Homework 3
(hard copy due Tuesday 6/11/24 by 5 PM)

Please type your responses and include the relevant printouts with each answer. Answers should be about one paragraph for each question, and they should be written as if they were part of a research report or journal article. Include the relevant statistical values in the text and include the relevant portions of your output. **Your answers should be in your own words.**

For all of the problems below, allow as many iterations as necessary for convergence. For all problems with continuous outcomes **use the robust standard error estimates for fixed effects tests**.

The data for the first few problems come from a longitudinal study of social interactions (N=854). Download the SPSS (long format; 3,527 records) and/or the HLM data file (`social.sav`, `social.mdm`) from the data page: http://web.pdx.edu/~newsomj/data.htm. The id variable is `id`. There is a time variable (time) coded as 0, 1, 2, 3, and 4 for the five measurement time points. The data contain five time point measurements of a positive affect (`posaff`) measure, which is an average of ratings of agreement with several adjectives such as "happy" or "satisfied" (values range between 1 and 4). There are also five measurements from a stressful life events inventory, based on counts of major life events such as "death of a close family member" or "major financial problem" (`slevents`). A person-level variable measured at baseline is included (`w1neg`), which is an average score for frequency of negative social interactions over the prior month derived from ratings of several items, such as "give you unwanted advice" or "forget or ignore you" (values range between 0 and 4).

1. Use SPSS, R, or HLM to test an unconditional growth curve model to see whether positive affect increases or decreases over time and whether the slopes vary across individuals. Obtain a plot of the slopes from a subset of the sample. Report and interpret your results in terms of the research problem, and be sure to include the average intercept value, average slope and significance, the intercept and slope covariance, and the significance of the random effects.

2. Use SPSS, R, or HLM to test whether baseline negative social interactions predicts changes in positive affect. Grand-mean center the negative social interactions variable. Allow the slopes for the time variable to vary. Report and interpret your results in terms of the research problem. Be sure to include the average intercept value, average slope and significance, the effects of negative social interactions, the cross-level interaction, and the significance of the random effects. No follow-up tests are required, but describe what follow-up test if any would be appropriate given the results.

3. In SPSS, R, or HLM, test a new model to investigate whether there is still a significant change in positive affect over time after controlling for stressful life events at each time point (i.e., a time-varying covariate). Grand-mean center the stressful life events variable. Allow slopes for the time variable, but not the slopes for stressful life events, to vary across individuals. Report and interpret your results in terms of the research problem, include the significance test and interpretation of the fixed and random effects. Add a brief statement at the end that distinguishes the analytic goals of the time-invariant covariate analysis in the prior model to the goals of this model with the time-varying covariate.

4. In SPSS, R, or HLM, test whether there is quadratic change in positive affect using centered time (i.e., center the time variable around the midpoint of 2 and compute the quadratic variable based on the centered time variable). Allow the linear slopes to vary but not the quadratic slopes. Obtain a plot with a quadratic or loess-type prediction line. Report and interpret your results in terms of the research problem, including the fixed effects for the linear and quadratic slopes and the random effect for slopes. Make sure to mention what the interpretation of the linear effect is in this circumstance.

For the following problem, you may use your own data or the new data set from the work family health study used in HW 2. If you use your own data, choose a binary variable that can be used as an outcome, one level-1 variable and one level-2 variable. The new version of the work family health study (`wfh2.sav`, `wfh2.mdm`) has a binary variable to be used as the dependent variable from a question about whether the employee has made accommodations in their family or personal life because of work (`accom`, 0=no accommodations, 1=accommodations). Along with this variable are two from the previous homework, perceived stress (`pss`) and work place demands for the work group environment (`wpdemands`). Grand-mean center both variables before using in the analysis. The work group id is `WGID`.

For these models, allow additional iterations if necessary. Use adaptive quadrature with 7 quadrature points. Because SPSS has only PQL estimation for fixed effects, I would like you to use one of the other programs for the following problems. If using HLM, report the PQL variance components but fixed effects from adaptive quad.

5. Use either R or HLM to test a multilevel logistic model predicting family and personal accommodations with perceived stress and workplace demands. Do not estimate any random slopes.