

Chapter 165

Scatter Plots with Error Bars

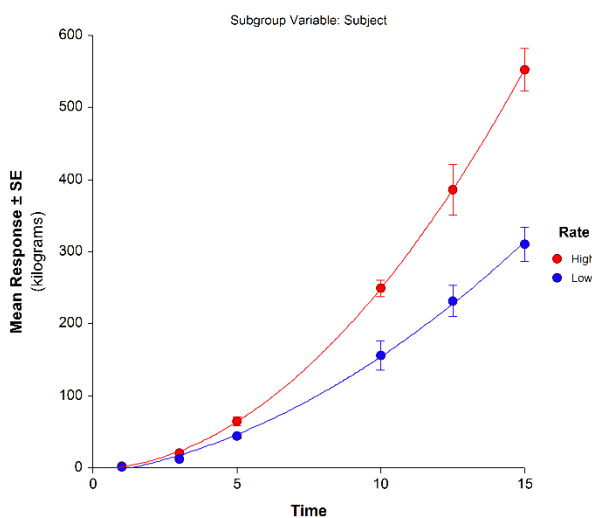
Introduction

The Scatter Plots with Error Bars procedure extends the capability of the basic scatter plot by allowing you to plot the variability in Y and X corresponding to each point. Each point on the plot represents the mean or median of one or more values for Y and X within a subgroup. Error bars can be drawn in the Y or X direction, representing the variability associated with each Y and X center point value. The error bars may represent the standard deviation (SD) of the data, the standard error of the mean (SE), a confidence interval, the data range, or percentiles. This plot also gives you the capability of graphing the raw data along with the center and error-bar lines.

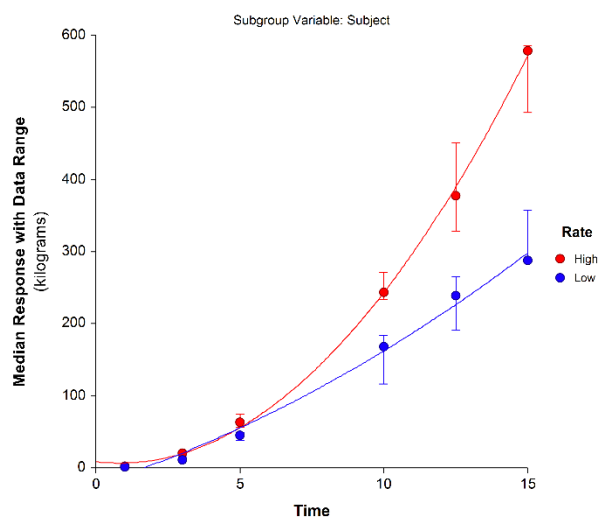
This procedure makes use of all of the additional enhancement features available in the basic scatter plot, including trend lines (least squares), confidence limits, polynomials, splines, loess curves, and border plots.

The following graphs are examples of scatter plots with error bars that you can create with this procedure. This chapter contains information only about options that are specific to the Scatter Plots with Error Bars procedure. For information about the other graphical components and scatter-plot specific options available in this procedure (e.g. regression lines, border plots, etc.), see the chapter on Scatter Plots.

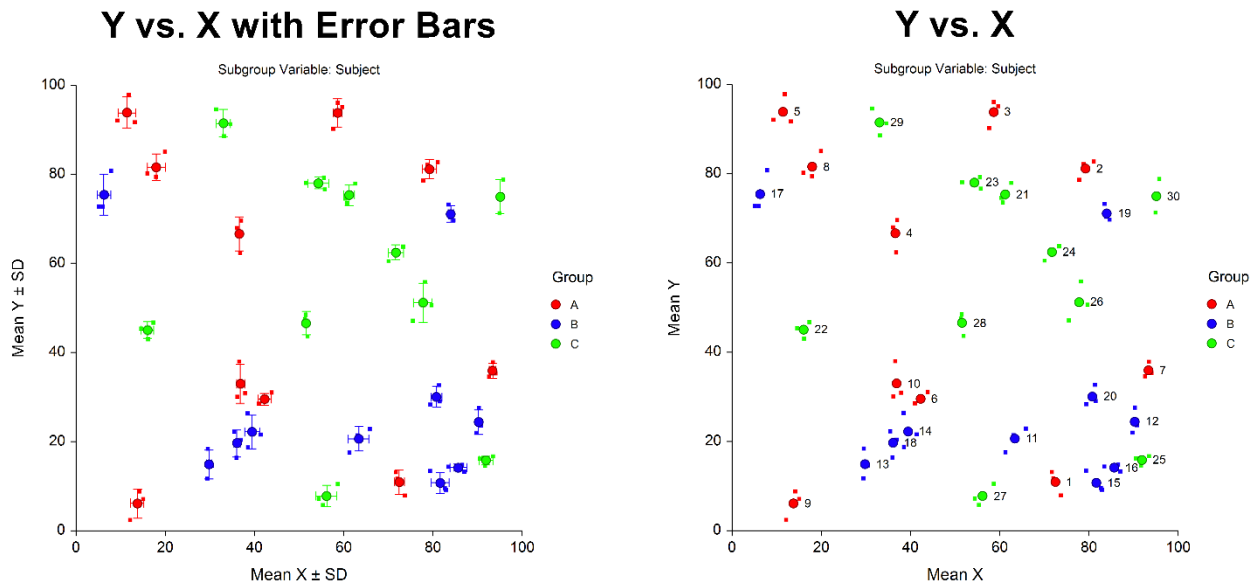
Response vs. Time with Error Bars



Response vs. Time with Error Bars



Scatter Plots with Error Bars



Data Structure

This procedure accepts data in four different input formats. The type of plot that can be created depends on the input format.

