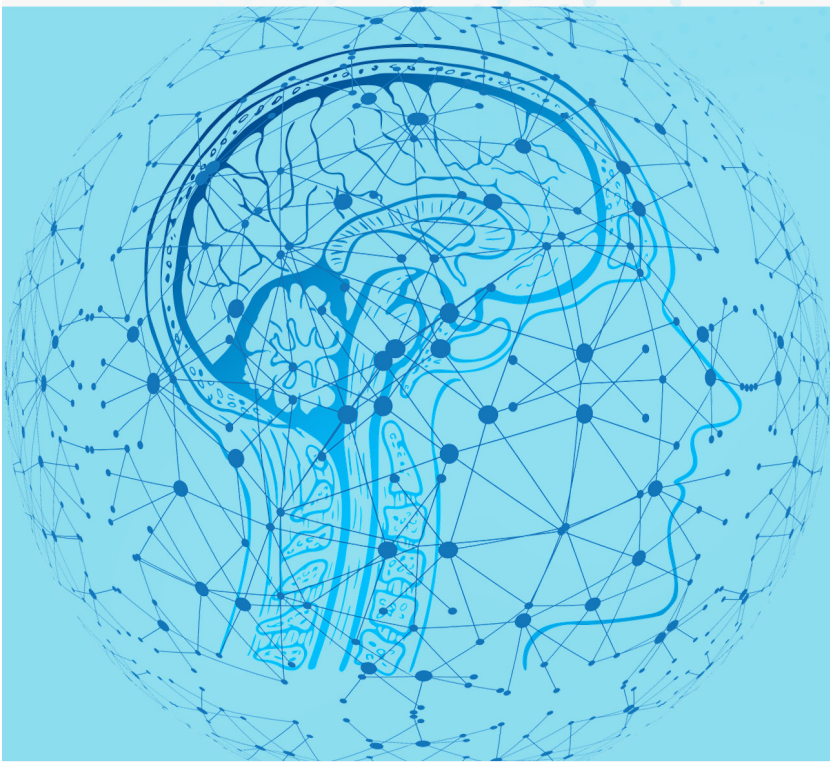


●
Commission
on Excellence
and Innovation
in Health.
●



Data Visualisation

Style & Best Practice Guide

LET'S PUT IMAGINATION TO WORK



Government
of South Australia

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Introduction

Data visualisations tell the story of information, and provides immediate answers to a single, specific question.

About this guide

Use this guide to create a strong user experience when designing visualisations to help our audiences make informed, data-driven decisions.

Visualisation should be:

- **Simple**
Convey a message at-a-glance, and tell a data story in the simplest way possible
- **Familiar**
Use common chart types that are easy to understand and interpret
- **Clear**
Your visualisations should have a clear message, highlighting what's important, removing the chance of incorrect interpretation
- **Audience-specific**
Tailor to the audience and consider their prior knowledge, conventions, and potential biases.

How to use this guide

This guide is a resource for the Clinical Informatics and Innovation Directorate and broader CEIH team to guide the creation of visualisations that are consistent, on-brand, and best practice.

While most assets produced by CEIH are to use this guide, there may be some assets that sit outside of this guide, such as working with another agency's style or branding guide.

Before you start

Good data visualisation starts with questions. Before you start making charts, ask yourself:

- **Who** is the audience for this visualisation?
- What **question** will this chart answer?
- What is the reader supposed to **do** with this information?

Tell a data story

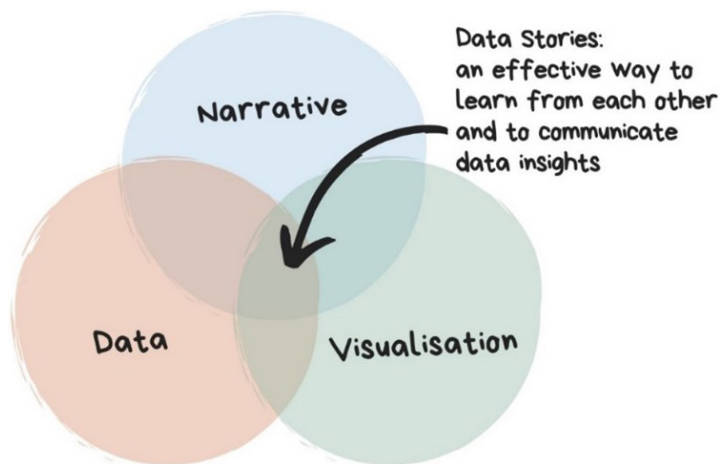
Get your data story straight, then choose the right chart type.

Data storytelling is a structured approach to communicating data insights and the best way to use data to take action and make decisions.

It involves three key elements:

- Data
- Visuals
- A narrative.

These elements take data, provide context and turn data into insight.



ABT storytelling framework (And, But, Therefore)

The ABT framework for storytelling is a simple yet effective way of structuring a data story.

It introduces context, builds tension and offers a solution to the problem.

TABLE 1: ABT STORYTELLING FRAMEWORK

AND = your story setup

BUT = your problem or tension

THEREFORE = your story solution

You can also use...

