

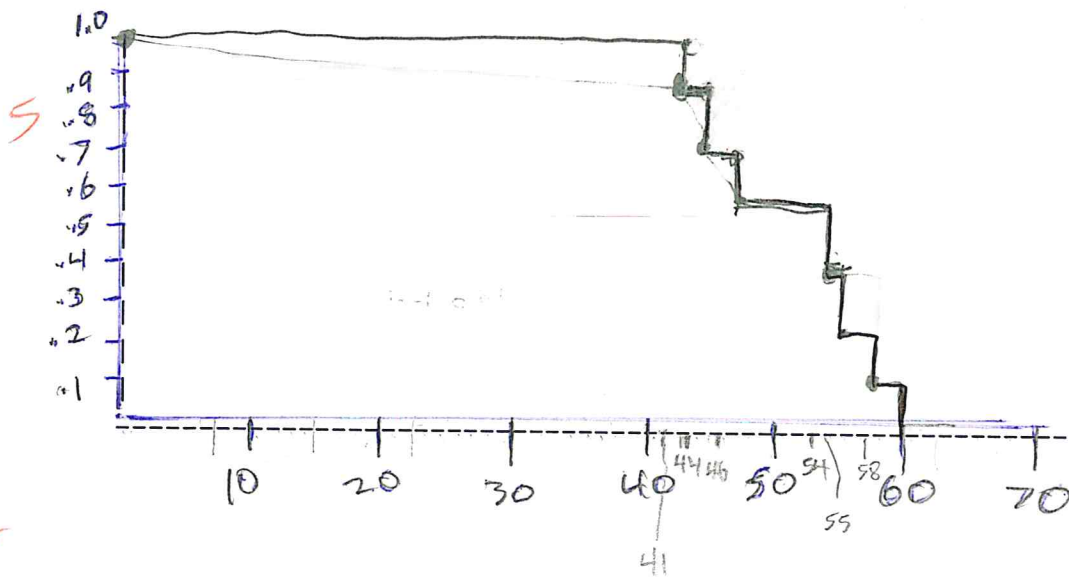
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1) Survival times in days after being inoculated with human tuberculosis for seven mice are given below.

41, 44, 46, 54, 55, 58, 60

Compute the empirical survival function $\hat{S}_E(t_i)$ by filling in the table below. Then plot the function.

$t_{(j)}$	t_i	d_i	$\hat{S}_E(t) = \hat{S}_E(t_{i-1}) - \frac{d_i}{n}$
	$t_0 = 0$		$\hat{S}_E(0) = 1 = \frac{7}{7}$
41	41	1	$\hat{S}_E(41) = \frac{6}{7} = \frac{6}{7} = .8571$
44	44	1	$\hat{S}_E(44) = \frac{5}{7} = \frac{5}{7} = .7143$
46	46	1	$\hat{S}_E(46) = \frac{4}{7} = \frac{4}{7} = .5714$
54	54	1	$\hat{S}_E(54) = \frac{3}{7} = \frac{3}{7} = .4286$
55	55	1	$\hat{S}_E(55) = \frac{2}{7} = \frac{2}{7} = .2857$
58	58	1	$\hat{S}_E(58) = \frac{1}{7} = \frac{1}{7} = .1429$
15 60	60	1	$\hat{S}_E(60) = \frac{0}{7} = \frac{0}{7} = 0$



2) Suppose 1000 white 71 year old females buy a 1 year \$100000 life insurance policy. Actuaries use $1 - S(t+a)/S(a) = 1 - P(Y > t+a | Y > a)$ to estimate how many claims will be filed. Hence actuaries want $S(72)/S(71)$. If $\hat{S}(72) = 0.77$ and $\hat{S}(71) = 0.78$, about how many of the 1000 claims will be filed?

$$\left(1 - \frac{0.77}{0.78}\right) 1000 = 12.82$$

3) Find the 95% classical CI for $S_Y(32)$ if $n = 9$ and $\hat{S}_E(32) = 6/9$.

$$\hat{S}(32) \pm 1.96 \sqrt{\frac{\hat{S}(32)(1-\hat{S}(32))}{n}} = \frac{6}{9} \pm 1.96 \sqrt{\frac{\frac{6}{9} \cdot \frac{3}{9}}{9}}$$

$$= 0.6667 \pm 1.96(0.1571) = 0.6667 \pm 0.3080 = (0.3587, 0.9747)$$

4) Find the 95% plus four CI for $S_Y(32)$ if $n = 9$ and $\hat{S}_E(32) = 6/9$.

$$\tilde{p}_{32} = \frac{n\hat{S}(32) + 2}{n+4} = \frac{9 \cdot \frac{6}{9} + 2}{9+4} = \frac{8}{13} = 0.6154$$

$$CI = \tilde{p}_{32} \pm 1.96 \sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}} = \frac{8}{13} \pm 1.96 \sqrt{\frac{\frac{8}{13} \cdot \frac{5}{13}}{13}} = 0.6154 \pm 0.2645$$

$$= (0.3509, 0.8799)$$

5) Suppose the hazard function is plotted for white females and white males in 1989. Is the top function for white males or for white females?

white males

Since low hazard is good and white females live longer

