

# **Data Visualizations & Graphical Storytelling for Data Analysts and Data Scientists**

## The Display of Information

Dr Cédric Scherer

Hello Heart // March 2024



# The Display of Information



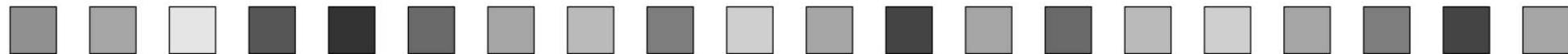
# Encoding

**Mapping data values to visual attributes.**



# Same Data, Different Encodings

4    3    0    7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3



# Same Data, Different Encodings

**Text**      7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3



# Same Data, Different Emphasis

4    3    0    7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3

4    3    0    7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3

4    3    0    7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3

4    3    0    7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3



# Same Data, Different Emphasis

**Plain**      7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3

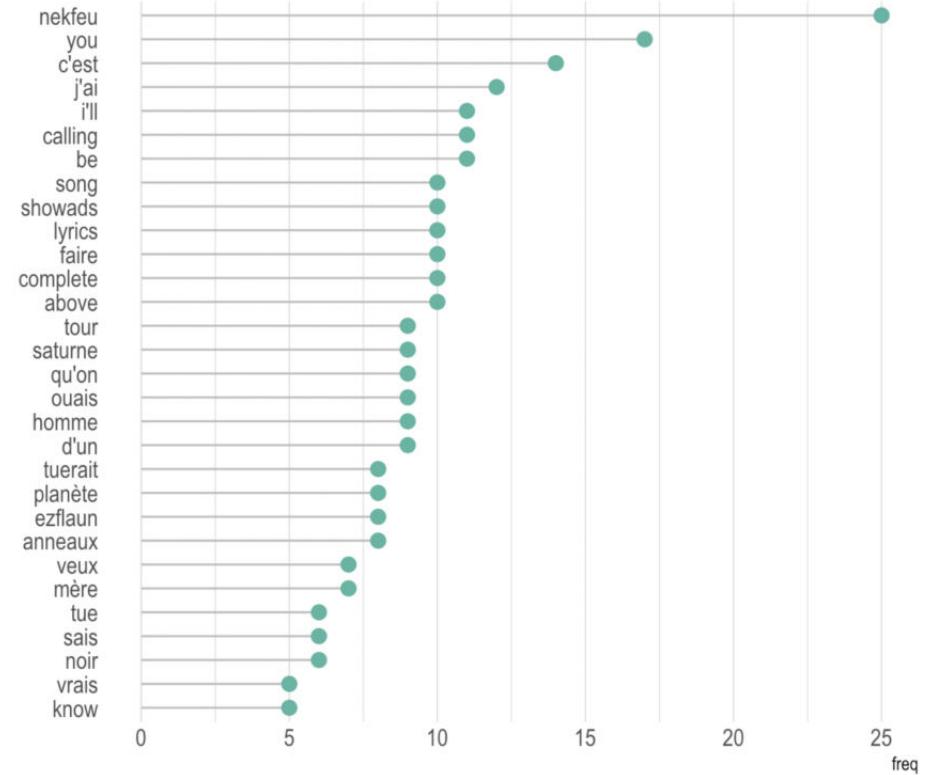
**Weight**    7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3

**Color**       7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3

**Size**        7    9    6    3    2    5    1    3    8    3    6    2    1    3    5    8    3



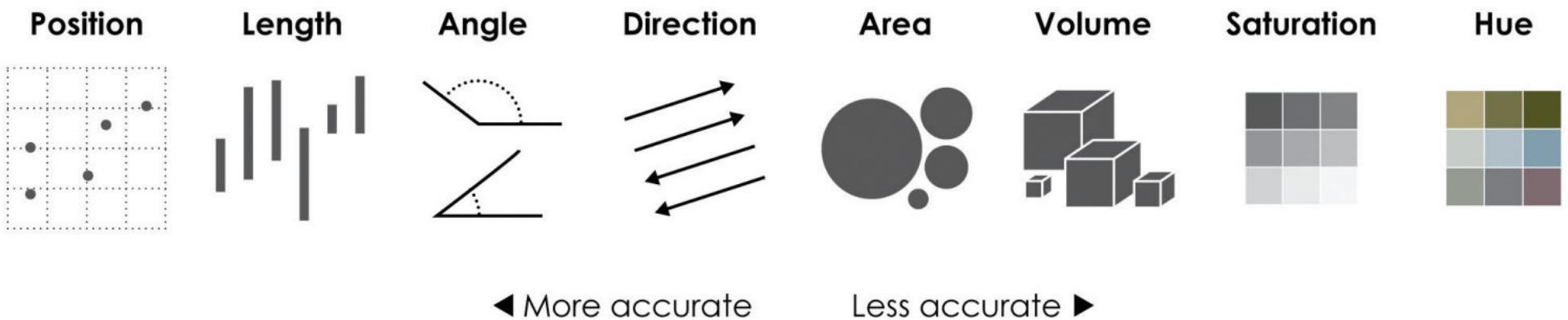
calling  
 you  
 showads  
 faire  
 ouais  
 i'll above  
 d'un qu'on  
 anneaux  
 xoz  
 j'aibes  
 lyrics  
 song  
 saturne  
 c'est  
 complete  
 nekfeu



Source: [Data to Viz](#)

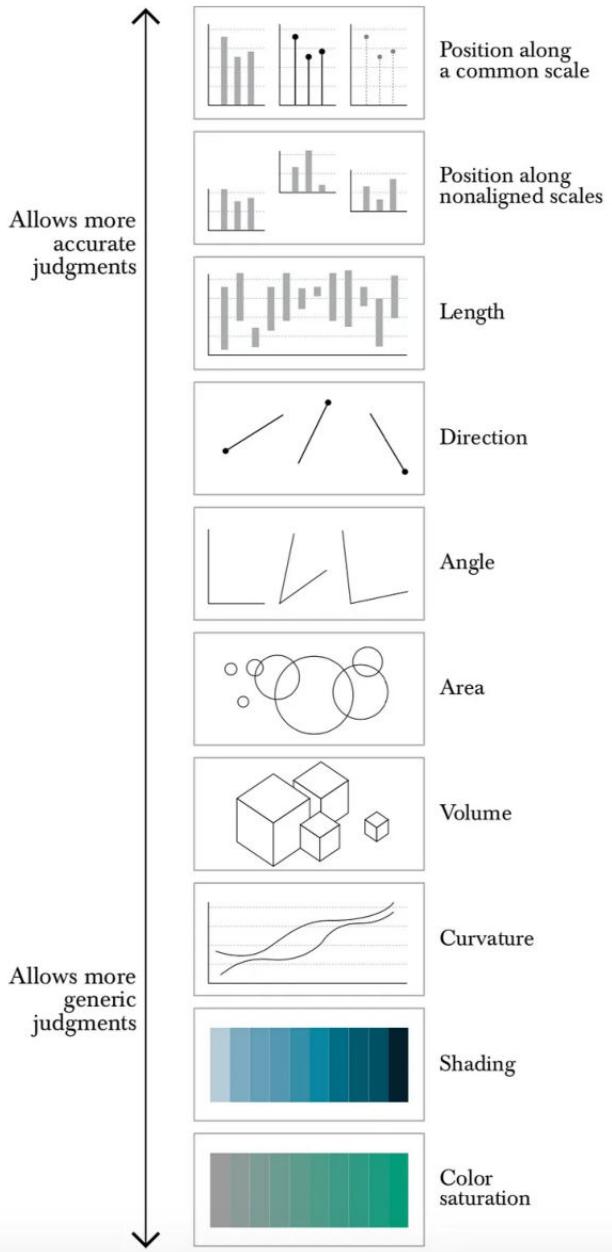
Source: [Data to Viz](#)





Source: "Data Points" by Nathan Yau (p. 104)

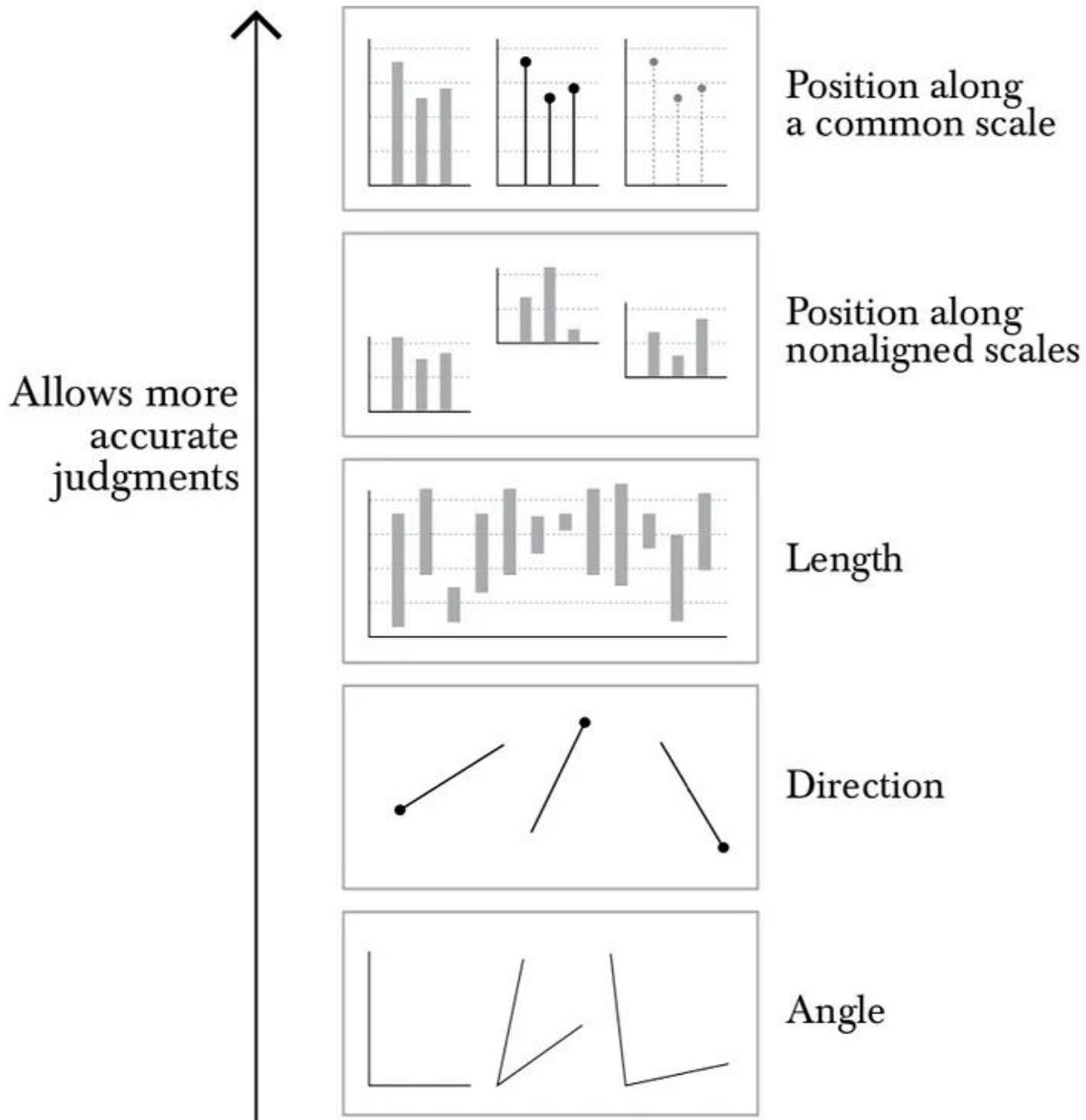




Cleveland's and McGill's Scale of Perpetual Elementary Tasks

Source: "The Functional Art" by Alberto Cairo (p. 120)



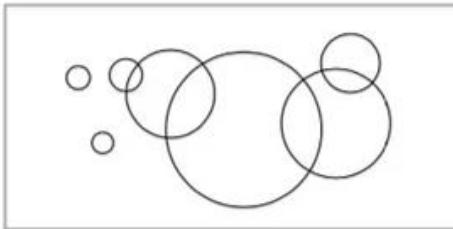


Cleveland's and McGill's Scale of Perpetual Elementary Tasks

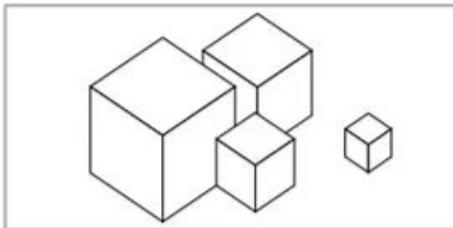
Source: "The Functional Art" by Alberto Cairo (p. 120)



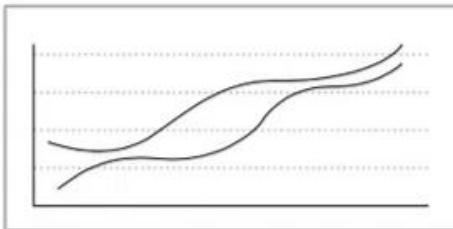
Allows more generic judgments



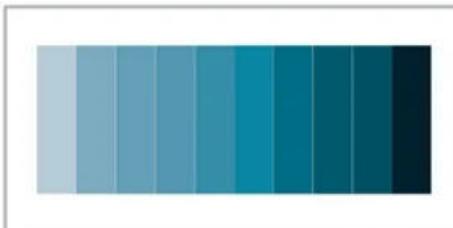
Area



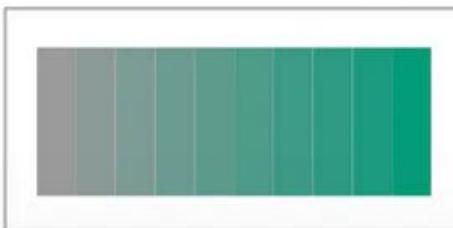
Volume



Curvature



Shading



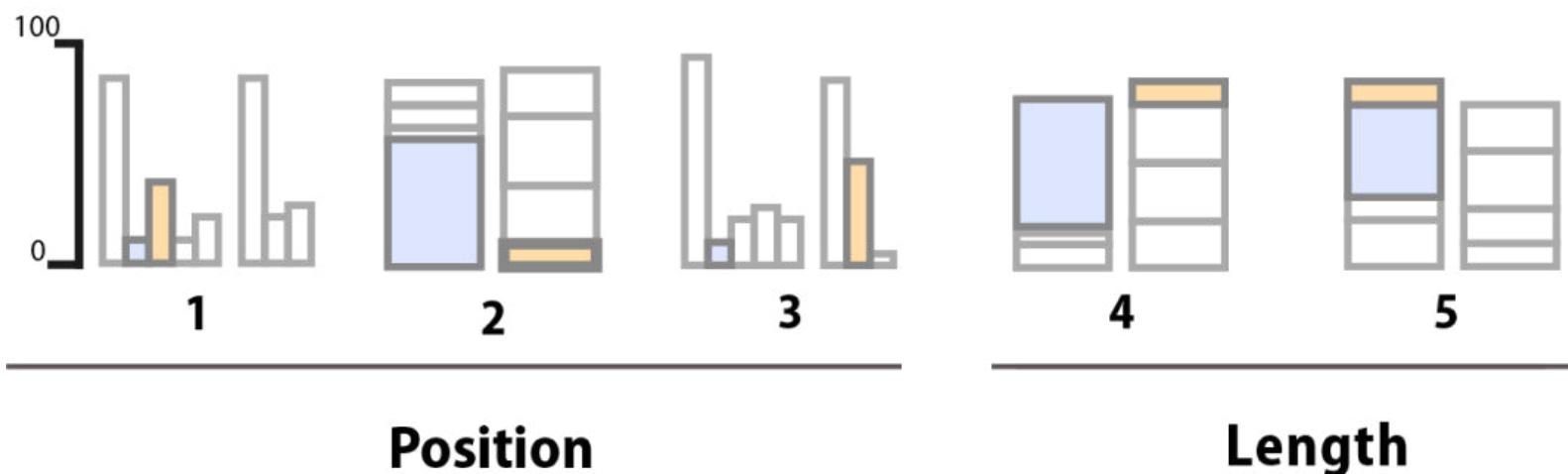
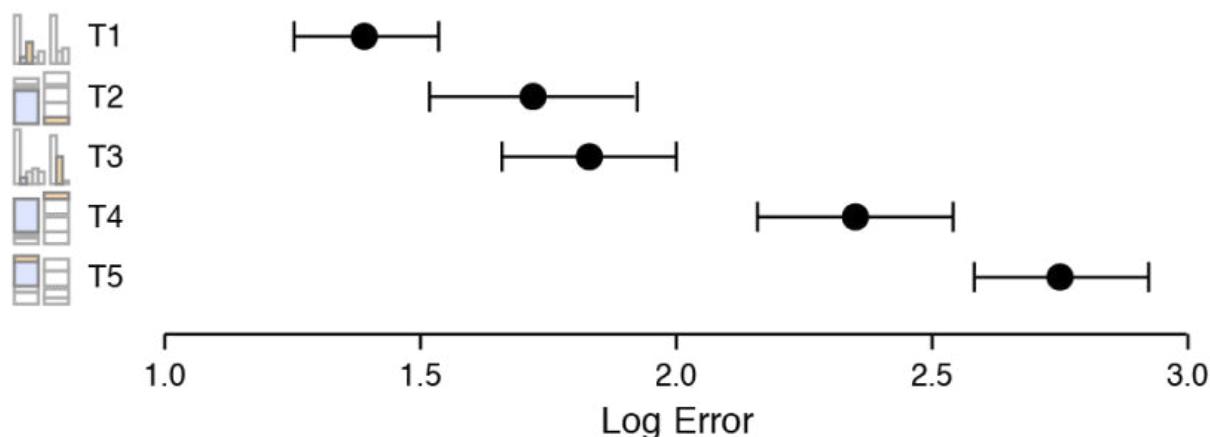
Color saturation

Cleveland's and McGill's Scale of Perceptual Elementary Tasks

Source: "The Functional Art" by Alberto Cairo (p. 120)



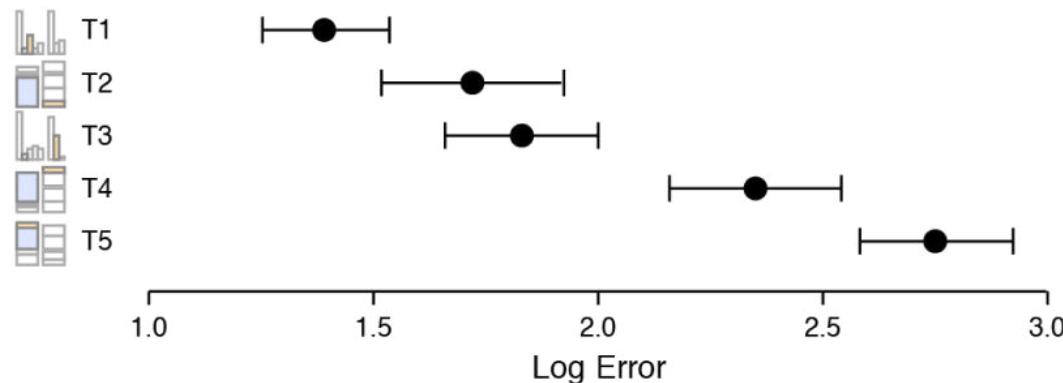
### Cleveland & McGill's Results



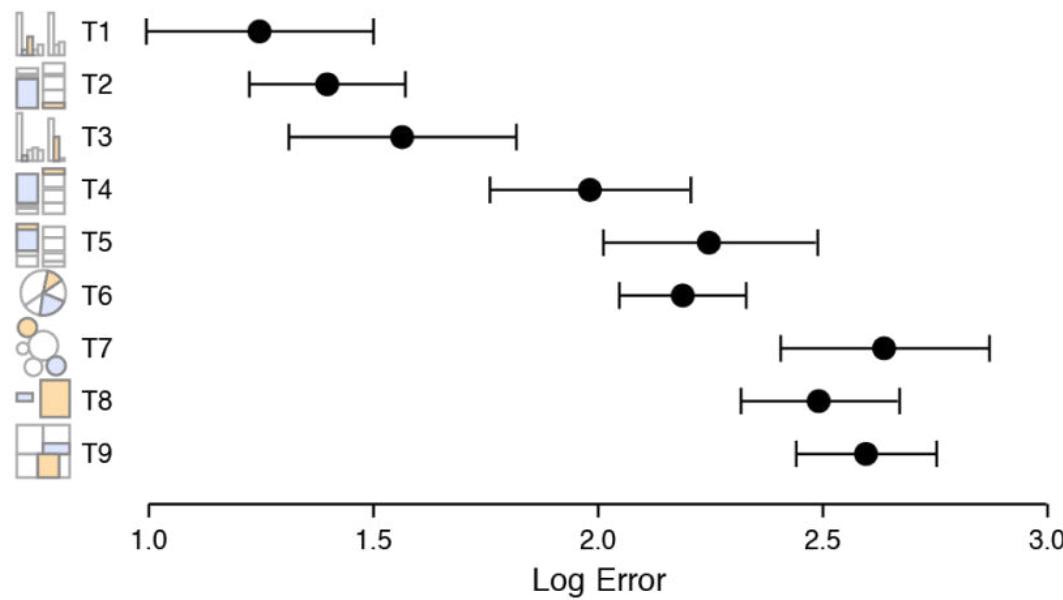
Source: "Data Visualization: A Practical Introduction" by Kieran Healy  
Results based on Cleveland and McGill (1984, 1987)



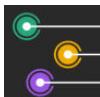
### Cleveland & McGill's Results



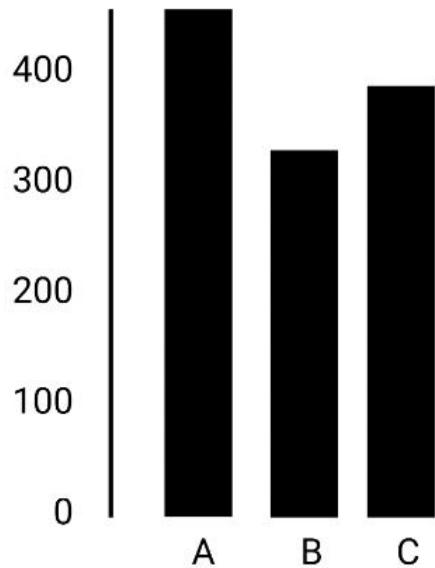
### Crowdsourced Results



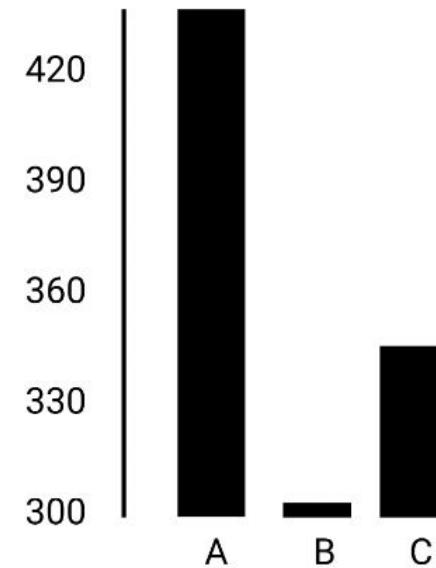
Source: "Data Visualization: A Practical Introduction" by Kieran Healy  
Results based on Cleveland and McGill (1984, 1987) and Heer & Bostock (2010)



# Always Start at Zero?



Good. Y-axis starts at 0  
and has natural increments



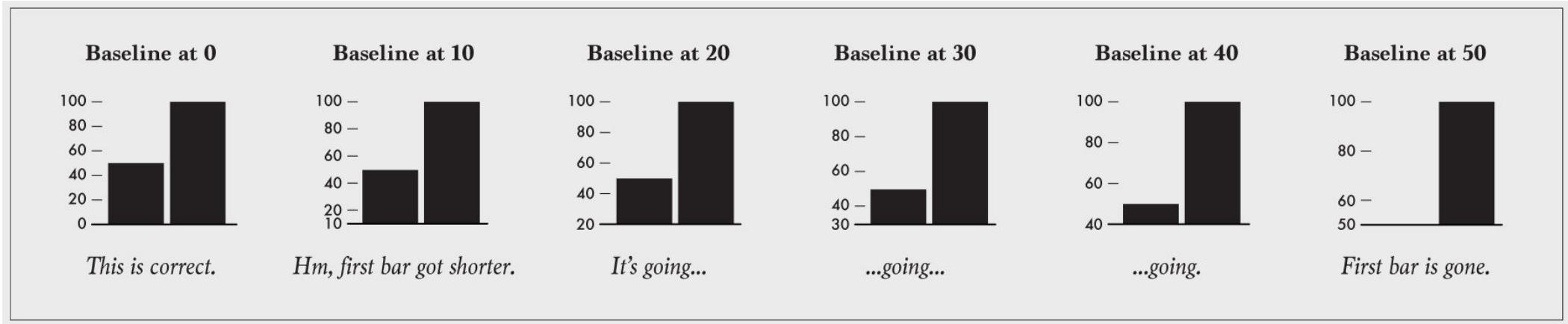
Bad. Y-axis starts at 300,  
exaggerating the difference  
among columns. Intervals are  
awkward

Source: "Hands-On Data Visualization" by Jack Dougherty & Ilya Ilyankou

→ more on the topic: e.g. Correl, Bertini & Franconeri 2020 and Witt (2019)



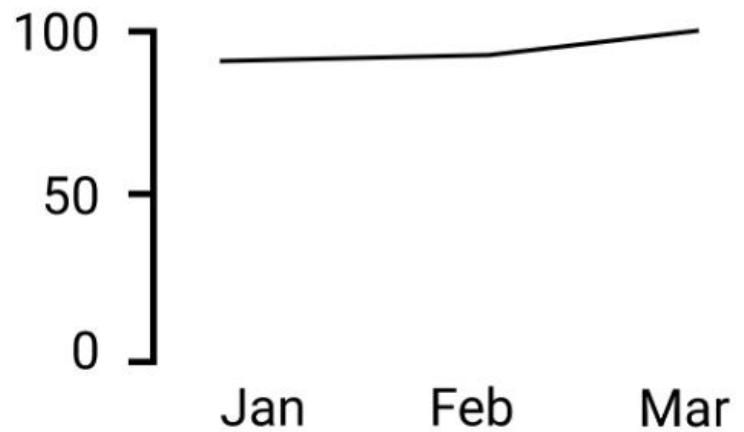
# Always Start at Zero?



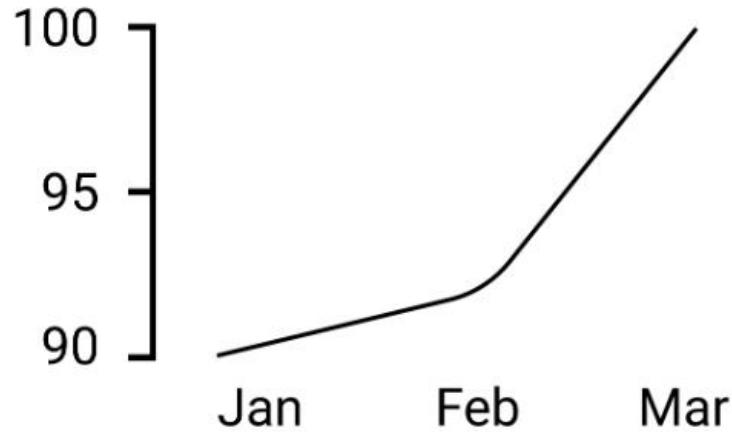
Source: Nathan Yau ([flowingdata.com](http://flowingdata.com))



# Always Start at Zero?



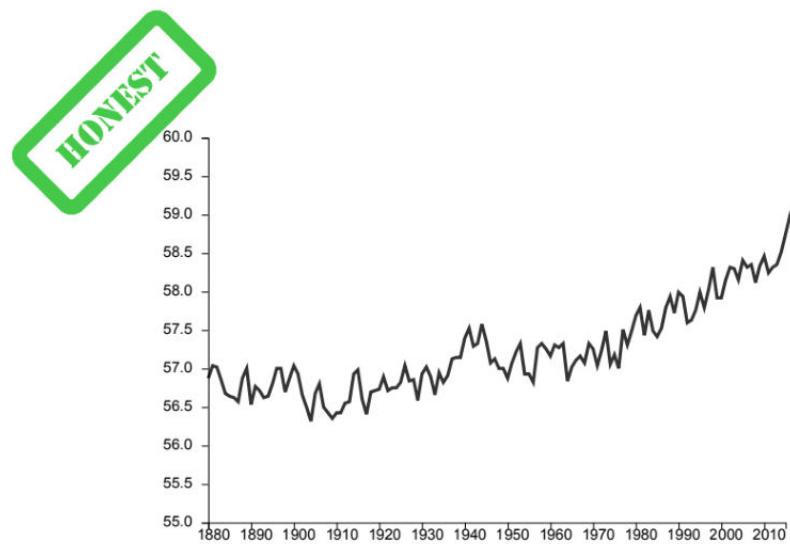
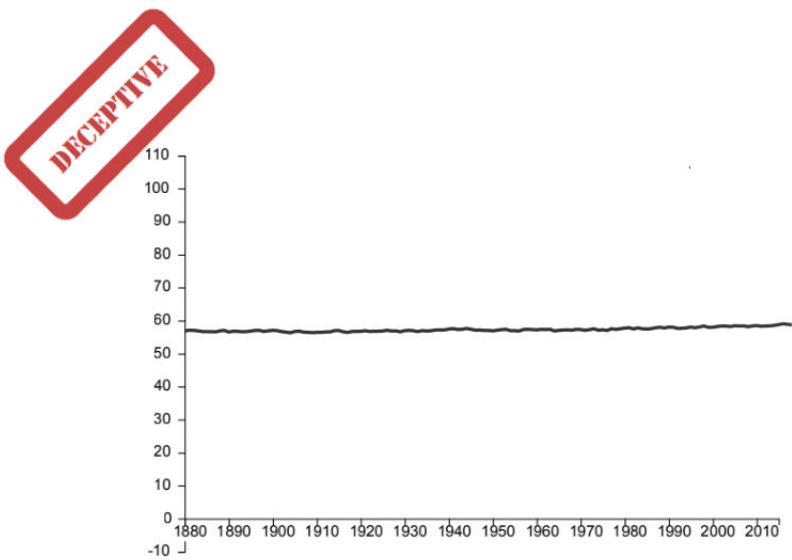
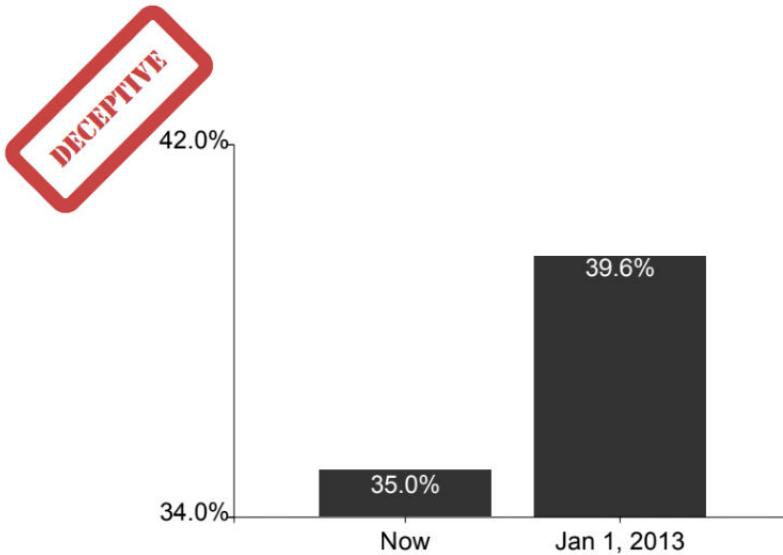
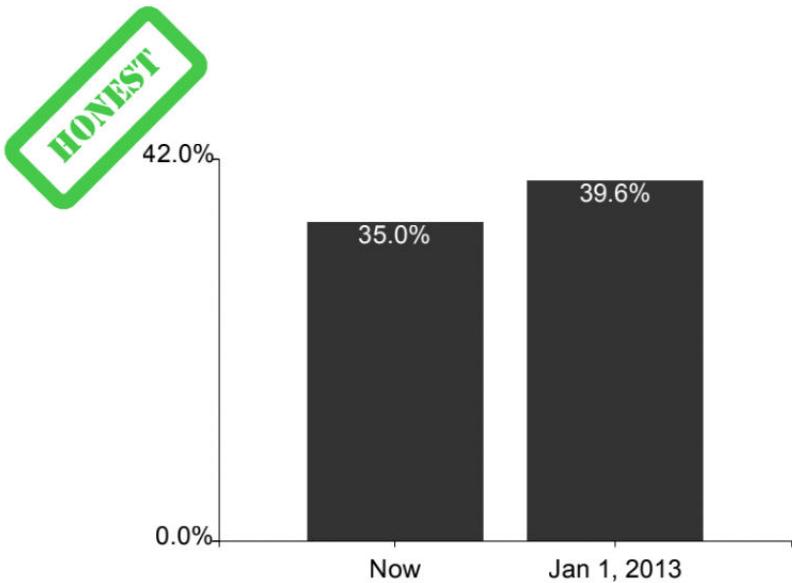
*Acceptable, but starting the vertical axis at zero obscures changes in values*



*Better: By reducing the vertical axis to match the values, we see change more clearly*

Source: "Hands-On Data Visualization" by Jack Dougherty & Ilya Illyankou





Source: Correl, Bertini & Franconeri 2020



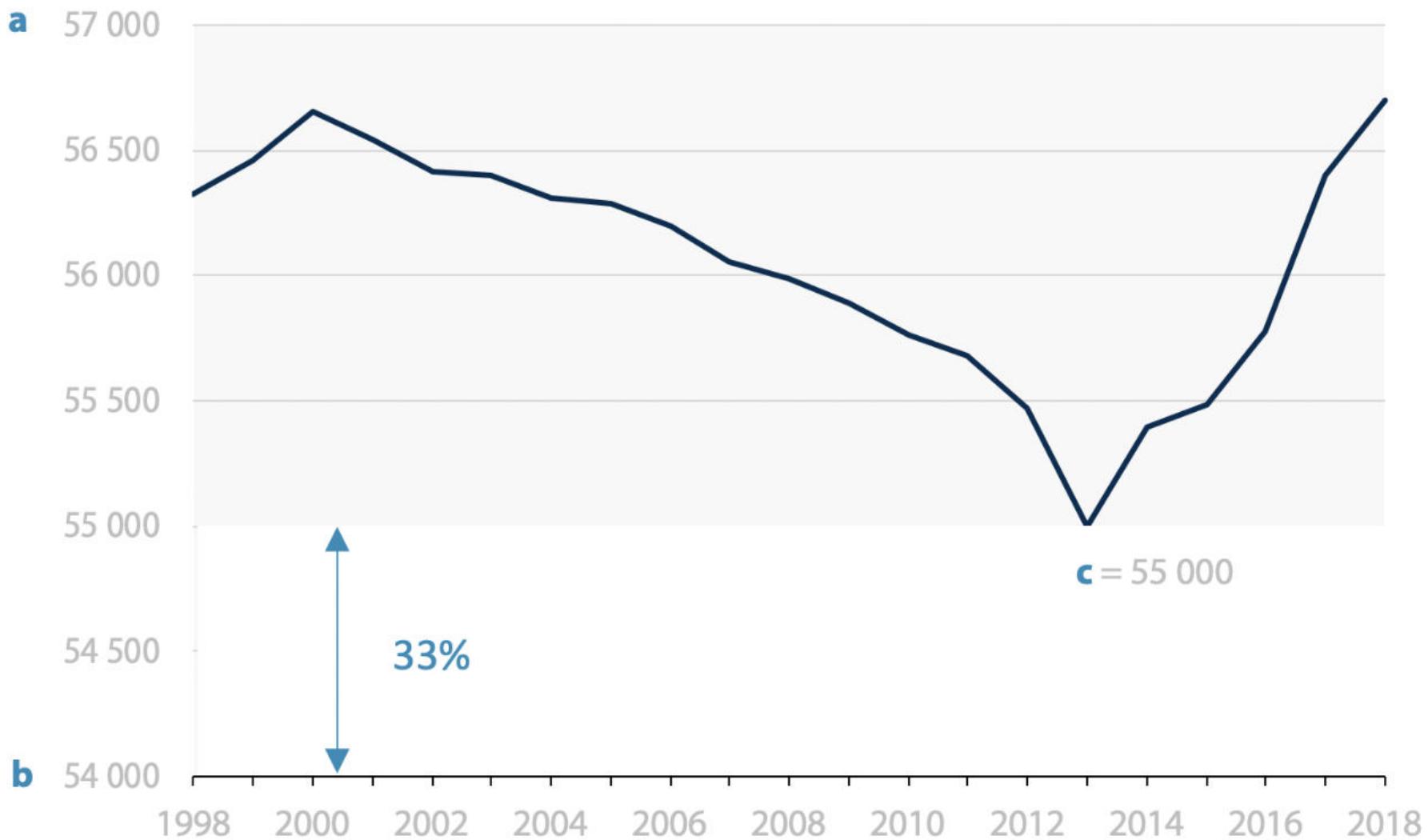
**“The subjective impact of axis truncation is persistent across visualizations designs, even for designs with explicit visual cues that indicate truncation has taken place.**

**We suggest that designers consider the scale of the meaningful effect sizes and variation they intend to communicate.”**

M. Correl, E. Bertini & S. Franconeri (2020)



# Sales of widgets



Source: Francis Gagnon

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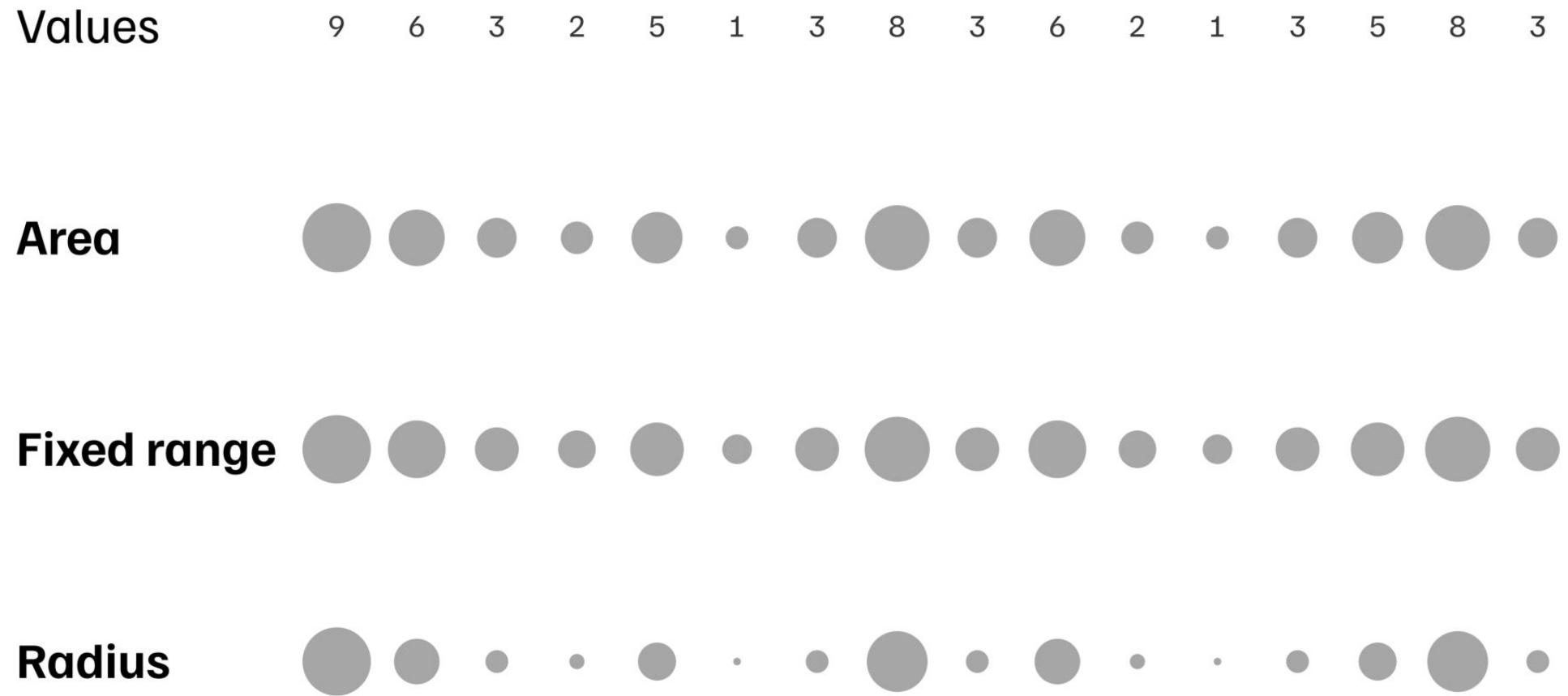


# Same Data, Different Scaling

4 3 0 7 9 6 3 2 5 1 3 8 3 6 2 1 3 5 8 3

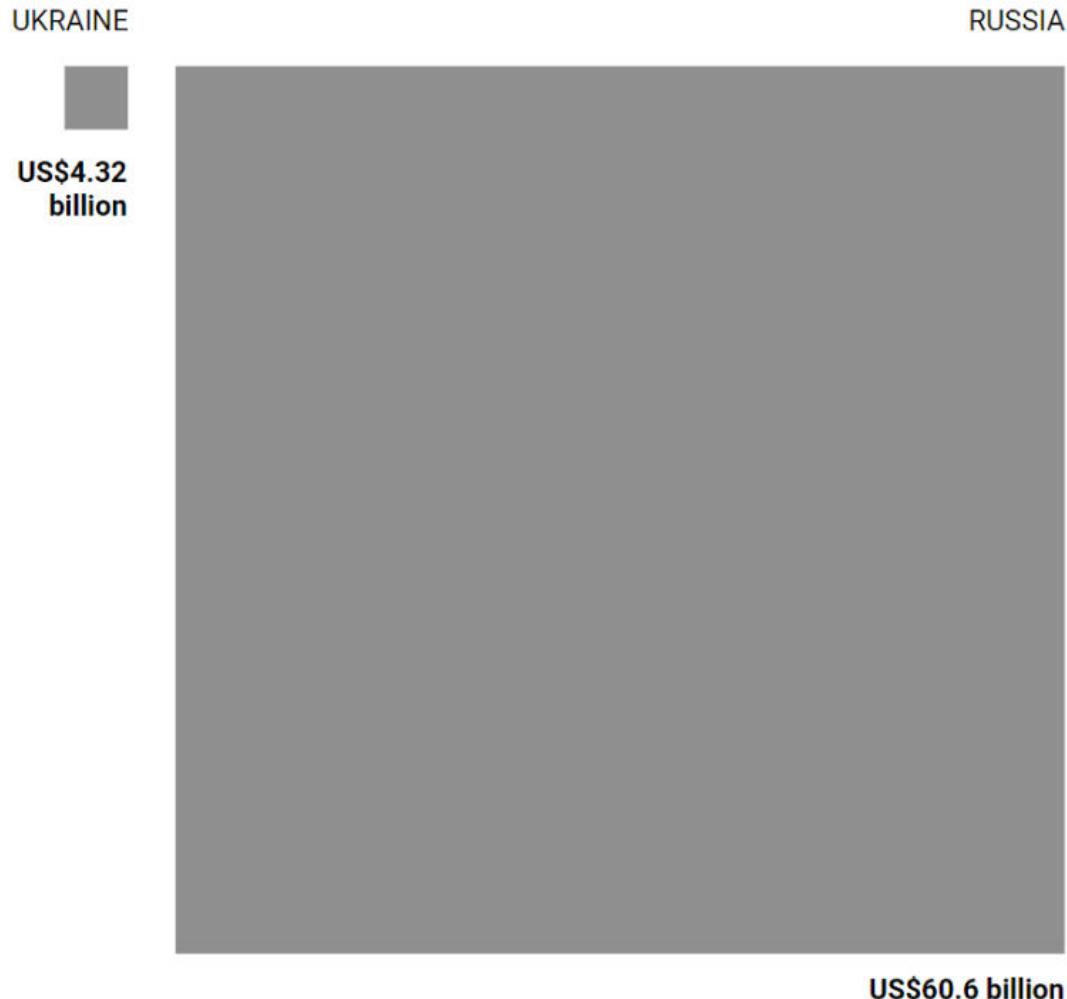


# Same Data, Different Scaling



## DEFENCE BUDGETS: RUSSIA VS UKRAINE (2020)

The national balance of forces is overwhelmingly in Russia's favour. Russian military spending in 2020 amounted to US\$60.6 billion in 2020. Ukraine's was less than a 10th of that amount.



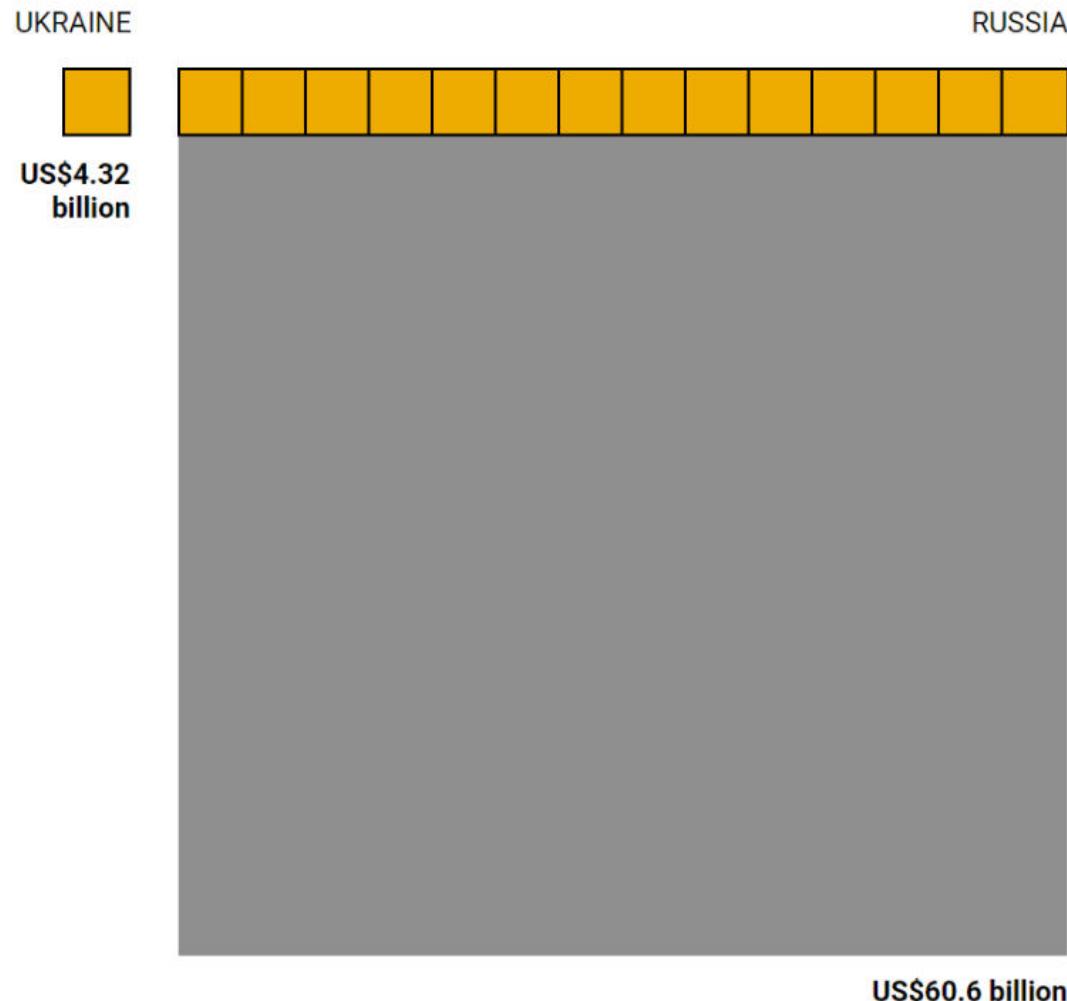
“Russia attacks Ukraine” by SCMP Graphic (South China Morning Post)

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## DEFENCE BUDGETS: RUSSIA VS UKRAINE (2020)

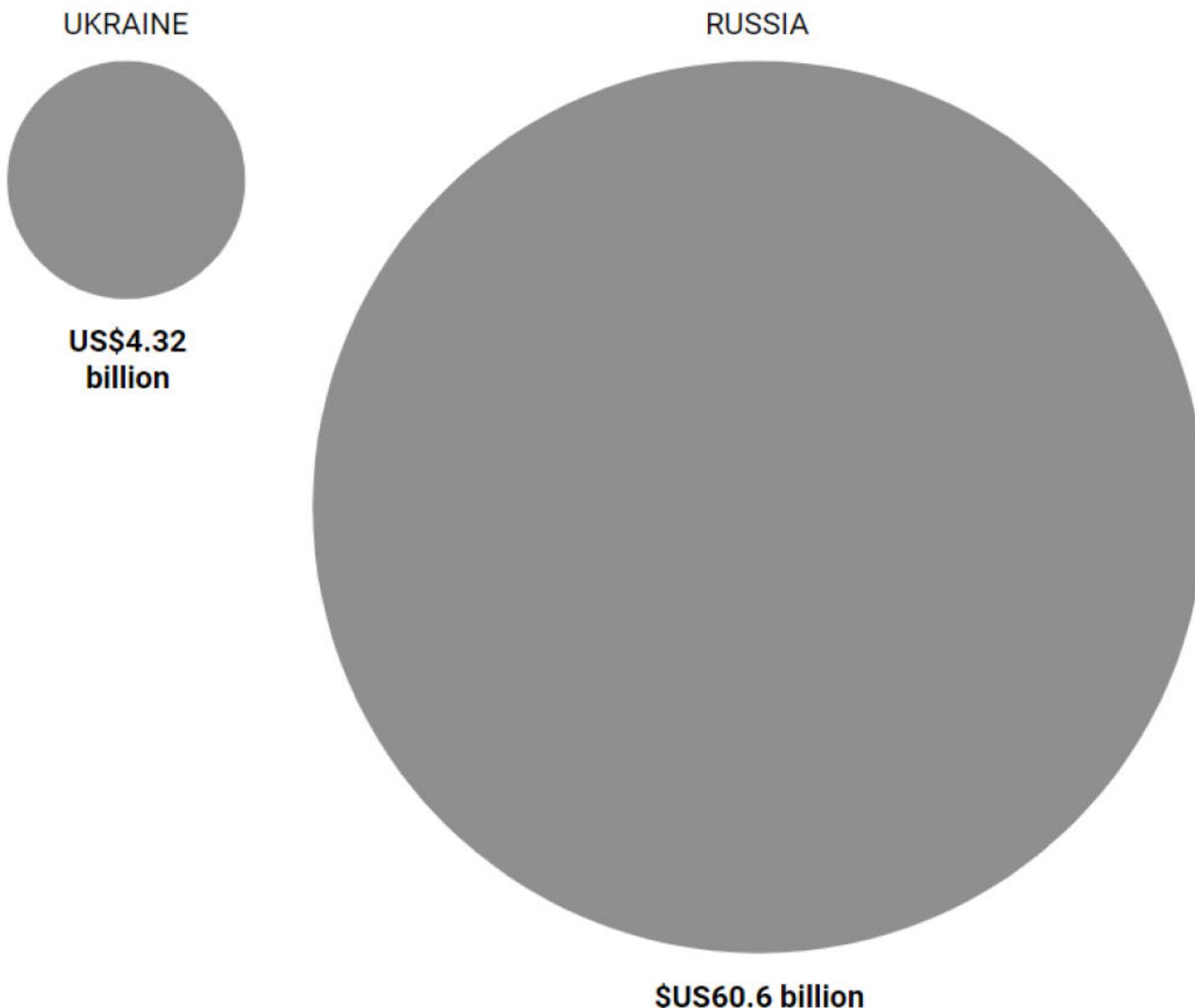
The national balance of forces is overwhelmingly in Russia's favour. Russian military spending in 2020 amounted to US\$60.6 billion in 2020. Ukraine's was less than a 10th of that amount.



