Supporting a Balanced, Modern and Ready Nation

Design Principles

MORS CSAP

Tuesday, March 11, 2025

Walt DeGrange

Agenda

Design Principles

- Instruction
- Guided practice

Design Critique

- Instruction
- Guided practice / check for understanding
- Focus session: Stoplight charts

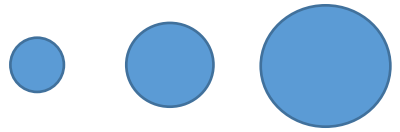
Design elements

Color

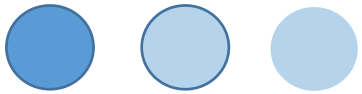
Shape

Position

Size

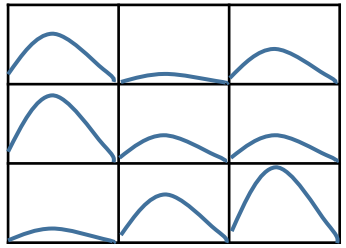


Transparency



Line Type

Composition



Text

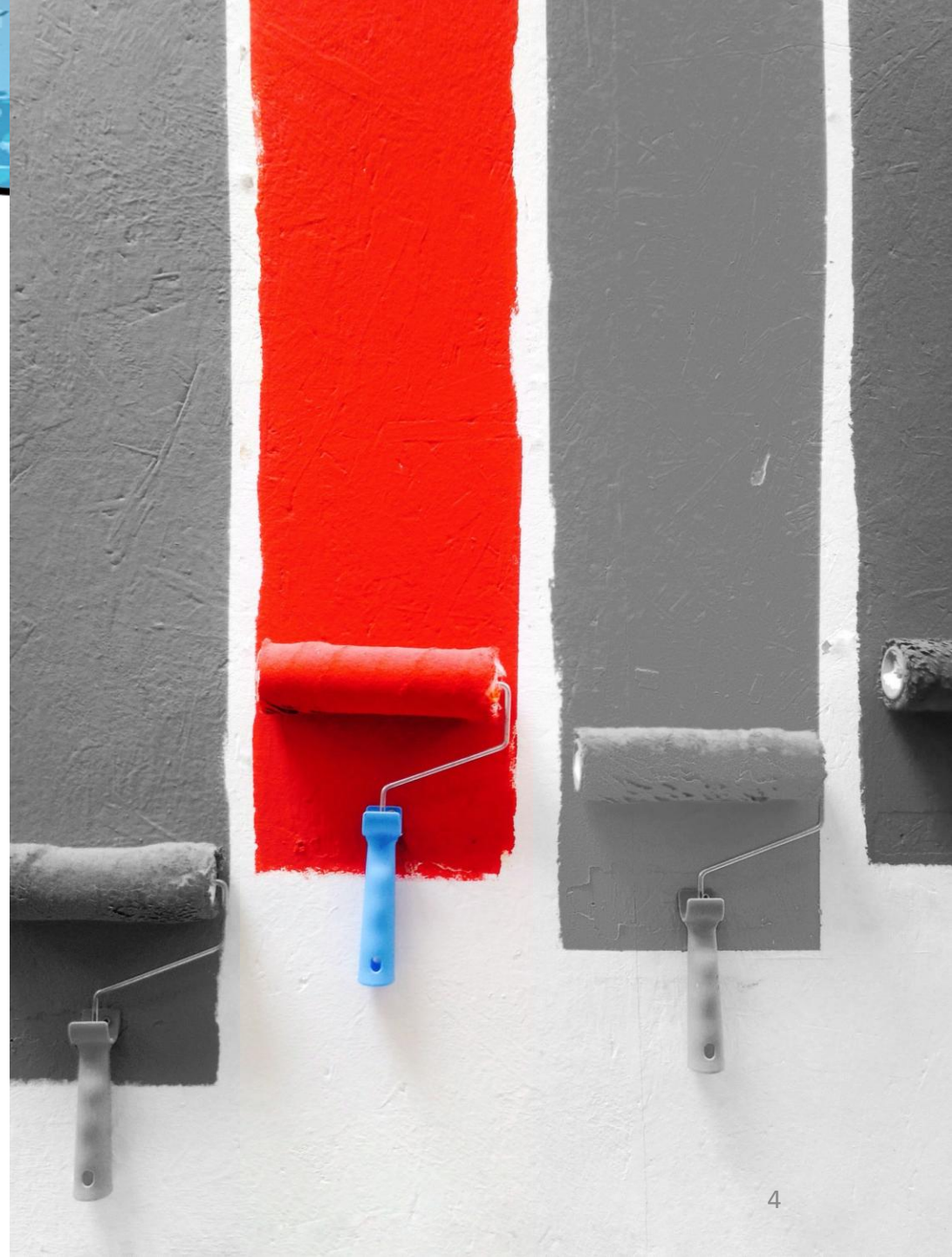
Text

Text

Text

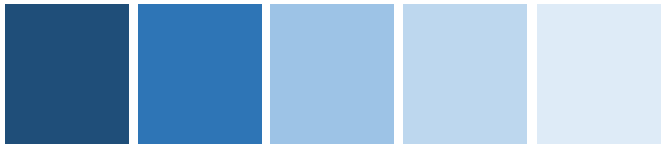
Working with color

- High contrast or saturation draws attention to most important data
- Color encodes meaning and can tie visuals together
- Use semantic color association
- Don’t disregard grey as a method of de-emphasis

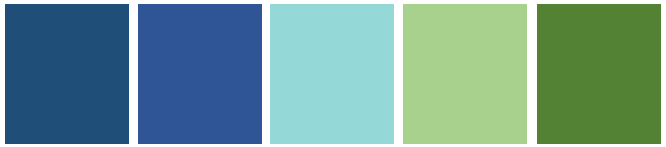


Color palettes

- **Sequential**
  - Continuous data
  - Color distinction not important

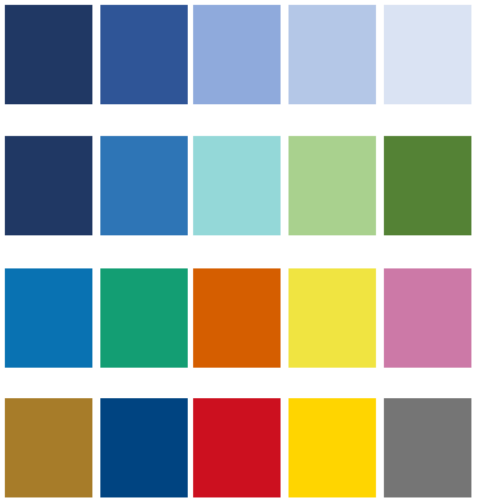


- **Diverging**
  - Quantitative data display
  - Progresses outward from a critical midpoint in data range