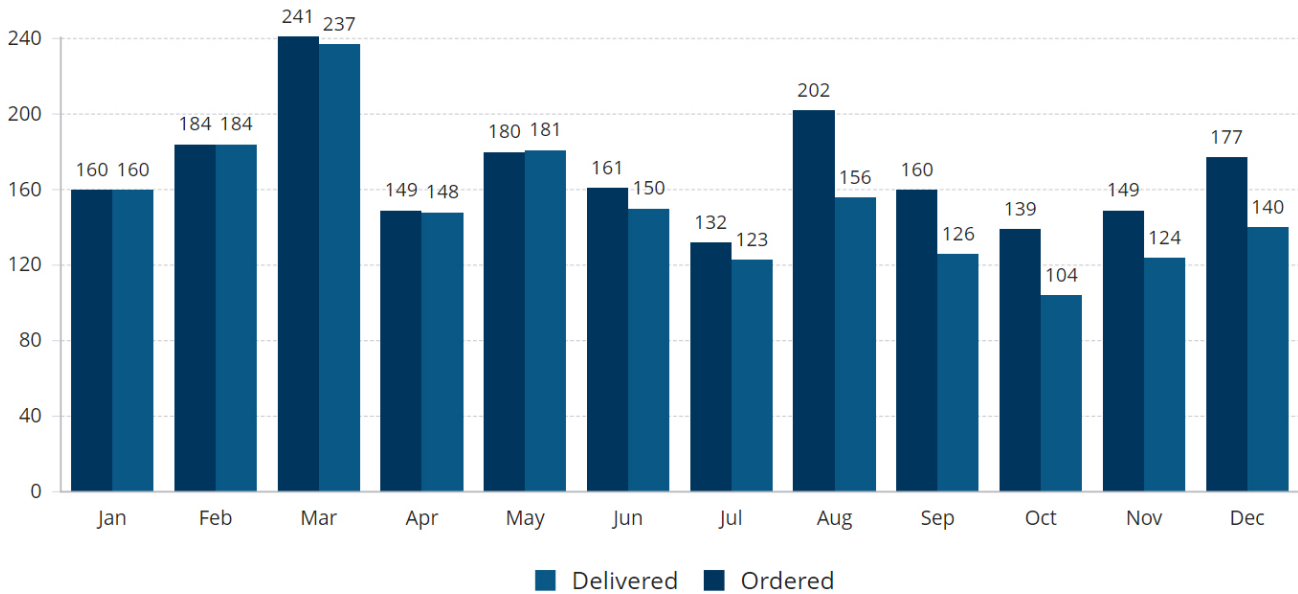
Also,
As well
Furthermore

Except
Yet
However

So
Thus
Accordingly

✘ Not ideal

Car sales



The above chart is the *trigger* for our ABT story.

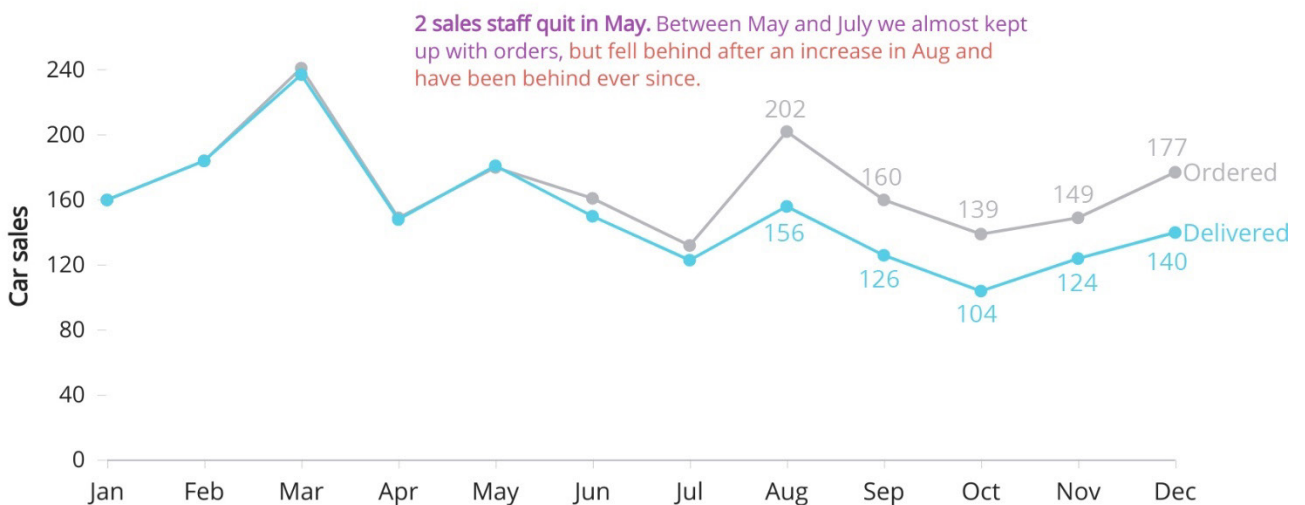
How does the ABT framework look when applied to our sale chart? Much better!

✔ Much better

Please approve the hire of 2 sales staff

to backfill those who quit in the last year

National car sales for Cars r Us in 2022



Source: ABC Dashboard, as at 1/01/2022. Detailed sales data for 2022 is available on request.

Let's break it down

The first chart shows sales data but doesn't create an actionable data story.

The second chart takes the *same* data and creates a story with a beginning, middle and end.

It also makes a recommendation, or 'call-to-action' to the reader.

Applying the ABT Framework

Let's look at how we applied the ABT Framework to our car sales chart.

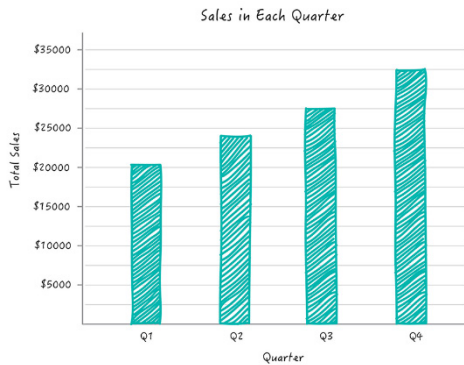
AND = 2 sales staff quit in May. Between May and July we almost kept up with orders.

BUT = Fell behind after an increase in Aug and have been behind ever since.

THEREFORE = Please approve the hire of 2 sales staff.

Choose the right chart

Get your data story straight, then choose the right chart type.



Column / bar chart

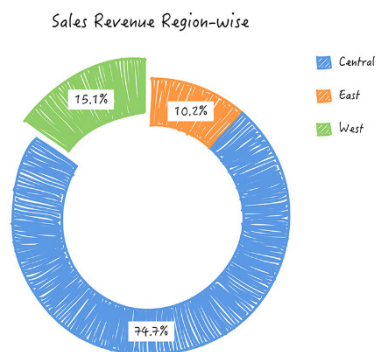
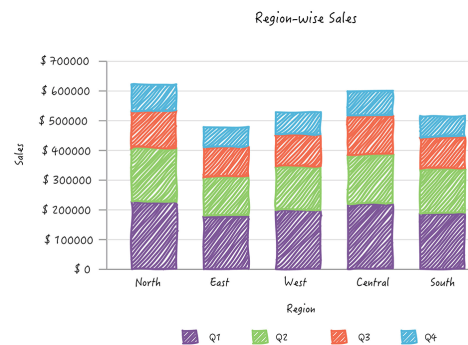
Show how a larger category is divided into smaller categories and the relationship each part has on the total.

