



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

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

LESSON 3 - 17/11/2025

Alice Corona

Dipartimento di Scienze Statistiche "Paolo Fortunati"

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



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?

VISUALIZING DATA

Using colors and text

tips for choosing
COLORS

use color to
distinguish

what's the focus from the rest

**Italy falls 15 places in the
Gender Gap Index.**

In Europe, only the Czech Republic, Hungary, Greece and Romania score worse in the ranking.

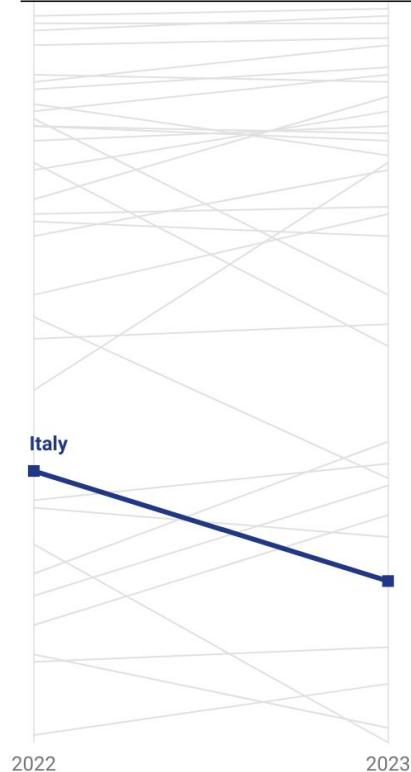


Grafico: Alice Corona • Fonte: Global Gender Gap Index (WEF) via Wikipedia • Creato con Datawrapper

Global Gender Gap, l'Italia scivola dal 63esimo al 79esimo posto

A pesare sul posizionamento del Paese nella classifica il netto peggioramento registrato in ambito di partecipazione e rappresentanza politica delle donne

di Monica D'Ascenzo

21 giugno 2023

I punti chiave

- Uguaglianza di genere in fase di stallo
- Svetta il Nord Europa
- Colmare il divario di genere



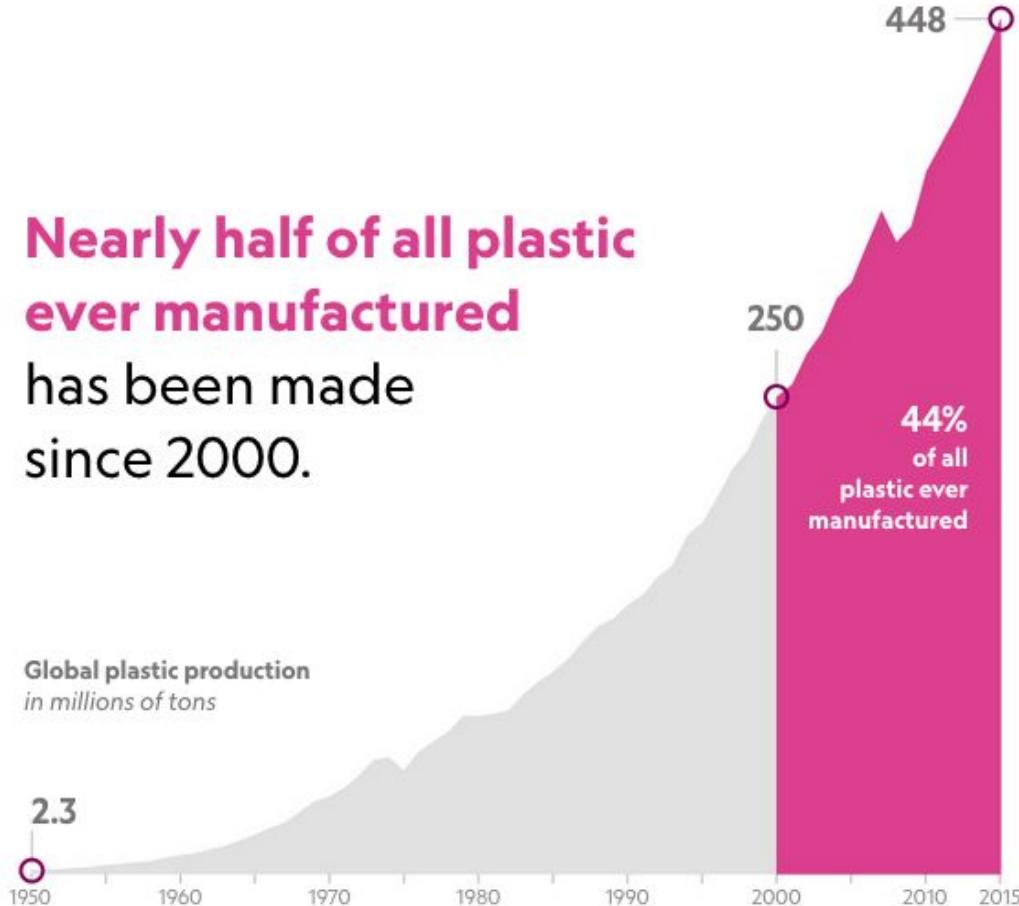
Ascolta la versione audio dell'articolo

🕒 4' di lettura | 🗃 English Version ⓘ

L'Italia aveva tenuto la posizione per un paio d'anni di seguito nella metà superiore della classifica stilata dal World Economic Forum (63esimo posto), ma nel report 2023 del Global Gender Gap **scivola di 13 posizioni al**

**Nearly half of all plastic
ever manufactured
has been made
since 2000.**

Global plastic production
in millions of tons



NGM STAFF. SOURCE: ROLAND GEYER,
UNIVERSITY OF CALIFORNIA, SANTA BARBARA



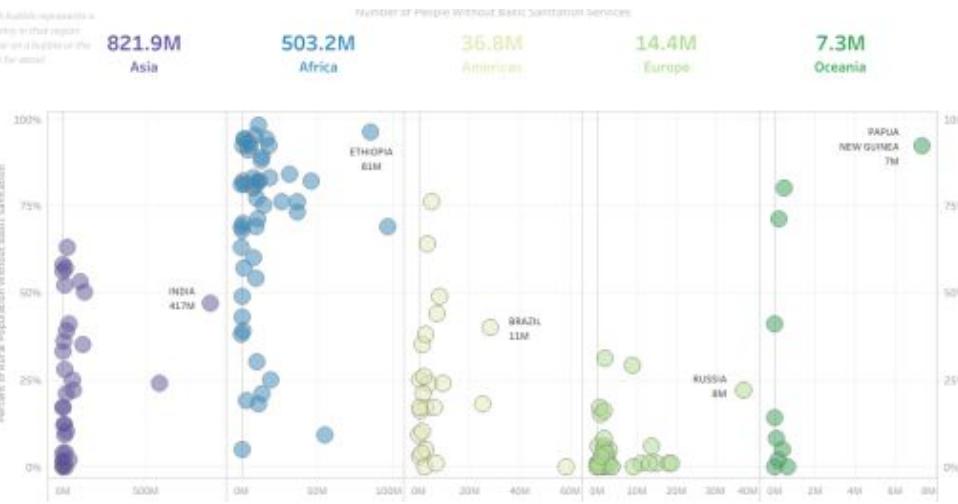
[The Workers Who Face the Greatest Coronavirus Risk by Lazaro Gamio \(NYT 2020\)](#)

use color to
connect

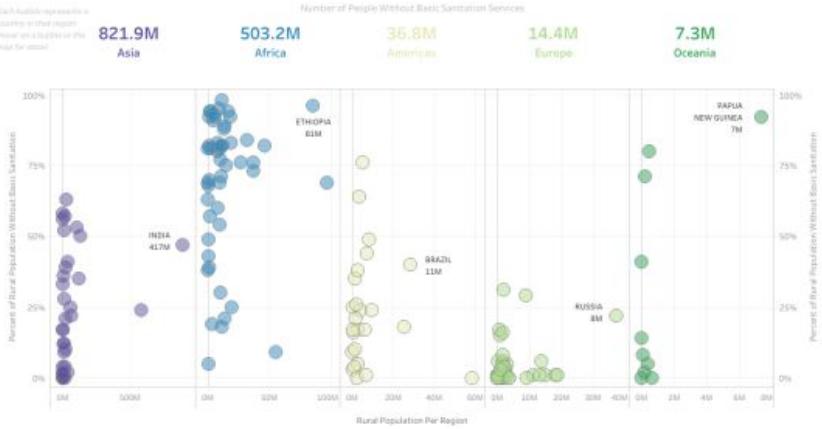
what's semantically connected

RURAL COMMUNITIES THAT STILL DON'T HAVE ACCESS TO BASIC SANITATION IN 2017

Each bubble represents a country in that region. Hover over it to find out the total for that region.



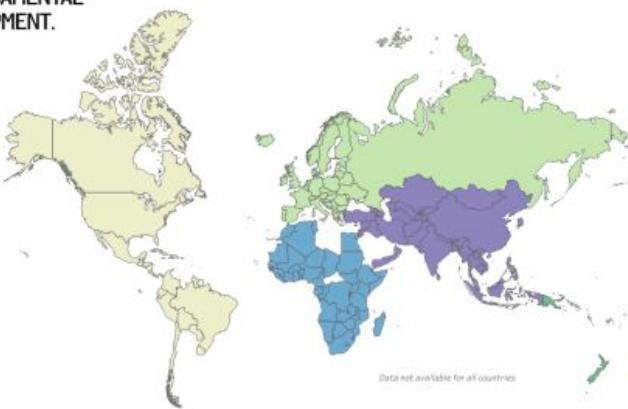
Each bubble represents a country in that region. Hover over it to find out the total for that region.



SANITATION IS FUNDAMENTAL TO HUMAN DEVELOPMENT.

Many international organizations use hygienic sanitation facilities as a measure for progress in the fight against poverty, disease, and death. Access to proper sanitation is also considered to be a human right, not a privilege, for everyone.

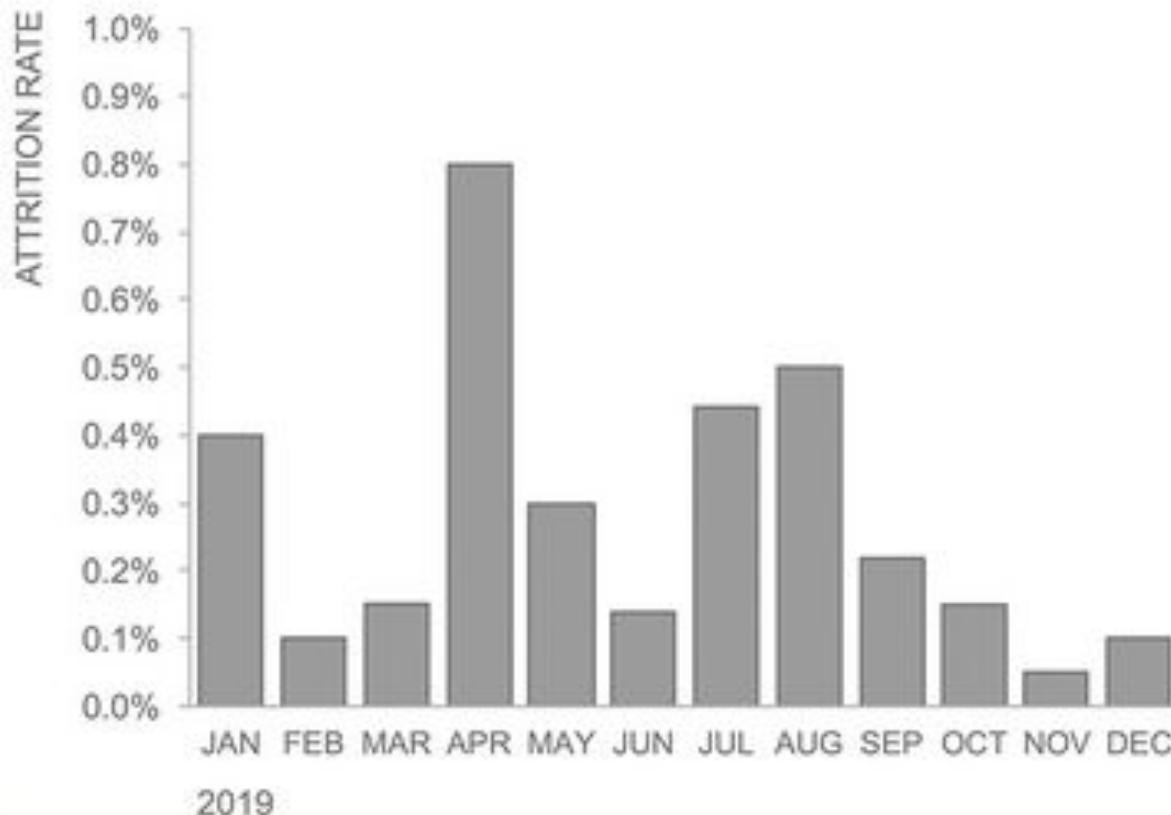
Sanitation generally refers to the provision of facilities and services for the safe disposal of human waste. Inadequate sanitation is a major cause of disease worldwide and improving sanitation is known to have a significant beneficial impact on people's health.



Infographic by Meera Umashankar

SOURCE: World Health Organization | CREATED BY: Katie Kirby @KatieKirby | #ProjectMeera 2018

2019 monthly voluntary attrition rate



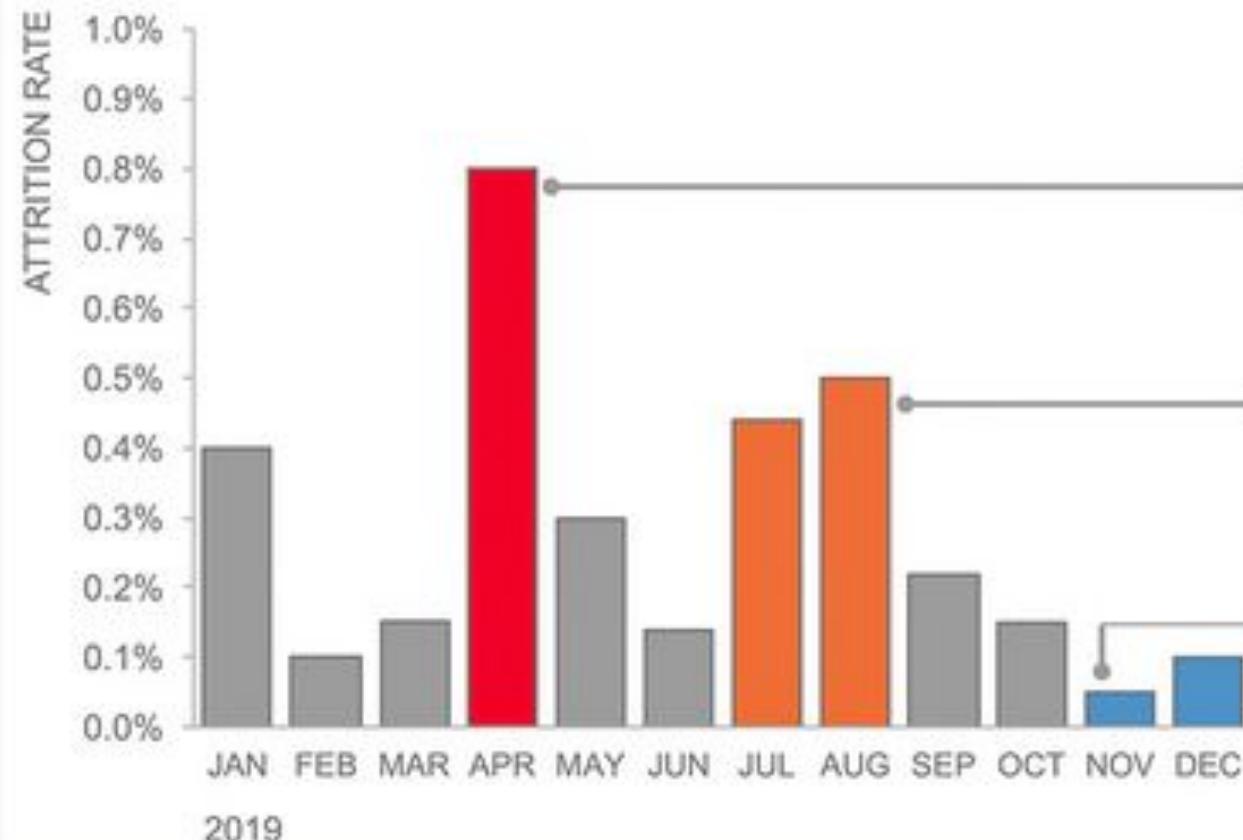
Highlights:

In April there was a reorganization. No jobs were eliminated, but many people chose to leave.

Attrition rates tend to be higher in the Summer months when it is common for associates to leave to go back to school.

Attrition is typically low in November and December due to the holidays.

2019 monthly voluntary attrition rate



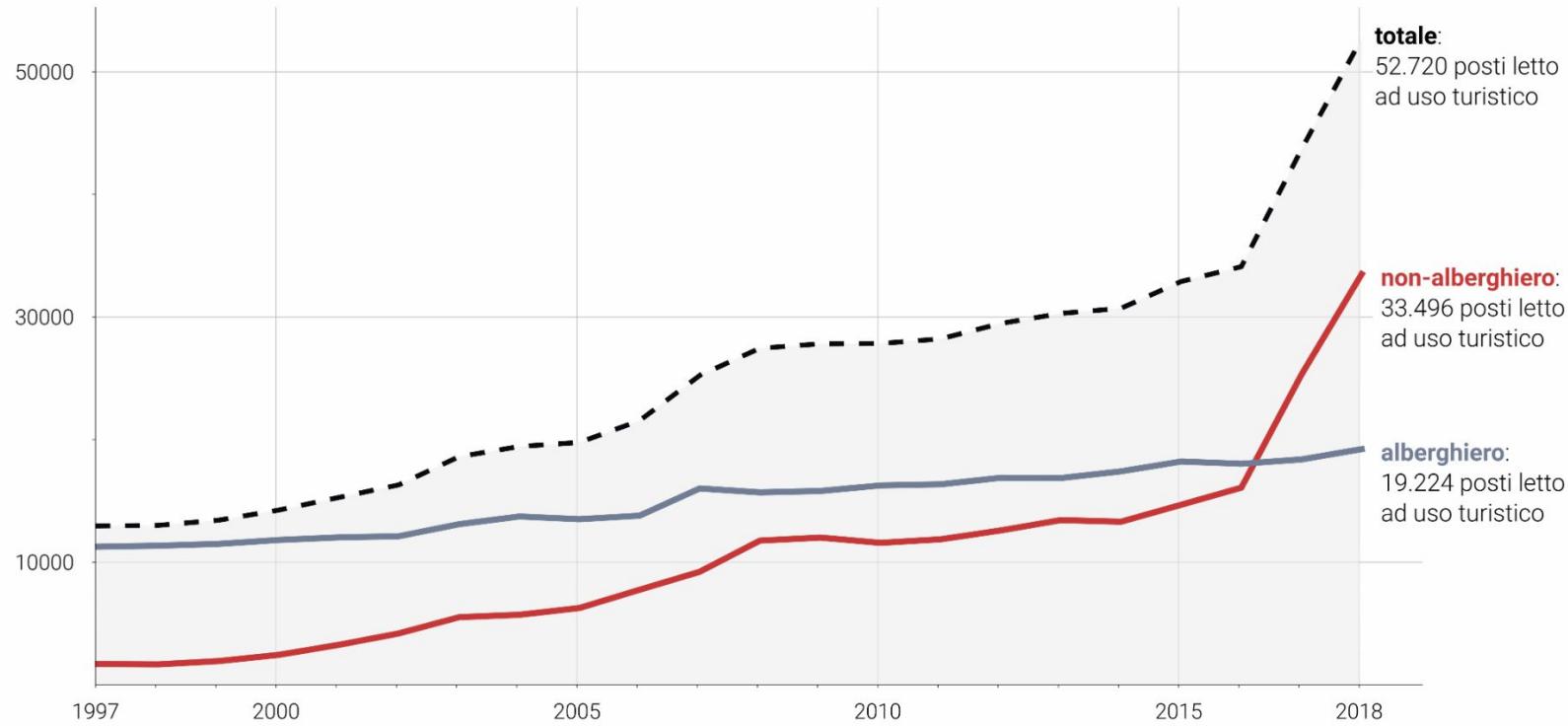
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L'andamento dell'offerta ricettiva, Venezia Insulare