“Russia attacks Ukraine” by SCMP Graphic (South China Morning Post)

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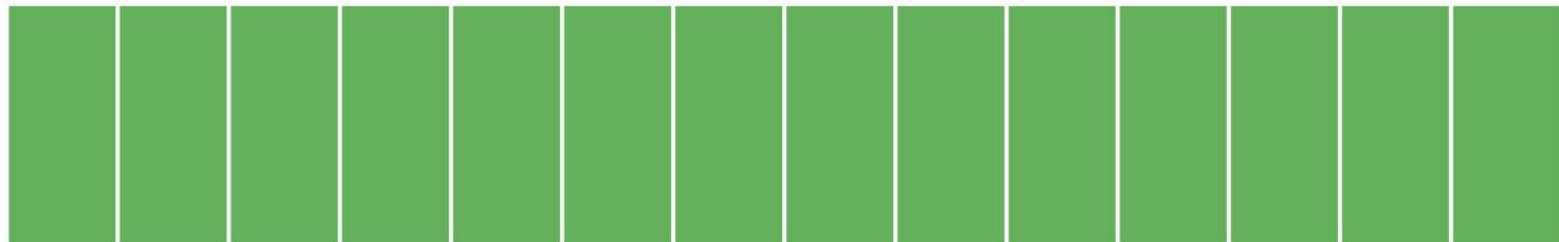


**Ukraine's military spending was less than a 14<sup>th</sup> of Russia's in 2020**



**UKRAINE**

US\$4.3 billion



**RUSSIA**

US\$60.6 billion

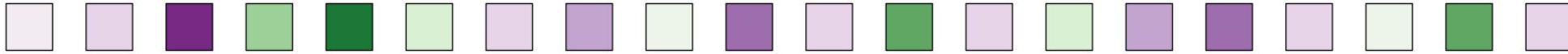
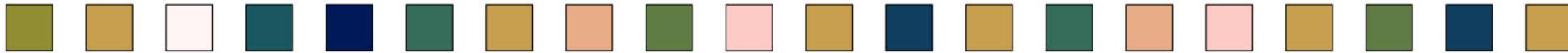
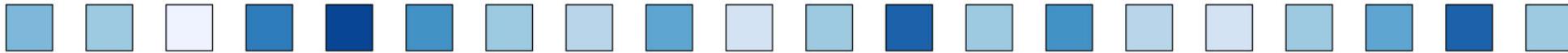
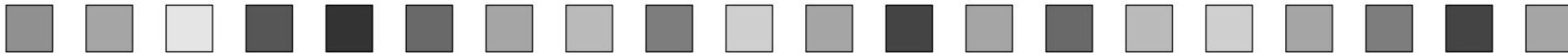


**Ukraine's military spending was less than a 14<sup>th</sup> of Russia's in 2020.**



# Same Data, Different Palettes

4 3 0 7 9 6 3 2 5 1 3 8 3 6 2 1 3 5 8 3



# Same Data, Different Palettes

Values

5 1 3 8 3 6 2 1 3 5 8 3

**Sequential (desaturated)**



**Sequential (single-hue)**



**Sequential (multi-hue)**



**Diverging**



# Same Data, Different Palettes

0      1      2      3      4      5      6      7      8      9



# Palette Types

## Sequential

Palette



Desaturated



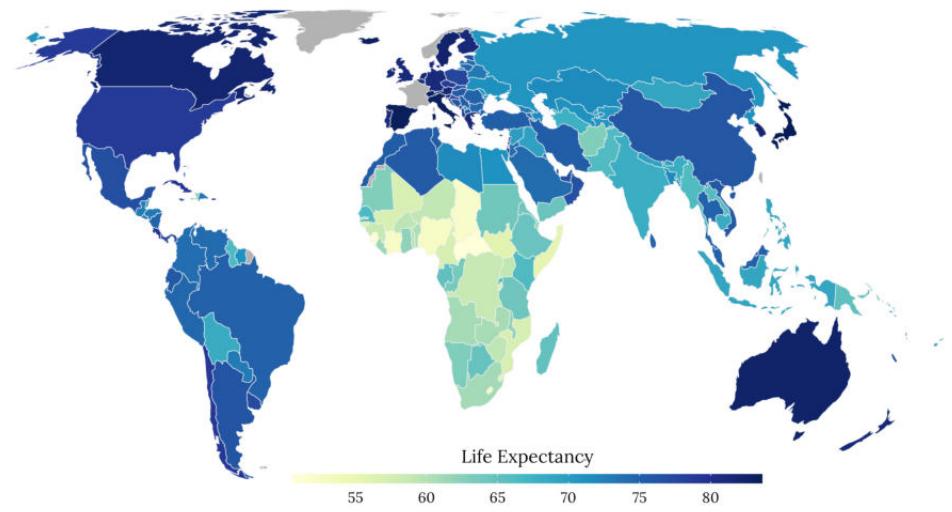
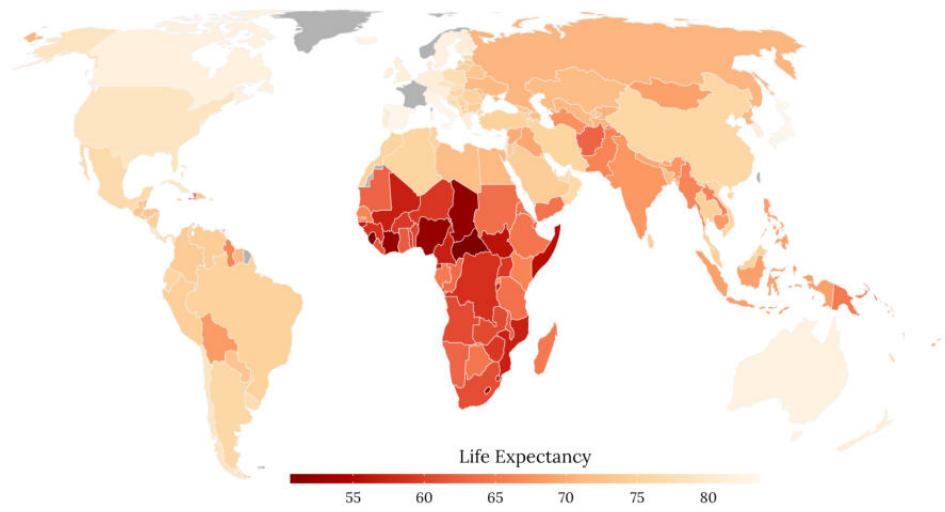
Use to encode  
***numerical information  
with order***

use highest contrast for  
most important information

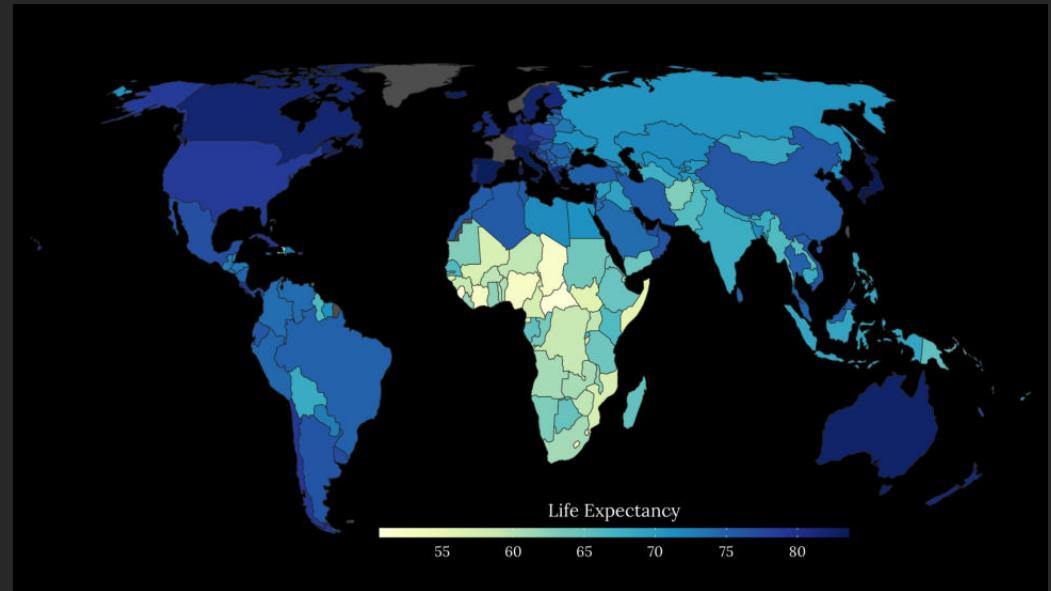
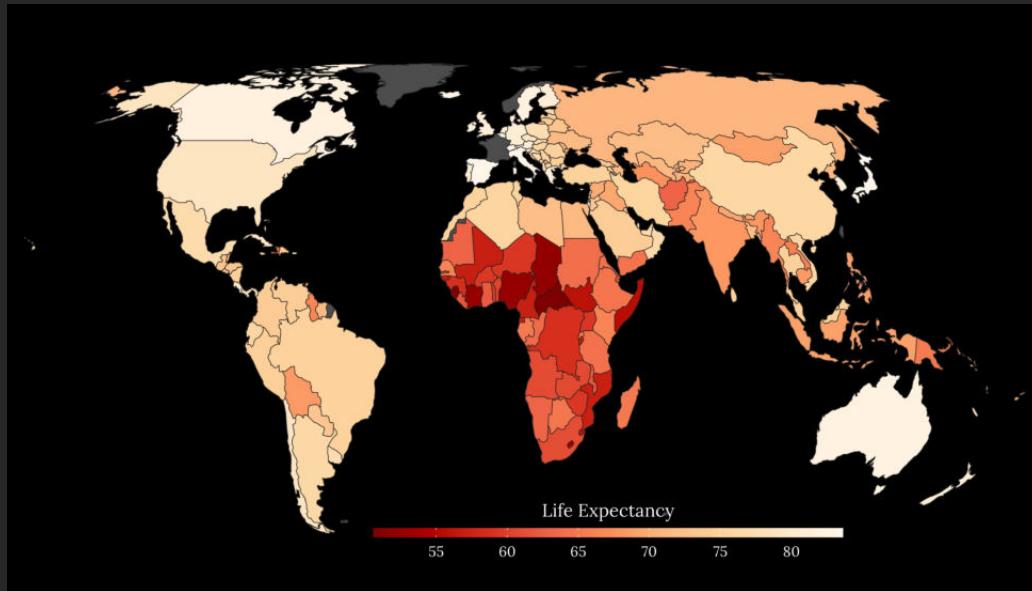
either single- or multi-hue



# Palette Types: Dark Equals More (?)



# Palette Types: Dark Equals More (?)



# Palette Types

## Sequential

Palette



Desaturated



Use to encode  
**numerical information  
with order**

use highest contrast for  
most important information

either single- or multi-hue

## Diverging

Palette



Desaturated



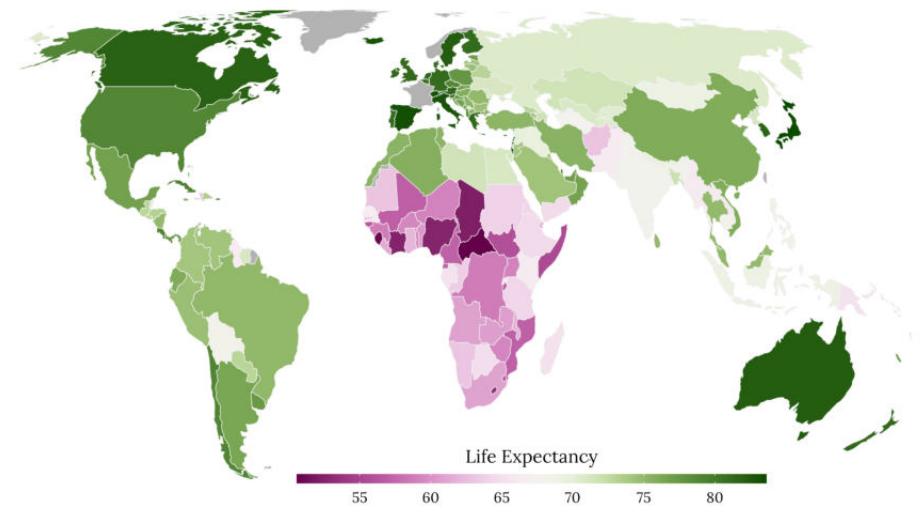
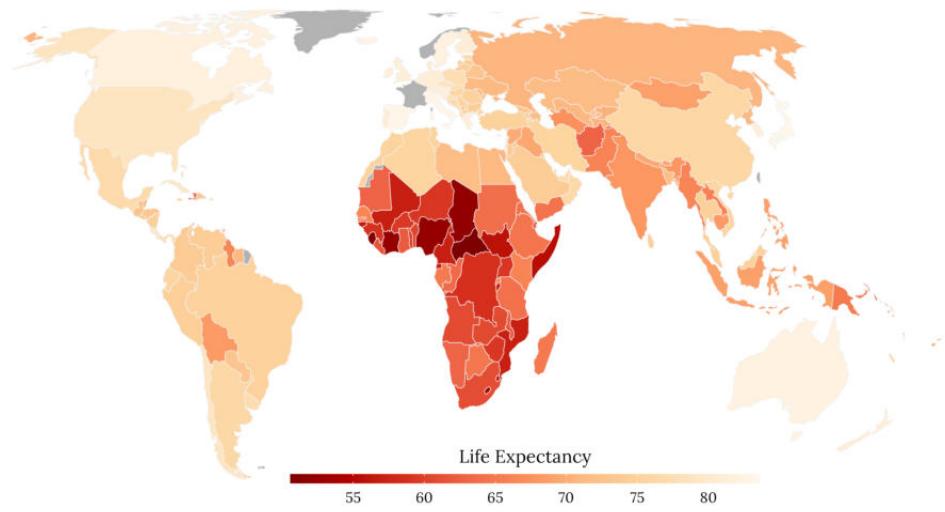
Use to encode  
**numerical information  
with critical midpoint**

ensure a meaningful midpoint value  
and use balanced extremes

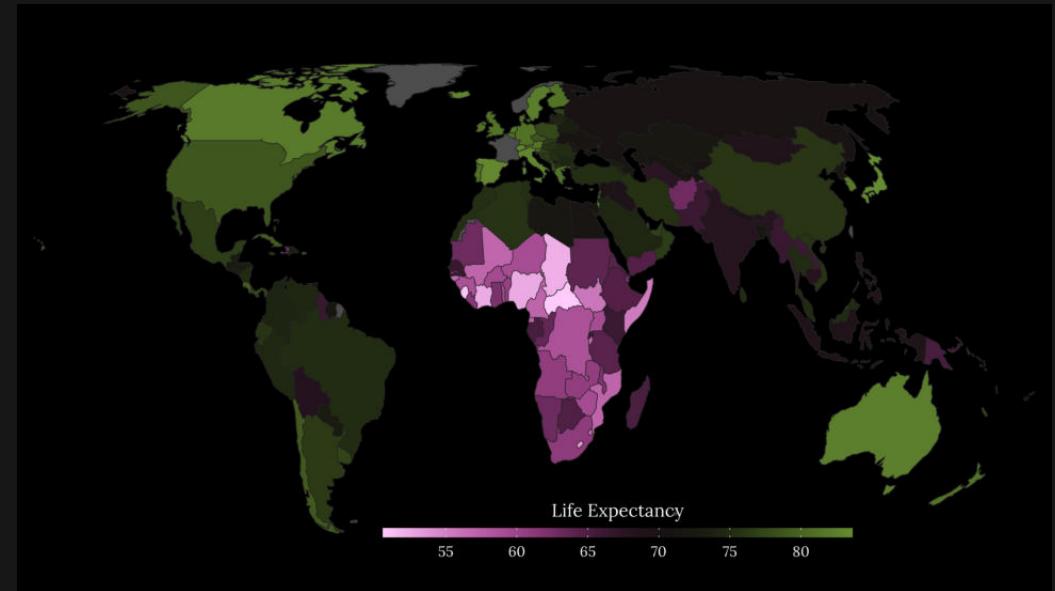
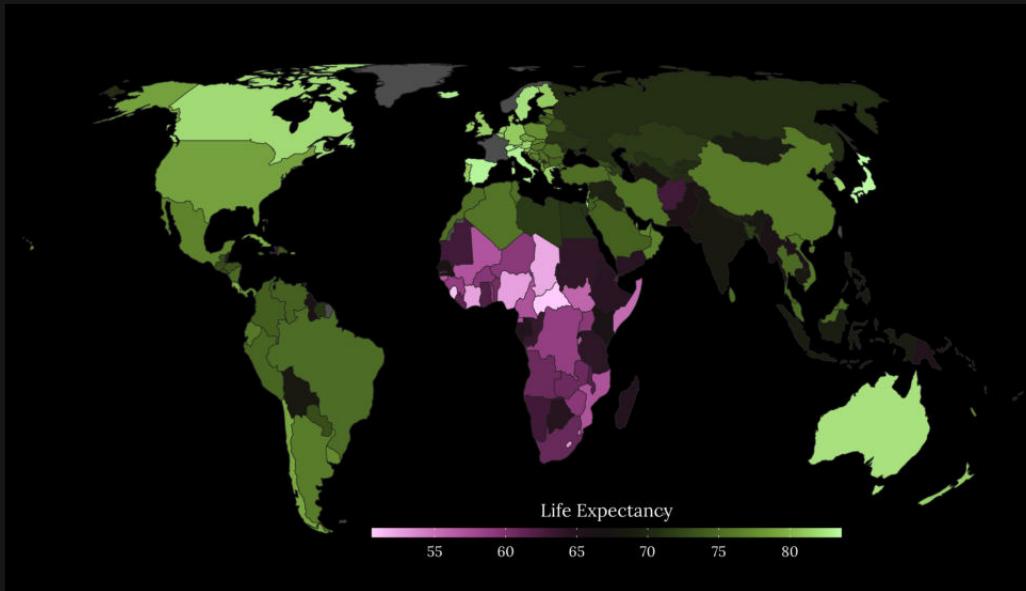
combination of  
two sequential palettes



# Palette Types: Sequential or Diverging?



# Palette Types: Midpoint



# Palette Types

## Sequential

Palette



Desaturated



Use to encode  
**numerical information with order**

use highest contrast for  
most important information

either single- or multi-hue

## Diverging

Palette



Desaturated



Use to encode  
**numerical information with critical midpoint**

ensure a meaningful midpoint value  
and use balanced extremes

combination of  
two sequential palettes

## Qualitative

Palette



Desaturated



Use to encode  
**categorical information**

pick distinct colors with  
the same perceptual weight

limit categories to 6-8

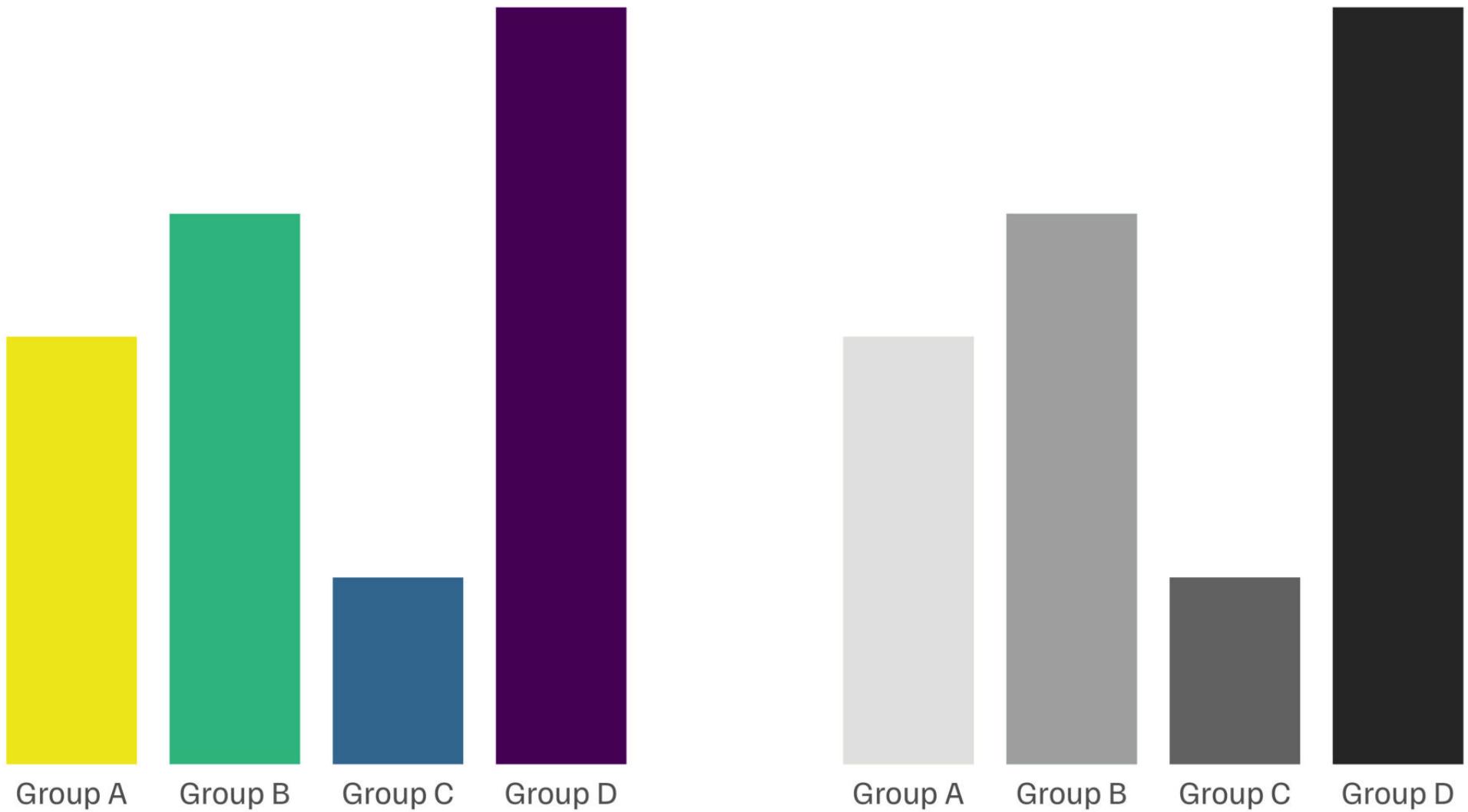


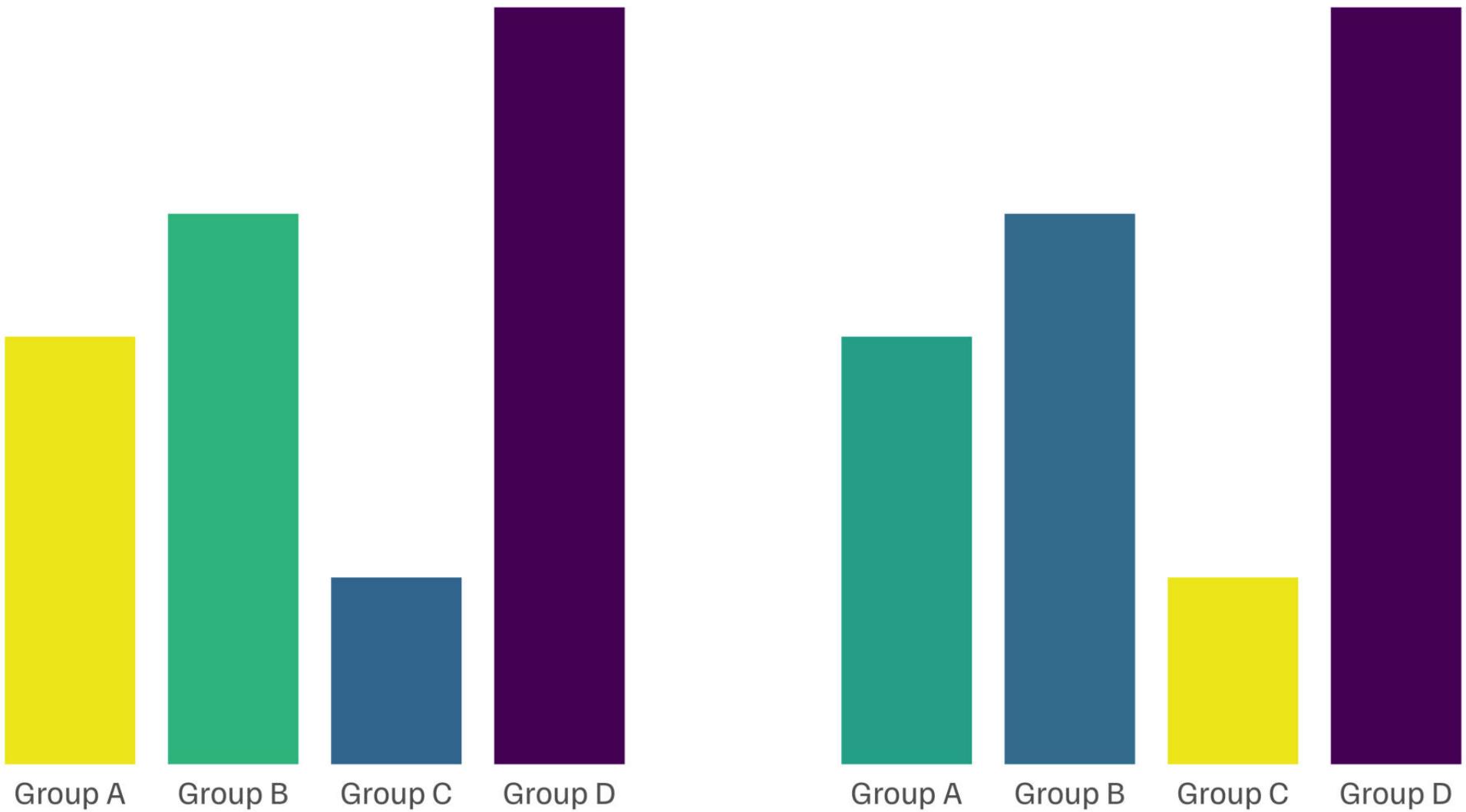
# Palette Types: Sequential Qualitative!

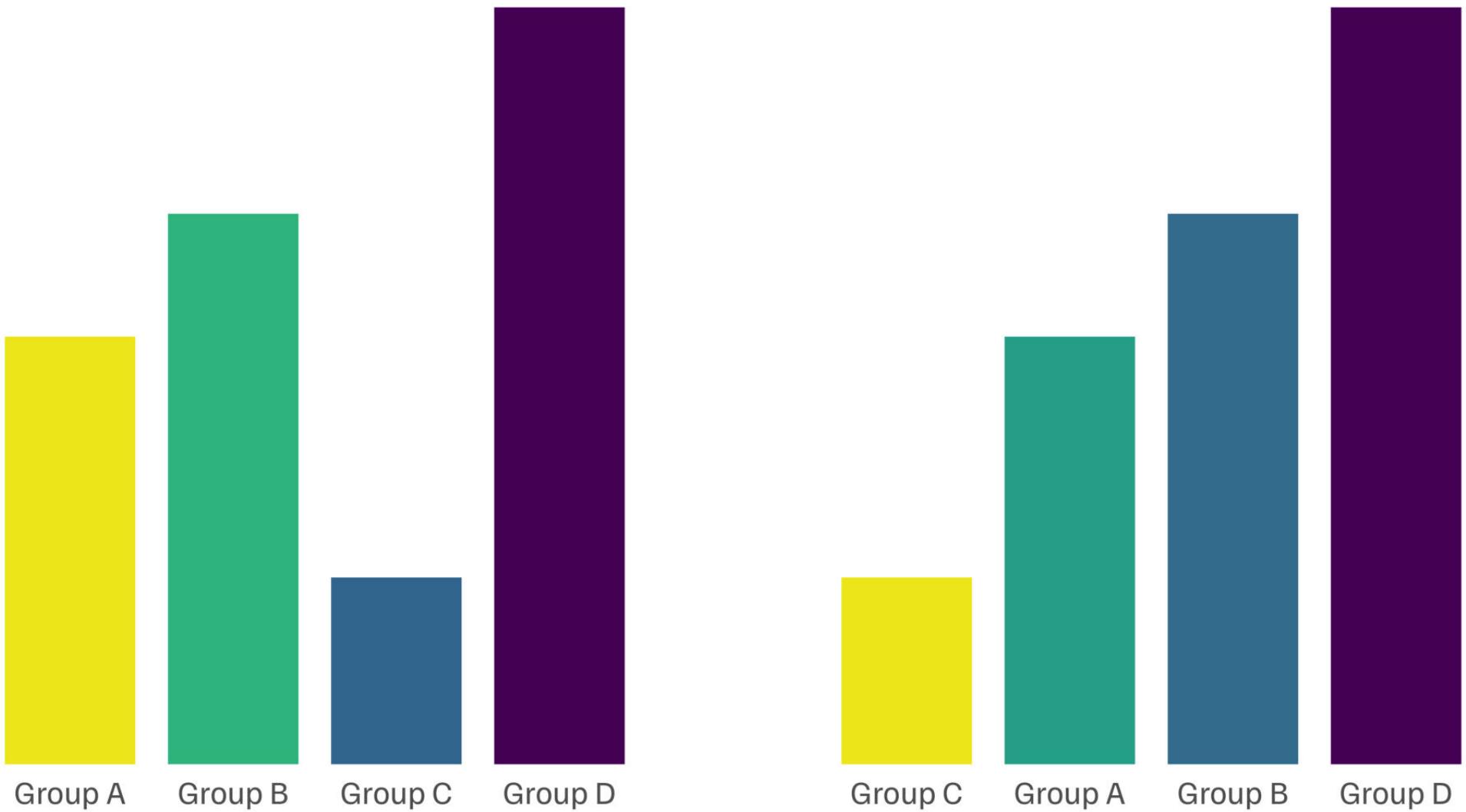


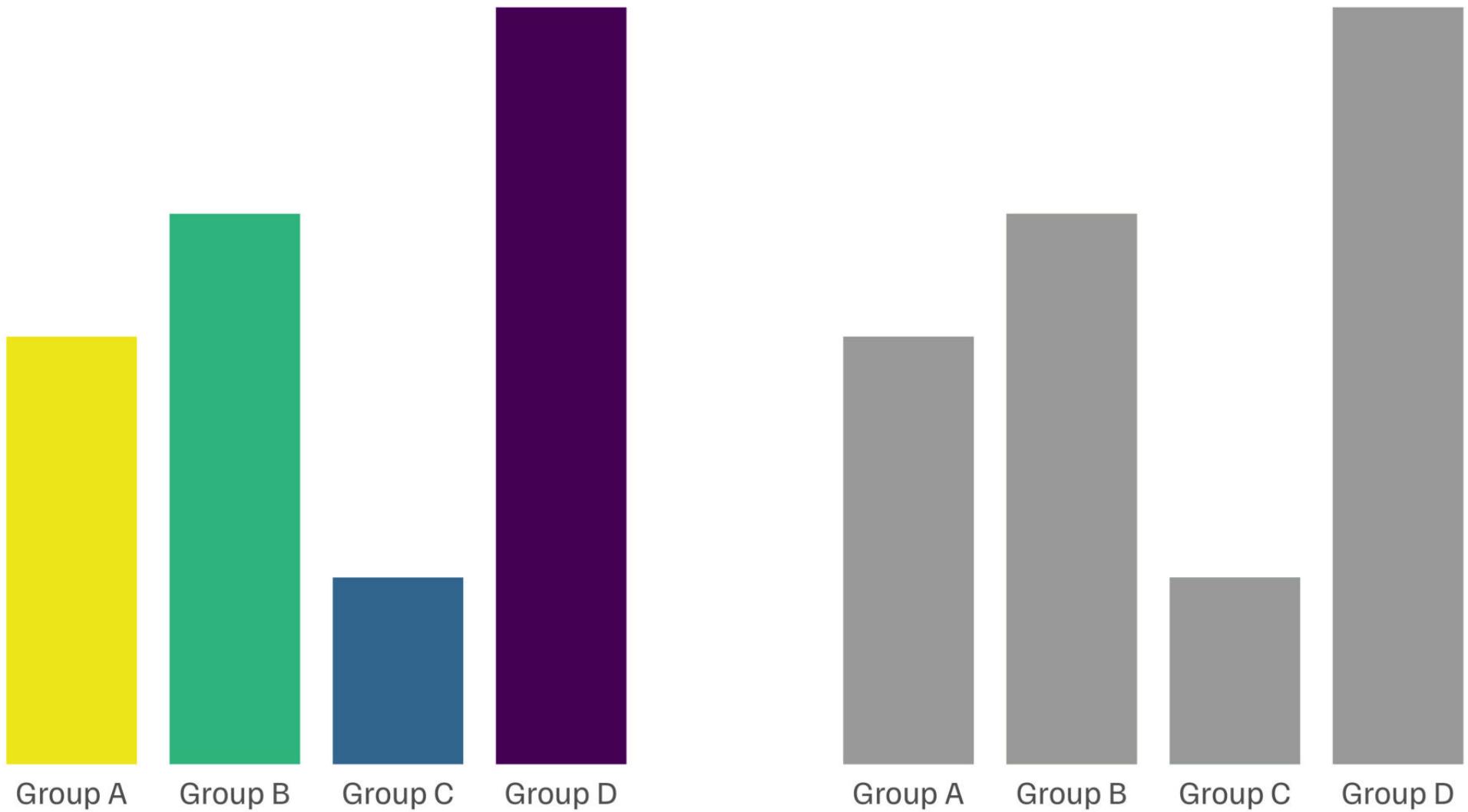
Source: Lisa Charlotte Muth, [DataWrapper Blog](#)

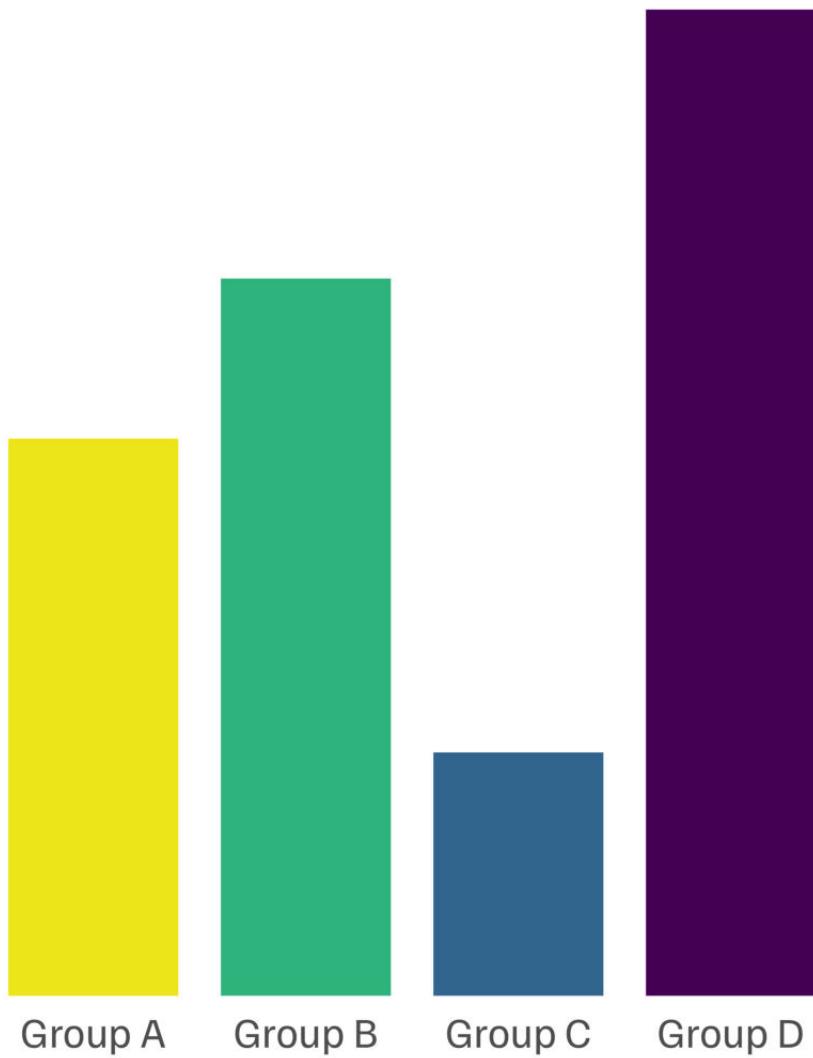




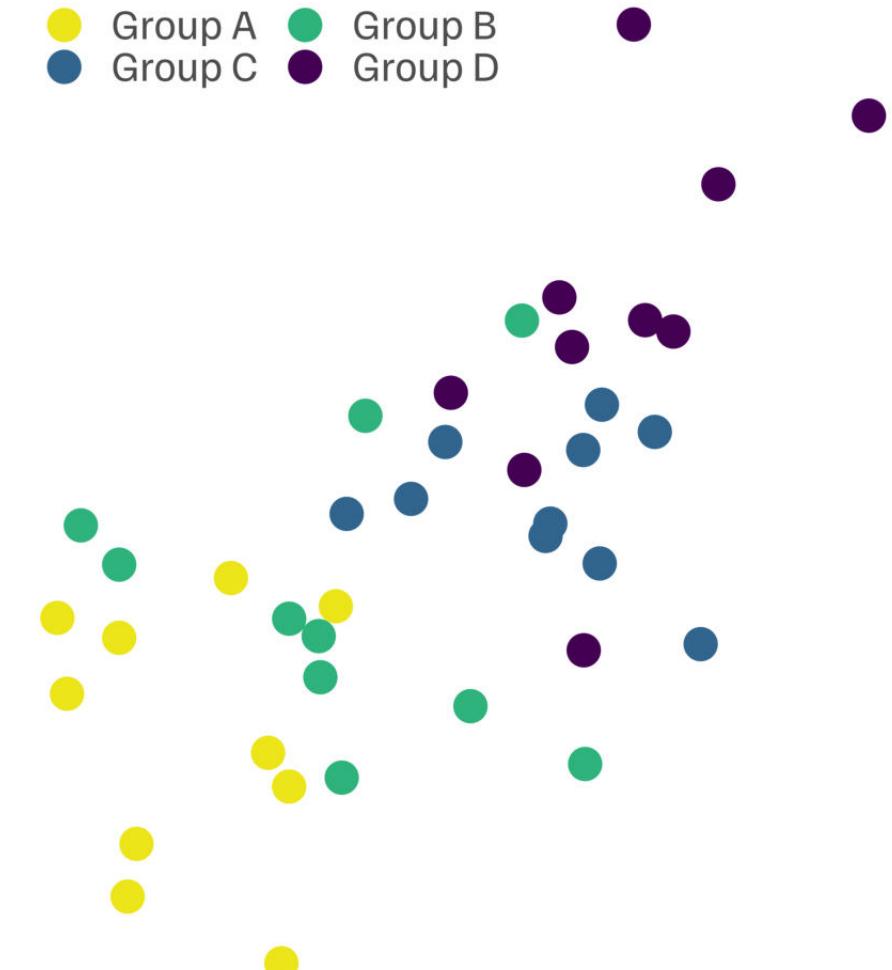


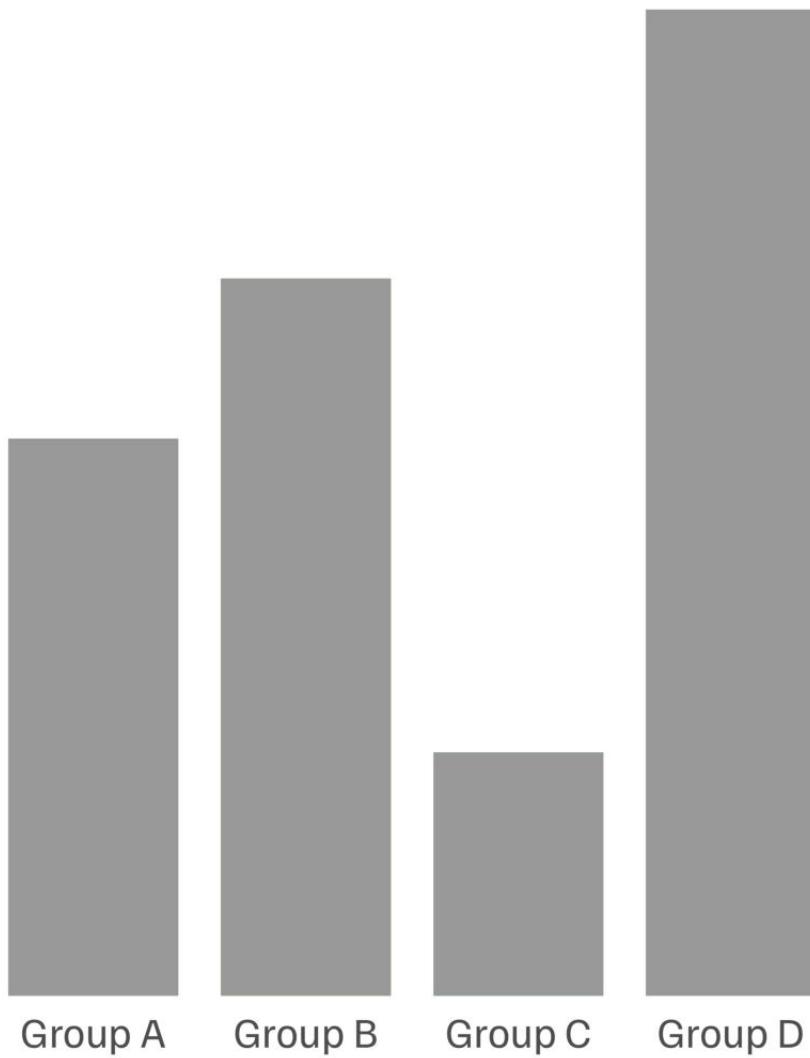




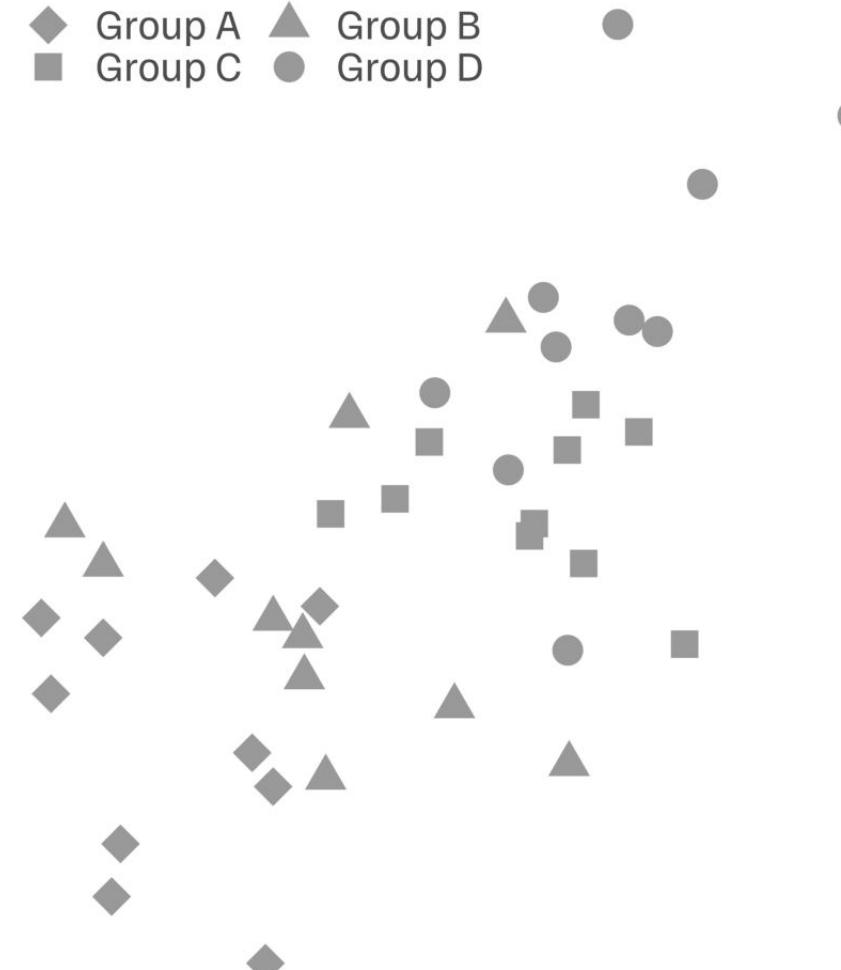


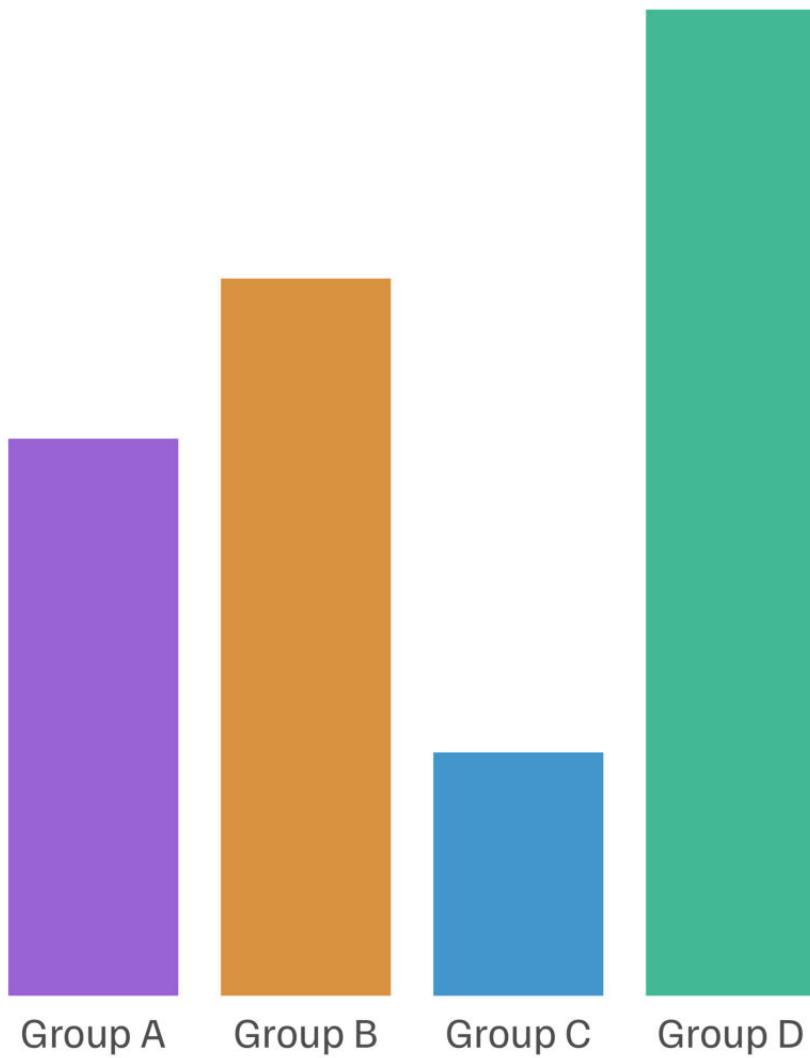
Group A    Group B  
Group C    Group D



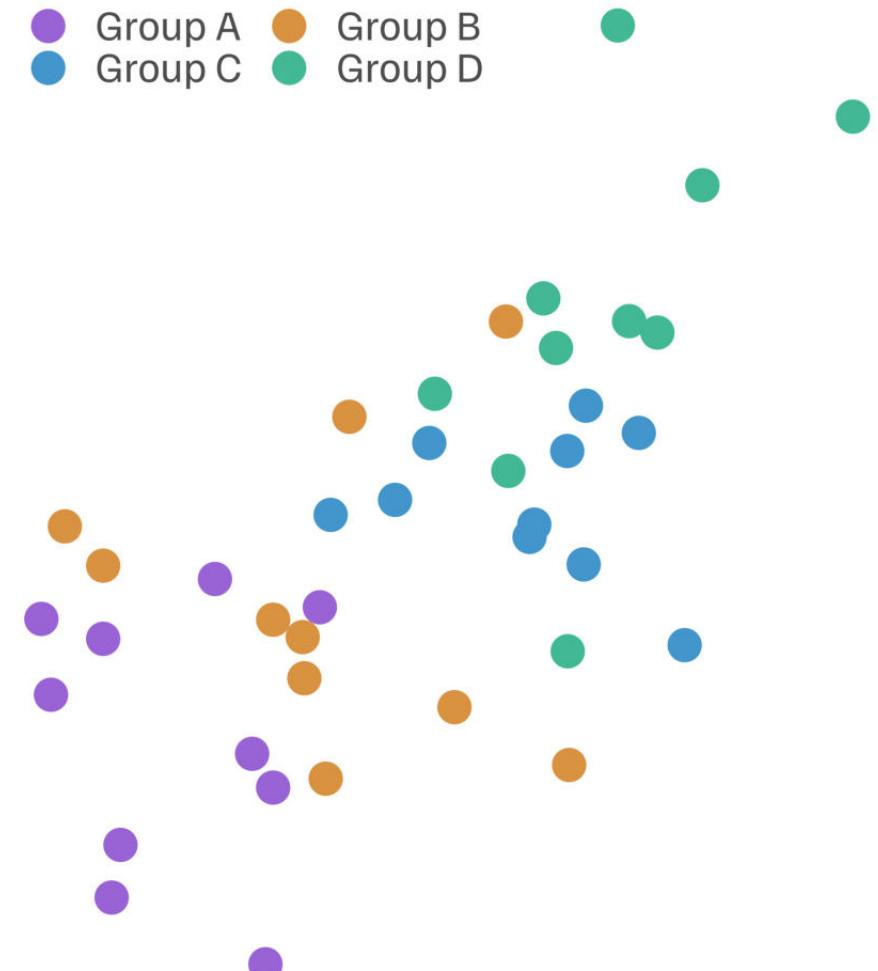


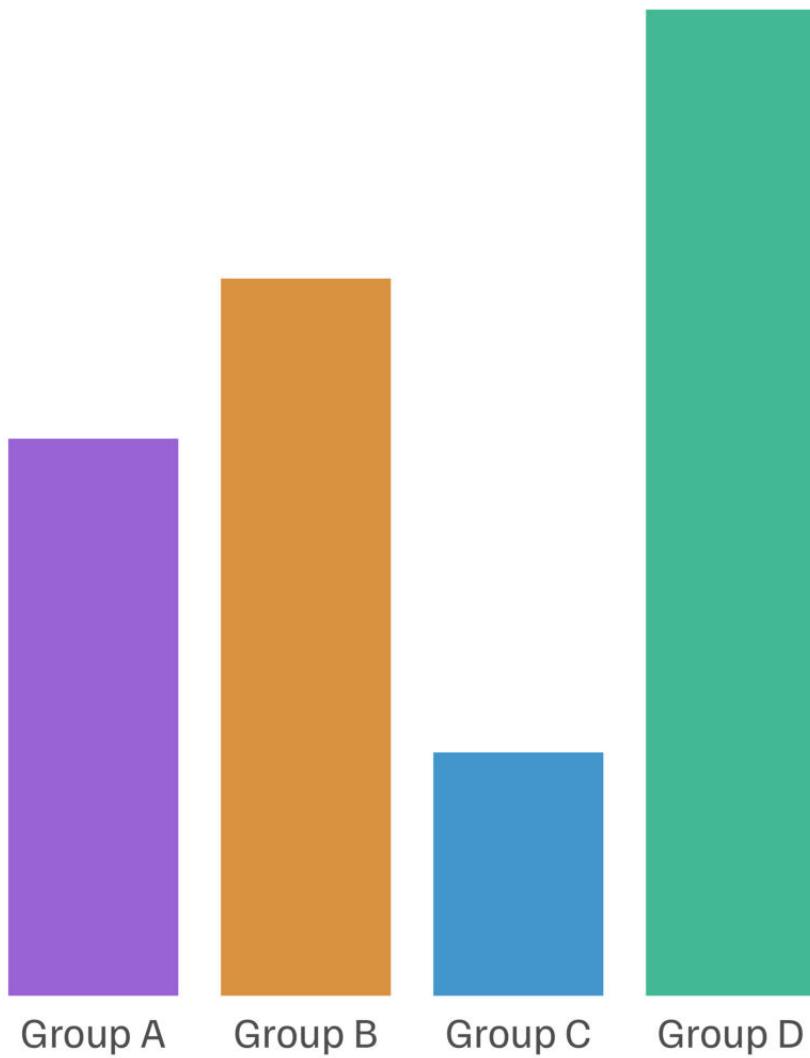
◆ Group A ▲ Group B  
■ Group C ● Group D



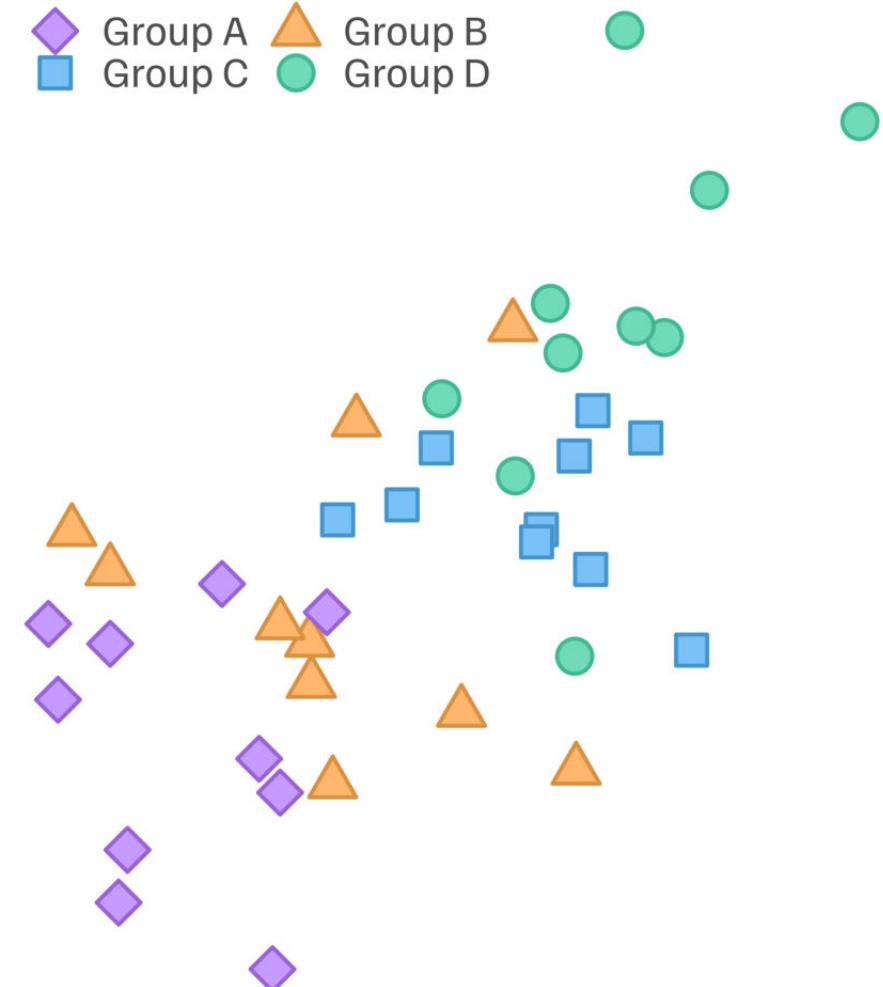


Group A    Group B  
Group C    Group D





Group A    Group B  
Group C    Group D

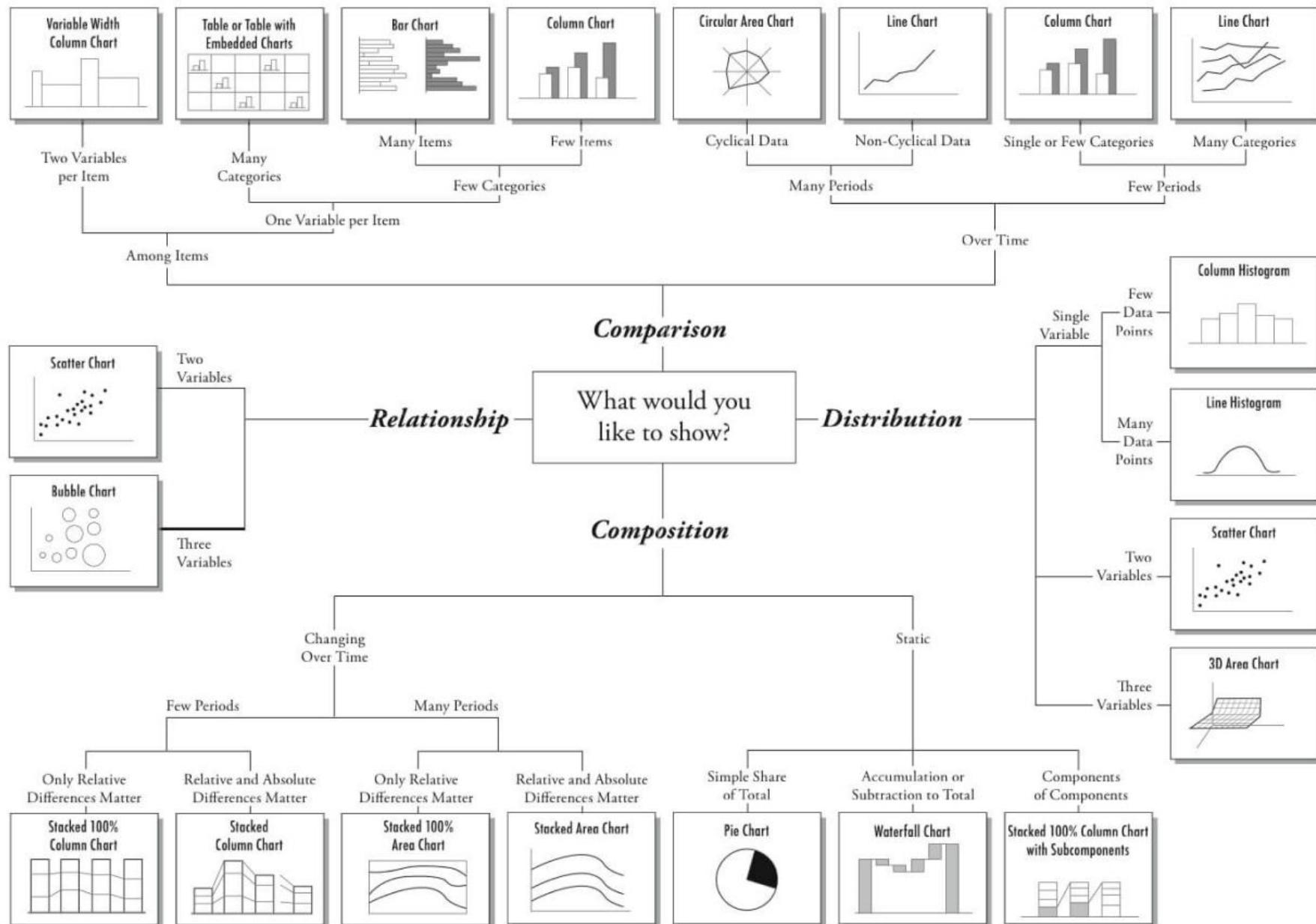


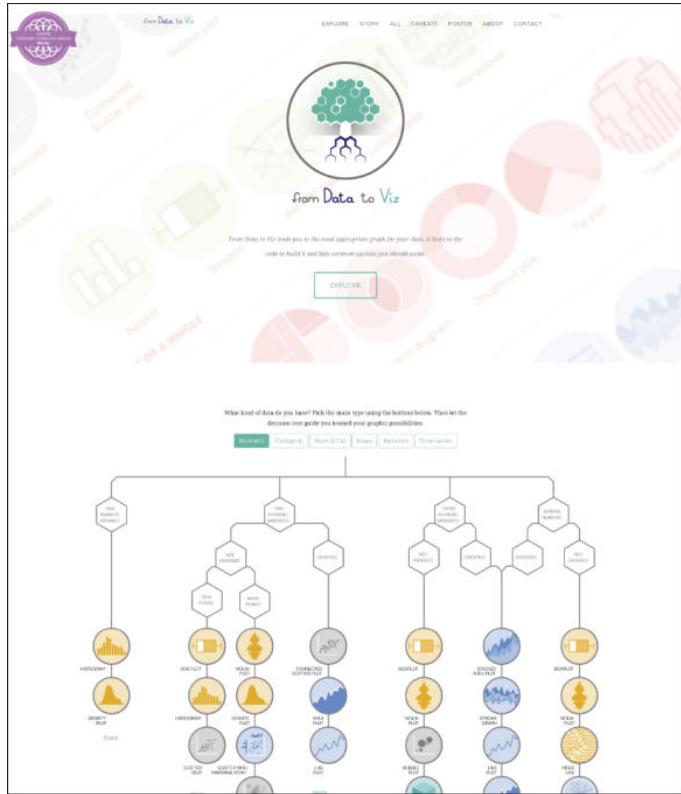
# *Chart Type Choice*



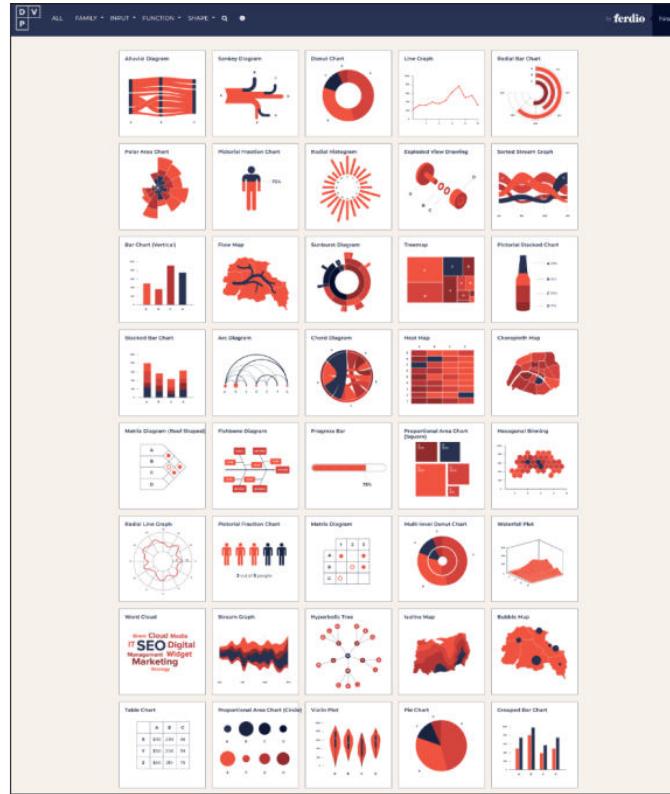
# Chart Suggestions—A Thought-Starter

www.ExtremePresentation.com  
© 2009 A. Abela — a.abela@gmail.com

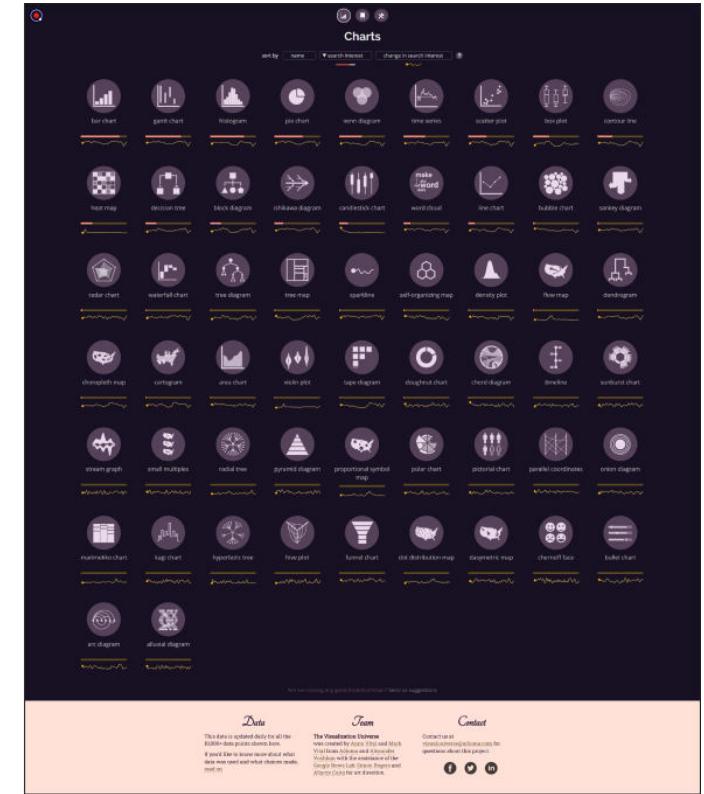




[data-to-viz.com](http://data-to-viz.com)



[datavizproject.com](http://datavizproject.com)



[visualizationuniverse.com](http://visualizationuniverse.com)



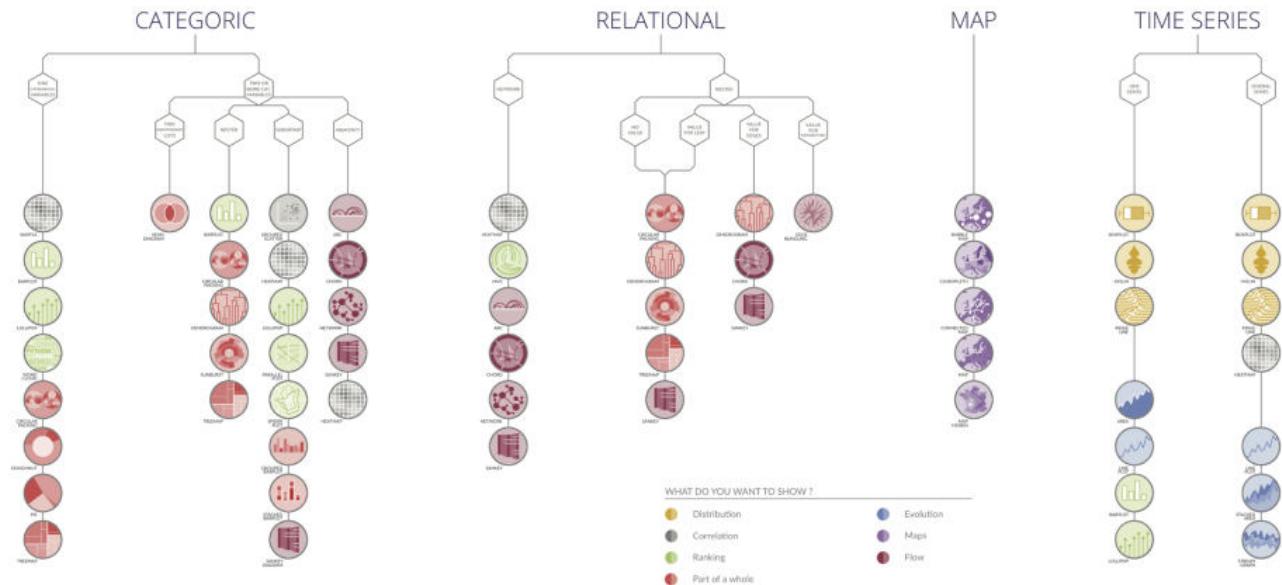


'From Data to Viz' is a classification of chart types based on input data format. It will help you find the perfect chart in three simple steps:

- ① Identify what type of data you have.
- ② Go to the corresponding decision tree and follow it down to a set of possible charts.
- ③ Choose the chart from the set that will suit your data and its needs best.

DataViz is a world with endless possibilities and this project does not claim to be exhaustive. However it should provide you with a good starting point. For an interactive version and much more, visit:

[data-to-viz.com](http://data-to-viz.com)



WHAT DO YOU WANT TO SHOW ?

