Description of Data

‘SURVIVAL65.TXT’ is data from a study on multiple myeloma in which researchers treated 65 patients with alkylating agents. Of those patients, 48 died during the study and 17 survived. The goal of this study is to identify important prognostic factors.

TIME survival time in months from diagnosis
STATUS 1 = dead, 0 = alive (censored)
LOGBUN log blood urea nitrogen (BUN) at diagnosis
HGB hemoglobin at diagnosis
PLATELET platelets at diagnosis: 0 = abnormal, 1 = normal
AGE age at diagnosis in years
LOGWBC log WBC at diagnosis
FRACTURE fractures at diagnosis: 0 = none, 1 = present
LOGPBM log percentage of plasma cells in bone marrow
PROTEIN proteinuria at diagnosis
SALCIUM serum calcium at diagnosis

1. Using Kaplan-Meier method to estimate the distribution of survival time for the total sample. What is the mean survival time and standard error? What is the median survival time and 95% CI? How many censored observations are there?

The mean survival time is 32.1 months (SE=4.0). The median survival time is 19.0 months (95% CI: 15~35). There are 26.2% censored.

2. Using Kaplan-Meier method to estimate whether fracture influences survival time. What is the median survival time and 95% CI in each group? Interpret the Log Rank test and the survival curves.

In the fracture group the median survival time is 19.0 months (95% CI: 13~35); in the group without fracture the median survival time is 18.0 months (95% CI: 11~88). The survival curves suggest a worse survival pattern for the fracture group (especially for the later times, after 2 years). The Log-Rank test shows that the two survival curves are homogeneity (x²=0.94, P=0.33).
3. Run Cox model by using the stepwise selection process. Please report and interpret the final model.

**Analysis of Maximum Likelihood Estimates**

<table>
<thead>
<tr>
<th>Variable</th>
<th>DF</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>Chi-Square</th>
<th>Pr &gt; ChiSq</th>
<th>Hazard Ratio</th>
<th>95% Hazard Ratio Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGBUN</td>
<td>1</td>
<td>1.67440</td>
<td>0.61209</td>
<td>7.4833</td>
<td>0.0062</td>
<td>5.336</td>
<td>1.608 - 17.709</td>
</tr>
<tr>
<td>HGB</td>
<td>1</td>
<td>-0.11899</td>
<td>0.05751</td>
<td>4.2811</td>
<td>0.0385</td>
<td>0.888</td>
<td>0.793 - 0.994</td>
</tr>
</tbody>
</table>

These data suggest that logbun and hgb are associated with survival with myeloma. Specifically, an increase in one unit of the log of blood urea nitrogen increases the hazard of dying by 433.6% (5.336-1). An increase in one unit of hemoglobin at diagnosis decreases the hazard of dying by 11.2% (1-0.888).