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Auto Charts - Hidden Gem in SAS® ODS Graphics Designer

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ABSTRACT

The 9.4 version of SAS ODS Graphic Designer contains a utility to automatically create many possible versions of graphs based on a list of variables. The user can then choose the most appropriate graph for further experimentation and enhancements. This is a very powerful tool to help a SAS user visualize various types of possible graphs without having to do any actual programming. This feature can also be used as one of the first steps to quickly learn SAS ODS Graphics programming or assist experienced SAS users in fine-tuning their graphic skills.

This paper describes how a SAS user can become more productive in data visualization using the Auto Charts feature.

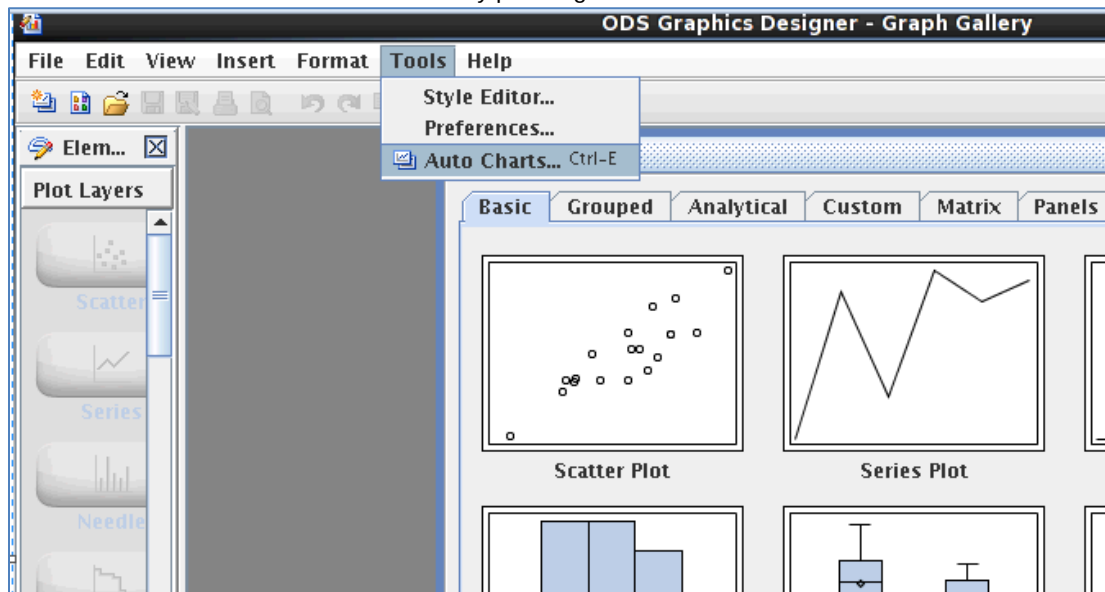
INTRODUCTION

SAS ODS Graphics Designer is a very good tool to help SAS users learn ODS graphical programming. The tool allows for an interactive, non-programming approach to graphical development. SAS users can design various graphics and analyze the code behind the plots using SAS ODS Graphics Designer.

The 9.4 version of the Designer now has a tool called Auto Charts. The purpose of the tool is to automatically create plots based on the provided list of variables. The system tries to guess possible plots and the user is then able to choose the best graph needed for optimal data visualization. Users can add or modify various graphical elements such as axis or labels to improve the graph further. Auto Charts also generates SAS code for the graph, which the user can then copy into Program Editor where the code can be analyzed and modified.

