8 Presenting and Visualising Data

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Presenting and Visualising Data

Data visualisation is an important component of the data lifecycle. When data is analysed, valuable insights are extracted from the data. When we visualise data, it is our responsibility to ensure that those insights are not buried within a complex data set, but rather, that they are presented in a way that is understandable, relevant, and actionable for the target audience.

In this module, we will help your team to learn to present and visualise data so that it can be effectively used to make planning and operational decisions.

Questions this module explores

- What are the principles of data presentation and visualisation?
- What are some of the key considerations to communicate the key insights in your data?

Learning Objectives

- Be able to identify data visualisation best practices and the reasons for applying them
- Be able to verify and communicate an accurate, effective story with data
- Be able to review data visualisations for audience appropriateness and accessibility

Module Topics

- Data visualisation overview: Identifying data visualisation best practices and why we should take the time to apply these best practices
- Data visualisation storytelling: How to tell an effective story with data
- Data visualisation accessibility: Ensuring data visualisations are appropriate and accessible for your audience

Recipes

A suggested step-by-step process to achieve learning objectives

1. Present the **Data Visualisation Overview (8 - 4)** slide deck to give participants a refresher on strategic ways data can be presented in order to best convey the data's key insights.
2. Provide participants with the **Data Visualisation Best Practices (8 - 3)** handout so that they can refer to it for subsequent learning exercises.
3. Ask participants to apply their knowledge in the **Data Makeovers (8 - 1)** exercise, in which they will give a "makeover" to a series of charts that are either misleading, confusing, or have an unclear key message.
4. Once they have completed the exercise, go through the **Data Visualisation Accessibility Overview (8 - 13)** slide deck, which will introduce different accessibility challenges that audiences may face when consuming a data visualisation.

5 Ask participants to return to their Data Makeovers product and make any necessary revisions in order to make it more accessible to different audiences.
6 Have each group present their Data Makeover again, this time noting the revisions they made to improve accessibility.

Ingredients

Pick and choose ingredients to create your own recipe. Do you have an ingredient we're missing? Send an email to data.literacy@ifrc.org

Exercises

Short, discrete social learning experiences

- **Data Makeovers (8 - 1)**: In this exercise, participants give a "makeover" to a series of charts that are either misleading, confusing, or have an unclear key message.
- **S-C-A-M-P-E-R (8 - 2)**: In this exercise, participants will apply a user-experience (UX) lens to improve navigation and user-friendliness of a data dashboard.
- **Data Gallery (8 - 5)**: In this exercise, participants interact with, and think critically about, data visualisations and the effect to which they are trustworthy, unbiased, and accurate.
- **Infographic Drawing (8 - 6)**: In this exercise, participants will be challenged to think visually about a data narrative.
- **Translating Technical Concepts for Audiences (8 - 7)**: In this exercise, participants with statistical analysis experience will practice their skills in communicating complex topics to non-technical audiences.
- **Data Sculptures (8 - 8)**: In this exercise, participants will review a dataset provided, identify the key insights, decide how to communicate those insights with the decision maker audience in mind, and frame the insights in an effective storytelling format without the aid of a computer.
- **Understanding Different Types of Colour Vision Deficiencies (8 - 12)**: In this exercise, participants will practice critically assessing iconography choices for audience appropriateness.

Slide Decks

Draft presentations to be used and/or revised:

- **Data Visualisation Overview (8 - 4)**: This slide deck provides an overview of common data visualisation best practices and why they should be applied.
- **Understanding Different Types of Colour Vision Deficiencies (8 - 12)**: This slide deck helps participants to gain familiarity with how colours are interpreted by individuals with different colour vision deficiencies.
- **Data Visualisation Accessibility Overview (8 - 13)**: This slide deck provides an overview of different accessibility challenges that audiences may face and provides tips to make a visualisation more accessible.

Checklists/Handouts/Materials

For documentation of essential elements of the learning experience

- **Data Visualisation Best Practices (8 - 3)**: This handout provides a helpful reminder as to the common data visualisation best practices.
- **Infographic Design Best Practices (8 - 9)**: This handout provides a helpful reminder as to the infographic design best practices.
- **10 Ideas to Visualise Qualitative Data (8 - 10)**: This handout provides the participant with some creative options for visualising qualitative data.
- **Data Visualisation Accessibility Checklist (8 - 14)**: This handout is a helpful checklist that participants can follow in order to improve the accessibility of their visualisation.

Next Steps

Relevant modules in the Data Playbook

- **Nurturing a Data Culture (2)** (Module 2) and **Making Decisions with Data (9)** (Module 9)

Module lead credit

Katherine Lilly with IFRC V1 Sprint and Data Playbook Beta contributors

8 - 1 Data Makeovers

Data visualisation does not mean making your data look more aesthetically pleasing- although that is a positive side effect! Rather, it facilitates greater comprehension of your data by your audience and promotes data use and evidence-based decision making.
In this exercise, participants will work in groups to give a "makeover" to charts that are either misleading, confusing, or have an unclear key message. This exercise is aimed at ***Data Active*** participants who have reviewed the list of **Data Visualisation Best Practices (8 - 3)** prior to the exercise.

Learning objective

Apply the data visualisation best practices and highlight a chart's key message.

People

Teams of 2 to 4 people

Time

- Option 1: one hour.
- Option 2: If 2-4 teams, two hours. If 5-10 teams, half day session.
- Option 3: a week-long group data makeover team competition, as explained below. This option has more flexible timing and is designed for teams to fit into their existing schedules at their convenience.

Difficulty

Intermediate

Materials

Slide deck with "before" data visualisations and associated data files.

- **In person:** Flipchart paper and markers (face-to-ace)
- **Virtual Materials:** virtual meeting platform, shared document/writing space.

Preparation and sources

We've prepared some examples of 'before' and 'after' visualisations with accompanying datasets and sources for your use. Please be sure to cite all sources of data and visualisations. You can also add your own versions that relate to your organisational work.

Please find the files for the datasets and images that are used for this exercise. To prepare, facilitators should download and reference accordingly.

1. 2018/W28: Volcano Eruptions
2. Smartphone Ownership Among Youth Is on the Rise
3. Zambia Southern Province Confirmed Malaria Cases
4. Violence Against Women & Girls
5. Women in Power
6. What Policymakers Know about Women's and Girls' Issues
7. Visualizing Conflict
8. The Rise of Soccer
9. Food: Greenhouse Gas Emission
10. Women in the Olympics

Instructions

Option 1, a Data Makeovers mini-exercise:

1. This option is designed for those with less data visualisation software experience, but who still want to practice interpreting and communicating a visualisation's key message. Each team is given the same dataset and corresponding data visualisation (a.k.a "The Before").
    - Questions to ask:
        - Is data presented accurately in this visualisation?
        - What is the key message?
        - How easy or difficult is it to interpret what this visualisation is saying?
2. In your team, work together to analyse the data set and identify the key message you want to highlight (this message may be the same or different than in the original "Before" visualisation).
3. Using pen and paper only, draw some visualisation ideas that you feel better communicate the chart's key messages.
4. When you are finished, discuss with other teams the ideas you had to improve the way the chart was presented.
    - Questions to ask:

- What steps did you take to improve the visualisation?
- How do those changes better convey the chart's key message than the "Before" version?

Option 2, a one session Data Makeovers exercise:

1. Each team is given the same dataset and corresponding data visualisation (a.k.a "The Before").
    - Questions to ask:
        - Is data presented accurately in this visualisation?
        - What is the key message?
        - How easy or difficult is it to interpret what this visualisation is saying?
2. In your team, work together to analyse the data set and identify the key message you want to highlight (this message may be the same or different than in the original "Before" visualisation).
3. Then, improve upon the original data visualisation you were given by applying data visualisation best practices, improving accessibility, and/or clarifying the message that the visualisation conveys. You may identify only small changes to make, or you may decide to recreate the whole visualisation in order to properly convey your key message. You may use whatever data visualisation tool you feel comfortable with for this exercise (i.e. a dashboard, a map, Excel chart, an infographic, etc.)
4. After everyone is completed, teams will have an opportunity to present their "Before" and "After" visualisation to the full group.
    - Questions to ask:
        - What steps did you take to improve the visualisation?
        - What data visualisation best practices did you apply?
        - Why does the "After" version better convey your key message than the "Before" version?

Option 3, a week-long, interactive Data Makeovers Team Challenge:

This format is similar to Option 1, but may be friendlier for virtual settings, and would be easier to facilitate outside of a formal data visualisation training session.

1. Preparation: participants are pre-assigned to teams, and each team should be set up with a virtual workspace (i.e. Microsoft Teams, Slack, Discord, etc.). Ensure that there is also a separate channel/workspace set up that all teams have access to.
2. Day 1: Each team's workspace is loaded with their data set and corresponding "Before" data visualisation.
3. Day 2: Teams are given a set amount of group work time (recommendation: 2 hours) to analyse their data, assign roles, brainstorm ideas, and start to develop their makeover visualisation. Time allotted can be whatever

works for your team's schedule that day. The idea is for this option to be more flexible than Option 1 so that it can fit into a normal day.

4. Day 3: Teams are given a set amount of group work time to continue to work on their visualisation.
5. Day 4: Teams post their completed first draft to the Challenge's shared virtual channel/workspace. Using an interactive social media-style commenting system, teams can comment on each other's posts, tag people, send GIFs, and share ideas and feedback.
6. Day 5: Teams are given a set amount of time to meet back in their team workspace, review the comments and feedback that came in on Day 4, and make any revisions that they want to make.
7. Day 6: Gallery day- each team gives a virtual presentation of their visualisation. Teams can then vote for categories of winners, like Overall Winner, Most Improved Based on Feedback, Most Creative, Best Storytelling, etc., and maybe even given certificates or a fun prize!

    - Questions to ask:

        - What steps did you take to improve the visualisation?
        - What data visualisation best practices did you apply?
        - What changes did you make based on your colleagues' feedback?
        - Why does the "After" version better convey your key message than the "Before" version?

Extra credit

Instead of using the example "Before" data visualisations and data sets, teams can use the data makeover exercise to periodically reflect upon the visualisations they have produced and identify areas of improvement for next time. Using their original data set (or an updated version of the same dataset), participants can review their visualisation and ask:

- What do we still like about this visualisation?
- What could we do differently to improve this visualisation, knowing what we know now?
- (If data has been updated) How has the key message changed since this visualisation was originally developed?

Credit

Inspired by Makeover Monday, a weekly social data project

8 - 2 S-C-A-M-P-E-R

In this exercise, participants will undergo a user experience exercise to improve navigation and user-friendliness of a data dashboard. SCAMPER is a pneumonic—each letter stands for a process or concept that allows participants to question and test different ideas by looking at them from a different angle. Participants should consider some of the best practices for user experience design, including:

1. Putting yourself in the user's position
2. Don't overwhelm users with too much information
3. Use a simple and consistent interface
4. "Principle of Least Astonishment" - functions of the dashboard should behave the way the user expects them to behave
5. Pay attention to how you feel while using the product, not only what you think about it

This exercise is aimed at Data Ready participants who have advanced data visualisation experience and are interested in taking their information products to the next level by improving the user experience.

Learning objective

To gain experience with user experience design through redesigning a data dashboard.

People

Teams of 4 people

Time

One hour

Difficulty

Advanced

Materials

- Pre-built data dashboard (example provided here or they can use their own example).
- **Virtual Materials:** virtual meeting platform, shared document/writing space
- **In Person materials:** Flipcharts/noteboards, sticky notes, markers

Instructions

1 Each team is given their example data product and set up with a Jamboard or Miroboard (if in a virtual setting) or sticky notes and poster board (if in an in-person-setting).

2 Teams explore their data product and brainstorm improvements that can be made by answering 7 questions (S-C-A-M-P-E-R!). Not all solutions have to be viable- this is a brainstorming exercise! Teams should record their brainstorming for each category:

   a) ***S—Substitute:*** What element within the data product can be swapped with something else? If you swap something, what would happen?
   b) ***C—Combine*:** What elements of the data product can be combined? How would this affect the product?
   c) ***A—Adapt:*** What aspects of the product can be adapted to a different context and how?
   d) ***M—Modify:*** What can be modified to improve the product?
   e) ***P—Put to other uses:*** Are there any other uses this product can serve?
   f) ***E—Eliminate:*** Is there anything within the product that can be removed to make it simpler?
   g) ***R—Rearrange or reverse:*** What can be reversed or rearranged to make this product better?

3 When teams are completed, they should reflect upon their suggested changes. Each team should take turns presenting to the group, summarizing their S-C-A-M-P-E-R findings.

   - Questions to ask:

     — Did you come up with any ideas that stand out as viable solutions to improve the data product?
     — How did your feelings change about the product, from the original version to the revised version?
     — Did this process spark any ideas for how to improve one of your own data products?