- ✓ Colour-coded variables are easy to read
- ✓ Useful for showing the sum of values
- ✗ Harder to read with more categories
- ✗ Precision of comparing parts is poor

Stacked column / bar chart

Show how a larger category is divided into smaller categories and the relationship each part has on the total.

- ✓ Colour-coded variables are easy to read
- ✓ Easy to highlight key data points
- ✗ Less effective with more slices
- ✗ Angles make comparing slices difficult



Pie / doughnut chart

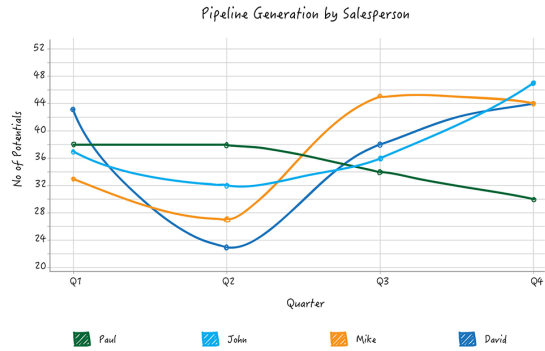
Show categories as parts to a whole in your data.

- ✓ Familiar and easy to understand
- ✓ Easy to highlight key data points
- ✗ Less effective with more slices
- ✗ Angles make comparing slices difficult

Line chart

Show how the value of something changes over time.

- ✓ Easily show changes over time
- ✓ Useful to show small changes
- ✗ Too many lines make it cluttered
- ✗ Requires relatively small data range



Area chart

Show how one or more quantities change over time.

- ✓ Easily show trends over time
- ✓ Can handle positive and negative values
- ✗ Doesn't work well for multiple data series
- ✗ Overlapping data plots are hard to read

Other chart types

This guide includes the most common chart types, however there may be other chart types or formats that work better for specific audiences. For example, statistical control charts or funnel plot charts.

This guide should be used to apply the same styling and best practice principles to charts not included in this guide, including infographics.

For a comprehensive list of chart types and their uses, visit DataVizProject.com.

Font & typeface

Choosing fonts that are designed for readability and establishing a clear font hierarchy helps users better understand your data.

Primary typeface

Font family: Arial

Arial has been chosen as the standard typeface because of its readability on computer screens and cross-platform support.

The font sizes below should be used as the default sizes. You may need to increase sizes to ensure readability for specific formats – For example a presentation on a digital screen.

	Size print/web	Weight	Style
Chart title	16pt, 1.3em	Bold	Normal
Subtitle and explanatory text	14pt, 1.2em	Normal	Normal
X and Y axis titles	11pt, 0.9em	Bold	Normal
X and Y axis values	11pt, 0.9em	Normal	Normal
Data point labels	11pt, 0.9em	Normal	Normal
FIGURE NUMBER	11pt, 0.9em	Normal	Normal
Data source and notes	10pt, 0.80em	Normal	Normal

Text colour

Primary



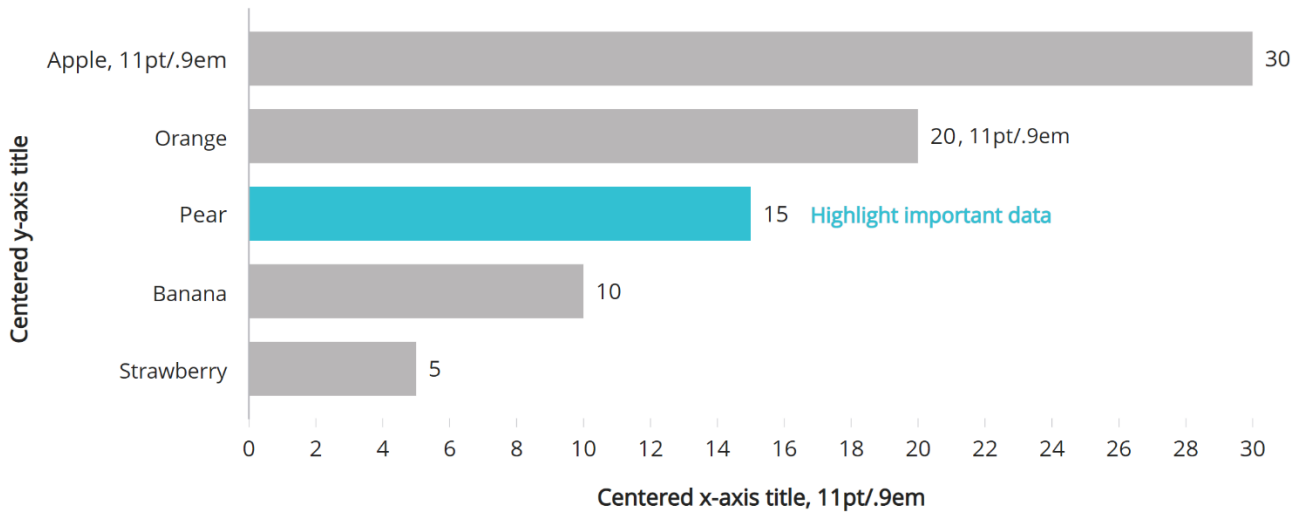
HEX: #222222

RGB: (34,34,34)

Let's look at how our fonts look when applied to a chart.

Short chart title - sentence case, 16pt/1.3em

Subhead and explanatory text for chart, can be 1 line or longer if needed, 14pt/1.2em



Source: Data source and notes, 10pt/.8em

Chart components

Title	Use a descriptive title that provides an overview of what the chart is about.
Subtitle	Write a descriptive subtitle to explain the general trends and why they're important. No more than two lines of text.
Data labels and key	Where possible directly label data points rather than using a key. This works well when they are fewer data points but can add clutter when there are many data points.
Figure number	In a report use all CAPS Don't include a figure number in a blog or social post
Data source	Clearly state where data is from to promote trust and validity Where possible include a URL to the data source for each chart to identify data's owner
Notes	Describe any caveats or inconsistencies in the data Use notes to add more context or communicate key observations



Start with a strong title

A strong chart title is powerful – it captures the reader’s attention and improves interpretability.

Try framing your title as a question – this engages the reader and makes them *think* about what the data is telling them.

