

# Deceptive Visualization



Michael Correll  
Tableau Research

What is a "bad" visualization?



bad visualization



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# What is a "bad" visualization?

Google bad visualization

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data pie chart infographic good dashboard 4 dimensional data network education the functi

100 Most Active Taxons

(f) Distribution of Grass

1990-1995

9 Worst Data Visualizations Ever... 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 CpG Island Hypermethylation Profile of Human Cancer

"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

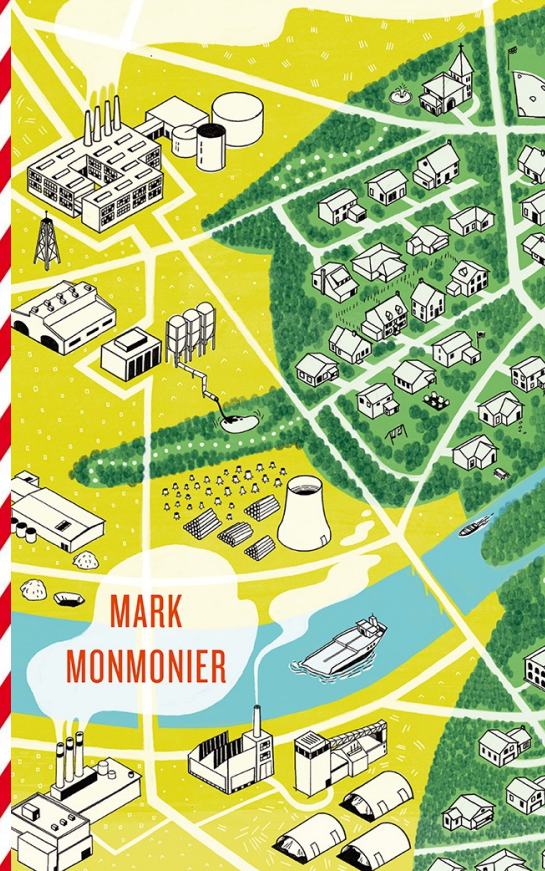


**DARRELL HUFF**

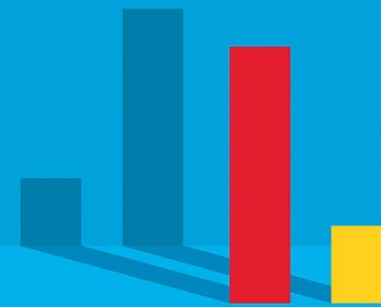
Illustrated by Irving Geis

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 sparse, abstract pattern of black geometric shapes on a white background. These shapes include thin diagonal lines, small circles, and 'x' marks scattered across the page. The central text is framed by several horizontal lines, some of which are slightly wavy or broken.

# DARK PATTERNS

*(They're Everywhere)*

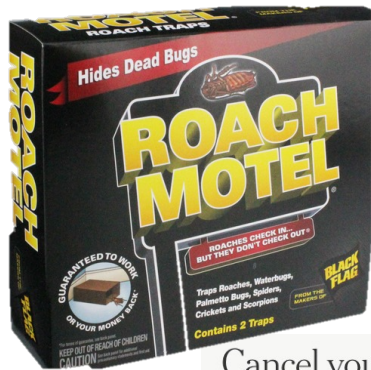
# Dark Patterns

The screenshot shows a web browser window displaying the Softpedia page for 'OnyX for Mac'. The page features a dark blue navigation bar with 'SOFTPEDIA' and menu items like 'DESKTOP', 'MOBILE', 'WEB', and 'NEWS'. Below the navigation, there's a breadcrumb trail: 'Softpedia > Mac > System Utilities > OnyX'. A red alert banner for '2016 Holiday Giveaways!' is visible. The main content area is titled 'OnyX for Mac' and includes a 'DOWNLOAD' button, download statistics (177,446 downloads, updated October 15th, 2016), and a 'DONATIONWARE' label. A 'CURRENT VERSION' section shows 'OnyX 3.2.1'. 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. A descriptive paragraph 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'. An 'IN-DEPTH REVIEW' section is also present. At the bottom, there's a 'Download Cleaner' advertisement featuring an image of a person using a laptop.

# 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 red alert banner at the top right says 'ALERT 2016 Holiday Giveaways!'. The main content area features a large blue 'DOWNLOAD' button, which is highlighted with an orange rectangular box. Below this button, there is a 'Start Download' section with 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 a sidebar with 'CURRENT VERSION' (OnyX 3.2.1), 'EDITOR'S REVIEW', '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:'. The main text describes OnyX as a free OS X application for optimization, maintenance, and customization. A 'Download Cleaner' advertisement is visible at the bottom right.





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Bad Visualizations

Incorrect Visualizations

Illegible Visualizations

Bullshit Visualizations

Unconventional Visualizations



# Bad Visualizations

## **Incorrect Visualizations**

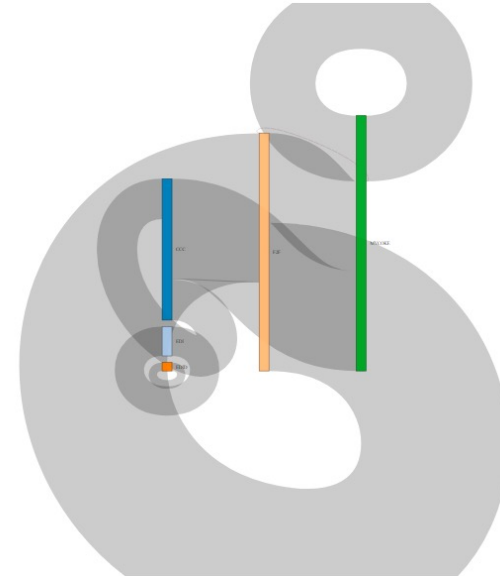
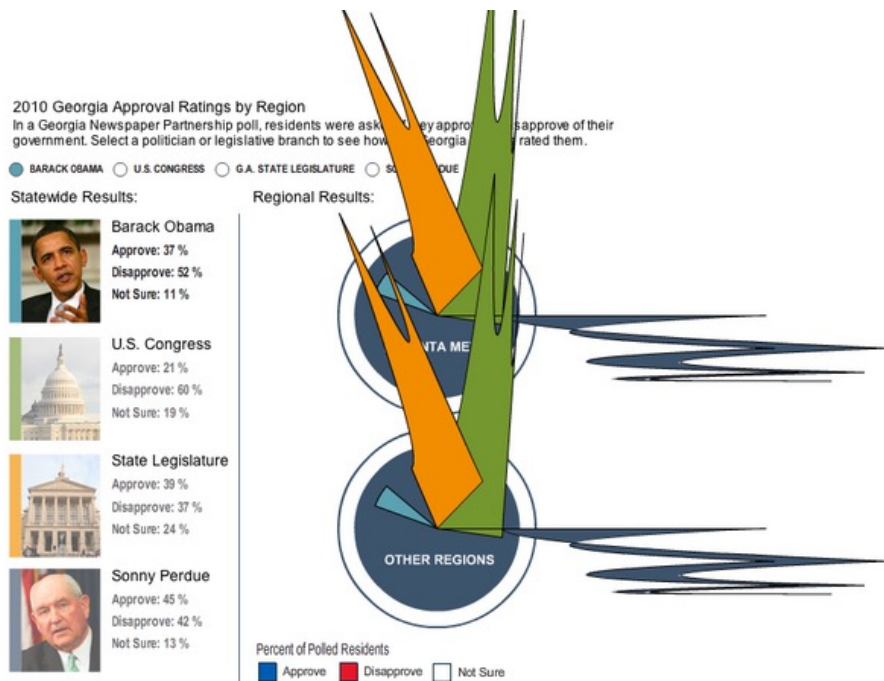
Illegible Visualizations

Bullshit Visualizations

Unconventional Visualizations



# Incorrect Visualization



<https://accidental-art.tumblr.com/>




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 (

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**

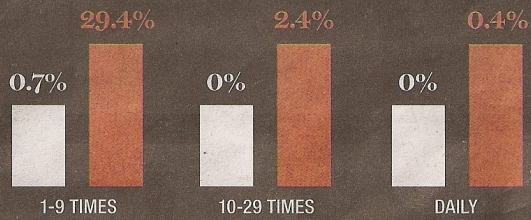
**FOX 10**

12:20 64°

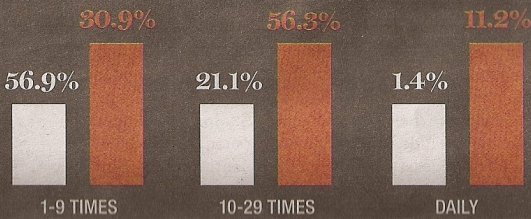
# BY THE NUMBERS

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.

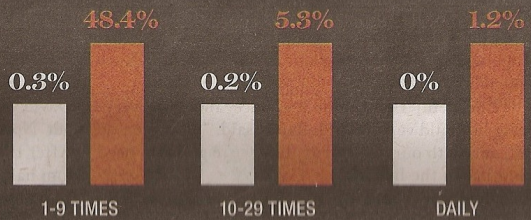
## OPIATES



## ALCOHOL



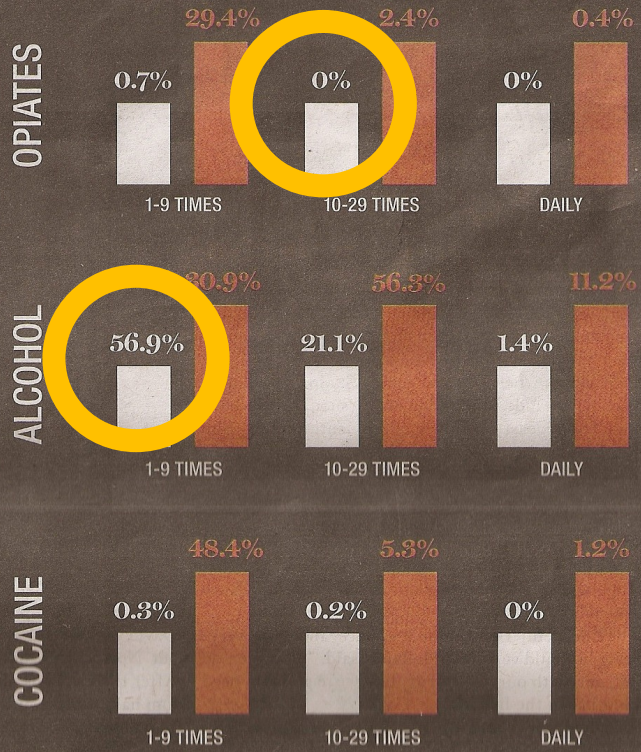
## COCAINE





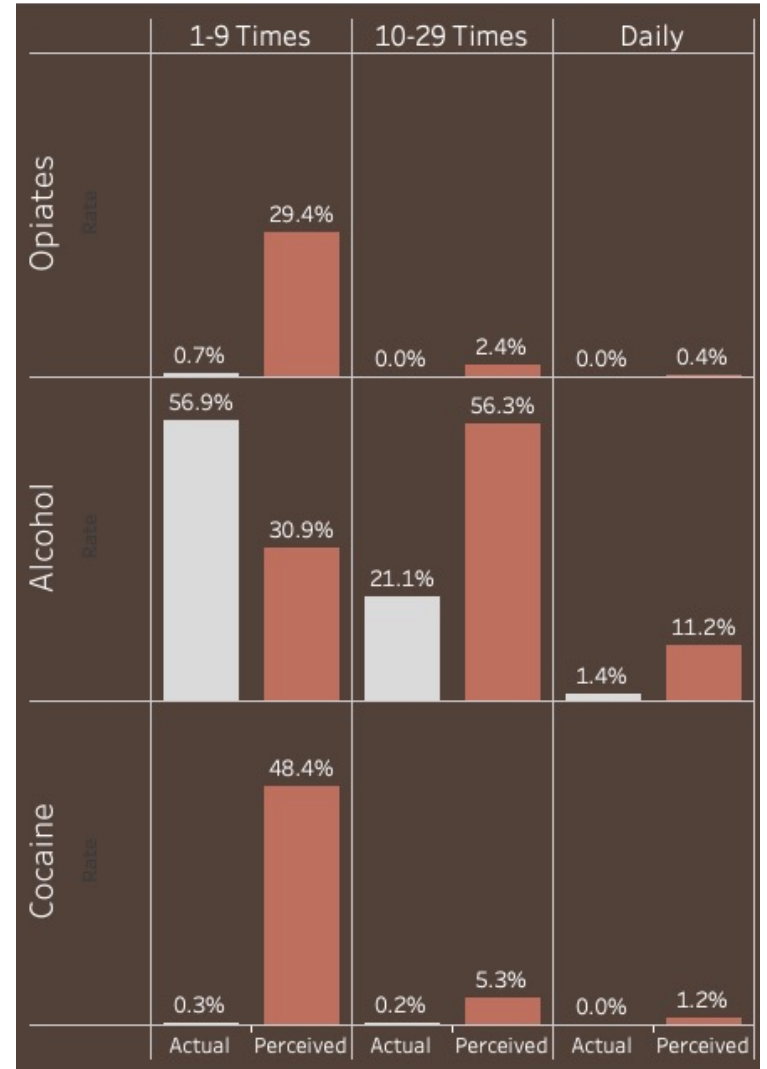
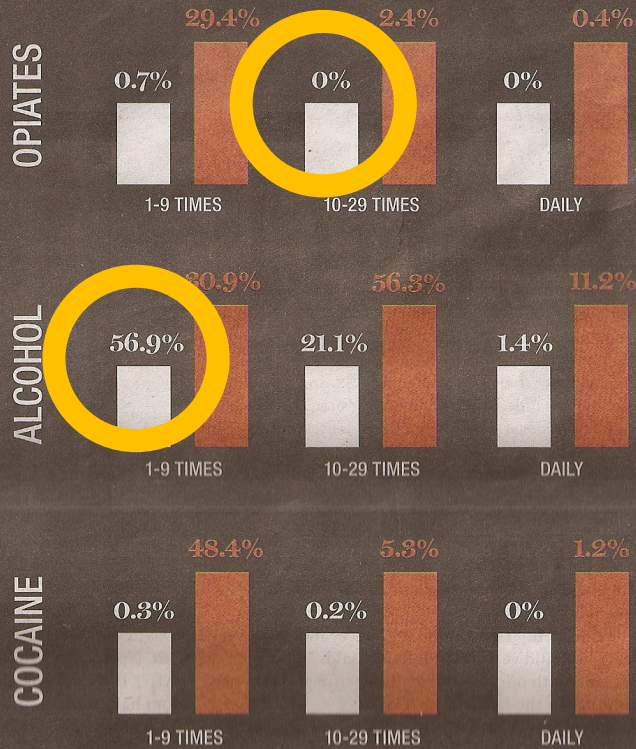
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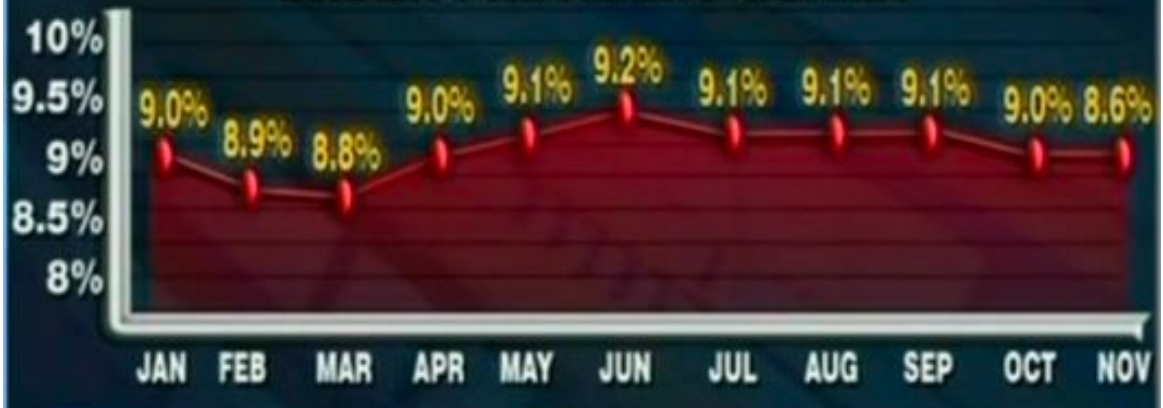


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## UNEMPLOYMENT RATE UNDER PRESIDENT OBAMA



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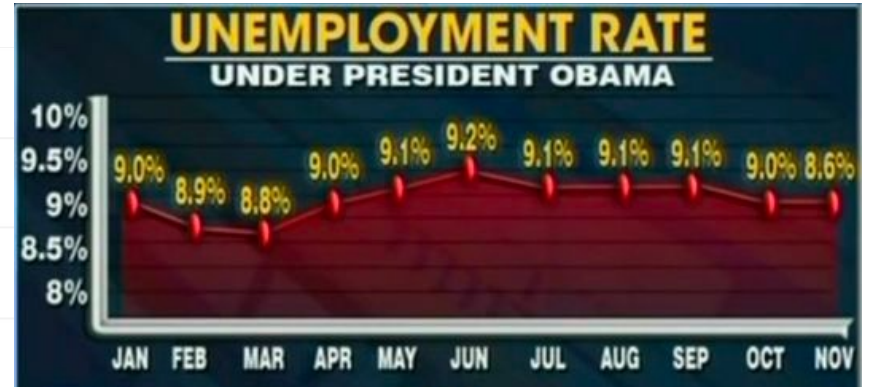


# UNEMPLOYMENT RATE UNDER PRESIDENT OBAMA





Unemployment



# Incorrect Visualizations

People assume that visualizations properly encode their data

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

Bad Visualizations

Incorrect Visualizations

**Illegible Visualizations**

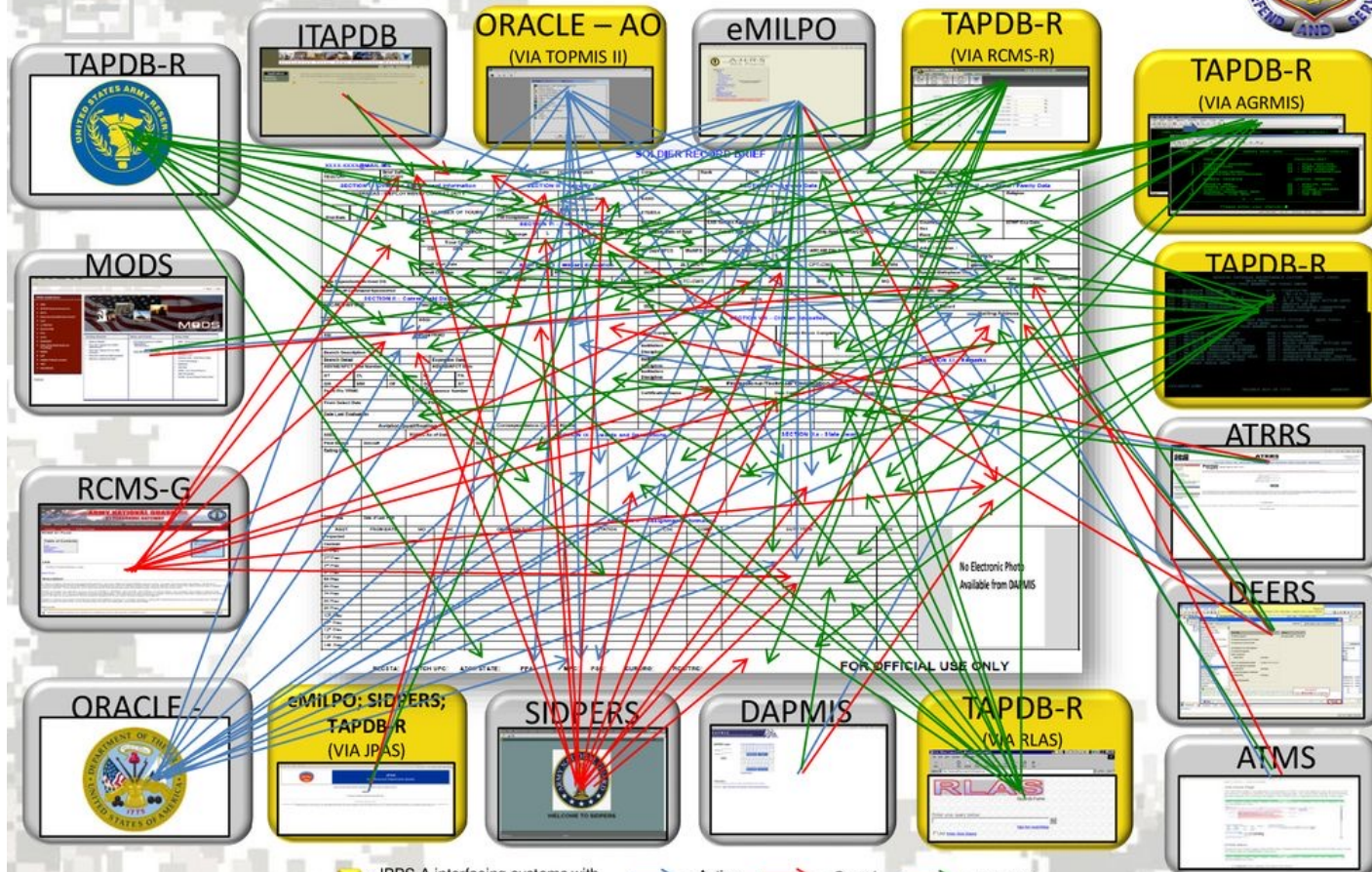
Bullshit Visualizations

Unconventional Visualizations





# Legacy Systems Activities



  = IPPS-A interfacing systems with depicted data update systems  
 → = Active  
 → = Guard  
 → = Reserve