A grouping variable may be used to divide the points into groups (e.g., age group or gender). Missing values are handled according to the Missing Values input option.

Y and/or X Error Bars (One Y, One X, and a Subgroup (Subject) Variable)

In this type, Y and X values are contained in two separate columns. A required Subgroup (Subject) Variable is used to break the Y and X values into subgroups for mean and variance calculations. Each center point on the plot and the associated error bars correspond to the average (or median) Y and X values and associated variability computed for each unique subgroup variable value. A separate point is plotted for each subgroup.

One Y Variable, One X Variable, and a Subgroup (Subject) Variable

Subject	Y	X
1	13.15	71.65
1	7.89	73.73
1	11.73	72.02
2	78.6	77.8
2	82.14	78.78
2	82.73	81.05
3	90.25	57.62
3	96.07	58.67
3	95.14	59.67
4	69.6	36.98
4	62.37	36.77
4	67.99	36.05

Scatter Plots with Error Bars

Y and/or X Error Bars (Data for Both Y and X in Multiple Columns)

In this type, each subgroup (or “subject”) is represented by a single row, with multiple Y and X columns entered for each individual. Each point on the plot and the associated error bars correspond to the average (or median) Y and X values and the associated variability computed for each row. A separate point is plotted for each row.

Data for Y and X in Multiple Columns

Subject	Y_1	Y_2	Y_3	X_1	X_2	X_3
1	13.15	7.89	11.73	71.65	73.73	72.02
2	78.6	82.14	82.73	77.8	78.78	81.05
3	90.25	96.07	95.14	57.62	58.67	59.67
4	69.6	62.37	67.99	36.98	36.77	36.05

Y Error Bars (Data for Y in Multiple Columns with One X Variable)

In this type, each subgroup (or “subject”) is represented by a single row, with multiple Y columns and one X column entered for each individual. Each point on the plot and the associated error bars correspond to the average (or median) Y values and the Y variability computed for each row. A separate point is plotted for each row.

Data for Y in Multiple Columns with One X Variable

Subject	Y_1	Y_2	Y_3	X
1	13.15	7.89	11.73	71.65
2	78.6	82.14	82.73	77.8
3	90.25	96.07	95.14	57.62
4	69.6	62.37	67.99	36.98

X Error Bars (Data for X in Multiple Columns with One Y Variable)

In this type, each subgroup (or “subject”) is represented by a single row, with multiple X columns and one Y column entered for each individual. Each point on the plot and the associated error bars correspond to the average (or median) X values and the X variability computed for each row. A separate point is plotted for each row.

Data for X in Multiple Columns with One Y Variable

Subject	Y	X_1	X_2	X_3
1	13.15	71.65	73.73	72.02
2	78.6	77.8	78.78	81.05
3	90.25	57.62	58.67	59.67
4	69.6	36.98	36.77	36.05

Lines and Border Plots

All regression lines, border plots, and other calculations are made using the center points (means and/or medians), not the raw data. The raw data, however, can be included on the plot.

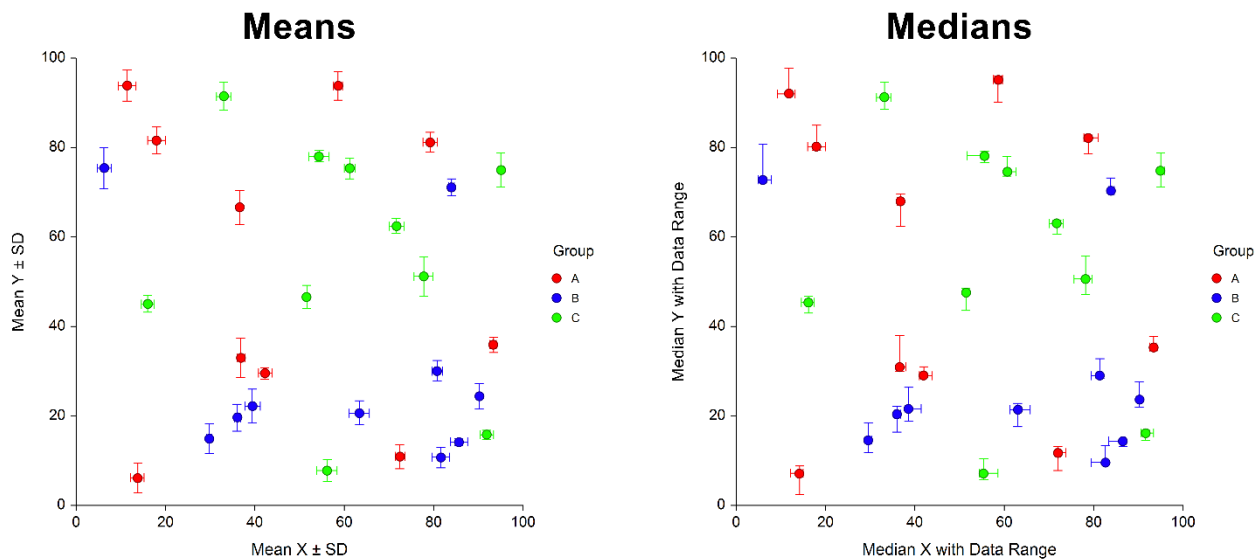
Scatter Plot with Error Bars Window Options

This section describes the specific options available on the Scatter Plot with Error Bars window, which is displayed when the Plot Format button is clicked. For information about the other graphical components and scatter-plot specific options available in this procedure (e.g. symbols, regression lines, data labels, etc.), see the chapter on Scatter Plots. Common plot options, such as axes, labels, legends, and titles are documented in the Graphics Components chapter.

