MAX REPORTING GUIDE SUPPLEMENT: USING TEXT, TABLES AND CHARTS TO COMMUNICATE DATA AND ANALYSIS FINDINGS

PLEASE NOTE THAT YOU WILL NEED TO BE LOGGED IN TO THE MAX TOOLKIT TO ACCESS THE GUIDES AND TOOLS LINKED IN THIS GUIDE.

Terms used in this guide: ASCOF (Adult Social Care Outcomes Framework); ASCS (Adult Social Care Survey); PSS SACE (Personal Social Services Survey of Adult Carers in England [or Carers' survey]).

INTRODUCTION

Data – and the key messages from data analysis – can be described or displayed in reports and presentations using a combination of text, tables and charts.[1] Selecting the most appropriate method of communication and communicating clearly and succinctly, however, can be challenging. Reporting and communication errors are surprisingly common and include charts or tables being used to describe the relationship between two values (text is more appropriate) or display a large amount of data (tables are more appropriate).

Unclear tables and charts and/or vague and ambiguous text may result in confusion, misunderstanding or disengagement, and your analysis findings not being used as intended.

This guide is designed to supplement the **MAX reporting guide** and can help you to produce succinct and unambiguous text and informative tables and charts. These guides and associated tools have been developed in response to the reporting practices and challenges described by local authority (LA) staff during the initial fact-finding phase of the MAX project,[2] and summarise the relevant strategies drawn from the report writing and data visualisation literature.

GETTING STARTED

SELECTING THE MOST APPROPRIATE DATA PRESENTATION METHOD

The most appropriate method of communicating ASCS and PSS SACE data should be determined by the **number of values** and the **type of message** you would like to convey. The use of unsuitable communication methods is surprisingly common but can be avoided by using the guidelines summarised in Table 1 below.

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[1] The MAX reporting guide and associated tools uses the term 'chart(s)' to refer to charts and graphs.
[2] See Heath et al. (2015) *How can MAX help local authorities to use social care data to inform local policy?* , available at www.maxproject.org.uk

Table 1: Guidelines for selecting the most appropriate data presentation method

Method	When to use
Text	• Describing two values • Summarising patterns in larger data sets (e.g. data displayed in tables or charts)
Table	• Displaying three or more values • Displaying large amounts of data and/or more than one unit of data • Readers need to know the numbers
Chart	• Displaying three or more values • Conveying a specific message about what the data means • Readers need to know the general trends or patterns

Key source: Ehrenberg (1978)

The **stage of your analysis** – and therefore the overall purpose of your data presentation – may also determine whether a table or chart is the most appropriate method of communicating ASCS and PSS SACE data or analysis findings. The guidelines summarised in Table 2 below may help you to establish the most suitable format.

Table 2: Guidelines for selecting between a table and chart

Stage	Table or chart?	Explanation
Exploration	Chart	Enables analyst/reader to get a feel for the data
Analysis	Table	Supports the in-depth analysis of data
Reporting	Chart	Helps communicate broad conclusions to others

Adapted from Cox (1977) quoted in Ehrenberg (1978)

TEXT: DESCRIBING QUANTITATIVE AND QUALITATIVE DATA

Text is used to describe or summarise the key findings from quantitative and qualitative analysis and, if written and structured well, can enhance the overall accessibility of a report. The guidelines summarised in Box 1 are drawn from the wider literature on report writing and may help you to convey the key messages from your analysis clearly and concisely.

- Always use clear, unambiguous and concise English

- Avoid technical jargon and acronyms wherever possible, and describe/explain them fully in everyday language when first used (e.g. in footnotes or glossary)

- Keep sentences short and focus on one issue or subject

- Ensure headings and subheadings describe the content of the section

- Apply text formatting consistently and use upper and lower case (rather than all capitals).

- Ensure chosen font is easy to read – recommended fonts include:

    Serif (with embellishment): Times New Roman, Palatino, Georgia

    Sans Serif (without embellishment) Arial, Calibri, Verdana, Helvetica

TABLES AND CHARTS: DISPLAYING QUANTITATIVE DATA

Tables and charts can be used to display data visually and can help readers to explore and make sense of large and often complex data sets (such as those provided by the ASCS and PSS SACE) and/or analysis findings. A familiarity with some of the relevant principles of data visualisation will help you to avoid some of the more common table and chart errors (e.g. omitting key features such as data labels and a suitable measurement scale).

TABLES: NUMERICAL DISPLAYS OF DATA

"Tables supplement, simplify, explain and condense written material … and, when well designed, are as memorable (as graphs)"

(Bigwood and Spore, 2003, p26)

Tables organise numerical data into vertical columns and horizontal rows and are particularly useful for displaying and summarising large amounts of data (e.g. using totals, averages, frequencies and distributions). There are two types of tables:

Demonstration	Demonstration tables use actual or rounded figures to emphasise a point (e.g. a key trend or exception) and are usually found in the main body of a report.
Look-up	Look-up tables store and organise raw data for further reference and are usually found in the appendices of a report.

