

Combining Text and Graphics with ODS LAYOUT and ODS REGION

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ABSTRACT

Through the Output Delivery System (ODS), SAS® Software provides a means for creating an attractive, concise, and functional report without post-processing using other software products. Because ODS is an object-oriented (OO) technology, it provides the ability to move beyond template descriptions to complete output layout. This paper presents a combined text and graphics report based on an exploratory analysis of behavioral health cost risk using ODS LAYOUT and ODS REGION and writing to the PDF destination. In addition, this paper provides information on additional options that can be used with both ODS LAYOUT and the PDF destination to assist users in the creation of customized presentation and production reports.

The example in this paper was developed with version 9.1.3 of SAS executing on a Windows XP platform. SAS Version 9.1 is required for the ODS graphics extensions and was required for the graphics used in this paper. The SAS features represented in this paper are not platform-specific and can be adapted by both beginning and advanced SAS users.

Keywords: ODS, ODS LAYOUT, ODS REGION, PDF, Layout, Region

INTRODUCTION

Health Management Corporation (HMC) is one of the nation's largest, most experienced providers of integrated care and total health solutions. Since 1983, HMC has offered members and clients comprehensive programs and services intended to empower members to take control of their health and see positive results. Through a population-based approach, HMC's disease management programs provide solutions for prevention, chronic condition support, lifestyle management and complex condition care. HMC's mission is to help improve the health and financial outcomes of its clients and members through innovative health solutions that consider every single member at his/her level of care.

To fulfill this mission, HMC provides research, business intelligence, and program evaluation support to measure the effectiveness of the services provided, analyze potential for future products and add to general knowledge of the disease management arena. SAS is the major analytic software used by HMC and, as such, the graphics examples and report layout illustrated in this paper were produced with SAS software in conjunction with this work. SAS software provides all the tools necessary for data validation, analysis, and results reporting, eliminating the need to move output to other software for report formatting.

ODS LAYOUT

ODS LAYOUT provides the ability to more easily combine text and graphics in a report within SAS. Absolute layout is supported, with the page divided into regions. ODS LAYOUT in its initial release is limited to a single page; however, page-spanning features are under development. SAS code to use layout consists of ODS statements, global statements, and procedures, but instead of placing the output as streaming output, each piece is placed into the identified region. ODS dimension units can be in centimeters (cm), millimeters (mm), inches (in), printers pt (pt), or pixels (px).

Absolute layout is ideal for reports that use a very precise format and provides flexibility within that context and has been available as experimental since SAS version 9.0. The exact position of each region is specified in the SAS code. For reports where the size and location of items do not need to be fixed, a relative layout option, gridded layout, is available as experimental beginning in SAS version 9.1. In gridded layout, the output area acts similar to a table where each cell in the table contains output from a single procedure or other item. This allows a series of rows and columns of different heights and widths and will also allow the expanding of space if the output does not fit in the "absolute" space. Both the absolute and gridded layout options allow regions to overlap.

Use ABSOLUTE LAYOUT for:

- Cover pages
- Static data or reports
- Pre-printed forms
- Single page only

Use GRIDDED LAYOUT for:

- Regions that can be dynamically sized

- Dynamic content
- Alignment
- Multiple page documents

ODS LAYOUT is available for the SAS Printer family destinations: PRINTER, PDF, PCL, and PS. Layout blocks always start with ODS LAYOUT START and end with ODS LAYOUT END. The syntax of ODS LAYOUT is as follows:

```
ODS LAYOUT START options;
ODS REGION options;
SAS Code. . ;
ODS LAYOUT START options;
ODS REGION options;
SAS Code. . ;
ODS LAYOUT END;
```

The ODS LAYOUT and REGION statements

The ODS LAYOUT and REGION statements allow many options that provide control over placement of content. Availability varies based on whether the output uses gridded or absolute layout. Options that can be used on the ODS LAYOUT statement include:

- WIDTH= – Width of the overall LAYOUT (absolute only).
- HEIGHT= – Height of the overall LAYOUT (absolute only).
- COLUMN_GUTTER= – Space to leave between columns (gridded only).
- ROW_GUTTER= – Space to leave between rows (gridded only)

Options that can be used on the ODS REGION statement include:

- X= - Relative to upper left corner of LAYOUT space (absolute).
- Y= – Relative to upper left corner of LAYOUT space (absolute).
- WIDTH= – Width of the REGION (absolute, gridded).
- HEIGHT = – Height of the REGION (absolute, gridded).
- COLUMN= – Column where the REGION should be placed (gridded only).
- ROW= – Row where the REGION should be placed (gridded only).
- COLUMN_SPAN= – Number of grid columns REGION should span (gridded only).
- ROW_SPAN= – Number of grid rows REGION should span (gridded only).

