

08

Information Visualization

Daniel Gonçalves, Sandra Gama

Simplicity, Legibility & Truth



Get Ready...

http://etc.ch/3Tt6



Principles to live by

1. Present information effectively with clarity, precision...
2. Tell the truth

Signal-To-Noise

Clear Message

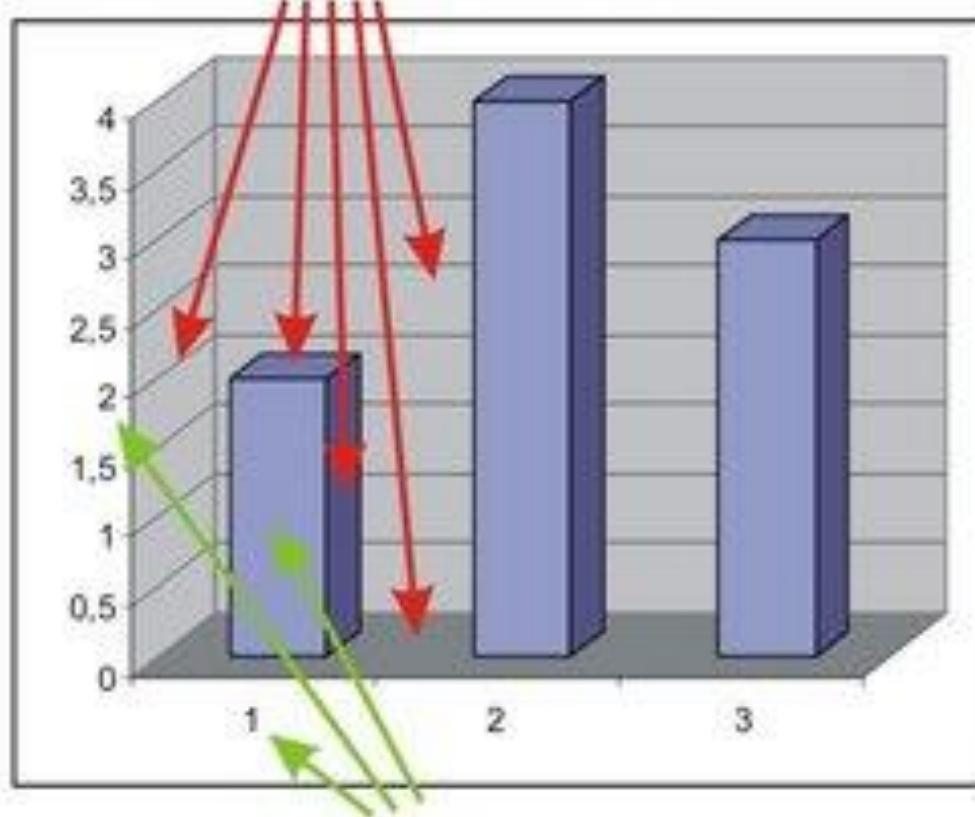
Signal-To-Noise



???

Direct
Poll

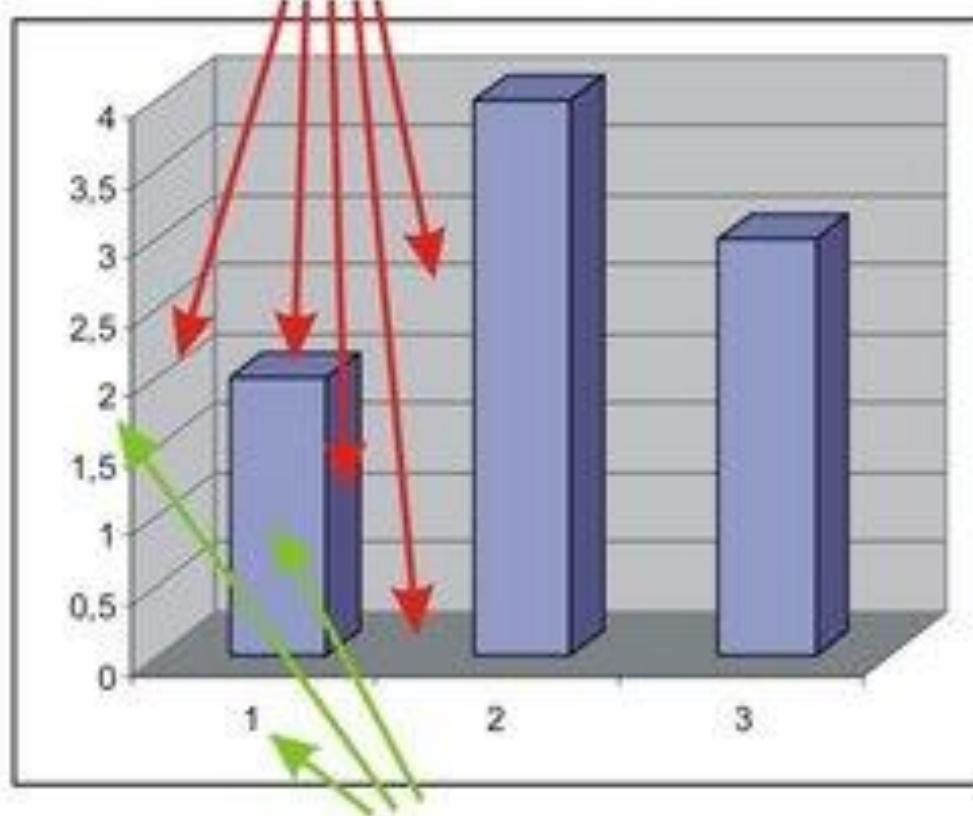
no extra information



information

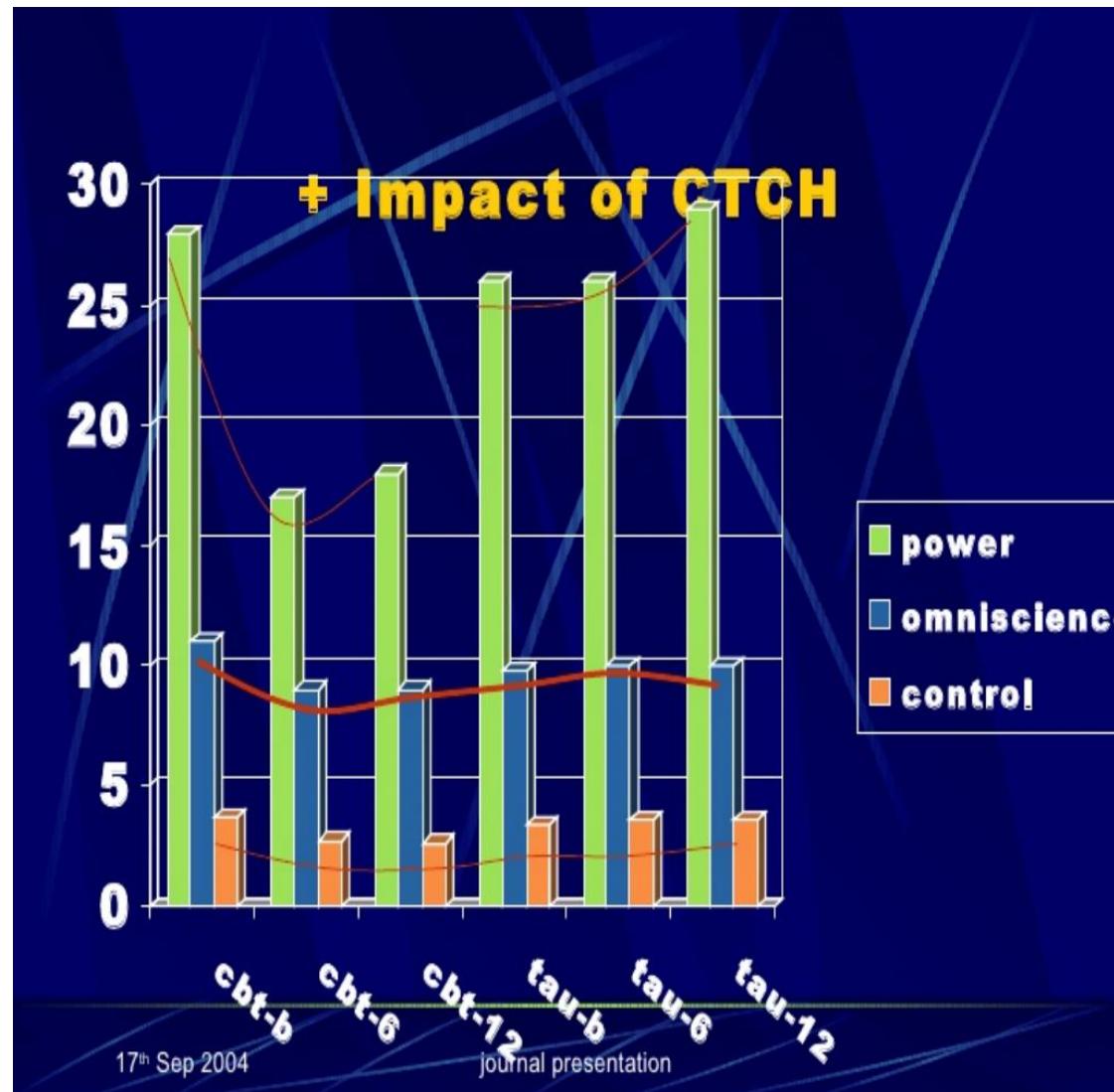
Chartjunk

no extra information

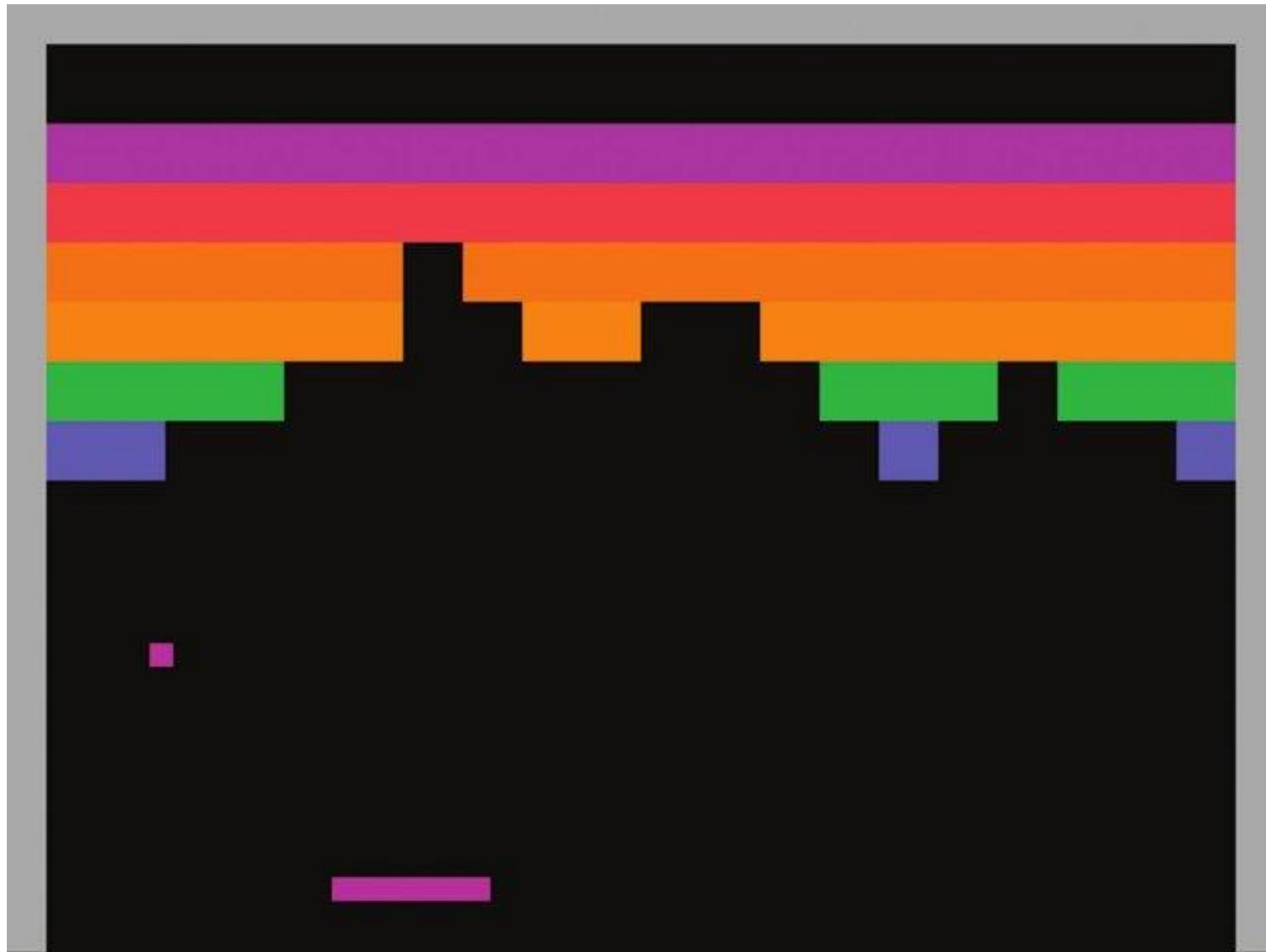


information

Argh!



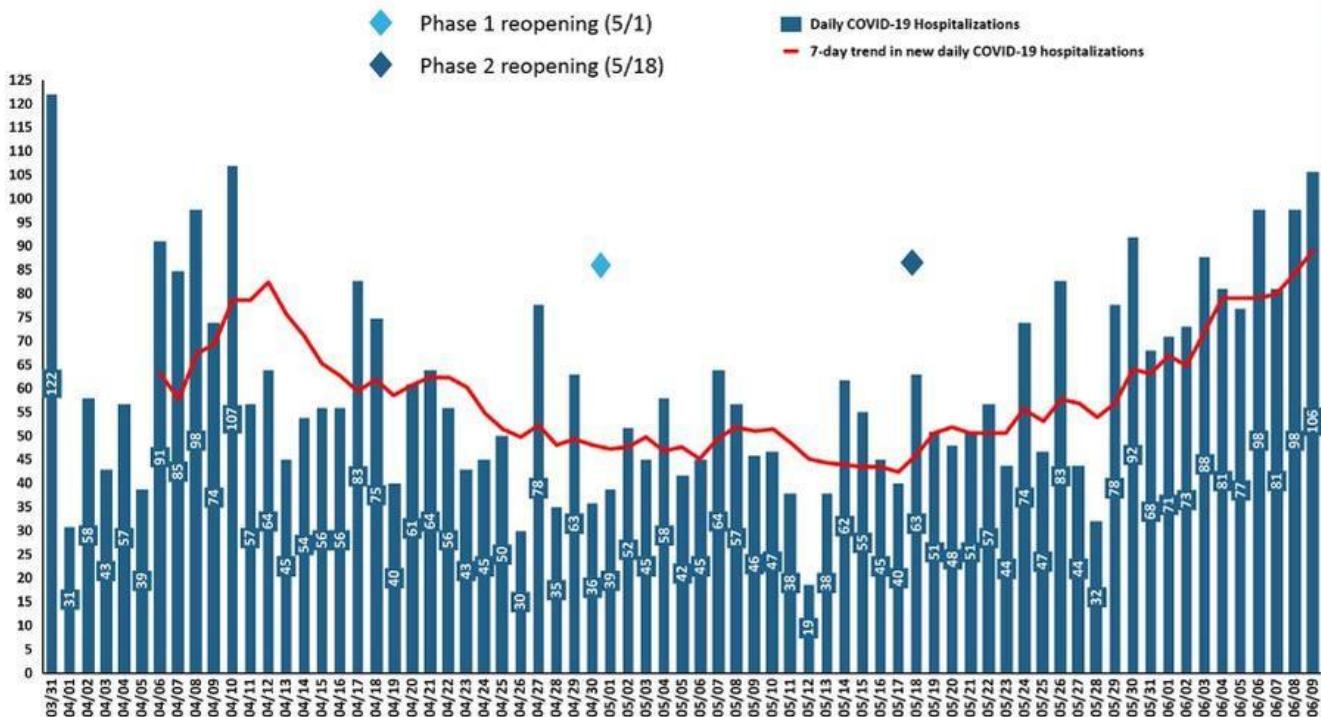
Breakout!



Redesign This!!!

TMC DAILY NEW COVID-19 HOSPITALIZATIONS

ICU & Med Surg hospitalizations



Source: TMC institution clinical census

TMC TEXAS MEDICAL CENTER

"TMC" refers to the group of individual hospitals and institutions that make up Texas Medical Center

Monitoring threshold:

Threshold is exceeded by the occurrence of a positive 7-day average growth

Current status:

4.5% average growth in the COVID-19 daily hospitalizations trend

Notes:

While new daily cases may fluctuate for a variety of reasons (e.g., testing), the daily hospitalization trend shows an objective view of how COVID-19 impacts hospital systems

This document is solely intended to share insights and best practices rather than specific recommendations. Individual institution data is shown as reported and has not been independently verified

Time to Break Out



Discuss among yourselves

Draw a redesigned version, without the
chartjunk!

Do it ONCE PER BREAKOUT GROUP

<https://bit.ly/3CB9KdM>

Meet you back in 10 minutes!



Time to Break Out



Discuss among yourselves

Draw a redesigned version, without the
chartjunk!

