Charts

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Introduction

Excel can create a variety of charts however, for Health data only a subset of them are really useful and some important chart types are not available.

Useful Charts	Column, Bar, XY scatter and (Pie)
Less useful (unlikely to use)	Line (commonly mistaken for XY scatter with line), Area, Surface, Radar, Doughnut, Bubble, Stock, Cylinder, Cone and Pyramid

A chart is a graphic representation of worksheet data.

When a chart is created based on a worksheet selection, Excel uses the values from the worksheet and presents them in the chart as data points, which are represented by bars, lines, columns, slices, dots and other shapes. These shapes are referred to as data markers.

Groups of data points, or data markers, originating from single worksheet rows or columns are grouped in data series. Each data series is then distinguished by a unique colour or pattern or both.

After creation, a chart can be enhanced to emphasise certain information by adding chart items, such as data labels, a legend (key), titles, text, trendlines, error bars and gridlines. Most chart items can be moved, sized and formatted.

When analysing data, the importance of plotting your data cannot be over-emphasised. Unless you are simply interested in frequency tables or crosstabulations, you should plot your data. Doing so will allow you to:

- study the distribution of your data (does it follow a normal distribution, for example?)
- check for any outliers or extreme values that need to be further investigated
- examine the relationships between two or more variables

The computation of any statistics, whether it be summary statistics such as means or medians or performing statistical tests, such as t-tests or correlation coefficients, should only proceed after plotting the data.

Creating a chart 

The key to producing the type of chart you want is to organise your data correctly. Arrange the data in columns. You might wish to copy the data that you want to plot onto a new worksheet. Ensure that the labels for categories in a bar chart, or the X (horizontal) axis values for a scatter plot are in the first column. Use the first row in the work sheet to give the data a label. You can then highlight the data and select the chart wizard.

Clicking the ChartWizard button reveals a series of dialogue boxes that simplifies creating a chart. The ChartWizard guides you through the process step by step: you verify your data selection, select a chart type and decide whether to add items such as titles and a legend. A

sample of the chart you are creating is displayed so that you can make changes before you finish working in the ChartWizard.

To create a chart embedded in a worksheet with the ChartWizard:

1. Click the ChartWizard button,  or choose **Insert | Chart**.
2. Follow the steps of the Chart wizard. Use the <Back and Next> buttons to move backwards and forwards through the 4 steps.

Note: The Excel Chart Wizard tries to identify the data that it thinks you want to plot. This can lead to charts being created that do not display the data in a sensible manner. This is influenced by the cell that is currently active when you select the char twizard.

Producing a Bar Chart

Suppose we wish to produce a bar chart of the following data showing the counts of people in a various health professions. The data is entered so that the categories are in cells 2 to 6 of column A and the counts in cells 2 to 6 of column B. Titles have be entered in row 1.

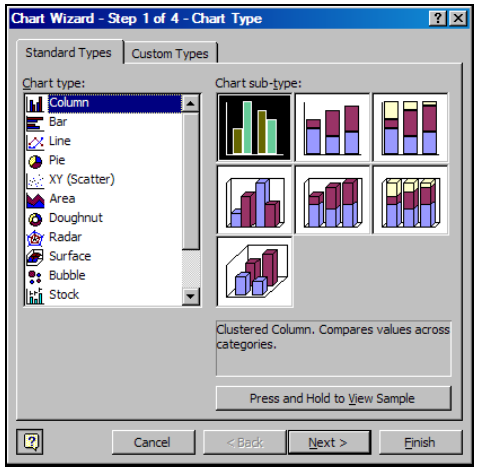
	A	B
1	**Profession**	**Number**
2	Doctor	9
3	Nurse	13
4	Pharmacist	2
5	Physiotherapist	5
6	Radiographer	3

Highlight cells A1 to B6 and select the Chart Wizard.

Step 1:

The default chart offered is a column bar chart of the type we want.

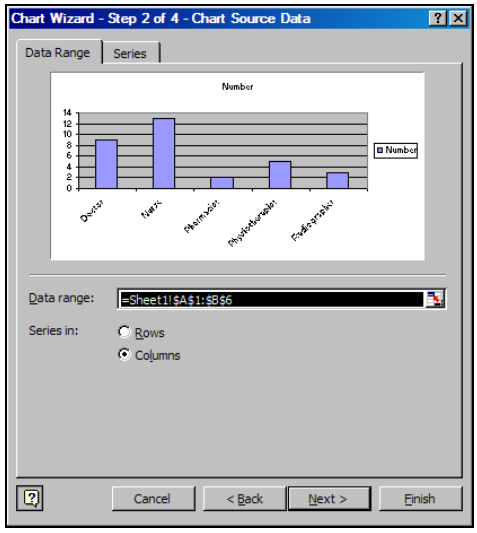
Click **Next >**.