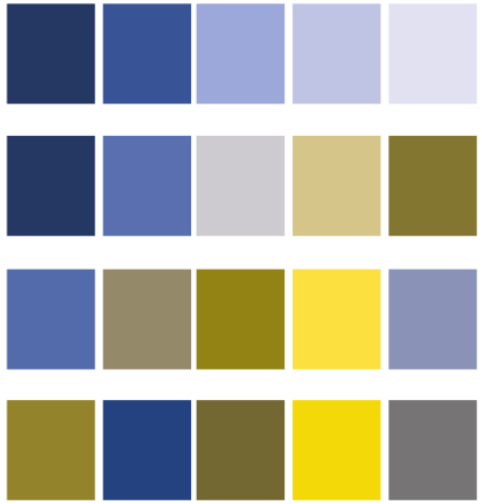


- **Qualitative**
  - Nominal data
  - Color distinction is important

Designing for inclusivity



Normal Color Vision



Protanopia

Deuteranopia

Tritanopia

https://www.color-blindness.com/coblis-color-blindness-simulator/

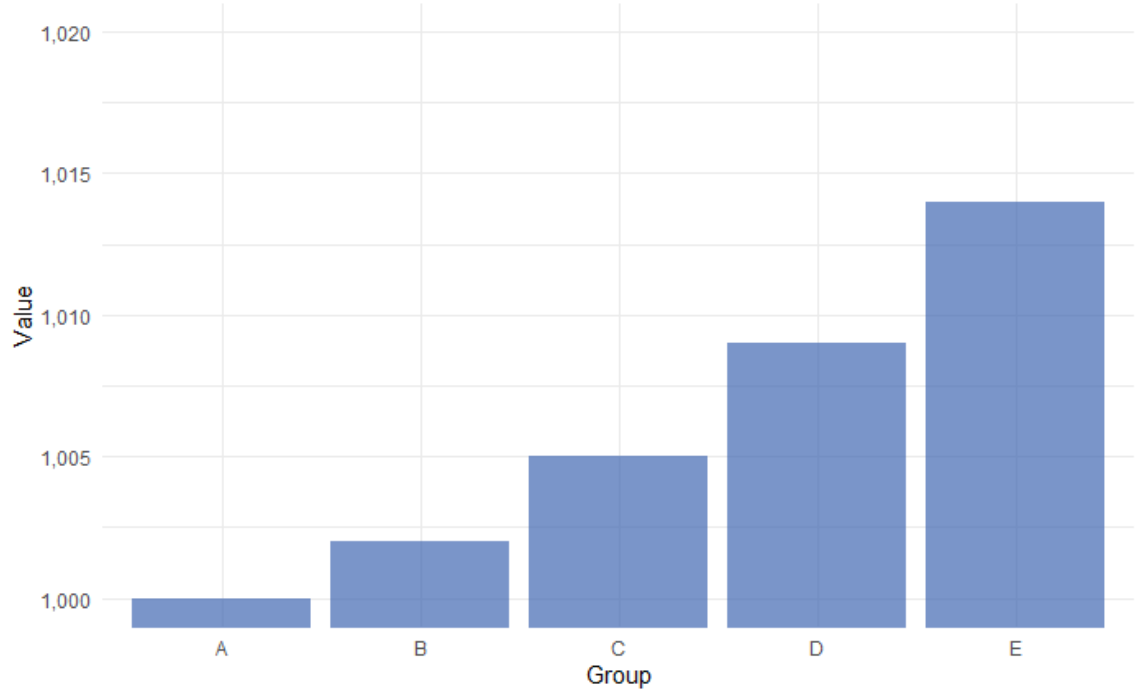
The principle of proportional ink

"The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities represented."

-Edward Tufte

The principle of proportional ink

- Why is this graph misleading?



Contrast

- Go for high contrast (especially with small text)
- Test it out
- Applies to text and other graphic elements

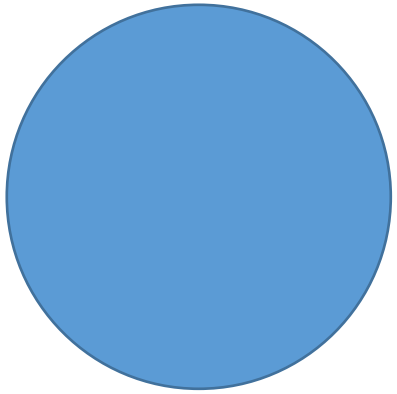
Avoid!	Great!	Acceptable
Avoid!	Alright!	Poor choice
Poor choice	Fair choice	Avoid!
Acceptable	Acceptable	Avoid!
Fair choice	Poor choice	Poor choice
Alright!	Avoid!	Acceptable
Great!	Avoid!	Fair choice

Decoding encodings

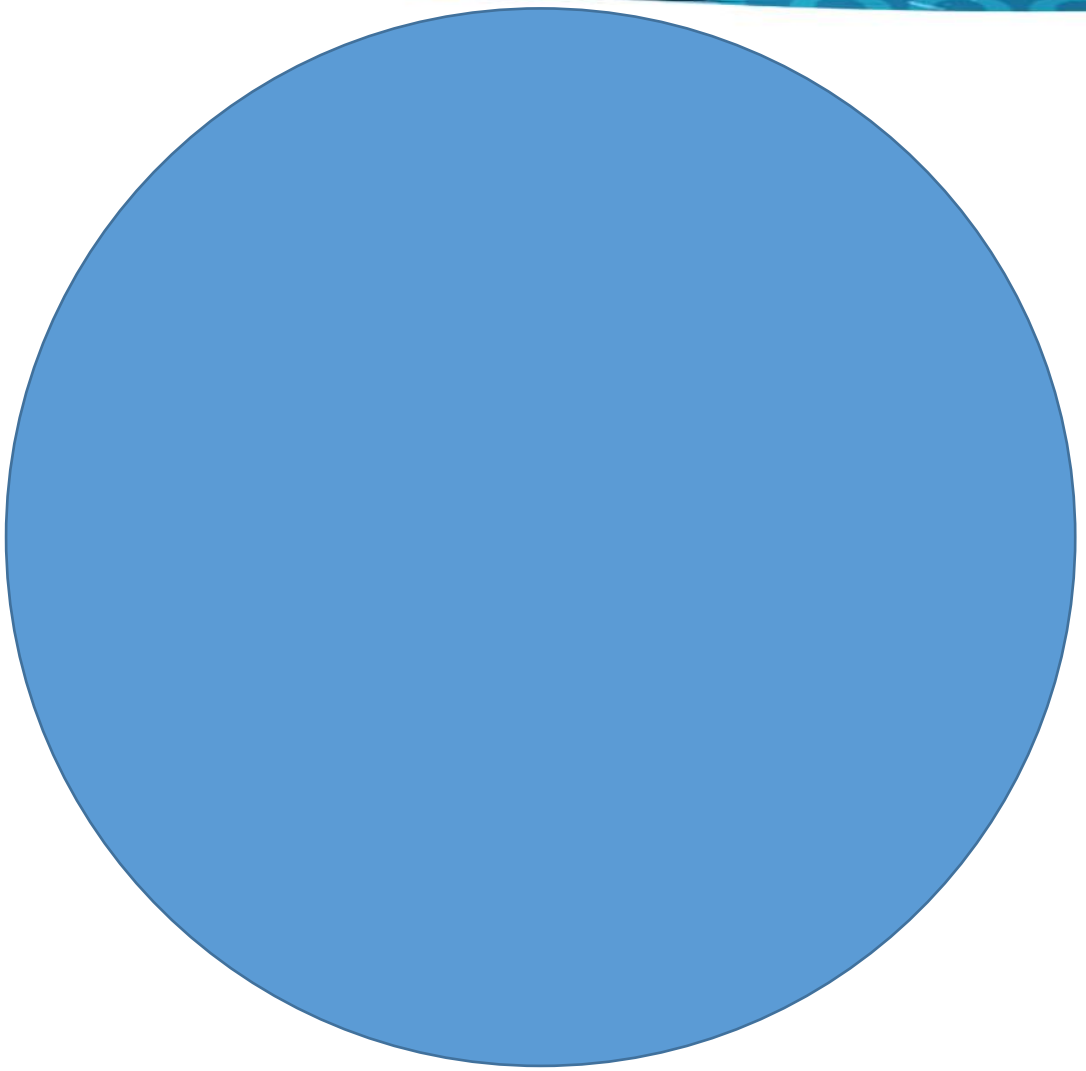
- Elements that provide graphical representation of data
- Include color, size, position, etc.
- Cleveland and McGill (1984): tested user perception of 10 elementary graphical encodings

Decoding encodings

- How much larger is circle b than a?



