

# visualizing spatial data



**Amelia McNamara**  
@AmeliaMN

The problem with maps is that the world looks like a map. We don't have that problem with other visualizations. @tmcw #NICAR14

9:15 AM - 28 Feb 2014

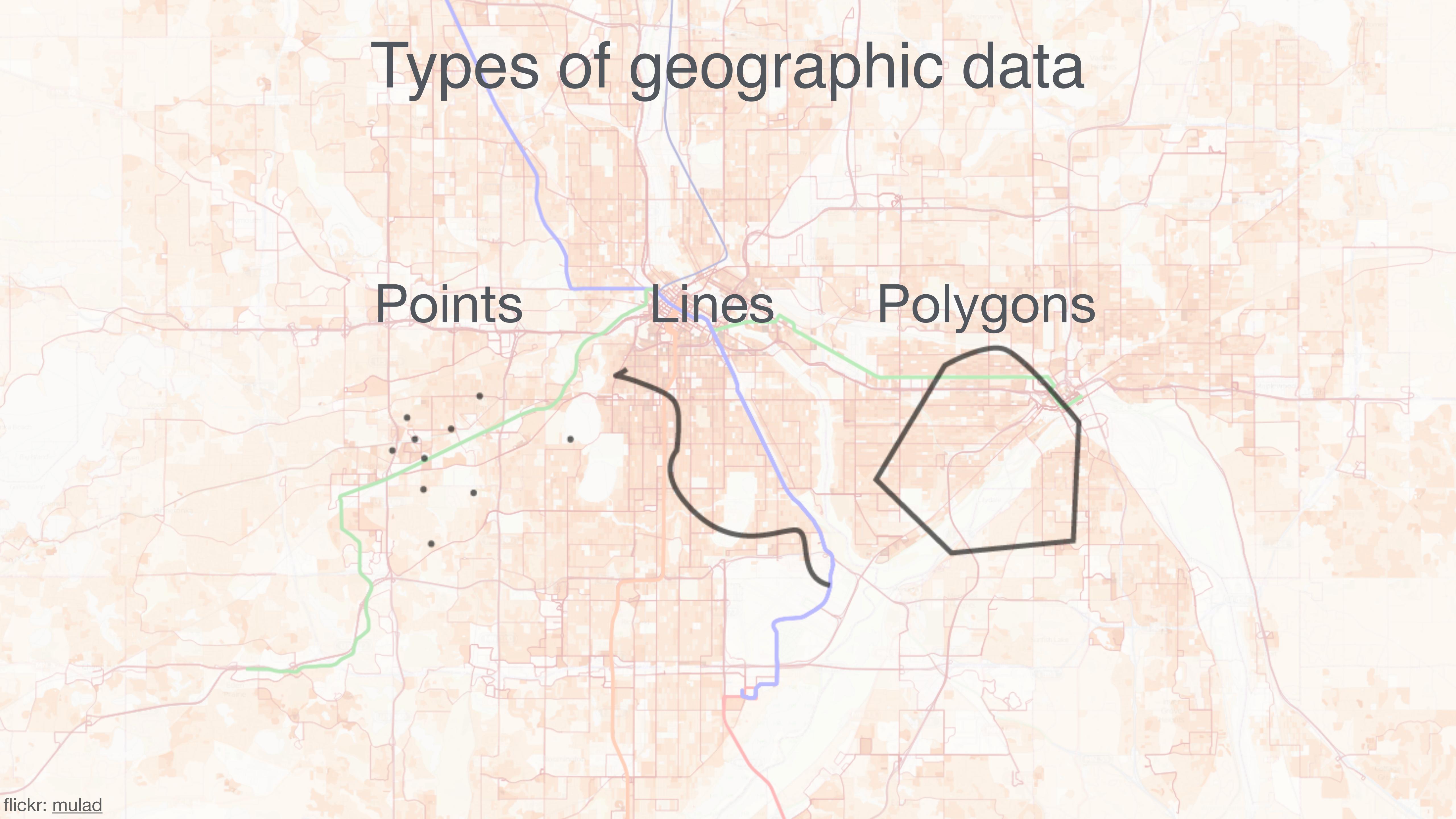


# Types of geographic data

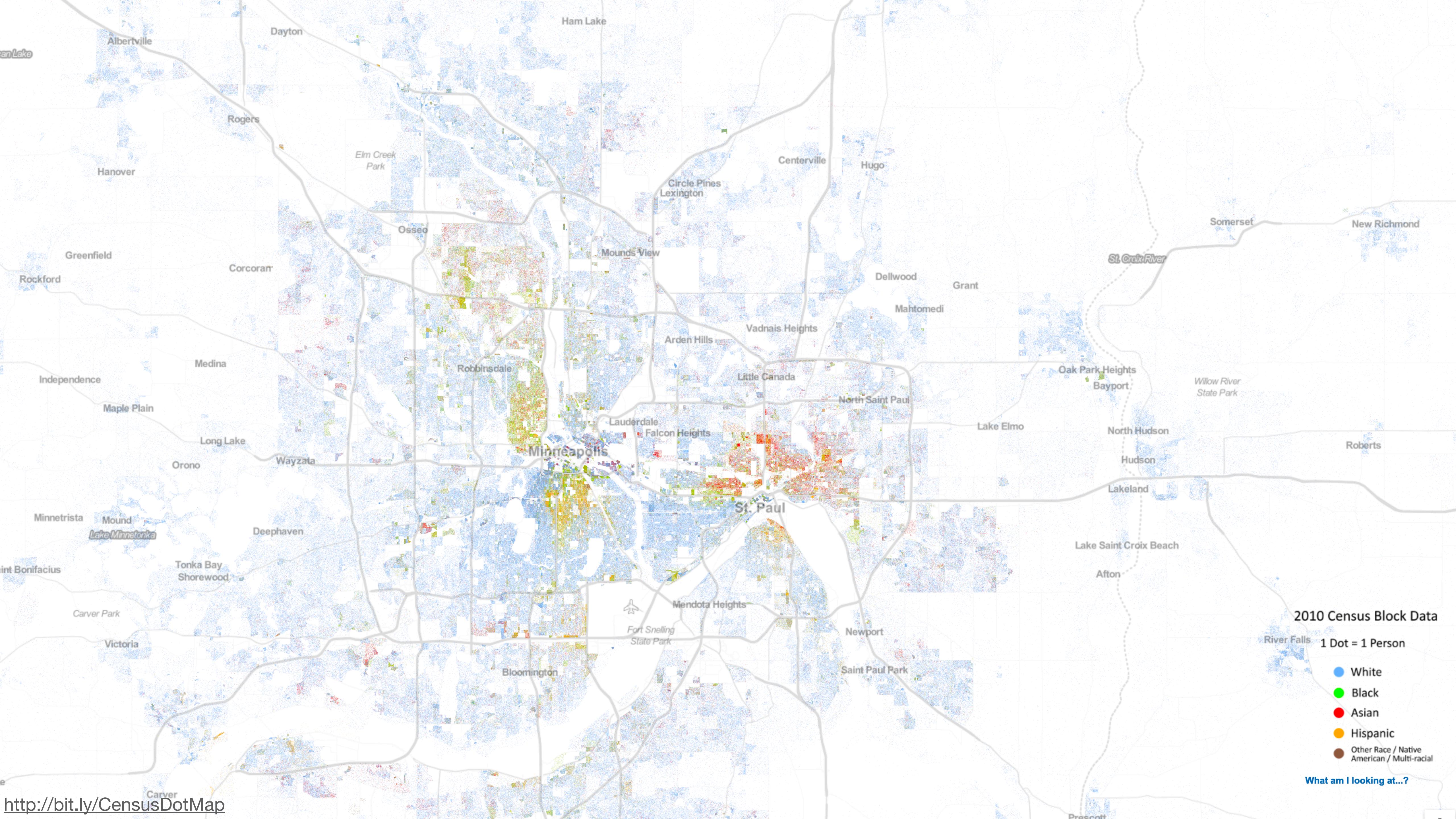
Points

Lines

Polygons



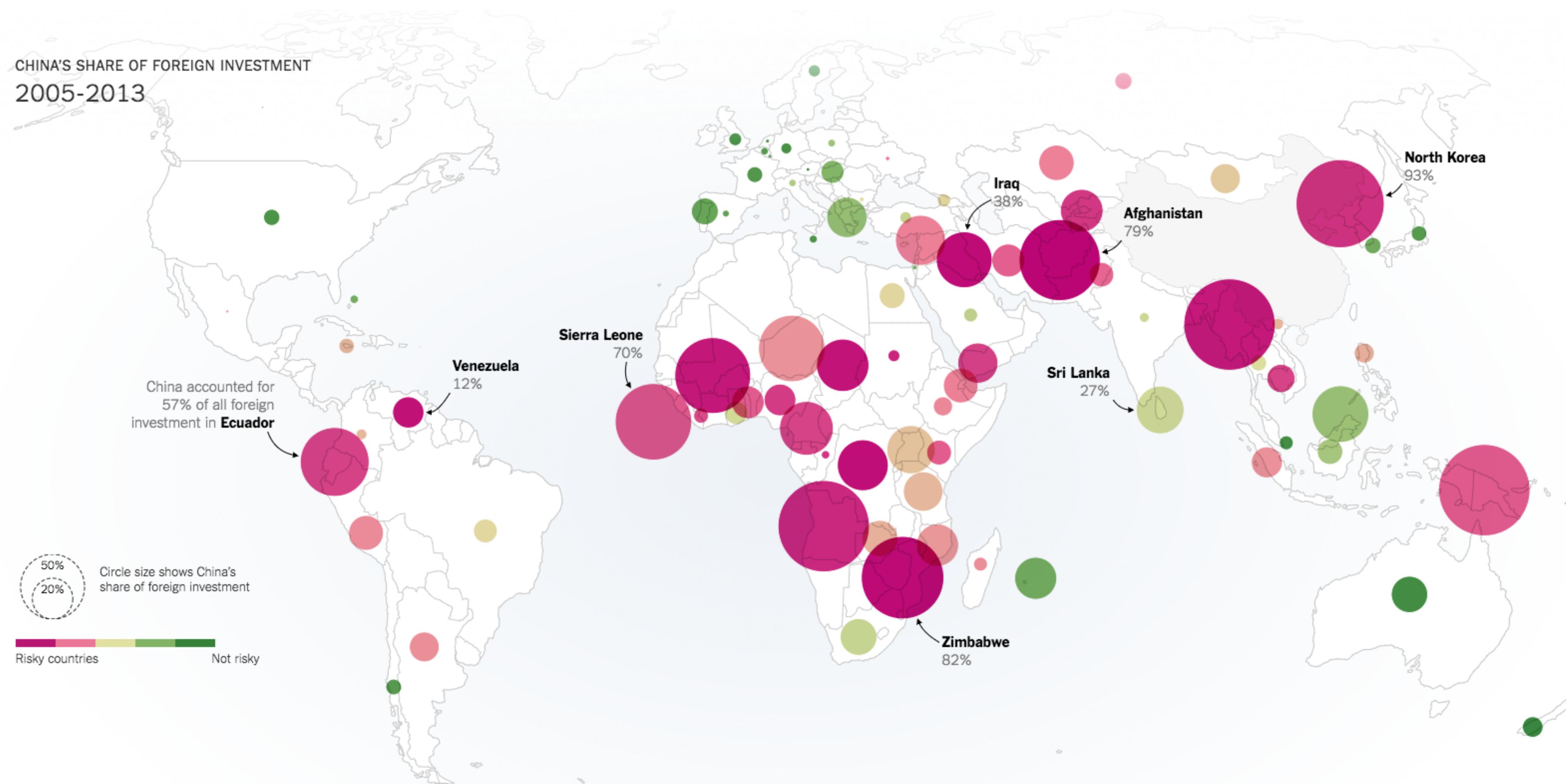
# Points



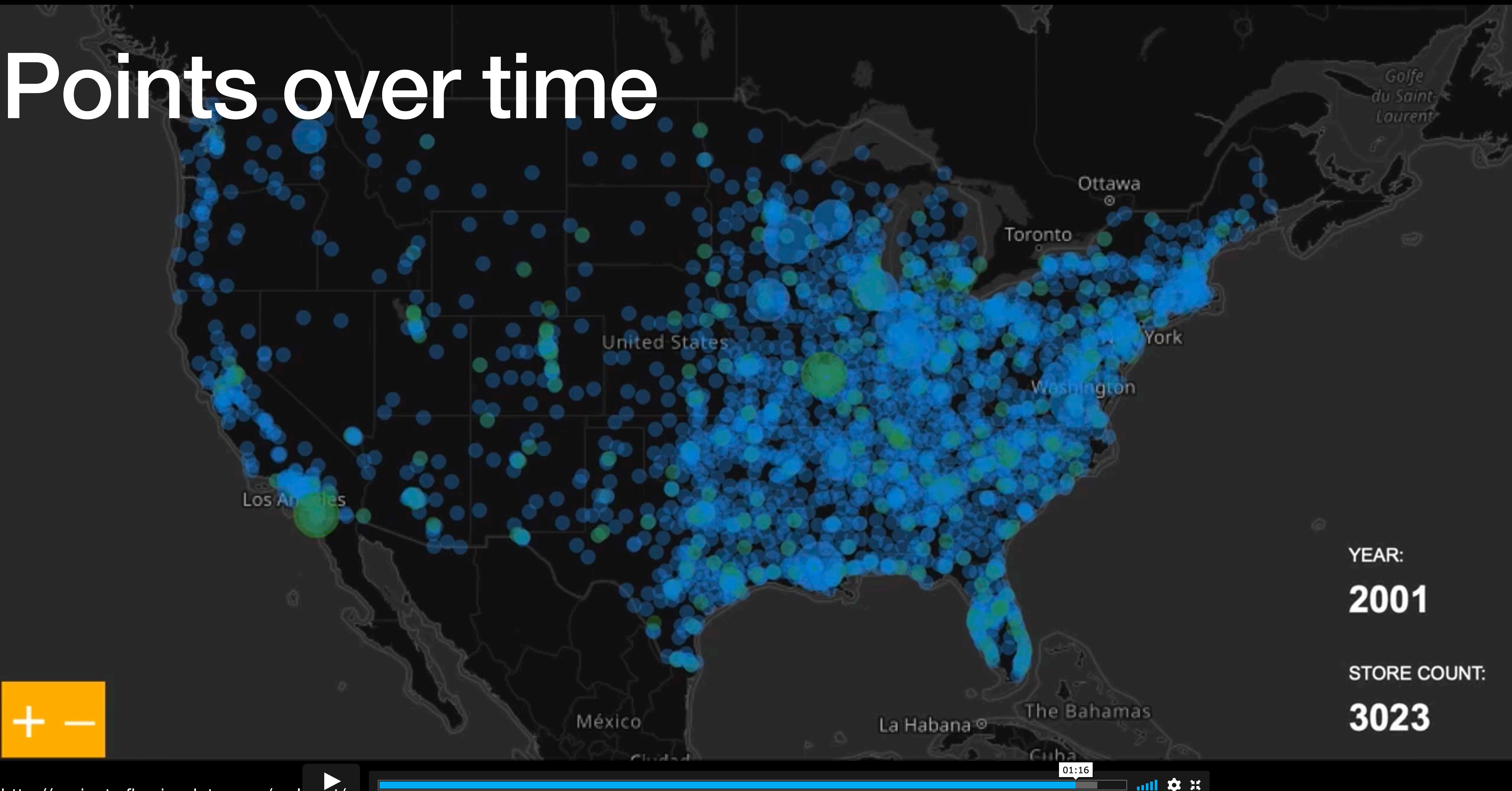
# The World According to China

By GREGOR AISCH, JOSH KELLER and K.K. REBECCA LAI

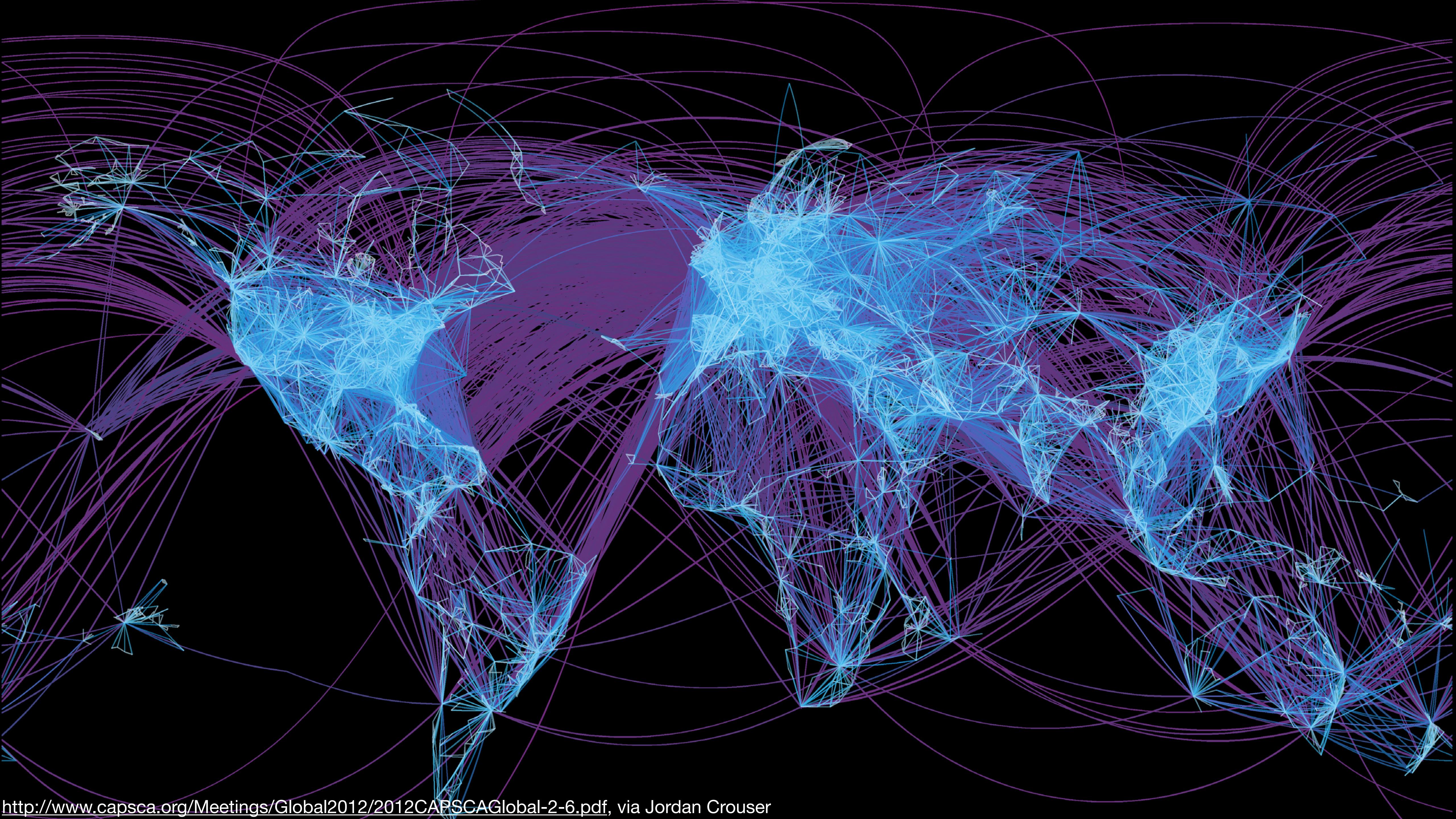
China's enormous overseas spending has helped it displace the United States and Europe as the leading financial power in large parts of the developing world. Here's where China has the most influence, based on its share of foreign investment since 2005. [RELATED ARTICLE](#)

