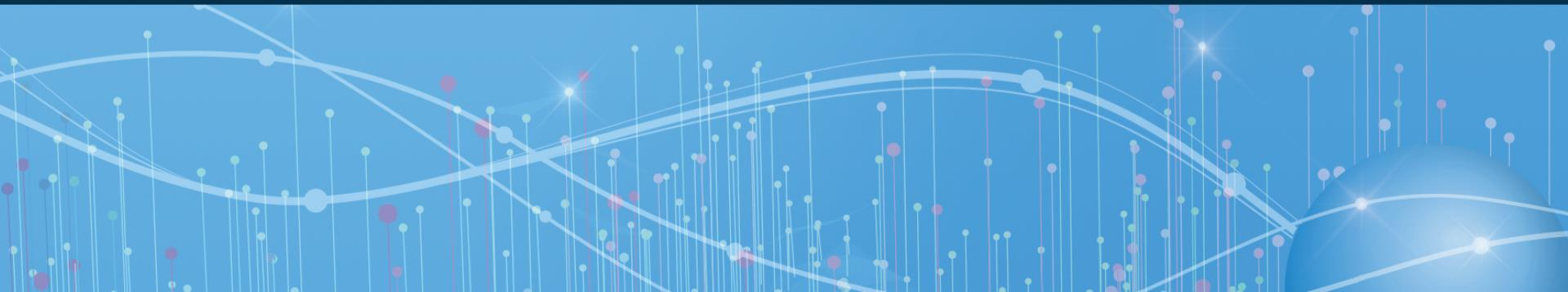
#SASGF

VIRTUAL

SAS® GLOBAL FORUM 2021



Super Static SG Graphs

Kriss Harris, SAS Specialists Limited

Kriss worked at GlaxoSmithKline for almost six years from 2005 to2011 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.

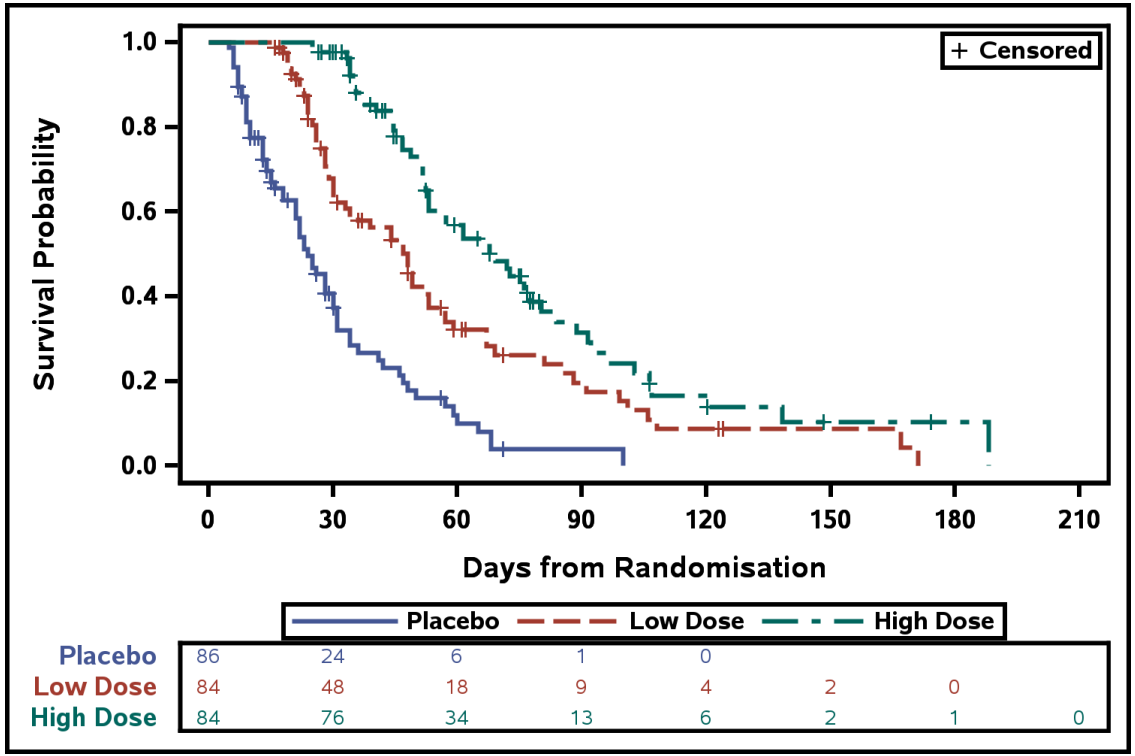
Agenda

- ODS Output Objects
- Kaplan Meier Plot

ODS Output Objects

Kaplan-Meier Plot

LIFETEST Procedure: SurvivalPlot



Obtaining ODS Output Object Names

```
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