- Distribution
- Correlation
- Ranking
- Maps
- Evolution
- Filter
- Part of a whole



Source: [Data to Viz](http://data-to-viz.com)

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The screenshot shows a web page from [Data to Viz](#). At the top left is a yellow circular icon containing a boxplot. To its right is a large white 'X' button. Below the icon is the word "BOXPLOT" in green capital letters. A subtitle "Summarize the distribution of numeric variables" follows. Underneath is a section titled "About" with a description of what a boxplot is. Below this is a section titled "Common Mistakes" with a bulleted list of three items. Further down is a "Code" section with links to R graph gallery, Python gallery, D3.js gallery, and Flourish. At the bottom of this sidebar is a link to "Read More" and a note to "See the dedicated page".  
  
The main content area has a dark grey background with a grid of circular icons, each representing a different type of visualization. The icons are arranged in four rows:

- Row 1: Boxplot, Ridgeline, Scatter
- Row 2: Connected scatter, Density 2d, Barplot
- Row 3: Lollipop, Circular Barplot, Treemap
- Row 4: Dendrogram, Circular packing, Sunburst

Each icon is accompanied by its name below it.

Source: [Data to Viz](#)



# Chart Types to...

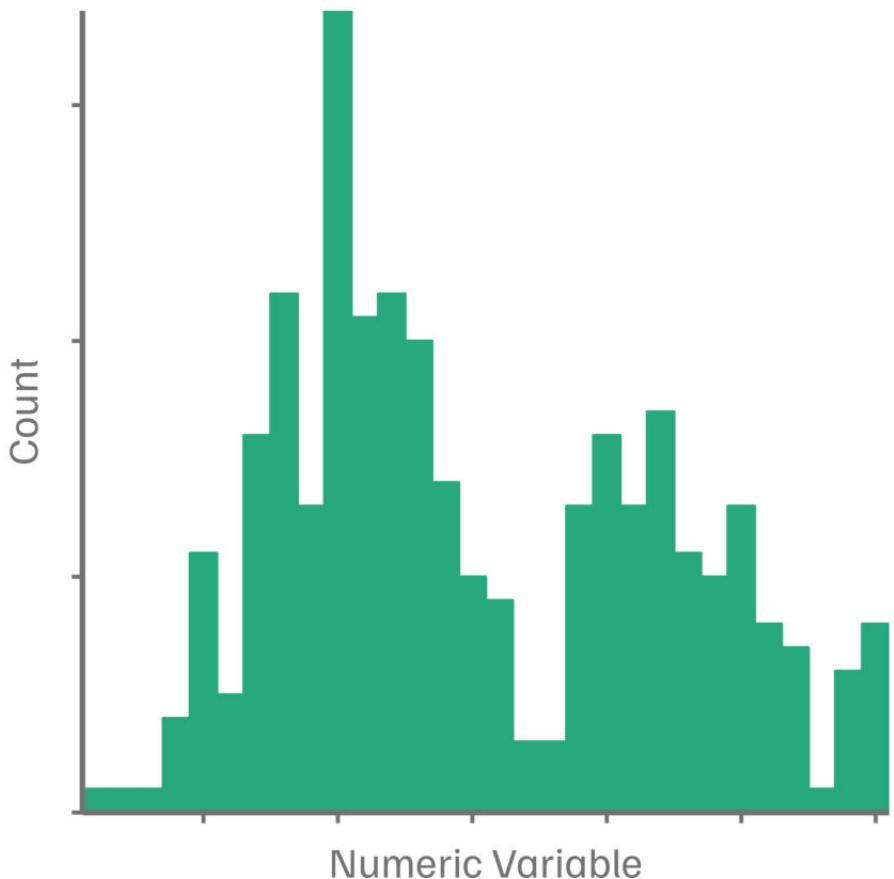


# Visualize Distributions

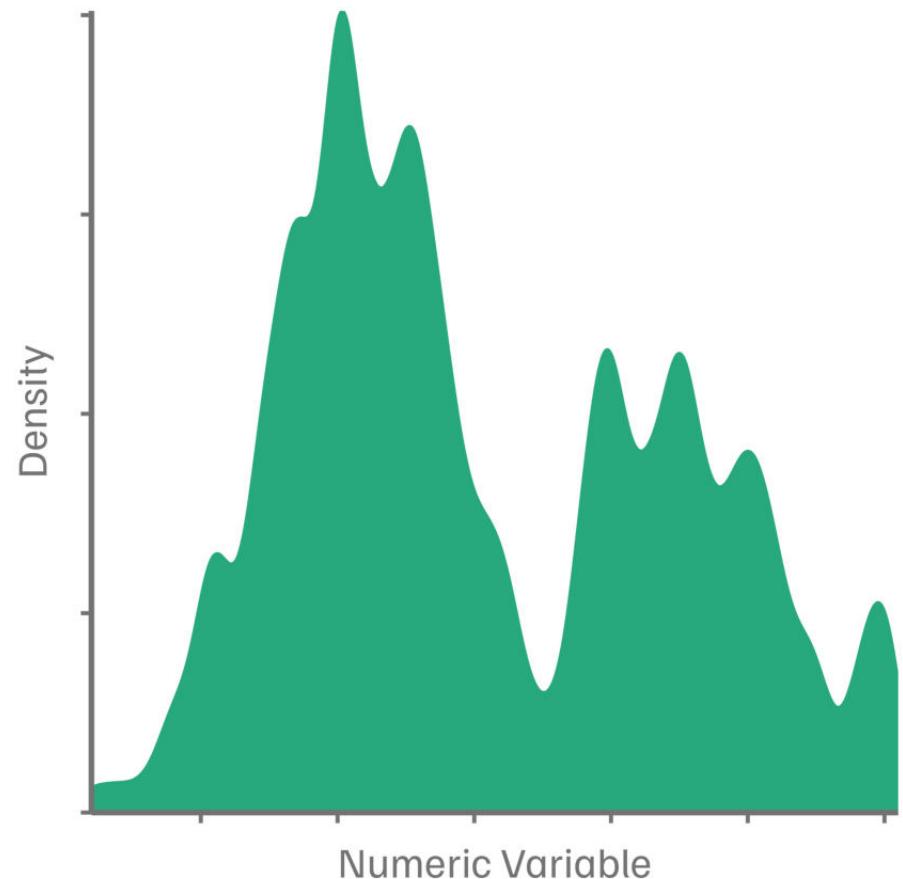


# Visualize Distributions

**Histogram**

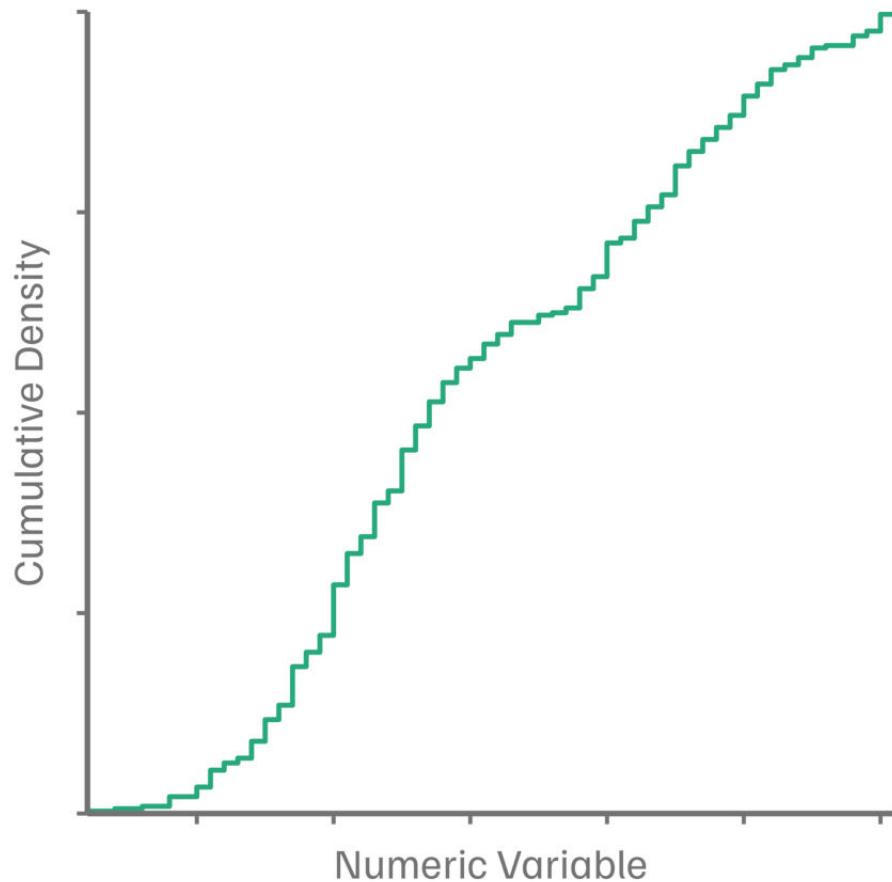


**Density Plot**

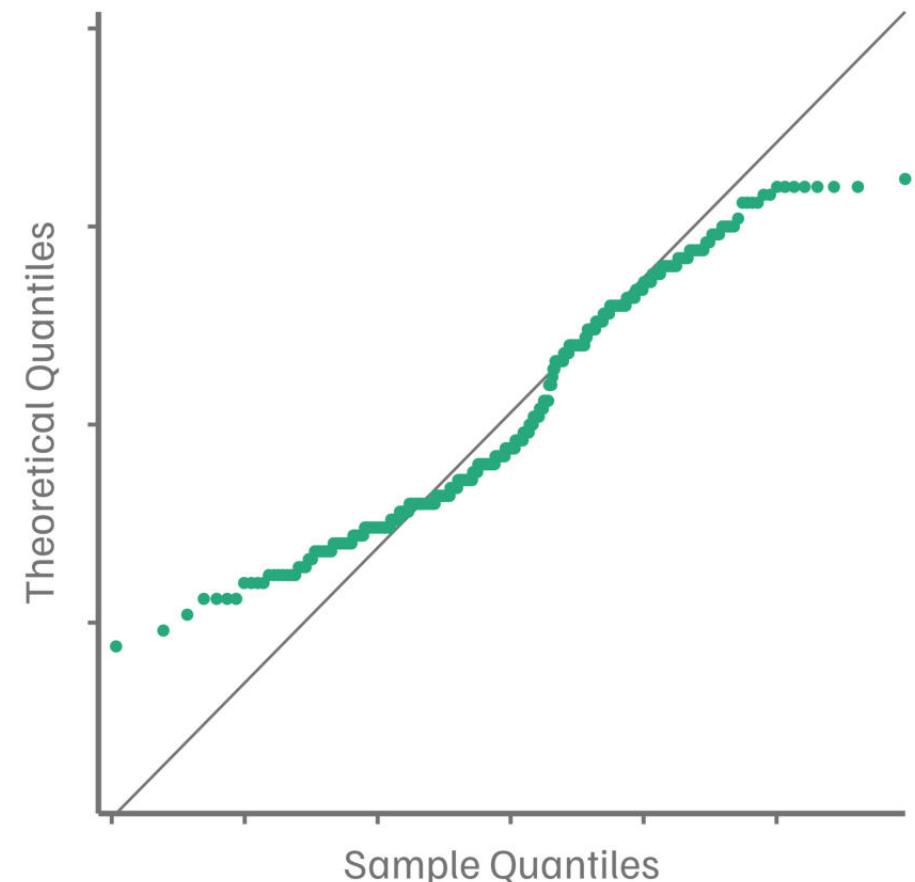


# Visualize Distributions

**Cumulative Density Plot (ECDF)**



**Quantile-Quantile Plot (QQ)**

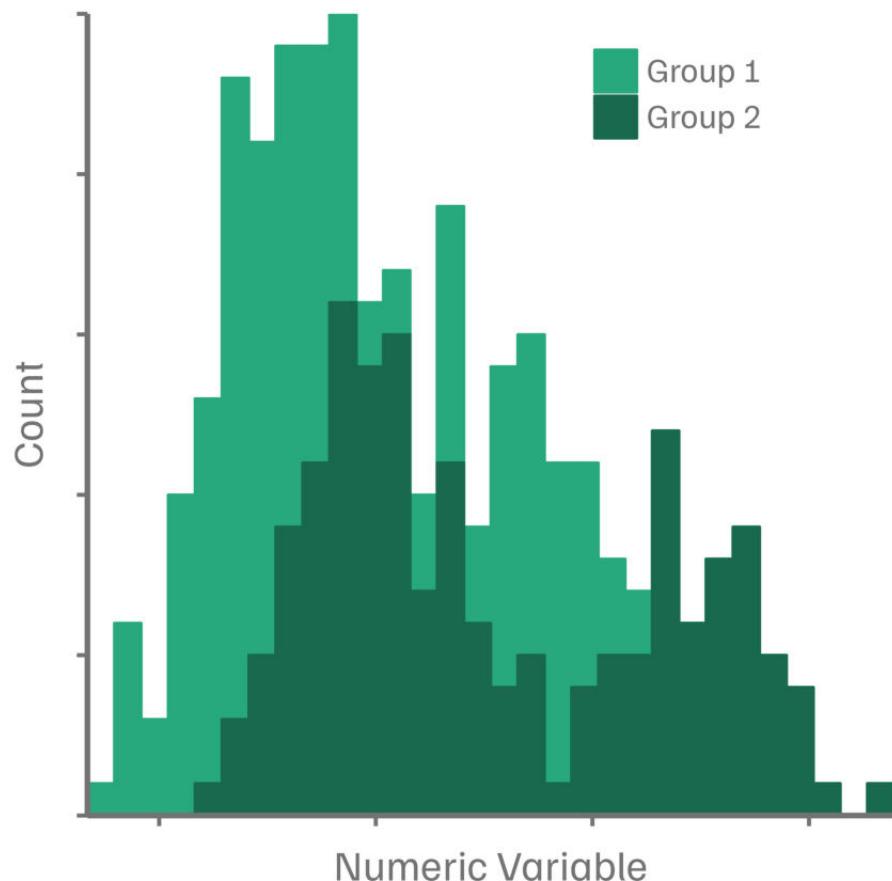


# Compare Distributions

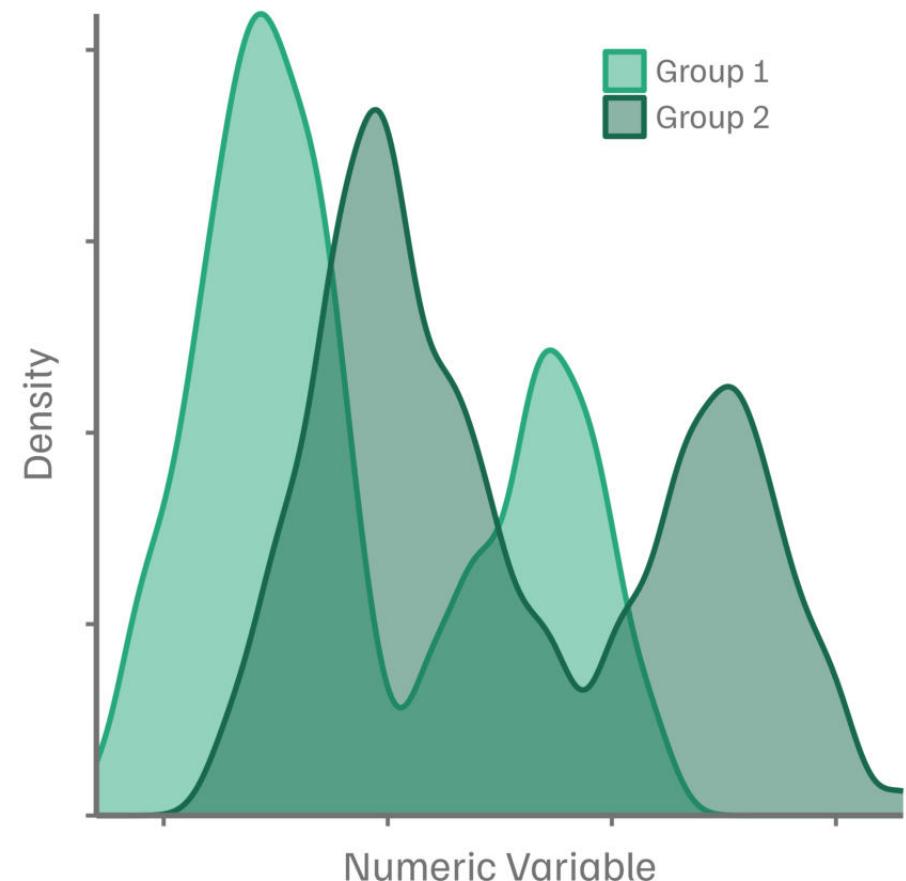


# Compare Distributions

Histogram (stacked)

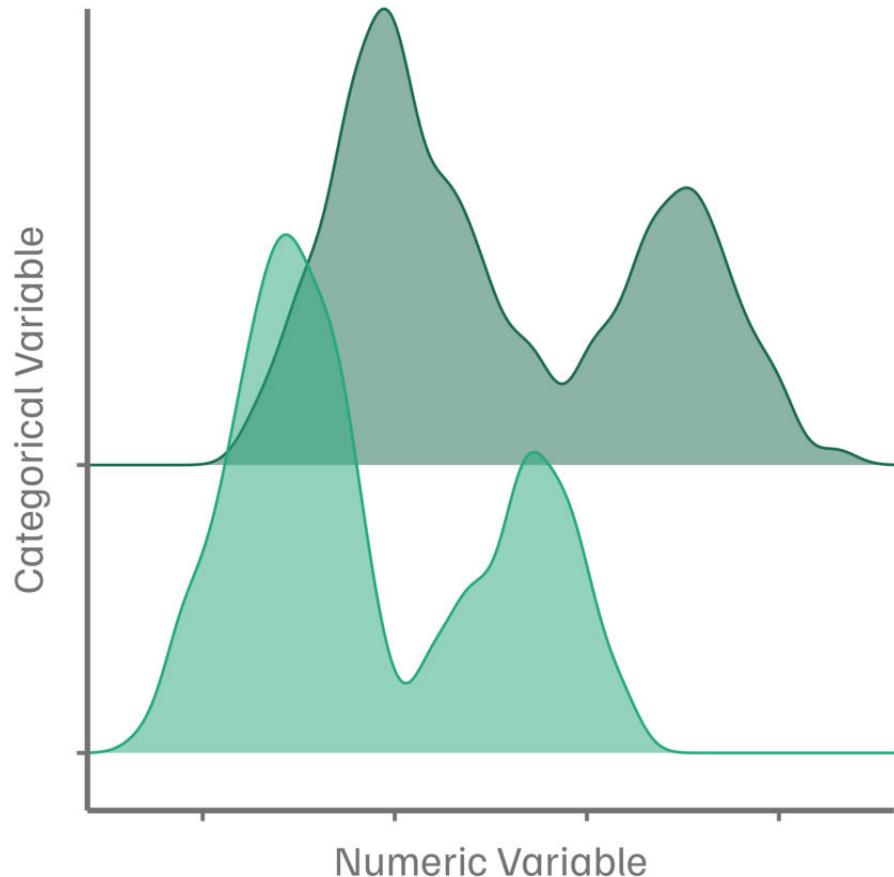


Density Plot (overlapping)

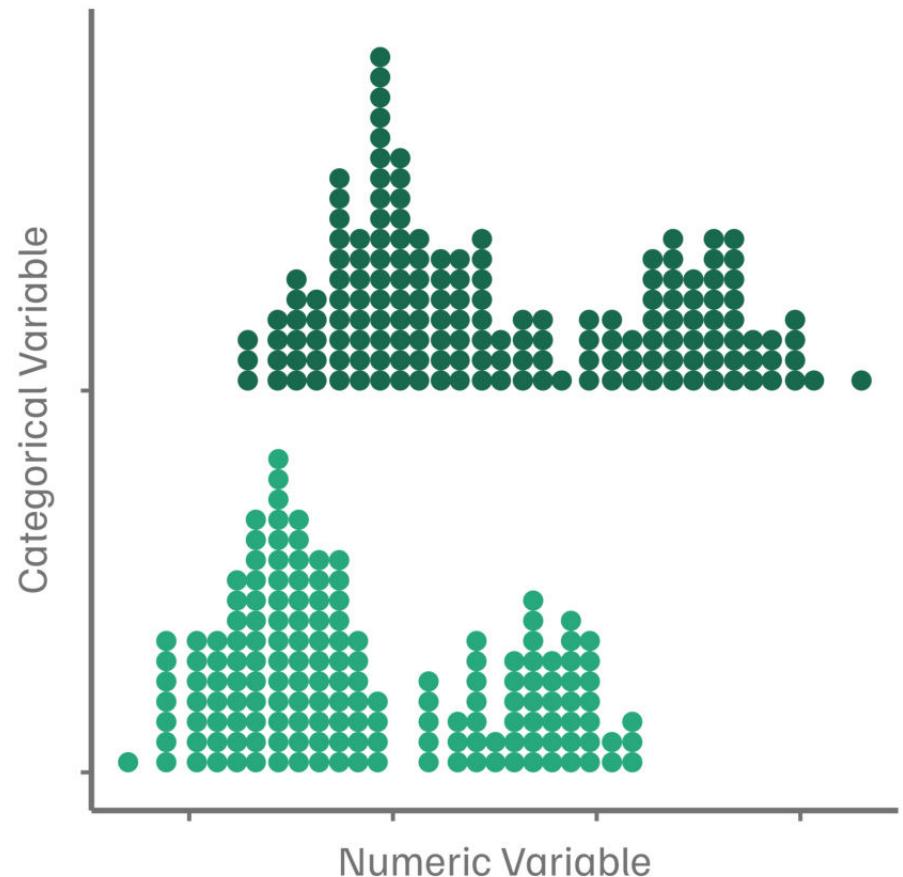


# Compare Distributions

Ridgeline Plot

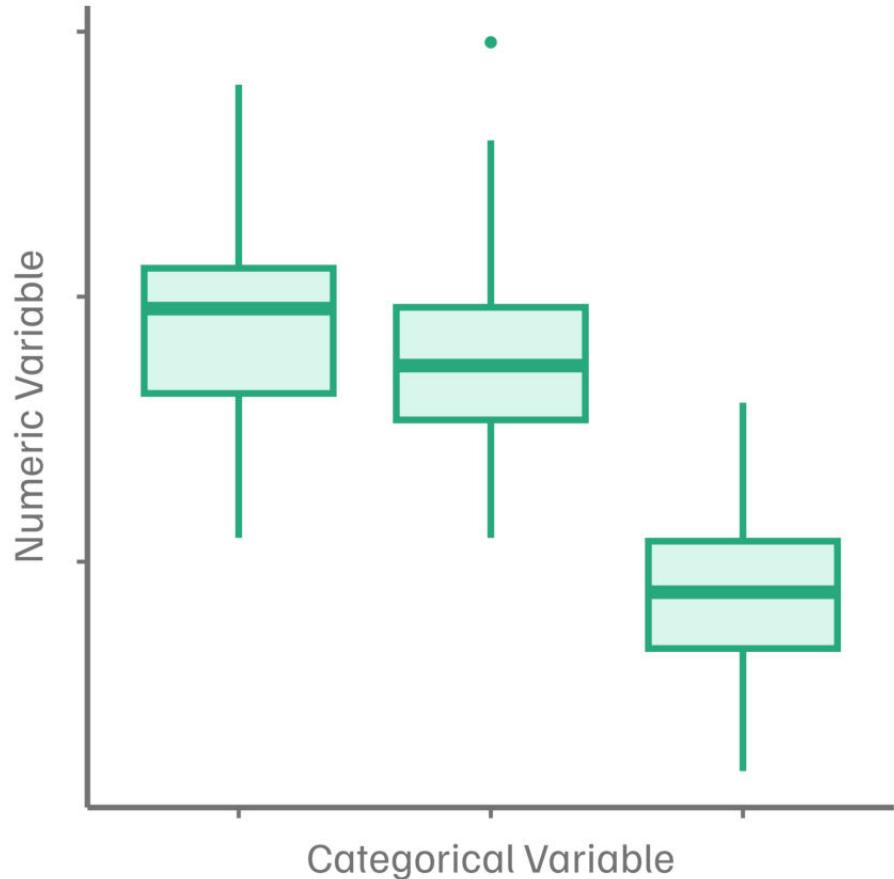


Dot Plots

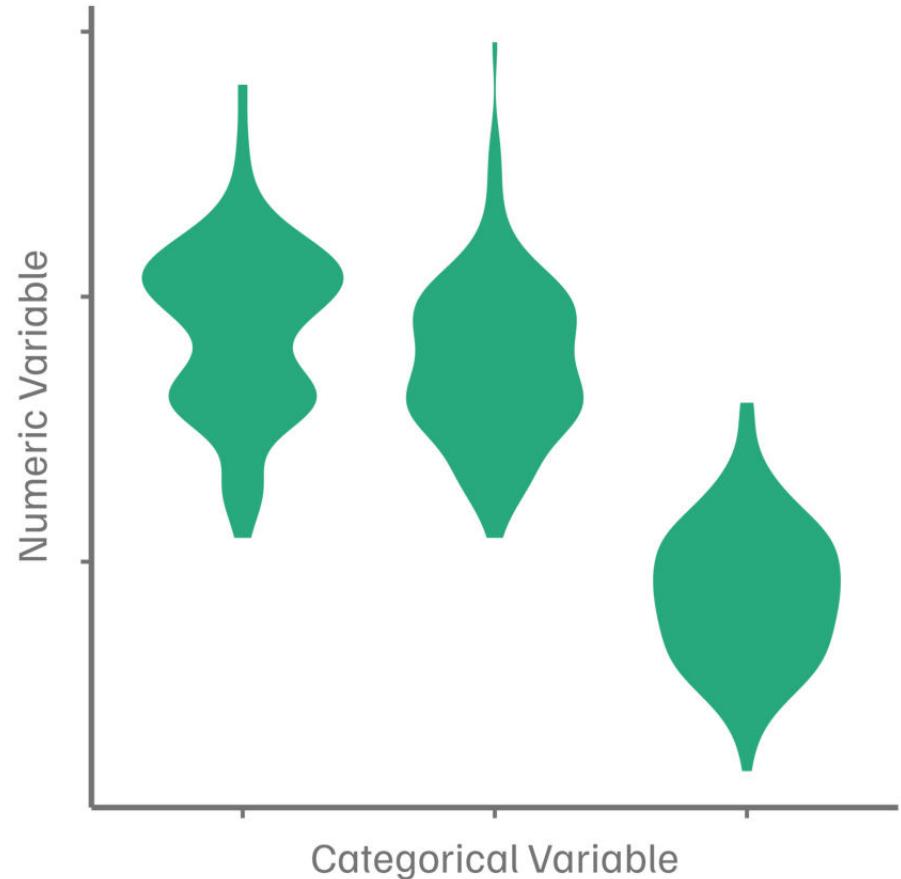


# Compare Distributions

Box-Whisker Plot

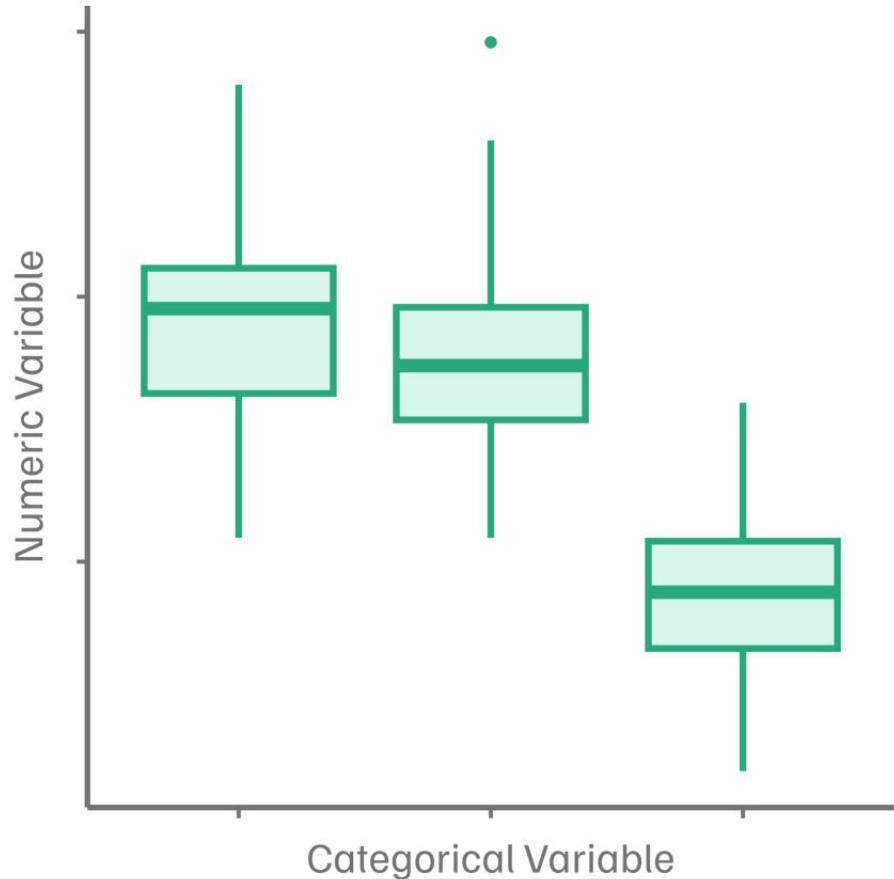


Violin Plot

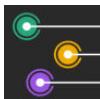
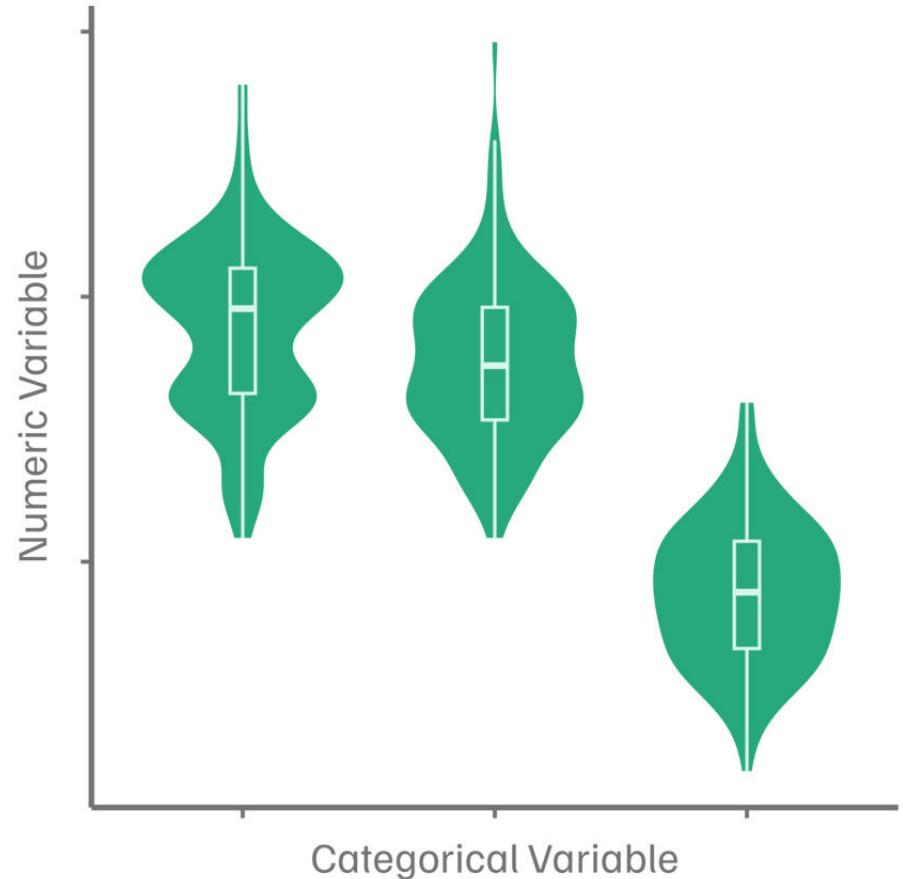


# Compare Distributions

Box-Whisker Plot

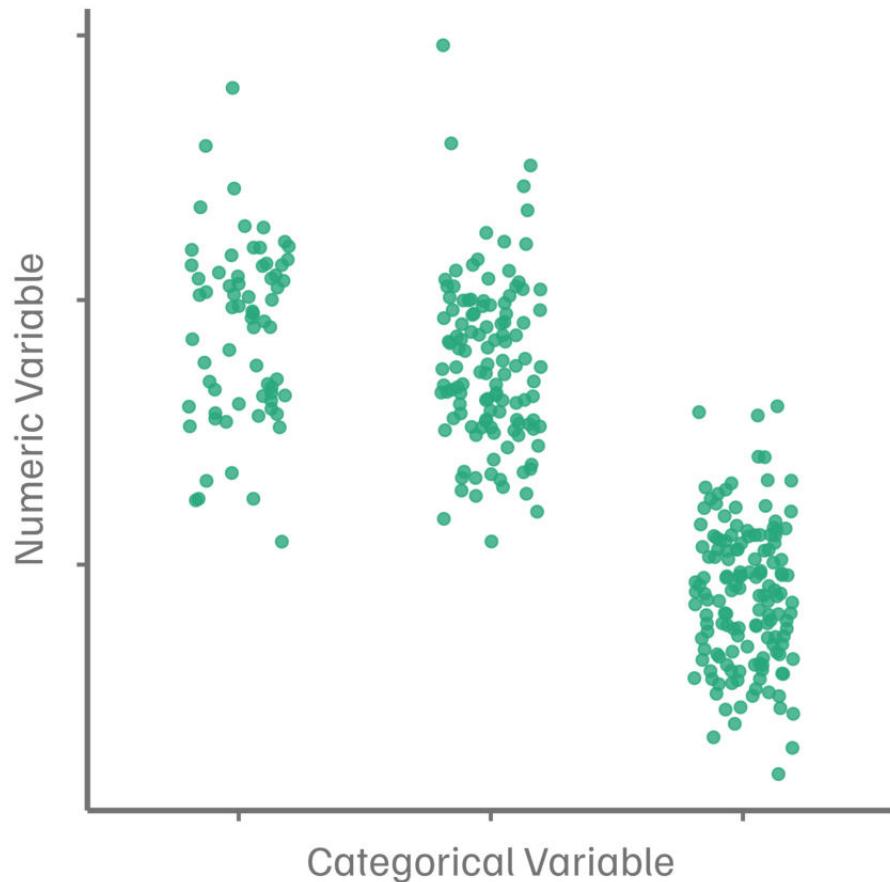


Violin Plot

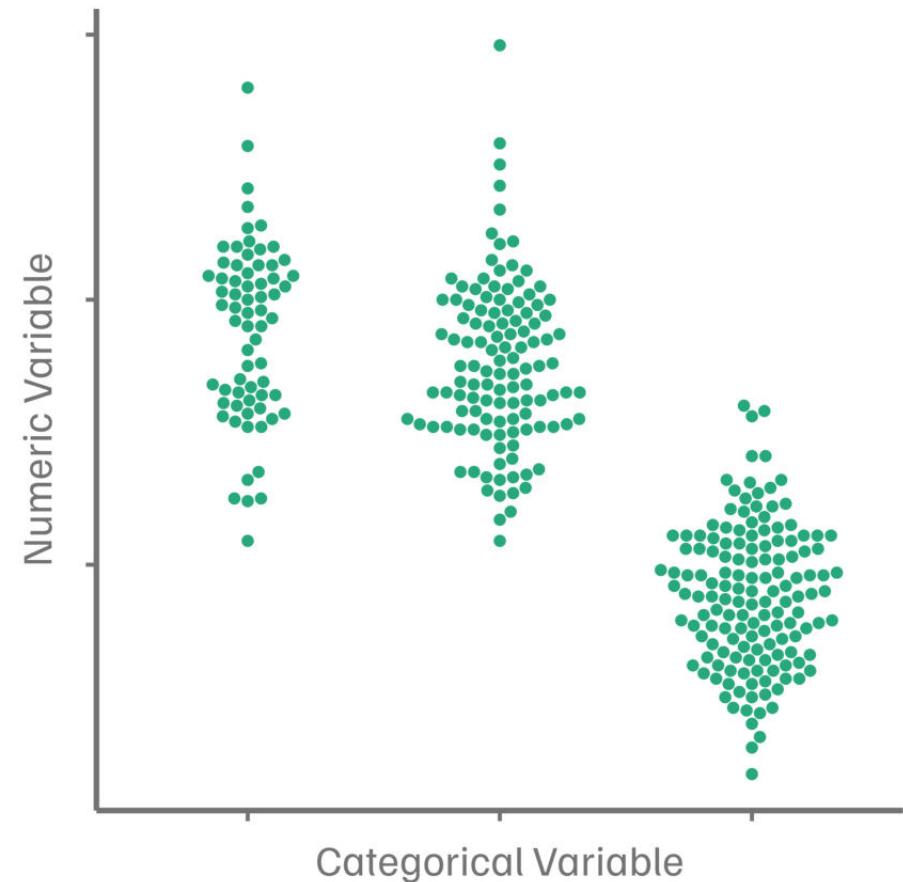


# Compare Distributions

Strip Plot



Beeswarm Plot

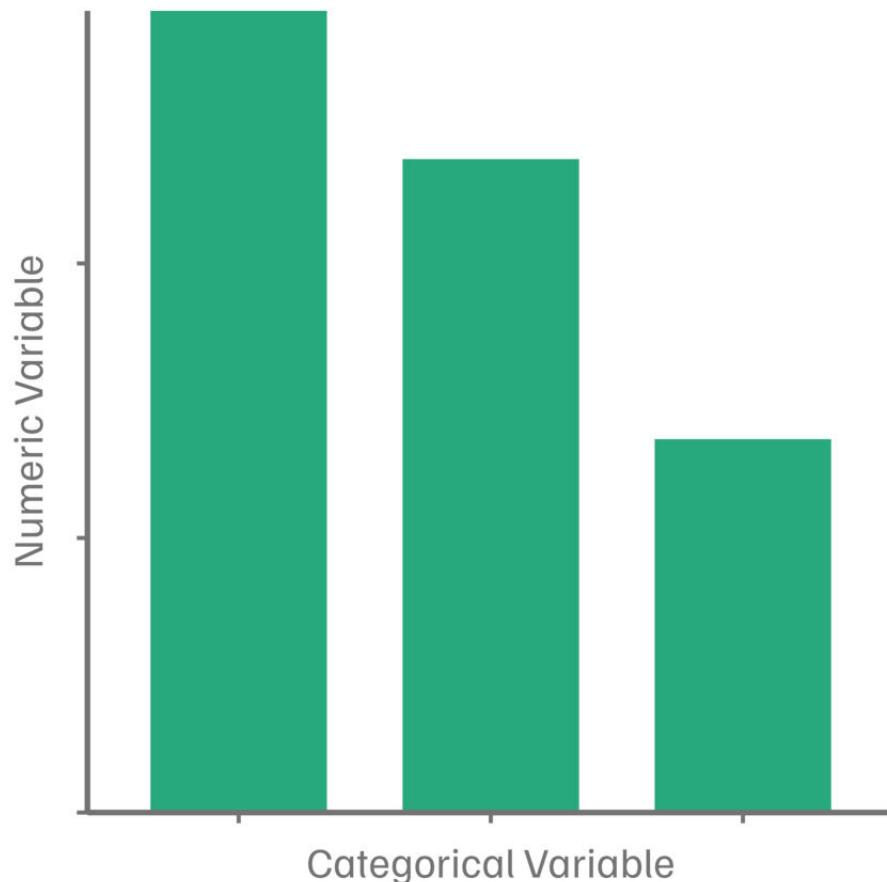


# *Compare Amounts*

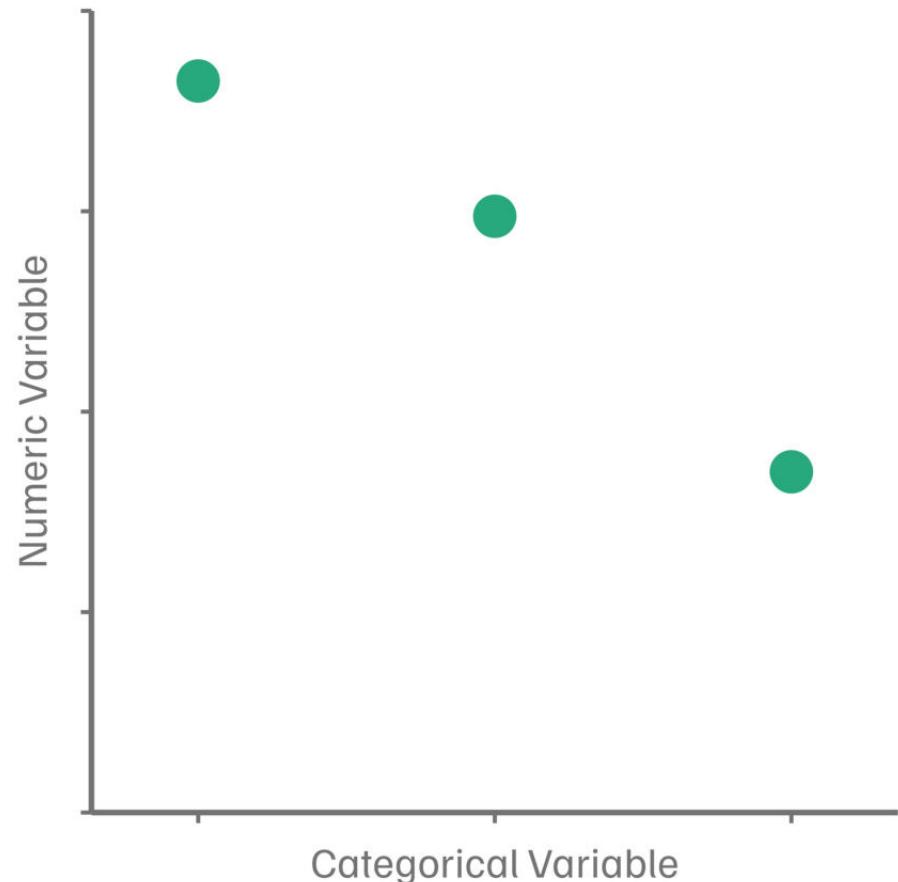


# Compare Amounts

**Bar Chart**

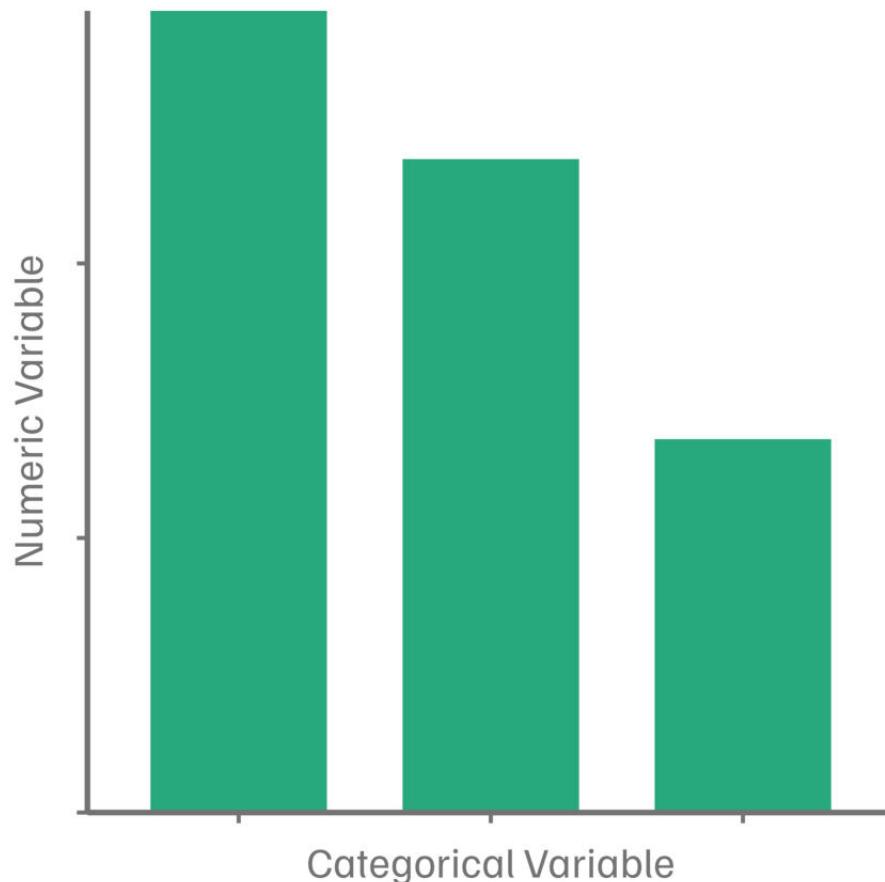


**Dot Plot**

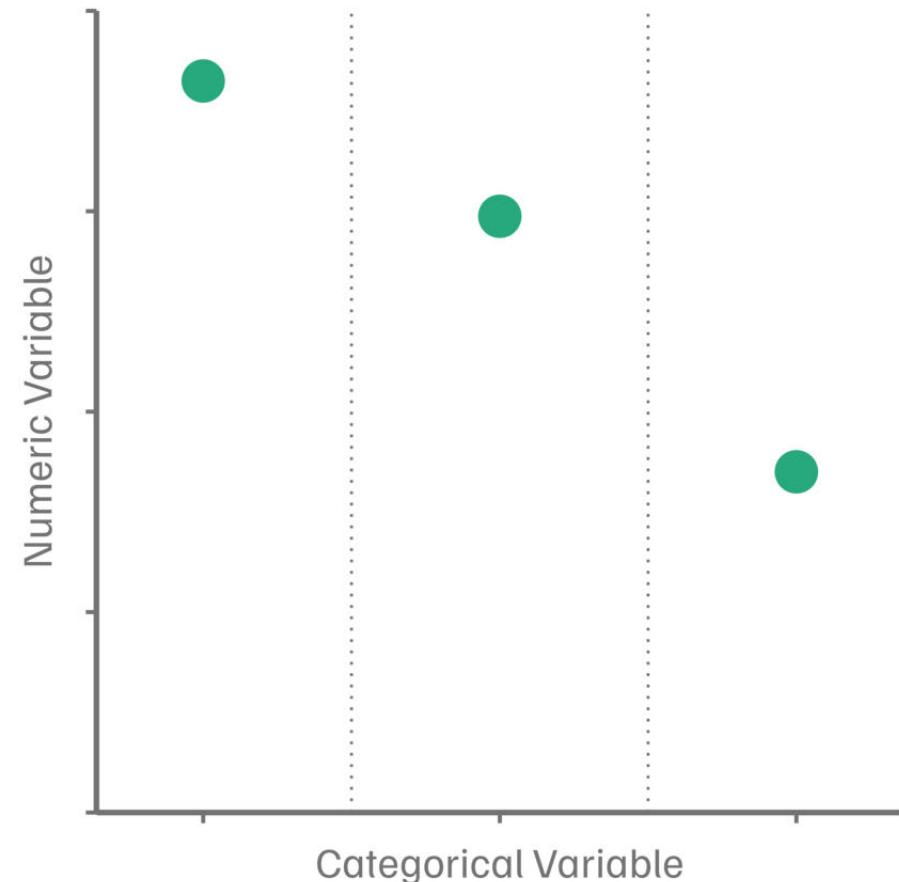


# Compare Amounts

**Bar Chart**

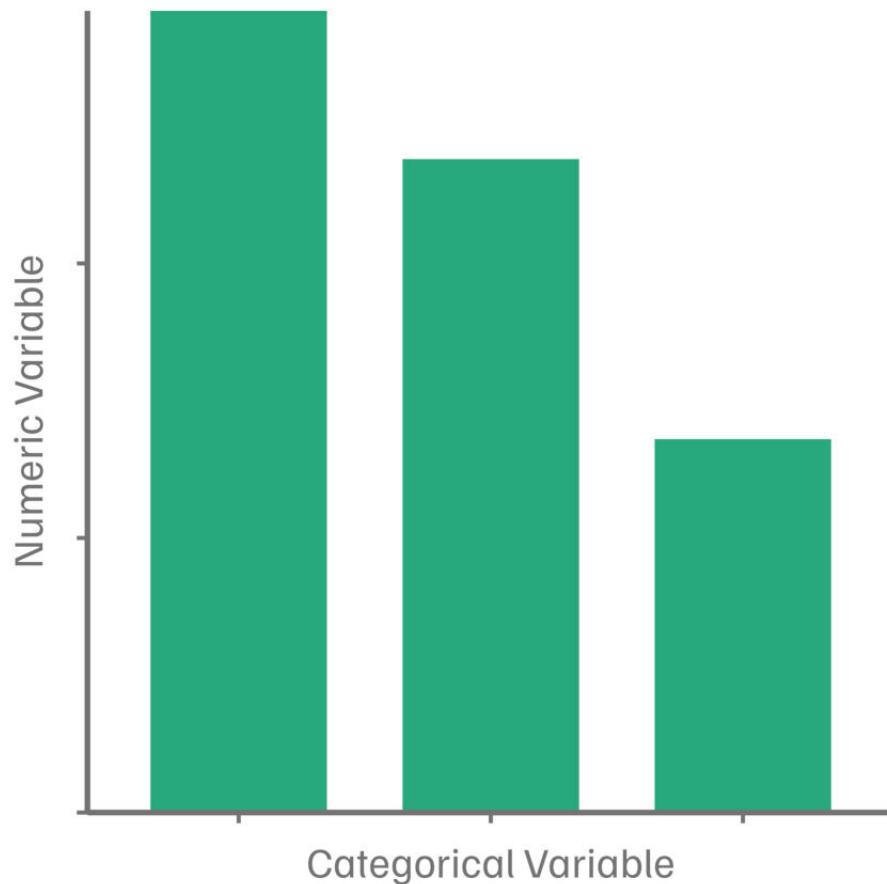


**Dot Plot**

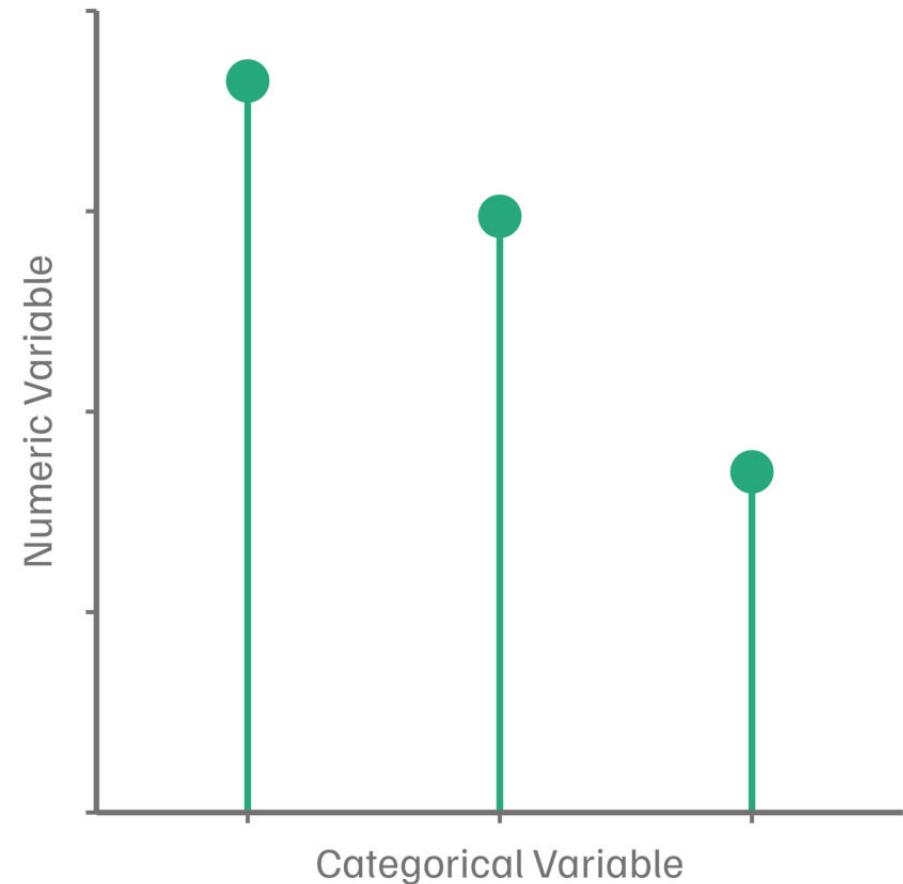


# Compare Amounts

**Bar Chart**

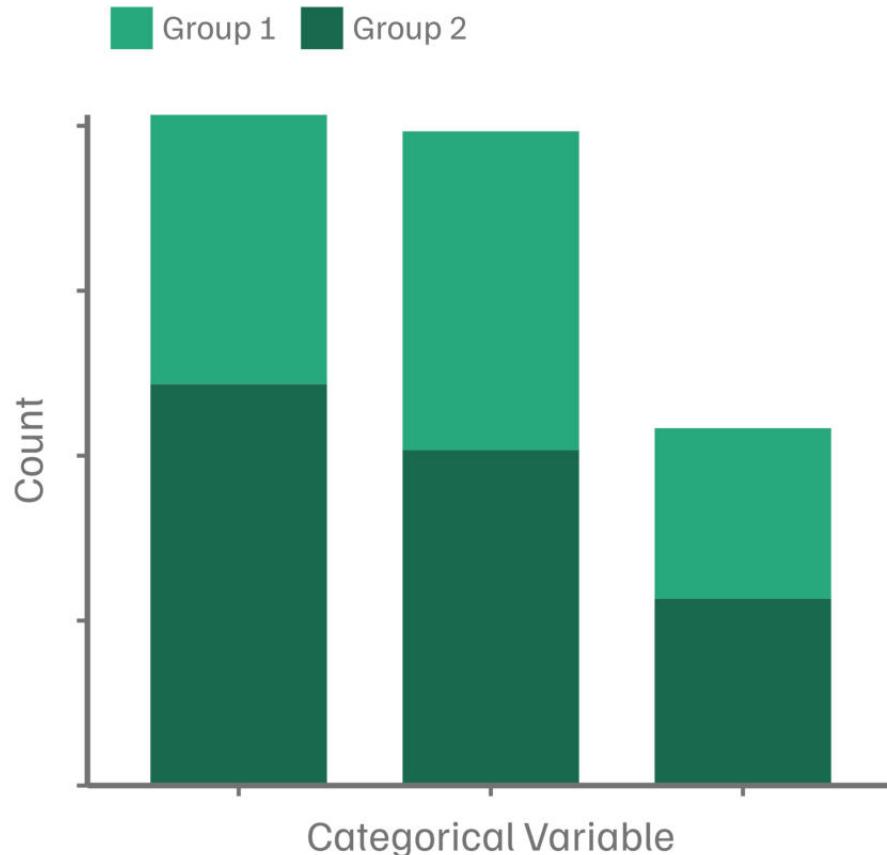


**Lollipop Chart**

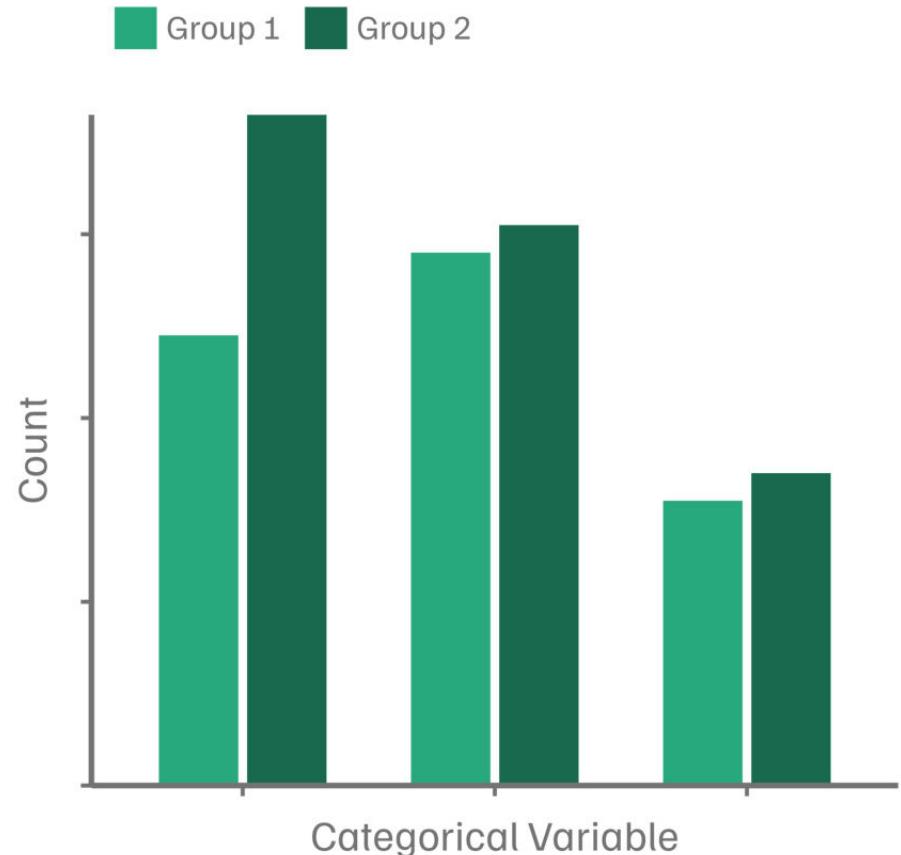


# Compare Amounts

Bar Chart (stacked)

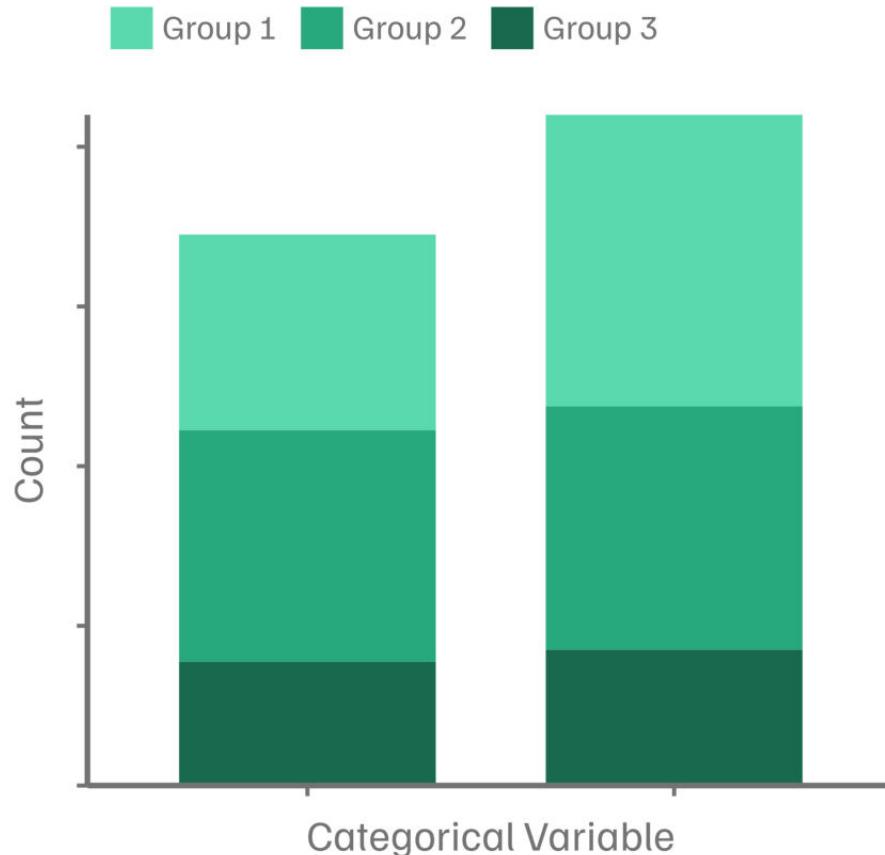


Bar Chart (grouped)

