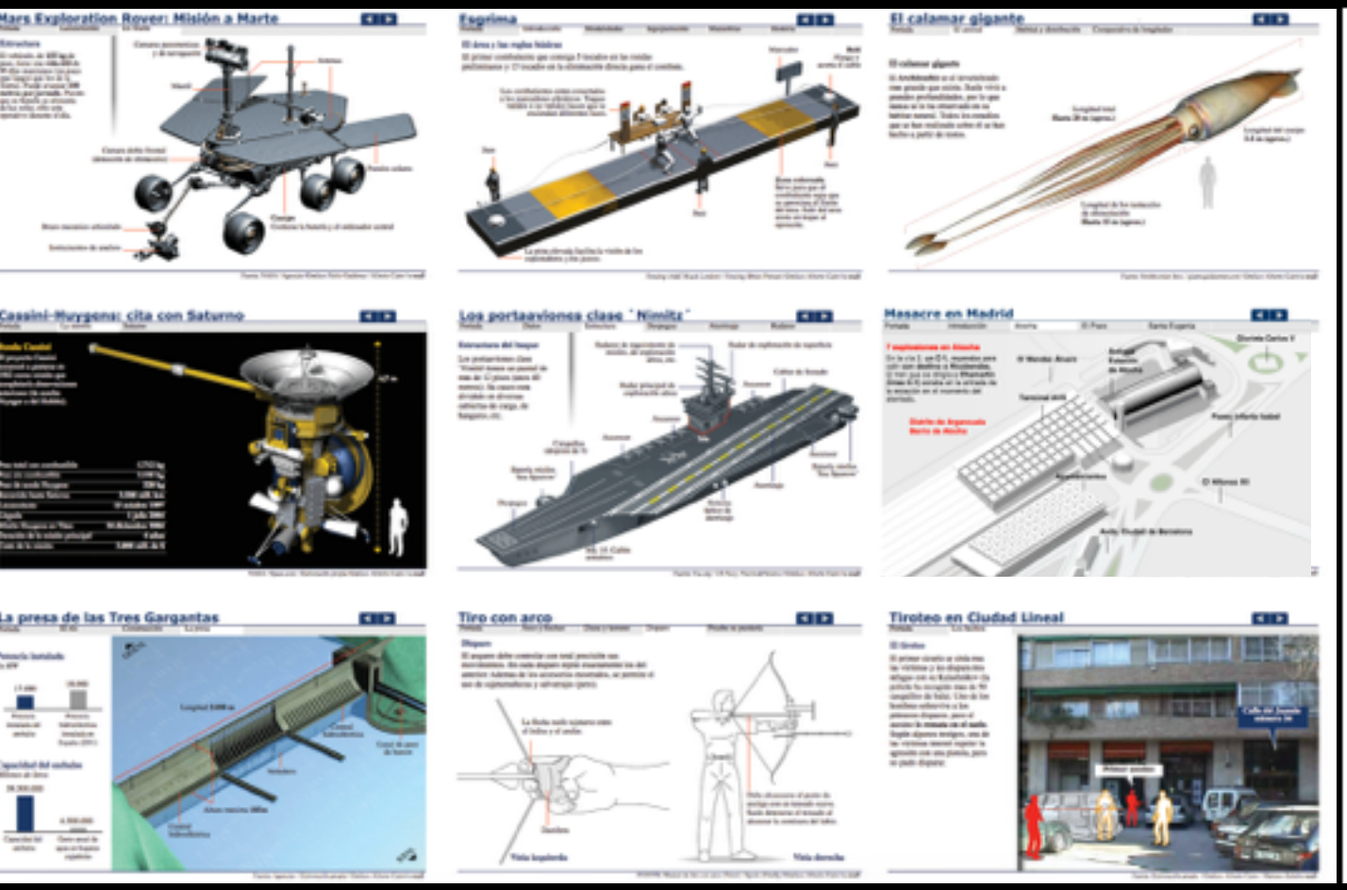
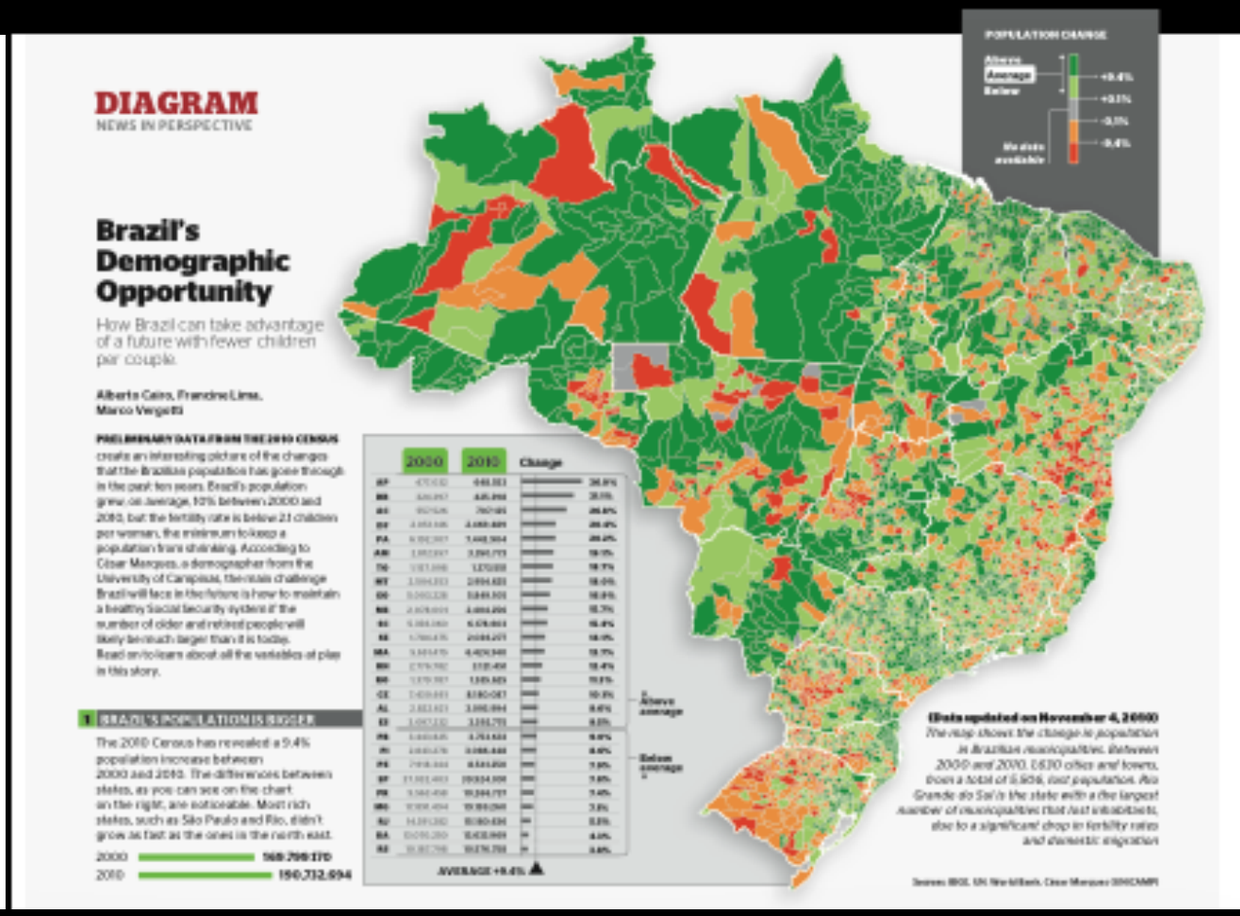
Turning the Tide
New Directions in Health Communication





Designing better
CHARTS & MAPS

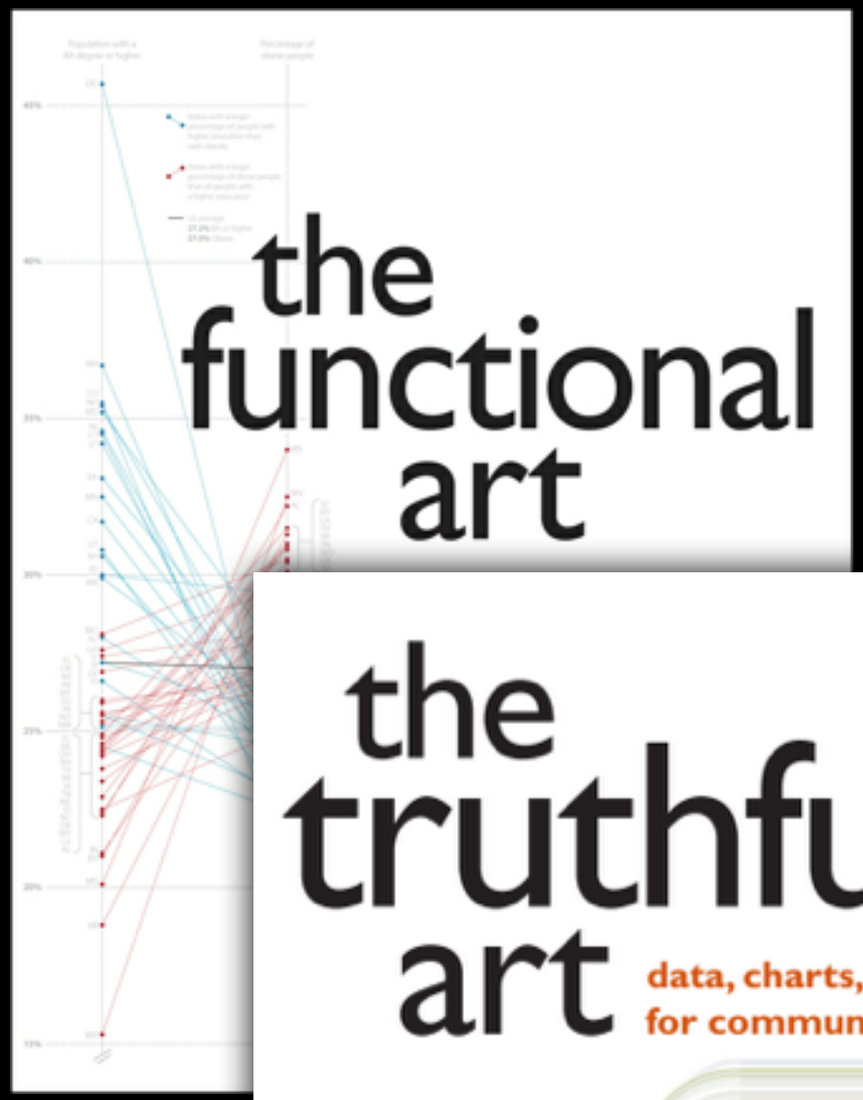
Alberto Cairo, School of Communication, University of Miami

Hi #TurningTheTide, here are the slides I used today:
https://www.dropbox.com/s/l3fhh1szr6bcvrp/ColumbiaTurningTheTide.pdf?dl=0

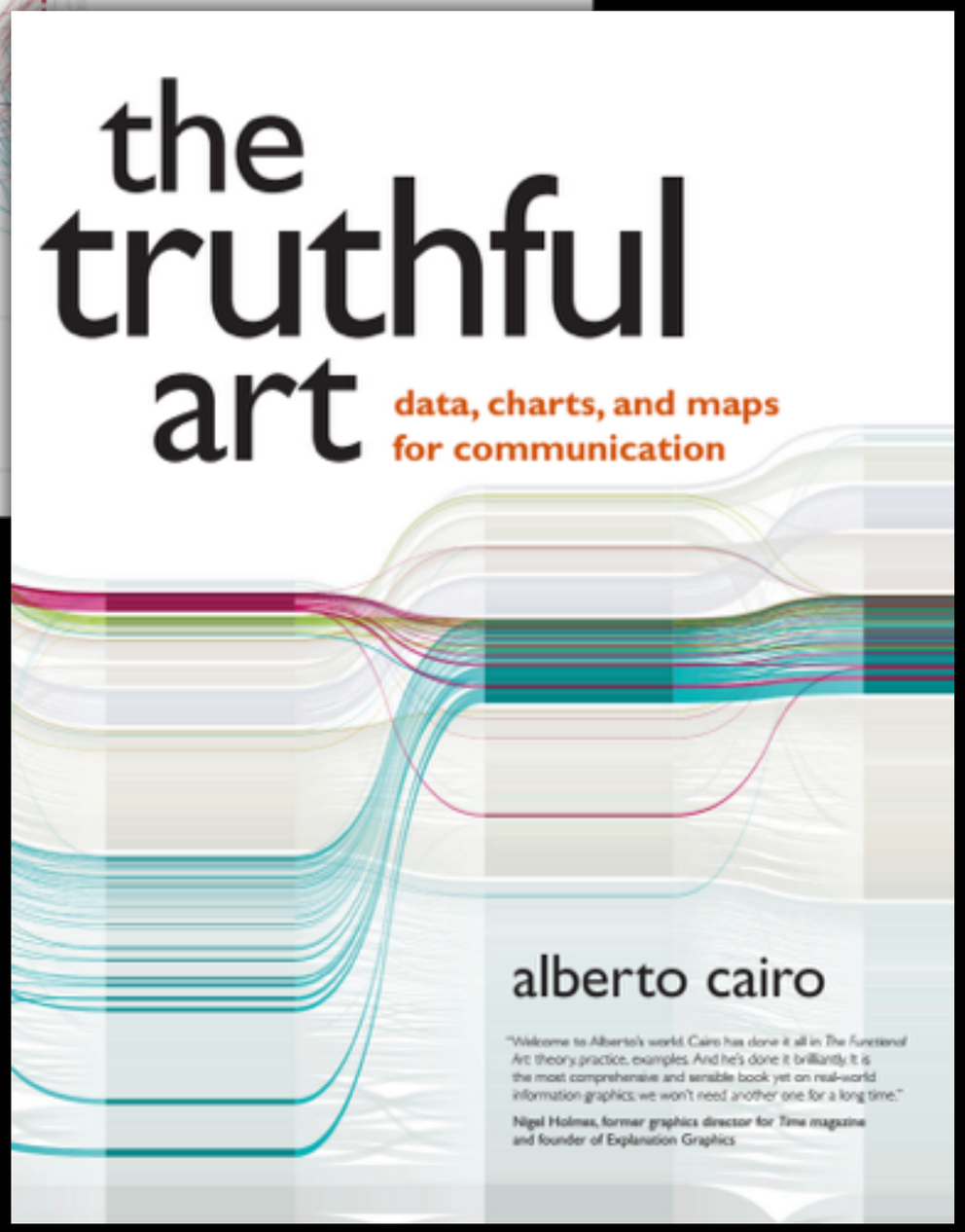
Who's in this photo?

GIF

Tweet



2012



2016

A visualization is a representation designed to enable **exploration**, **discovery**, or **communication**

Try to extract useful information from this:

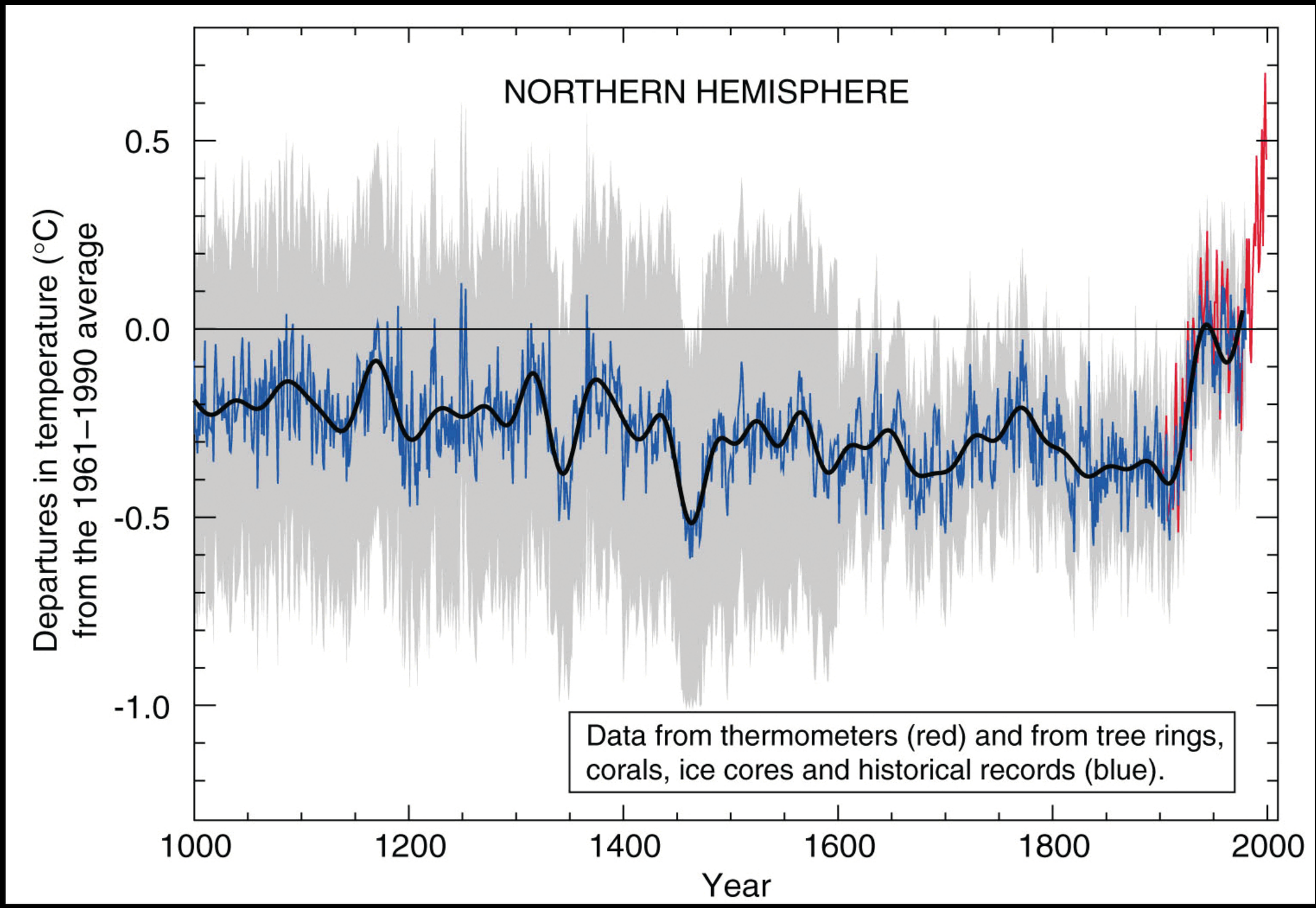
Workbook1

	A	B	C	D	E	F	G
1	YEAR	TEMP	YEAR	1 SIGMA	2 SIGMA		
2	1000	0.0659	1000	0.240346	0.480693	0.206137	0.123588
3	1001	-0.1241	1001	0.240347	0.480694	0.206137	0.123589
4	1002	-0.1208	1002	0.240346	0.480692	0.206136	0.123588
5	1003	-0.1801	1003	0.240347	0.480694	0.206137	0.123589
6	1004	-0.0711	1004	0.240347	0.480693	0.206137	0.123588
7	1005	-0.1334	1005	0.240346	0.480692	0.206136	0.123588
8	1006	-0.0644	1006	0.240346	0.480693	0.206137	0.123588
9	1007	0.0042	1007	0.240347	0.480693	0.206137	0.123588
10	1008	-0.1288	1008	0.240347	0.480693	0.206137	0.123588
11	1009	-0.0296	1009	0.240347	0.480693	0.206137	0.123588
12	1010	0.1187	1010	0.240347	0.480694	0.206137	0.123589
13	1011	-0.1252	1011	0.240346	0.480692	0.206136	0.123588
14	1012	-0.1634	1012	0.240347	0.480694	0.206137	0.123588
15	1013	-0.0791	1013	0.240347	0.480693	0.206137	0.123588
16	1014	-0.1120	1014	0.240347	0.480693	0.206137	0.123588
17	1015	-0.1146	1015	0.240346	0.480692	0.206136	0.123588
18	1016	-0.1206	1016	0.240346	0.480692	0.206136	0.123588
19	1017	-0.0815	1017	0.240347	0.480693	0.206137	0.123588
20	1018	-0.2031	1018	0.240346	0.480693	0.206137	0.123588
21	1019	0.0305	1019	0.240347	0.480693	0.206137	0.123588
22	1020	0.1098	1020	0.240347	0.480694	0.206137	0.123589
23	1021	0.0244	1021	0.240347	0.480693	0.206137	0.123588
24	1022	-0.0743	1022	0.240347	0.480693	0.206137	0.123588
25	1023	-0.0323	1023	0.240347	0.480693	0.206137	0.123588
26	1024	-0.0434	1024	0.240346	0.480693	0.206137	0.123588

