Three Fundamental Models

Component	M1 Linear	M2 Hierarchical Linear	M3 Hierarchical Logistic
Observation	$y_i \sim N(x_i^T \beta, \tau_e^{-1})$	$y_{ij} \sim N(x_{ij}^T \beta + u_i, \tau_e^{-1})$	$y_{ij} \sim \text{Bernoulli}(\text{logit}^{-1}(x_{ij}^T \beta + u_i))$
Regression coefficients β	$\beta \sim N(0, \Gamma_\beta)$	$\beta \sim N(0, \Gamma_\beta)$	$\beta \sim N(0, \Gamma_\beta)$
Random effects u	—	$u_i \sim N(0, \tau_u^{-1})$	$u_i \sim N(0, \tau_u^{-1})$
Residual precision τ_e	$\tau_e \sim \text{Gamma}(\alpha_e, \beta_e)$	$\tau_e \sim \text{Gamma}(\alpha_e, \beta_e)$	—
Random-effects precision τ_u	—	$\tau_u \sim \text{Gamma}(\alpha_u, \beta_u)$	$\tau_u \sim \text{Gamma}(\alpha_u, \beta_u)$