

BIOS 662, Fall 2018

Homework 6

Assigned: Tuesday, November 6

Due: Tuesday, November 13

Instructions: For this homework, calculations need not be done “by hand.” If you use software such as R or SAS to do the calculations, please include the code you used, not just the output. For all problems involving testing, include a definition of the parameters to be tested, the null and alternative hypotheses, the test statistic to be employed and its distribution, the critical region, whether you reject the null, the p-value, and an interpretation of the results in a language suitable for investigators. All tests should be performed at the $\alpha = 0.05$ significance level.

Peppermint extract is believed to have various medicinal properties. A study was conducted to investigate the effect of peppermint extract on triglyceride levels in rats. Fifty rats were randomly assigned to 5 groups, each having 10 rats. Those in groups 1 through 5 received, respectively, 0 (control group), 75, 150, 300 or 600 mg/kg of peppermint extract daily for three weeks. At the end of three weeks blood was drawn and assayed for various lipids, including triglycerides. The file “HW6_TRG.txt” in the “Datasets” sub-folder of the “Homework materials” section of the Sakai site contains data on triglyceride levels in the blood of the rats. Only those rats with non-missing triglyceride levels are included. There are three variables, ID, group and trg (triglycerides, in $\mu\text{g/dL}$).

1. The investigators’ primary interest is in which groups (that is, which dosages of peppermint extract) differ from one another in terms of the effect on triglyceride levels. Conduct an appropriate statistical analysis of the data using a parametric ANOVA model. Include in your report: (a) an analysis plan, (b) results of your analysis, and (c) a brief conclusion in language suitable for the investigators. As part of your analysis, investigate whether a transformation of the data would be appropriate. If so, state what transformation should be used and check whether it improves the diagnostics, but conduct your analysis on the untransformed data (so as not to introduce an extra level of complication in the grading of this homework).
2. Two items of secondary interest are (i) whether the mean triglyceride level in the control group differs from that in the other 4 groups combined and (ii) whether there is a linear relationship between group number and triglyceride levels. Use your parametric ANOVA model to address these items.
3. Now use a linear regression model with peppermint extract dose as a continuous variable (actual dose in mg/dL, not group number). Provide an

estimate and associated confidence interval for how triglyceride levels change with dose of peppermint extract. Use the regression model to predict the mean triglyceride level for the control group. How does this compare with the sample mean for the control group? (For the purposes of this homework, it is *not* necessary to check the assumptions of the regression model.)