

IRTPRO™

Contents

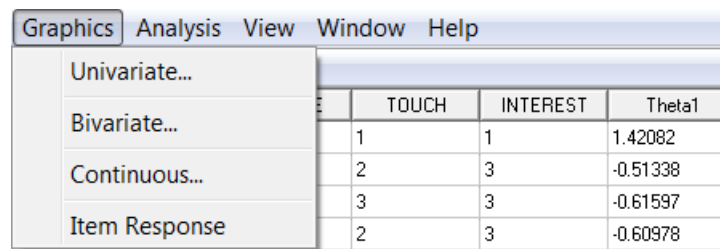
1. Data-based graphics	1
1.1 Introduction	1
1.2 Univariate Graphs	2
1.3 Bivariate Graphs	8
1.4 Graphs for continuous variables	12

1. Data-based graphics

1.1 Introduction

Graphics are often useful for data exploration. Relationships and trends may be conveyed in an informal and simplified visual form via graphical displays. IRTPRO offers both data-based and model-based graphs). In the case of data-based graphs, IRTPRO distinguishes between univariate and bivariate graphs. Univariate graphs are particularly useful to obtain an overview of the characteristics of a variable. However, they do not necessarily offer the tools needed to explore the relationship between a pair of variables. For that purpose, bivariate graphs are more appropriate.

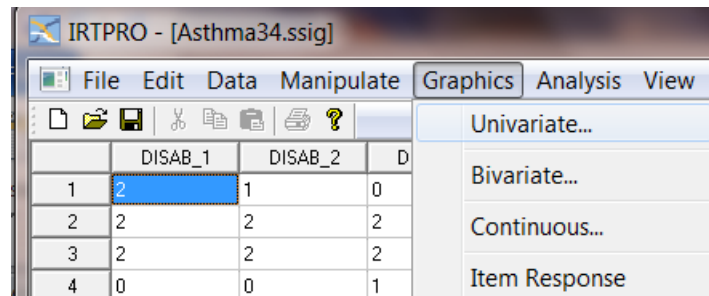
To make univariate or bivariate graphs, the IRTPRO dataset of interest must be the currently opened window. Click the **Graphics** button on the main menu bar and select between the **Univariate...**, **Bivariate...**, and **Continuous (variables)** options.



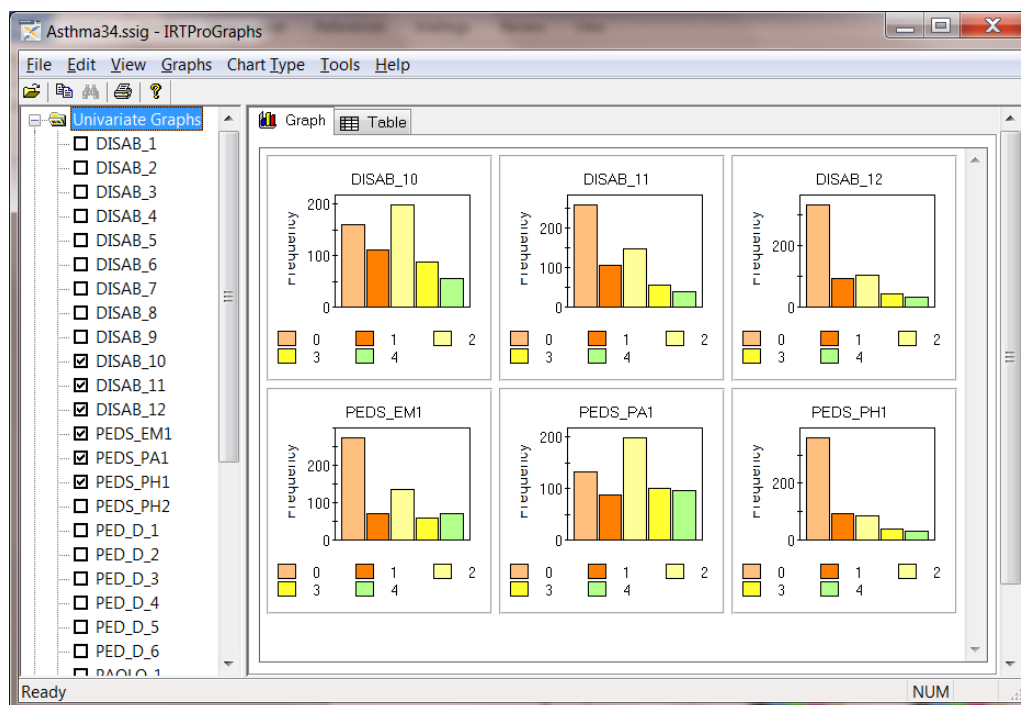
1.2 Univariate Graphs

The default graph type is a bar chart for each item selected. A bar chart is a graphic representation of the frequency distribution of discrete or categorical data in which the values or categories are given on the horizontal axis and the frequencies are given on the vertical axis.

The image below shows the selection of the **Graphics, Univariate...** option.