Tables are often overlooked in favour of more visually appealing charts and graphs but have a number of strengths that, in some cases, make them a superior method of communicating data. For example, tables **excel at managing and displaying large amounts of data** and **can succinctly communicate multiple units of measurement** and both detailed and summary figures. Tables are also **generally well understood** and are **less prone to distortion** than charts and graphs.

When to use tables and why: guidelines for the brave provides additional guidelines on when to use tables and is available for download at
http://www.plainfigures.com/downloads/when_to_use_tables_and_why.pdf

GRAPHS AND CHARTS: GRAPHICAL DISPLAYS OF DATA

The power of graphs is their ability to present the shape of the data all at once, within a single eye-span
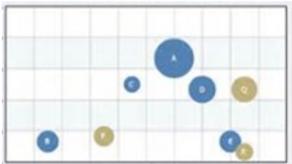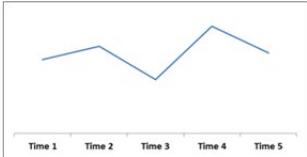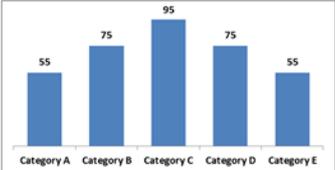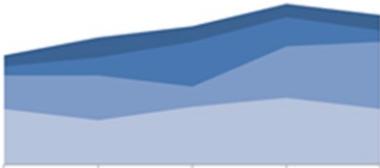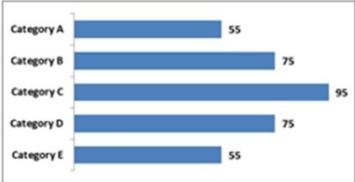
Stephen Few, 2004

Charts are visual displays of data and are **particularly useful for showing qualitative aspects of a quantitative data set** (e.g. broad relationships, patterns and trends) that, according to Bigwood and Spore (2003, p38), '*are difficult to see in tables or to describe in words*'.

Standard word processing and spreadsheet software, such as Microsoft Word and Excel, provide a wide range of graph and chart options but, while visually appealing, most are generally considered unsuitable methods for displaying data. Charts, doughnut charts, pie charts and area graphs, for example, take considerable time to comprehend and may

confuse or even mislead the reader. Line graphs, bar charts and column charts are easier to understand and are therefore generally considered the most suitable method of displaying data. An overview of which charts to avoid and which charts to use in your reports and presentations is provided in Table 3.

 Eenie, meenie, minie, moe: selecting the right graphs for your message – provides an accessible overview of the most appropriate methods for displaying the different patterns found in quantitative data analysis. Available at https://www.perceptualedge.com/articles/ie/the_right_graph.pdf

Table 3: Charts to avoid and use

X **Charts to avoid**	✔ **Charts to use**
 Bubble charts	 Line graphs
 Doughnut charts	 Bar chart
 Area charts	 Column chart

STRATEGIES FOR PRODUCING INFORMATIVE TABLES AND CHARTS

Despite widespread use in reports and presentations, data tables and charts are often badly designed. Such tables and charts often include features that disrupt eye-scanning (e.g. excessive gridlines or bold shading) and/or exclude features that support comprehension (e.g. titles, column or row headings) and, as a result, fail – or only partially succeed – to convey the intended information or message.

Creating tables and charts that communicate clearly and accurately, however, is relatively easy and can be achieved by following a few design principles and rules (see Box 2).

Box 2: General design principles for creating informative tables and charts

Tables and charts must be accompanied by a verbal commentary, which describe what the data shows (i.e. the 'key messages') rather than the data itself (i.e. the quantitative features, which are already apparent in the table).

Rule 1: Include all key components

- Table/chart number and title (including all relevant information e.g. units of measurement)
- Column and row headings (tables) or axis titles (charts)
- Appropriate scale (charts)
- All relevant data (plus links to reference tables if appropriate)

Rule 2: Use a simple layout

- Select the most appropriate chart (charts)
- Do not use 3D or overlapping bars (charts)
- Use single-spaced rows and narrow columns (tables)
- Use white space and subtle fill
- Avoid excessive gridlines and heavy shading

Rule 3: Write clearly, concisely and precisely

- Keep it simple and be succinct

- Ensure accuracy

- Use consistent formatting and handle numbers appropriately

Rule 4: Embed tables in a clear and structured page

RULE 1: INCLUDE ALL KEY COMPONENTS

An informative table or chart includes a range of features to support comprehension, such as a reference number, title, and column and row headings (see Figure 1), and links to accompanying text. Footnotes and data sources should be included where relevant.

Figure 1: the key components of an informative table or chart

> The verbal commentary accompanying tables and charts should describe what the data shows (i.e. the 'key messages). A common strategy of describing the data itself (i.e. the quantitative features that are already apparent in the charts) should be avoided.

Table | chart number: links the table or chart to the accompanying text. To avoid confusion, they must be numbered sequentially (e.g. Table 1, Table 2 etc.).

