Biotext

The Biotext guide to effective data visualisation and infographics

How to turn information into visual communication

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Why effective data visualisation and infographics are important

The combination of data and visuals is powerful. This is because:

- good data provide objective, robust information – data can help make decisions more objective, and conclusions, instructions and recommendations harder to argue with
- images can generate an emotional response very quickly – think of some of the most moving, frightening or pretty images you have seen.

> A clear graph or an engaging infographic can get your message across quickly and powerfully.

A note about terminology: *data visualisation* is a general term used to refer to graphs (plots and charts), diagrams, maps and infographics that are based on specific data; *infographics* are visual displays that might be based on data, but can also be based on a message or a process. This guide covers the most common type of data visualisation (graphs) and the 3 key types of infographic (data, message and process).

Data and information presented through visuals can be immediately understood and persuasive. People often engage more with visual data and infographics than with text. A page of text can seem dull, and text is linear – we read through it from start to end to understand its meaning. But we can look at a picture and immediately grasp the message without having to work our way through it.

Data visualisation can widen your audience, because images can reach people of many languages and literacy levels.

What makes data visualisation or infographics effective

An effective data visualisation or infographic is:

- clear – it is accurate and easy to understand
- engaging – it sparks understanding, interest and action in the audience.

An effective data visualisation or infographic also limits the 'cognitive load' on the audience. In other words, your audience doesn't have to think too hard to understand your message. An effective data visualisation or infographic gets its primary message across as soon as the reader looks at it.

> If a data visualisation or infographic is effective, the audience says, 'Now I get it!', not 'I don't know what that's supposed to mean'.

If a reader must study the visualisation in detail – decode it or puzzle it out – the visualisation has failed.

A visualisation can contain secondary messages that become visible on deeper engagement – but the main message should be immediate and self-evident. An ideal visual makes its primary message immediately available, and is interesting enough to encourage a closer look.

Why it's important to get it right

It's important not to just use data visualisation and infographics for the sake of it, but to get them right. Because data visualisation and infographics make a strong impression, they must be accurate and of high quality.

People make decisions based on data. If we present data correctly, and in a way that focuses on the main issues and messages, we can better inform those decisions – especially if the decision-maker is time-poor.

We must always:

- know what we want to say
- be clear and accurate in how we present data
- be aware of how our message will be perceived
- stay true to the underlying data.

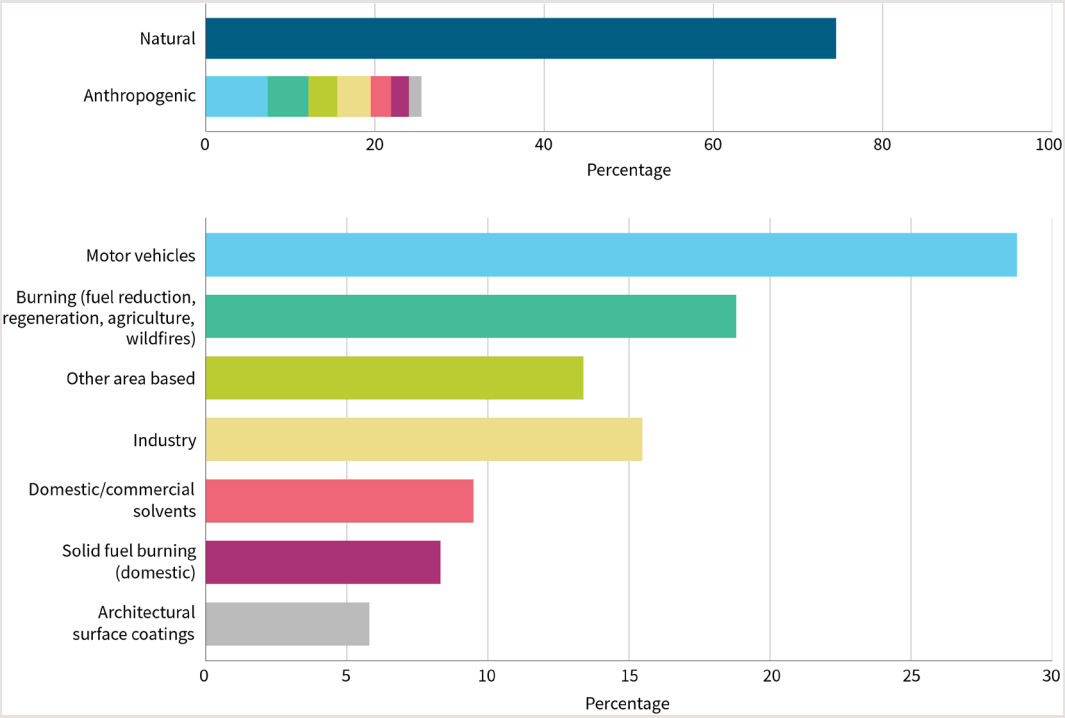
It's easy to exaggerate or skew the data, or get the message wrong – especially if a key part of our message is about subtle things like our degree of certainty. But this could lead to poor understanding and bad decisions.

It's also important to get visual communication right because research and effective data presentations take time and money to develop. The data and presentation must be right, so the money is well spent and things don't need to be redone. A badly considered message takes as much time and money to present as a good one.

> Making data visualisation and infographics effective turns your information into communication.

Example 1 Presenting complex information

Australia state of the environment reports summarise the conditions and trends in Australia's environment. The data visualised in the report must be correct, clear and easy to understand for many audiences, including governments, industries and researchers. The data inform important decisions in these fields. For example, if we are to understand and manage the effect of volatile organic compounds on our climate, we need to know the main sources in Australia (Figure 1, from the 2021 report).



Source: Emmerson & Keywood (2021)

Figure 1 An example of splitting information into 2 graphs to make it easier to understand

This graph is effective for a few reasons. It does not try to say too much in a single graph. Instead, information is split into 2 graphs:

- The first shows the high-level data on natural and anthropogenic sources of volatile organic compounds.
- The second delves into the detail of the sources of anthropogenic volatile organic compounds (and takes the place of a legend for the first).

The design focuses on the data by removing unnecessary elements such as legends, borders and data labels. This means decision-makers can quickly interpret the graphs to get the information they need.

Data visualisation and infographics in an AI world

Most users will see the AI summary first when they run an online search. This means you must consider AI in developing online content, and make sure your content is optimised to be found, selected as evidence, and presented accurately by AI.

Although AI models mainly summarise text, current models can look at and incorporate visual elements such as graphs, diagrams, infographics and videos in their results.

Visual elements alone may not increase the chances that your content will be found and selected by AI. However, well-crafted data visualisations and infographics can summarise complex information succinctly, and deliver the authoritative, easily summarised, unique content AI is looking for.

Images can appear directly in AI summaries if those visuals help answer a user query. This means original visuals can increase the visibility of your information and organisation.

Some visual elements are more useful – to both human users and AI – than others:

- Highly valuable
  - original graphs (plots of data)
  - original diagrams
  - process flow charts
  - annotated screenshots
  - comparison tables (made available as HTML text)
  - maps
  - labelled illustrations
- Good
  - real photographs that illustrate something being discussed
  - before-and-after examples
  - examples of products or techniques
- Less valuable
  - decorative stock photography
  - abstract hero images.

Making the effort to create original data visualisations and infographics can benefit both your human audiences and the likelihood of your information being selected for an AI summary. If your page answers a question clearly in text, an image can reinforce that answer.

Getting started

Making an effective data visualisation or infographic involves 2 essential components: the context and the project itself.

Understanding the context

Understanding the context provides the basis for developing effective data visualisation and infographics.

> Don't just dive into development. If you want your message to be clear, accurate and immediate, you must know what you want to say, and who you are talking to.

Your message or story

Think about what you are trying to achieve. Are you trying to explain what the data show, make a case for change, explain a process, or have your audience understand a key point or change their behaviour?

Before developing a graph or infographic, it is worth spending some time teasing out your aim and your single most important message. What is the 1 thing that readers *must* get from your presentation if it is to be successful?

This understanding can drive many of the subsequent decisions in development and design. For example, if you want your audience to know how household fire regulations affect air quality, you might use a simple line graph that marks the year that slow-combustion stoves were banned, and the subsequent falling levels of air pollution.

It can also save a lot of wasted time. For example, if you are unsure of your message, you might include every step of a process in a diagram – making it longer and more complicated, as well as spending more time on development. If you know that your key message is 'Our approval processes make implants safe', you can leave out all but the safety aspects of the process.

To identify your key message, brainstorm ideas (alone or with colleagues) or write a short, punchy statement (like you would see in a social media post). Sum up your key message in a single sentence. For example, 'Handwashing is an effective way to prevent disease'.

Use the message as a touchpoint throughout development – as you develop, regularly come back to your message to see whether your graphic is achieving what you want it to. You can also use the message to test your graphic. Ask friends or colleagues what the main message is and see how closely their response aligns with your aim.

If your graph or infographic is part of a larger document or presentation, see how the various visualisations add together to tell an overall story. Do they support the aim of your publication, or are they a distraction?

Try to identify things you *don't* need to say. Trying to say too much is a common error. The more messages you try to convey, the less effective any single message will be.

Your audience

Think about your audience: who are they, what are their main characteristics, and what do they understand already?

> Understanding your audience helps to shape your message. This means thinking about what they want to know, not just what you want to tell them – 'pull' versus 'push'.

For example, if you want to present information on healthcare regulation, audiences are not asking 'How does healthcare regulation work in Australia?'; they really want to know 'How do I know my hospital is safe?' You may cover similar material in your answer, but focusing on what the audience wants to know will allow you to talk to them directly and produce content that is more relevant to their needs.

