STA 580 — Fall 2008 — Dr. Charnigo

Written Assignment 3

This assignment is due on Thursday 16 October 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 of the information in the table can be obtained by adapting the code in {http://www.richardcharnigo.net/STA580F08/SASquantiles.txt}.

Let μ_1 and σ_1 denote the mean and standard deviation of plasma glucose concentration among diabetics in the population of which the sample is representative. Let μ_2 and σ_2 denote the mean and standard deviation of plasma glucose concentration among non-diabetics in the population of which the sample is representative.

For parts a through d you may assume that plasma glucose concentration is normally distributed among diabetics and that plasma glucose concentration 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 130 df	-1.978	-1.657	1.657	1.978
T on 146 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 $H_0 : \sigma_1^2 = 100$ against $H_1 : \sigma_1^2 > 100$ 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 plasma glucose concentration cannot be assumed normally distributed among either diabetics or non-diabetics. For each part above (a, b, c, d) state whether: (i) your method (and answer) would remain the same; (ii) your method would change but you could still obtain an answer (based on the first seven weeks of STA 580); or, (iii) you could not obtain an answer (based on the first seven weeks of STA 580). If (ii) applies, indicate what method would now be used.

[50] 2. Refer, once more, to sheet {Data} of {Diabetes.xls}. Let p denote the proportion of diabetics in the population of which the sample is representative.

[10] a. Test $H_0 : p = 0.3$ against $H_1 : p \neq 0.3$ at level $\alpha = 0.05$.

[10] b. What power would you have to conduct the test in part a if the sample size were 500?

[10] c. What sample size would provide 80% power to conduct the test in part a? What if you wanted 90% power?

[10] d. Suppose that you have an opportunity to enlarge your originally planned sample size by 75 but that you will only do so if you can gain (at least) another 5% in power. If your originally planned sample size provided 80% power, will you enlarge it? What if your originally planned sample size provided 90% power?

[10] e. Why do you suppose that so few researchers aim for more than 90% power when planning their studies?