McMaster University
FAMILY MEDICINE

Presenting Data in Visually Engaging Ways

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Topics

- Basic Design for Data Visualization
- Designing Tables
- Designing Graphs
- Process Diagram (if time allows)

Learning Objectives

- Understand basic design concepts for creating tables and charts
- Apply methods of table and chart design in Office software

Practical Considerations

- Demonstrations will be in PowerPoint or Word (but applicable to other Office products)
  - These programs are common to everyone
  - Used for slides as well as poster design
- Many concepts should carry over to other software programs
- Presentation is aimed at creating posters and presentations
  - Approach might be a bit different than used in journal articles, one-pagers, funder reports, etc.

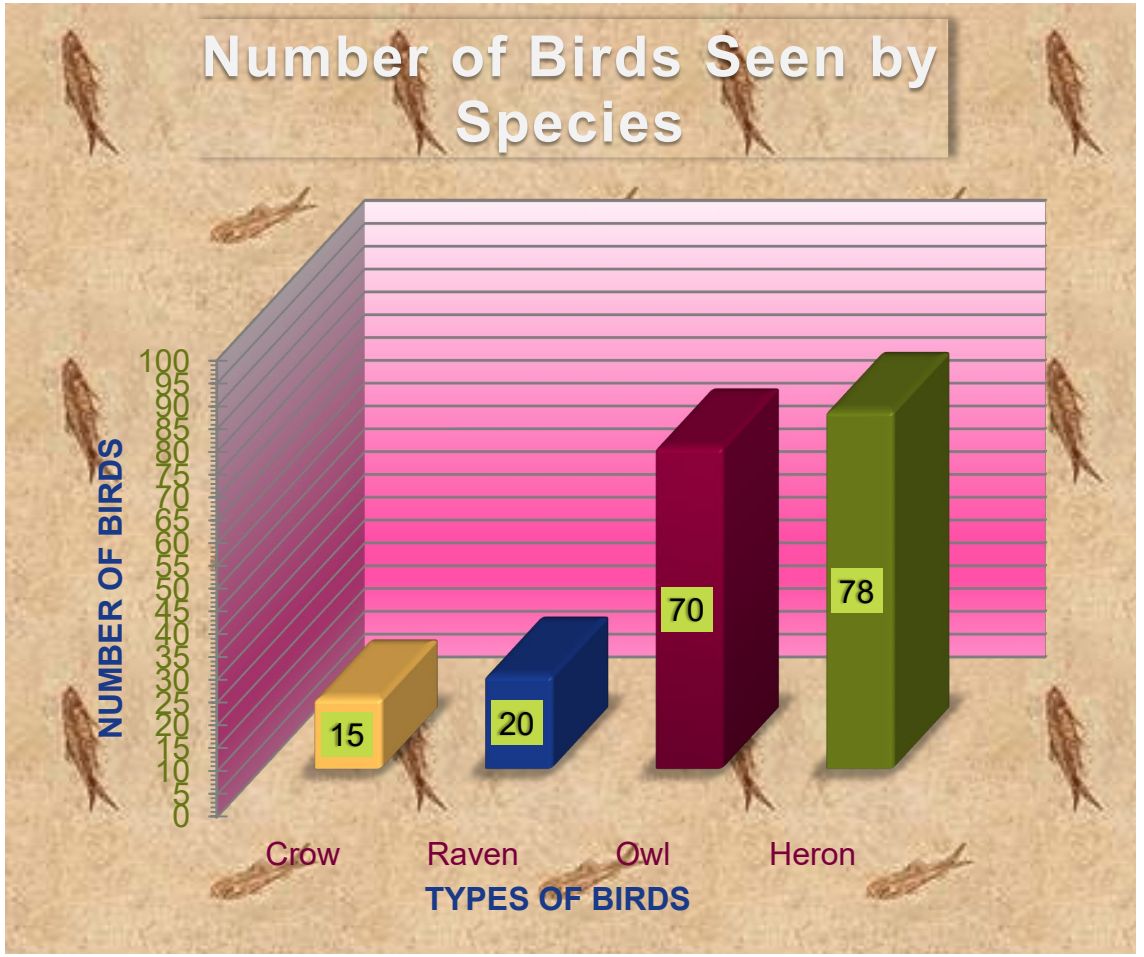
Disclaimer

If anything I say does not jive with proper statistical or research methodology or conventions, please say so and we can address it as a group

