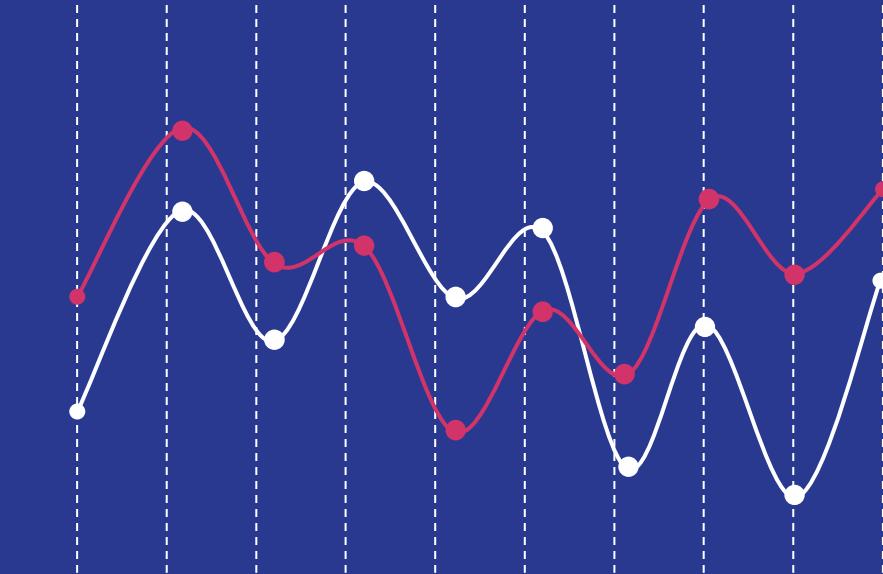


Best Practices for Data Visualization

Jess Cohen-Tanugi, Visualization Specialist, Harvard Library

The data does not speak for itself

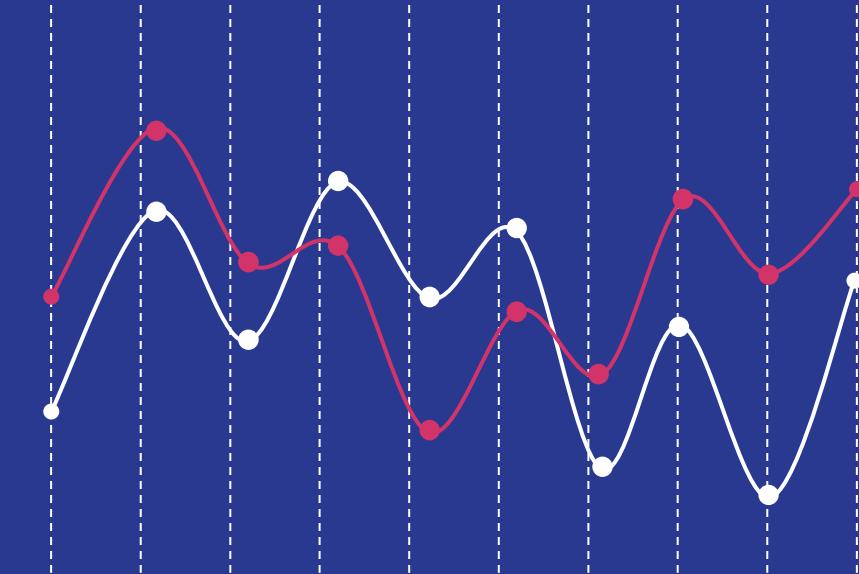
Date	Ozone ($\mu\text{g}/\text{m}^3$)	Temperature ($^{\circ}\text{C}$)	Relative humidity (%)	n deaths
1 Jan 2002	4.59	-0.2	75.7	199
2 Jan 2002	4.88	0.1	77.5	231
3 Jan 2002	4.71	0.9	81.3	210
4 Jan 2002	4.14	0.5	85.4	203
5 Jan 2002	2.01	4.3	93.5	224
6 Jan 2002	2.4	7.1	96.4	198
7 Jan 2002	4.08	5.2	93.5	180
8 Jan 2002	3.13	3.5	81.5	188
9 Jan 2002	2.05	3.2	88.3	168
10 Jan 2002	5.19	5.3	85.4	194
11 Jan 2002	3.59	3.0	92.6	223
12 Jan 2002	12.87	4.8	94.2	201



The data does not speak for itself

Date	Ozone ($\mu\text{g}/\text{m}^3$)	Temperature ($^{\circ}\text{C}$)	Relative humidity (%)	n deaths
1 Jan 2002	4.59	-0.2	75.7	199
2 Jan 2002	4.88	0.1	77.5	231
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9 Jan 2002	2.05	3.2	88.3	168
10 Jan 2002	5.19	5.3	85.4	194
11 Jan 2002	3.59	3.0	92.6	223
12 Jan 2002	12.87	4.8	94.2	201

...but many people of charts and graphs as “objective”



BEST PRACTICES FOR DATA VISUALIZATION

Data visualization is an iterative process

University Name	State	2019	2018	2017
Princeton University	NJ	1	1	1
Harvard University	MA	2	2	2
Yale University	CT	3	3	3
University of Chicago	IL	3	3	3
Columbia University	NY	3	5	5
Massachusetts Institut	MA	3	5	7
Stanford University	CA	7	5	5
University of Pennsylvania	PA	8	8	8
Duke University	NC	8	9	8
Johns Hopkins Univers	MD	10	11	10
Northwestern Univers	IL	10	11	12
California Institute of	CA	12	10	12
Dartmouth College	NH	12	11	11
Brown University	RI	14	14	14
Vanderbilt University	TN	14	14	15
Cornell University	NY	16	14	15

University Name	State	Year	Rank
Columbia University	NY	1988	18
Columbia University	NY	1989	8
Columbia University	NY	1990	11
Columbia University	NY	1991	10
Columbia University	NY	1992	9
Columbia University	NY	1993	10
Columbia University	NY	1994	11
Columbia University	NY	1995	9
Columbia University	NY	1996	15
Columbia University	NY	1997	11
Columbia University	NY	1998	9
Columbia University	NY	1999	10
Columbia University	NY	2000	10
Columbia University	NY	2001	10
Columbia University	NY	2002	9

Choose a message, and compose a visualization.

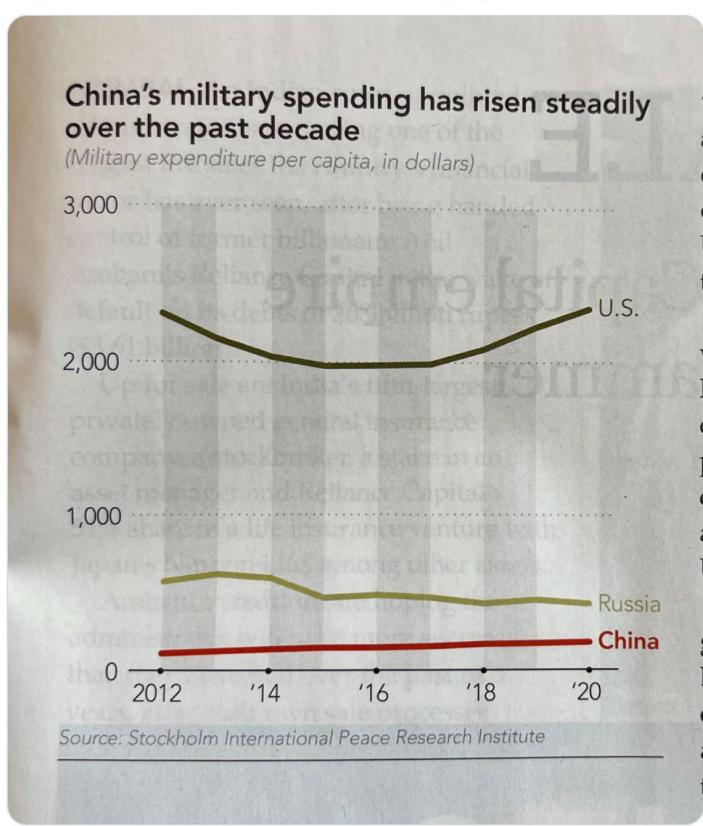


Your visualization is probably part of a narrative, and will have a message you can summarize in words.

You can (and probably will) tell many different stories with the same data.

Mismatch between message and graph

yea that's what stands out on this graph



CHOOSING THE “RIGHT” CHART TYPE

Chart picking tools can be very helpful

Deviation

Emphasise point variations ($>/<$) from a fixed reference point. Typically the reference point is a mean or median value over a longer period. A long-term average can also be used to show movement.

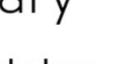
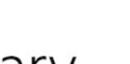
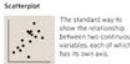
Example FT uses
Trade surplus/deficit, climate change



Correlation

Show the relationship between two or more variables. Be mindful that, unless you have a causal relationship, correlation will assume the relationships you show them to be causal (e.g. one causes the other).

Example FT uses
Inflation and unemployment, income and life expectancy



Ranking

Use where an item's position in an ordered list is more important than its absolute value. It's good for ranking, but afraid to highlight the lack of uniformity or equality in the data.

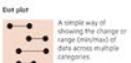
Example FT uses
World, domestic, league tables, constituency election results



Distribution

Show values in a dataset and how often they occur. The shape (or 'view') of a distribution can tell us a lot about the highlighting the lack of uniformity or equality in the data.

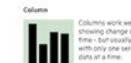
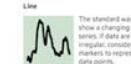
Example FT uses
Income distribution, population
Geographic distributions, revealing
inequality



Change over Time

Give emphasis to changing trends. These can be short (one-day) or long (decades). It's good to see time differences; if data are changing frequently, it's better to use time differences. Choosing the correct time period is crucial for the reader.

Example FT uses
Share price movements, economic time series, sectoral changes in a market



Magnitude

Show size comparisons. These can be relative (just being able to see which is larger) or absolute (able to see the size difference). If data are changing frequently, it's better to use a calculated number (for example, billions, millions, thousands) rather than a calculated rate per cent.

Example FT uses
Commodity production, market capitalisation, volumes in general



Part-to-whole

Show how a single entity can be broken down into its component elements. If the components are large enough in their own right, consider a magnitude chart instead.

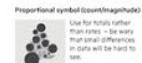
Example FT uses
Fiscal budgets, company structures, national election results



Spatial

Avoid from locator maps only used when precise locations or geographical patterns are important. Consider helping the reader than anything else.

Example FT uses
Resource, natural resource locations, natural disaster risk/impact, campaign areas, turnout in election results



Show the reader volumes or intensity of movement between two or more states, regions, countries, or administrative sequences or geographical locations.

Example FT uses
Movement of funds, trade, migrants, leisure, information, relationships graphs.



Visual vocabulary



ft.com/vocabulary

Part-to-whole

Show how a single entity can be broken down into its component elements. If the reader's interest is solely in the size of the components, consider a magnitude-type chart instead.

Example FT uses

Fiscal budgets, company structures, national election results

Stacked column/bar



A simple way of showing part-to-whole relationships but can be difficult to read with more than a few components.

Marimekko



A good way of showing the size and proportion of data at the same time – as long as the data are not too complicated.

Pie



A common way of showing part-to-whole data – but be aware that it's difficult to accurately compare the size of the segments.

Spatial

Aside from locator maps only used when precise locations or geographical patterns in data are more important to the reader than anything else.

Example FT uses

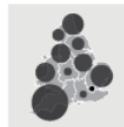
Population density, natural resource locations, natural disaster risk/impact, catchment areas, variation in election results

Basic choropleth (rate/ratio)



The standard approach for putting data on a map – should always be rates rather than totals and use a sensible base geography.

Proportional symbol (count/magnitude)



Use for totals rather than rates – be wary that small differences in data will be hard to see.

Flow map



For showing unambiguous movement across a map.

Flow

Show the reader volumes or intensity of movement between two or more states or conditions. These might be logical sequences or geographical locations.

Example FT uses

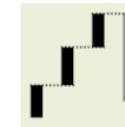
Movement of funds, trade, migrants, lawsuits, information; relationship graphs.

Sankey



Shows changes in flows from one condition to at least one other; good for tracing the eventual outcome of a complex process.

Waterfall



Designed to show the sequencing of data through a flow process, typically budgets. Can include +/- components.

Chord



A complex but powerful diagram which can illustrate 2-way flows (and net winner) in a matrix.

<https://www.data-to-viz.com/>



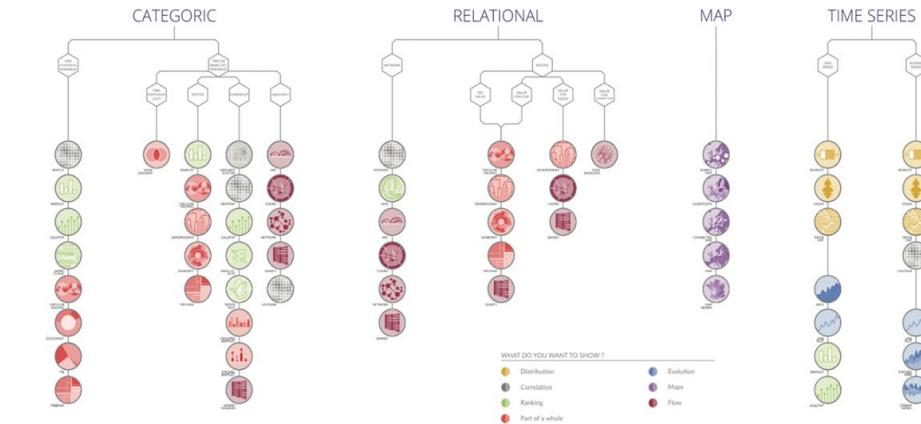
from Data
to Viz

This 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.

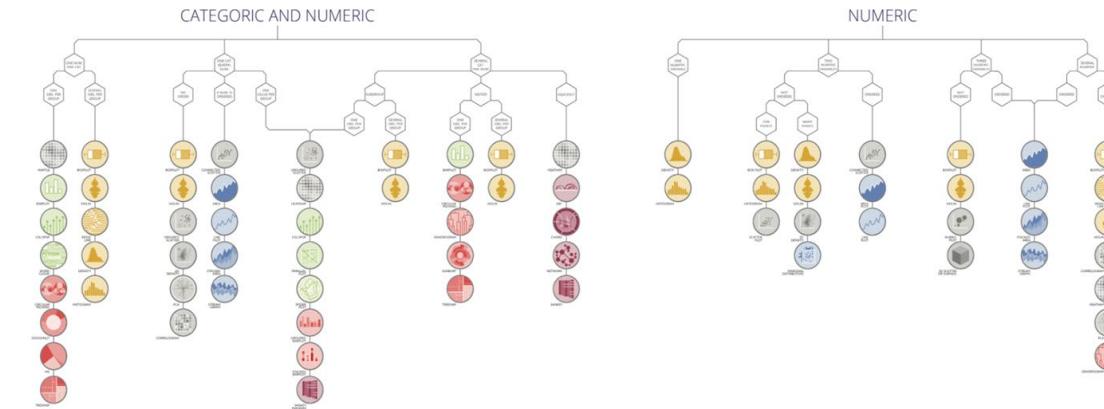
Dataviz is a world with endless possibilities and this project is just a starting point. We hope it will prove useful and should provide you with a good starting point. For an interactive version and much more, visit:

data-to-viz.com



WHAT DO YOU WANT TO SHOW ?

● Distribution	● Evolution
● Correlation	● Maps
● Ranking	● Flow
● Part of a whole	

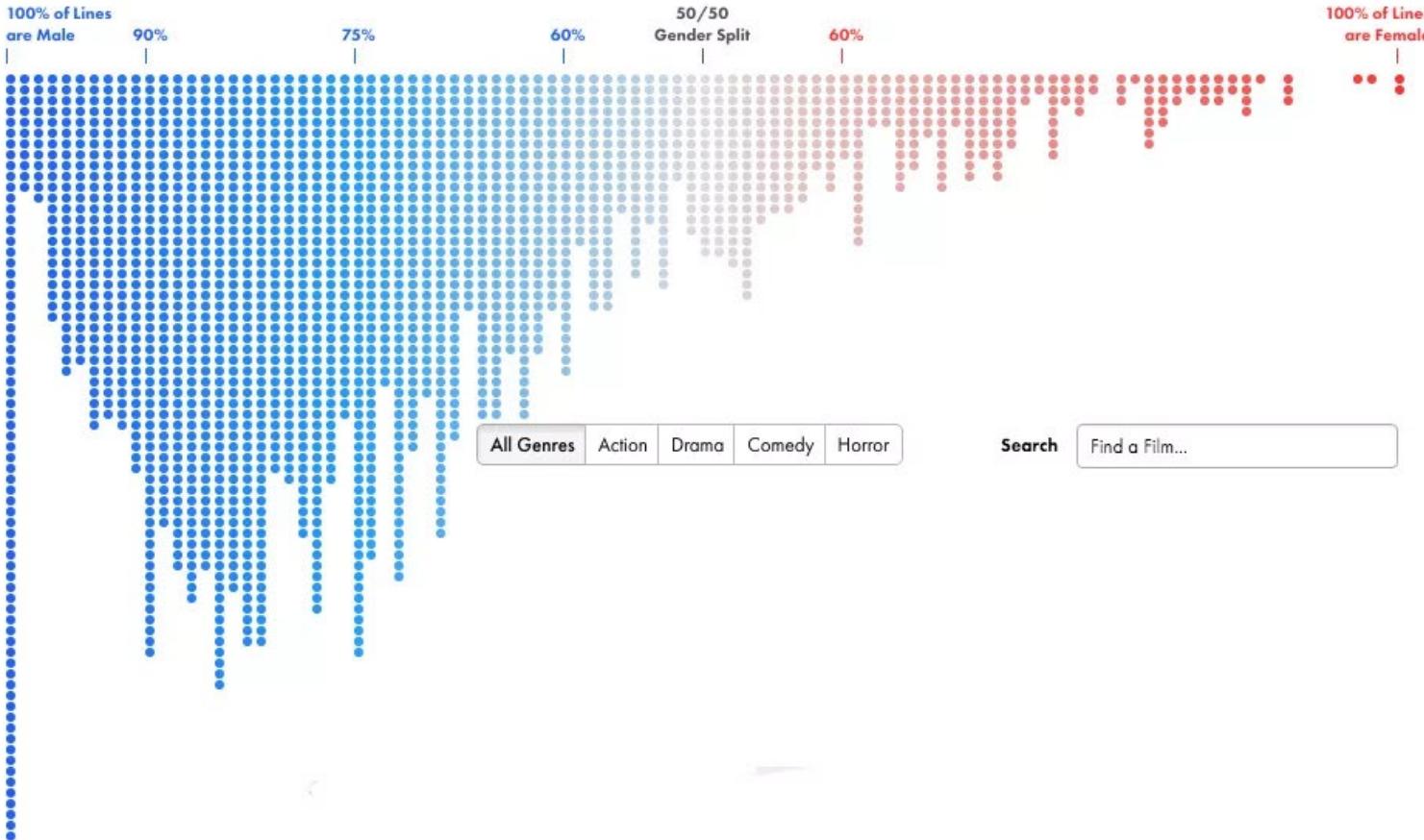




Screenplay Dialogue,
Broken-down by Gender

2,005 Screenplays: Dialogue Broken-down by Gender

Only High-Grossing Films: Ranked in
the Top 2,500 by US Box Office*



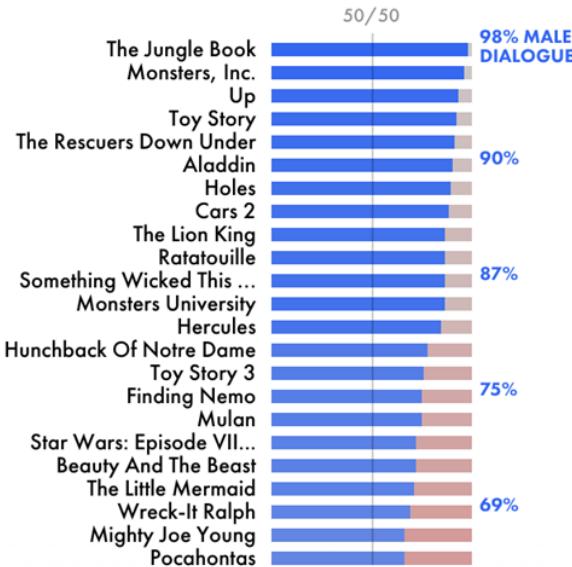


Screenplay Dialogue, Broken-down by Gender

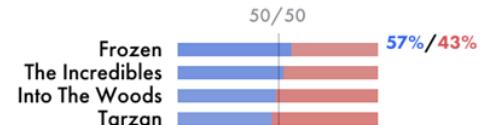
2,000 Screenplays: Dialogue
Broken-down by Gender