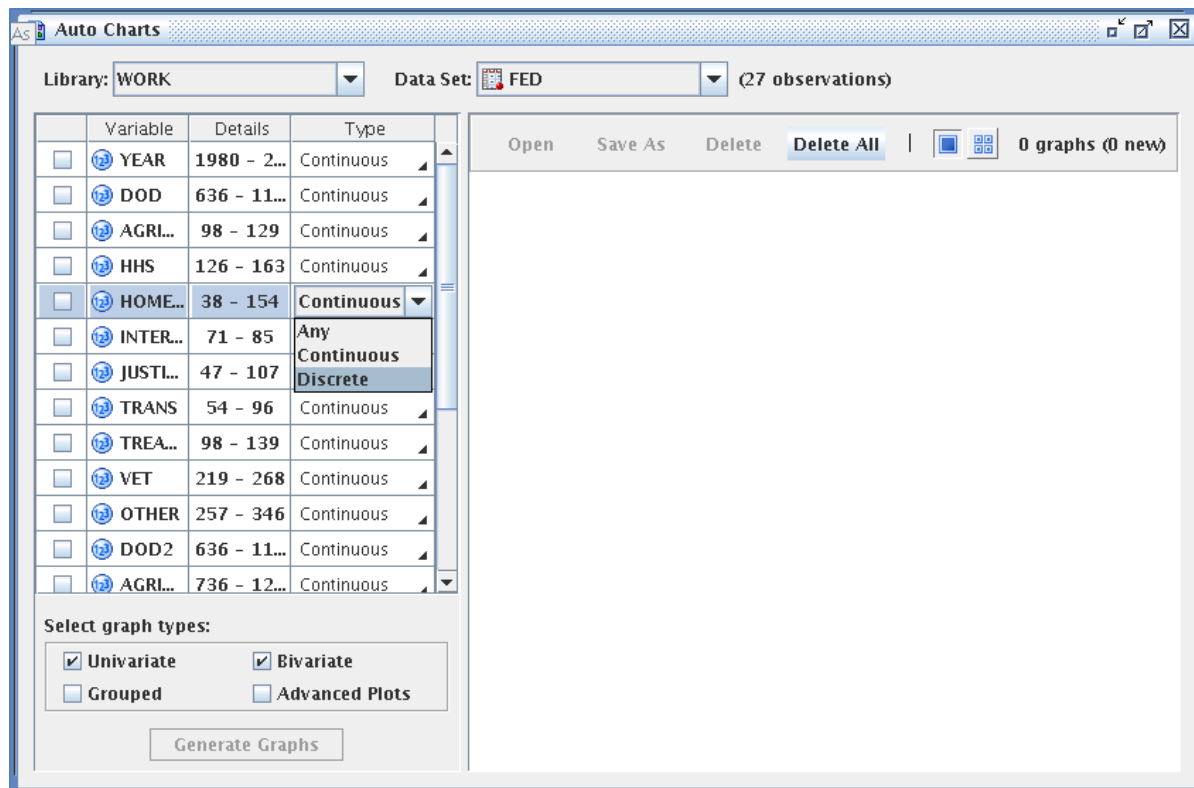
STARTING AUTO CHARTS

SAS ODS Graphics Designer must be activated for the Auto Charts feature to be used. It can be done either by submitting %sdesign madro call or by choosing Tools-> SAS ODS Graphics Designer. The Auto Charts feature can then be started with Tools->Auto Charts or by pressing CTRL-E:



Display 1. Starting Auto Charts

The list of libraries and datasets can be found in the top menu. Upon selecting a dataset, a list of variables needed for the plot can be selected. The type of each variable can be set to either Continuous, Discrete and Any.