When you have identified your most important audience, think about their needs so you can tailor the visuals to suit. Consider:

- their current level of understanding of the subject – are they already experts in the field, or in a different field, or are they without specialist knowledge?
- their point of view on the subject – are they for or against, interested or not?
- their feelings on the subject – could the topic trigger strong emotions because of previous negative experiences?
- how they like to receive information – are they digitally savvy and source their information from websites or social media, or do they prefer printed material?
- how they are influenced – do they 'just want the facts and figures' or do they want to see relatable examples and stories?
- their cultural and social background – do certain words, colours and images hold specific meanings? Are your message, wording and design inclusive and accessible?

Answers to these questions will influence the type of information you include, as well as the text and visual style. Knowing your audience can govern:

- the tone – chatty or formal
- the level of detail – high-level key points or layers of meaning
- the language – the level of readability to aim for
- the type of presentation – a standard scientific graph or a simple cartoon.

For example, an infographic for early primary school students may:

- use bright colours and a limited amount of text
- use story-telling techniques, like narratives and comics
- include images of young people as protagonists
- use a suitable vocabulary and simple sentences.

Planning the project

Once you know your aim and audience, you are ready to tackle the project itself.

Your format

First, think about exactly what you want to produce.

There are many types of visual displays, all presenting information in different ways:

- A **table** presents data in a set grid. Use a table if your audience needs to look up or compare individual values, or if showing the precision of the values is necessary – that is, showing a few things in detail.
- A **graph** presents data visually in a technical format. There are various standard graph forms, such as line graphs, bar graphs and so on. Use a graph if you want to show trends, change and other patterns over time, or across a large number of categories or groups.
- A **map** shows how data vary across an area. Geographically distributed data might be best presented on a map. Maps are useful on the web because they can be interactive and users can click through for further information.
- An **infographic** presents data or a story using relevant graphics. It uses a combination of text, pictures and data visualisation to convey messages. An infographic can be part of other content (website, report) or can be stand alone (poster, presentation).

Think about which type of display you need to meet your goals. Factors that influence your choice include:

- whether your story is based on a message or data
- the nature of the data (numbers are easier to graph than text responses)
- the data literacy of the audience (how comfortable they are with statistics and data)
- the format of the publication (online or print, poster, pamphlet or report)
- the tone of the publication (for example, formal or informal)
- the best-practice ways to present the kind of data you have (for example, do you need to compare categories, show change over time or show a correlation?).

Your constraints

You also need to think about how your data visualisation or infographic is going to be produced. This will depend on several factors:

- Your resources. If your team has graphic design skills, you may be able to produce your visual element inhouse. If you don't, you may need to outsource expertise.
- The products you are developing. Does the product you want match your resources? If you want a simple graph, you are likely to have inhouse resources that can produce it. If you want an interactive infographic, you may need external expertise.
- Your timeline. If you have a short timeline, you may just add a graph to a fact sheet, but a longer timeframe could allow you to produce a suite of infographic posters.

Principles for effective data visualisation and infographics

Some common principles can help you to achieve an effective visual display, whether showing a numerical result or telling a story.

Know when not to visualise

Before you start, ask yourself whether you really need to add that graph or infographic. Be clear on what you are trying to achieve and why a visual element is the best way to achieve it.

> Don't add graphs or infographics just for the sake of it – make sure they have a real purpose. Consider your own motivations for including visual elements, and how the elements fit with your overall content.

Don't use a graph or infographic when:

- you don't have a message to convey
- you just want to break up or enliven text – maybe what you need is a rewrite
- you just found a graph that has something to do with your topic
- words are enough
- the topic needs the precision and detail only words can give (for example, caveats, definitions)
- the topic or audience needs the precision and detail only a table can give (for example, specific values)
- what is really needed is more engaging overall design.

We must be prepared to throw out the visualisations that are not essential, no matter how much we personally like them or how hard we worked to produce them.

Focus on key messages

The whole aim of your graph or infographic is to convey a message, so don't make your audience work harder than they should have to.

> Reduce the cognitive load on your audience by making the design show the message, or by simply telling them what the message is.

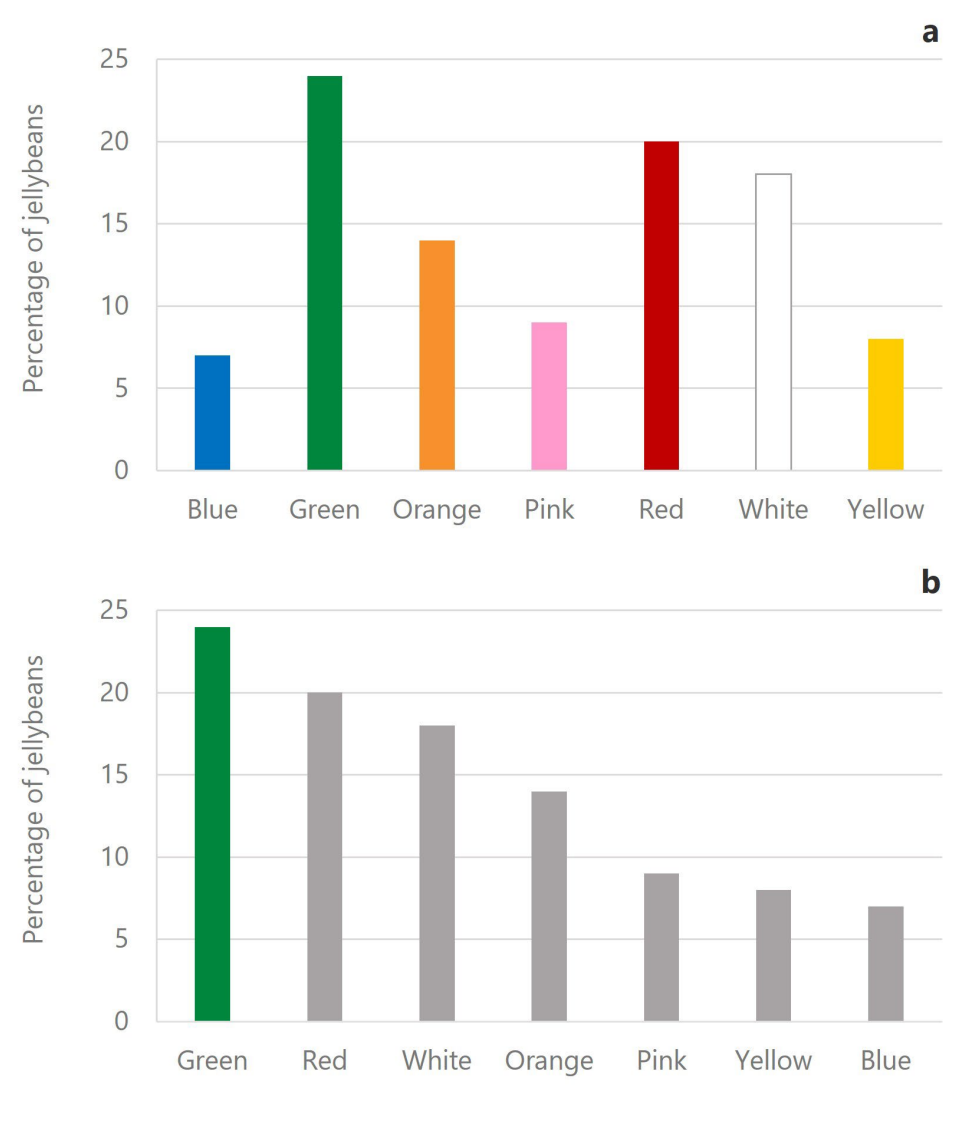
In graphs, make the key points stand out by using bold text, colour or highlighting, or by using the design to convey your message.

For example, both graphs in Figure 2 show the same data, but the second focuses our attention on the green column. Using fewer colours is also more accessible, because it's easier to differentiate between 1 dark colour and 1 pale colour.

Example 2 Using colour to highlight key information

Imagine a dataset containing the number of jellybeans per colour in a packet. In this example, we decide that our main message for this graph is: *There are, on average, more green jellybeans in a packet than any other colour.*

Ordering the categories alphabetically and colouring them to match the jellybeans is not incorrect (Figure 2a). But to highlight that green jellybeans are the most common we can emphasise the green column by ordering the categories by value. This works because colours have no intrinsic order, so we can reorder them without misrepresenting the data. Shading the other jellybean categories in a neutral colour keeps the focus on the green category (Figure 2b).



Source: Data provided by J Randell.

Figure 2 An example of using colour to draw attention, with (a) using too many colours and (b) using a colour to highlight key information

It is good practice to discuss the key points of a graph and then direct the reader with an in-text reference, rather than just announcing the inclusion of the graph. This highlights the message directly, and makes the text more active and interesting:

> A study of 9 small packets of a popular brand of jellybeans showed that green was the most common colour, followed by red and white (Figure 2).
> *not*
> Figure 2 shows the frequencies of the colours in 9 small packets of a popular brand of jellybeans.

In graphs and infographics, you can reduce cognitive load on your audience by just telling them your message. For example, rather than having a heading of 'Biosecurity', you can have 'Australia strictly controls imports to protect our crops and wildlife', and instead of 'Health guide', you can have 'Steps to reduce your cancer risk'.

In figures included in reports, the form of figure titles is often specified by a corporate style – for example, quantity, conditions, place and time. In such cases, a title like 'Number of feral cats in Australia, 1900–2020 (estimated)' may be inevitable. The same graph, presented in an infographic or on a webpage, might instead (depending on the key messages) be titled 'There are about 6 million feral cats in Australia, killing about 300 million native birds a year'.