Workbook1

	A	B	C	D	E	F	G	H
878	1876	-0.1891	1876	0.113228	0.226456	8.25297E-02	7.75207E-02	
879	1877	-0.0140	1877	0.113228	0.226457	8.25299E-02	7.75209E-02	
880	1878	-0.0873	1878	0.113228	0.226457	8.25298E-02	7.75209E-02	
881	1879	-0.2959	1879	0.113229	0.226458	8.25302E-02	7.75212E-02	
882	1880	-0.2368	1880	0.113229	0.226457	8.25300E-02	7.75210E-02	
883	1881	-0.1977	1881	0.113229	0.226458	8.25302E-02	7.75212E-02	
884	1882	-0.2036	1882	0.113229	0.226457	8.25300E-02	7.75210E-02	
885	1883	-0.2489	1883	0.113228	0.226455	8.25293E-02	7.75204E-02	
886	1884	-0.2125	1884	0.113229	0.226457	8.25301E-02	7.75211E-02	
887	1885	-0.1896	1885	0.113228	0.226457	8.25299E-02	7.75210E-02	
888	1886	-0.1084	1886	0.113228	0.226456	8.25298E-02	7.75208E-02	
889	1887	-0.3265	1887	0.113228	0.226456	8.25296E-02	7.75206E-02	
890	1888	-0.1694	1888	0.113228	0.226457	8.25298E-02	7.75209E-02	
891	1889	-0.1339	1889	0.113228	0.226456	8.25298E-02	7.75208E-02	
892	1890	-0.3107	1890	0.113229	0.226457	8.25301E-02	7.75211E-02	
893	1891	-0.1754	1891	0.113229	0.226457	8.25300E-02	7.75210E-02	
894	1892	-0.3186	1892	0.113228	0.226456	8.25295E-02	7.75205E-02	
895	1893	-0.3236	1893	0.113228	0.226456	8.25297E-02	7.75207E-02	
896	1894	-0.1970	1894	0.113228	0.226456	8.25295E-02	7.75205E-02	
897	1895	-0.1578	1895	0.113228	0.226456	8.25297E-02	7.75207E-02	
898	1896	-0.0804	1896	0.113228	0.226456	8.25298E-02	7.75208E-02	
899	1897	-0.0537	1897	0.113228	0.226456	8.25298E-02	7.75208E-02	
900	1898	-0.2195	1898	0.113229	0.226457	8.25301E-02	7.75211E-02	
901	1899	-0.3486	1899	0.113228	0.226456	8.25297E-02	7.75207E-02	
902	1900	-0.1253	1900	0.113229	0.226457	8.25300E-02	7.75210E-02	
903	1901	-0.1575	1901	0.113228	0.226456	8.25296E-02	7.75206E-02	

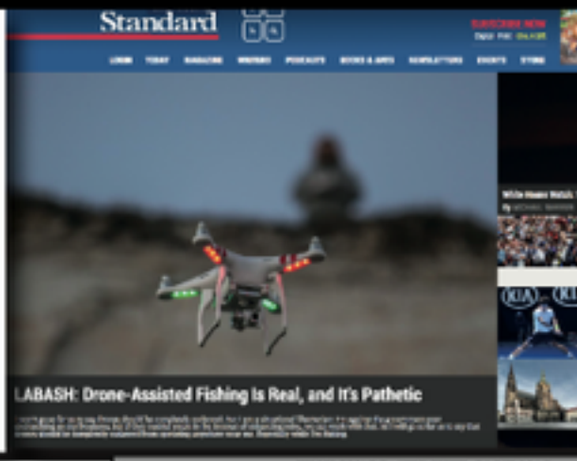
It's easier with a visualization

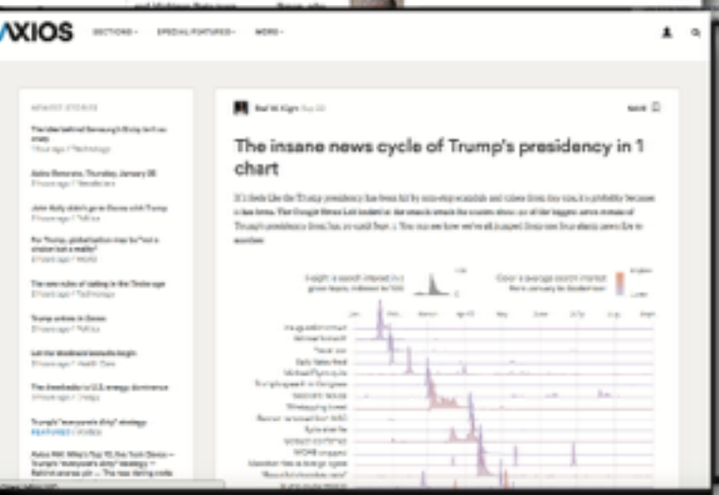


Michael E. Mann, Raymond S. Bradley, and Malcolm K. Hughes

Intergovernmental Panel on Climate Change (IPCC), Third Report, 2001

VISUALIZATIONS ARE EVERYWHERE NOWADAYS…





To learn how to design better data visualizations, it's necessary to understand what data visualizations are made of.

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A FRAMEWORK

+

ONE OR MORE VISUAL ENCODINGS

+

ANNOTATIONS

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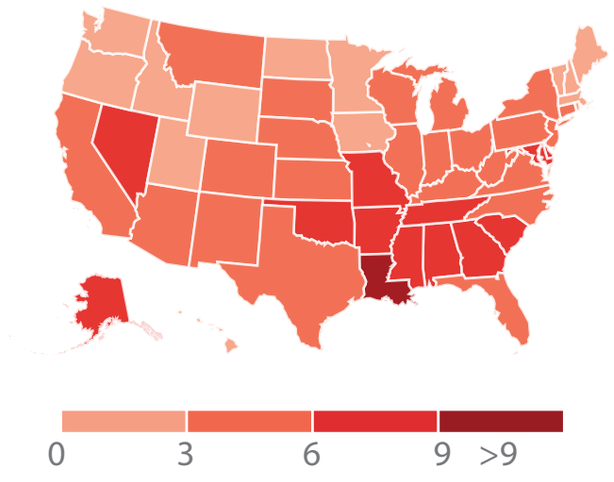
COMPLETE CHART

MURDERS

Rate per 100,000 people (2015)

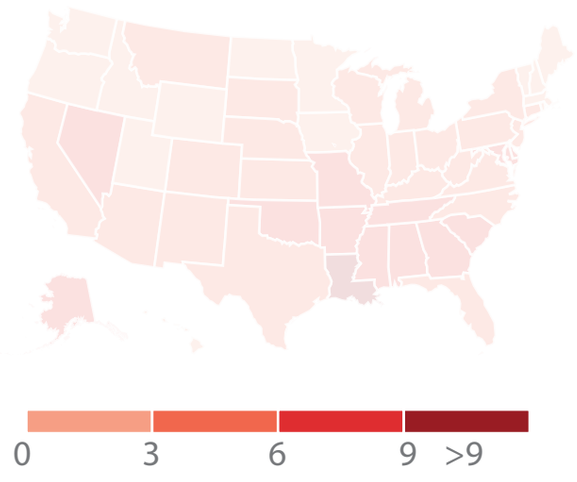


Source: FBI Uniform Crime Reports

FRAMEWORK

MURDERS

Rate per 100,000 people (2015)

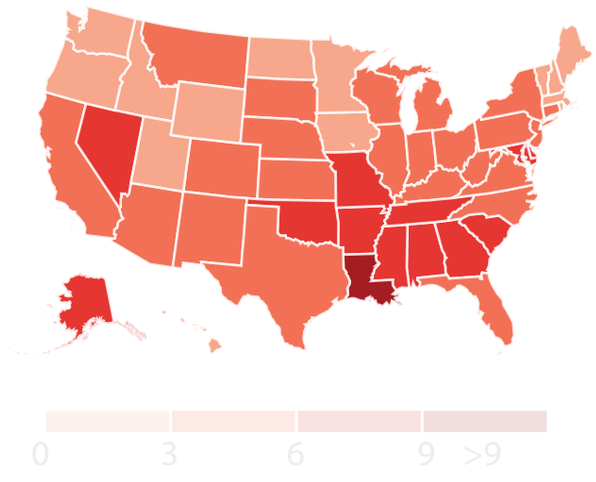


Source: FBI Uniform Crime Reports

CONTENT (ENCODING)

MURDERS

Rate per 100,000 people (2015)

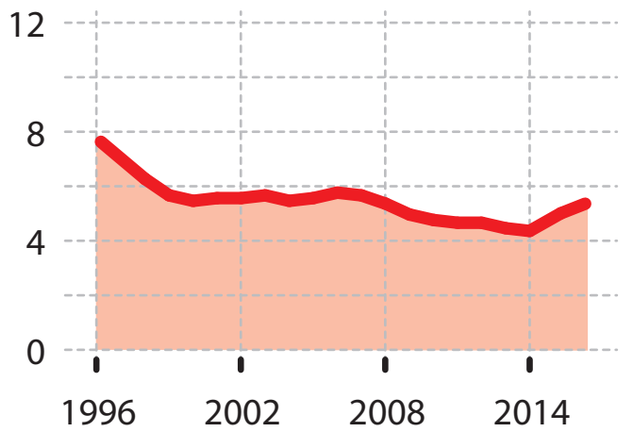


Source: FBI Uniform Crime Reports

COMPLETE CHART

MURDERS

Rate per 100,000 people

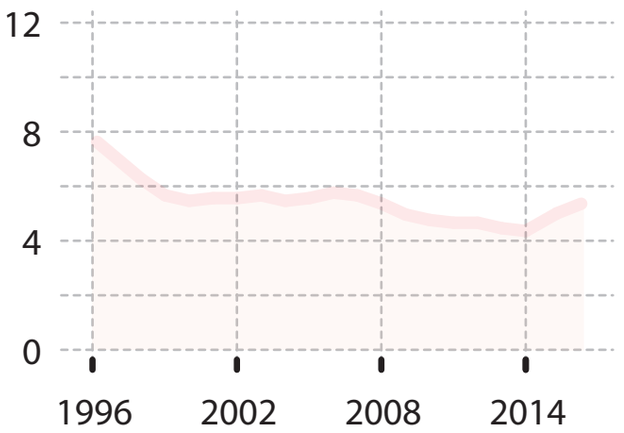


Source: FBI Uniform Crime Reports

FRAMEWORK

MURDERS

Rate per 100,000 people

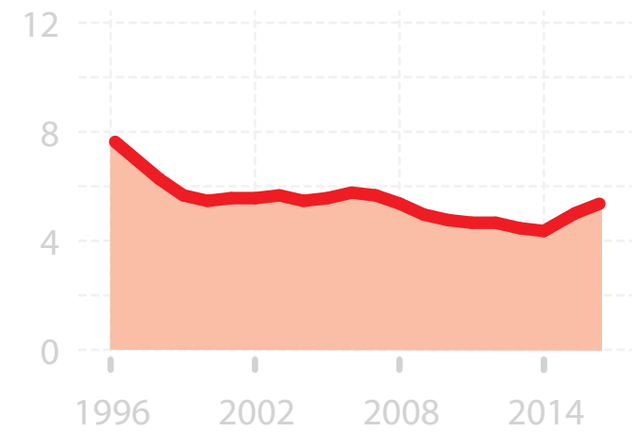


Source: FBI Uniform Crime Reports

CONTENT (ENCODING)

MURDERS

Rate per 100,000 people



Source: FBI Uniform Crime Reports

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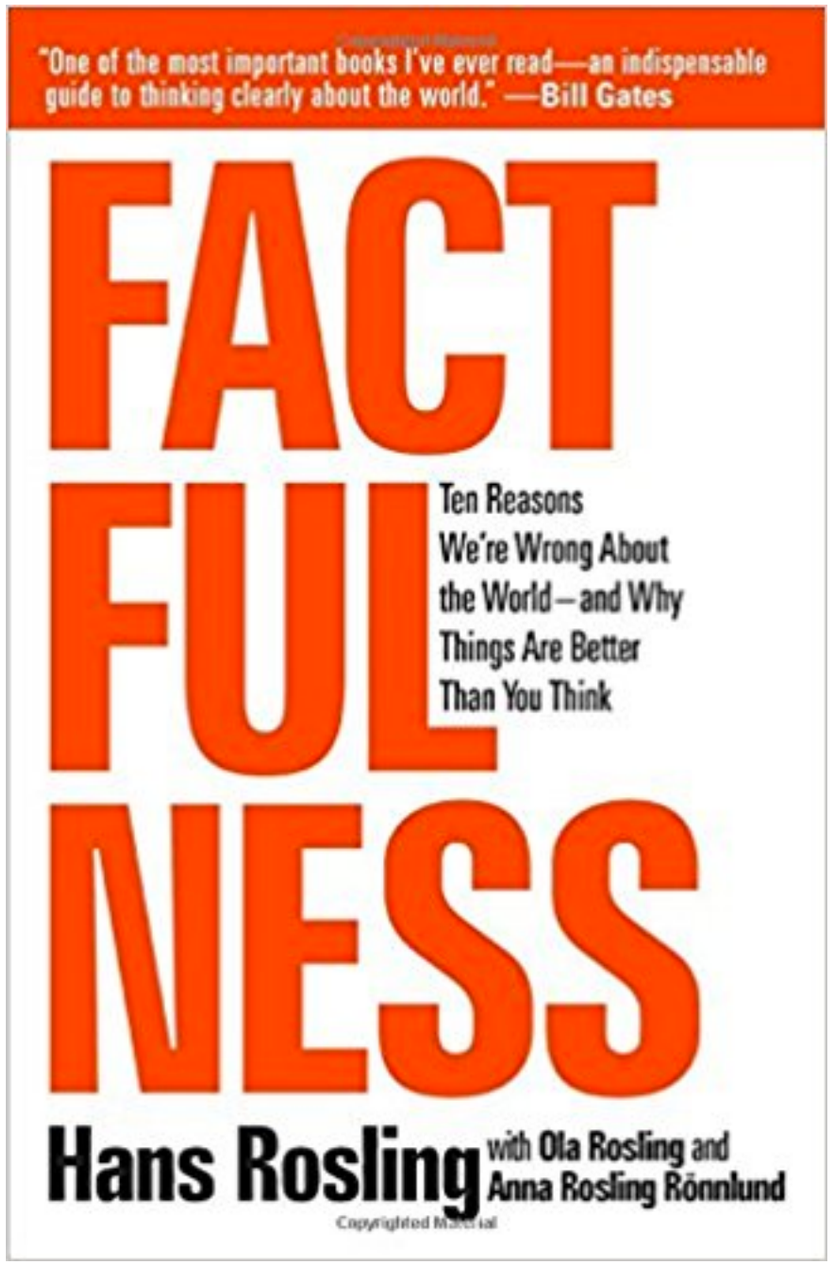
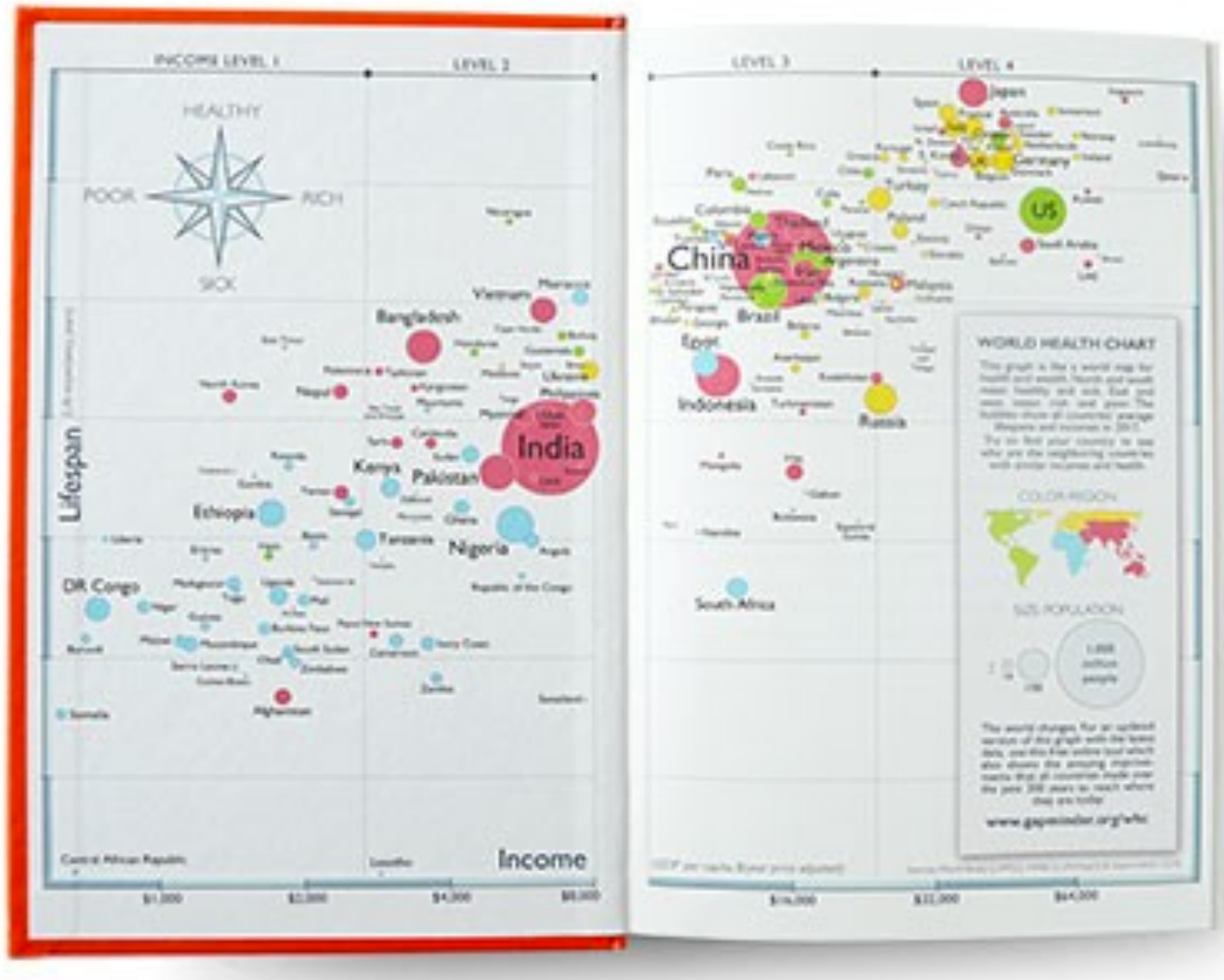
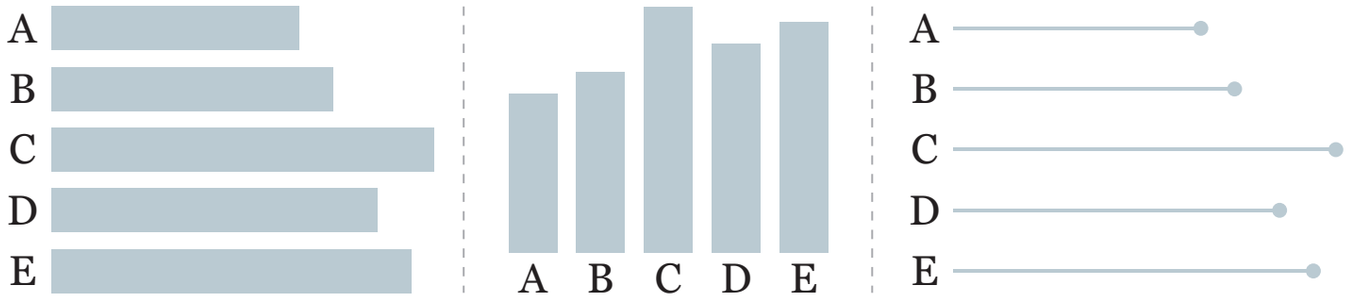