Only High-Grossing Films: Ranked in
the Top 2,500 by US Box Office*

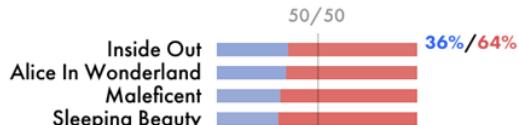
Men have 60%+ Dialogue



Gender Balance, +/- 10%



Women have 60%+ Dialogue

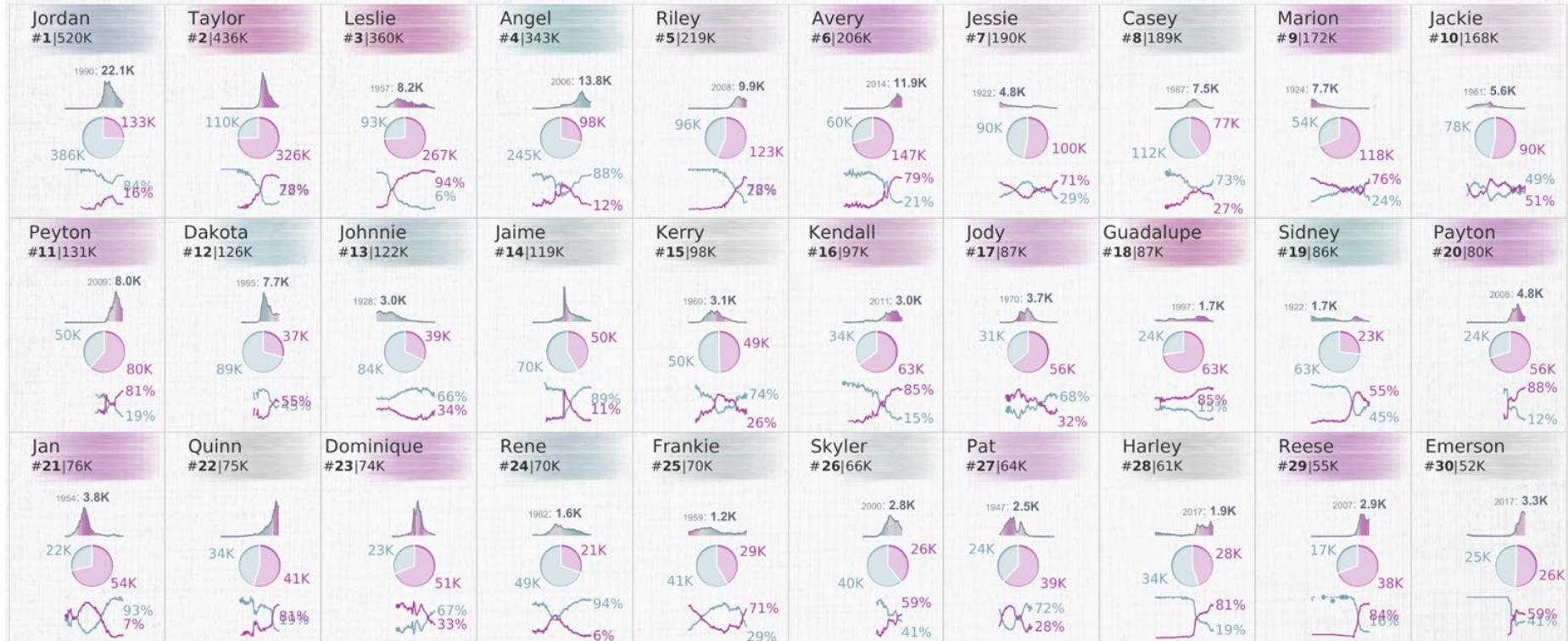


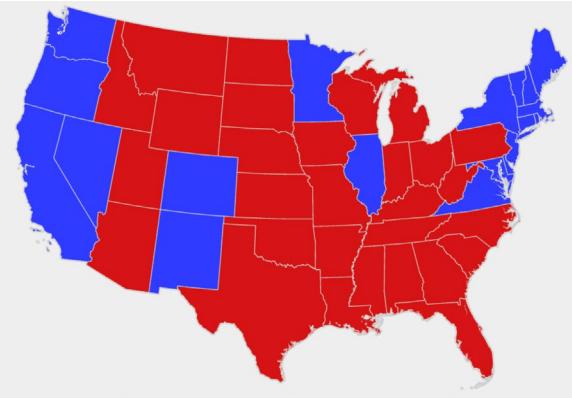


Unisex Names in US Top 50, between 1922 - 2021

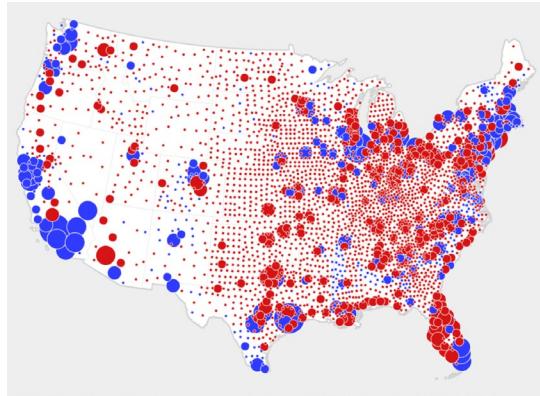
M F

unisex name benchmark: at least 25% share for each gender

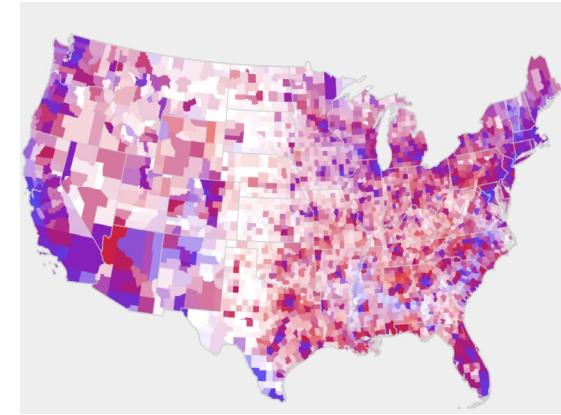




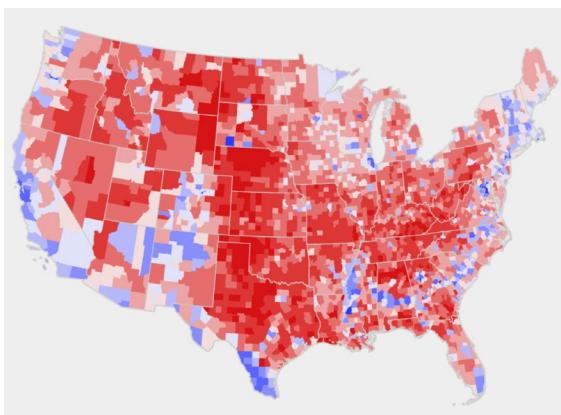
Unique values



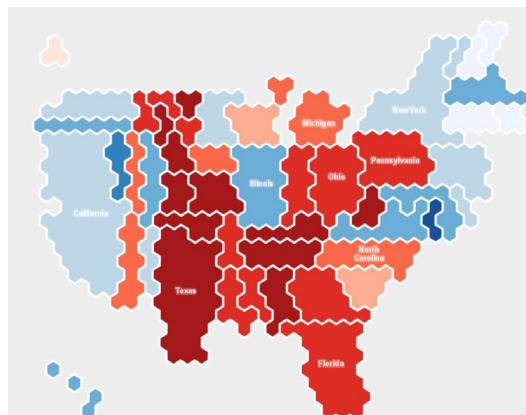
Graduated symbol



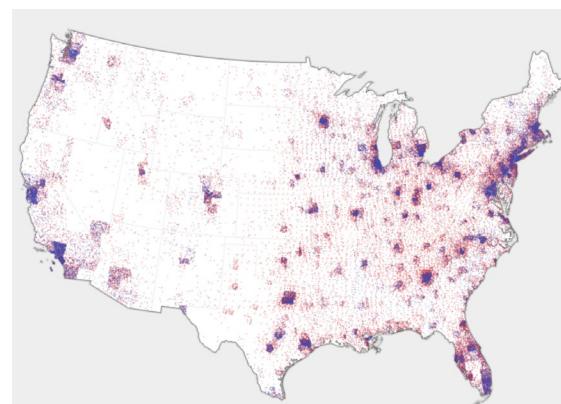
Value-by-alpha



Choropleth diverging hues



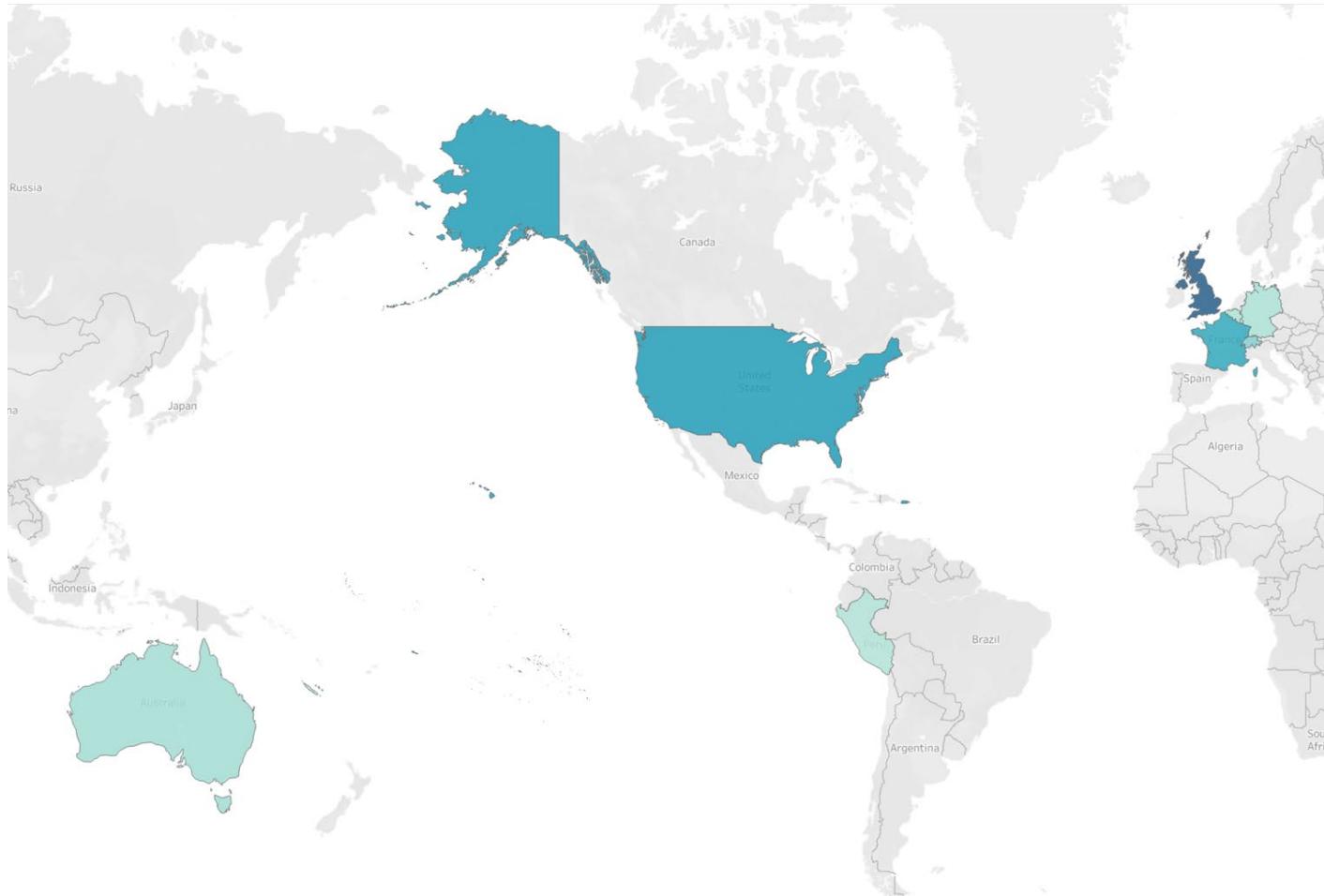
Gridded cartogram



Dot density

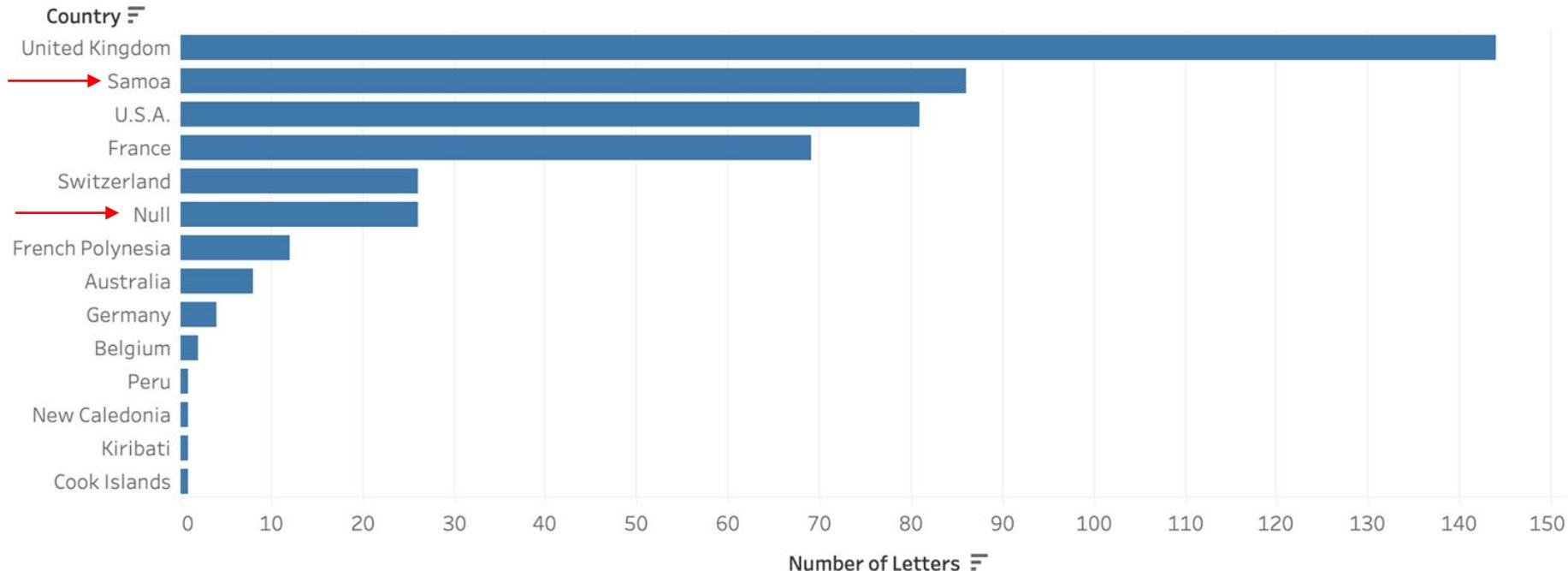
Just because you can map doesn't mean you should

Addressee	Date	City	State	Country	Letter Text
SPRING GROVE SCHOOL	NOVEMBER 12 1863	Isleworth	England	United Kingdom	<div class="prose"> <p>Letter: SPRING GROVE S...
CHARLES BAXTER	APRIL 9 1872	Dunblane	Scotland	United Kingdom	<p>Letter: TO CHARLES BAXTER</p> <p> <...
MRS. THOMAS STEVENSON	JULY 25 1872	Brussels	null	Belgium	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
MRS. THOMAS STEVENSON	JULY 29 1872	Frankfurt	null	Germany	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
MRS. THOMAS STEVENSON	AUGUST 2 1872	Frankfurt	null	Germany	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
THOMAS STEVENSON	AUGUST 4 1872	Frankfurt	null	Germany	<p>Letter: TO THOMAS STEVENSON</p> <p>...
MRS. THOMAS STEVENSON	AUGUST 1872	Frankfurt	null	Germany	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
CHARLES BAXTER	FEBRUARY 2 1873	Edinburgh	Scotland	United Kingdom	<p>Letter: TO CHARLES BAXTER</p> <p> <...
2 SULYARDE TERRACE	APRIL 1866	Torquay	England	United Kingdom	<p>Letter: 2 SULYARDE TERRACE, TORQUAY, THU...
MRS. THOMAS STEVENSON	SEPTEMBER 11 1868	Wick	Scotland	United Kingdom	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
MRS. THOMAS STEVENSON	SEPTEMBER 5 1868	Wick	Scotland	United Kingdom	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
MRS. THOMAS STEVENSON	SEPTEMBER 1868	Wick	Scotland	United Kingdom	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
MRS. THOMAS STEVENSON	SEPTEMBER 1868	Wick	Scotland	United Kingdom	<p>Letter: TO MRS. THOMAS STEVENSON</p> ...
MRS. CHURCHILL BABINGTON	SUMMER 1871	Edinburgh	Scotland	United Kingdom	<p>Letter: TO MRS. CHURCHILL BABINGTON</p> ...



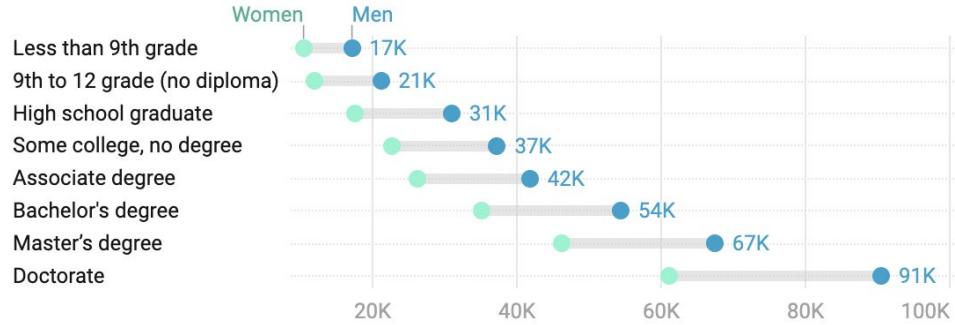
Robert Louis Stevenson wrote letters to correspondents from these countries; darker blue, more letters.

Missing/ambiguous data is not mappable

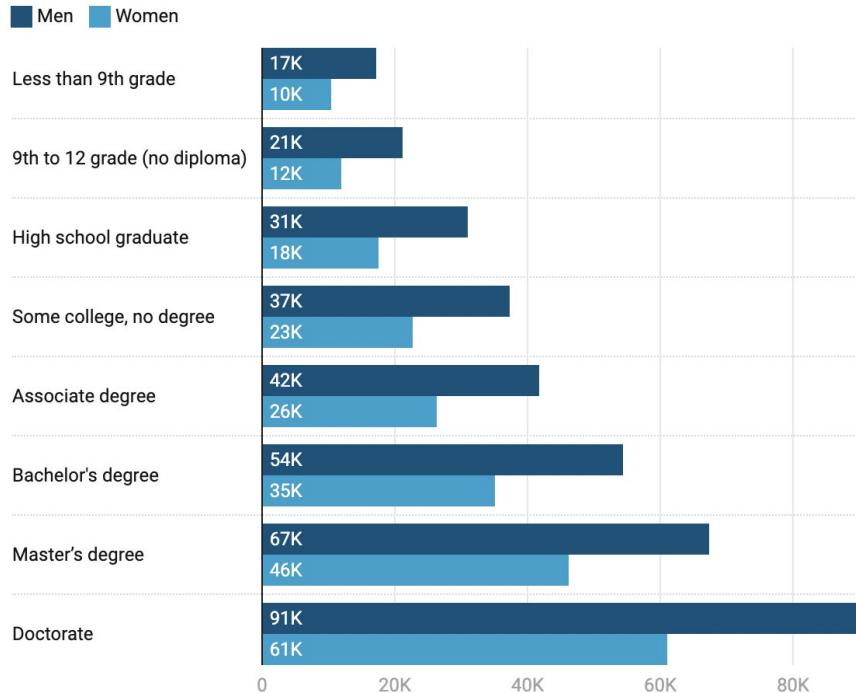


What tells a stronger story?

Gender Gap in Earnings

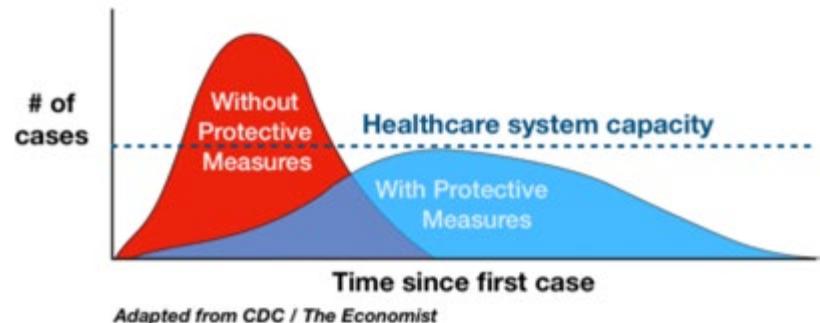


Gender Gap in Earnings



The evolution of Covid visualizations over time: a case study in form

The chart that went around the world

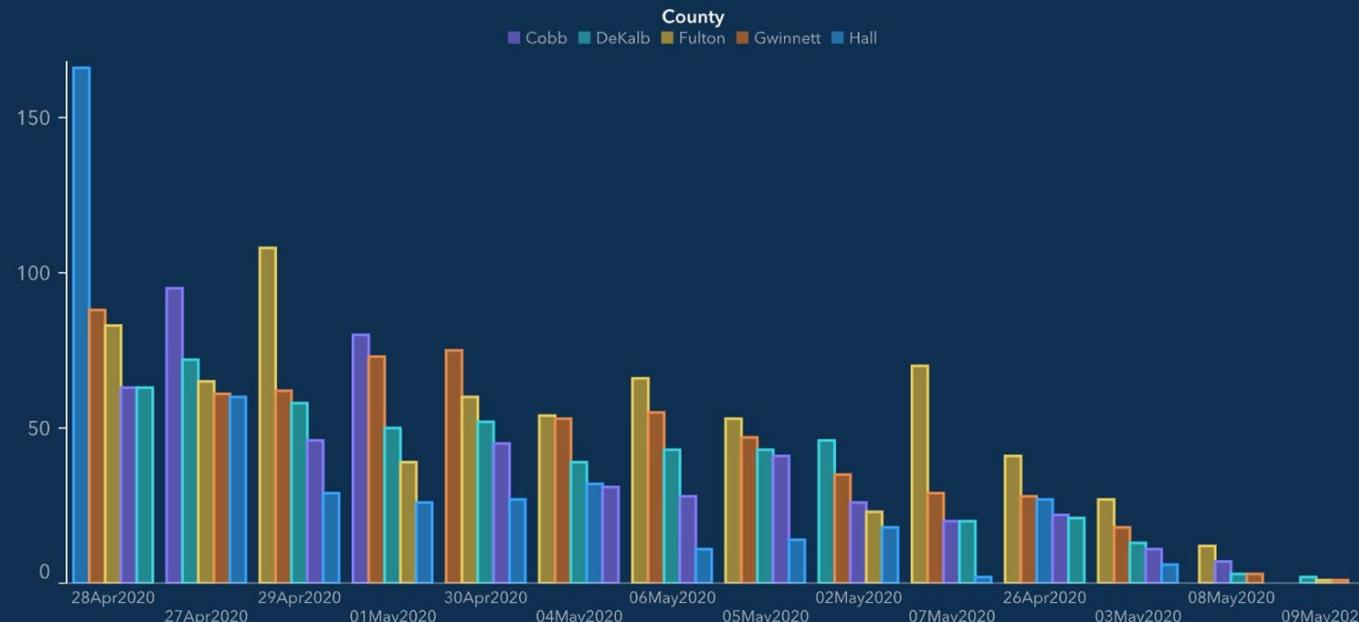


Graph by [Drew Harris](#).

There was much incompetence

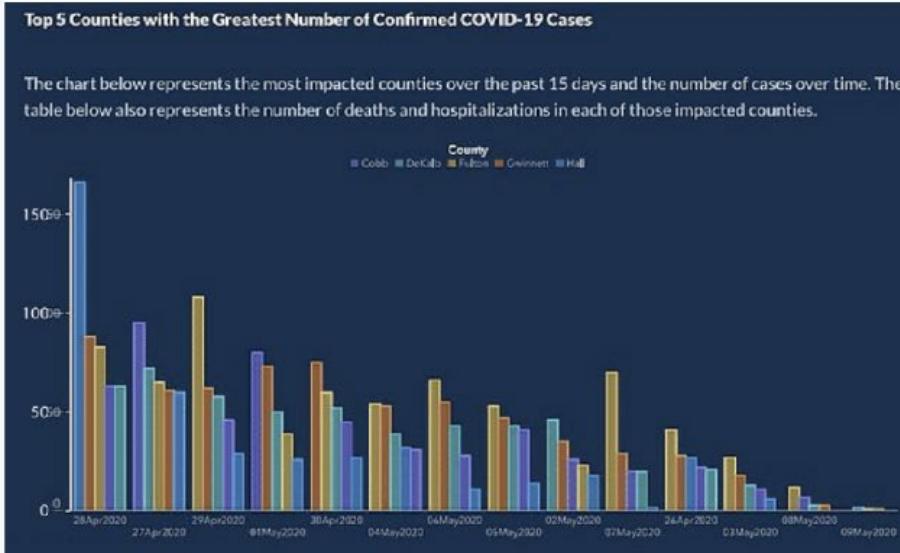
Top 5 Counties with the Greatest Number of Confirmed COVID-19 Cases

The chart below represents the most impacted counties over the past 15 days and the number of cases over time. The table below also represents the number of deaths and hospitalizations in each of those impacted counties.

