INTRODUCTION
WHAT IS THIS GUIDE FOR?

A Work in Progress

Within the City Intelligence Unit at City Hall, we work on a diverse range of data visualisation and information design projects. These projects range from static presentations, simple chart publishing, interactive visualisation applications and both simple and more complex web mapping applications.

This guide has evolved out of documenting principles & styles that have worked across those projects so far, in order to keep our work consistent.

Now seemed like a good time to share these simple principles so far, to help us all think about how we present data, and as handy guide if you are looking for answers to your own chart design challenges.

This is an ongoing, evolving work in progress, that will expand, shift and change format as we tackle more projects, and see what does & doesn’t work. So, if you have any thoughts or feedback on the guide so far, then do get in touch: mike.brondbjerg@london.gov.uk

Guiding principles, not rigid rules

Your data and design challenges will be unique to you and the context you are working in. The solution you create will never be perfect, and will always be compromised, but using some guiding principles can help us keep aiming for the best and most consistent design outcome possible.

For every chart or graphic you design, you have to make the decisions about adding, removing or highlighting elements, and these guidelines are here to help that decision-making process.

The code is more what you’d call “guidelines” than actual rules. Welcome aboard the Black Pearl, Miss Turner.
- Captain Barbossa, Pirates of the Caribbean

Guidelines are just a guide, and not rules to be dogmatically followed.

You should make a conscious decision about the charts types you choose, the data you use, and the elements you add or remove to highlight the data.
CHART DESIGN
CHART DESIGN
PRINCIPLES

Remove the noise, highlight the signal

The quote below is one of Dieter Rams’ 10 Principles of good design and is particularly pertinent to the field of data visualisation & information design (as noted in the book “Data Visualisation” by Andy Kirk²).

"Good design is as little design as possible. Less, but better.
- Dieter Rams³"

Within data visualisation, “Less, but better” means removing unnecessary visual clutter, but keeping, improving and highlighting only elements that reinforce or illustrate the point we are trying to make with the data. Because a chart isn’t the data, it’s an opinion about (or at least a narrow view of) the data.

The same principle can be applied to the editorial content surrounding and contextualising our charts too.

Maximizing the Data-Ink Ratio

Edward Tufte has an interesting approach to reducing visual clutter, and focusing only on elements that “show the data”.

"Above all else, show the data.
- Edward Tufte⁴"

“Data-Ink” is the “non-erasable core of a graphic”, and he encourages you to dedicate as much of the ink in a graphic to showing the data.

The “Data-Ink Ratio” describes the amount of ink that is used to communicate data vs other decorative clutter.

Edward Tufte’s Five “Laws” of Data-Ink:
1. Above all else show the data.
2. Maximize the data-ink ratio.
3. Erase non-data ink.
4. Erase redundant data-ink.
5. Revise and edit.

CITY INTELLIGENCE
CHART DESIGN
PRACTICAL STEPS

Practical steps to reduce clutter

Minimal gridlines & tick marks
Use as few gridlines and ticks as is necessary to understand the range & context of your data. Aiming for around 5 gridlines / tick marks is usually adequate. Make your gridlines as light as possible, but still visible.

Remove borders
Remove borders around the chart to give it more space.

Minimise labelling
Labelling your axis as unobtrusively as possible, gives you space to accentuate important points on the axis or in the data.

Remove decoration and effects
Get rid of any unnecessary key lines around shapes, drop shadows and bevelling effects.

Don’t try and show too much
If you have lots of data to show, perhaps use small multiples of charts rather than over complicating one chart.

Minimise use of colour
Remove colour encoding of data that is there only for context or comparison. Using lighter/thinner grey lines for this contextual data allows to better highlight with meaningful colour later.
CHART DESIGN
PRACTICAL STEPS

Practical steps to highlight the data or message

Focus
Focus ranges to show data most clearly. Only if doing so doesn't remove important context.

Use colour or line weight
Highlight the important data with a consistent / thematic colour, and increasing the weight of the line.

Label directly
This can help draw attention to a key data point and simplifies reading by not having to translate the meaning of a colour legend.

Show key points on the axis
Highlight key dates or values on the axis. Consider only including the date ticks on your axis that are relevant to the chart.

Highlight important thresholds and contextual ranges
Draw attention to important thresholds in the range of your data. E.g. placing a stronger gridline when your y-axis DOES start at zero. Or where you need to show data around a threshold.

Projects A is projected to fall, but then recover
A longer more detailed description of the context and methodology behind the projection that A, will fall but eventually rise again.

