



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

96801 - LANGUAGE LABORATORY: COMMUNICATION OF STATISTICS AND DATA BUSINESS ANALYTICS

LESSON 5 - 24/11/2025

Alice Corona

Dipartimento di Scienze Statistiche "Paolo Fortunati"

COMMUNICATING DATA

Structuring the content and storyboarding

DATASETS



DATASET #1: Museums and culture

[Source: Ministero della Cultura, ISTAT, Louvre, Tate Gallery]



DATASET #2: Diversity and inclusion

[Fonte: OECD, Kaggle, Grape, Google]



DATASET #3: Survey - Attitudes on the environment

[Fonte: Eurobarometer]

EXERCISE → C. STORYBOARDING INSIGHTS

Continue working on the dataset you chose last time, for which you have identified an audience and a communication goal.

PART 1: Begin analyzing the dataset by:

- Write **data questions** that are relevant to the identified audience and context.
- Find an **answer** to these questions.
- Reiterate if more questions come up during the data exploration.

access Mural
workspace

CONTEXT

**Dataset**

The project uses the dataset on Diversity and Inclusion at Google between 2015 and 2023.

**Client / Employer / Institution & Motivation**

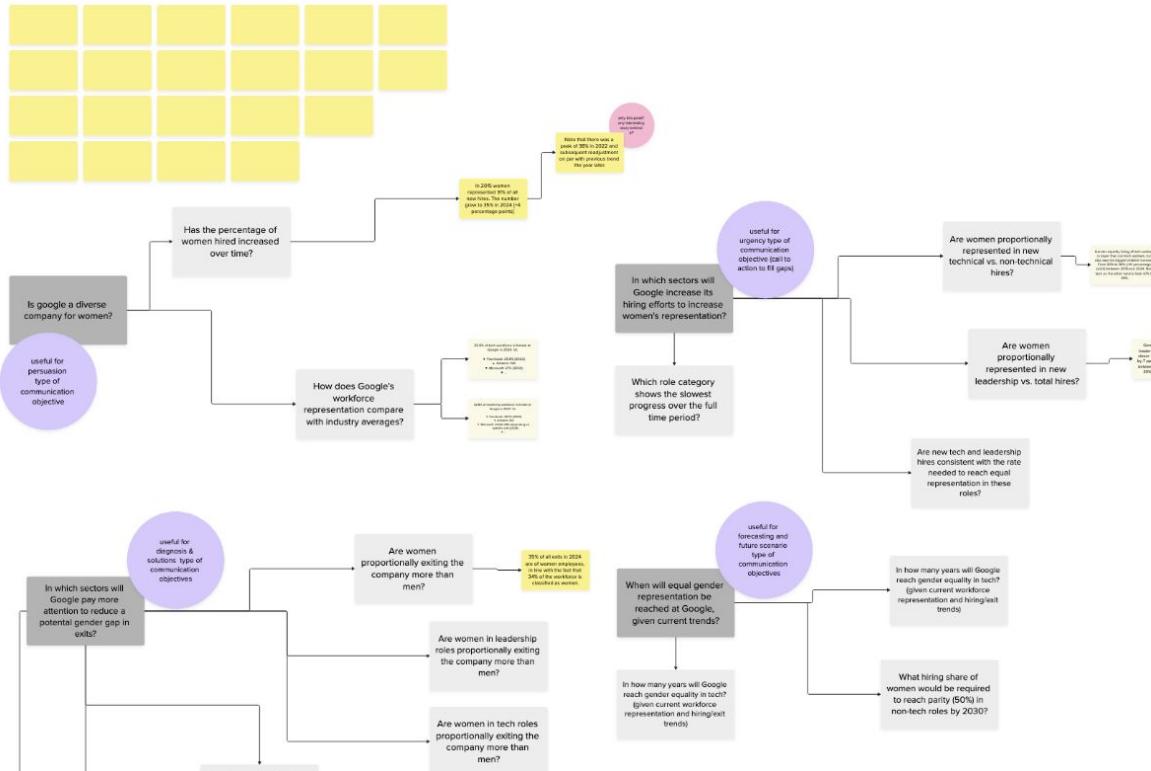
Google's HR Department wants to demonstrate progress in gender diversity hiring to the company's current and prospective employees, to strengthen its branding by showing commitment to inclusion and to support recruitment campaigns targeting underrepresented groups.

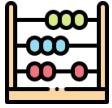
**Audience segments**

Current employees and perspective employees, with a focus on those in tech or leadership.

STEP #1

Brainstorm data questions... and write down the answers.





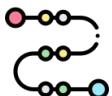
COUNT / MEASURE



COMPARE / RANK



SPATIAL DISTRIBUTION



CHANGE IN TIME



CORRELATION

IDEAS FOR FINDING INSIGHTS

A

I would like you to draft about 20 insights that would be useful for the scenario "I work for google hr and want t publish a press release about how we are a diverse company and improving". Then 20 more for the scenario "I am an equality-focused ngo and want to publish a story about googles struggles in diversity".

Scenario 1: Google HR Press Release (Positive Framing)

- 1. Record Growth in Leadership Diversity:** Women in global leadership have increased 58% from 20.8% in 2014 to 32.8% in 2024, demonstrating our commitment to inclusive advancement.
- 2. Black+ Representation Momentum:** Black+ employees have more than doubled from 2.4% to 5.7% globally over the past decade, with 2024 hiring reaching 12.1%.
- 3. Hispanic/Latinx+ Acceleration:** Hispanic/Latinx+ representation has grown 67% from 4.5% to 7.5%, with new hire rates of 11.6% signaling continued upward trajectory.

A

however these should be calibrated by actual population % right

Weighed demographic baselines against workforce representation metrics.



You're absolutely right - this is a critical point for interpreting the data properly. Let me recalibrate:

US Workforce Compared to Population Benchmarks

Asian+ employees (29.2% of US workforce in 2024):

- US population: ~6%
- **Significantly overrepresented** (nearly 5x population rate)
- But closer to CS degree holders (~15-20%), suggesting pipeline alignment

Black+ employees (3.3% of US workforce).

A

i would like some more creative insights. For example with projections

Scenario 1: Google HR Press Release (Creative Positive Insights)

- 1. Path to Gender Parity:** At current growth rates (0.5% annually), women will reach 40% of global workforce by 2036, with tech roles achieving 30% by 2028—establishing Google as an industry leader.
- 2. The Billion Dollar Diversity Pipeline:** Google's hiring of 12.1% Black+ in 2024 represents a potential \$500M+ annual investment in Black talent at scale, the largest corporate commitment in tech.

[Read chat](#)

Enrico Bertini - Things You Can
Now Ask an AI When Working
With Data

Organize insights by topic / point. Order them vertically by importance

1	2	3	4	5	other
Google is still not on par with gender representation in the conference by it's making considerable efforts 80% of tech jobs for females are in IT and software development, while only 20% of tech workers are female 27% of men view the lack of women in tech as a problem, while only 11% of women do Google's position on the issue has not changed since 2013, when 30% of Google employees were women	message	message	message	message	

STEP #3

Storyboard your content. Start ordering the insights in the squares depending on where you want them to be communicated. Use each square as a single insights or to coherent set of insight. You can add or delete squares as need. Other than for organizing the insights, use the single squares also for other types of relevant storytelling elements like "hook"/ rhetorical questions / transitions / contextualizations / call to actions, etc.

INTRO



Caption...



Caption...



Caption...



Caption...

BODY



Caption...



Caption...



Caption...



Caption...

END



Caption...



Caption...



Caption...