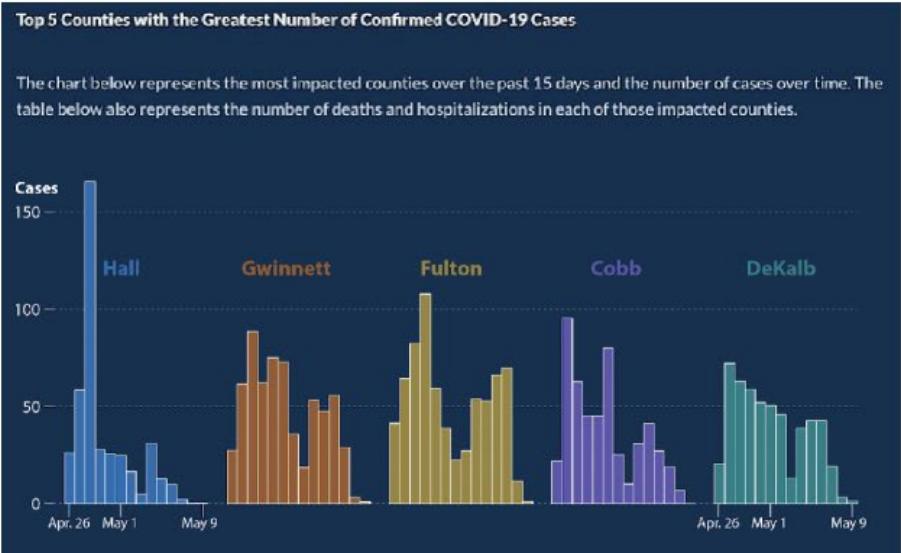


There was much incompetence

ORIGINAL



MAKEOVER

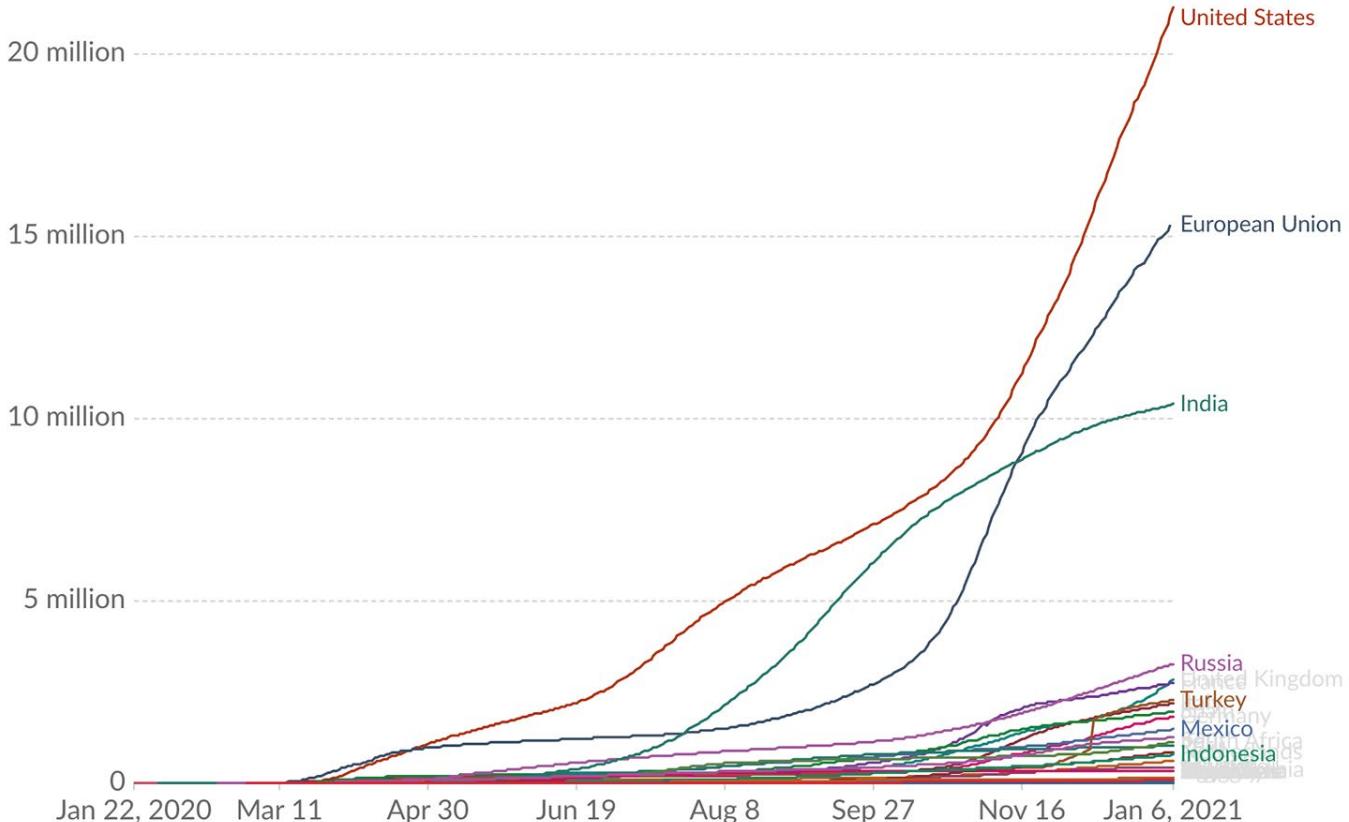


Fixed graph by Alberto Cairo: <https://ijnet.org/en/story/tips-visualizing-covid-19-data>

Cumulative confirmed COVID-19 cases

The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.

Our World
in Data



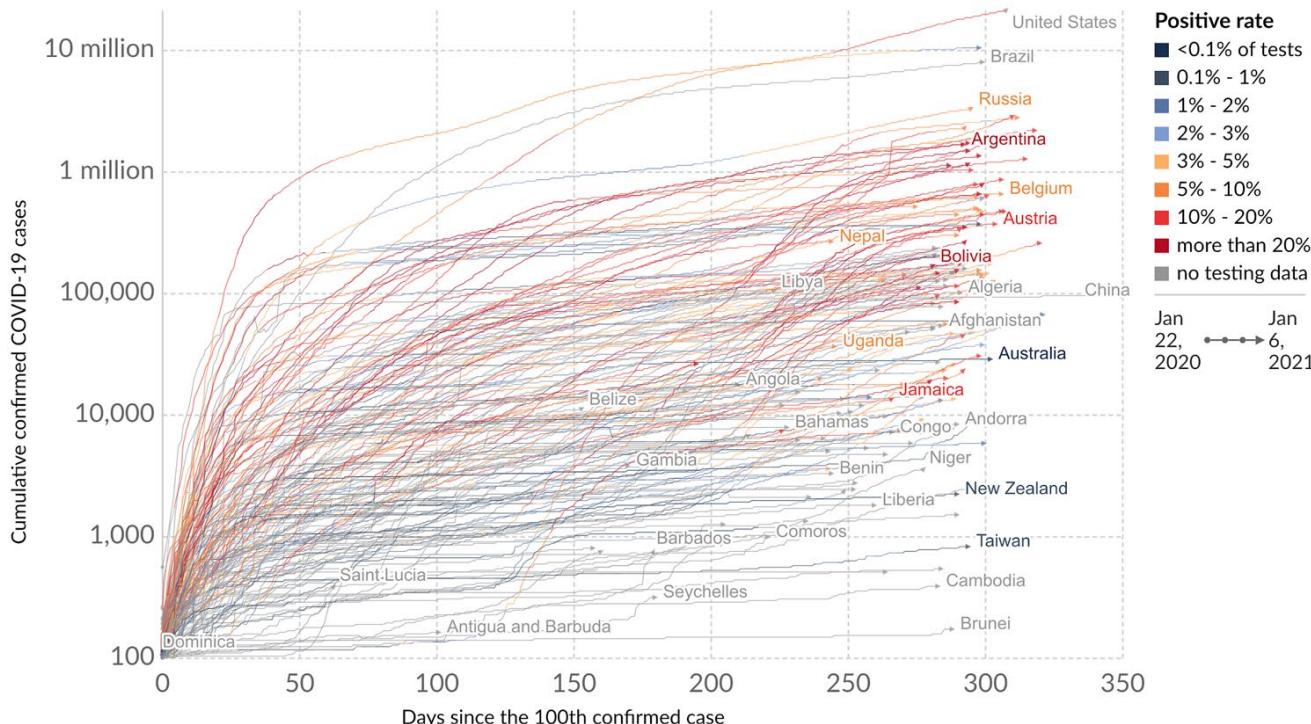
Source: Johns Hopkins University CSSE COVID-19 Data – Last updated 7 January, 06:07 (London time)

CC BY

Created with Our World in Data: <https://ourworldindata.org/covid-cases#what-is-the-total-number-of-confirmed-cases>

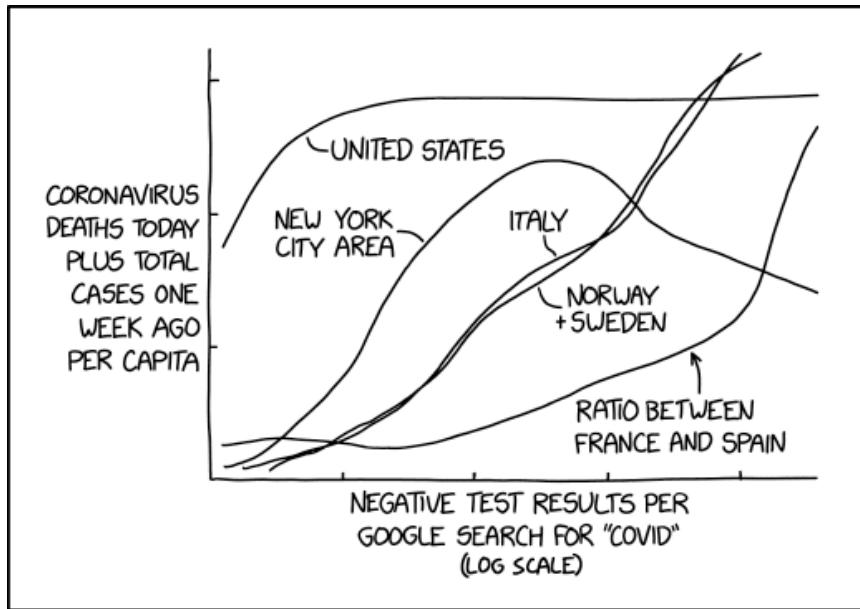
Cumulative confirmed COVID-19 cases

The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.



Source: Johns Hopkins University CSSE COVID-19 Data – Last updated 7 January, 06:07 (London time), Official data collated by Our World in Data
CC BY

Graphs got a little complicated

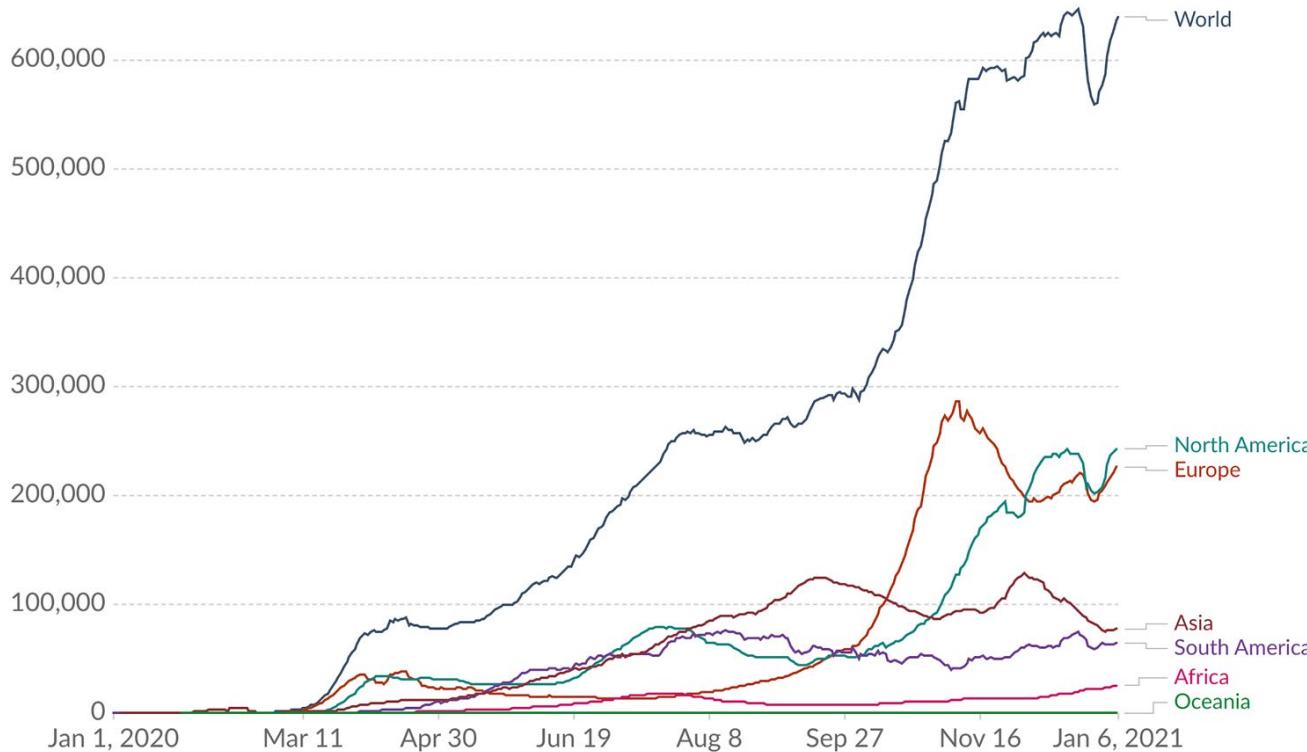


I'M A HUGE FAN OF WEIRD GRAPHS, BUT EVEN I ADMIT SOME
OF THESE CORONAVIRUS CHARTS ARE LESS THAN HELPFUL.

Daily new confirmed COVID-19 cases

Our World
in Data

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.



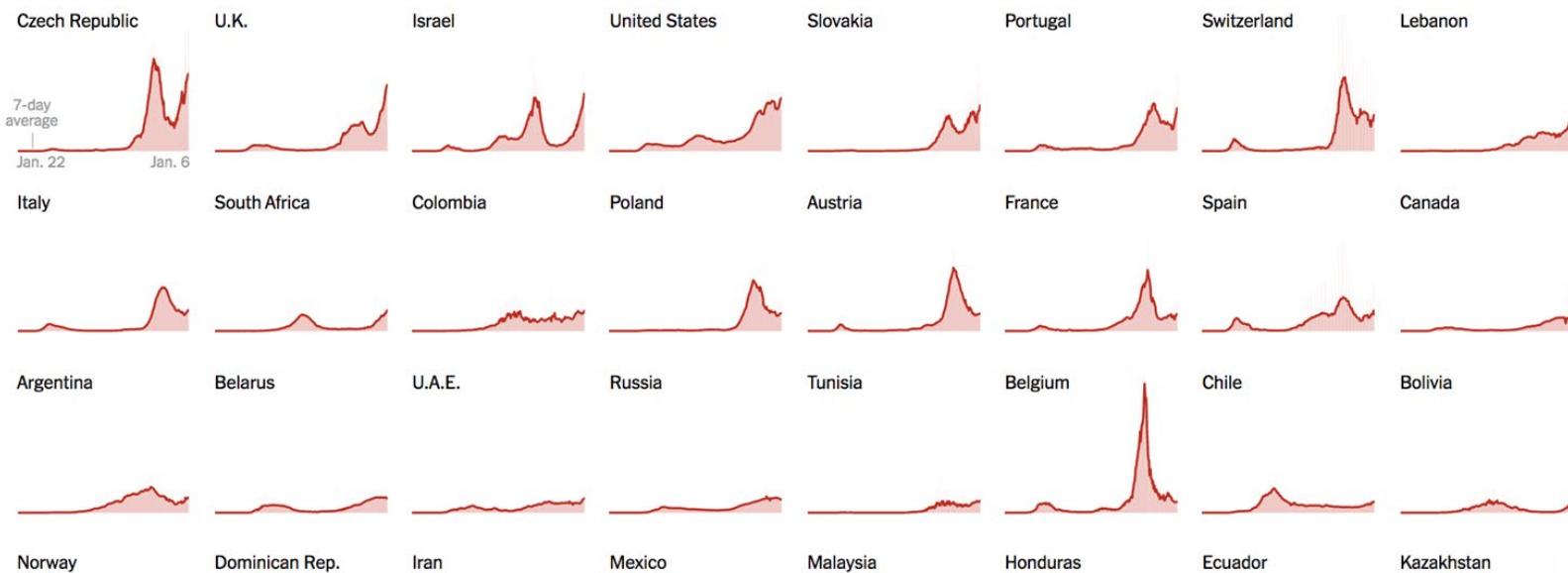
Source: Johns Hopkins University CSSE COVID-19 Data - Last updated 7 January, 06:07 (London time)

CC BY

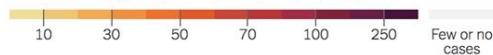
Small multiples became very, very popular

Where new cases are higher and staying high

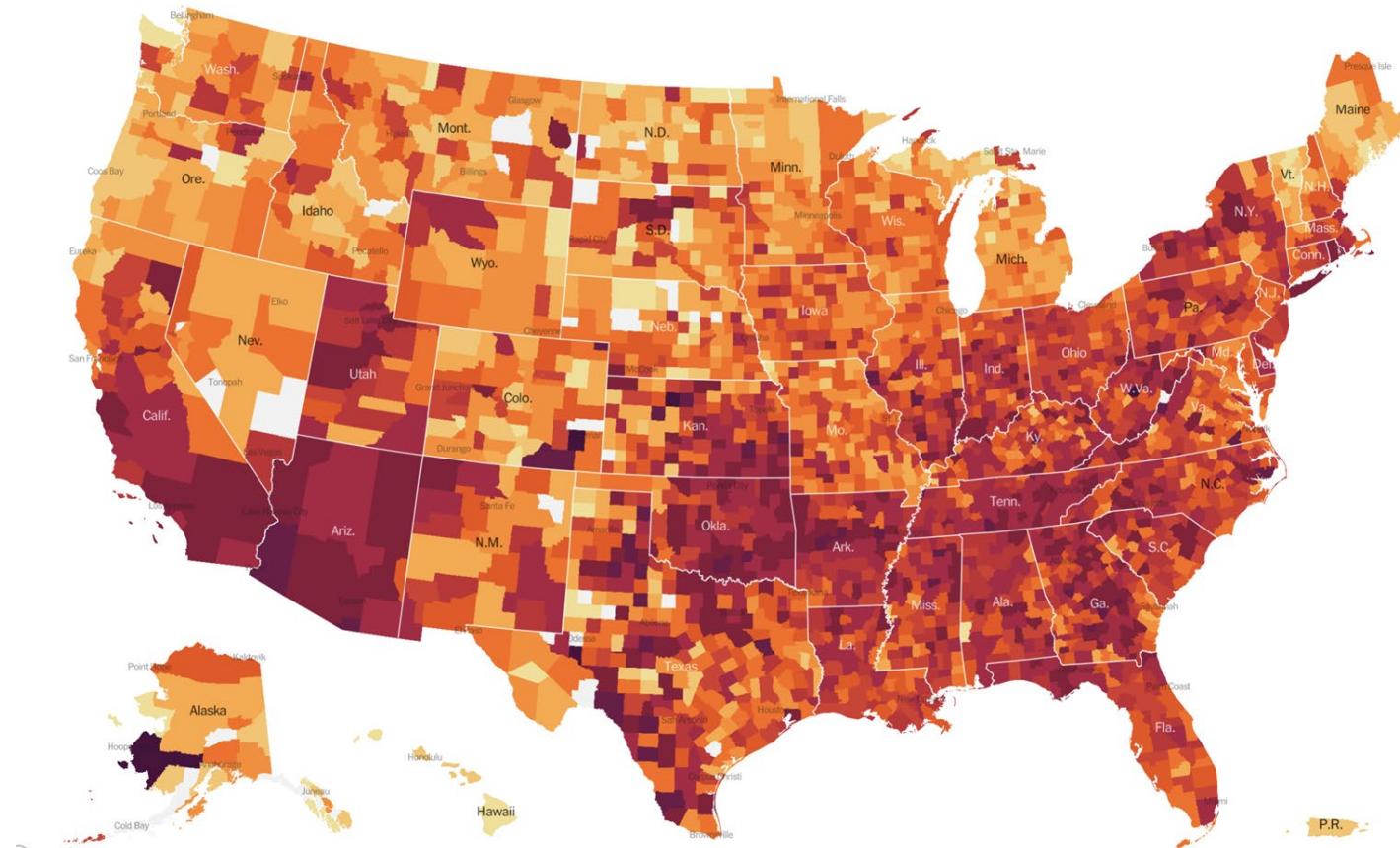
Countries where new cases are higher had a daily average of at least four new cases per 100,000 people over the past week. The charts, which are all on the same scale, show daily cases per capita and are of countries with at least five million people.



Average daily cases per 100,000 people in past week

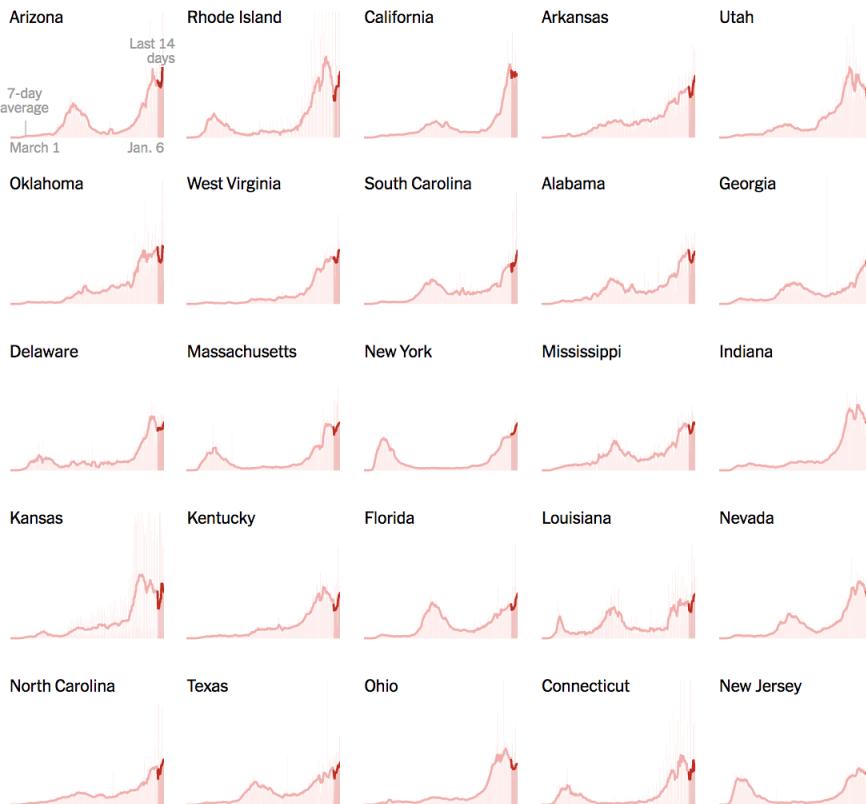


Double-click to zoom into the map.



Where new cases are higher and staying high

States where new cases are higher had a daily average of at least 15 new cases per 100,000 people over the past week. Charts show daily cases per capita and are on the same scale. Tap a state to see detailed map page.

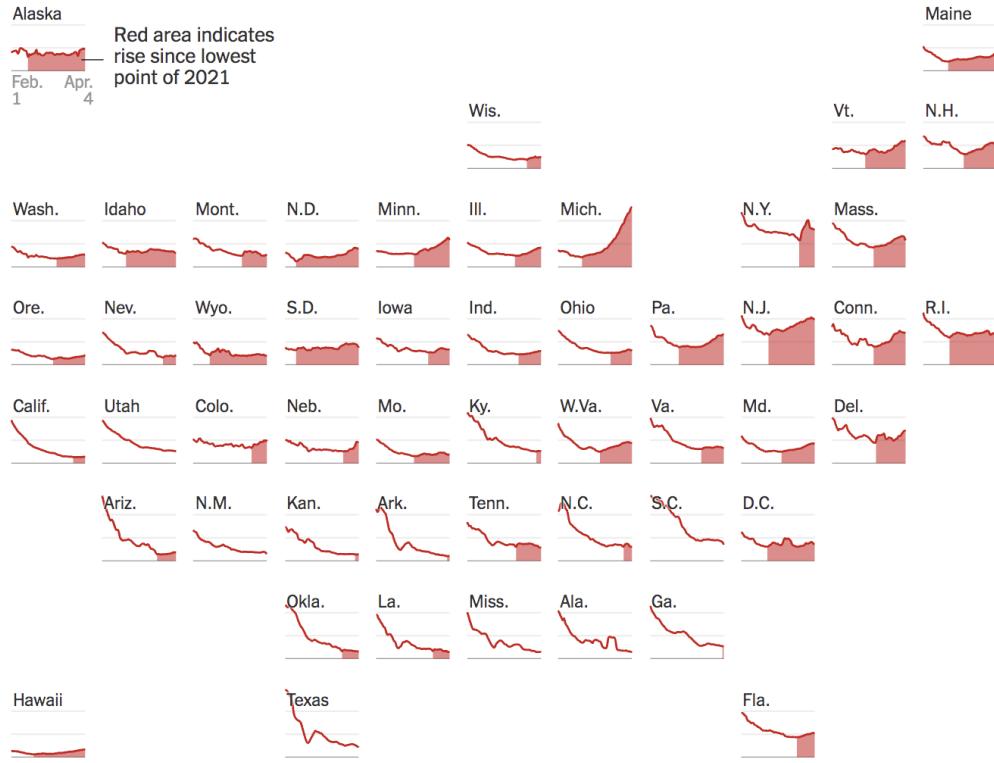


Cases and deaths by state and county

This table is sorted by places with the most cases per 100,000 residents in the last seven days. Charts are colored to reveal when outbreaks emerged.

	Cases	Deaths	Search counties		
	TOTAL CASES	PER 100,000	DAILY AVG. IN LAST 7 DAYS	▼ PER 100,000	WEEKLY CASES PER CAPITA
+ Arizona MAP »	578,623	7,950	9,037	124	March 1 Jan. 6
+ Rhode Island MAP »	95,463	9,011	1,073	101	
+ California MAP »	2,548,494	6,450	38,998	99	
+ Arkansas MAP »	242,593	8,039	2,880	95	
+ Utah MAP »	292,720	9,131	2,969	93	
+ Tennessee MAP »	610,347	8,937	6,270	92	
+ Oklahoma MAP »	311,573	7,874	3,506	89	
+ West Virginia MAP »	94,678	5,283	1,493	83	
+ South Carolina MAP »	333,235	6,472	4,251	83	
+ Alabama MAP »	384,184	7,835	3,909	80	

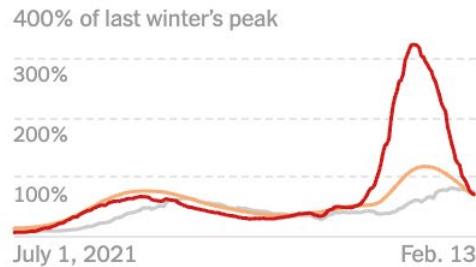
Cases per 100,000



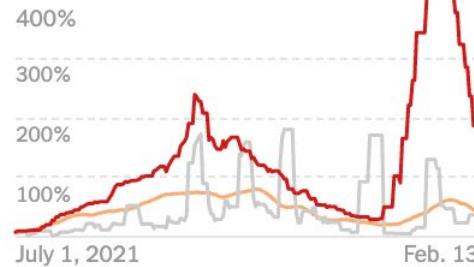
Note: Shows seven-day average.