Only use dots & marks on important data points
- First & last values
- Interesting events
- Show where there are few, or inconsistent data points.

Say what you see
Help the reader by titling the chart with a description of what you want them to see in the graphic. Use colour to connect body copy in your document to data points in your chart.

DATA

<table>
<thead>
<tr>
<th>Year</th>
<th>Data A</th>
<th>Data B</th>
<th>Data C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>£600</td>
<td>£690</td>
<td>£651</td>
</tr>
<tr>
<td>2018</td>
<td>£765</td>
<td>£690</td>
<td>£651</td>
</tr>
<tr>
<td>2025</td>
<td>£800</td>
<td>£690</td>
<td>£651</td>
</tr>
<tr>
<td>2028</td>
<td>£765</td>
<td>£690</td>
<td>£651</td>
</tr>
</tbody>
</table>
CHART DESIGN
PRACTICAL STEPS

Practical steps to improve presentation layout, design & readability

Maintain consistency
Make consistent design decisions throughout your work, and certainly within any given presentation. For example, once your reader has learned that “pink” might mean “London” don’t contradict that in your next chart.

Aid navigation & context
Allow users to navigate your presentation or document easily by signposting (with colour or icons) where they are. This also gives them context for the data they are reading.

Consider chart comparison
Ensure any two charts that are likely to be compared, use the same space for layout and use the same scale on the x & y axis.

Consistent text hierarchy across charts and within document
Your chart should feel that it belongs to your document, so keep the text size consistent with the hierarchy of your document or web page.

Connect data and narrative
Highlight body copy in your document with a colour or style that connects it to a highlighted data in your chart.

Keep the visual quality high
Avoid poor quality icons or pictograms that don’t lend clear meaning to your design or might appear trite or cliched. Try to avoid poor quality or tired stock photography.

Audience
Pick the style, tone, depth & layout of your presentation to suit your audience and the platform they will be viewing it on. Print, presentation, online, or all of the above.

Perhaps start thinking about working “Digital First”
Should we still be presenting work as a Word document, PowerPoint presentation, or (like this) PDF? Web based content makes navigation easier and content richer and more accessible.

If we can create the infrastructure, support & training, can we strive towards “digital first” publication?
CHART DESIGN
STYLING & LAYOUT

Consistent layout, labels & lines
For ease of comprehension, it’s important that your charts are presented consistently, and are as clean and uncluttered as possible.

A descriptive chart title in 18pt Bold #353d42
More detailed explanation matching the document body copy in 14pt

Remember, your charts should feel part of the document they are displayed within, and so text sizes should relate to the document text hierarchy and all chart text should be consistent across the document.

Shown are typical text and line weight settings derived from the London Datastore’s body copy. Depending on your tools, device / document context, and resolution, you may want to change the specific settings, but the relative relationships between lines & type settings should be similar.

A descriptive chart title in 18pt Bold #FFFFFF
More detailed explanation matching the document body copy in 14pt

Projected: 12pt #666666

Source: General chart text in 12pt #666666
When we produce a graphic, we often use colour for differentiating categories or encoding value. But colour is tricky to get right, and not always as useful as we might hope. Balancing accessibility, perception, cultural association, branding and its appearance in different contexts, and to different users, can limit our options.

**Consider the following principles when using colours:**

- Favour direct labelling over using a wide range of categorical colours
- Try and use a single colour to highlight your data, and grey/white for contextual / comparison data.
- Apply colour to meaning consistently across all your charts that are likely to be read in the same context.
- Use colour to connect information across different charts and editorial.
- Some colours have overriding cultural, political or contextual meaning. Try and reserve those if you’ll need them later in your presentation. E.g. Red = Bad, Failing or Hot, Green = Good, improving or Environment, Blue = cold, etc...
The Mayor of London brand guidelines contain this set of 11 colours, of which Pink (#ee266d) is the hero colour. These colours are brilliantly impactful for brand communications when used in isolation or small pairings. However for data visualisation and information design we need to think about colour slightly differently.

When presenting data, and while not ideal, we sometimes need to use a wide range of categorical colours. These categorical colours, for the sake of clarity and accessibility need to be visually distinct from each other.

Some of the brand colours, can’t be used to together in a visualisation because they are not visually distinct enough for some readers, and in some environments and applications (like small lines or points).

