

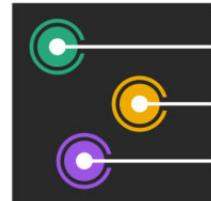
# Effektives Visualisieren von Daten

Dr. Cédric Scherer

Roland Müller Autorenakademie der DGIM // 23. November 2023







**CÉDRIC SCHERER**  
Data Visualization & Information Design



**Consulting**

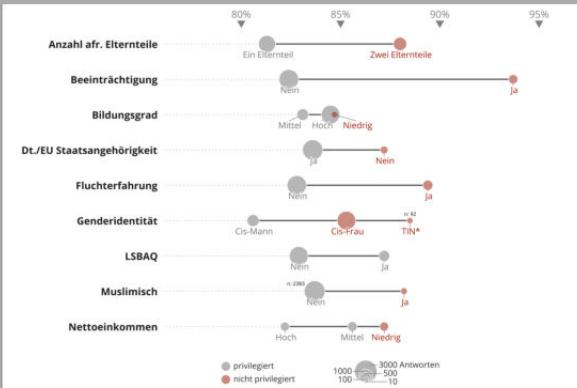
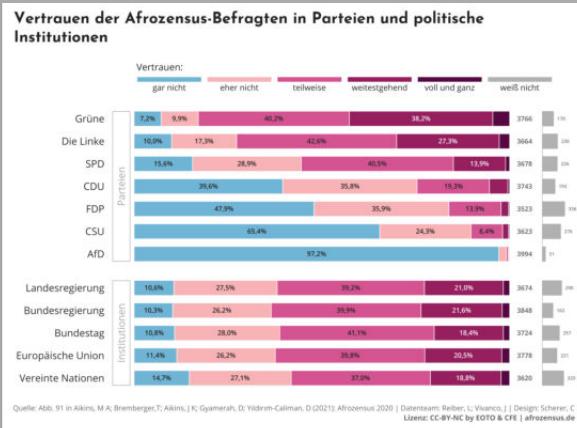
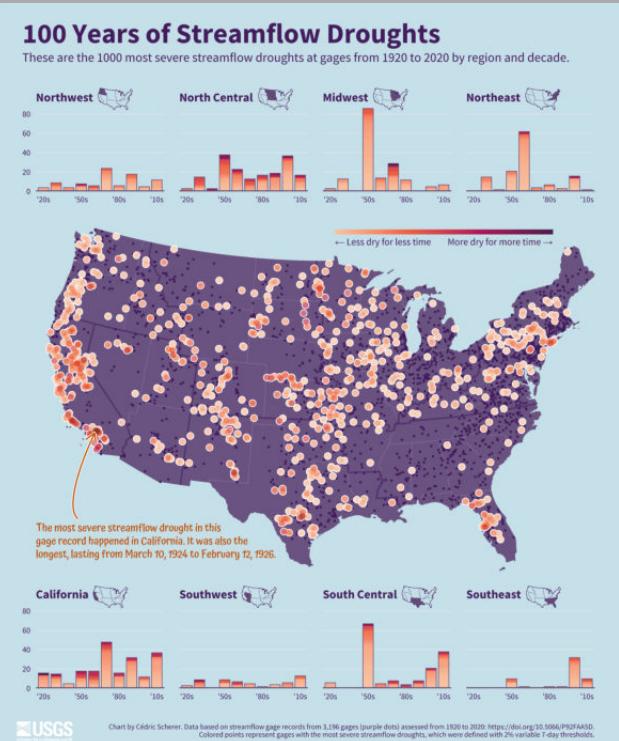
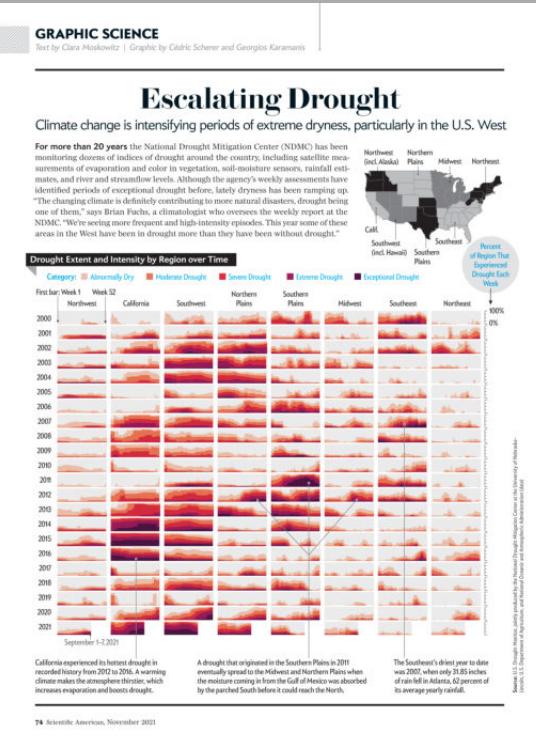


**Coaching**



**Coding**





Politiker rechnen bald mit einer Fortsetzung der Fußball-Bundesliga. Wenn auch nicht im Stadion, so ist es voraussichtlich bald wieder möglich Fußball im Fernsehen zu sehen.

Ich habe **einen** Vertrag mit einem Anbieter für Sportübertragungen.

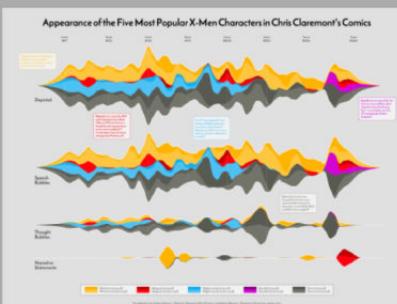
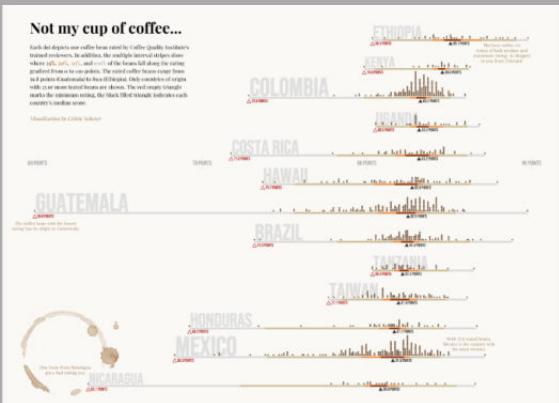
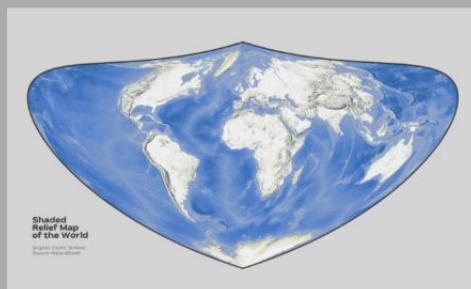
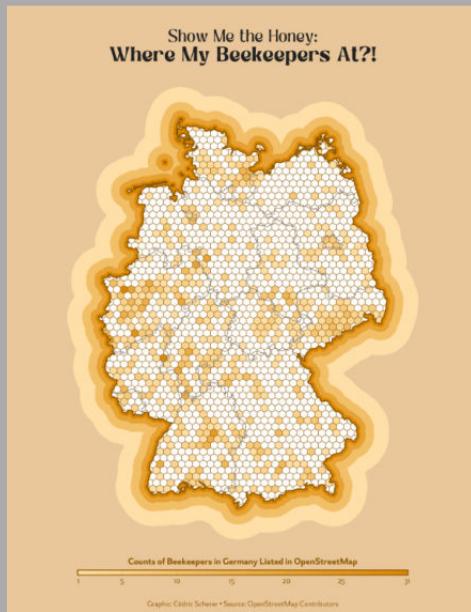
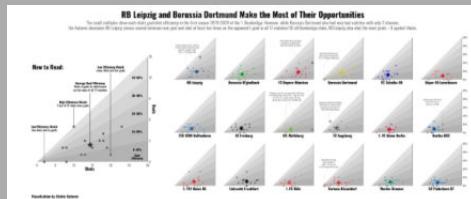


Ich habe **keinen** Vertrag mit einem Anbieter für Sportübertragungen.



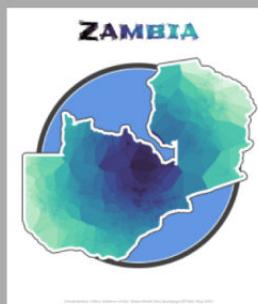
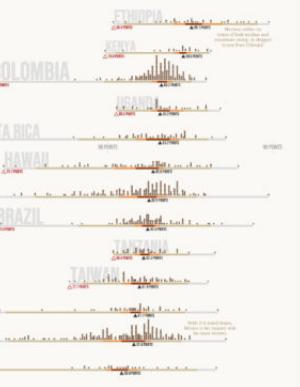
Bewertung auf 146 Antworten auf eine Umfrage von KÜNDIGUNG.CIRQ



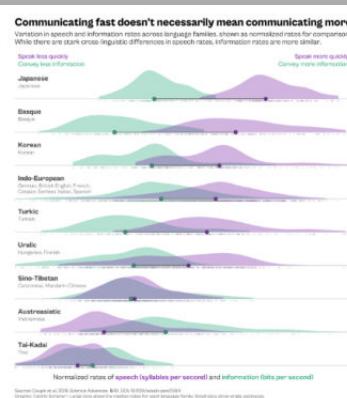
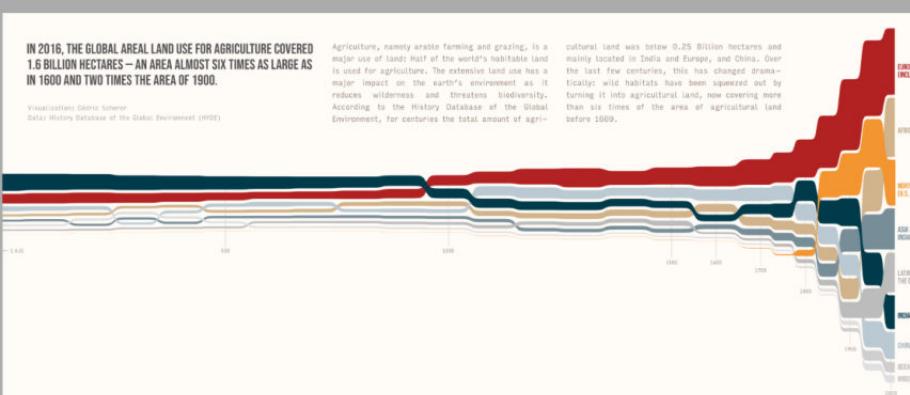


IN 2016, THE GLOBAL AREAL LAND USE FOR AGRICULTURE COVERED 1.6 BILLION HECTARES – AN AREA ALMOST SIX TIMES AS LARGE AS IN 1600 AND TWO TIMES THE AREA OF 1900.

Visualisation: Cédric Scherer  
Data: History Database of the Global Environment (HDE)



Agriculture, namely arable farming and grazing, is a major use of land. Half of the world's habitable land is used for agriculture. The extensive land use has a negative impact on the global environment. It reduces wilderness and threatens biodiversity. According to the History Database of the Global Environment, for centuries the total amount of agricultural land was below 0.25 Billion hectares and mainly located in India and Europe, and China. Over the last few centuries, this has changed dramatically. Many habitats have been squeezed out by turning it into agricultural land, now covering more than six times of the area of agricultural land before 1600.



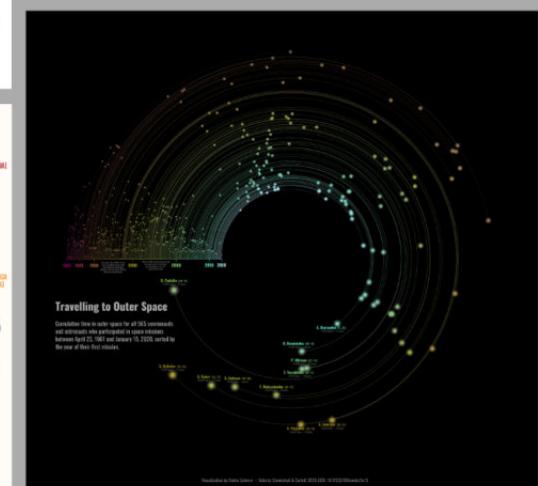
Speaking more quickly  
Speaking more slowly  
Speaking more informatively  
Speaking more uninformatively

## Ergebnisse der Bundestagswahl 2021

Die stärksten Parteien nach Prozent der Zweitstimmen.



Grafik: Cédric Scherer • Daten: DIE ZEIT • Gridkarte: Ansgar Wöhling & Cédric Scherer



The website features a prominent, multi-layered, wavy graphic in shades of purple, teal, yellow, and orange that serves as the background for the header and main content areas.

**CÉDRIC SCHERER**  
Data Visualization & Information Design

**Hi, I am Cédric**

Data Visualization Designer, Consultant and Instructor  
for Engaging and Effective Graphical Storytelling.

[→ Read more about me](#) [→ Schedule a discovery call](#)

**Yet Another How-to on Labelling Bar Graphs in ggplot2**

Yes, I have written about creating bar charts with ggplot2 before. As one of the most common chart types, creating bar charts is a task that thousands of people likely face every day. This time we discuss approaches to place the category labels above the bars.

Thursday · October 26, 2023

**Efficiency and Consistency: Automate Subset Graphics with ggplot2 and purrr**

Discover how to effortlessly generate custom and even complex graphics for subsets of your data by seamlessly integrating {ggplot2}'s versatile plotting functionalities with {purrr}'s powerful functional programming capabilities. This is especially helpful for data featuring many categories or step-by-step graphical storytelling

Wednesday · July 5, 2023

**The 30DayChartChallenge is Ready to Kick Off**

The #30DayChartChallenge is a data visualization community challenge with the aim of creating a data visualization on a particular theme for each day in April. Read on for a behind-the-scenes look at the two previous years' challenges, then join us on social media (Twitter, Instagram, LinkedIn, and Mastodon) to participate!

Tuesday · March 28, 2023

**2-Day Workshop on "Graphic Design with ggplot2" at rstudio::conf 2022**

End of July, I had the honor to teach an in-person ggplot2 workshop at the rstudio::conf in Washington DC. All course resources are available on the course webpage featuring slides.

**Quick Links**

- ggplot2 Tutorial
- Evolution of a ggplot2
- rstudio::conf Workshop

**Featured Tags**

- 30DAYCHARTCHALLENGE
- ANIMATIONS
- ANNOTATIONS
- BERLIN
- CHALLENGE
- CODEBOOK
- DATAVIZ
- DESIGN
- GGPLOT2
- MAPS
- R
- TIDYTUESDAY
- TIDYVERSE
- TUTORIAL
- WEATHER
- WORKSHOP

[Schedule a discovery call](#)



# Datenvisualisierung

ist die grafische Darstellung von  
Informationen und Daten.



# Datenvisualisierung

wandelt Datenwerte in visuelle,  
quantifizierbare Formen um.



# Datenvisualisierung

hilft zu erkennen, entdecken,  
erklären und entscheiden.



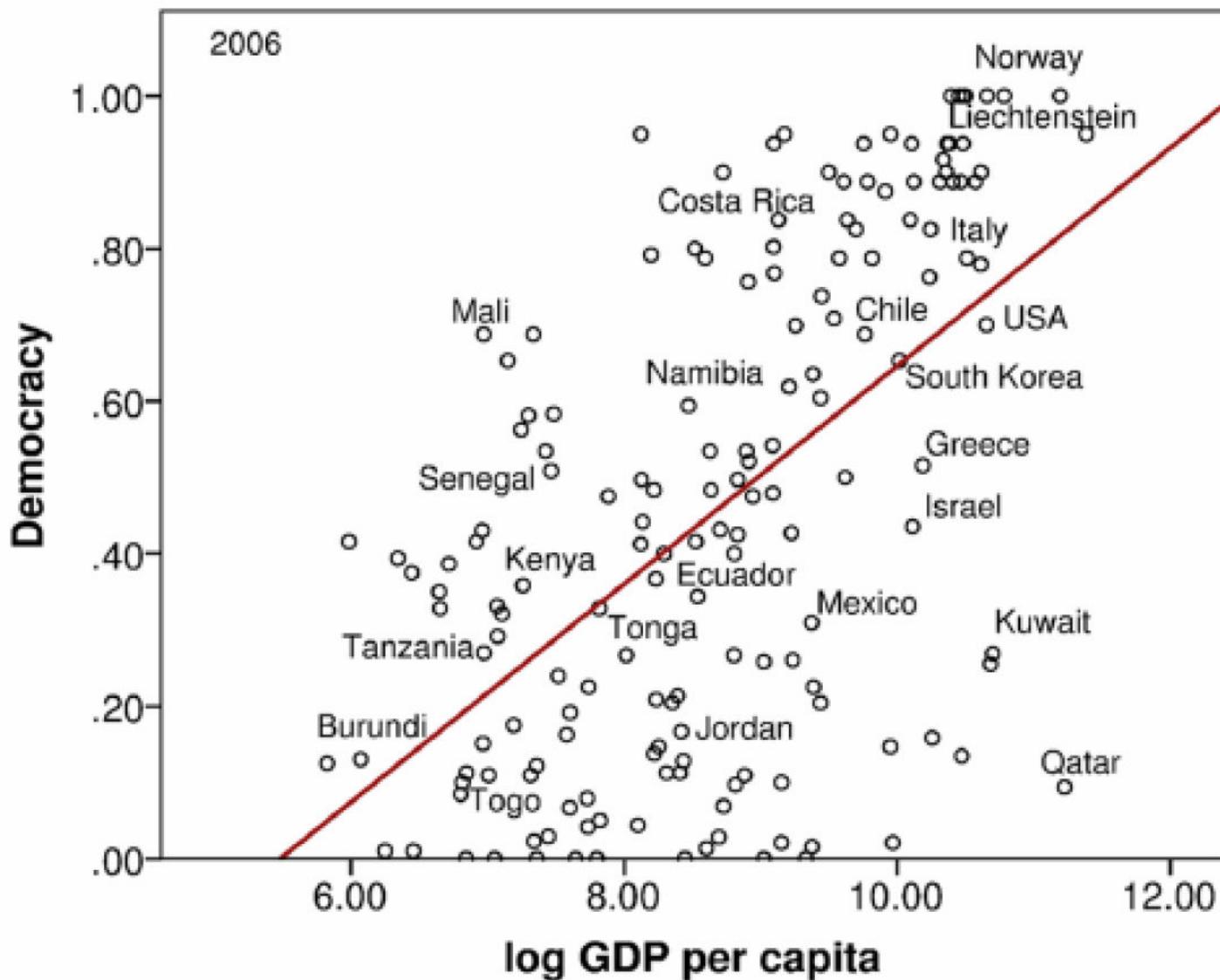
**Datenvisualisierung**  
ist einerseits eine Kunst und  
andererseits Wissenschaft.





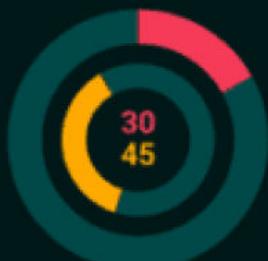
Quelle: eazybi



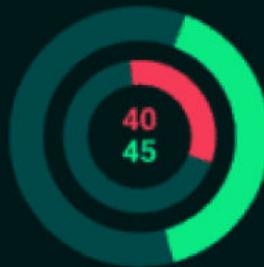


Quelle: Ranganathan et al. 2014





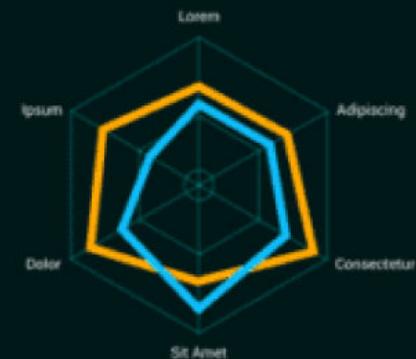
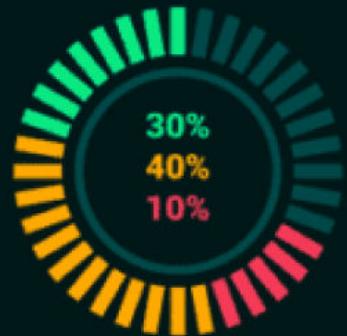
Lorem ipsum dolor sit amet,  
consectetur adipiscing elit.  
Integer ante elit.



Lorem ipsum dolor sit amet,  
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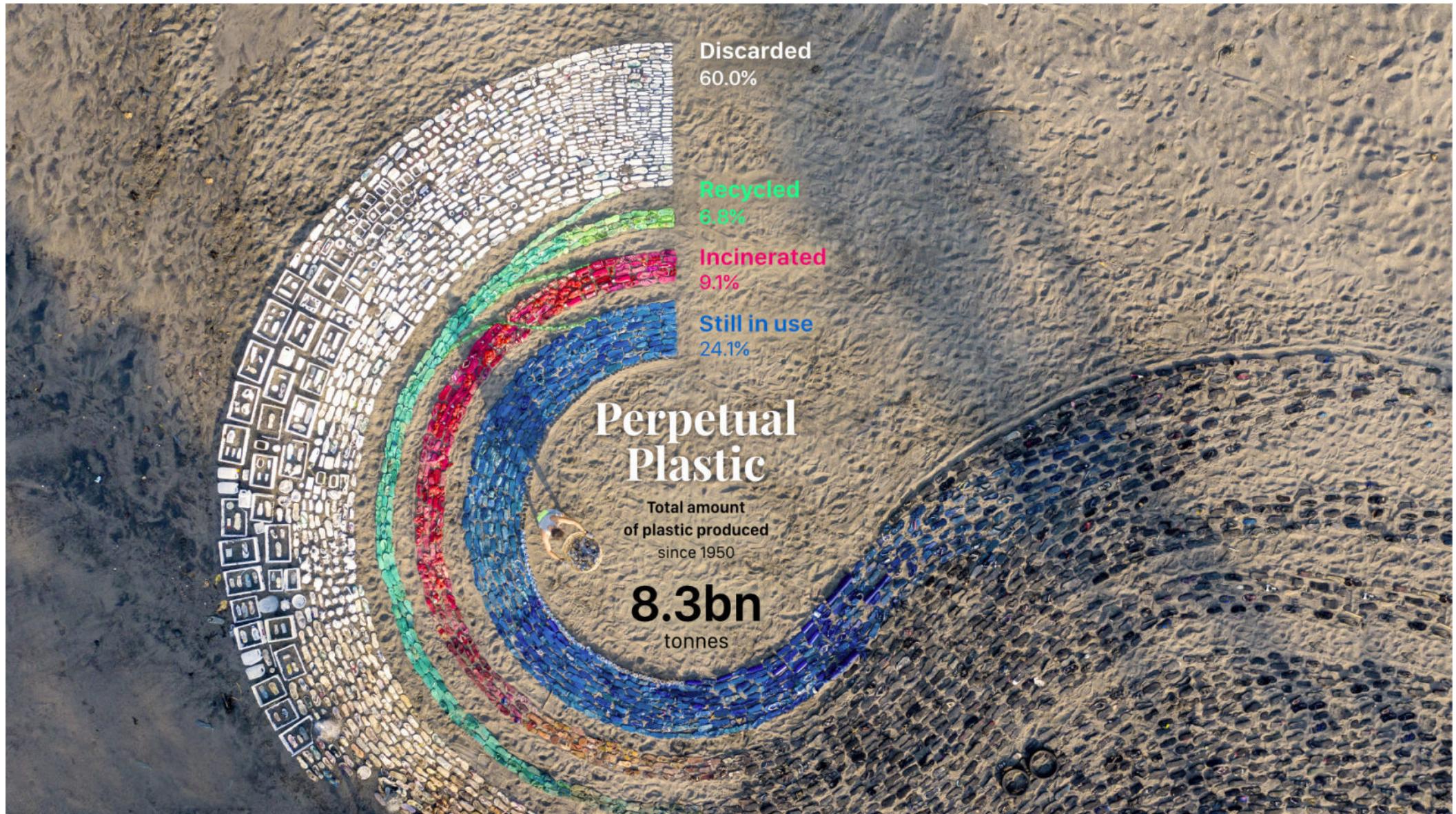
- Single Downloaded
- Downloaded
- Package Downloaded



- |                           |                           |
|---------------------------|---------------------------|
| <b>60%</b><br>LOREM IPSUM | <b>75%</b><br>LOREM IPSUM |
| <b>45%</b><br>LOREM IPSUM | <b>60%</b><br>LOREM IPSUM |

Quelle: [datameer.com](http://datameer.com)





Quelle: "Perpetual Plastic" von Liina Klauss, Skye Morét & Moritz Stefaner





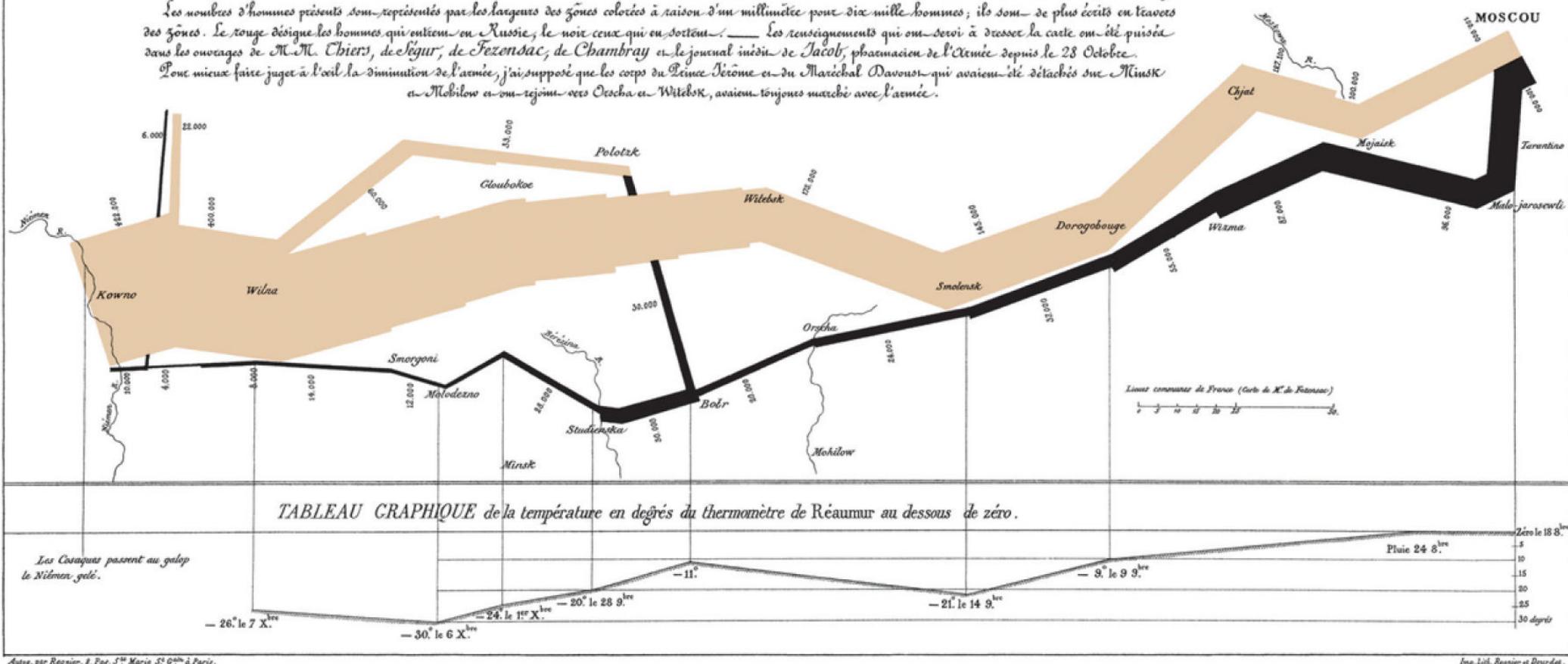
Quelle: "Patchwork Kingdoms" von Nadieh Bremer



*Carte Figurative des pertes successives en hommes de l'Armée Française dans la Campagne de Russie 1812-1813.*  
Dessiné par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite. Paris, le 20 Novembre 1869.

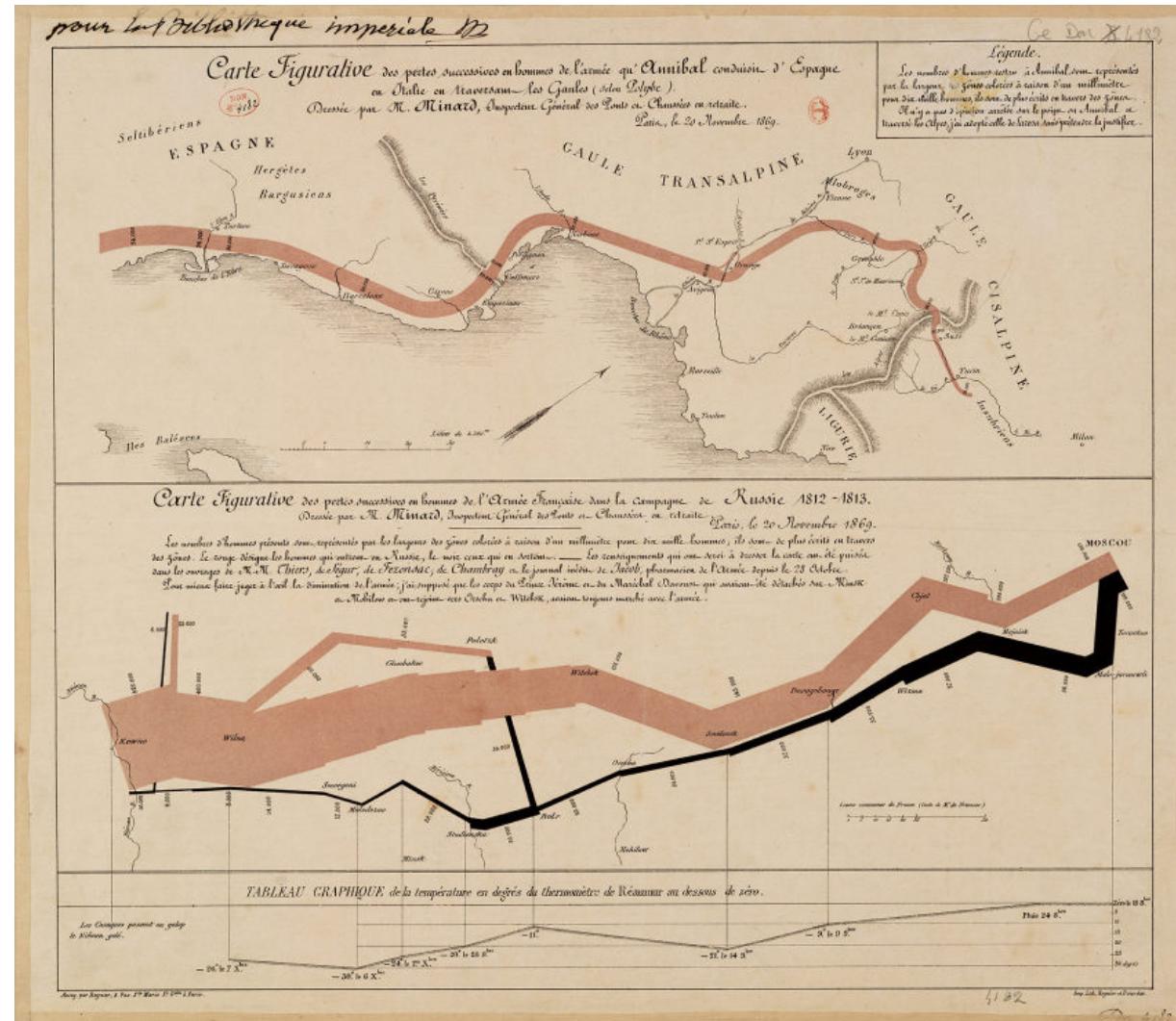
Les nombres d'hommes perdus sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en lettres des zones. Le rouge désigne les hommes qui sont entrés en Russie; le noir ceux qui en sortent. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. Chiers, de Léger, de Tézondac, de Chambray et le journal médical de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Napoléon et du Maréchal Davout qui avaient été détachés sur Minsk et Mohilow se rejoignaient vers Ossaka en Wilno, avaient toujours marché avec l'armée.



"Carte figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812–1813" von Charles Joseph Minard (1869)

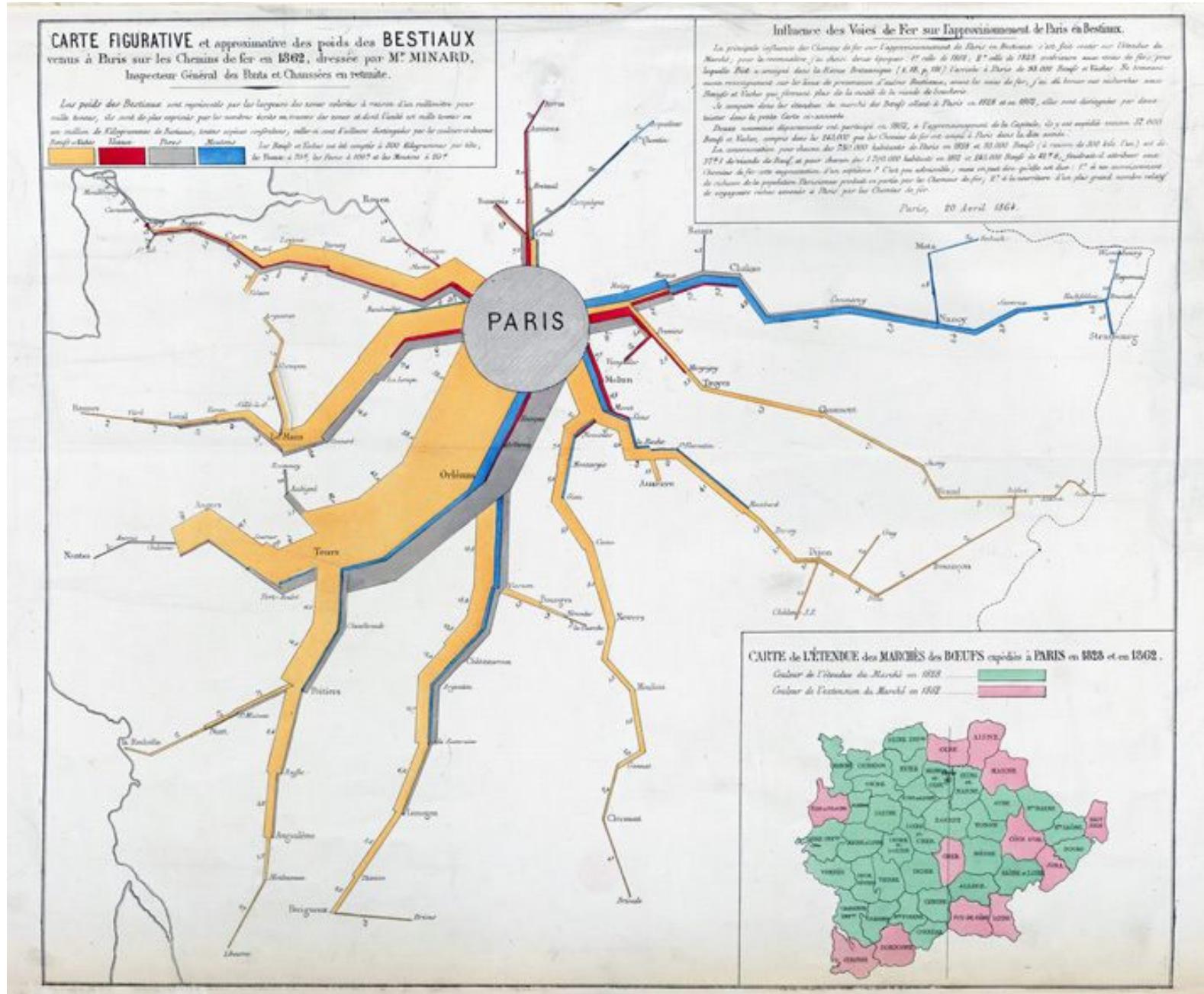




"Carte figurative des pertes successives en hommes de l'Armée qu'Annibal conduisit d'Espagne en Italie en traversant les Gaules (selon Polybe)" (oben) und "Carte figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812–1813" (unten) von Charles Joseph Minard (1869)

- zeigt die Truppenstärke der Armeen von Hannibal (218 v. Chr.) und Napoleon (1812–1813)
- wird als eine der besten statistischen Visualisierung überhaupt betitelt





"Carte figurative et approximative des poids des bestiaux venus à Paris sur les chemins de fer en 1862" von Charles Joseph Minard (1864)

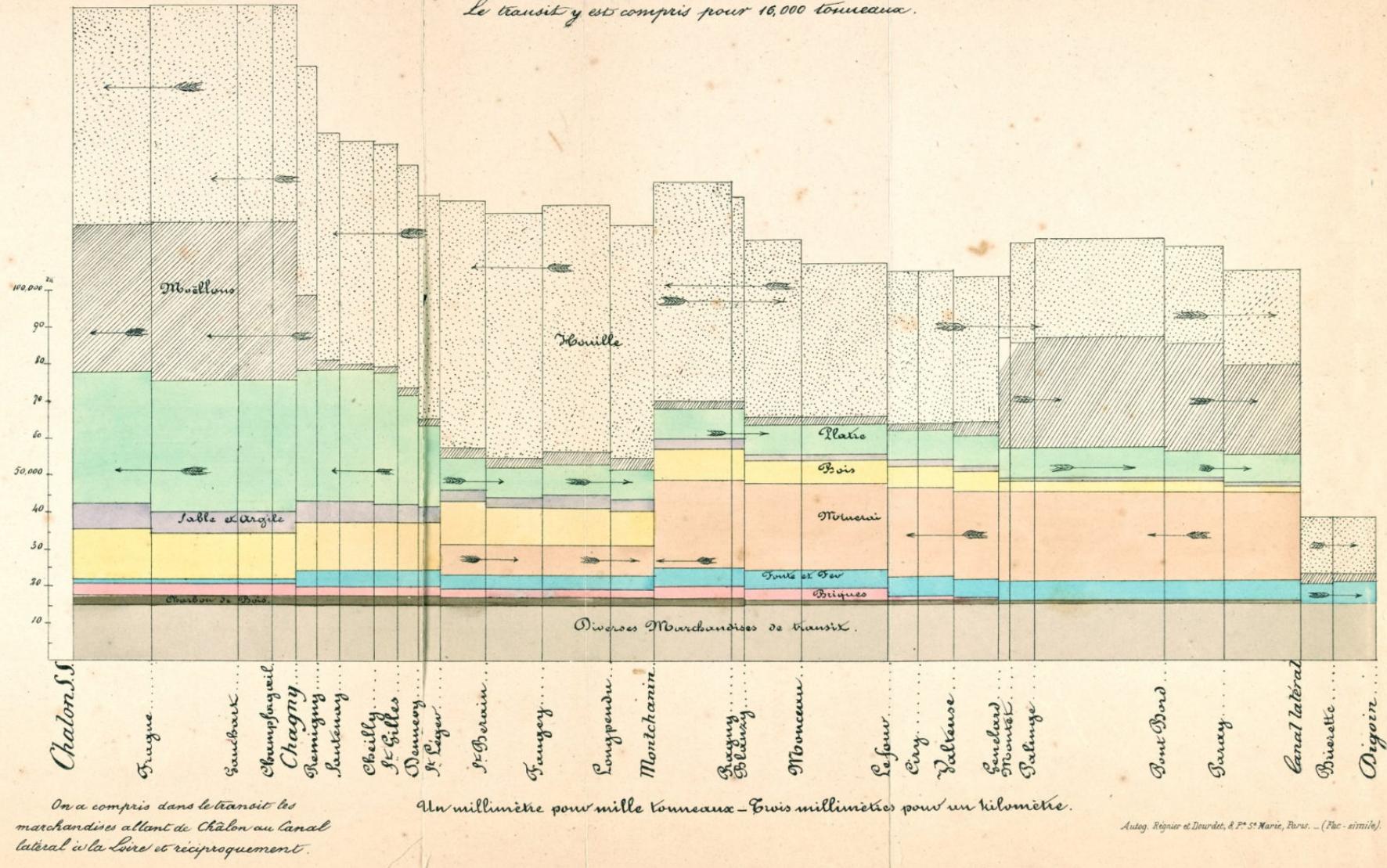


# Tableau figuratif du mouvement commercial du Canal du Centre en 1844

dressé par M<sup>e</sup> Moinard sur les renseignements de M<sup>e</sup> Comoy

Le mouvement total équivaut à 131,000 tonnesx parcourant la longueur du Canal ou 117 kilomètres

Le transit y est compris pour 16,000 tonnesx.



"Tableau figuratif du mouvement commercial du Canal du Centre en 1844" von Charles Joseph Minard (1845)

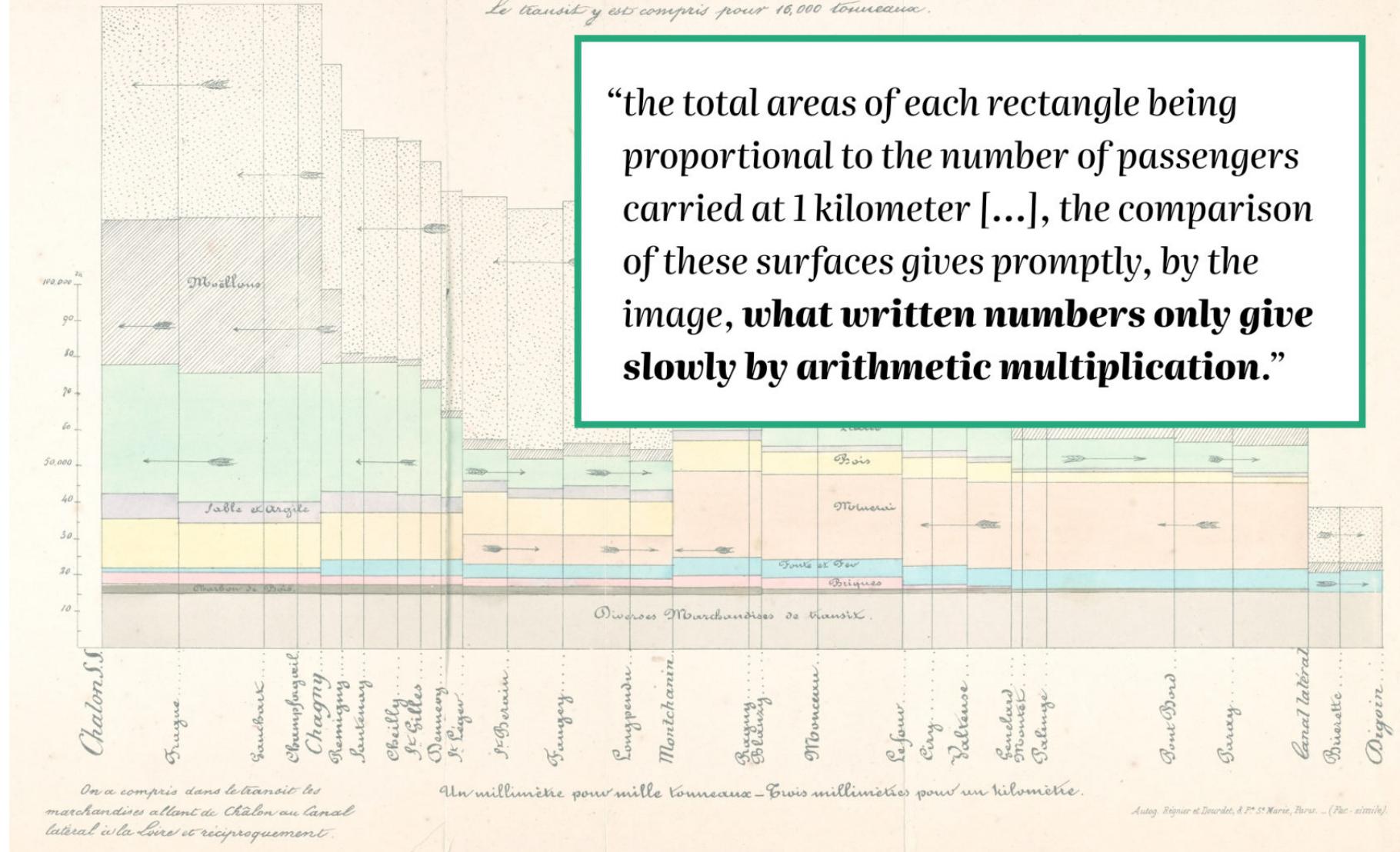


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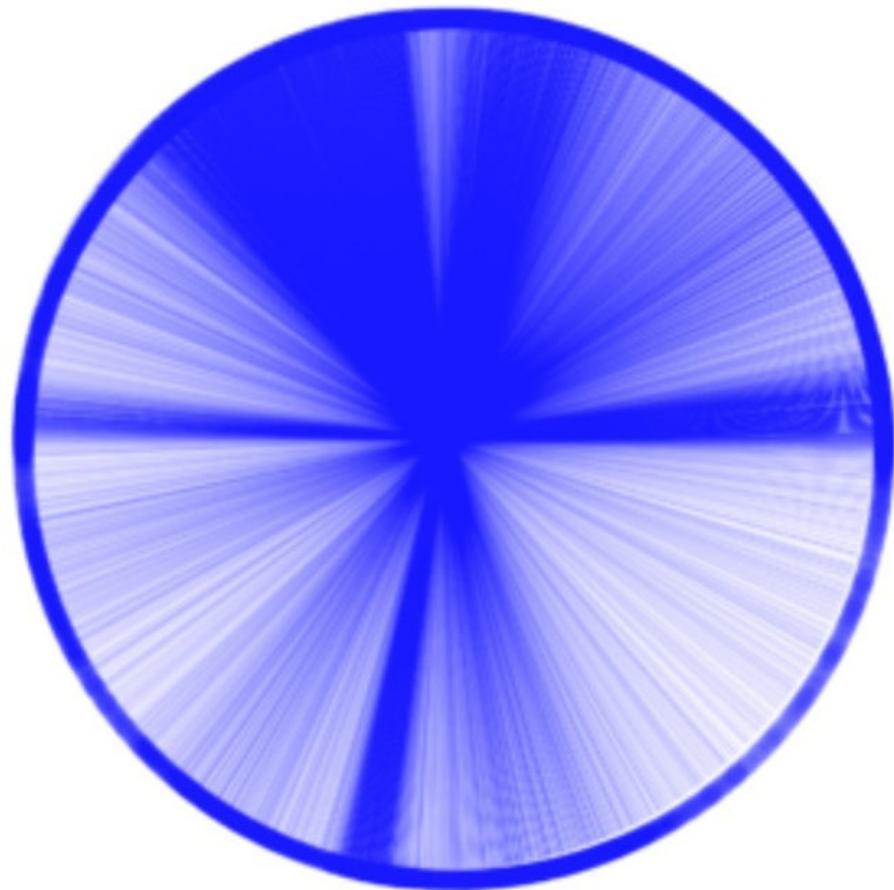


# Experiment

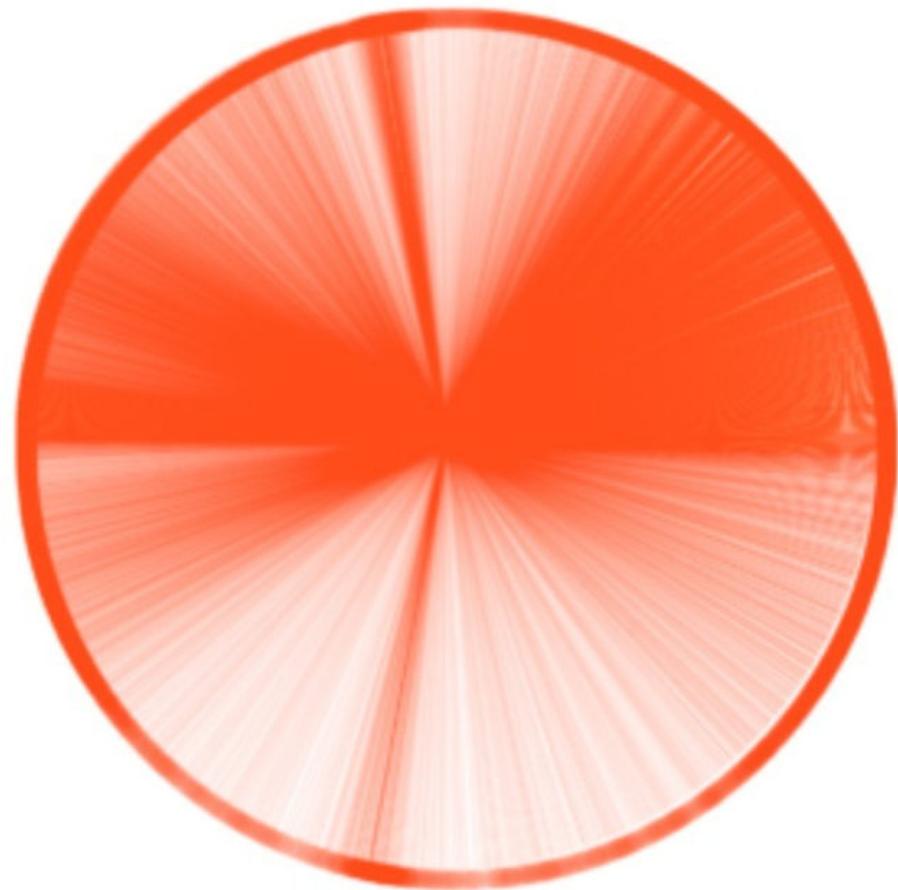


*Wenn das Jahr ein Kreis ist - wo befinden sich März und Dezember?*





**December**

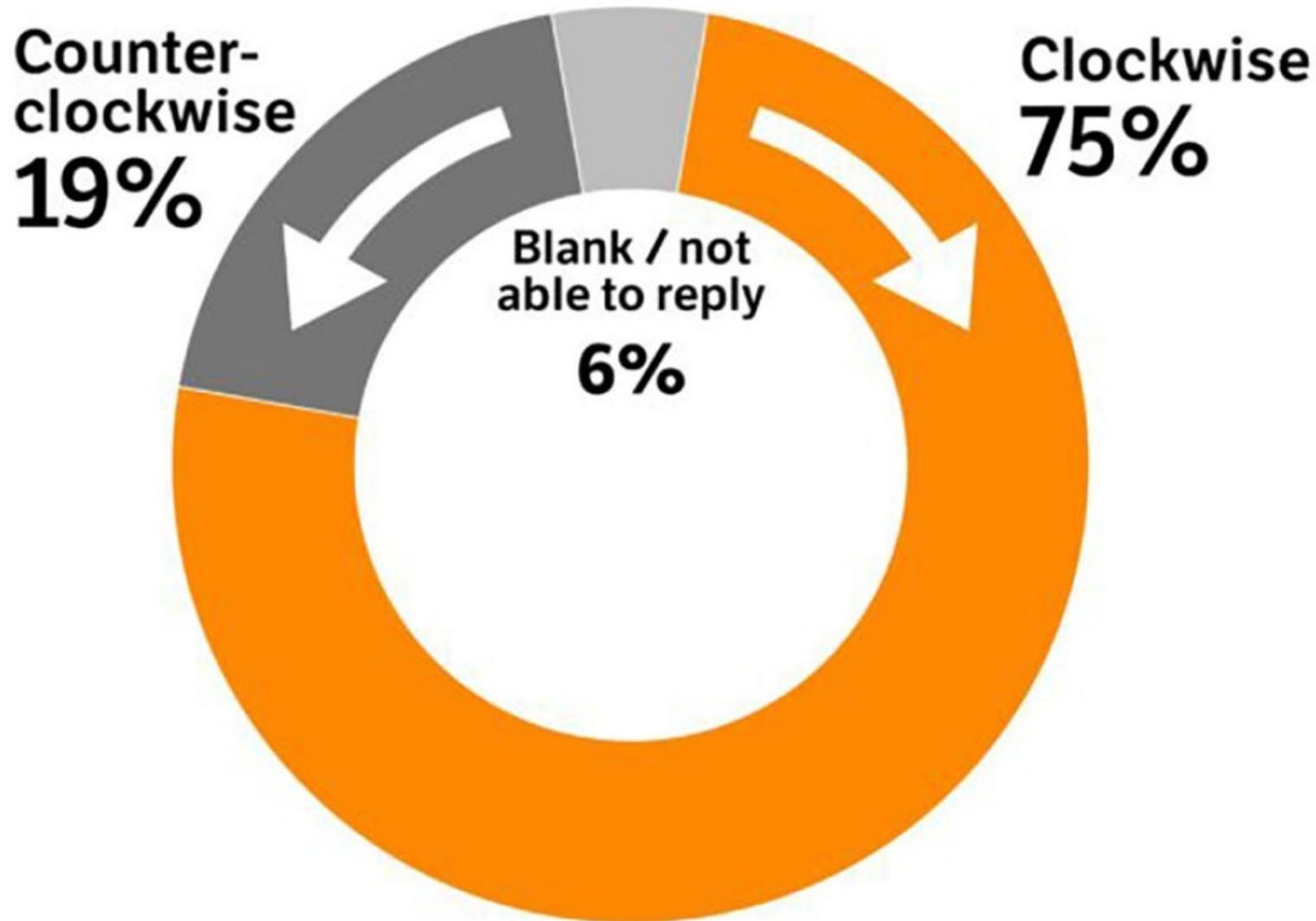


**March**

76,922 Platzierungen der Monate Dezember und März entlang eines Kreises.

Visualisierung: Henrik Lied, NRKbeta *Laeng & Hofseth, Front Psychol. 2019*



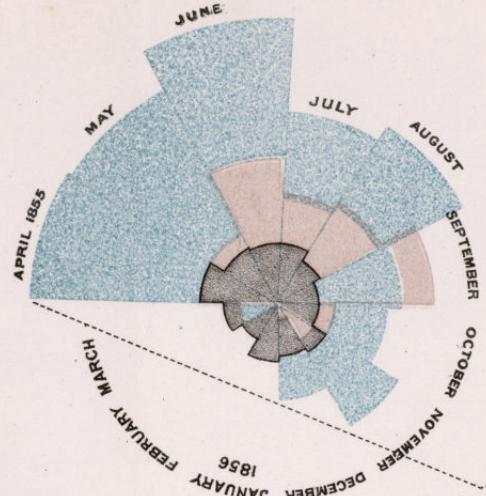


Anteil der Befragten gruppiert nach Richtung der Zeit auf dem Jahresrad.  
Visualisierung: Vidar Kvien, NRK Laeng & Hofseth, *Front Psychol.* 2019

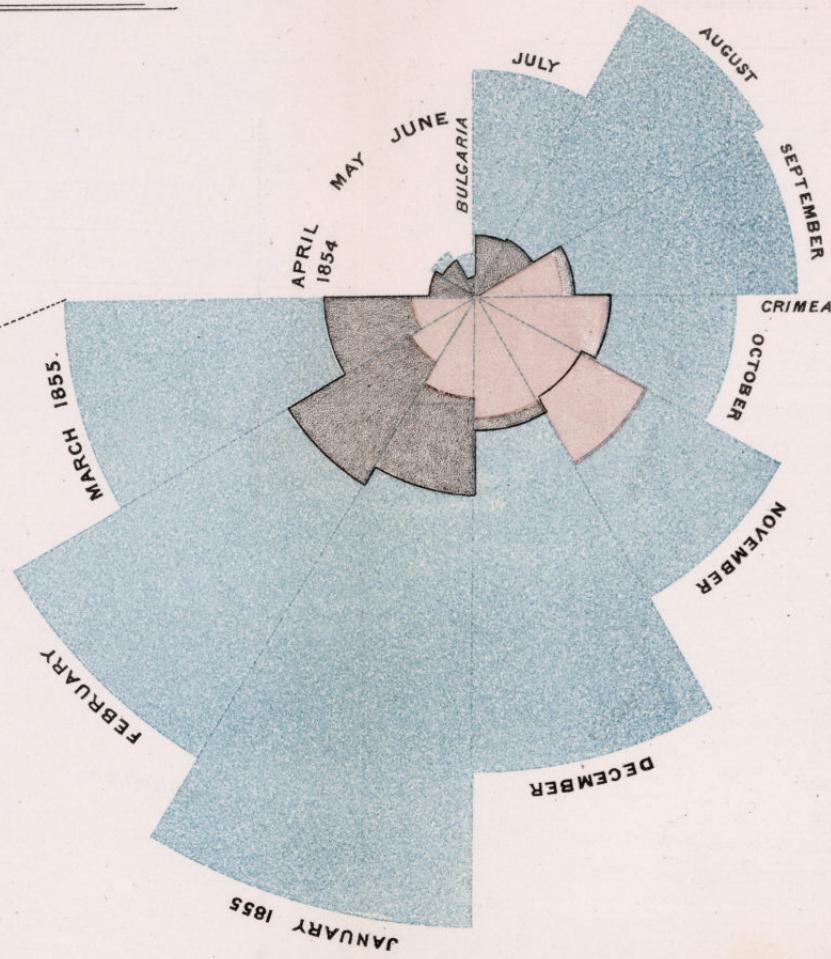


DIAGRAM OF THE CAUSES OF MORTALITY  
IN THE ARMY IN THE EAST.

2.  
APRIL 1855 TO MARCH 1856.



1.  
APRIL 1854 TO MARCH 1855.



The areas of the blue, red, & black wedges are each measured from the centre as the common vertex.

The blue wedges measured from the centre of the circle represent area for area the deaths from Preventible or Mitigable Zymotic diseases, the red wedges measured from the centre the deaths from wounds, & the black wedges measured from the centre the deaths from all other causes.

The black line across the red triangle in Nov. 1854 marks the boundary of the deaths from all other causes during the month.

In October 1854, & April 1855, the black area coincides with the red; in January & February 1856, the blue coincides with the black.

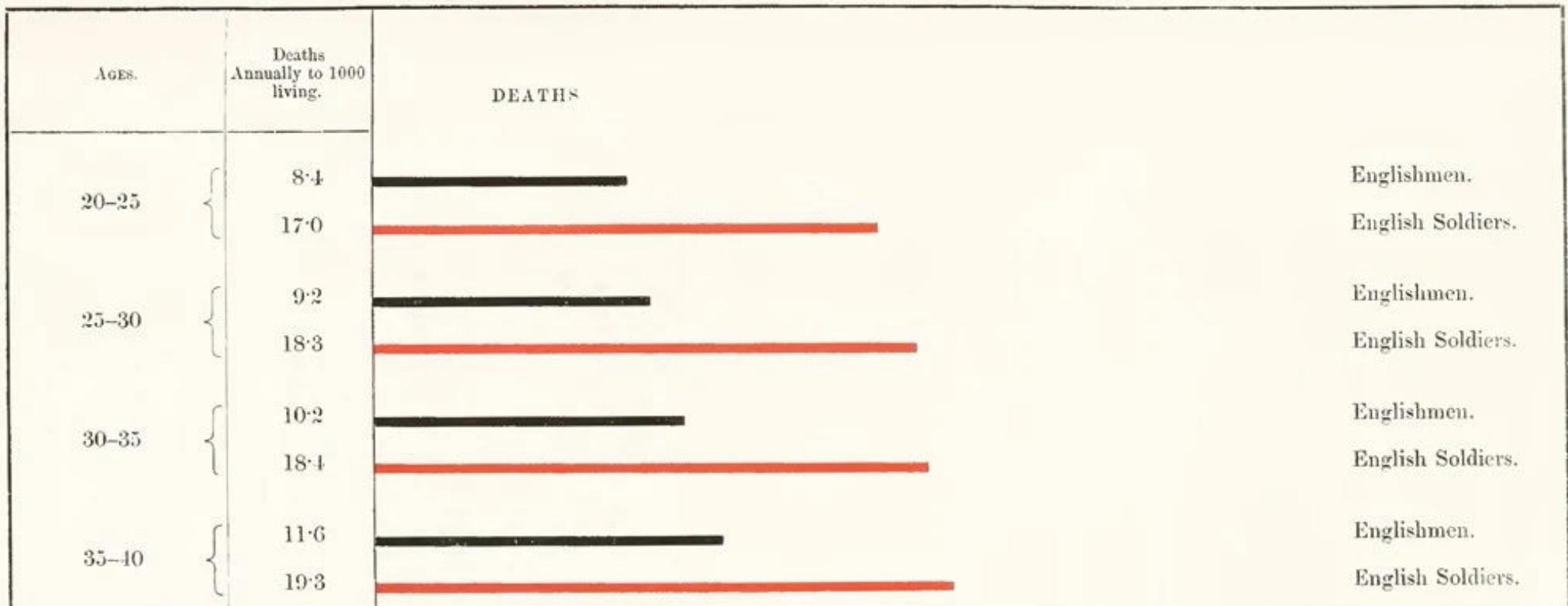
The entire areas may be compared by following the blue, the red & the black lines enclosing them.

Harrison & Sons, St. Martin's Lane.

"Diagram of the causes and mortality in the army in the East" (coxcomb diagram) von Florence Nightingale (1858)



*Representing the Relative Mortality of the Army at Home and of the English Male Population at corresponding Ages.*



JAMES LEWIS, del.

"Relative mortality of the army at home and of the English male population at corresponding ages" von Florence Nightingale (1858)



# Visualisiere deine Daten!



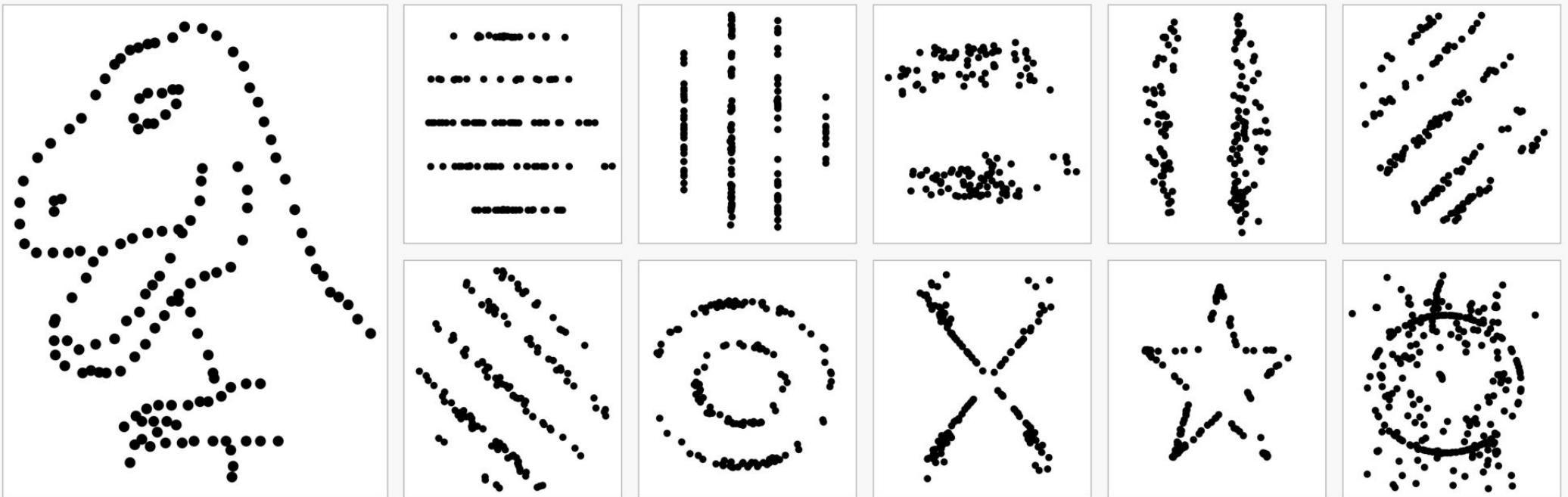
*... make both **calculations** and **graphs**.  
Both sorts of output should be studied;  
each will **contribute** to **understanding**.*

F. J. Anscombe (1973)



# The Datasaurus (*Anscombosaurus spec.*) Dozen

is a set of 13 different datasets with nigh-identical summary statistics, which could lead one to believe the datasets are quite similar. After visualizing the data, it becomes clear that the datasets are markedly different.

