Edpsych/Psych/Stat 587
Spring 2021
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Homework # 2
Due tba

Use the following HLM model to answer questions below:

1. **Level 1**

$$\text{math}_{ij} = \beta_{0j} + \beta_{1j}(\text{SES}_{ij} - \overline{\text{SES}}_j) + \beta_{2j}(\text{female}_{ij}) + \beta_{3j}(\text{minority}_{ij}) + R_{ij}$$

where $R_{ij} \sim N(0, \sigma^2)$ and independent (within and between schools).

Level 2

$$
\begin{aligned}
\beta_{0j} &= \gamma_{00} + \gamma_{01}\overline{\text{SES}}_j + U_{0j} \\
\beta_{1j} &= \gamma_{10} \\
\beta_{2j} &= \gamma_{20} \\
\beta_{3j} &= \gamma_{30}
\end{aligned}
$$

where $U_{0j} \sim N(0, \tau_0^2)$ and independent (over schools and with R_{ij}).

   (a) What is the corresponding linear mixed model?
   (b) What is the corresponding marginal model?

2. Suppose that you have a data set and you want to model science scores of students within school (i.e., $Y_{ij} = \text{science}_{ij}$). Write out the following for a random intercept model where math scores are predictors (i.e., $x_{ij} = \text{math}_{ij}$.... don't forget the assumptions

   (a) As an HLM
   (b) What is the corresponding linear mixed model?
   (c) What is the corresponding marginal model?

3. Suppose that you have a data set and you want to model science scores of students within school (i.e., $Y_{ij} = \text{science}_{ij}$). Write out the following for a random intercept model where school centered math scores are predictors of Y_{ij}s (i.e., $cx_{ij} = x_{ij} - \bar{x}_i = \text{math}_{ij} - \sum_i \text{math}_{ij}/n_j$) and school mean (i.e., $\bar{x}_j = \sum_i \text{math}_{ij}/n_j$) is a predictor of the intercept.... don't forget the assumptions

   (a) As an HLM

   (b) What is the corresponding linear mixed model?

   (c) What is the corresponding marginal model?