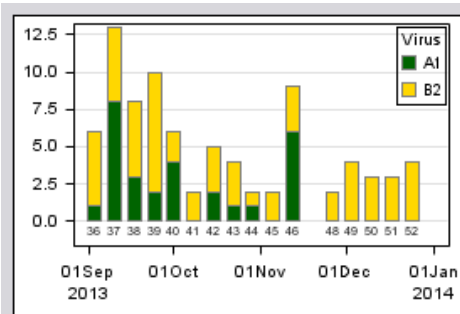# Key Features in ODS Graphics for Efficient Clinical Graphing

Yuxin (Ellen) Jiang
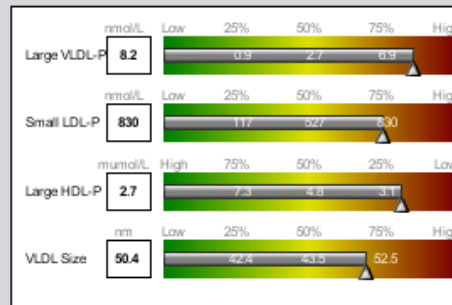
BASUG
March 23, 2016

SAS Data Visualization is Improving!

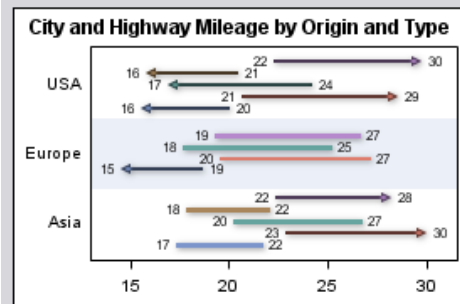
Grouped Timeline — 2014/06/16
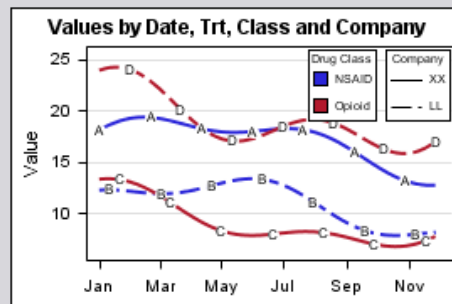
Lab Values Panel — 2014/06/07
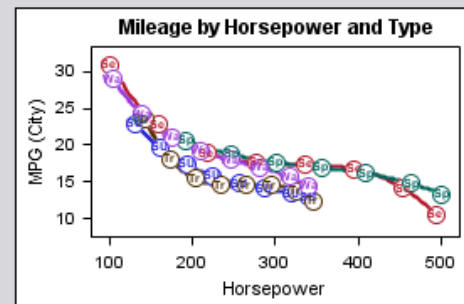
PharmaSUG 2014 — 2014/06/05

The HIGHLOW Plot — 2014/05/04

Multi-Group Series Plots — 2014/04/27

Labeled Curves — 2014/04/20
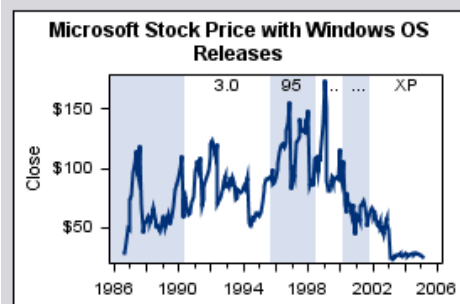
The BLOCK Plot — 2014/04/14
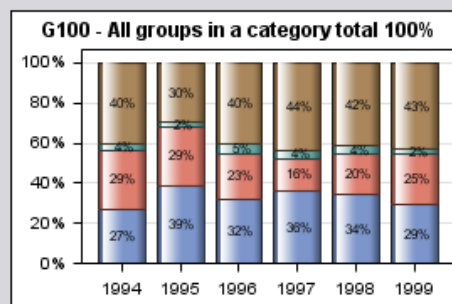
G100 with SGPLOT — 2014/04/06

SGF 2014 — 2014/03/28

Introduction

➢ **New features in SG PROCs and GTL:**

1) Plots overlay in single-cell or multi-cell graphs

2) Flexible ways to control graph appearance

3) Enhanced annotation

4) Plots overlay in multi-cell graphs

5) Classification panel of multiple plots with individualized labeling

Statistical Graphics (SG) Procedures and Graphic Template Language (GTL)

- **SG Procedures**
  - For programmers to create commonly used graphs
    - SGPLOT
    - SGPANEL
    - SGSCATTER
- **GTL**
  - For programmers to create highly customized complex graphs

Feature1: Better Control of Axes in Different Scales and Intervals

- In SGPLOT, the default axis scale is automatically chosen based on the variable types on the axis. If a numeric variable on the axis, a linear scale axis will be automatically set as default for the axis.

