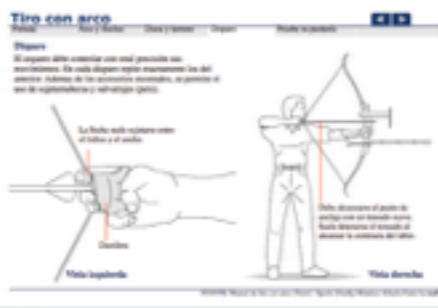
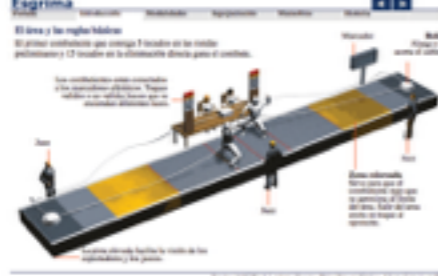
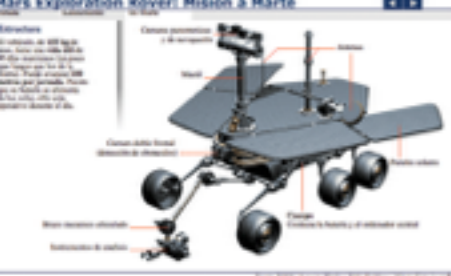


# THE ART OF TRUTH

Data Visualization and Infographics for Everyone

#DataVizTruth



## DIAGRAM

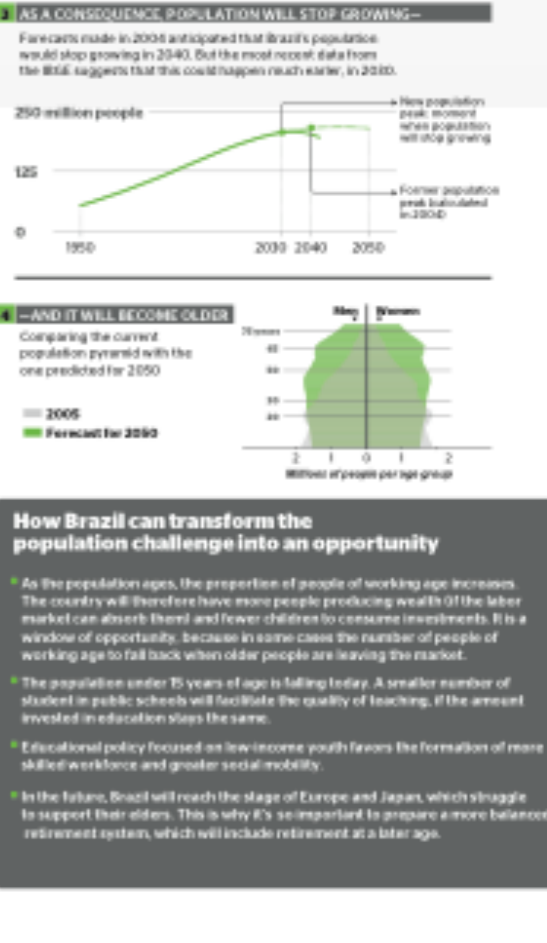
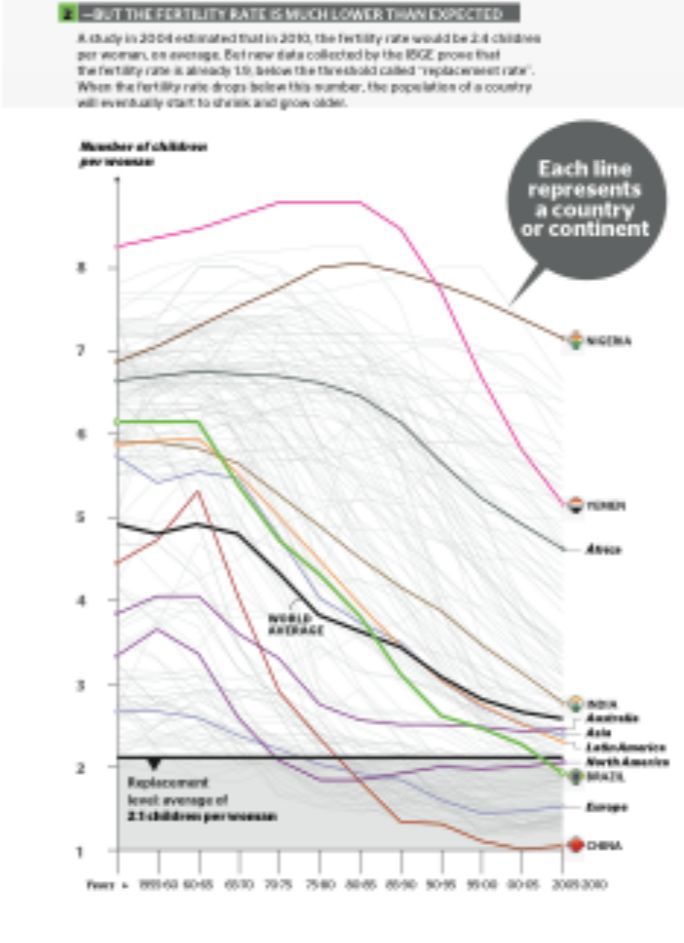
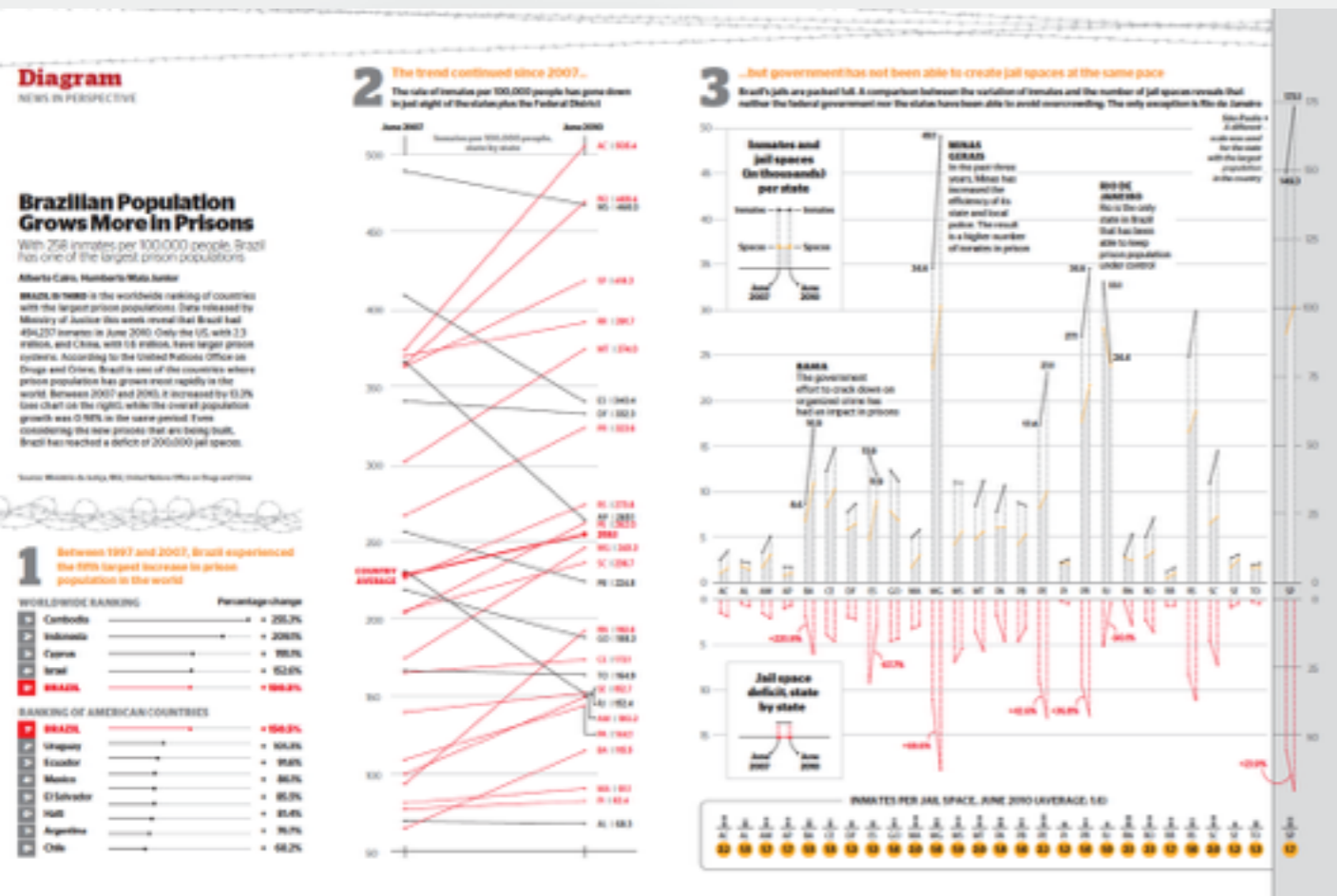
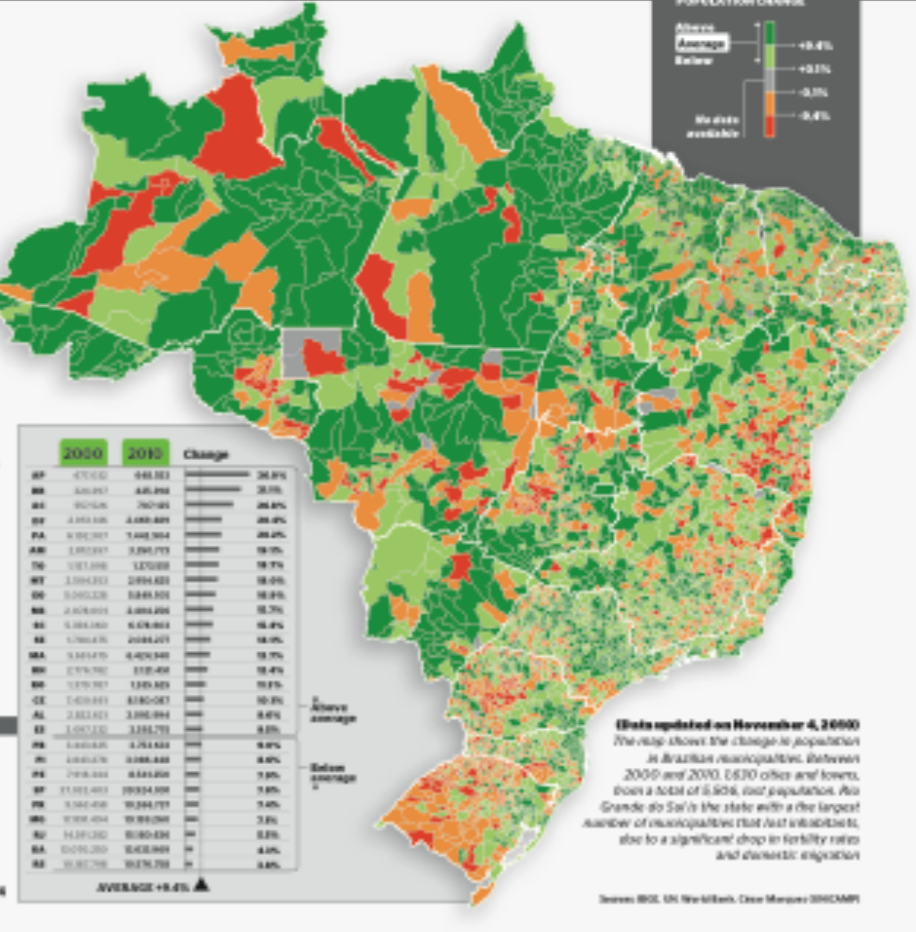
NEWS IN PERSPECTIVE

### Brazil's Demographic Opportunity

How Brazil can take advantage of a future with fewer children per couple.

Alberto Cairo, Franches Lima, Marco Vegetti

**PRELIMINARY DATA FROM THE 2010 CENSUS** create an interesting picture of the changes that the Brazilian population has gone through in the past few years. Brazil's population grew, on average, 10% between 2000 and 2010, but the fertility rate is below 2.1 children per woman, the minimum to keep a population from shrinking. According to Cesar Marques, a demographer from the University of Campinas, the main challenge Brazil will face in the future is how to maintain a healthy social security system if the number of older and retired people will likely be much larger than it is today. Read on to learn about all the variables of play in this story.



TOOLS  
+  
PRINCIPLES



@WCSJ2017 Thanks for coming to my #WCSJ #WCSJ2017 #dataVizTruth talk today. Here are my slides:

<https://www.dropbox.com/s/gsdz89ovafu2ja4/ScienceJournalismSF2017.pdf?dl=0> and some extra readings:

[https://www.dropbox.com/sh/15uaf1c16z3bt97/AAB\\_OD95Jz9rMsJR0Tfi-Hma?dl=0](https://www.dropbox.com/sh/15uaf1c16z3bt97/AAB_OD95Jz9rMsJR0Tfi-Hma?dl=0)



Who's in this photo?



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# #DataVizTruth



# the functional art

2012

an introduction to  
information graphics  
and visualization



# the truthful art

data, charts, and maps  
for communication

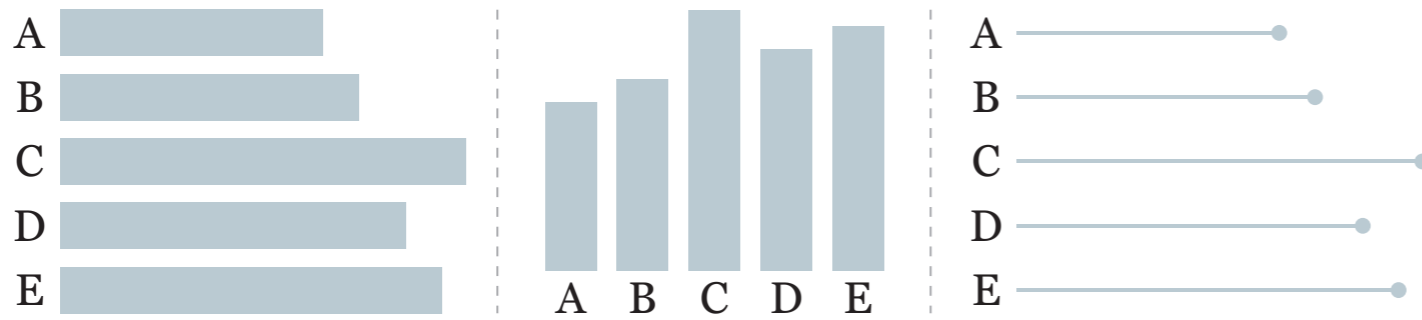
alberto cairo

"Welcome to Alberto's world. Cairo has done it all in The Functional Art: theory, practice, examples. And he's done it brilliantly. It is the most comprehensive and sensible book yet on real-world information graphics; we won't need another one for a long time."  
Nigel Holmes, former graphics director for Time magazine and founder of Explanation Graphics

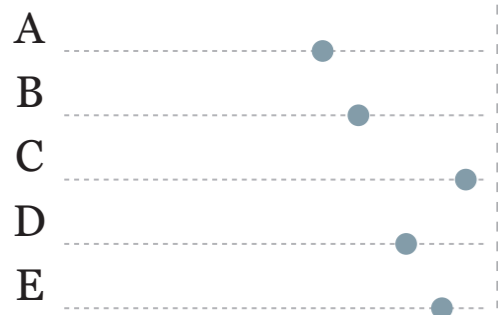
A visualization is a graphical representation designed to enable exploration, analysis, or communication