Continuing innovation, now with axes

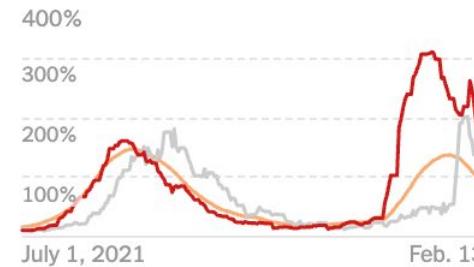
United States



Alaska



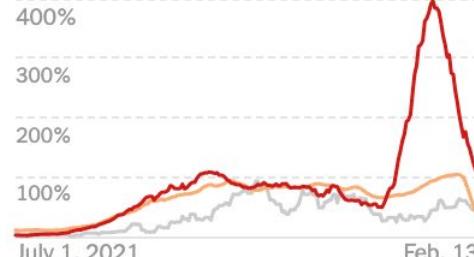
Mississippi



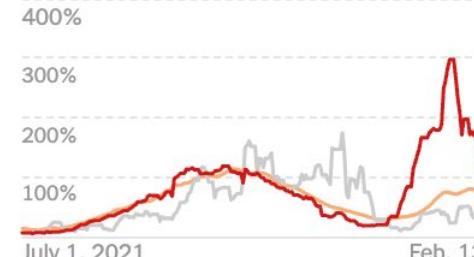
Idaho



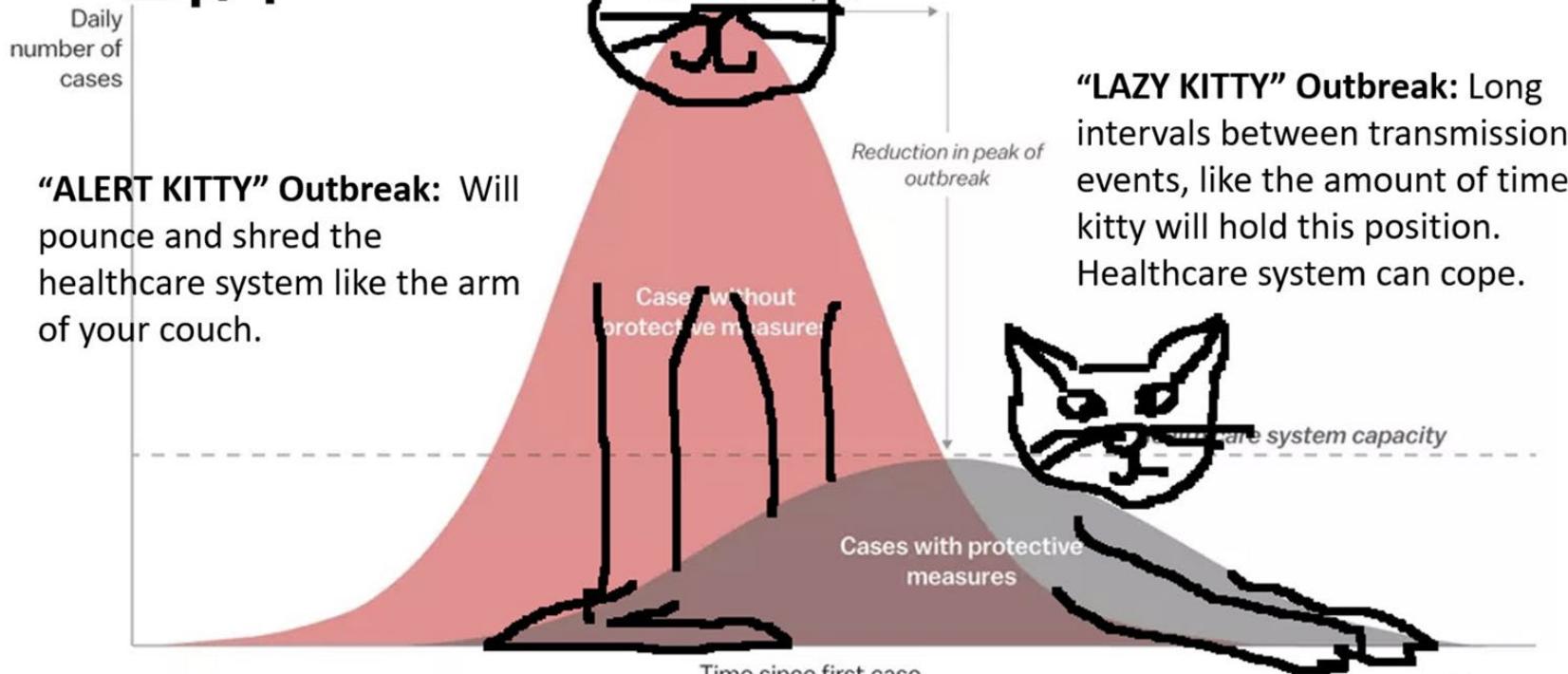
North Dakota



Montana



Flattening the curve CAT



Source: CDC

Vox

PROCESSING VISUAL INFORMATION

How many 3s can you find?

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

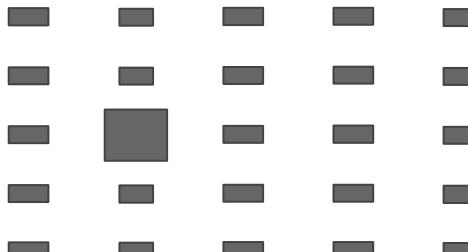
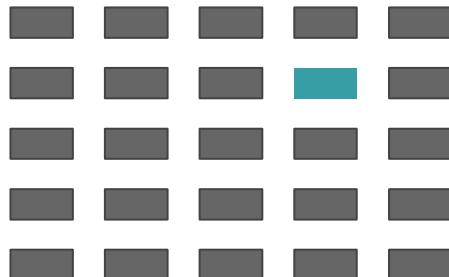
How many 3s can you find?

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

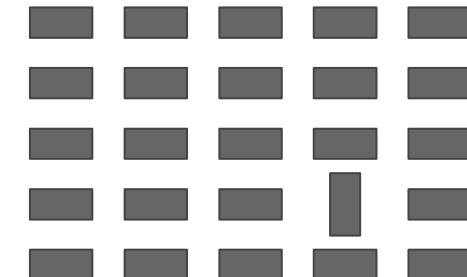
3 9 2 8 1 0 2 4 **3**
5 8 7 1 **3** 4 5 9 2
0 4 6 2 7 **3** 2 2 9
9 5 8 1 2 5 1 0 **3**
8 1 9 4 0 2 6 **3** 5

Preattentive visual cues

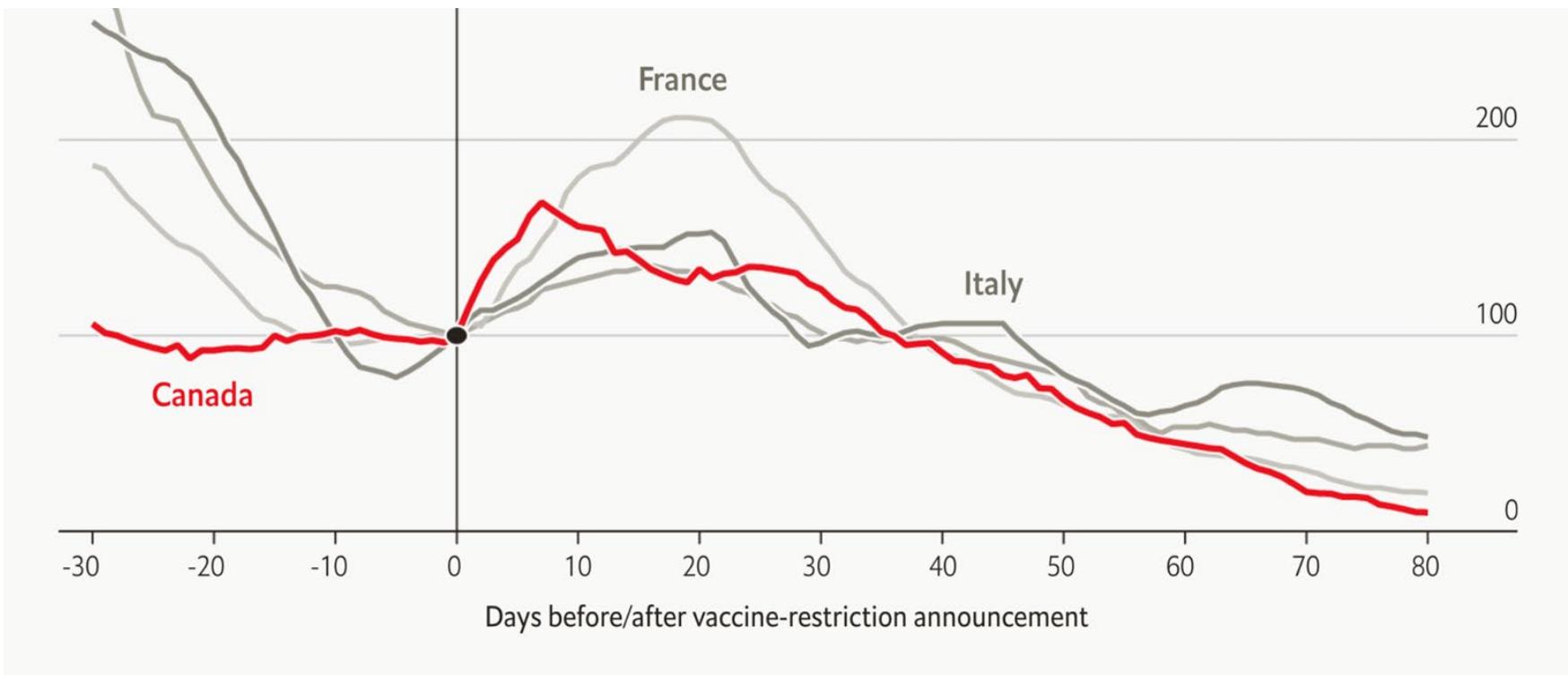
3 9 2 8 1 0 2 4 3
5 8 7 1 3 4 5 9 2
0 4 6 2 7 3 2 2 9
9 4 8 2 7 5 1 0 3
8 1 9 4 0 2 6 3 5



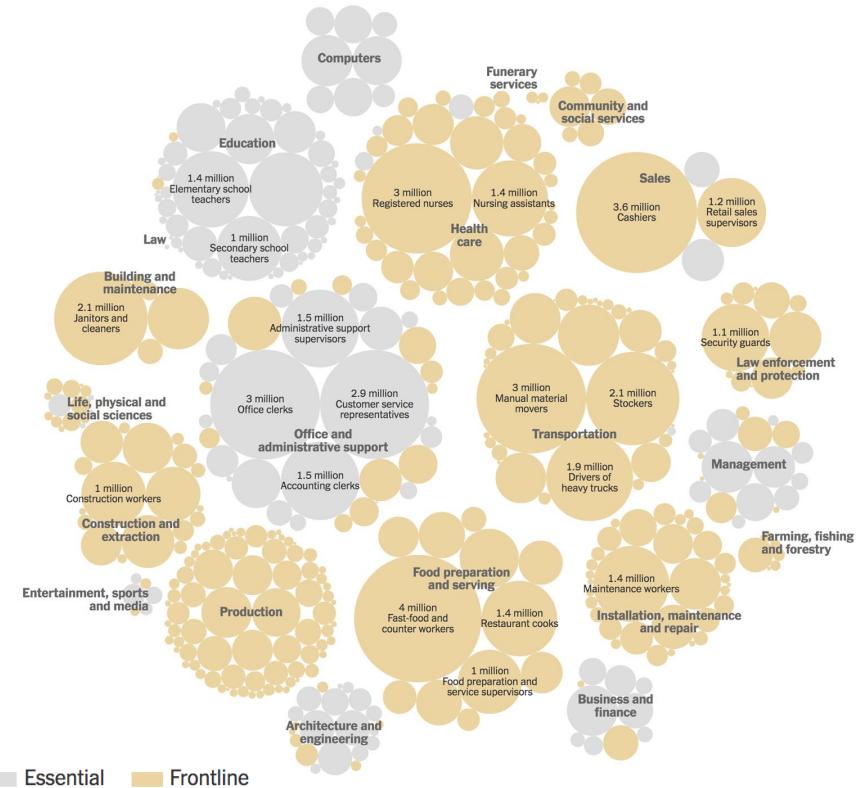
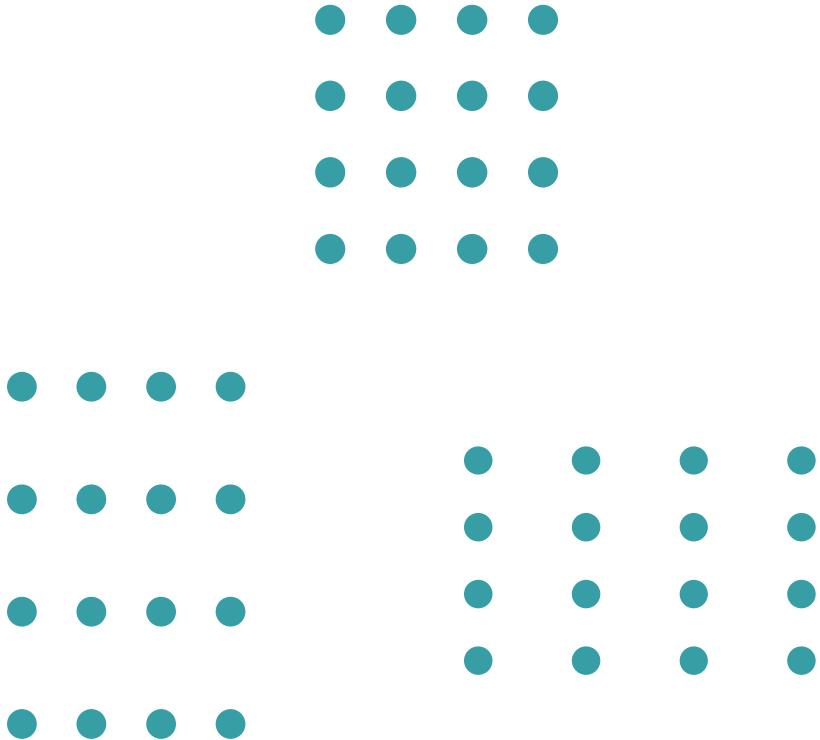
3 9 2 8 1 0 2 4 **3**
5 8 7 1 **3** 4 5 9 2
0 4 6 2 7 **3** 2 2 9
9 5 8 1 2 5 1 0 **3**
8 1 9 4 0 2 6 **3** 5



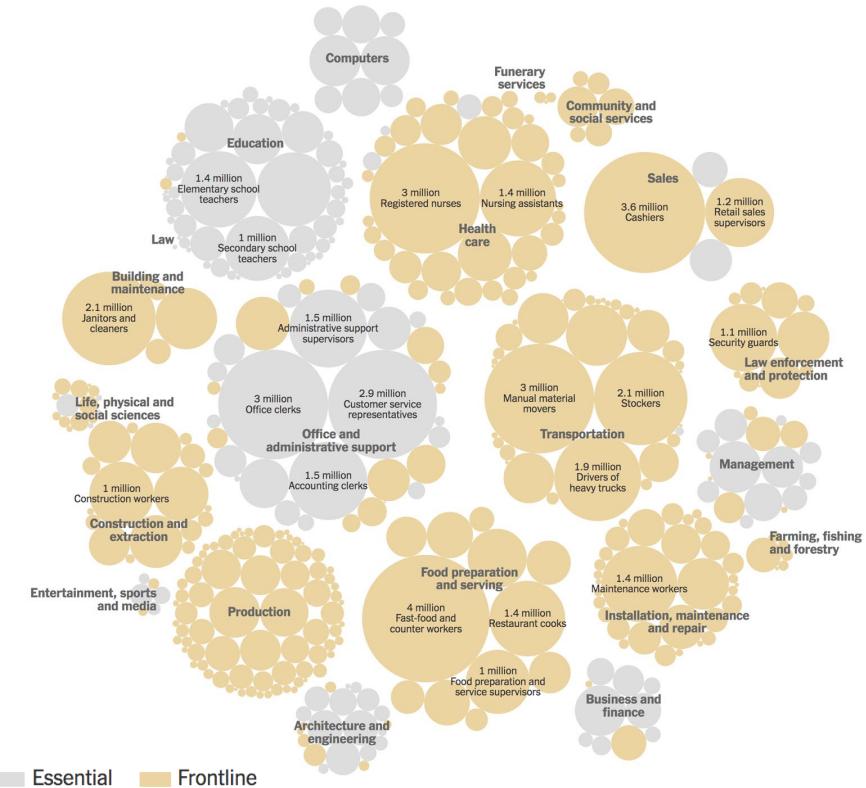
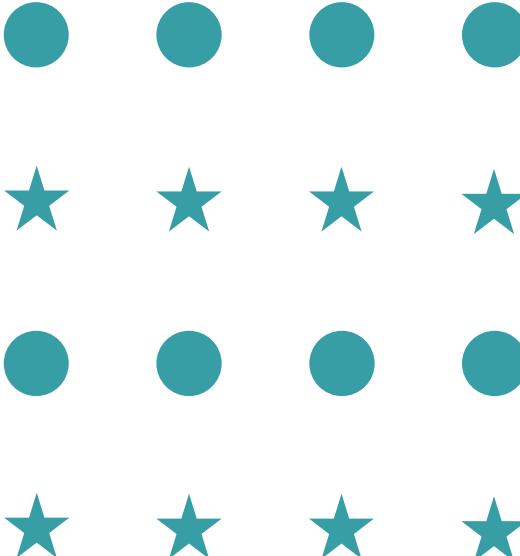
Example



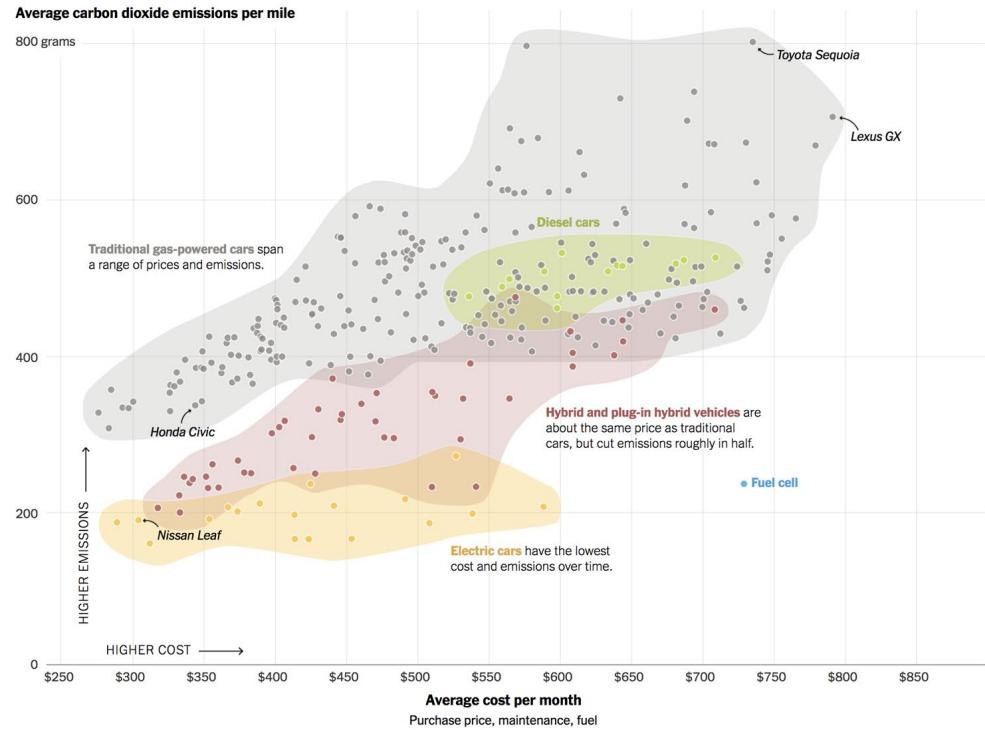
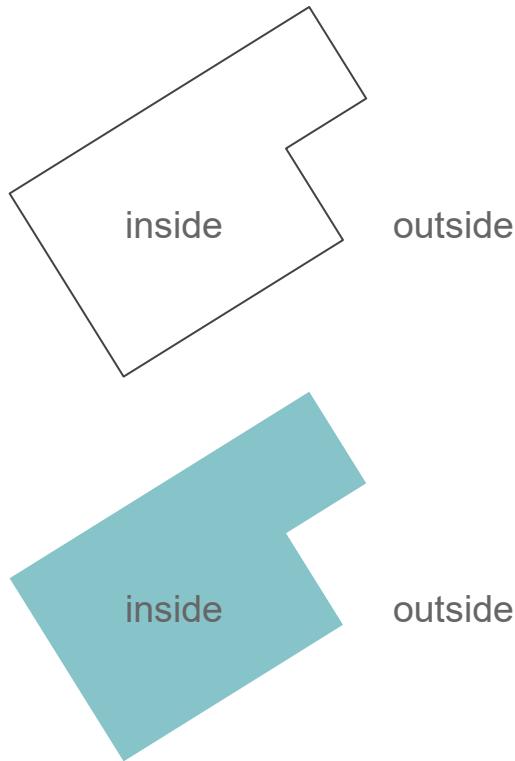
Gestalt principles: proximity



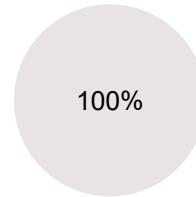
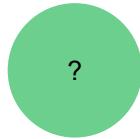
Gestalt principles: similarity



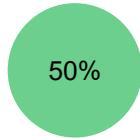
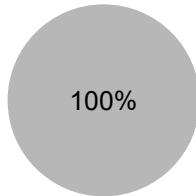
Gestalt principles: common region



