

# Using SAS® Visual Analytics to Effectively Visualize Health Care Data

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## ABSTRACT

Health-care professionals who can successfully curate data assets into data insights can realize benefits such as reduced costs, healthier patients and higher satisfaction rates. Some insights are discovered by comparing your data to national benchmarks while others are found dissecting your data using a different viewpoint or approach. Using SAS® Visual Analytics we demonstrate how to effectively visualize data related to health plan quality performance metrics and providing users the power and flexibility to allow for enhanced inferences about their data. Visualization enables decision makers and data analysts to leverage data to uncover new associations, engage users, and communicate their messages more effectively.

## INTRODUCTION

This paper demonstrates useful techniques for visualizing healthcare data and enhancing SAS Visual Analytics reports and dashboards. The motivation for the paper originated from recent experiences learning the Visual Analytics graphical interface as experienced SAS programmers.

The paper focuses on using report objects and data features in the Report Designer and Report Viewer modules and less on data visualizations techniques, or what makes an effective dashboard. Examples show screenshots of versions SAS Visual Analytics 7.4 and Visual Statistics (released April 2017) to help users with older versions along with some examples using the SAS Viya version 8.3.

The term “user” throughout this paper refers to a report developer and “viewer” refers to those viewing and interacting with reports. Visual Analytics users of all experience levels will find this paper worthwhile; however, it’s intended for newer users who are familiar with the application basics. Those more experienced users may find it helpful for learning and discovering newer features. This paper is also intended for those in the health care industry whom are looking for ways to find data associations and demonstrate value of interventions and quality performance.

## GETTING STARTED

With any new tool users are often faced with learning while applying. Or to use a popular Silicon Valley idiom, “We’re kind of flying the plane while we’re building it.”

To help with this harrowing process here are recommended learning paths; somewhat of a quick start guide.

- Read the [SAS Visual Analytics documentation](#) on the SAS Support site
- Visit and participate in the [SAS Support Visual Analytics Communities](#)
- Watch [Free Tutorials](#) on the SAS Support site
- Attend [Live Web Classes](#) and [Ask the Expert](#) classes
- Read SAS Visual Analytics books and blogs, such as [BI Notes](#)

In addition to tapping into the above resources you can work with experts to elevate your skills. Working with an expert for even a few hours can elevate your skillset and allow you to gain more value from the application.

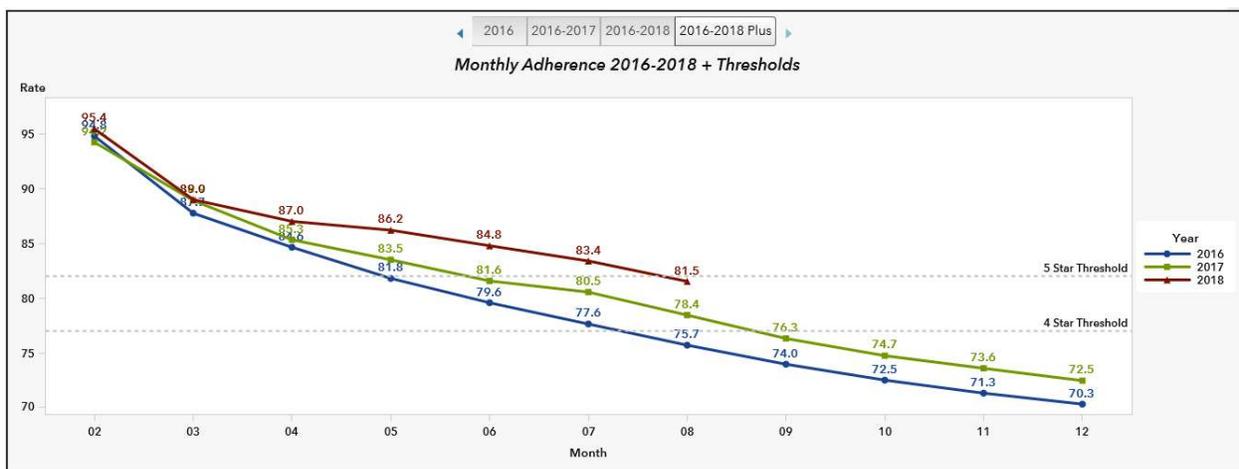
## TRENDING QUALITY PERFORMANCE METRICS

In this section we show how health plans can compare their data to other plans and national benchmarks. The key to showing relative performance is choosing the proper comparator and visually communicating the differences between the selected group and these comparator groups. Comparators can be a national benchmark or a health plan similar in characteristics (e.g., size, geography, plan type, etc.) to the plan of interest. Also, a health plan's own performance can act as a comparator value and used in pre-post analyses. The following displays are examples of displaying relative performance.