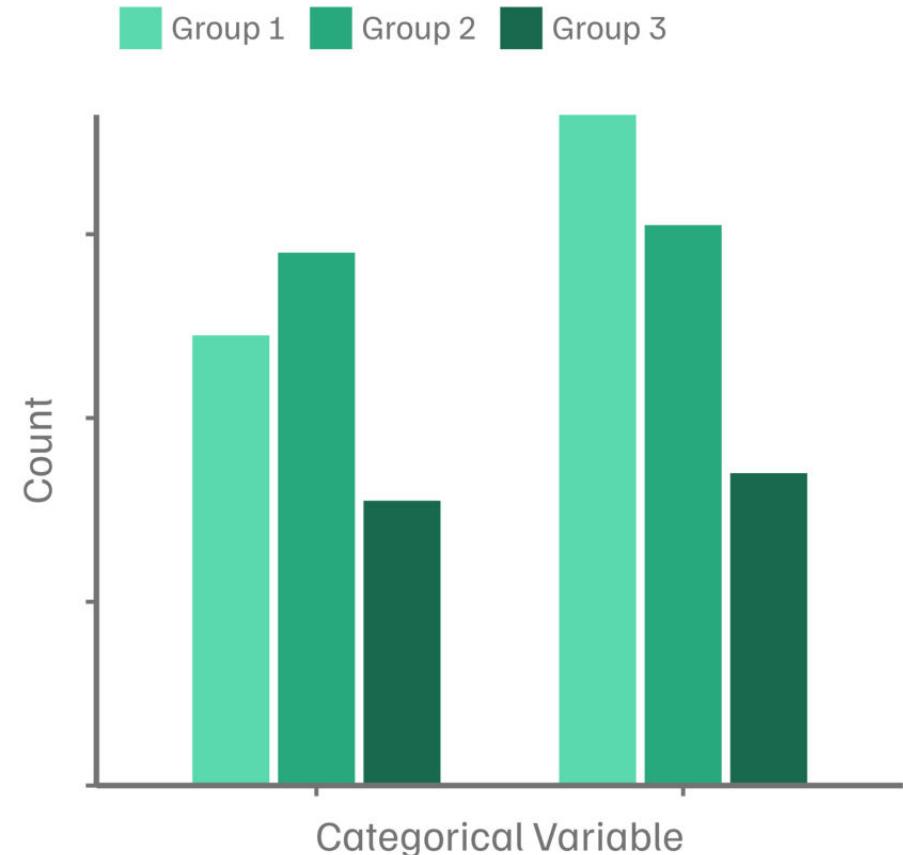


# Compare Amounts

Bar Chart (stacked)

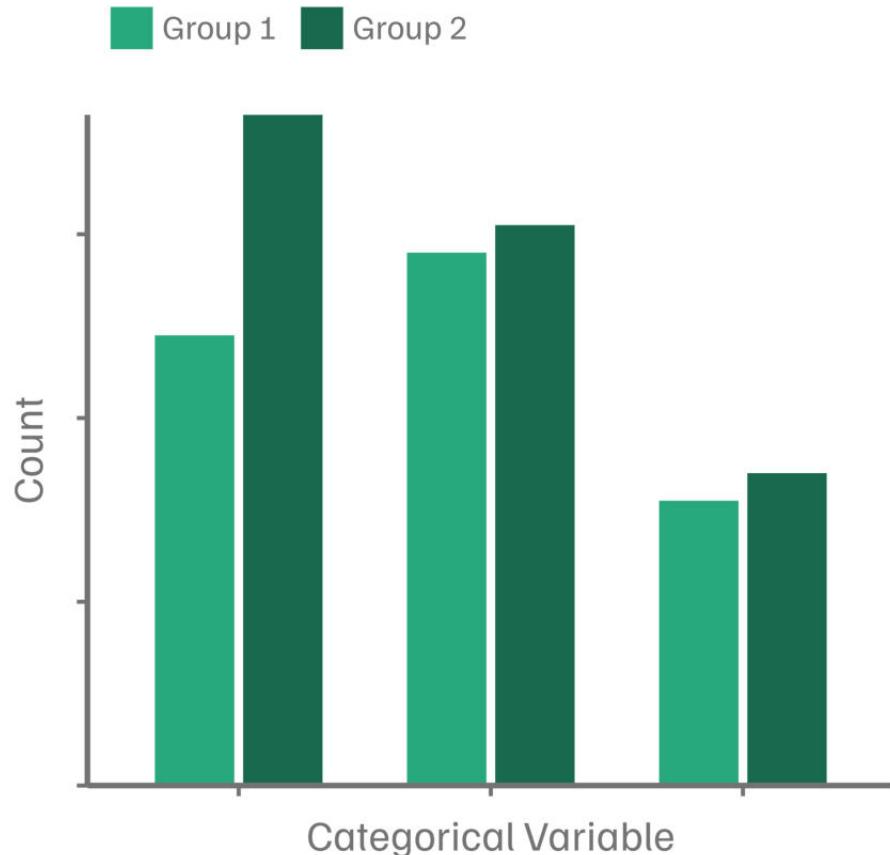


Bar Chart (grouped)

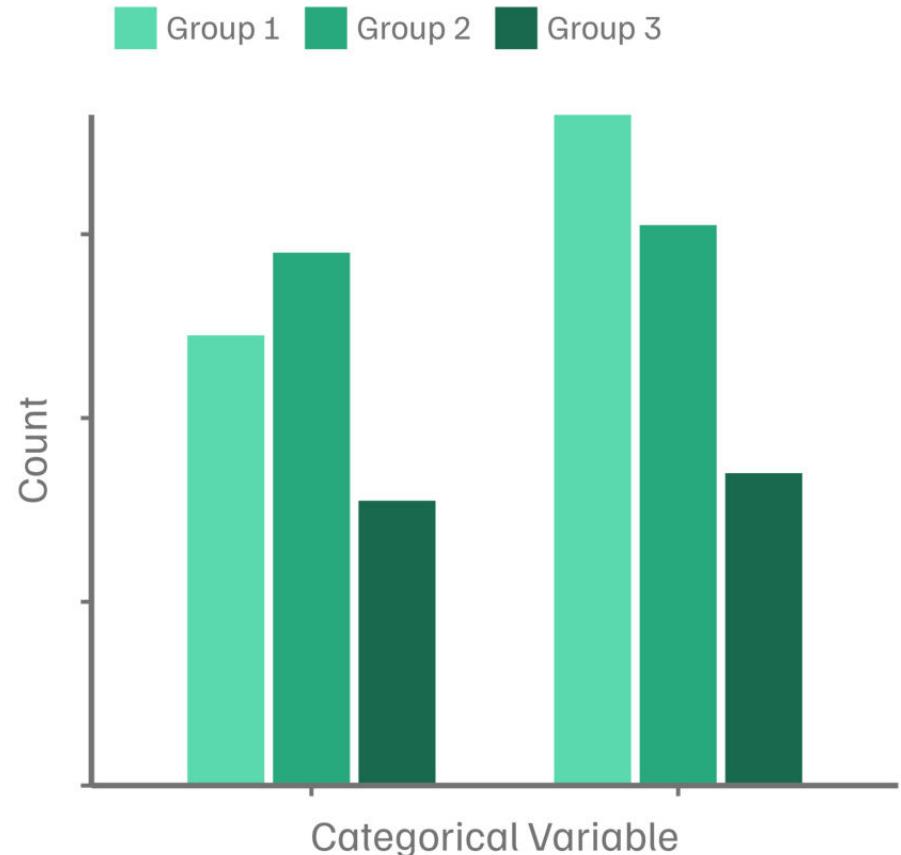


# Compare Amounts

Bar Chart (grouped)

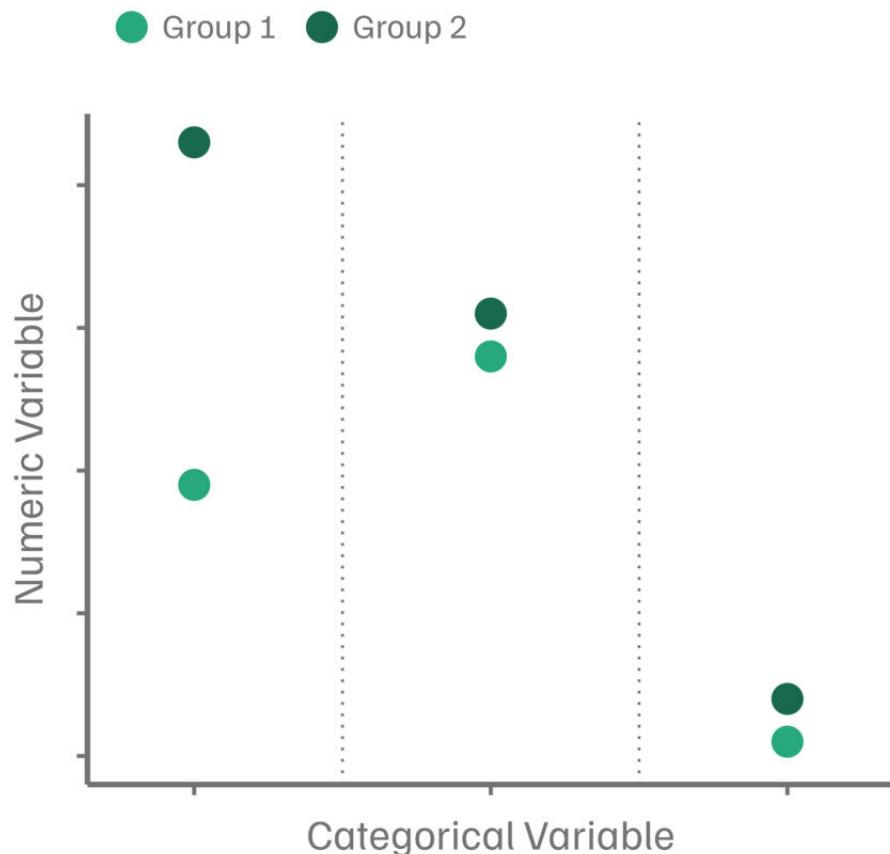


Bar Chart (grouped)

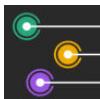
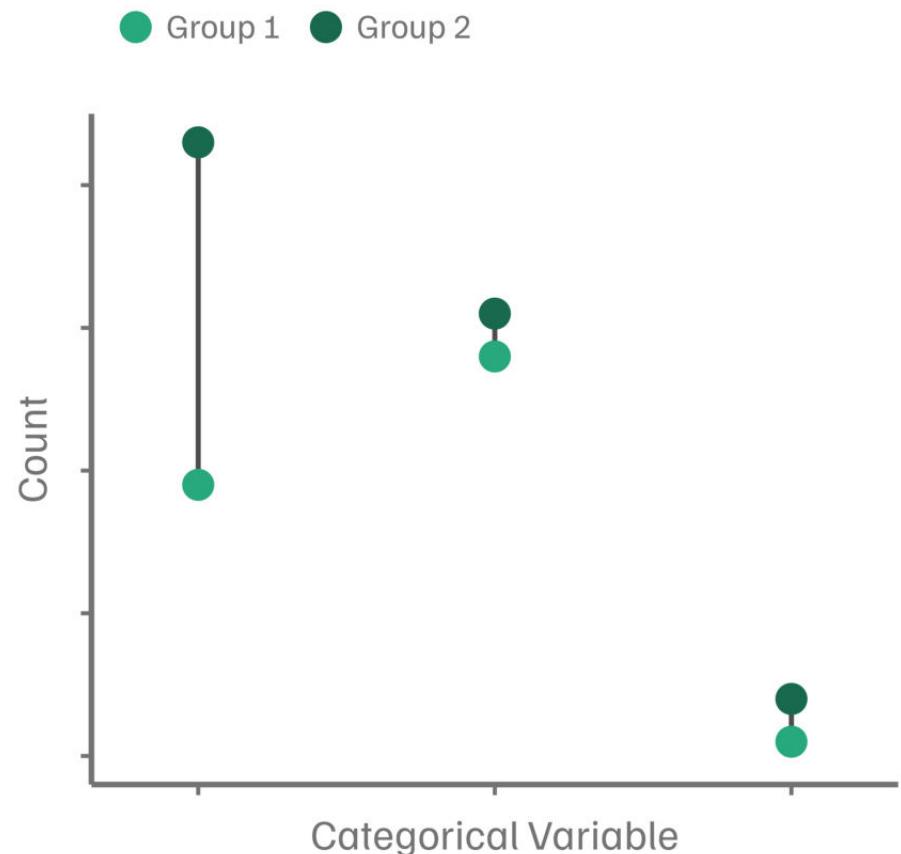


# Compare Amounts

Dot Plot

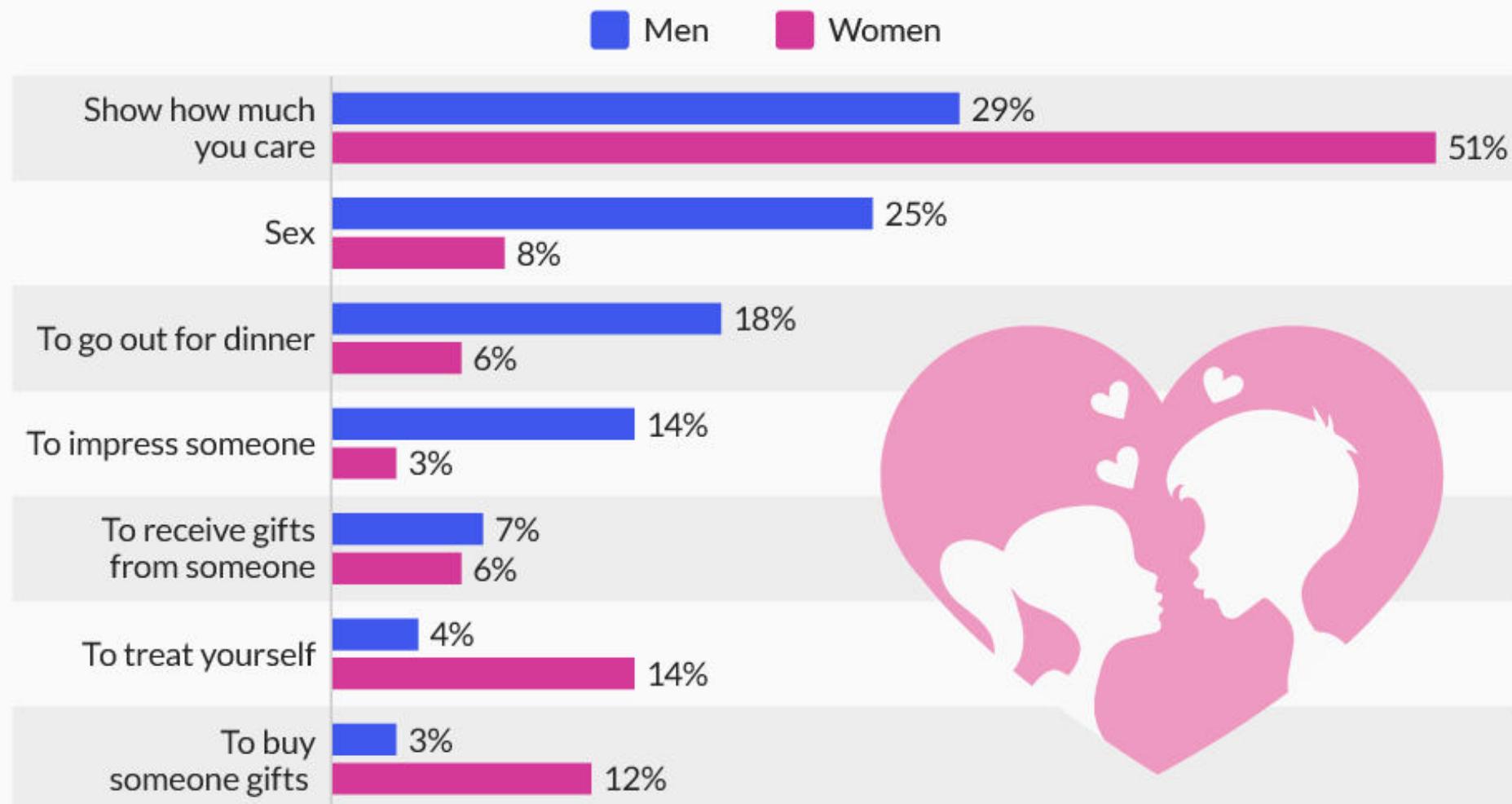


Dumbbell Plot



# What's the point of Valentine's Day?

% of men and women in the UK saying the following are the point of Valentine's Day



@StatistaCharts

Source: Chillisauce.co.uk

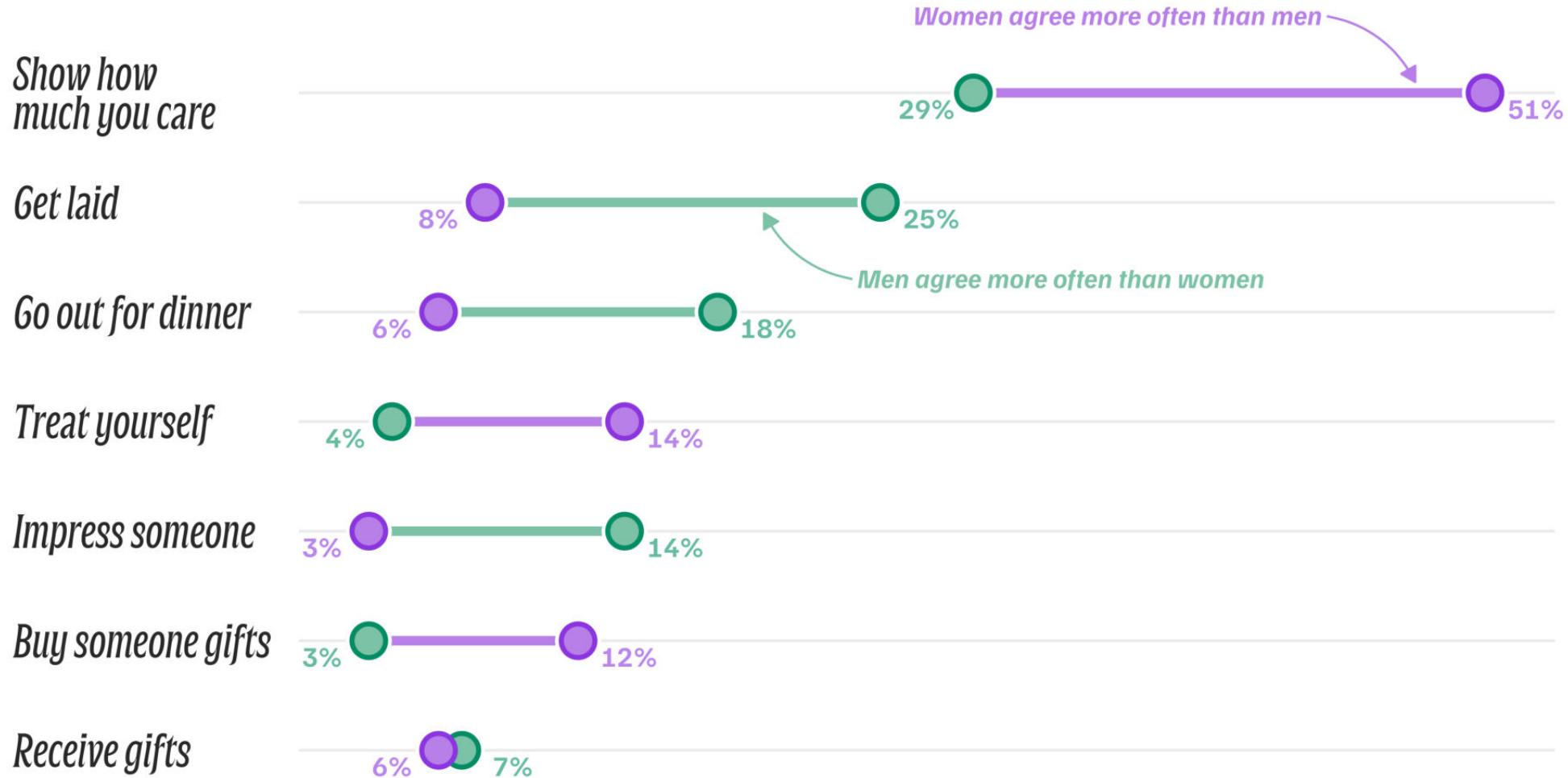
i100

from  
The INDEPENDENT

statista



For 25% of surveyed men, the point of Valentine's Day is to “*get laid*” —more than the half of women responded “*show how much you care*”

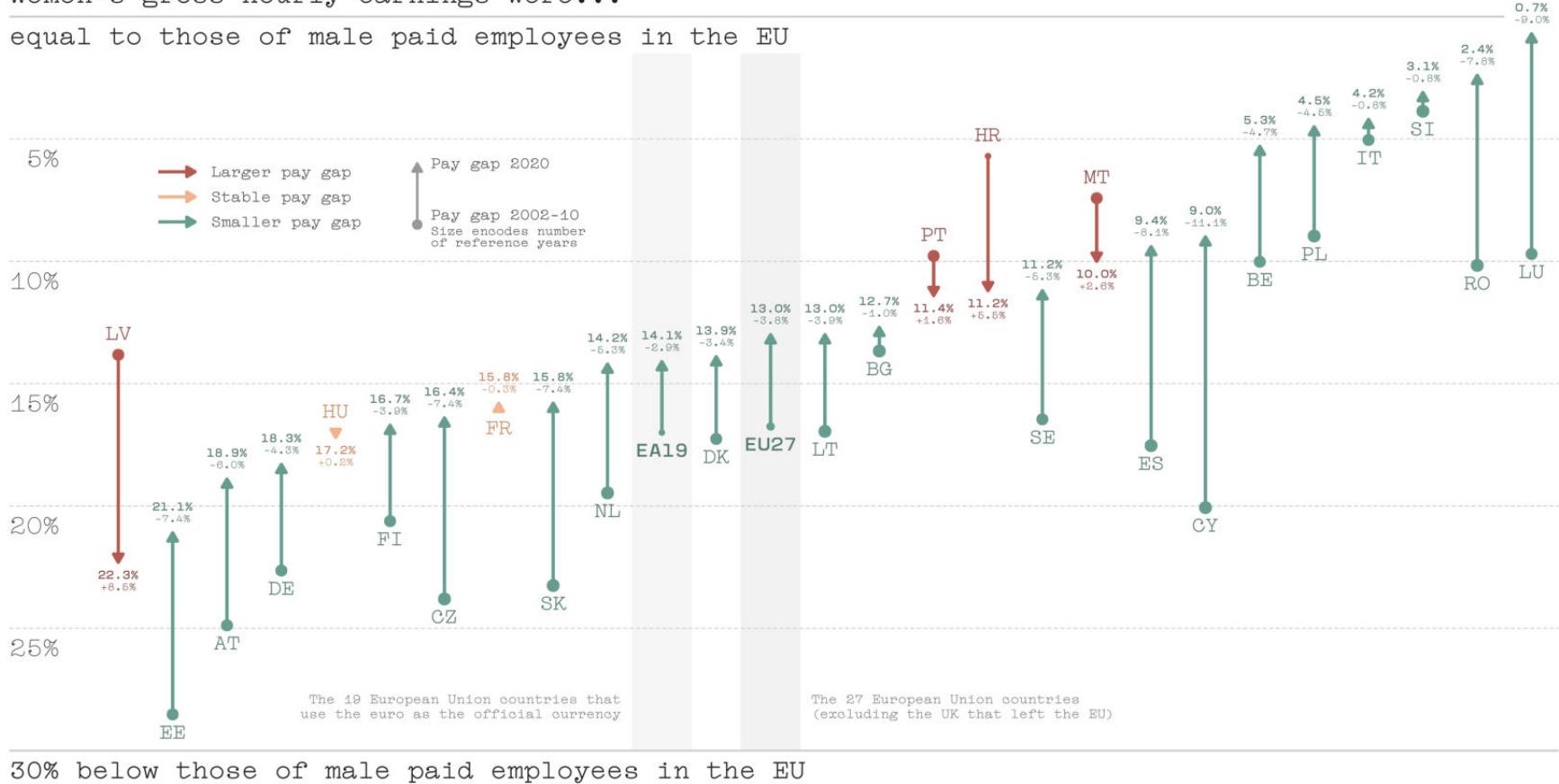


Visualization: Cédric Scherer • Data: UK survey in 2015 by chilisauce.co.uk



Women's gross hourly earnings were...

equal to those of male paid employees in the EU



In 2020, women's gross hourly earnings were on average 13% below those of men in the EU. Many countries were able to decrease the pay gap between male and female employees: most notably Luxembourg with the smallest gap in 2020 of 0.7% and Romania with a decrease of 13.6% within 18 years to 2.4%, ranking second. However, in several countries the pay gap was almost stable (Hungary and France) or even increased (Latvia, Portugal, Croatia, and Malta) compared to the gap in the reference period from 2002 to 2010 for all years available via Eurostat.

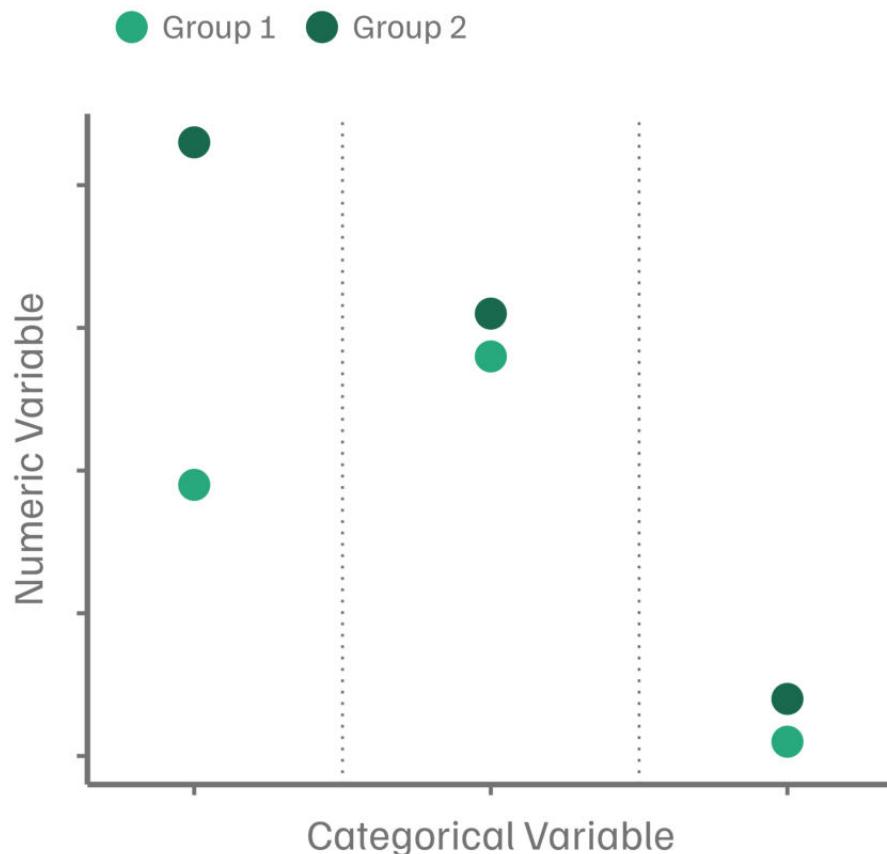
As an unadjusted indicator, the gender pay gap gives an overall picture of the differences between men and women in terms of earnings and measures – a concept which is broader than discrimination in the sense of: *equal pay for work of equal value*.

Graphic: Cédric Scherer • Data: Eurostat (SDG\_05\_20; no data for Greece and Ireland) • #InternationalWomensDay2022

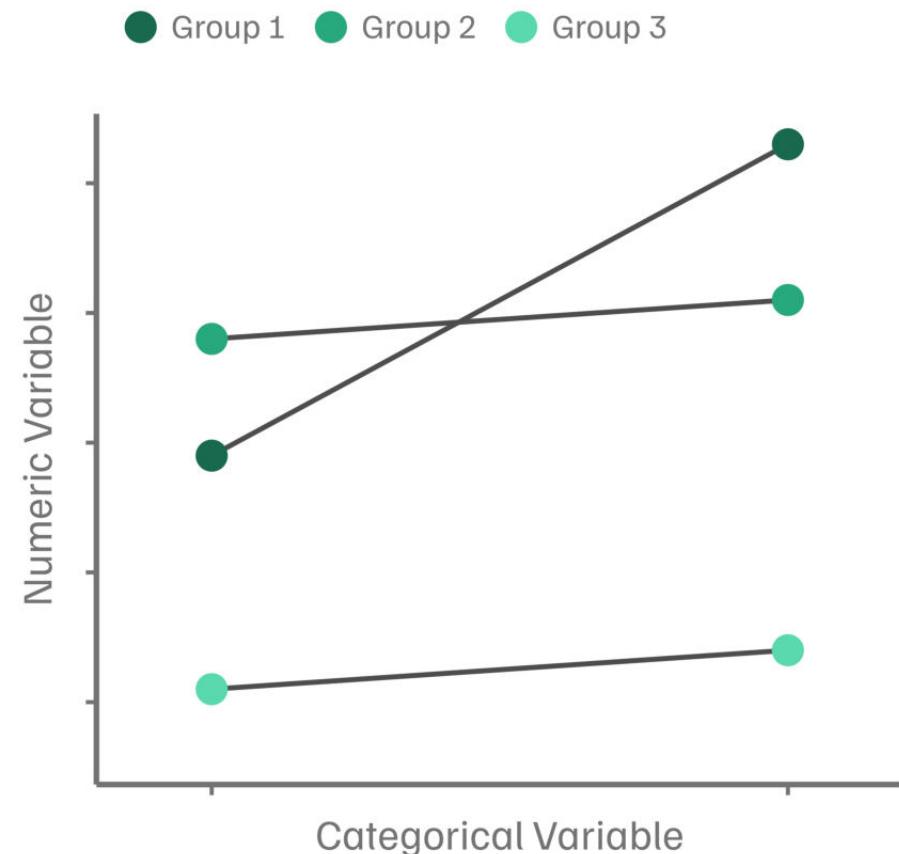


# Compare Amounts

**Dot Plot**

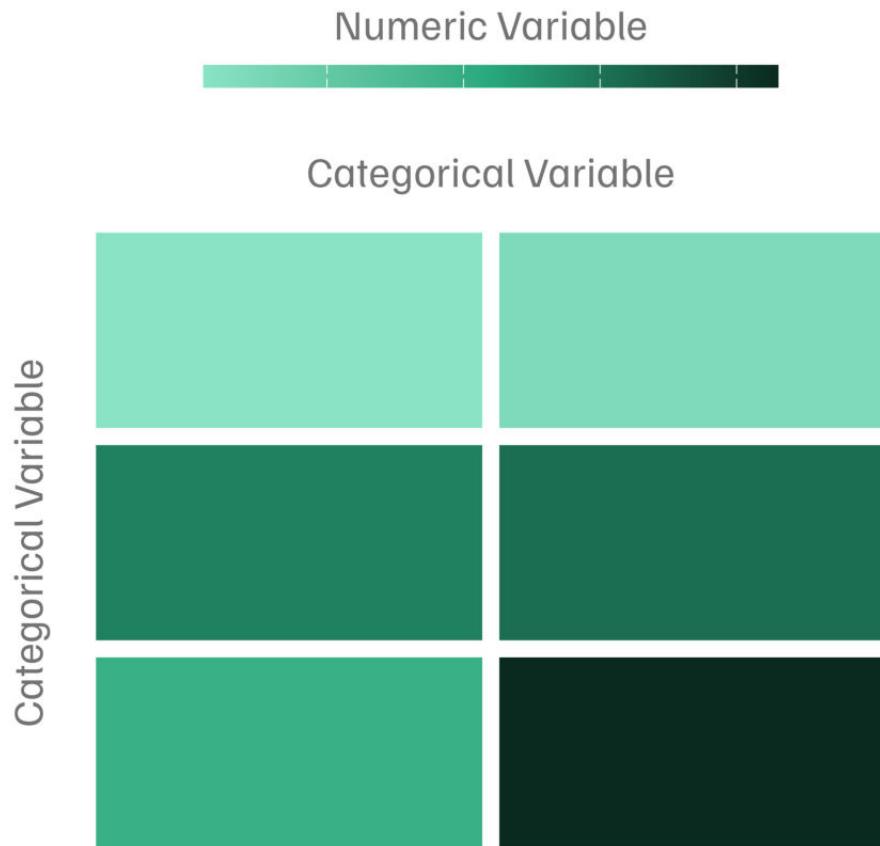


**Slope Chart**

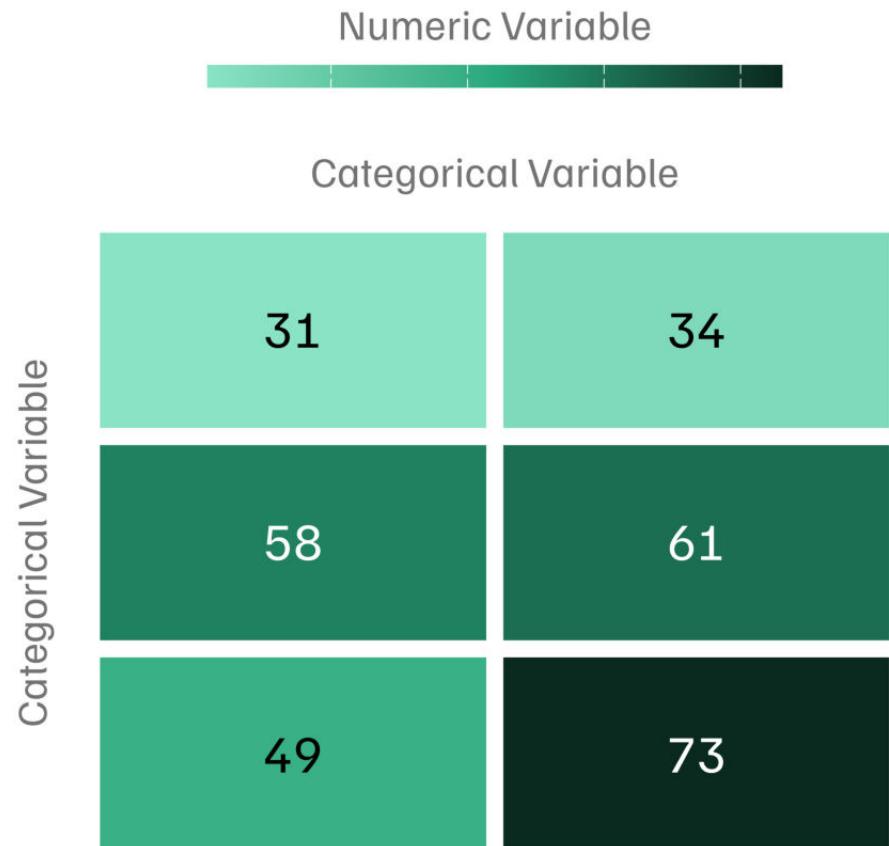


# Compare Amounts

## Heatmap



## Heatmap Table

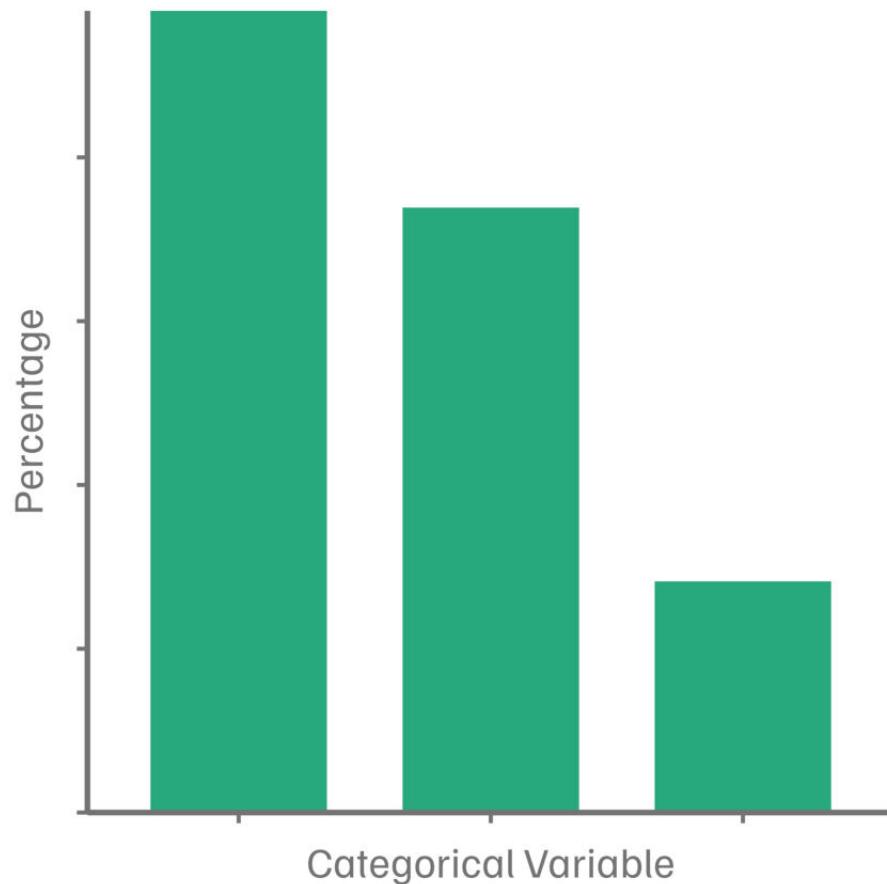


# Compare Proportions

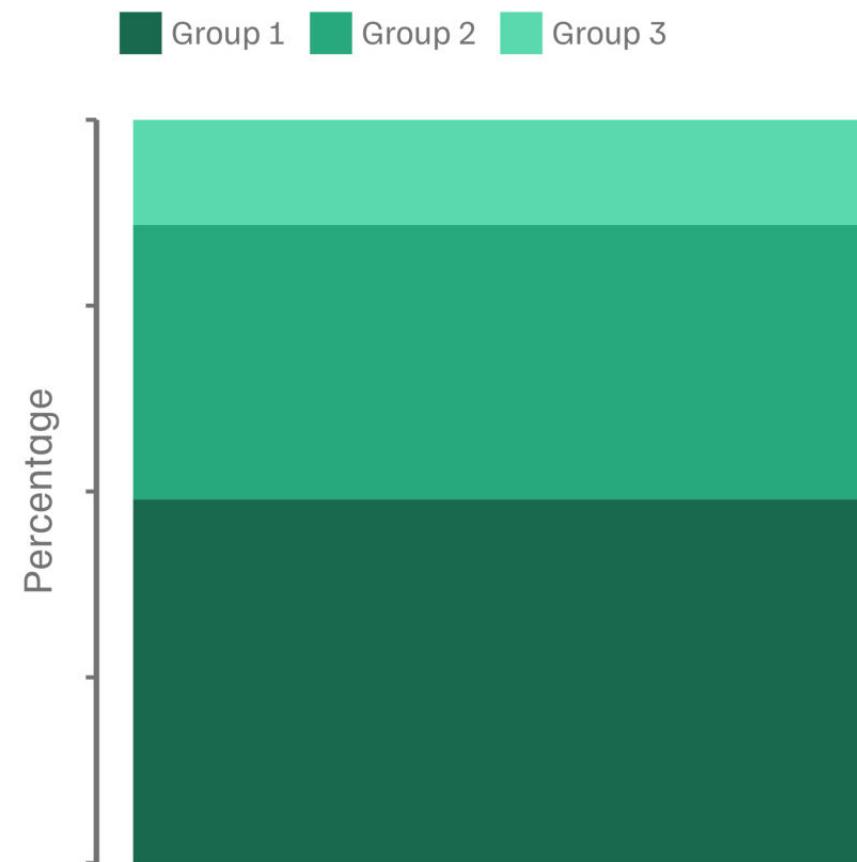


# Compare Proportions

Bar Chart

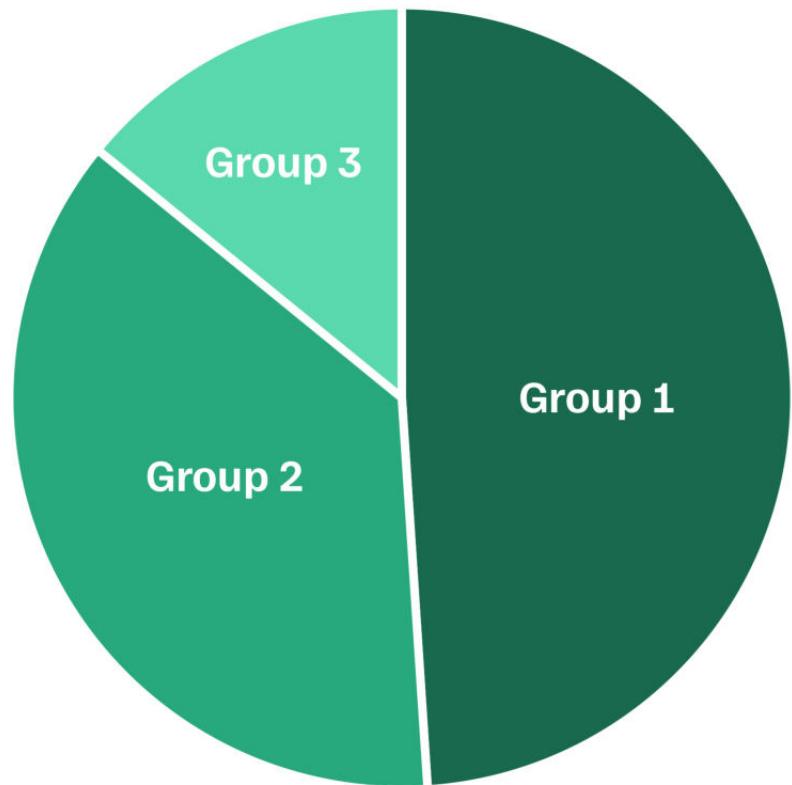


Bar Chart (stacked to 100%)

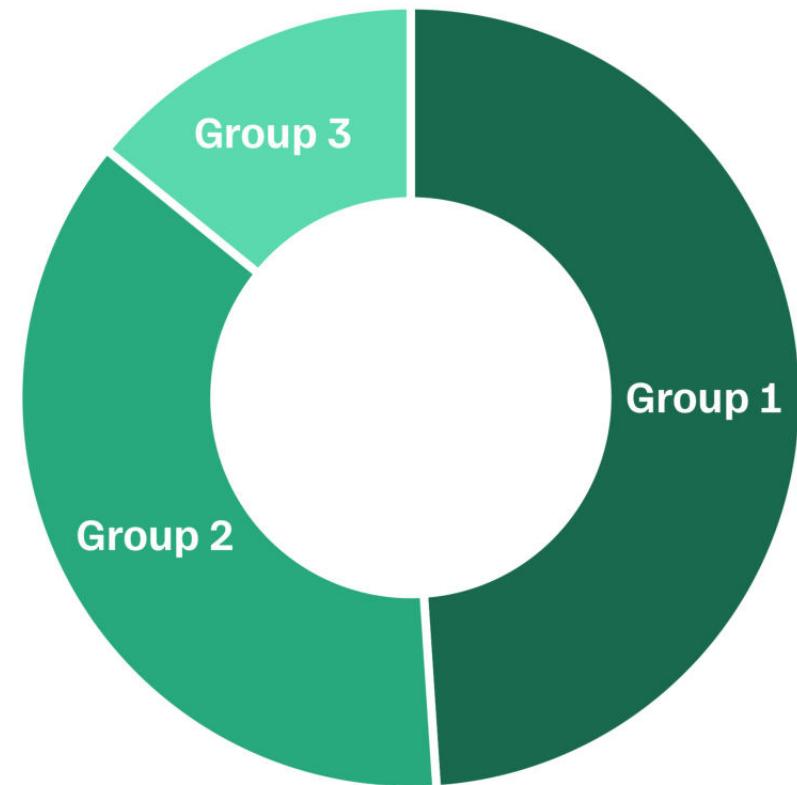


# Compare Proportions

Pie Chart

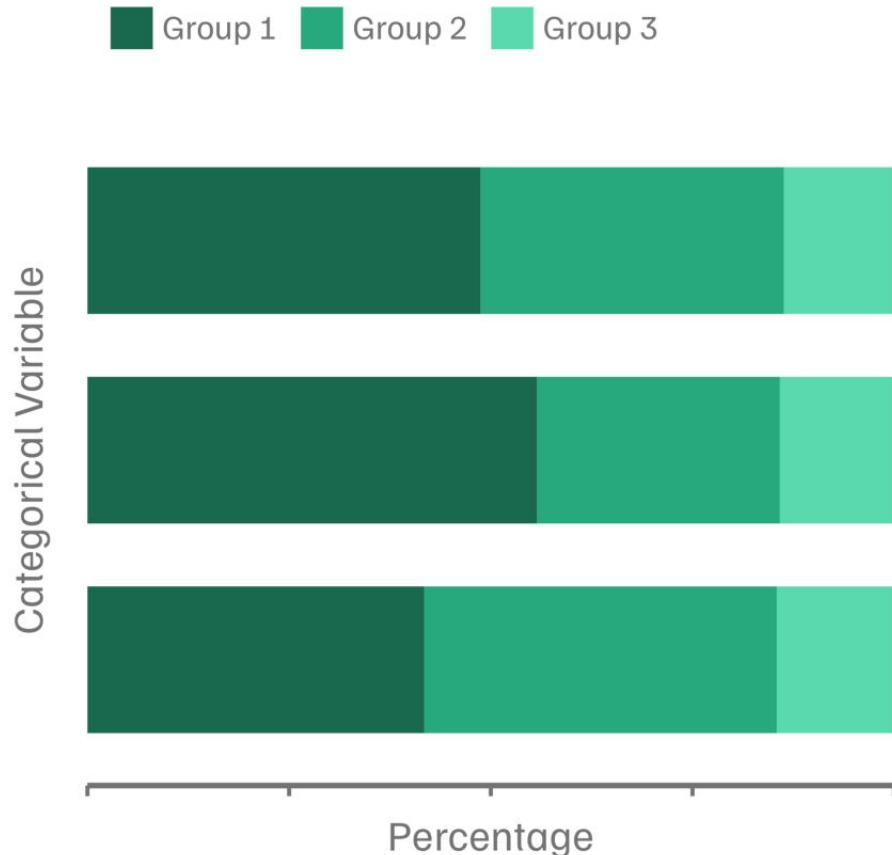


Donut Chart

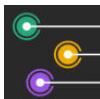
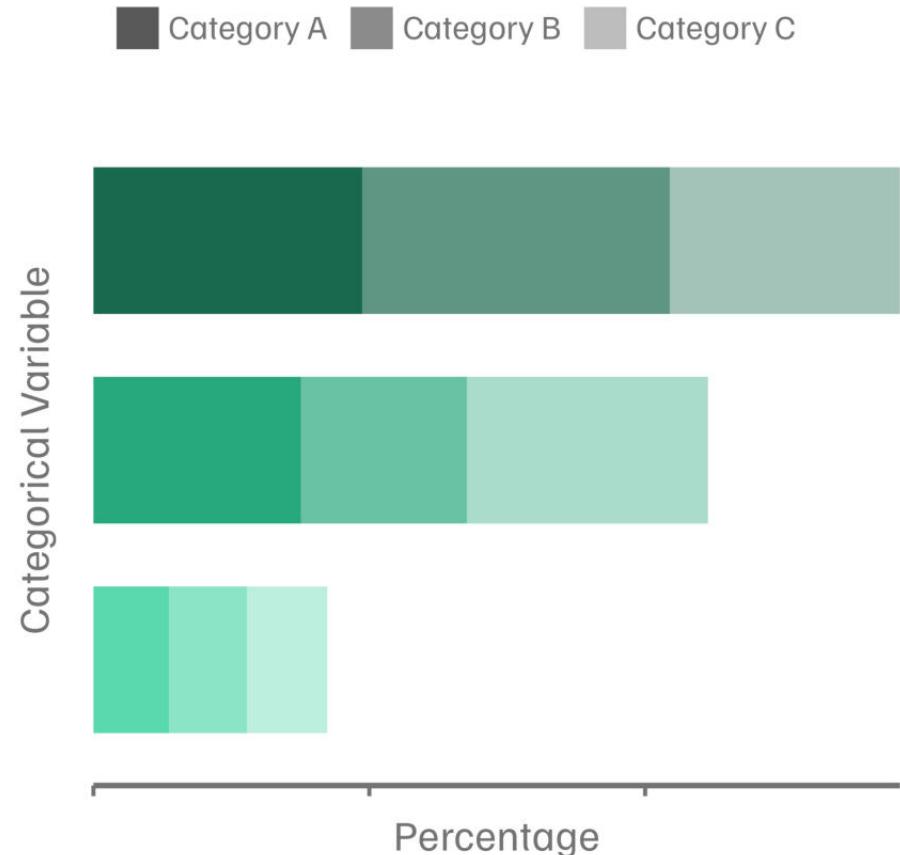


# Compare Proportions

Bar Charts (stacked to 100%)

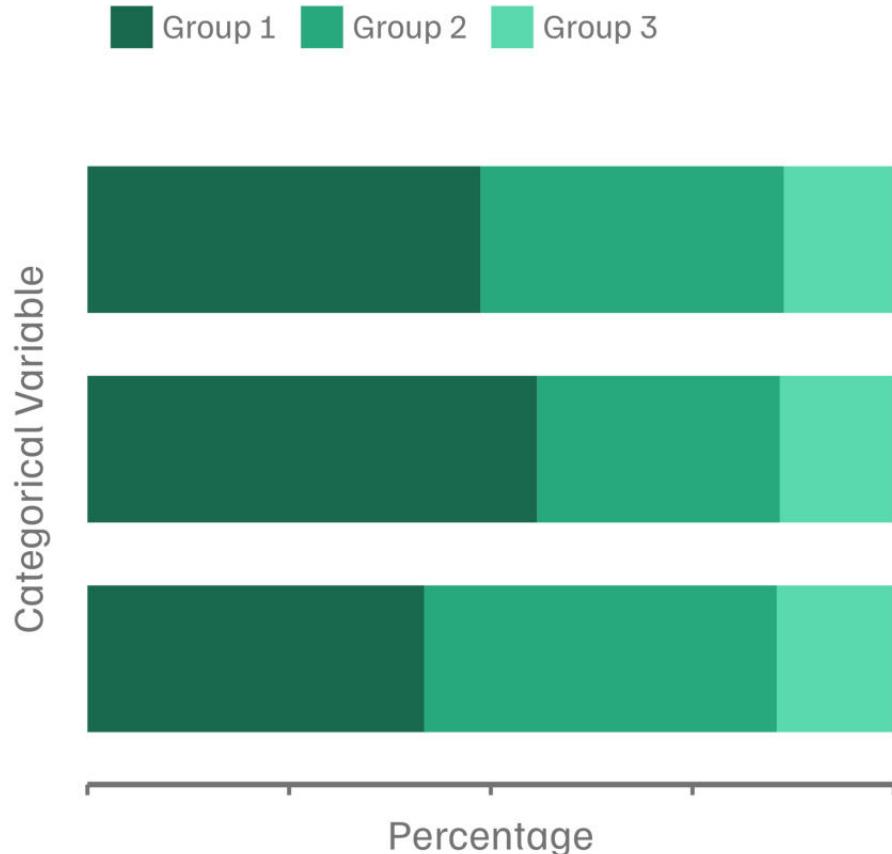


Bar Charts (stacked by category)