```
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Output Added:
-------------
Name:         SurvivalPlot
Label:        Survival Curves
Template:     Stat.Lifetest.Graphics.ProductLimitSurvival
Path:         Lifetest.SurvivalPlot
-------------
```

ODS Table Names

Seen in the details tab within the help guide

The LIFETEST Procedure

Overview | Getting Started | Syntax | Details | Examples | References

ODS Table Names

PROC LIFETEST assigns a name to each table it creates. You can use these names to reference the table when using the Output Delivery System (ODS) to select tables and create output data sets. These names are listed in Table 72.6. For more information about ODS, see Chapter 20: Using the Output Delivery System.

Table 72.6: ODS Tables Produced by PROC LIFETEST

ODS Table Name	Description	Statement / Option
BreslowEstimates	Breslow estimates	PROC LIFETEST METHOD=B
CensoredSummary	Number of event and censored observations	PROC LIFETEST METHOD=PL | B | FH
CIF	Cumulative incidence function estimates	TIME / EVENTCODE
FailureSummary	Summary of failure outcomes for competing-risks data	TIME / EVENTCODE
FlemingEstimates	Fleming-Harrington estimates	PROC LIFETEST METHOD=FH
FlemingHomCov	Covariance matrix for k-sample FLEMING statistics	STRATA / TEST=FLEMING
GrayTest	Results of k-sample test of Gray (1988) comparing CIFs	TIME / EVENTCODE; STRATA
HomStats	Test statistics for k-sample tests	STRATA / TEST=
HomTests	Results of k-sample tests	STRATA / TEST=
LifetableEstimates	Life-table survival estimates	PROC LIFETEST METHOD=LT
LogForStepSeq	Forward stepwise sequence for the log-rank statistics for association	TEST

ODS Graph Names

Seen in the details tab within the help guide

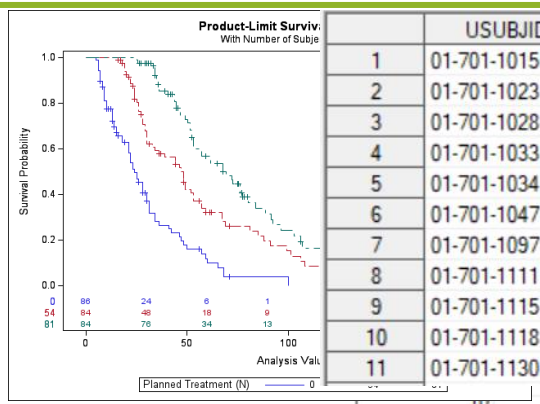
Table 72.7: Graphs Produced by PROC LIFETEST

ODS Graph Name	Plot Description	PLOTS= Option
cifPlot	Cumulative incidence function	CIF
cifPlot	Cumulative incidence function with pointwise confidence limits	CIF(CL)
cifPlot	Cumulative incidence function with Gray's test	CIF(TEST)
DensityPlot	Density function for life-table method	PDF
FailurePlot	Cumulative distribution function	survival(FAILURE)
HazardPlot	Hazard function for life-table method or smoothed hazard for product-limit, Breslow, or Fleming-Harrington method	HAZARD
LogNegLogSurvivalPlot	Log(-log(survivor function)	LOGLOGS
NegLogSurvivalPlot	Log(survivor function)	LOGSURV
SurvivalPlot	Survivor function	SURVIVAL
SurvivalPlot	Survivor function with number of subjects at risk	SURVIVAL (ATRISK)
SurvivalPlot	Survivor function with pointwise confidence limits	SURVIVAL(CL)
SurvivalPlot	Survivor function with equal-precision band	SURVIVAL (CB=EP)
SurvivalPlot	Survivor function with Hall-Wellner band	SURVIVAL (CB=HW)
SurvivalPlot	Survivor function with homogeneity test	SURVIVAL(TEST)

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;
```