Do it ONCE PER BREAKOUT GROUP

<https://bit.ly/3CB9KdM>

Meet you back in 10

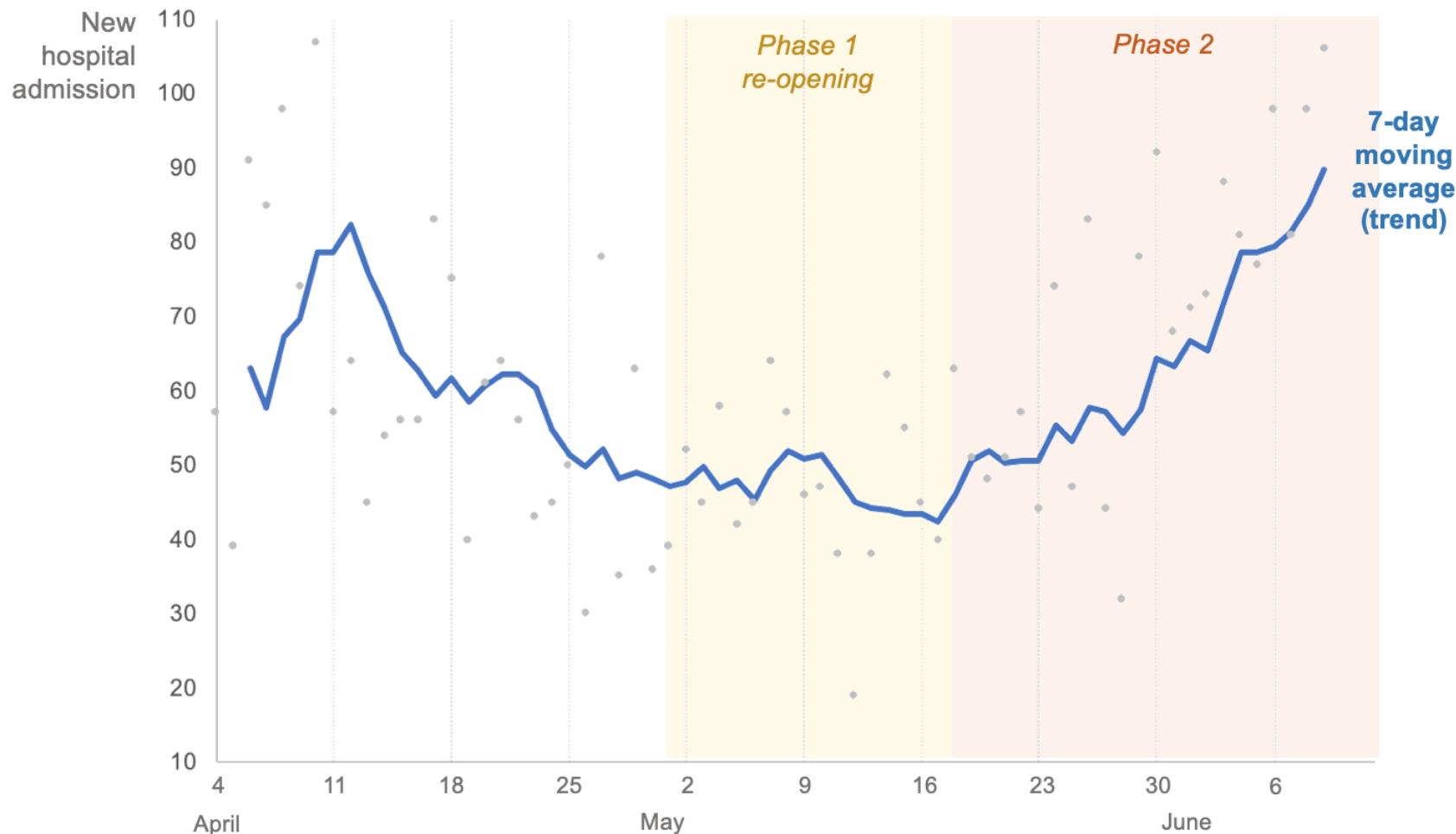


10:00

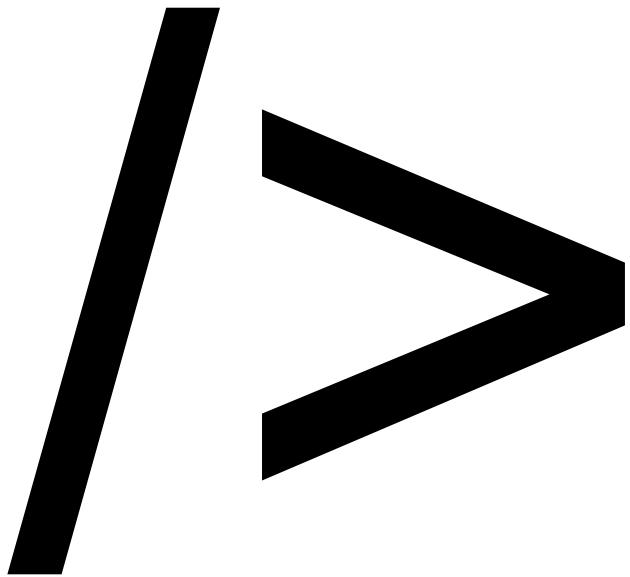
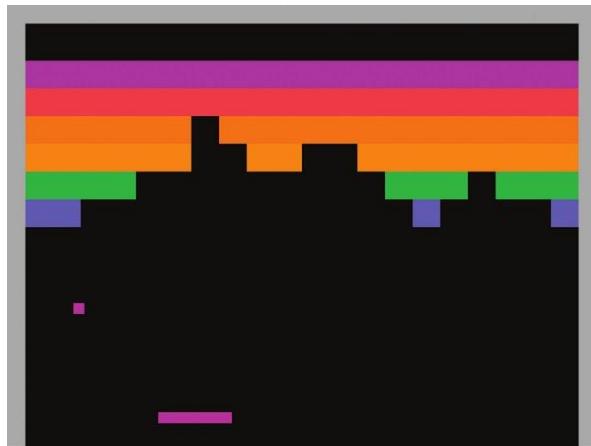
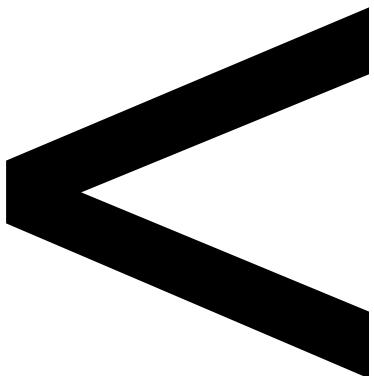
For instance...

https://junkcharts.typepad.com/junk_charts/2020/06/what-is-the-price-for-objectivity.html

After **Phase 2 re-opening**, Texas has seen a rise in new admissions to ICU and Med. Surg. in hospitals.



Breakout Over!



Chartjunk

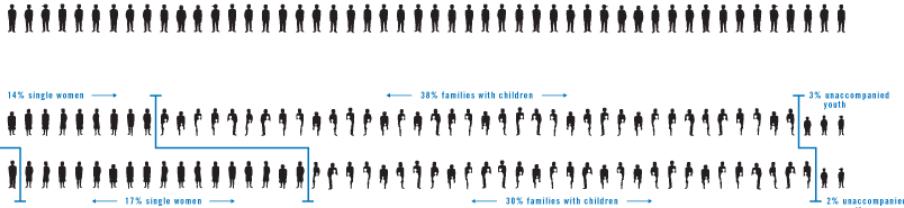
<http://www.perceptualedge.com/example15.php>

GOOD

Transparency Issue 005 Jul/Aug 07

Getting to Know the Homeless

HOMELESS POPULATION VS. NATIONAL POPULATION [2005]



ETHNICITY (BASED ON 27 CITIES) [2006]



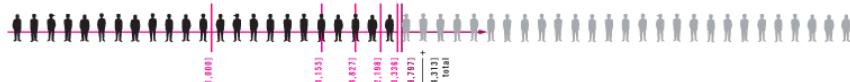
AGE GROUPS (SHELTERED)



LOCATION [2006]



TOP 5 CITIES (NATIONAL HOMELESS POPULATION: 744,313)



SHELTERED / NOT SHELTERED



TRANSPARENCY Graphical explorations of the data that surrounds us
A collaboration between GOOD and OFFICE of CC

SOURCES National Coalition For the Homeless; The United States Conference of Mayors; U.S. Department of Housing and Urban Development; University of Pennsylvania Health System

COST BENEFIT Cost of one homeless person to taxpayers per year:
\$40,500. Cost of supportive housing for one homeless person per year:
\$41,494

Chartjunk – Fixed

<http://www.perceptualedge.com/example15.php>

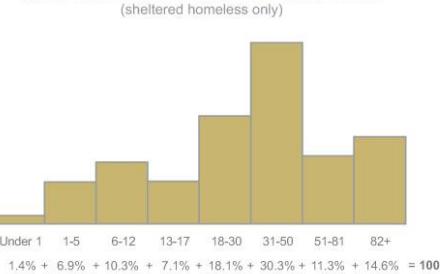
Getting to Know the Homeless

Over the course of one year, 3 million Americans (1% of the entire population) will be homeless for at least one night.
On any given day, an average of 744,313 people are homeless.

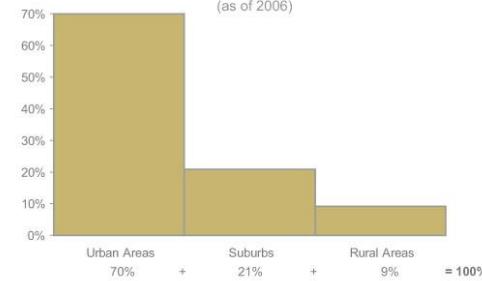
Composition is Changing



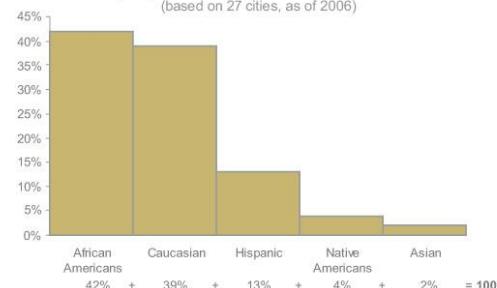
Most are in their Middle or Elder Years



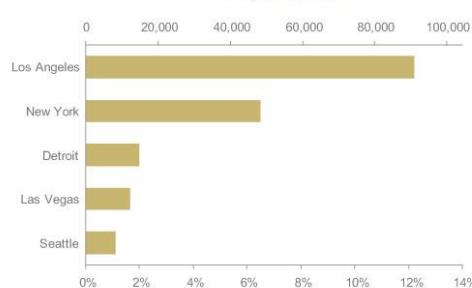
Most Live in Cities
(as of 2006)



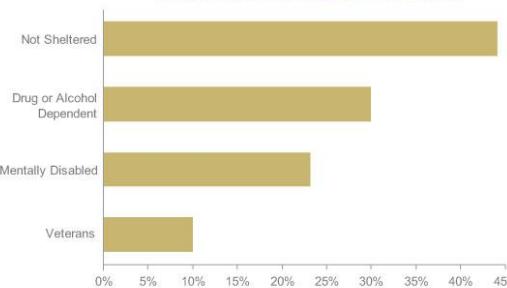
Disproportionately African American
(based on 27 cities, as of 2006)



Top 5 Cities



Other Facts About the Homeless



All percentages refer to a portion of the entire homeless population, except those corresponding to age groups, which represent only the sheltered homeless.
All information is valid as of 2005, unless otherwise indicated.

02

RULES OF THUMB

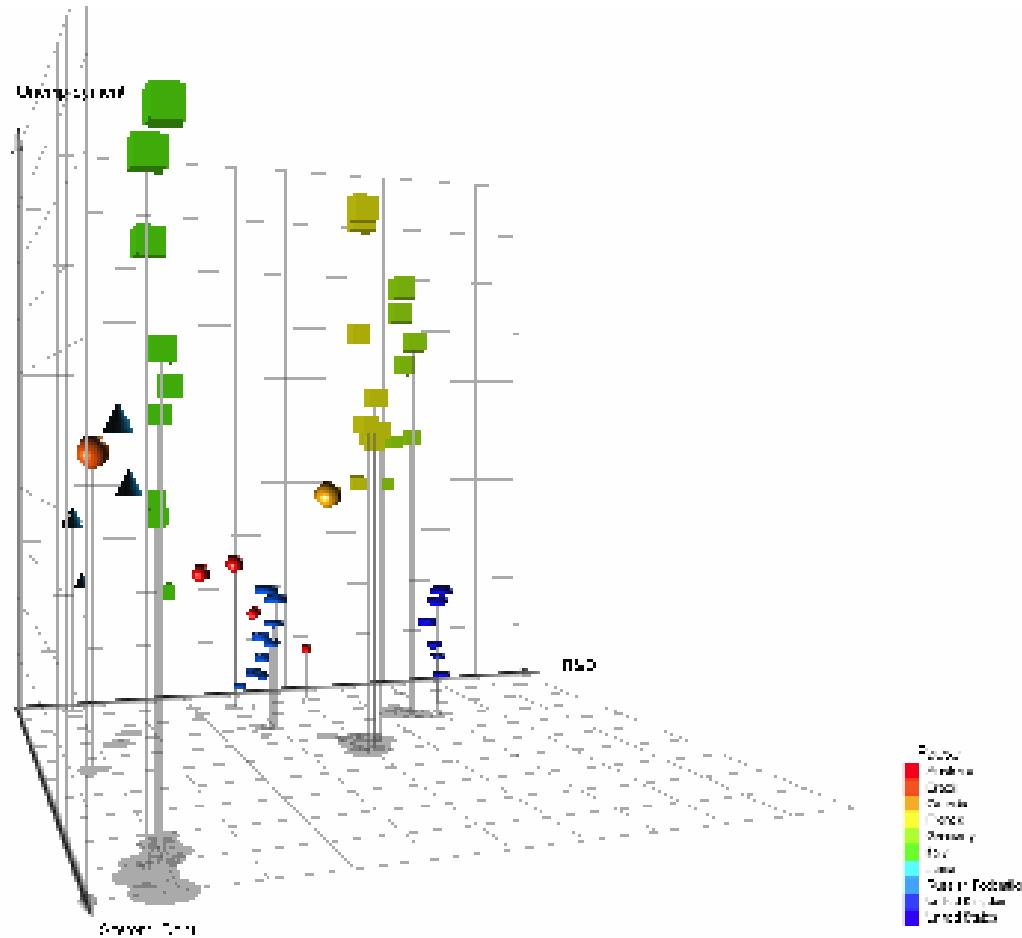
3D InfoVis... SUCKS!

Direct
Poll

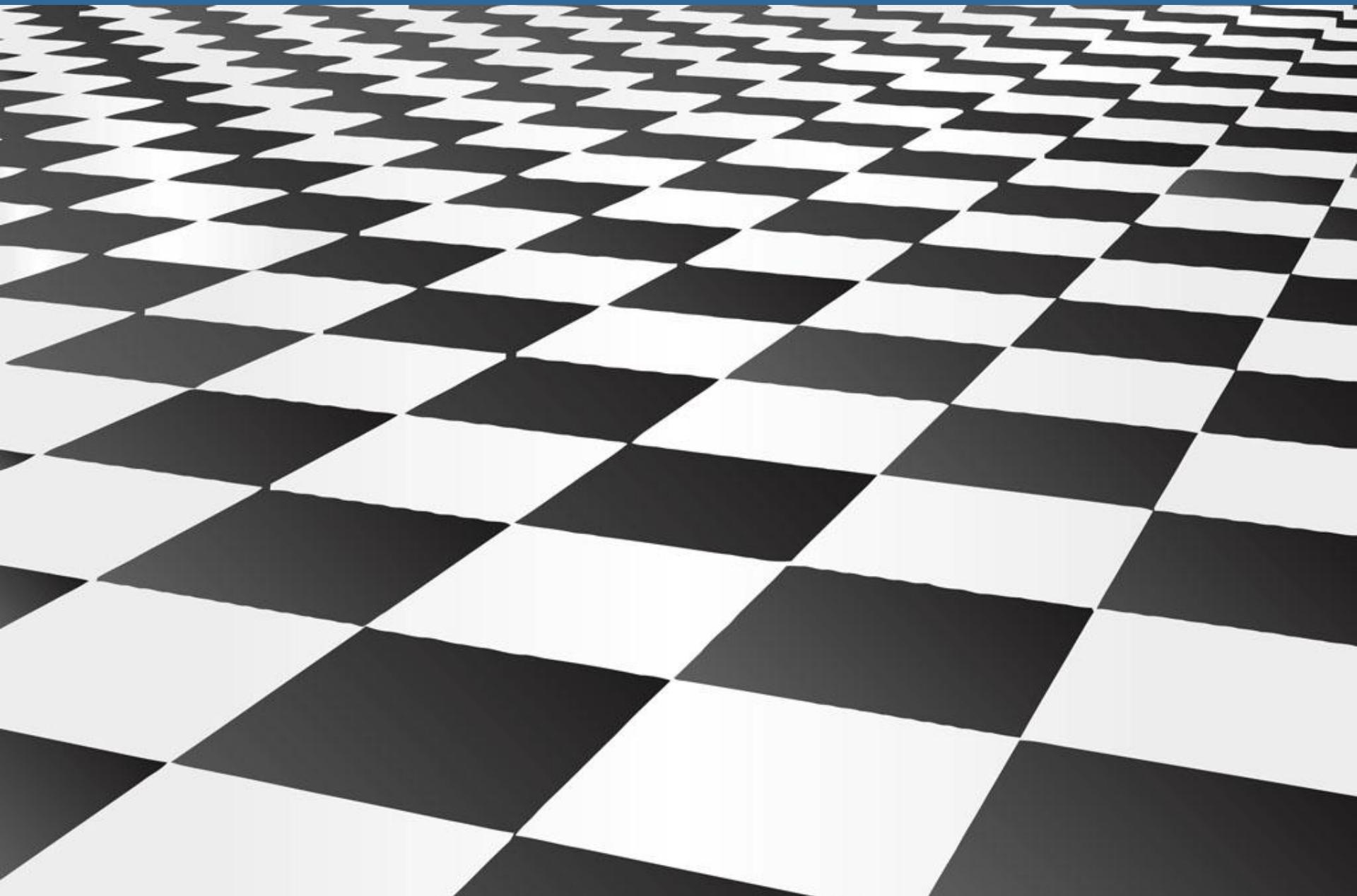


In 3D

Interaction, navigation required!