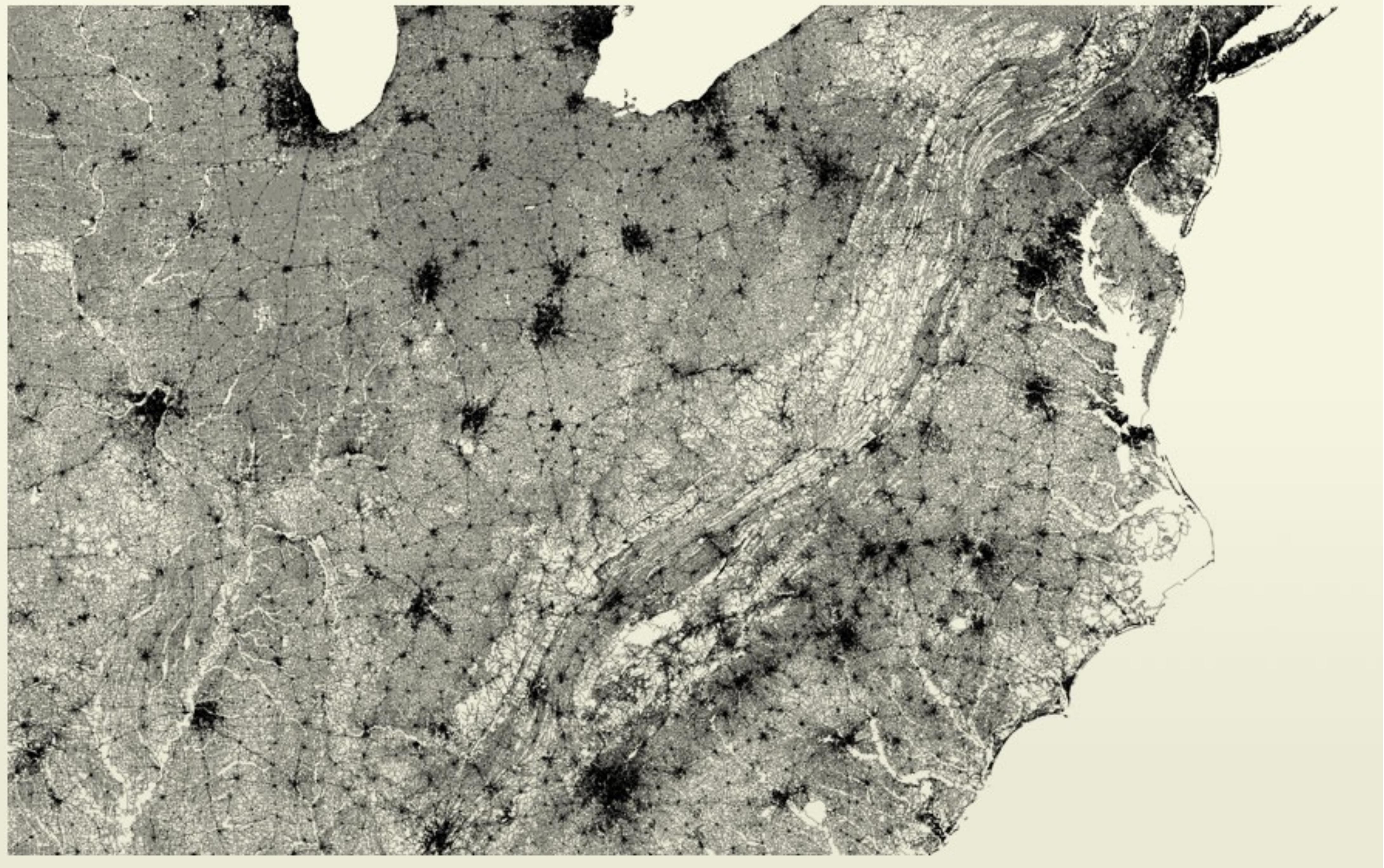


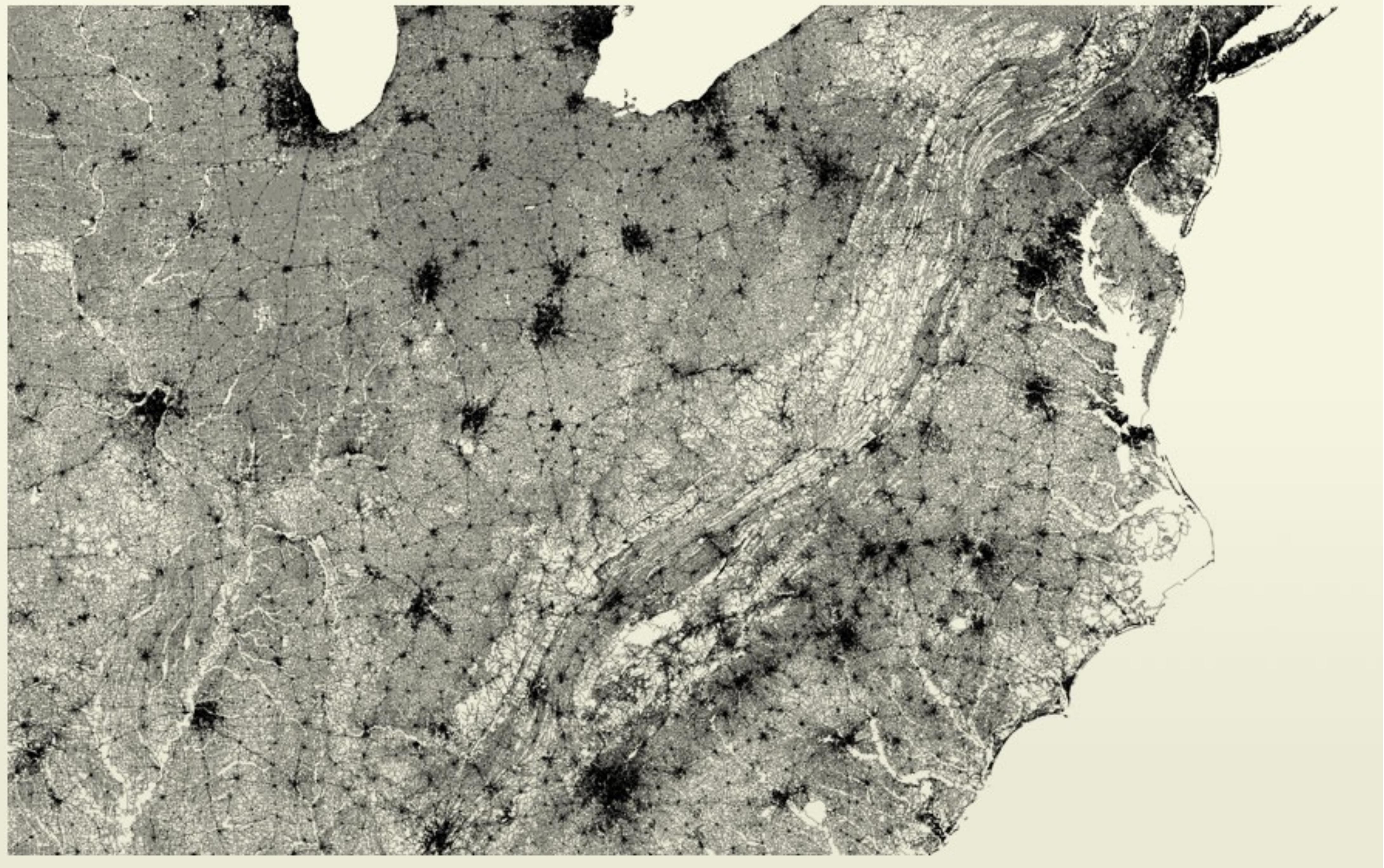
# Points over time



# Lines







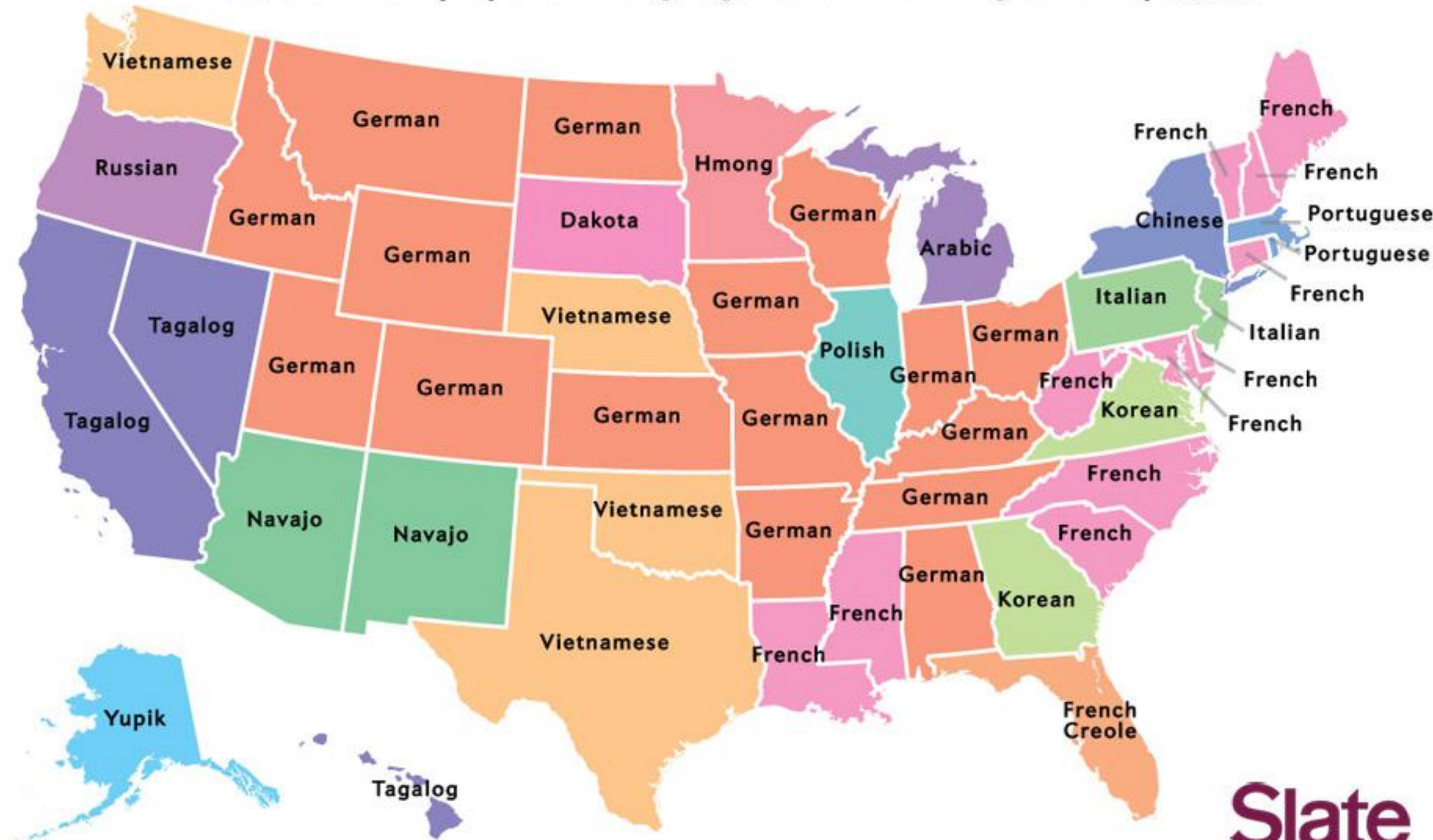
# Polygons

# Choropleth maps



# Choropleth maps

## Most Commonly Spoken Language Other than English or Spanish

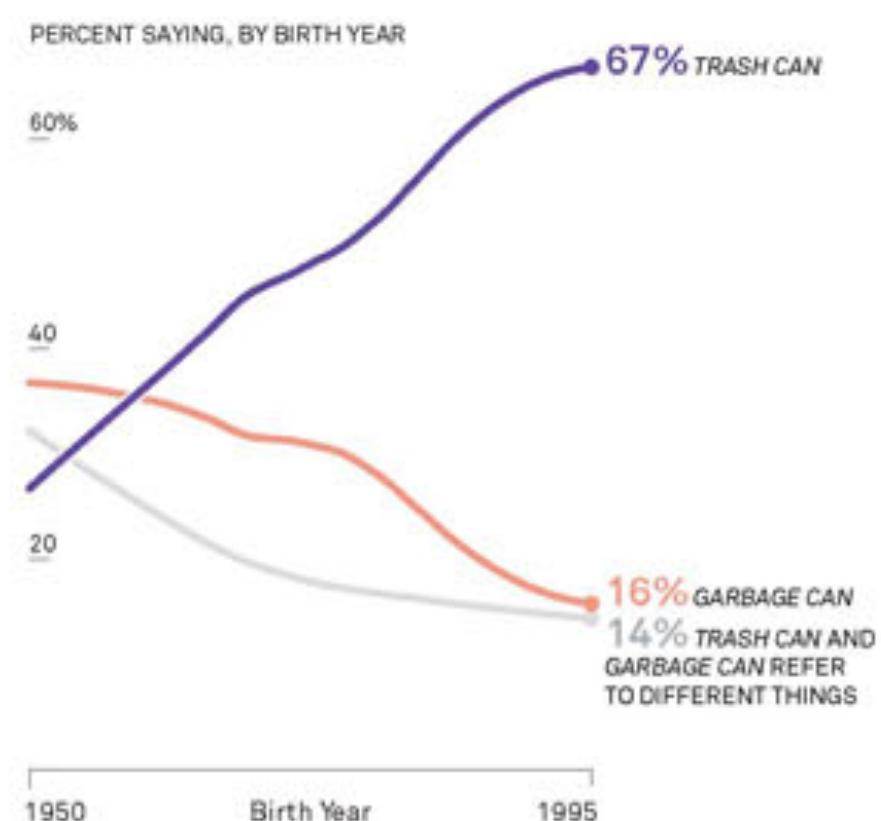


Slate

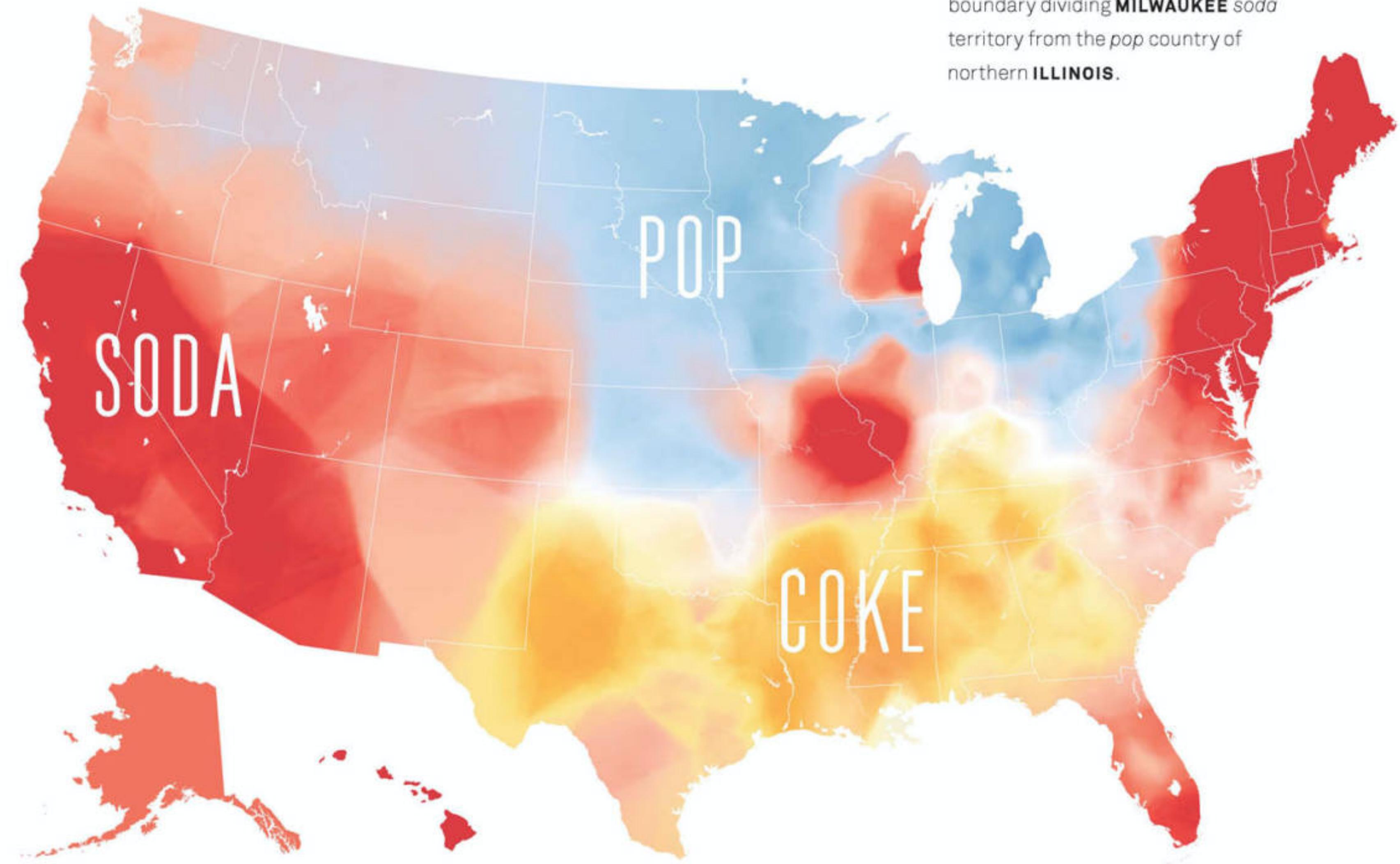
# Heat maps

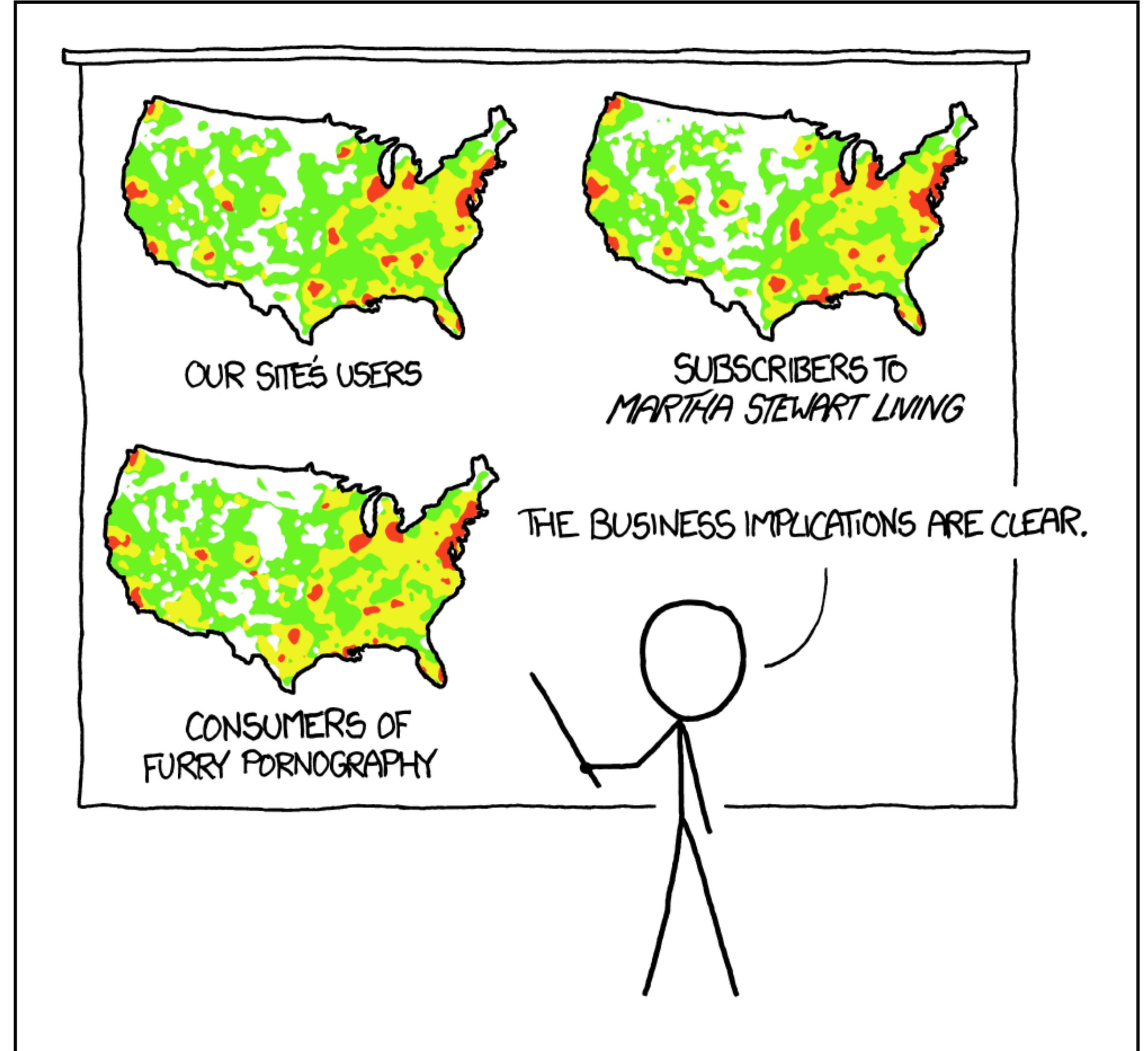
## WHERE WE THROW OUR TRASH

Since the 1950s, trash can has become increasingly common in American speech. Two in three people born in the 1990s would say trash can over garbage can.