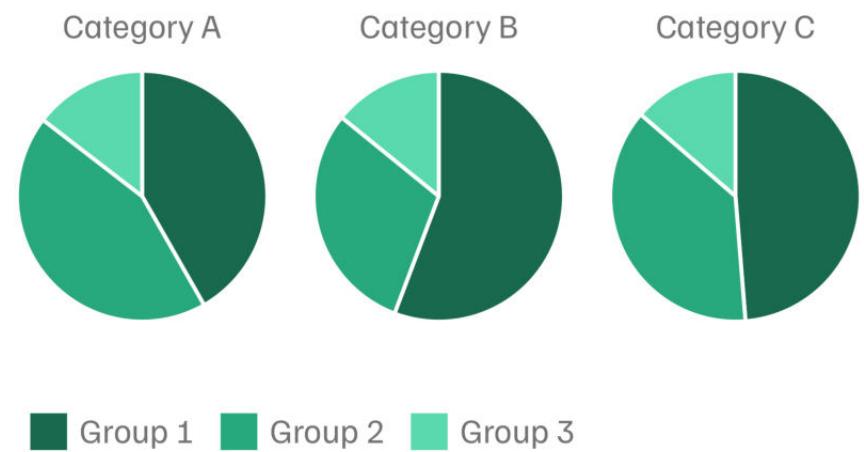


# Compare Proportions

## Bar Charts (stacked to 100%)



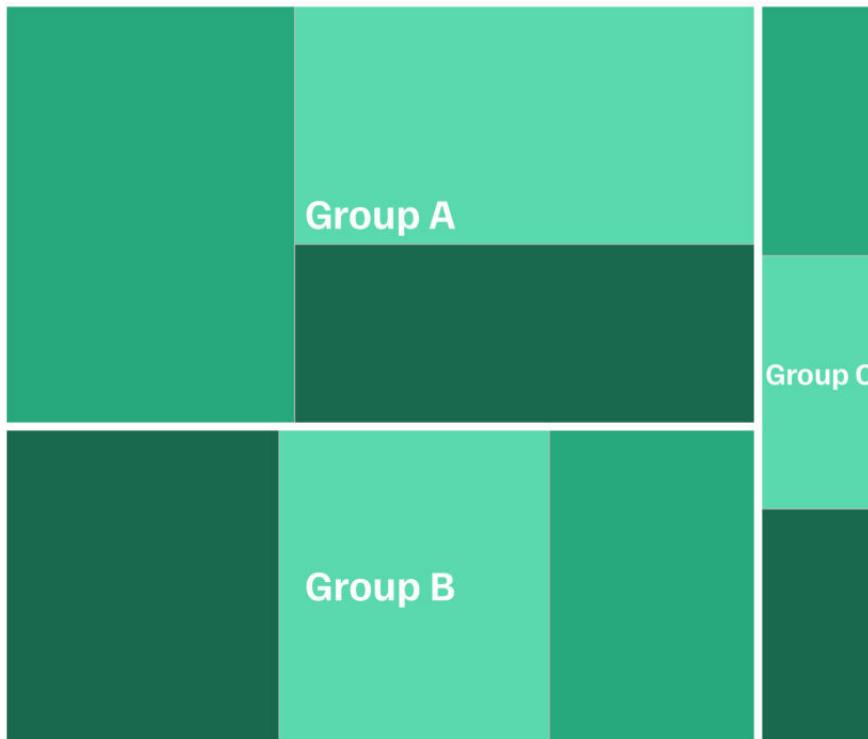
## Pie Charts



# Compare Proportions

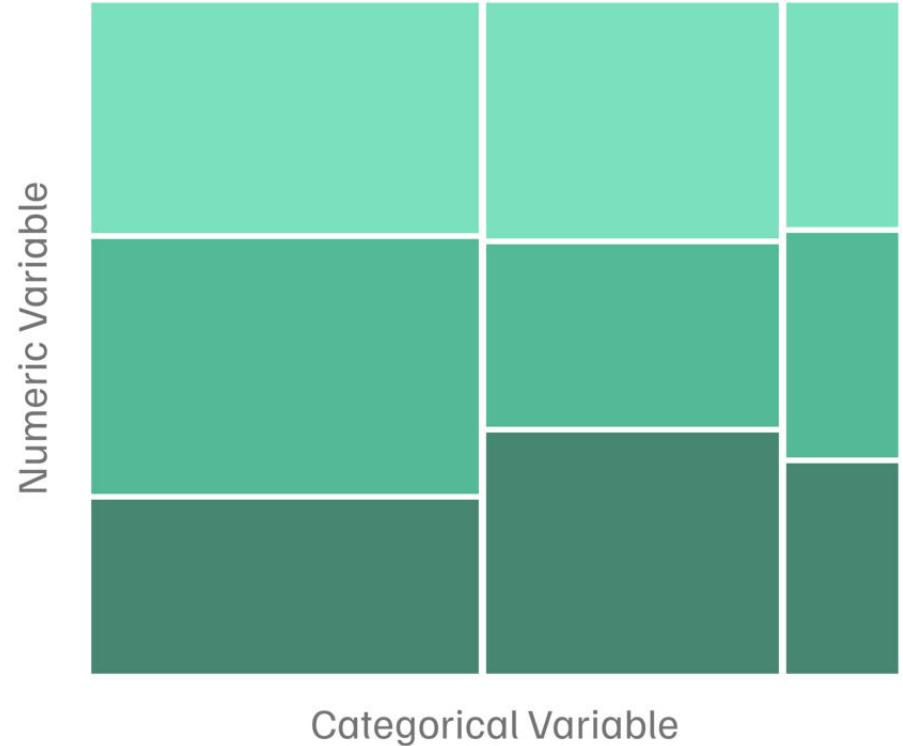
## Treemap

■ Group 1 ■ Group 2 ■ Group 3



## Mosaic Plot

■ Group 1 ■ Group 2 ■ Group 3

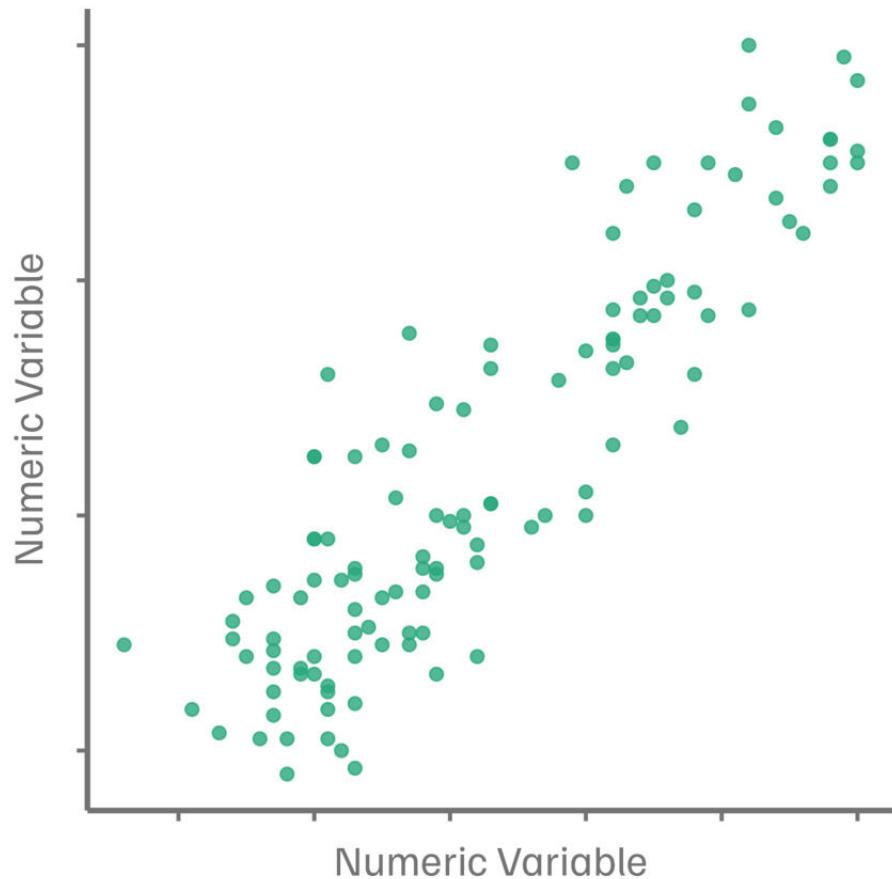


# Visualize Relationships

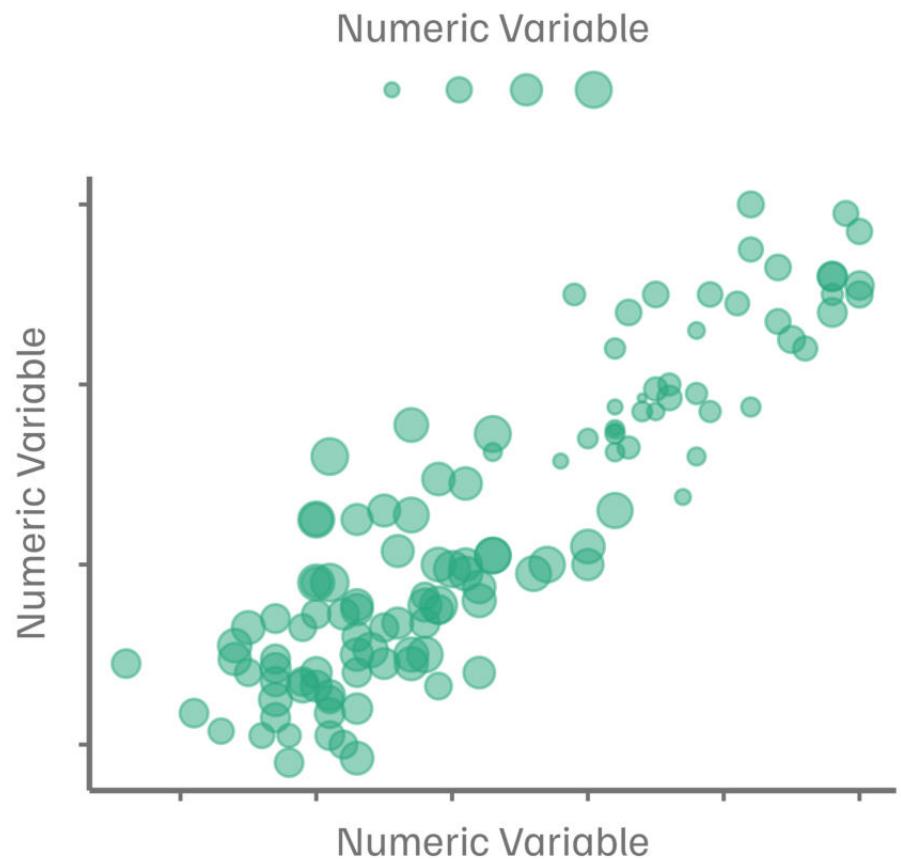


# Visualize Relationships

Scatter Plot

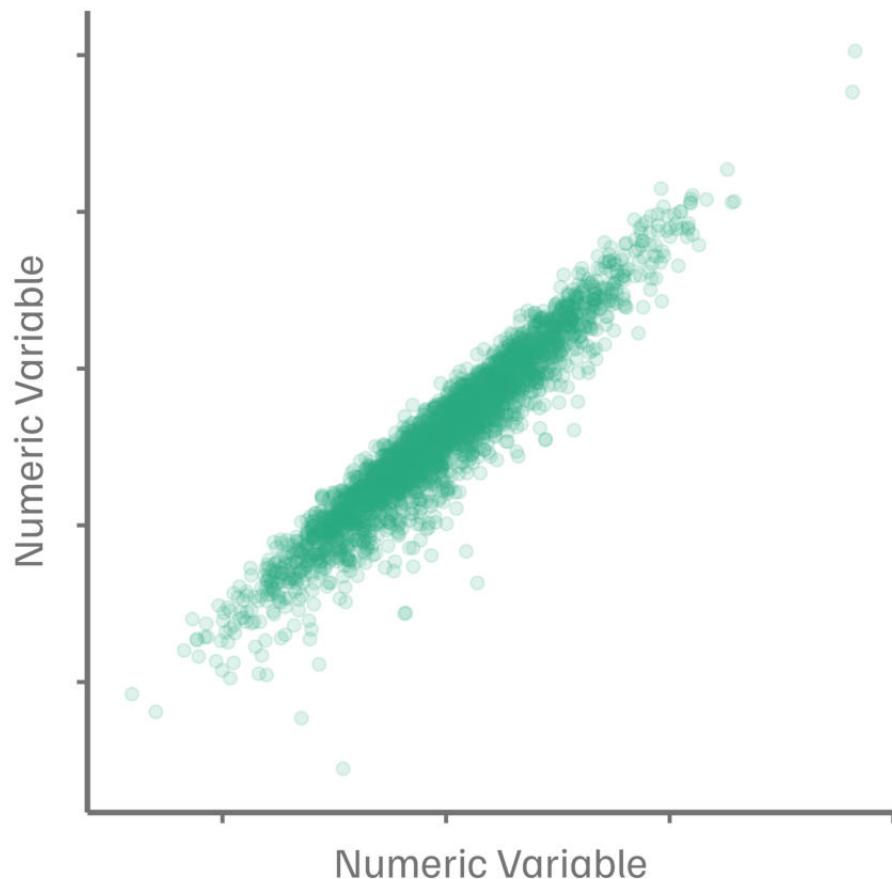


Bubble Chart

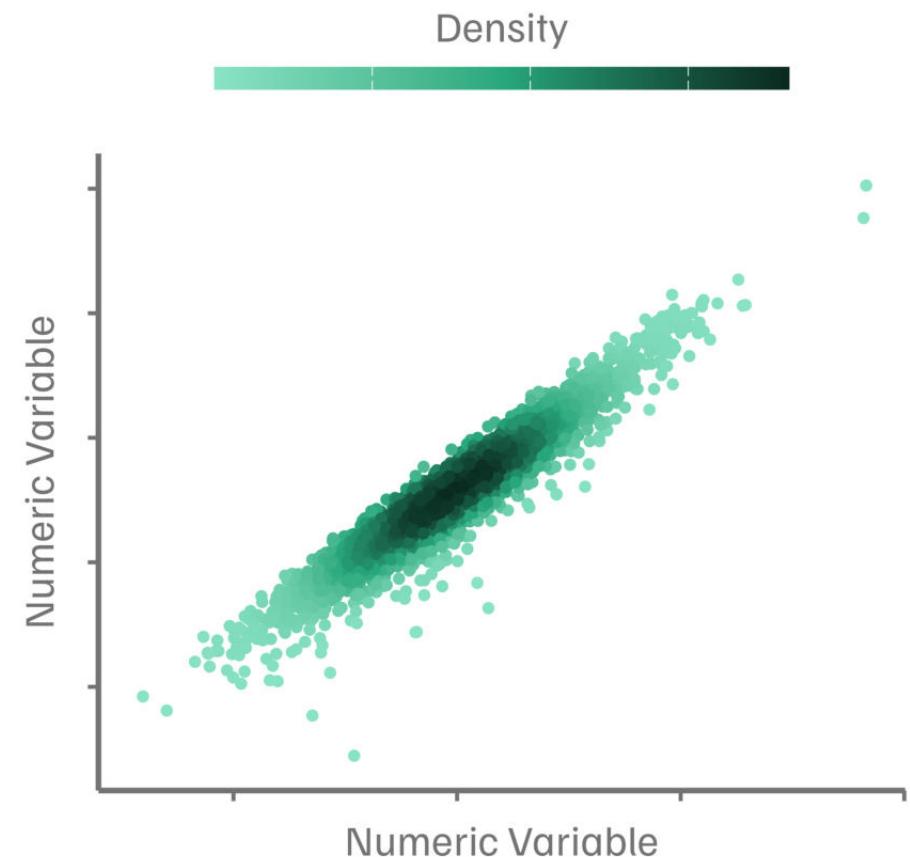


# Visualize Relationships

Scatter Plot

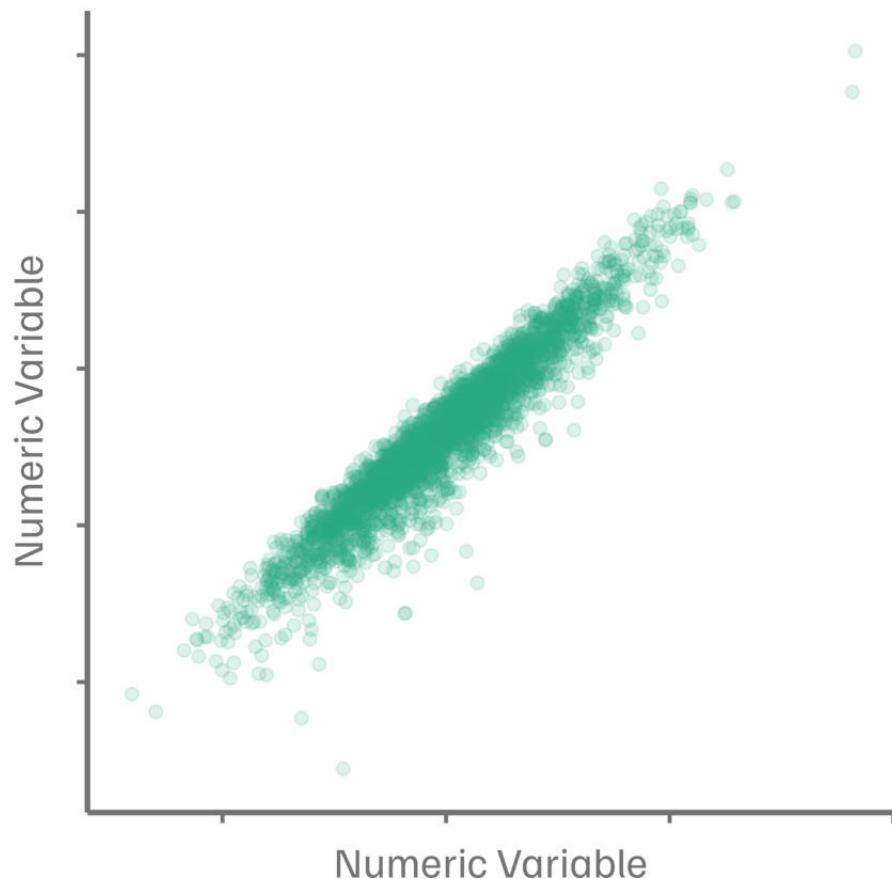


Scatter Plot: Point Density

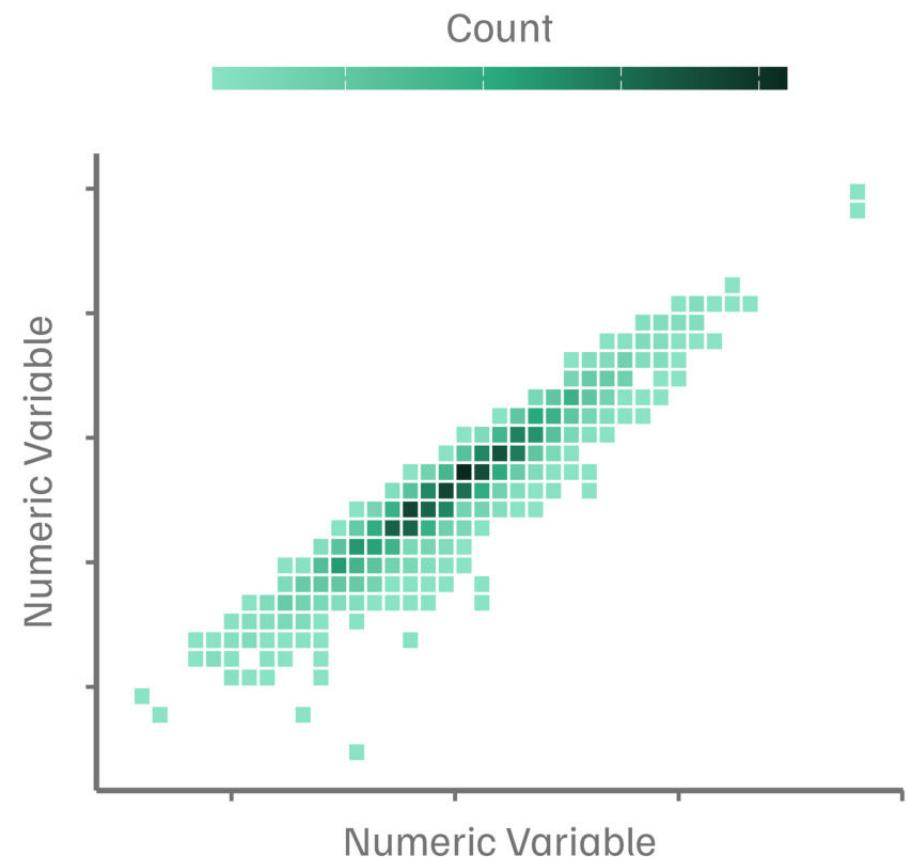


# Visualize Relationships

Scatter Plot

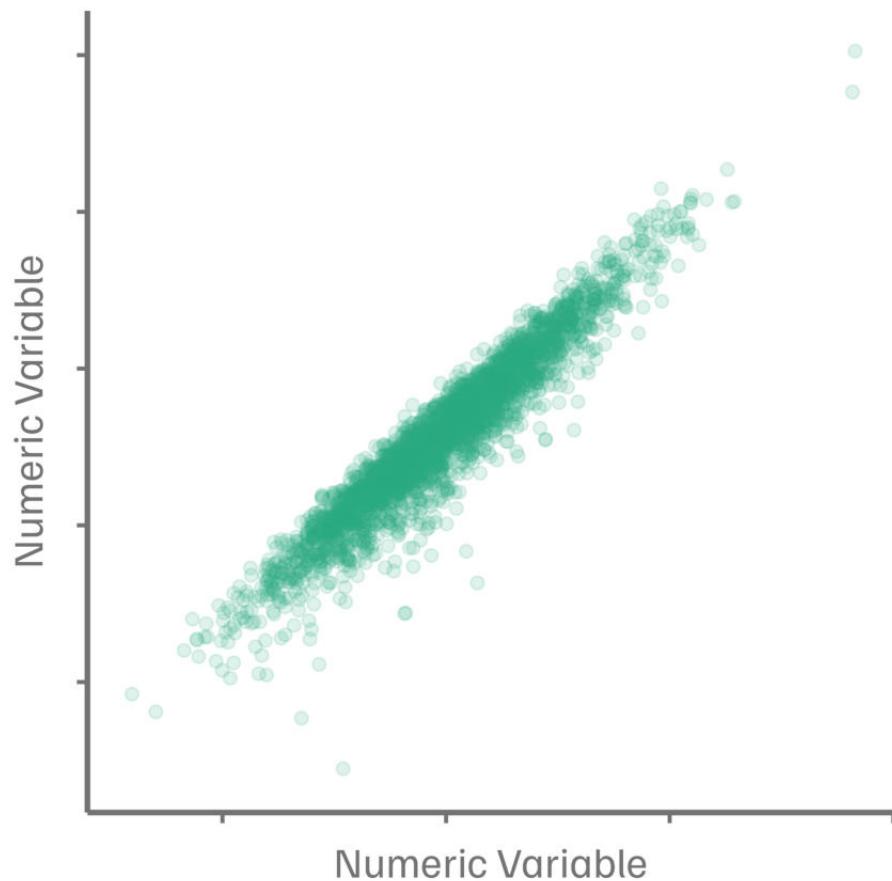


Binned Scatter Plot: Tile Grid

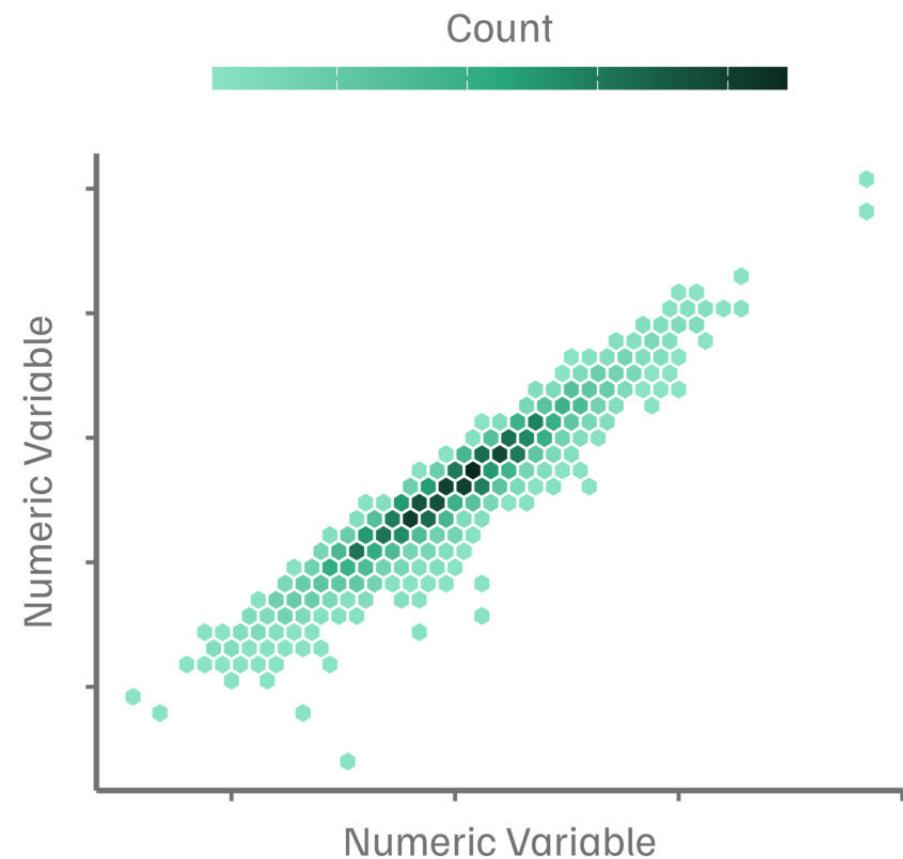


# Visualize Relationships

Scatter Plot

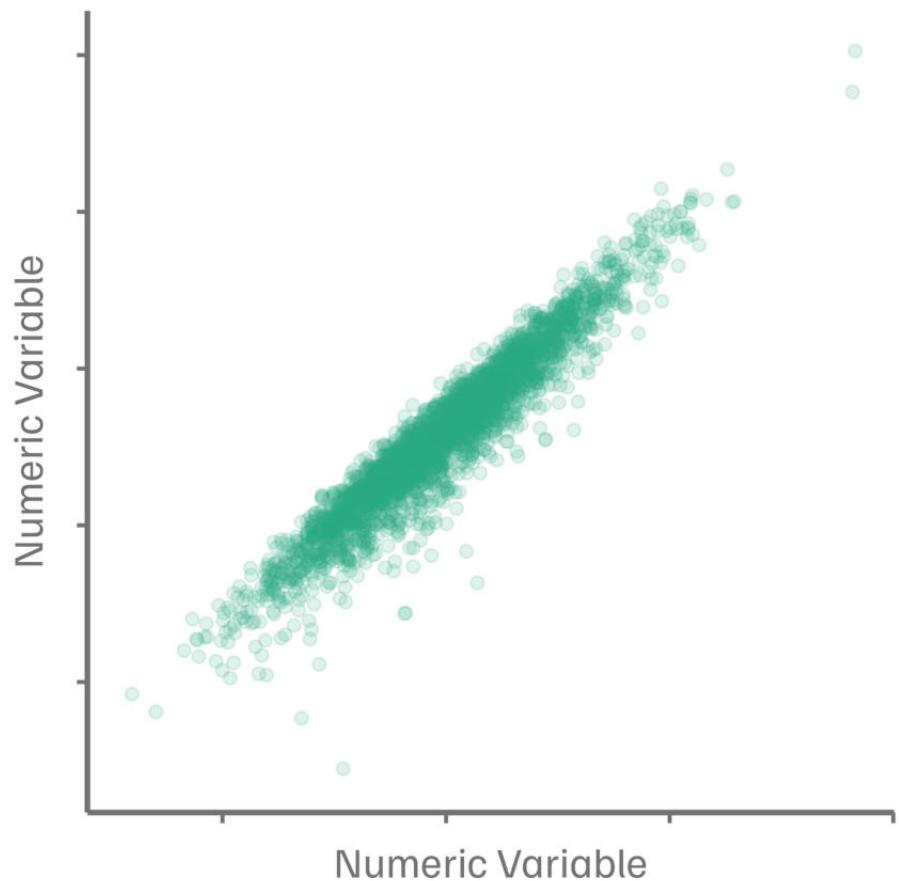


Binned Scatter Plot: Hex Grid

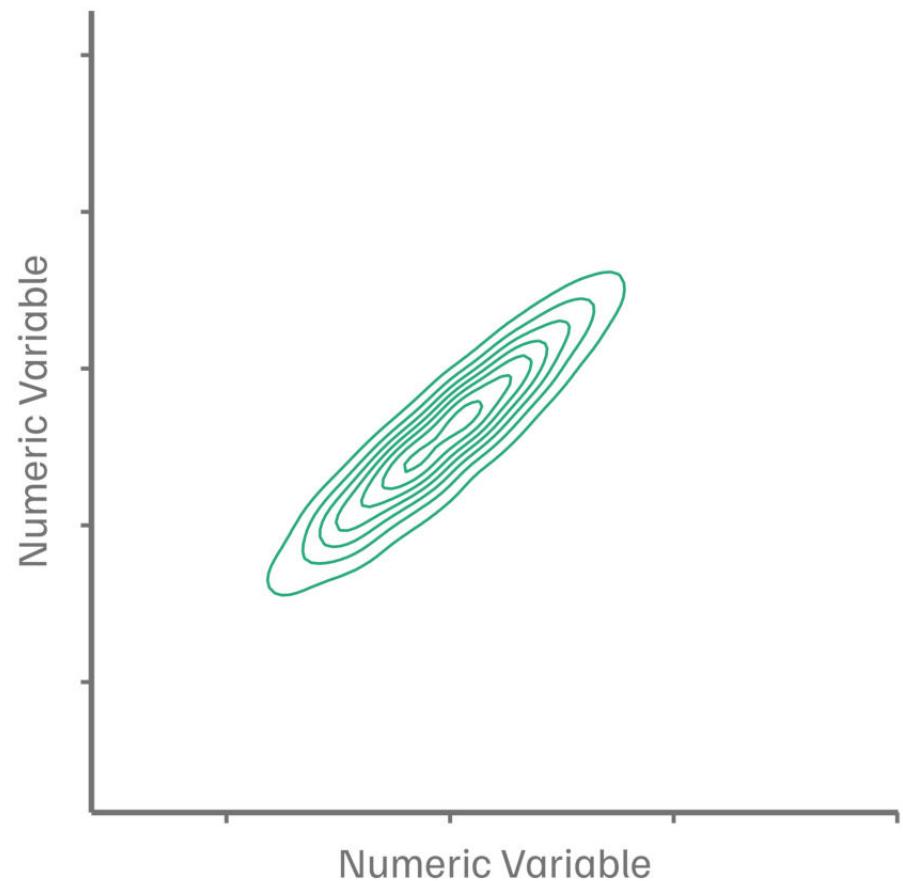


# Visualize Relationships

**Scatter Plot**

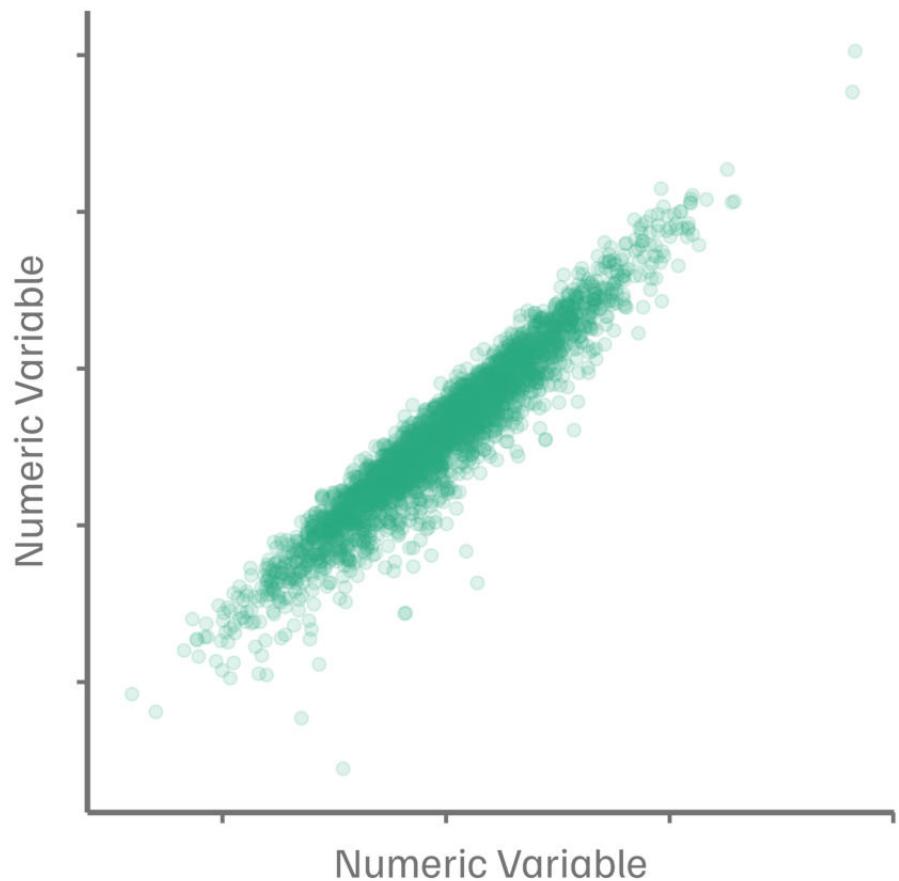


**Density Contour Plot**

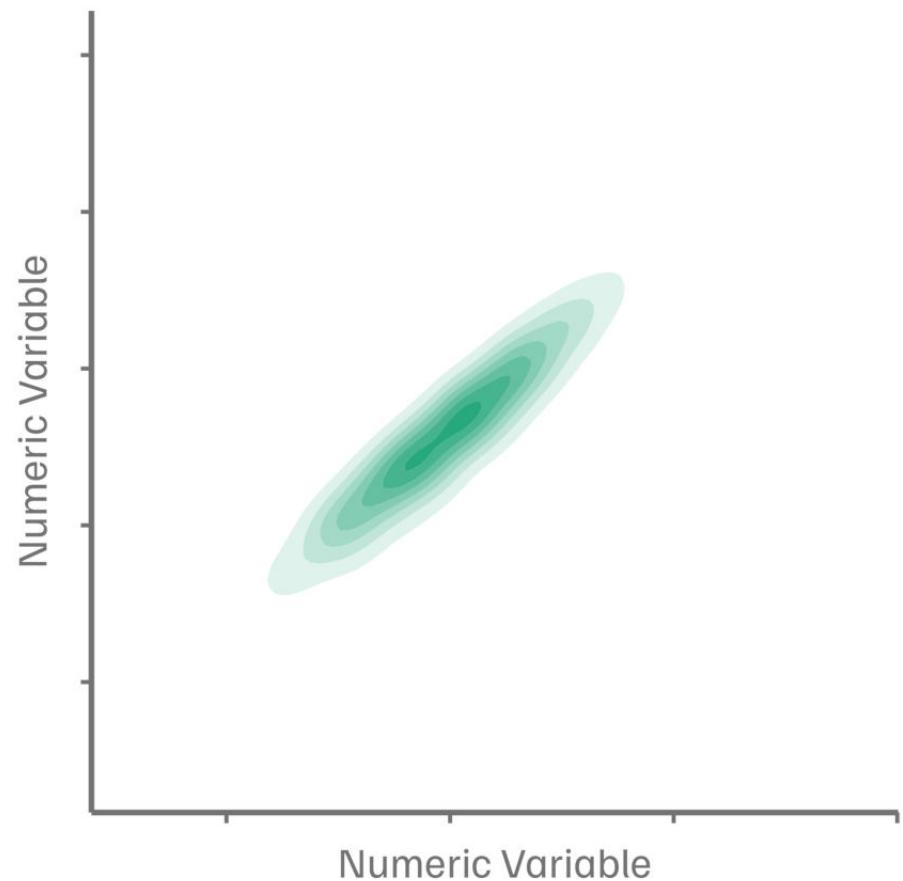


# Visualize Relationships

**Scatter Plot**

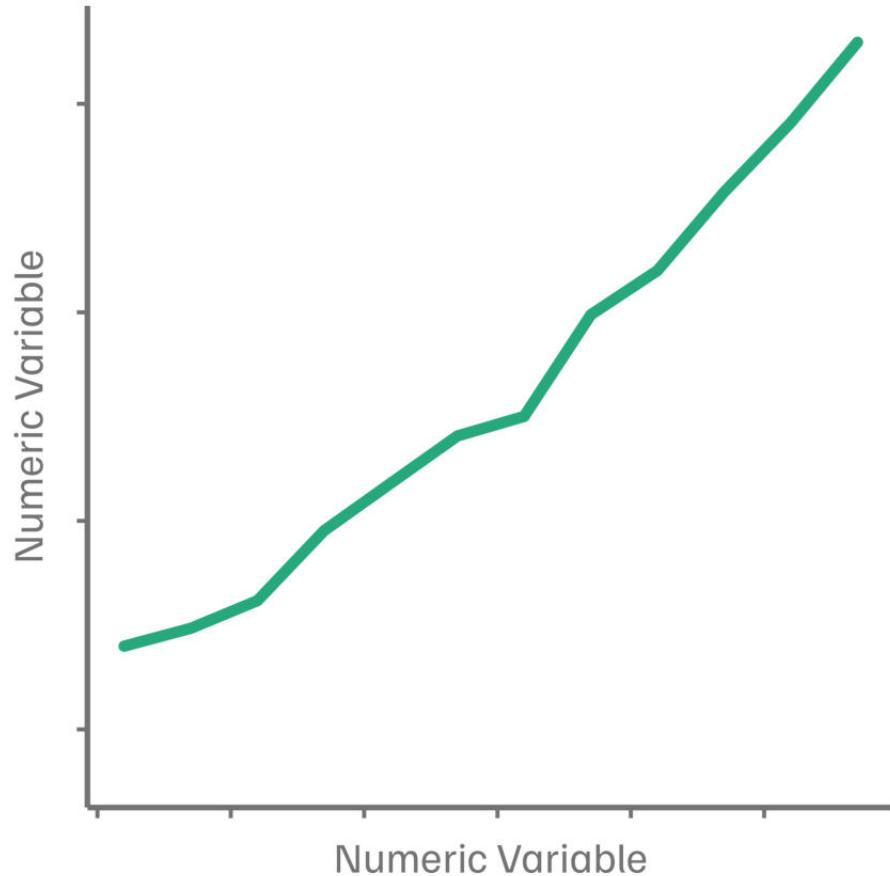


**Density Contour Plot**

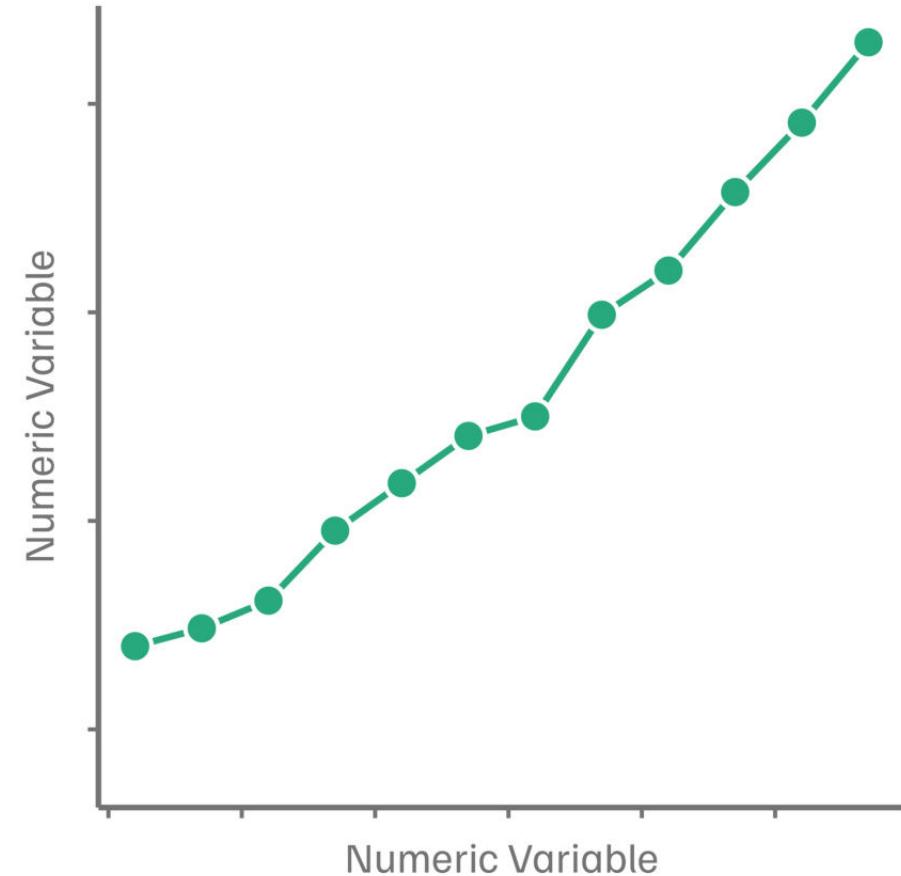


# Visualize Relationships

**Line Chart**

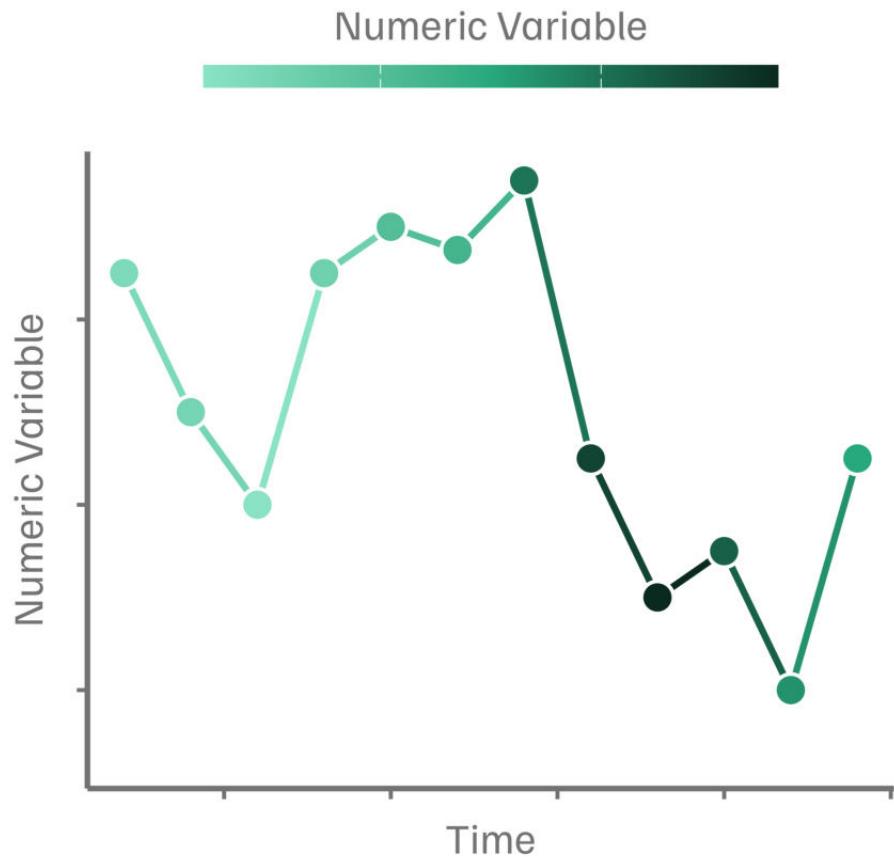


**Line Chart with Observation Markers:**

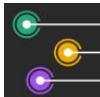
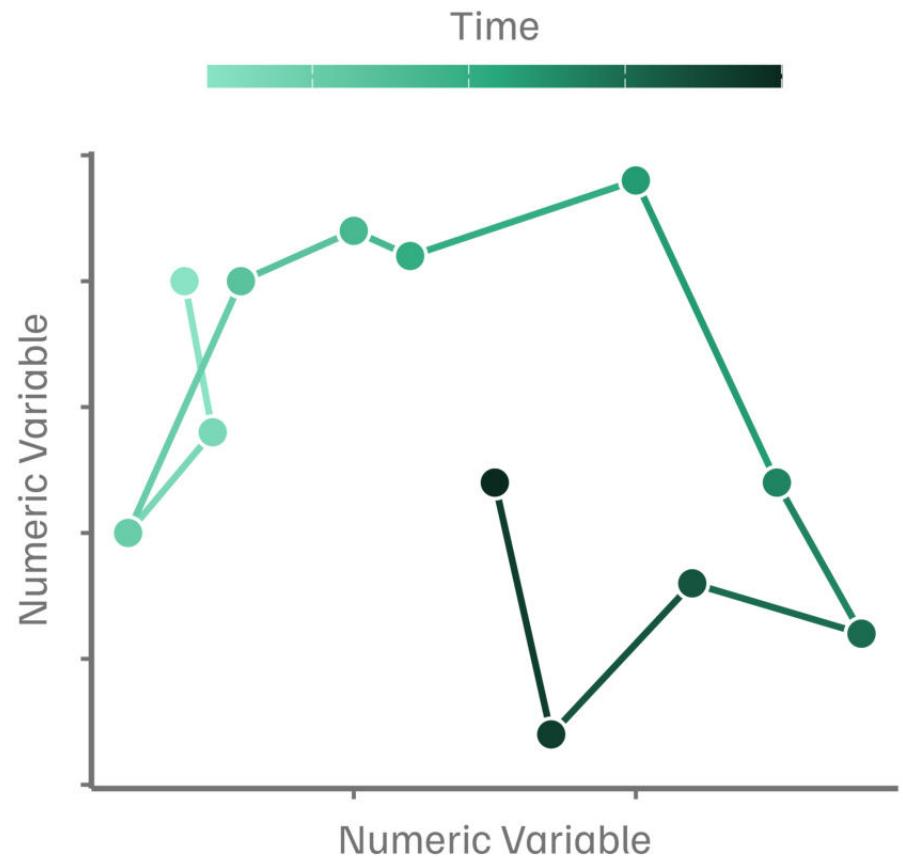


# Visualize Relationships

Line Chart (Timeseries)



Connected Scatterplot

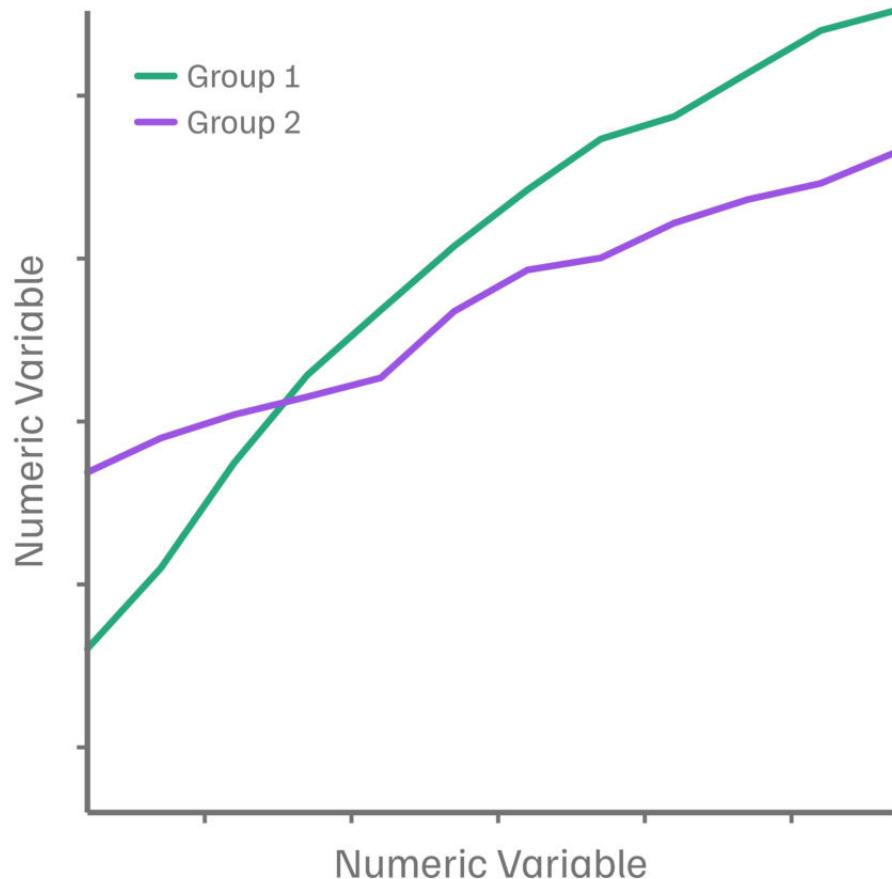


# *Compare Relationships*

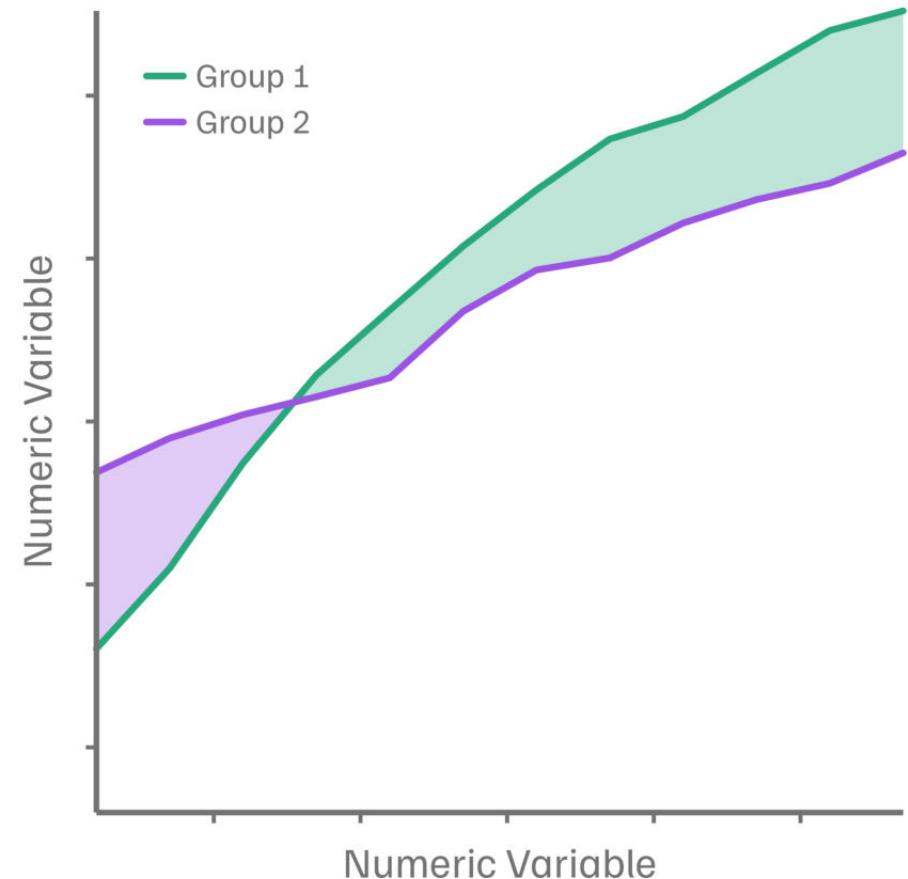


# Compare Relationships

Line Chart

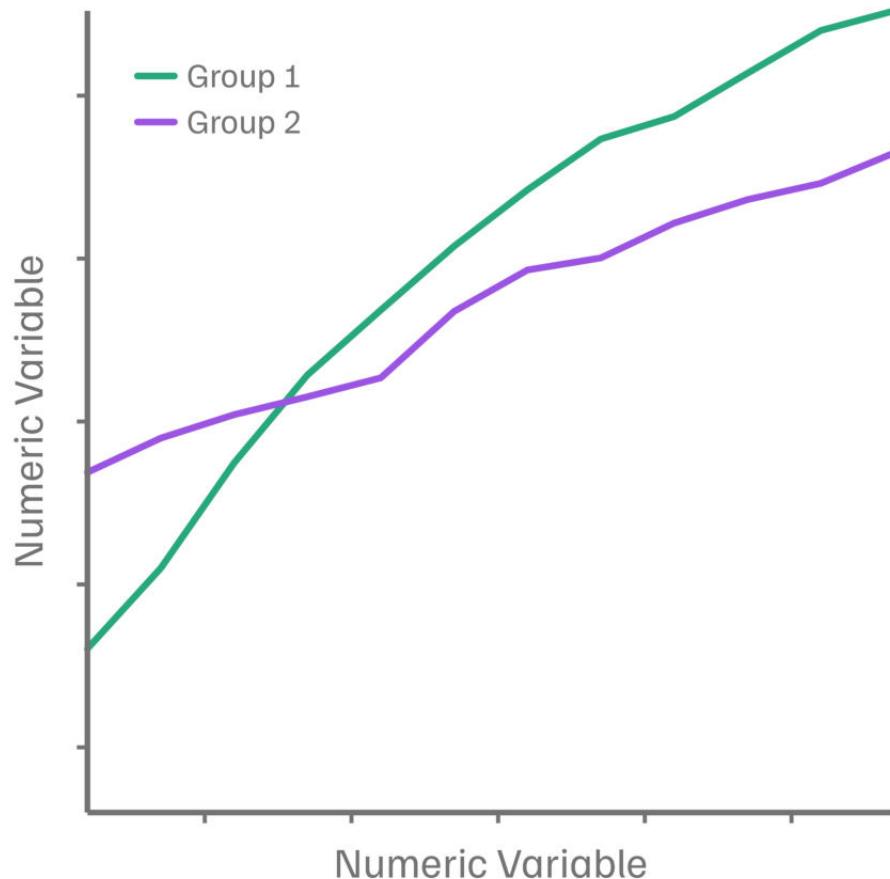


Line Chart with Ribbons

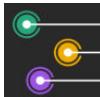
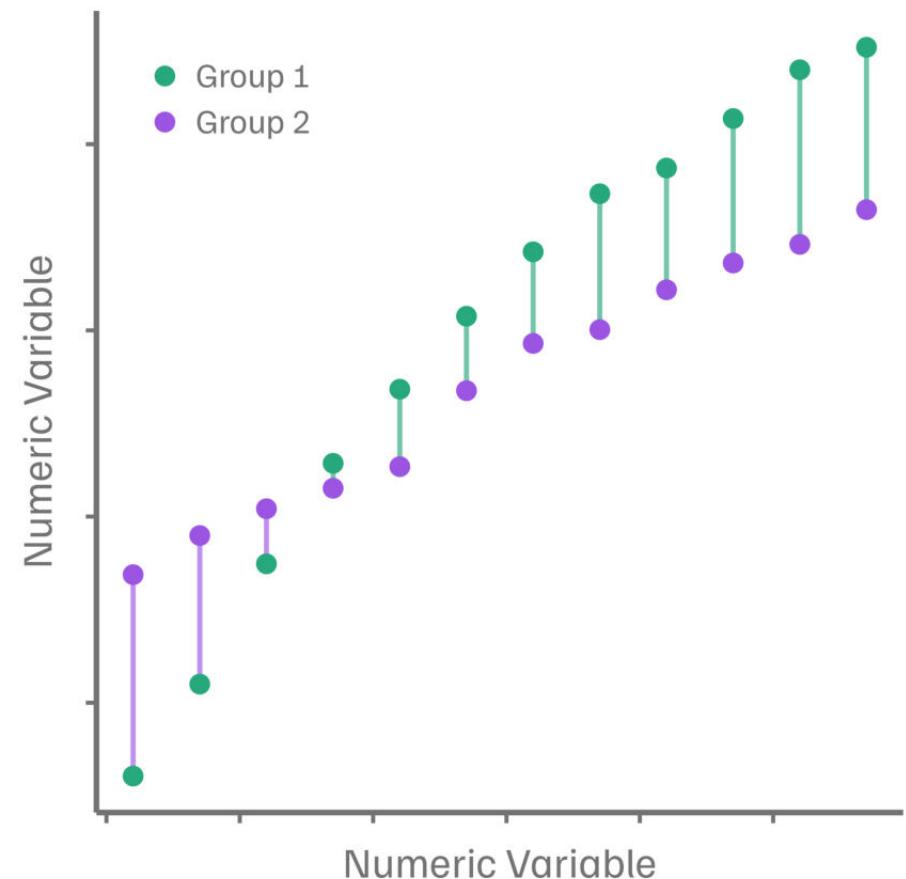


# Compare Relationships

Line Chart

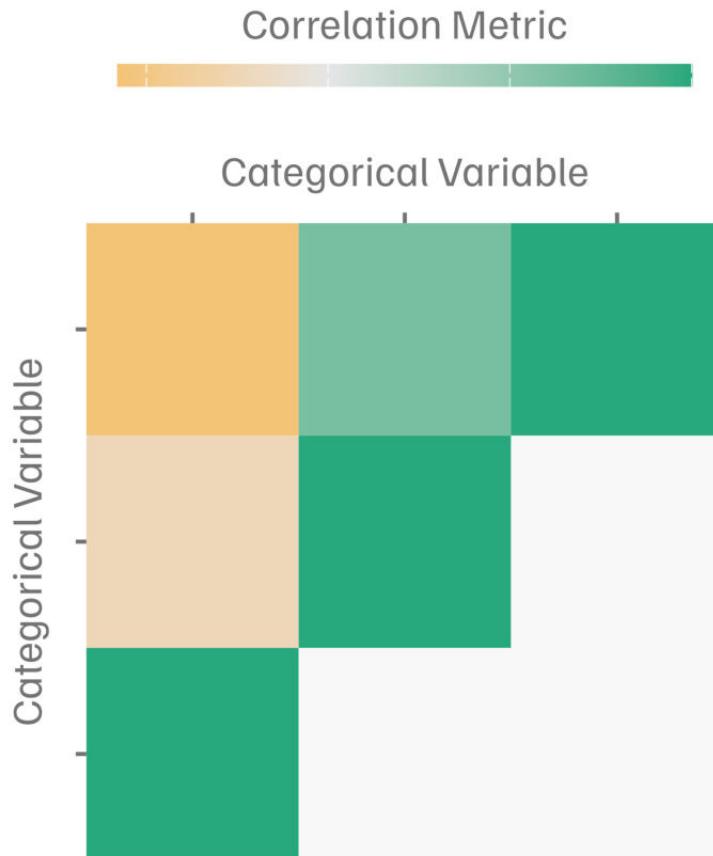


Dumbbell Chart

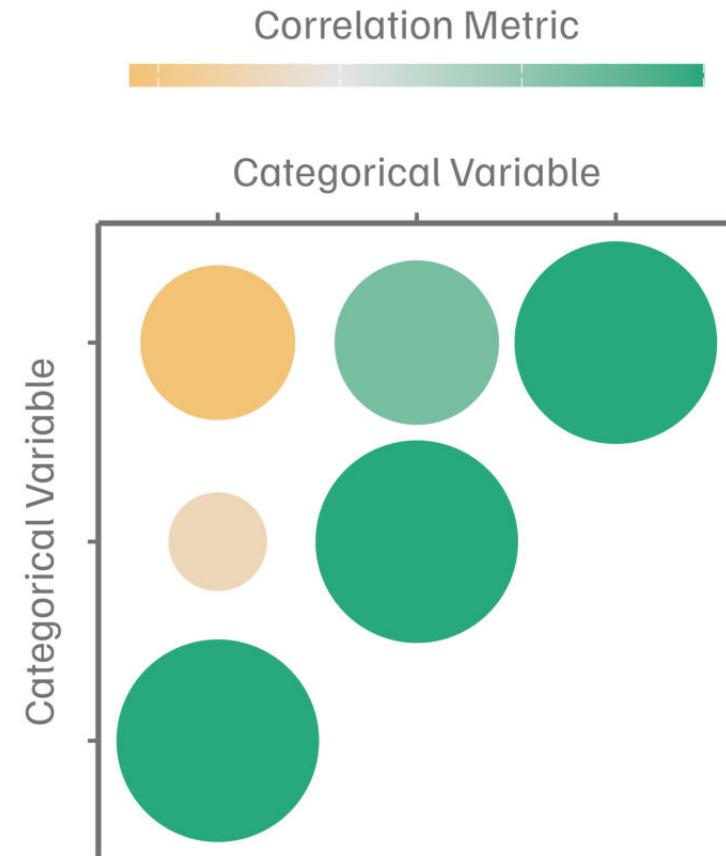


# Compare Relationships

Correlogram (Tiles)



Correlogram (Bubbles)

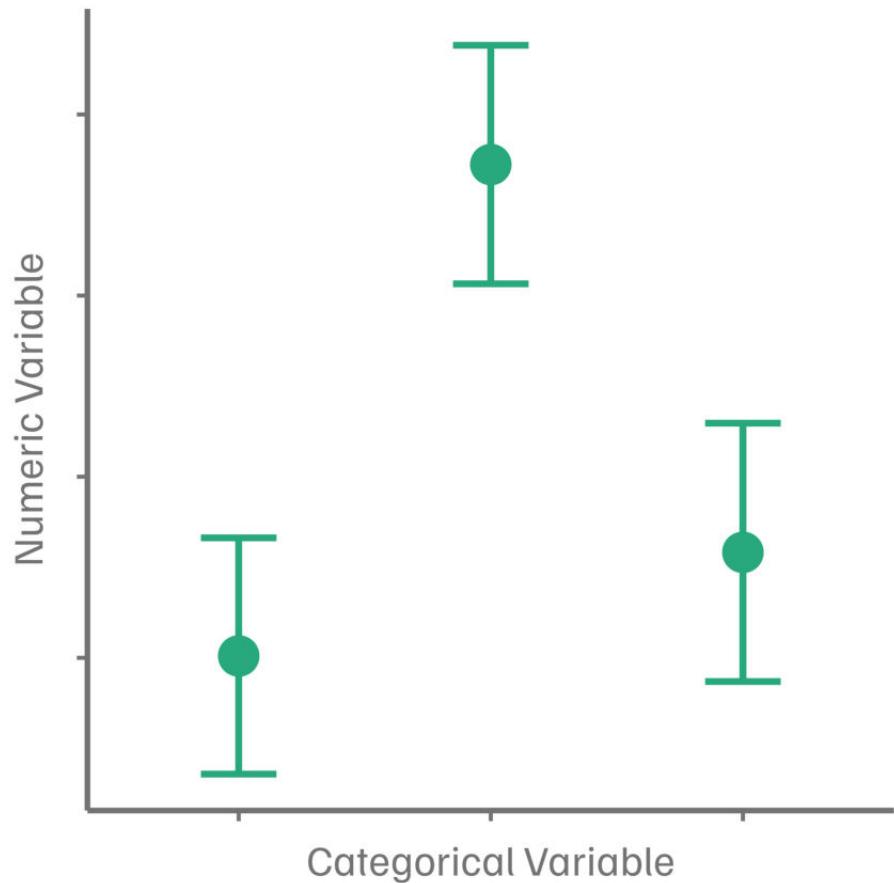


# Visualize Uncertainty



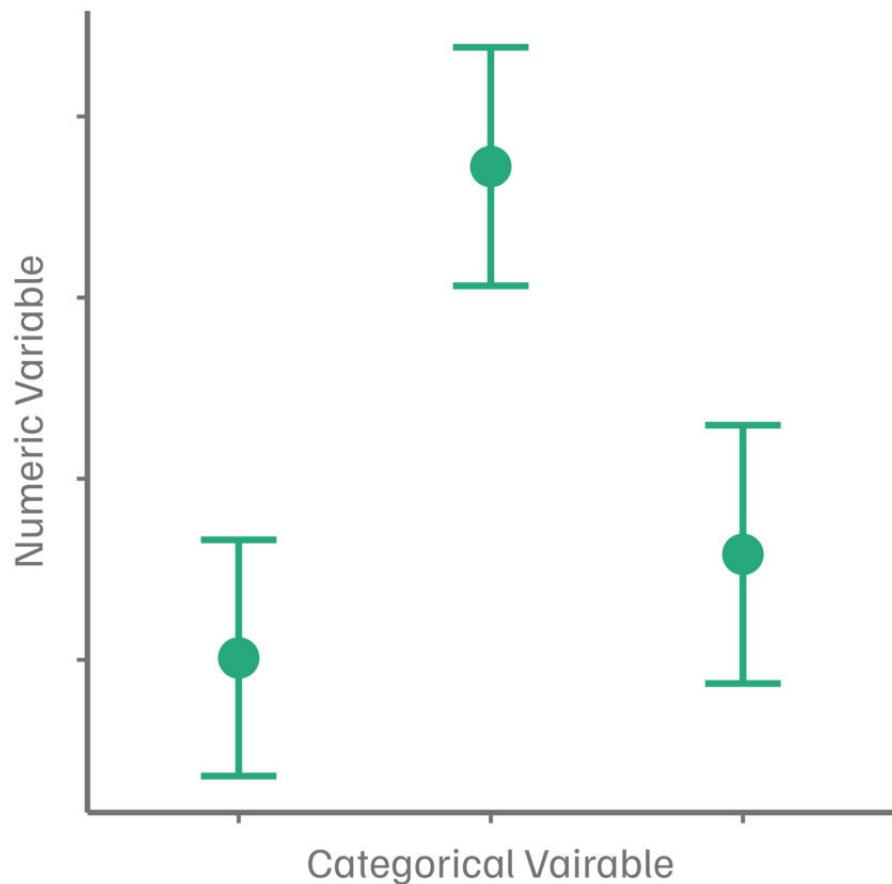
# Visualize Uncertainty

## Error Bars

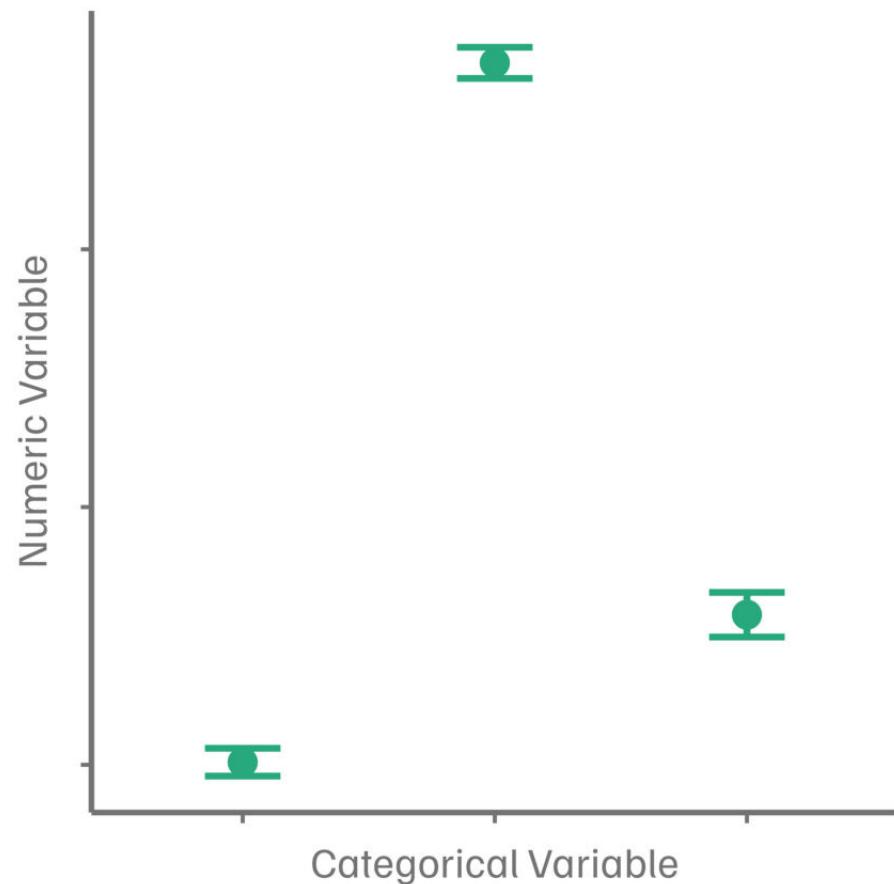


# Visualize Uncertainty

Error Bars: mean  $\pm$  SD

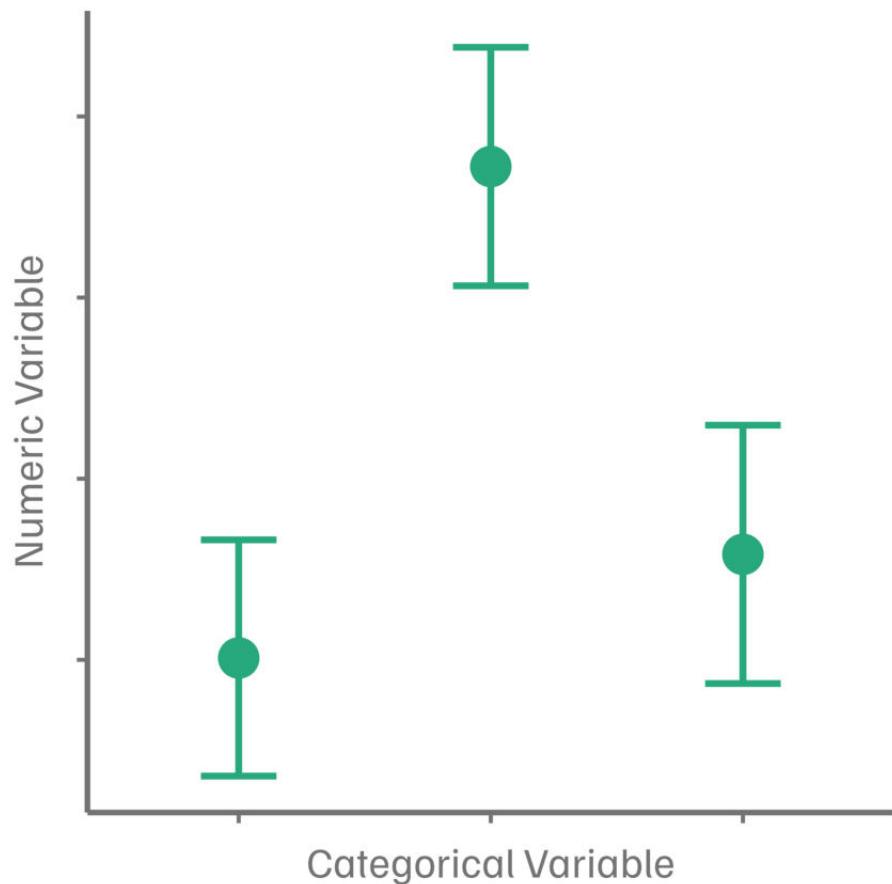


Error Bars: mean  $\pm$  SE

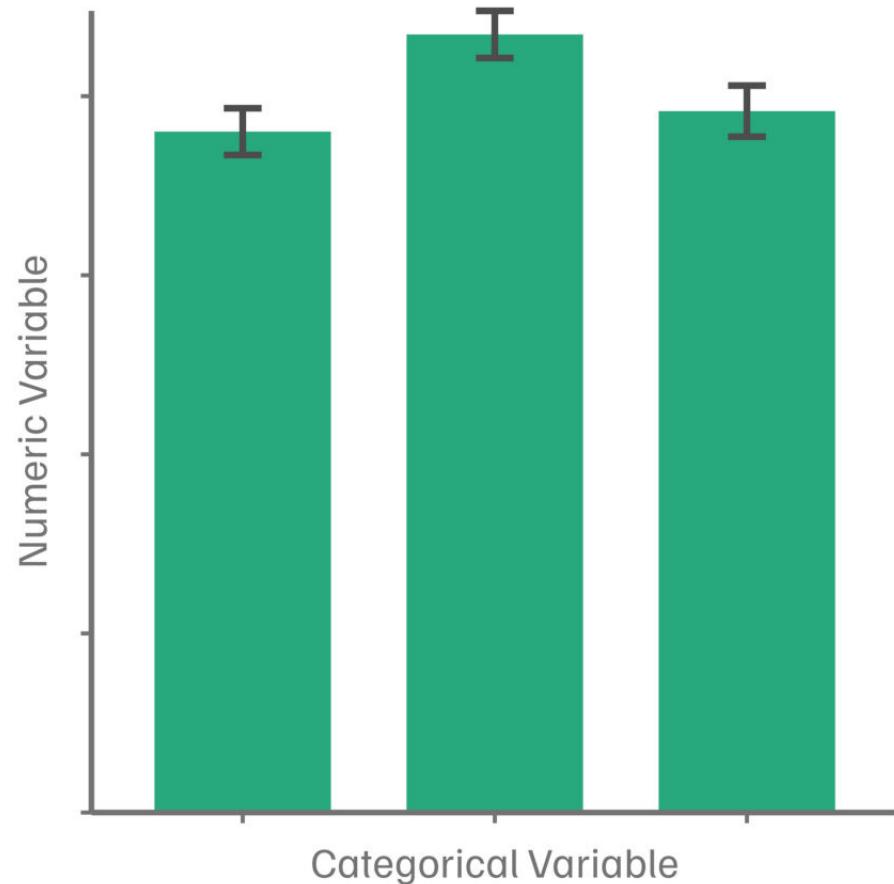


# Visualize Uncertainty

## Error Bars



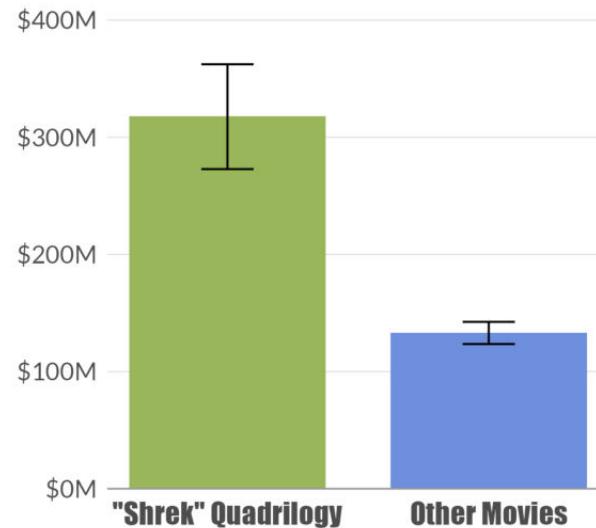
## Dynamite Plots



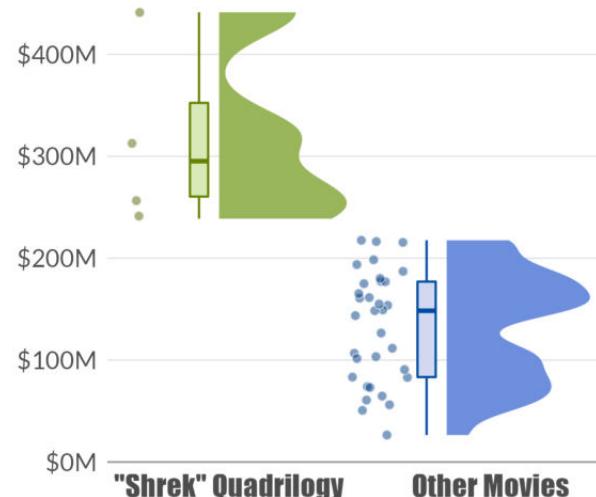


© Dreamworks Animation

## Domestic Box Office of DreamWorks Movies



## Domestic Box Office of DreamWorks Movies



Why Dynamite Plots Are Terrible—and Why You Should Use Something Else | Cédric Scherer | #30DayChartChallenge 2021 | Day 27: Educational