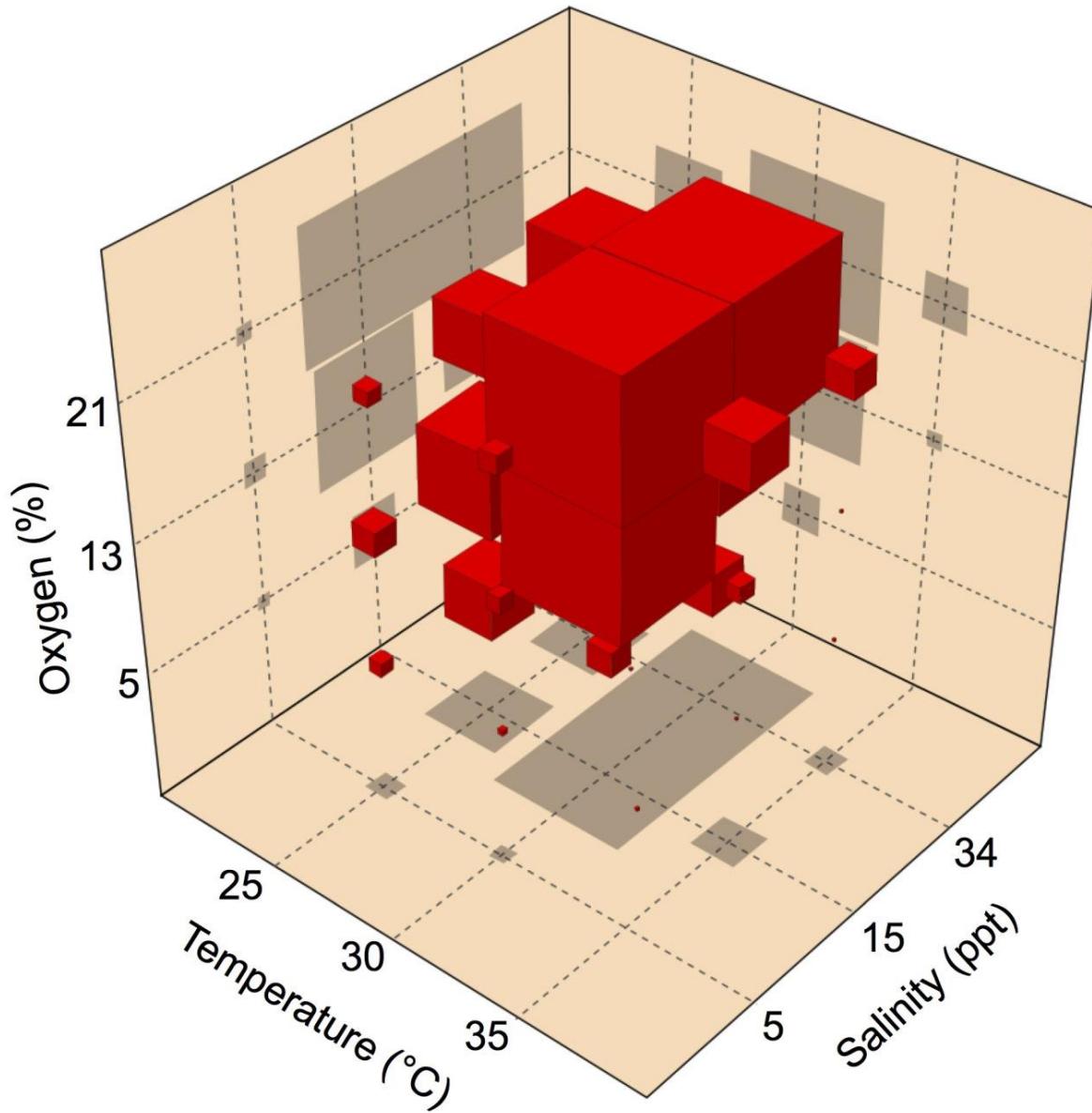
Perspective Distortion!



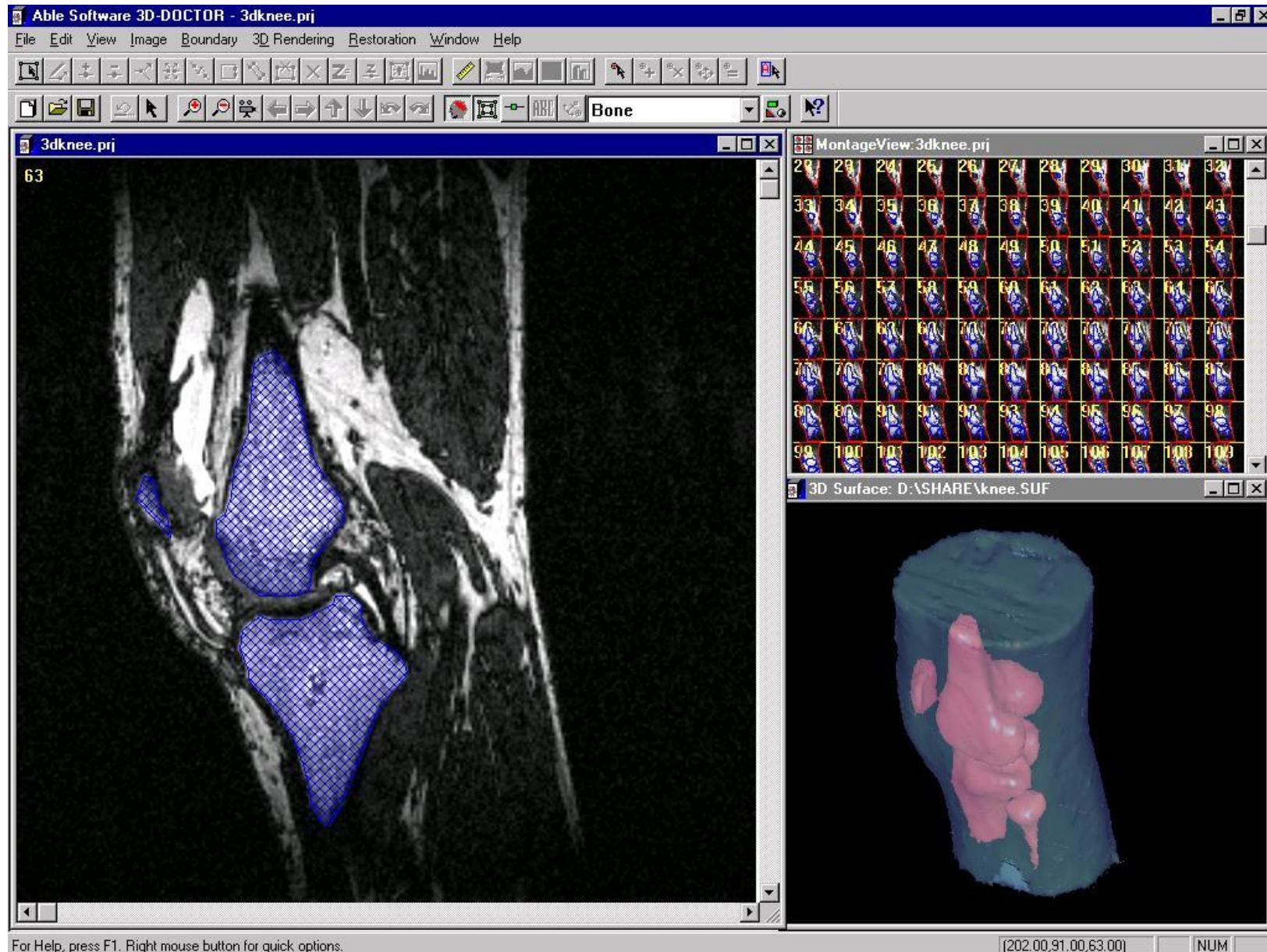
Perspective Distortion



Occlusion



Medical imaging (and other sci vis)



Maybe it will get better?



Self-Sufficiency Test

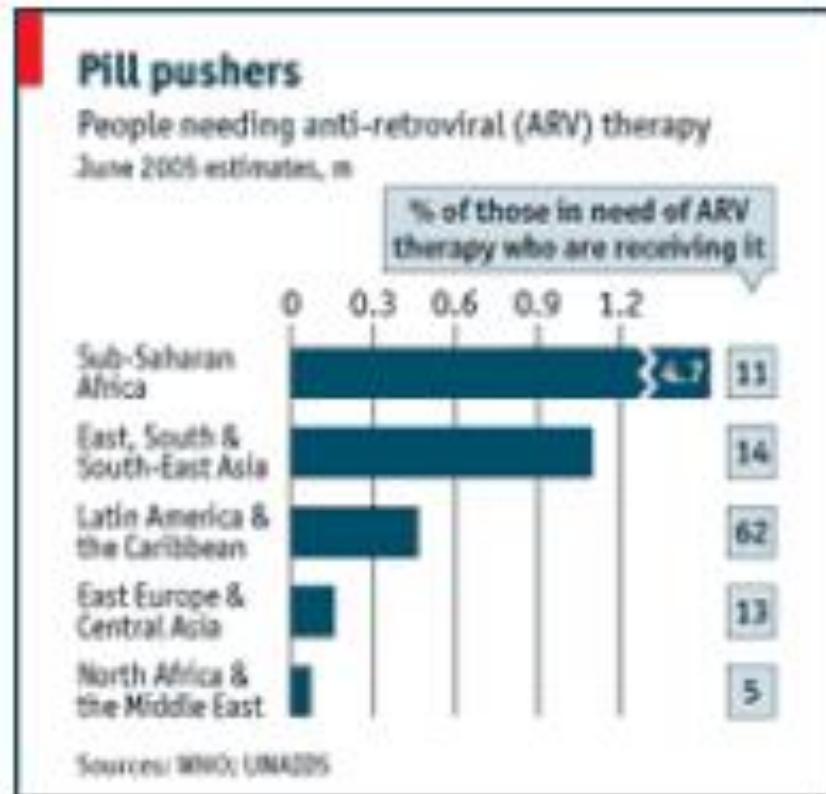
http://junkcharts.typepad.com/junk_charts/2005/10/the_selfsuffici.html

If one removes the numbers from
the graphic, can one still
understand the key messages?

Works?

Numbers Printed

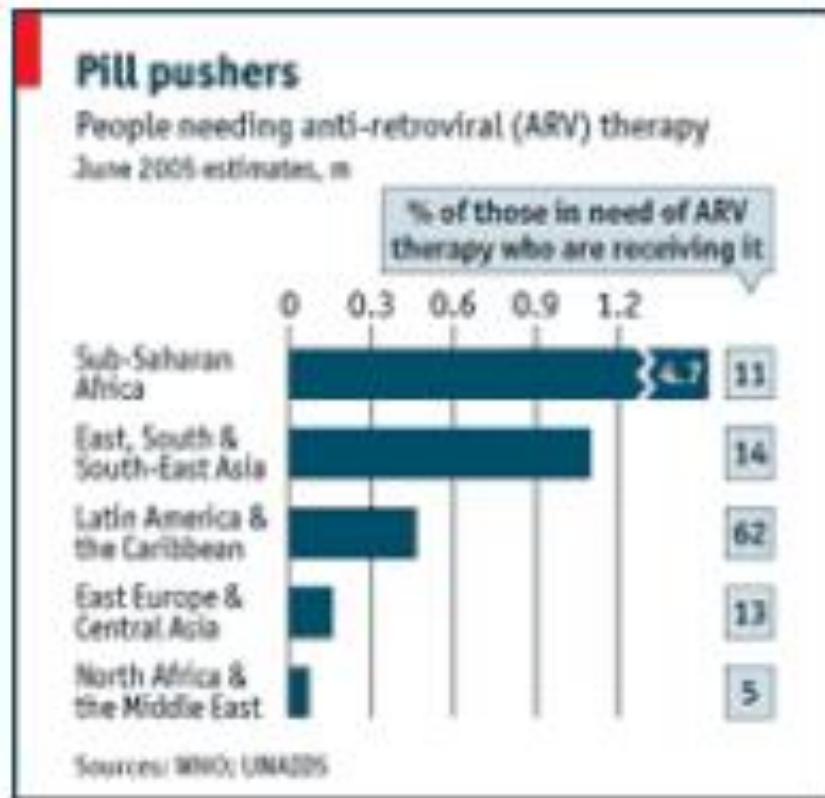
Direct
Poll



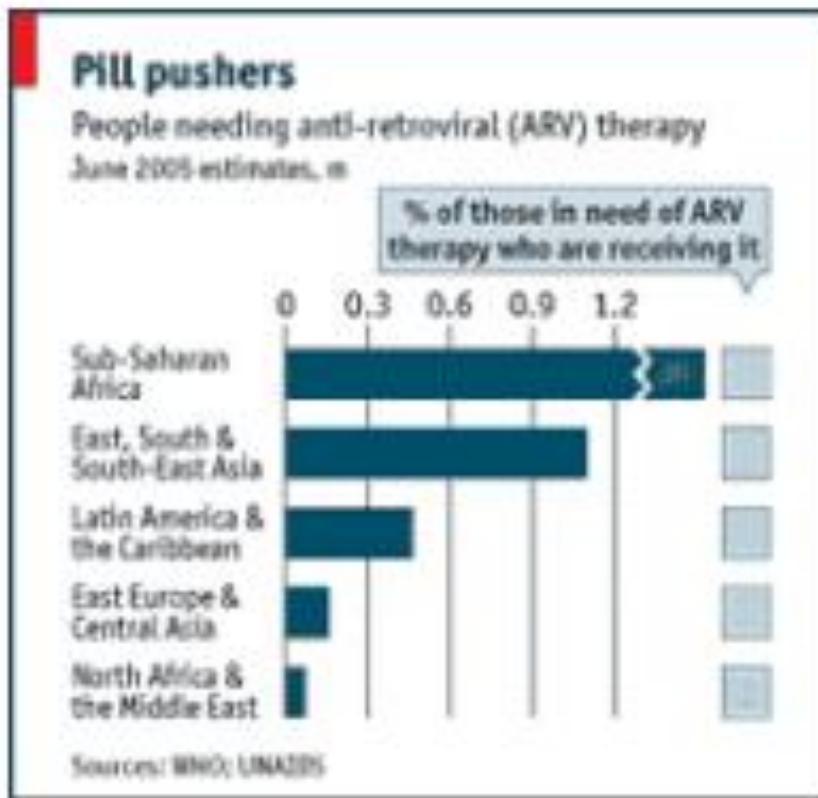
What happens to Sub-Saharan Africa?
How many % are receiving it?

Fail!

Numbers Printed



Numbers Removed



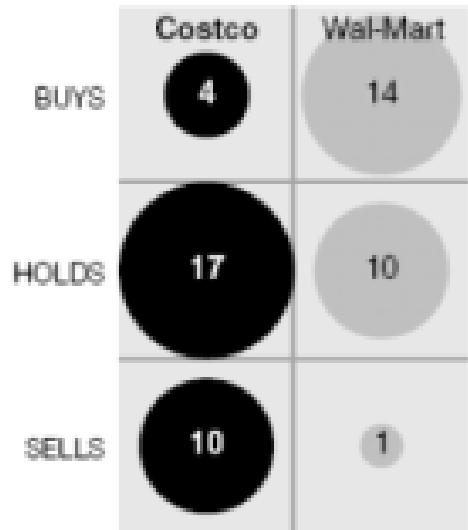
What happens to Sub-Saharan Africa?
How many % are receiving it?

Works?



Numbers Printed

ANALYST RECOMMENDATIONS



Bloomberg 12-month consensus
analysts' recommendations

Fail!

Numbers Printed

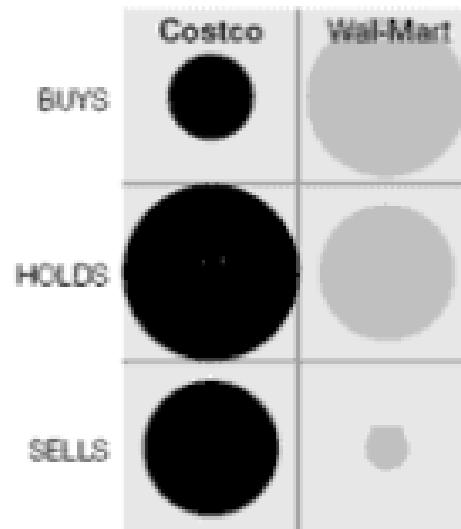
ANALYST RECOMMENDATIONS



*Bloomberg 12-month consensus
analysts' recommendations*

Numbers Removed

ANALYST RECOMMENDATIONS



*Bloomberg 12-month consensus
analysts' recommendations*

Can you tell how many of which by looking at the areas?

If you need numbers, use a table...

GDP, based on exchange rates, over time. Values in billion USDs.

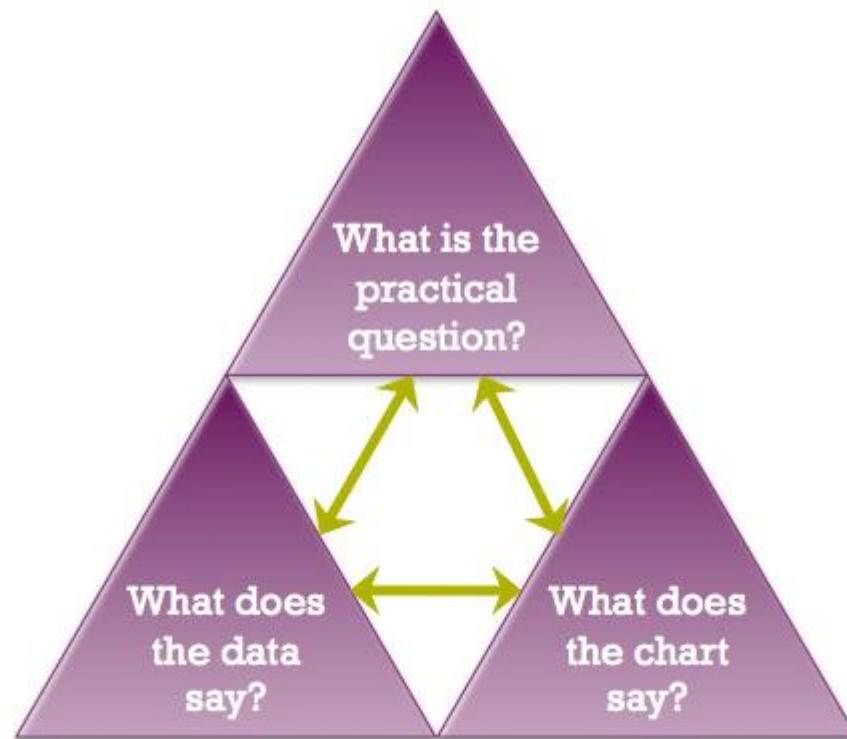
	2003	2002	2001	2000	1999	1998
USA	10,882	10,383	10,020	9,762	9,213	8,720
EU	10,970	9,040	8,303	8,234	8,901	8,889
UK	1,765	1,564	1,430	1,438	1,460	1,423
China	1,575	1,434	1,345	1,252	1,158	1,148
India	599	510	479	457	447	414

GDP, based on exchange rates, over time. Values in billion USDs.

The Trifecta Checkup

http://junkcharts.typepad.com/junk_charts/junk-charts-trifecta-checkup-the-definitive-guide.html

Junk Charts Trifecta Checkup



Three Questions

“All outstanding charts have all three elements in harmony. Typically, a problematic chart gets only two of the three pieces right.”