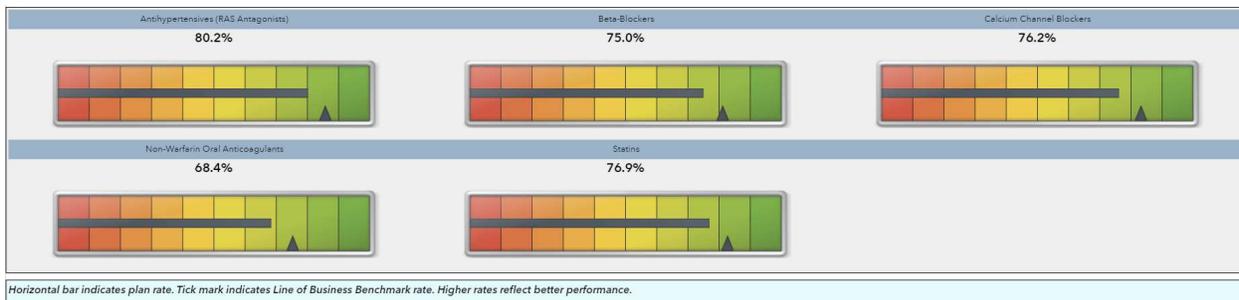
Display 1 shows medication adherence rates over 3 years including a national benchmark represented as dashed horizontal lines.

Display 2 shows the use of a gauge to show performance relative to a benchmark.

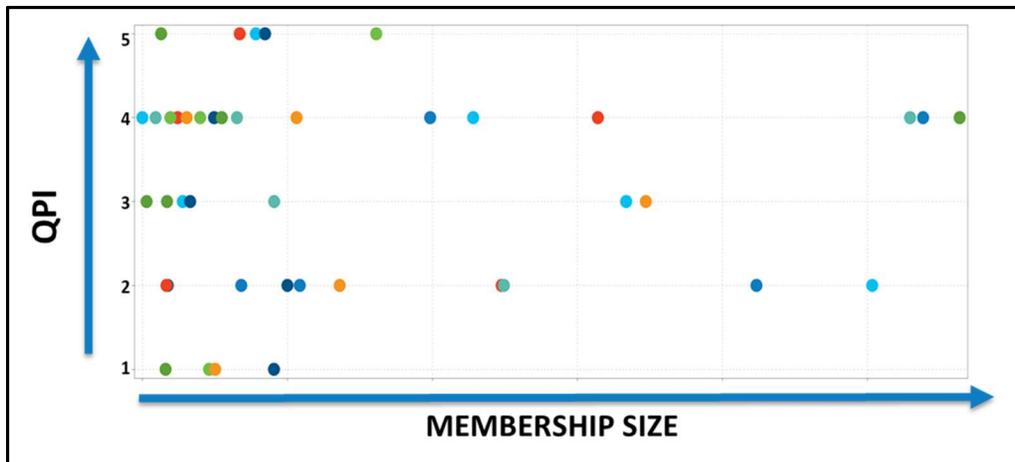
Display 3 uses a scatterplot to show relative performance where each dot is a client.



Display 1. Trending Medication Adherence



Display 2. Relative Performance with a Gauge Diagrams



Display 3. Relative Performance with a Scatterplot

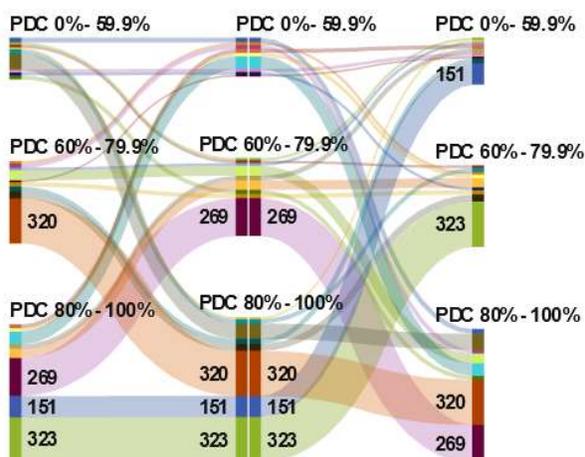
## UNCOVERING ASSOCIATIONS AND MAKING INFERENCES

This section describes techniques to uncover trends and associations within your data.

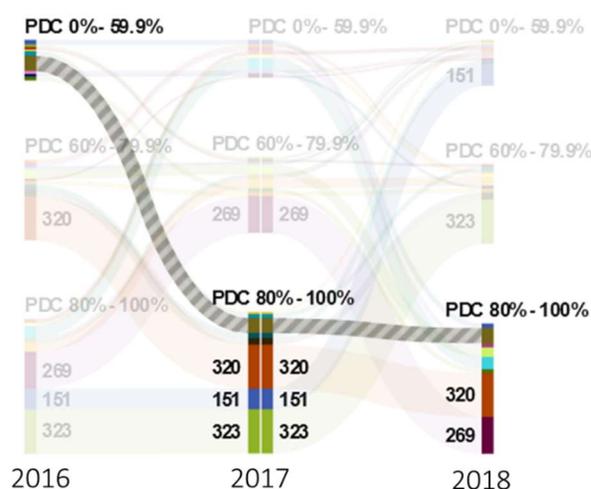
### SANKEY DIAGRAMS

Sankey diagrams, or what is more recently called path analysis, shows the flow of observations across different paths where each path is proportional to the quantity of observations. An often-used example is website traffic showing the number of people entering a site and moving to subsequent pages (e.g., Cart, Checkout). Sankey diagrams can be used in healthcare to track medication adherence for patient cohorts over time. This visualization can also be used to track patient behavior pre and post intervention to understand program effects and identify subpopulations.

