# Making Your SAS® Data JMP® Through Hoops

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## ABSTRACT

Longtime SAS users can benefit by adding JMP to their repertoire.  JMP provides an easy-to-use and robust environment for data exploration, graphics and analytics without the need for programming expertise.  This paper will provide an introduction to JMP 9 with an emphasis on features that SAS users will find useful.

During this presentation, users will learn how to read their SAS data, import Excel spreadsheets, transform their data, explore distributions, create reports and create sophisticated graphics all in the JMP environment. Users will be introduced to the tools within the JMP 9 environment that provide a pathway to quickly learn how to use the product and some of its unique features.

## INTRODUCTION

Anyone embarking on a data exploration and reporting project, even an experienced SAS user, can benefit from adding JMP to their analytics toolkit.  JMP's graphical and drill-down approach makes data analysis an accessible and enjoyable process.

This paper will show the step-by-step basics of how to use JMP, and how the graphical exploration process facilitates data transformation, description, modeling, graphing and reporting. As this is a high level overview of JMP, it only scratches the surface of the available functionality.  The intention is to give novice users a place to start and some insight into JMP's menu system.

All examples in this paper use the JMP 9-provided sample data set entitled "Lipid Data".  Since all JMP 9 users will have access to the data set via the JMP Help tab, the examples can be used as an introductory tutorial. All examples in this paper are created using JMP 9 in a Windows environment.
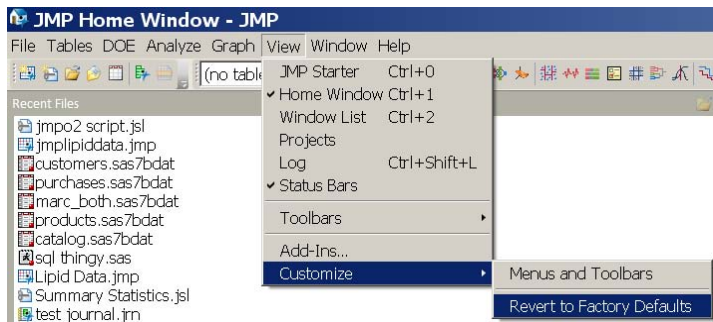
## GETTING STARTED

If you have a shortcut set up on your desktop, click on the icon and JMP will open.  Alternatively you may navigate through the *Start→All Programs* menu to access your JMP application.
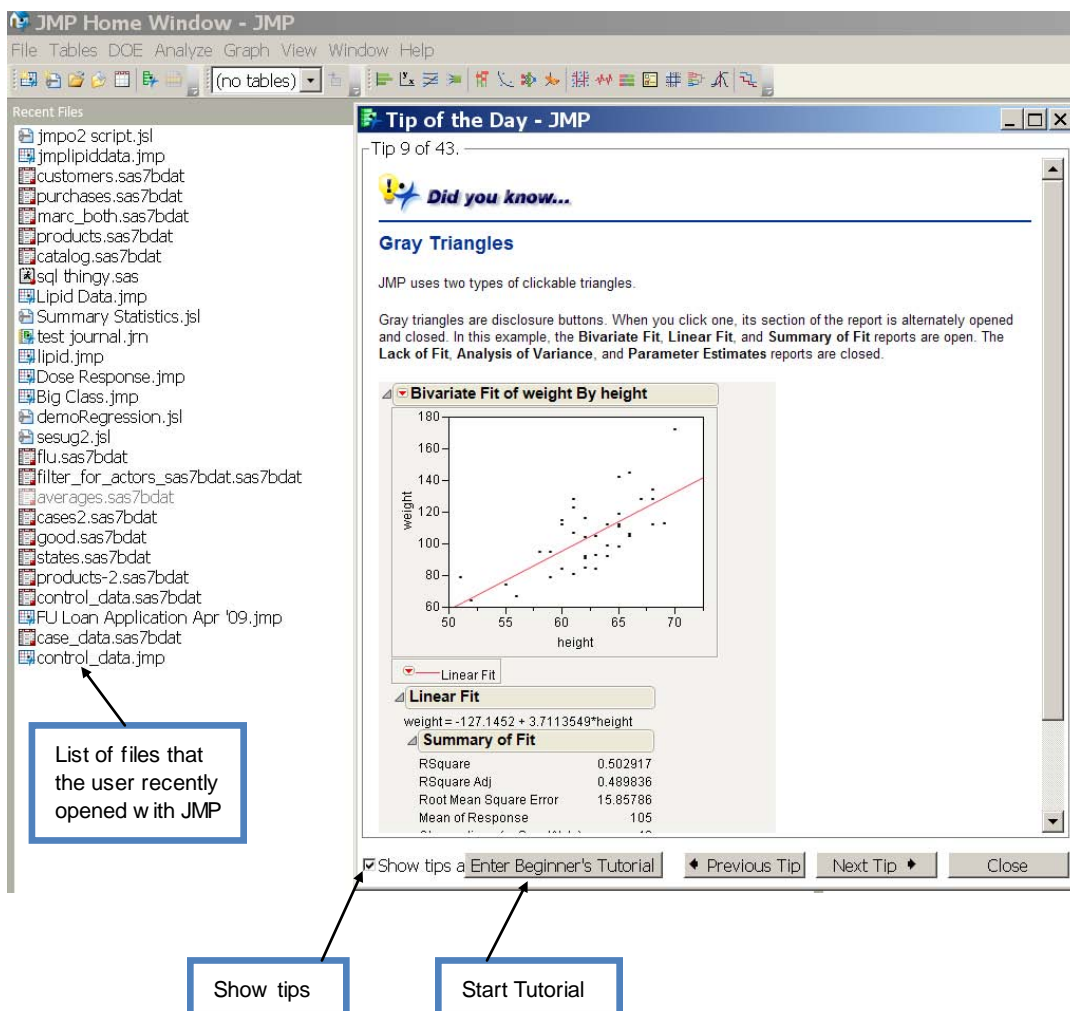
### DEFAULT JMP WELCOME SCREEN

When you open JMP for the first time you will see the *JMP Home Window-JMP* displayed with the *Tip of the Day-JMP* window displayed in the foreground. The user may customize this view.  However, the user may revert back to the default settings by going to *View→Customize→Revert to Factory Defaults.*

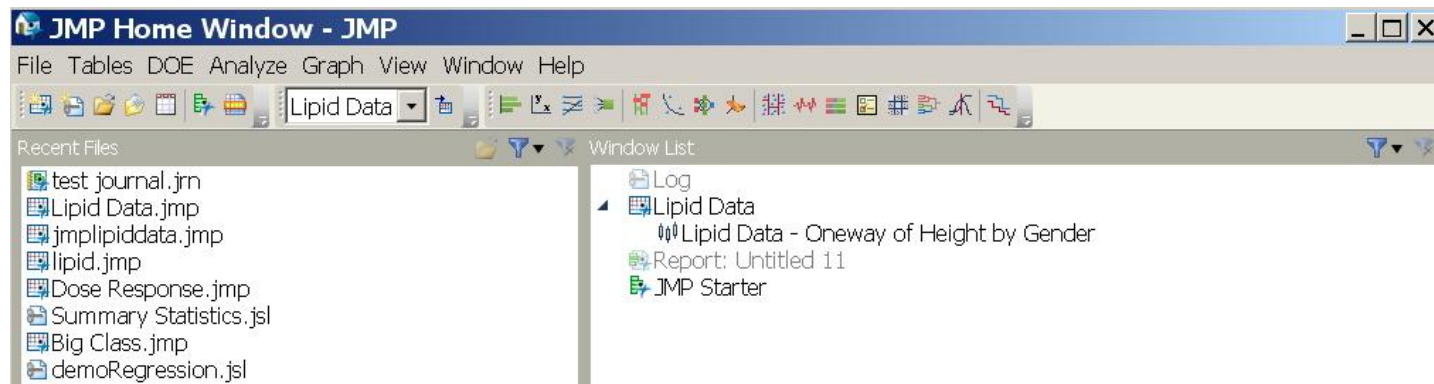Making Your SAS® Data JMP® Through Hoops, continued