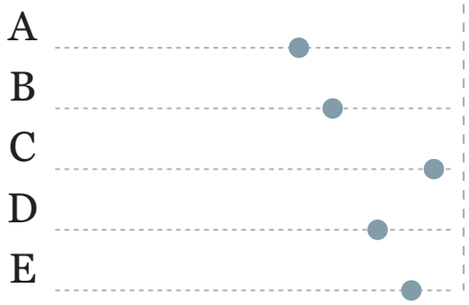


Visual encoding

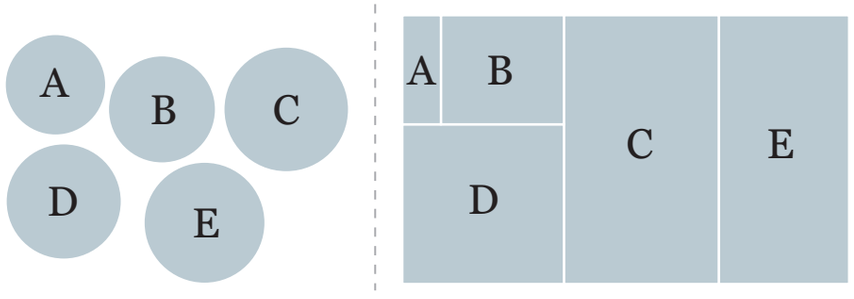
Length or height



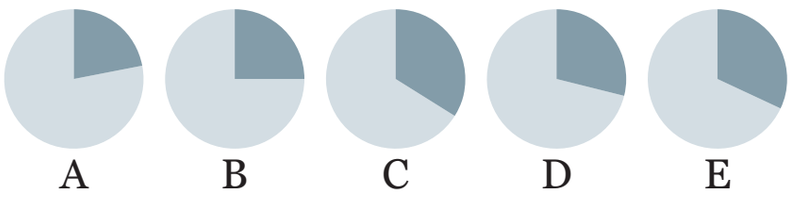
Position



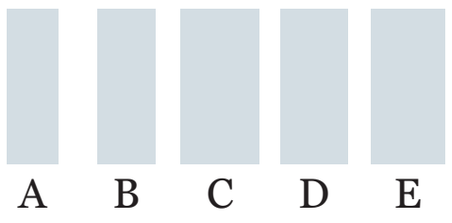
Area



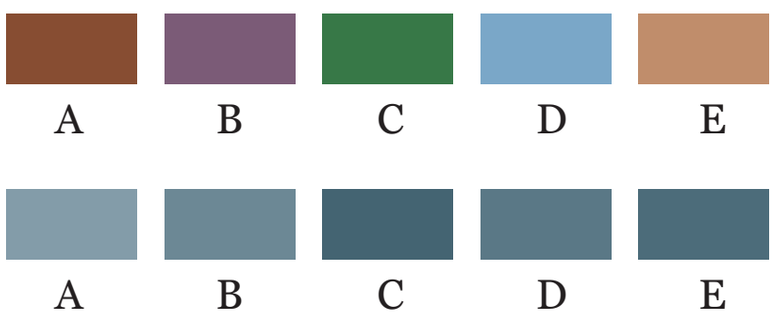
Angle/area



Line weight



Hue and shade



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

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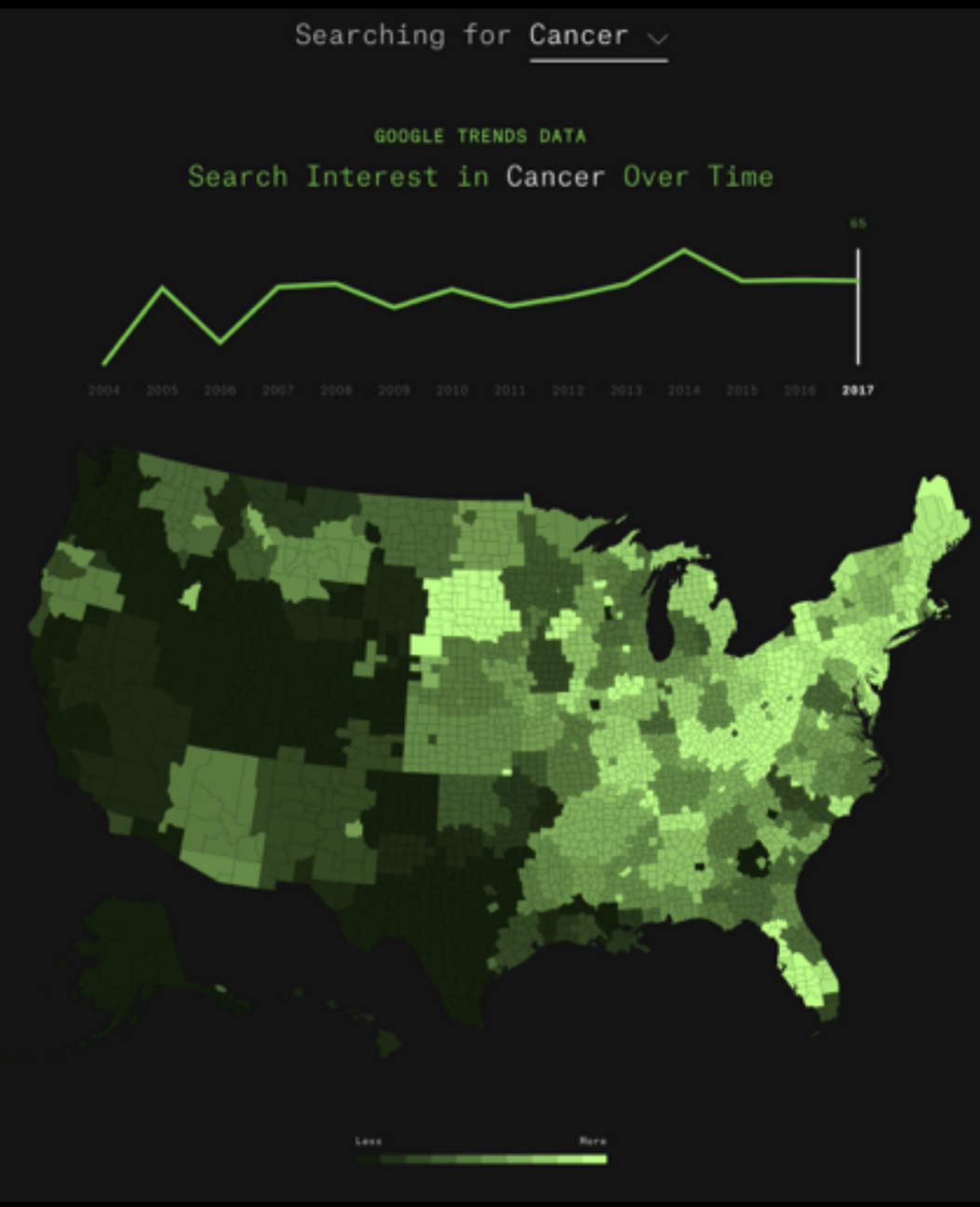

https://www.schemadesign.com/work/searching-for-health
http://www.searching-for-health.com/

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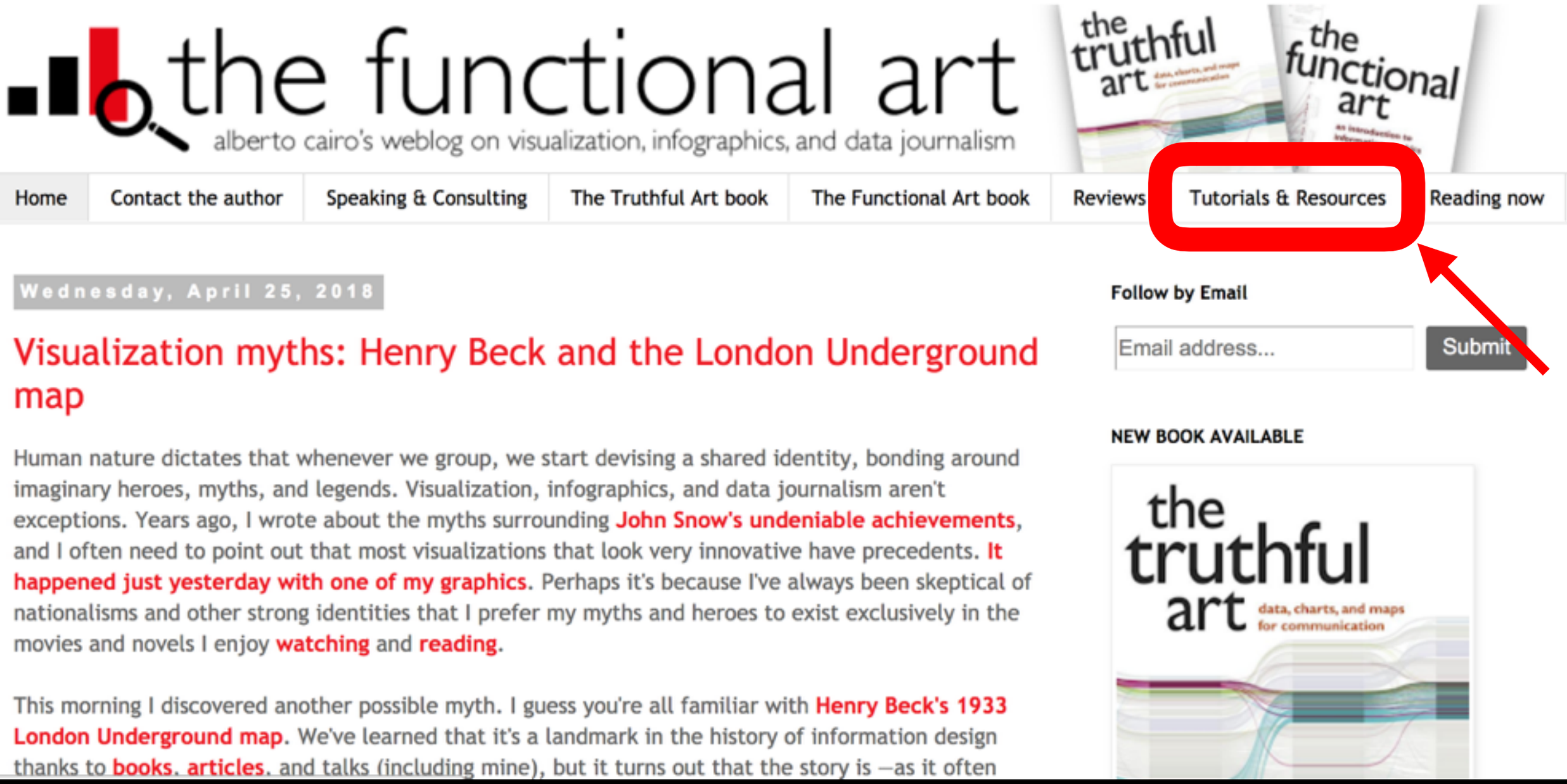
Many tools —many of them free and easy to use



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

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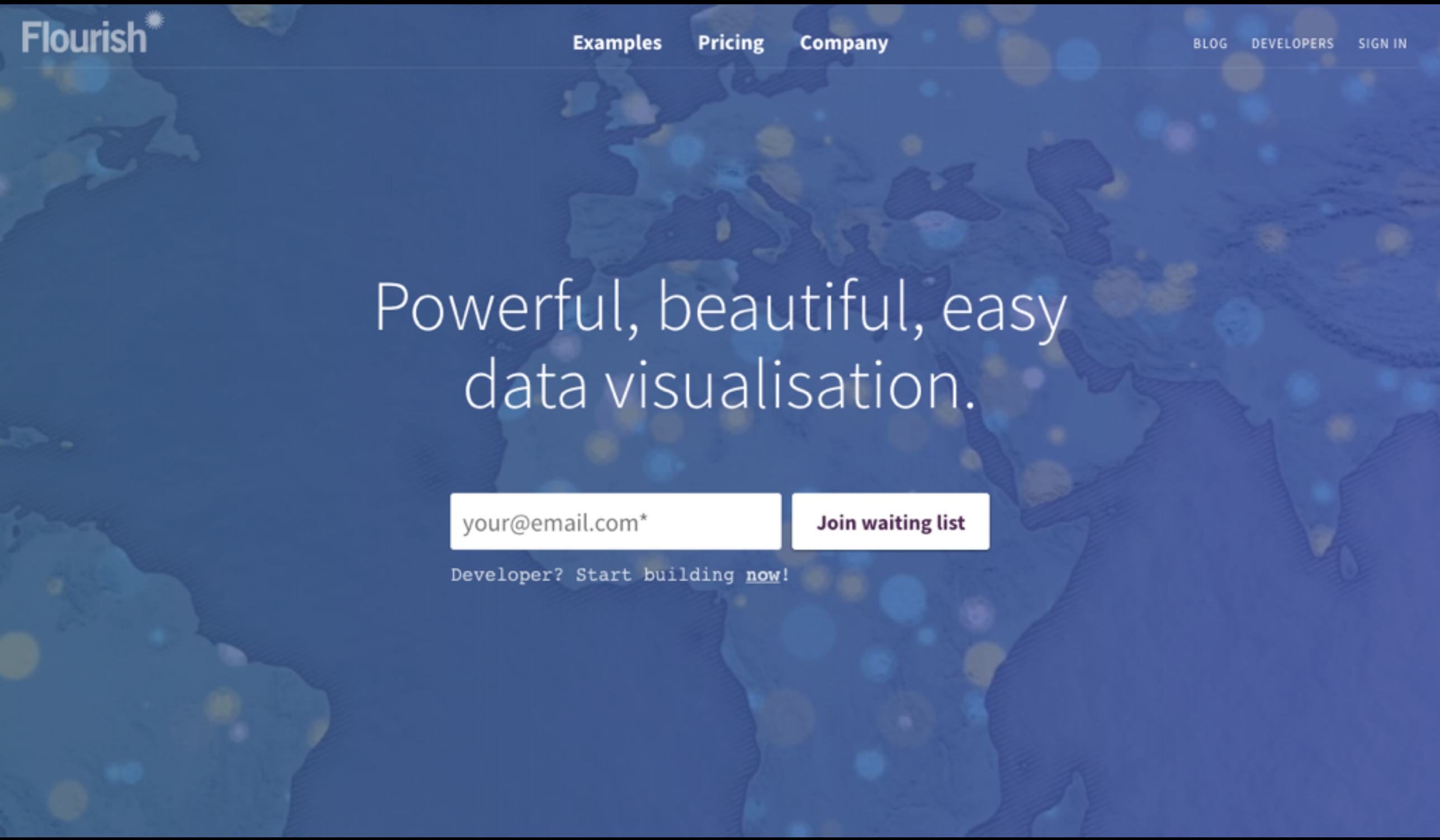

https://flourish.studio/

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Hi #TurningTheTide, here are the slides I used today:
https://www.dropbox.com/s/l3fhh1szr6bcvrp/ColumbiaTurningTheTide.pdf?dl=0

Who's in this photo?

GIF

Tweet

THANKS!

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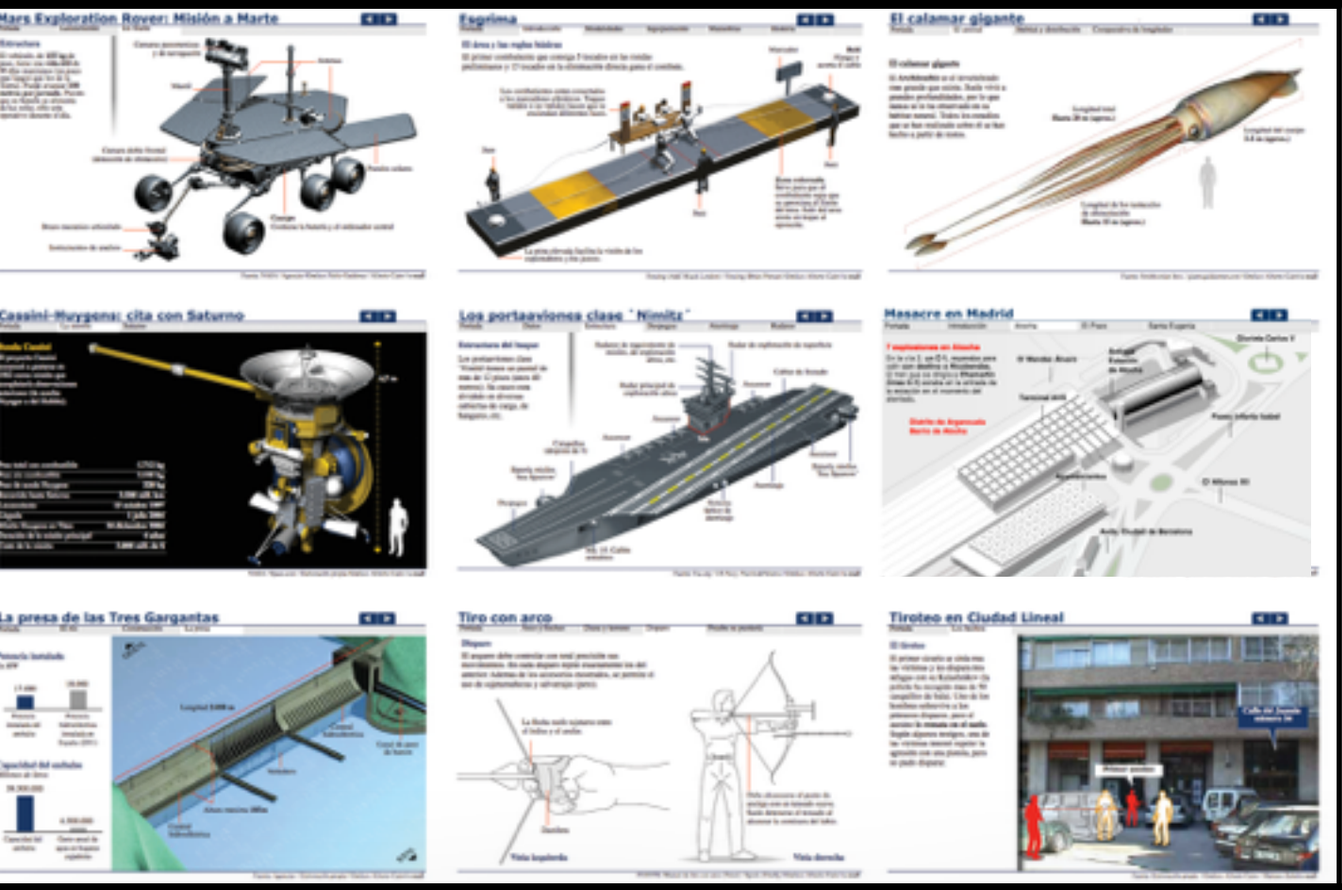
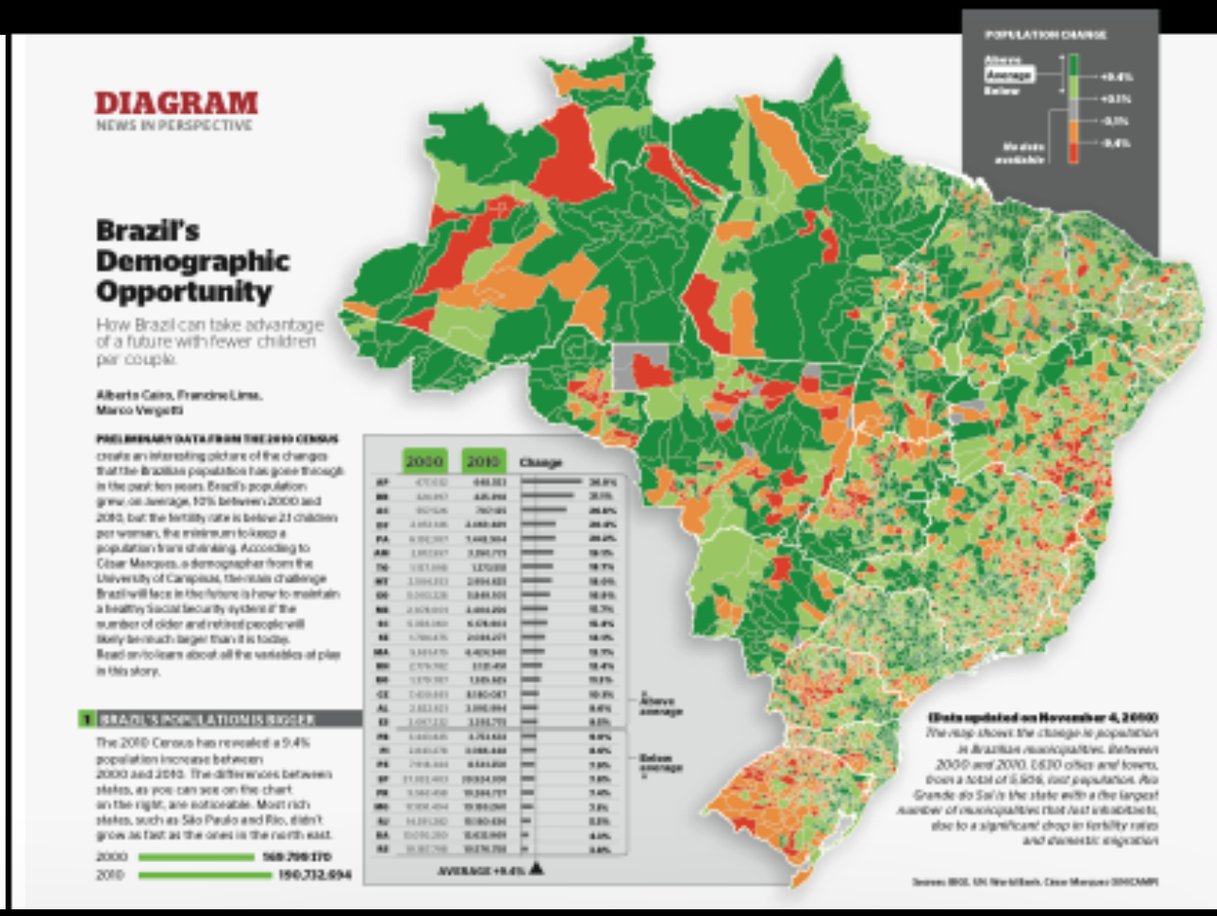
Turning the Tide

