

# Homework 7

Statistics 411/511: Spring 2018

Due: In class Monday, February 26

Do Exercise 23 in Chapter 6 re: *Diet Wars*. As usual, provide all R-code in an Appendix. You do not need to format this HW as a *Statistical Report*. Work together in a group of 2-4 students and turn in a single report.

A researcher has TWO primary research questions:

(I) Is there a difference in weight loss, on the average, between the low-fat and low-carbohydrate diets?

(II) Is there a difference in mean weight loss for the low-fat and low-carbohydrate diets compared to the mean of just the Mediterranean diet group?

1. Explain why it is appropriate to test the primary research questions using an individual CI or individual test for each.
2. Fit an ANOVA to these data and check all relevant assumptions.
3. Test the FIRST research question. Feel free to use the follow-up *t*-test approach from Chapter 5 (as you did in HW6), or use the `estimable()` function from R's `gmodels` package to answer this question.
  - (a) Using the notation  $\mu_1$  for the mean weight-loss of the low-carbohydrate group,  $\mu_2$  for the mean weight loss of the low-fat group and  $\mu_3$  being the mean weight loss of the Mediterranean group, write out the parameter  $\gamma$  being tested as a linear combination of  $\mu_1, \mu_2$  and  $\mu_3$ .
  - (b) Give all 6 steps of the hypothesis test being conducted.
  - (c) Give a conclusion in terms of the problem.
4. Construct an individual 95%CI to test the SECOND research question.
  - (a) Using the notation  $\mu_1$  for the mean weight-loss of the low-carbohydrate group,  $\mu_2$  for the mean weight loss of the low-fat group and  $\mu_3$  being the mean weight loss of the Mediterranean group, write out the parameter  $\gamma$  being tested as a linear combination of  $\mu_1, \mu_2$  and  $\mu_3$ .
  - (b) Give an estimate for  $\gamma$  and a 95% CI for  $\gamma$ . Feel free to use the `estimable()` function from R's `gmodels` package to answer this question.
  - (c) Give a conclusion in terms of the problem.
5. Is it appropriate to test for any pairwise differences in addition to the primary research questions? If it is appropriate, use Tukeys to perform all pairwise comparisons and write a conclusion in terms of the problem. Do any of the 3 diets outperform the other two?
6. What is the *Scope of Inference*?