If you are using JMP for the first time, it is extremely helpful to go through the beginner's tutorial by clicking on the *Enter Beginner's Tutorial* button that is displayed at the bottom of the **Tip of the Day-JMP** window. There is an option to *Show Tips.* It is recommended that beginning users leave that box checked.  New users can learn a great deal about JMP by scrolling through the tips. If you close the **Tip of the Day-JMP** window, you can reopen it by going to the Menu Bar and going to *Help→Tip of the Day*.
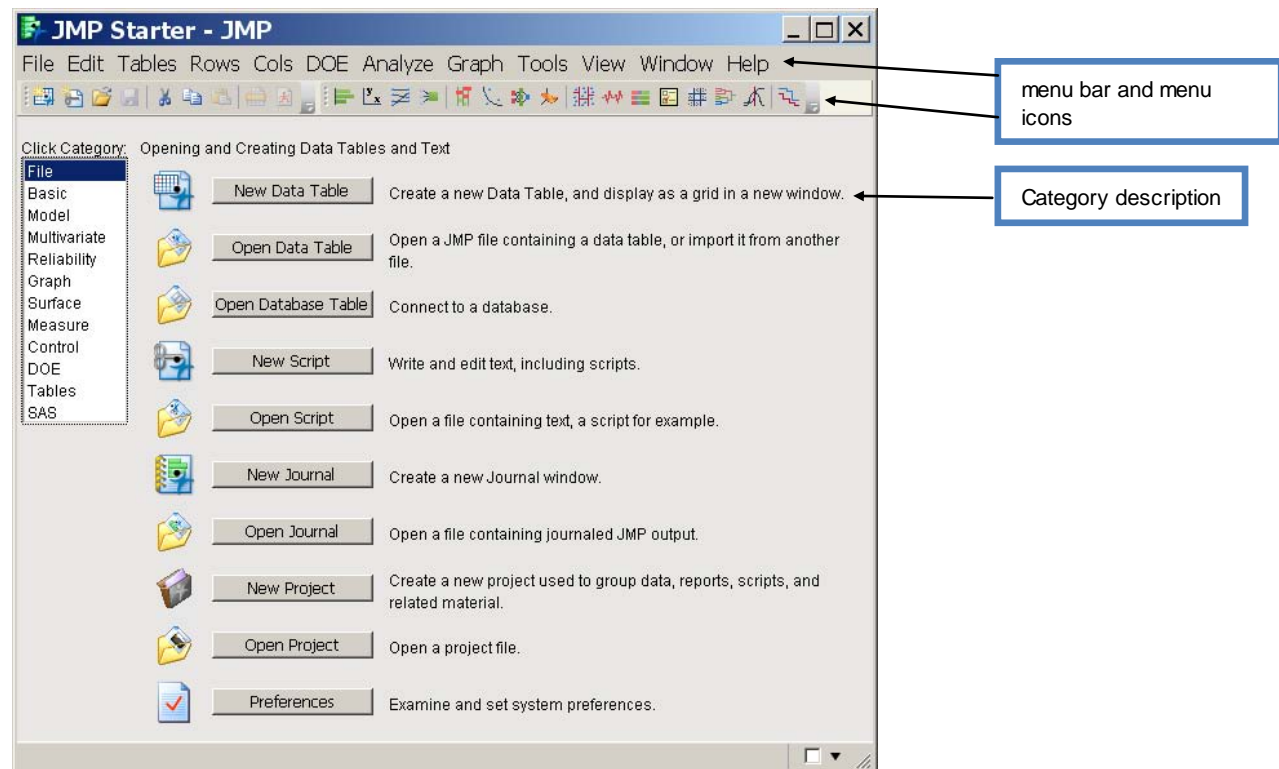
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### Finding Your Way Around: JMP Starter and JMP Home Window

There are multiple ways to use JMP menus to access and explore JMP's functionality. Those users who have a general idea of what operations they would like to perform might choose the *JMP Home Window.* With a Menu Bar with all of the JMP functionality organized behind eight tabs, the JMP user can quickly navigate to their desired operation under each of the categories. In addition, icons below the standard categories will take the user directly to their desired operation. Placing the cursor over the icon will reveal the icon's meaning and use.
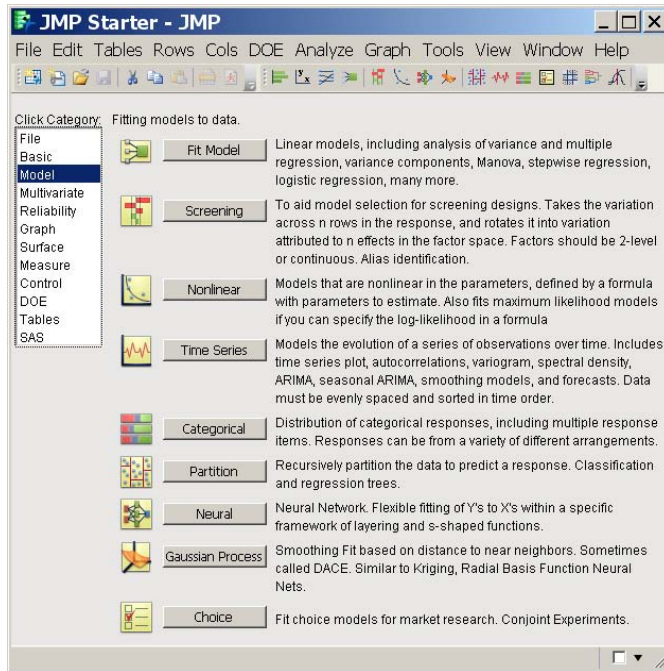


For those users who prefer a description of the operations available within JMP, the *JMP Starter* is recommended. Shown below are the File and Model categories. The Category description at the top and the description of each of the operations provide a great deal of information to assist the user in selecting the appropriate operation. The menu bar and menu icons are still visible when using the *JMP Starter.*

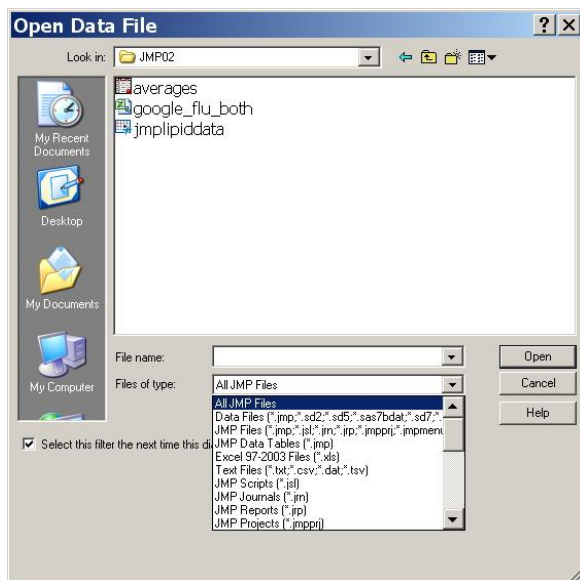Making Your SAS® Data JMP® Through Hoops, continued

The *JMP Starter, Model* category gives clear descriptions of each of the operations. The *Basic*, *Multivariate* and several of the other categories include a variety of modeling options.