Reduce clutter and distraction

It is important for the message or data to shine through your visual display. It should be the most prominent and legible item in your display.[1] Reducing clutter can help to achieve this.

Garish, multicoloured or zebra-striped graphs with large amounts of bolded text, heavy lines and effects (for example, 3D, perspective, shadow) can bamboozle and repel readers, as well as distort the data (Figure 3a).

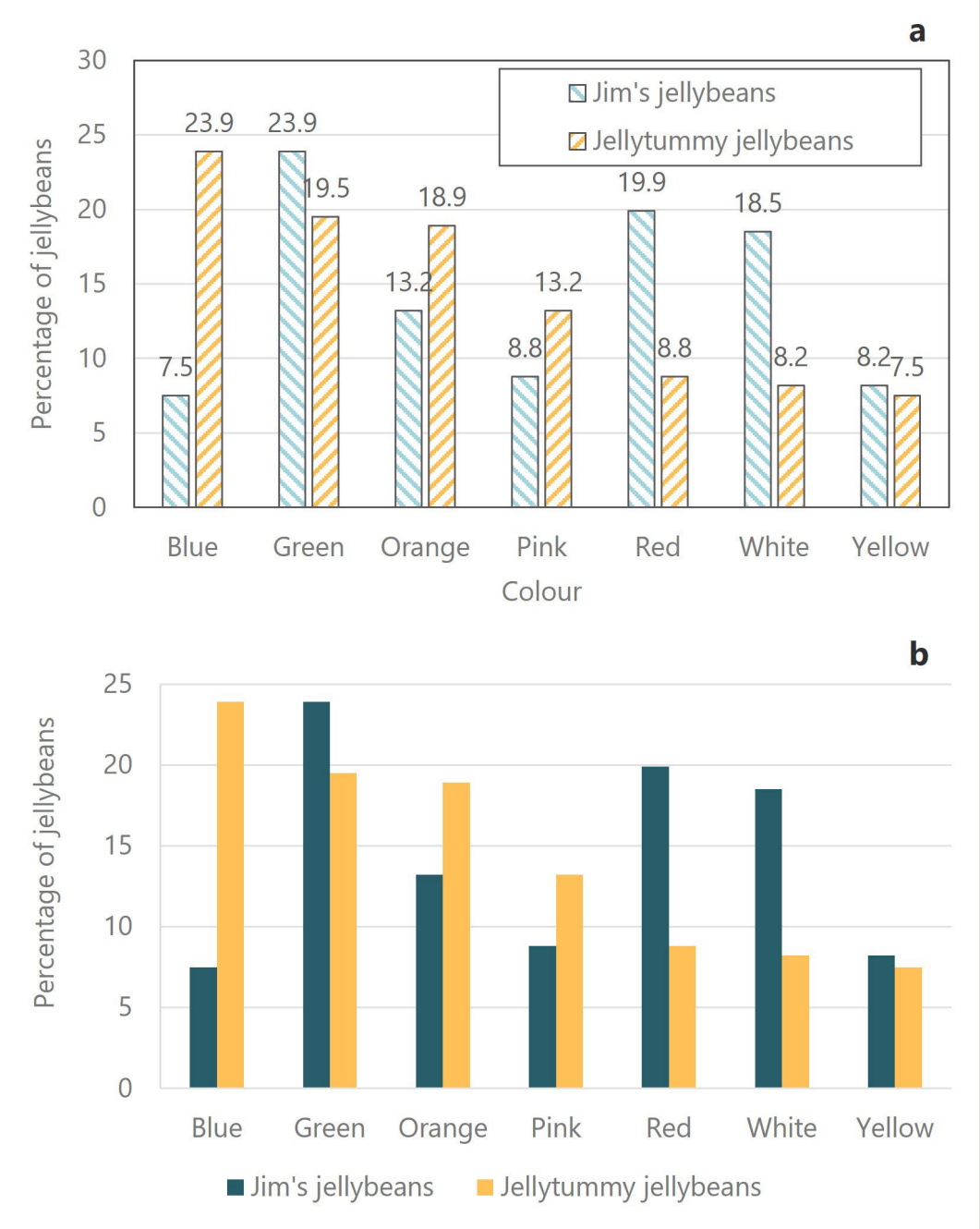
Pay attention to the ratio of data to ink (or pixels).[2] This means using paler tints or finer lines for non-data elements, such as gridlines, arrows, borders and shading. Wherever possible, remove citations, caveats, logos, background shading, borders and other irrelevant data or graphic elements. The focus should be on the data, not the surrounds.

> Stick to the principle 'less is more' and strip unnecessary parts out of the presentation.

[1] Kirk A (2012). *Data visualization: a successful design process*, Packt Publishing, Birmingham.
[2] Tufte ER (2001). *The visual display of quantitative information*, 2nd edn, Graphics Press, Connecticut.

Example 3 Removing unnecessary elements

Both graphs in this example show the same data. Unnecessary elements that clutter the graph make the data harder to interpret (Figure 3a). Without these elements, the graph is visually cleaner and easier to interpret (Figure 3b).



Source: Data provided by J Randell.

Figure 3 An example of presenting information cleanly, with (a) a cluttered graph and (b) a clean graph

Use colour wisely

Be restrained with use of colour. Using a single splash of a strong colour to highlight a key point can be more powerful and effective than colouring the entire graph or having a psychedelic infographic. If everything is coloured, nothing stands out (Figure 2a).

If the colour serves no function, reconsider its use. For example, in a clustered column graph, the proximity of columns shows they belong to the same category, so there is no need to use colour to show this (Figure 4a). Colour can then be used to show the subcategory (Figure 4b).

Adjust colours to suit the design concept, as long as this does not interfere with the integrity of the data (such as a map key, or colours relating directly to data or existing schemes). You may have to work within a corporate colour palette.

List colours and patterns in the legend in the order in which they appear in the figure. In a series of figures, use the same colours for the same categories. Ensure that there is enough contrast between colours – steps of at least 20% tint for monochrome shading – or use patterns or patterned lines (for example, dotted, dashed) to meet accessibility needs when a coloured graph is printed in black and white. Avoid zebra striping and rainbow colours.

Be aware that some colours can carry cultural meaning, such as green for good, go or environment; and red for bad, stop, warning or heat. Colours also create a psychological response – bright colours are exciting and energetic, and attract attention, whereas pale colours are tranquil and soothing.

Remember that the cultural meaning of a colour can vary from place to place. For example, in some parts of the world, red is strongly associated with former communist regimes and its use may come with undesirable meanings and connotations for some audiences and contexts.

Look for opportunities to use colour meaningfully, and don't imply meaning where there is none. For example, you could use 2 shades of a single colour to indicate different years or subcategories of data (as done in Figure 4b), rather than red (stop; danger; fire) and green (go; good; nature), unless you want to imply a judgement about the data series.

Example 4 Using colour for clarity

Think about what you want your audience to understand, and what your use of colour is conveying.

Both graphs show the testing results of 2 different samples.

Figure 4a uses colour to highlight the different laboratories (B, C and D). This focuses on the differences between the 3 labs, and adds labels to differentiate the 2 samples.

Figure 4b uses colour to label the 2 samples, which focuses on the differences between the samples. It also reduces clutter, reduces the number of colours (which is good for accessibility) and makes it clearer that the different laboratories all tested samples of the same kind.

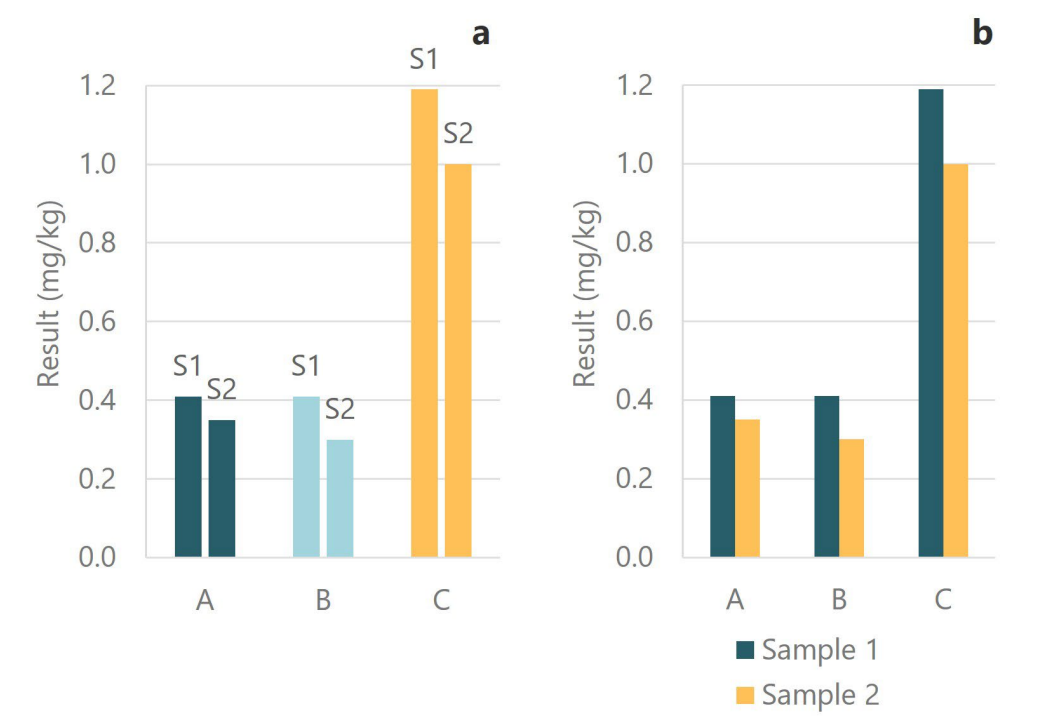


Figure 4 An example of using colour to present information clearly, with (a) using colour poorly and (b) using colour well

Ensure consistency

Having a consistent look within your visual element and across all elements in your content will help the audience quickly understand the displays. The consistent look also reduces cognitive load and how much work the audience needs to do to understand.