Scatter Plot Tab

Estimation of Center

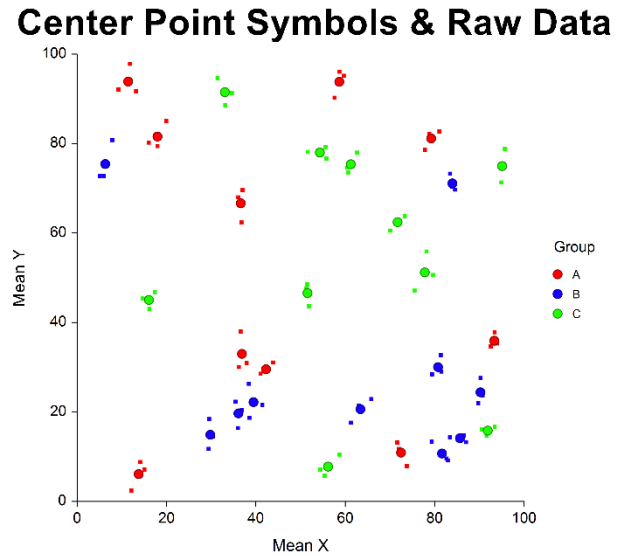
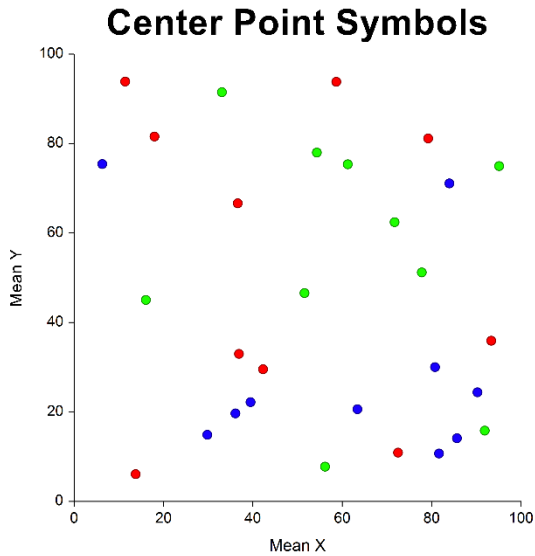
You can choose whether to plot means or medians for Y and X.



Scatter Plots with Error Bars

Symbols

You can choose whether to plot the center points, the raw data values, or both. You can also modify the appearance of all symbols on the plot.

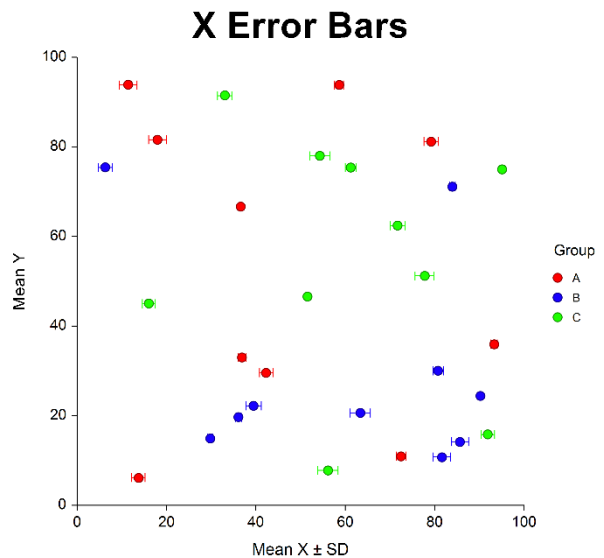
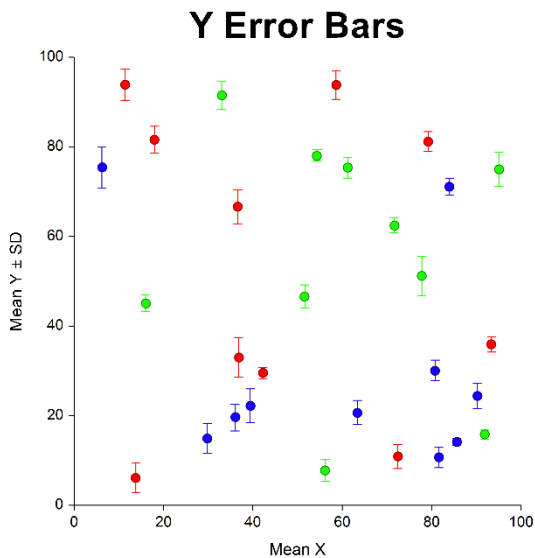


Variation (Error Bars)

You can modify the content and appearance of the vertical and horizontal error bars using these options. We will highlight the most commonly used options.

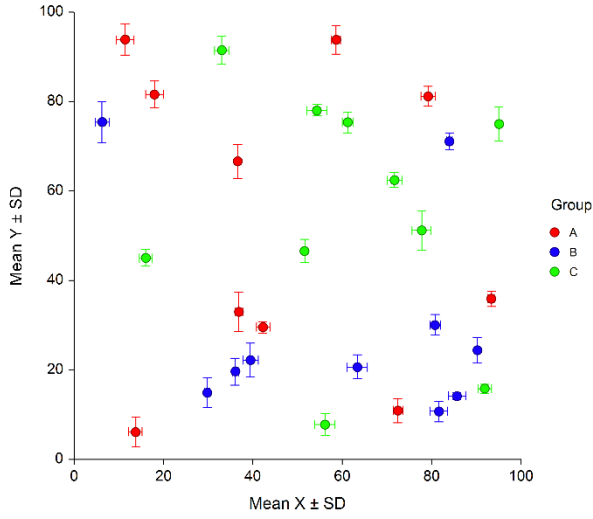
Y and X Error Bar Lines

Select the error bars to be displayed.