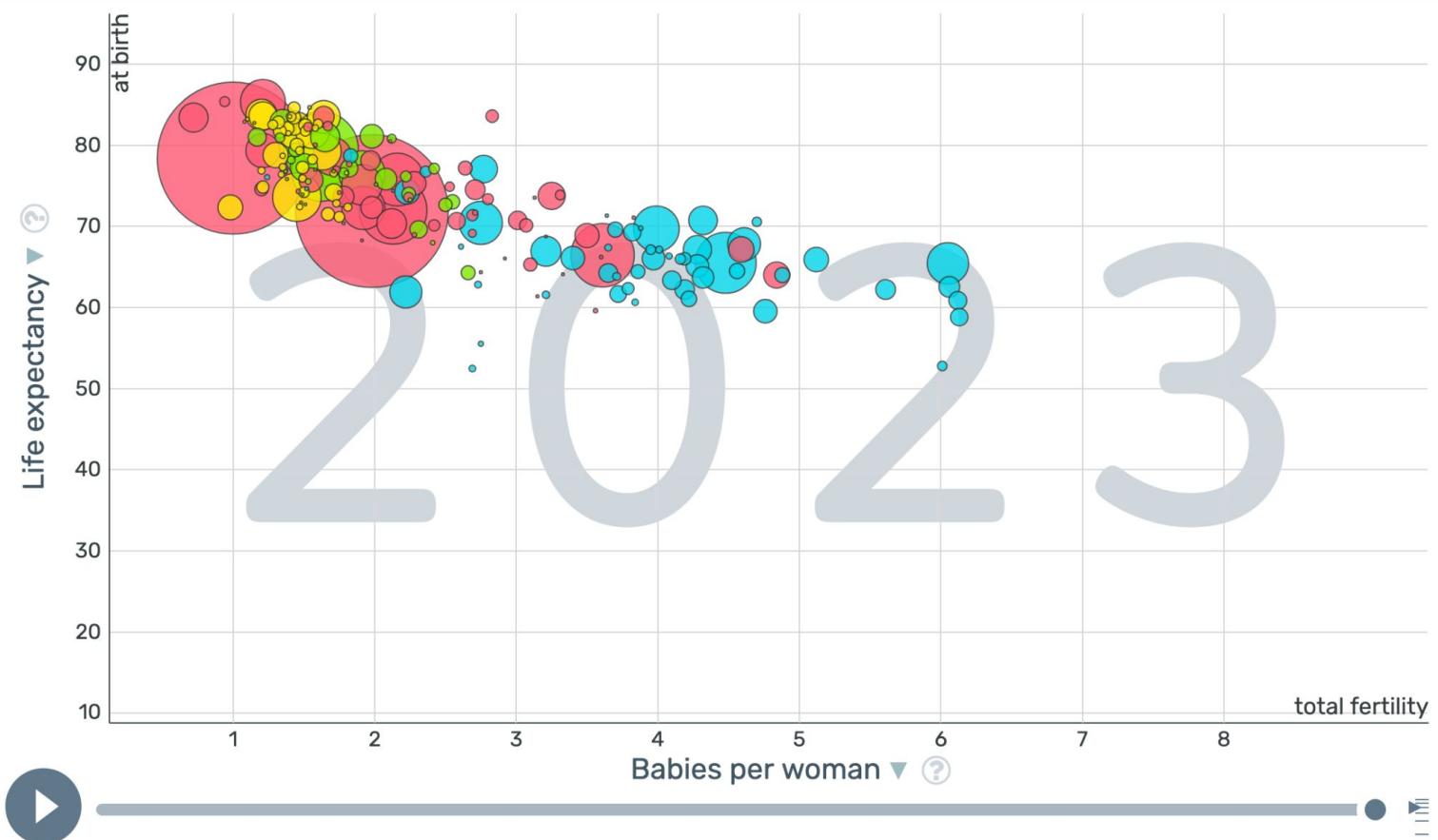
Caption...

EXERCISE → C. STORYBOARDING INSIGHTS

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PART 2: Create a storyboard by:

- Assigning a priority to the insights found: which is the more important? Which are useful but lower importance? Which can be discarded?
- Create a narrative flow for the insights by reasoning on their **order**, their relationship with the **text**, and their potential **visual representation**.





The best stats you've ever seen, Hans Rosling (2007)

**DATA STORYTELLING
COMMUNICATES
A DATA-DERIVED
MESSAGE.**

THIS MAY OR MAY NOT BE VISUAL.

**DATA VISUALISATION
PRESENTS DATA
VISUALLY.**

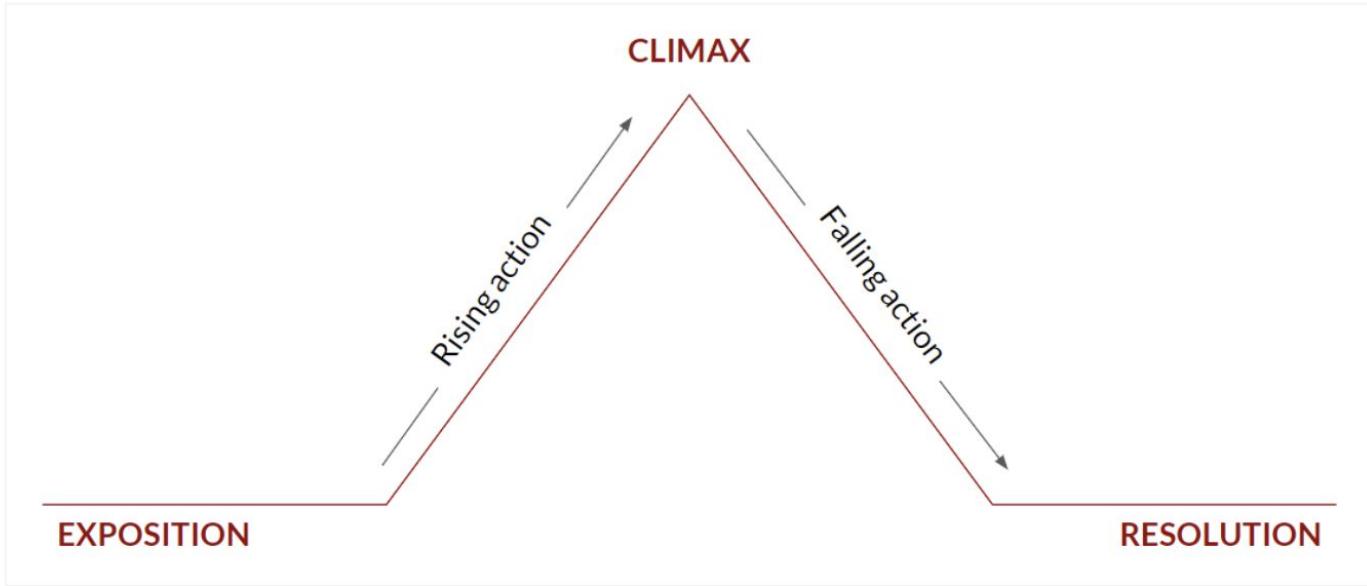
THIS MAY OR MAY NOT TELL A STORY.

structure the
NARRATIVE

“Without a main point, your data story will lack purpose, direction, and cohesion.

A central insight is the unifying theme (telos appeal) that ties your various findings together and guides your audience to a focal point or climax for your data story.”

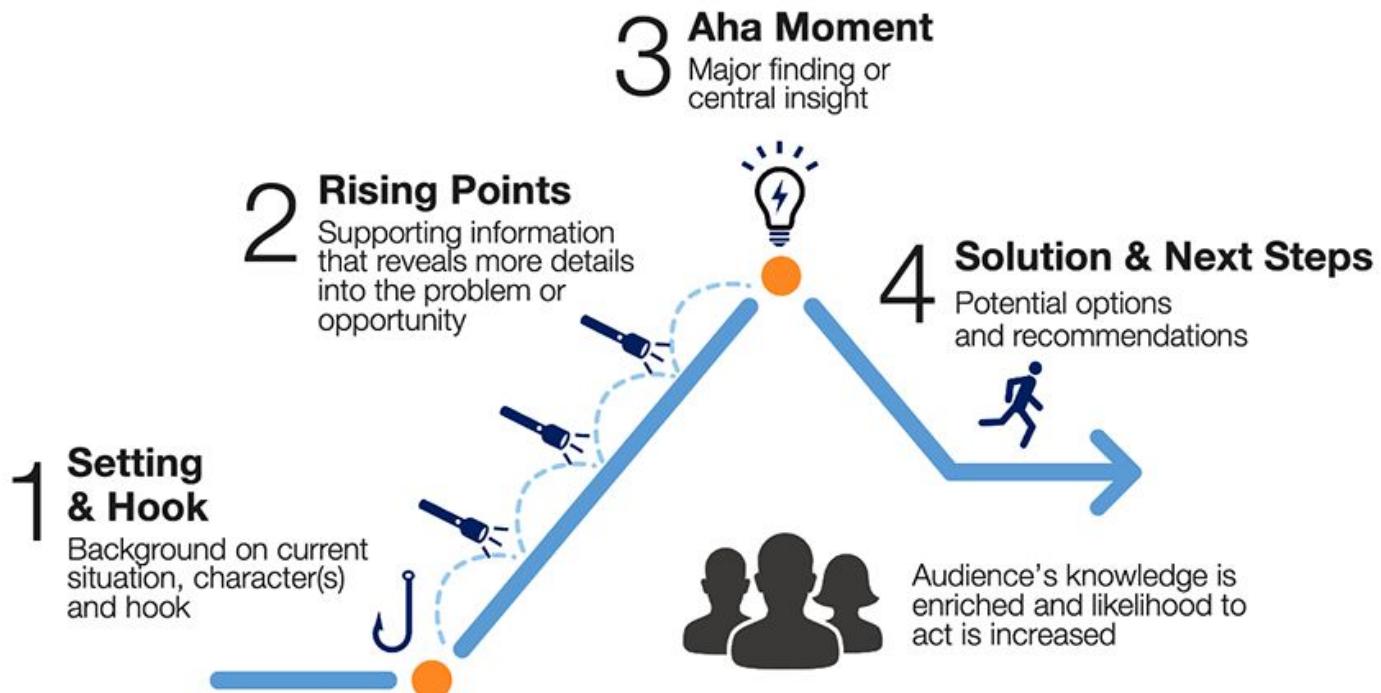
~ Brent Dykes • Effective data storytelling: How to drive change with data, narrative and visuals. (2020)



Freytag's Pyramid

© Marie Lefevre

Data Storytelling Arc™



Effectivedatastorytelling.com

Data Storytelling Arc: Demystifying Narrative Structure In Data Stories

“Overview first, zoom and filter, then details on demand.”

~ Ben Shneiderman (see: The eyes have it: a task by data type taxonomy for information visualizations)

"Overview first, zoom and filter, then details on demand."

National

More than
570,000
people have died from
coronavirus in the U.S.

More than **31,973,000** cases have been reported.

"Overview first, zoom and filter, then details on demand."

