

Homework # 2
Answer Key

1. The linear mixed model that corresponds to the HLM on page 65 (of random intercept notes):

$$\begin{aligned}(\text{math})_{ij} &= \gamma_{00} + \gamma_{01}(\overline{\text{SES}})_j + \gamma_{10}(\text{SES}_{ij} - \overline{\text{SES}}_j) \\ &\quad + \gamma_{20}(\text{female})_{ij} + \gamma_{30}(\text{minority})_{ij} + U_{0j} + R_{ij}\end{aligned}$$

and

- $R_{ij} \sim N(0, \sigma^2)$ *i.i.d.*
- $U_{0j} \sim N(0, \tau_0^2)$ *i.i.d.*
- R_{ij} and U_{0j} independent

2. The corresponding marginal model:

$$(\text{math})_{ij} \sim N(\mu_{ij}, \text{var}(\text{math}_{ij})) \quad \textit{i.i.d.}$$

where

$$\mu_{ij} = \gamma_{00} + \gamma_{01}(\overline{\text{SES}})_j + \gamma_{10}(\text{SES}_{ij} - \overline{\text{SES}}_j) + \gamma_{20}(\text{female})_{ij} + \gamma_{30}(\text{minority})_{ij}$$

and

$$\text{var}(\text{math}_{ij}) = \sigma^2 + \tau_0^2$$