**One Soldier ★ One Record ★ One Army**

Note: IPPS-A foundation table sources systems not shown are TESS, DRRS-A, TAPDB-AE, and POSCEdit



## Interactive Weekly Unemployment Insurance Claims

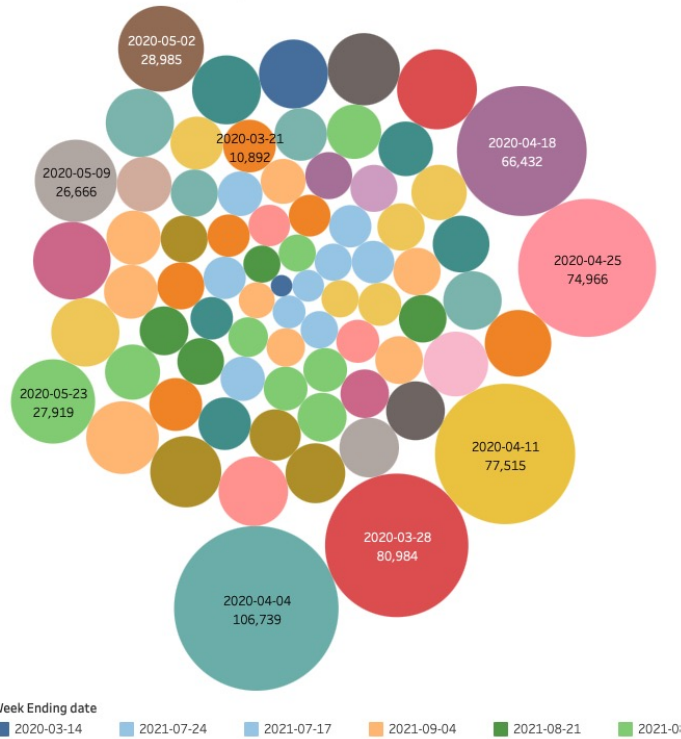
Initial\_Claims\_byCounty Historical

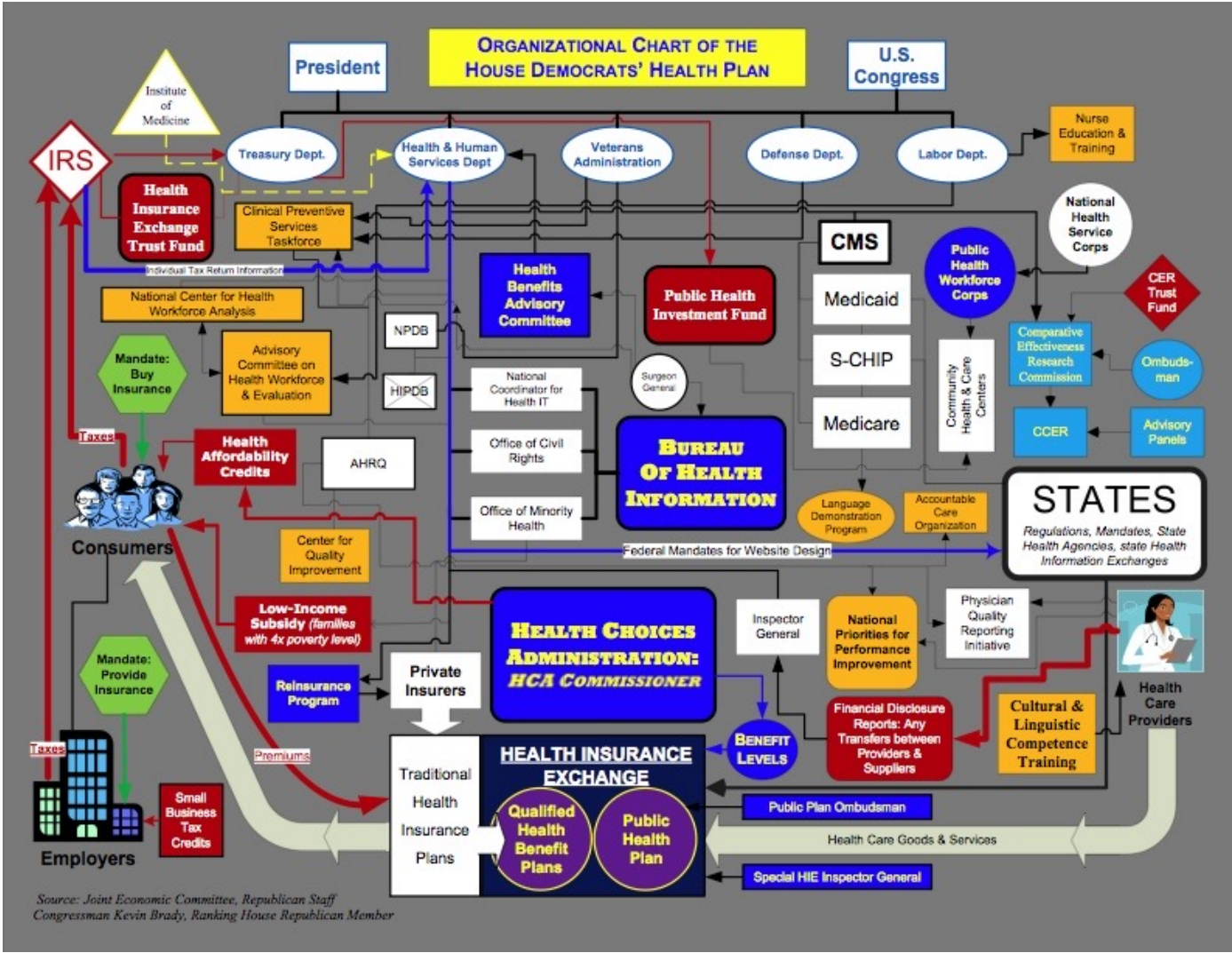
County

Total

Historical Initial Claims by Week

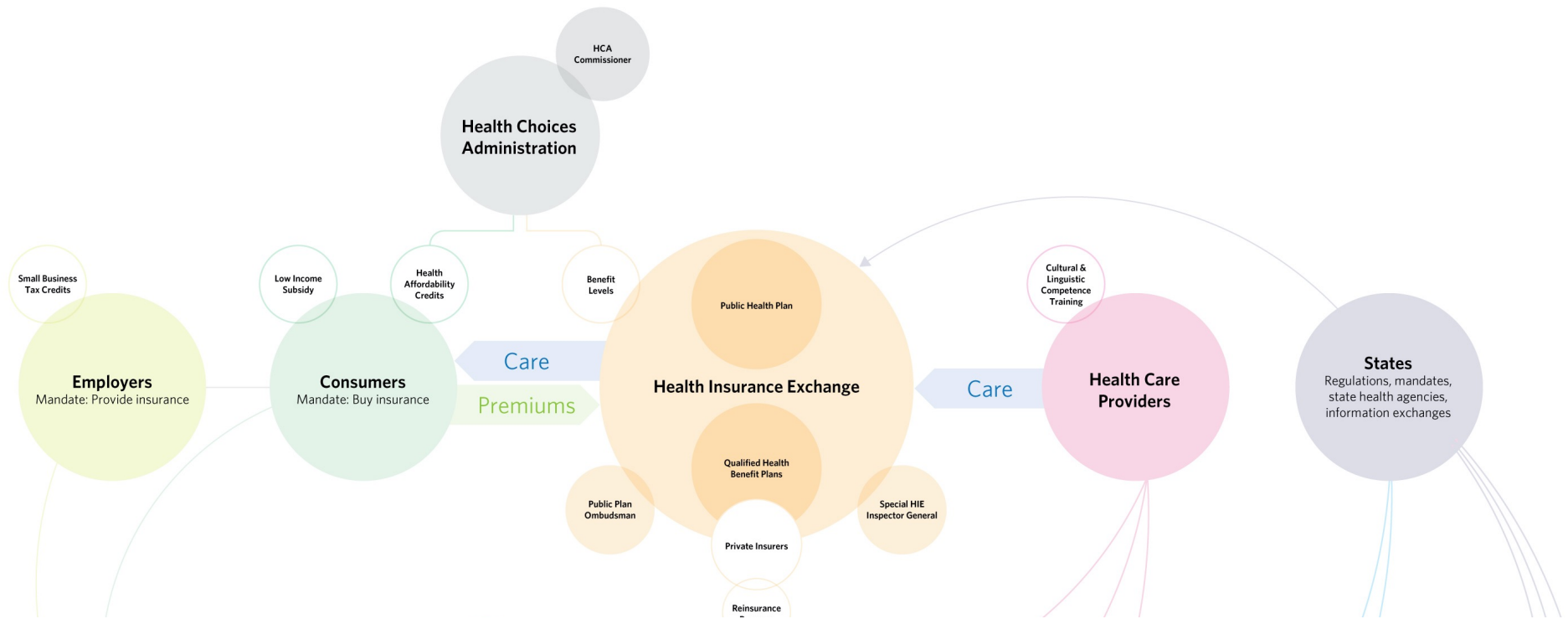
2020-12-26	5,506
2021-01-02	10,986
2021-01-09	14,084
2021-01-16	11,983
2021-01-23	11,615
2021-01-30	12,664
2021-02-06	13,464
2021-02-13	12,087
2021-02-20	11,395
2021-02-27	11,624
2021-03-06	13,592
2021-03-13	16,506
2021-03-20	13,994
2021-03-27	18,710
2021-04-10	10,909
2021-04-17	8,983
2021-04-24	8,704
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











**“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

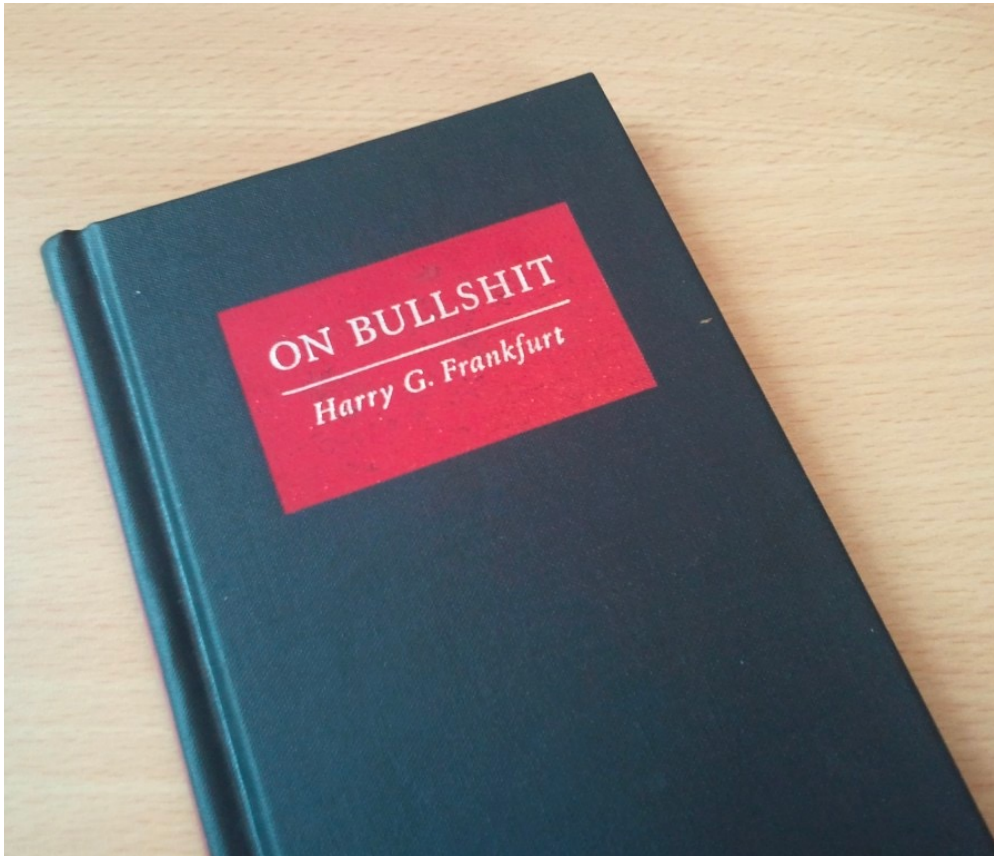
Illegible Visualizations

**Bullshit Visualizations**

Unconventional Visualizations



# Bullshit Visualization



## Lie:

“No, officer, I wasn’t speeding”

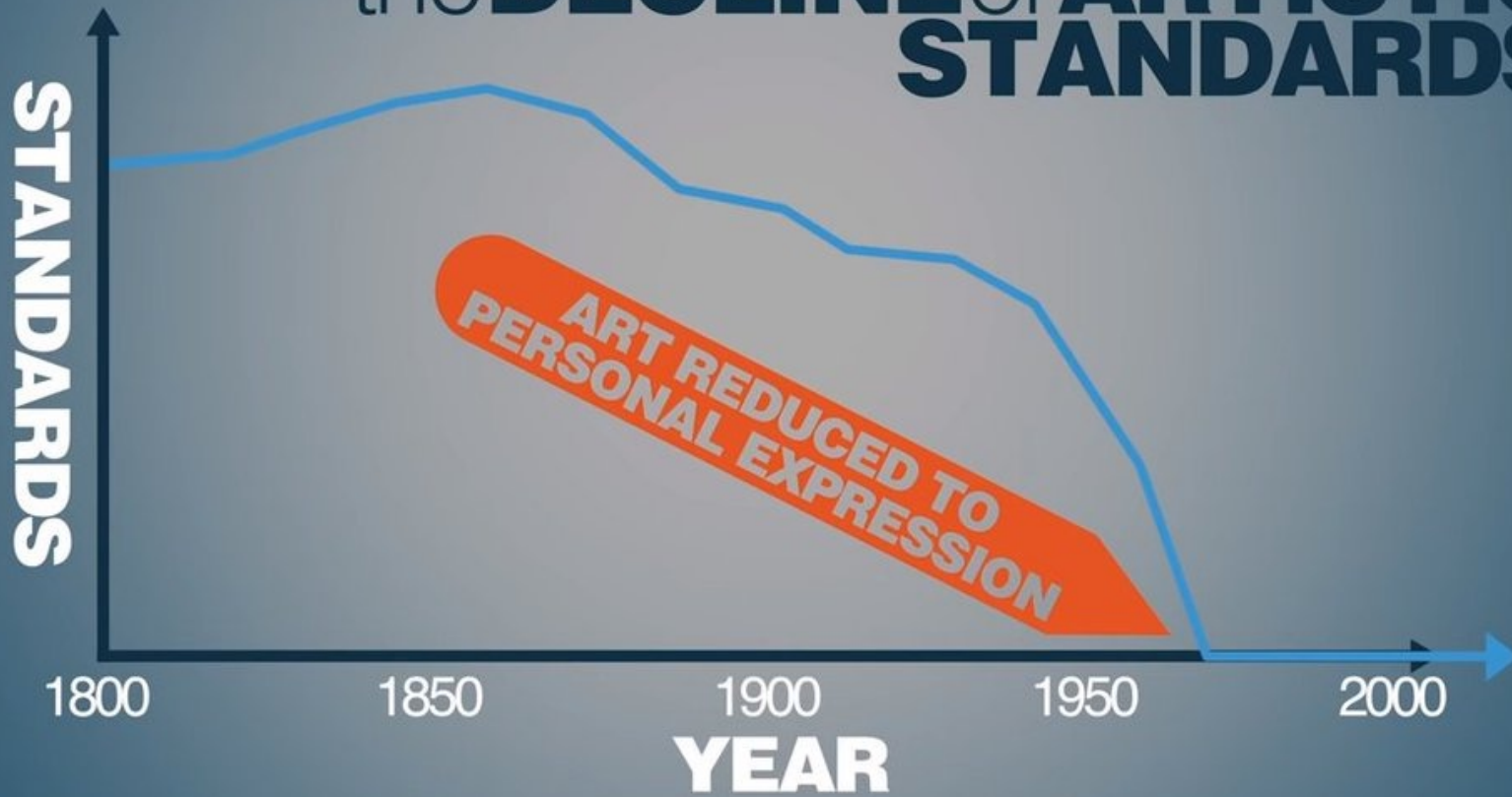
(you know the truth, but intentionally say something you know is untrue)

## Bullshit:

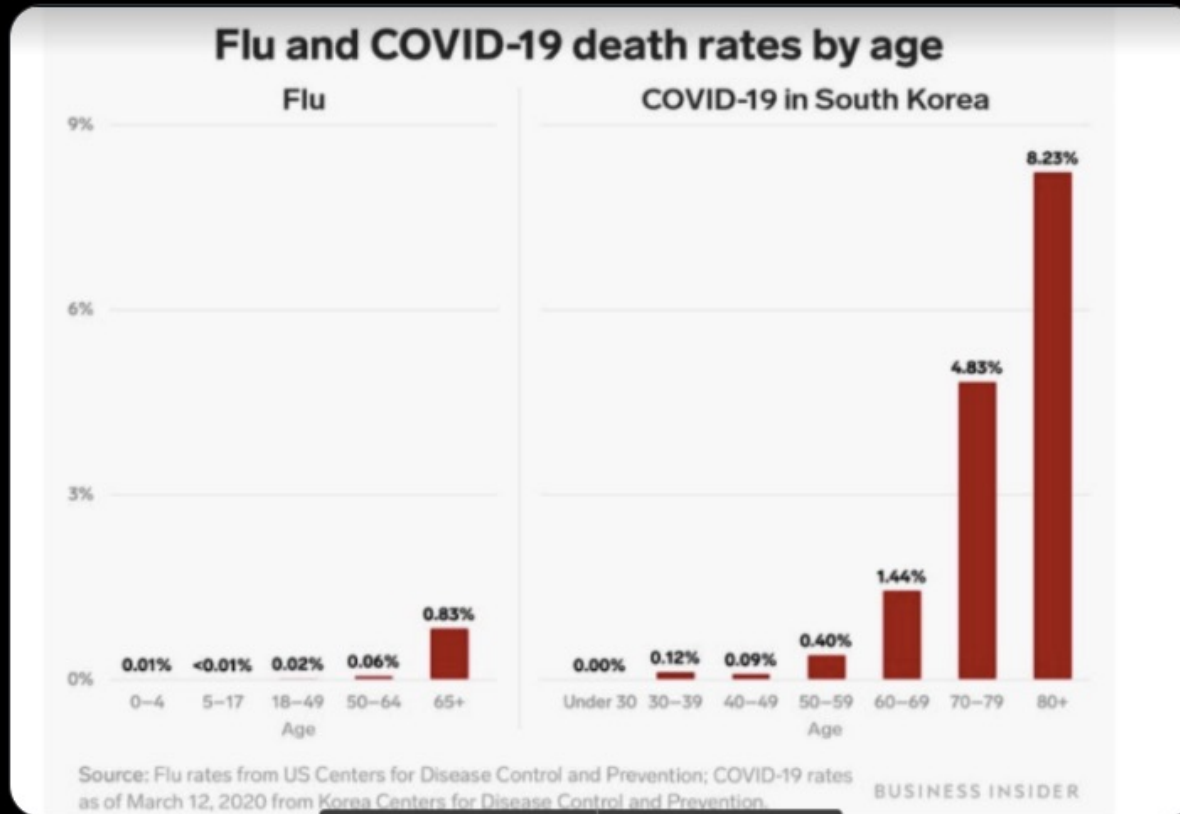
“The party was lame anyways, it’s good I wasn’t invited”