Options available beginning with SAS 9.2

- ENTIREPAGE – LAYOUT should occupy entire page (absolute only).
- CHAIN – Output that overflows REGION should flow into next designated REGION (absolute only).
- CONTINUE – Duplicate LAYOUT and continue overflow contents into same REGION space in duplicated LAYOUT (absolute only).

Because ODS LAYOUT is experimental, features, options, and syntax may change for the production version, especially for the gridded option.

EXAMPLE USING ODS LAYOUT

The example presented in this paper uses ABSOLUTE LAYOUT to create a one page project summary report of a cost risk analysis for behavioral health. A two-column report is created mixing graphics and text and includes a banner and a company logo. The ODS PDF destination is used. While ODS LAYOUT has been most often associated with PROC REPORT, PRINT, and TABULATE, the example here combines free-form text and images. The example illustrates use of separate regions for parts of the report as well as the combining of text and graphics within a single region. (See output at end of paper.) Some of the other options illustrated in this paper are:

- ODS escapechar – Sets separator character to introduce new syntax and separate options.
- PREIMAGE – Add image before other elements.
- POSTIMAGE – Add image after other elements.
- FONT_FACE – Set font to Arial.
- FONT_SIZE – Set font size to 12 for title, 9 for main text and 7.5 for figure captions.
- FONT_WEIGHT – Set bold on for titles and figure captions.
- JUST – Set justification (center for title – otherwise left).

- STARTPAGE – While not currently implemented for absolute layout, this will eventually tell SAS that new procedures should not start new pages.
- COLOR= –

IMAGE SCALING

Because this is a summary, the graphics had already been created earlier in the project and are pulled in from file. They could be created as part of the report program also. An example could be as follows:

```
ODS REGION height=3 in width=3 in x=4.1 in y=6 in;
proc gmap map=maps.uscounty data=bhdatamap;
  id state county;
  choro pctbhgrp / legend=legend coutline=gray;
run;
quit;
```

Images used in the example use the SCALEHEIGHT and SCALEWIDTH options to fit the available space. ODS LAYOUT images can be scaled with the following options:

- NOSCALE – The default.
- SCALETOFIT – Make image conform to space available.
- SCALEHEIGHT – Scale the height to conform exactly to the space available and scale the width as necessary to match the height without distorting the image.
- SCALEWIDTH – Scale the width to conform exactly to the space available and scale the height as necessary to match the width without distorting the image.
- SCALE – Scale the image to fit into the available space such that it doesn't distort the image.
- TILE – Repeat the image (at its "regular" size) so as to fill up the available space.
- X= Supply the width to use for the image scaling.
- Y= Supply the height to use for the image scaling.

SAS CODE TO CREATE EXAMPLE:

