

## PSYC 5086: Advanced Statistical Methods

Tarleton State University

Homework 6

1. Consider the following ANCOVA situation: you have a dependent variable  $Y$  which represents the posttest of an achievement test, and a covariate  $X$ , which represents the pretest of the same test. The data are below:

Group	$X$	$Y$
1	40	120
	50	125
	60	130
2	70	140
	75	150
	80	160
3	90	160
	100	175
	110	190

- (a) Calculate the posttest group means  $\bar{Y}_j$  for  $j = 1, 2, 3$ .
  - (b) Assuming that  $\beta = 1$ , calculate the adjusted posttest group means  $\bar{Y}'_j$  for  $j = 1, 2, 3$ .
  - (c) What effects (if any) did the covariate adjustment have on the overall results? Explain.
2. An education researcher wants to determine whether children whose preschool classroom has a window differ in their vocabulary acquisition as compared to children whose classroom does not have a window. At the beginning of the school year, 10 children were randomly assigned to one of two different classrooms: Classroom 1, which had a window, and Classroom 2, which had no window. All children were given a standardized vocabulary test as a pretest. At the end of the school year, each child's vocabulary was tested again. The data can be downloaded from <https://t.ly/YgTpz>.
    - (a) Perform an ANOVA testing whether there are significant differences in posttest vocabulary scores between the two classroom types. Report the results of your test along with the group means.
    - (b) Perform an ANCOVA to include the effect of pretest. Report the results of your test along with the adjusted group means.
  3. Suppose 30 depressive individuals have been randomly assigned to one of three conditions: (1) selective serotonin reuptake inhibitor (SSRI) antidepressant medication, (2) placebo, or (3) wait list control. The Beck Depression Inventory (BDI) has been administered to each individual prior to the study, and then later is administered a second time at the end of the study. The data can be downloaded from <https://t.ly/tm63a>.
    - (a) Because the groups were randomly assigned, it might seem acceptable to simply ignore pretest scores and just compare the three different groups' BDI scores at posttest. Test to see whether there is a significant difference between groups on the pretest. Why would this be an important test to conduct?
    - (b) Use an ANOVA to test for differences between the three groups on the *posttest* scores. Report the results of your test along with the group means.

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- (c) Perform an ANCOVA to include the effect of pretest scores in your model from part (b). Report the results of your test along with covariate adjusted means.
- (d) Some people argue that ANCOVA always exaggerates differences between group means. Is that the case here? If not, what is the ANCOVA doing?