Questions for Multi-level Workshop – March 2, 2010

1) Pair up with the person next to you and pick a project that one of you is working on as the topic for the workshop

2) Write down your research question

3) Describe two levels of your data for discussion (pick only two levels even if there are more).
   a. At what levels do you observe your data (e.g., patient-level and hospital level)?
   b. Which level is clustered within the other level?
   c. How many observations do you have at each level?
   d. Why are your data clustered (i.e., what is the source of the clustering)?

4) Describe variables of interest at each level of the data
   a. What is your dependent variable and at what level is it?
   b. Describe at least one explanatory variable for each level of the data
   c. Do you have a main explanatory variable and at what level is it?
   d. Why do you think your dependent variable will be explained by these variables?

5) Draw a matrix of your data (combined data structure)
   a. Include about 5 rows with at least 2 rows in each cluster
   b. Include IDs for each of the two levels
   c. Include your dependent variable with reasonable guesses for values
   d. Include an explanatory variable at the lowest (micro) level with reasonable values
   e. Include an explanatory variable at the higher (macro) level with reasonable values

6) Write down an equation for simple linear regression relating one micro-level variable and one macro-level variable to your dependent variable (use subscripts)
   a. What main assumption do you need to make to run your model using simple linear regression?
   b. What would you need to do to make this assumption reasonable?

7) Write down an equation for random intercept model relating one micro-level variable to your dependent variable (use subscripts). (Ignore your macro-level variables)
   a. What is the simplest way to estimate this model with correct standard errors?
   b. Could you include macro-level variables if you use this simple way?

8) Write down an equation that models your random intercept as a fixed effect.
   a. Does this approach also correct your standard errors for clustering?
   b. If you used this approach for your actual data (not the 5-row sample data), how many variables would you add to your model?
   c. What challenges might occur if you model your random intercept as a fixed effect?

9) Write down an equation for random intercept model relating one micro-level variable and one macro-level variable to your dependent variable (use subscripts).
   a. What approach to modeling could you use if you want to estimate a value for the variation in your random intercept, in addition to getting correct standard errors?
   b. Is this approach to modeling needed for your research question?
   c. What types of challenges might occur if you decide to model this way?