STA 580 — Spring 2009 — Dr. Charnigo

Written Assignment 3

This assignment is due on Thursday 05 March at 5:20 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.

[50] 1. Refer to sheet {Data} of {Diabetes.xls}, with which you have already worked in Written Assignment 2. Also, refer to the table below for information that may be useful in this exercise. All information in the table can be obtained by adapting the code in {http://www.richardcharnigo.net/STA580S09/SASquantiles.txt}.

Let μ_1 and σ_1 denote the mean and standard deviation of diastolic blood pressure among diabetics in the population of which the sample is representative. Let μ_2 and σ_2 denote the mean and standard deviation of diastolic blood pressure among non-diabetics in the population of which the sample is representative.

For parts a through d you may assume that diastolic blood pressure is normally distributed among diabetics and that diastolic blood pressure is normally distributed among non-diabetics.

Distribution	0.025 quantile	0.05 quantile	0.95 quantile	0.975 quantile
T on 125 df	-1.979	-1.657	1.657	1.979
T on 135 df	-1.978	-1.656	1.656	1.978
T on 145 df	-1.976	-1.655	1.655	1.976
T on 198 df	-1.972	-1.653	1.653	1.972
chi-square on 73 df	51.26	54.33	93.95	98.52
chi-square on 74 df	52.10	55.19	95.08	99.68
chi-square on 125 df	95.95	100.2	152.1	157.8
chi-square on 126 df	96.82	101.1	153.2	159.0
F on 73, 125 df	0.656	0.702	1.399	1.491
F on 74, 126 df	0.657	0.704	1.396	1.488
F on 125, 73 df	0.670	0.715	1.424	1.525
F on 126, 74 df	0.672	0.716	1.421	1.521

[10] a. Test $H_0 : \sigma_1^2 = 225$ against $H_1 : \sigma_1^2 < 225$ 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. 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] d. 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 and c.

[10] e. Now suppose I tell you that diastolic blood pressure cannot be assumed normally distributed among either diabetics or non-diabetics. Up through Lecture 7 of STA 580, what is your best data analysis option for comparing diabetics and non-diabetics with respect to central tendency on diastolic blood pressure? Carry out this data analysis. (Lectures 8 and 9 will present some other data analysis options.)

[50] 2. Refer, once more, to sheet {Data} of {Diabetes.xls}. Let p denote the proportion of diabetics with diastolic blood pressure greater than 80 in the population of which the sample is representative. Note that p may be regarded as a conditional probability, $P($ diastolic blood pressure greater than 80 $|$ diabetic $)$.

[10] a. Test $H_0 : p = 0.25$ against $H_1 : p > 0.25$ at level $\alpha = 0.05$.

[10] b. What power would you have to conduct the test in part a if the sample included 150 diabetics?

[10] c. How many diabetics would need to be in the sample for 80% power to conduct the test in part a? What if you wanted 90% power?

[10] d. If you increased the overall sample size by 100, including both diabetics and non-diabetics, how many of the 100 would you expect to be diabetics?

[10] e. Using your answers to parts c and d, determine the extent to which you would need to increase the overall sample size, including both diabetics and non-diabetics, for 80% power to conduct the test in part a. What if you wanted 90% power? (Ignore the possibility that the number of diabetics might be less than expected when you increased the overall sample size.)