

Data Science Basics in R

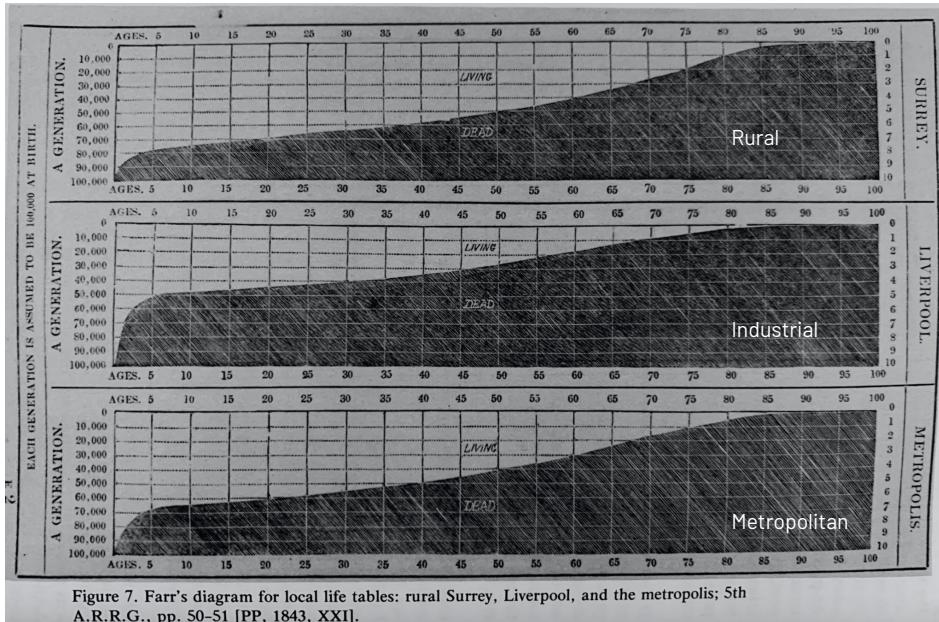
Day 4: Designing Data Visualizations

Goals for today

- **Learn** a step-by-step process for creating great data visualizations
- **Understand** your audience and your goals when visualizing data
- **Design** some fun and beautiful data visualizations

Goals of data visualization

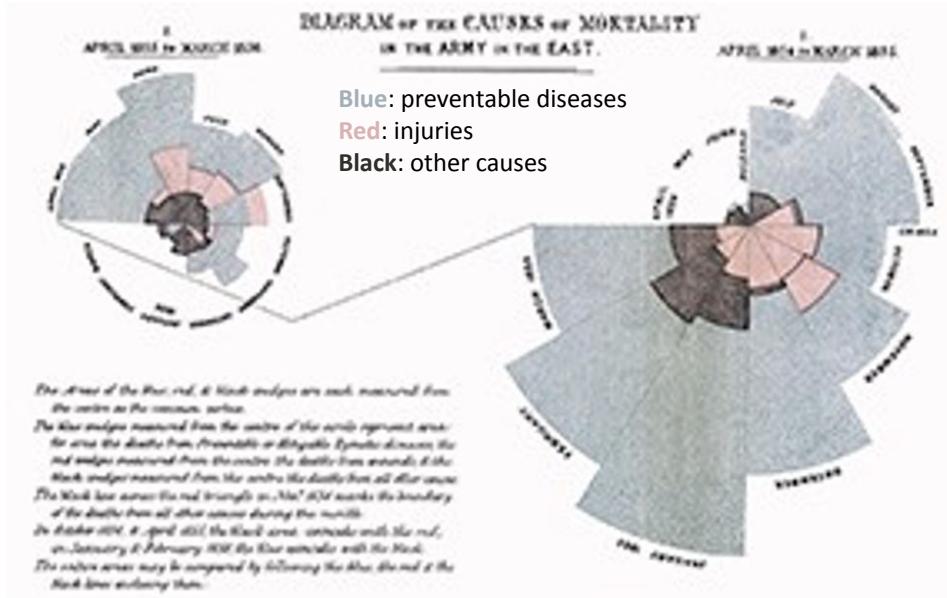
William Farr's Life Tables



“In Surrey, the increase of mortality after birth is a gentle slope upward, a dune rising out of the waterline. The spike in Liverpool, by comparison, looks more like the cliffs of Dover.

That steep ascent condensed thousands of individual tragedies into one vivid and scandalous image: in industrial Liverpool, more than half of all children born were dead before their fifteenth birthday.”

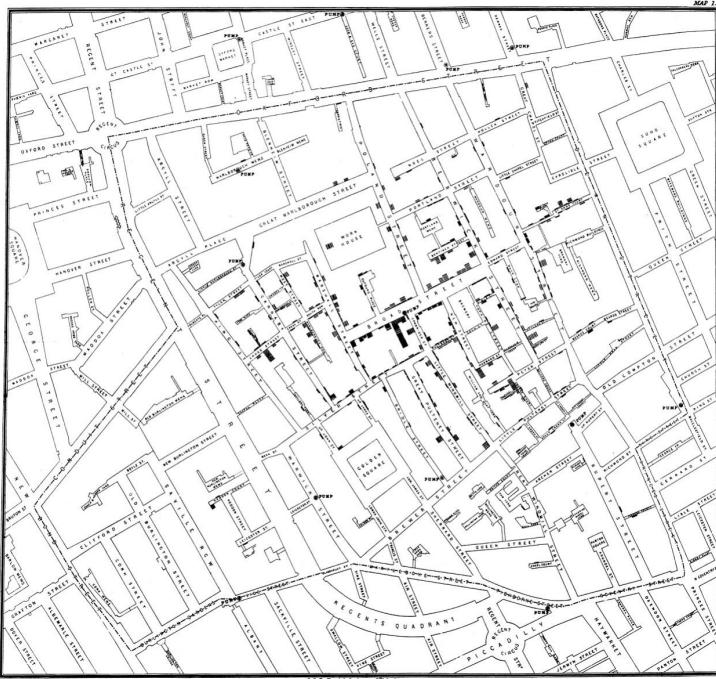
Florence Nightingale's "Diagram of the causes of mortality in the army in the East".



To convince people that sanitation and mortality were inextricably linked,

Nightingale waged a war of her own—one of information, fought primarily against the British government's War Office.... Directing a team of lithographers, statisticians, and scientists, she often worked 20-hour days to create graphics that illustrated how improved sanitation would save lives... She was relentless."

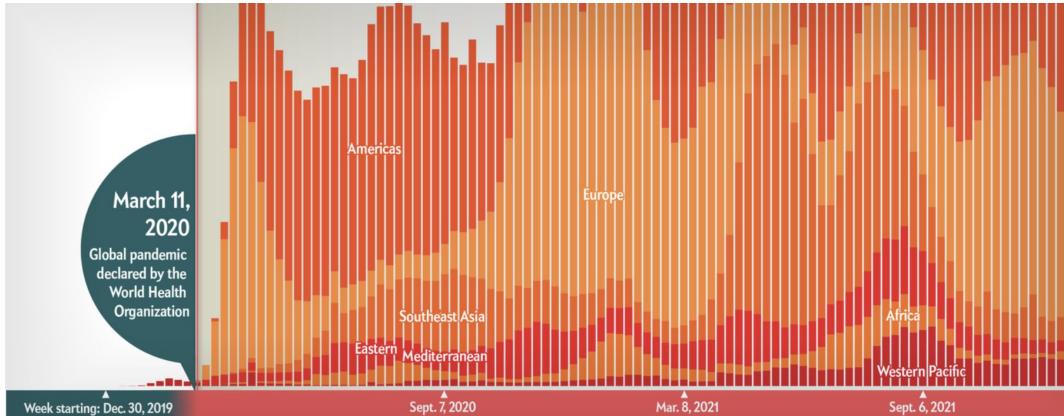
John Snow's cholera map



"John Snow conducted pioneering investigations on cholera epidemics in England and particularly in London in 1854 in which he demonstrated that contaminated water was the key source of the epidemics. His thorough investigation of an epidemic in the Soho district of London led to his conclusion that contaminated water from the Broad Street pump was the source of the disease and, **consequently, the removal of the handle led to cessation of the epidemic.**"

Tulchinsky TH. John Snow, cholera, the broad street pump; waterborne diseases then and now. Case Studies in Public Health. 2018:77.

Visualizing outbreaks today



Montanez et al. March 1, 2022. COVID's Uneven Toll Captured in Data
<https://www.scientificamerican.com/article/covidss-uneven-toll-captured-in-data/>.

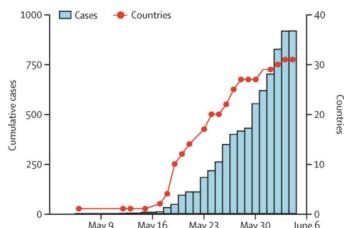
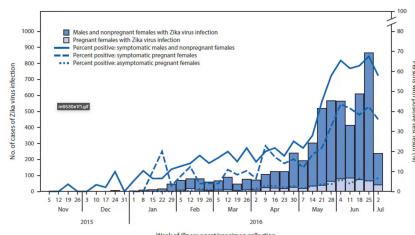


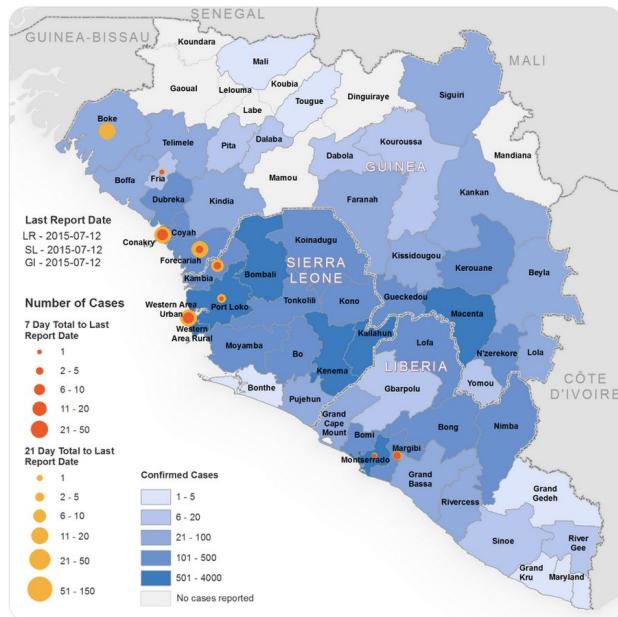
Figure Rapid expansion of the 2022 monkeypox outbreak
 Kraemer MU, Tegally H, Pigott DM, Dasgupta A, Sheldon J, Wilkinson E, Schultheiss M, Han A, Oglia M, Marks S, Kanner J. Tracking the 2022 monkeypox outbreak with epidemiological data in real-time. *The Lancet Infectious Diseases*. 2022 Jul 1;22(7):941-2.



Adams L, Bello-Pagan M, Lozier M, et al. Update: Ongoing Zika Virus Transmission — Puerto Rico, November 1, 2015–July 7, 2016. *MMWR Morb Mortal Wkly Rep* 2016;65:774–779. DOI: <http://dx.doi.org/10.15585/mmwr.mm65304d>



WHO #Ebola situation report (15 July) goo.gl/lftpkc



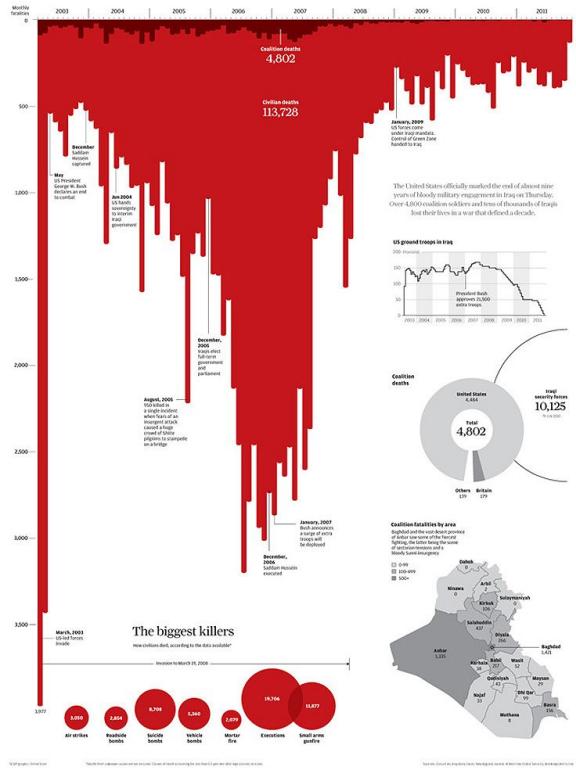
4:48 AM · Jul 16, 2015

Kraemer MU, Tegally H, Pigott DM, Dasgupta A, Sheldon J, Wilkinson E, Schultheiss M, Han A, Oglia M, Marks S, Kanner J. Tracking the 2022 monkeypox outbreak with epidemiological data in real-time. *The Lancet Infectious Diseases*. 2022 Jul 1;22(7):941-2.

...

Other impactful data visualizations

Iraq's bloody toll

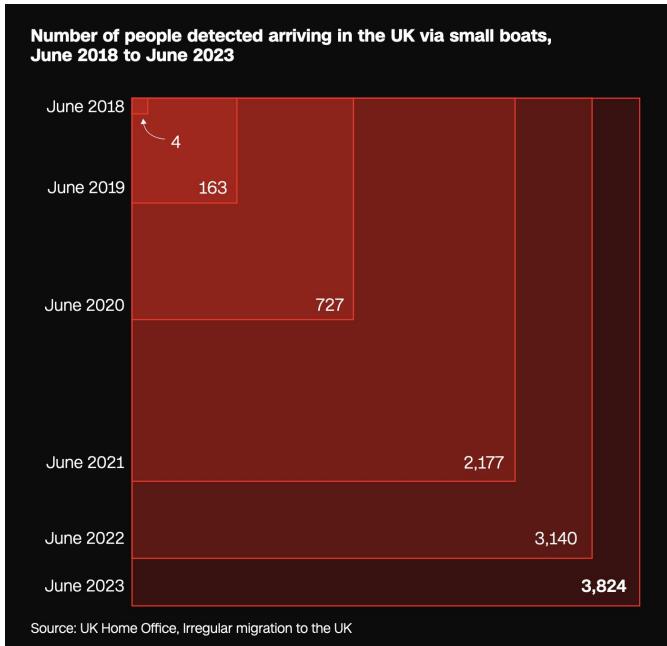


"This graphic was created to mark the end of the United States' military engagement in Iraq in 2011. **Over 4,800 coalition soldiers and tens of thousands of Iraqis lost their lives in the war.**

One deliberate design choice with this graphic was the visual metaphor of blood. This striking visual would hopefully draw the reader into the graphic."

Graphic by By Simon Scarr. South China Morning Post. <http://www.simonscarr.com/iraqs-bloody-toll>

Other impactful data visualizations



"This piece explores one facet of a global trend in using AI technology to digitize border security. The mapping starts out with a snapshot of the frequency and type of UK channel boat crossings.

