

Mile-High Visual Analytics: Ways to Enhance Reports and Dashboards

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ABSTRACT

The recent versions of SAS® Visual Analytics include enhancements to several useful features that can elevate your reports and dashboards from good to great. This presentation describes workable solutions to common obstacles faced by report developers and data scientists. Topics include the use of parameters, when and how to calculate items, adding dynamic chart titles and creating hierarchies to add drill-down functionality. This paper is suitable for users of all experience levels and demonstrates how to optimize SAS Visual Analytics to elevate your reports and dashboards to the next level.

INTRODUCTION

This paper demonstrates useful techniques for enhancing SAS Visual Analytics reports and dashboards. The motivation for the paper originated from our experiences learning the 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 (released April 2017) to help users with older versions.

The term “user” throughout this paper refers to a report developer and “viewer” refers to those viewing and interacting with reports. 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.

NOTE: This paper uses cannabis data to demonstrate examples. Since recreational use of cannabis is illegal in most states and against federal law, the authors are not advocating cannabis use. We are merely using this data because this paper was first presented in Colorado (one of the first states to legalize recreational cannabis).

WE’RE KIND OF FLYING THE PLANE WHILE WE’RE BUILDING IT

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.

DATA SOURCES USED FOR THIS PAPER

Because this paper was first presented at SAS Global Forum 2018 in Denver we used data pertinent to the conference location. Colorado is traditionally known for the Rocky Mountains, skiing and outdoor activities; however, in the last 6 years Colorado is acclaimed for being one of the first two states (Washington the other) to legalize the recreational use of cannabis (commonly referred as marijuana). We thought this data would be novel or more interesting, so we searched for publicly available data and other interested cannabis information.

We found monthly recreational and medical cannabis sales plus tax revenue from the Colorado Department of Revenue. Interesting side facts: cannabis taxes, license, and fee revenue from February 2014 to December 2017 is nearly \$639 million and total sales during this period are \$4.4 billion.

We also found several websites dedicated to describing the characteristics, such as positive effects and flavors, of thousands of cannabis strains. Other sites describe self-reported prices, location, quality and amount of cannabis sales and purchases. Several sites map dispensary locations and other sites describe tourist activities (e.g. cannabis tours) centered on use of the now legal crop. These data sources can be found in the Acknowledgement section.

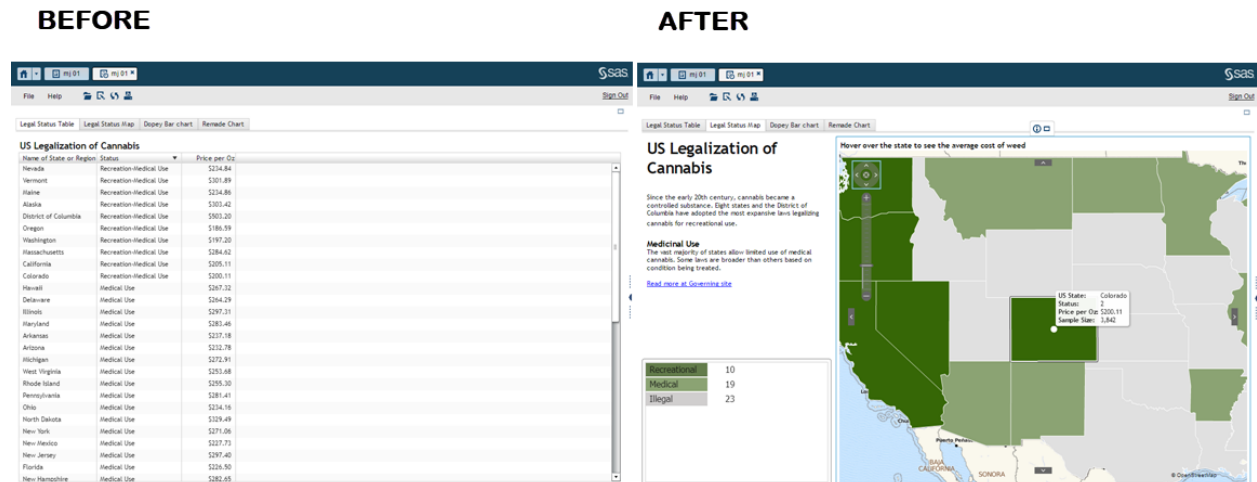
We used the publicly available data for some visuals and fabricated other data to demonstrate visuals and report features. We also used data from one of [Robert Allison's blogs](#) on the SAS Learning Post that describes self-reported sales price by state.

UNDERSTANDING THE PAPER LAYOUT

When users first start with SAS Visual Analytics, they typically produce rather bland or simple reports mainly because of their limited knowledge. We wanted to show some ways you could take a simple report and, with little effort, improve the overall appearance.

Each example of the paper has a Before graphic that has a simple look. The Before report shows how a new user might present the information. The After graphic shows a way to present the data more effectively.

