

Deceptive Visualization



Michael Correll
Tableau Research

What is a "bad" visualization?



bad visualization



Sign in

All

Images

Videos

News

Shopping

More

Settings

Tools

SafeSearch

What is a "bad" visualization?

Google

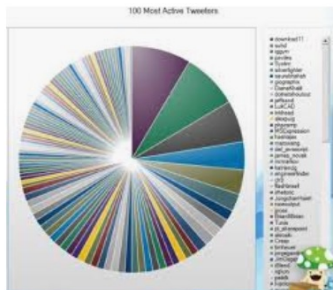
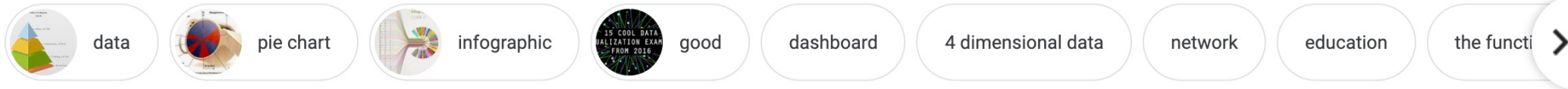
bad visualization



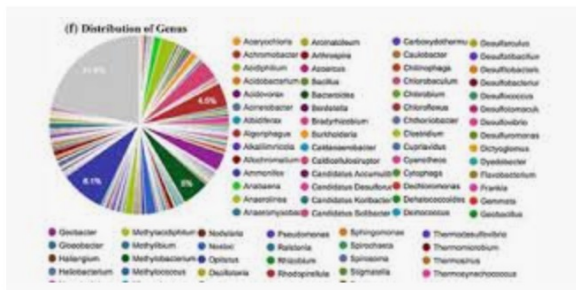
Sign in

All Images Videos News Shopping More Settings Tools

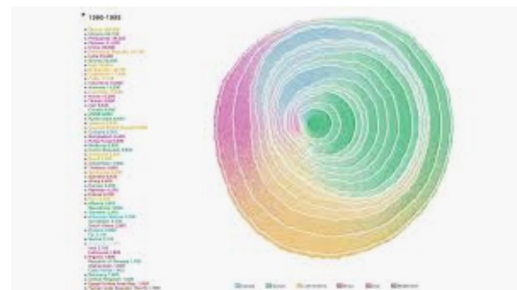
SafeSearch



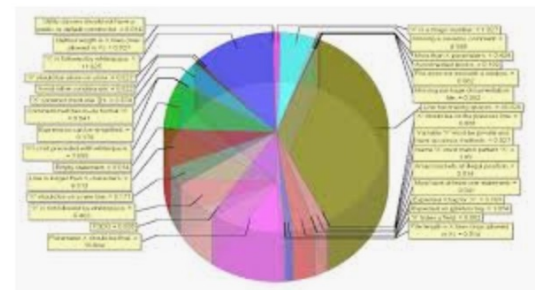
9 Worst Data Visualizations Ev...
livingqlikview.com



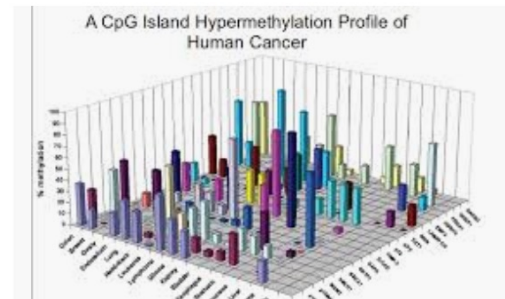
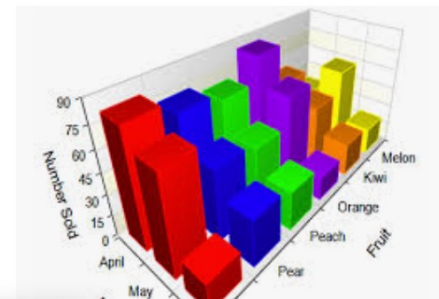
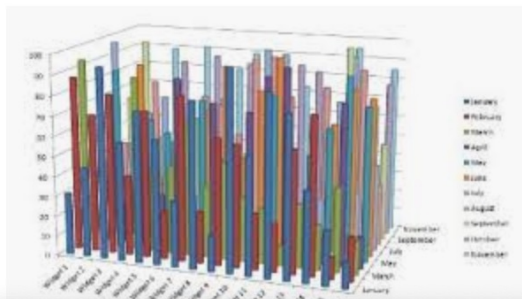
Data Stories: Avoiding Visualization ...
tdwi.org



The Best and Worst Data Visualizations ...
kdnuggets.com



Pin on Chartjunk Data Visualization
pinterest.com



<https://tdwi.org/articles/2018/02/28/bi-all-visualization-fails.aspx>

“A great introduction to the use of statistics,
and a great refresher for anyone who’s already
well versed in it.” —**BILL GATES**

HOW TO LIE WITH STATISTICS

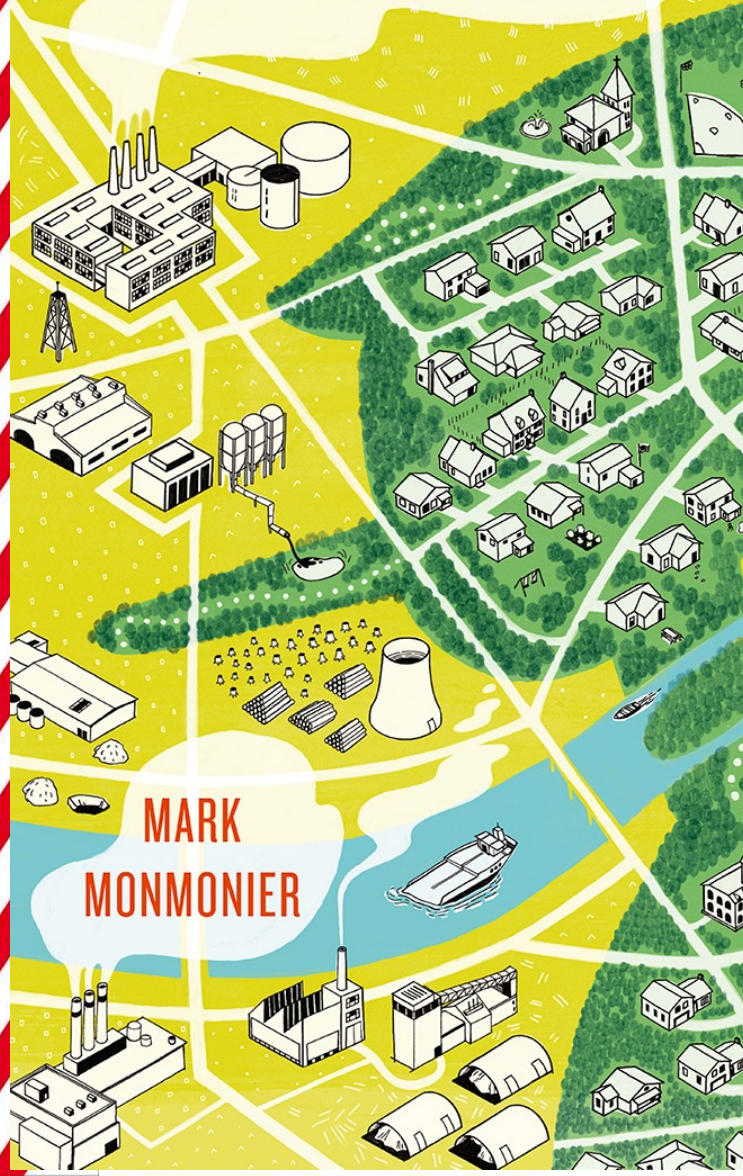


DARRELL HUFF

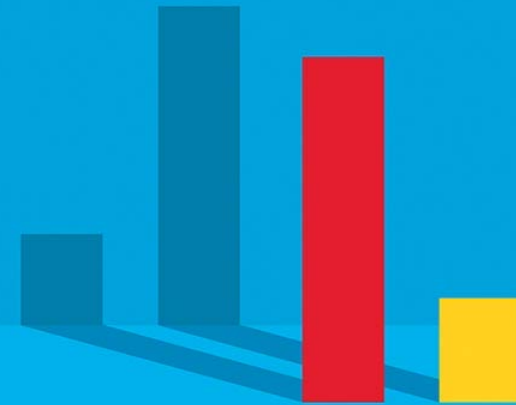
Illustrated by **Irving Geis**

An Honest-to-Goodness Bestseller

HOW TO LIE WITH MAPS



How Charts Lie



Getting Smarter about
Visual Information

Alberto Cairo

Takeaway:

Visualizations are a form of communication.

You can lie, stretch the truth, and bullshit with visualizations, just like any form of communication.

The background features a minimalist, abstract pattern of black and grey geometric shapes. These include thin, hand-drawn style lines of various orientations, solid black circles of different sizes, and bold black 'x' marks. The shapes are scattered across the white background, creating a sense of movement and depth. The central text is framed by several horizontal lines, some of which are slightly wavy, suggesting a hand-drawn or layered aesthetic.

DARK PATTERNS

(They're Everywhere)

Dark Patterns

The screenshot shows the Softpedia website for 'OnyX for Mac'. The page features a dark blue navigation bar with 'SOFTPEDIA' and menu items for 'DESKTOP', 'Mac', 'MOBILE', 'WEB', and 'NEWS'. A breadcrumb trail indicates the path: 'Softpedia > Mac > System Utilities > OnyX'. An alert banner for '2016 Holiday Giveaways!' is visible. The main content area includes a 'DOWNLOAD' button, download statistics (177,446 downloads, updated October 15th, 2016), and a 'DONATIONWARE' label. A large 'Start Download' section contains a 'DOWNLOAD NOW' button and a three-step process: '1. Click Download', '2. Run the quick scan', and '3. Enjoy your clean Mac'. Below this, there are tabs for 'EDITOR'S REVIEW', 'DOWNLOAD', 'SPECIFICATIONS', and 'CHANGELOG', along with a '100% CLEAN' badge. The main text describes OnyX as a 'Free OS X application designed to help you perform a large variety of optimization, maintenance, and customization tasks via a very simple and intuitive interface'. A sidebar on the left provides details such as 'CURRENT VERSION: OnyX 3.2.1', 'FILE SIZE: 34.8 MB', 'RUNS ON: macOS 10.12 or later (Intel only)', 'CATEGORY: Home | System Utilities', and 'DEVELOPER:'. A vertical 'STICKY' label is on the right. At the bottom right, there is a 'Download Cleaner' section with an image of a person using a laptop.

SOFTPEDIA

DESKTOP Mac MOBILE WEB NEWS

Softpedia > Mac > System Utilities > OnyX

ALERT 2016 Holiday Giveaways!

OnyX for Mac

DOWNLOAD 177,446 downloads Updated: October 15th, 2016 DONATIONWARE 5.5/5 260

CURRENT VERSION: OnyX 3.2.1 SEND US AN UPDATE

17 SCREENSHOTS

IN-DEPTH REVIEW OnyX in-depth review

FILE SIZE: 34.8 MB

RUNS ON: macOS 10.12 or later (Intel only)

CATEGORY: Home | System Utilities

DEVELOPER:

EDITOR'S REVIEW DOWNLOAD SPECIFICATIONS CHANGELOG 100% CLEAN REPORT MALWARE

Start Download
Follow 3 steps for quick install & scan

1. Click Download
2. Run the quick scan
3. Enjoy your clean Mac

Free OS X application designed to help you perform a large variety of optimization, maintenance, and customization tasks via a very simple and intuitive interface

Tweaking applications for macOS come in various shapes and prices, and you are free to pick the one that meets your needs, be it focused on finding and fixing as many system errors and problems as possible or on boosting your Mac's overall performance.

Onyx is a free and very complex macOS application created to cope with both these aspects, while also providing its users with a very simple and intuitive interface.

It has a version for each specific macOS version, so download the

Download Cleaner

Dark Patterns

The image shows a screenshot of the Softpedia website for the application 'Onyx for Mac'. The browser address bar shows 'mac.softpedia.com/get/System-Utilities/Onyx.shtml'. The website has a dark blue header with 'SOFTPEDIA' and navigation links for 'DESKTOP', 'Mac', 'MOBILE', 'WEB', and 'NEWS'. A navigation breadcrumb shows 'Softpedia > Mac > System Utilities > Onyx'. An alert banner at the top right says 'ALERT 2016 Holiday Giveaways!'. The main content area features a large 'DOWNLOAD' button with a download icon, highlighted by an orange box. Below it, the current version is 'Onyx 3.2.1' and it has '177,446 downloads' and a '5.5/5' rating. A 'Start Download' section includes a 'DOWNLOAD NOW' button and a three-step process: '1. Click Download', '2. Run the quick scan', and '3. Enjoy your clean Mac'. The page also includes an 'EDITOR'S REVIEW' section with a '100% CLEAN' badge and a 'REPORT MALWARE' link. A description states: 'Free OS X application designed to help you perform a large variety of optimization, maintenance, and customization tasks via a very simple and intuitive interface'. A sidebar on the left contains links for '17 SCREENSHOTS', 'IN-DEPTH REVIEW', 'FILE SIZE: 34.8 MB', 'RUNS ON: macOS 10.12 or later (Intel only)', 'CATEGORY: Home | System Utilities', and 'DEVELOPER:'. A vertical 'STICKY' label is on the right. At the bottom right, there is a 'Download Cleaner' advertisement with an image of a person using a laptop.



Zone Kaiwei Ni factory
Sponsored

80% OFF

BLACK FRIDAY SALE



[Shop Now](#)



Bad Visualizations

Incorrect Visualizations

Illegible Visualizations

Bullshit Visualizations

Unconventional Visualizations



Bad Visualizations

Incorrect Visualizations

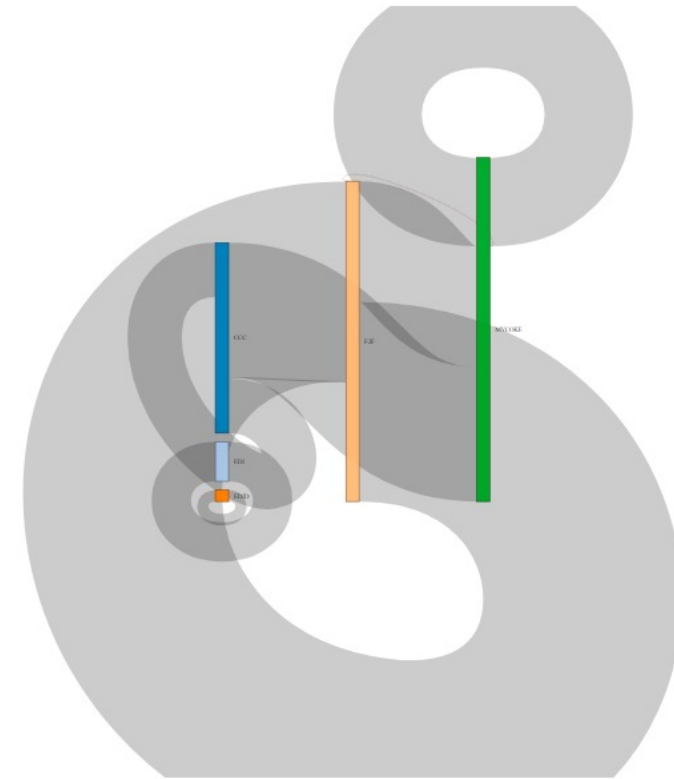
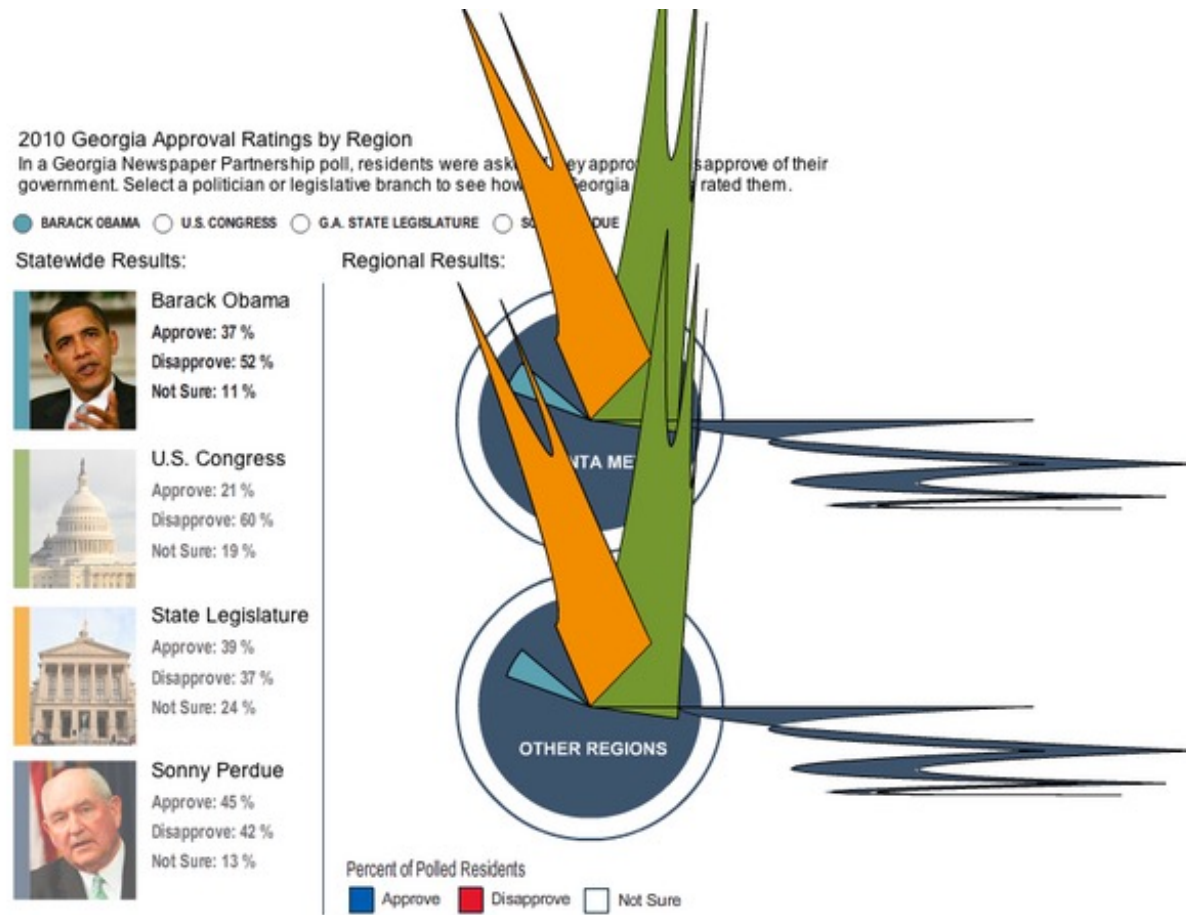
Illegible Visualizations

Bullshit Visualizations

Unconventional Visualizations



Incorrect Visualization





HONG KONG




AROUND
THE
WORLD


GIANT HORNETS KILL 42 PEOPLE IN CHINA

LIVE
CNN

RIGHT NOW

CHICAGO  71°

DETROIT  66°

HOUSTON  77°

HEALTH EVALUATION IN MIRIAM CAREY'S HOME AFTER DC C

CNN.com

RIGHT NOW

FOX 10
AccuWeather

TEMPERATURES

Wickenburg
2385

Cave Creek
2960

Surprise
1350

Deer Valley
65

Fountain Hills
1665

Glendale
66

Scottsdale
64

Buckeye
66

Goodyear
64

Sky Harbor
64

Mesa
63

Apache Junction
64

Ahwatukee
1270

Chandler
63

Gateway
63

Queen Creek

Maricopa
63

Florence
1625

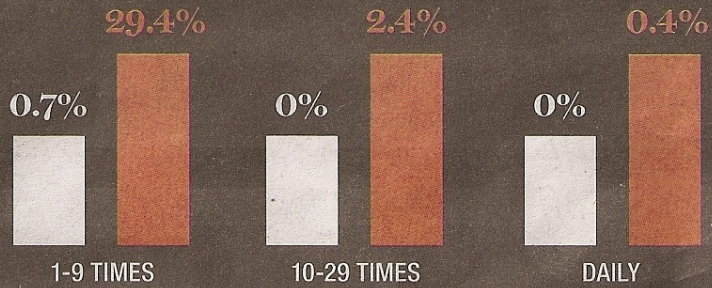
FOX 10

12:20 64°

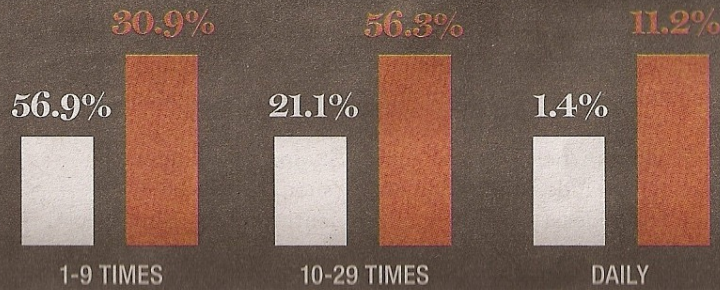
BY THE NUMBERS

The National Collegiate Health Assessment was taken by 1,000 UCSB students in Spring 2009. Participants were asked how frequently they used substances over the past 30 days. Numbers in white reflect actual student use, while red numbers indicate perceived substance use. The average age of participants was 20 years and approximately 99 percent were full-time students.

