Fitted GLMM: 4/28/22

$\begin{cases} 1 & \text{prog.} \\ 0 & \text{else} \end{cases}$

$$\log\left(\frac{\hat{E}(Y_{ij} \mid b_i)}{T_{ij}}\right) = 1.071 + 0.0512\, X_{1ij}$$

4 fixed effect coefs

$$- 0.0004996\, X_{2ij} - 0.3062\, X_{1ij} X_{2ij}$$

$\begin{cases} 1 & \text{post-base} \\ 0 & \text{else} \end{cases}$

$$+ b_{0i} + b_{2i} X_{2ij}$$

Interpreting coefs $\Rightarrow$ "Typical individual" ($b_{0i} = b_{2i} = 0$)

- or when comparing two individuals $\rightarrow$ for same rand. effects.

Variances (est). of rand. effects:

$\hat{Var}(b_{0i}) = 0.4999 \quad \leftrightarrow \quad \hat{SD}(b_{0i}) = 0.7070$

$\hat{Var}(b_{2i}) = 0.2319 \quad \leftrightarrow \quad \hat{SD}(b_{2i}) = 0.4816$

$\hat{Corr}(b_{0i}, b_{2i}) = 0.16$

3 variance/covariance parameters

$= 4 + 3 = 7$ total parameters

Individual subject w/ rand. effects $\underline{b}_i = \begin{pmatrix} b_{0i} \\ b_{2i} \end{pmatrix}$

① Placebo at baseline:

$$\frac{E(Y_{ij} \mid \underline{b_i})}{T_{ij}} = \exp(\beta_0 + b_{0i})$$

Seizure rate per week

② Progabide at baseline

$$\frac{E(Y_{ij} \mid b_0)}{T_{ij}} = \exp(\beta_0 + b_{0i} + \beta_1)$$

③ Placebo post-baseline

$$\frac{E(Y_{ij} \mid b_i)}{T_{ij}} = \exp(\beta_0 + b_{0i} + \beta_2 + b_{2i})$$

④ Progabide post-baseline

$$\frac{E(Y_{ij} \mid b_i)}{T_{ij}} = \exp(\beta_0 + b_{0i} + \beta_1 + \beta_2 + b_{2i} + \beta_3)$$

Interpreting β_2:

$$\frac{\text{Seizure rate indiv. placebo post-baseline}}{\text{Seizure rate indiv. placebo at baseline}}$$

$$= \frac{\exp(\beta_0 + b_{0i} + \beta_2 + b_{2i})}{\exp(\beta_0 + b_{0i})} = \exp(\beta_2 + b_{2i})$$

Estimates of Sample Variance

$$s^2 = \frac{\sum (y_i - \bar{y})^2}{n-1} \qquad S^2_{MLE} = \frac{\sum (y_i - \bar{y})^2}{n}$$

- Restricted maximum likelihood
  ↳ random effects (variances)

↳ biased
- Maximum Likelihood
  → fixed effects (β's)

Do we need b_{2i}?

$$H_0: \sigma_2^2 = 0, \quad \sigma_{02} = 0$$

Marginal Model – Y_{ij} = j^{th} observation on individual i

↳ Specify $E(Y_{ij})$, $Var(Y_{ij})$, $Cov(Y_{ij}, Y_{ik})$ $j \neq k$

- no distributional assumptions

$$\log(E(Y_{ij})) = \beta_0 + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \beta_3 X_{1ij} X_{2ij} + \log(T_{ij})$$

$$\underline{Y_i} = \begin{pmatrix} Y_{i1} \\ Y_{i2} \\ Y_{i3} \\ Y_{i4} \end{pmatrix} \qquad Corr(\underline{Y_i}) = \begin{bmatrix} 1 & \rho & \rho & \rho \\ \rho & 1 & \rho & \rho \\ \rho & \rho & 1 & \rho \\ \rho & \rho & \rho & 1 \end{bmatrix}$$

Compound symmetry

$$Var(E(Y_{ij})) = E(Y_{ij})$$