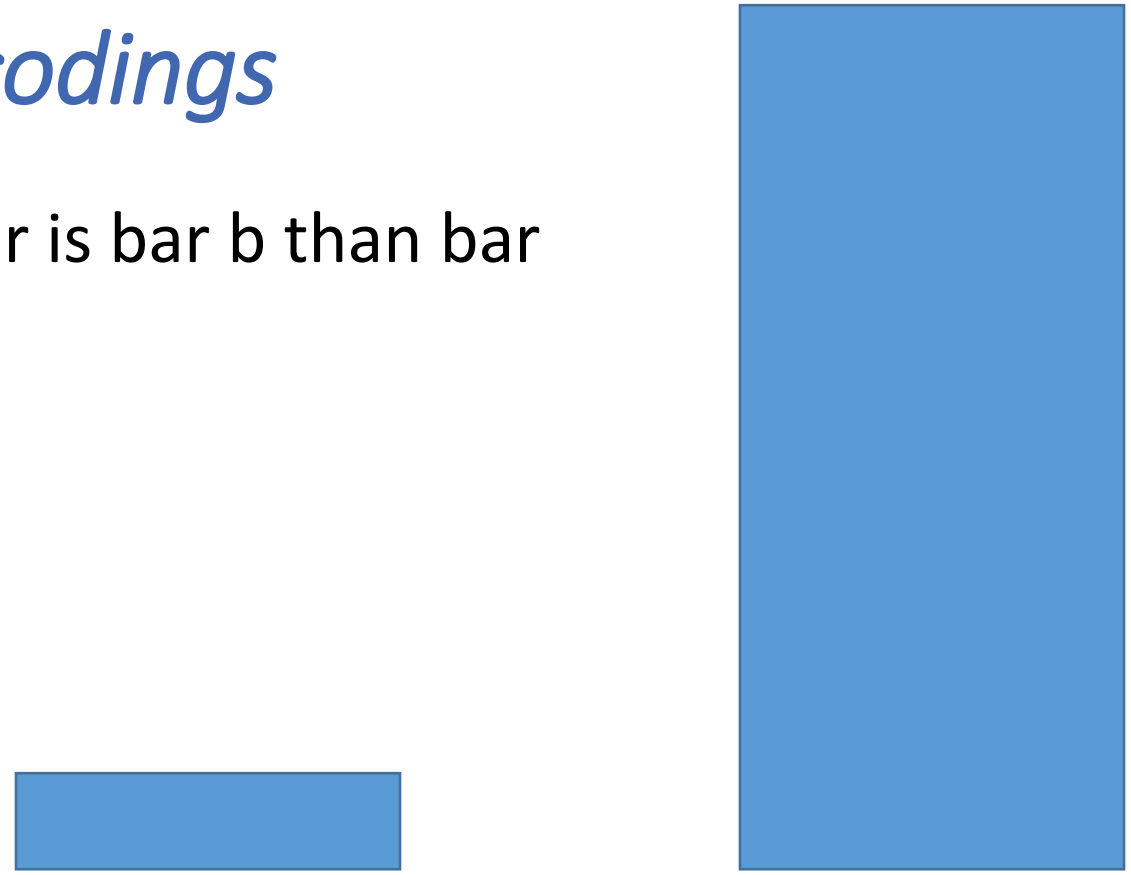
Circle A



Circle B

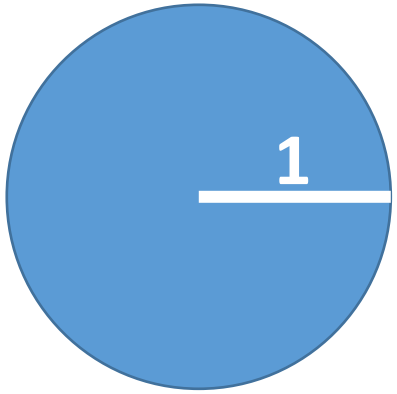
Decoding encodings

- How much larger is bar b than bar a?