Here's the graphics from the first section – it shows the startling transformation of a table into a map. Instantly the viewer has more details.



Display 1. Before and After Approach

EXAMPLE 1: IMPROVING THE DATA DECODING WITH MAPS

SAS Visual Analytics is a visualization tool, which some new users seem to forget as they create reports. For instance, if you have any list tables in your report, then you should consider ways to visualize that data. Consider the following narrative where we are discussing where cannabis is legal.

BEFORE: IT'S JUST A LIST TABLE DUDE

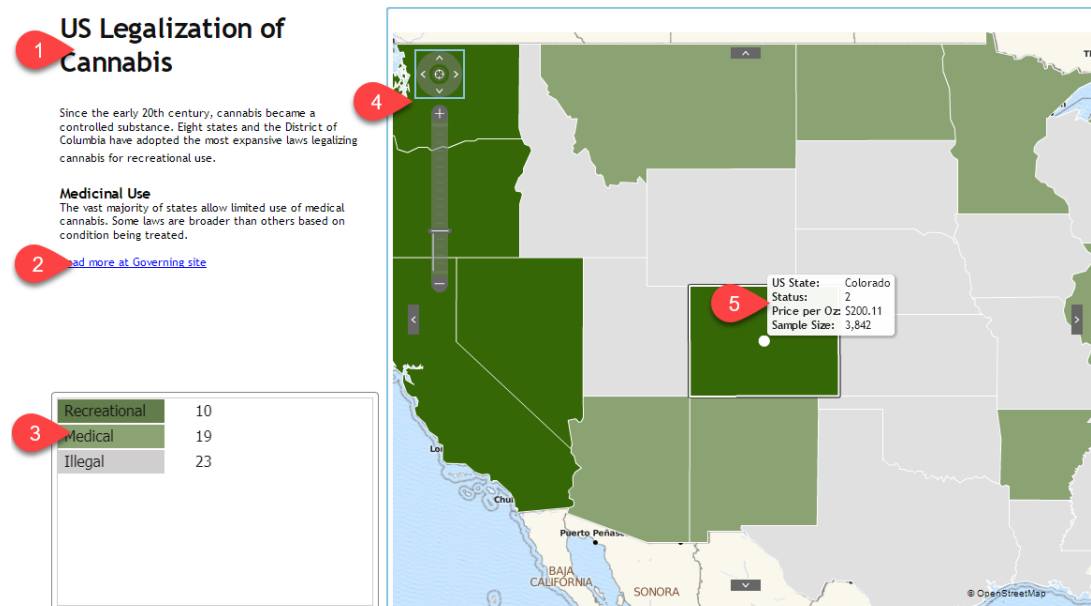
Understanding the legal status and price of cannabis by state is easy with a data table (Display 1); but that puts unnecessary work on report viewers. The viewers can sort the information, but they are forced to use their short-term memory to compare various states or to sum the values in their heads.

Name of State or Region	Status	Price per Oz ▼
District of Columbia	Recreation-Medical Use	\$503.20
South Dakota	Illegal	\$335.51
North Dakota	Medical Use	\$329.49

Display 2. Before is a List Table

AFTER: ADDING A MAP WITH A TEXT BOX

The table above can easily be visualized on a map, which makes it easier to understand. Plus, if you add the text box, you can share the narrative to add more details.



Display 3. After is a Magazine Layout

These are the modifications we made:

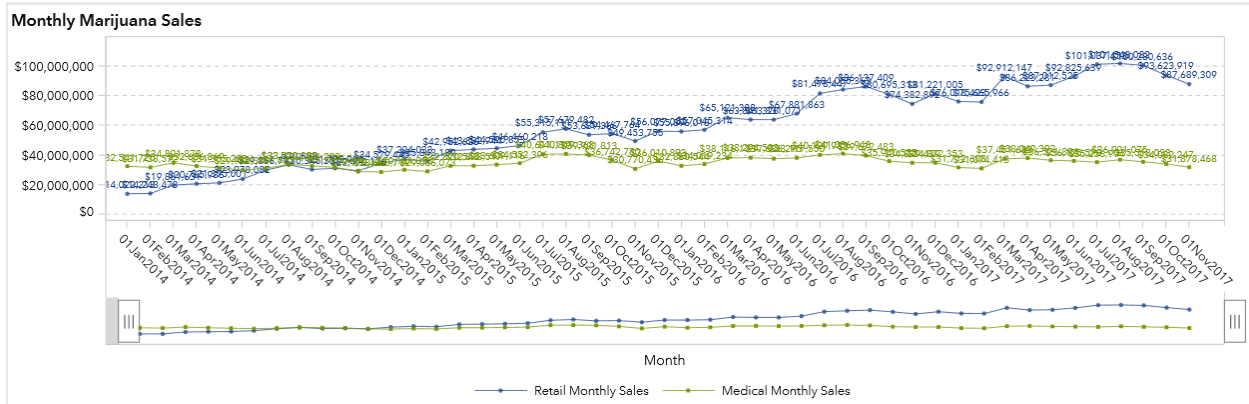
1. Add a Text Box object and use the font settings to create more of a magazine effect.
2. In the Text Box, you can link to outside sources to enrich your report.
3. Add a List table object to show a quick count that acts like a legend indicating the color shading rules.
4. Add a GeoRegional map and use the State variable to map the status. We changed the variable status into a number, so we could plot it on the map.
5. Add data tips to your map so the report viewer is invited to explore the map.