This subset of the brand colours do work as categorical colours:

- A: Pink  "#ee266d", rgb(238,38,109);
- B: Cyan  "#00aeef", rgb(0,174,239);
- C: Dark Pink  "#9e0059", rgb(158,0,89);
- D: Mustard  "#dca000", rgb(220,160,0);
- E: Red  "#e0001b" rgb(224,0,27);

These colours and pairings are problematic for accessibility:

- Green vs Red
- Blue vs Purple and Dark Pink
- Purple vs Dark Pink
- Orange vs Red
- Yellow on white doesn’t contrast well

As a solution to this need for an extended range of categorical colours, we have used the Hero Pink and Dark Pink, and then developed a new set of colours around them. They are as similar as possible to the brand colours but with modifications in Hue, Saturation and Brightness to give them more visual separation.

Core colours and chart design system

Below are a quick reference to our core categorical colours that have been developed to extend the LDN Pink and Dark Pink brand colours.

- **Blue** #6da7de
- **LDN Dk Pink** #9e0059
- **Yellow** #dee000
- **Red** #d82222
- **Green** #6eac0c
- **Purple** #893939
- **Turquoise** #5c95c3
- **Pink** #ff38ba
- **Orange** #eb861e
- **LDN Pink** #ee266d

### Light BG
- **Context Data** #cccccc
- **Highlight Area** #000000
- **Strong Grid** #666666
- **Light Grid** #d8d8d8

### Dark BG
- **Context Data** #ffffff
- **Highlight Area** #ffffff
- **Strong Grid** #ffffff
- **Light Grid** #4e5254

### Chart Labels
- **Black** #000000
- **White** #ffffff

### Document Text
- **Heading** #353d42
- **Body Text** #666666
- **Highlighted Labels** #353d42

This subset work well on the LDN Grey background.

All colours work on a dark background.
Core categorical colour palette

While fewer colours are better, we often need numerous categorical colours on charts and maps. The following colours have been carefully chosen to work with LDN Pink and Dark Pink and (unless coloured areas are small) are discernable by people with most* colour vision deficiencies. Below are suggested default usage order and possible colour ramps.

Core categorical colours by default use order

A: Blue
B: LDN Dk Pink
C: Yellow
D: Red
E: Green*
F: Purple
G: Turquoise
H: Pink
I: Orange
J: LDN Pink*

Example single hue categorical colour ramp end/mid points:

Visit https://gka.github.io/palettes/ to generate your own steps.
For accessibility and clarity, you ideally wouldn’t use this many colours, but here we show all 10 categorical colours together on a map. They work on both light and dark basemaps or application canvases. A couple of colour ramps for choropleths are also shown.
Some colours don’t contrast well with the “mid” LDN grey background, so here we have a reduced palette of 6 of our core categorical colours.

### Reduced Core categorical colours by default use order

- **A: Blue**  "#6da7de", rgb(109,167,222);
- **C: Yellow**  "#dee000", rgb(222,224,0);
- **E: Green**  "#5ea15d", rgb(94,161,93);
- **G: Turquoise**  "#63c5b5", rgb(99,197,181);
- **I: Orange**  "#eb861e", rgb(235,134,30);
- **J: LDN Pink**  "#ee266d" rgb(238,38,109);

It looks odd if ramps start darker than this LDN grey BG. Here we have a some example ramps, starting from a lighter base, as shown in the colour wheel. Visit [https://gka.github.io/palettes/](https://gka.github.io/palettes/) to generate your own steps

- **A: Blue**  37485b, 6da7de, c3d5ec
- **C: Yellow**  5d5b1f, dee000, f5f0ce
- **E: Green**  3f633e, 5ea15d, d8e4d6
- **G: Turquoise**  33534d, 63c5b5, a2d9ce
- **I: Orange**  8e541f, eb861e, fadfcf
- **J: LDN Pink**  bd2a69, ee266d, fad2d8
The core categorical colours (above) work well with the GLA brand mayoral & pink and used as key colours they are great. However, as a group they are quite bright and saturated, so here we have a set of less saturated, less contrasting, darker variations. As a consequence we have fewer categorical colours to use, but still enough for most projects.

