Obesity – Can a New Drug Help?

Introduction
Obesity is known to be a major health risk. The data here arise from a study which aimed to investigate whether or not a new drug, used as part of a regime of diet, exercise and drug treatment, could assist in weight reduction for obese individuals. Patients taking part in the study were healthy adults (aged 18 to 65 years) and were between 30% and 80% above their ideal body weight. 37 patients received either the new drug or a placebo (dummy treatment) for an eight-week period - 18 were given the new drug and 19 the placebo.

The purpose of this worksheet is to perform a visual analysis of the data by considering charts for a number of variables.

Getting started
Start Excel and select File > Open from the main menu. In the dialog box that appears choose to view Files of type: Excel (*.xls) and in the Look in box navigate to the folder containing Obesity.xls. Click on this file and then Open.

The spreadsheet Obesity.xls contains a single worksheet with eleven columns of data:

<table>
<thead>
<tr>
<th>Column</th>
<th>Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Patient number</td>
<td>Patient number</td>
</tr>
<tr>
<td>B</td>
<td>Age</td>
<td>Age (years)</td>
</tr>
<tr>
<td>C</td>
<td>Gender</td>
<td>Gender (F: Female, M: Male)</td>
</tr>
<tr>
<td>D</td>
<td>Height</td>
<td>Height (cm)</td>
</tr>
<tr>
<td>E</td>
<td>Family history</td>
<td>Family history of obesity? (N: No history, Y: Some history)</td>
</tr>
<tr>
<td>F</td>
<td>Motivation</td>
<td>Motivation rating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1: Some, 2: Moderate, 3: Great)</td>
</tr>
<tr>
<td>G</td>
<td>Attempts</td>
<td>Number of previous weight loss attempts</td>
</tr>
<tr>
<td>H</td>
<td>Age at onset</td>
<td>Age at onset of obesity (1: Under 12 years, 2: 12 to 17 years, 3: 18 years or over)</td>
</tr>
<tr>
<td>I</td>
<td>Weight at week 0</td>
<td>Weight at week 0 (kg)</td>
</tr>
<tr>
<td>J</td>
<td>Weight at week 8</td>
<td>Weight at week 8 (kg)</td>
</tr>
<tr>
<td>K</td>
<td>Treatment group</td>
<td>Treatment group (1: Placebo, 2: New drug)</td>
</tr>
</tbody>
</table>

One of the questions of interest is whether the patients in each treatment group were similar at the start of the study. Here you will perform a visual analysis of the data to investigate this.
**Gender analysis**

The first task is to see whether there were the same number of males and females in each treatment group. You can use Excel’s pivot-table facility to do this.

- Select cell A1 and choose Data > PivotTable and PivotChart Report.
- At Step 1 of the Wizard accept the default settings, then Next.
- At Step 2 check that the default data range is A1:K38 - if not, enter the box and edit it - then Next.
- At Step 3 opt to put the pivot-table on a New worksheet, then Finish.

This produces the following screen.

![PivotTable example](image)

If the PivotTable toolbar is not visible then View > Toolbars > PivotTable will retrieve it. The labels Patient…, Age, Gender, etc. are actually buttons that are used to specify how the table is constructed.

- Drag the Gender button and drop it in the Drop Column Fields Here area. This will ensure that the table has two columns, F and M.
- Drag the Treatment group button and drop it in the Drop Row Fields Here area. This will ensure that the table has two rows, 1 and 2.
- Drag the Gender button again and drop it in the Drop Data Items Here area. This will produce a table in which the Gender column is used to count how many patients are in each Gender/Treatment group category.

Since the placebo and treated groups are not of equal size, you need to use percentages to compare the proportion of males and females in each group.

- Double-click on the Count of Gender button in the top left-hand corner of the table to bring up the dialog on the right.
- Click on the Options >> button and under Show data as: select the % of row option, then OK.

![PivotTable field options](image)
Q1. What is the gender breakdown in each group?

To produce a chart of the pivot-table you simply click on the Chart Wizard icon on the PivotTable toolbar or on the Standard toolbar at the top of the screen. This will produce a very basic chart on a separate worksheet that needs some considerable attention before it can be used in any kind of report.