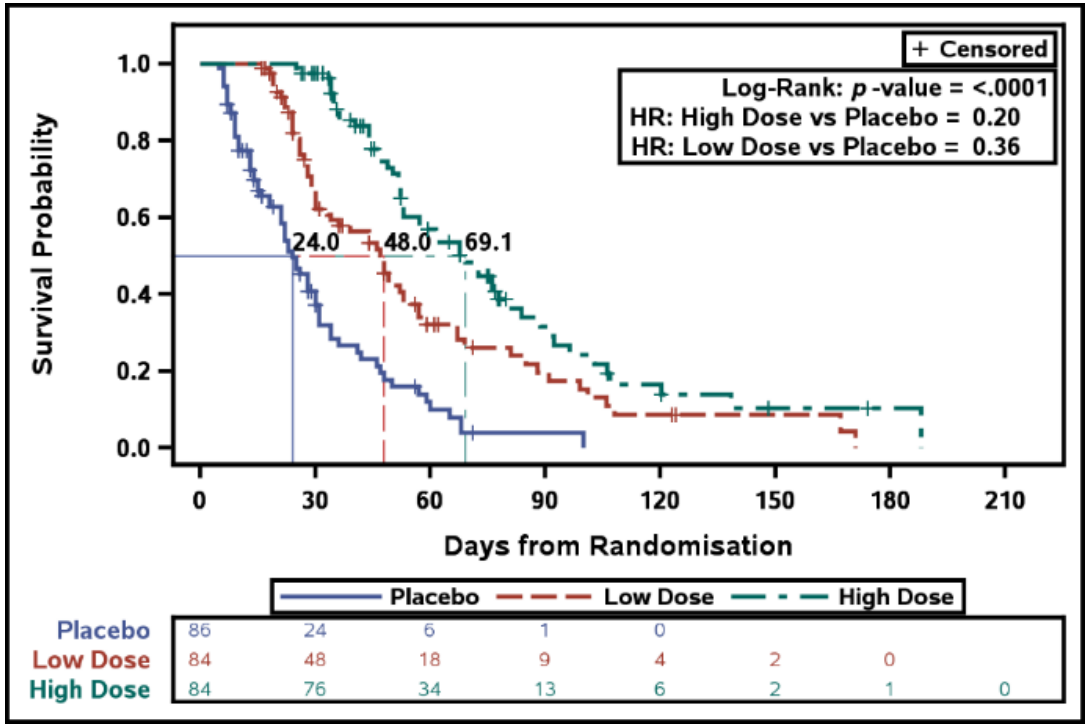
	USUBJID	TRTPN	TRTP	AVAL	CNSR	Stratum	StratumNum
1	01-701-1015	0	Placebo	5	0		1
2	01-701-1023	0	Placebo	30	1		1
3	01-701-1028	81	Xanomeline High Dose	74.7	1		1
4	01-701-1033	54	Xanomeline Low Dose	16	1		1
5	01-701-1034	81	Xanomeline High Dose	52.3	1		1
6	01-701-1047	0	Placebo	31	0		1
7	01-701-1097	54	Xanomeline Low Dose	26	0		1
8	01-701-1111	54	Xanomeline Low Dose	24	1		1
9	01-701-1115	54	Xanomeline Low Dose	44	1		1
10	01-701-1118	0	Placebo	14	0		1
11	01-701-1130	0	Placebo	12	1		1