Jump to metric:

[Trends](#) • [Daily counts](#) • [Map](#) • [State totals](#) • [Testing](#) • [Hospitalizations](#) • [Vaccinations](#)

Deaths

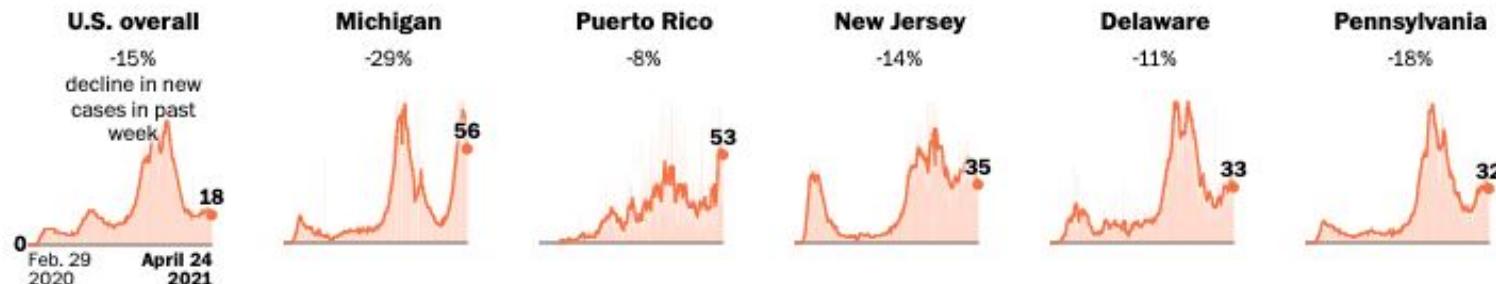
Cases

Adj. for population

Totals

Places with highest daily reported cases per capita

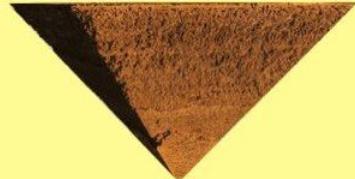
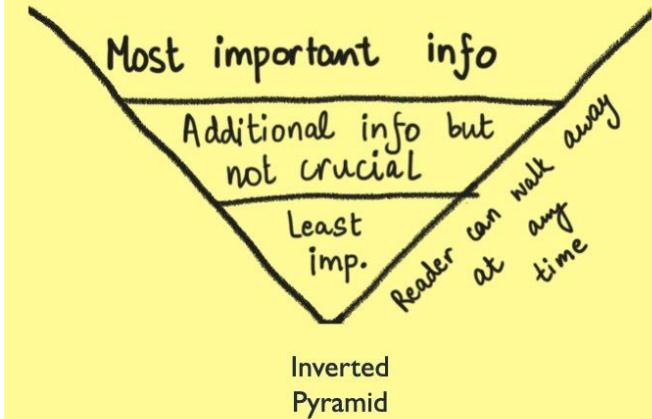
— 7-day rolling average of daily new reported cases per 100,000 residents



Show all ▾

"Overview first, zoom and filter, then details on demand."





Inverted
Pyramid



Martini
Glass



Hourglass



The Kebab



Diamond

@gurmanbhatia

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Organize insights by topic / point. Order them vertically by importance

1	2	3	4	5	other
Google is still not on par with gender representation in the conference by it's making considerable efforts 80% of tech firms have less than 20% of female employees 20% of men have less than 20% of female employees Google's position was at the 50th percentile of the 100 largest tech companies in terms of gender diversity.	message	message	message	message	

STEP #3

Storyboard your content. Start ordering the insights in the squares depending on where you want them to be communicated. Use each square as a single insights or to coherent set of insight. You can add or delete squares as need. Other than for organizing the insights, use the single squares also for other types of relevant storytelling elements like "hook"/ rhetorical questions / transitions / contextualizations / call to actions, etc.

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Caption...



Caption...



Caption...



Caption...

BODY



Caption...



Caption...



Caption...



Caption...

END



Caption...



Caption...



Caption...

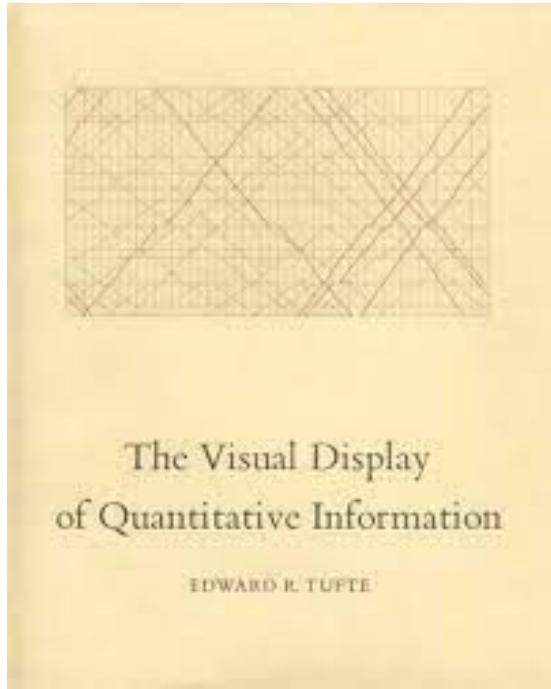


Caption...

make it

MEMORABLE

EDWARD TUFTE, DATA-INK RATIO & THE CHART JUNK DEBATE



PRINCIPLES OF GRAPHICAL EXCELLENCE

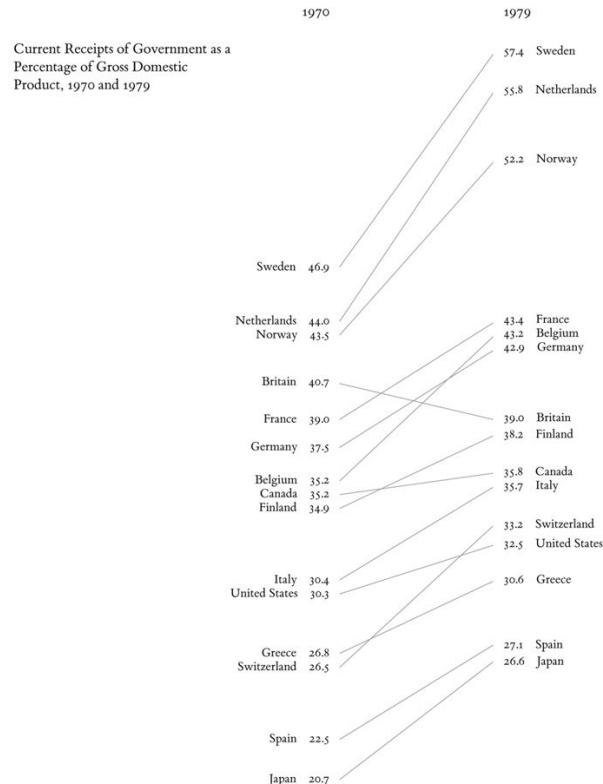
Graphical excellence is the well-designed presentation of interesting data - a matter of *substance, statistics and of design*.

Graphical excellence consists of complex ideas communicated with clarity, precision, and efficiency.

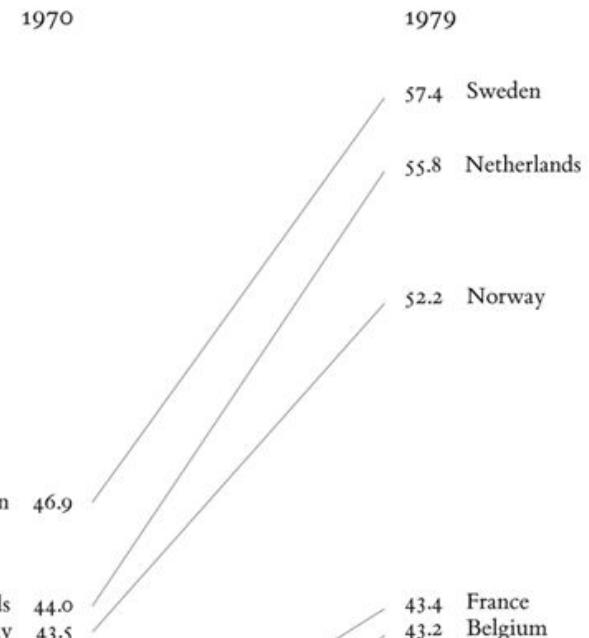
Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space.

Graphical excellence is nearly always multivariate.

And graphical excellence requires telling the truth about the data.