Example dashboard for S-C-A-M-P-E-R exercise

The dashboard for this exercise is found at this link

Data Source: The United Nations Survey for a Better World. Positive Impact Events

Data set

Positive Impact Events - Actions

Positive Impact Events

Extra credit

Instead of using the example pre-built dashboard, teams can use the S-C-A-M-P-E-R exercise to periodically reflect upon the visualisations they have produced and identify areas to improve the user experience. For example, if a dashboard has been produced but isn't being used optimally by the target audience for decision-making, this could be an ideal time to make some simple improvements to the user experience using S-C-A-M-P-E-R.

Credit

S-C-A-M-P-E-R mnemonic device developed by Bob Eberle, an education administrator and author. Serrat, Olivier. (2017). The SCAMPER Technique. 10.1007/978-981-10-0983-9_33. Exercise designed by: Katherine Lilly

8 - 3 Data Visualisation Best Practices

Top Ten Tips for Visualising Data

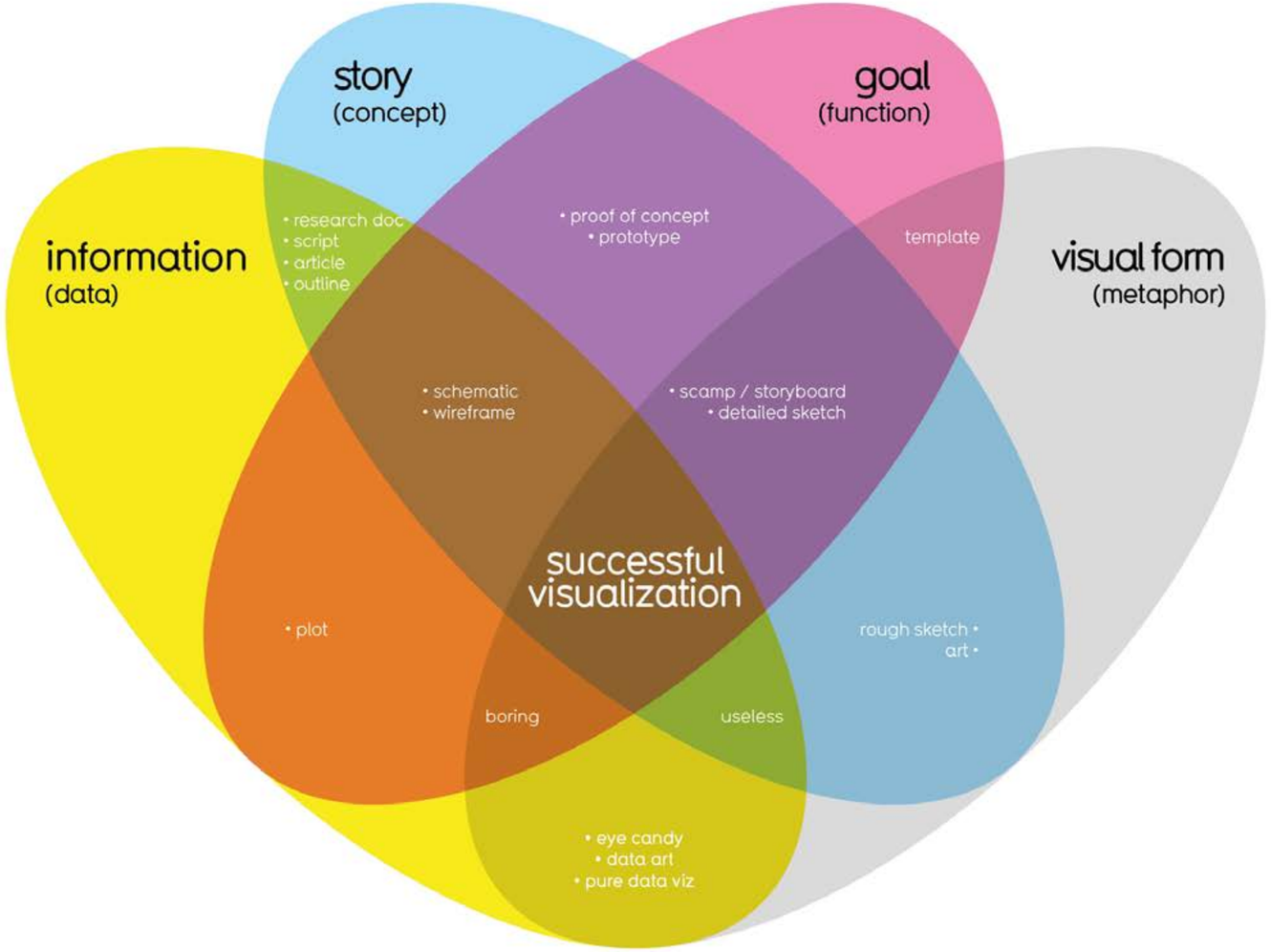
10 Astuces pour la visualisation des données

Top 10 Tips for Data Visualisation handouts developed by: Katherine Lilly, American Red Cross, katherine.lilly@redcross.org

8 - 4 Data Visualisation Overview

Data visualisation is the graphical representation of information and data...

...used to share analysis and make data-driven decisions.



David McCandless
InformationisBeautiful.net

taken from new book
Knowledge is Beautiful

find out more
bit.ly/KIB_Books

informationisbeautiful.net

Eight steps for success

1. Define your **audience**
2. Set clear **goals**
3. Define your **layout**
4. Choose your topic and your **story**
5. Collect your **data**
6. Process your **data**
7. Find the story in the **data**
8. Identify **patterns**

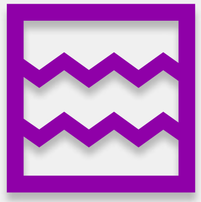
Building a data viz

Define data type

Discrete

Numerical data that has a finite number of possible values.

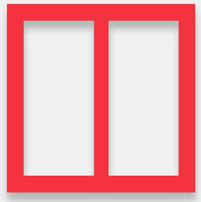
Example: Number of employees in the office.



Continuous

Data that is measured and has a value within a range.

Example: Rainfall in a year.



Categorical

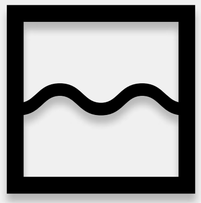
Data that can be sorted according to group or category.

Example: Types of product sold.

Look for data relationships

Nominal comparison

A simple comparison of the quantitative values of subcategories.



Deviation

How data points relate to each other, particularly how far any given point differs from the mean.

Correlation

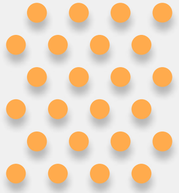
Data with two or more variables that may demonstrate a positive or negative correlation to each other.

Ranking

How two or more values compare to each other in relative magnitude.

Time series

Track changes in values of a consistent metric over time.



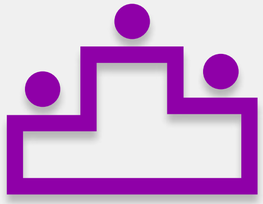
Distribution

Often around a central value.

Think about these principles

And apply them

Simplification



Hierarchy

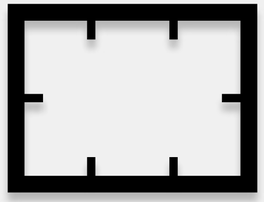
Layout

Eye Flow - "Z" path

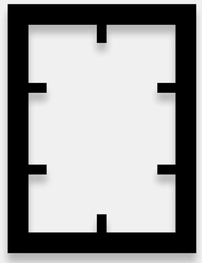
From the + important to the – important

Draft your layout

Anticipate your needs



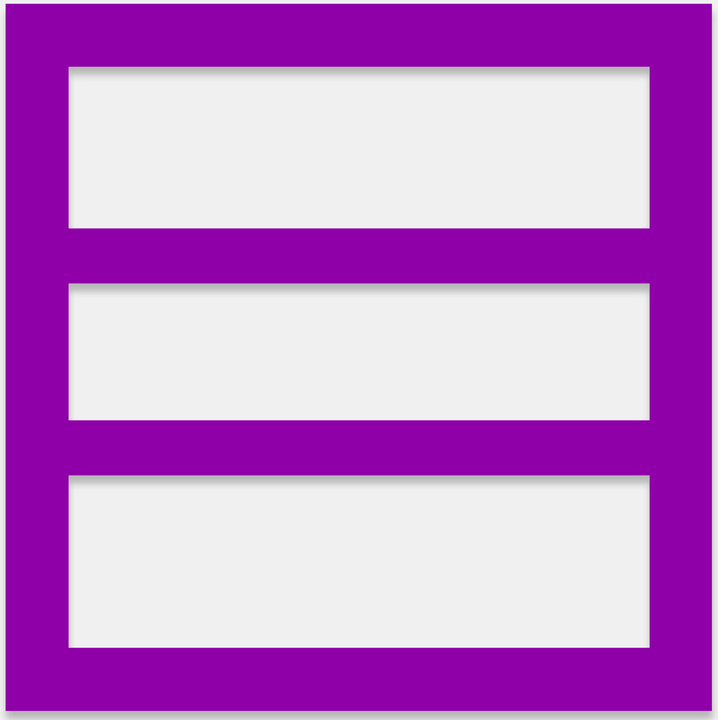
Use **Landscape** for presentation



Use **Portrait** for printing or mobile phone viewing

Make use of gridlines

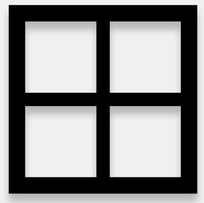
The baseline grid provides a guide for **positioning elements on the page with accuracy**, which is difficult to achieve by eye alone.



Focus on alignment

Make your design visually more appealing and **helps to create relationships between elements**.

Measure proximity



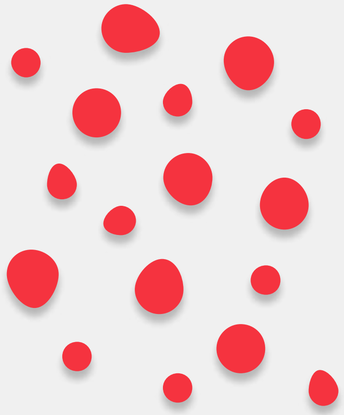
Related elements should be placed closer.

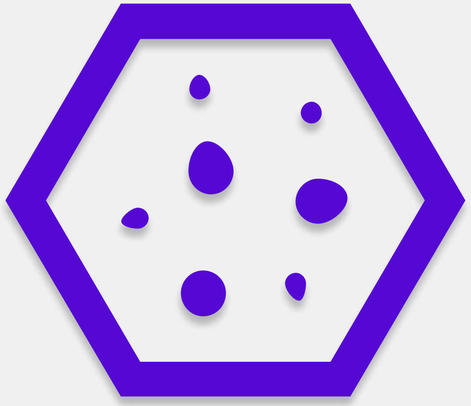
Unrelated elements should not be placed closed.

Use lines or space to separate elements, find the balance.

Enclose your data points

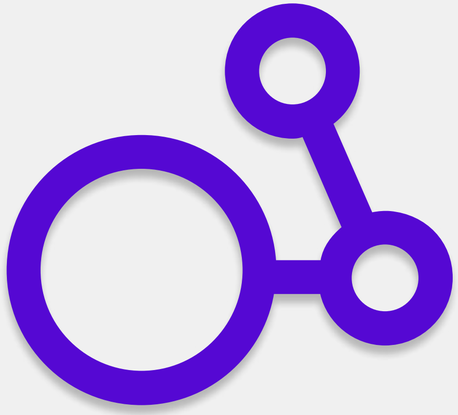
Eyes perceive object as belonging together when they are **enclosed**.





Enclose your data points

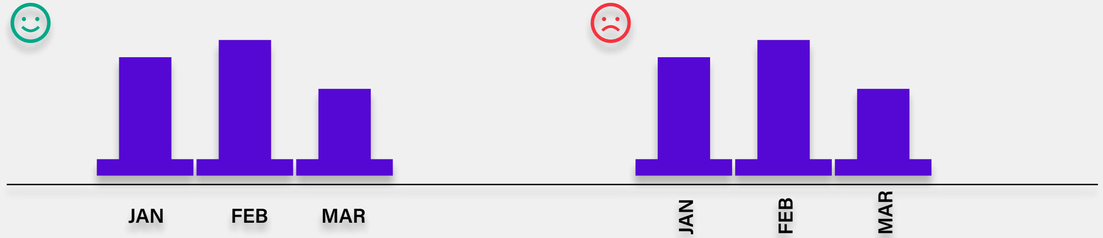
Eyes perceive object as belonging together when they are **connected**.



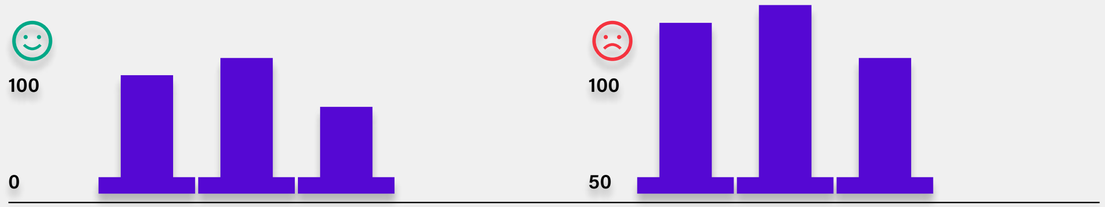
Is your design consistent?