Display 2. Changing type of variables required for generation of graphs

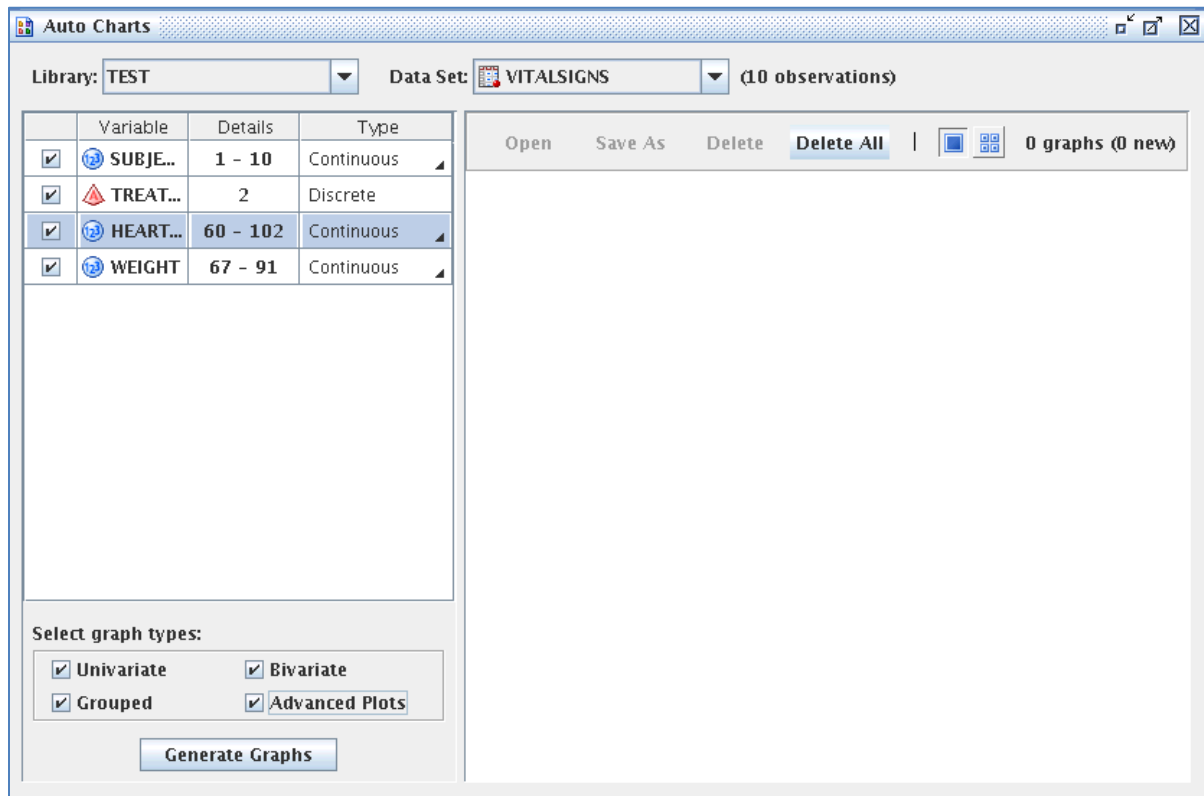
EXAMPLE 1: SCATTER PLOT

The following example demonstrates how Auto Charts automatically generates a simple scatter plot of baseline weight, heart rate, and treatment group.

Subject	Treatment	HeartRate	Weight
1	A	79	80
2	A	60	91
3	B	100	67
4	A	65	77
5	B	88	88
6	A	102	71
7	B	65	86
8	B	87	75
9	B	98	90
10	A	101	78