Dark (lower contrast) categorical colours by default use order

- A: Blue:
  - "#3681bf",
  - rgb(54,129,191);
- B: Magenta
  - "#89105d",
  - rgb(137,16,93);
- C: Yellow
  - "#d3c913",
  - rgb(211,201,19);
- D: Red
  - "#af2828",
  - rgb(175,40,40);
- E: Green
  - "#73a072",
  - rgb(115,160,114);
- F: Turquoise
  - "#56b2a1",
  - rgb(86,178,161);
- G: Purple
  - "#884299",
  - rgb(136,66,153);
- H: Orange
  - "#b76325",
  - rgb(183,99,37);

Example single hue categorical colour ramp end/mid points:
Visit https://gka.github.io/palettes/ to generate your own steps

- A: Blue: 1e2630, 3681bf, d3dea
- B: Magenta 581a3e, 89105d, e2cad5
- C: Yellow 35321a, d3c913, f2ccc
- D: Red 4e201b, af2828, eecdc8
- E: Green 242c24, 73a072, dae3d9
- F: Turquoise 212e2c, 56b2a1, d7e8e3
- G: Purple 3f2644, 884299, edd1e3
- H: Orange 312118, b76325, eed7c9
For accessibility and clarity, you ideally wouldn’t use this many colours, but here we show all 8 darker categorical colours together on a map. They work on both light and dark basemaps or application canvases. A couple of colour ramps for choropleths are also shown.
CHART DESIGN
DARKER CATEGORICAL COLOUR PALETTE

Some colours don’t contrast well with the “mid” LDN grey background, but with the darker/less contrasting set we can still use 7 colours.

Reduced dark (lower contrast) categorical colours by default use order
- A: Blue: "#3681bf", rgb(54,129,191);
- C: Yellow: "#d3c913", rgb(211,201,19);
- D: Red: "#af2828", rgb(175,40,40);
- E: Green: "#73a072", rgb(115,160,114);
- F: Turquoise: "#59541e", rgb(86,178,161);
- G: Purple: "#884299", rgb(136,66,153);
- H: Orange: "#b76325", rgb(183,99,37);

*A: Blue: rgb(2e5174); C: Yellow: rgb(3681bf); D: Red: rgb(af2828); E: Green: rgb(73a072); F: Turquoise: rgb(59541e); G: Purple: rgb(884299); H: Orange: rgb(b76325)*

Avoid red unless needed on this LDN BG

It looks odd if ramps start darker than this LDN grey BG. Here we have a some example ramps, starting from a lighter base, as shown in the colour wheel. Visit https://gka.github.io/palettes/ to generate your own steps

- A: Blue: 2e5174, 3691bf, d3ddea
- C: Yellow: 59541e, d3c913, f2eccc
- D: Red: af2828, eecdc8
- E: Green: 374636, 73a072, dae3d9
- F: Turquoise: 2f4d46, 56b2a1, b9dad3
- G: Purple: 6f397b, 884299, e0d1e3
- H: Orange: 714120, b76325, eed7c9

Avoid red unless needed on this LDN BG
The core categorical colours (above) work well with the GLA brand mayoral & pink and used as key colours they are great. However, as a group they are quite bright and saturated, so as well as they darker, less saturated set, we have also created this reduced, lighter, less saturated, less contrasting palette of 7 colours.

Light (lower contrast) Categorical colours by default use order

A: Blue
B: Purple
C: Yellow
D: Red
E: Green
F: Turquoise
G: Orange

Example single hue categorical colour ramp end/mid points:
Visit https://gka.github.io/palettes/ to generate your own steps

A: Blue
B: Purple
C: Yellow
D: Red
E: Green
F: Turquoise
G: Orange

Lighter, less contrasting categorical colour palette
For accessibility and clarity, you ideally wouldn’t use this many colours, but here we show all 7 lighter categorical colours together on a map. They work on both light and dark basemaps or application canvases. A couple of colour ramps for choropleths are also shown.
All 7 of these lighter, less saturated, lower contrast colours work with LDN grey background.

**Light (lower contrast) Categorical colours by default use order**

- **A: Blue**  
  "#7ab5e5", rgb(122,181,229);
- **B: Purple**  
  "#964a92", rgb(150,74,146);
- **C: Yellow**  
  "#ddd82c", rgb(221,216,44);
- **D: Red**  
  "#d84545", rgb(216,69,69);
- **E: Green**  
  "#65aa63", rgb(101,170,99);
- **F: Turquoise**  
  "#49bf9a", rgb(73,191,154);
- **G: Orange**  
  "#d6793a", rgb(214,121,58);

It looks odd if ramps start darker than this LDN grey BG. Here we have a some example ramps, starting from a lighter base, as shown in the colour wheel. Visit https://gka.github.io/palettes/ to generate your own steps

- **A: Blue**  
  3b4d5d, 7ab5e5, dee8f2
- **B: Purple**  
  793776, 964a92, e3d2e0
- **C: Yellow**  
  5c5923, ddd82c, f4f8f7
- **D: Red**  
  ad3d3a, d84545, f6d4cf
- **E: Green**  
  334a31, 65aa63, d9e6d7
- **F: Turquoise**  
  2c5043, 49bf9a, d5ebe2
- **G: Orange**  
  824d2b, d6793a, f4dce8
Our three colour palettes have been developed to work in various contexts, with the GLA/MOL brand & (if used sparingly) will be accessible to most people in most applications.

