

Biostatistical Methods I (BIOS 5710)
Breheeny

Assignment 12
 Due: Never

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 data from the corresponding period of time for the placebo group is

Therapy	Time (Days)	Death/Transplant	$n(t)$
	...		
Placebo	837	Yes	129
Placebo	850	Yes	
Placebo	853	Yes	
Placebo	859	Yes	
Placebo	890	Yes	
	...		

Construct a 2x2 table for testing association between drug and liver failure at day 850. You do not have to carry out any sort of test; just set up the table.

- (c)
 - (i) Test whether or not survival (of the liver) is the same in the penicillamine and placebo groups.
 - (ii) Plot Kaplan-Meier curves for the drug and placebo groups.
 - (iii) Look at the Cochrane Review for penicillamine and primary biliary cirrhosis (you can find it by Googling “Cochrane penicillamine primary biliary cirrhosis”). Based on your analysis in parts (a) and (b), would you agree with the conclusions presented in that literature review?
- (d) Based on your Kaplan-Meier plots from the previous question,
 - (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?
- (e) 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?
- (f) Compared to the confidence interval for the median survival time, will the confidence interval for the 25th percentile (i.e., the time such that $S(t) = 0.75$) be
 - (i) wider
 - (ii) narrower
 - (iii) exactly the same?