New Directions in Health Communication

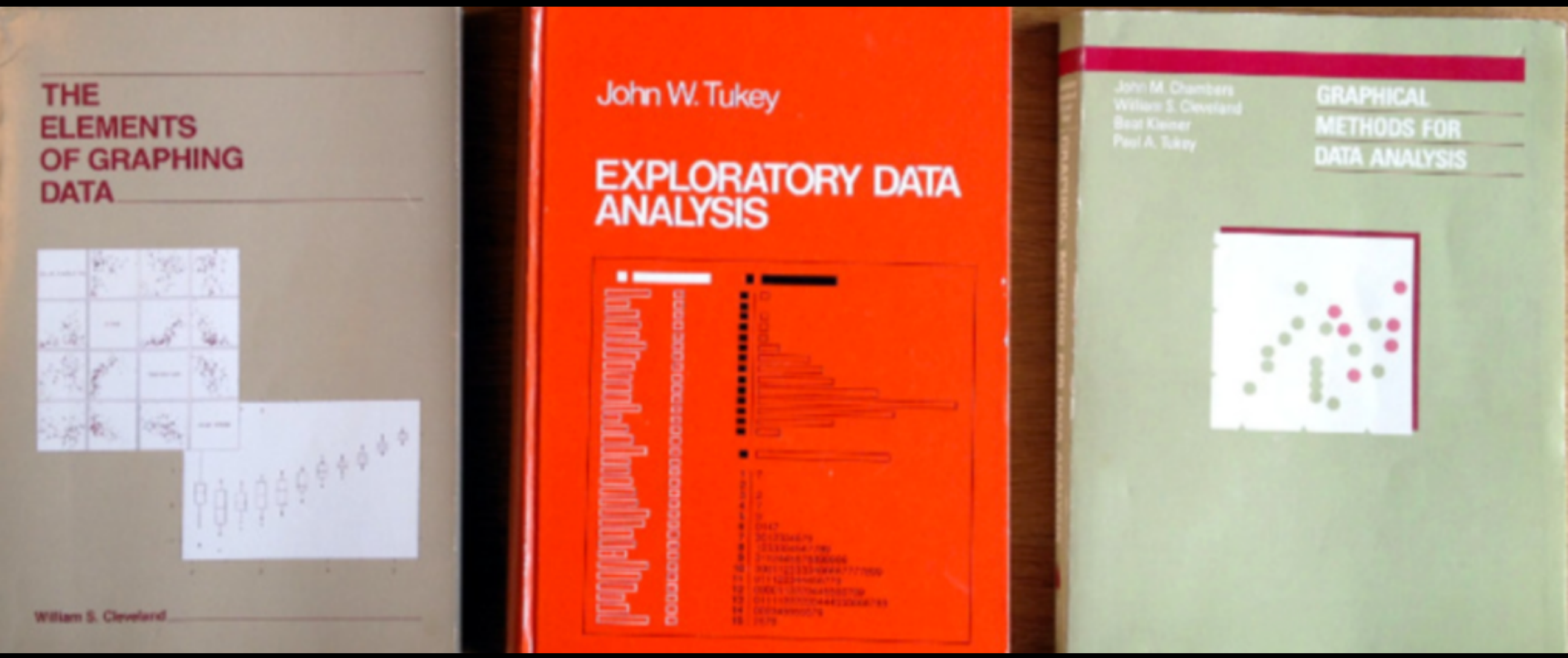




EXPLORATION

Alberto Cairo, School of Communication, University of Miami

Never trust summary statistics alone. Always visualize your data



VISUALIZATION FOR DETECTING FEATURES IN DATA

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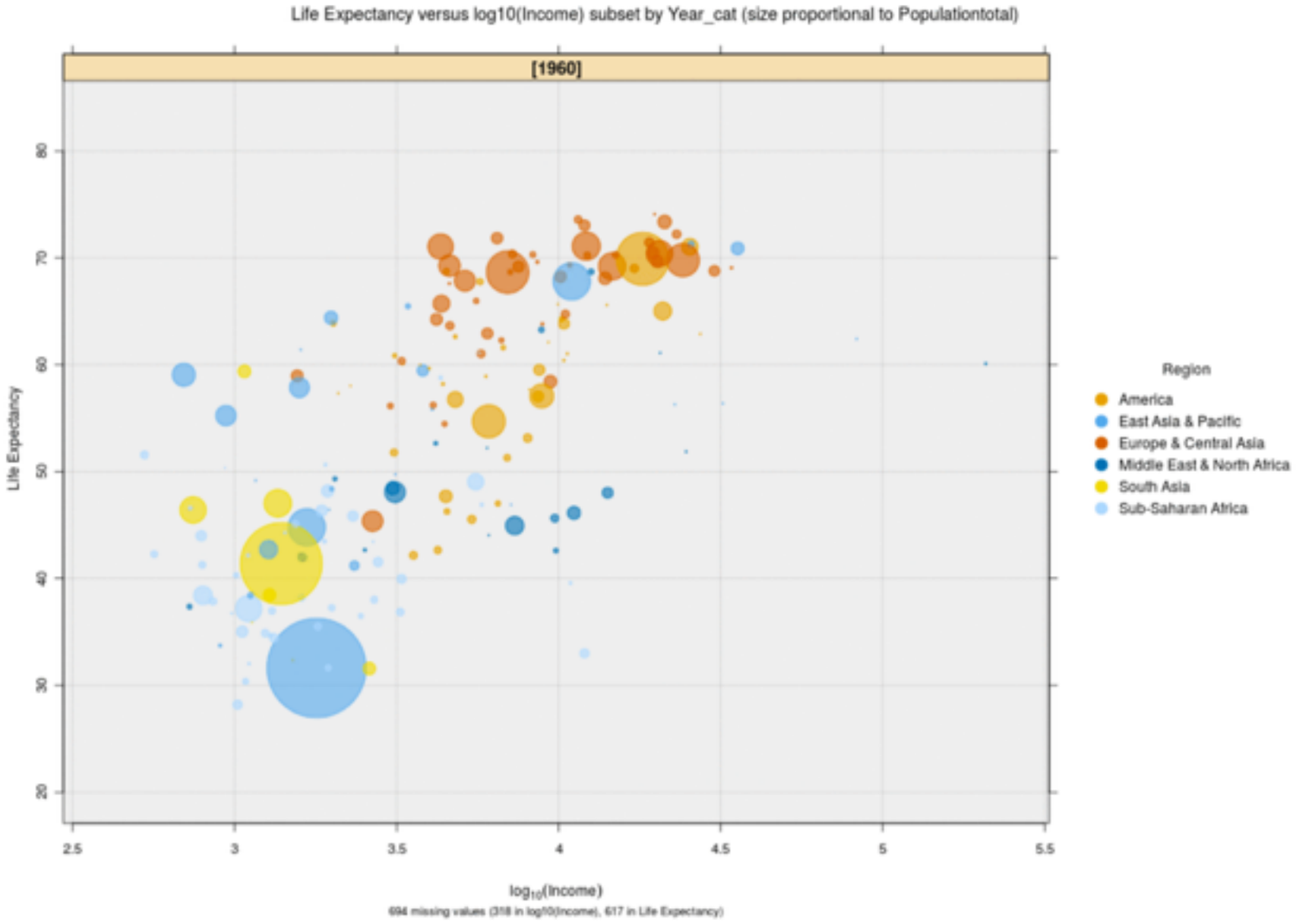

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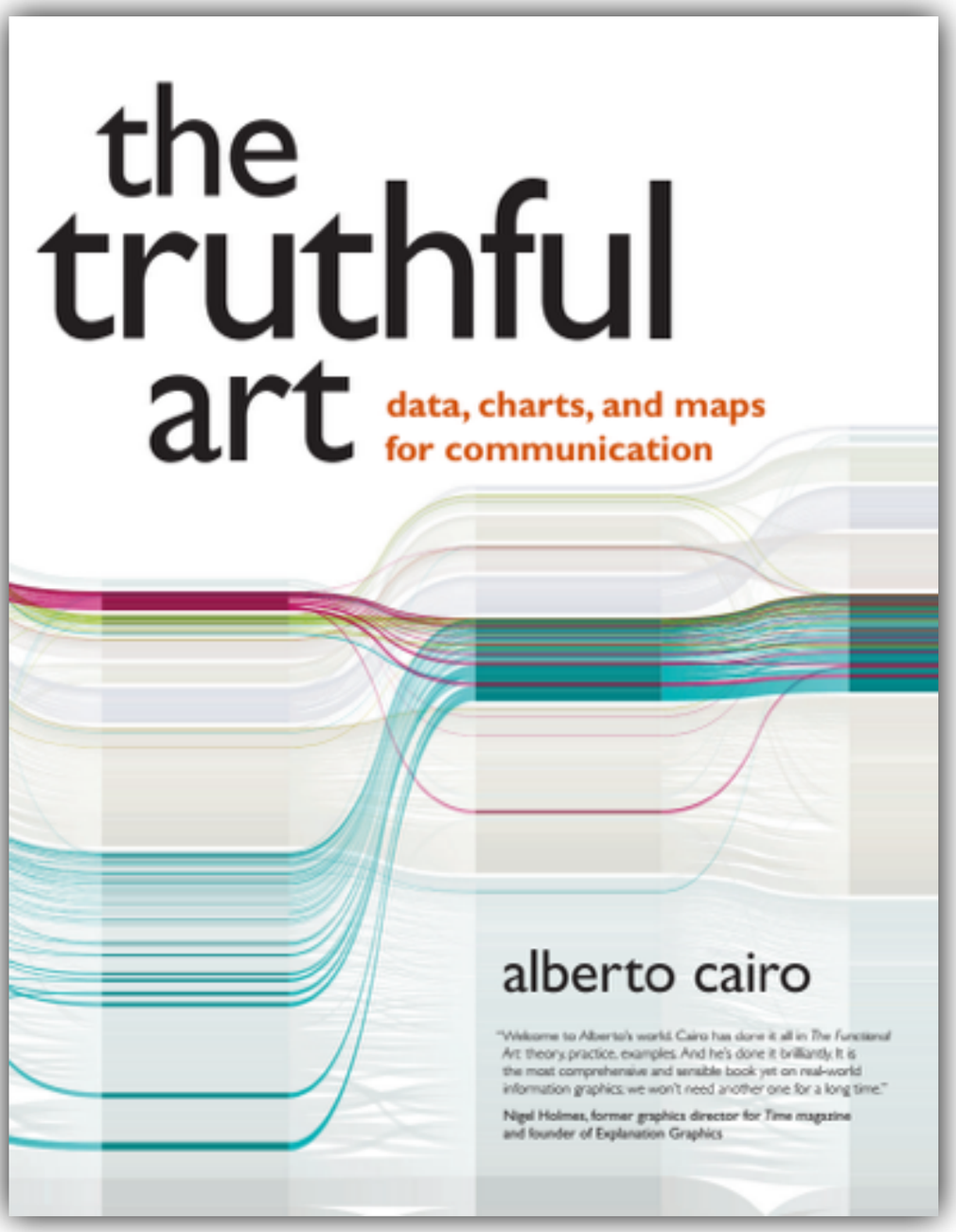
Schools in Miami-Dade County



	A	B	C	D	E	F	G	H
1	SchoolName	BoardDistrict	SchoolGrade	Reading2012	Reading2013	ReadingDiffe	Math2012	Math2013
2	0041 AIR BAS	9	A	82	80	-2	71	75
3	0070 CORAL	9	A	71	73	2	64	56
4	0071 EUGEN	5	A	69	69	0	66	64
5	0072 SUMMI	9	B	57	50	-7	50	54
6	0073 MANDA	9	C	34	32	-2	38	39
7	0081 LENOR	2	F	28	29	1	26	47
8	0091 BOB GF	4	A	68	70	2	68	66
9	0092 NORMA	3	A	73	72	-1	78	77
10	0100 MATER	4	A	68	68	0	73	76
11	0101 ARCOL	2	C	39	32	-7	41	39
12	0102 MIAMI	9	D	38	41	3	43	47
13	0111 MAYA A	5	B	45	35	-10	59	50
14	0121 AUBUR	6	A	53	51	-2	56	55
15	0122 DR ROL	5	A	65	64	-1	66	63
16	0125 NORMA	7	A	70	67	-3	74	70
17	0161 AVOCA	9		45	33	-12	45	45
18	0201 BANYA	8	A	73	74	1	72	70
19	0211 DR MA	7	A	71	71	0	74	68
20	0231 AVENTI	3	A	68	68	0	67	67
21	0241 R K BRC	3	A	76	75	-1	81	77
22	0251 ETHEL I	8	A	85	80	-5	89	90
23	0261 BEL-AIF	9	D	32	32	0	36	48
24	0271 BENT T	8	A	70	61	-9	69	60
25	0311 GOULD	9	B	36	40	4	51	52
26	0312 MATER	4	A	75	76	1	84	85
27	0321 BISCAY	3	B	45	42	-3	52	50
28	0332 SOMER	9	A	62	66	4	54	64
29	0339 SOMER	9	B	67	57	-10	60	54
30	0341 ARCH C	1	B	47	48	1	47	48
31	0342 PINECR	7	A	72	75	3	78	76
32	0361 BISCAY	1	D	37	35	-2	39	37
33	0400 RENAIS	5	A	80	82	2	76	82
34	0401 VAN E I	2	A	46	44	-2	62	56
35	0410 ACADE	8	A	68	69	1	62	74

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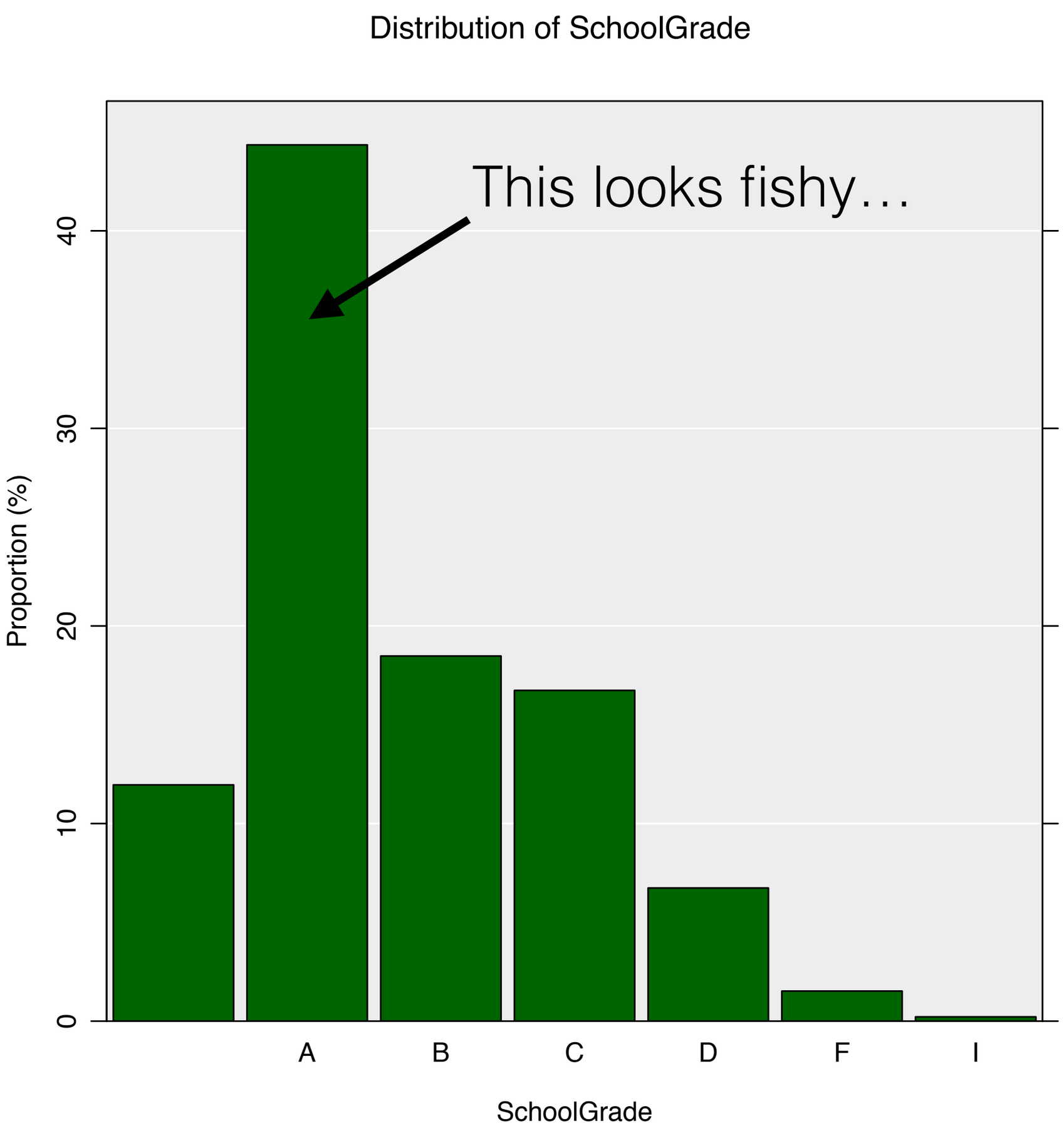

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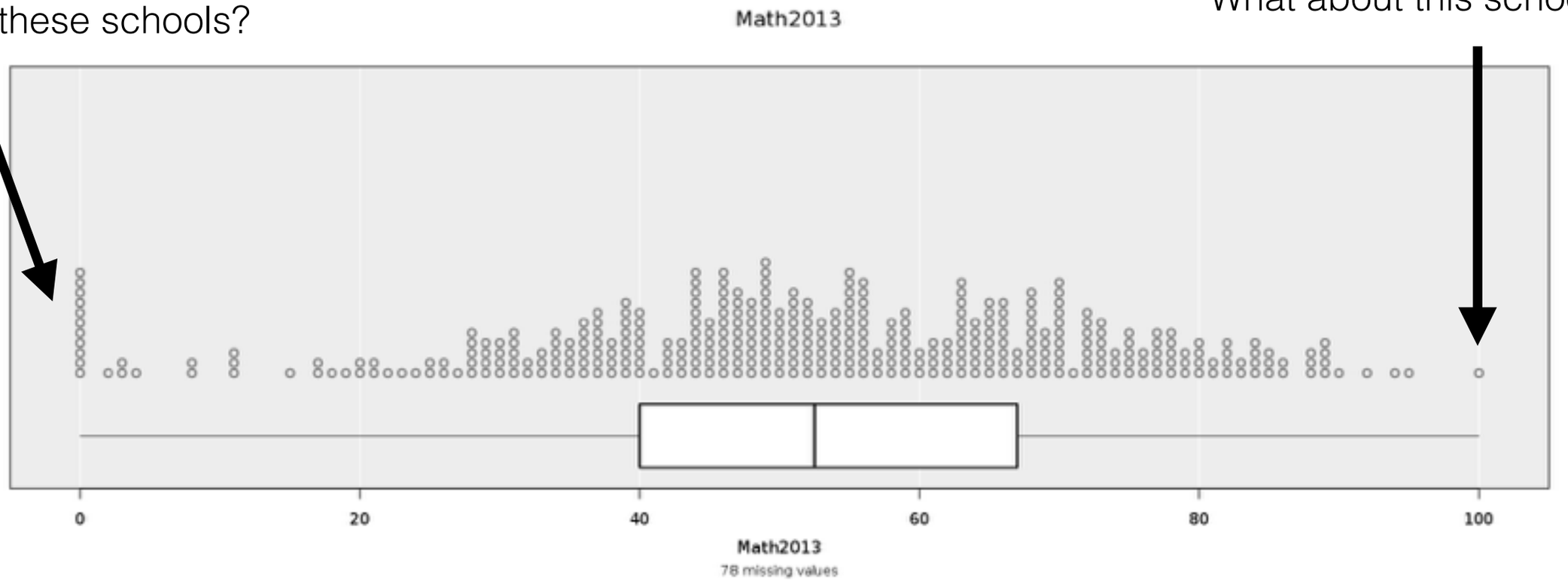
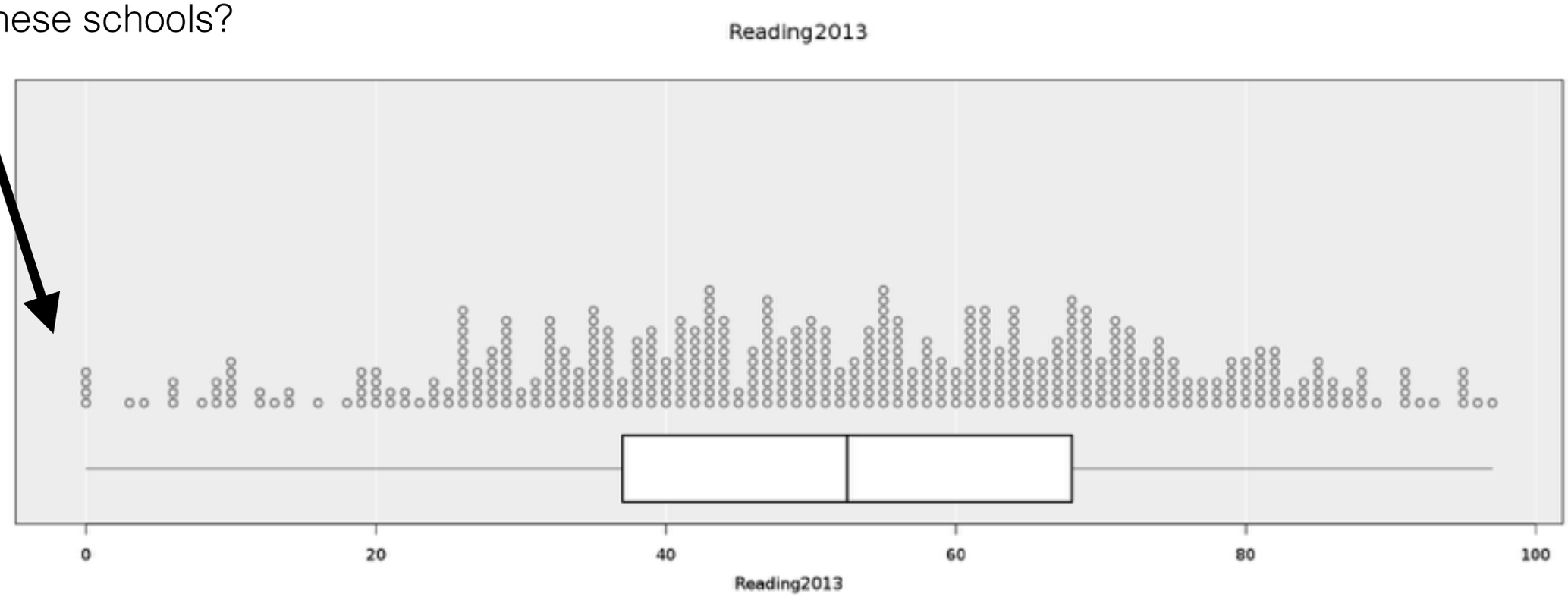
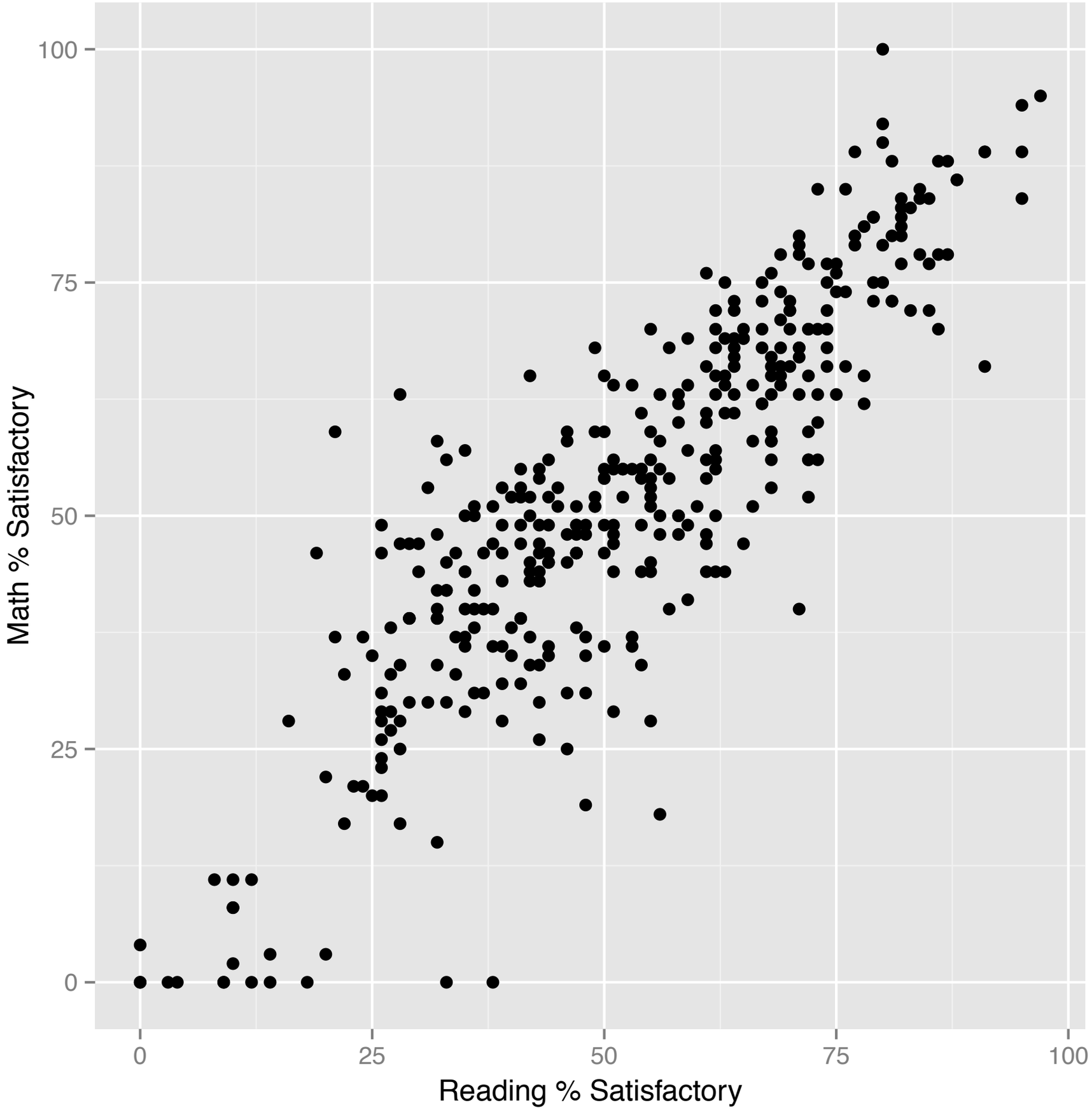
Why no students pass Math tests in these schools?

