TO: Students in CJ 605 SP 04
FROM: R. B. Taylor
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RE: Comments on your questions about RCR submodel and related HLM questions

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At the end of class last week I asked you all for some questions. Here are some of your questions, and some of my answers. Hope this helps and clarifies.

1. *Building Level 1 – is the process always ANOVA -> ANCOVA -> RCR?*

YES. You need the ANOVA to see if you have significant ecological variation to start with. And as a benchmark (see tonight's exercise). You need ANCOVA to see how your L1 model is doing. You can OMIT the RCR stage if a) there is no compelling theoretical or policy rationale to do it and/or b) you are definitely not interested in individual/group interactions. **Varying slopes is how HLM operationalizes the idea that the group context influences individual-level dynamics**. This is the first step anyway. The full model is the second step. If this is not your interest, then you need not do it. But see # 2.

2. *In terms of deciding which slopes to vary, isn't it logical to base a good deal of rationale on relevant literature?*

Yes, but. It is not unusual for the literature not to have expressly considered how group context influences individual-level dynamics, which is what you are getting at with the RCR submodel. So one reason to do the RCR even though there is no already-articulated theoretical rationale is because you want to do **theoretical elaboration**, i.e., to further elaborate or refine a particular theory.

In class last week during a very interesting discussion period we also talked about two additional rationales for allowing slopes to vary. First, it might have policy relevance. There might be practical or policy reasons you want to explore these matters. Second, one point raised had to do with theory scope. If the theory says x affects y, but you find this is true only under certain conditions (z but not w) then finding and admitting that this relationship is circumscribed is part of finding the boundaries of theories.

The variance of slopes, especially when we find what L2 factors drive those slopes (full model, we are not there yet), represents as noted above a person X situation interaction term, at least as we have the models set up here. Some suggest that theories built on interaction terms are harder to empirically replicate than main effect theories. I just put that out there for your consideration.

3. *If we lose neighborhoods because of a lack of variance, what are the consequences for our models?*

The consequences are that you are now no longer working with your full sample. So there are questions about a) would statistical tests still be appropriate?; and b) how do these respondents or locations look differ from the full sample?

Practically speaking, you want to compare the remaining neighborhoods with the full sample, to try and convince readers that your subsample is relatively random. But it also depends on the numbers. If you are losing 1 or 2 neighborhoods out of 45 that is one thing; but if you are losing 10, remaining representativeness is a much harder argument to make.

4. *Why are high correlations between slopes and intercepts a problem in RCR? How high is too high? / How does HLM deal with the covariance between slope and intercept? / Correlations between slope and intercept: how do you use this information? Is high or low or either bad? What is it telling?/ At what point do we not trust the results?*

High correlations in the variance-covariance matrix for Tau (T00, T11, T01) are a problem because the program is trying to simultaneously estimate multiple paramters which are closely intertwined. That is very hard for the program to do. You have some clues to how hard this is (see below).

A **rough** analogy is from OLS regression where you have highly correlated predictors and you are trying to find the independent contribution of each to an outcome. It creates problems.

There is no clear guideline about how high is too high. There are too many properties of the data to be considered simultaneously. And I do not understand enough of the underlying math.

My suggestions:

a) If T01 – the correlation between the variance of the intercepts and the variance of the slopes – in the correlation matrix is above .90 or .95, and/or
b) if the variance of the slopes or of the intercepts are very tiny,

you want to proceed in a circumspect fashion.

This means looking carefully at your solution, and comparing b s and se s of b s and T00 to solutions with one fewer parameter (one more fixed slope) to see if there are marked contrasts. If HLM is trying too hard to pull out the information with the additional added parameter, some of previously estimated parameters are going to look very different with this change.

It also means looking at how much the program is iterating. If you are getting into several hundred iterations, proceed cautiously. If you get into the thousands, I would be extremely cautious. (These are suggested guidelines only; and will not apply when we get to binary models.) Lots of iterations mean the program is trying very very hard to pull things apart.

5. *How do we save the residual file in RCR?*

Same way you do with any other run. Request it. Be apprised: with varying slopes, you will now have an OLS and EB slope for each neighborhood or Level 2 unit. As with the intercepts, these are expressed as deviations from the grand slope (G10)

6. *Do we have an intraclass correlation in the RCR? What does it say?*

Of course. You still have between vs. within variance for the intercepts. There is nothing analogous for slopes. All you have is a certain amount of Level 2 variance for each varying slope. What you have for both slopes and intercepts are reliabilities.

7. *What types of centering is best with RCR?*

As with any other model, there is no rule of thumb for which type of centering to use. You just want to be aware that if you center, you are creating a different type of variable, and you will want to be aware of it when you are interpreting slopes.

A couple of points on centering:
a) if you seek to separate L1 and L2 impacts of a predictor, you must group mean center the predictor at L1. See what we did with incivilities in the Robinson et al. paper.
b) Group mean or grand mean centering can sometimes help with reducing potential multicollinearity problems.

8. *How can G10 NOT be significant while the variance component IS significant?*

This would be saying: the average impact of x1 on y is zero, but the impact across neighborhoods varies significantly. The variance component being significant does NOT mean that some slopes are significant; rather it just means that – as a group – they really differ across the L2 units. See for example Figure 3.3, page 37 in Kreft and DeLeeuw. For MORE on the RCR model read pages 39-44 in Kreft and DeLeeuw