Title: a succinct description of the subject or purpose of the table or chart. A title should be clear, concise and include all the relevant information (e.g. units of measurement etc.). Ambiguous terms and abbreviations should be avoided where possible or be defined in footnotes.

Column and row headings [tables only]: descriptions of the data contained respectively in the table columns or rows. Headings should be clear and self-explanatory (e.g. by avoiding abbreviations and/or adding further information in footnotes).

Axis title or labels [charts only]: titles, labels and/or appropriate scales are required for both axes. Additional information (e.g. units of measurement, source of data) can be included in footnotes (see Figure 1).

Data: the information stored in the table or chart. Data can be text or numerical, and should be limited to what is necessary to fulfil the information needs of report recipients and/or convey the intended message. Reference (or look-up) tables containing the entire data set can be added to the appendices of a report as required.

Data labels [charts only]: optional feature if axes titles or scales are used. May help reader to digest numbers.

Legend [charts only]: enables reader to identify different categories or groups of data. Usually best positioned at the bottom of the chart. Can be omitted if data sets can be labelled directly.

Further info: sparklines and/or comparisons can be added to a table to help readers to explore the data and/or identify trends, and can improve the overall accessibility and value of the table
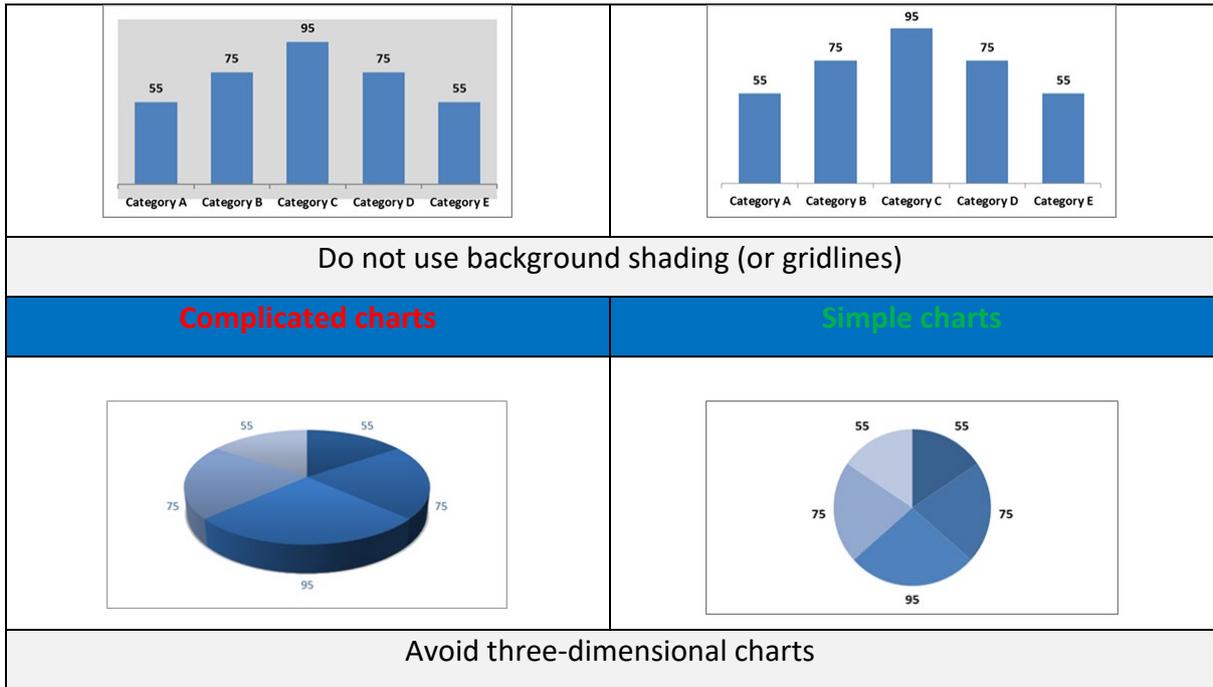
RULE 2: USE A SIMPLE LAYOUT

Excessive gridlines, patterns and heavy shading are common features of tables and charts but they can disrupt natural eye-scanning tendencies and, consequently, comprehension of the data contained within them. A number of alternative features, however, can be adopted to help organise data into tables and charts, and support comprehension, including white space, subtle fill and restrained gridlines.

Simple and appropriate charts: select the most straightforward chart to display your data (usually a line, bar or column chart) and avoid graphical features that do not contribute to the readers' comprehension of the data and the overall intended message of the chart.

Such graphical features – often referred to as '**chart junk**' – include excessive patterns, background shading and three-dimensional components; in some cases, they can distort the data and result in misinterpretation. The examples shown in Box 3 demonstrate the value of using simple layouts and chart designs, and further information about each type of chart can be found in the next section.