- In GPLOT, it's not straightforward when data are collected at uneven intervals, a plot with equal-width intervals will be incorrectly generated and SAS log will have a warning.

Feature1: Better Control of Axes in Different Scales and Intervals

SGPLOT – New
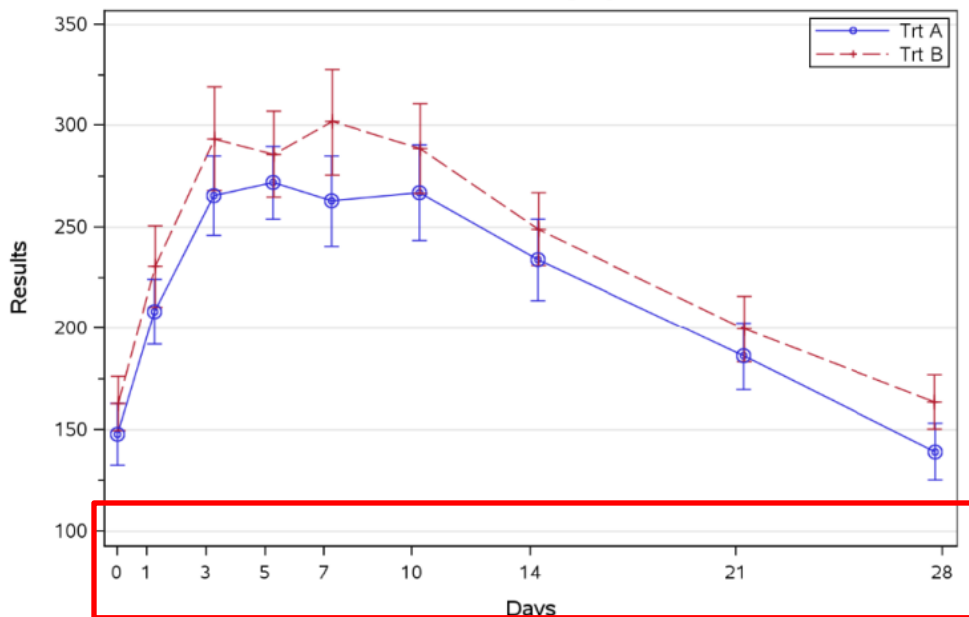
xaxis values=(0 1 3 5 7 10 14 21 28) ;

GPLOT –Old
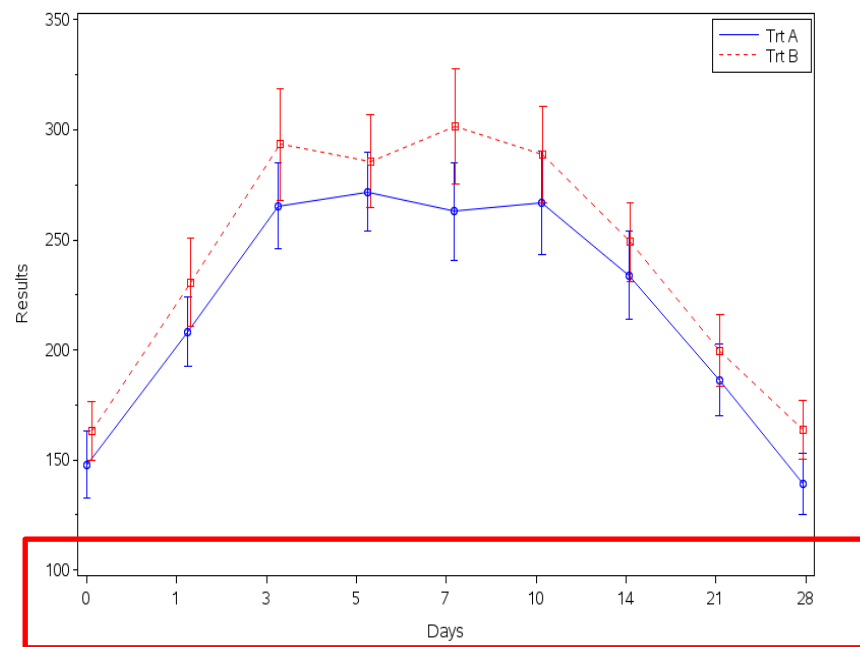
axis1 order=(0 1 3 5 7 10 14 21 28);