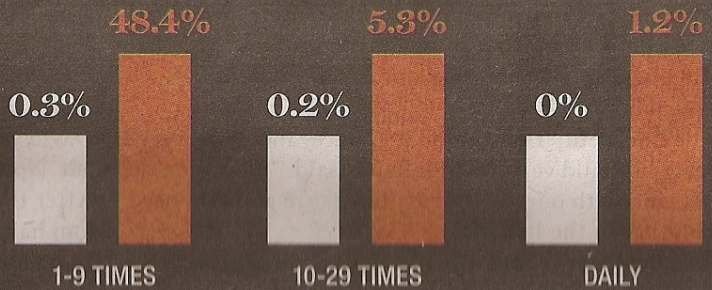
OPIATES



ALCOHOL



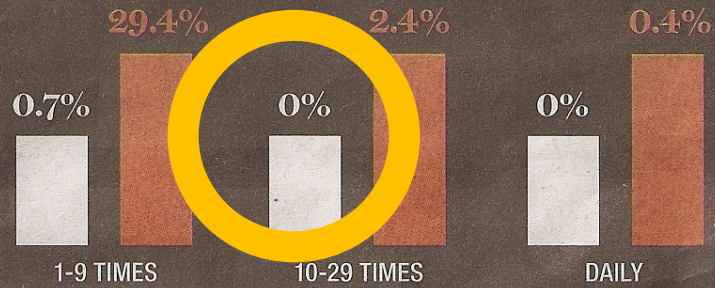
COCAINE



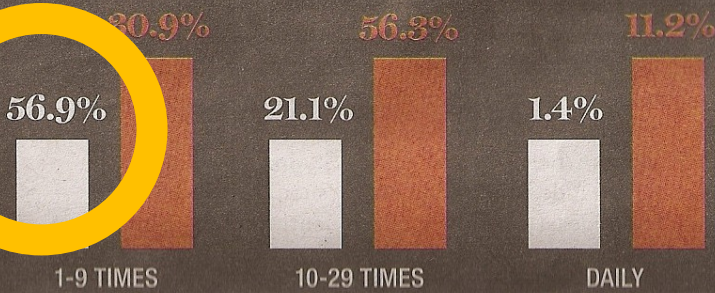
BY THE NUMBERS

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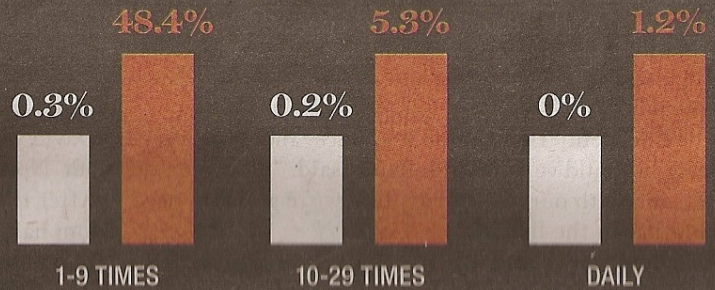
OPIATES



ALCOHOL



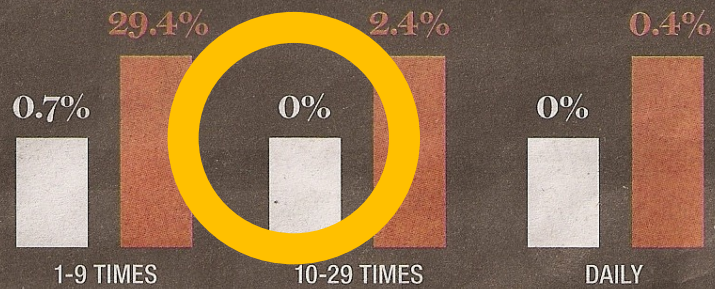
COCAINE



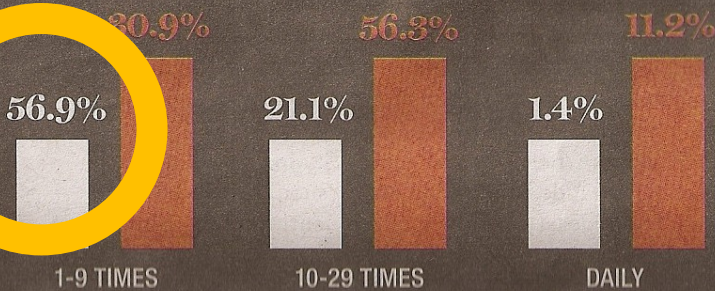
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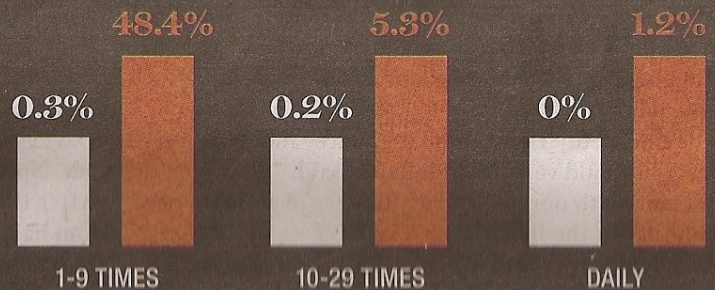
OPIATES



ALCOHOL



COCAINE



Opiates

| | 1-9 Times | 10-29 Times | Daily |
|------|---------------|--------------|--------------|
| Rate | 0.7% 29.4% | 0.0% 2.4% | 0.0% 0.4% |

Alcohol

| | 1-9 Times | 10-29 Times | Daily |
|------|----------------|----------------|---------------|
| Rate | 56.9% 30.9% | 21.1% 56.3% | 1.4% 11.2% |

Cocaine

| | 1-9 Times | 10-29 Times | Daily |
|------|---------------|--------------|--------------|
| Rate | 0.3% 48.4% | 0.2% 5.3% | 0.0% 1.2% |
| | Actual | Perceived | Actual |
| | Perceived | Actual | Perceived |

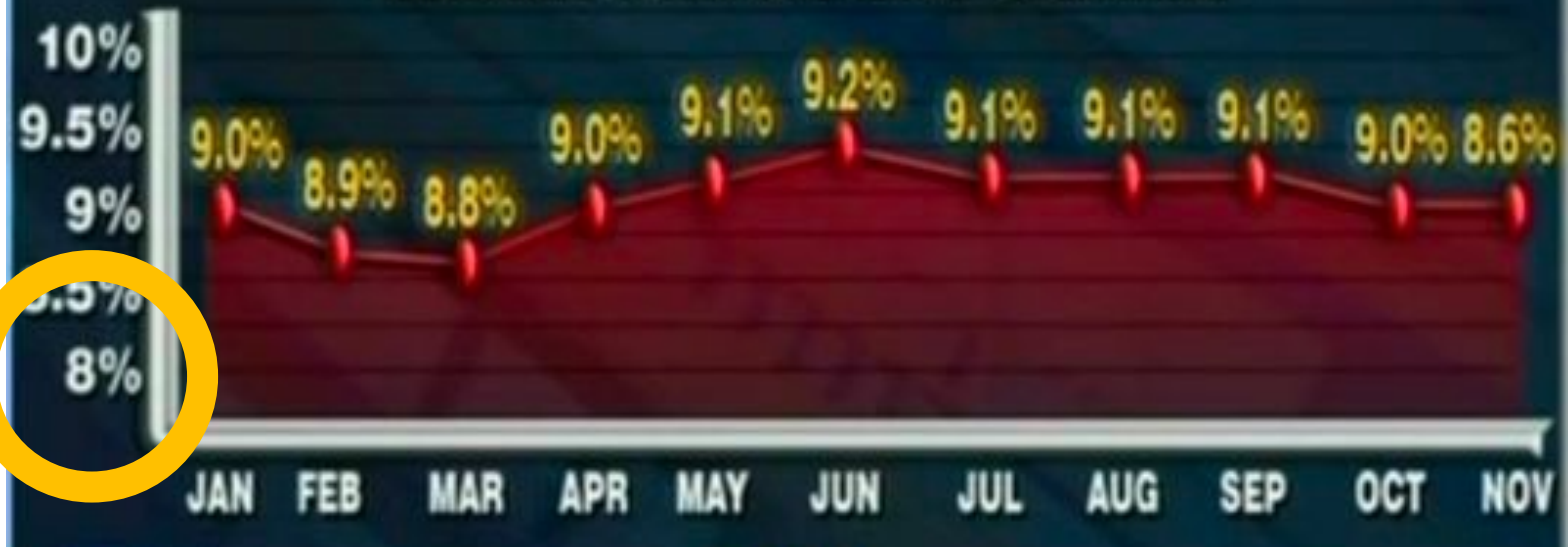
UNEMPLOYMENT RATE

UNDER PRESIDENT OBAMA



UNEMPLOYMENT RATE

UNDER PRESIDENT OBAMA



UNEMPLOYMENT RATE

UNDER PRESIDENT OBAMA



UNEMPLOYMENT RATE

UNDER PRESIDENT OBAMA



UNEMPLOYMENT RATE

UNDER PRESIDENT OBAMA



UNEMPLOYMENT RATE

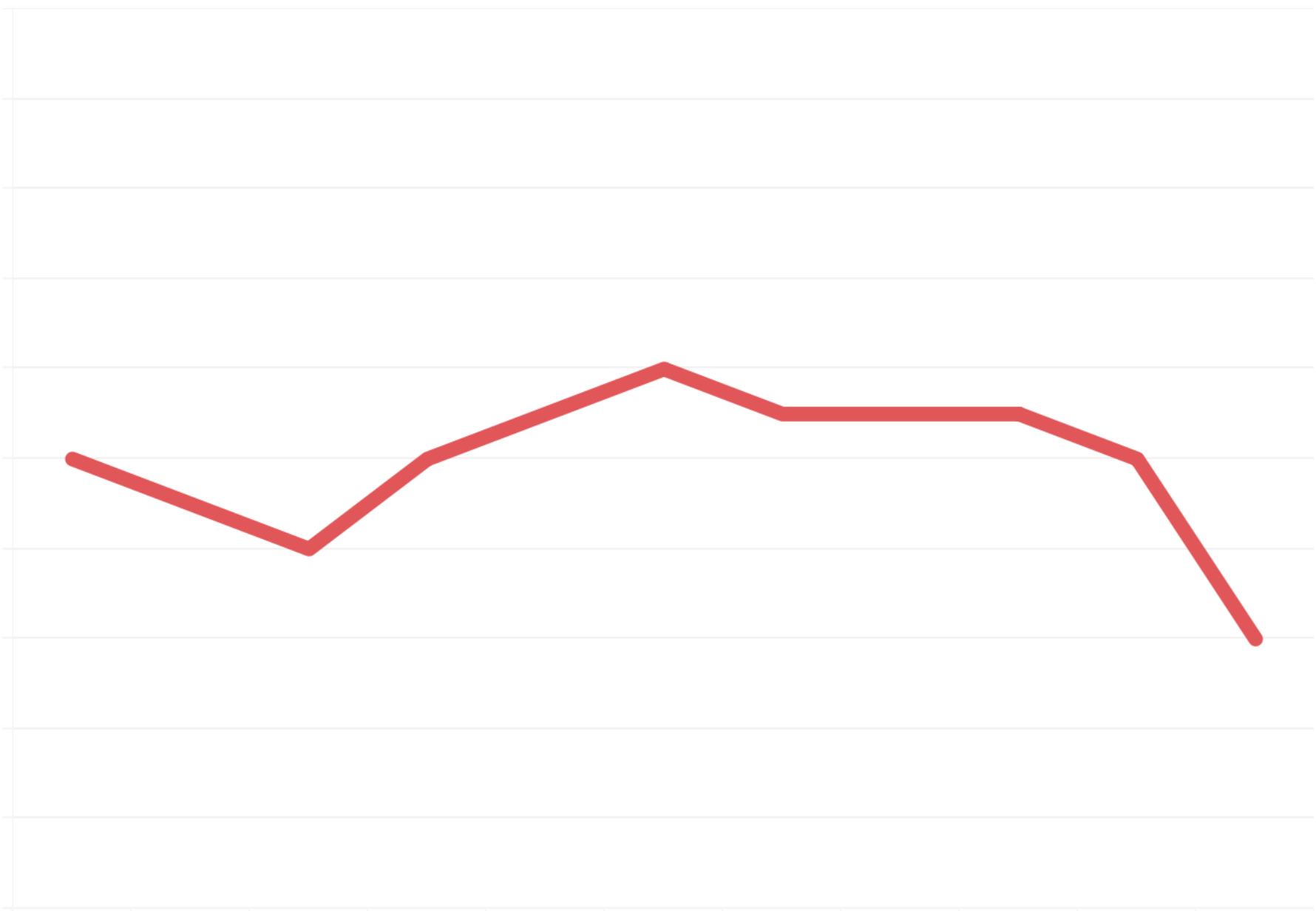
UNDER PRESIDENT OBAMA



Unemployment

9.8
9.6
9.4
9.2
9.0
8.8
8.6
8.4
8.2

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov



Incorrect Visualizations

People assume that visualizations properly encode their data

...if we violate that assumption, we can do anything we want.

Bad Visualizations

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Interactive Weekly Unemployment Insurance Claims

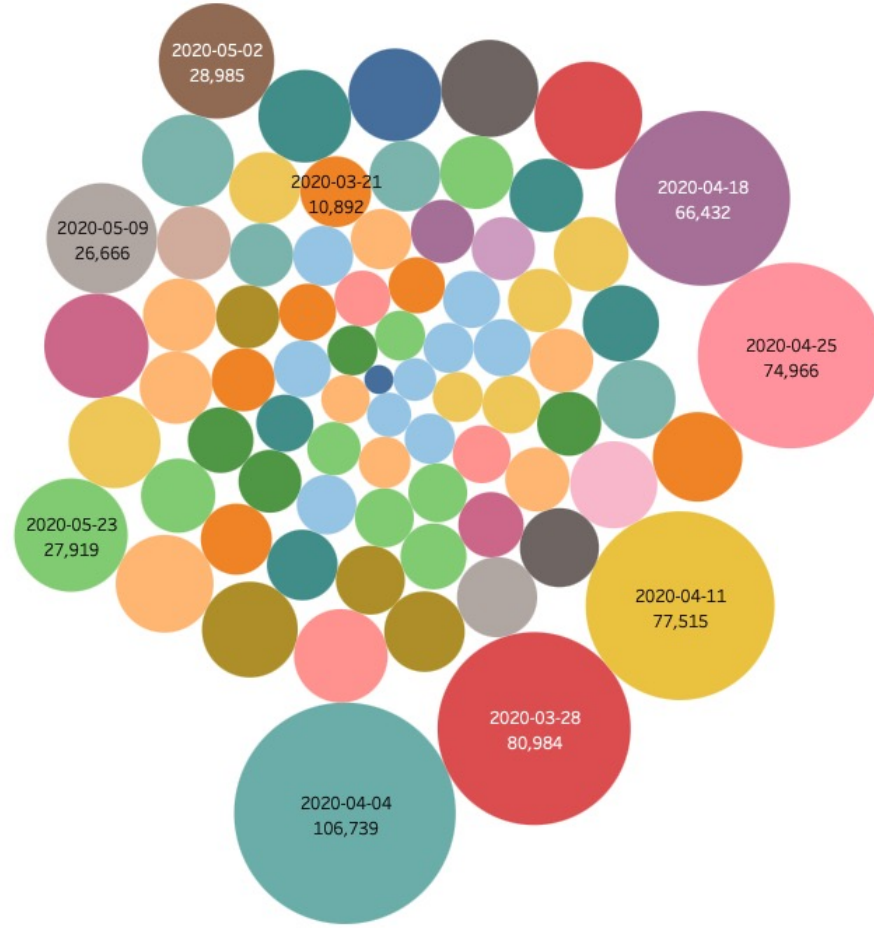
Initial_Claims_byCounty | **Historical**

County

Total

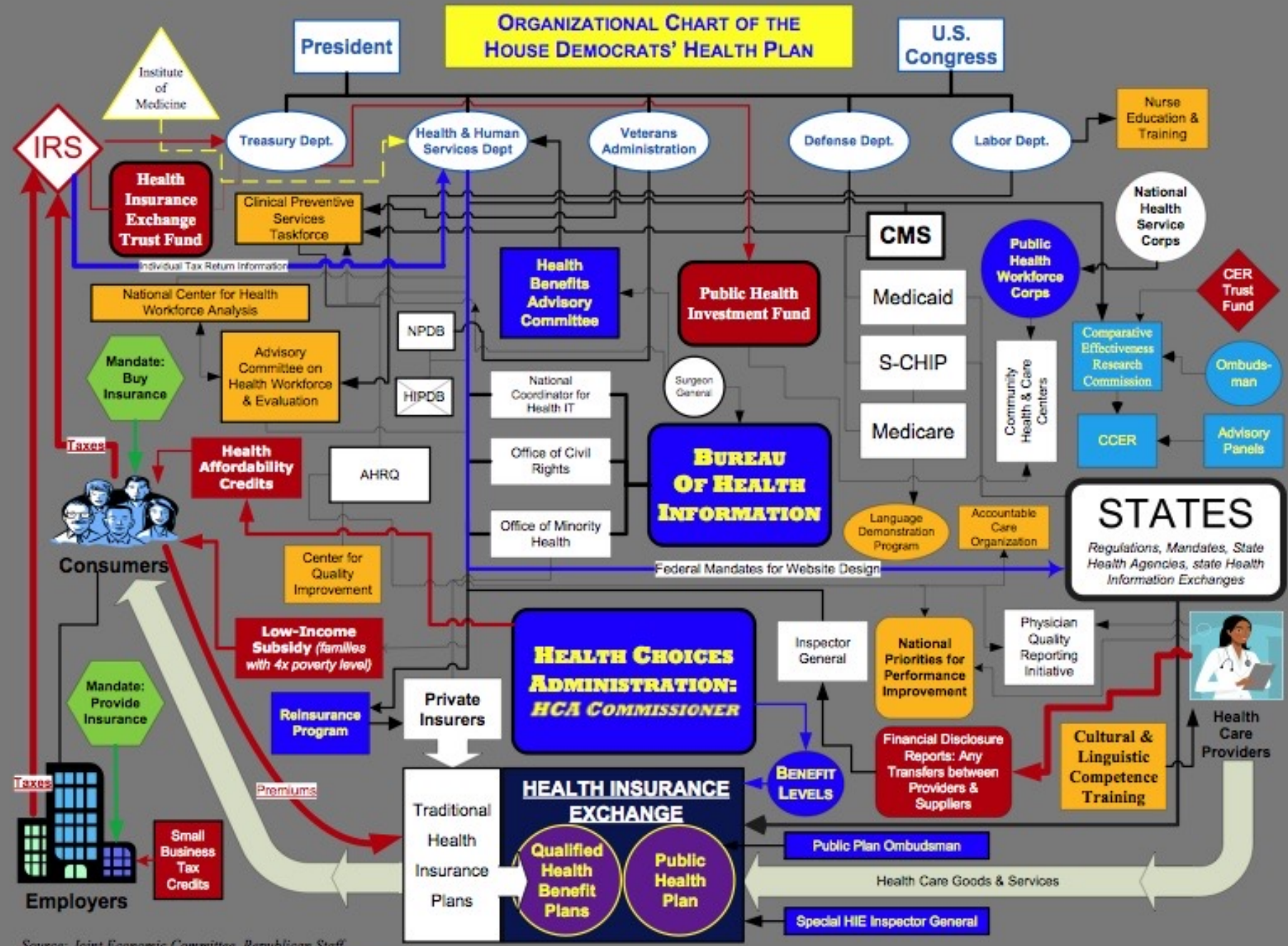
Historical Initial Claims by Week

| | |
|------------|--------|
| 2020-12-26 | 5,506 |
| 2021-01-02 | 10,986 |
| 2021-01-09 | 14,084 |
| 2021-01-16 | 11,983 |
| 2021-01-23 | 11,615 |
| 2021-01-30 | 12,664 |
| 2021-02-06 | 13,464 |
| 2021-02-13 | 12,087 |
| 2021-02-20 | 11,395 |
| 2021-02-27 | 11,624 |
| 2021-03-06 | 13,592 |
| 2021-03-13 | 16,506 |
| 2021-03-20 | 13,994 |
| 2021-03-27 | 18,710 |
| 2021-04-10 | 10,909 |
| 2021-04-17 | 8,983 |
| 2021-04-24 | 8,704 |
| 2021-05-01 | 10,325 |
| 2021-05-08 | 10,841 |
| 2021-05-15 | 9,377 |
| 2021-05-22 | 8,698 |
| 2021-06-05 | 7,290 |
| 2021-06-12 | 6,847 |
| 2021-06-19 | 7,108 |
| 2021-06-26 | 5,816 |
| 2021-07-03 | 7,295 |
| 2021-07-10 | 5,435 |
| 2021-07-17 | 4,254 |
| 2021-07-24 | 3,977 |
| 2021-07-31 | 6,793 |
| 2021-08-07 | 6,196 |
| 2021-08-14 | 5,469 |
| 2021-08-21 | 5,407 |
| 2021-08-28 | 5,431 |
| 2021-09-04 | 5,095 |



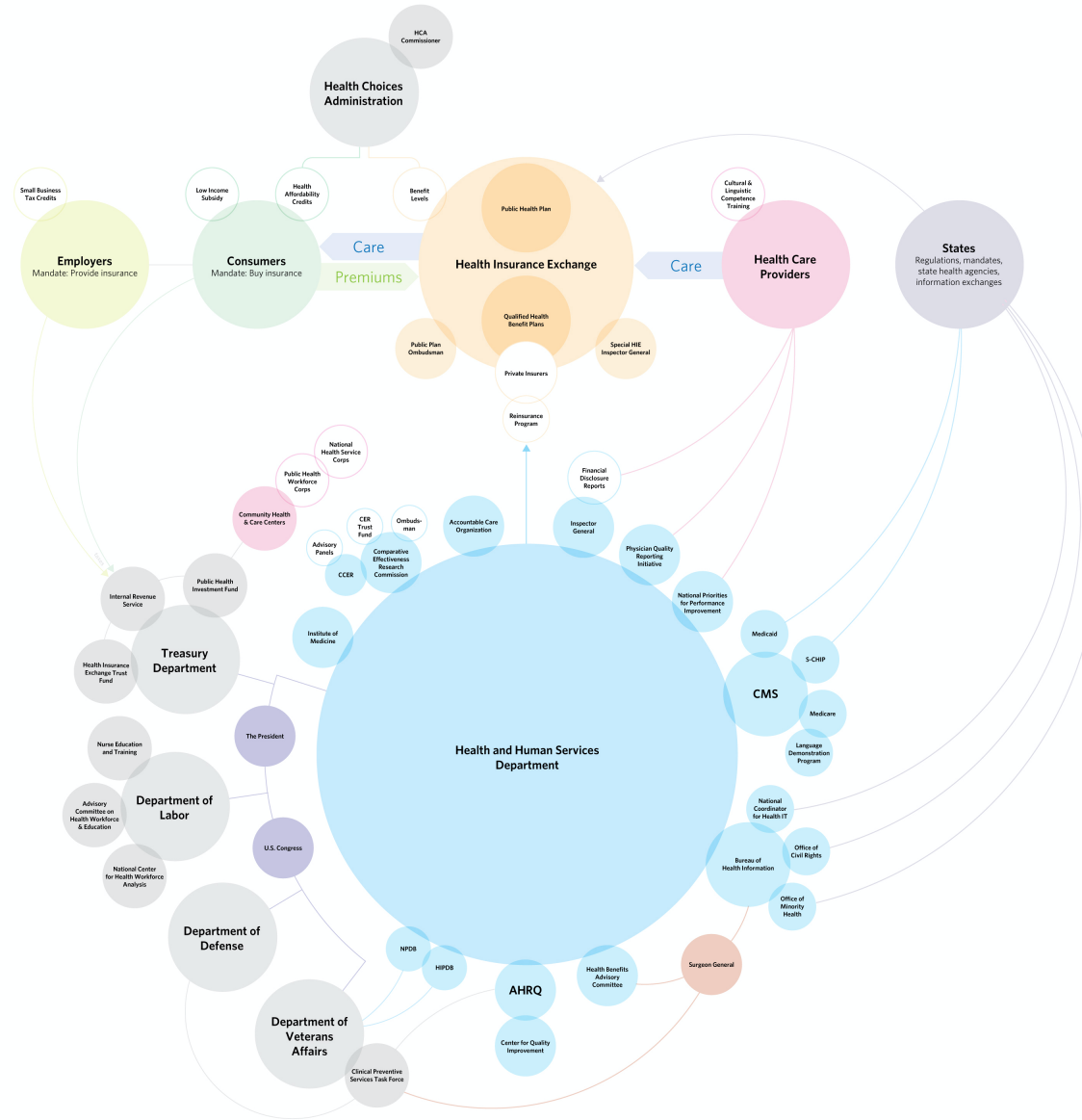
Week Ending date

■ 2020-03-14
 ■ 2021-07-24
 ■ 2021-07-17
 ■ 2021-09-04
 ■ 2021-08-21
 ■ 2021-08-14

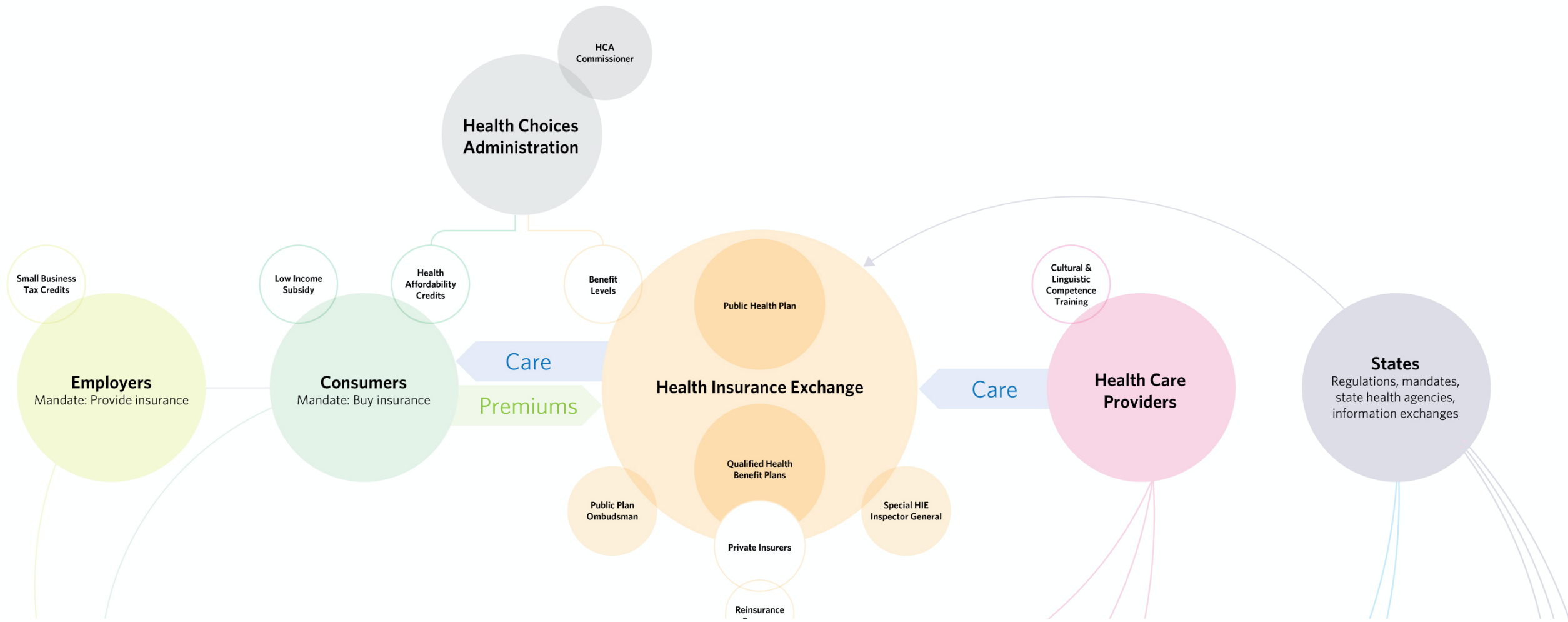


Source: Joint Economic Committee, Republican Staff
 Congressman Kevin Brady, Ranking House Republican Member

Organizational Chart of the House Democrats' Health Plan



“Do not fuck with graphic designers” – Robert Palmer



“Do not fuck with graphic designers” – Robert Palmer

Illegible Visualizations

People will get lost in the details or overwhelmed by complexity

...if we make things intentionally complex people then people will just assume we know what we're talking about or will be too dazed to check too closely.

