

Using colours

Resources and guidance on how best to use colour when visualising data and advice on accessibility.

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Colour is an important consideration in design. Use colour carefully, it should reinforce the main messages in your data.

Don't rely on colour alone to communicate the stories in your data. The important messages communicated by the data must be clear if the graphic is viewed in black and white or if the user is colour-blind.

When considering your colour choices look at the relationships present in the data. It should be used to group related items and command attention. Contrasting colours can be used to focus attention on differences, or interesting areas, within the data.

A safe starting point is to use subdued, pastel colours or [greyscale](#) to communicate the majority of your information.

For categorical data that can't be organised into broad groups use the same colour and shade.

EXAMPLE



EXAMPLE



If the categorical data can be grouped use colour to help highlight this relationship.

EXAMPLE

Don't

EXAMPLE

Do

Colour by broad category

Use colour when sub-categories are not shared across broad categories to show hierarchy in the data

EXAMPLE

Do

Colour by year

Use colour when sub-categories are common across broad categories to show secondary relationships in the data.

Ethnic group	men	women
White	39	37
Mixed/Multiple ethnic group	25	20
Asian/Asian British	24	29
Black/African/Caribbean/Black British	16	13
Other ethnic group	16	13

Use colour to distinguish between lines on a line chart. If the data has an implied order, for example age ranges, use different shades of 1 colour, or colours with different luminance values, but the same hue and saturation.

EXAMPLE

If the data has no implied order, for example male and female, different colours (hues) can be used.

EXAMPLE

Lines have a smaller area than bars, which means fewer colours can be distinguished. Try to avoid using more than 4 shades of 1 colour on a line chart without using another mechanism to differentiate between them. Using colour and texture can be particularly powerful.

Where data categories can be ordered

EXAMPLE



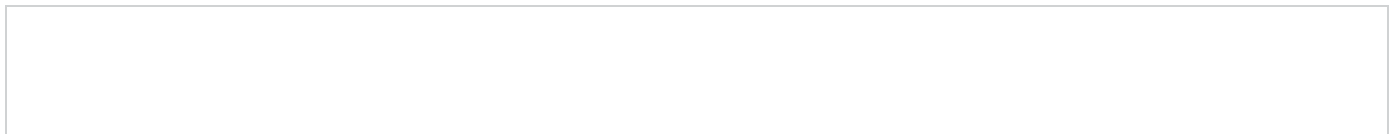
Where data categories have no order

EXAMPLE



Different shades of 1 colour, or colours with different luminance values, or different colours (hues) can be used in pie charts.

EXAMPLE



You can also use colour to connect information and charts on a page or within an article.

EXAMPLE



Always ensure that people who can't perceive colour or see it in a different way can still understand the information.

If you need to use colour to convey information make sure that colour-blind safe colours are used. Use a colour-blind simulator, such as [Vischeck](#), to test your colours to see whether they are colour-blind safe.

Colour palettes should be chosen to maximise the difference in perception between the colours and also appear distinct to people with varying types of colour blindness.

A good starting point is to choose colours that are distinct from the background and each other.

When choosing a colour palette [tools](#) like [Colorbrewer](#) can provide a good starting point. Palettes for use in ONS will be added here in the future.

Use these tools to help ensure your colours are accessible:

- [Colorbrewer](#) is a useful basic tool that allows you to choose 3 to 12 colours according to specified requirements, for example colour-blind safe or diverging colours
- [Colorhexa](#) allows greater control over choosing optimally distinct colours, a colour-blind simulator shows how colours appear to people with different types of colour blindness
- [Adobe Illustrator](#) allows you to simulate different kinds of colour blindness

Certain colours have different meaning associated with them, which will vary dependent on context.

For example:

- red: caution, anger, love, negative (in finance), hot
- orange: warm, autumn
- yellow: happy, fun, young
- green: nature, calm, good luck
- blue: stability, professional, cold, trust, intelligence
- purple: wealth, mystical, decadent
- brown: rustic, practical, warm, vintage
- white: sterile, innocence, peace, truth, cleanliness
- black: sophistication, death, night, contemporary
- multicolour: international, all inclusive, multicultural

Where appropriate use colours that are naturally associated with the categories they are representing.

EXAMPLE



EXAMPLE



However, you need to be aware of colour association with potentially sensitive topics, for example, political parties. The use of a particular colour can change the context of what you are presenting.

Colour can be used to show the data are part of a particular brand or collection. For example, the 2011 Census used a purple colour scheme and this was used in the design of their charts.

EXAMPLE



But....

Don't be constrained to only using your corporate or brand colours. Use the colours that are most appropriate to highlight patterns in the data and can be perceived the most clearly by all users.

Approximately 1 in 12 men (8%) and 1 in 200 women suffer from colour blindness. There are many different forms of colour blindness:

Normal Vision



Deuteranomaly



Protanomaly



Protanopia



Deuteranopia



Tritanopia



Tritanomaly



Achromatopsia



Use these 3 helpful rules when choosing your colours

“Get it right in black and white”

Make sure your design works in greyscale (black and white) before adding in colour. Don't assume colours will signal meaning when used on their own.