EXAMPLE 2: IMPROVING LINE CHARTS

SAS Visual Analytics has several graphing objects (e.g., Line Chart and Dual Axis Line Chart) that can effectively visualize your time-dependent data story. In the below example we intended to trend monthly medical and recreational cannabis sales from January 2014, the first month recreational cannabis was legal, using public use data from the Colorado Department of Revenue.

BEFORE: MESSY, HARD TO READ LINE CHART

Our initial view of the data used a typical Line Chart object. This rendered a messy, hard to read graph with too many data labels and a large, indecipherable x-axis label that listed every month (Display 4). The date values also dominated the report space.



Display 4. Before is Messy, Hard to Read Line Chart

AFTER: PART 1 - USE A TIME SERIES PLOT

The goal was to view several years of data by month without having a busy x-axis listing every month.



Display 5. After Time Series plot in Stacked Container

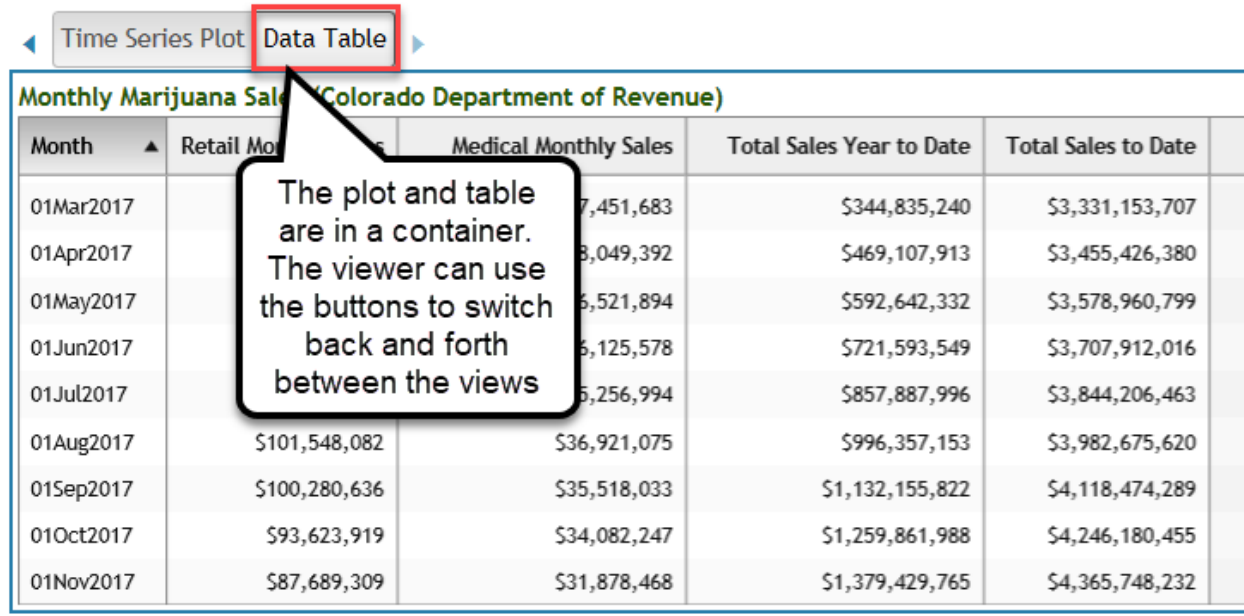
Here are the steps used to make the improved visual.

1. Insert a Time Series Plot. This chart type allows equally spaced time intervals on the x-axis. The chart type also renders the y-axis label in \$millions.
2. Move the Legend placement to the top of the Time Series for visual appeal. Also remove the data point labels – many data visualization experts consider these “chart junk”.
3. Extend the x-axis by setting the “Set fixed maximum” property setting to show future months. This is optional but sometimes viewers ask to see the future months and this setting gives you an easy way to extend the plot without adding data.

AFTER: PART 2 – SHOWING THE LIST TABLE

Even with the best visualization, viewers ask to see the data in a List table. However, tables use a lot of screen real estate without offering much value in return. One way around the requirement is to use a Stacked Container object. By clicking on the tab at the top, this object allows the viewers to flip between the visualization and table. Report viewers can see the data by clicking a tab at the top but preserves the visualization for the other viewers.

Time Series Plot and Data Table



Display 6. List table in Stacked Container

Here are the steps we used to create this visual:

1. Added a List Table for view of the granular plot data.
2. Insert a Stacked Container and placed the Time Series Plot and List Table in the Stacked Container.