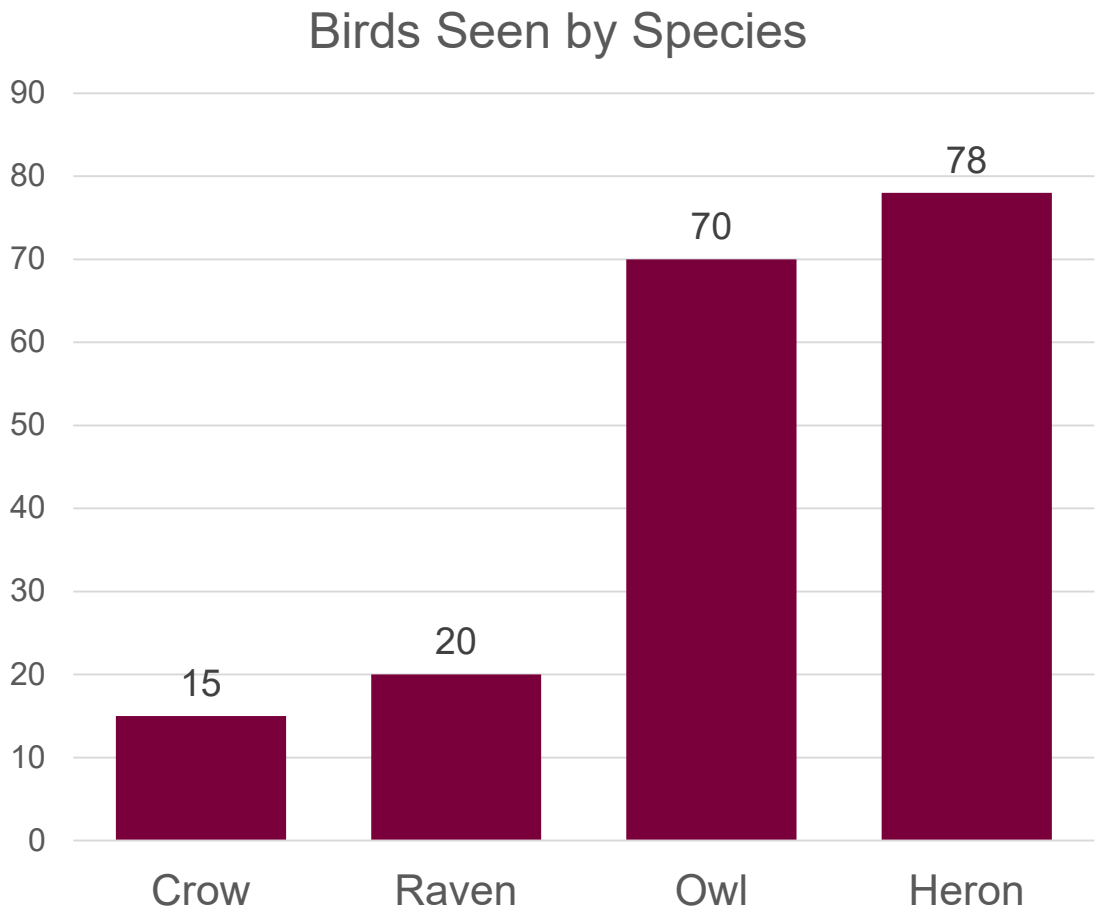
Basic Design Principles

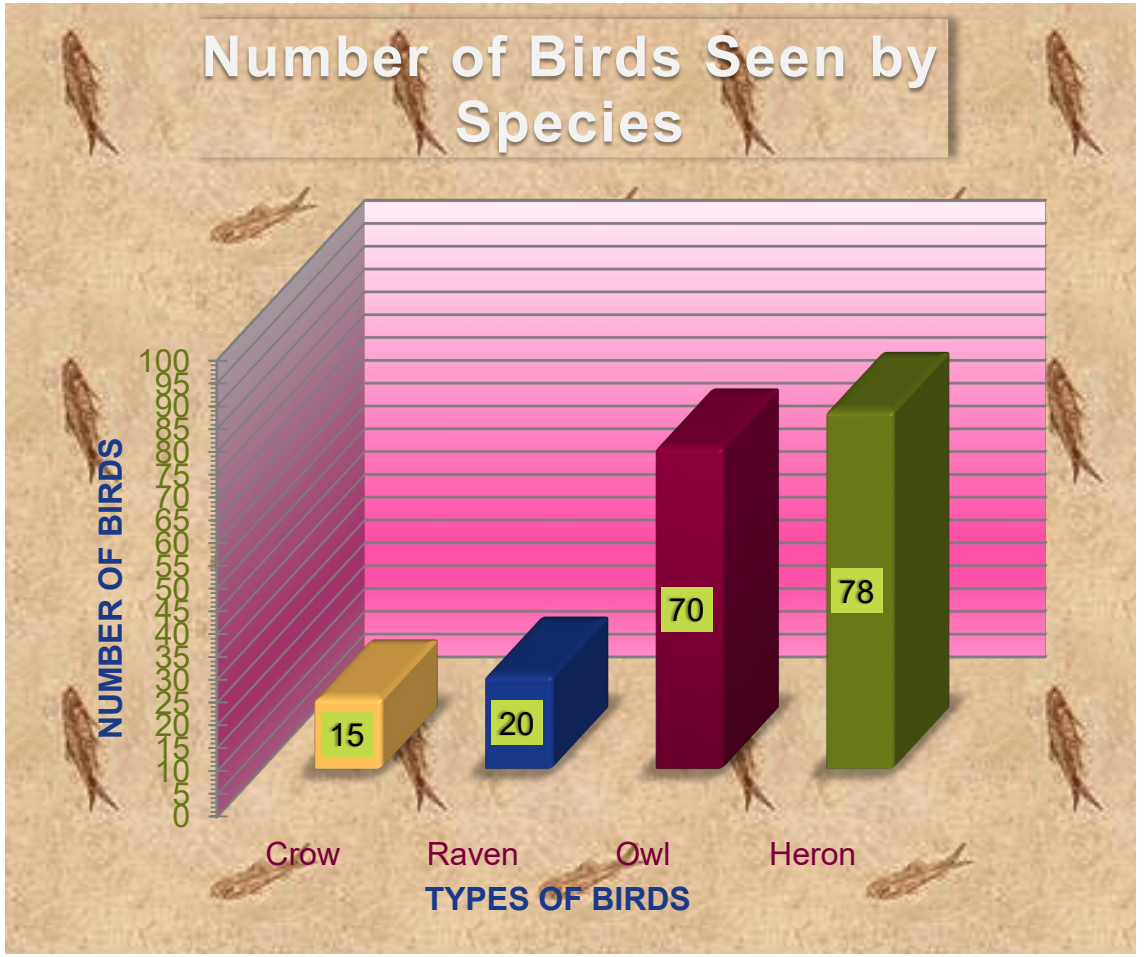
Chartjunk

- Unnecessary components of a chart – those that do not support the message of the chart or ease of reading the chart (Tafte E, 2001)