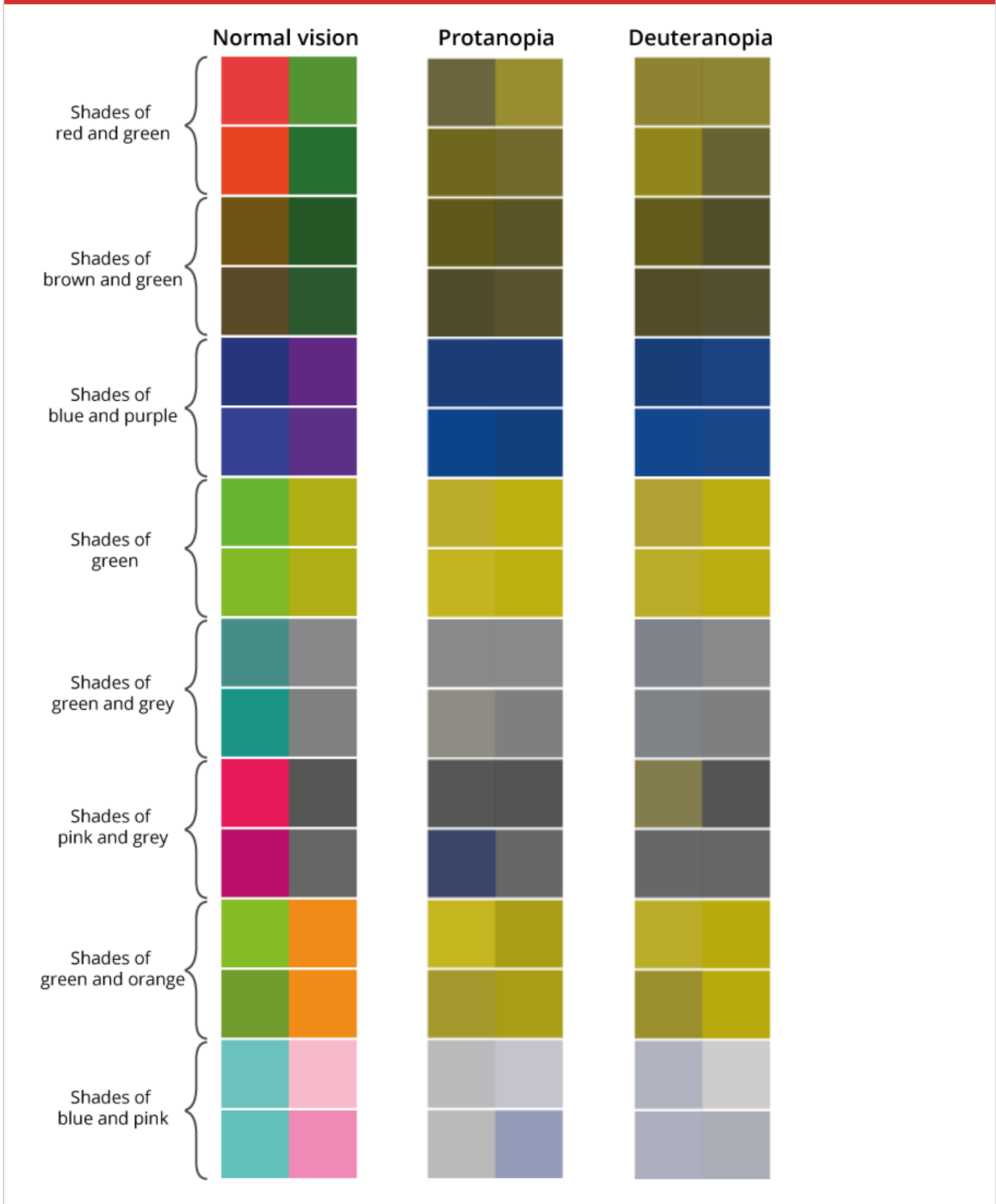
“The safest hue is blue”

The richest colour across all types of colour blindness is blue, therefore blue is often a good colour choice.

“Red and green should never be seen”

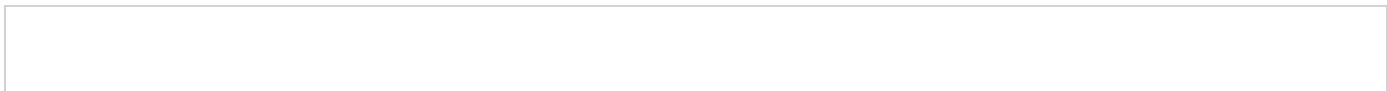
Avoid using red and green together as they are difficult to distinguish from one another in the more common types of colour blindness.

Avoid colour combinations that are especially hard for colour-blind people to see.



Use various shades of a single colour, instead of multiple colours to help avoid colour blindness issues. This can be done by varying the luminance or saturation and holding the hue constant

EXAMPLE



Colour-blind people can still perceive contrast, as well as differences in hue, saturation and brightness. Use bright colours which are easier to distinguish rather than dim ones, which tend to blur into one another.

Some mildly colour-blind people are able to see a colour, but only if there's a sufficient "mass" of it. Use larger areas and thicker lines if possible.