Current Receipts of Government as a Percentage of Gross Domestic Product, 1970 and 1979



HUMOR

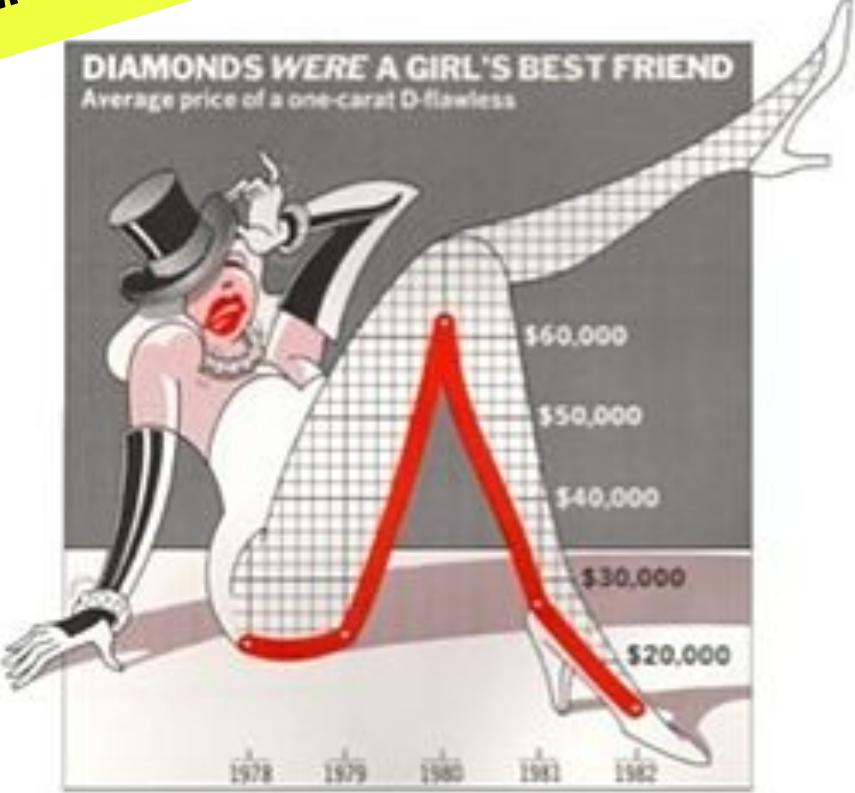
MONSTROUS COSTS

Total House and Senate campaign expenditures, in millions



DIAMONDS WERE A GIRL'S BEST FRIEND

Average price of a one-carat D-flawless

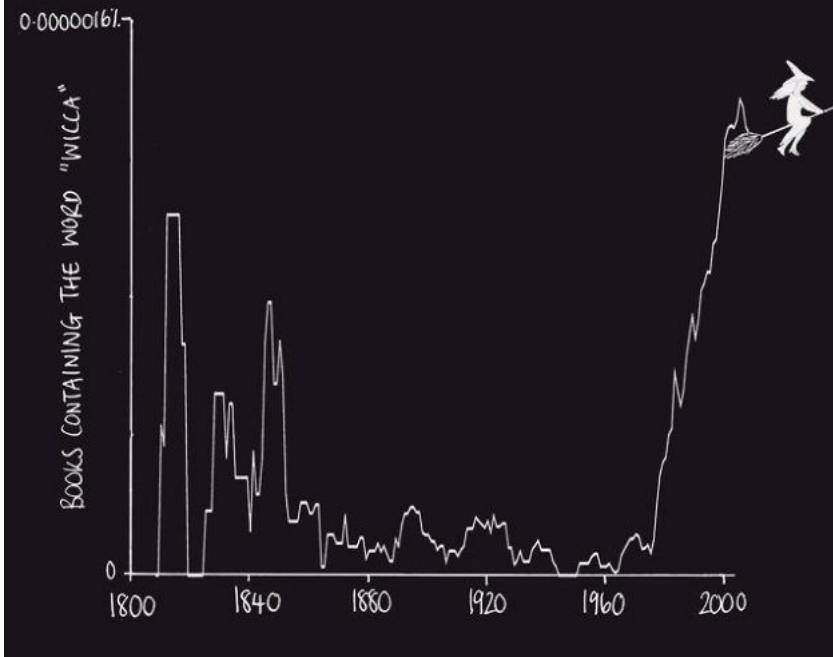


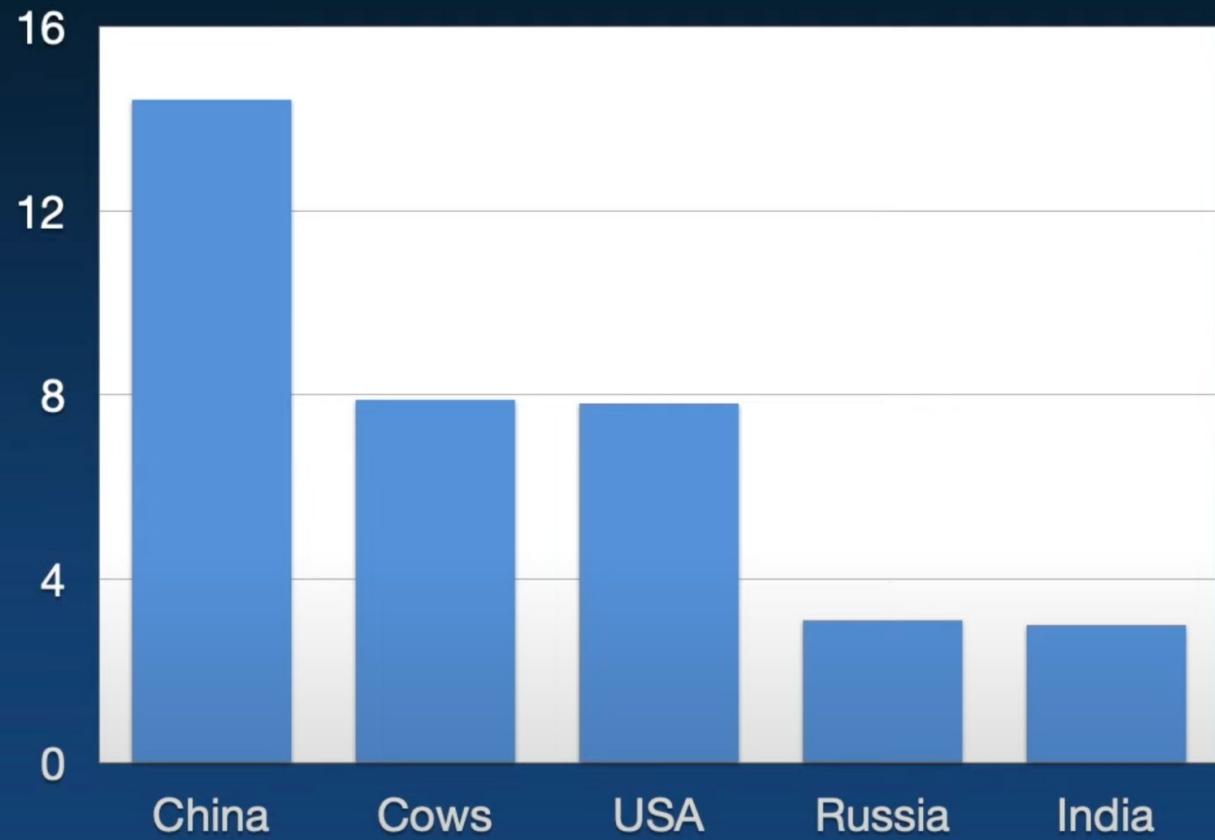
Graphics by Nigel Holmes for the Time



HUMOR

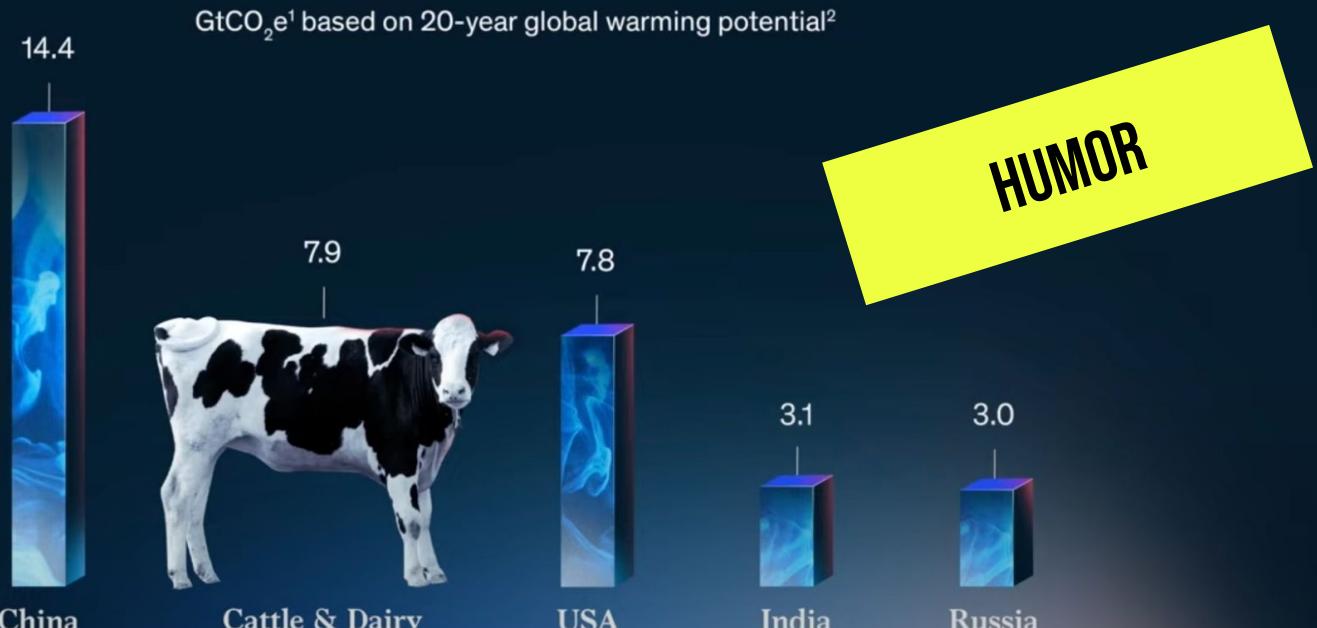
Witches Resurrect





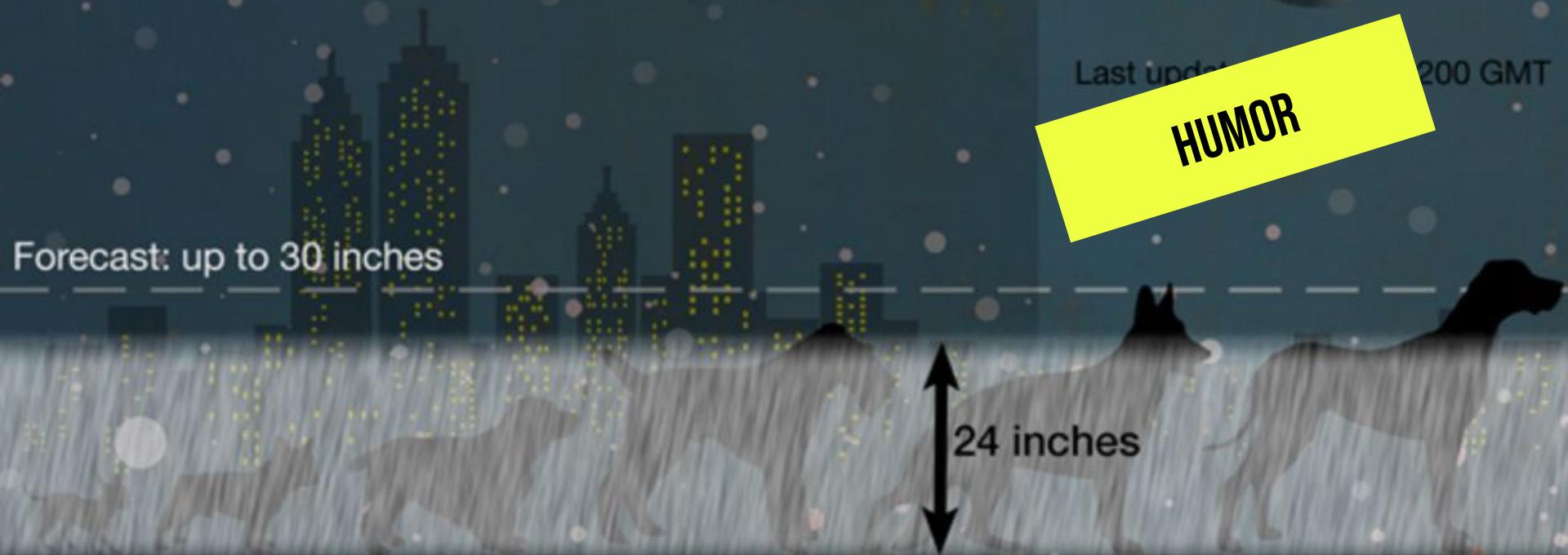
Robert Kosara • This should have been a bar chart

If cows were a country, they would be among the top greenhouse-gas emitters



Can you still see your dog?

Snow accumulation in Boston





Elon Musk is set to make more than every U.S. elementary teacher combined

See how your profession stacks up against Musk's pay.

