Answers to Exercises: Module 1

Answers are in Orange.

If you have any questions as you go through these, feel free to ask it in the forum.

1. If you haven't done so recently, watch the Fixed and Random Factors Video. If you want a refresher, watch Dummy and Effect Coding as well. Both are on the Bonus Materials page of the workshop website.

2. For the Swallowing Data Set, identify the following:

   a. Which variable identifies a subject?
      ParticipantID
   b. Are there any between-subjects factors?
      Gender
   c. Are there any within-subjects factors? Do they have unique values per trial?
      Task
   d. Are there any time-varying covariates?
      No.
   e. Are there any time-invariant covariates?
      No.
   f. For each predictor variable in the data set, indicate if it is measured at level 1 or level 2.
      Level 1 (Trial): Task
      Level 2 (Subject): Gender
   g. For each combination of factors, indicate if the factors are crossed or nested. If nested, which is nested in which?
      Task is crossed with Participant
      Participant is nested within Gender (each participant has only one gender)
      Gender is crossed with Task

h. List all the factors in the table below and all the interactions for the crossed factors. Now check off whether each variable or interaction is fixed or random. (Really, if you haven't listed to the webinar on Fixed or Random effects, do it now).

Factor	Fixed	Random
Task	X	
Participant		X
Gender	X	
Task*Participant		X
Task*Gender	X	

3. For the Infant Data Set, identify the following:
   a. Which variable identifies a subject?
      Subject
   b. Are there any between-subjects factors?
      No
   c. Are there any within-subjects factors? Do they have unique values per trial?
      Yes. Breath
   d. Are there any time-varying covariates?
      Yes. dBSPL, uttdur
   e. Are there any time-invariant covariates?
      Yes. Ageweeks
   f. For each predictor variable in the data set, indicate if it is measured at level 1 or level 2.
      Breath level (level 1): dBSPL, uttdur, Breath
      Subject level (level 2): Ageweeks
   g. For each combination of factors, indicate if the factors are crossed or nested. If nested, which is nested in which?
      Breath and Subject are crossed
   h. List all the factors in the table below and all the interactions for the crossed factors. Now check off whether each variable or interaction is fixed or random.

Factor	Fixed	Random
Breath	X	
Subject		X
Breath*Subject		X

4. For the County Data Set, identify the following:
   a. Which variable identifies a subject?
      County
   b. Are there any between-subjects factors?
      Yes. NatAmenity. It's also possible (and often done) to use baseline measures of other variables as between-subjects factors. Eg. Rural1960.
   c. Are there any within-subjects factors? Do they have unique values per trial?
      Yes. Rural and HWY. They don't have unique values at each time point. (Rural changes slowly if at all, but there are some counties that shift from rural to urban over the 50 years).
   d. Are there any time-varying covariates?
      Yes. Most covariates are time-varying. Mobil, ContigJobsK, College, Pop, LFP.
   e. Are there any time-invariant covariates?
      Yes. LandArea
   f. For each predictor variable in the data set, indicate if it is measured at level 1 or level 2.
      Level 1 (Decade level): Mobil, ContigJobsK, College, Pop, LFP, Rural, HWY.
      Level 2 (County level): LandArea, NatAmenity
   g. For each combination of factors, indicate if the factors are crossed or nested. If nested, which is nested in which?
      - County is nested within NatAmenity
      - NatAmenity, HWY, and Rural are all crossed.
      - County is theoretically crossed with both Rural and HWY - they can and do change. However, not all counties change (only a few counties change from rural to non-rural, and most, but not all counties change from not having to having a highway). This would be considered an incomplete cross, but it means you cannot fit an interaction term.
   h. List all the factors in the table below and all the interactions for the crossed factors. Now check off whether each variable or interaction is fixed or random.

Factor	Fixed	Random
County		X
NatAmenity	X	
Rural	X	
HWY	X	
NatAmenity*Rural	X	
HWY*NatAmenity	X	
Rural*HWY	X	