Sometimes the boundaries between terms are fuzzier. In **OKLAHOMA**, *soda*, *pop*, and *coke* all mix together. Contrast this with the sharp boundary dividing **MILWAUKEE** *soda* territory from the *pop* country of northern **ILLINOIS**.



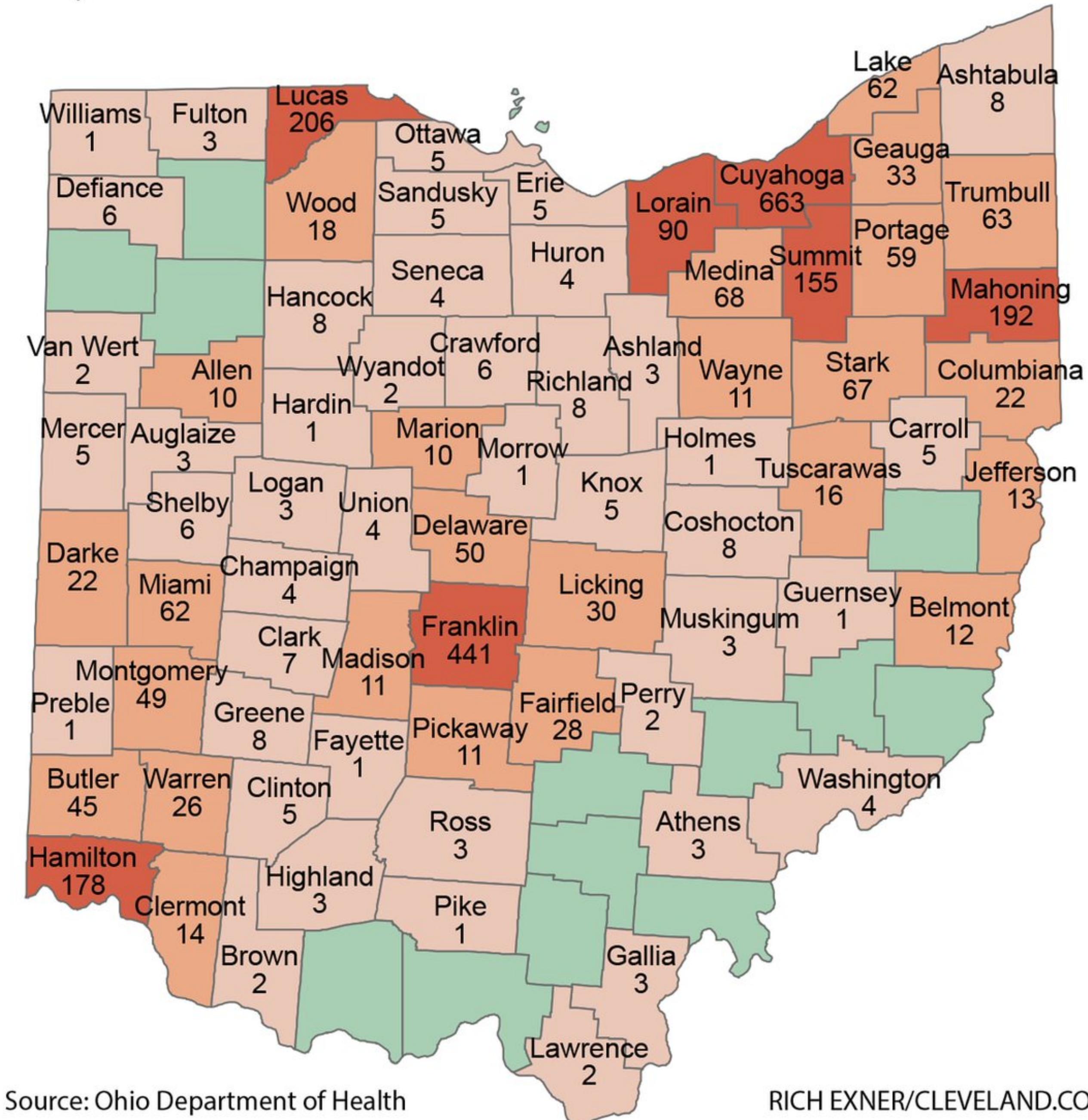


PET PEEVE #208:  
GEOGRAPHIC PROFILE MAPS WHICH ARE  
BASICALLY JUST POPULATION MAPS

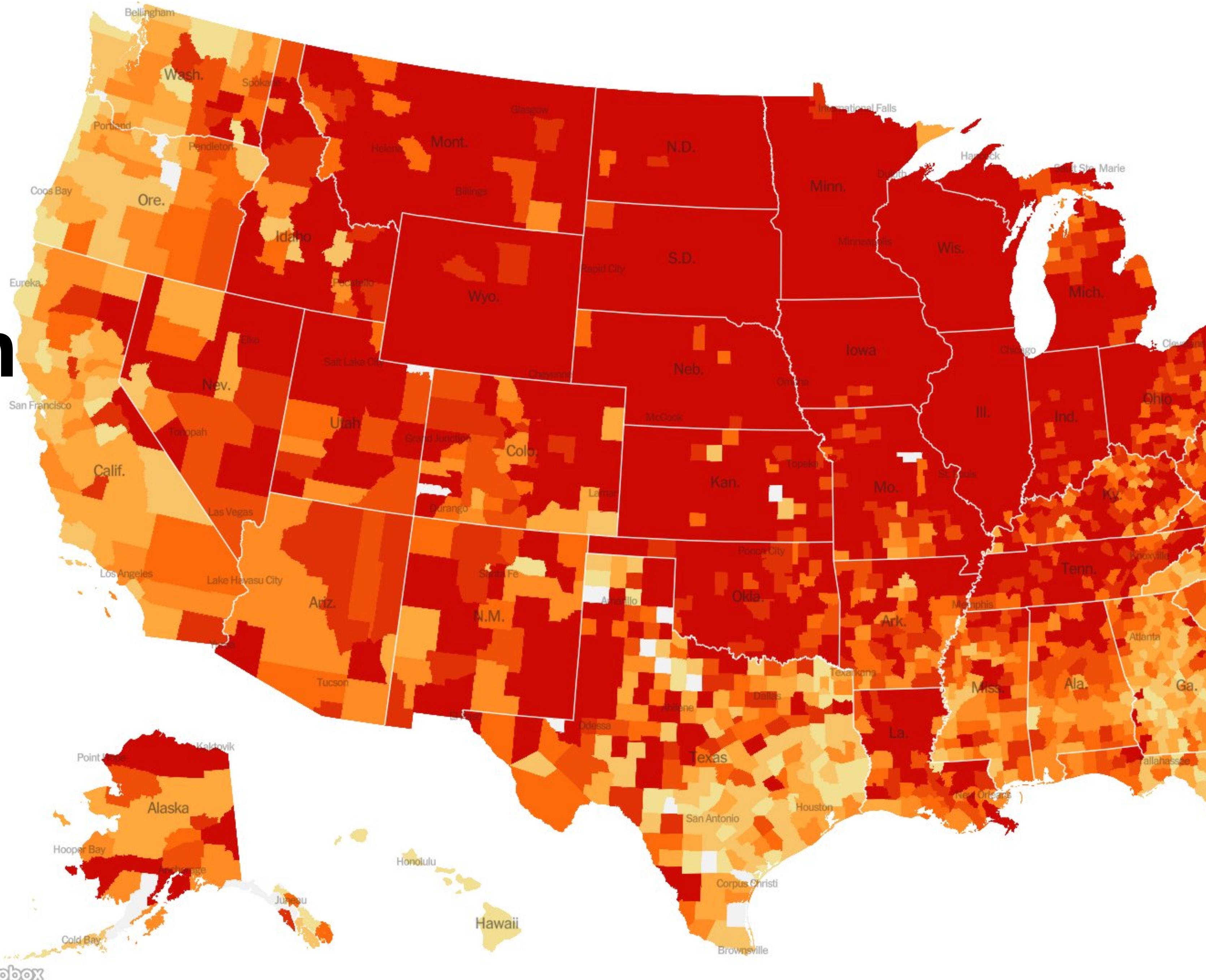
**“all maps of parameter estimates  
are misleading”**  
- Gelman and Price