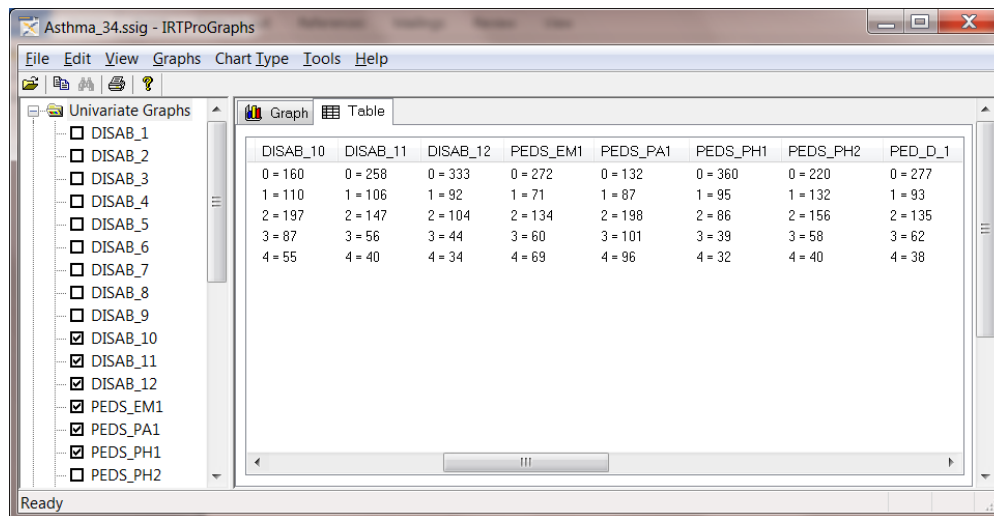


Selection of this option opens a **Univariate Graph** dialog that enables one to select one or more of the variables in the data set. By clicking on the **OK** button, a simultaneous display of bar charts is obtained. The default display is to show the bar charts after removal of missing values.



The data used to create the graphs can be viewed by selecting the **Table** "mode" as shown

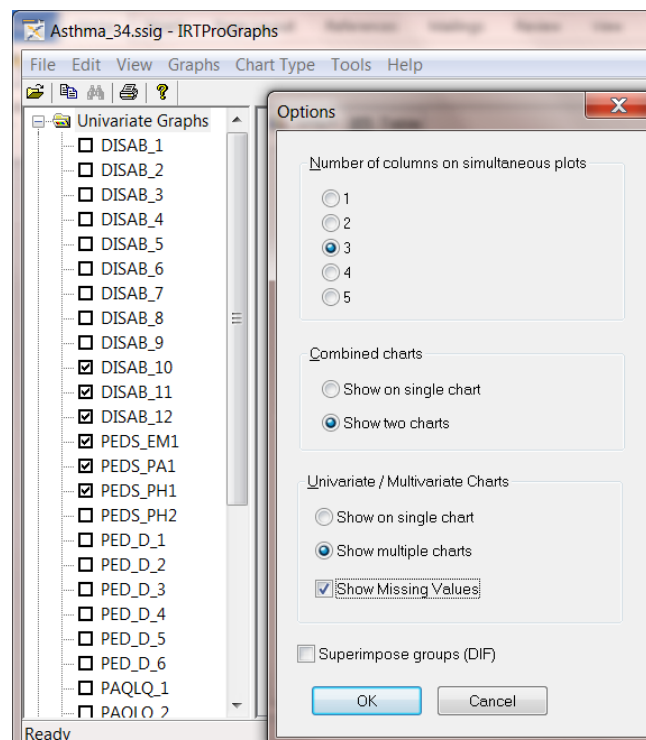
below. For example, for the DISAB_10 item, there are 160 values equal to 0, 110 values equal to 1, 197 values equal to 2, 87 values equal to 3, and 55 values equal to 4.



The screenshot shows the IRTProGraphs window with the 'Table' tab selected. The table displays the frequency of values for eight items: DISAB_10, DISAB_11, DISAB_12, PEDS_EM1, PEDS_PA1, PEDS_PH1, PEDS_PH2, and PED_D_1. The values range from 0 to 4 for the DISAB items and 0 to 2 for the PEDS items.

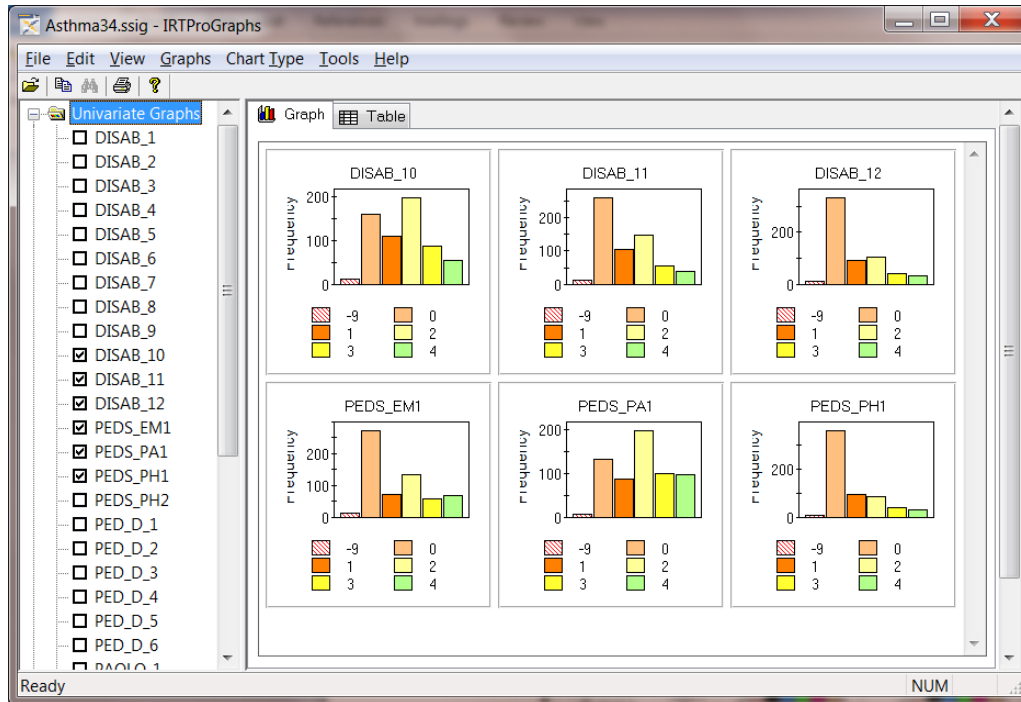
DISAB_10	DISAB_11	DISAB_12	PEDS_EM1	PEDS_PA1	PEDS_PH1	PEDS_PH2	PED_D_1
0 = 160	0 = 258	0 = 333	0 = 272	0 = 132	0 = 360	0 = 220	0 = 277
1 = 110	1 = 106	1 = 92	1 = 71	1 = 87	1 = 95	1 = 132	1 = 93
2 = 197	2 = 147	2 = 104	2 = 134	2 = 198	2 = 86	2 = 156	2 = 135
3 = 87	3 = 56	3 = 44	3 = 60	3 = 101	3 = 39	3 = 58	3 = 62
4 = 55	4 = 40	4 = 34	4 = 69	4 = 96	4 = 32	4 = 40	4 = 38

