STA 5364, Report 2.6

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Example 4.2 (Continued)

This example illustrates the construction of confidence intervals for the survival function using the Kaplan-Meier (KM) estimator. We use the estimated survival function and variance for Acute Lymphoblastic Leukemia (ALL) patients as shown in Table 4.3 of Klein and Moeschberger.

Data and Calculations

The survival probability at 365 days is $S(365) = 0.5492$ with an estimated variance of $\hat{V}[S(365)] = 0.0812^2$. We calculate $\sigma_S^2(365)$ as:

$$\sigma_S^2(365) = (0.0812 \times 0.5492)^2 = 0.14792$$

95% Linear Confidence Interval

Using the formula for a linear confidence interval:

$$S(t_0) \pm Z_{1-\alpha/2}\sqrt{\hat{V}[S(t_0)] \cdot S(t_0)^2}$$

With $Z_{1-\alpha/2} = 1.96$ (for 95% confidence), the confidence interval is:

$$0.5492 \pm 1.96 \cdot \sqrt{0.14792}$$

$$= (0.3900, 0.7084)$$

R Code for Reproducibility

Below is the R code to calculate the confidence interval.

```
# Survival probability and variance
S <- 0.5492
var_S <- 0.0812^2

# Standard error
se_S <- sqrt((0.0812 * S)^2)

# Confidence interval
alpha <- 0.05
z <- qnorm(1 - alpha / 2)
lower <- S - z * se_S
upper <- S + z * se_S

cat("95% CI for Survival at 365 days:", round(lower, 4), round(upper, 4), "\n"
```

Results

The 95% confidence interval for the survival probability at 365 days is $(0.3900, 0.7084)$.