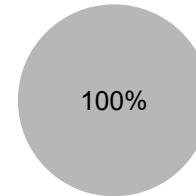
Guess that area



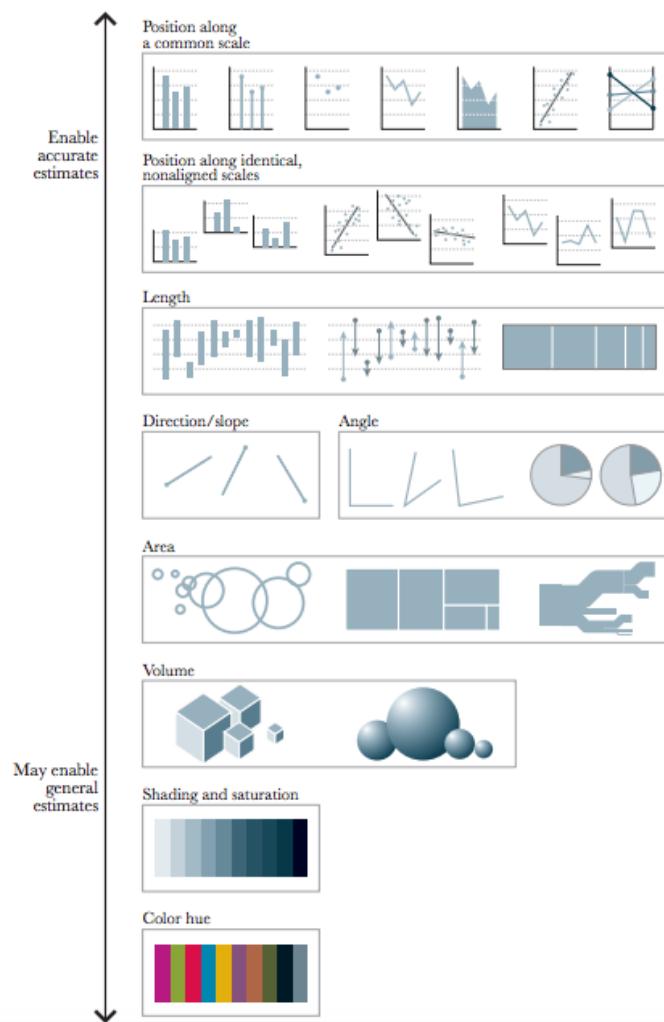
Guess that area



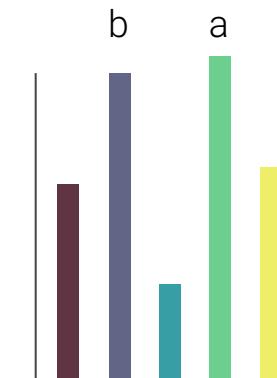
50% area
71% diameter



25% area
50% diameter



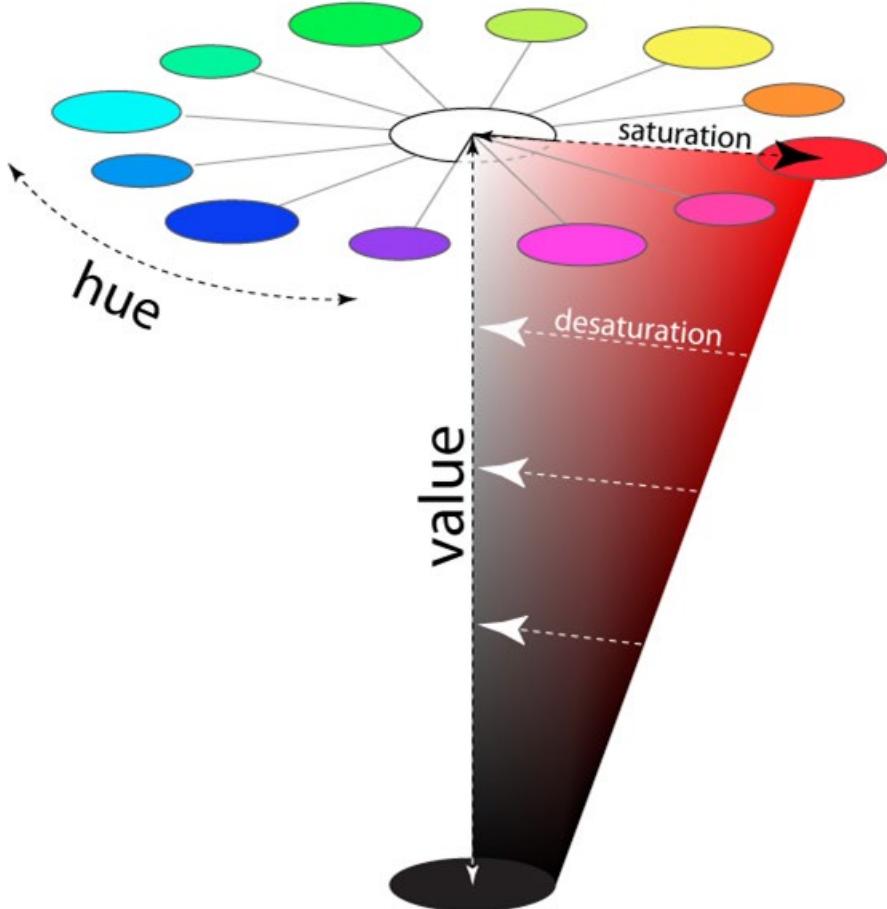
Points scored



- Crows
- Blue Jays
- Seagulls
- Hawks
- Robins

- Crows
- Blue Jays
- Seagulls
- Hawks
- Robins

COLOR



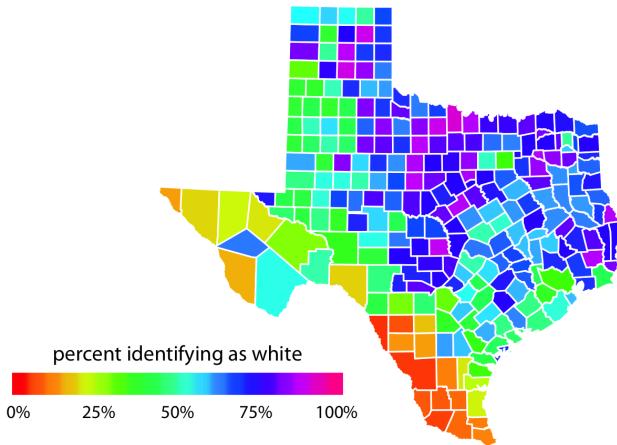
For fun, check out the [XKCD color survey](#)

Data dictates palette choices.

For discrete or **qualitative** data:



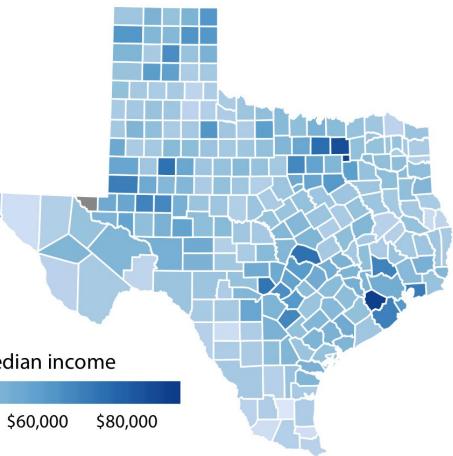
Ex. “apples, bananas,”
or “USA, UK, France.”



For continuous or **sequential** data:



Ex. income, age data.

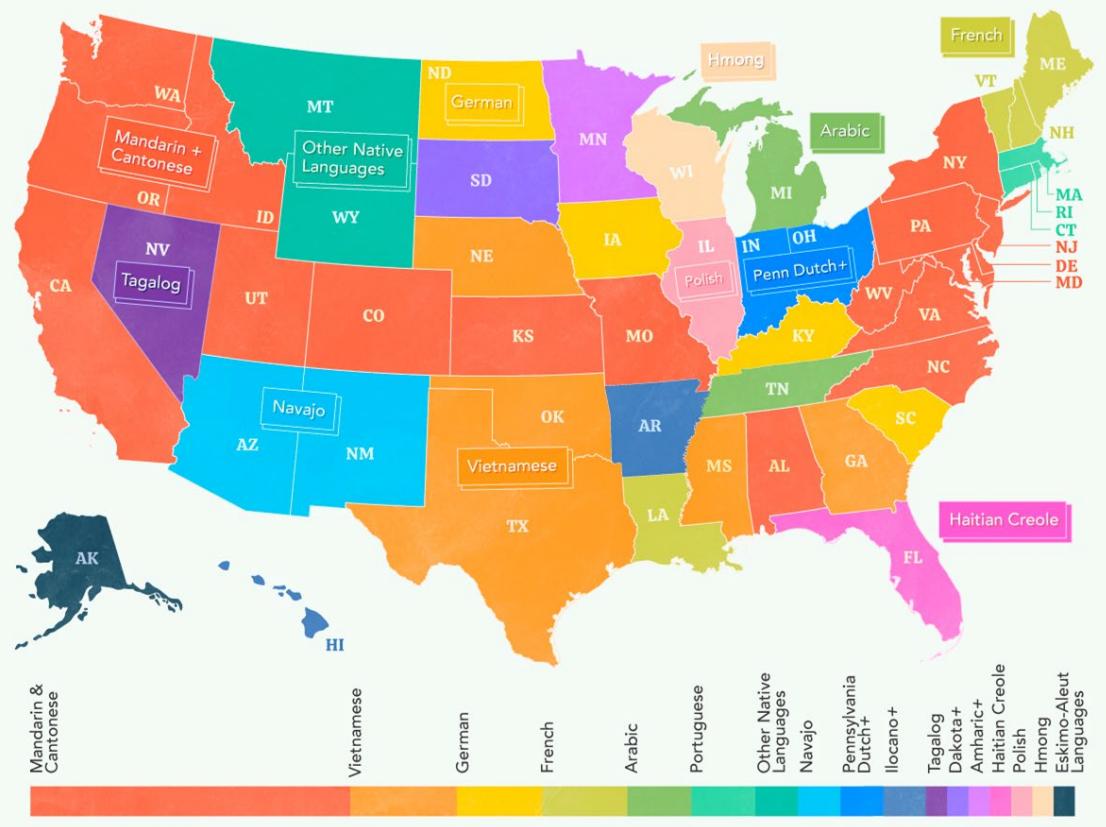


For **continuous** data
diverging from a midpoint:



Ex. temperature or
stock data.

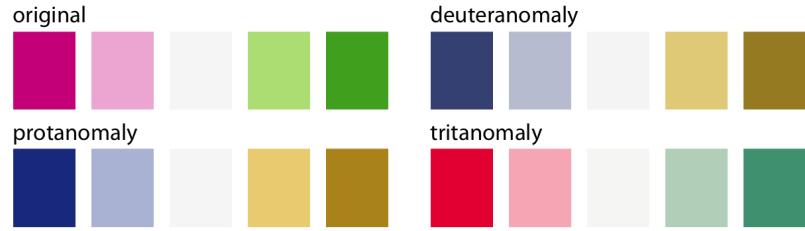
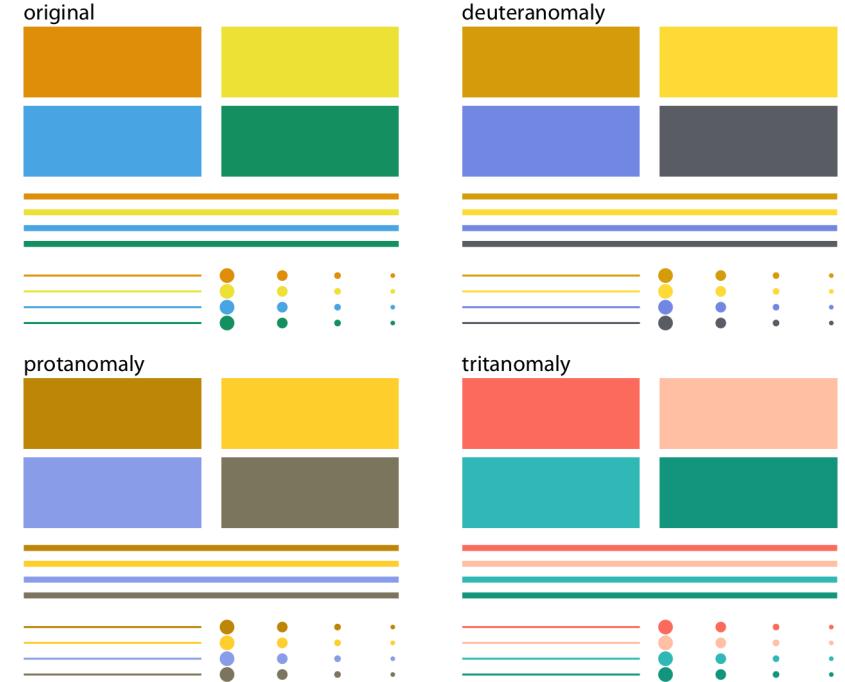
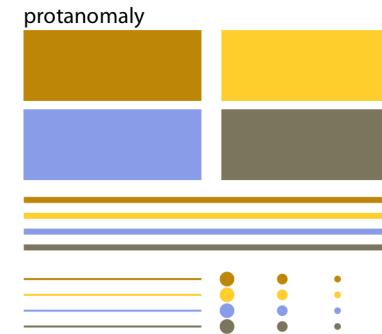
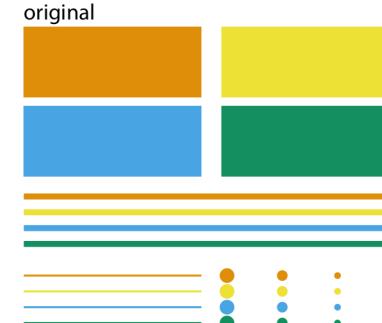
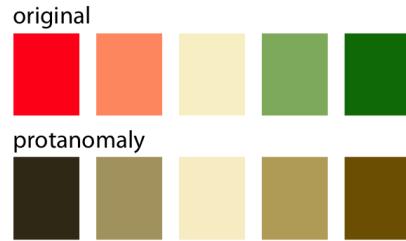
Most Commonly Spoken Language (besides English & Spanish)



Visual Capitalist.

<https://www.visualcapitalist.com/most-common-language-spoken-in-the-u-s-map/>

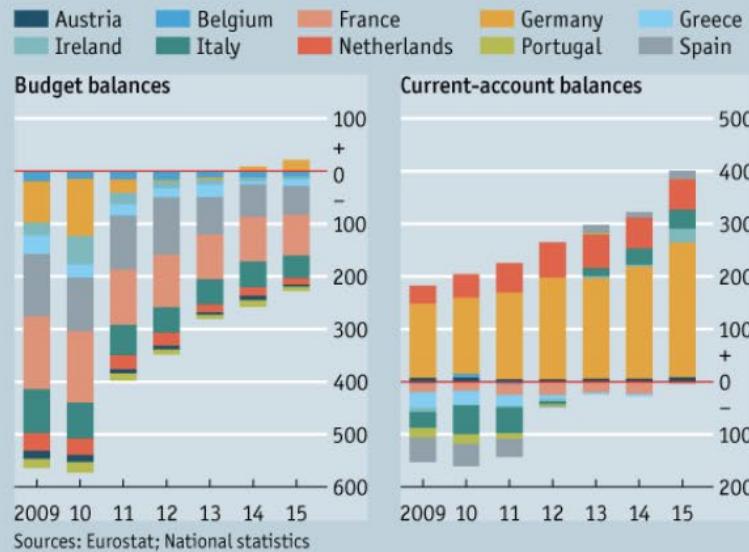
Color blindness



Original

Surfeit of surpluses

Selected euro-area countries, €bn



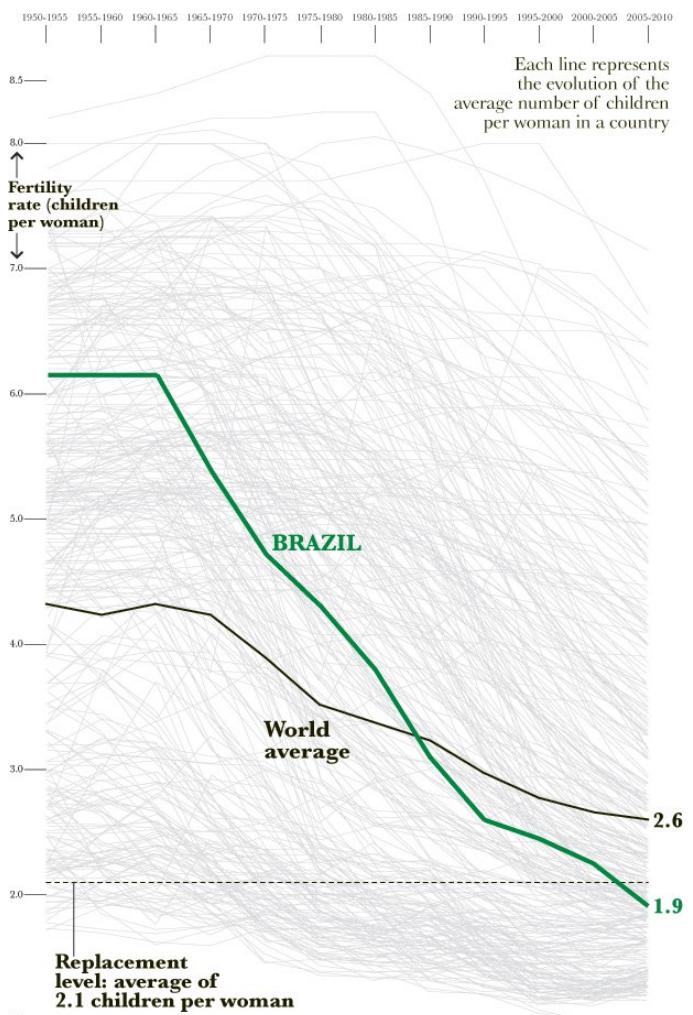
Better

Surfeit of surpluses

Euro-area, €bn



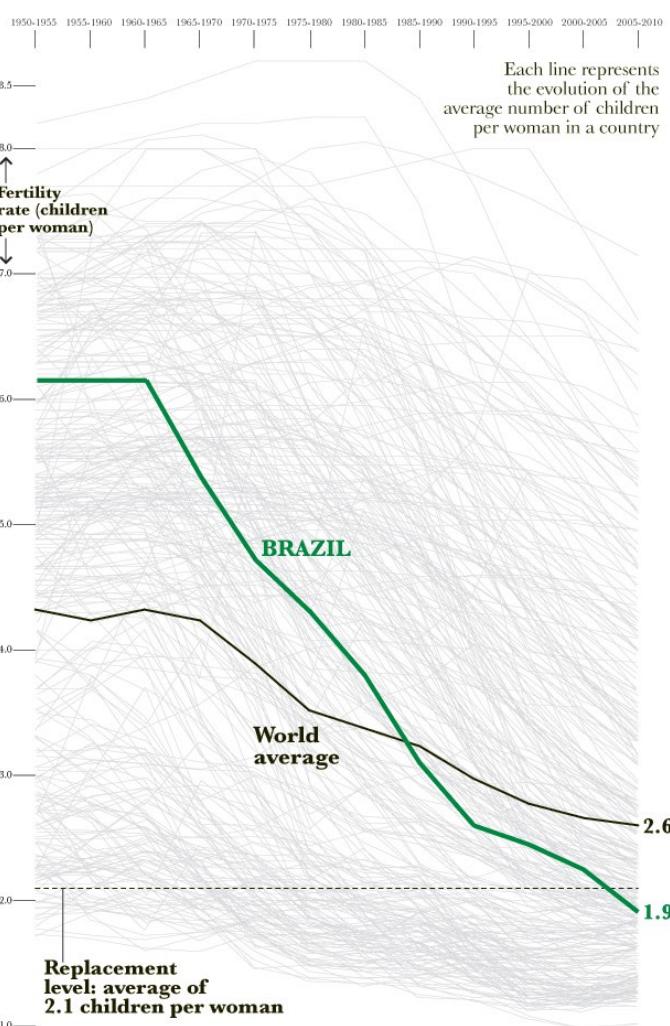
"The more colours the better!" — No good data visualiser, ever



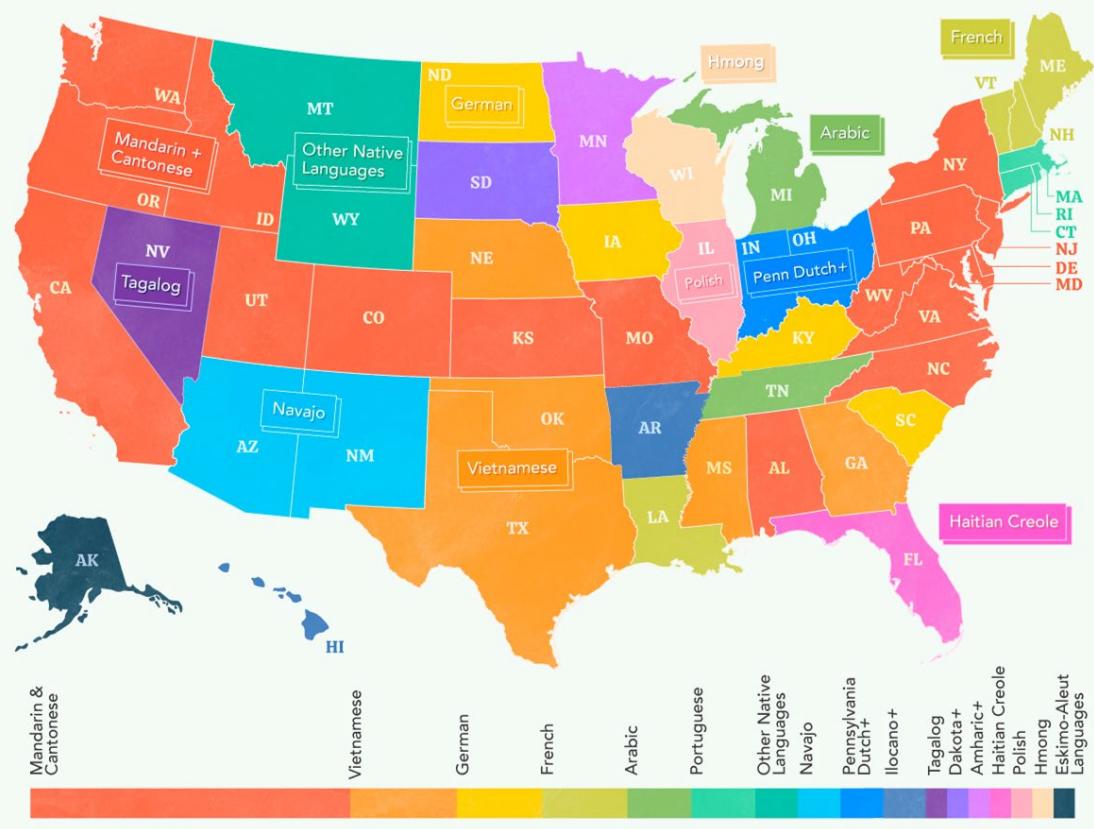
Visual from Cairo, Alberto. *The Functional Art: An Introduction to Information Graphics and Visualization*. Berkeley, CA: New Riders, 2012.

MORE VISUAL STORYTELLING TECHNIQUES

Draw the eye to the main story and simplify axis labeling



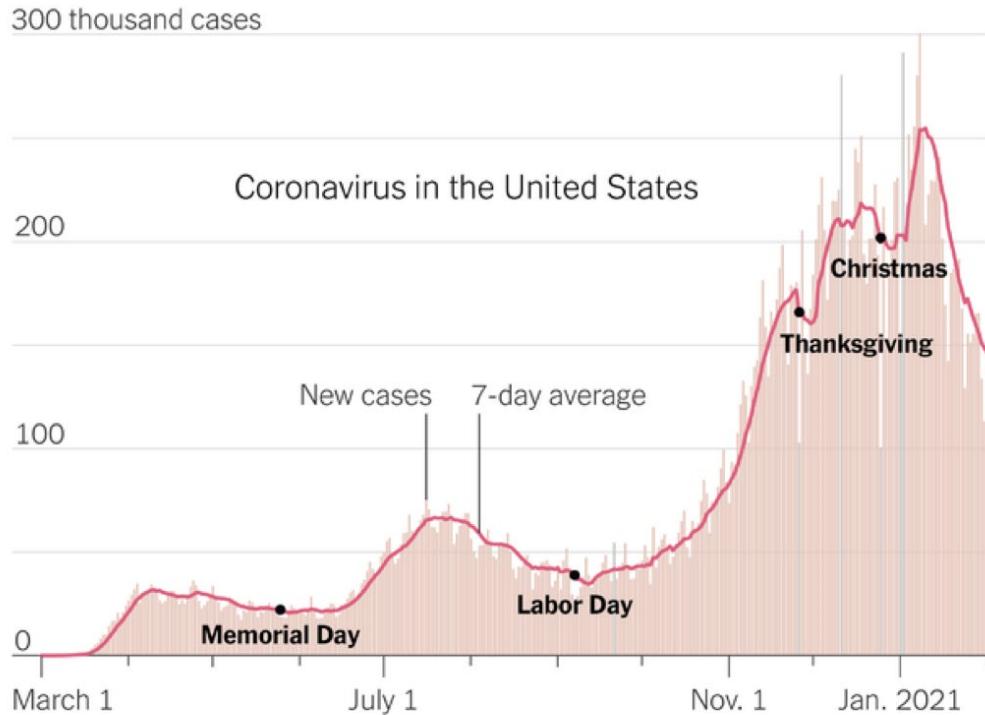
Label colors directly for easier parsing



Visual Capitalist.