Every cashier in the U.S.

The combined paychecks of all **3.2 million cashiers** are about as valuable as Musk's average annual compensation.

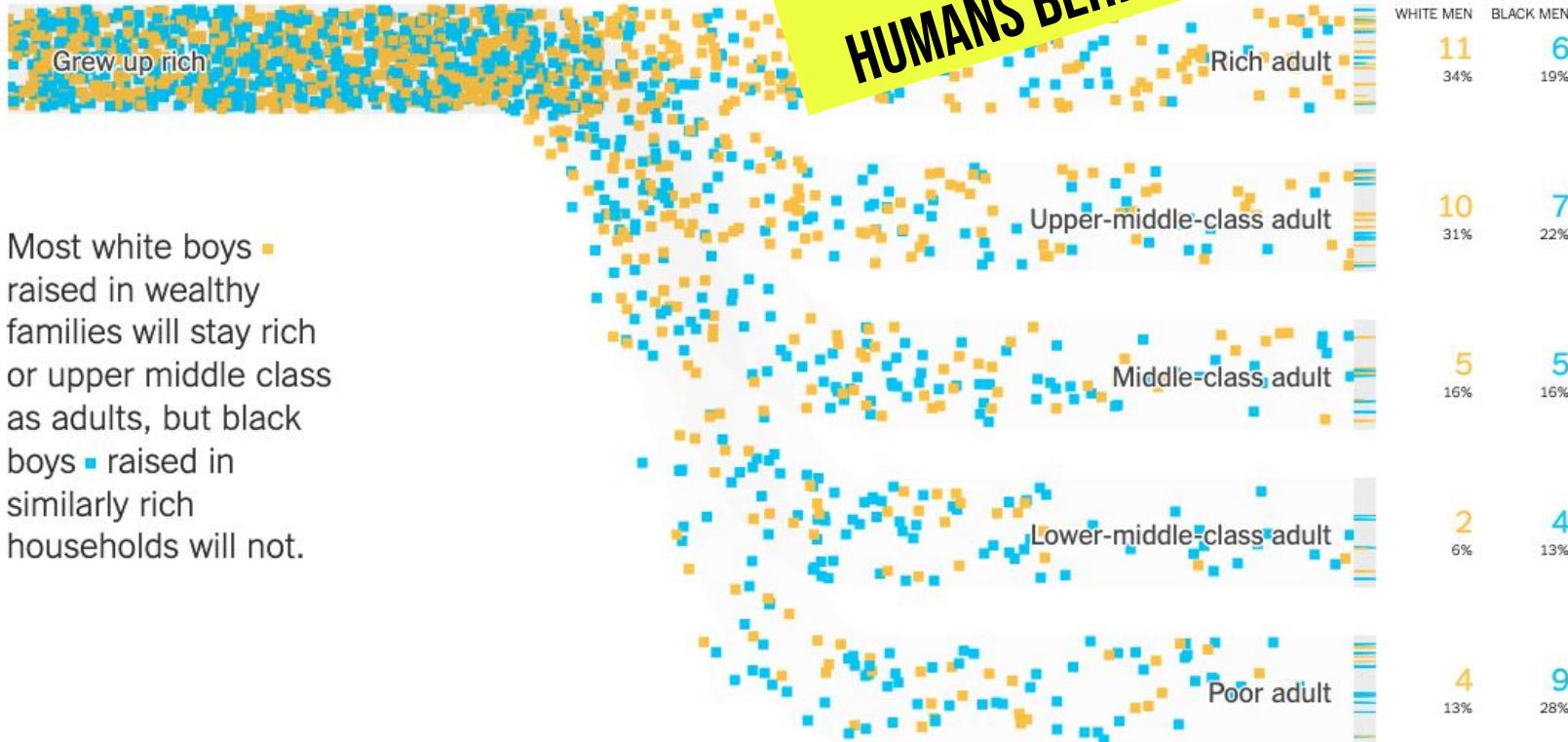
On this page, each figure represents 500 cashiers. Together, they made \$100 billion last year.

Elon Musk is set to make more than every U.S. elementary teacher combined

COMPARED TO
WHAT?

Follow the lives of 2,144 boys who grew up in rich families ...

SUGGEST THE
HUMANS BEHIND



Adult outcomes reflect household incomes in 2014 and 2015.

Extensive Data Shows Punishing Reach of Racism for Black Boys - New York Times

U.S. GUN KILLINGS IN 2018

5

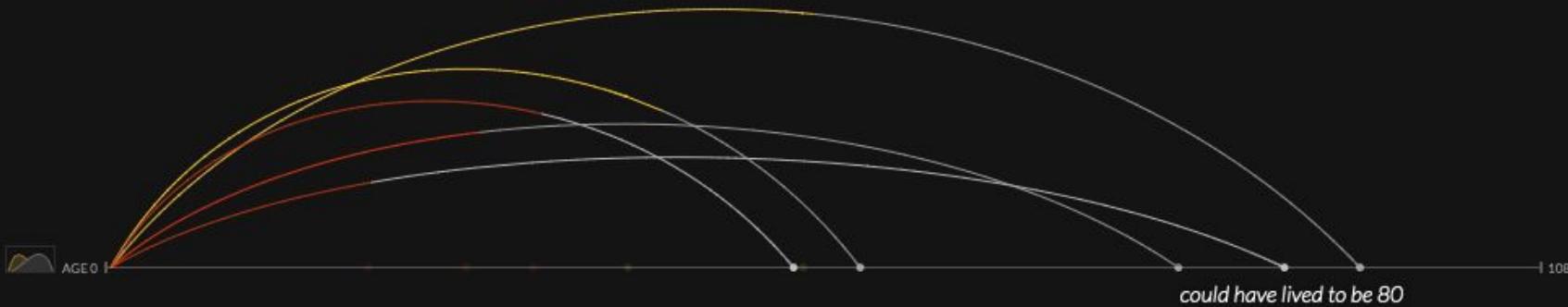
PEOPLE KILLED

SUGGEST THE
HUMANS BEHIND

JANUARY

202

STOLEN YEARS



How has the world's health changed in your lifetime?
Put yourself at the centre of our Global Health Check.