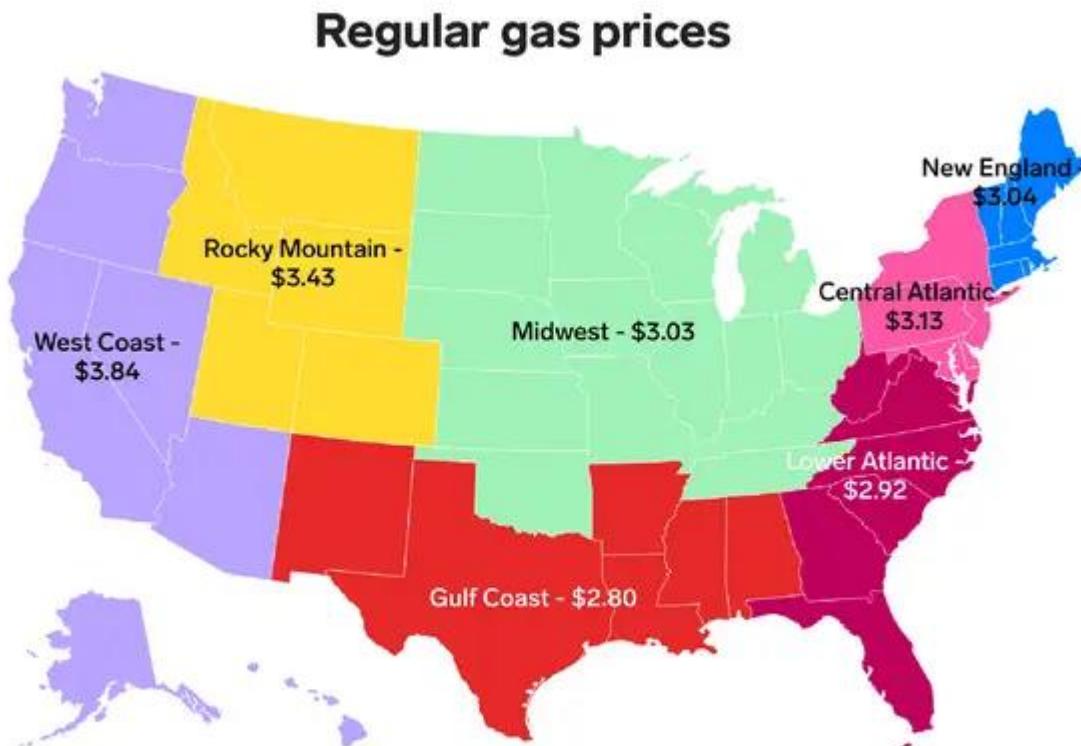
What is the QUESTION?

What does the DATA say?

What does the VISUAL say?

(and they should match)

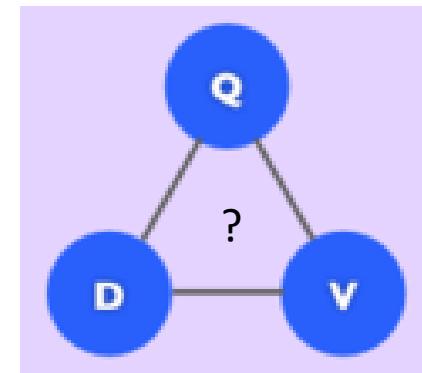
What type is this?



Map: Madison Hoff/Insider

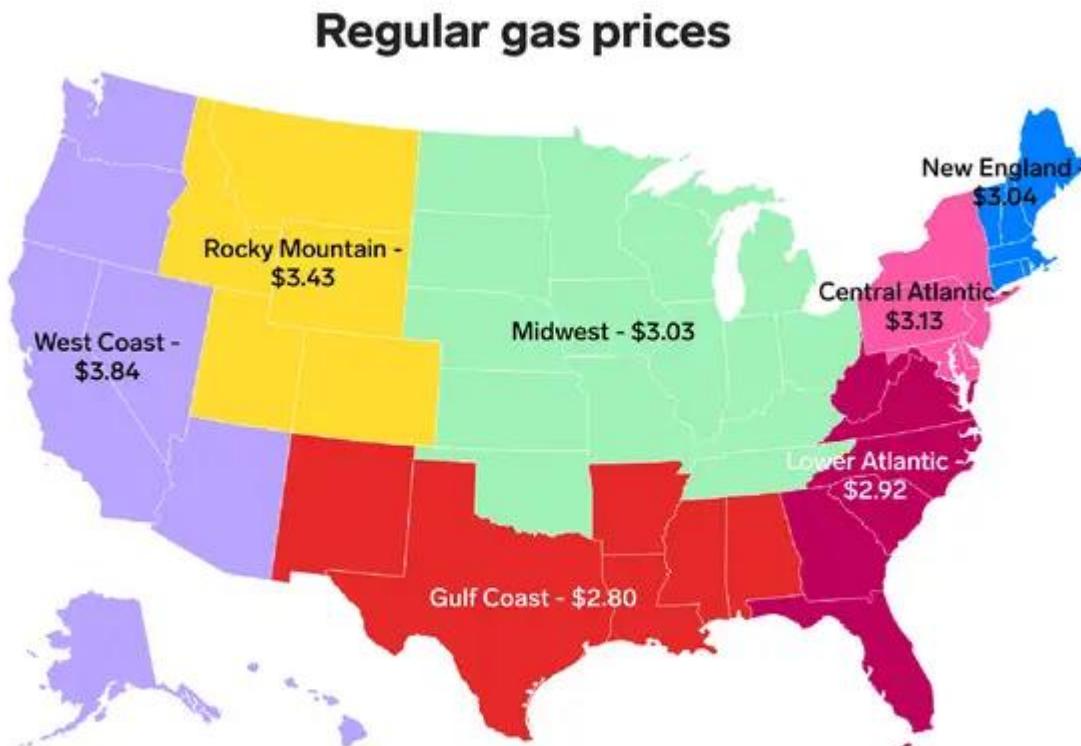
Source: US Energy Information Administration

INSIDER



What type is this?

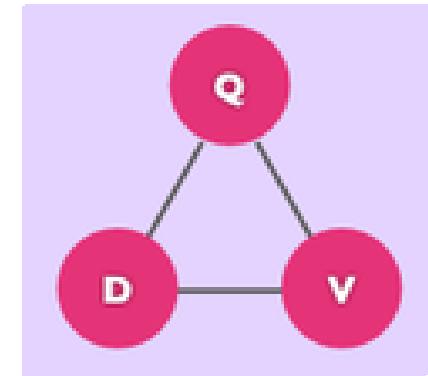
https://junkcharts.typepad.com/junk_charts/2021/07/one-of-the-most-frequently-produced-maps-is-also-one-of-the-worst.html



Map: Madison Hoff/Insider

Source: US Energy Information Administration

INSIDER

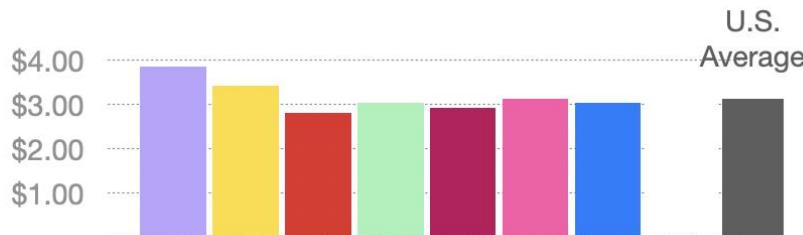


Possible fix?

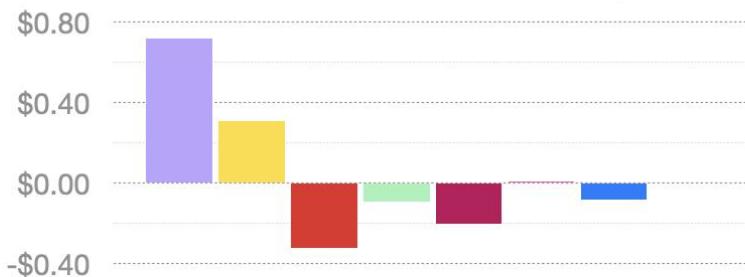
https://junkcharts.typepad.com/junk_charts/2021/07/one-of-the-most-frequently-produced-maps-is-also-one-of-the-worst.html

Regular Gas Prices, July 5 2021

Average Price by region



Above/Below U.S. Average



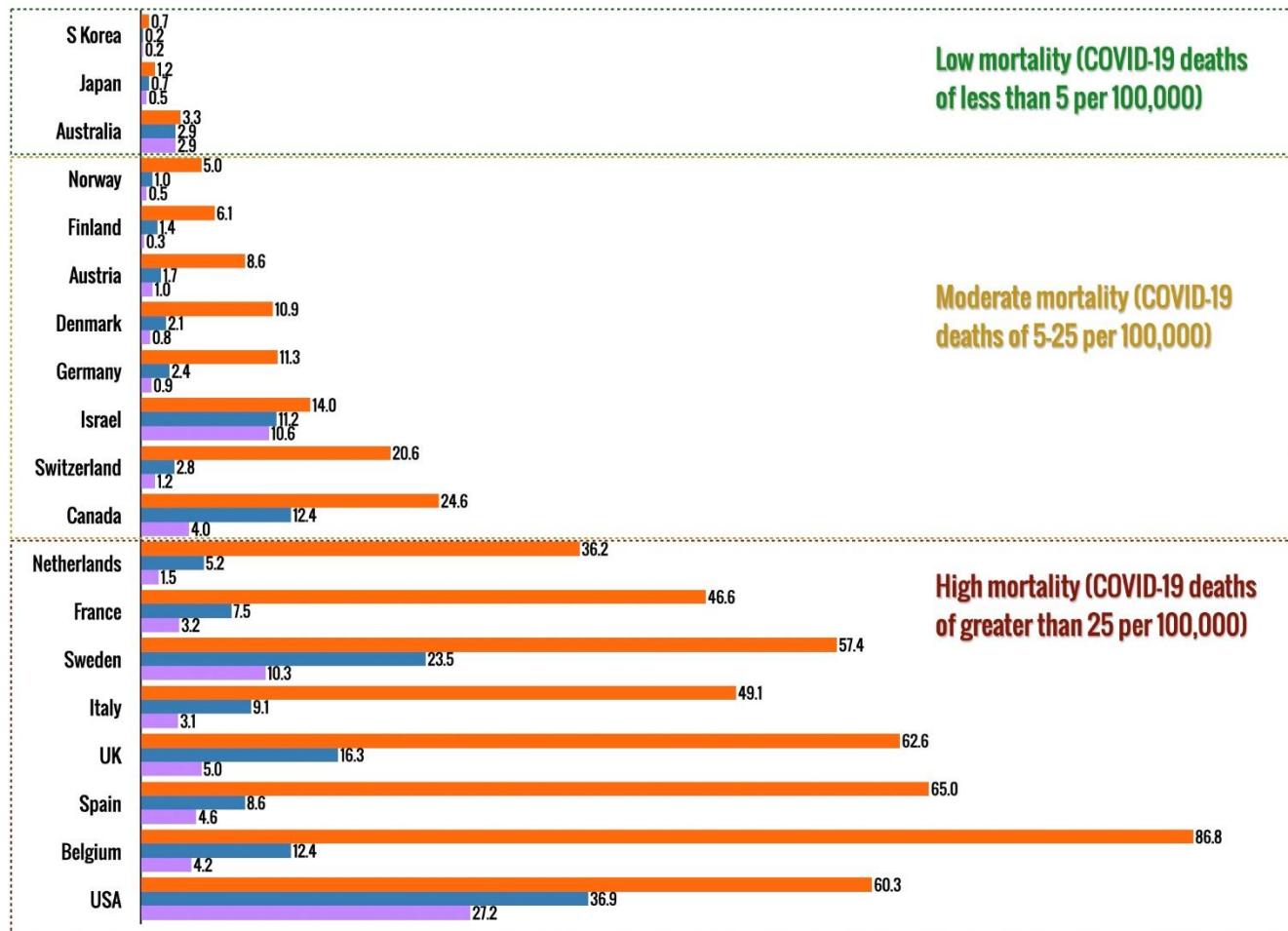
Adapted from Business Insider

Kaiser Fung / JunkCharts

What type is this?

USA COVID-19 MORTALITY COMPARED TO OTHER COUNTRIES

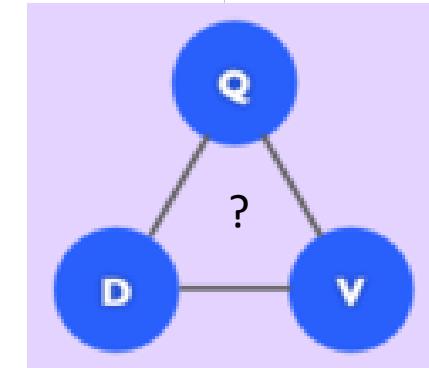
Deaths per 100,000 people



Low mortality (COVID-19 deaths of less than 5 per 100,000)

Moderate mortality (COVID-19 deaths of 5-25 per 100,000)

High mortality (COVID-19 deaths of greater than 25 per 100,000)



Direct
Poll

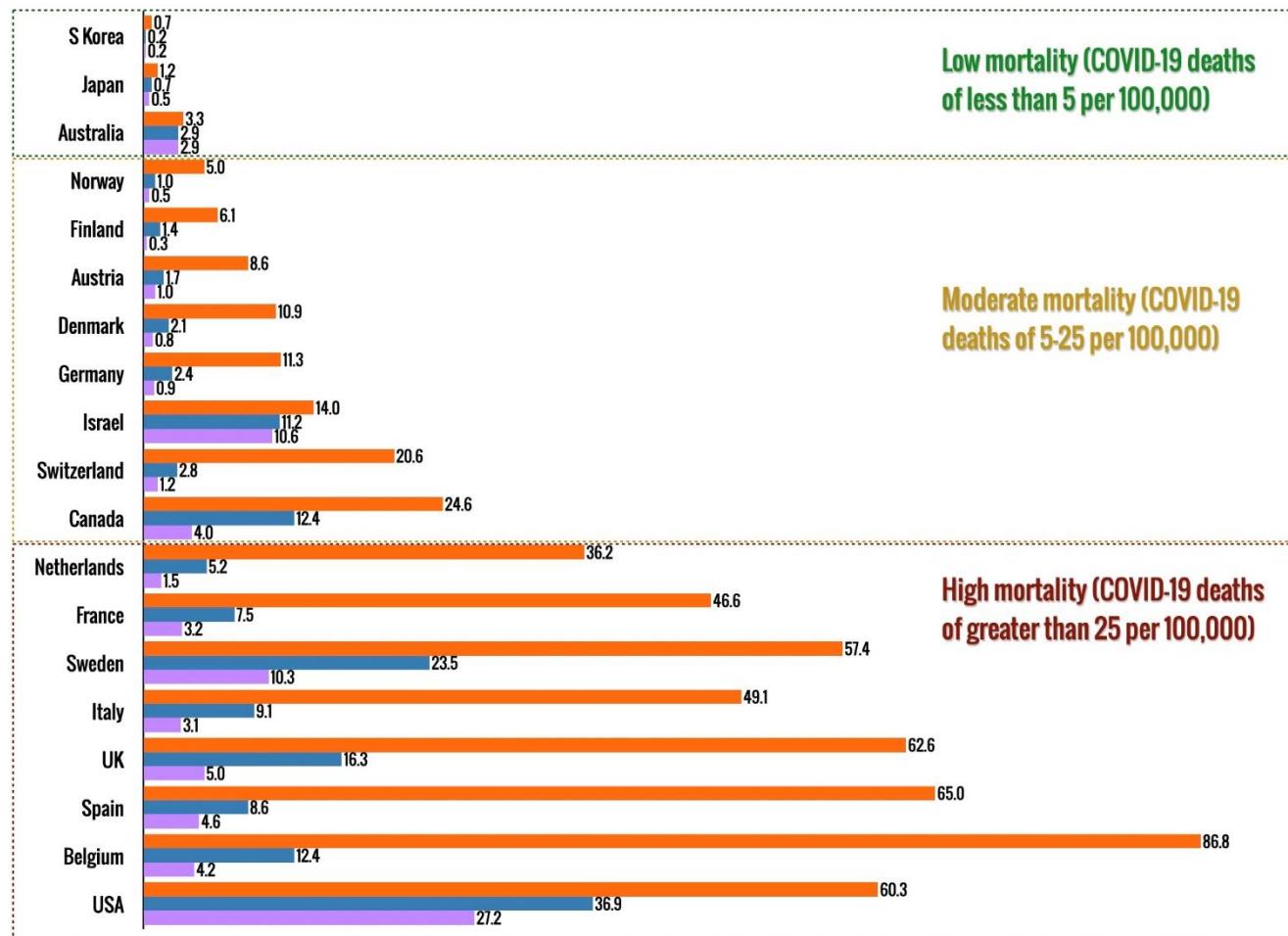


What type is this?

https://junkcharts.typepad.com/junk_charts/2020/10/visualizing-change-over-time-case-study-via-arsTechnica.html

USA COVID-19 MORTALITY COMPARED TO OTHER COUNTRIES

Deaths per 100,000 people

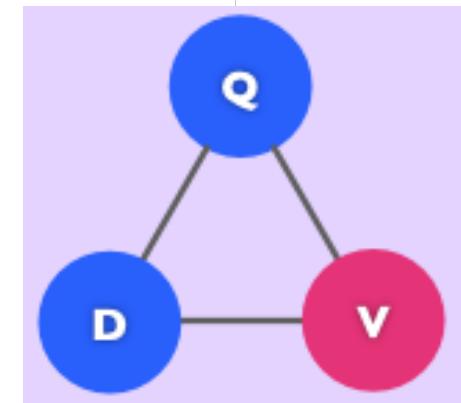


- Since pandemic start
- Since May 10
- Since June 7

Low mortality (COVID-19 deaths of less than 5 per 100,000)

Moderate mortality (COVID-19 deaths of 5-25 per 100,000)

High mortality (COVID-19 deaths of greater than 25 per 100,000)



Possible fix?

https://junkcharts.typepad.com/junk_charts/2020/10/visualizing-change-over-time-case-study-via-arsTechnica.html