Scatter Plots with Error Bars

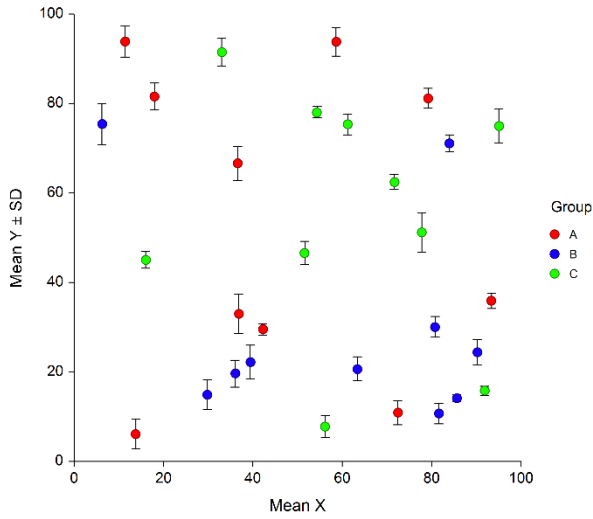
Y and X Error Bars



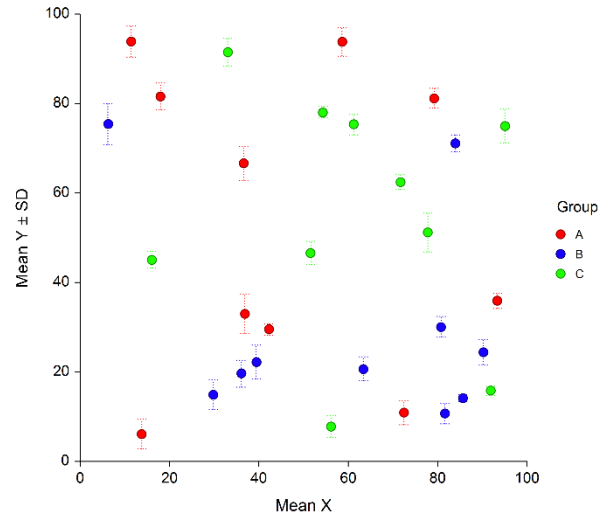
Line Color and Style

Specify the color and style of error bar lines. The lines and symbols are completely customizable.

Black Error Bars



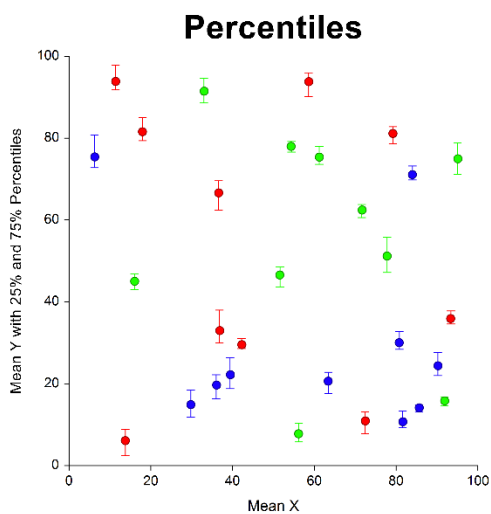
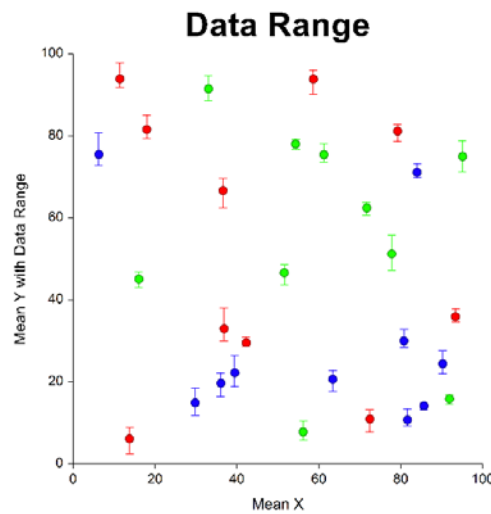
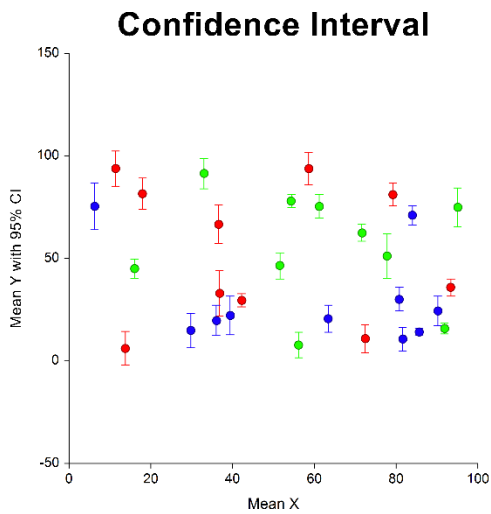
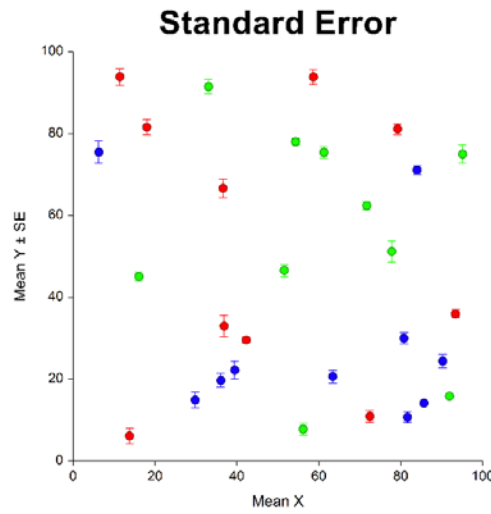
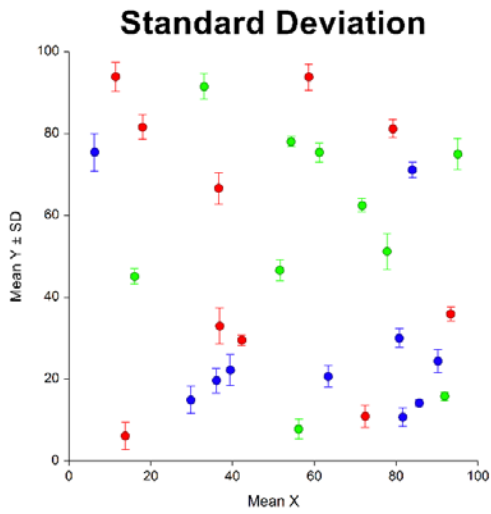
Dotted Error Bars