When were you born?

1989



Go

Since you were born,
global life expectancy has
increased by

7 years

from 65 to 72 years

WHEN YOU WERE BORN

That's enough time for



364

extra weekends



6 new skills

to be mastered
(according to the 10,000 hour 'rule')

PERSONALIZE

Opinion

 SHARE

Can You Live on the Minimum Wage?

By JEREMY ASHKENAS FEB. 8, 2014

More than 4.8 million workers now earn the lowest legal pay. This calculator, for a single childless worker, shows the hard choices that have to be made living on the smallest paychecks.

Start by choosing your state: ▾

The minimum wage in New York is **\$8.00** an hour. Tally your living expenses by entering what you think is the least you need for each item. You may find that even your rock-bottom expenses aren't met and that you have to work more hours, pay your bills late, borrow money or do without. [Related Editorial »](#)



Housing

Can You Live on the Minimum Wage? • Jeremy Ashkenas (NYT)
pay for a modest apartment or home in your area. **\$16,000** in yearly income





Spend Bill Gates' Money

\$100,000,000,000



Big Mac
\$2

Sell

0

Buy



Flip Flops
\$3

Sell

0

Buy



Coca-Cola Pack
\$5

Sell

0

Buy



Movie Ticket
\$12

Sell

0

Buy



Book
\$15

Sell

0

Buy



Lobster Dinner
\$45

Sell

0

Buy



Video Game



Amazon Echo
\$99

NETFLIX

Year of Netflix
\$100

Sell

0

Buy



Air Jordans
\$125

Sell

0

Buy



Airpods
\$199

Sell

0

Buy



Gaming Console
\$299

Sell

0

Buy



Drone
\$350

Sell

0

Buy



Smartphone
\$699

Sell

0

Buy



Bike
\$800

Sell

0

Buy



Kitten
\$1,500

Sell

0

Buy



Puppy
\$1,500

Sell

0

Buy



Auto Rickshaw
\$2,300

Sell

0

Buy



Horse
\$2,500

Sell

0

Buy



Acre of Farmland
\$3,000

Sell

0

Buy

Sell

0

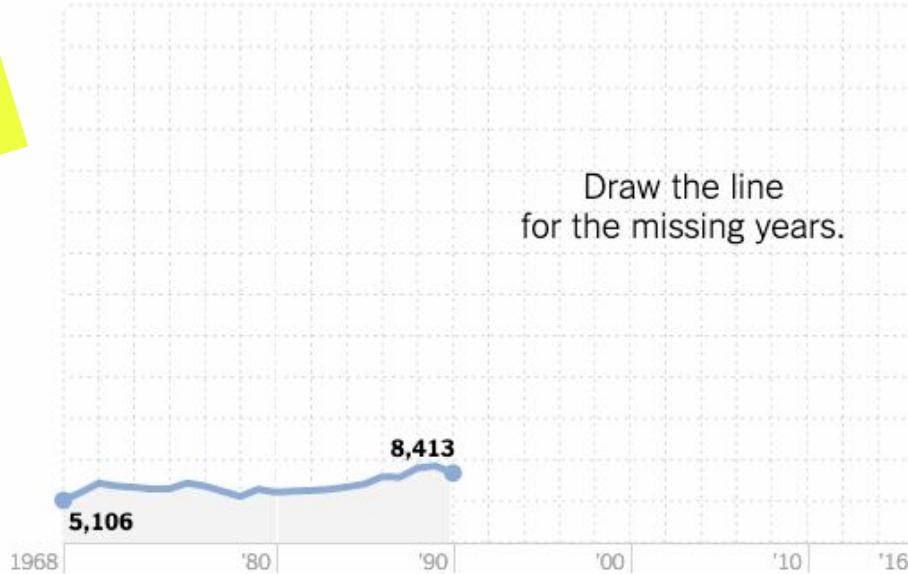
Buy

Spend Bill Gates' Money

GAMIFICATION

Since 1990, the number of Americans who have died every year from **drug overdoses**...

KEEP 'EM GUESSING



Draw the line
for the missing years.



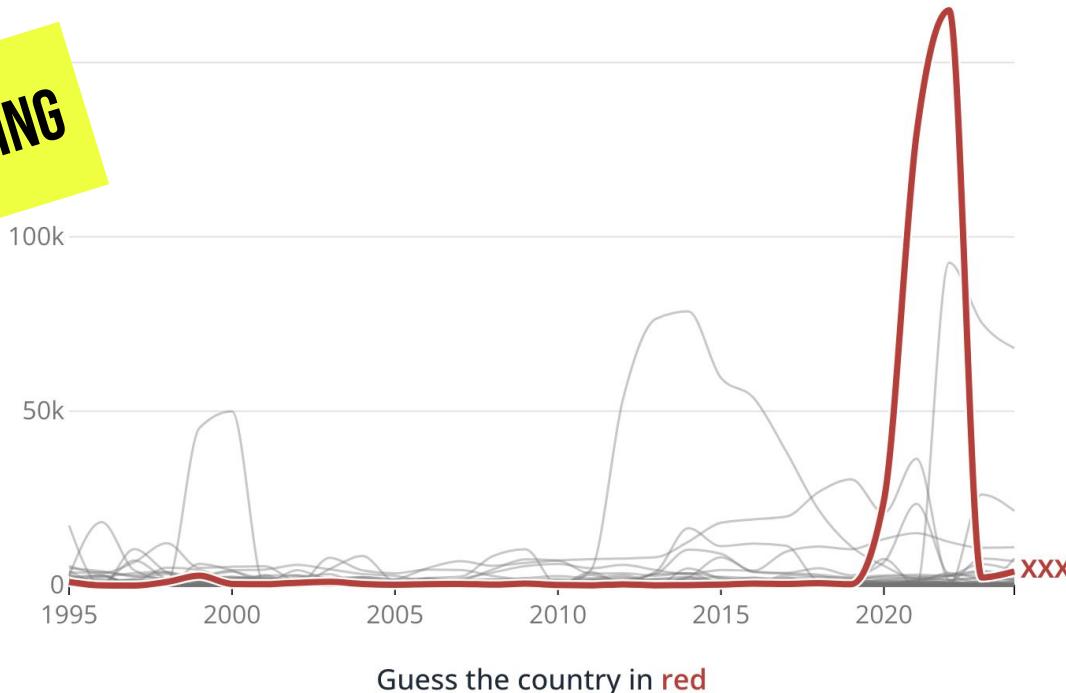
Show me how I did.

Just How Bad Is the Drug Overdose Epidemic? - The New York Times

Deaths in armed conflicts

Based on where they occurred

KEEP 'EM GUESSING



Enter country

Guess 1/5

Quiz

Upd

KEEP 'EM GUESSING How to use this template API docs

Select your country

Albania

How many chickens are there per 1000 people?

Drag the slider to estimate the amount

**Submit**

VISUALIZING DATA

Making it easier to see your point

EVERY DESIGN CHOICE MUST BE

DELIBERATE.

IT IS INEVITABLY SUBJECTIVE,

BUT IT SHOULD NEVER BE

ARBITRARY.

Alberto Cairo

Visualizing data with impact (data.europa.academy)

1. CHOOSING A CHART TYPE

-  Do I really need a chart? (Not all data or patterns are best told through a viz. Sometimes a sentence or a single number might be more efficient.)
-  Have I decided what are the messages the chart should communicate, and what chart types might be suited for it?
-  Have I created these charts and reflected on the pros and cons of how the visual encodings are perceived?
-  Have I evaluated whether calculating and visualizing a metric/indicator, rather than the unprocessed data, could be more effective?
-  Have I thought about if/how to include contextual data (prior years, reference values, etc.)?
-  Have I tested different data granularities (in terms of geography, time, etc.) to see which is more suited for the message I want to communicate?
-  Have I sorted the elements (es. bars, rows of the table, etc.) in a meaningful way?
-  Have I selected the appropriate amount of data points to be visualized?
-  Am I using appropriate visual metaphors for my data?

2. CHOOSING COLORS



Have I decided a type of color palette (qualitative/quantitative/sequential, etc.) that is suited for my data?



Have I thought about the shape/skewness of my data, as well as my communication goals, to decide on the interpolation (linear, quartiles, binned, etc.) with which to assign colors?



Can I use color to help viewers navigate the chart (by showing connections, highlighting what's important or leveraging colors' culturally-dependent meanings)?



Have I tested colors for accessibility and readability (color blindness testing, contrast, etc.)?



Have I checked whether I am using too many colors?

3. USING TEXT



Does my chart have the appropriate amount of text to help make sense of it? (title, sources, axis titles and labels, subtitles, annotations, footnotes, etc.)



Are my titles consistent with the messages I want to communicate?