Example: ‘Life expectancy rates’ vs ‘How has life expectancy changed in Australia since 1950?’

Colour

Choose colours that turn an unassuming visualisation into an emotion-filled data story.

Main colours

While CEIH brand colours are vibrant and fitting of our brand personality, not all brand colours can be used together for data visualisation. The following colour palette has been optimised for colour-blind audience.



Light blue

HEX: #32COD2
RGB: (50,192,210)



Dark blue

HEX: #106EAO
RGB: (16,110,160)



Yellow

HEX: #E0B165
RGB: (224,177,101)



Green

HEX: #00969E
RGB: (0,150,158)



Red

HEX: #963C4C
RGB: (150,60,76)

HEADLINES, BODY TEXT



Black
HEX: #222222
RGB: (34,34,34)

AXIS LINES



Grey
HEX: #B5B6BC
RGB: (181,182,188)

GRID LINES



Light grey
HEX: #D8D8D8
RGB: (216,216,216)

NULL DATA, DE- EMPHASIS



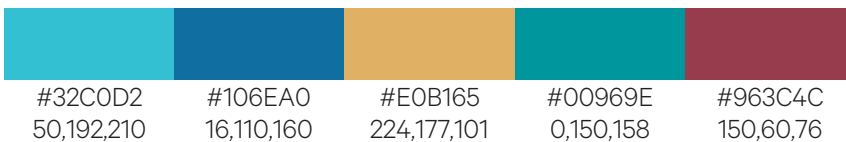
Grey
HEX: #ADADAD
RGB: (173,173,173)

Using colour

Category palette

Use to differentiate between different groups or categories. The colours should be distinctly different.

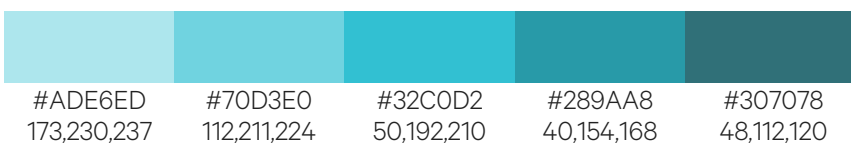
Use colours in the order below.



Sequential palette

Use to show numerical differences. The sequential palette is a single shade going from light to dark.

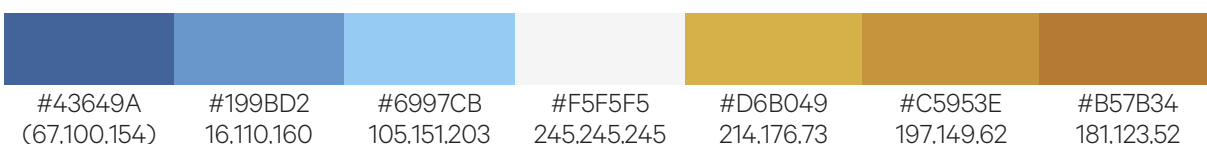
Light colours represent smaller values, dark colours represent larger values.



Diverging palette

Also used for numerical differences. The diverging palette has two contrasting extremes with a neutral midpoint.

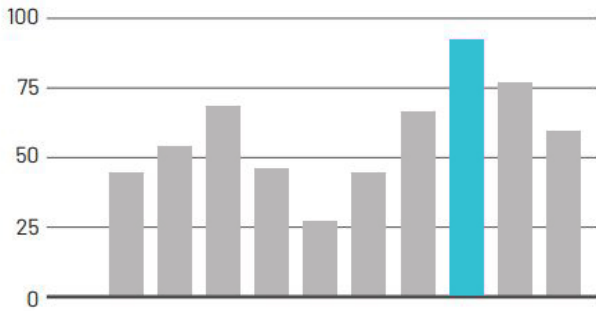
Red is avoided as blue-red is commonly used to denote political leaning. Green-orange scale is not colour-blind friendly.



Using highlights

Use colour to call out important details in your visualisations.

By keeping the colour consistent, your audience will recognise this colour as something they should pay attention to. Ensuring this colour isn't overused will reinforce this association.



Users by category

Product	Type	Type	Type
Category 1	4	2	0
Category 2	3	4	3
Category 3	6	8	12
Category 4	3	11	14
Category 5	2	4	6

Highlight colour

CALL OUTS,
HIGHLIGHTS



Blue

HEX: #32COD2
RGB: (50,192,210)

DEMPHASISED
DATA POINTS



Grey

HEX: #B8B6B7
RGB: (184,182,183)

Colour best practices



DO

Use high contrast colours to easily distinguish foreground from background

Use varied intensity to indicate size of values

Use colour to emphasise important data points and greyscale for de-emphasise

Use colours to evoke emotion, E.g. Red = danger, green = safe



DON'T

Use very bright or very dim colours

Use yellow for background or non-focus aspects

Use multiple colours for the same category

Use red and green together and they're not colourblind friendly



Be consistent

Be consistent with colour across charts by matching colours that refer to the *same* group or category. This improves familiarity and readability.