Scatter Plots with Error Bars

Type

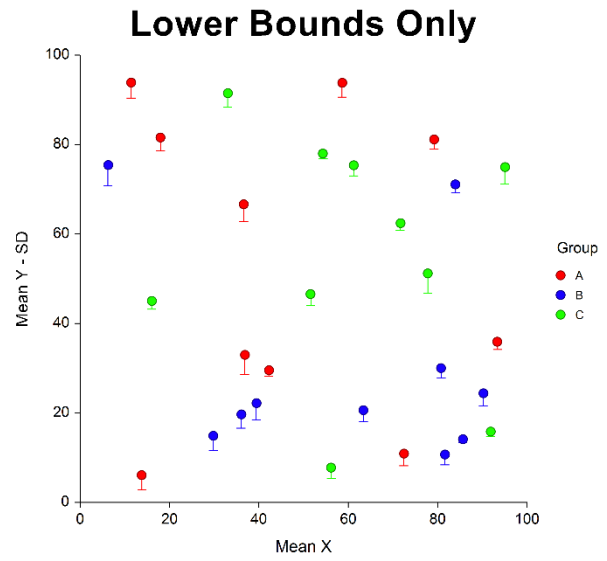
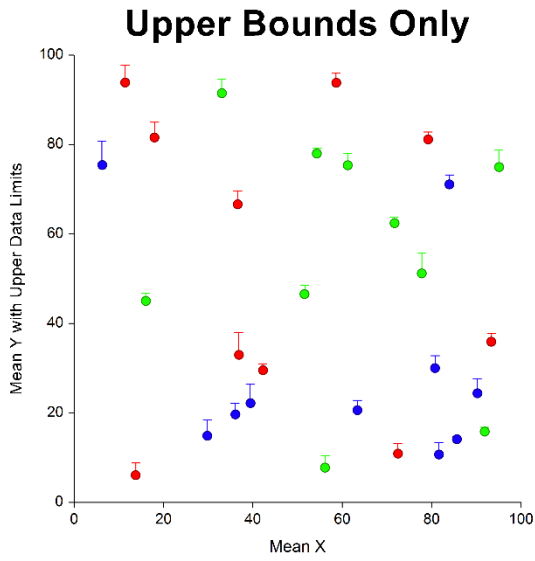
Specify whether to use the standard deviation (SD) of the data, the standard error of the mean (SE), a confidence interval, the data range, or percentiles in computing the length of the error bars and their bounds.



Scatter Plots with Error Bars

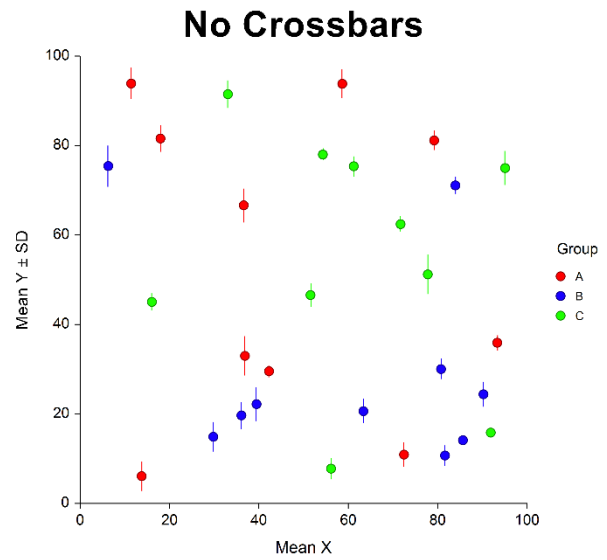
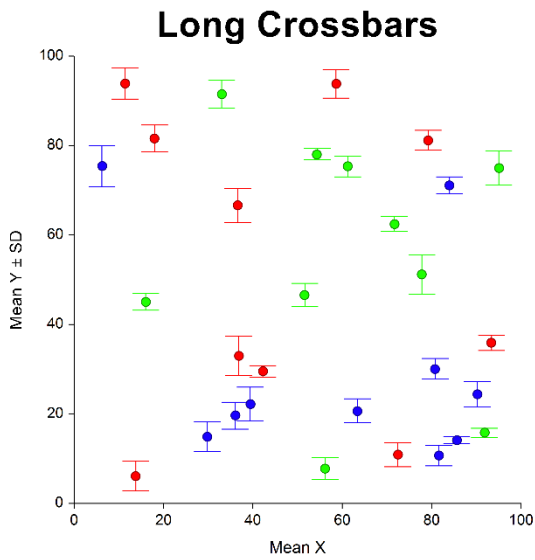
Direction

Specify whether error bars extend up or down (right or left) from the center point.



Crossbars

Specify whether or not to include crossbars and their size.