What about this school?

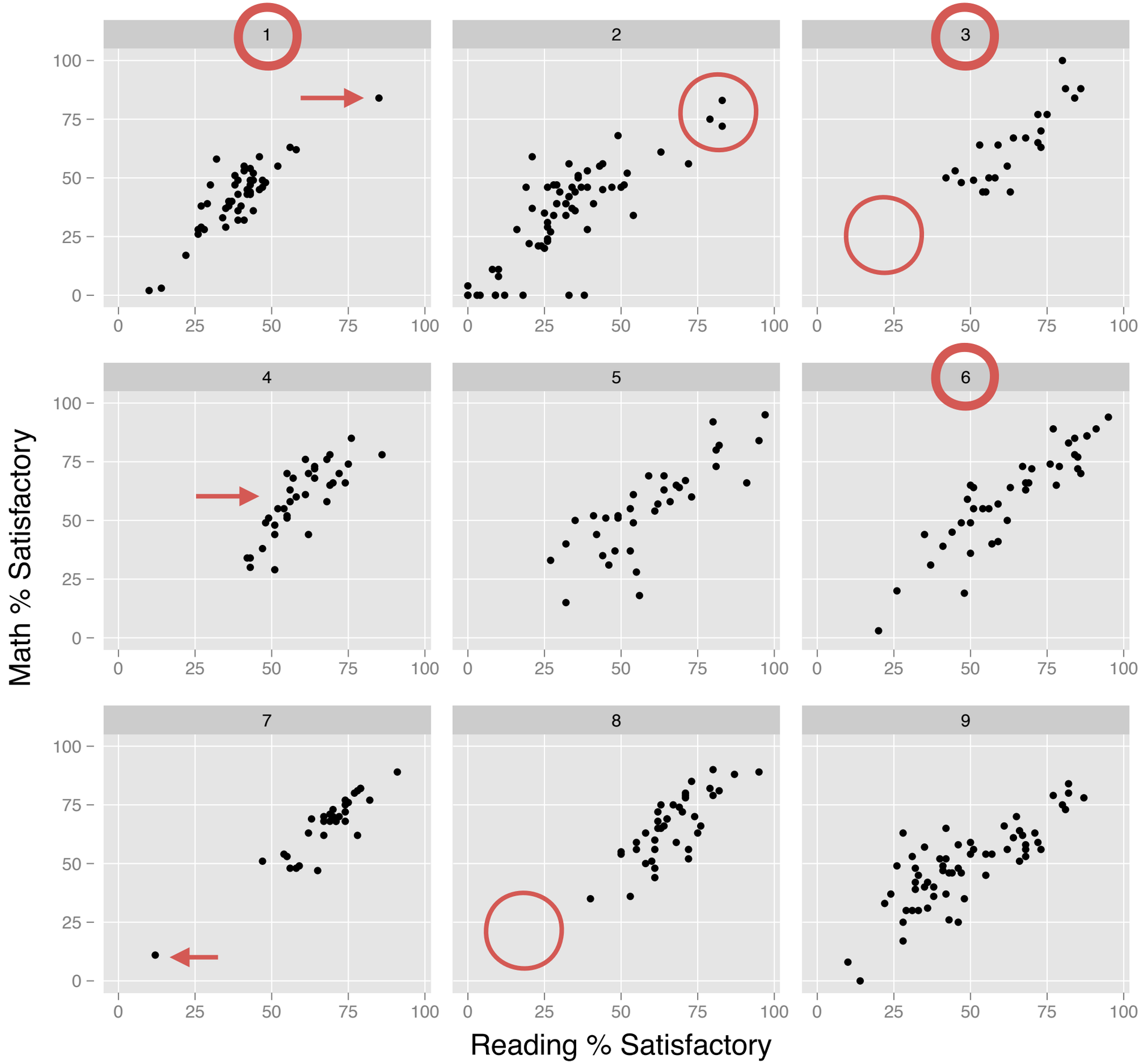


Why no students pass reading tests in these schools?




100
75
50
25
0
Math % Satisfactory
0
25
50
75
100
Reading % Satisfactory

Potential interesting clues



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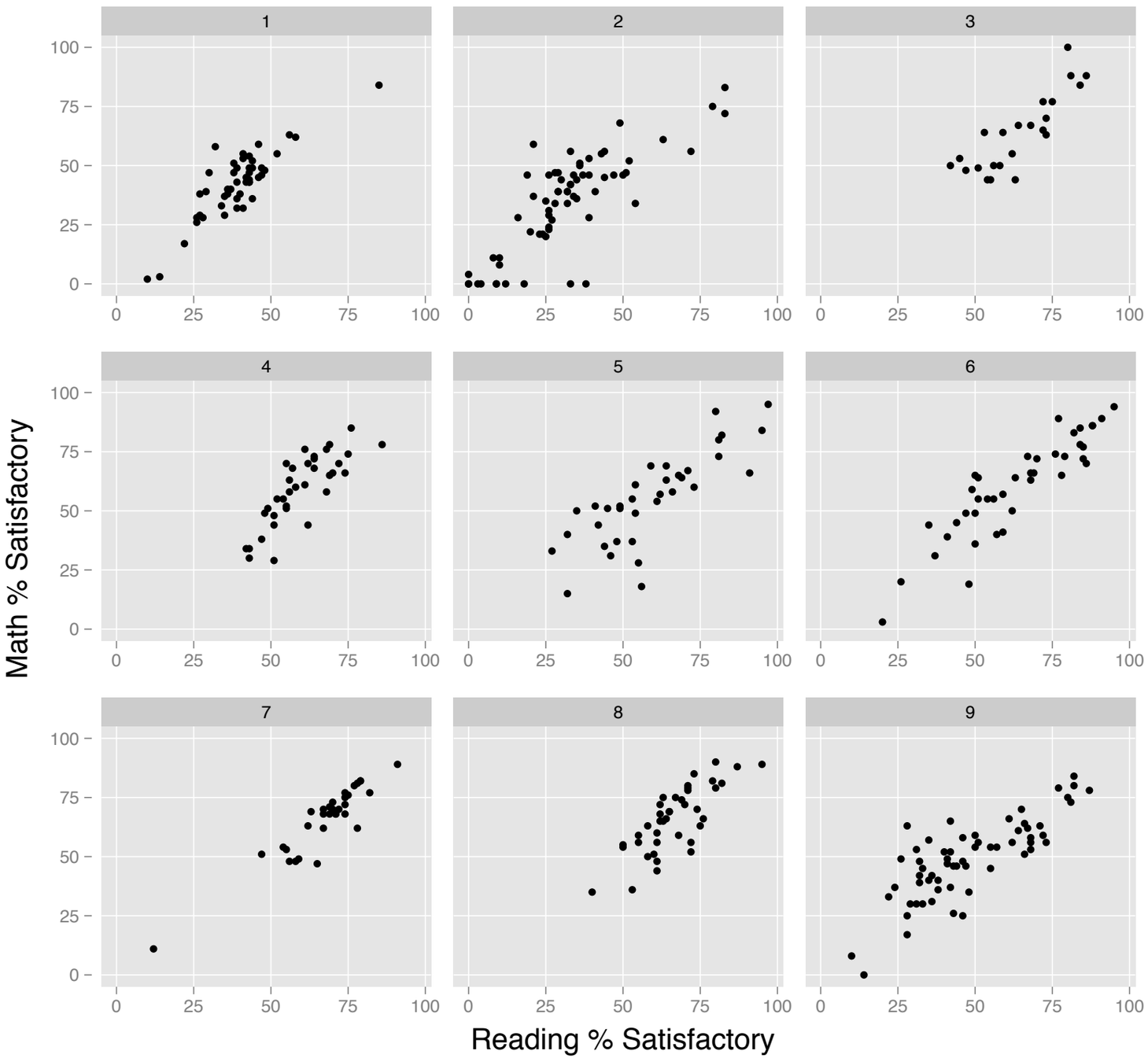

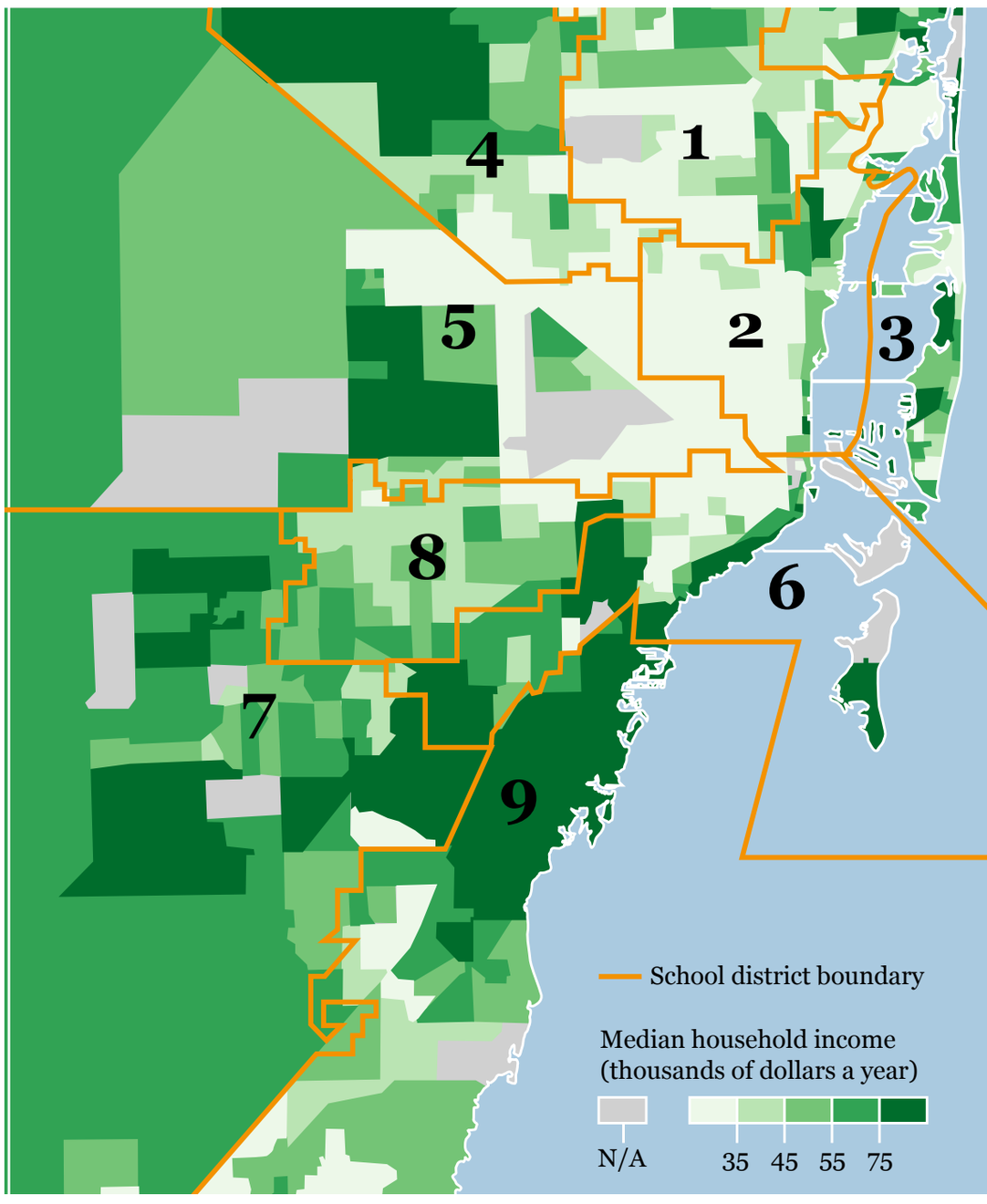

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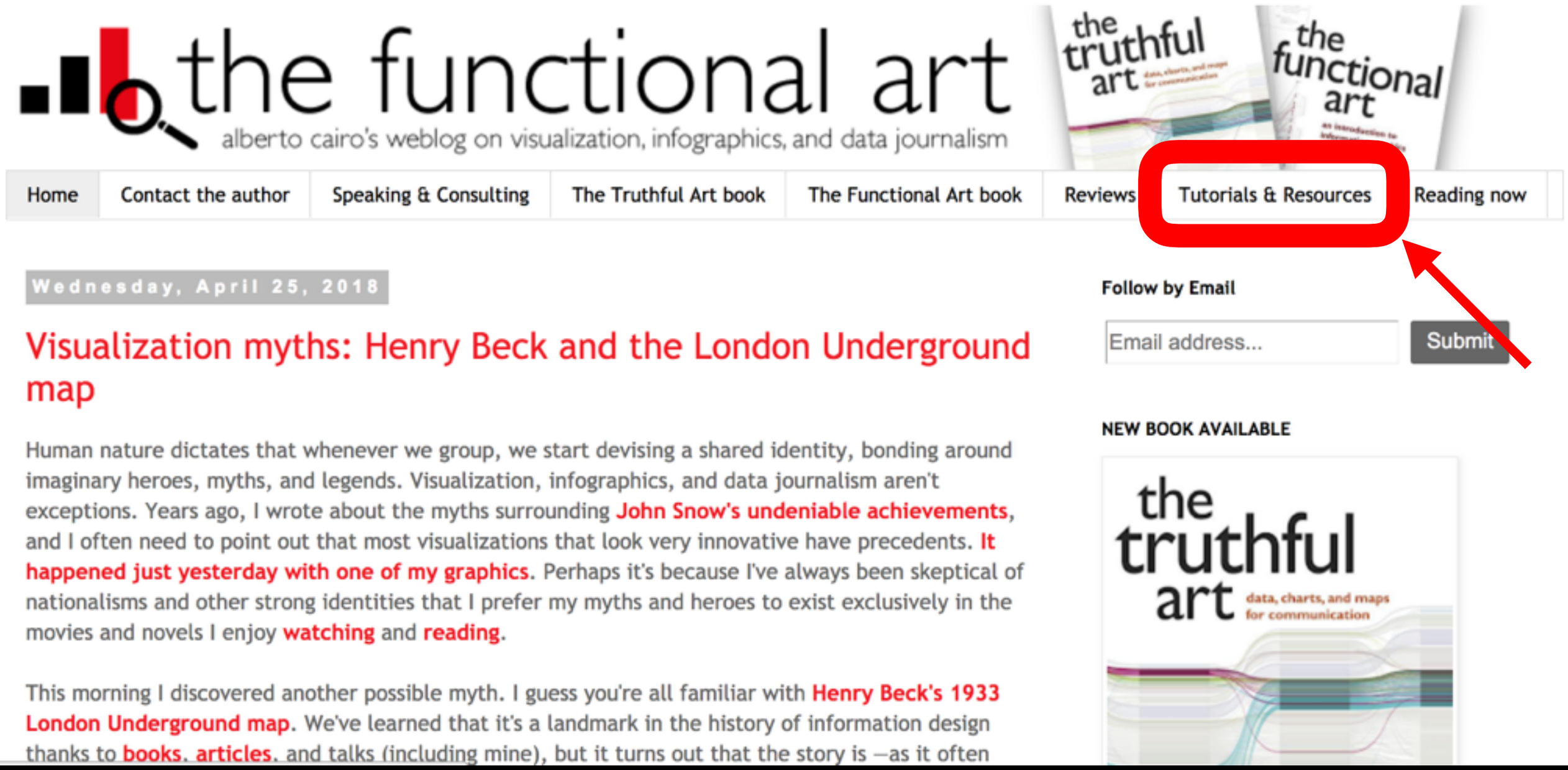
More and more tools —many of them free and easy to use



