ATCR Biostatistics 209 **Spring 2025**

REPEATED MEASURES HOMEWORK

Hwk #5 (Repeated measures part 2) due 5/20/25

1. (6 points) Using the Georgia babies dataset, fit a model that allows for both mom-specific intercepts and trends in birth weight with birth order.
   a. Does this model fit appreciably better than a model that only has mom-specific intercepts? (Hint: consider the change in log likelihood).
   b. Compared to either an GEE analysis or the mixed-model analysis with only random intercepts, does the model with random trends give a different conclusion with respect to the primary question of interest (the relationship of birth weight to birth order).
   c. Provide interpretations of the variances of the random intercepts and of the random trends. This may be easiest to do by considering the birth weight versus birth order relationship for a woman who is one standard deviation above or below normal for the intercept or for the trend.
2. (4 points) Find the longitudinal OAI_pain dataset on the website. The relevant variables are sev_pain (which is 1 if severe pain was reported in the right knee in at least one activity and 0 otherwise), BMI, visit (0=baseline, then yearly), sex (1=male, 2=female), and race (0=other non-white, 1=white, 2=African American, 3=Asian).
   a. Use a log link to fit a model to assess whether BMI and sex are related to the change in pain over time. Provide an interpretation of coefficients relevant to the change in pain over time (you do not need to interpret all the coefficients in the model).
3. (8 points) Find the OAI walking speed dataset on the website. This gives the walking speed of OAI participants over a number of visits. Walking speeds of less than 1 meter per second are predictive of poor health outcomes, including mortality. The slow_walk variable is defined as 1 if the walking speed is less than 1 m/s. In this analysis we will be interested whether the probability of a slow walking speed increases with age and whether it is the same or different by race.
   a. Briefly (one paragraph) discuss the advantages and disadvantages of using GEE models (as opposed to mixed models) for this analysis.
   b. Fit a GEE model to address whether the probability of a slow walking speed changes with age are the same or different by race.
   c. What are the assumptions of the model?
   d. Provide checks of each of the assumptions.