However, you will inevitably need a different colour or shade at some point. You could combine colours or shades from within these palettes, or pick your own.

Either way you will need to test that there is good visual separation between categorical colours to make them as clear and accessible to as many people as possible.

Here we’ll show you some tools to help you do just that!

### Viz Palette
https://projects.susielu.com/viz-palette
This is a great tool that helps check and emulate a colour palette for different colour impairments.
CHART DESIGN
FIND & TEST YOUR OWN COLOUR VARIATIONS

Viz Palette (continued)
Here you can see, tested under "Deuteranopia" colour deficiency (affecting 0.56% of the population) our core colour palette has a few minor issues (thin connections), and one major issue (thick connection), when trying to combine ALL 10 colours together.

So, we should make sure that if we are using certain colours together, we should ensure our lines are not too fine, and (as mentioned above) avoid the LDN Pink with this green if possible.

COLOR REPORT

Remember, we shouldn’t rely on colour alone, particularly when using more than around 5 colours.

We can use other methods too, like labelling and interactivity, to help users navigate and decode the data.

Picking a new colour methodically
The “Viz Palette” tool makes use of another great library (under the hood) called chroma.js. Within the colour picker it allows use to move away from a particular colour in steps of “lightness/darkness” and “saturation” that are reasonably perceivable.

You can also use the HSL controls to shift around the Hue spectrum and make finer adjustments to your Saturation and Lightness.

It’s useful to imagine the HSL colour model as a cylinder. Move around the perimeter for different Hues on the colour spectrum, away from the center for saturation (amount of colour) and vertically for lightness.

Image credit:
https://commons.wikimedia.org/wiki/File:HSL_color_solid_cylinder_saturation_gray.png
A bit of background on colour scales
Creating Single Hue colour scales (one hue, moving from lighter to darker) is fairly simple (though errors can occur), but creating multi-hued scales (moving from one hue to another) can create real problems, because not all colours across the spectrum are perceived equally.

Looking at this rainbow scale, we can see there are brighter and darker areas, and places where the colour seems to change faster than others. This makes it hard to read and perceive value correctly.

Rainbow:

This issue has been addressed recently and researchers have developed a more perceptually uniform set of scales known as the Viridis Scales:

Viridis:
Magma:
Plasma:
Inferno:
Cividis:

More Info: https://cran.r-project.org/web/packages/viridis/vignettes/intro-to-viridis.html

Chroma.js Colour Scale Helper
https://gka.github.io/palettes/
You will inevitably need to create your own colour scales at some point for a choropleth map or some continuous data. This tool (developed by Gregor Aisch, and also built into Datawrapper.de) can help you create single and multi-hued, sequential and diverging scales that are perceptually correct.

It helps adjust a scale’s brightness, avoids colour kinks that occur when you interpolate across the spectrum and let’s choose your step count.

Chroma.js Color Scale Helper
In our colour wheels you can see we have the core categorical colours, but also suggestions of darker and lighter shades from which you can start and end your colour scales.

Chroma.js colour scales (continued)

In our colour wheels you can see we have the core categorical colours, but also suggestions of darker and lighter shades from which you can start and end your colour scales.

We found the dark and light shades, by generating an 11 step diverging scale from the core colour out to dark (#121212) and light grey (#f5f5f5).

You can see in the diverging scale there is a slight perceptual kink in the center where they converge on our core colour.

Also the dark step at D-4 is (we judge) probably a bit too dark to be useful, so we want to run our scale from D-3, smoothly through our core red, and then too D+4, the lightest shade.

Remember, on screen, the dark shades will be harder to see on a white background so think about the context your colours will be seen in.

Finally we switch back to the "sequential" mode, and generate a nice smooth scale from D-3, bending toward our core red, and out to D+4.

Note: the kink in the scale
Diverging scales with Chroma.js
https://gka.github.io/palettes/#diverging
Chroma.js tool can also help you generate diverging scales. Here we have created a few for you as a starting point, but you can of course adjust them to your required number of steps and endpoints.