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

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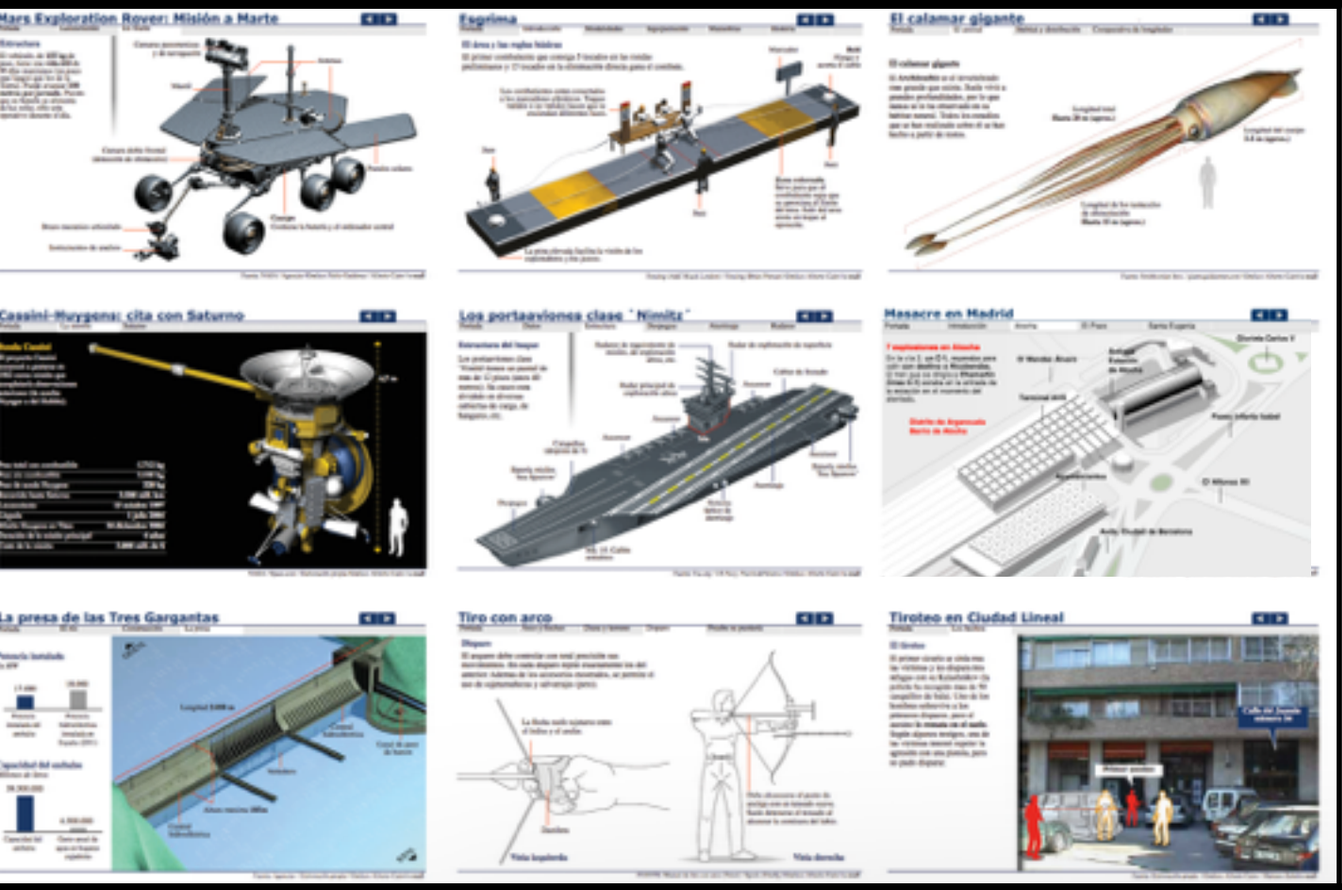
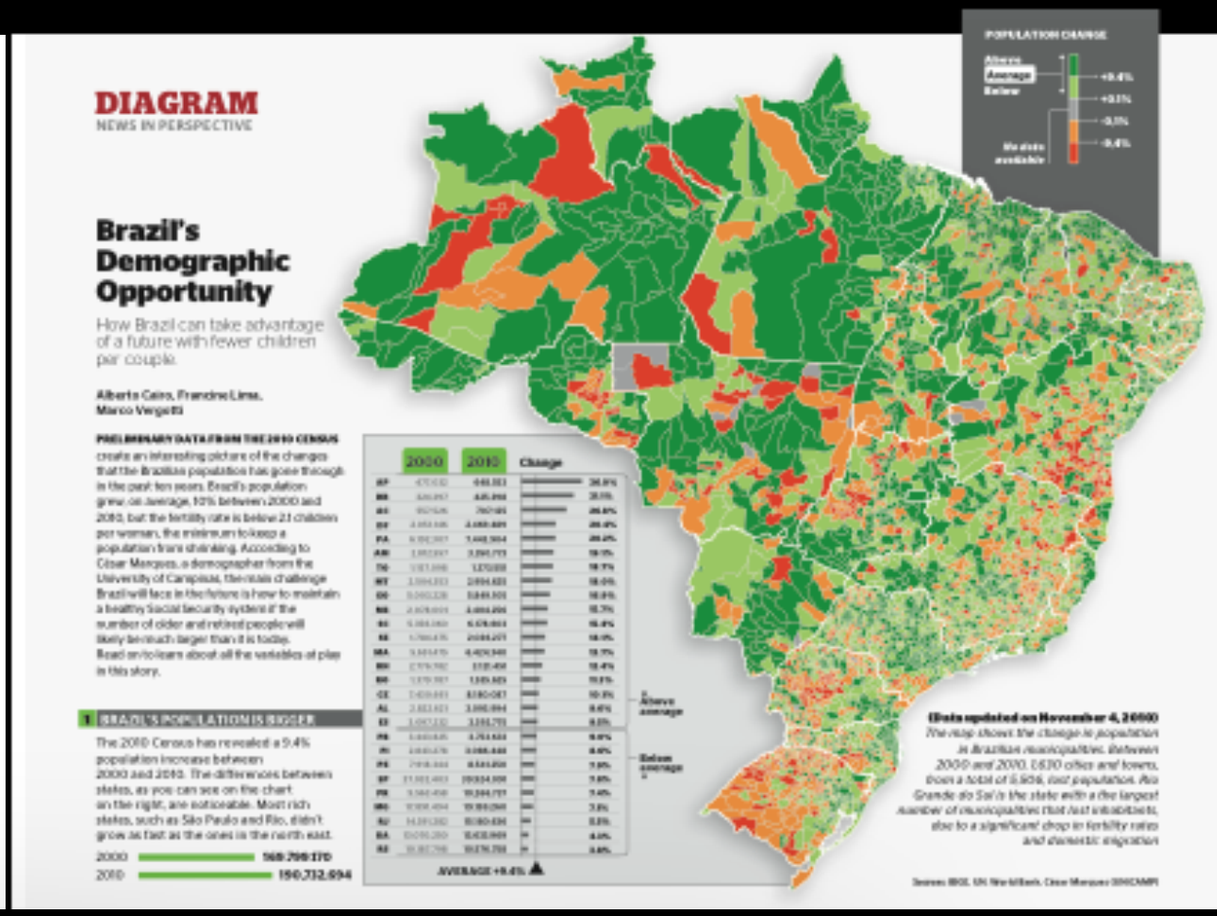
Turning the Tide

New Directions in Health Communication



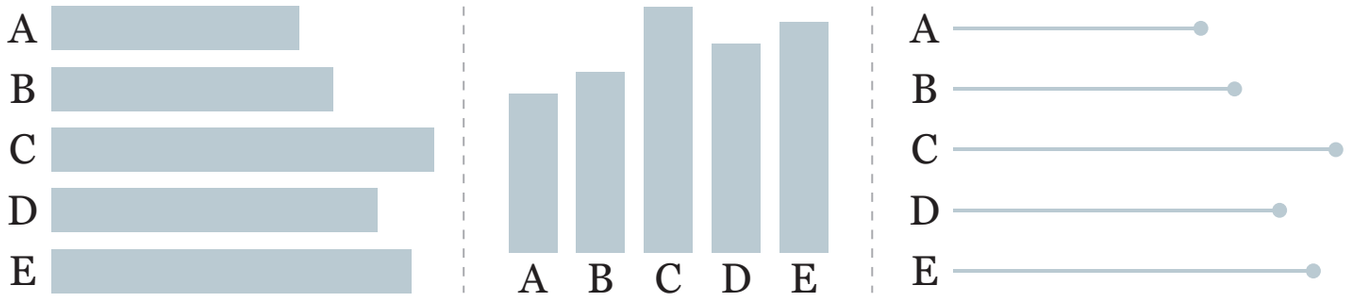


CHOOSING THE RIGHT VISUALIZATION

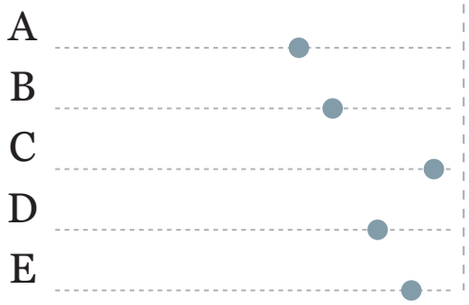
Alberto Cairo, School of Communication, University of Miami

Visual encoding

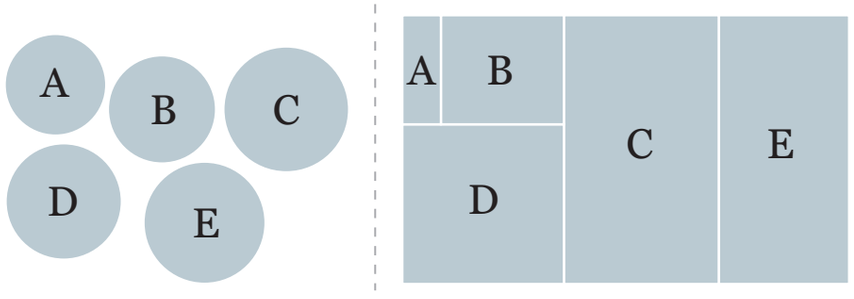
Length or height



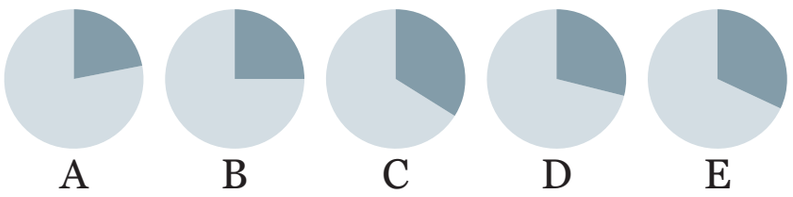
Position



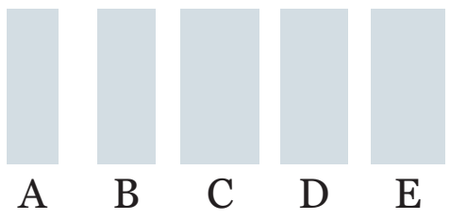
Area



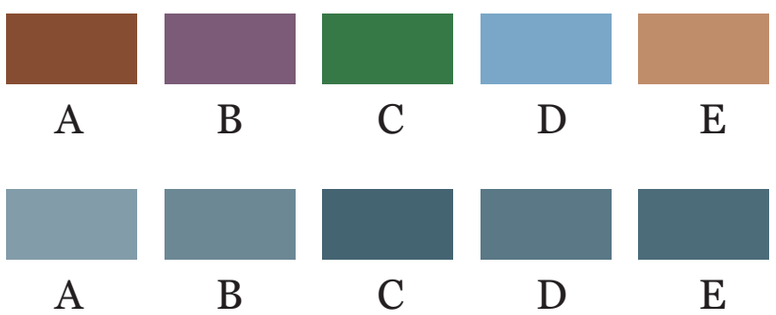
Angle/area



Line weight



Hue and shade



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

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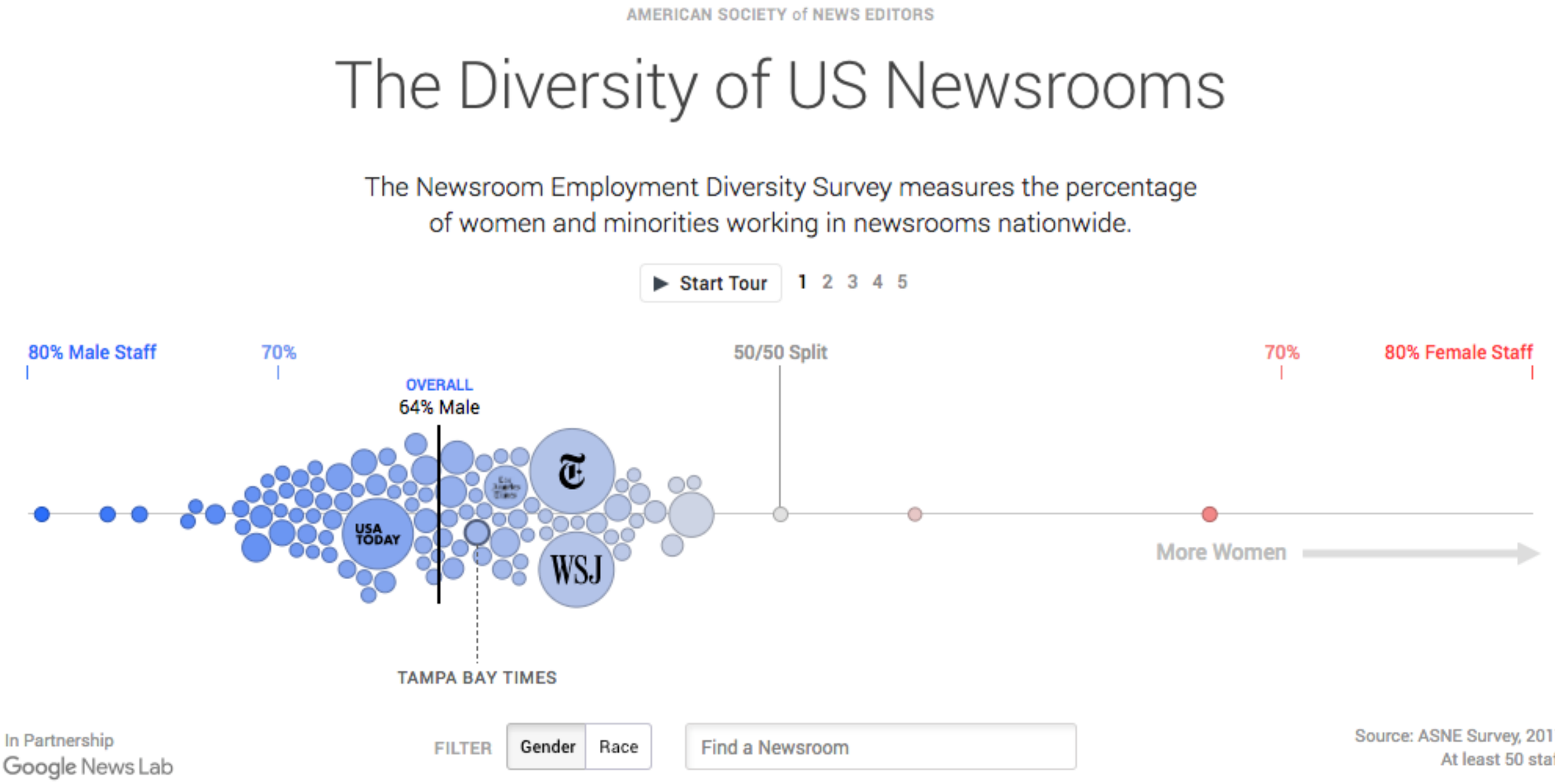
What methods of encoding can you spot here?

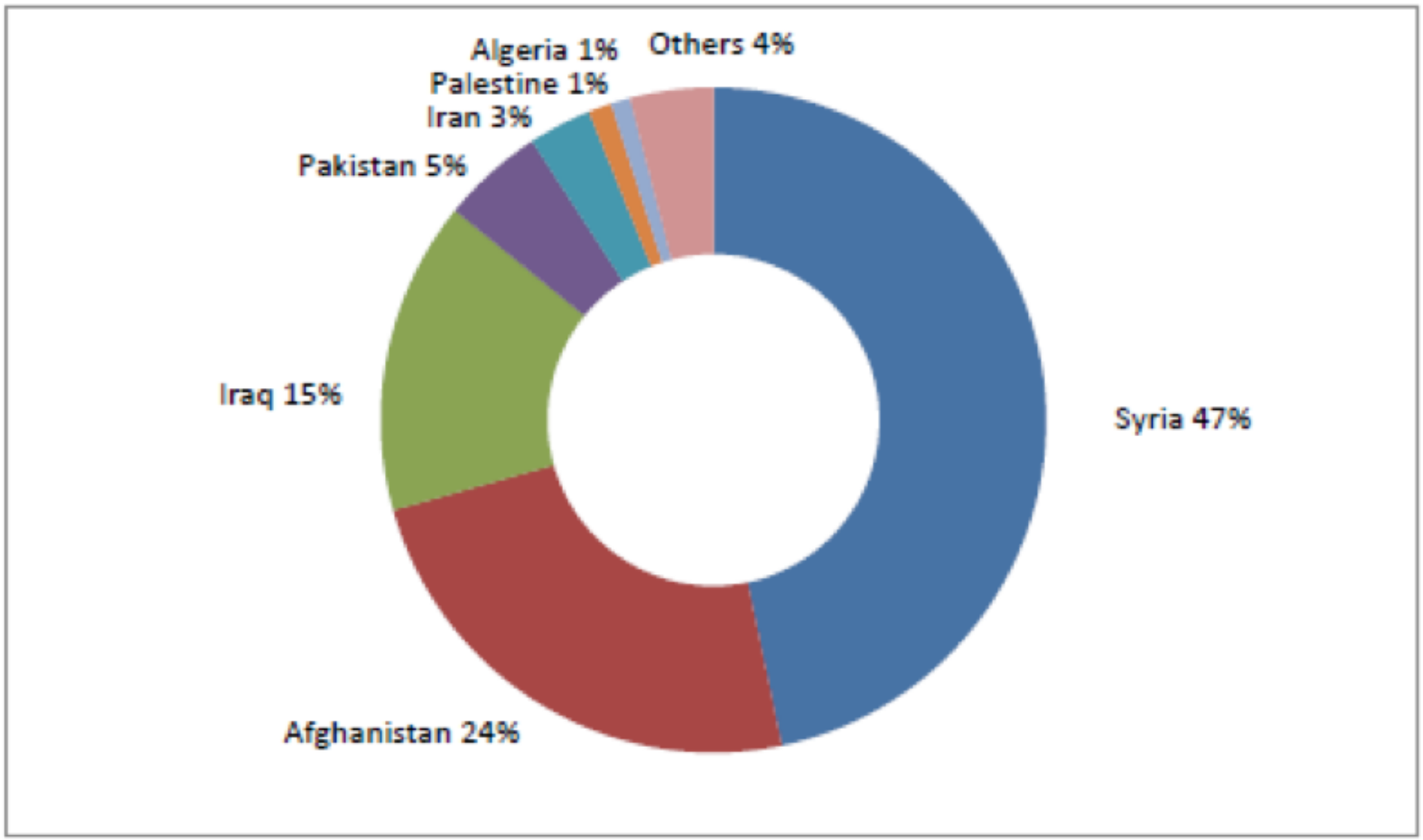


https://polygraph-cool.github.io/asne/dev/

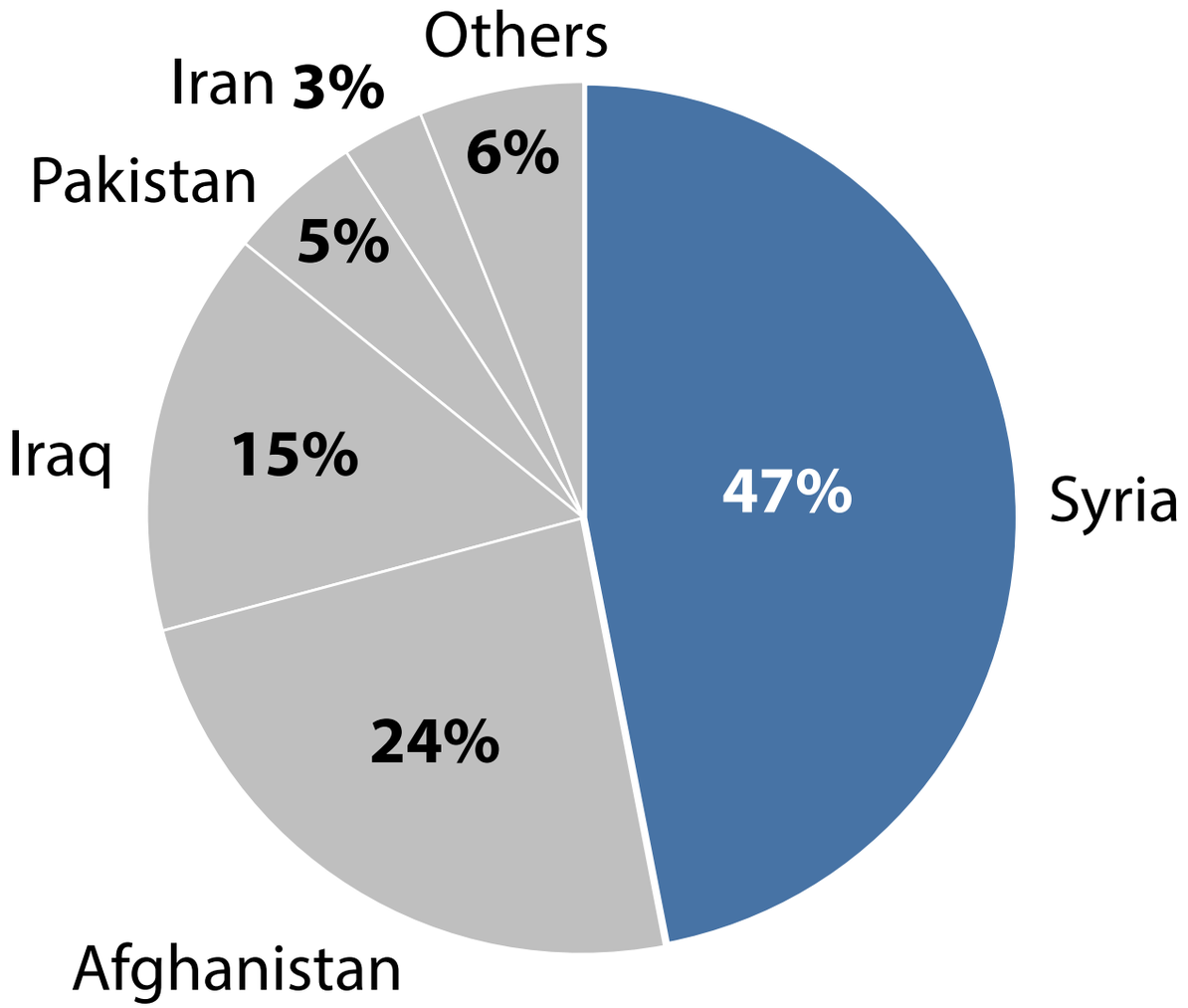
Always think about the purpose of a graphic