use color to

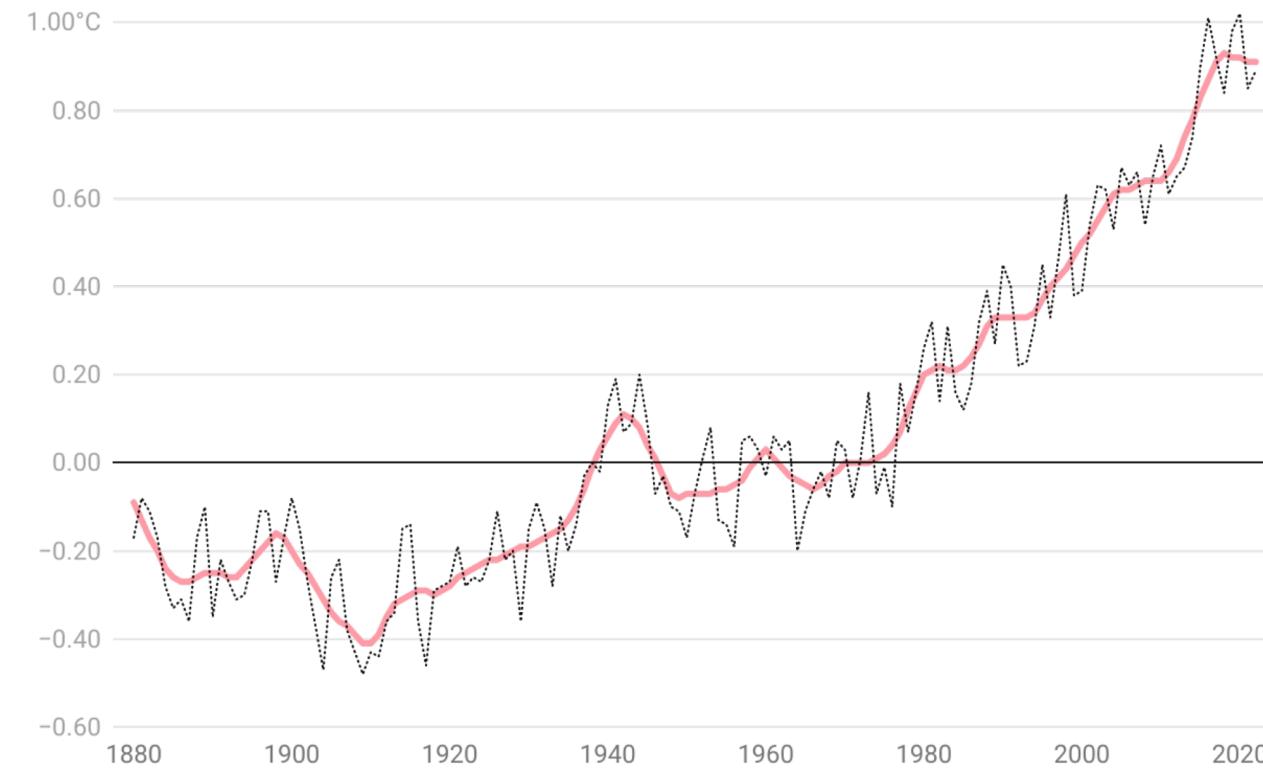
suggest

meaning and tone

GLOBAL LAND-OCEAN TEMPERATURE INDEX 2018 - 2022

Compared to the long-term average from 1951 to 1980

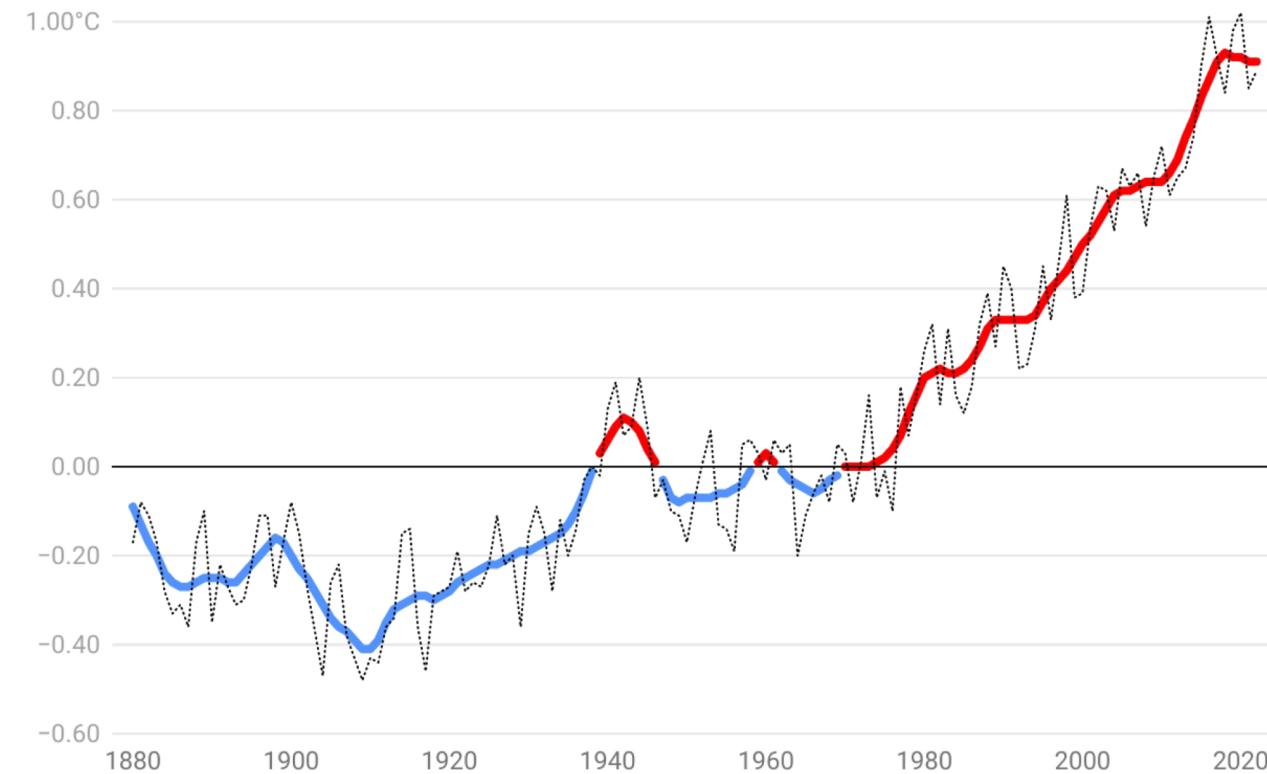
Fonte: NASA's Goddard Institute for Space Studies (GISS)



GLOBAL LAND-OCEAN TEMPERATURE INDEX 2018 - 2022

Compared to the long-term average from 1951 to 1980

Fonte: NASA's Goddard Institute for Space Studies (GISS)



95% — Average
confidence

● ● Modelled two-party popular vote

Aug 13th

Election day prediction

60

55

50

45

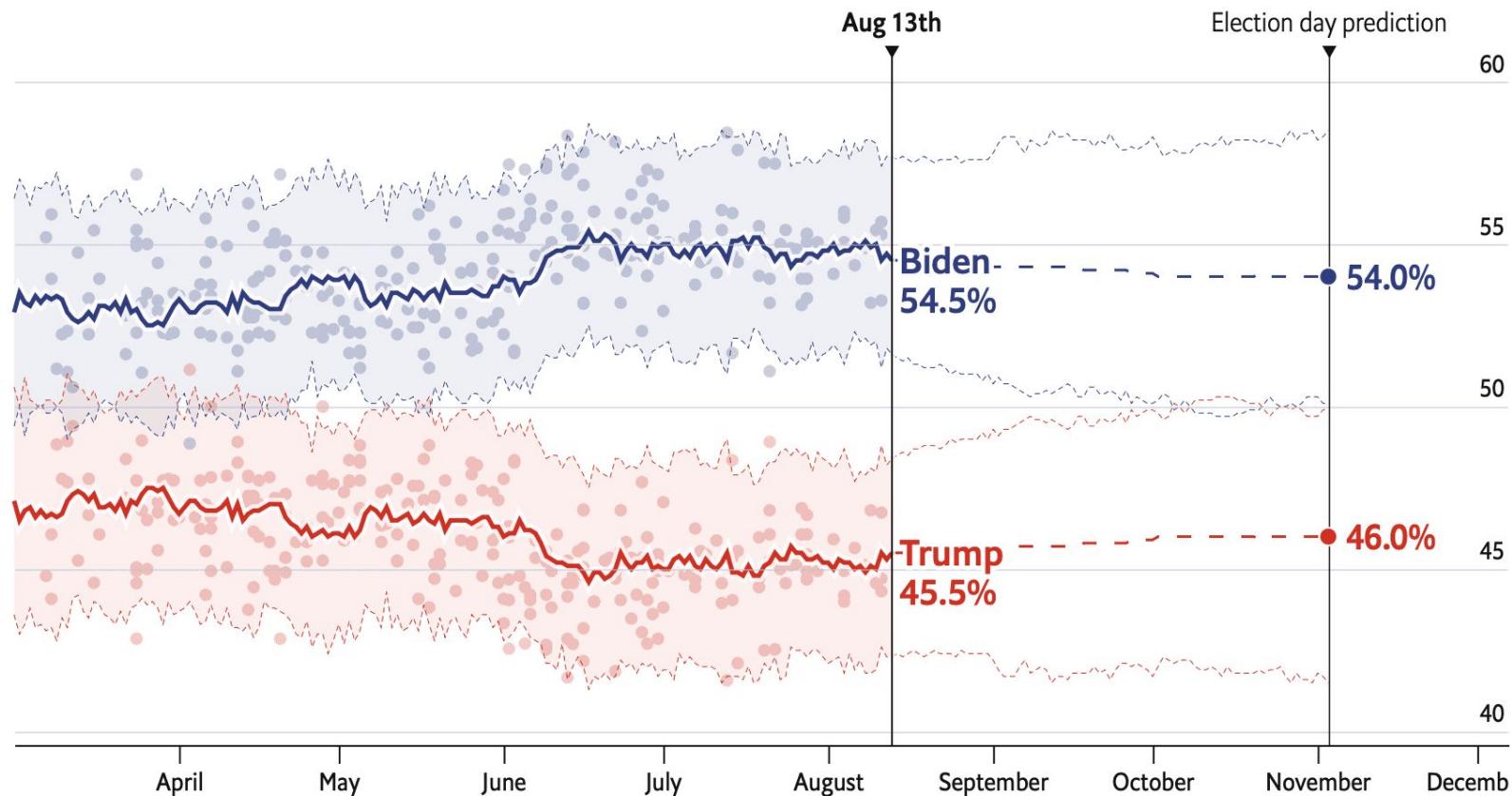
40

Biden -
54.5%

Trump -
45.5%

54.0%

46.0%

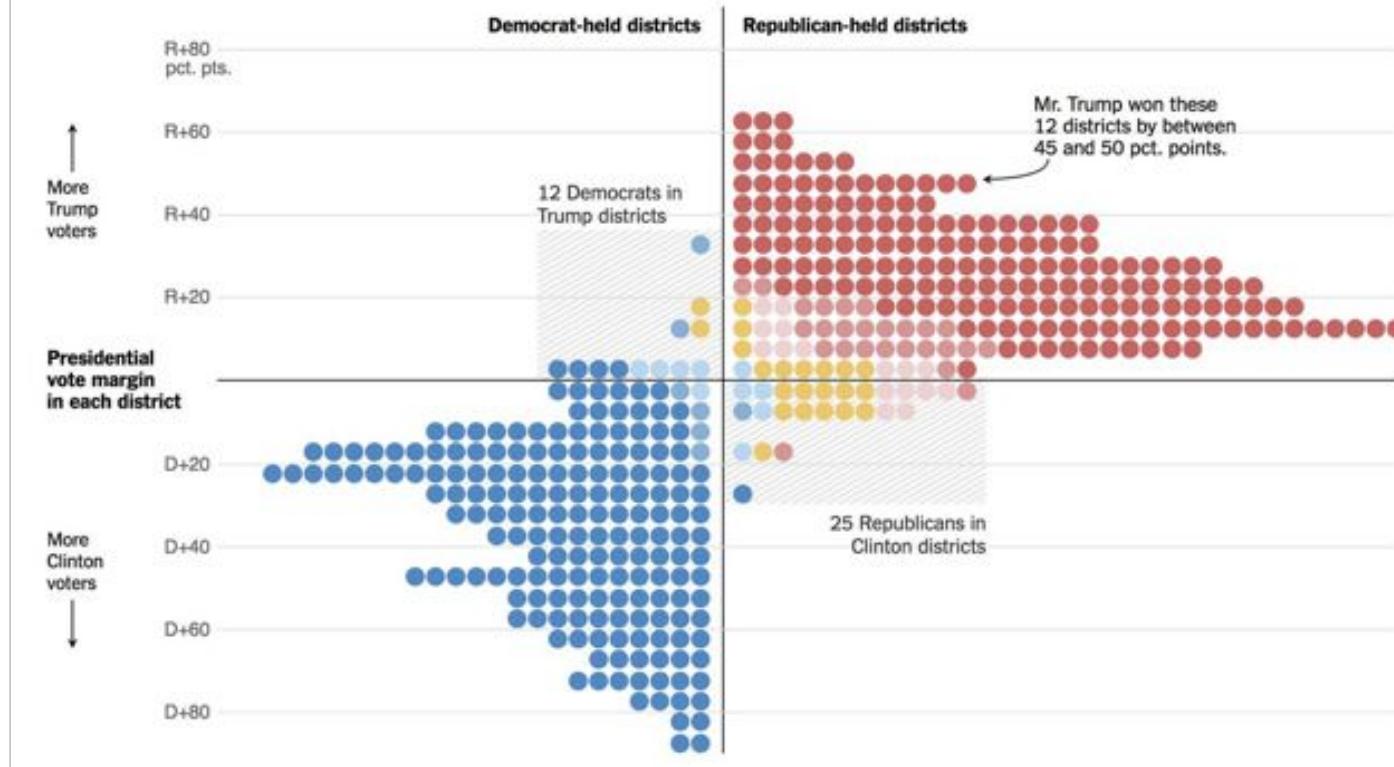




Elezioni 2018: mappe e grafici prima, durante e dopo il voto by Marianna Bruschi (Italy)

Ratings for Each House Race

DEMOCRATIC				REPUBLICAN			
Solid	Likely	Lean	Tossup	Lean	Likely	Solid	
182	7	10	22	16	26	172	



To Reclaim the House, Democrats Need to Flip 24 G.O.P Seats by New York Times(USA)

use color

consciously



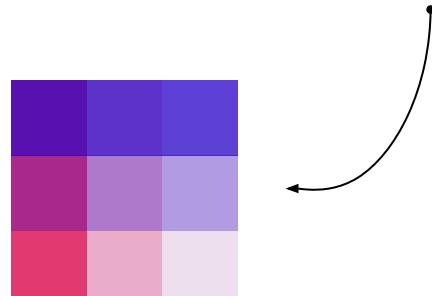
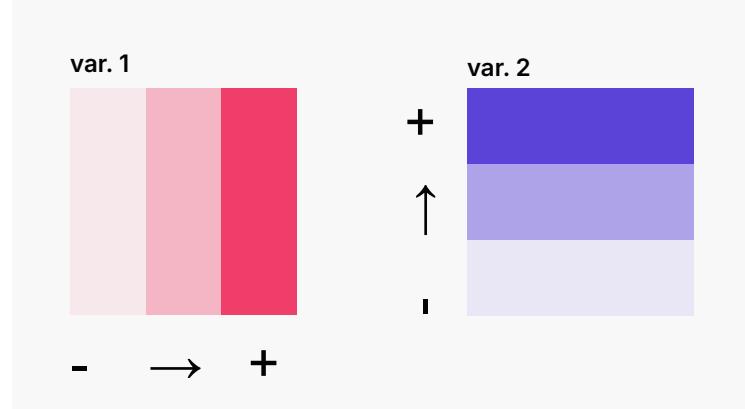
QUALITATIVE



SEQUENTIAL



DIVERGING



BIVARIATE



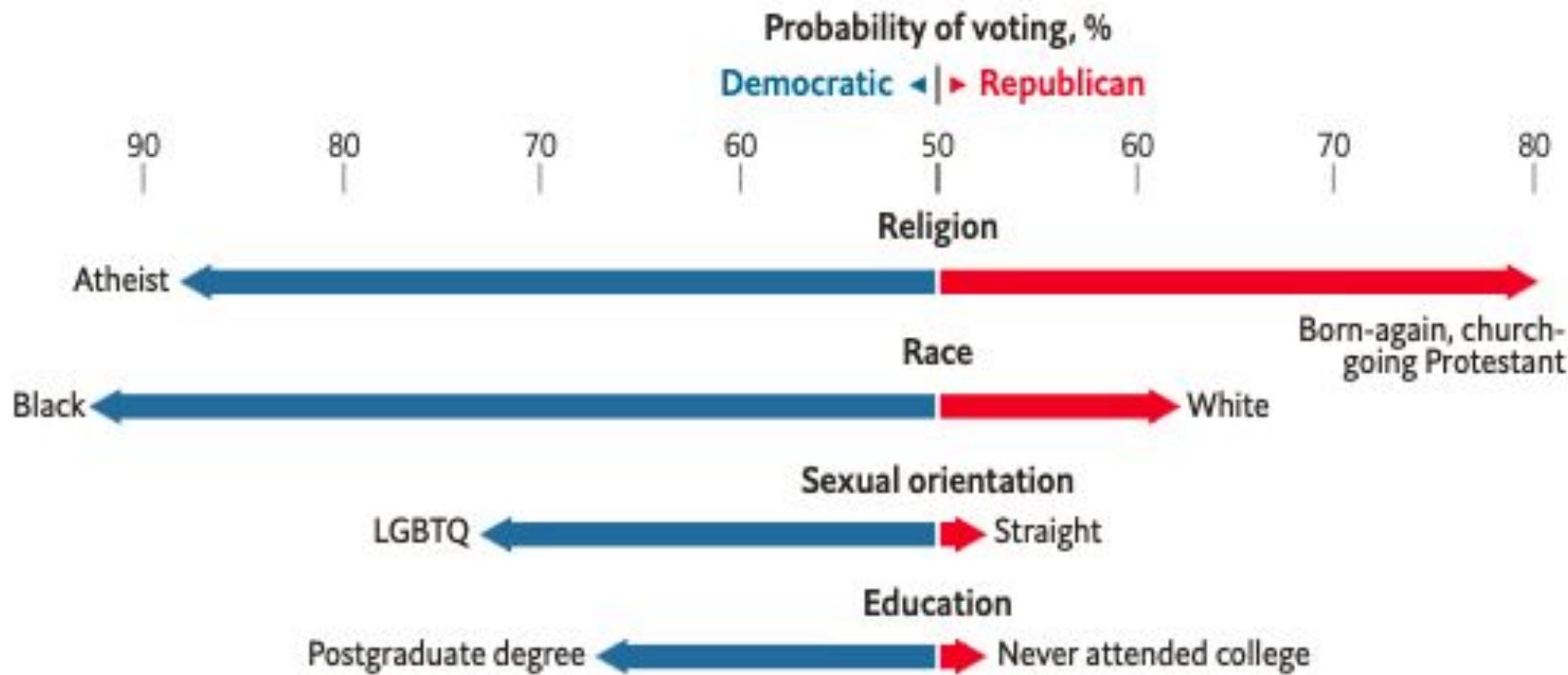
QUALITATIVE COLOR PALETTE

GOOD WHEN....