Cédric Scherer @ Hello Heart // Data Visualization & Information Design



PERSPECTIVE

# Beyond Bar and Line Graphs: Time for a New Data Presentation Paradigm

**Tracey L. Weissgerber<sup>1</sup>\*, Nataša M. Milic<sup>1,2</sup>, Stacey J. Winham<sup>3</sup>, Vesna D. Garovic<sup>1</sup>**

**1** Division of Nephrology & Hypertension, Mayo Clinic, Rochester, Minnesota, United States of America,

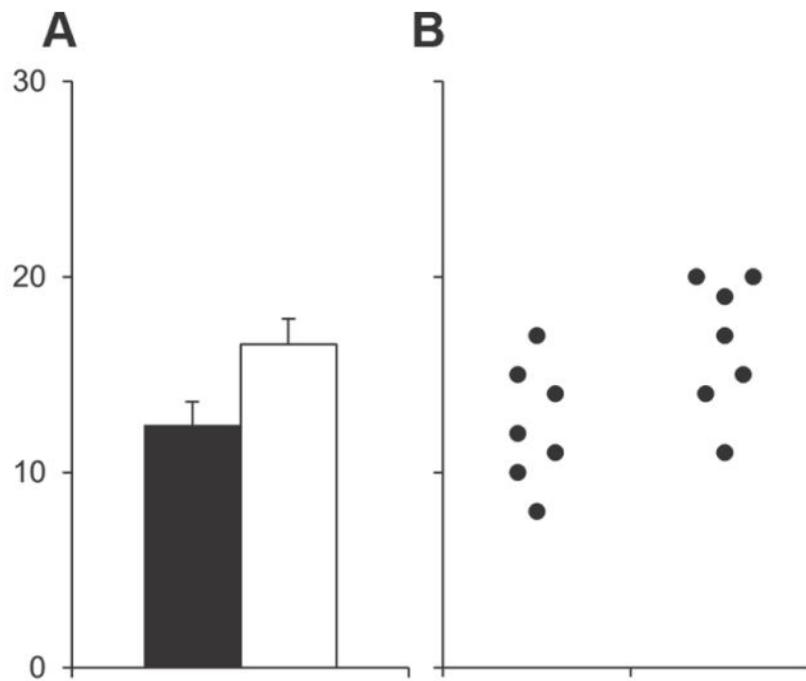
**2** Department of Biostatistics, Medical Faculty, University of Belgrade, Belgrade, Serbia, **3** Division of Biomedical Statistic and Informatics, Mayo Clinic, Rochester, Minnesota, United States of America

\* [weissgerber.tracey@mayo.edu](mailto:weissgerber.tracey@mayo.edu)

Weissgerber et al. (2015) PLoS Biology

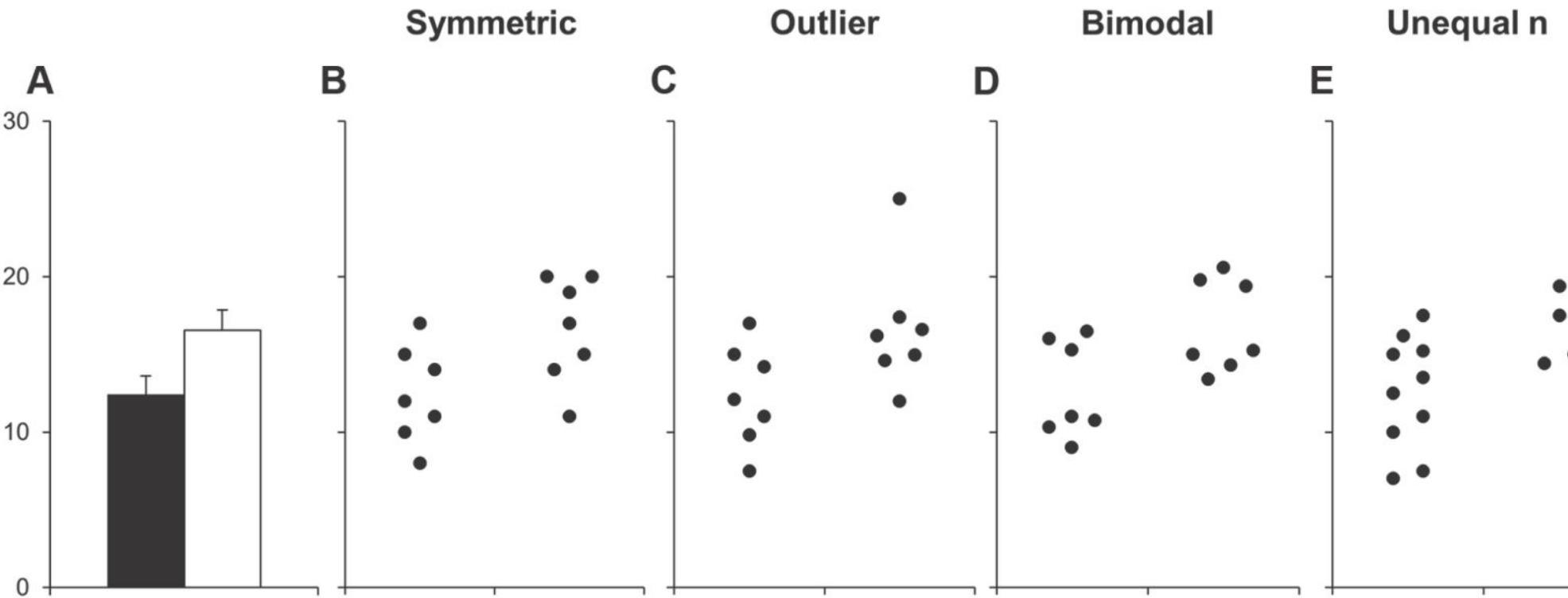


## Symmetric



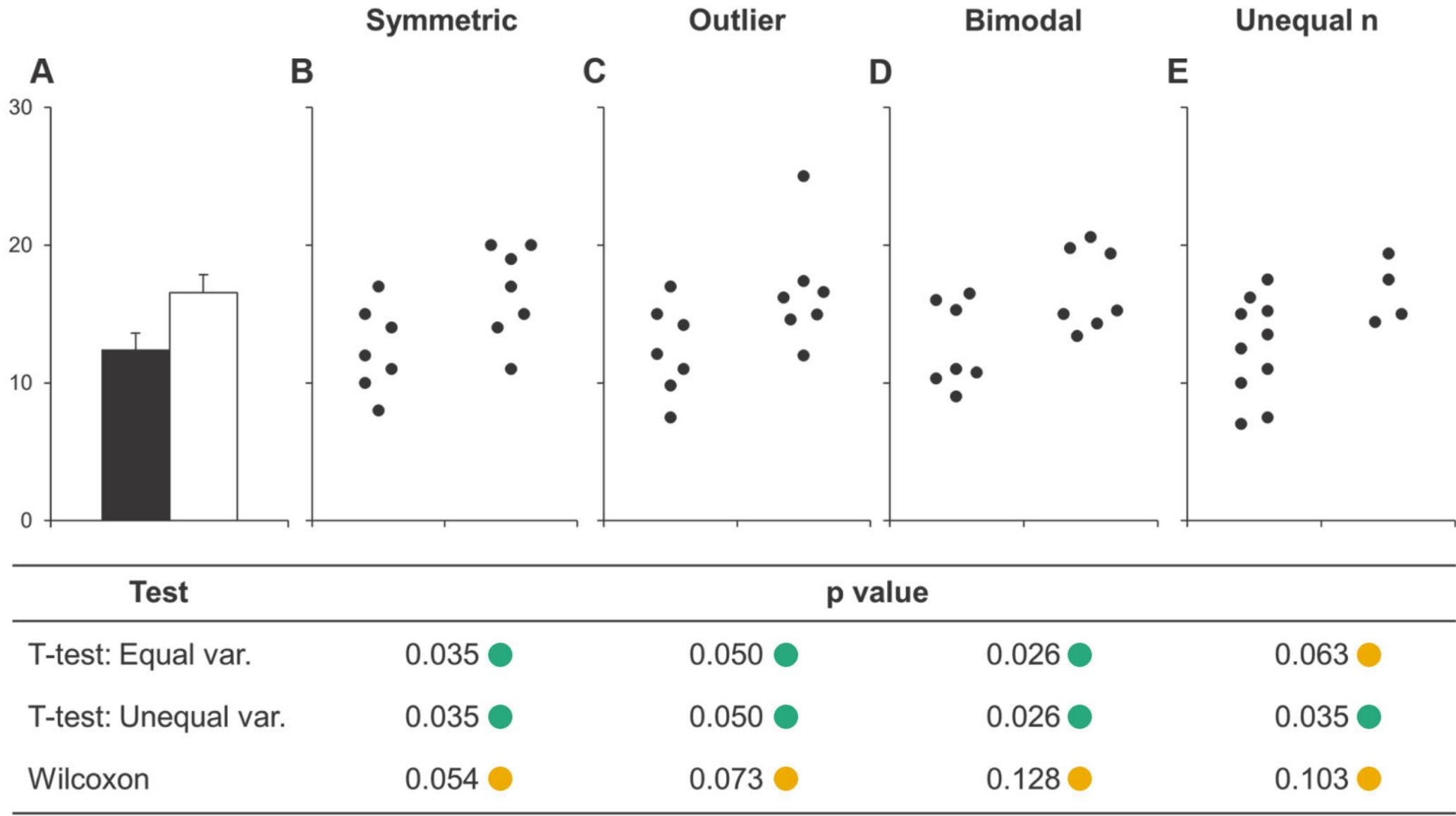
Modified from [Weissgerber et al. \(2015\) PLoS Biology](#)





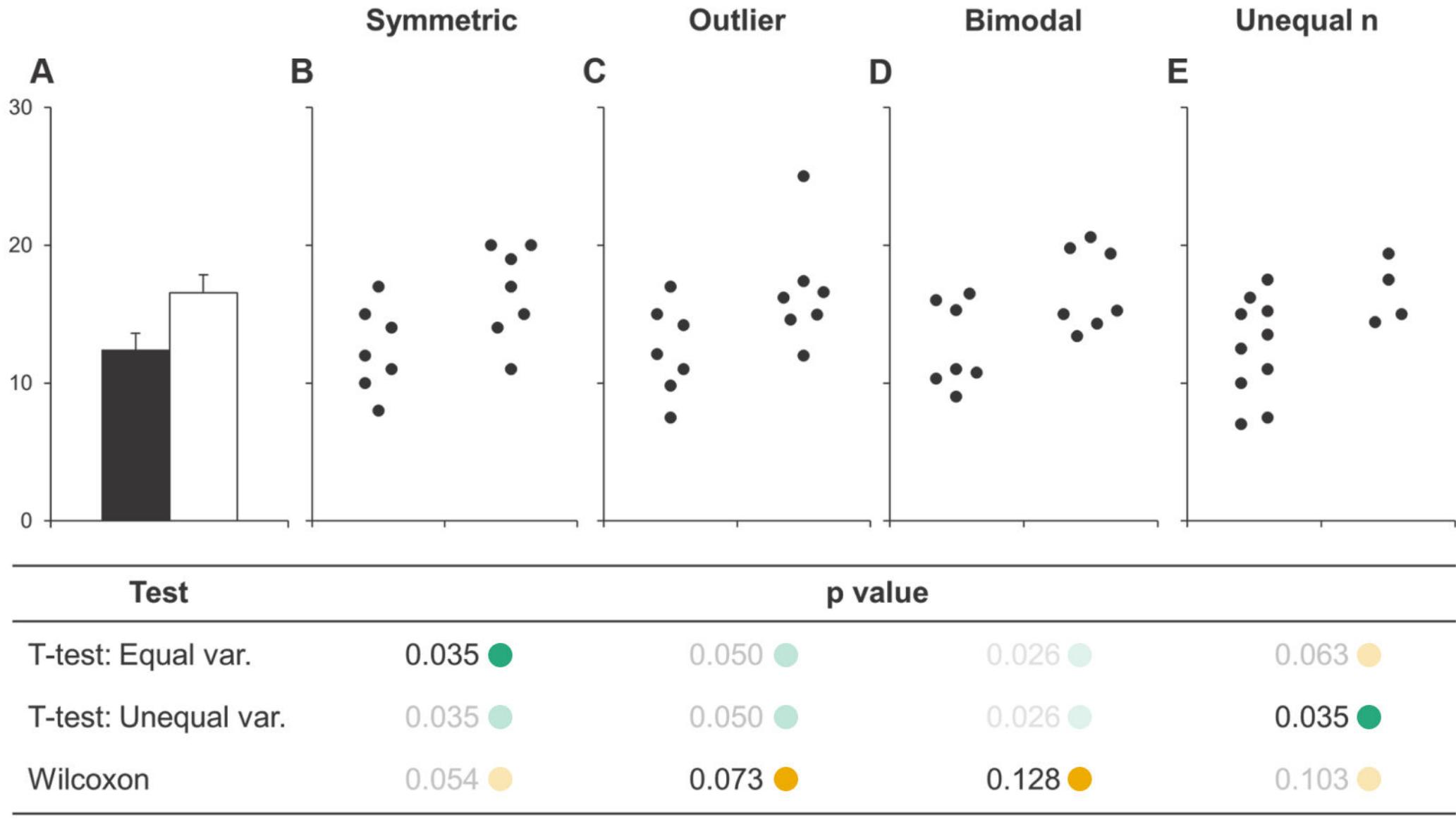
Modified from [Weissgerber et al. \(2015\) PLoS Biology](#)





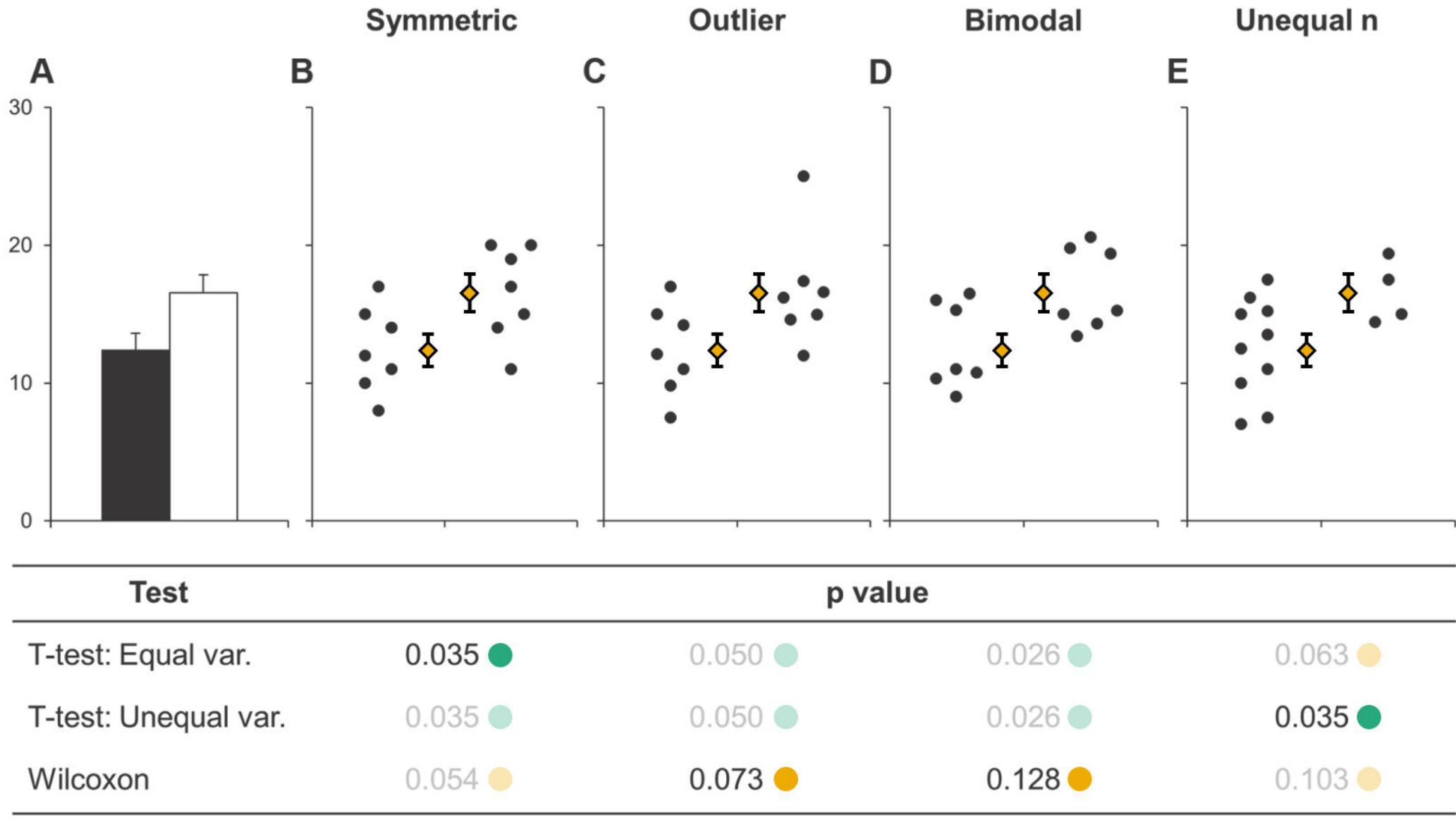
Modified from Weissgerber et al. (2015) PLoS Biology





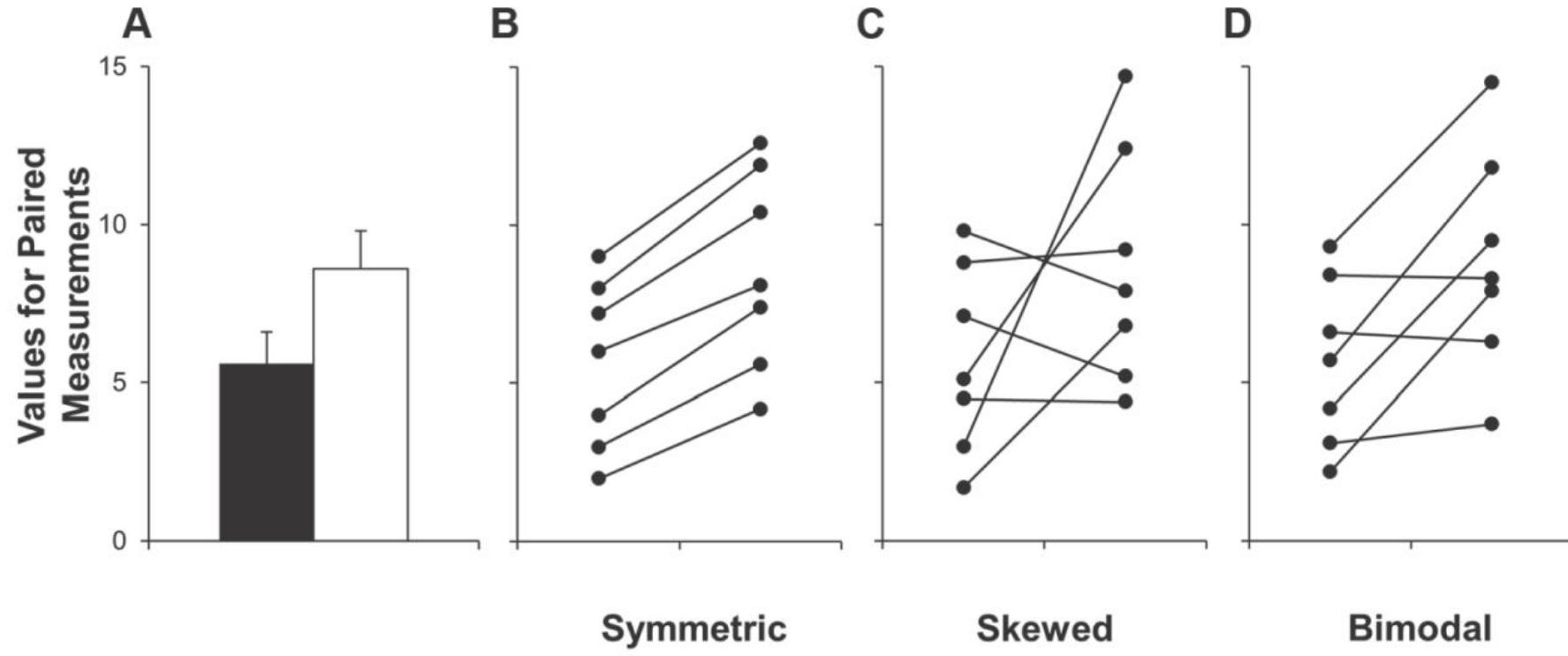
Modified from Weissgerber et al. (2015) PLoS Biology





Modified from Weissgerber et al. (2015) PLoS Biology

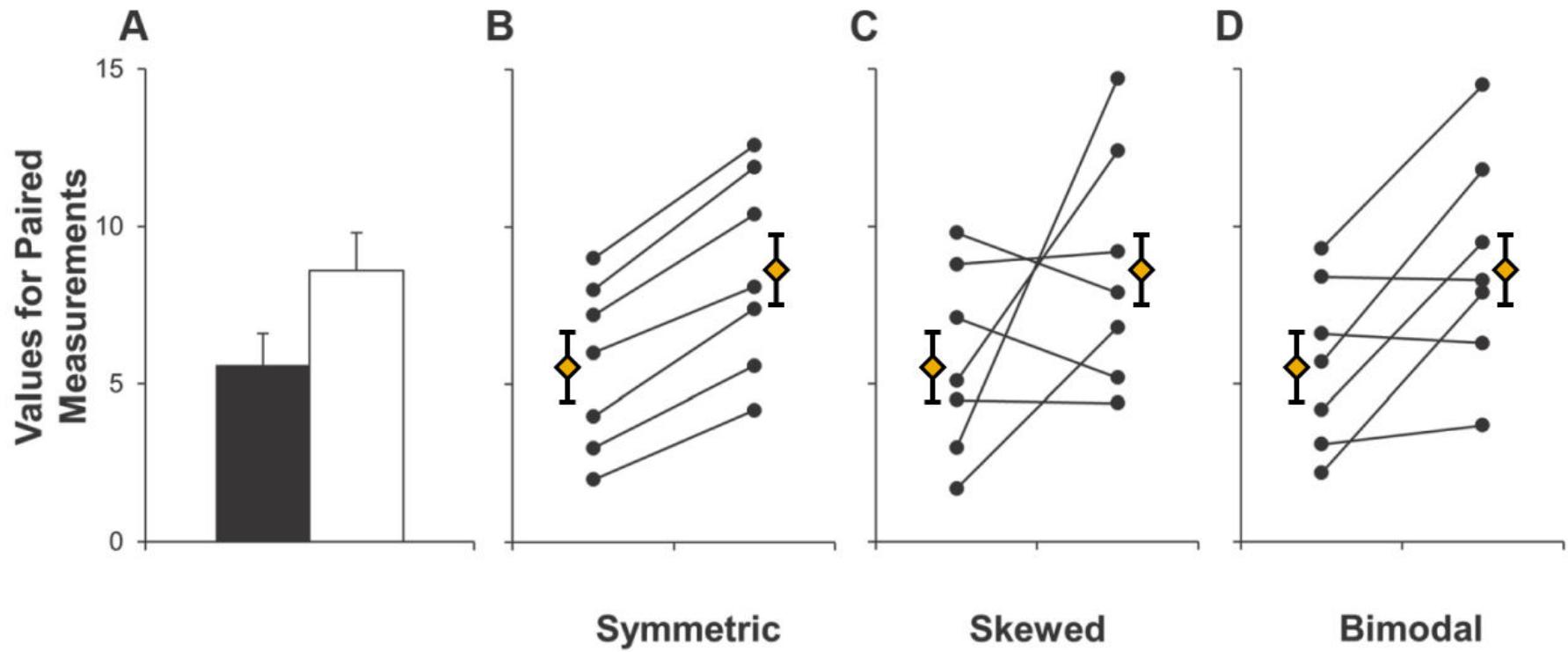




Modified from Weissgerber et al. (2015) PLoS Biology

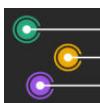
Cédric Scherer @ Hello Heart // Data Visualization & Information Design

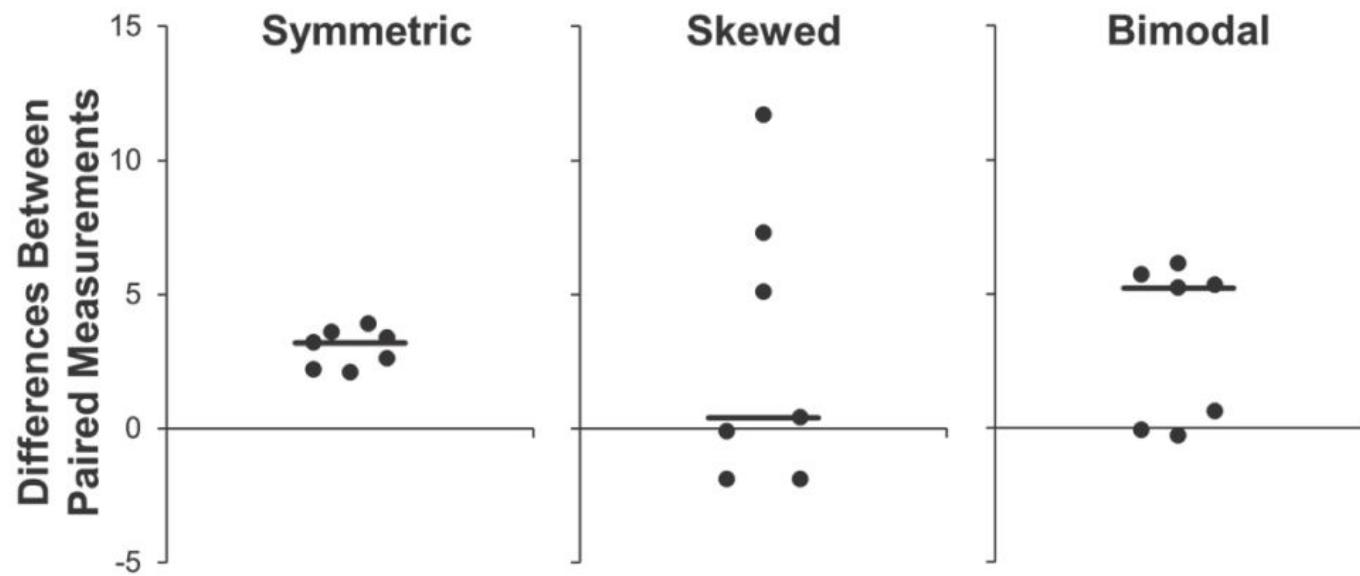
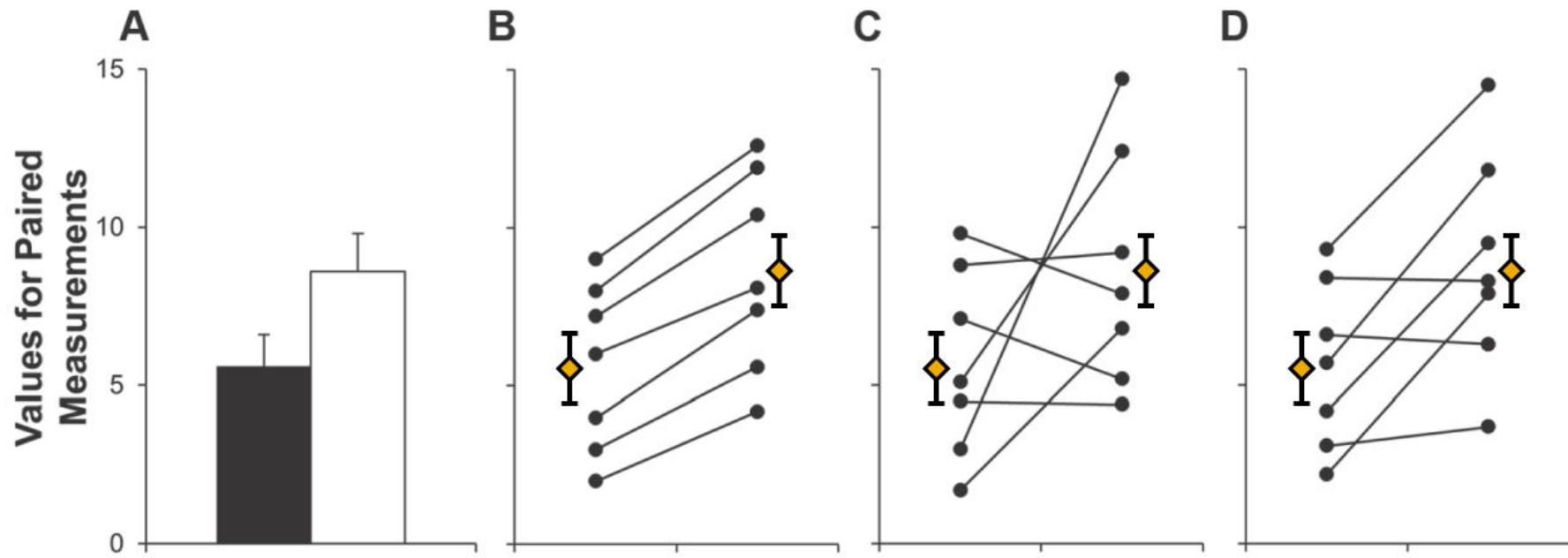




Modified from Weissgerber et al. (2015) PLoS Biology

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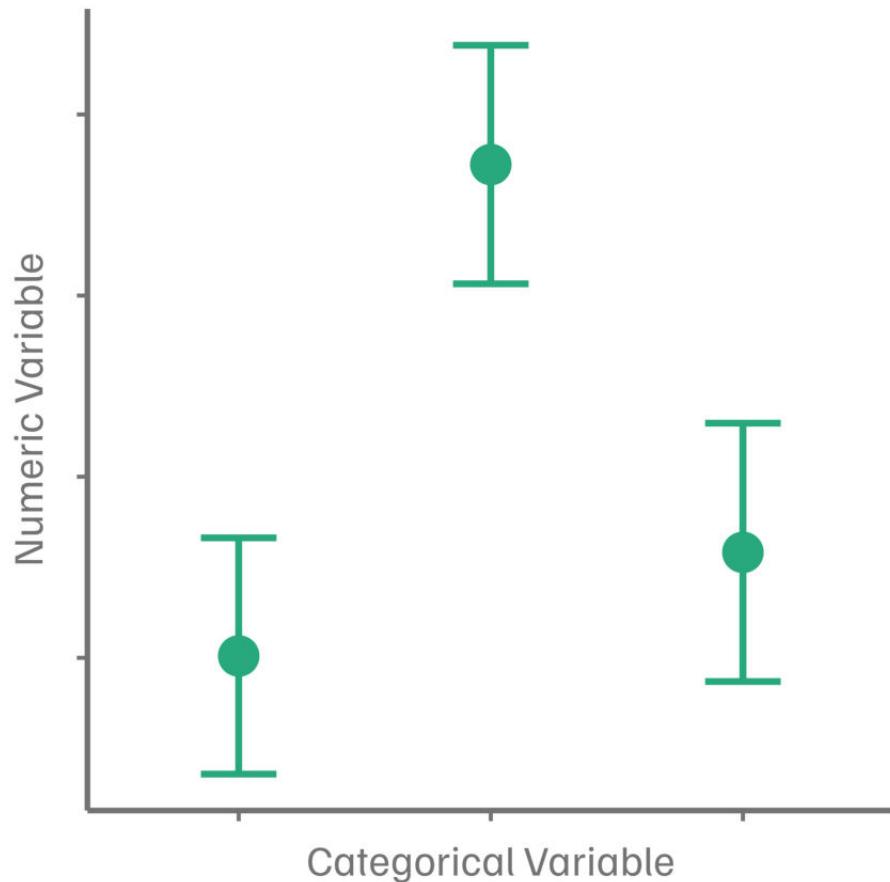
Modified from Weissgerber et al. (2015) PLoS Biology

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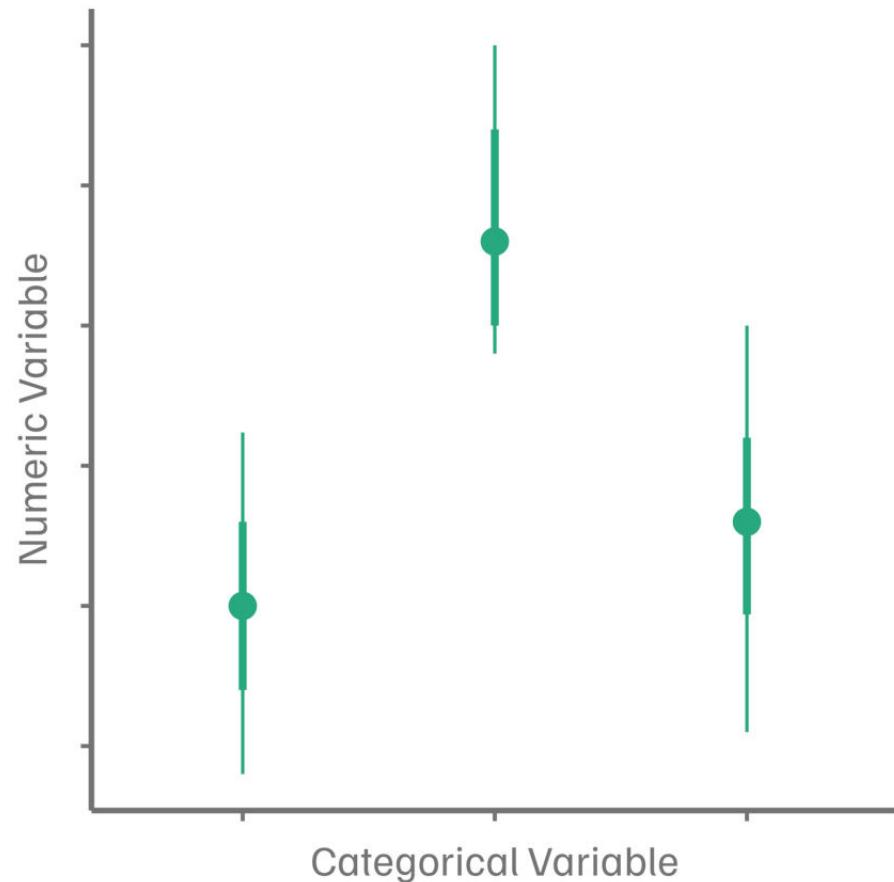


# Visualize Uncertainty

## Error Bars

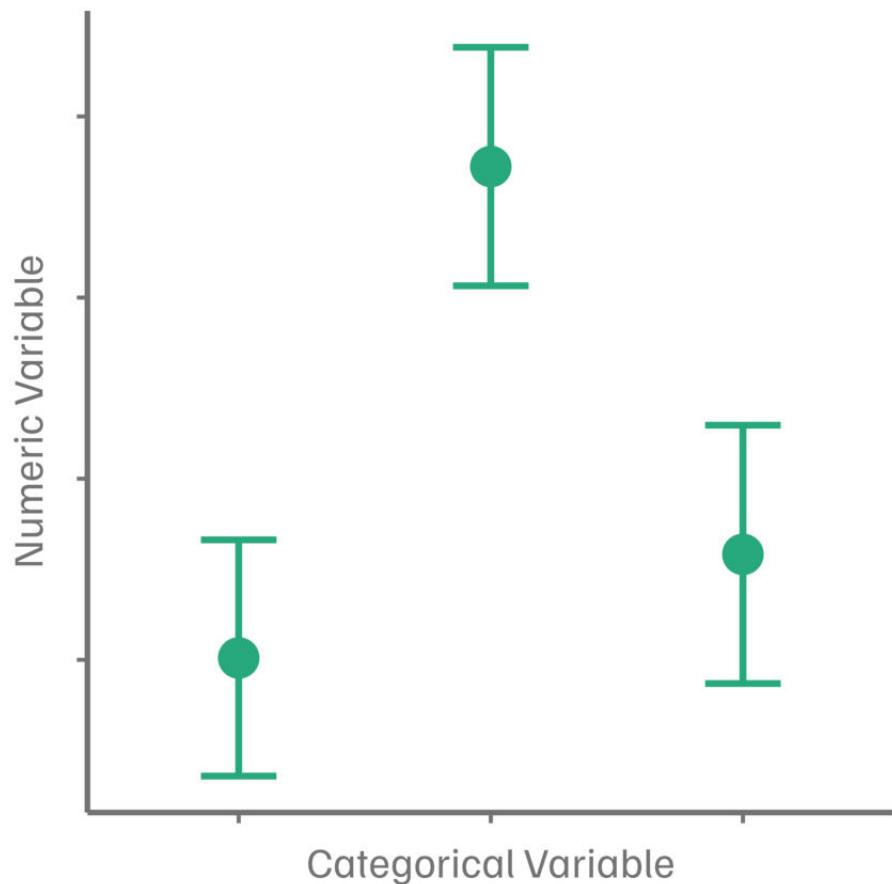


## Multi-Interval Errors Bars

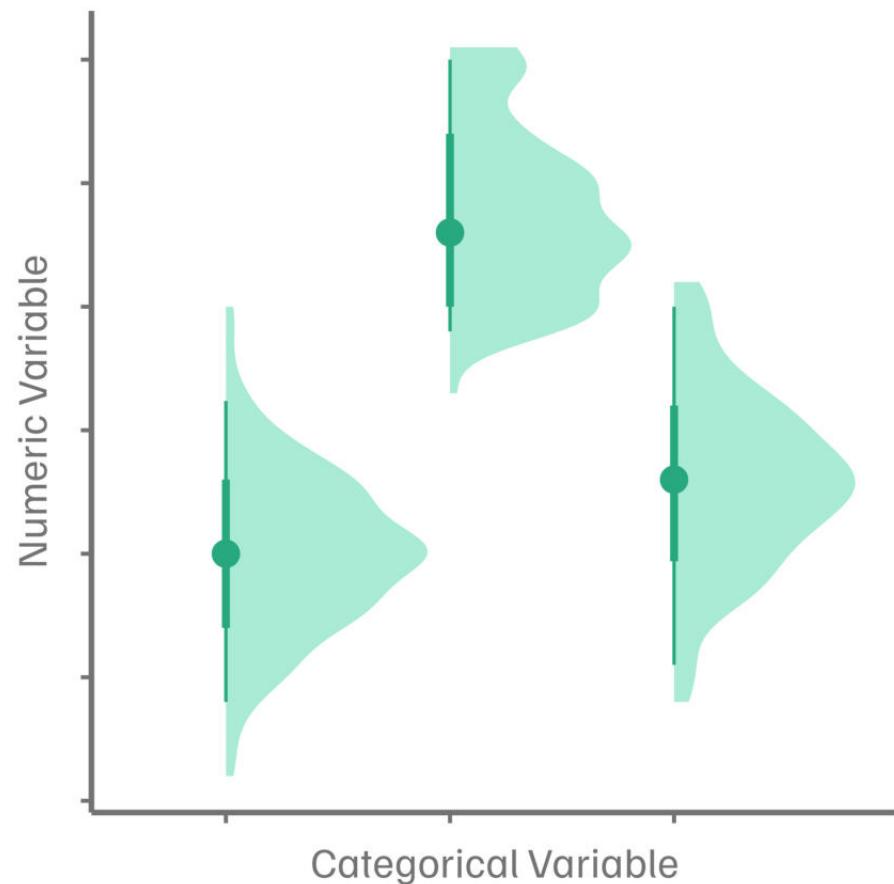


# Visualize Uncertainty

## Error Bars

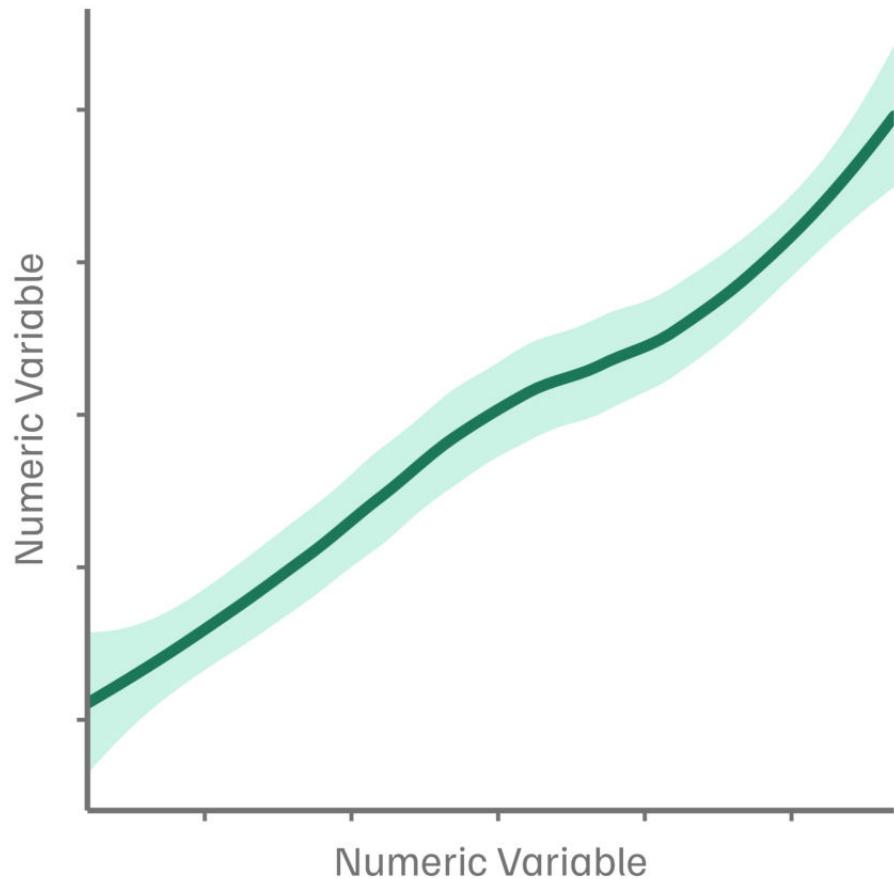


## Half-Eye Plots

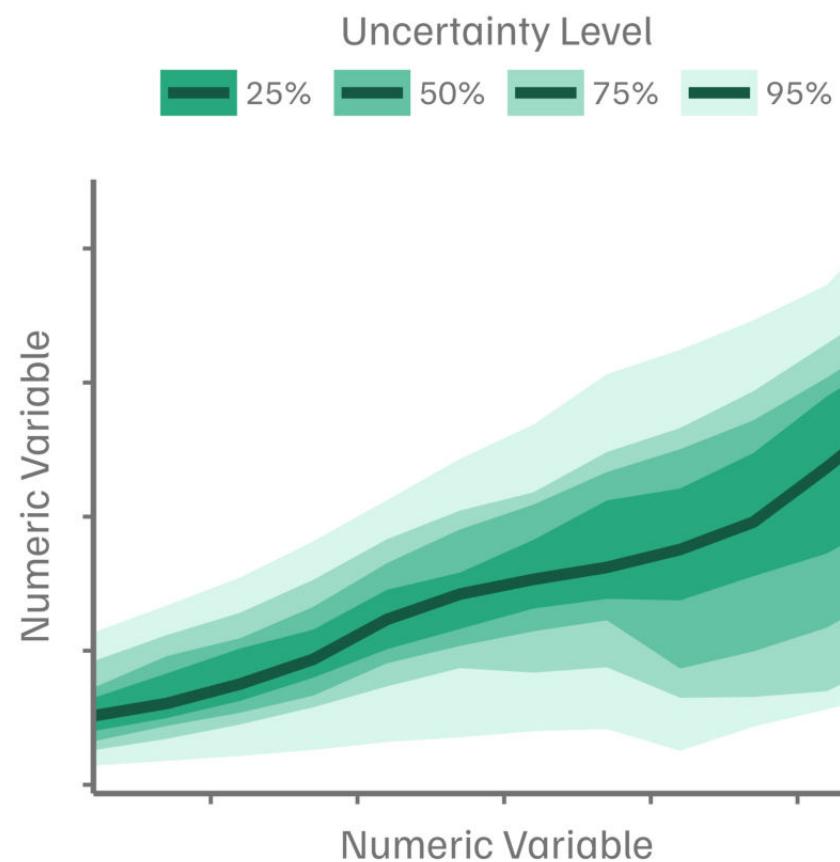


# Visualize Uncertainty

**Confidence Band**



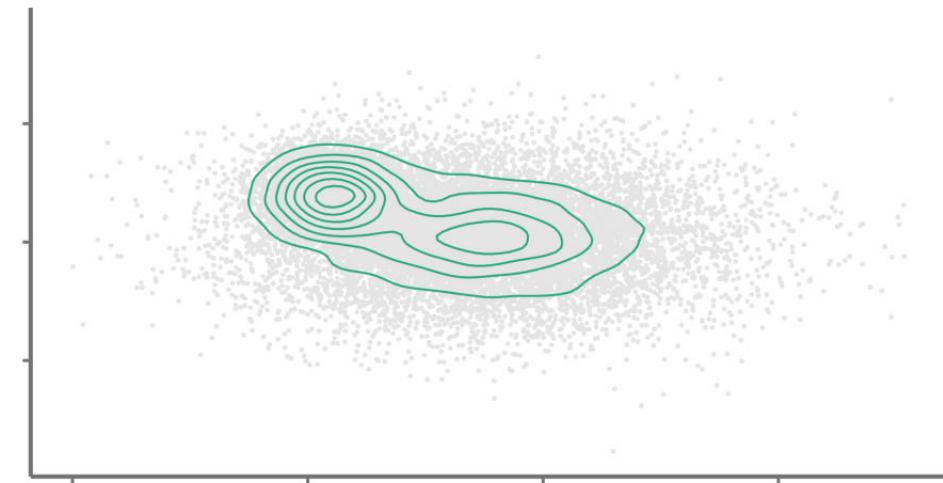
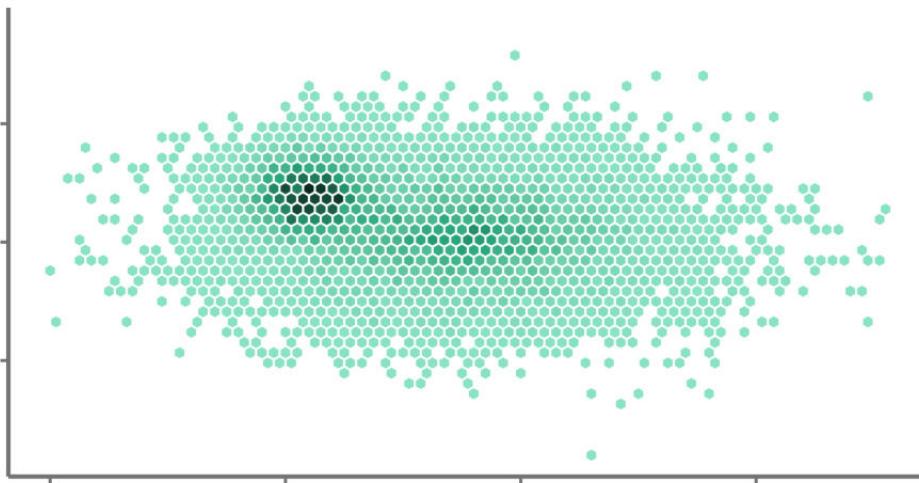
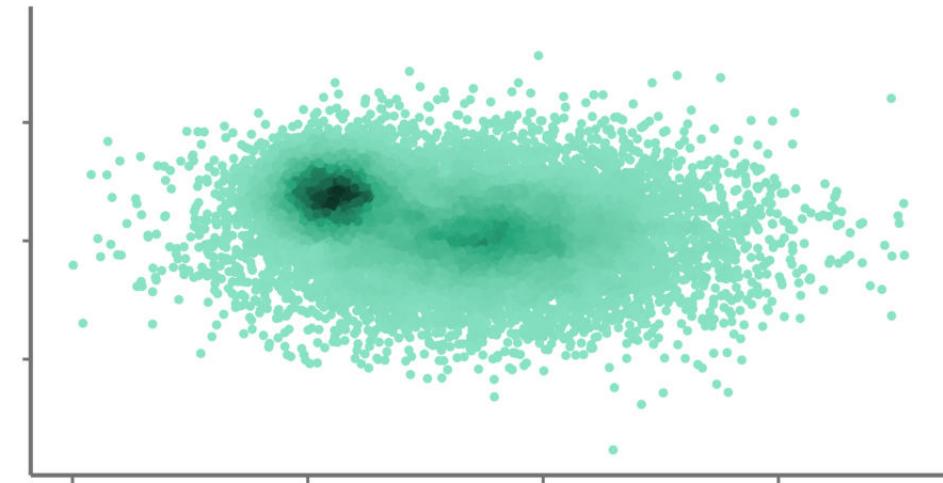
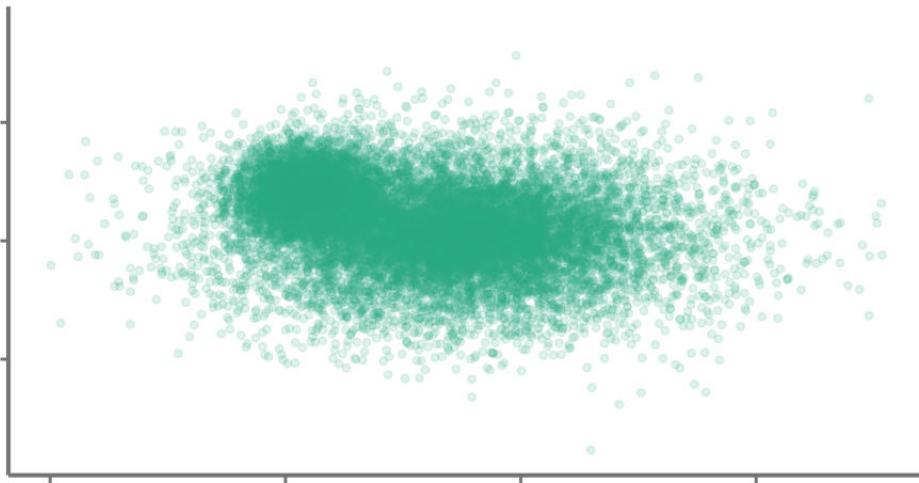
**Graded Confidence Bands**