We found some interesting trends with this new visual. First, medicinal use sales remained flat while recreational use sales steadily increased over the four calendar years since legalization. Second, monthly variation; recreational sales are consistently lower in February and November. Perhaps this is due to lesser days in these months plus the Thanksgiving holiday weekend. Less shopping days! Or people are starting holiday shopping.

EXAMPLE 3: VISUALIZING MULTIPLE VARIABLES

It is a challenge to work with multiple values when you want to show the various aspects of the values. In this visualization, we wanted to rank strains based on their reviews and ratings. Cannabis is available in three types: indica, sativa, and hybrid.

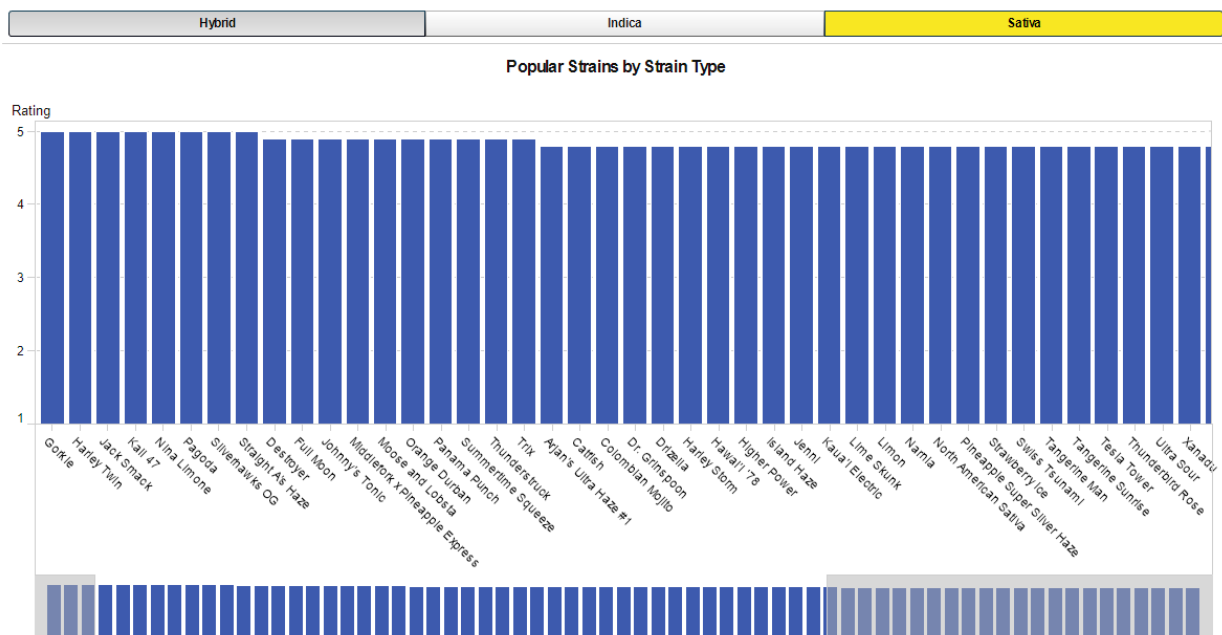
Based on your medical condition, some strains are more effective. [Leafly](#) reported that indica strains are more physically sedating and have a relaxing effect, which may be better for acting as a muscle relaxant. While sativa strains provide uplifting cerebral effects that could provide relief from depression. The hybrids combine the effects based on the parent strain used. Leafly noted the data may not support all these claims but many medical cannabis consumers use the strain type as a starting point.

There are hundreds of strains within each type. Several sites (see References section) allow consumers to rate strains on a scale of 1 to 5. Some strains are more popular and hence have more reviews. We simulated this data for this example.

BEFORE: DOPEY BAR CHART

We started with a button bar and a bar chart to show ratings by type (Display 7). This resulted in a boring wall of blue bars; but it did reveal the little variation in ratings. It didn't account for number of reviews, so it was difficult to explore the data.

The x-axis labels were difficult to read and monopolized the report space. Even adding an overview bar beneath it did nothing more than add confusion.



Display 7. Dopey Bar Chart with Huge Labels

We wanted to show strains by type and use the review count to show the ratings. But we wanted a way to show those strains above a threshold for their type.