Am I using my titles types coherently with my type of piece (scientific paper vs. journalism ...) [see [E. Bertini on types of titles](#)]



Am I using my titles types coherently throughout the whole piece? [see [E. Bertini on types of titles](#)]



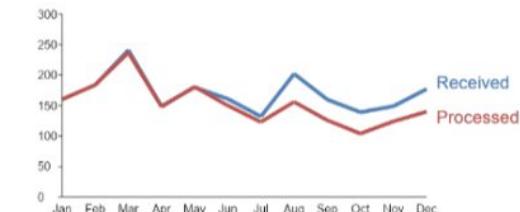
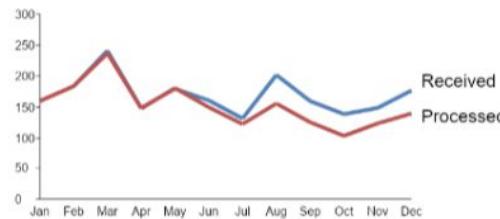
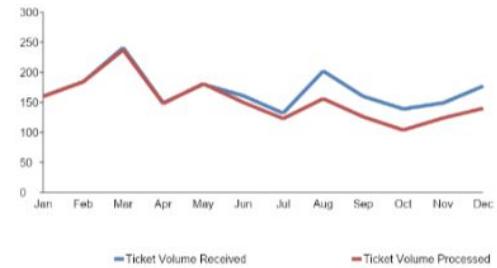
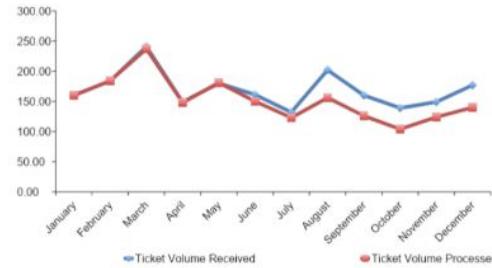
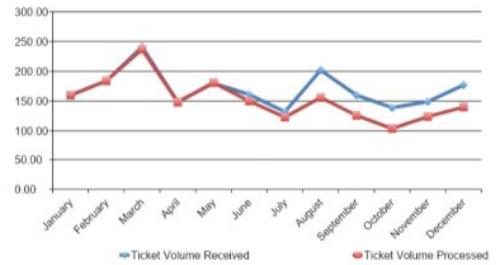
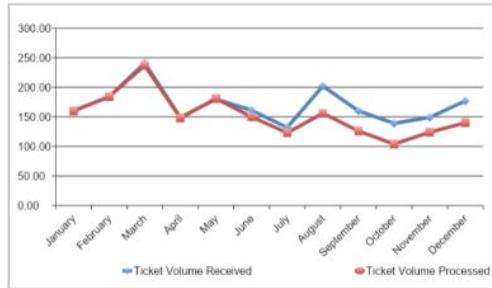
Am I using labels and category names in a way that is coherent with the data but also ethical?

tips for reducing

INFO LOAD

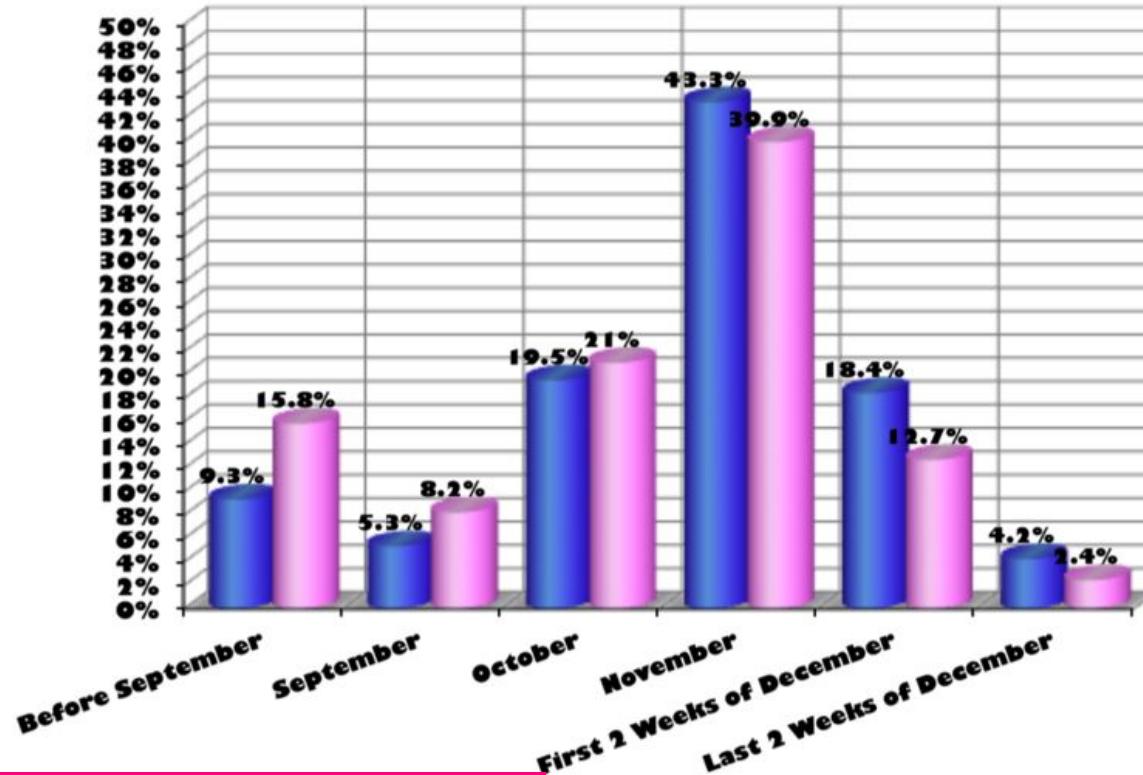
Clutter vaguely refers to visual elements that take up space but don't increase understanding.

Clutter can make things seem complicated and requiring a lot of cognitive resources even when they aren't.



