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 $\hat{S}(t_j) < 0.5$

$\hat{t_j}$	$\hat{S}(t_j)$
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 suvival time is 4.64 years.

(c) $\hat{\mu}_1$ will be bigger. If $\hat{\mu}_2$ is the mean survival time where all the listed points are events, then 2 more events are occuring before $\hat{\mu}_1 = (4.64)$ and thus the average surivival time will decrease.

Problem 2

```
data hw2;
    input year status;
    datalines;
    0.4 1
    1.2 1
    1.2 0
    3.4 0
    4.3 1
    5.0 1
    5.0 1
    5.1 1
    6.1 0
    7.1 1
;
run;

proc lifetest data = hw2 method = KM
               conftype = loglog outsurv = hw2_conf
               stderr plots = survival(cl);
    time year*status(0);
run;
```

(a)

Quartile Estimates				
	Point		95% Confidence Interval	
Percent	Estimate	Transform	[Lower	Upper)
75	7.10000	LOGLOG	5.00000	7.10000
50	5.00000	LOGLOG	0.40000	7.10000
25	4.30000	LOGLOG	0.40000	5.00000

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)

Mean	Standard Error
4.64000	0.76310

The estimated average survival time is 4.64 years.