ST745, Spring 2016

Homework 2 Due: Thursday, 02/11/2016

1. The following table shows data on time to HIV development for a sample of 100 individuals with STD but free of HIV at time 0:

Year intervals	# of HIV positive	# lost to follow-up
0-2	1	1
2-4	2	1
4-6	8	4
6-8	5	8
8-10	5	18
10-12	3	20
12-14	8	16

Use the data in this table to do the following (here we assume that censoring occurred in the middle of the interval):

   (a) Find the life-table estimate of the survival function of the time to HIV at years 6, 8, and 10 for the individuals with STD.

   (b) Find the variance of the estimate you got in (a) at year 6, 8, and 10.

   (c) Repeat the above using `SAS` and R.

2. For the following small data set of survival time: 3, 4, 5+, 6, 6+, 8, 11+, 14+, 15, 16+, where "+" means a right censored survival time, do the following:

   (a) Find the Kaplan-Meier estimate of the survival function and its variance at each failure time.

   (b) Use the above Kaplan-Meier estimate to get an estimate and its variance of the cumulative hazard function at each failure time.

   (c) Find the Nelson-Aalen estimate of the cumulative hazard function and its variance at each failure time.

   (d) Find an estimate and its variance of the survival function using the Nelson-Aalen estimate you got in (c) at each failure time.

3. Based on the AZT cohort study data of the textbook in problem 4.7.7, answer the following questions by using statistical software (such as `SAS` or R). The AZT data set can be download from the book webpage:

   http://www.mcw.edu/biostatistics/Faculty/Faculty/JohnPKleinPhD/SurvivalAnalysisBook.htm.

   (a) Find and plot the Kaplan-Meier estimate and the 95% pointwise confidence intervals of the survival function (any type of confidence interval is ok).

   (b) Find the estimate and its 95% confidence interval of the median survival time using the method described in class.