For the examples in this paper we will be navigating to the operations through use of the *JMP Home Window* and Menu Bar. All of the operations can also be accessed through the *JMP Starter.*
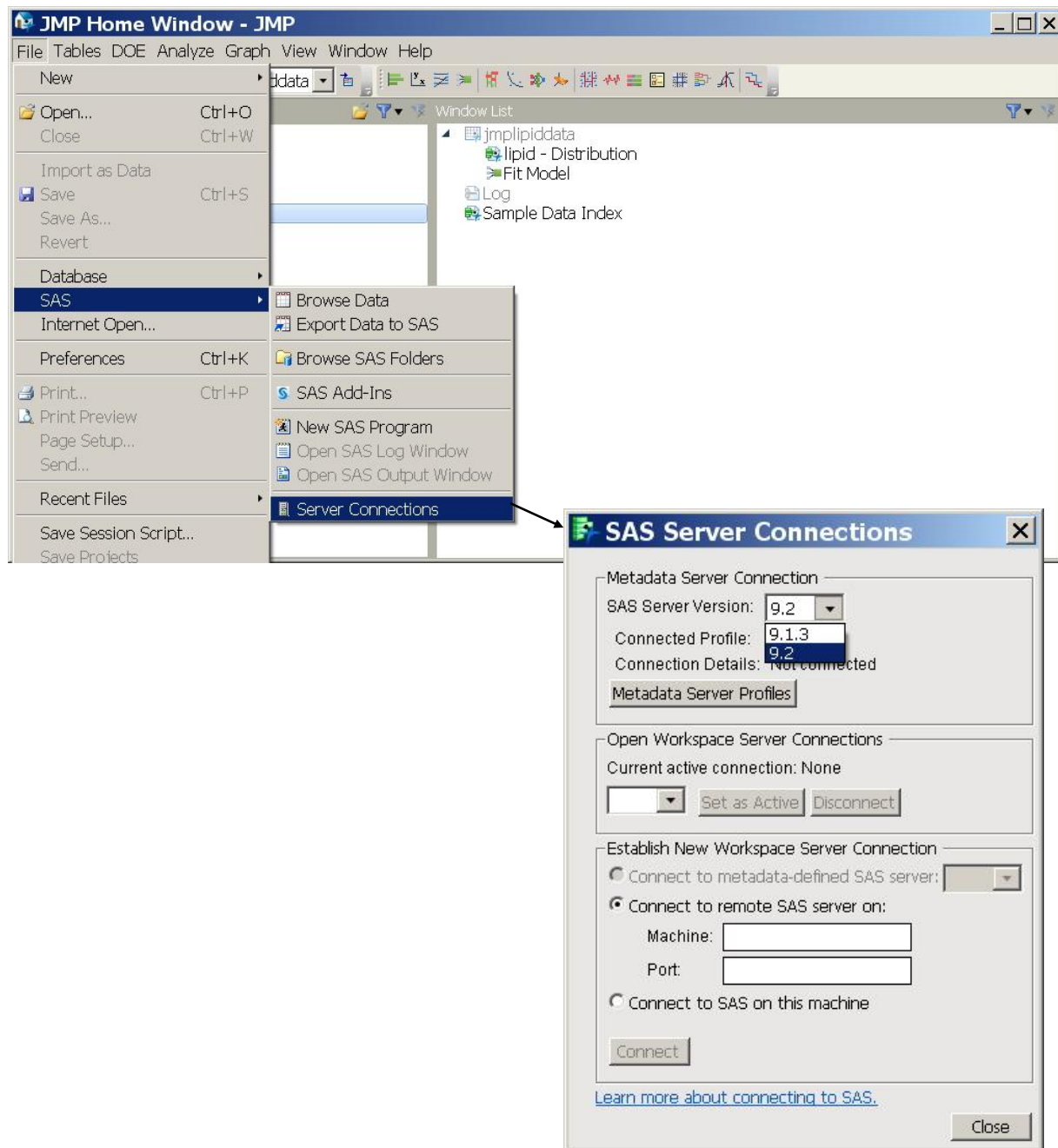
## POPULATING YOUR JMP DATA TABLE

JMP provides the capability to open many types of data through the *JMP Home Window→File→Open*. The file types include JMP, Excel, SAS, CSV, text and many others.
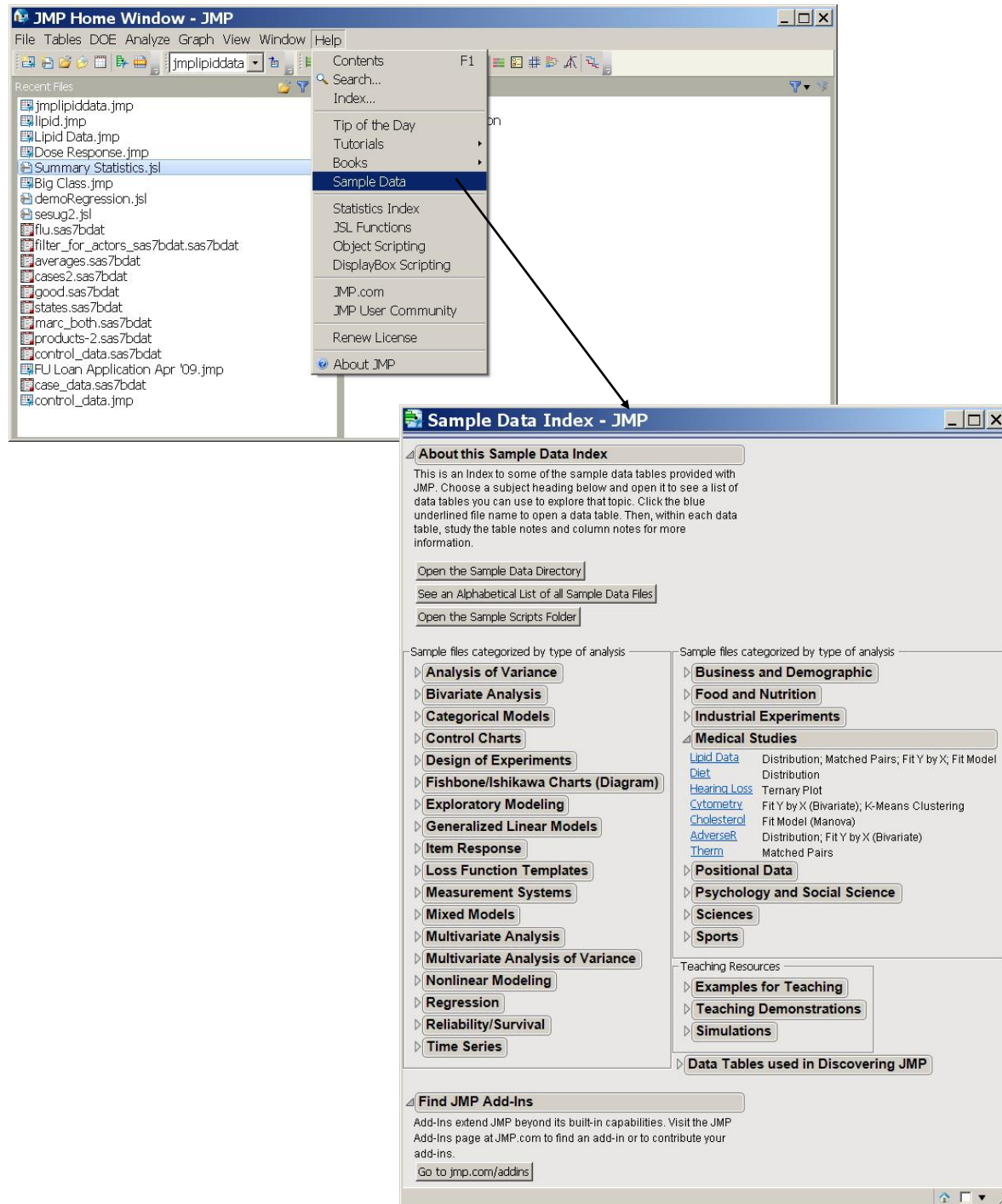
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You can connect your local or remote SAS Metadata Server through the *JMP Home Window→SAS→Server Connections*.  This functionality is also included in the Mac version of JMP and, with a properly configured network, will allow Mac users to access the organization's SAS Metadata Servers.