- Right-click on a blank piece of chart area and under Location opt to place the chart on the same sheet as your pivot-table.
- Right-click on one of the unsightly grey buttons on the chart and choose Hide PivotChart Field Buttons.
- Over-type the column labels in your pivot-table to be Female and Male – the chart will update accordingly.
- Similarly, over-type the row labels to be Placebo and New drug.
- Right-click on a blank piece of chart area and under Chart Options > Titles enter appropriate titles for the chart and both axes, then OK.
- Right-click on the vertical axis of the chart and under Format Axis force the Scale to finish at 1.0 (i.e. 100%) rather than 1.2 (i.e. 120%) and change the Number format to zero decimal places.
- Right-click on one of the columns and under Format Data Series > Options reduce the gap between the columns from 150 to about 80 (% of column width), then OK.

Because this chart is based on a pivot table it is a PivotChart and will not behave like a normal Excel chart. For example, you will find that you are unable to alter the size of the plot area or the position of the legend. However, hopefully your chart will now look something like the one below.
**Family history**

With very little additional effort you should be able to modify your gender analysis to see whether there is any difference between the two treatment groups in the proportion of patients with a family history of obesity. The buttons used to construct the pivot-table can be dragged off the table and replaced by others from the PivotTable toolbar. The pivot chart will update accordingly. Care is needed to ensure that the labelling of the chart is clear – labels Yes and No are meaningless unless the reader knows what the question was!

**Q2. What is the difference in family history between each group?**

![Patients' Family History of Obesity](chart)

**Previous weight loss attempts**

By appropriate dragging and dropping of field buttons you could again modify your initial pivot-table and chart to display the data on previous weight loss attempts (in Column G).

**Q3. Why is the type of chart used for the gender analysis not suitable for the previous weight loss attempts?**

![Previous weight loss attempts](chart)
It is probably best to create a new pivot-table to investigate previous weight loss attempts.

- Return to the data sheet and select cell A1. Use Data > PivotTable and PivotChart Report as before and accept the default settings. At Step 3 a cautionary message will appear suggesting that you re-use the existing pivot-table – respond No to this message to create a new table.
- Drag the Attempts button into the Row Field area, Treatment group into the Column area, and Gender into the Data Items area.
- Double-click on the Count of Gender button and under Options choose to show the data as % of column.
- Click on the Chart Wizard icon to create a chart. A stacked column chart will be created by default.
- Re-locate the chart so that it is on the same sheet as its source table.
- Right-click on a blank piece of chart area and under Chart Type change to a Clustered Column chart. With some additional formatting it could look like the one below.

Q4. Is there a difference in the distribution of previous weight loss attempts between the two groups?
**Age analysis**

Try replacing *Attempts* by *Age* in your previous pivot-table.

**Q5. Why is the clustered column chart unsuitable for the age data?**

- Right-click on the *Age* button in your pivot-table and choose **Group and Outline > Group**. Accept the default grouping by clicking on **OK**.
- Actually age is a continuous numerical variable and there should be no gaps between the columns. Reduce the gap between the columns to zero by right-clicking on one of the columns and using **Format Data Series > Options**.

Although it is possible to see the age distribution of both groups quite clearly, this chart is technically incorrect as it suggests that each column only spans half of the interval it covers. It would be better to draw a separate chart for each distribution.

- Click on the drop-down arrow next to the **Treatment group** button in the pivot-table and de-select **New drug**. You should get a chart like the one on the right.
- Repeat to get the distribution of the New drug group.

**Q6. Is there any evident difference in the distribution of patients’ ages between the two groups?**

The default age interval of 10 years is perhaps rather large. Return to the **Group** dialogue and experiment with smaller intervals such as 5 or 3 years.

**Q7. Is there any difference now in the distribution of patients’ ages between the two groups?**
**Height and baseline weight**

Try replacing Age by Height in the analysis above.

**Q8. Does the distribution of patients’ heights differ between the two groups?**

Repeat the analysis using the baseline weights, stored as **Weight at week 0**.

**Q9. Does the distribution of patients' baseline weights differ between the two groups?**

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**Weight difference**

It is of interest to see if the weight loss for each treatment group follows a Normal distribution. You can calculate the weight losses as follows.

- Return to the data sheet and in cell L1 enter the column label **WtLoss**.
- In cell L2 enter the formula `=I2-J2`, to calculate the weight loss, and copy it down to L38.

WtLoss will not appear among the variable fields on the PivotTable toolbar, because the specified data source was A1:K38. You can change this to include Column L as follows.

- Right-click anywhere within an existing pivot-table and select the **Wizard** option on the menu.
- Click the **Back** button to return to Step 2 of the Wizard and change the K to L in the data range, then **Finish**.

You should now be able to investigate the distribution of **WtLoss**.

**Q10. Is weight loss Normally distributed for each treatment group?**

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**Further investigation**

You could investigate whether there is a difference in motivation rating or age at onset between the two groups of patients, or between the genders.