ that an average child ($b = 0$) has no bruises in TEN locations but *at least* two bruises elsewhere.

For model fitting, the reference group was taken to be the accidentally injured children. We included main effects for group, child's age, and location of bruise, and interactions between group and age, and group and location.