Box 3: comparisons of overly complicated and simple charts

Complicated charts	Simple charts
Avoid excessive patterns	

Do not use background shading (or gridlines)	
Complicated charts	Simple charts
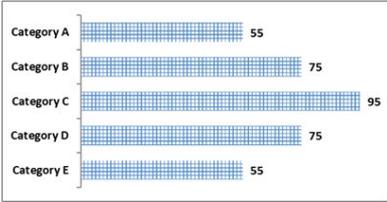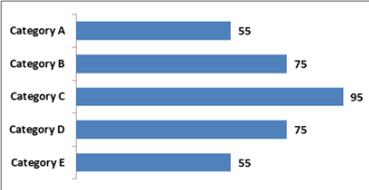
Avoid three-dimensional charts	

White space: blank areas within and around a table or chart can be used to facilitate eye scanning and, in the case of a table, break up larger data sets (e.g. by inserting blank lines every four or five rows) and/or to direct focus to particular areas. Where possible, tables and charts should also be surrounded by areas of white space to establish clear separation from the accompanying text.

	A	B	C	TOTAL
Row 1	14	21	10	45
Row 2	35	28	19	82
Row 3	24	32	17	73
Row 4	18	38	11	67
Row 5	24	32	15	71

Wider spacing to the left and/or right of a column (in this case, after column C) encourages vertical eye scanning (i.e. scanning down the column)

	A	B	C	TOTAL
Row 1	14	21	10	45
Row 2	35	28	19	82
Row 3	24	32	17	73
Row 4	18	38	11	67
Row 5	24	32	15	71

Wider spacing above and below a row (in this case, Row 1) encourages horizontal eye-scanning (i.e. scanning across the row)

Subtle fill: light shading can be used for highlighting data, defining different categories and/or helping readers to scan across larger data sets. Bold colours, which reduce the clarity of the data, should be avoided.

	A	B	C	TOTAL
Row 1	14	21	10	45
Row 2	35	28	19	82
Row 3	24	32	17	73
Row 4	18	38	11	67
Row 5	24	32	15	71

Dark shading can reduce the clarity of the data.

	A	B	C	TOTAL
Row 1	14	21	10	45
Row 2	35	28	19	82
Row 3	24	32	17	73
Row 4	18	38	11	67
Row 5	24	32	15	71

Light shading can support eye scanning, in this case across the row.

Gridlines: lines and rules are commonly used to demarcate data but often disrupt eye-scanning and data comparisons. White space or a subtle fill are the preferred options, but lines can be used to separate headers and totals.

	A	B	C	TOTAL
Row 1	14	21	10	45
Row 2	35	28	19	82
Row 3	24	32	17	73
Row 4	18	38	11	67
Row 5	24	32	15	71

Multiple gridlines disrupt eye-scanning and data comparisons so should not be used.

	A	B	C	TOTAL
Row 1	14	21	10	45
Row 2	35	28	19	82
Row 3	24	32	17	73
Row 4	18	38	11	67
Row 5	24	32	15	71

Single lines can be used to separate column headings or delineate data without disrupting eye scanning.

RULE 3: WRITE CLEARLY, CONCISELY AND PRECISELY

Text is used to label the data displayed within tables and charts, and to describe what the data shows (e.g. particular patterns or exceptions). To avoid confusion and/or misinterpretation, ensure that you do the following:

Keep it simple: overly complicated sentences can hide the key message(s) you wish to convey. To aid interpretation:

- Use plain language to label and describe your tables and charts;

- Avoid ambiguous words, and limit technical terms, abbreviations and acronyms to the necessary. Define any potentially confusing terms, abbreviations and acronyms in footnotes or accompanying text; and

- Ensure that each table or chart conveys one message. Use multiple tables and charts where necessary.

Be succinct: long-winded prose may confuse your reader and lead to disengagement. To encourage readership, limit your descriptions of your tables to the key information needed by the report recipient to make sense of the data.

Ensure accuracy: minor errors or discrepancies in or between tables and supporting text can cause considerable confusion. Allow sufficient time to recheck your tables or, where possible, ask a colleague to check them for you.

Use consistent formatting:

- Align numbers to the right and text to left;[3]

- Total column data in the bottom row and row data in the left column; and

- Use similar format throughout report or presentation

Handle numbers appropriately:

- Order logically by row or column (e.g. largest to smallest);

- Compare numbers in columns rather than rows;

- Ensure unit of measurement (if applicable) is specified;

- Do not use more than 2 decimal points unless necessary; and

- Consider rounding numbers in summary tables

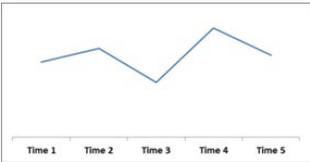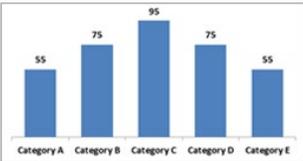[3] Single letters, such as Y or N, can be centred

RULE 4: EMBED TABLES AND CHARTS IN A CLEAR AND STRUCTURED PAGE

The overall design of the page can hinder eye-scanning and comparisons, and can affect the extent to which the key messages communicated by tables are absorbed and understood. To avoid these relatively common pitfalls, ensure that tables and charts are close to explanatory text, ideally on the same page, and are linked using table numbers and appropriate referencing.