Establish a **style** for each element in a design and use it on similar element.

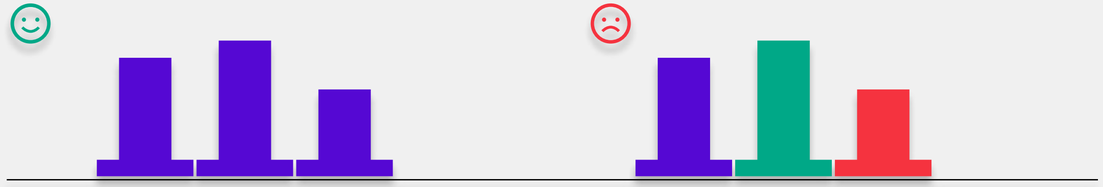
If you want to use bar charts



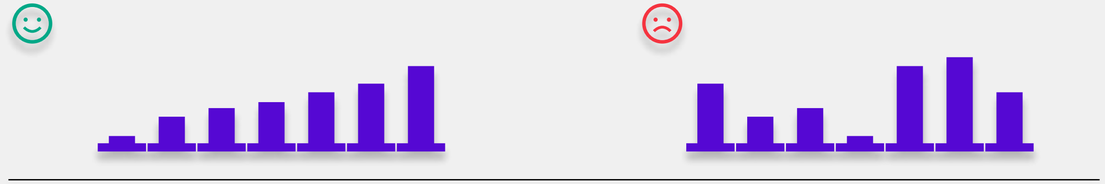
Use horizontal labels: Avoid steep diagonal or vertical type, as it can be difficult to read



Start the Y-axis value at 0: Starting at a value above zero truncates the bars and doesn't accurately reflect the full value

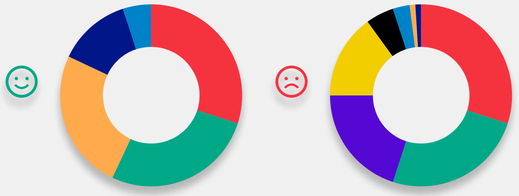


Use consistent colours: Use one colour for bar charts. You may use accent colour to highlight a significant data point.



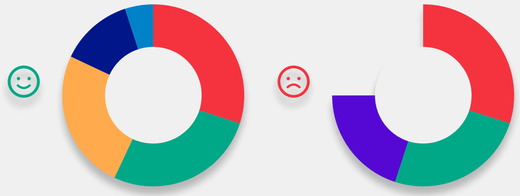
Order data appropriatly: Order categories alphabetically, sequentialy, or by value

If you really want to use pie charts



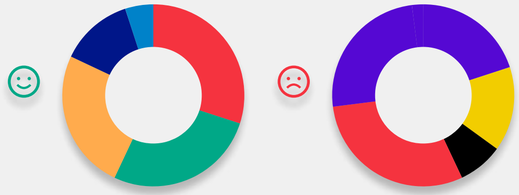
Visualise no more than 5 categories

It is difficult to differentiate between small values.



Make sure all data adds up to 100%

Verify that values total 100% and that pie slices are sized proportionate to their corresponding value.

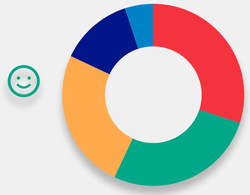


Start at 12 0'clock

Always start at 12 o'clock with the largest segment clockwise.

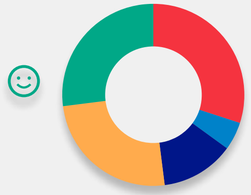
Order slices correctly

There are two ways to order sections, both of which are meant to aid comprehension:



Option 1

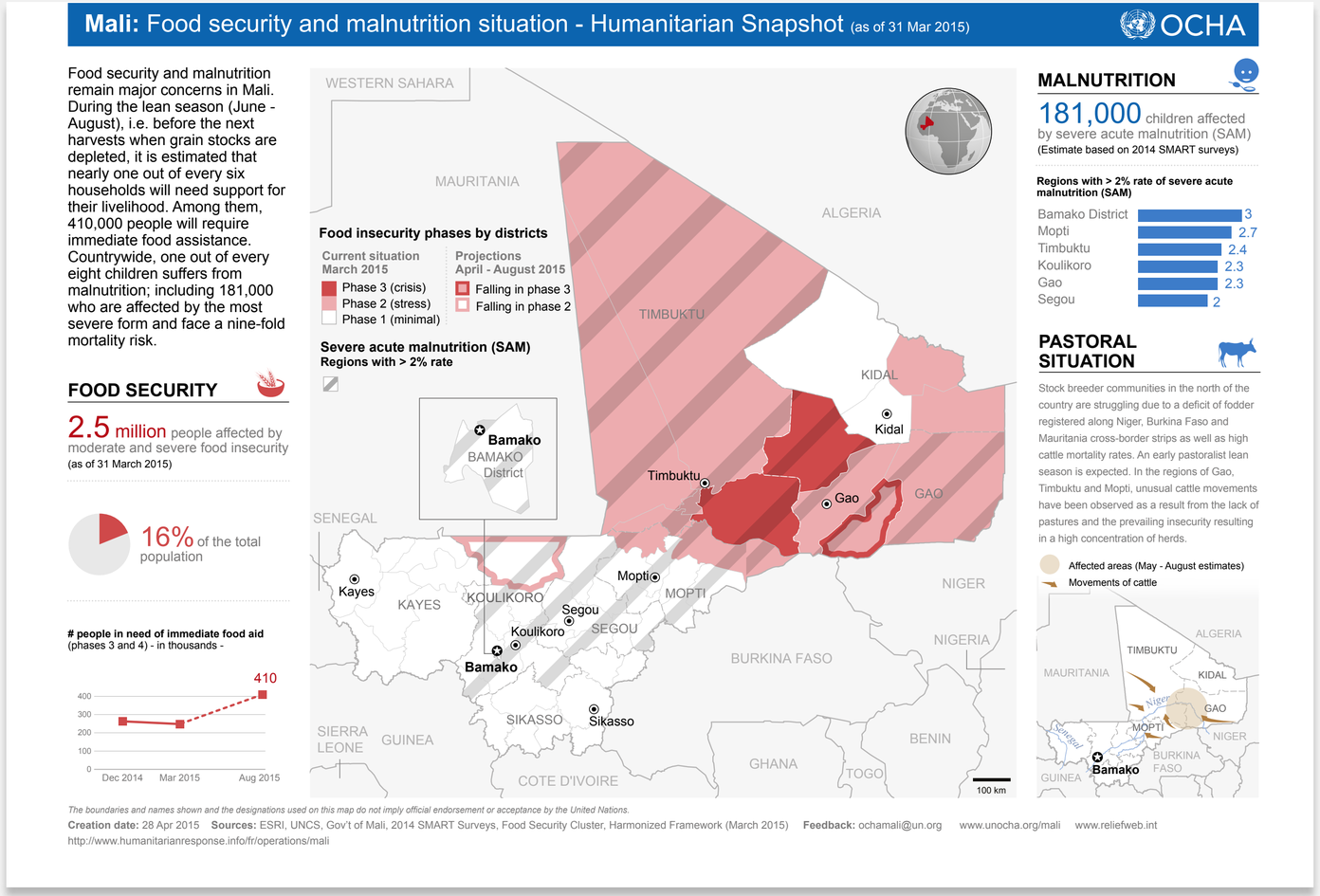
Start the largest at 12 o'clock, going clockwise. Place remaining sections in descending order, going clockwise.



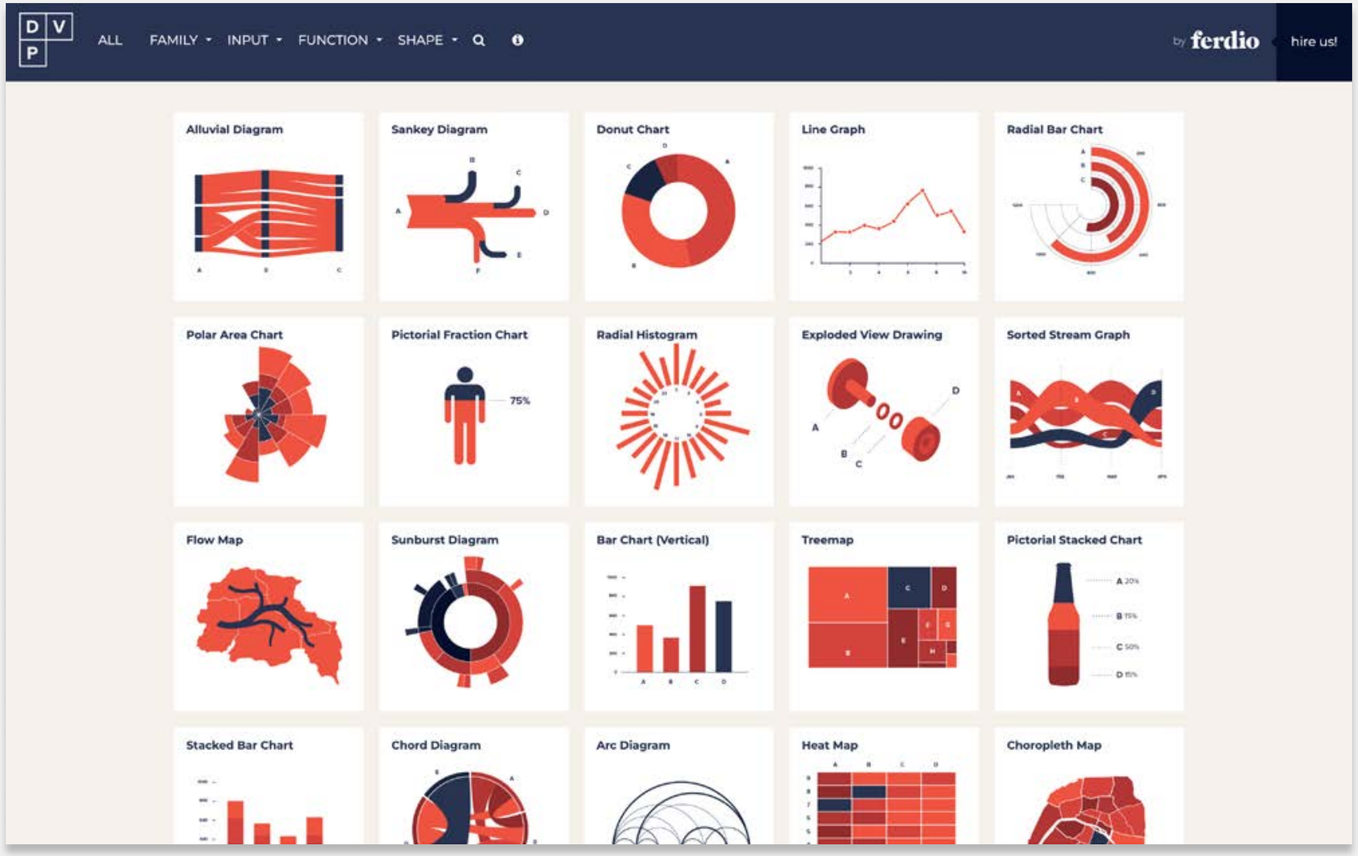
Option 2

Place the largest section at 12 o'clock, going clockwise. Place the second largest section at 12 o'clock going counterclockwise. The remaining sections can be place below.