Feature 2: Flexible Ways to Control Graph Appearance

▸ Pre-defined **ODS style templates**

▸ **STYLEATTRS**, a new enhancement in SAS 9.4, conveniently modify frequently changed figure attributes such as colors, line patterns and data symbols in SGPLOT and GTL .

▸ In statement **LINEATTRS** or **MARKERATTRS** options to customize attributes for individual plot

Feature 2: Flexible Ways to Control Graph Appearance
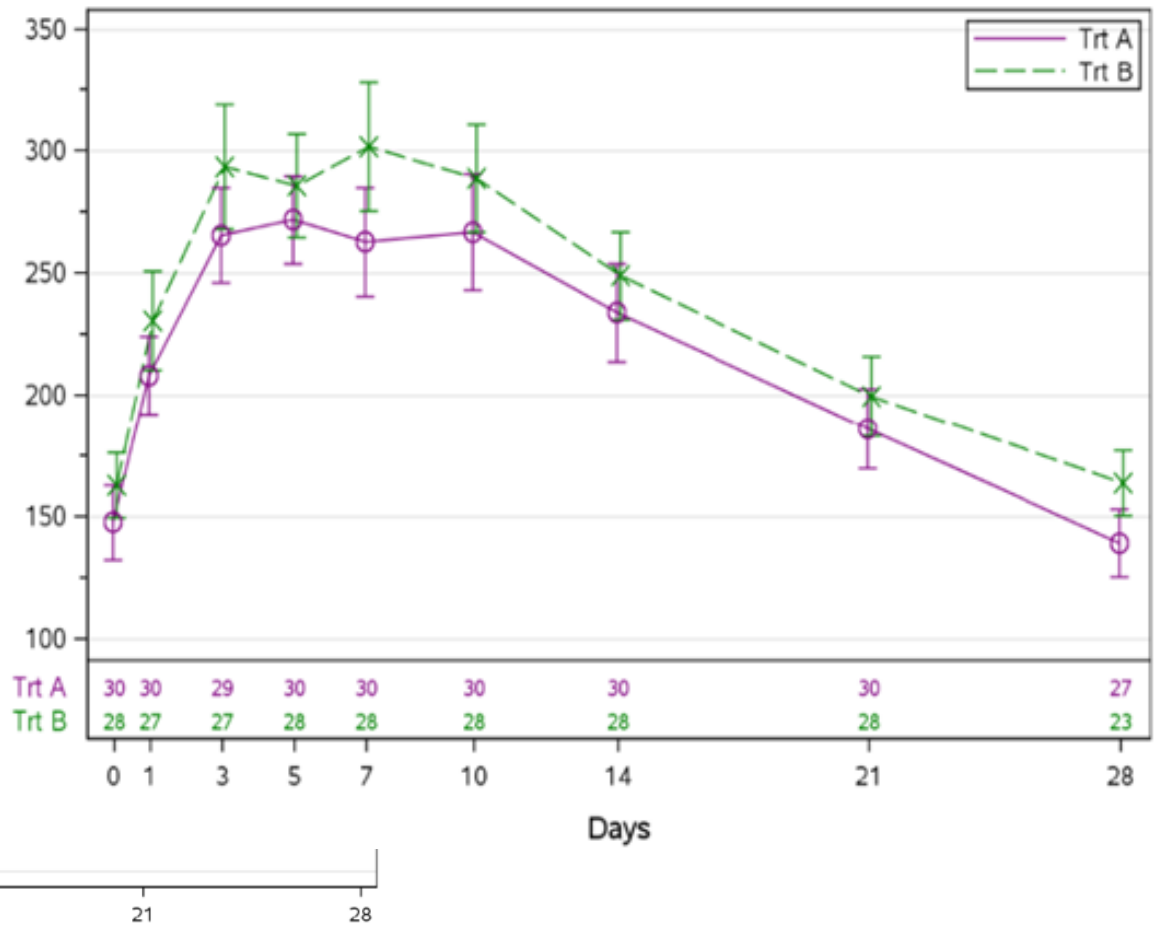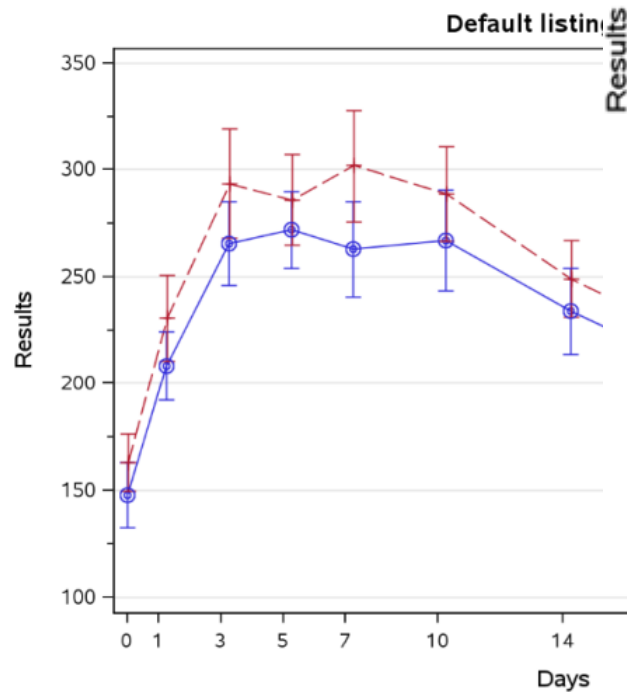
Feature 2: Flexible Ways to Control Graph Appearance

```
proc template;❶
  define style mystyle;
  parent=styles.listing;
    style GraphData1 from GraphData1 / MarkerSymbol =  "circle";
    style GraphData2 from GraphData2 / MarkerSymbol =  "X";
  end;
run;
ods rtf file = "&filename..rtf" style=mystyle ❶ ;
proc sgplot data=final;
  styleattrs datasymbols=(Circle X)
        datacontrastcolors=(purple green); [❷ SAS 9.4]
  series x=xaxis y=mean /group=trtpn lineattrs=(size=1)❸ ;
  scatter x=xaxis y=mean /group=trtpn yerrorlower=lower
        yerrorupper=upper markerattrs=(size=7)❸;
  .......
run;
ods rtf close;
```

