

ESM 206B
Hampton
April 23, 2009

Homework 3 – ANCOVA exercise

Puritan Oats Inc., a fictitious firm, recently conducted a research study. The subjects were selected by Puritan employees from a long list of Cheesetown, Wisconsin residents who wanted to participate.

Fifty-four female subjects between the ages of 21 and 40 were selected, supposedly at random. Twenty-seven were instructed to eat Puritan oatmeal each morning for six months. The remaining 27 were told to eat whatever they desired for breakfast. Cholesterol scores were recorded for each participant before and after the study. An independent statistician was on hand for the initial cholesterol screens, but he is unfortunately now missing along with his data.

You have been hired by the company to attend the post-experiment cholesterol screening and you are given the data. You are charged with evaluating the company's claim that continuous oatmeal consumption will lower cholesterol scores. While on site you notice that the treatment group seems a bit more spry and healthy. Before each participant leaves you have the good sense to ask each one for their age.

The data from the cholesterol experiment are available in the cholesterol.xls file on the ESM 206B website. The following table defines the variables.

<u>Variable</u>	<u>Definition</u>
Treatment	= Y if the person was told to eat oatmeal each day, otherwise = N
Cholesterol	The Cholesterol score of each participant recorded after the experiment
Age	The age of each participant

Input the data into JMP for analysis.

Puritan Oatmeal claims that selection into the study, and into treatment and control groups, was random. You begin your analysis by assuming that the company's claim is true.

1. What simple test can you use to evaluate the average treatment effect? Briefly defend your choice? (hint: think ESM 206A – is this a one-sample or two-sample test)?
2. What do you conclude from your simple test? Does eating oatmeal every day lower cholesterol? Briefly comment on the internal and external validity of your findings? That is, can the findings be applied to males or other age groups or to other communities?

Puritan Oatmeal is satisfied with your findings and wants you to write up the results without further analysis. Although you are tempted by the large paycheck, you decide to first investigate whether the assignment into treatment and control groups is systematically related to age.

3. Perform as simple test to see if the average age is different between the treatment and control group.
4. What do you conclude? Does this make you skeptical of the company's random selection claim?

Even if the random selection claim is true, you want to use the data you have on age to determine (a) if a significant average treatment effect still exists when we control for age, and (b) whether the treatment effect varies with age.

5. Which statistical tool described in lecture can you use to evaluate (a) and (b)? (Hint: we have both a categorical and continuous variable).
6. What do you conclude with respect to (a)? That is, is the average effect of treatment on cholesterol robust to controlling for age?
7. What do you conclude with respect to (b)?
8. Given your analysis here, briefly describe the strongest conclusion you can make that is favorable to Puritan Oatmeal. Also briefly describe the strongest conclusion you can make that is unfavorable to Puritan Oatmeal.
9. Now suppose you track down the independent statistician. He tells you that the mean pre-experiment cholesterol for the 'treatment' group was 210.1 and the mean cholesterol for the 'control' group was 210.6. The difference in pre-experiment means was not at all close to being statistically significant. How does this change your most and least favorable conclusions?