In the diagram below patients are in 3 groups: poor, suboptimal and optimal based on continuous adherence rates and monitored over 3 calendar years. This visual is useful to see patients move between adherence levels.



Display 4. Tracking Member Adherence



Display 5. Tracking Member Adherence: Poor to Optimal

Required data for generating a Sankey diagram are,

1. Event: It requires the variable to be a category. These values are represented as nodes in Sankey diagram.
2. Sequence Order: A date-time or a measure variable.
3. Transaction Identifier: A numeric or category variable.

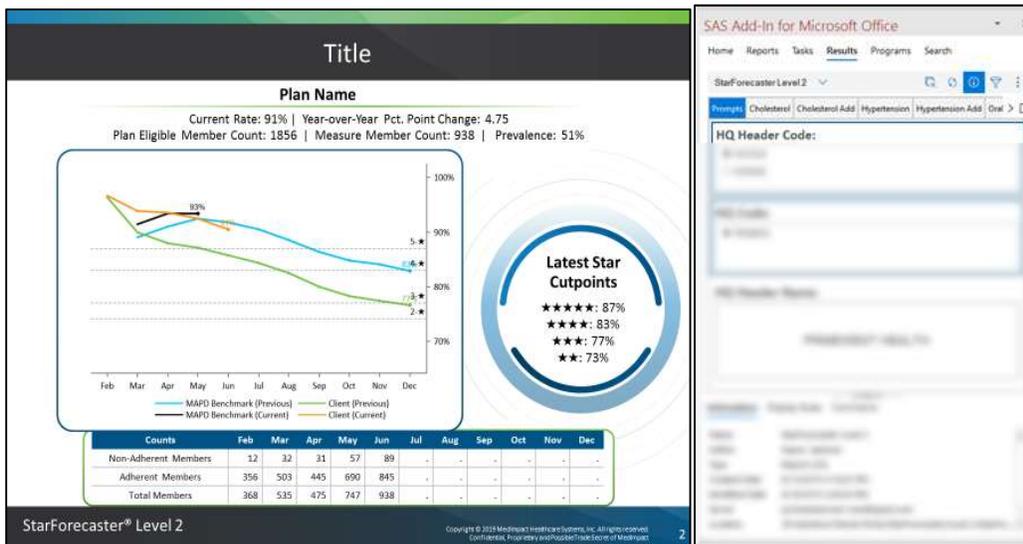
## SAS ADD-IN FOR MICROSOFT OFFICE

SAS Add-In for Microsoft Office, or SAS AMO, provides access to SAS data and Visual Analytics reports from Microsoft Office applications (Word, Excel, PowerPoint, Outlook). This is especially useful for non-SAS users as they can run analyses and generate reports developed by SAS programmers and developers. There are several use cases for this technology including embedding results in a document, programming and running code from Microsoft applications plus sharing results via Microsoft Outlook.

In our case we built a Visual Analytics report for end users to create client-specific PowerPoint slide decks. From the Visual Analytics report we embedded report objects within the PowerPoint template. We instructed users to open a PowerPoint template, open the SAS menu from the PowerPoint menu ribbon, open the Visual Analytics report associated with the slide deck via SAS AMO and then use the report prompts that change the slide content specific to their client. Below are screen captures of SAS AMO in PowerPoint.



Display 6. SAS Add-In for Microsoft Office in PowerPoint



Display 7. Resulting PowerPoint Slide with Embedded Visual Analytics Report Objects

## CONCLUSION

Creative use of SAS® Visual Analytics expands the ways in which one can effectively communicate associations and findings. Combining Visual Analytics reports with Microsoft Office applications expands delivery options allowing non-SAS users to present SAS generated analytics and visuals beyond the web-based Visual Analytics tool.

## REFERENCES

- SAS Support. 2019. "SAS Products-SAS® Visual Analytics". Accessed February 28, 2019. <http://support.sas.com/software/products/visual-analytics/index.html#s1=1>
- SAS Support. 2019. "SAS Visual Analytics". Accessed February 28, 2019. <http://go.documentation.sas.com/?cdclid=vacdc&cdcVersion=8.1&docsetId=vaov&docsetTarget=home.htm&locale=en>
- SAS Support. Travis Murphy and Falko Schulz. Supercharge Your Dashboards with Infographic Concepts Using SAS® Visual Analytics. SAS Institute Inc. Available at <https://www.sas.com/content/dam/SAS/support/en/sas-global-forum-proceedings/2018/2069-2018.pdf>

## RECOMMENDED READING

- *Aanderud, T. Collum, R. Kumpfmiller, R. 2017. Introduction to SAS Visual Analytics. SAS Institute Inc.*
- *SAS Visual Analytics User Documentation*

## CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the authors at:

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