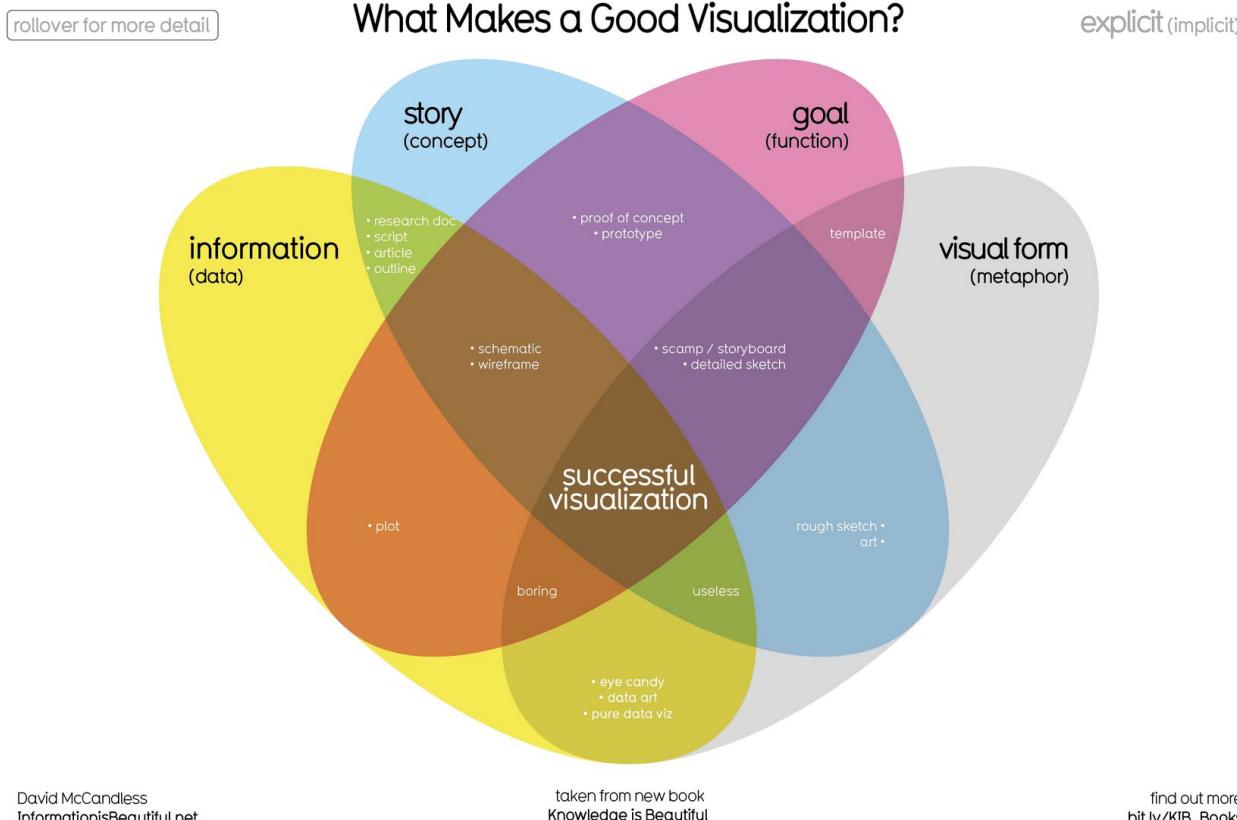
That same map transitions to show the depth of UK surveillance. **And then delves into one investigation of a perilous Channel journey that resulted in loss of life.**"

Goals of data visualization

People use data visualizations for all types of reasons and audiences. Information is often easier to quickly understand in visualization as compared to other forms of communication (for example, listed in a table or described out loud)

- **Understand** what is happening in a new dataset or situation
- **Communicate** information quickly and rapidly
- **Make decisions** based on an understanding of what is currently known

What makes a data visualization good?

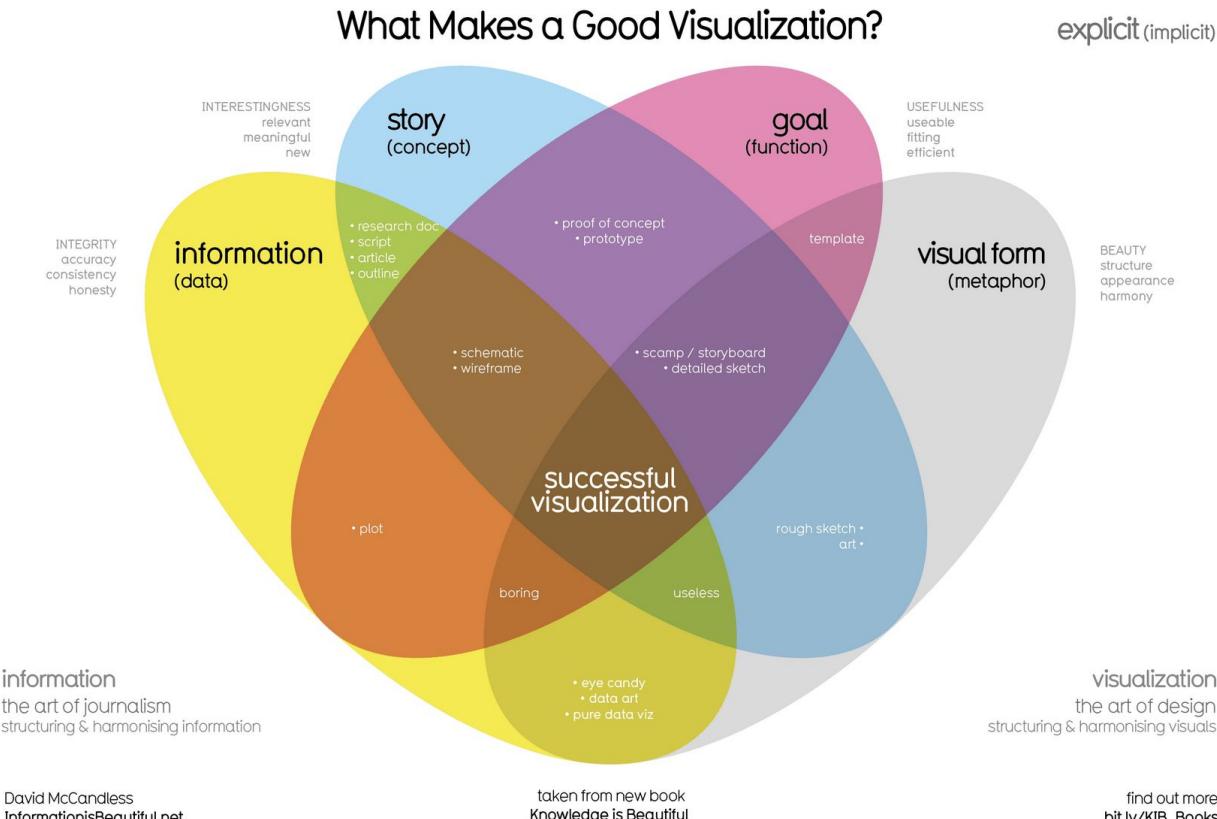


David McCandless
InformationisBeautiful.net

taken from new book
Knowledge is Beautiful

find out more
bit.ly/KIB_Books

What makes a data visualization good?



Stages of creating a new data visualization

Plan

Define goals and audience

Design

Brainstorm and sketch out ideas

Build

Create your data visualization

Refine

Review, update, and clarify

Plan

Define goals and audience

Design

Build

Refine

Ask yourself

Why are you doing this?

understand your data; support a decision; deliver a message; teach a topic

What are you trying to communicate?

today's status; change over time; comparing groups; highlighting extremes

Who is your audience?

what are their expectations; how much background do they have

When and where will the visualization be used?

peer-reviewed publication; poster; dashboard; slide-deck

Why this matters

Degree of effort

how much time you spend on the plot, based on goals, audience, timeline

Level of complexity

how visually simple or complex your plot is, including the type of plot

Style and formatting

how the data are presented visually, including colors, sizing, resolution

Context

how the data are described in writing and how they are presented overall

Plan

Design

Build

Refine

Brainstorm and
sketch out ideas

Explore

Data sources and types

do you already have the data, or do you also need to find/collect it

Different types of plots

visual elements (lines, points, size, shape, width) and their layouts

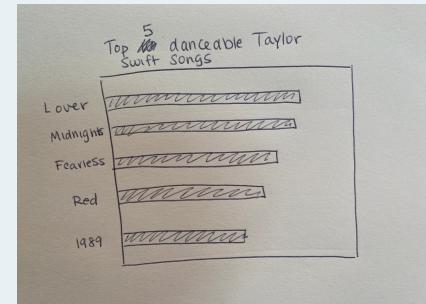
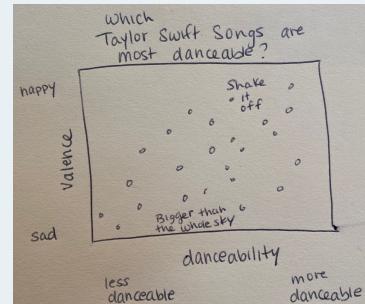
Analysis methods

different ways of summarizing and grouping data, where relevant

Color schemes

hues, color gradients in one direction, color gradients in two directions

Examples



Plan

Design

Build

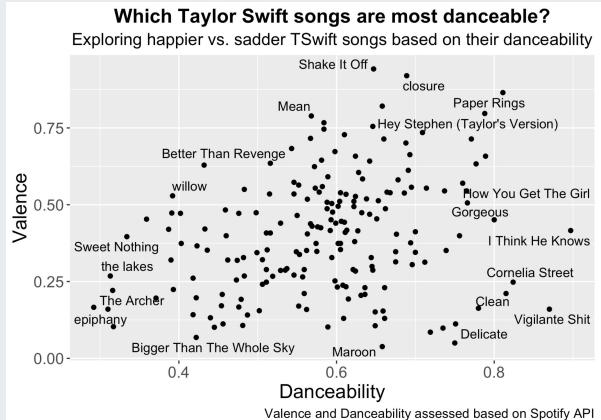
Refine

Create your data visualization

Code or sketch

```
ggplot(taylor_album_songs, aes(x = danceability, y = valence, label = label)) +  
  geom_text_repel() +  
  geom_point() +  
  labs(x = "Danceability",  
       y = "Valence",  
       title = "Which Taylor Swift songs are most danceable?",  
       subtitle = "Exploring happier vs. sadder TSwift songs based on their danceability",  
       caption = "Valence and Danceability assessed based on Spotify API") +  
  theme(plot.caption = element_text(size = rel(1)),  
        plot.title = element_text(hjust = 0.5, size = rel(1.5), face = "bold"),  
        plot.subtitle = element_text(hjust = 0.5, size = rel(1.3)),  
        axis.text.x = element_text(size = rel(1.5)),  
        axis.text.y = element_text(size = rel(1.5)),  
        axis.title = element_text(size = rel(1.5)))
```

Examples



Plan

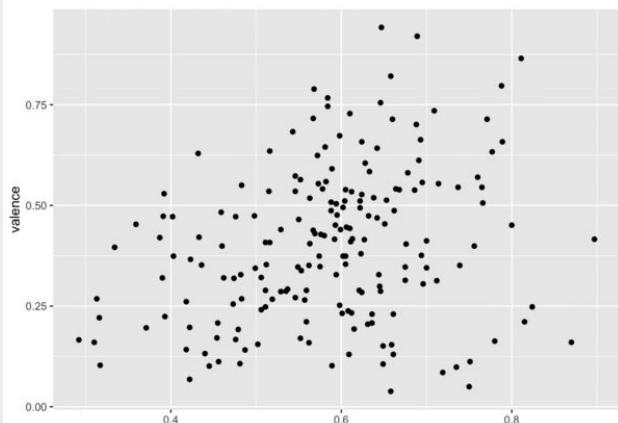
Design

Build

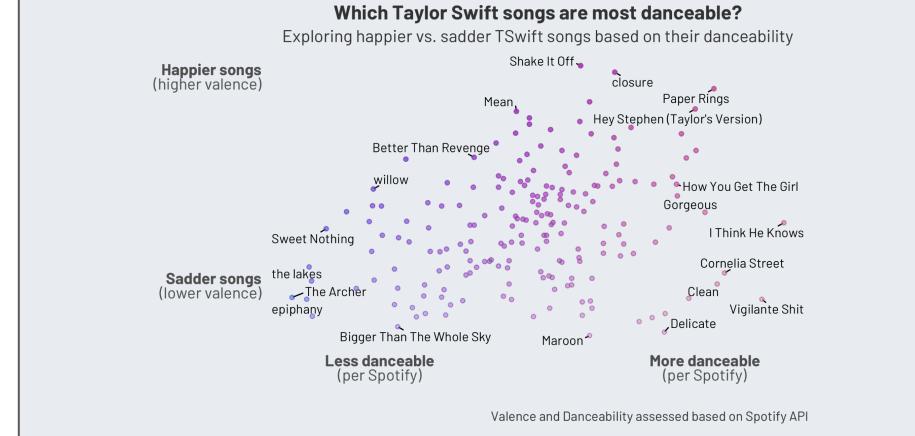
Refine

Review, update,
and clarify

Iterations



Final design



Stages of creating a new data visualization

Plan

Define goals and audience

Design

Brainstorm and sketch out ideas

Build

Create your data visualization

Refine

Review, update, and clarify

Stages of creating a new data visualization

Plan

Design

Build

Refine

Define goals and
audience

Planning stage:

planning worksheet

Ask yourself

Why are you doing this?

understand your data; support a decision; deliver a message; teach a topic

What are you trying to communicate?

today's status; change over time; comparing groups; highlighting extremes

Who is your audience?

what are their expectations; how much background do they have

When and where will the visualization be used?

peer-reviewed publication; poster; dashboard; slide-deck

Why are you doing this?

understand your data; support a decision; deliver a message; teach a topic; something else?

What are you trying to communicate?

today's status; change over time; comparing groups; highlighting extremes; something else?

Who is your audience?