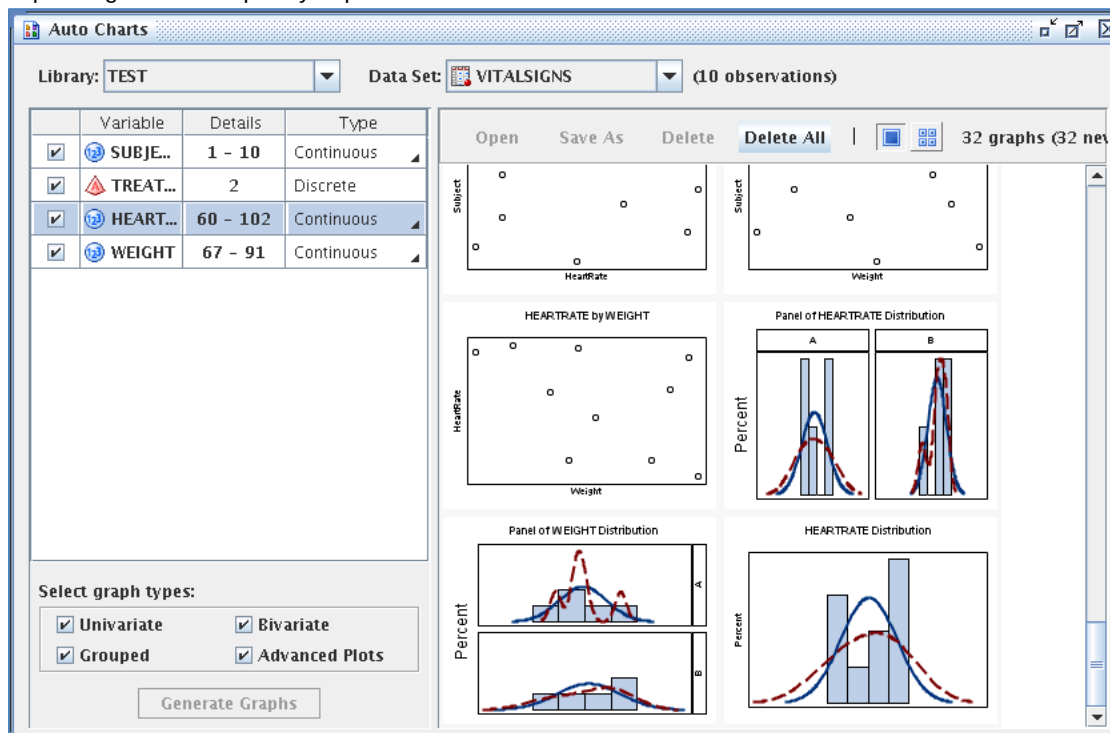
Table 1. Dataset for scatter plot

A user needs to choose the appropriate variables. In this example, the dataset already contains only those variables needed for the graph; therefore, all the variables are selected. The next step is to choose the type of graphs: Univariate, Bivariate, Grouped and Advanced.



Display 3. Selecting variables and types of graphs

The system will automatically produce a list of possible graphs. The generation of graphs may take some time depending on the complexity of plots and the data.



Display 4. Auto generated graphs

A SAS user can then choose the most appropriate graph.

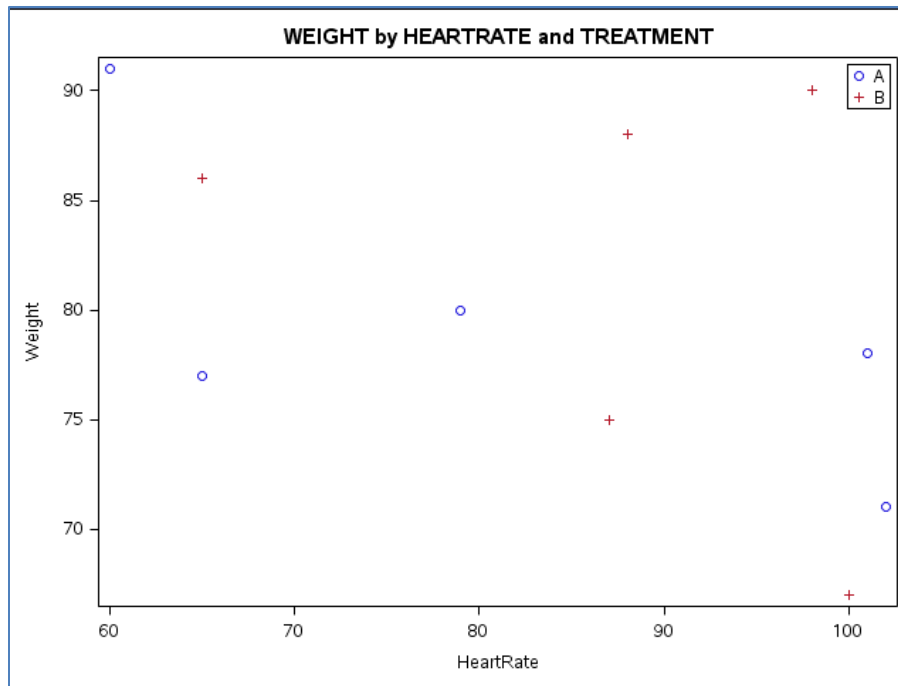


Figure 1: The scatter plot of weight, heart rate and treatment automatically generated by Auto Charts

The graph can be further improved by customizing it. For example, the x-axis label can be manually changed from “Heart” to “Heart rate (bpm)” as shown below:

