Advanced Theory

Survival Analysis 2005

Problem for February 1, 2005

1) Prove:

$$\text{area} = E(T) = \int_0^\infty S(t)dt$$

a) when S(t) = $\exp(-\lambda t)$

b) In general for non-negative random variable T.

Problems for February 8, 2005 (complete the problems associated with pages that Dr. Selvin covered during the prior week)

2) Look at page 6 of the Kaplan Meier notes.

Prove:

Complete data (n=d)

$$\widehat{\mu} = \frac{1}{n}\sum_i^N t_i = \sum_i^N P_i(t_i - t_{i-1})$$

3) Look at page 15 of the Kaplan Meier notes.

Prove:

Complete data (n=d)

$$\text{variance}(\widehat{P_k}) = \widehat{P}_k^2 \sum_i^k \frac{q_i}{n_i p_i} = n\widehat{P_k}(1 - \widehat{P_k})$$

4) Look at page 19 of the Kaplan Meier notes.

Prove:

Complete data (n=d)

$$variance(\widehat{\mu}) = \frac{1}{n}\sum_{i}^{N}(t_i - \bar{t})^2$$

5) Look at page 20 of the Kaplan Meier notes.

Prove:

Complete data (n=d)

$$variance(\widehat{t_m}) \approx \left[\frac{t_l - t_u}{\widehat{P_l} - \widehat{P_u}}\right]^2 V_m$$

$$V_m = \widehat{P}_m \sum \frac{q_i}{n_i p_i} \qquad \text{(Greenwood's Formula)}$$

Explore the accuracy (computationally) when

$$P(t) = \exp(-\lambda t)$$