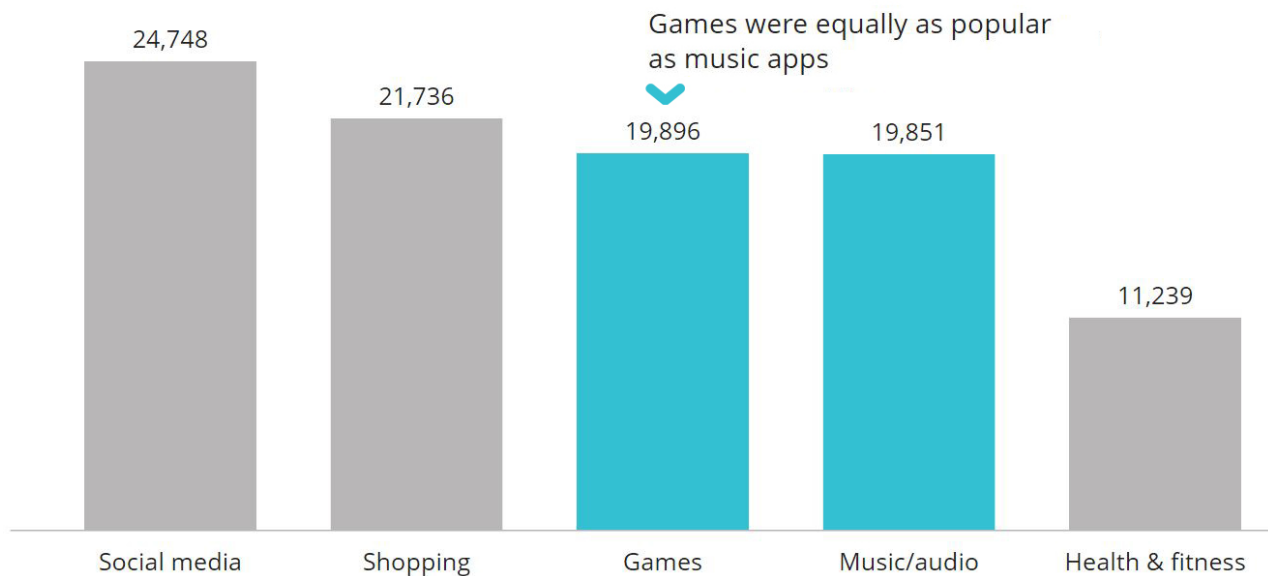
Bar charts

Compare data classified into discrete groups or categories.

Let's look at an example of a bar chart.

Which mobile apps are the most popular?

Top app categories by number of app store downloads in 2021



Note: Downloads include the Apple Store and Android Play store

Bar chart best practices



DO



DON'T

Start y-axis values at zero

Slant labels to make them fit

Abbreviate labels, E.g. Mon, Tues, \$1.2k, Jan, Feb etc

Use decimal values on the x-axis

Use one colour for all bars unless using callouts

Add background colours or borders

Make the space between each bar half the width of the bars

Add legends for a single category

Sort categories by value

Use multiple colours for the same category

Remove gridlines and axis labels if not necessary



Be consistent

Be consistent with colour across charts by matching colours that refer to the *same* group or category. This improves familiarity and readability.

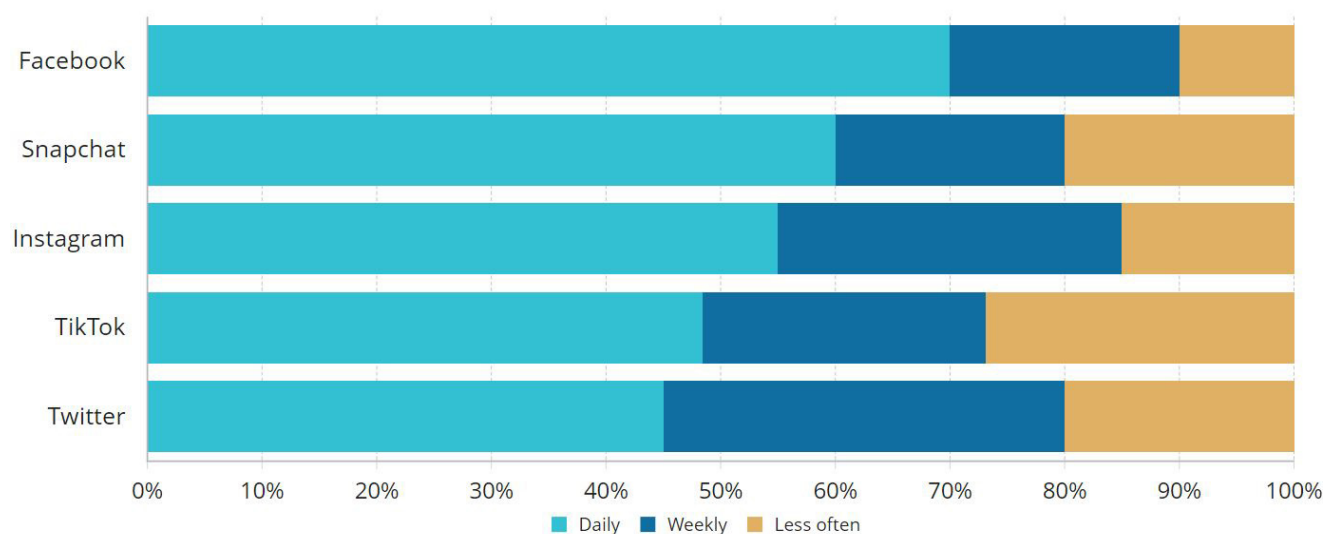
Stacked column/bar chart

Show how a larger category is divided into smaller categories and the relationship each part has on the total.

Let's look at an example of a stacked column/bar chart.

Which social media apps are used most frequently?

Percentage of people who use popular social media sites by frequency of use



Note: Use includes both mobile and desktop apps of the platform

Stacked bar/column best practices

✓ DO

✗ DON'T

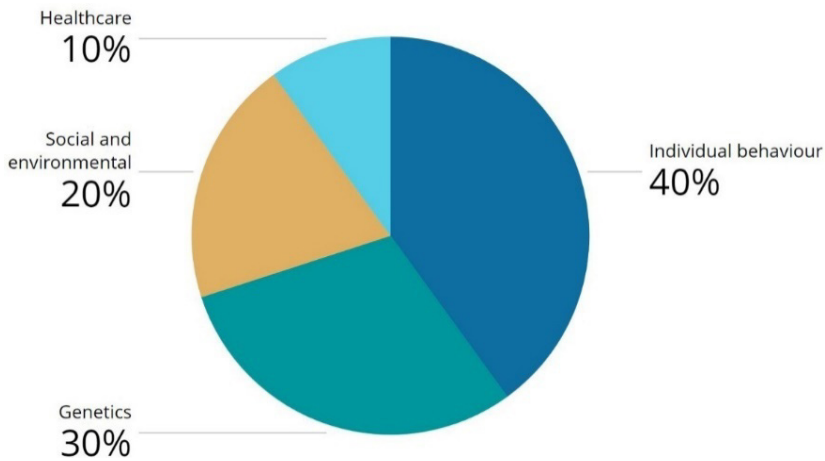
Maintain a zero baseline	Use long labels
Order bars from largest to smallest	Compare more than 8 categories
Use the sequential colour palette for sequential values, E.g. age group, date range, time range etc.	Use to plot changes over time
Limit each bar to 3 or 4 sub-categories	Have negative values
Remove gridlines and axis labels if not necessary	
Include a legend	

Pie/donut chart

Show categories as parts to a whole in your data.