The code below created the example at the end of this paper. Text entries are truncated in this code for readability of the code. Text could also be read in from a file or stored in a macro.

```
ODS PDF file="r:\SESUG 2008\SESUG_bh.PDF" color=yes style=fancyprinter
STARTPAGE=NEVER;
ODS escapechar="^";
ODS LAYOUT start width=8 in height=10 in;
ODS REGION x=10 y=0 width=8 in height=2 in;
  ODS PDF text="^S={preimage='R:\SESUG 2008\SESUG 2008.bmp^scaleheight'}";

ODS REGION x=90 pct y=10.3 in width=1 in height=1 in;
  ODS PDF text="^S={postimage='R:\SESUG 2008\hmc.bmp^scalewidth'}";

ODS REGION x=10 y=1.3 in width=8 in height=1 in;
  ODS PDF text="^S={just=c font_weight=bold font_size=12pt
    font_face=Arial}Exploration of Behavioral Health Cost Risk";

ODS REGION x=0.3 in y=1.6 in width=3.5 in height=3.5 in;
  ODS PDF text="^S={just=l font_size=9pt font_weight=bold
    font_face=Arial}Introduction";
  ODS PDF text="^S={just=l font_size=9pt font_face=Arial}As a part of this
    study, eight impactable behavioral health conditions were . . .";
  ODS PDF text=" ";
  ODS PDF text="^S={just=l font_size=9pt font_weight=bold
    font_face=Arial}Analysis";
  ODS PDF text="^S={just=l font_size=9pt font_face=Arial}The first
    exploratory procedure uses kernel density estimation (kde) to . . .";

ODS REGION x=0.3 in y=3.95 in width=3.5 in height=8.1 in;
  ODS PDF text="^S={preimage='R:\SESUG 2008\graph1.bmp^scalewidth'}";
  ODS PDF text="^S={just=l font_size=7.5pt font_weight=bold
    font_face=Arial}Fig 1. Cost Impact of Behavioral Health.";
  ODS PDF text=" ";
  ODS PDF text="^S={just=l font_size=9pt font_face=Arial}In this second
    exploratory procedure, behavioral health admissions are plotted . . .";
```

```

ODS PDF text="^S={preimage='R:\SESUG 2008\graph2.bmp^scalewidth'}";
ODS PDF text= "^S={just=l font_size=7.5pt font_weight=bold
font_face=Arial}Fig 2. Behavioral Health Admissions Seasonality.";

ODS REGION x=4.1 in y=1.6 in width=3.5 in height=8.7 in;
ODS PDF text= "^S={just=l font_size=9pt font_face=Arial}It is important to
not only know the behavioral health costs, but how much impact . . .";
ODS PDF text="^S={preimage='R:\SESUG 2008\graph3.bmp^scalewidth'}";
ODS PDF text= "^S={just=l font_size=7.5pt font_weight=bold
font_face=Arial}Fig 3. Proportion of Total Cost.";
ODS PDF text=" ";
ODS PDF text= "^S={just=l font_size=9pt font_face=Arial}As part of the
cost question, it is also important to know whether there . . .";
ODS PDF text="^S={preimage='R:\SESUG 2008\graph4.bmp^scalewidth'}";
ODS PDF text= "^S={just=l font_size=7.5pt font_weight=bold
font_face=Arial}Fig 4. Referrals.";
ODS PDF text=" ";
ODS PDF text= "^S={just=l font_size=9pt font_weight=bold
font_face=Arial}Conclusion";
ODS PDF text= "^S={just=l font_size=9pt font_face=Arial}Visual depictions
of data relationships assist analysts and other users in better . . .";

run;
ODS LAYOUT end;
ODS _all_ close;

```

FANCYPRINTER STYLE CODE:

Although the paper changed text fonts to Arial, the base style that was used for the example was the fancyprinter style, listed below. Another formatting option would be to modify the style, changing the fonts and sizes within the style, rather than within the program.

```

proc template;
  define style Styles.fancyPrinter;
    parent = styles.Printer;
    replace fonts /
      'TitleFont2' = ("Palatino, Arial, Times Roman",13pt,Bold Italic)
      'TitleFont' = ("Palatino, Arial, Times Roman",13pt,Bold Italic)
      'StrongFont' = ("Palatino, Book Antiqua, Times Roman",10pt,Bold)
      'EmphasisFont' = ("Palatino, Book Antiqua, Times Roman",10pt,Bold
      Italic)
      'FixedEmphasisFont' = ("Courier",10pt,Italic)
      'FixedStrongFont' = ("Courier",10pt,Bold)
      'FixedHeadingFont' = ("Courier",10pt,Bold)
      'BatchFixedFont' = ("SAS Monospace, Courier",8pt)
      'FixedFont' = ("Courier",10pt)
      'headingEmphasisFont' = ("ITC Zaph Chancery, Palatino, Times Roman",
      13pt,Bold Italic)
      'headingFont' = ("ITC Zaph Chancery, Palatino, Times Roman",12pt,
      Italic)
      'docFont' = ("Palatino, Times Roman",10pt);
    replace GraphFonts /
      'GraphDataFont' = ("Times Roman",8pt)
      'GraphValueFont' = ("Times Roman",10pt)
      'GraphLabelFont' = ("Times Roman",12pt,Bold)
      'GraphFootnoteFont' = ("Times Roman",12pt,Bold)
      'GraphTitleFont' = ("Times Roman",14pt,Bold);
    style Table from Output /
      rules = ALL
      cellpadding = 4pt
      cellspacing = 0.25pt
      borderwidth = 0.75pt;
    style Graph from Graph
      "Graph attributes" /
      cellspacing = 0.25pt
      borderwidth = 0.75pt;
  end;
run;