For data on light backgrounds and maps
Blue - Green: Left: 2e5174,3681bf,333333 Right: eeeeee,73a072,4a6349
Red - Blue: Left: 8e2724,af2828,333333 Right: 333333,3681bf,8eaed5
Red - Yellow: Left: 8e2724,af2828,333333 Right: 333333,dee000,59541e
Red - Green*: Left: 8e2724,af2828,333333 Right: 333333,73a072,8cb08b

For data on dark backgrounds and maps
Blue - Green: Left: 8eaed5,3681bf,333333 Right: 333333,73a072,8cb08b
Red - Blue: Left: d57f73,af2828,333333 Right: 333333,3681bf,8eaed5
Red - Yellow: Left: d57f73,af2828,333333 Right: 333333,d3c913,ded153
Red - Green*: Left: d57f73,af2828,333333 Right: 333333,73a072,8cb08b

*With caution

Hex to rgb() - Colour code conversion tool
https://bjoernkw.github.io/hexrgb/
Once you have worked with these tools, you will end up with strings of Hex values, but you can convert them to RGB here if you need to.

Introducing gglaplot for R
https://github.com/Greater-London-Authority/gglaplot
In an effort to make the layout, styling and colour palettes we have introduced in this styleguide easier to access, we have started the development of a new R package called "gglaplot". As you can guess it’s a branch of the popular ggplot.
Colour in your presentation context

We also need to consider the context in which our graphics are going to be displayed. Think about who is viewing your graphic and how?

- Will it be printed to make notes on in a meeting?
- Will you be presenting in a brightly lit room with a poor projector?
- Not all monitors are equal... lighter greys and washed out colours can be hard to see on some monitors.
- Will the audience need to be able understand the colour quickly and without labelling?
- Think about accessibility and use distinct colours.
  Larger blocks of colour can also help those with colour blindness perceive the colour better.

What to consider if printing (if you have to print)

- Use white / light backgrounds to reduce ink and improve readability.
- Pink looks great on screen, but can print quite red. This may communicate the wrong meaning, and be confused with other reds.

Projectors

Just like monitors, some projectors are better than others. Some meeting rooms are brighter than others too. Check that your projector is using the correct colour mode, and not changing your colours, but also think about your data colours.

- Bright rooms make light colours hard to see
- Increasing contrast in your presentation will help
- The neon pink can sometimes appear indistinct on thin lines if used on a darker background.

Subject & cultural considerations

The core colour palettes are a suggested first place to look for your colours, but of course sometimes they won't be appropriate.

If you are presenting data of a sensitive nature, then a bright, saturated colour palette may well not be appropriate. Perhaps think about using the darker less saturated palette (above).
Some real world examples

We have been working with, and evolving this system over a few different projects. Here you’ll find a few examples of common charts, illustrating where we have stuck to the system, and some places where we have deviated from it, hopefully to increase clarity.

Standard line chart
Key features of this chart:

- Y-Axis starts at 0, and is clearly indicated by use of a stronger baseline that stands out from the background gridlines.
- Only enough gridlines to show range and groups of values
- Data is highlighted using a thematic colour and by marking and labelling key dates & values.
- A legend is no longer needed as data is labelled directly.
- Projections differentiated through line style and a highlighted future date range.

London’s population is bigger than ever and still growing
With approximately 8.9m residents, London’s population is bigger than ever, and is set to grow to approximately 10.5m inhabitants by 2041.

Source: London Measured Report (Sep 2018)
Standard line chart variations

Key features of this chart:

• To focus on the detail of the data, we have NOT started the Y-Axis at zero. To highlight this, we have removed the strong baseline. We have also shown the vertical gridlines extending beyond the horizontal grid, to imply that the range continues beyond our current view.

• London data highlighted by use of thematic colour and UK shown in white for context.

• The labelling is tricky to place so we have connected the labels to the data with dotted lines. Labels are using large 20pt & smaller 16pt text.

• As the data is quite granular and detailed, we must reduce the default line weight to 2pt, so as not to obscure any detail.

• We needed to include months as well as years on the X-Axis, which meant reducing the default axis text from 20pt to 16pt.