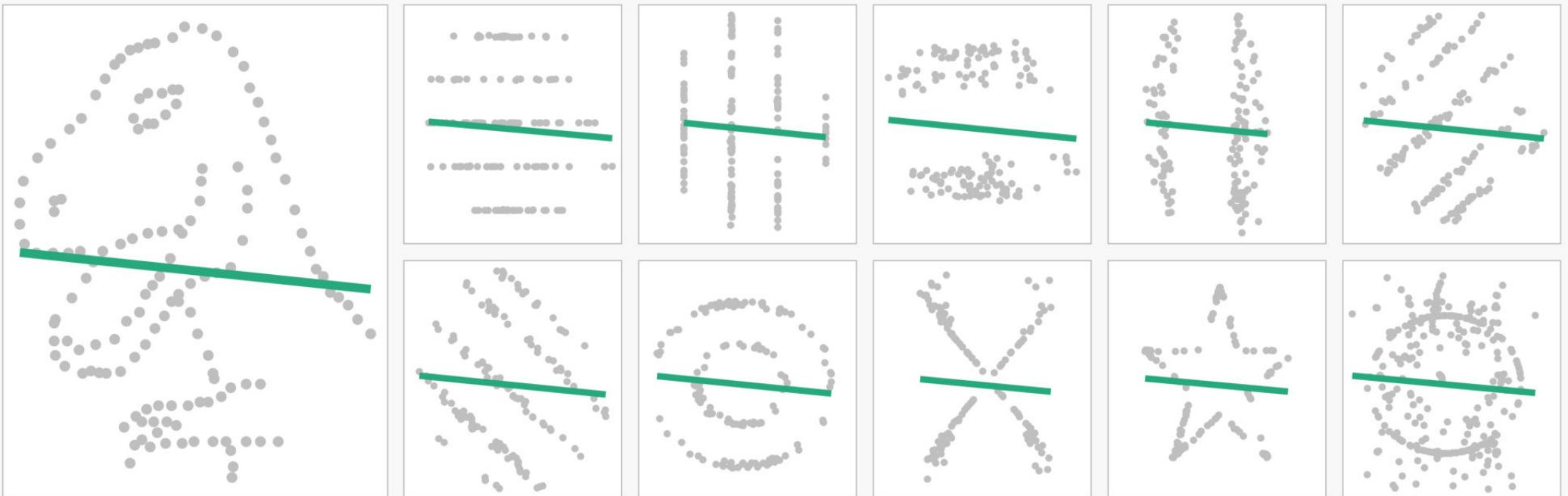


Quelle: "Same Stats, Different Graphs: Generating Datasets with Varied Appearance and Identical Statistics through Simulated Annealing", Justin Matejka & George Fitzmaurice (2017) • Grafik: Cédric Scherer



# The Datasaurus (*Anscombosaurus spec.*) Dozen

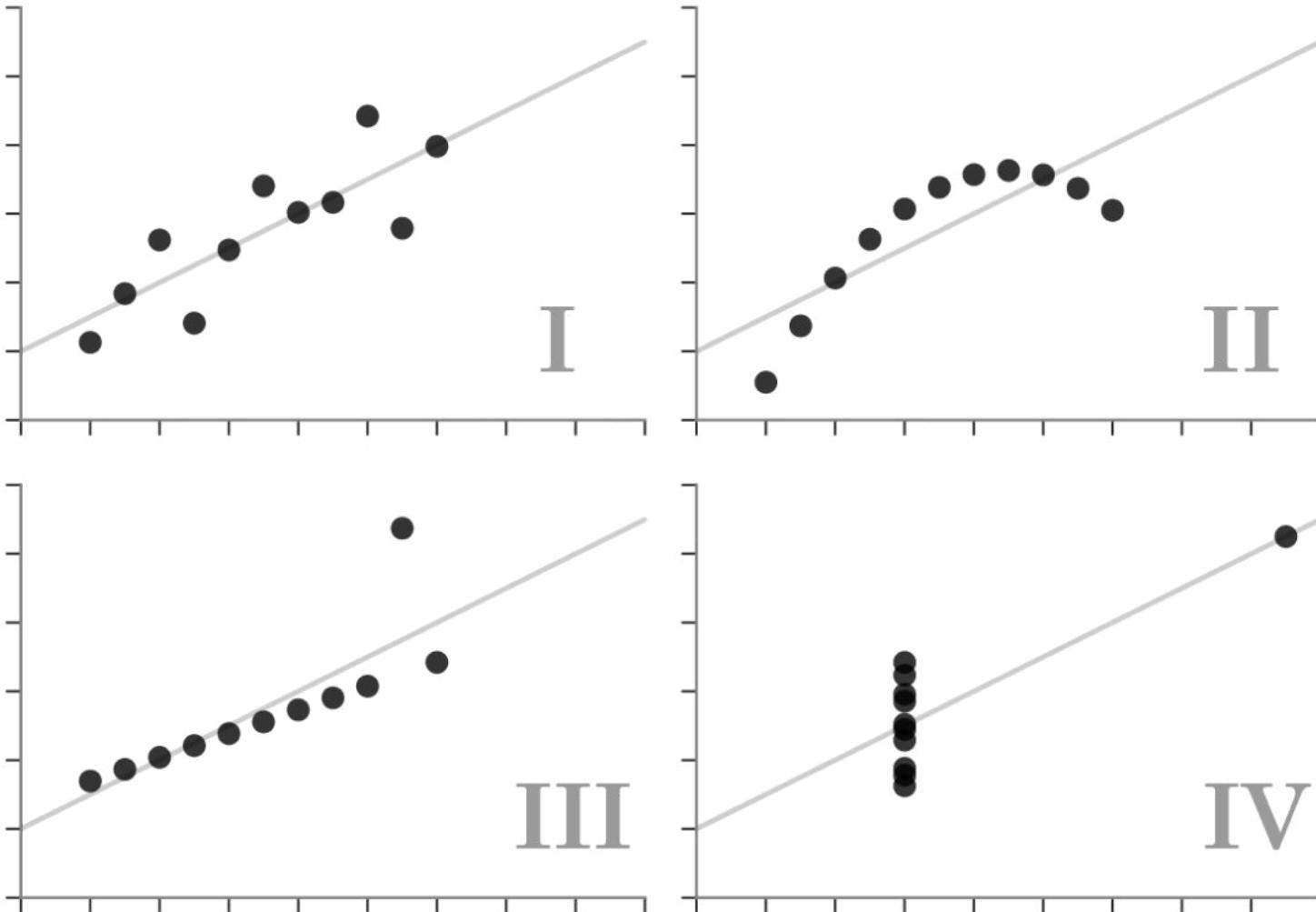
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Quelle: "Same Stats, Different Graphs: Generating Datasets with Varied Appearance and Identical Statistics through Simulated Annealing", Justin Matejka & George Fitzmaurice (2017) • Grafik: Cédric Scherer



# Anscombe's Quartet



Quelle: Matejka & Fitzmaurice (2017)



# Muster erkennen

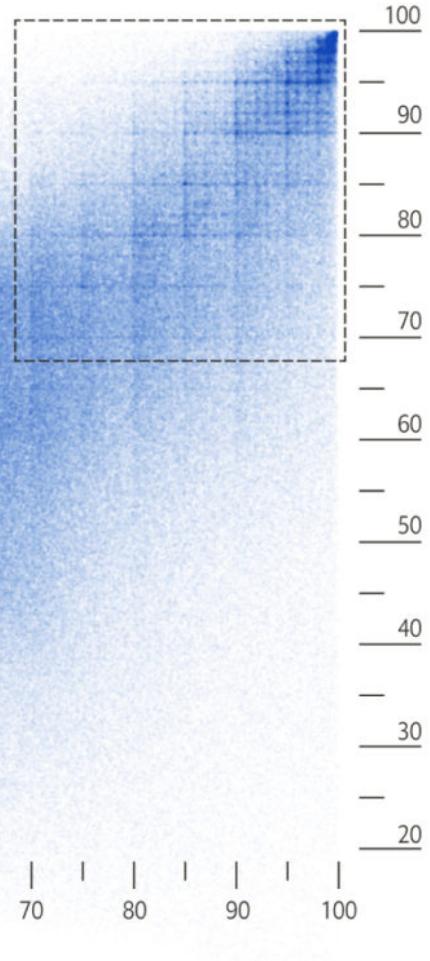
## Fair and square?

Russian federal elections, 2000-21

● 1 dot = 1 polling station

→ The fact that "gridlines" are visible at numbers ending in zero and five suggests foul play

Putin, Medvedev or United Russia result, %



Source: Kobak and Shpilkin (2021)

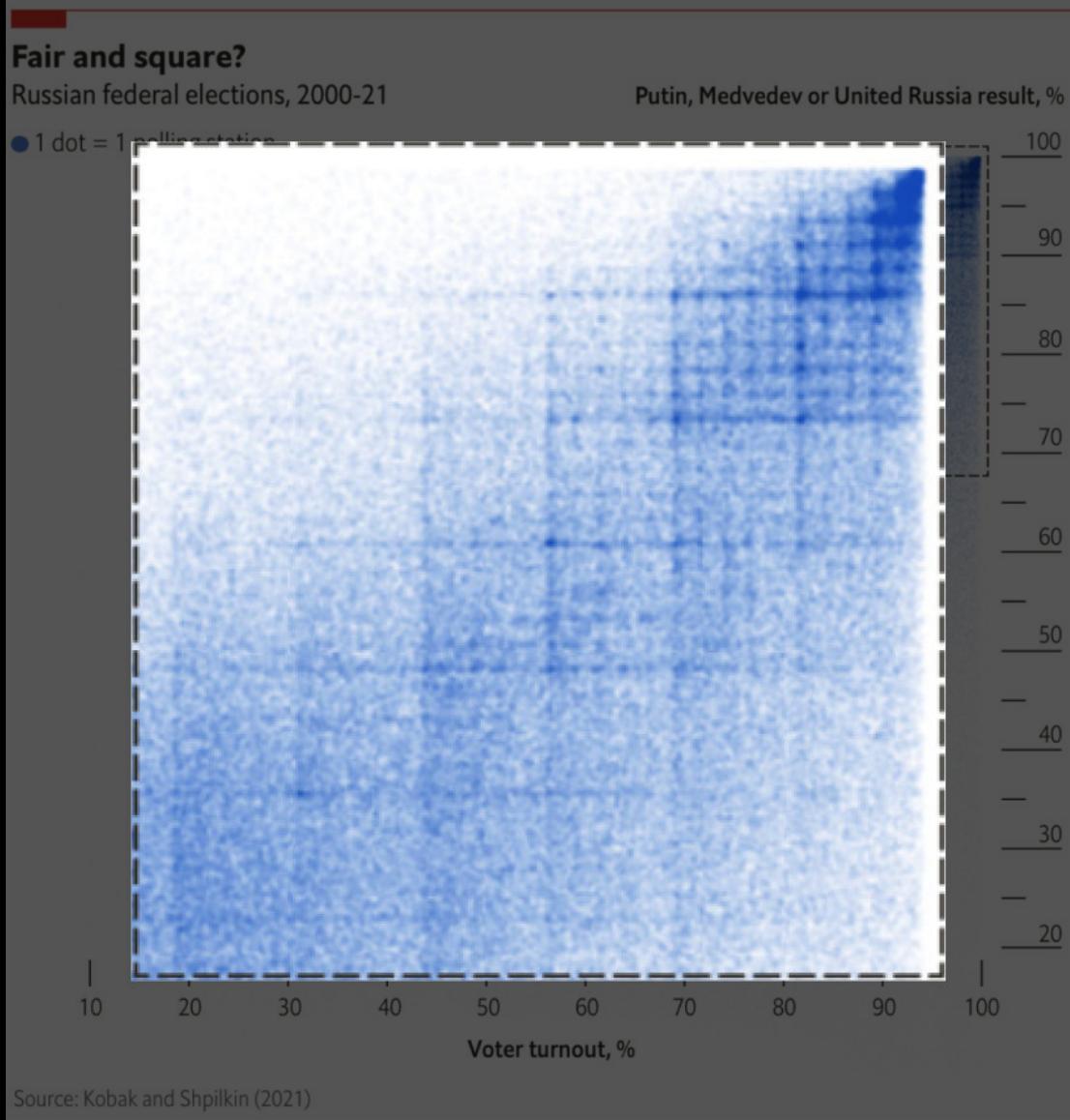
When Dmitry Kobak and Sergey Shpilkin [...] analysed the results, they found that an unusually high number of turnout and vote-share results were multiples of five (eg, 50%, 55%, 60%), a tell-tale sign of manipulation.

"Russian elections once again had a suspiciously neat result" (*The Economist*)





# Muster erkennen



When Dmitry Kobak and Sergey Shpilkin [...] analysed the results, they found that an unusually high number of turnout and vote-share results were multiples of five (eg, 50%, 55%, 60%), a tell-tale sign of manipulation.

*"Russian elections once again had a suspiciously neat result" (The Economist)*





# Eine effektive Datenvisualisierung kann den Unterschied zwischen **Erfolg** und **Scheitern** bedeuten.

- Kommunikation bedeutender Ergebnisse und Erkenntnisse
- Einwerben von Geldmitteln für eine Organisation oder ein Projekt
- Präsentation vor einem Gremium oder auf einer Konferenz
- Unterstützung bei fundierten Entscheidungen
- Grundlagen und Orientierung für Verbesserungen bieten
- ...
- **Deine Botschaft vermitteln!**





# Good vs Bad



# Was macht eine gute Visualisierung aus?

- **Information** (Integrität)
- **Erzählung** (Bedeutsamkeit)
- **Ziel** (Zweckmäßigkeit)
- **Visuelle Form** (Eleganz)



# Integrität der Daten und mögliche Probleme



# Integrität der Daten

- Datenqualität:
  - Schätzung, Präzision und Fehler
  - Fehler und Irrtümer bei der Berechnung
  - Unvollständige Daten und fehlende Werte
  - Zusammengefasste und relative Daten
- Nur ein Teilabbild:
  - nicht Straftaten, sondern gemeldete Straftaten\*
  - historischer oder gegenwärtiger Zustand

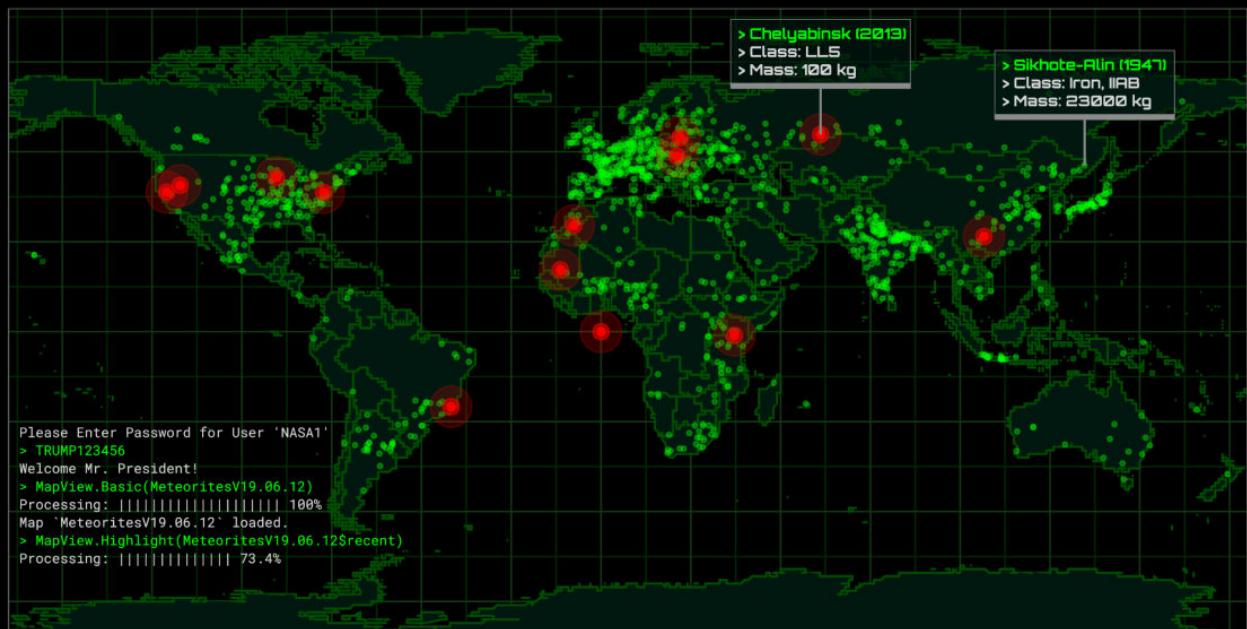
\* oder Ratten, UFO-Sichtungen, ...



Unsere Daten sind niemals eine  
perfekte Abbildung der realen Welt.

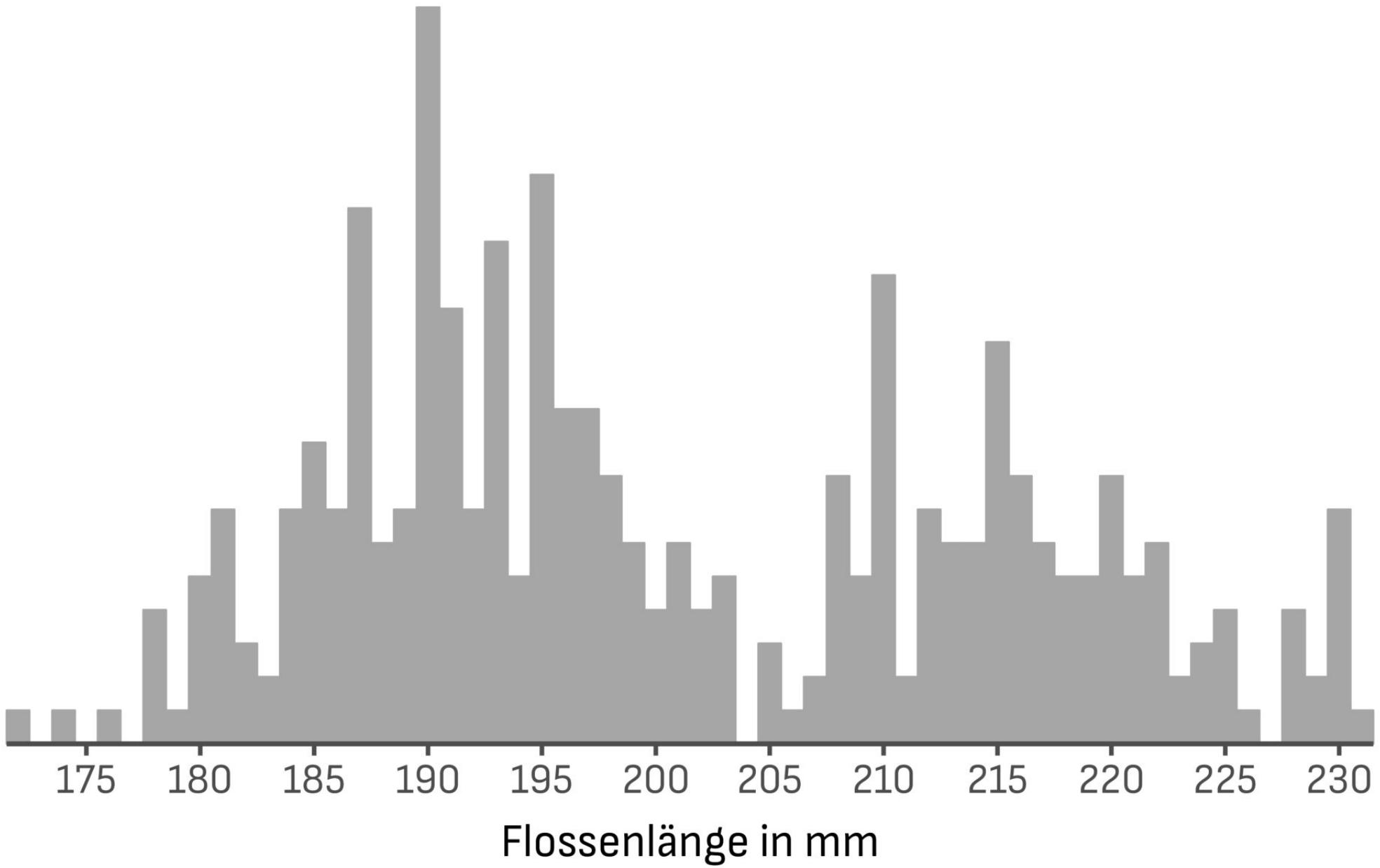


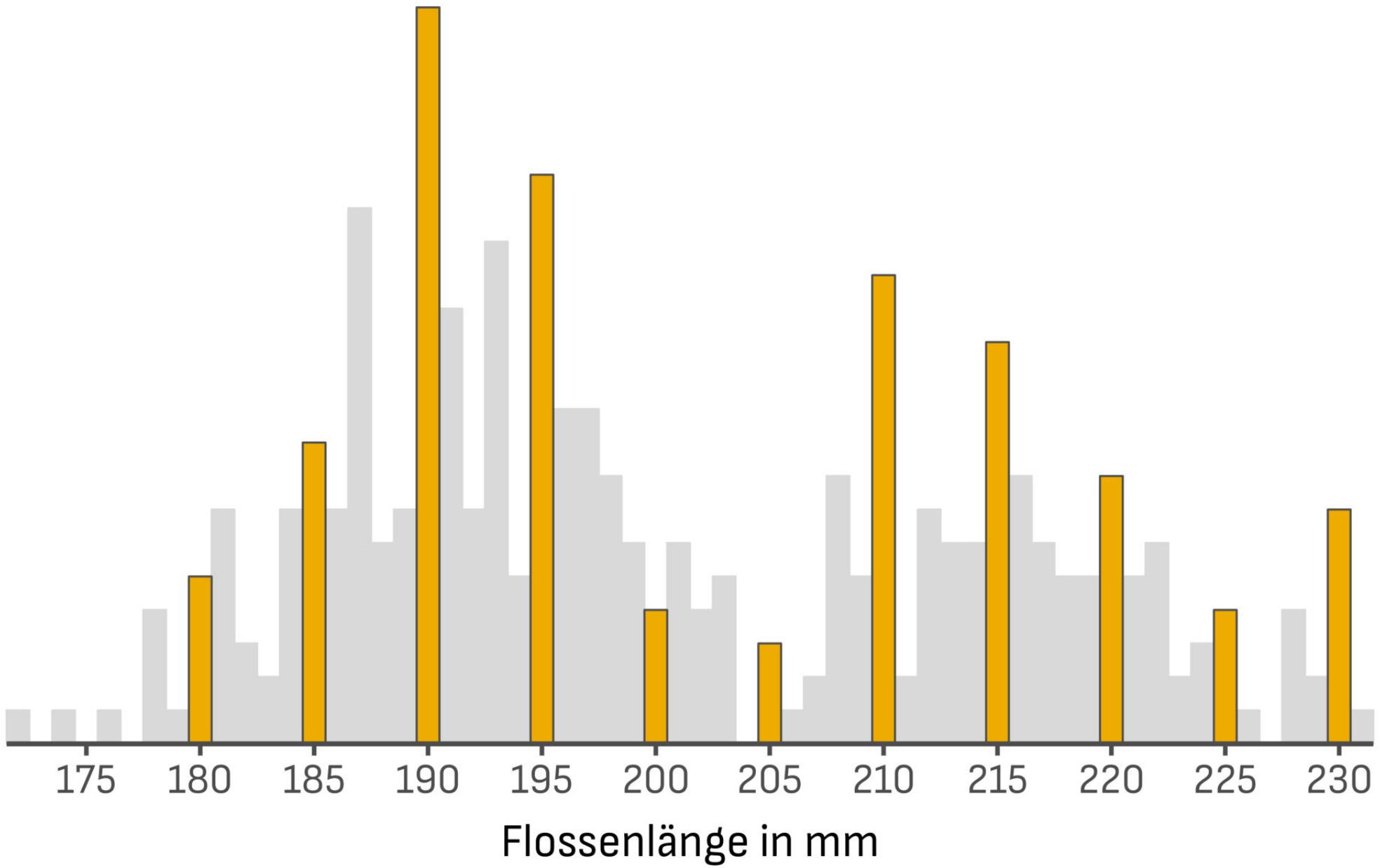
# SPACE OBSERVER 3000 X V3.5.1

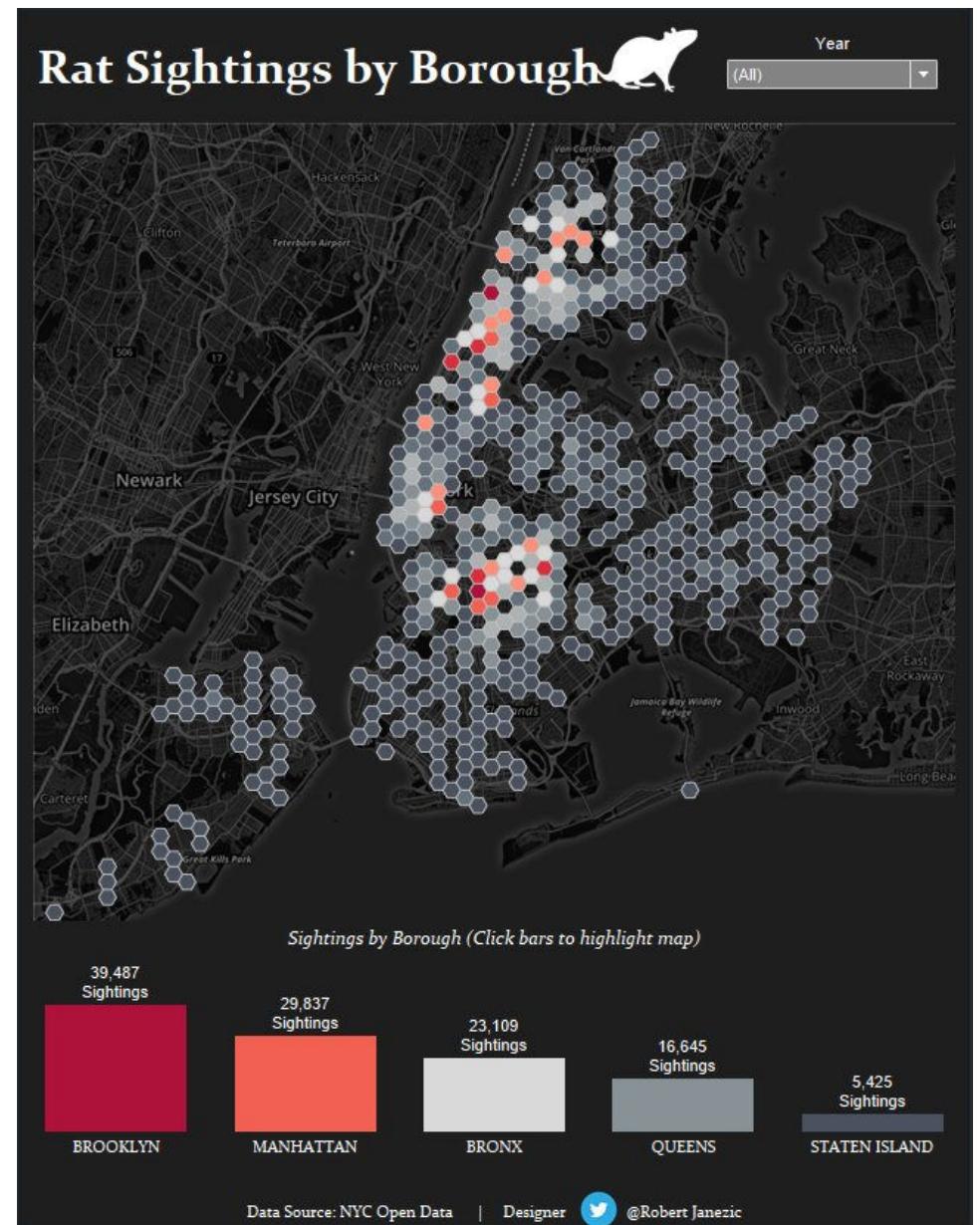
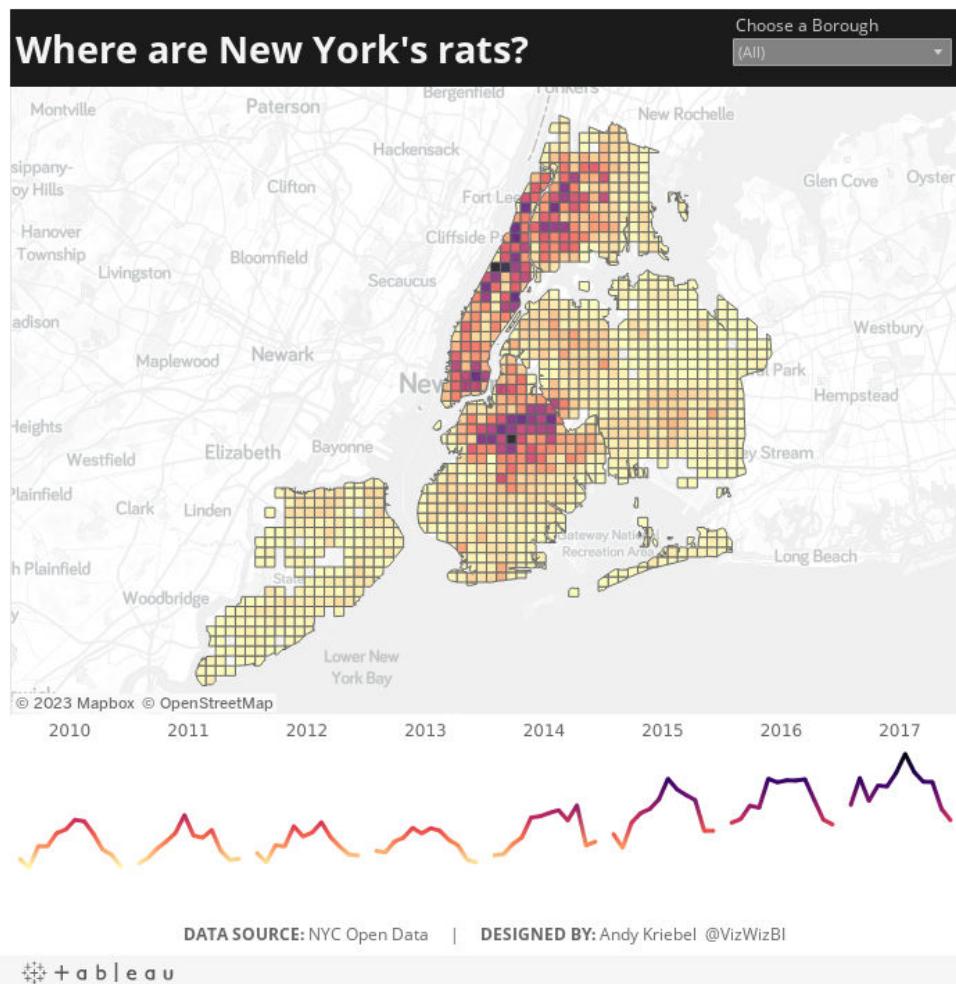


Provided by Cédric Scherer & National Aeronautics and Space Administration (NASA)









# Kontext



# Typologie von Informationsgrafiken

Ist die Information **konzeptionell** oder **messbar** ?

→ Art der Information: Schematische Darstellung <> Umwandlung von Datenwerten

Ist das Ziel, die Information zu **erkunden** oder zu **erklären** ?

→ Zweck der Grafik: Entdeckung erleichtern <> Informationen vermitteln



# Publikum (wer)

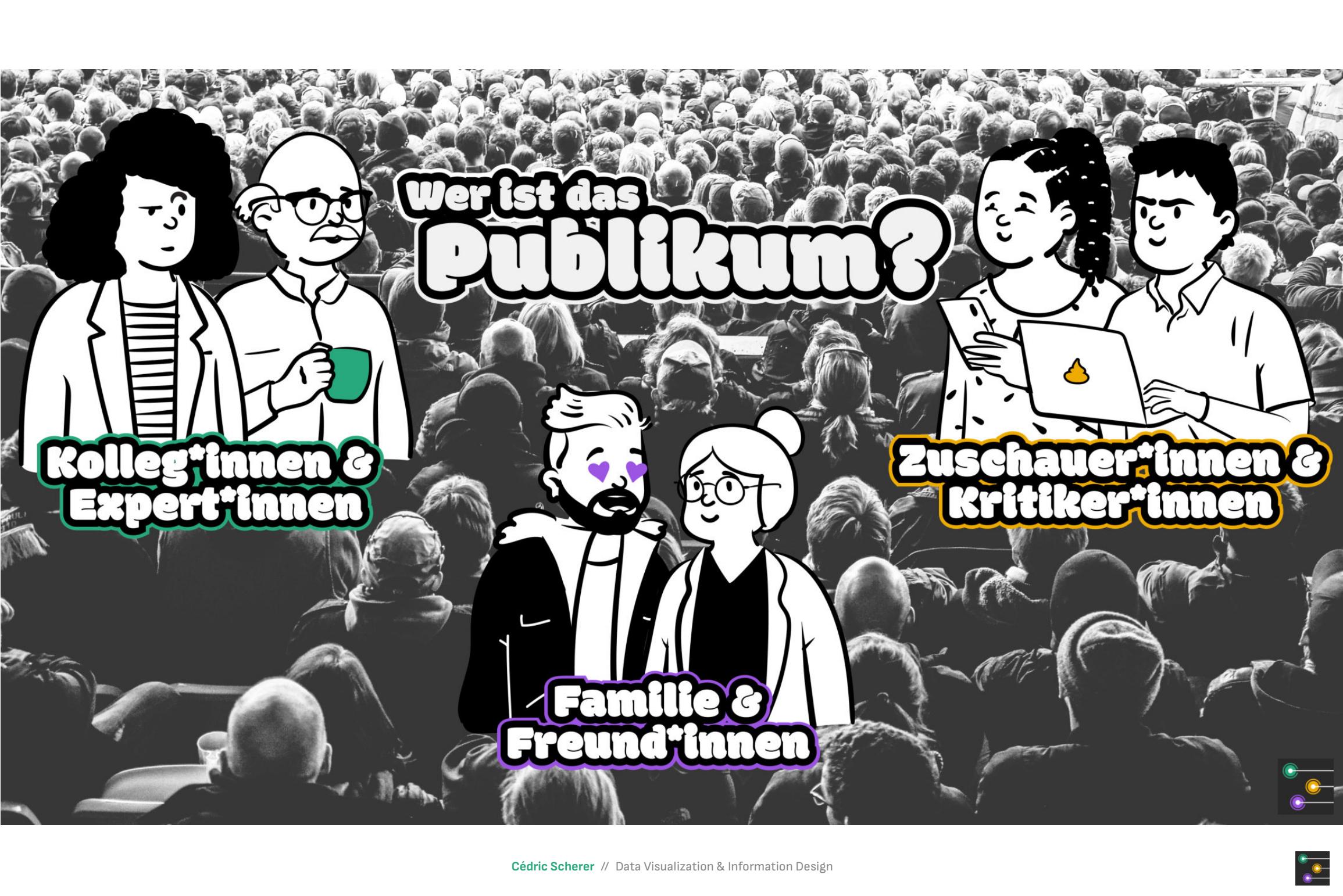
- An wen richtet sich die Kommunikation?
- Was weiß das Publikum bereits?
- Was ist die eigene Position und Beziehung?





# das Publikum



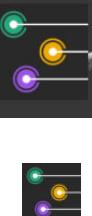


# Wer ist das Publikum?

Kolleg\*innen &  
Expert\*innen

Zuschauer\*innen &  
Kritiker\*innen

Familie &  
Freund\*innen



## Publikum (wer)

- An wen richtet sich die Kommunikation?
- Was weiß das Publikum bereits?
- Was ist die eigene Position und Beziehung?

## Inhalt (was)

- Welche Erkenntnisse oder Aufgaben sollen die Zuhörenden mitnehmen?
- Auf welchem Weg findet die Kommunikation statt?
- Welchen Ton soll die Datenvisualisierung transportieren?



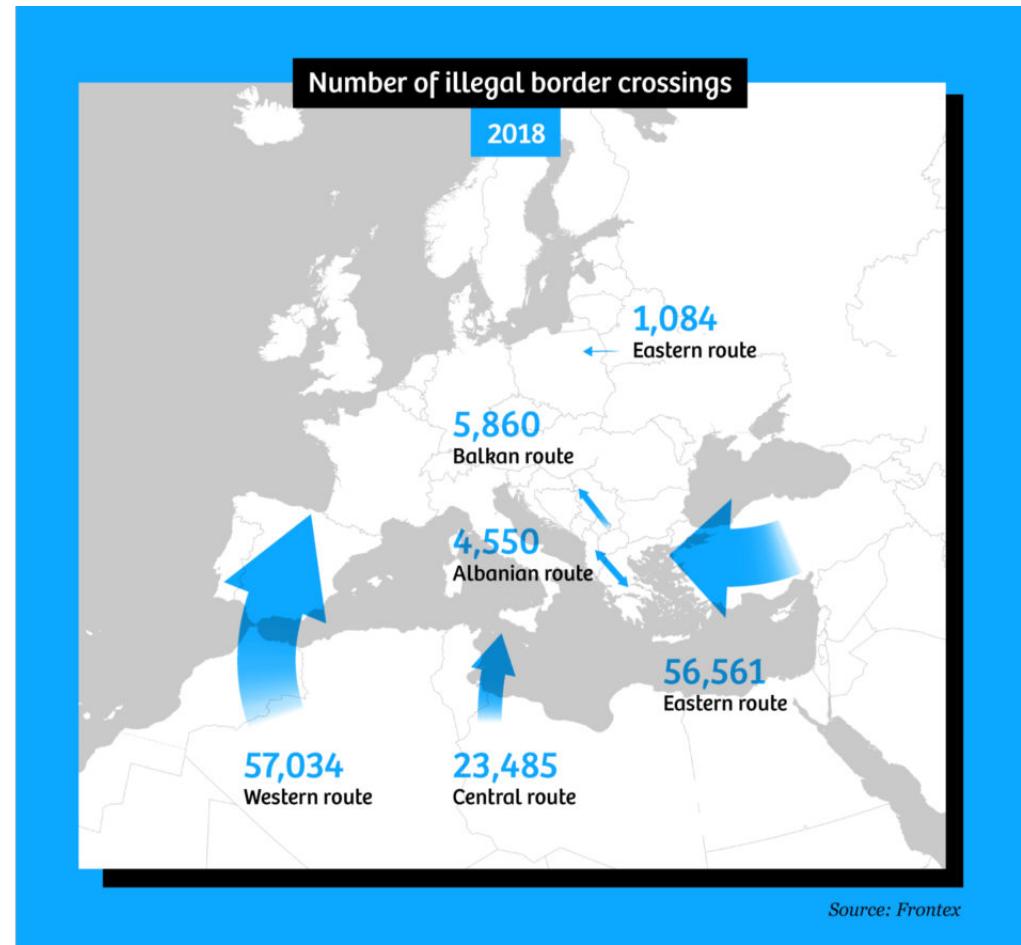
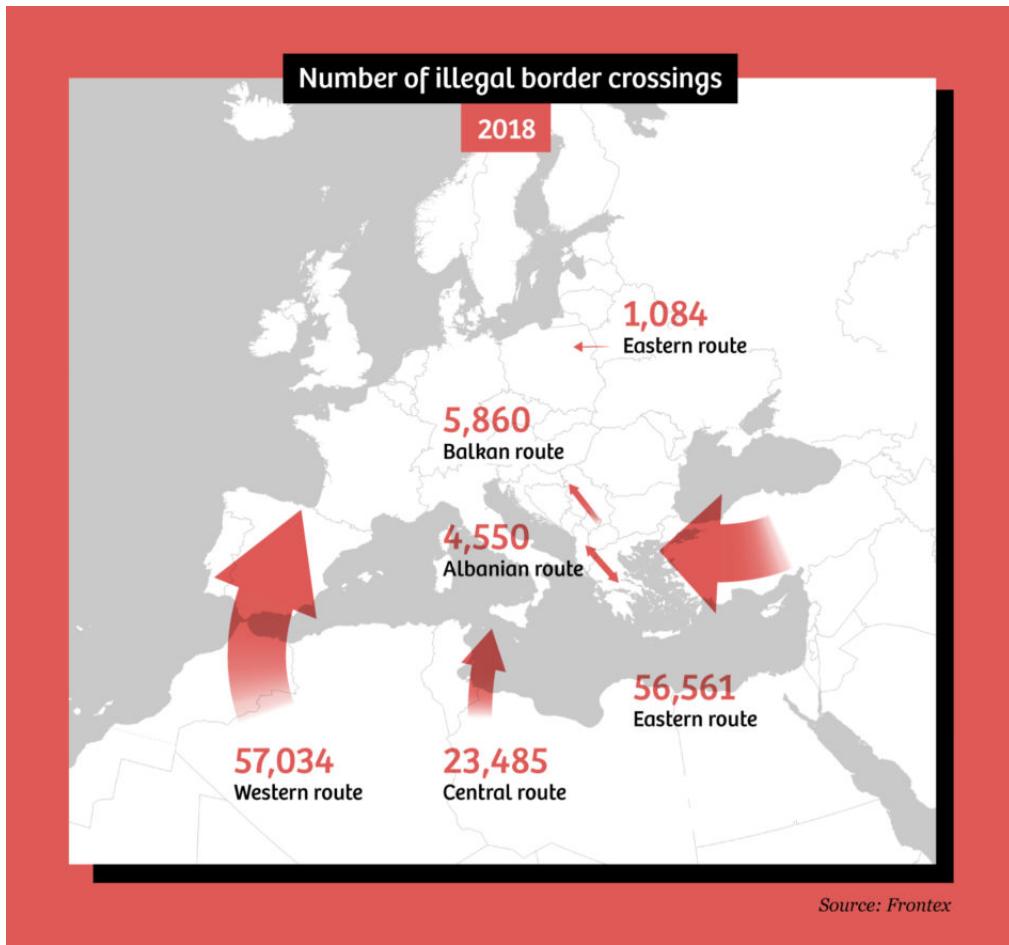


Visualiser Control

Viewer Control

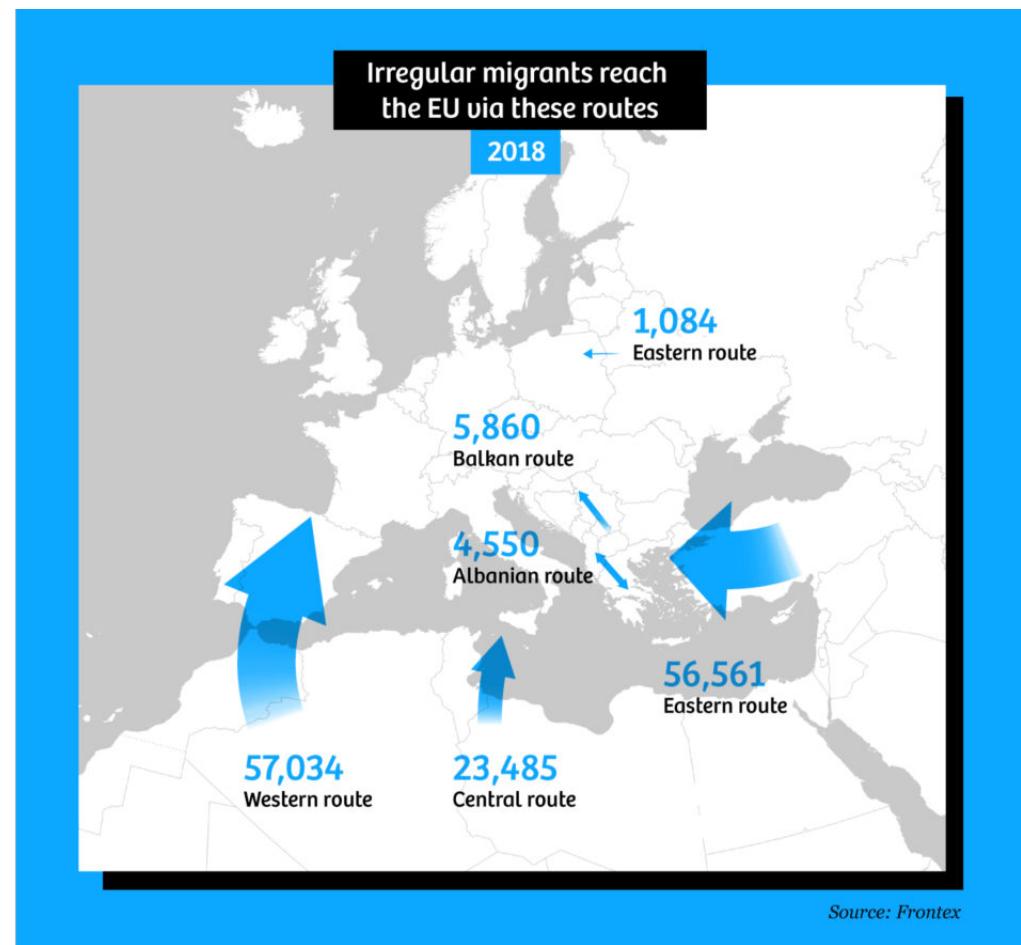
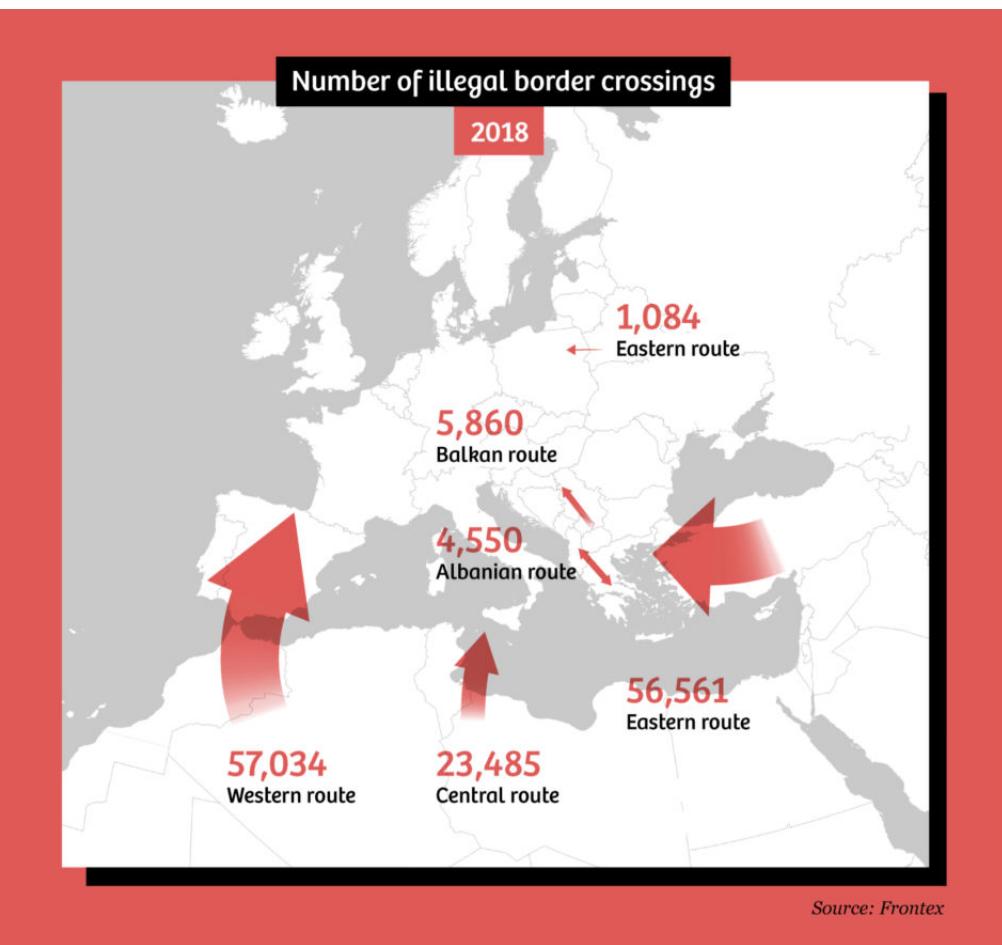
Schema von Andy Kirk (modifiziert)





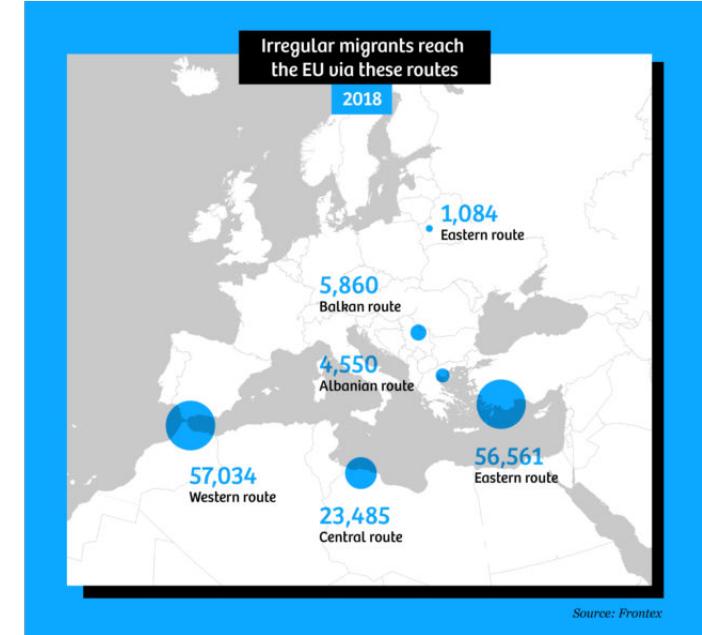
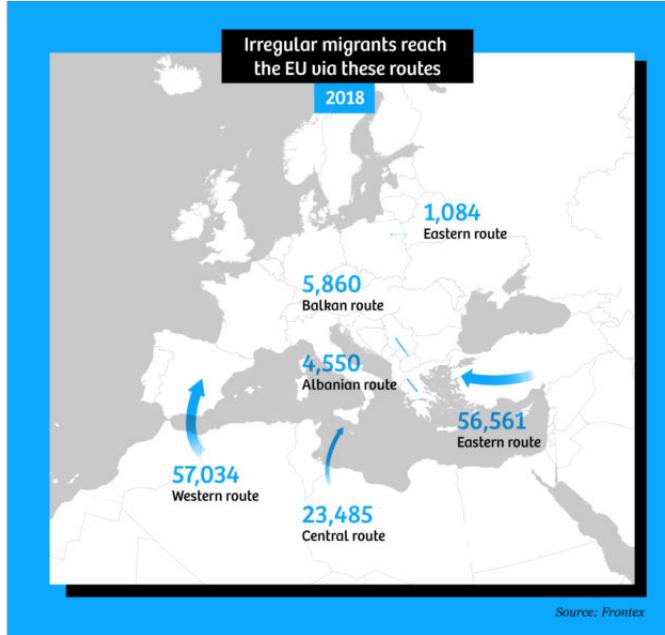
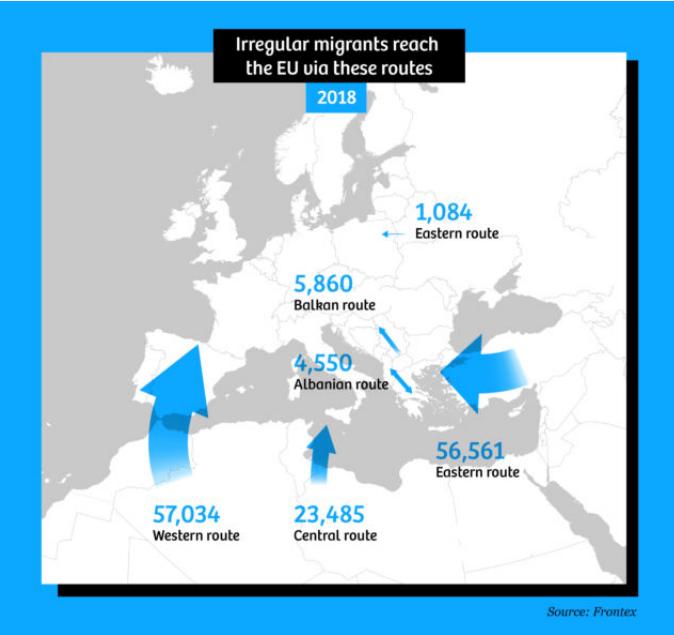
*"How maps in the media make us more negative about migrants"* von Maite Vermeulen, Leon de Korte & Henk van Houtum





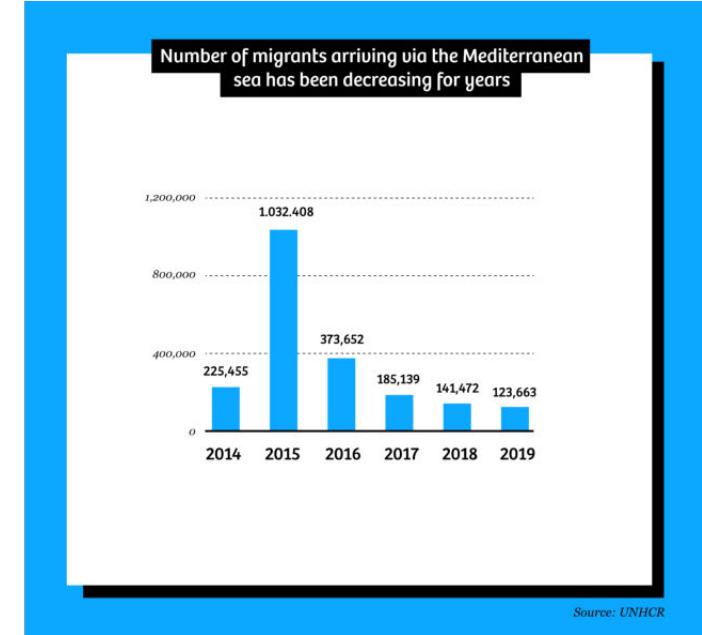
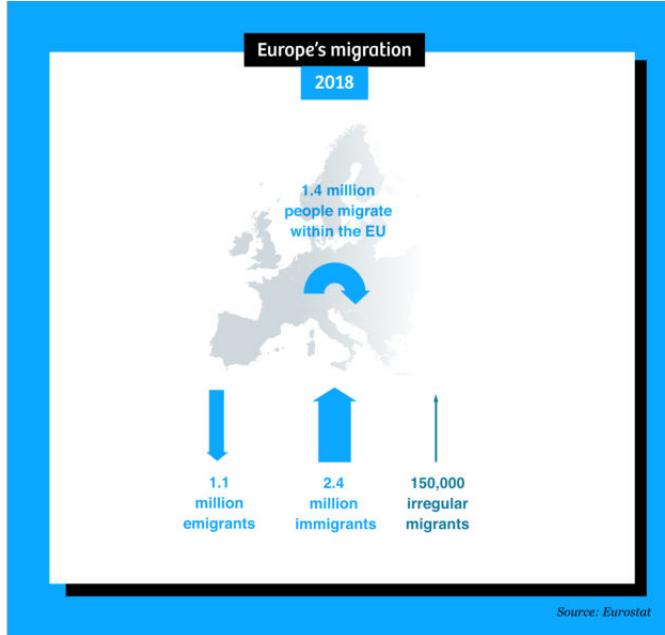
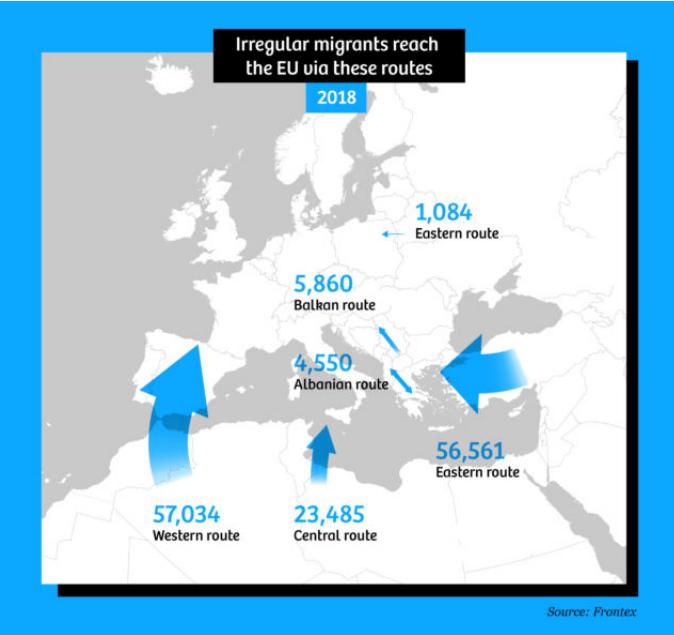
*"How maps in the media make us more negative about migrants"* von Maite Vermeulen, Leon de Korte & Henk van Houtum





*"How maps in the media make us more negative about migrants"* von Maite Vermeulen, Leon de Korte & Henk van Houtum





*"How maps in the media make us more negative about migrants"* von Maite Vermeulen, Leon de Korte & Henk van Houtum



## Publikum (wer)

- An wen richtet sich die Kommunikation?
- Was weiß das Publikum bereits?
- Was ist die eigene Position und Beziehung?

## Inhalt (was)

- Welche Erkenntnisse oder Aufgaben sollen die Zuhörenden mitnehmen?
- Auf welchem Weg findet die Kommunikation statt?
- Welchen Ton soll die Datenvisualisierung transportieren?

## Grundlage (wie)

- Welche Daten können meinen Standpunkt untermauern?



# Kontext: Vorbereitet sein!

- Was ist die wichtigste Botschaft, die sie mitnehmen sollten?
- Welche (Hintergrund-)Informationen sind wesentlich? Was ist irrelevant?
- Welche potenziellen Voreingenommenheiten könnten bei (einigen) Teilnehmenden bestehen?
- Welche Faktoren könnten die eigene Position schwächen? Kann man ihnen proaktiv begegnen?



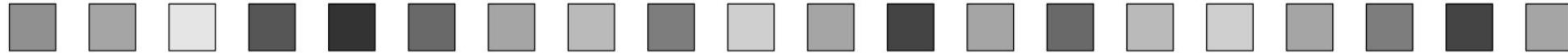
# Kodierungen

Zuordnung von Datenwerten  
zu visuellen Eigenschaften.

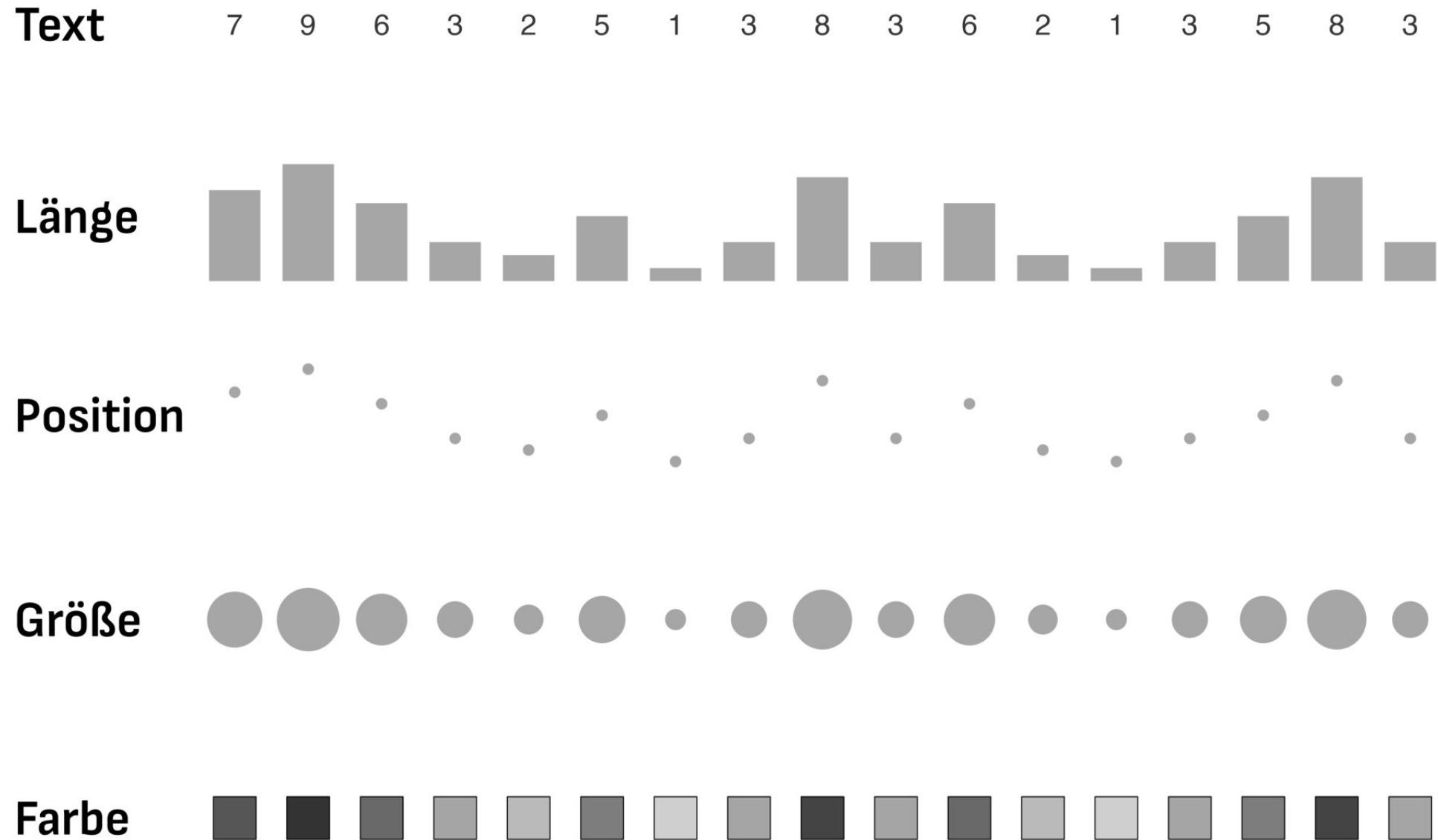


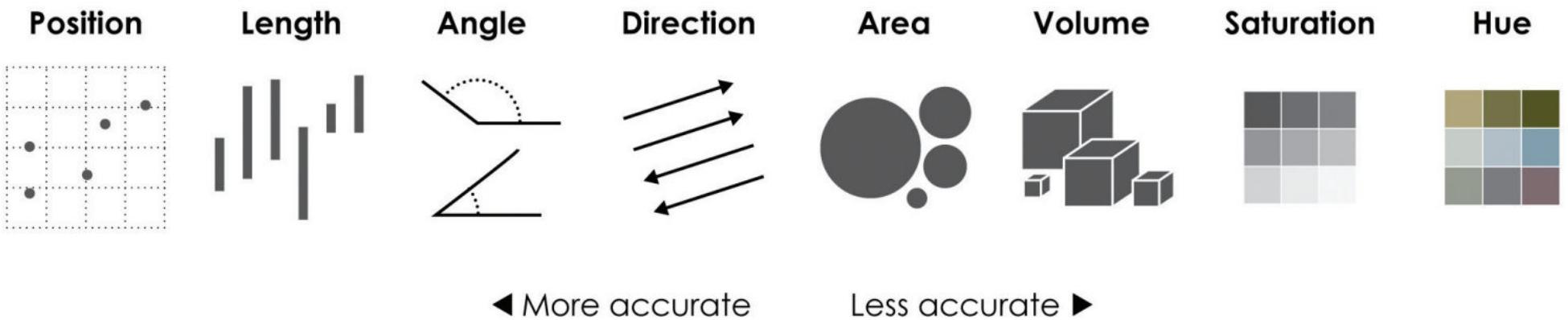
# Gleiche Werte, andere Kodierung

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



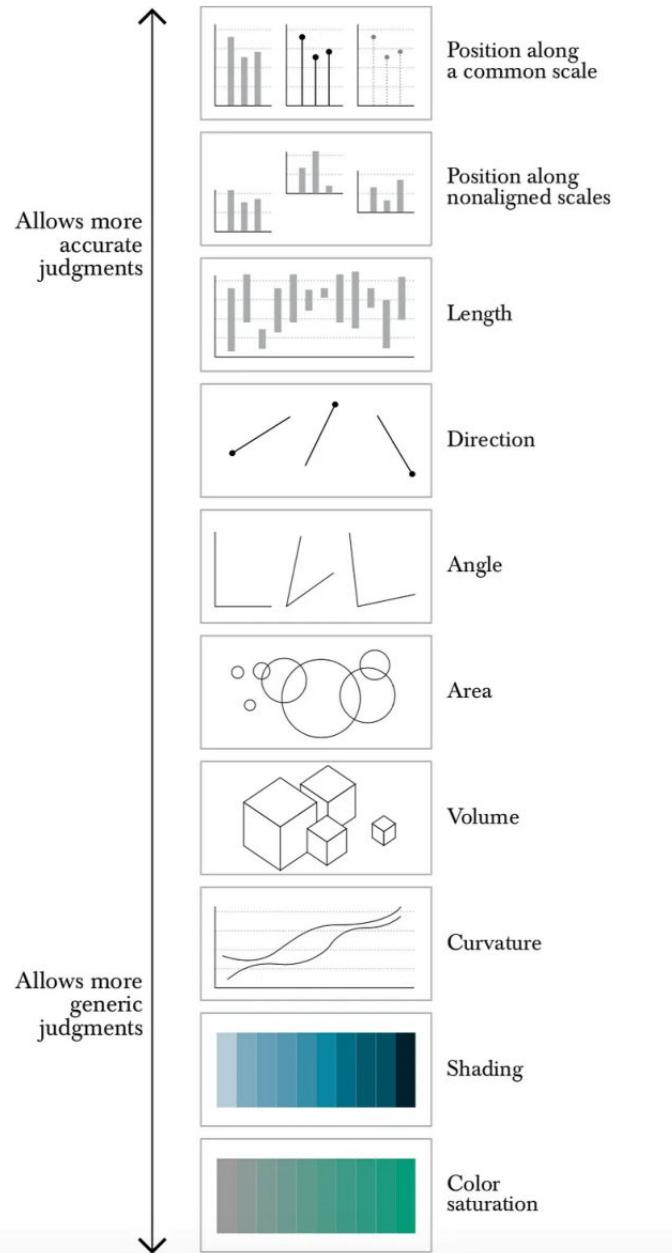
# Gleiche Werte, andere Kodierung





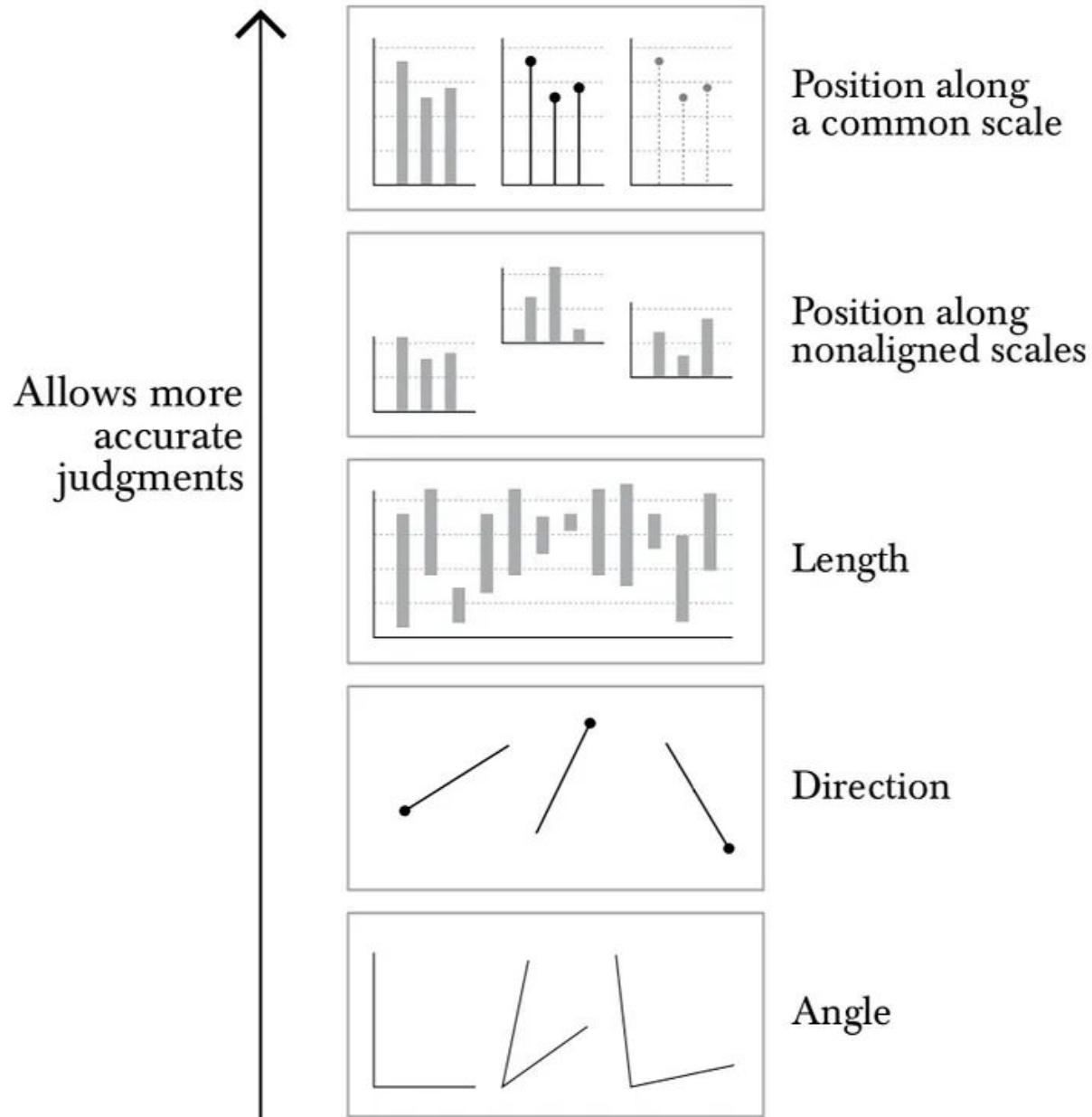
Quelle: "Data Points" von Nathan Yau (S. 104)





*Cleveland's and McGill's Scale of Perpetual Elementary Tasks*  
Quelle: "The Functional Art" von Alberto Cairo (S. 120)

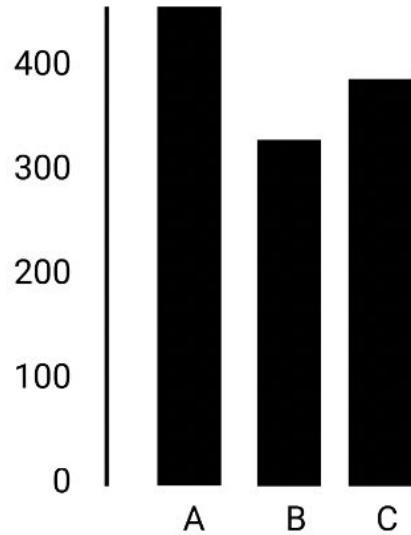




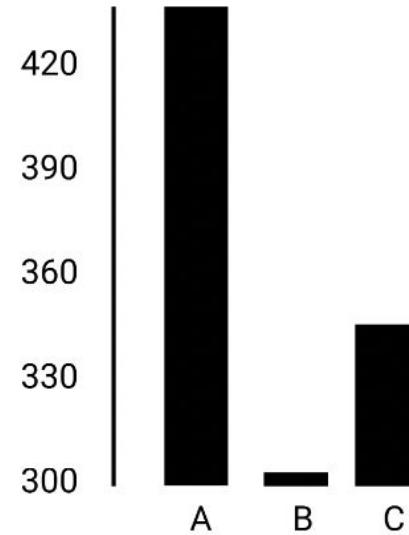
Cleveland's and McGill's Scale of Perpetual Elementary Tasks  
Quelle: "The Functional Art" von Alberto Cairo (S. 120)



# Immer bei Null beginnen?



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



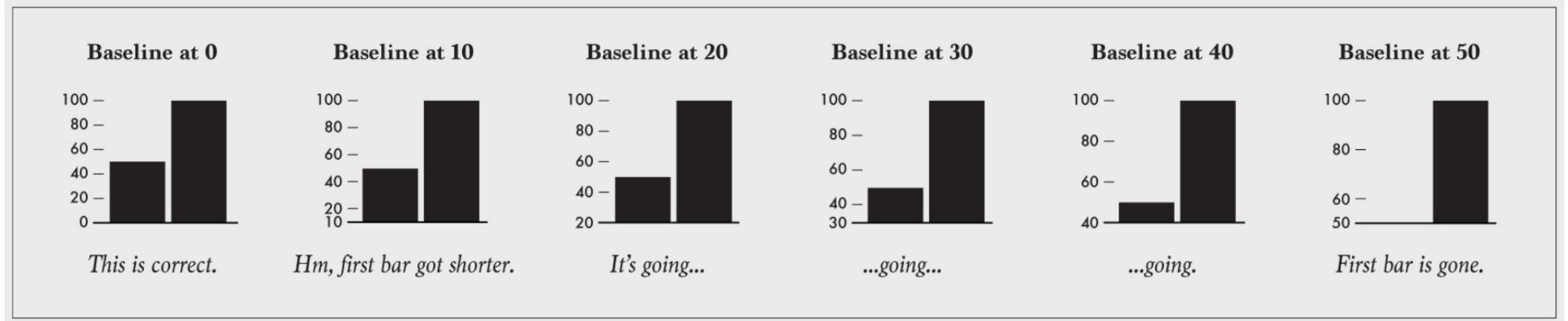
*Bad. Y-axis starts at 300,  
exaggerating the difference  
among columns. Intervals are  
awkward*

Quelle: "Hands-On Data Visualization" von Jack Dougherty & Ilya Ilyankou

mehr dazu: z.B. Correl, Bertini & Francoeri (2020) und Witt (2019)



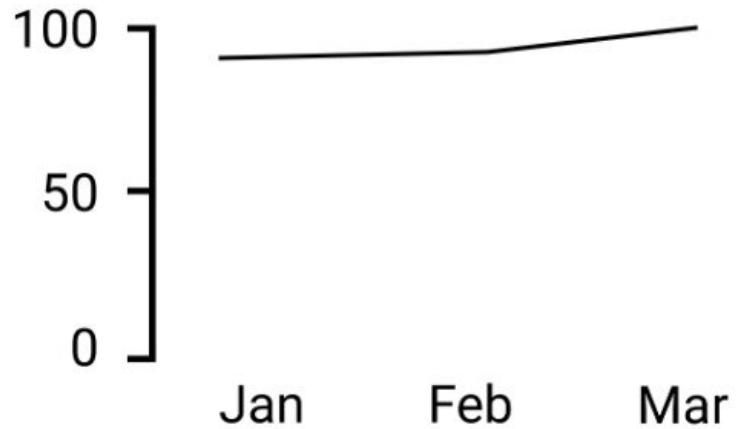
# Immer bei Null beginnen?