Bad Visualizations

Incorrect Visualizations

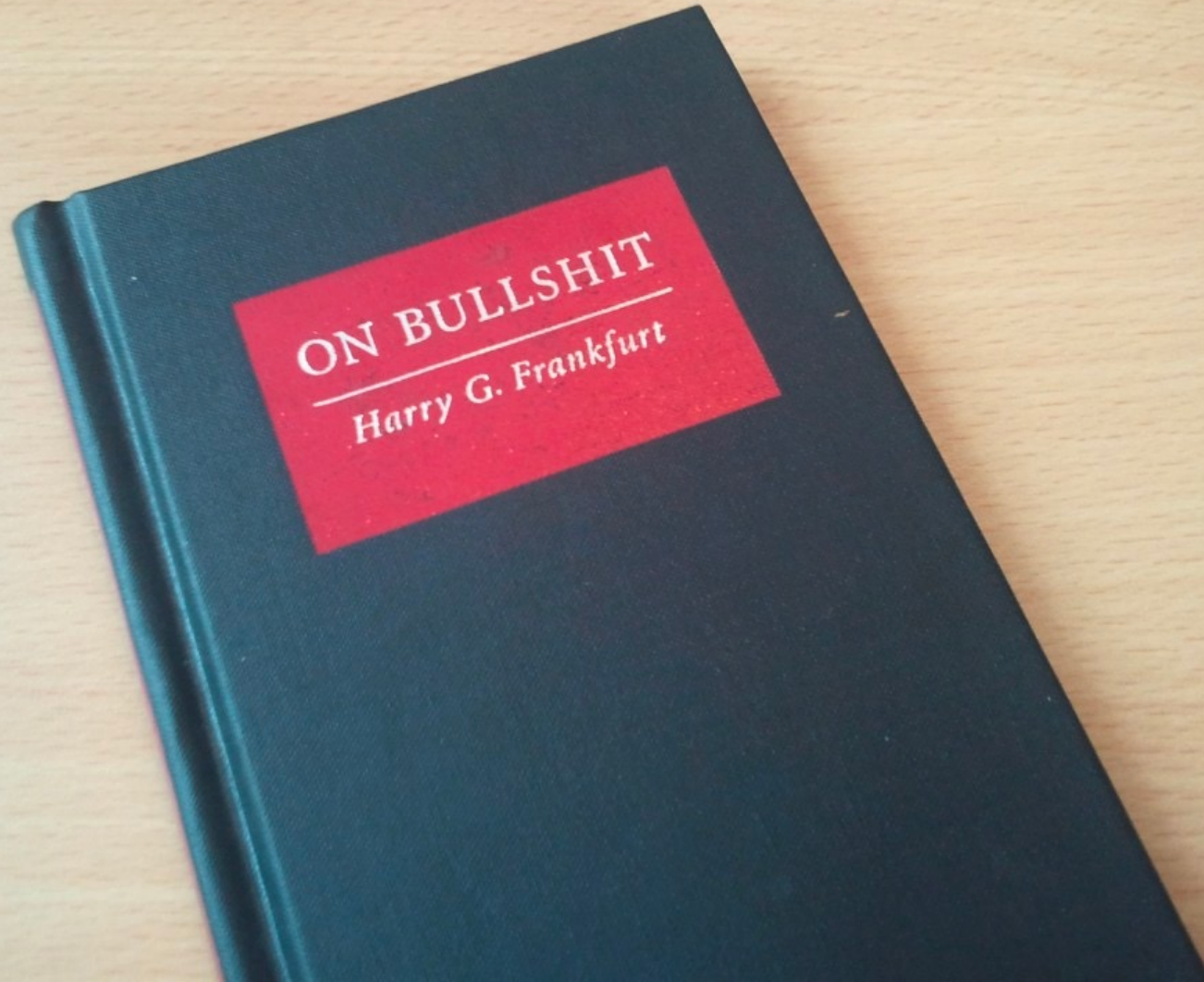
Illegible Visualizations

Bullshit Visualizations

Unconventional Visualizations



Bullshit Visualization



Lie:

“No, officer, I wasn’t speeding”

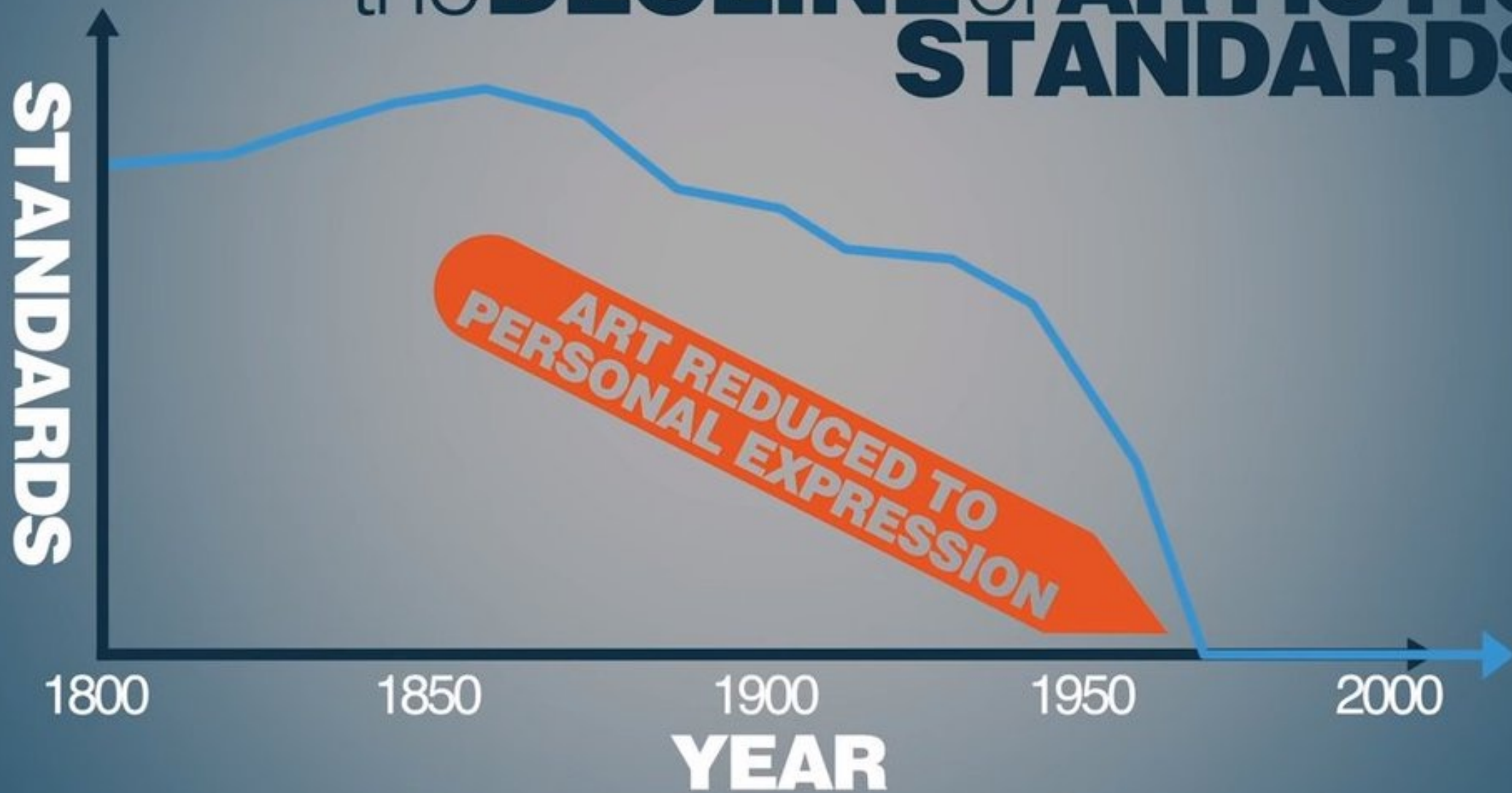
(you know the truth, but intentionally say something you know is untrue)

Bullshit:

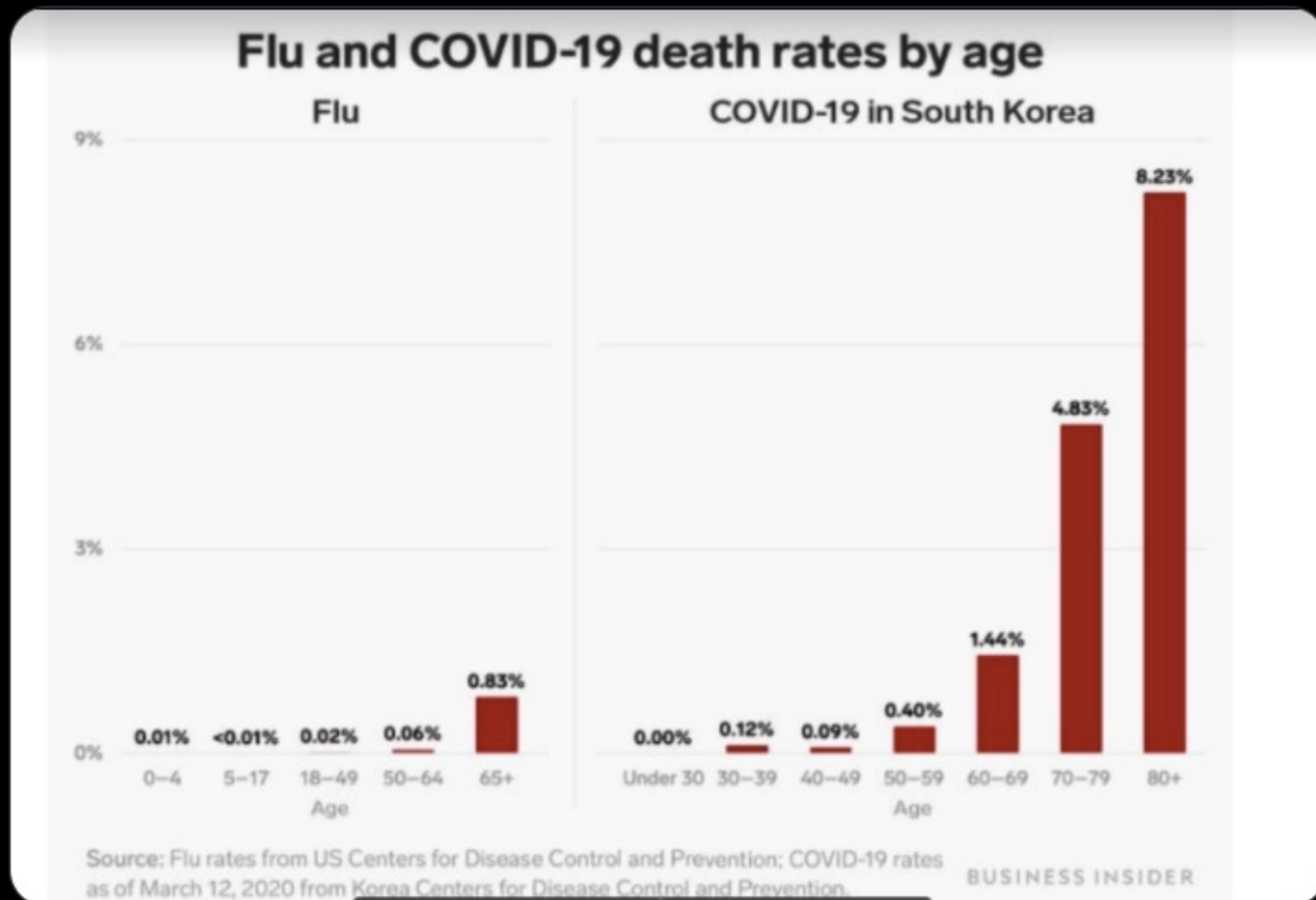
“The party was lame anyways, it’s good I wasn’t invited”

(you don’t know or don’t care about the truth, but intentionally say something you hope is persuasive)

the **DECLINE** of **ARTISTIC STANDARDS**

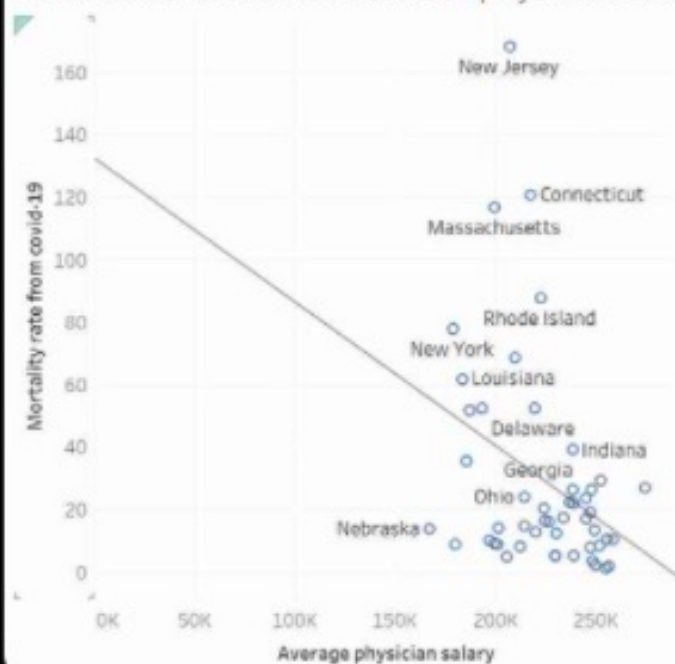


For people under 60, coronavirus is LESS dangerous than the seasonal flu:

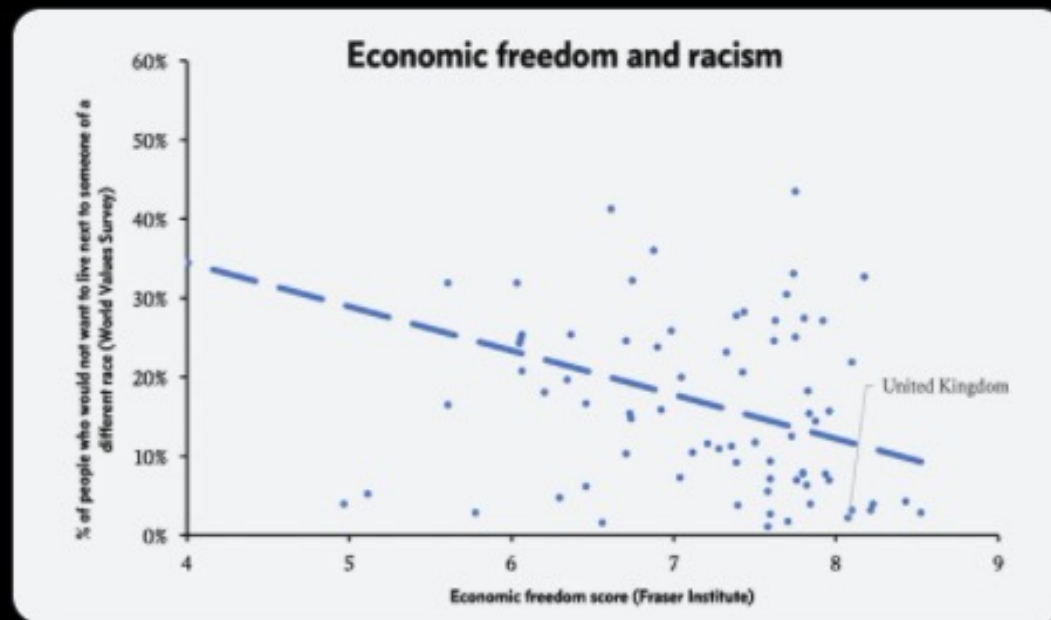


States where physicians are highly paid have lower Covid-19 mortality per capita.

Relation across states between physician salary and covid-19 mortality

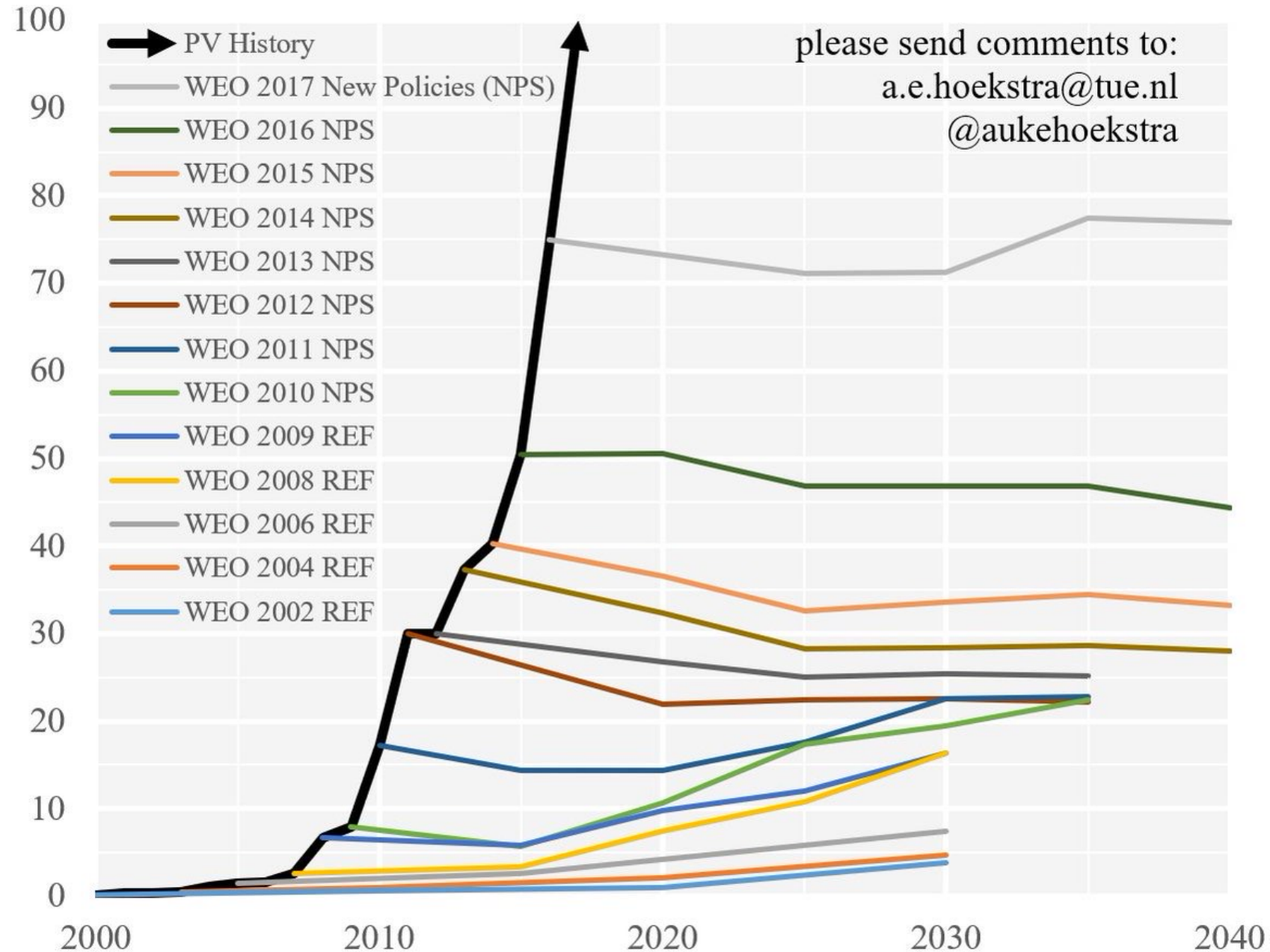


Fact check: Countries with more economic freedom have less racist attitudes, according to the World Values Survey.