## OVERVIEW OF THE MOST SUITABLE CHARTS FOR DISPLAYING DATA

Quantitative (numerical) data can be displayed most clearly in line graphs or bar/column charts. These are summarised in Table 4 along with pie charts that, though generally considered an unsuitable method for displaying data, are favoured by many producers of reports and report-recipients.

**Table 4: overview of the most suitable charts for displaying data[4]**

	Line graph	**Bar/column chart**	**Pie chart**
Data	Continuous	Discontinuous	Categorical
Display	Change(s) over time Relationship between variables	Frequencies, counts or characteristics (e.g. mean) Changes over time Comparisons Parts of a whole	Parts of a whole

[4] Please note that the charts used in this section are for illustration purposes only and may lack some essential features.

LINE GRAPHS
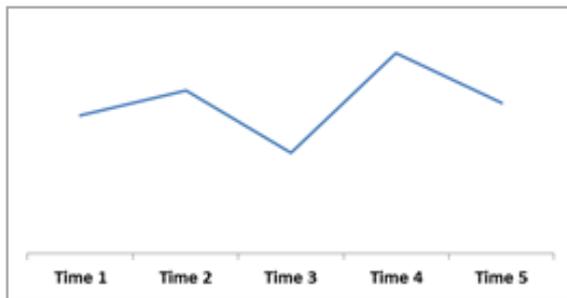
Simple line chart
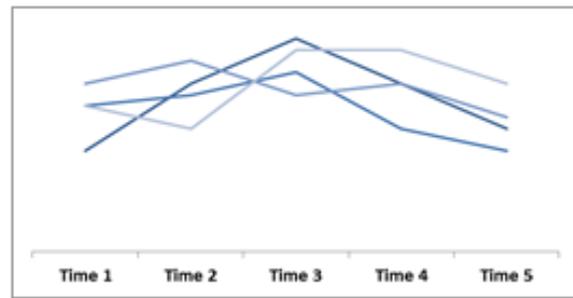
Multiple line chart

| Description |
| --- |
| Line graphs are a simple and common method of displaying **continuous data**[5] where individual data points are plotted along the horizontal x-axis and are measured against the vertical y-axis. In contrast to scatter plots where a single line is used to demonstrate a trend among the values in the data set, a single line is used in line graphs to join the individual data points from the same data set. |
| **Used to display** |
| • **Change** (e.g. variations in ASCOF 1A over time)
• **Comparisons** (e.g. variations in all ASCOF scores over time) |
| **Strengths** |
| Line graphs are easy to design and simple to understand, and can clearly demonstrate patterns and trends. If sufficient data is available, line graphs can be used to depict multiple datasets (so good for comparisons) or predictions. |
| **Recommendations** |
| • Use a limited number of lines (five or fewer)
• Include a sufficient amount of data (four data points or more on a single line) to demonstrate a pattern. Use text if using less.
• Ensure the axis does not distort the data |
| **A word of caution** |

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[5] Data that takes a value in an unlimited range and is measured (e.g. on a scale) rather than counted.

Line graphs are not good at displaying small changes or differences so take time to explore other chart options.

VARIATION: AREA OR LAYERED LINE GRAPHS
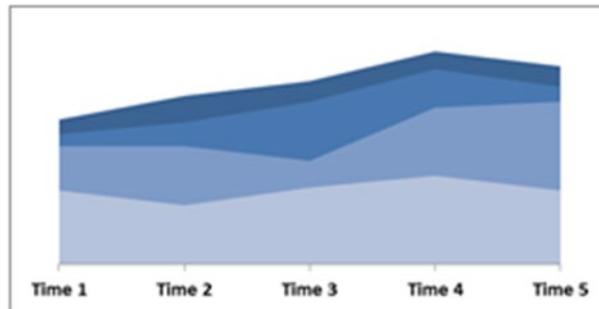

Area Graph

Area or layered line graphs use colours to block out the area under the line. According to the data visualisation expert Stephen Few, such graphs *sacrifice comprehension for showmanship* (2012, p69) and should be avoided.

Doing the line charts right provides an accessible overview of how to design line charts. Available at https://vis4.net/blog/posts/doing-the-line-charts-right/

Further information about line graphs, including instructions on how to create them in Excel, is available at http://betterevaluation.org/evaluation-options/LineGraph

BAR OR COLUMN CHARTS
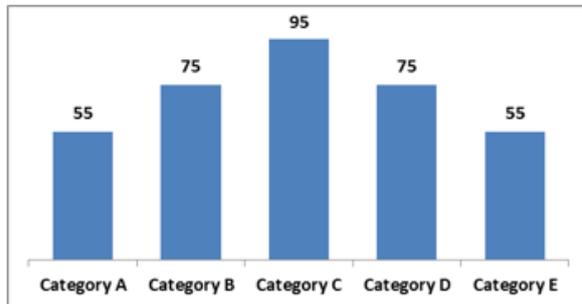
Vertical column chart
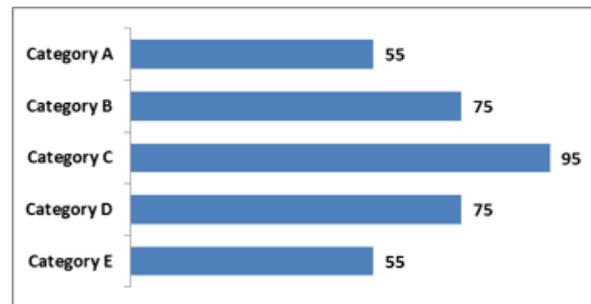
Horizontal bar chart

