Lab 3: Building regression models/subgroup-specific effects

Practical objective: To practice building, writing, and interpreting coefficients from regression models.

Background on saturated models: A saturated model is one that does not impose or encode within it any structure besides positing the existence of subgroup-specific means within all groups defined by the right-hand side of the model. Information about the means is not therefore not "borrowed" across those subgroups. For instance, a simple linear regression model with a binary exposure is a saturated model. The model's coefficient estimates would be the same as what you would get by computing means/mean differences by-hand.

Scenario: Suppose we conduct a four-arm randomized controlled trial to evaluate an experimental antihypertensive drug (X=0: control, X=1: low dose, X=2: standard dose, X=3: high dose). The outcome, Y, is systolic blood pressure (SBP) after some period of time on the treatment. While baseline SBP is not directly recorded, it is categorized as follows: (Z=0: normal, Z=1: elevated).

Exercise 1: Write down the simplest *saturated* model possible that would allow you to compare the mean SBP across the four intervention groups; interpret each of its coefficients.

Exercise 2: Consider a model that allows an interaction between treatment and baseline SBP category. Before even writing it down, we should know how many parameters it should have. Interpret each of its coefficients (or at least enough of them until we get the point).

Exercise 3: Use the model of Exercise 2 to determine a parameter/combination of parameters that represents the mean SBP among those in the high dose group with elevated SBP at baseline.

Exercise 4: Use the model of Exercise 2 to determine a parameter/combination of parameters that represents the difference in mean SBP between those in the high-dose group with normal SBP at baseline and those in the low-dose group with elevated SBP at baseline.

Exercise 5: Use the model of Exercise 2 to determine a parameter/combination of parameters that allows you to test whether mean SBP varies across dose groups.

Exercise 6: Use the model of Exercise 2 to determine a parameter/combination of parameters that allows you to test whether baseline SBP category modifies the effect of dose on mean SBP.

Exercise 7: Use the model of Exercise 2 to determine a parameter/combination of parameters that allows you to test whether mean SBP varies across the three non-zero doses of the drug.