Maps and dashboards

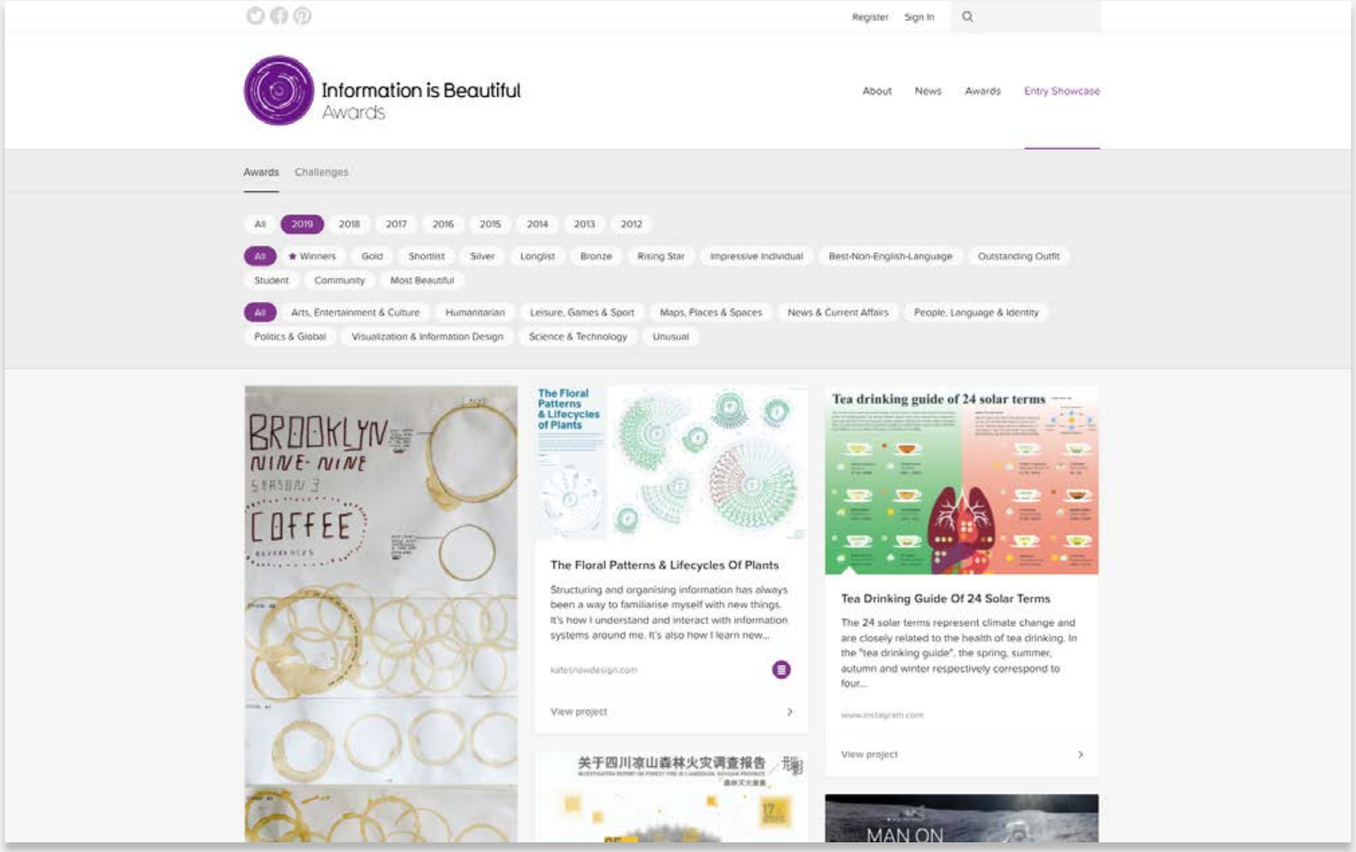


Looking for inspiration?



(i) https://datavizproject.com/#

Looking for inspiration?



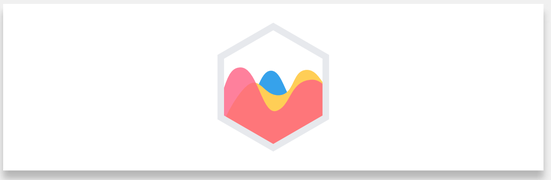
(i) https://www.informationisbeautifulawards.com/

Looking for tools

Review of 20 big data visualisation tools

No coding required

Coding required



IFRC operations

- Bangladesh - Population Movement
- Bahamas: Hurricane Dorian
- Ebola Virus Disease Response

It’s time to be creative!

On your table, you can find a piece of flipchart paper – turn in into a dashboard showing information about:

- Group 1 and 2 – people in the room (participants and facilitators),

- Group 3, 4, and 5 – content/summary of the training.

It’s an emergency operation so you have very little time – 30 minutes to put all data and information together (unless you really want to skip your coffee break).

Each group will have 5 minutes to present their final product.

Thank you

8 - 5 Data Gallery

“Can this data visualisation be trusted?” It is important to present your data as accurately and transparently as possible, in order for your audience to trust that data to guide decision-making. In this exercise, participants interact with, and think critically about, data visualisations and the effect to which they are trustworthy, unbiased, and accurate. This exercise is aimed at Data Curious participants who want to build their skills in creating data visualisations to be used for decision-making.

Learning objective

To critically assess a data visualisation for effectiveness and trustworthiness, and identify areas where content may be manipulated.

People

6-12 people, in groups of 3

Time

One hour

Difficulty

Beginner

Materials

12 A3 prints of data visualisations

Instructions

1. Preparation: Preselect 12 infographics and data visualisations from the selection included here, or others that you have encountered. Choose a variety of visualisations, from those that show a lot of data to those that are just using visual metaphors. Print them on larger paper (A3 or Tabloid works well) if possible. Place them on the walls around the room with an equal amount of space between them. Number them with post-it notes. Try to disperse complicated ones evenly between those that are not so complicated, so that you avoid bottlenecks during the gallery walk.
2. Each group of three should start in front of one poster (try to spread out around the room if possible). In your group, review the data visualisation on the poster in front of you. Spend 3 minutes discussing the following questions:

a) What's the message?
b) Who is the creator of this data visualisation and who is the audience?
c) What's the evidence or data contained?
d) Is there a source cited? Do you think the source is credible?
e) Does the data appear to be presented accurately?
f) Is the presented key message a correct interpretation of the data?

3 Every 3 minutes your group should rotate in a clockwise direction until you have looked at all the posters.
4 After all groups have reviewed all the posters, all participants should come back together for a discussion about the posters they reviewed. Discuss topics such as:

g) Which ones were the most effective? Why?
h) Which ones were the least effective? Why?
i) Were there any posters where the data source was not included, or where the data source was not credible?
j) Were there any posters where the data was not presented accurately, or where the key message may have been misinterpreted?
k) Reinforce for participants how knowing your audience is critical. Talk about how different audiences might understand a visualisation differently than others. Emphasize the importance of presenting data accurately, above all else, and reviewing your visualisation to ensure it is not misleading, biased, or manipulated.

Credit

Adapted from an exercise originally created by Tactical Technology Collective

8 - 6 Infographic Drawing

One of the most important components of data storytelling is to communicate the action you want your audience to take based on the data. This exercise will challenge participants to think visually about a data narrative. This exercise is aimed at *Data Active* and *Data Advocate* participants who have reviewed the list of Infographic Design Best Practices (8 - 9) prior to the exercise.

Learning objective

Apply the infographic design best practices. Gain practice with highlighting the desired action for the audience to take.

People

Teams of 2 to 5 people, up to 24 participants total

Time

One hour

Difficulty

Intermediate

Materials

Example Data Narrative (see below), either shown to all participants on a slide or distributed as a handout. A computer with internet access for each group.

- **In person:** Flipchart paper and markers (face-to-face)
- **Virtual Materials:** virtual meeting platform, shared document/writing space.

Instructions

1. Preparation: Distribute the Example Data Narrative (see below) to each group of participants.
2. Take about 5 minutes to read through the Example Data Narrative and figures included.
3. After you have read through the Example Data Narrative, spend about 10 minutes examining the data and fact-checking. Determine if all the information provided is accurate or not. You are welcome to use the internet for research.

4 Spend the next 20 minutes sketching your infographic, based on the narrative and data provided. You may refer to the list of Infographic Design Best Practices for tips. As you are designing your infographic, please consider the following:

a) If you find errors or inaccuracies in the information and data provided, you should not include those errors. Please only include accurate data in your infographic.
b) If you have additional data and information related to the subject presented, you are welcome to integrate and complement information based on your sources.
c) You are welcome to use any graphics, maps, charts, text, or any other elements you find relevant to tell your story.
d) Ensure that you communicate an action that you want the audience to take based on the data.

5 After you have finished, please use tape to hang your infographic on the wall.
6 Conduct a "gallery walk". Everyone should spend 5 minutes walking around the room and reviewing all the infographics. They should be on the lookout for: 1) following the Infographic Design Best Practices, and 2) an action that they think they should take based on the data.
7 Each group should then take turns presenting their infographic.

e) Questions to ask:

— What did you learn during this infographic design process?
— How did you address any inaccuracies in the data?
— What action did you want your audience to take and how is that communicated on your infographic?

Example Data Narrative

The African Union (AU) is a continental union consisting of all 55 countries on the African continent. It was established on 26 May 2001 in Addis Ababa, Ethiopia, and launched on 9 July 2002 in South Africa, with the aim of replacing the Organisation of African Unity (OAU). The most important decisions of the AU are made by the Assembly of the African Union, a semi-annual meeting of the heads of state and government of its member states. The AU's secretariat, the African Union Commission, is based in Addis Ababa.

All UN member states based in Africa and African waters are members of the AU, as is the disputed Sahrawi Arab Democratic Republic (SADR). Morocco, which claims sovereignty over the SADR's territory, withdrew from the Organisation of African Unity, the AU's predecessor, in 1984 due to the admission of the SADR as a member. However, on 30 January 2017 the AU admitted Morocco as a member state.

Top 10 most populated countries in Africa:

1 Nigeria: 182.2M

2 Ethiopia: 99.39M
3 D.R. Congo: 77.27M
4 Algeria: 39.67M
5 Uganda: 39.03M

Please feel free to add additional data on missing countries or other information that you might find interesting!

Credit

Exercise: Guido Pizzini

Infographic Design Best Practices: Katherine Lilly, American Red Cross

8 - 7 Translating Technical Concepts for Audiences

When you are creating a data visualisation for an audience outside of yourself or your data team, there's a good chance that your audience will be less familiar with your data than you are. However, if your audience does not understand the insights in your data, they will not be able to use those insights for decision making. This exercise is aimed at Data Ready participants with statistical analysis experience who want to practice their skills in communicating complex topics to non-technical audiences.

Learning objective

Translate complex, technical data for non-technical audiences. Ensure that any technical concepts presented (such as weights, benchmarks, confidence intervals, etc.) are explained to improve comprehension and transparency.

People

Teams of 2 to 4 people

Time

One hour

Difficulty

Advanced

Materials

Example visualisation (Sampling Distribution Mean Income) and scenario below; one computer with PowerPoint/Google Slides access for each group.

- **In person:** Flipchart paper and markers (face-to-face)
- **Virtual Materials:** virtual meeting platform, shared document/writing space.

Instructions

1. Review the scenario below. Pretend that you and your group represent a team of statisticians, and you have to share the findings from your data in an upcoming presentation with a client. The client does not have a statistics background, so you will need to communicate the key insights from your data in a way he will understand.

2 With your group, spend a few minutes reviewing this visualisation. Make a list of a few of the elements that may be hard for a non-technical audience to understand. These may include, but are not limited to:

a) Population mean (μ)
b) Population standard deviation (σ)
c) Probability density
d) Confidence intervals
e) Sampling distribution

3 Then, think about the elements from your list that are critical to include in order to communicate your chart's key message, versus what should be excluded or explained in a different way.

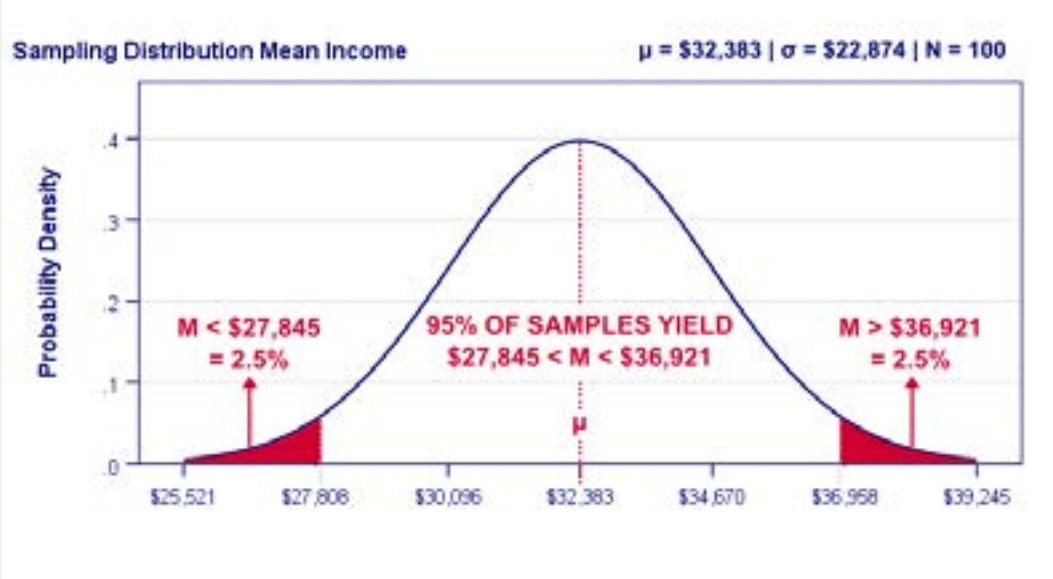
4 Create a Powerpoint/Google Slide that communicates the insight that you want your client to understand. Be sure to explain any technical concept in a simple way.

5 Each group should then present their slide to the rest of the participants. Participants should act as non-technical audience members, and ask the presenting group to explain any elements or concepts that are still unclear.

f) Questions to ask:

— What strategies did you use to adapt your visualisation for a non-technical audience? Focus not only on what you changed but why.
— How did your new key message compare to the original chart's key message?

Scenario



Credit

Katherine Lilly. Exercise adapted from SPSS Tutorials: Simple Introduction to Confidence Intervals

8 - 8 Data Sculptures

This playful exercise encourages participants to focus more on presentation of key messages than the visualisation itself. As an energizer activity, it may also help to break down power structures that may exist within the group. Participants will act as individuals responsible for communicating an insight to a key decision maker. They should review a dataset provided, identify the key insights, decide how to communicate those insights with the decision maker audience in mind, and frame the insights in an effective storytelling format. Oh, and one more thing: participants cannot use computers or any writing utensils for this exercise! This exercise is aimed at Data Curious and Data Active participants who are new to data visualisation, or who want to provoke some creative energy within their data team.