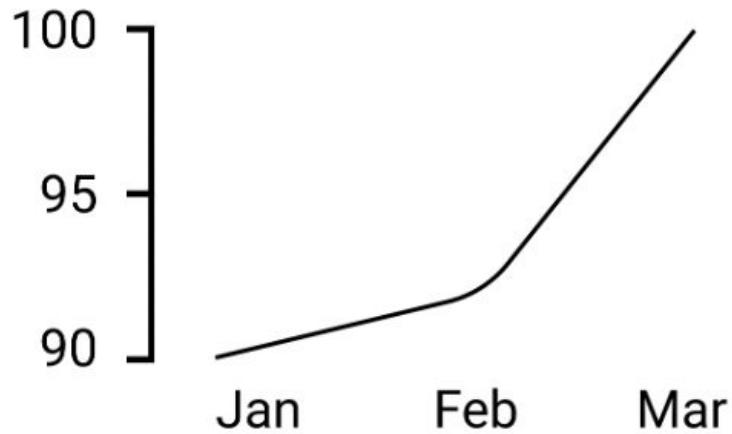
Quelle: Nathan Yau



# Immer bei Null beginnen?



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

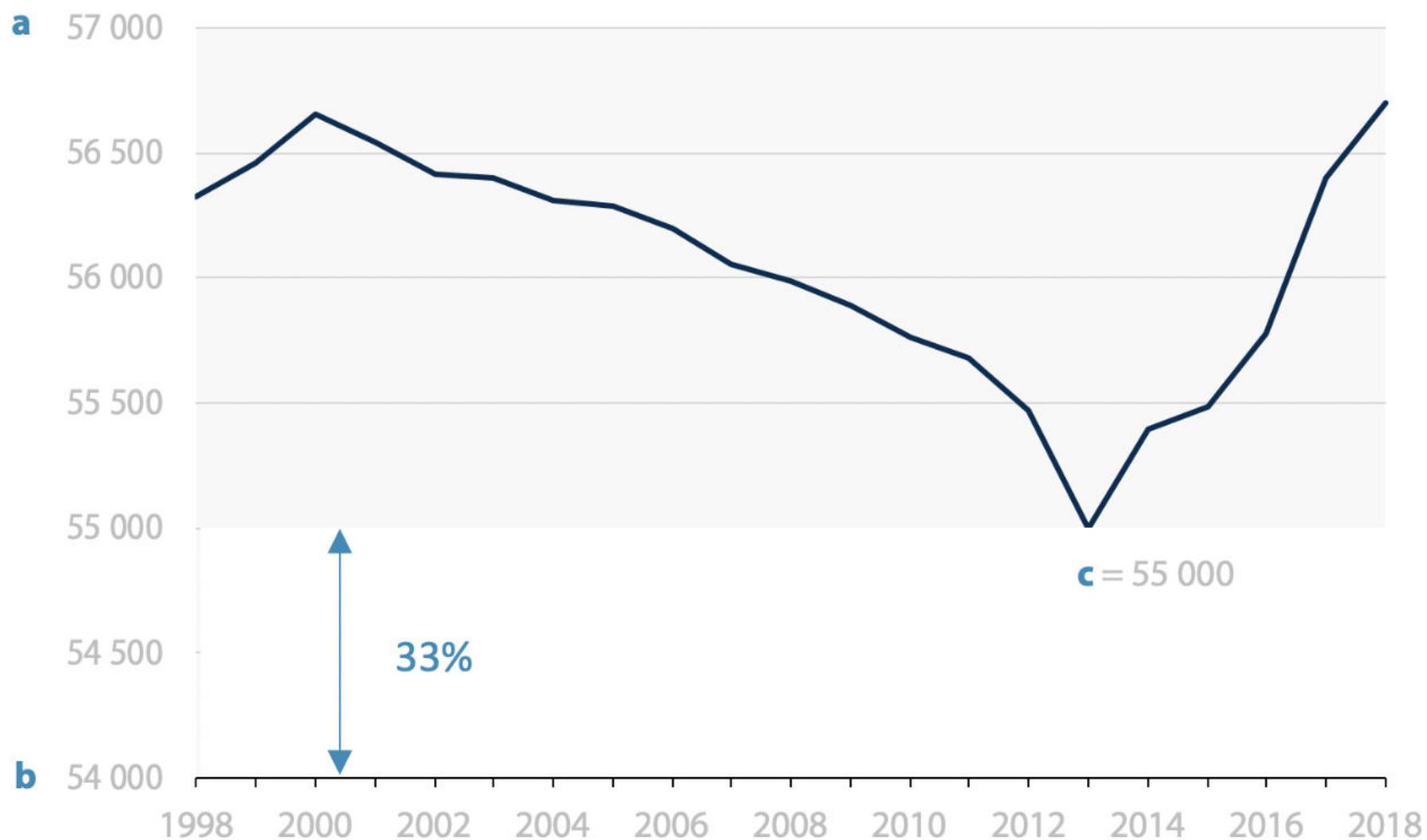


*Better: By reducing the vertical axis to match the values, we see change more clearly*

Quelle: "Hands-On Data Visualization" von Jack Dougherty & Ilya Illyankou



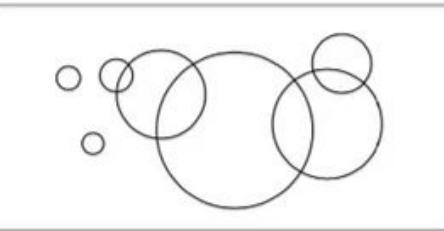
# Sales of widgets



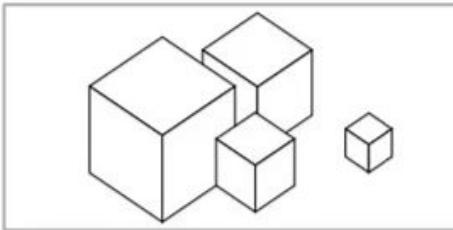
Quelle: [Francis Gagnon](#)



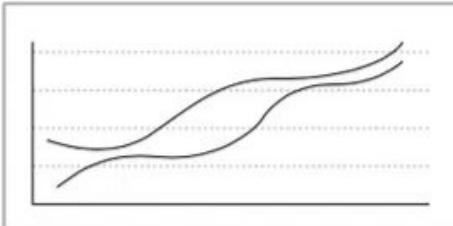
Allows more generic judgments



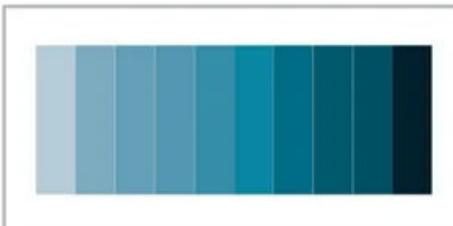
Area



Volume



Curvature



Shading



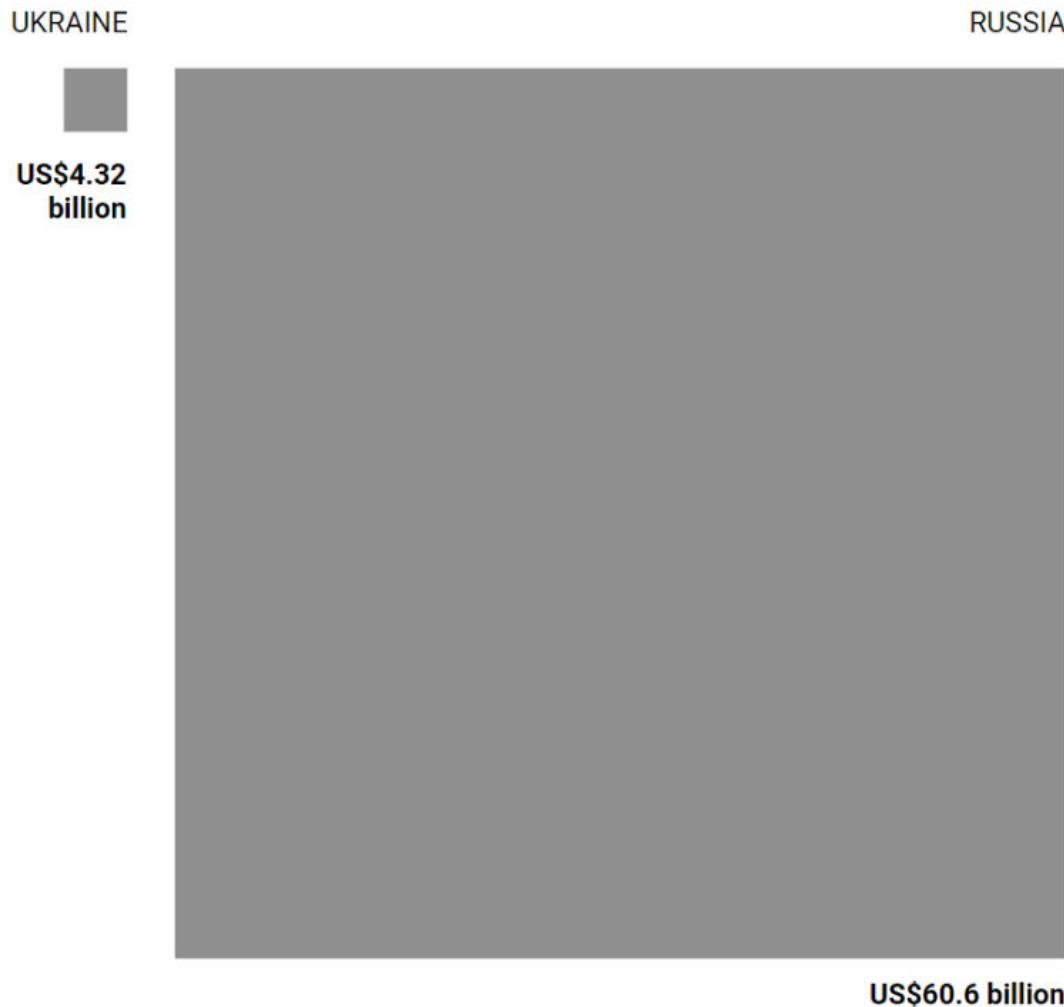
Color saturation

Cleveland's and McGill's Scale of Perpetual Elementary Tasks  
Quelle: "The Functional Art" von Alberto Cairo (S. 120)



## 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.

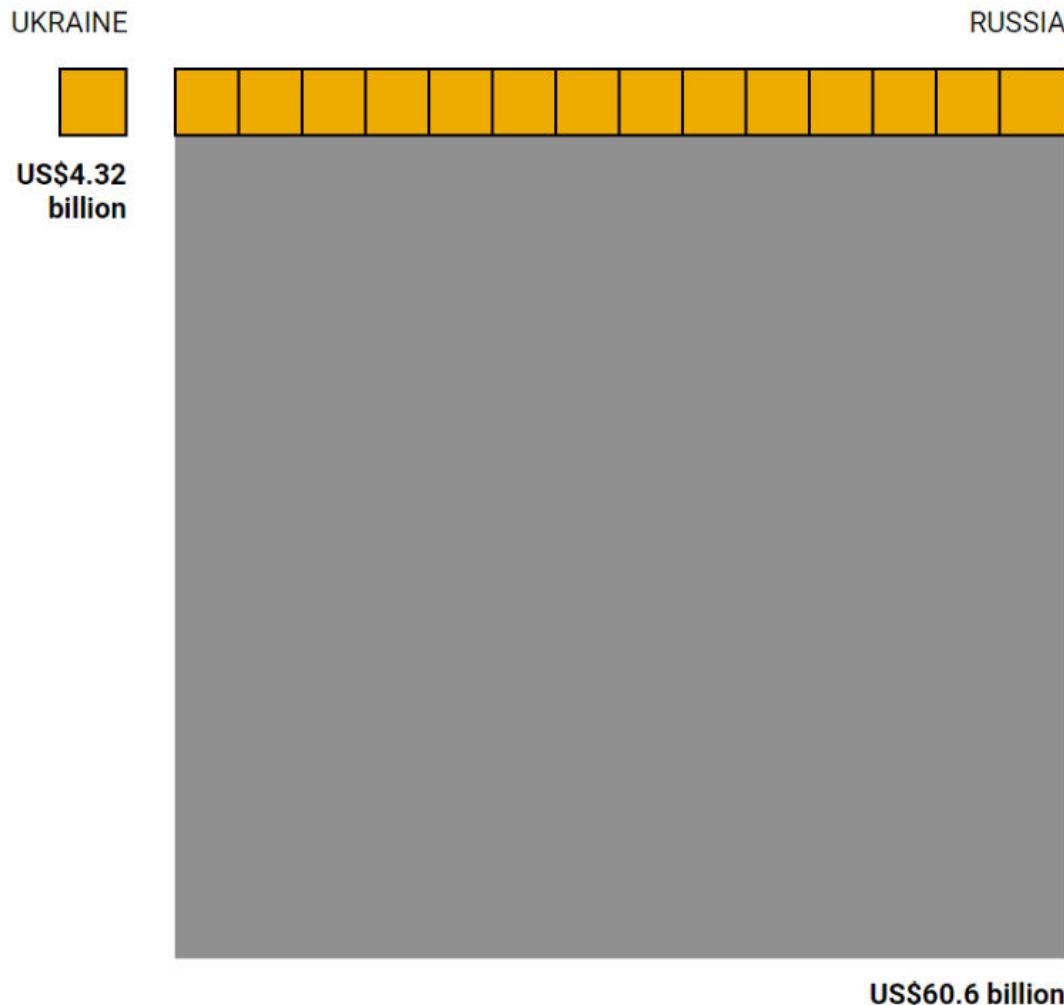


*"Russia attacks Ukraine"* von SCMP Graphic (South China Morning Post)



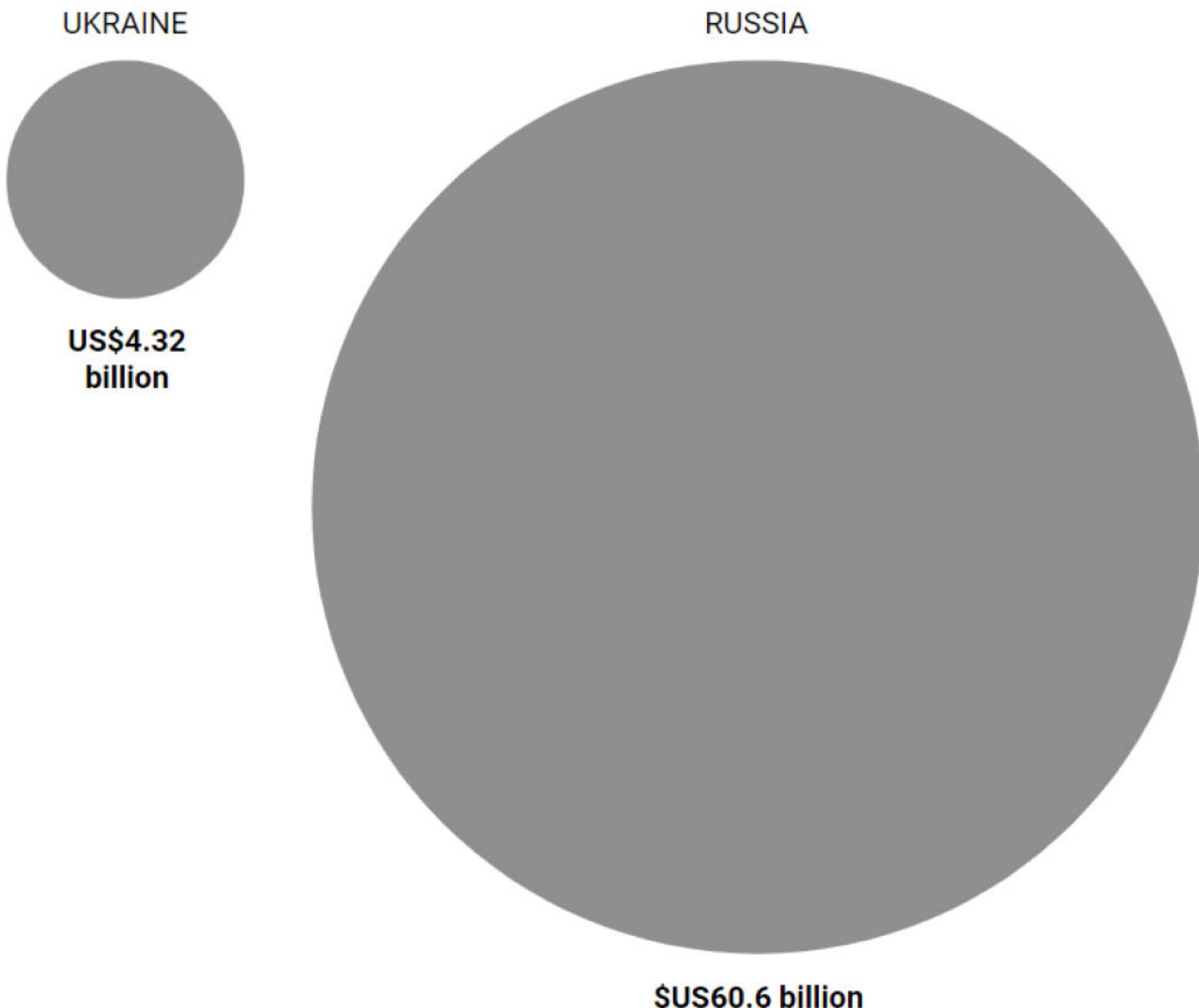
## DEFENCE BUDGETS: RUSSIA VS UKRAINE (2020)

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*"Russia attacks Ukraine"* von SCMP Graphic (South China Morning Post)





*"Russia attacks Ukraine"* von SCMP Graphic (South China Morning Post)

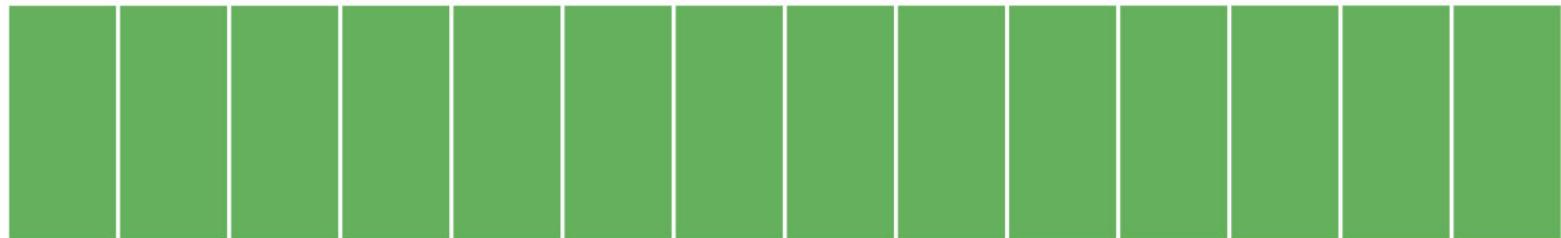


**Ukraine's military spending was less than a 14<sup>th</sup> of Russia's in 2020**



**UKRAINE**

US\$4.3 billion



**RUSSIA**

US\$60.6 billion

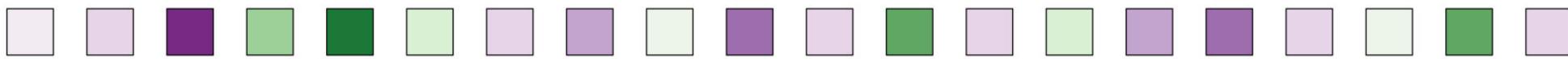
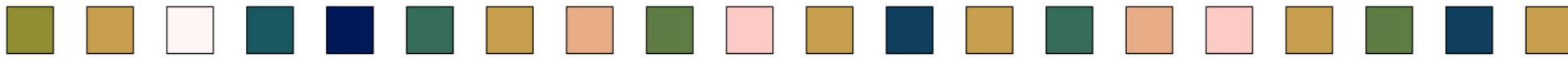
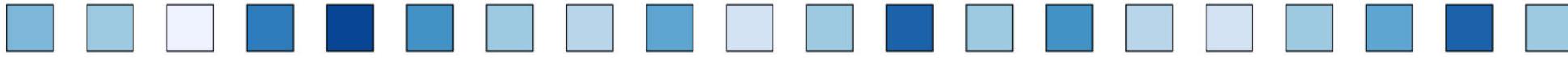
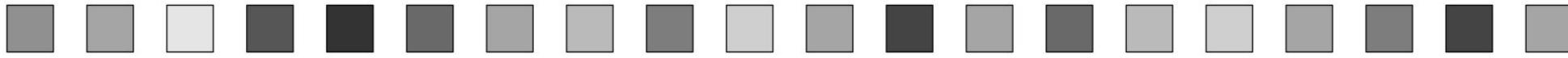


**Ukraine's military spending was less than a 14<sup>th</sup> of Russia's in 2020.**



# Gleiche Werte, andere Farben

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



# Gleiche Werte, andere Farben

Werte

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

Sequentiell (Graustufen)



Sequentiell (einfarbig)



Sequentiell (mehrfarbig)

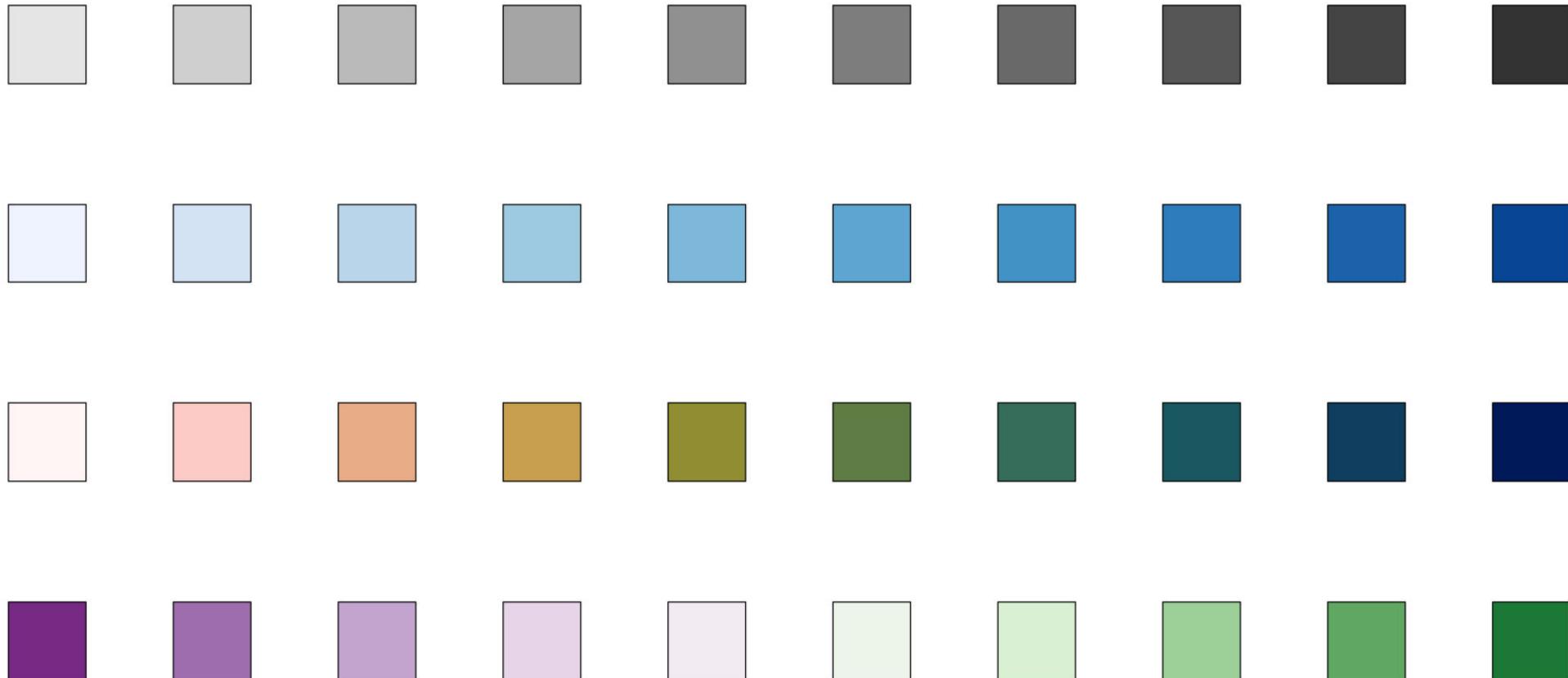


Divergierend



# Gleiche Werte, andere Farben

0      1      2      3      4      5      6      7      8      9



# Arten von Farbpaletten

## Sequentiell

Beispiel



Graustufen



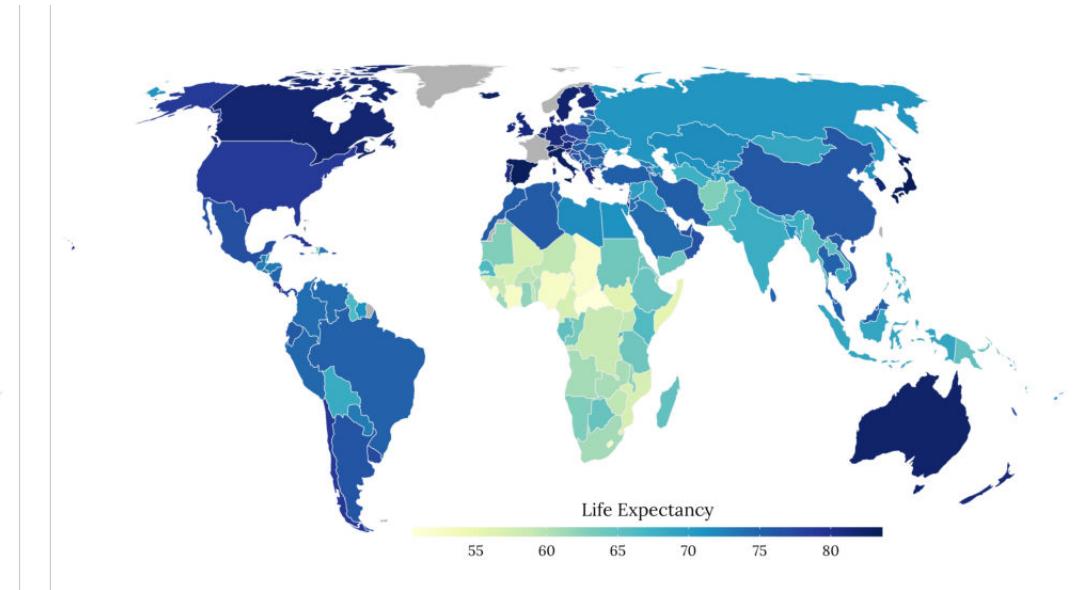
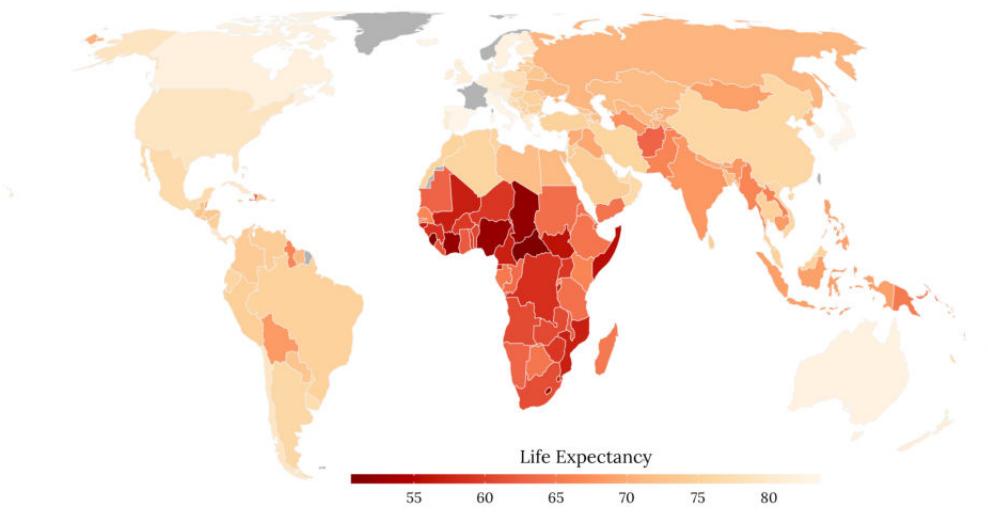
***numerische Informationen  
mit steigender Reihenfolge***

*verwende den höchsten Kontrast  
für die wichtigsten Informationen*

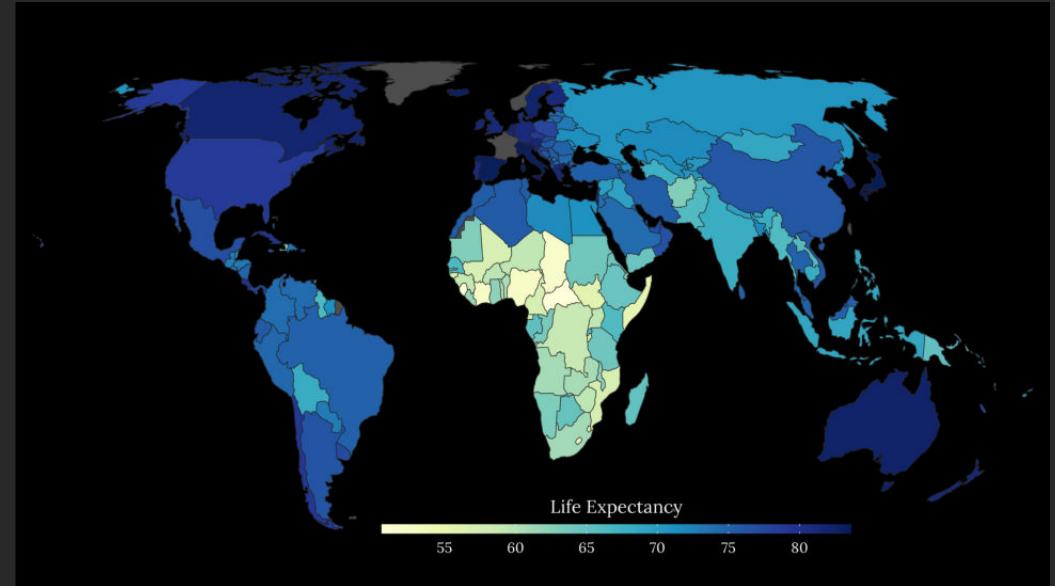
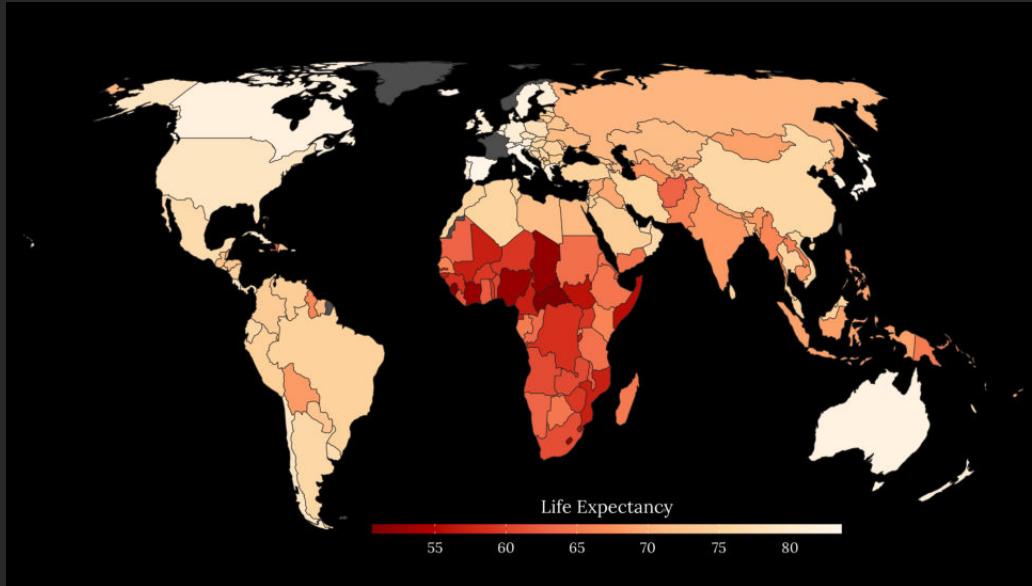
*entweder einfarbige oder  
mehrfarbige Farbpaletten*



# Sequentiell: Dunkel entspricht mehr (?)



# Sequentiell: Dunkel entspricht mehr (?)



# Arten von Farbpaletten

## Sequentiell

Beispiel



Graustufen



**numerische Informationen  
mit steigender Reihenfolge**

verwende den höchsten Kontrast  
für die wichtigsten Informationen

entweder einfarbige oder  
mehrfarbige Farbpaletten

## Divergierend

Beispiel



Graustufen



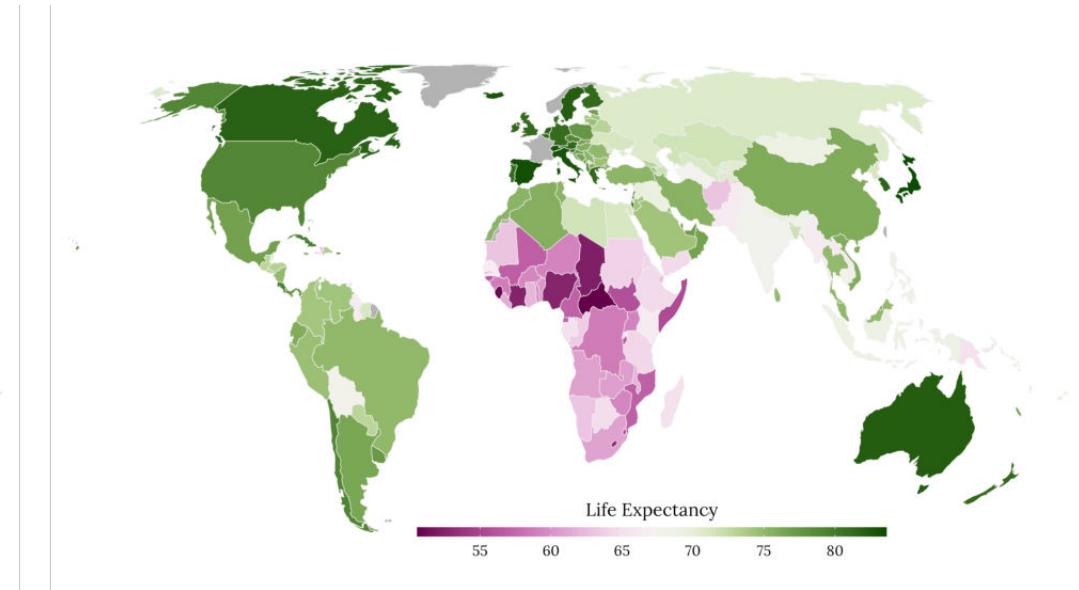
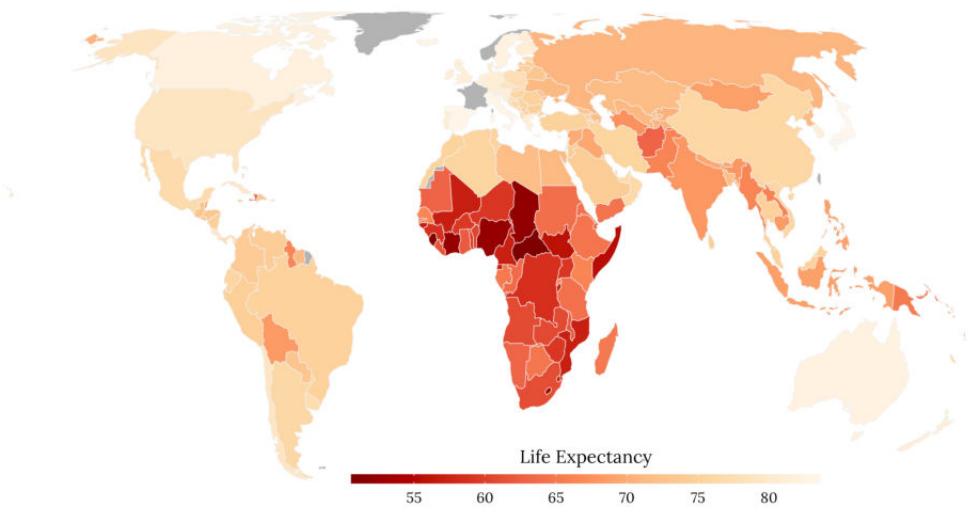
**numerische Informationen  
mit kritischem Mittelpunkt**

verwende einen bedeutsamen Mittelpunkt  
und nutze ausgewogene Extremwerte

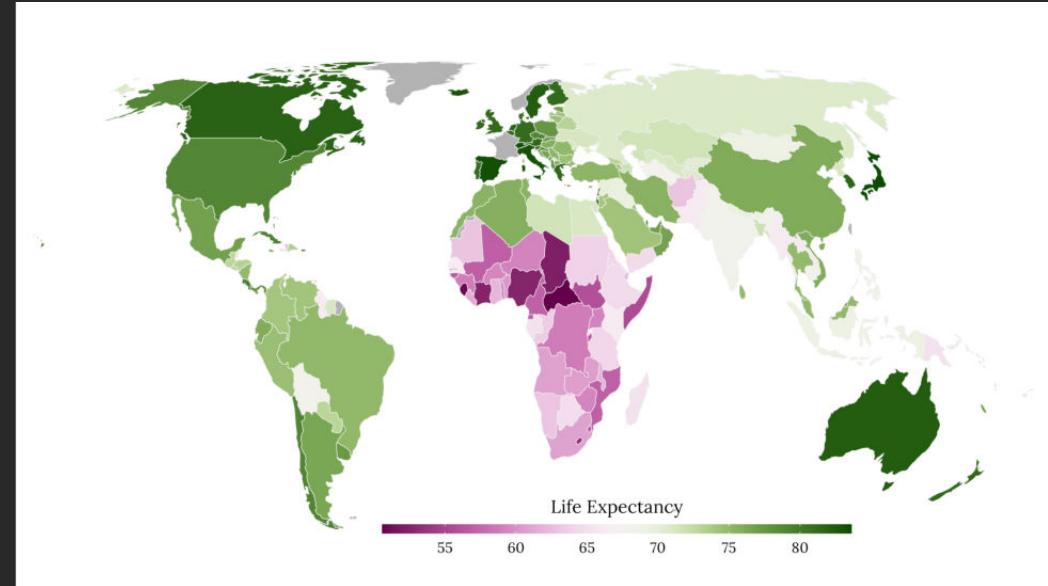
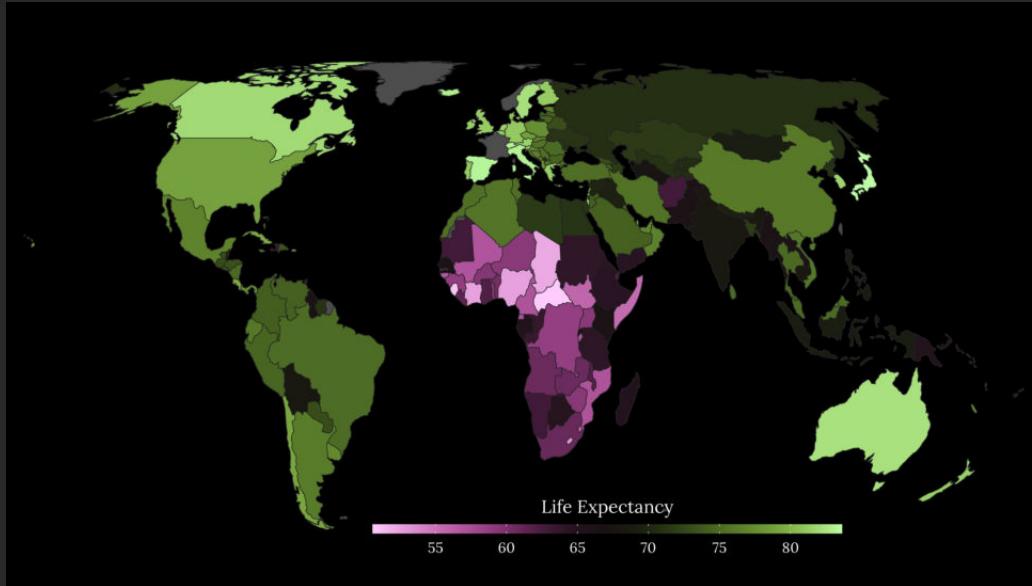
Kombination von zwei  
sequentiellen Farbpaletten



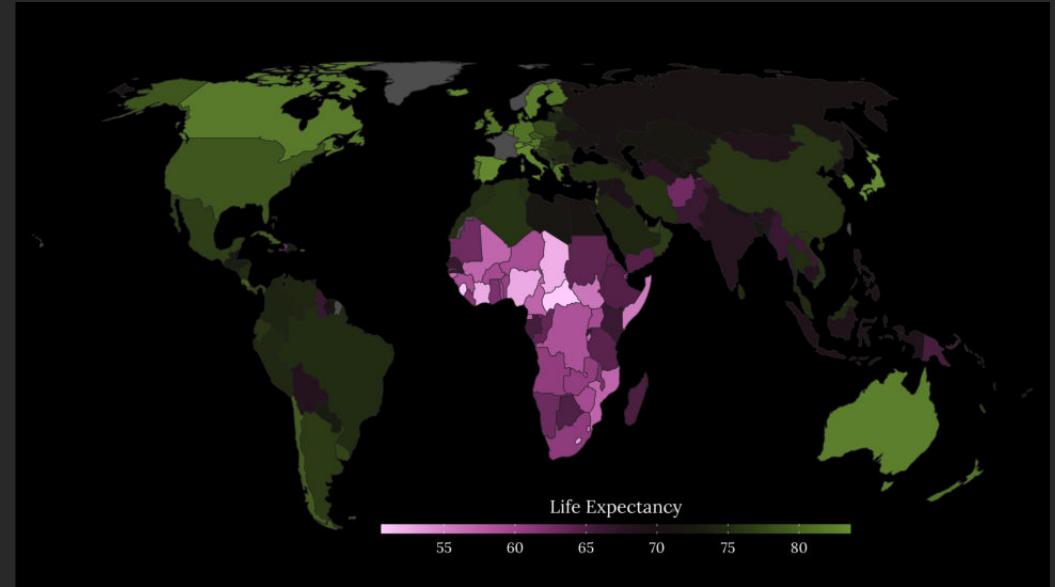
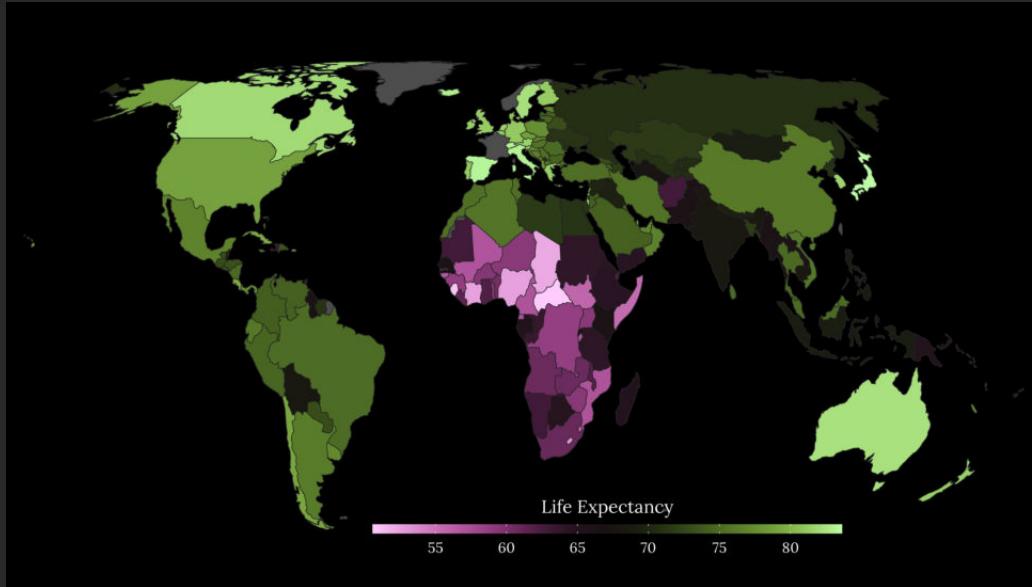
# Aber welche: Sequentiell oder divergierend?



# Divergierend auf dunklem Hintergrund



# Divergierend: Der *richtige* Mittelpunkt





[Med Phys.](#) 2015 Jun; 42(6): 2942–2954. Published online 2015 May 20. doi: [10.1118/1.4921125](https://doi.org/10.1118/1.4921125)

PMCID: PMC5148121 | PMID: [26127048](https://pubmed.ncbi.nlm.nih.gov/26127048/)

Effect of color visualization and display hardware on the visual assessment of pseudocolor medical images

[Silvina Zabala-Travers](#), [Mina Choi](#), [Wei-Chung Cheng](#), and [Aldo Badano<sup>a\)</sup>](#)

10 March 2017

## Interpretation of the rainbow color scale for quantitative medical imaging: perceptually linear color calibration (CSDF) versus DICOM GSDF

[Frédérique Chesterman](#), [Hannah Manssens](#), [Céline Morel](#), [Guillaume Serreli](#), [Bastian Piepers](#), [Tom Kimpe](#)

Author Affiliations +

[Proceedings Volume 10136, Medical Imaging 2017: Image Perception, Observer Performance, and Technology Assessment; 10136OR \(2017\) <https://doi.org/10.1117/12.2253885>](#)

Event: [SPIE Medical Imaging](#), 2017, Orlando, Florida, United States

*IEEE Computer Graphics and Applications*

## Rainbow Color Map (Still) Considered Harmful

March/April 2007, pp. 14-17, vol. 27

DOI Bookmark: [10.1109/MCG.2007.46](https://doi.org/10.1109/MCG.2007.46)

Authors

[David Borland](#), University of North Carolina at Chapel Hill

[Russell M. Taylor II](#), University of North Carolina at Chapel Hill

Education and communication

Rainbow color map distorts and misleads research in hydrology – guidance for better visualizations and science communication

Michael Stoelzle<sup>1</sup> and Lina Stein<sup>2</sup>

<sup>1</sup>Faculty of Environment and Natural Resources, University of Freiburg, Freiburg, Germany

<sup>2</sup>Department of Civil Engineering, University of Bristol, Bristol, UK



[Med Phys.](#) 2015 Jun; 42(6): 2942–2954. Published online 2015 May 20. doi: [10.1118/1.4921125](https://doi.org/10.1118/1.4921125)

PMCID: PMC5148121 | PMID: [26127048](https://pubmed.ncbi.nlm.nih.gov/26127048/)

## Effect of color visualization and display hardware on the visual assessment of pseudocolor medical images

[Silvina Zabala-Travers](#), [Mina Choi](#), [Wei-Chung Cheng](#), and [Aldo Badano<sup>a\)</sup>](#)

10 March 2015

Interpreting quantitative color maps  
Frédérique C. Gosselin

Author Affiliation

Proceedings of the  
Technology in  
Medical Imaging Conference

Event: SPIE Medical  
Imaging 2015

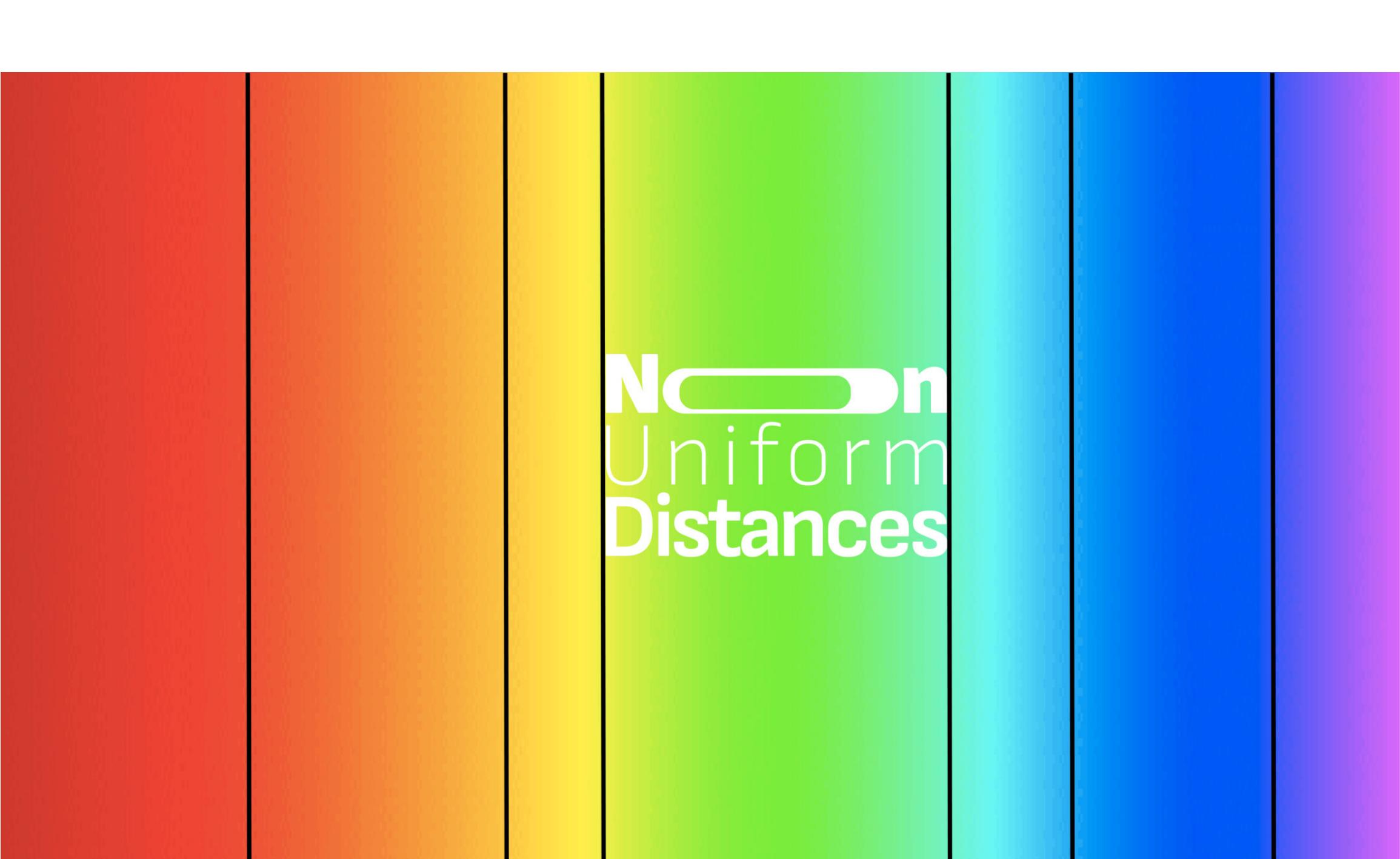
“The ad hoc manner in which color is handled and the lack of standard approaches have been associated with suboptimal and **inconsistent diagnostic decisions with a negative impact on patient treatment and prognosis.**”

Zabala-Travers, Choi, Cheng & Badano 2015 *Med. Phys.*

<sup>1</sup>Faculty of Environment and Natural Resources, University of Freiburg, Freiburg, Germany

<sup>2</sup>Department of Civil Engineering, University of Bristol, Bristol, UK

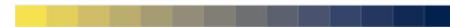
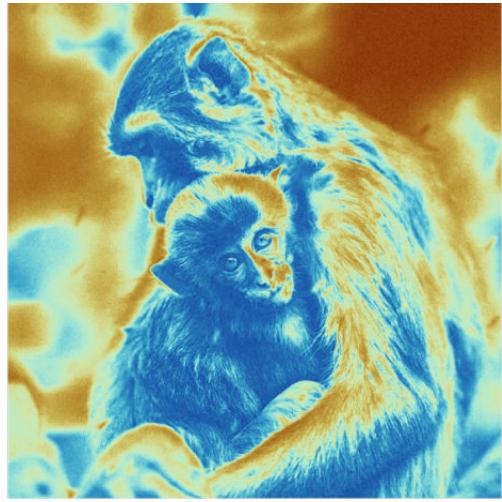
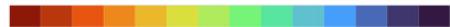
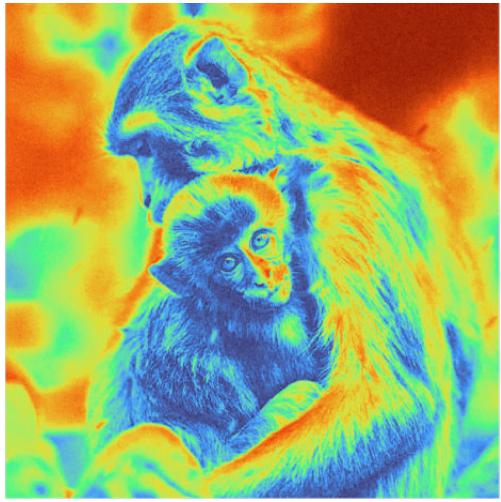
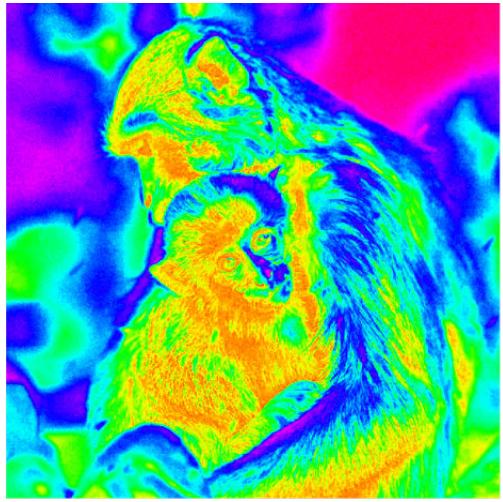




# No Uniform Distances



# Hinter dem Regenbogen



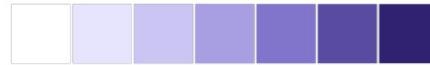
Inspiriert von *Fabio Cramer* | Original Fotografie von *Richard Strozyński*



