

BIOS 662, Fall 2018

Homework 4

Assigned: Thursday, September 27

Due: Thursday, October 4

Instructions: For the problems below, confidence intervals and testing procedures should be done “by hand.” You may use appropriate software such as R or SAS to estimate means and variances if these are needed. You should also feel free to use the software to verify any results. For 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. (Get into the habit of supplying these, not just for this homework.) All tests should be performed at the $\alpha = 0.05$ significance level.

1. This is based on Problem 5.2 on page 142 of the textbook. “In data of Dobson et al. [1976], 36 patients with a confirmed diagnosis of phenylketonuria (PKU) were identified and placed on dietary therapy before reaching 121 days of age. The children were tested for IQ (Stanford-Binet test) between the ages of 4 and 6; subsequently, their normal siblings of closest age were also tested with the Stanford-Binet.” The dataset “HW4.PKU.txt” contains data on the 21 pairs *not* listed in Problem 5.2, which is why numbering of pairs in the dataset starts with 16. For parts (a)–(d) assume IQ data are normally distributed.
 - (a) State a suitable null and an alternative hypotheses with regard to these data.
 - (b) Test the null hypothesis (using $\alpha = 0.05$).
 - (c) Give a 95% confidence interval for the true effect of PKU on IQ.
 - (d) State your conclusions.
 - (e) What are your assumptions?
 - (f) Now suppose we cannot assume normality and need to use the sign test. State the hypotheses, conduct the test and state your conclusions.
 - (g) Discuss how and why your conclusions in parts (d) and (f) differ.

2. The following data concern the association between sodium chloride (salt) intake and hypertension. Fifteen hypertensive and twelve normotensive subjects were isolated for a week so that their sodium (Na^+) intakes could be measured accurately. The average daily (Na^+) intakes (in milligrams) are listed in the table below. Compare the average daily (Na^+) intake of the hypertensive subjects with that of the normal volunteers using an appropriate statistical test. Include a justification for the statistical test employed.

Hypertensive	Normal
1100	1000
1320	1220
1350	1300
1450	1400
1600	1555
1850	1600
1900	1780
1990	1780
2050	1900
2120	2020
2200	2350
2210	2375
2500	
2610	
2720	