To display the missing values, click on the **Tools** button and make sure that the **Show Missing Values** check box is selected. The **Options** dialog also enables the user to select the number of columns on the simultaneous plots.

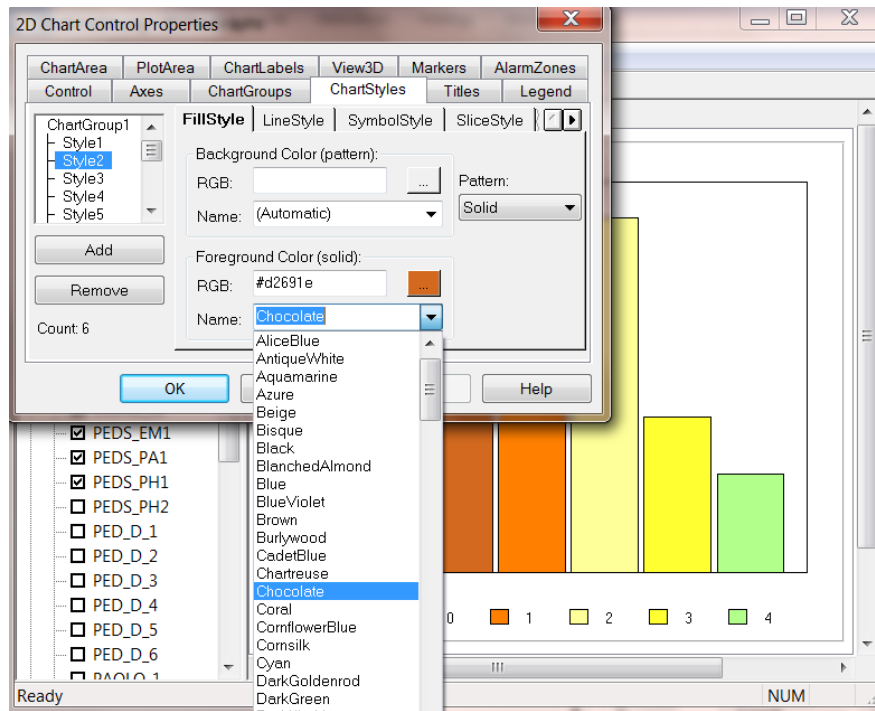


Below we show the bar charts for the six items selected. As can be seen, all the items

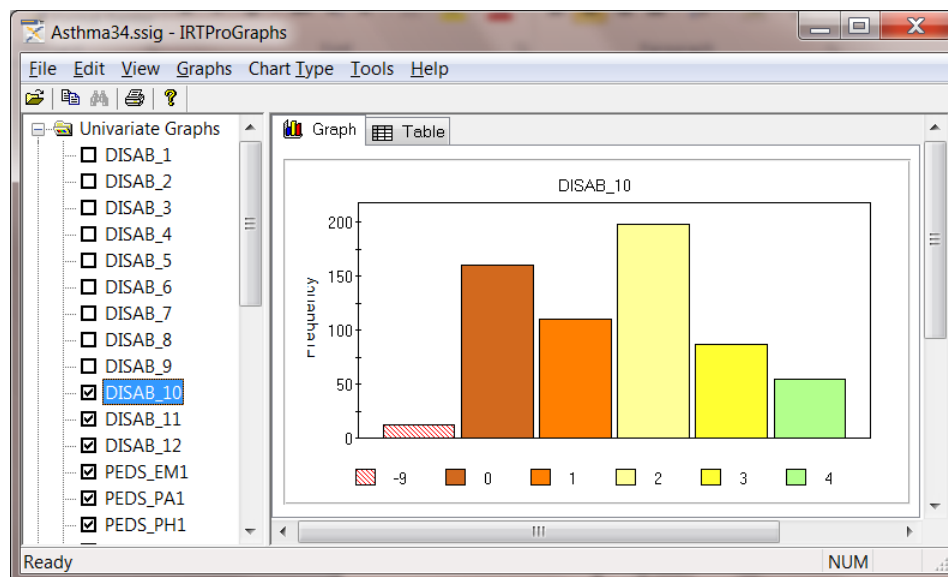
selected have missing values (coded –9). By right-clicking in the DISAB_10 plot area (for example), the **Chart Properties** dialog is obtained that can be used to change the color of each bar.