Standardise common elements across similar graphs and infographics (for example, font, appearance of legends, data elements, axes, borders, colours, line styles).

Make sure that comparable information is shown in equivalent formats (for example, don't show 1 year's dataset in a line graph and the same dataset for a different year in a bar graph). Graphs that are to be compared with each other should also have comparable scales (even if they don't all need the same height of scale) and categories, and consistent styling.

Ensure accessibility

We want our information to be available to the widest possible audience. This means we must think about accessibility.[3] This is an essential requirement for all government communication.[4]

For data visualisation and infographics, the first thing to consider for accessibility is the design.

Choose colour combinations that can be distinguished by colourblind readers (about 8% of Australian males and 0.4% of females are colourblind to some degree).[5] Set minimum font sizes to help people with poor vision engage with your content. Make sure there is strong contrast between foreground and background colours.

Consider whether the presentation matches the data literacy and existing subject matter knowledge of your audience, who might:

- use English as a second language
- be children
- have intellectual disability
- have poor literacy or numeracy
- have poor access to (or understanding of) technology and the internet
- be subject matter experts or have existing knowledge.

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3 Henry SL (ed) (2023). WCAG 2 Overview | Web Accessibility Initiative (WAI) | W3C. Cambridge MA.

4 Australian Government Style Manual. Accessible and inclusive content: Agency responsibilities and commitments. Australian Government, Canberra.

5 Vision Eye Institute (2017). Colour blindness. Vision Eye Institute, Melbourne.

Finally, any visual element should be supported with alternative (alt) text. Alt text can be added to webpages, Word documents and PDF files.

Alt text allows users with screen readers to hear a description of the graphics on the page.

Alt text is also critical to ensure content can be seen by AI platforms. Although AI prioritises the text on the page, alt text helps AI to 'see' the image and parse the information. A visual display should be thought of as one part of a package of information – the combination of a well-crafted display plus descriptive alt text is more likely to be cited than the display alone.

Alt text is more than the figure caption. It should convey what the image is and its main messages. For Figure 2, the alt text might be, 'A column graph showing that green jellybeans were the most common, followed by red and white'. Saying 'Graph showing the percentage of each colour of jellybeans' describes the graph but does not provide the main messages, so it is not helpful to the audience who relies on alt text.

Effective graphs

Graphs are the most common form of data visualisations (other forms include maps and diagrams). Making an effective graph involves choosing the right graph and design principles to make your message clear to the reader.

Choosing the right graph

Graphs are the best way to display data when the overall patterns in the data are more important to convey than the individual data values (if you need to show specific values, consider using a table instead or as well as a graph).

Some data patterns that you might want to show are:

- change over time
- comparisons of groups or categories
- distribution (once or over time)
- part to whole
- deviation
- correlation (association).

Choosing the correct type of graph for your data makes these patterns clear.

> Bad graphs or the wrong type of graph can confuse or distort your messages.

Graphs are a technical format and require some interpretation. The more familiar the format, the easier it is to understand.

The simplest graphing option is usually the best. Readers will engage with, and be persuaded by, the message if the data are presented in a way that matches their understanding of common data patterns. For example, people generally understand that horizontal lines represent measurements over time.

For audiences who are not highly data literate, use simpler, more common graphs, such as line and bar graphs. Even if your audience is data literate, a bar graph may be easier to understand than, for example, a dumbbell plot. Your audience should inform every decision.

Example 5 Avoiding unfamiliar graphs

Dumbbell plots are used to show the change in some quantity between 2 periods or 2 subcategories. Figure 5 uses a dumbbell plot to show the differences in the percentages of jellybean colours across 2 brands. This plot is a good choice if you want to highlight which colours showed the biggest differences (we can see quickly that blue jellybeans differ most between brands). But it is not a common type of graph and can be hard to interpret for those who aren't familiar with it.

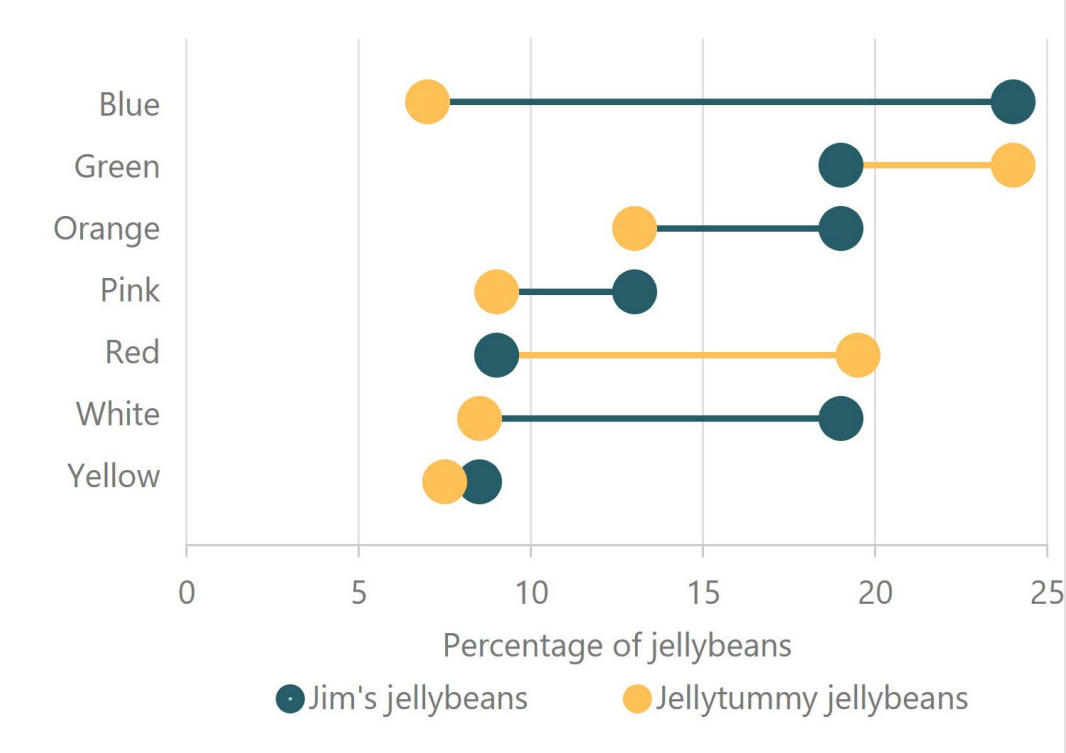


Figure 5 An example of a dumbbell plot

Some kinds of graphs or graph designs are not as effective as others. This may be because they add complication, or because they don't mesh well with the natural preferences of the brain. For example, humans find comparing lengths with a common baseline much easier than comparing angles and areas. This means that bar and column graphs are usually easier to interpret than pie charts.

Pie charts use pie segments to show relative proportions of a total measure. However, the relative sizes of these segments is difficult for readers to judge and compare, and they can't show exact percentages unless data labels are included for each segment.[6] The choice of colour can also influence how well readers can compare the size of sections – a smaller section can appear larger if it is in a strong colour.

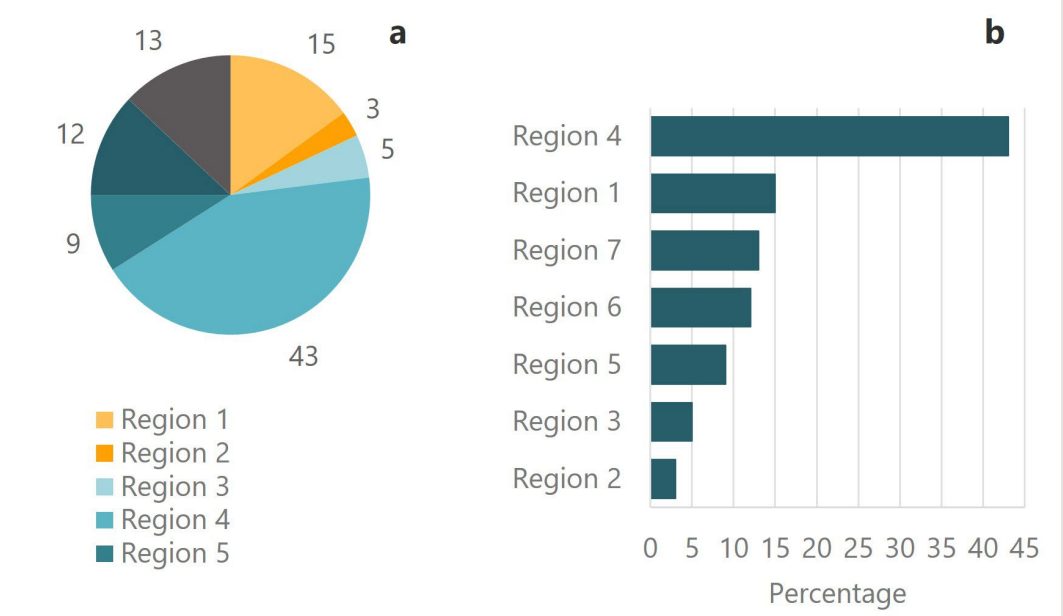
[6] Few S (2012). *Show me the numbers: designing tables and graphs to enlighten*, 2nd edn, Analytics Press, Burlingame, California.