If you're using red to signal "warning," or "caution," and green to signal "approval" or "correctness" consider adding a symbol to make sure colour-blind users can still understand the message.

EXAMPLE

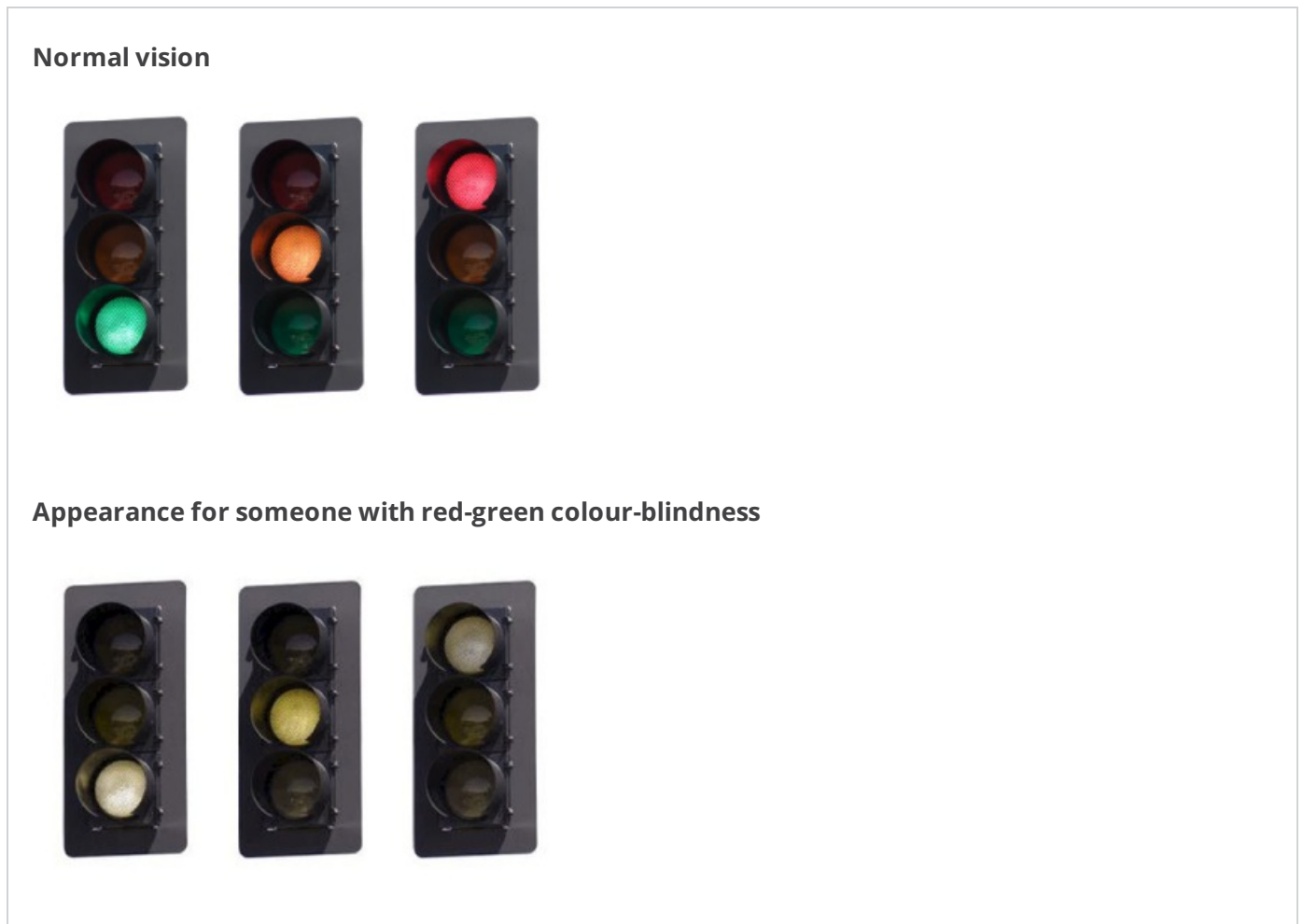


EXAMPLE



Traffic lights use red and green, but the position of the lights communicates "stop" or "go", even if the colours can't be seen.

EXAMPLE



When the use of red and green is unavoidable, for example RAG (red, amber, green) ratings make sure that colour isn't the only method of communication.

Consider representing RAG ratings in the same way:

EXAMPLE



Colour theory is complex and is based on [colour models](#) and [colour spaces](#).

Colours are defined in many ways, 3 of the more common ways are:

- RGB (red, green, blue) – which describes the type of light emitted to produce a colour
- HSL (hue, saturation, luminance) – commonly used by artists
- CMYK (cyan, magenta, yellow, black) – used in printing to describe the inks required to produce a given colour

EXAMPLE

This colour can be defined in the following ways:

RGB(35, 165, 142), HTML traditionally uses hexadecimal conversions of the RGB value to define colour. For example #23A58E

HSL(169.38°, 78.79%, 64.71%)

CMYK(77.75%, 11.45%, 54.28%, 0.34%)

You can use at least one of these methods to define colour in most software packages.