# Arten von Farbpaletten

## Sequentiell

Beispiel



Graustufen



**numerische Informationen  
mit steigender Reihenfolge**

verwende den höchsten Kontrast  
für die wichtigsten Informationen

entweder einfarbige oder  
mehrfarbige Farbpaletten

## Divergierend

Beispiel



Graustufen



**numerische Informationen  
mit kritischem Mittelpunkt**

verwende einen bedeutsamen Mittelpunkt  
und nutze ausgewogene Extremwerte

Kombination von zwei  
sequentiellen Farbpaletten

## Qualitativ

Beispiel



Graustufen

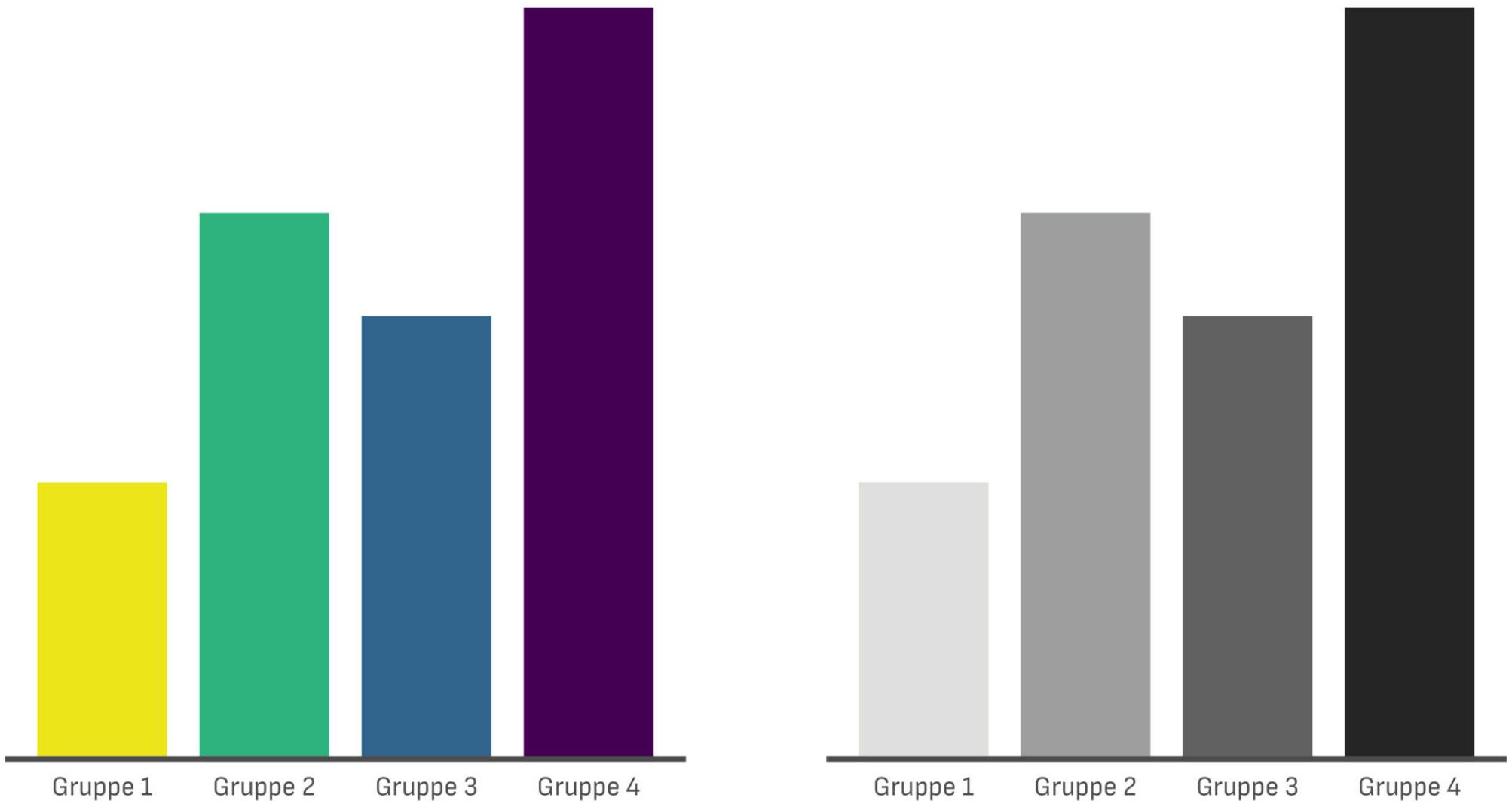


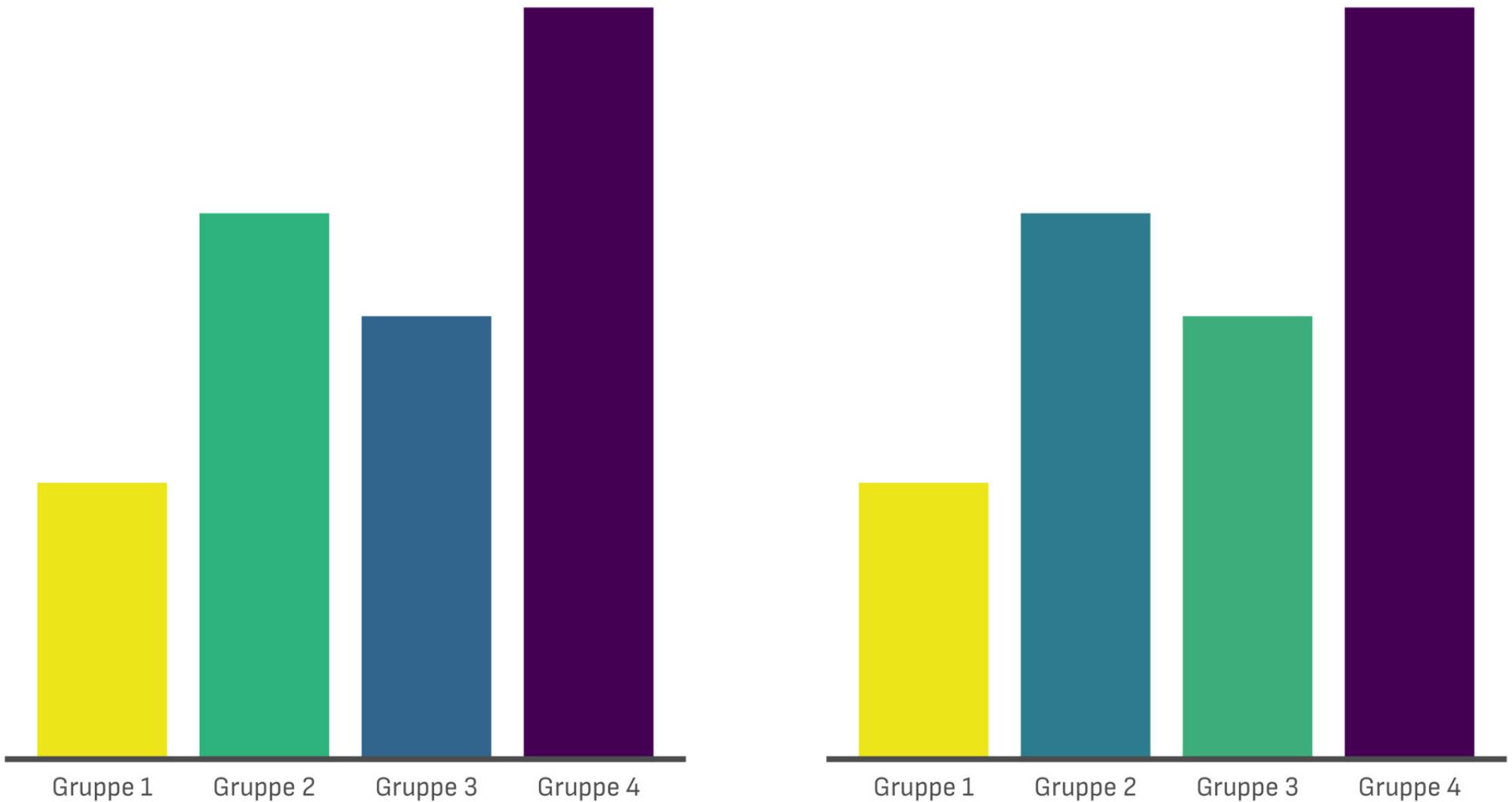
**kategorische Informationen  
(ohne Reihenfolge)**

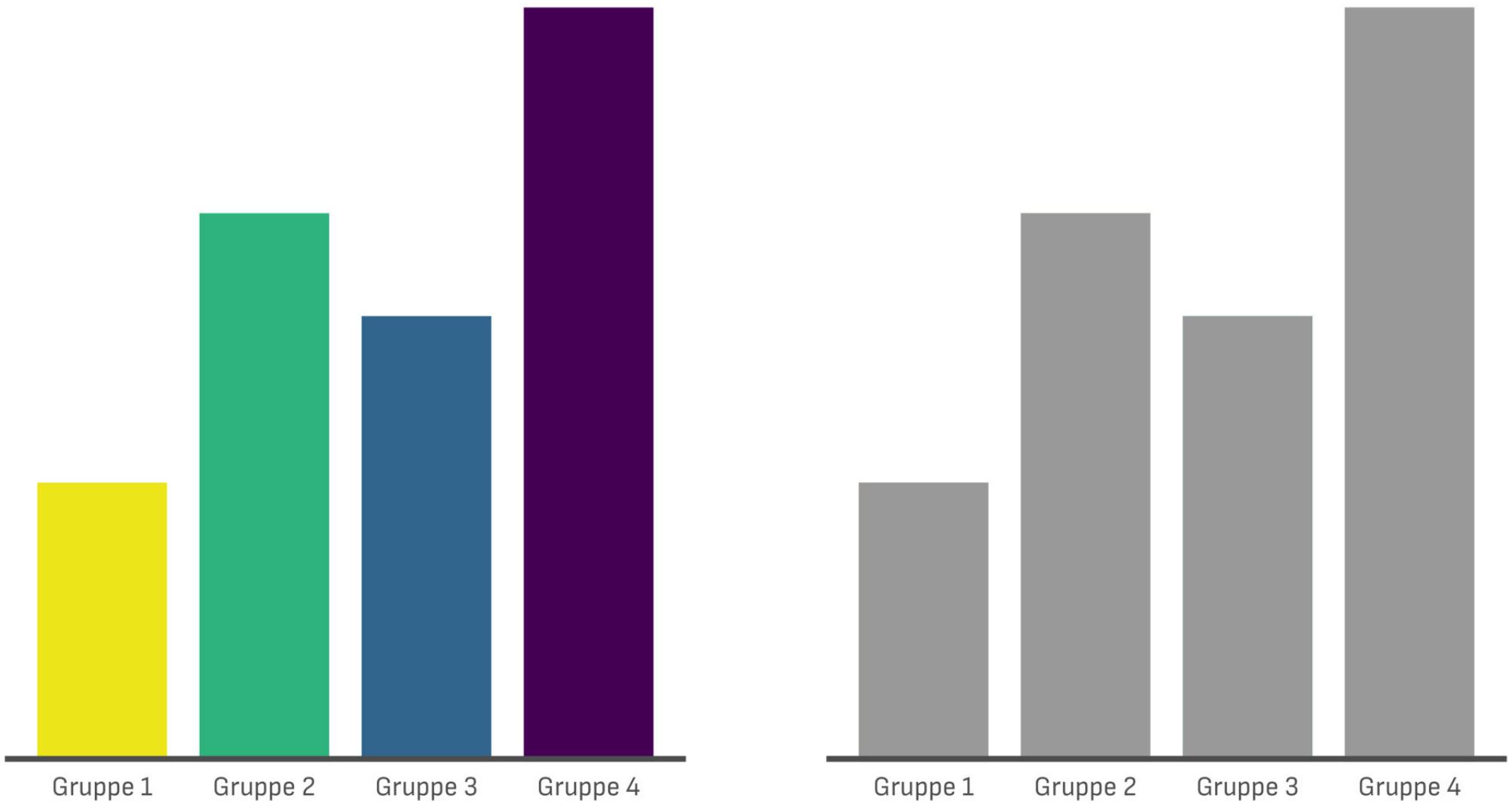
wähle verschiedene Farben mit  
demselben Wahrnehmungsgewicht

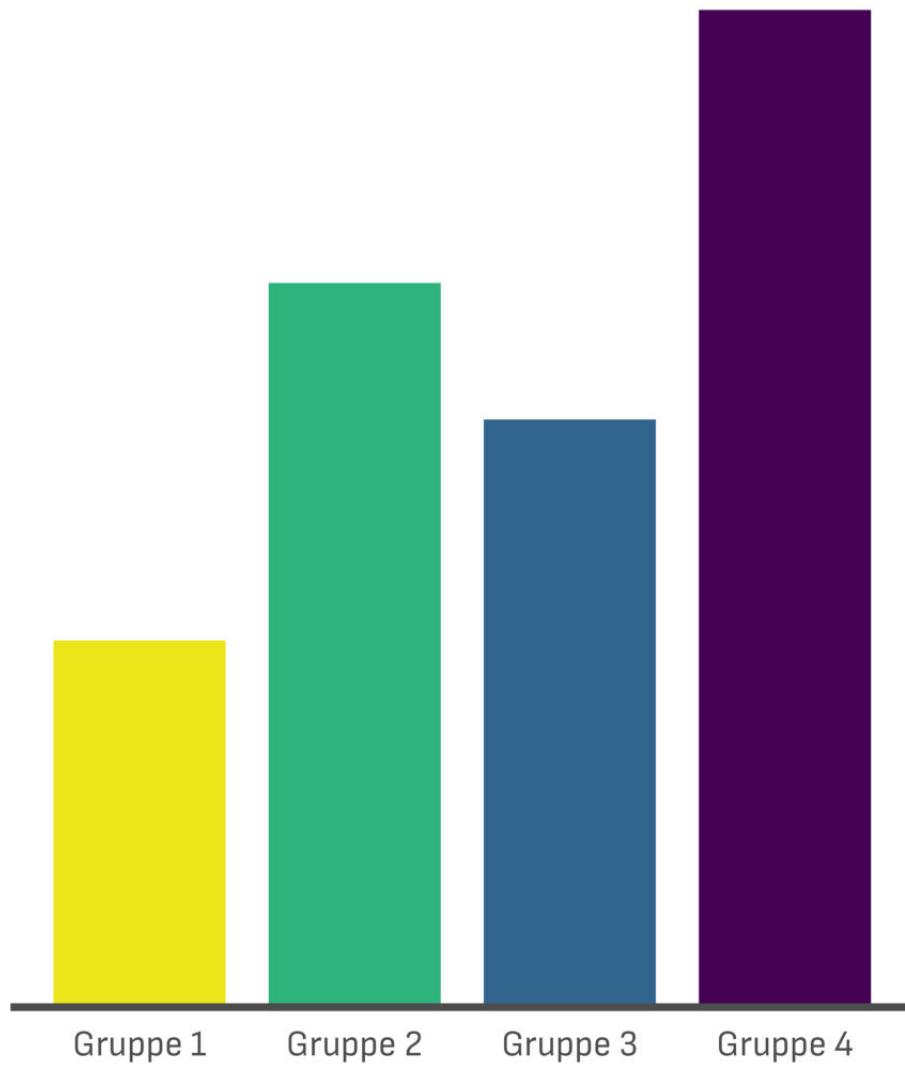
Anzahl auf 6 bis 8  
Kategorien begrenzen





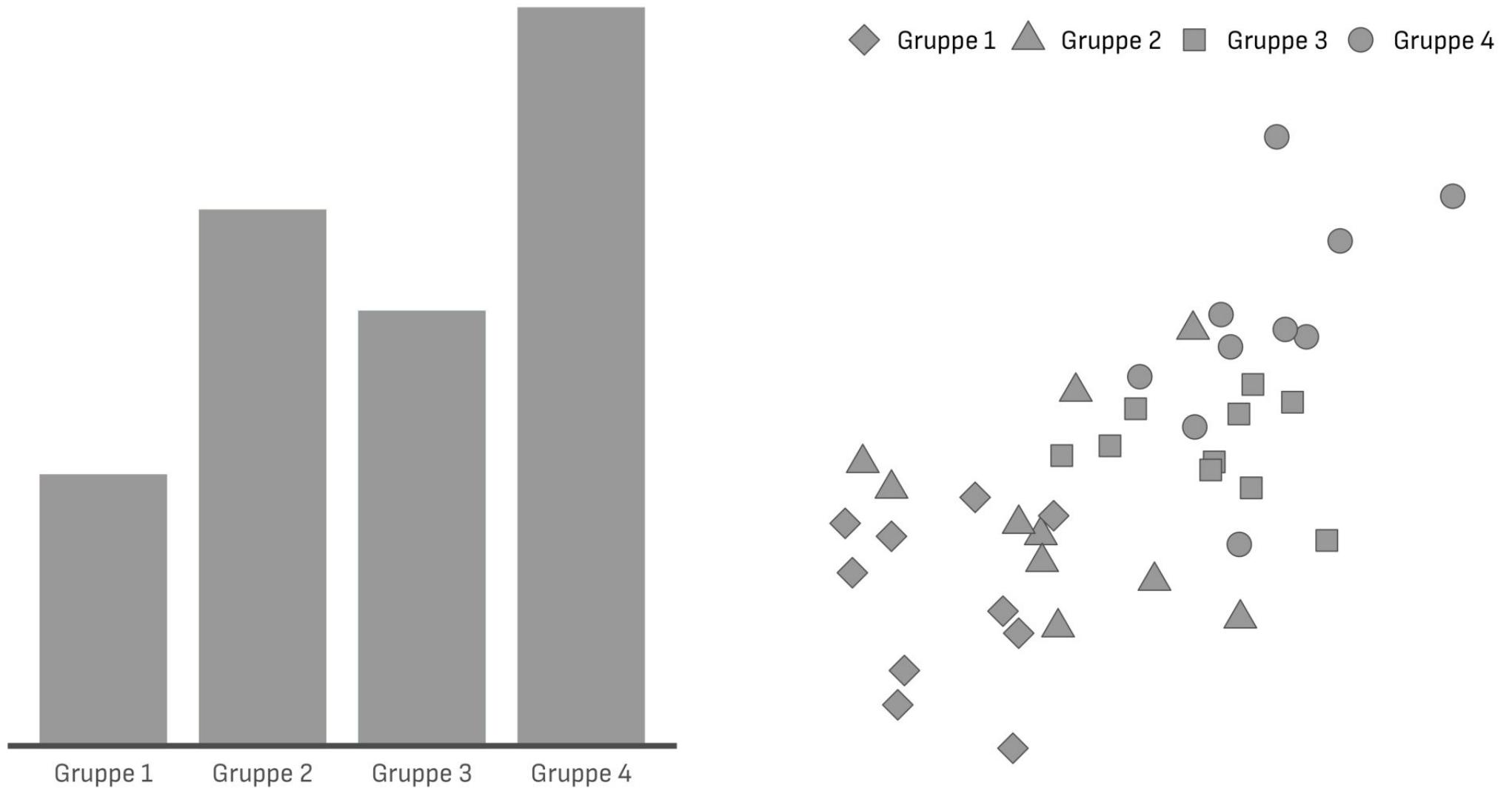


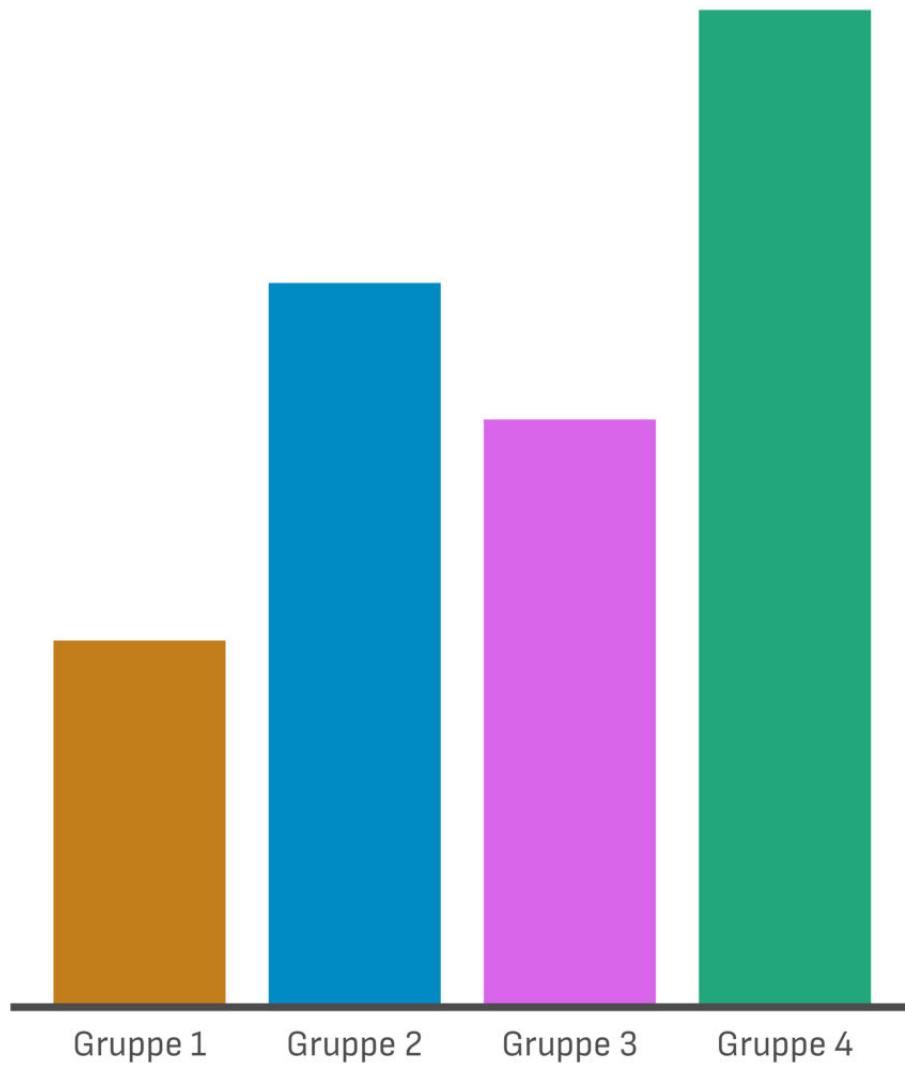




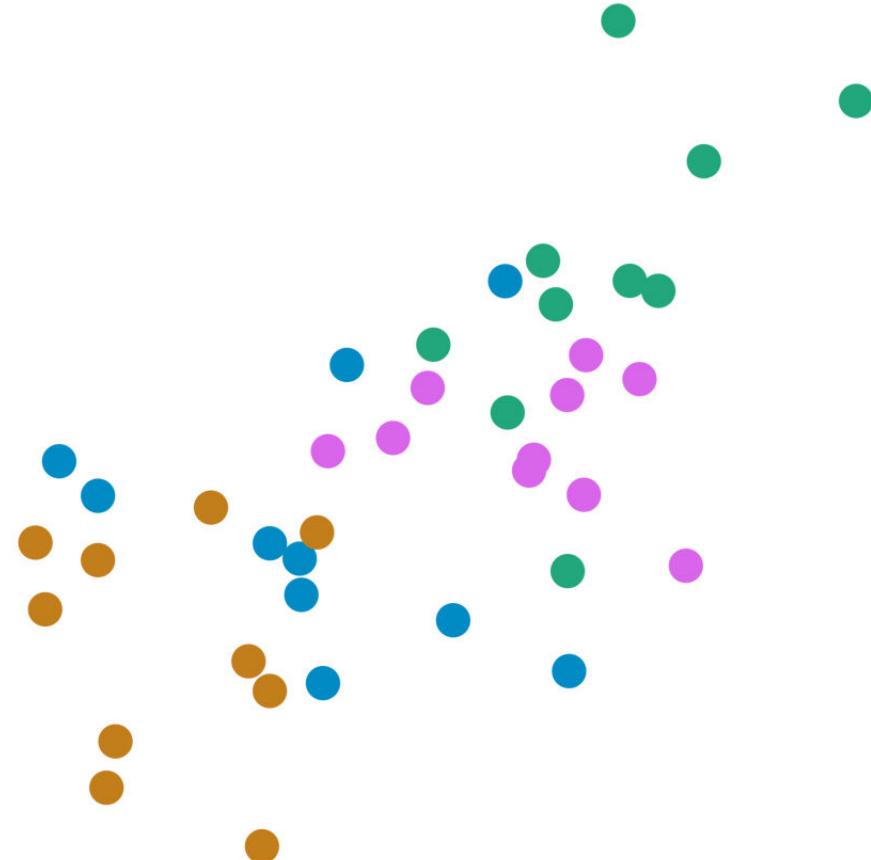
● Gruppe 1 ● Gruppe 2 ● Gruppe 3 ● Gruppe 4







● Gruppe 1 ● Gruppe 2 ● Gruppe 3 ● Gruppe 4

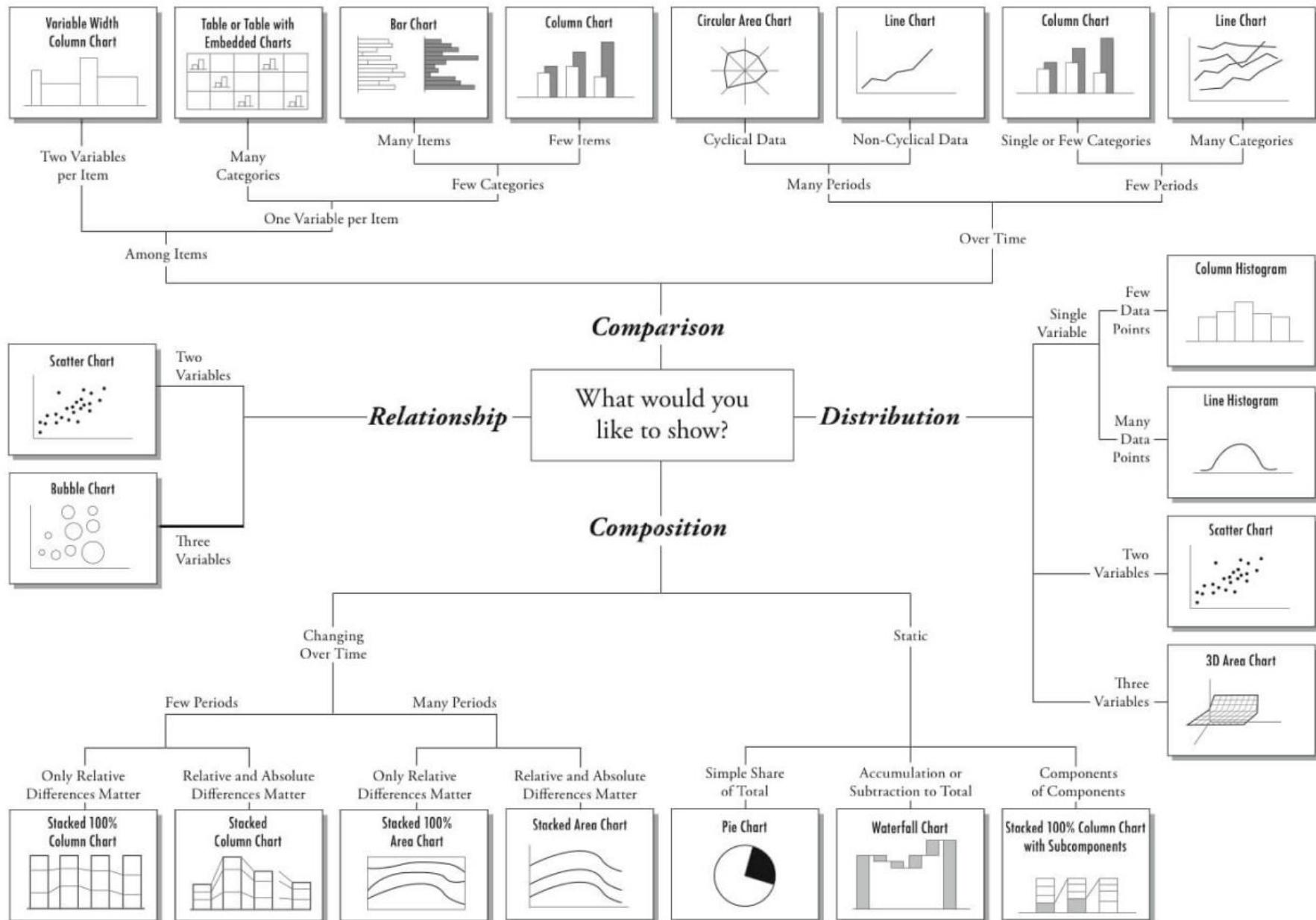


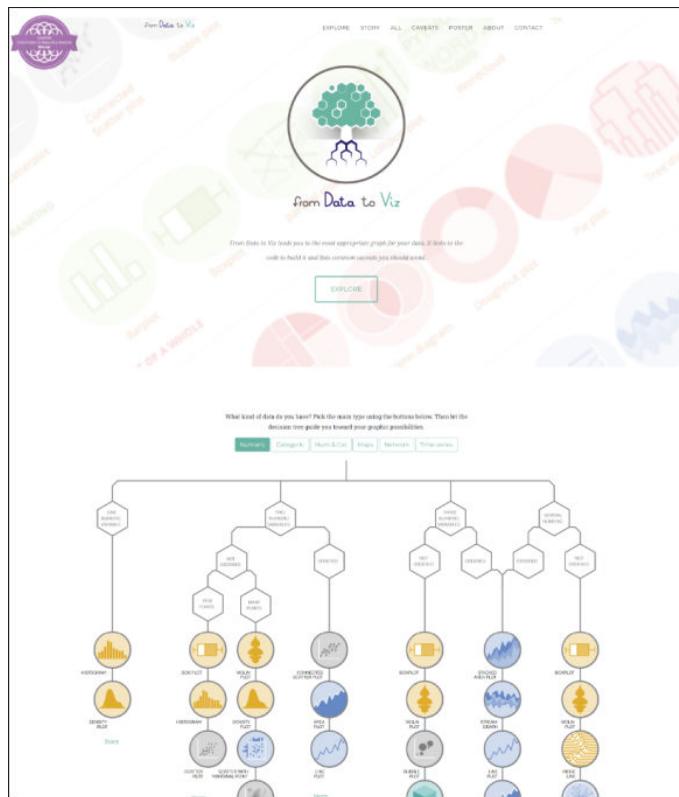
# Auswahl des Diagrammtyps



# Chart Suggestions—A Thought-Starter

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





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



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



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





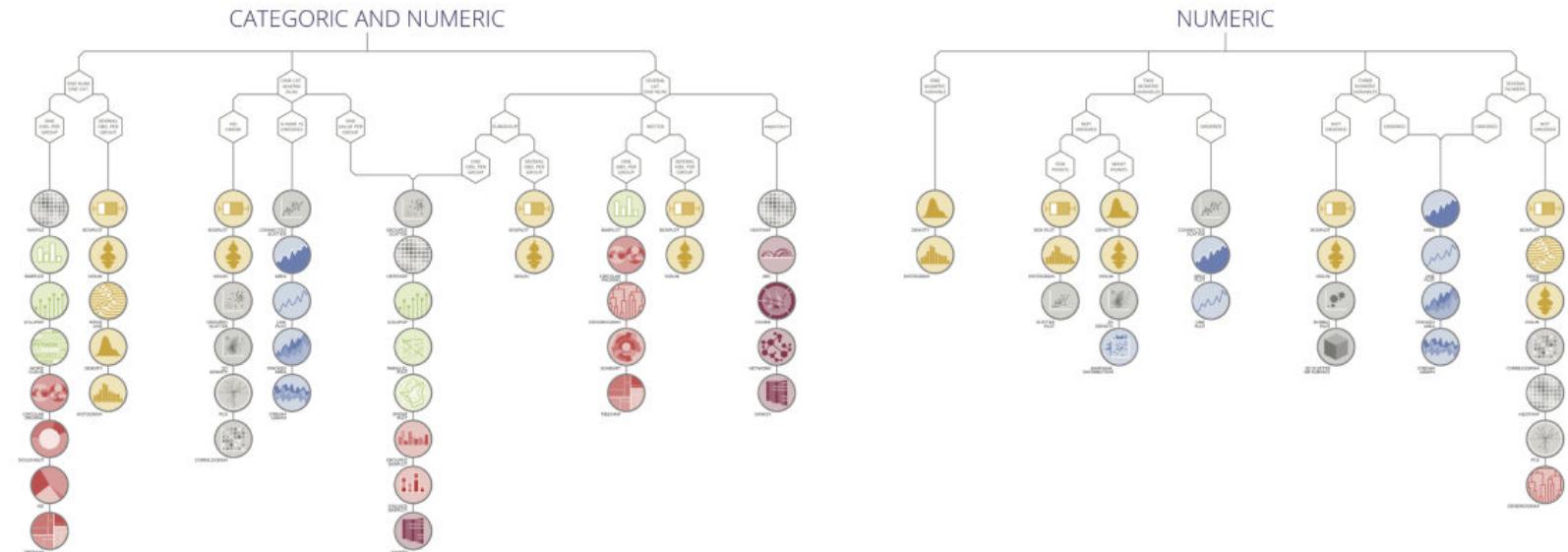
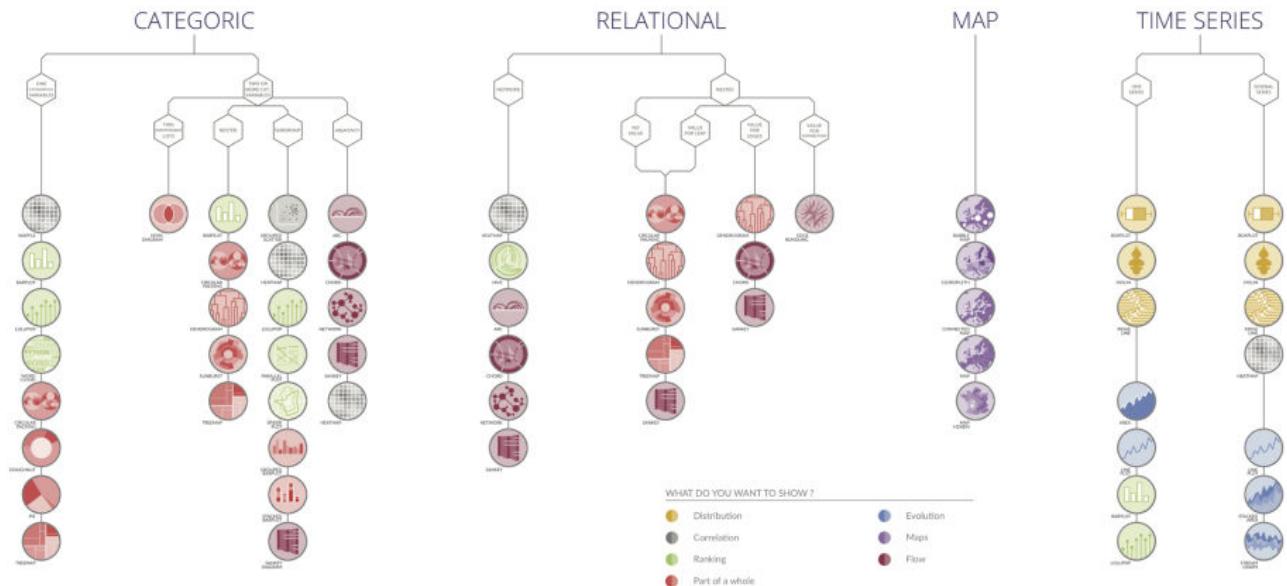
# from Data to Viz

*'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 your needs best.

Data-to-viz 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)



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



The screenshot shows a white card on a dark background. At the top left is a yellow circular icon containing a boxplot. To its right is a large orange 'X'. Below the icon is the word 'BOXPLOT' in bold green capital letters. Underneath is the subtitle 'Summarize the distribution of numeric variables'. A section titled 'About' follows, containing a paragraph about what a boxplot is. Below this is a section titled 'Common Mistakes' with a bulleted list of three items. Another section titled 'Code' is present with four buttons: 'R graph gallery', 'Python gallery', 'D3.js gallery', and 'Flourish'. A 'Read More' link is at the bottom of this section. The main content area has a grey background with a grid of circular icons representing various data visualizations. The first row contains 'Boxplot', 'Ridgeline', and 'Scatter'. The second row contains 'Connected scatter', 'Density 2d', and 'Barplot'. The third row contains 'Lollipop', 'Circular Barplot', and 'Treemap'. The fourth row contains 'Dendrogram', 'Circular packing', and 'Sunburst'. The fifth row contains 'Venn diagram', 'Doughnut', and 'Pie chart' with their respective icons below them.

SSIBILITIES

presented in this website.

art of a whole Evolution Map Flow

Boxplot Ridgeline Scatter

Connected scatter Density 2d Barplot

Lollipop Circular Barplot Treemap

Dendrogram Circular packing Sunburst

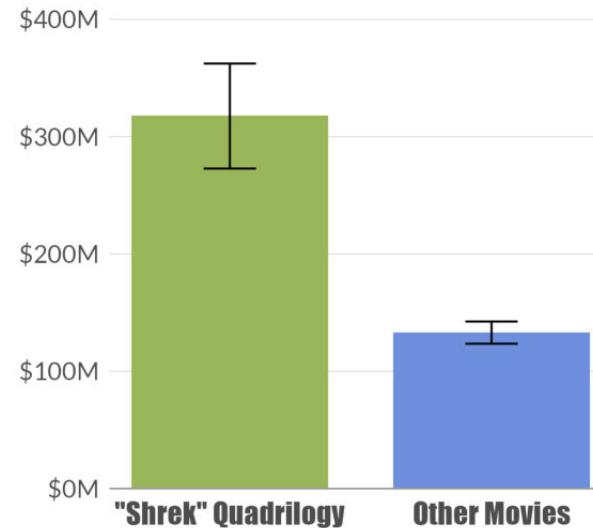
Venn diagram Doughnut Pie chart

Quelle: [Data to Viz](#)



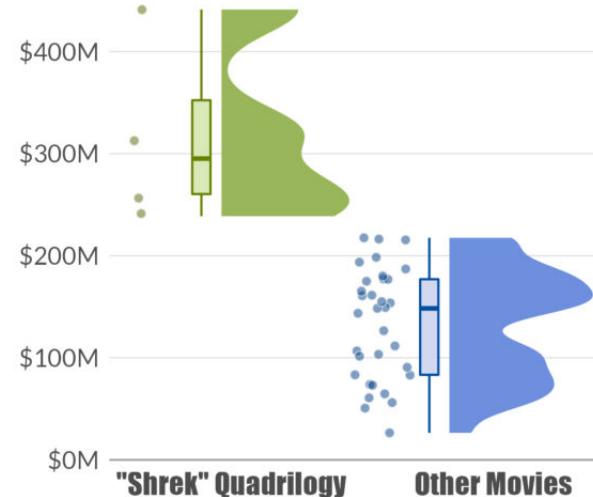


## Domestic Box Office of DreamWorks Movies



© Dreamworks Animation

## 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



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>**

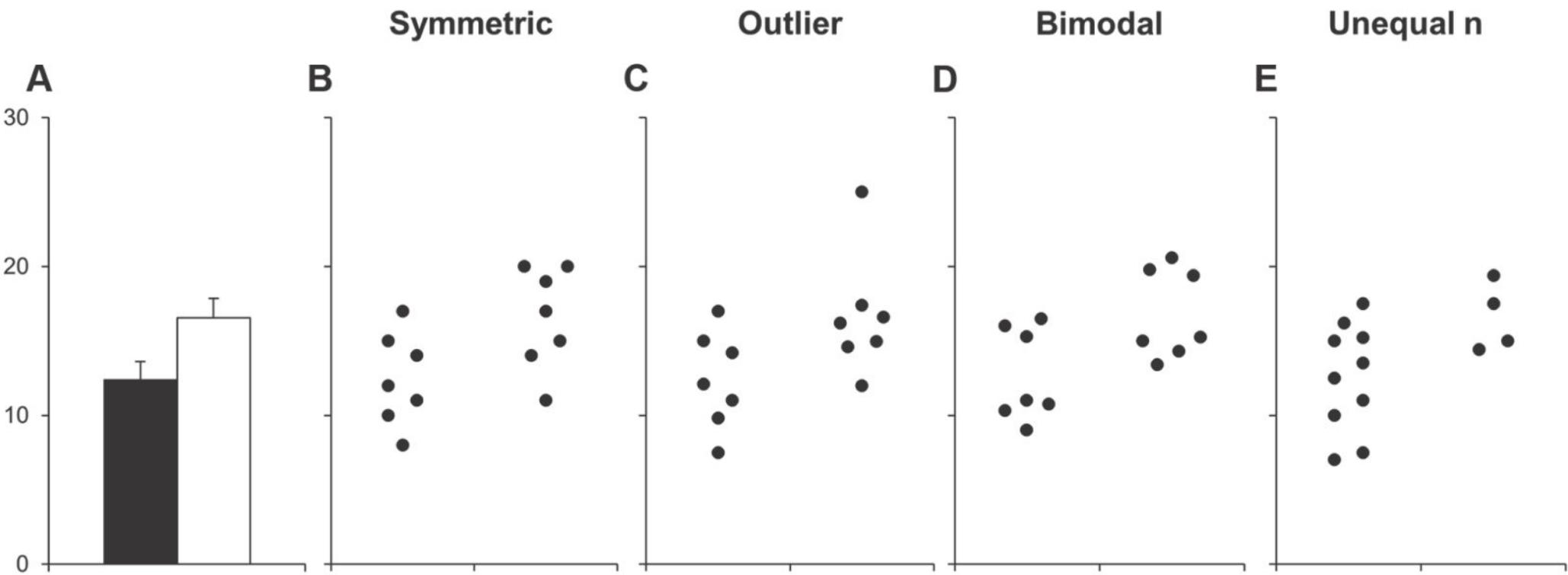
**1** Division of Nephrology & Hypertension, Mayo Clinic, Rochester, Minnesota, United States of America,

**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)

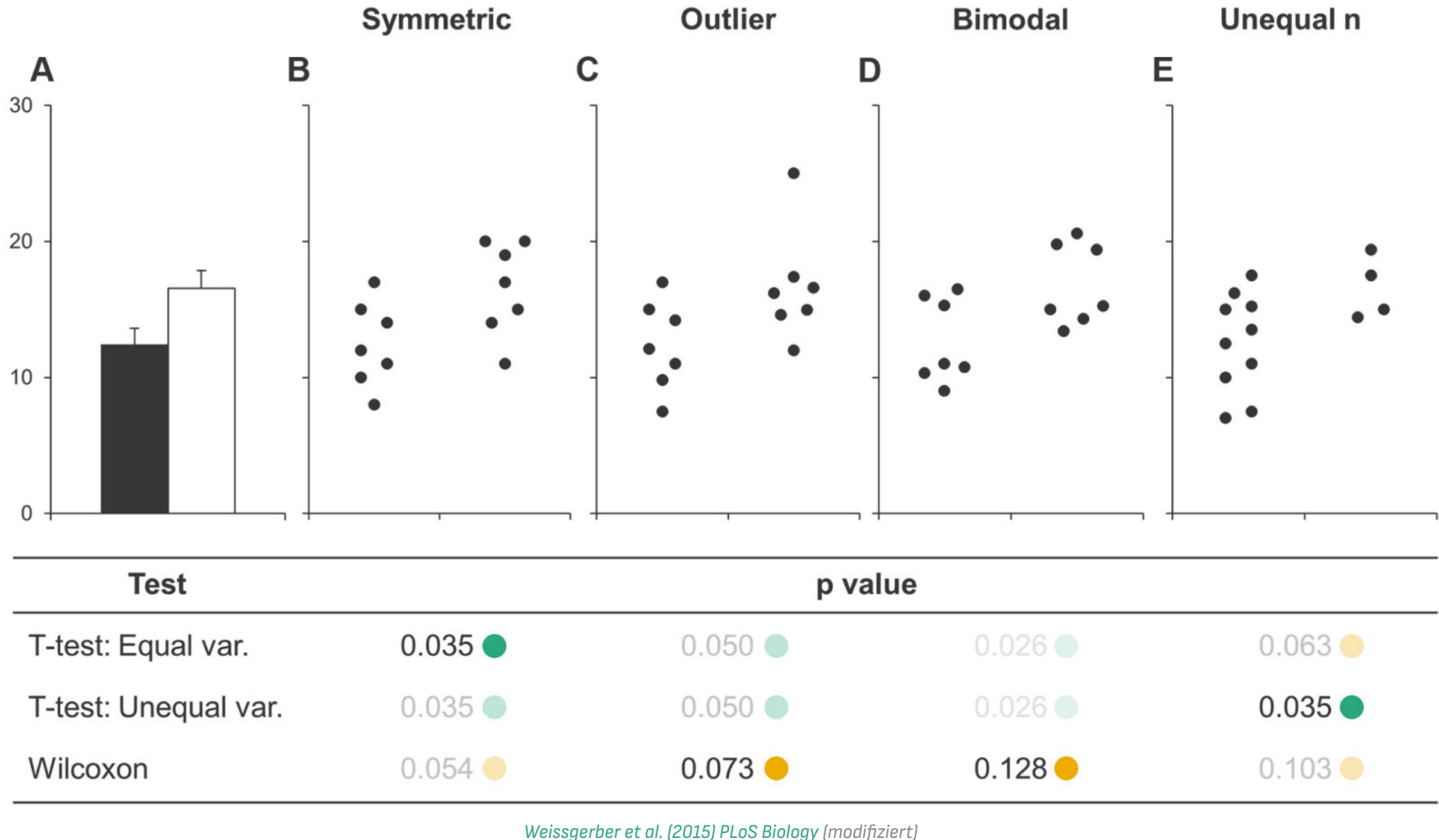
Weissgerber et al. (2015) PLoS Biology

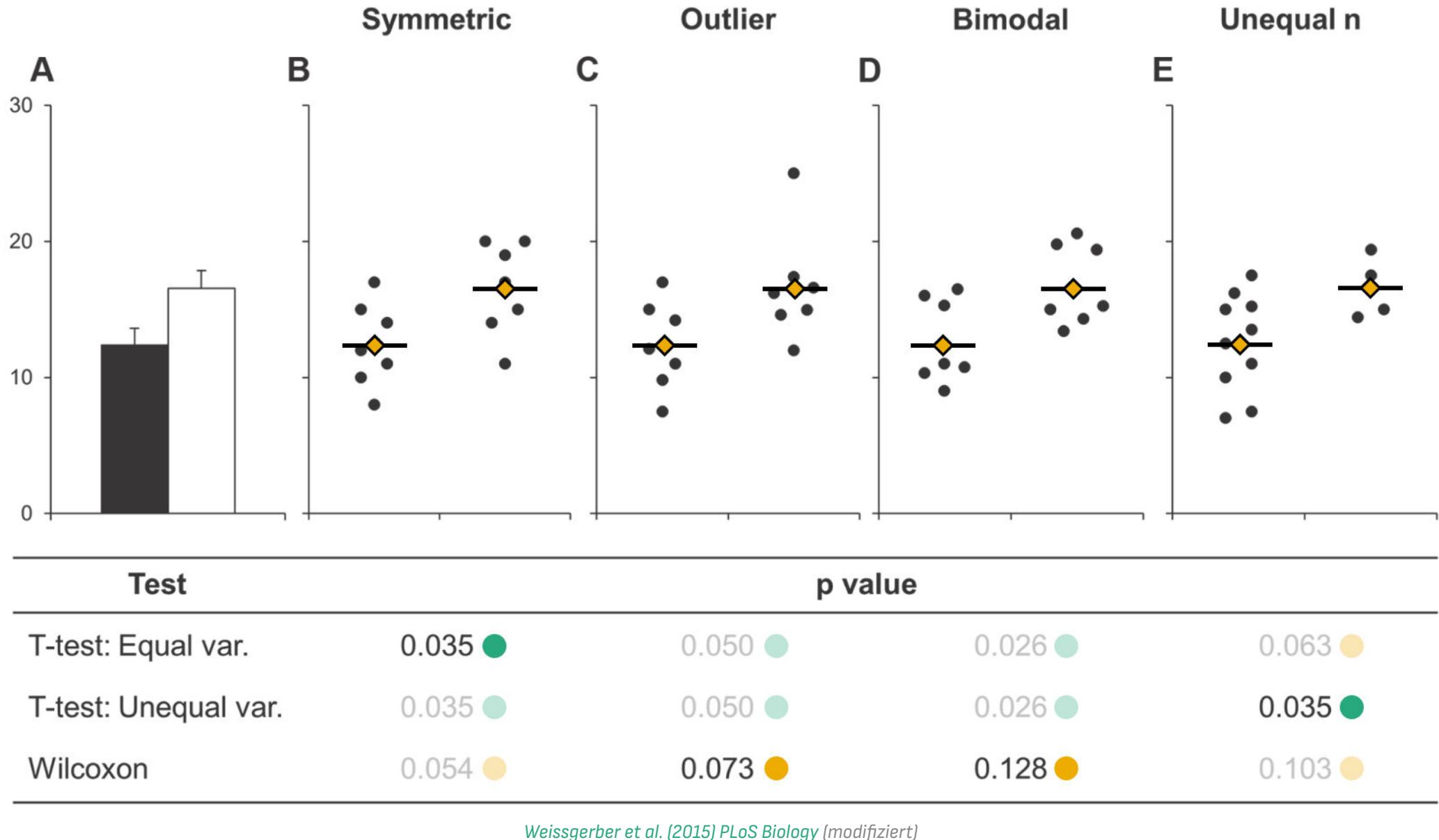


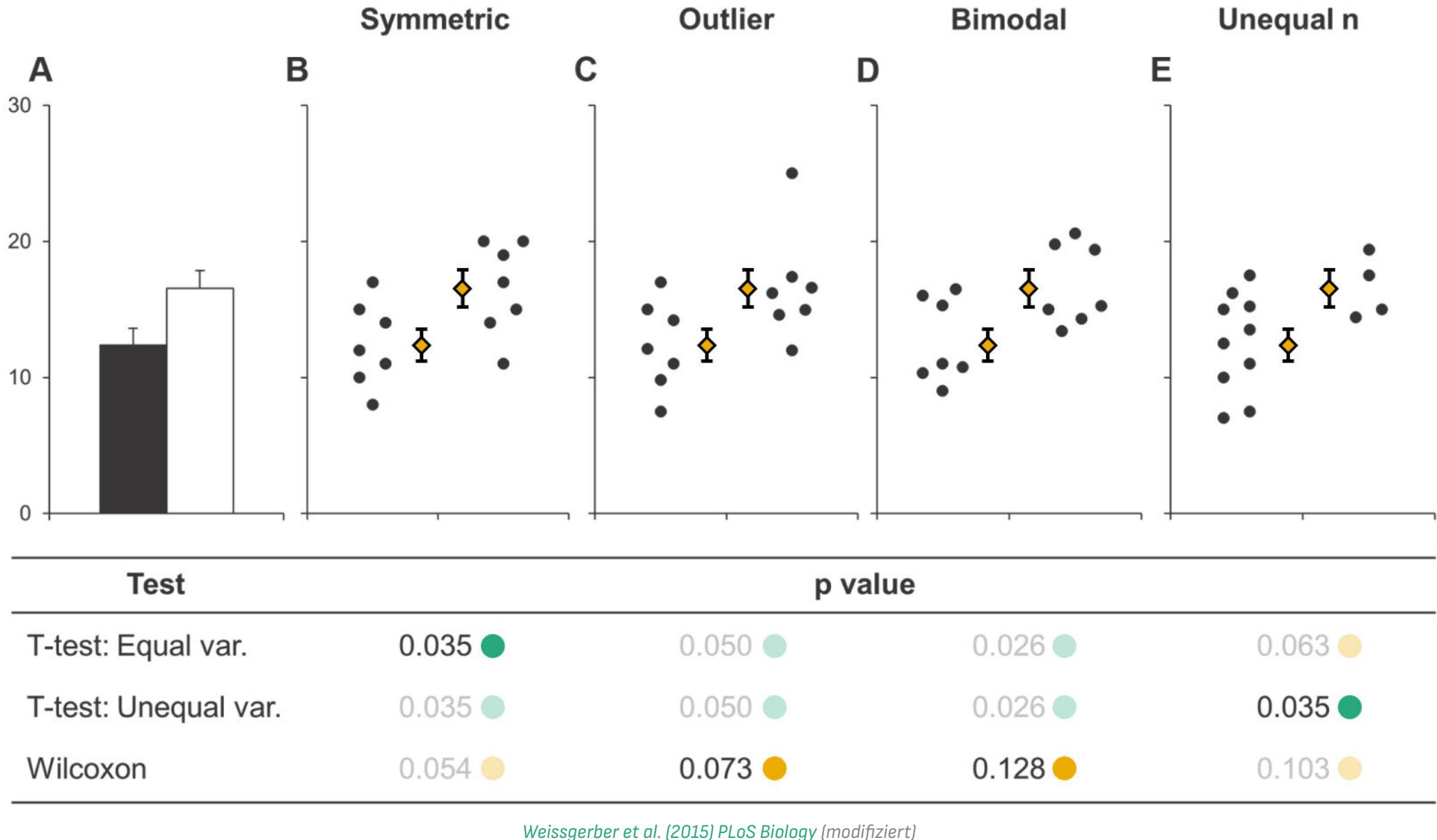


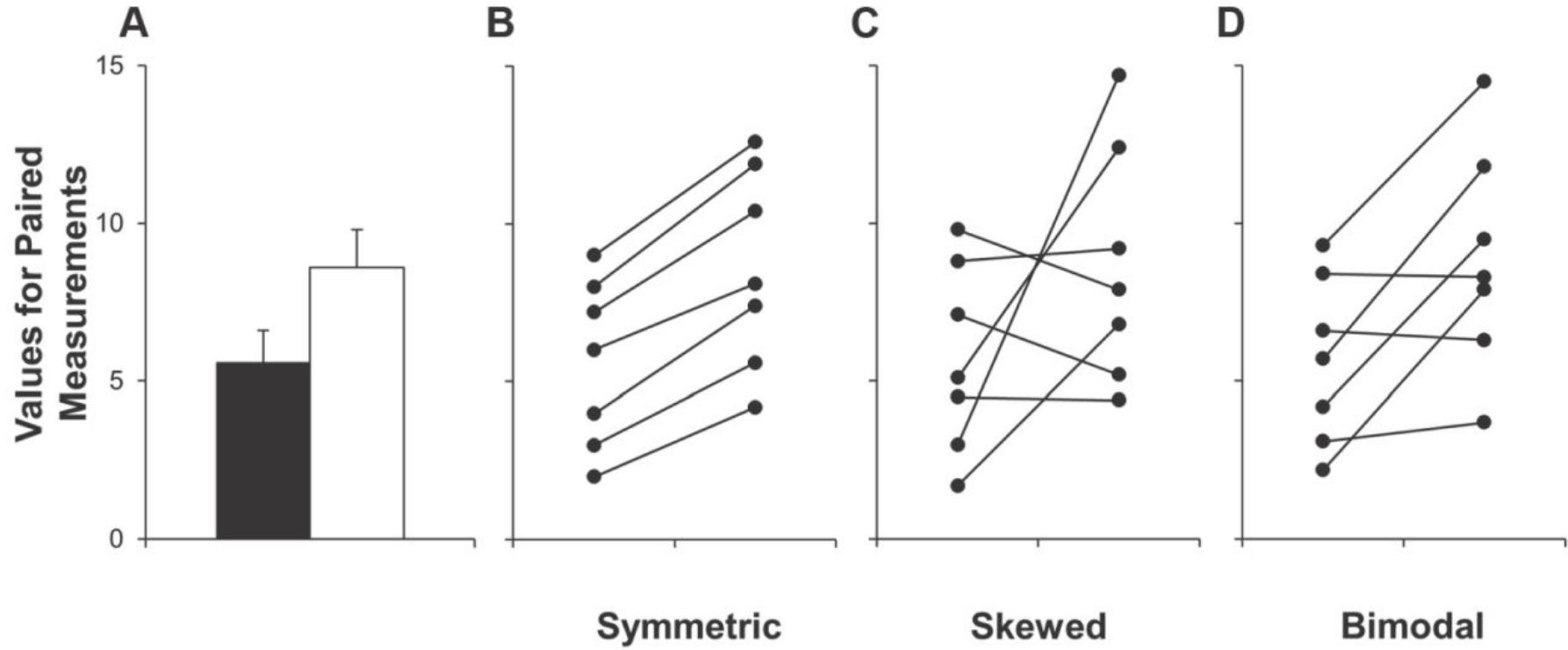
Modifiziert nach Weissgerber et al. (2015) PLoS Biology





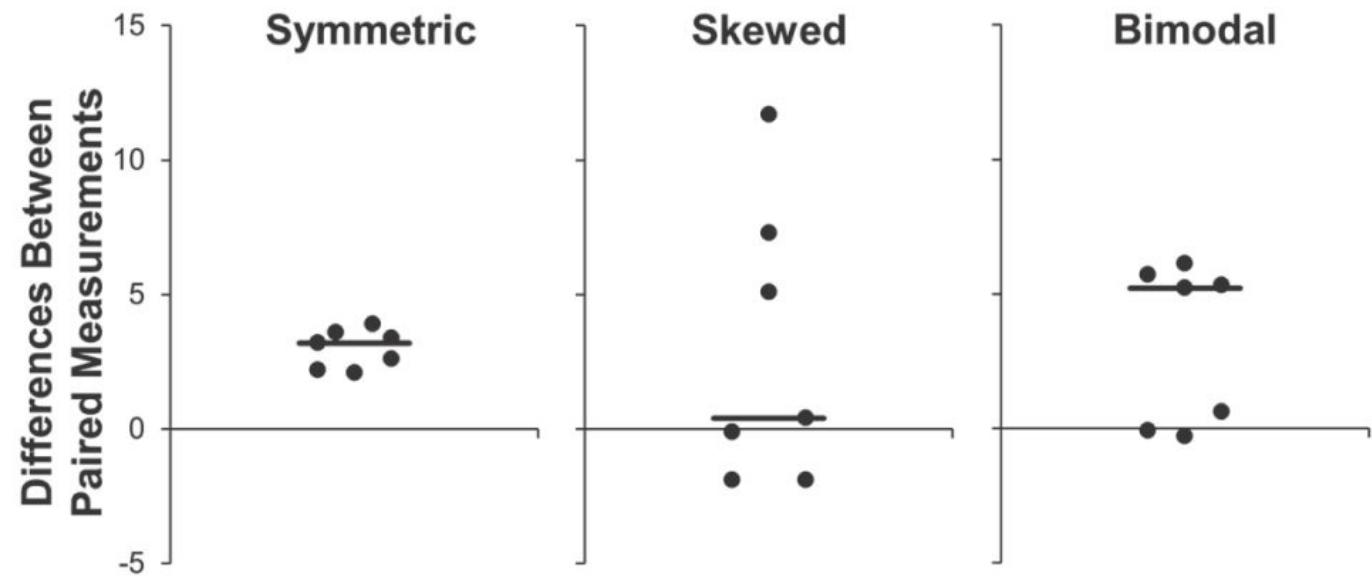
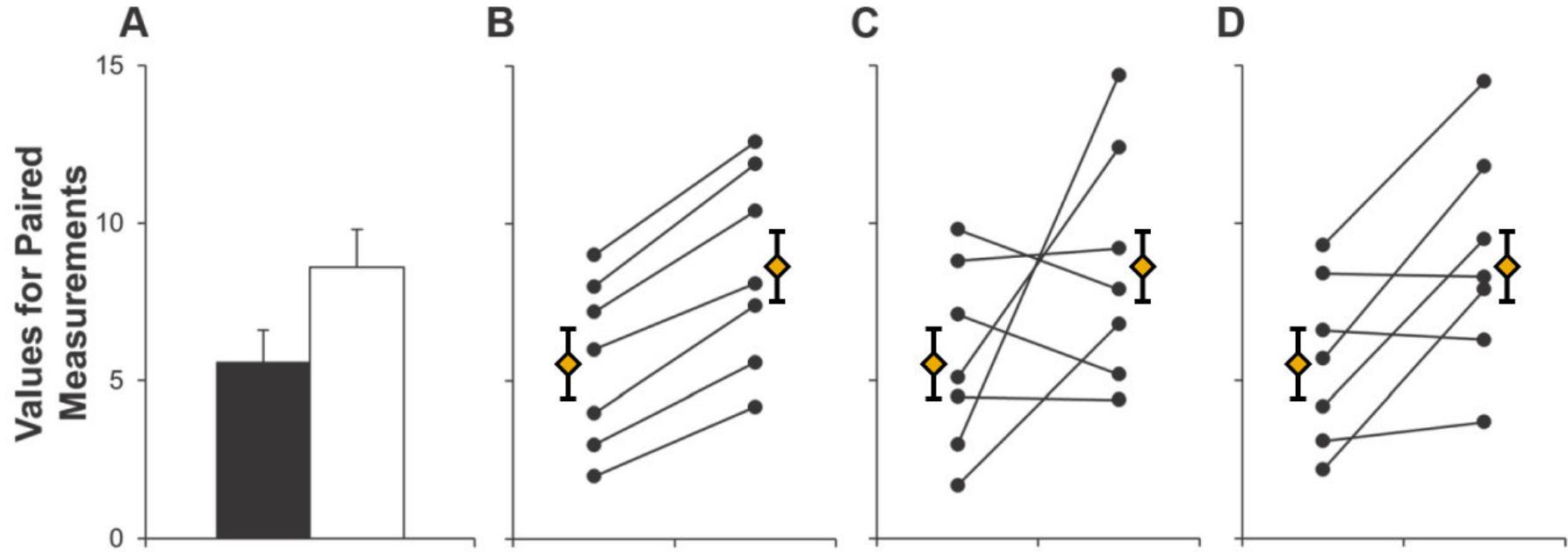






Modified from Weissgerber et al. (2015) PLoS Biology





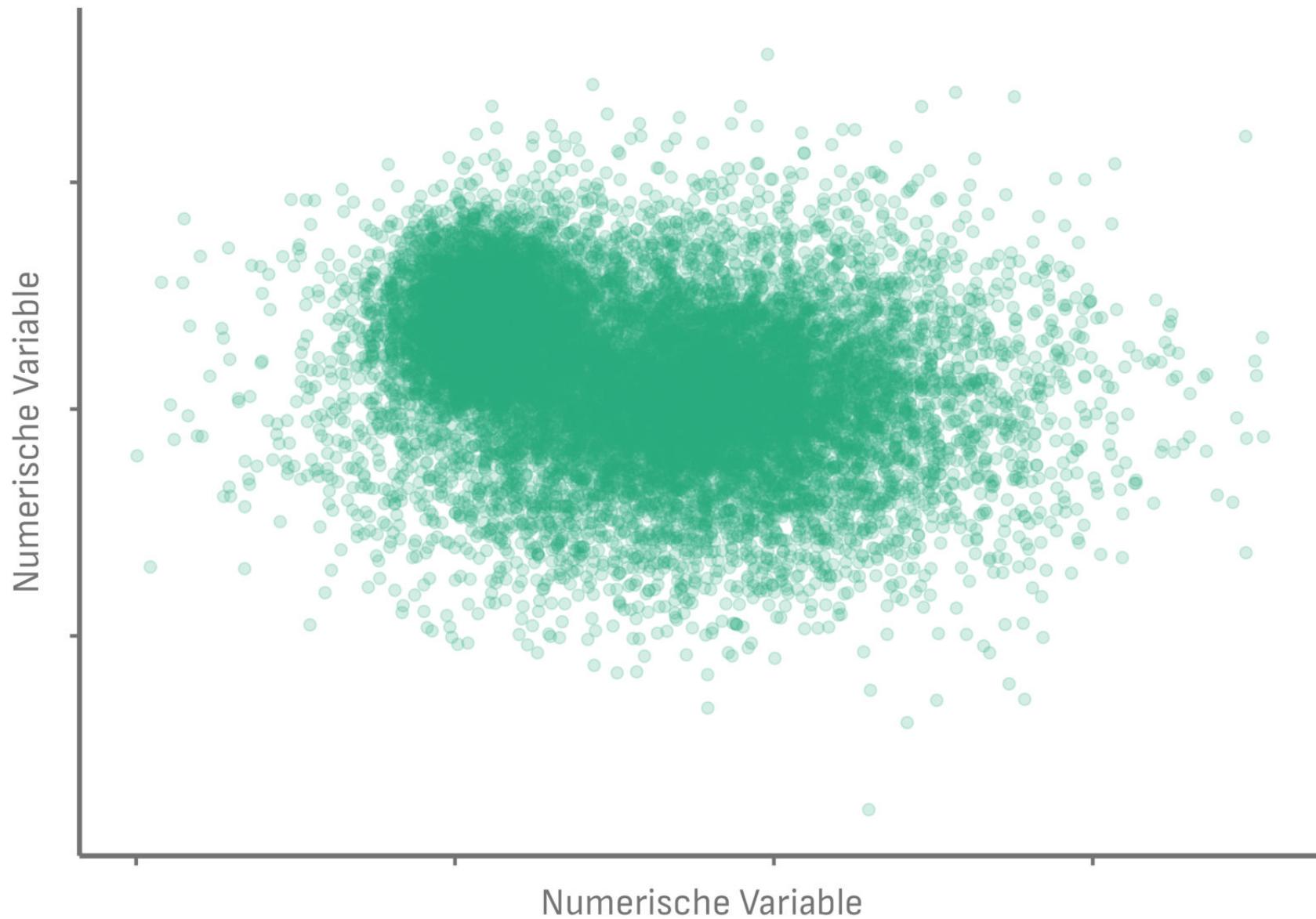
Weissgerber et al. (2015) PLoS Biology (modifiziert)



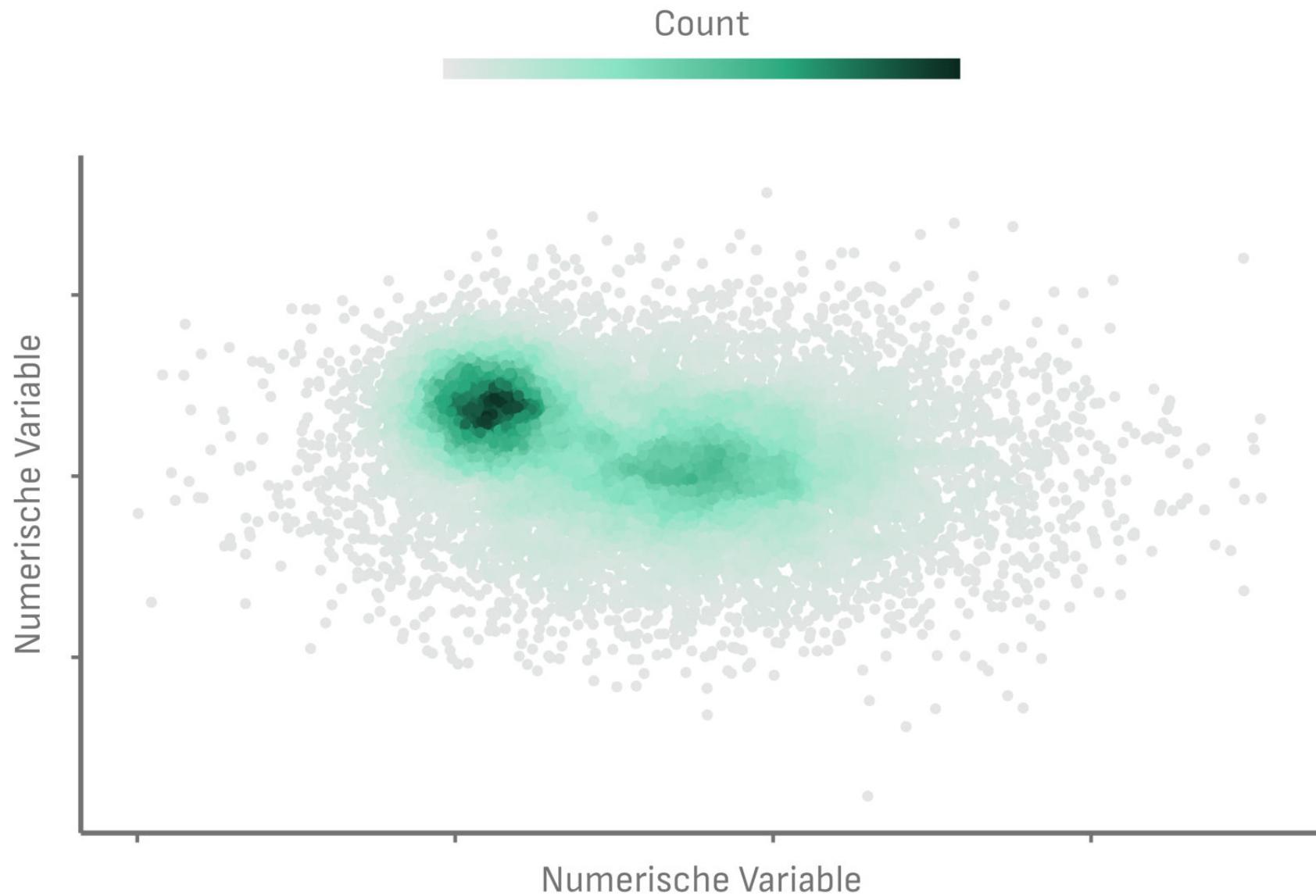
# Häufige Probleme bei der Darstellung von Daten