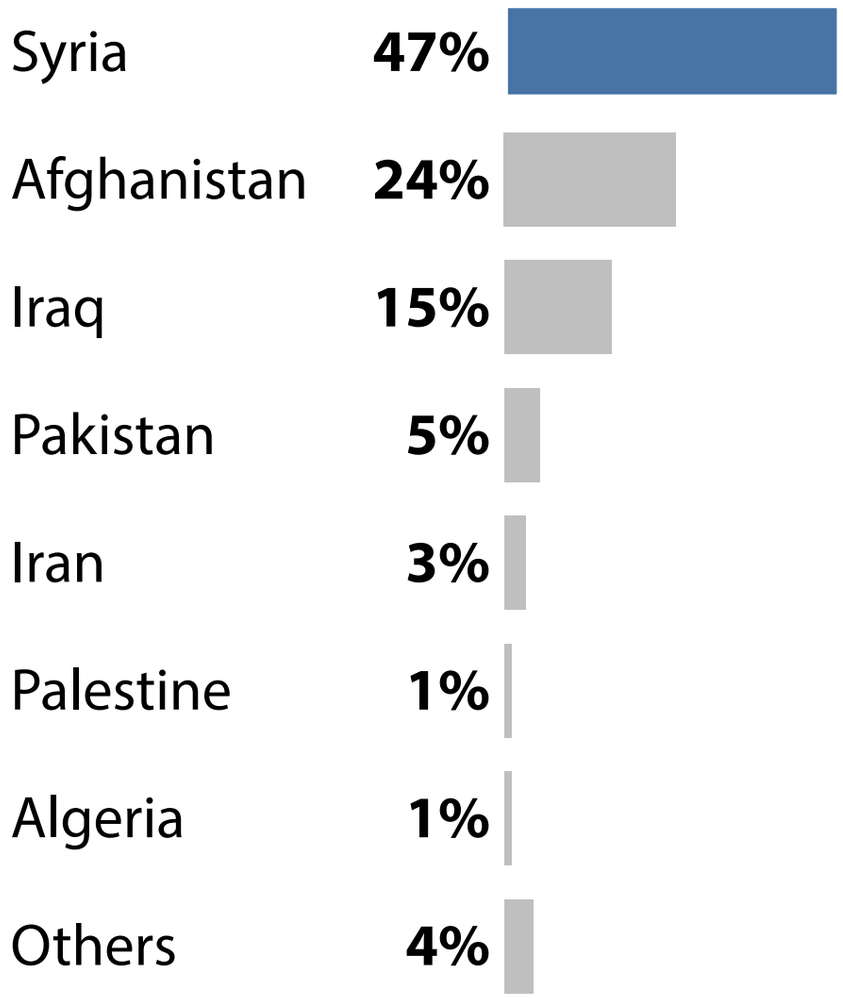
Figure 2 - Main nationalities of arriving migrants – 2016

Greece



Always think about the purpose of a graphic





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Ann K. Emery

data analysis + visualization

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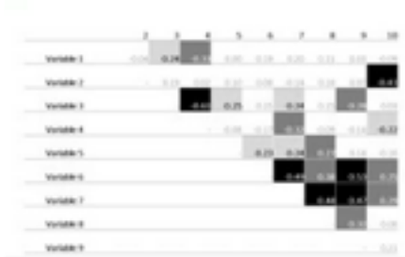
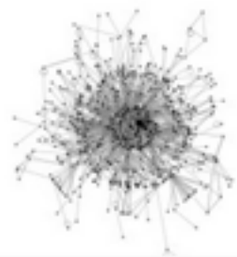
EMERY'S ESSENTIALS Chart Choosing Tool

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

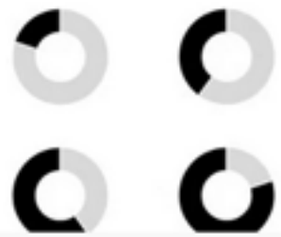

Heat Tables


Social Network Map


Pie


Donut


Small Multiples Pie


Small Multiples Donut


Clustered Bar


Side-by-Side Bar

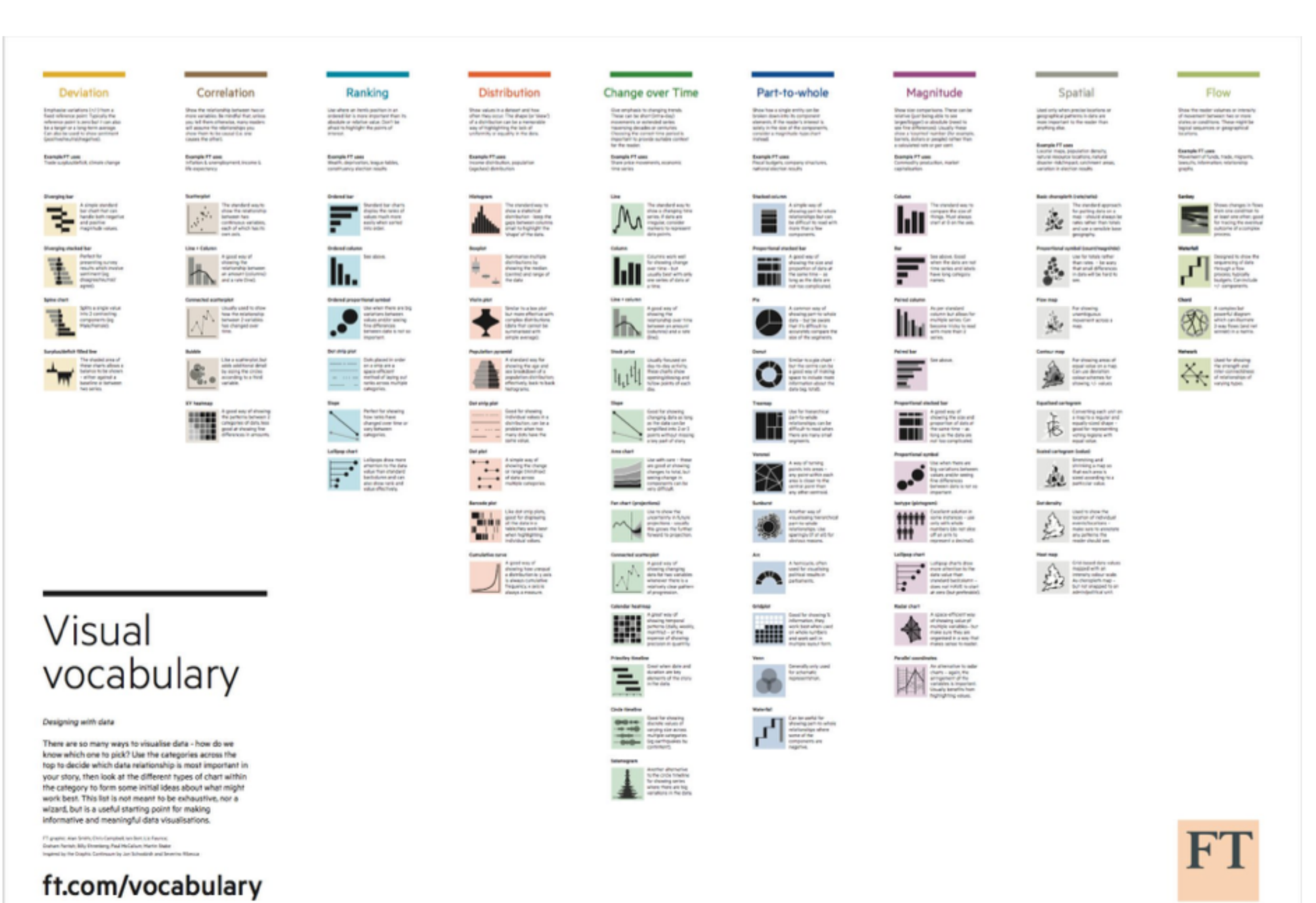

Bar


Small Multiples Bar


Stacked Bar


Back-to-Back Bar

http://annkemery.com/essentials/



https://github.com/ft-interactive/chart-doctor/blob/master/visual-vocabulary/Visual-vocabulary.pdf

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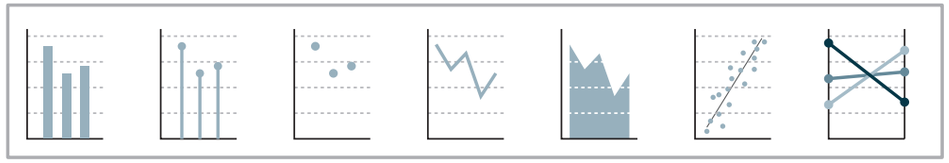
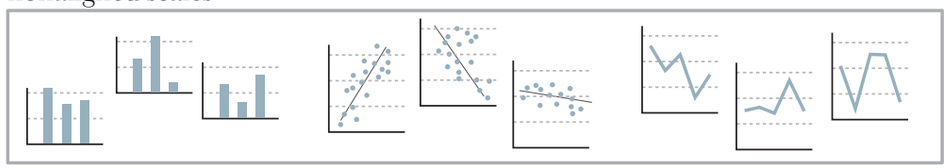
Enable accurate estimates

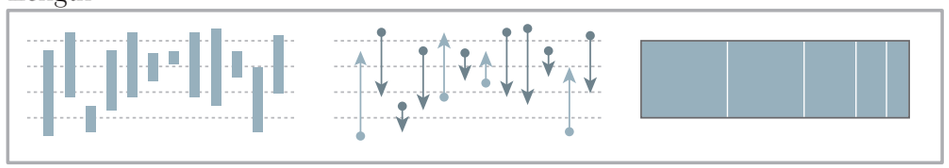
Position along a common scale



Position along identical, nonaligned scales



Length



Direction/slope

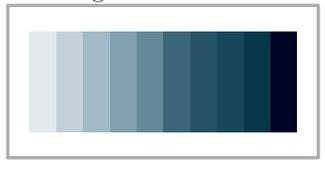
Angle

Area

Volume

May enable general estimates

Shading and saturation

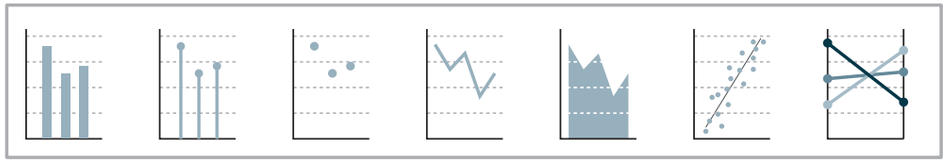


Color hue

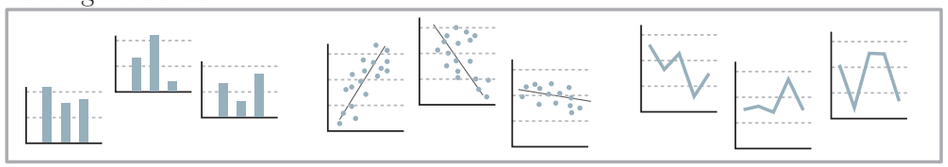
Based on Cleveland and Robert McGill (1984)

Enable accurate estimates

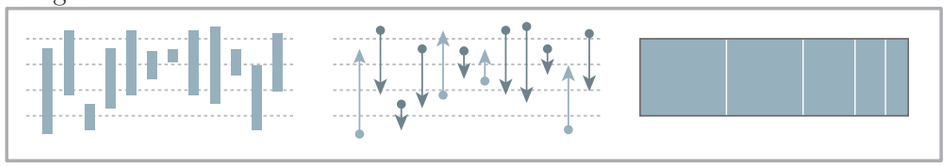
Position along a common scale



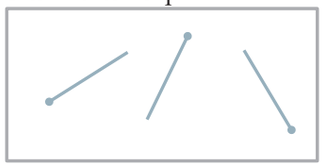
Position along identical, nonaligned scales



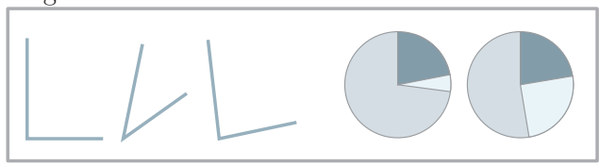
Length



Direction/slope



Angle

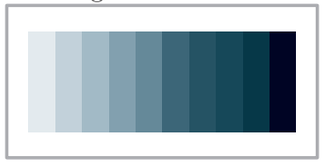


Area

Volume

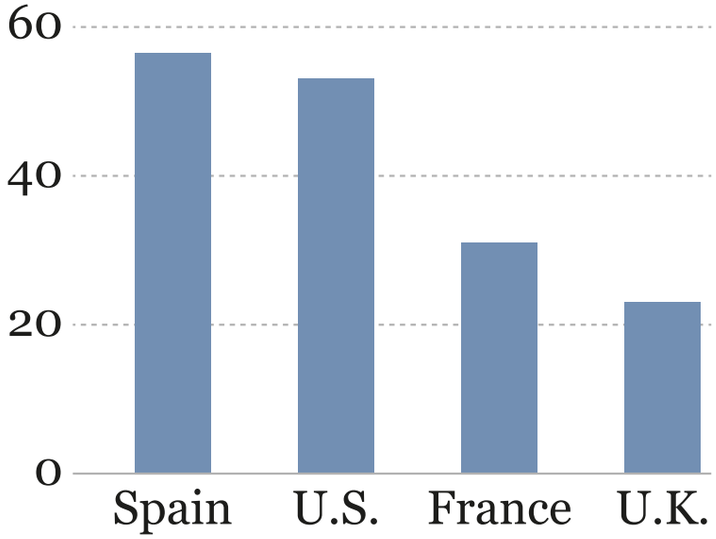
May enable general estimates

Shading and saturation

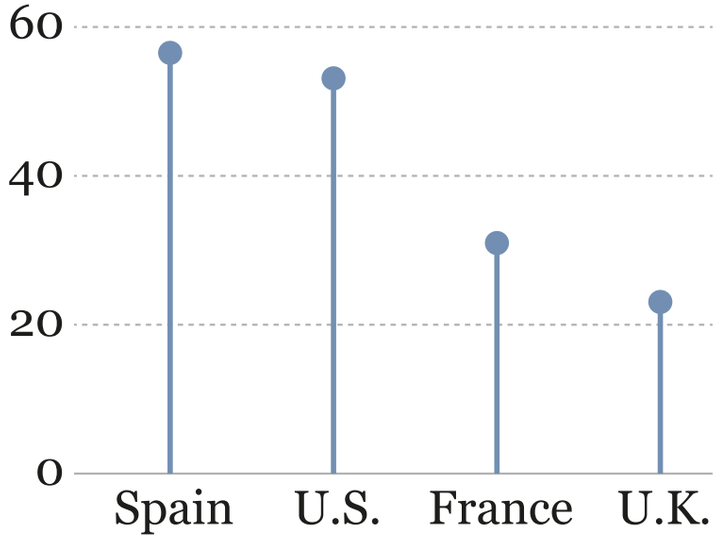


Color hue

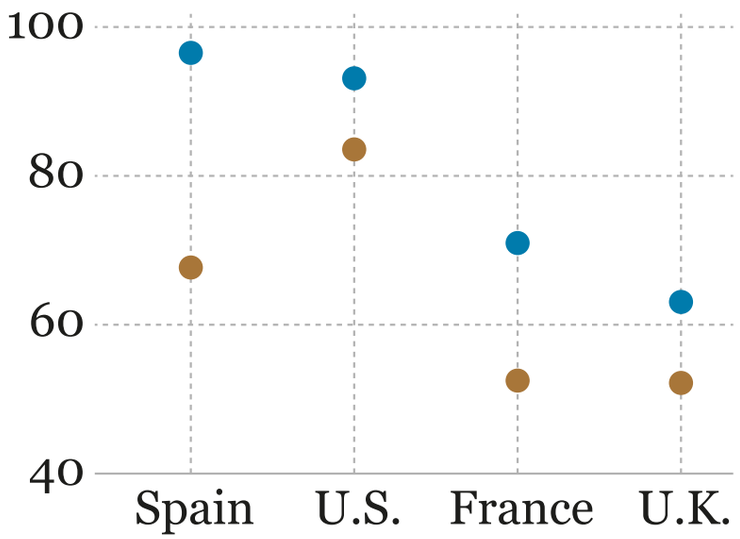
Based on Cleveland and Robert McGill (1984)



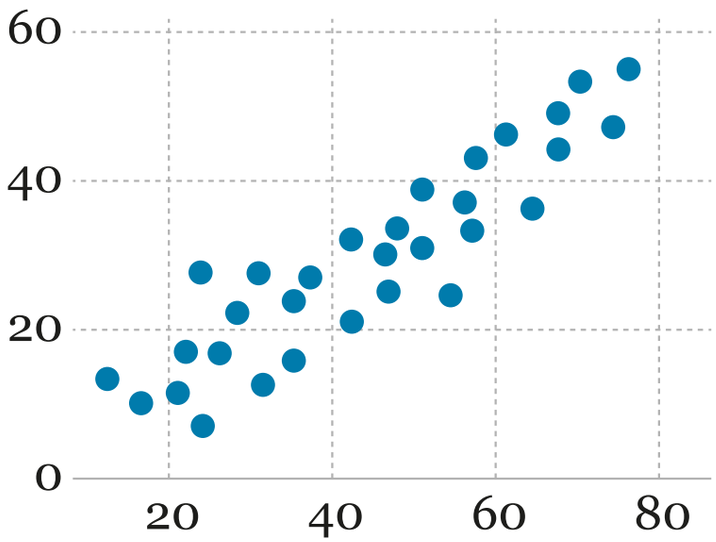
BAR CHART



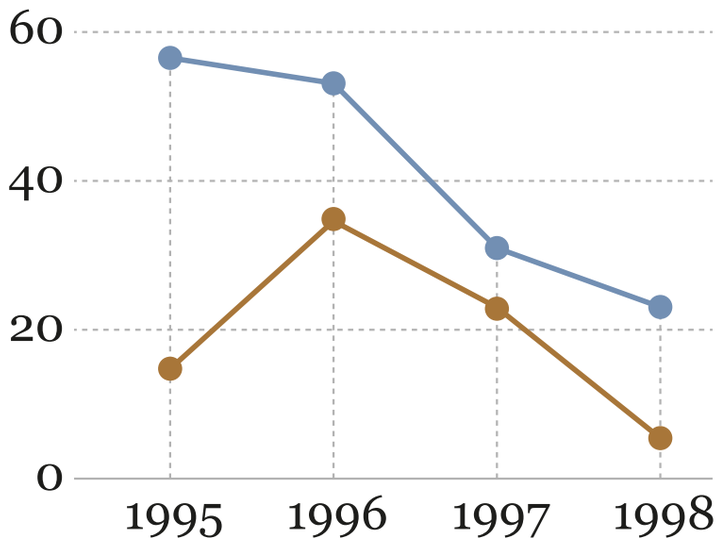
LOLLIPOP CHART



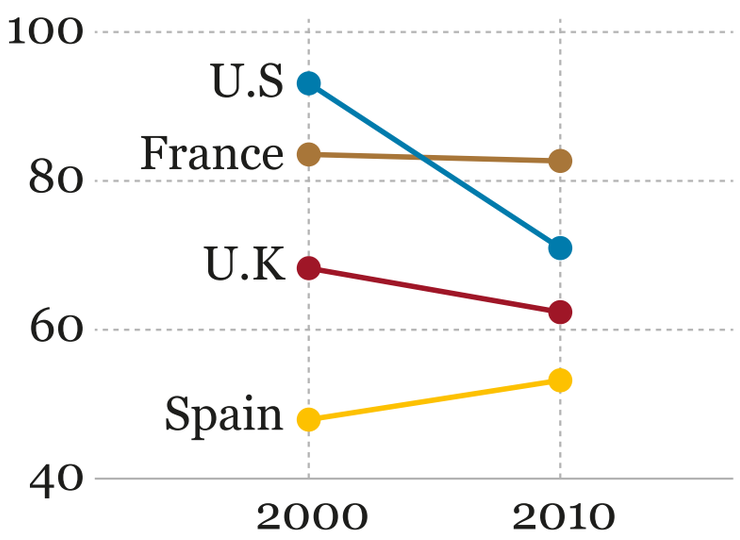
DOT CHART
(or dot plot)



SCATTER CHART
(or scatter plot)



LINE CHART
(or time series chart)



SLOPE CHART

Great for accurate judgments: Comparisons, relationships, etc.

