

BIOSTATISTICS 740 (BIOS7400)

Clinical Trials

Lecture 20

Survival Analysis III

**(Check for Proportionality, Residuals,
Stratification, Model Selection, Time-Dependent
Covariates, and Sample Size)**

Standard Error (SE) of KM Estimator

$$\hat{S}(t) = \hat{S}(t_j) = \prod_{i=1}^j \left(1 - \frac{d_i}{n_i}\right) \quad \text{\textit{j is the index for the maximum value of } } t_j \leq t$$

$$\hat{S}(t) = \begin{cases} 1 & t < t_1 \\ \prod_{t_i \leq t} \left(1 - \frac{d_i}{n_i}\right) & t \geq t_1 \end{cases}$$

$$\text{Var}[\hat{S}(t)] = [\hat{S}(t)]^2 \sum_{t_i \leq t} \frac{d_i}{n_i(n_i - d_i)}$$

$$\text{SE}[\hat{S}(t)] = \hat{S}(t) \sqrt{\sum_{t_i \leq t} \frac{d_i}{n_i(n_i - d_i)}}$$

Greenwood's formula for the variance (or SE) of $\hat{S}(t)$

Example for KM Survival Curves for Leukemia Clinical Trial Example

SAS_Code_1_for_Leukemia_Data_KM_Survival_Curves.pdf

Output Delivery System

```
ods html;
ods graphics on;

title "Leukemia Clinical Trial example";
data leukemia;
input weeks status gender log_WBC trtmt;
cards;
35      0      1      1.45      0
34      0      1      1.47      0
32      0      1      2.2       0
.....
23      1      1      1.97      1
22      1      0      2.73      1
17      1      0      2.95      1
.....
;

proc lifetest data=leukemia plots = (s);
time weeks*status(0);
strata trtmt/test=(LOGRANK WILCOXON TARONE PETO);
symbol1 v=none color=blue line=1;
symbol2 v=none color=red line=2;
title "Kaplan-Meier Survival Curves for Leukemia Clinical Trial Data";
run;

ods graphics off;
ods html close;
```

gender (1=male, 0=female)

trtmt = 0 ⇒ 6-mercaptopurine (6-MP)

trtmt = 1 ⇒ Placebo

Create the KM estimate survival plots

Tells SAS which values are censored (i.e., "0" for this program)

Tells SAS which test(s) shall be applied

tells SAS which variable to use to compare KM survival curves