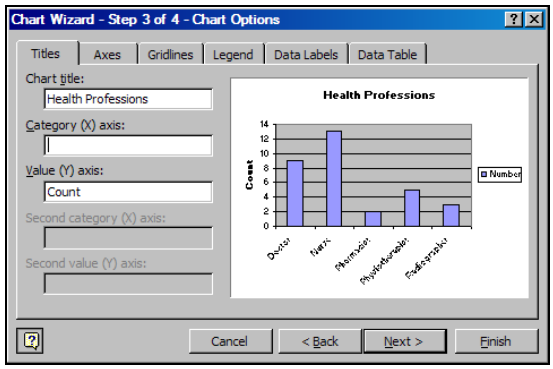
Step 2:

Because the data was organised correctly, Excel displays the chart correctly.

Click **Next >**



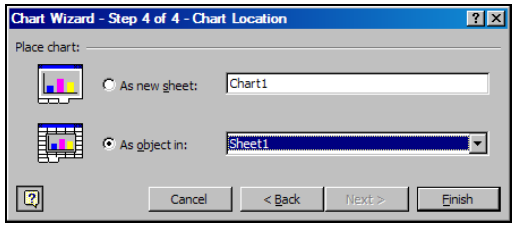
Step 3:



Change the Chart title to: **Health Professions**
Change the Value (Y) axis to: **Count**

Note: The other tabbed options Axes, Gridlines can be used to change other features of this chart, for example removing the legend.

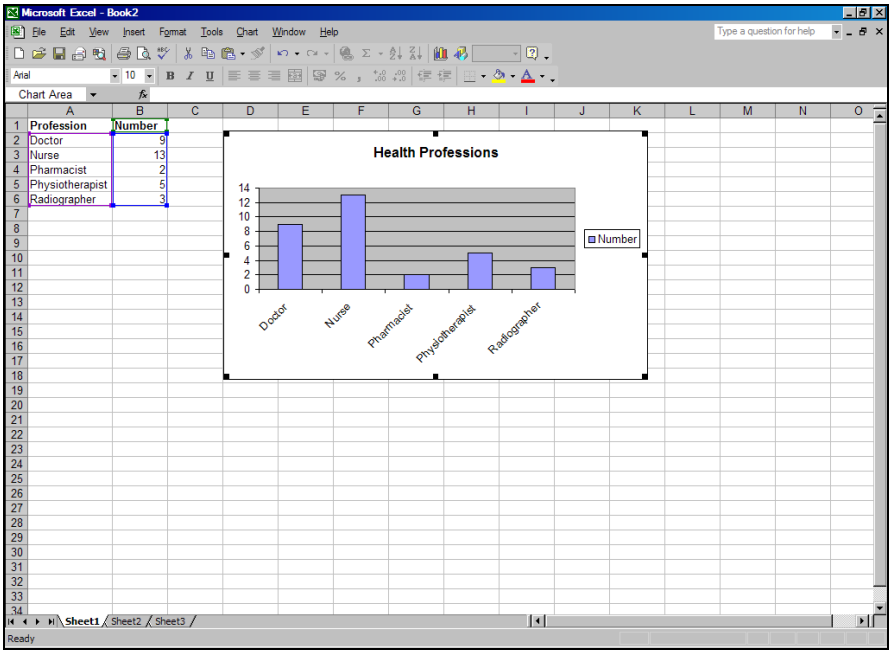
Click **Next >**
Step 4:



Leave the option to Place chart As object in

Click **Finish**

The chart will be embedded in the current worksheet.



Embedded charts and chart sheets

You can create an embedded chart as an object on a worksheet when you want to display a chart along with its associated data. For example, you can use embedded charts for reports and other documents in which it is best to display a chart within the context of the worksheet data.

An embedded chart can be sized or moved on the worksheet. To size an embedded chart:

1. Click once anywhere on the chart so handles appear at the chart borders.
2. Position the mouse pointer over a handle and it will change to a cross hair.

3. Click and drag the cross-hair to size the chart. ***Hold down the <Shift> key whilst sizing to keep the embedded chart's original proportions***.