Learning objective

To channel their creativity by telling a data story using art supplies/crafts/recyclables, etc. To encourage participants to "think outside the box" when it comes to telling stories with data, and be reminded that not every data communicator has the ability to rely on a computer.

People

Teams of 4 to 5 people

Time

45 minutes (could be an optimal ice breaker activity or early morning energizer activity)

Difficulty

Beginner

Materials

- **Virtual Materials:** virtual meeting platform, shared document/writing space
- **In Person materials:** Flipcharts/noteboards, sticky notes, markers
- Handout with two traditional charts. Locally available physical art/ craft supplies such as: plastic bottle caps, wooden sticks, coloured paper, Play-do or clay, Legos or blocks, tape, glue, scissors, wire, cardboard rolls. (Note - if this is a digital session, be sure to send the supplies list in advance so that people can plan accordingly.)

Instructions

1. Preparation: Distribute the art supplies and handout to each group of participants.

2 For 15-20 minutes, each team should use the art supplies to create a "data sculpture". A data sculpture is a creative presentation of the key messages of the data. Avoid recreating traditional charts (i.e. making bar charts out of blocks). Think creatively and use your art supplies to help you think outside of the box.

- Questions to ask:
  - How would you communicate this data to someone unfamiliar with traditional data visualisations like charts, or to a child, or to someone who cannot read?

3 For the remainder of the session, teams should present their data sculptures.

- Questions to ask:
  - What are some similarities or differences between the sculptures? (i.e. Did Group A focus on one interesting data point, while Group B focused on a big picture story?).
  - Was it challenging to communicate the data without using a computer?
  - What are some ways that you can incorporate creative thinking to ensure your data message reaches non-traditional audiences, such as someone unfamiliar with traditional data visualisations like charts, or to a child, or to someone who cannot read?

Extra credit

Other icebreaker/energizer activities that involve use of physical materials to creatively understand and communicate data:

- DataBasic.io, "Data Storybook" activity: targets a team's ability to understand the story within the data
- DataBasic.io, "Remix an Infographic" activity: targets a team's ability to pinpoint and communicate the story within an infographic using art supplies

Credit

Exercise: DataBasic.io

Reference Article: Tools Won't Write Your Data Story for You

8 - 9 Infographic Design Best Practices

Top Ten Tips for Designing Infographics

10 Astuces pour la conception des infographies

8 - 10 10 Ideas to Visualise Qualitative Data

10 Ideas to Visualise Qualitative Data

8 - 11 Iconography Interpretation

When are icons appropriate or not appropriate?

Icons may mean different things in different settings

- Icons are a helpful design element to represent a person, place, or thing in your maps, infographics, and dashboards.
- At the IFRC, we know that there are some icons that are universally recognized, like the Red Cross emblem!
- Other commonly used and accepted icons may include:

- However, other icons may be misinterpreted or misunderstood when presented in different contexts.

Game rules:

This game is meant to be played in a group setting, with up to 10 participants in each group. Participants may include anyone from the Data Curious to the Data Ready; anyone who uses icons in their information management products!

On the following slides you will see examples of icons. For each icon, participants should discuss a situation where that icon would be **appropriate** to use and a situation where the same icon would be **inappropriate** to use.

Remember to consider cultural appropriateness, as well as other audience characteristics such as age, education level, gender, religion, wealth, literacy, tech-savviness, career, etc.

What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: Wilson Joseph from The Noun Project

What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: Creative Stall from The Noun Project

What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: IronSV from The Noun Project

What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: Anna Racaza from The Noun Project

What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: Dmitry Mirolyubov from The Noun Project

What are some situations where you could use this icon appropriately?

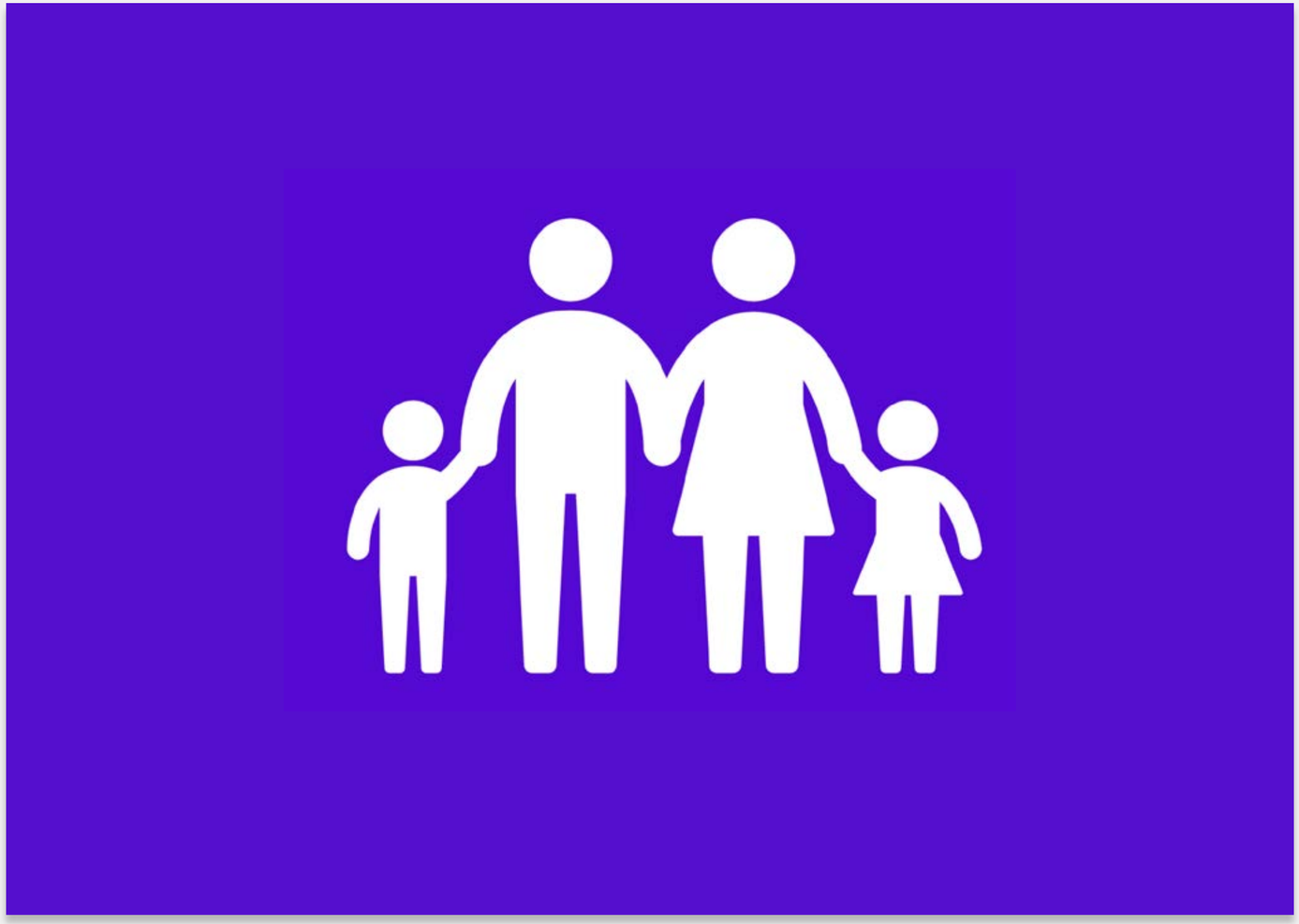
What are some situations where you should not use this icon?

(i) Source: IconTrack from The Noun Project

What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: Saeful Muslim from The Noun Project



What are some situations where you could use this icon appropriately?

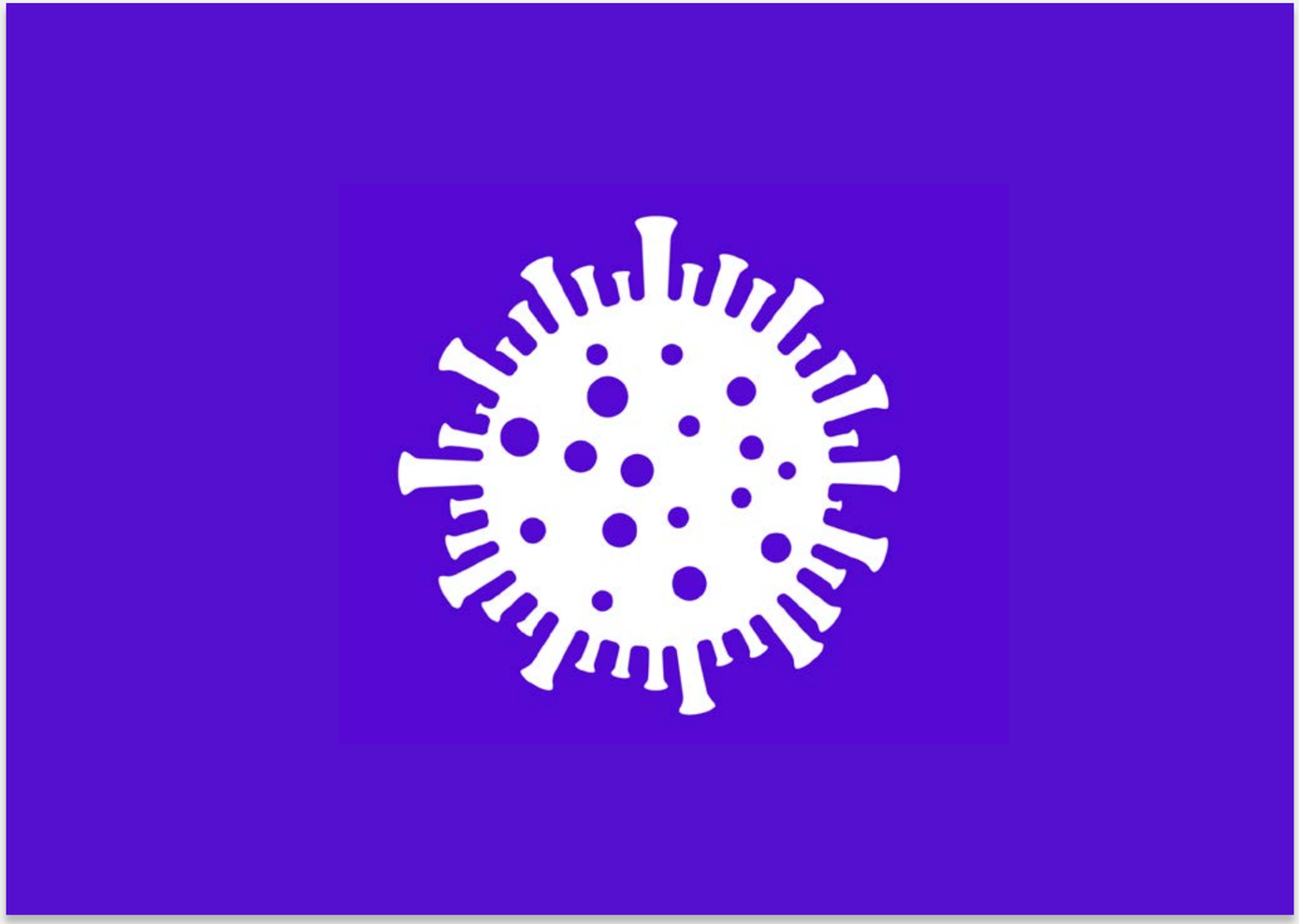
What are some situations where you should not use this icon?

(i) Source: David Khai from The Noun Project

What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: Мила Омина from The Noun Project



What are some situations where you could use this icon appropriately?

What are some situations where you should not use this icon?