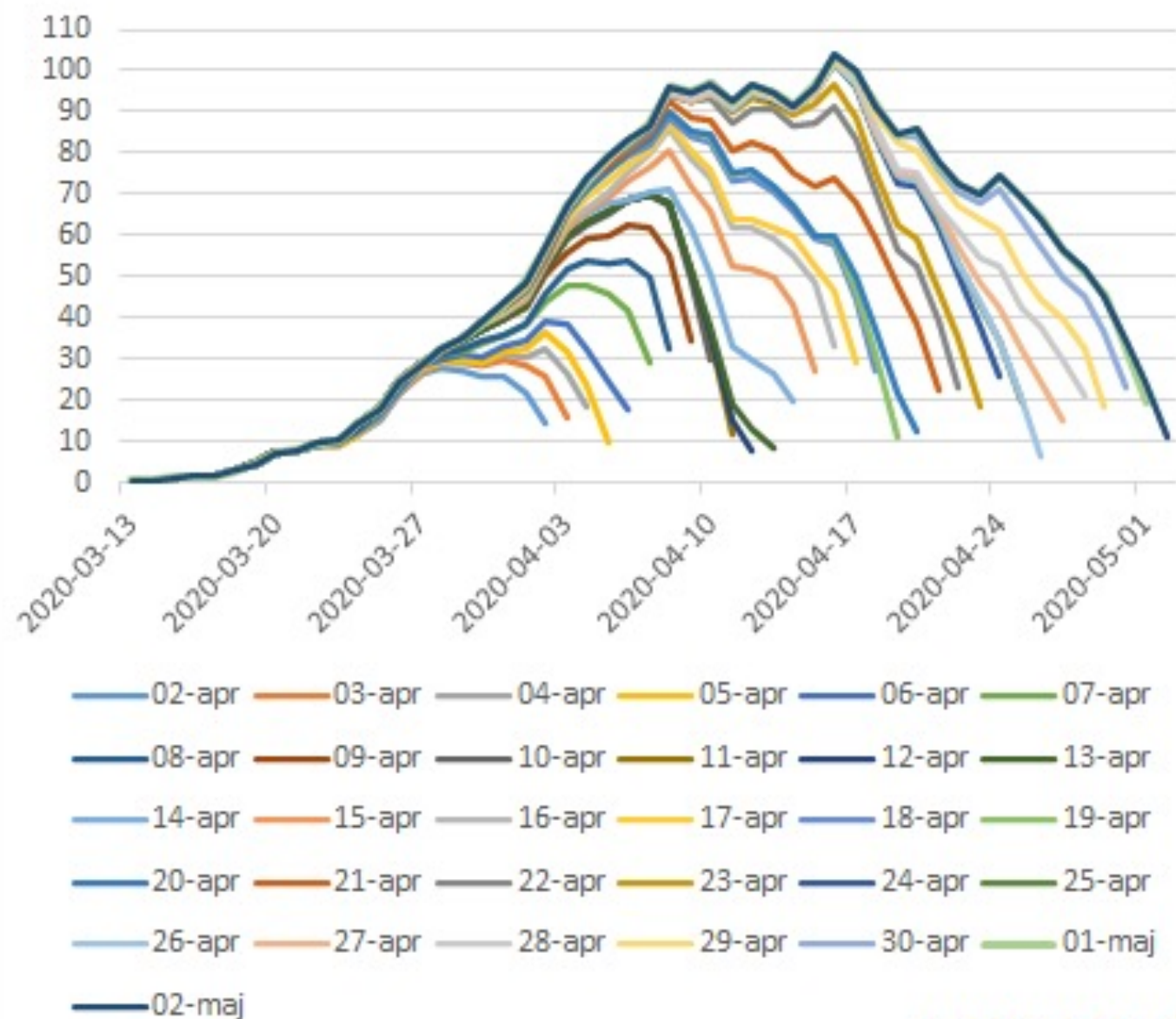


Annual PV additions: historic data vs IEA WEO predictions

In GW of added capacity per year - source International Energy Agency - World Energy Outlook



Sweden Covid-19 deaths per day
Rolling 3-day average
source: Folkhälsomyndigheten, daily spreadsheet



Bullshit Visualizations

You can just make stuff up with no connection to reality

...show stuff that looks like data but isn't

...assume a conclusion and pretend it's true

...or give people data they can't do anything with

Bad Visualizations

Incorrect Visualizations

Illegible Visualizations

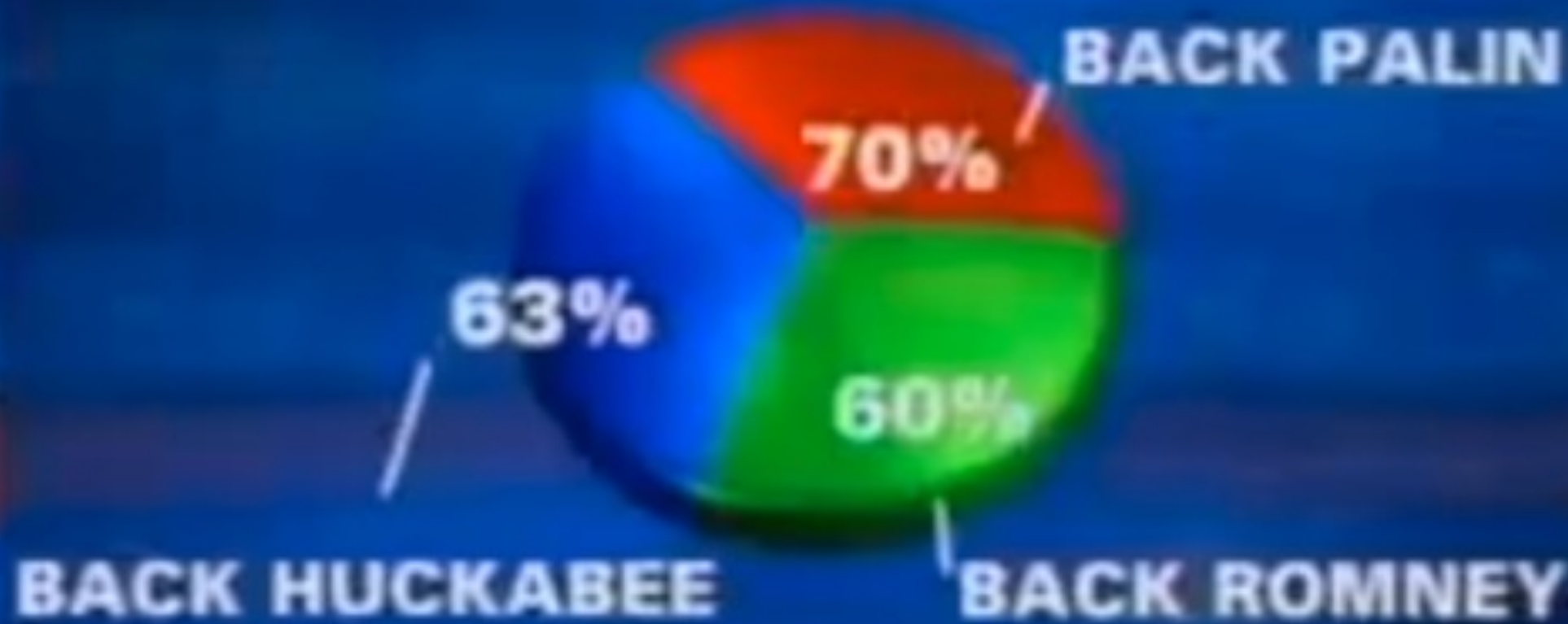
Bullshit Visualizations

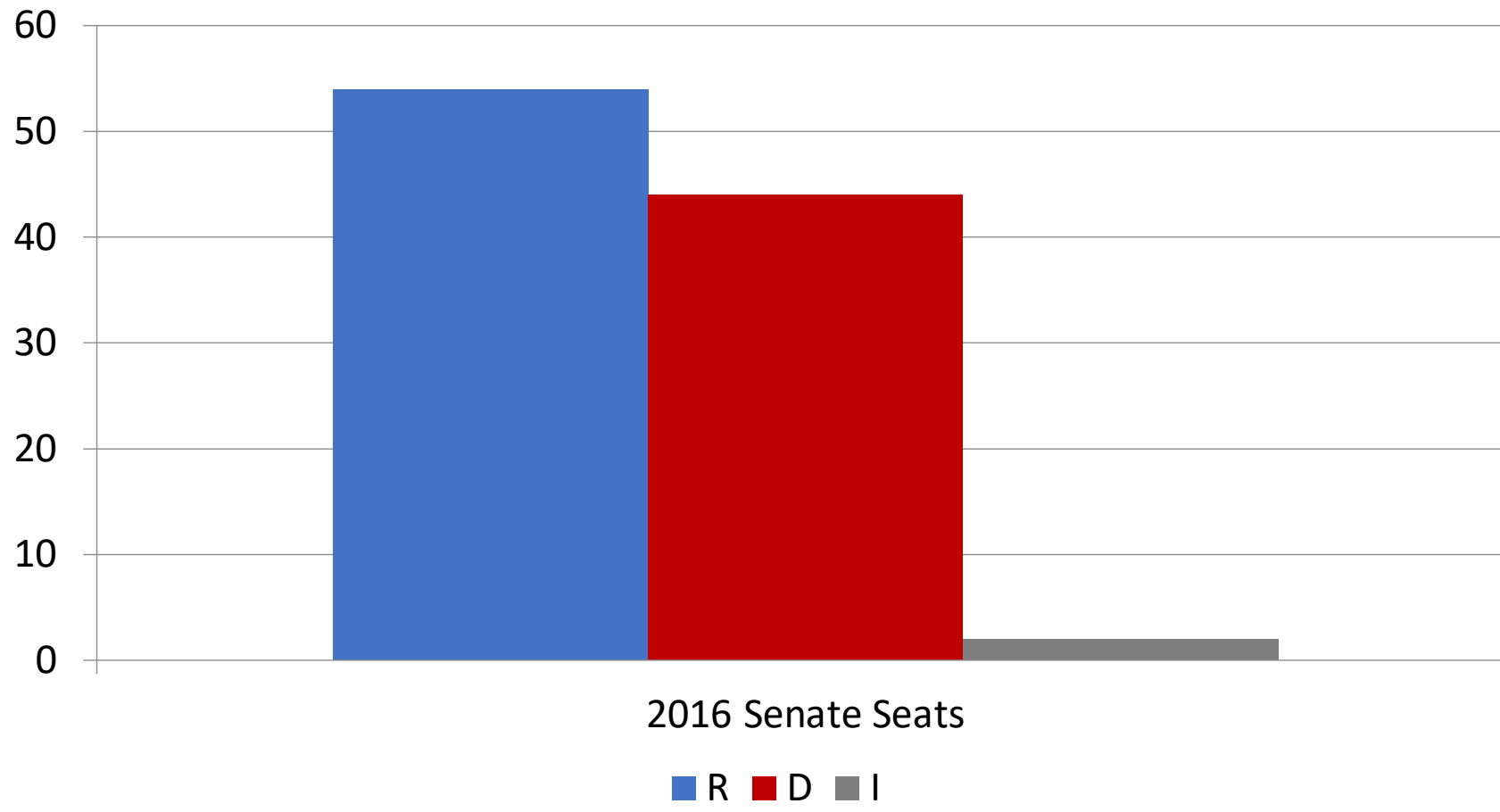
Unconventional Visualizations

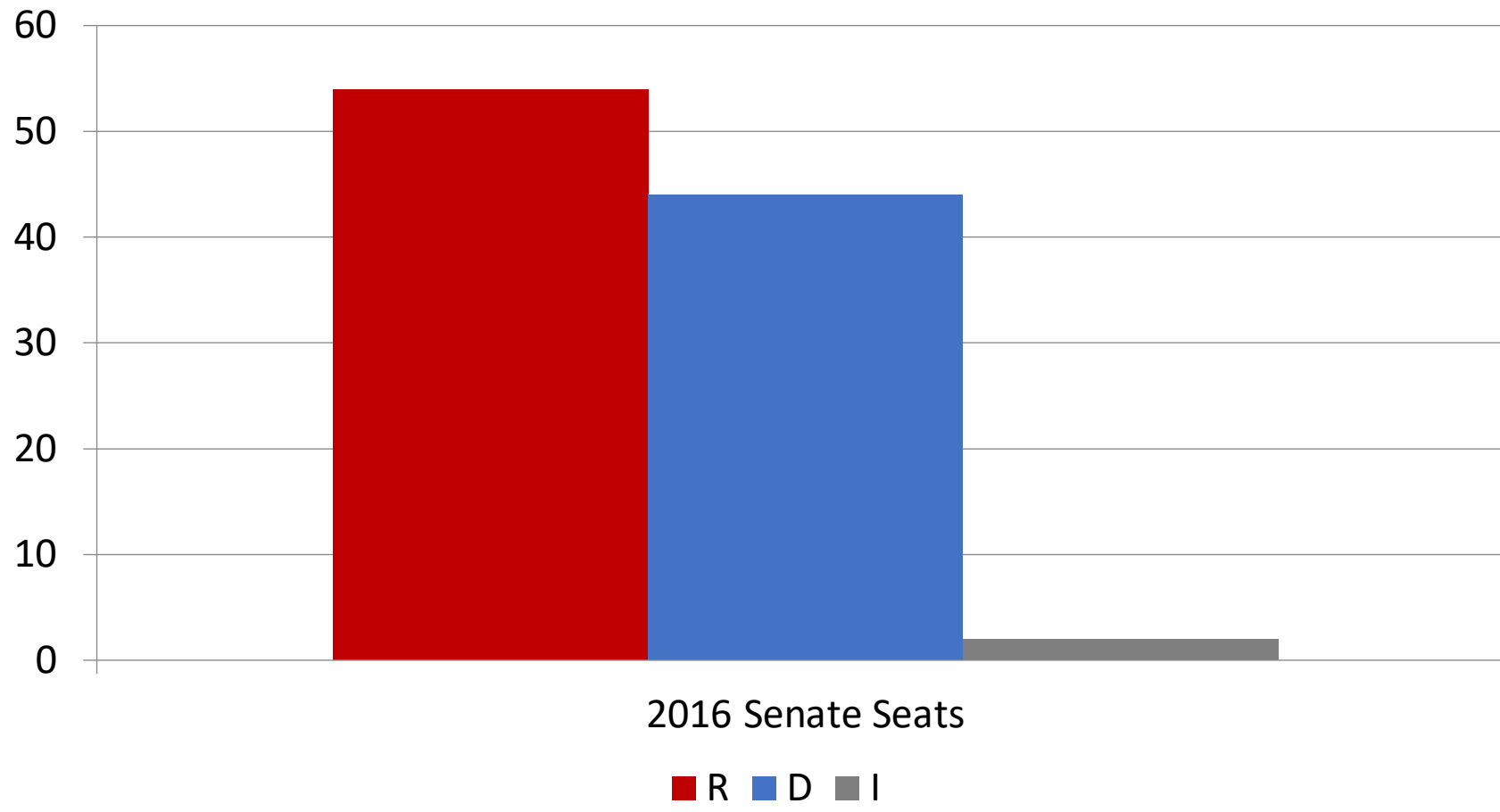


2012 PRESIDENTIAL RUN

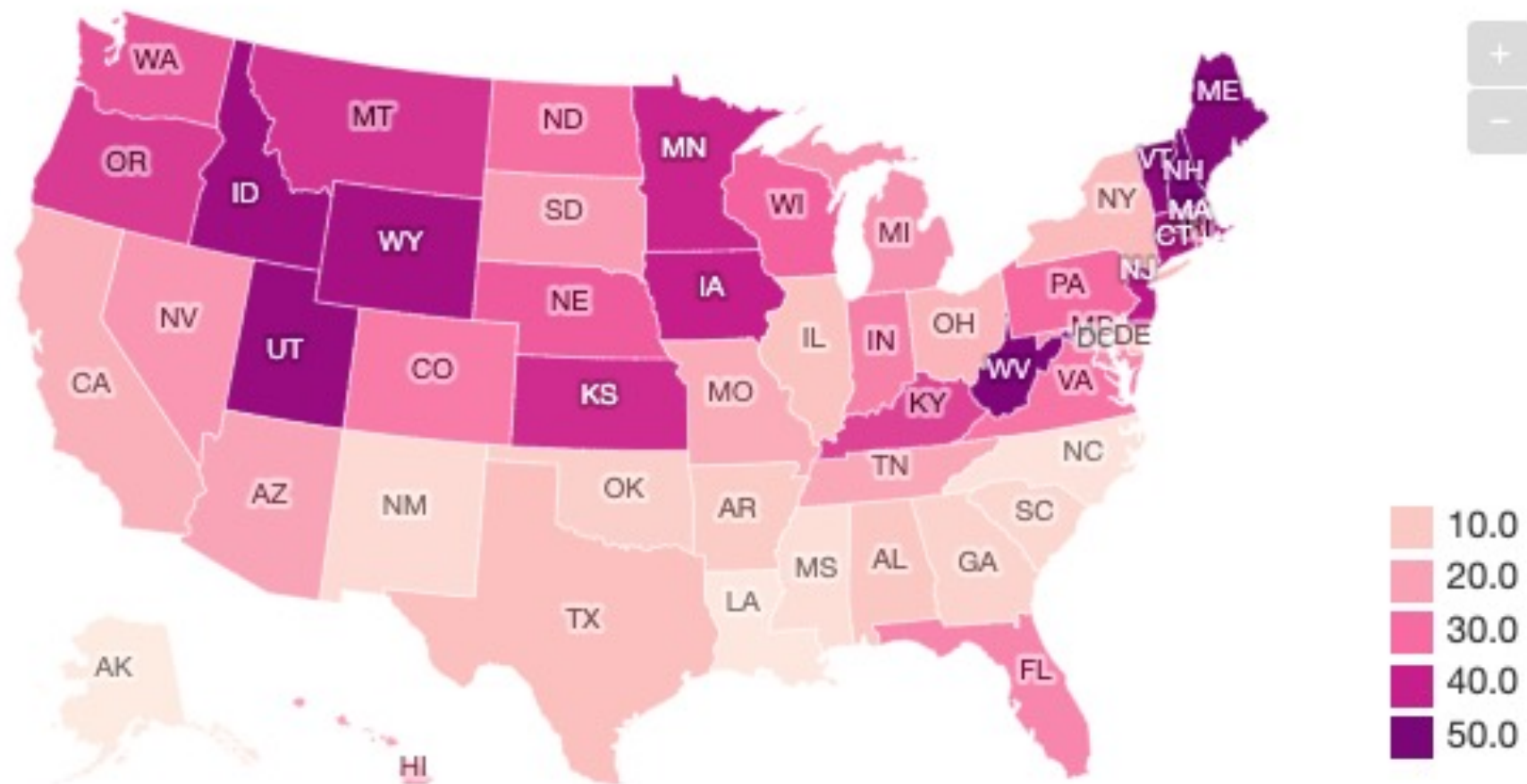
GOP CANDIDATES



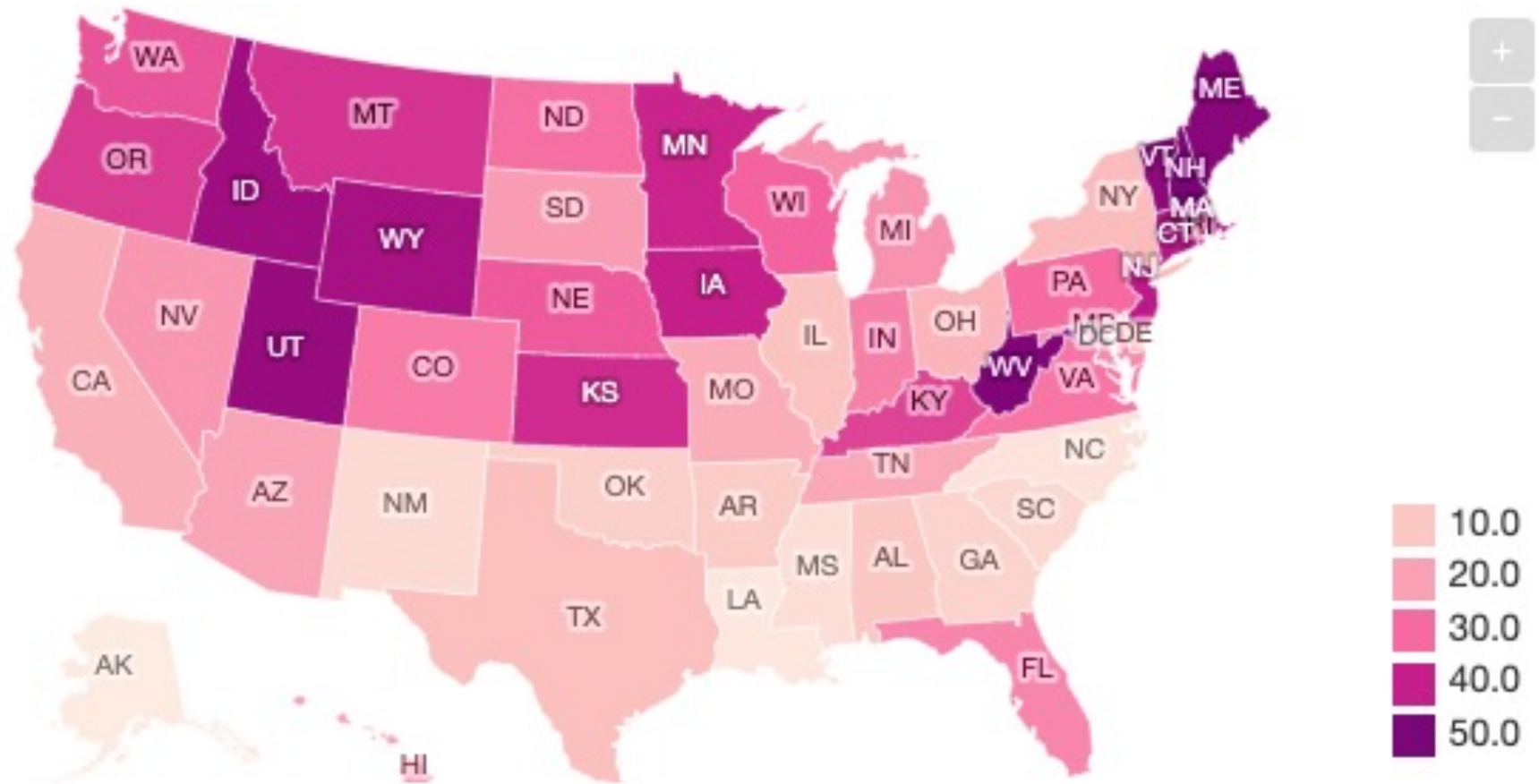




Which states have the most STIs?



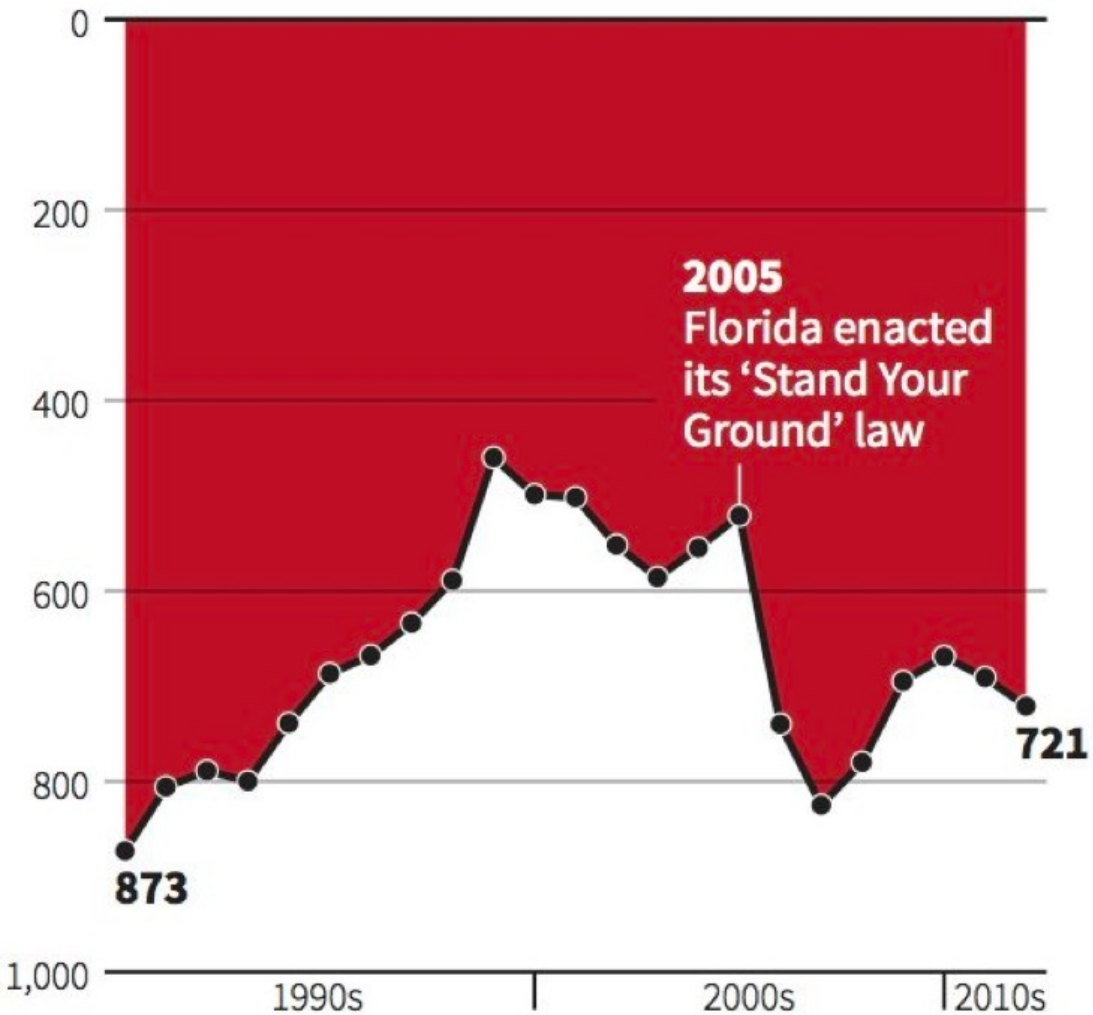
Which states have the most STIs?