To move an embedded chart:

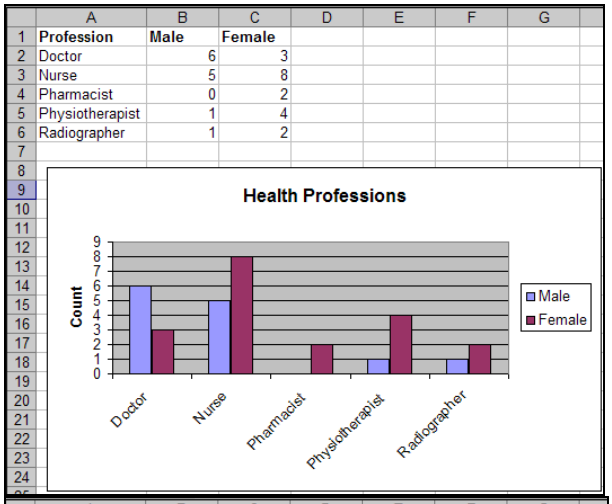
1. Position the mouse pointer anywhere over the chart.
2. Click and drag the whole chart to a new position. ***Hold the <Alt> key whilst sizing or moving for the embedded chart to snap to the cell grid.***

You can create a chart sheet as a separate sheet in a workbook when you want to display a chart apart from its associated data. You might do this when you want to show overhead projections of your charts as part of a presentation. When a chart sheet is inserted it is inserted to the left of the worksheet containing the data and the sheet is temporarily named Chart1, etc.

When you create a chart, if you change the data on your worksheet, the chart is updated to reflect these changes.

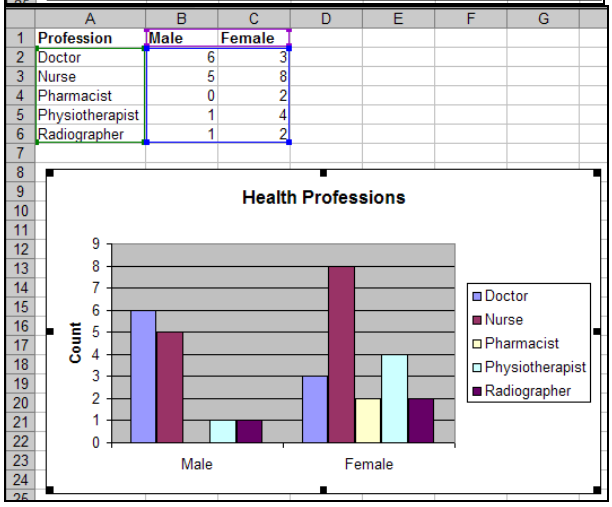
Producing a Clustered Bar Chart

A clustered bar can be used to display categories grouped by an attribute such as Gender. The chart opposite was produced in the same way as for the previous bar chart. One the cells in the range A1 to C6 was selected and the Chart Wizard selected and. Excel decided what to plot.



Profession	Male	Female
Doctor	6	3
Nurse	5	8
Pharmacist	0	2
Physiotherapist	1	4
Radiographer	1	2

At step 2 of the Wizard (see page 3) if the ***Series in*** option chosen had been ***rows***, then the clustered category would have been profession and a different looking chart would have been produced.



Editing Charts

Each part of a chart is considered to be a distinct object, for example the Main Title, the Category (X) axis, the plot area. Each object has its own set of attributes whose Format can be changed, or the object can be cleared.

To edit a chart either double-click on the area or item that wish to edit and the appropriate dialogue box should appear, or click the right mouse button over an object to reveal a menu and select from this. For example if you double clicked over a bar, in a bar chart, the ***Format Data Series*** dialogue box is displayed.

To edit directly text which is the main title or axis title without using dialog boxes, make two single clicks (not a double click) on the text, which can then be modified.

If a Chart is highlighted, the menu bar displays a Chart option which when selected displays options for modifying the highlighted chart. Selecting **Chart | Chart Options** displays the Chart Options dialogue box which is the same as that in Step 3 of the Wizard.

The Chart toolbar can be displayed by selecting **View | Toolbars** and selecting **Chart**.

The drop down list allows you to select which chart object you want to modify, the buttons on the Chart toolbar represent the Format Chart Area, Chart Type, Legend, Data Table, Select Data by Row, Select Data by Column, and Angle Text Downward and Angle Text Upward, respectively.