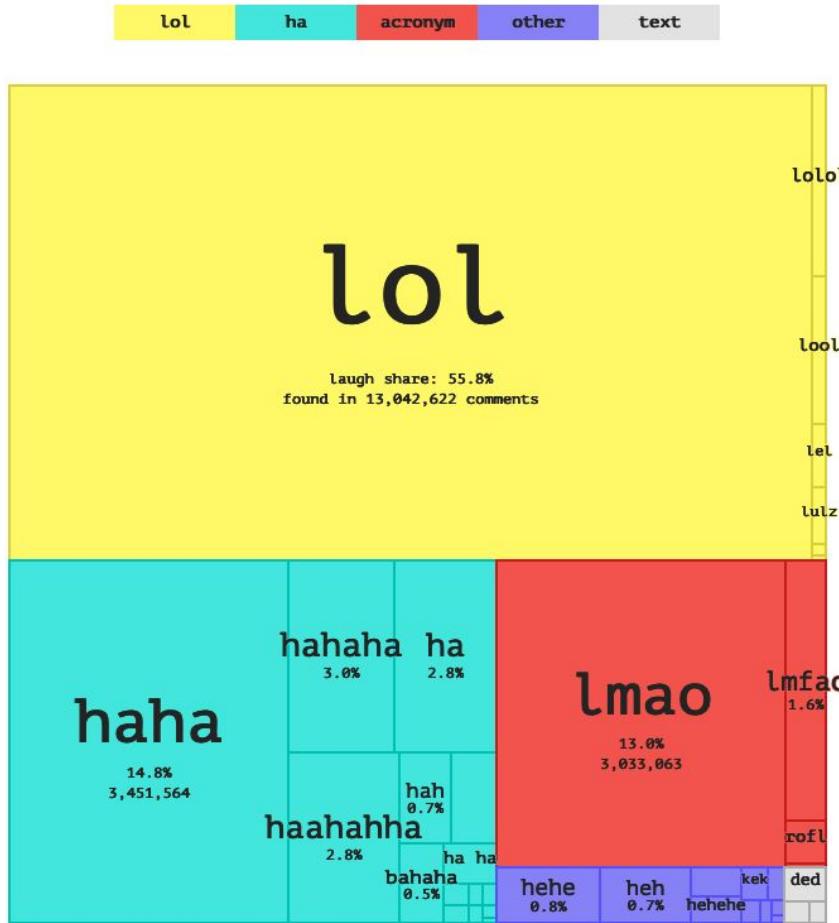
- 👉 Values don't have an order (whether number or text)
- 👉 You want to keep (few) things easy to distinguish

What has the biggest effect on congressional voting intention?

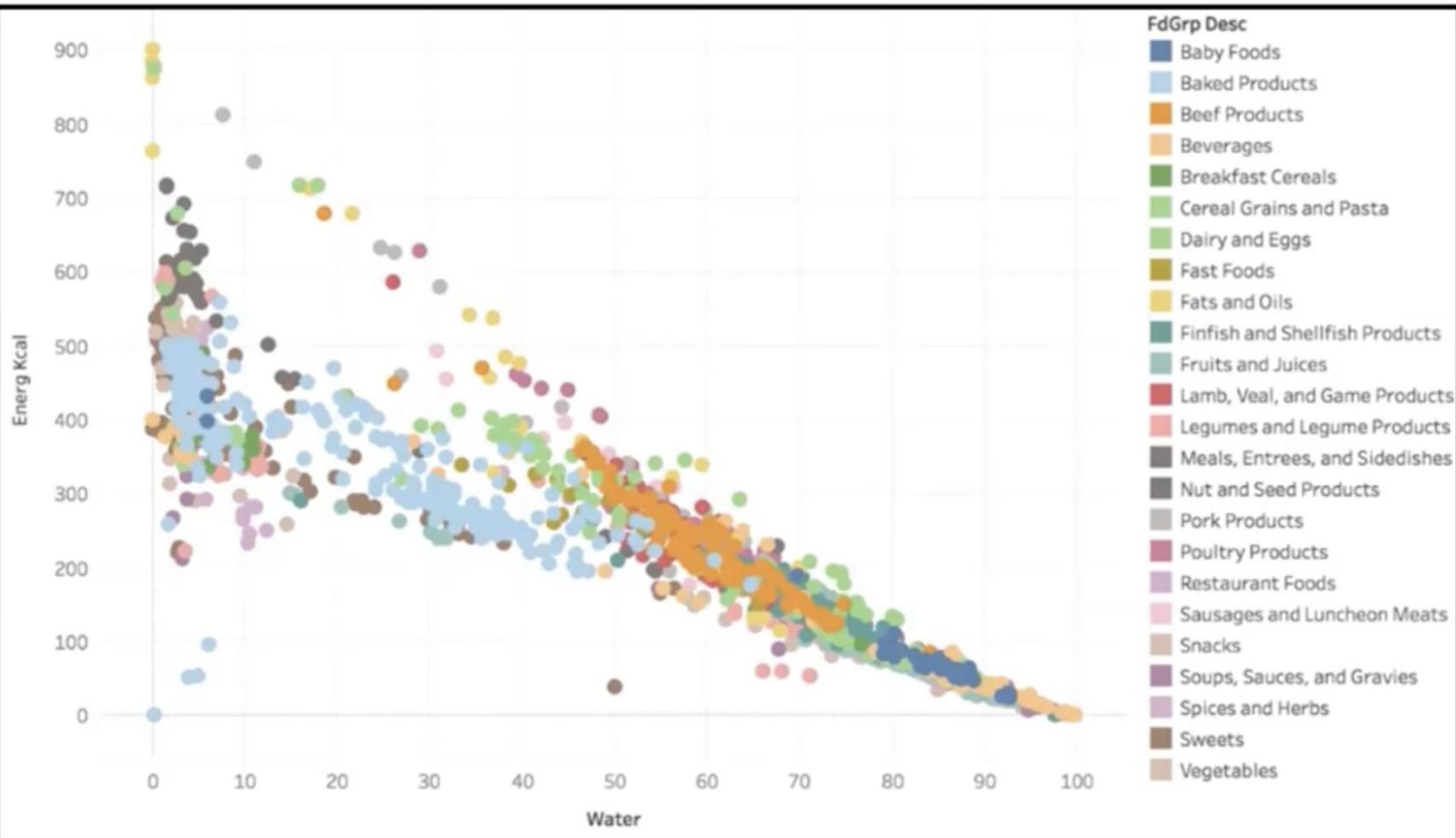
Strongest predictors by demographic category



2019 usage share of laughs by category on Reddit



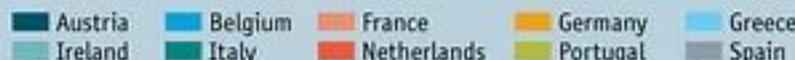




Original

Surfeit of surpluses

Selected euro-area countries, €bn



Budget balances



Sources: Eurostat; National statistics

Better

Surfeit of surpluses

Euro-area, €bn



Budget balance



Source: Eurostat

Mistakes, we've drawn a few, Sarah Leo, The Economist



NOT IDEAL



BETTER

FOSSIL FUEL

- COAL
- OIL
- GAS

RENEWABLES

- HYDRO
- SOLAR
- BIOMASS
- WIND

OTHERS

- NUCLEAR
- OTHERS

ALSO BETTER

SEQUENTIAL COLOR PALETTE

GOOD WHEN....

- 👉 Values do have an order or hierarchy (whether number or text)
- 👉 There are outliers which you want to highlight

Percentage of area burned
Annual average, 2001-17

Area burned*, %

Percentage Range (%)	Color
0 - 1	Light Orange
1 - 3	Medium Orange
3 - 10	Dark Orange
10 - 30	Red
30 - 100	Darker Red

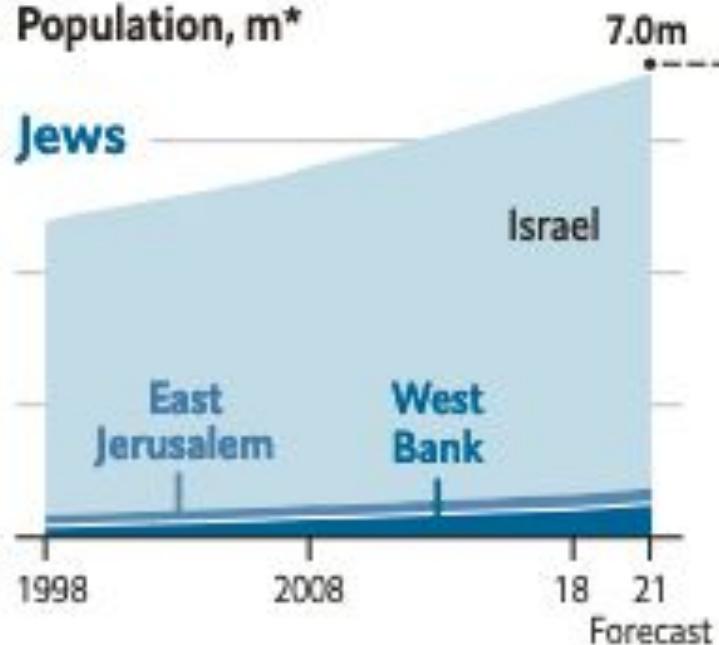
2% of the world's
land burned
by wildfire is in
North America

67% of the world's
land burned by
wildfire is in Africa

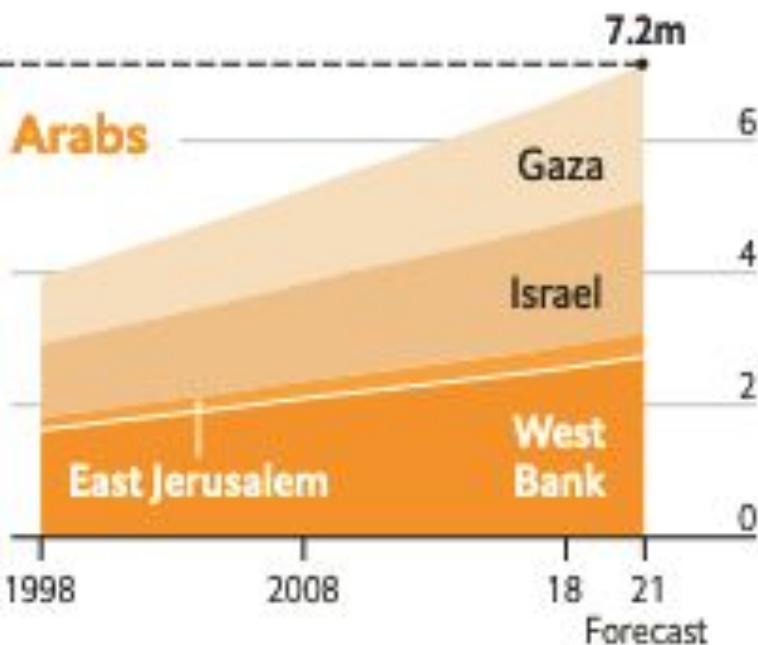
Arabs may soon outnumber Jews in Israel and the occupied territories

Population, m*

Jews

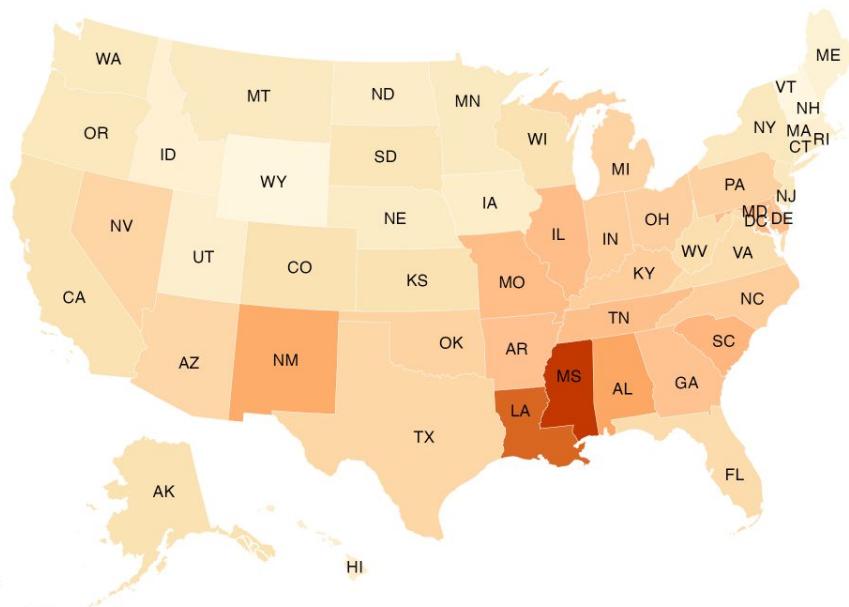


Arabs



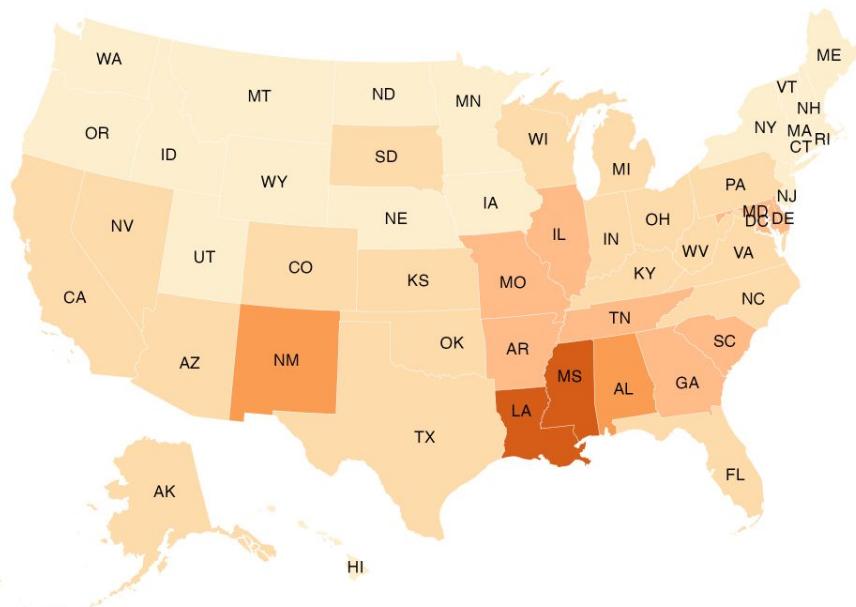
Homicide rates by state

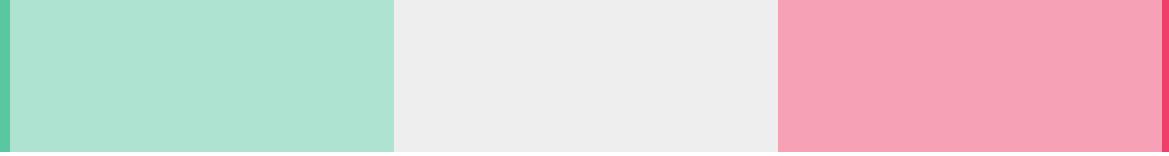
Deaths per 100,000 people



Homicide rates by state

Deaths per 100,000 people





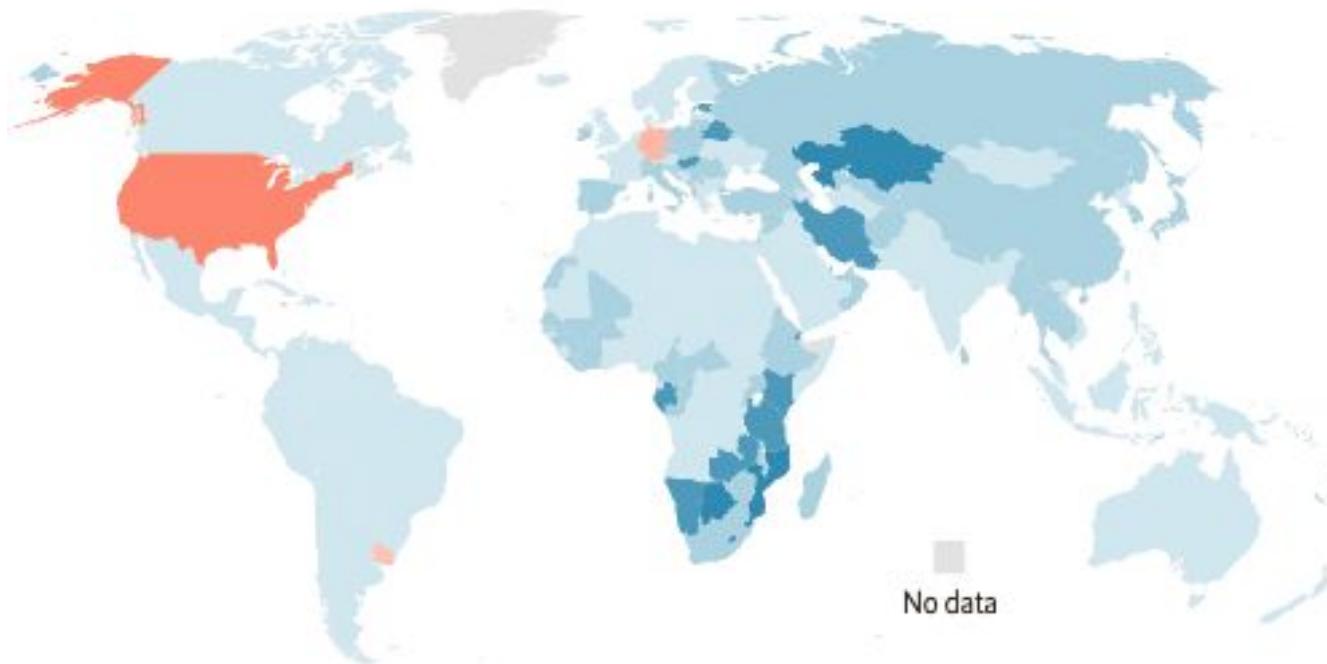
DIVERGING COLOR PALETTE

GOOD WHEN...