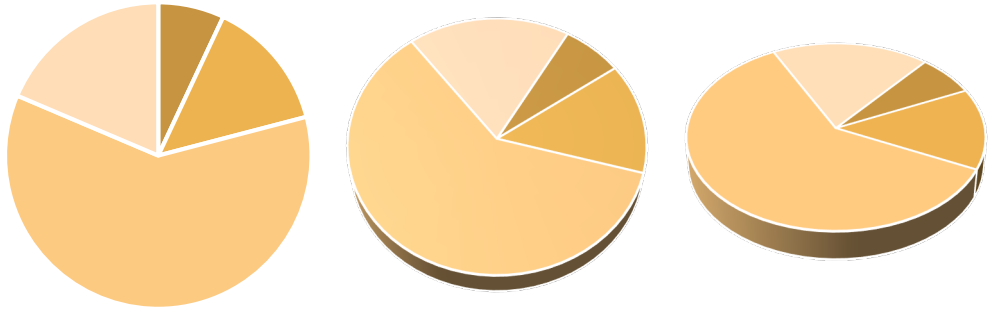


Chartjunk


Birds Seen by Species
90
80
70
60
50
40
30
20
10
0
15
20
70
78
Crow
Raven
Owl
Heron

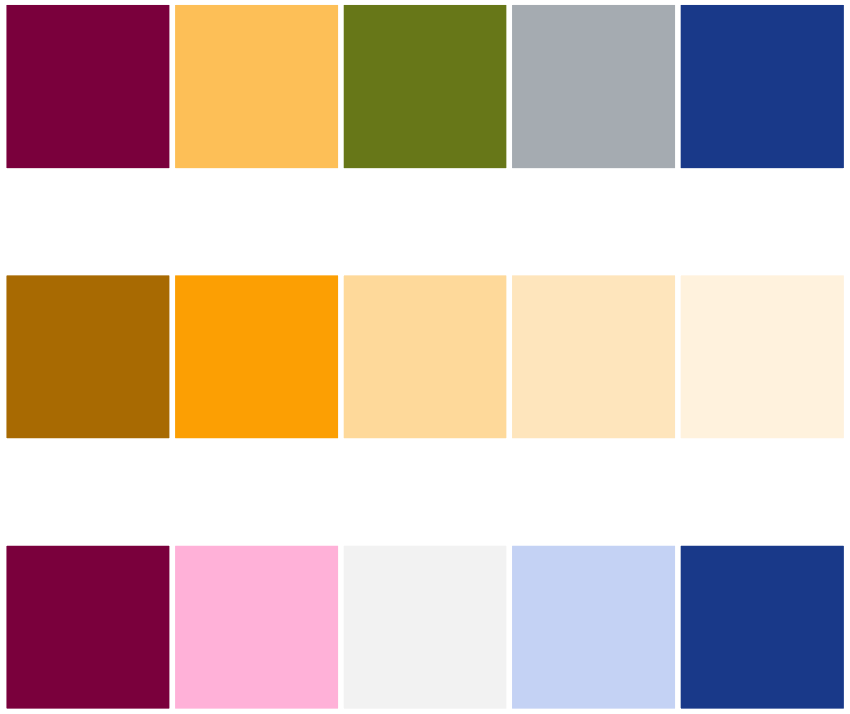

Number of Birds Seen by Species
NUMBER OF BIRDS
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
15
20
70
78
Crow
Raven
Owl
Heron
TYPES OF BIRDS

Common Chartjunk



- 3D
  - Adding an extra dimension, that has no significance to the data, only makes interpretation more difficult
- Insignificant colours
  - This includes coloured backgrounds (they only reduce contrast)
- Too many axis gridlines/marks
- Pictures
- Redundant information (e.g., between chart title and axis title)

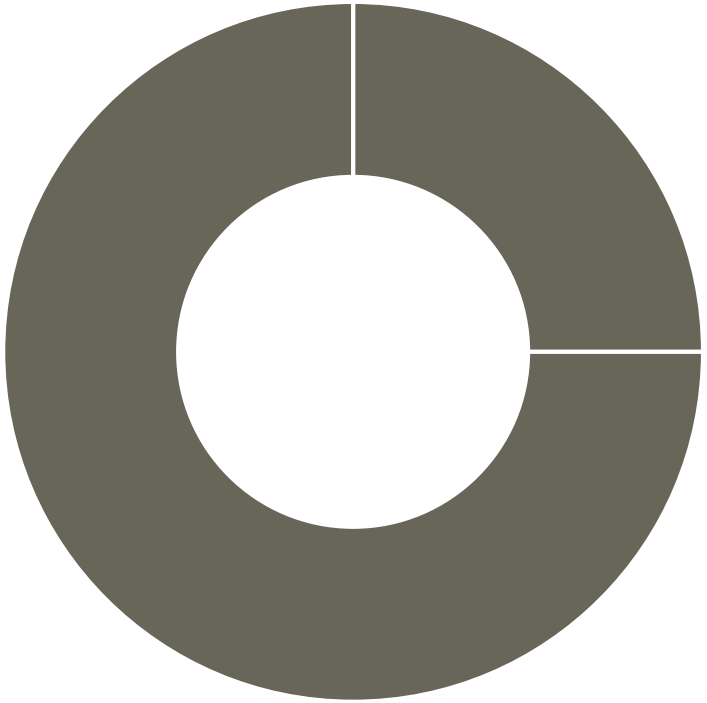
Colours



- Categorical
  - Colours are distinct and unrelated by order
- Sequential
  - Colours values change in a single direction from one extreme to the other
- Divergent
  - Colours move away from a neutral centre value in two directions