2016

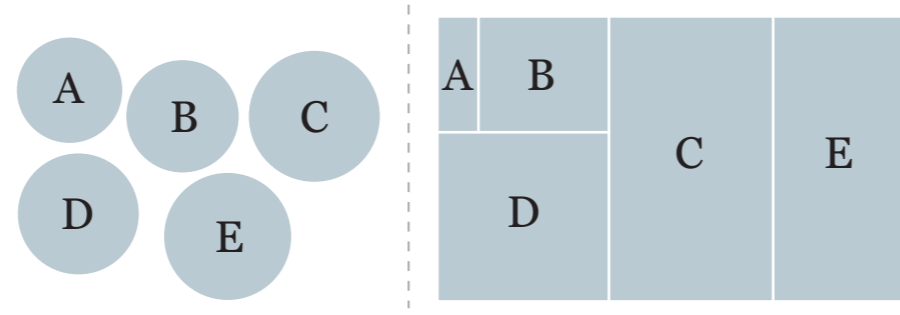
## Length or height



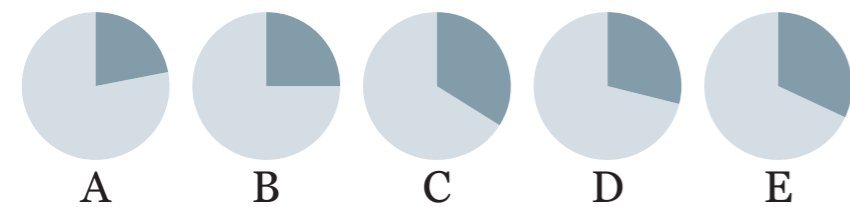
## Position



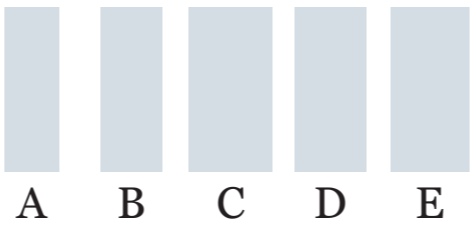
## Area



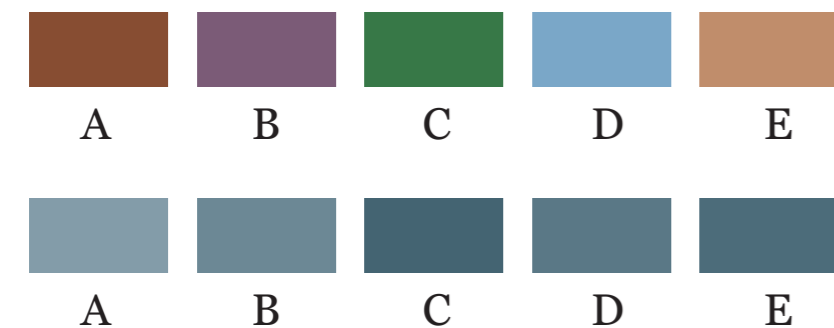
## Angle/area



## Line weight

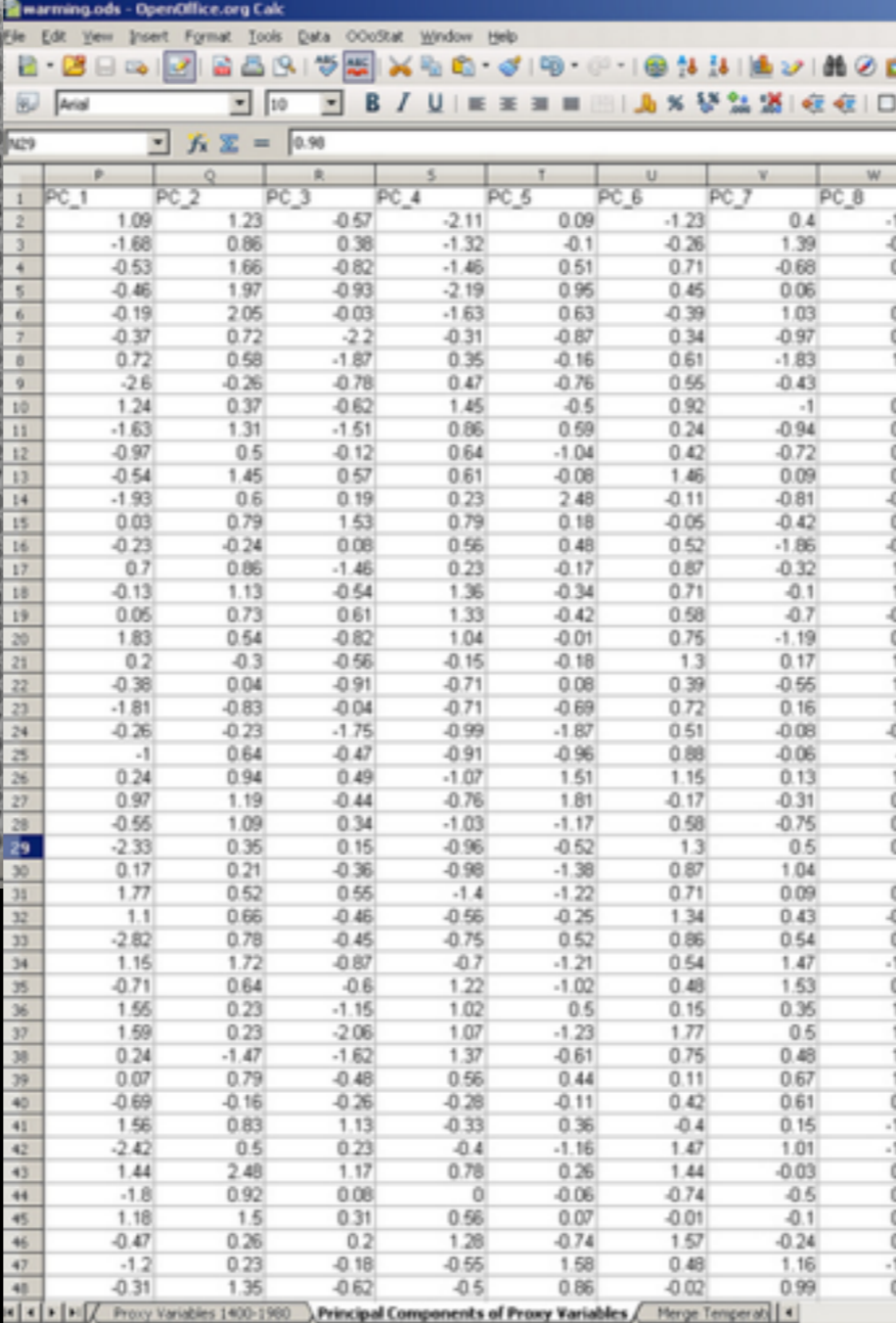
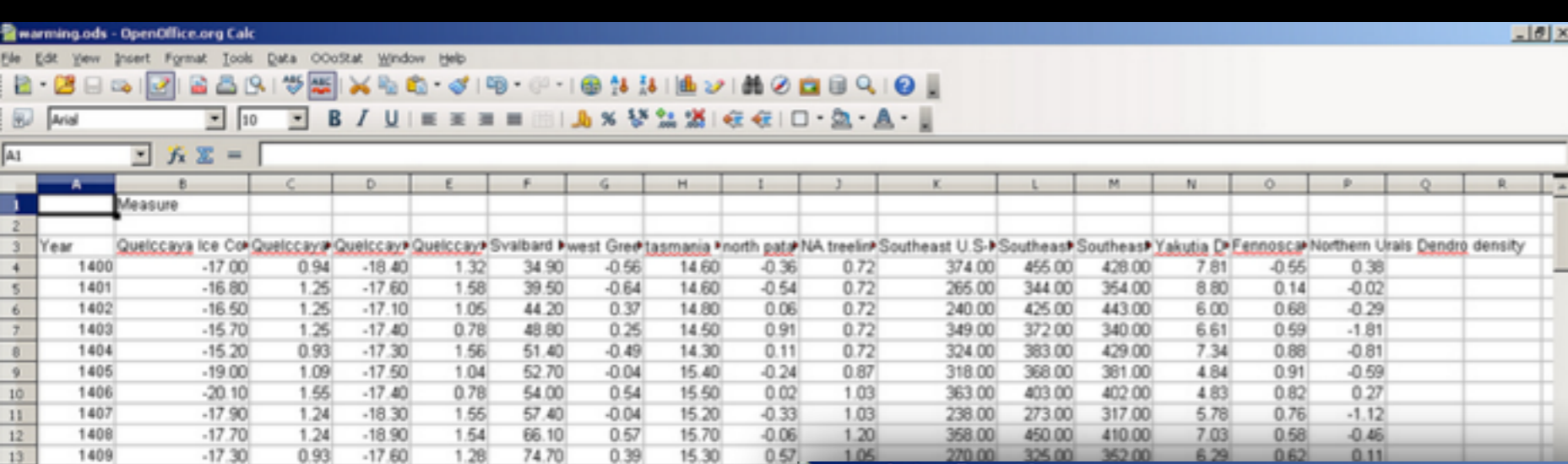


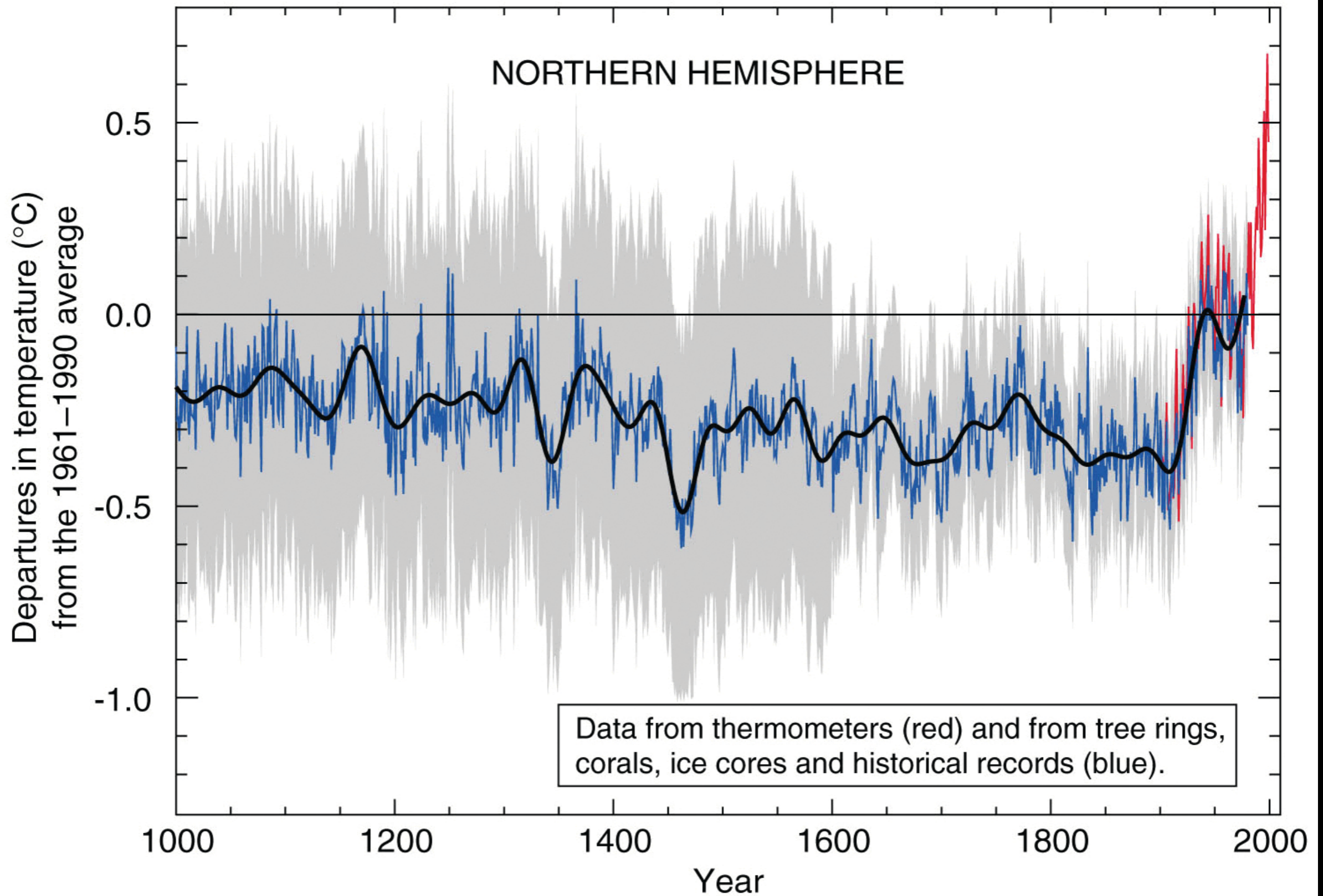
## Hue and shade



Figures represented  
in all these graphics:  
22%, 25%, 34%, 29%, 32%

Data visualization  
and **visual encoding**





**Michael E. Mann, Raymond S. Bradley, and Malcolm K. Hughes**  
Intergovernmental Panel on Climate Change (IPCC), Third Report, 2001



Visualization is  
becoming mainstream

# Hans Rosling [www.gapminder.org](http://www.gapminder.org)

<http://www.gapminder.org/videos/200-years-that-changed-the-world-bbc/>

# GAPMINDER

a fact-based worldview

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DATA



## Refresh your world

Pour the sparkling fresh numbers into your eyes and upgrade your worldview.

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- Wealth & Health of Nations ▶
- CO<sub>2</sub> emissions since 1820 ▶
- Africa is not a country! ▶
- Is child mortality falling? ▶
- Where is HIV decreasing? ▶

**BUBBLE CHART** ▶



Latest News

The labor market is tightening. Will that mean raises for employees? 13 MINUTES AGO

HBO's Show Me a Hero turns the long, grinding work of government into gripping television 33 MINUTES AGO

Why erratic schedules are one of the worst parts of low-wage work 43 MINUTES AGO

The Republican Party doesn't want to believe its voters agree with Trump. But they do. By Eric Klein



The Republican Party doesn't want to believe its voters agree with Trump. But they do.

By Eric Klein



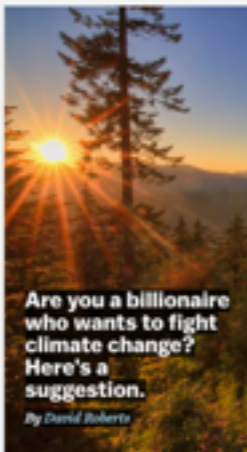
The labor market is tightening. Will that mean raises for employees?

By Timothy B. Lee



Why erratic schedules are one of the worst parts of low-wage work

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By NATE SILVER



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Significant Digits For Monday, Aug. 17, 2015 By WALT HICKEY

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7:58 AM Significant Digits For Monday, Aug. 17, 2015

6:03 AM Hillary Clinton's Inevitable Problems

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AUG 15

INTERACTIVES

The Endorsement Primary



Should Prison Sentences Be Based On Future Crimes?



A major explosion at a shrine in the heart of Bangkok killed at least 15 people



An explosion at a major religious shrine at the center of Bangkok's shopping district has killed at least 15 people and injured 80, according to...

Adam Pasick | 35 mins ago

Jeff Bezos memo: If Amazon was the company the New York Times described, employees would be "crazy to stay"

Republicans Say They Are Happier With Their Marriages

By DAVID LEONHARDT

About 67 percent of self-identified Republicans report having a "very happy" marriage, compared with 60 percent of Democrats, an analysis finds.



How to Know Whether to Believe a Health Study By AUSTIN FRANK Two key questions: What method did the researchers use? How similar am I to the people examined?

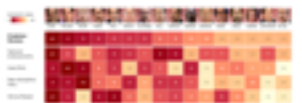


Are You Smarter Than Other New York Times Readers? By DAVID LEONHARDT and KEVIN QUEALY

Who's Winning the G.O.P. Campaign?

Polls get most of the attention, but at this early stage, endorsements and fund-raising are more important.

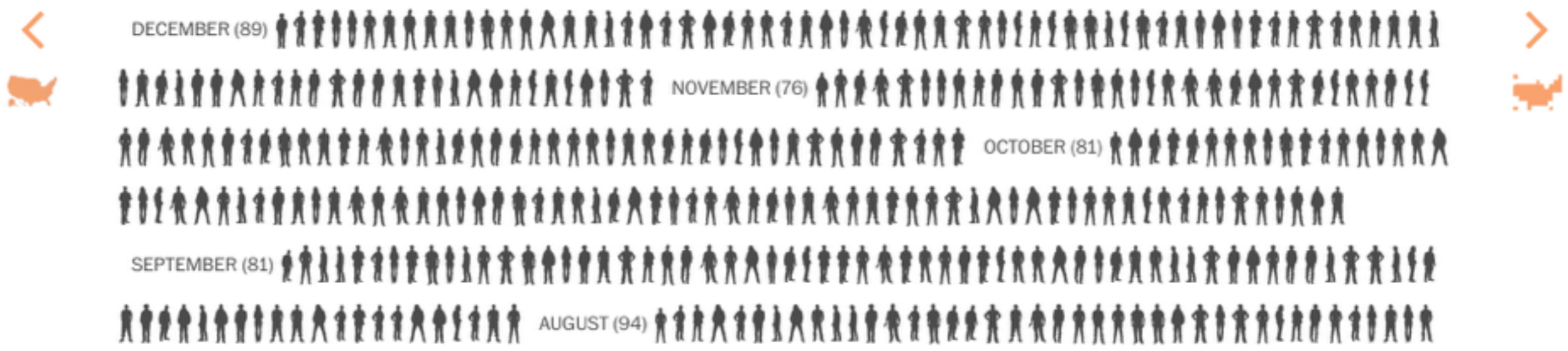
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STATE	GENDER	RACE	AGE
AL AK AZ AR CA CO CT DE DC	Male 948	White 494	Under 18 18
FL GA HI ID IL IN IA KS KY	Female 42	Black 258	18 to 29 330
LA ME MD MA MI MN MS MO MT	Unknown 0	Hispanic 172	30 to 44 353
NE NV NH NJ NM NY NC ND OH	<b>WEAPON</b>	Other 38	45 and up 277
OK OR PA RI SC SD TN TX UT	Deadly weapon 783	Unknown 28	Unknown 12
VT VA WA WV WI WY	Vehicle 54	<b>SIGNS OF MENTAL ILLNESS</b>	<b>THREAT LEVEL</b>
	Toy weapon 34	Yes 250	Attack in progress 730
	Unarmed 93	No or unknown 740	Other 216
	Unknown 26		Undetermined 44

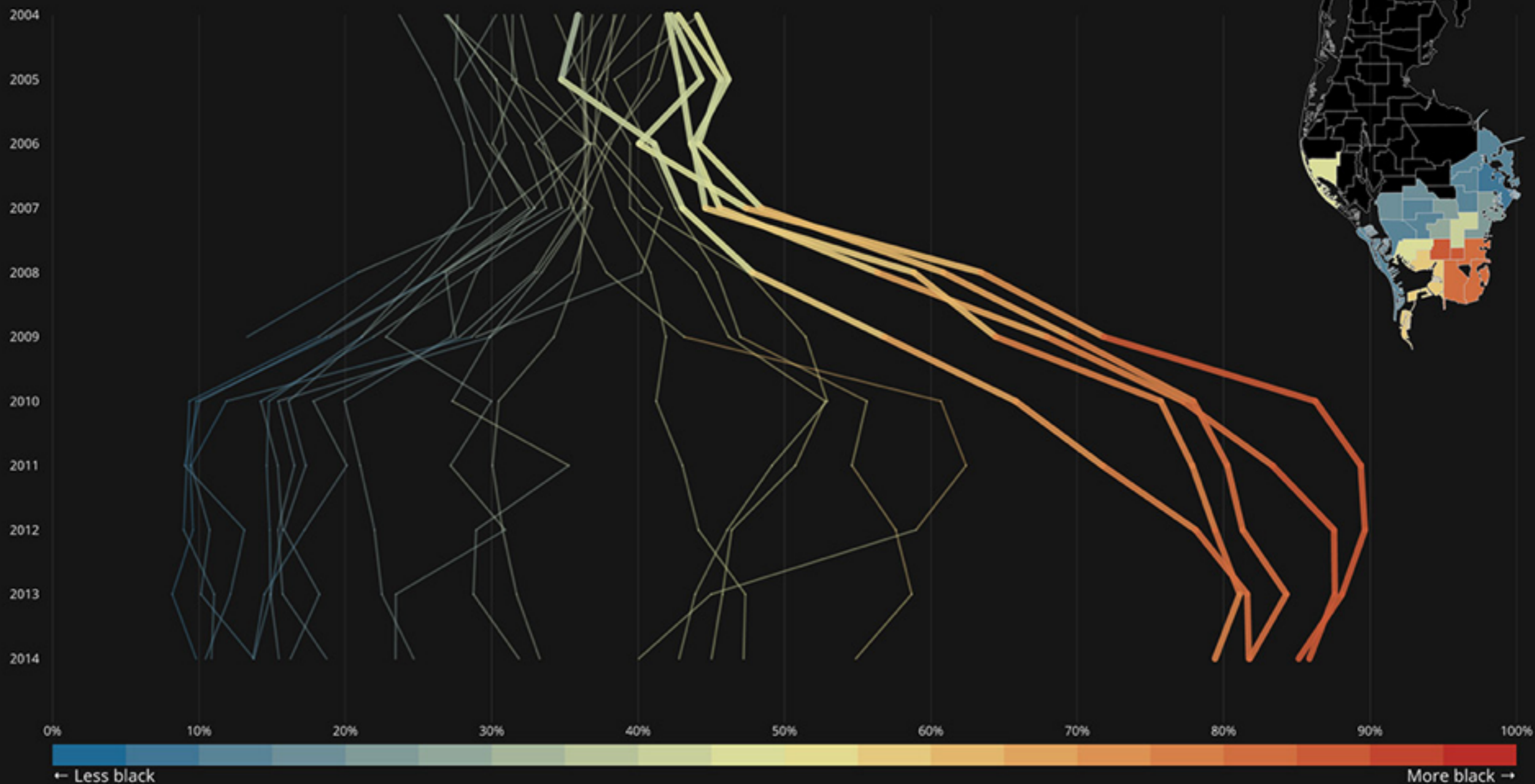
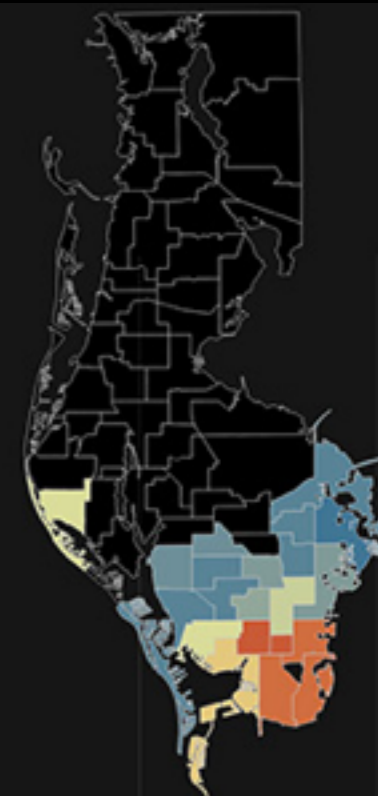
^ TAP TO HIDE THESE FILTERS ^

### SHOOTINGS BY POLICE PER MONTH IN 2015



<https://www.washingtonpost.com/graphics/national/police-shootings/>

Today, **Campbell Park, Fairmount Park, Lakewood, Maximo** and **Melrose** are the **most segregated** schools in Pinellas.



<http://www.tampabay.com/projects/2015/investigations/pinellas-failure-factories/chart-failing-black-students/>

But you don't need  
advanced programming or  
design skills to get started

## SOME TOOLS THAT I COVER IN MY "INTRODUCTION TO INFOGRAPHICS AND DATA VISUALIZATION" COURSES

### DATA CLEANING AND EXPLORATION

Excel  
Data Wrangler (or Trifacta)  
iNZight (for visual exploration)



(NOTE: I use the R programming language more every day for these tasks, but if you're a beginner it's better to have fun with the tools above first)



### GENERATING BASE GRAPHICS

Charts and graphs  
iNZight, RAWGraphs, Illustrator



Data maps  
QGIS, Tilegrams



Pictorial Illustrations and icons  
Illustrator's pen tool and 3D features



### STYLING AND COMPOSITION

Adobe  
Illustrator



### OUTPUT

For print  
Illustrator: Save as PDF



For the Web  
Ai2html



<http://www.thefunctionalart.com/p/instructors-guide.html>

# RAWGraphs

The missing link between spreadsheets and data visualization.

USE IT NOW!