(i) Source: Ainul Muttaqin from The Noun Project

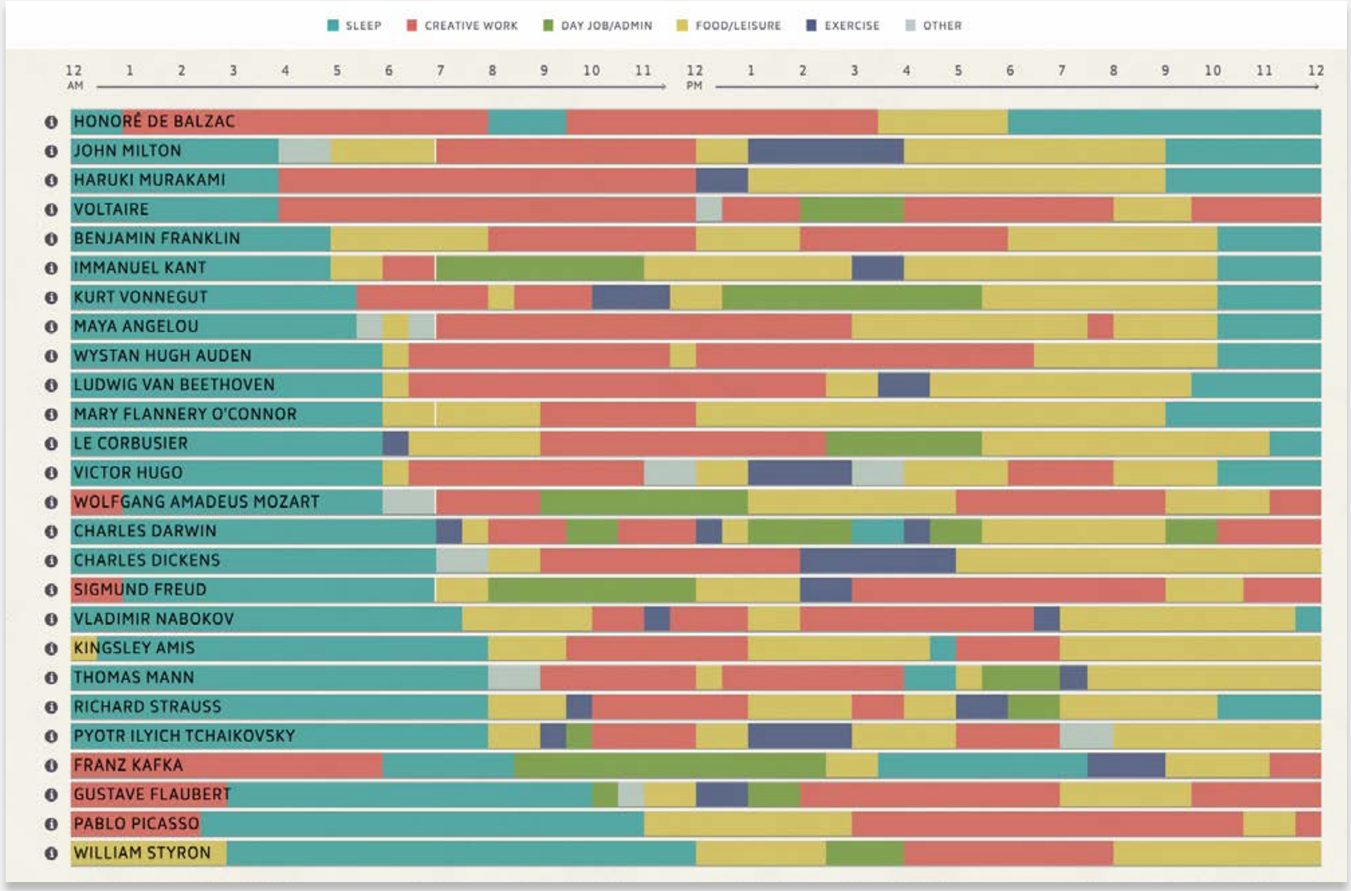
Conclusion

- Can you think of any more examples from your own work where you had to reconsider an icon based on appropriateness?
- How will you think about choosing icons in the future?

(i) Credit: Katherine Lilly

8 - 12 Understanding Different Types of Colour Vision Deficiencies

Check out this nice data visualisation!

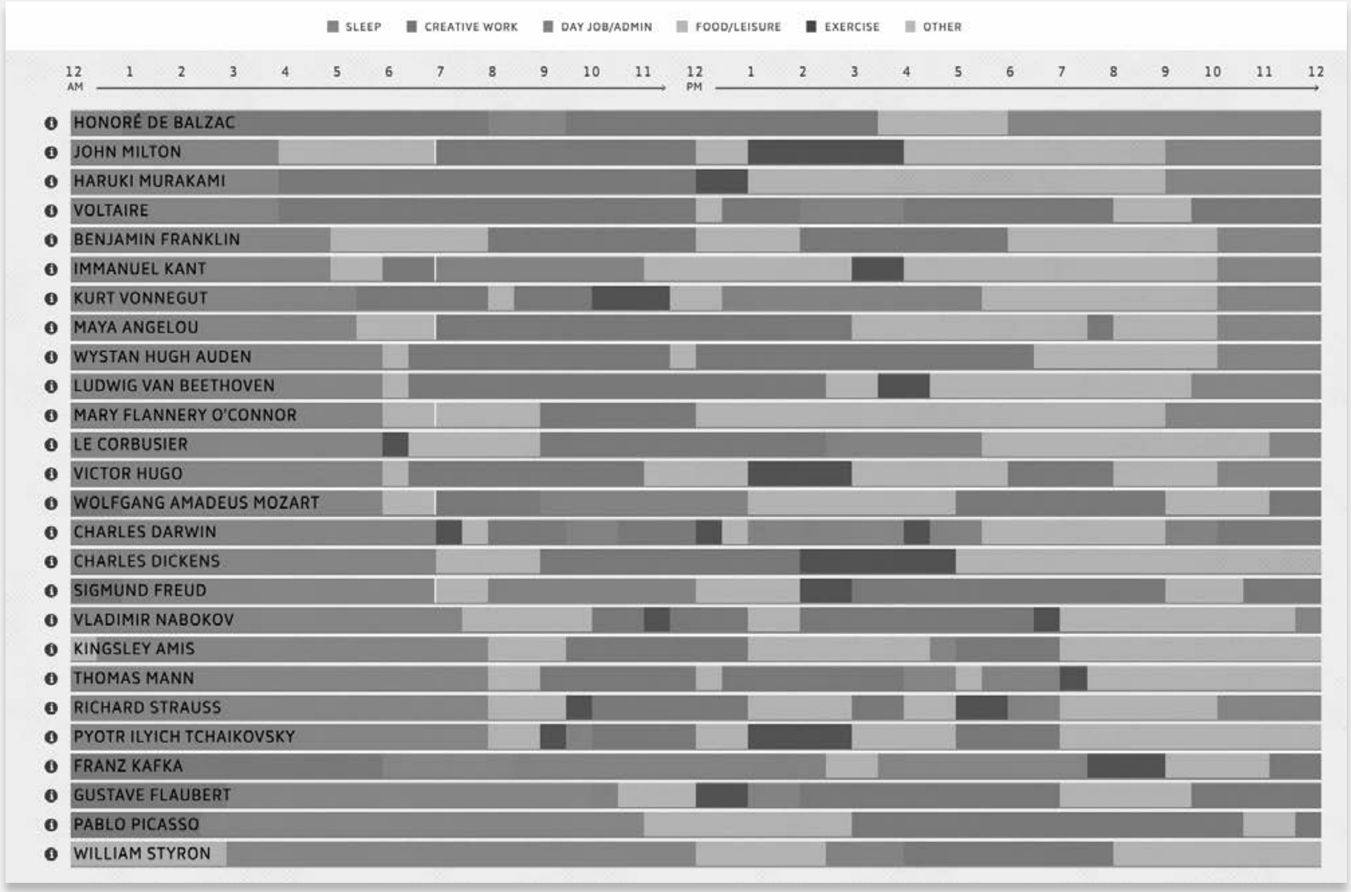


(i) Data from Maison Currey of Daily Rituals, Visualization created by Podio

This visualisation displays data on daily routines of famous creative people.

What are your initial impressions of the appearance of this visualisation?

Check out this nice data visualisation!



Click back and forth between the previous slide and this slide.

Would the data be interpreted the same in both charts?

Colour vision deficiency is prevalent, to some extent, in **1 in 12 men** and **1 in 200 women**.

There are three main types of colour vision deficiency

Red-green colour vision deficiency (most common type of colour vision deficiency):

- **Deuteranomaly**, which makes **green** appear more **red**
- **Protanomaly**, which makes **red** appear more **green**

Blue-yellow colour vision deficiency:

- **Tritanomaly**, which makes **blue** appear **green** and **yellow** appear **red**
- **Tritanopia**, which makes **blue** appear **green**, **purple** appear **red**, and **yellow** appear **pink**

Complete colour vision deficiency:

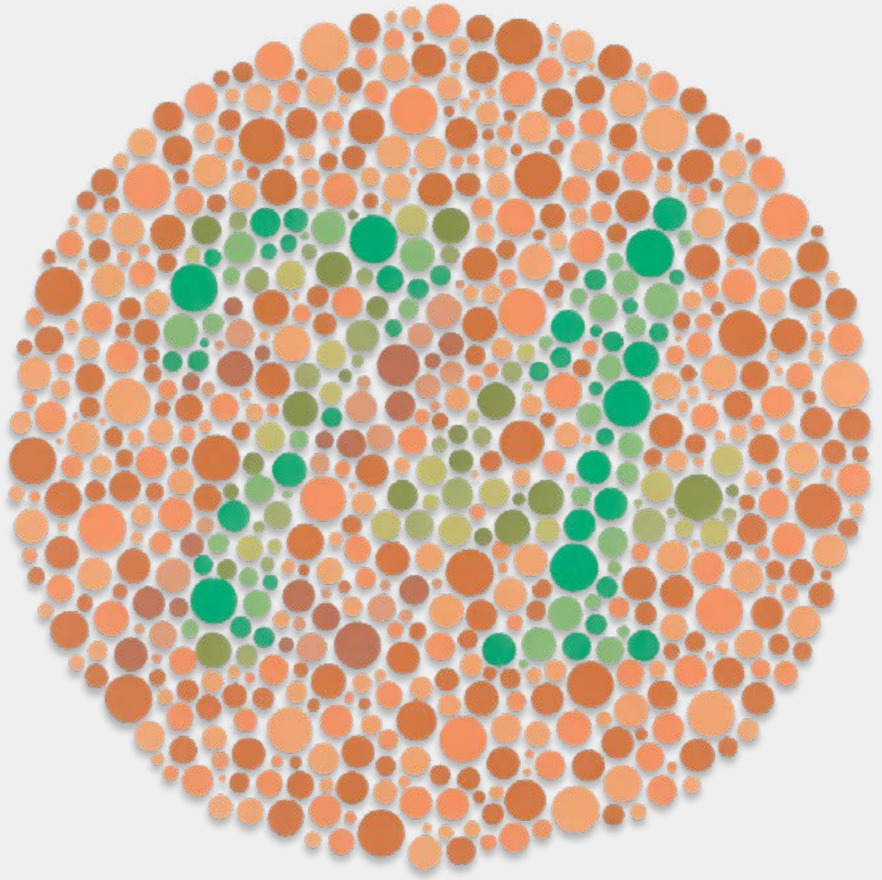
- **Achromatopsia**, **achromatomaly**, or **monochromacy**, which make colours appear in shades of gray
- These are the most rare types of colour vision deficiency and usually are accompanied by other visual impairments.

There are three main types of colour vision deficiency

In the circle to the right, people with normal vision should see the number "**74**".

People with red-green colour vision deficiency will see the number "**21**".

People with monochromacy may see no number in the circle.

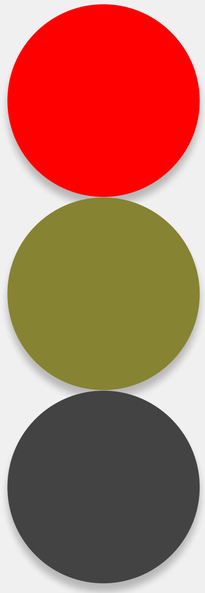


(i) Source: Shinobu Ishihara, a professor at the University of Tokyo, who first published his tests in 1917.

Should I avoid red and green altogether?

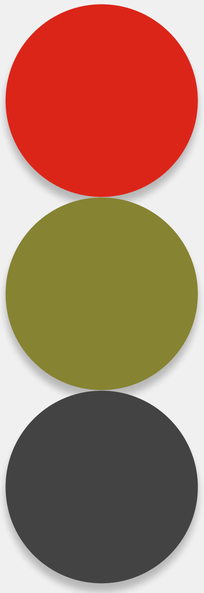
No, these are still very culturally-relevant colours and useful for communicating data. However, you can make tweaks to the colours used to ensure they are visible to people with colour vision impairments.