**2,902 confirmed coronavirus cases**

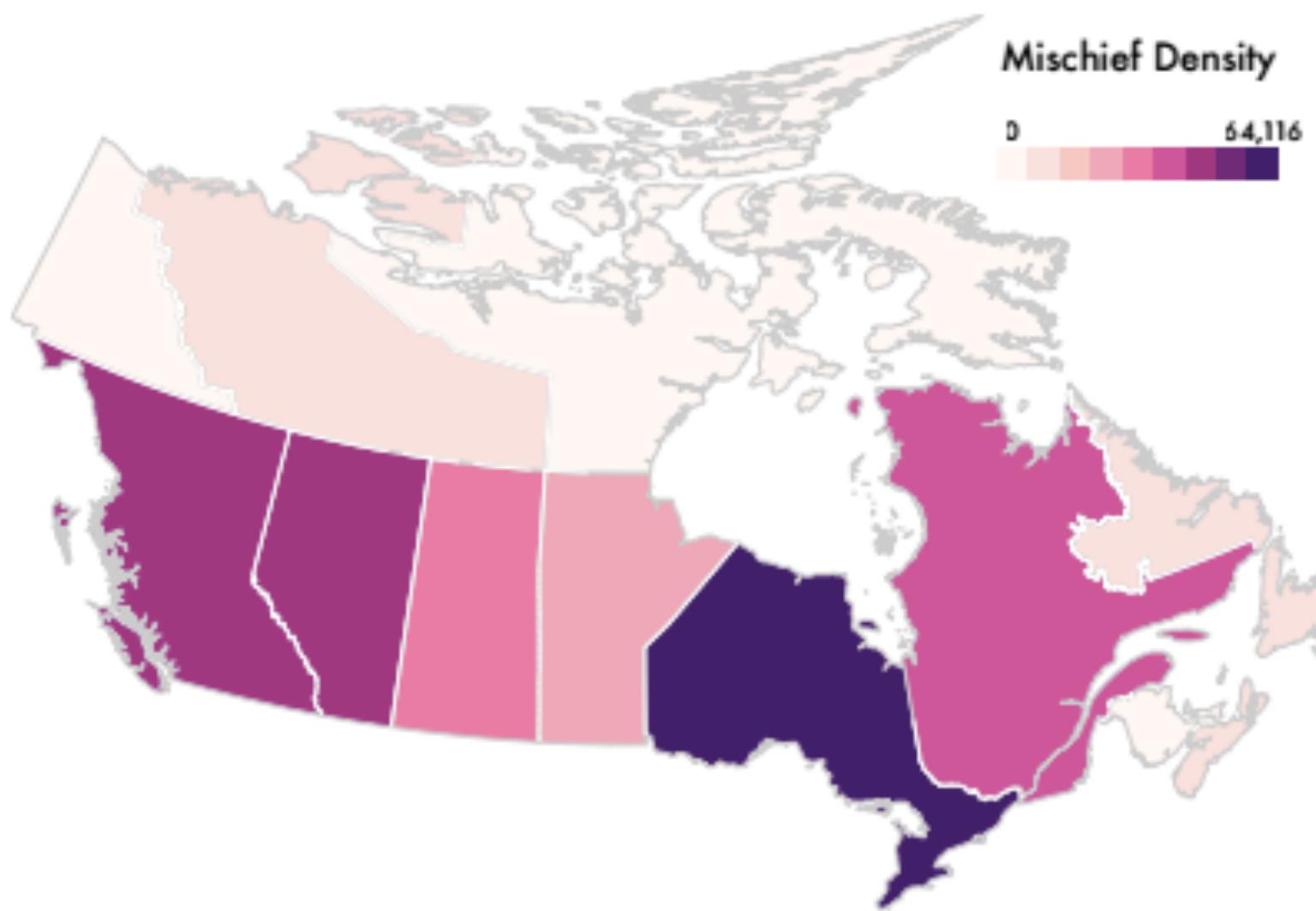
# Showing raw numbers highlights high-population areas



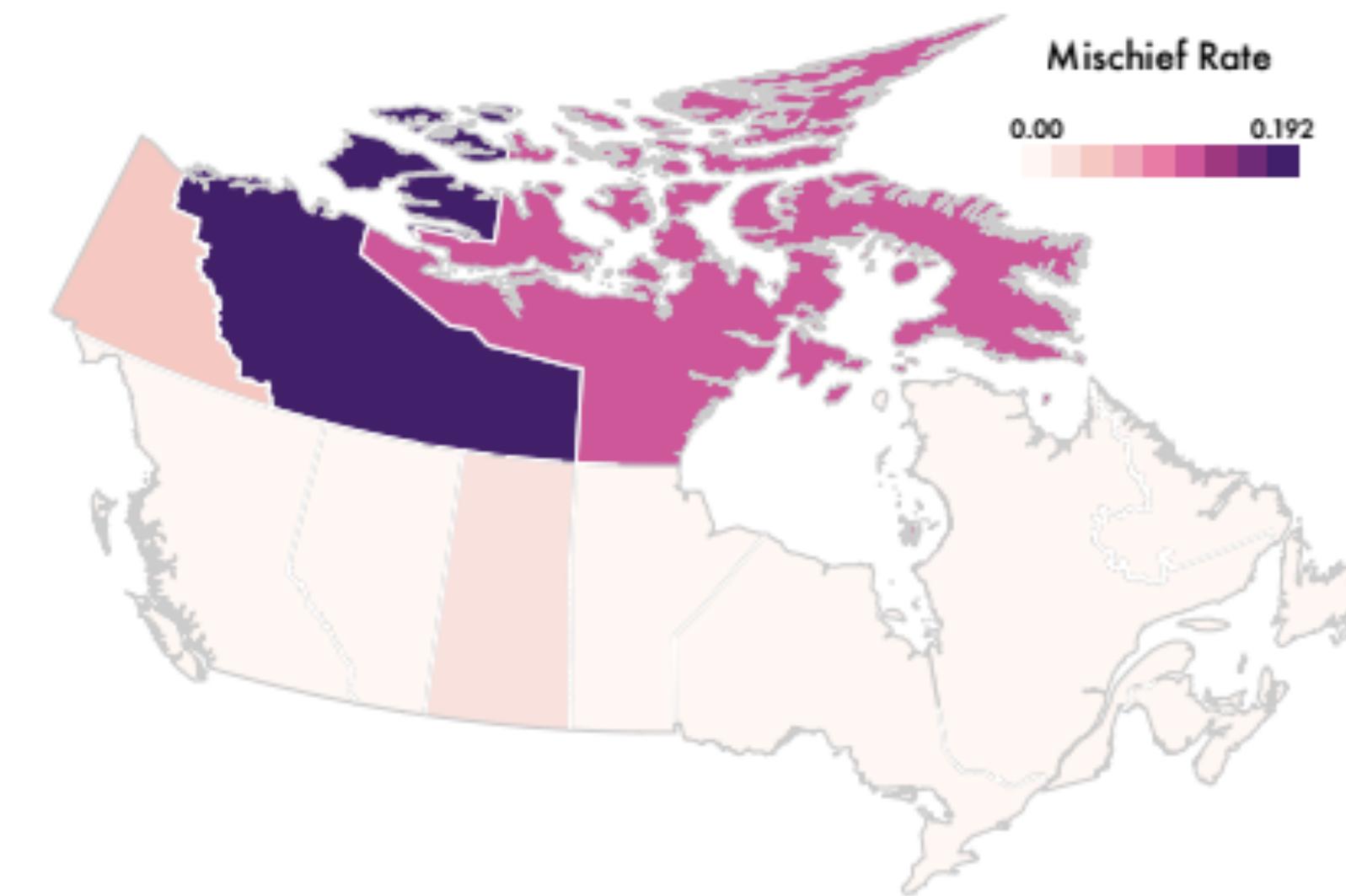
# Showing rates highlights high variability in low-population areas



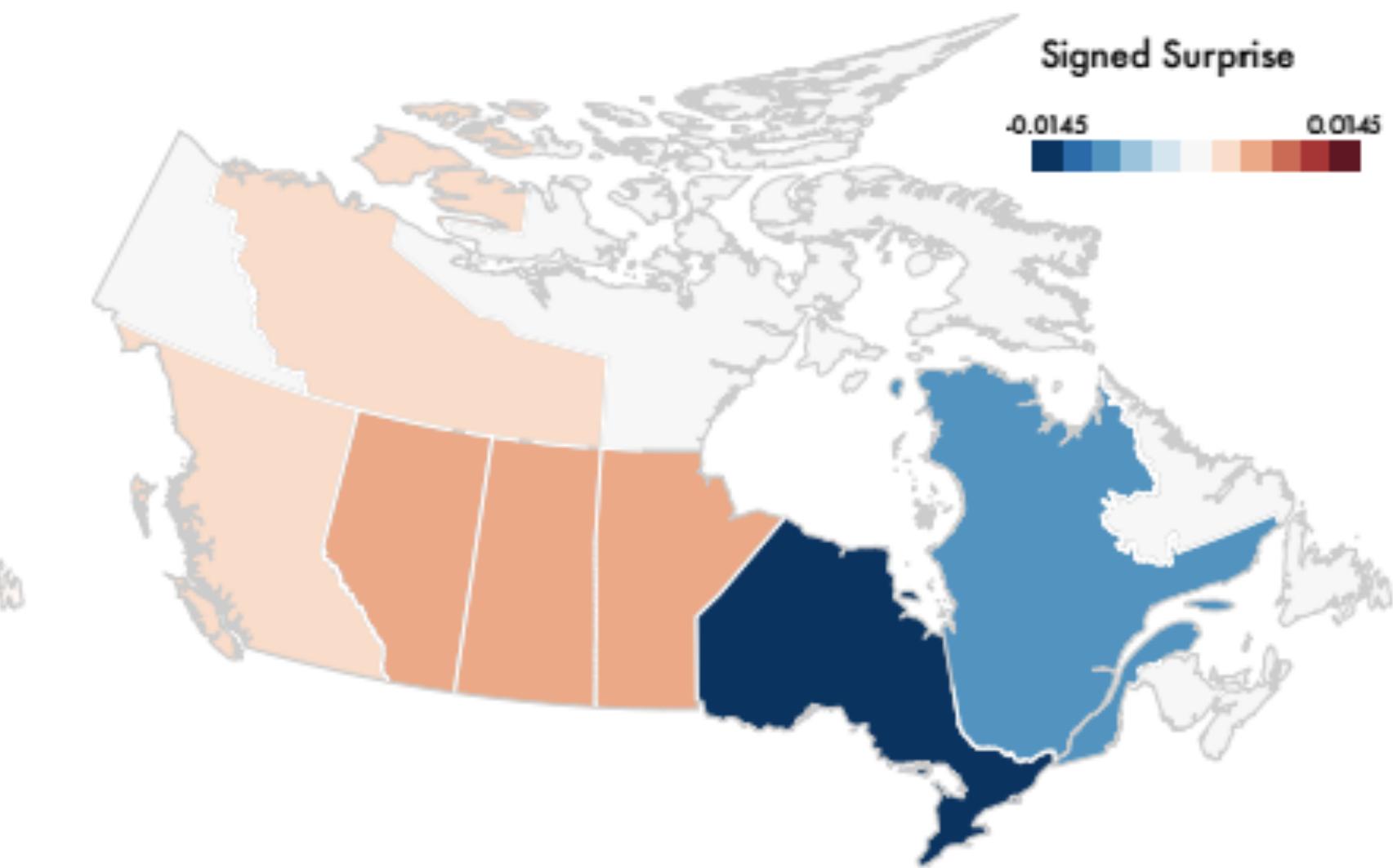
# Surprise! Bayesian Weighting for De-Biasing Thematic Maps.



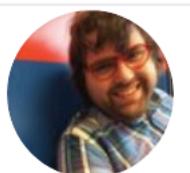
(a) The Event Density of “mischief” in Canada.



(b) The per-capita Event Rate of mischief.



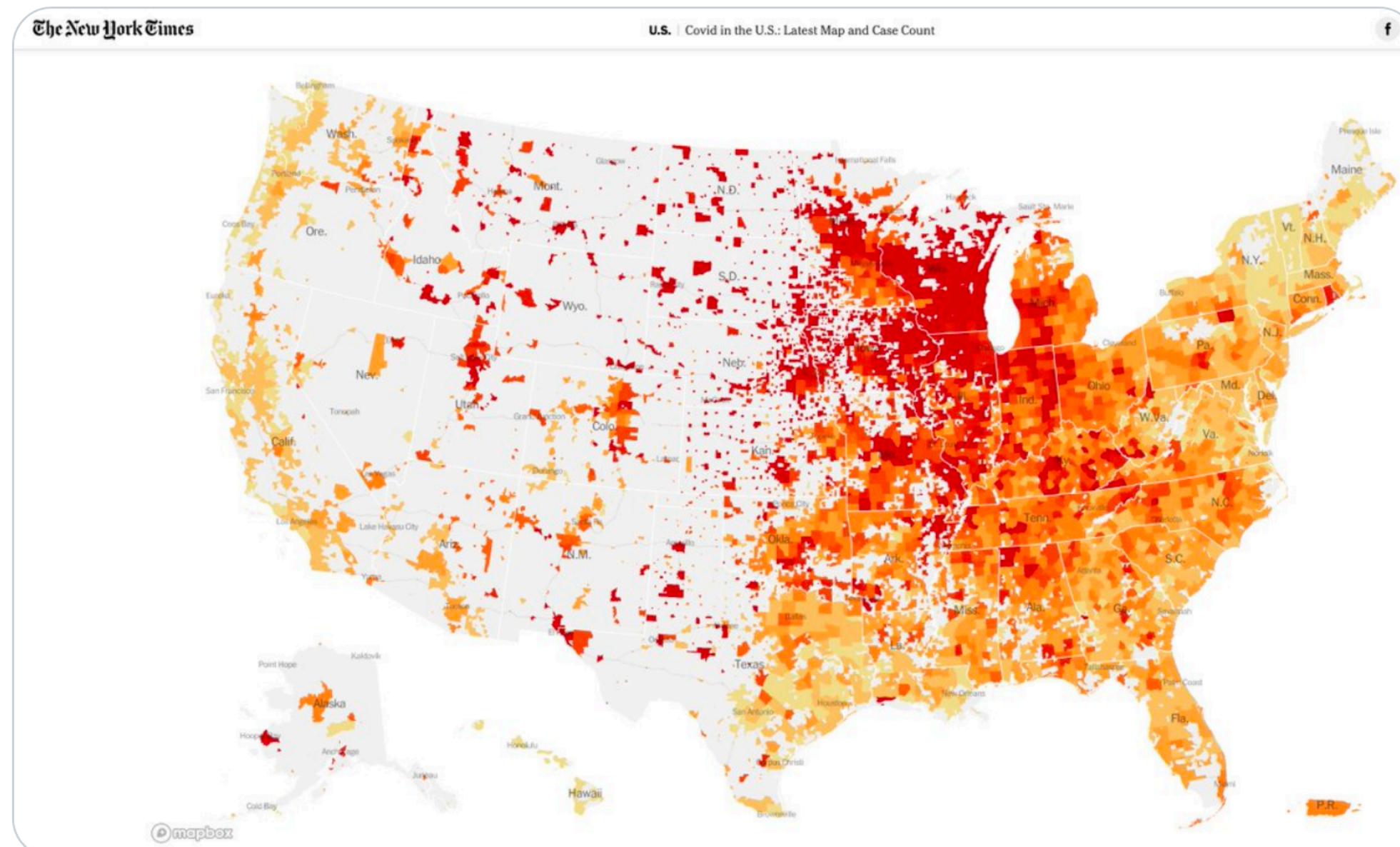
(c) The Surprise Map of mischief.



Ben Lamb  
@bennyfactor

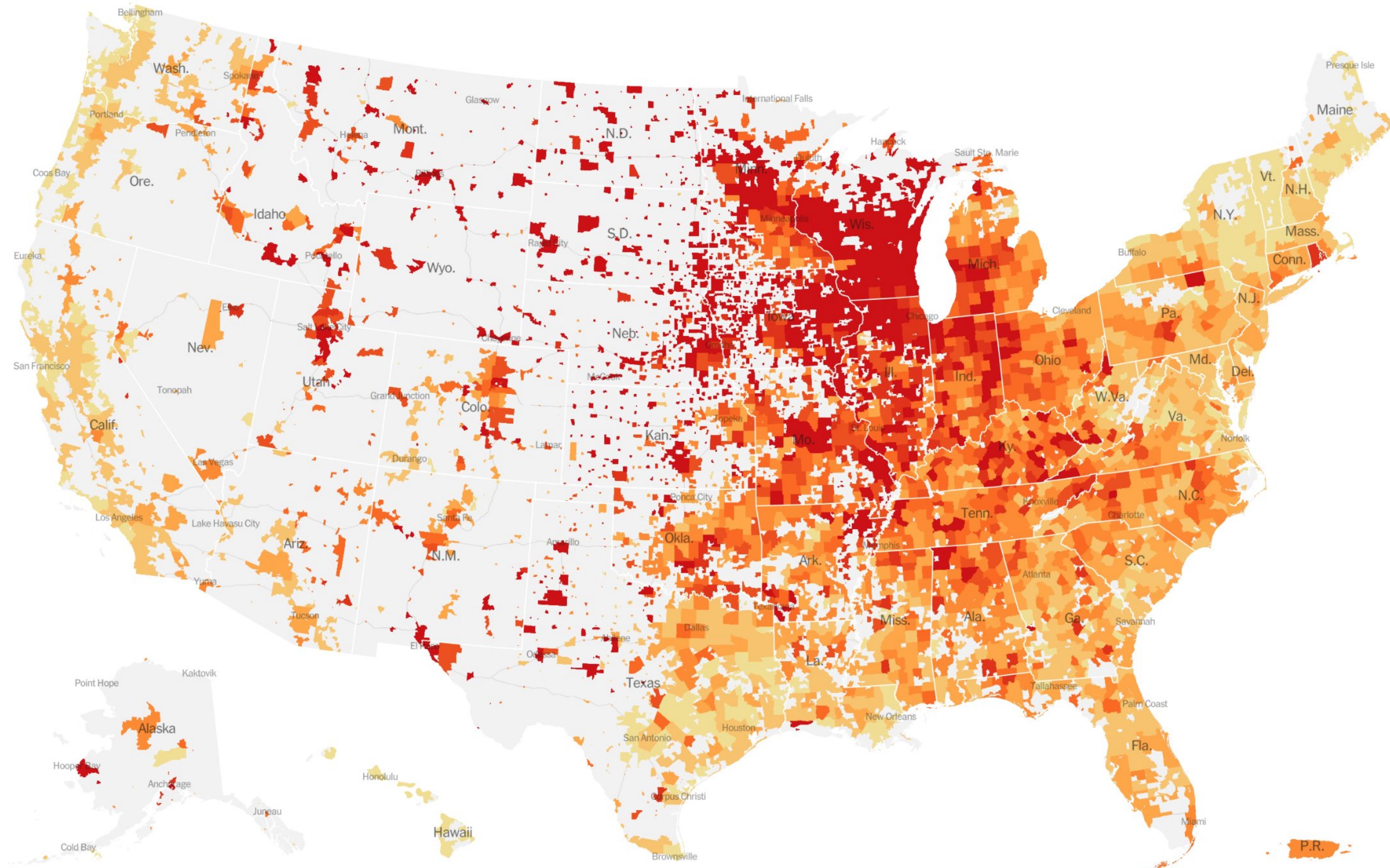
...