# *Solving Common Chart Issues*

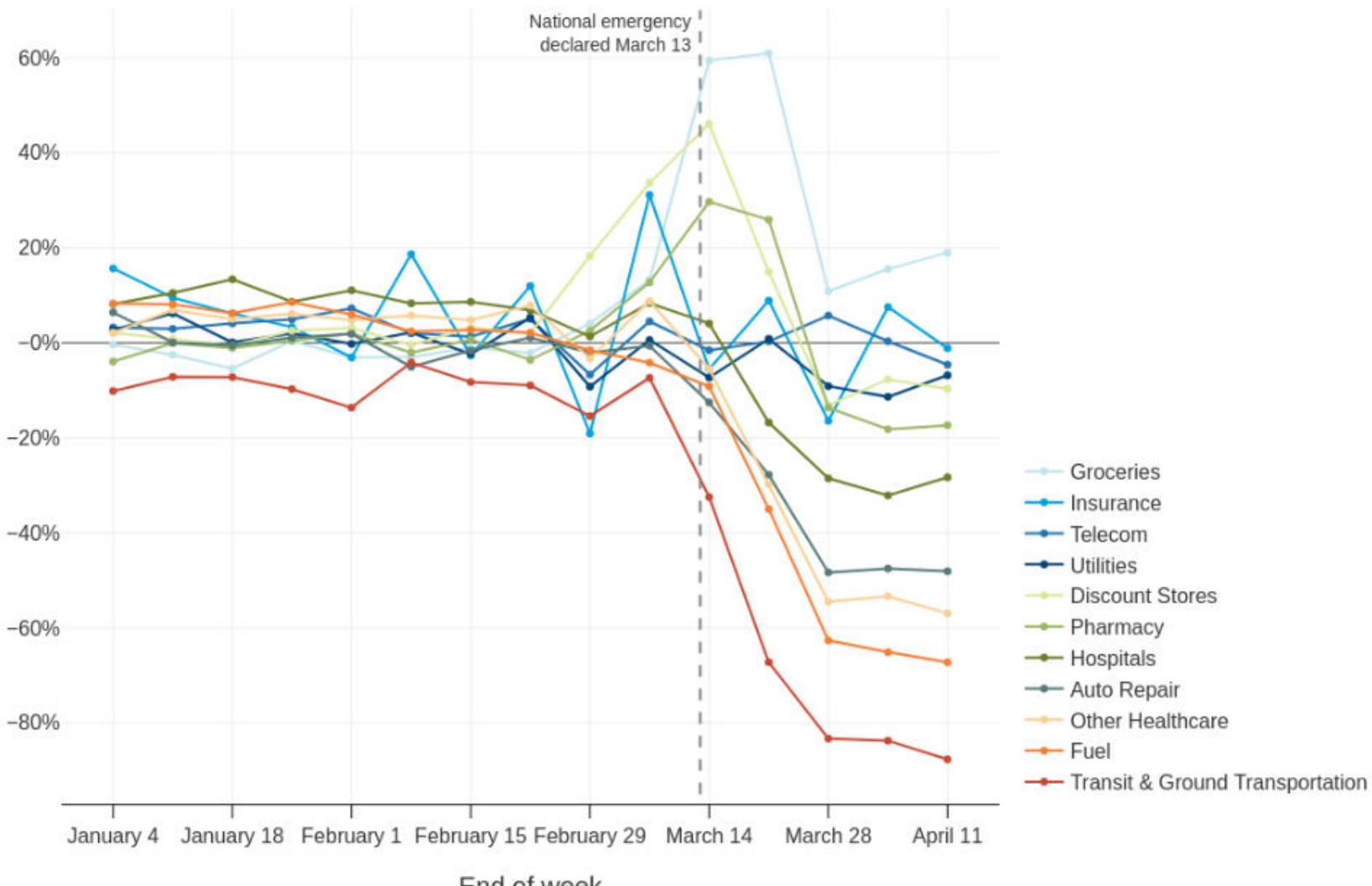


# Overplotting Issue

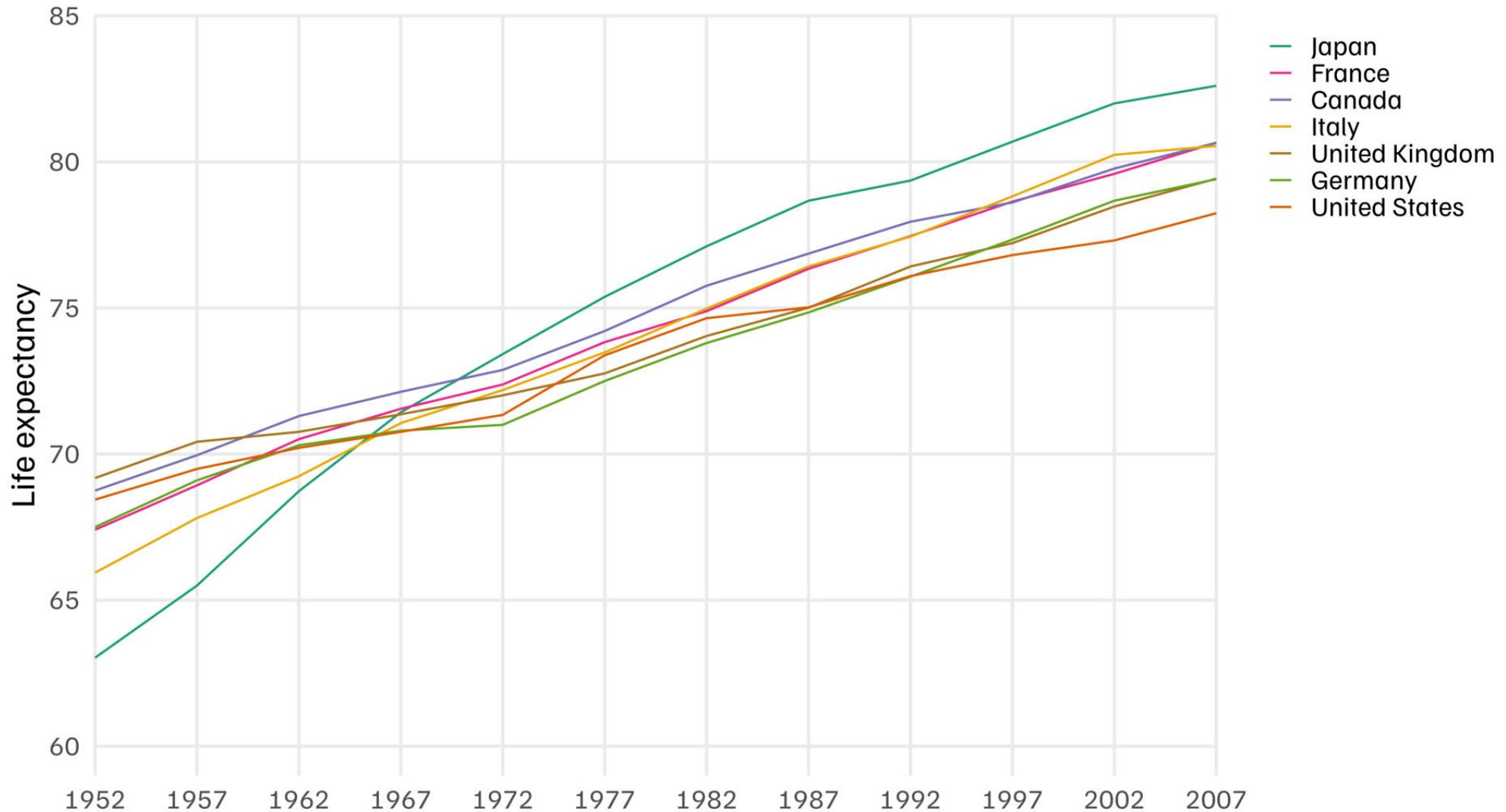


# Spaghetti Plots

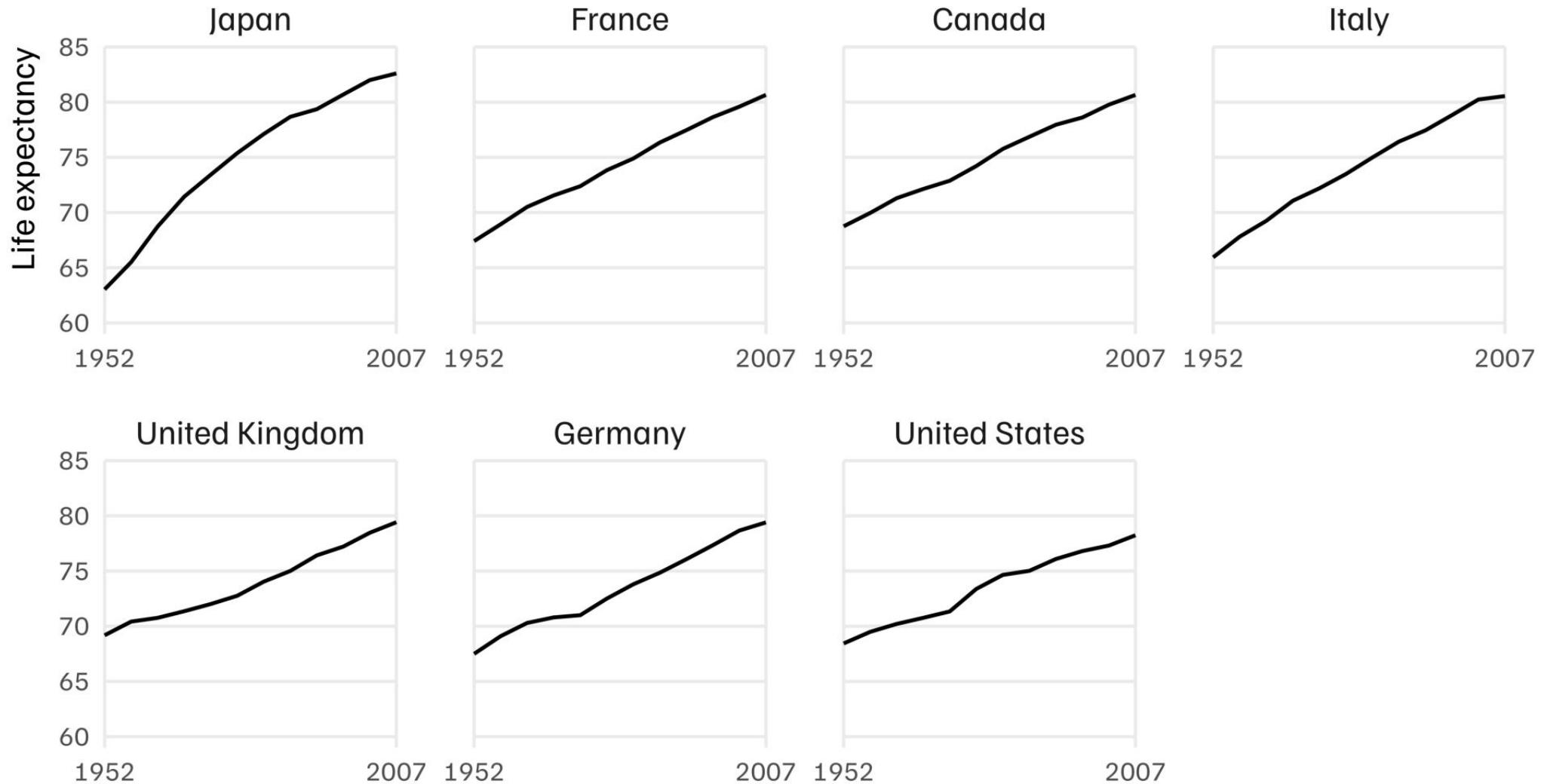
Year-over-year percent change in spending by essential category



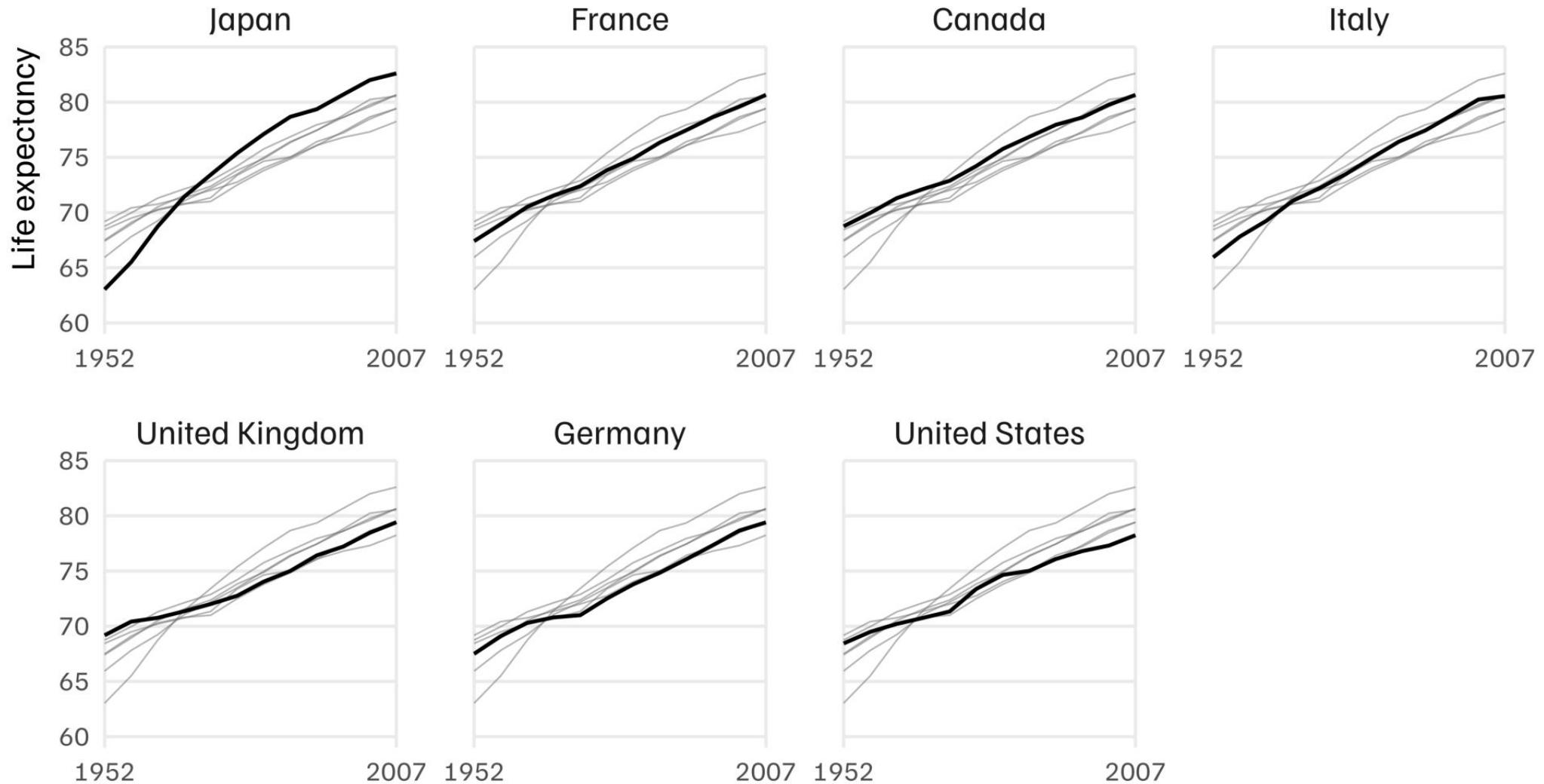
# Spaghetti Plots



# Spaghetti Plots

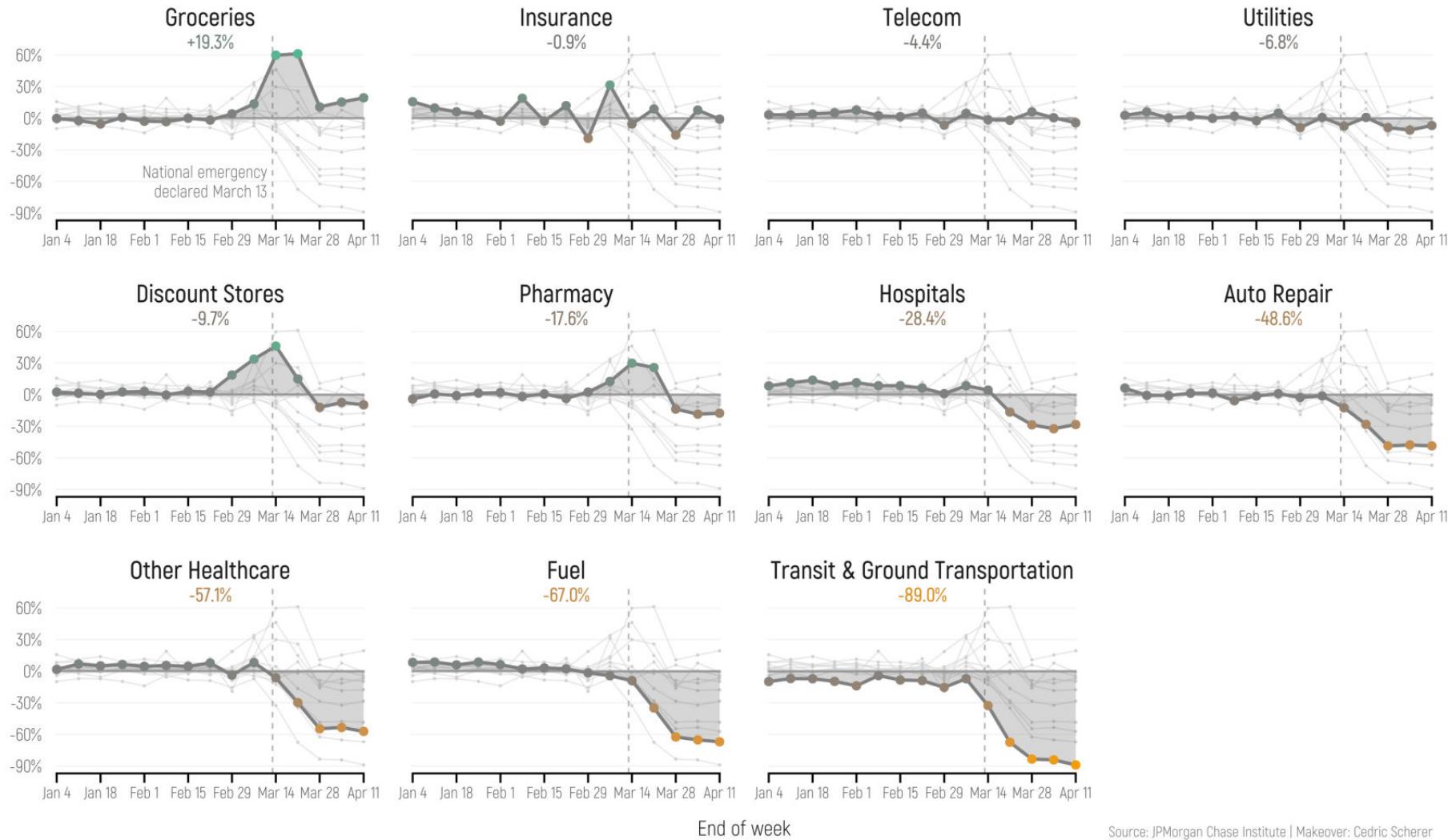


# Spaghetti Plots



# Spaghetti Plots

Most essential categories experienced **negative trends** in year-over-year percent changes in spending after the National Emergency was declared. Only groceries were found to have an overall **positive trend**.

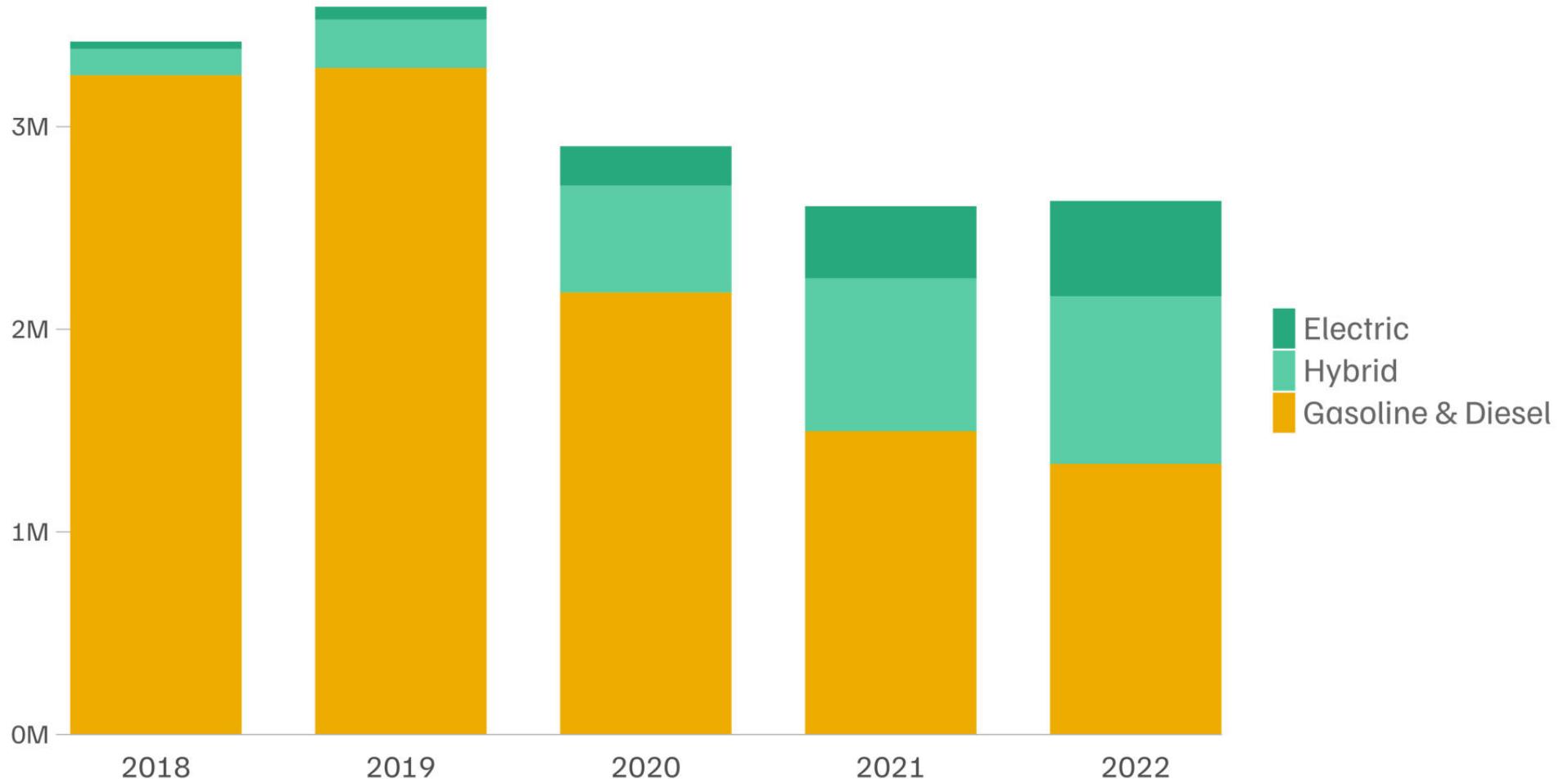


Source: JPMorgan Chase Institute | Makeover: Cedric Scherer



# Stacked Bars Issue

## New vehicle registrations in Germany

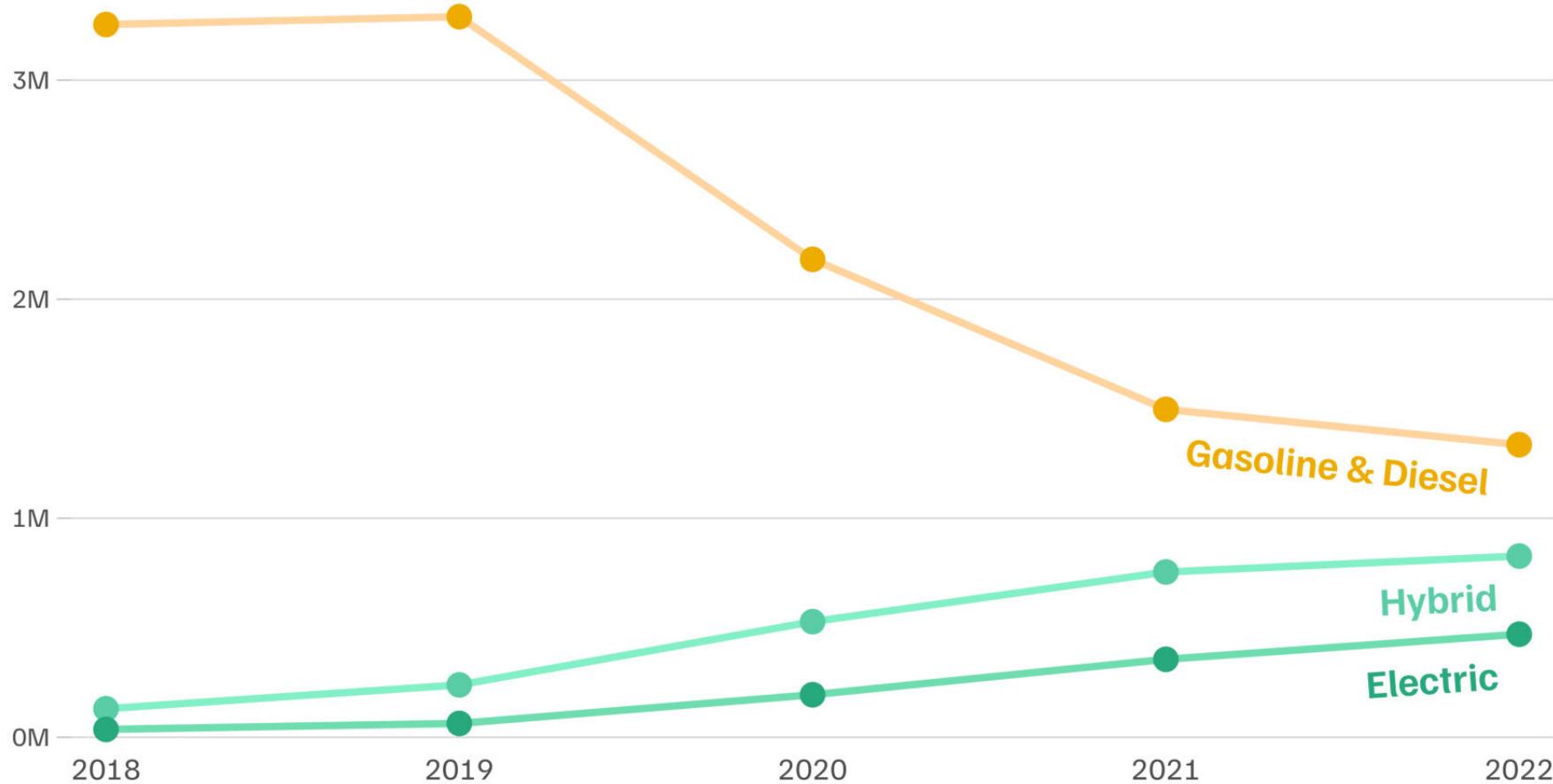


Source: Federal ministry for digital and transport / Kraftfahrt-Bundesamt • Graphic: Cédric Scherer



# Stacked Bars Issue

## New vehicle registrations in Germany

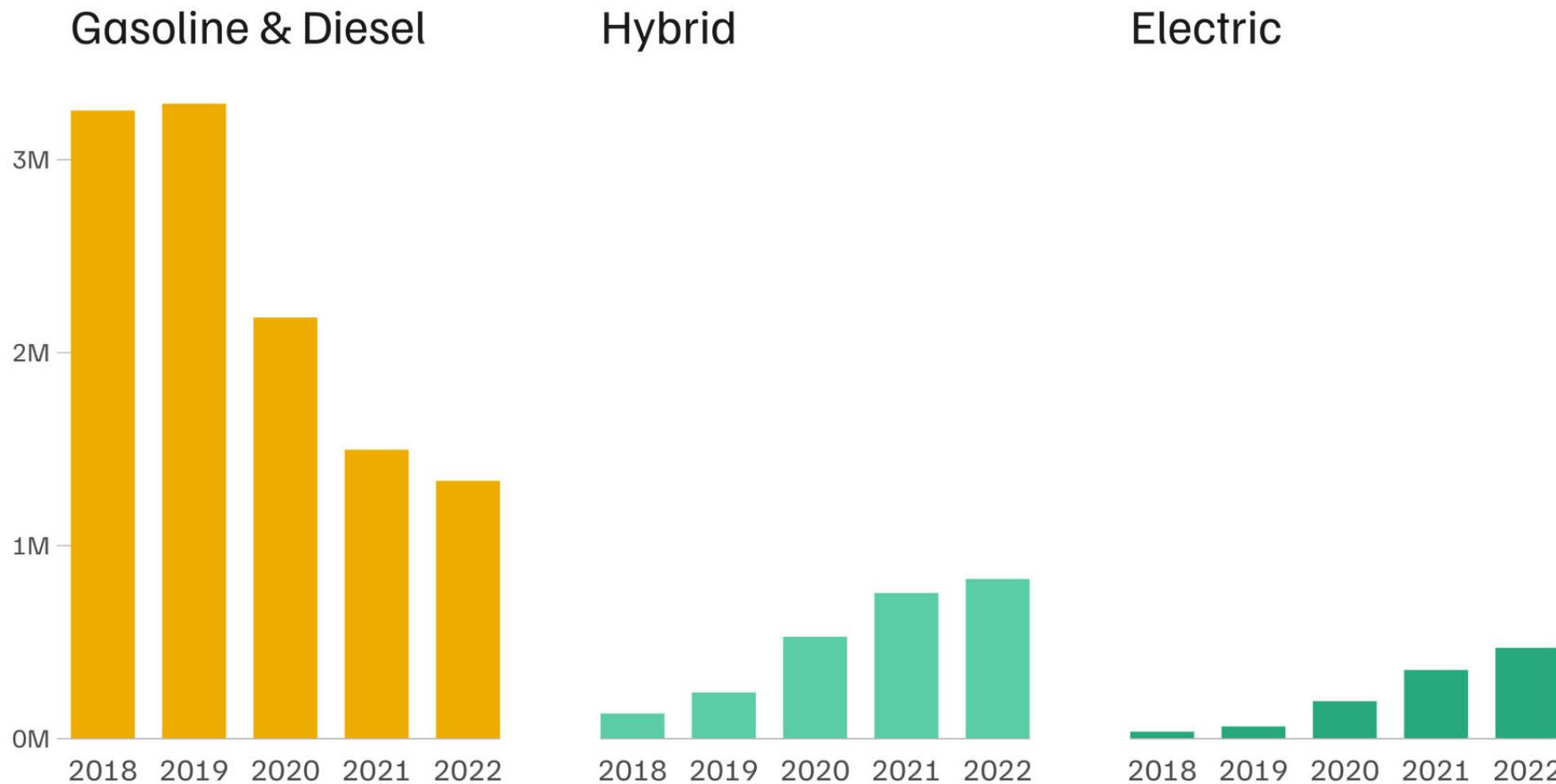


Source: Federal ministry for digital and transport / Kraftfahrt-Bundesamt • Graphic: Cédric Scherer



# Stacked Bars Issue

## New vehicle registrations in Germany

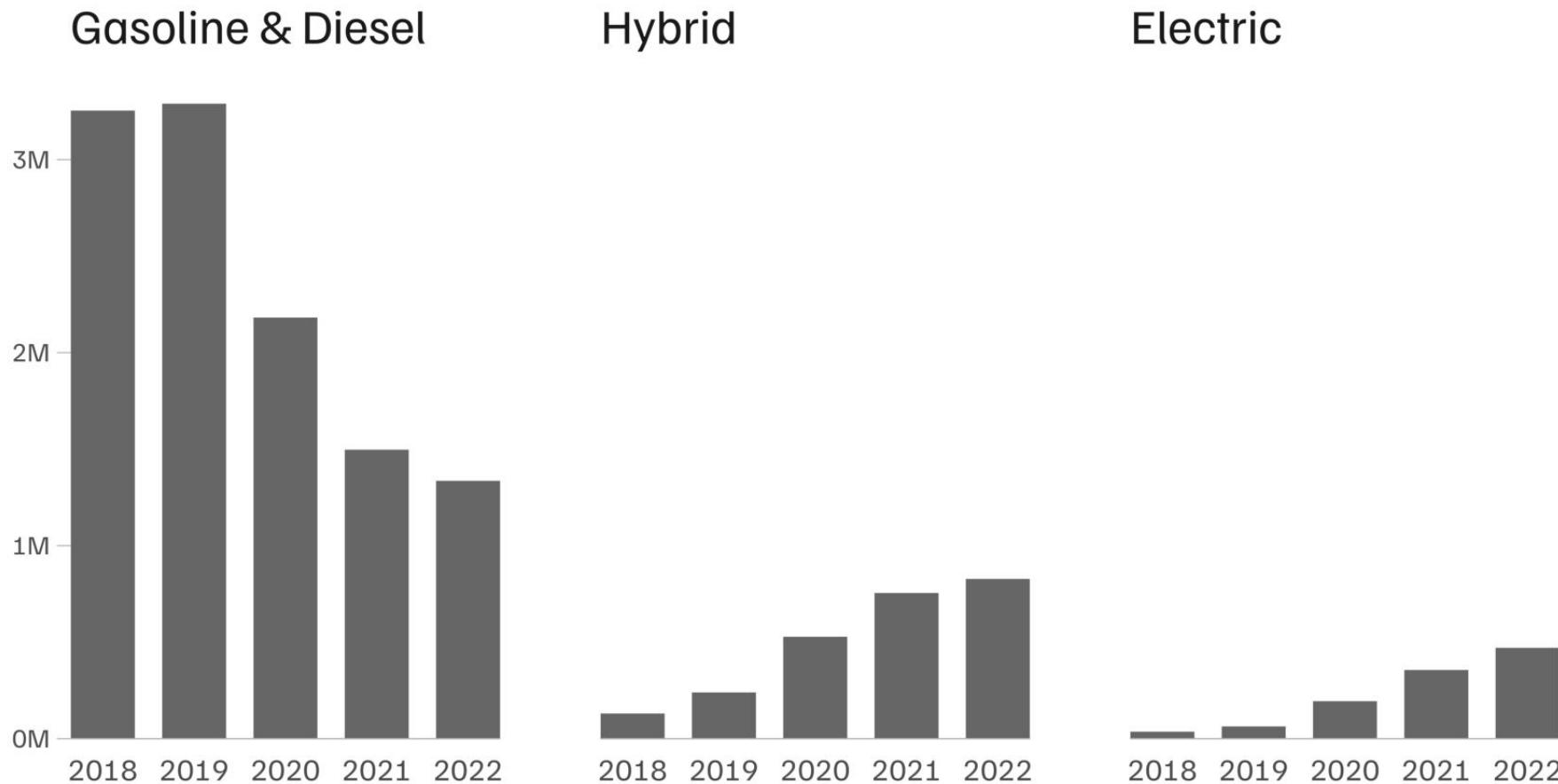


Source: Federal ministry for digital and transport / Kraftfahrt-Bundesamt • Graphic: Cédric Scherer



# Stacked Bars Issue

## New vehicle registrations in Germany

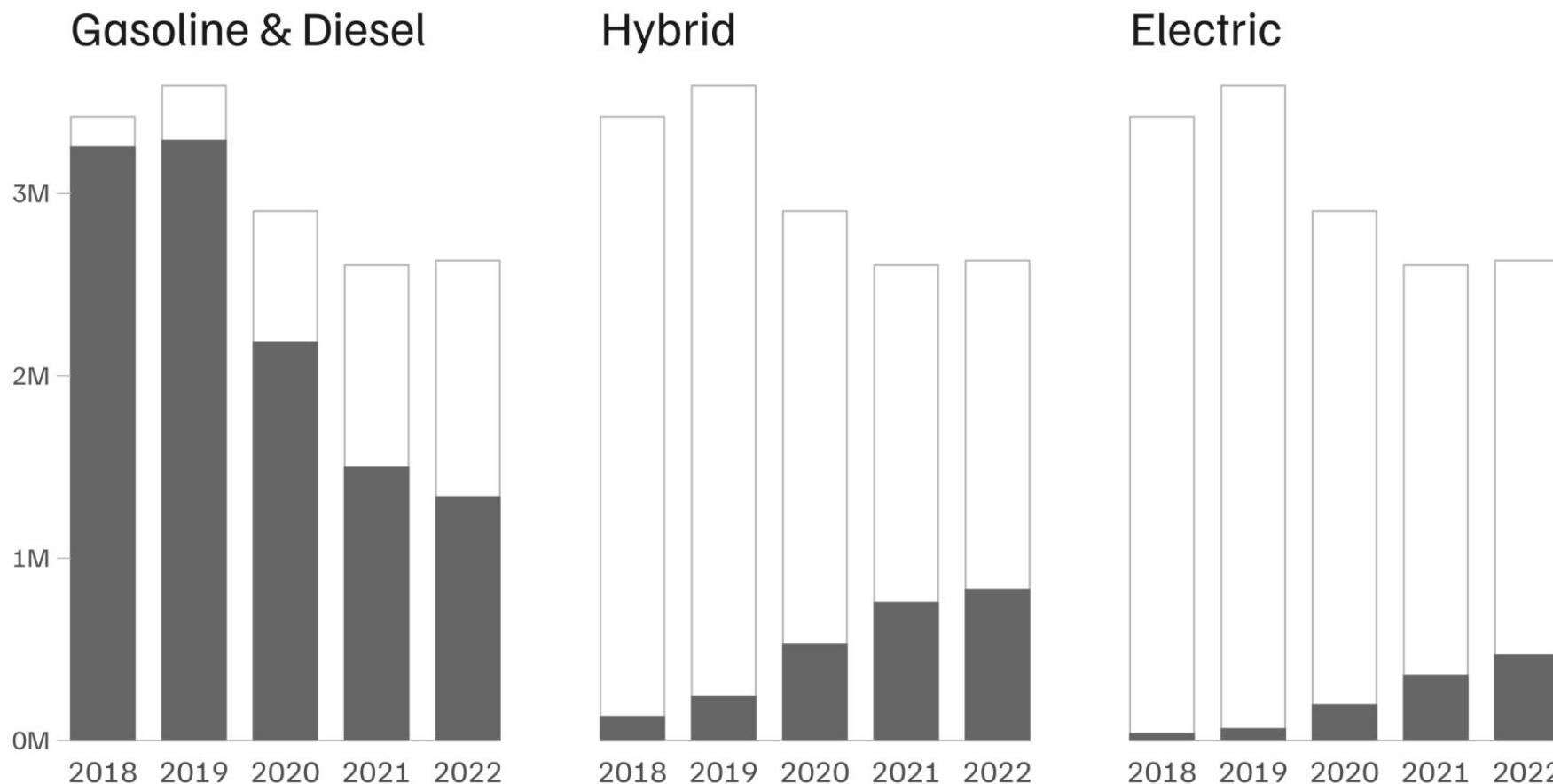


Source: Federal ministry for digital and transport / Kraftfahrt-Bundesamt • Graphic: Cédric Scherer



# Stacked Bars Issue

## New vehicle registrations in Germany

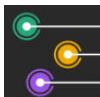
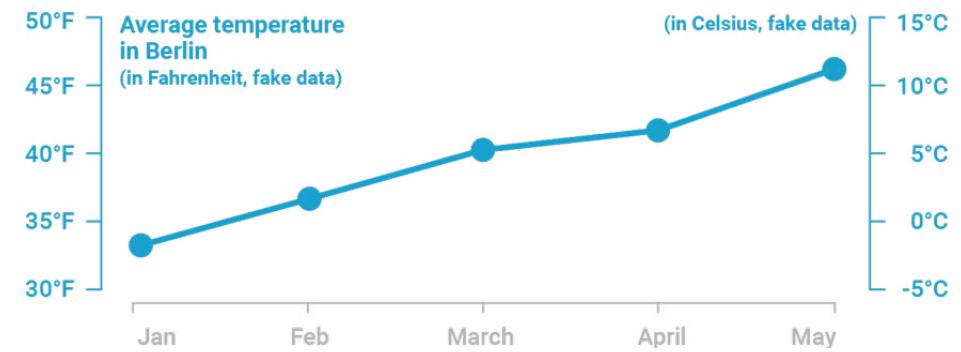
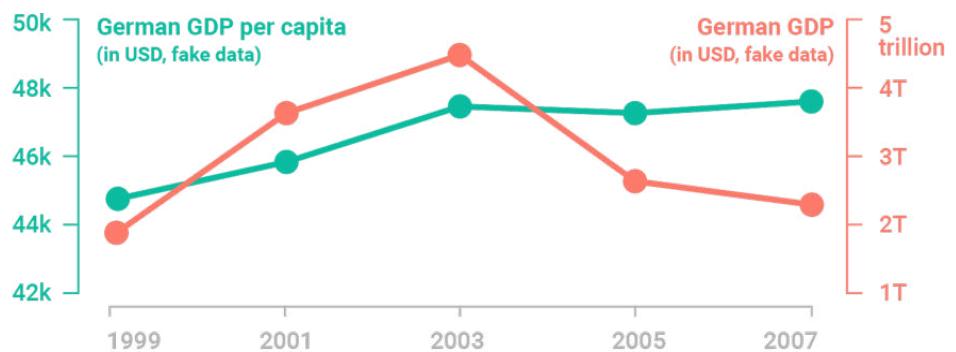
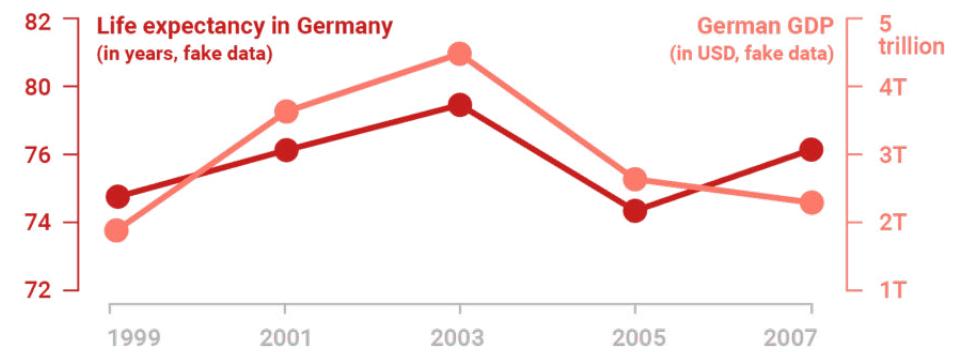
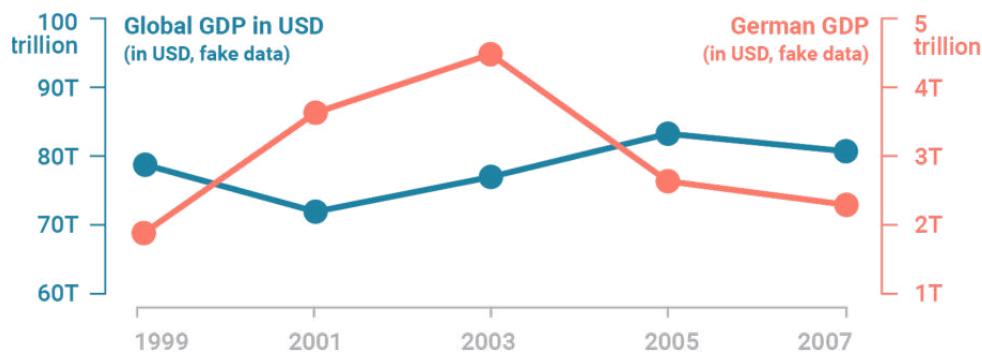


Source: Federal ministry for digital and transport / Kraftfahrt-Bundesamt • Graphic: Cédric Scherer



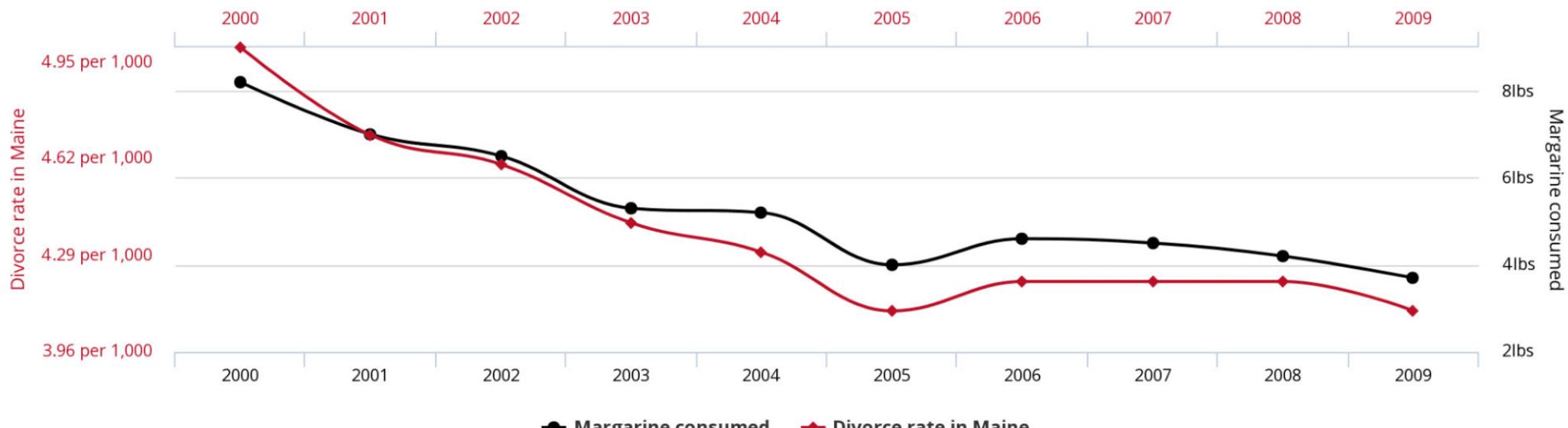
# Dual Axis Issue

Examples by Lisa Charlotte Muth, DataWrapper Blog



# Dual Axis Issue

**Divorce rate in Maine**  
correlates with  
**Per capita consumption of margarine**

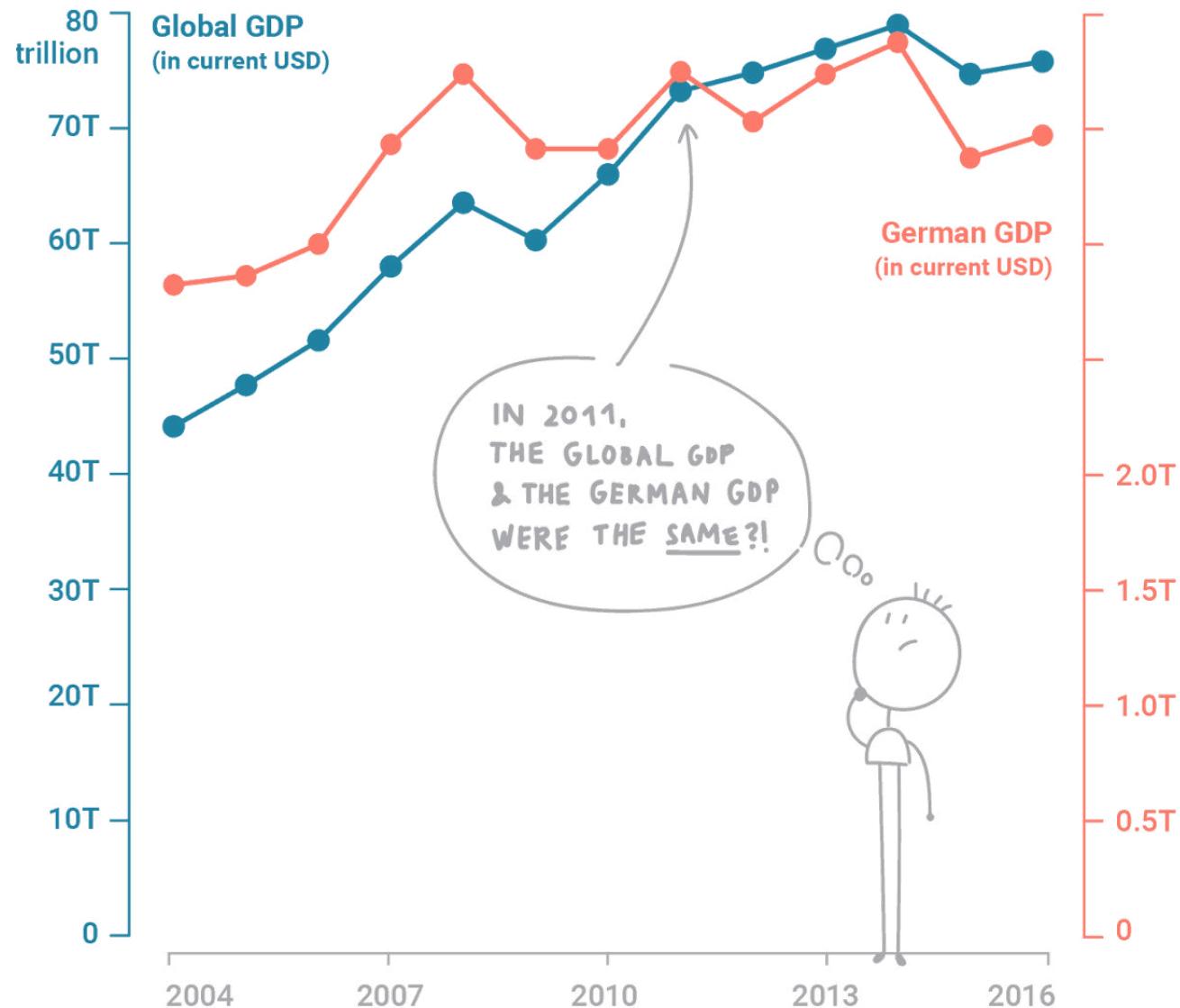


[tylervigen.com](http://tylervigen.com)

Source: [Spurious Correlations](#)



# Dual Axis Issue



Source: Lisa Charlotte Muth, [DataWrapper Blog](#)

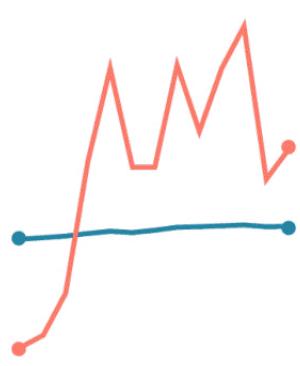
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# Dual Axis Issue



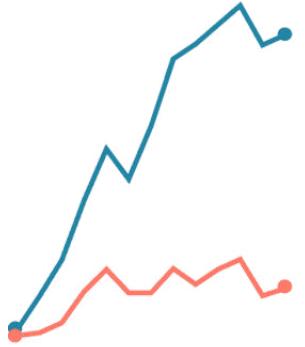
Orange steady,  
Blue massively increasing.



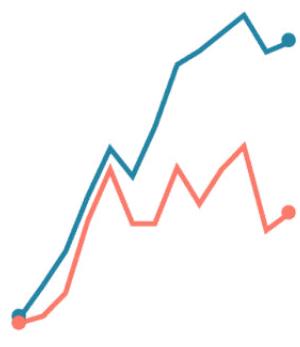
Blue steady,  
Orange increasing.



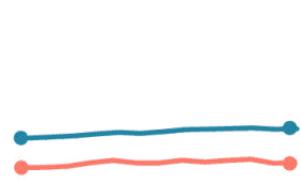
Both started at the same  
level, but Orange increased  
far more than Blue.



Both started at the same  
level, but Blue increased far  
more than Orange.



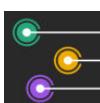
Both started with the  
same increase, then Blue  
raced to the top.



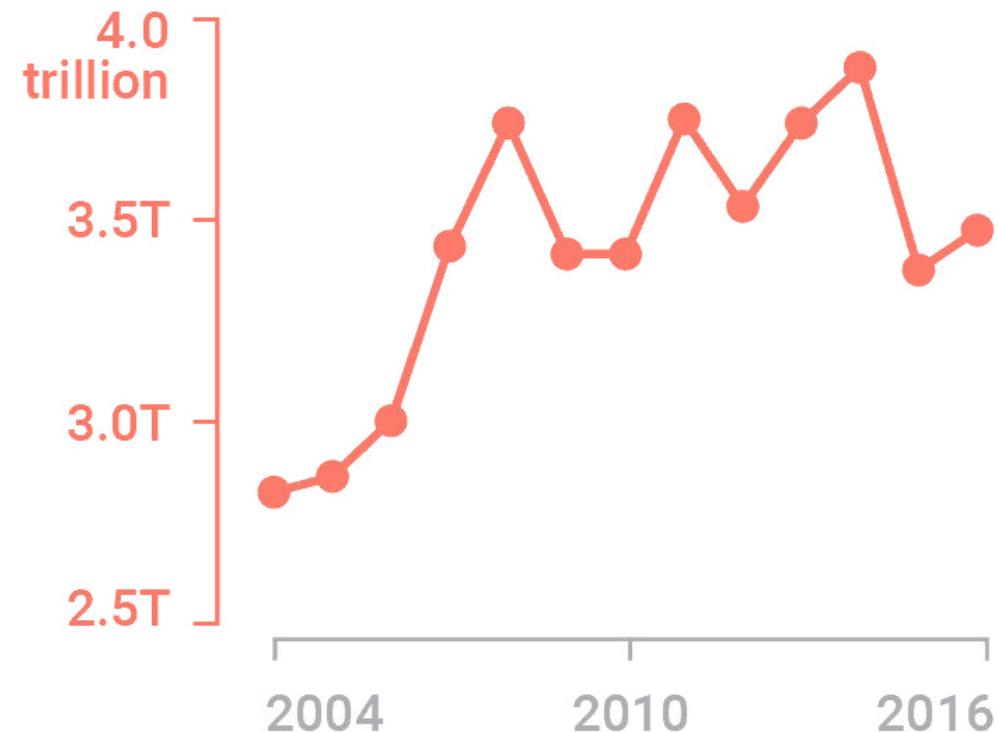
Both steady.