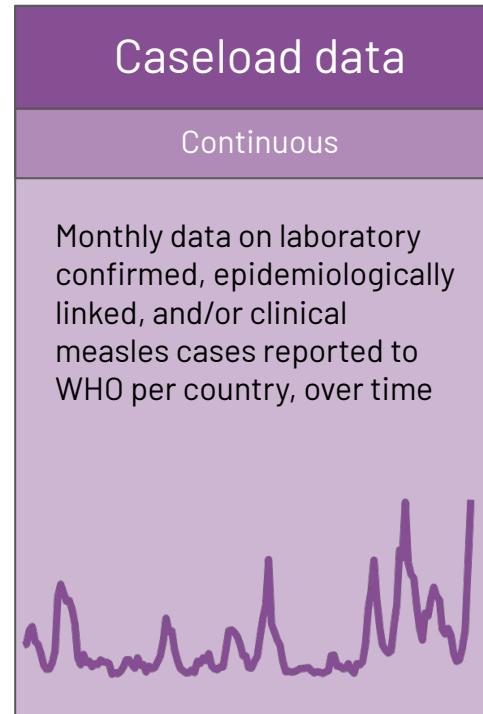
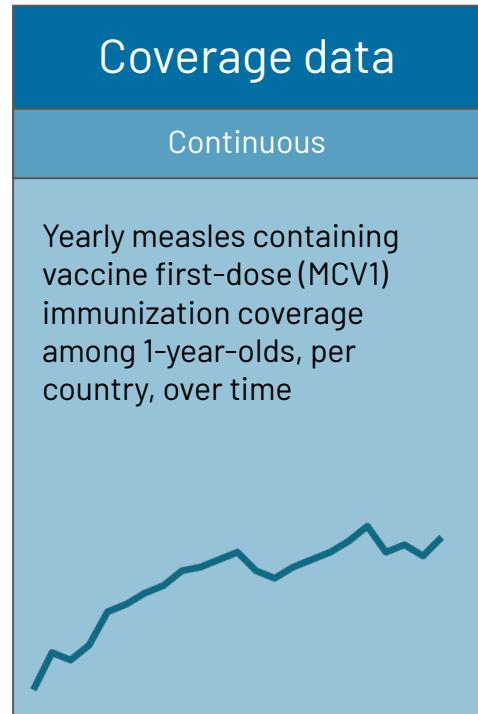
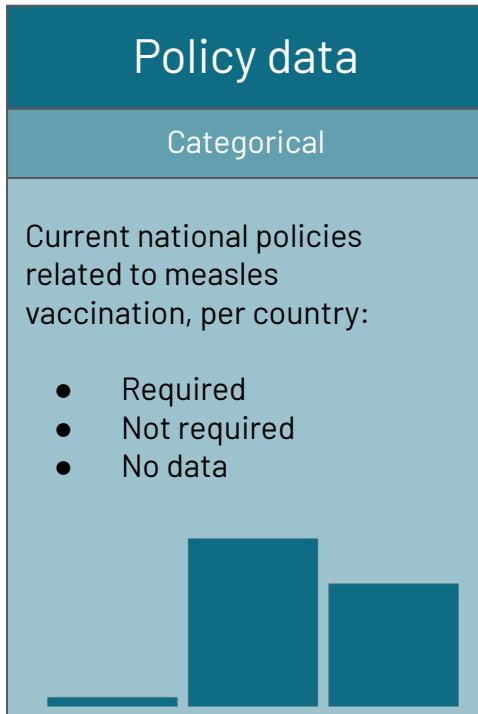
Who are they? What are their expectations? How much background do they have? Anything else?

When and where will the visualization be used?

peer-reviewed publication; poster; dashboard; website; slide deck (presented? shared as a deck?)
also note any known formatting constraints (e.g., size, image resolution, color schemes, fonts)

Reminder: Course datasets

Plan



Plan

Your turn

bit.ly/plan-data-visualization

04:00



In-class analysis plan planning worksheet

Why are you doing this?

understand your data; support a decision; deliver a message; teach a topic; something else?

understand our data and share what we've learned in a simple, beautiful graphic

What are you trying to communicate?

today's status; change over time; comparing groups; highlighting extremes; something else?

highlight the countries or types of countries that are most impacted by measles since 2022, as defined based on total measles caseload information

→ we will refine this as we learn more from the actual data, might include information on measles vaccination policy status, country size, region, or income group

Who is your audience?

Who are they? What are their expectations? How much background do they have? Anything else?

people who are interested in health and who are familiar with time series data, but who have limited familiarity with measles specifically

When and where will the visualization be used?

peer-reviewed publication; poster; dashboard; website; slide deck (presented? shared as a deck?)

also note any known formatting constraints (e.g., size, image resolution, color schemes, fonts)

presented on an informal slideshow, featured on a github profile or maybe a LinkedIn post

One option:

highlight the countries or types of countries that are most impacted by measles since 2022, as defined based on cumulative measles caseload information

Stages of creating a new data visualization

Plan

Define goals and audience

Design

Brainstorm and sketch out ideas

Build

Refine

Design phase:

brainstorming and sketching

Explore

Data sources and types

do you already have the data, or do you also need to find/collect it

Different types of plots

visual elements (lines, points, size, shape, width) and their layouts

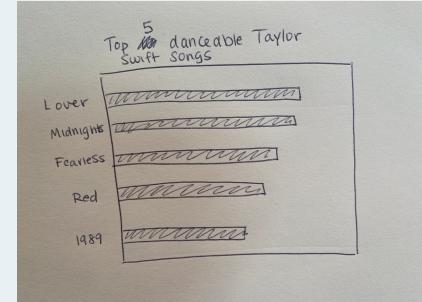
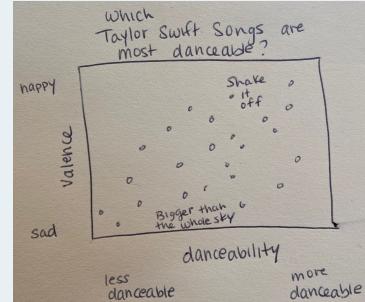
Analysis methods

different ways of summarizing and grouping data, where relevant

Color schemes

hues, color gradients in one direction, color gradients in two directions

Examples



Start with the data

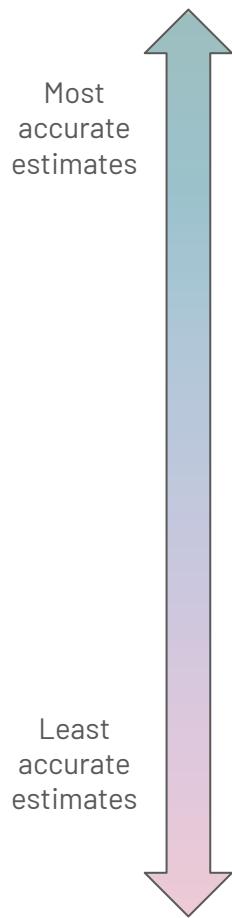
Understand the data you have

- Understand your data, including strengths and limitations
 - How was it collected, for what purpose?
 - What types of data, in what format?
 - How much is missing?
 - Who is represented? Who is not?
- Explore general trends, ask questions, and learn

Cleveland McGill Scale

How do we understand data, visually?

- 1985 study of how humans understand plots
- How accurately are people were able to interpret data?
 - experimented by asking subjects to guess data from graphics
 - varied plot design and details: position, shape, size, symbols
 - ranked most-to-least interpretable visual elements



Position



position along a specified scale
examples: *barchart, scatterplot*

Design

Length



length of a segment
examples: *line segment, stacked barchart*

Slope/Angle



slope or angle of a line or segment
examples: *line chart, donut chart*

Area



area of a shape or segment
examples: *pie chart, treemap*

Color intensity



intensity of a single color
example: *varying color saturation or lightness*

Color hue

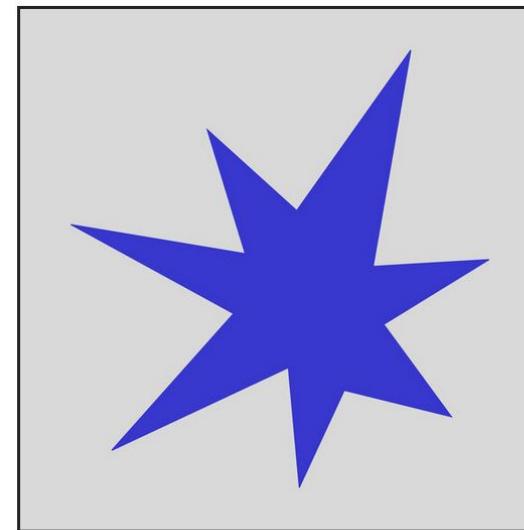
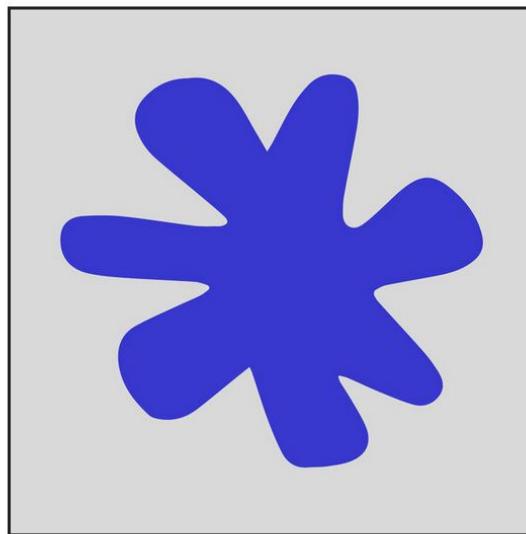


sets of multiple colors or a range of colors
example: *multi-color gradient*

Design

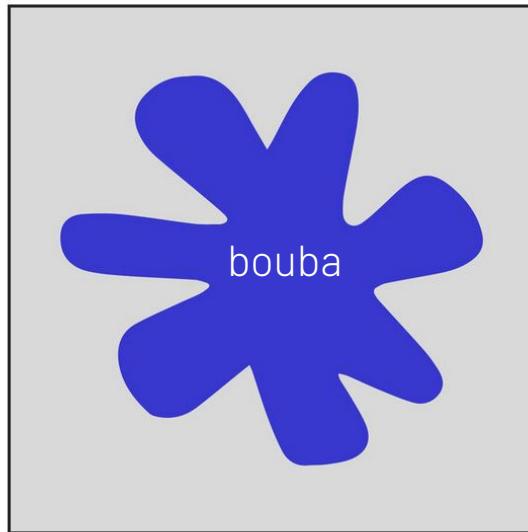
Bouba Kiki Effect

Which is bouba? Which is kiki?

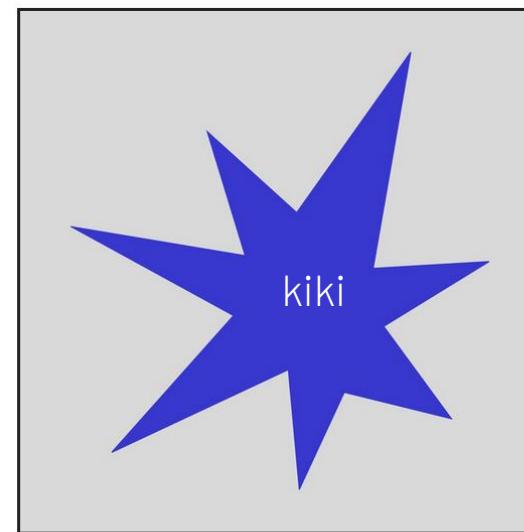


Bouba Kiki Effect

Which is bouba? Which is kiki?



bouba



kiki

Bouba Kiki Effect

Exploring cognition and visual perception

- 1929 study of how Spanish speakers match sounds and shapes (Köhler)
- Studies have replicated results across some languages and age groups
 - demonstrates human tendency to match certain sounds to shapes
 - not uniformly true and not replicated in all languages (e.g., Mandarin)
 - cognitive steps that link shapes, language, and meaning

Design

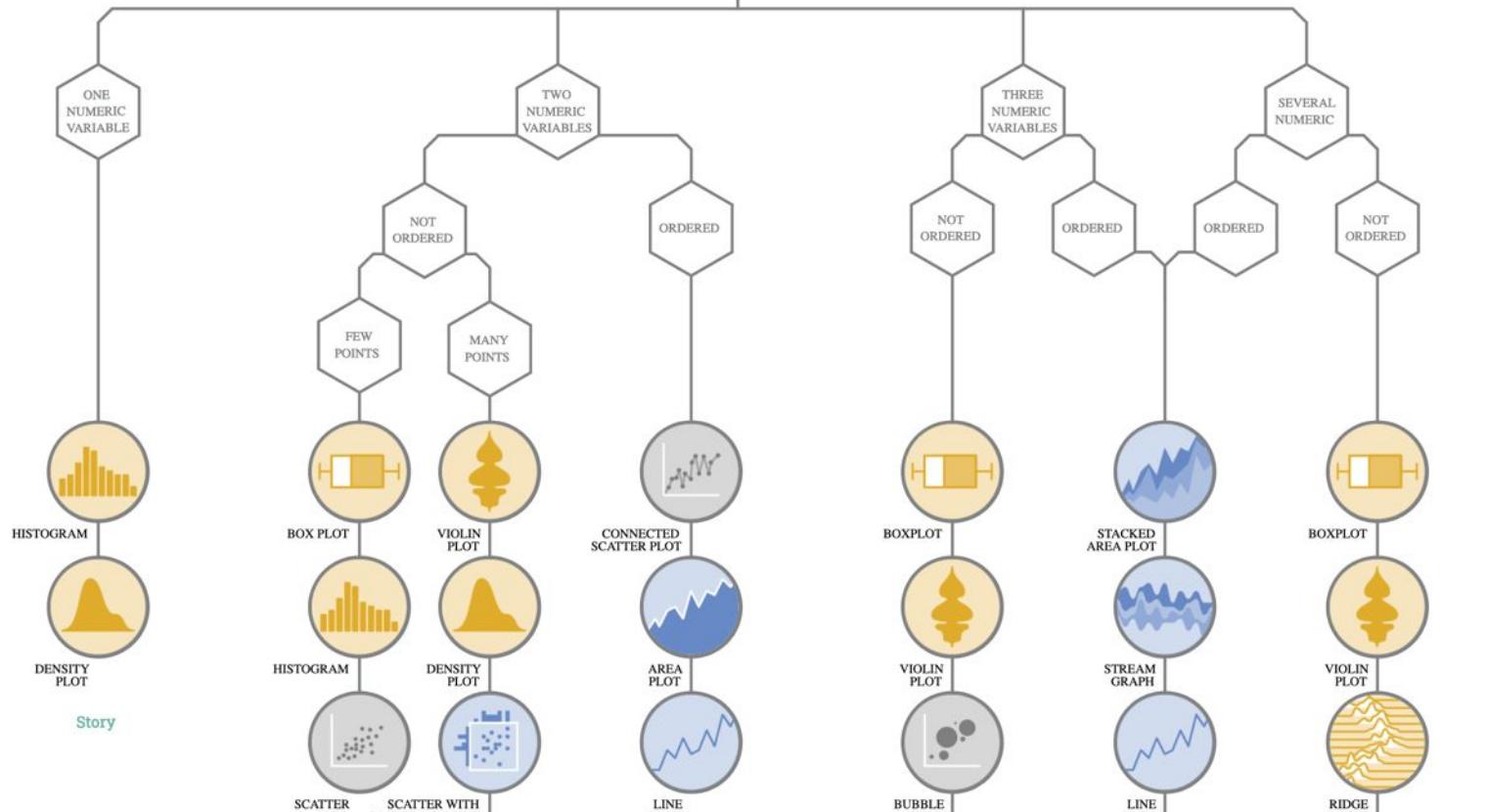
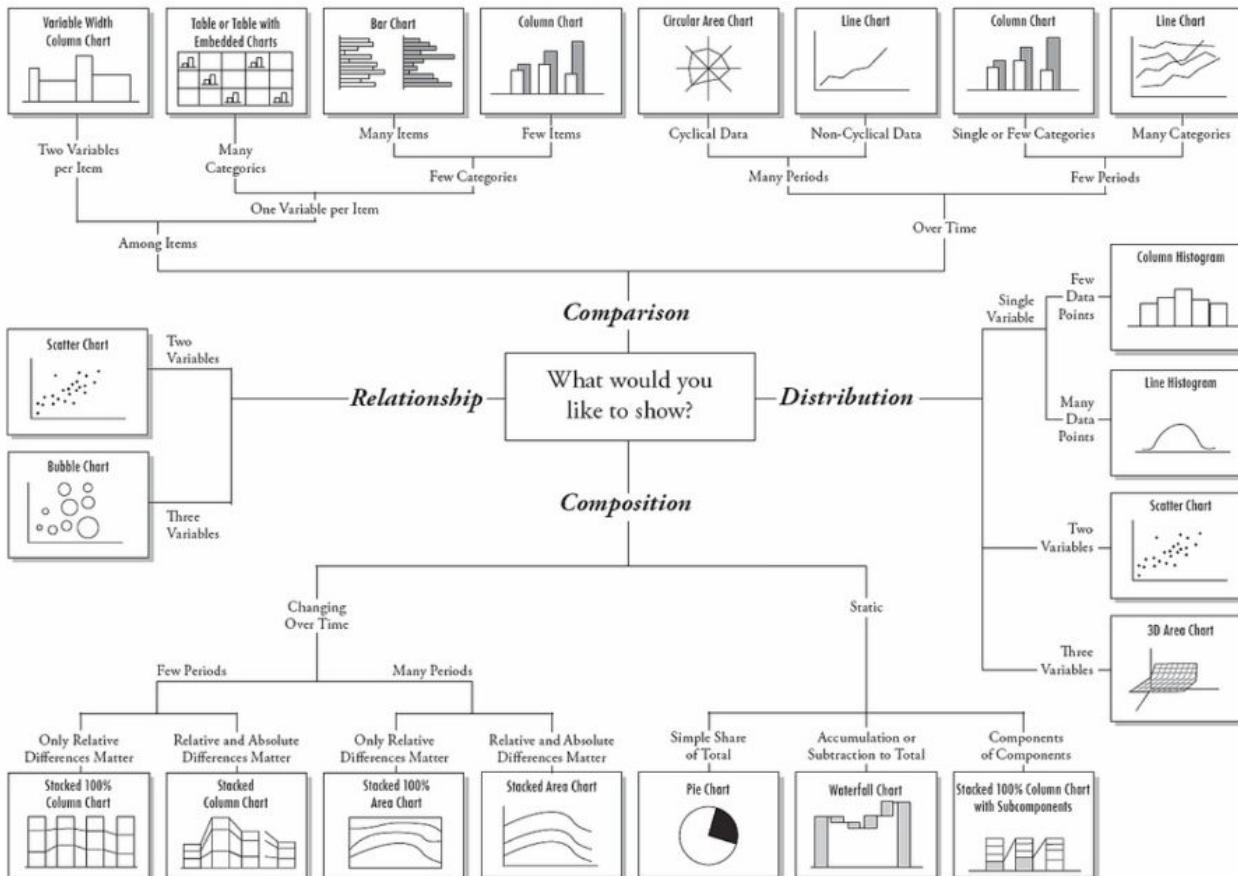


