

## Aplikasi General Linear Mixed Model (GLMM) Bi-respon Pada Respon Pasien Penderita Diabetes Mellitus

Adji Achmad Rinaldo Fernandes <sup>1)</sup>, Sulis Harmamik <sup>2)</sup>

<sup>1)</sup> Staf Pengajar Program Studi Statistika Jurusan Matematika Fakultas MIPA, Universitas Brawijaya, Malang

<sup>2)</sup> Alumni Program Studi Statistika Jurusan Matematika Fakultas MIPA Universitas Brawijaya, Malang

### ABSTRAK

General Linear Mixed Model (GLMM) Bi-respon merupakan alternatif penyelesaian data longitudinal dengan respon ganda yang menggabungkan efek tetap, efek acak dan vektor realisasi dari proses bi-respon ke dalam model statistik tunggal. GLMM dapat mengatasi korelasi antara pengamatan pada data longitudinal dengan respon data kontinyu. Pembentukan model GLMM diawali dengan penentuan model tentatif melalui eksplorasi data. Eksplorasi data terdiri dari beberapa cara, yaitu profil individu, struktur rata-rata, struktur ragam, dan struktur korelasi. Pembentukan GLMM dilakukan melalui pemilihan efek tetap menggunakan metode Maximum Likelihood (ML), dan pemilihan komponen ragam (jumlah efek acak) menggunakan metode Restricted Maximum Likelihood (REML). Berdasarkan hasil perbandingan nilai AIC, penelitian mengenai penyakit Diabetes Mellitus Tipe 2 sesuai apabila dimodelkan menggunakan GLMM dengan satu respon. Elemen matriks cross correlations yang terbentuk berkisar antara 0,3 sampai 0,6 dengan korelasi antara dua respon sebesar 0,5526 dan menghasilkan struktur peragam unstructured covariance (tidak berstruktur).

Kata kunci: Longitudinal, GLMM, Bi-Respon

### ABSTRACT

General Linear Mixed Model (GLMM) Bi-respon was an alternative solution for longitudinal data with bi-responses which joining fixed effects, random effects and vector of realization of bi-responses process into single statistical model. GLMM can overcome the correlation between observations in longitudinal data for the response in the form of continuous data. In each formation GLMM model beginning with the determination of a tentative model through exploration of data. Exploration data covering several aspects of the individual profile, average structure, variance structure, and correlation structure. Building GLMM was done by selecting fixed effects under using Maximum Likelihood (ML) method, and the selection of variance components (the number of random effects) using Restricted Maximum Likelihood (REML) method. Based on the comparison of AIC value, Diabetes Mellitus Type 2 disease data was better to be modeled using GLMM with one response. Cross correlations matrix elements were about 0,3 to 0,6 and produced unstructured covariance. Correlation coefficient between two responses was 0,5526 and produced unstructured covariance.