"Pure" red



"Pure" Green

Orangish Red



Bluish Green

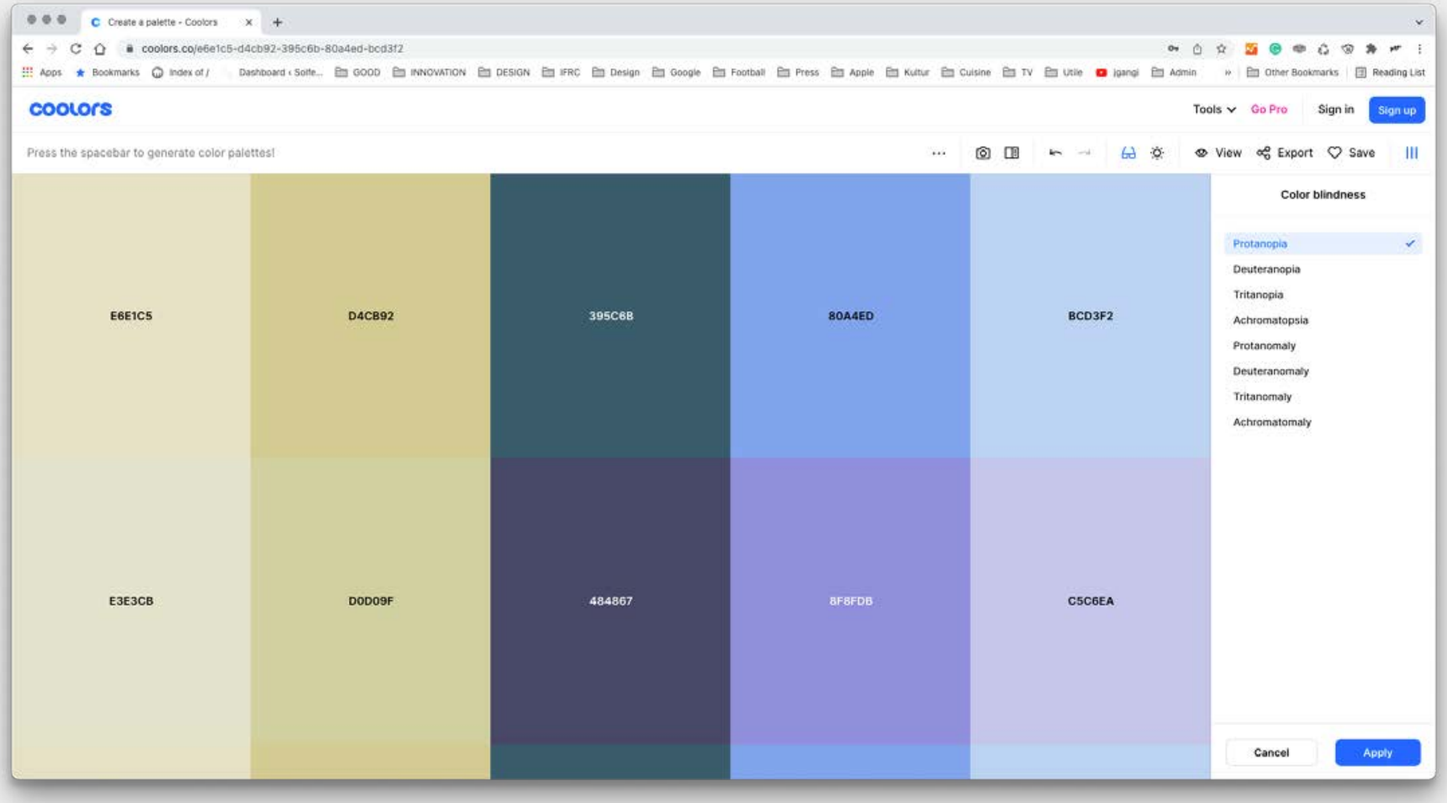
For example: use reds that are more towards orange, and greens that are more blue.

(i) Source: Nancy Organ, An Incomplete Guide to Accessible Data Visualisation. Towards Data Science.

Resources for ensuring your colour palette is accessible

Coolors.co: Enter in the hex codes of your colour palette and see how it would be viewed by people with different types of colour vision deficiency.

WebAIM Contrast Checker: Tells you if your colours have sufficient contrast between them to be distinguishable.



8 - 13 Data Visualisation Accessibility Overview

Introduction

What is meant by “accessible”?

- Creating dashboards, maps, charts, tables, graphics, and other information management products that all individuals can use, inclusive of those with disabilities or life experiences that result in temporary situational limitations.
- Making design modifications to our products so that our data insights can be communicated to individuals with auditory, cognitive, neurological, physical, speech, or vision disabilities.

Why is this so important?

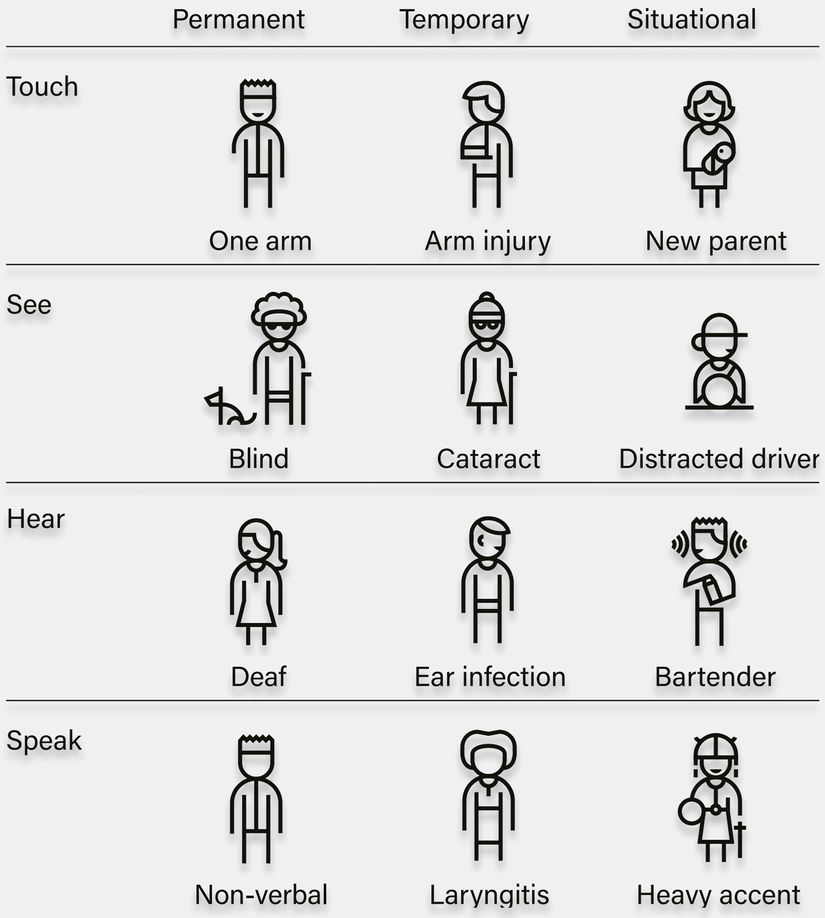
- Within the RCRC Movement, we are working to become more diverse, equitable, and inclusive. We do not want anyone to feel excluded from understanding our data on the basis of a disability or temporary situational limitation.
- This slide deck is a very brief overview, but there are many resources online to help you improve the accessibility of your data visualisations.

Introduction

There are many types of conditions that could affect the way a user interacts with or consumes information. Not all are permanent; some could be temporary or situation-based.

It isn't possible to anticipate the conditions of every single one of your users. Nor is it possible to create a "perfect" visualisation that is accessible to everyone.

However, there are some design tricks we can employ to make sure we are making our visualisations as easy to interpret as possible.



(i) Source: Microsoft Inclusive Design Guide

Reflection moment

- In the United States, 1 in 4 adults have some type of disability. This amounts to **61 million people**.
- Take a moment to look up some statistics about disability in your country.

(i) Source: Centres for Disease Control and Prevention

Accessibility tips and best practices

In the following slides, you will find some examples of design modifications you can make that will help your visualisation to be more accessible.

When you make the time and effort to conduct an accessibility check on your visualisation, you are helping to create a more inclusive learning environment for your audience.

Colour modifications

Colour vision deficiency

Colour vision deficiency, sometimes referred to as “colour blindness”, is a condition where an individual interprets colour differently. With some types of colour vision deficiency, colours are subdued and blend together, and with other types colours appear as different colours altogether.

For more information on the types of colour vision deficiency, refer to this Data Playbook Scenario: **Understanding Different Types of Colour Vision Deficiencies (8 - 12).**

Improving colour contrast

Do:

Don't:

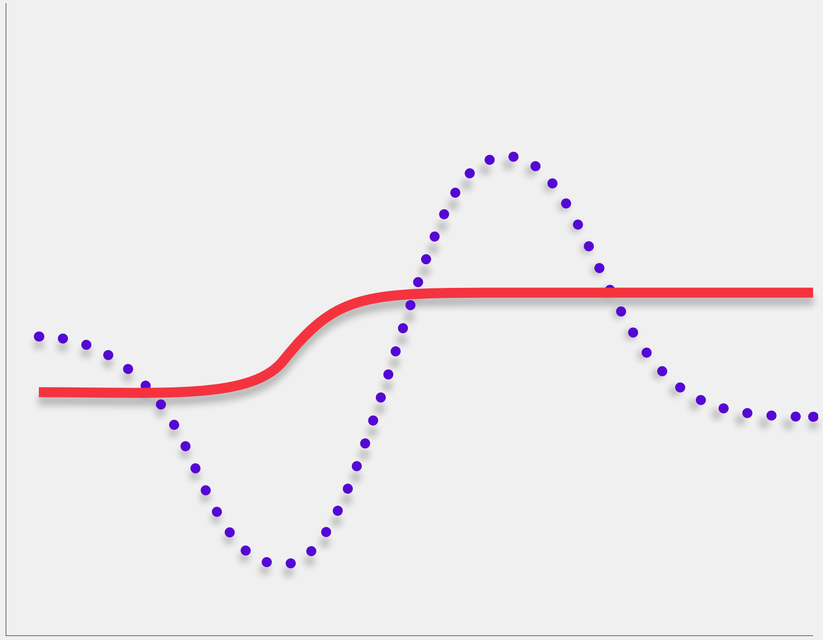
The image on the left has a high colour contrast, meaning text stands out easily from the background. The image on the right has a low colour contrast. Text blends into the background. This would be hard to read from a distance, or if you have a vision impairment.

Use a contrast checker to ensure that your text and backgrounds have sufficient contrast.

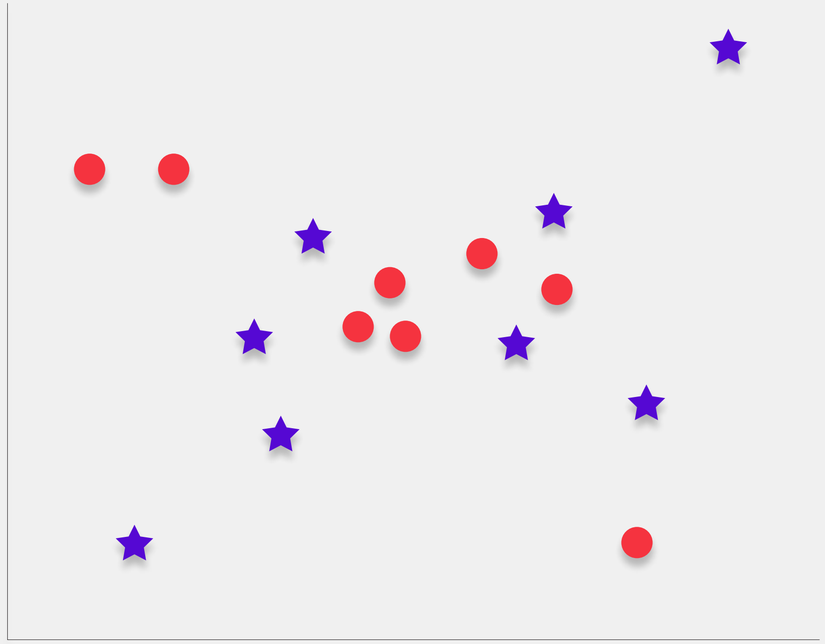
(i) Source: Amanda Miller, Betterment. A Comprehensive Guide to Accessible Data Visualisation.

Rely on more than just colour to differentiate elements

If you have multiple lines, bars, dots, or other data points, try to incorporate some texture to differentiate them. You can use dotted lines, fill textures, or varying shapes as an alternative to just colour.