FORK IT ON GITHUB



<http://rawgraphs.io/>



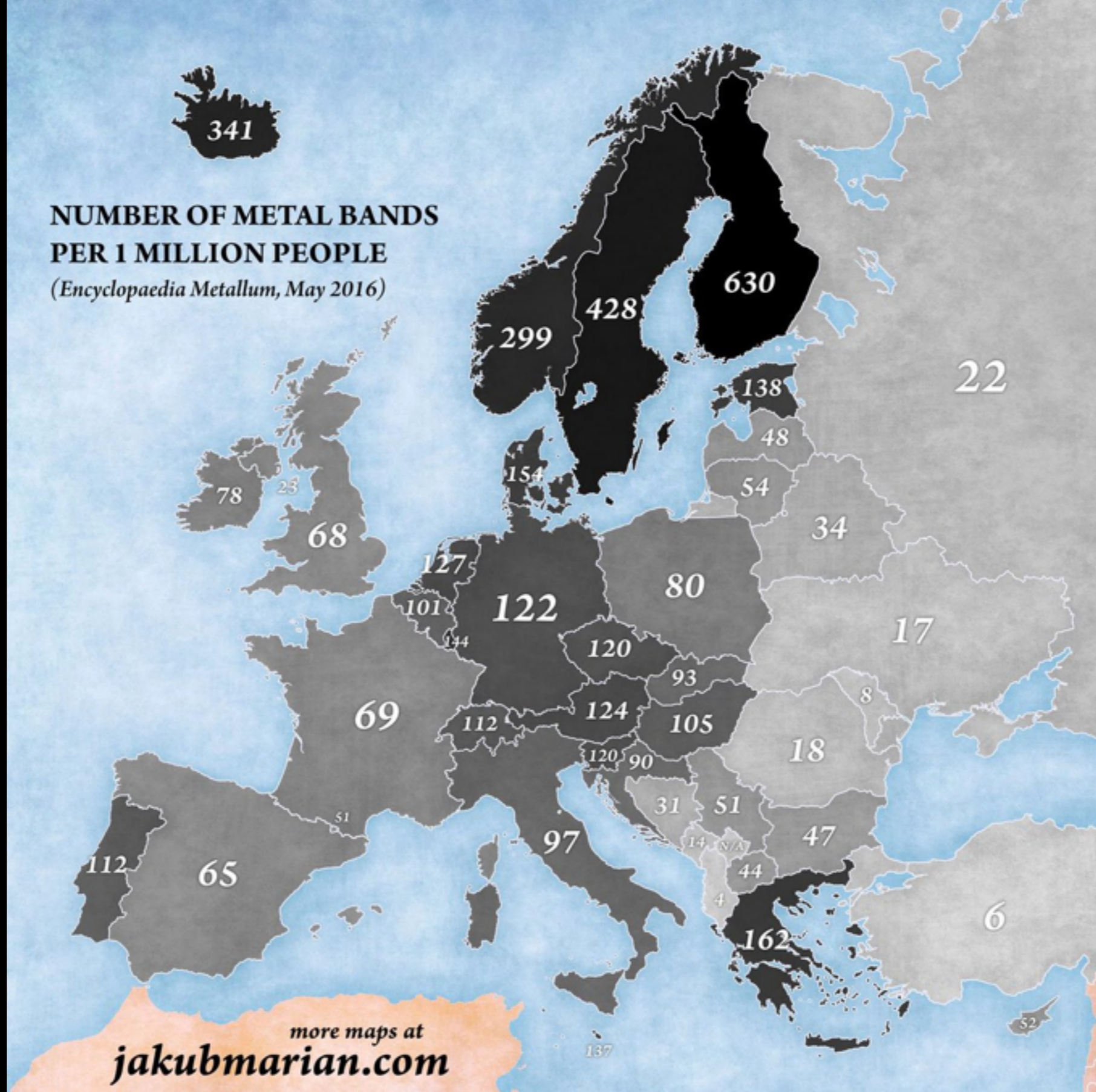
# Core principles

## Good graphics...

1. ...Are based on good data
2. ...Attract your attention
3. ...Represent the data accurately
4. ...Show the right amount of data

## Good graphics...

1. ...Are based on good data
2. ...Attract your attention
3. ...Represent the data accurately
4. ...Show the right amount of data



Source: Encyclopaedia Metallum

# Judas Priest



The most metal of the  
metal bands

## Judas Priest



The most metal of the  
metal bands

## Bon Jovi



“Metal”?



## SEARCH RESULTS FOR "BON JOVI"

Searching bands by name

Showing 0 to 0 of 0 entries



Band name

Genre

Country

No matches found. Please try with different search terms. You could use wildcards (\*) for more matches, or read more about your search options.



## SEARCH RESULTS FOR "FOREIGNER"

Searching bands by name

Showing 0 to 0 of 0 entries



Band name

Genre

Country

No matches found. Please try with different search terms. You could use wildcards (\*) for more matches, or read more about your search options.

Showing 0 to 0 of 0 entries



Search:  Band name   
ADVANCED SEARCH SUBMIT

HELP RULES FOI  
FAQ | SUPPORT US | AdC



## SEARCH RESULTS FOR "JOURNEY"

Searching bands by name

Showing 1 to 8 of 8 entries



Band name	Genre	Country
Darkside Journey	Metalcore	United States
Endless Journey	Doom Metal/Post-Rock	Russia
Eternal Journey	Progressive Metal	Germany
Melancholic Journey	Atmospheric Black Metal	Bulgaria

Search:  Band name   
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Search:  Band name   
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## SEARCH RESULTS FOR "ASIA"

Searching bands by name

Showing 0 to 0 of 0 entries



Band name

Genre

Country

No matches found. Please try with different search terms. You could use wildcards (\*) for more matches, or read more about your search options.

Showing 0 to 0 of 0 entries

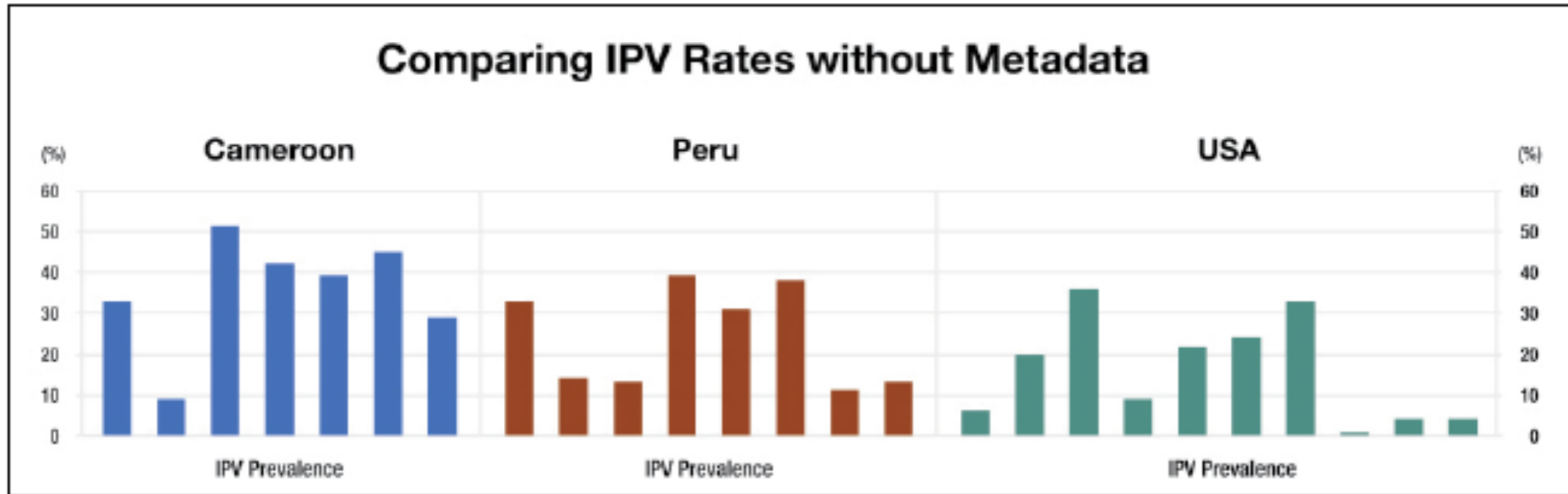


Search:  Band name   
ADVANCED SEARCH SUBMIT

HELP RULES FOI  
FAQ | SUPPORT US | AdC

<https://www.metal-archives.com/>

## Comparing IPV Rates without Metadata



**Figure 11.15** Bars represent the intimate partner violence rate (IPV) measured by several sources in these three countries. Notice the enormous differences. (Chart by Heather Krause, <http://idatassist.com/>.)

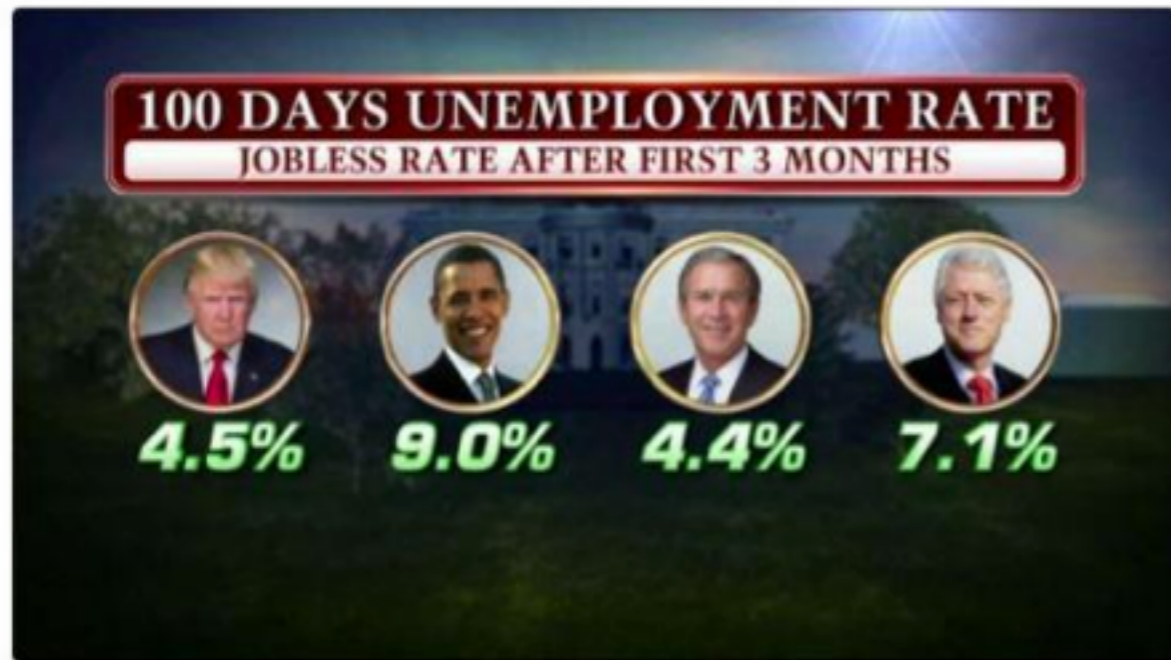
Example by Heather Krause quoted in *The Truthful Art* (Chapter 11)



## Good graphics...

1. ...Are based on good data
2. ...Attract your attention
3. ...Represent the data accurately
4. ...Show the right amount of data

Jobless rate after first 3 months: Trump vs. Obama vs. Bush vs. Clinton.



RETWEETS 1,135 LIKES 2,322 

10:34 PM - 29 Apr 2017

 3.3K  1.1K  2.3K 

Jobless rate after first 3 months: Trump vs. Obama vs. Bush vs. Clinton.



RETWEETS 1,135 LIKES 2,322

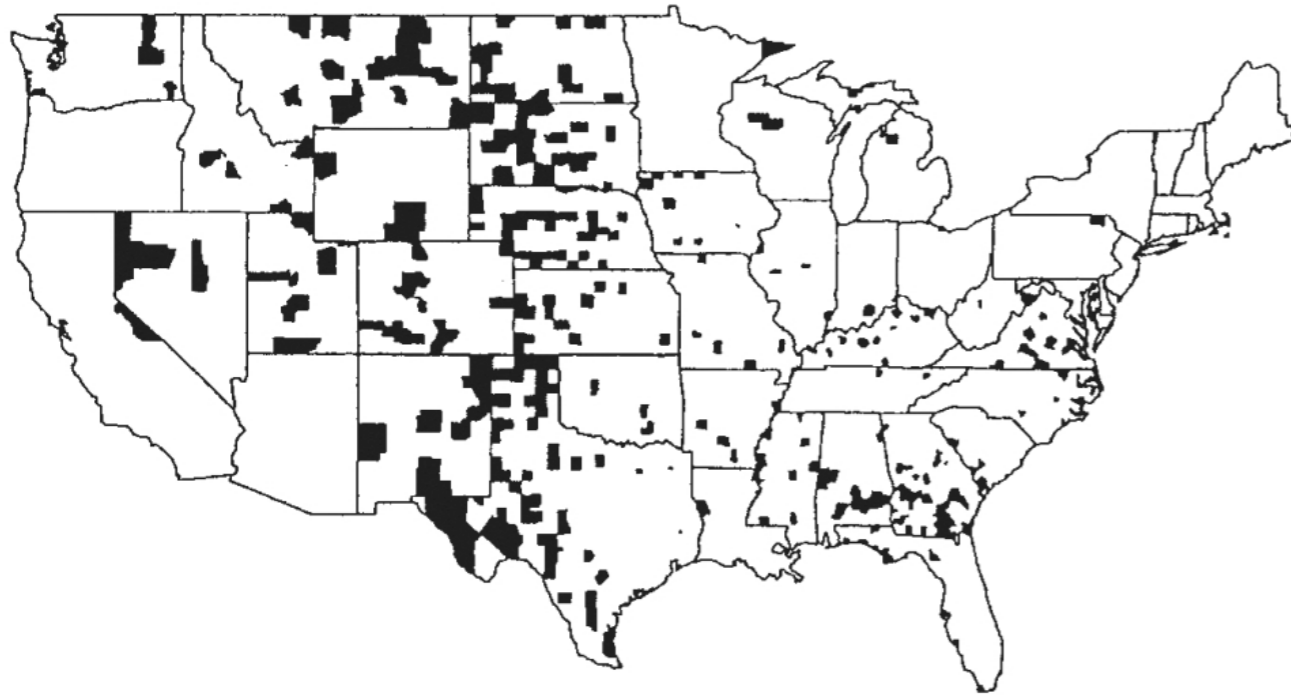
10:34 PM - 29 Apr 2017

3.3K 1.1K 2.3K

	Beginning of presidency	End of presidency	Difference
Clinton	7.3%	4.2%	-3.1
Bush	4.2%	7.8%	+3.6
Obama	7.8%	4.8%	-3.0
Trump	4.8%	?	?

Always tell yourself:

“A chart shows as much as it hides —think about what might be hidden”

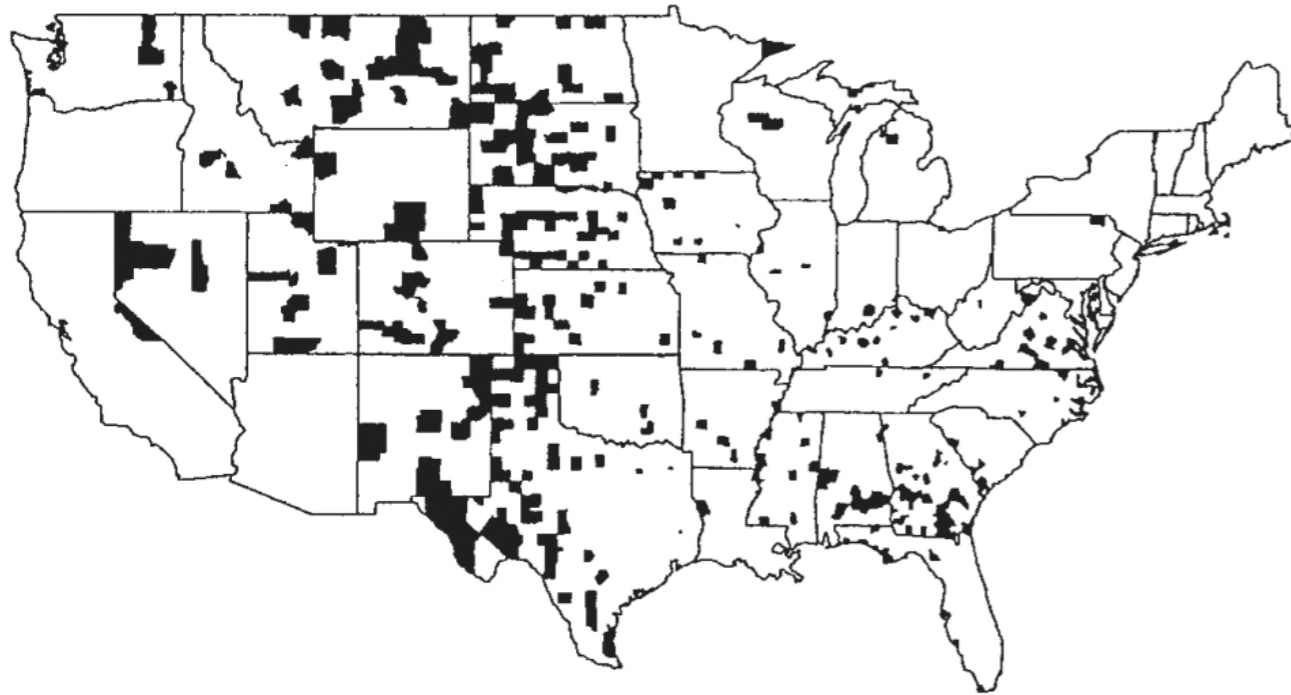


Counties with the **LOWEST**  
kidney cancer death rates  
(1980-1989)

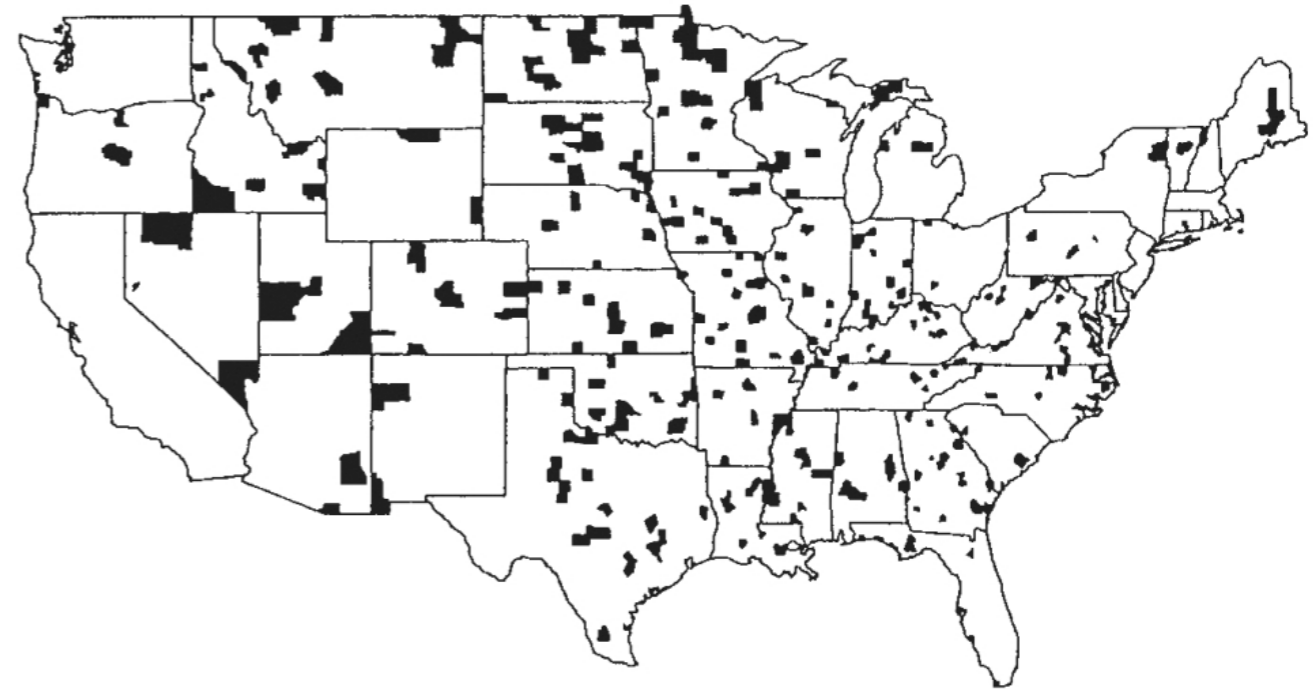
From *Teaching Statistics: A Bag of Tricks*  
Andrew Gelman, Deborah Nolan

Always tell yourself:

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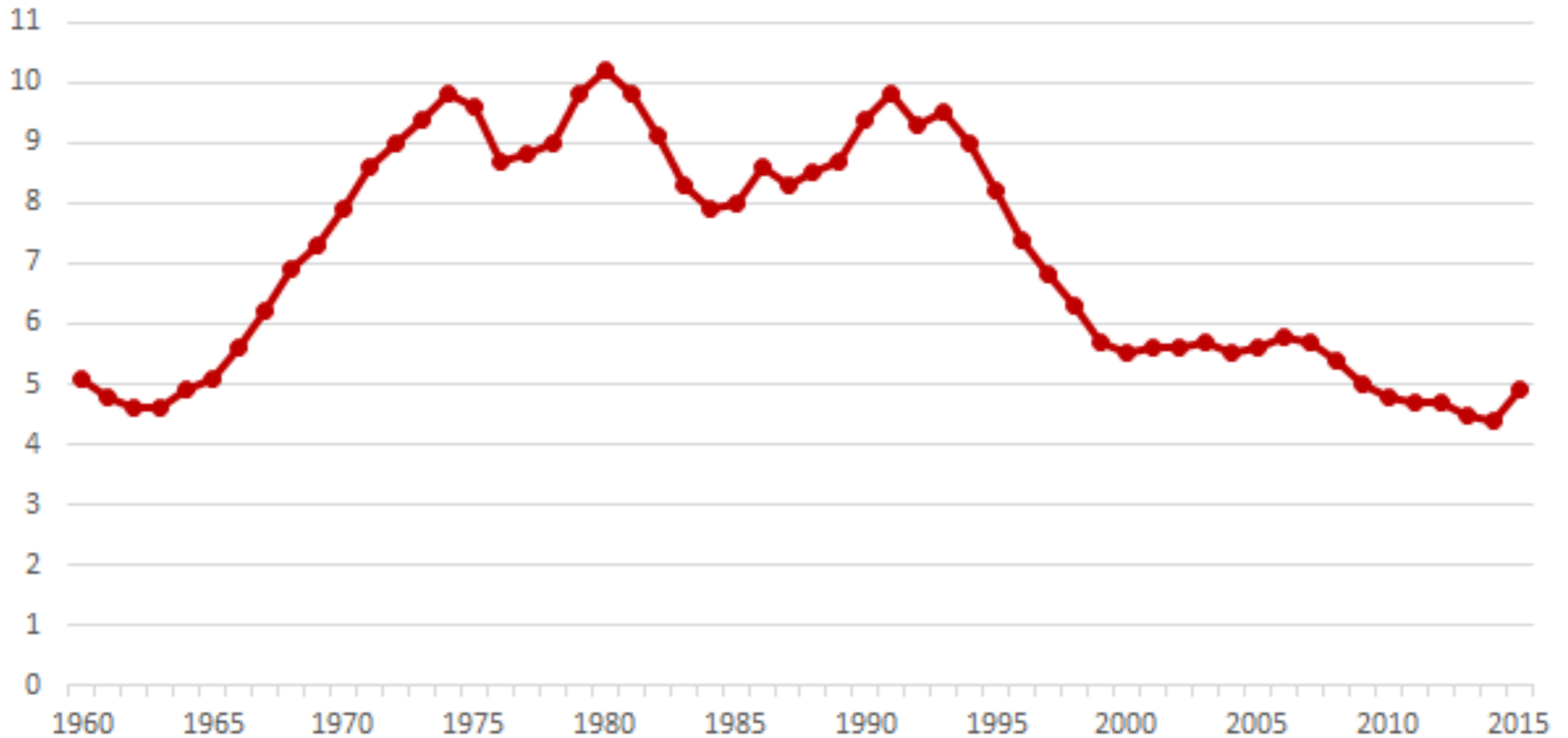
Counties with the **LOWEST**  
kidney cancer death rates  
(1980-1989)



Counties with the **HIGHEST**  
kidney cancer death rates  
(1980-1989)

From *Teaching Statistics: A Bag of Tricks*  
Andrew Gelman, Deborah Nolan

# The U.S. Murder Rate (per 100,000 people)



FactCheck.org chart based on FBI data

Careful with amalgamation  
paradoxes and outliers

<http://journal.frontiersin.org/article/10.3389/fpsyg.2013.00513/full>

# Whether Crime Is Up or Down Depends on Data Being Used

By TIMOTHY WILLIAMS SEPT. 27, 2016



## RELATED COVERAGE



U.S. Murders Surged in 2015, F.B.I. Finds  
SEPT. 26, 2016

The news from the [F.B.I.](#) crime data was alarming: The murder rate rose sharply last year, driven by jumps in several major cities.