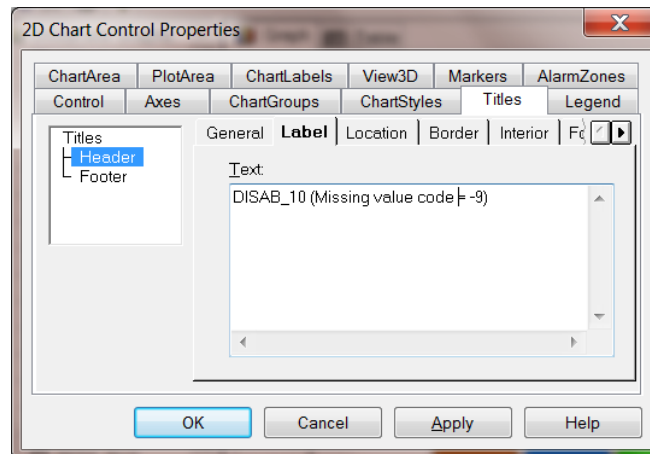
In the illustration below, use is made of the **ChartStyles** tab to change the color of the bar corresponding to the value "0" to Chocolate.



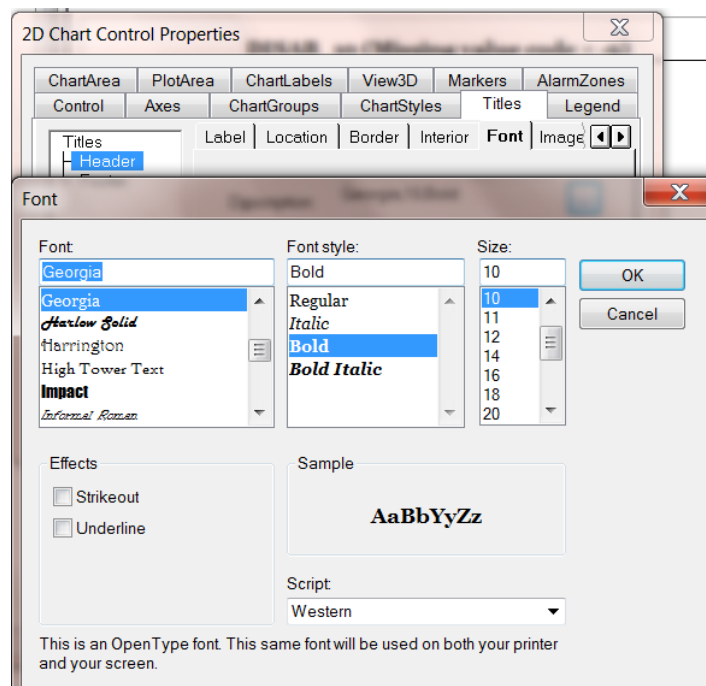
After making the desired color changes, click the **OK** button to view the modified display shown below.



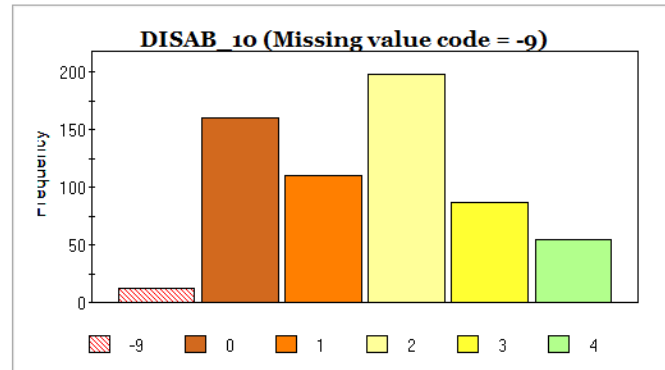
As an illustration, suppose that we want to change the text and font of the current title (DISAB_10). Right-click in the DISAB_10 plot area to display the **Chart Properties** dialog and select the **Titles** tab. Use the **Titles** window to first select the **Label** tab and then the **Font** tab. Change the **Header**, **Text** as shown below.