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



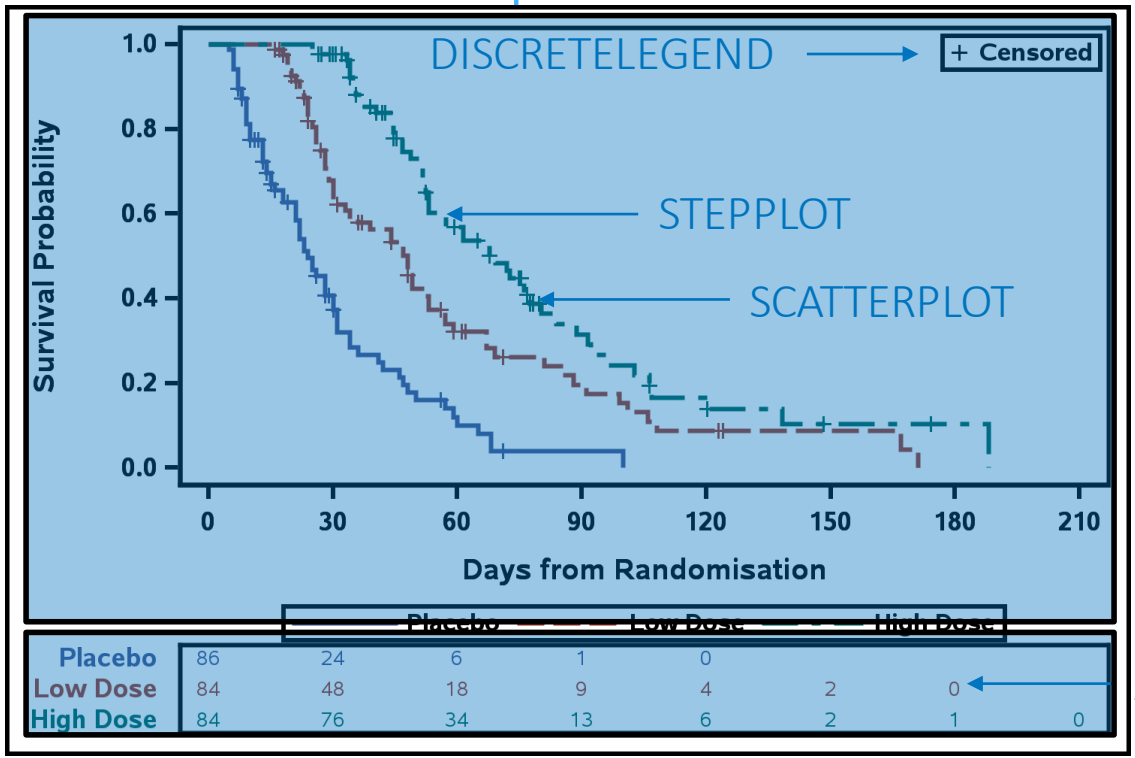
Creating Kaplan-Meier Plot

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



Step 1 – SAS Code

KM Curve

```
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

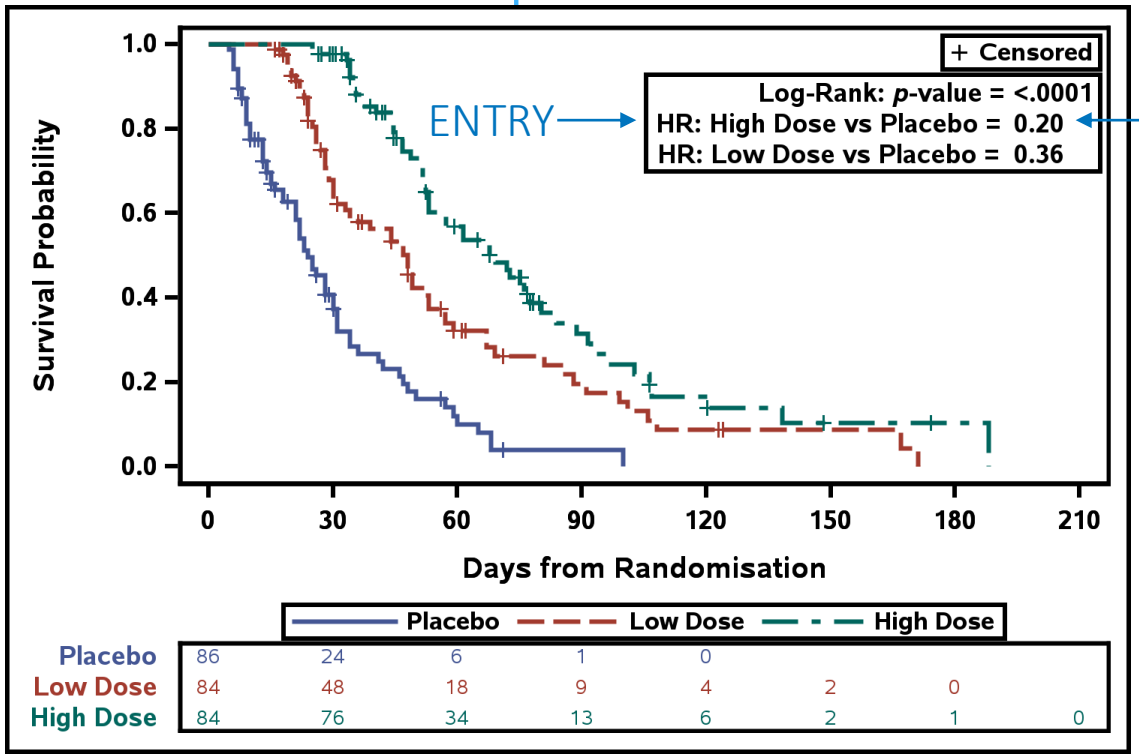
```
layout overlay /
   xaxisopts=(display=none
      linearopts=(tickvaluesequence=(start=0
      end=210 increment=30))) border=off;