AFTER: TARGET BAR CHART WITH PARAMETERS

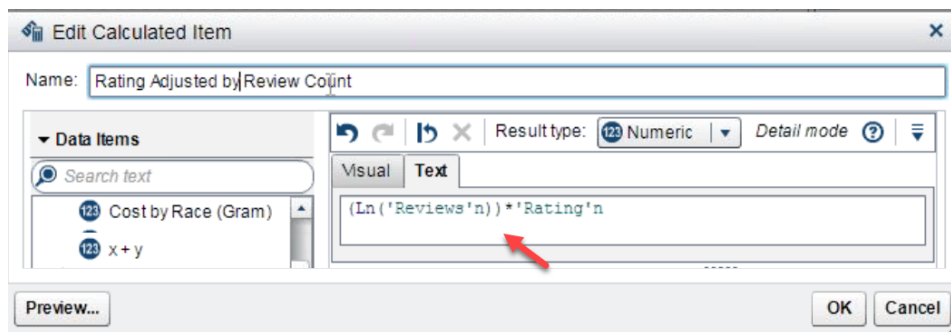
We created a new rating variable that adjusted for the number of reviews. Then we replaced the bar chart with a Target Bar Chart and selected a horizontal view, so the strain names are more legible. The strains were ranked by our new adjusted review rating variable and limited to the top 25 strains. Since the average rating varies by type, we used a parameter to create a target line, or threshold rating, for each type. Finally, we added a section link to the strains, so the viewer can link to a list table that contained details about the strain.



Display 8. New and Improved Target Bar Chart

Here are the techniques we used to create this interactive chart.

1. Create a Calculated Item that uses the Reviews and Ratings variables. We used the natural log (LN) function for the Reviews and multiplied it by the Ratings to create the Ratings Adjusted by Review Count variable. This variable was used as the Measure in the Target Bar Chart.



2. Since there are over 500 strains within each type, we ranked the strains by the Ratings Adjusted by Review Count variable. This chart only shows the top 25. Since we are trying to find the popular strains, the viewer can focus on those. Plus, the chart is readable!
3. Those lower-ranking strains might be considered substandard; therefore, we used a Display Rule to turn the bar gray for all strains rated below 28. This helps the viewer focus their attention.
4. For each Strain Type, we wanted to indicate the strains of higher quality, so we set a reference

point. Since you cannot automatically change the reference line by type, we set a target for each strain by using a parameter to change the Target variable value.

- a. Create a character parameter called pStrainTypes that holds the user selection in the button bar.

Edit Parameter

Name:

Type:

Current value:

- b. In the Roles tab, assign the pStrainType parameter to the button bar.

Button Bar 1

Data source: all_strains_final_va

Category:

Frequency:

Parameter:

- c. Create a Calculated Item called cTarget using the parameter. You need a value for each Strain Type and then a default value. These values display the target based on which button the users chooses.

Edit Calculated Item

Name:

Result type:

Data Items

- Charac...
- Numeric
- Param...
- pStr...**

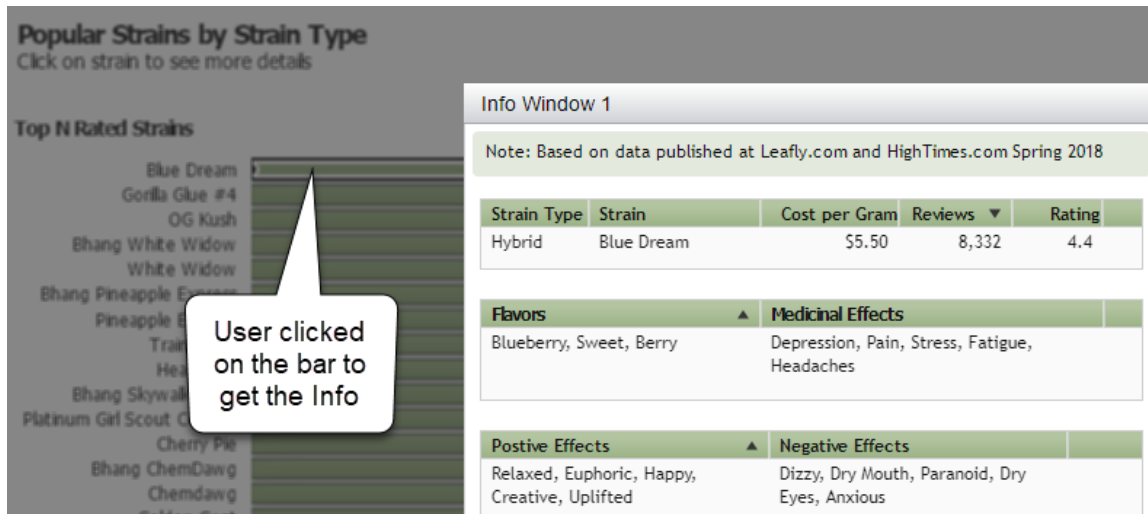
Text

```

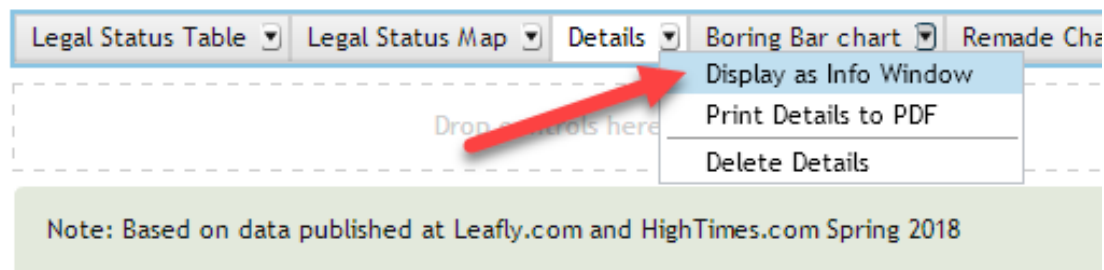
IF ( pStrainType = " Hybrid " )
    RETURN 33
ELSE [ IF ( pStrainType = " Sativa " ) ]
    RETURN 31
    ELSE 29
    
```

- d. In the Roles tab, assign the cTarget to the Target role in the Targeted Bar Chart area.