Nations Ranked by COVID19 Deaths per 100,000

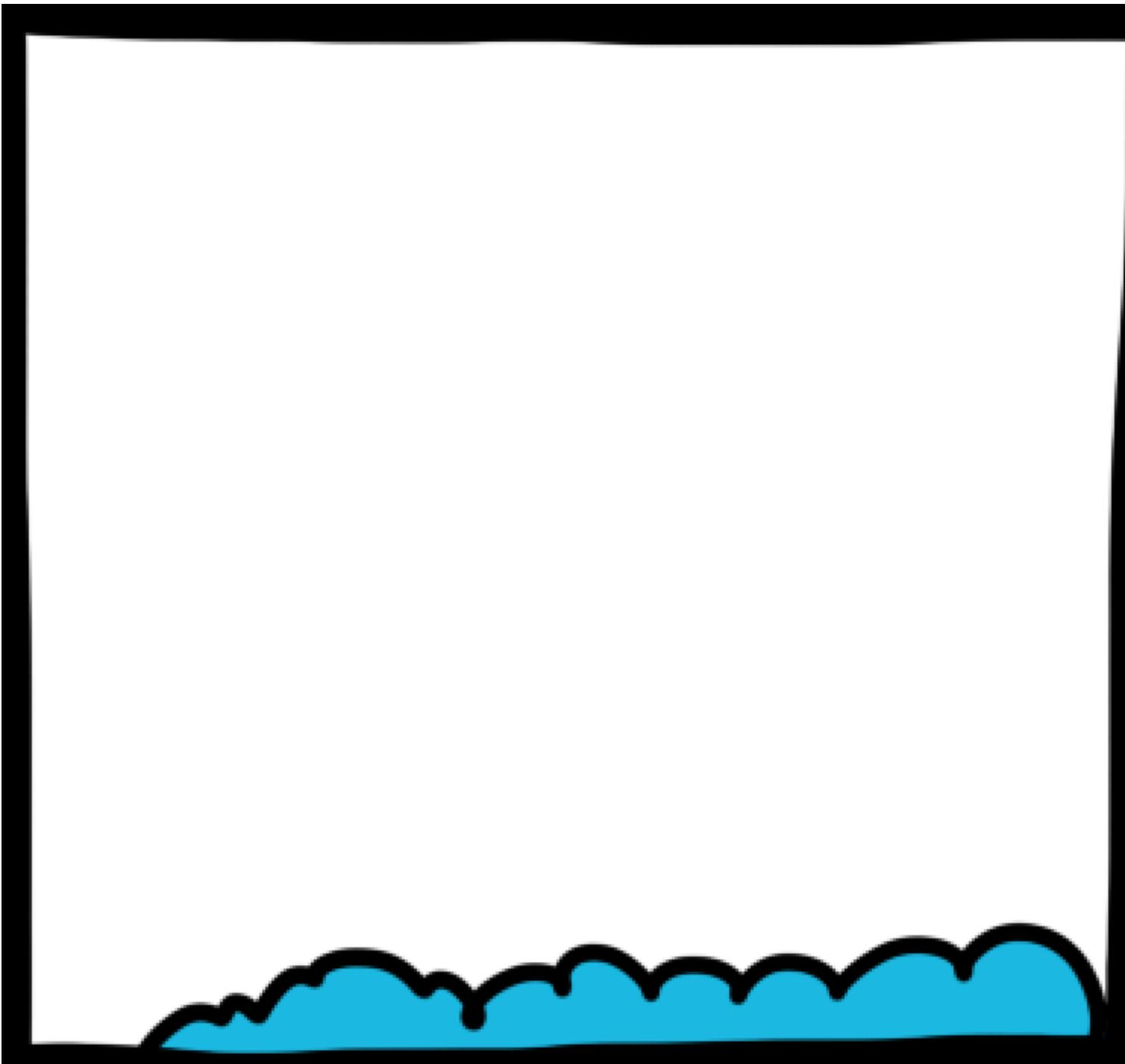


USA has suffered the worst COVID19 mortality rate in the most recent period -- 25 deaths per 100,000 is more than double that of the other countries.

USA, Israel and Sweden have slid down the league table as other countries have reduced mortality to below 5 deaths per 100,000 over the course of the pandemic.

A cartoon illustration of a bald man with a large, bulbous nose. He is wearing a green turban and a purple feather. He has a mustache and is holding a white rectangular sign with both hands. The sign contains the text "THERE WILL NOW BE A BRIEF INTERMISSION".

**THERE WILL
NOW BE A
BRIEF
INTERMISSION**





THERE WILL
NOW BE A
BRIEF
INTERMISSION

GOOD or EVIL?



Exhibit A

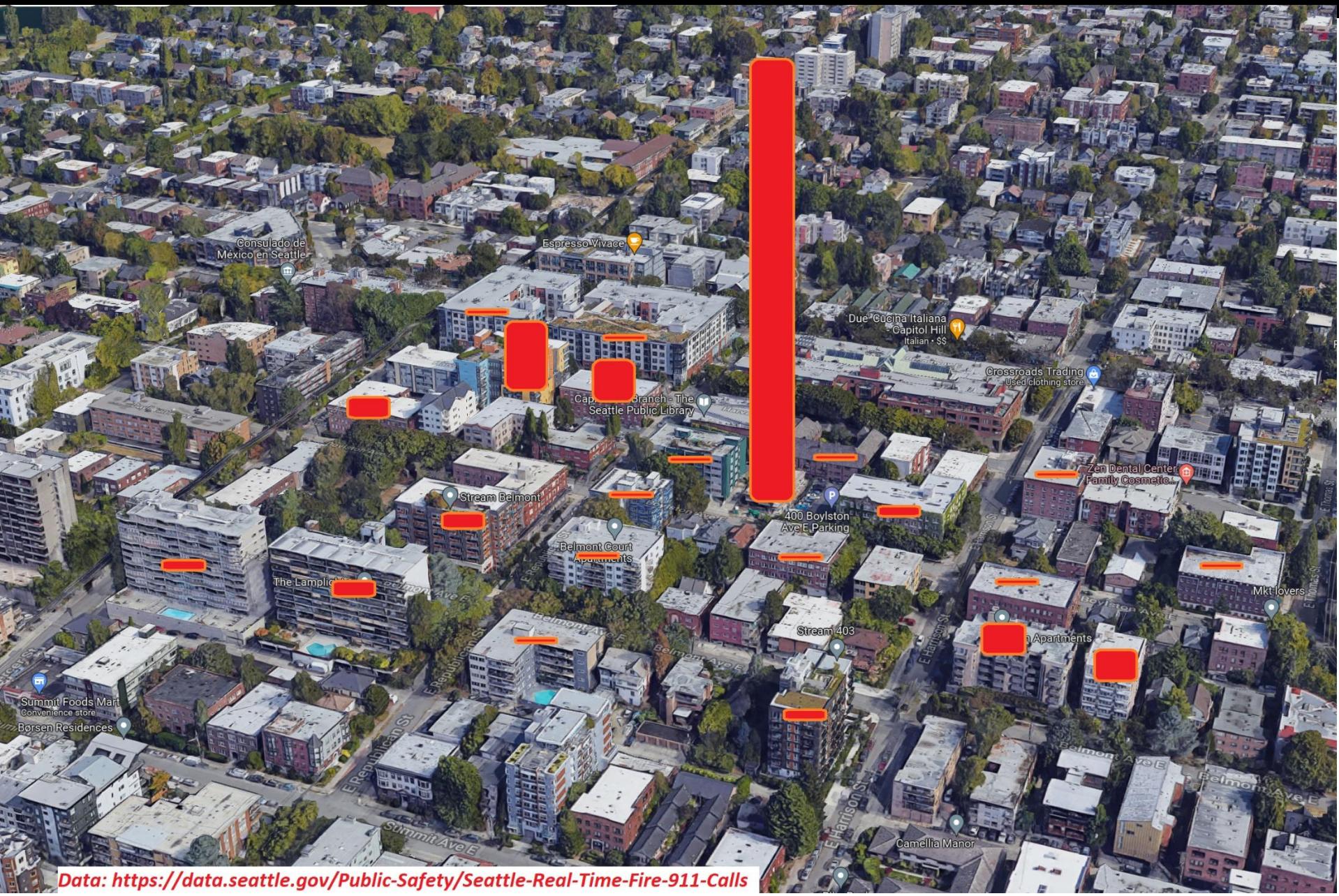


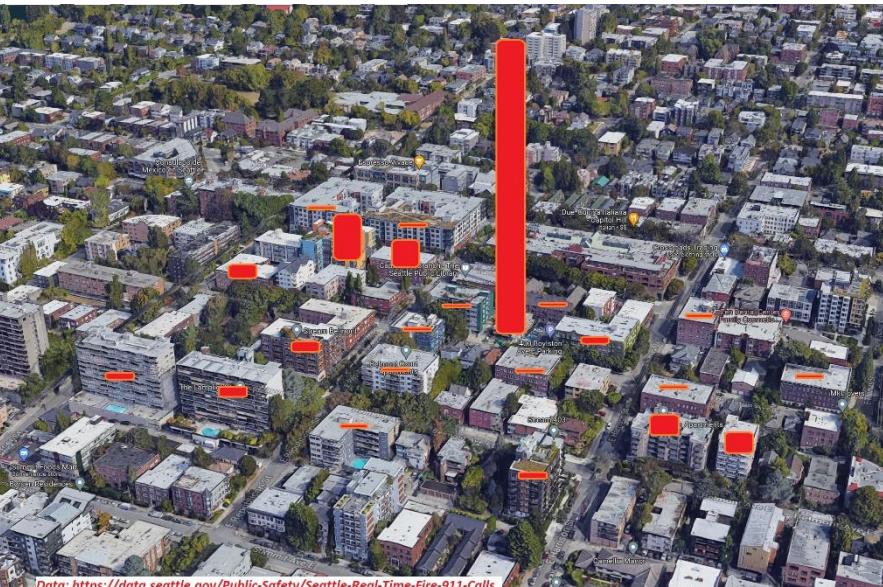
Exhibit B

<https://www.eater.com/2016/9/26/13051528/most-ordered-food-delivery-america>



All Together Now!

A



B



03

KEEPING IT TRUE

Infovis is a Superpower



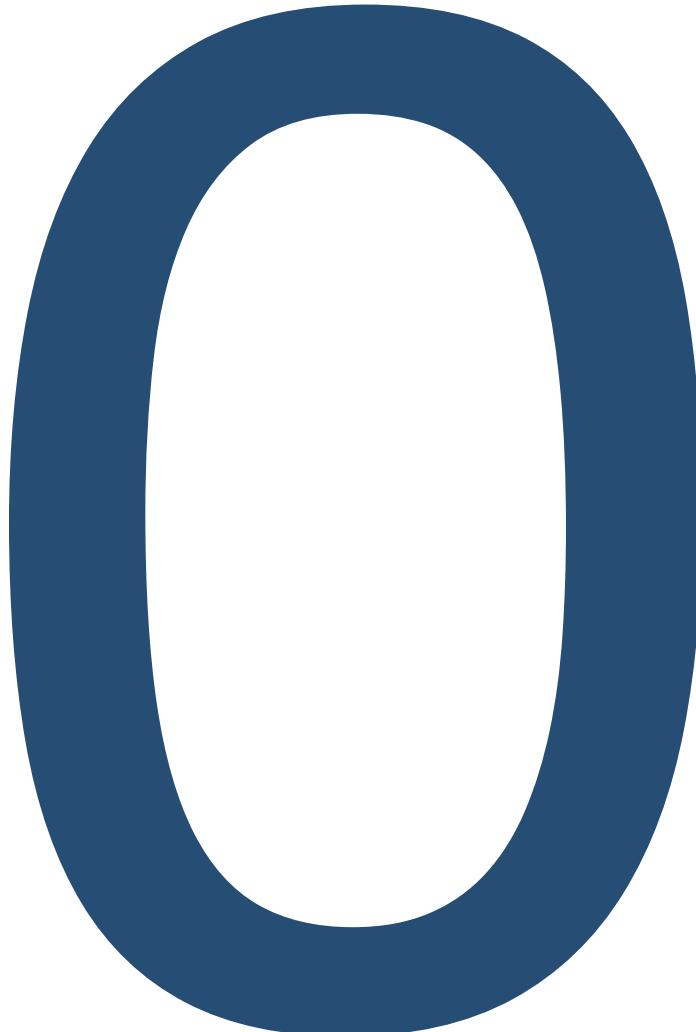
Don't use it for evil!



1. Don't Distort the Truth

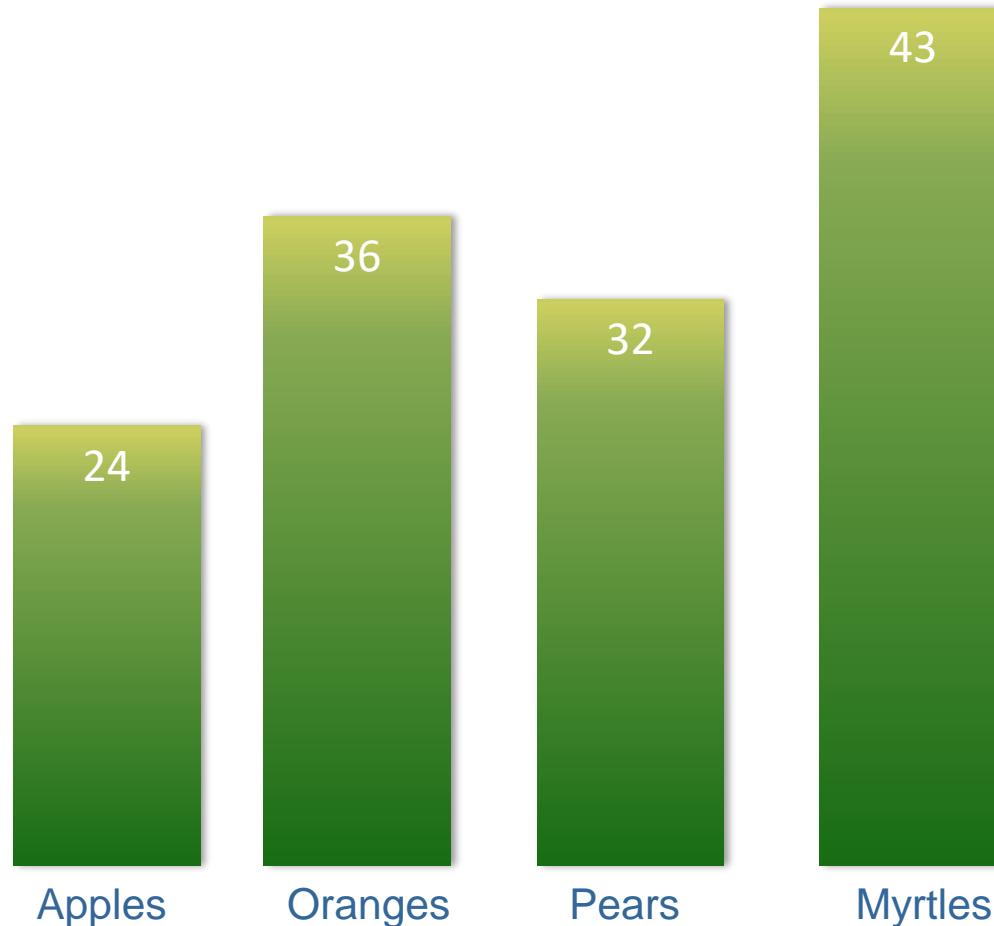
DON'T LIE!

Scales start at ZERO!

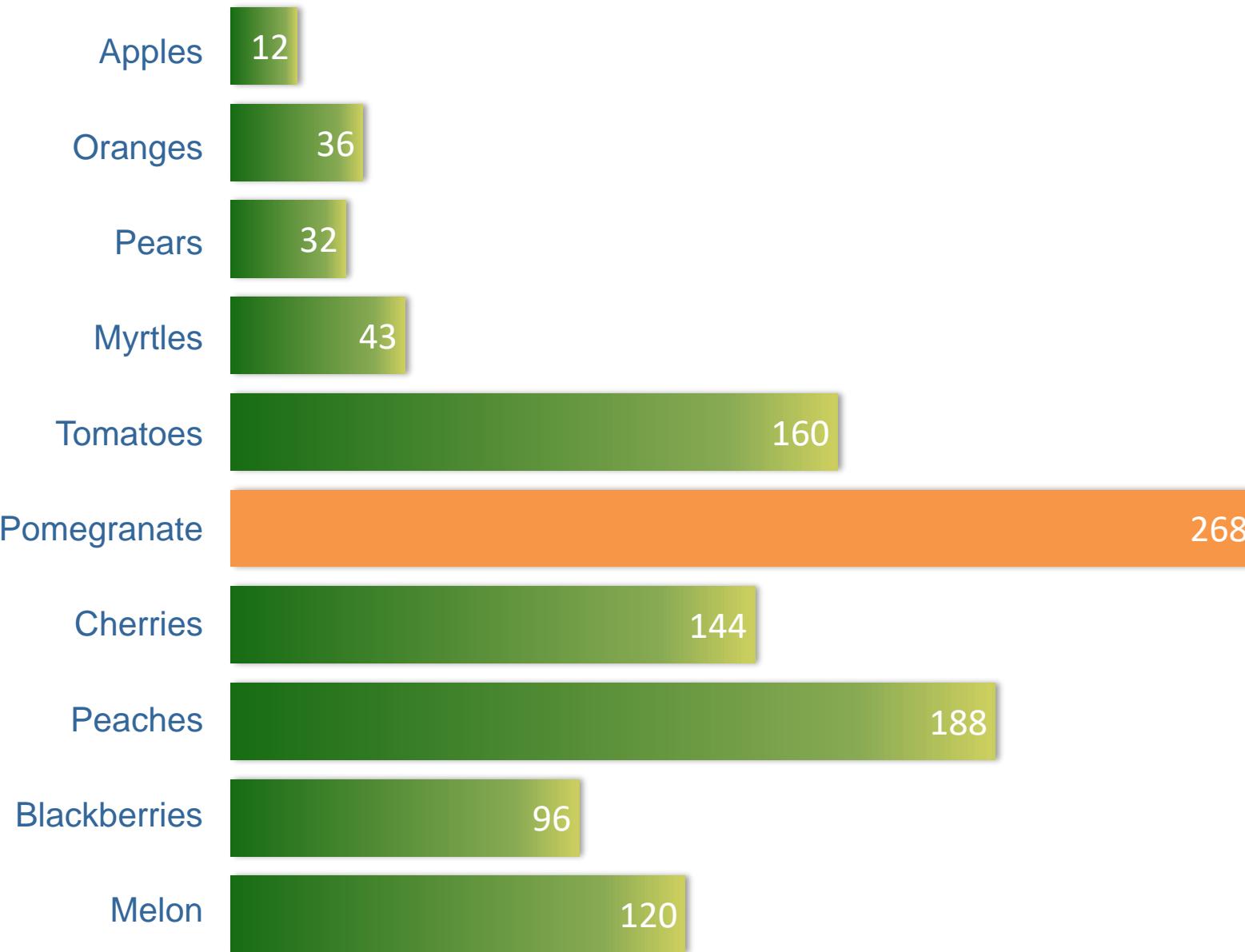


2. Show Data in Context

Myrtles are selling really well, right?



Show data in context!



3. The vis only shows what it shows

How are they Lying?