Four urban areas — Baltimore, Chicago, Milwaukee and Washington — accounted for about a fifth of the increase in homicides in 2015. Those cities, however, make up only about 1 percent of the nation's population.

But whether crime is up or down depends on what data is being looked at — and who is doing the looking.

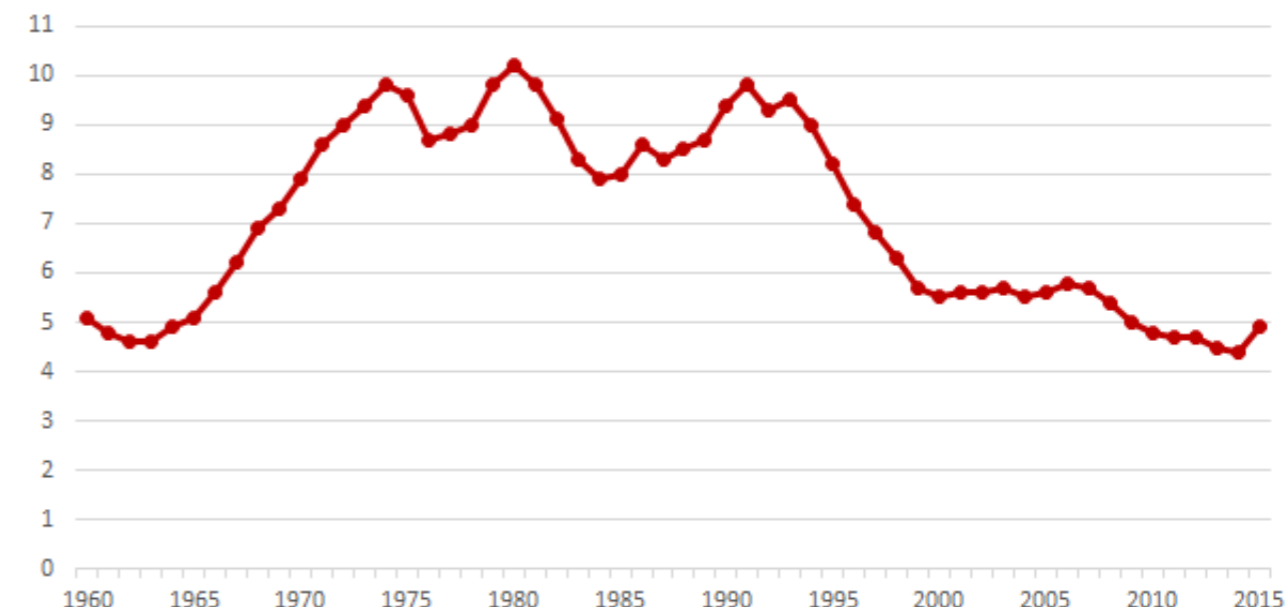
The F.B.I. data showed that violent crime rose about 4 percent last year from 2014, and homicides increased 10.8 percent. Yet crime over all fell in 2015 for the 14th consecutive year.

And the total number of homicides last year was fewer than 20 years ago even as the country's population increased, criminologists said. There were 19,645 homicides in 1996 in a nation of 265 million; in 2015, there were 15,696 in a population of 321 million.

What that data means, criminologists and police officials said, is that the decline in homicides has been so significant in the last quarter century that sudden increases in the number of killings in just a few cities can skew the entire national picture, even as the country has one of its safest periods on record.

"It isn't a national trend, it's a city trend, and it's not even a city trend, but a problem in certain neighborhoods," said [Richard A. Berk](#), a professor of statistics and criminology at the University of Pennsylvania. "Certainly,

## The U.S. Murder Rate (per 100,000 people)



FactCheck.org chart based on FBI data

## Careful with amalgamation paradoxes and outliers

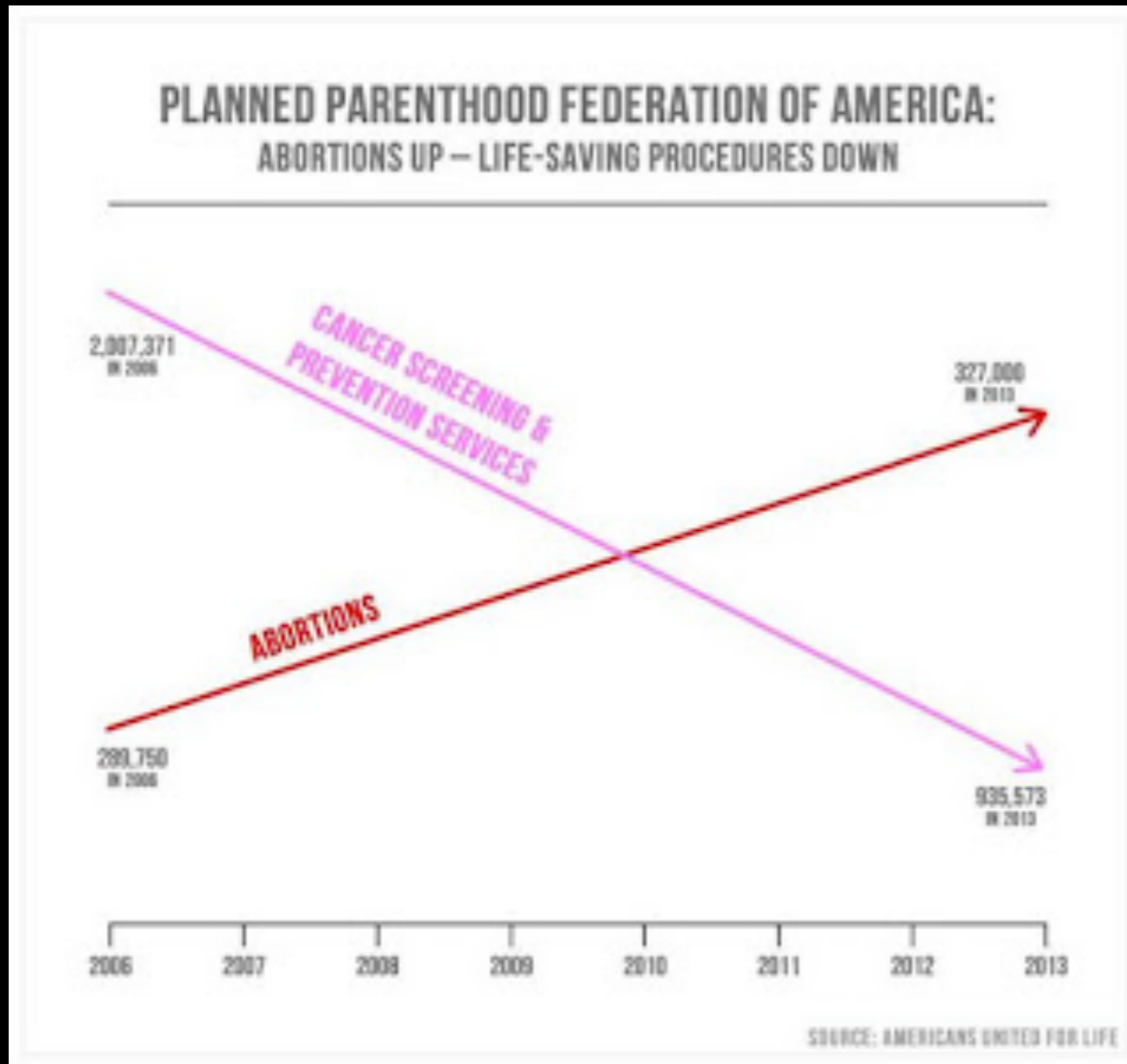
<http://journal.frontiersin.org/article/10.3389/fpsyg.2013.00513/full>

## Good graphics...

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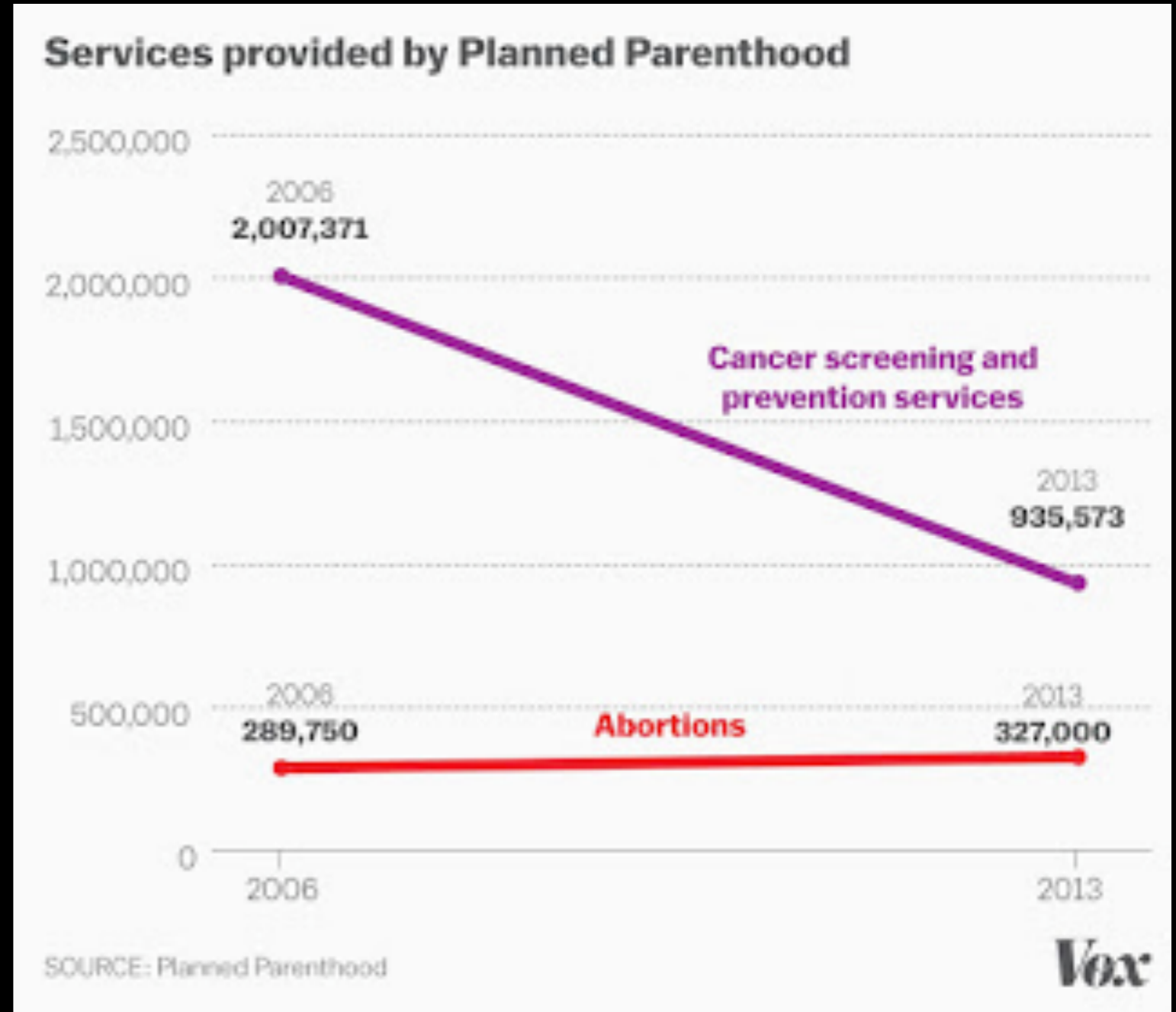
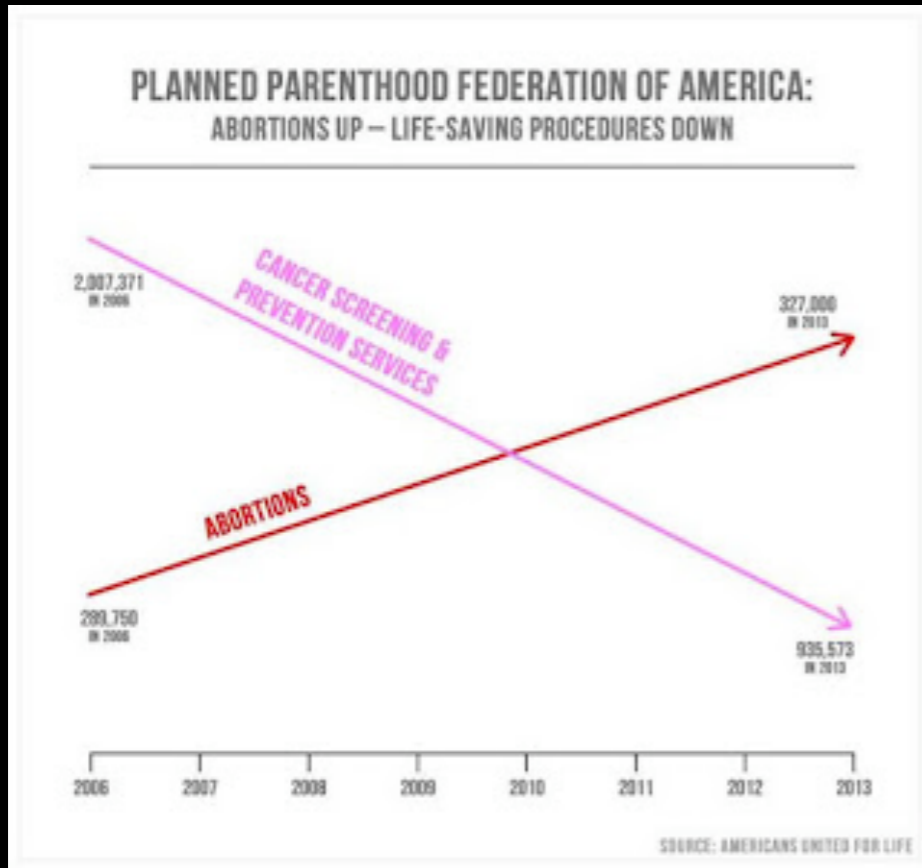
“Double the axes, double the mischief”  
(Quote from Gary Smith’s *Standard Deviations*)



<http://www.thefunctionalart.com/2015/10/if-you-see-bullshit-say-bullshit.html>

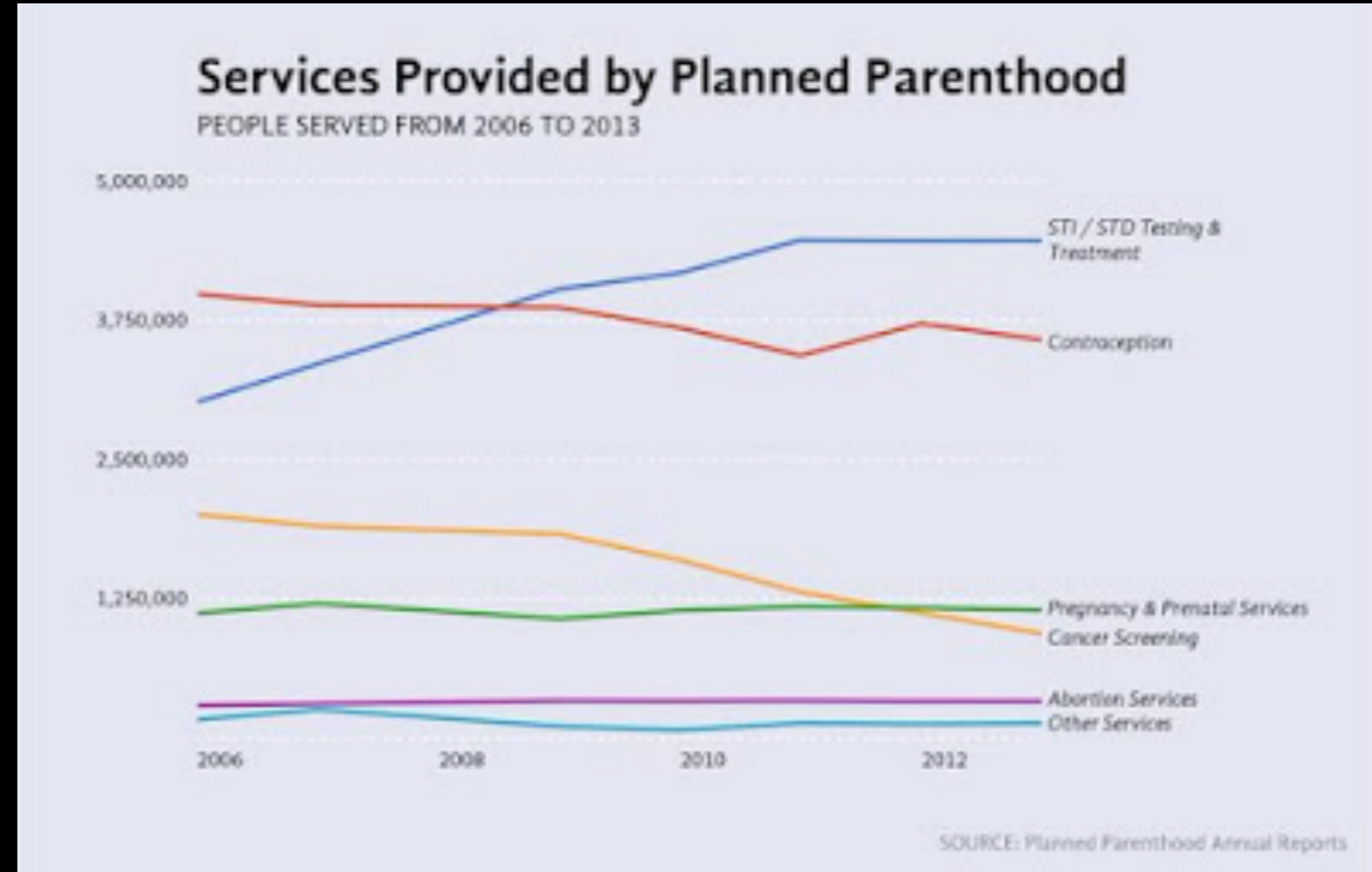
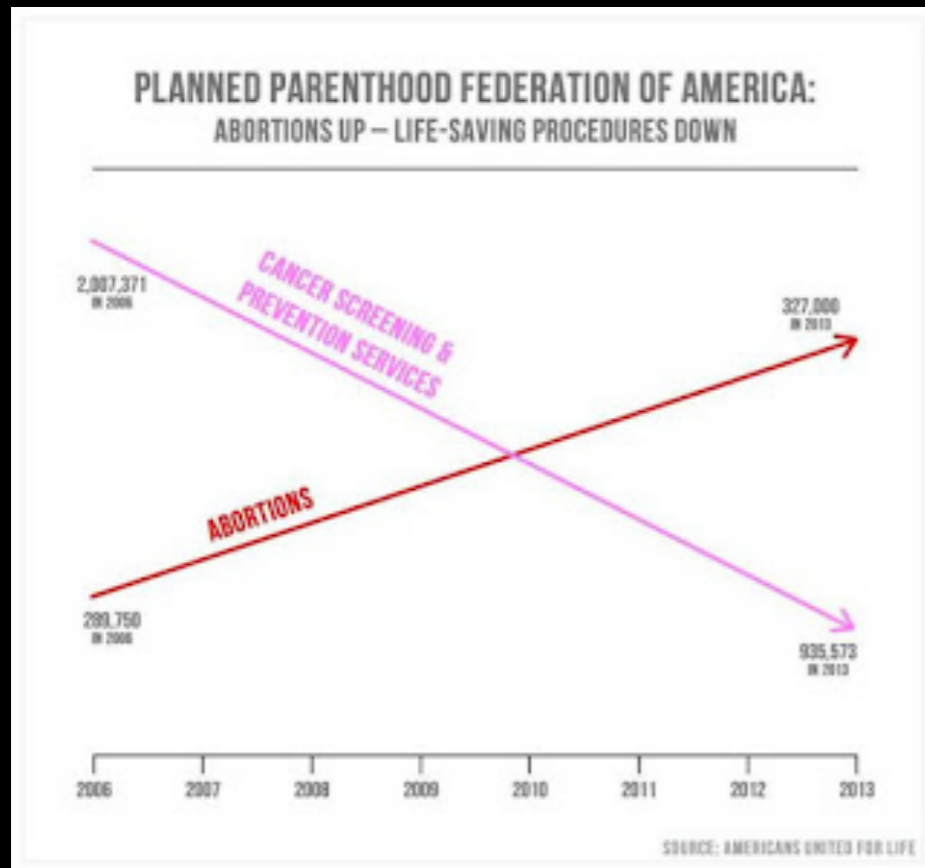
“Double the axes, double the mischief”