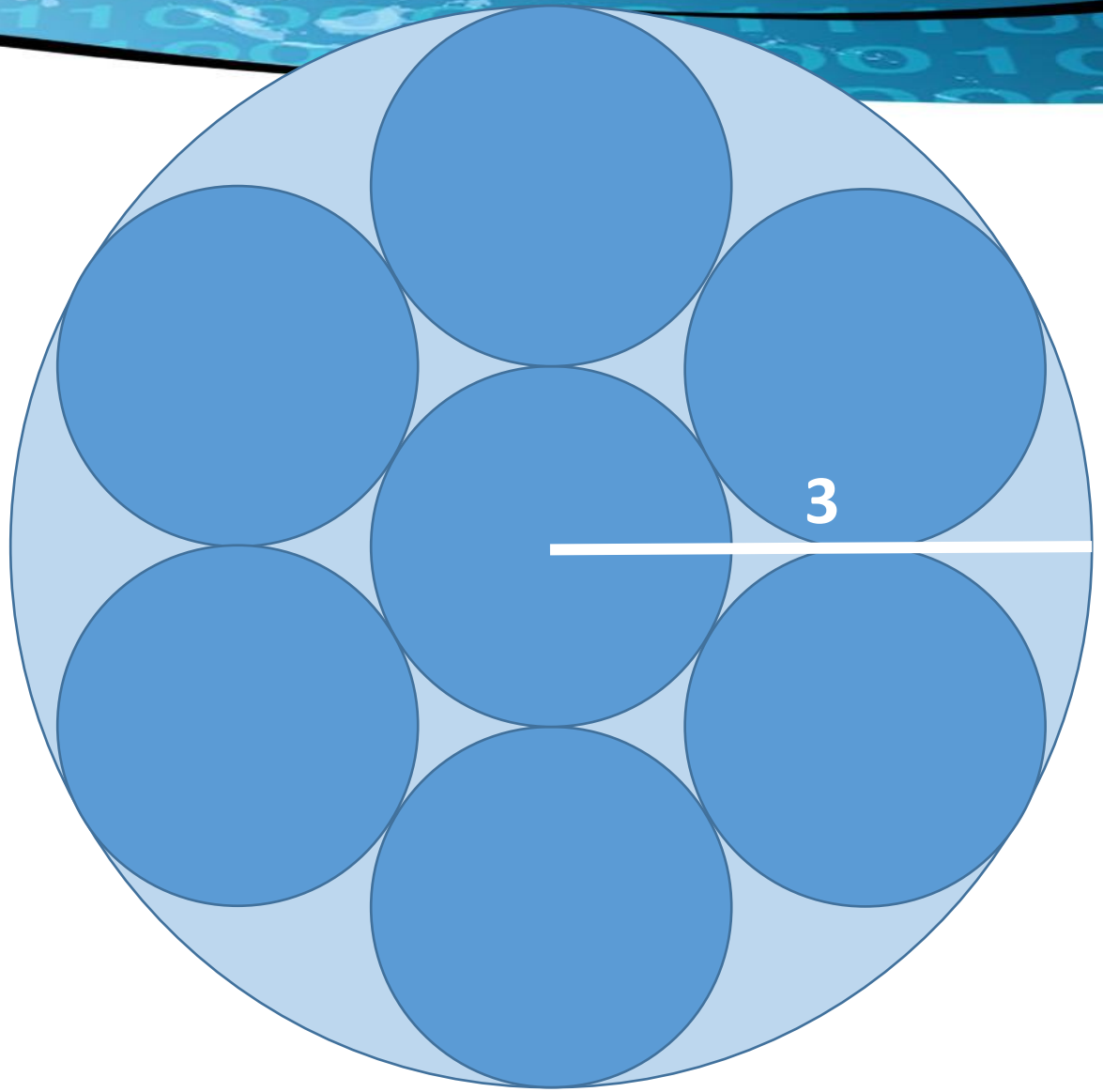


Decoding encodings

- How much larger is circle b than a?
- Answer: 9x



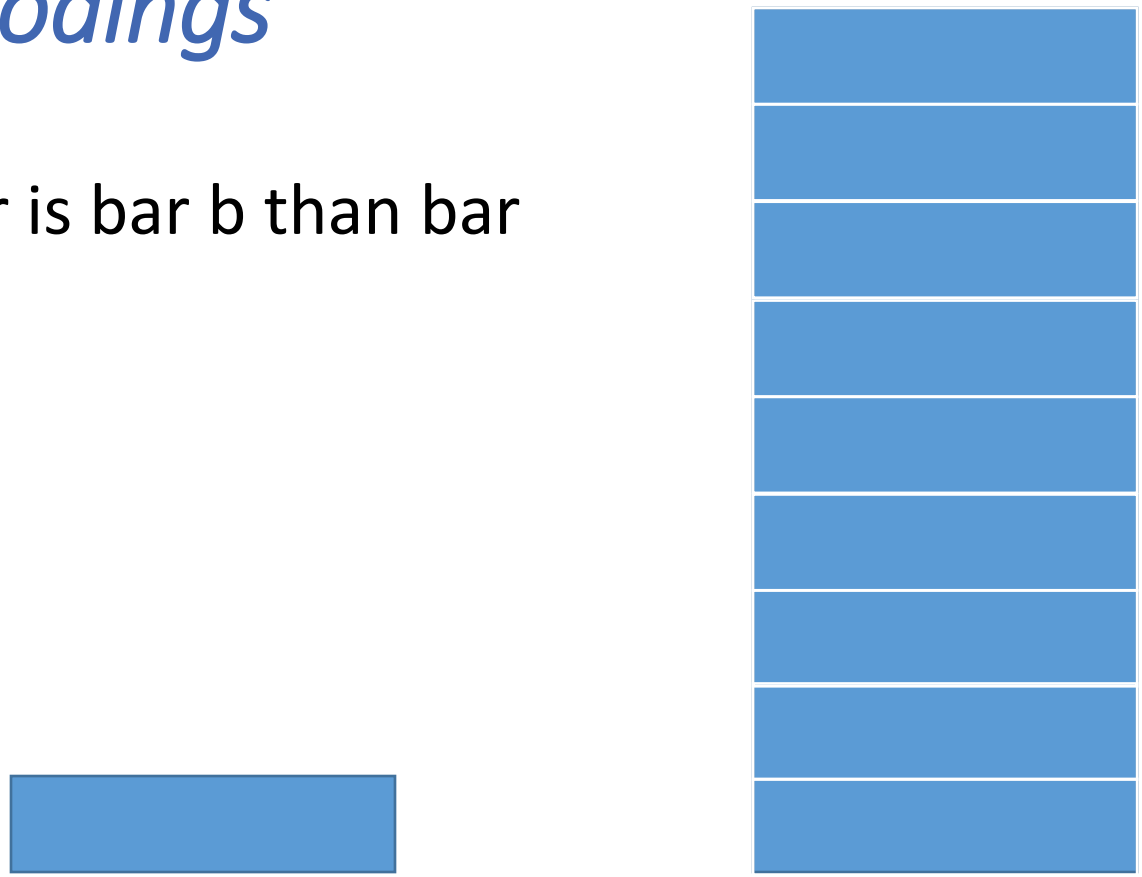
Circle A



Circle B

Decoding encodings

- How much larger is bar b than bar a?
- Answer: 9x



Bar A

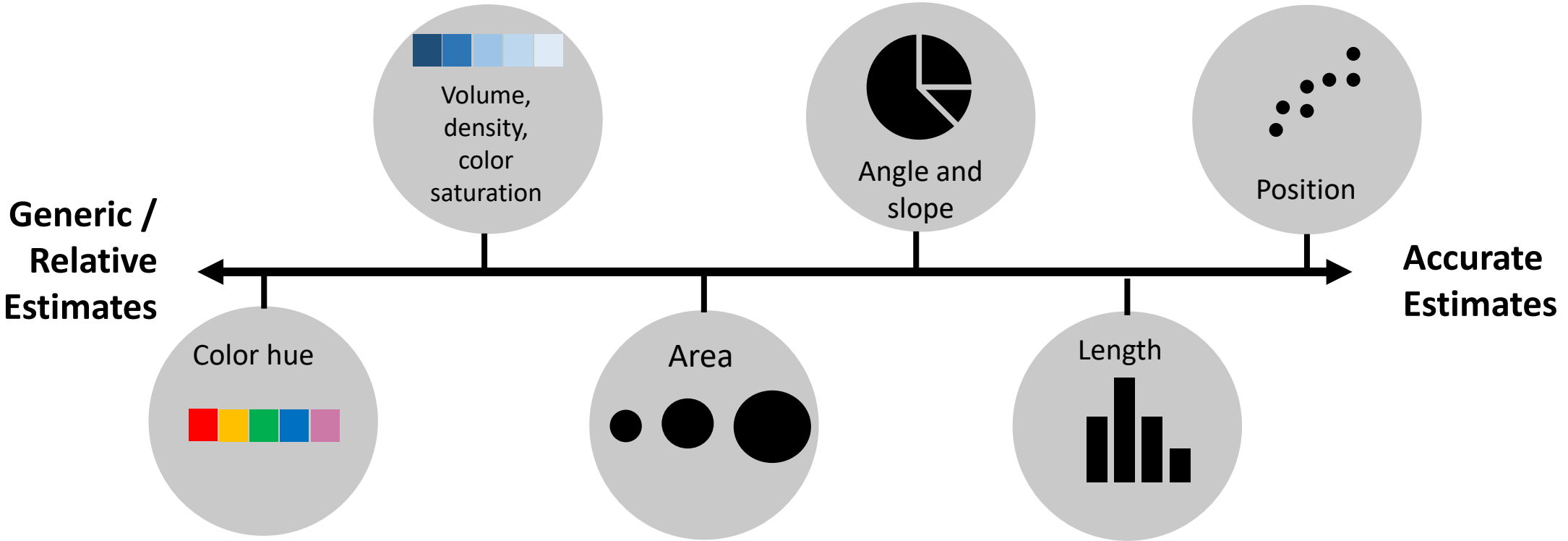
Bar B

Decoding encodings

- This is why simple bar and scatter plots are so effective!
- While elements like color and area add interest and relative information to graphics, they should be used with care.
- Which encodings do viewers interpret accurately?

Decoding encodings

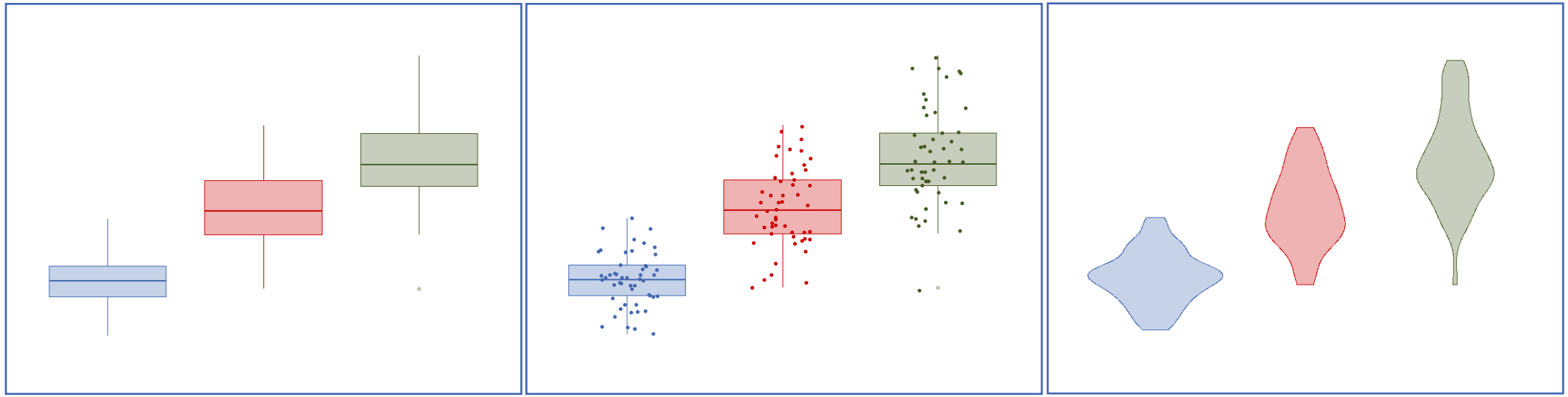
- Which encodings do viewers interpret accurately?



Findings from: Cleveland and McGill (1984)

Visualizing the whole

- Providing decision-makers with the right amount of information. Some prefer brief overviews, while others prefer overviews with the underlying data.
- All these graphics show the same data– what do we learn from each?