While I hate the sheer amount of covid illness this map represents, I think it's really smart what the NYT did here in not coloring in areas where the population density is below 10/sq mile. Gives a vastly more useful understanding of who is sick, where than a usual choropleth

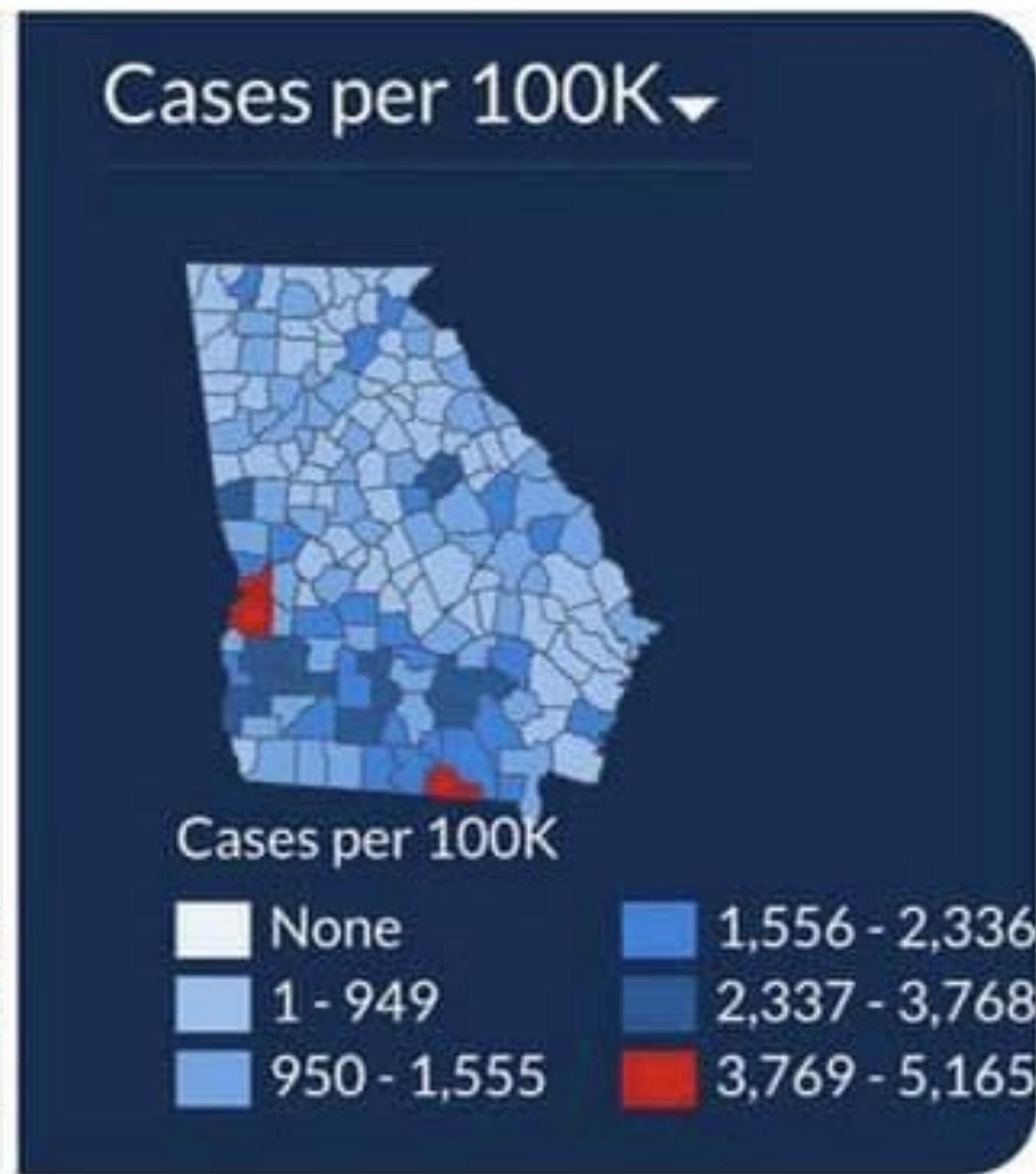
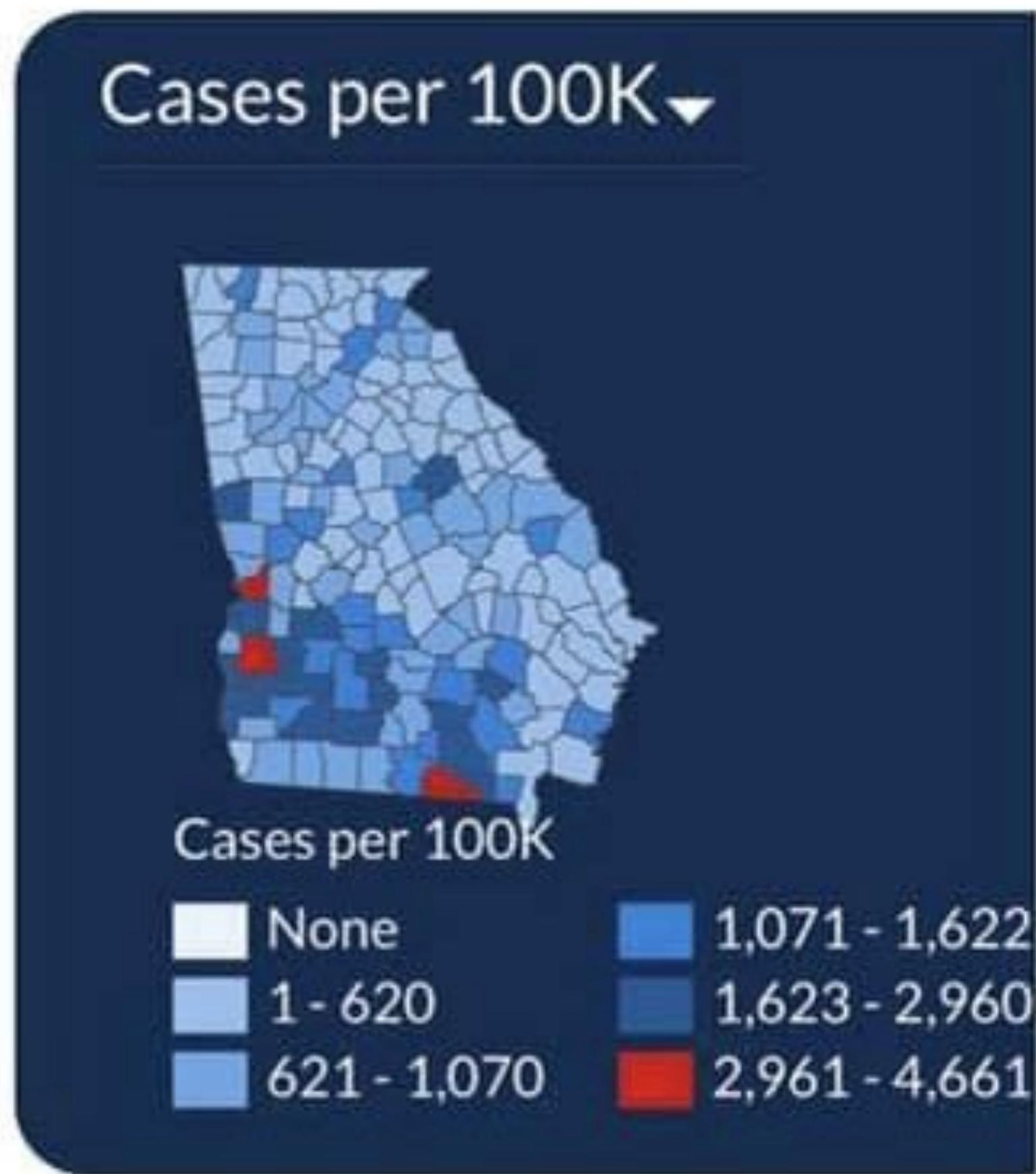