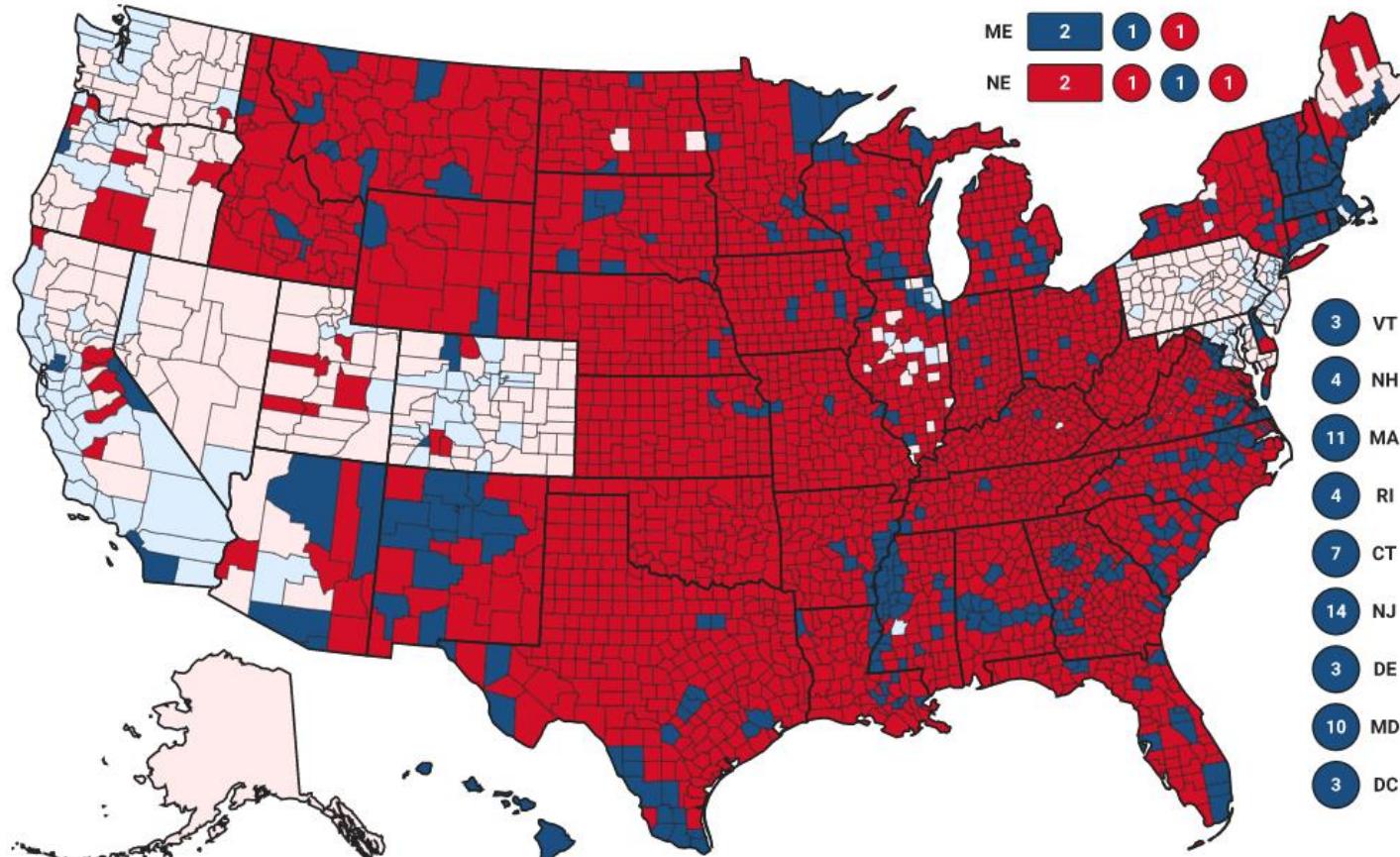
<https://www.foxnews.com/elections/2020/general-results>

Direct
Poll

2020 Live ▾

States

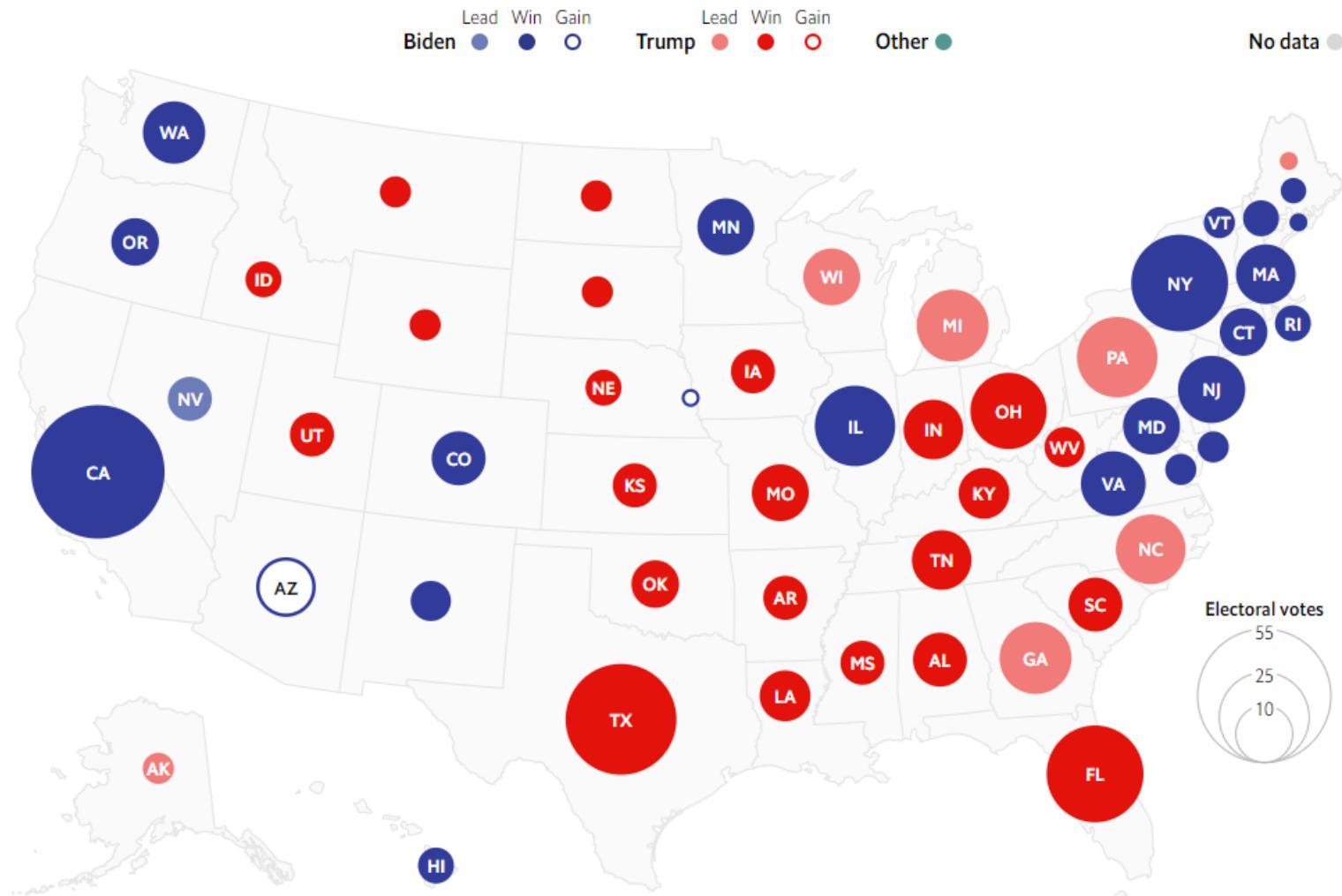
Counties



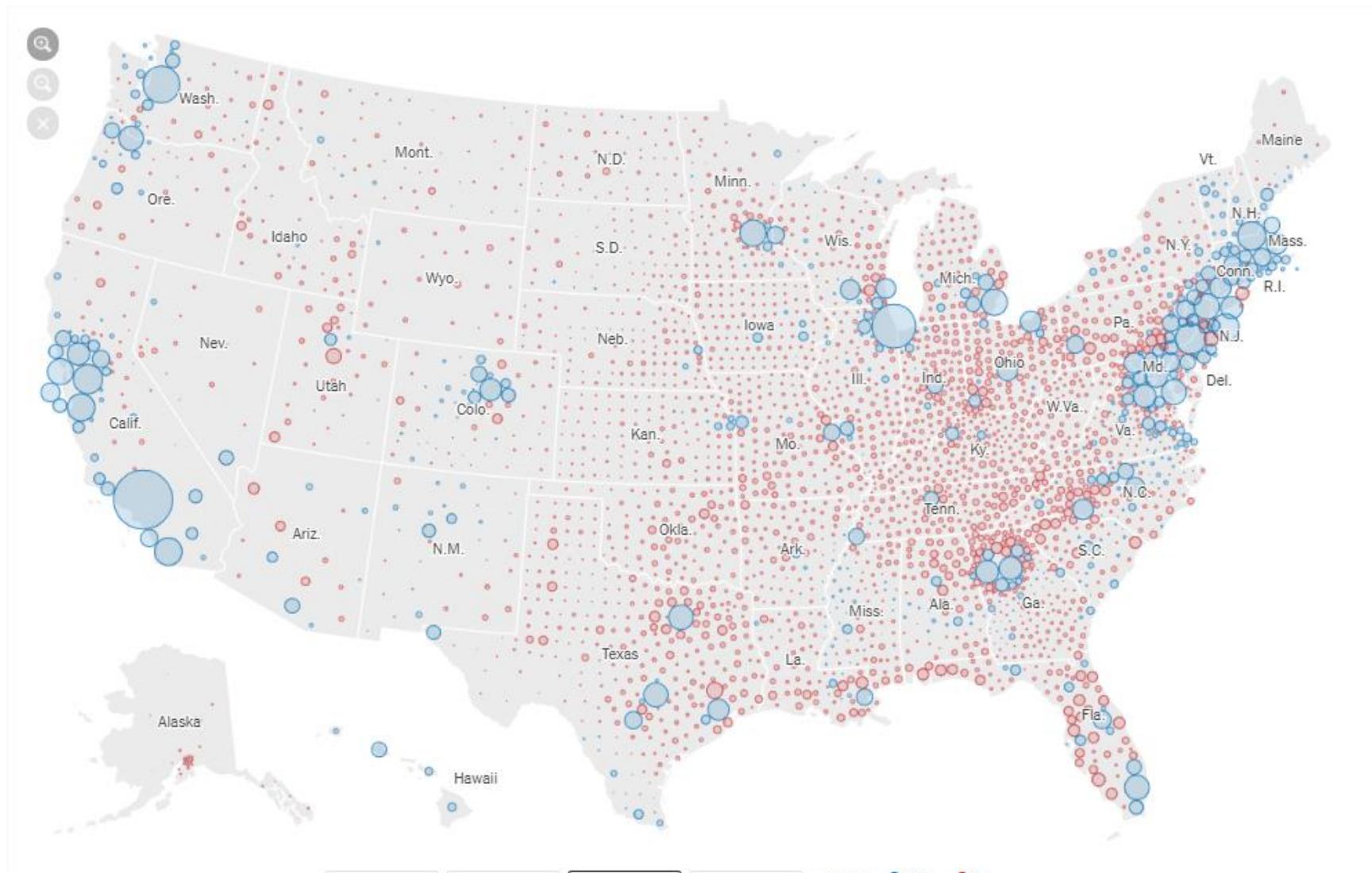
Maine and Nebraska allocate their Electoral Votes using the Congressional District Method. Two votes go to the overall state vote outcome and one vote is allocated to each district.

leading ○○ declared ●●

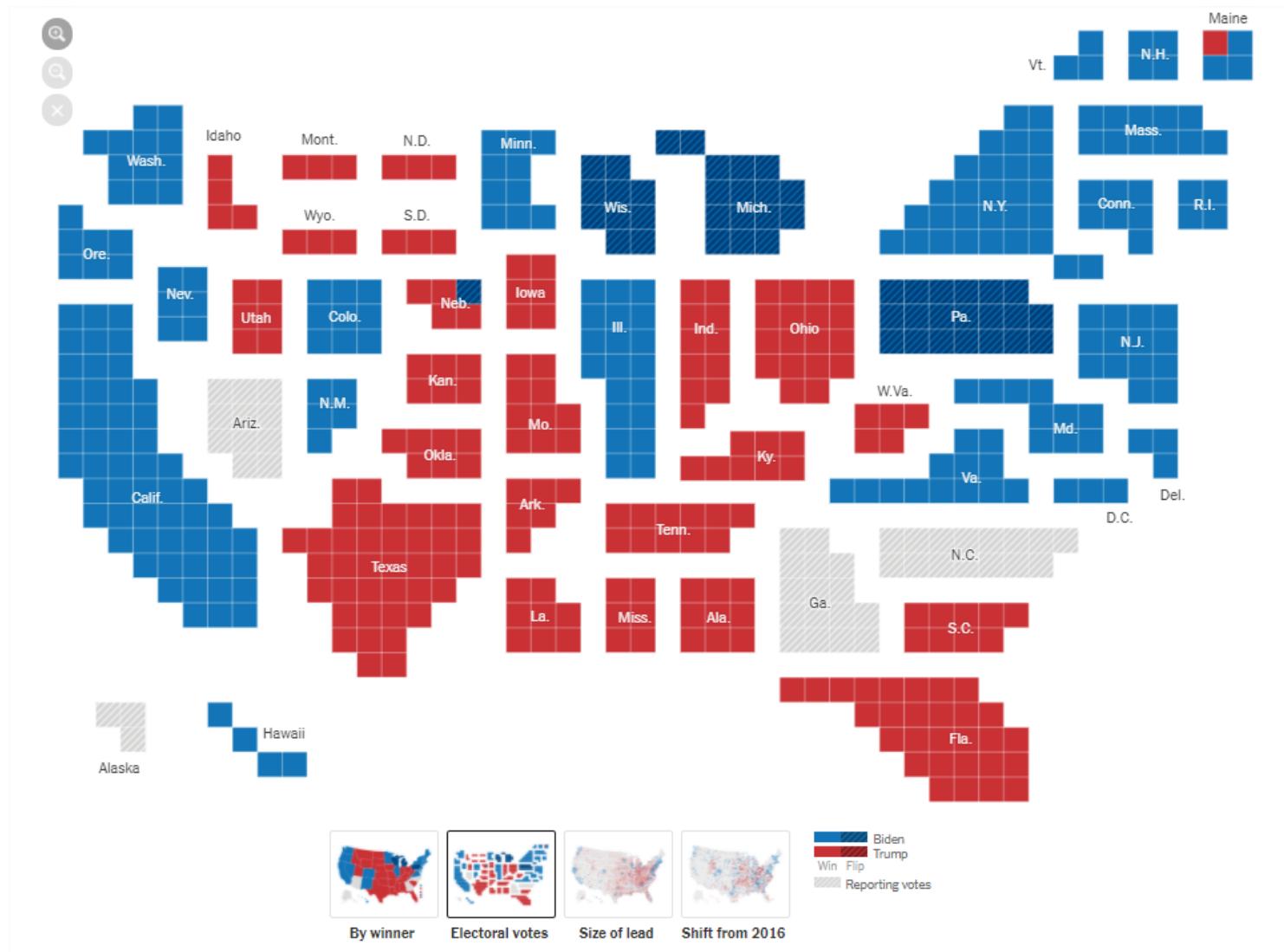
One possible fix...



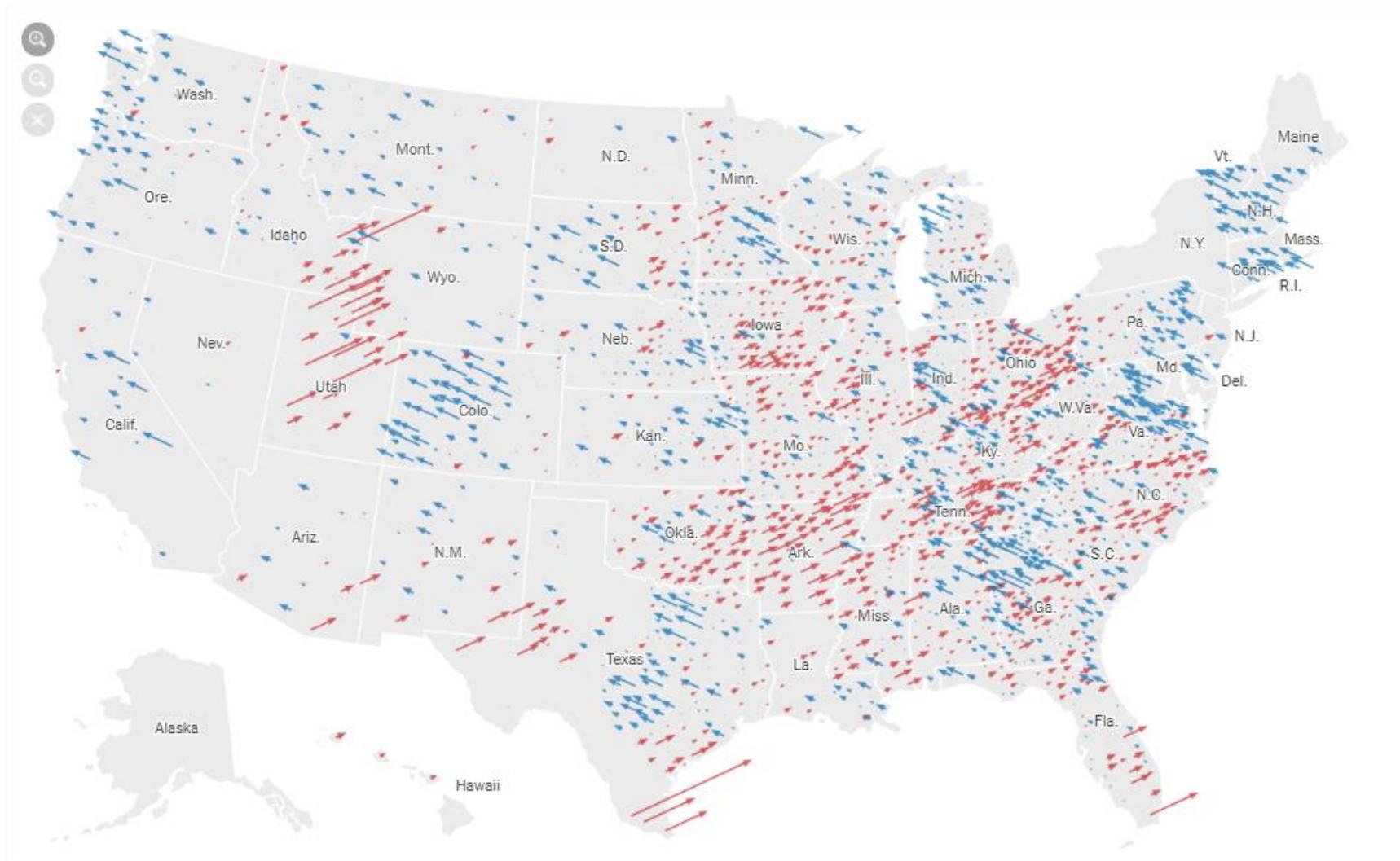
Alternative (NYT)