Description
One of the most commonly used types of chart where data is represented as solid columns or bars, and is plotted against one axis and is measured against the other. Data represented in a column or bar chart is **discrete**[6] and can be **quantitative** (i.e. numerical) or **qualitative/categorical** (i.e. non-numerical). The length of the bars or columns are proportional to the size of the category they represent: thus, higher columns and longer bars have a higher value than lower columns or shorter bars.

Used to display
Frequency, count or key characteristics (e.g. breakdown of respondents by age categories)   **Changes over time** (e.g. variations in carer-reported QOL over data collections)   **Comparisons** (e.g. average SCRQOL for men vs women)   **Parts of a whole** (e.g. breakdown of social contact by level of need)

Strengths
Bar and column charts are easy to design and simple to understand. They are adaptable (see variations below) and can display positive and negative values. Bar and column charts are also more effective than pie charts at displaying parts of a whole

Recommendations
Use columns or bars of equal width

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[6] Data that takes a value in a limited range and is counted rather than measured.

- Order columns/bars of **nominal data**[7] by size and **ordinal data**[8] using the most appropriate sequence
- Ensure axis does not distort the data
- Include all relevant data

Variations
• Histogram

Box 4: Choosing between column and bar charts

Column charts are traditionally used to display data but can sometimes be hard to label (e.g. when categories labels are overly long or include acronyms). In these cases, a horizontal bar chart may be the more suitable option. Experiment with both approaches and see what works best for your data.
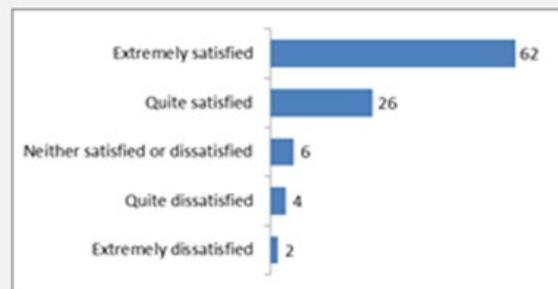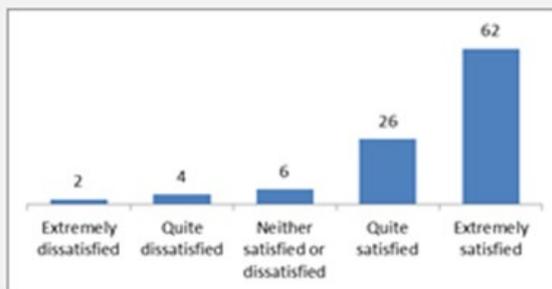
The **University of Leicester** have written a useful guide to bar charts and bar chart variations - http://www2.le.ac.uk/offices/ld/resources/numerical-data/bar-charts

The **Better Evaluation** website has a short overview of bar charts and a link to guidelines on how to create bar charts in Exce - http://betterevaluation.org/evaluation-options/BarChart

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[7] Data that can be classified into distinct categories but has no numerical value or order.
[8] Data that can be categorised and ordered but the gaps between the categories are not equal

VARIATION: HISTOGRAMS
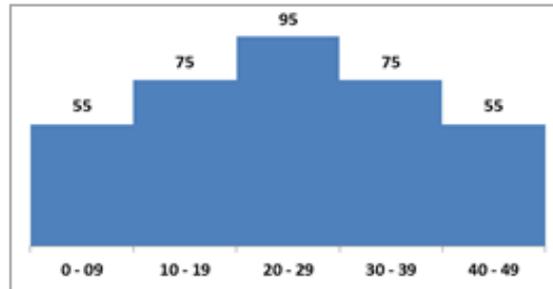
Description
A form of bar or column chart where **continuous**[9] **quantitative data** is represented as solid columns or bars and is plotted individually or in intervals against one axis (usually the horizontal x-axis) and is measured in terms of frequencies, percentages or proportions against the other axis (usually the vertical y-axis). Columns or bars are placed alongside each other (i.e. without a gap) to indicate that data is derived from the same set, and the area of the bars or columns is proportional to the size of the category they represent; thus, larger columns and bars have a higher value than smaller columns or shorter bars. Depending on the range of values within the data set, data may be organised into groups.
Used to display
Frequency, count or key characteristics (e.g. breakdown of respondents by age categories)   **Dispersion or distribution of data** (e.g. distribution of SCRQOL composite scores)
Strengths
Histograms, like bar and column charts, are easy to design and simple to understand. They can manage, organise and simplify large data sets, and display positive and negative values.
Recommendations
When grouping data, use equal intervals (e.g. 0-9, 10-19, 20-29)

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[9] Data that can take a value in an unlimited range and is measured (e.g. on a scale) rather than counted.