10:22 PM · Nov 4, 2020 · Twitter Web App

2 Retweets 6 Likes

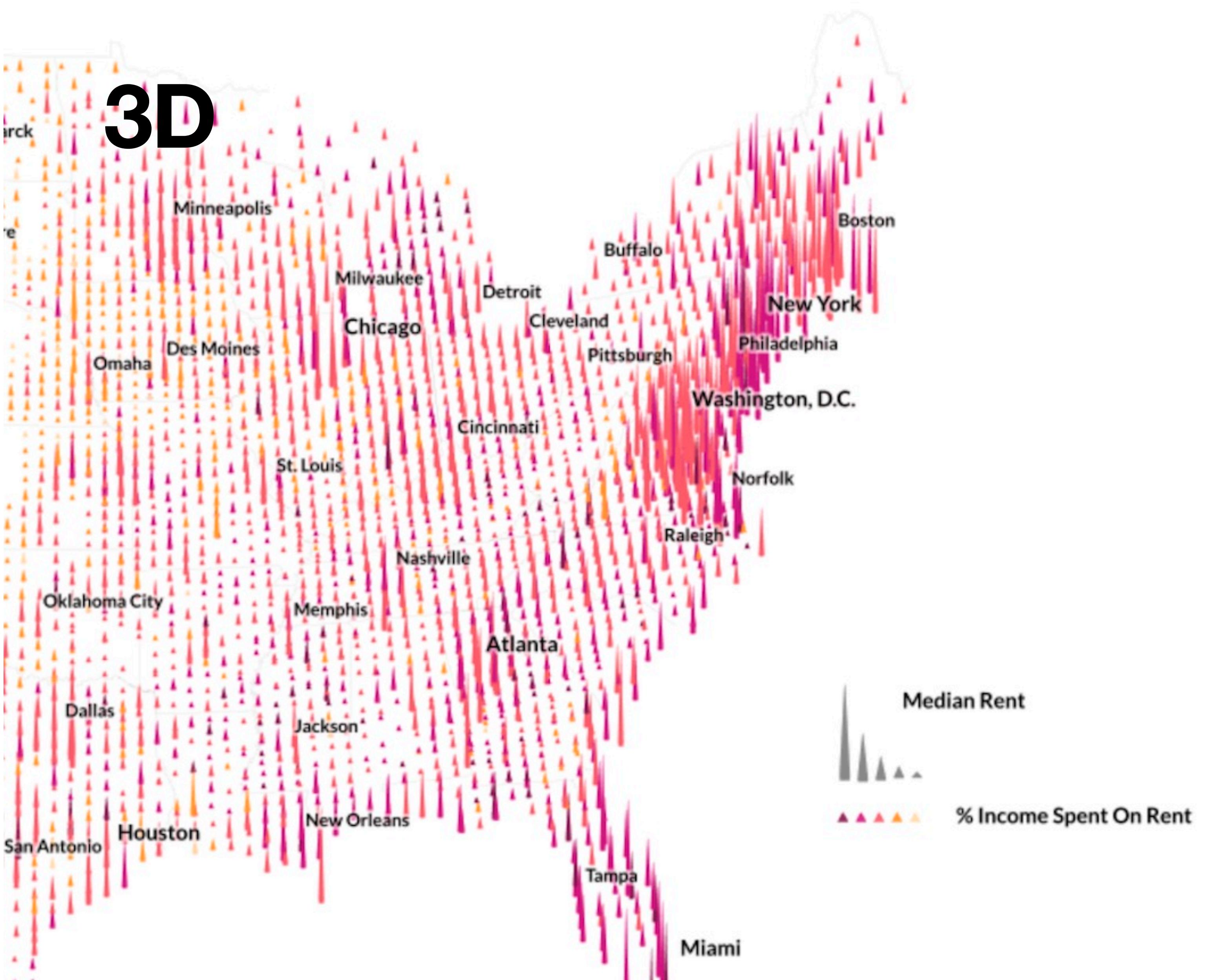


# If things are changing over time, watch the legend



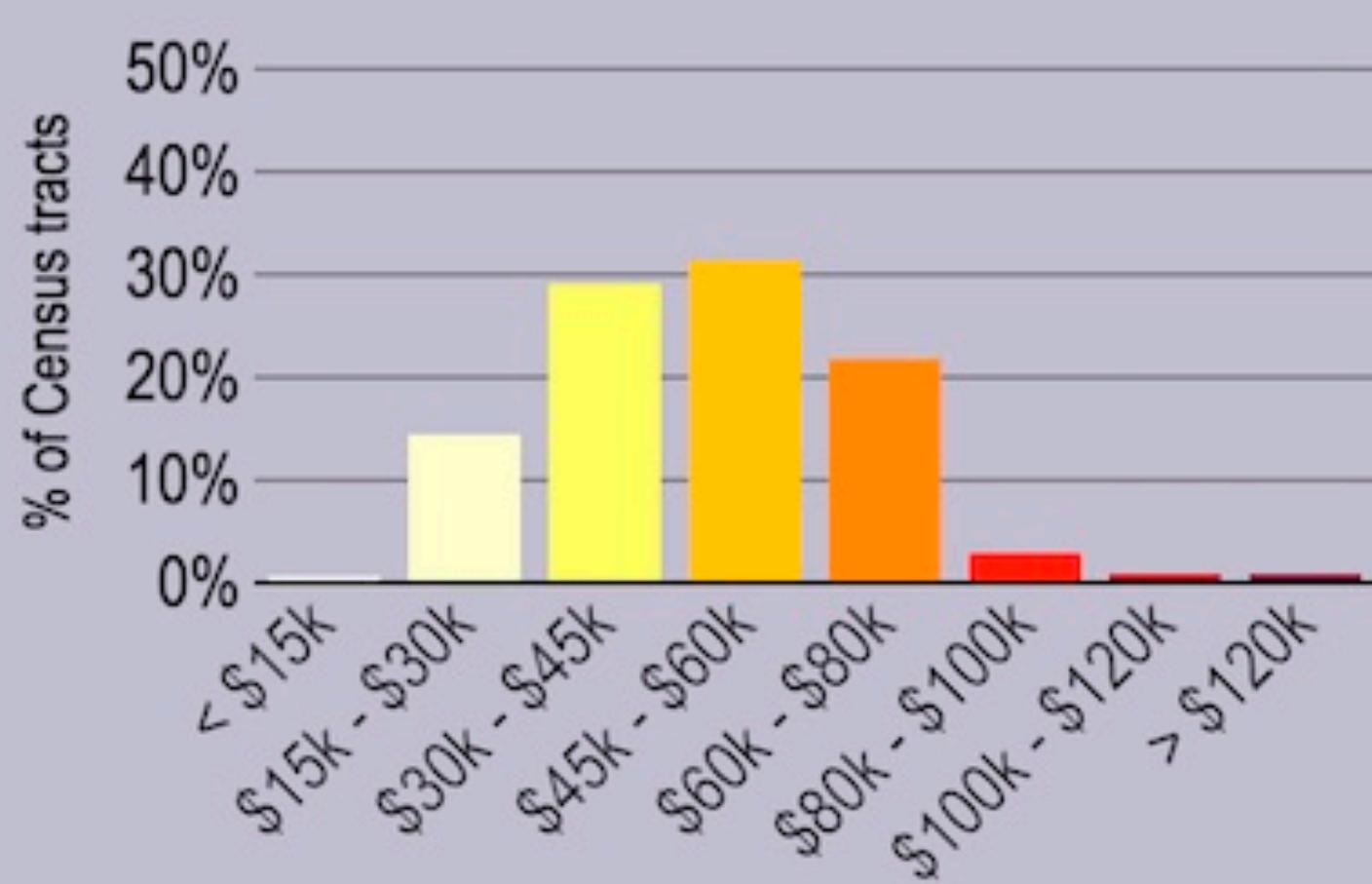
# More variables

# 3D



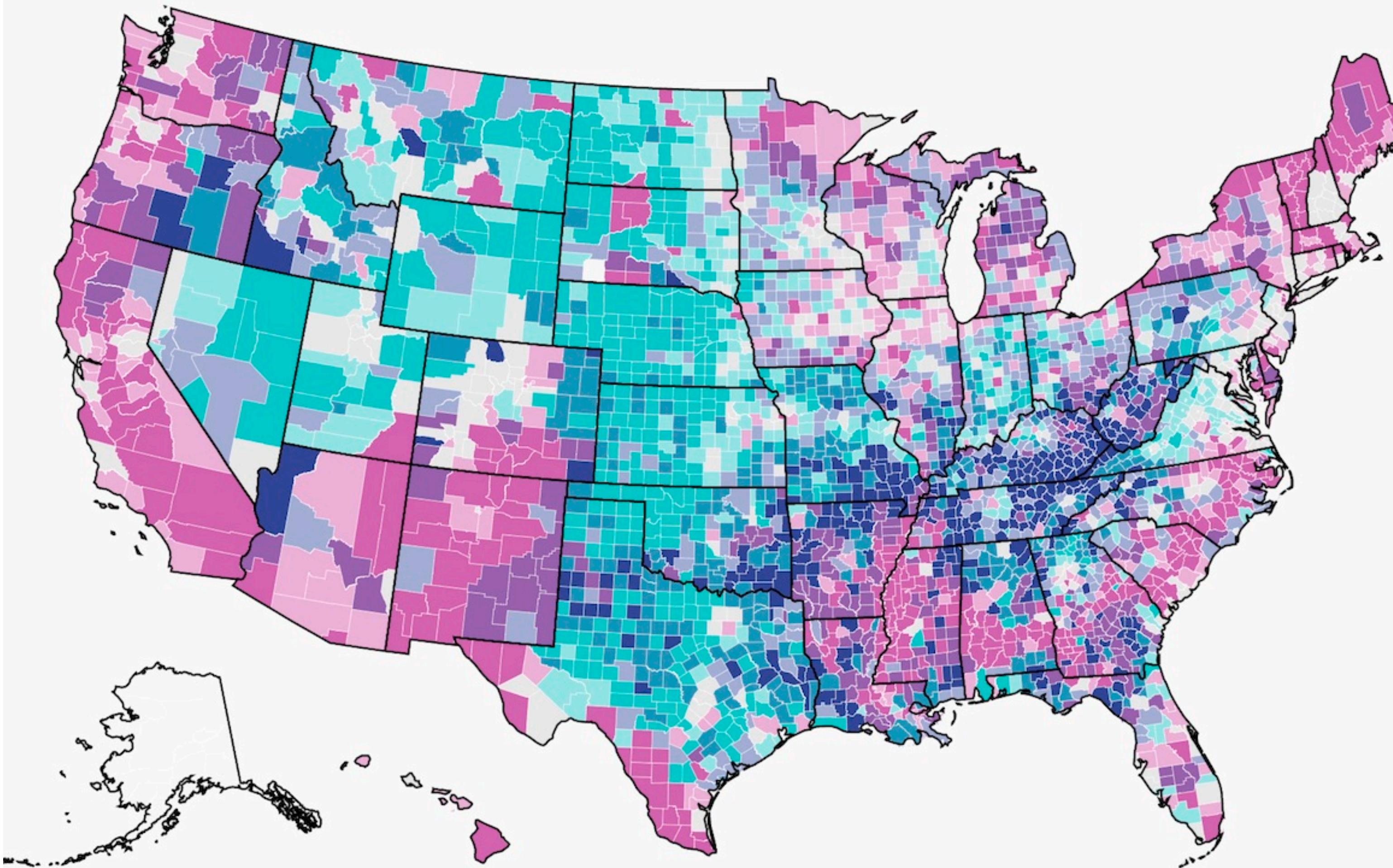
**3D**

**Median Household Income**  
Adjusted for inflation (2017 dollars)



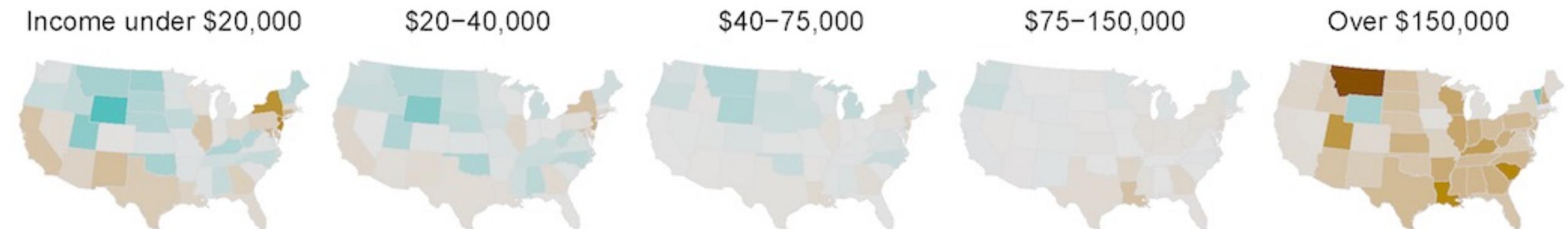
## Where Medicaid cuts would hit Trump supporters hardest

# More colors



# Small multiples

2000: Do you support school vouchers?



All voters

White Catholics

White evangelical  
Protestants

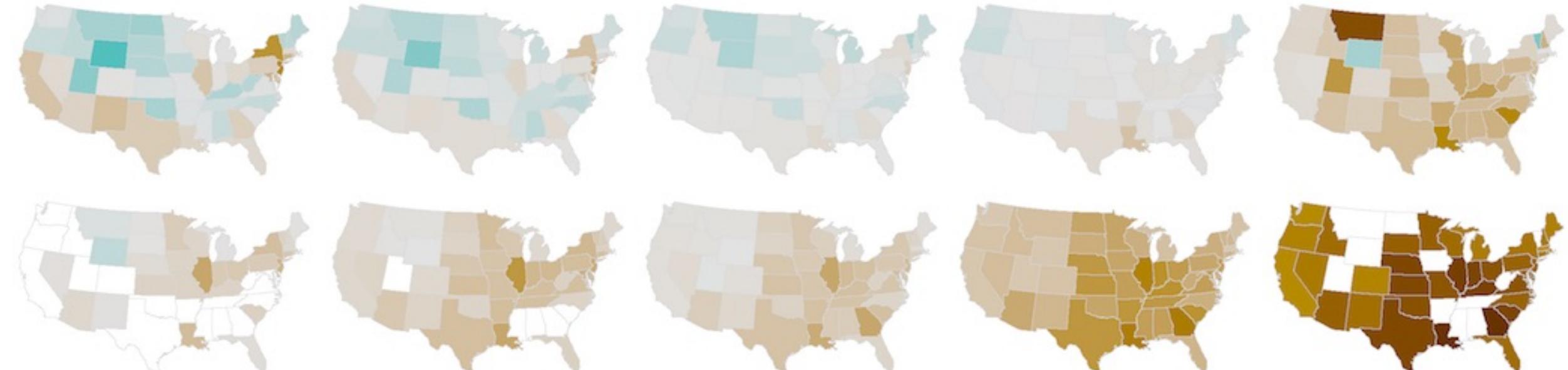
White non-evang.  
Protestants

White other/  
no religion

Blacks

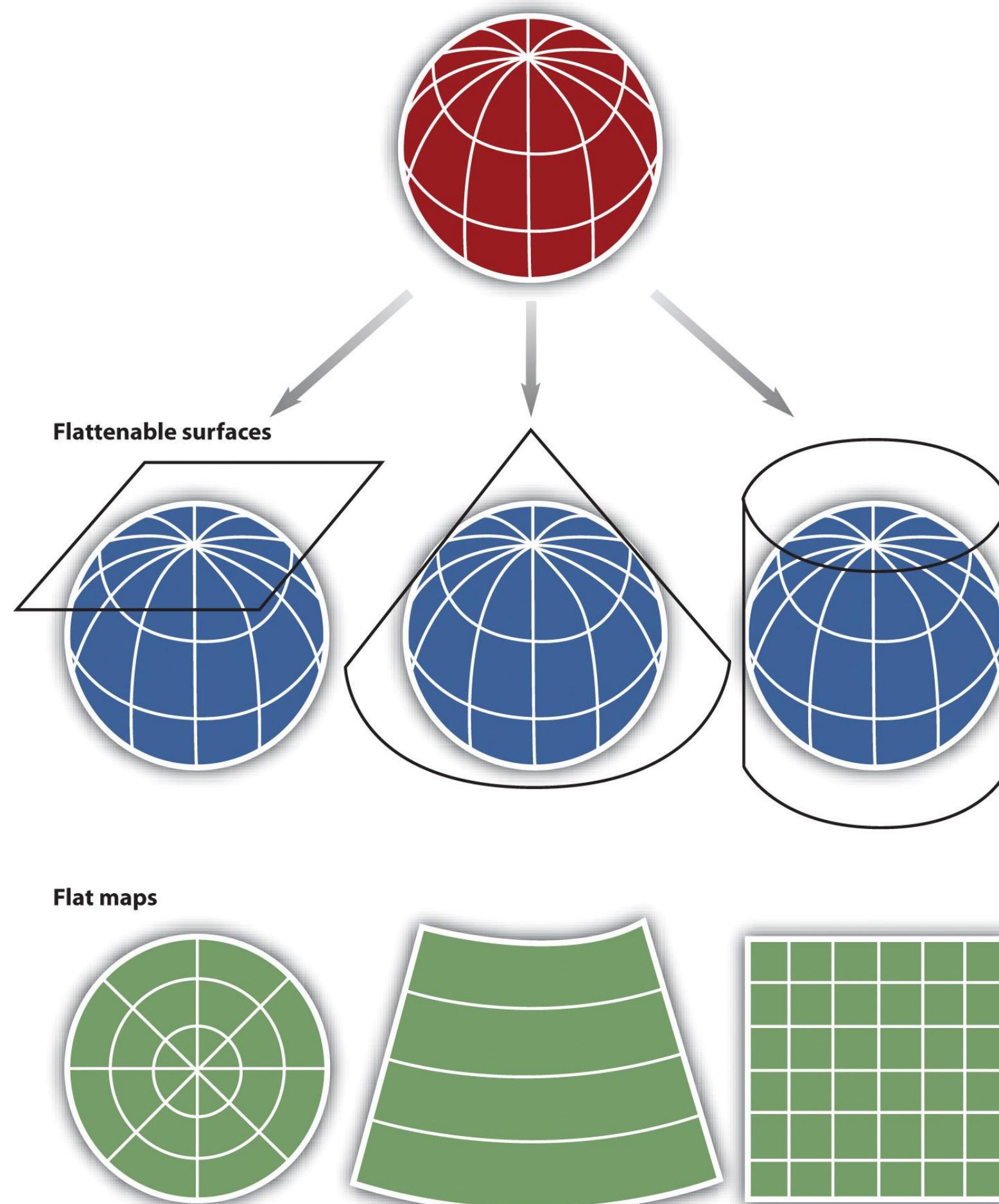
Hispanics

Other races



# Projections

# Map projections



Campbell, J.E., & Shin, M. (2012). Geographic Information System Basics.

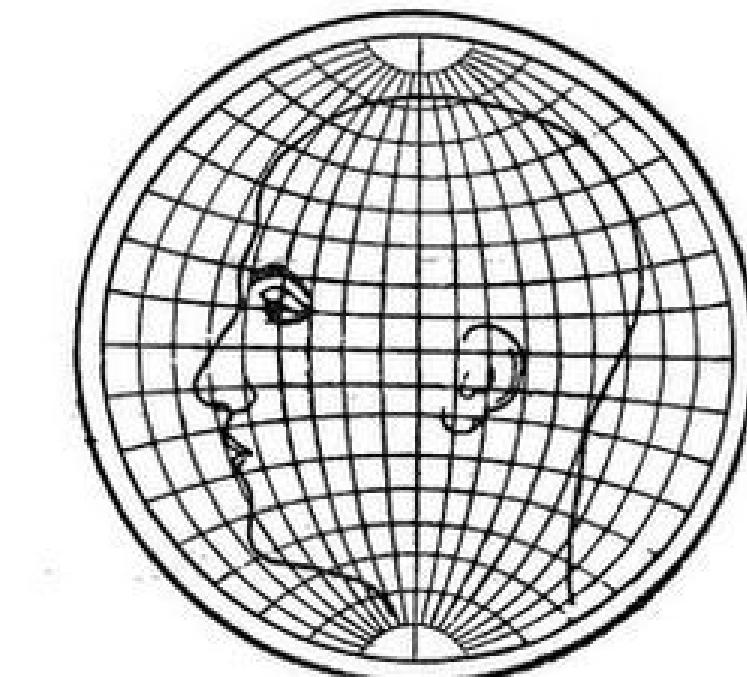


FIG. 42.—Man's head drawn on globular projection.

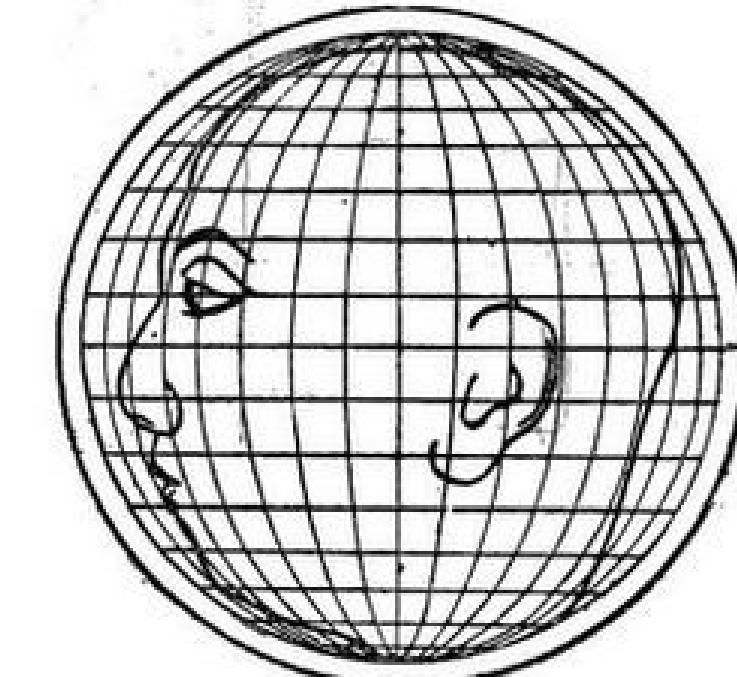


FIG. 43.—Man's head plotted on orthographic projection.

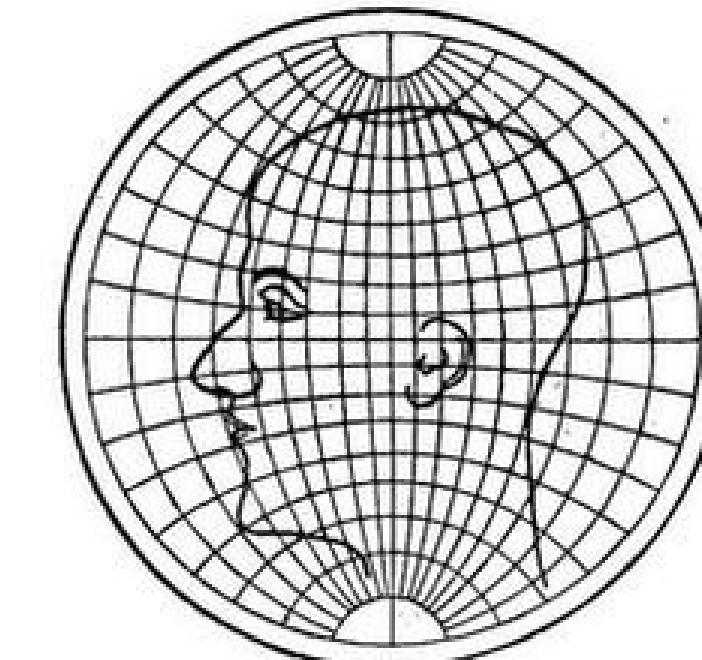


FIG. 44.—Man's head plotted on stereographic projection.