“Each state has been rated from one to 50: the higher the score, the smaller the proportion of STIs. So on the map - the darker the colour, the smaller the rate of STIs.”

Gun deaths in Florida

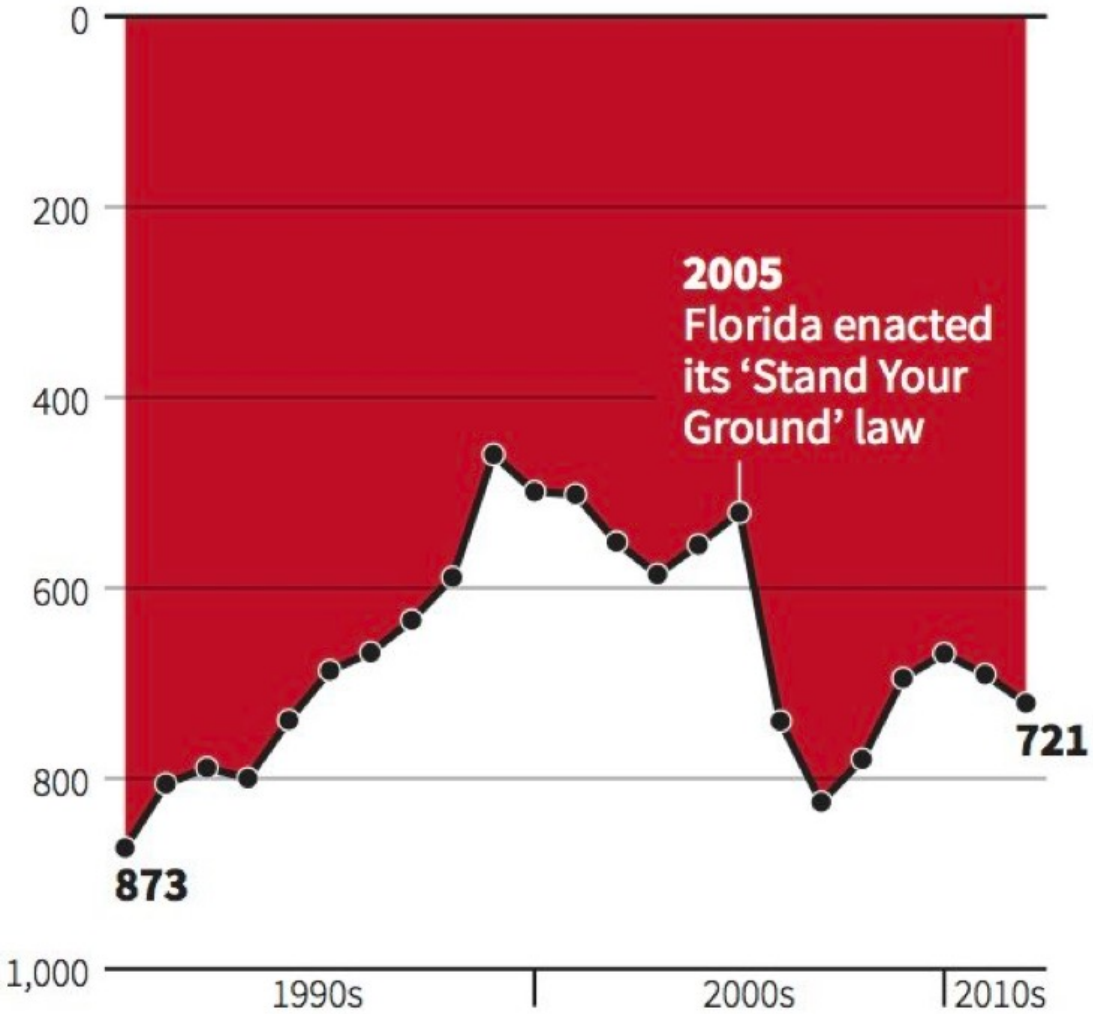
Number of murders committed using firearms



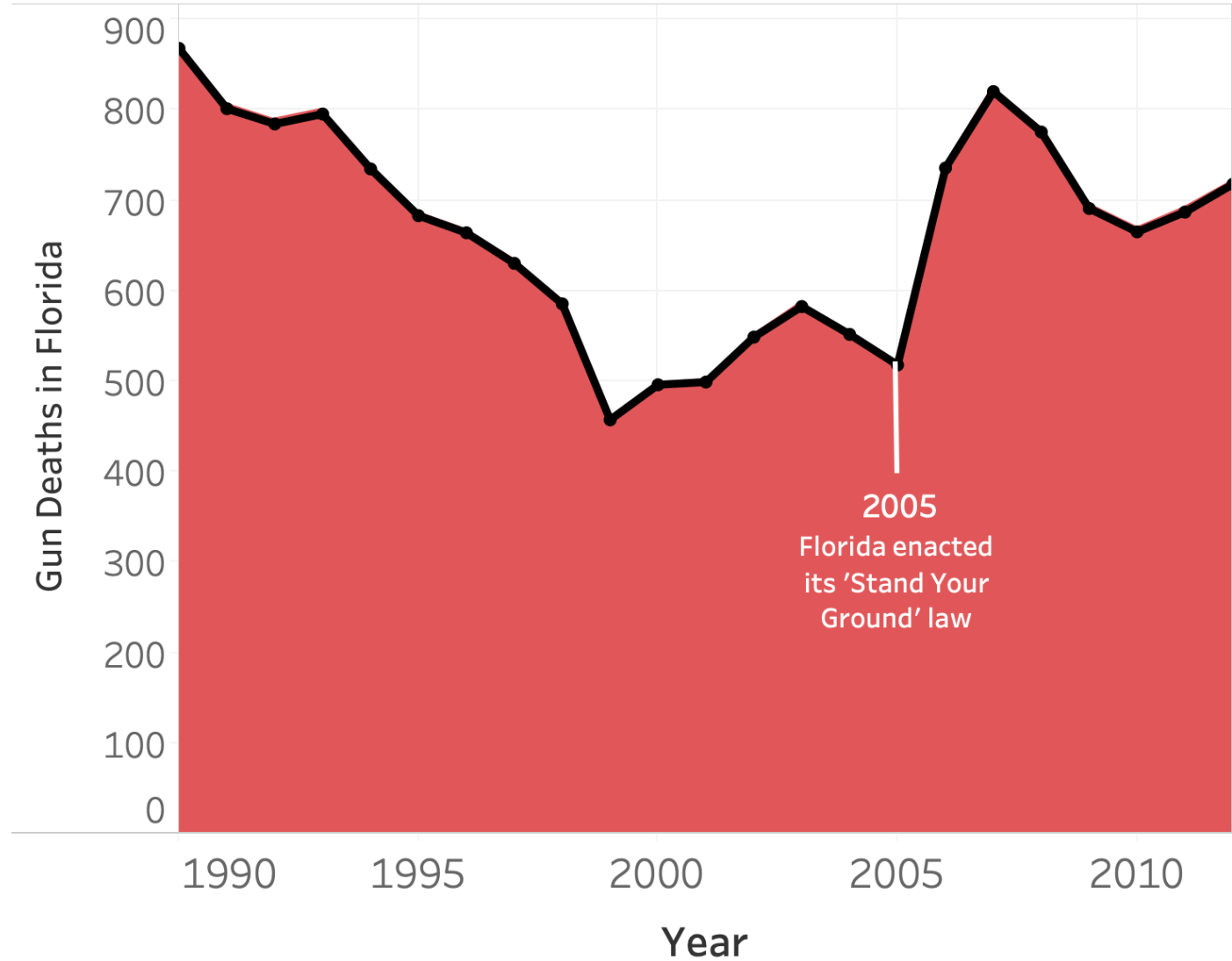
Source: Florida Department of Law Enforcement

Gun deaths in Florida

Number of murders committed using firearms

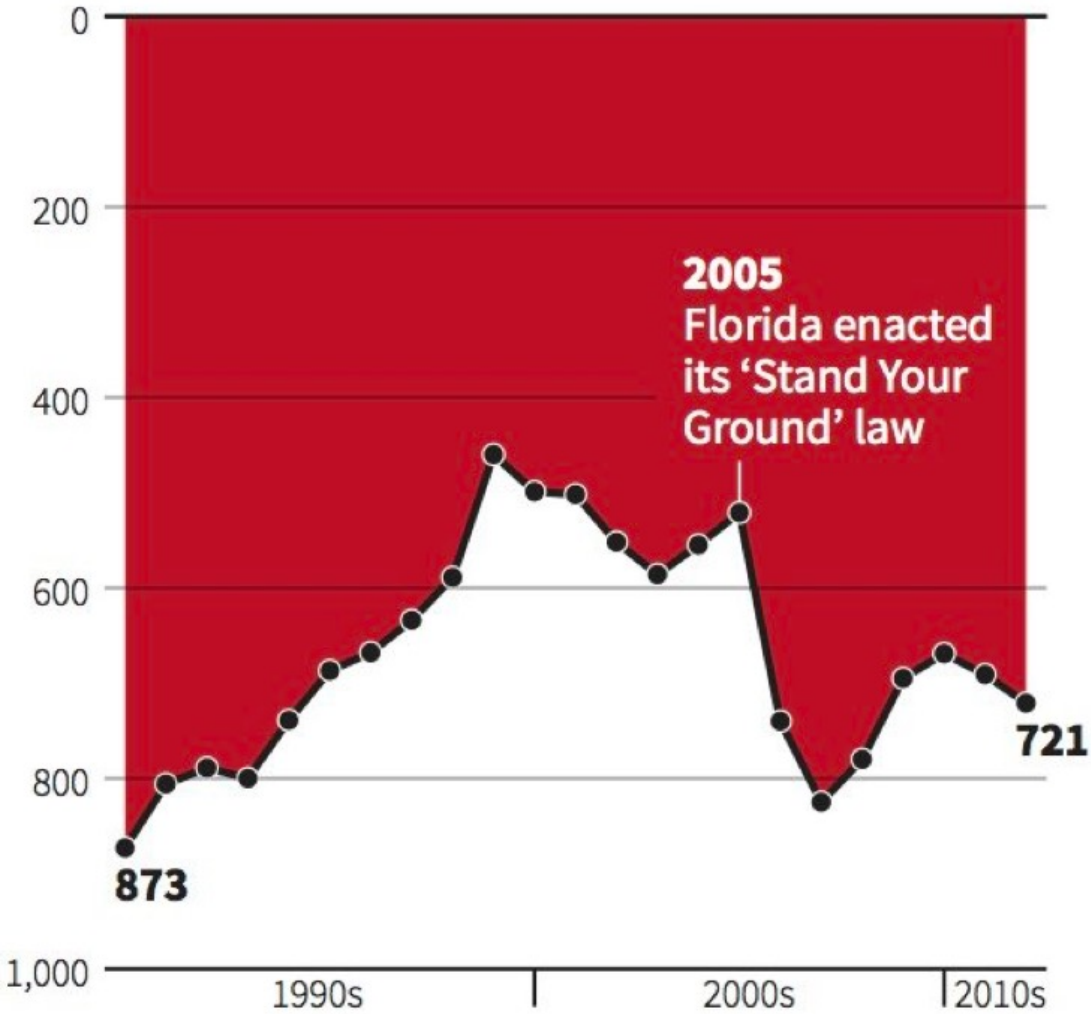


Source: Florida Department of Law Enforcement



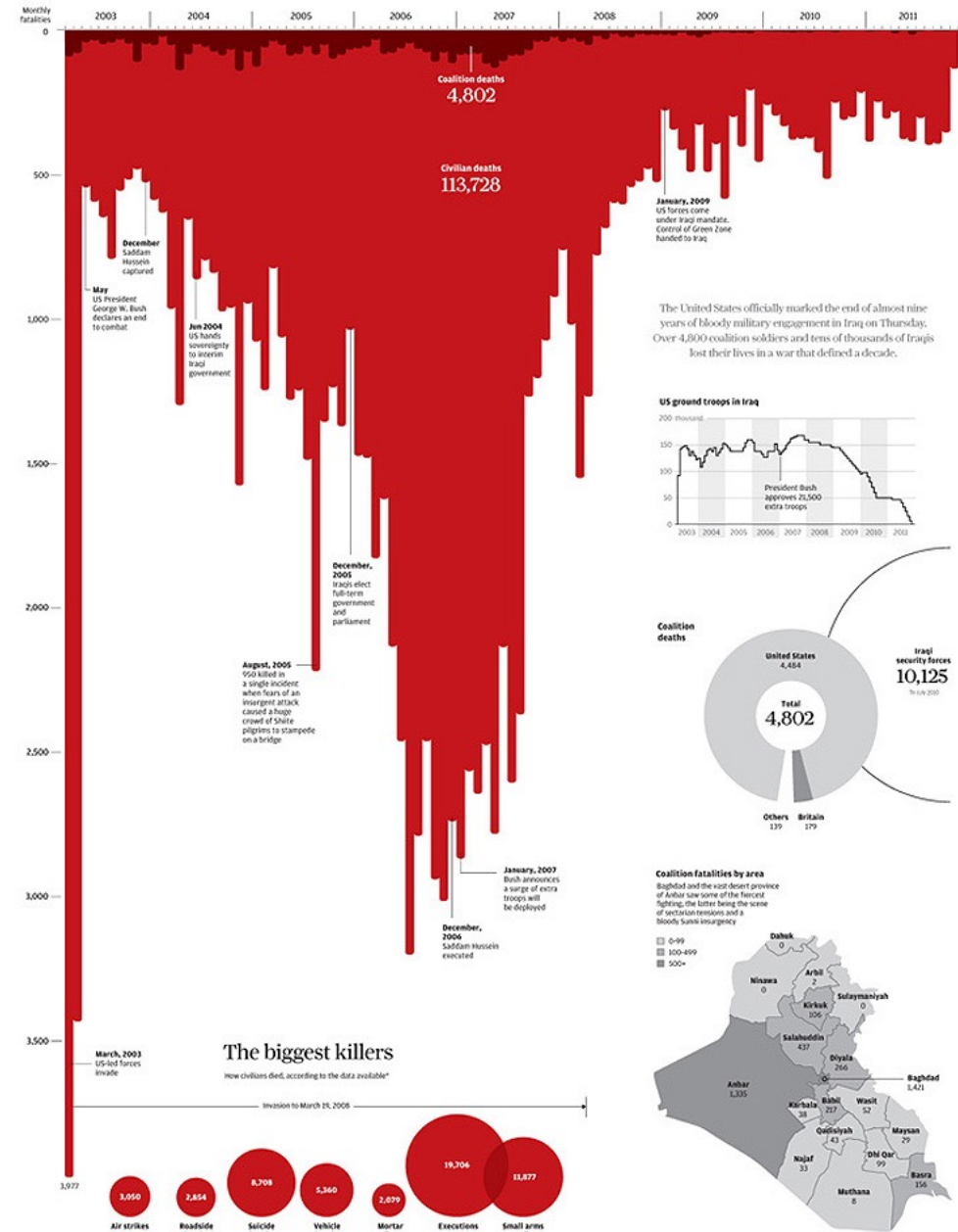
Gun deaths in Florida

Number of murders committed using firearms



Source: Florida Department of Law Enforcement

Iraq's bloody toll



ITHACA TIMES

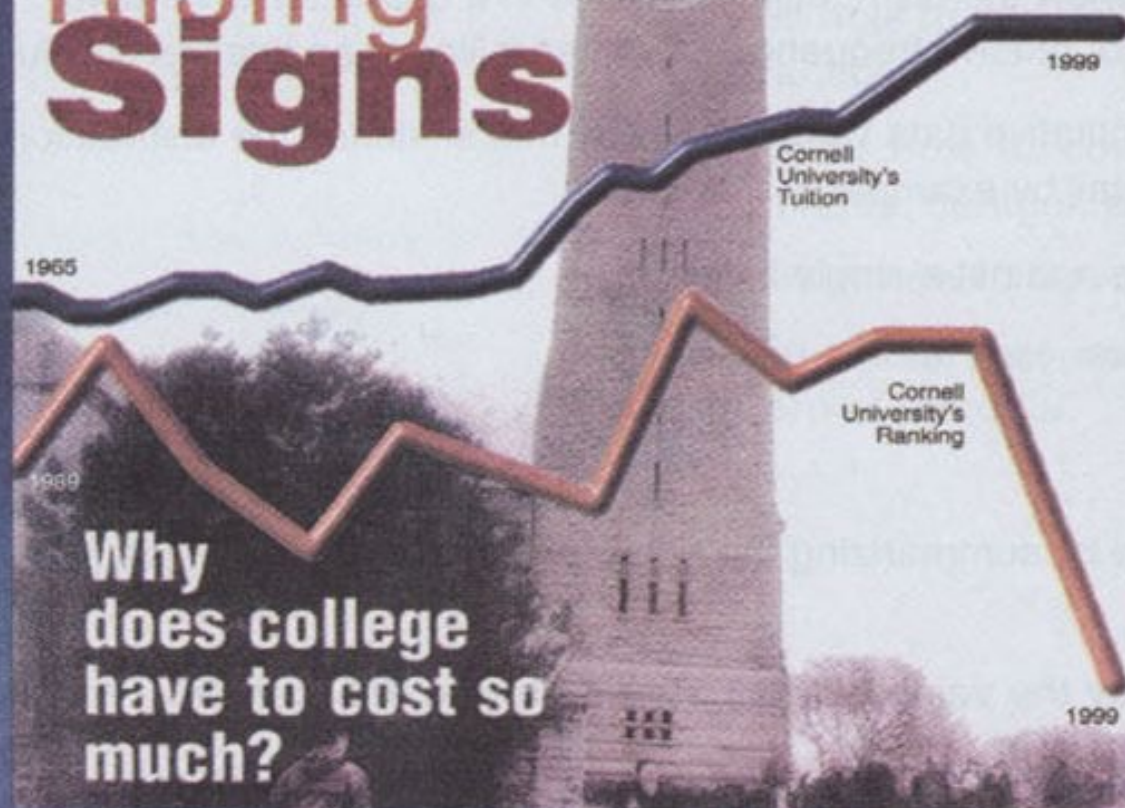
Visit us online at <http://www.ithacatimes.com>

Planning Board approves
Widewaters development

IC students occupy Job Hall

Cayuga Vocal Ensemble
ushers in the holidays with
"Judas Maccabaeus"

Rising Signs



Why
does college
have to cost so
much?

ITHACA TIMES

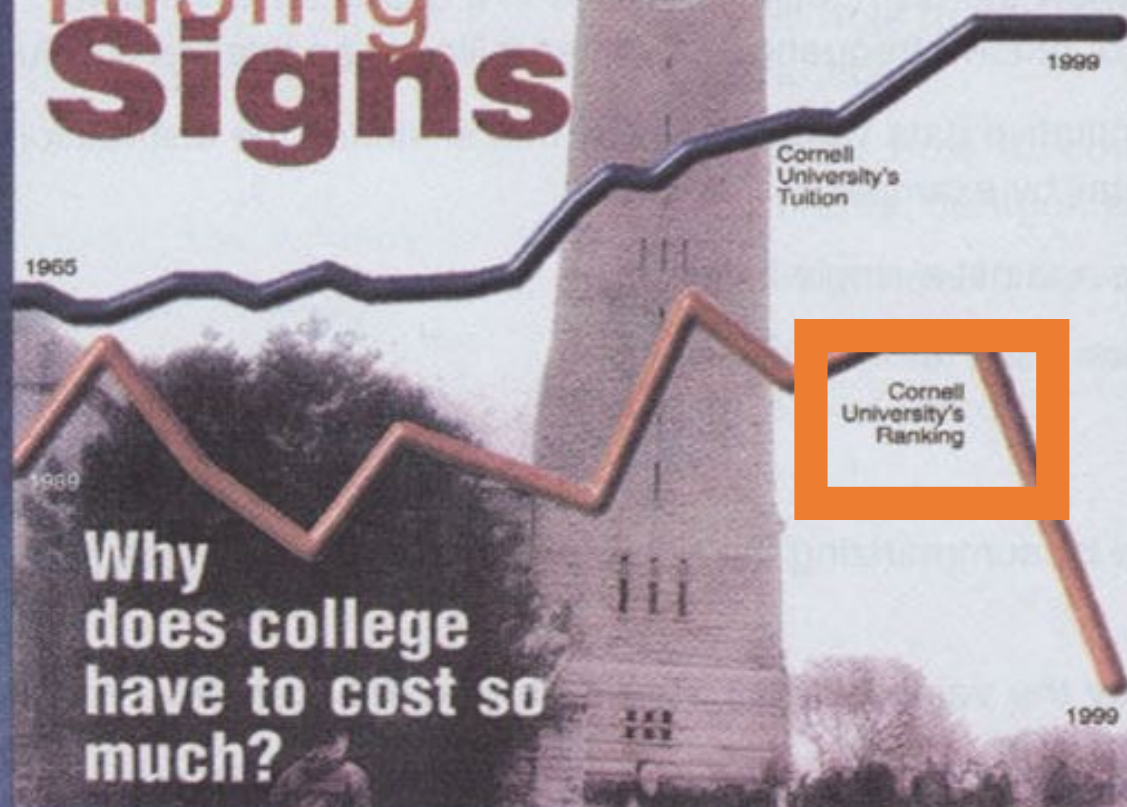
Visit us online at <http://www.ithacatimes.com>

Planning Board approves
Widewaters development

IC students occupy Job Hall

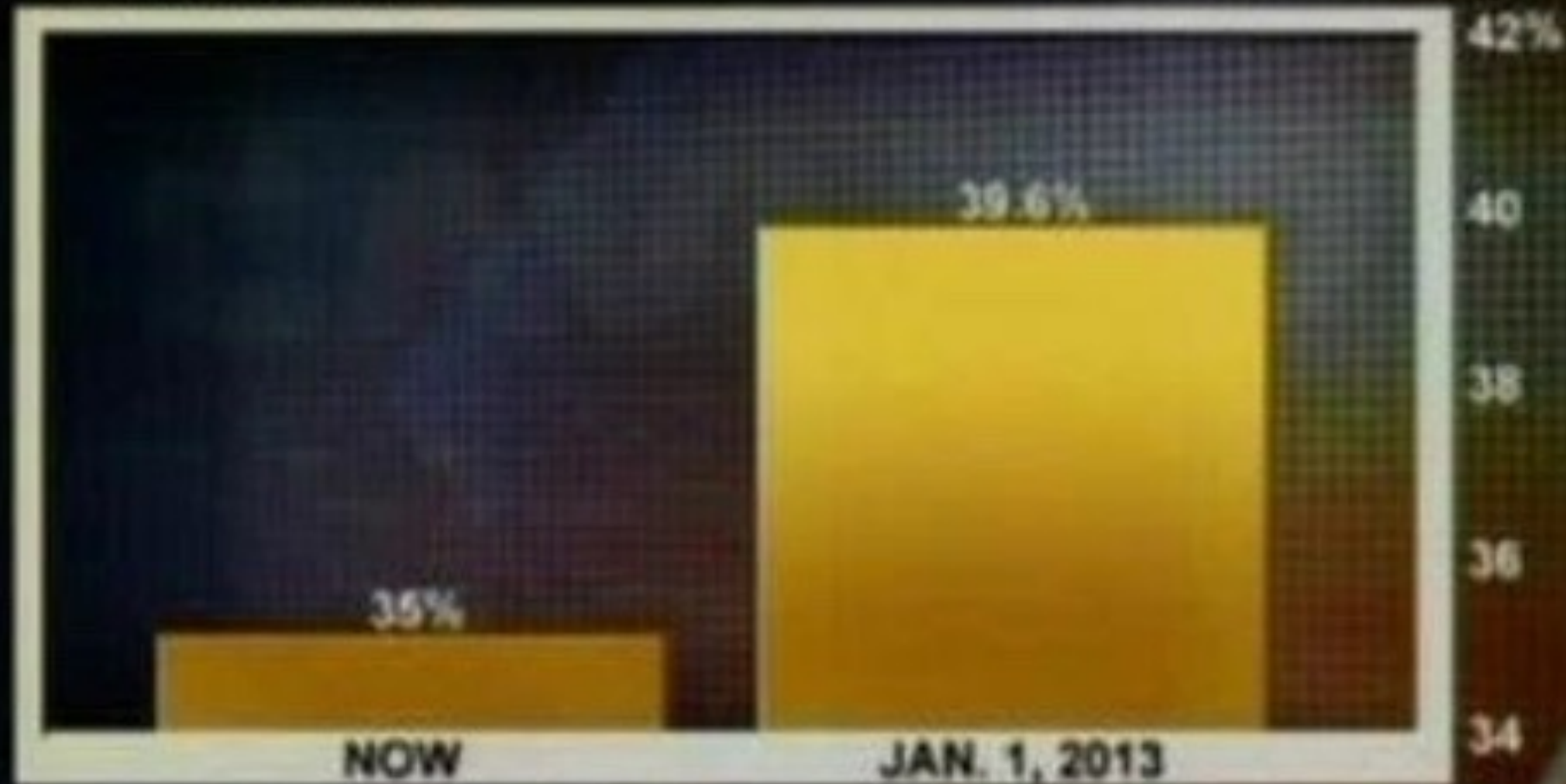
Cayuga Vocal Ensemble
ushers in the holidays with
"Judas Maccabaeus"

Rising Signs



Why
does college
have to cost so
much?