Chart Suggestions—A Thought-Starter

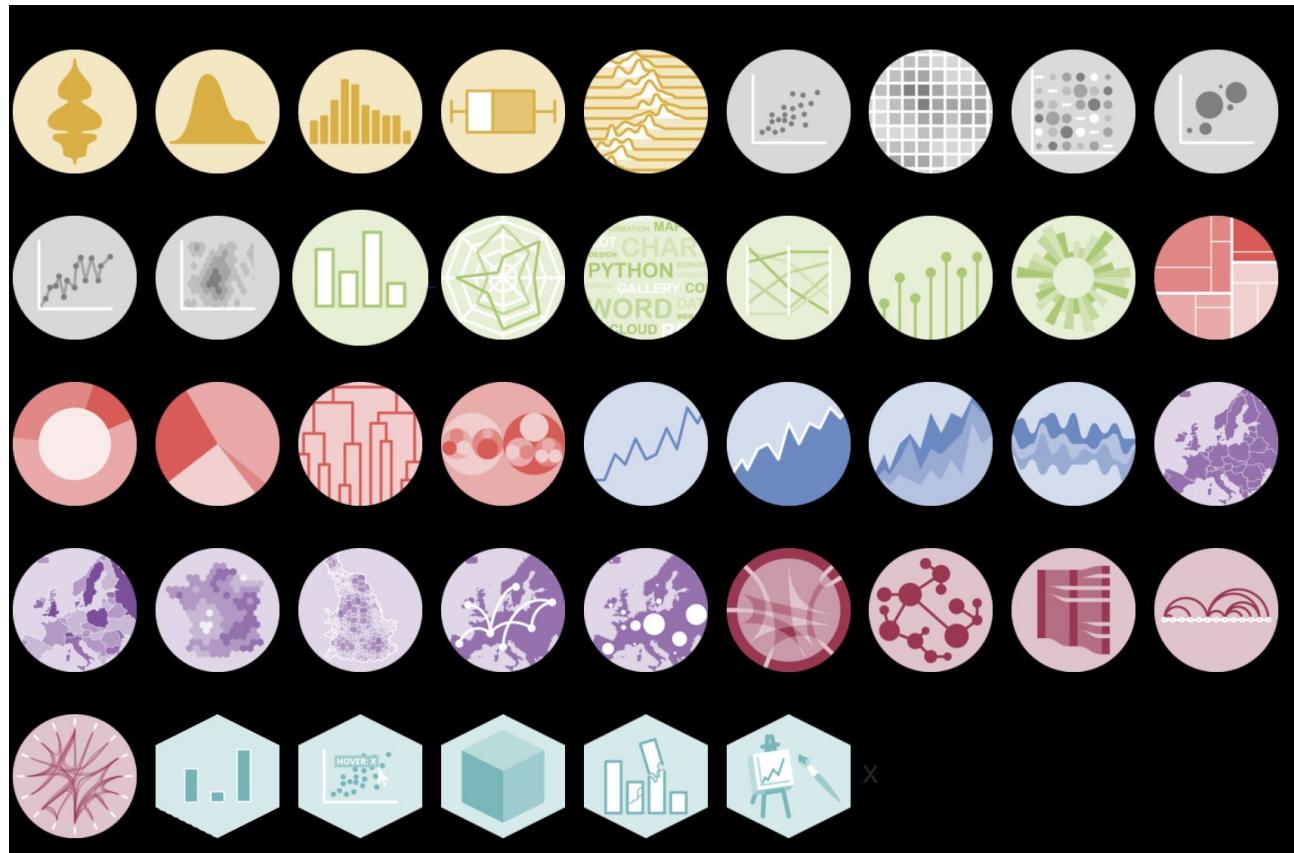


Graphic by Andrew Abela

https://extremepresentation.typepad.com/blog/2006/09/choosing_a_good.html

© 2006 A. Abela — a.v.abela@gmail.com

Design



Your turn!

Design

Spend 5 minutes reviewing charts at
<https://r-graph-gallery.com/index.html>

Please be ready to share one example of a plot style that you think would be interesting to use to help answer the question you proposed in the planning stage.

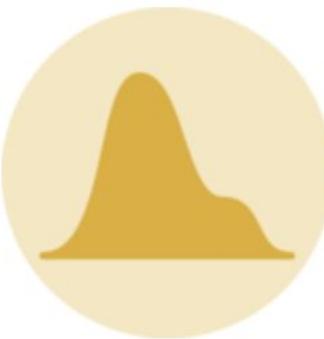
**Wave me over if you feel totally stuck on this step!
We can chat.**

Basic plot styles

distribution



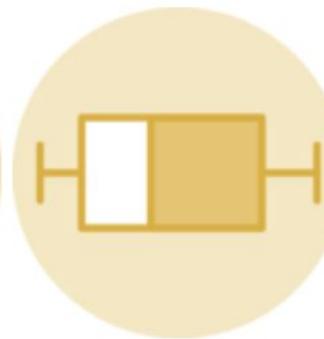
Violin



Density



Histogram



Boxplot



Ridgeline

Basic plot styles

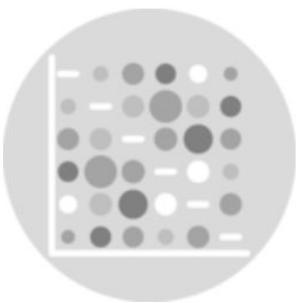
correlation



Scatter



Heatmap



Correlogram



Bubble



Connected scatter



Density 2d

Basic plot styles

ranking



Barplot



Spider / Radar



Wordcloud



Parallel



Lollipop



Circular Barplot



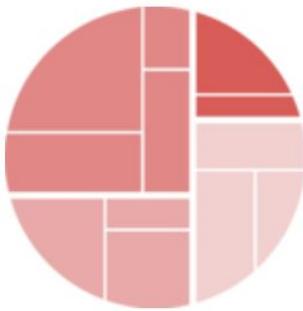
Table

Basic plot styles

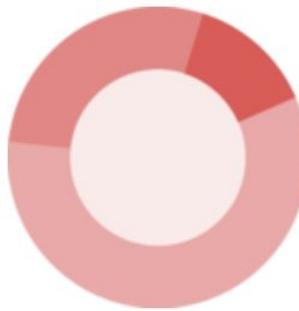
part of a whole



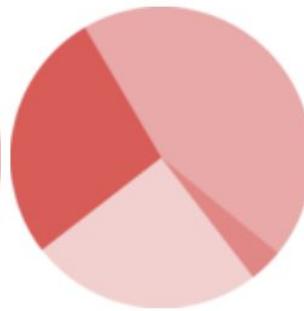
Grouped and
Stacked barplot



Treemap



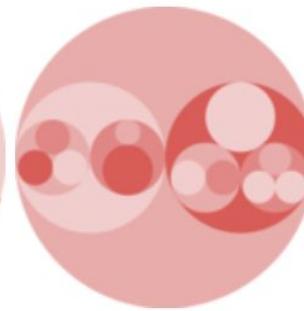
Doughnut



Pie chart



Dendrogram



Circular packing

Basic plot styles change over time



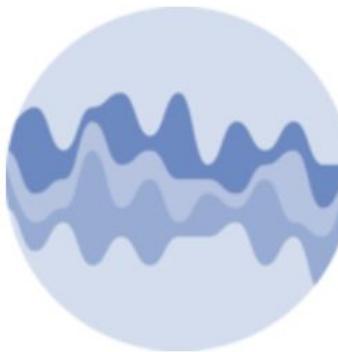
Line plot



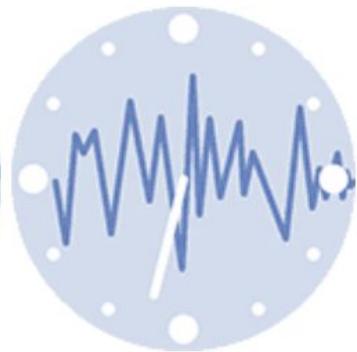
Area



Stacked area



Streamchart



Time Series

Basic plot styles

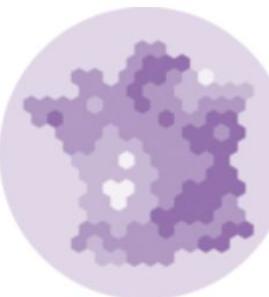
maps



Map



Choropleth



Hexbin map



Cartogram



Connection



Bubble map

Basic plot styles

networks or flow



Chord diagram



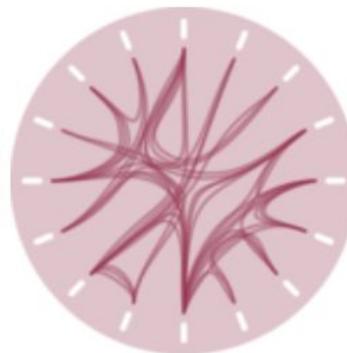
Network



Sankey



Arc diagram



Edge bundling

Design

Your turn

brainstorming and sketching

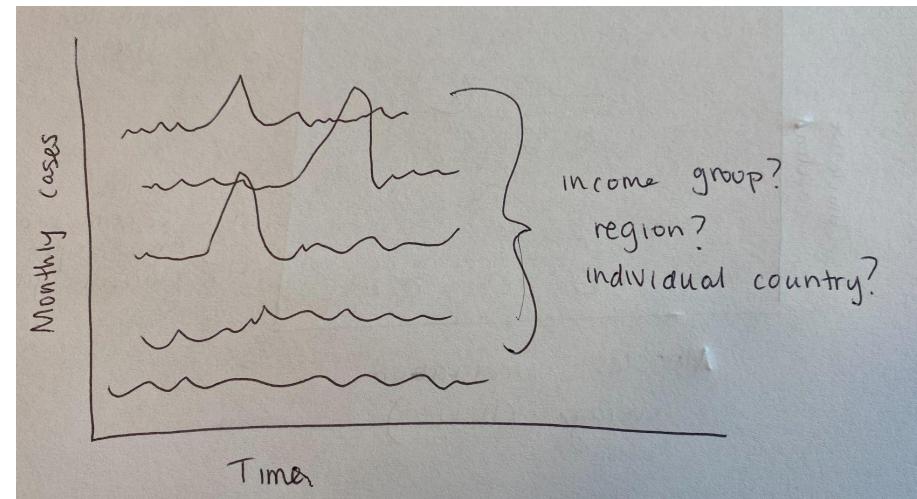
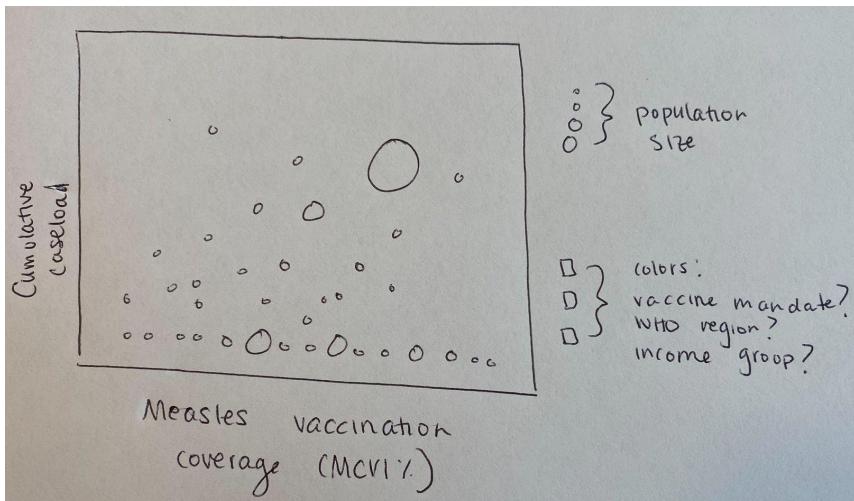
04:00

Your turn!