Bar/column charts are used to display and/or compare categorical variables belonging to distinct groups. Histograms, on the other hand, are used to show the distribution of variables belonging to the same group or category.

| Bar/Column Chart	Histogram
Categorical data	Quantitative data
One measurement scale	Two measurement scales
Comparison of variables	Distribution of variables
Bars / columns are separate	Bars / columns are joined

The **University of Leicester** have written a useful guide to histograms - http://www2.le.ac.uk/offices/ld/resources/numerical-data/histograms

The **Better Evaluation** website also includes a short overview of histograms and a link to guidelines on how to create histograms in Excel™ - http://betterevaluation.org/evaluation-options/BlockHistogram

VARIATION: GROUPED OR CLUSTER COLUMN AND BAR CHARTS
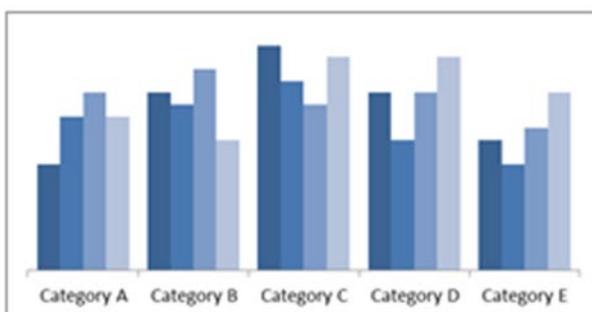
Cluster column chart
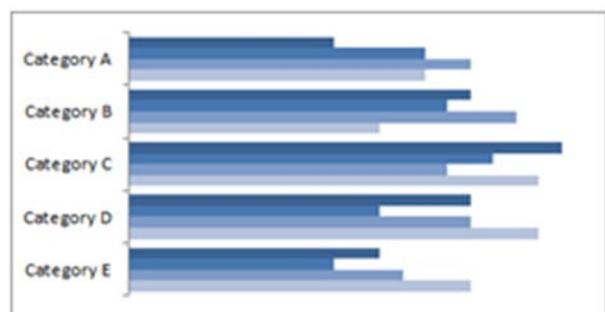
Cluster bar chart

Description
A form of bar or column chart where sub-groups of data categories are represented as solid columns or bars and are plotted against one axis and are measured along a scale against the other axis. Columns or bars of data belonging to the same category are placed

alongside each other (i.e. without a gap) to indicate that data is derived from the same set. Groups of columns or bars are set apart from each other (i.e. with a gap) to indicate that the data for each group is derived from different data sets.

Used to display
• Comparisons (e.g. ASCOF scores by domain, grouped by year of data collection)

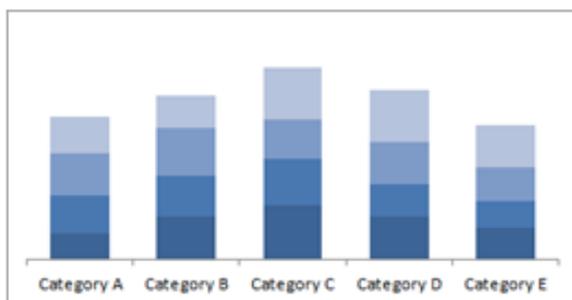| **Strengths** |
| --- |
| • Easy to design and simple to understand

• Can manage, organise and simplify large data sets

• Can be used to display positive and negative values |

| **Recommendations** |
| --- |
| • Use colour to delineate different categories

• Consider adding data labels or linking to a data table to facilitate comparisons

• Limit the number of categories |

| **A word of caution** |
| --- |
| Such charts are useful for comparisons but can easily distort the data if not designed well. Take time to consider the presentation of your data (in particular, the most appropriate primary axis) and, where possible, get feedback about your chart from a colleague who is not familiar with the data. |

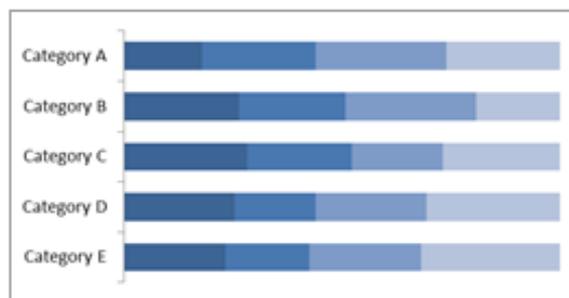## VARIATION: STACKED OR COMPONENT COLUMN OR BAR CHARTS