A simple bar chart is usually a better choice if you want people to easily understand and compare values.

Example 6 Comparing pie charts and bar charts

Figures 6a and 6b show the percentages of Queensland's koala population that occur in different regions. Figure 6a shows the data as a pie chart, with each segment representing the percentage of the koala population found in a particular region. Pie charts depend on distinct colours to visually separate segments and a legend is needed to identify what each segment refers to.

Figure 6b shows the data as a bar chart. This format makes it easier for the reader to see the differences in population across each region. Having axes labelled with the regions and percentage values removes the need for separate colours, data labels and a legend. This results in a cleaner, easier-to-read graph.



Source: Biotext-generated data.

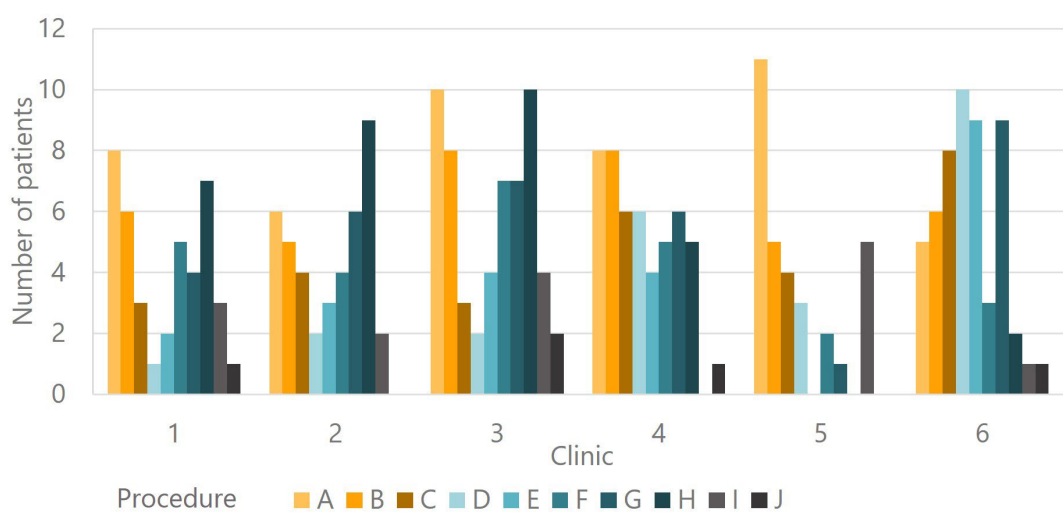
Figure 6 An example showing how pie charts (a) are harder to interpret than bar charts (b)

Sometimes it may be better to show several related graphs, rather than squeeze a large amount of information into a single graph. If we want to look at changes over time among many categories, for example, a column graph may become too cluttered.

When showing data across several graphs, think about the overall layout and how readers will view the graphs in relation to each other. You may want readers to notice a similar pattern of data values across 2 or more graphs, or make a series of comparisons for the same population across several graphs. Using the same design and scale for all graphs, and aligning the graphs vertically or horizontally on the page helps readers to see these similarities or make comparisons.

Example 7 Choosing the most effective graph

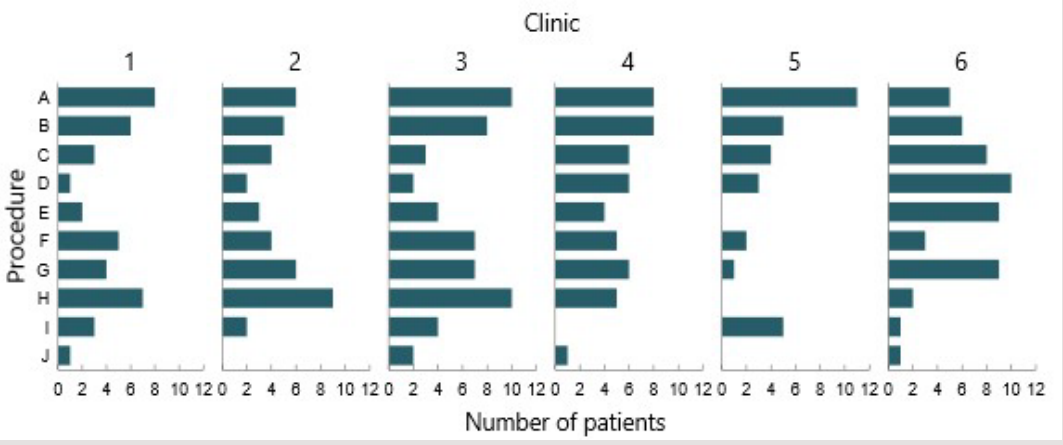
Figures 7a and 7b compare the frequencies of 10 different procedures across 6 different medical clinics. Figure 7a plots this data in a single conventional clustered column graph. This approach depends on the use of colour to show the different procedures, so it must include a legend, which adds more complexity.



Source: Biotext-generated data.

Figure 7a An example of a complex single cluster bar graph

Figure 7b uses a separate graph with consistent scales for each clinic. This panel graph uses a single colour so it needs no legend, meaning less clutter. This design easily shows which procedure was most common at each clinic. If the key message was about which clinic was performing each procedure most often, we would group the data by procedure rather than by clinic.



Source: Biotext-generated data.

Figure 7b An example of a simple panel graph

Designing for accuracy and clarity

Graphs can easily be produced by various software packages, but don't let the bells and whistles lure you into poor practices – just because you can doesn't mean you should.

Avoiding bells and whistles is part of reducing clutter and distraction. If 3D effects, borders, shadows and SmartArt are not adding anything to the message or making the display easier to understand (and usually they won't), don't use them.

Using axes that are simple and familiar to your audience reduces the risk of data being misinterpreted. Familiar axes start at zero and increase by the same value at each increment.

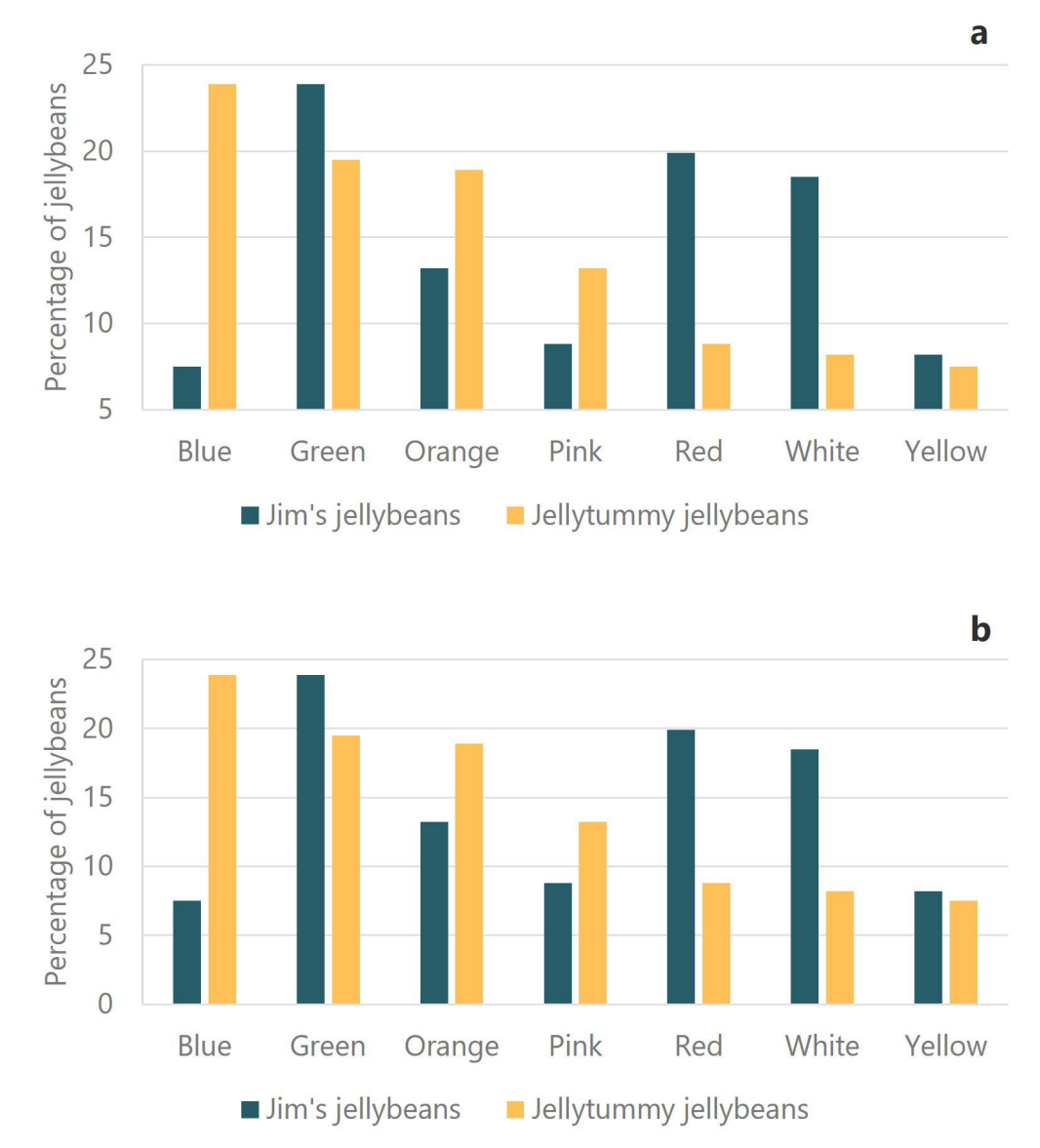
Not starting an axis at zero may not appear to affect your graph but it can give the wrong impression. Complex axes such as discontinuous or exponential scales are not readily understood by most readers and may give a distorted impression or, worse, misrepresent the message of the data. Such axes are sometimes used when the range of data values is very wide – that is, very small data values need to be compared with very large data values. A discontinuous axis skips intervals at some point along the axis before continuing. An exponential axis has unevenly spaced intervals, becoming smaller with distance away from the origin.