Design

Does anyone want to share?
(no pressure – really)

A few examples



Stages of creating a new data visualization

Plan

Define goals and audience

Design

Brainstorm and sketch out ideas

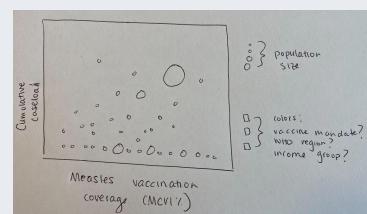
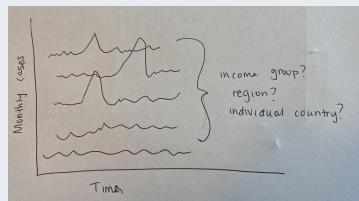
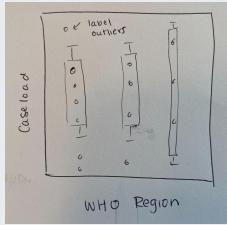
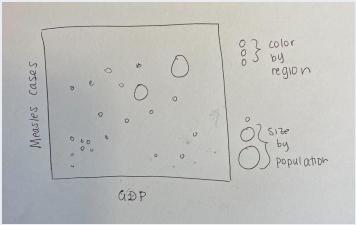
Build

Create your data visualization

Refine

Build

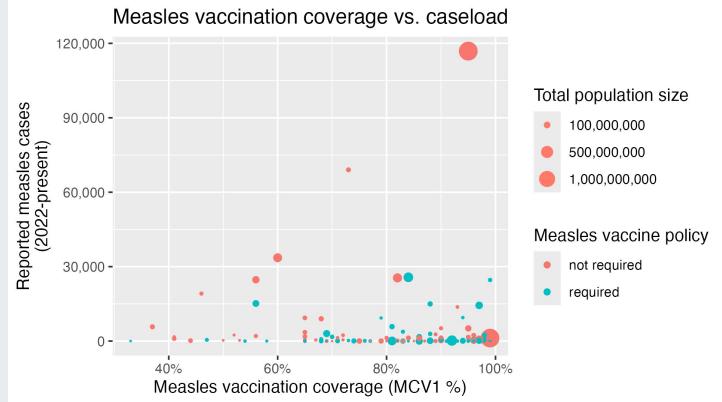
Ideas



Code

```
coverage_cases %>%  
  filter(country_name != "North Korea") %>%  
  filter(measles_vaccine_policy != "no data") %>%  
  ggplot(aes(x = mcv1_coverage/100,  
             y = cases_total,  
             color = measles_vaccine_policy,  
             size = total_population)) +  
  geom_point() +  
  labs(title = "Measles vaccination coverage vs. caseload",  
       x = "Measles vaccination coverage (MCV1 %)",  
       y = "Reported measles cases\n(2022-present)",  
       color = "Measles vaccine policy",  
       size = "Total population size") +  
  scale_x_continuous(labels = scales::percent) +  
  scale_y_continuous(labels = scales::comma) +  
  scale_size_continuous(labels = scales::comma,  
                        breaks = c(100000000, 500000000, 1000000000),  
                        range = c(.05, 5)) +  
  guides(size = guide_legend(override.aes = list(colour = "#FF7A69")))+  
  theme(legend.position = "right")
```

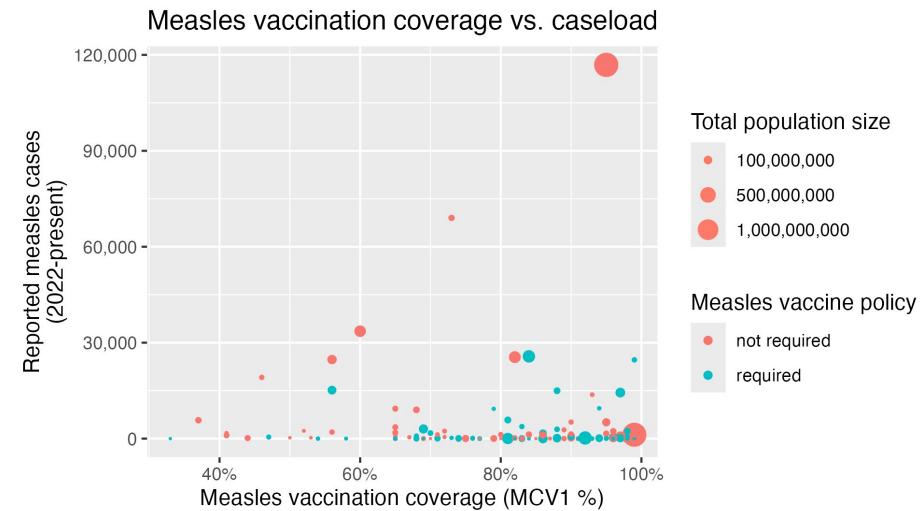
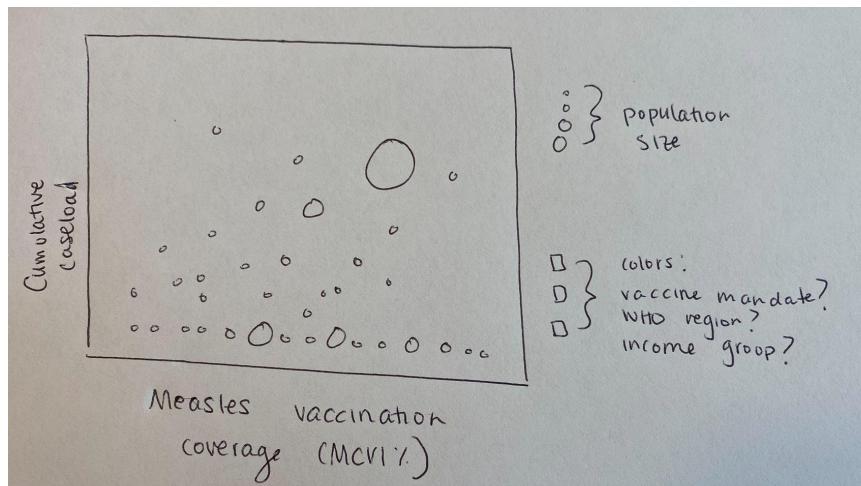
Figure



Build

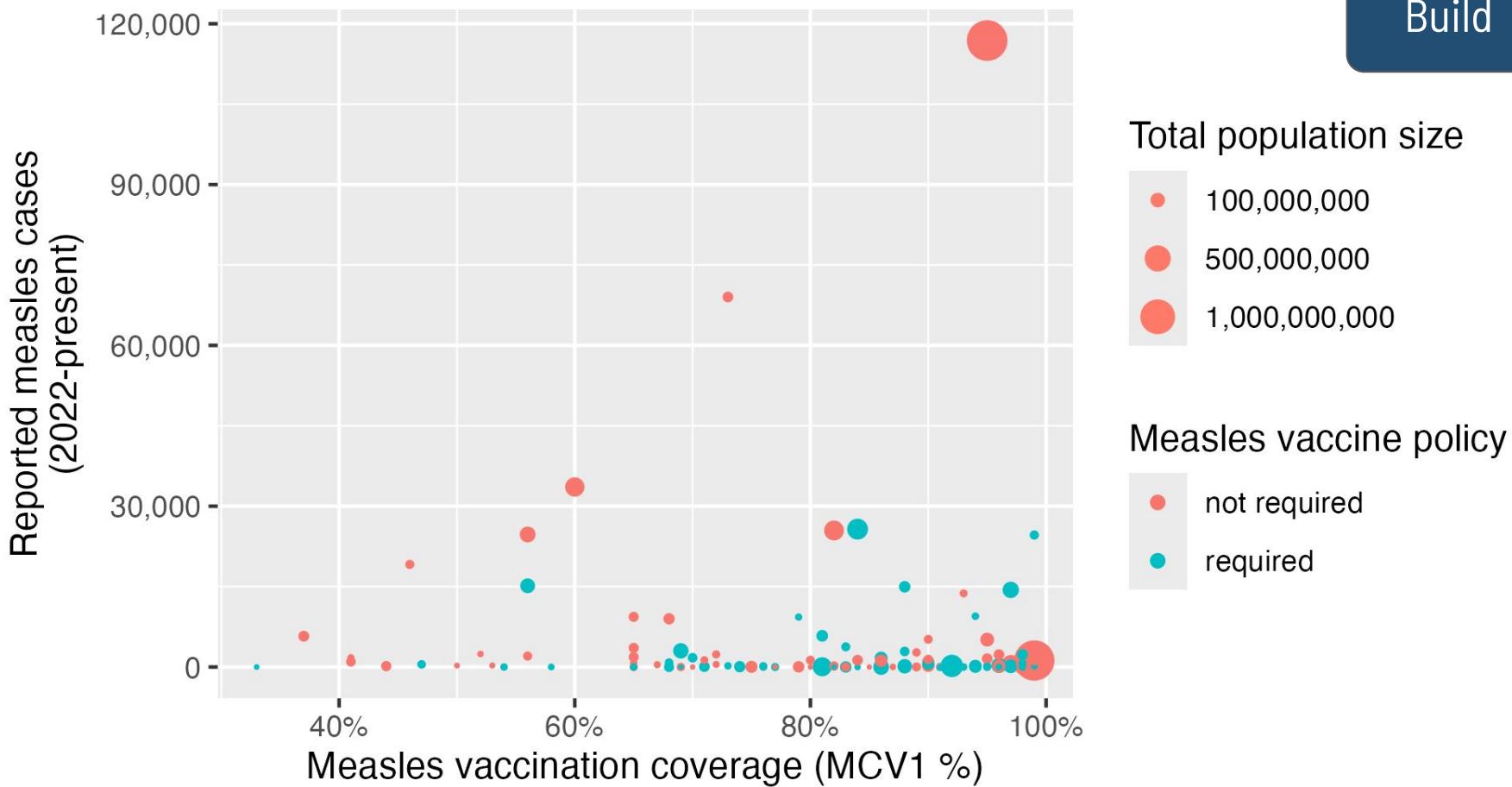
Build a “first draft”

it won't be perfect (it will never be perfect)

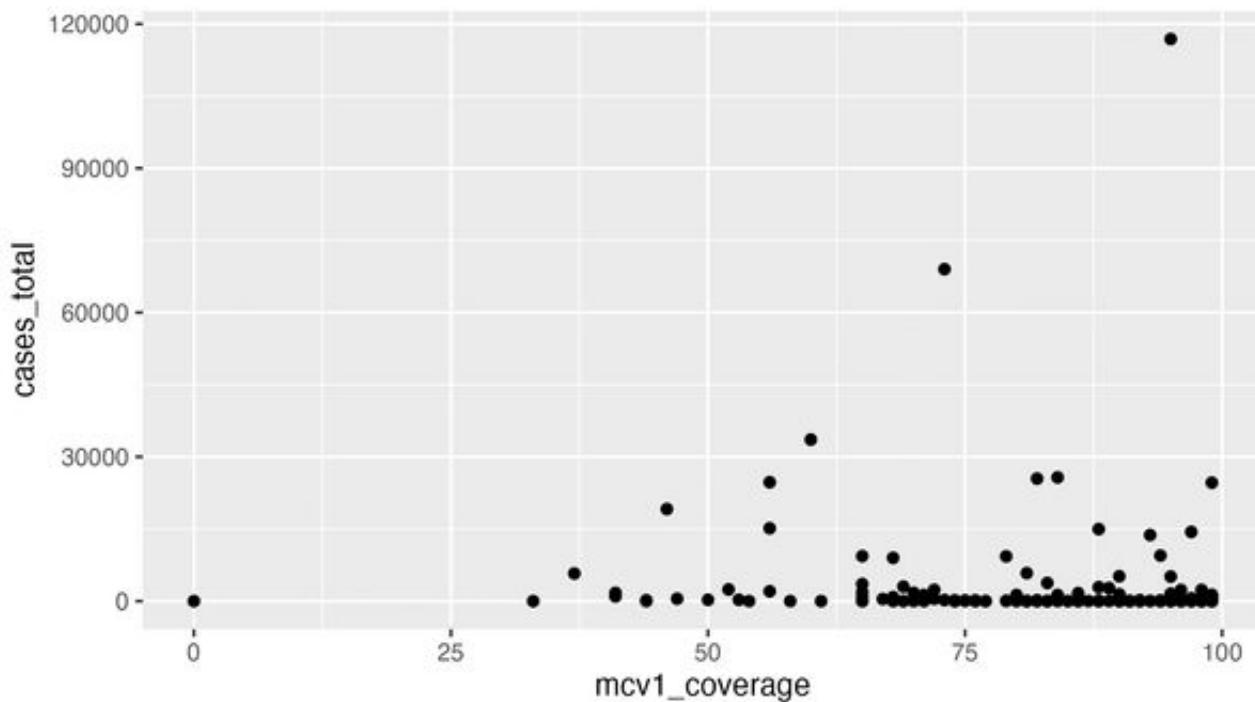


Measles vaccination coverage vs. caseload

Build



Build



Stages of creating a new data visualization

Plan

Define goals and audience

Design

Brainstorm and sketch out ideas

Build

Create your data visualization

Refine

Review, update, and clarify

Refine

Color

Text

Sizing & Style

Refine your visualization

Adjust colors, labels, and visual styles

- Use **color** intentionally
- Write clear and relevant **text** with simple **fonts**
- Adjust **sizing and style** based on your audience

Refine

Color

Colors

use colors intentionally

Sequential



Numbers or categories from low to high
Emphasize range of data

example: % of people with internet

Diverging



Scale from negative to positive
Emphasize extreme values

% votes in a two-party system

Unordered categories



Unordered categories
Easily distinguishable colors

gender

Refine

Color

Colors

resources for choosing colors



ColorSpace: Generate various palettes based on one starting color

<https://mycolor.space/>

Chroma.js Color Helper: Generate scales from multiple colors

<https://www.vis4.net/palettes/>



Data Color Picker: Pick equidistant colors from two ends of a scale

<https://www.learnui.design/tools/data-color-picker.html#palette>



ColorBrewer: Pre-defined colorblind friendly palettes

<https://colorbrewer2.org/>



My three most frequently used resources

Refine

Color

Colors

borrow from existing palettes

Ask about “design systems” or “brand guidelines”

World Health Organization: apps.who.int/gho/data/design-language/design-system/colors/