<https://www.visualcapitalist.com/most-common-language-spoken-in-the-u-s-map/>

Add context directly on graph

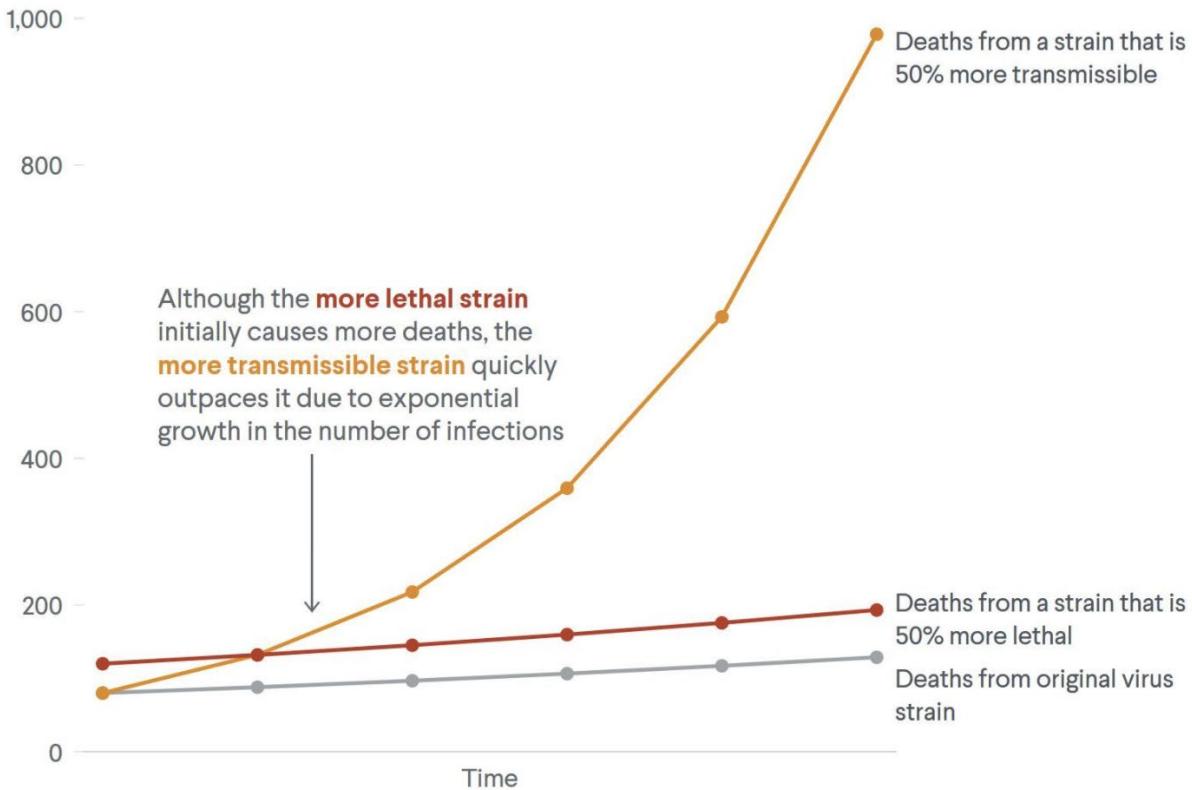


Bars in gray represent days with data reporting anomalies.

By The New York Times | Sources: State and local health agencies and hospitals

Credit: NYTimes. <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html>

Interpretation on graph



Notes: The line for the original strain assumes a fatality risk of 0.8% and that each infected person transmits the virus to 1.1 other people on average.

Source: Adam Kucharski, Associate Professor, London School of Hygiene and Tropical Medicine.

Source link: <https://covidreference.com/variants>

When a chart goes viral and is misinterpreted



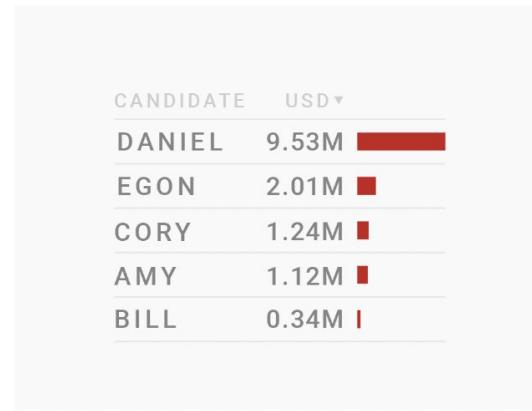
Tips for data visualization in “Table” format

CANDIDATE ▲	USD
AMY	1.12M
BILL	0.34M
CORY	1.24M
DANIEL	9.53M
EGON	2.01M

NOT IDEAL

CANDIDATE	USD▼
DANIEL	9.53M
EGON	2.01M
CORY	1.24M
AMY	1.12M
BILL	0.34M

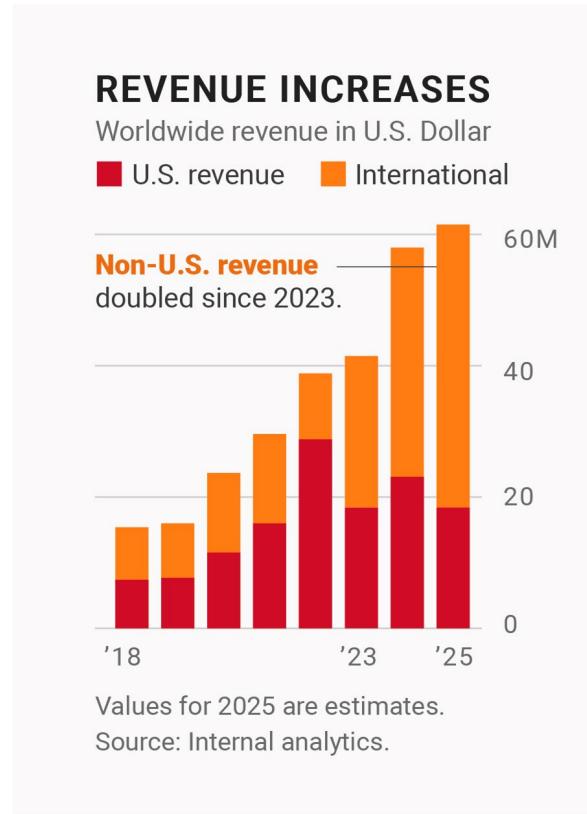
BETTER



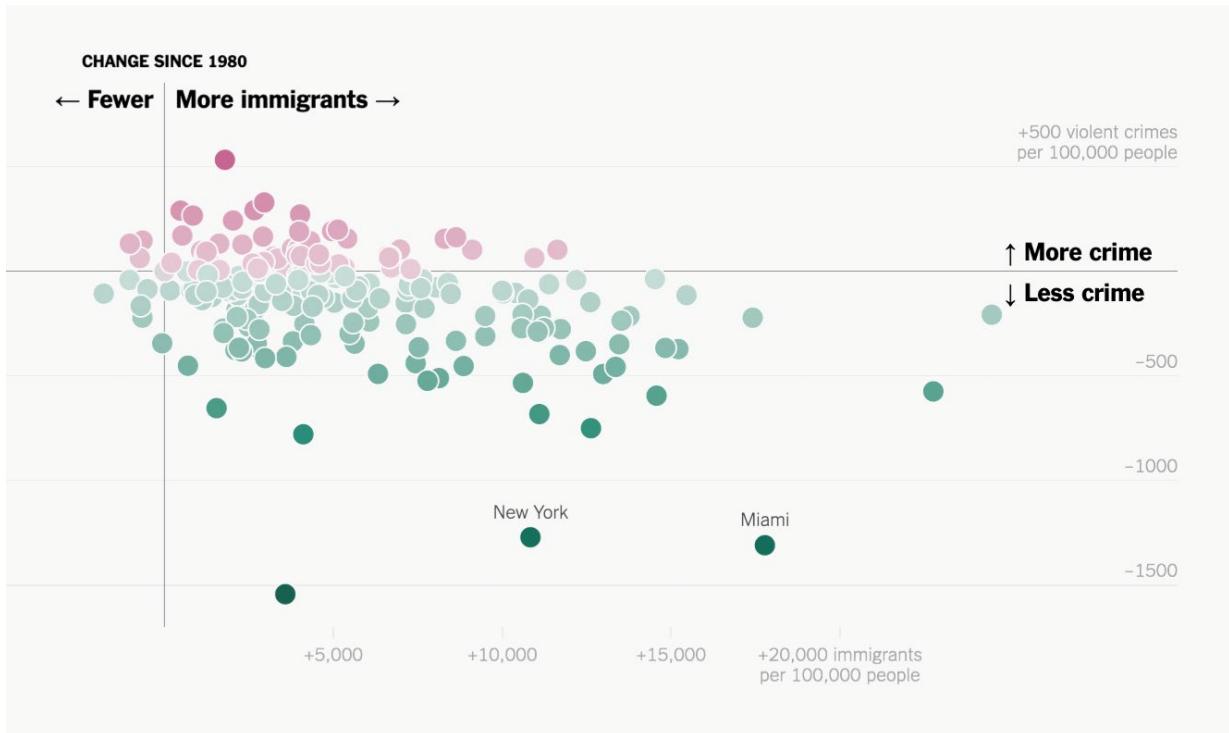
BETTER

“Put some consideration into how your table is sorted. It’s tempting to just sort the first column alphabetically. But often, that approach won’t bring the most interesting data to the top. In which row does the most important value hide? Consider showing this one first.”

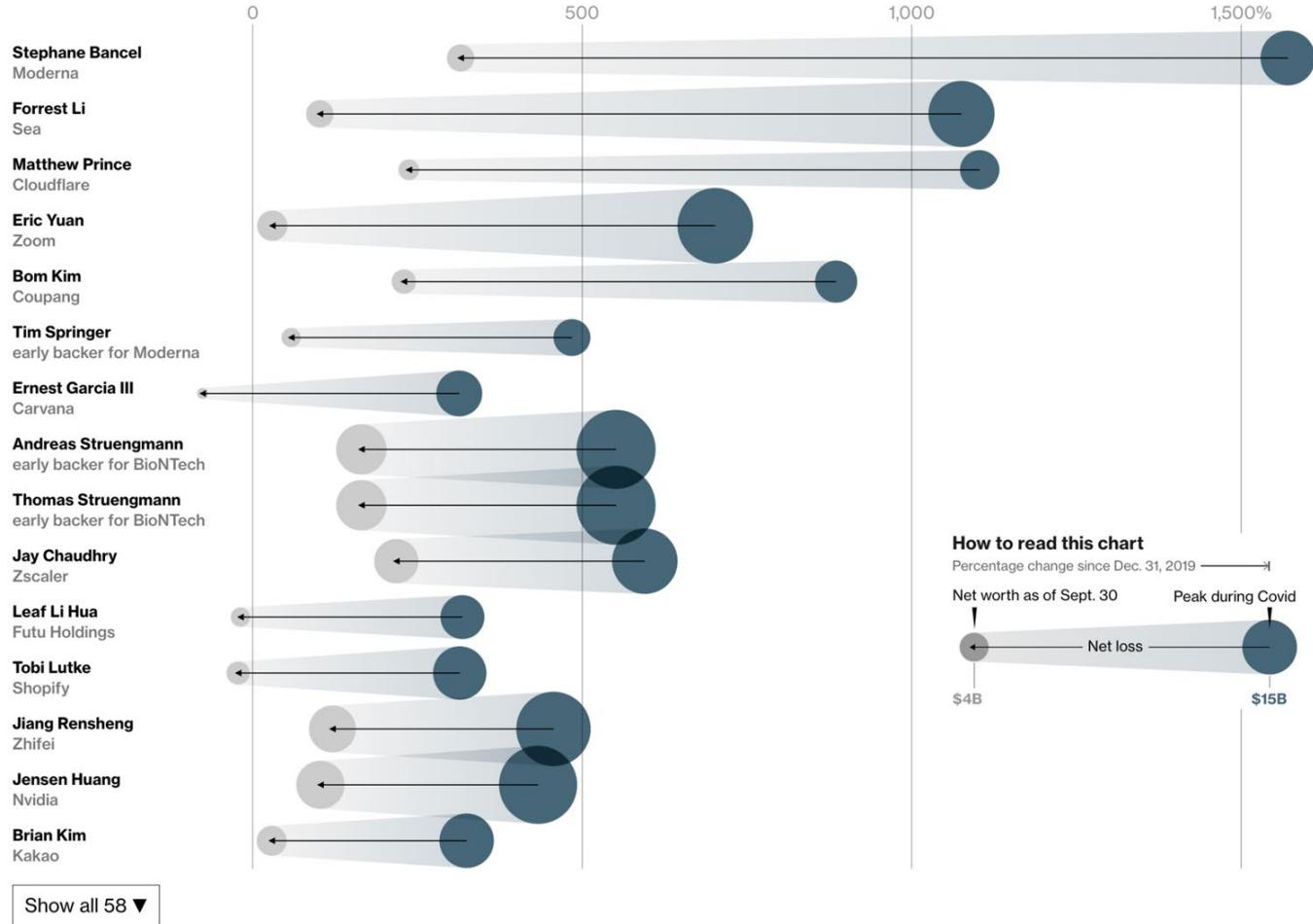
Examples



Examples



Examples



Examples

Senate Representation by State

1 voter in Wyoming has similar representation as **1 voter in North Dakota**

White



has similar representation as

1 voter in North Dakota

White



or

6 voters in Connecticut

White



Black



Asian



or

7 voters in Alabama

White



Black



or

18 voters in Michigan

White



Black



Asian



Hispanic



Other



or

59 voters in California

White



Black



Asian



Hispanic

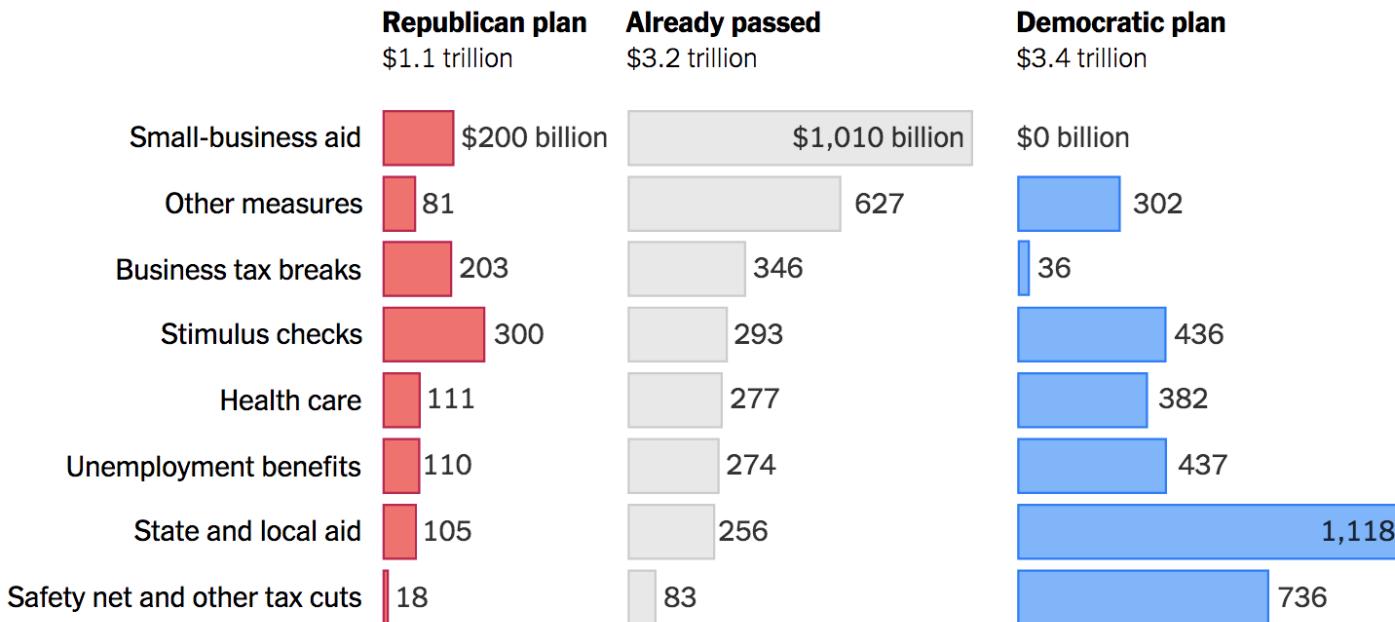


Other



BASIC GRAPHIC DESIGN PRINCIPLES

Graphic design in visualization



A more complicated example [here](#).

Analysis of data from The Committee for a Responsible Federal Budget. About \$800 billion of the aid that has already passed, primarily in the form of loans, is not expected to add to the deficit.

C.R.A.P. principles of graphic design

- **Contrast:** be bold in your differences
- **Repetition:** repeat visual elements to make visual themes
- **Alignment:** everything should align to something. Beware of centering.
- **Proximity:** related things should be closer together.

Title

Texty text
example text text
text to show
some good
design principles
about alignment
and lots of other
things.

TITLE

texty text
example text text
text to show

some good
design principles
about alignment
and lots of other
things.

How about an advertisement?

- The best ad ever
- With an image and all
- It's really the best
- Check it out



How about an advertisement?

- The best ad ever
- With an image and all
- It's really the best
- Check it out



Omeka Plugin Development

In addition to supporting a standard installation of Omeka for FAS courses, Academic Technology for the FAS, DARTH, and the History Department have collaborated on a number of Omeka plugins to extend Omeka functionality, making it easier to use the platform in a classroom setting.

HarvardKey Integration



When the service first launched, Omeka users had to maintain separate login information for each site. With the integration of HarvardKey credentials, students, staff, and faculty can all use their HarvardKey credentials to log in to Omeka sites.

This plugin also allows users to be added in bulk, simply by copying a list of emails into the plugin configuration. This plugin has greatly simplified the use of Omeka in a classroom setting.

Elasticsearch



For larger Omeka collections, it can be beneficial to have a faster, more robust search engine. The [Omeka Elasticsearch plugin](#) not only allows users to search through the contents of their Omeka sites more easily, but also gives them all of the features that Elasticsearch has to offer, including advanced facets and filters through a simple search syntax.

Course Tools



This plugin allows instructors to manage the permissions of their students dynamically throughout the term, enabling and disabling various editing and viewing permissions.

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Course Tools



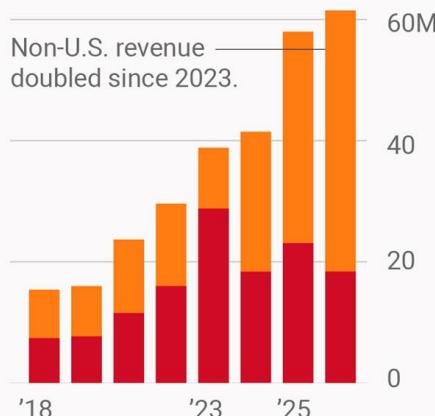
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Contrast example

Revenue increases

Worldwide revenue in U.S. Dollar

■ U.S. revenue ■ International



Values for 2025 are estimates.

Source: Internal analytics.

REVENUE INCREASES

Worldwide revenue in U.S. Dollar

■ U.S. revenue ■ International

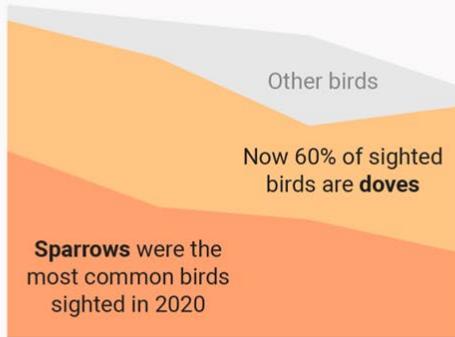


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Source: Internal analytics.

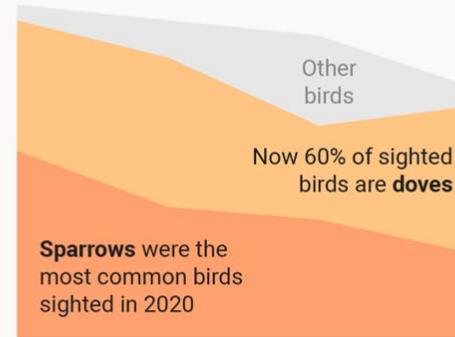
Centered text example

Fewer birds sighted in the city park, especially sparrows



NOT IDEAL

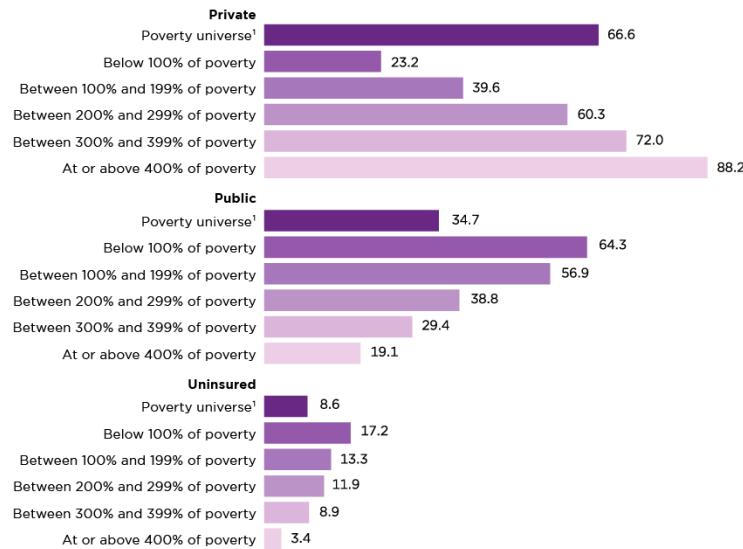
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BETTER

Spacing example

Figure 4.
Health Insurance Coverage and Type by Income-to-Poverty Ratio: 2020
(Population as of March of the following year)

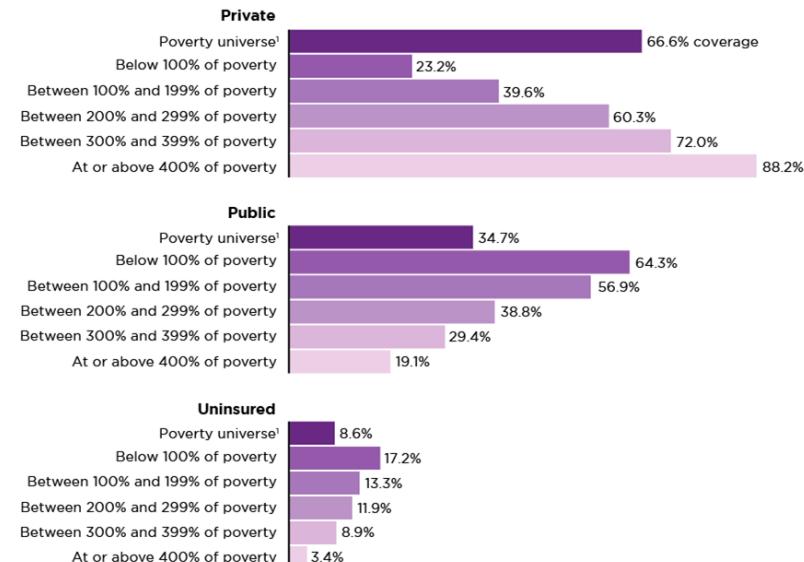


¹The poverty universe excludes unrelated individuals under the age of 15 such as foster children.

Note: The estimates by type of coverage are not mutually exclusive; people can be covered by more than one type of health insurance during the year. Information on confidentiality protection, sampling error, nonsampling error, and definitions is available at <<https://www2.census.gov/programs-surveys/cps/techdocs/cpsmar21.pdf>>.

Source: U.S. Census Bureau, Current Population Survey, 2021 Annual Social and Economic Supplement (CPS ASEC).