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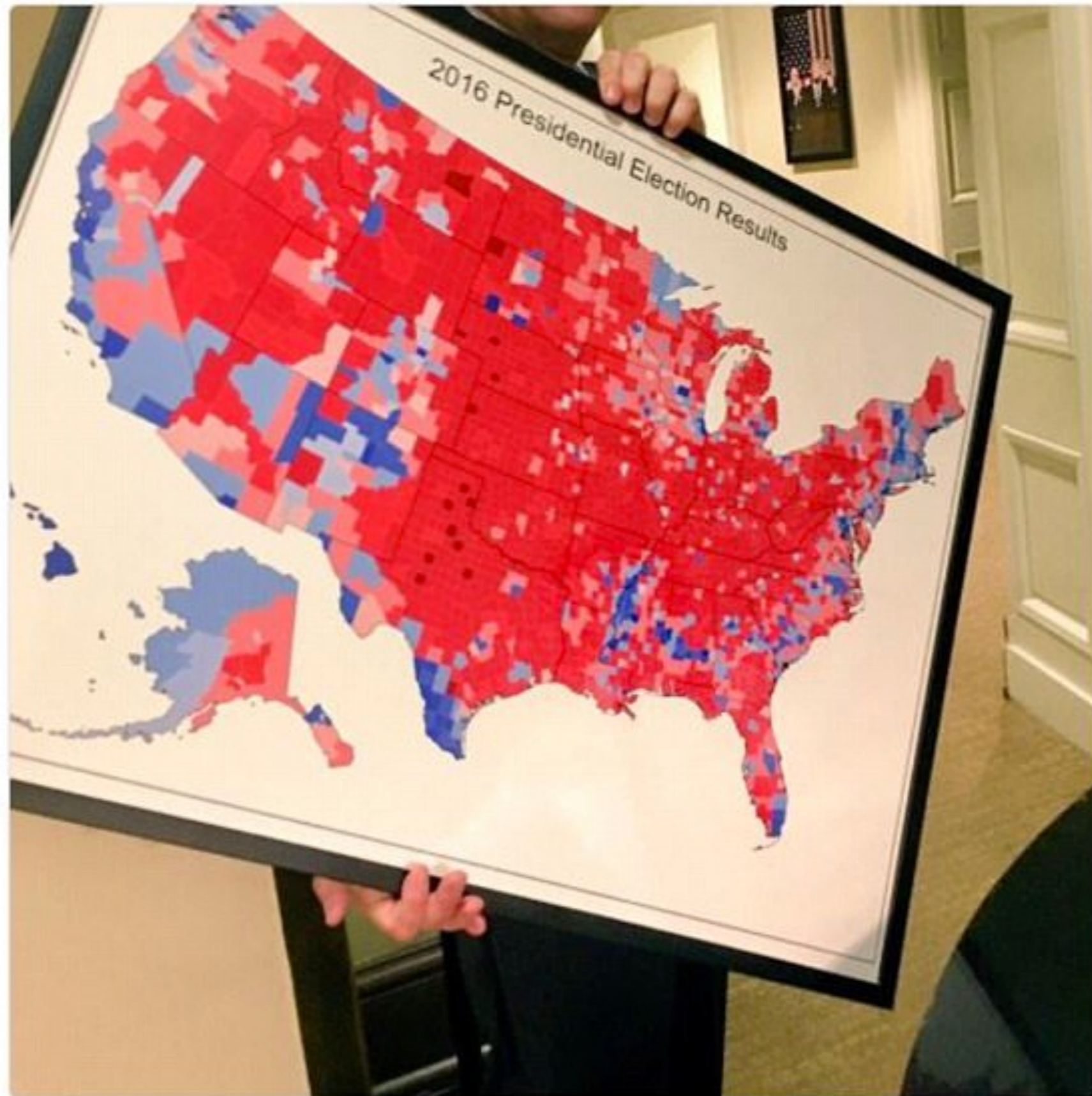
Graph by: Emily Schuch

<http://www.thefunctionalart.com/2015/10/if-you-see-bullshit-say-bullshit.html>



Trey Yingst [@TreyYingst](#) · May 11

Spotted: A map to be hung somewhere in the West Wing





**Gideon Resnick**  @GideonResnick · 32m

here's a pic from reuters of Trump with the electoral maps he showed to reporters yesterday



Likely photoshopped, but the story is real:

<http://www.cnn.com/2017/04/28/politics/trump-brought-printed-map-handouts-cnntv/index.html>



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# TRUMP'S 'LANDSLIDE': 2,623 TO 489 AMONG U.S. COUNTIES

But popular-vote fans say nation should abandon Electoral College

Published: 12/25/2016 at 3:37 PM



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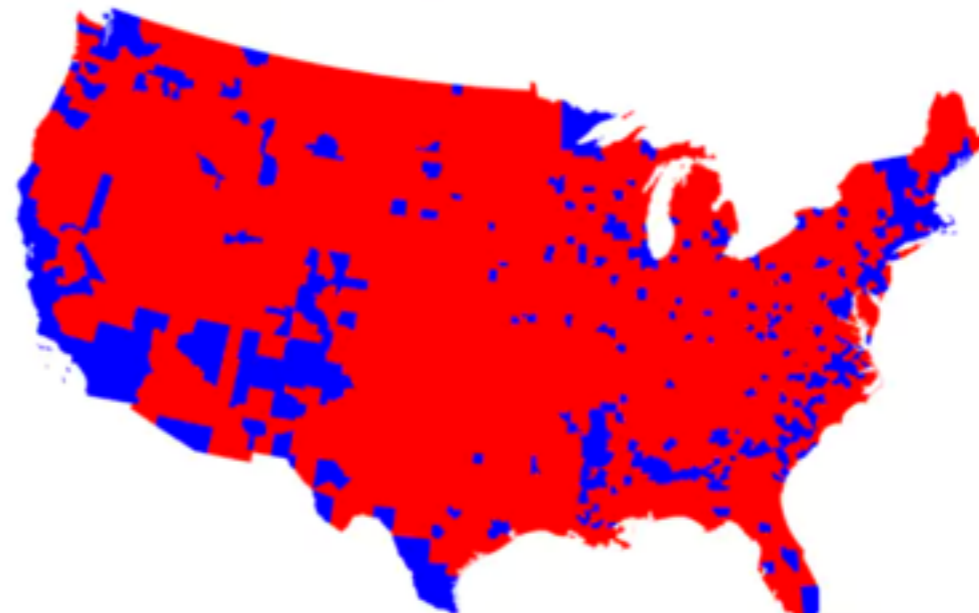
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by MICHAEL PATRICK LEAHY | 15 Nov 2016

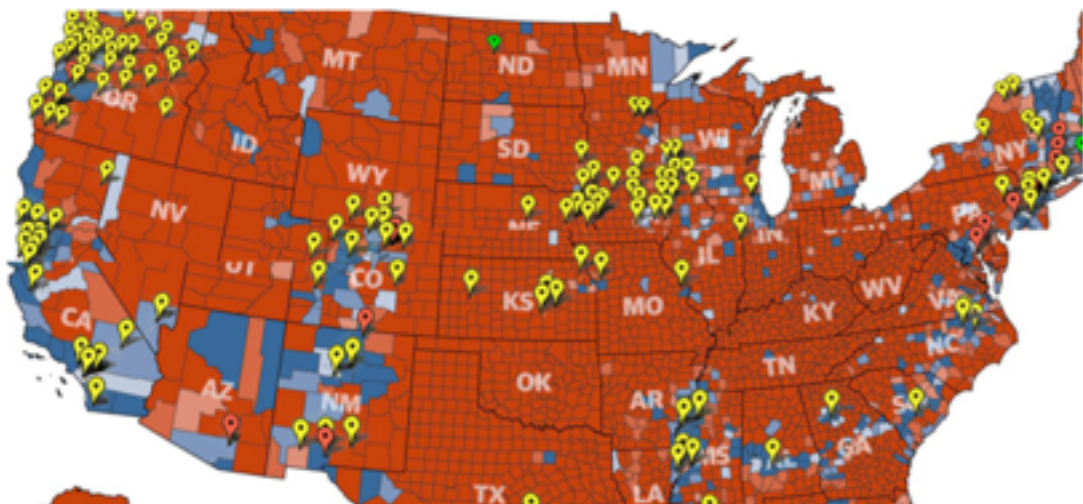
# INFO WARS

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## MAP SHOWS SANCTUARY CITY ISLANDS OF BLUE IN SEA OF RED

Democrats take advantage of immigrants to vote blue

Adan Salazar | Infowars.com - NOVEMBER 10, 2016 592 Comments



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WITH CURT SCHILLER  
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MONDAY-FRIDAY

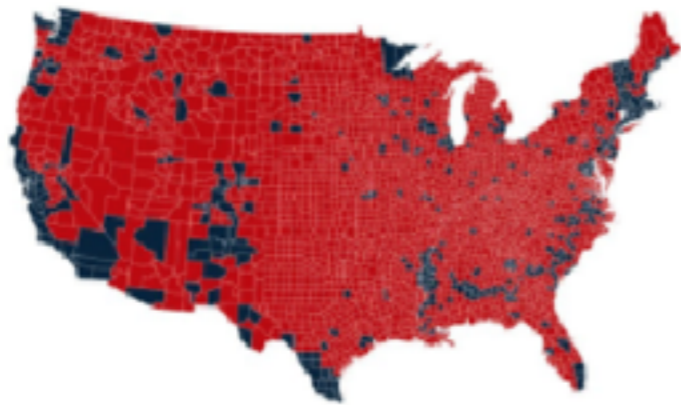
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TODAY ON THE ALEX JONES SHOW

# CITIZENS<sup>FOR</sup> TRUMP



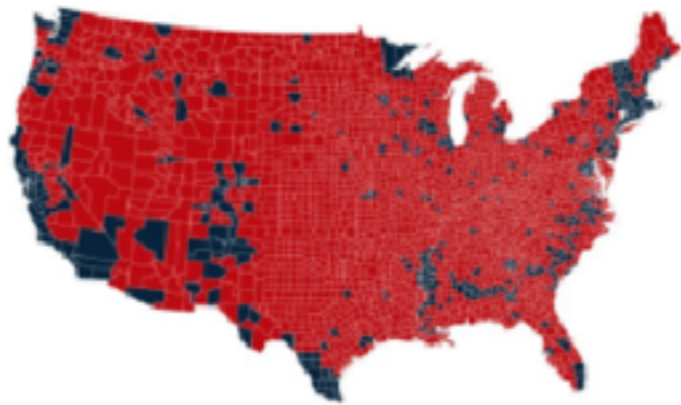
THE INSIDE STORY  
OF THE PEOPLE'S MOVEMENT  
TO TAKE BACK AMERICA



**JACK POSOBIEC**

# WRONG

**CITIZENS<sup>FOR</sup>  
TRUMP**



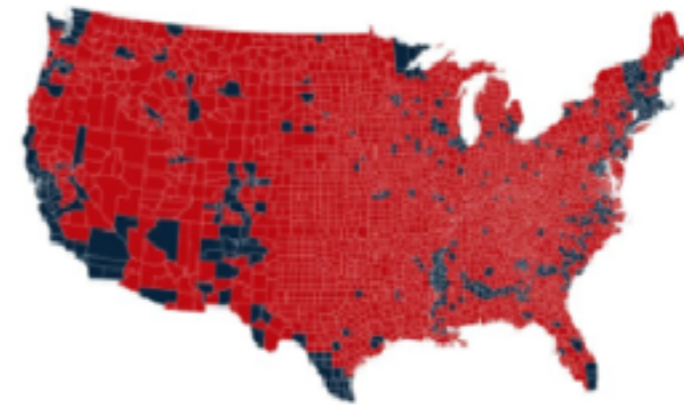
THE INSIDE STORY  
OF THE PEOPLE'S MOVEMENT  
TO TAKE BACK AMERICA



**JACK POSOBIEC**

# RIGHT

**COUNTIES<sup>FOR</sup>  
TRUMP**

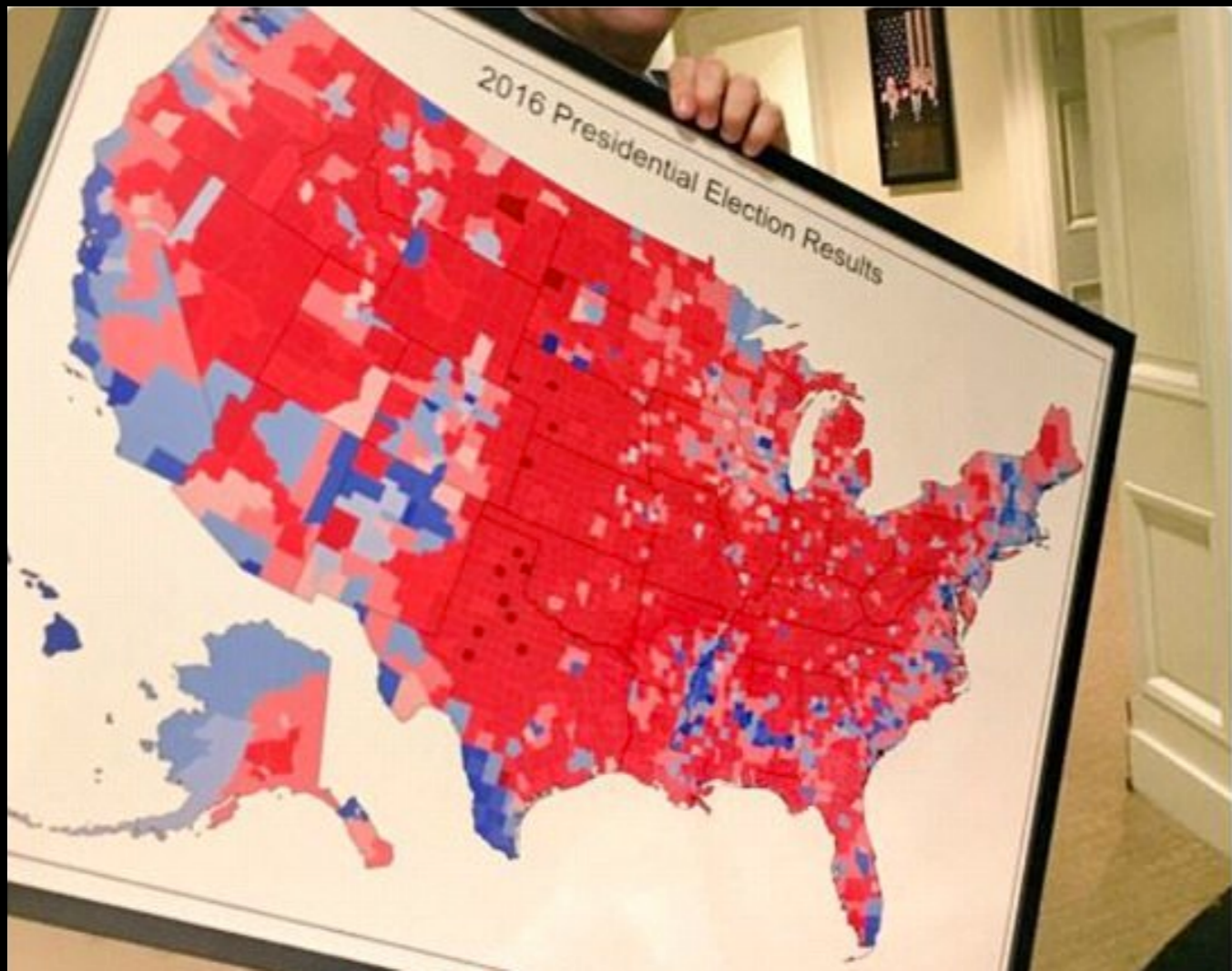


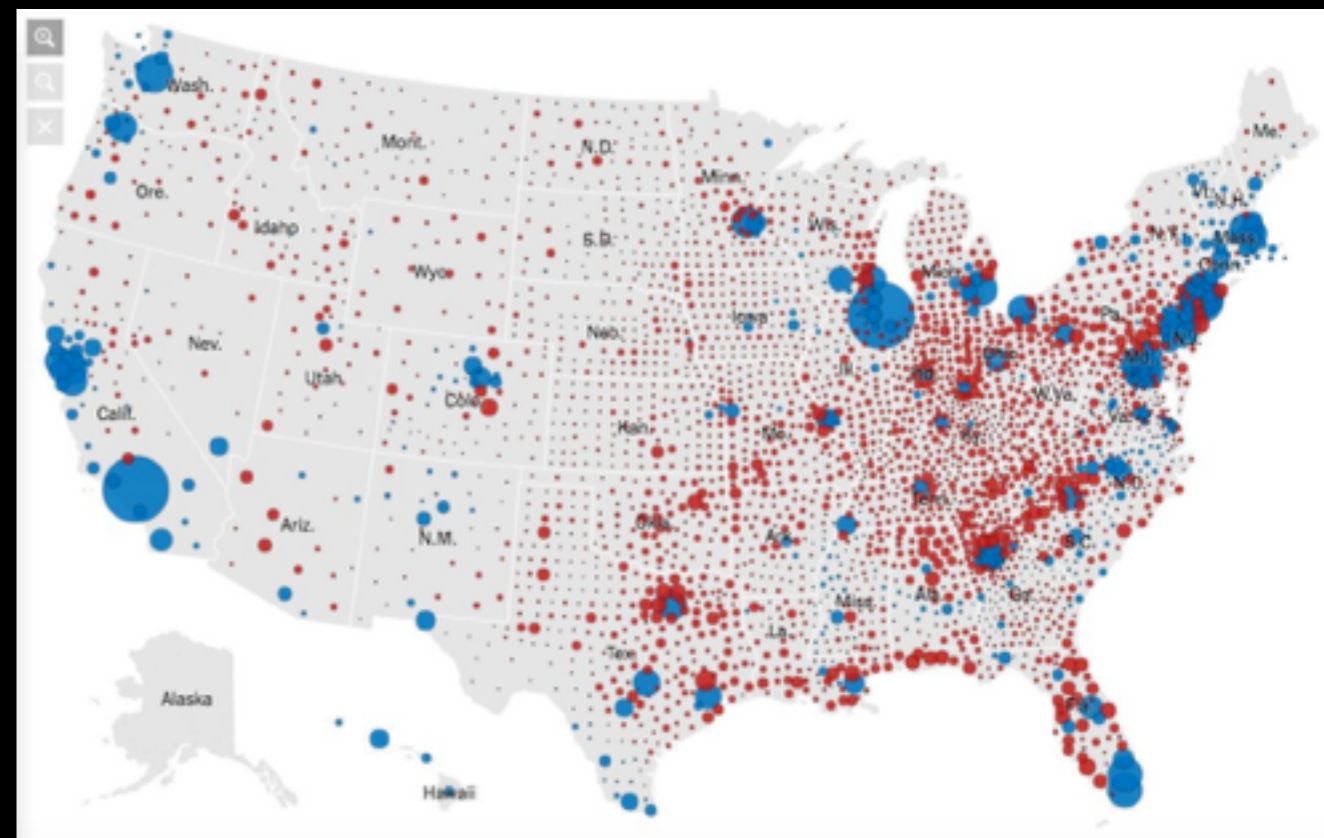
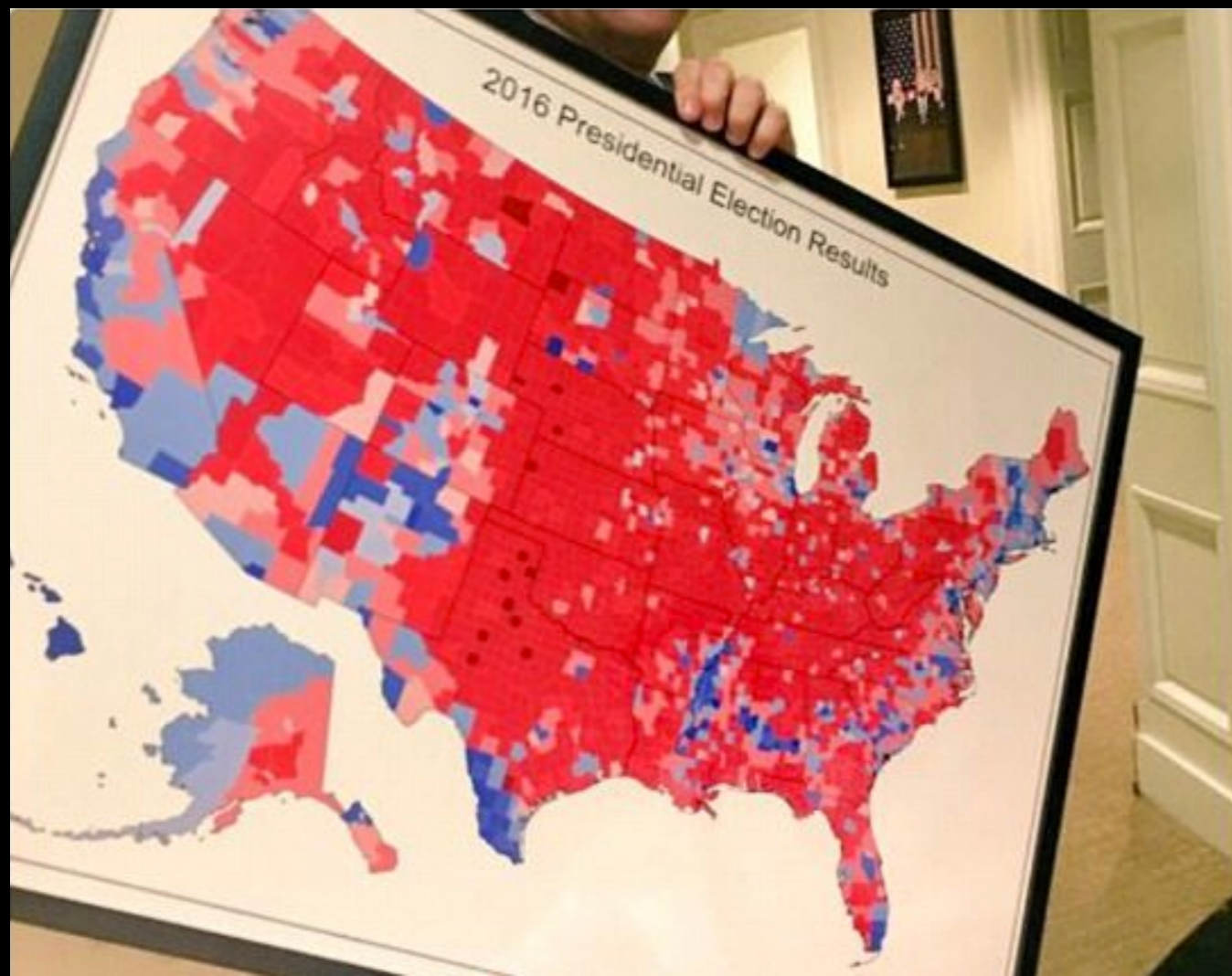
THE INSIDE STORY  
OF 46% OF VOTERS' MOVEMENT  
TO TAKE BACK AMERICA