If data seem to require distorted axes, find another way to depict the values so that their full scale and the contrast between them are clear – perhaps as 2 different graphs, or a combination of an overall graph and a zoomed-in graph of the critical portion that you want the reader to notice. You might need to experiment.

Using common axes is also important for accuracy in AI summaries. For example, AI models can misread logarithmic scales as linear scales, or miss the units entirely if they are buried in small axis labels. Use common axes wherever possible. If specific, uncommon axes are needed, including further information in alt text can help AI to parse and present the information accurately (for example, 'chart 3: x axis denotes time in nanoseconds at a linear scale 0–100'.

Example 8 Comparing vertical axes

In our jellybean data, all the jellybean colours occur more than 5% of the time, so we could begin the plot at 5% rather than at 0%. This approach is taken in Figure 8a, which appears to show that 1 brand has about 4 times as many red and white jellybeans as the other. This is visually misleading, as the real proportion is closer to double (Figure 8b). Such a distortion could lead a reader to misinterpret the results and make the wrong decision.



Source: Data provided by J Randell.

Figure 8 An example of a graph with a truncated vertical axis (a) and an example of a graph with a standard vertical axis (b)

Ensuring text and graphics work together

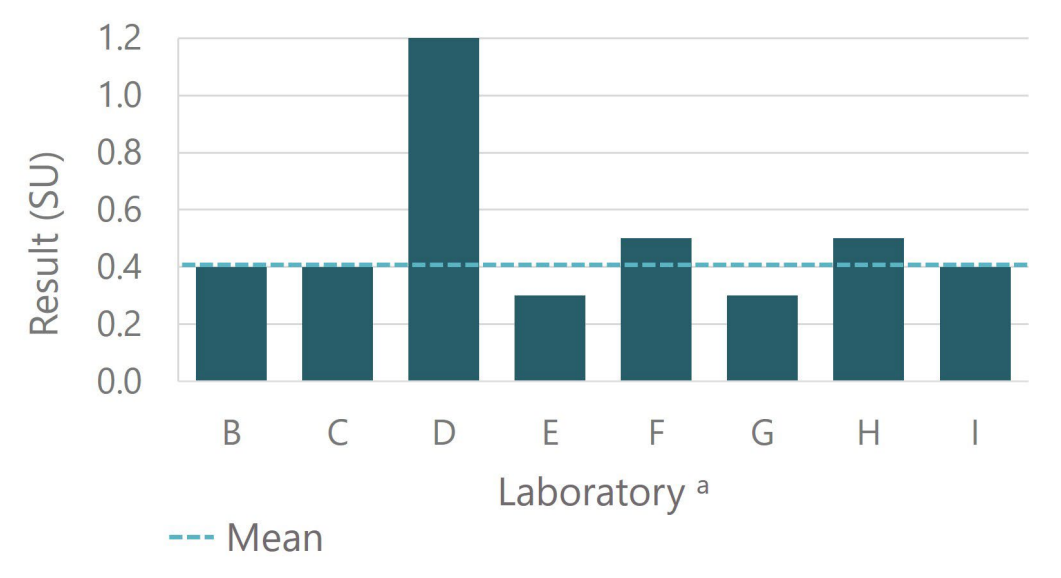
When graphics are incorporated throughout a document or webpage, they should be numbered to make cross-referencing easy and unambiguous. Distributing information between text, figures and figure notes helps everything work together. Make sure you:

- refer to each figure before it is shown
- place the main discussion in the running text, with the figure title or design highlighting the message
- present each figure as per your organisation's style guide, and in a consistent way
- use figure notes correctly (for example, define abbreviations in figure notes)
- attach appropriate alt text (see Ensure accessibility).

Example 9 Using figure notes to help understanding

Figure notes help readers understand the contents of a figure. Use figure notes to avoid lengthy details in the figure title. Figure notes include:

- definitions of abbreviations
- keyed notes that refer to a specific part of the figure
- general notes (possibly numbered) that refer to the figure as a whole
- source notes.



SU = strontium unit
a Laboratory D results were corrected for recovery calculated by the study coordinator.
Note: Data for January to February have not been included.
Source: Biotext (2020).

Figure 9 An example of a graph with figure notes shown below the graph

Avoiding pitfalls

If not done right, graphs can easily be unengaging, confusing or inaccurate. Considering what you want to say to your audience and what they want to know will help you avoid these common pitfalls:

- A graph just to break up text. Sometimes graphs are used to try and make a piece of text more engaging. But if the graph isn't highlighting data that support the aim of the content, it can confuse readers – people assume that if it's in a graph, it must be important.
- Using the wrong type of graph. This includes using unfamiliar types of graphs, and using familiar types for the wrong type of data. Using the wrong type of graph will make it harder for your audience to see the trends or understand the key points you want to highlight.
- Using too much colour. Colour is a powerful tool when used sparingly. Using too much – by colouring bars in different colours, or colouring the background or borders – draws attention away from the data you want to highlight.
- Including too many elements. Not all graphs need gridlines, legends and decorative elements. Consider what information your audience needs to understand the data, and what information can be simplified or removed.
- Inaccessible graphs. Colour, text, font size and alt text affect the accessibility of your graph. Avoid colours with low contrast, and make sure fonts and text sizes are clear. When choosing colours, also consider that the graph may be printed in black and white – will your colour choices still work? Make sure you add alt text to capture the main message of the graph.

Effective infographics

'Infographic' is a broad term. Understanding the different types is the first step to making a clear and effective infographic:

- **Message infographic**. These are used to help readers understand an idea or concept. The message should be one you can sum up in a sentence. Think about what you want your audience to remember (take-home message) or what you want them to do (call to action).
- **Process infographic**. These are used to explain how a process, or a key part of a process, works. Process infographics lead the user through something (for example, tracing decision points in a flowchart). They can
  - be simple or complex
  - be plain or technical
  - consist of only shapes, lines and text, or include graphical elements.
- **Data infographic**. These are used to show interesting data when a graph or map is not engaging enough or can't capture enough aspects of the data (for example, greenhouse gas emissions shown as different sized clouds for different industries). They are based on real data and should show the data accurately.

How to make an infographic

Making effective infographics is an iterative process, involving a subject matter expert, a writer or editor and a designer working together. There are 6 main activities:

- Gather information. Research or work with the subject matter expert to understand the topic and the aim of the infographic.
- Find the story. Decide on a single message for the infographic. You should be able to sum this up in 1 punchy sentence.
- Identify the visual structure. Work out the visual features that will best communicate your message, such as a visual metaphor, a flowchart, illustrations or graphs.
- Draft the design. Work with the designer to turn the sketch into a draft infographic.
- Test the infographic. Share the draft infographic with different audiences, including some who know the subject matter, and some who don't. The expert audience can identify what's wrong or missing; the non-expert audience can tell you whether it's understandable.
- Produce the final design. Refine the design brief based on testing and work with the designer to finalise the infographic.

The best infographics are produced when the writer and the designer work together in each stage. By understanding the designer's process, including how to focus attention

and use visual metaphors, writers and editors can improve their processes. By being involved in the early stages of research and drafting key messages, designers form a stronger understanding of the subject matter and can avoid designs that may misinterpret or conflict with the message.

Choosing the right metaphor for your story

Once you know the message and audience (see The context), the next step is developing compelling images to support and explain the story. Often, this means finding an overarching metaphor for the story you're telling.

There's no magic formula to this. Take the message, then … create ideas. Brainstorm – alone or with colleagues – write, scribble, try your ideas out with friends and colleagues. Sketch, sketch, sketch!