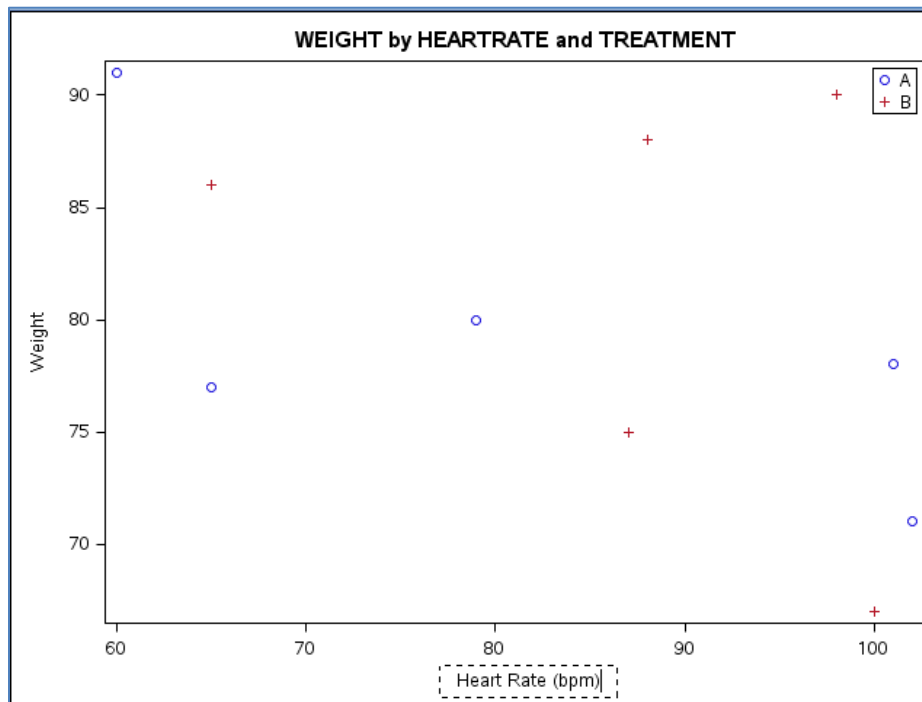


Figure 2: Customizing a graph by modifying the X-axis label

One of the most useful features of Auto Charts is the option to automatically generate SAS code without having to learn any ODS graphics syntax. This is done by using the code section of Auto Charts, which can be found in Code window. The Code Window can be started by View->Code. SAS code will then be displayed in ODS code window as

shown below:

```
Code - Graph
proc template;
define statgraph sgdesign;
dynamic _HEARTRATE _WEIGHT _TREATMENT;
begingraph;
  entrytitle halign=center 'WEIGHT by HEARTRATE and TREATMENT';
  layout lattice / rowdatarange=data columndatarange=data rowgutter=10
  columngutter=10;
  layout overlay / xaxisopts=( display=(TICKS TICKVALUES LINE LABEL )
  label=('Heart Rate (bpm)') discreteopts=( tickvaluefitpolicy=splitrotate))
  yaxisopts=( display=(TICKS TICKVALUES LINE LABEL ) discreteopts=(
  tickvaluefitpolicy=none));
  scatterplot x=_HEARTRATE y=_WEIGHT / group=_TREATMENT
  name='scatter';
  discretelegend 'scatter' / opaque=false border=true halign=right
  valign=top displayclipped=true across=1 order=rowmajor location=inside;
  endlayout;
  endlayout;
endgraph;
end;
run;

proc sgrender data=TEST.VITALSIGNS template=sgdesign;
dynamic _HEARTRATE="HEARTRATE" _WEIGHT="WEIGHT"
_TREATMENT="TREATMENT";
run;
```

Display 5. The ODS code window used in Auto Charts

This code can be copied and later studied or re-used in a stand-alone SAS program.