Colour Alone is Insufficient

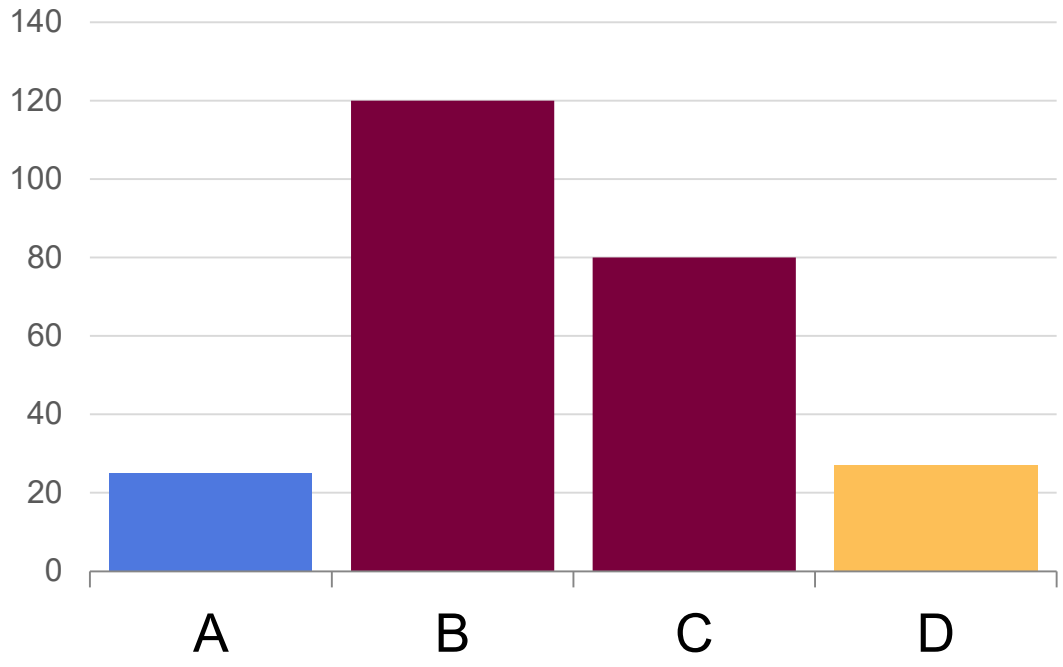
Simulated Protanopia

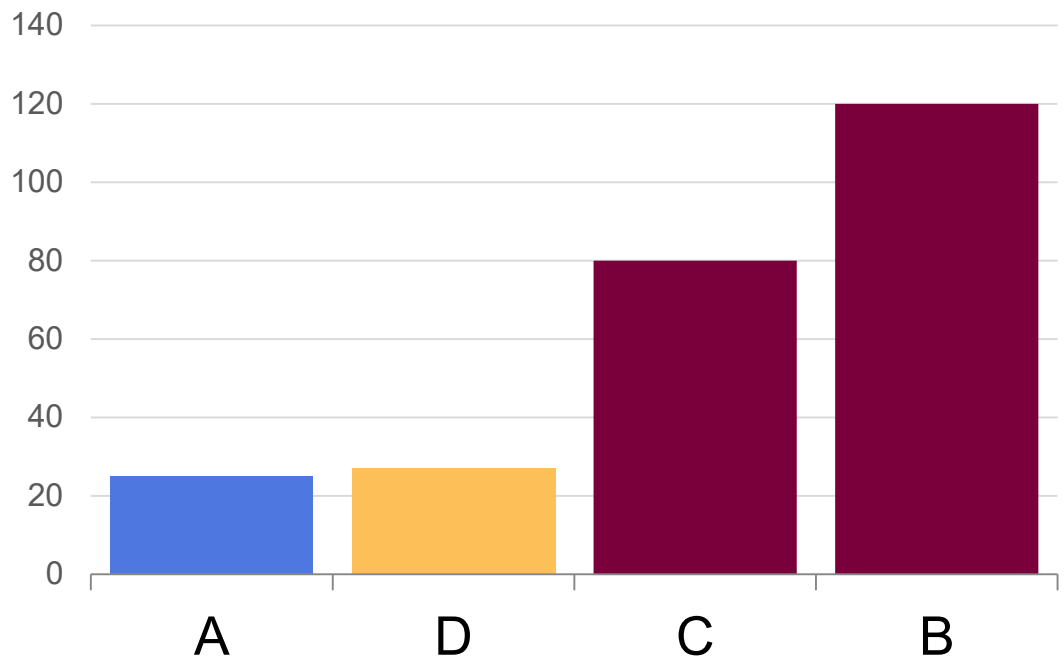


Typical Vision

Order Data to Make Important Comparisons Easy

- Ordering by value (rather than title) allows your viewer to closely compare similar values





BONUS TABLE RESOURCE

Start Slideshow to View

https://www.darkhorseanalytics.com/blog/clear-off-the-table

Designing Tables

Table Title	
	Column Headers
Row Stubs	Data
Foot Notes	
Source	

Two Types of Tables

Reference Table

- For others to draw conclusions with or critique your work
- Larger amounts of data

Demonstration Table

- Used to illustrate a point
- Generally shorter (just the data relevant to the point)

UK Government Statistical Service, 7.