The main thing to remember is that you are looking for a logical connection between your message and the visuals. For example:

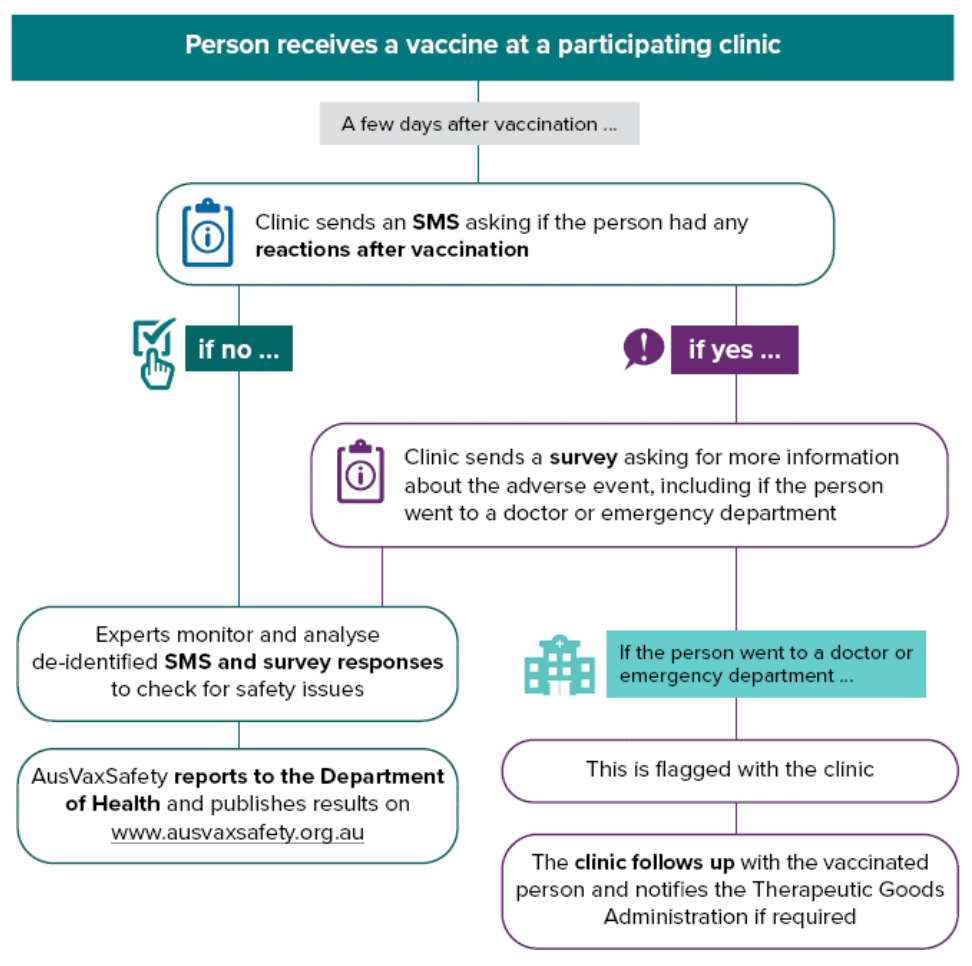
- links or connections could be shown with chains or handshakes
- growth can be shown with a tree or an increasing balloon
- a linear process could be a river
- a repeating process could be a circle
- advances can be steps or pathways towards a goal.

Even if the concept is more complex, the process is the same. Play around with ideas until you have 1 that your audience will find easy to understand.

> Test ideas with your audience. Share sketches with people who are not familiar with the messages – show not just members of your team, but family, friends and colleagues in other areas. See what they understand, and adjust the design if needed.

Example 10 Using infographics to describe processes

Process infographics (when done right) are a great way to explain steps or instructions. Figure 10 uses a process infographic to explain how data on reactions to vaccines are collected.



Source: *Vaccine safety in Australia: AusVaxSafety summary report 2020*[7]

Figure 10 An example of a process infographic

[7] health.gov.au/resources/publications/vaccine-safety-in-australia-ausvaxsafety-summary-report-2020

Example 11 Brainstorming and sketching infographics

Different metaphors could be used to show the key message that an ecosystem can cope with 1 disaster or even 2, but not all of them at once. Figure 11 shows sketches developed during the brainstorming stage.

Figure 11a represents the environmental pressures as weights (shown as books or reports) that build up on a shelf (which represents the ecosystem). The more weights, the more pressure and eventually the shelf will break.

Figure 11b is inspired by Venn diagrams and the idea of pressures 'overlapping' in transparent filters. A single filter lets plenty of light through, but when 3 overlap, things look pretty dark.

Figure 11c shows a see-saw that balances a healthy ecosystem on one end with pressures on the other. The weight on the pressures end builds up until it tips and the ecosystem collapses.

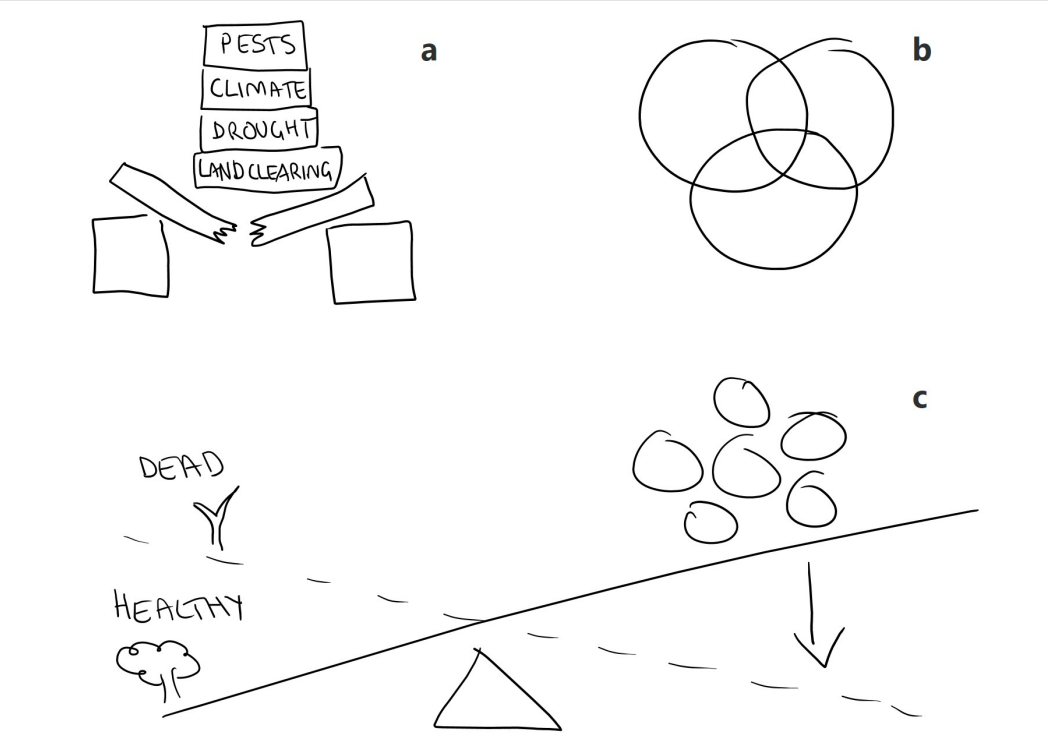
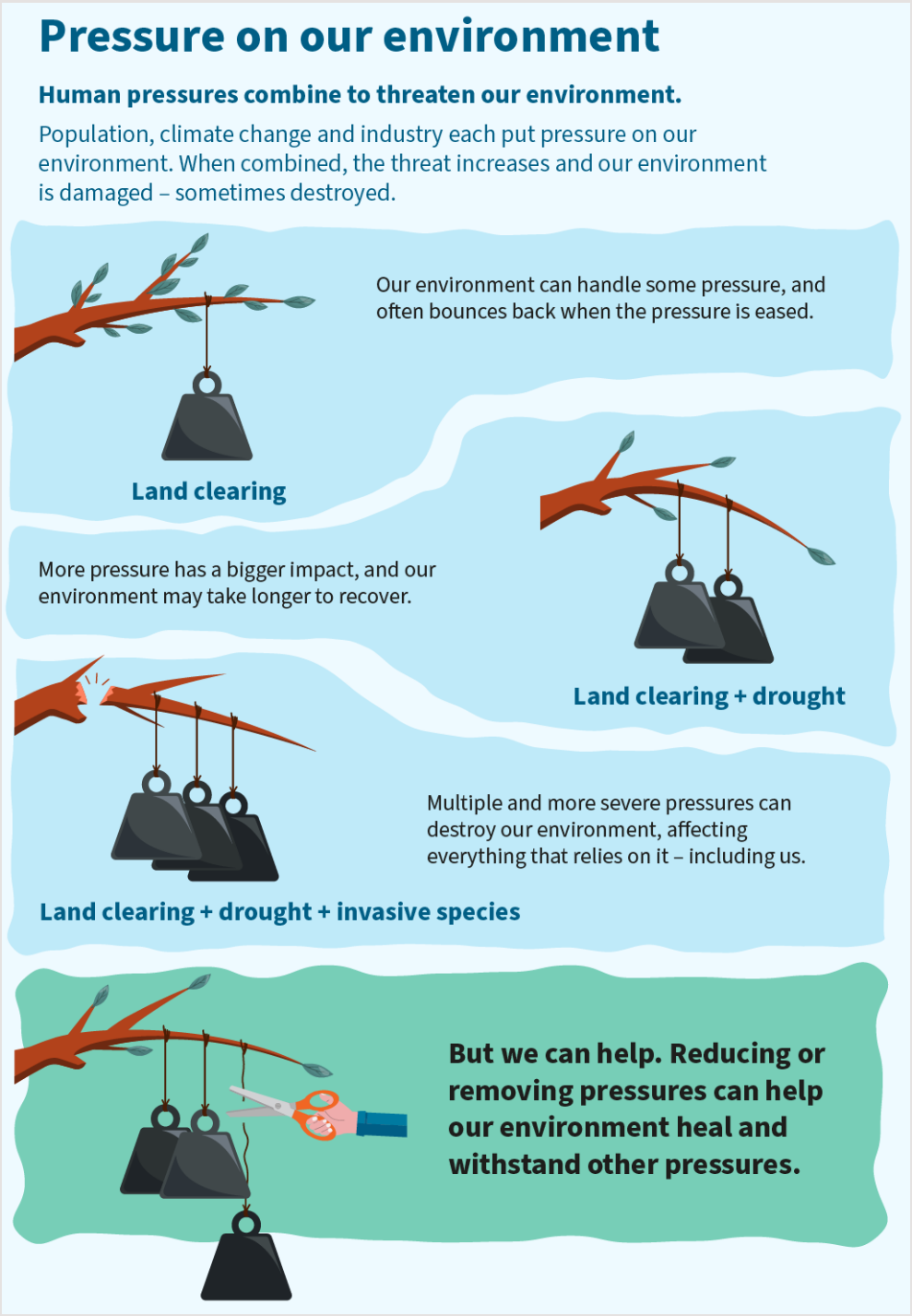


Figure 11 Early sketches showing the 'piling up of weights' metaphor (a), Venn-style 'overlapping' pressures diagram (b) and 'see-saw' metaphor (c).