TOP TAX RATE



8:01p ET

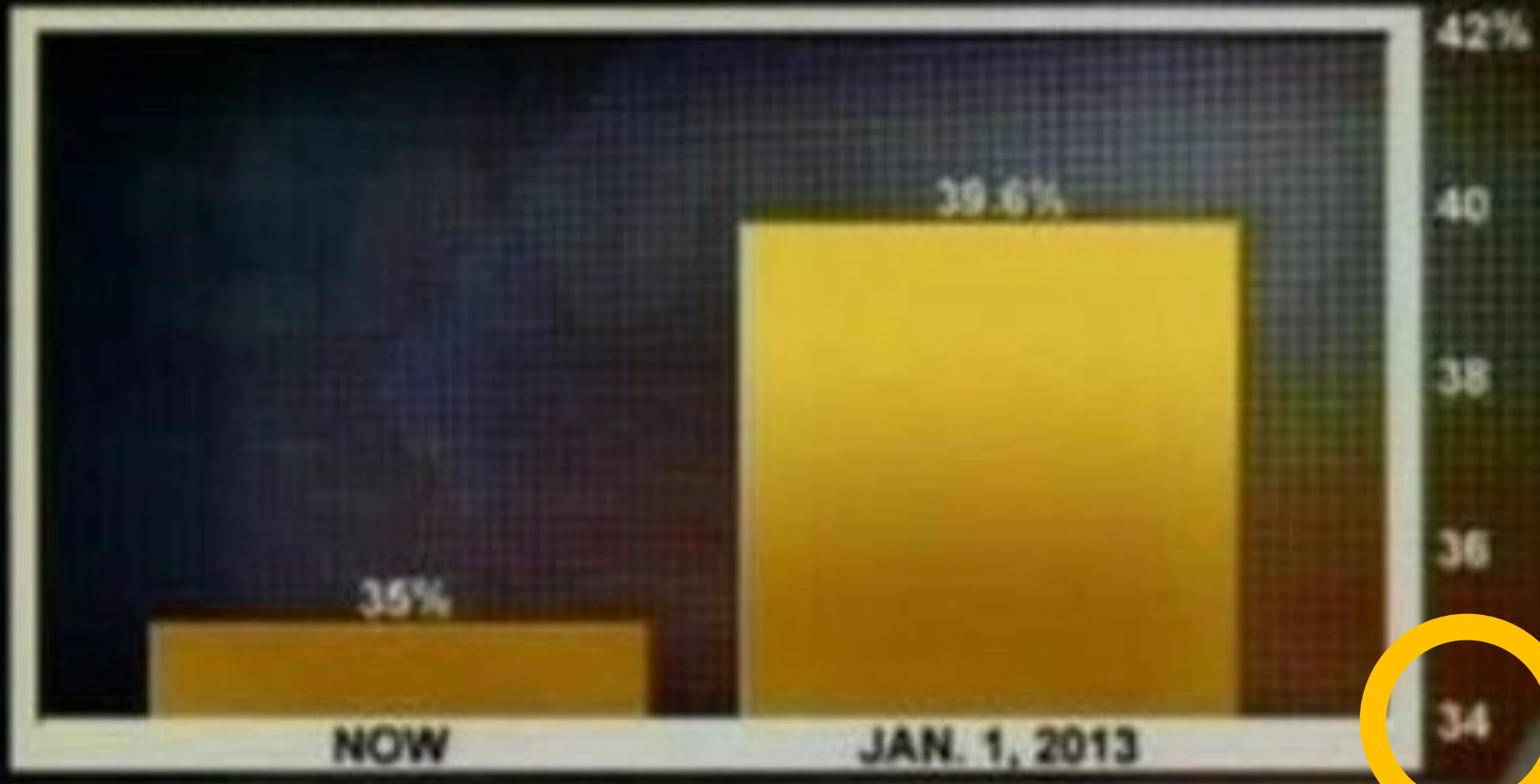
FOX

TOP STORIES

TECHNOLOGY

CONSUMER

TOP TAX RATE



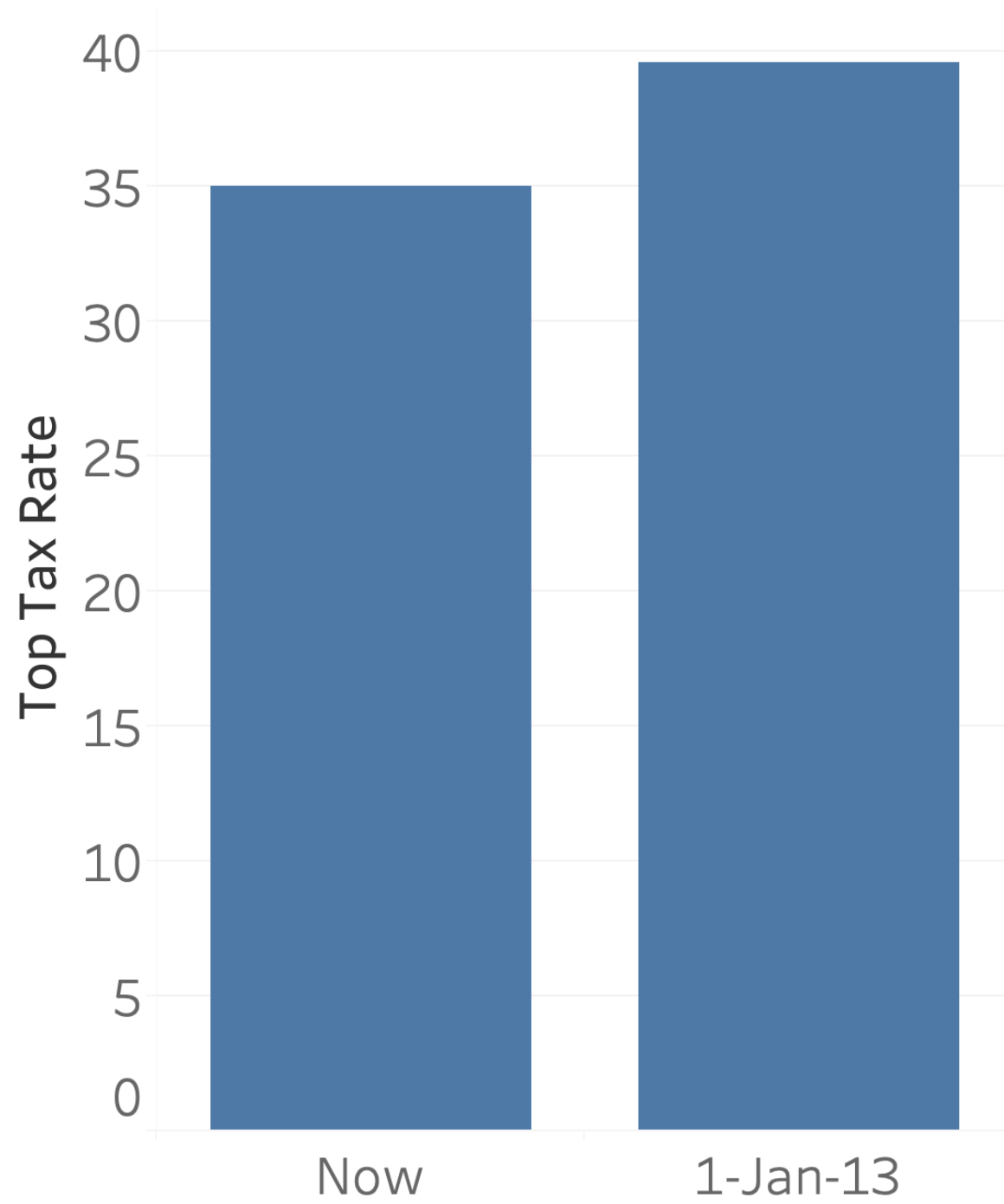
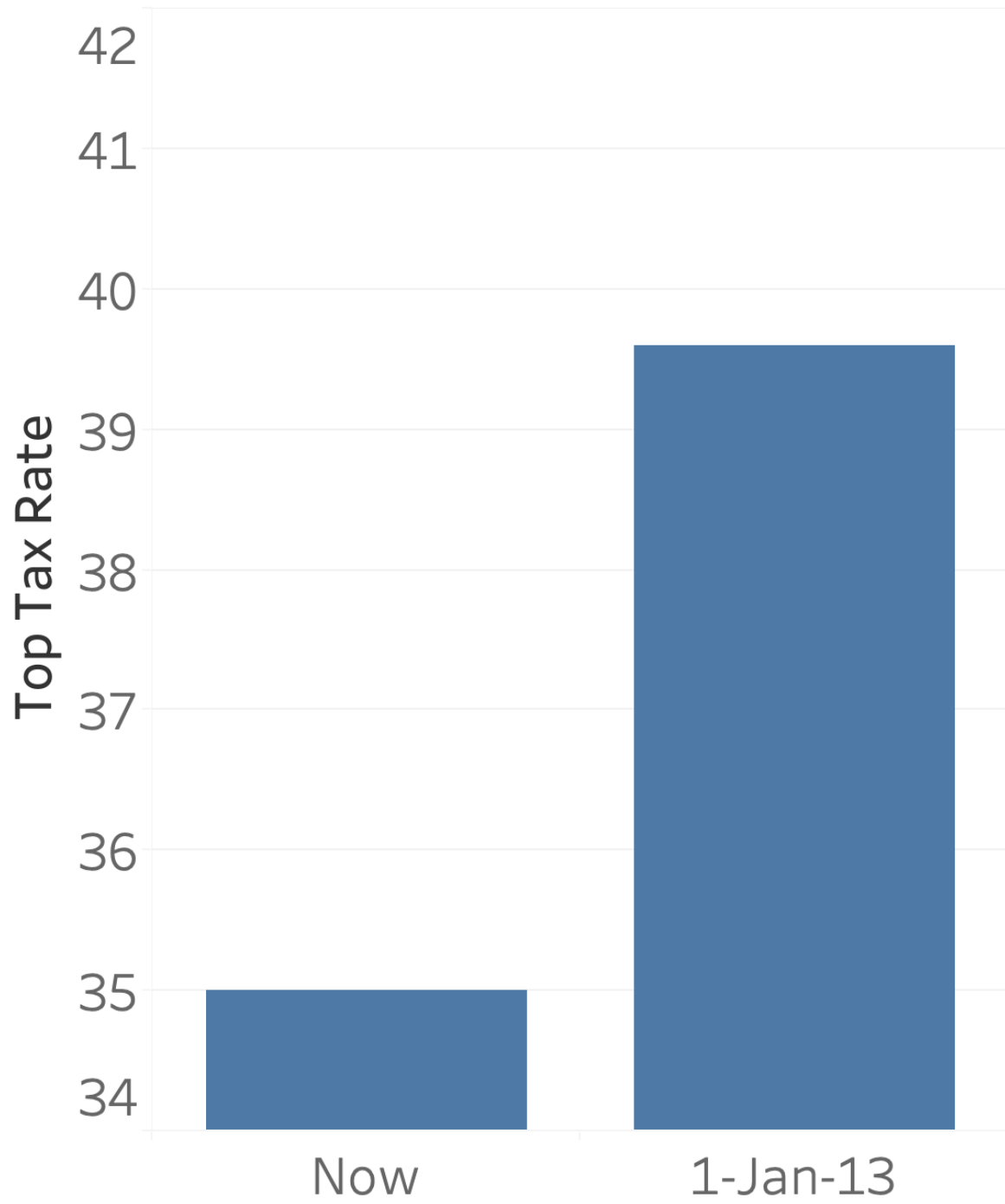
8:01p ET

FOX

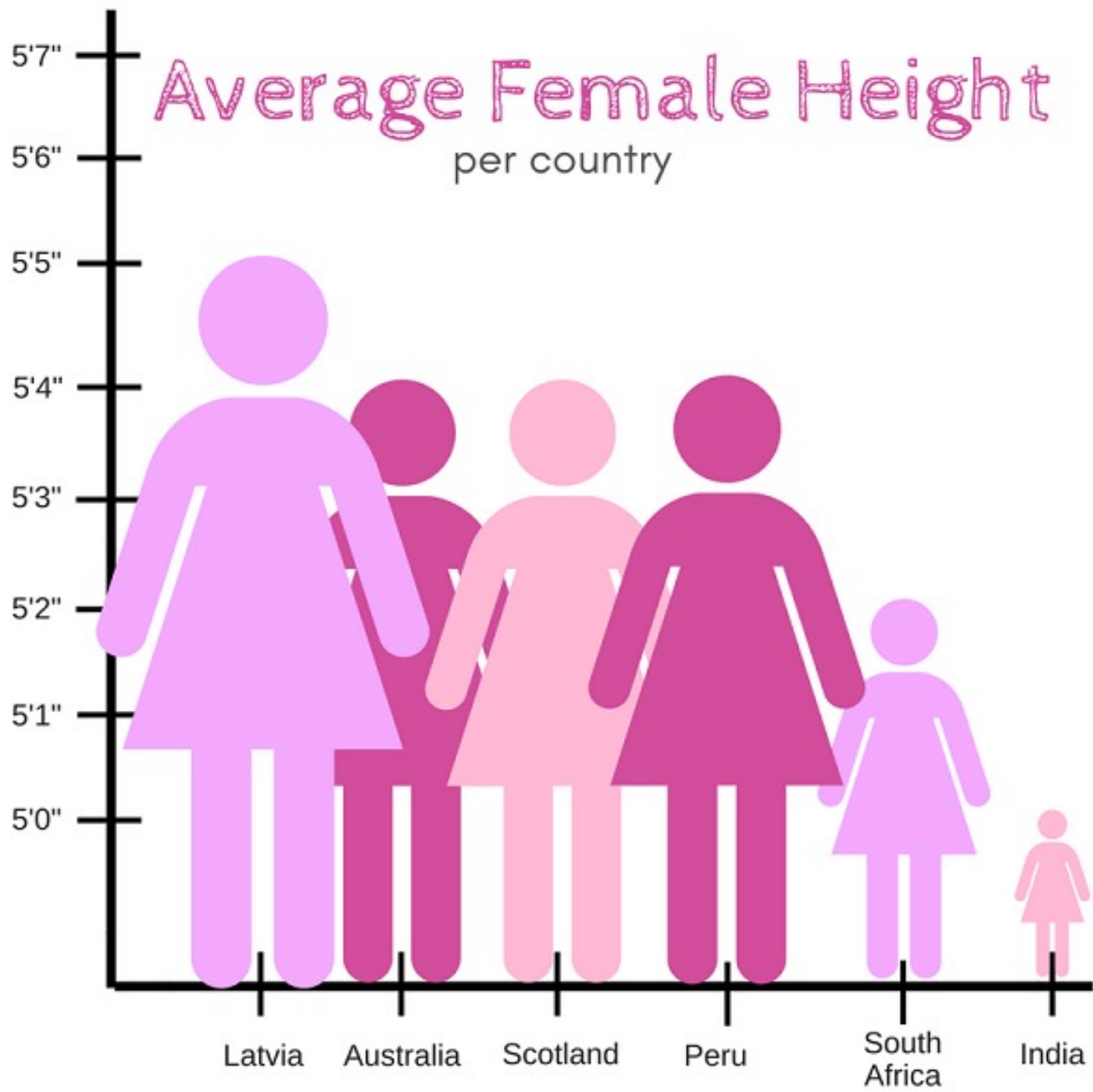
TOP STORIES

TECHNOLOGY

CONSUMER



Average Female Height per country



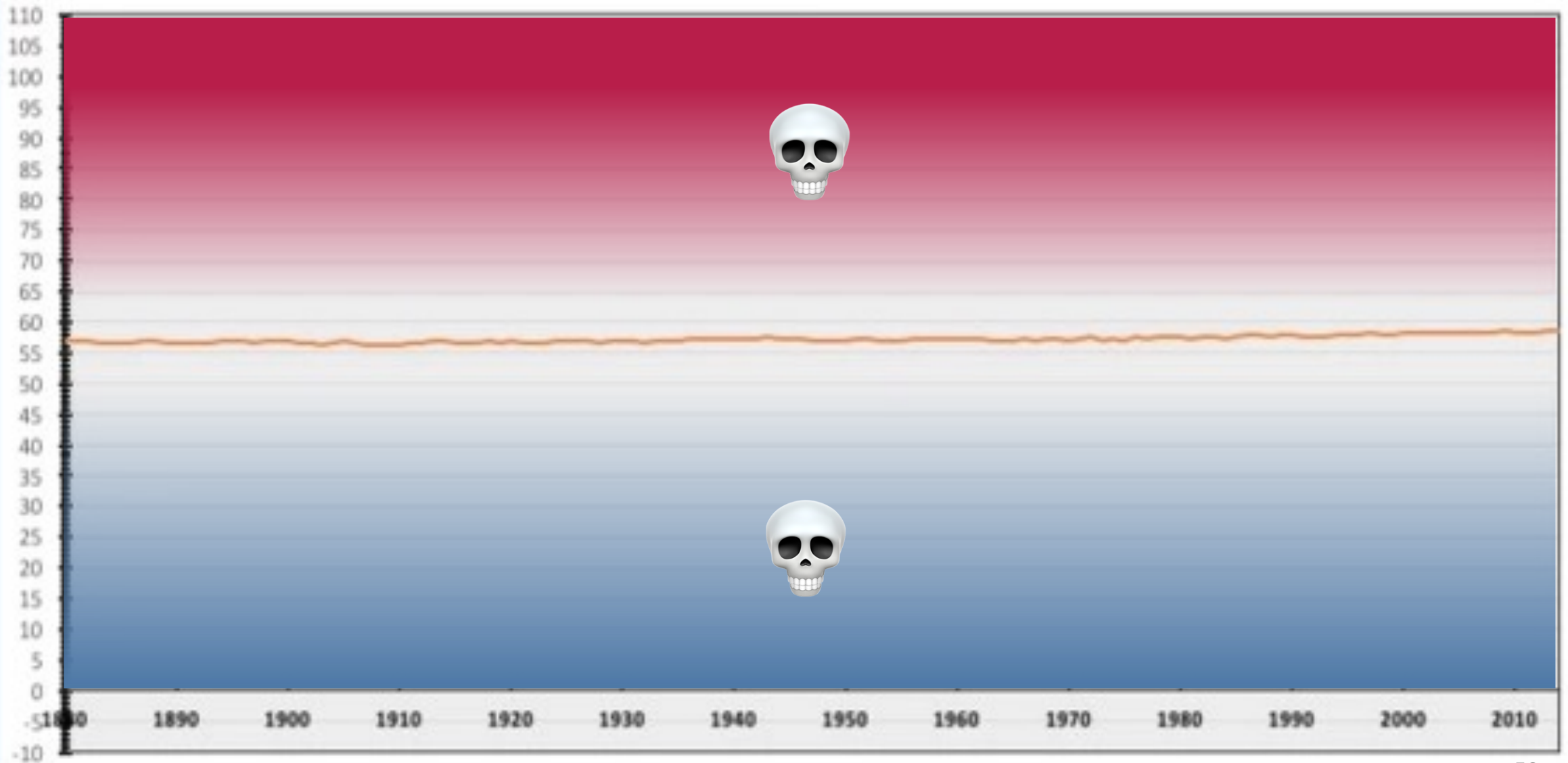
Average Annual Global Temperature in Fahrenheit 1880-2015



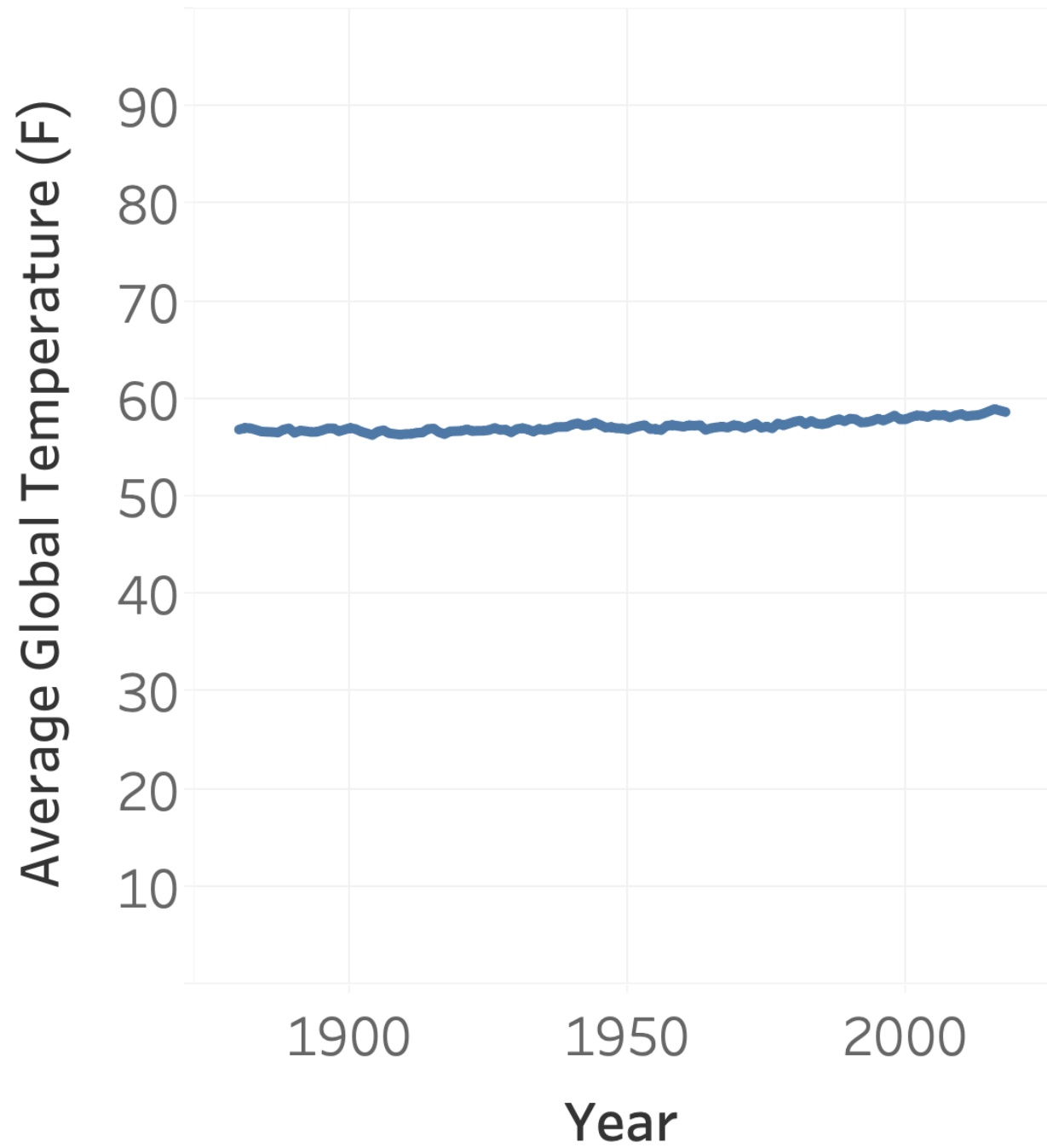
Average Annual Global Temperature in Fahrenheit 1880-2015