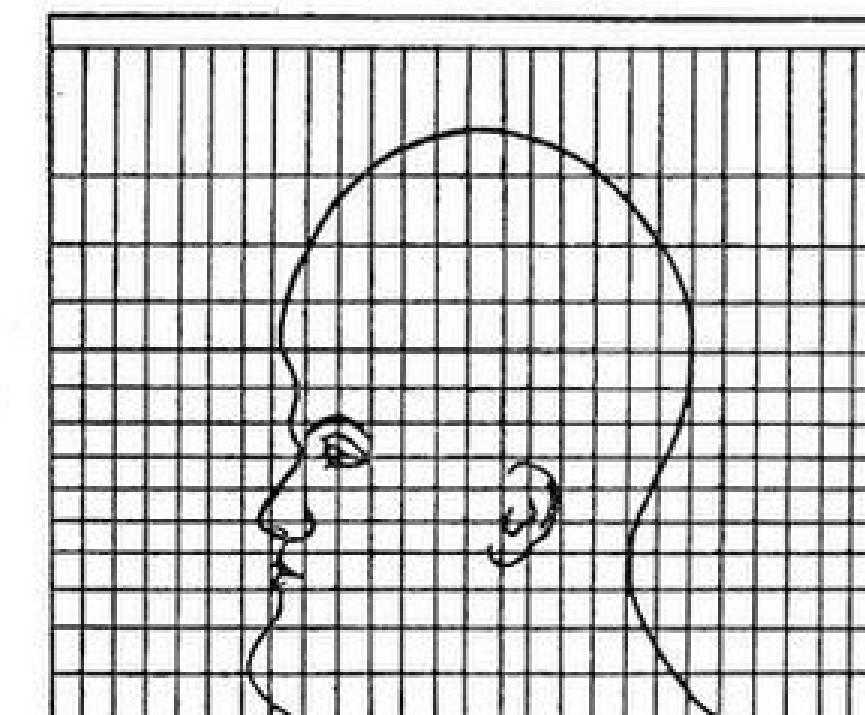
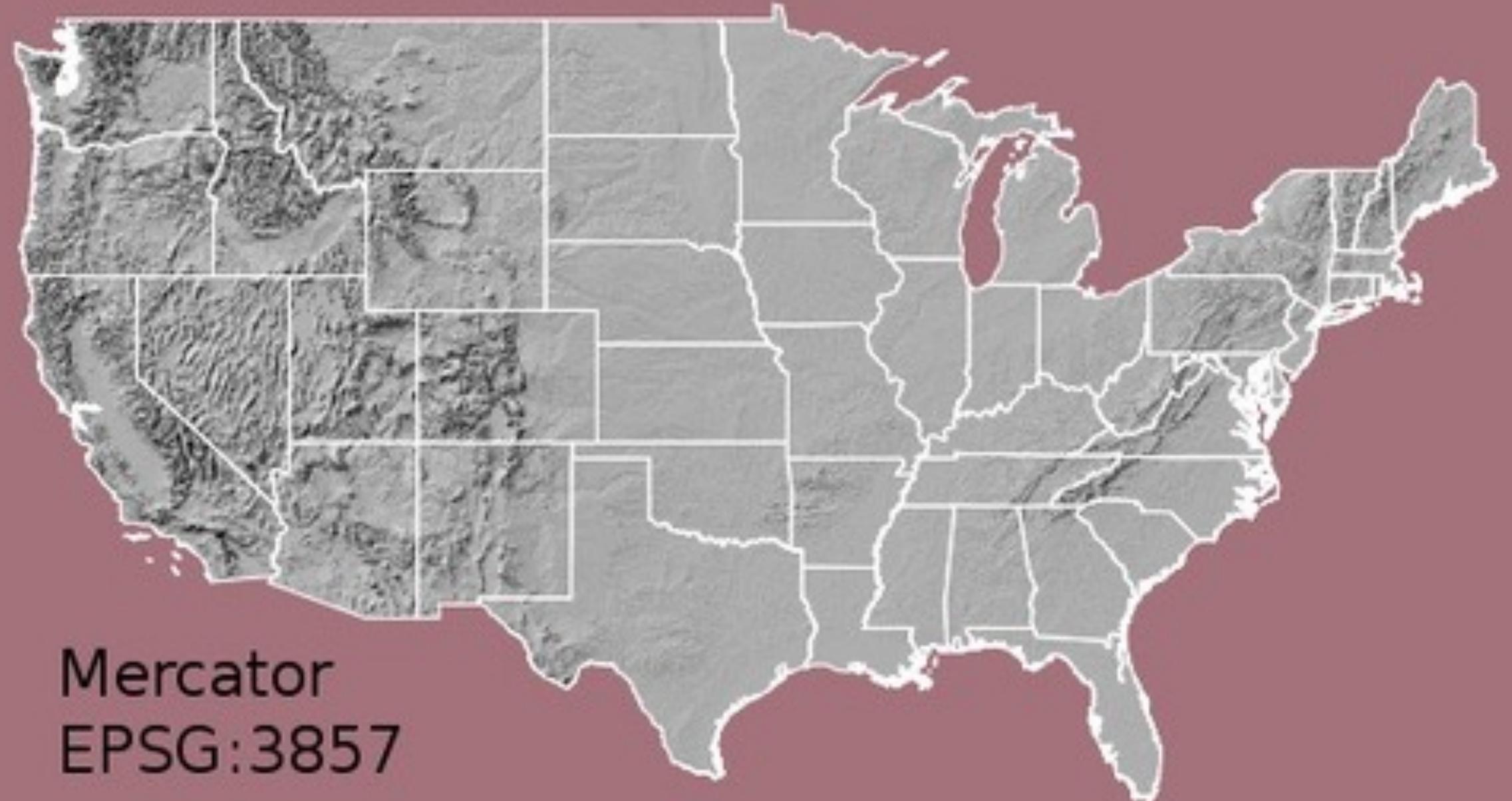
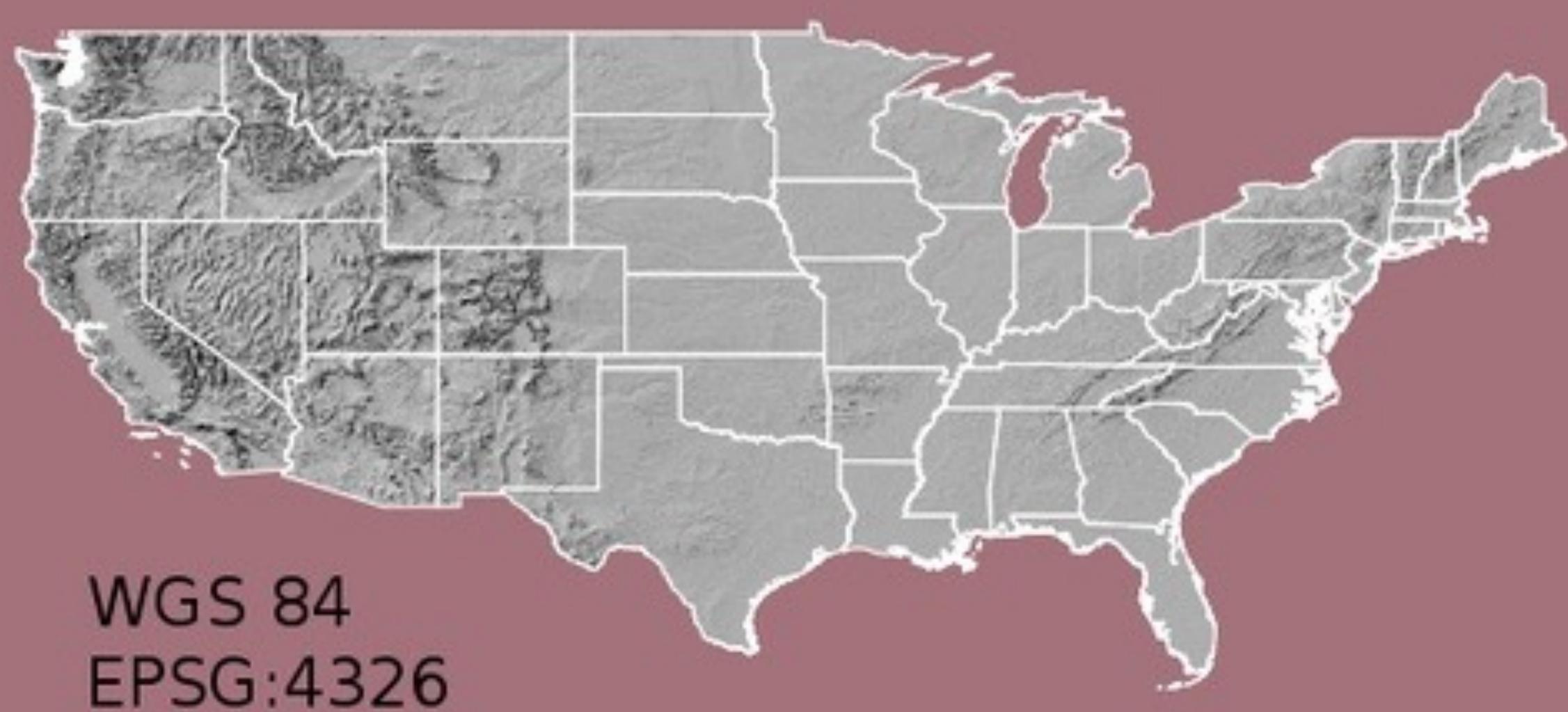


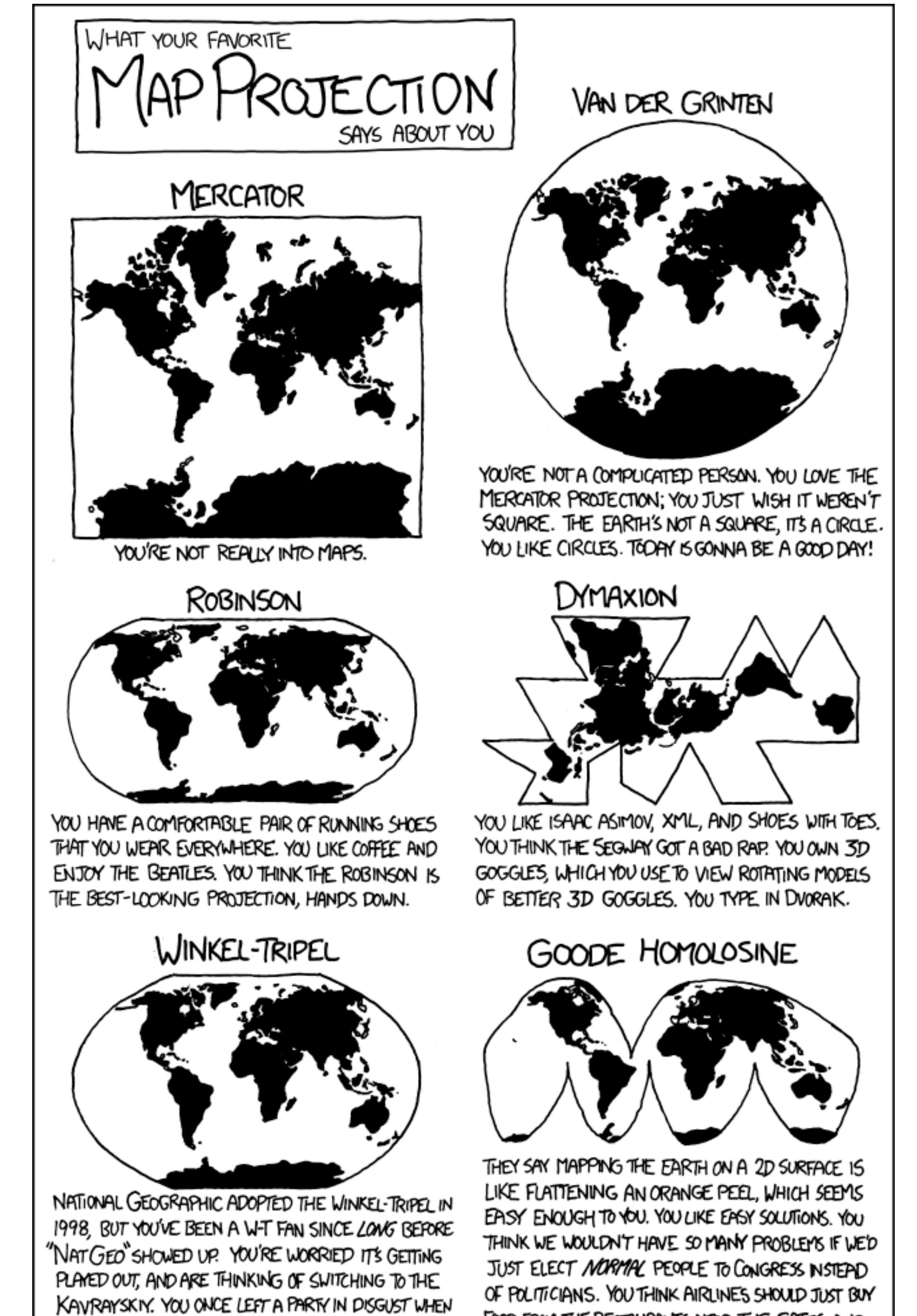
FIG. 45.—Man's head plotted on Mercator projection.

Deetz, C. H., & Adams, O. S. (1921). Elements of map projection with applications to map and chart construction.



UTM Zone 11N  
EPSG:2955





WINKEL-TRIPEL



NATIONAL GEOGRAPHIC ADOPTED THE WINKEL-TRIPEL IN 1998, BUT YOU'VE BEEN A WT FAN SINCE LONG BEFORE "NAT GEO" SHOWED UP. YOU'RE WORRIED IT'S GETTING PLAYED OUT, AND ARE THINKING OF SWITCHING TO THE KAVRAYSKY. YOU ONCE LEFT A PARTY IN DISGUST WHEN A GUEST SHOWED UP WEARING SHOES WITH TOES. YOUR FAVORITE MUSICAL GENRE IS "POST-".

HOBBO-DYER



YOU WANT TO AVOID CULTURAL IMPERIALISM, BUT YOU'VE HEARD BAD THINGS ABOUT GALL-PETERS. YOU'RE CONFLICT-AVERSE AND BUY ORGANIC. YOU USE A RECENTLY-INVENTED SET OF GENDER-NEUTRAL PRONOUNS AND THINK THAT WHAT THE WORLD NEEDS IS A REVOLUTION IN CONSCIOUSNESS.

A GLOBE!



YES, YOU'RE VERY CLEVER.

PEIRCE QUINCUNCIAL



GOODE HOMOLOSIDINE



THEY SAY MAPPING THE EARTH ON A 2D SURFACE IS LIKE FLATTENING AN ORANGE PEEL, WHICH SEEMS EASY ENOUGH TO YOU. YOU LIKE EASY SOLUTIONS. YOU THINK WE WOULDN'T HAVE SO MANY PROBLEMS IF WE'D JUST ELECT NORMAL PEOPLE TO CONGRESS INSTEAD OF POLITICIANS. YOU THINK AIRLINES SHOULD JUST BUY FOOD FROM THE RESTAURANTS NEAR THE GATES AND SERVE THAT ON BOARD. YOU CHANGE YOUR CAR'S OIL, BUT SECRETLY WONDER IF YOU REALLY NEED TO.

PLATE CARRÉE  
(EQUIRECTANGULAR)



YOU THINK THIS ONE IS FINE. YOU LIKE HOW X AND Y MAP TO LATITUDE AND LONGITUDE. THE OTHER PROJECTIONS OVERCOMPLICATE THINGS. YOU WANT ME TO STOP ASKING ABOUT MAPS SO YOU CAN ENJOY DINNER.

WATERMAN BUTTERFLY



REALLY? YOU KNOW THE WATERMAN? HAVE YOU SEEN THE 1909 CAHILL MAP IT'S BASED— ... YOU HAVE A FRAMED REPRODUCTION AT HOME?! WHOA. ... LISTEN, FORGET THESE QUESTIONS. ARE YOU DOING ANYTHING TONIGHT?

GALL-PETERS

A GUEST SHOWED UP WEARING SHOES WITH TOES. YOUR FAVORITE MUSICAL GENRE IS "POST-".

HOBBO-DYER



YOU WANT TO AVOID CULTURAL IMPERIALISM, BUT YOU'VE HEARD BAD THINGS ABOUT GALL-PETERS. YOU'RE CONFLICT-AVERSE AND BUY ORGANIC. YOU USE A RECENTLY-INVENTED SET OF GENDER-NEUTRAL PRONOUNS AND THINK THAT WHAT THE WORLD NEEDS IS A REVOLUTION IN CONSCIOUSNESS.

A GLOBE!



YES, YOU'RE VERY CLEVER.

PEIRCE QUINCUNCIAL



YOU THINK THAT WHEN WE LOOK AT A MAP, WHAT WE REALLY SEE IS OURSELVES. AFTER YOU FIRST SAW INCEPTION, YOU SAT SILENT IN THE THEATER FOR SIX HOURS. IT FREAKS YOU OUT TO REALIZE THAT EVERYONE AROUND YOU HAS A SKELETON INSIDE THEM. YOU HAVE REALLY LOOKED AT YOUR HANDS.