Visual metaphors come about through being playful and not being too critical during the brainstorming stages. Eventually, 1 idea must be chosen, which will be developed and presented. Sometimes, it is only then that you see whether it really works.

Example 12 Choosing the design for general audiences

Figure 12 shows the final design of a weights metaphor, similar to the sketch in Figure 11a.



Source: Cresswell ID, Janke T & Johnston EL (2021).**Error! Bookmark not defined.**

Figure 12 An example of an infographic for general audiences

Making the right design decisions

Bring together your images, colour, text, type design, structure and metaphor to create the final infographic. In some cases, you might not have a choice – for example, you may have to work with a set corporate font or colour palette.

Effective design choices are informed by:

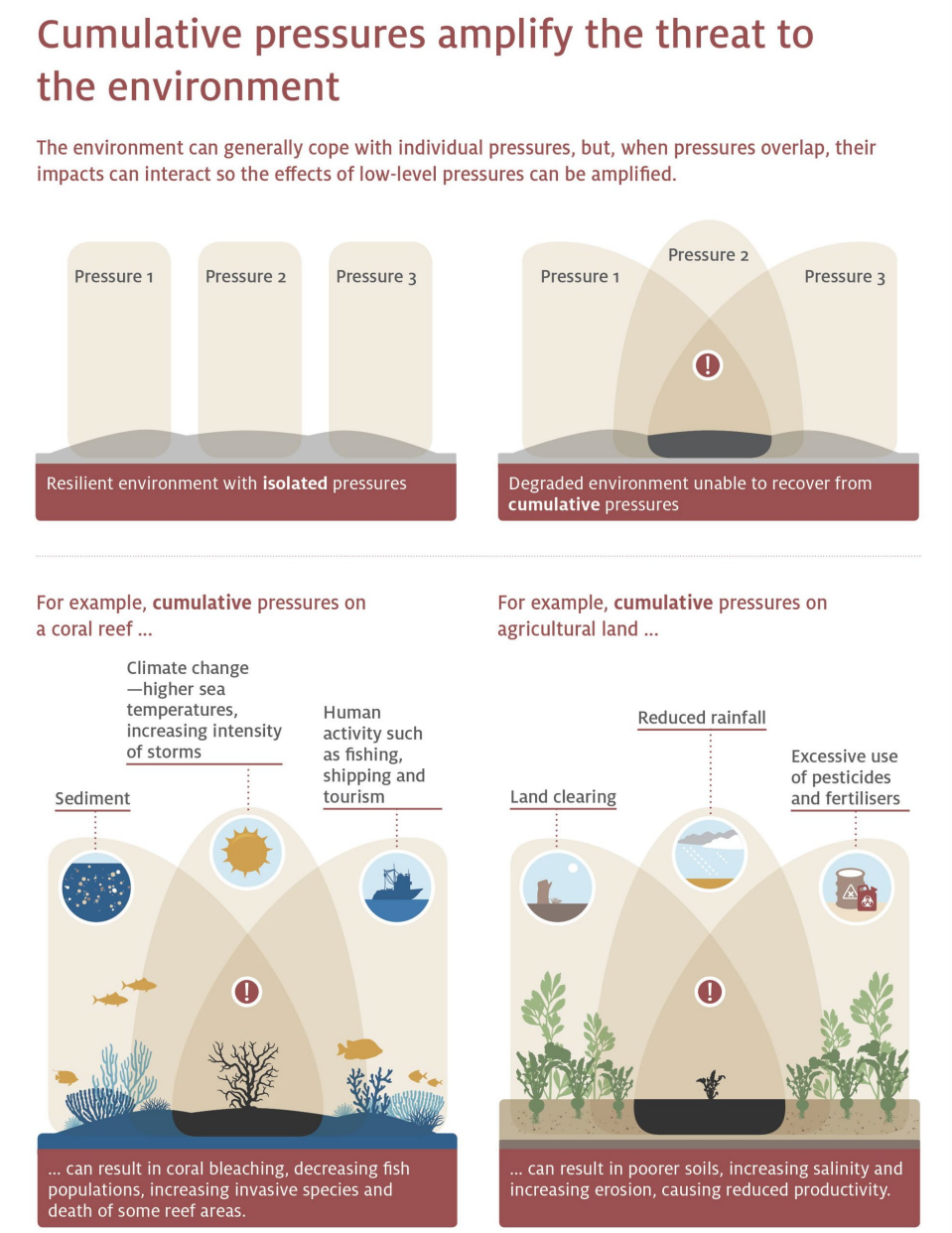
- your audience – the design may have a technical or corporate style to present to professionals, or a fun and colourful style for public or younger audiences (Examples 12 and 13 show the same message designed for a general audience and a more technical audience)
- your content and message – colours can relate to the subject matter (for example, green for environment) and emphasise the emotional and moral aspects of your message (for example, using red, black and darker shades to highlight negative points)
- how the infographic will be viewed – colour choice, text and image size may differ depending on whether the infographic will be printed or viewed online
- accessibility needs – things like colour contrast, text size and familiar icons and imagery will ensure your infographic is easily viewed and understood.

The design choices for Figure 12 (above) were based on making a visual that was simple and engaging for a wide range of audiences:

- The first thing seen – the text at the top – is a brief synopsis of the main message. The rest of the infographic expands on that, approaches it in other ways, and strives to make it memorable.
- The story is broken up into steps – because several simple things are better than 1 complicated thing.
- A few simple words say the same message as the visuals – because people learn and remember in different ways.
- The top 3 images show the evolution of the branch with pressures adding up. The key thing is the branch, so the background colour and fonts remain unchanged, but the branch evolves – it droops down and loses its leaves.
- The last section is a positive message – 'we can help' – and is not an evolution of the first 3, but a reversal. This difference is hinted at by the changed background and darker, larger typeface.
- The images used are branches (directly evocative of ecosystems), weights (simple, instantly recognisable) and a human hand. That the only appearance of a human feature is in the positive 'we can help' cell helps shape the message as not all negative, and reinforces the message that humans can take action.

Example 13 Choosing the design for technical audiences

Figure 13 shows the final design of the Venn diagram metaphor (Figure 11c). This design is for a technical report and has a very neat, corporate style.



Source: Jackson et al (2017).[8]

Figure 13 An example of an infographic for technical audiences

[8] Jackson WJ, Argent RM, Bax NJ, Clark GF, Coleman S, Cresswell ID, Emmerson KM, Evans K, Hibberd MF, Johnston EL, Keywood MD, Klekociuk A, Mackay R, Metcalfe D, Murphy H, Rankin A, Smith DC & Wienecke B (2017). *Australia state of the environment 2016: overview*, independent report to the Australian Government Minister for the Environment and Energy, Australian Government Department of the Environment and Energy, Canberra.

Avoiding pitfalls

Authors can fall into the trap of wanting an infographic to enliven their work without thinking about what they want to say or what the infographic is to achieve. This is a recipe for poor infographics, and can cause some common pitfalls:

- **Too many messages.** The most common problem we see with infographics is a desire to cover all aspects and details of the concept. Instead, identify the key message you want your audience to understand, and focus on that. This might mean omitting some details, simplifying complex ideas or breaking ideas down into several parts or steps.
- **Unclear message**. It's easy to fall into the trap of wanting an infographic to enliven your work without thinking about what you want to say or what the infographic is supposed to achieve. This is a recipe for poor infographics. Summarise your key message in writing before you start planning your infographic.
- **Too much text**. Reading large blocks of text slows the reader's interaction with the infographic and weakens the overall message. Brief, effective text that is well matched to the graphics works better. Extra details can always be added to the other content around the infographic.
- **An infographic that is not an infographic.** Icons can improve document navigation and interest, but a dot-point list with icons is not an infographic. Infographics should convey a particular narrative or process, not just comprise a list.
- **One infographic when several are needed**. Breaking down a complex idea into separate panels, or even separate infographics, can improve understanding. This is useful if the message is actually a bundle of separate ideas. It's also useful if you find yourself hoping for '1 summary infographic'. Such an infographic can be impossibly complicated, and you may need to either simplify the message or come up with a linked set of infographics.
- **Trying to be too close to real life**. Sometimes authors want icons or graphics to show an object that looks exactly like 'the real thing'. However, this can impede understanding. Audiences can often more readily recognise a cartoon icon of an object than a real-life drawing of the same object. Visuals and icons don't need to be realistic to prompt the audience to think of a certain thing – for example, younger computer users recognise the 'save' symbol in many computer applications even though they may never have used a floppy disk.

Resources

If you would like help with data visualisation, infographics, content development or processes, Biotext can help.

We are content experts specialising in complex content, including health and biomedical science, environment, agriculture, government and policy. We provide content strategy and design, writing, editing, information design, data visualisation and infographics.

We provide practical training in content and information design. Our popular online workshops include *Writing and editing complex content*, *Creating effective infographics* and *Making accessible documents*.

We provide tips and insights on communicating effectively with your audiences and improving your content processes. Quick guides are available in:

- discovery and strategy
- effective content
- quality assurance
- visual communication.

See our free resources at biotext.com.au.

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