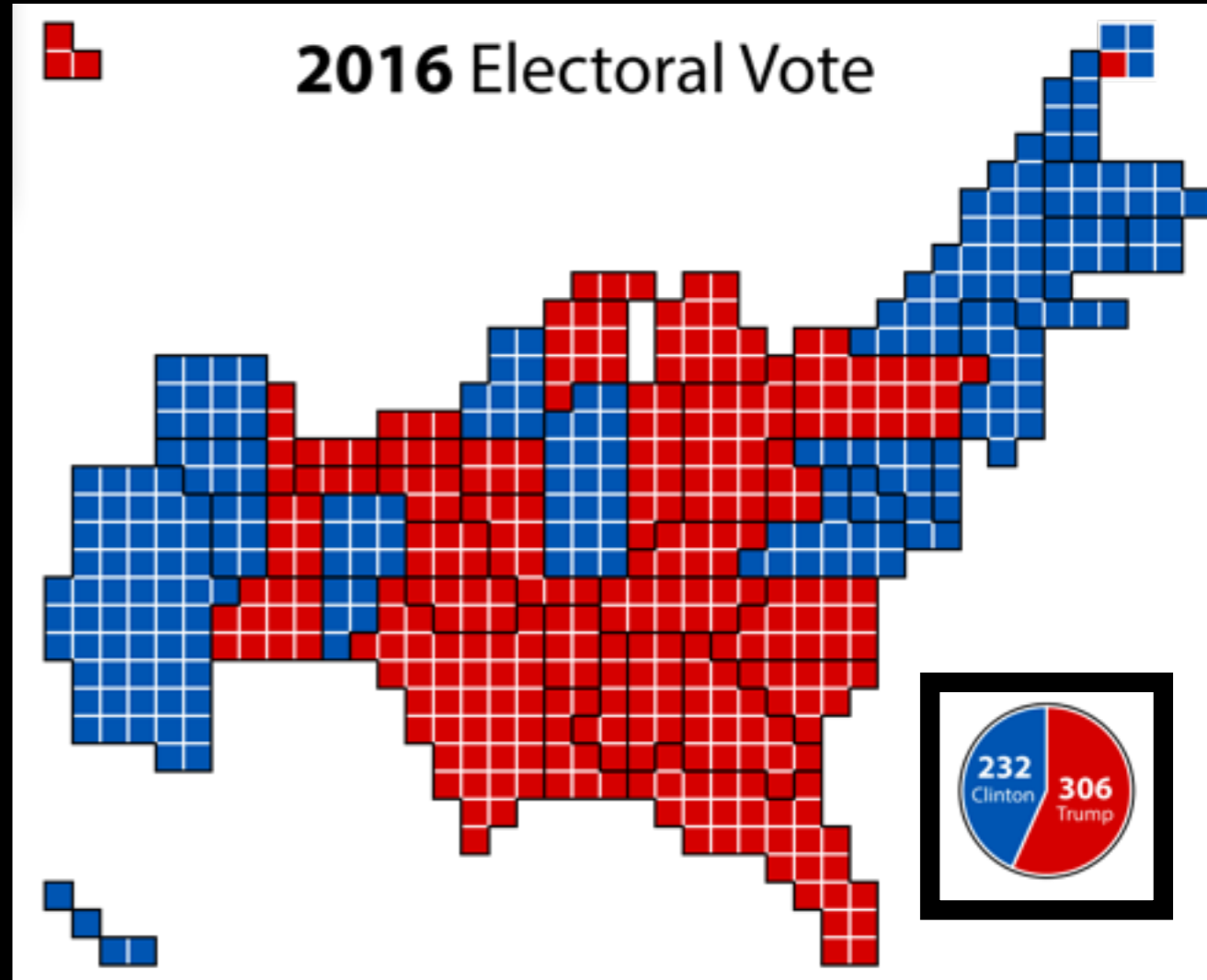
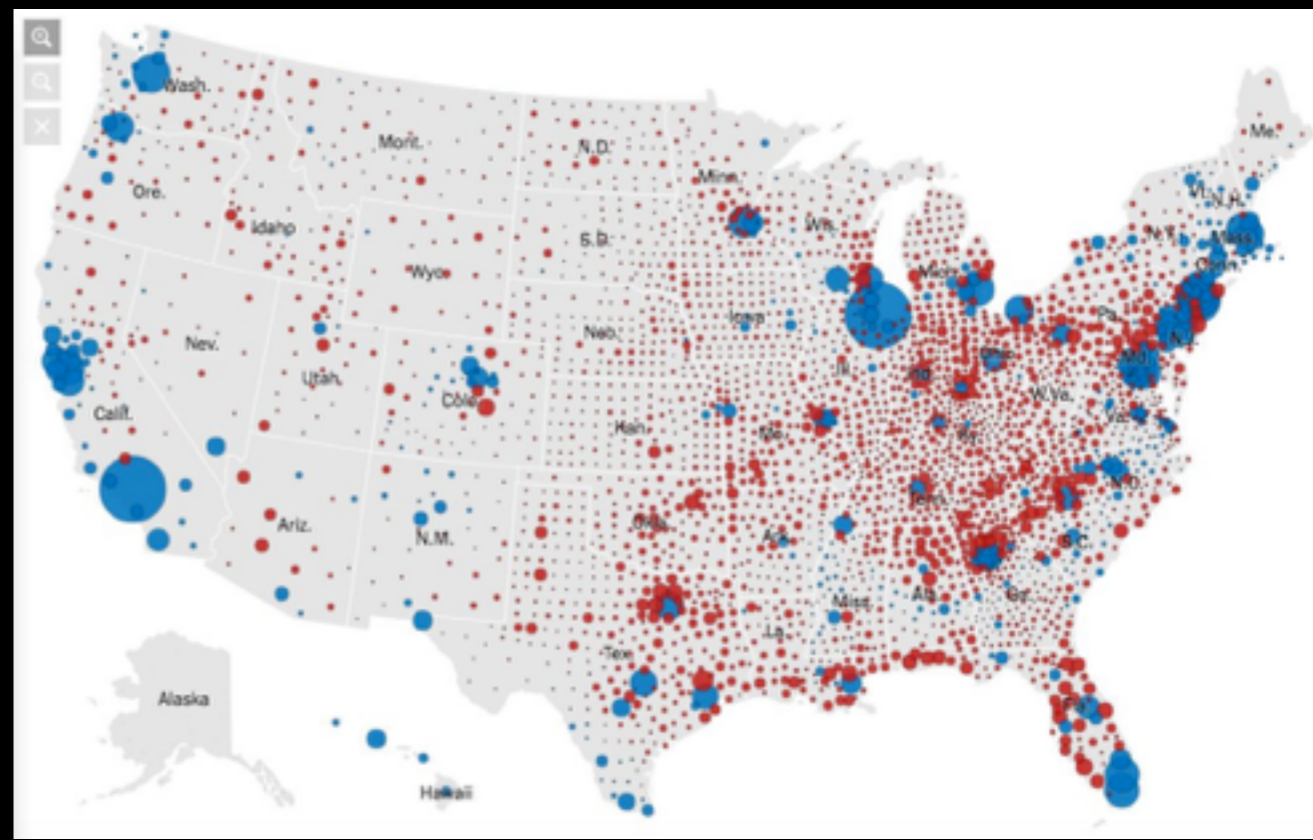
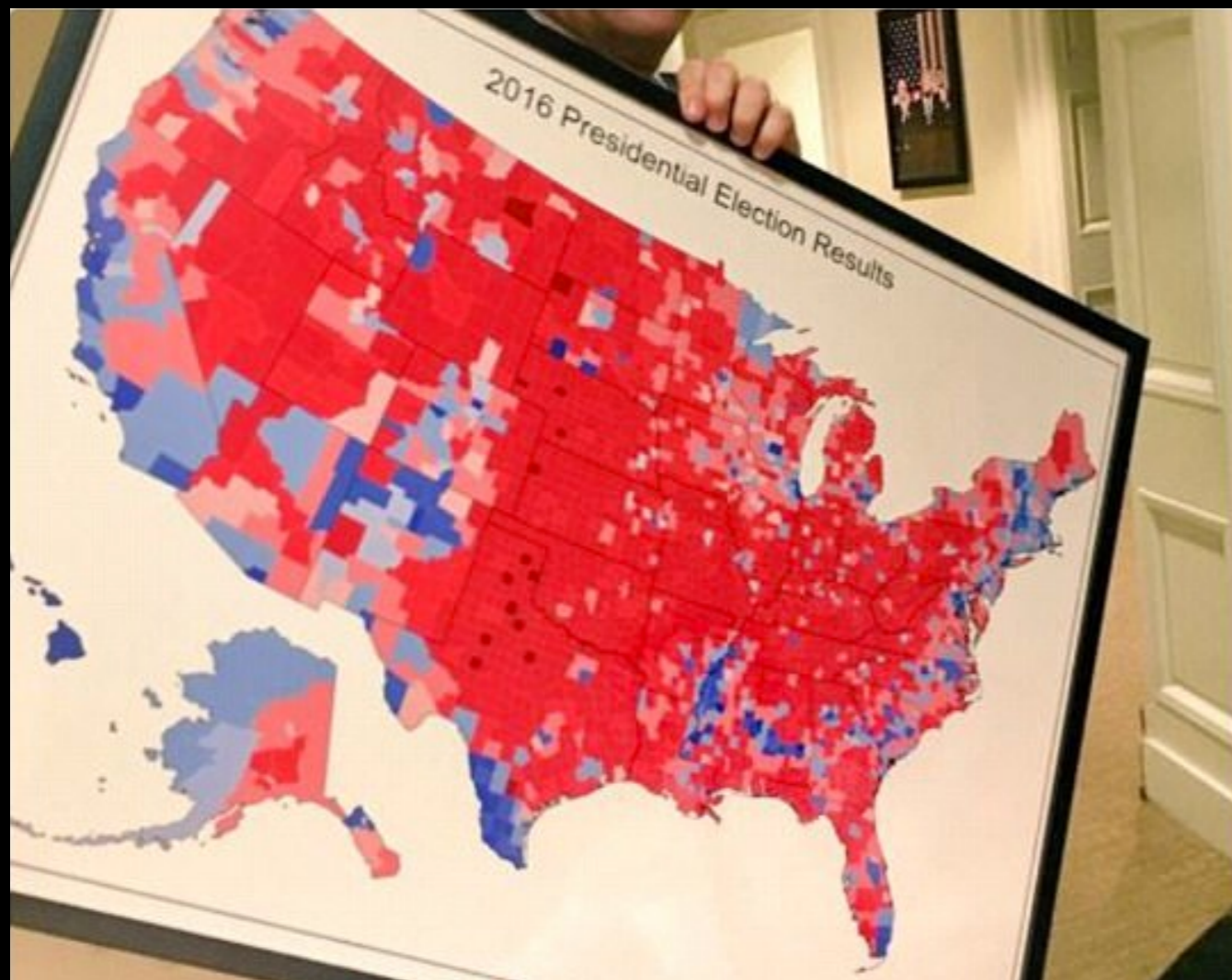


**JACK POSOBIEC**











*Kid Rock*

— FOR —

***US SENATE***

*Michigan deserves  
senators who can map!*



# KID ROCK KID ROCKS AMERICA UNISEX T-SHIRT

Availability: In stock

**\$24.99**

[Be the first to review this product](#)

Size

Qty:

[+ AddThis](#)

ADD TO CART

+ ADD TO WISHLIST



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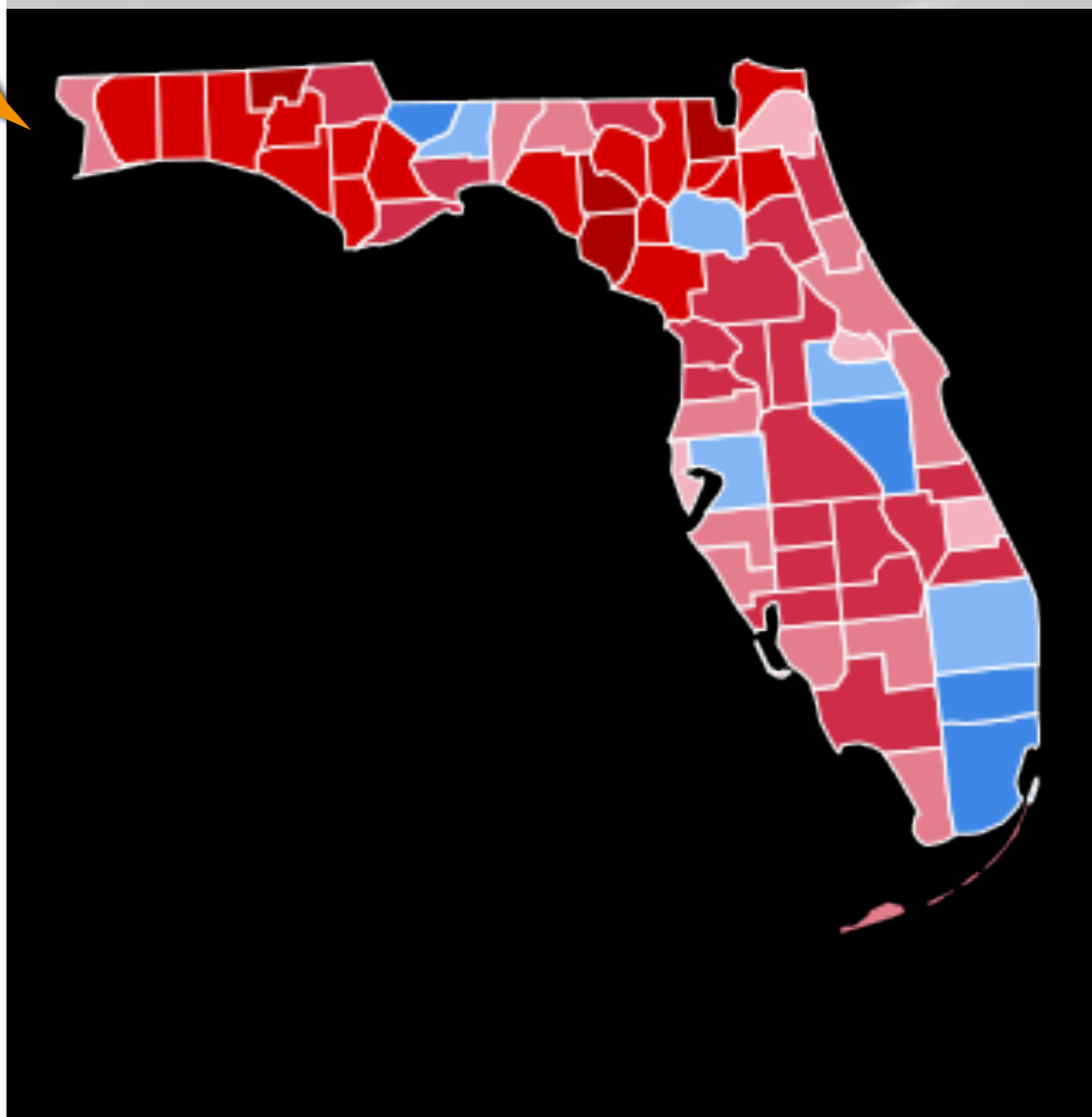
Size

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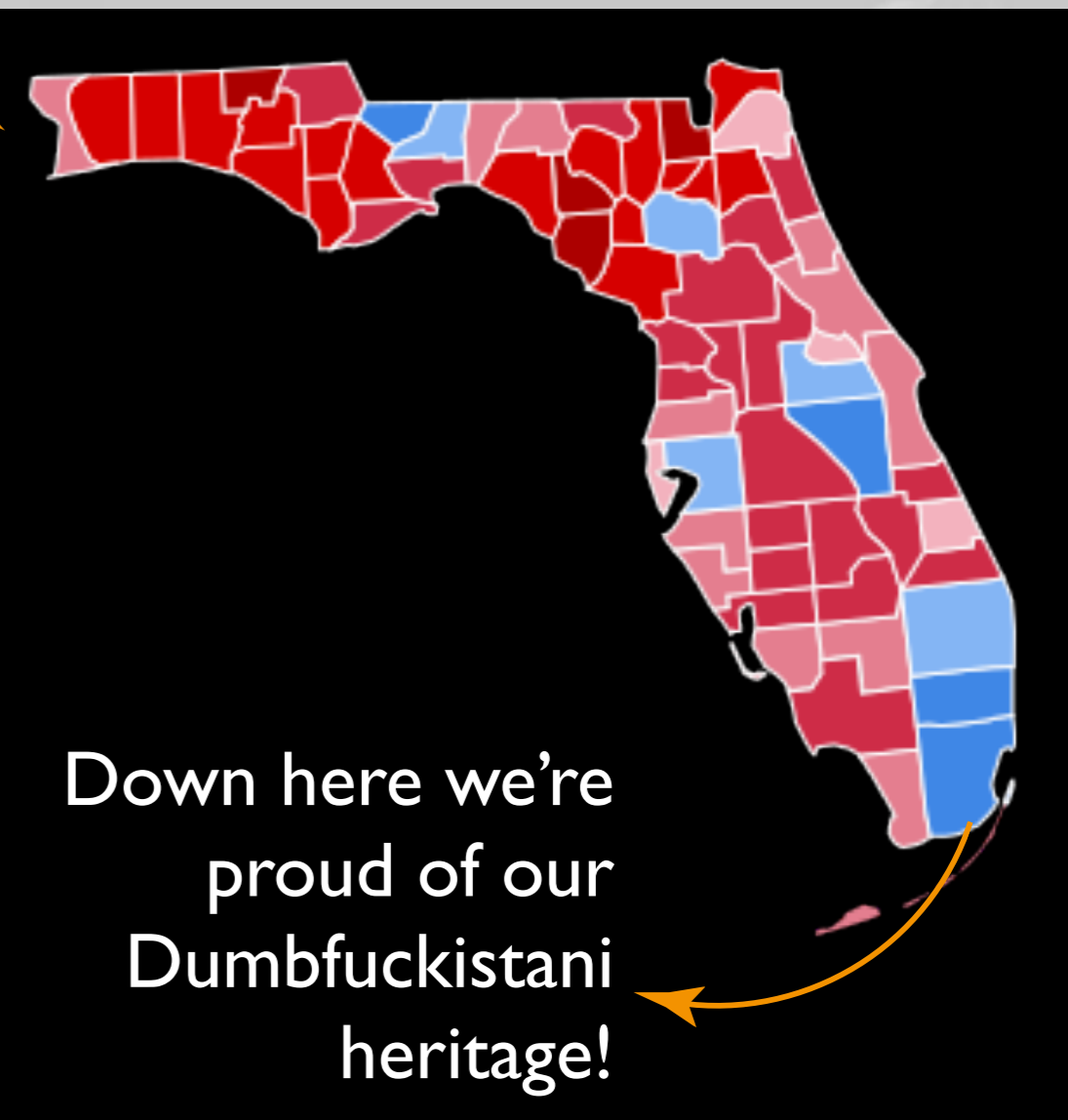
Size

Qty:

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Down here we're proud of our Dumbfuckistani heritage!