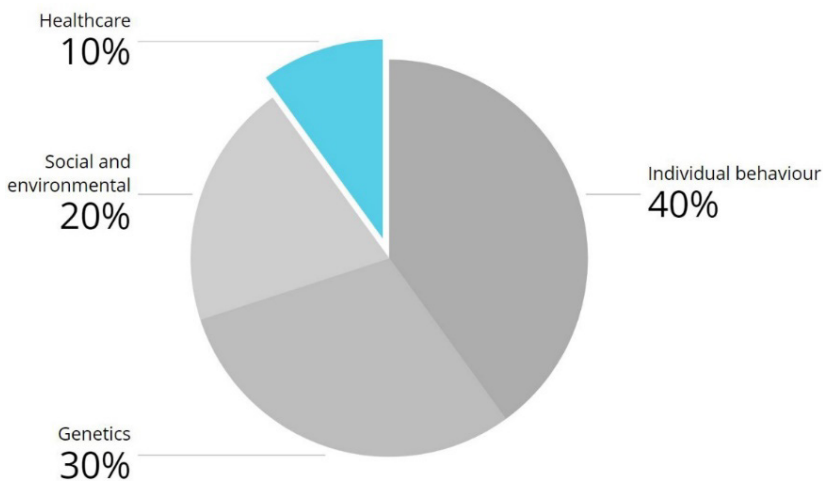
Let's look at an example of a pie chart.

What factors influence wellbeing?



Let's look at an example of a pie chart using callouts.

What factors influence wellbeing?



Stacked bar/column best practices

✓ DO

✗ DON'T

Maintain a zero baseline	Use long labels
Order bars from largest to smallest	Compare more than 8 categories
Use the sequential colour palette for sequential values e.g. age group, date range, time range etc.	Use to plot changes over time
Limit each bar to 3 or 4 sub-categories	Have negative values
Remove gridlines and axis labels if not necessary	
Include a legend	

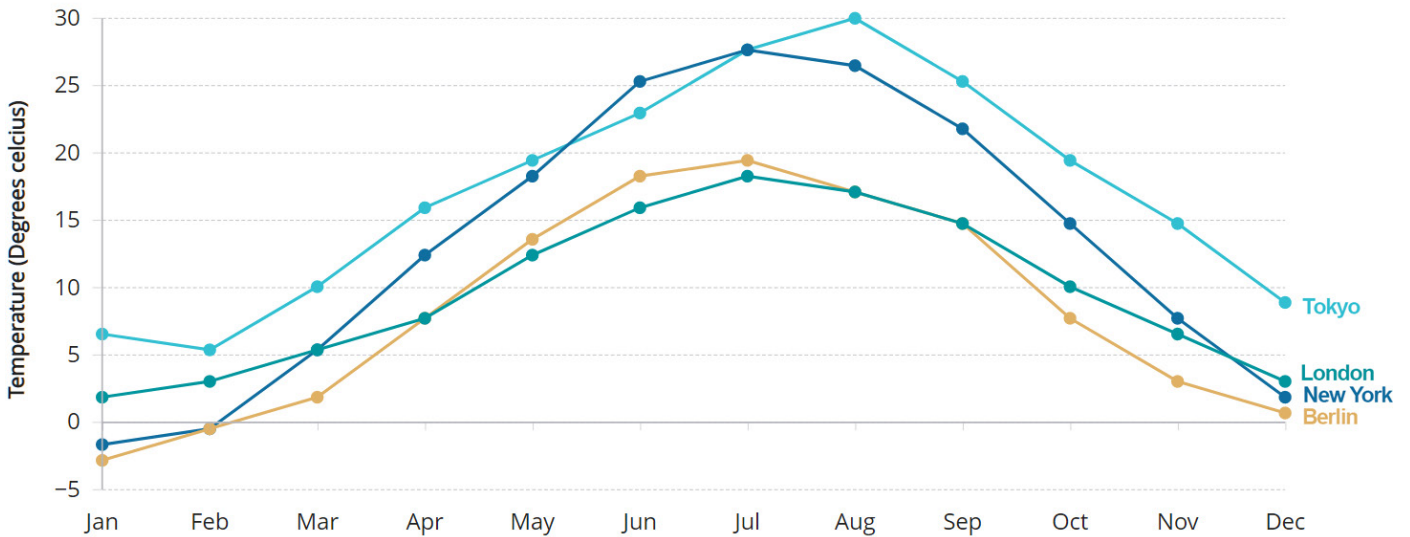
Line charts

Show how the value of something changes over time.

Let's look at an example of a line chart.

What is the average temperature of the most visited cities?

Average monthly temperature of the world's top five city destinations in 2021

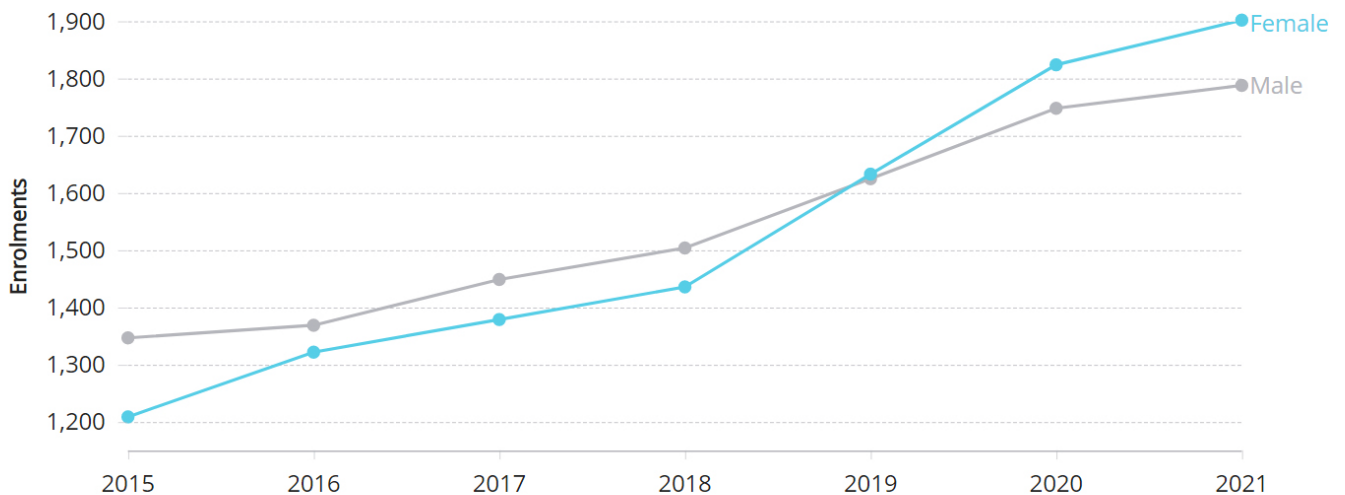


Source: Bureau of Meteorology

Let's look at an example of a line chart using callouts.

