

HOMEWORK ASSIGNMENTS

Homework #5

Assigned: 11/20/14

Due: 12/11/14

#1. A sample of 3 hospitals is taken without replacement from a population of 5 hospitals with probability proportional to the number of beds (B). Then a quality score (S) is calculated for each of the selected hospitals. The data are shown in the table below.

Hospital	B	S
.....
1	120	80
2	80	--
3	90	50
4	100	--
5	110	75

Find the second-order inclusion probabilities. [5 points] Deduce the first-order inclusion probabilities. [5 points] Use the Horvitz-Thompson estimator to find an approximate 95% confidence interval for the population total. [5 points] Compare your interval with the one based on simple random sampling. [5 points]

#2. The following are the scores out of 40 for Test 2 in MA547, Fall 2014.

Males	Females
.....
24	34
25	27
37	25
24	36
26	27
38	32
28	36
	32
	36

Use the Wilcoxon rank sum statistic to show whether females performed better than males. Be sure to state all assumptions. [You may use SAS to perform the exact calculations.]

#3. Consider the case of no imbalance in Table 3.8, page 94 of Rosenbaum's text book. Use the McNemar's test to study whether vasectomy might cause myocardial

infarction. What about if all the data are used ignoring the imbalance? Be sure to state all assumptions. [You may use SAS to perform the exact computations.]

#4. Let $\tilde{z}'\tilde{q}$ denote a sum statistic, where \tilde{z} is the set of treatment indicators and \tilde{q} is the set of scores. Under the hypothesis of no treatment effect, find the mean and variance for the following statistics and write down a formula to find the p-value of a test of no treatment effect.

(a) Fisher's exact test in which the $q_i = r_i = 0, 1, i = 1, \dots, n$ are the binary responses.

(b) Wilcoxon rank sum test in which the $q_i, i = 1, \dots, n$ are the ranks of the $r_i, i = 1, \dots, n$

#5. Consider Rosenbaum's data on genetic damage from alcohol (chromosome data) in which 20 alcoholics are matched with 20 non-alcoholics for age and gender.

(a) Find an approximate p-value of a test of no treatment effect.

(b) Under the additive model with a shift of τ , find the Hodges-Lehmann estimate of τ and an approximate 95% confidence interval for τ .