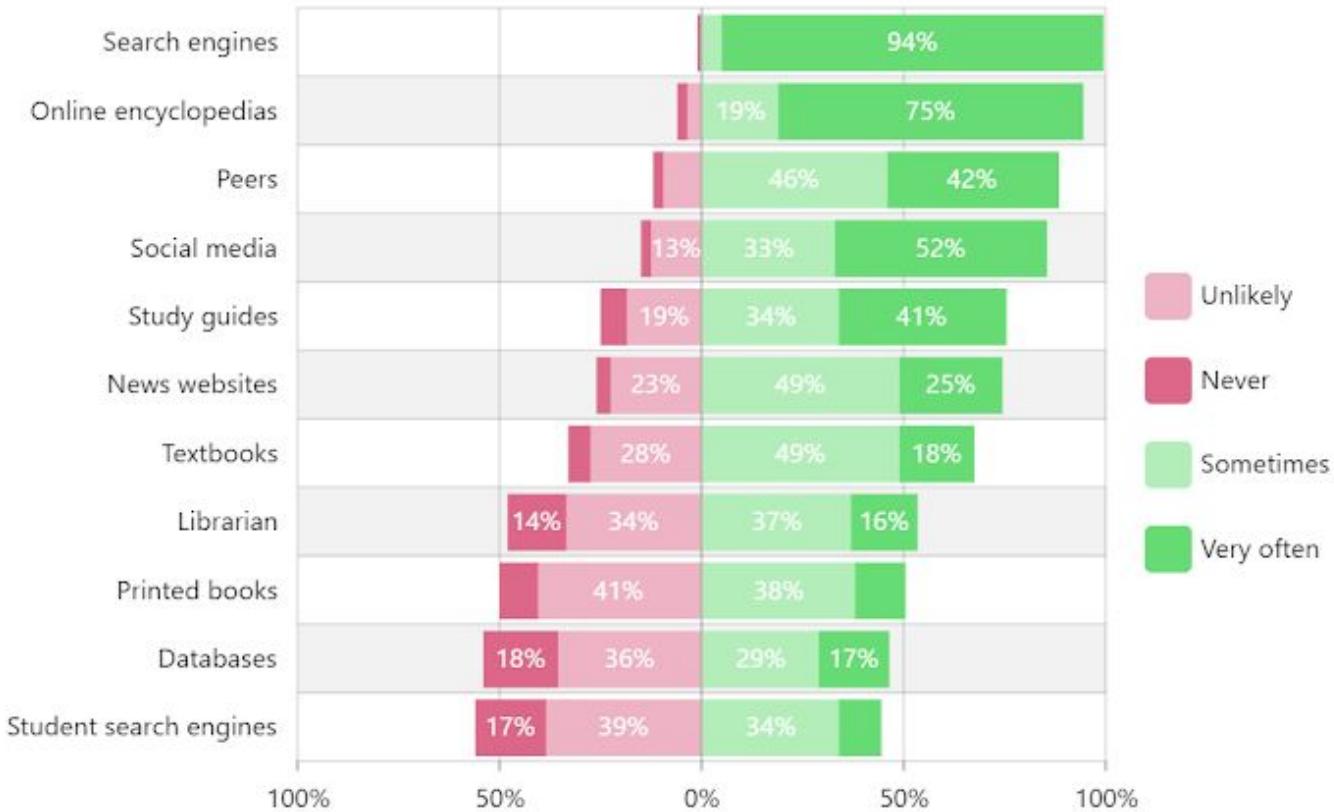
- 👉 QUANTITATIVELY: Values diverge from a meaningful middle (*a zero, an average, a threshold, a target, a standard deviation, ...*)
- 👉 QUALITATIVELY: categories have some order or hierarchy
(positive/negative, agreement/no agreement, ...)

→ In Africa, prescription drugs save lives. In America they are ending them

Change in adult mortality rate*, 2010-15 to 2015-20, %



Research tools used by students



→ Alcohol firms depend financially on problem drinkers' dependency

Alcohol consumption, Britain, 2013-14, units* per week



25% of Britons drink hazardous or harmful amounts

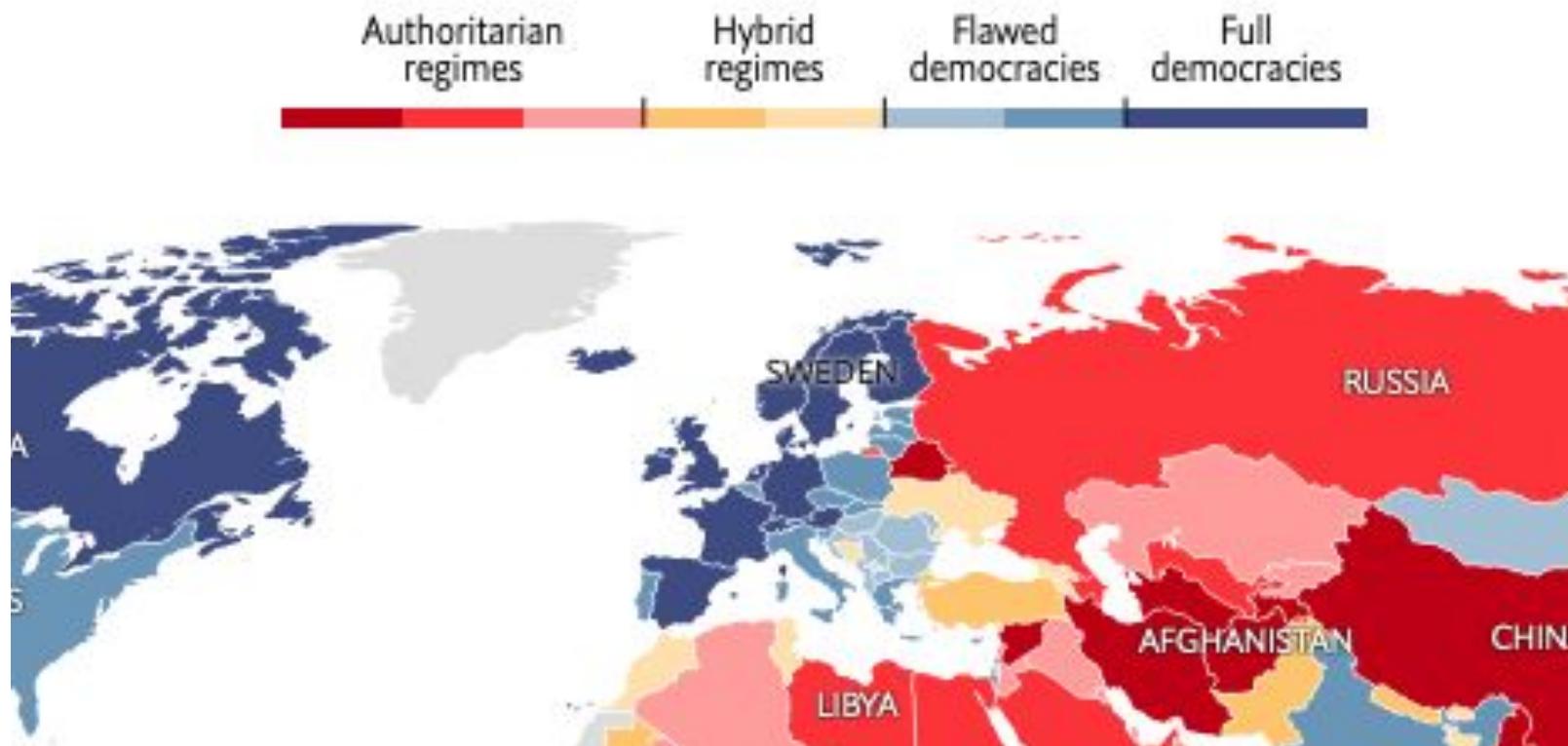


They account for 68% industry revenues

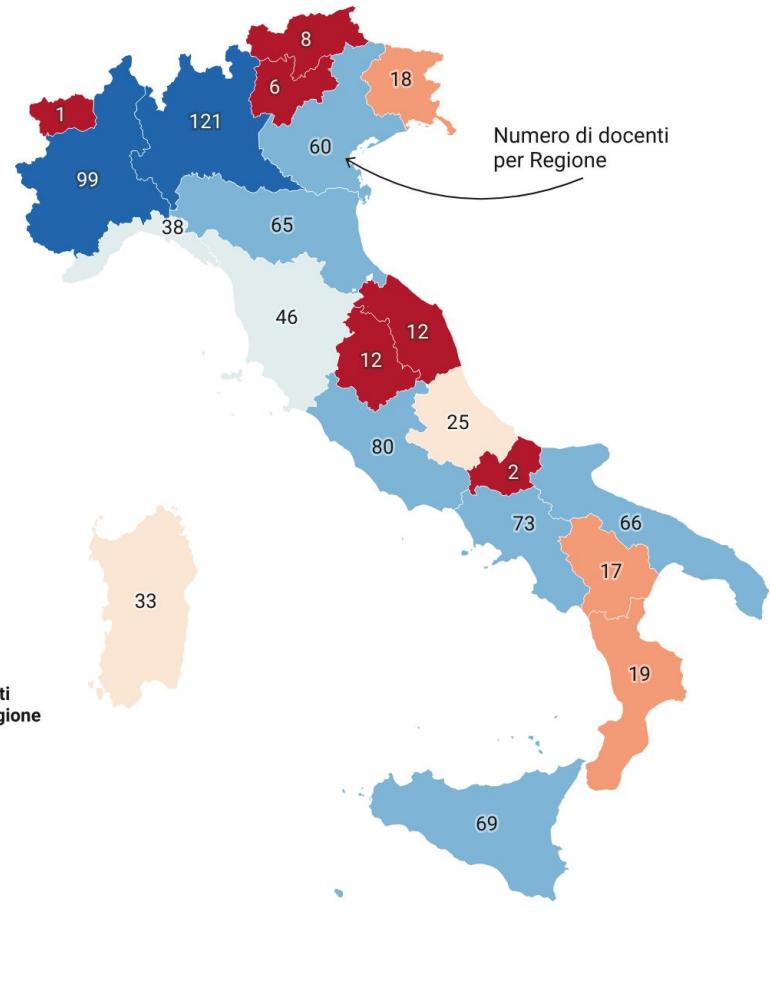


They drink 78% of all alcohol consumed





The world's most, and least, democratic countries in 2022 - The Economist (2019)





Emergency Rental Assistance Priority Index

LOW PRIORITY

0

50

HIGH PRIORITY

85

90

95

100

n/a

Seasonal snowfall totals

Through Feb. 1



[From snowy West to snow-starved East, a map of winter winners and losers](#) - The Washington Post



CENSIMENTI PERMANENTI

data warehouse

Login | Guida | Contatti

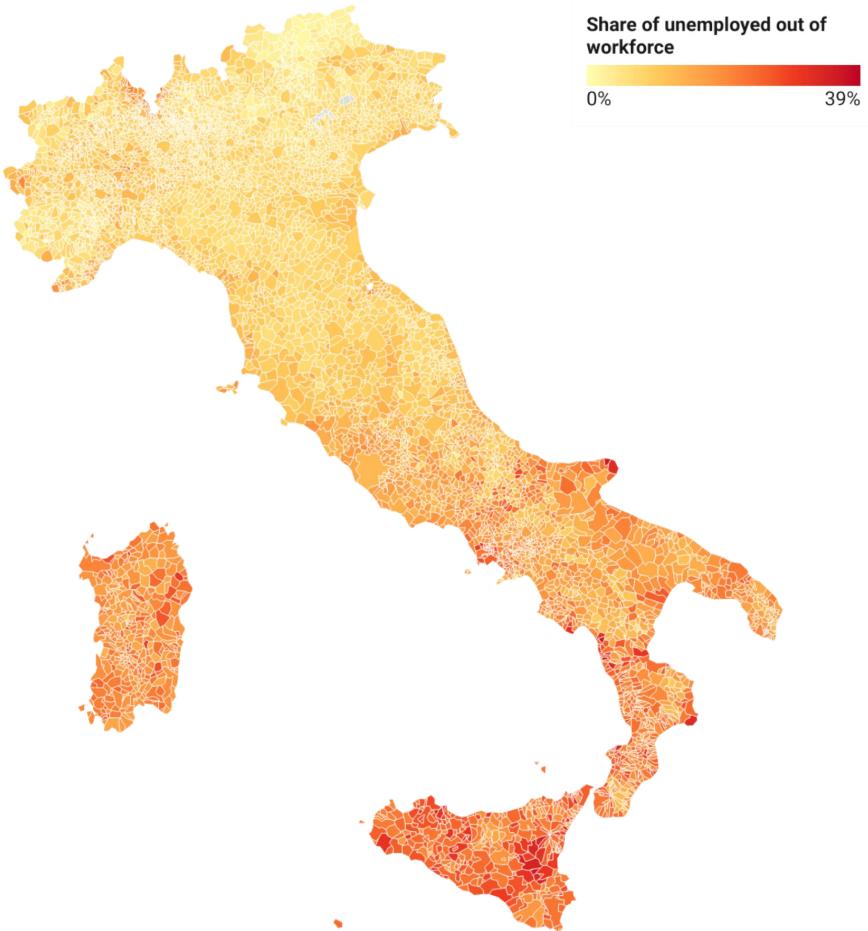
CENSIMENTO DELLA POPOLAZIONE E DELLE ABITAZIONI	
■ Popolazione	
■ Caratteristiche demografiche e cittadinanza	
■ Istruzione, lavoro e spostamenti per studio o lavoro	
□ Grado di istruzione, età - comuni	
■ Grado di istruzione, cittadinanza - comuni	
■ Condizione professionale, età - comuni	
■ Condizione professionale, cittadinanza - comuni	
■ Spostamenti per studio o lavoro - comuni	
■ Regioni e province	
■ Piemonte	
■ Valle d'Aosta/Vallée d'Aoste	
■ Liguria	
■ Lombardia	
■ Provincia Autonoma Bolzano/Bozen	
■ Provincia Autonoma Trento	
■ Veneto	
■ Friuli Venezia-Giulia	
■ Emilia-Romagna	

Istruzione, lavoro e spostamenti per studio o lavoro ¹ : Condizione professionale, cittadinanza - comuni

Personalizza ▾ Esporta ▾ La tua interrogazione ▾

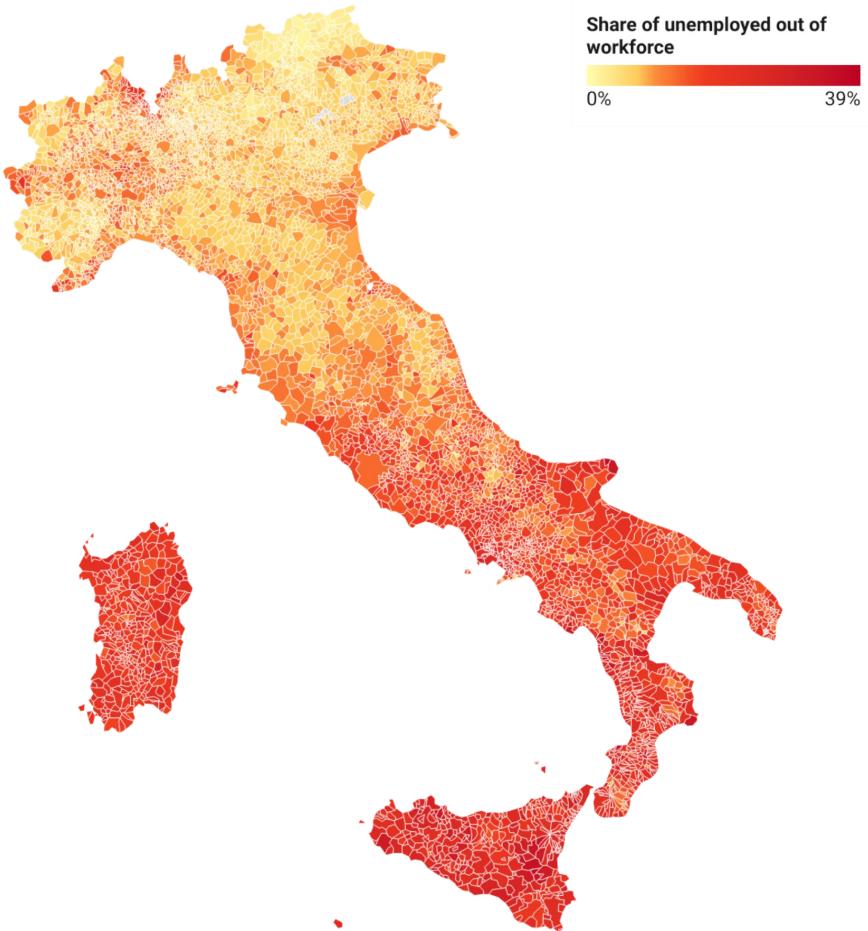
Page: 1 /30

Tipo dato	popolazione residente									
	Sesso	totale								
Età	15 anni e più									
	Cittadinanza	totale								
Selezione periodo	2019									
Condizione professionale	forze di lavoro	forze di lavoro		lavoro	non forze di lavoro					totale
	occupato	in cerca di occupazione	percettore/rice di una o più pensioni per effetto di attività lavorativa precedente o di redditi da capitale		studente/ssa	casalinga/o	in altra condizione			
Territorio	▲ ▼	▲ ▼	▲ ▼	▲ ▼	▲ ▼	▲ ▼	▲ ▼	▲ ▼	▲ ▼	▲ ▼
■ Italia	27 236 829	23 662 475	3 574 356	24 677 106		11 582 201	4 082 882	5 605 576	3 406 451	51 913 934
■ Nord-ovest	7 643 308	6 931 766	711 542	6 293 735		3 450 036	1 000 582	1 155 699	687 419	13 937 042
■ Piemonte	2 034 907	1 829 556	205 351	1 750 873		1 001 095	261 804	291 203	196 772	3 785 779
■ Torino ¹	1 052 562	938 442	114 120	902 558		507 979	139 486	152 377	102 717	1 955 120
Agliè	1 244	1 128	116	1 045		638	143	151	113	2 288
Airasca	1 750	1 557	193	1 344		718	240	258	128	3 094
Ala di Stura	213	203	10	180		101	29	28	22	393
Albiano d'Ivrea	776	708	68	694		435	100	87	72	1 470



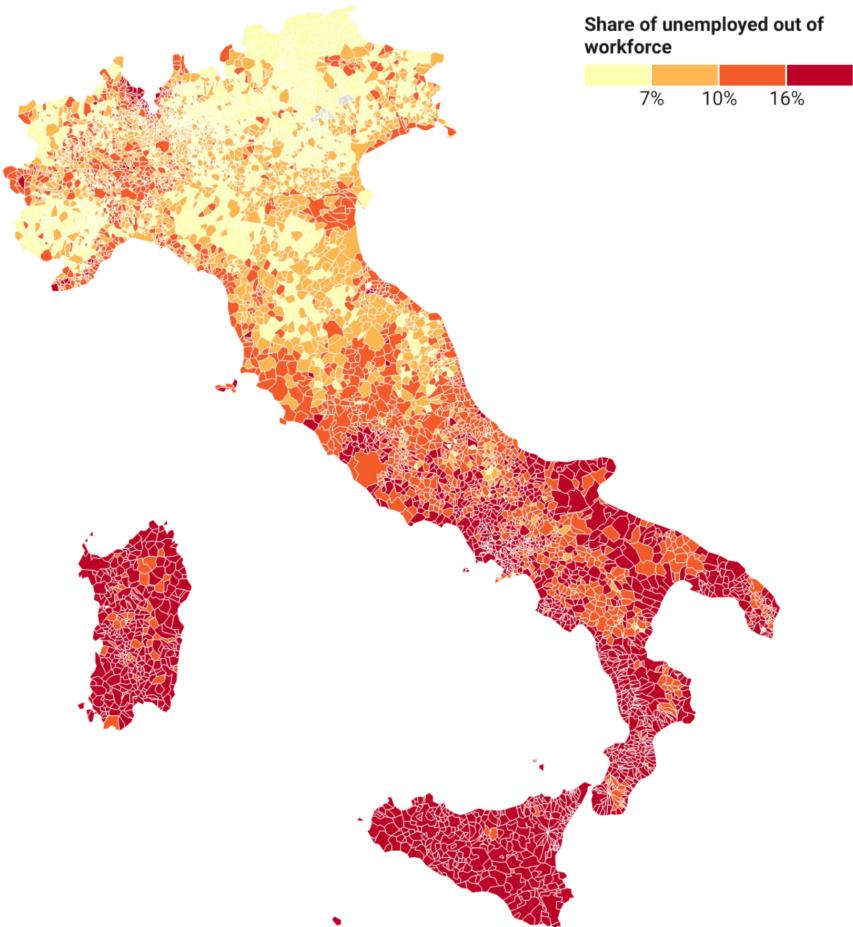
palette
sequential
linear

interpolation
equal intervals



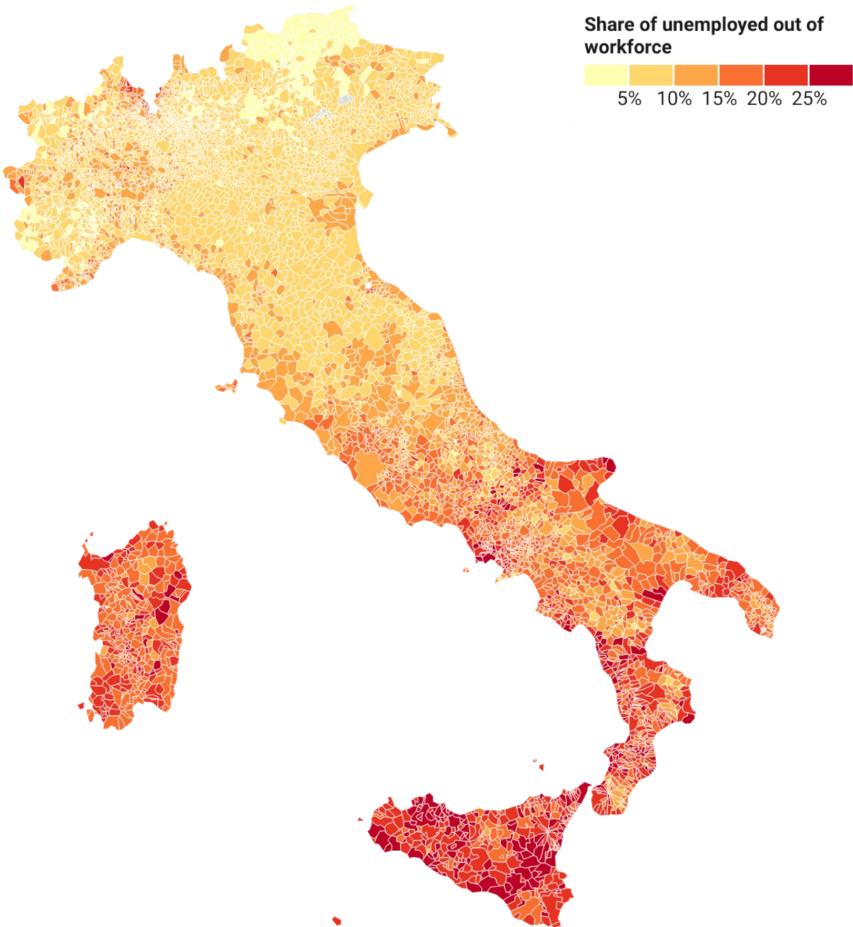
palette
sequential
linear

interpolation
equal counts
(quartiles)