How do primary school enrolments compare between boys and girls in Adelaide?

Total number of female enrolments outnumbered males from 2019 to 2021



Source: Australian Curriculum, Assessment and Reporting Authority

Line chart best practices



DO



DON'T

Choose an appropriate measurement interval

Use more than five lines if possible

Directly label lines where possible. This works well when they are fewer data points but can add clutter when there are many data points.

Start with a zero baseline where a zero line isn't useful

Use contrasting colours for multiple lines

Use too many colours – less is more

Add comparison data such as averages

Use 3D charts or unnecessary chart elements

Use colour, line width and line dashes to highlight important data

Use an axis title if the axis labels are obvious, E.g. Month, Day etc

Consider factors that may influence how data is represented. E.g. ED presentations are higher on weekends, and months with more weekends may screw results. Provide this context to your reader

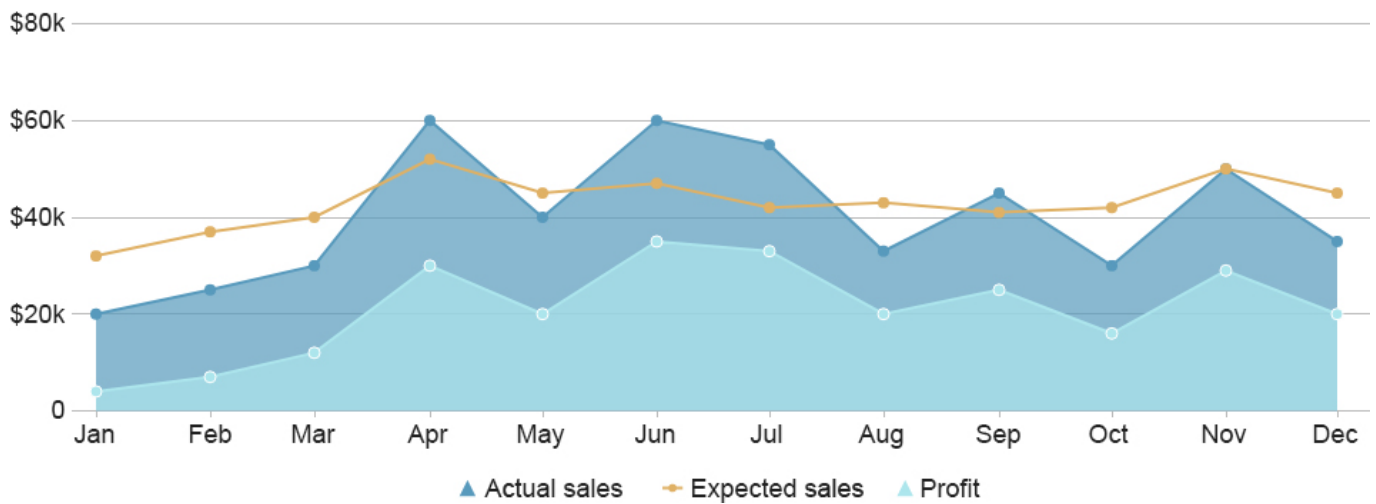
Area charts

Show how one or more quantities change over time.

Let's look at an example of an area chart.

How have monthly sales been tracking?

In 2021 sales and profit margin steadily increased throughout the year



Area chart best practices

✓ DO

✗ DON'T

Use to show the magnitude of a change

Use to compare more than 4-5 categories

Bring the most important data to the bottom of the chart

Use when you need to compare exact values

Directly label areas where possible

Use to plot a single series – use a line chart instead

Use a zero baseline where possible

Use transparency for overlapping data points

Use to show the magnitude of a change

Use to compare more than 4-5 categories

Test it out

Design is iterative. Usability testing helps to make your visualisations more understandable, impactful and actionable.

Usability testing helps you to check for:

- **Expectations:** The visualisation meets users' expectations
- **Comprehension:** The visualisation communicates what you think it does
- **Explainability:** Users can explain the information being communicated
- **Actionability:** Users can use the information to take a specific course of action.

Crucial questions to ask your users during usability testing are:

- What is this visualisation *telling* you?
- What are you *seeing* here?
- What do you *like* about the visualisation? What do you *dislike* about the visualisation?
- How might this information affect your *decision-making*?

Print in greyscale

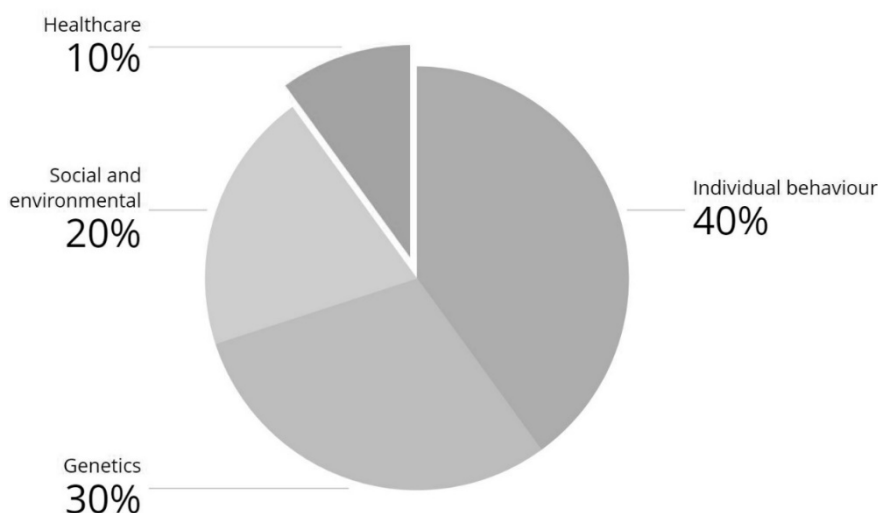
Make sure your chart can be read easily when printed in greyscale, and that the contrast between different visual elements is clear.