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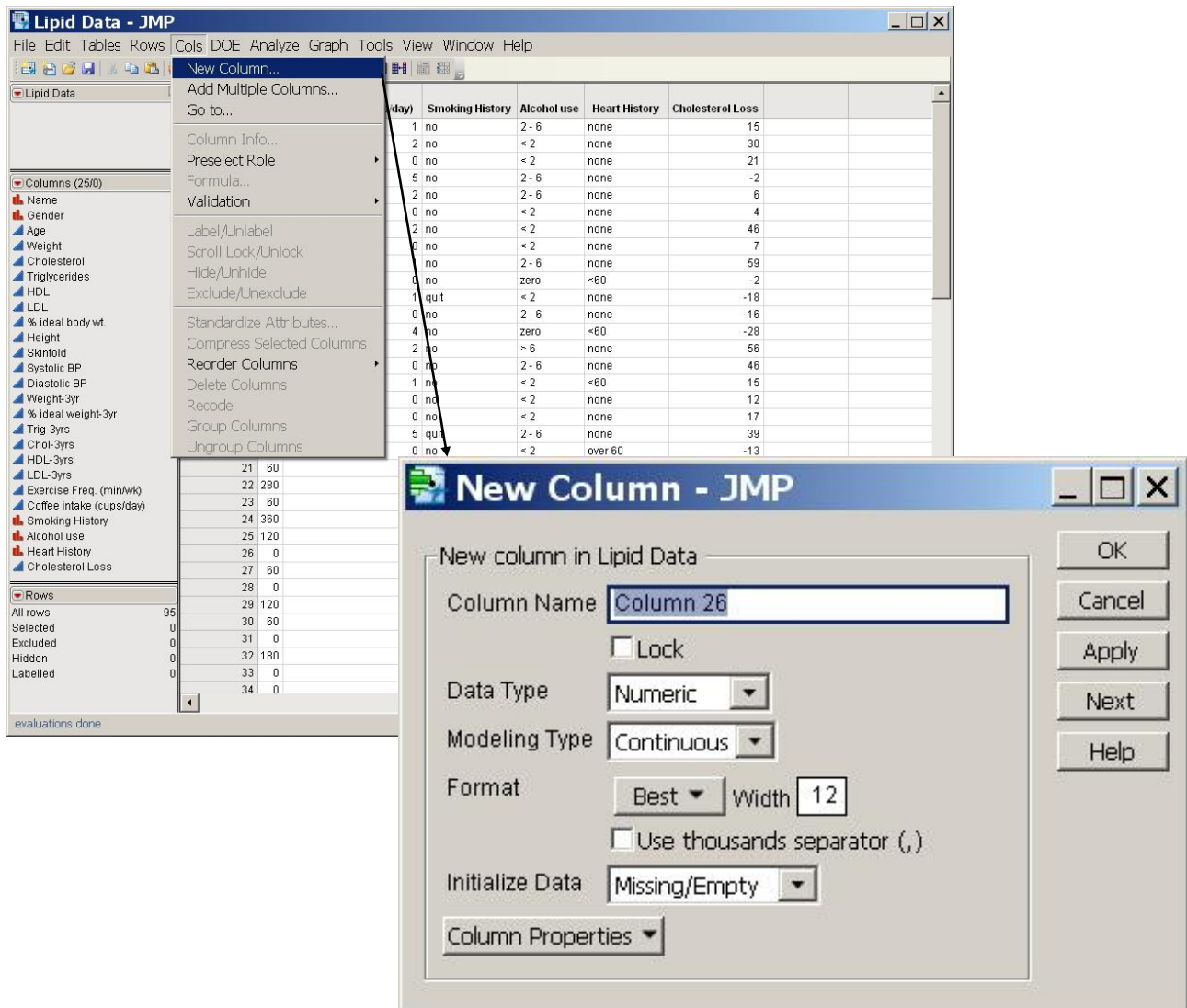
## JMP SAMPLE DATA SETS

A variety of sample data sets are included with JMP.  The index of data sets is helpful to find a sample data set by subject area or analysis type and provides opportunities for new users to explore JMP's capabilities.  The examples in this paper use the sample data set "Lipid Data".  The sample JMP data sets are found under the *JMP Home Window→ Help→Sample Data*.
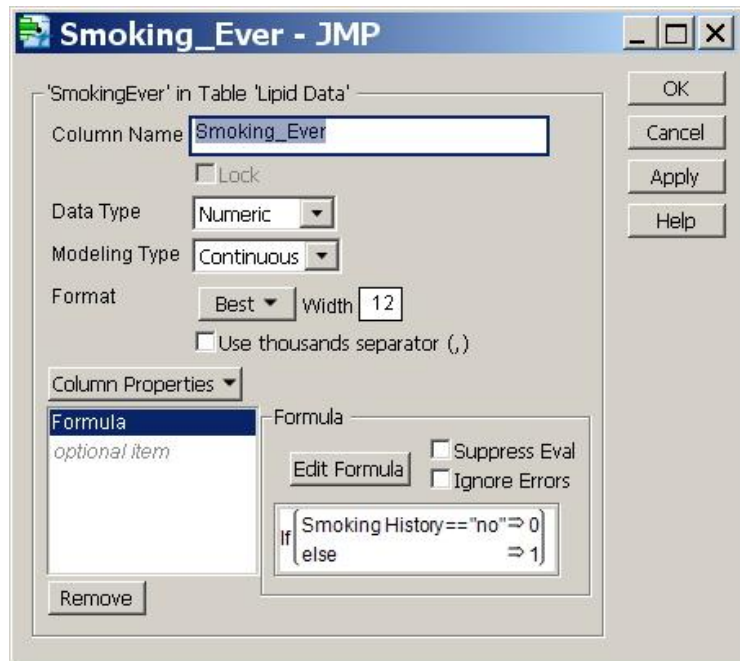
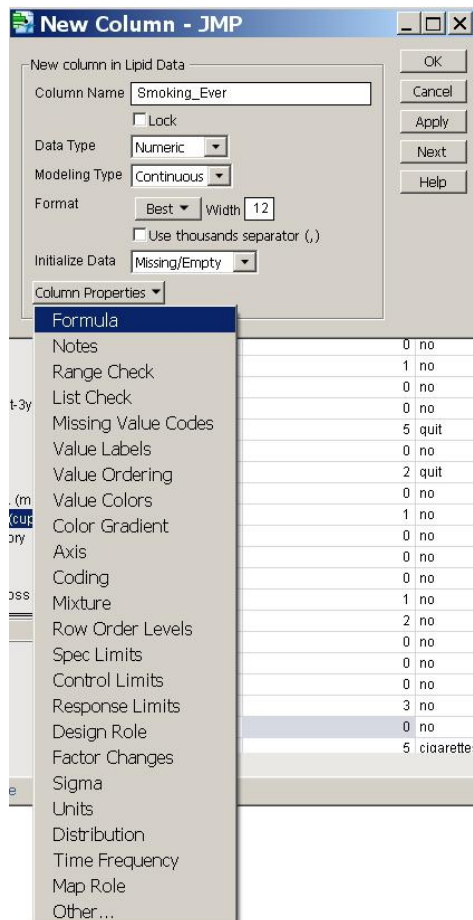Making Your SAS® Data JMP® Through Hoops, continued

## MANIPULATING YOUR DATA: ADDING A NEW COLUMN

Inserting a new column or multiple columns to the data table can be accomplished through *Cols→New Column...* or, in the case of multiple columns, *Cols→Add Multiple Columns...*

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Clicking on *Column Properties* allows for selection of a formula, naming the column, and associating range checks, labels and performing other operations and associating them with the newly created column.  In this example a new column called *Smoking_Ever* is created by applying a formula to the *Smoking History* column. *Smoking_Ever* is coded as 0 if the value of *Smoking History* is no, and as 1 if *Smoking History* is either quit, cigarettes or pipes.
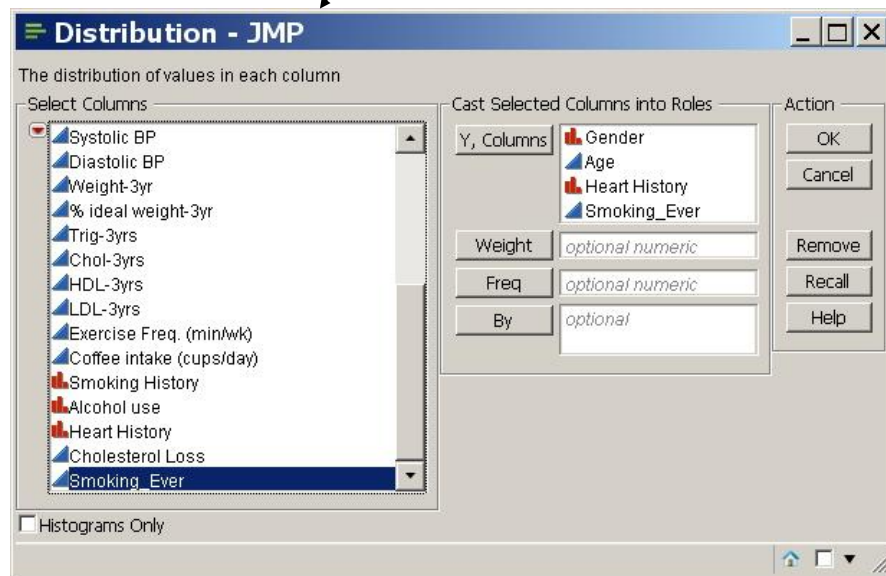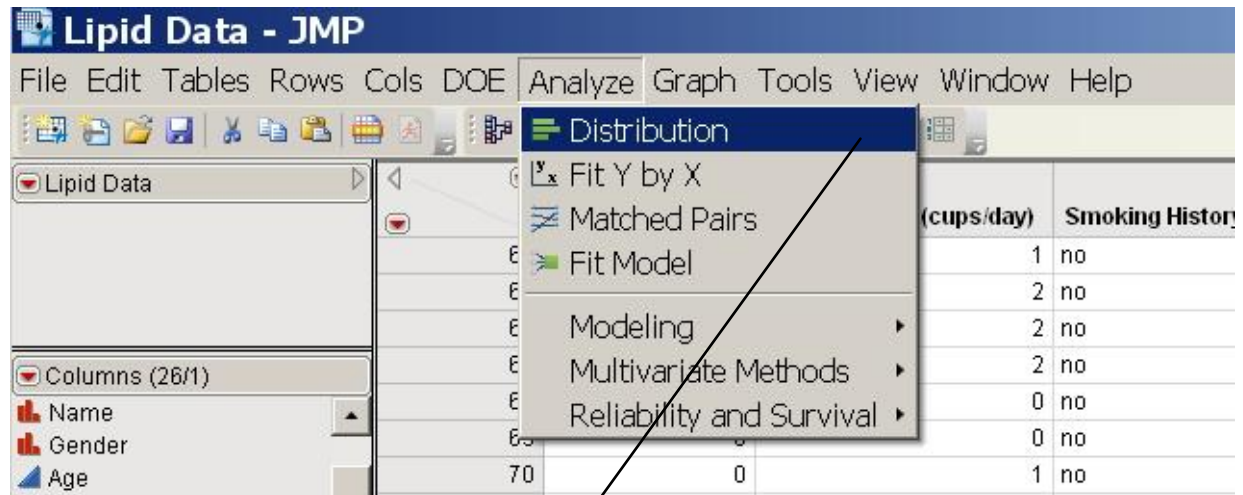