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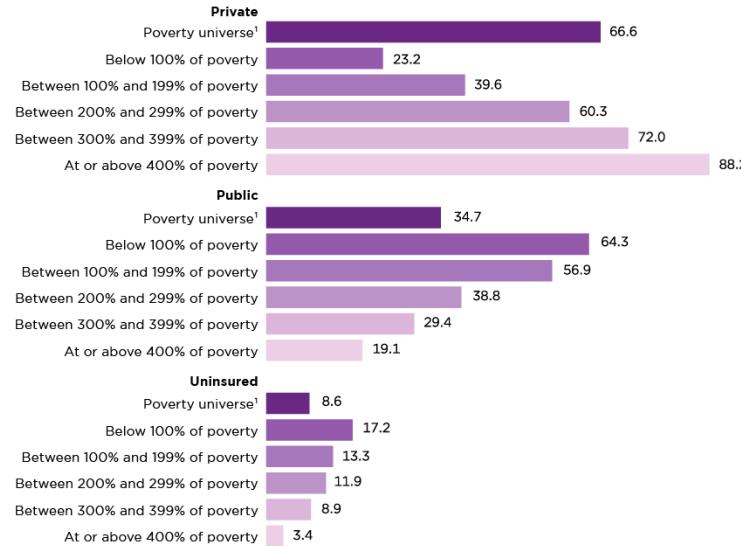
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Spacing example

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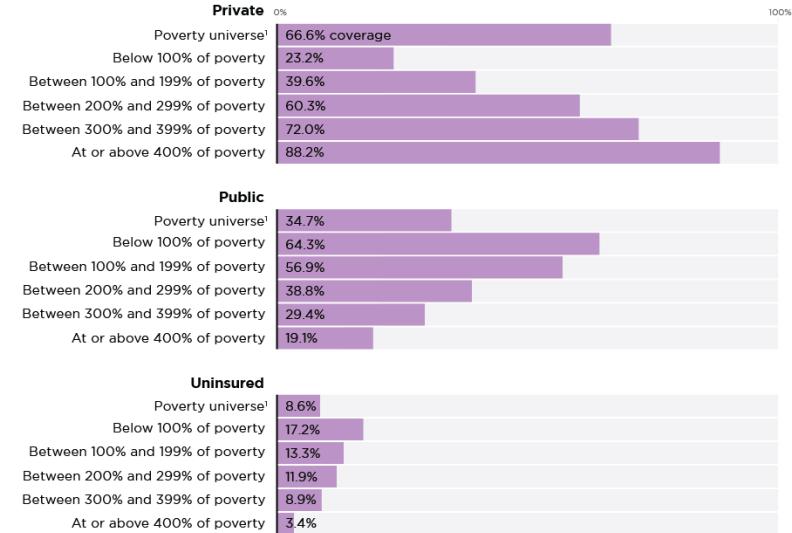


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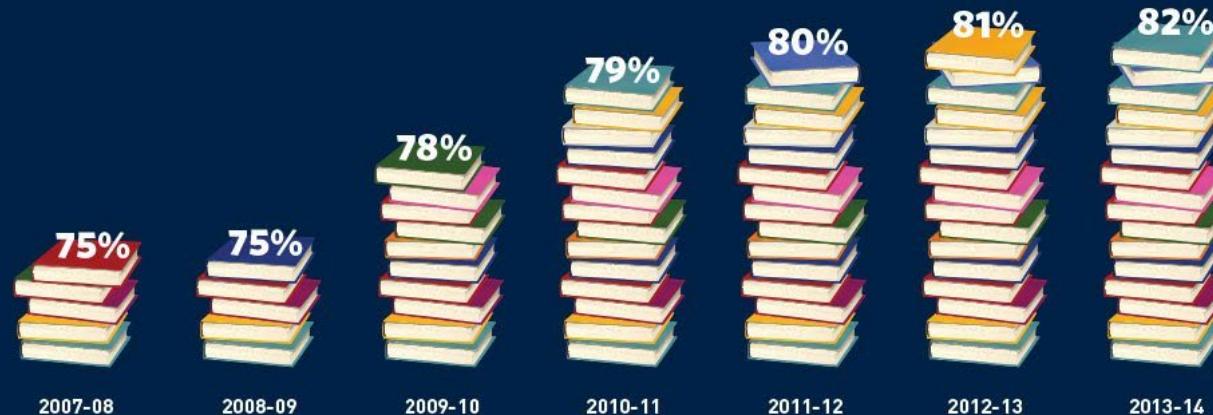
MISLEADING CHARTS AND GRAPHS

Don't ever truncate bar charts, for any reason.

UNDER PRESIDENT OBAMA,

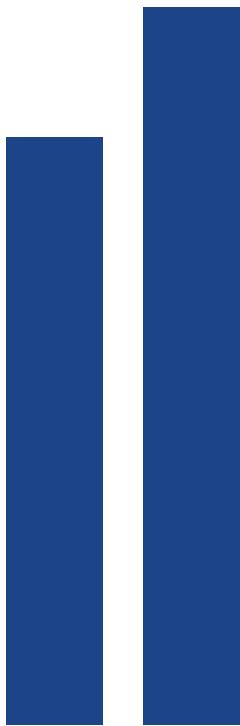
MORE STUDENTS ARE EARNING THEIR HIGH SCHOOL DIPLOMAS THAN EVER BEFORE

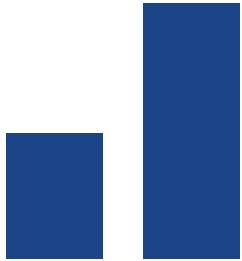
HIGH SCHOOL GRADUATION RATE



#LeadOnEducation

SOURCE: U.S. DEPARTMENT OF EDUCATION,
NATIONAL CENTER FOR EDUCATION STATISTICS



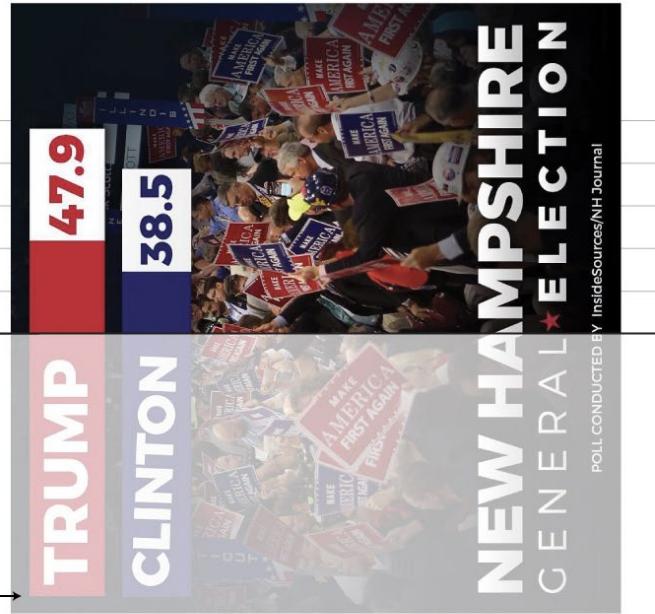


Don't ever truncate bar charts, for any reason.



Baseline obscured,
bars fade

False baseline →

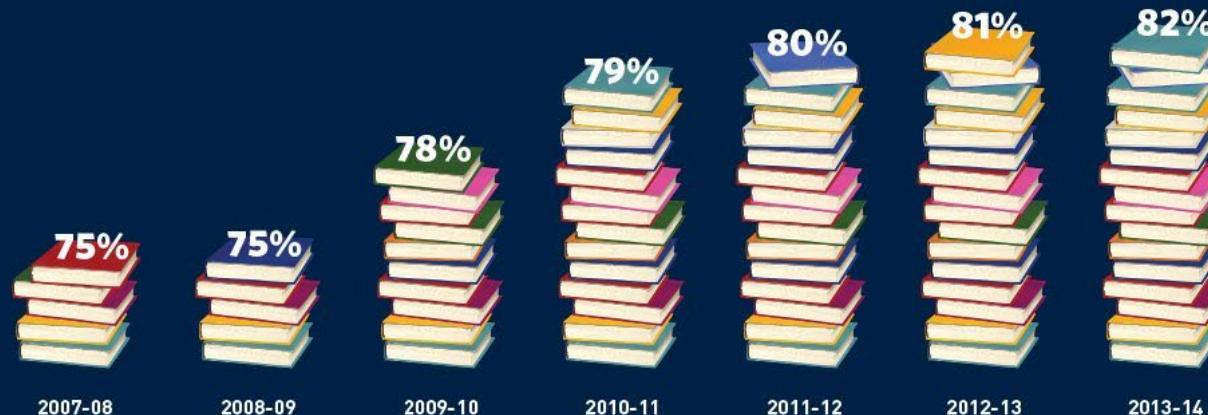


Back to the first example

UNDER PRESIDENT OBAMA,

MORE STUDENTS ARE EARNING THEIR HIGH SCHOOL DIPLOMAS THAN EVER BEFORE

HIGH SCHOOL GRADUATION RATE

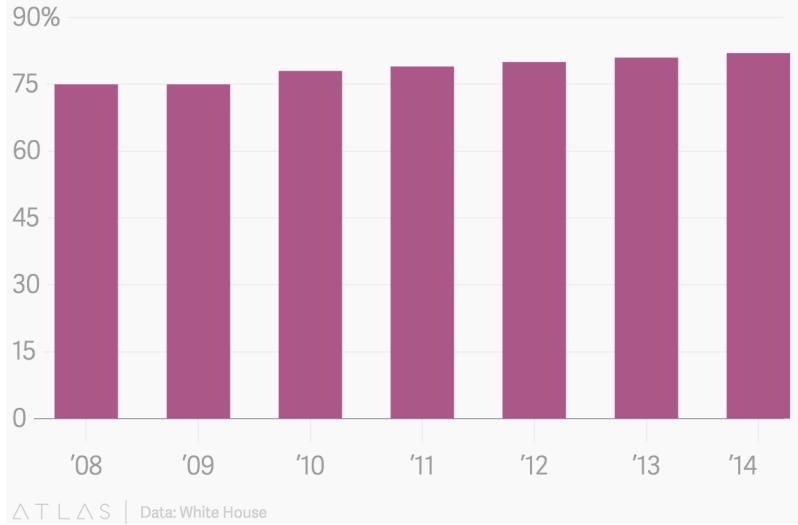


#LeadOnEducation

SOURCE: U.S. DEPARTMENT OF EDUCATION,
NATIONAL CENTER FOR EDUCATION STATISTICS

When encoding data using length, start at zero.

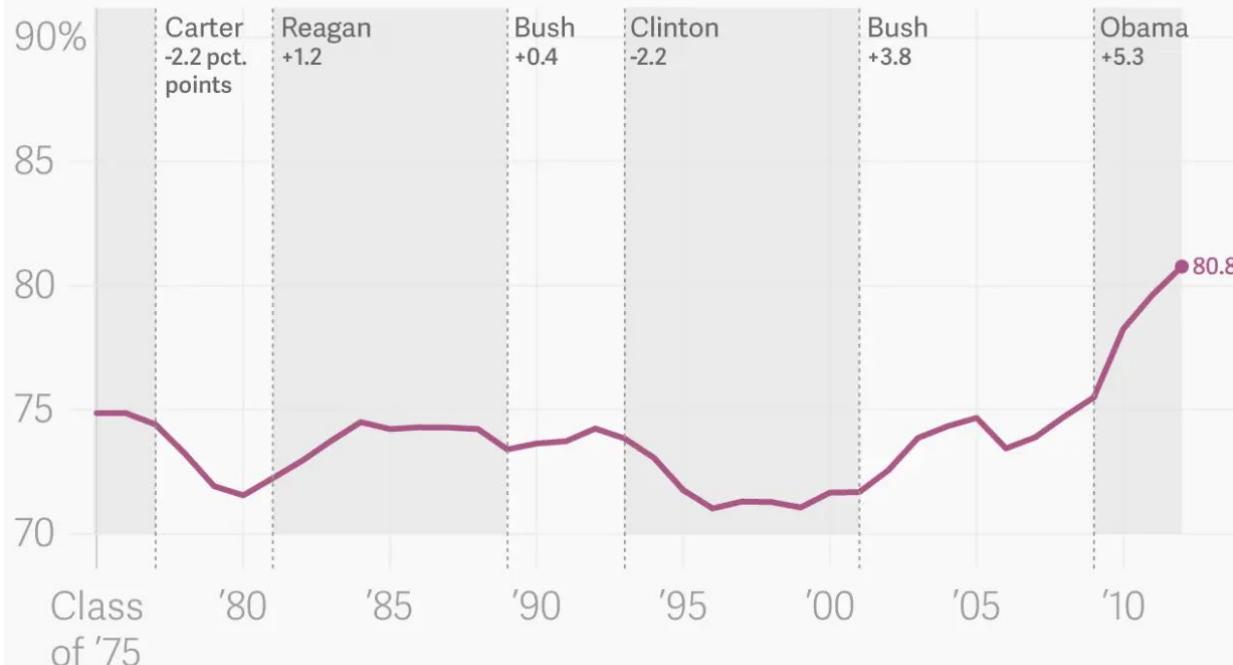
High school graduation rates in the US



.... (and choose a different chart type).

Make sure to include enough data

High school graduation rates in the US, 1975 to 2012

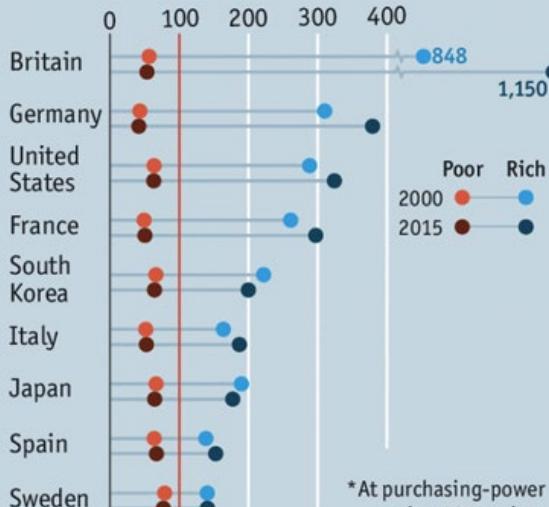


“Axis of evil”

The rich get richer

GDP per person* of poorest and richest regions†

National average =100



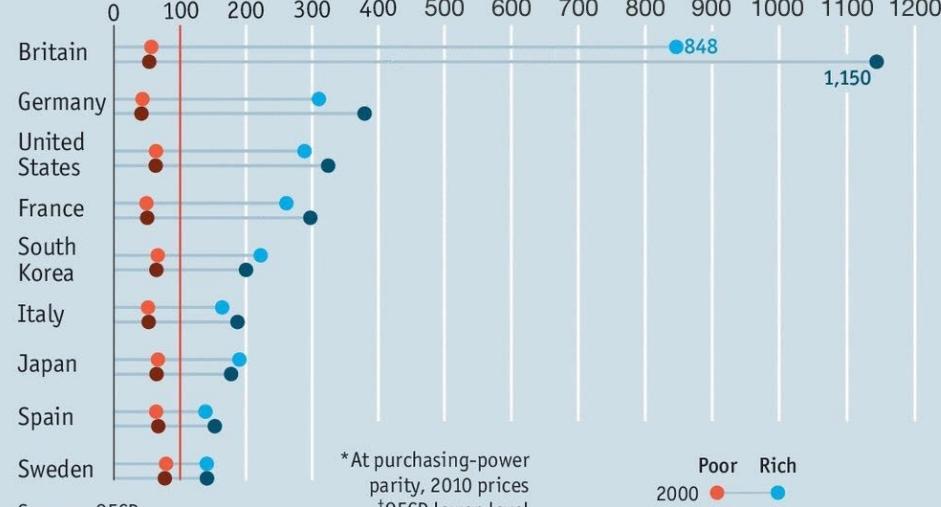
Sources: OECD;
The Economist

*At purchasing-power
parity, 2010 prices
†OECD lower-level
regions and US states

The rich get richer

GDP per person* of poorest and richest regions†

National average =100



Sources: OECD;
The Economist

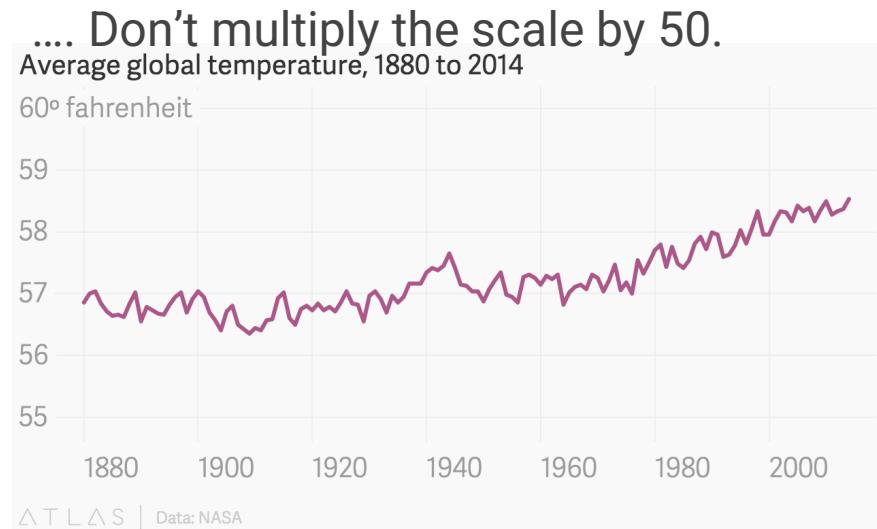
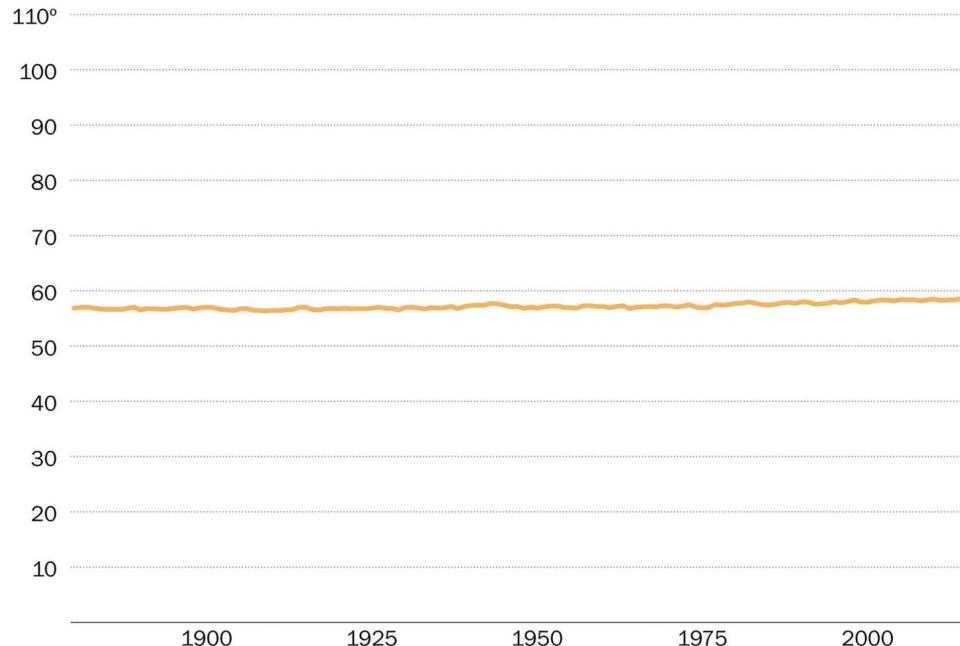
*At purchasing-power
parity, 2010 prices
†OECD lower-level
regions and US states

Poor Rich
2000 2015

Economist.com

Scale axes carefully (0 is not always the answer!)

Data from NASA/GISS.



Final note: beware 3D graphs

UNDER PRESIDENT OBAMA,

MORE STUDENTS ARE EARNING THEIR HIGH SCHOOL DIPLOMAS THAN EVER BEFORE

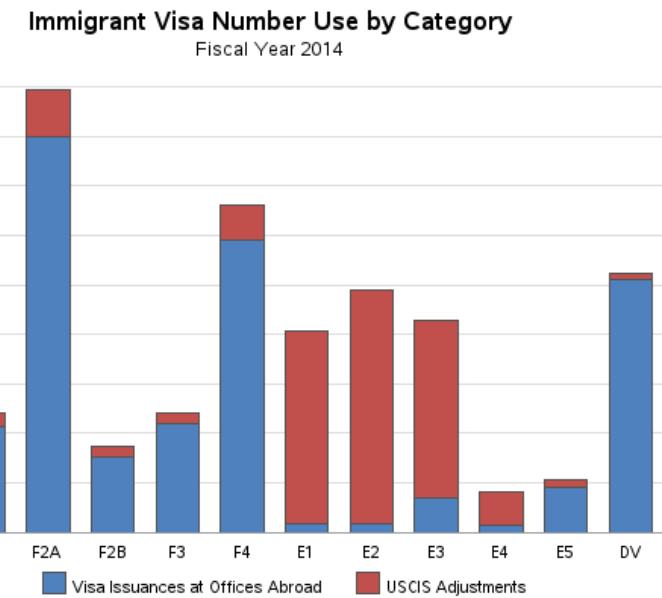
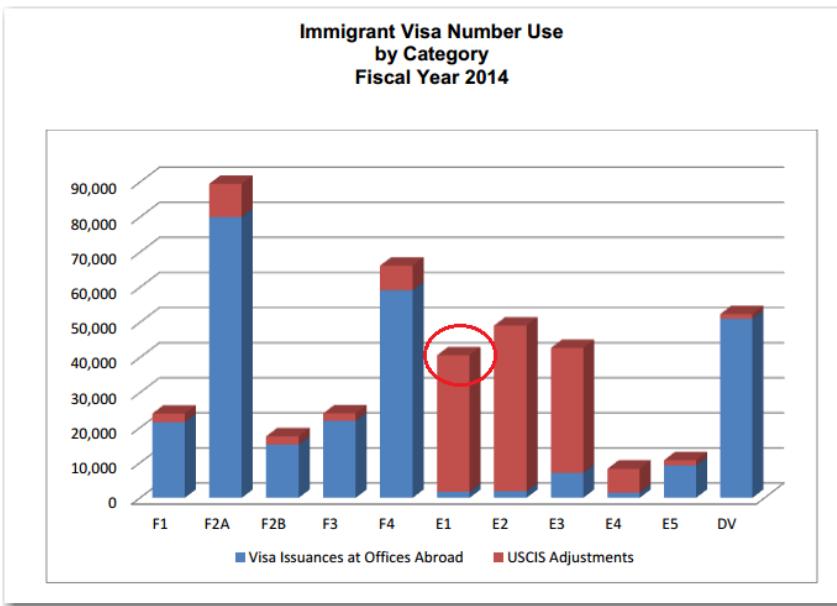
HIGH SCHOOL GRADUATION RATE



#LeadOnEducation

SOURCE: U.S. DEPARTMENT OF EDUCATION,
NATIONAL CENTER FOR EDUCATION STATISTICS

Final note: beware 3D graphs

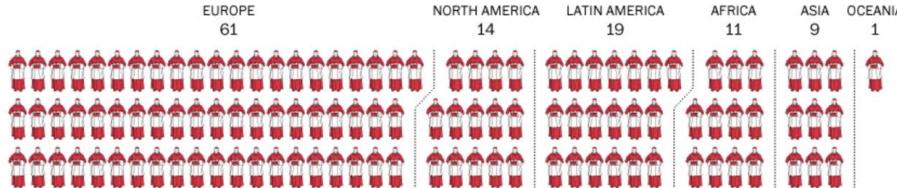


INSPIRATION

Who is eligible to vote

Under a change of rules stipulated by Pope Paul VI, only cardinals who have not yet reached their 80th birthday on the day of the pope's death may enter the conclave. Those over 80 may participate in preliminary meetings.

Cardinals who are under age 80 and will be voting:



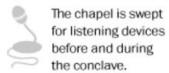
About the 115 electors

Forty-eight cardinals were appointed by Pope John Paul II. Sixty-seven were appointed by Pope Benedict XVI.

They come from 48 countries.

The average age is 72.

Conclave rules



The chapel is swept for listening devices before and during the conclave.



Each cardinal has to be present to vote and must cast his own ballot.



Other people allowed inside the conclave: two technicians, medical personnel and several assistants.



Cardinals and assistants swear an oath of absolute secrecy. Leaking information would result in excommunication.



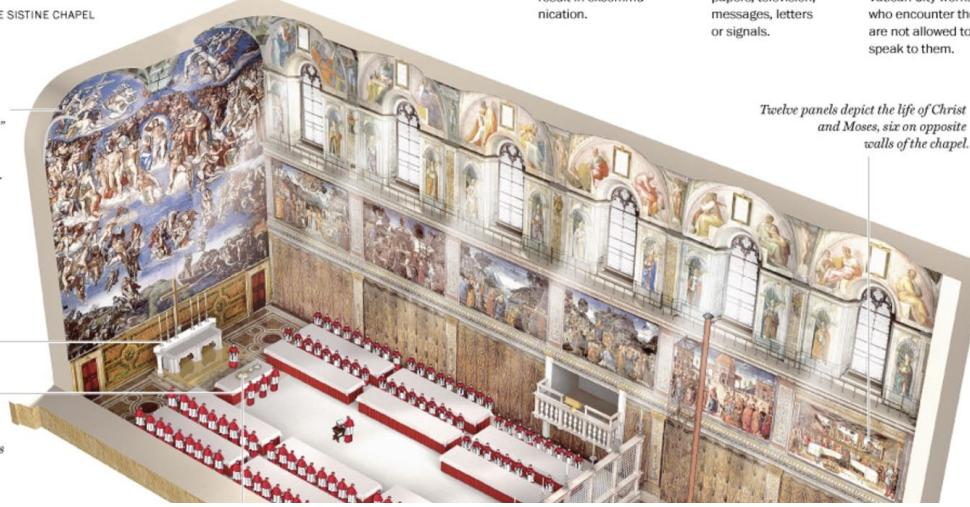
The cardinals are not permitted any contact with the outside world: No cellphones, newspapers, television, messages, letters or signals.