```

ODS STYLE ATTRIBUTES

Style attributes that can be used vary by the destination of the report. The table below lists those attributes that are available for the PDF destination in SAS v 9.1. Some additional features that are available in SAS v 9.2 include the ability to underline, overline, and line-through text. V 9.2 also adds the ability to password protect and/or encrypt the created files.

ODS Style Attributes Available for PDF Destination	
PDF Style Attribute	Description
ASIS=	How to handle leading spaces and line breaks.
BACKGROUND=	Color of the background of the table or graph
BORDERCOLOR	Color of the border if the border is just one color.
BORDERCOLORDARK	Darker color to use in a border that uses two colors to create 3-D effect.
BORDERCOLORLIGHT	Lighter color to use in a border that uses two colors to create 3-D effect.
BORDERWIDTH	Width of the border of the table.
BOTTOMMARGIN=	Bottom margin for the document.
CELLHEIGHT=	Height of the cell.
CELLPADDING=	Amount of white space on each of the four sides of the text in a cell.
CELLSPACING=	Thickness of the spacing between cells.
CELLWIDTH=	Width of the cell.
CONTRASTCOLOR=	Alternate colors for maps to be applied to the blocks in region areas in block maps.
DROPSHADOW=	Whether to use a drop shadow effect for text in a graph.
ENDCOLOR=	End color for a gradient effect in a graph.
FLYOVER=	Text to show in a tool tip for the cell.
FONT_FACE=	Specify font to use.
FONT_SIZE=	Size of the font to use.
FONT_STYLE=	Style of the font.
FONT_WEIGHT=	Font weight.
FONT_WIDTH=	Font width compared to the width of the usual design.
FONT=	Specify a font definition.
FOREGROUND=	Color of text or data items
GRADIENT_DIRECTION=	Direction of gradient effect in either the X or Y axis direction.
IMAGE=	Image to appear in the background. This image can be positioned or tiled.
INDENT=	Set a numeric value to use as the indentation depth.
JUST=	Horizontal positioning for text or images.
LEFTMARGIN=	Left margin for the document.
LINESTYLE=	Line type to use in a graph (SAS/GRAPH line types).
LINETHICKNESS=	Thickness (width) of a line that is part of a graph.
LINKCOLOR=	Color for links that have not yet been visited.
MARKERSIZE=	Size of the symbol used to represent data values.
MARKERSYMBOL=	Symbol used to represent data values.
NOBREAKSPACE=	How to handle space characters.
OUTPUTHEIGHT=	Height for graphics in the document.
OUTPUTWIDTH=	Width of the table or of the graph or line thickness.
OVERHANGFACTOR=	Upper limit for extending the width of the column.
POSTIMAGE=	Image to place after the table or cell.
POSTTEXT=	Text to place after the cell or table.
PREIMAGE=	Image to place before the table or cell.
PRETEXT=	Text to place before the cell or table.
PROTECTSPECIALCHARACTERS=	Determine how <, >, and & are interpreted.
RULES=	Types of rules to use in a table.
STARTCOLOR=	Start color for a gradient effect in a graph.
TOPMARGIN=	Top margin for the document.
TRANSPARENCY=	Level of transparency for a graph.
URL=	Specify a URL to link to.
VJUST=	Vertical justification.

CONCLUSION

ODS LAYOUT provides the ability to easily mix text, graphics, and tables on the same page, arranging them in any position desired on that page. It provides the ability to run SAS code within the layout code or to use output created at an earlier date. Additionally, a large number of formatting options are available to enhance the ODS output, especially for the PDF destination. This functionality in SAS allows the creation of production quality reports without post-processing. This is especially valuable in the service industry where timely creation of reports, both scheduled and ad hoc, is a major part of securing and retaining business.