London’s employment rate stands near to a record high
Working age (16-64) employment rate % 1992-2018 seasonally adjusted

Source: London Measured Report (Sep 2018)
**CHART DESIGN EXAMPLES**

**Bar / column chart**
Key features of this chart:

- Always start bar Y-Axis at zero, and indicate with a strong baseline.
- Show just enough gridlines to frame the data.
- Colour bars to visually group and easily focus on key vs context data.
- Group through labelling rather than many colour variations.
- Label bars with value directly if possible (right: using small 16pt text).

**Life expectancy in London is higher than the UK, but is inconsistent across Boroughs**
Life expectancy at birth (Males only shown here)

<table>
<thead>
<tr>
<th>Borough</th>
<th>Value (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>London Average</td>
<td>80.3</td>
</tr>
<tr>
<td>UK Average</td>
<td>79.5</td>
</tr>
<tr>
<td>Barking &amp; Dagenham</td>
<td>77.6</td>
</tr>
<tr>
<td>Kensington and Chelsea</td>
<td>83.3</td>
</tr>
</tbody>
</table>

Source: London Measured Report (Sept 2018)

**London is more highly qualified than the rest of the UK**
Qualification level of 25-64 year olds in London and rest of UK, 2017

<table>
<thead>
<tr>
<th>Qualification Level</th>
<th>London</th>
<th>Rest of UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVQ4+</td>
<td>56%</td>
<td>40%</td>
</tr>
<tr>
<td>NVQ3</td>
<td>11%</td>
<td>15%</td>
</tr>
<tr>
<td>Trade</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>NVQ2</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>NVQ1</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>Other</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>None</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: London Measured Report (Sep 2018)
**Stacked bars (for cumulative total)**

Key features of this chart:

- Good for comparing grand total score or count.
- Good for showing categorical breakdown of total, however comparing categories can be tricky as baseline shifts. So, essential to label each segment with a value directly. Consider using split bars instead.

---

**London pupils do better than those across England as a whole, on each element of the Attainment 8**

Average score per pupil in each Attainment 8 element - 2016/17

<table>
<thead>
<tr>
<th>Language</th>
<th>Mathematics</th>
<th>English Baccalaureate</th>
<th>Open</th>
<th>Average Total Per Pupil</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>10.6</td>
<td>9.5</td>
<td>13.6</td>
<td>15.1</td>
</tr>
<tr>
<td>England</td>
<td>9.9</td>
<td>9</td>
<td>12.6</td>
<td>14.9</td>
</tr>
</tbody>
</table>

Source: Department for Education / data.london.gov.uk/economic-fairness/

---

**London is renowned for its diversity**

40% of London perceived themselves as Black, Asian or Minority Ethnic.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>London</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>60%</td>
<td>87%</td>
</tr>
<tr>
<td>Asian</td>
<td>18%</td>
<td>7%</td>
</tr>
<tr>
<td>Black</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Mixed/Other</td>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

Source: London Measured Report (Sep 2018)

---

**London vs UK Employment Rate**

Employed

<table>
<thead>
<tr>
<th>Location</th>
<th>Employment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>74.7%</td>
</tr>
<tr>
<td>UK</td>
<td>75.7%</td>
</tr>
</tbody>
</table>

Source: London Measured Report (Sep 2018)
Donut charts (for proportions of the total)
Because donuts are nicer than pies... But beware, as with real donuts, inappropriate use can be bad for your health, but sometimes you need a change from stacked bar charts.

Key features of this chart:
• Showing proportion of parts within whole.
• Visual variation from stacked bars, but not as good for comparison.
• Use as few variables as possible (ideally 2, but no more than 3 or 4).
• Indicate what the entire donut represents.
• Label segments directly.
• Proportion of ring to hole, is important... not too skinny or too thick.

Stacked bars (for proportions of total)
Key features of this chart:
• All variables sum to 100% to show proportion of total.
• Single colour and labelling in place to highlight narrative in text.

London accounts for 23% of UK economic output
In 2016 London’s economic output (its ‘Gross Value Added’) totalled £396 billion accounting for around 23% of UK economic output. London makes up 13% of the UK population as a whole.

Source: London Measured Report (Sep 2018)
**CHART DESIGN EXAMPLES**

**Choropleth maps**

Key features of this chart:

- Use a continuous or quantized colour scale to show value.
- Differentiating colour can be tricky, so label map & legend if possible.
- Choropleths can be misleading as larger areas can be perceived as having higher values. Try a symbol map or hex map instead.