Feature 2: Flexible ways to control graph appearance – compare to old GPLOT

In GPLOT, those attributes such as symbol, color and size have to be set by SYMBOL statement or create template outside PROC GPLOT.

```
symbol1 interpol=hiloctj color=blue line=1 height=6;
symbol2 interpol=hiloctj color=red line=2 height=6;
symbol3 interpol=none color=blue value=circle height=2;
symbol4 interpol=none color=red value=square height=2;

Axis1 order=(0 1 3 5 7 10 14 21 28) label='days' ;
Axis2 label=(angle=90) order=(&yaxis) label=('Results') ;
Proc gplot data=reshape;
   plot yvar*xvar=trtpn / haxis=axis1 vaxis=axis2 legend=legend1;
   plot2 mean*xvar=trtpn / vaxis=axis2 noaxis nolegend;
run;
```

Feature 3: Enhanced annotation

▸ %SGANNO graph annotation facilities
▸ AXISTABLE is a new feature in SAS 9.4, which prints a table of counts(N) on the bottom of the plot either inside or outside the plot.
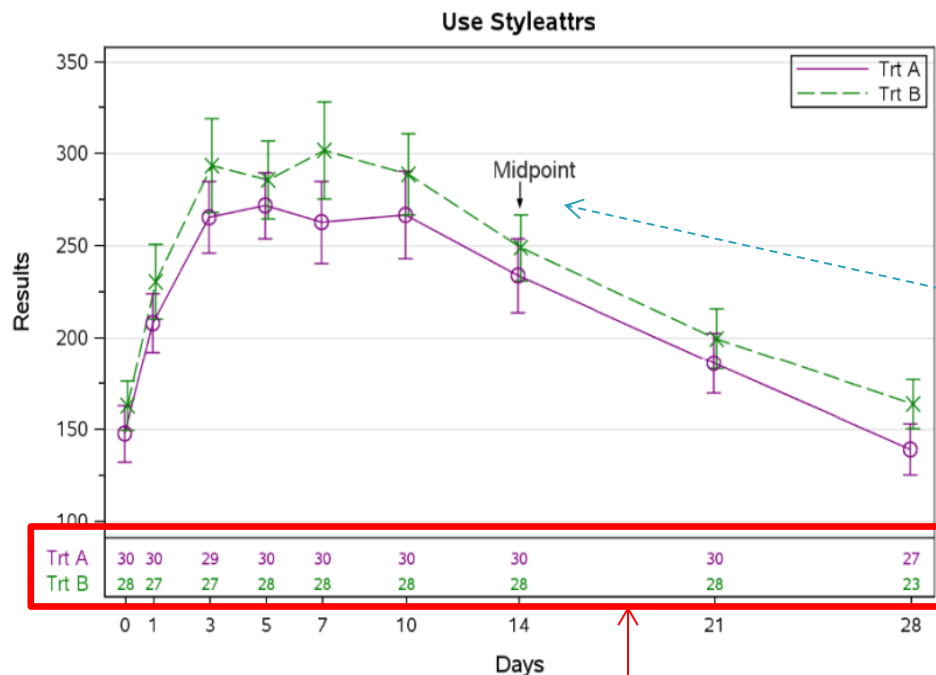
%sganno;

data anno;

  %sgarrow(x1=14,y1=285,x2=14,y2=270,
    shape='filled', linethickness=1, scale=0.2,
    x1space='datavalue', ….);

  %sgtext(label="Midpoint", x1=13,y1=300,
    width=22, widthunit="data", textsize=10.5,
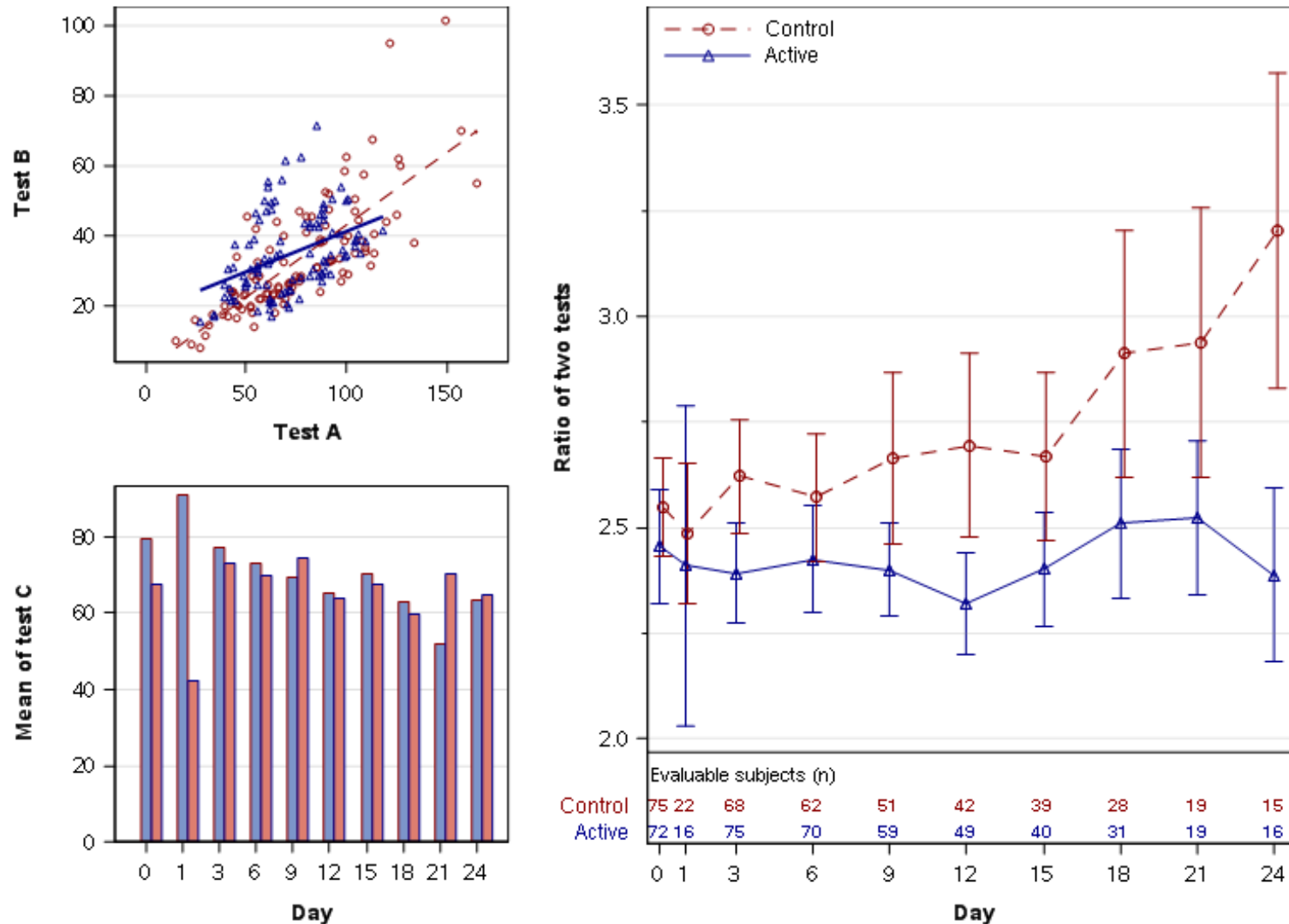   textcolor='black',x1space='datavalue', …);