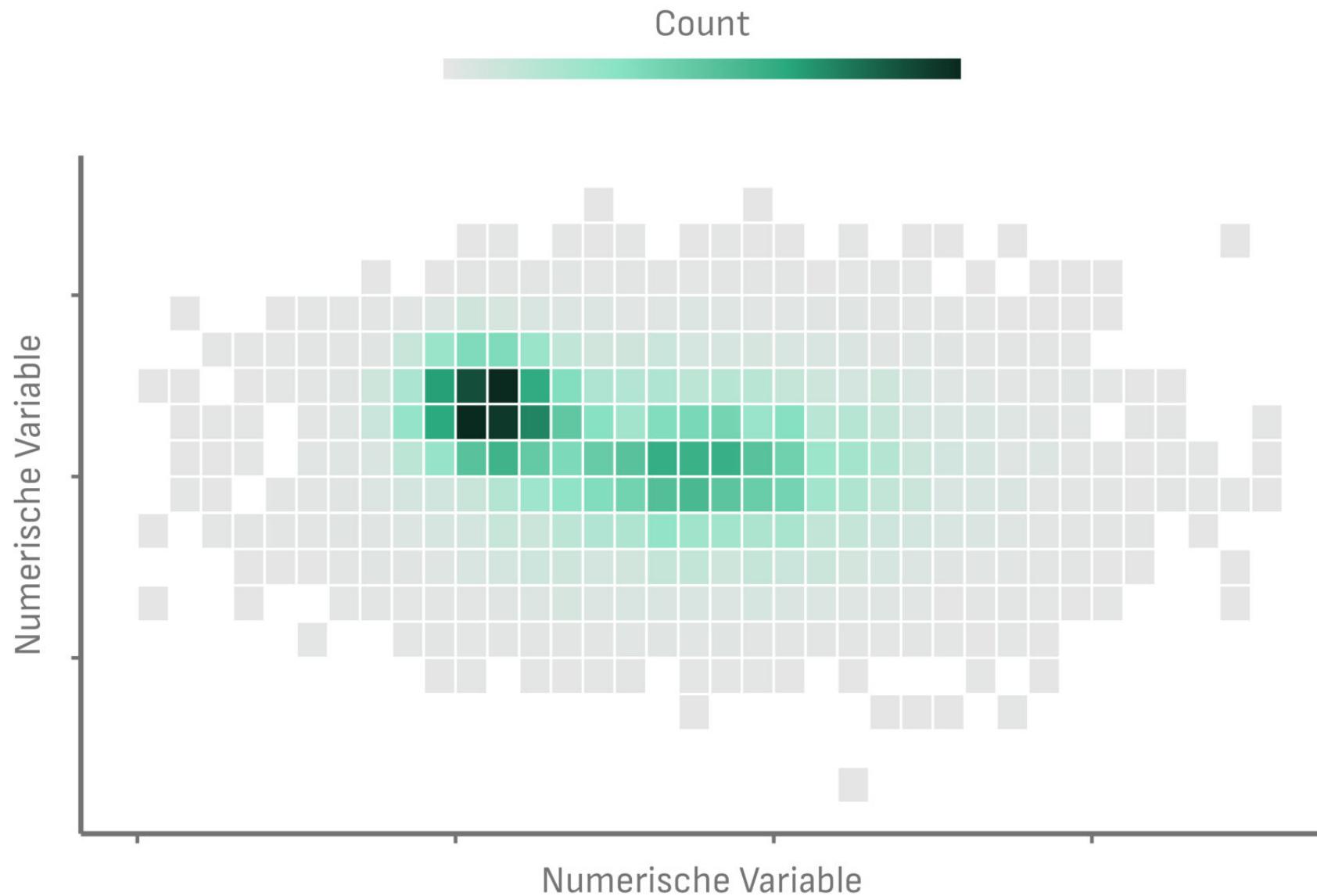
# Zu viele Punkte



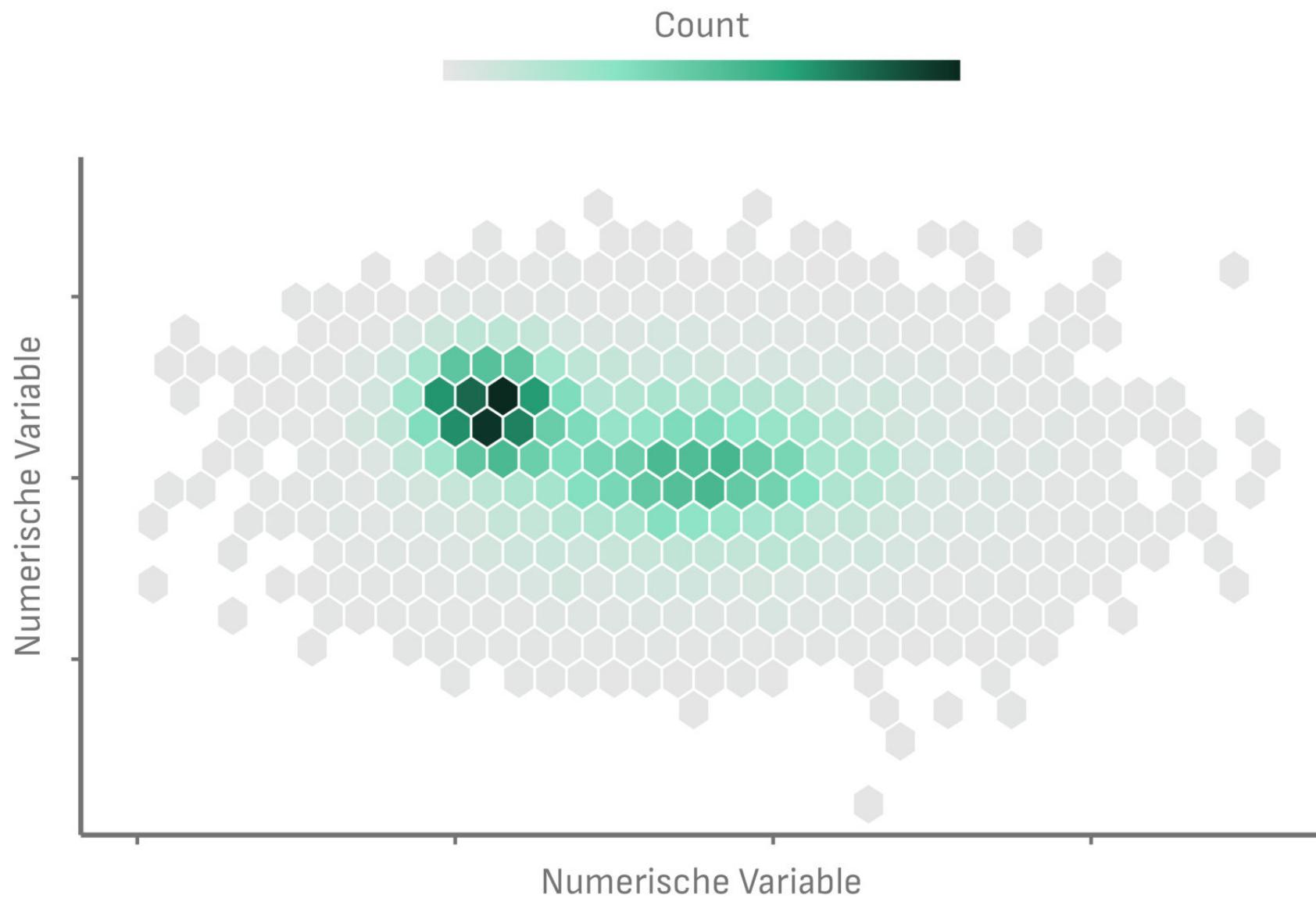
# Zu viele Punkte



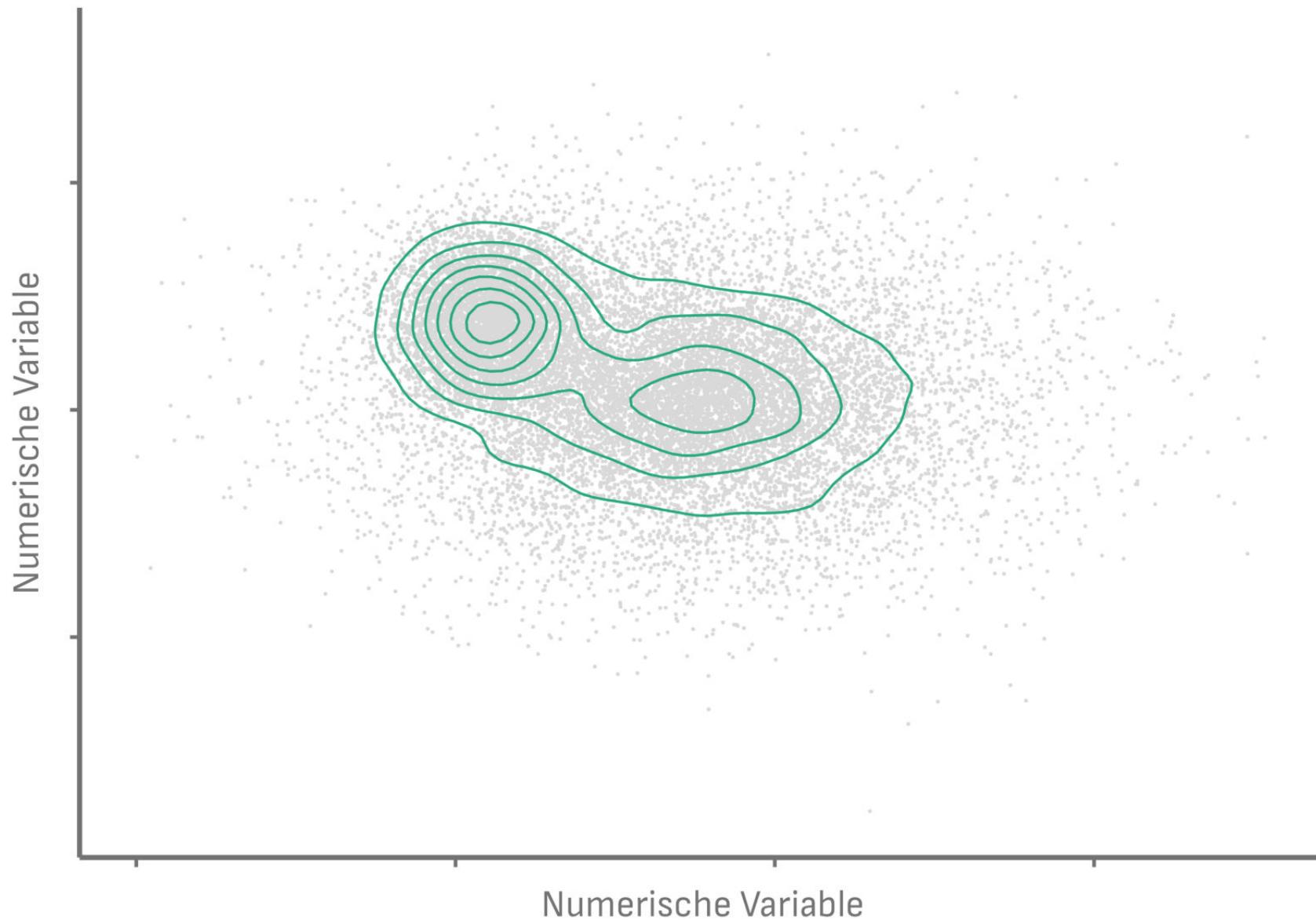
# Zu viele Punkte



# Zu viele Punkte



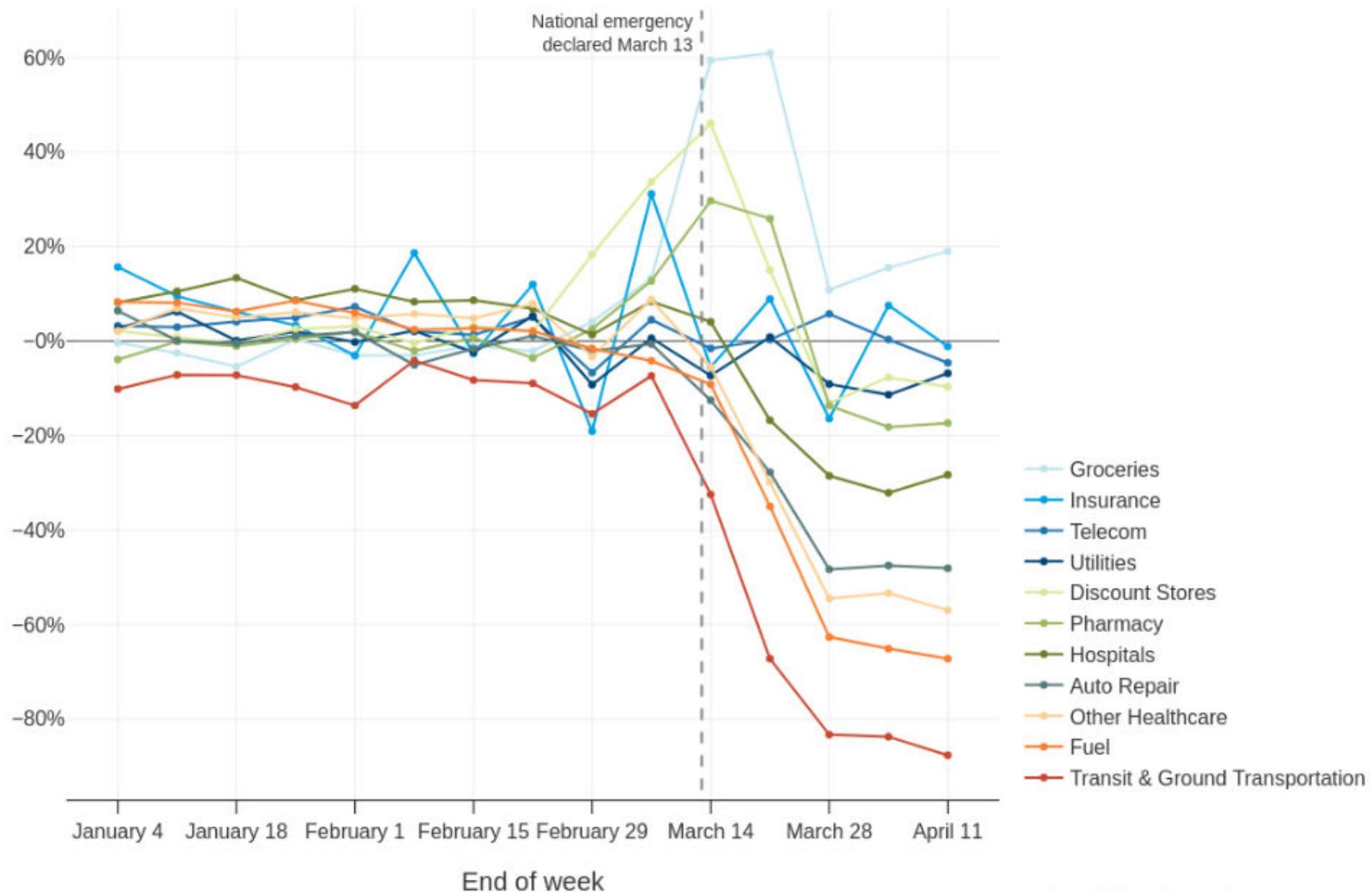
# Zu viele Punkte



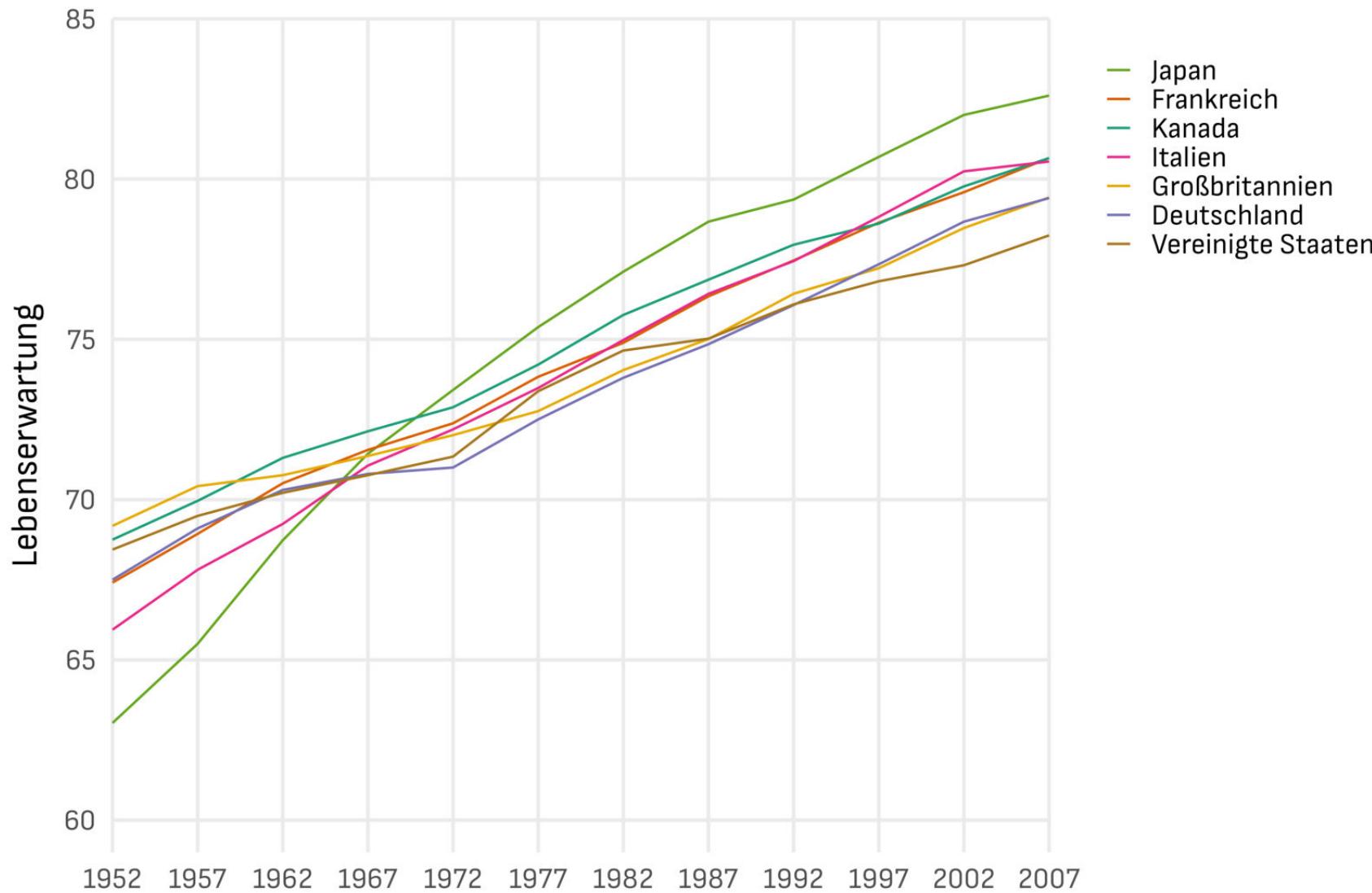


# Zu viele Linien

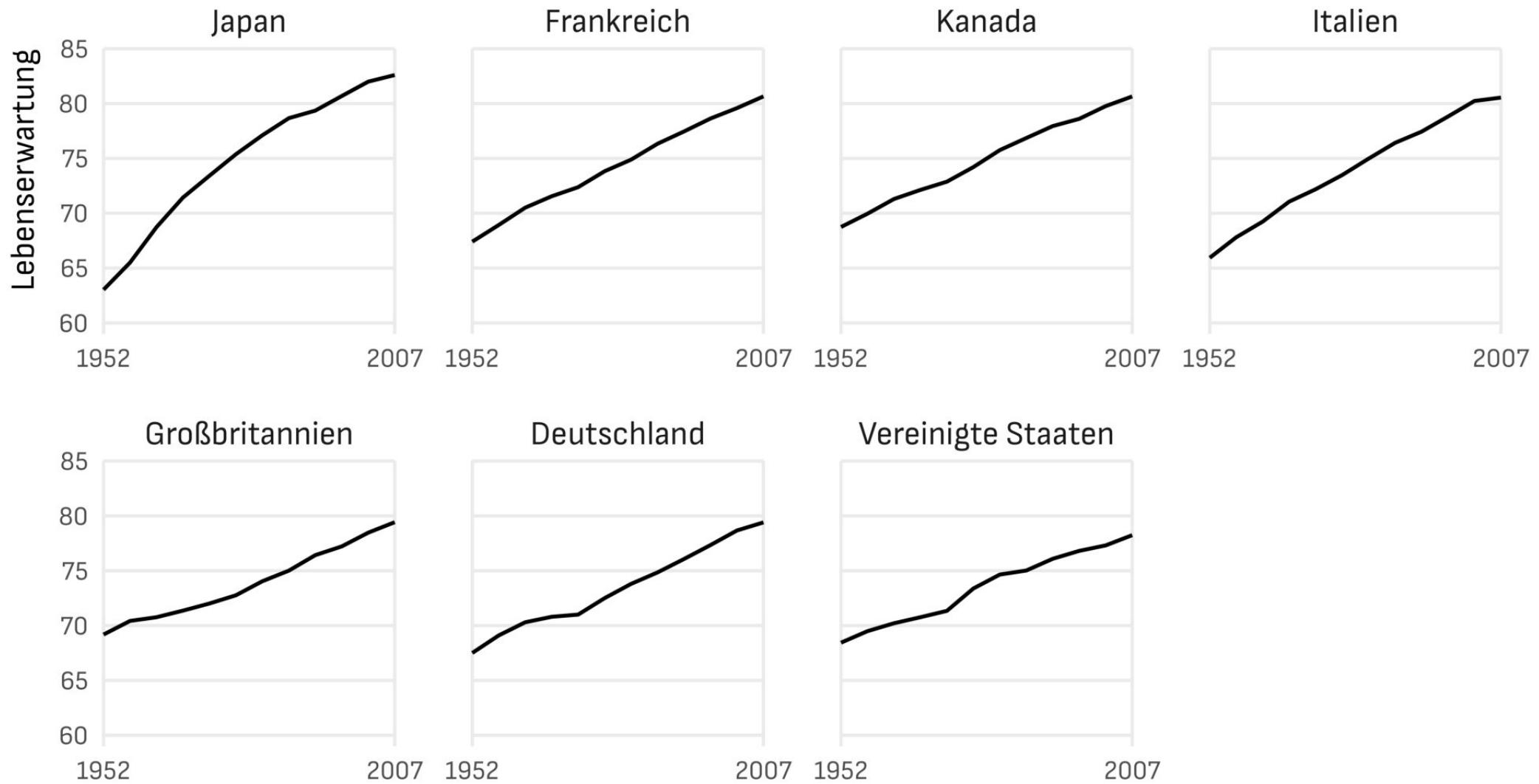
Year-over-year percent change in spending by essential category



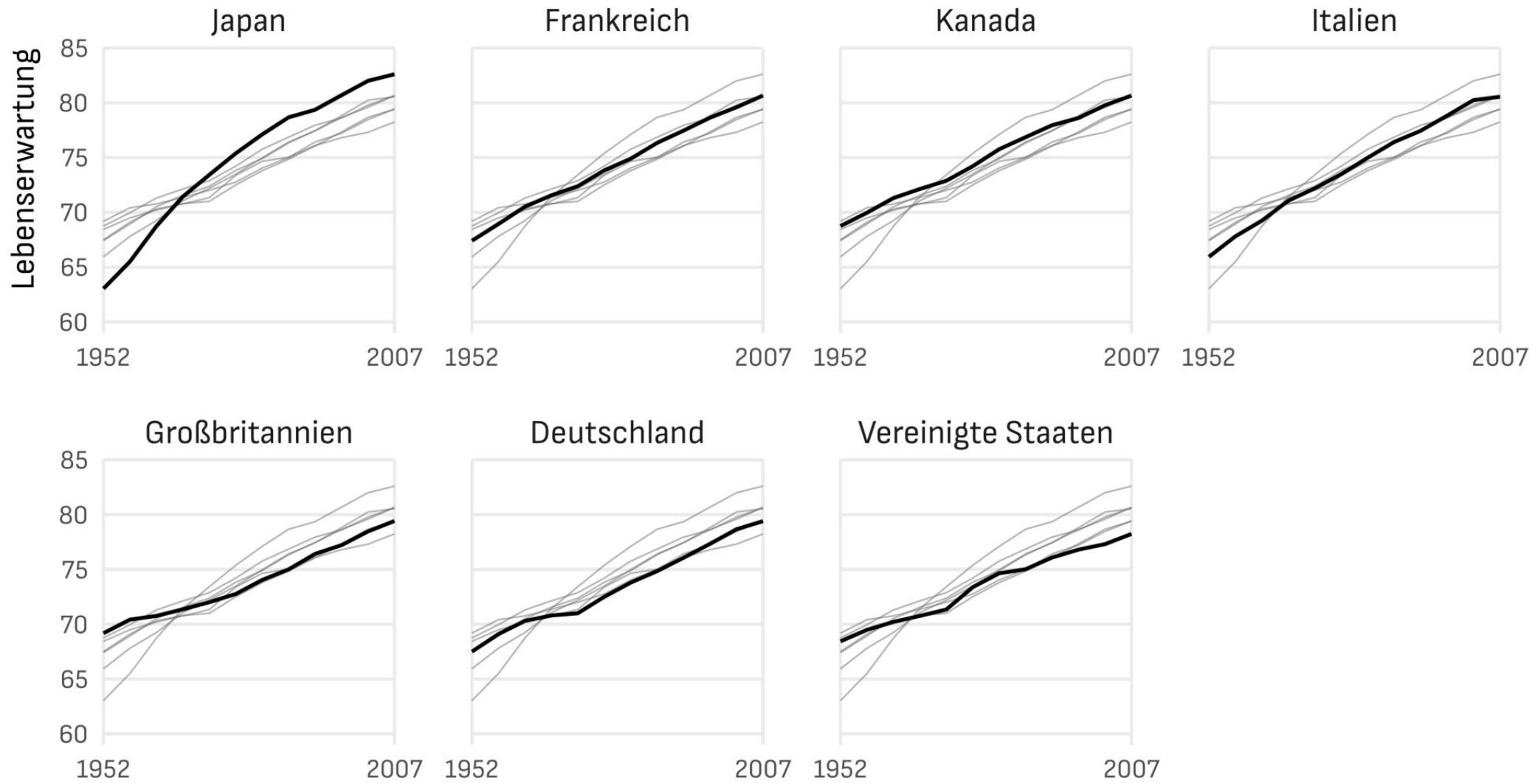
# Zu viele Linien



# Zu viele Linien

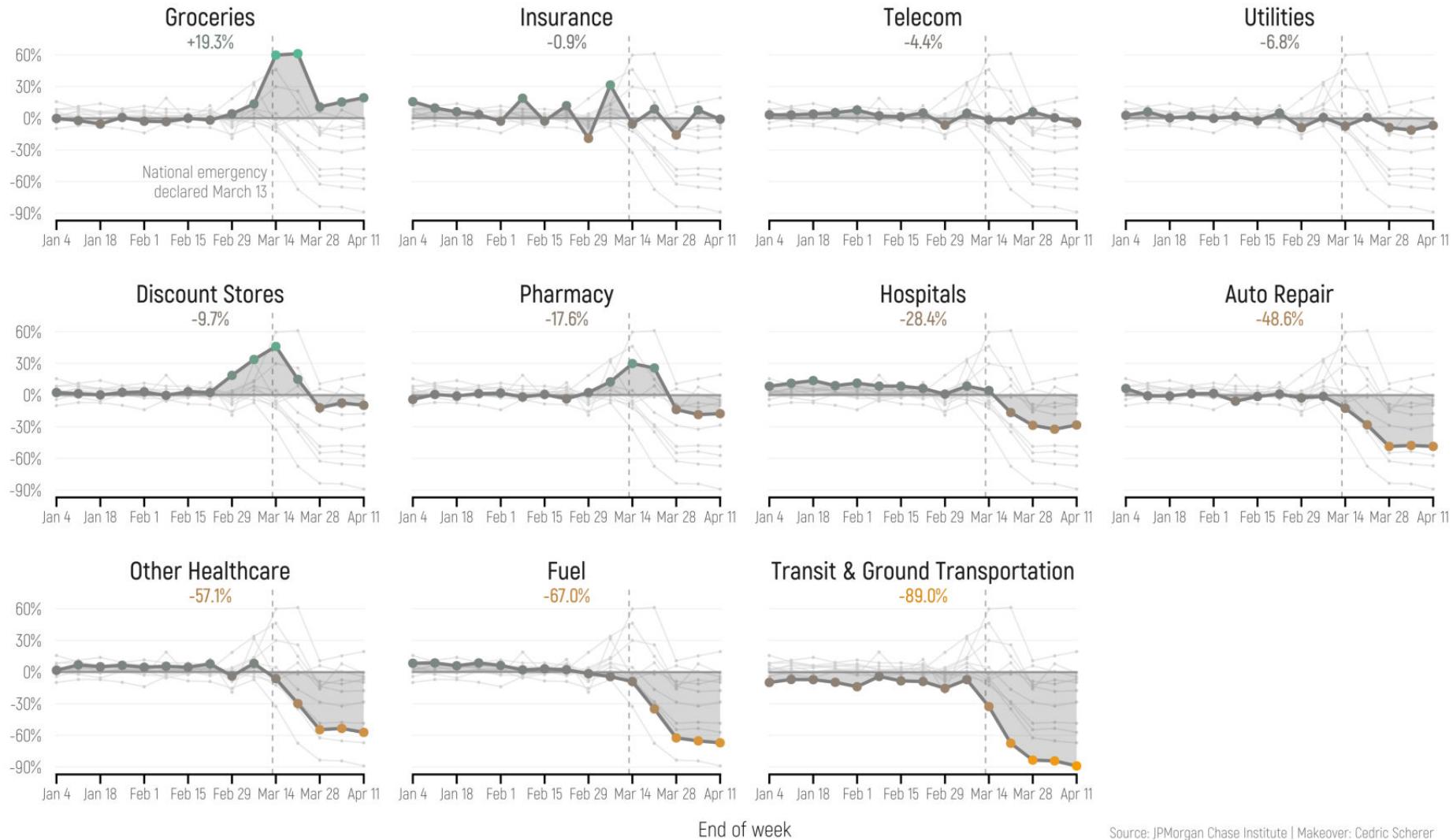


# Zu viele Linien



# Zu viele Linien

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



**LÉGENDE** — Quantités et couleurs pour chaque Pays de provenance.

	Etats-Unis	Inde (Vénitie, Chine etc.)	Egypte, Sicile	Pérou, Bolivie, Pérou	Angleterre, Irlande
Imports des années	532.000 <sup>a</sup>	70.000 <sup>b</sup>	20.000 <sup>c</sup>	5.400 <sup>d</sup>	60.000 <sup>e</sup>
1858	546.000 <sup>f</sup>	180.000 <sup>g</sup>	27.000	9.400	135.000
1861	26.200 <sup>h</sup>	200.000	37.500	19.100	36.000
1862	20.800	161.000 <sup>i</sup>	71.700 <sup>j</sup>	19.300	102.000
1863	39.600 <sup>k</sup>	193.000 <sup>l</sup>	95.000	17.500	94.700
1864	84.300 <sup>m</sup>	264.000	125.000	50.700	119.600

A. Importation plus forte que celle de 1858, malgré les entrées navaillées de la guerre civile, à cause de la vente de tous les Stocks.

B. Entrée diminuée due à la guerre civile, et qui est devenue plus forte si quelques navires n'avaient échappé aux blocus.

C. Augmentation due à la réouverture de la provenance du coton Américain dont on se privait par les Stocks aussi importants.

D. Augmentation due à la guerre civile, et la France expédiait ses entrées pour la première fois en Europe.

E. Entrée diminuée due à la guerre civile, et la France expédiait ses entrées pour la première fois en Europe.

F. Entrée diminuée due à la guerre civile, et la France expédiait ses entrées pour la première fois en Europe.

G. Augmentation due au succès de la guerre civile, et de nouvelles plantations furent plus facilement ouvertes.

H. Augmentation due à de nouveaux chevaux de file et de nouvelles plantations de coton dans l'Ohio et sans préavis envoya des signaux.

I. Augmentation due au succès de la guerre civile qui était rentré après la guerre qu'il avait livrée.

**CARTE** figurative et approximative des quantités de **COTON BRUT** importées en Europe en 1858 en 1864 et en 1865,

Dressée par M<sup>r</sup> MINARD, Inspecteur Général des Ponts et Chaussées en retraite.

Paris, le 14 Mai 1866.

Les tonnages de coton transportés sont représentés par les longueurs des souches colorées à raison d'un millimètre pour cinq mille tonnes, ils sont de plus exprimés par les nombres écrits en travers des souches et dont l'unité est mille tonnes.

Les Cartes ont été dressées sur les Documents des Douanes Françaises, Anglaises, Belges, Hollandaises, Bâtonnières, Autrichiennes, Le Dictionnaire du Commerce, le Trade of cotton de M.J.A. Maran, le coton circulaire, et la publication Stutterfeld de Liverpool, le Merchant's Magazine de New-York, l'économiste de Londres, la circonscription Cope's d'Alexandrie etc.

Observation: Les importations sont un peu plus fortes que celles de la Carte parce qu'il souligne celles d'une seule tranche et que les Douanes demandent en bloc les très petites expéditions de toute provenance, je n'ai rien à laquelle les rapporter.

De l'importation du Coton en 1865. — La question commerciale du coton entre dans des phases nouvelles depuis que la guerre civile des Etats-Unis d'Amérique a éclaté.

On attendait sans curiosité la lutte épouvantable des trois Pays grands producteurs de coton. L'Etat-Unis qui cherchait à conquérir le marché, mais dont le prix exorbitant et sa concurrence fut complètement entouré par l'Angleterre, et l'Inde dont les récoltes démodées de l'Europe ont entraîné plus de coton qu'ordinairement et en conséquence pris de vive volonté contre à Marseille et à Trèves. Il y a donc aujourd'hui un intervalle d'actualité générale pour la production de cette plante textile.

Toutefois l'importation de 1865 est encore d'un caractère au-dessous de ce qu'elle était avant la guerre.

As outre des importations directes, un fait remarquable à lire. Des voies canalisées aujourd'hui de Bruxelles à Liverpool, par le Mer Rouge, le chemin de fer de Suez à Alexandrie, la Méditerranée et l'Océan. Le rapport est unique outre des mouvements sur les rives et sur les mers; ces mouvements sont indépendants ceux de la Compagnie Fluviale Orientale et de la Compagnie des Messageries Impériales.

Cette voie assurée par dessous le Canal 7 Indique-t-elle d'autres voies

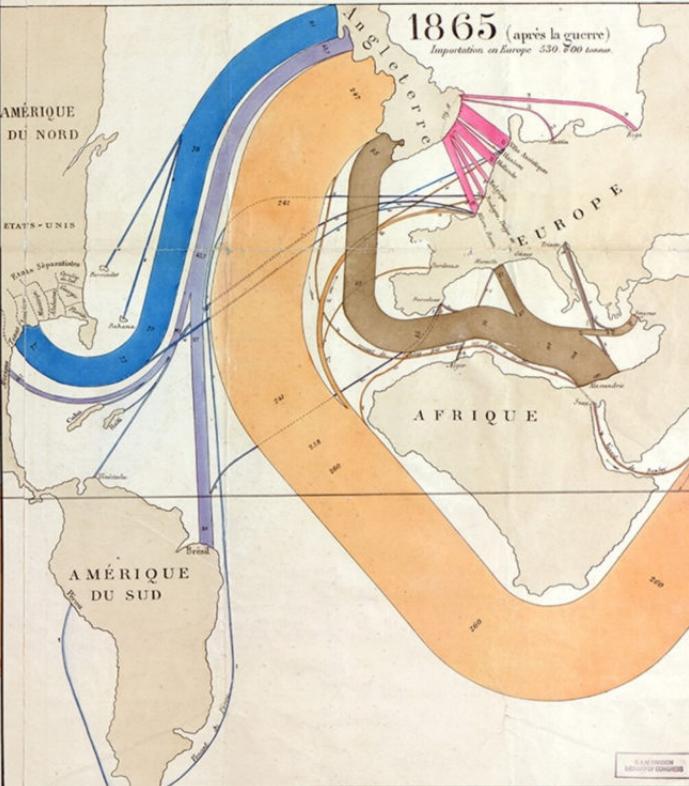
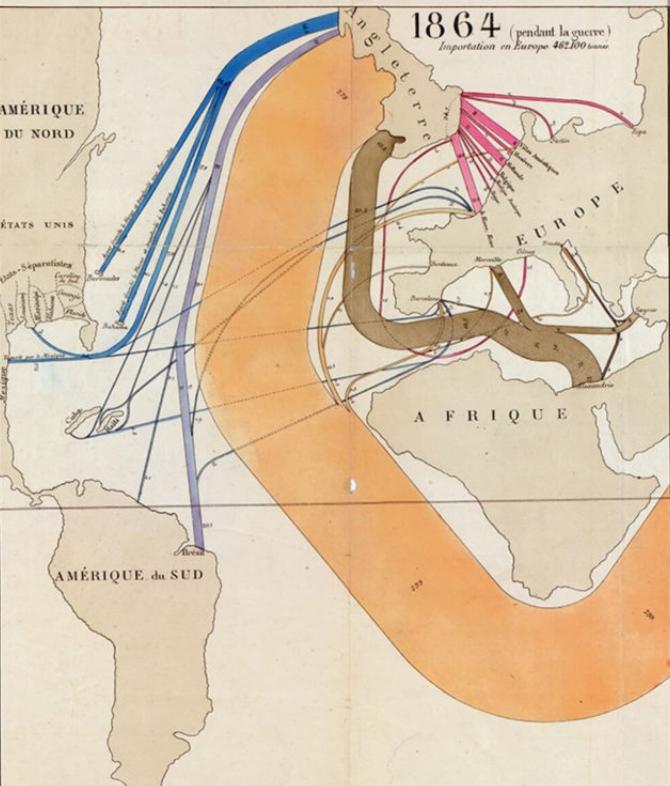
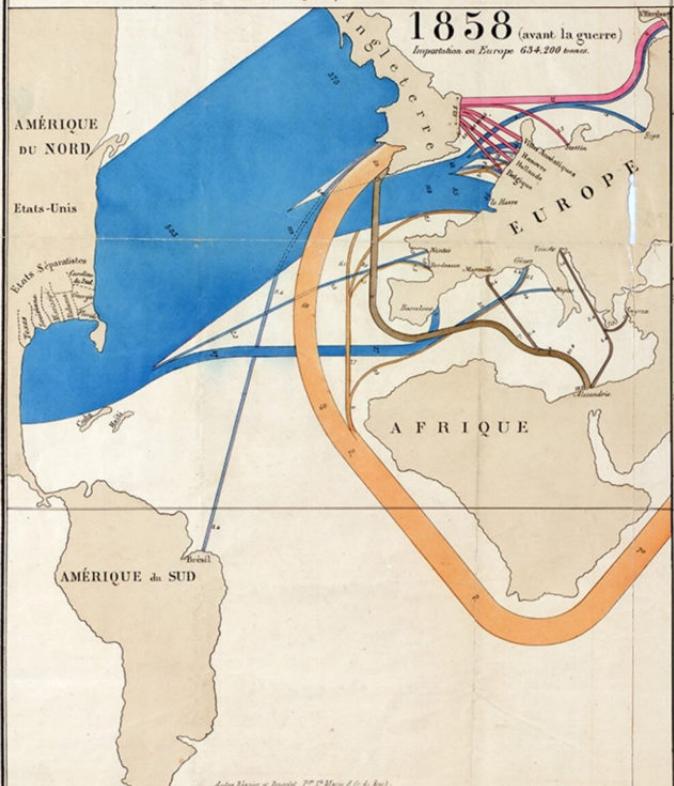
possibles pour le cours de l'Inde versant traversant la Mer Noire et la Mer Caspienne? C'est ce que l'on peut dire.

On attendait sans curiosité la lutte épouvantable des trois Pays grands producteurs de coton. L'Etat-Unis qui cherchait à conquérir le marché, mais dont le prix exorbitant et sa concurrence fut complètement entouré par l'Angleterre, et l'Inde dont les récoltes démodées de l'Europe ont entraîné plus de coton qu'ordinairement et en conséquence pris de vive volonté contre à Marseille et à Trèves. Il y a donc aujourd'hui un intervalle d'actualité générale pour la production de cette plante textile.

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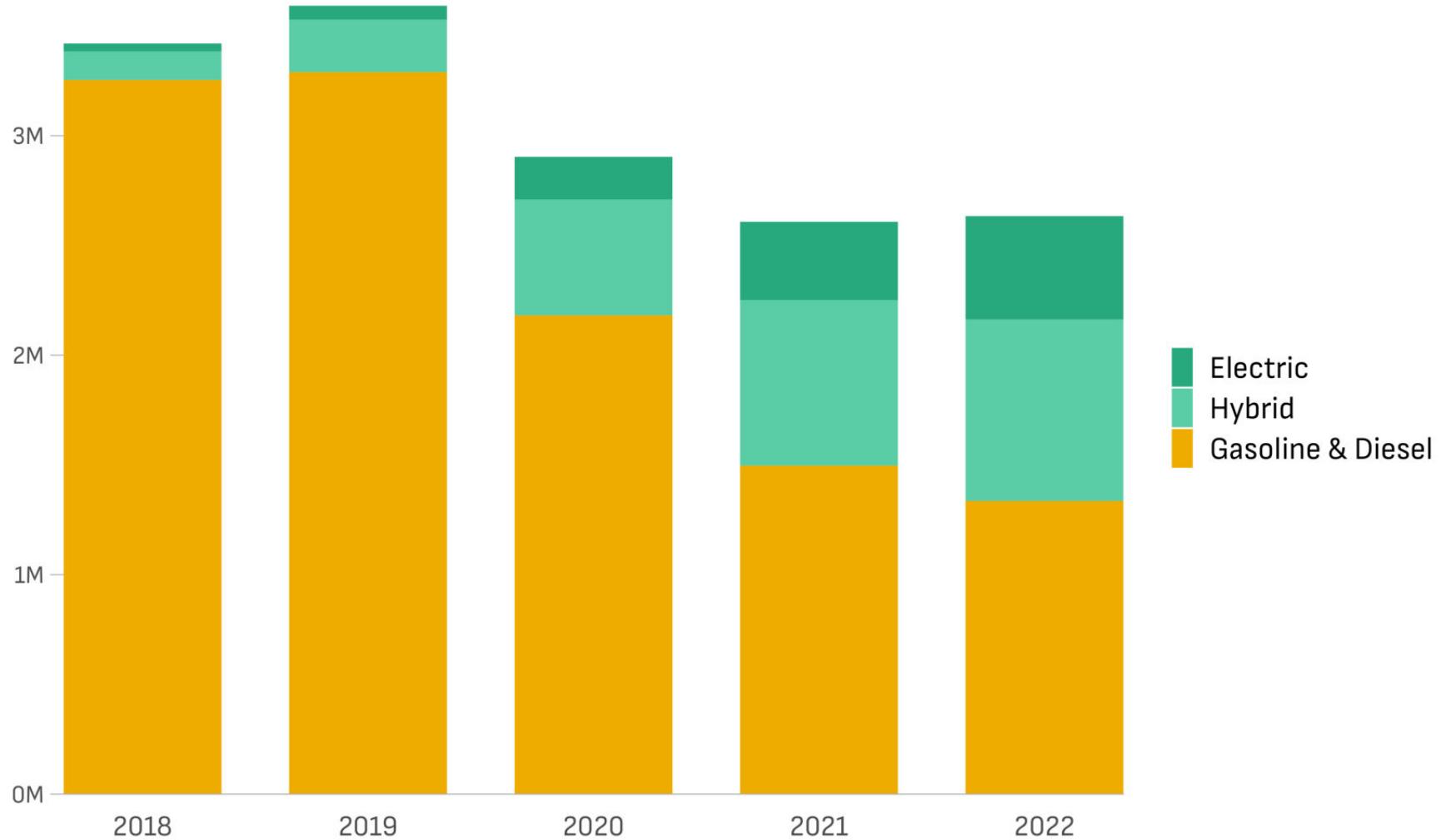


"Carte figurative et approximative des quantités de coton brut importées en Europe en 1858, en 1864 et en 1865" von Charles Joseph Minard (1866)



# Gestapelte Balken

## Pkw-Neuzulassungen in Deutschland

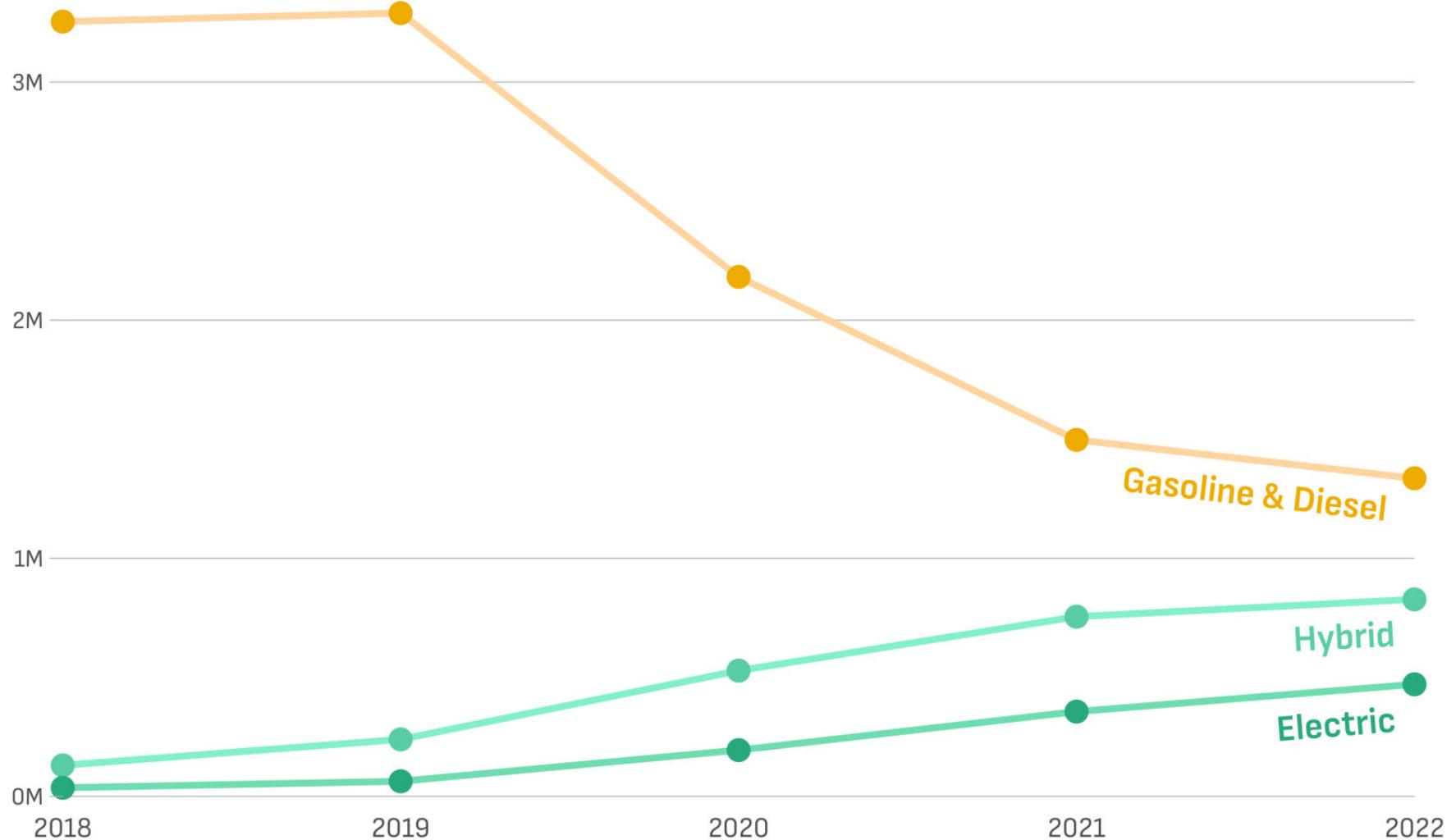


Daten: Kraftfahrt-Bundesamt • Grafik: Cédric Scherer



# Gestapelte Balken

## Pkw-Neuzulassungen in Deutschland



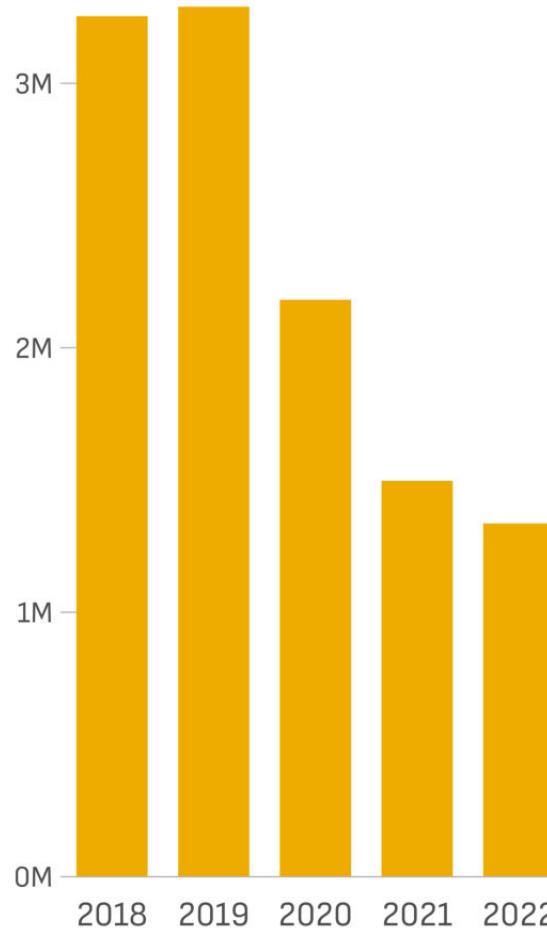
Daten: Kraftfahrt-Bundesamt • Grafik: Cédric Scherer



# Gestapelte Balken

## Pkw-Neuzulassungen in Deutschland

Gasoline & Diesel



Hybrid



Electric



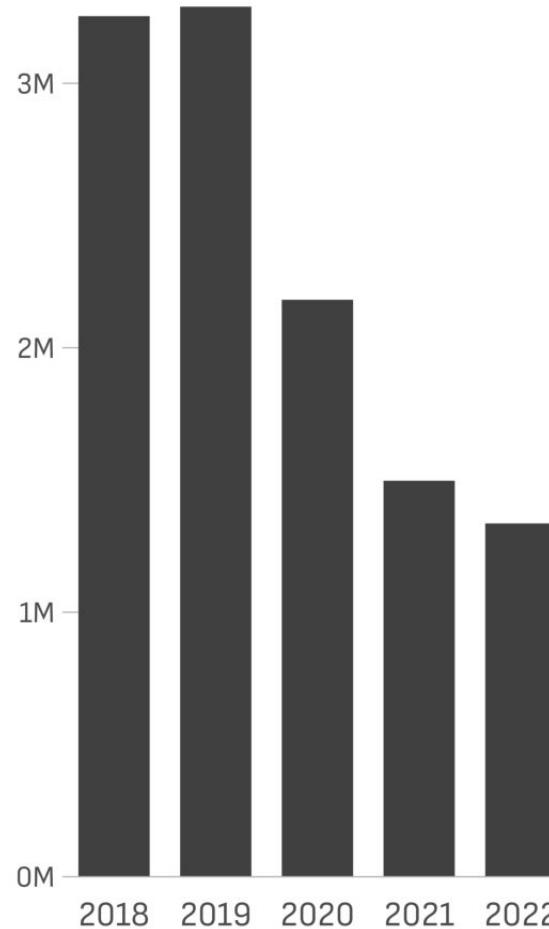
Daten: Kraftfahrt-Bundesamt • Grafik: Cédric Scherer