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

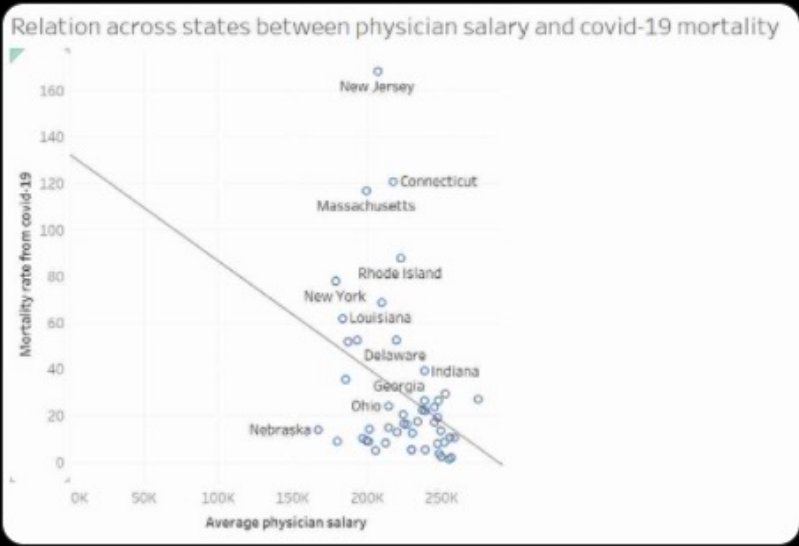
# the **DECLINE** of **ARTISTIC STANDARDS**



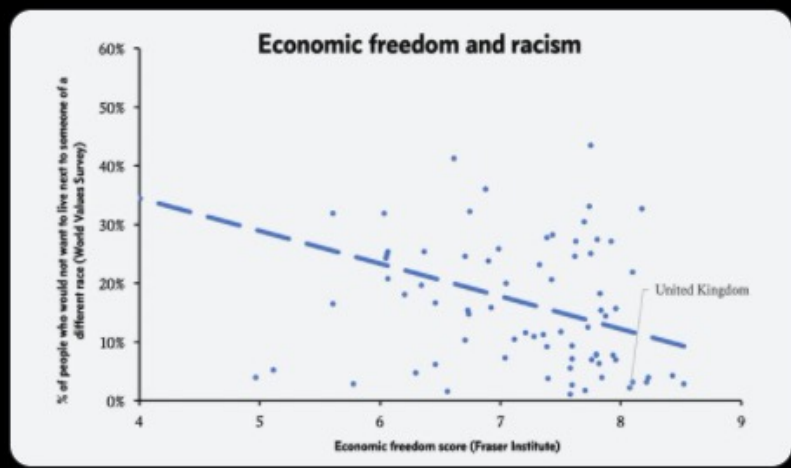
For people under 60, coronavirus is LESS dangerous than the seasonal flu:



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

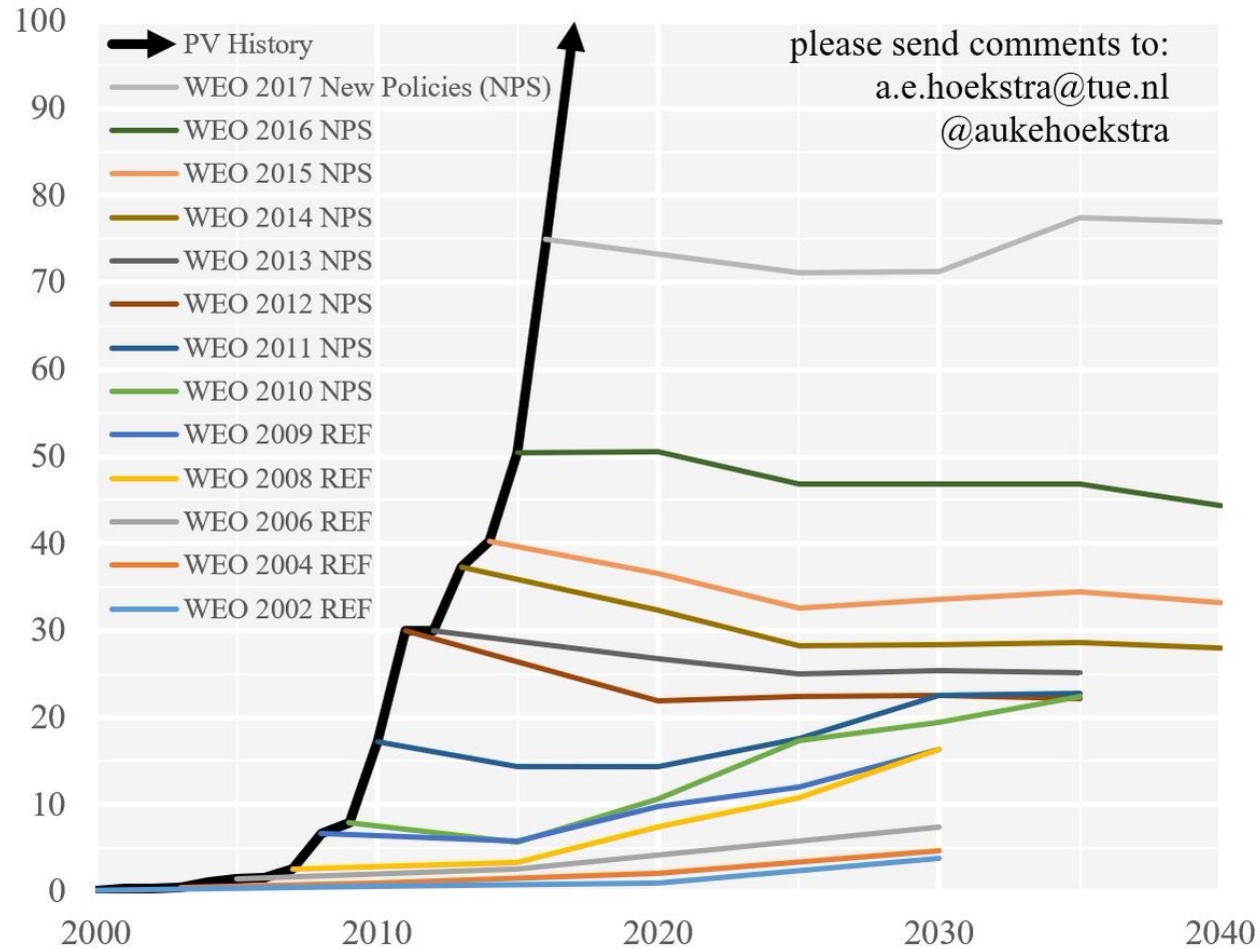


Fact check: Countries with more economic freedom have less racist attitudes, according to the World Values Survey.



# Annual PV additions: historic data vs IEA WEO predictions

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





# 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

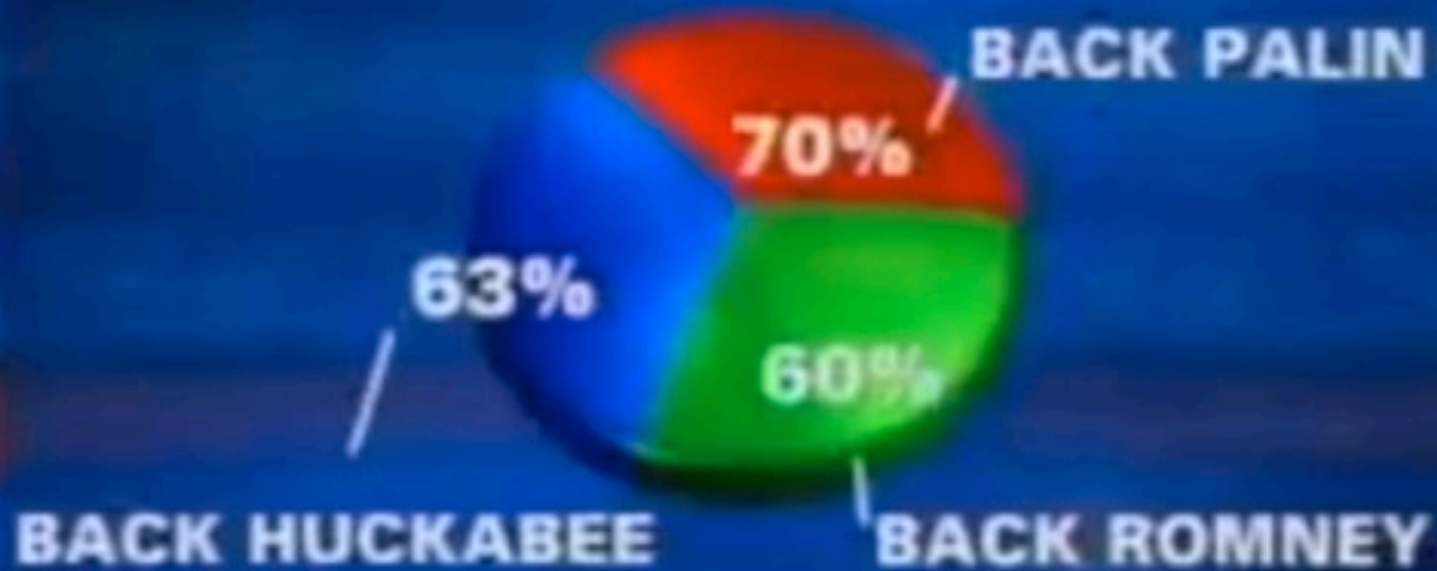
Bullshit Visualizations

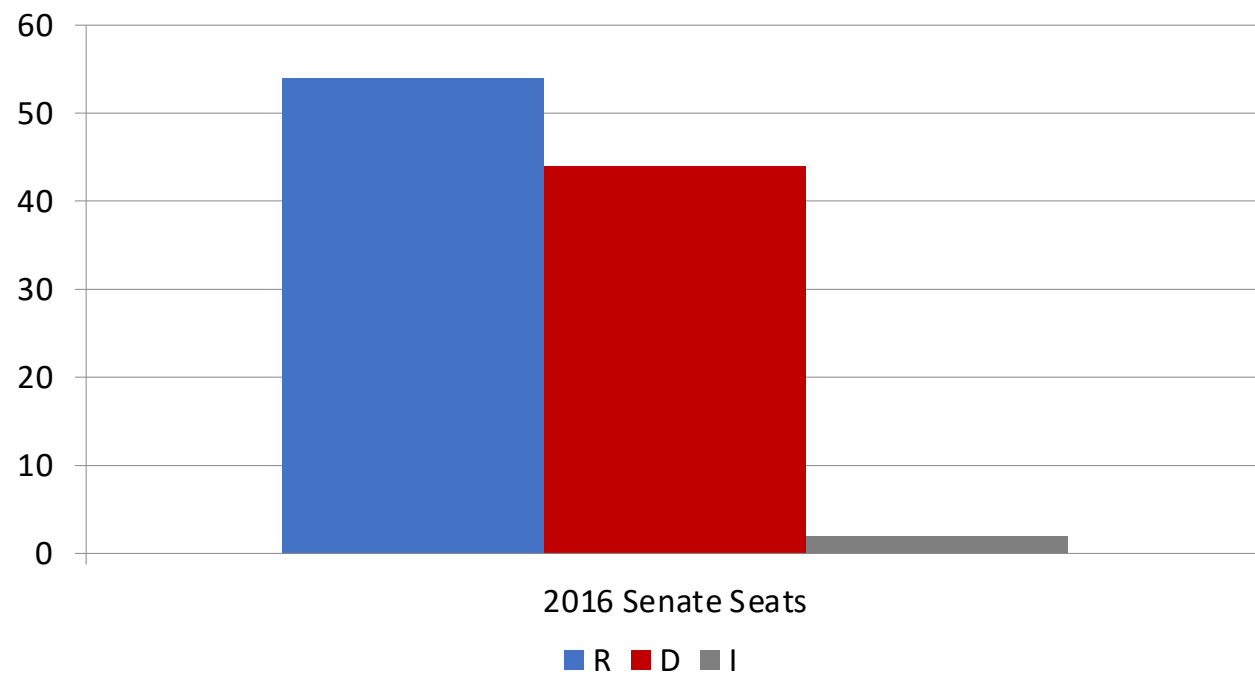
**Unconventional Visualizations**

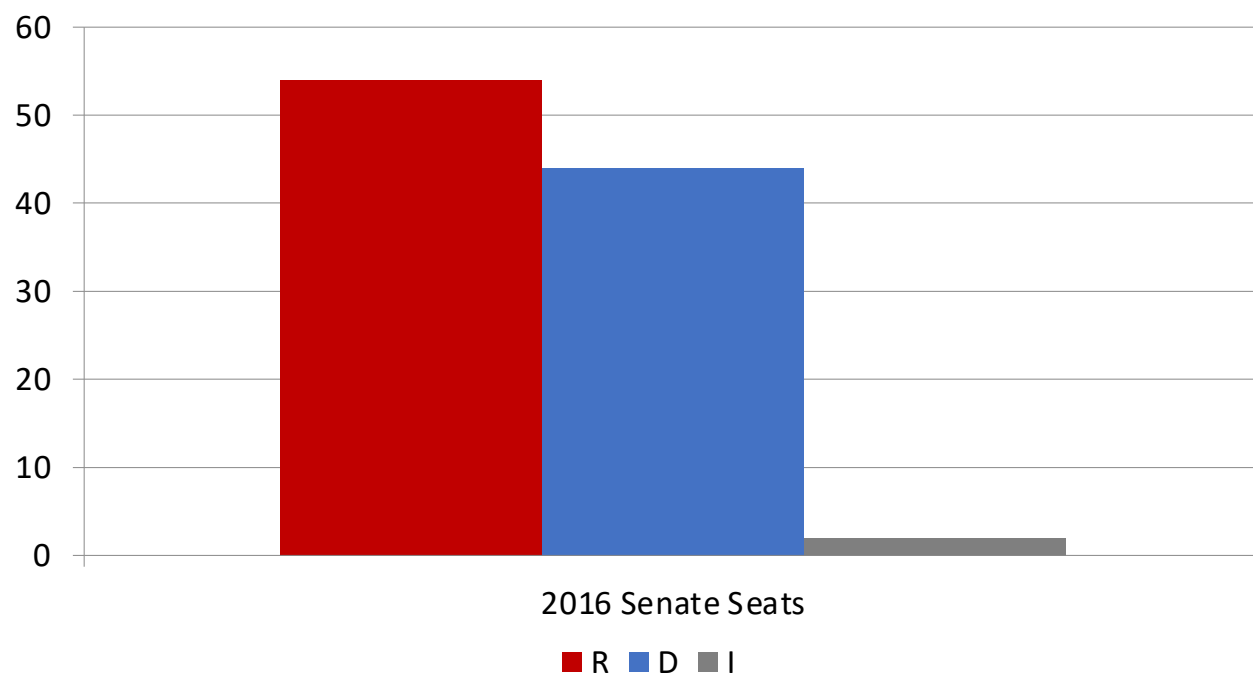


# 2012 PRESIDENTIAL RUN

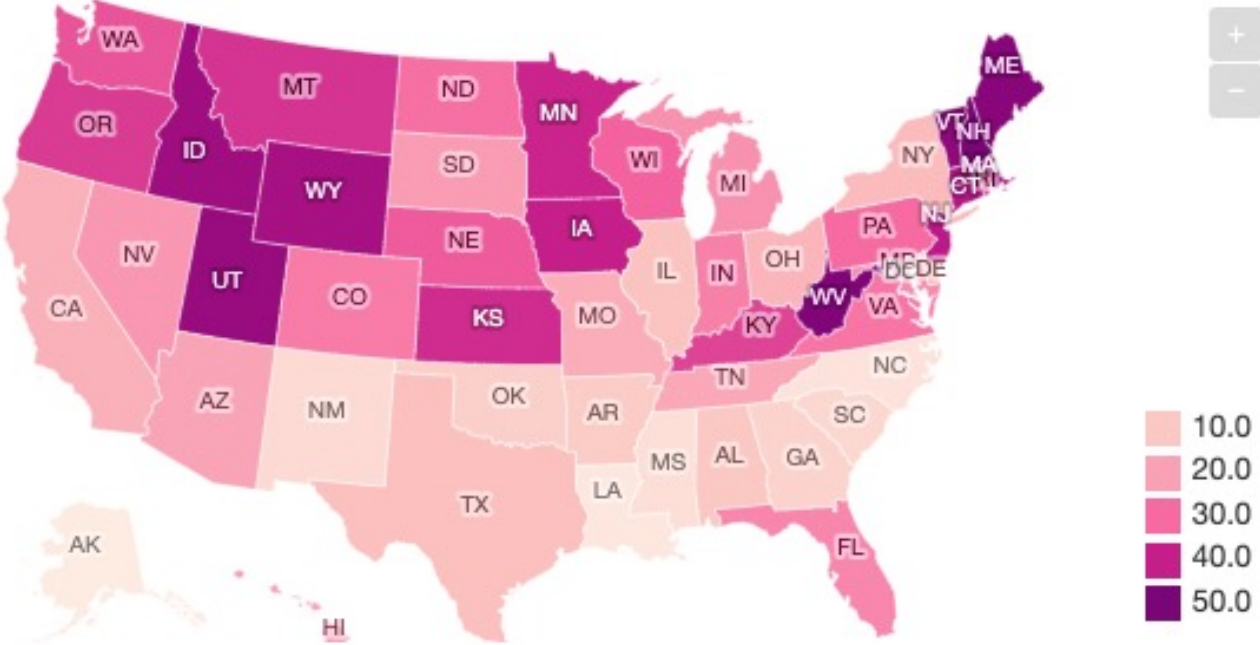
## GOP CANDIDATES



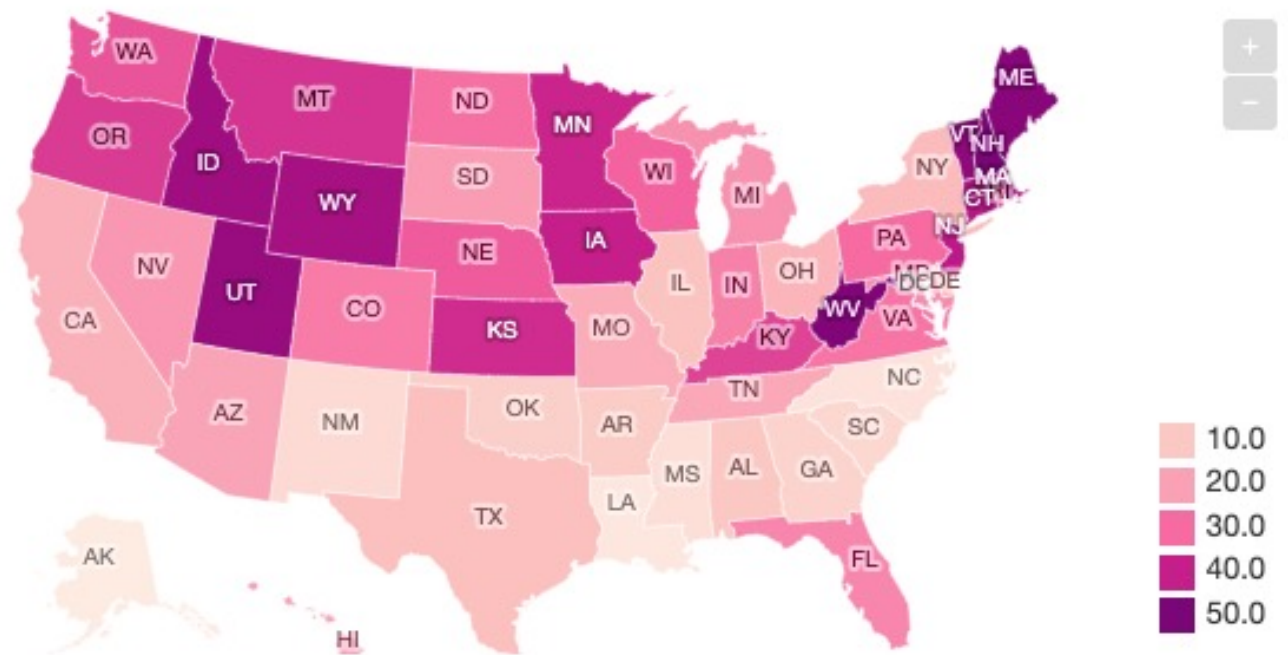




Which states have the most STIs?