Example 1 – Creating a Scatter Plot with Error Bars using a Subgroup (Subject) Variable

This example demonstrates how to generate a simple scatter plot with error bars from data that includes a subgroup variable. The data used are contained in the ScatPlotError1 dataset. In this example, Response is the Y variable and Time is the X variable. Each response is repeated three times for each time value.

Setup

To run this example, complete the following steps:

1 Open the ScatPlotError1 example dataset

- From the File menu of the NCSS Data window, select **Open Example Data**.
- Select **ScatPlotError1** and click **OK**.

2 Specify the Scatter Plots with Error Bars procedure options

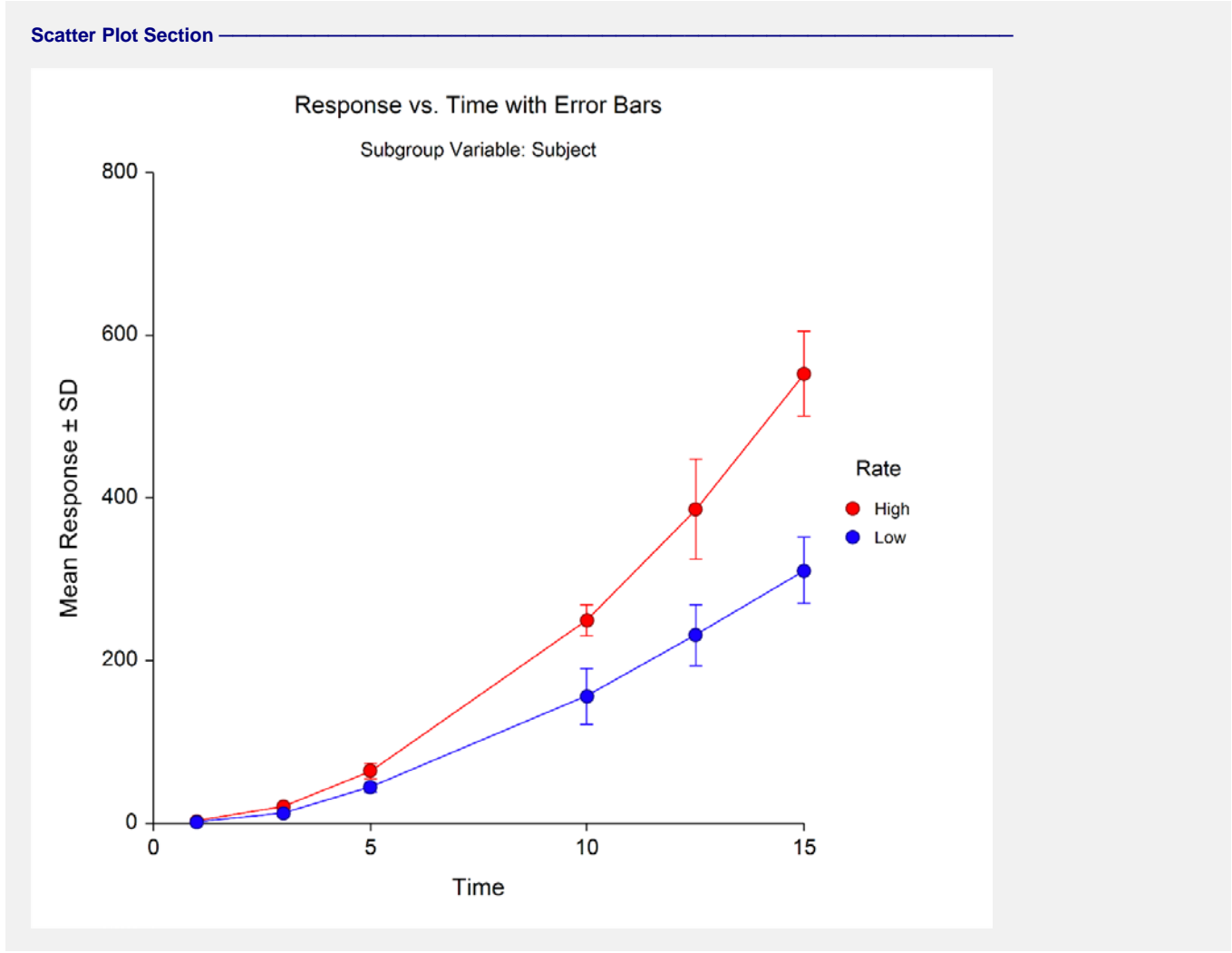
- Find and open the **Scatter Plots with Error Bars** procedure using the menus or the Procedure Navigator.
- The settings for this example are listed below and are stored in the **Example 1** settings template. To load this template, click **Open Example Template** in the Help Center or File menu.

<u>Option</u>	<u>Value</u>
Variables Tab	
Data Input Type	Y and/or X Error Bars (One Y, One X, and a Subgroup (Subject) Variable)
Y (Vertical) Variable	Response
X (Horizontal) Variable	Time
Subgroup (Subject) Variable	Subject
Grouping (Symbol) Variable	Rate
Scatter Plot with Error Bars Format (<i>Click the Button</i>)	
<i>Scatter Plot Tab</i>	
Y Error Bar Variation Line Type	Standard Deviation (SD)
<i>More Lines Tab</i>	
Line (Connect Center Points)	Checked

3 Run the procedure

- Click the **Run** button to perform the calculations and generate the output.

Scatter Plot Output



Example 2 – Creating a Scatter Plot with Error Bars from Data with Y's and X's in Multiple Columns

This example demonstrates how to generate a simple scatter plot with both Y and X error bars from data where X and Y measurements are stored in multiple columns. In this example, we'll plot medians instead of means. The data used are contained in the ScatPlotError2 dataset.