# Gestapelte Balken

## Pkw-Neuzulassungen in Deutschland

Gasoline & Diesel



Hybrid



Electric

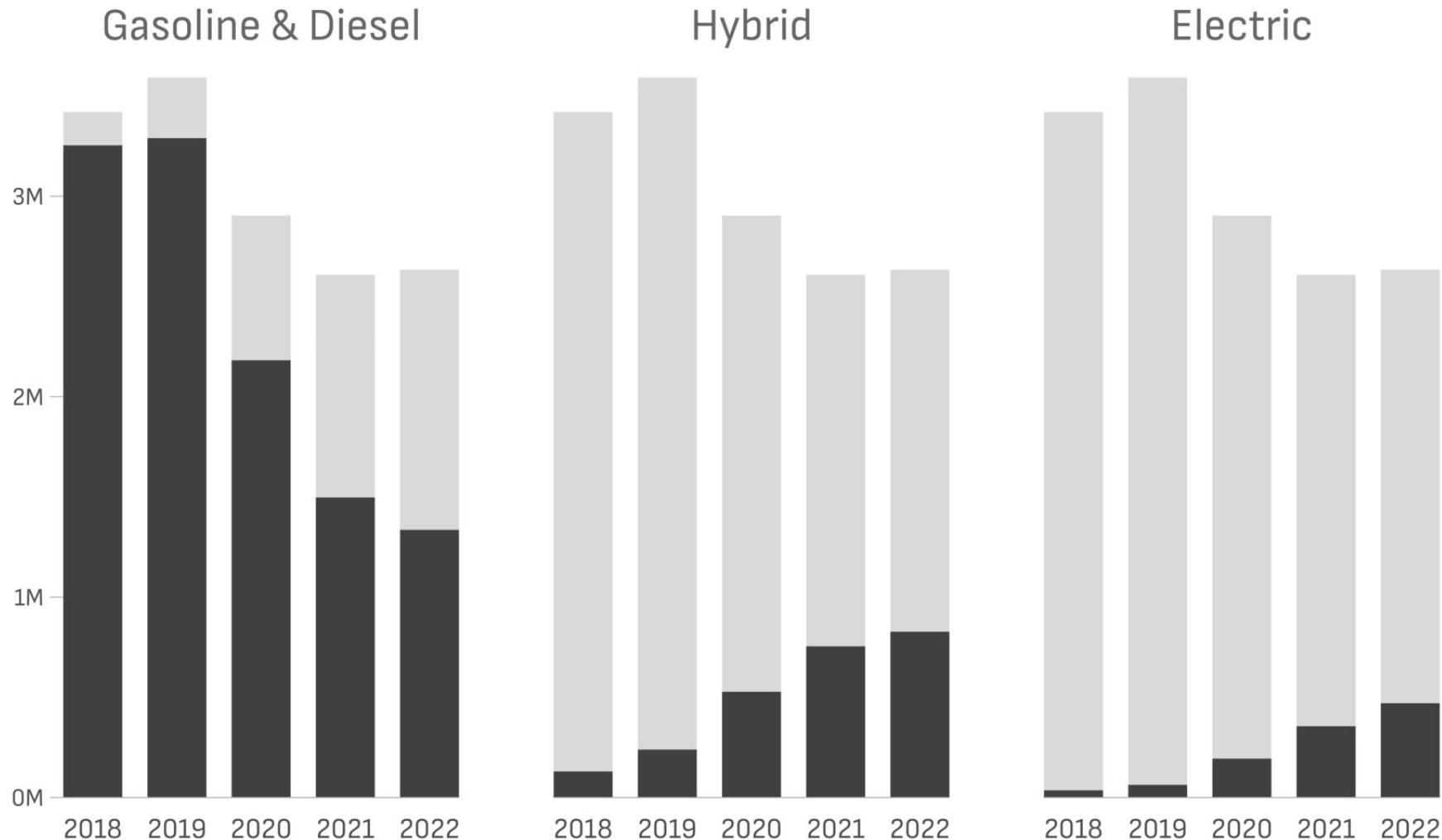


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# Gestapelte Balken

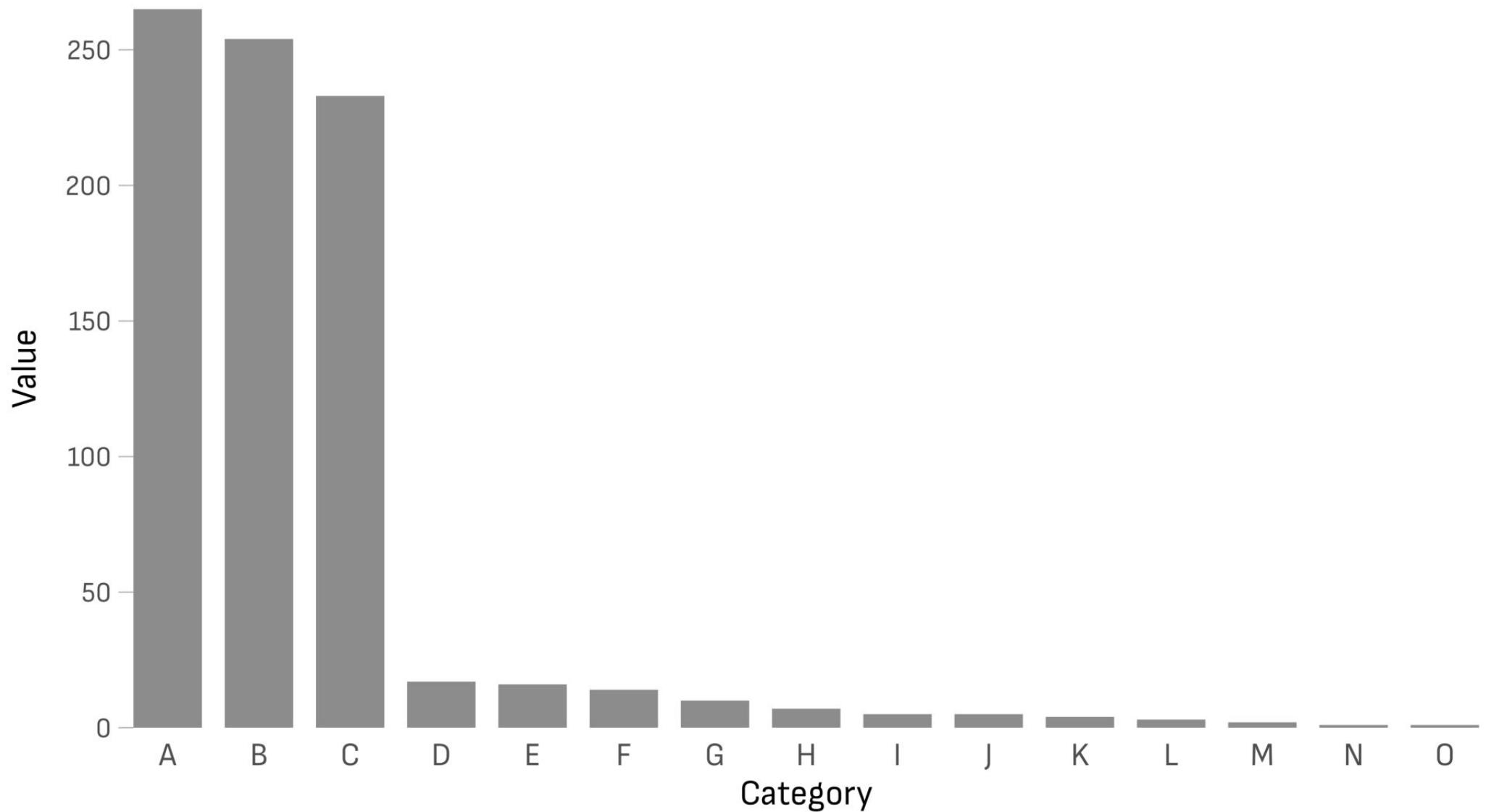
## Pkw-Neuzulassungen in Deutschland



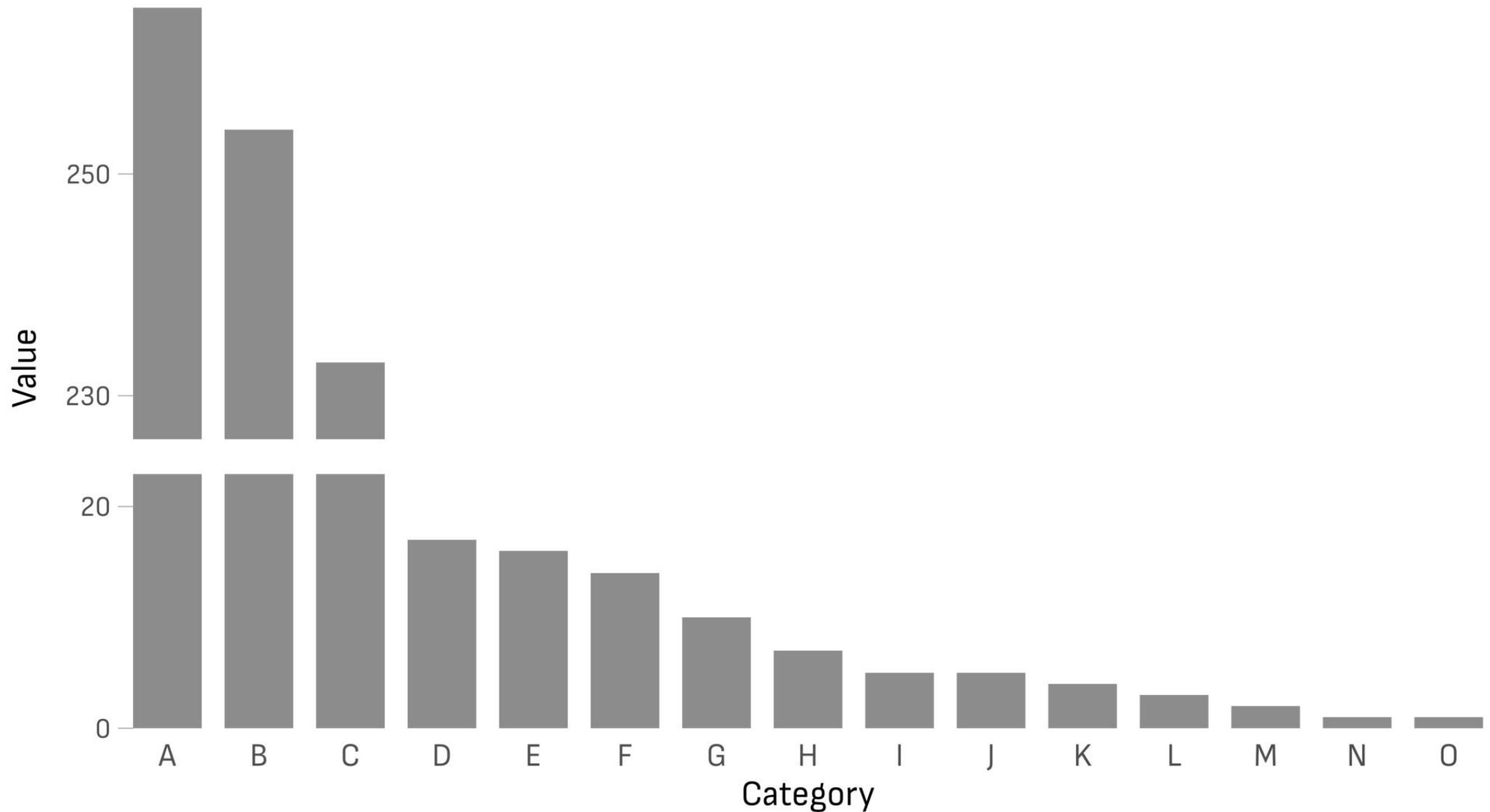
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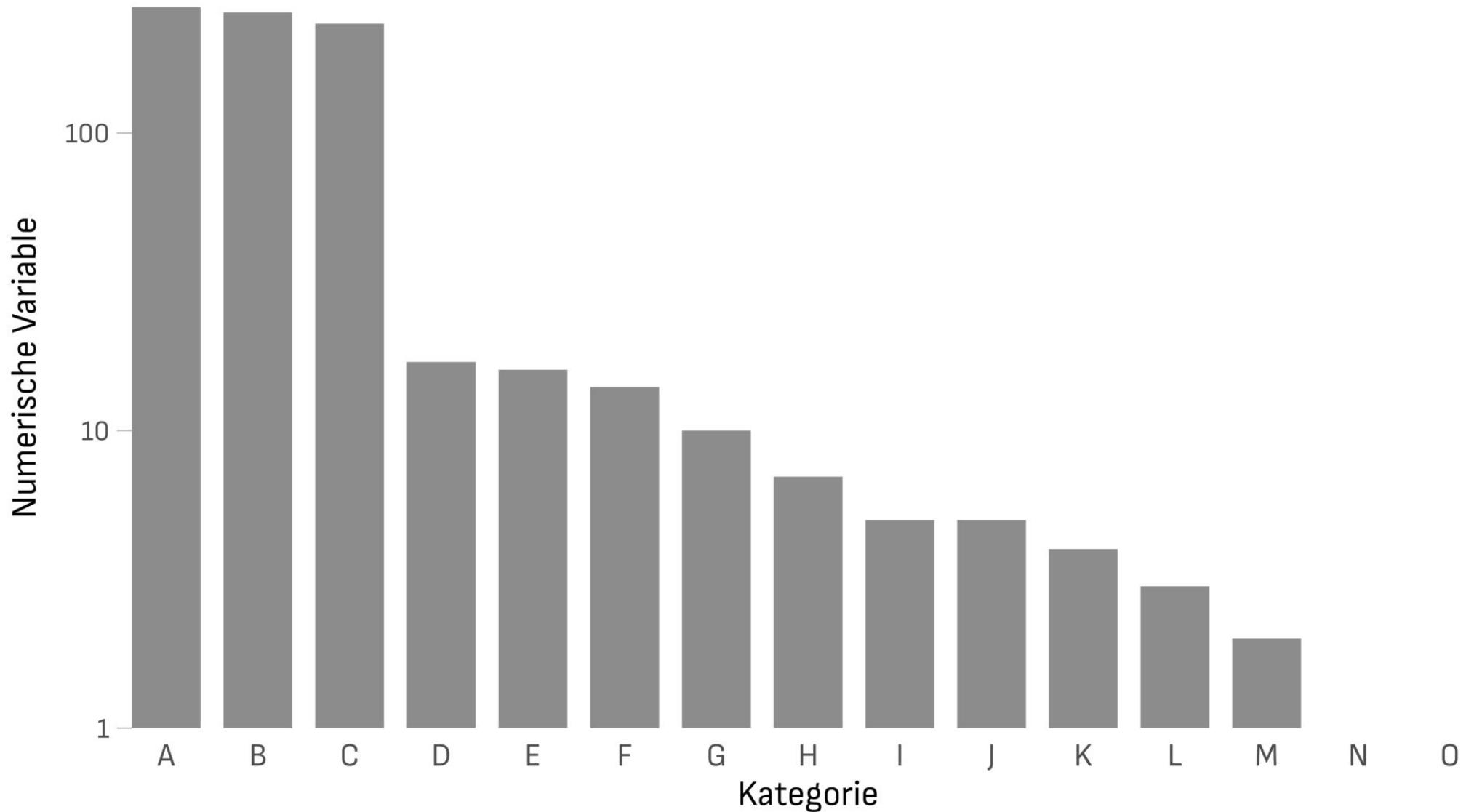
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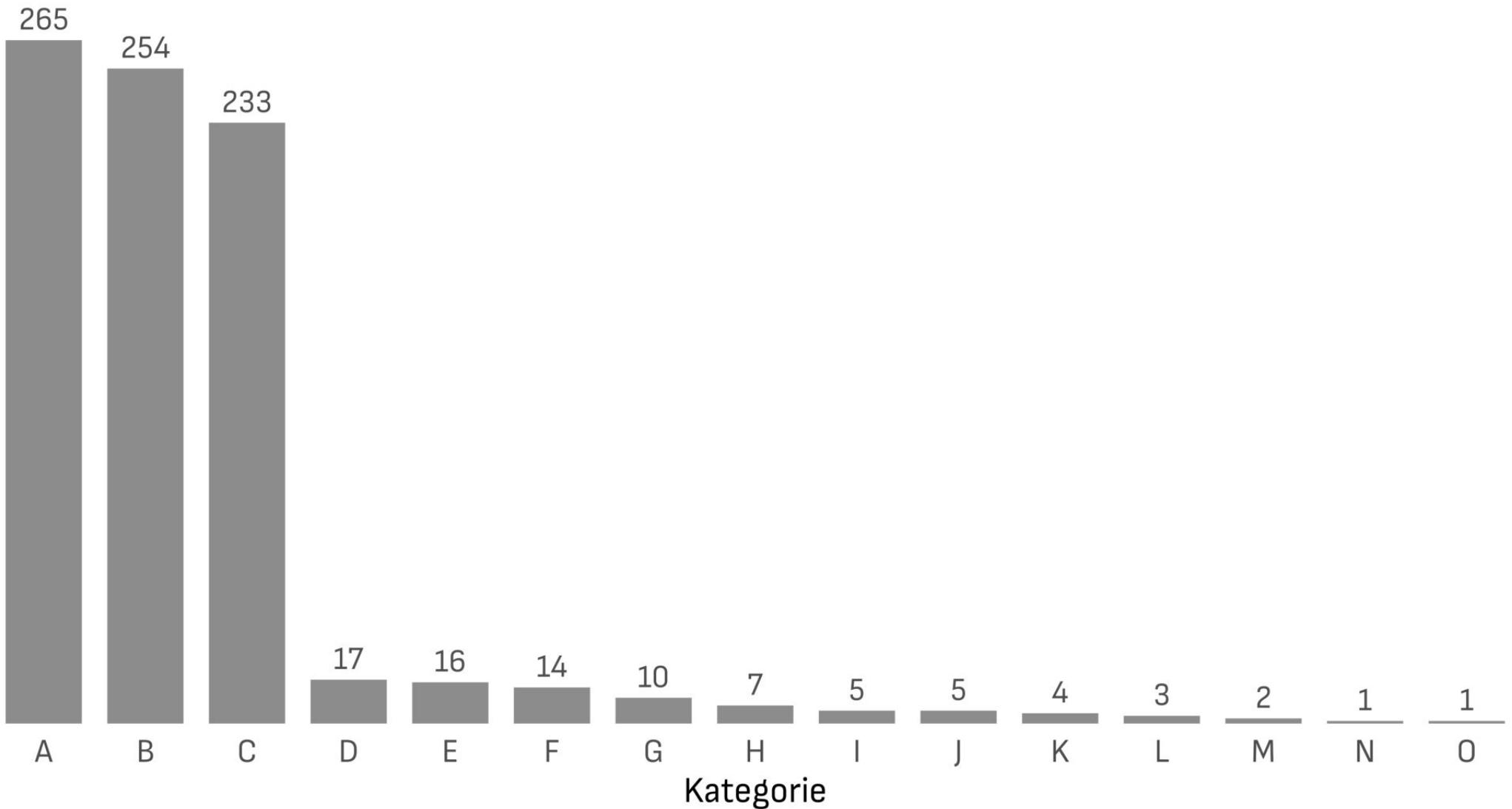
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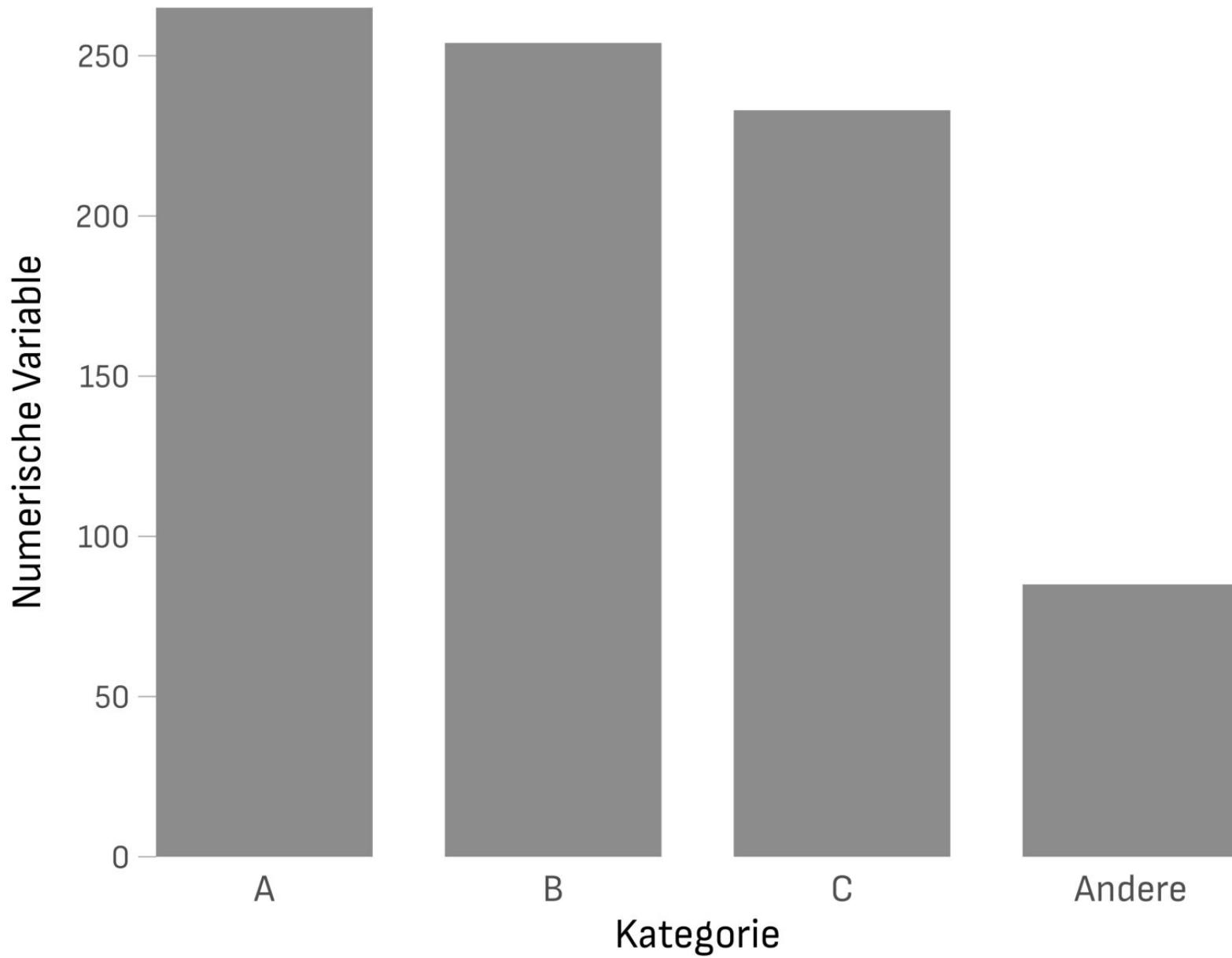
# Schiefe Datenverteilung



# Schiefe Datenverteilung

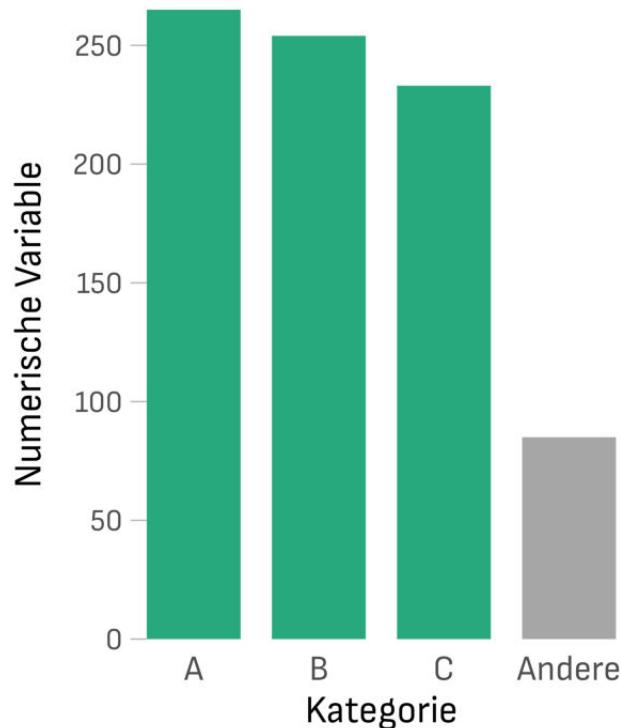


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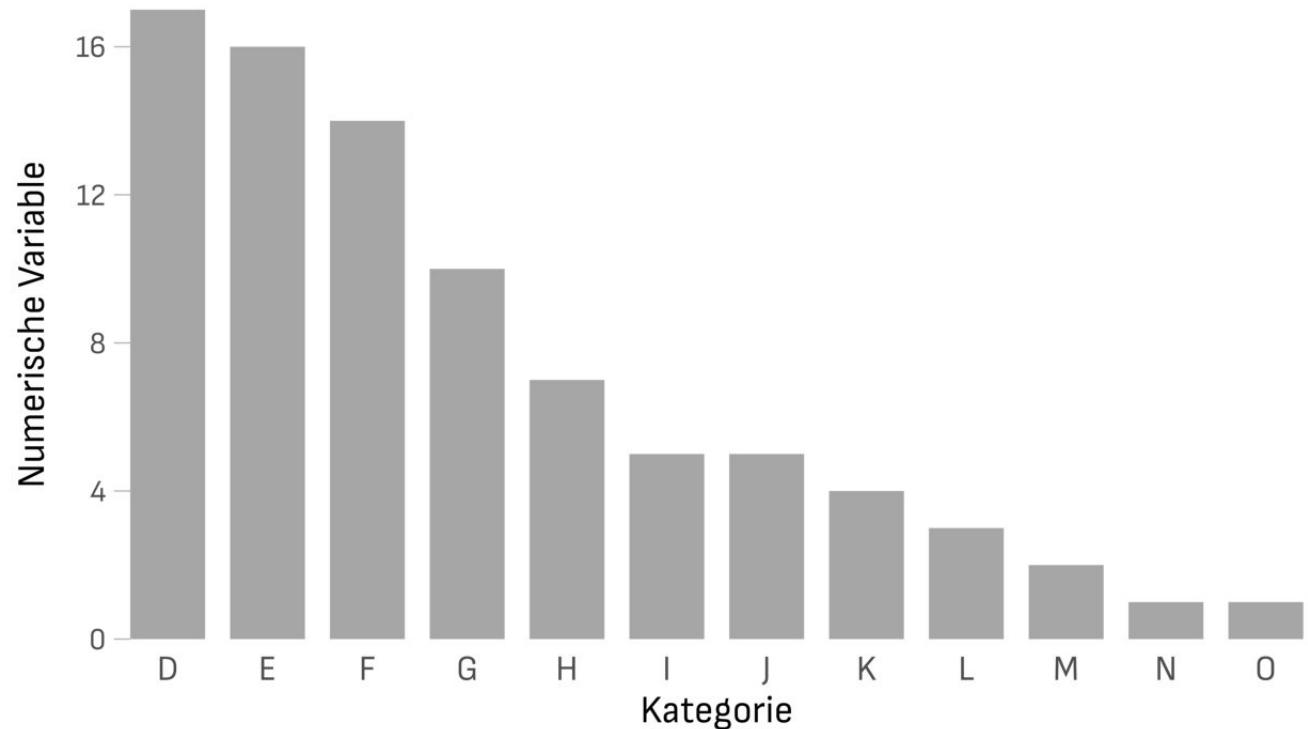


# Schiefe Datenverteilung

Hauptkategorien

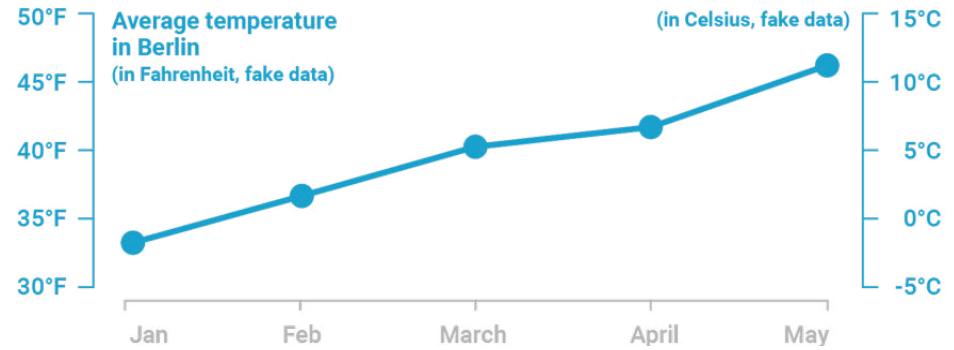
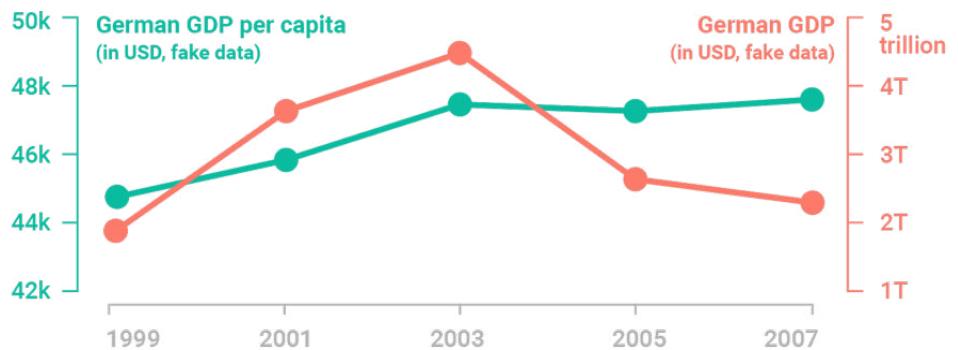
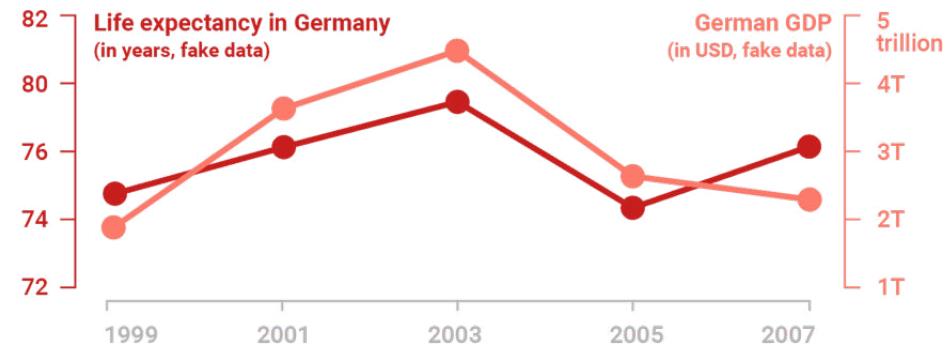
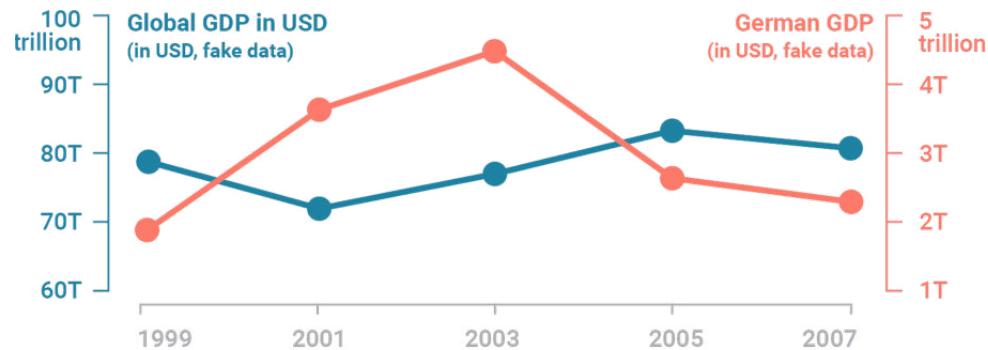


Andere Kategorien



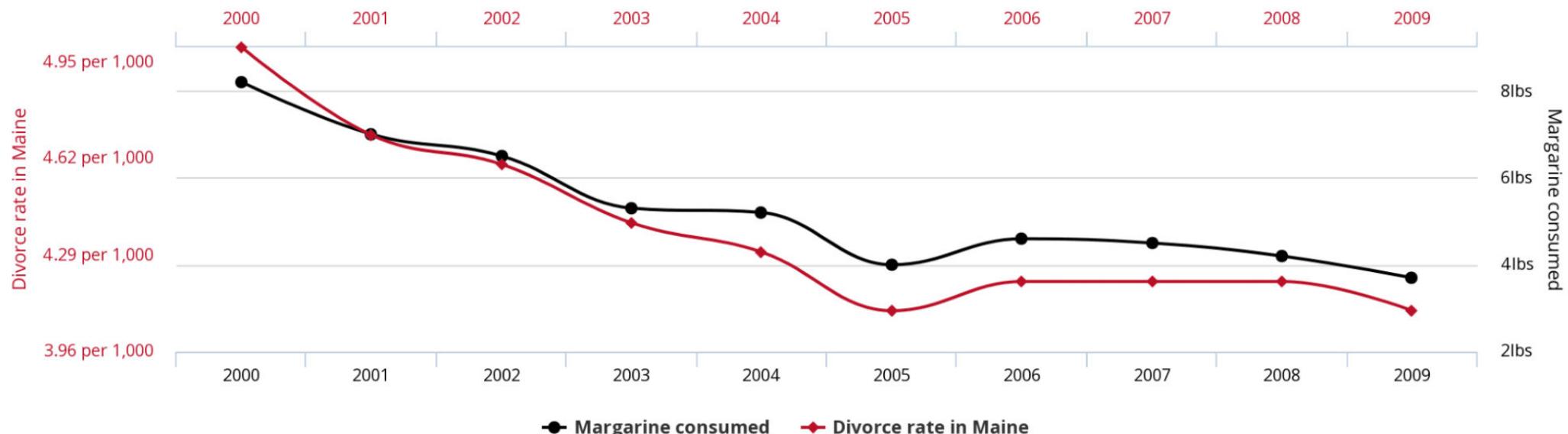
# Doppelachsen

Beispiele von Lisa Charlotte Muth, DataWrapper Blog



# Doppelachsen

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



Quelle: *Spurious Correlations*

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



# Doppelachsen



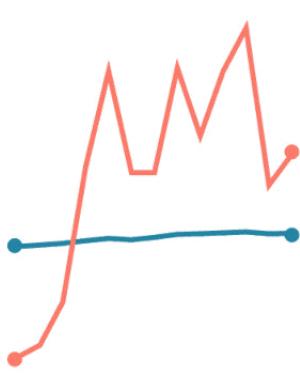
Quelle: Lisa Charlotte Muth, [DataWrapper Blog](#)



# Doppelachsen



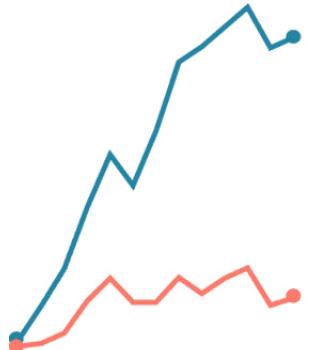
Orange steady,  
Blue massively increasing.



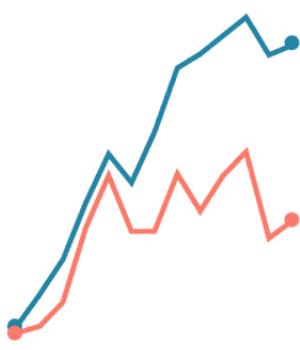
Blue steady,  
Orange increasing.



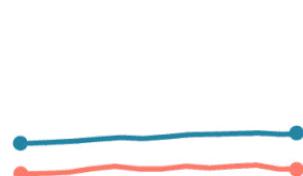
Both started at the same  
level, but Orange increased  
far more than Blue.



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.

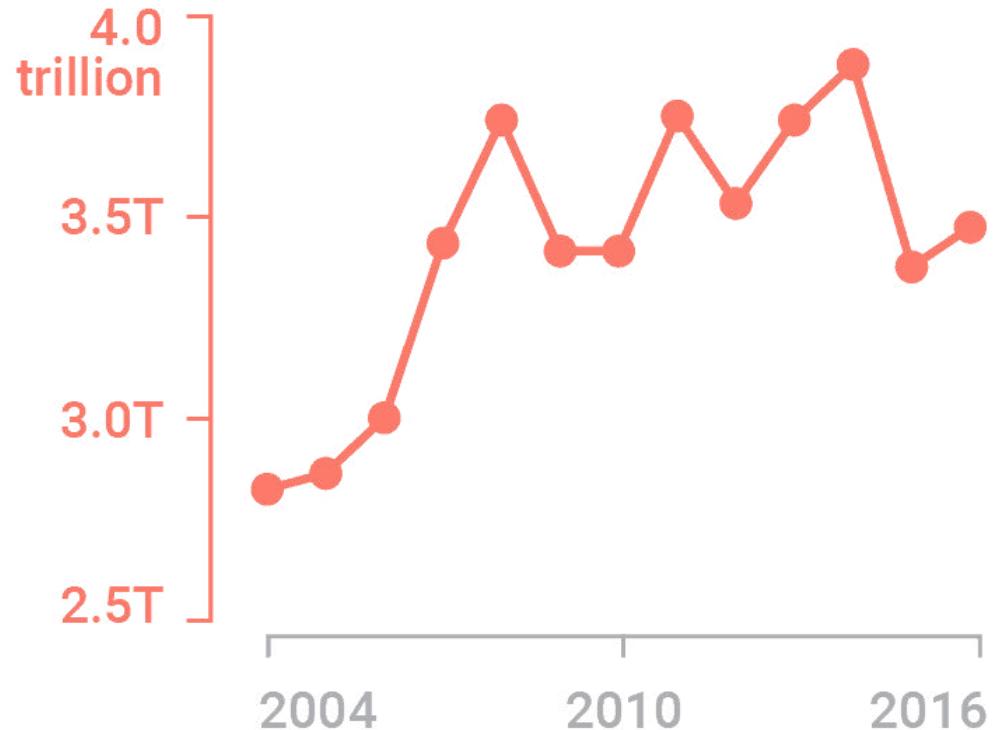
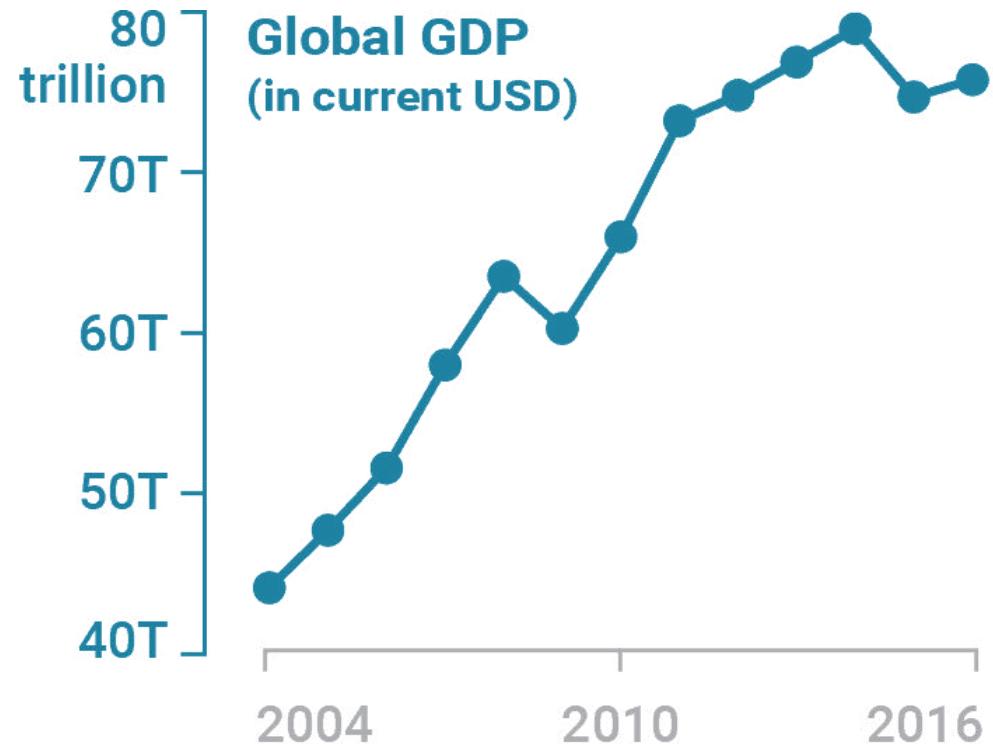


Both steady.

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



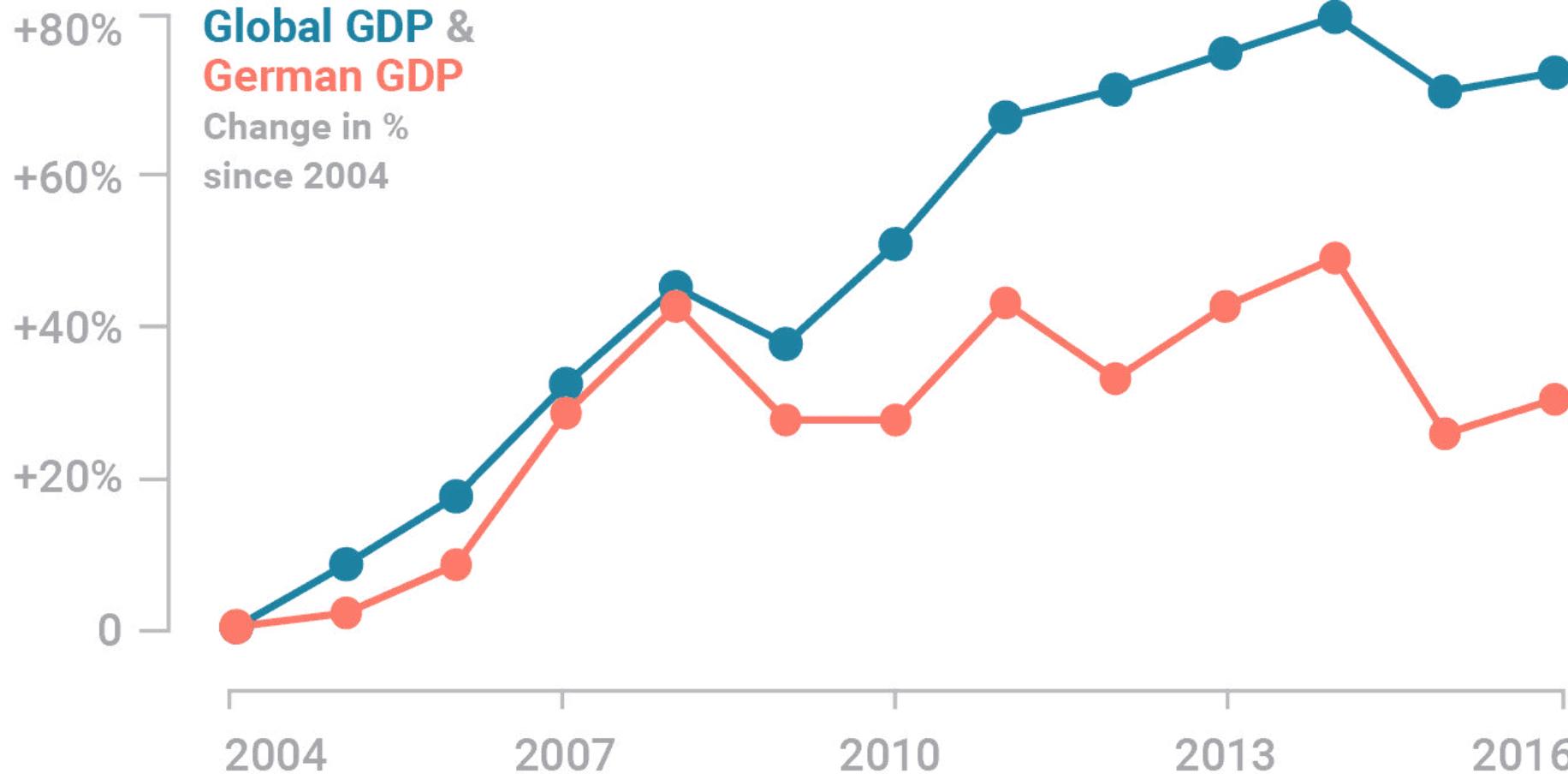
# Doppelachsen



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



# Doppelachsen



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





ONE  
WAY

ONE  
WAY

Guide the  
View(er)



# Peak Break-Up Times

According to Facebook status updates

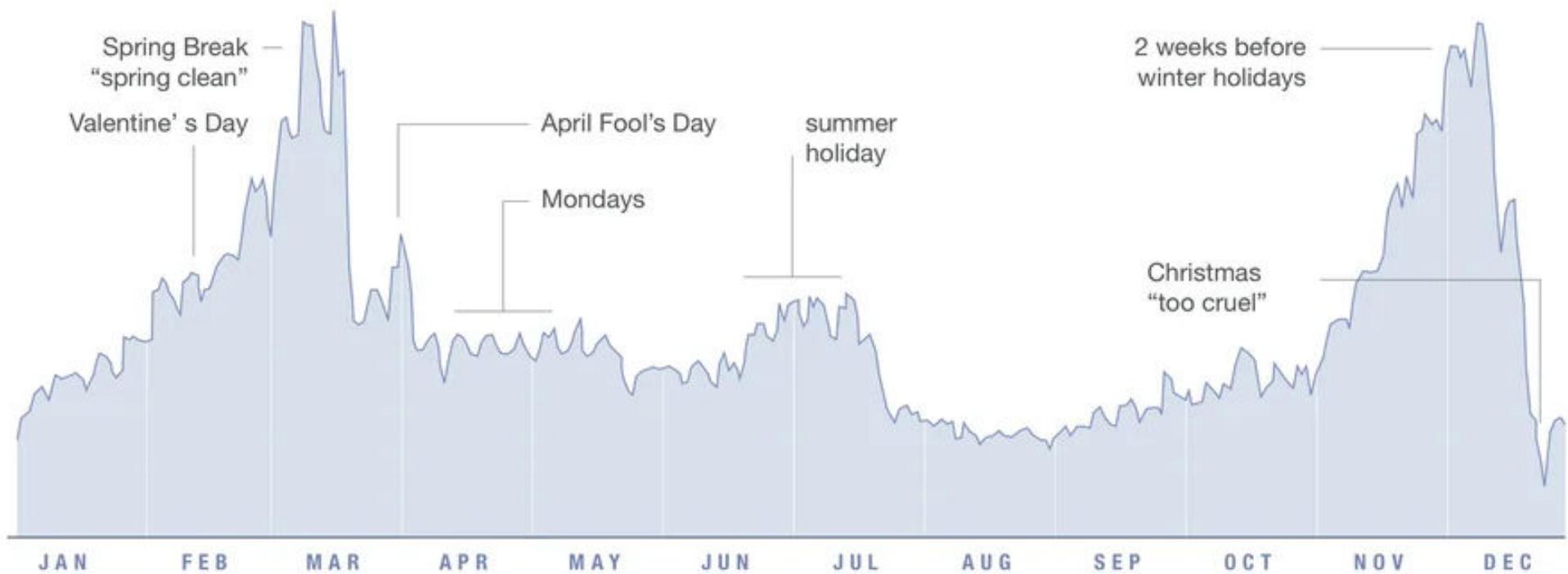


Quelle: David McCandless & Lee Byron, [Information is Beautiful](#) (modifiziert)



# Peak Break-Up Times

According to Facebook status updates



Quelle: David McCandless & Lee Byron, *Information is Beautiful*



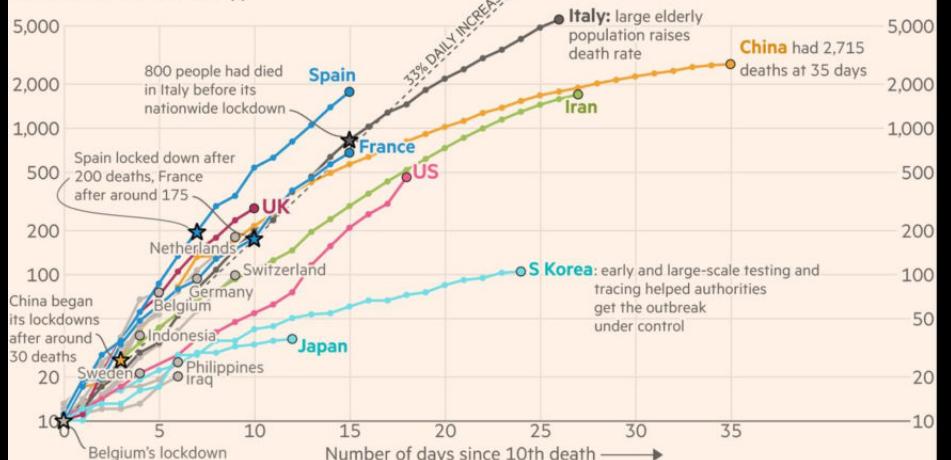
**"The key thing we do is to add a title to the chart, as an entry point and to explain what is going on. **Text and other annotations add enormous value for non-chart people.**"**

John Burn-Murdoch, Financial Times

Coronavirus deaths in Italy, Spain and the UK are increasing much more rapidly than they did in China

Cumulative number of deaths, by number of days since 10th death

Nationwide lockdowns: ★



FT graphic: John Burn-Murdoch / @jburnmurdoch

Source: FT analysis of Johns Hopkins University, CSSE; Worldometers; FT research. Data updated March 23, 09:00 GMT

© FT

Covid has grown gradually less lethal over the pandemic, mainly due to immunity, but it remains more dangerous than flu on average

Evolution of Covid-19's infection fatality ratio\* in England, relative to seasonal flu

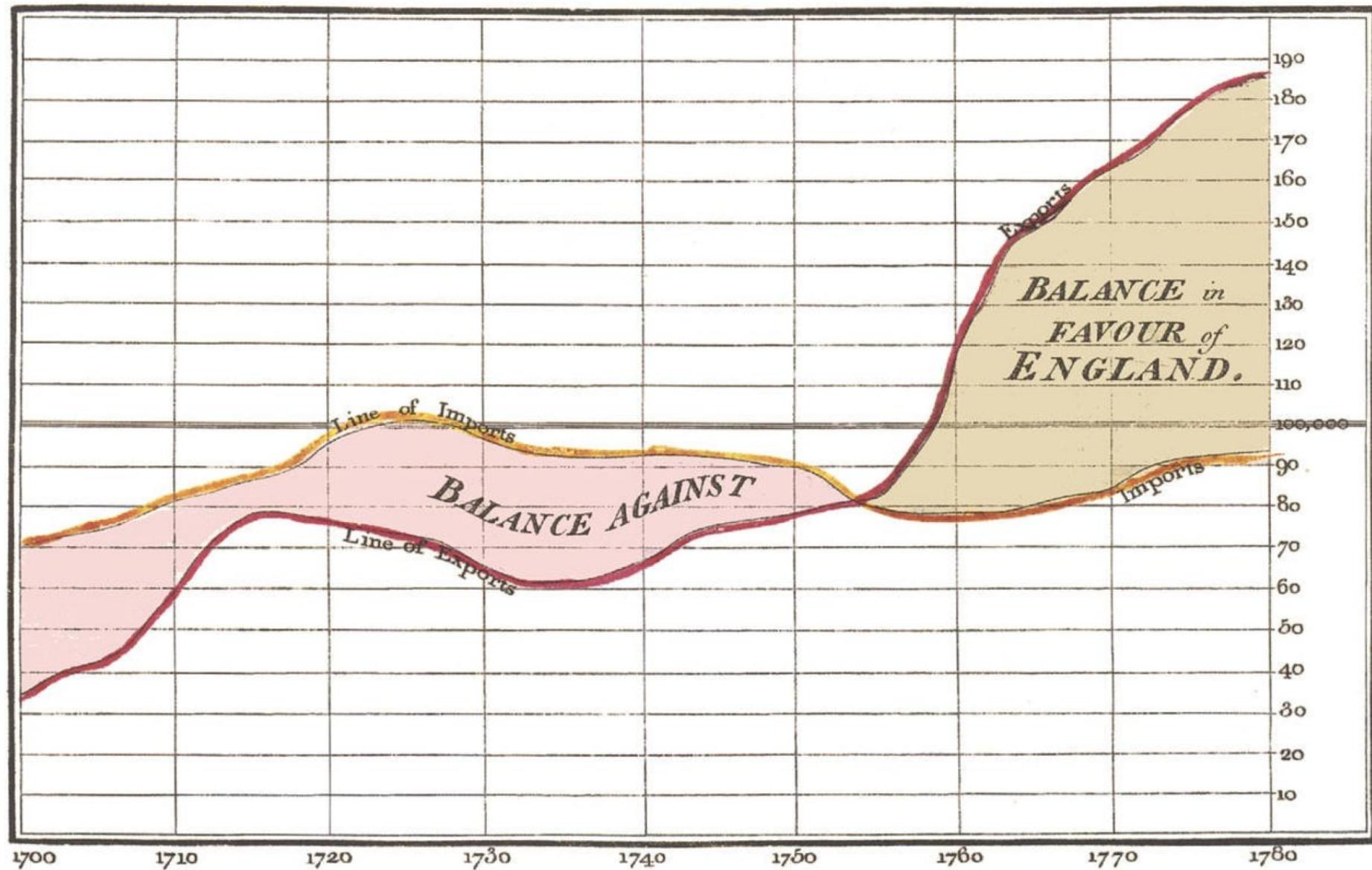


\*Covid IFR calculated using ONS death cert. mentions and ONS infection survey. \*\*IFR for seasonal flu as calculated for New Zealand in BMJ Source: ONS. Based on prior work by Dan Howdon

FT graphic: John Burn-Murdoch / @jburnmurdoch

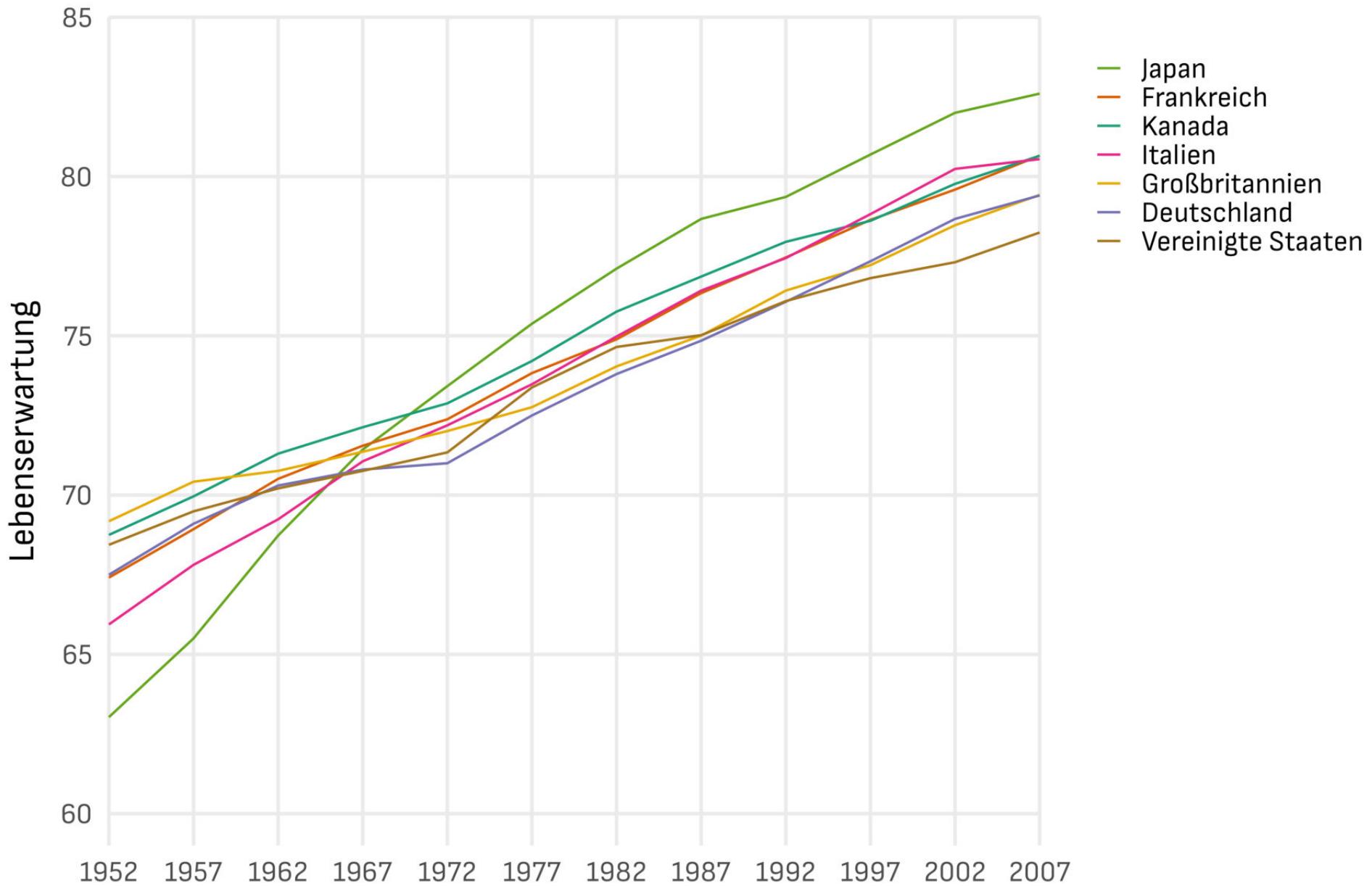


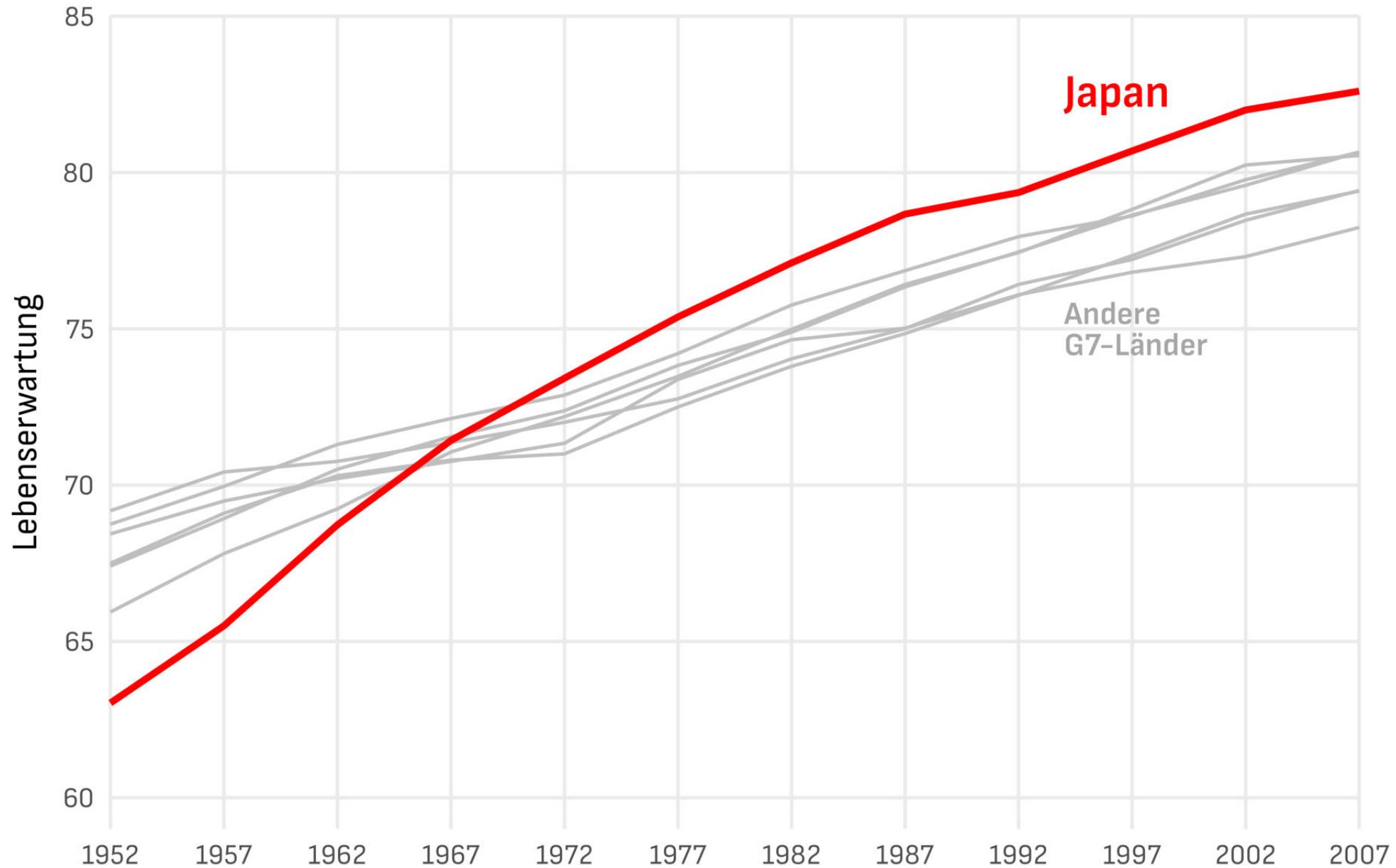
Exports and Imports to and from DENMARK & NORWAY from 1700 to 1780.

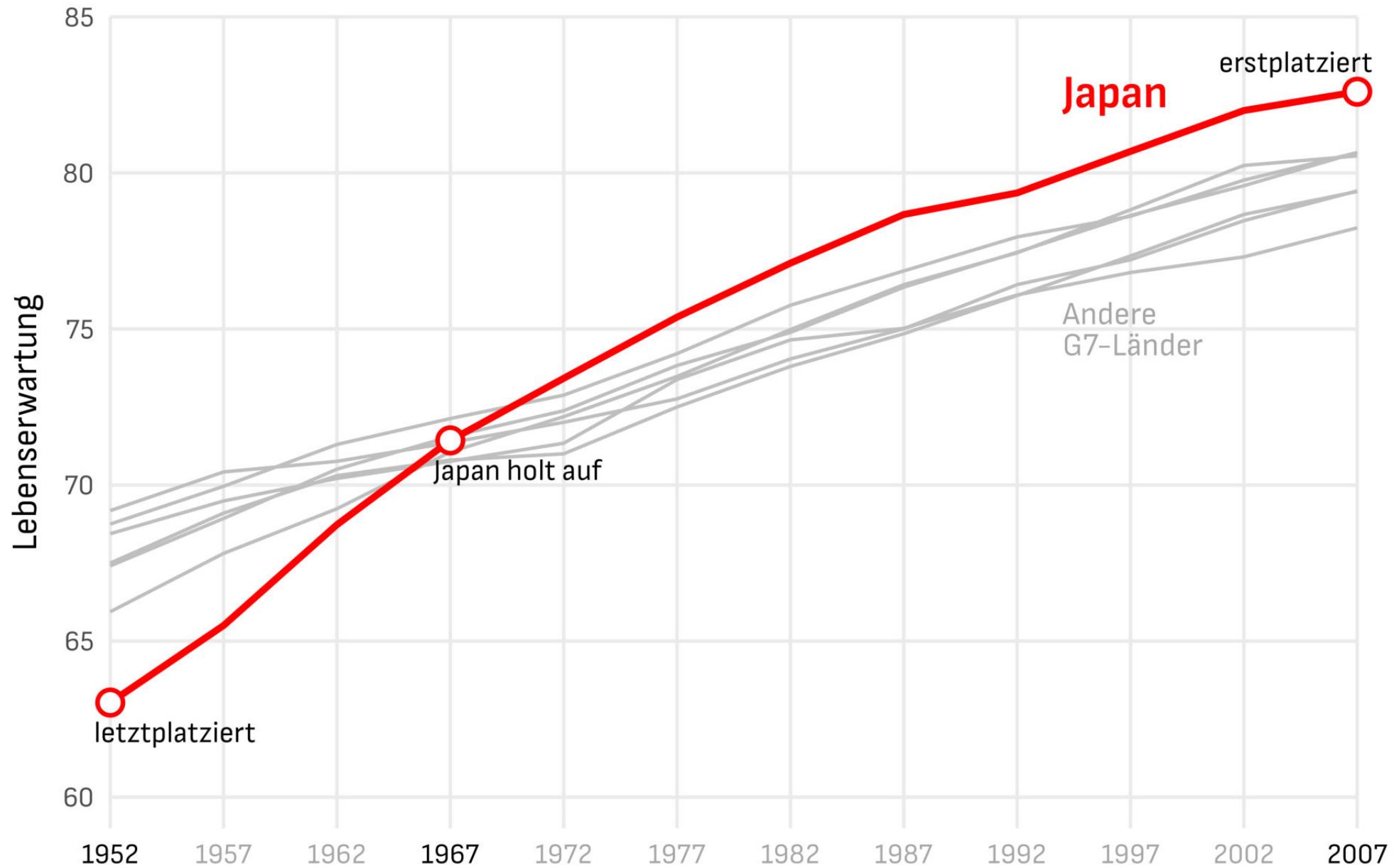


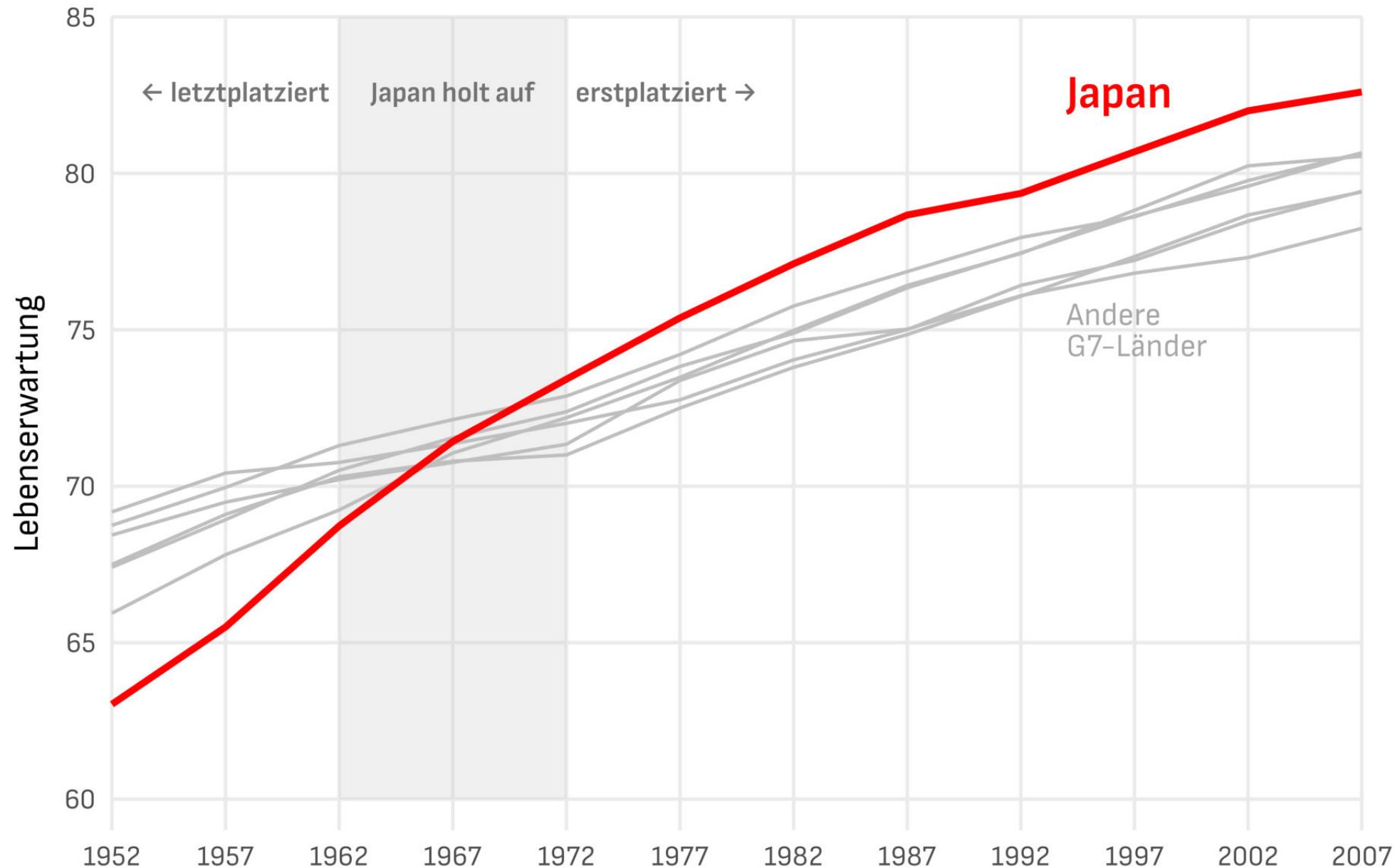
Zeitreihen mit Anmerkungen von William Playfair aus "The Commercial and Political Atlas and Statistical Breviary" (1786)