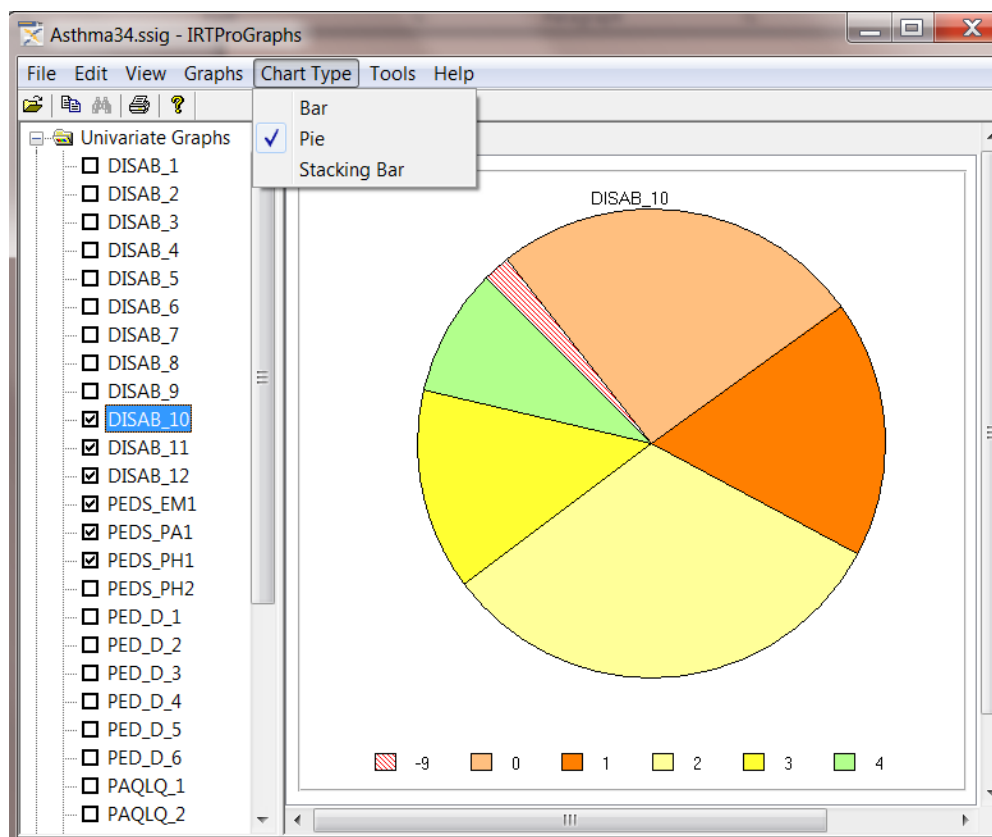
Next, use the **Font** tab to change to default font, font style and font size. In this case, it was changed to Georgia, Bold, 10.



Click the **OK** button of the **Font** dialog to return to the **2D Chart Control Properties** dialog, then click **OK** to view the edited graph.

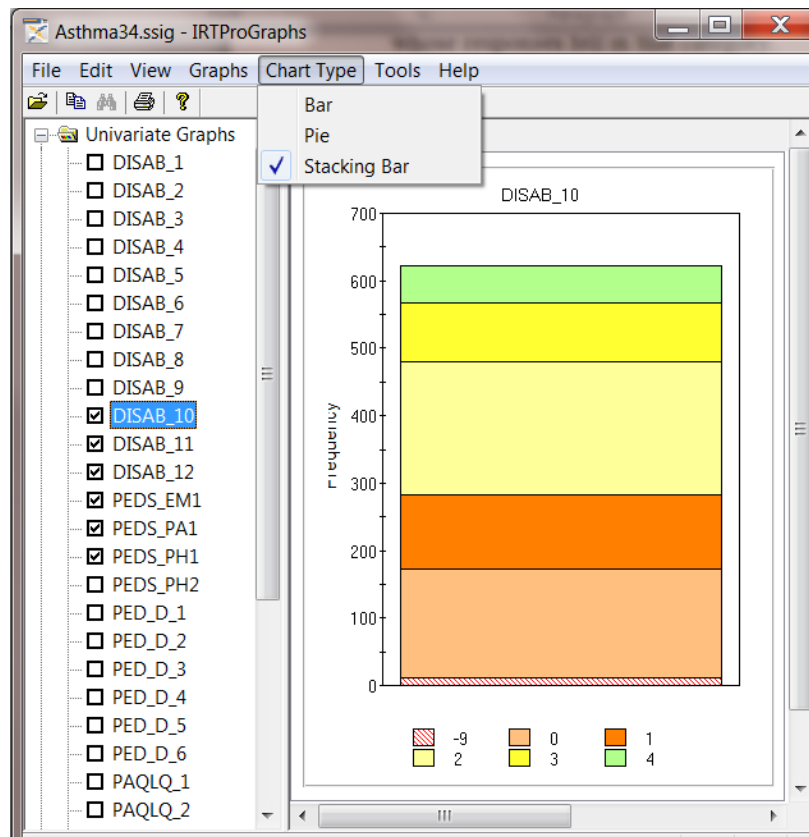


A pie chart display of the percentage distribution of a variable may be obtained by selecting the **Chart Type, Pie** option. A pie chart is a graphic representation of percentages or frequencies by means of a circle that is subdivided into slices in such a way that the areas of these slices are proportional to the percentages or frequencies. Pie charts may be customized by using the graph editing dialog boxes obtained by right-clicking in the plot area of the pie chart.



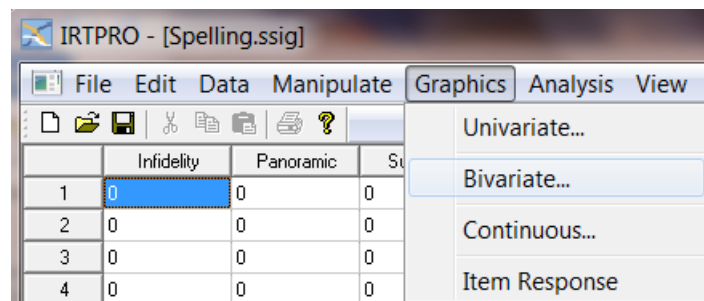
The distribution of frequencies over the categories of an item can also be displayed in the form of a stacked bar chart by selecting the **Chart Type, Stacking Bar** option. The bars in a

stacked bar graph are divided into the categories of the item displayed. Each bar represents the number of examinees whose responses fell in that category.

