

Stat 462: Lab 10

For this lab, do the following exercise:

Consider the data attached to this pdf called reading.RData. The data are as follows:

- School is a factor coding for which school a student is in
- Minority is a factor coding for whether the student belongs to a visible minority group
- Sex is a factor coding for the sex of the student
- SES is a standardized socio-economic indicator for each student
- Score is a standardized test score measuring the reading skills of the student
- SESschool is the mean SES indicator for the student's school

Answer the following questions:

1. Which of these variables would you consider to be fixed effects, and which would you consider to be random effects?
2. What is a situation in which we would treat School as a fixed effect?
3. What is a situation in which we would treat School as a random effect?
4. Write down the model that has Score as the response and includes all covariates except SESschool. Treat School as a random effect.
5. Analyze these data using the model you specified in (4.). Are there statistically significant effects of Minority, Sex, and SES? Compute an estimate of the proportion of variation attributable to differences between schools given the covariates.
6. Write down the model that has Score as the response and includes all covariates except SESschool. Include separate intercepts and slopes for each school, treating the schools as fixed effects.
7. Analyze these data using the model you specified in (6.). Predict the expected Score for a female student with Minority status and $SES = 1$ by averaging across schools. For which schools does this prediction apply?

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8. Write down the model that has Score as the response and includes all covariates except SESschool. Include random intercepts and slopes for each school.
9. Analyze these data using the model you specified in (8.). Are there statistically significant effects of Minority, Sex, and SES? Predict the expected Score for a female student with Minority status and $SES = 1$. For which school does this prediction apply?

You are free to use either R or SAS to answer each question. A SAS script to load the data has been included via the foreign package from R (see attachments to this pdf).

For all questions, provide the code you used as well as any output asked for and clear, thorough explanations where necessary. Do not provide output that was not requested in the question.