Which states have the most STIs?

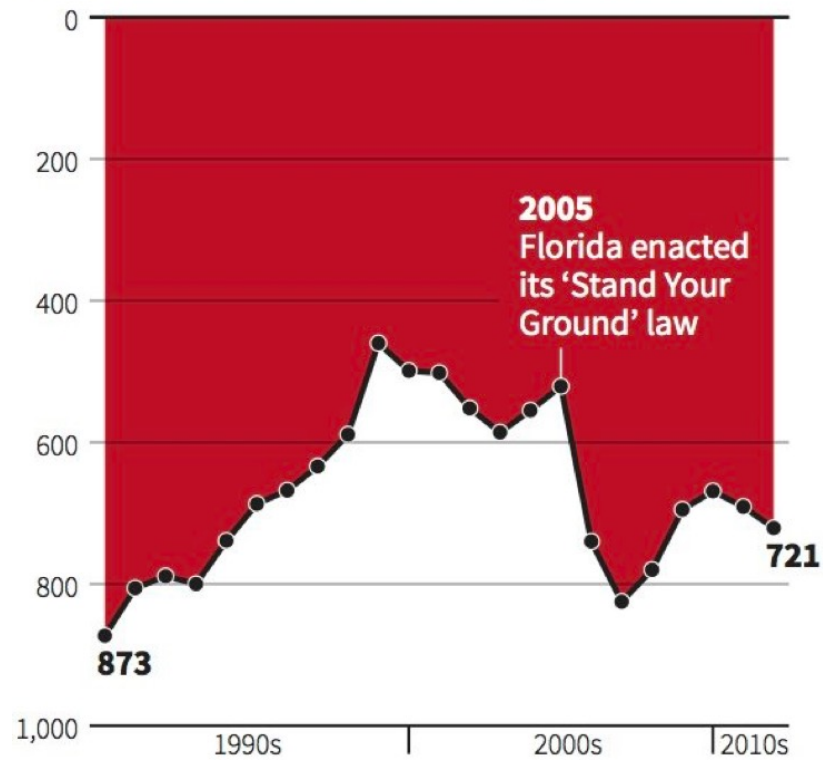


“Each state has been rated from one to 50: the higher the score, the smaller the proportion of STIs. So on the map - the darker the colour, the smaller the rate of STIs.”

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# Gun deaths in Florida

Number of murders committed using firearms



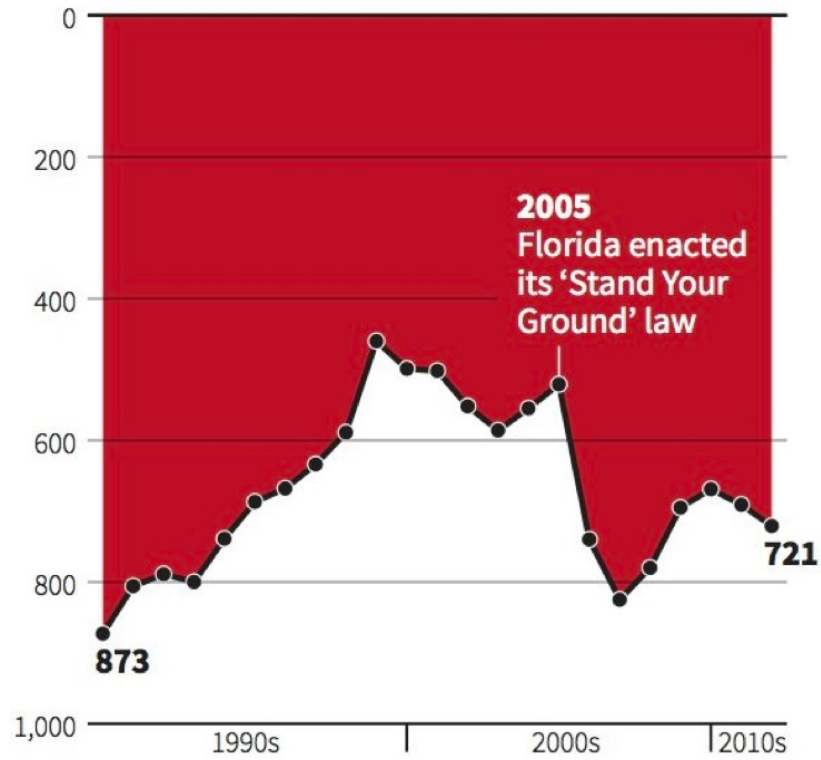
Source: Florida Department of Law Enforcement

C. Chan 16/02/2014



# Gun deaths in Florida

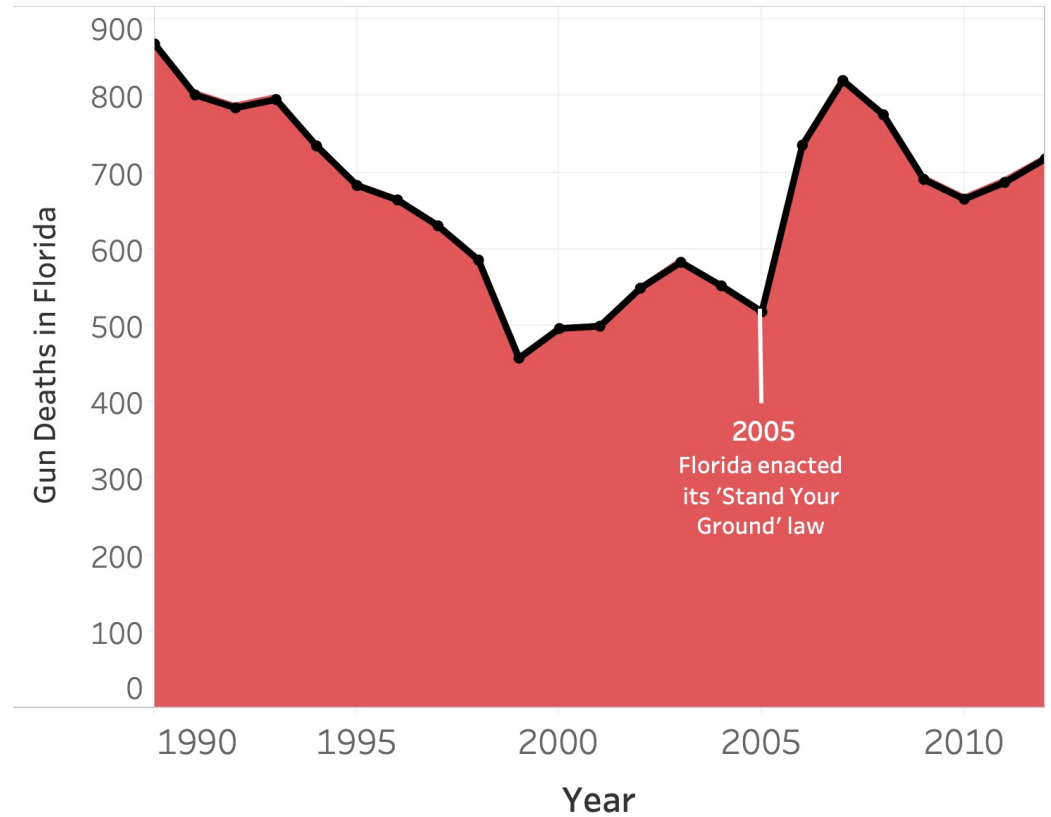
Number of murders committed using firearms



Source: Florida Department of Law Enforcement

C. Chan 16/02/2014

REUTERS

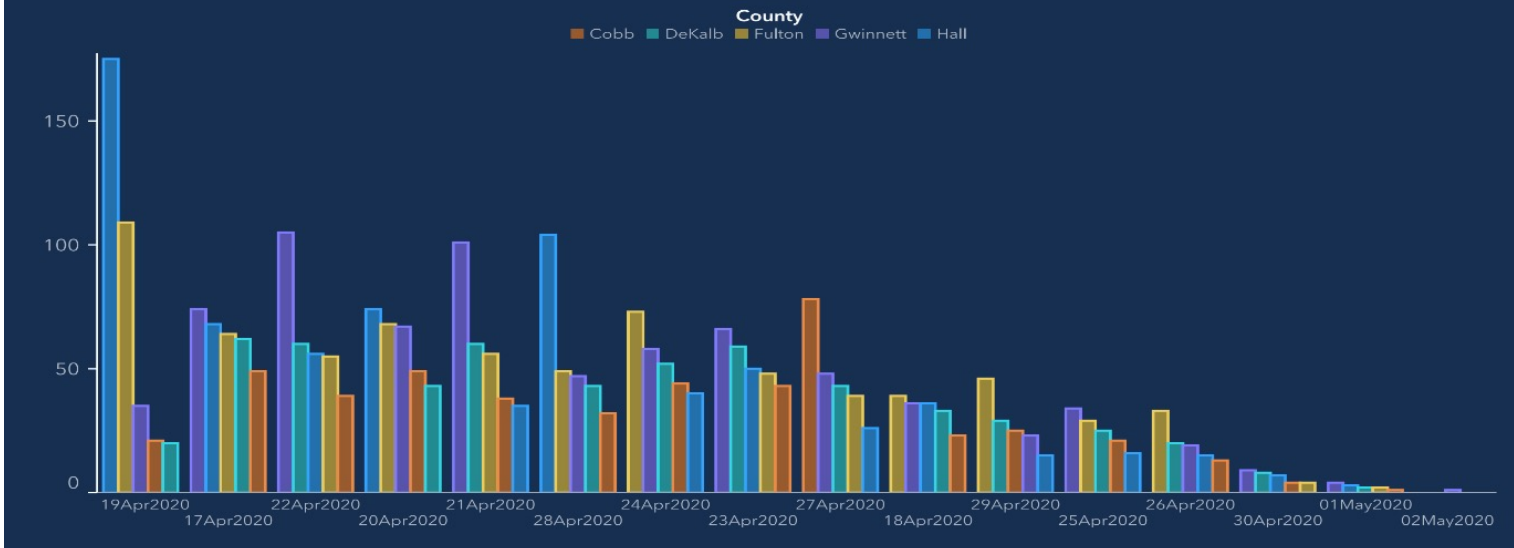




# Convention Manipulation

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

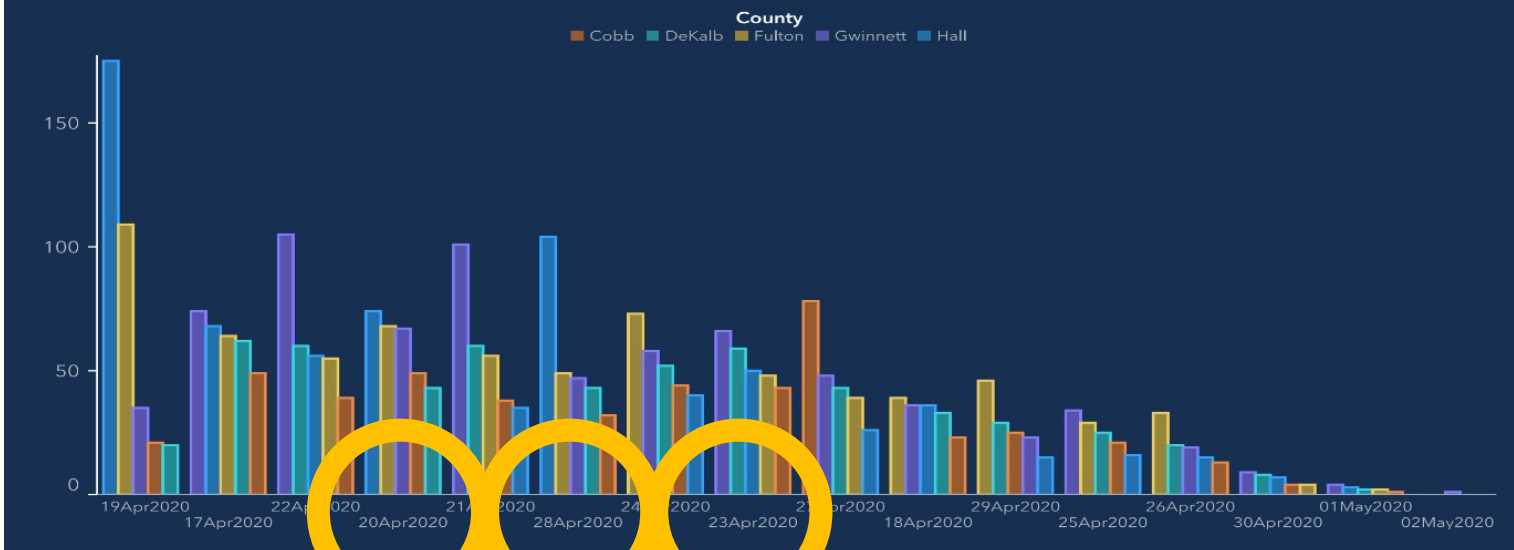
The chart below represents the most impacted counties over the past 15 days and the number of cases over time. The table below also represents the number of deaths and hospitalizations in each of those impacted counties.



# Convention Manipulation

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

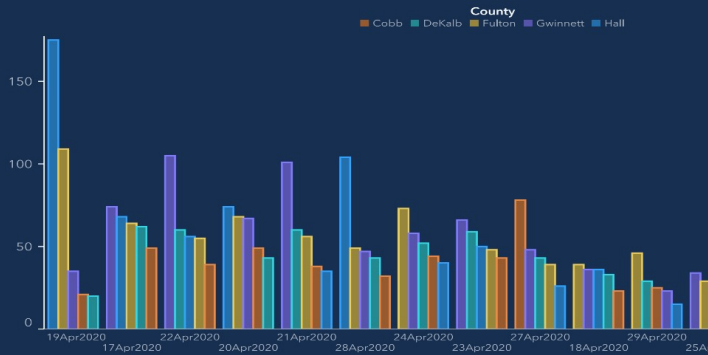
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# Convention Manipulation

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

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



**Candice Broce**

@candicebroce

Replying to @petecorson and @AJCInteractives

The x axis was set up that way to show descending values to more easily demonstrate peak values and counties on those dates. Our mission failed. We apologize. It is fixed.

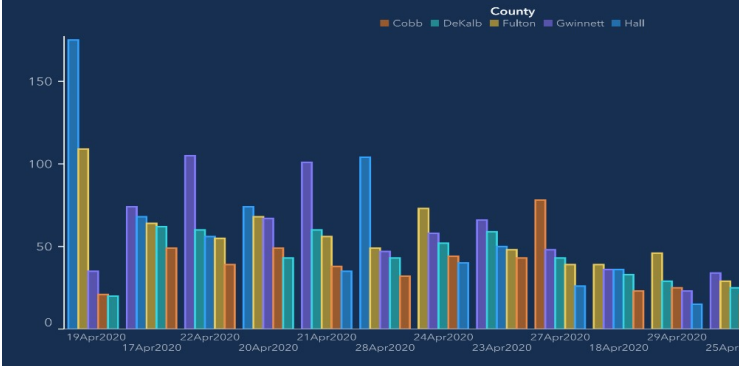
1:38 PM · May 11, 2020 · Twitter for iPhone

14 Retweets 50 Quote Tweets 28 Likes

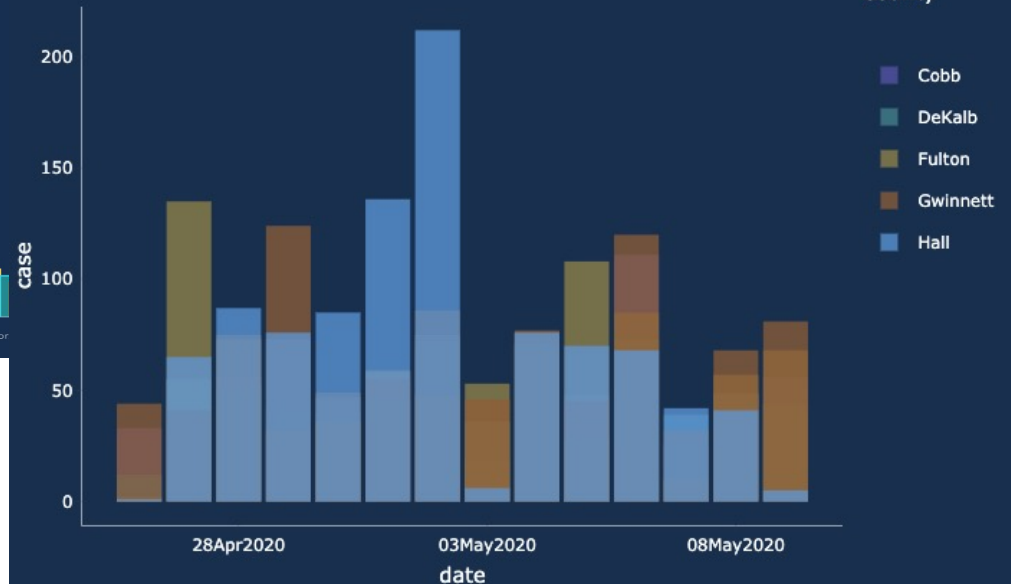
# Convention Manipulation

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

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



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



Redesign from Lucy D'Agostino McGowan

<https://livefreeordichotomize.com/2020/05/17/graph-detective/>

# ITHACA TIMES

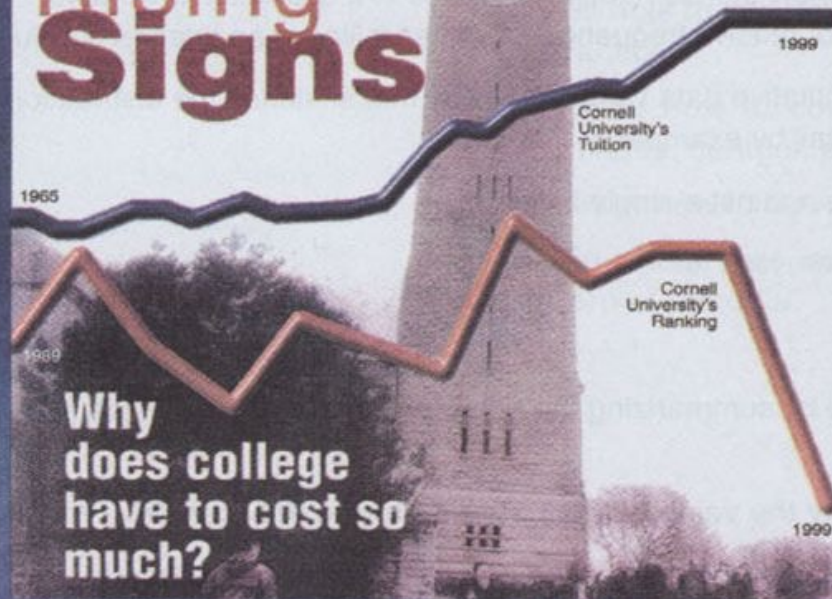
Visit us online at <http://www.ithacatimes.com>

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?