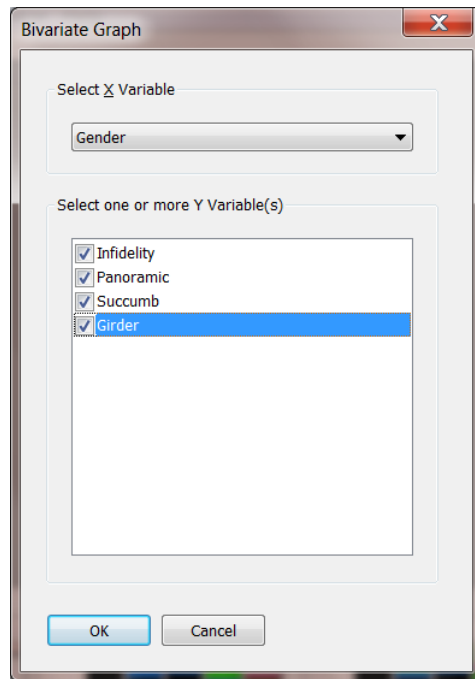


1.3 Bivariate Graphs

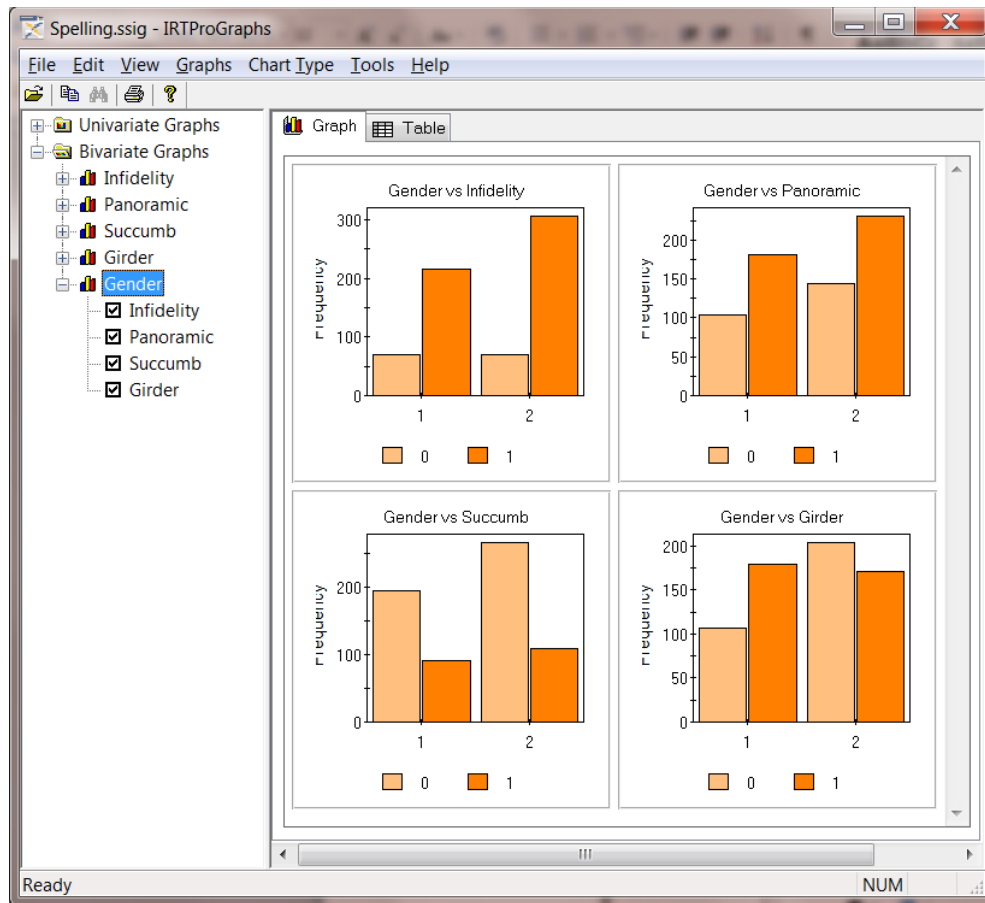
The **Graphics, Bivariate...** option allows us to graphically display a two-way frequency table.



Selection of this option results in the display of a **Bivariate Graph** dialog allowing the user to select an **X-variable** and one or more **Y-variables** to obtain a set of bivariate plots. In the following example, Gender is selected as the **X-variable** and the items Infidelity, Panoramic, Succumb and Girder as the **Y-variables**.