run;

proc sgplot data=final **sganno=**anno;

xaxistable n / x=xaxis class=trt location=inside colorgroup=trt separator;

Feature 4.1: Plots overlay by GTL

Biomarker test summary

Feature 4.2: Structure of Layout Containers

❶ **PROC TEMPLATE** and **PROC SGRENDER** to create and apply overall layout template.

❷ **Two LAYOUT LATTICE** statements define the position(ROWS=,COLUMNS=) and the size of each layout container (COLUMNWEIGHTS =)

❸ **Three LAYOUT OVERLAY** statements pairing up with END OVERLAY create blocks which define the plots in three layout container.

```
proc template; ❶
define statgraph gtl_overlay;
begingraph / datacontrastcolors=(darkblue darkred) datasymbols=(circle triangle)
            datalinepatterns=(dash solid);
entrytitle halign=center "Biomarker test summary" / textattrs=(size=11.7pt) haligncenter=graph;
    layout lattice /rows=1 columns=2 columnweights=(0.4 0.6) columngutter=.5cm; ❷
        layout lattice / rows=2 columns=1 rowgutter=.5cm;  ❷

            layout overlay / xaxisopts=(label="Test A" labelAttrs=(Weight=bold)) ❸
                             yaxisopts=(griddisplay=on label="Test B" labelAttrs=(Weight=bold));
                scatterplot x=v1 y=v2/group=trtp1;
                regressionplot x=v1 y=v2/group=trtp1;
            endlayout;

            layout overlay / xaxisopts=(label="Day" labelAttrs=(Weight=bold)) ❸
                             yaxisopts=(griddisplay=on label="Mean of Test C)

              barchart category=day response=v3/group=grp stat=mean groupdisplay=cluster;
            endlayout;
        endlayout;


        layout overlay/<option1>; ❸
            seriesplot x=xvar y=mean_ratio / group=grpc display=(markers) name="l";
            scatterplot x=xvar y=mean_ratio/ group=grpc primary=true
                        yerrorupper=upper_ratio yerrorlower=lower_ratio ;

            innermargin / align=bottom opaque=true separator=true;
                ❹ axistable value=n_ratio x=day/includemissingclass=false          [SAS 9.4]
                    headerLabel="Evaluable subjects (n)" labelPosition=min class=grpc
                    valueattrs=(size=7) colorgroup=grpc;
            endinnermargin;

            discreteLegend "l" / Location=Inside across=1 halign=left valign=top Border=false;
        endlayout;
    endlayout;
endgraph;
end;
run;
```

proc sgrender data = final template = gtl_overlay;

Feature 5: Classification Panel with Individualized Labeling - SGPANEL

❶ **PANELBY,** by subject classification panel layout with one subject per cell.