Tips for Designing Tables

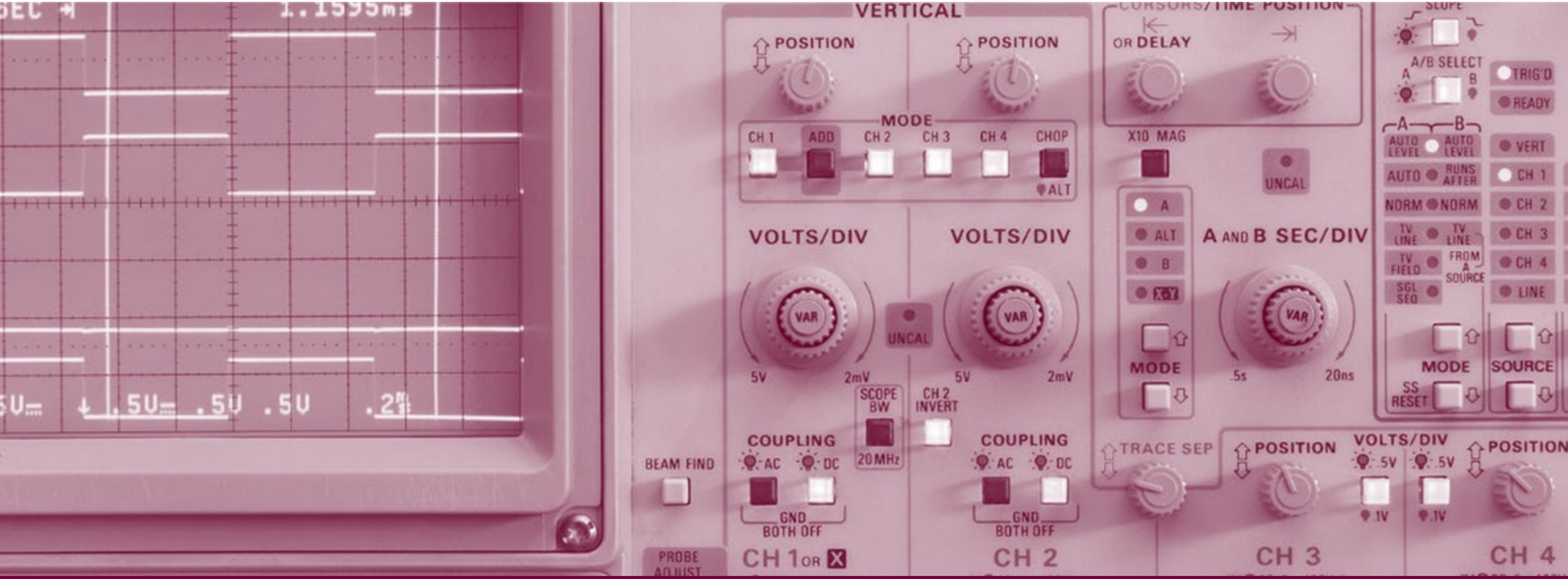
- Use cell margins to keep data uncluttered
  - Wide setting works well for Posters
- Don’t overuse gridlines
  - Light shading may be less visually distracting
- Mix Bold and Regular text within cells to highlight just the important parts
  - **Control** (n=156)

Symbols for Footnotes

- If you need to give a footnote to a value on the table here is a common sequence of symbols
  - † (dagger) *Alt 0134*
  - ‡ (double dagger) *Alt 0135*
  - § (section mark) *Alt 21*
  - || (parallels) *on keyboard above Enter key*
  - # (number sign, or pound)
- Avoid *, ** and *** unless being used to indicate significance (e.g., *p < 0.05) as is the convention

Adapted from Chicago Manual of Style 3.79 and 3.80

Tips for Designing Charts



Uses of Graphs, to show:

- Deviation – plus or minus from a fixed point
- Correlation – relationship between multiple variables
- Ranking – relative position in set is most important aspect
- Distribution – how often a value occurs
- Change over Time – trends
- Magnitude – size comparisons
- Part-to-whole – breakdown of single set
- Spatial – data laid over to a map
- Flow – traces movement

Adapted from Financial Times Visual Vocabulary: Designing with Data

Financial Times Visual Vocabulary: Designing with Data

Deviation

Emphasise variations (+/-) from a fixed reference point. Typically the reference point is zero but it can also be a target or a long-term average. Can also be used to show sentiment (positive/neutral/negative).

Example FT uses
Trade surplus/deficit, climate change

Diverging bar

A simple standard bar chart that can handle both negative and positive magnitude values.

Diverging stacked bar

Perfect for presenting survey results which involve sentiment (eg disagree/neutral/agree).

Spine

Splits a single value

Correlation

Show the relationship between two or more variables. Be mindful that, unless you tell them otherwise, many readers will assume the relationships you show them to be causal (i.e. one causes the other).

Example FT uses
Inflation & unemployment, income & life expectancy

Scatterplot

The standard way to show the relationship between two continuous variables, each of which has its own axis.

Line + Column

A good way of showing the relationship between an amount (columns) and a rate (line).

Connected scatterplot

Usually used to show

Ranking

Use where an item's position in an ordered list is more important than its absolute or relative value. Don't be afraid to highlight the points of interest.

Example FT uses
Wealth, deprivation, league tables, constituency election results

Ordered bar

Standard bar charts display the ranks of values much more easily when sorted into order.

Ordered column

See above.

Ordered proportional symbol

Use when there are big

Distribution

Show values in a dataset and how often they occur. The shape (or 'skew') of a distribution can be a memorable way of highlighting the lack of uniformity or equality in the data.