- As a final touch, let's allow the user to view detailed information about the strain in a pop-up window.

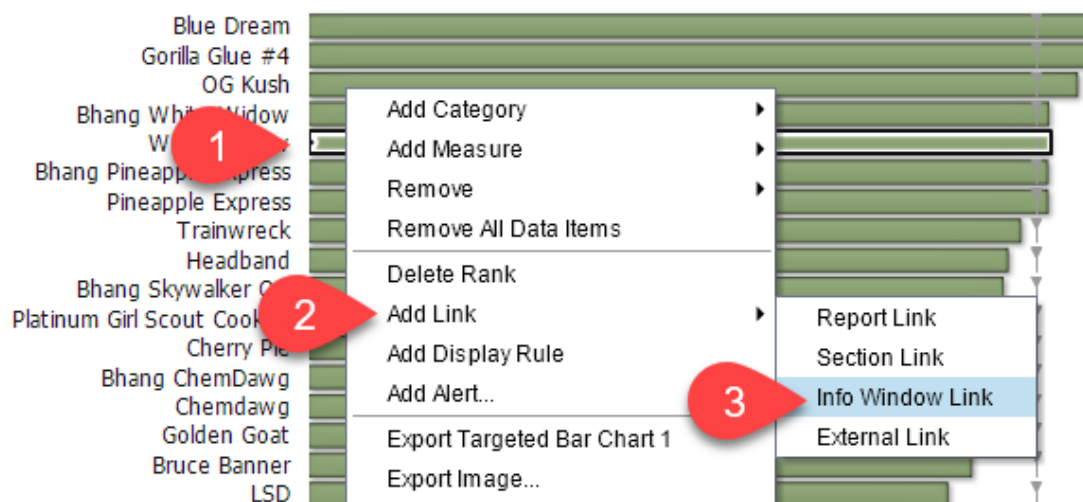


- We added a section that contained three tables of in-depth information about the specific strain (Flavors, Effects). We changed the section into a pop-up window.



- From the Target Bar chart, we added a link to the Info Window as shown below. When prompted, we selected our Info window to establish the link.

Top N Rated Strains

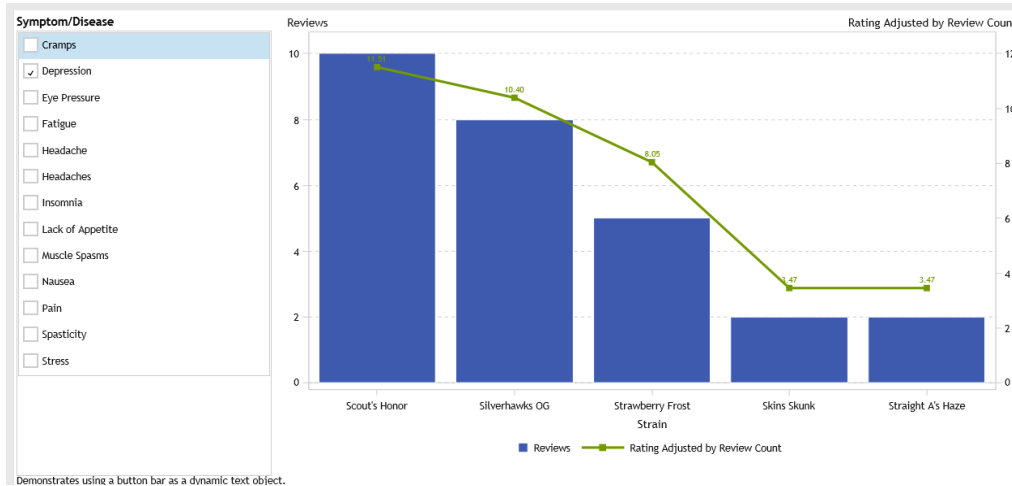


EXAMPLE 4: DYNAMIC OBJECT LABELING

Section and report prompts let viewers see specific data based on their selections. For instance, selecting a particular client in a prompt will change the associated report objects to show data/visuals for that client. However, the prompt selections aren't always near the visual and the section prompt information is lost when printing to PDF. That is, it's not always apparent what client is represented in the visual. Wouldn't it be nice to see what client you selected?