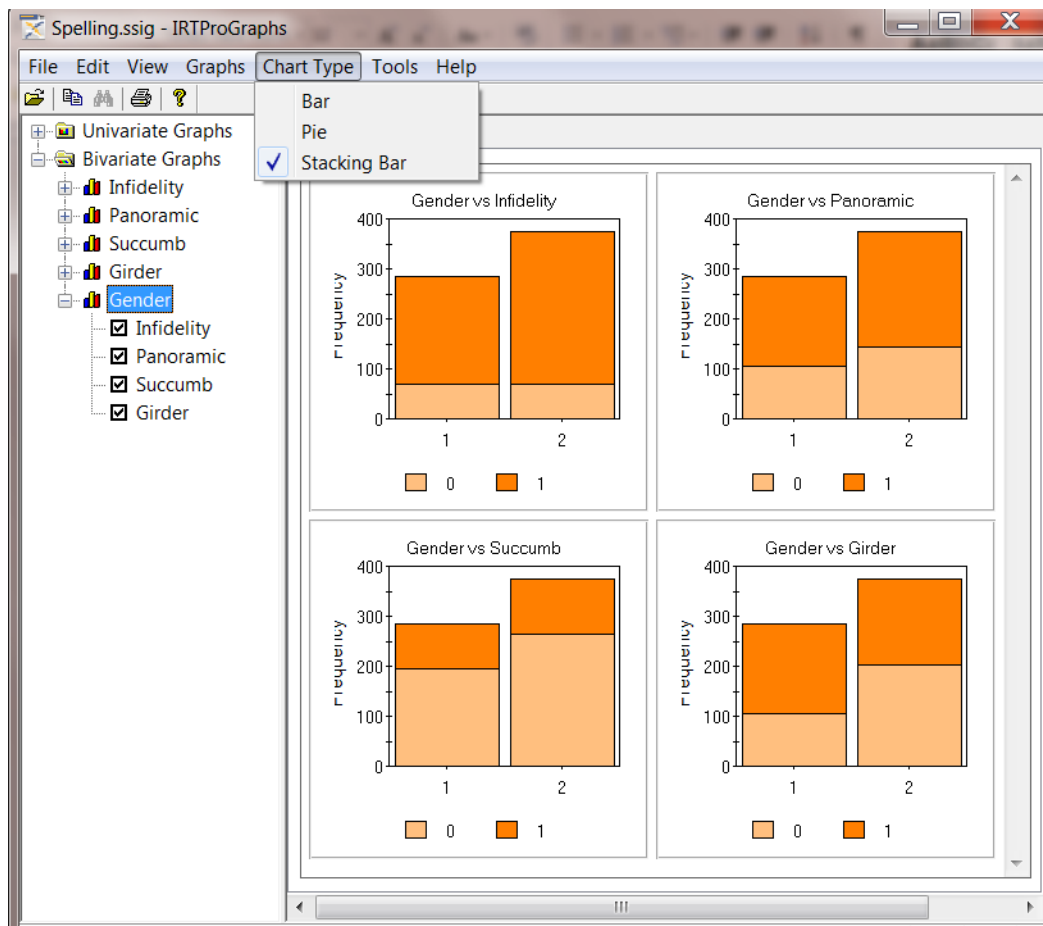


Clicking the **OK** button results in the following graphical display. Note that the categories of Gender (the **X-variable**) are displayed below the horizontal axis. Each category of a selected **Y-variable** corresponds to a color and the color legend is given at the bottom of the graph.



Note that in the left pane (above) all the items included in the model are listed. If a specific item is clicked, an expanded list of all the items (excluding the one selected) is displayed and any of these items may be selected as **Y-variables**.

A more informative display of the relationship between two variables might be stacked bar charts, obtained by selecting the **Chart Type, Stacking Bar** option. In the display below, it can be observed that there are more Gender = 2 subjects compared to the number off Gender = 1 subjects. Furthermore, for the item Girder a larger percentage Gender = 2 individuals chose the "0" category than is the case for Gender = 1.



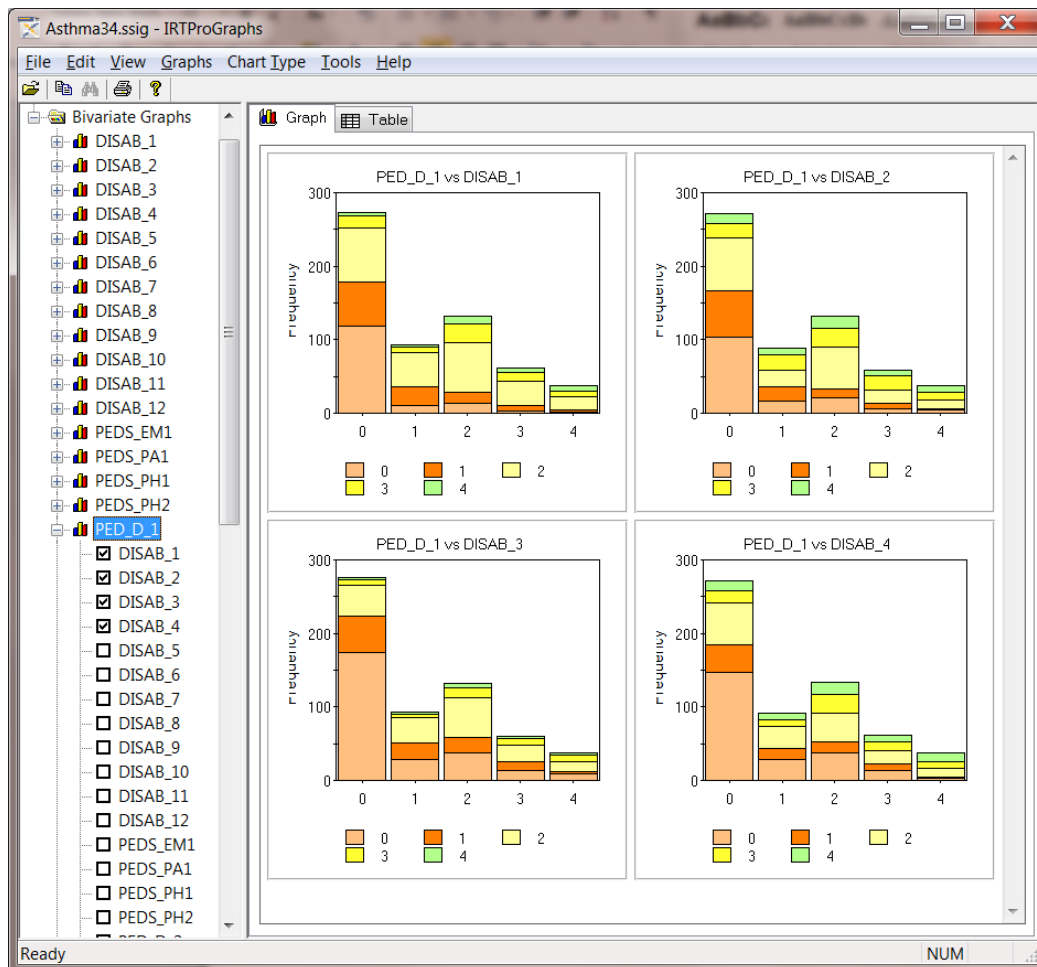
As mentioned earlier, one can switch to the **Table** mode to view the data generated for the plots requested. The frequencies listed in the table below, substantiate the conclusions drawn from the stacked bar-charts display.

