Unit 6 – Estimation
Homework #10 (Unit6 – Estimation, part 2 of 2)

Due Monday November 16, 2015
Last submission date for credit: Monday November 23, 2015

1. **This exercise is NOT a mimicking of the lecture notes. It is asking you to start your thinking from the WIDTH of a confidence interval and then reason your solution from there. See notes Unit 6. Estimation, p 34**

Alzheimers' disease has a poorer prognosis when it is diagnosed at a relatively young age. Suppose we want to estimate the age at which the disease was first diagnosed using a 90% confidence interval. Under the assumption that the distribution of age at diagnosis is normal, if the population variance is $\sigma^2=85$, how large a sample size is required **if we want a confidence interval that is 10 years wide**? ***Hint.*** **Confidence Interval Width = [Upper Limit] - [Lower Limit]**

2. **In this exercise, you get practice in combining the ideas of estimation in unit 6 and the z-score methods that you learned in unit 5. See notes Unit 6. Estimation, page 31.**

The National Health and Nutrition Examination Survey of 1975-1980 give the following data on serum cholesterol levels in US males.

Group	Age, years	Population Mean, μ	Population Standard Deviation, σ
1	20-24	180	43
2	25-34	199	49

Suppose the distribution of serum cholesterol is normal in each age group. If you draw simple random samples of size 50 from each of the two groups, what is the probability that the difference between the two sample means (Group 2 mean – Group 1 mean) will be more than 25?

Source: National Center or Health Statistics, R. Fulwood, W. Kalsbeek, B. Rifkind, et al. "Total serum cholesterol levels of adults 20-74 years of age: United States, 1976-1980". Vital and Health Statistics Series 11, No. 236. DHHS Pub. No (PHD) 86-1686, Public Health Service, Washington, DC, US Government Printing Office, May 1986. Cited in Daniel (p 140, 5.4.1 Copyright 1999 by John Wiley & Sons, Inc. By permission of John Wiley.

3. **The solution to this exercise uses the same approach that is described on page 41 of the unit 6 lecture notes. See the example on page 42.**

The objectives of a study by Kennedy and Bhambhani (1991) were to use physiological measurements to determine the test-retest reliability of the Baltimore Therapeutic Equipment Work Simulator during three simulated tasks performed at light, medium, and heavy work intensities, and to examine the criterion validity of these tasks by comparing them to real tasks performed in a controlled laboratory setting. Subjects were 30 healthy men between the ages of 18 and 35. The investigators reported a standard deviation of s=0.57 for the variable peak oxygen consumption (1/min) during one of the procedures. Assuming normality, compute a 95% confidence interval for the population variance for the oxygen consumption variable.

4. **This exercise draws from the material presented on pp 44-47 of the unit 6 notes. Because two measurements are made on each patient, the data in this exercise are "paired".**

The purpose of an investigation by Alahuhta et al (1991) was to evaluate the influence of extradural block for elective caesarian section simultaneously on several maternal and fetal hemodynamic variables and to determine if the block modified fetal myocardial function. The study subjects were eight healthy parturient in gestational weeks 38-42 with uncomplicated singleton pregnancies undergoing elective caesarian section under extradural anesthesia. Among the measurements taken were maternal diastolic arterial pressure during two stages of the study. The following are the lowest values of this variable at the two stages. Compute a 95% confidence interval for the difference in diastolic blood pressure between the two stages.

Patient ID	1	2	3	4	5	6	7	8
Stage 1	70	87	72	70	73	66	63	57
Stage 2	79	87	73	77	80	64	64	60

Source: Alahuhta S., Rasanen J, Jouppila R, Jouppila P., and Kangas-Saarela T., and Hoomen AI (1991)"Uteroplacental and fetal hemoydynamics during extradural anesthesia for caesarian section", British Journal of Anesthesia, 66: 319-323. Cited in Daniel (p 248, 7.4.3) Copyright 1999 by John Wiley & Sons, Inc. By permission of John Wiley.

5. **The ideas and calculations pertaining to confidence intervals for the ratio of two variances is described in the lecture notes. See notes Unit 6. Estimation, page 57. See the example, pp 58-59.**

A possible environmental determinant of lung function in children is the amount of cigarette smoking in the home. To study this question, two groups of children were studied. Group 1 consisted of 23 nonsmoking children aged 5-9 both of whose parents smoke in the home. Group 2 consisted of 20 nonsmoking children aged 5-9 neither of whose parents smoke. The sample mean (sample SD) of FEB1 for group 1 is 2.1 L (0.7) and for the Group 2 children, the sample mean (sample SD) of FEV1 is 2.3 L (0.4). Under the assumption of normality, construct a 95% confidence interval for the ration of the variance of the two groups. What is your conclusion regarding the reasonableness of the assumption of equality of variances?

6. **See notes 6. Estimation, pp 49-56.** .

For the same data in problem #5 and drawing upon your answer to #5 (regarding the reasonableness of equality of variances), compute a 95% confidence interval for the true mean difference in FEV1 between 5-9 year old children whose parents smoke and comparable children whose parents do not smoke.