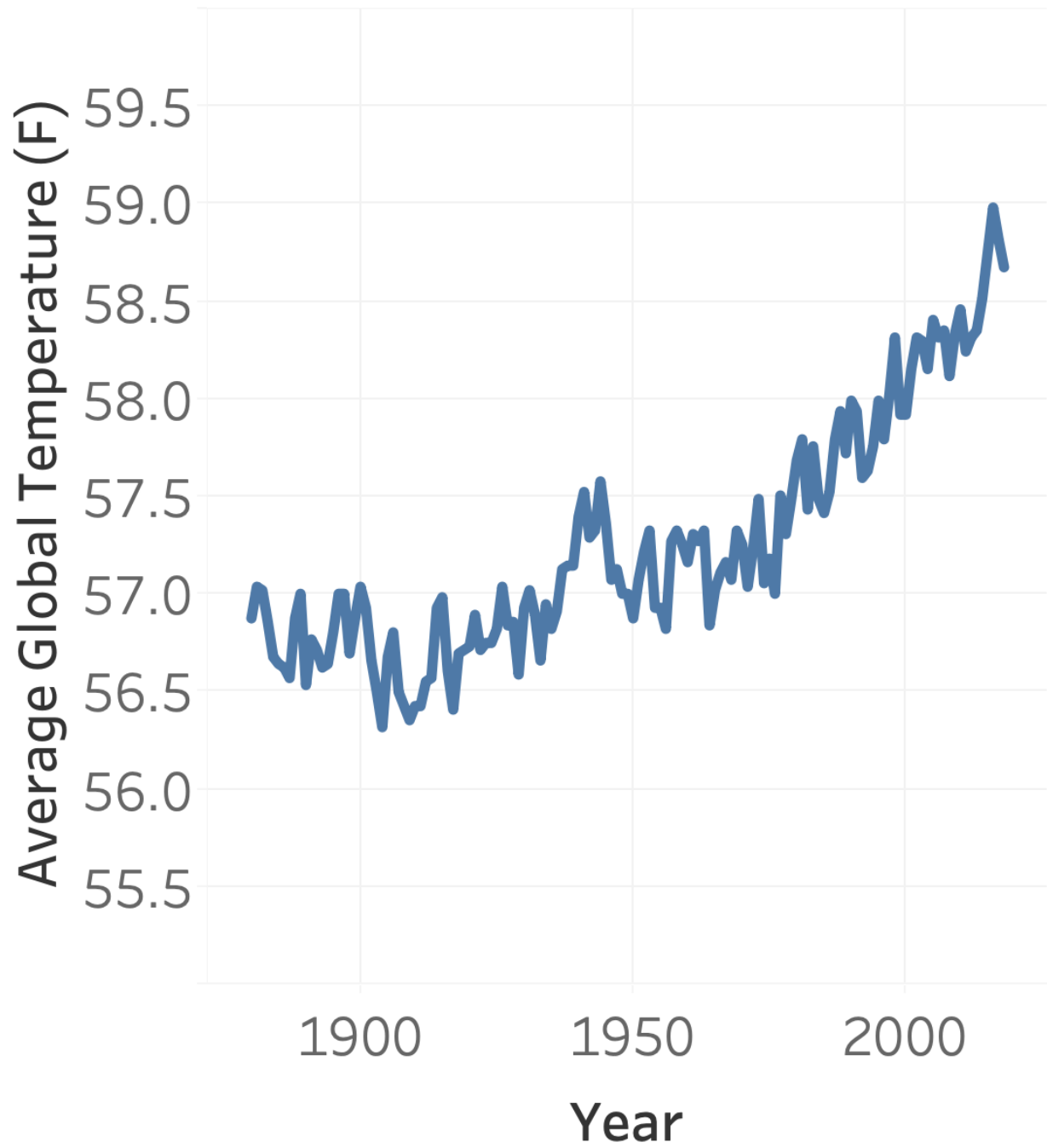
Average Annual Global Temperature in Fahrenheit 1880-2015



NRO



NRO (Truncated)



Unconventional Visualizations

People have tacit conventions on how they interpret charts
(around colors, axes, slopes)

...if you violate those conventions, you can catch people off guard.

Bad Visualizations

Incorrect Visualizations

Illegible Visualizations

Bullshit Visualizations

Unconventional Visualizations

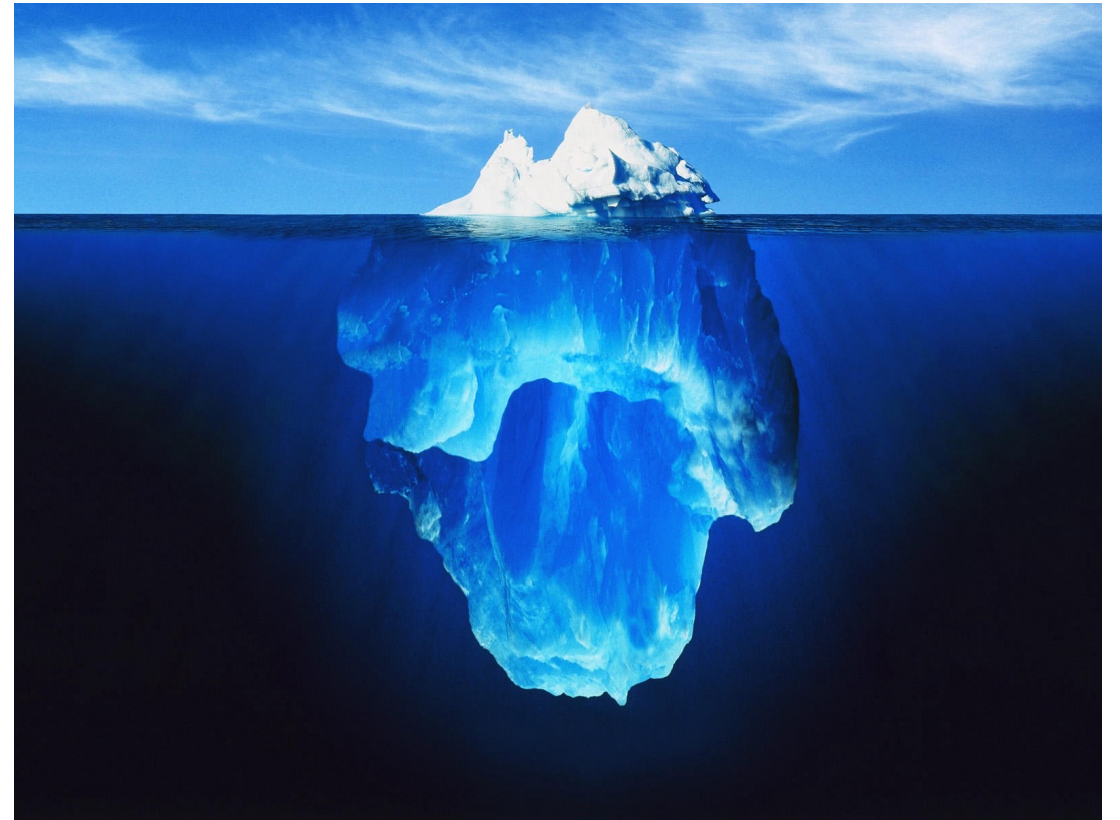


Other Types of Bad Visualizations

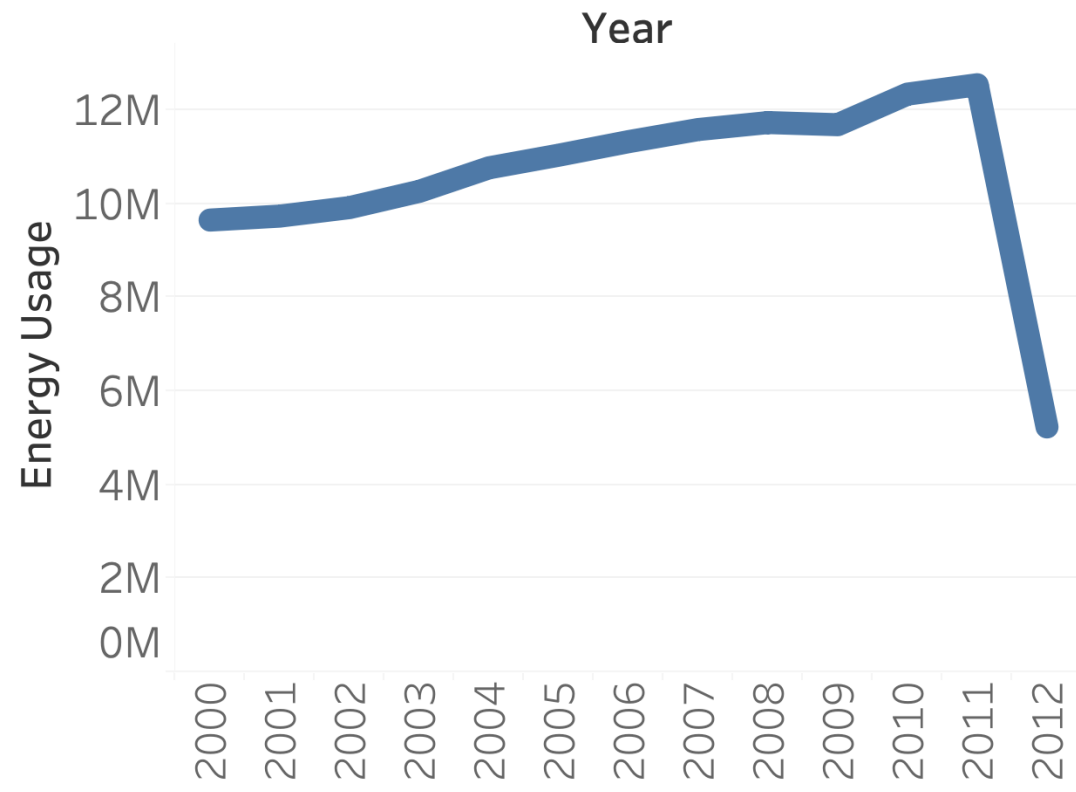
Fragile Visualizations?

Inhuman Visualizations?

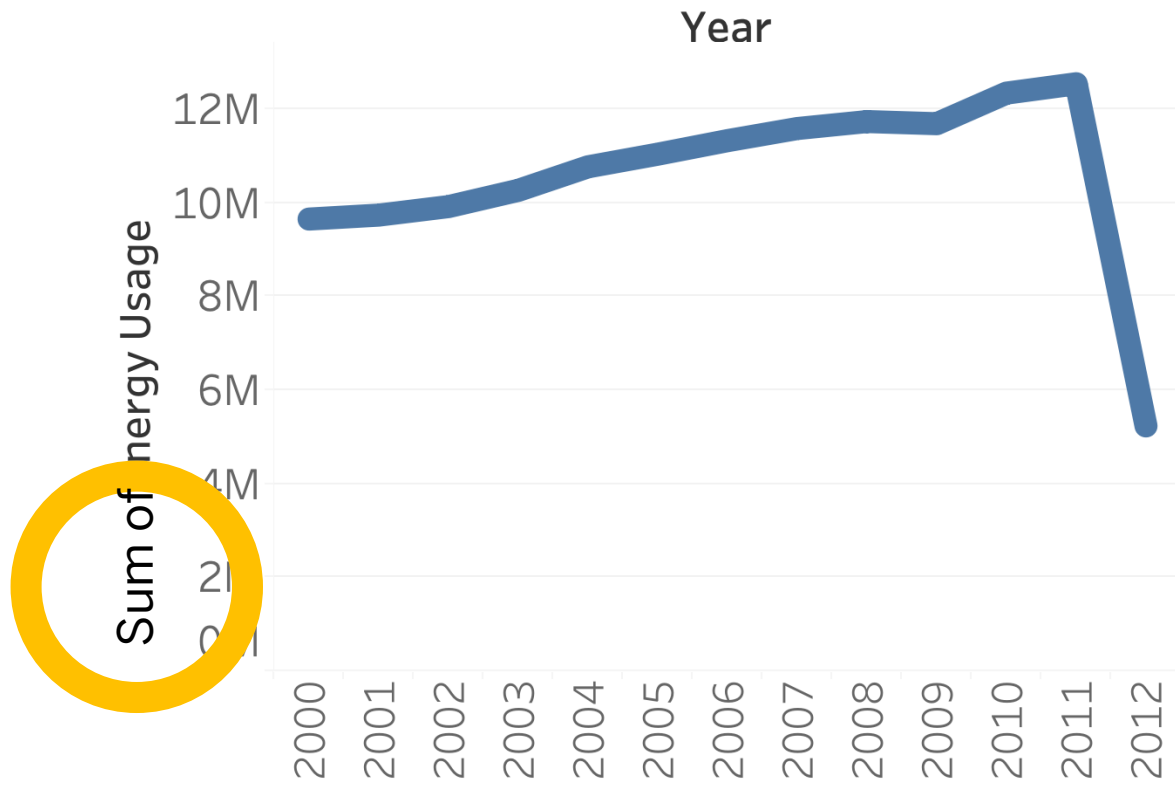
Visualization White Lies?



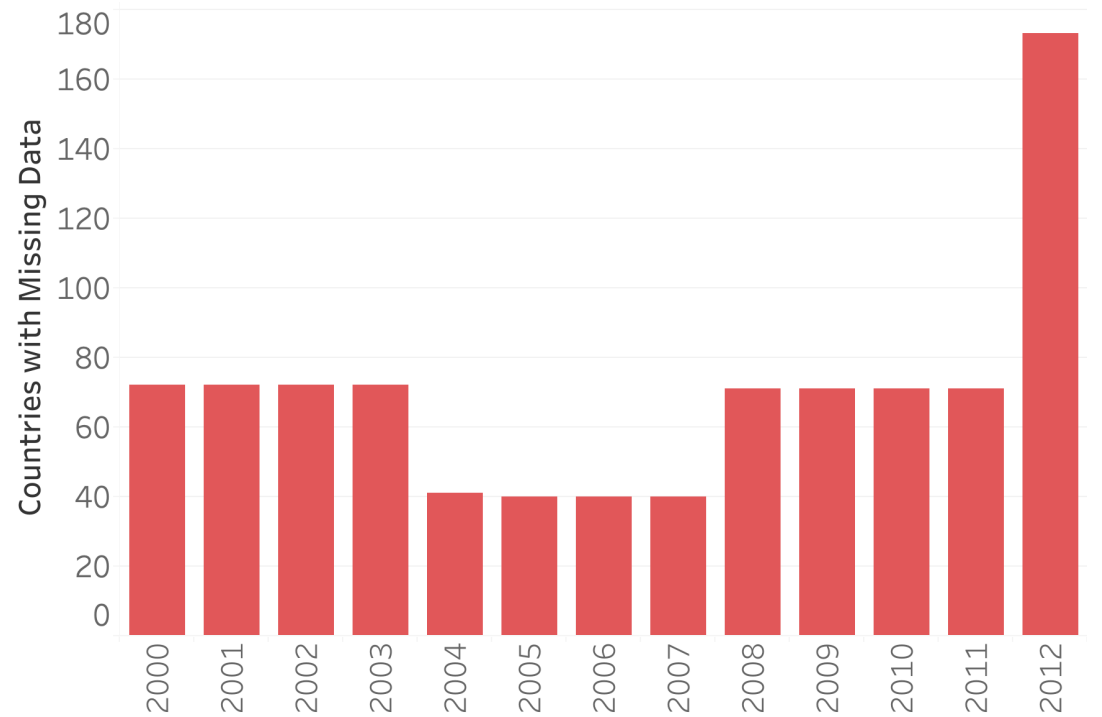
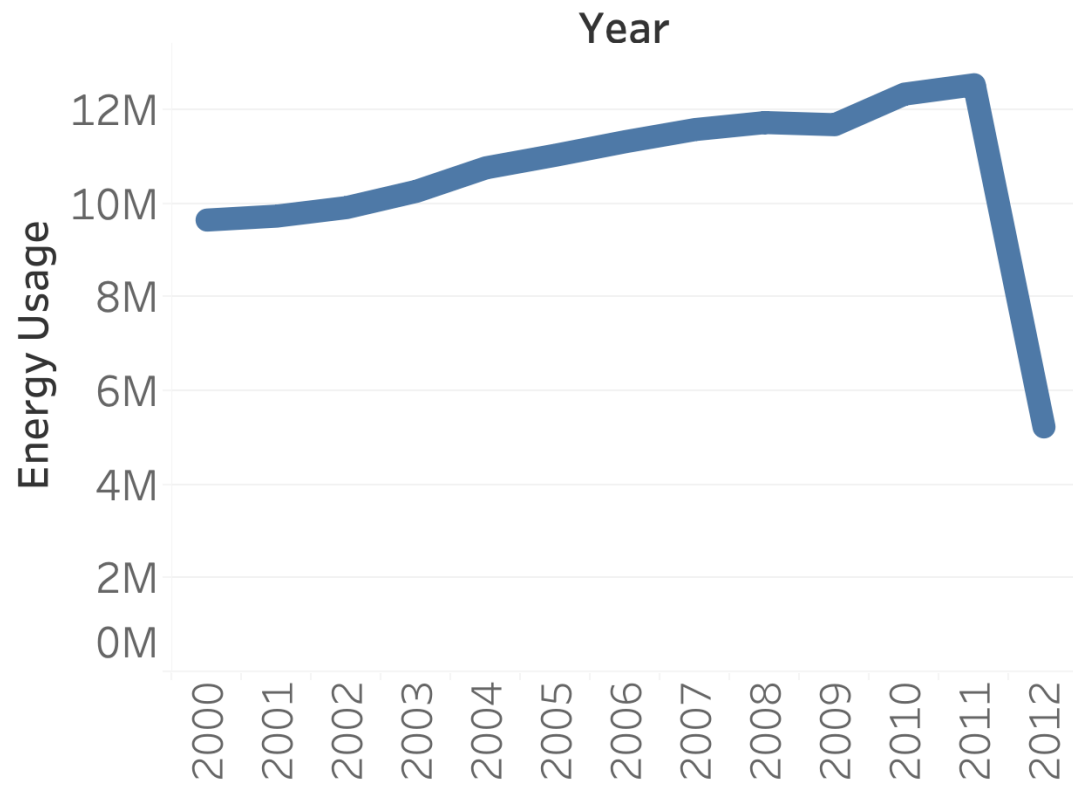
Energy Usage Down?



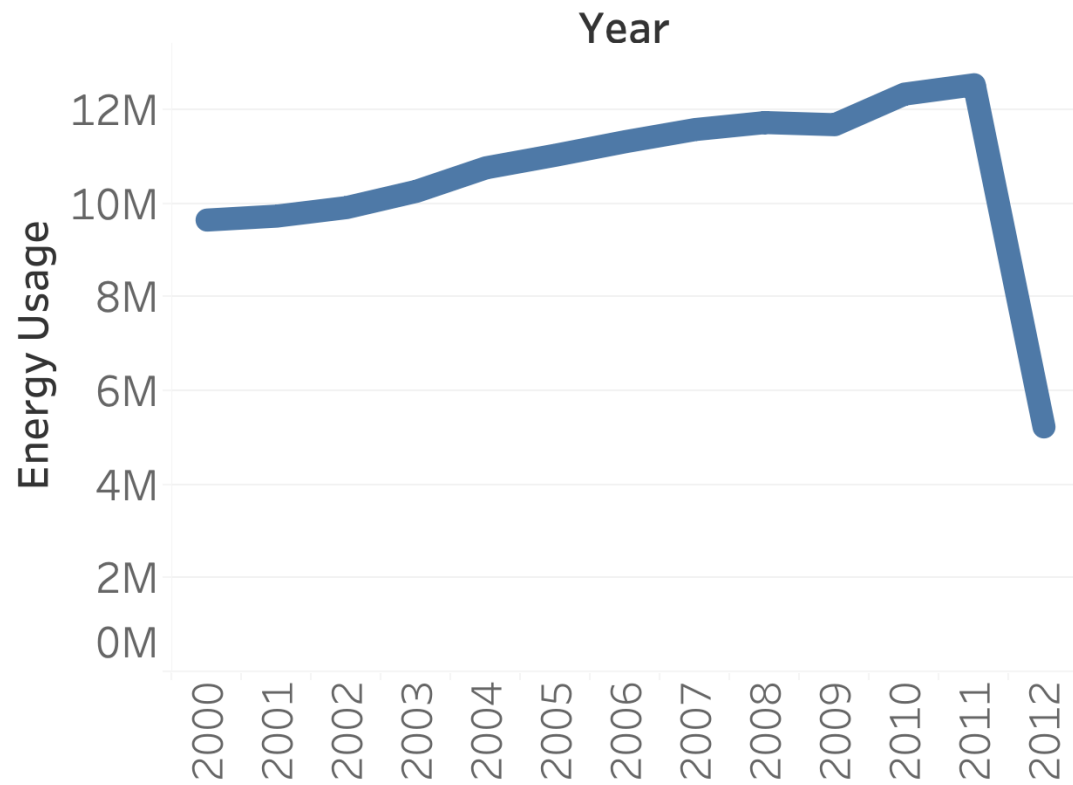
Energy Usage Down?



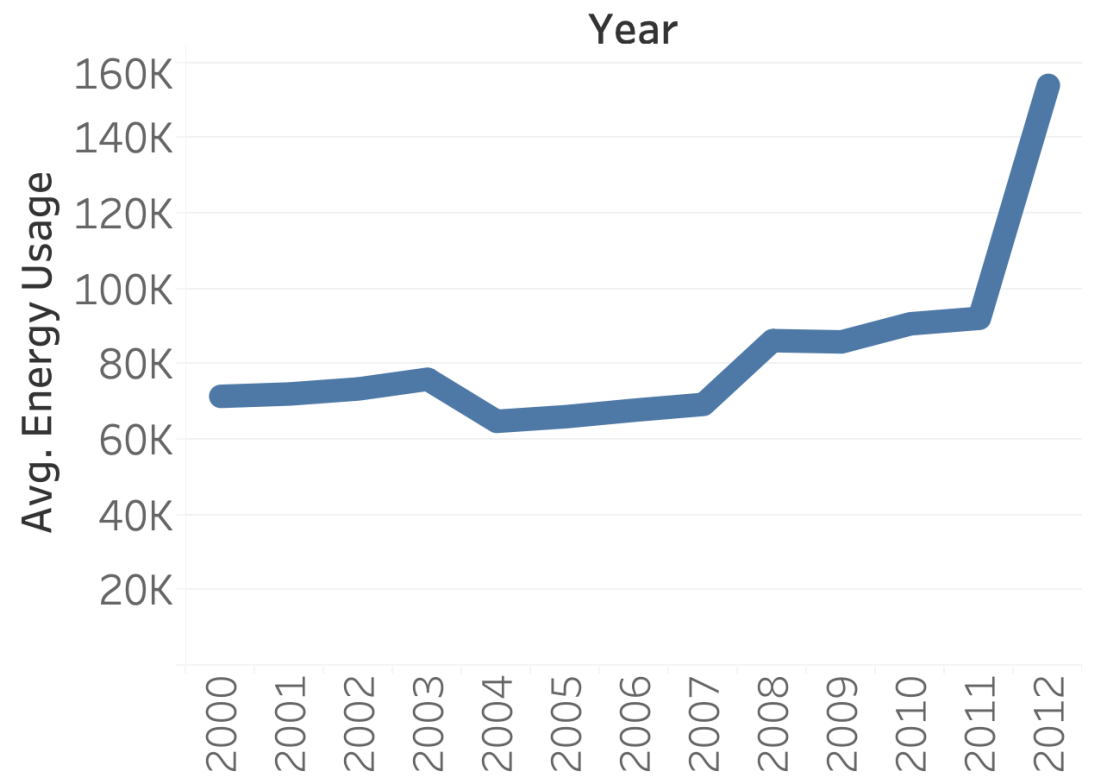
Energy Usage Down?