**London Borough Populations**

ONS Mid-Year London Borough Population Estimates 2015

**Higher value, more “ink”**

Here we’re showing two different scales based around the core blue. On the lighter background, darker colour means higher value. On the dark background, it’s the opposite. Higher values are shown as brighter. This LDN dark BG is not very dark, so it’s important that the darkest shade of the map is NOT darker than the LDN grey background.
Custom charts
Some data and narratives can't be communicated well through a regular chart, so sometimes we need to create custom graphics.

Wealth in London is more unequally divided than income
Percentage of total wealth owned by households in each decile 2014-16

<table>
<thead>
<tr>
<th>Decile</th>
<th>London Wealth Ownership</th>
<th>Population %</th>
<th>GB Wealth Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>61%</td>
<td>Wealthiest 10%</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>16%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4%</td>
<td>Poorest 10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

London’s richest 10% have 9.6x the income of it’s poorest 10%. A difference greater than the rest of the UK

Weekly Income (After Housing Costs)

<table>
<thead>
<tr>
<th>Income Range</th>
<th>London</th>
<th>Rest of UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>£1,200</td>
<td>£1,069</td>
<td>£862</td>
</tr>
<tr>
<td>£1,000</td>
<td>£1,059</td>
<td>£800</td>
</tr>
<tr>
<td>£800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>£0</td>
<td>£111</td>
<td>£169</td>
</tr>
</tbody>
</table>

Source: Department for Work and Pensions

Custom charts like these are created by generating simpler visualisations with tools like D3 and or Datawrapper, outputting as PDF/SVG and then enhancing and adapting the graphic in Adobe Illustrator.
This guide has focused on the general principles of better information design, but it does raise issues around the format and technology we should / could be using to produce our work (including this document).

*Roads? Where we’re going, we don't need roads.*
- Dr. Emmett Brown, Back to the Future

Can we aim to produce more of our work as “digital first”?
Producing content for the web, simplifies navigation issues, helps keep chart and document text consistent, makes labelling more dynamic, charts more accessible and creates opportunity for richer, deeper, personalised interaction and discovery. It also allows content to be kept up to date, eases sharing and extends the reach of content.

If we can better define who our users are, what they need, and work on tools, platforms & training to support easier web publishing, perhaps we can move faster toward producing work as “digital first”.

Feedback
This style guide is a collection of rules and guides I had made for myself, over a range of projects, to keep my own work consistent.

By opening it open for all to share, I’m hoping it will make everyone’s work a little easier, and maybe a little more beautiful.

But, it’s a work in progress! So please let me know if you spot any issues, find things that don’t work for you, or need anything else covered.

Email: mike.brondbjerg@london.gov.uk

References:
1. Captain Barbossa - Pirates of the Caribbean
   - https://www.imdb.com/title/tt0325980/
2. Data Visualisation by Andy Kirk
3. Dieter Rams – 10 Principles of good design
4. The Visual Display of Quantitative Information - Edward Tufte
   - https://www.edwardtufte.com/tufte/books_vdqi
5. Dr. Emmett Brown – Back to the Future
   - https://www.imdb.com/title/tt0088763/
CONCLUSION
FURTHER READING

Not exhaustive (at all), but a hopefully useful collection of articles, podcasts, tools & resources from around the data viz world.

Data Viz Reading & Listening
1. FT Chart doctor - https://www.ft.com/chart-doctor
2. Datawrapper Blog - https://blog.datawrapper.de/
3. ONS Style - https://style.ons.gov.uk/category/data-visualisation/
8. Inspiration from IIB - https://www.informationisbeautifulawards.com/

Chart Choosers
2. Data Viz Project - https://datavizproject.com/

Guidance / How To
2. Datawrapper How To - https://academy.datawrapper.de/
5. Nathan Yau Tutorials (R) - https://flowingdata.com/category/tutorials/
6. Stephanie Evergreen (Excel) - https://stephanieevergreen.com/how-to/

Resource Lists & Tools
2. Chroma.js Colour Scale Tool - https://gka.github.io/palettes
3. HEX to RGB Conversion Tool - https://bjoernkw.github.io/hexrgb/
4. Andy Kirk:
   Resources - http://www.visualisingdata.com/resources/
6. Datawrapper - https://www.datawrapper.de/
7. D3 - https://d3js.org/
8. DC.js - https://dc-js.github.io/dc.js/
CONCLUSION
QUICK STYLE REFERENCE

A Chart Title

Axis Tick

Small Axis Tick

Focus

Comparison

Part of a whole (not comparison)

0% 50% Something 68% 100%

Stacked bar elements separated by thin keyline

London 33.3% 33.3% 33.3%