Added Column *Smoking_Ever*



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## EXPLORING YOUR DATA: ANALYZE-->DISTRIBUTION

One of the first steps in any analysis is to explore the distributions for each variable. Once your JMP Data Table is open, the menu bar provides multiple ways to explore your data. One way to quickly evaluate any of the variables in the data table is to use the Analyze→Distribution approach. In this example the variables *Gender*, *Age*, *Heart History* and *Smoking_Ever* are dragged and dropped into the Y, Columns role. Note the icon in front of each variable indicating the variable type. The variable type dictates which types of statistics are calculated for a particular variable.
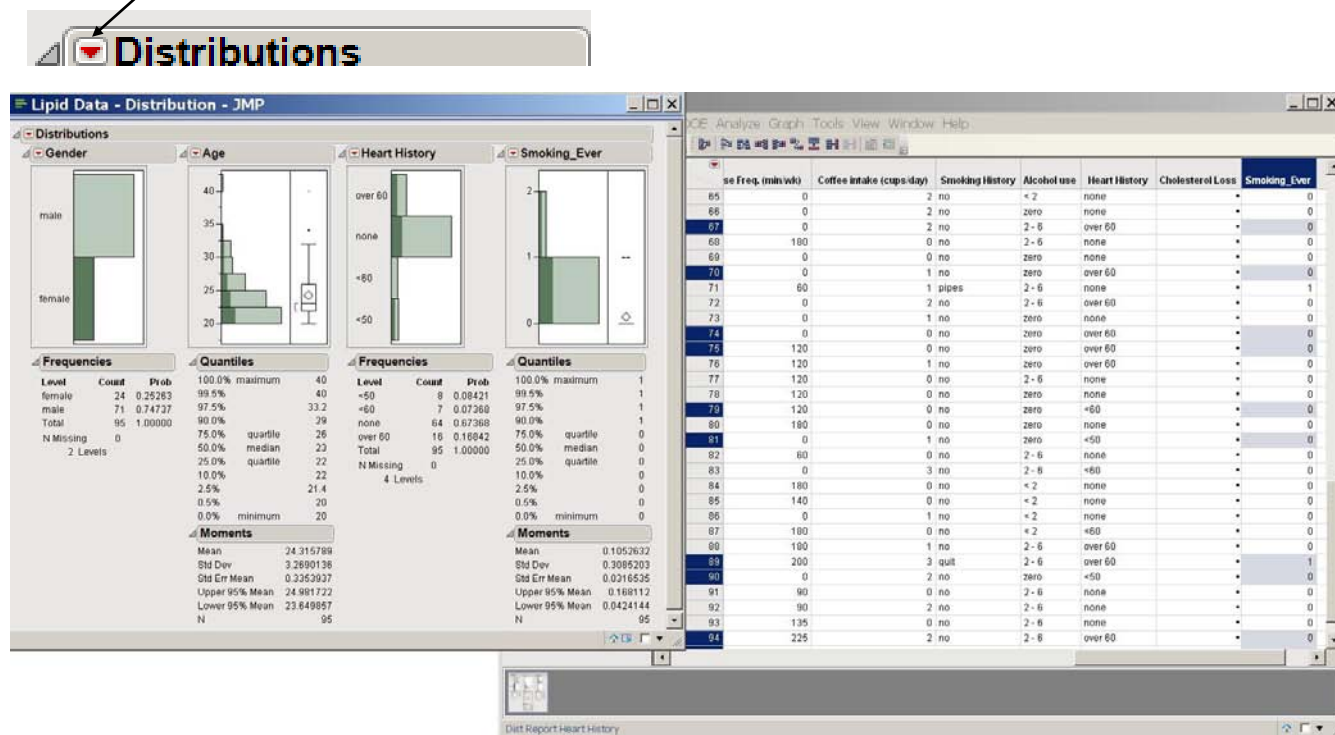
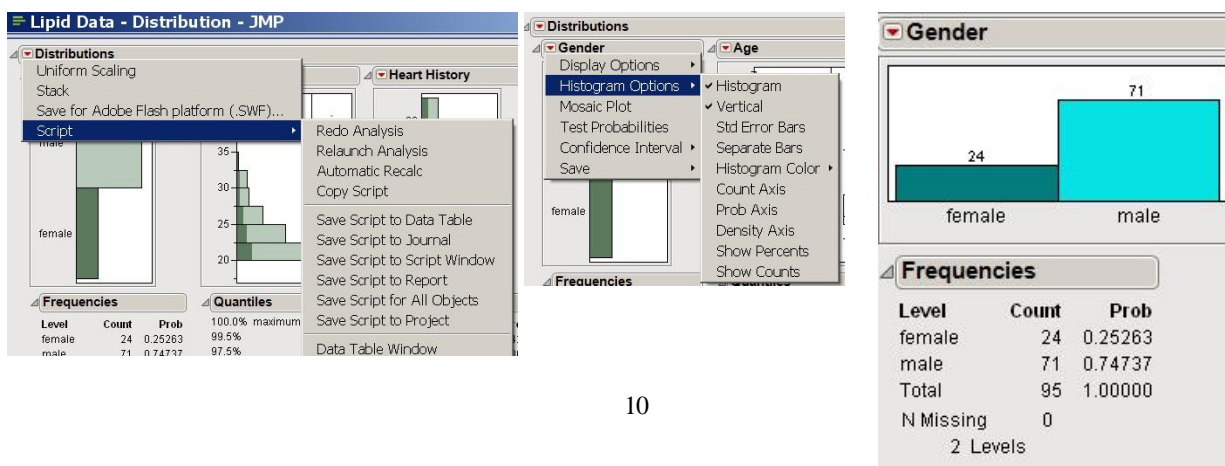Making Your SAS® Data JMP® Through Hoops, continued

Clicking the OK button displays the results in a new window. There are several important features of the results window to notice:

**Dynamic Linking**:  In this example, the female section of the gender graph was selected and became shaded a darker green.  JMP then shaded the portions of the other graphs associated with females and highlighted the roles for female participants as well. As other graphs and results are produced and displayed, specific areas will also be highlighted in the same way.