BEFORE: UNIMPRESSIVE LIST TABLE AND DUAL AXIS BAR CHART

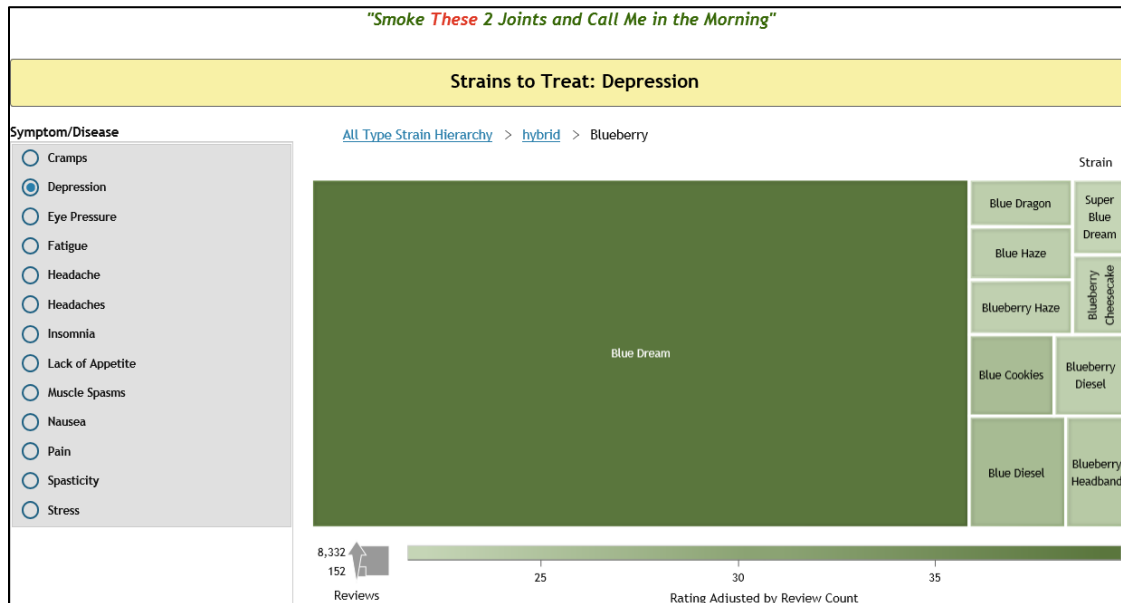
Display 9 uses a List Control (left side of visual) and an associated Dual Axis Bar-Line Chart (right side) to show number of reviews and ratings for strains that are associated with treating a symptom or disease. Notice the generic title that lacks any indication of the disease selected (depression) in the List Control.



Display 9. Ratings Visual before Adding Dynamic Titles and Hierarchy

AFTER: ADDING CHART TITLES USING A BUTTON BAR

We wanted viewers to find cannabis strains to treat specific disease or symptoms and have the title change based on a viewer's Disease/Symptom selection in the List Table. We also wanted a drill down function so viewers can compare strains when picking their desired flavors.



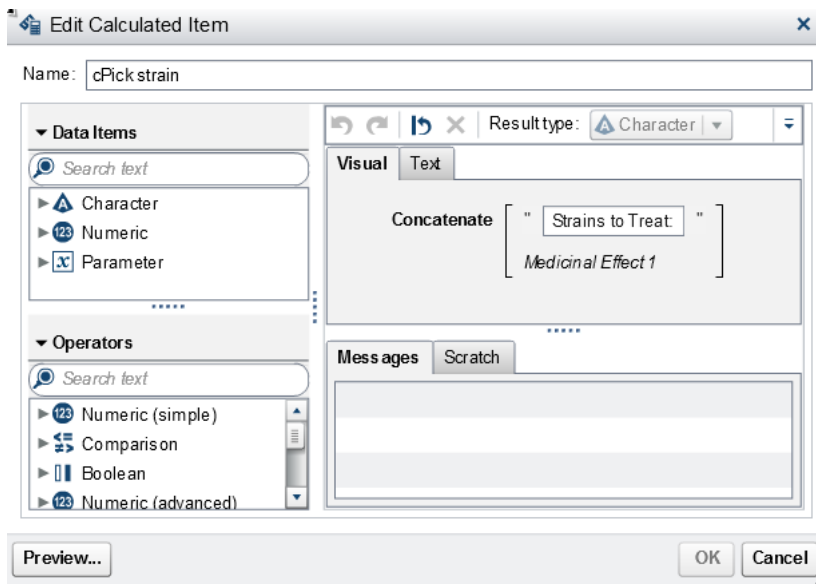
Display 10. Adding a tree map and dynamic titles

If you're using version 7.3 or an earlier version, you can use List and Button Bar Controls with a Calculated Item to act as a title which will change with different prompt selections. Bobby Wagoner describes this trick in a [SAS Community post](#). If using version 7.4, you're in luck. Version 7.4 has a dynamic text capability that can do some of the functions explained in this example.