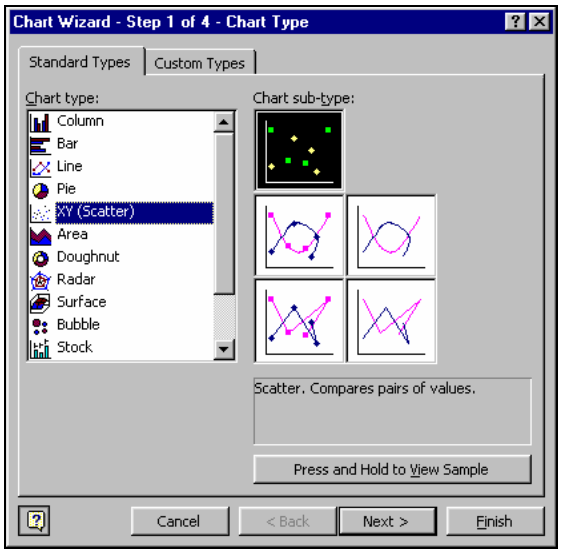
Note *You can reuse the Chart wizard on an existing chart, this is often a good way to edit the chart. Click on the chart and then click the chart wizard button*  *, the wizard is displayed.*

Producing a scatterplot

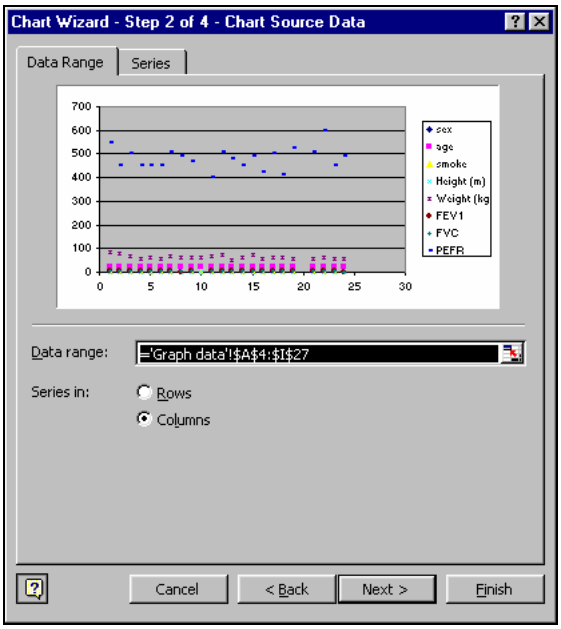
Step 1:

Use the ***Standard Types*** tab to select the ***Chart type*** and Chart sub-types to select the ***XY (Scatter)*** scatterplot type of interest
Press the left mouse button down on the **Press and Hold to View Sample** button, to view the chart to check what will be displayed.

Click **Next >**



Step 2:



Change the ***Data Range*** field. Either delete the range offered by Excel and type in the correct range, or click on  identify the data by dragging the mouse over the labels and data to be plotted.

Click on  to end selection of data range.

Note *Excel includes the worksheet name in the data range, 'Graph data' in the example above.*

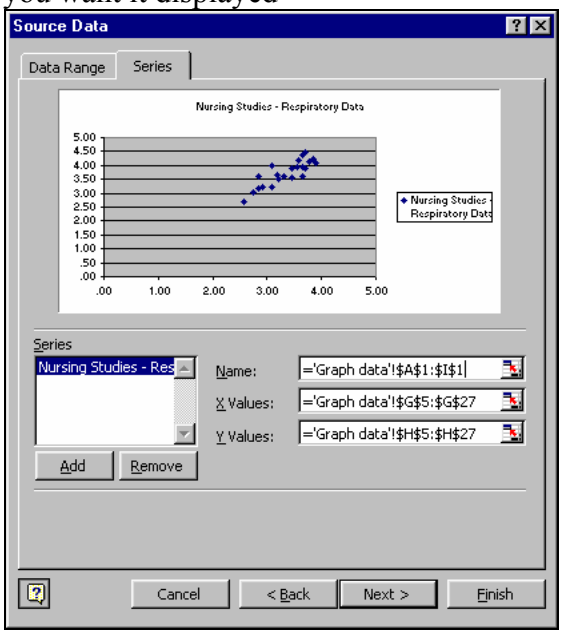
***In this example Excel is not displaying what we want; it is plotting data values for each variable by the row number. This is corrected in the next step.

Note *To select data that is not adjacent, use the <Ctrl> key to select non-consecutive columns or rows. Highlight the first column then hold down the <Ctrl> key whilst highlighting a further columns). Do not leave any empty rows or columns in the area of data to be plotted. Include cells containing labels for rows or columns.*

Use the ***Series in*** option to indicate whether the data are arranged in rows or columns.

Click on the ***Series*** tab. This allows more control over what is plotted and can be used to sort out charts that, initially, do not display the data as you want it displayed

Series Tab



Series allow different data to be plotted in different colours. This would allow you to distinguish between male and female subjects in your study.

Each ***Series*** has a Name, which appears in the legend box and, in this example of a scatterplot, a pairs of X values and Y values.
The Name (legend text) can be changed by typing text directly into the ***Name*** text box or clicking on the  button to select a cell containing the legend data. This later approach is recommended because the legend text can be altered more easily.