**Hot Spot**:  At the upper-left corner of many of the JMP frames, there is a red triangle called a hot spot.  This indicates that there are more options, operations or information associated with this area.
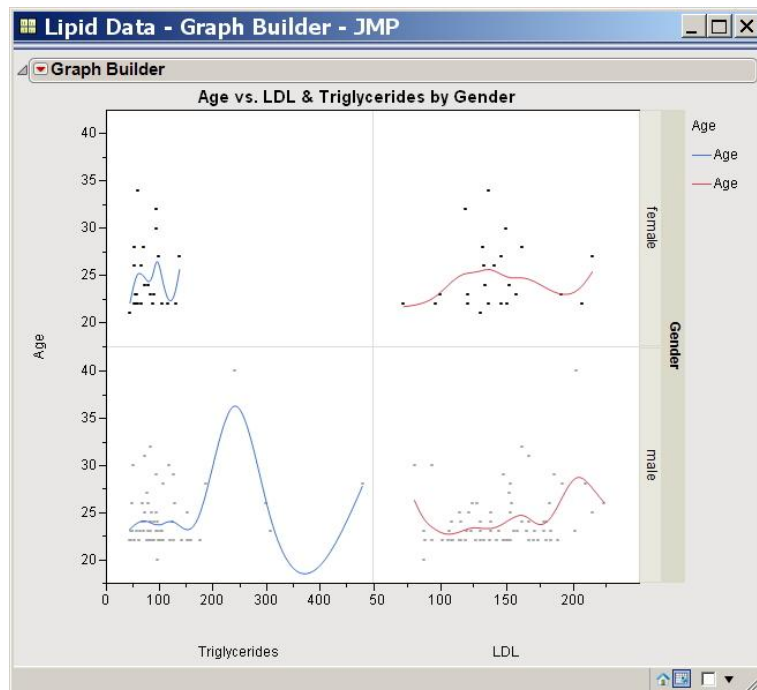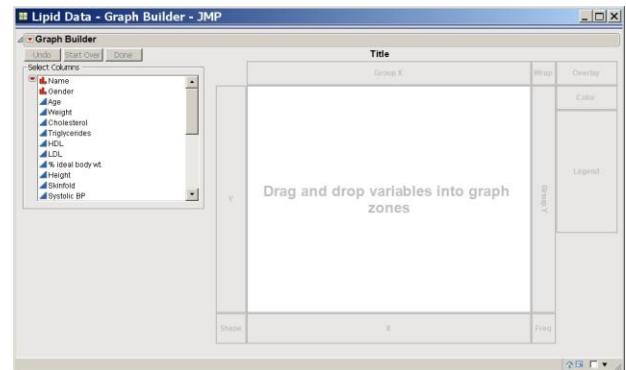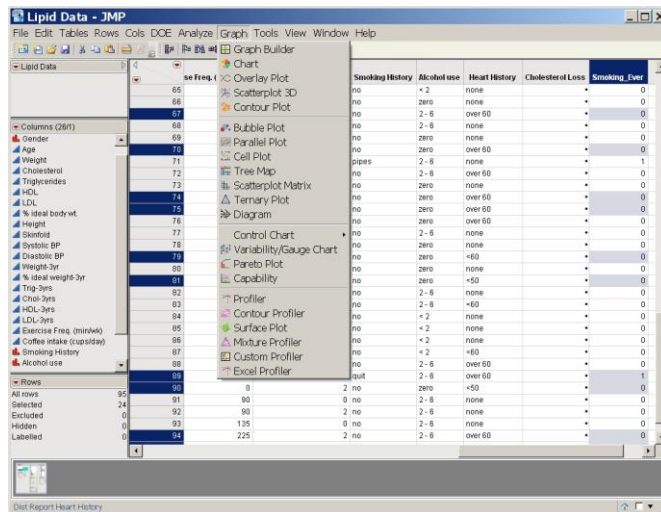




If the hot spot next to **Distribution** is clicked, options are presented to change the way in which the graphs are scaled, to save an Adobe SWF file, and to select multiple options for saving and re-running the analysis. If the hot spot is clicked for a particular variable's results, options are displayed for adding additional statistics for the variable, for adding details and for changing the associated histogram. In this example for Gender, the **Vertical** option was unchecked, resulting in a horizontal histogram display; the color was changed from green to blue; and **Show Counts** was checked to add counts to the histogram bars.



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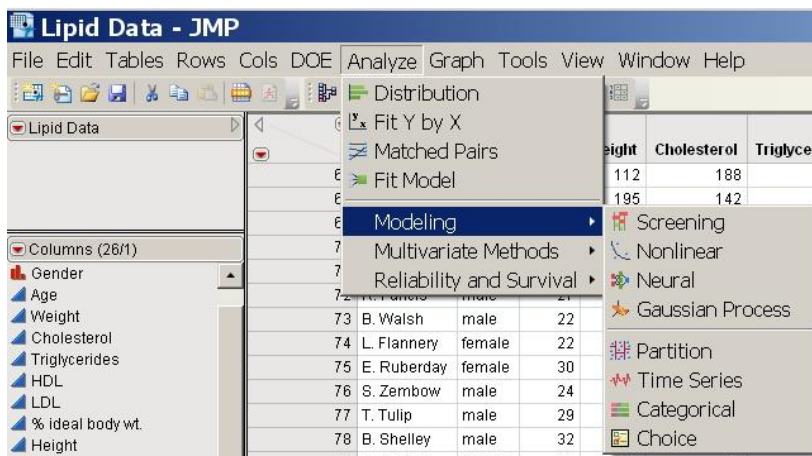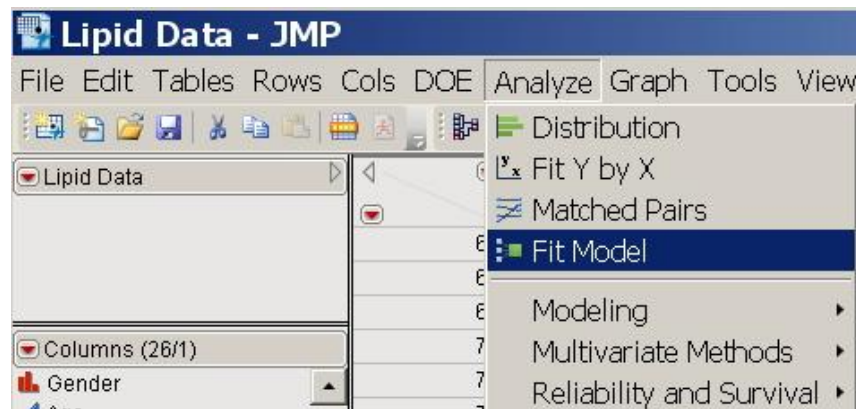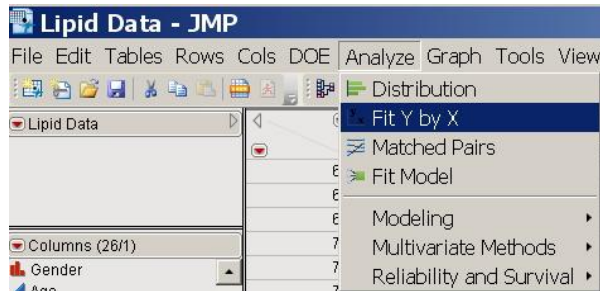
## GRAPHING: GRAPH-->GRAPH BUILDER

JMP is designed around the concept of the visual display of information, so it is not surprising that there are numerous ways to produce graphs and a multitude of options. Selecting **Graph** on the menu bar in the data table window displays the list of possible graph types available. One way to quickly create a graph is through the Graph Builder tool. When you select **Graph Builder**, a drag-and-drop window is displayed.  Notice the Hot Spot next to **Graph Builder**, indicating that there are additional options to explore for Graph Builder.  In this example, in order to build a graph, *Age* was dragged to the Y axis, *Triglycerides* and *LDL* were dragged to the X axis, and *Gender* was dragged to the Group Y area; and then the *Done* button was clicked. There are many ways that graphs created by Graph Builder can be changed and embellished, including changing the title created by JMP.





