# **Colours for data visualisation - Part 2**

## **1. Problem current pallet**



What do we have? 4 color series with a overlap in brightness and hue.

### Problem

- You can use only colors from the same series (the contrast is on the edge)

- If you want to use different colors this is only possible in diagonal direction, otherwise there is not enough contrast.

There are different types of data and depending on the type of data color should be applied in different ways. Below the different data types are explained with some examples.

This knowledge is necessary to understand the compexity of data visualisation and the color pallettes we need for this.

# 2. Data types

Color for data should be used in four primary ways:

- **1. Qualitative |** Contrasting colors for individual comparison
- 2. Sequential | Color is ordered from low to high
- **3. Diverging |** Two sequential colors with a neutral midpoint
- 4. Alert or highlight | Color is used to alert or activate a visitor





### Qualitative data

Qualitative or categorical data is the statistical data type consisting of categorical variables or of data that has been converted into that form, for example as grouped data. Color is used to seperate areas into distinct categories. The palette should consist of colors that distinct from each other.



### Depression

Average yearly health care cost of a 45-year-old with Depression: \$4,454 Personal Cost: \$901 Insurer Cost: \$3,552

Total yearly health care cost for the 780 patients with Depression: \$3,474,717

Age 45 

### Sequential data

Sequential data (mulit & single) is any kind of data where the order matters. For example time series are a kind of sequential data, because the order matters. Also when you want to show a strong relation between the data sequential colors can be used.





### Diverging data

If you want to emphasize how a variable diverts from a baseline (say the national average), you may want to consider using a diverging palette. It's important to use clearly distinguishable hues for both sides of the gradient. The center color should ideally be a light grey, but not white.





### Conclusion

How colors are applied is completely dependent on the information you want to present. As designer you have to think which interpretation the visitor has to make. If you want to present a relation between different data then it can be wise to use sequential colors. But if you want to focus more on the diversity between data a qualative color scheme can help. However it is important to prevent over colored data visualisation. Therefor the base should be neutral and colors must be chosen that radiate peace and confidence.



#### QUALITATIVE COLOR SCHEME







## **3. Finding the base colors**

### Considerations

**. 10-12 colours** The color set should work with 2 colors, but also with 12 colors

. **Radiate peace and confidence** Multiple graphs would be shown on the dash at once, so the palettes needed to be harmonious.

**. Incorporate brand colours** The orange shades are the brand colours and needed to be considered in the palettes.

**.Consider multiple types of data** Because the date is diverse it necessary to create a set of categorical, sequential and diverging palettes.

**. All values are of equal importance** Maintain visual consistency in saturation, no values should be more important than others (except for orange).

### Color theory applied to data visualisation

Basic color theory applied to data visialisation—borrowed from: Choosing colors for your data visualization—Cambridge Intelligence



#### Monochromatic

Shades of a single hue, ideal for sequential data.

#### **Analogous colors**

Colors that sit beside each other on the color wheel. Multi-Hue gradients actually work better for sequential data visualisation as they are easier to distinguish yet still remain harmonious.

#### **Complementary colors**

From opposite sides of the color wheel. When paired with a neutral (e.g. white or grey) these palettes are perfect for diverging data. Complimentary also works if you only require two hues in a qualitative palette.

#### **Triadic colors**

Three colors equally spaced around the wheel, which are a good starting point for a qualitative palette.

#### **Tetradic colors**

Two sets of complementary colors. A good starting point for a qualitative palette.

### Finding your base colors

To set the base, colors at the opposite sides (split complementary) of the colour wheel are used. Those colors are perfect for diverging data, but can also works in a qualitative palette (see color theory). Below you see the complementary colors of the orange shades.

#### Brand colors/primary UI colors





If we select the middle orange and translated this into the split complementary colors, the color palette below is created. Those colors can be used to create the base colors. However because orange will not be used as standard color the 3 colors left are not enough for the base.



		◯ Vision simulation <del>▼</del>		
COLORS	PRESETS	PREVIEW 👻	EXAMPLES	TABLES / EXPORT

### Diverging color palette

The split complementary colors can be used as a input to create a diverging color palet. This palette is necessary to select another color for the base. For the palette the complementary green is used, the most soft green and the purple.





#### **Base colors**

Based on the color palette and the split complementary colors the base below is determinated. Those base colors are used as a starting point to build out the rest of the palettes.



To make sure the colors are working a tool is used where you can see the colors in action. Also here is tested for colour blindness and other accessibility.



### Next steps

The next step will be to make the differen type of color palettes based on the different data types.



Determine color system

## 3. Color base applied to data types

### **Qualitative colors**

Qualitative or categorical data is the statistical data type consisting of categorical variables or of data that has been converted into that form, for example as grouped data. Color is used to seperate areas into distinct categories. The palette should consist of colors that distinct from each other.

### Primary colors



Primary extension colors



Full set colors



## **Sequential scales**

Sequential data is any kind of data where the order matters. For example time series are a kind of sequential data, because the order matters. Also when you want to show a strong relation between the data sequential colors can be used.

#### **Creating sequential scales**



Secondaire sequential colors



### **Divergent scales**

If you want to emphasize how a variable diverts from a baseline (say the national average), you may want to consider using a diverging palette. It's important to use clearly distinguishable hues for both sides of the gradient. The center color should ideally be a light grey, but not white

### Creating divergent scales



## Examples











#### Sources

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https://blog.datawrapper.de/colors/

https://blog.graphiq.com/finding-the-right-color-palettes-for-data-visualizations-fcd4e707a283

https://blog.prototypr.io/another-post-about-colours-for-data-visualisation-part-3-diy-palettes-bfc8c8bad72f

https://projects.susielu.com/viz-palette? colors=[%22#3a1aa1%22,%22#006b95%22,%22#04967a%22,%22#d8f767%22,%22#ea640d%22]&backgroundColo r=%22white%22&fontColor=%22black%22&mode=%22protanopia%22

https://paletton.com/#uid=40o0u0kuetniP-XnTv2vrn9BFi7

https://learnui.design/tools/data-color-picker.html

http://eyetracking.upol.cz/color/#