Vol. XXII, No. 15 / For Twenty Sixth Year / December 7, 2000 / FREE

# ITHACA TIMES

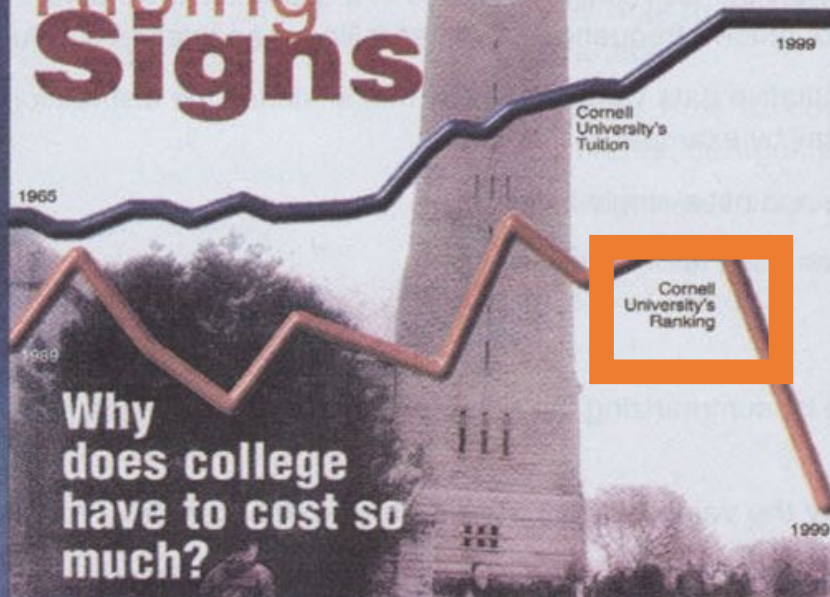
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Planning Board approves  
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IC students occupy Job Hall

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## Rising Signs



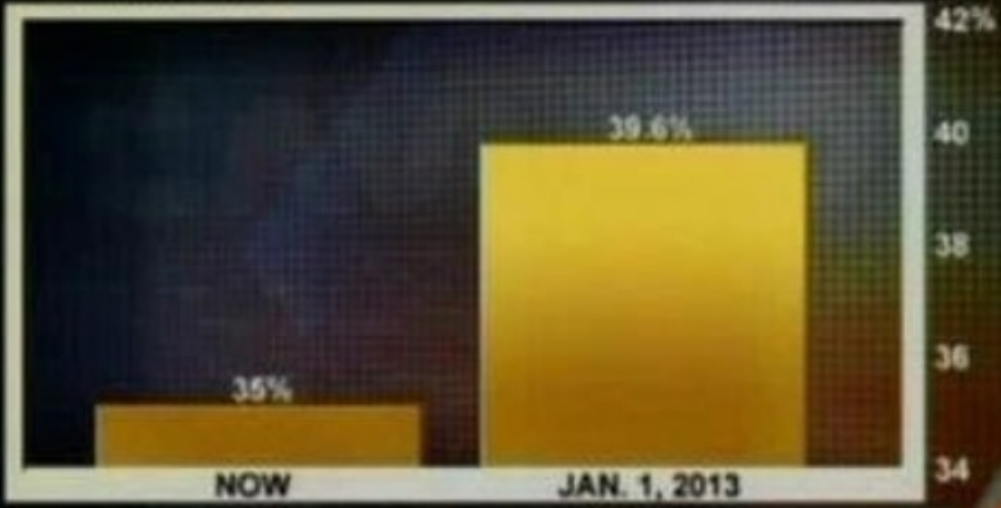
Why  
does college  
have to cost so  
much?

Cornell  
University's  
Ranking



# IF BUSH TAX CUTS EXPIRE

TOP TAX RATE



8:01 p ET

**FOX**  
BUSINESS

TOP STORIES

TECHNOLOGY

CONSUMER

WITH THE JUSTICE DEPARTMENT AND ACQUIRES FULL T

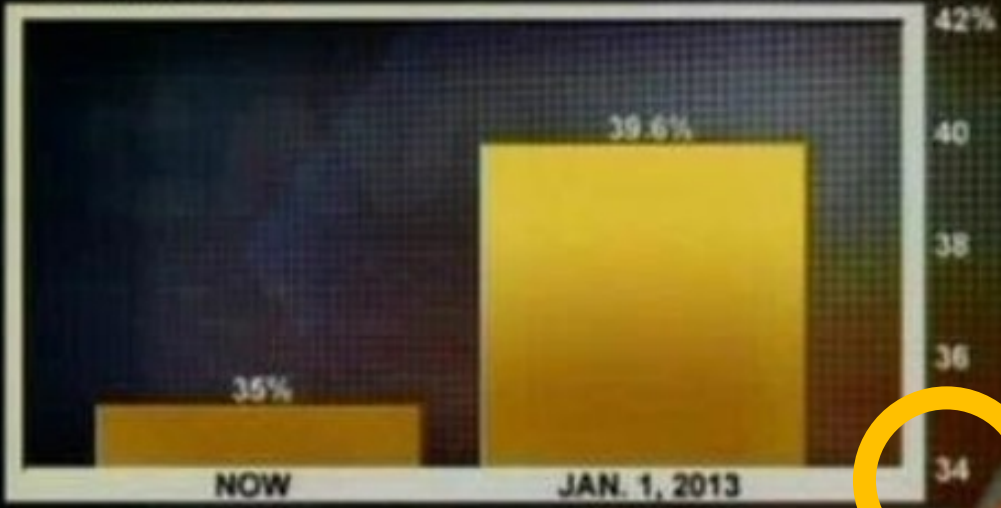
DOW 13008.68  $\nabla$  64.33

S&P 1379.32  $\nabla$  5.98

NASDAQ 2939.52  $\nabla$  6.32

# IF BUSH TAX CUTS EXPIRE

TOP TAX RATE



8:01 p ET

**FOX**  
BUSINESS

TOP STORIES

TECHNOLOGY

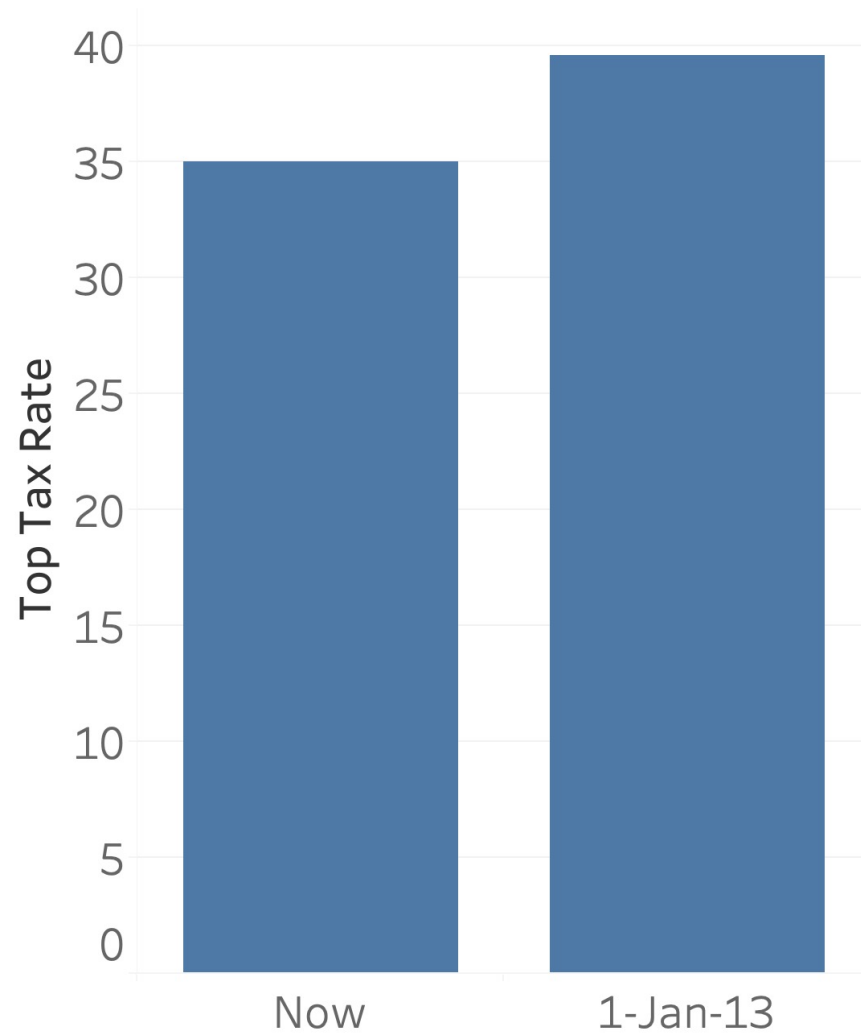
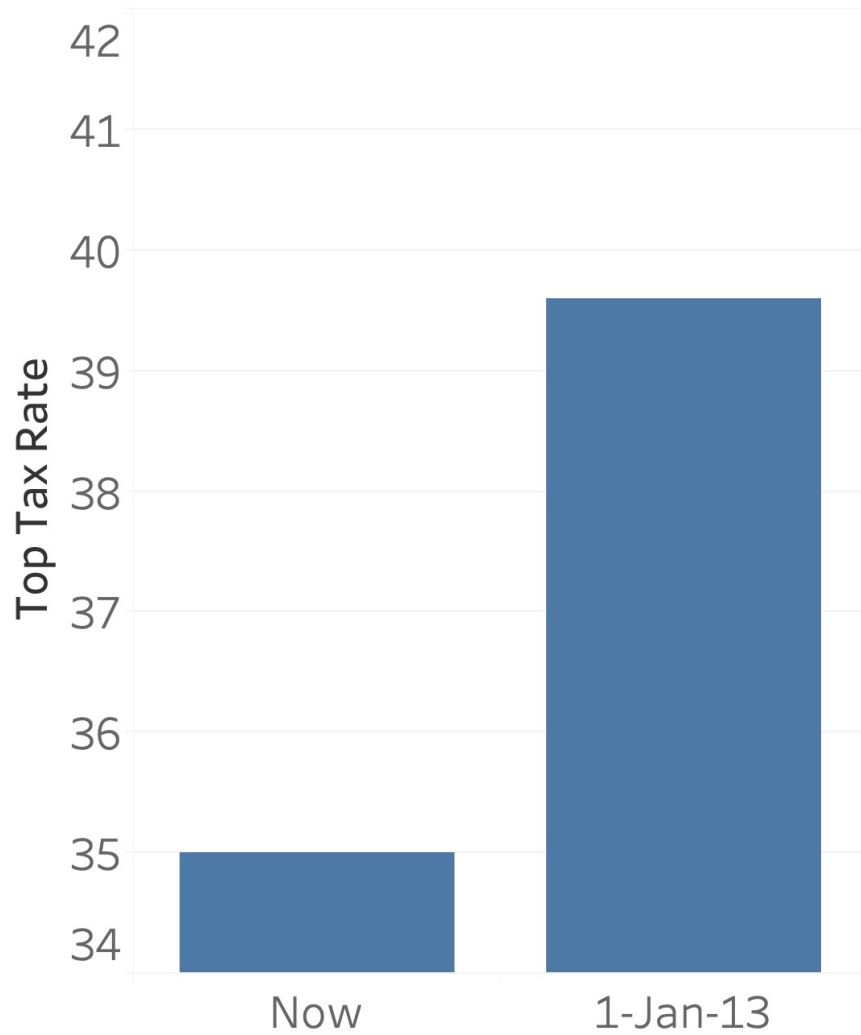
CONSUMER

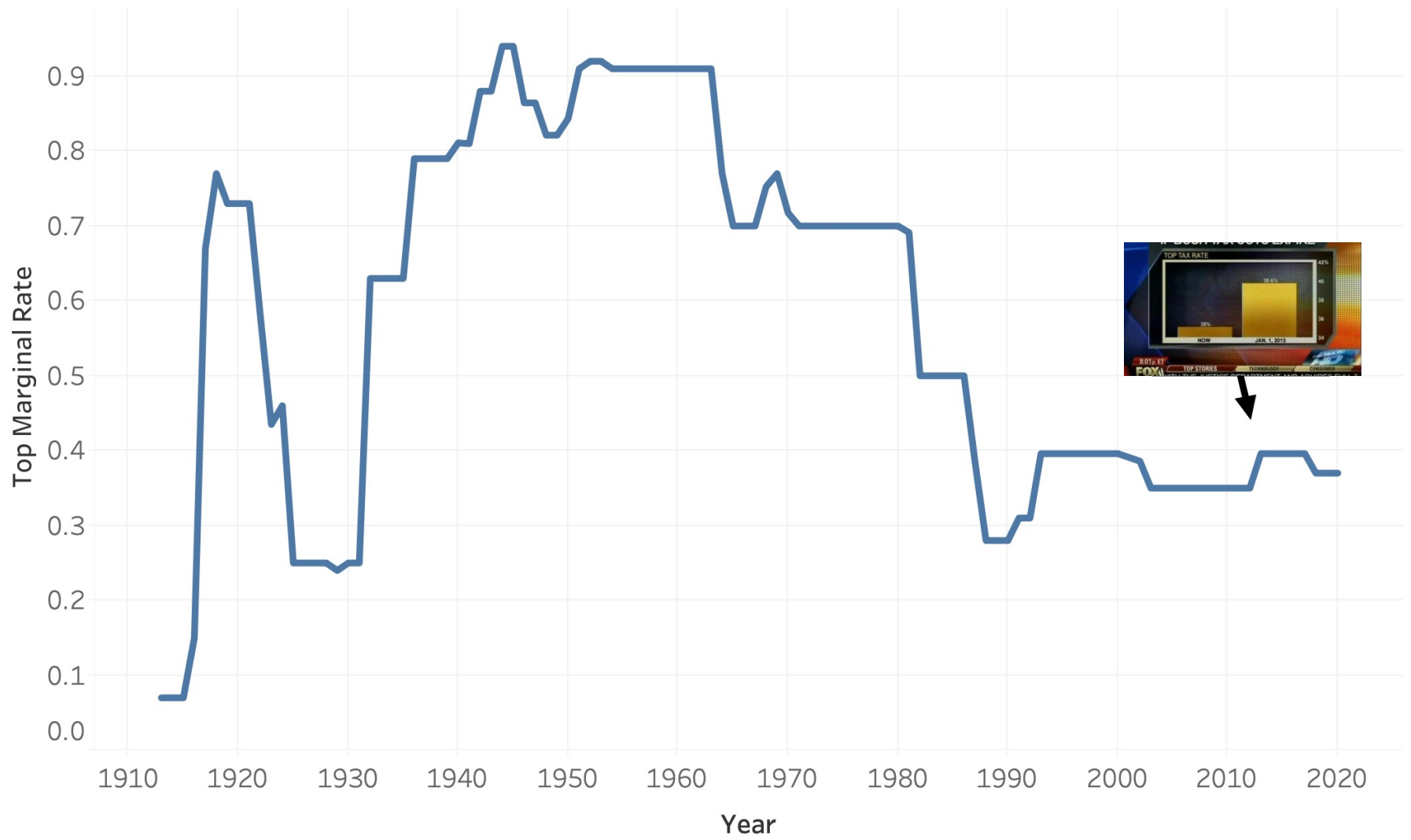
WITH THE JUSTICE DEPARTMENT AND ACQUIRES FULL T