Text in Graphics

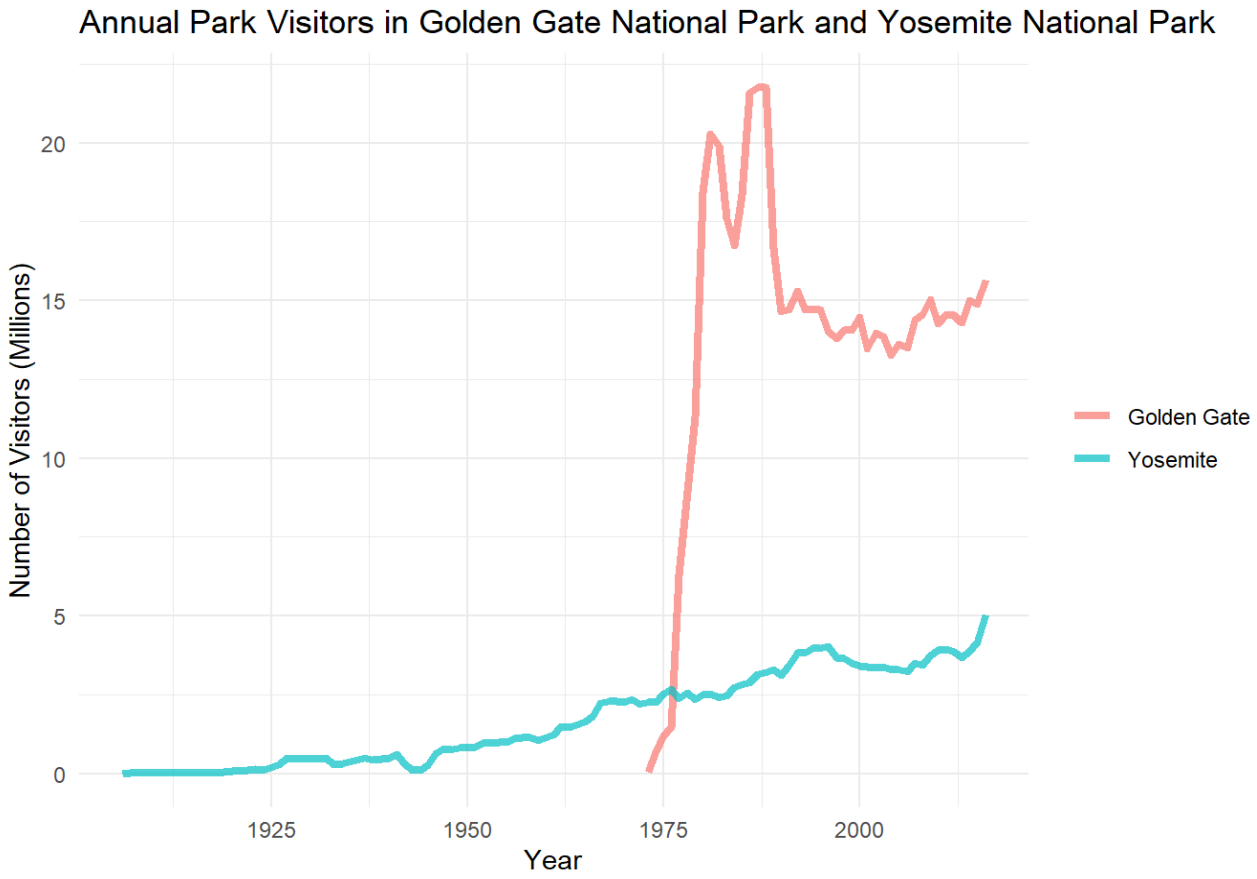
- **Caption**
  - Concise description of the data shown, highlighting data/features of note
- **Sub caption**
  - Provide additional background information to help the user
- **Axis labels**
  - Always label in units that are easy to understand
- **Legends**
  - Aligned with the order colors and shapes appear in the graphic
  - Clear, concise descriptions of what is shown
- **Data labels**
  - An alternate to legends

Embedding Information in Text

- Text is another tool to embed information into graphics
- Integrate text into the graphic with color, position, and style
- Let's look at some examples of this in practice