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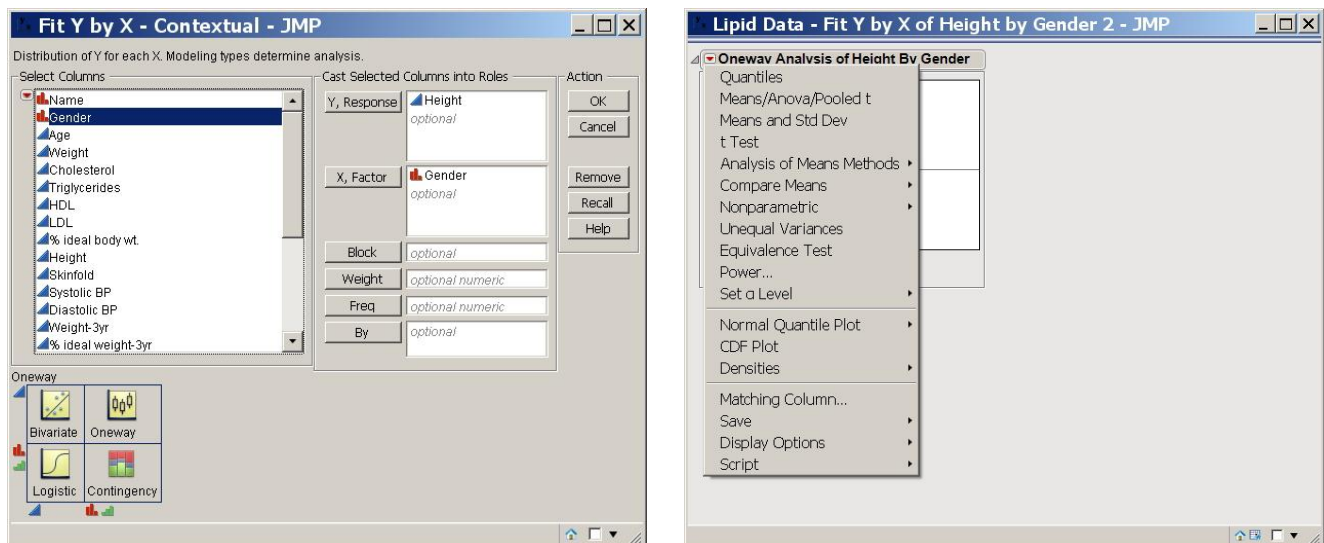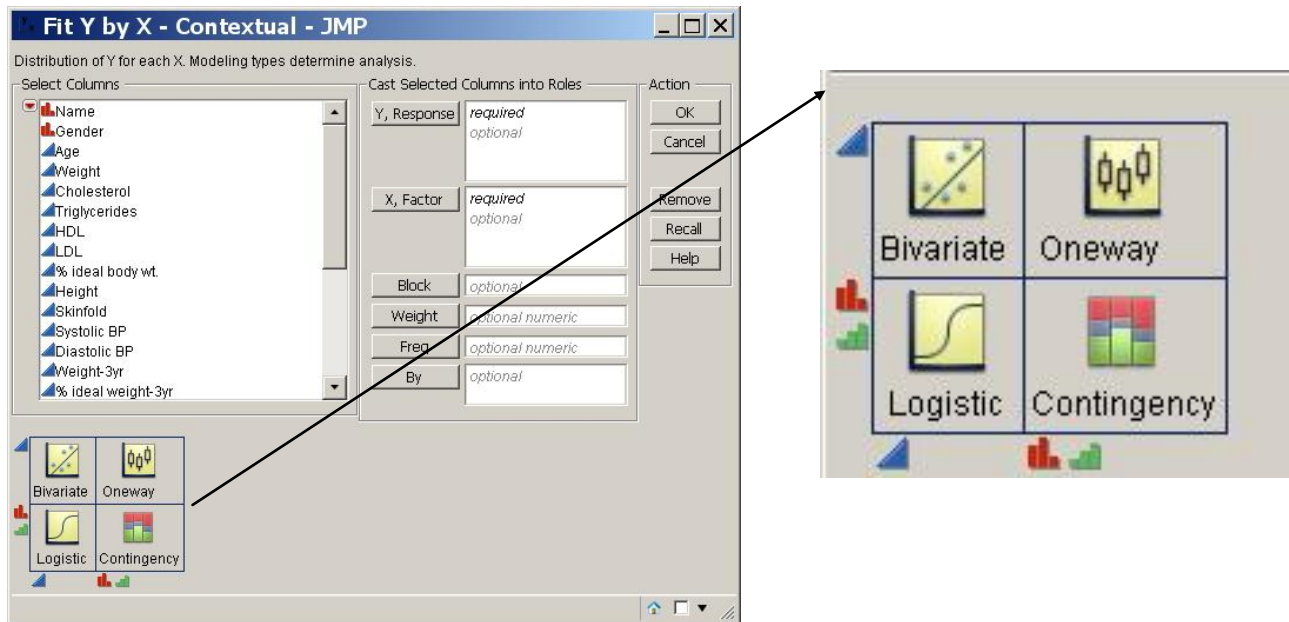
## MODELING: A MULTITUDE OF CHOICES

Now that we have opened a JMP Data Table, created a new variable, explored variable distributions, and created a graph, we are ready to explore creating models.  In JMP there are multiple ways to create models, from the simple to extremely complex.  The goal in this section of the paper is not to evaluate the statistics or results created by the modeling process, but to point out some of the JMP model building tools.  Here we will take a closer look at *Analyze→Fit Y by X, Analyze→Fit Model*, and *Analyze→Modeling*.

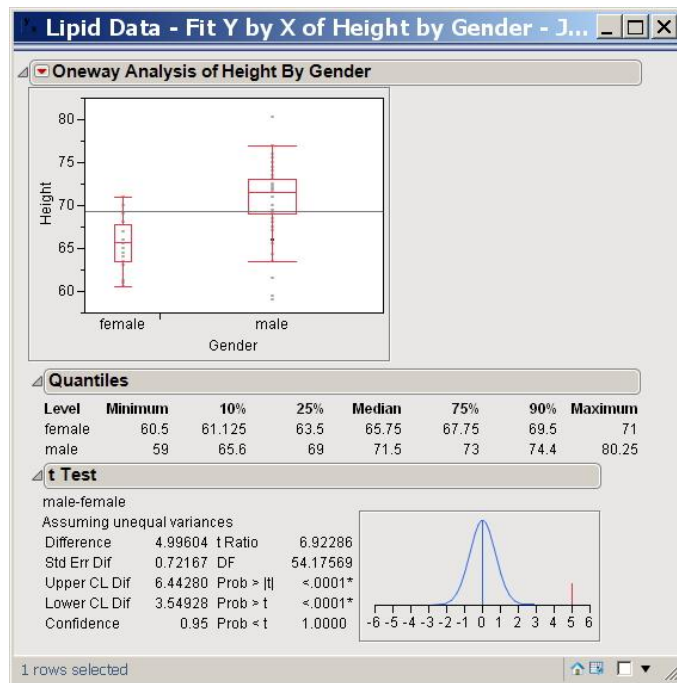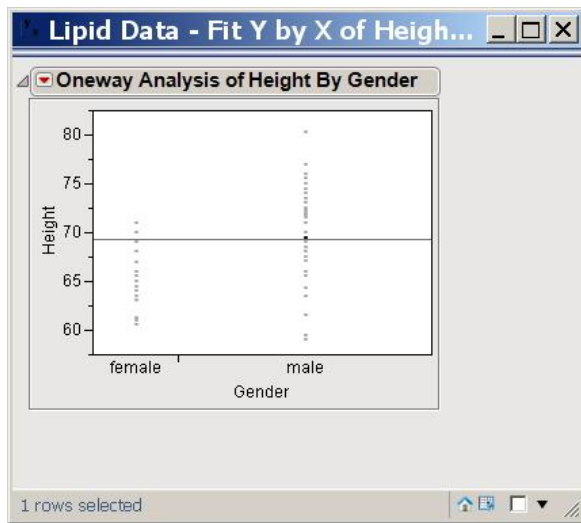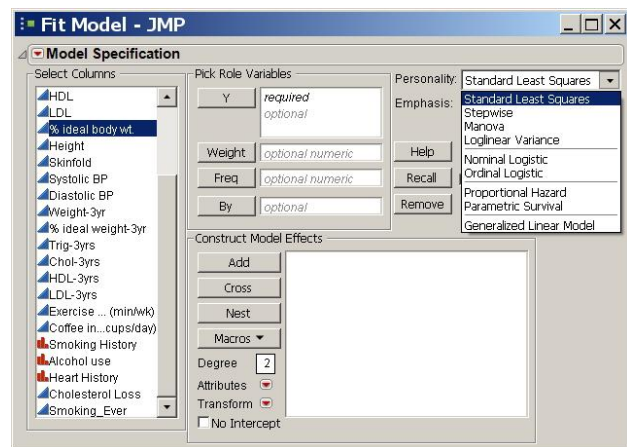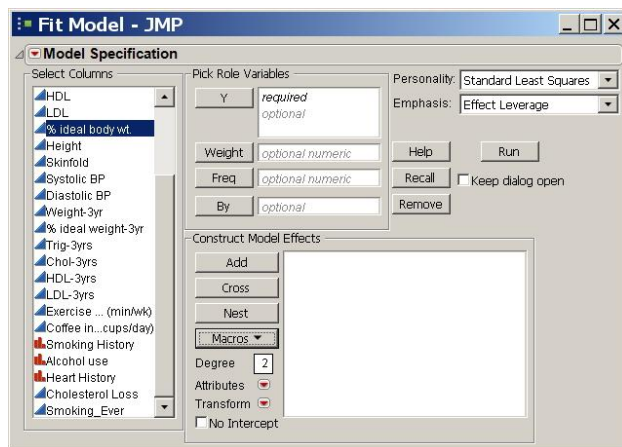Making Your SAS® Data JMP® Through Hoops, continued