Global Fund: brandpad.io/the-global-fund-brand-guide-for-partners/

UNAIDS: unaids.org/en/brandbuilder/colour

UNICEF: unicef.github.io/design-system/design-guidelines.html

US HHS: hhs.gov/web/services-and-resources/icon-and-widget-library/index.html

IBM: ibm.com/design/language/color/

Refine

Color

Colors

borrow from real-life

Canva Color Palette: Find colors in photos you can upload

<https://www.canva.com/colors/color-palette-generator/>



Refine

Color

Colors

consider accessibility

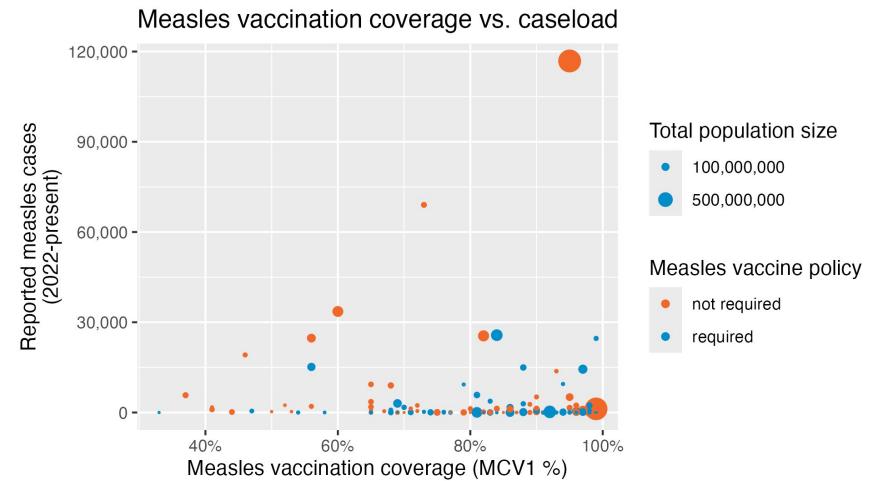
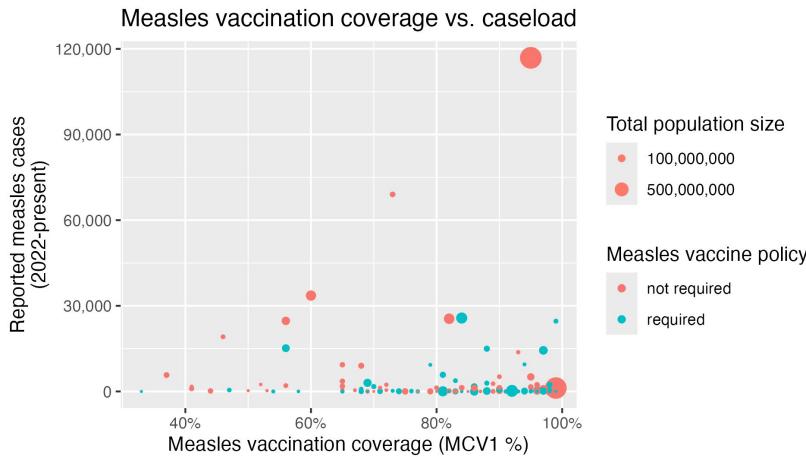
- Utilize **visual contract**, including between text and colors
 - check contrast with coolors.co/contrast-checker/
- Take into account the most common forms of **colorblindness**
 - Red-green color deficiency (reds/green, red/black, yellow/green)
 - Check construct with coolers.co/ (click sunglasses icon)
- Consider **using text**, in addition to color, to convey meaning

Refine

Color

Colors

refine color selection for our plot



Refine

Text and labels

use clear and informative axis titles

Text

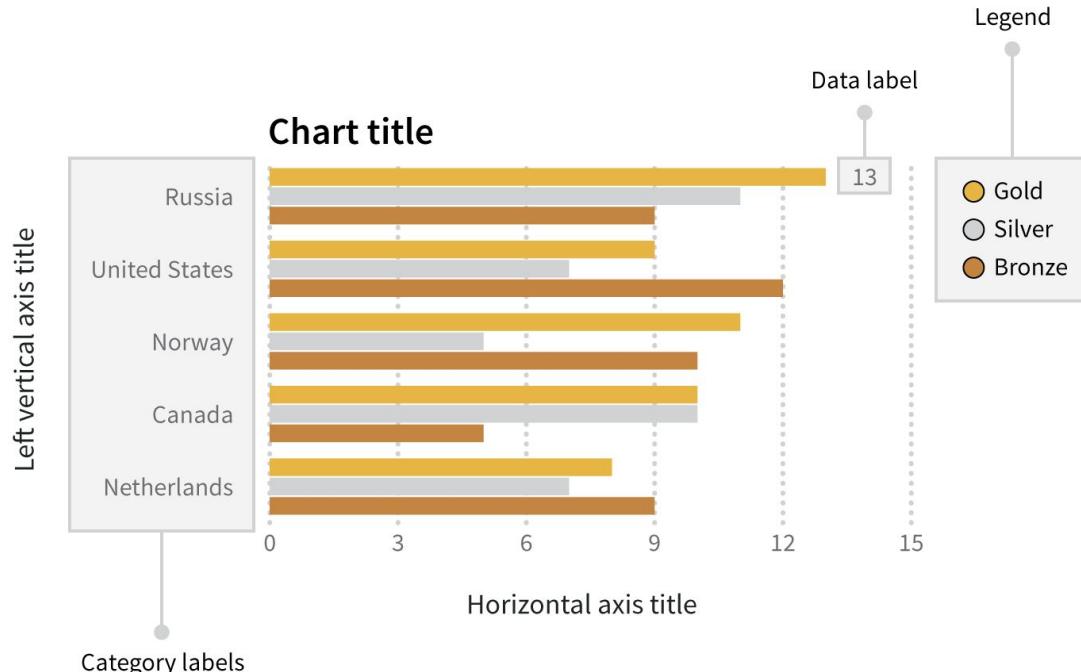
- Visualizations should include text to clearly communicate what the graphic shows, on which timeframes, for which populations, etc
- The specific text and labels you choose depends on how your visualization will be used and who will be looking at it
 - How much context do they need?
 - How much space do you have?
 - How will the graphic be presented (projected? printed? online?)
- Footnotes can be your friend here

Refine

Text

Text and labels

use clear and informative axis titles



Refine

Text and labels

consider size, style, and positioning

Text



- Which line of text did you read first?
- Even though English readers typically read from top to bottom, left to right, the combination of size, style, and color probably meant that you read “Dracula” first

Refine

Text

Text and labels

highlight key information with text or color

683490145738294768593

475894306749305843920

564395048325940367839

683490145738294**76**85934

7589430**6**7493058439205

64395048325940**36**7839

- How long does it take you to find all the “6”s in the top line of text vs. the bottom?
- We can use size (e.g., larger), style (e.g., bold), and color to emphasize results in text labels and in a figure itself

Refine

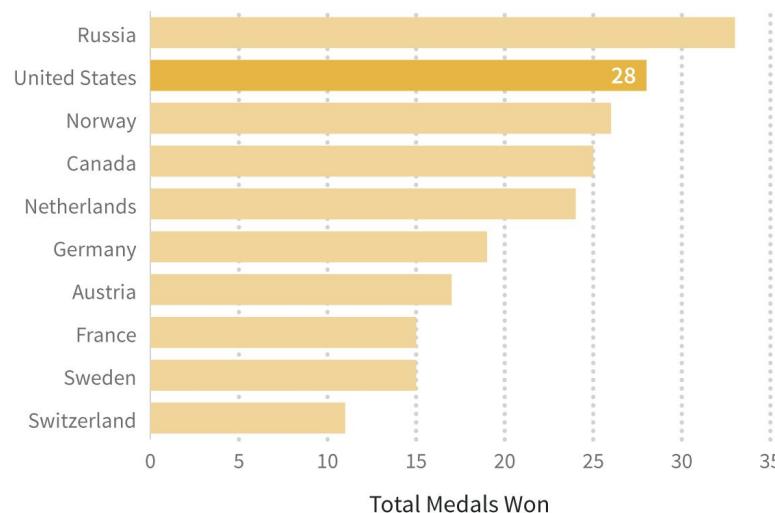
Text and labels

highlight key information with text or color

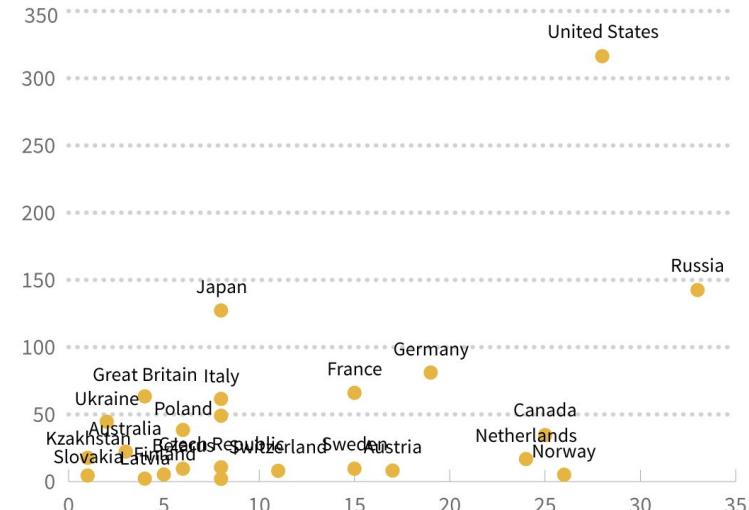
Text

Top ten countries by total medal count

Sochi Winter Olympics, 2014



Comparing medals won to total population



Refine

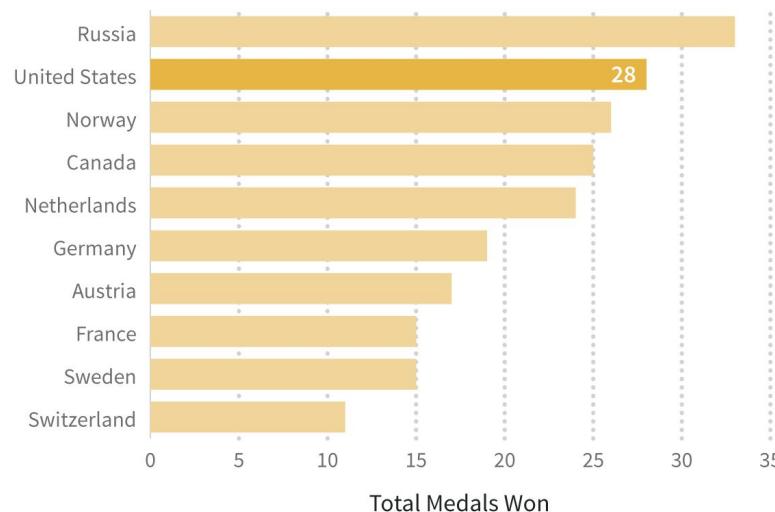
Text and labels

highlight key information with text or color

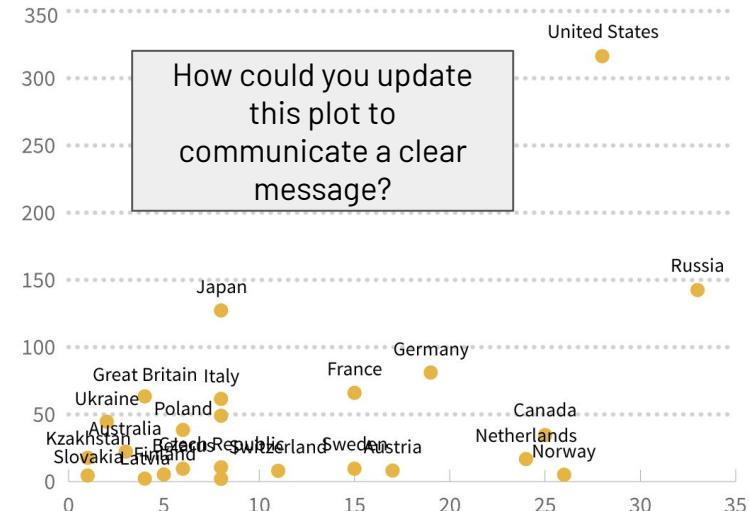
Text

Top ten countries by total medal count

Sochi Winter Olympics, 2014



Comparing medals won to total population

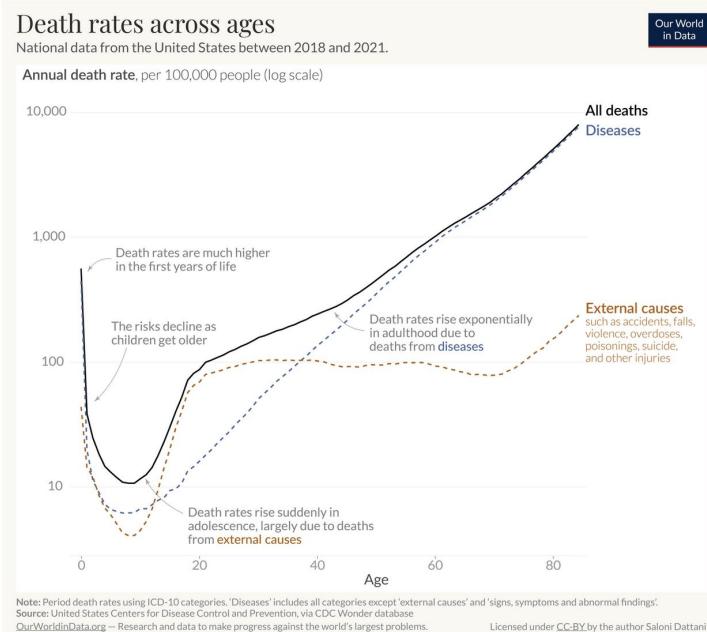


Refine

Text and labels

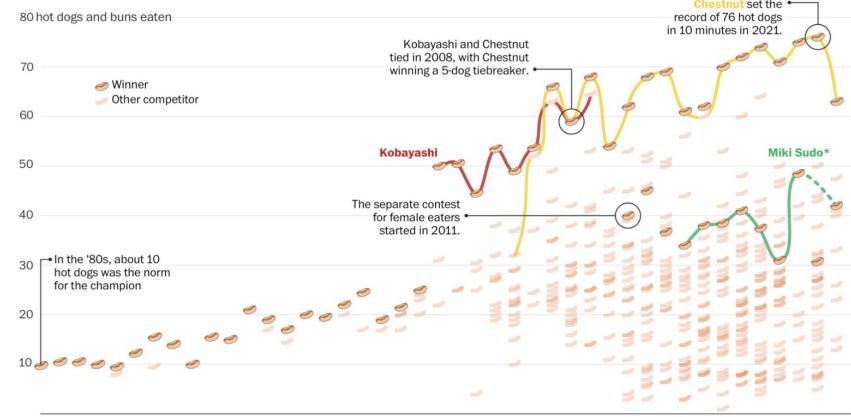
highlight key information with text or color

Text



Competitive hot dog eating requirements

Professional eaters have vastly improved over time



Data for other contestants unavailable for 1980 to 2004 and 2006. Previously 12 minutes most years, the contest switched to 10 minutes long in 2008.

*Sudo did not compete while pregnant in 2021.

Saloni Dattani. Our World in Data.

How does the risk of death change as we age – and how has this changed over time?
<https://ourworldindata.org/how-do-the-risks-of-death-change-as-people-age>

Washington Post, via Flowing Data.

<https://flowingdata.com/2023/07/03/competitive-hot-dog-eating-requirements/>

Refine

Text

Text and labels

choose a font intentionally

Serif

A font **with** serifs – lines or marks at the end of a letter's stroke

Examples:

Times
EB Garamond
Merriweather
Source Serif Pro
Lora
Bitter
Crimson Pro

Rule of thumb:
Good for titles, stylized fonts, or to convey emotion

Sans Serif

A font **without** ("sans") serifs on the letters, with clearly defined edges of each letter

Examples:

Open Sans
Roboto
Poppins
Noto Sans
Work Sans
Epilogue
Barlow

Rule of thumb:
Good for plot labels, projecting on a screen with lower resolution

Refine

Text

Text and labels

explore different font options

The screenshot shows the Google Fonts website's search interface. At the top left is the "Google Fonts" logo. To its right is a search bar with the placeholder "Search fonts". Further right is a dropdown menu labeled "Sort by: Trending". Below the search bar is a blue button labeled "Filters". At the bottom of the interface are two small text links: "104 of 1603 families" on the left and "About these results ⓘ" on the right.