Choosing graphic forms

What do you want readers to do with your graphic?

What tasks do you want to enable?

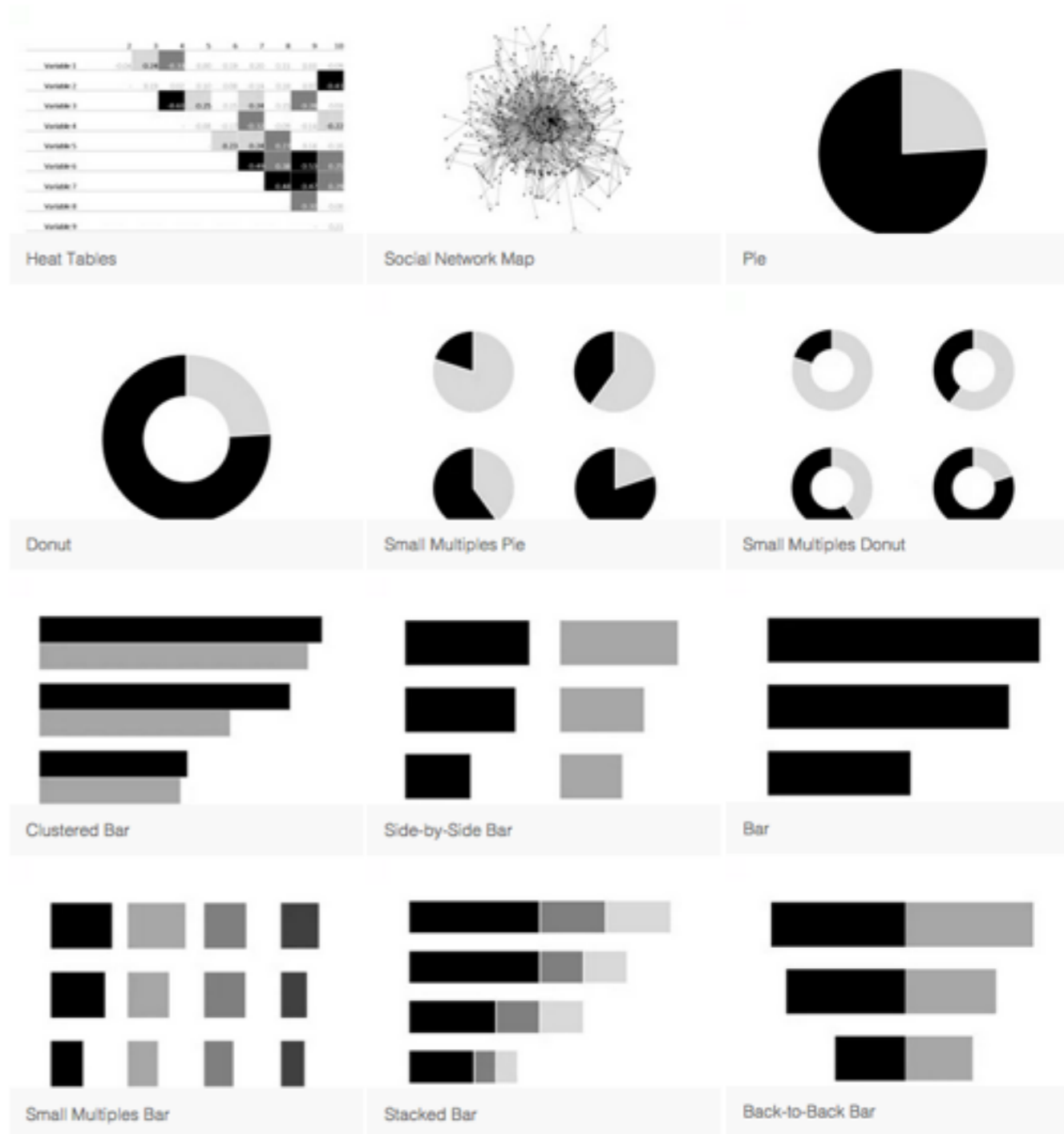
Search by Function

View by List



## EMERY'S ESSENTIALS Chart Choosing Tool

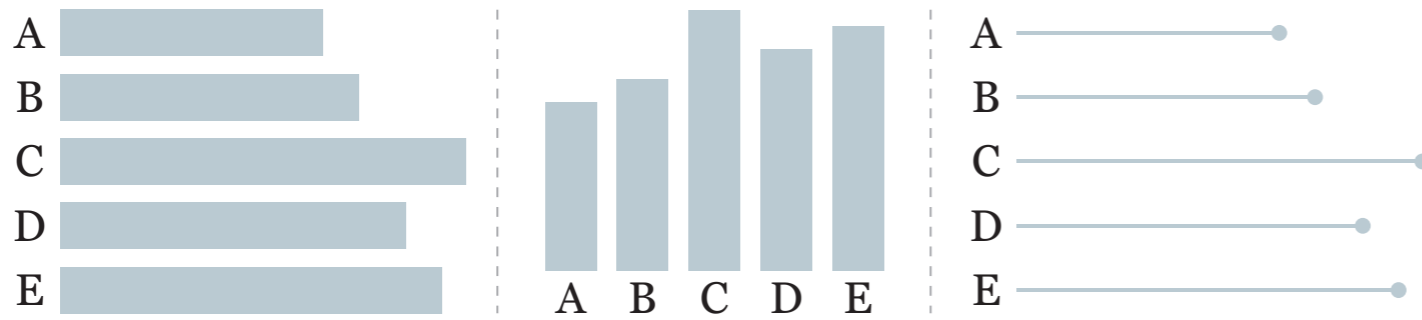
ALL / SMALL MULTIPLES / COMPARING 2 OR MORE CATEGORIES / RANGES OR DISPERSION / PART TO WHOLE / DO-ABLE IN EXCEL / GEOGRAPHIC MAPS / RELATIONSHIPS / COLLAGES / QUALITATIVE / EXPLORATORY / CORRELATION / 1 POINT IN TIME / 2 POINTS IN TIME / 3+ POINTS IN TIME



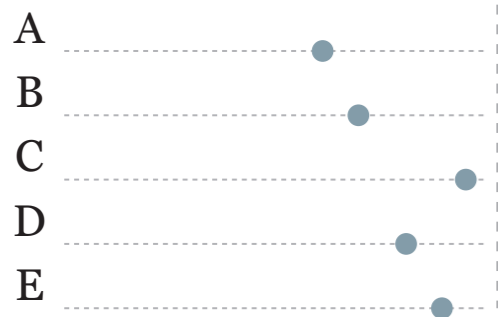
<http://www.datavizcatalogue.com/>

<http://annkemery.com/essentials/>

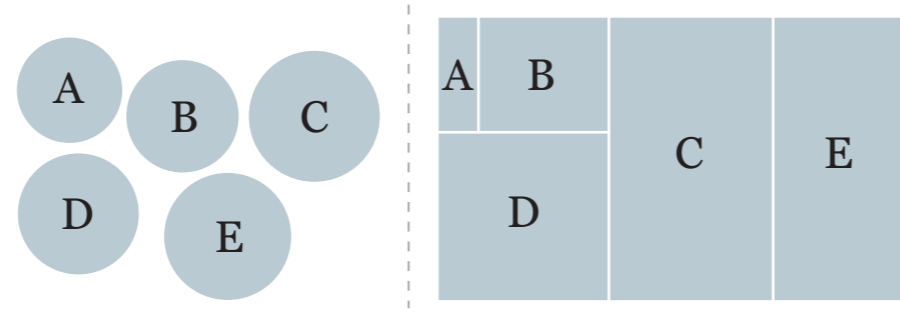
## Length or height



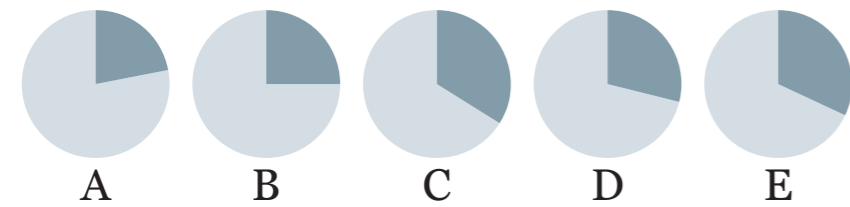
## Position



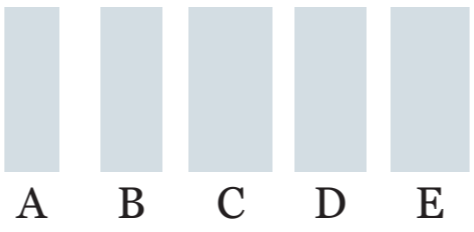
## Area



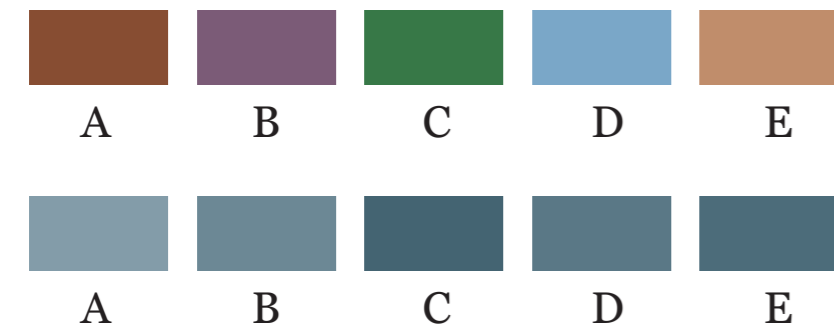
## Angle/area



## Line weight

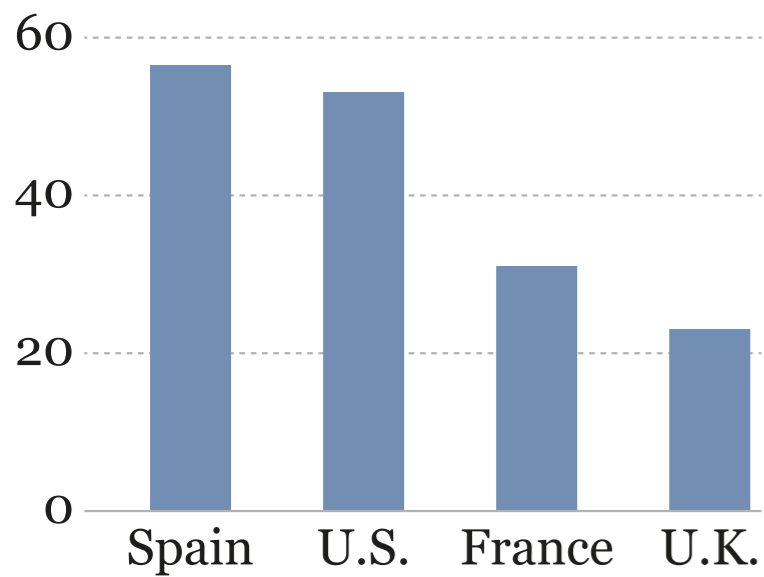


## Hue and shade

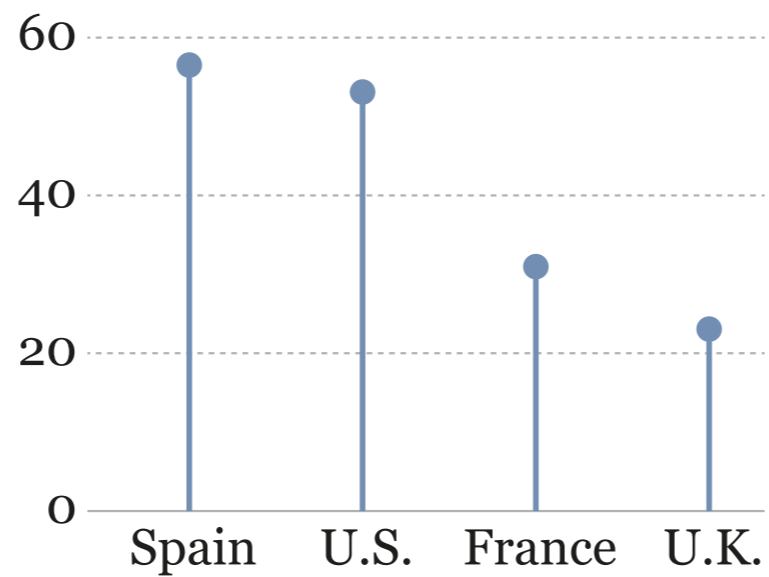


Figures represented  
in all these graphics:  
22%, 25%, 34%, 29%, 32%

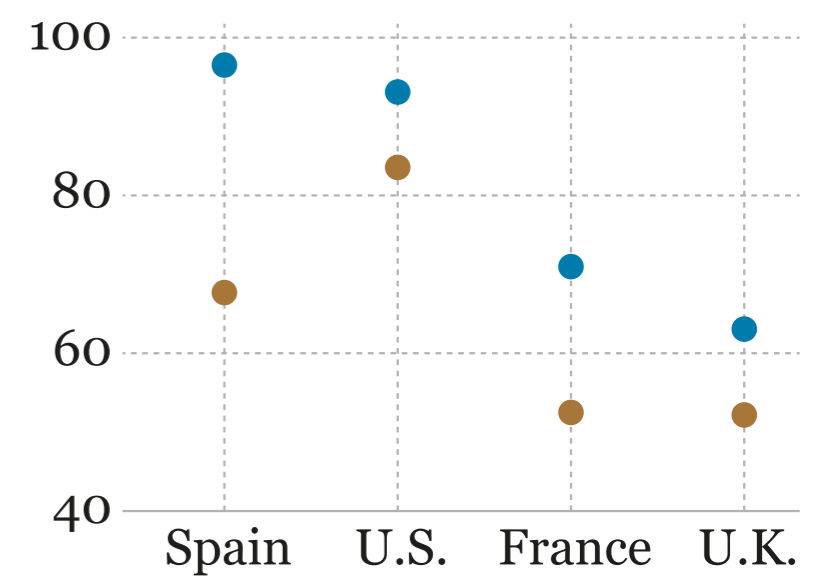
Data visualization  
and **visual encoding**



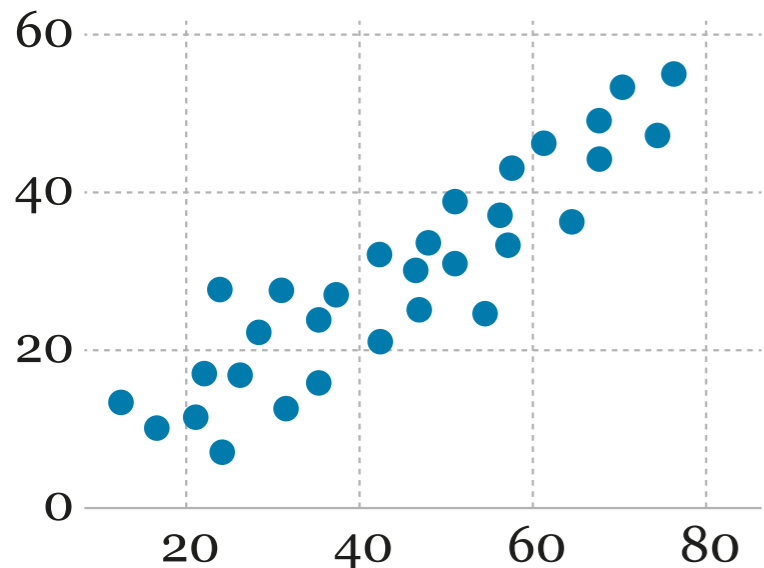
**BAR CHART**



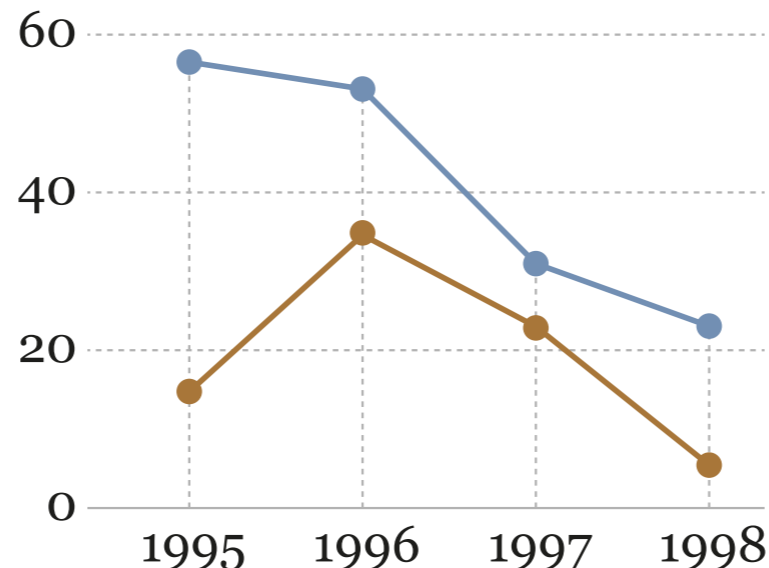
**LOLLIPOP CHART**



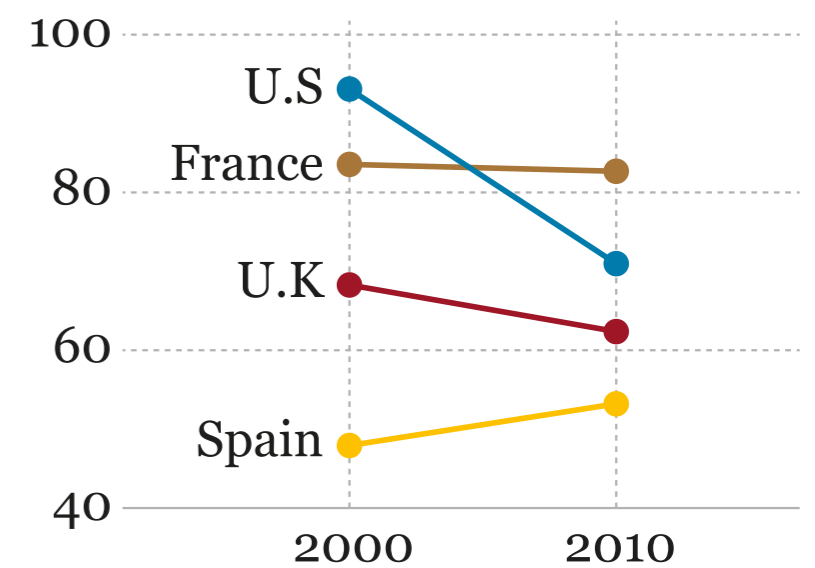
**DOT CHART  
(or dot plot)**



**SCATTER CHART  
(or scatter plot)**



**LINE CHART  
(or time series chart)**



**SLOPE CHART**

Graphics based on length, height, and position along common axes:  
**Great for accurate estimates**