Source: Lisa Charlotte Muth, [DataWrapper Blog](#)

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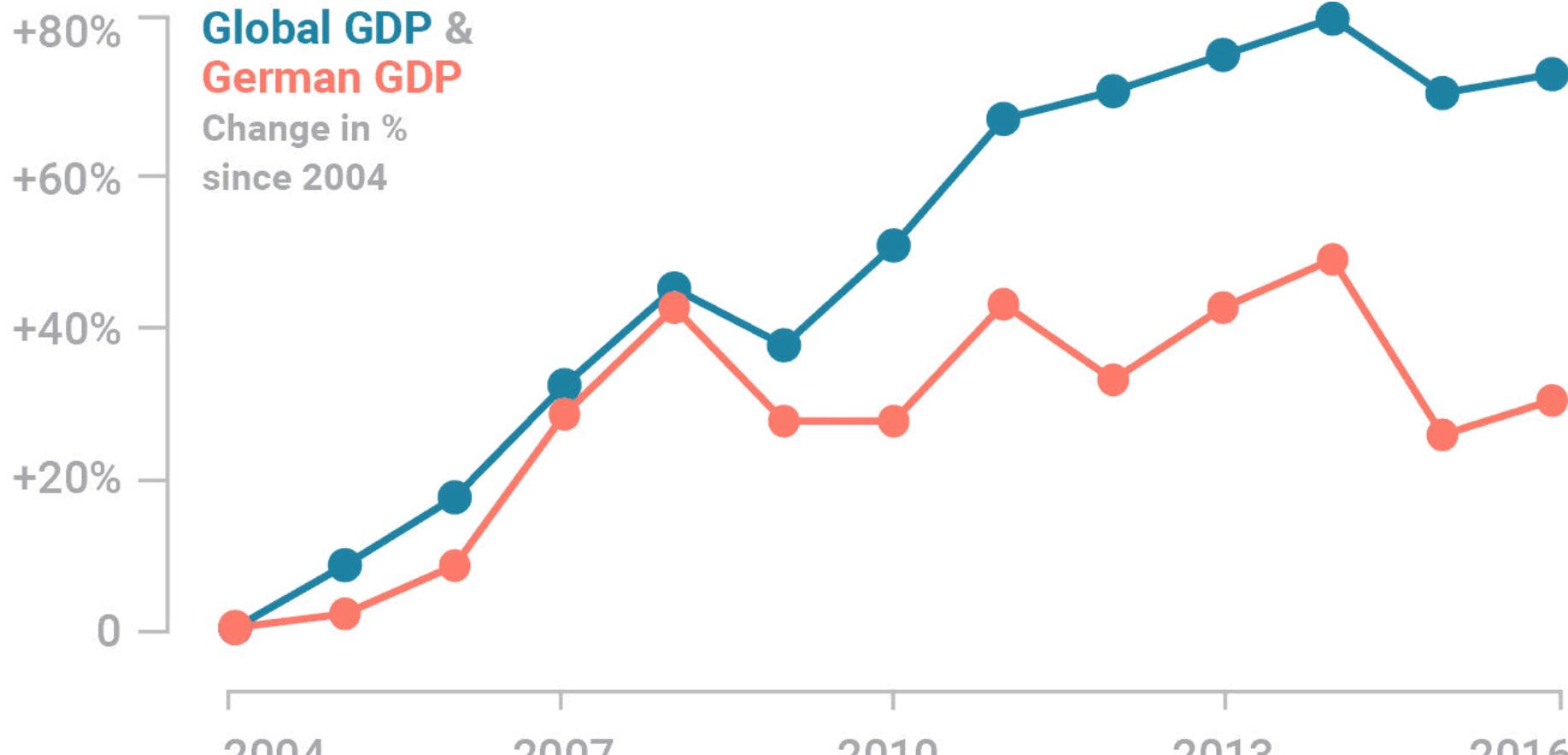
# Dual Axis Issue



Source: Lisa Charlotte Muth, [DataWrapper Blog](#)



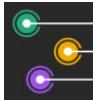
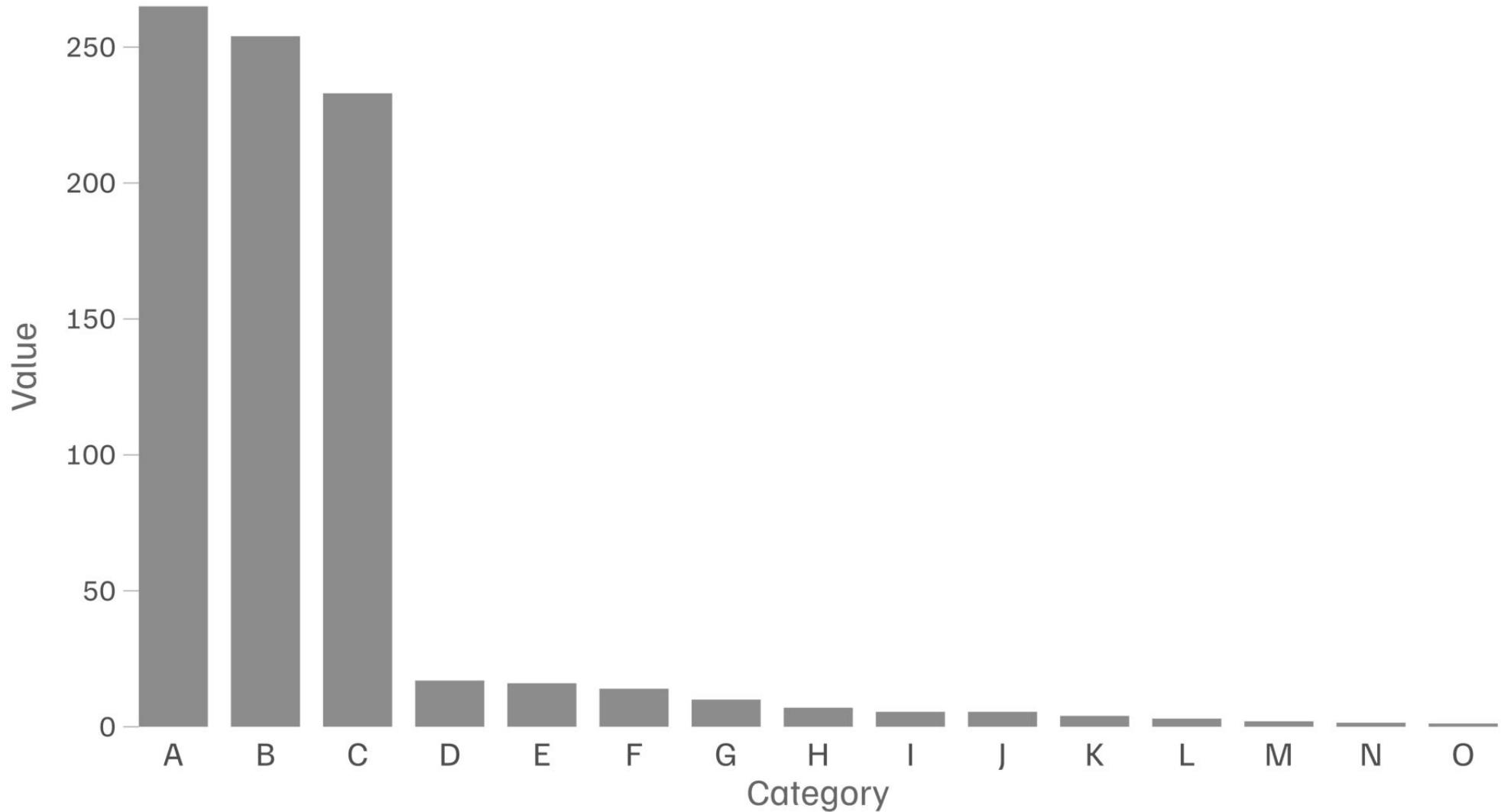
# Dual Axis Issue



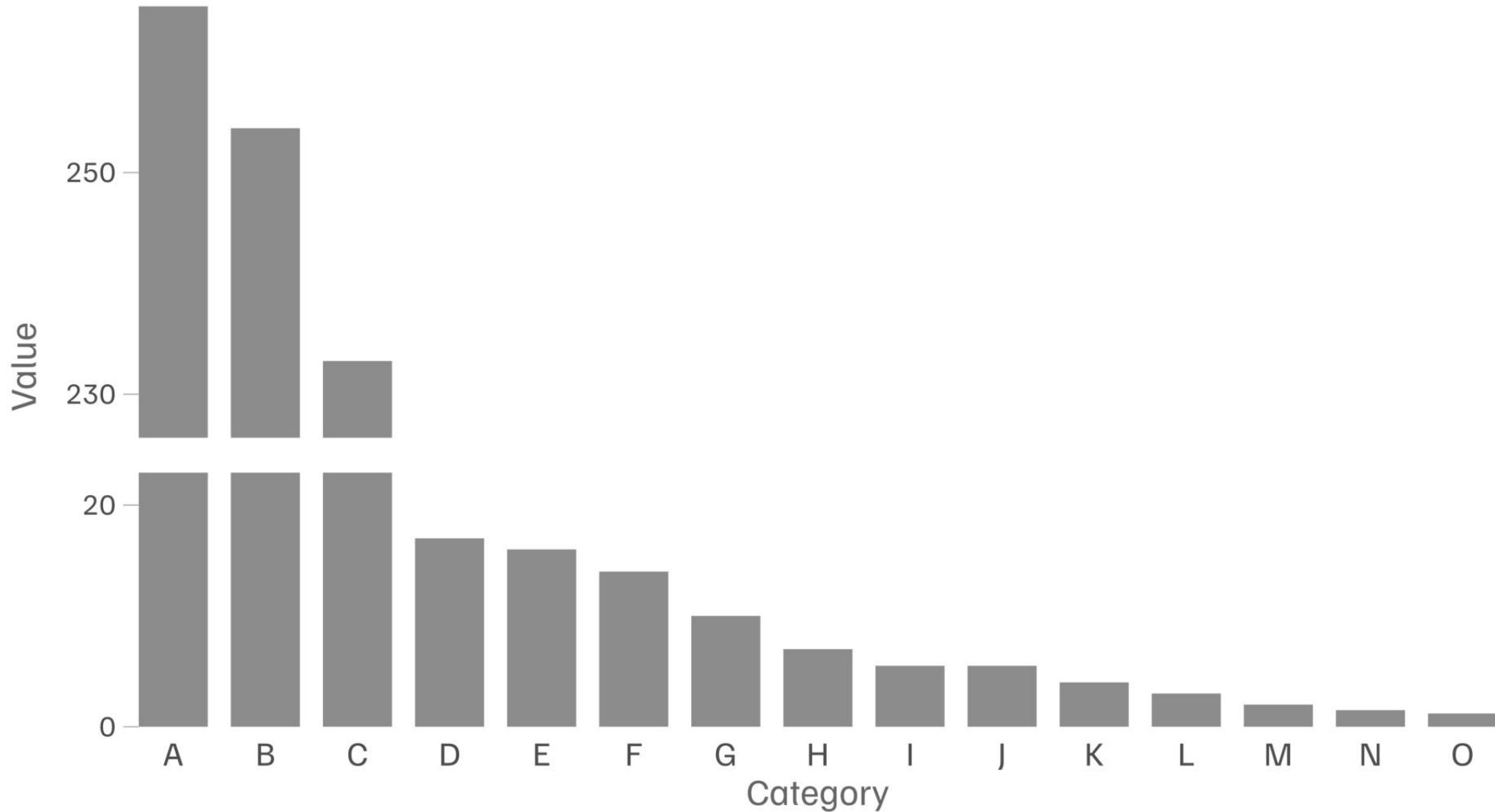
Source: Lisa Charlotte Muth, [DataWrapper Blog](#)



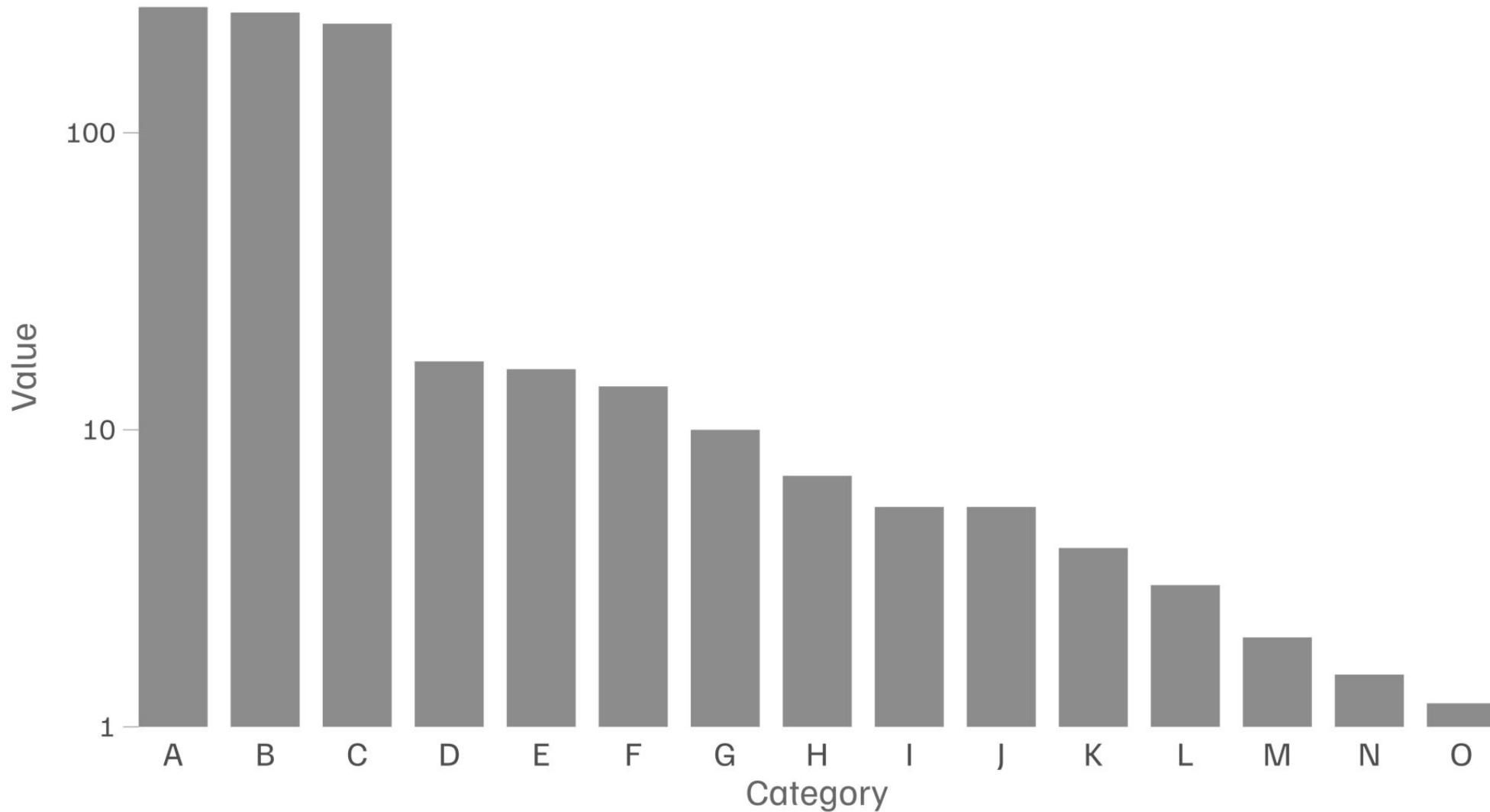
# Skewed Data



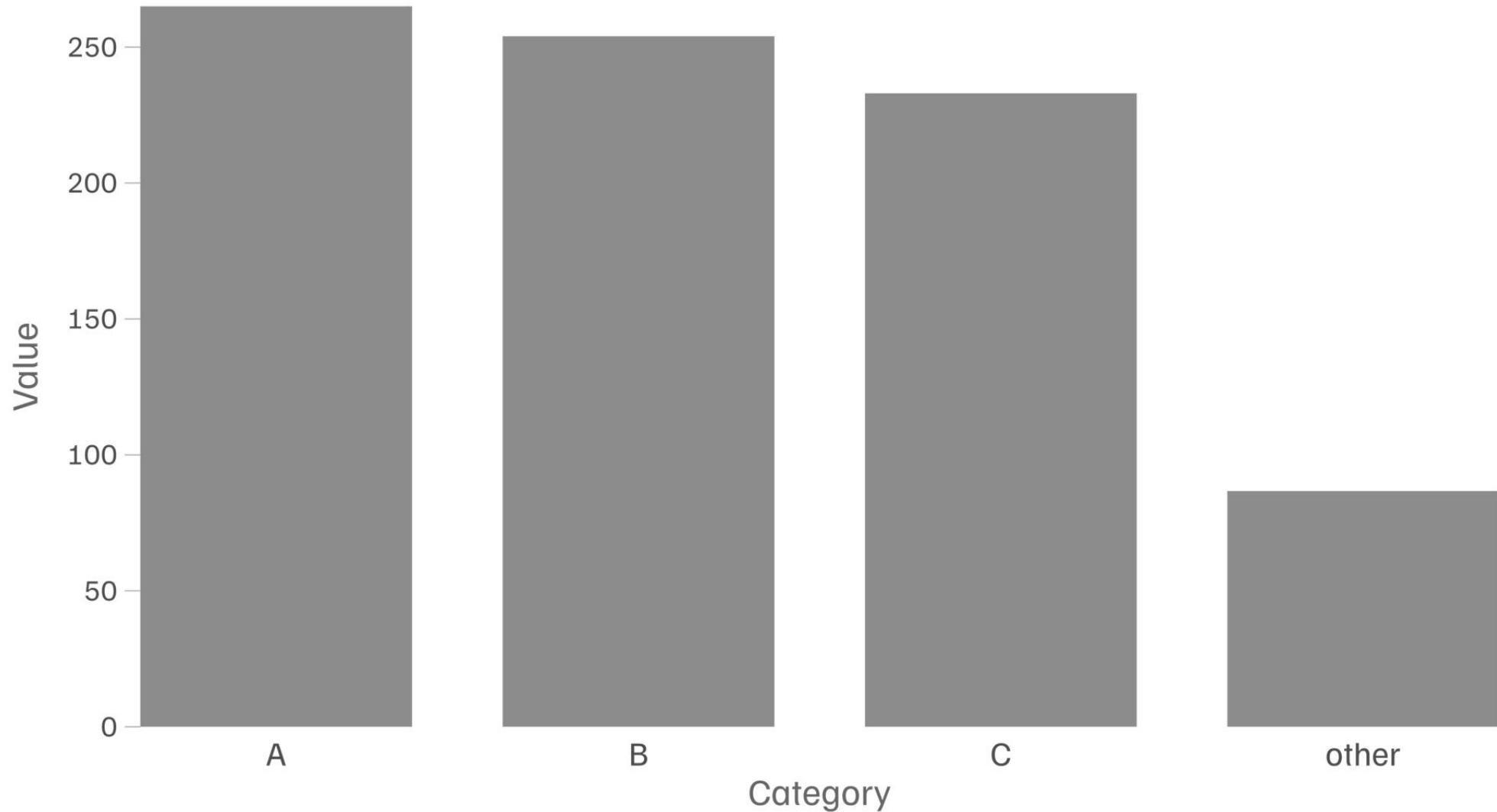
# Skewed Data



# Skewed Data

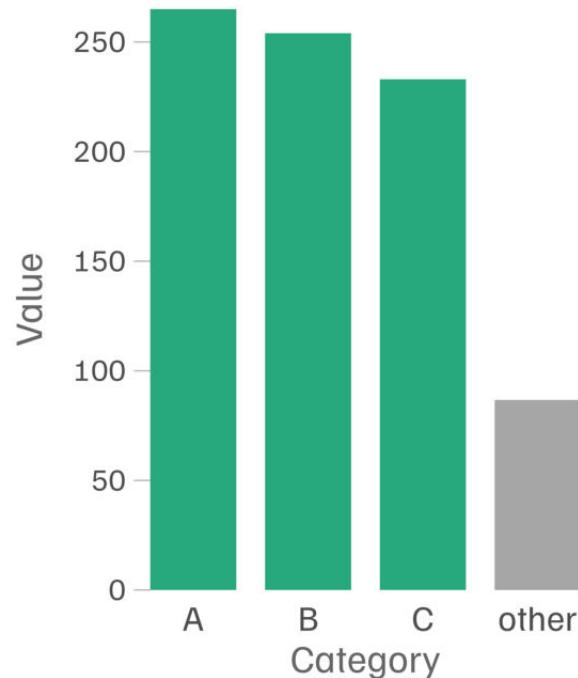


# Skewed Data

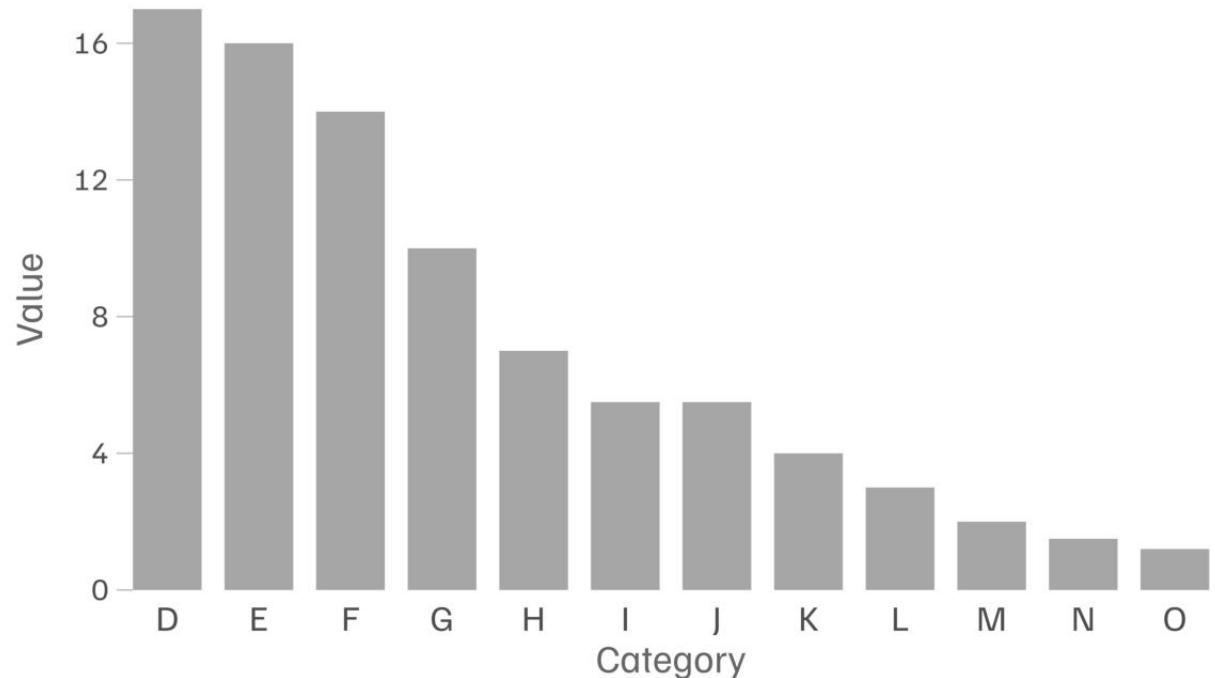


# Skewed Data

All categories



Other categories



# Exercises

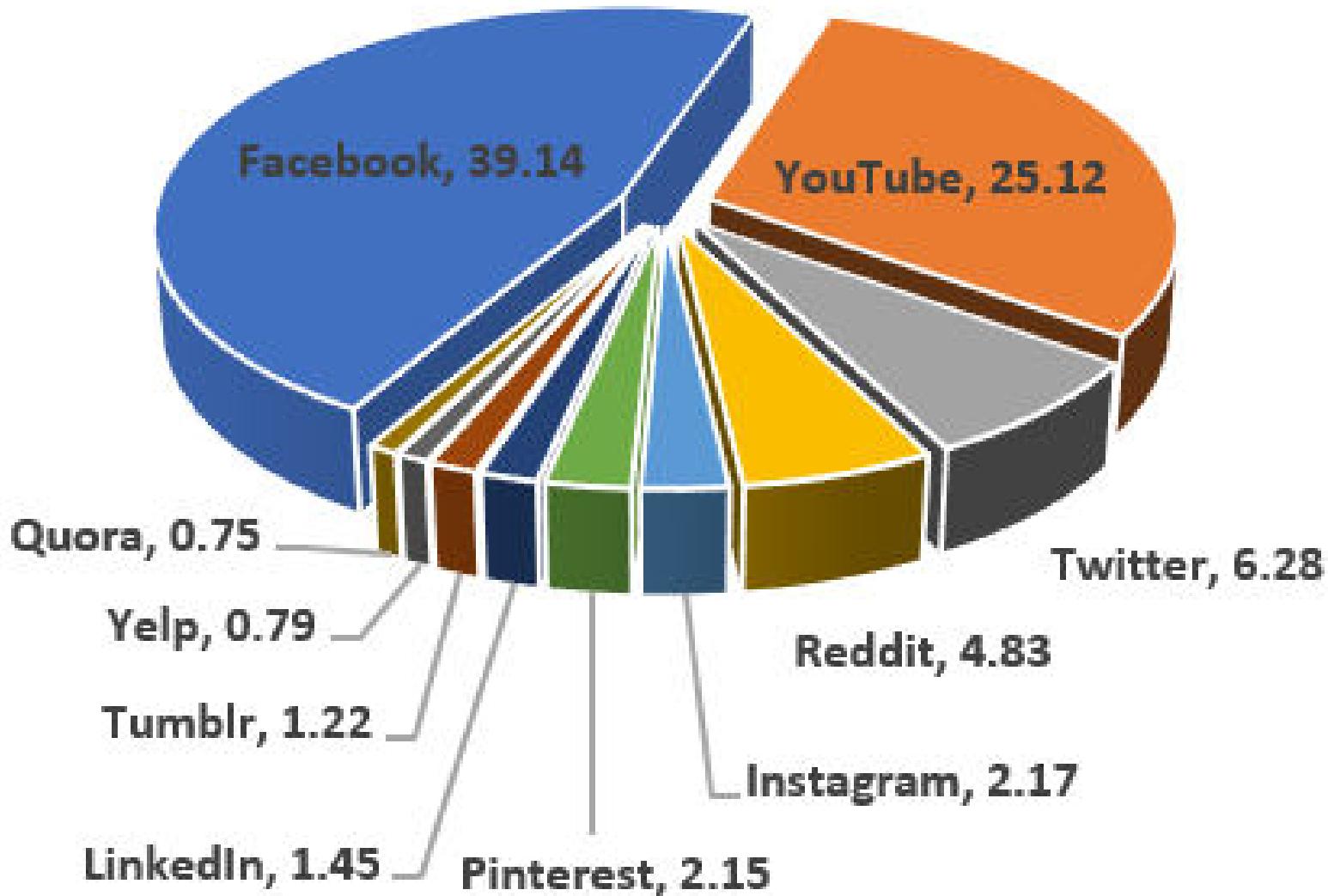


# Exercise 1

- **Discuss the following graphic.**
  - What is the main message?
  - Does the chart type work?
  - What other chart types could be used to represent the data?
  - Would you rather keep all the data or condense the information?
  - Draw alternative charts that emphasize the main message.



# Exercise 1



Market share of visits to social network sites in November 2017,  
found in the blog post on "[Why you shouldn't use pie charts](#)" by The University of Melbourne



# Exercise 2

- **Work on your current data sets and visualization(s).**
  - List all encodings used to represent your variables.
    - Is the level of accuracy appropriate and meaningful?
  - If you use color to encode variables:
    - What palette type are you using?
    - Is the palette type adequate to represent your data?
    - Does it fulfill the requirements?
  - Based on the “who”, “what” and “how” review the current chart type.
    - Is it suitable to transport the story to your audience?
  - Explore other options to visualize the findings. Draw sketches and discuss the different variants with your group.



# Suggested Solutions

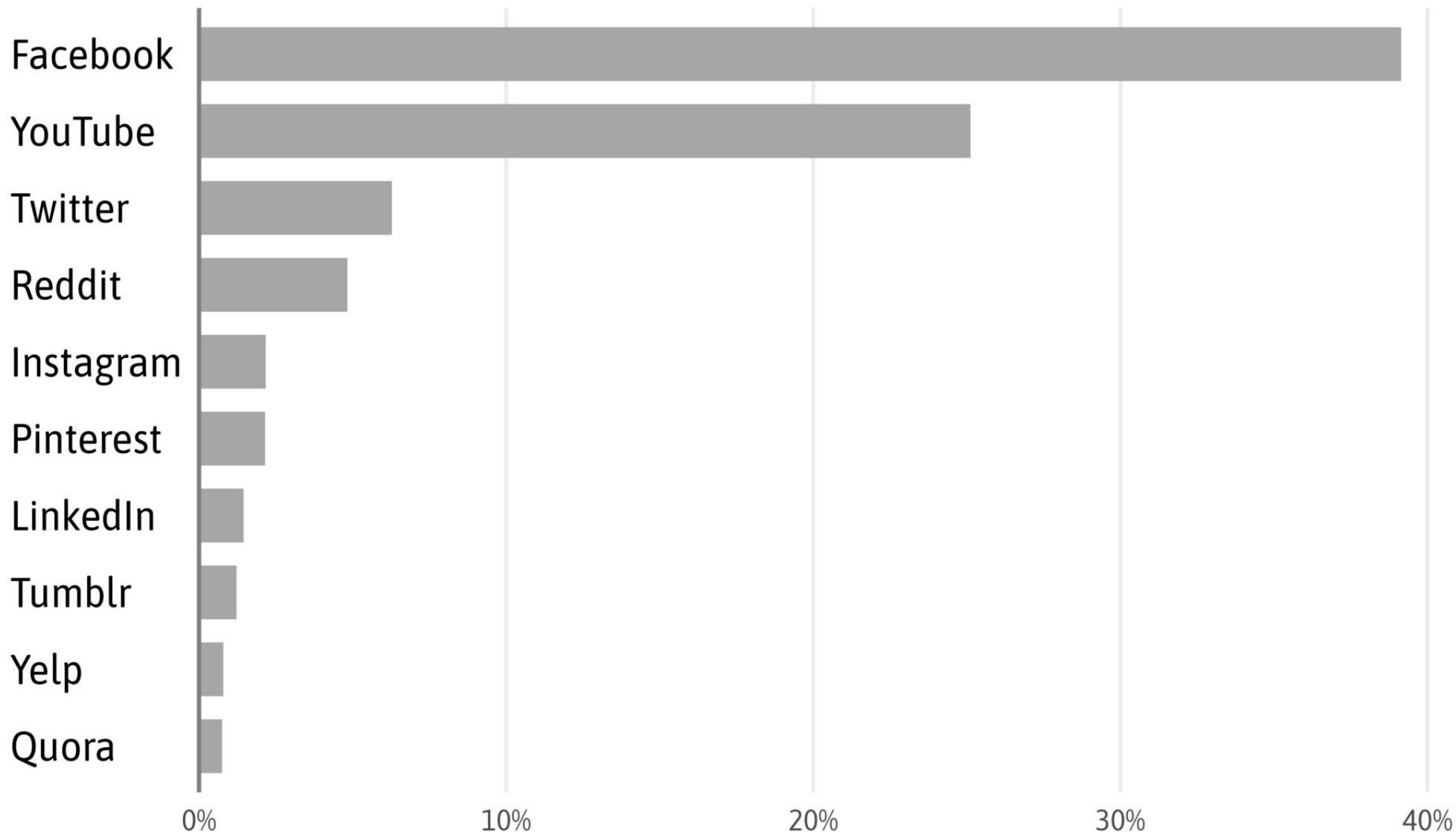


# Exercise 1

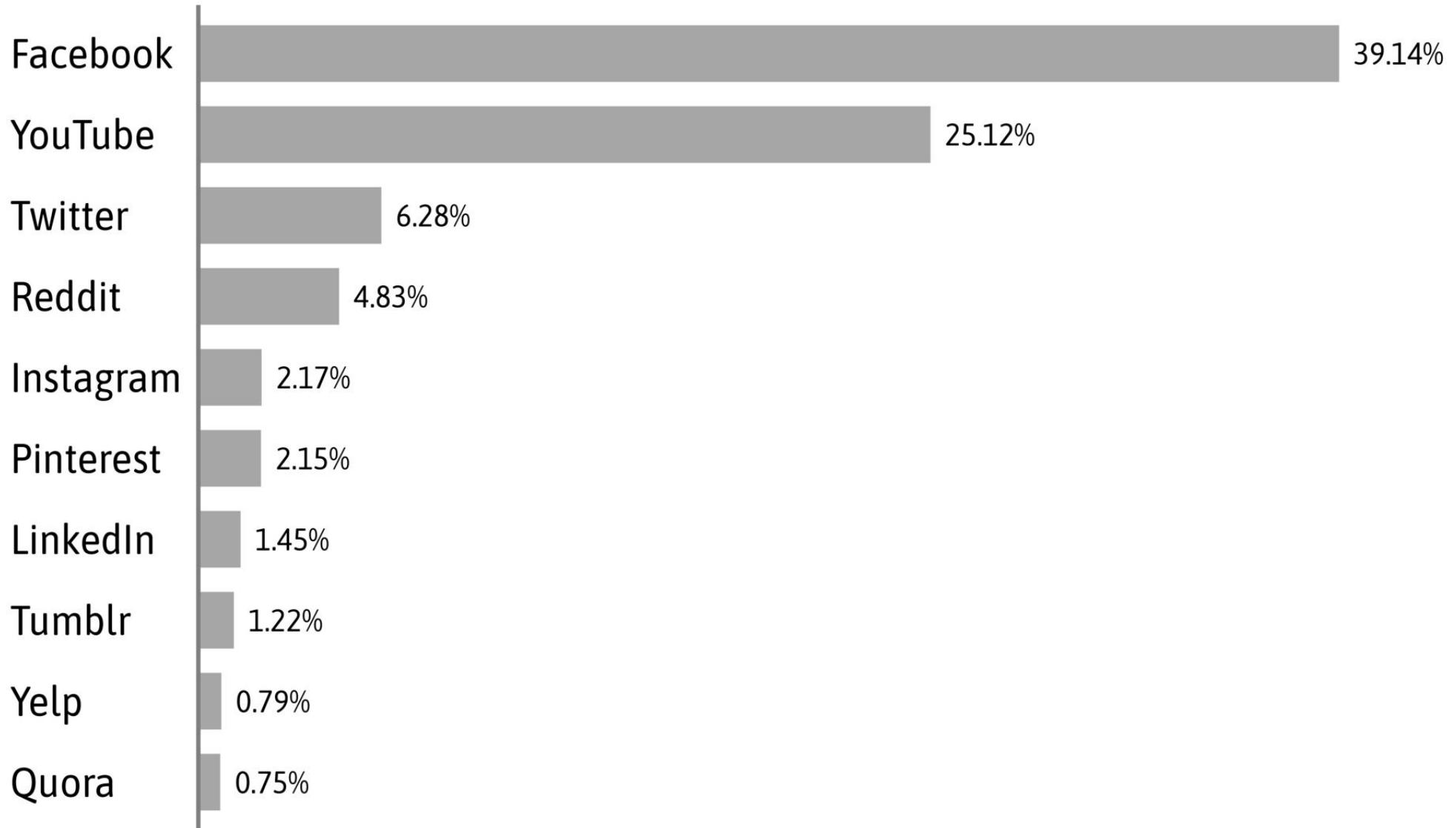
- **Discuss the following graphic.**
  - What is the main message?
  - Does the chart type work?
  - Is there a better chart type?
  - Draw an alternative version(s) using different chart type(s).



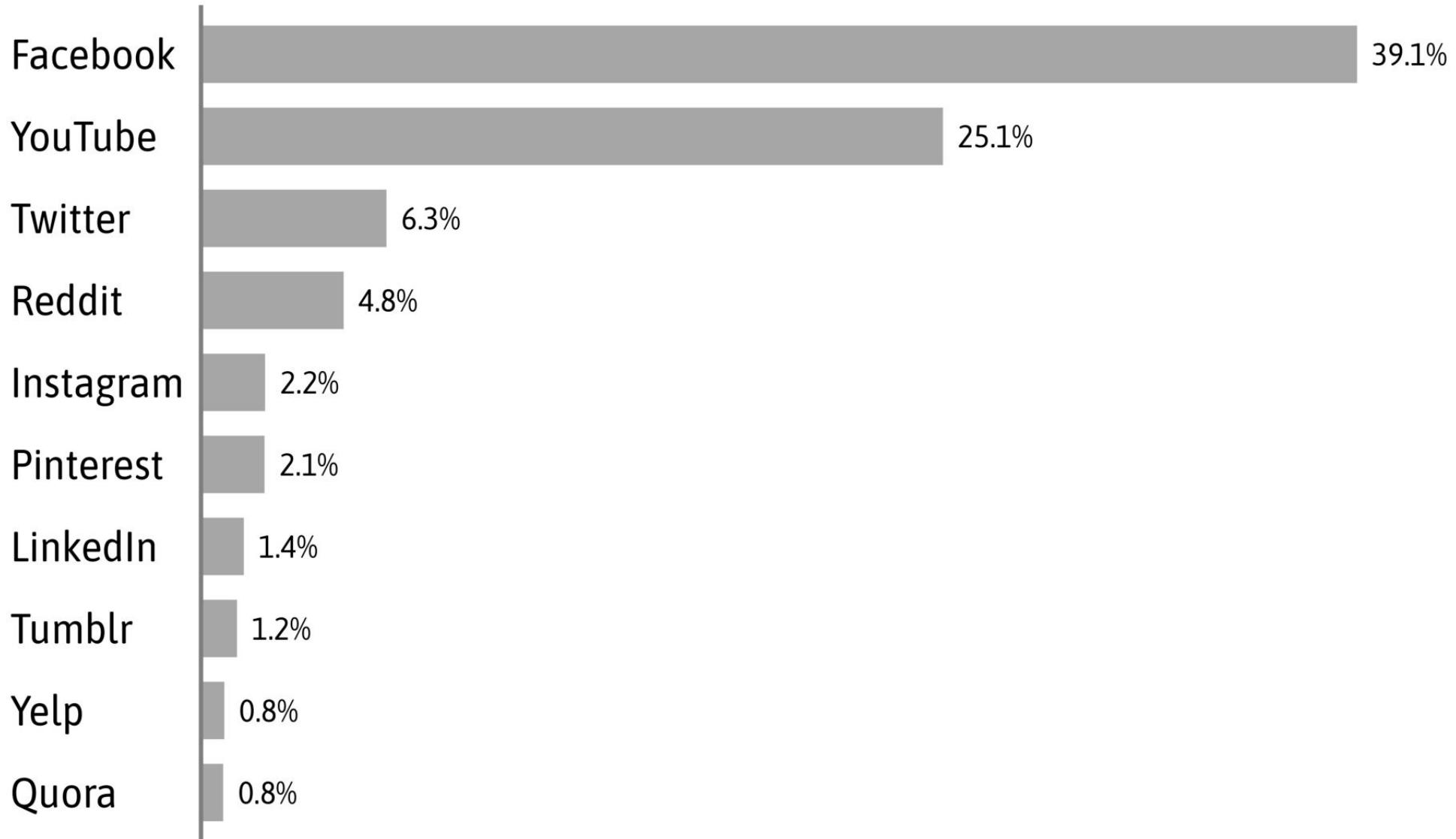
# Market share of social media visits (Nov. 2017)



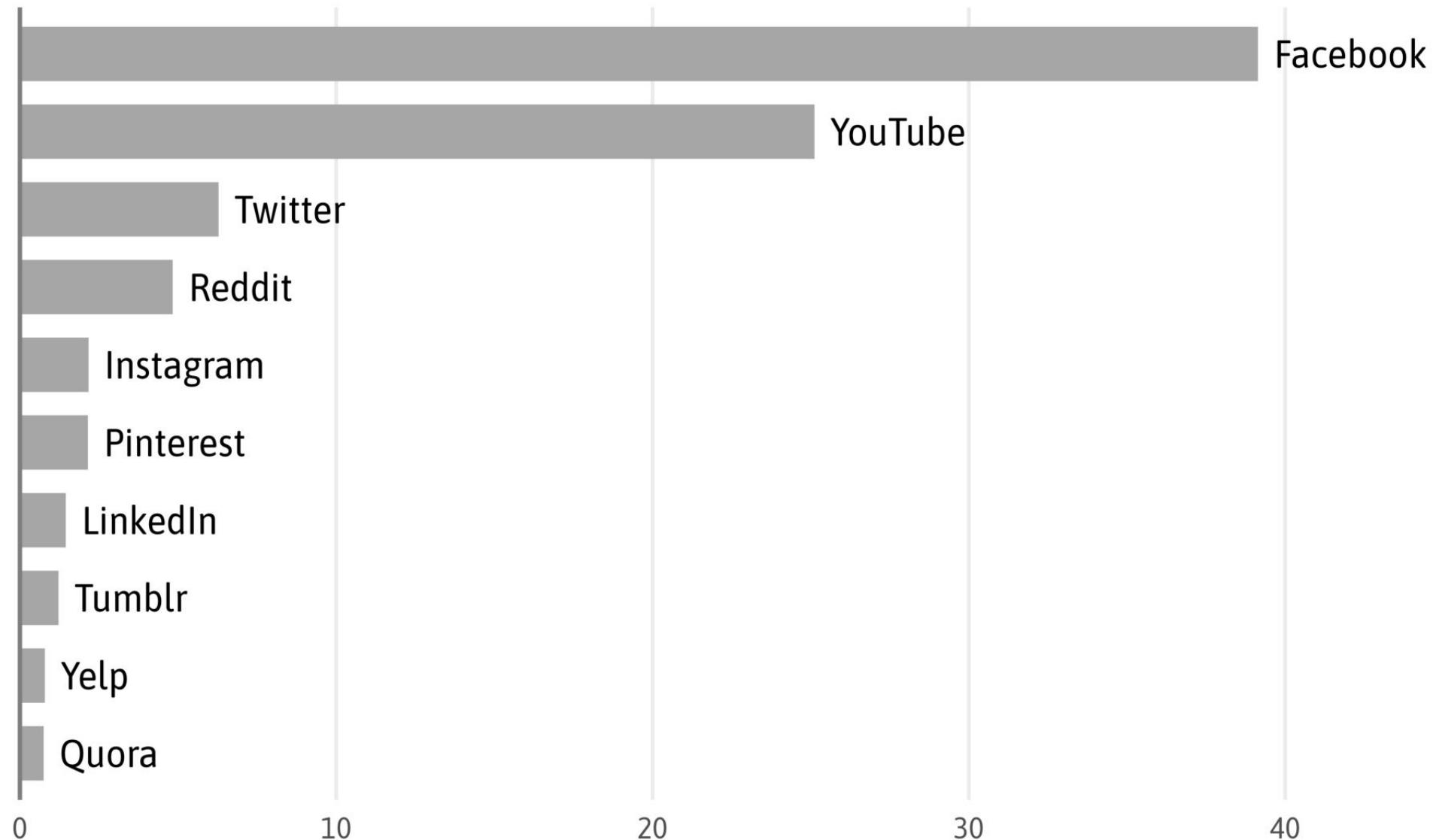
# Market share of social media visits (Nov. 2017)



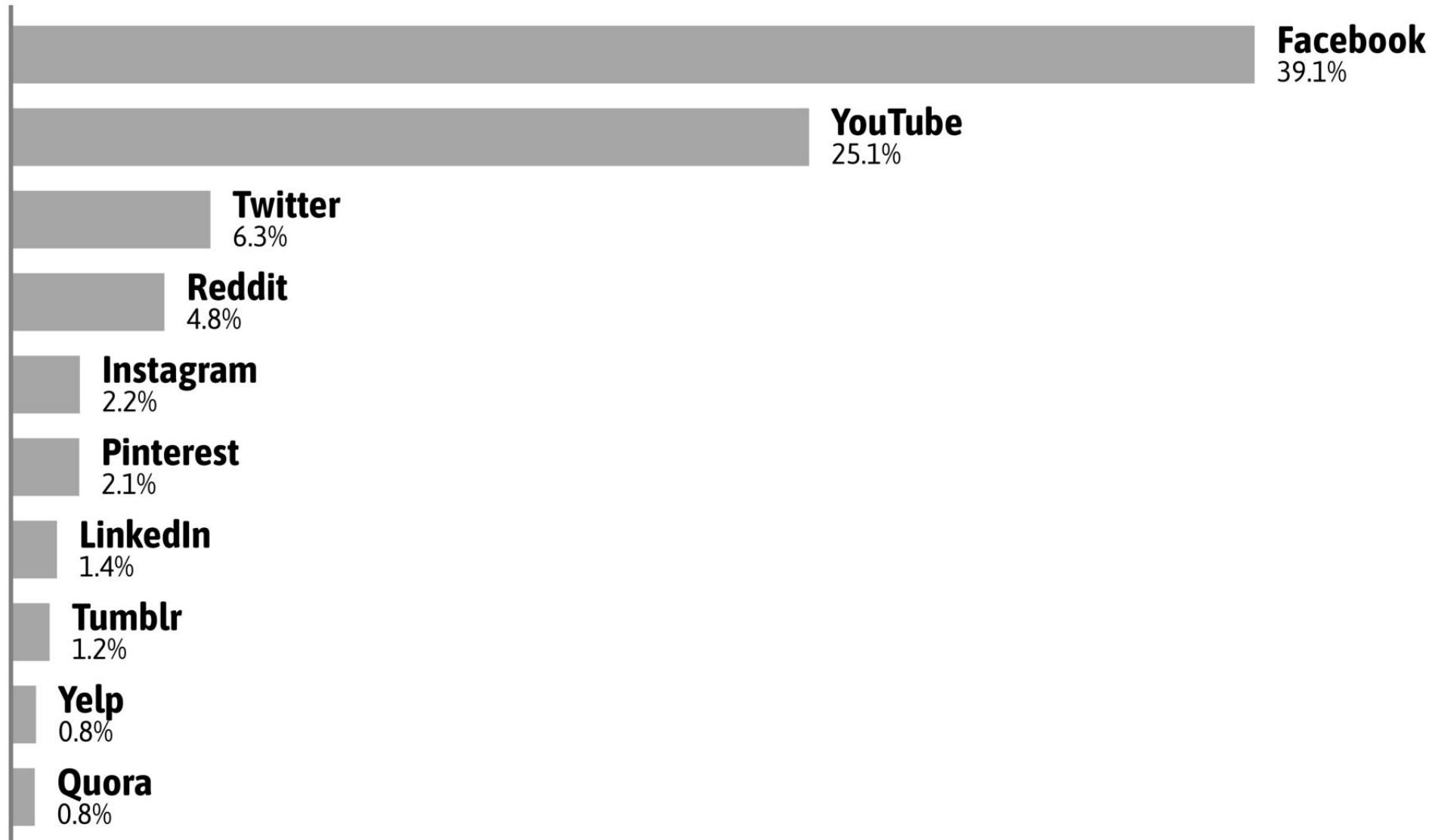
# Market share of social media visits (Nov. 2017)



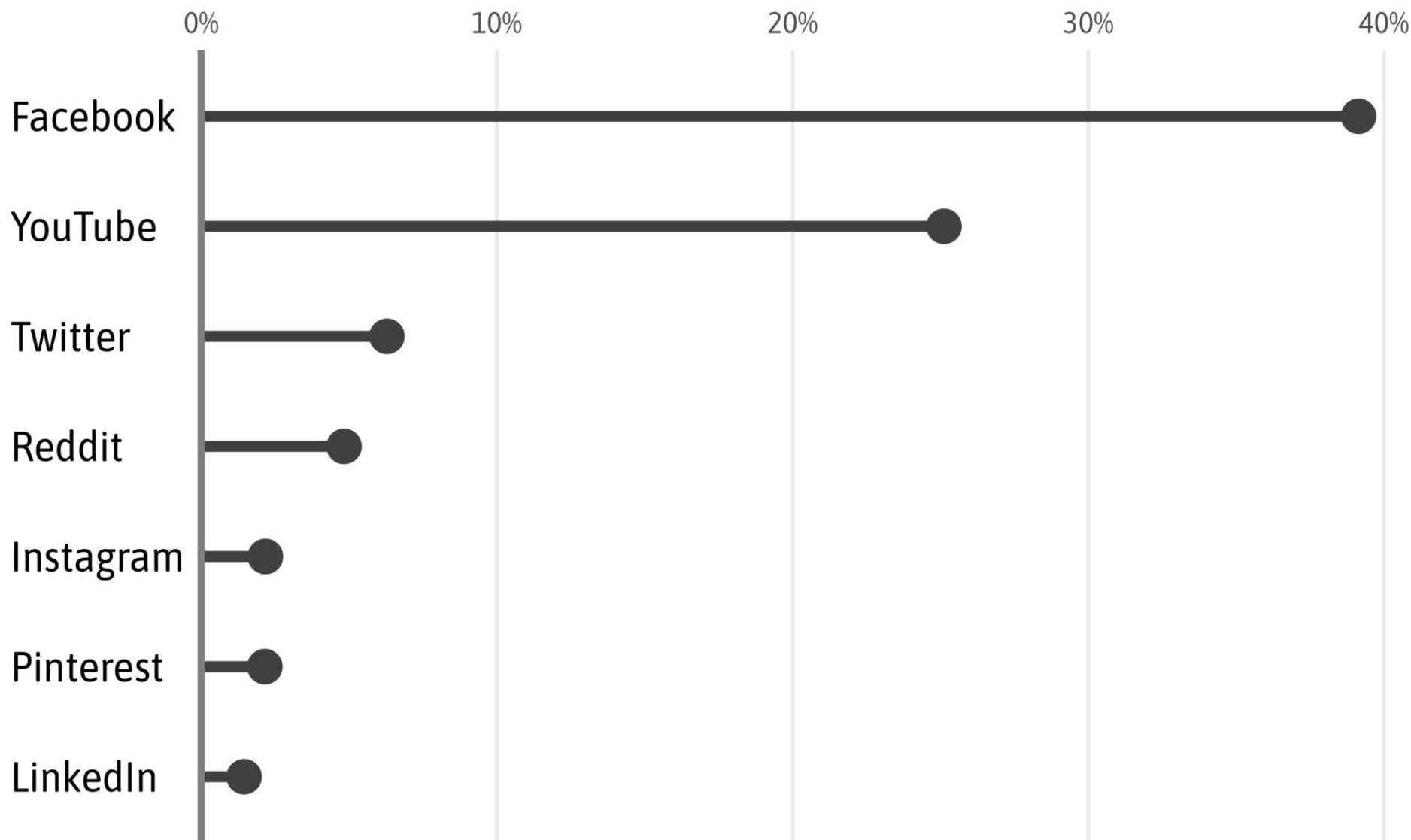
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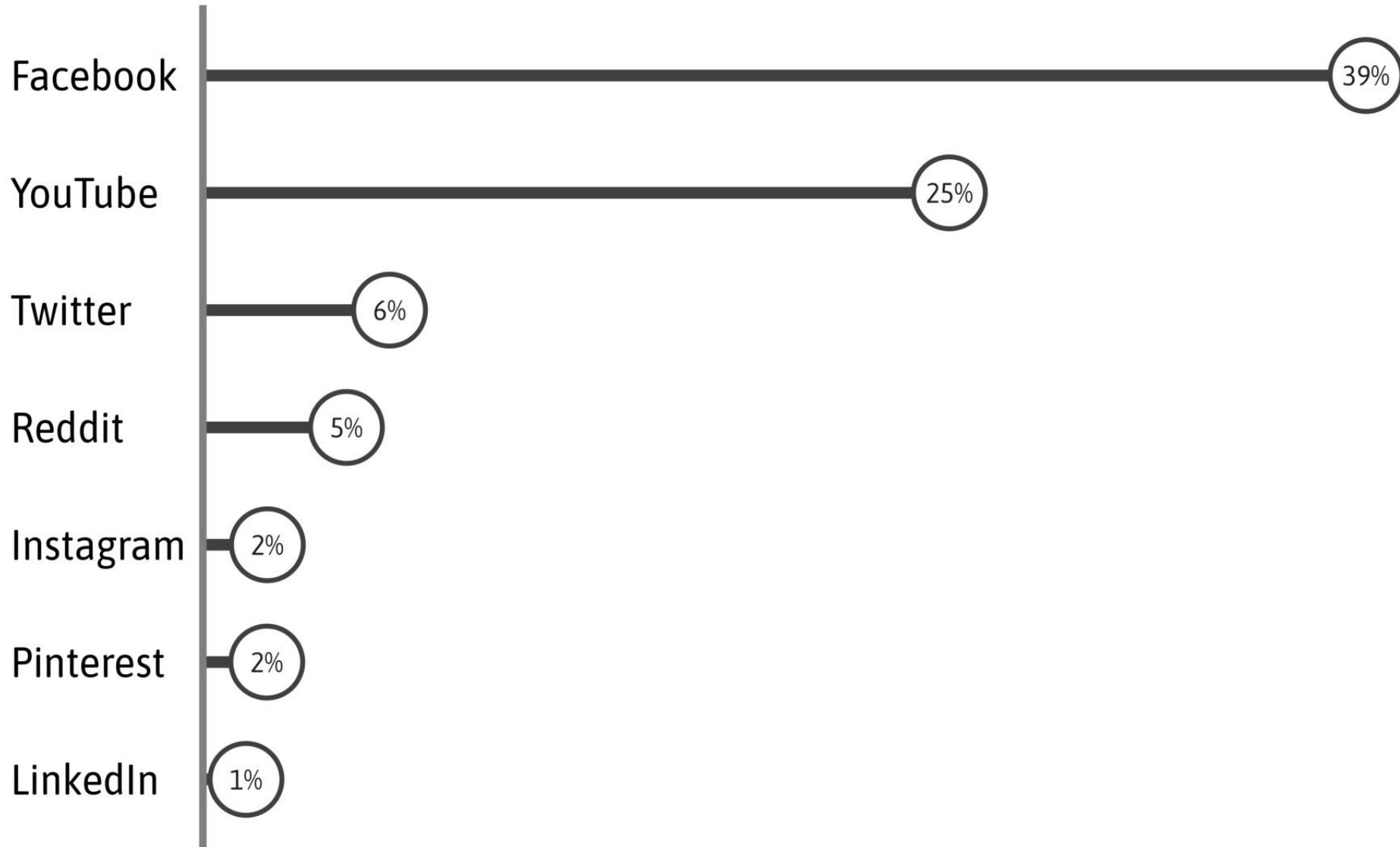
# Market share of social media visits (Nov. 2017)



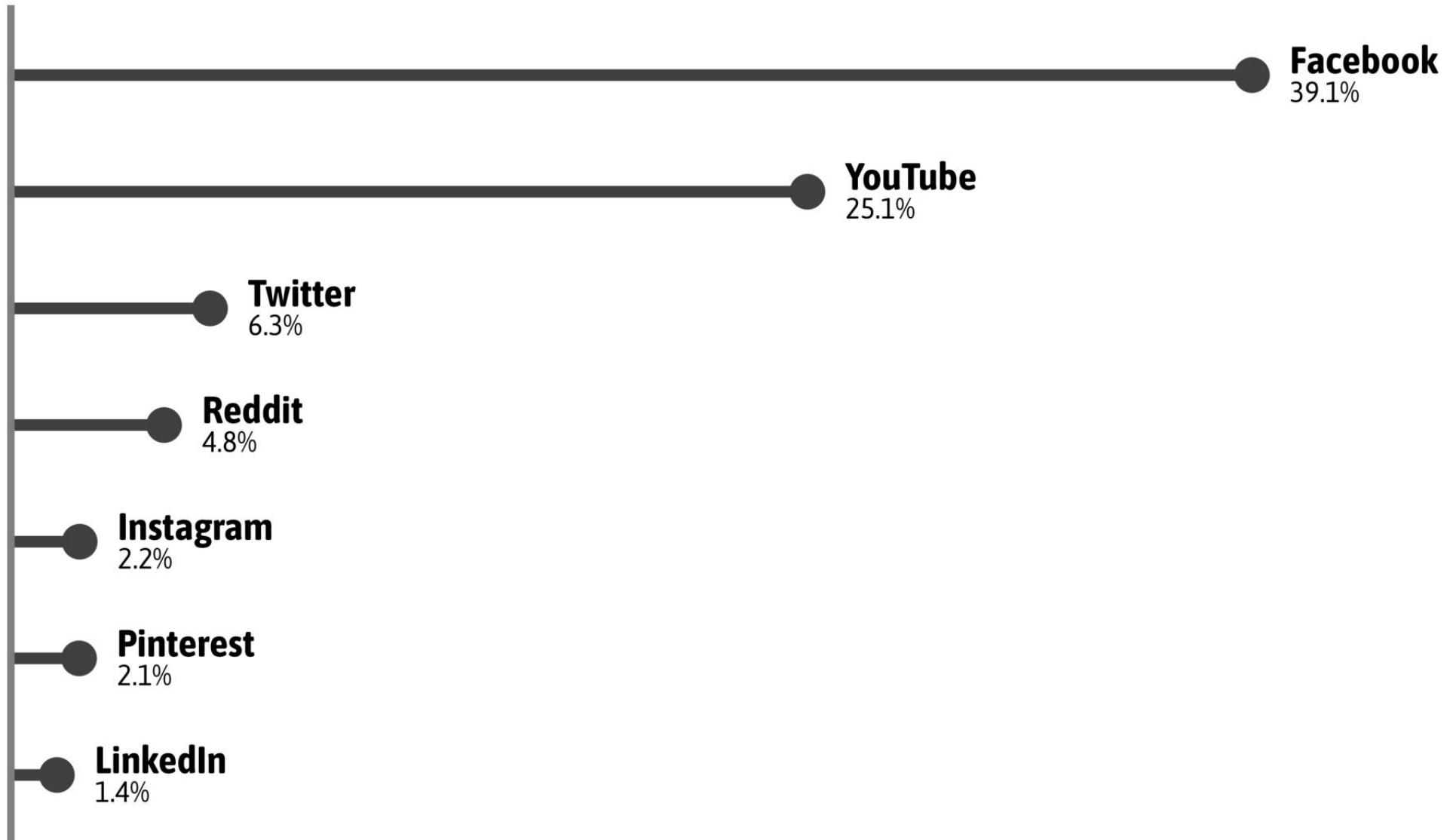
# Market share of social media visits (Nov. 2017)



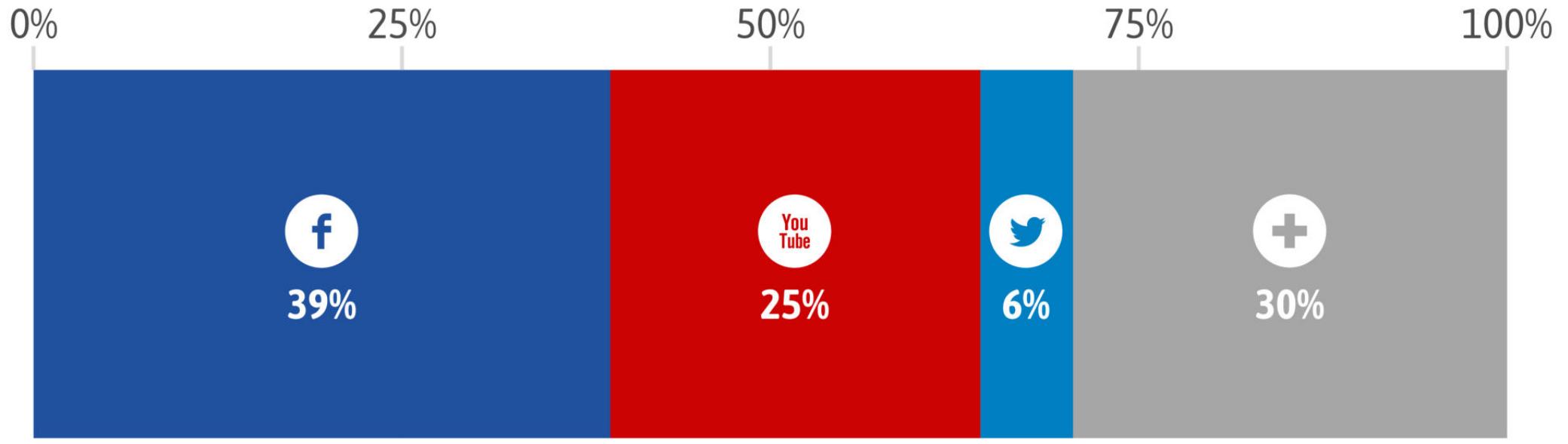
# Market share of social media visits (Nov. 2017)



# Market share of social media visits (Nov. 2017)



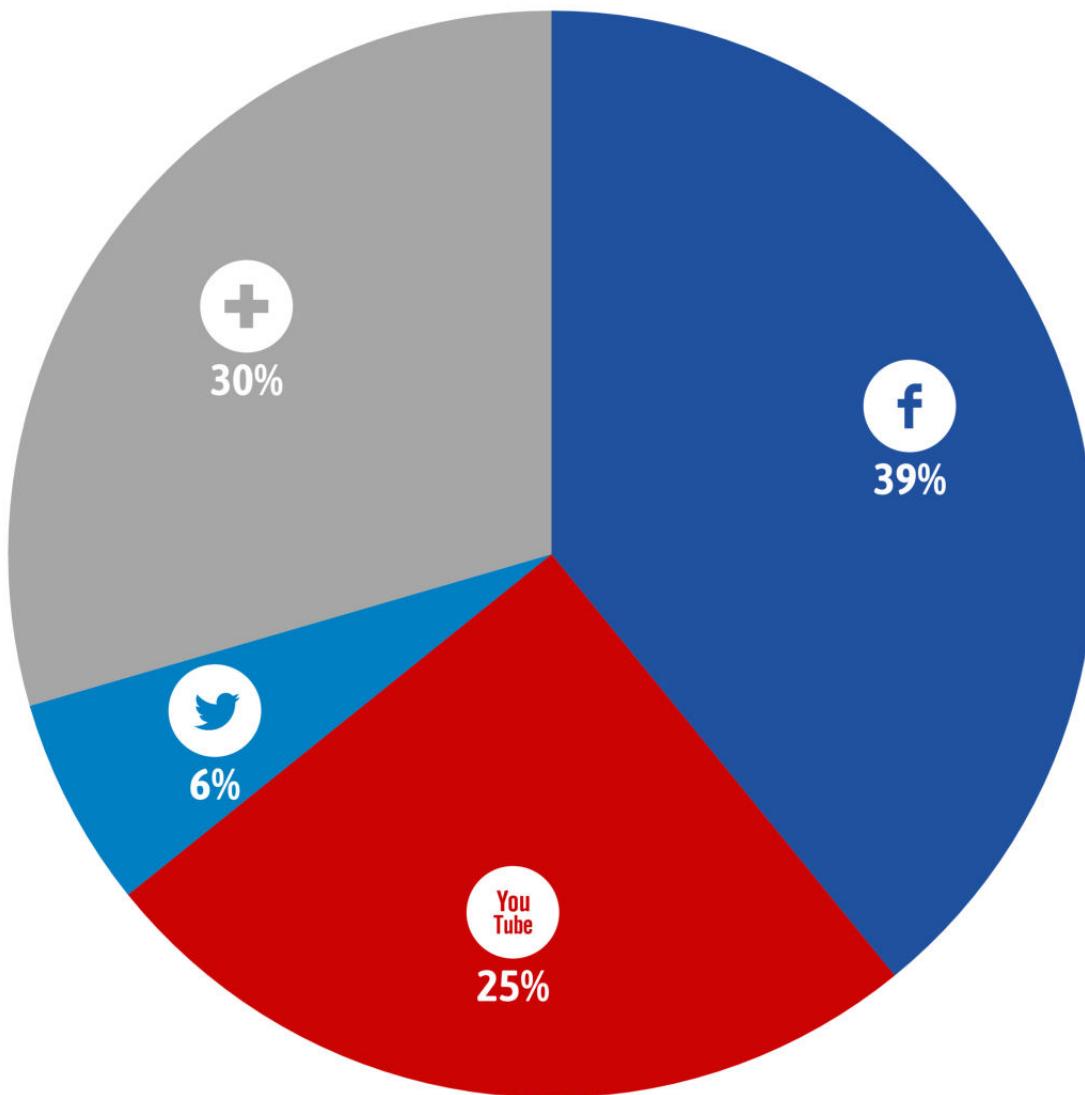
# Market share of social media visits (Nov. 2017)



⊕ represents other social media sites with a share of less than 5%



# Market share of social media visits (Nov. 2017)



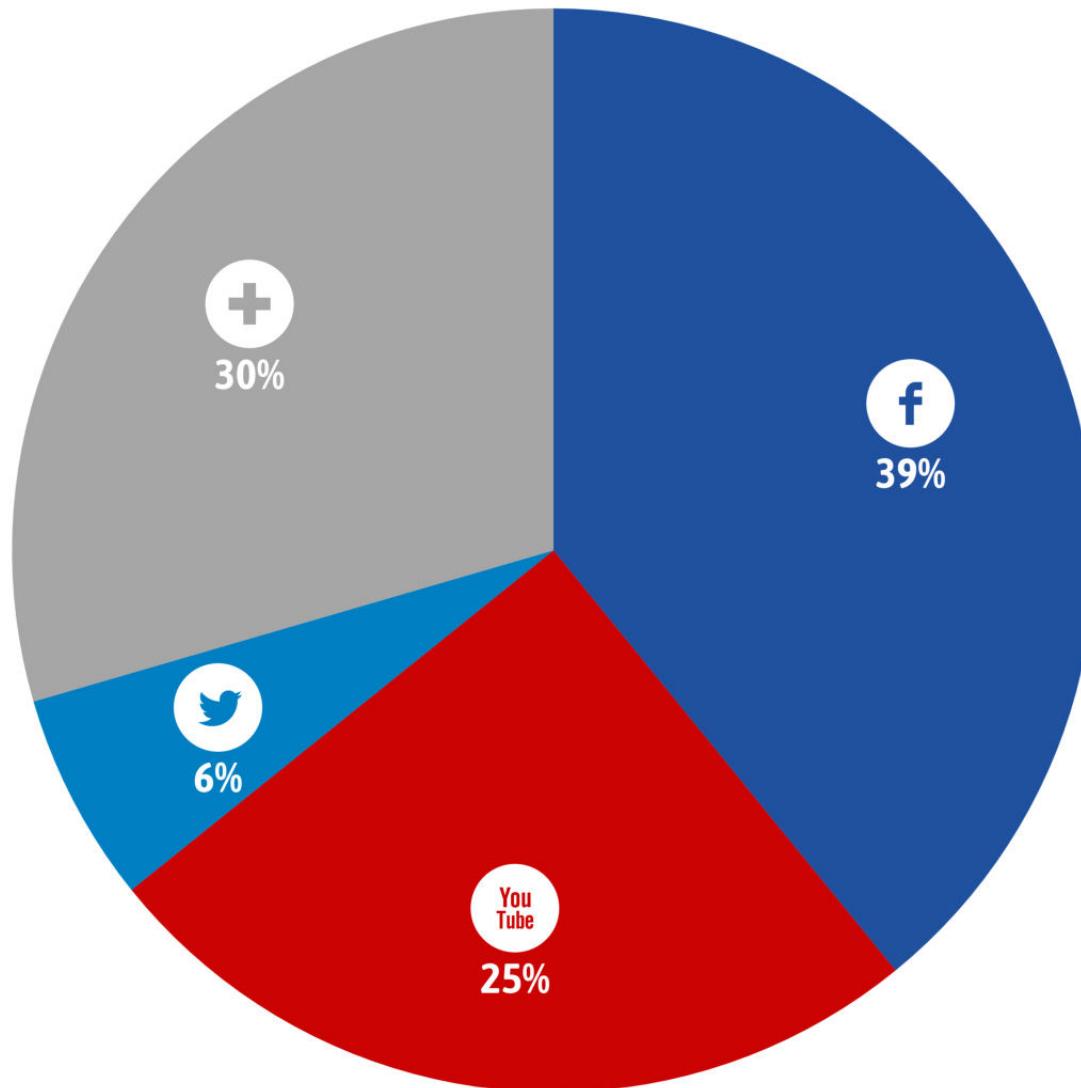
⊕ represents other social media sites with a share of less than 5%

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# Facebook and YouTube dominate social media platforms

Market share of social media visits, Nov. 2017



⊕ represents other social media sites with a share of less than 5%