104 of 1603 families

About these results ⓘ

Montserrat Variable (2 axes) | Julieta Ulanovsky, Sol Matas, Juan Pablo del Peral, Jacques Le Bailly

Everyone has the right to freedom of thought, conscience and religion

Poppins 18 styles | Indian Type Foundry, Jonny Pinhorn

Everyone has the right to freedom of thought, conscience and religion

Roboto Condensed Variable (2 axes) | Christian Robertson

Everyone has the right to freedom of thought, conscience and religion; this

Google Fonts.

<https://fonts.googleapis.com/?stylecount=14>

Refine

Text

Text and labels

some of my (personal) favorite fonts for data viz

- Barlow
- Montserrat
- Work Sans

Google Fonts.

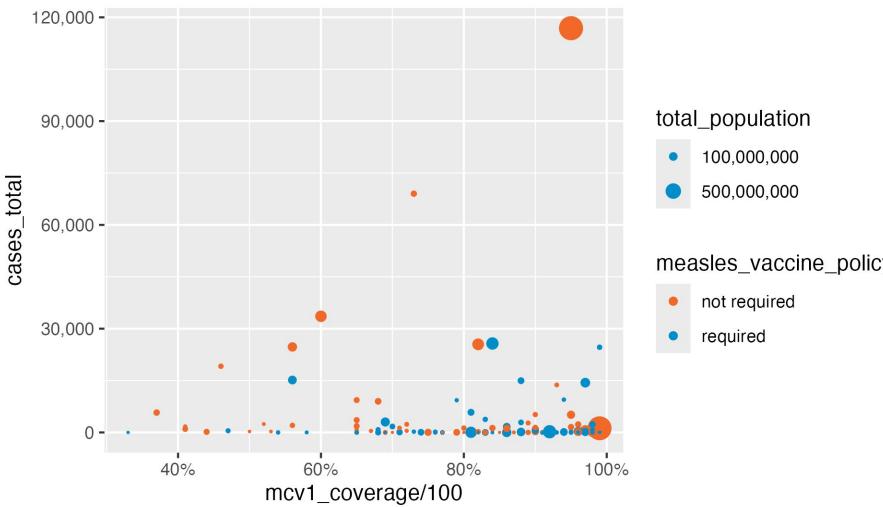
<https://fonts.google.com/?stylecount=14>

Refine

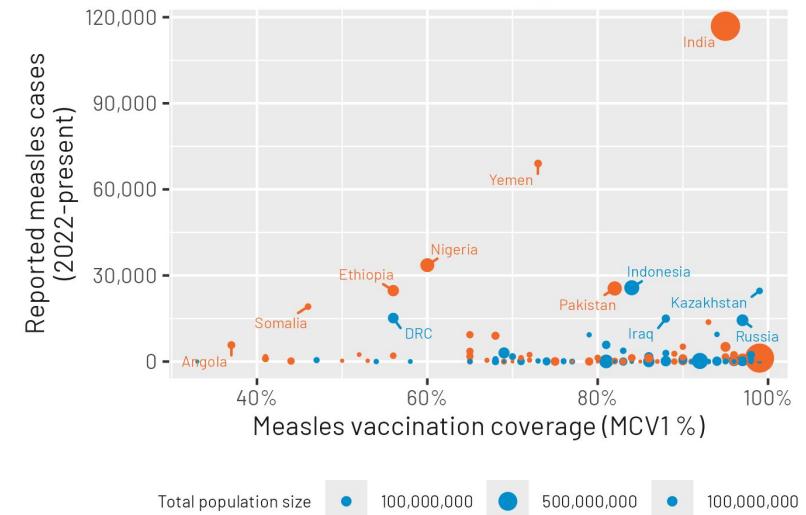
Text

Text and labels

refine text selection for our plot



Measles vaccination coverage vs. caseload
Countries where vaccination is **required** and **not required**



Sizing and style

where will your graphic be presented?

Sizing & Style

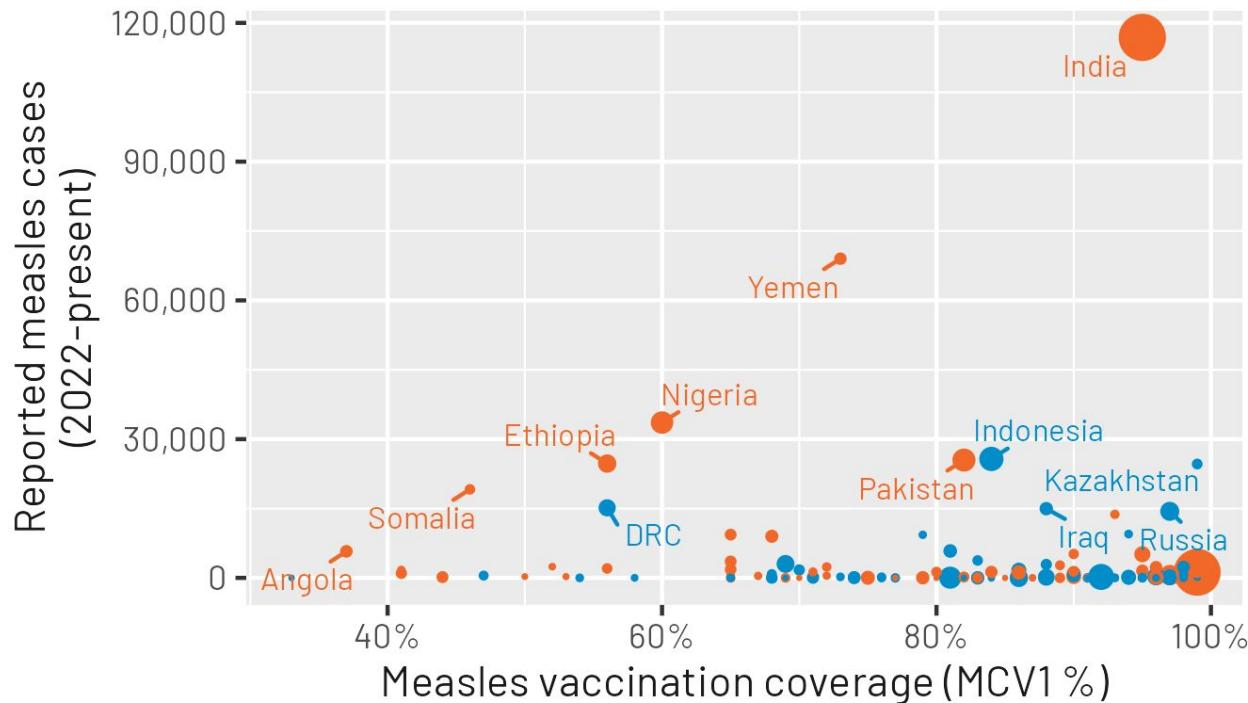
- Peer-reviewed journal
 - typically must be high resolution (at least 350 dpi)
- Presentation
 - boardroom (printed on paper/mailed) vs. ballroom (presented to big group)
 - if projected, fonts often need to be larger to be visible
- Poster
 - ensure that the text/colors in the graphic align with written descriptions
- Social media
 - look up ideal figure sizes based on available space for graphics

Measles vaccination coverage vs. caseload

Countries where vaccination is **required** and **not required**

Refine

Sizing & Style



Total population size

100,000,000

500,000,000

1,000,000,000

Your turn

anything you would change?

Refine

Color

Text

Sizing & Style



04:00

Recap from today

- **Learn** a step-by-step process for creating great data visualizations
- **Understand** your audience and your goals when visualizing data
- **Design** some fun and beautiful data visualizations

An open offer

- We didn't have time today to actually build these visualizations in R
- **For those in the class**, we'll do this tomorrow as our final project
- **For those attending today only**, if you're interested in seeing what your idea looks like built against a real dataset, come talk to me for 5 minutes after class. I am happy to help build it and share some R code with you, if you're curious what the code would look like.

contact me at: sde31@georgetown.edu

Plan for tomorrow

- **Build** the data visualizations you designed today in R
- **Create a portfolio** to showcase your work on github

OPTIONAL homework

review some beautiful and creative data visualizations

- One of the most helpful ways to improve my data visualization skills is to learn from the amazing work that other people are already doing.
 - [Cara Thompson's portfolio](#)
- What are your favorite visualizations (from this list or elsewhere)? Why?
- What do they communicate?

OPTIONAL reading

learn more about **colors**

Lisa Charlotte Muth. A detailed guide to colors in data vis style guides

<https://blog.datawrapper.de/colors-for-data-vis-style-guides/>

Cara Thompson. Five tips for creating bespoke colour schemes

<https://www.cararthompson.com/talks/nhsr2022-palatable-palettes/>

Lisa Charlotte Muth. When to use sequential and diverging color scales

<https://blog.datawrapper.de/diverging-vs-sequential-color-scales/>

Color palettes and accessibility features for data visualization

medium.com/carbondesign/color-palettes-and-accessibility-features-for-data-visualization-7869f4874fca

OPTIONAL reading

learn more about **fonts**

Elliot Jay Stocks. Making sense of typographic classifications

fonts.google.com/knowledge/introducing_type/making_sense_of_typographic_classifications

Elliot Jay Stocks. Pairing typefaces

[onts.google.com/knowledge/choosing_type/pairing_typefaces](https://fonts.google.com/knowledge/choosing_type/pairing_typefaces)

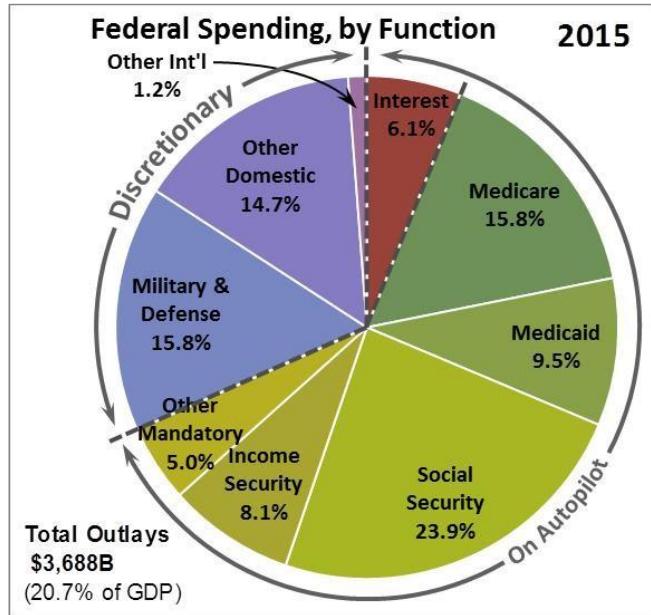
WCAG2 Accessibility by Design

wcaq2.com/accessible-typography-and-style/

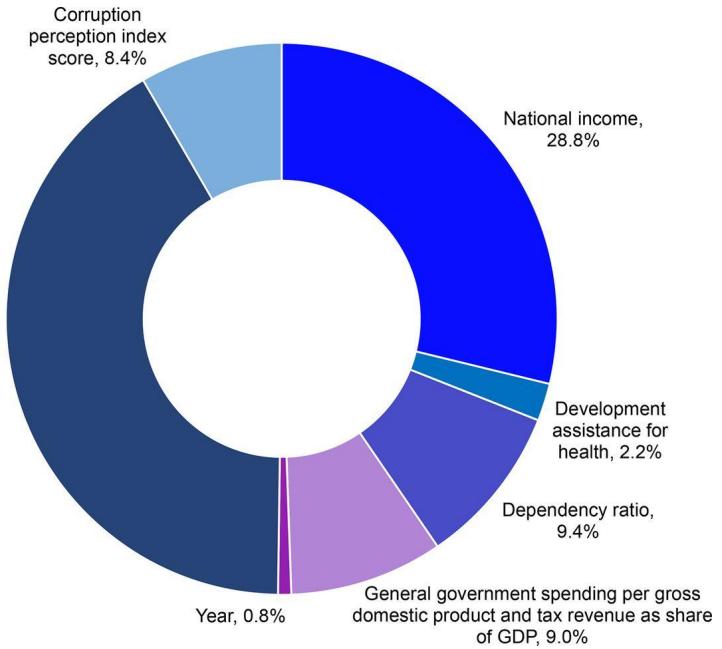
Appendix

Plot styles

pie or donut charts



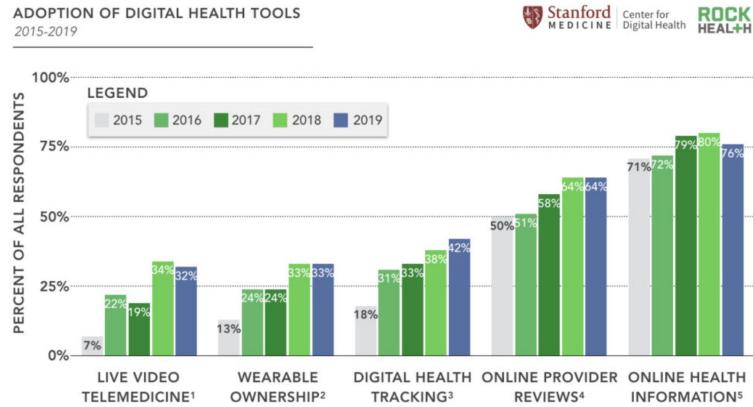
Source: Randall Bolten
<https://www.linkedin.com/pulse/last-pie-chart-actually-says-something-important-randall-bolten>



Source: Micah AE, Chen CS, Zlavog BS, Hashimi G, Chapin A, Dieleman JL. Trends and drivers of government health spending in sub-Saharan Africa, 1995–2015. BMJ global health. 2019 Jan 1;4(1):e001159.