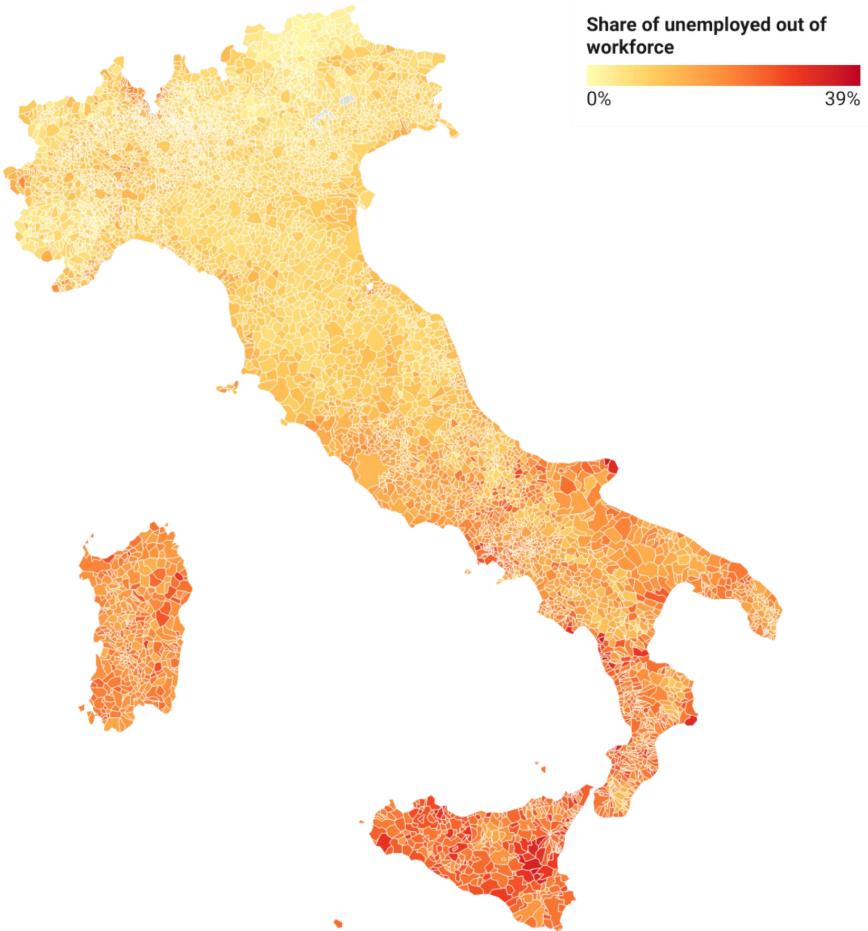
palette
sequential
binned

bins criteria
equal counts
(quartiles)



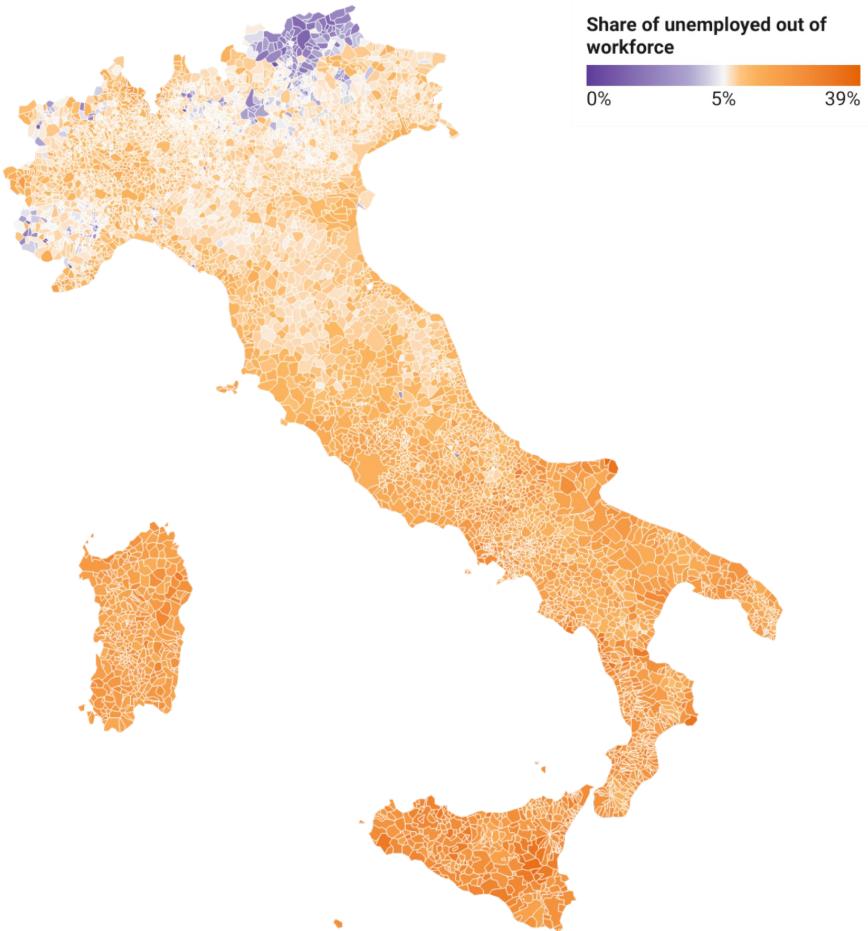
palette
sequential
binned

bins criteria
custom
capped



palette
sequential
linear

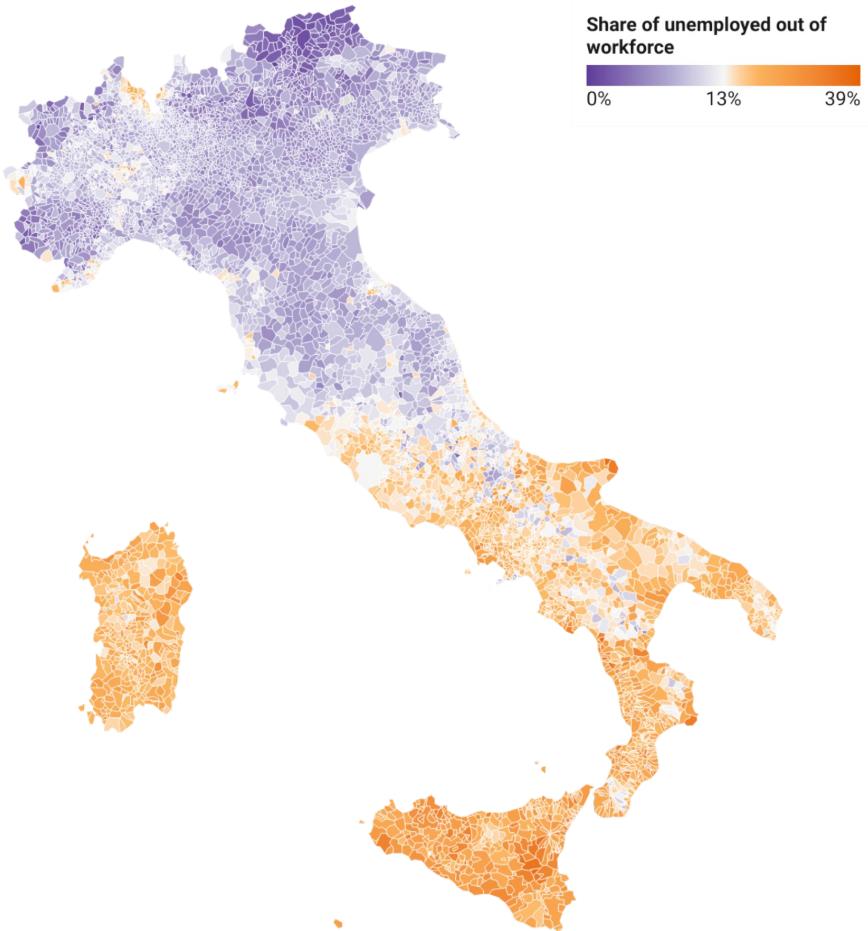
interpolation
equal intervals



palette
diverging
linear

interpolation
equal intervals

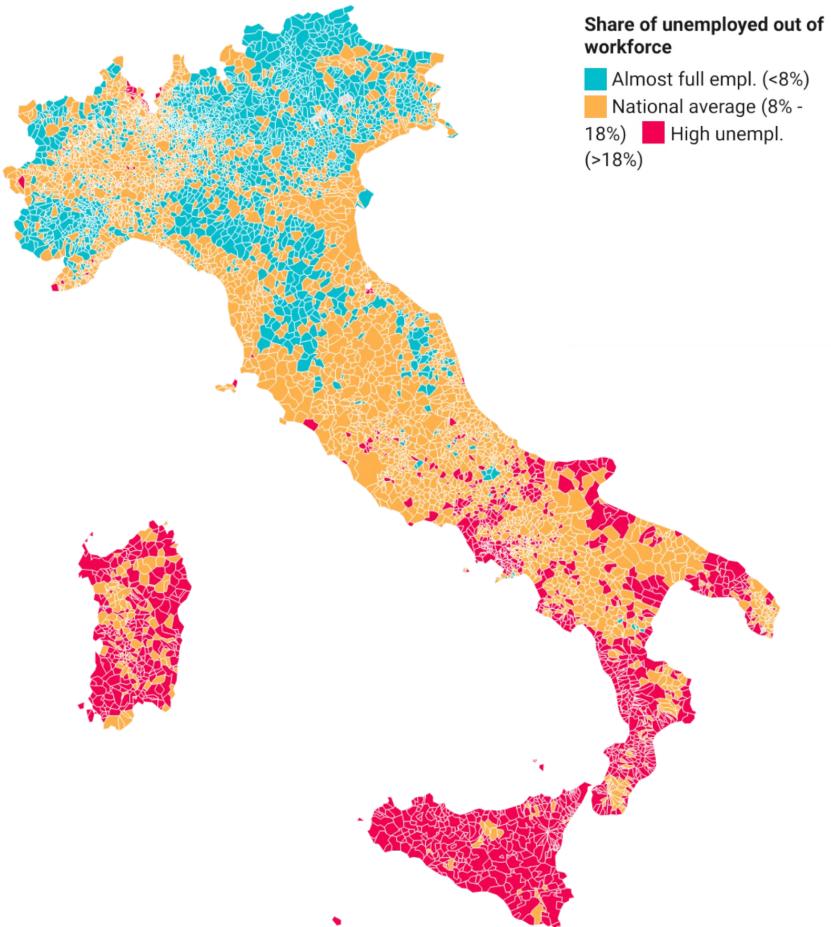
center
5% (full occupation)



palette
diverging
linear

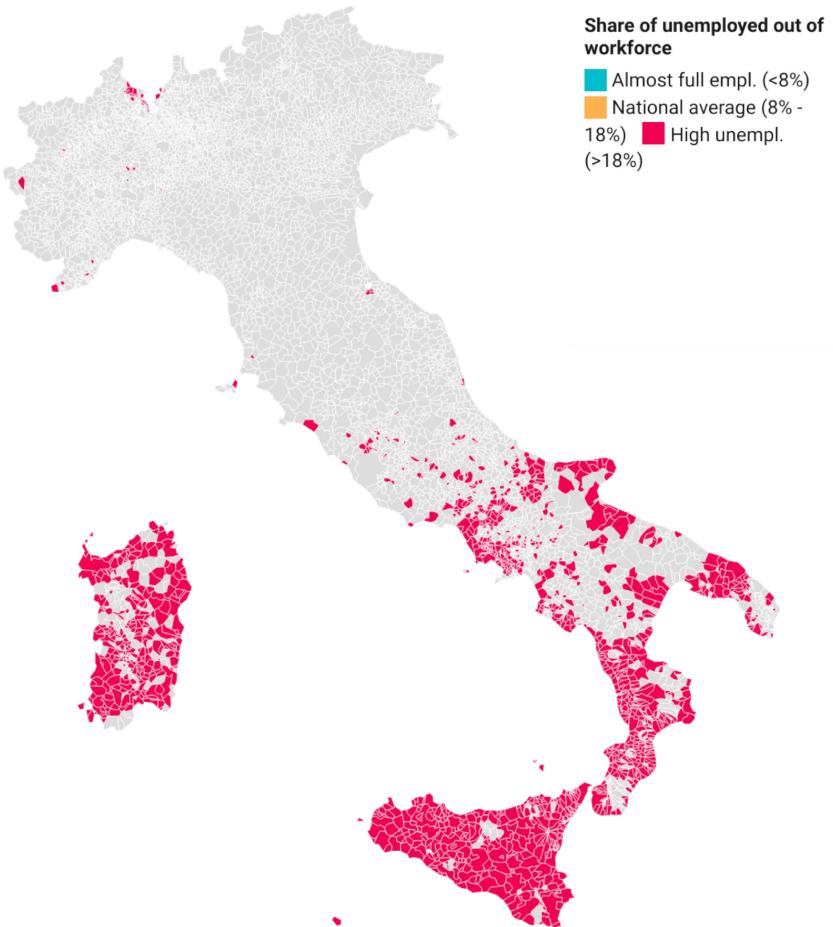
interpolation
equal intervals

center
13% (national average)