Observers can see the cardinals only when they travel between their lodging and the chapel. Vatican City workers who encounter them are not allowed to speak to them.

INSIDE THE SISTINE CHAPEL

The "Last Judgment" fresco, painted by Michelangelo



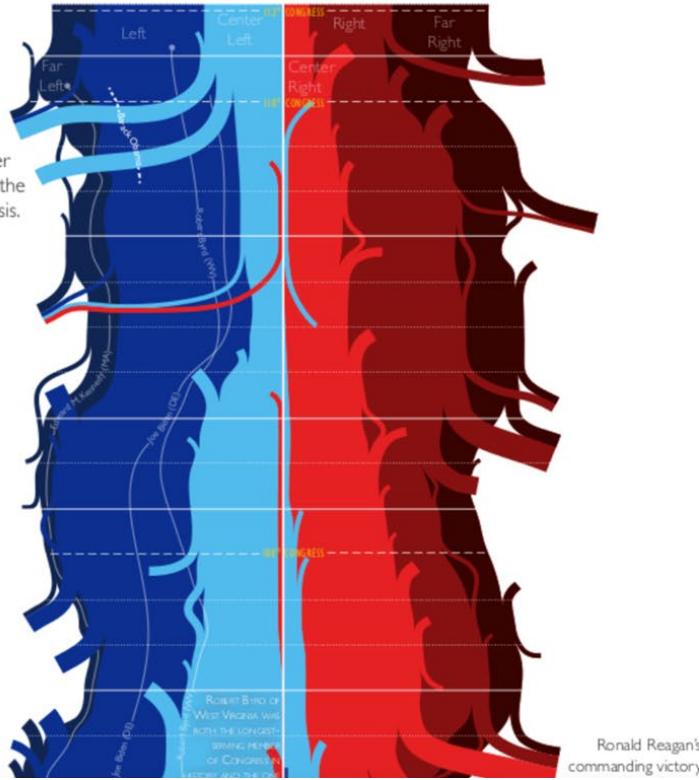
Twelve panels depict the life of Christ and Moses, six on opposite walls of the chapel.

SENATE

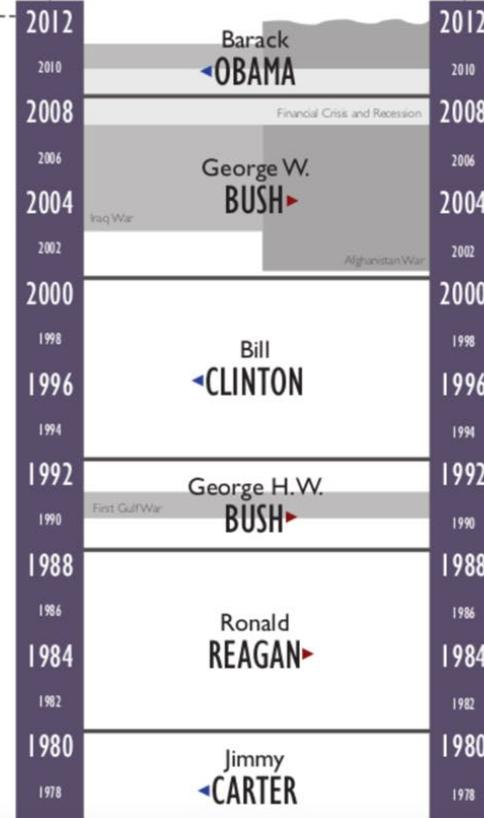
Members of Left-Leaning Parties

Members of Right-Leaning Parties

In the later years of the Bush Administration, Democrats regained control of the Senate in 2006, and won a larger majority in 2008 during the onset of the financial crisis.

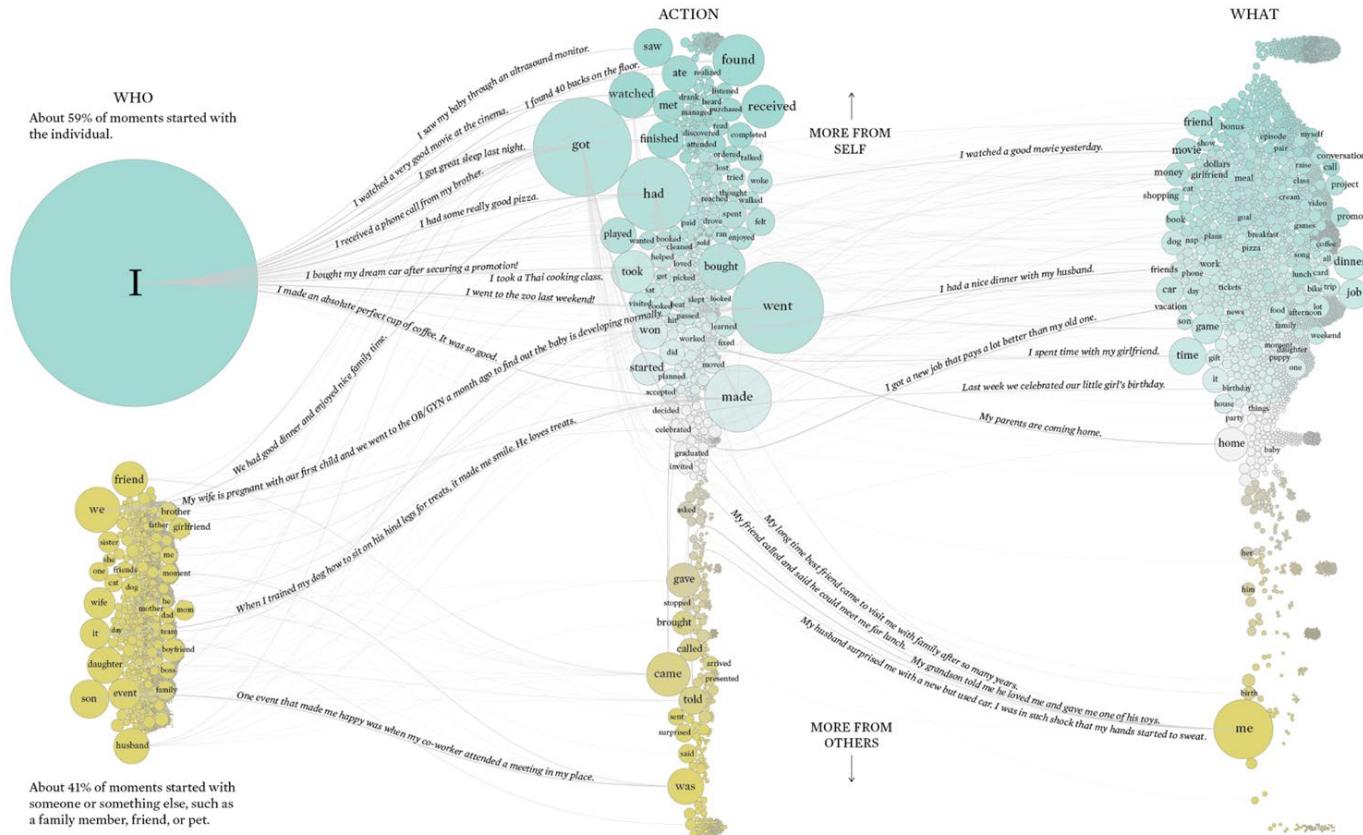


PRESIDENCIES



Moments of Happiness

People were asked what made them happy recently. The result was HappyDB, a collection of 100,000 moments. This is a breakdown of the moments using sentence parts: subject (who), verb (action), and object (what).

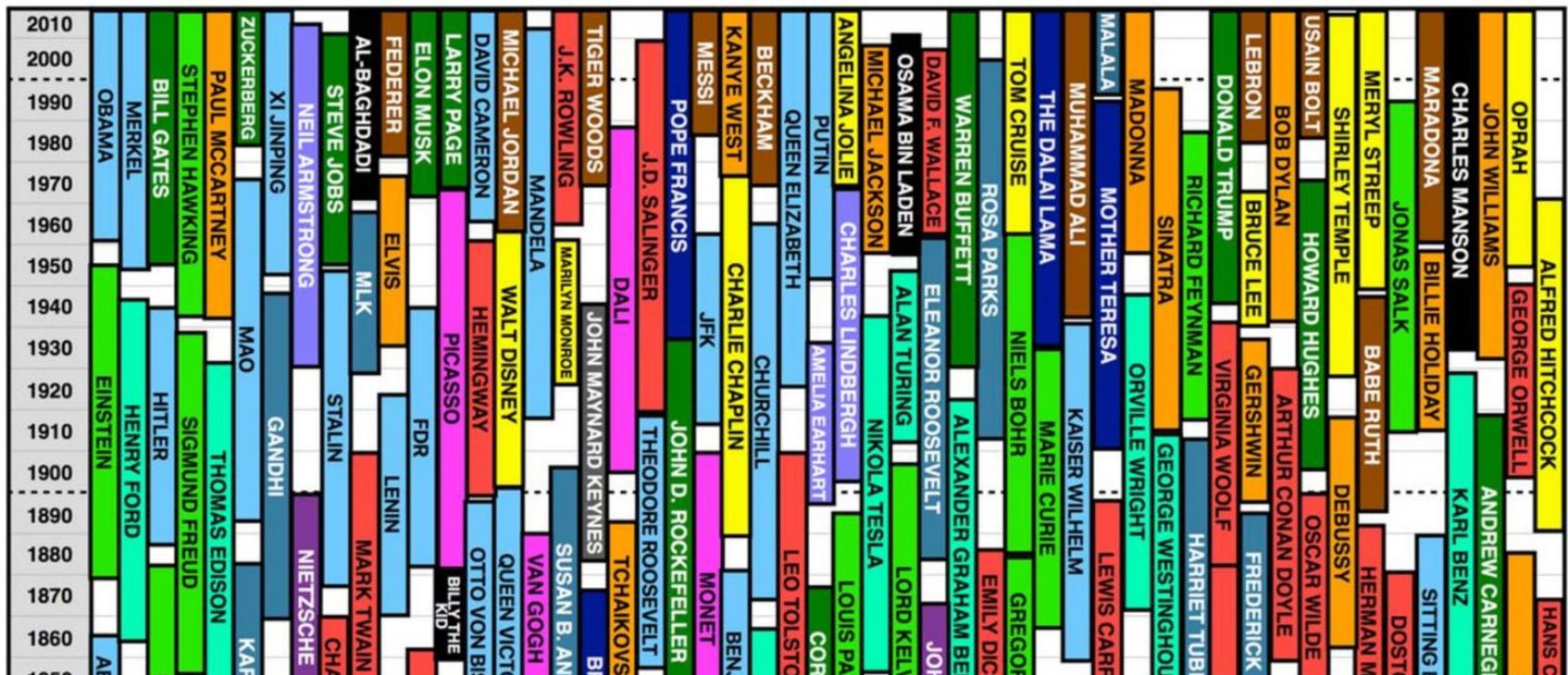


About 41% of moments started with someone or something else, such as a family member, friend, or pet.

Circle area represents total usage. Circle color and vertical position represent whether the words were more often used with "I" as the subject or someone or something else.

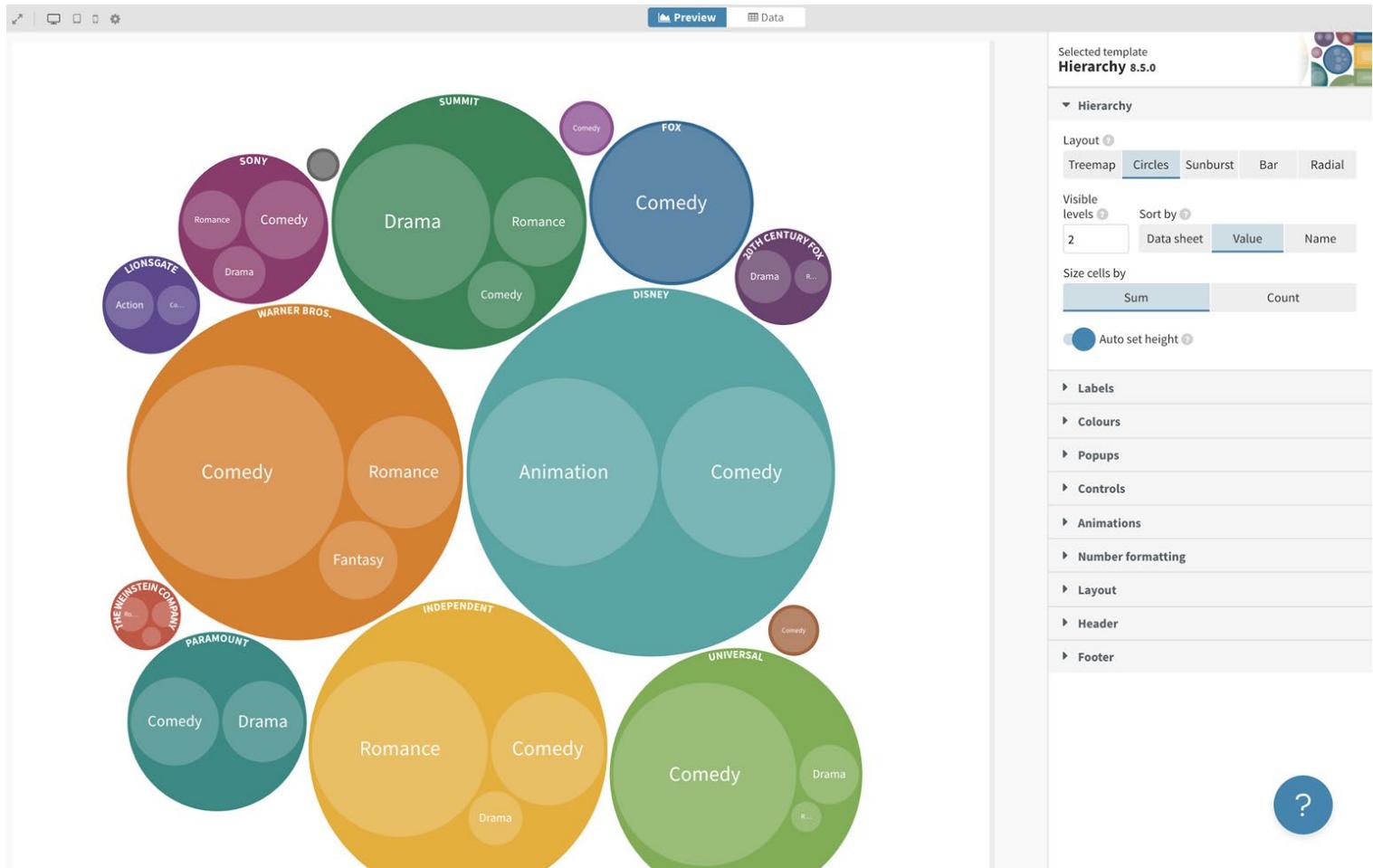
KEY

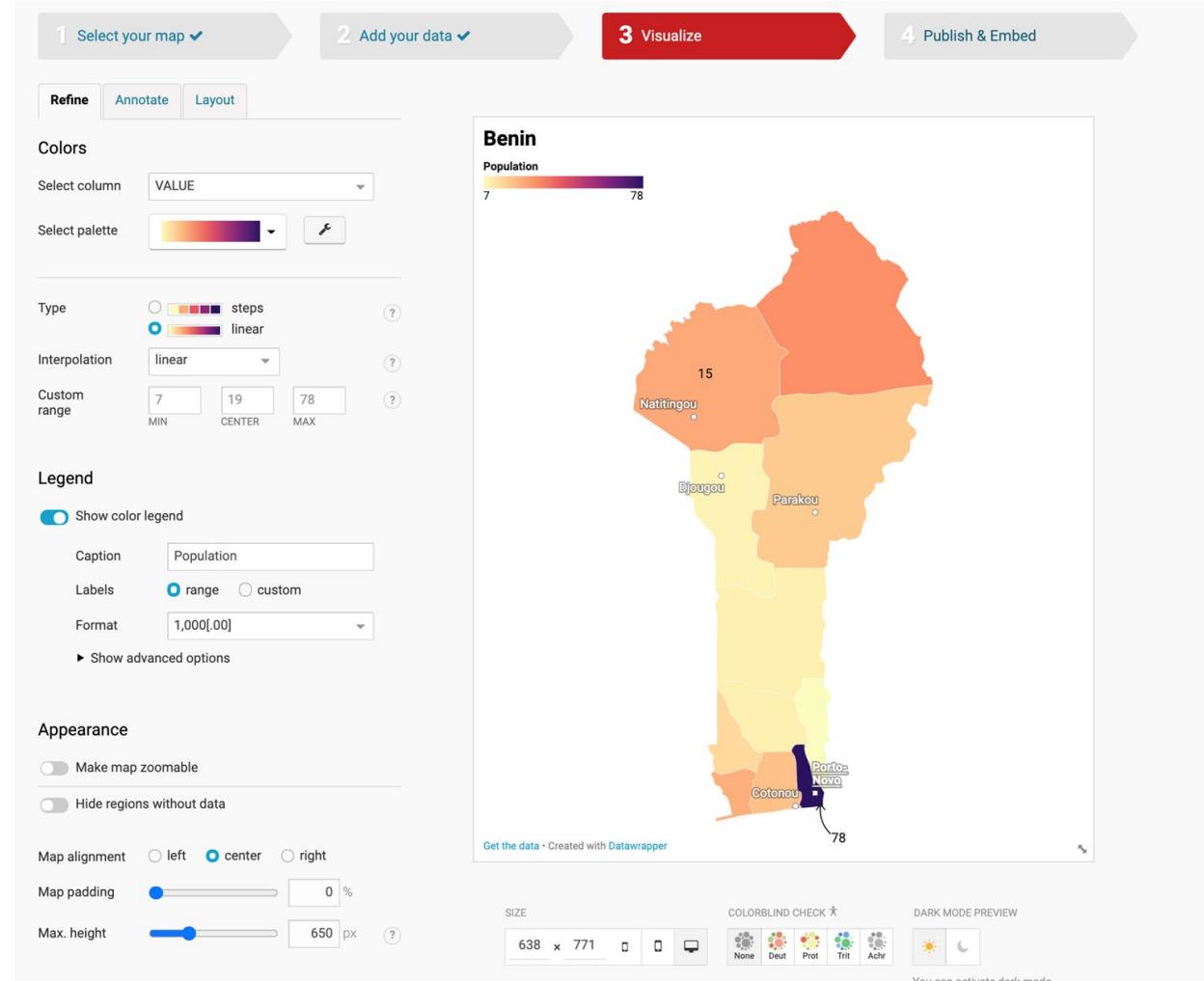
POLITICAL LEADERS		CULTURAL LEADERS		RELIGIOUS LEADERS		PIONEERS AND EXPLORERS			
		SCIENCE	INVENTION	BUSINESS / TECH		ECONOMICS			
PHILOSOPHY	ART	WRITING	MUSIC	ENTERTAINMENT		SPORTS	DICKS	OTHER	



TOOLS FOR VISUALIZATION

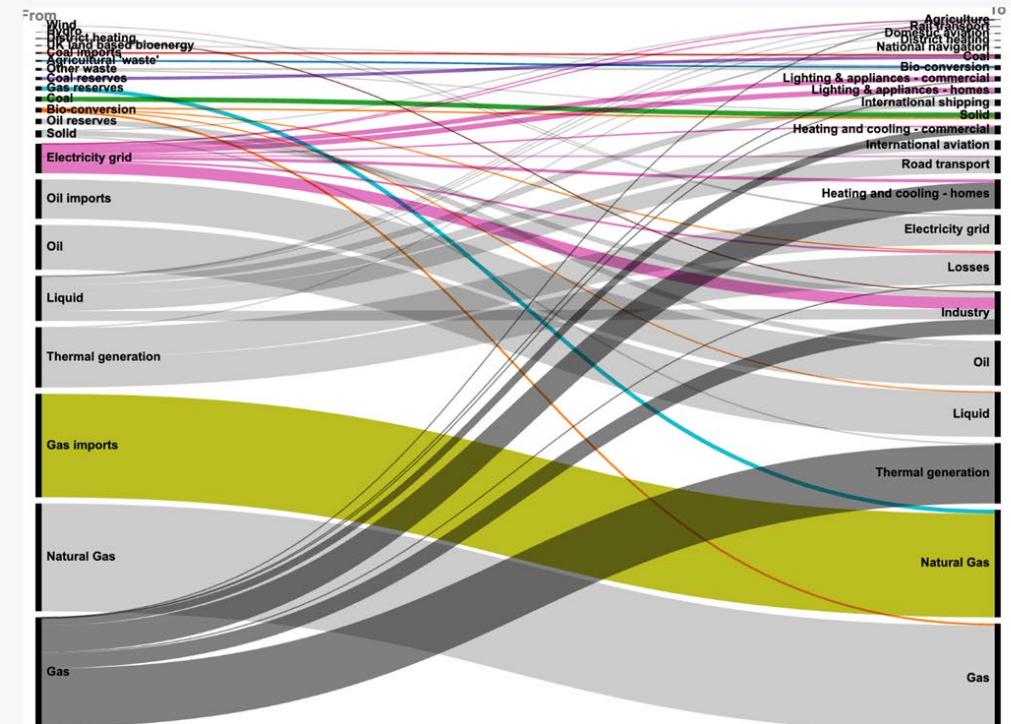
Flourish.studio





4. Customize

ARTBOARD



Width (px)

805

Height (px)

600

Background

#FFFFFF

Margin (top)

10

Margin (right)

10

Margin (bottom)

10

Margin (left)

10

CHART



COLORS



LABELS



Tableau

Tableau - Workshop Better

Dashboard Layout Device Preview Device type Tablet Model Generic Tablet (1024 x 768) Tableau Mobile app Add Tablet Layout

Map

Generation

- (All)
- Baby Boomers
- Millenials

% Change in jobs

-6.10 16.56

% Change in jobs

-6.10 16.56

Change in Workforce

Occupation

Occupation	Value
Food Preparation and Related Occupations	16.56
Sales and Related Occupations	-6.10
Healthcare Practitioners and Technicians	-6.10
Healthcare Support Occupations	-6.10
Personal Care and Service Occupations	-6.10
Production Occupations	-6.10
Office and Administrative Occupations	-6.10
Transportation and Material Moving Occupations	-6.10
Building and Grounds Cleaning and Maintenance Occupations	-6.10
Management Occupations	-6.10
Installation, Maintenance, and Repair Occupations	-6.10
Life, Physical, and Social Science Occupations	-6.10
Community and Social Service Occupations	-6.10
Business and Financial Occupations	-6.10
Architecture and Engineering Occupations	16.56
Farming, Fishing, and Forestry Occupations	-6.10
Arts, Design, Entertainment, and Sports Occupations	-6.10
Protective Service Occupations	-6.10

Jobs Breakdown

Occupation Category
Food Preparation and Serving Related Occupations
Personal Care and Service Occupations
Healthcare Support Occupations
Sales and Related Occupations

Objects

- Horizontal
- Vertical
- Text
- Image
- Tiled
- Floating

Web Page

Blank

Button

Extension

Show dashboard title

Data Source Change in Jobs Jobs Breakdown Change in Workforce Map All the Millenials The sad sorry tale of the rece...

354 marks 1 row by 1 column SUM(% Change in jobs): 723.30 Highlighting on Generation

Google Sheets

COUNTA of Costume Type

	A	B	C	D	E	F	G	
1	COUNTA of Cos	Costume Type						
2	Grouped Age	Animal	Character	Object	Superhero	Grand Total		
3	0 - 3	6	2	7	1	16		
4	4 - 7	13	9	5	2	29		
5	8 - 11	3	23	1	5	32		
6	12 - 16	4	13		5	22		
7	Grand Total	26	47	13	13	99		

Breakdown of Costumes by Age Group

Grouped Age	Animal	Character	Object	Superhero	Total
0 - 3	7	2	6	1	16
4 - 7	13	9	5	1	29
8 - 11	1	23	1	5	32
12 - 16	5	13	0	4	22

'Halloween Dataset'!A1:I100

Suggested

Rows Add

Grouped Age X

Order Ascending Sort by Grouped Age

Show totals

Columns Add

Costume Type X

Order Ascending Sort by Costume Ty...

Show totals

Values Add

Costume Type X

Summarize by COUNTA Show as Default

Filters Add

Voyant Tools

