

# P8110 Homework Two

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## Problem 1

(a)

$$\hat{t}_{0.5} = \min\{t_j : \hat{S}(t_j) < 0.5\}$$

1: identify  $\hat{t}_j$  such that  $\hat{S}(t_j) < 0.5$

t_j	surv_prob
t_6	0.0000
t_5	0.2667
t_4	0.4000

2: identify minimum  $\hat{t}_j : \hat{t}_4 = 5$

$$\begin{aligned} 95\% \text{CI} &= \text{all } t_j \text{CI} \ni 0.5 \\ &= t_1, t_2, t_3, t_4, t_5 \\ &= [0.4, 1.2), [1.2, 4.3), [4.3, 5.0), [5.0, 5.1), [5.1, 7.1) \\ &= [0.4, 7.1) \end{aligned}$$

We estimate that 50% of patients will survive for more than 5 years. Furthermore, we are 95% confident that the true median survival time is between 0.4 and 7.1 years.

(b)

$$\begin{aligned} \hat{\mu}_{t_j} &= \sum_{j=1}^J \hat{S}(t_{j-1})(t_j - t_{j-1}) \\ &= 1(0.4) + 0.9(1.2 - 0.4) + 0.8(4.3 - 1.2) + 0.6667(5.0 - 4.3) + 0.4(5.1 - 5.0) + 0.2667(7.1 - 5.1) \\ &= 0.4 + 0.72 + 2.48 + 0.4667 + 0.04 + 0.5334 \\ &= 4.64 \end{aligned}$$

The estimated average survival time is 4.64 years.