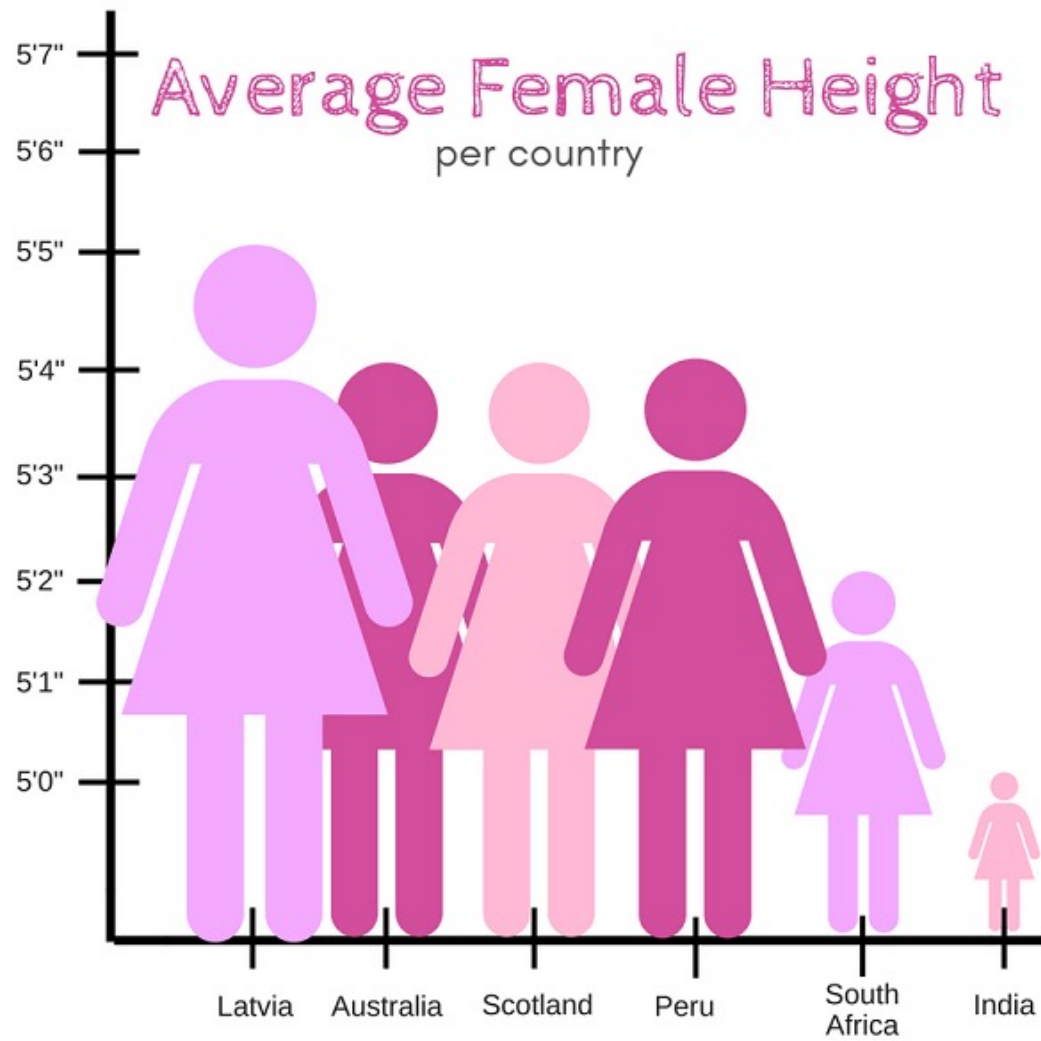
DOW 13008.68 ▼ 64.33

S&P 1379.32 ▼ 5.98

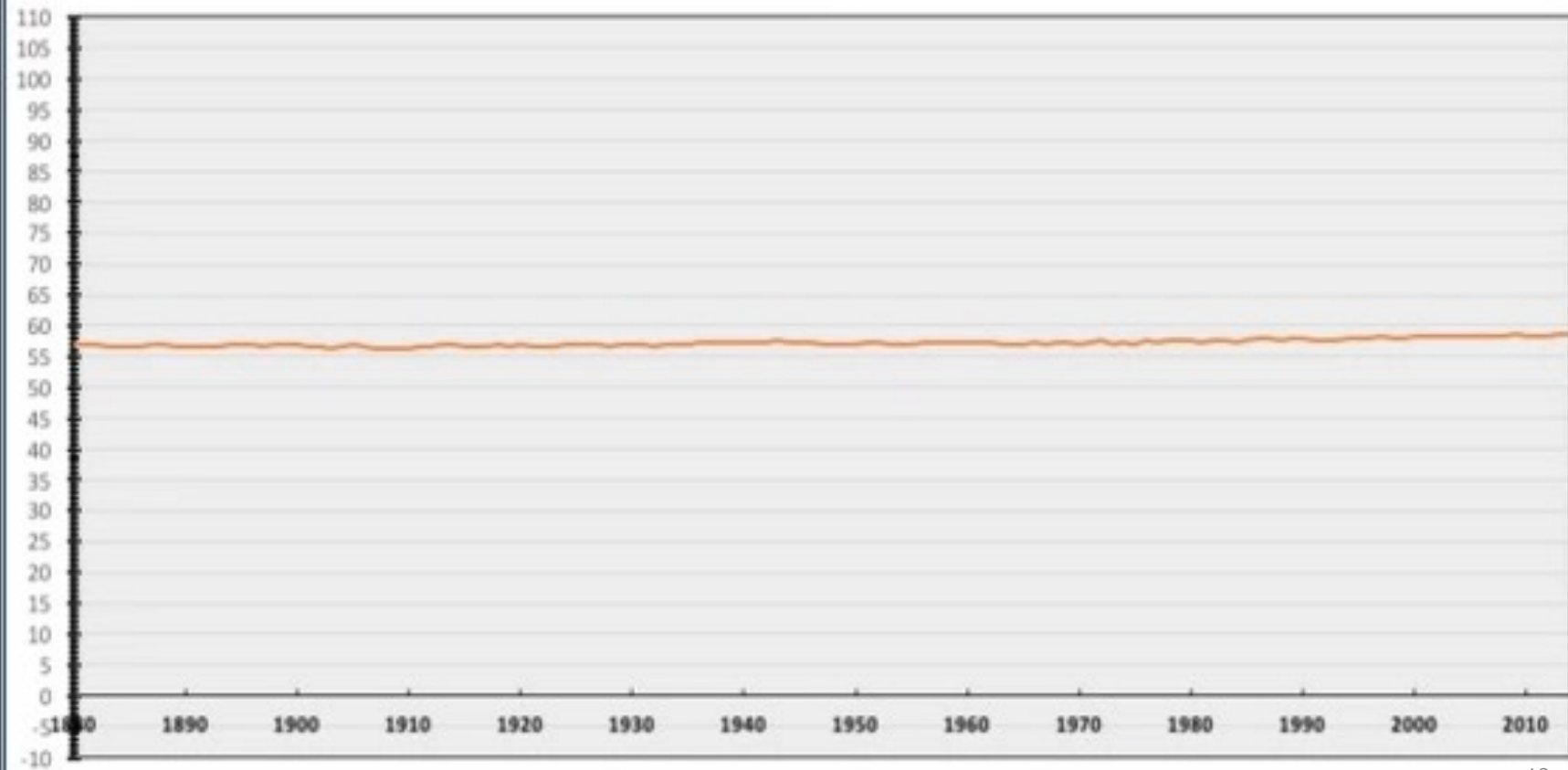
NASDAQ 2939.52 ▼ 6.32



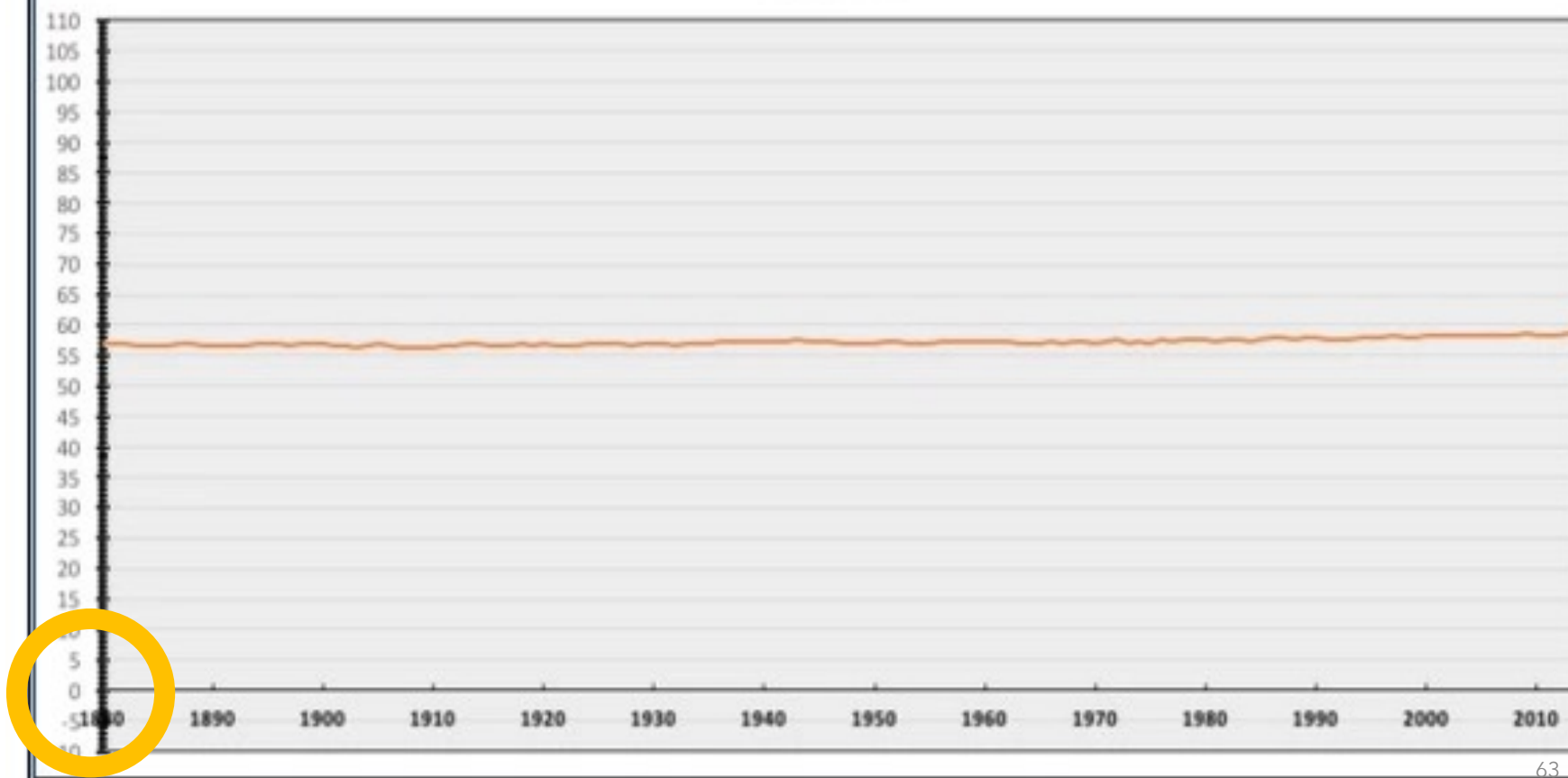




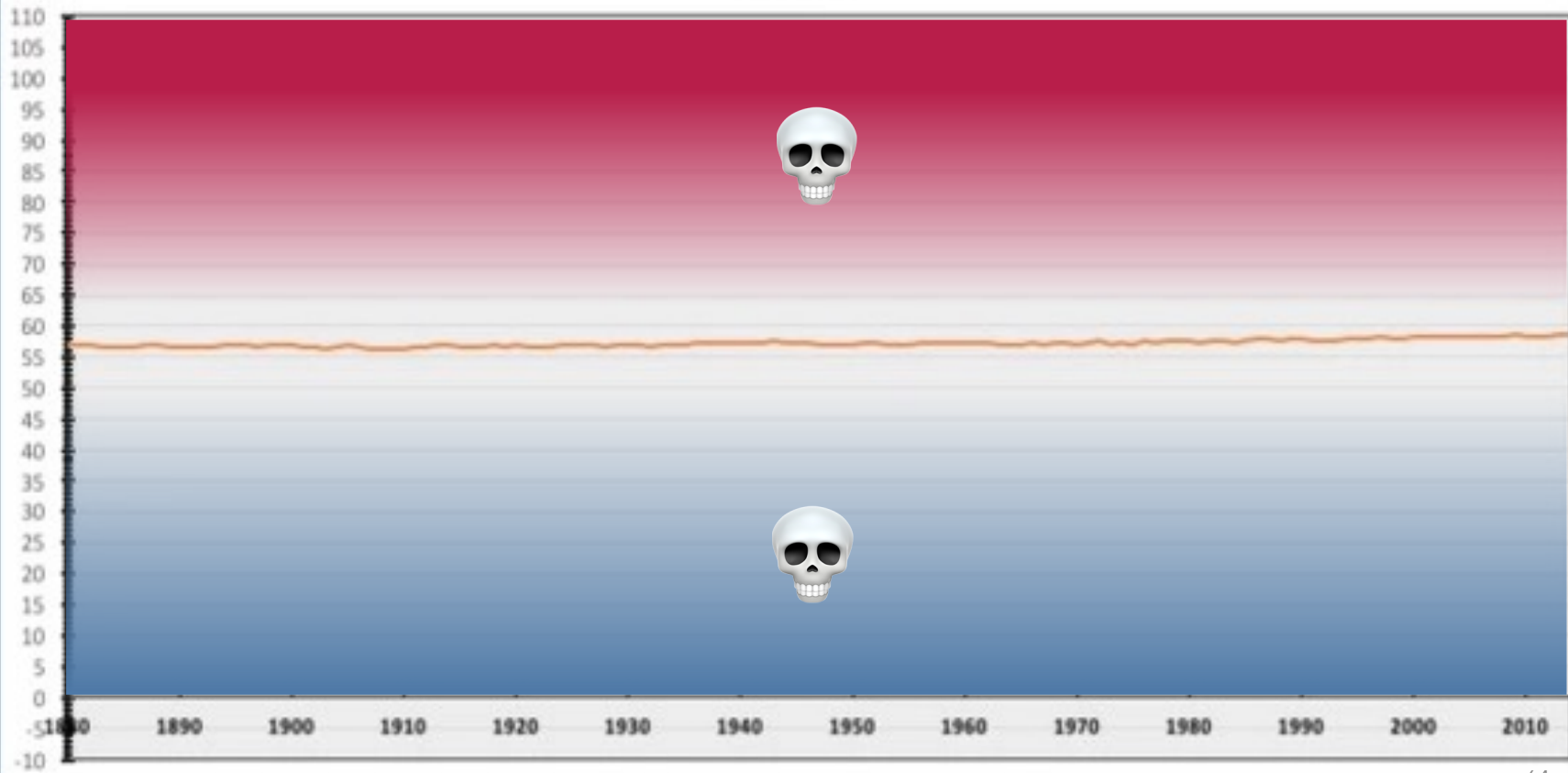
Average Annual Global Temperature in Fahrenheit  
1880-2015



Average Annual Global Temperature in Fahrenheit  
1880-2015

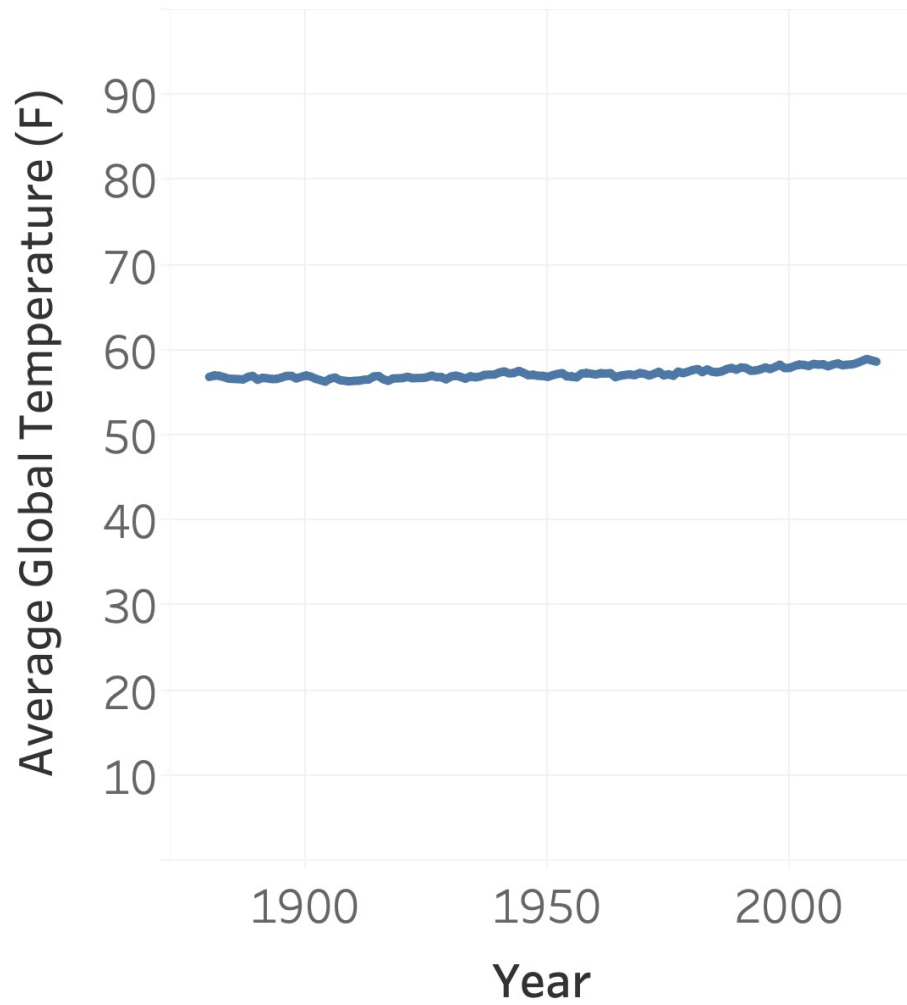


### Average Annual Global Temperature in Fahrenheit 1880-2015

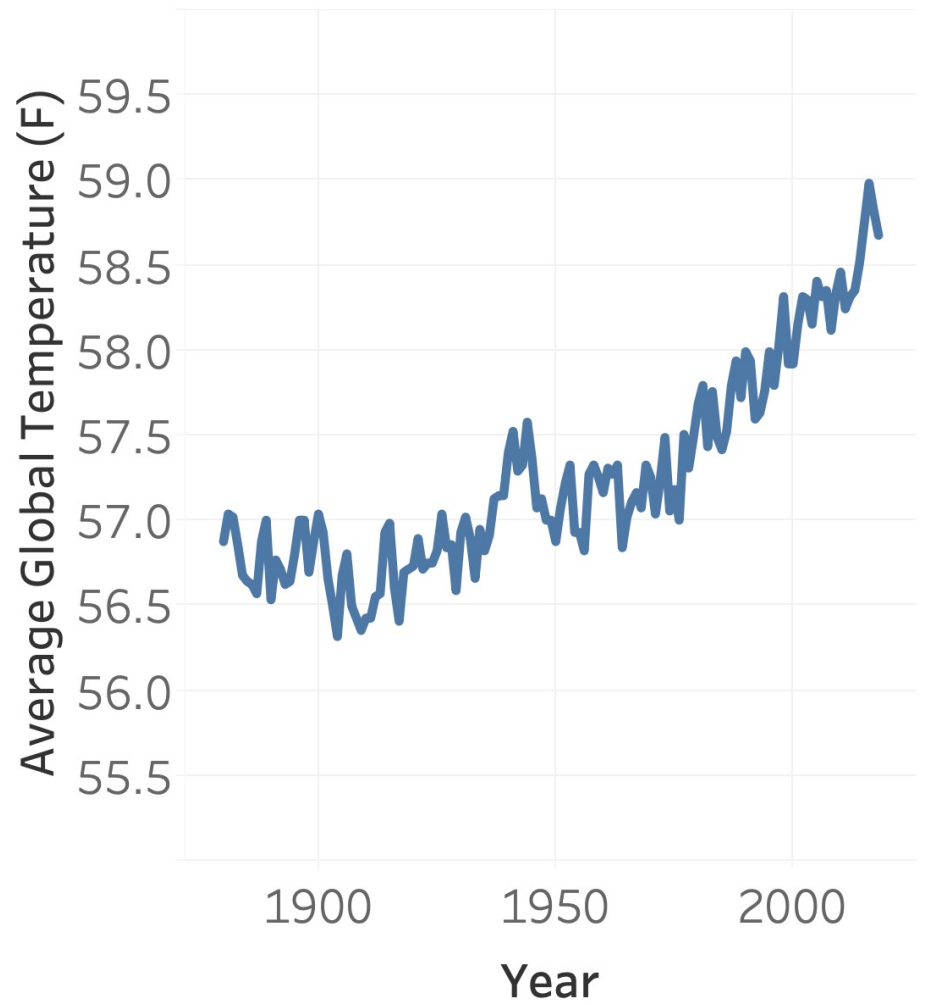




NRO



NRO (Truncated)



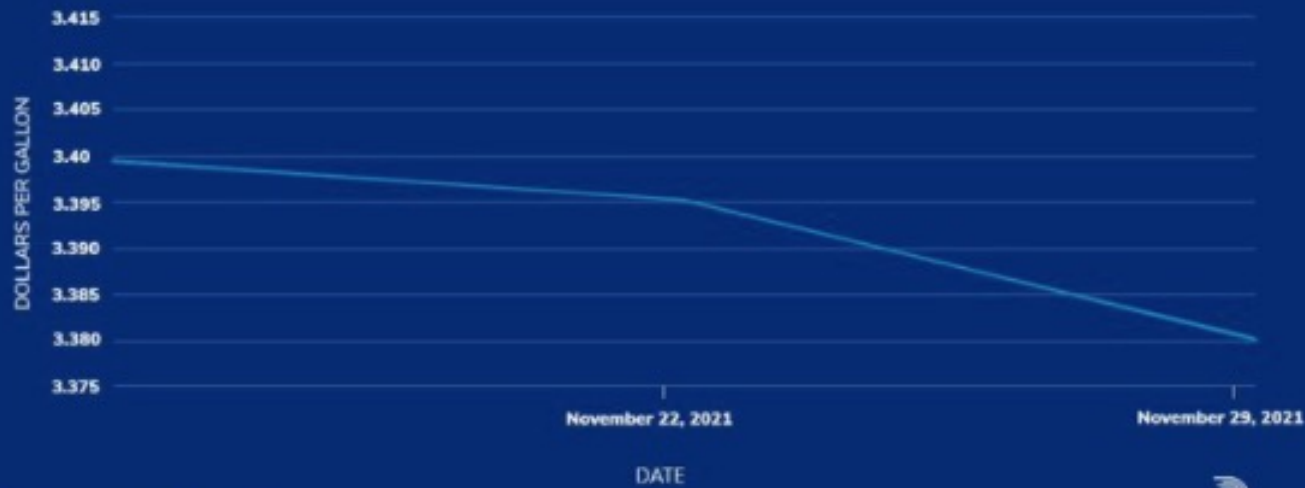


DCCC ✓  
@dccc



Thanks, @JoeBiden.

### US REGULAR ALL FORMULATIONS GAS PRICE



FRED Economic Data, 12/2/21

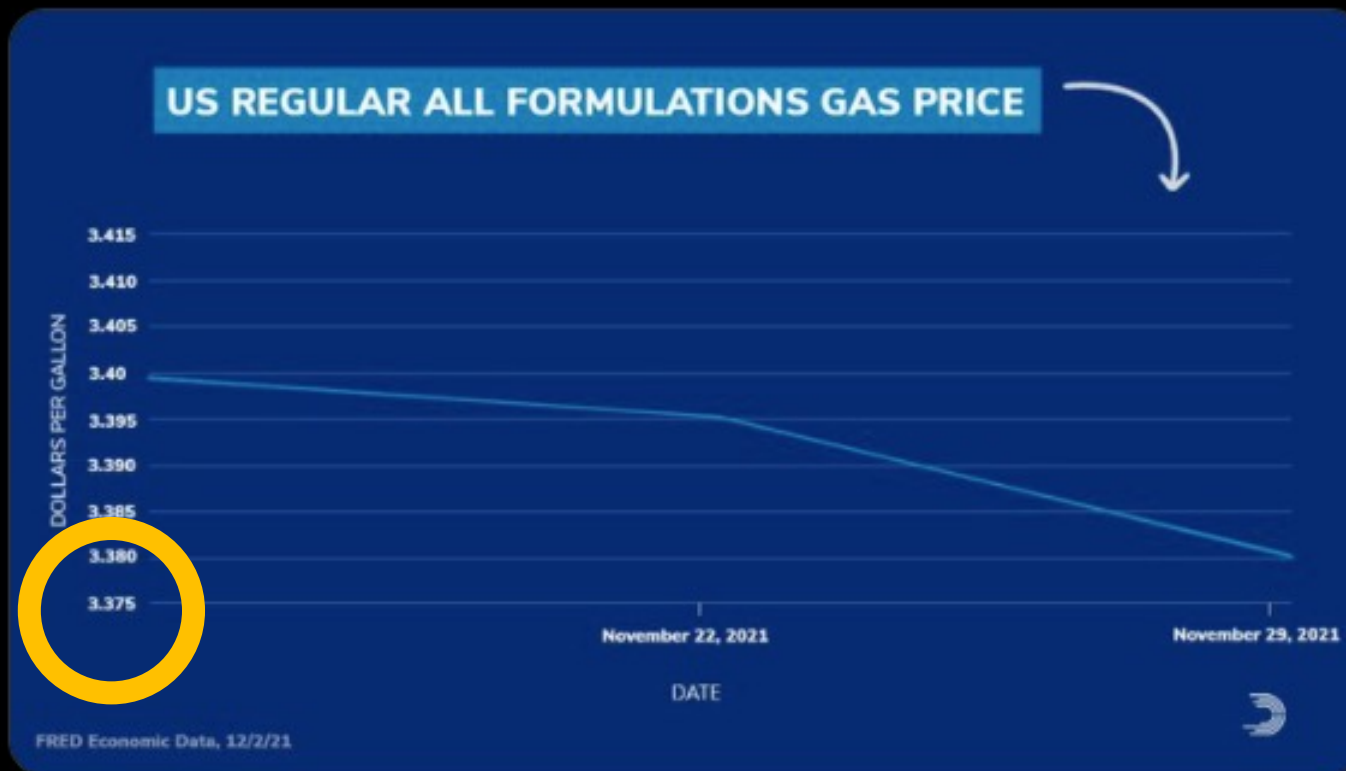




DCCC ✓  
@dccc

...