Setup

To run this example, complete the following steps:

1 Open the ScatPlotError2 example dataset

- From the File menu of the NCSS Data window, select **Open Example Data**.
- Select **ScatPlotError2** and click **OK**.

2 Specify the Scatter Plots with Error Bars procedure options

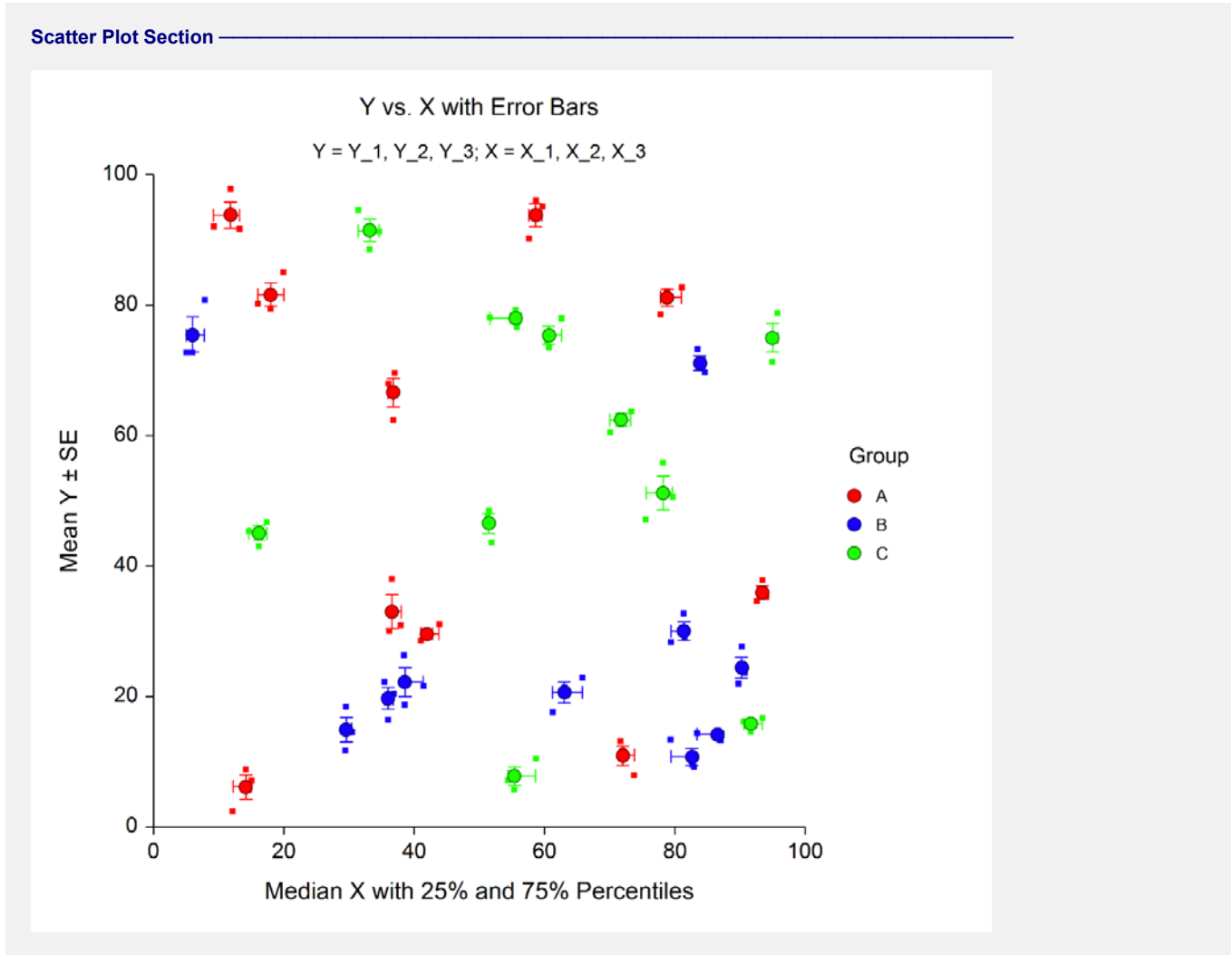
- Find and open the **Scatter Plots with Error Bars** procedure using the menus or the Procedure Navigator.
- The settings for this example are listed below and are stored in the **Example 2** settings template. To load this template, click **Open Example Template** in the Help Center or File menu.

<u>Option</u>	<u>Value</u>
Variables Tab	
Data Input Type	Y and/or X Error Bars (Data for Both Y and X in Multiple Columns)
Y (Vertical) Variable(s)	Y_1, Y_2, Y_3
X (Horizontal) Variable(s)	X_1, X_2, X_3
Grouping (Symbol) Variable	Group
Scatter Plot with Error Bars Format (<i>Click the Button</i>)	
<i>Scatter Plot Tab</i>	
X (Estimation of Center)	Median
Raw Data (Symbols)	Checked

3 Run the procedure

- Click the **Run** button to perform the calculations and generate the output.

Scatter Plot Output



Example 3 – Creating a Scatter Plot with Y Error Bars from Data with Multiple Y Variables and One X Variable

This example shows how to generate a simple scatter plot with Y error bars from data where Y measurements are stored in multiple columns. The data used are contained in the ScatPlotError2 dataset.

Setup

To run this example, complete the following steps:

1 Open the ScatPlotError2 example dataset

- From the File menu of the NCSS Data window, select **Open Example Data**.
- Select **ScatPlotError2** and click **OK**.