### ANALYZE→ FIT Y BY X

The JMP application *Fit Y by X* produces a model relating a single response and a single factor.  The type of model is dictated by the type of variables chosen for each role.  The table at the bottom of the *Fit Y by X* window indicates which data type combinations yield a Bivariate, Oneway, Logistic, and Contingency analysis.  In this example we have chosen *Height* as the Y Response and *Gender* as the X Factor. As expected from looking at the table, a continuous Y variable by a categorical X variable yields an Oneway analysis. Clicking on the red triangular hot spot reveals the options available for this Oneway analysis. We have chosen to display the quantile plot and T-test results, providing more information to access the relationship between *Gender* and *Height.*
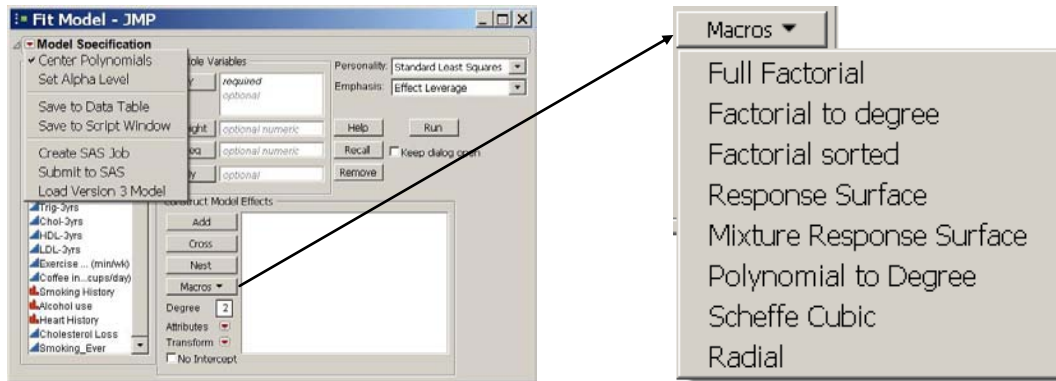
**ANALYZE→FIT MODEL**

The Fit Model portion of JMP allows for complex model building. Though exploring all of the options available in the **Fit Model** portion of JMP is beyond the scope of this introductory paper, here are displays of some of the menus and options available for creating models via this path. The **Personality** (model type) pull-down menu gives a variety of model choices. When the variables are chosen and moved into the role panel, JMP selects the **Personality**. Depending on the types of variables that are chosen, options to change this specification are available. The **Macros** button provides the user with the ability to select a design for their model. By selecting the red triangular hot spot, the user is provided with additional options, including creating a SAS job from the model specifications.
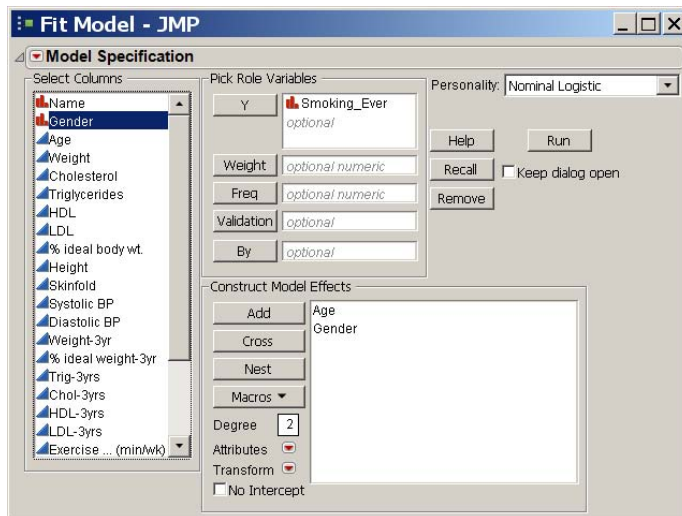
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Example: Nominal Logistic Regression

In order to use our new ly created variable *Smoking_Ever* as the Y-variable role in a *Nominal Logistic Regression* w e changed the variable type to character. We chose for the *Age* and *Gender* as the *Model Effects* and then clicked the *Run* button.



The results of the Nominal Logistic Regression are then displayed:

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Analyze→Modeling

The **Analyze→Modeling** path in JMP provides for the creation of Nonlinear, Time Series, Partition and a variety of other model types. The Partition model tool is particularly valuable in that it provides the capability to create decision trees. Once the model is created, the model can be exported and used in Base SAS.



**Example: Partition (Decision Tree)**

We cast *HeartDisease* as the Y-Response variable and *Coffee*, *Age* and, *Gender* as X –Factors in our model and click *OK*.



The first split is on *Gender*. Since *Partition* (Decision Tree Models) is a recursive process, you may split the tree again or perform other functions such as "prune" to perfect your model, and the diagram and results will be updated in JMP.

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Once you have perfected your model, you may export the model to SAS to use with your SAS Datasets. In order to export the model, click on the red *Hot Spot* next to Partition for Heart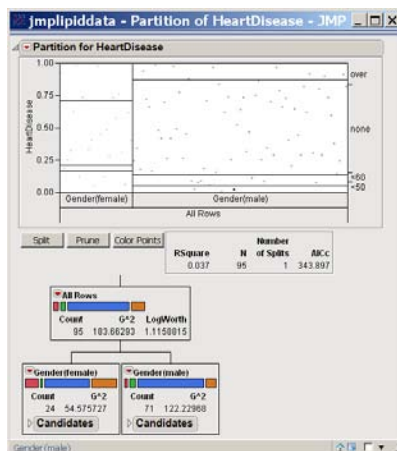Disease and move your cursor down to *Save Columns.* JMP will then create the Data Step code that can then be implemented in SAS.



## REPORTING IS EASY: USING YOUR OUTPUT IN REPORTS

Most often the results of an analysis need to be included in a document, on a server, or on the web.  There are two simple ways that JMP results and graphics can be inserted into documents.

Go to the output window of interest, and mouse over the blue line underneath the title to reveal the tool bar.



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One available option is to go to *File→Save As..,* save the file in the format that is best for your target location, and then insert the file into your final document.



Another approach is to copy the output and *Paste Special* into your target document.  The easiest way to accomplish this is to go to *Edit→Copy*, and the contents of the output window will be saved to the clipboard.  Open the document where you would like to place the output.  In this example, we are inserting the output into this Microsoft Word document.  *Select File→Paste→ Paste Special…* and select the *Picture (Enhanced Metafile)*.  The image will be placed in your document ready for resizing and placement.

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The results from the Oneway analysis were added to this document using the Copy/Past Special approach.  A border was added to the results using the *Picture→Format→Picture Border* option.

**Oneway Analysis of Height By Gender**



**Quantiles**

| Level | Minimum | 10% | 25% | Median | 75% | 90% | Maximum |
|-------|---------|-----|-----|--------|-----|-----|---------|
| female | 60.5 | 61.125 | 63.5 | 65.75 | 67.75 | 69.5 | 71 |
| male | 59 | 65.6 | 69 | 71.5 | 73 | 74.4 | 80.25 |

**t Test**

male-female

Assuming unequal

| Difference | 4.99604 | t Ratio | 6.92286 |
|------------|---------|---------|---------|
| Std Err Dif | 0.72167 | DF | 54.17569 |
| Upper CL Dif | 6.44280 | Prob > |t| | <.0001 * |
| Lower CL Dif | 3.54928 | Prob > t | <.0001 * |
| Confidence | 0.95 | Prob < t | 1.0000 |

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6

## CONCLUSION

This paper provides a brief introduction and overview of JMP and its capabilities.  The reader is provided with a roadmap through some of the many JMP menu options, with the goal of shortening the learning curve. All of the examples in the paper use the "Lipid Data" included as a sample data set with JMP 9, so that the reader can recreate the examples and use the screenshots to navigate through the JMP menu structure.

JMP is a tool that will enhance any analytics professional's ability to quickly explore, analyze and report on their data with a point-and-click graphical approach requiring no programming effort.  JMP's scripting language (JSL) and the ability to connect to SAS provide programming options for experienced users.

## REFERENCES

Saving Graphs, Tables and Reports in JMP, JMP® Blog, Monday, February 22. 2010

http://blogs.sas.com/jmp/index.php?/archives/286-Saving-Graphs,-Tables-and-Reports-in-JMP.html

http://jmp.com/support/  and the JMP 9.02 Help Facility

Mastering JMP®:  An Overview  of Data Exploration and the JMP®  Scripting Language,  Course Notes, SAS Institute Inc.

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