palette
qualitative

n. categories
3



palette
qualitative

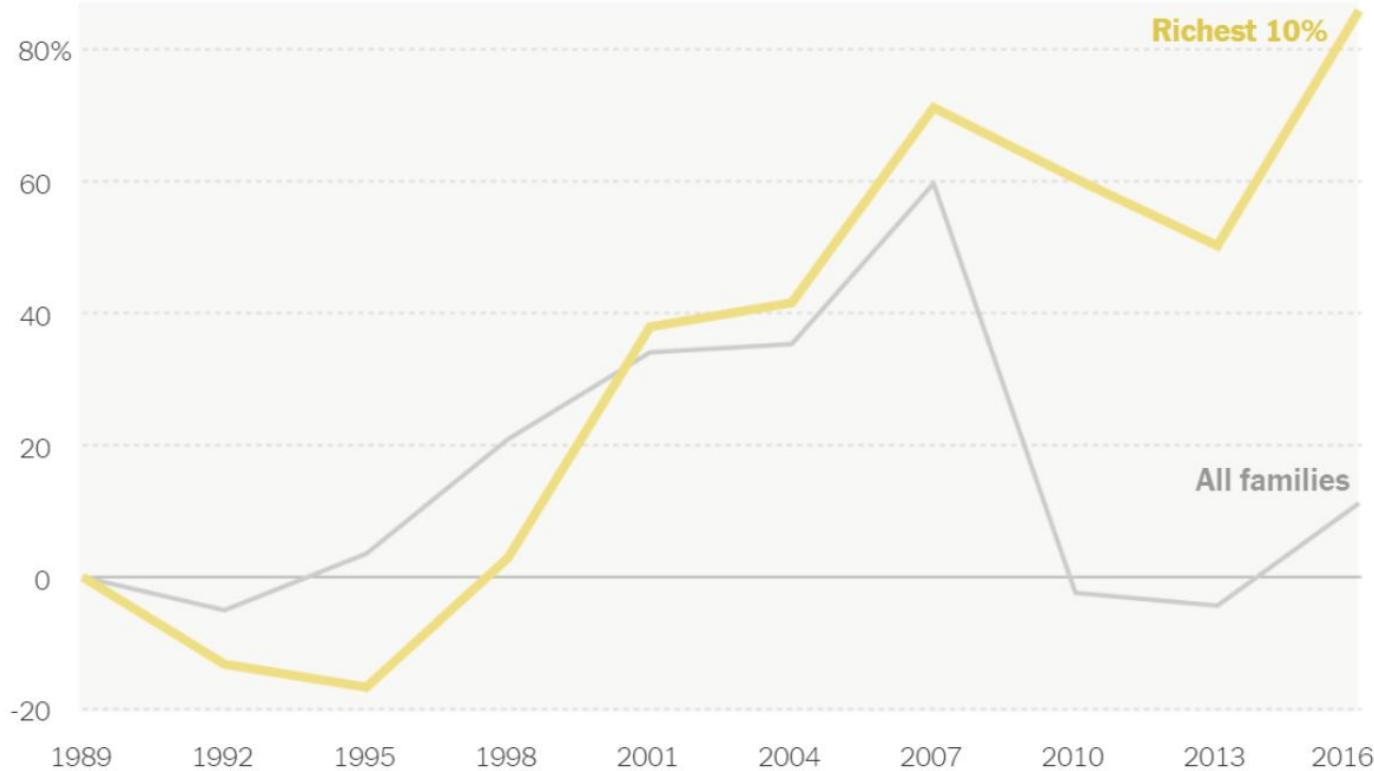
n. categories
1+ other

tips for choosing

TEXT

ELEMENTS

Change in median net worth since 1989

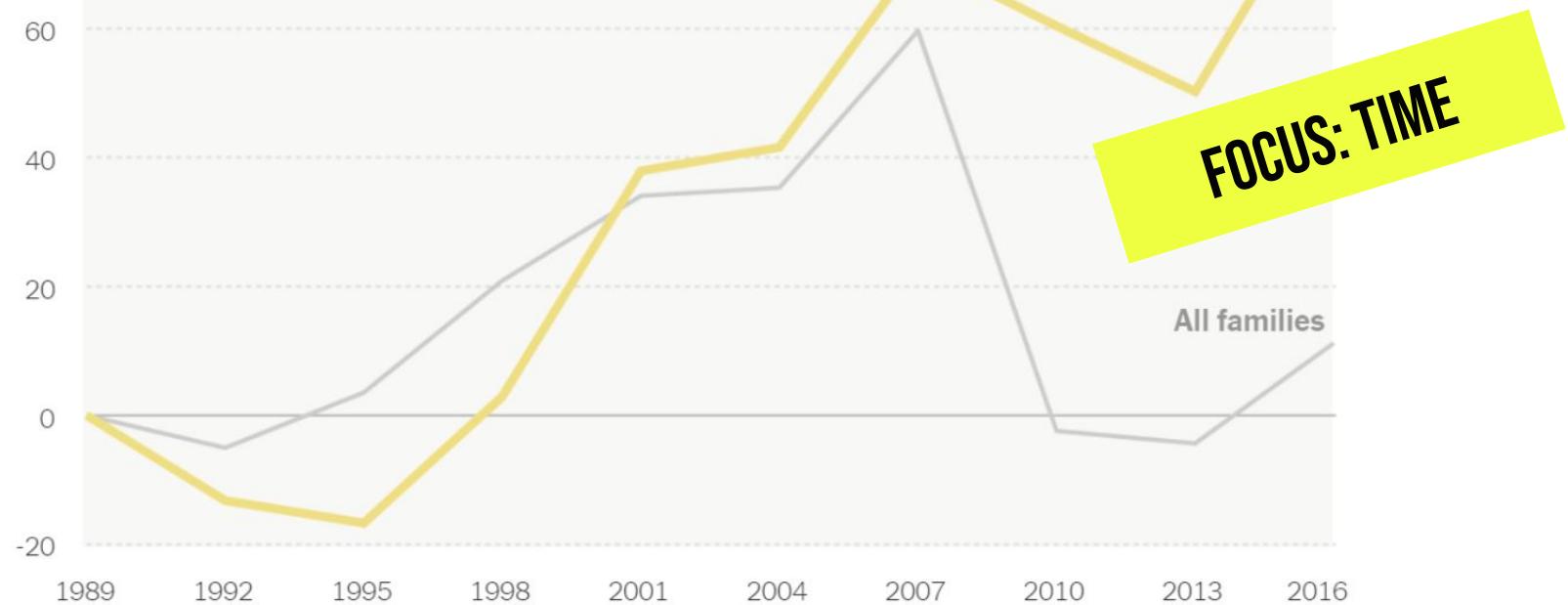


Note: 2016 dollars. Source: Kaiser Family Foundation

America Will Struggle After Coronavirus. These Charts Show Why - New York Times

American families have yet to recover from the 2008 financial crisis

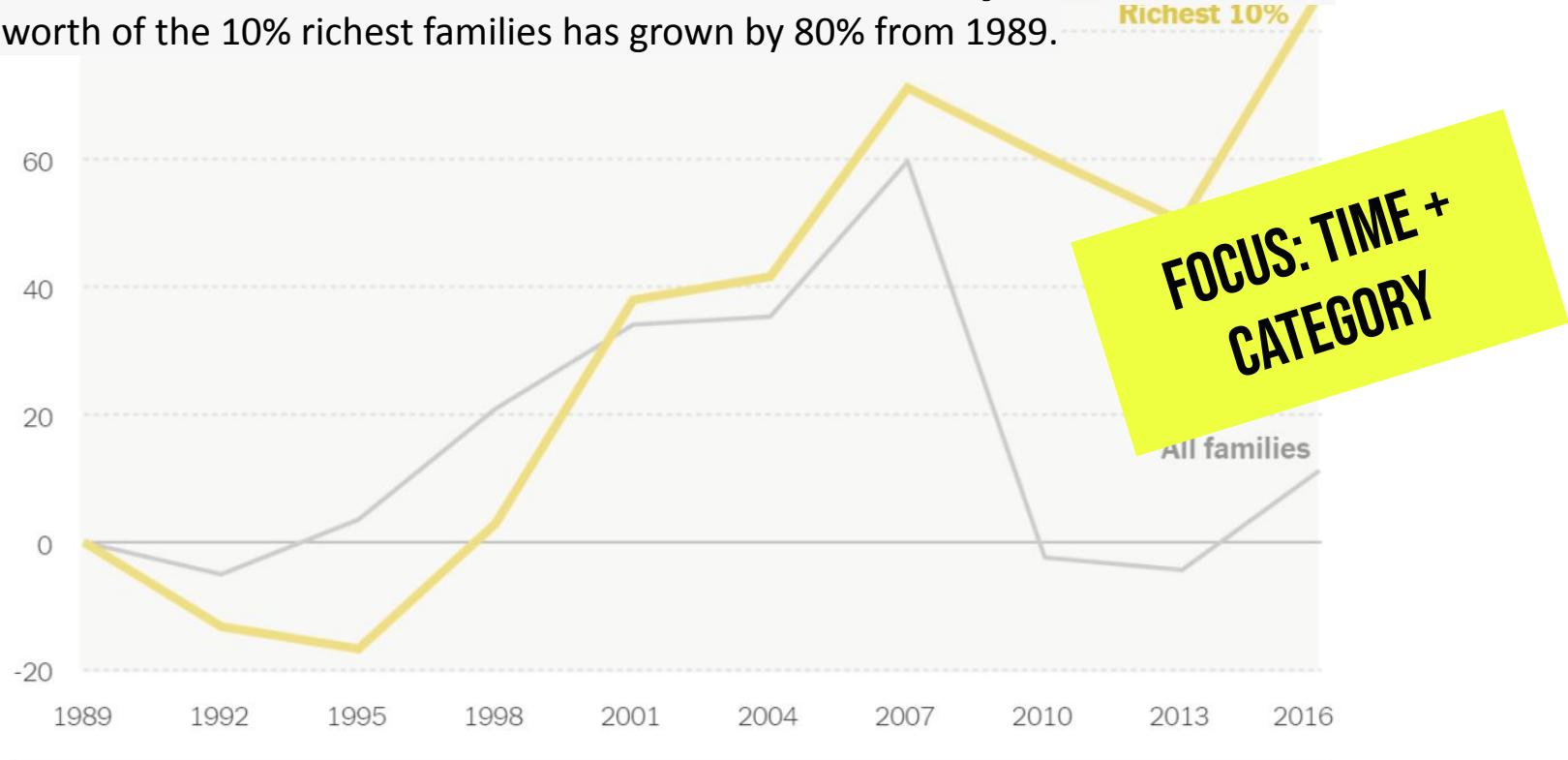
Median net worth of all American families in 2016 is still 31% lower than it was in 2007, before the crisis hit.



Note: 2016 dollars. Source: Kaiser Family Foundation

The richest families are almost twice as rich as they were in 1989.

Median net worth of the 10% richest families has grown by 80% from 1989.

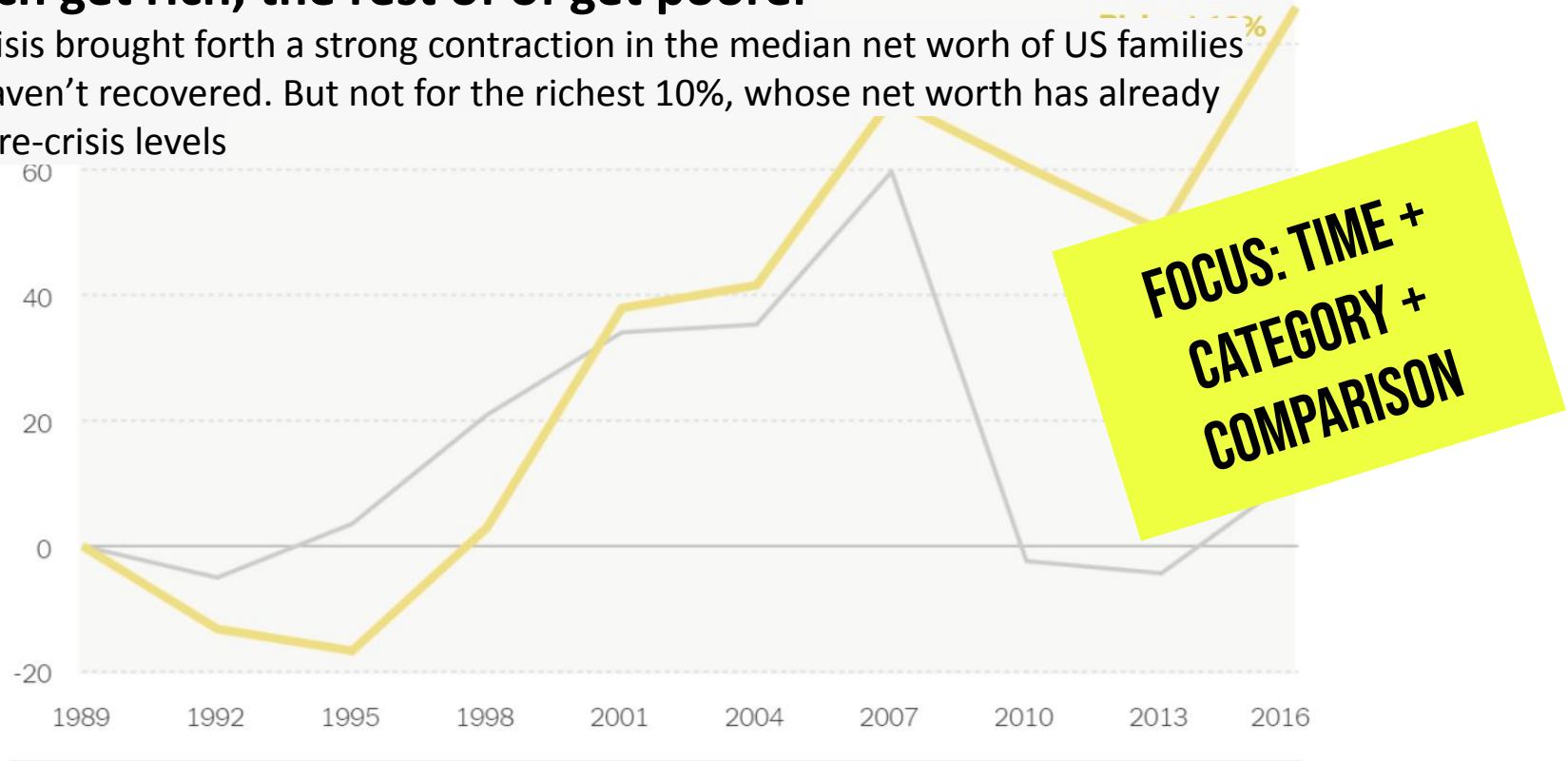


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America Will Struggle After Coronavirus. These Charts Show Why - New York Times

As the rich get rich, the rest of us get poorer

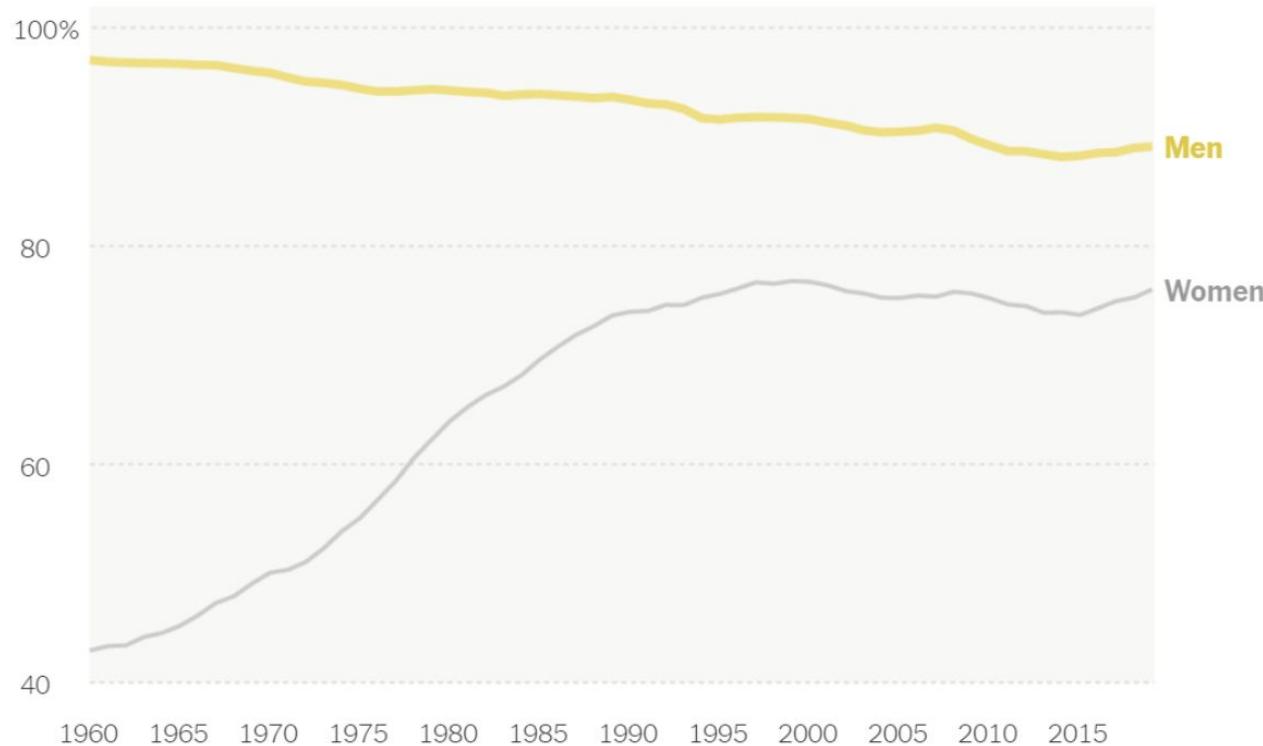
The 2008 crisis brought forth a strong contraction in the median net worth of US families which still haven't recovered. But not for the richest 10%, whose net worth has already surpassed pre-crisis levels



Note: 2016 dollars. Source: Kaiser Family Foundation

America Will Struggle After Coronavirus. These Charts Show Why - New York Times

Work force participation, individuals aged 25-54

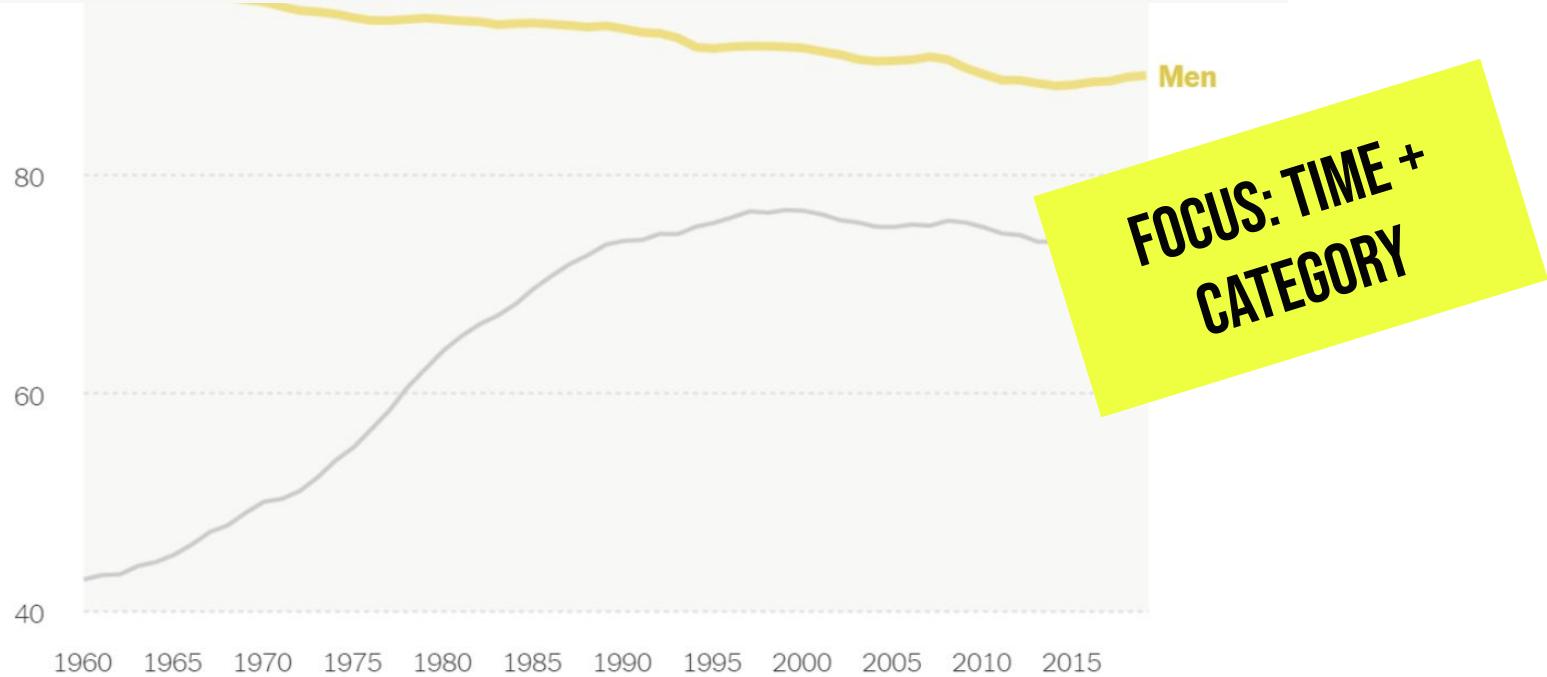


Source: Federal Reserve Bank of St. Louis

America Will Struggle After Coronavirus. These Charts Show Why - New York Times

More and more women participate in the workforce

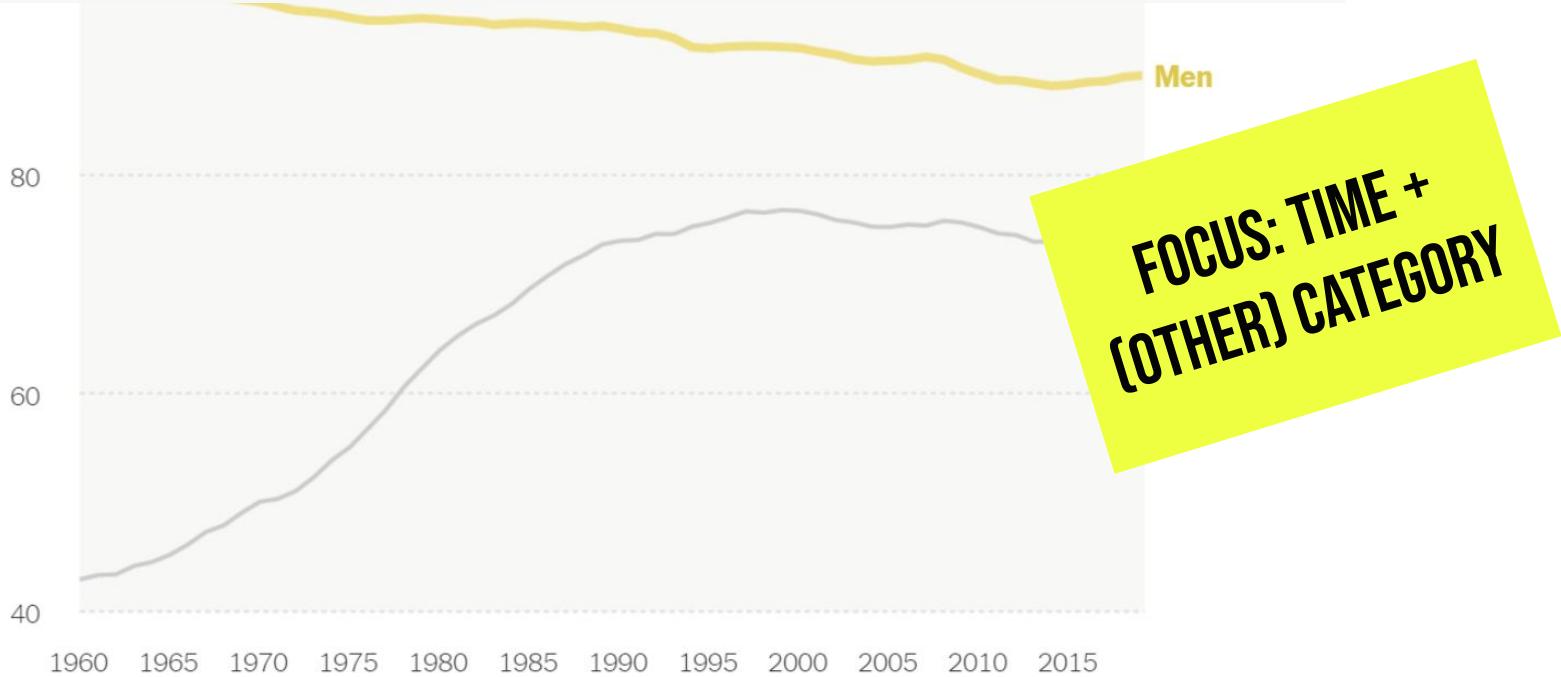
The rate of women participating in the workforce has been on a steady rise since the 1960.