# In a Decisive Victory, Obama Reshapes the Electoral Map

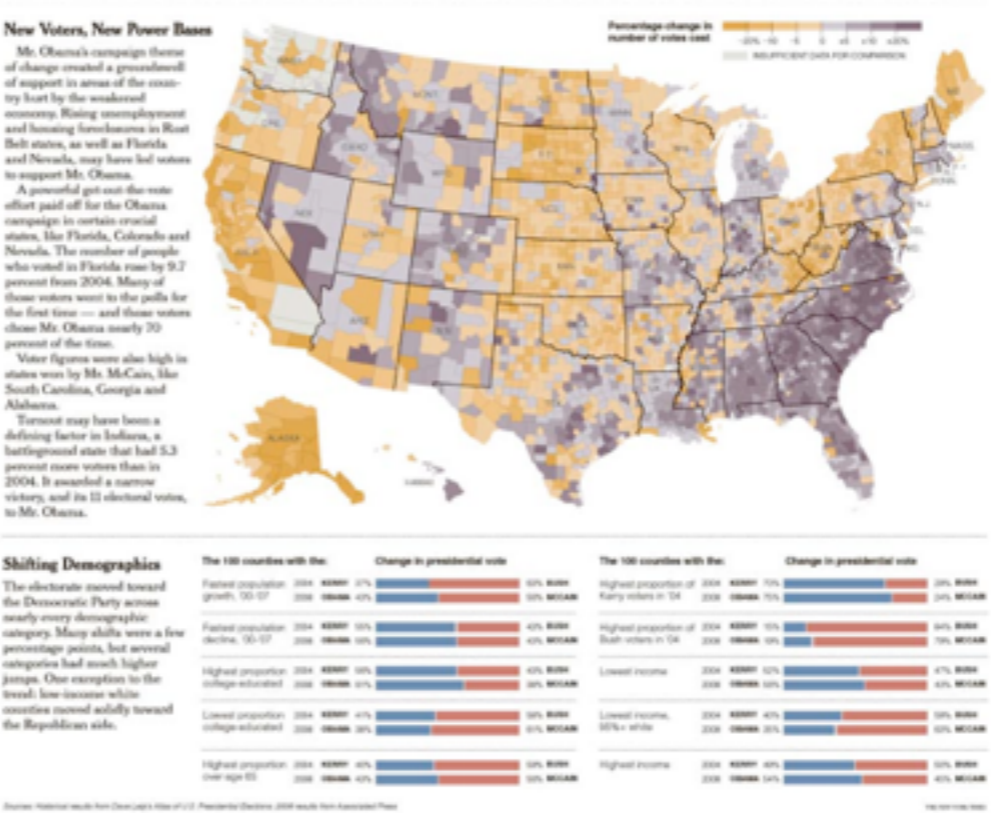
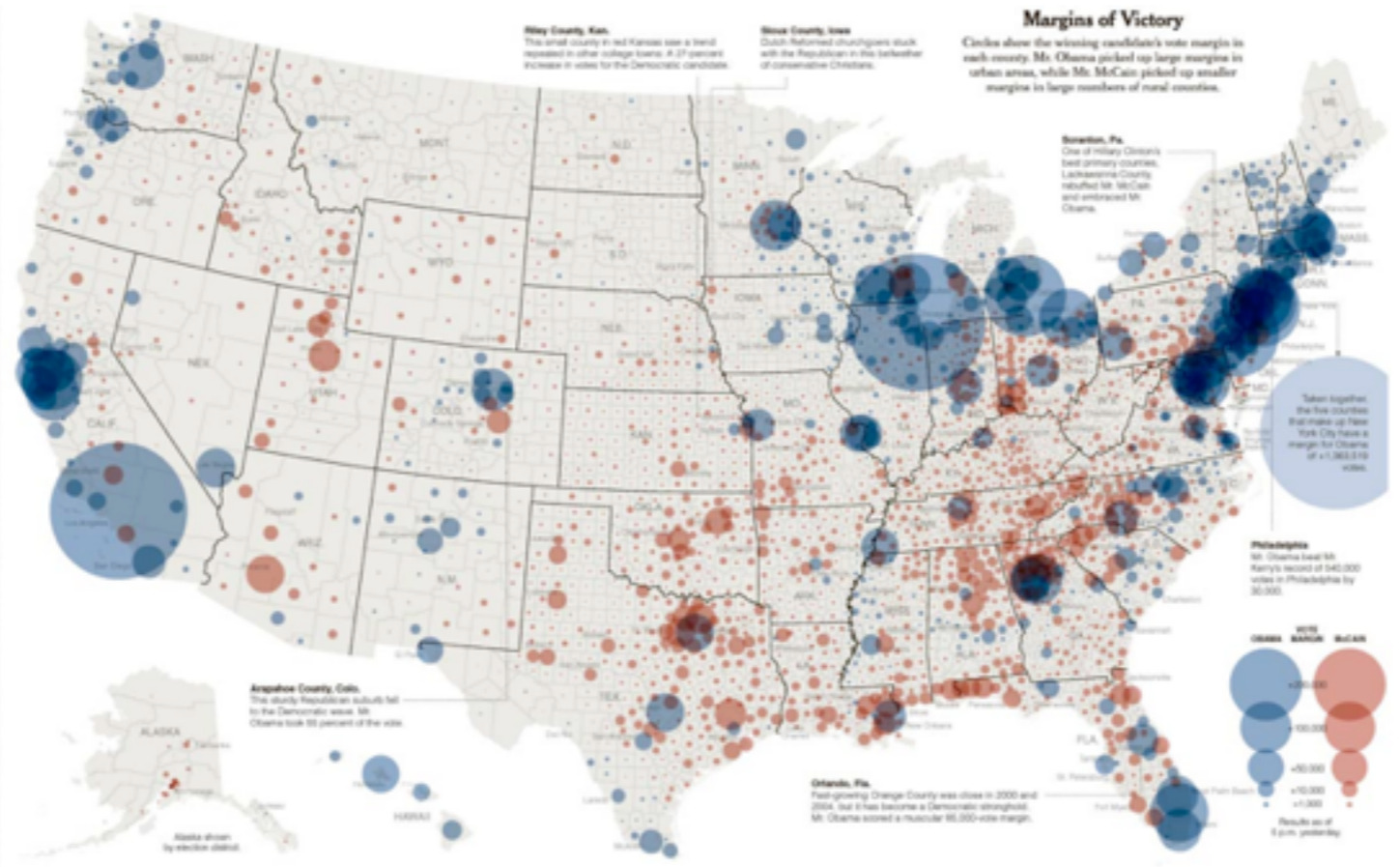
Barack Obama's historic win, with at least 349 electoral votes to John McCain's 162, can be attributed to his victories in several high-population states, like Florida, Virginia and Ohio, that George W. Bush won barely in 2004.

Obama's historic win, with at least 349 electoral votes to John McCain's 162, can be attributed to his victories in several high-population states, like Florida, Virginia and Ohio, that George W. Bush won barely in 2004.

By Erin Aigner, Joe Bergson, Braden Copeland, Matthew Ericson, Hannah Fairfield, Fred Feuerstein, Haynes Park and Archie Tan



State	Obama %	McCain %	Margin	Electoral votes
Alabama	30%	68%	-38%	9
Alaska	33%	66%	-33%	3
Arizona	39%	60%	-21%	10
Arkansas	35%	64%	-29%	6
California	67%	31%	+36%	55
Colorado	52%	47%	+5%	9
Connecticut	68%	31%	+37%	7
Delaware	70%	30%	+40%	3
D.C.	100%	0%	+100%	3
Florida	53%	46%	+7%	29
Georgia	35%	64%	-29%	15
Hawaii	71%	29%	+42%	4
Idaho	33%	66%	-33%	6
Illinois	60%	38%	+22%	21
Indiana	35%	64%	-29%	11
Iowa	65%	34%	+31%	7
Kansas	35%	64%	-29%	6
Kentucky	35%	64%	-29%	8
Louisiana	35%	64%	-29%	9
Maine	68%	31%	+37%	7
Maryland	68%	31%	+37%	10
Massachusetts	68%	31%	+37%	7
Michigan	52%	47%	+5%	16
Minnesota	60%	38%	+22%	10
Mississippi	35%	64%	-29%	6
Missouri	40%	59%	-19%	10
Montana	33%	66%	-33%	3
Nebraska	35%	64%	-29%	5
Nevada	35%	64%	-29%	6
New Hampshire	68%	31%	+37%	4
New Jersey	68%	31%	+37%	14
New Mexico	35%	64%	-29%	5
New York	68%	31%	+37%	29
North Carolina	35%	64%	-29%	15
North Dakota	33%	66%	-33%	3
Ohio	52%	47%	+5%	21
Oklahoma	35%	64%	-29%	7
Oregon	60%	38%	+22%	7
Rhode Island	68%	31%	+37%	4
South Carolina	35%	64%	-29%	9
South Dakota	33%	66%	-33%	3
Tennessee	35%	64%	-29%	7
Texas	35%	64%	-29%	34
Vermont	68%	31%	+37%	3
Virginia	58%	41%	+17%	13
Washington	60%	38%	+22%	12
West Virginia	35%	64%	-29%	5
Wisconsin	58%	41%	+17%	10
Wyoming	33%	66%	-33%	3
<b>TOTAL</b>	<b>51%</b>	<b>48%</b>	<b>+3%</b>	<b>538</b>



Other methods of encoding (size, area, color, etc.): Great for the big picture, but not so much for accuracy

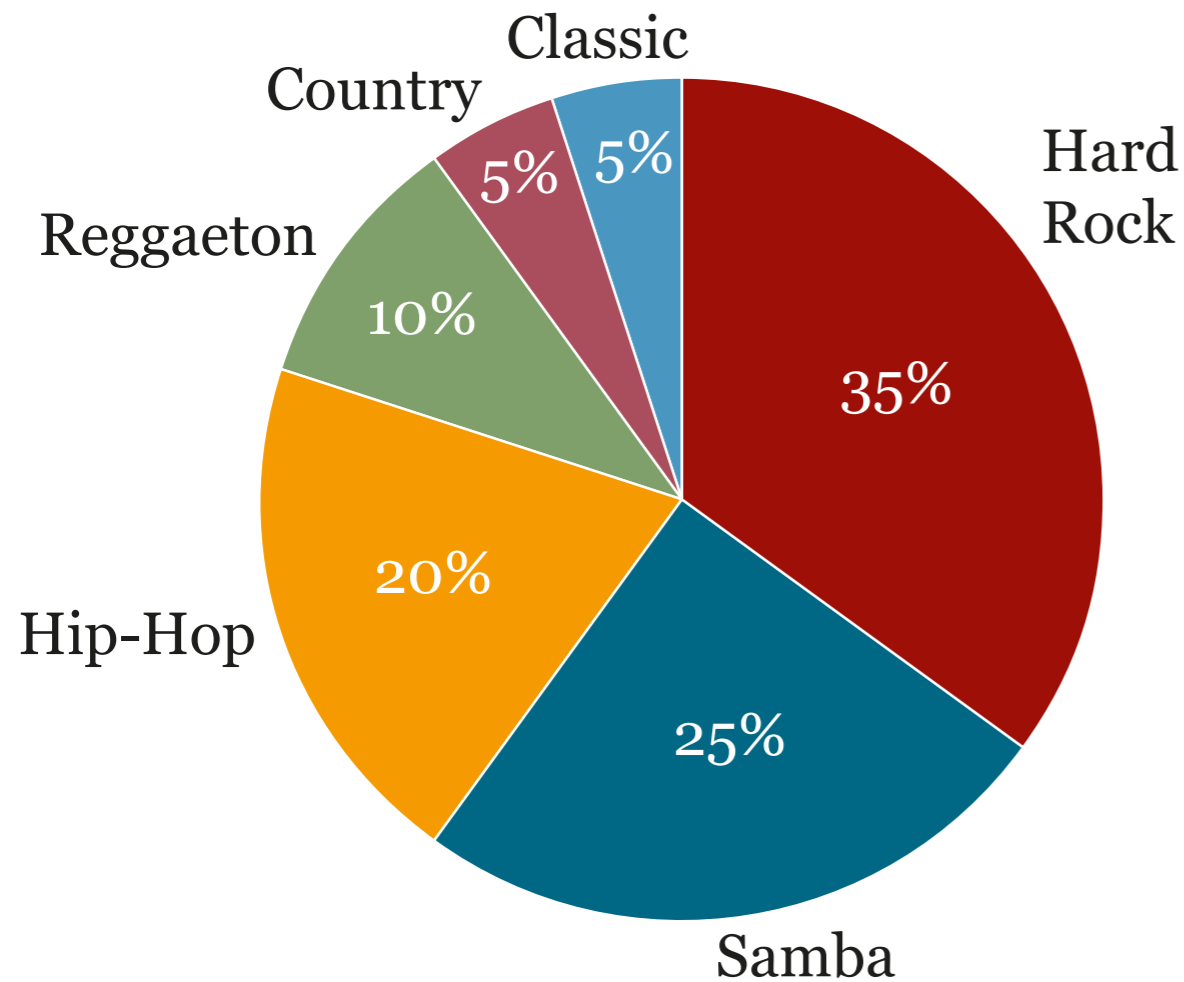
Using the wrong method of encoding...

# How Music Preferences Have Changed in Two Decades

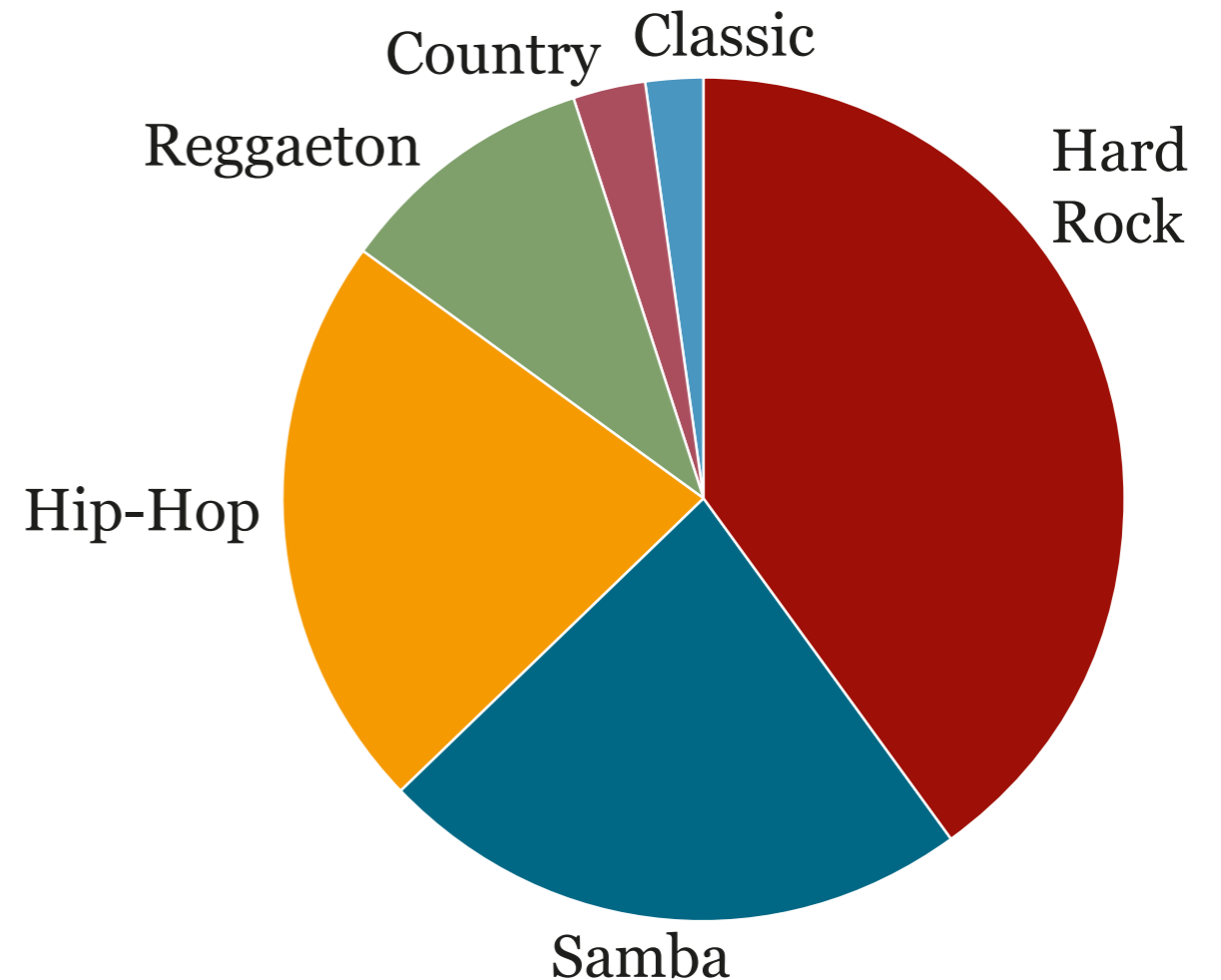
Music styles preferred by University of Miami students. Survey based on interviews with 1,000 students.

**SOURCE: WishfulThinkingData Inc.**

## 1994



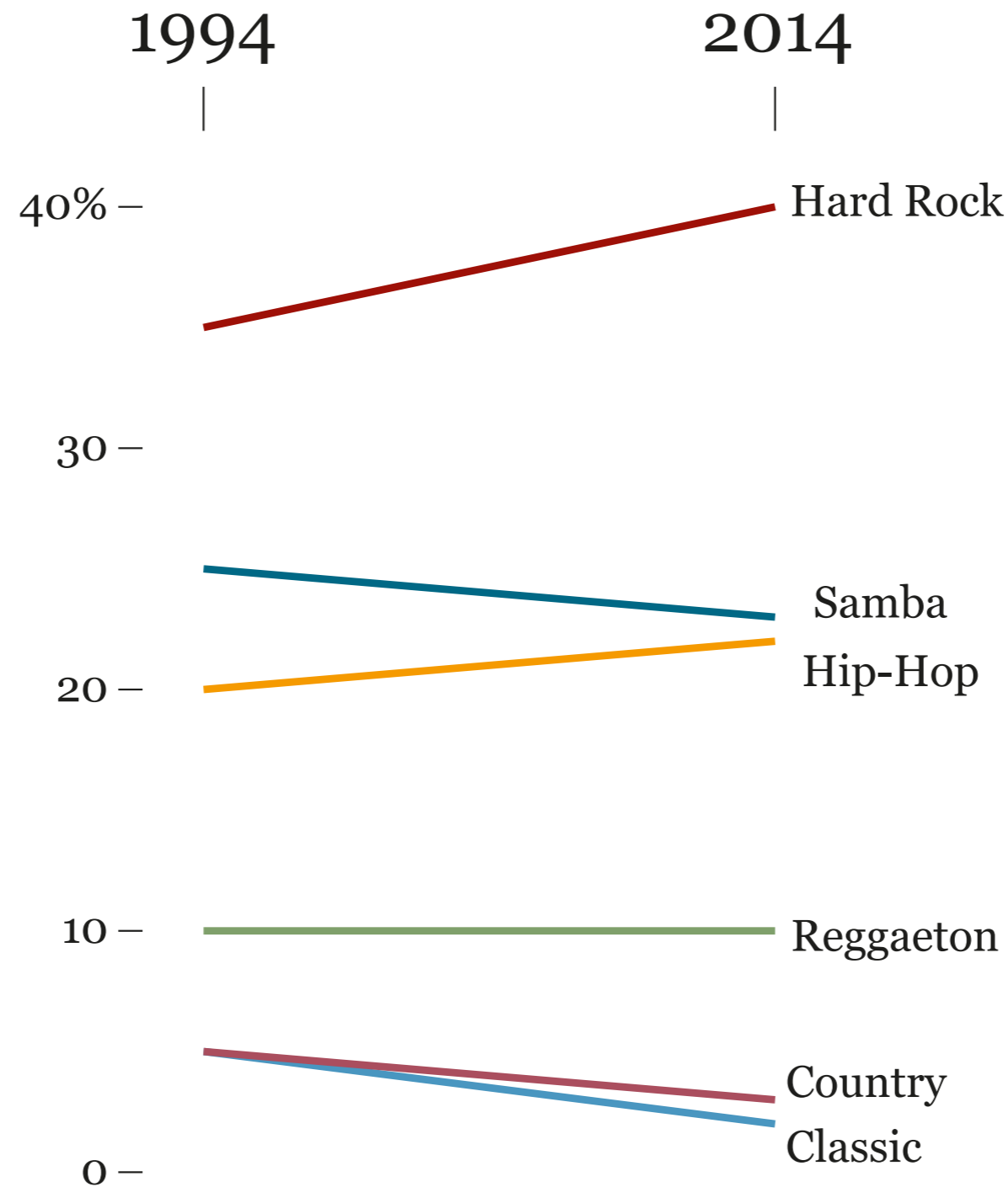
## 2014



# How Music Preferences Have Changed in Two Decades

Music styles preferred by University of Miami students.  
Survey based on interviews with 1,000 students.

**SOURCE: WishfulThinkingData Inc.**





## Good graphics...

1. They are based on good data
2. They attract readers' attention
3. They don't frustrate readers
4. They show the right amount of data



@WCSJ2017 Thanks for coming to my #WCSJ #WCSJ2017 #dataVizTruth



talk today. Here are my slides:

<https://www.dropbox.com/s/gsdz89ovafu2ja4/ScienceJournalismSF2017.pdf?dl=0>

and some extra readings:

[https://www.dropbox.com/sh/15uaf1c16z3bt97/AAB\\_OD95Jz9rMsJR0Tfi-Hma?dl=0](https://www.dropbox.com/sh/15uaf1c16z3bt97/AAB_OD95Jz9rMsJR0Tfi-Hma?dl=0)



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# THANKS A LOT!