Shoppers Begins Shopping for Holidays

Men Women

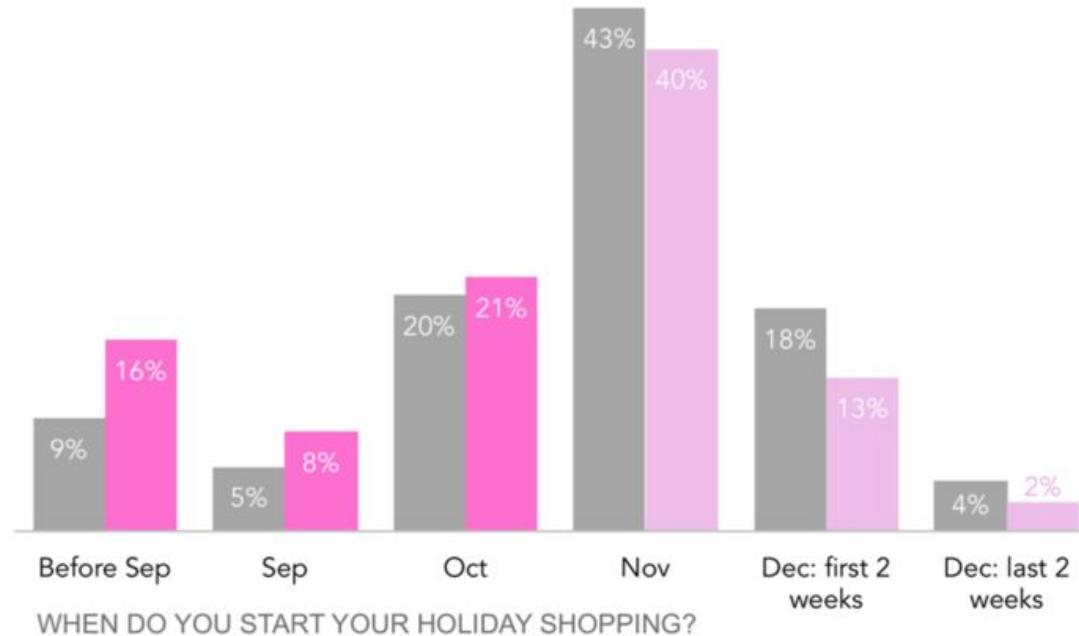


Declutter this graph! By Cole Nussbaumer Knaflic

More women start their holiday shopping early

■ Men ■ Women

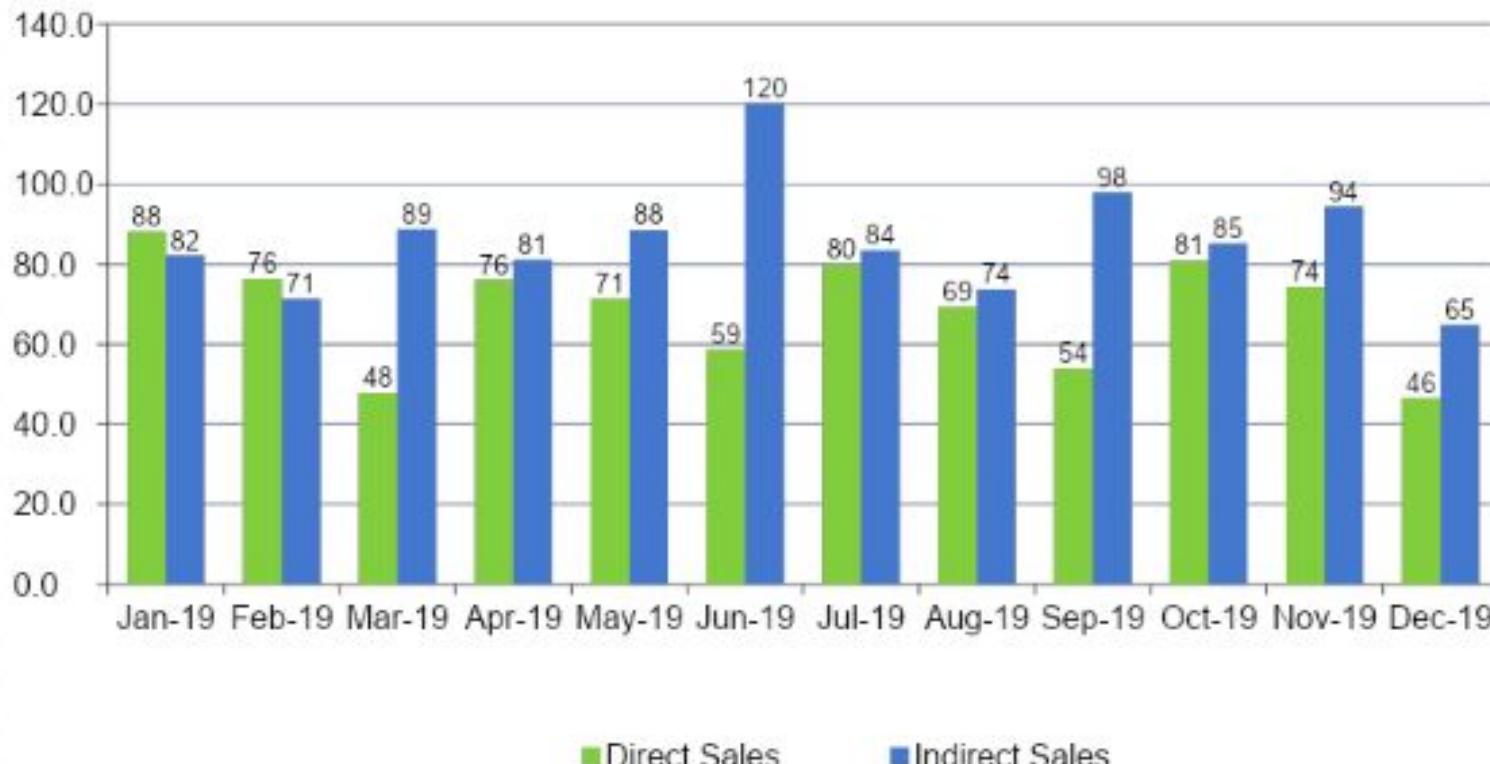
% OF TOTAL



Declutter this graph! By Cole Nussbaumer Knaflic

Time to Close Deal

Goal = 90 days



Storytelling with data • Let's practice! • Cole N. Knaflc, exercise 3.4: declutter

EXERCISE → IMPROVE THESE CHARTS

Look at the following charts. What you would change? Think of text, colors, narrative, etc.

1. CHOOSING A CHART TYPE

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Can I use color to help viewers navigate the chart (by showing connections, highlighting what's important or leveraging colors' culturally-dependent meanings)?



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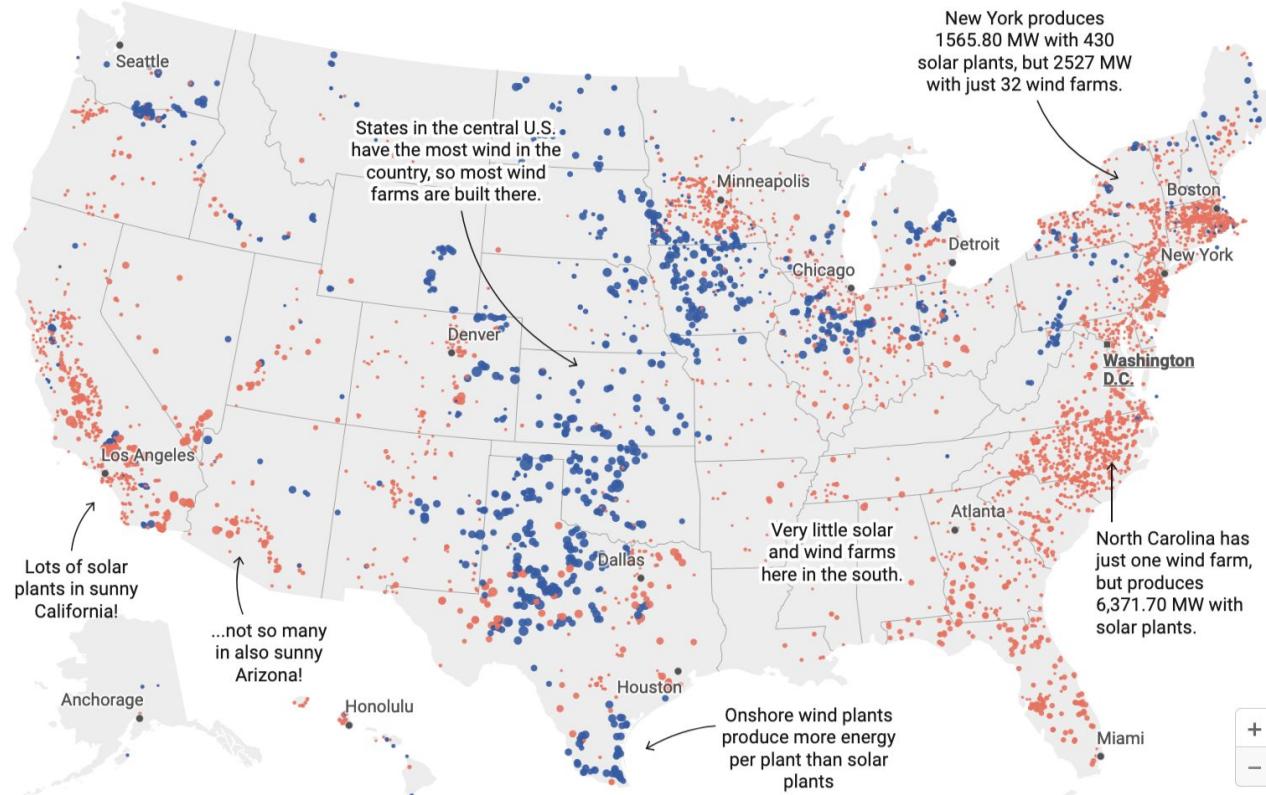
Am I using my titles types coherently throughout the whole piece? [see [E. Bertini on types of titles](#)]



Am I using labels and category names in a way that is coherent with the data but also ethical?

Solar And Wind Power Plants In The U.S.

Solar Capacity in MW 100 400 1,000
Wind



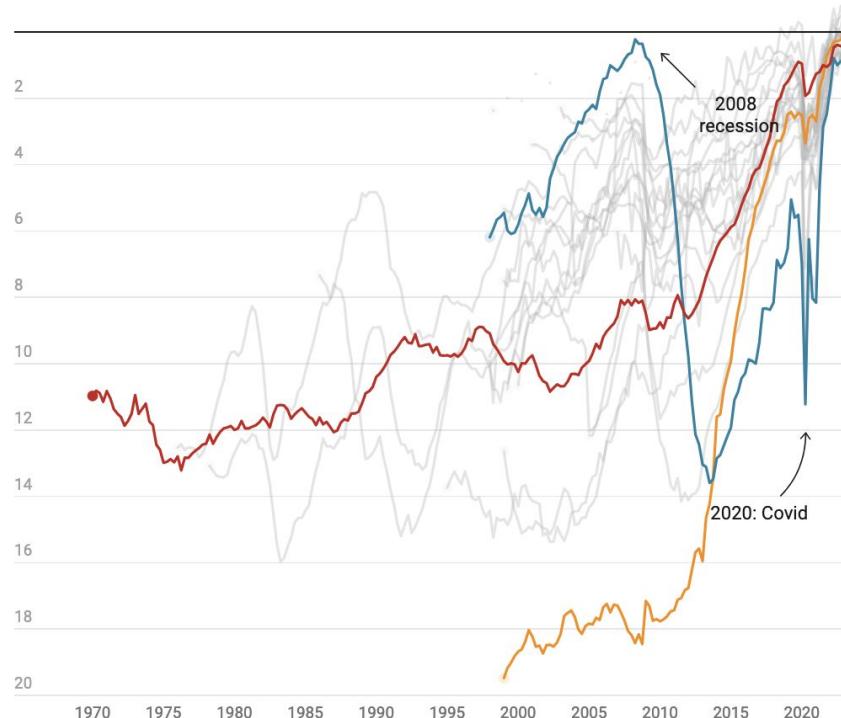
The capacity is the net summer capacity of in megawatts (MW).

Source: U.S. Energy Information Administration • Get the data • Created with Datawrapper

OECD employment rates are record high in Q2 2023

Indexed difference between the **employment rate** in Q3 2023 vs in all quarters before. The employment rate in Q2 2023 was at or within 0.2 percentage point of its record high in Australia, Austria, the Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Portugal, the Slovak Republic, Sweden, and Switzerland.

— Australia — Austria — Belgium — Canada — Czech Republic — Finland — France — Germany
— Greece — Hungary — Ireland — Israel — Italy — Japan — Korea — Luxembourg — the
Netherlands — New Zealand — Slovak Republic — Sweden



India has seen a massive change in their demographic numbers over the last 75 years

Four key indicators between 1950 and 2024

population growth

1.5B

1.2B

900M

600M

300M

0

1950

life expectancy

75 years

60

45

30

15

0

2024

fertility rate

6 children

4.8

3.6

2.4

1.2

0

1950

infant mortality

200

160

120

80

40

0

2024

BEFORE DEC. 1st

Fill in the survey about your group project.