Source: Federal Reserve Bank of St. Louis

Less and less men participate in the workforce

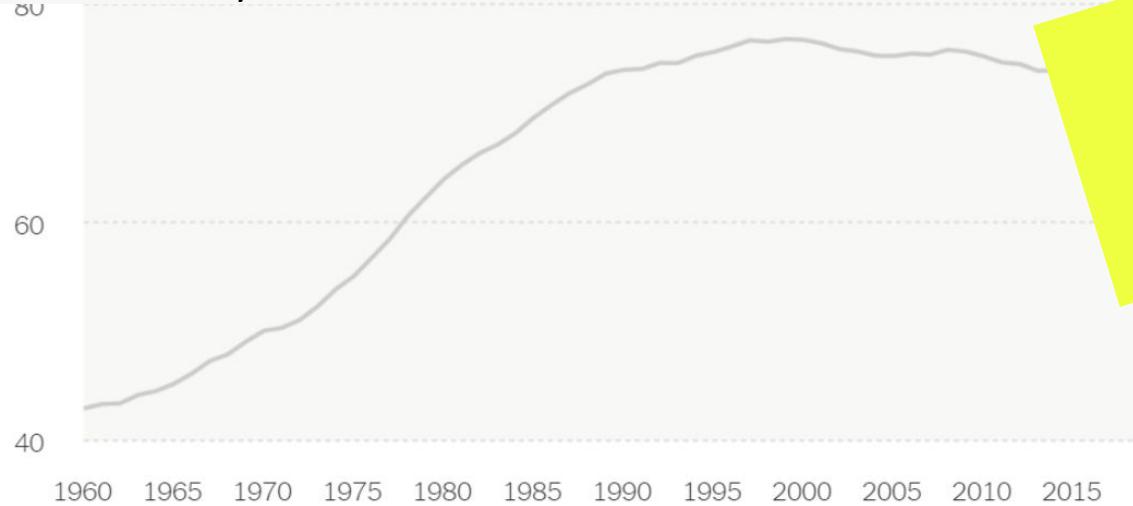
The rate of women participating in the workforce has been on a steady decline since the 1960.



Source: Federal Reserve Bank of St. Louis

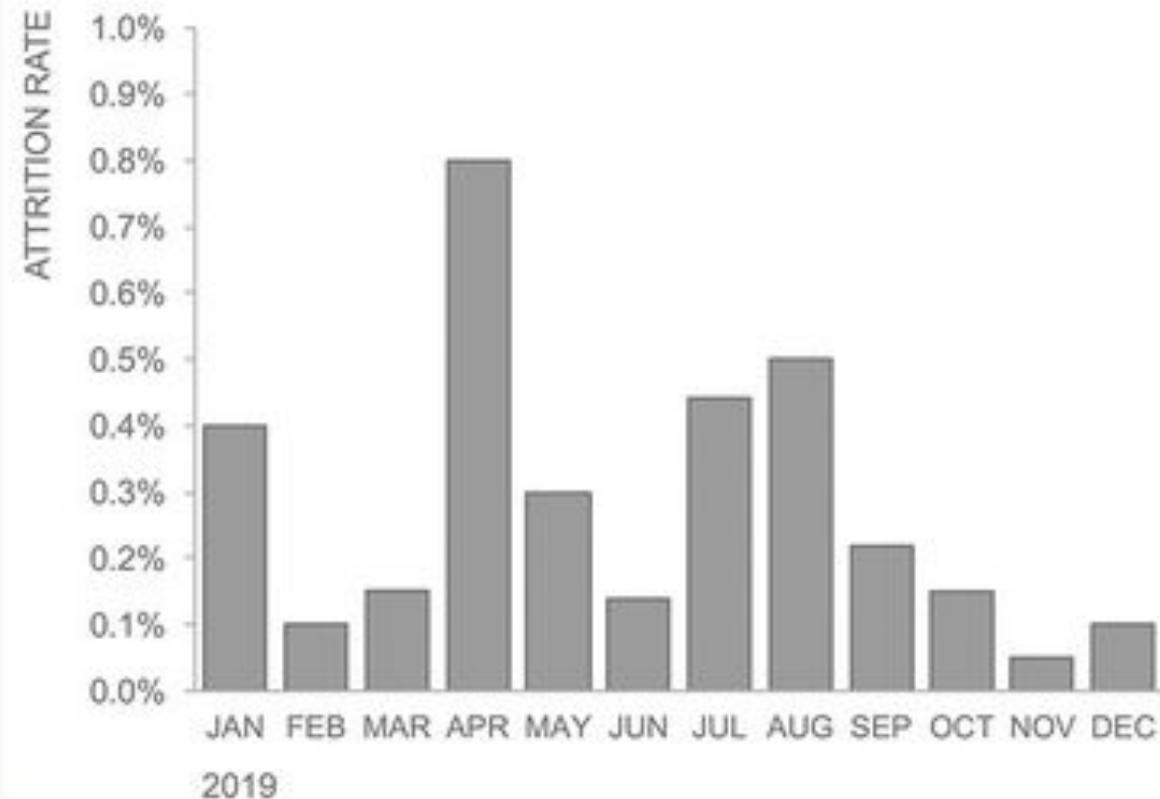
More and more women participate in the workforce, but the gender gap isn't closing anytime soon.

The rate of women participating in the workforce has grown from 1960, when it was at 42%, to 78%. However, the biggest surge occurred during the '60s - '80s and the numbers have since plateaued or even dropped in more recent years.



Source: Federal Reserve Bank of St. Louis

2019 monthly voluntary attrition rate



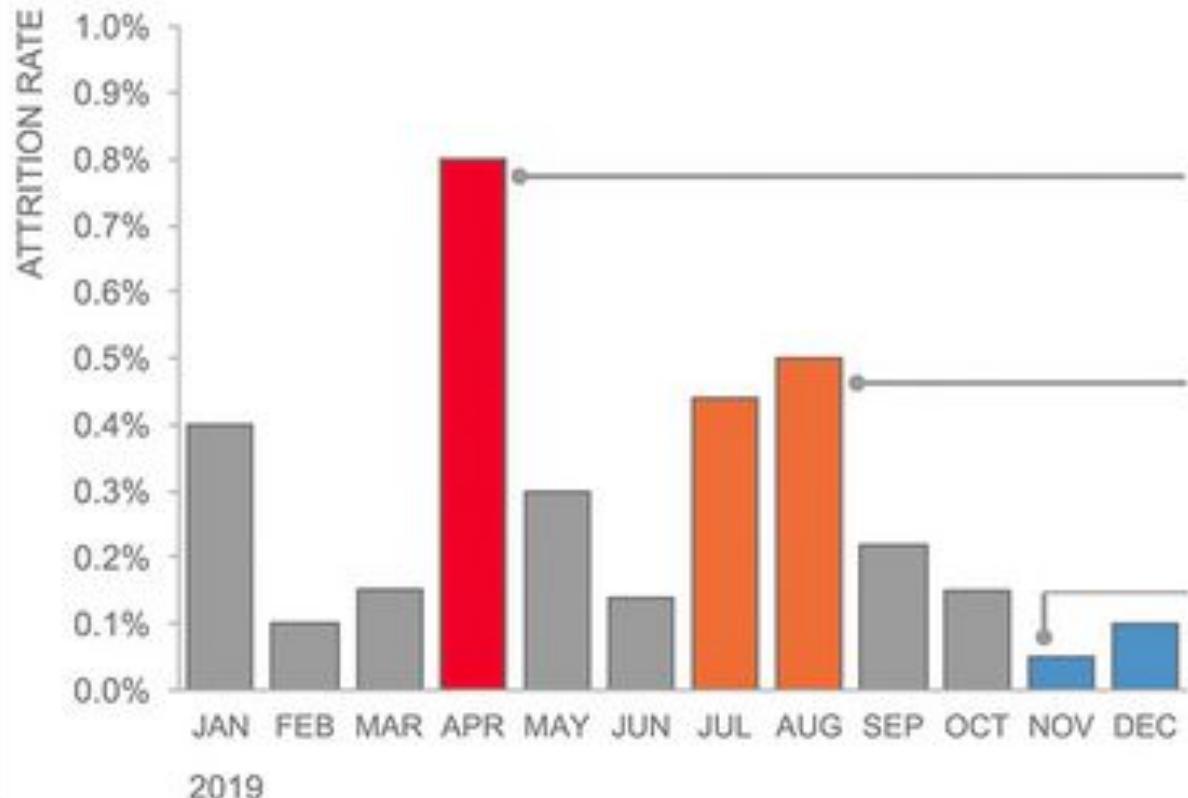
Highlights:

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Attrition rates tend to be higher in the Summer months when it is common for associates to leave to go back to school.

Attrition is typically low in November and December due to the holidays.

2019 monthly voluntary attrition rate



Highlights:

In **April** there was a reorganization. No jobs were eliminated, but many people chose to leave.

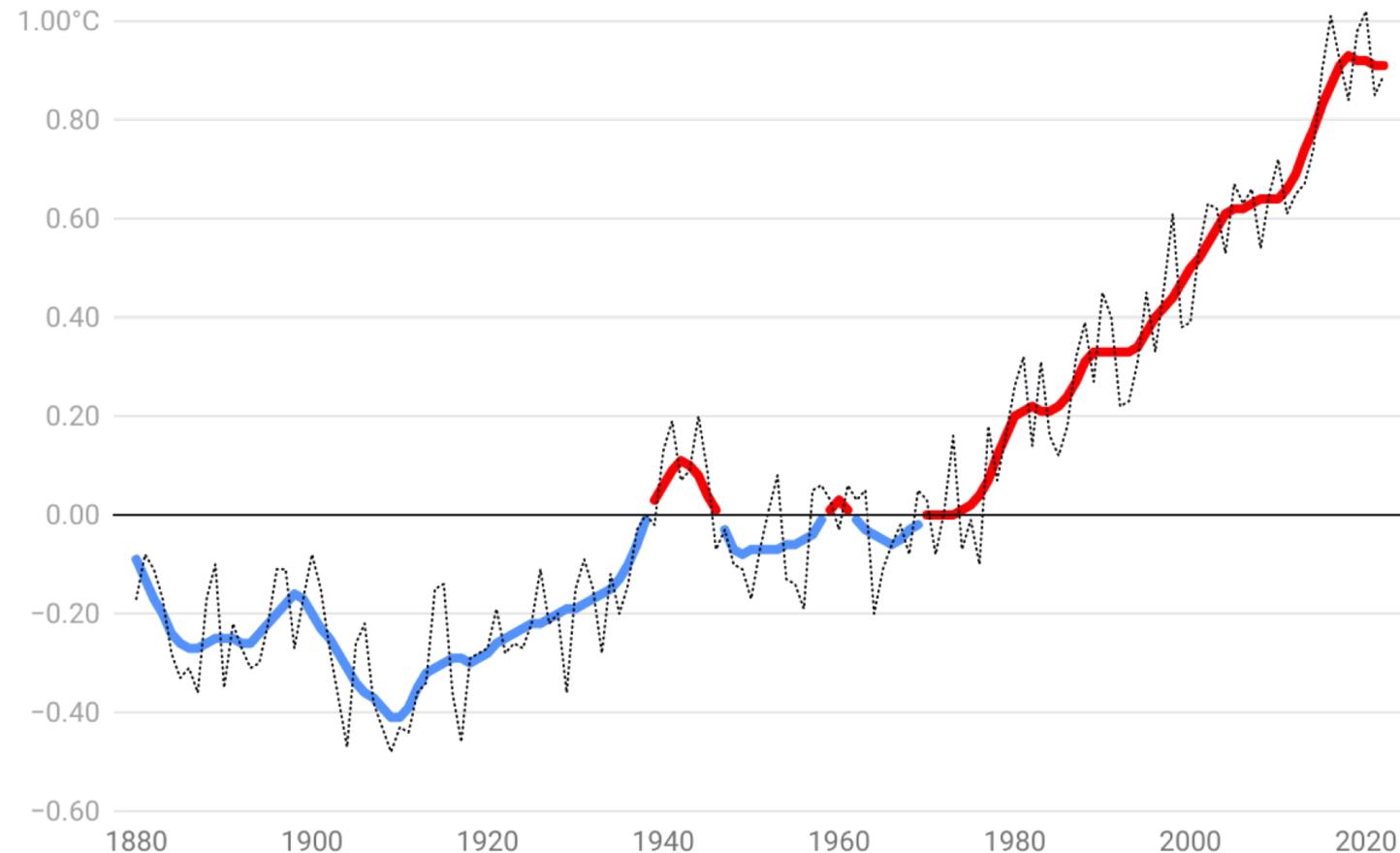
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GLOBAL LAND-OCEAN TEMPERATURE INDEX 2018 - 2022

Compared to the long-term average from 1951 to 1980

Fonte: NASA's Goddard Institute for Space Studies (GISS)



c) The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term

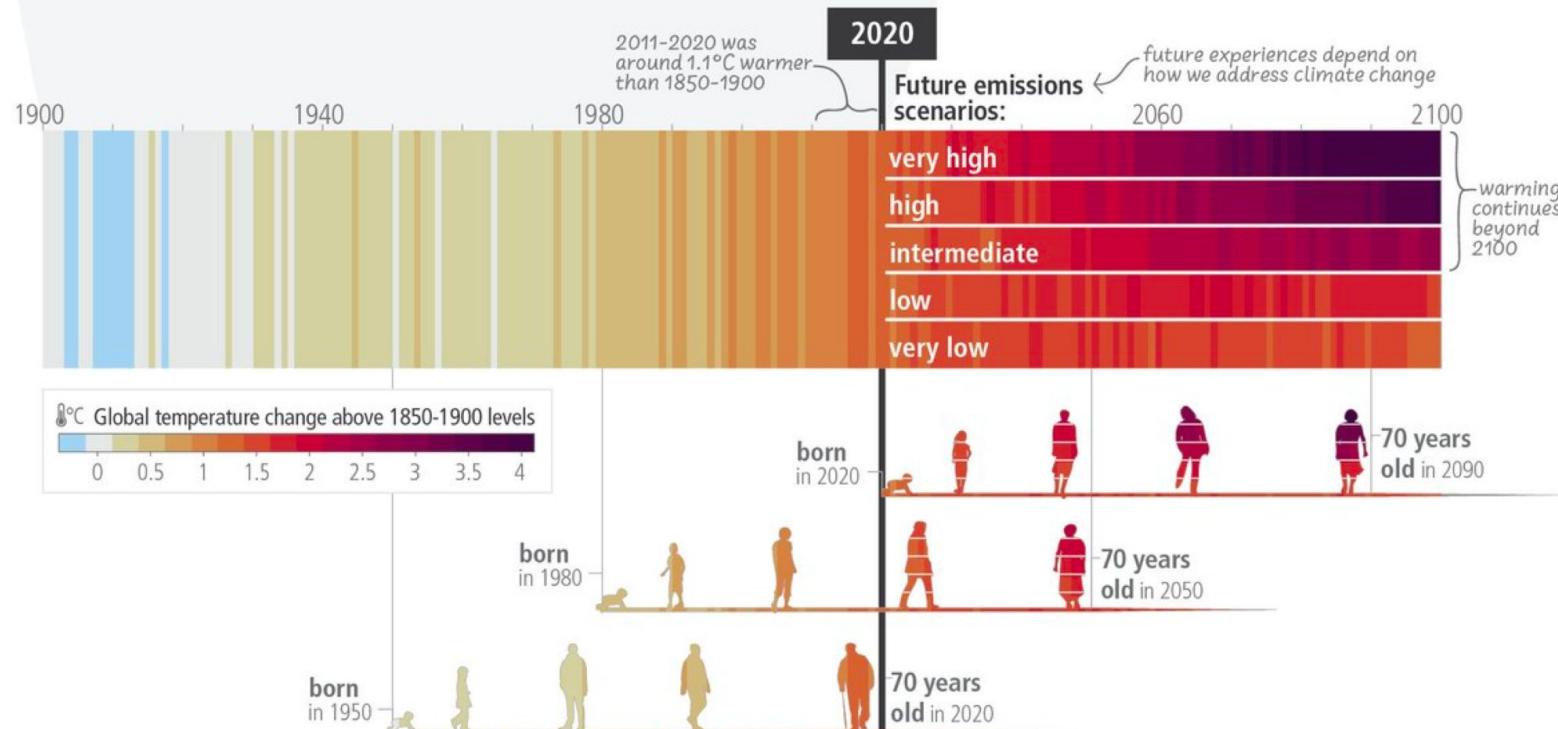


Chart proposal for IPCC 6th assessment report, from a tweet by Ed Hawkins (21/03/2023)

“THE PRACTICAL POLITICS OF COLUMNS AND CATEGORIES”

“Counting Feminicide” by Catherine D’Ignazio (2024)

- “Victim name” or
“Name” or “Her name”
- “Sexual preference” or
“Sexual identity” ..or nothing?
- “Prostitution” or
“sex work”?
- “Neither” / “Other” / “NA” /

- “Refugee” or “Migrant” or
“Immigrant” or “Foreigner”
or “Expat”

...