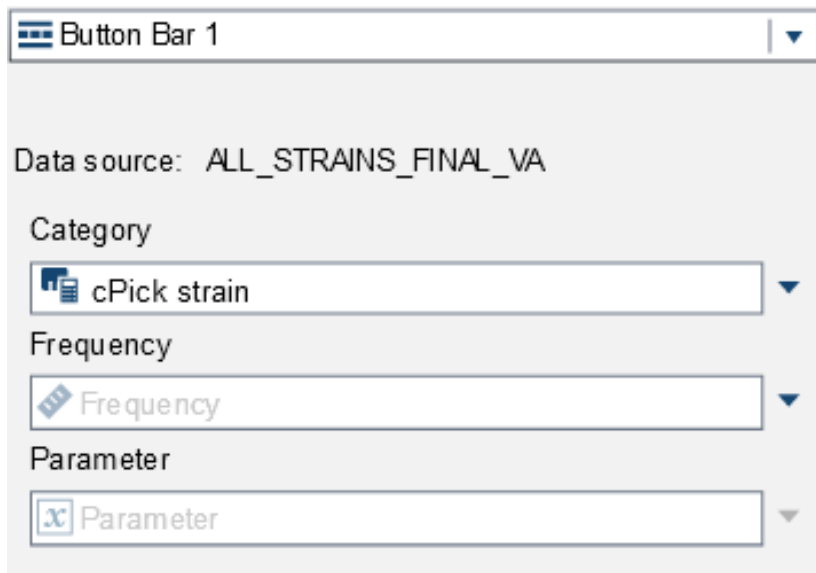
Here are the main steps used to create the interactive chart and dynamic text.

1. Create a Calculated Item that concatenates a phrase with a variable. In this case, concatenate "Strains to Treat:" with the Medicinal Effect 1 variable

cPickstrain = Concatenate('Strains to Treat: ', 'Medicinal Effect 1'n)



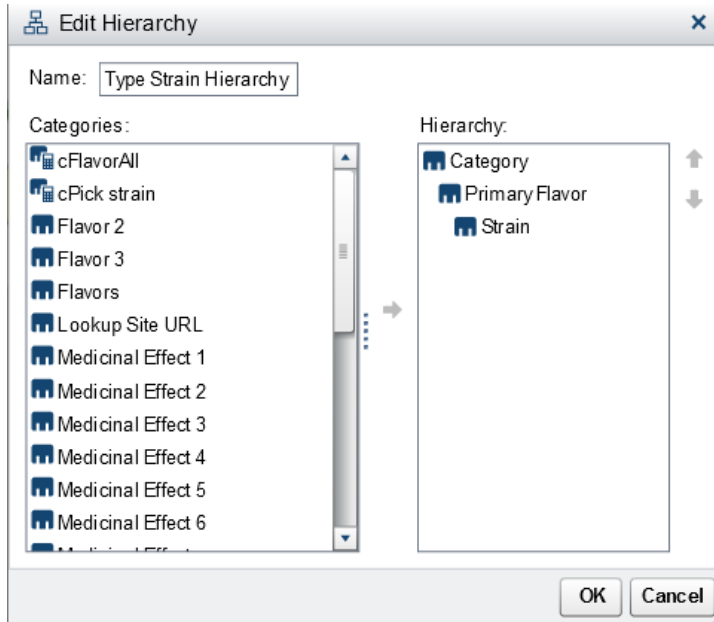
2. Create a button bar and assign the new Calculated Item, cPickstrain, to the Category role.



3. Create interactions between the List Table and Button bar and Tile Map. This creates the link so the button bar changes to reflect new prompts, Symptom/Disease in this case.

Additionally, we replaced the Dual Axis Bar-Line Chart with a Tree Map object to better show number of reviews and ratings for cannabis strains. We added a hierarchy to the Tile Map to add drill-down functionality. In this case, strains are grouped under the 3 types or categories (indica, sativa, and hybrid).

1. Create a Hierarchy: Category→Primary Flavor→Strain. Then create a Tree Map and assign the new hierarchy to the Tile role.



2. From the Styles menu, use Gradient data colors to show the difference in ratings by strain.



The Tree Map changes with the drill selection. There are 10 strains with a primary flavor of blueberry to treat depression. Blue Dream had the most review and highest rating.

CONCLUSION

Time invested in learning SAS Visual Analytics can pay off tremendously. Several powerful report objects in the Report Designer can bolster your reports to the next level. The newer versions of SAS® Visual Analytics include enhancements to several useful features allowing users to improve their reports and dashboards. Combining report objects (e.g., graphs, plots, tables) with other features, such as parameters, can expand reporting capabilities and enrich your data visualizations.

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- Bailey Rahn on Leafly, 2014. Sativa vs. Indica vs. Hybrid: What's the Difference Between Cannabis Types? Accessed March 8, 2018. <https://www.leafly.com/news/cannabis-101/sativa-indica-and-hybrid-differences-between-cannabis-types>

ACKNOWLEDGMENTS

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RECOMMENDED READING

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

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