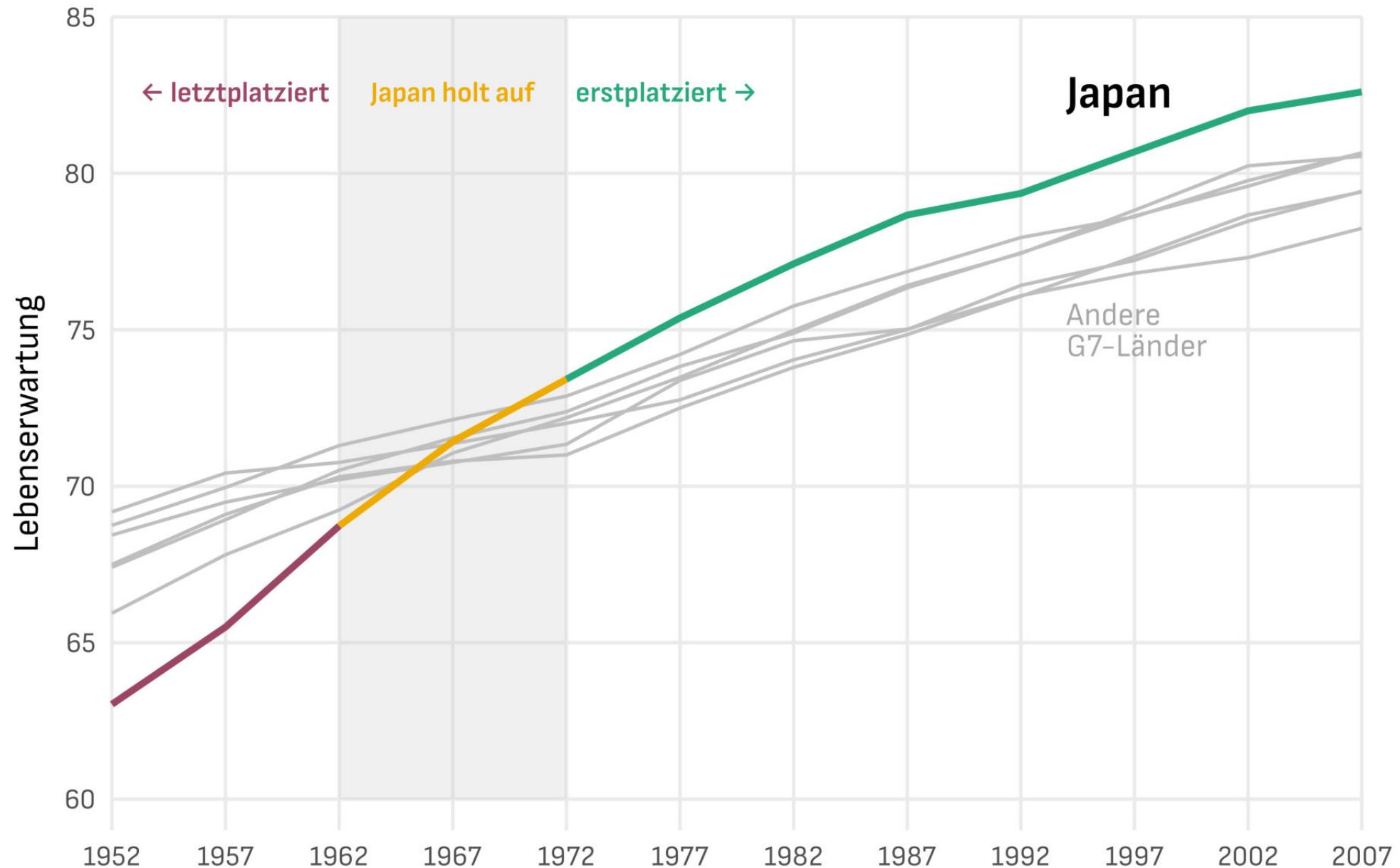


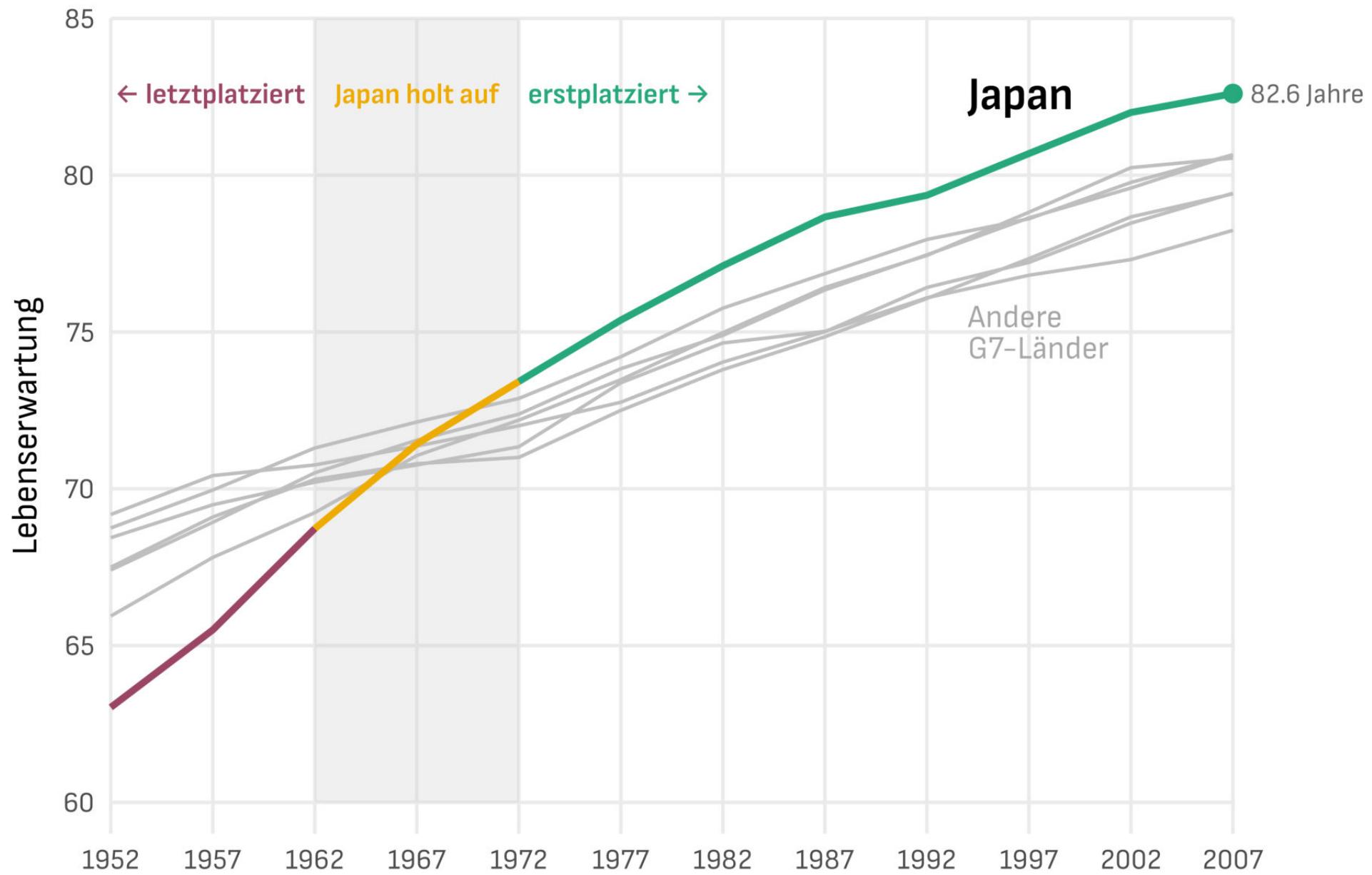


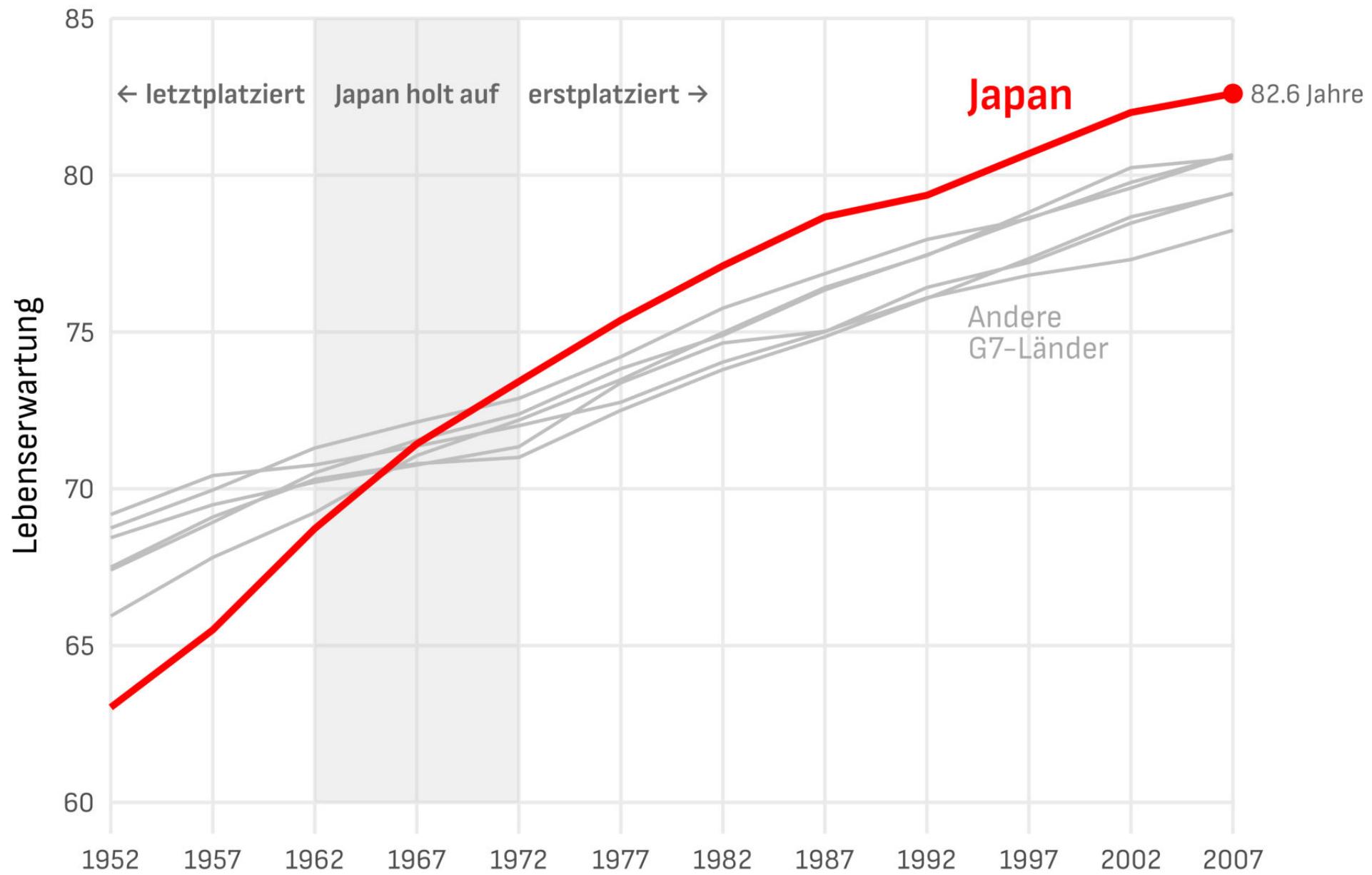


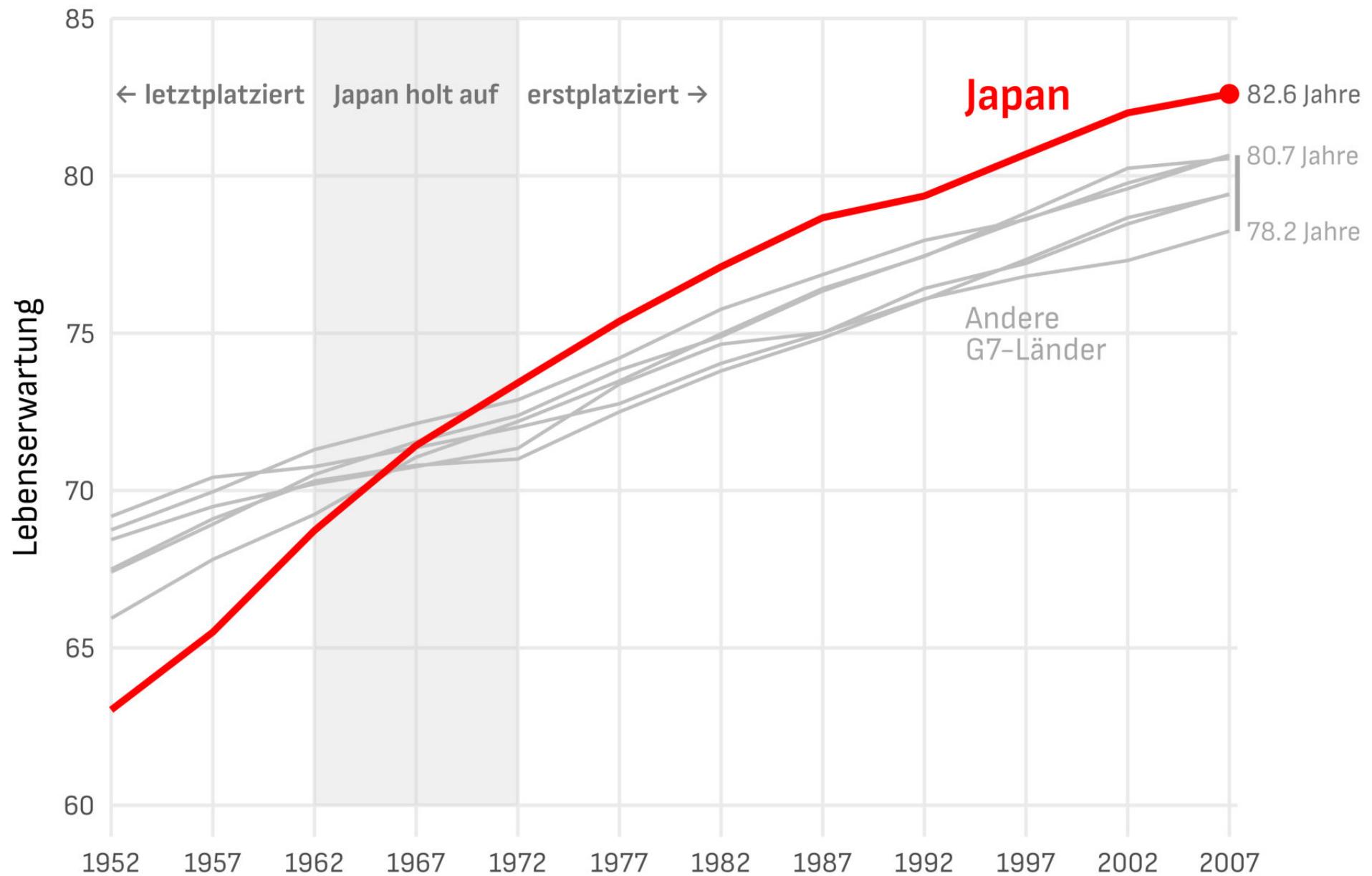




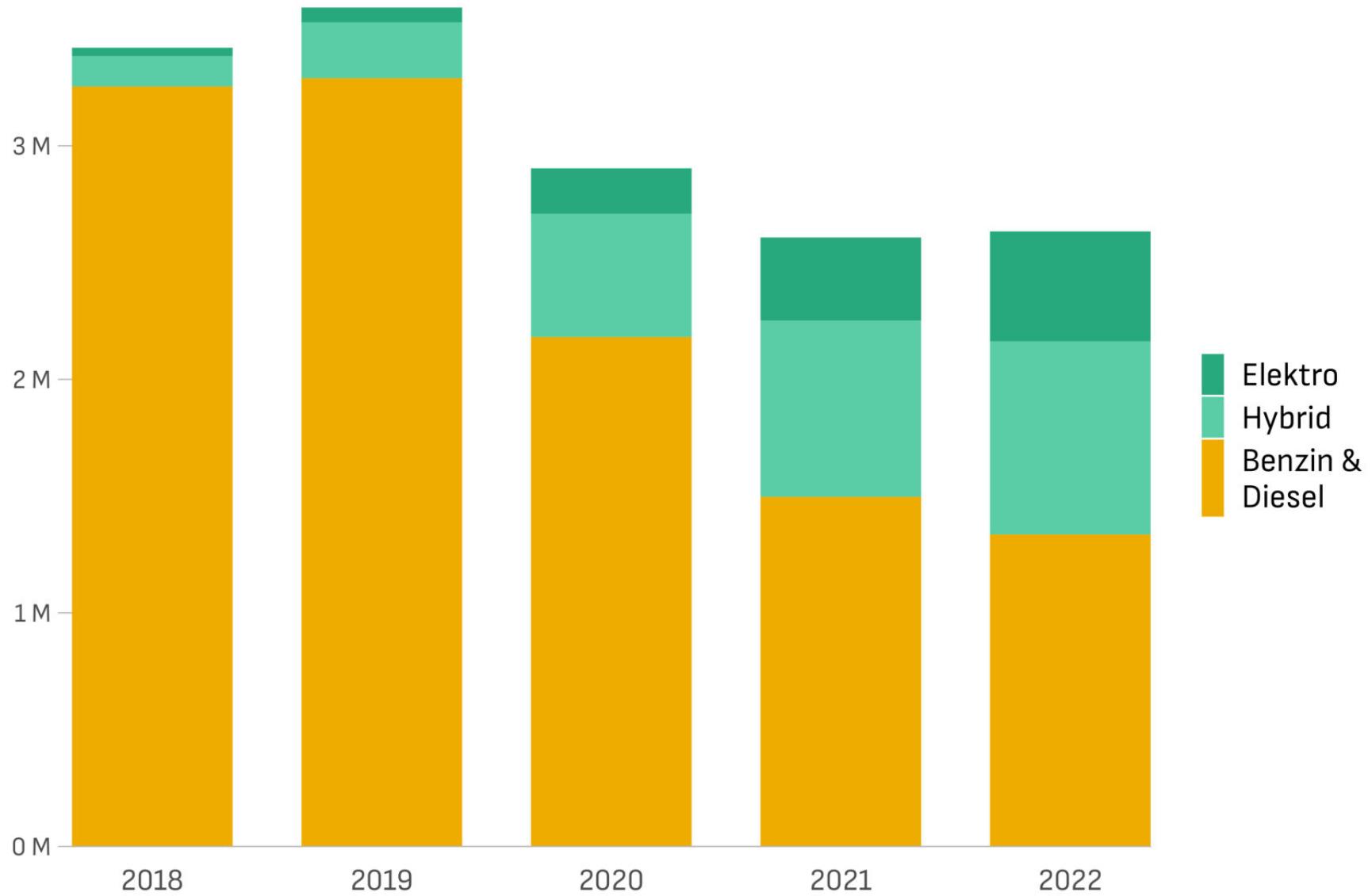








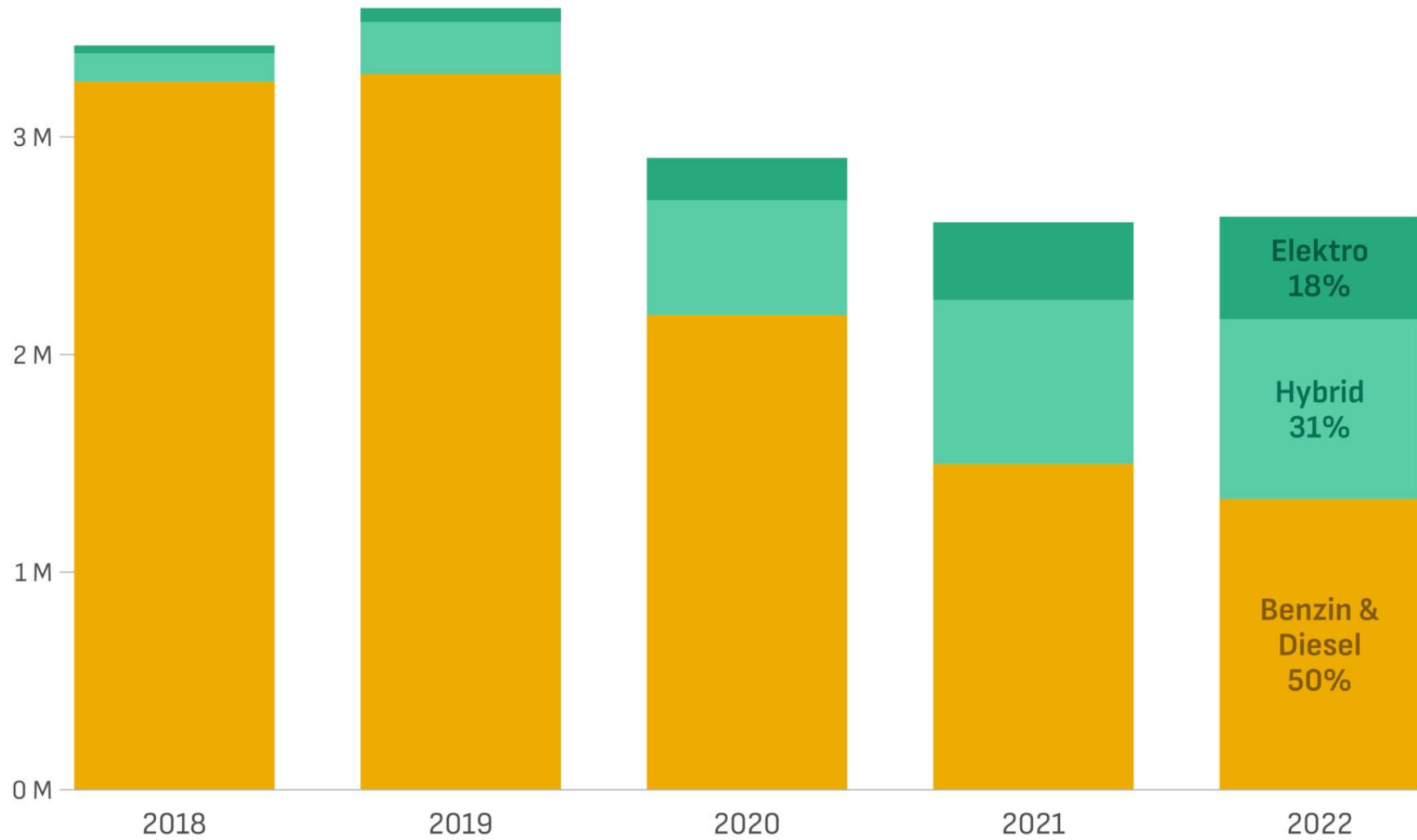
# Pkw-Neuzulassungen in Deutschland



Daten: Kraftfahrt-Bundesamt • Grafik: Cédric Scherer



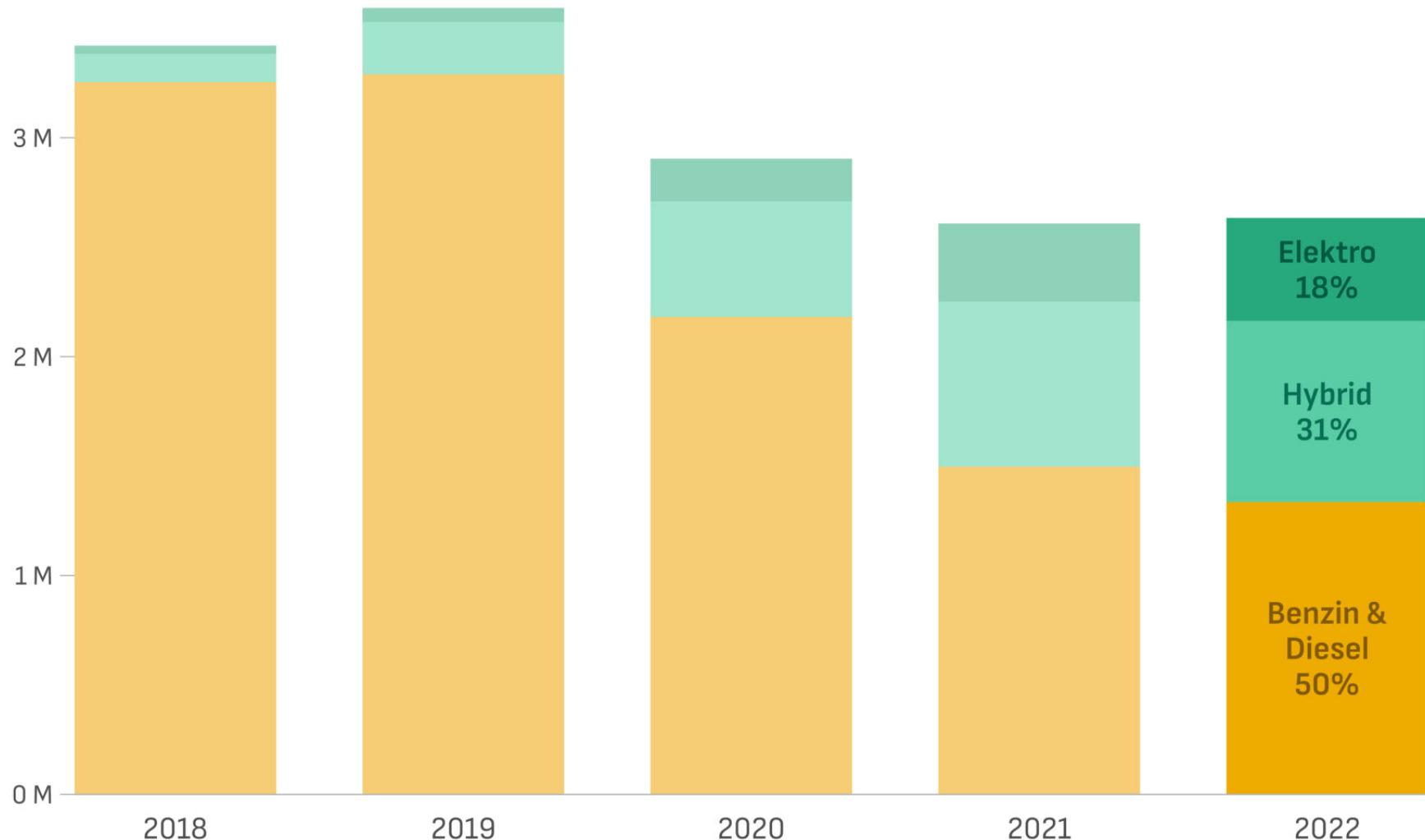
Im Jahr 2022 machen Benzin- und Dieselfahrzeuge nur die Hälfte aller Neuzulassungen in Deutschland aus – Hybrid- und Elektrofahrzeuge setzen ihren Anstieg fort.



Daten: Kraftfahrt-Bundesamt • Grafik: Cédric Scherer



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Daten: Kraftfahrt-Bundesamt • Grafik: Cédric Scherer



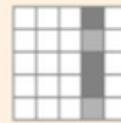
## The Brexit banking matrix: The contenders lining up for London's crown

Bank

Branch

Other\*

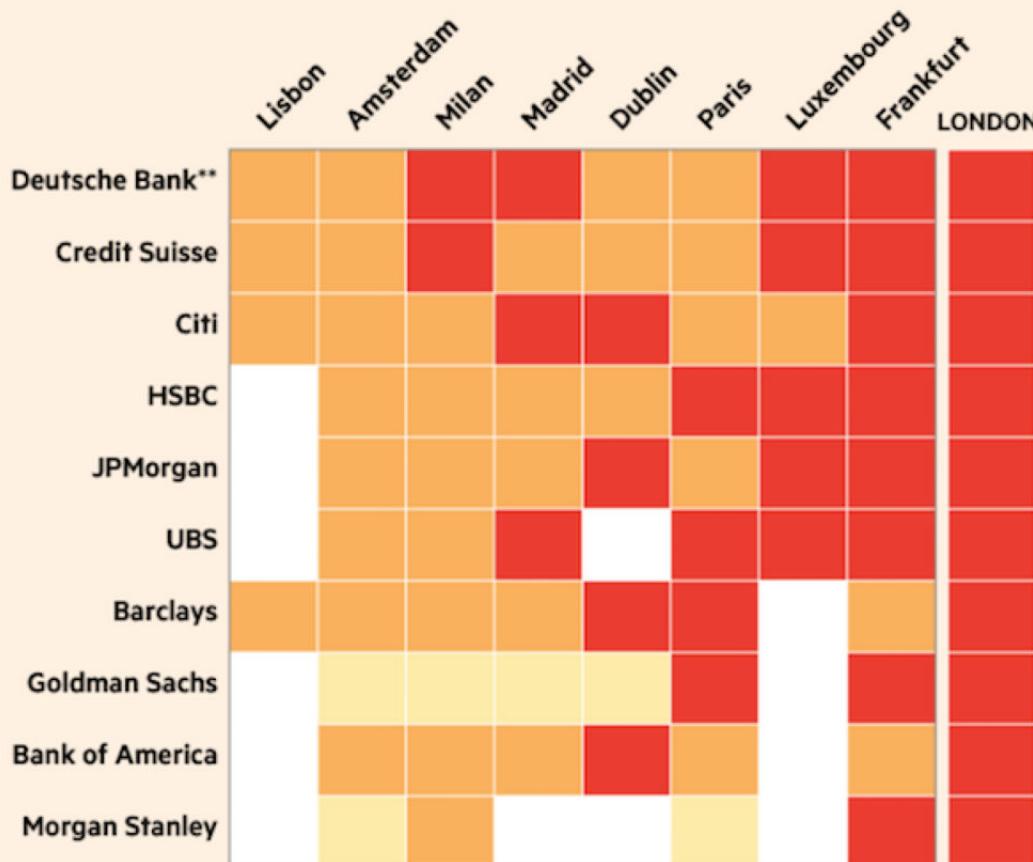
The highest level  
of presence in  
each city



Darker columns  
indicate strong  
presence in  
a city



Darker rows  
indicate broad  
presence of  
a bank



\* Broker dealer branches are included for Morgan Stanley and Goldman Sachs as they are a significant part of their European network

\*\* Deutsche Bank has a London subsidiary but its main entity is a branch

FT graphic Alan Smith, Laura Noonan Source: FT research

FT

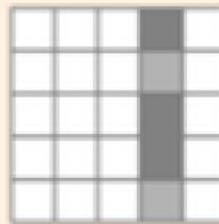
"Frankfurt vies for UK banking jobs post-Brexit" von Alan Smith & Laura Noonan (Financial Times)



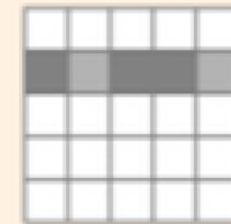
## The Brexit banking matrix: The contenders lining up for London's crown

Bank  
Branch  
Other\*

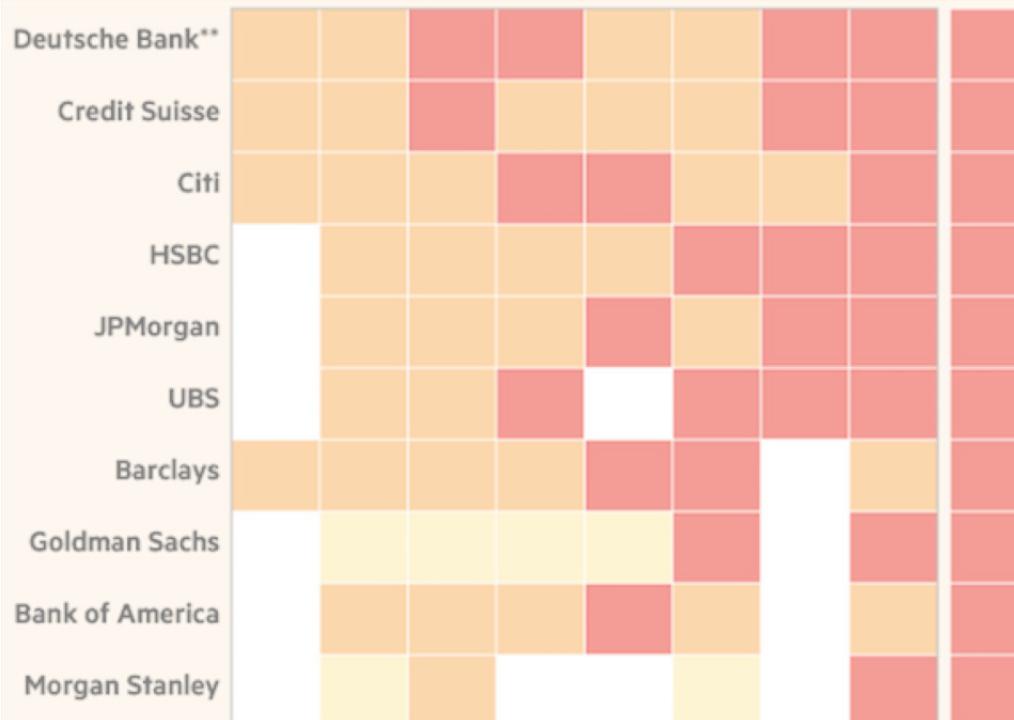
The highest level of presence in each city



Darker columns indicate strong presence in a city



Darker rows indicate broad presence of a bank



\* Broker dealer branches are included for Morgan Stanley and Goldman Sachs as they are a significant part of their European network

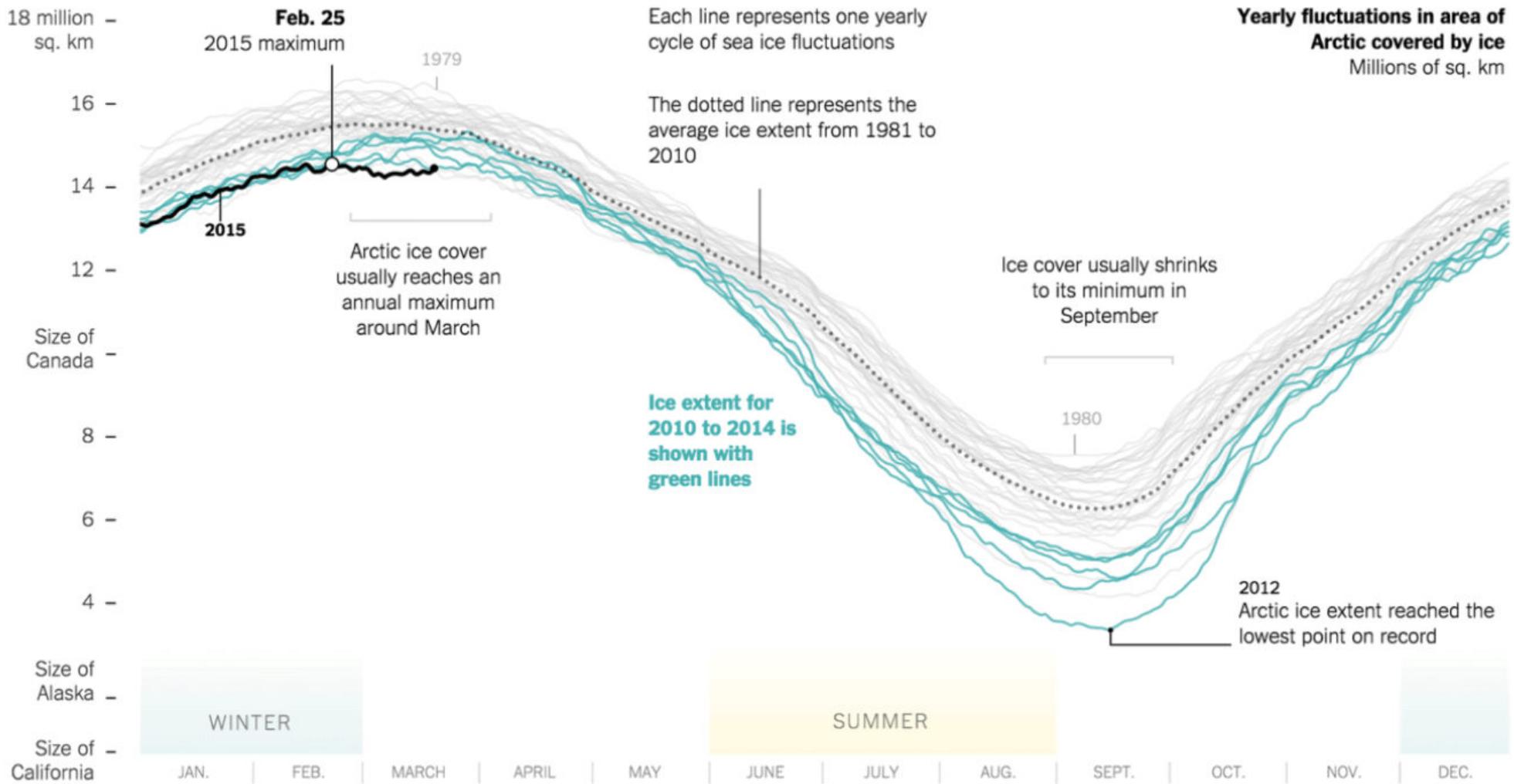
\*\* Deutsche Bank has a London subsidiary but its main entity is a branch

FT graphic Alan Smith, Laura Noonan Source: FT research

FT

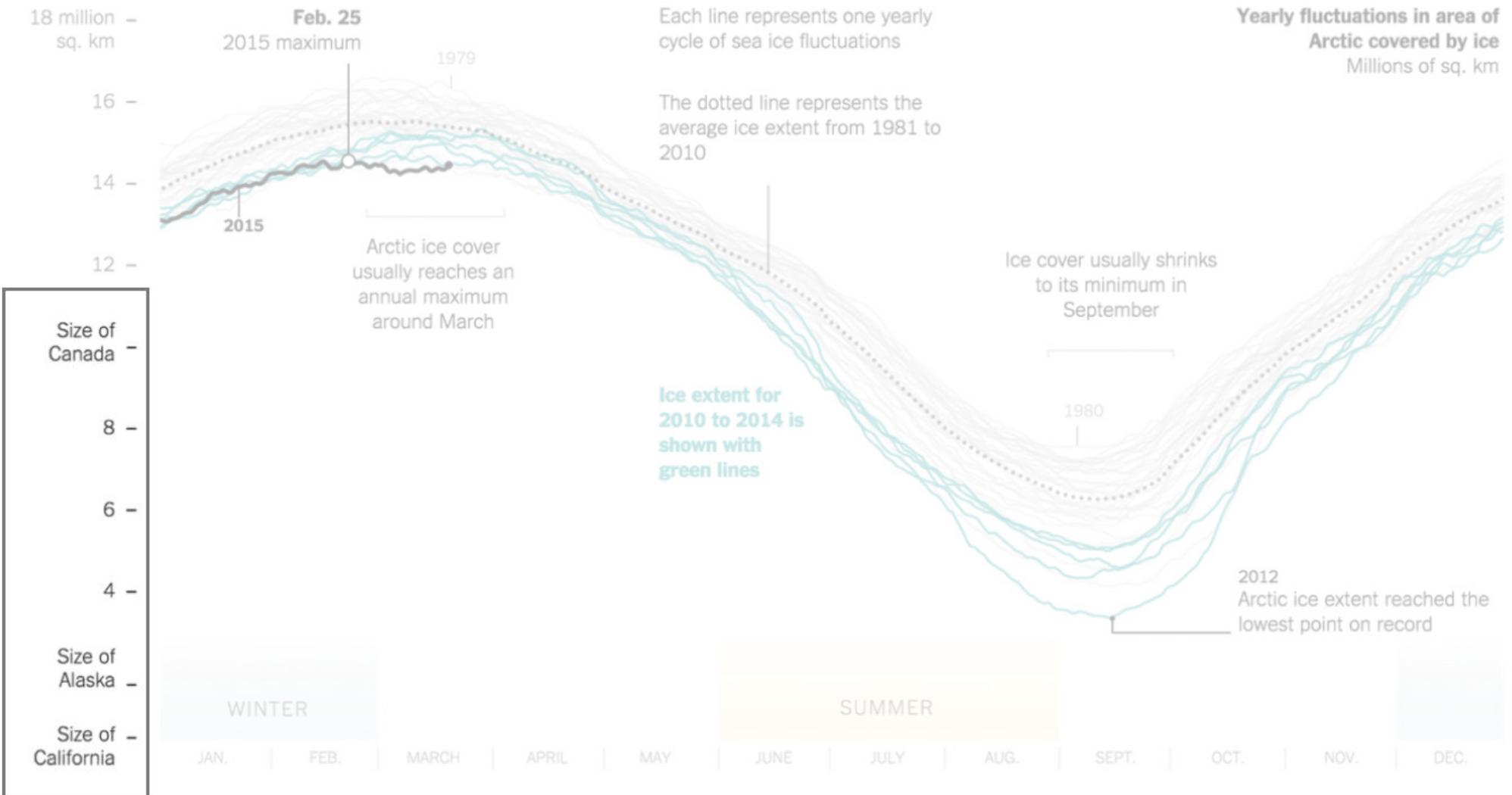
"Frankfurt vies for UK banking jobs post-Brexit" von Alan Smith & Laura Noonan (Financial Times)





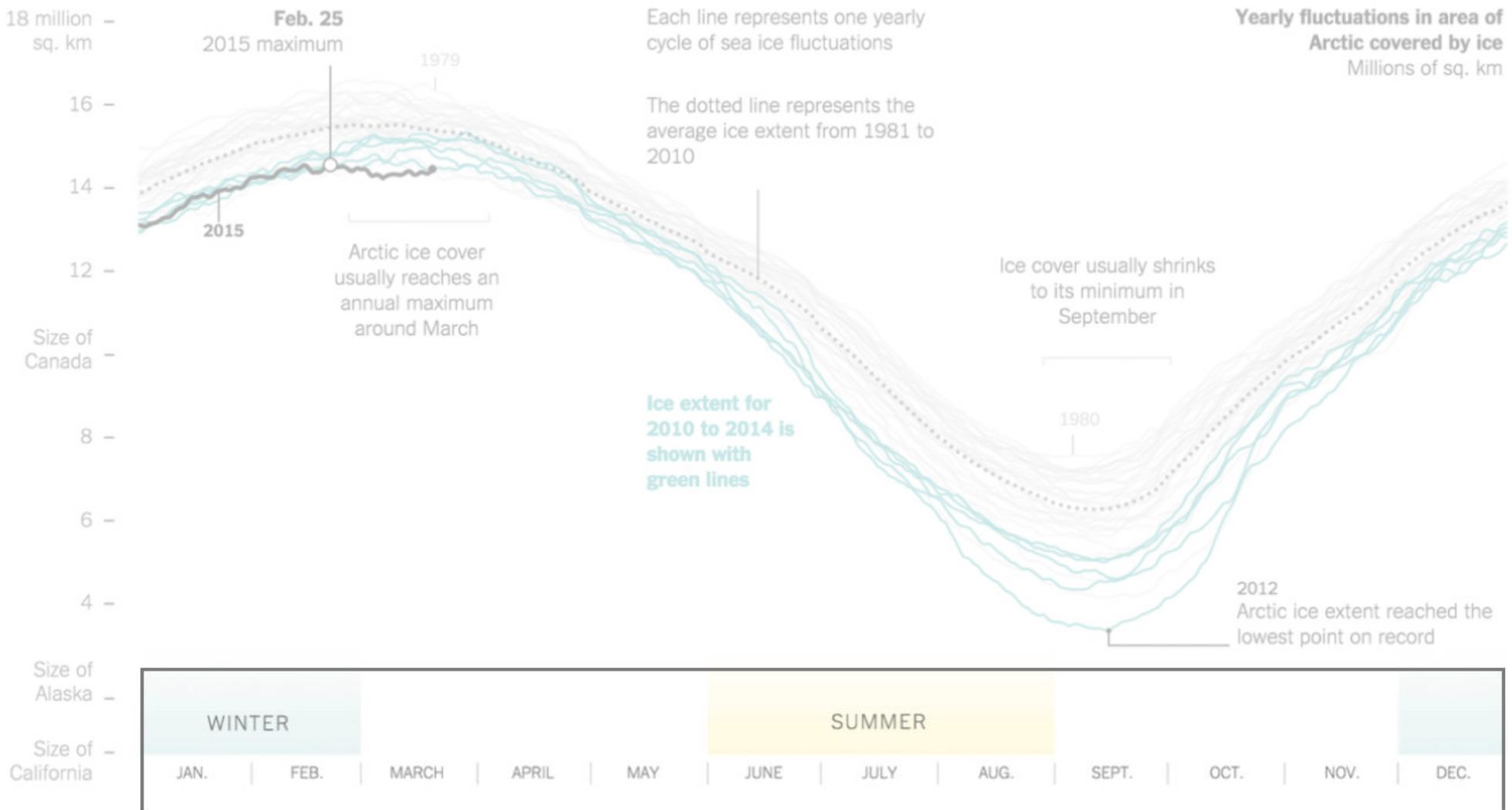
"Yearly Fluctuations in Area of Arctic Covered by Ice" von Derek Watkins (New York Times)





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# 100 Years of Streamflow Droughts

These are the 1000 most severe streamflow droughts at gages from 1920 to 2020 by region and decade.

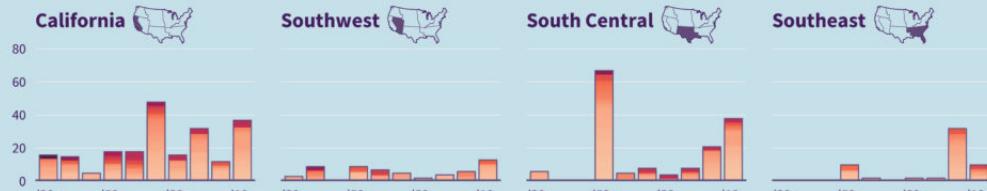
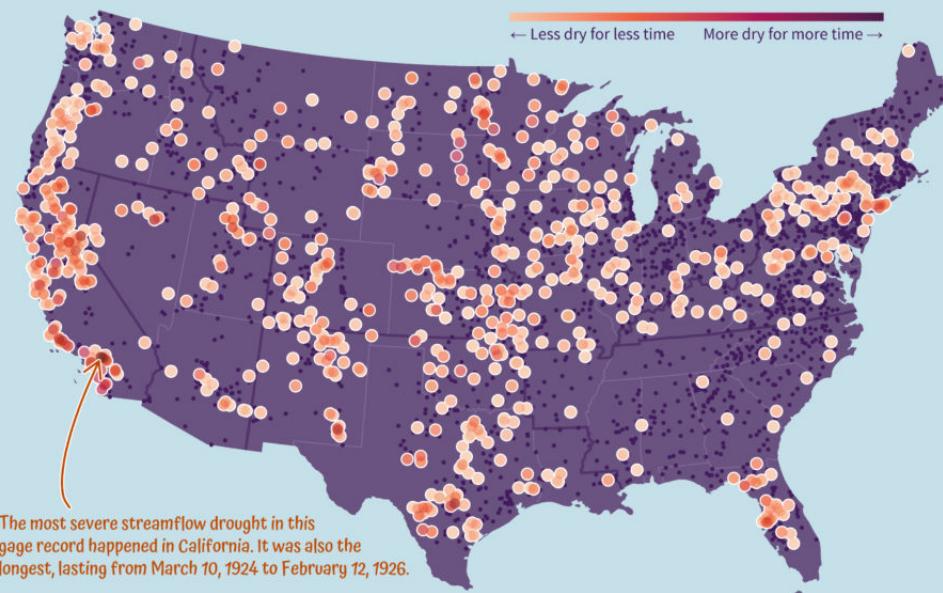


Chart by Cédric Scherer. Data based on streamflow gage records from 3,196 gages (purple dots) assessed from 1920 to 2020: <https://doi.org/10.5066/P92FAASD>. Colored points represent gages with the most severe streamflow droughts, which were defined with 2% variable 7-day thresholds.

"100 Years of Streamflow Drought", in Kollaboration mit United States Geological Survey (USGS)



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These are the 1000 most severe streamflow droughts at gages from 1920 to 2020 by region and decade.

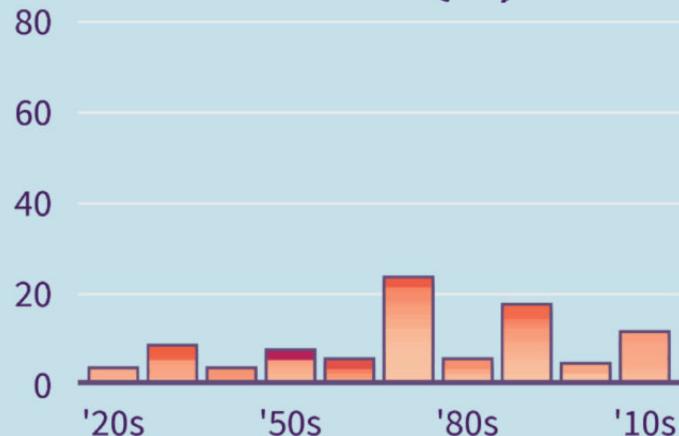
Northwest 

North Central 

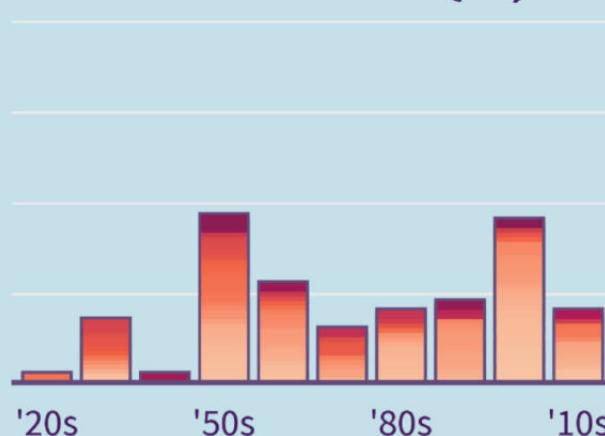
Midwest 

Northeast 

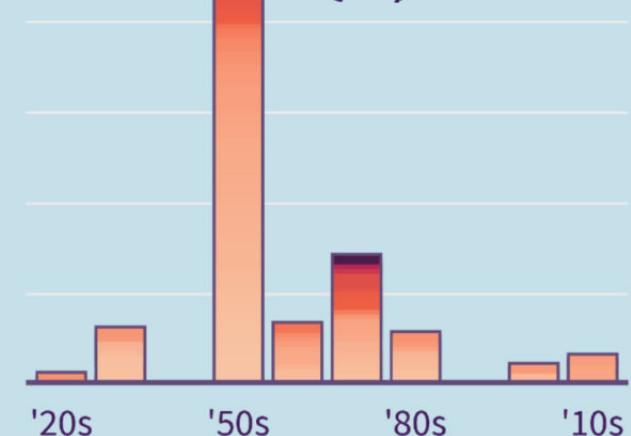
## Northwest



## North Central



## Midwest



The most severe streamflow drought in this gage record happened in California. It was also the longest, lasting from March 10, 1924 to February 12, 1926.

California 

Southwest 

South Central 

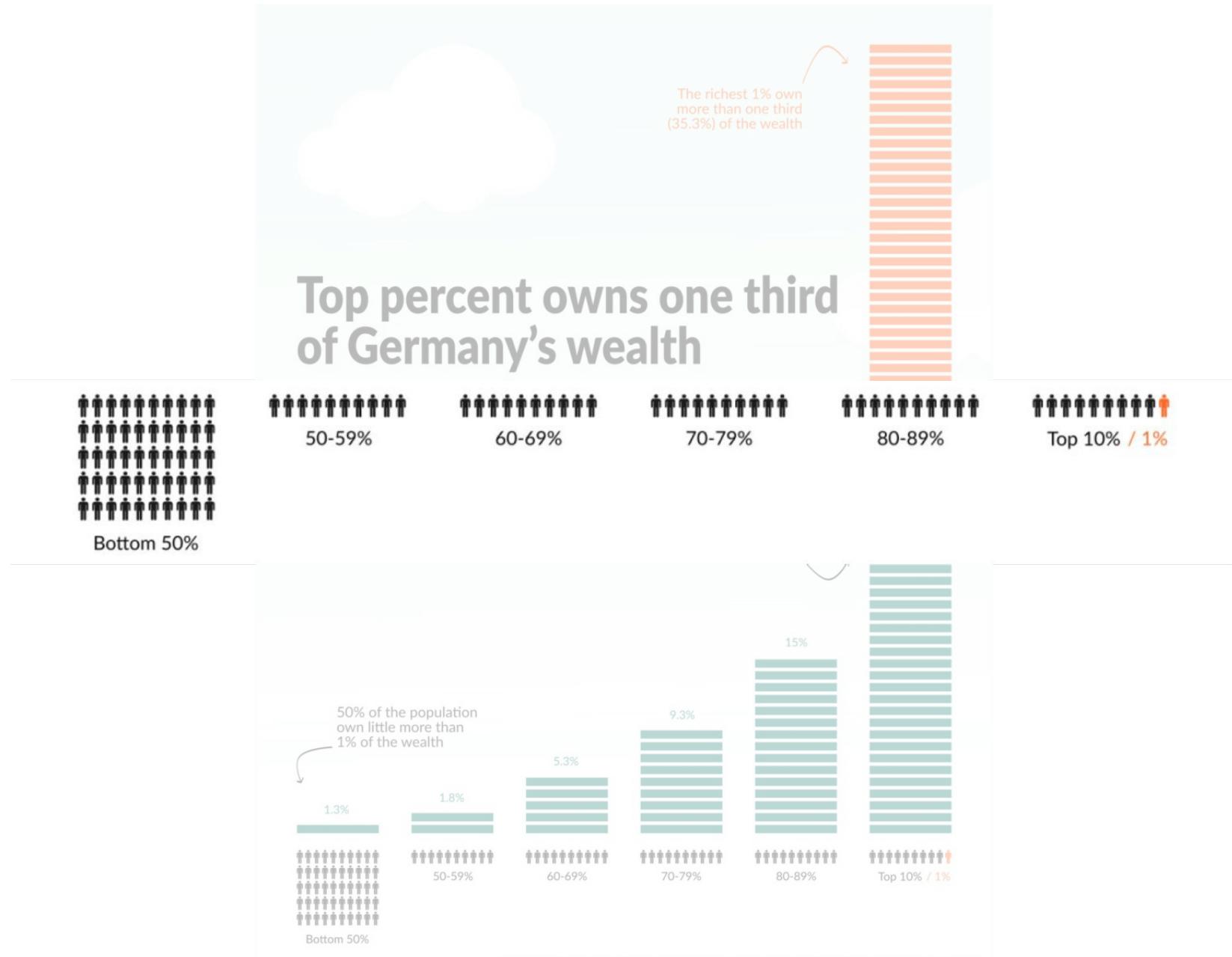
Southeast 



Chart by Cédric Scherer. Data based on streamflow gage records from 3,196 gauges (purple dots) assessed from 1920 to 2020: <https://doi.org/10.5066/P92FAASD>. Colored points represent gages with the most severe streamflow droughts, which were defined with 2% variable 7-day thresholds.

"100 Years of Streamflow Drought", in Kollaboration mit United States Geological Survey (USGS)





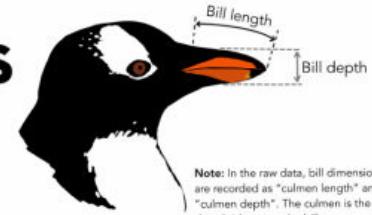
Quelle: Jan Kühn



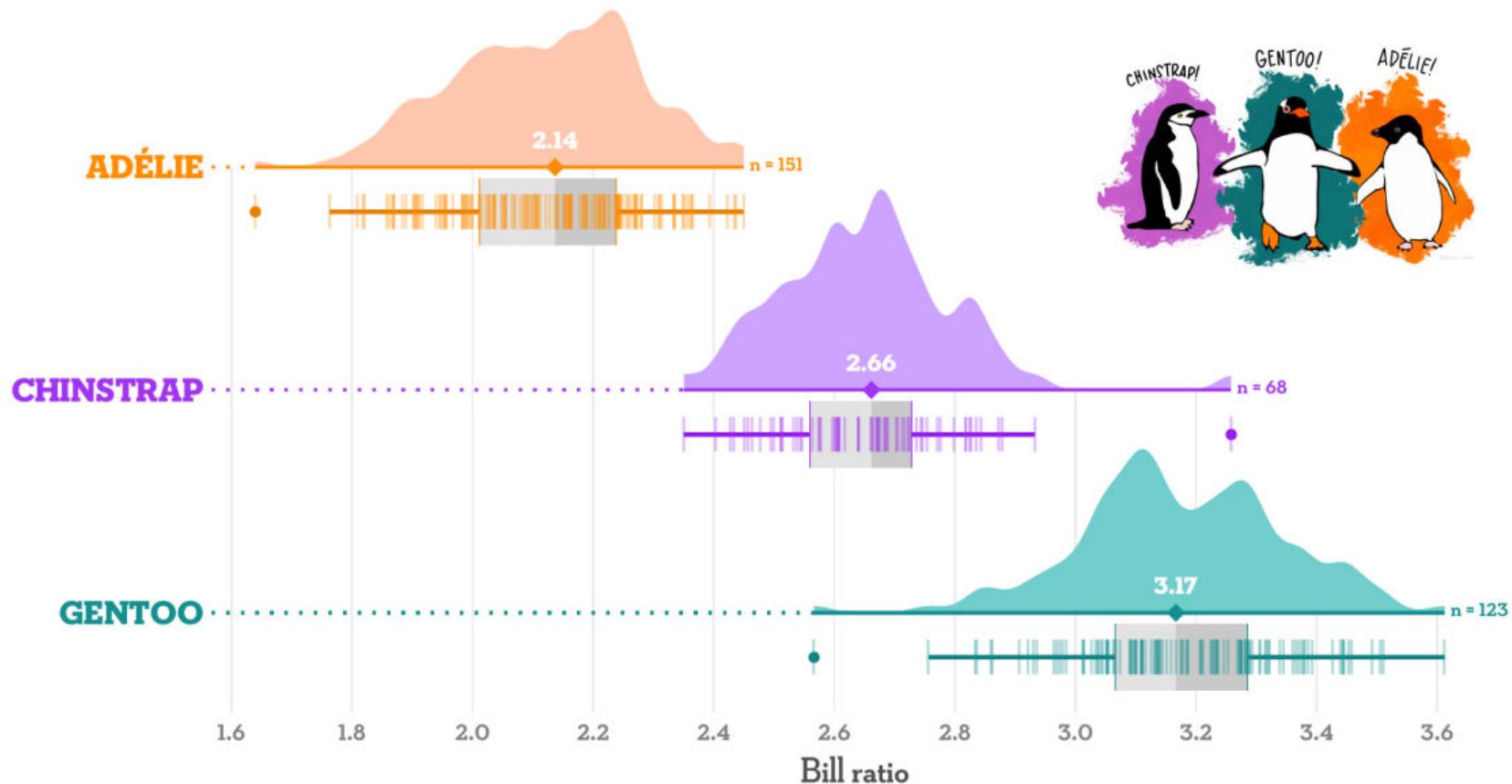
# BILL DIMENSIONS OF BRUSH-TAILED PENGUINS

*Pygoscelis adélieae* (Adélie penguin) • *P. antarctica* (Chinstrap penguin) • *P. papua* (Gentoo penguin)

Distribution of the bill ratio, estimated as bill length divided by bill depth



Note: In the raw data, bill dimensions are recorded as "culmen length" and "culmen depth". The culmen is the dorsal (upper) ridge of a bird's bill.



Note: In the original data, bill dimensions are recorded as "culmen length" and "culmen depth". The culmen is the dorsal (upper) ridge of a bird's bill.  
Visualization: Cédric Scherer • Data: Gorman, Williams & Fraser (2014) DOI: 10.1371/journal.pone.0090081 • Illustrations: Allison Horst

"Bill Dimensions of Brush-tailed Penguins" (modifiziert) | Illustration: Allison Horst



# Not my cup of coffee...

Each dot depicts one coffee bean rated by Coffee Quality Institute's trained reviewers. In addition, the multiple interval stripes show where 25%, 50%, 95%, and 100% of the beans fall along the rating gradient from 0 to 100 points. The rated coffee beans range from 59.8 points (Guatemala) to 89.9 (Ethiopia). Only countries of origin with 25 or more tested beans are shown. The red empty triangle marks the minimum rating, the black filled triangle indicates each country's median score.

Visualization by Cédric Scherer

60 POINTS

70 POINTS

80.3 POINTS

86.1 POINTS

The best coffee—in terms of both median and maximum rating—is shipped to you from Ethiopia!

GUATEMALA

△ 50.8 POINTS  
The coffee bean with the lowest rating has its origin in Guatemala.



One bean from Nicaragua got a bad rating, too.

NICARAGUA

△ 63.1 POINTS

HONDURAS

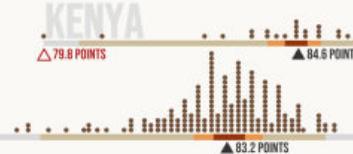
MEXICO

△ 69.2 POINTS

△ 68.3 POINTS

Cédric Scherer // Data Visualization & Information Design

COLOMBIA



ETHIOPIA

△ 80.3 POINTS

△ 86.1 POINTS

KENYA

△ 79.8 POINTS

△ 84.6 POINTS

UGANDA

△ 80.5 POINTS

△ 83.2 POINTS

COSTA RICA

△ 71.8 POINTS

80 POINTS

90 POINTS

HAWAII

△ 73.7 POINTS

△ 82.8 POINTS

BRAZIL

△ 73.2 POINTS

△ 82.4 POINTS

TANZANIA

△ 80.3 POINTS

△ 82.2 POINTS

TAIWAN

△ 77.7 POINTS

△ 81.9 POINTS

With 218 tested beans,  
Mexico is the country with  
the most reviews.

HONDURAS

△ 81.7 POINTS

△ 81.6 POINTS

With 218 tested beans,  
Mexico is the country with  
the most reviews.

MEXICO

△ 80.8 POINTS

△ 80.8 POINTS

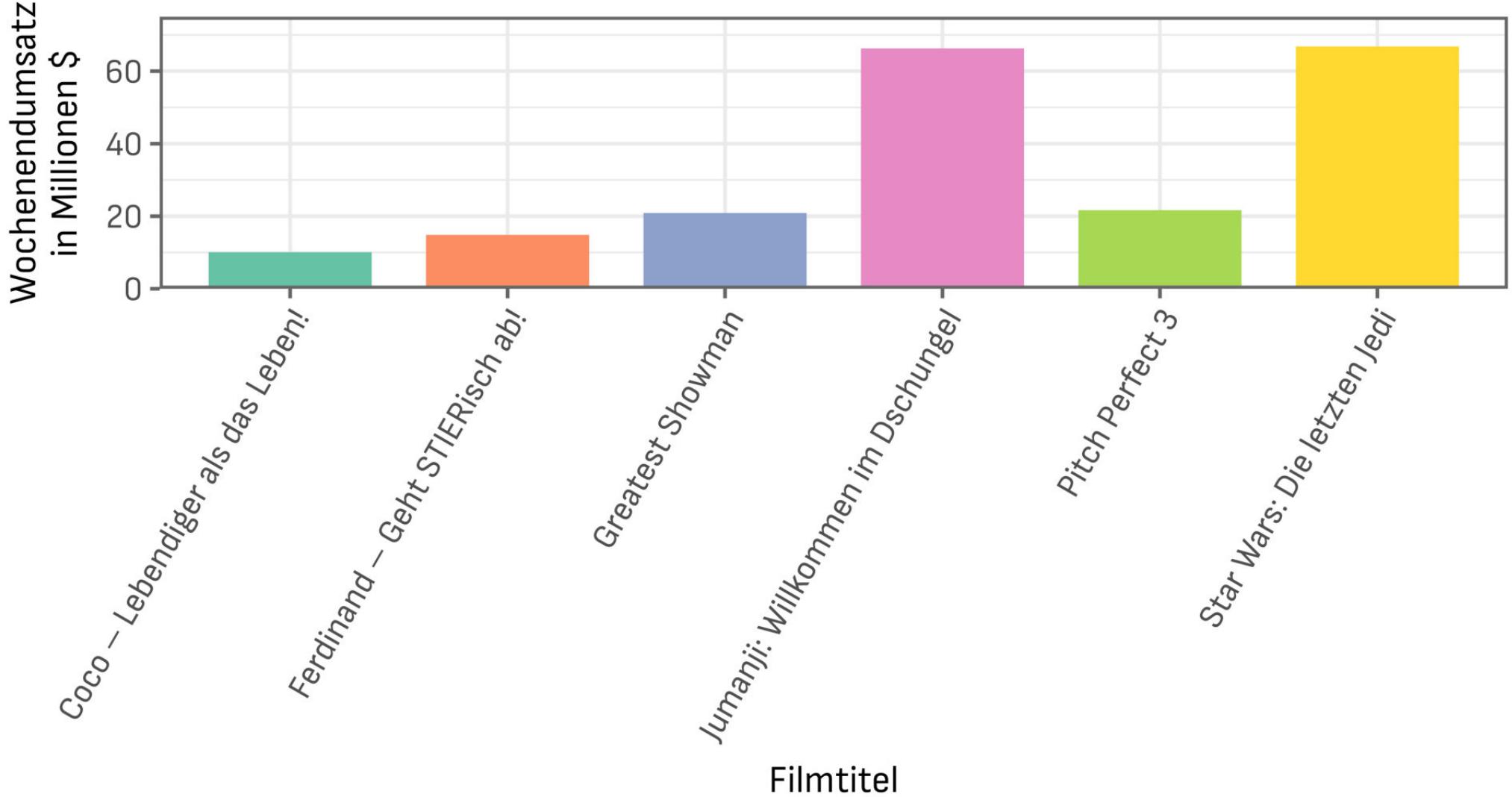
"Not my Cup of Coffee"