Show what it needs to show! (NYT)



How it evolved (NYT)

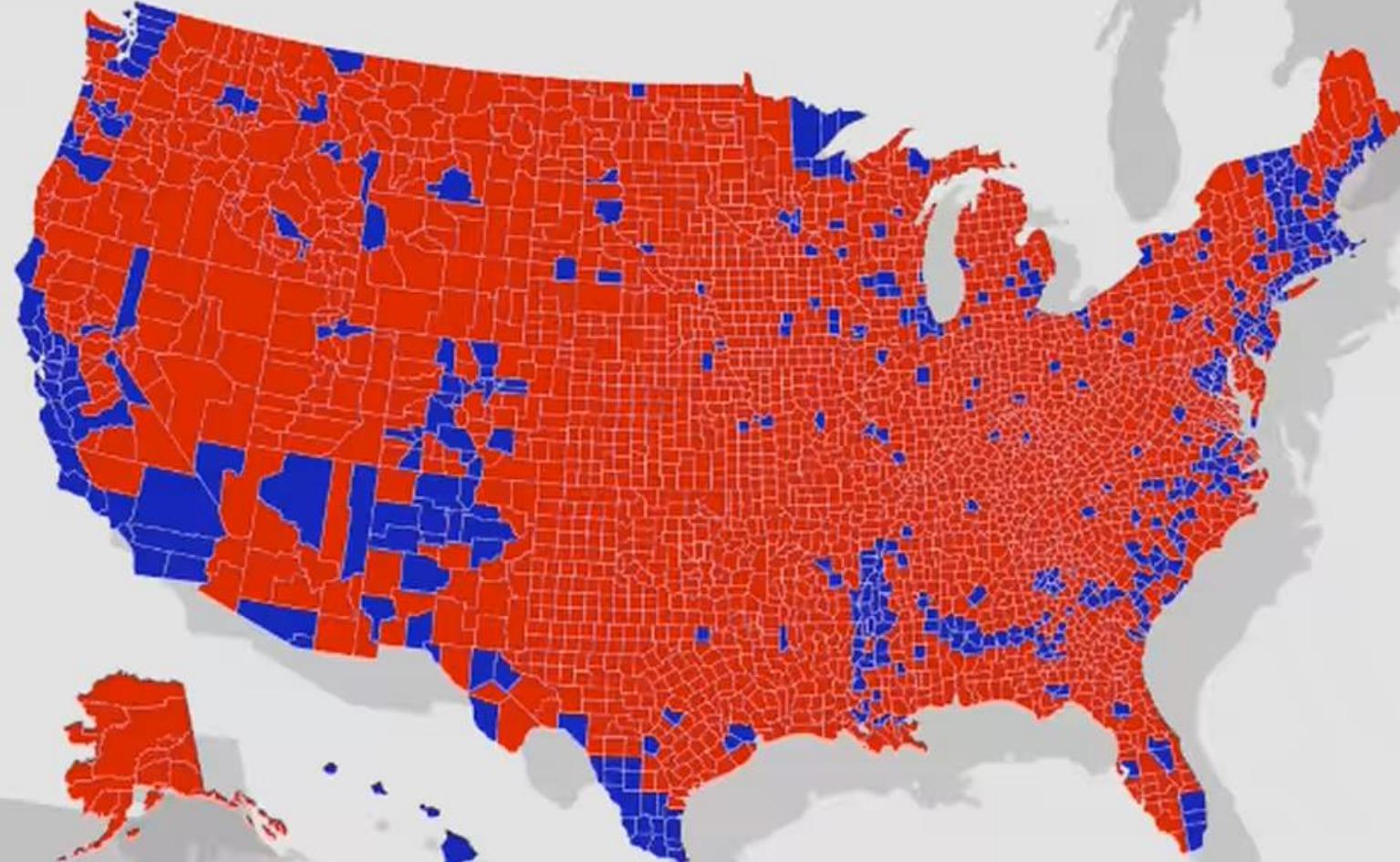


Impeach This!



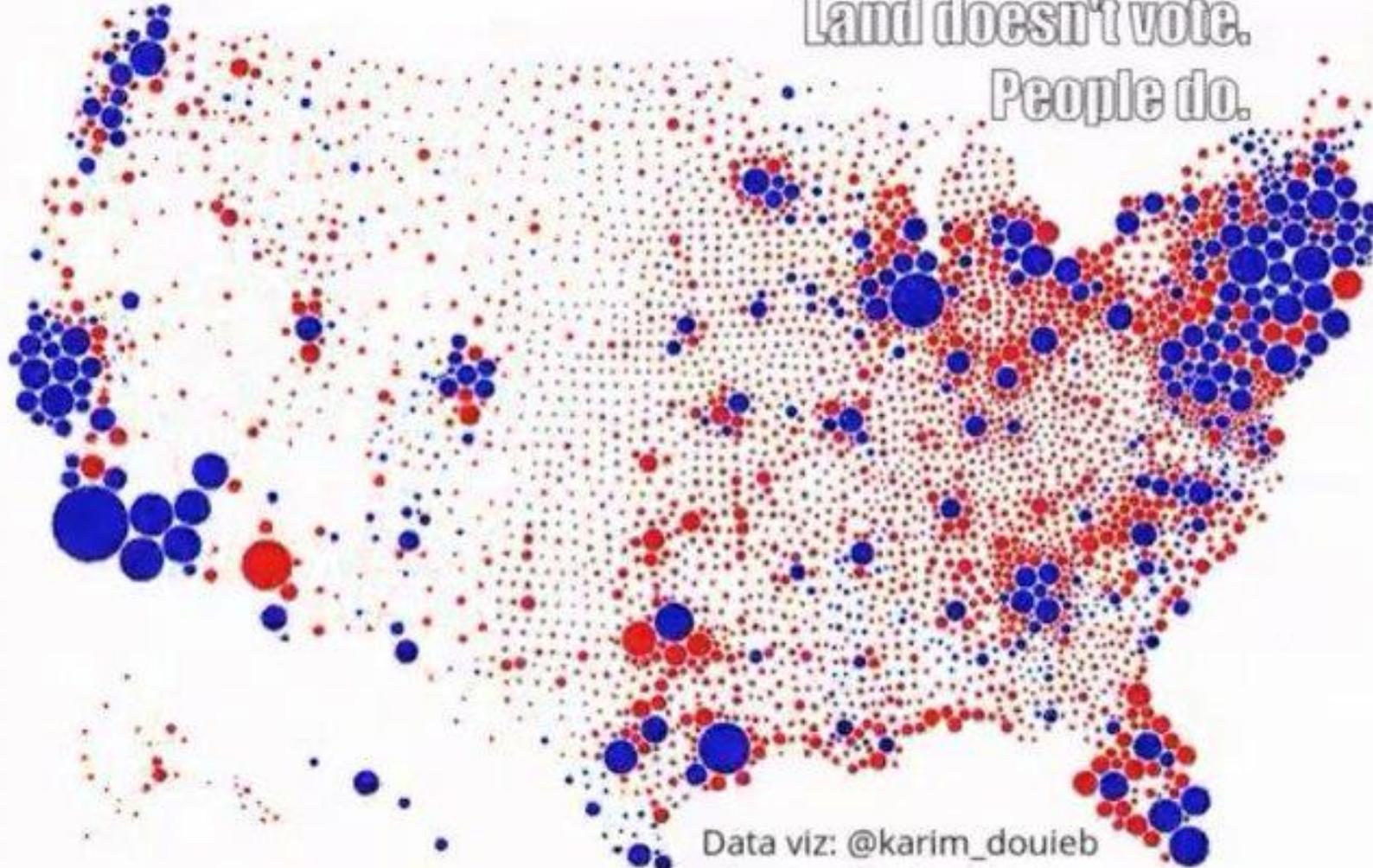
Land doesn't vote, people do.

<https://www.fastcompany.com/90572489/u-s-election-maps-are-wildly-misleading-so-this-designer-fixed-them>



Land doesn't vote, people do.

Land doesn't vote.
People do.



Data viz: @karim_douieb
Quote: @politicalmiller

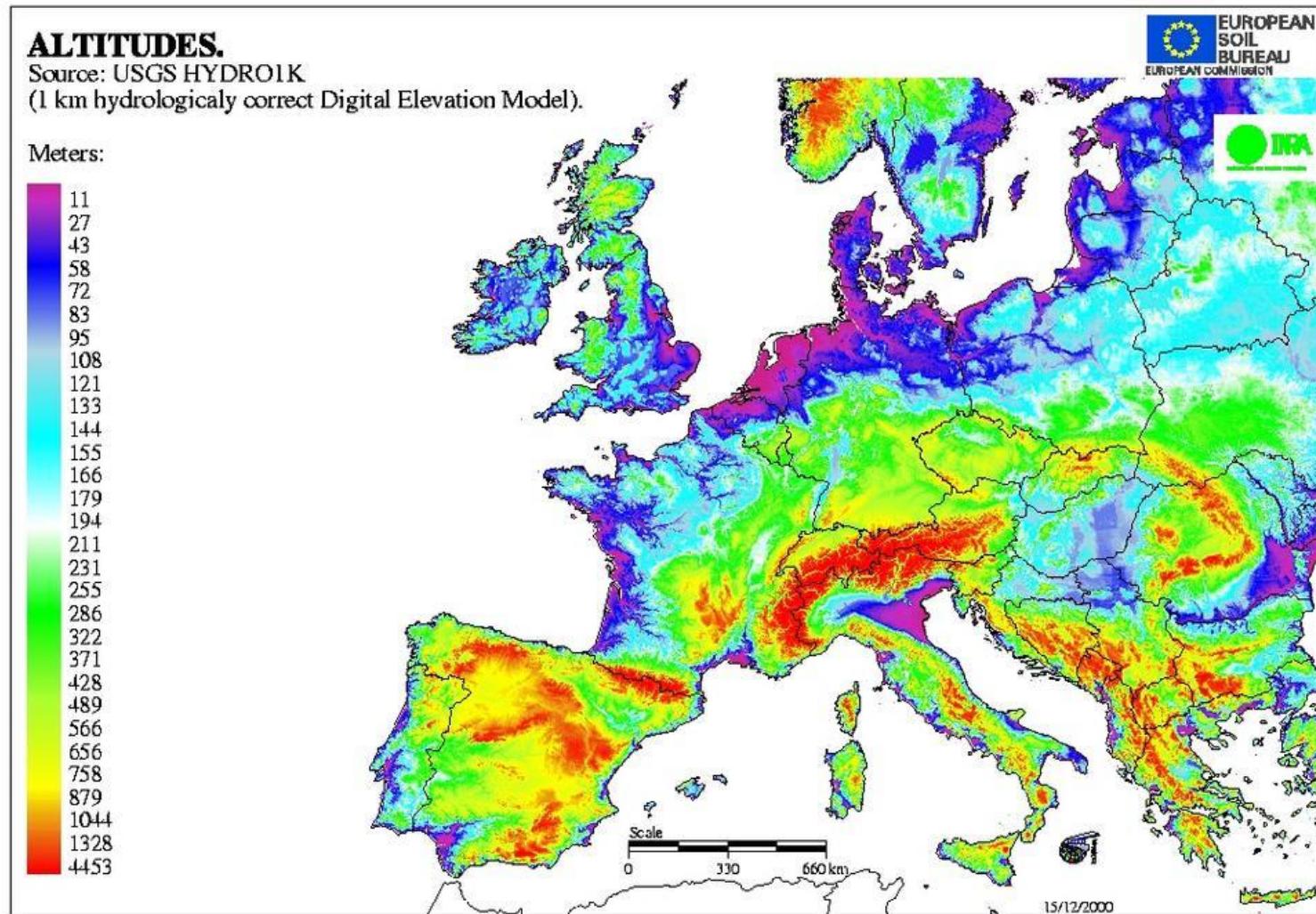
4. The Vis should not show what isn't there

Expressiveness Principle

The visual encoding should
express all of, and only, the
information in the attributes

Expressiveness Principle: violated?

<https://www.safaribooksonline.com/library/view/designing-data-visualizations/9781449314774/ch04.html>

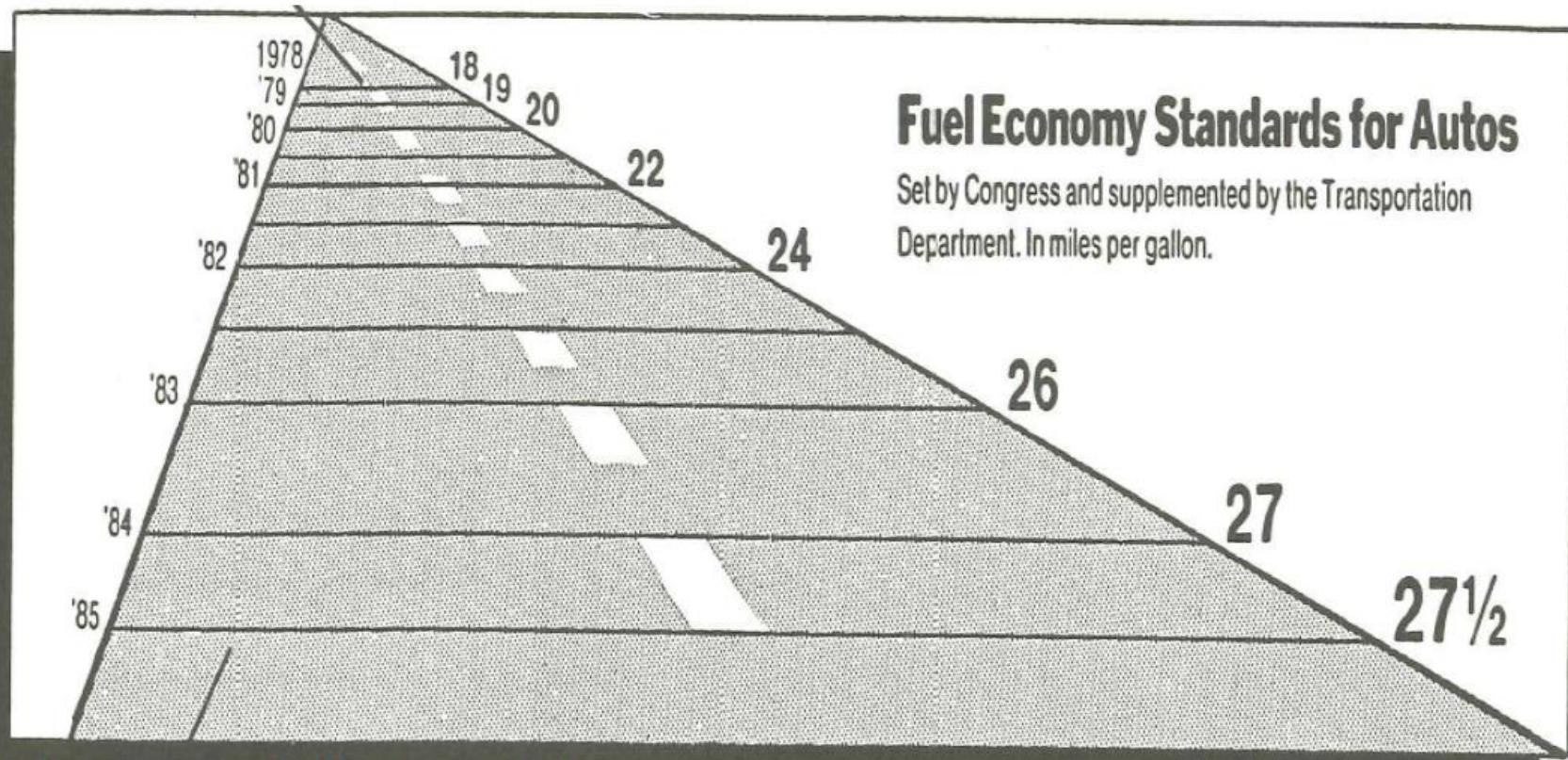


Expressiveness Principle: violated?



Avoid Distortion

18mpg in 1978, 0.6 inch line

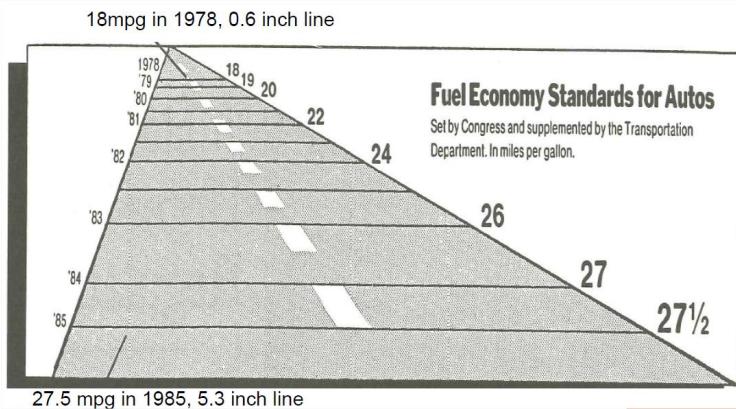


27.5 mpg in 1985, 5.3 inch line

Lie Factor

$$\text{Lie Factor} = \frac{\text{size of effect in graphic}}{\text{size of effect in data}}$$

Lie Factor



Effect in data = $(27.5 - 18.0) / 18 = 53\% \text{ increase}$

Effect in graphic = $(5.3-0.6) / 0.6 = 783\% \text{ increase!}$

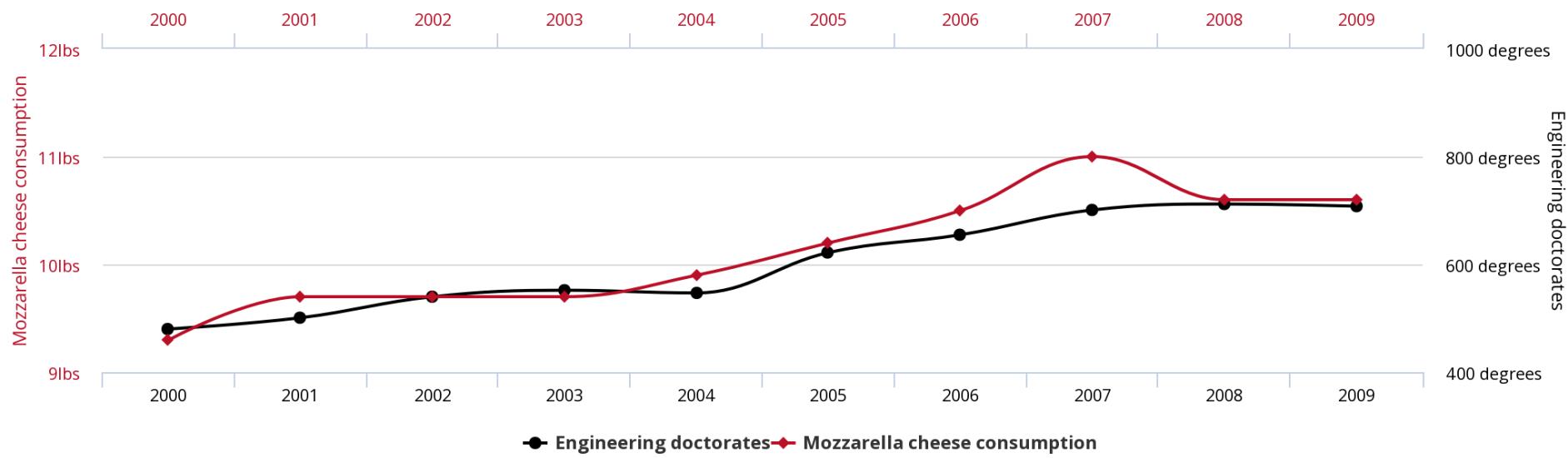
Lie factor = 14.8!