Thanks, @JoeBiden.

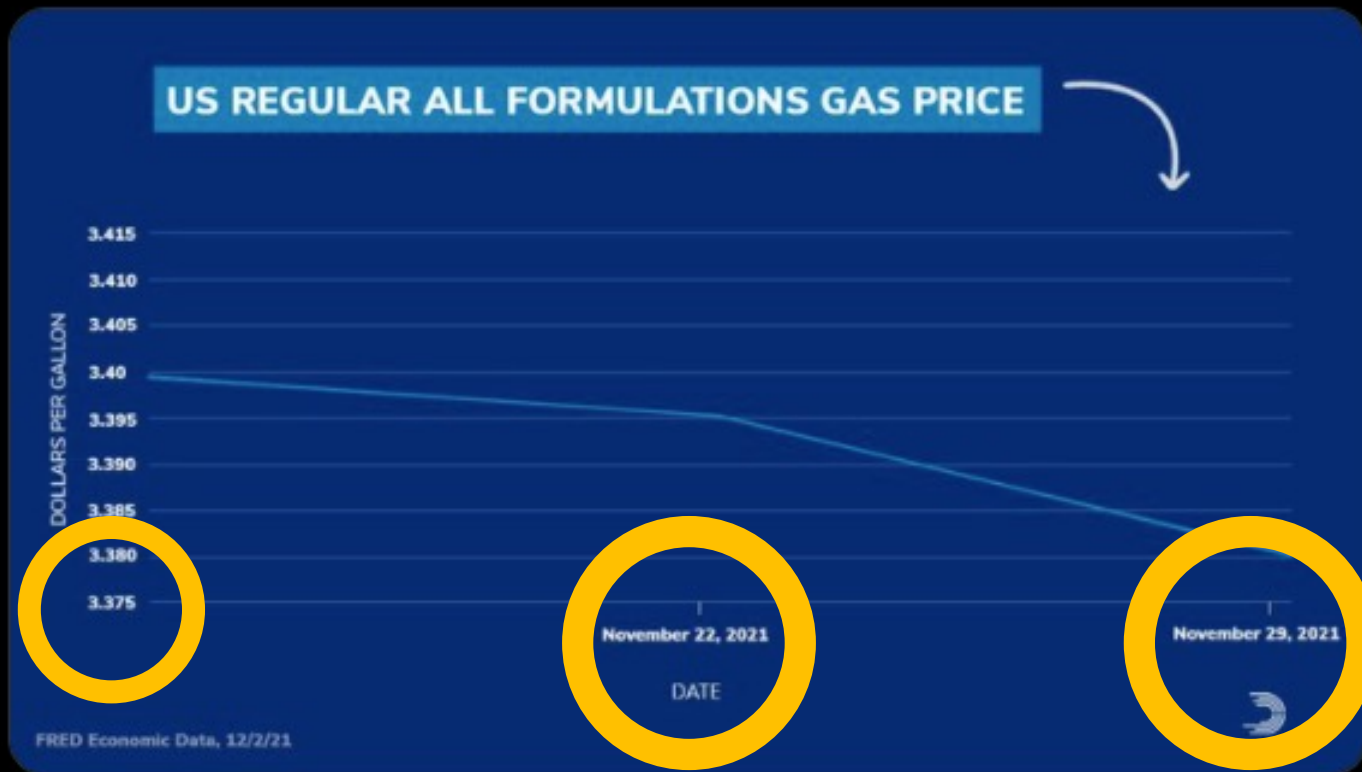




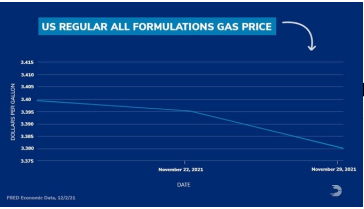
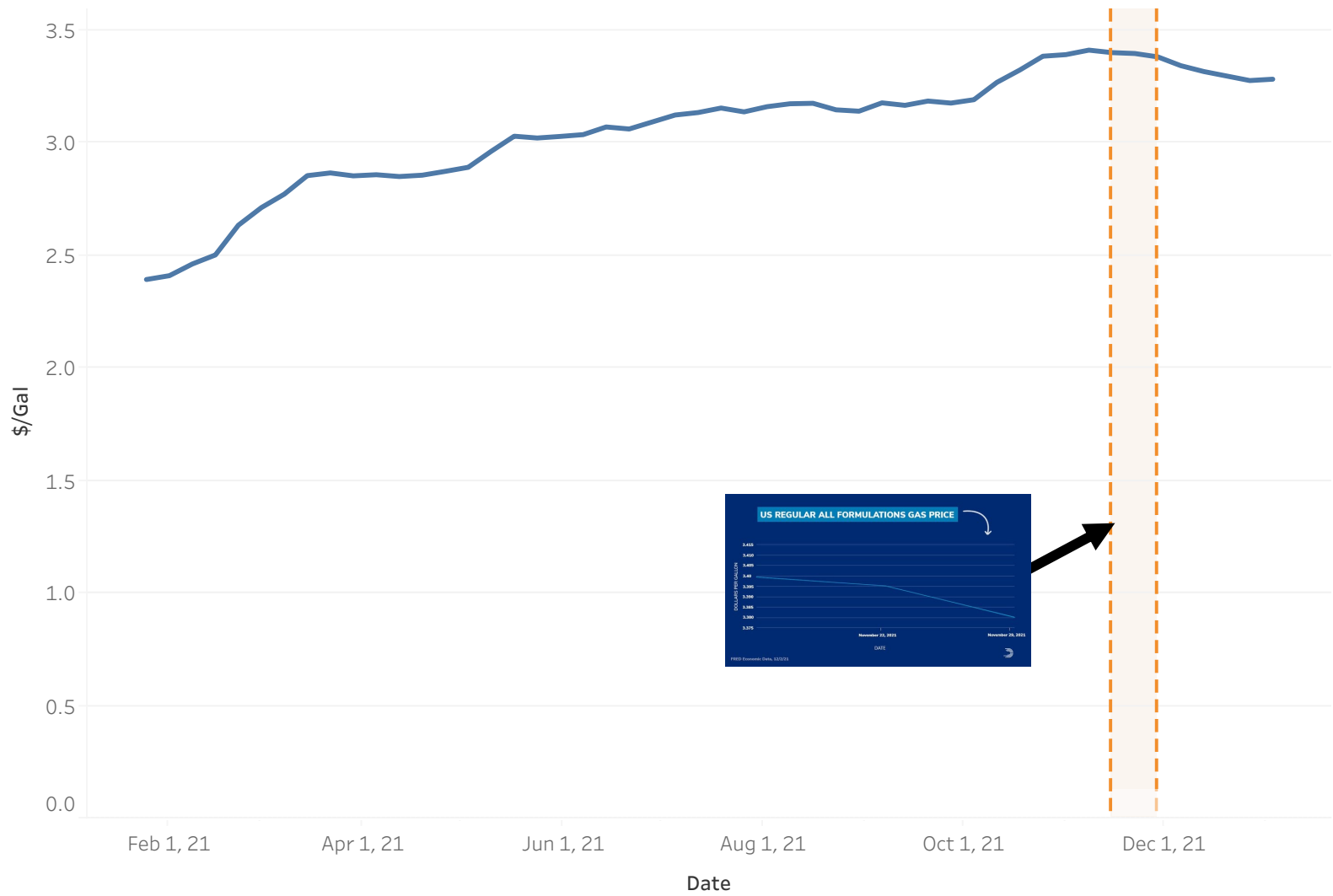
DCCC ✓  
@dccc

...

Thanks, @JoeBiden.







# Unconventional Visualizations

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

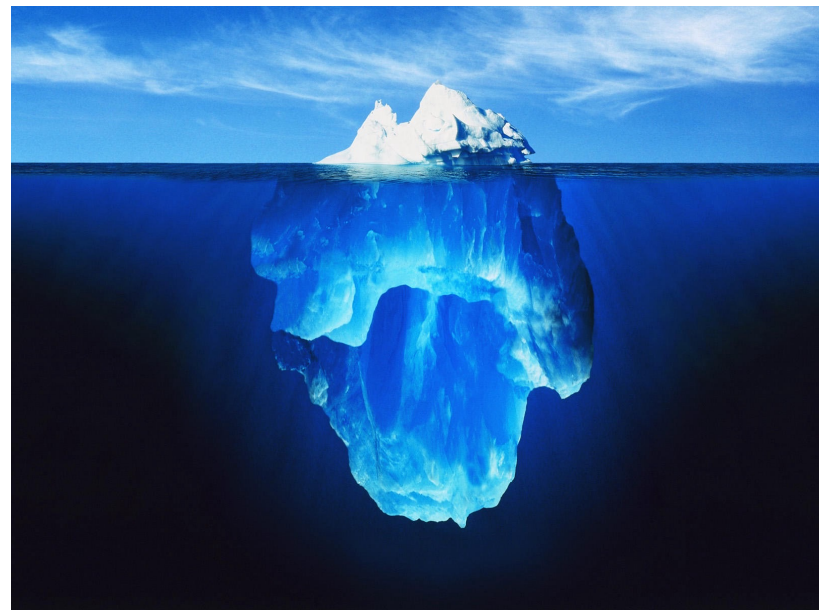
...if you violate those conventions, you can catch people off guard.

# Other Types of Bad Visualizations

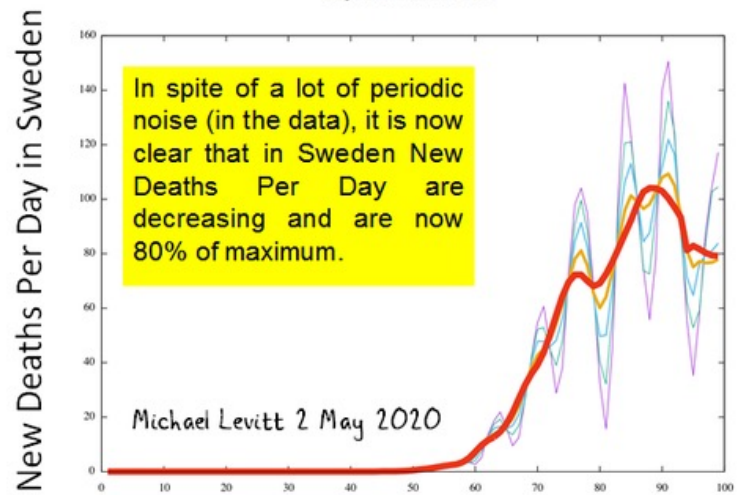
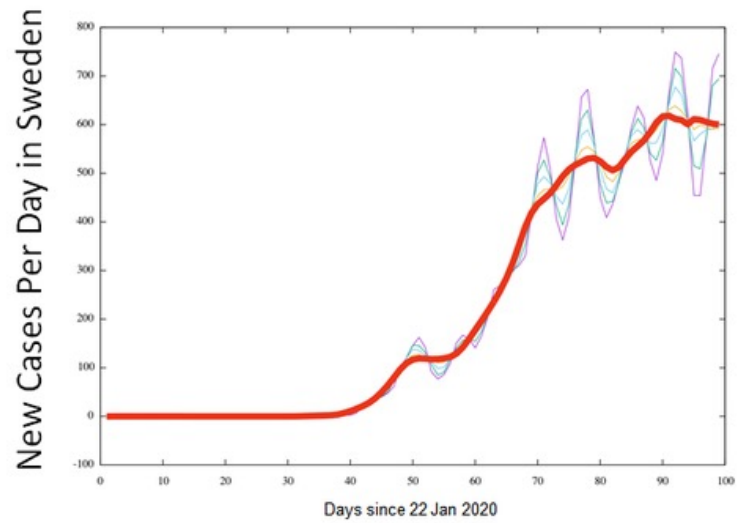
Fragile Visualizations?

Visualization White Lies?

Inhuman Visualizations?

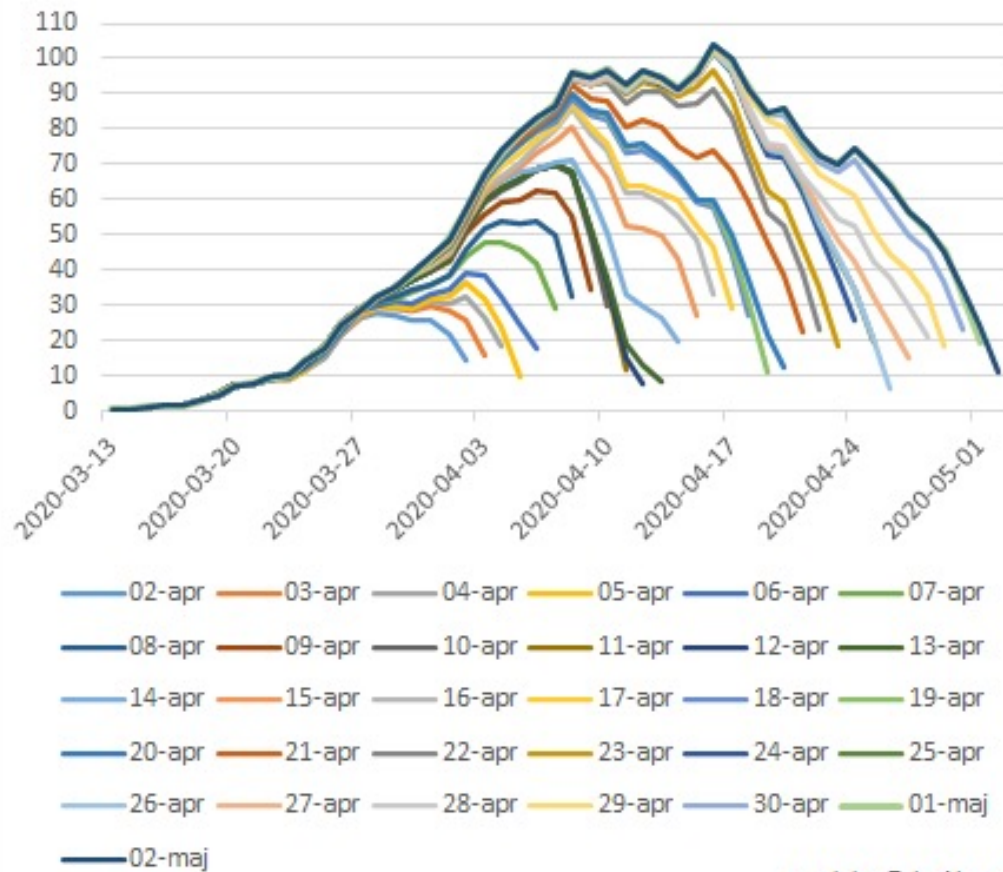






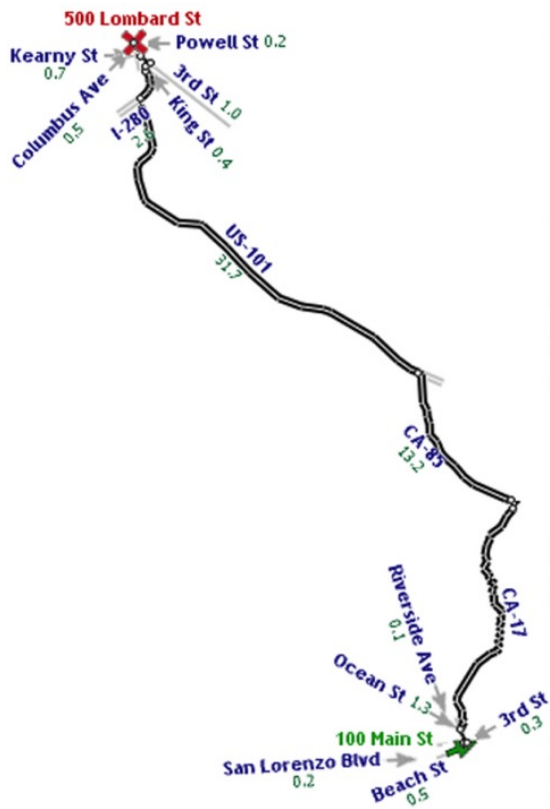
### Sweden Covid-19 deaths per day Rolling 3-day average

source: Folkhälsomyndigheten, daily spreadsheet

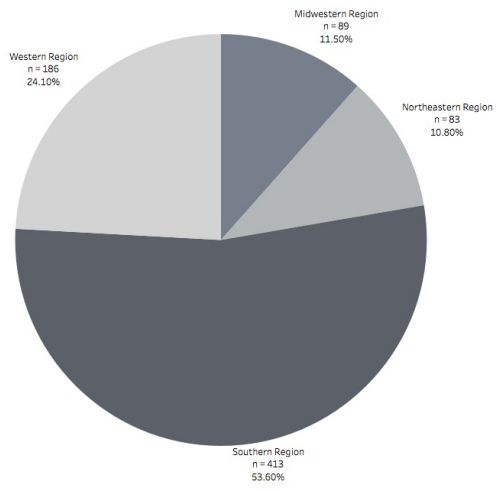


graph by @davidsteadson

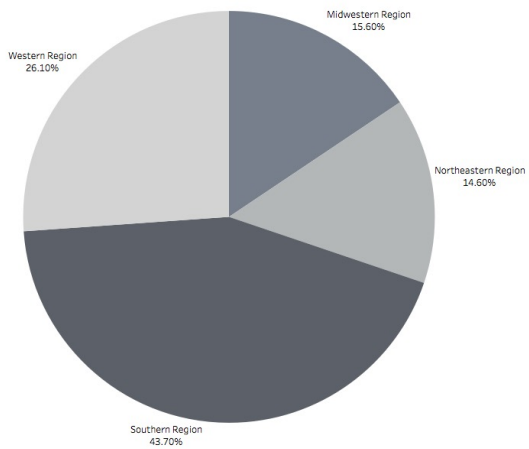
# Visualization "White Lies"



Logging fatalities and percentages by region, 1992-97

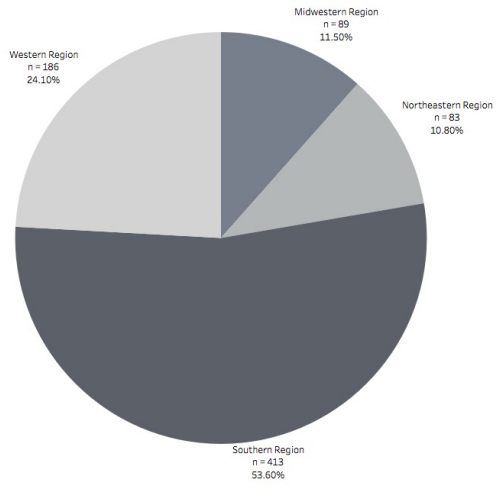


Logging employment percentages by region, 1992-97

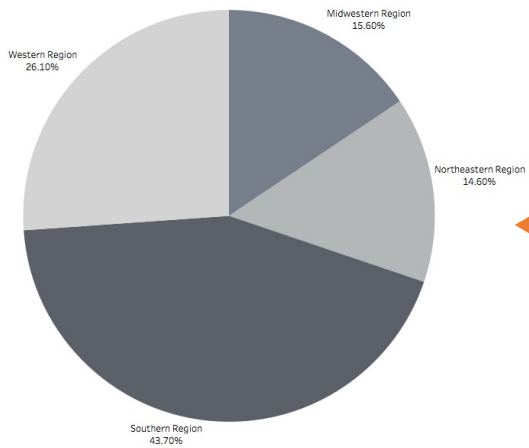


Sam Dragga & Dan Voss “Cruel Pies: The Inhumanity of Technical Illustrations”