2 Specify the Scatter Plots with Error Bars procedure options

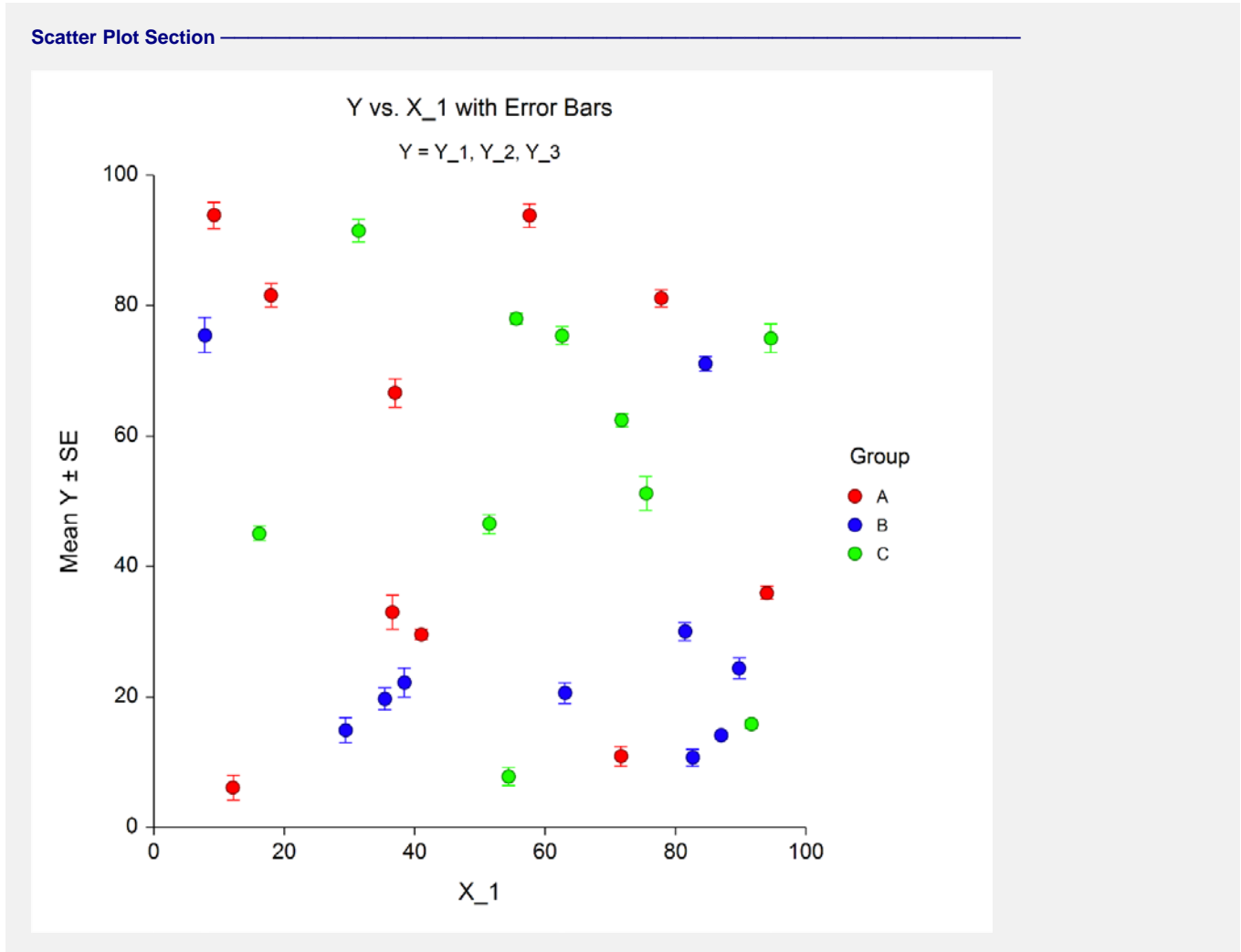
- Find and open the **Scatter Plots with Error Bars** procedure using the menus or the Procedure Navigator.
- The settings for this example are listed below and are stored in the **Example 3** settings template. To load this template, click **Open Example Template** in the Help Center or File menu.

<u>Option</u>	<u>Value</u>
Variables Tab	
Data Input Type	Y Error Bars (Data for Y in Multiple Columns with One X Variable)
Y (Vertical) Variable(s)	Y_1, Y_2, Y_3
X (Horizontal) Variable	X_1
Grouping (Symbol) Variable	Group

3 Run the procedure

- Click the **Run** button to perform the calculations and generate the output.

Scatter Plot Output



Example 4 – Creating a Scatter Plot with 95% Confidence Interval Limits for X from Data with Multiple X Variables and One Y Variable

This example shows how to generate a simple scatter plot with 95% confidence intervals for X from data where X measurements are stored in multiple columns. The data used are contained in the ScatPlotError2 dataset.

Setup

To run this example, complete the following steps:

1 Open the ScatPlotError2 example dataset

- From the File menu of the NCSS Data window, select **Open Example Data**.
- Select **ScatPlotError2** and click **OK**.

2 Specify the Scatter Plots with Error Bars procedure options

- Find and open the **Scatter Plots with Error Bars** procedure using the menus or the Procedure Navigator.
- The settings for this example are listed below and are stored in the **Example 4** settings template. To load this template, click **Open Example Template** in the Help Center or File menu.

<u>Option</u>	<u>Value</u>
Variables Tab	
Data Input Type	X Error Bars (Data for X in Multiple Columns with One Y Variable)
Y (Vertical) Variable	Y_1
X (Horizontal) Variable(s)	X_1, X_2, X_3
Grouping (Symbol) Variable	Group
Scatter Plot with Error Bars Format (<i>Click the Button</i>)	
<i>Scatter Plot Tab</i>	
Raw Data (Symbols)	Checked
X Error Bar Variation Line Type	Confidence Interval

3 Run the procedure

- Click the **Run** button to perform the calculations and generate the output.

Scatter Plot Output