EXERCISE

Look at the following map and reflect on its storytelling. The authors chose a specific metric and a specific title/use of text to persuade of their point. What choices did they make which are questionable? **Can you think of other ways to process the data to communicate different messages?**

- 👉 Open this dataset and make your own copy.
- 👉 Make other maps (in Excel / Google Sheets) that, by playing with different aggregations/calculations and different color and text elements (titles, annotations, etc) can communicate radically different messages.
- 👉 Upload PNG / Screenshots in this folder

[OC] China emits more CO2 than the entire Western hemisphere

OC

China emits more CO2 than the entire Western hemisphere



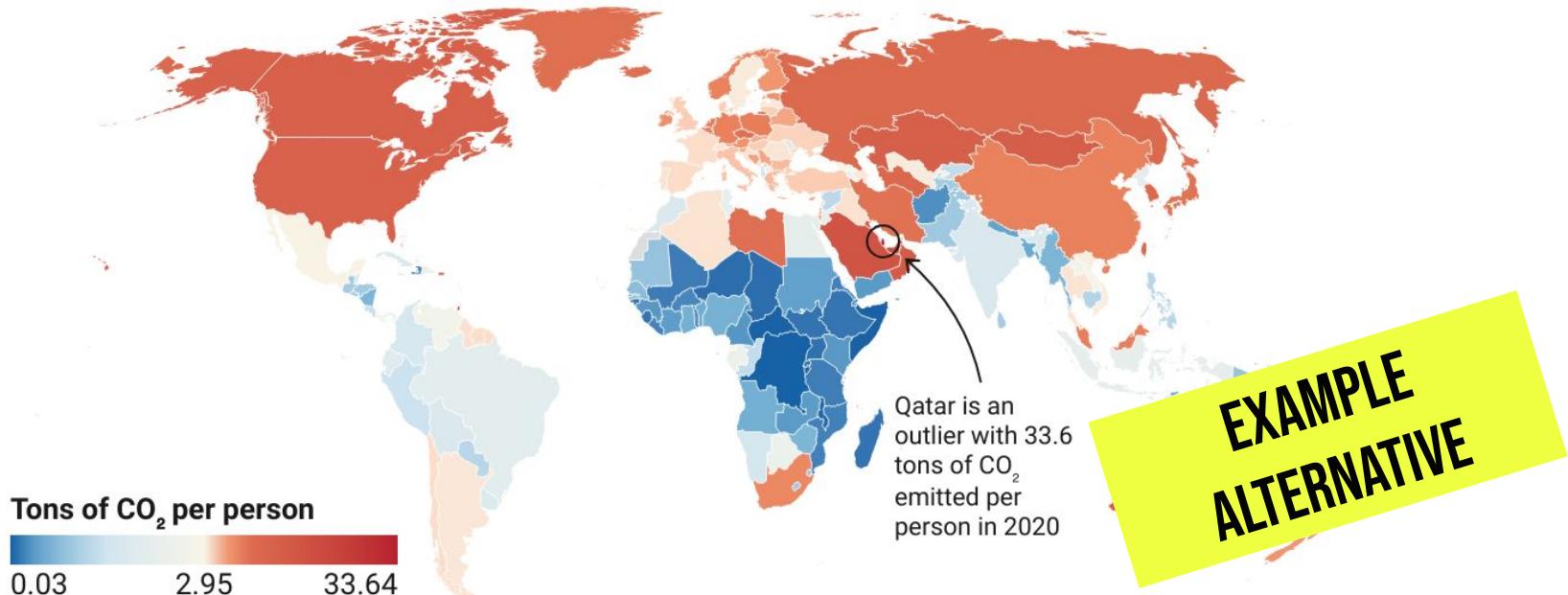
Countries spanning both Western and Eastern hemispheres are included

China and the Western hemisphere each have a total population of about 1.4 billion

CHART TO CRITIQUE

Per capita, China's emissions look more like Germany's

Carbon dioxide (CO₂) emissions from fossil fuels and industry in 2020.



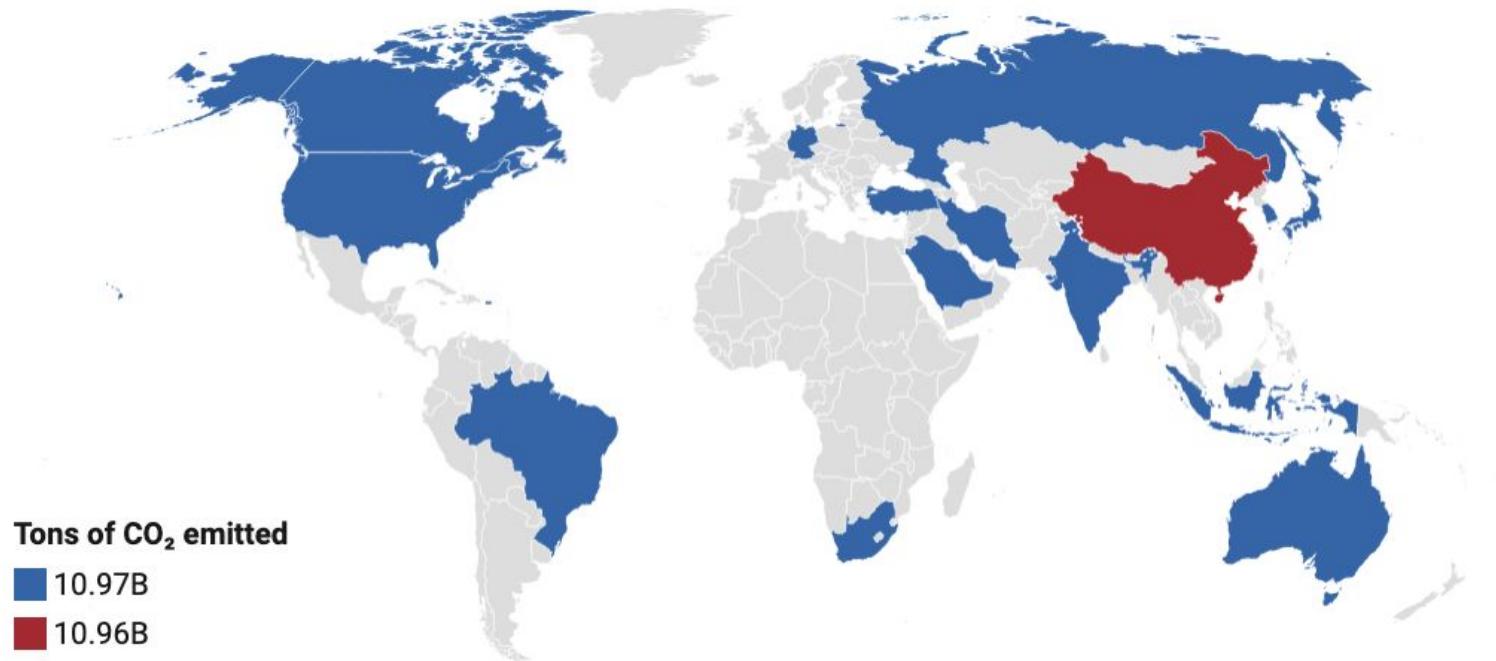
Land use change is not included.

Map: Jack Goodall • Source: Our World in Data • Created with Datawrapper

A fair way (or four) to look at global carbon emissions • Jake Goodall

China's CO₂ emissions equal the next 14 countries combined

Countries with equivalent carbon dioxide (CO₂) emissions from fossil fuels and industry in 2020.



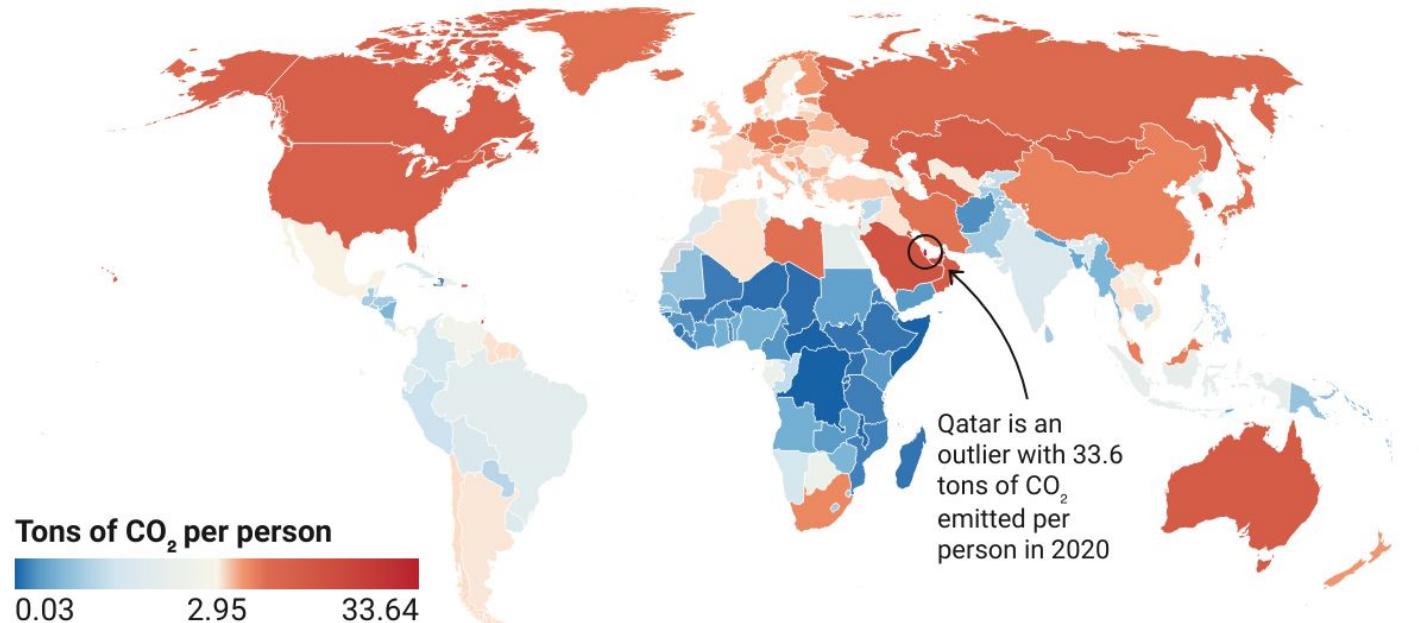
Land use change is not included.

Map: Jack Goodall • Source: [Our World in Data](#) • [Get the data](#) • Created with [Datawrapper](#)

A fair way (or four) to look at global carbon emissions • Jake Goodall

Per capita, China's emissions look more like Germany's

Carbon dioxide (CO₂) emissions from fossil fuels and industry in 2020.



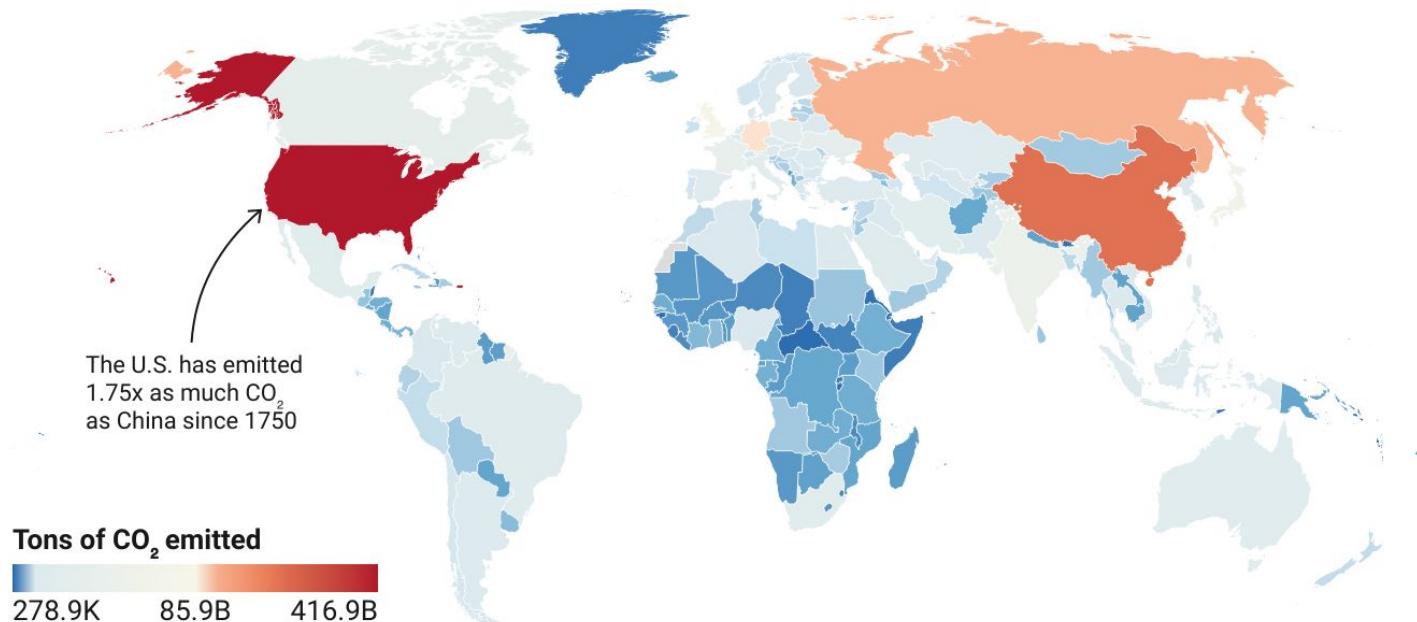
Land use change is not included.

Map: Jack Goodall • Source: Our World in Data • Created with Datawrapper

A fair way (or four) to look at global carbon emissions • Jake Goodall

The U.S. is still history's biggest carbon emitter

Cumulative emissions, the running sum of CO₂ released from fossil fuels and industry since 1750.



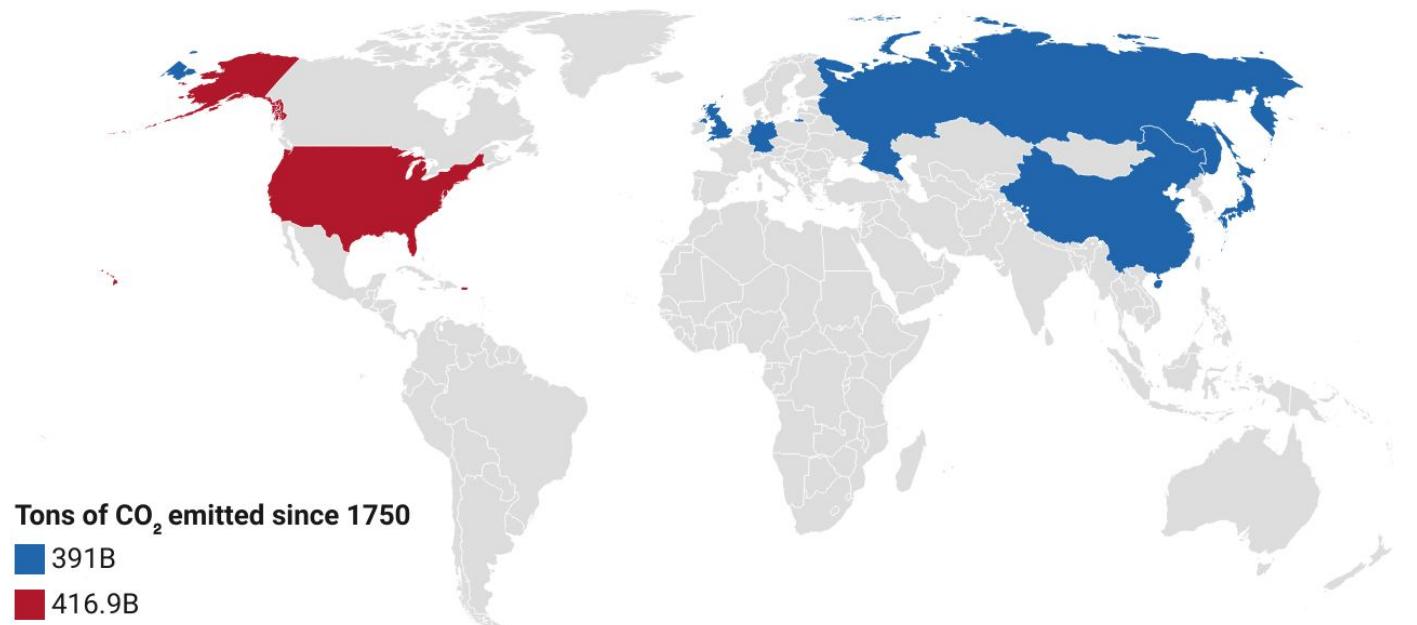
Land use change is not included.

Map: Jack Goodall • Source: Our World in Data • Created with Datawrapper

A fair way (or four) to look at global carbon emissions • Jake Goodall

The U.S. has emitted more carbon than the 5 next highest historical emitters combined.

Countries with equivalent cumulative carbon dioxide (CO_2) emissions from fossil fuels and industry since 1750.



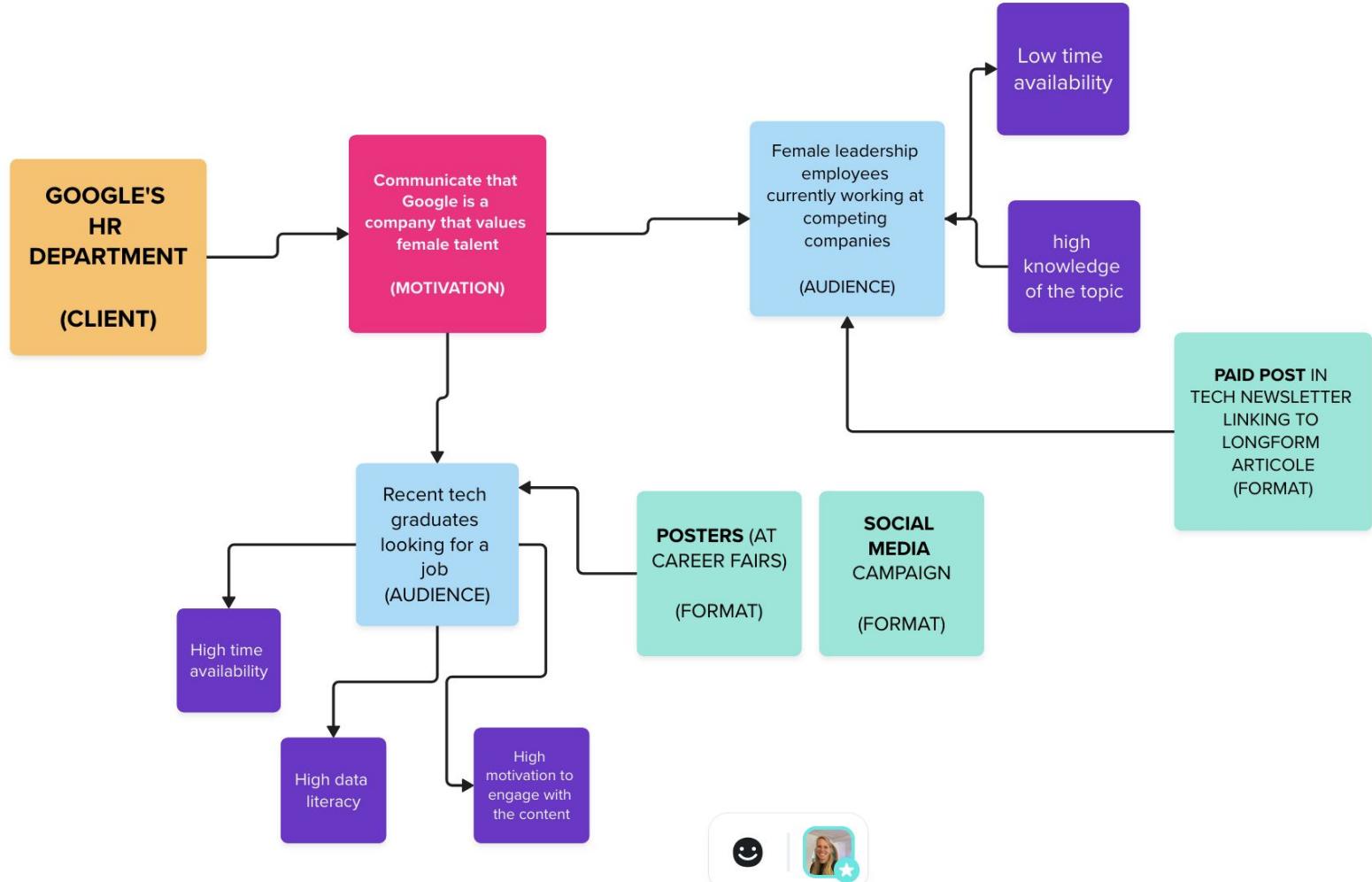
Land use change is not included

Map: Jack Goodall • Source: Our World in Data • Created with Datawrapper

A fair way (or four) to look at global carbon emissions • Jake Goodall

COMMUNICATING DATA

Structuring the content and storyboarding



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.

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]

BEFORE WEDNESDAY 19th:

- 👉 Create an account on Datawrapper
- 👉 Fill in this form with the email you have used to create the account

BEFORE DEC. 1st

Fill in the survey about your group project.