Example FT uses
Income distribution, population (age/sex) distribution

Histogram

The standard way to show a statistical distribution - keep the gaps between columns small to highlight the 'shape' of the data.

Boxplot

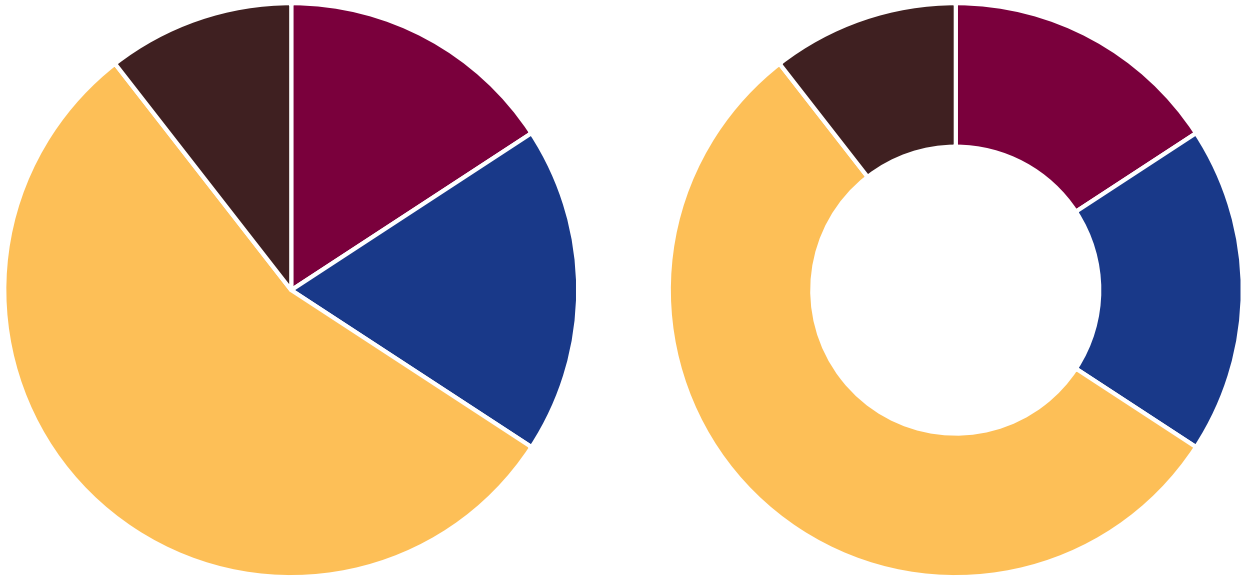
Summarise multiple distributions by showing the median (centre) and range of the data

Violin plot

Similar to a box plot but

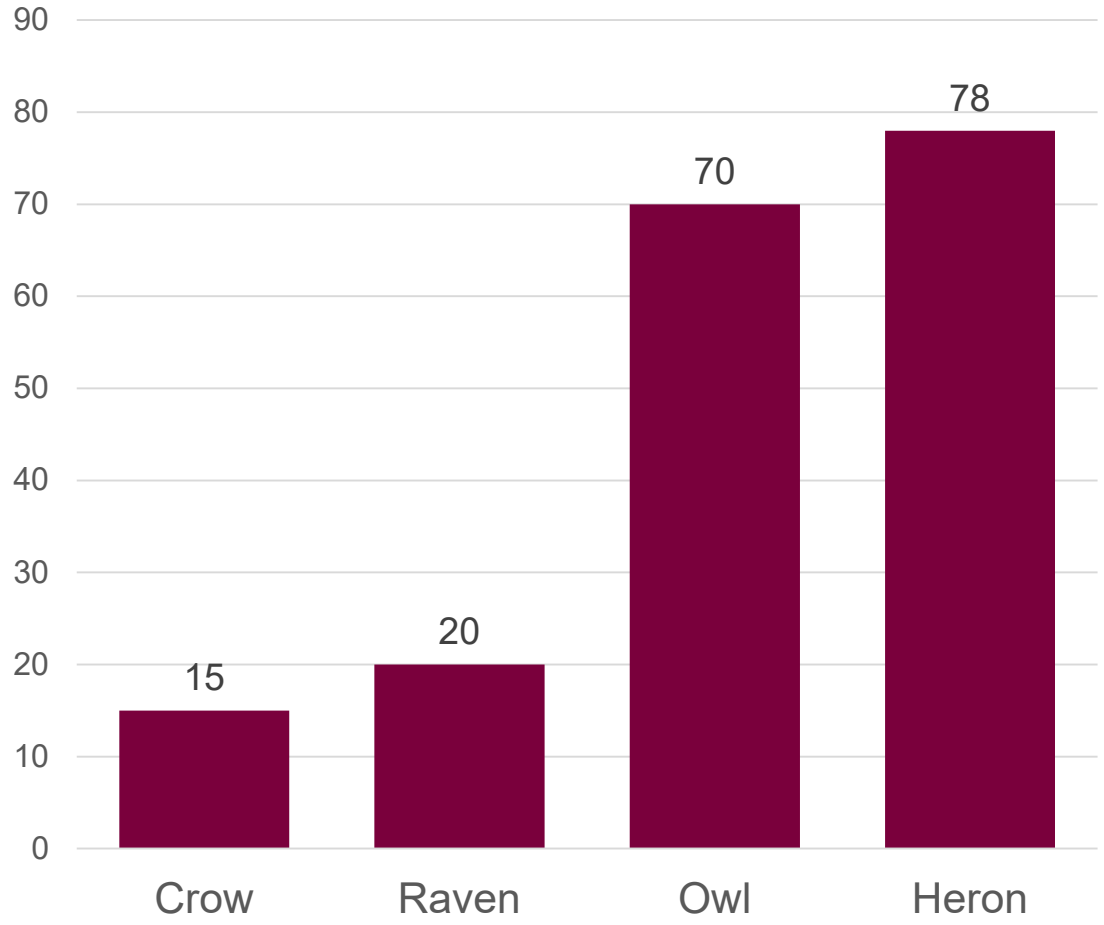
Use Ring Charts in place of Pie Charts

- A pie chart depends largely on the viewer's ability to judge angles relative to each other
- With an inner circle, the viewer can use the **length** of the inner edge to help judge relative size