The cells containing the X and Y values can be changed in a similar fashion.

New Series can be added by Clicking on the **Add** button.

You might use the ***Series*** tab to swap the X and Y axes by retyping the correct data range.

Click **Next >**

Step 3:

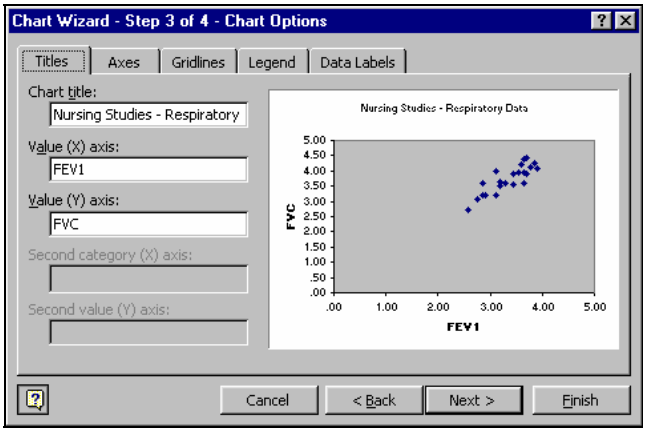
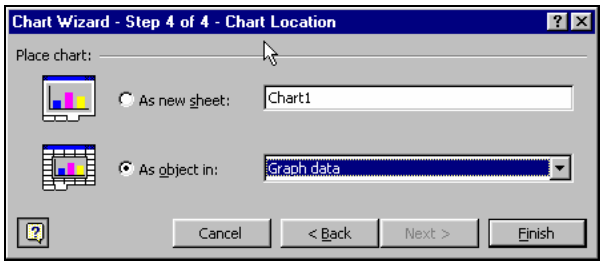


Chart Options allow you to control the Titles, Axes, Gridlines, legend (show or not), and Data Labels.

In the figure shown, labels for the axes have been added using Values (X) axis and Value (Y) axis, the Gridlines tab was selected to remove the horizontal lines, the Legend table was selected to remove the legend as none is required for a single series

Click **Next >**

Step 4:



Choose between a chart sheet or an embedded chart.

Click **Finish**

Using the drawing tools to enhance the chart

Items, such as text boxes and arrows can be added to the chart by using the Drawing Toolbar:

1. Click on  to reveal the Drawing toolbar.

2. Select the drawing object required. The mouse pointer will change to a cross-hair pointer. Click at the required place on the chart and drag the pointer out to produce the shape.

Formatting chart elements

The various elements of a chart can be formatted to display with different colours, fonts, border styles, etc.:

1. Select the element to be changed.
2. Click the right mouse button or choose the Format menu. Excel will show the format commands relevant to the object you have chosen.

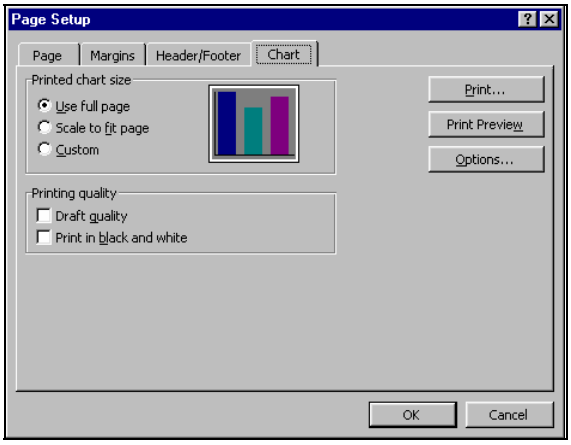
Identify data points (XY scatter plot)

Move the cursor to a data point on the scatter plot and Excel will identify the data values.

Printing an embedded chart

An embedded chart can either be printed as part of the selected sheet or Print Area, or separately from the worksheet.

1. Activate the chart by clicking it.
2. Choose the Chart tab of **File | Page Setup**.
3. Choose a Printed Chart Size:



Use Full Page	Expands the chart to fit the full width and height of the page margins. The sizes of objects relative to each other in the chart may change on the printed page because the proportions of the chart are changed to fill the page.
Scale To Fit Page	Expands the chart the nearest page margin before printing. The chart expands in both dimensions proportionally until one dimension fills the space between the margins. The sizes of objects relative to each other in the chart are preserved.
Custom	Scales the chart sheet as it appears on the worksheet.

You may also choose to print the chart in draft quality (for speed) or in black and white only.

Note: A description of how to create a scatterplot with a regression line is available from:

www.som.soton.ac.uk/learn/resmethods/Excel/Scatterplot.htm