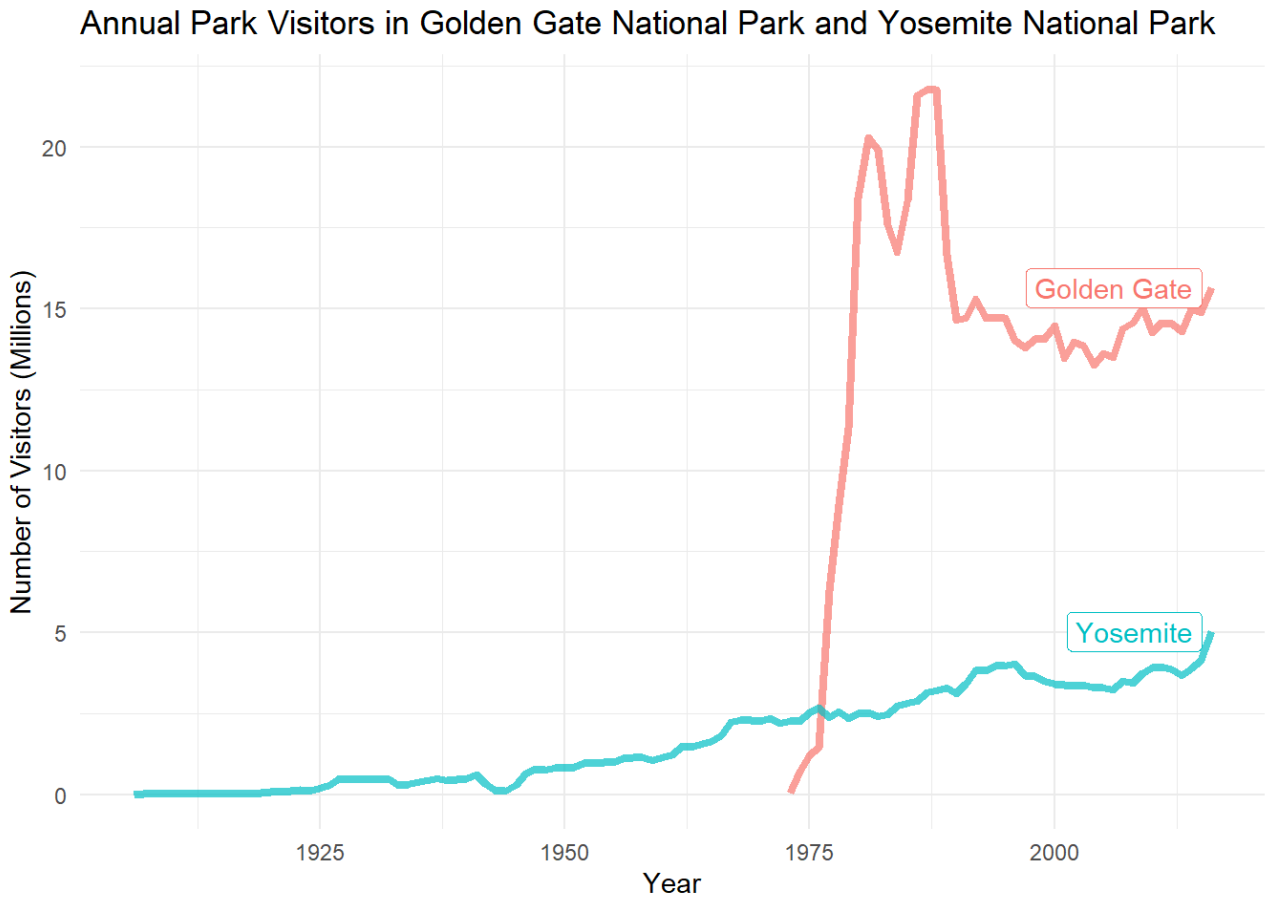
Embedding Information in Text

Option 1: Legend



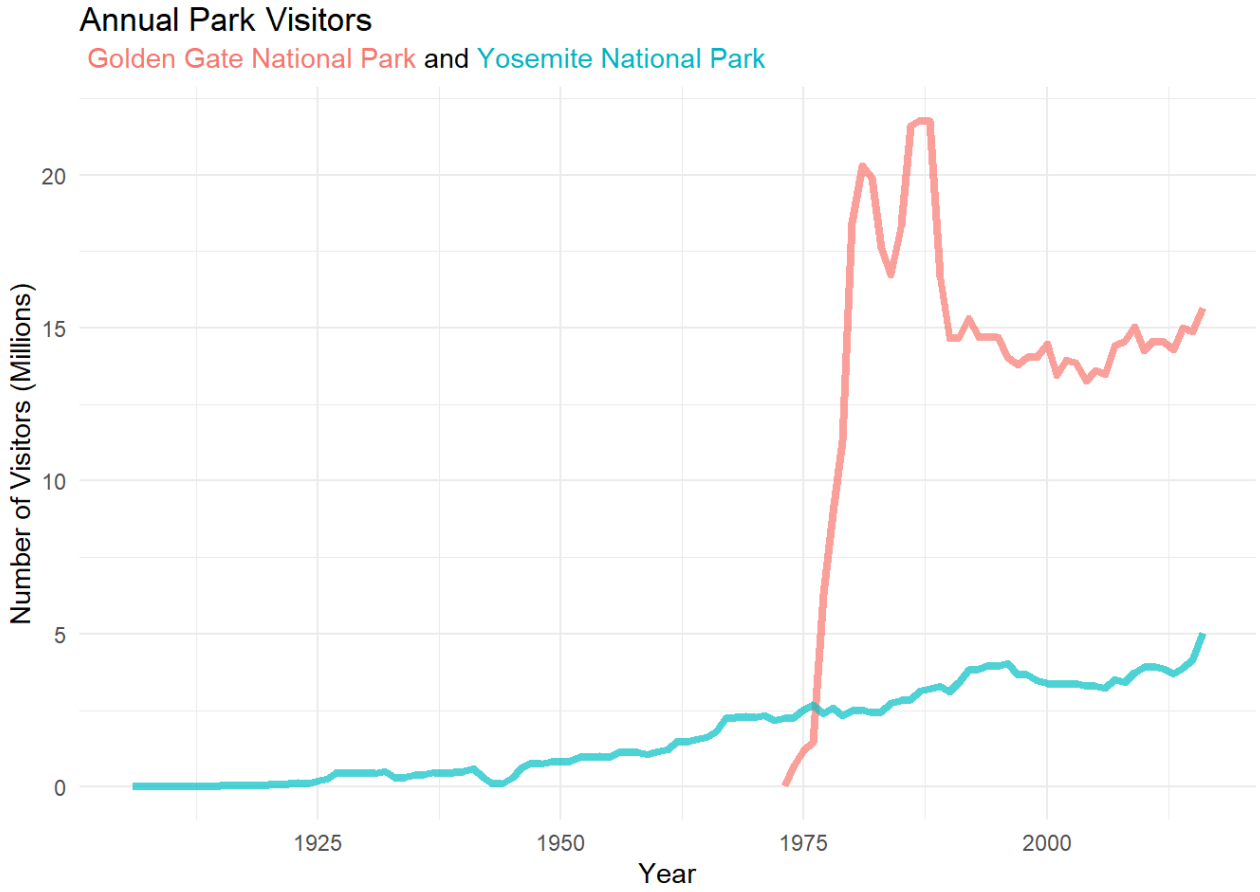
Embedding Information in Text

Option 2: Label



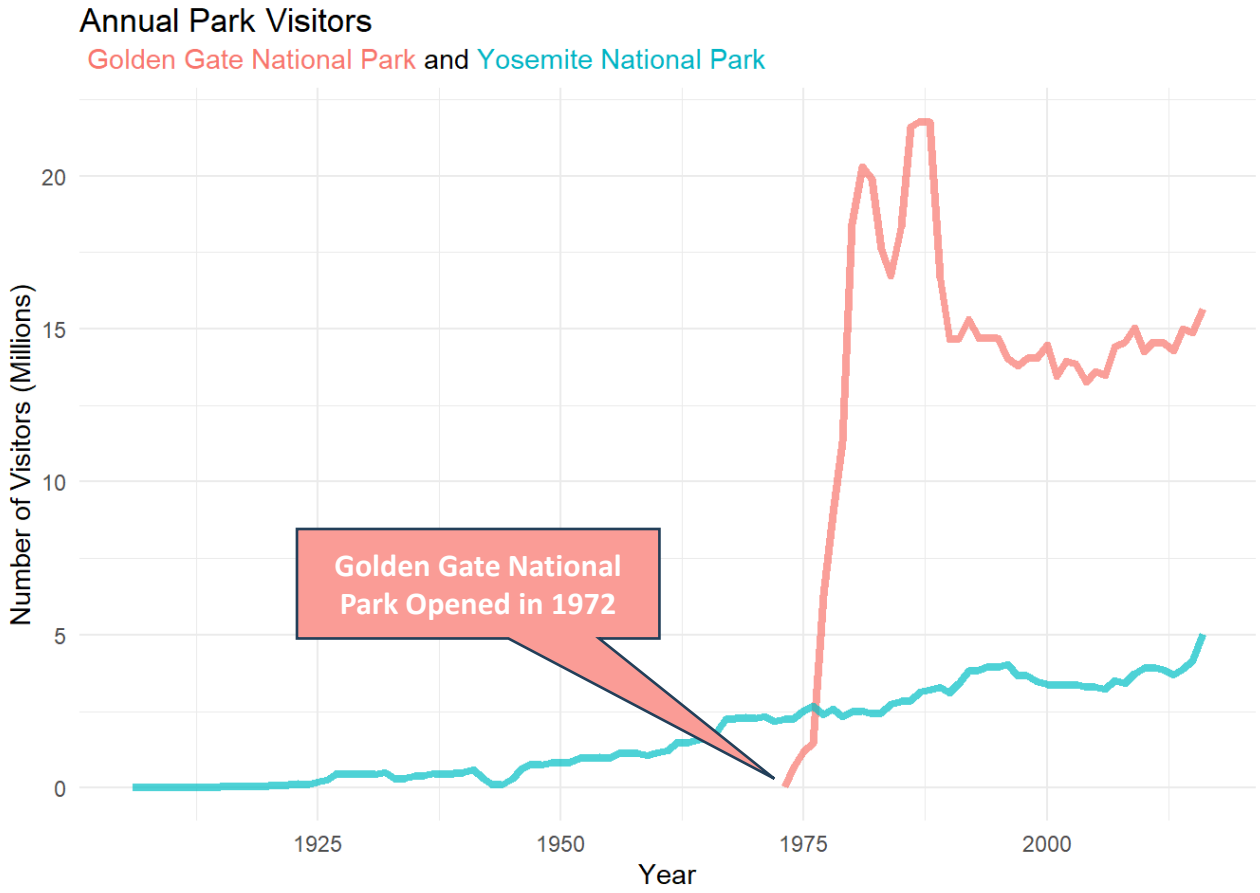
Embedding Information in Text

Option 3:
Title



Annotations in Text

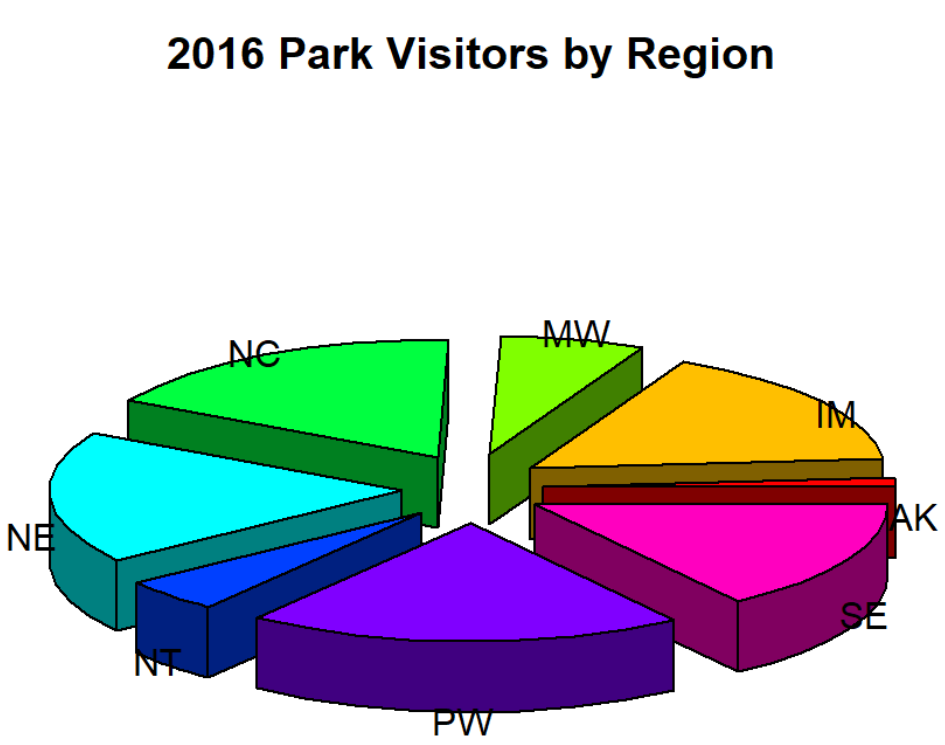
Explaining the obvious



Case Study
National Parks

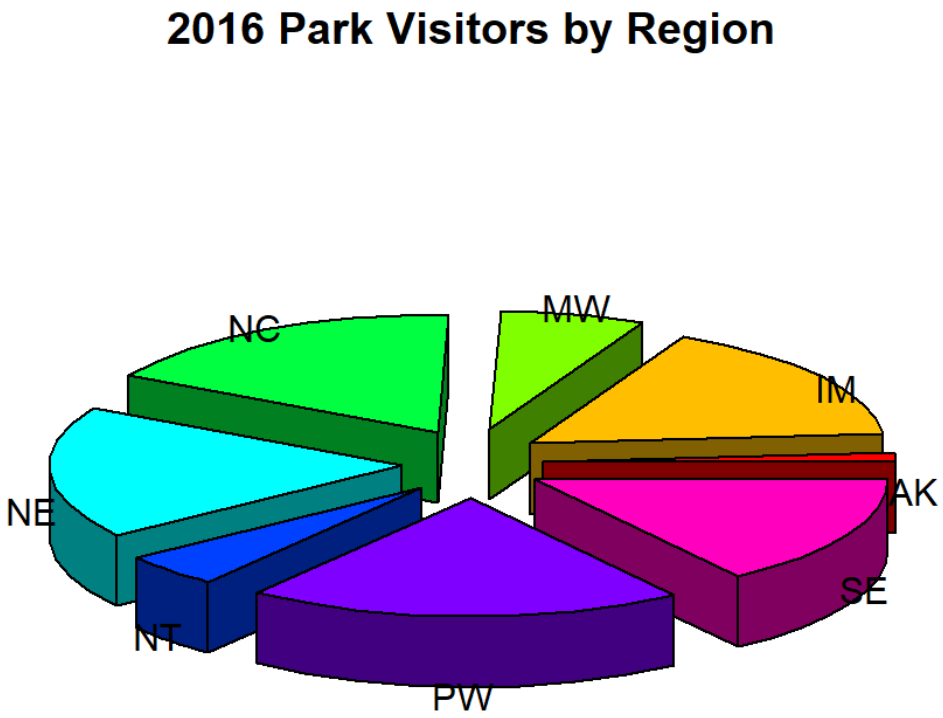
- National park visitors by year
- Data fields:
  - Year
  - National park name
  - Region
  - State
  - Visitors