FOOD FROM THE RESTAURANTS NEAR THE GATES AND SERVE THAT ON BOARD. YOU CHANGE YOUR CAR'S OIL, BUT SECRETLY WONDER IF YOU REALLY NEED TO.

PLATE CARRÉE  
(EQUIRECTANGULAR)



YOU THINK THIS ONE IS FINE. YOU LIKE HOW X AND Y MAP TO LATITUDE AND LONGITUDE. THE OTHER PROJECTIONS OVERCOMPLICATE THINGS. YOU WANT ME TO STOP ASKING ABOUT MAPS SO YOU CAN ENJOY DINNER.

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GALL-PETERS



I HATE YOU.

# The True Size of Africa

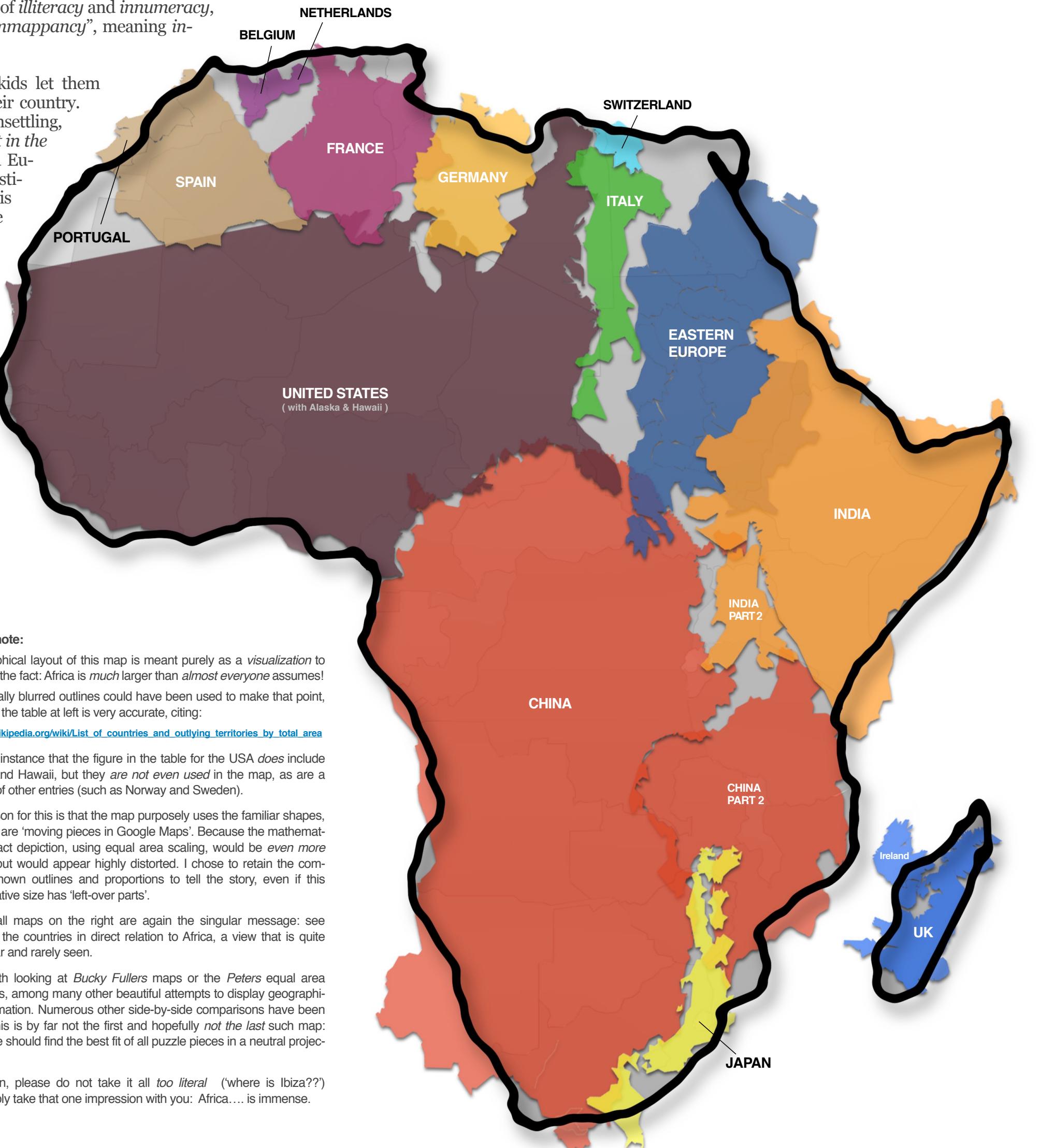
A small contribution in the fight against rampant *Immappancy*, by Kai Krause

In addition to the well known social issues of *illiteracy* and *innumeracy*, there also should be such a concept as "*immappancy*", meaning *in-sufficient geographical knowledge*.

A survey with random American schoolkids let them guess the population and land area of their country. Not entirely unexpected, but still rather unsettling, the majority chose "*1-2 billion*" and "*largest in the world*", respectively. Even with Asian and European college students, geographical estimates were often off by factors of 2-3. This is partly due to the highly distorted nature of the predominantly used mapping projections (such as *Mercator*).

A particularly extreme example is the worldwide misjudgement of the true size of Africa. This single image tries to embody the massive scale, which is larger than the USA, China, India, Japan and all of Europe - combined!

COUNTRY	AREA x 1000 km <sup>2</sup>
USA	9.629
China	9.573
India	3.287
Mexico	1.964
Peru	1.285
France	633
Spain	506
Papua New Guinea	462
Sweden	441
Japan	378
Germany	357
Norway	324
Italy	301
New Zealand	270
United Kingdom	243
Nepal	147
Bangladesh	144
Greece	132
<b>TOTAL</b>	<b>30.102</b>
<b>AFRICA</b>	<b>30.221</b>
Just for Reference: The Surface of the MOON	37.930



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## Top 100 Countries

Area in square kilometers, Percentage of World Total  
Sources: Britannica, Wikipedia, Almanac 2010

	AREA km <sup>2</sup>	%
1	17.098.242	11,50
2	9.984.670	6,70
3	9.596.961	6,40
4	9.629.091	6,40
5	8.514.877	5,70
6	7.692.024	5,20
7	3.287.263	2,30
8	2.780.400	2,00
9	2.724.900	1,80
10	2.505.813	1,70
11	2.381.741	1,60
12	2.344.858	1,60
13	2.166.086	1,50
14	2.149.690	1,40
15	1.964.375	1,30
16	1.860.360	1,30
17	1.759.540	1,20
18	1.628.750	1,10
19	1.564.100	1,10
20	1.285.216	0,86
21	1.284.000	0,86
22	1.267.000	0,85
23	1.246.700	0,85
24	1.240.192	0,83
25	1.221.037	0,82
26	1.141.748	0,76
27	1.104.300	0,74
28	1.098.581	0,74
29	1.025.520	0,69
30	1.002.000	0,67
31	945.087	0,63
32	923.768	0,62
33	912.050	0,61
34	824.116	0,55
35	801.590	0,54
36	796.095	0,53
37	783.562	0,53
38	756.102	0,51
39	752.612	0,51
40	676.578	0,45
41	652.090	0,44
42	637.657	0,43
43	632.834	0,43
44	622.984	0,42
45	603.500	0,41
46	587.041	0,39
47	582.000	0,39
48	580.367	0,39
49	527.968	0,35
50	513.120	0,34
51	505.992	0,34
52	488.100	0,33
53	475.442	0,32
54	462.840	0,31
55	447.400	0,30
56	446.550	0,30
57	441.370	0,30
58	438.317	0,29
59	406.752	0,27
60	390.757	0,26
61	377.930	0,25
62	357.114	0,24
63	342.000	0,23
64	338.419	0,23
65	331.212	0,22
66	330.803	0,22
67	323.802	0,22
68	322.463	0,22
69	312.685	0,21
70	309.500	0,21
71	301.336	0,20
72	300.000	0,20
73	274.222	0,18
74	270.467	0,18
75	267.668	0,18
76	266.000	0,18
77	256.369	0,20
78	245.857	0,17
79	242.900	0,16
80	241.038	0,16
81	238.539	0,16
82	238.391	0,16
83	236.800	0,16
84	214.969	0,14
85	207.600	0,14
86	199.951	0,13
87	196.722	0,13
88	185.180	0,12
89	181.035	0,12
90	176.215	0,12
91	163.820	0,11
92	163.610	0,11
93	147.181	0,10
94	143.998	0,10
95	143.100	0,10
96	131.957	0,09
97	130.373	0,09
98	120.538	0,08
99	118.484	0,08
100	117.600	0,08
TOP 100 TOTAL		132.632.524
89,34		





**Alan McConchie**  
@mappingmashups

...

Even if you're fully vaccinated the CDC still recommends never using a Mercator projection for choropleth maps.

12:34 PM · Apr 13, 2021 · TweetDeck

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51 Retweets 7 Quote Tweets 382 Likes

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# Humanizing maps



**Amelia McNamara**  
@AmeliaMN

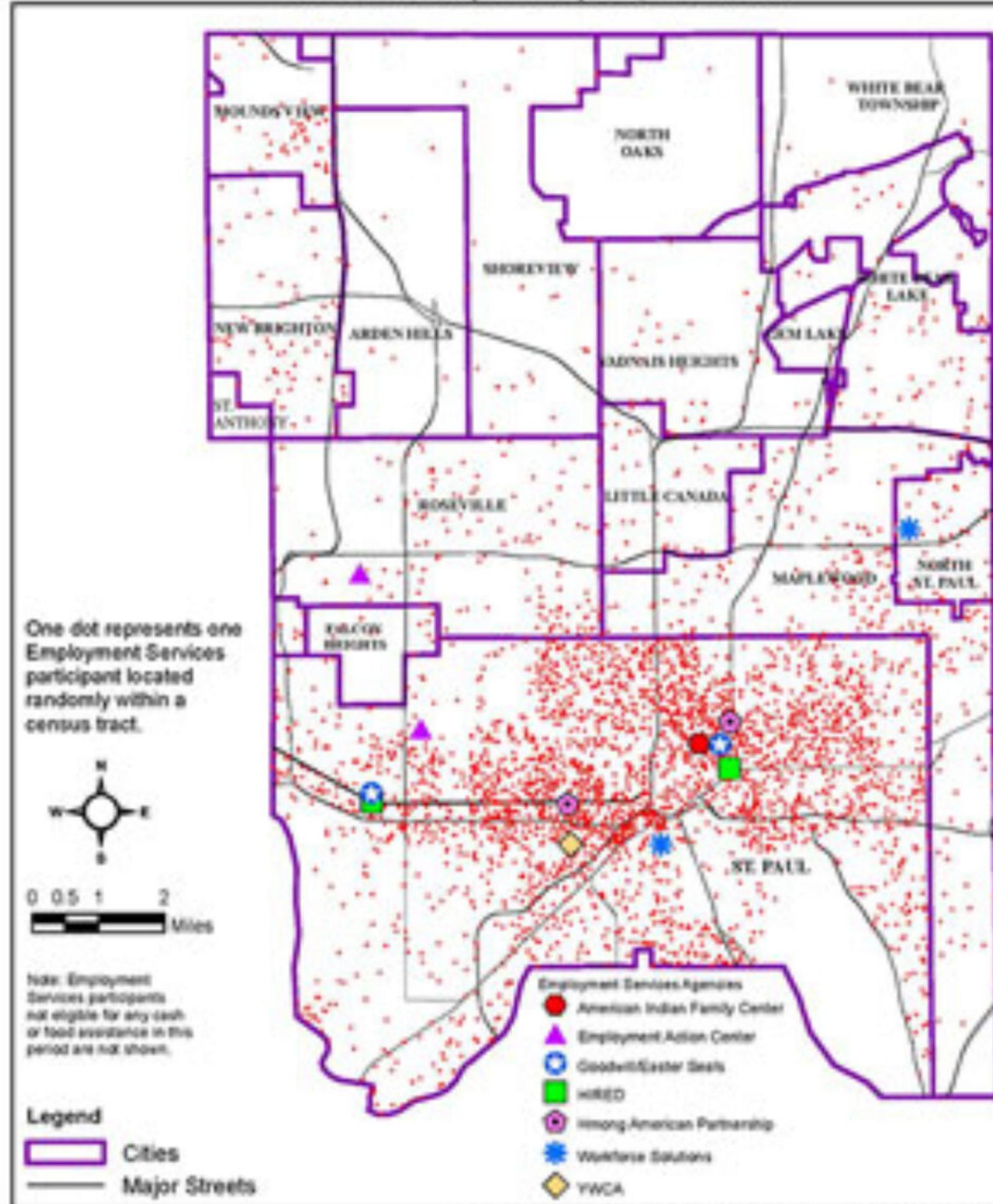
The problem with maps is that the world looks like a map. We don't have that problem with other visualizations. @tmcw #NICAR14

9:15 AM - 28 Feb 2014

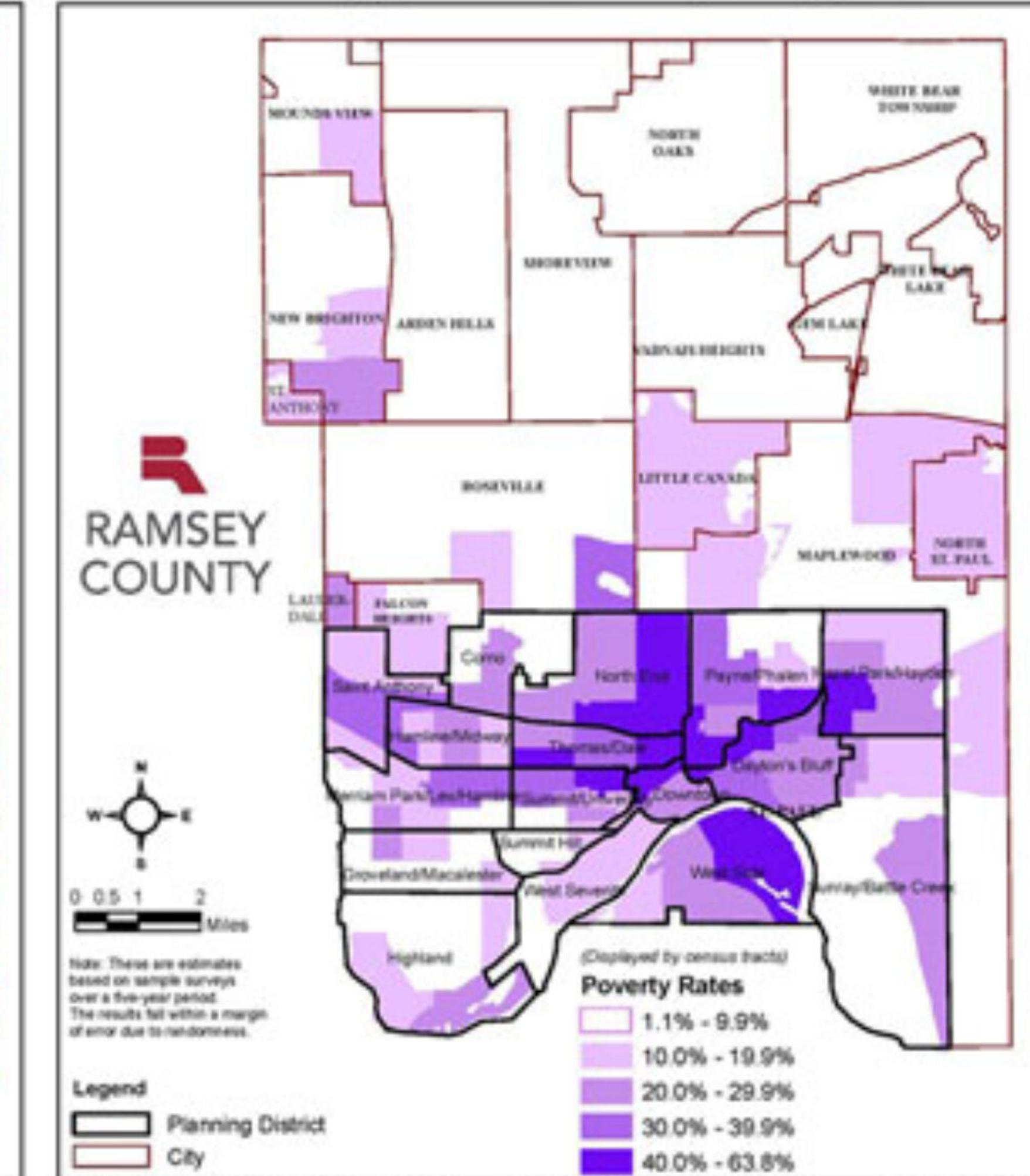




**African American MFIP Participants in Employment Services**  
Active in WF1 any time July 2013 to June 2014



**Estimated Poverty Rates for Individuals,  
2009-2013 Average, American Community Survey, US. Census**



# **Discussion prompt – when should a map not be a map?**