Plot styles

barcharts



Source: Rock Health Digital Health Consumer Adoption Survey (n2019 = 4,000; n2018 = 4,000; n2017 = 3,997; n2016 = 4,015; n2015 = 4,017)

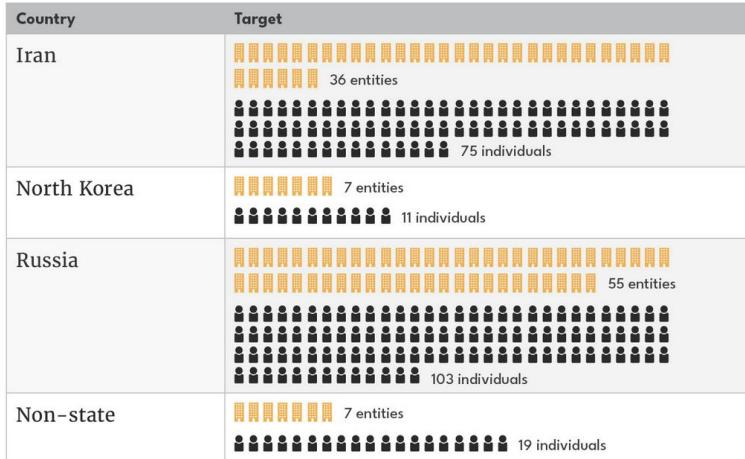
Source: Rock Health
<https://rockhealth.com/insights/digital-health-consumer-adoption-report-2019/>

Plot styles

variations of barcharts

America's Cyber Sanctions by Target

Entity  Individual



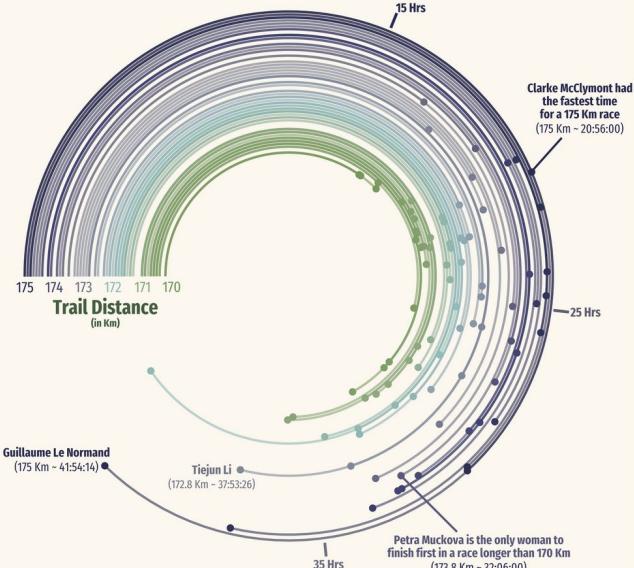
Source: This data is primarily drawn from "Countering Malicious Cyber Activity: Targeted Financial Sanctions" by Natalie Thompson. It has been reorganized and brought up to date as of January 1, 2021. Thompson, Natalie. "Countering Malicious Cyber Activity: Targeted Financial Sanctions." Carnegie Endowment for International Peace, Oct. 2020, p. 11–13. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3700816. Accessed 23 Jan. 2021. See Appendix 1 for additional details.

Source: Third Way

<https://www.thirdway.org/memo/unpacking-us-cyber-sanctions>

Ultimate Trail Running

Plot displays finishing times in hours (line length) of first place runners. Trails longer than 170 Km are displayed, and races range between 2012 and 2021



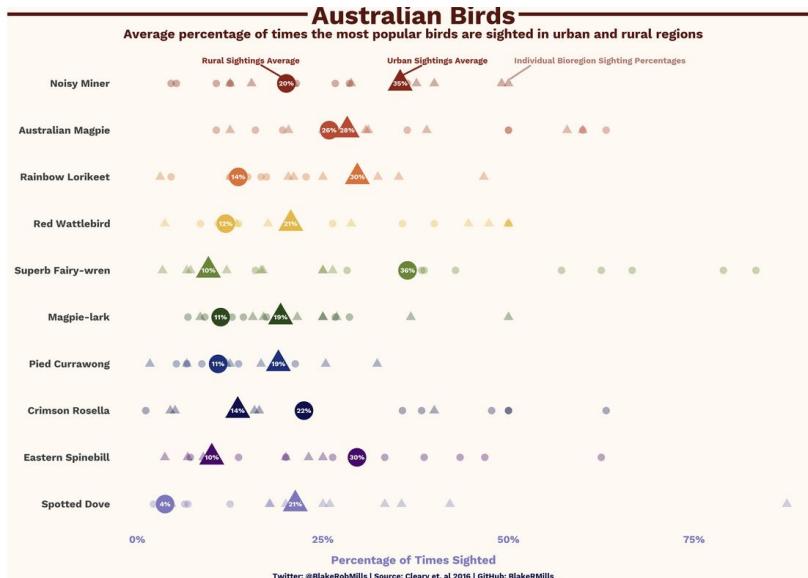
Twitter: @BlakeRobMills | Source: International Trail Running Association | GitHub: BlakeRMills

Source: Blake Mills, TidyTuesday

<https://github.com/BlakeRMills/TidyTuesday>

Plot styles

dot plots



Source: Blake Mills, TidyTuesday
<https://github.com/BlakeRMills/TidyTuesday>

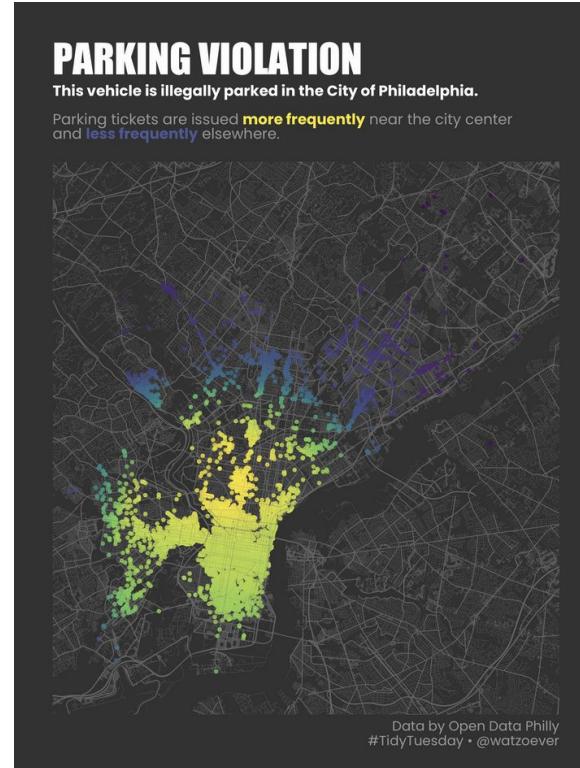
Plot styles

heatmaps

	Cassidy-Graham	Skinny repeal	Partial repeal	Repeal and replace	House-passed plan
Individual mandate	Repeal	Repeal	Repeal	Repeal	Repeal
Employer mandate	Repeal	Repeal	Repeal	Repeal	Repeal
Subsidies for out-of-pocket costs	Repeal	Keep	Repeal	Repeal	Repeal
Tax credits for premiums	Repeal	Keep	Repeal	Change	Change
Medicaid expansion	Repeal	Keep	Repeal	Change	Change
Essential health benefits	Up to states	Keep	Keep	Up to states	Up to states
Prohibitions on annual and lifetime limits	Up to states	Keep	Keep	Up to states	Up to states
Pre-existing conditions policy	Up to states	Keep	Keep	Up to states	Up to states
Restrictions on charging more for older Americans	Up to states	Keep	Keep	Up to states	Up to states
Taxes created under Obamacare	Change	Change	Change	Change	Repeal
Health savings account	Change	Change	Change	Change	Change
Dependent coverage until 26	Keep	Keep	Keep	Keep	Keep
Vote results	Expected next week	Failed 49-51	Failed 45-55	Failed 43-57	Passed 217-213
Increase in the number of uninsured in 10 years	No score	16 million	32 million	No score	23 million

Source: New York Times

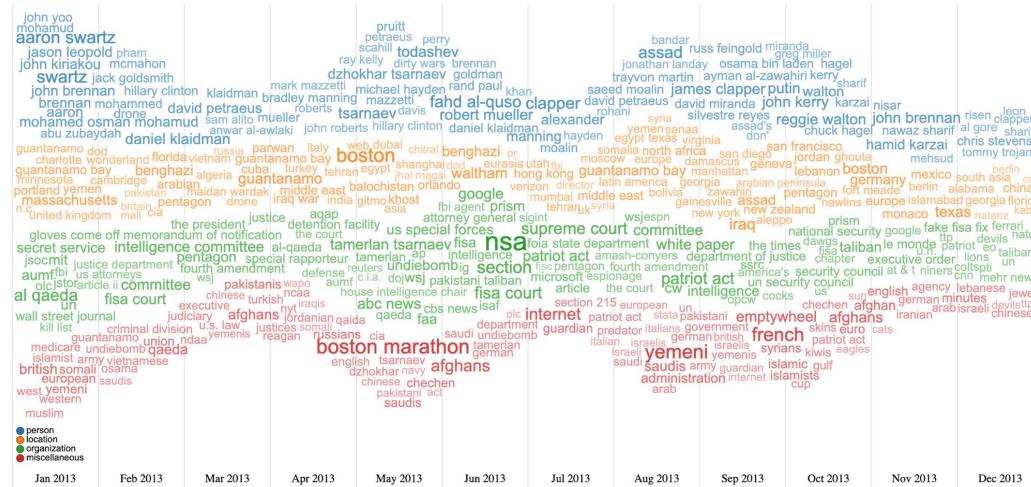
<https://www.nytimes.com/interactive/2017/09/22/us/republican-health-plan-comparison.html>



Source: Julia Watzek TidyTuesday
<https://github.com/jwatzek/tidytuesday>

Plot styles

word clouds

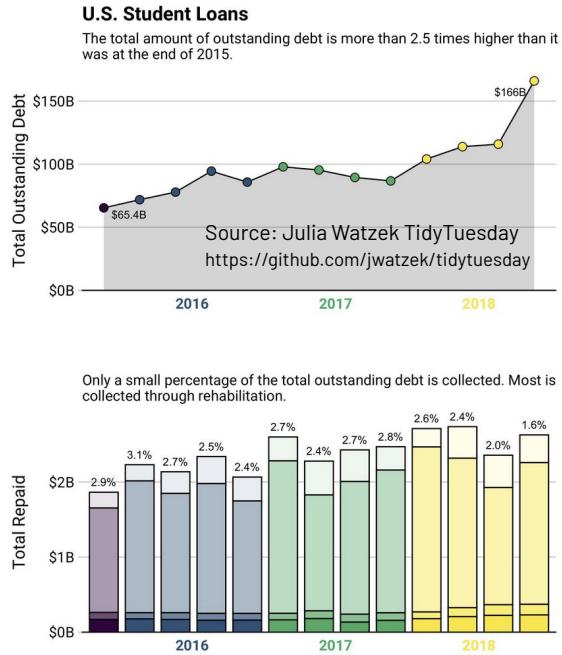


Source: WordStream

<https://idatavisualizationlab.github.io/WordStream/examples.html?>

Plot styles

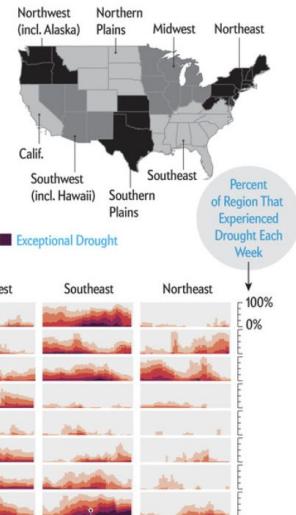
combining plot styles



Escalating Drought

Climate change is intensifying periods of extreme dryness, particularly in the U.S. West

For more than 20 years the National Drought Mitigation Center (NDMC) has been monitoring dozens of indices of drought around the country, including satellite measurements of evaporation and color in vegetation, soil-moisture sensors, rainfall estimates, and river and streamflow levels. Although the agency's weekly assessments have identified periods of exceptional drought before, lately dryness has been ramping up. "The changing climate is definitely contributing to more natural disasters, drought being one of them," says Brian Fuchs, a climatologist who oversees the weekly report at the NDMC. "We're seeing more frequent and high-intensity episodes. This year some of these areas in the West have been in drought more than they have been without drought."



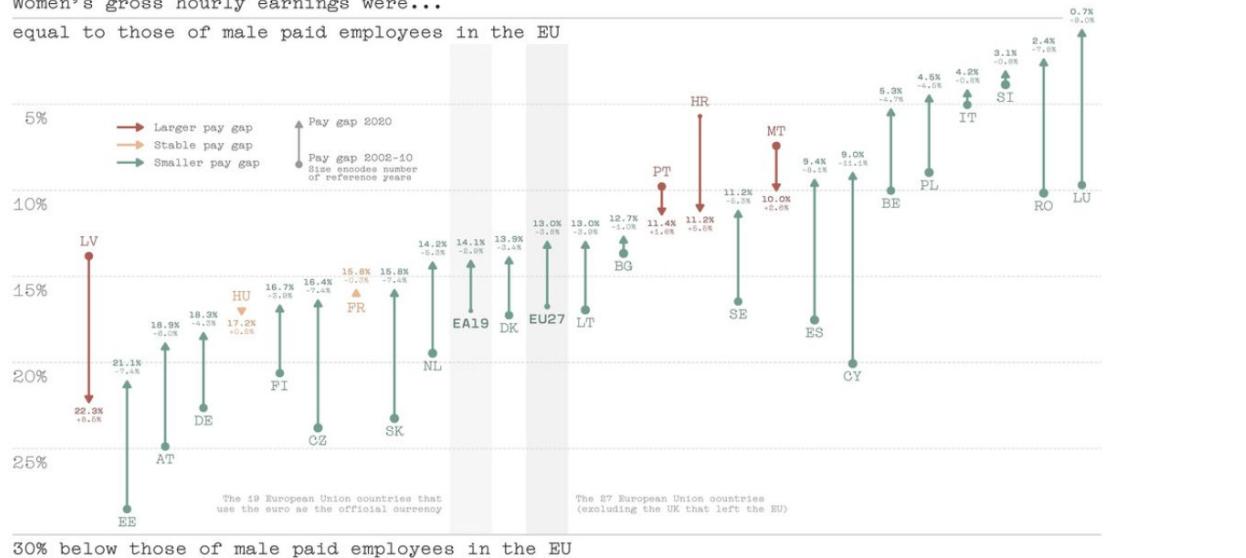
Source: Cedric Scherer
<https://www.cedricscherer.com/top/dataviz/>

Other plot styles

Cleveland dot plot

Women's gross hourly earnings were...

equal to those of male paid employees in the EU



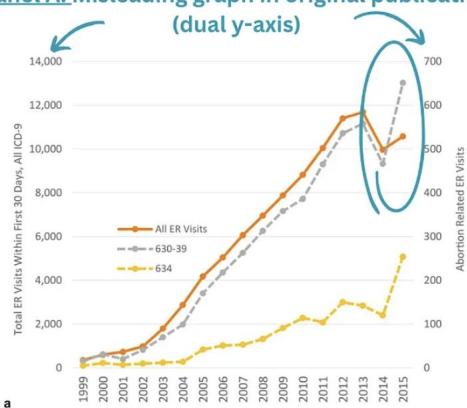
Source: Cedric Scherer

<https://www.cedricscherer.com/top/dataviz/>

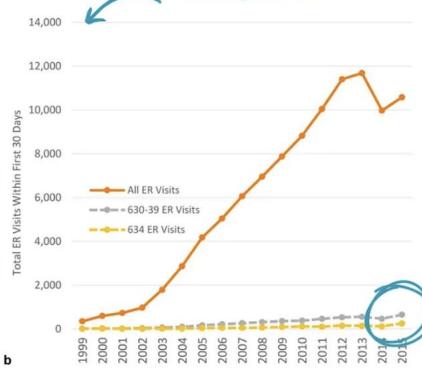
Get the details right

Axes matter

Panel A: Misleading graph in original publication



Panel B: Correct graph by external reviewers



(Misleading) Conclusion: Almost all ED visits are due to abortions

Conclusion: Very few emergency room visits are for abortion

Figure Source: Upadhyay et al, 2024; Annotations by YLE

Source: Your Local Epidemiologist Substack.

<https://yourlocalepidemiologist.substack.com/p/two-retracted-studies-at-the-supreme>