Kriss worked at GlaxoSmithKline for almost six years from 2005 to 2011 as a statistician supporting drug discovery. He developed a passion for teaching and taught SAS Graphics to programmers, and statisticians. He is now an independent statistical programmer, consulting at Eli Lilly, supporting oncology and creating edit checks at MedaVante.
Agenda

• ODS Output Objects

• Kaplan Meier Plot
ODS Output Objects
Kaplan-Meier Plot

LIFETEST Procedure: SurvivalPlot

Survival Probability

Days from Randomisation

<table>
<thead>
<tr>
<th>Placebo</th>
<th>Low Dose</th>
<th>High Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>86</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>84</td>
<td>48</td>
<td>18</td>
</tr>
<tr>
<td>84</td>
<td>76</td>
<td>34</td>
</tr>
</tbody>
</table>

+ Censored
Obtaining ODS Output Object Names

```sas
ods trace on;
proc lifetest data = adam.adtteeff
   plots=survival(atrisk=0 to 210 by 30);
   time aval * cnsr(1);
   strata trtpn;
run;
ods trace off;
```
ODS Output Object Names

Output Added:

Name: SurvivalPlot
Label: Survival Curves
Path: Lifetest.SurvivalPlot

-------------------
ODS Table Names

Seen in the details tab within the help guide
### ODS Graph Names

Seen in the details tab within the help guide

#### Table 72.7: Graphs Produced by PROC LIFETEST

<table>
<thead>
<tr>
<th>ODS Graph Name</th>
<th>Plot Description</th>
<th>PLOTS= Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>ciiPlot</td>
<td>Cumulative incidence function</td>
<td>CIF</td>
</tr>
<tr>
<td>ciiPlot</td>
<td>Cumulative incidence function with pointwise confidence limits</td>
<td>CIF(CL)</td>
</tr>
<tr>
<td>ciiPlot</td>
<td>Cumulative incidence function with Gray’s test</td>
<td>CIF(TEST)</td>
</tr>
<tr>
<td>DensityPlot</td>
<td>Density function for life-table method</td>
<td>PDF</td>
</tr>
<tr>
<td>FailurePlot</td>
<td>Cumulative distribution function</td>
<td>survival(Failure)</td>
</tr>
<tr>
<td>HazardPlot</td>
<td>Hazard function for life-table method or smoothed hazard for product-limit, Breslow, or Fleming-Harrington method</td>
<td>HAZARD</td>
</tr>
<tr>
<td>LogNegLogSurvivalPlot</td>
<td>Log(-log(survivor function))</td>
<td>LOGLOGS</td>
</tr>
<tr>
<td>NegLogSurvivalPlot</td>
<td>Log(survivor function)</td>
<td>LOGSURV</td>
</tr>
<tr>
<td>SurvivalPlot</td>
<td>Survivor function</td>
<td>SURVIVAL</td>
</tr>
<tr>
<td>SurvivalPlot</td>
<td>Survivor function with number of subjects at risk</td>
<td>(A TRISK)</td>
</tr>
<tr>
<td>SurvivalPlot</td>
<td>Survivor function with pointwise confidence limits</td>
<td>SURVIVAL( CL)</td>
</tr>
<tr>
<td>SurvivalPlot</td>
<td>Survivor function with equal-precision band</td>
<td>(C B= EP)</td>
</tr>
<tr>
<td>SurvivalPlot</td>
<td>Survivor function with Hall-Wellner band</td>
<td>SURVIVAL(CB=HW)</td>
</tr>
<tr>
<td>SurvivalPlot</td>
<td>Survivor function with homogeneity test</td>
<td>SURVIVAL(TEST)</td>
</tr>
</tbody>
</table>

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Kaplan-Meier Plot

LIFETEST Procedure

ods output SurvivalPlot = SurvivalPlot;
ods output HomTests=HomTests(where=(test="Log-Rank"));
proc lifetest data = adam.adtteeff plots=survival(atrisk=0 to 210 by 30);
   time aval * cnsr(1);
   strata trtpn;
run;

#SASGF
Graph Template Language

Creating Kaplan-Meier Plot with Median Survival Times and HR table
Graph Template Language
Creating Kaplan-Meier Plot with Median Survival Times and HR table

![Graph showing Kaplan-Meier plot with median survival times and hazard ratio table.](image)

- Log-Rank p-value = <.0001
- HR: High Dose vs Placebo = 0.20
- HR: Low Dose vs Placebo = 0.36
Creating Kaplan-Meier Plot
with Median Survival Times and HR table

• Use Time-to-event Dataset, for example, ADTTE
• Use PROC LIFETEST to obtain Kaplan Meier survival dataset and median survival times
• Use PROC PHREG to obtain hazard ratios
• Create macro variables that contain the median survival times and hazard ratios
• Use GTL (or SGPLOT) to create the Kaplan-Meier plot
Creating Kaplan-Meier Plot

Step 1

- LAYOUT OVERLAY
- LAYOUT OVERLAY
- LAYOUT LATTICE
- AXISTABLE
- STEPPLOT
- SCATTERPLOT
- DISCRETELEGEND
- + Censored

#SASGF
Step 1 – SAS Code

**KM Curve**

```sas
stepplot x = time y = survival / 
  group = stratum
  name="Survival"
  legendlabel="Survival";

scatterplot x=time y=censored / 
  markerattrs=(symbol=plus)
  group=stratum;
```
Step 1 – SAS Code

Censored Legend

```
scatterplot x=time y=censored / markerattrs=(symbol=plus color=black) name="Censored";

discretelegend "Censored" / location = inside autoalign = (topright);
```
Step 1 – SAS Code

At-Risk Table

```sas
layout overlay /
  xaxisopts=(display=none
    linearopts=(tickvaluesequence=(start=0
      end=210 increment=30))
    border=off;

  axistable value=atrisk x=tatrisk /
    class=stratum colorgroup=stratum;

endlayout;
```
Creating Kaplan-Meier Plot

Step 2

Log-Rank: p-value = <.0001
HR: High Dose vs Placebo = 0.20
HR: Low Dose vs Placebo = 0.36
Step 2 – SAS Code

Summary Statistics Table

```sas
mvar log_rank_pvalue HazardRatio1 HazardRatio2;

layout gridded / columns=2 rows=3 border=true
  halign=right valign=to outerpad=(top=25px);
entry halign=right "Log-Rank:"
  textattrs=(style=italic) "p"
  textattrs=(style=normal) "-value = ";
entry halign=left log_rank_pvalue;
<Other Entry Statements>
endlayout;
```
Creating Kaplan-Meier Plot

Final Step

Log-Rank: p-value = <.0001
HR: High Dose vs Placebo = 0.20
HR: Low Dose vs Placebo = 0.36

Days from Randomisation

Survival Probability

Placebo  Low Dose  High Dose
86  24  6  1  0
84  48  18  9  4  2  0
84  76  34  13  6  2  1  0

NMVAR
DROPLINE
Final Step – SAS Code

Median Survival Time

```
%do i = 3 %to 1 %by -1;
  dropline y = 0.50 x = MedianSurvival&i /
    dropto = both
    lineattrs=(thickness=1px
      color=graphdata&i;color
      pattern=graphdata&i:linestyle)
    label=CMedianSurvival&i;
%end;
```
Conclusion
Conclusion

• Data from a procedure can be saved in ODS output objects to be used

• Creating a custom template and associating with the necessary data allows you to create custom graphs.

• It is relatively simple to create Kaplan-Meier plots using SAS.
  • The STEPLOT statement creates the Kaplan-Meier curves
  • The AXISTABLE statement creates the subjects at risk table
Thank you!

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