REFERENCES

More information on ODS LAYOUT can be found at <http://support.sas.com/rnd/base/early-access/index.html>. Other references used in this paper are:

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Exploration of Behavioral Health Cost Risk

Introduction

As a part of this study, eight impactable behavioral health conditions were identified and defined: alcohol abuse, anxiety disorder, bipolar, depression, eating disorder, other substance abuse, personality disorder, and schizophrenia. These were applied to a test population of about 100,000 members for prevalence and cost of these conditions. Several exploratory analyses were performed.

Analysis

The first exploratory procedure uses kernel density estimation (kde) to provide a smoothed histogram to show behavioral health dollar distribution. The following graphic illustrates the impact of behavioral health on total care dollars and includes both inpatient and outpatient visits for members identified as at risk for future behavioral health.

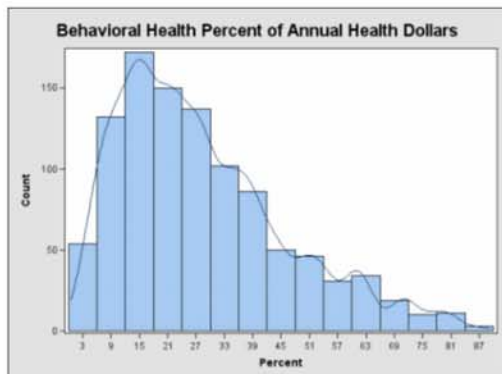


Fig 1. Cost Impact of Behavioral Health.

In this second exploratory procedure, behavioral health admissions are plotted for detection of seasonality for a single client. Data is bi-monthly. The graph shows an increase in admissions over time with an upswing each year either at the beginning of the year or just after. The display suggests a need for further investigative analysis to definitively answer the question of seasonality.



Fig 2. Behavioral Health Admissions Seasonality.

It is important to not only know the behavioral health costs, but how much impact these costs have on total costs, especially in inpatient and emergency department settings. Behavioral health conditions add to inpatient costs regardless of whether the admission is for a behavioral health condition or whether the behavioral health condition is comorbid. This graphic illustrates how those conditions drive overall cost. While the graphic shows a decline in behavioral health cost proportion, further analysis would be needed to understand what is driving this change.

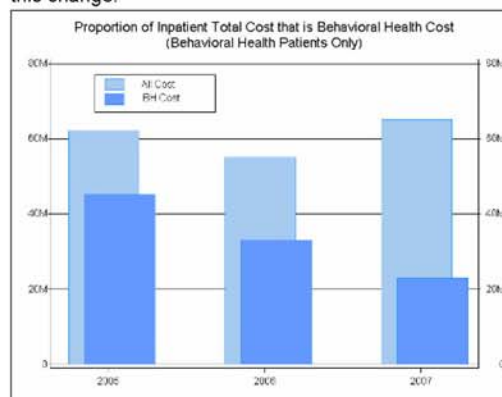


Fig 3. Proportion of Total Cost.

As part of the cost question, it is also important to know whether there are differences in geographic areas for those referred to behavioral health programs. The graphic below shows that the northeast and northwest are more likely to receive behavioral health care.

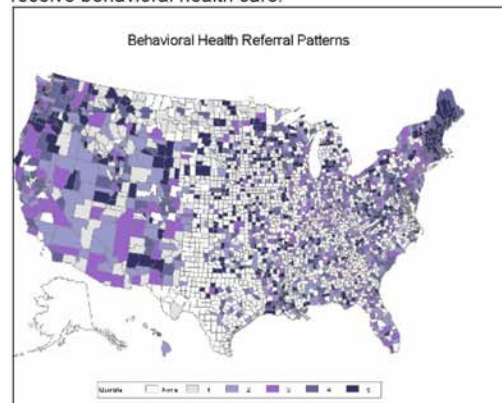


Fig 4. Referrals.

Conclusion

Visual depictions of data relationships assist analysts and other users in better understanding of data through the quick identification of true associations, anomalies, and areas for further study. This information provides a foundation for further analyses to identify additional interactions and critical factors that enhance the behavior health risk modeling process.