❷ **DATALABEL**, add annotation to data points, make the figure more informative.

```
proc sgpanel data=fix ;
❶panelby id/ layout=panel rows=3 columns=2 spacing=10 ;
    series x=xvar y=yvar / group=grp lineattrs=(pattern=solid) markers
    ❷datalabel=grpname name='l';
    scatter x=xvar y=yvar / group=grp markerattrs=(size=7) name='s';
    rowaxis min=1 max=100 minor type=log logbase=10
      LOGSTYLE=LOGEXPAND valueattrs=(size=9) label= 'Results';
    colaxis min=0 values=(0 1 2 3 5 7) valueattrs=(size=9) label='Days';
    refline 5 10 50 / transparency = 0.8 ;
run;
```
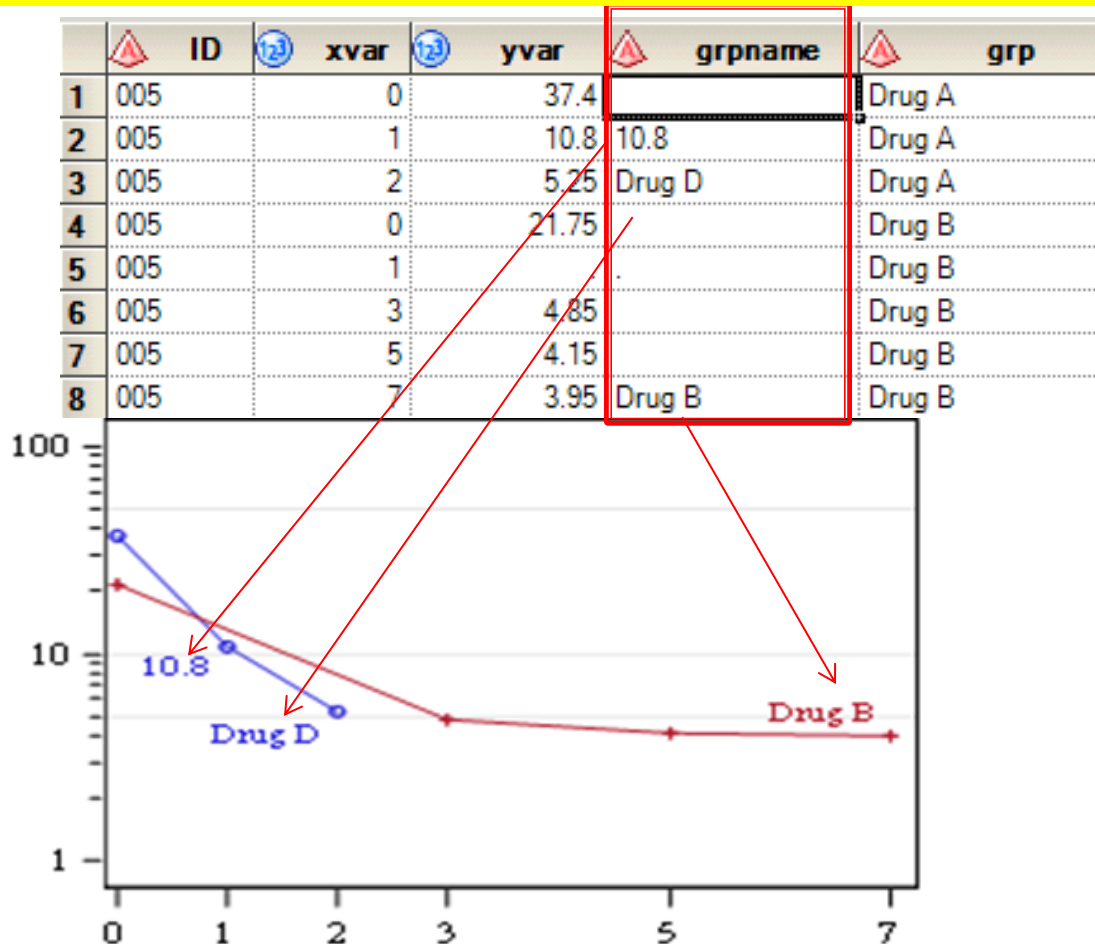
Feature 5.1: Create classification panel