Energy Usage Down?

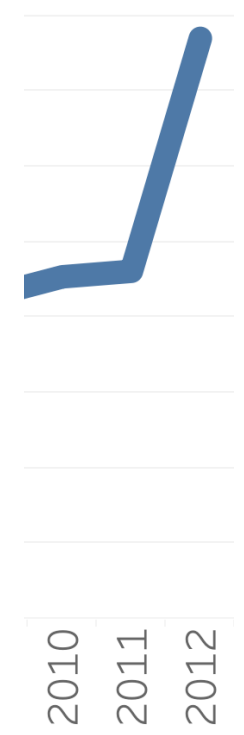
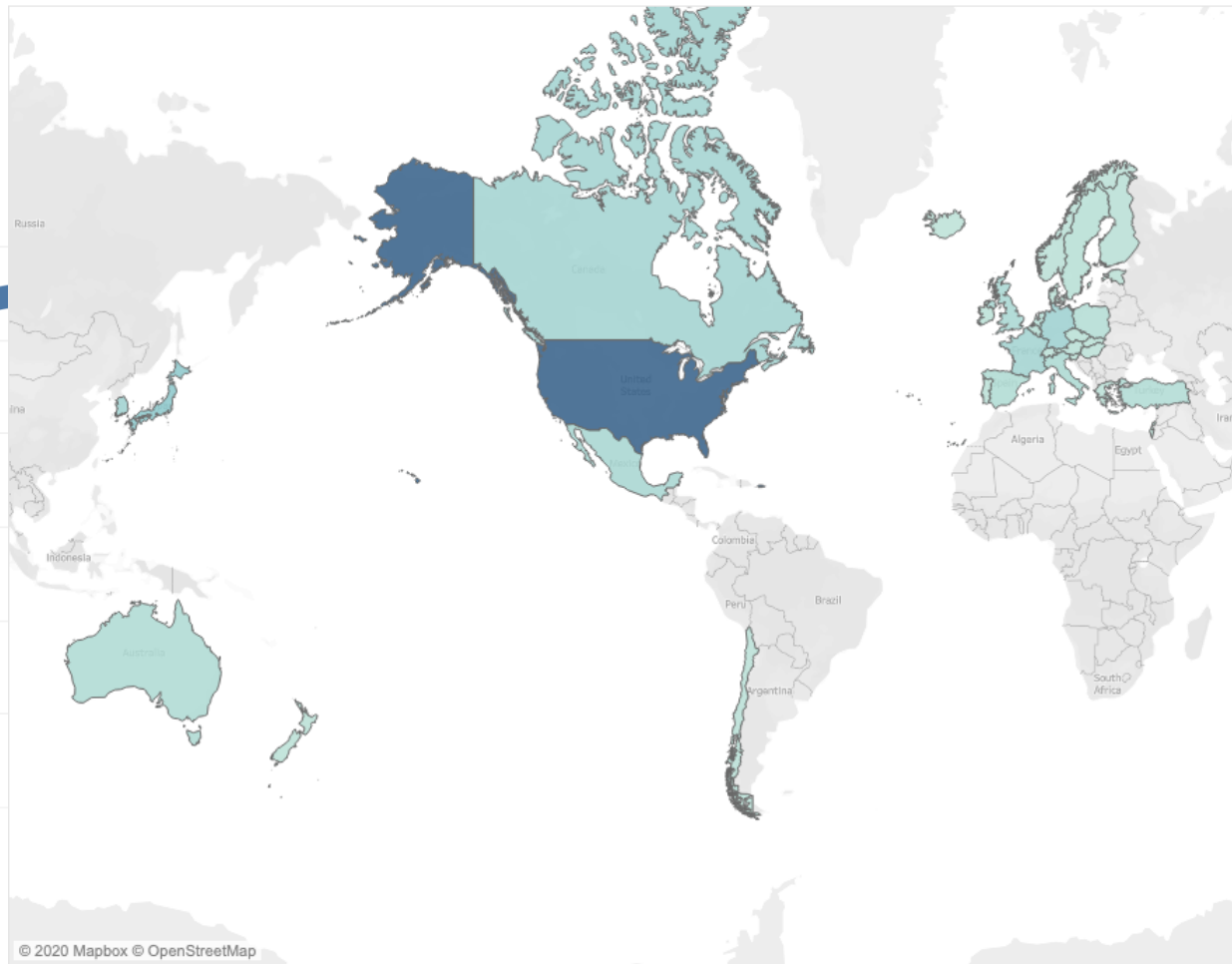
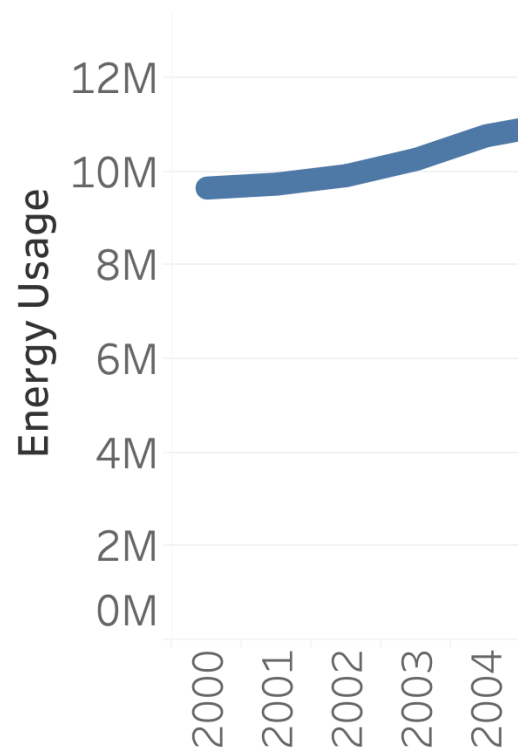


Energy Usage Up?

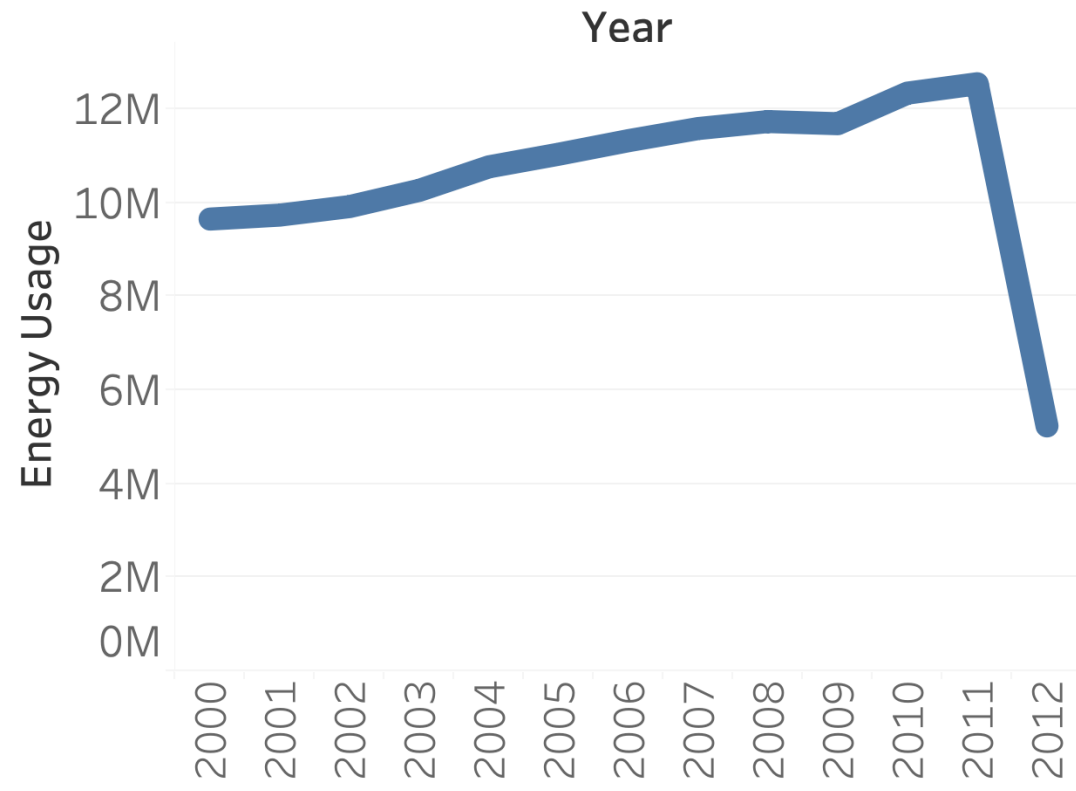


2012 Non-Nulls Are OECD Countries

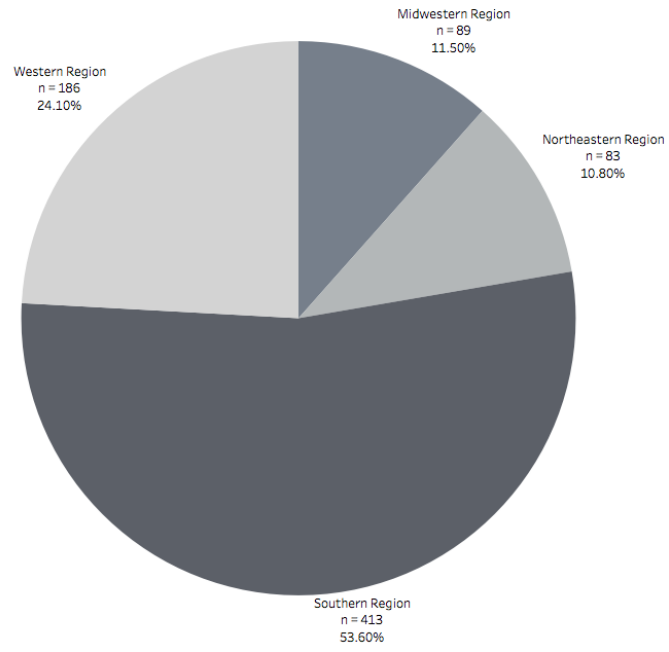
Energy Usage Down?



Energy Usage Down?

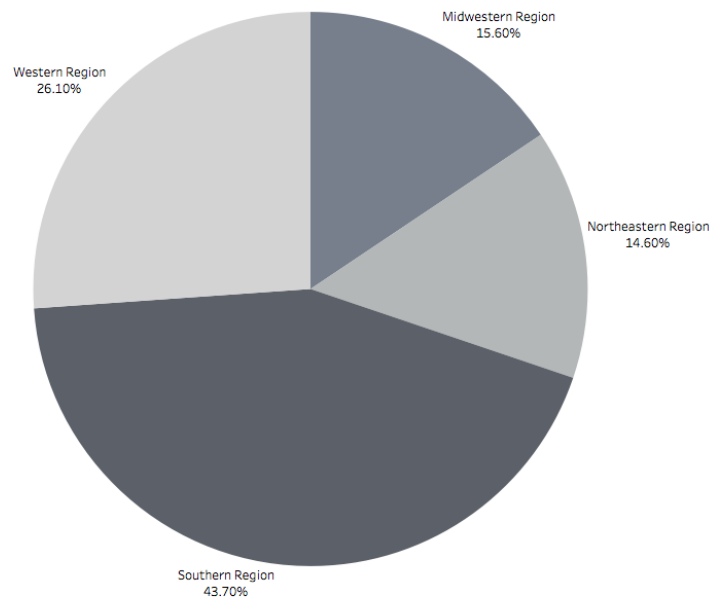


Logging fatalities and percentages by region, 1992-97

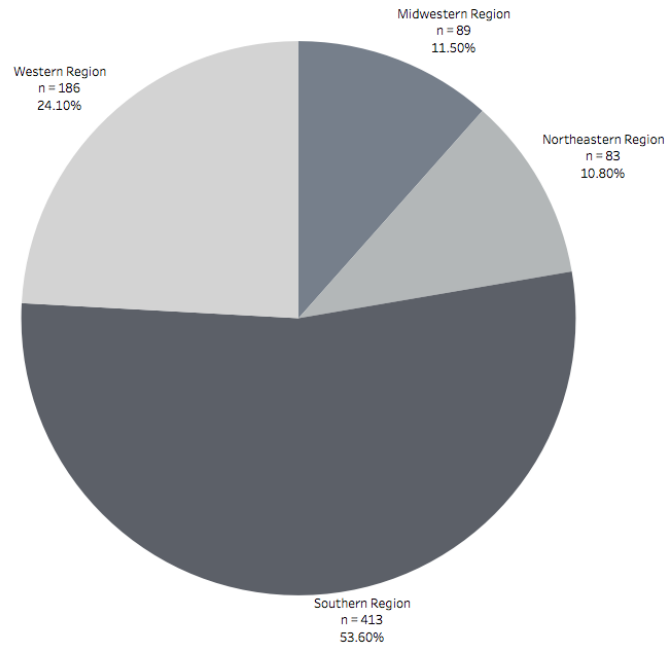


Sam Dragga & Dan Voss “Cruel Pies: The Inhumanity of Technical Illustrations”

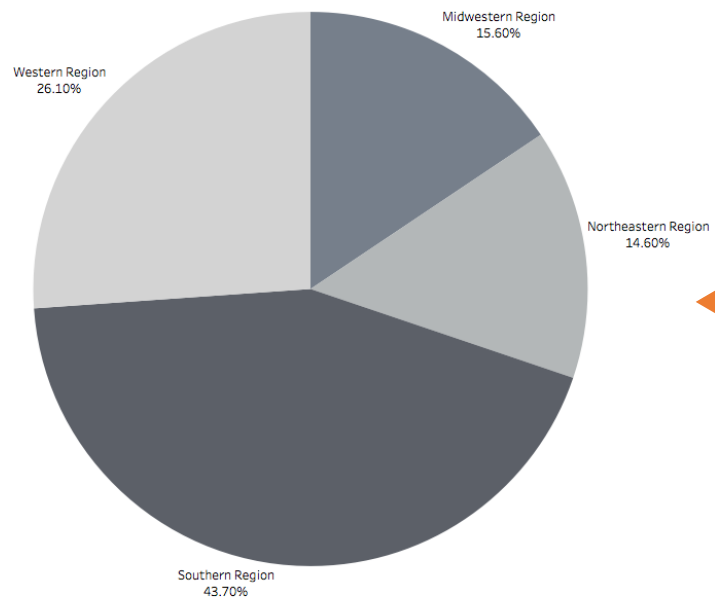
Logging employment percentages by region, 1992-97



Logging fatalities and percentages by region, 1992-97

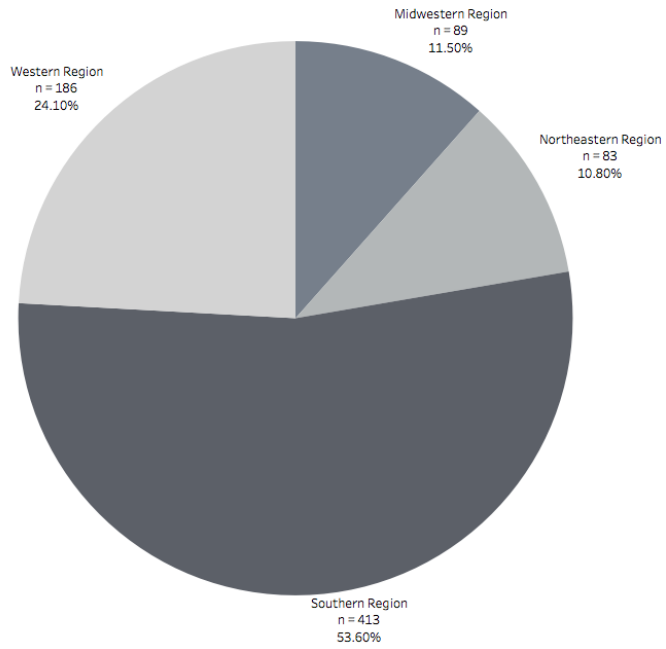


Logging employment percentages by region, 1992-97



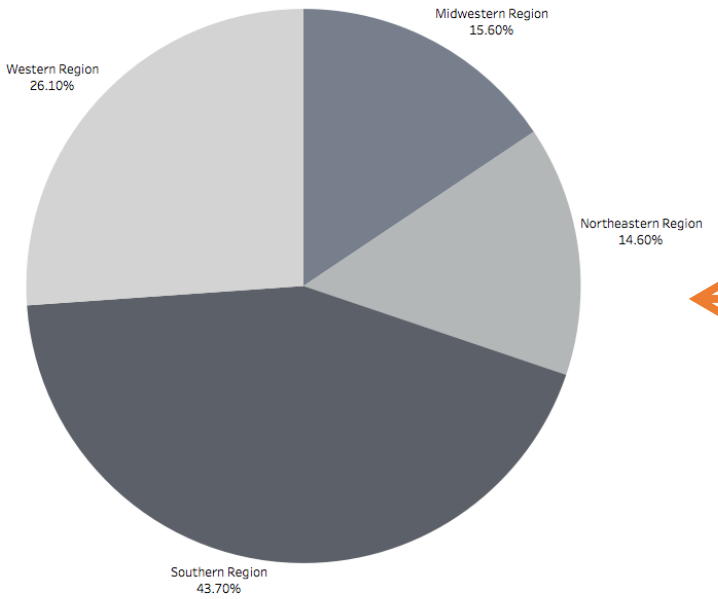
← Where Your Employees Live

Logging fatalities and percentages by region, 1992-97



← 771 Dead People

Logging employment percentages by region, 1992-97

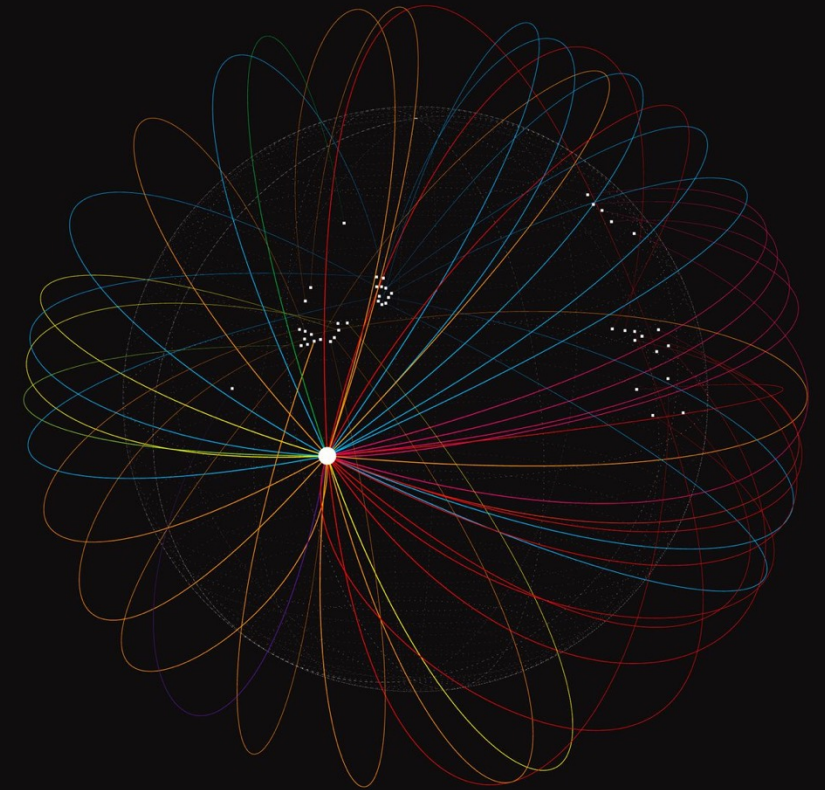


← Where Your Employees Live

"The UnEmpathic Art"

I am just very skeptical of the idea that data visualization is a medium that can convey (or even care about conveying) or increase "empathy"

-Alberto Cairo



HIROSHIMA

34° 23' 53" N, 132° 26' 32" E

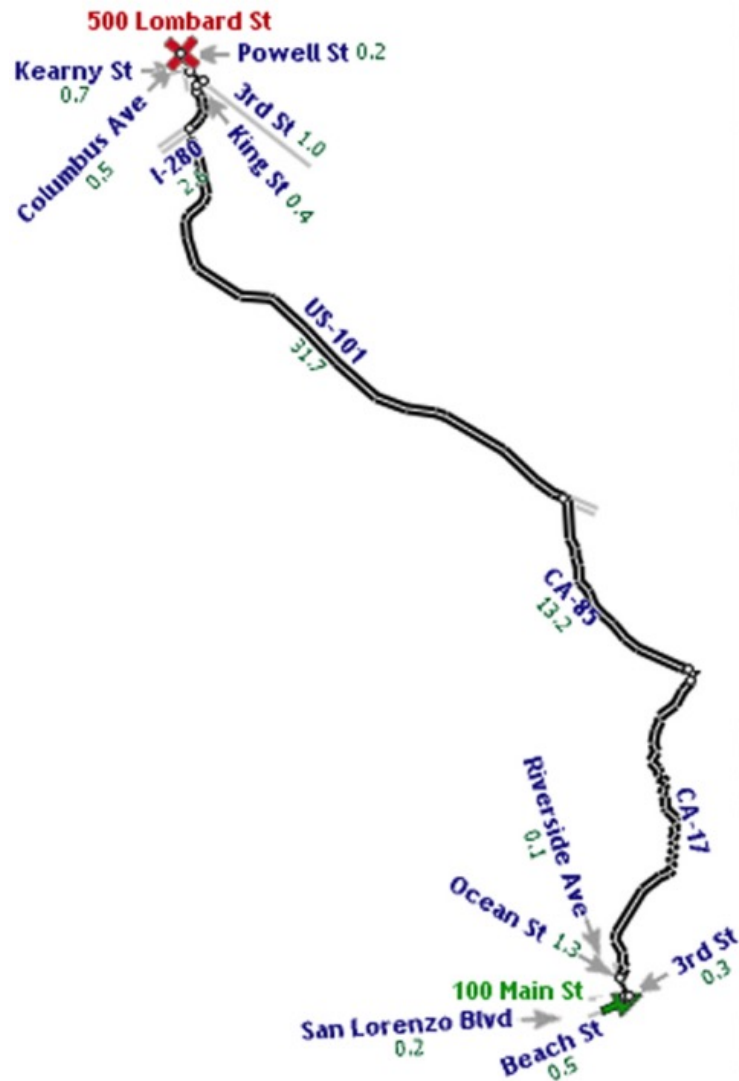
During the final stages of World War II in 1945, the United States conducted two atomic bombings against the cities of Hiroshima and Nagasaki in Japan, the first on August 6, 1945 and the second on August 9, 1945.

This graphic shows all the locations, geographically on the globe, of the events leading up to the dropping of the bomb. Each line is also colored so that it is easier to distinguish. The white large spot near the middle is Hiroshima and where the bomb hit. The smaller square spots are the locations of where the events happened on the Earth.

The shape of the graphic was inspired by the atom of Uranium 235, which was used in the bomb on Hiroshima.

- BRITAIN
- CANADA
- FRANCE
- GERMANY
- ITALY
- NORWAY
- SWITZERLAND
- UNITED STATES

Visualization "White Lies"



Wrap Up

Ways to mislead:

Breaking assumptions, expectations, conventions, drowning people in details... or just making stuff up.

Nuance:

Not every chart that breaks a "rule" is misleading

Not every chart that follows the "rules" is truthful