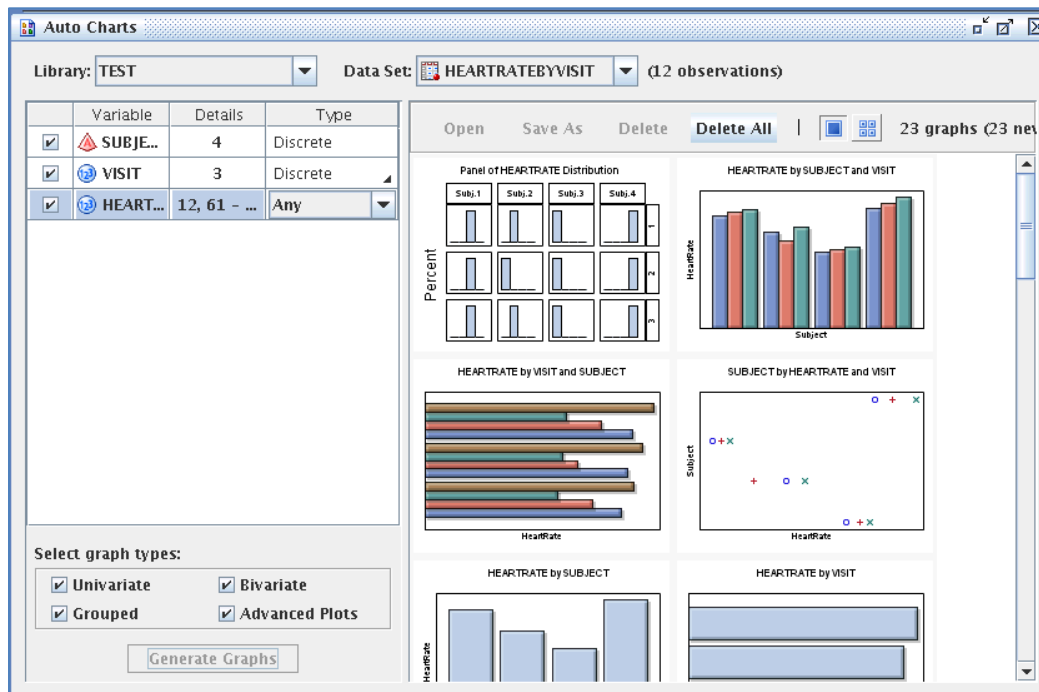
EXAMPLE 2: GROUPED VERTICAL BAR CHART

The dataset below will be used to create a grouped bar chart summarizing subject's heart rate at each visit.

Subject	Visit	HeartRate
Subj.1	1	90
Subj.1	2	93
Subj.1	3	95
Subj.2	1	77
Subj.2	2	70
Subj.2	3	81
Subj.3	1	61
Subj.3	2	63
Subj.3	3	65
Subj.4	1	96
Subj.4	2	100
Subj.4	3	105

Table 2. Dataset containing heart rate at each visit

The author was able to obtain better results after changing the type of Heart Rate variable to "Any" from "Continuous". Auto Charts generated 23 figures



Display 6. Automatically generated figures

There are no vertical bar charts, but there is a horizontal bar chart.

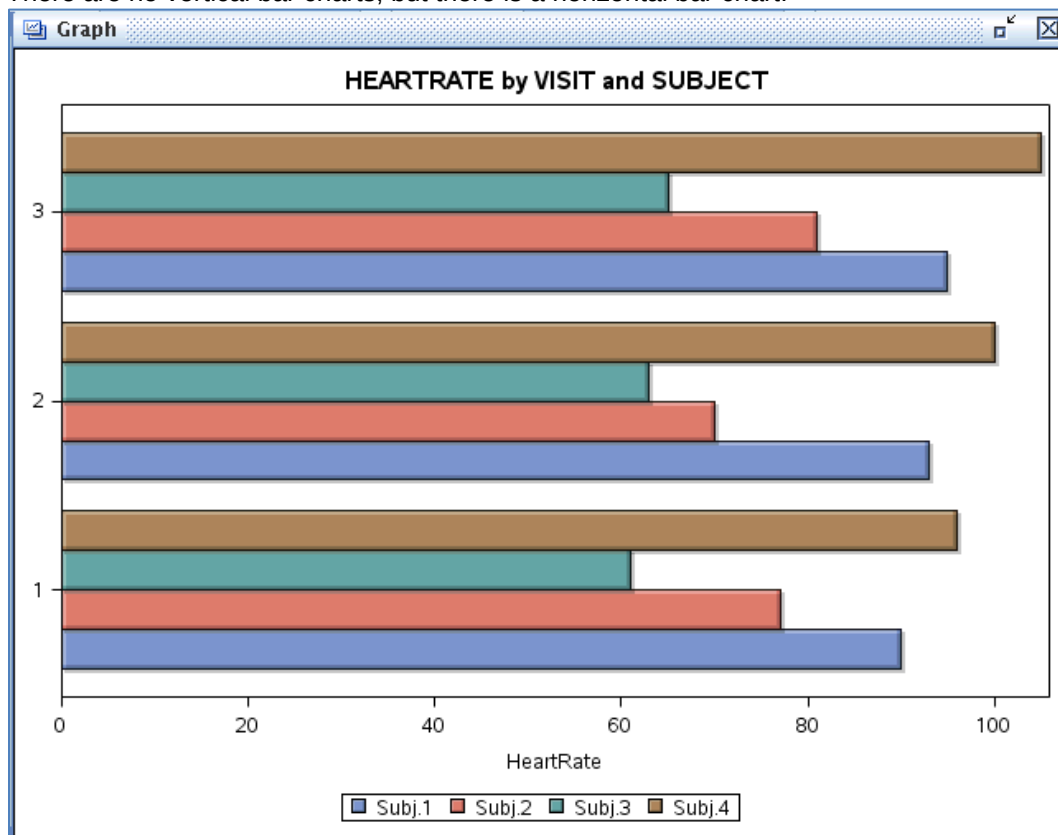


Figure 3: Automatically generated vertical bar chart of heart rate grouped by subject at each visit

The legend and Y axis can be easily modified by manually typing the new labels.