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

endlayout;
```

Creating Kaplan-Meier Plot

Step 2



Step 2 – SAS Code

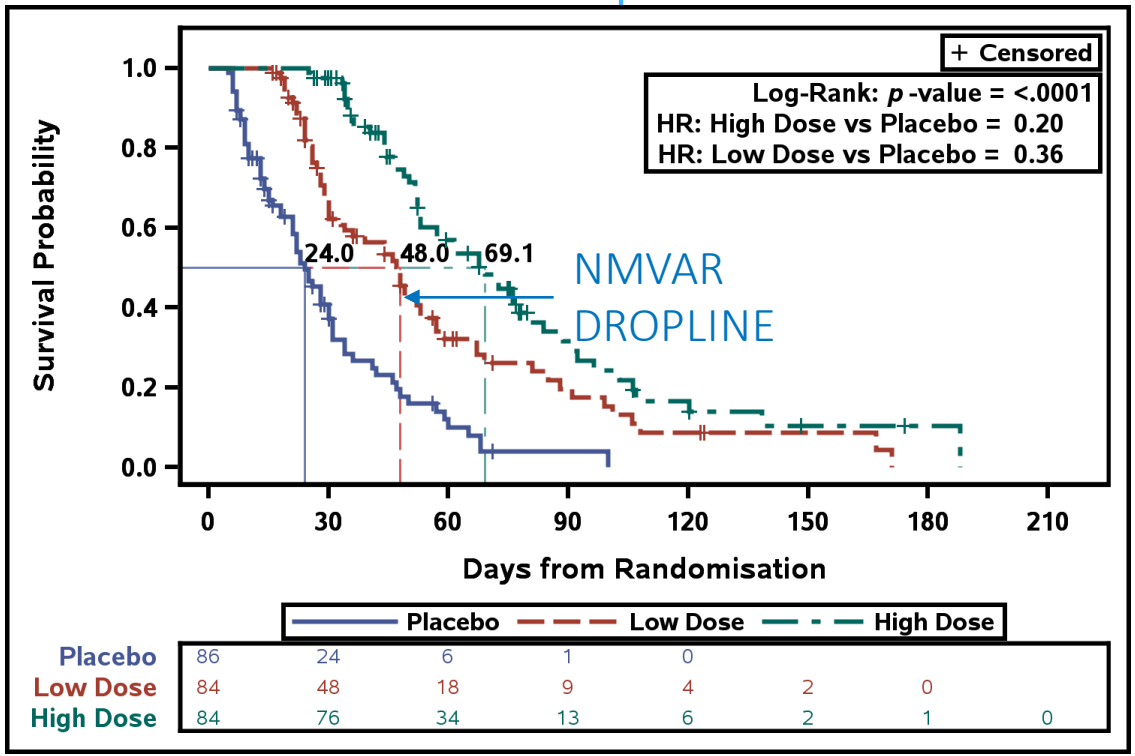
Summary Statistics Table

```
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



Final Step – SAS Code

Median Survival Time

```
nmvar MedianSurvival1 MedianSurvival2 MedianSurvival3;
mvar CMedianSurvival1 CMedianSurvival2 CMedianSurvival3;

%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!

Contact Information

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