The screenshot shows the IRTProGraphs software interface with the 'Table' mode selected. The table displays the frequency data for Gender vs. Infidelity, Panoramic, Succumb, and Girder. The data is as follows:

Gender	Infidelity	Panoramic	Succumb	Girder
1	0 = 70	0 = 104	0 = 194	0 = 106
1	1 = 215	1 = 181	1 = 91	1 = 179
2	0 = 69	0 = 144	0 = 265	0 = 203
2	1 = 305	1 = 230	1 = 109	1 = 171

In the next illustration, bivariate charts are requested for the item PED_D_1 versus the items DISAB_1, DISAB_2, DISAB_3 and DISAB_4, from the IRTPRO dataset **Asthma34.ssig**. This dataset were selected since each item has more than two categories. In this case, the stacked

bars representation is less cluttered than the side-by-side bar charts representation and usually easier to interpret visually.

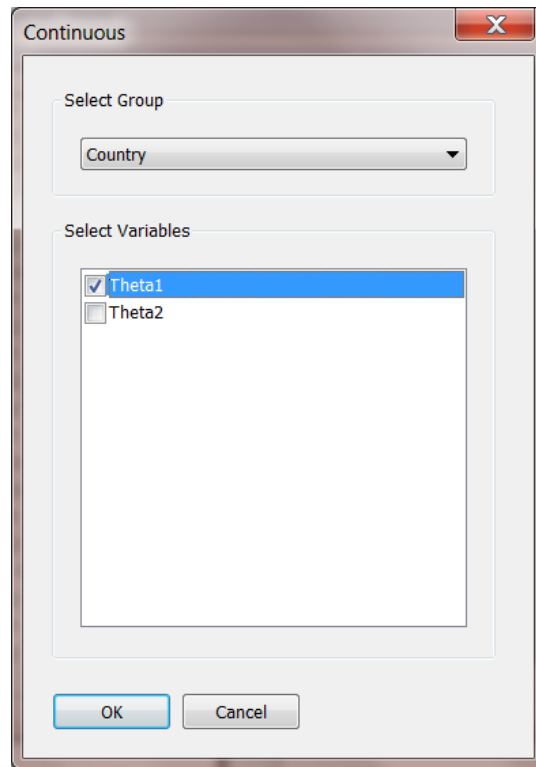


1.4 Graphs for continuous variables

The **Graphics, Continuous...** option allows us to graphically display the distribution of one or more continuous variables. In the case of more than one group, the distributions across groups are overlaid on the same axis system.

Graphics Analysis View Window Help				
Univariate...				
Bivariate...				
Continuous...				
Item Response				
	TOUCH	INTEREST	Theta1	Theta2
1		1	1.42082	2.00026
2		3	-0.51338	-0.68564
3		3	-0.61597	-1.10888
2		3	-0.60978	-0.72688

Selection of this option results in the display of a **Continuous Graph** dialog allowing the user to select a **Group-variable** and one or more **Continuous-variables** to obtain set of distributions. In the following example, Country is selected as the group variable and the item Theta1 as the continuous variable. The dataset **efficacy_six_country.ssig** is located in the **Fixed Theta** sub-folder of the IRTPRO Examples folder.



Click the **OK** button when done. By selecting the **Table** tab (screen below) the frequency intervals and number of observations within each interval is display. Note that there are 10 intervals for each country. The number of intervals can be changed via the **Tools** (main menu bar), **Options** menu.

Country	Theta1
1	-4.34 - -3.64 = 0
1	-3.64 - -2.94 = 0
1	-2.94 - -2.24 = 7
1	-2.24 - -1.55 = 28
1	-1.55 - -0.85 = 249
1	-0.85 - -0.15 = 451
1	-0.15 - 0.55 = 575
1	0.55 - 1.25 = 284
1	1.25 - 1.95 = 92
1	1.95 - 2.65 = 24

The distributions of the Theta1-values for each of the six countries is shown in the graph shown below.