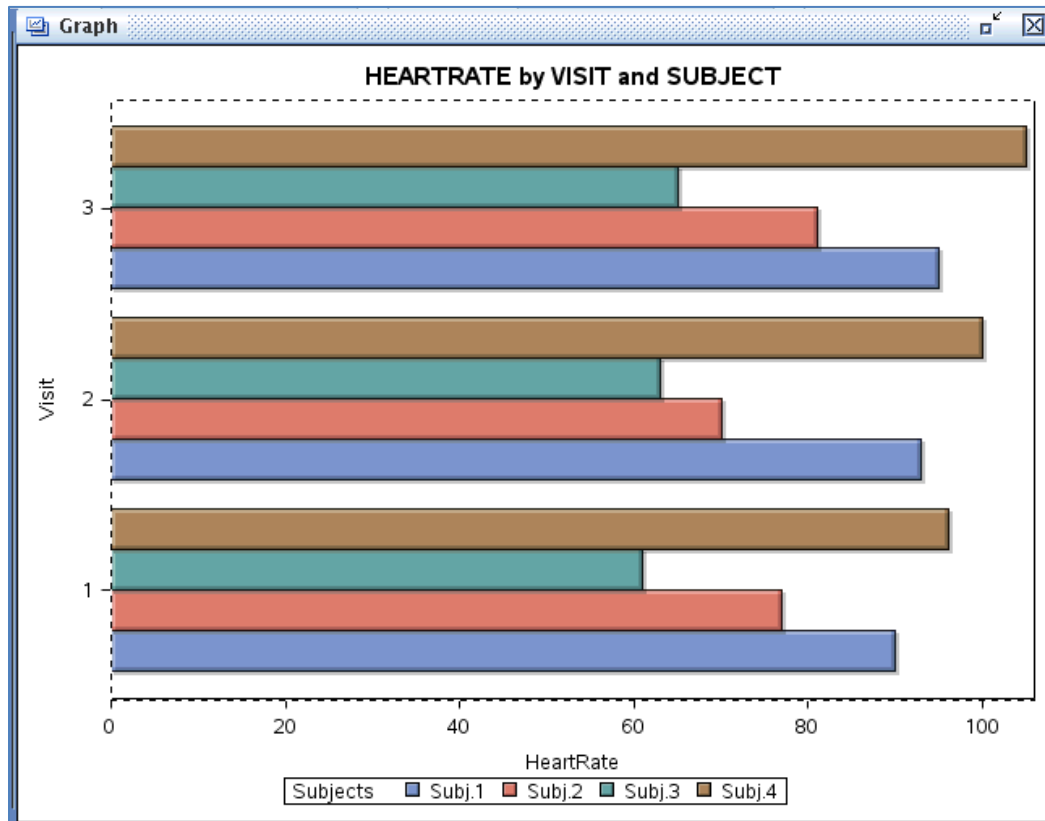


Figure 4: The same graph with updated Y axis and legend

Finally, the plot must be vertically re-oriented. This can be done by copying the automatically generated code produced by Auto Charts into SAS editor and changing the ORIENT option from Horizontal to Vertical as shown below.

```
proc template;
define statgraph sgdesign;
dynamic _VISIT _HEARTRATE _SUBJECT;
begingraph / dataskin=CRISP;
  entrytitle haln=center 'HEARTRATE by VISIT and SUBJECT';
  layout lattice / rowdatarange=data columndatarange=data rowgutter=10
columngutter=10;
  layout overlay / xaxisopts=( display=(TICKS TICKVALUES LINE LABEL )
discreteopts=( tickvaluefitpolicy=splitrotate)) yaxisopts=( display=(TICKS
TICKVALUES LINE LABEL ) discreteopts=( tickvaluefitpolicy=none));
  barchart category=_VISIT response=_HEARTRATE / group=_SUBJECT
name='bar(h)' stat=mean orient=horizontal groupdisplay=Cluster;
endlayout;
  sidebar / align=bottom spacefill=false;
  discretelegend 'bar(h)' / opaque=true border=true haln=center
valn=center title='Subjects' displayclipped=true order=rowmajor;
endsidebar;
endlayout;
endgraph;
end;
run;

proc sgrender data=TEST.HEARTRATEBYVISIT template=sgdesign;
dynamic _VISIT="VISIT" _HEARTRATE="HEARTRATE" _SUBJECT="SUBJECT";
run;
```