Logging fatalities and percentages by region, 1992-97

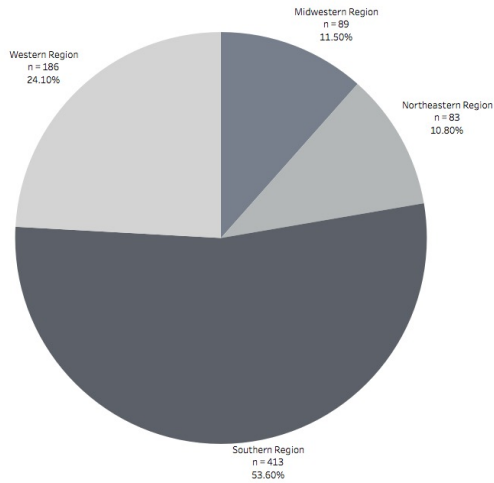


Logging employment percentages by region, 1992-97



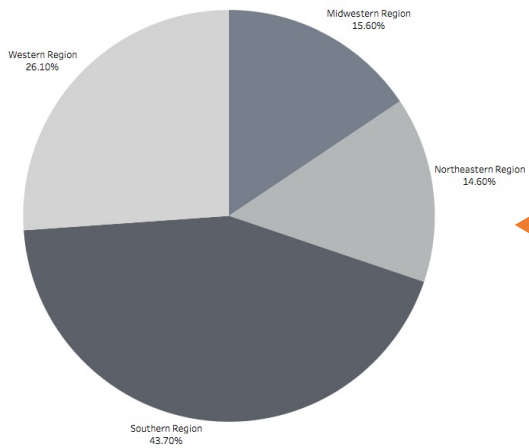
← Where Your Employees Live

### Logging fatalities and percentages by region, 1992-97



← 771 Dead People

### Logging employment percentages by region, 1992-97

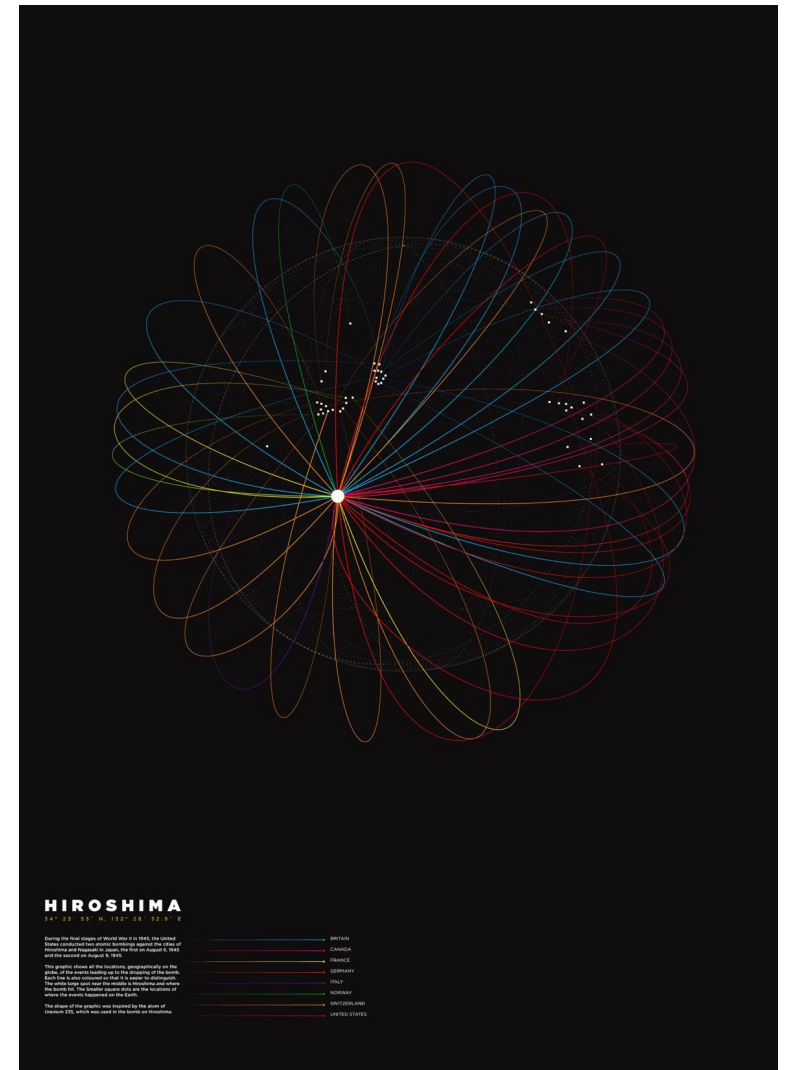


← Where Your Employees Live

# “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



# Wrap Up

Ways to mislead:

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






Nuance:

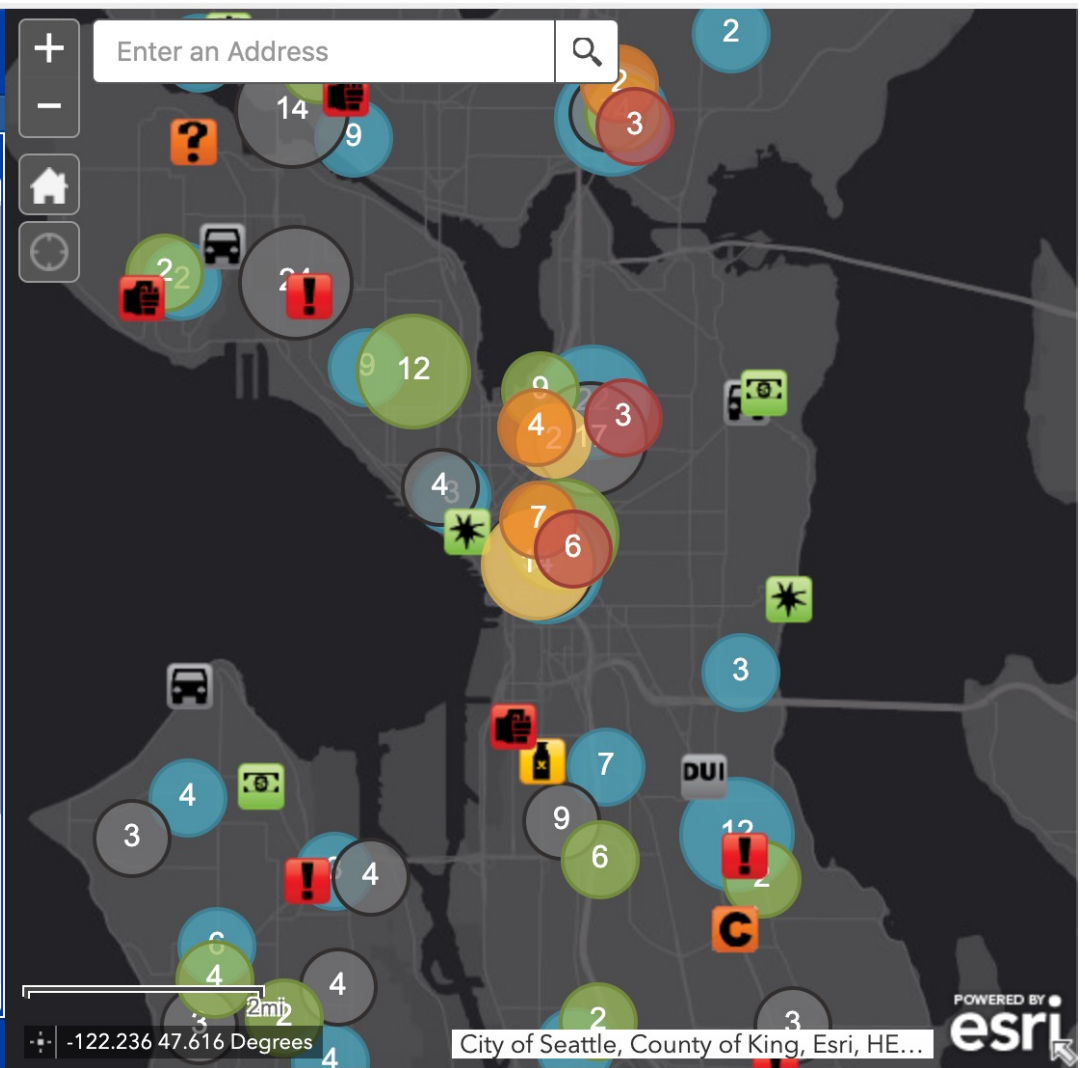
Not every chart that breaks a "rule" is misleading

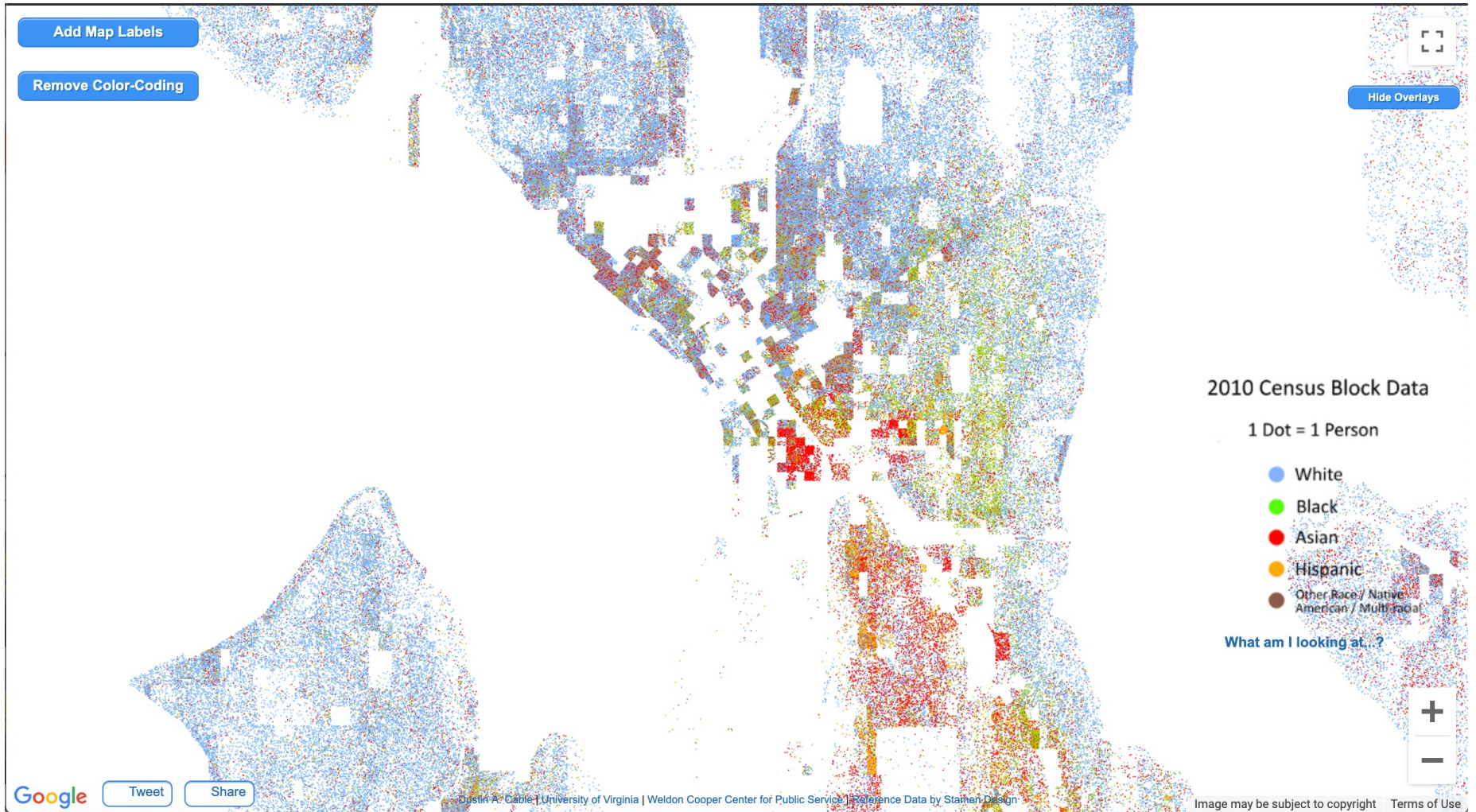
Not every chart that follows the "rules" is truthful



Call Type Summary

	Crimes Against Persons	21
	Assault	8
	Robbery	5
	Threats	8
	Assisting the Public	18
	Drugs and Vice	17
	Property Crime/Theft	75
	-	100





Add Map Labels

Remove Color-Coding

Hide Overlays

### 2010 Census Block Data

1 Dot = 1 Person

- White
- Black
- Asian
- Hispanic
- Other Race / Native American / Multi-racial

What am I looking at...?

Google

Tweet

Share

Dustin A. Cable | University of Virginia | Weldon Cooper Center for Public Service | Reference Data by Statmap Design

Image may be subject to copyright Terms of Use

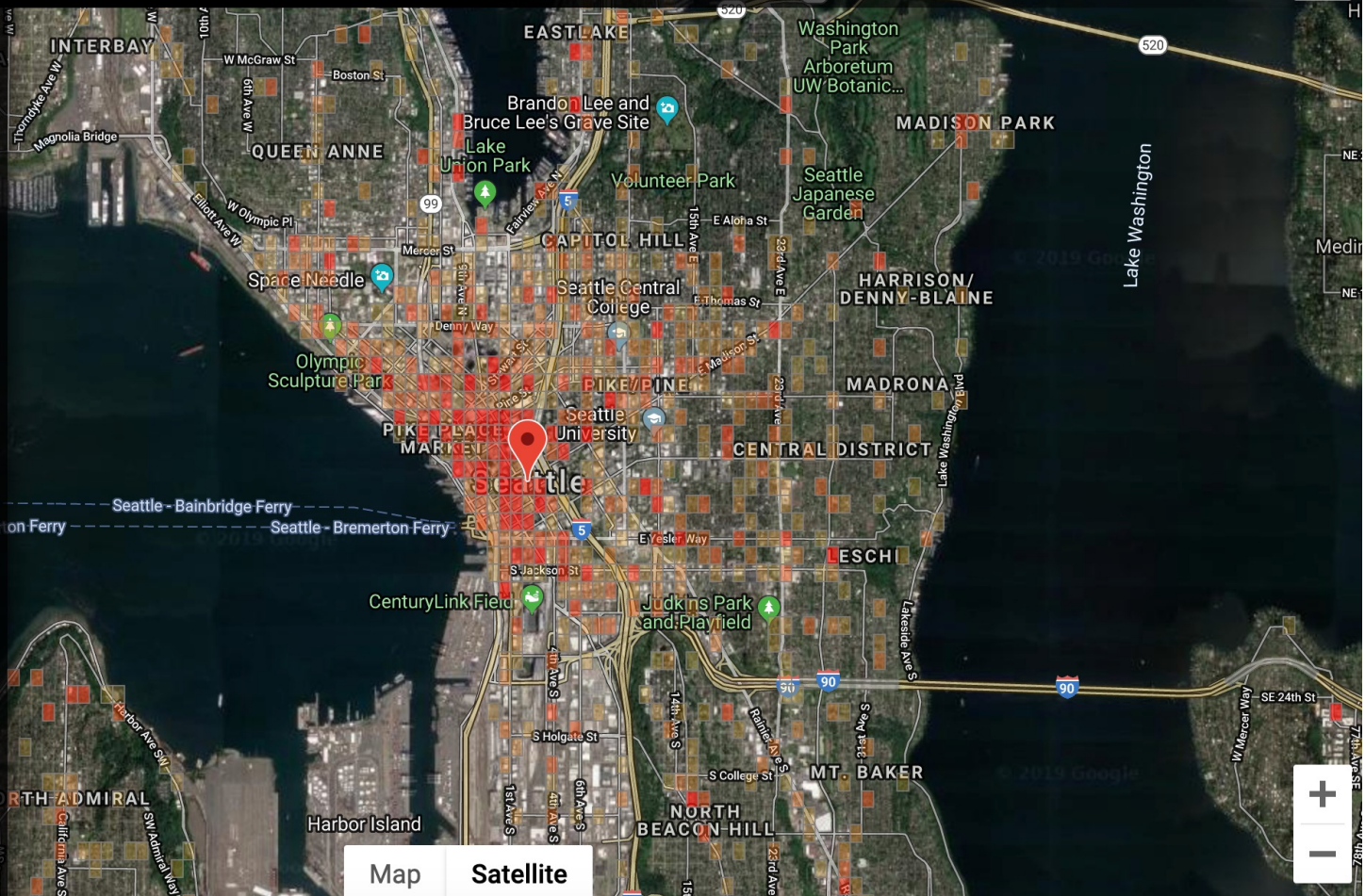
# WHITE COLLAR CRIME RISK ZONES

# THE NEW INQUIRY



White Collar Crime Risk Zones uses machine learning to predict where financial crimes are mostly likely to occur across the US. To learn about our methodology, read our [white paper](#).

By [Brian Clifton](#), [Sam Lavigne](#) and [Francis Tseng](#) for *The New Inquiry Magazine*, Vol. 59: [ABOLISH](#).



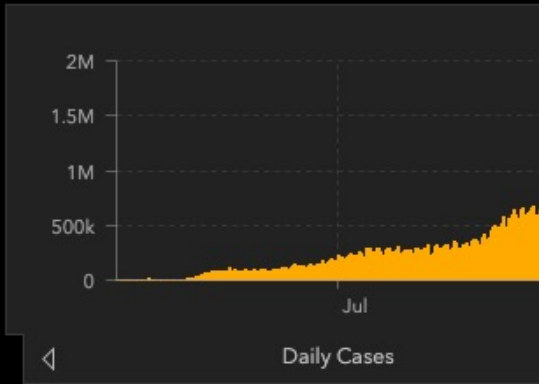
Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (J..



- Cumulative Cases
- Active Cases
- Incidence Rate
- Case-Fatality Ratio
- Testing Rate

**191**  
countries/regions

Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#). Data sources: [Full list](#). Downloadable database: [GitHub](#), [Feature Layer](#).  
Lead by JHU CSSE. Technical Support: [Esri Living Atlas team](#) and [JHU APL](#). Financial Support:



# 100 years of world cuisine

38,000,000 deaths    25 conflicts    1915 - present  
[100yearsofworldcuisine.com](http://100yearsofworldcuisine.com)



Armenian genocide 1915-16 1,500,000 †

Korea war 1950-53 3,500,000 †

Congo wars 1998-2003 3,900,000 †

Biafran war 1967-70 1,000,000 †

Sudanese civil war 1983-2005 2,200,000 †

Gulag system 1929-53 1,600,000 †

Wars in Indochina 1945-75 6,000,000 †

North Korean famine 1990-ongoing 2,000,000 †

Holodomor 1932-33 3,000,000 †

Iraq 2003-2010 100,000 †

Stalingrad 1942-43 1,520,000 †

Khmer genocide 1975-79 3,000,000 †

Romas 1941-45 200,000 †

Holocaust 1941-45 5,000,000 †

Expulsion of Germans after WW2 1944-45 500,000 †

Immigration to Europe 1988-ongoing 15,000 †

Mexican drug war 2006-ongoing 30,000 †

Afghanistan 2001-ongoing 40,000 †

Arab-Israeli conflict 1950-ongoing 51,000 †

Chechen wars 1999-ongoing 160,000 †

Yugoslav wars 1991-95 130,000 †

Algeria war 1954-62 960,000 †

9/11 attacks 2001 2,997 †

Rwandan genocide 1994 1,000,000 †

Iran-Iraq war 1980-88 500,000 †

Partition of India 1947 500,000 †