**Introduction to Biostatistics (171:161)**
**Breheny**

Assignment 14
Due: No due date

1. From 1974 to 1984, the Mayo Clinic conducted a randomized, placebo-controlled clinical trial of the drug penicillamine on patients with primary biliary cirrhosis of the liver. Their data is available from our course website and contains three variables:

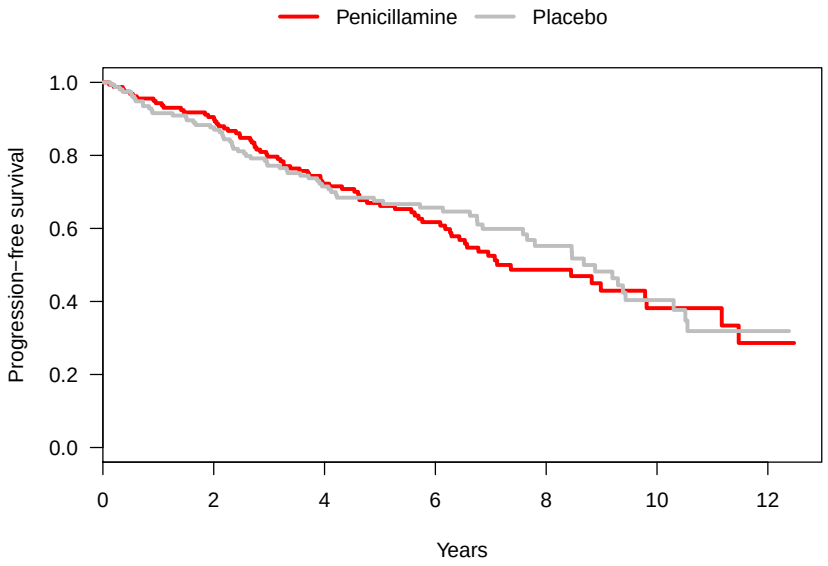
   - Time: the time until either censoring, death, or transplant. Measured in years.
   - Status: what happened at the end of the patient's time on study. Either the patient's failure time was censored (0), the patient required a liver transplant (1), or the patient died (2).
   - Group: whether the patient received penicillamine or placebo.

   The outcome of interest was the time until the patient either died or required a liver transplant (*i.e.*, the time until the death of the liver). All of the questions on this assignment concern this data set.

   (a) The table below lists a portion of the data for the penicillamine group, sorted by survival time. The table starts somewhere in the middle of the observed failure times, after 20 patients' livers had already failed. Fill in the rest of the table.

| Therapy | Time (Days) | Death/Transplant | $n(t)$ | $\hat{S}(T)$ |
|---|---|---|---|---|
| | ... | | | |
| Penicillamine | 799 | Yes | 139 | .873 |
| Penicillamine | 824 | Yes | | |
| Penicillamine | 839 | No | | |
| Penicillamine | 877 | Yes | | |
| Penicillamine | 901 | Yes | | |
| Penicillamine | 904 | Yes | | |
| | ... | | | |

(b) The Kaplan-Meier curves for this study are given below.




(i) What are the estimated 5-year survival rates for patients on penicillamine and placebo, respectively?

(ii) What are the median survival times for patients on penicillamine and placebo, respectively?

(c) If there were truly no difference between the groups, there would be a 73% chance of seeing a difference as large or larger than the one in the above figure. What procedure that we discussed in class could be used to calculate that "73%" number?

(d) Compared to the confidence interval for $\hat{S}(1)$, will the confidence interval for $\hat{S}(9)$ be (i) wider (ii) narrower (iii) exactly the same?