

ST745, Spring 2005

Homework 4, due: Thursday, 2/24/2005

1. (10 pts) You are given a small data sets on survival times of subjects in two groups: group 1: 1, 1+, 2, 2+ and group 2: 2, 3, 3+, 4, where + means a censored observation. Conduct the standard log-rank test (weight function = 1) **by hand** to compare the difference in the survival distribution. Which group has better survival?
2. (10 pts) Using all the data in problem 7.7 on page 240 of the textbook (the data can also be downloaded from <http://www.biostat.mcw.edu/homepgs/klein/7.8.7.html>), do the following (you can do it using SAS):
  - (a) Compare the survival curves for the three groups using the logrank test.
  - (b) Perform pairwise (logrank) tests to determine if there is any difference in survival between pairs or groups.
3. (10 pts) The website <http://www.biostat.mcw.edu/homepgs/klein/7.8.13.html> contains data on time to tumor development for some litters of rats treated with drug or placebo. Test the hypothesis that there is no difference in the times to tumor between the treated and control rats using a log-rank statistic stratified on litter.
4. (10 pts) An investigator asked you to help design a clinical trial for comparing a new treatment to the standard treatment for patients with some kind of cancer. Suppose the mean survival time of the standard treatment is 2 years and the new treatment is expected to extend the mean survival time to 3 years. For design purpose, let us assume the survival times for each treatment have exponential distribution. We would like to use the log-rank test for testing the survival difference at level  $\alpha = 0.05$  and the investigator wants to have 90% power to detect the above difference. Assume equal number of patients will be allocated to each treatment. Do the following:
  - (a) What is the expected total number of deaths we have to observe in order for the log-rank test to have the desired power to detect the difference we expect?
  - (b) Suppose the study length is  $L$  (years) and the investigator wants to let the patients enter the study throughout the whole study. What is the relationship the total sample size and the study length  $L$  have to satisfy? Assume patients enter the study randomly.
  - (c) If on average there are 100 patients available each year. Find the study length  $L$  so that we have the above design characteristics.