Stacked column chart
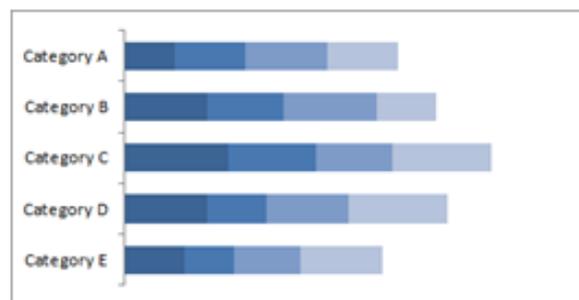
Stacked bar chart
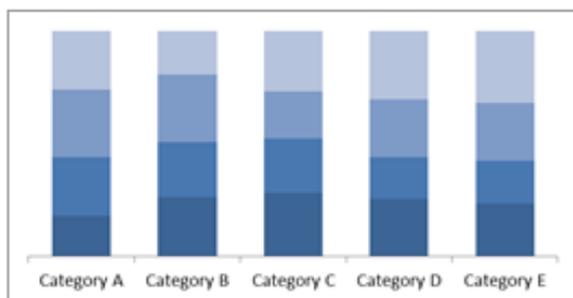
100% Stacked column chart

100% Stacked bar chart

| Description |
|---|
| A form of bar or column chart where components of the same data set are represented as elements of a single column or bar, stacked on top of each other. Data can be presented as frequencies in normal stacked/component charts or as percentages in 100% stacked/component charts. |
| **Used to display** |
| • Change (e.g. over time)
• Breakdown of response options (e.g. for individual survey questions, such as satisfaction by response) |
| **Strengths** |
| • Easy to design and simple to understand
• Can manage, organise and simplify large data sets
• Can be used to display positive and negative values |
| **Recommendations** |
| • Use colour to delineate different elements
• Consider adding data labels or linking to a data table to facilitate comparisons
• Limit the number of categories |
| A word of caution |
| While visually pleasing, these charts can easily distort the data and/or be hard to read, particularly if the value of the lower elements varies considerably. A potentially more suitable alternative is a grouped or cluster column or bar chart. |

> The **Better Evaluation** website has a short overview of stacked bar charts and links to a number of useful articles and tools –
>
> http://betterevaluation.org/evaluation-options/stacked_graph
>
> **When are 100% Stacked Bar Charts Useful?** – a short and very useful blog written by Stephen Few - http://www.perceptualedge.com/blog/?p=2239
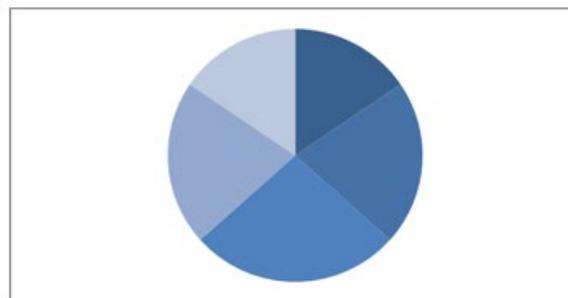
PIE CHARTS

While other types of chart are generally more effective at displaying data, guidance on how to create a pie chart is provided here for those of you who plan to include them in your survey reports (e.g. due to the reporting preferences of report-recipients).

Description
A common and much favoured type of chart where the data set is represented as a circle and independent elements within it as individual segments – or slices – of varying size. Data is **categorical** (**nominal**[10] or **ordinal**[11]) and must be exclusive (i.e. belongs to only one category) and based on the same unit of measurement (e.g. percentages).
Used to display
• Parts of a whole (e.g. percentages, ratios) using positive numbers (e.g. breakdown of a survey question by response option)
Strengths
• Popular type of data visualisation

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[10] Data that can be classified into distinct categories but has no numerical value or order.
[11] Data can be categorised and ordered, but the gaps between the categories are not equal.

Recommendations
• Limit the number of segments in the pie chart to a maximum of 6[12]   • Arrange segments into a coherent order (e.g. largest to smallest) and start from the 12 o'clock position   • Use shades of same colour to denote related components and different colours to denote unrelated components   • Emphasise data by detaching particular segments   • Reference the size of the whole (e.g. in the title or footnotes) to enable readers to gauge volume   • Avoid 3D effects which further distort the data

A word of caution
Despite their popularity, pie charts cannot convey detailed information, often distort the data and do not facilitate comparisons and interpretation as well as other chart types. We therefore recommend that pie charts are avoided wherever possible and are never used to compare two data sets (in this instance, a data table, line graph or bar chart is more suitable).

Excel Pie Charts – a short and accessible blog outlining the pros and cons of pie charts. Available for download at http://www.excelcharts.com/blog/data-visualization-excel-users/excel-charts-pie-charts/

Save the Pies for Dessert – a detailed and informative article on pie charts and the reasons why they should not be used to display data written by Stephen Few in the *Perceptual Edge Visual Business Intelligence Newsletter* (August 2007). Available for download at http://www.perceptualedge.com/articles/08-21-07.pdf

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[12] If data set has more than six segments, either group smaller components into a single segment or use a bar chart or table.

A Pie in the Face for Visual Information Research – another informative blog written by Stephen Few about pie charts -

https://www.perceptualedge.com/blog/?p=1492

Pie Charts are Bad – an amusing but thought-provoking blog on why pie charts should be avoided, written by Steve Fenton (April 2009). Available at

https://www.stevefenton.co.uk/2009/04/pie-charts-are-bad/

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