STA 580 — Spring 2011 — Dr. Charnigo

Written Assignment 4

This assignment is due on Thursday 31 March at 5:30 p.m. You may work in self-selected groups of two or three, in which case you may hand in one copy of the assignment for the group.

[20] 1. Refer to "Infectious Disease" and Table 10.31 on page 454. Let p_1 denote the probability of HIV infection for an intravenous drug user enrolled in a methadone program whose total family income is less than \$10,000, and let p_2 denote the probability of HIV infection for an intravenous drug user enrolled in a methadone program whose total family income is greater than or equal to \$10,000.

[10] a. Test $H_0 : p_1 = p_2$ against $H_1 : p_1 \neq p_2$ at level $\alpha = 0.05$ by calculating a z statistic based on the difference in sample proportions.

[10] b. Test $H_0 : p_1 = p_2$ against $H_1 : p_1 \neq p_2$ at level $\alpha = 0.05$ by calculating a χ^2 statistic based on the disparities between expected and observed values in a two-by-two contingency table.

[50] 2. Refer to "Otolaryngology, Pediatrics" and Table 9.9 on page 380. Use $\alpha = 0.05$ for all hypothesis tests.

[10] a. Create boxplots of effusion duration for the two groups (breast-fed and bottle-fed babies), one boxplot for each group.

[10] b. Apply the sign test to assess whether there is a nonzero median difference in effusion duration between the two groups.

[10] c. Apply the signed rank test to assess whether there is a nonzero median difference in effusion duration between the two groups.

[10] d. Proceeding as if the difference scores were normally distributed, apply the paired t-test to assess whether there is a nonzero mean difference in effusion duration between the two groups.

[10] e. Comment on the agreements/disagreements of the results from the three testing procedures. Which of the procedures do you think is most appropriate for this data set?

[30] 3. Continue with "Otolaryngology, Pediatrics" and Table 9.9 on page 380, but now suppose (contrary to your textbook author's description) that the samples of breast-fed and bottle-fed babies are independent. Use $\alpha = 0.05$ for all hypothesis tests.

[10] a. Apply the rank sum test to assess whether median effusion duration differs between the two groups (breast-fed and bottle-fed babies).

[10] b. Apply the procedure in Section 8.4 to logarithmically-transformed effusion duration. Do you conclude that mean logarithmically-transformed effusion duration differs between the two groups?

[10] c. Find the equal sample sizes from the two groups for which you would have 90% power to conclude that mean logarithmically-transformed effusion duration differs between the two groups.