Design Critique

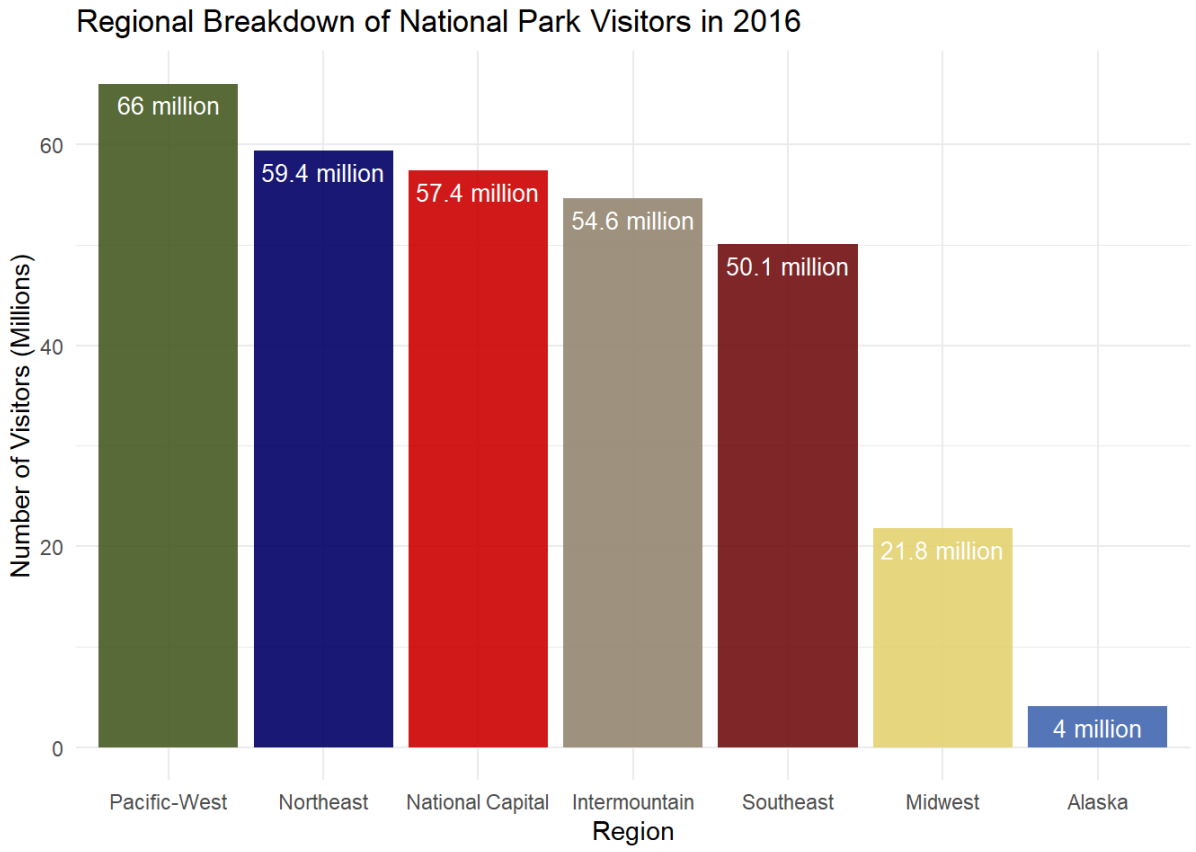


- What challenges does this graphic pose?
- How would you improve this graphic?