With line Texture

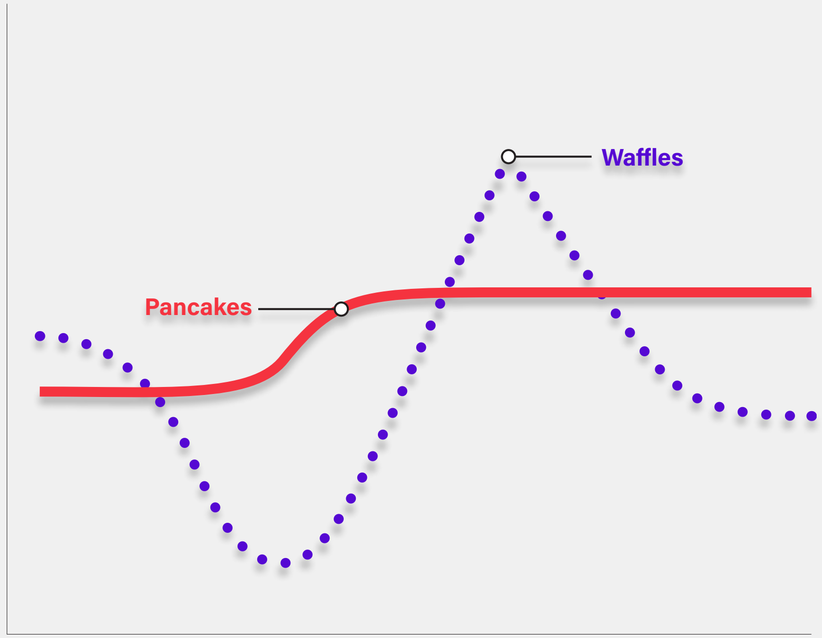


With shape variability

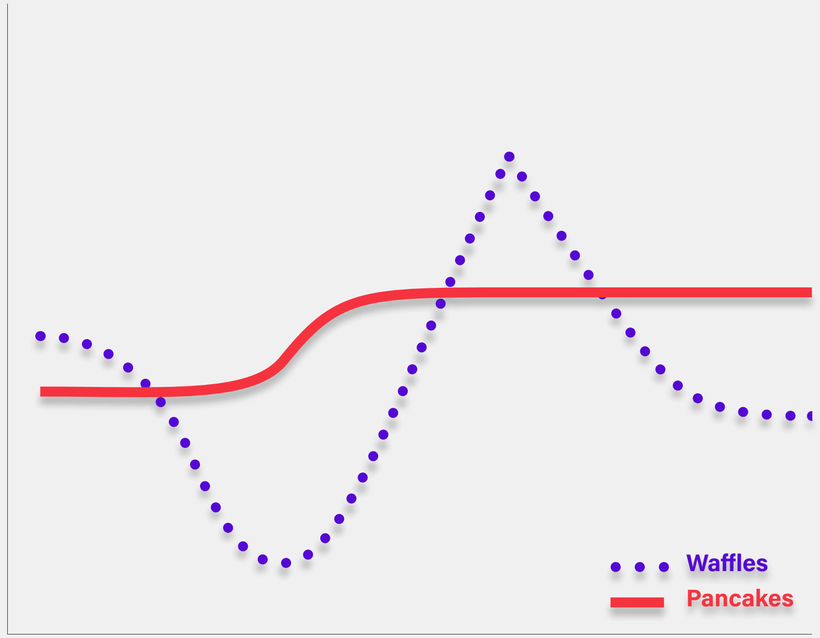
(i) Source: Nancy Organ, Towards Data Science. An Incomplete Guide to Accessible Data Visualisation.

Label data points directly

Labeling data points directly, instead of in a separate legend, could help users with colour vision deficiency to differentiate between the data points in your chart.



Do



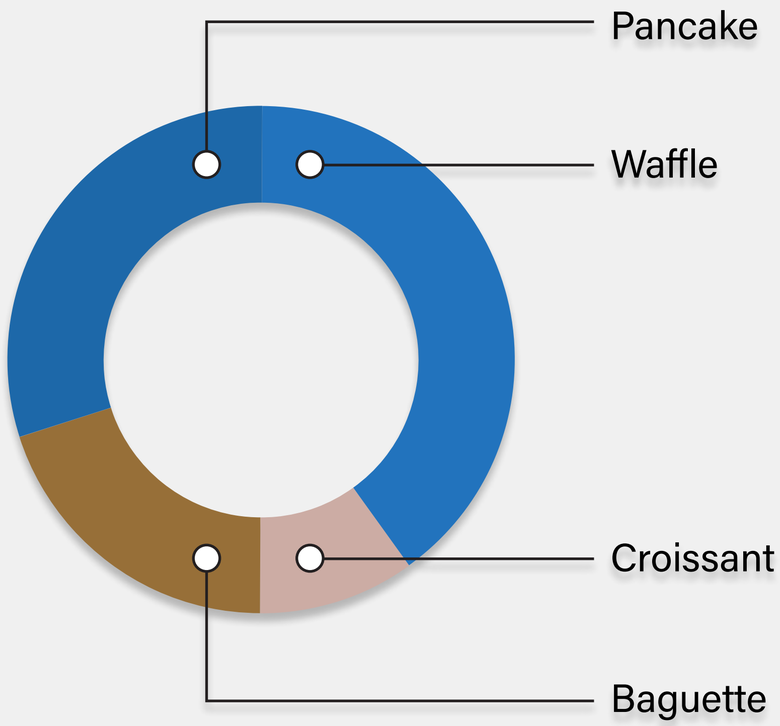
Don't

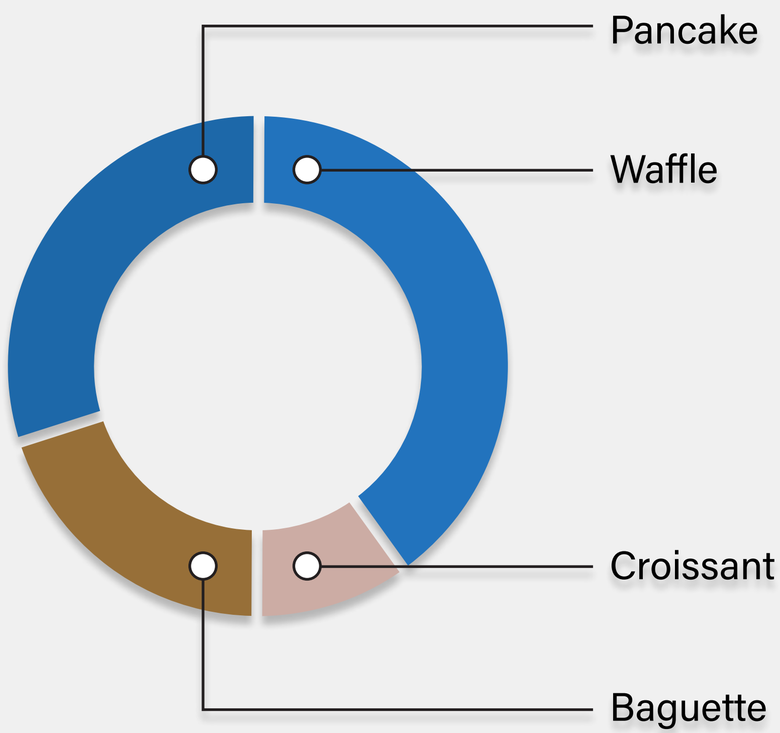
(i) Source: Amanda Miller, Betterment. A Comprehensive Guide to Accessible Data Visualisation.

Use white borders between data segments

In this image, a filter is applied to show how a user with deuteranopia would view these two charts. There is not enough contrast between the shades, causing colours to blend together.

If you add white borders around data segments, a user could more easily differentiate between them, even if they have trouble differentiating the colours used.





(i) Source: Amanda Miller, Betterment. A Comprehensive Guide to Accessible Data Visualisation.

Adjust your colour palette

(i) Source: Nancy Organ, Towards Data Science. An Incomplete Guide to Accessible Data Visualisation.

The most common type of colour vision deficiency results in an individual incorrectly interpreting red and green.

If you're using red and green in your visualisation, use red shades that are more towards orange, and green shades that are more towards blue.

Check your colour palette using a simulator like coolers.co.

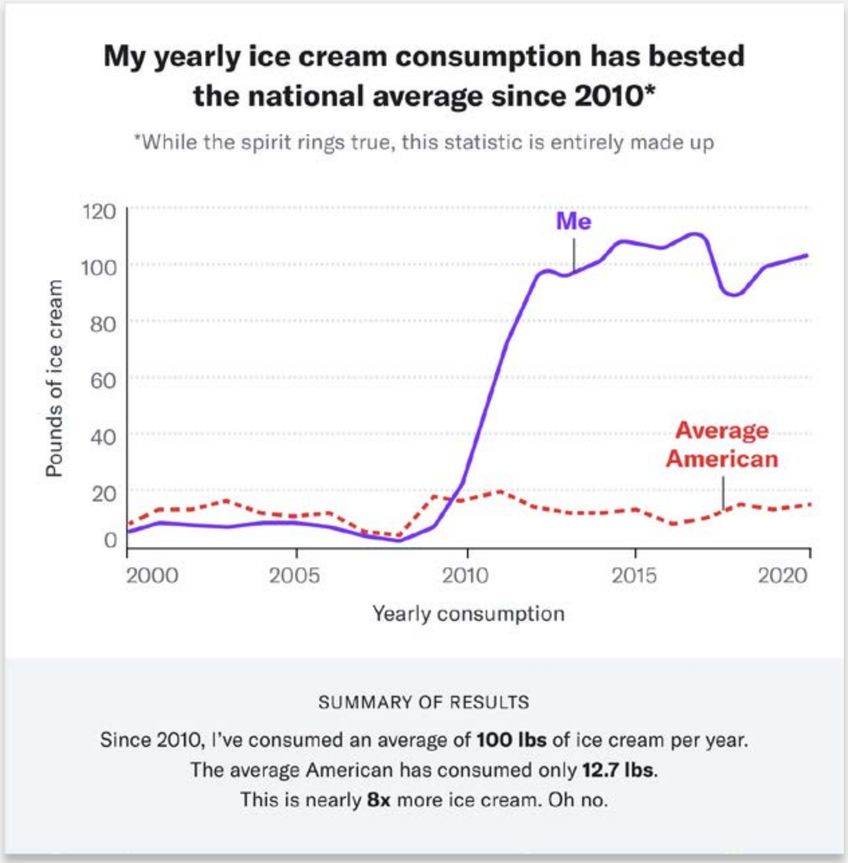
Preparing visualisation for assisted technology, like screen readers

What are screen readers?

Screen readers are commonly used by individuals with limited vision or blindness to help them consume digital content. Text is read by the screen reader technology and translated into braille or read aloud to the user.

Here are some suggestions for optimizing your data so that it can be interpreted by a screen reader and communicated effectively to the user.

Screen reader tips



(i) Source: Amanda Miller, Betterment. A Comprehensive Guide to Accessible Data Visualisation.

Title: Instead of using a generic chart title (e.g. "My yearly ice cream consumption"), summarize the chart's key message in the title.

Summary of results: Include a caption that summarizes your analysis.

Labels: Ensure all axes and chart elements are clearly labeled (if possible, without the user having to refer to a separate legend).

Alt text: Ensure your visual has descriptive alt-text. This is a text box that appears when you hover the cursor over the image. A screen reader can read the alt-text and then describe the visual to the user.

Screen reader tips

Interactive dashboards often require a user to hover over the data point to see key information about that point, yet this hover-over feature may not be interpretable by assisted reader technology.

Instead (or in addition to the hover-over feature), include labels next to the data point. Or, include data in a table or CSV download.

Tips to improve cognitive understanding of your visualisation

Remove/write out acronyms and avoid jargon

There are some instances where users with certain types of learning disabilities may have trouble understanding how acronyms should be interpreted. It is best to write out acronyms and abbreviations in visualisations when possible, even if they are written out elsewhere in your document.

You should also avoid figures of speech or idioms that may not be familiar to someone to does not speak your language fluently. Use language that is as simple and clear as possible!

Choose user-friendly fonts

Your choice of fonts is important to accessibility and readability, especially to users with dyslexia. Many fonts are created specifically with this in mind. Sans serif fonts are generally preferred, as they tend to be perceived as less crowded. Studies also recommend avoiding cursive/italic font styles.

Note that line spacing and word spacing also affect font readability, and should be taken into consideration.

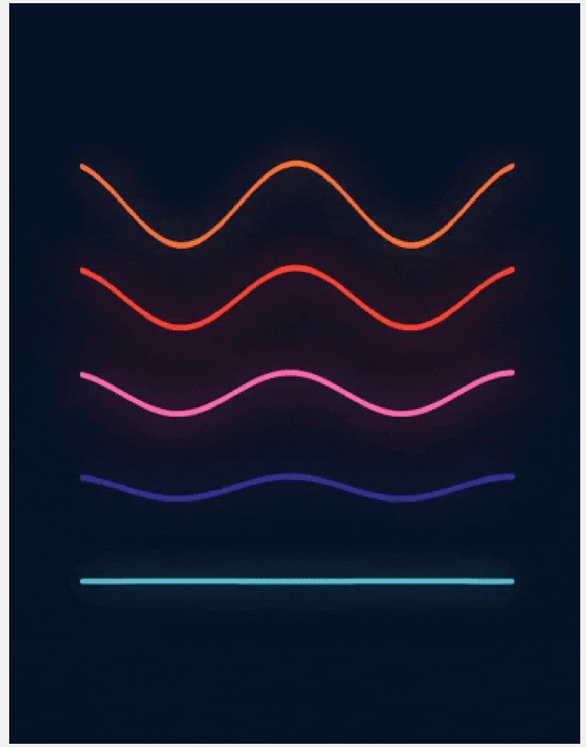
This is a User Friendly Font

This font may be hard to read by some

Give options to turn off animations

Users with vestibular disorders could experience nausea or other sensitivities from animated content. Other users could also be distracted or confused by animations, causing them to divert their attention away from your visualisation.

If your visualisation or graphic features some type of animation, it is a good idea to have an option for the user to turn off the animation and view the visualisation as static. This will allow them enough time to process your visualisation's key message and not cause unnecessary distraction or movement sensitivities.



In summary...

Making small modifications to our visualisations, like the ones included here, help our visualisation to be more easily understandable to everyone, not just individuals with disabilities. Several of them overlap with data visualisation best practices you are already familiar with!

This is just a brief list of ways to make your visualisations more accessible. You may want to explore this topic further by doing your own research. Making our visualisations more accessible will help us ensure that our data reaches as many people as possible!

8 - 14 Data Visualisation Accessibility Checklist

Data Viz Accessibility Checklist