5. Always understand the domain

Mozzarella

<https://www.tylervigen.com/spurious-correlations>

Per capita consumption of mozzarella cheese
correlates with
Civil engineering doctorates awarded



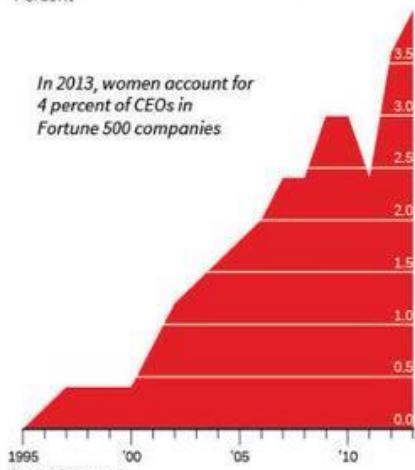
6. Pure Evil...

Axis Scale Manipulation

The glass ceiling persists

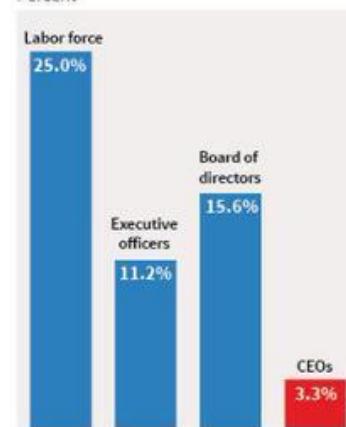
General Motors named Mary Barra as its next CEO, replacing Dan Akerson. Here's a look at how women are faring in their advancement to the top of Fortune 500 companies and the durable goods sector.

Women CEOs in Fortune 500 companies
Percent



Source: Catalyst.org
S. Culp, 12/10/2013

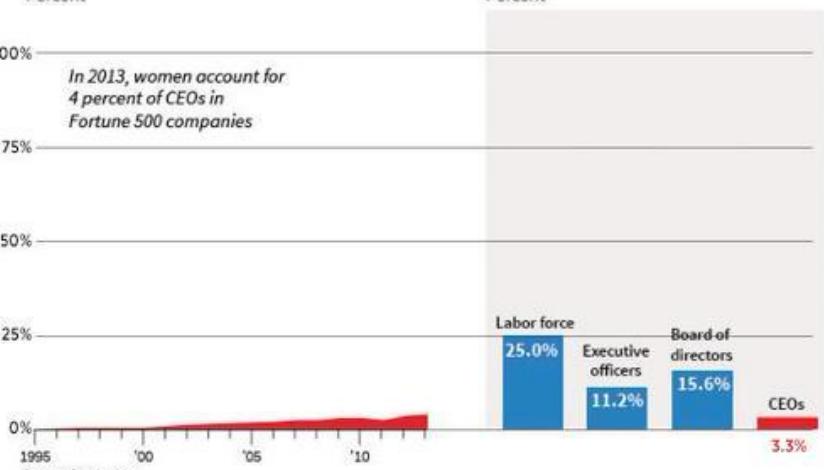
Women in durable goods manufacturing
Percent



The glass ceiling persists

General Motors named Mary Barra as its next CEO, replacing Dan Akerson. Here's a look at how women are faring in their advancement to the top of Fortune 500 companies and the durable goods sector.

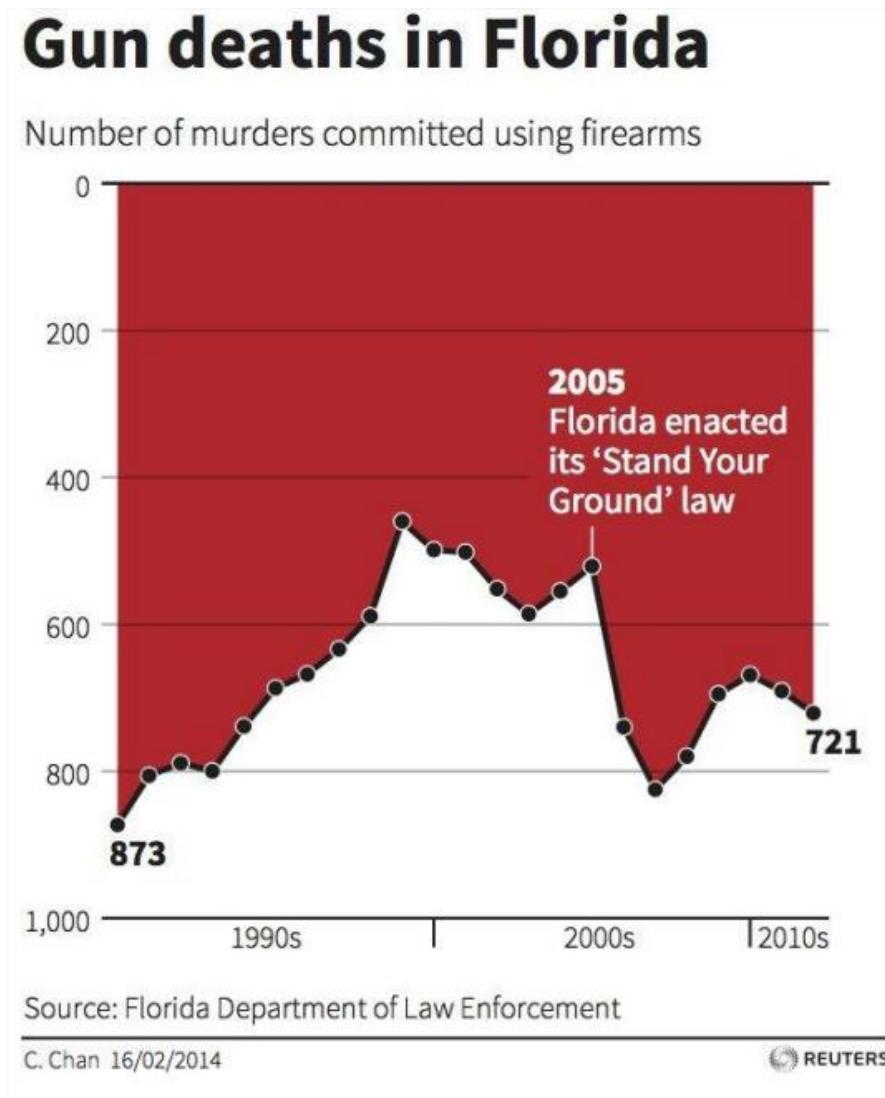
Women CEOs in Fortune 500 companies
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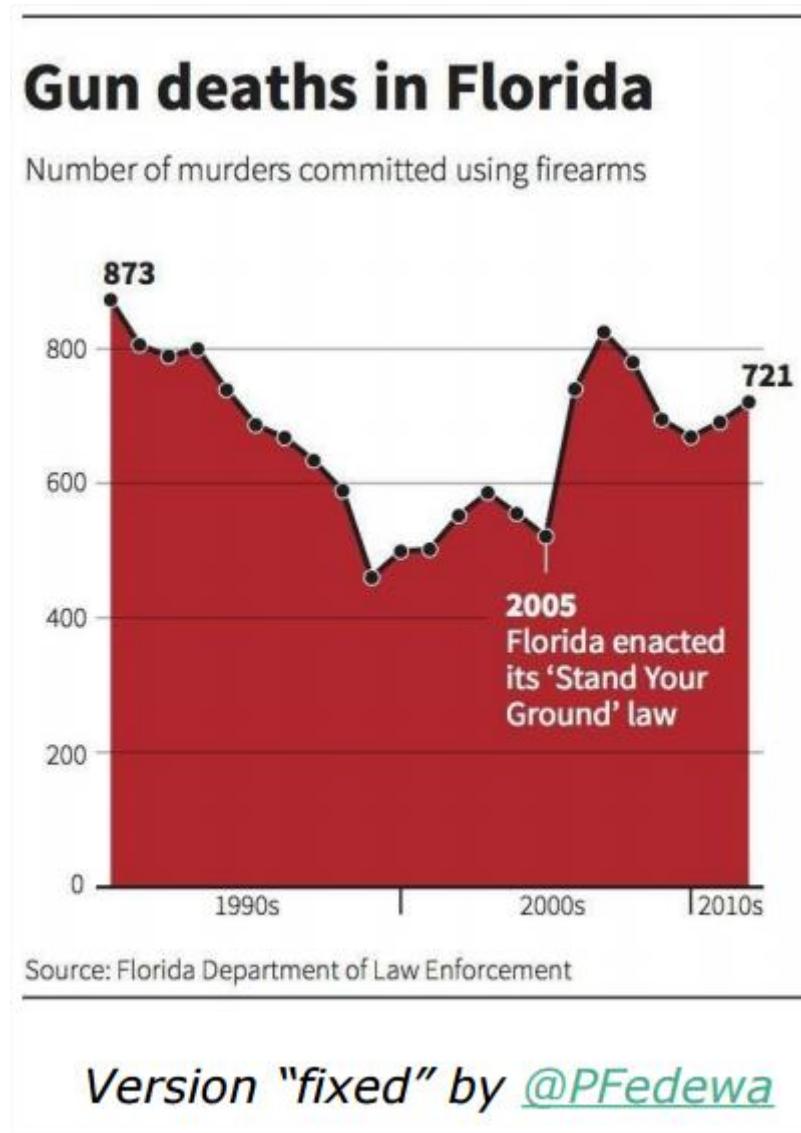
Source: Catalyst.org
S. Culp, 12/10/2013 JK Keller, 12/10/2013

REUTERS

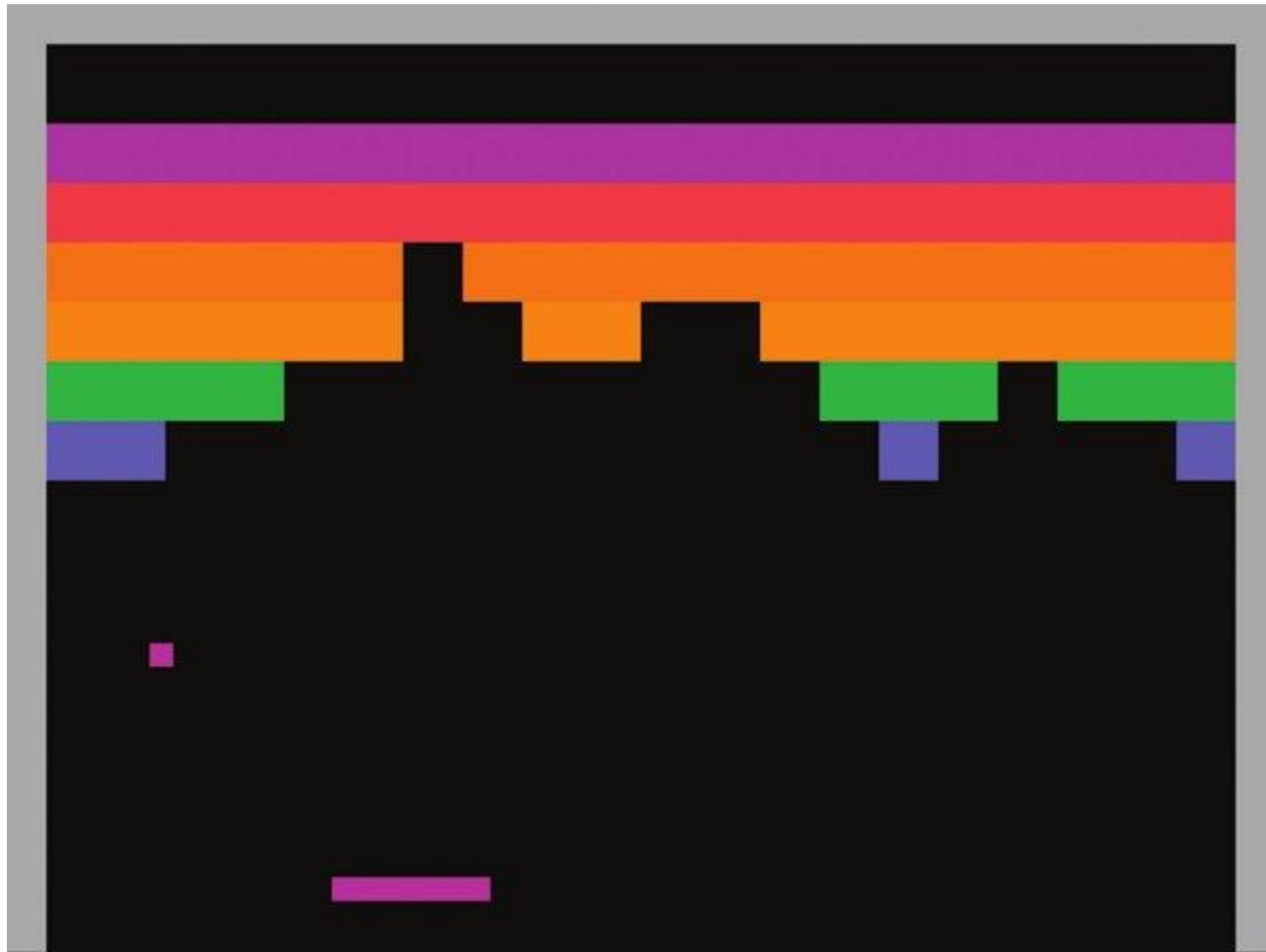
How are they Lying?



How are they Lying? – Fixed!



Breakout!



Fool Me!



Consider the following dataset

Name	Yield	Year
Beans	130	2012
Beans	135	2013
Beans	140	2014
Tomatoes	150	2012
Tomatoes	160	2013
Tomatoes	155	2014
Potatoes	200	2012
Potatoes	205	2013
Potatoes	210	2014



Draw a visualization that helps you convey the (wrong!) message that beans are producing no more than 75% of the production of tomatoes.

<https://bit.ly/3SS9M60>

Fool Me!



Consider the following dataset

Name	Yield	Year
Beans	130	2012
Beans	135	2013
Beans	140	2014
Tomatoes	150	2012
Tomatoes	160	2013
Tomatoes	155	2014
Potatoes	200	2012
Potatoes	205	2013
Potatoes	210	2014

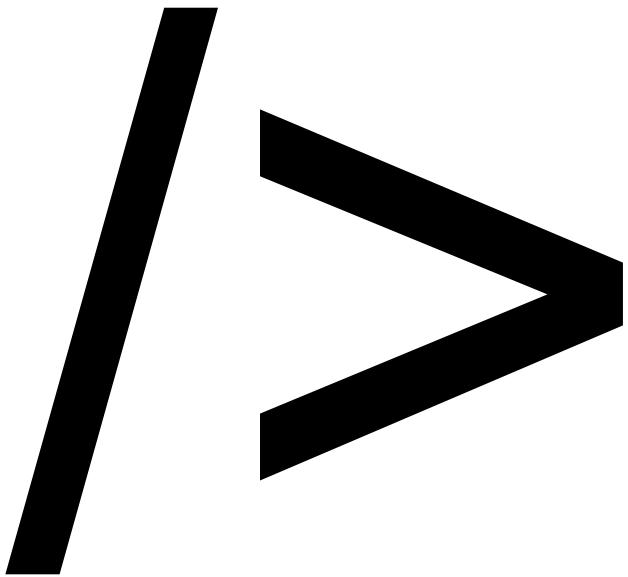
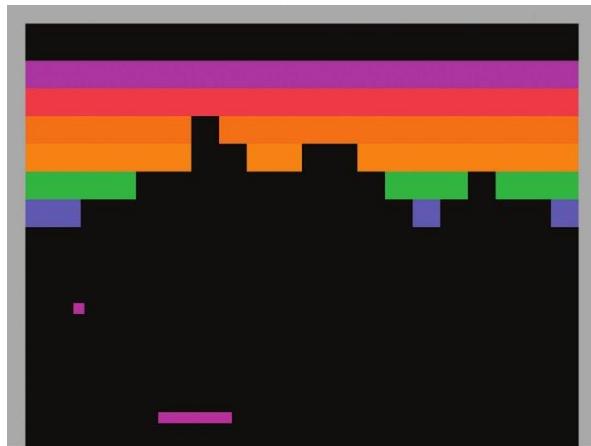
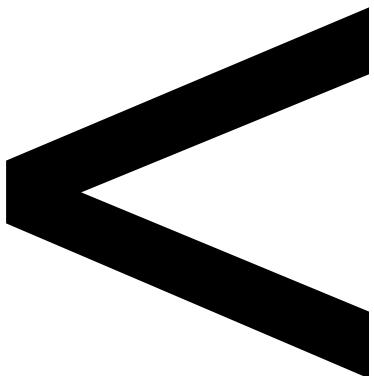


Draw a visualization that helps you convey the (wrong!) message that beans are producing no more than 75% of the production of tomatoes.

<https://bit.ly/3SS9M60>

10:00

Breakout Over!



QUESTIONS?