**PSYC 5670: Multilevel Modeling**

**Homework #1**

**Due 9/12**

Dataset: ECLS-K third-grade assessment

1. Import the data into R.
2. Report the marginal (e.g., overall) descriptive statistics for the mathematics t-score and SES. This should include the mean, std dev, min, max, and total n. Also report the number of clusters (teacher ids) as well as the average cluster size.
3. Using the math t-score as the outcome, fit the oneway ANOVA model with random effects. (This is an intercept-only multilevel modeling with a random intercept).
   1. Report the following values: γ00, τ00, σ2. Explain what each of them means in plain language.
   2. Report the AIC value for the model.
   3. Calculate the intraclass correlation coefficient, ρ. Explain what it means.
   4. Would multilevel modeling techniques be required to analyze this outcome or would OLS regression suffice? You will need to calculate DEFT.
   5. Write down the level-1 and level-2 submodels and the combined (reduced-form) model.
4. Now add a single level-2 predictor to the model: the classroom average classroom SES score. Re-run the analysis. (This model is sometimes called the means-as-outcomes model).
   1. Report and interpret γ01.
   2. Report the AIC value for the model.
   3. How has the interpretation of γ00changed compared to its interpretation in the oneway ANOVA model?
   4. Report τ00 and σ2. How have they changed compared to the oneway ANOVA model and why?
   5. What is the new ICC? (This is a *conditional* ICC, conditional on the level-2 predictor variable).
   6. Write down the level-1 and level-2 submodels and the combined (reduced-form) model.
5. Now add an additional predictor to the model: the child’s SES score. The model now includes a level-1 and a level-2 predictor.
   1. Report and interpret γ10.
   2. Report the AIC value for the model.
   3. How has the interpretation of γ00changed compared to its interpretations in the oneway ANOVA model and in the means-as-outcomes model?
   4. Report τ00 and σ2. How have they changed compared to the oneway ANOVA model and why? Is this what you expected?
   5. What is the new ICC? (This is a *conditional* ICC, conditional on the level-1 predictor variable).
   6. Write down the level-1 and level-2 submodels and the combined (reduced-form) model.

6) Which of these three models fits the data best? How do you know?