STA 580 — Spring 2011 — Dr. Charnigo

Written Assignment 3

This assignment is due on Thursday 03 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.

[70] 1. Refer to sheet {Data} of {Diabetes.xls}, with which you have already worked in Written Assignment 2. Let μ_1 and σ_1 denote the mean and standard deviation of body mass index among diabetics in the population of which the sample is representative. Let μ_2 and σ_2 denote the mean and standard deviation of body mass index among non-diabetics in the population of which the sample is representative. You may assume that body mass index is normally distributed among diabetics and that body mass index is normally distributed among non-diabetics.

[10] a. Test $H_0 : \sigma_1^2 = 25$ against $H_1 : \sigma_1^2 \neq 25$ at level $\alpha = 0.05$.

[10] b. Test $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$ at level $\alpha = 0.05$ assuming $\sigma_1^2 = \sigma_2^2$.

[10] c. Construct a 95% confidence interval for $\mu_1 - \mu_2$ assuming $\sigma_1^2 = \sigma_2^2$. Comment on how this confidence interval relates to part b.

[10] d. Test $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$ at level $\alpha = 0.05$ assuming $\sigma_1^2 \neq \sigma_2^2$.

[10] e. Construct a 95% confidence interval for $\mu_1 - \mu_2$ assuming $\sigma_1^2 \neq \sigma_2^2$. Comment on how this confidence interval relates to part d.

[10] f. Test $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 \neq \sigma_2^2$ at level $\alpha = 0.05$. Comment on the implications for parts b through e.

[10] g. Is the following statement true or false? Defend your answer. "If $H_0 : \sigma_1^2 = 25$ were rejected in favor of $H_1 : \sigma_1^2 \neq 25$ at level $\alpha = 0.05$, then $H_0 : \sigma_1^2 = 25$ would also be rejected in favor of at least one of the following at $\alpha = 0.05$: $H_1 : \sigma_1^2 < 25$, $H_1 : \sigma_1^2 > 25$."

[30] 2. Refer, once more, to sheet {Data} of {Diabetes.xls}. Let p denote the proportion of diabetics with body mass index greater than 25 in the population of which the sample is representative. Note that p may be regarded as a conditional probability, $P($ body mass index greater than 25 | diabetic $)$.

[10] a. Test $H_0 : p = 0.50$ against $H_1 : p > 0.50$ at level $\alpha = 0.05$.

[10] b. What power would you have to conduct the test in part a if the sample included 80 diabetics?

[10] c. How many diabetics would need to be in the sample for 80% power to conduct the test in part a?