❶ **panelby id/ layout=panel rows=3 columns=2 spacing=10;**
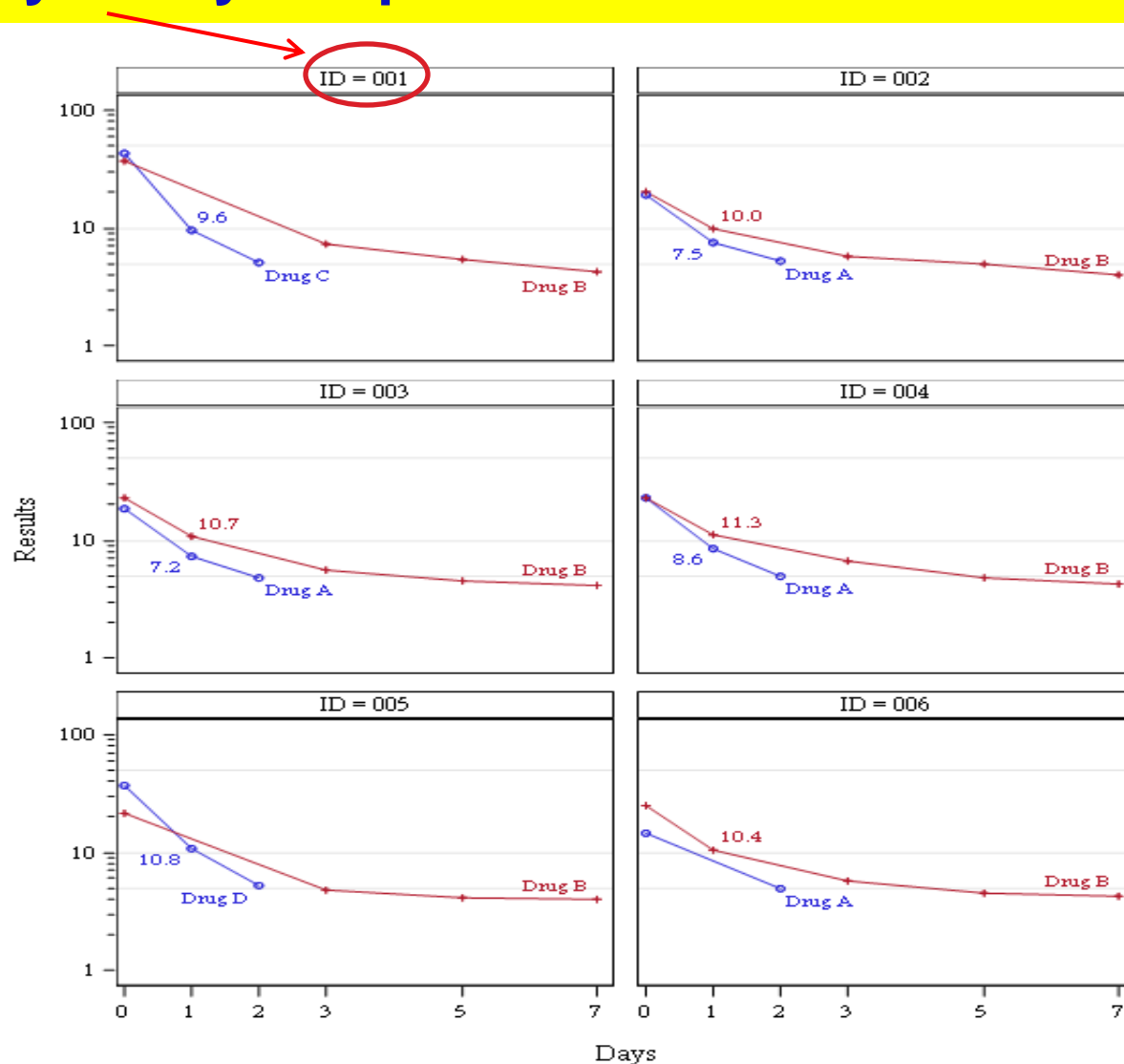
Feature 5.2: individualized labeling

Series x=xvar y=yvar / group=grp lineattrs=(pattern=solid)
markers ❷ **datalabel=grpname** name='l';

Conclusion

▸ As SAS keeps adding new enhancements in ODS Graphics, it provides powerful flexibility to make clinical graphing much more effective and efficient.

▸ Coding of graphs become much clearer and easier with ODS Graphics tools .

▸ The best way to learn is to USE IT!

Acknowledgments

BASUG

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Mr. Arthur Collins

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Daclizumab team

Q & A

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