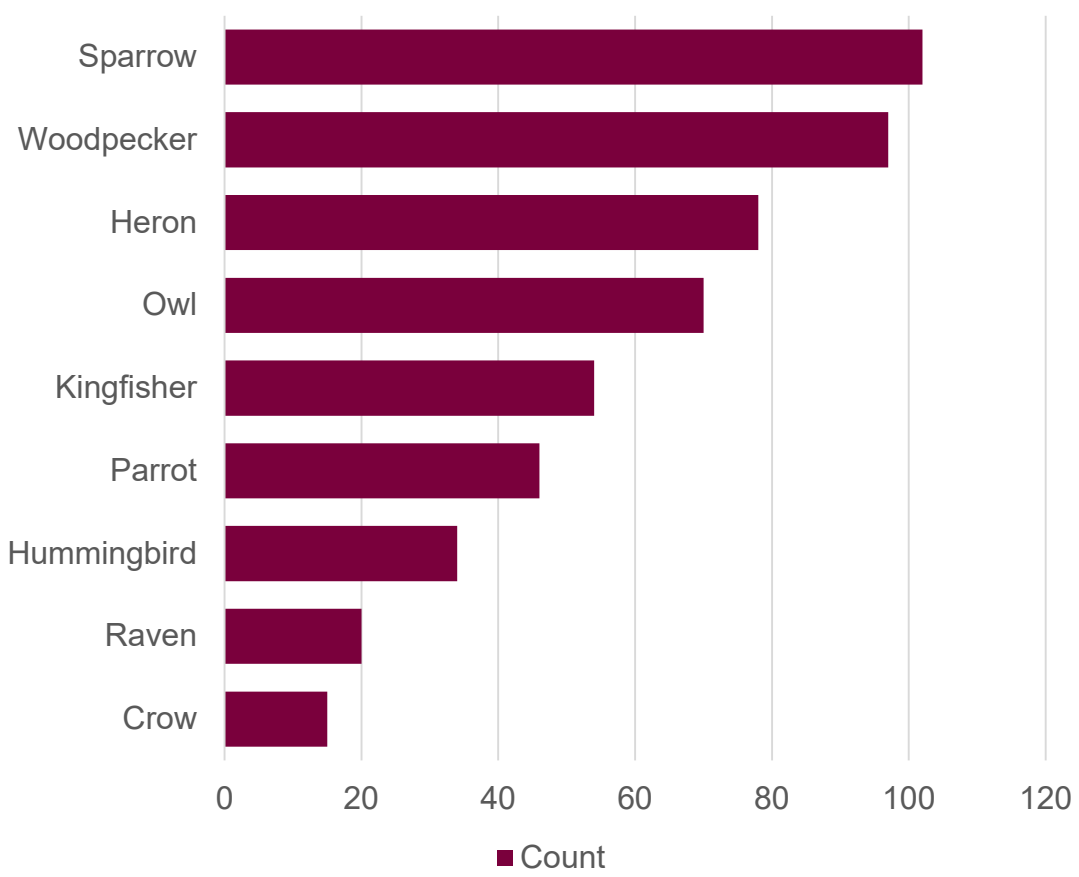


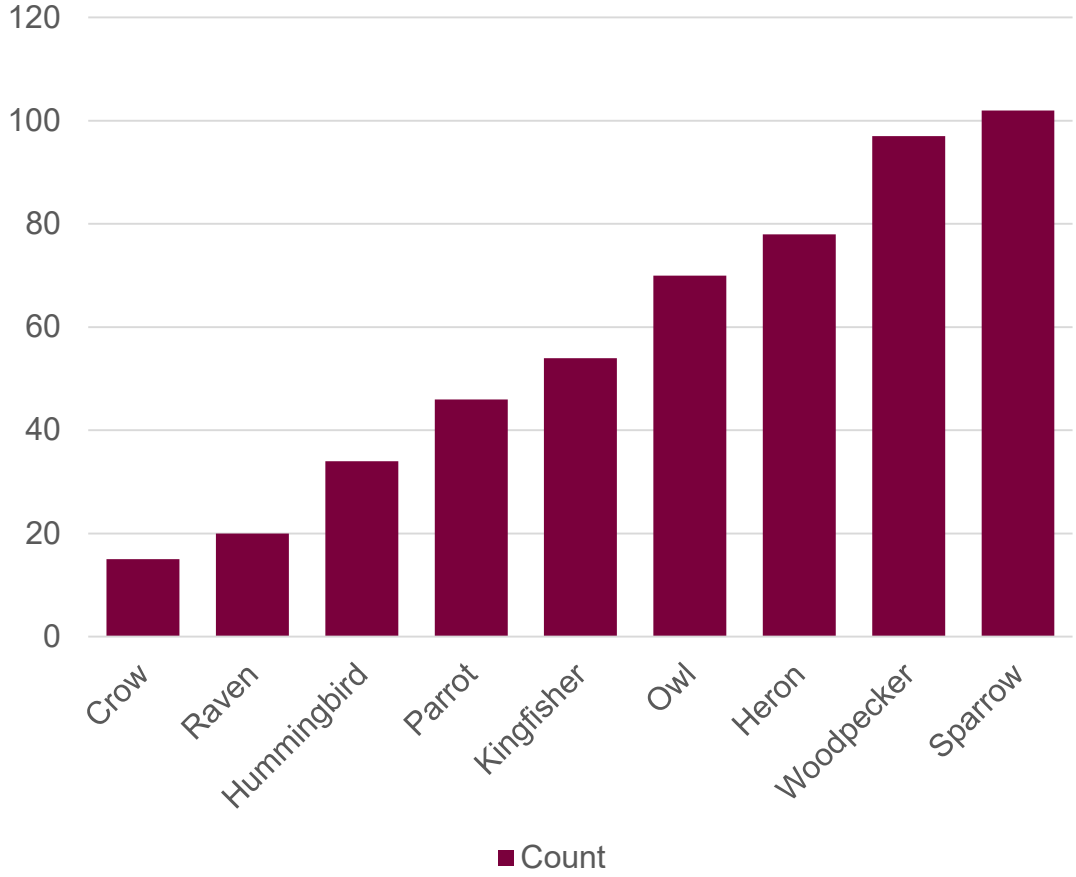
Bars

- Bars should be separate
- All bars should be the same colour (unless there is a good reason not to)
- Choose an order that matches your message and makes important comparisons easy



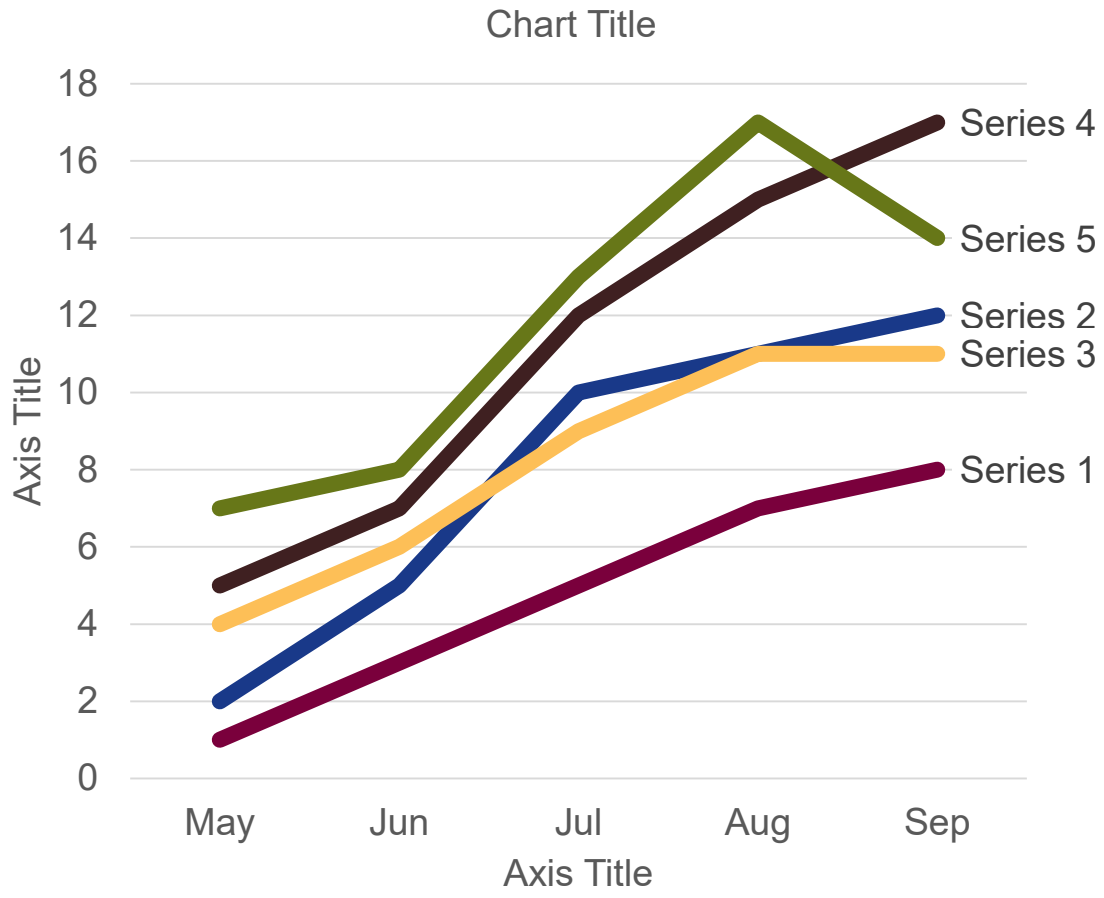
Many Categories, Use Horizontal Bars





Lines

- Be care with the number of lines on the chart, they can become confusing to follow fairly easily



Useful Resources

UK Government Statistical Service. *Effective Tables and Graphs in Official Statistics: Guidance for Producers, Second Edition*. January 2017.

Financial Times. Visual Vocabulary: Designing with Data. ND.

United Nations Economic Commission for Europe. *Making Data Meaningful Part 2: A guide to presenting statistics*. 2009.

Rougier NP, Droettboom M, Bourne PE. Ten Simple Rules for Better Figures. PLOS Computational Biology 10(9): e1003833.

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Tufte E. *The Visual Display of Quantitative Information.* 2001.

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University of Chicago. *Chicago Manual of Style 17th Edition*. 2017.

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