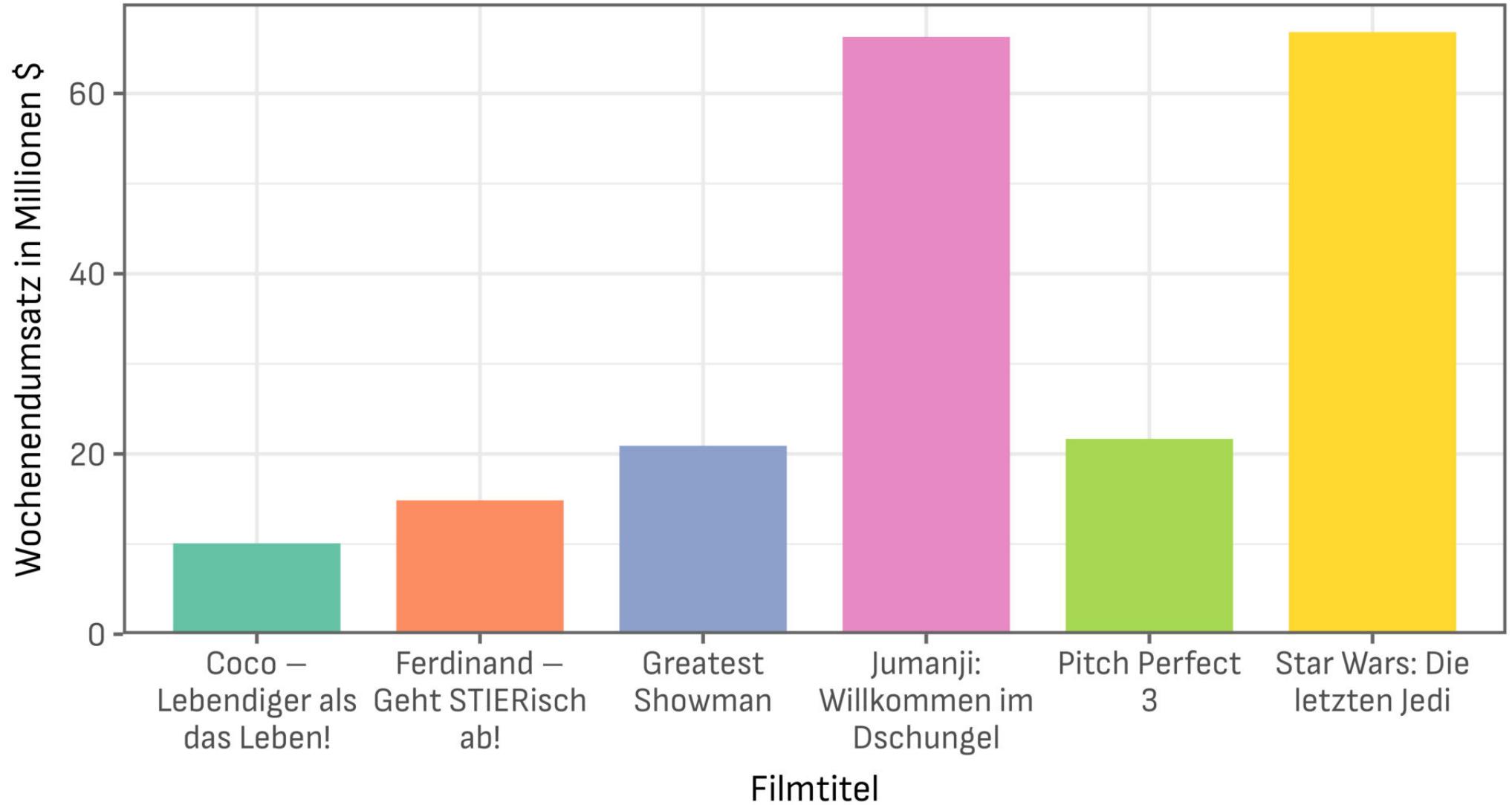


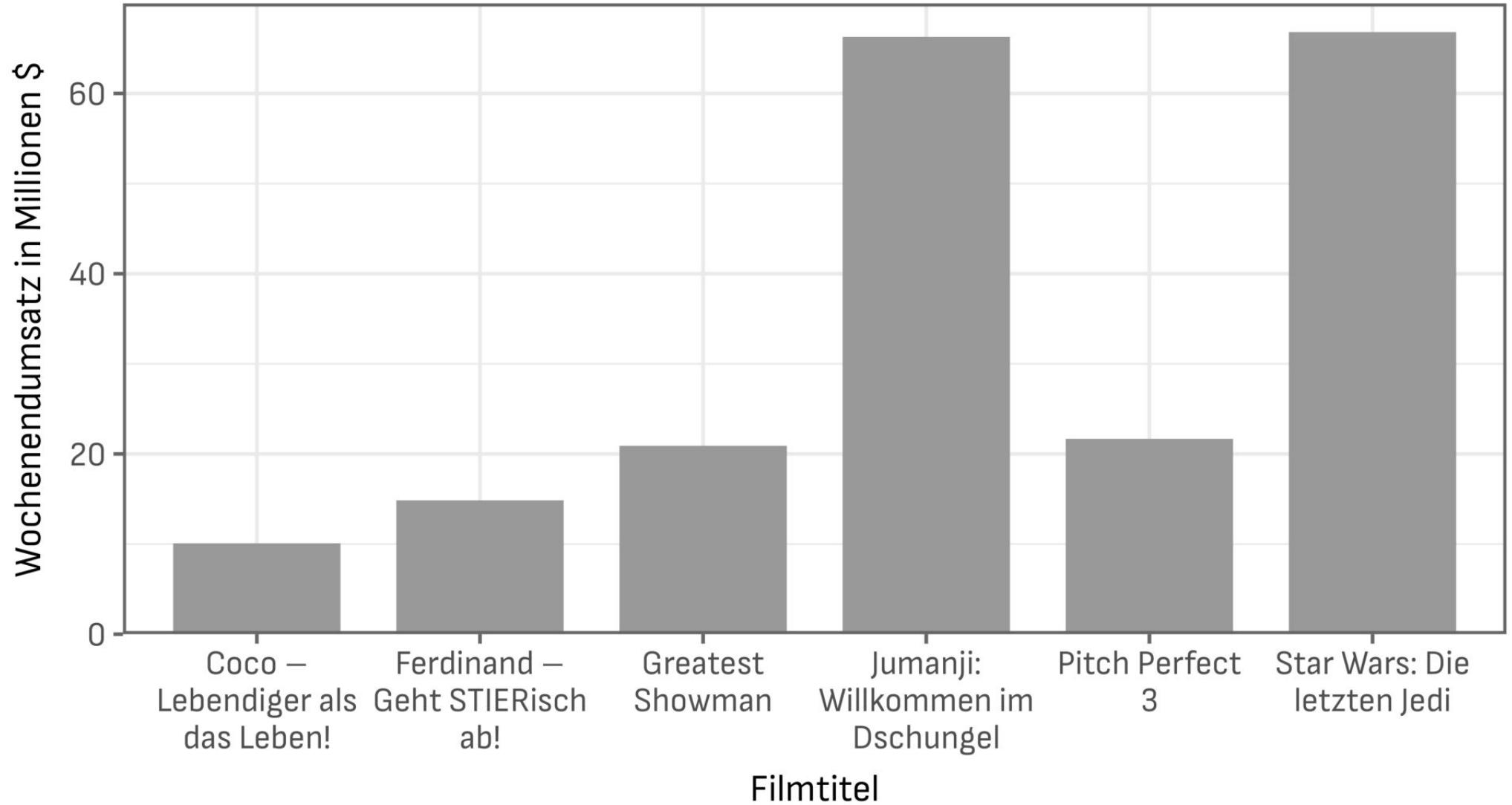
# Designing Charts

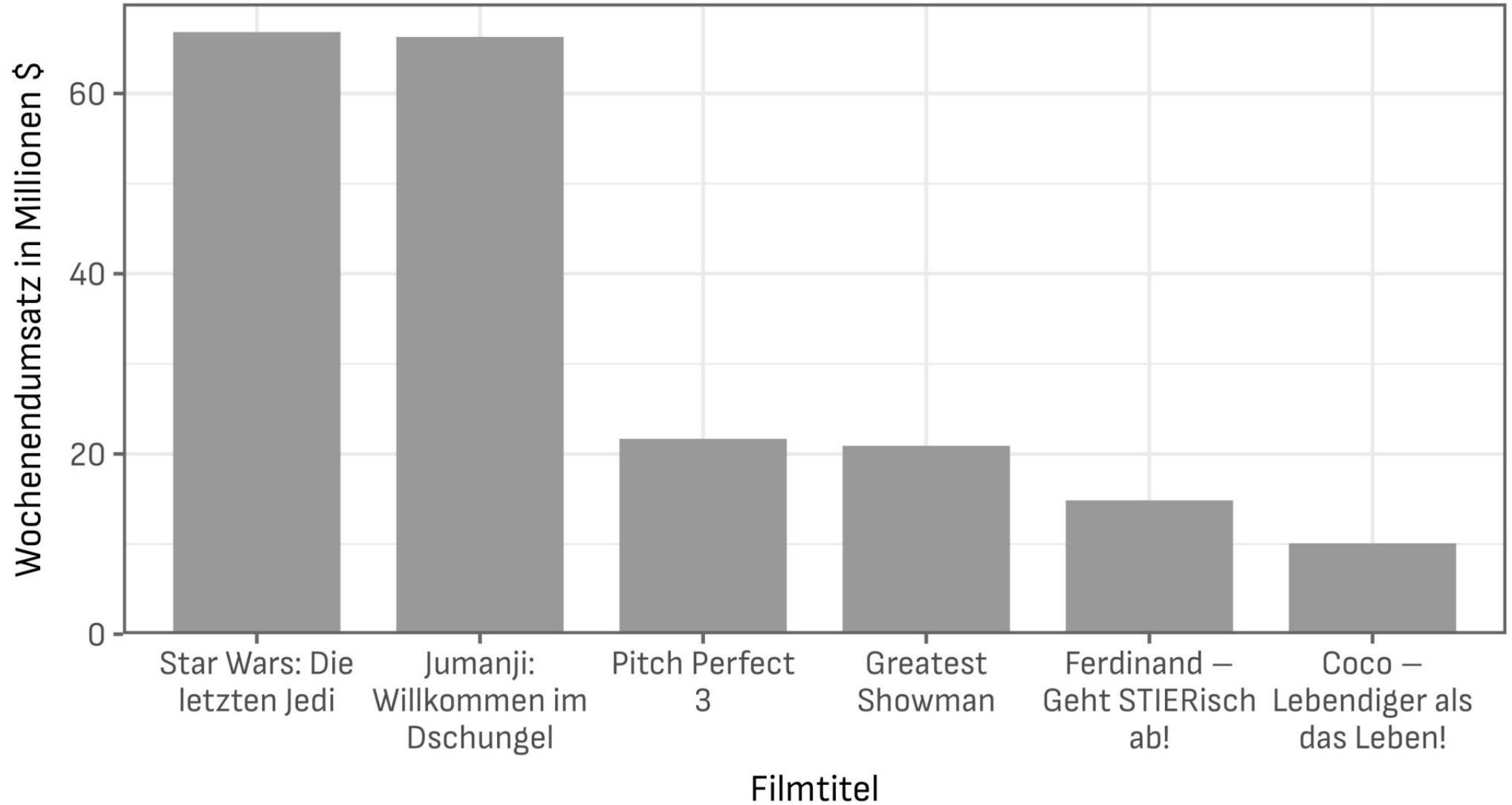
## Ein illustrierendes Beispiel

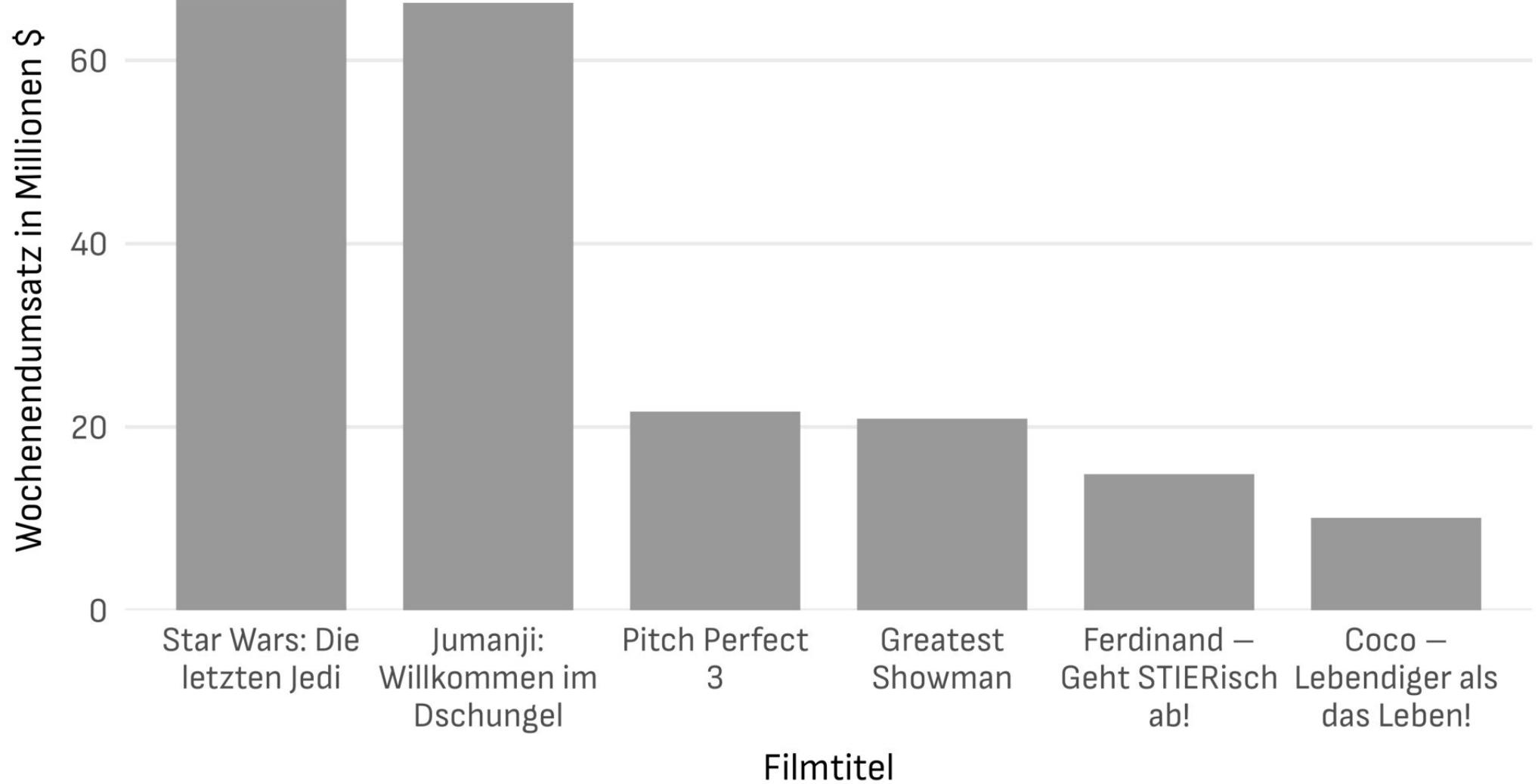


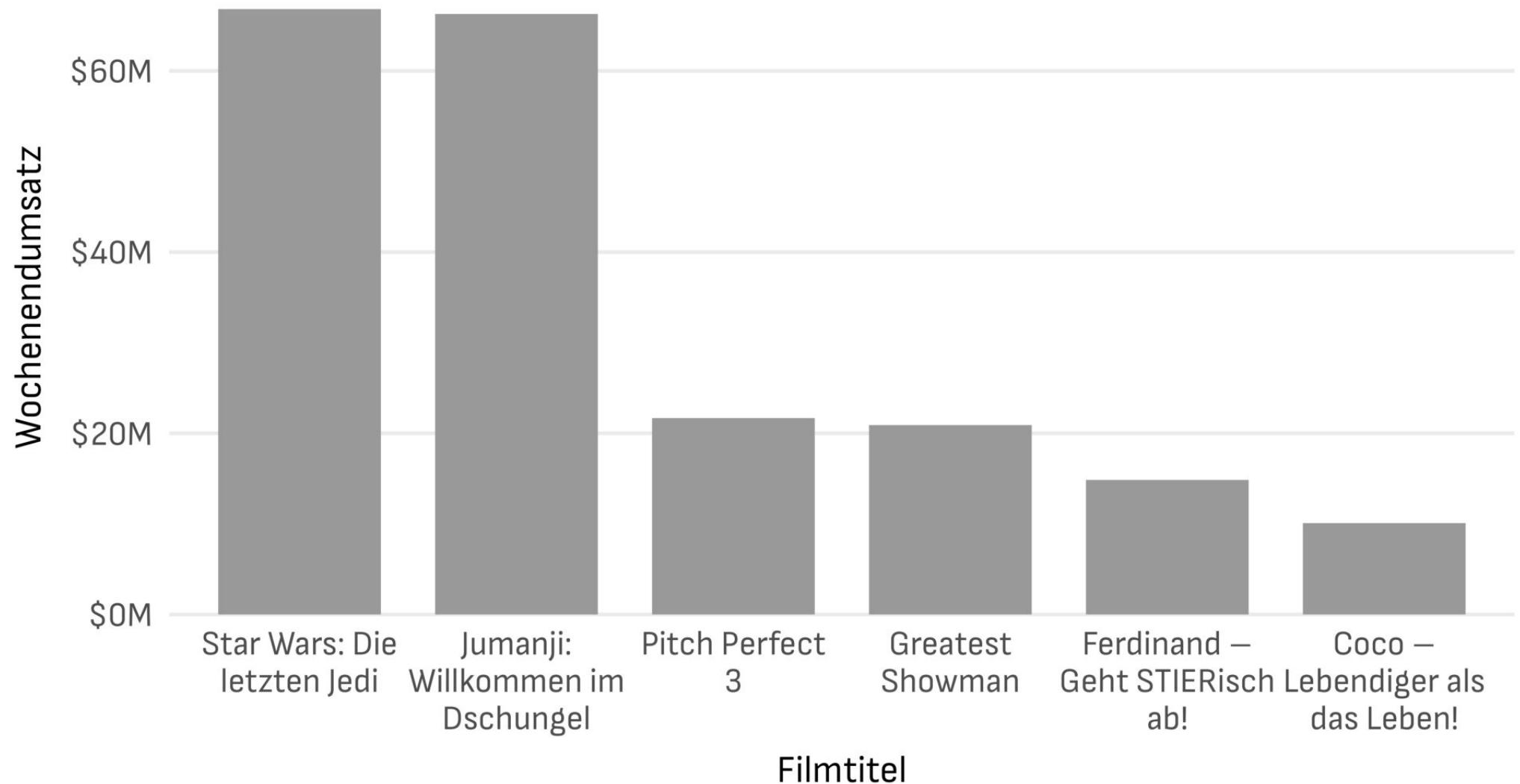




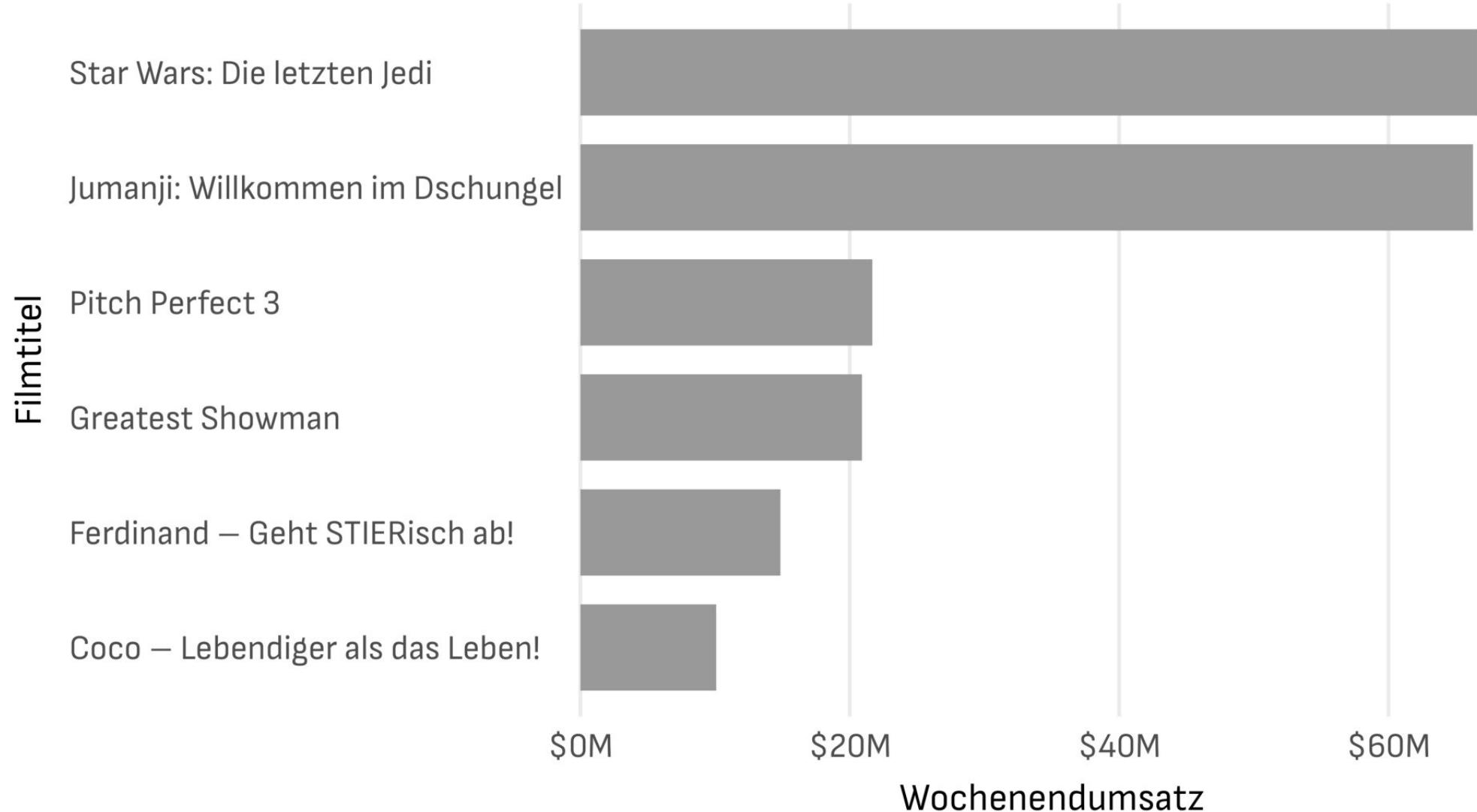


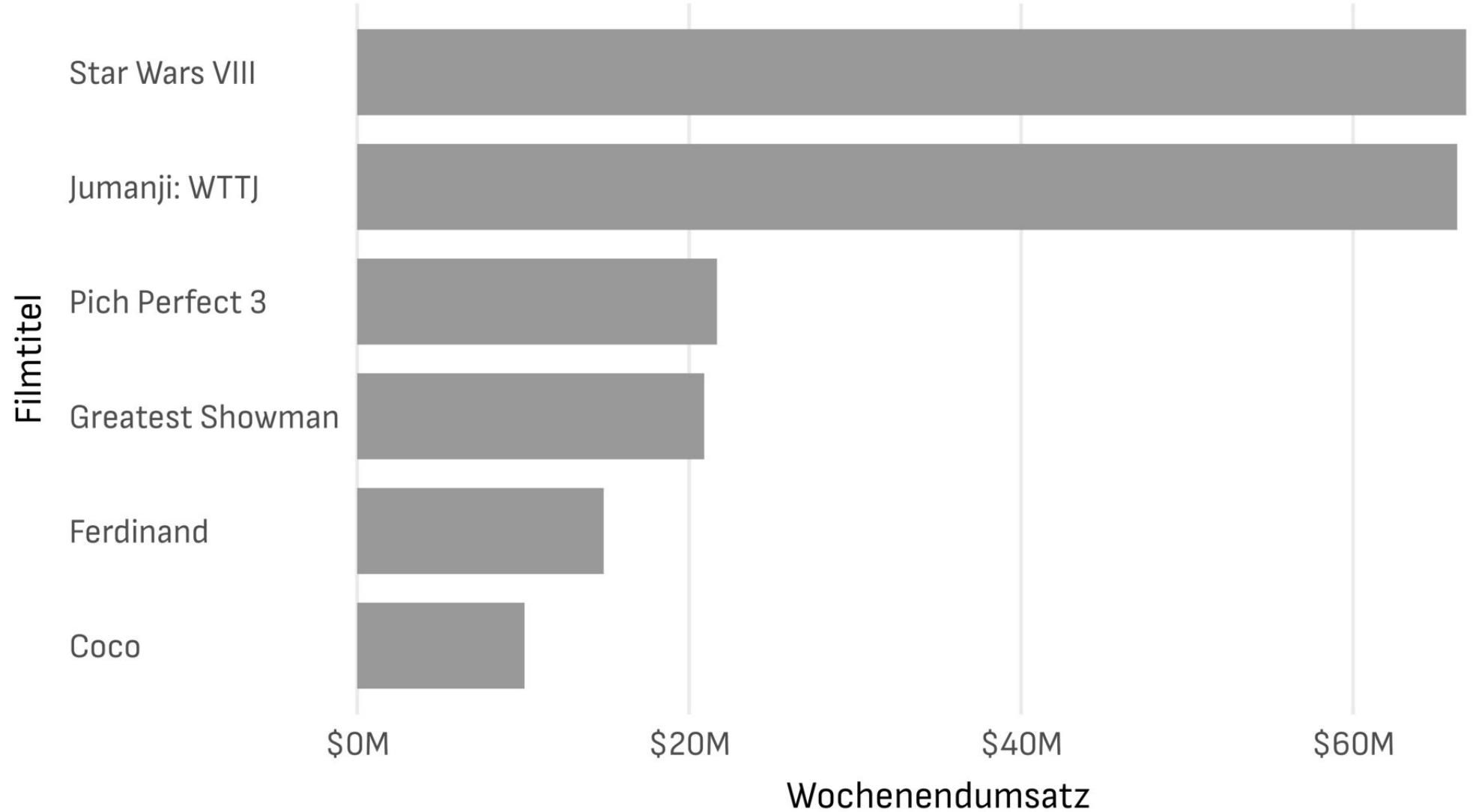


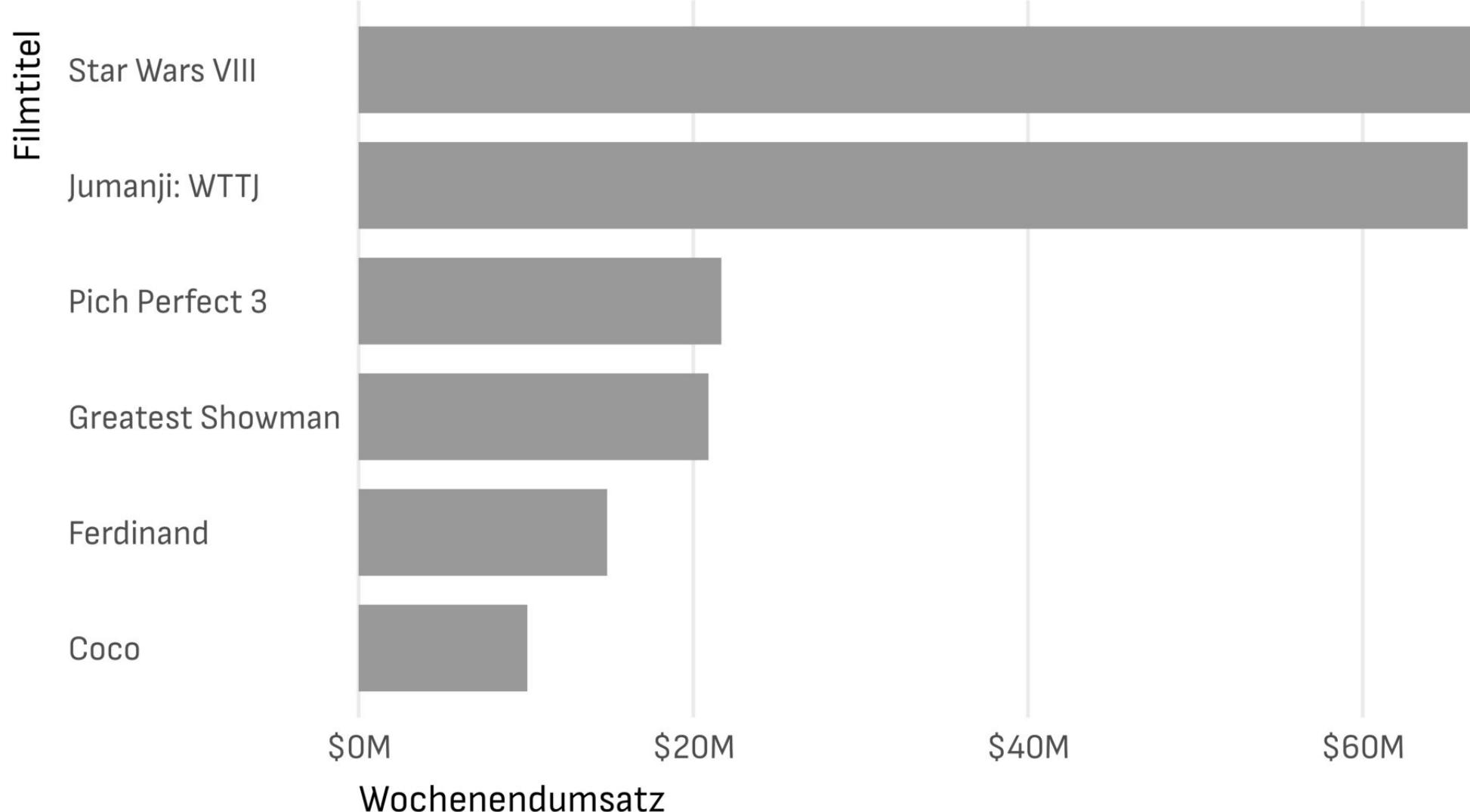


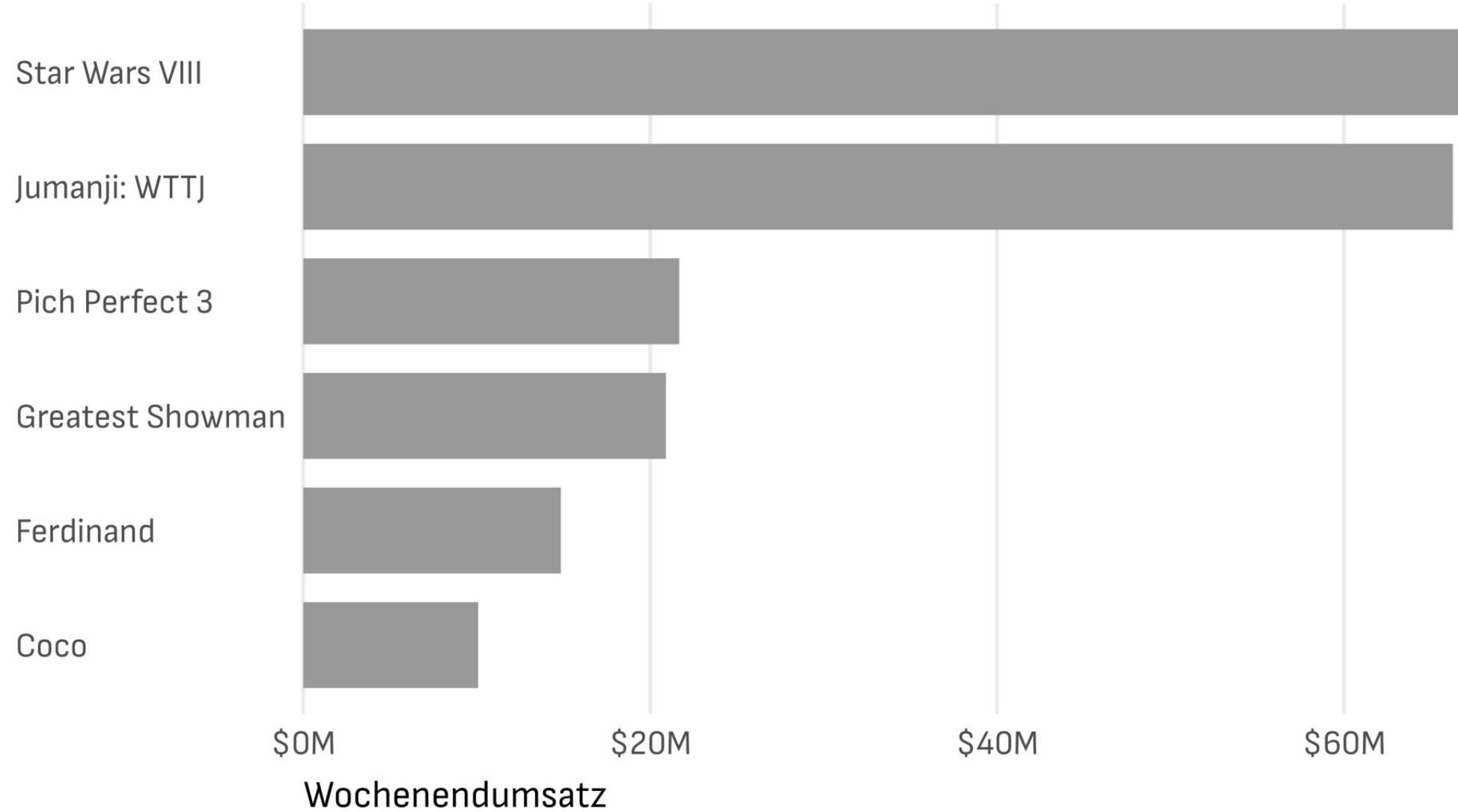




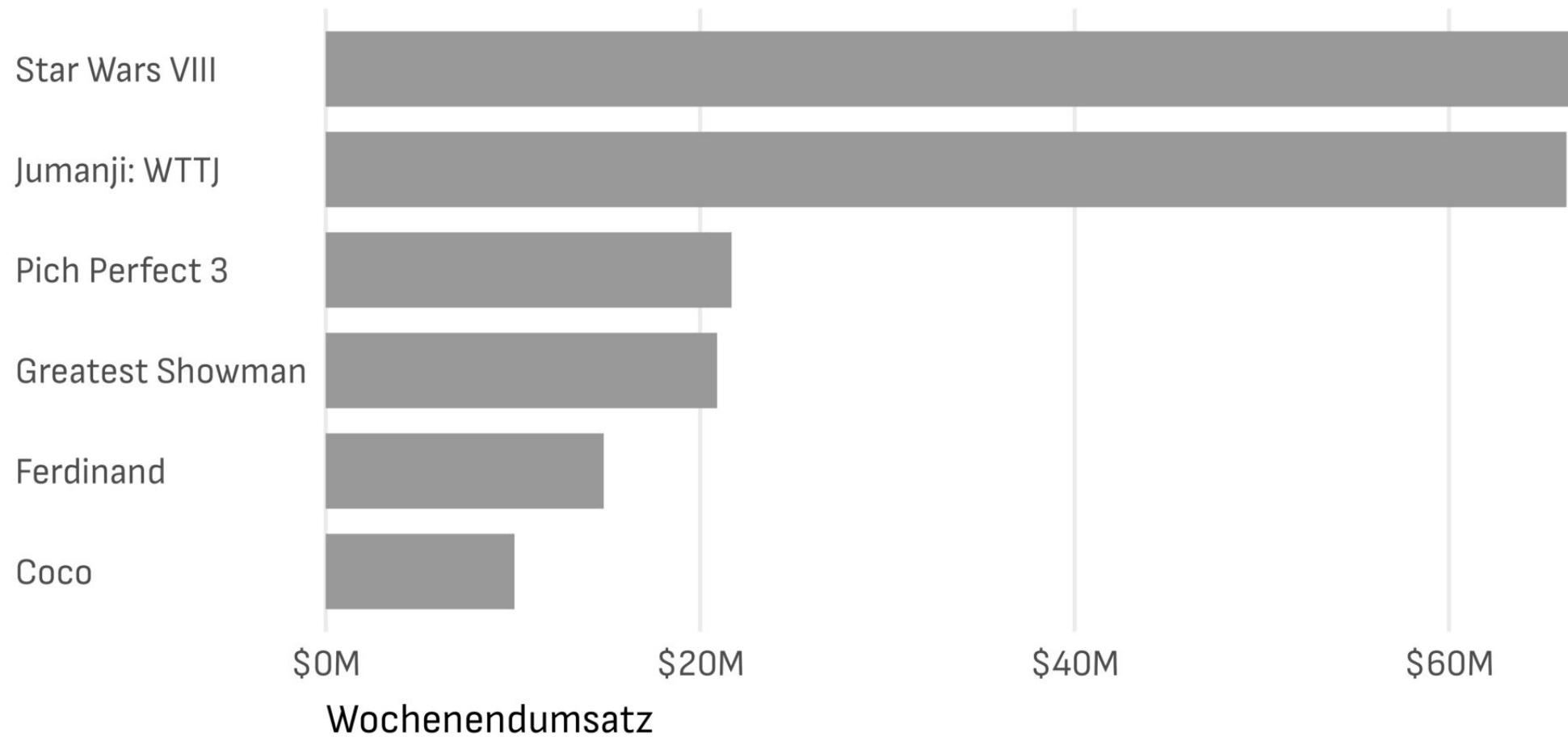




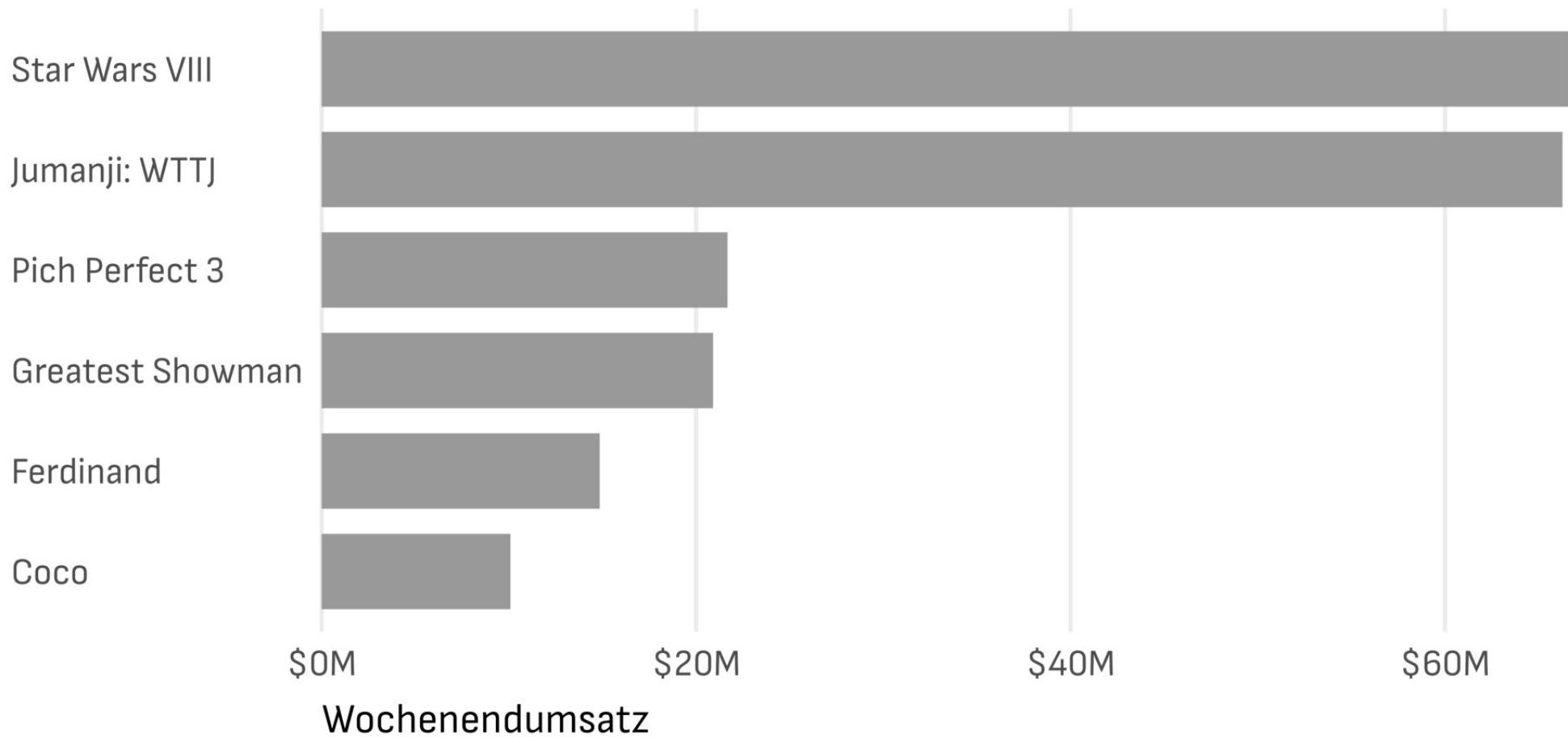




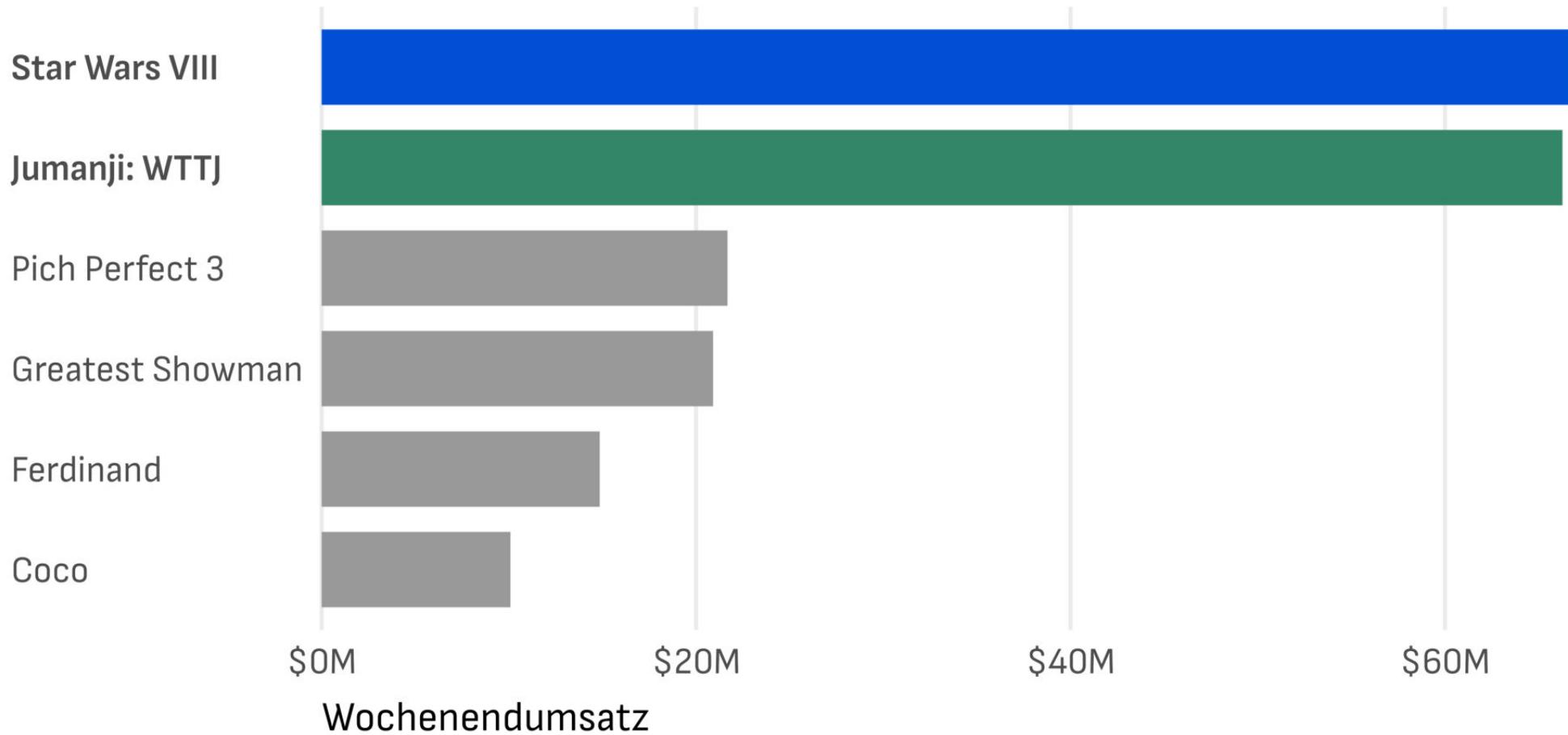
**“Star Wars VIII” führt das dritte Wochenende in Folge die Kinocharts an, jedoch nur ganz knapp vor “Jumanji: Willkommen im Dschungel”.**



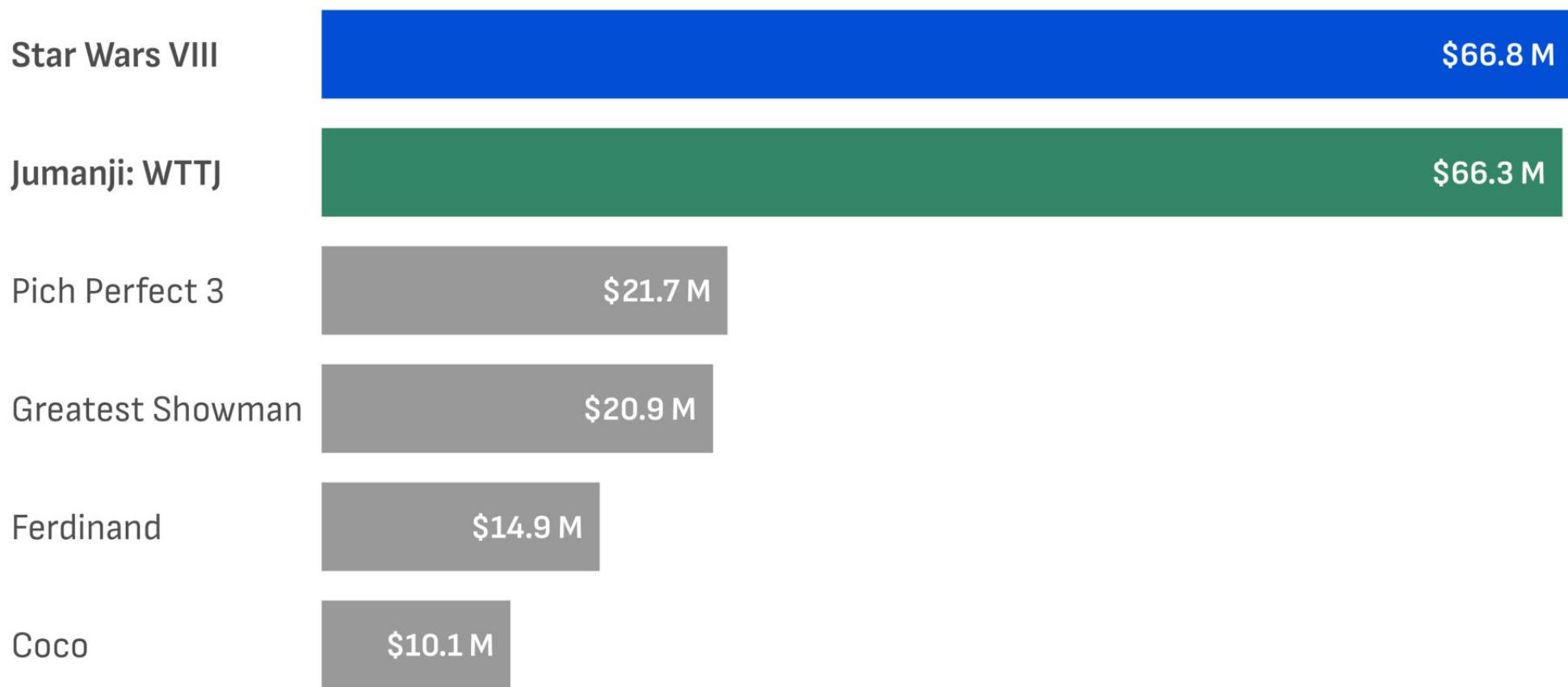
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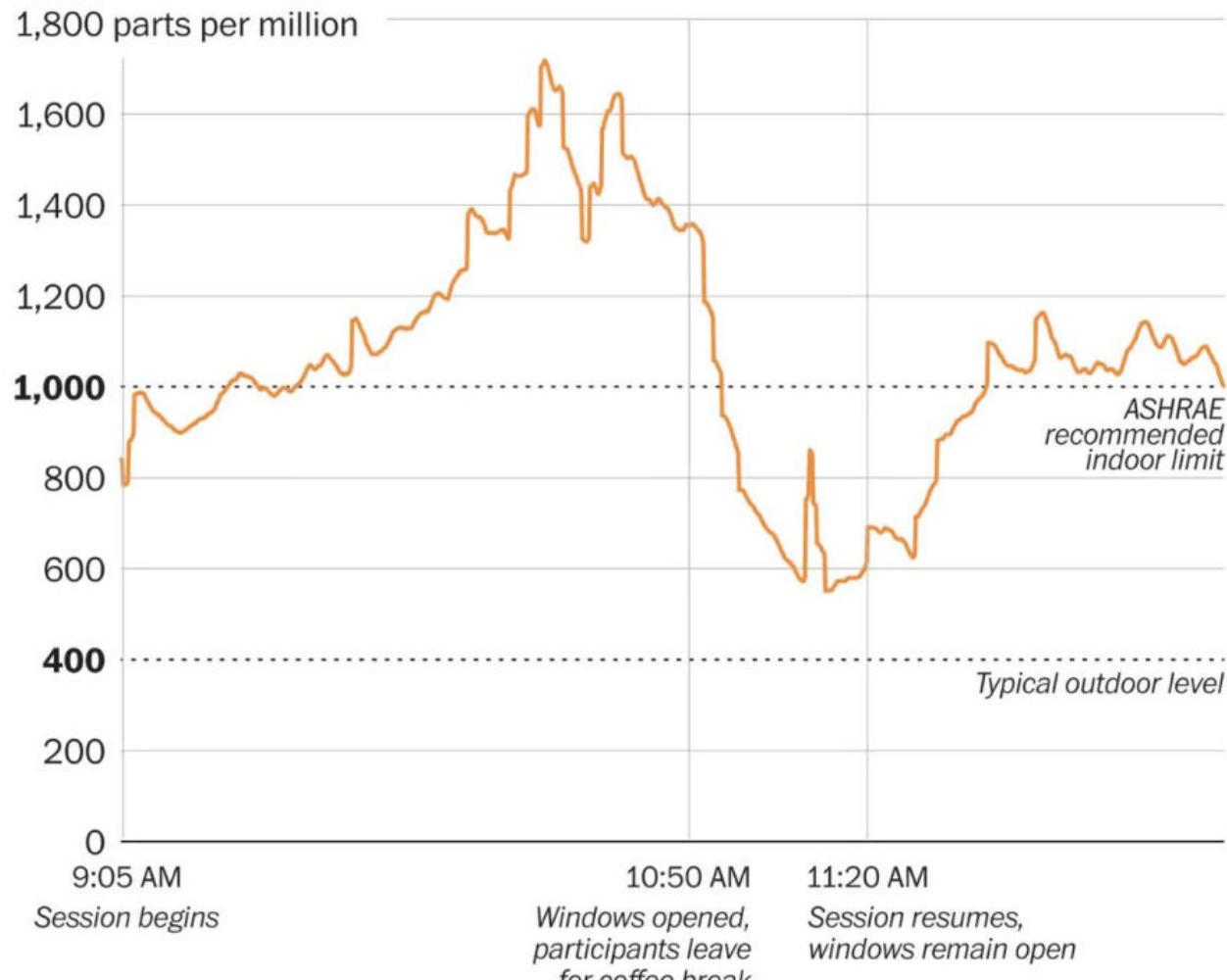


# *Wrap-up*



# Clearing the air

CO<sub>2</sub> levels in an occupied conference room on June 4, 2019



Source: Adam Ginsburg

THE WASHINGTON POST

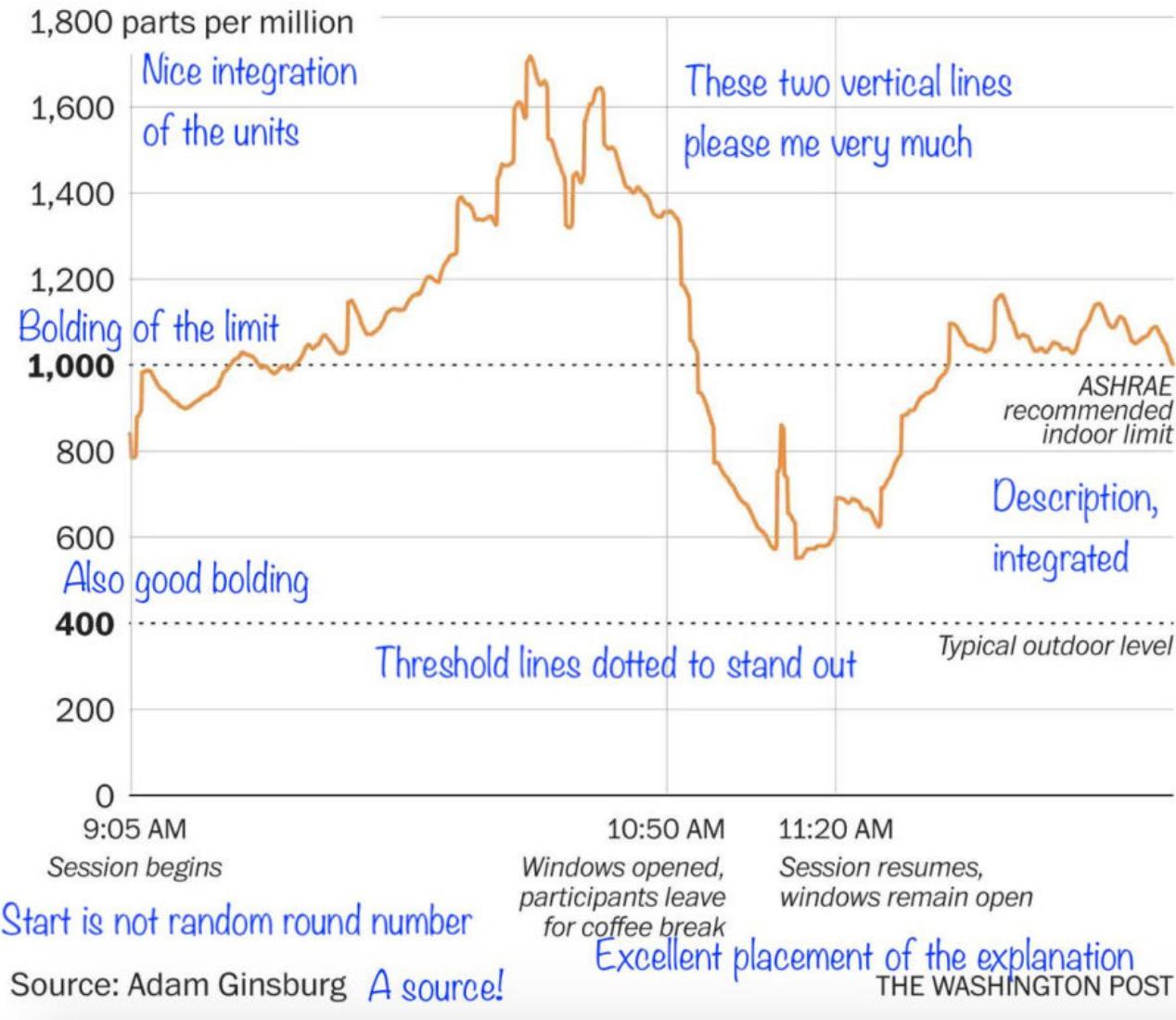
Quelle: "Clearing the Air" von Adam Ginsburg (Washington Post)



# Clearing the air

Fun and helpful title

CO<sub>2</sub> levels in an occupied conference room on June 4, 2019  
Units and metho in a subtitle, NOT in vertical text on the side



Notizen von Francis Gagnon (Voilà)



# Information .....

*Verstehe deine Daten und sei genau und ehrlich.*

# Erzählung .....

*Sei dir über die gewünschte Botschaft im Klaren.*

# Ziel .....

*Wähle geeignete Diagramme, um die Botschaft zu vermitteln.*

# Visuelle Form .....

*Rücke die Daten in den Mittelpunkt und leite das Publikum.*



# Dankeschön!



[www.cedricscherer.com](http://www.cedricscherer.com) // [www.linktr.ee/CedScherer](http://www.linktr.ee/CedScherer)



# Übung

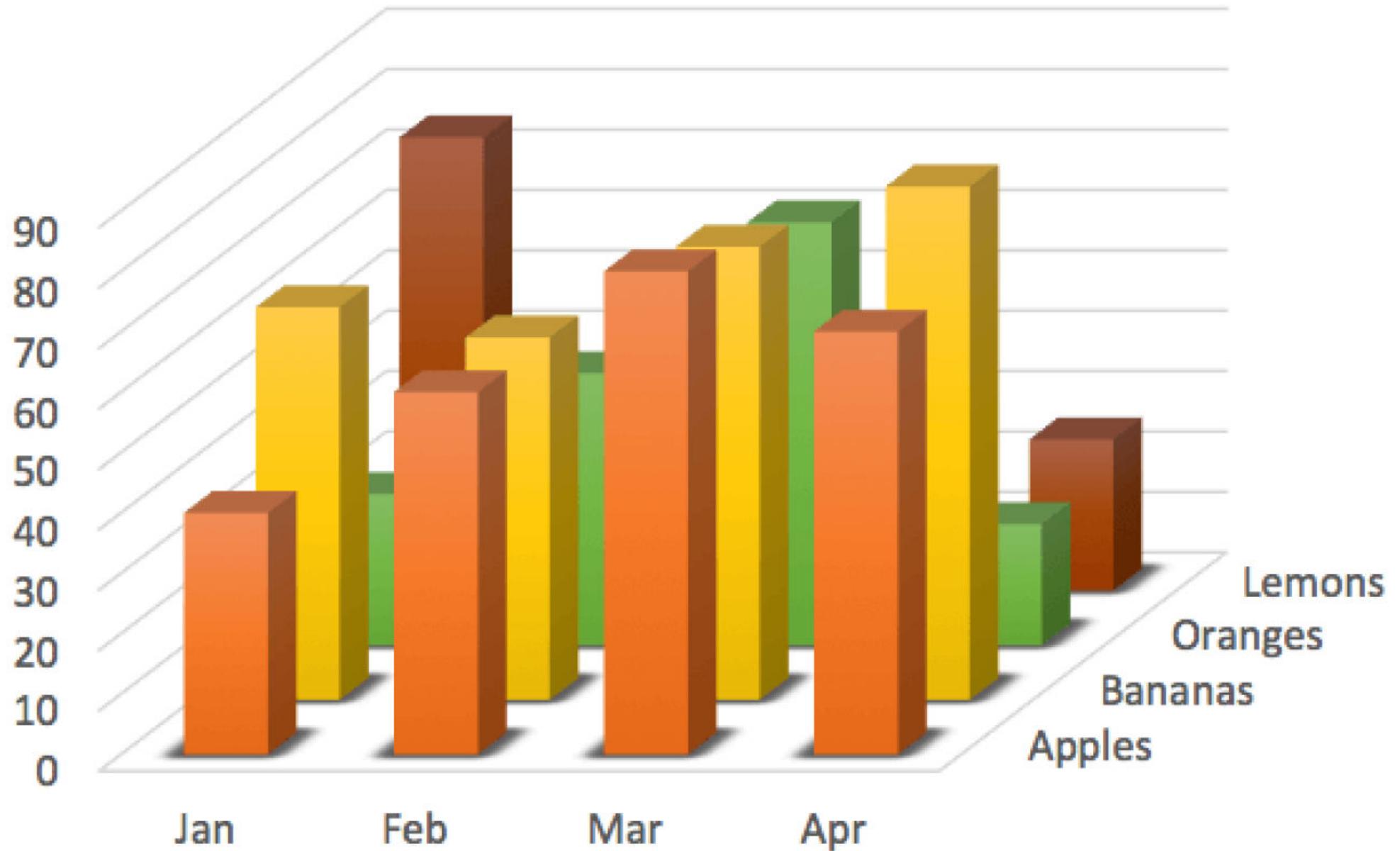


# Übung

Betrachtet die folgenden Datenvisualisierungen genauer.

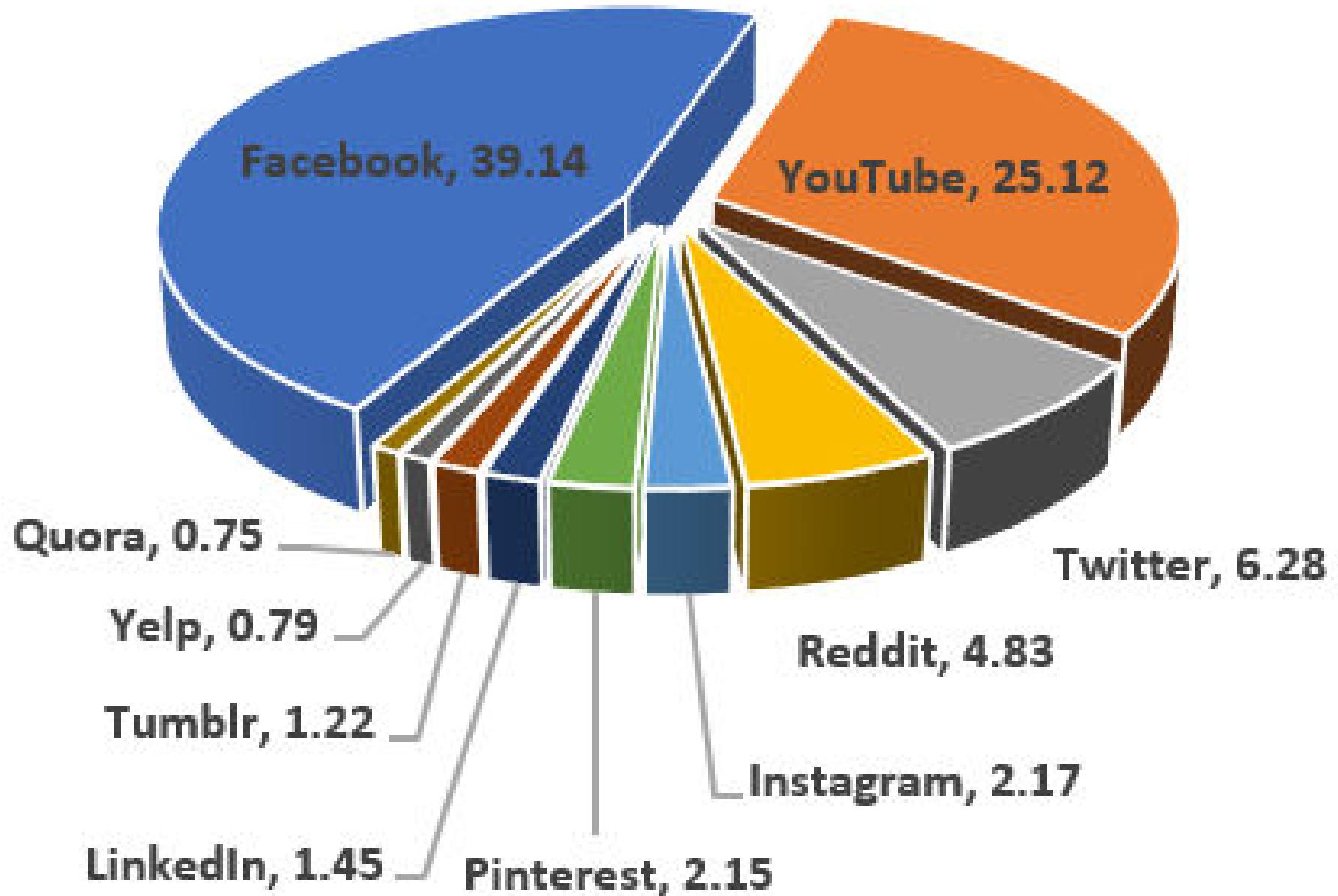
- Was ist die **Hauptbotschaft**, die die Grafik transportiert?
- Was ist der **Zweck** der Visualisierung? Wer ist das **Publikum**?
- Welche **Kodierung(en)** wurde(n) genutzt? Ist sie sinnvoll?
- Ist der **Fokus** klar? Falls ja: welche Attribute wurden genutzt? Falls nein: wie könnte man das Publikum besser führen?
- Bewertet die Grafiken nach den vier Kriterien:  
**Information, Erzählung, Ziel und Visuelle Form.**
- Sammelt drei Dinge, die euch auffallen, egal ob positiv oder negativ. Wie könnten die Details, die euch nicht gefallen, verbessert werden?





Quelle: unbekannt



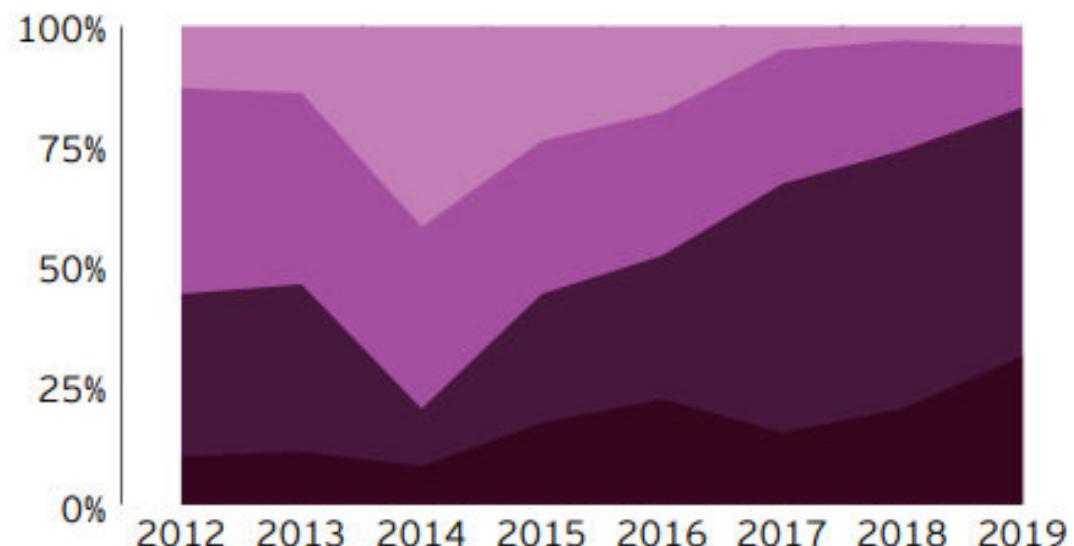
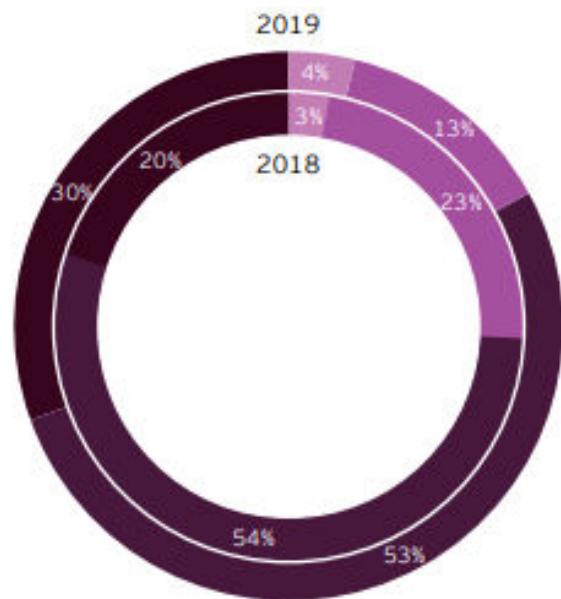


Marktanteil der Besuche auf sozialen Netzwerkseiten im November 2017,  
gefunden im Blog-Beitrag über "[Why you shouldn't use pie charts](#)" der Universität Melbourne



Do you agree with the following statement?  
«The price of banking services will fall.»

- I entirely disagree
- I partly disagree
- I partly agree
- I agree

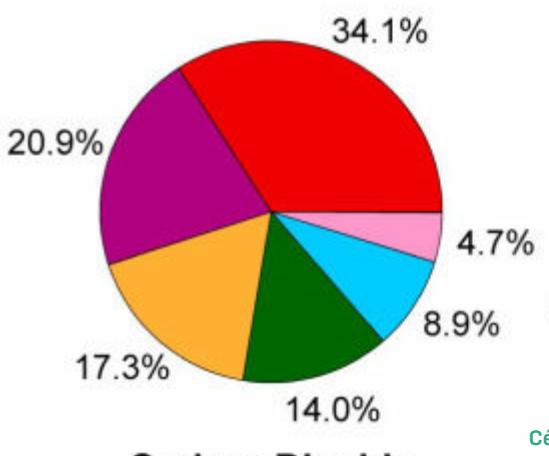
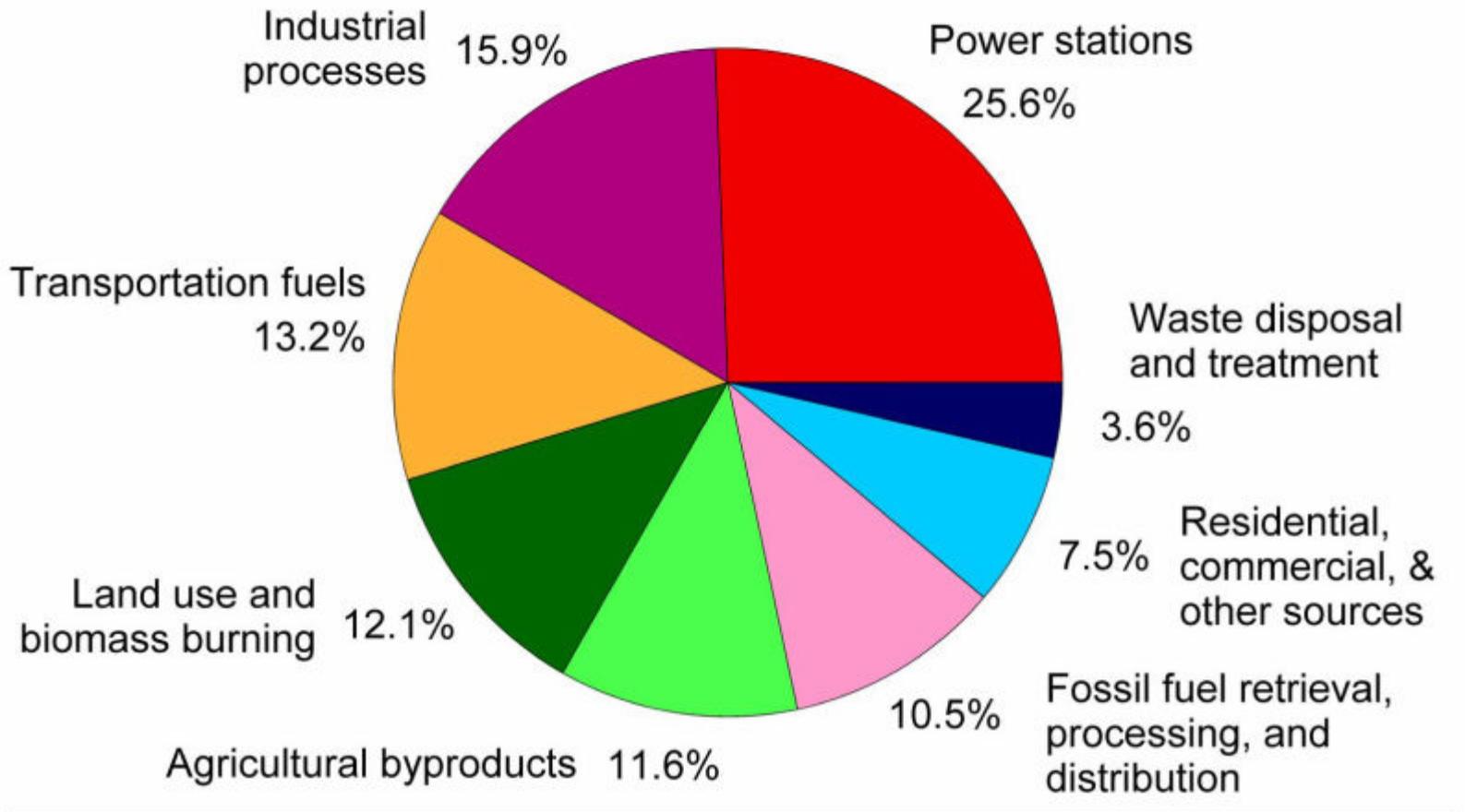


Quelle: Ernest & Young





# Annual Greenhouse Gas Emissions by Sector



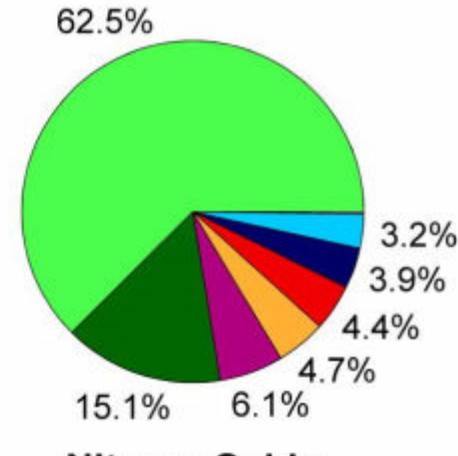
Cédric Scherer // Data Visualization & Information Design

Methane

34.5%

16.5%

3.4%  
4.3%



Nitrous Oxide