Design Critique

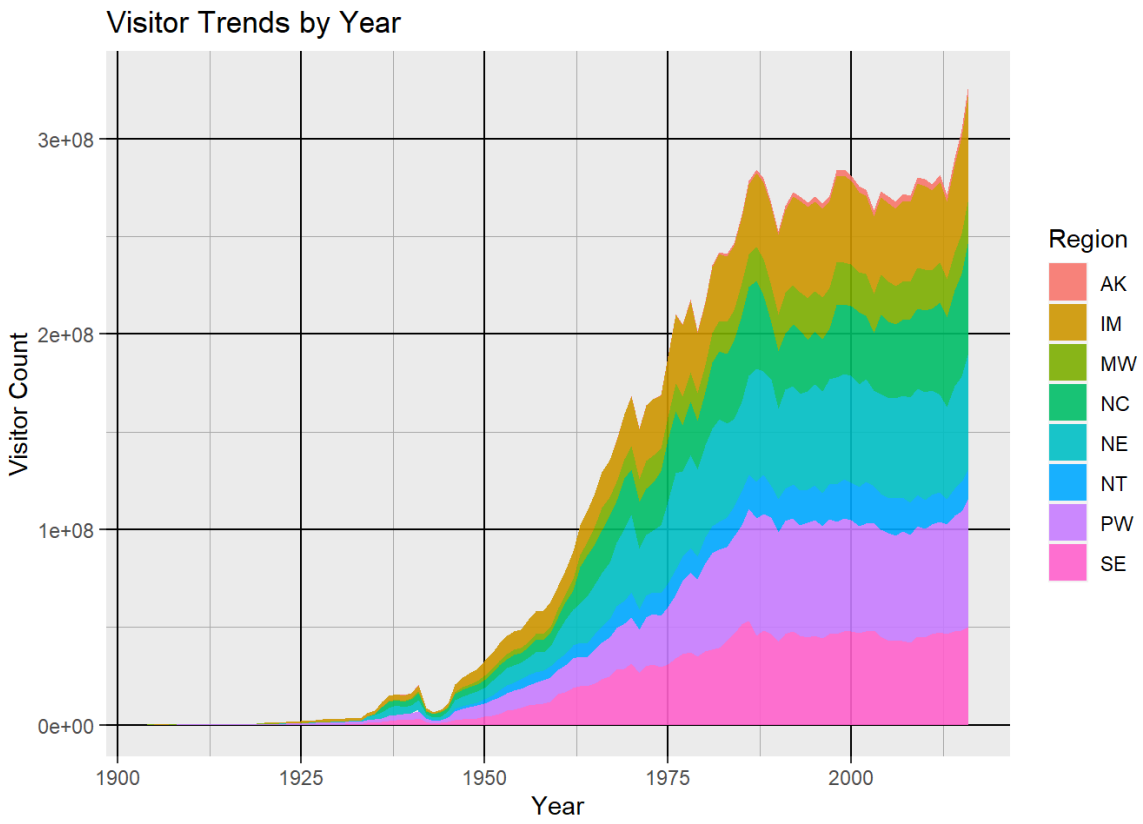


Original Graphic



Alternate Representation

Design Critique



- What challenges does this graphic pose?
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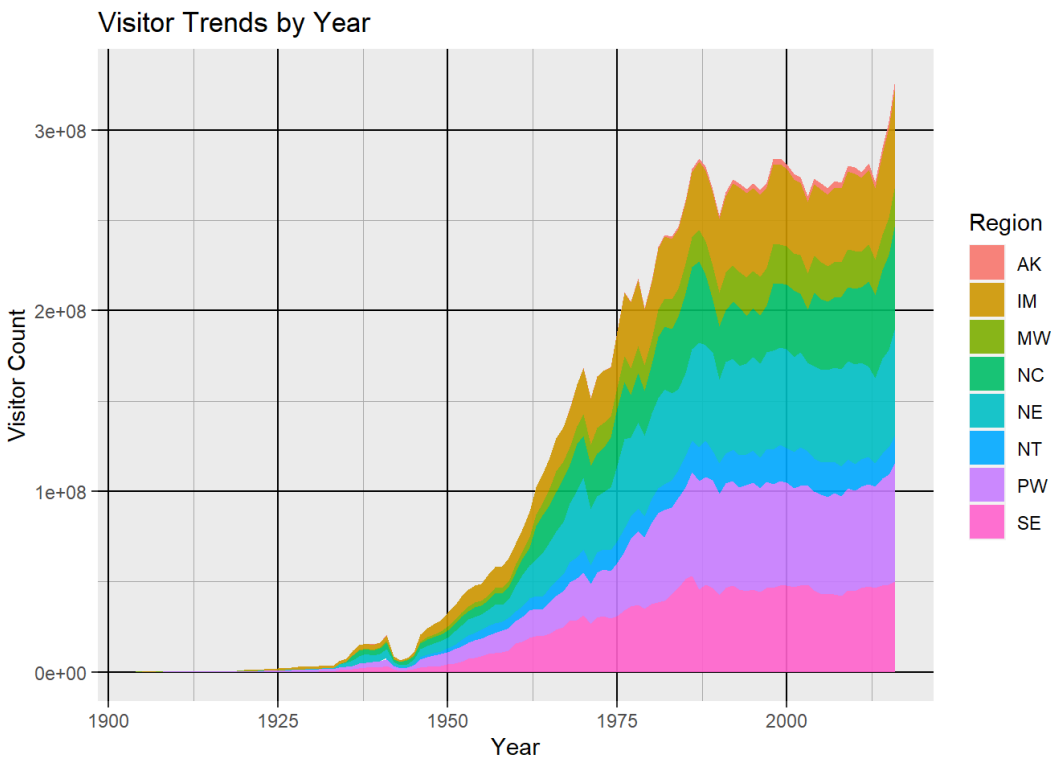
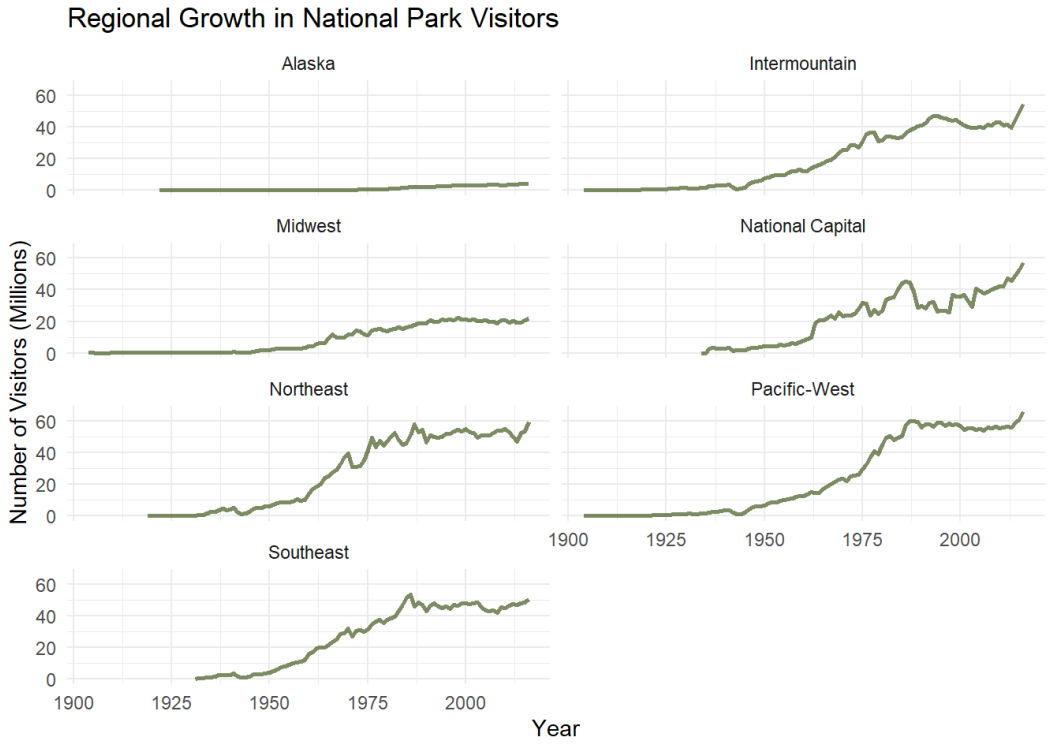


Original Graphic



Alternate Representation

Why Use Them

- One stop shop
- Take action quickly
- Focus on issues requiring attention
- Visual in nature

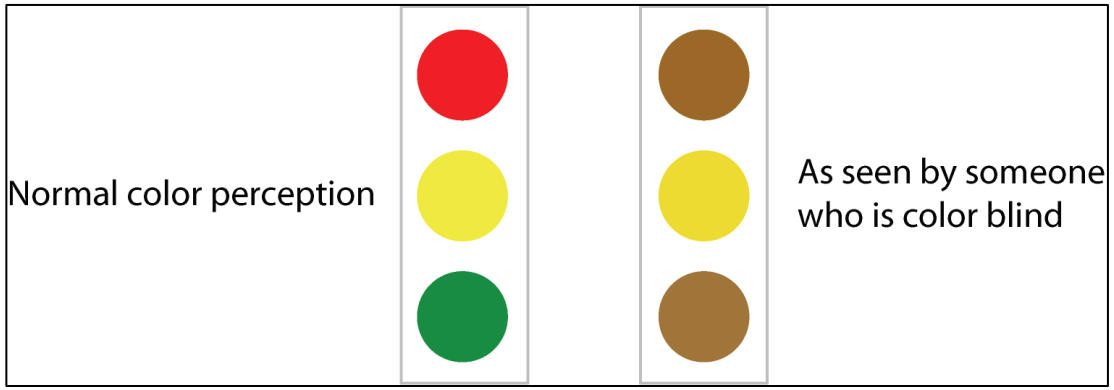
"the more that you can rely on images to tell the story, the faster that story can be perceived"

Stephen Few

https://www.perceptualedge.com/articles/Whitepapers/Dashboard_Design.pdf

Challenges with Traffic Light Reporting

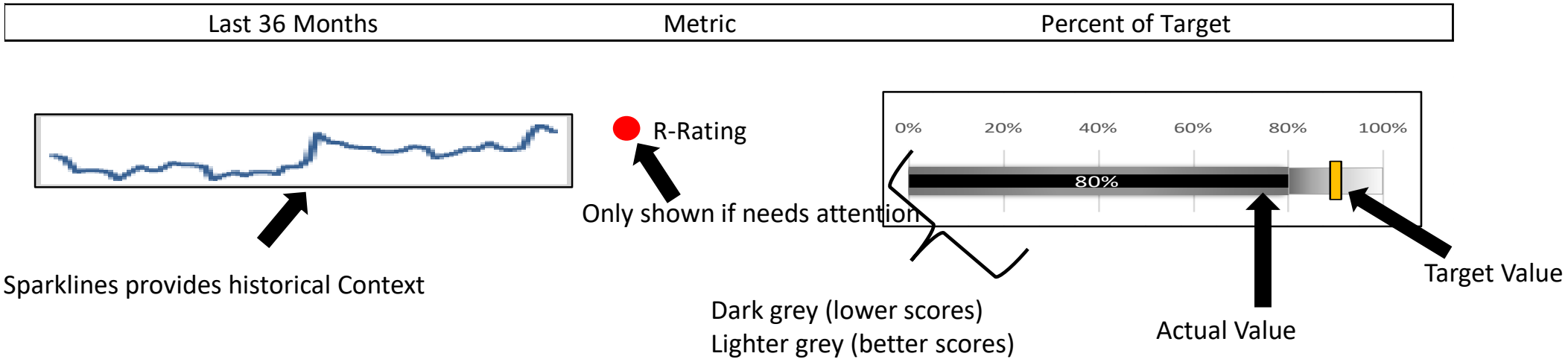
TAMCN	Date	S Rating	R Rating	MR Rating
D0003	06/01/2020	97% ↓6%	76% ↓2%	74% ↓3%
D0005	06/01/2020	88% →	71% →	63% →
D0030	06/01/2020	0% →	80% ↓3%	0% →
D0036	06/01/2020	140% →	81% →	113% →



- Can be overwhelming
- Many times rear view focused, not actionable
- Many times does not measure performance
- Not enough context
- 10% males, 1% females green/red color blind
- Introduces Judgement and defensiveness

https://www.perceptualedge.com/articles/Whitepapers/Dashboard_Design.pdf

Sparklines and Bullet Charts



- While this can be achieved in Excel, Power BI provides a built-in solution