Let's look at how we can achieve this.

Plain white background	Like the page it's printed on. Any background colour will show up as grey, reducing contrast.
Use line weights	Print has much higher resolution than a screen, so line weights are much more usable. Use heavier lines for emphasis, and very thin lines for stuff like grids.
Find other ways to highlight	Use labels, outlines, etc. to guide the viewer's attention. Dashed and dotted lines can work miracles in print.
Create focus	Figure out what you want your chart to say and remove anything that doesn't help it make its point. Break one chart up into several if needed.
Use fewer colours	Most charts use too much colour. Don't use colour unless you absolutely must.
Directly label charts	Remove the legend and place your labels as close to the data as possible. This works well when they are fewer data points but can add clutter when there are many data points.

Let's look at an example.

What factors influence wellbeing?



Make it intuitive

Intuitive design helps people understand the intent behind the data and focus on the areas that need attention, for better decision-making.

Structure charts in a way that's logical.

This improves readability, adds context, and reduces the chance of misinterpretation.

Present data in its *logical* sequence, by:

- Days
- Months
- Age brackets
- Frequencies
- Scores or test ranges
- Sorting data by value (largest to smallest).

Sort by category



Sorting categories in descending or ascending order helps people make sense of your charts by telling the story in the right order.

Sort by data ranges



Sorting sequential data in a logical sequence makes comparisons easier.

Make it accessible

When you design for accessibility, you benefit everyone. Your charts and readers will thank you.

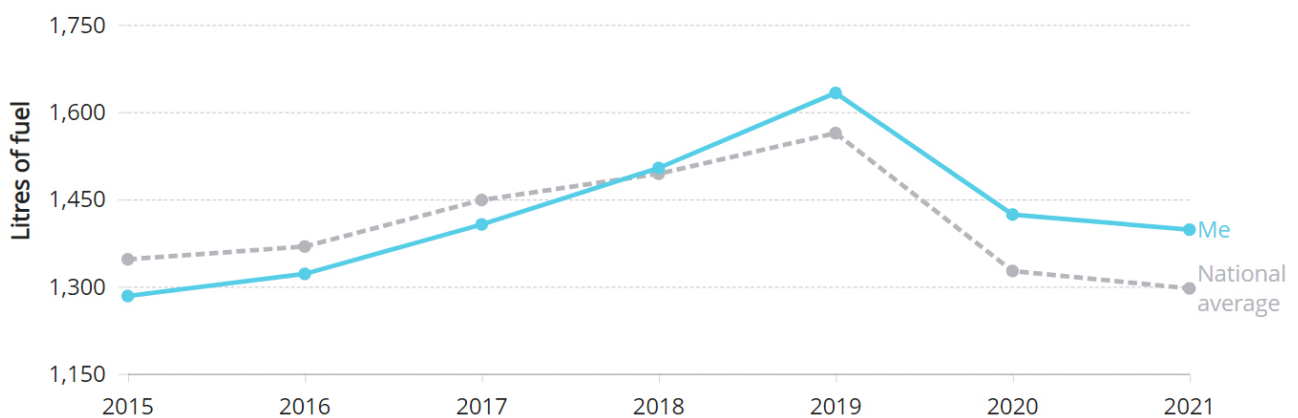
Elements of an accessible graph

The example below is a graph that's accessible in its own right—it doesn't rely on a table to communicate the data to people using assistive technologies.

Let's look at an example of an accessible chart.

How does my yearly fuel consumption compare to the national average?

Since 2018 I've consumed more fuel per year than the national average in Australia



SUMMARY OF RESULTS

Since 2018 I've consumed an average of 69 litres of fuel per year more than the Australian national average of 1,408 litres.

Let's break down the elements of an accessible chart

Title	Give the visualisation a descriptive 'takeaway' title that illustrates the major insight.
Text summary	<p>In plain text, summarise the data story the information conveys.</p> <p>This text can be discoverable only by assistive technologies. If it's also visible on screen without those tools, even better.</p>
Axis labels (when applicable)	Label each axis if the label isn't obvious from the chart title.
Data labels	Label each data point directly rather than using a separate legend
Alt text (alternative text)	<p>Ensure your visual has descriptive alt text:</p> <p>Bad: "fuel_consumption_chart"</p> <p>Great: "Graph showing my yearly fuel consumption since 2018 is greater than the national average".</p>

Visual best practices

Now you have all the right elements of your data visualisation in place, follow these guidelines for its appearance.

Here, we're considering people with assistive technology and colour vision deficiency.

Colourblind users	Avoid green-red colour combinations and ensure colour has a contrast of 4.5:1 or greater. For more information see: Understanding colour contrast ratios .
Label data points directly	It's quicker to read and ensures the chart can be read without relying on colour. This works well when they are fewer data points but can add clutter when there are many data points.
Separate elements with whitespace or pattern	This means distinguishing between data isn't entirely reliant on contrast between colours.
Avoid hover overlays	Label data directly. Assistive technology often can't read content in hover overlays.

Check out these resources

Great resources to help you create engaging data visualisations that turn insight into action.

How to embed key messages into a story with the right structure: [Story Purpose and The And-But-Therefore Format](#)

Tools to help you choose the right chart for your visualisation: highcharts.com/chartchooser
datavizproject.com

Ensure your visualisations are accessibility to people with different visual abilities: accessibility.digital.gov/visual-design/data-visualizations

Appendix A – Chart format guideline for large reports

Use this template if you have a team of people working together on multiple charts for a report.

Modify if required to suit the project – the defaults have been included below.

TABLE 2: CHART FORMAT TEMPLATE

Data	
Data source	Define data source
Definition/logoc	Define business rules / cohort criteria or hyperlink to where these are documented
Chart formatting	
Chart title	16pt, 1.3em
Subtitle and explanatory text	14pt, 1.2em
X and Y axis titles	11pt, 0.9em
X and Y axis values	11pt, 0.9em
Data point labels	11pt, 0.9em
FIGURE NUMBER	11pt, 0.9em
Data source and notes	10pt, 0.80em
Colour palette	
Chart element	Define chart element and its colour