The rotated plot is shown below.

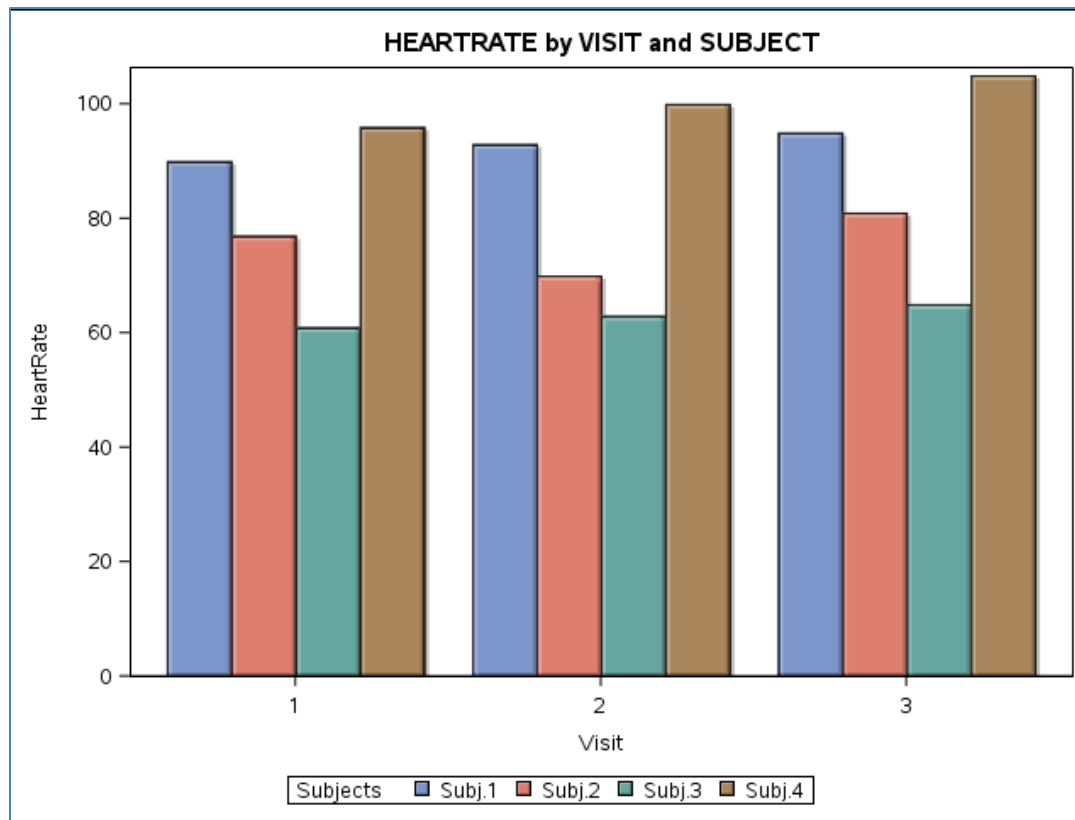


Figure 5: Updated version of the bar chart

LIMITATIONS OF AUTO CHARTS

The tool still needs work. While the tool generates many versions of plots, it does not produce all possible plots, as of December, 2018. The graphical user interface still requires additional improvements in terms of the ease of use, as not all typical graphical elements can be easily added to existing plots.

CONCLUSION

The Auto Charts feature provides numerous ways to make data visualization easier and more efficient, even for a novice user. Additionally, the tool is an excellent way to learn and experiment with various features of ODS graphics. There are other SAS applications that help users generate graphs manually, such as SAS Enterprise Guide. However, Auto Charts is the only tool that automatically produces many possible combinations of graphs.

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