Homework 1

(Due 5/2/24 at 10:00 AM)

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. **All answers should be in your own words.** Please be sure to include an interpretation of the findings for each question (i.e., what do the results mean in terms of the research problem?).

The problems below use data from a study of psychological health of soldiers.[1] There are a total of 49 military units (companies) with 2042 military personnel (the number of soldiers per company varied).[2] `compid` is the variable identifying the companies (i.e., group ID number). The outcome we will use in these analyses is an average of several items asking soldiers about their perceptions of their superiors' leadership qualities (e.g., agreement ratings of "impressed by leadership" and "officers interested in what I think") called `lead`, with scores ranging from 1 to 4. The predictor variable we will use is a hostility scale (`chostile`), which is an average of five questions (agreement ratings of e.g., "Easily annoyed or irritated" and "Temper outburst that you cannot control"), which has been centered, but having original scores ranging from 1 to 4. (There is an additional variable in the data set, `glead`, that we will not use in this HW). Download the data set, `soldiershm.sav` or `soldiershm.mdm`, from the data page, http://web.pdx.edu/~newsomj/data.htm.

1. Use SPSS, R, or HLM to test an empty (intercept only) model with `lead` as the dependent variable. [3] Calculate the intraclass correlation coefficient by hand (showing your work), report, and interpret its value (no statistical test of the ICC is required). Report and interpret your results. Be sure to report and interpret the intercept mean and the test of the intercept variance.

2. Use SPSS, R, or HLM to test another model with `lead` as the dependent variable. This time, include hostility (`chostile`) as a nonvarying (level-1) predictor (i.e., do not allow the slope to vary across companies). (If using HLM enter `chostile` as uncentered). Interpret your results in terms of the test of an ANCOVA model. Be sure to report information about the fixed and random effects, including the intercept mean and the test of the intercept variance and the test of the slope. For this problem, compute the standardized coefficient for the predictor variable and the R-square measure developed by Xu (2003) by hand. (REML estimation is ok for this for now.) Provide a statement about how these findings are similar or differ from the results of the empty model?

3. Use SPSS, R or HLM to test the same model as in the previous problem, but this time allow the predictor slope to vary. Be sure to report information about the fixed and random effects, including the intercept mean, the test of the intercept variance, the test of the slope, the test of the slope variance, and the covariance (correlation) between intercept and slope.

4. Generate a plot of the slopes for the model with random slopes. Describe the plot and report and interpret the correlation between the intercepts and slopes.

For the following problems, use your own data set that has a nested data structure with individuals nested within groups (please restrict to two levels). I suggest you have at least approximately 50 groups and you will need a continuous outcome (i.e., a variable with five or more ordinal values). If

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[1] Halverson, R. R., Bliese, P. D., Moore, R. E., & Castro, C. A. (1995). Psychological well-being and physical health symptoms of soldiers deployed for Operation Uphold Democracy: A summary of human dimensions research in Haiti (p. 0068). Walter Reed Army Institute of Research, Division of Neuropsychiatry, Department of Military Psychiatry.

[2] As we will find out later, we would rather have more than this number of groups for many of the types of tests we want to conduct.

[3] **Important**: If you are using R, the `compid` may need to be transformed to a factor and other variables need to be numeric. Change it to numeric to avoid automatic dummy coding.

you do not have a data set you can use, download and use the Head Start child mental health data set.[4]

5. Use SPSS, R, or HLM and your own data with a nested data structure for this and the following problem. Choose a continuous dependent variable (five or more ordinal categories, interval, or ratio scale) and test an intercept-only (empty) model. Be sure to calculate the ICC using the results. Report and interpret your results in terms of the research problem, being sure to include interpretation of the fixed and random effects.

6. Use SPSS, R, or HLM and using the same outcome, test a random slope model with one level-1 predictor. Prior to your analysis, grand-mean center the predictor. Obtain a plot of a subset of slopes. Report and interpret your results in terms of the research problem, being sure to include interpretation of the random and fixed effects and the correlation (covariance) between slopes and intercepts.

[4] These data come from a teacher survey about child mental health problems and resources in Head Start programs in Oregon. There are a total of 81 programs with 685 teachers surveyed (the number of teachers per program varied). `program` is the variable identifying the program sites (i.e., group ID number). The outcome we will use in these analyses is an average of several items asking teachers about the frequency of child problem behaviors (e.g., aggressiveness, self-destructive behavior, temper tantrums) called `probbeh`, with scores ranging from 1 to 4. `mhsup` is an average of two questions (program has a good mental health consultant, job is easier because of mental health resources) about whether the teacher feels there is support for dealing mental health problems in the classroom, with scores ranging from 0 to 3. The variable `size` is a level-2 variable (not needed for this HW) with information about the size of the program (number of kids: small=0, medium=1, or large=2).