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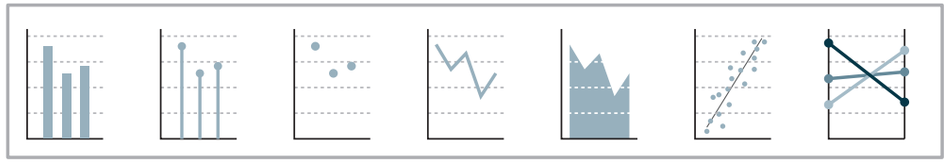
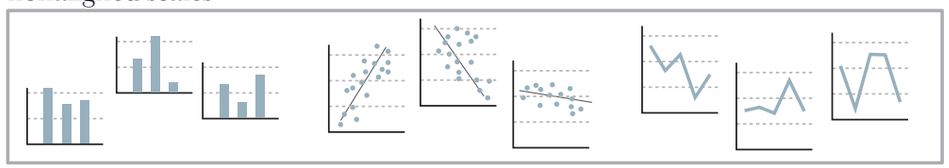
Enable accurate estimates

Position along a common scale



Position along identical, nonaligned scales



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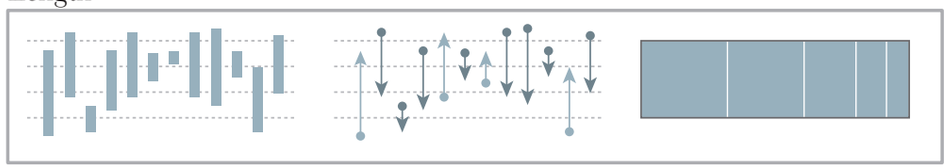


Direction/slope

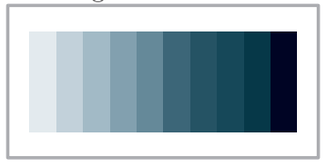
Angle

Area

Volume

May enable general estimates

Shading and saturation



Color hue

Based on Cleveland and Robert McGill (1984)

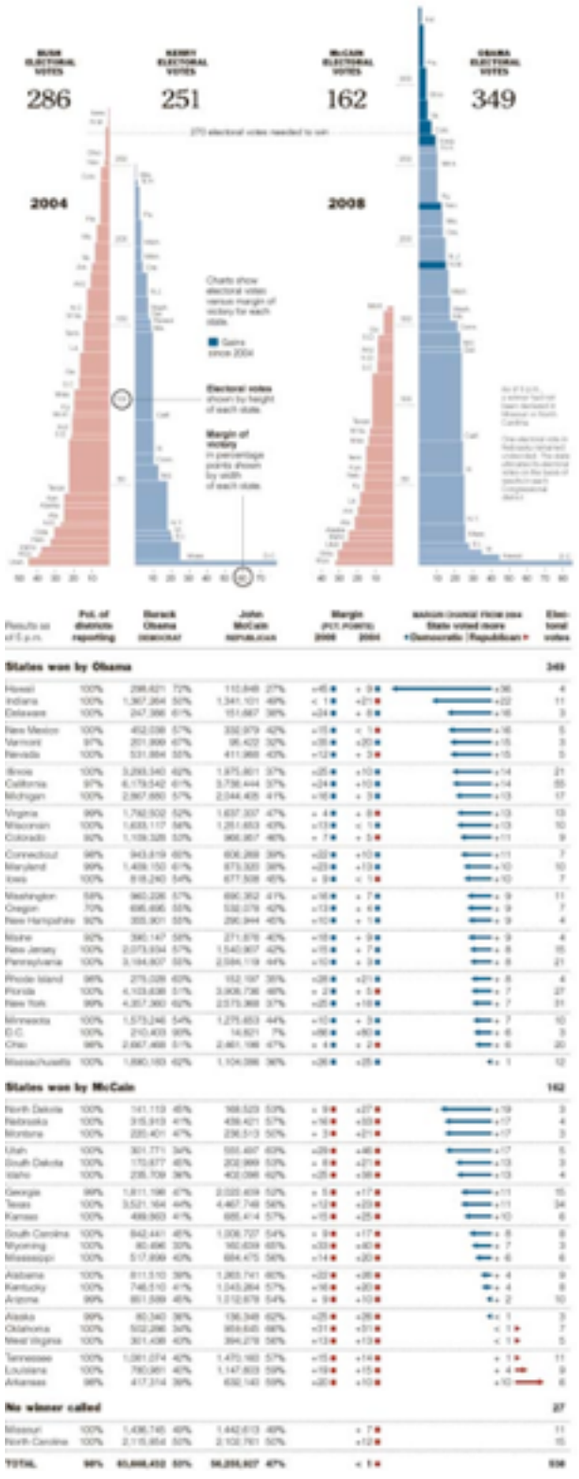
In a Decisive Victory, Obama Reshapes the Electoral Map

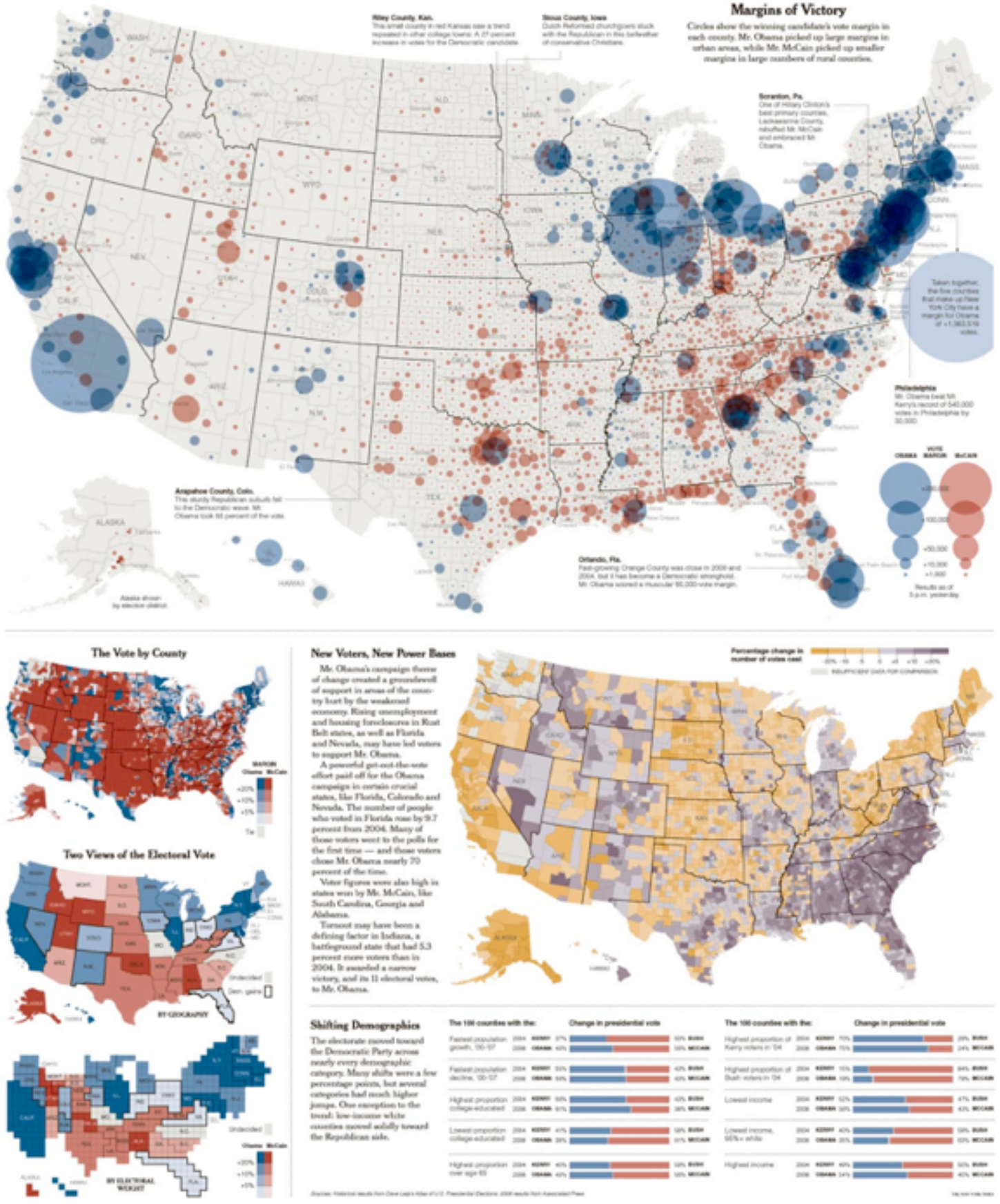
Barack Obama's historic win, with at least 349 electoral votes to John McCain's 162, can be attributed to his victories in several high-population states, like Florida, Virginia and Ohio, that George W. Bush won handily in 2004.

The struggling economy, especially in more industrial states, and high numbers of new voters helped flip key areas from red to blue.

Even where Mr. McCain beat Mr. Obama, he won by slimmer margins, as much of the electorate — across age, race and income lines — swung toward the Democratic Party.

By Erin Aigner, Joe Burgess, Baden Copeland, Matthew Ericson, Hannah Fairfield, Ford Fessenden, Haeyeun Park and Archie Tse





New Voters, New Power Bases

Mr. Obama's campaign theme of change created a groundswell of support in areas of the country hurt by the weakened economy. Rising unemployment and housing foreclosures in Rust Belt states, as well as Florida and Nevada, may have led voters to support Mr. Obama.

A powerful get-out-the-vote effort paid off for the Obama campaign in certain crucial states, like Florida, Colorado and Nevada. The number of people who voted in Florida rose by 9.7 percent from 2004. Many of those voters went to the polls for the first time — and those voters chose Mr. Obama nearly 70 percent of the time.

Voter figures were also high in states won by Mr. McCain, like South Carolina, Georgia and Alabama.

Turnout may have been a defining factor in Indiana, a battleground state that had 5.3 percent more voters than in 2004. It awarded a narrow victory, and its 11 electoral votes, to Mr. Obama.

Shifting Demographics

The electorate moved toward the Democratic Party across nearly every demographic category. Many shifts were a few percentage points, but several categories had much higher jumps. One exception to the trend: low-income white counties moved solidly toward the Republican side.

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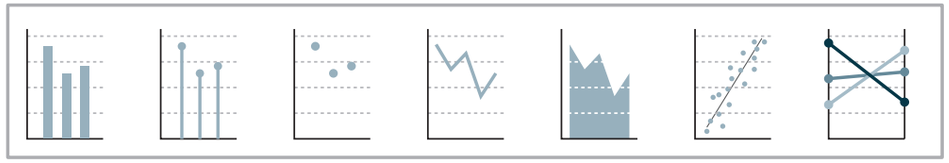
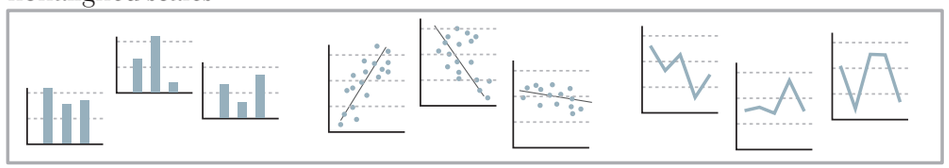
Using graphic forms erroneously

Enable accurate estimates

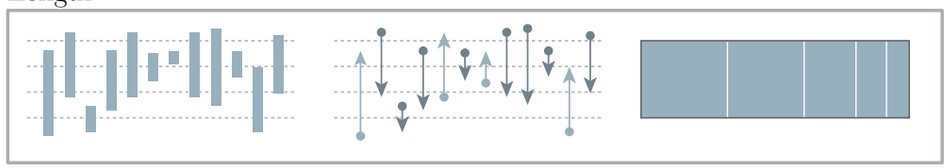
Position along a common scale



Position along identical, nonaligned scales



Length



Direction/slope

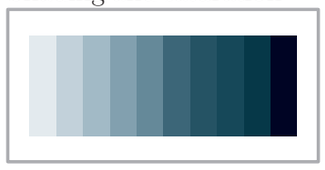
Angle

Area

Volume

May enable general estimates

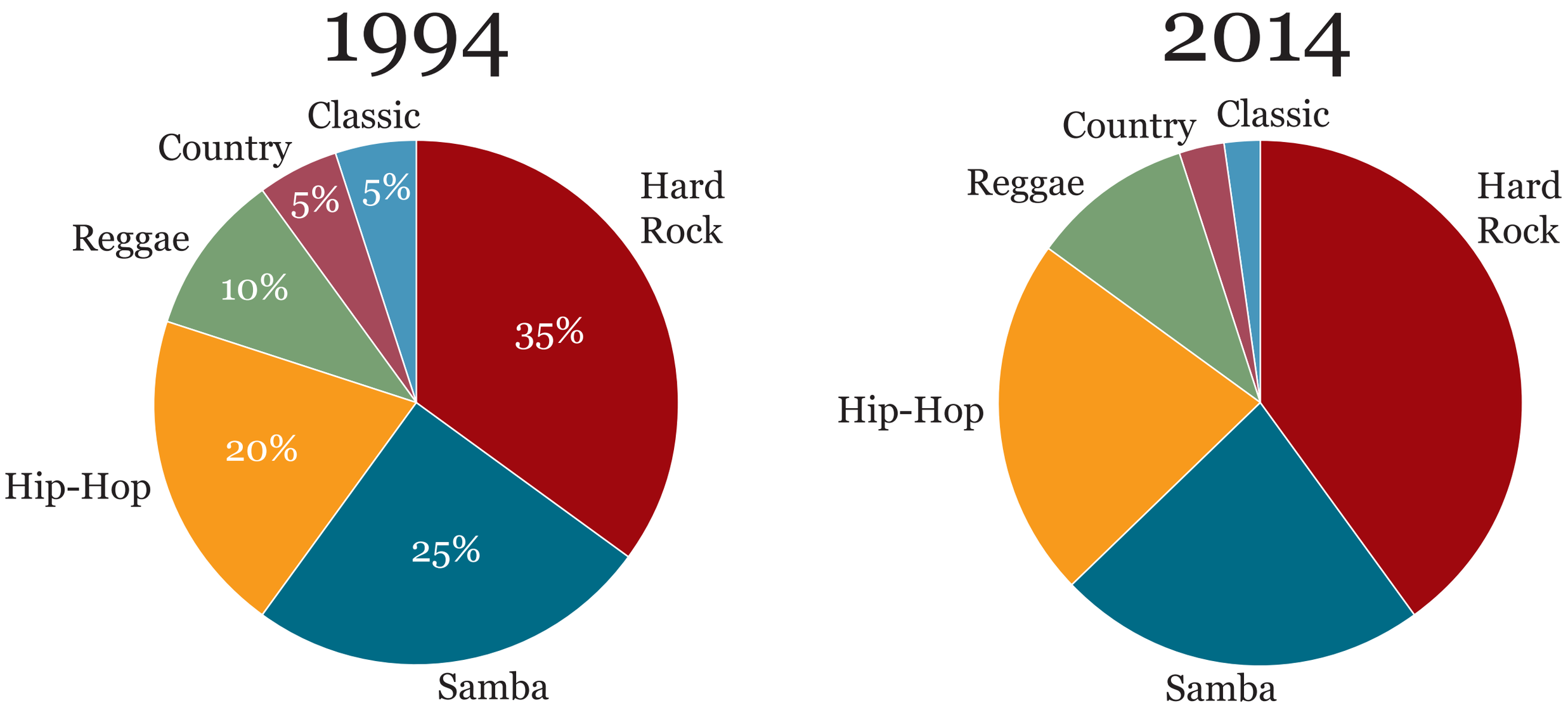
Shading and saturation



Color hue

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.



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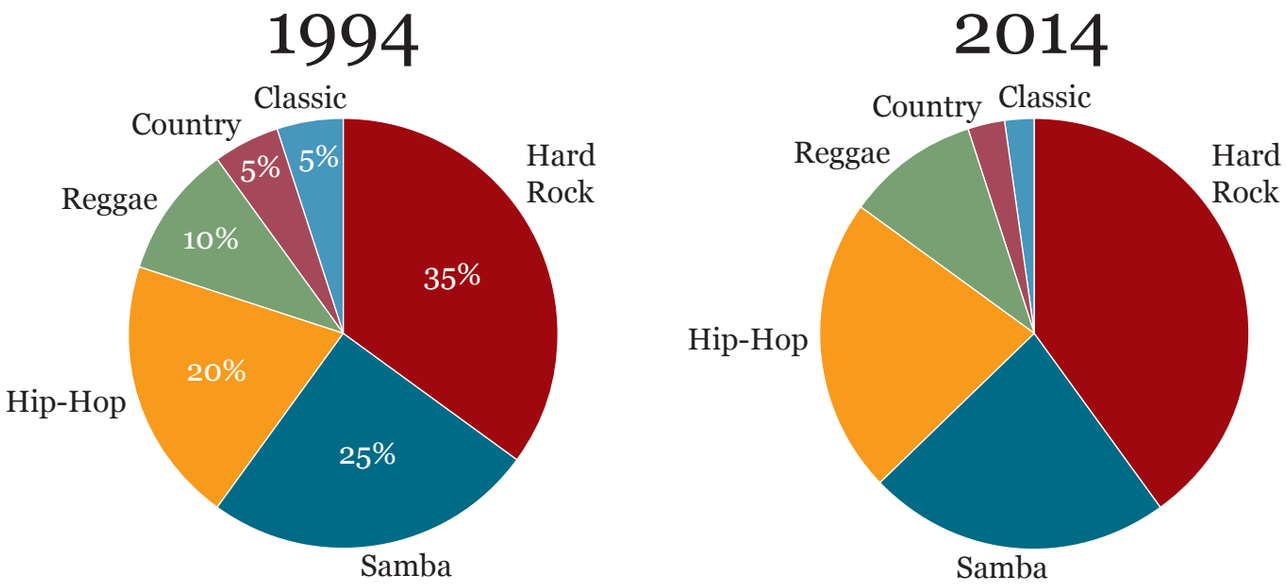
Lesson: Choice of encoding depends on tasks you want to enable

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.



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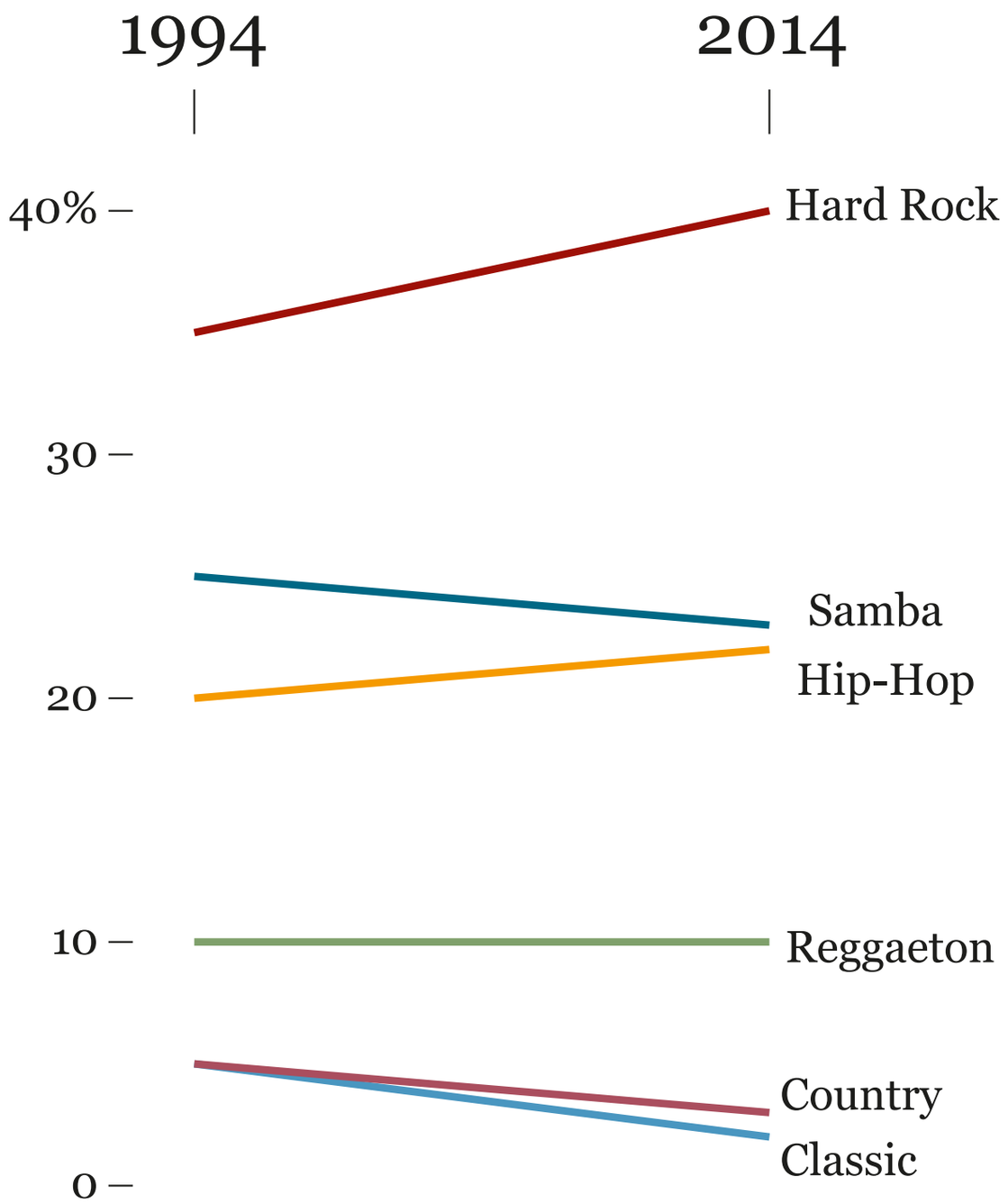
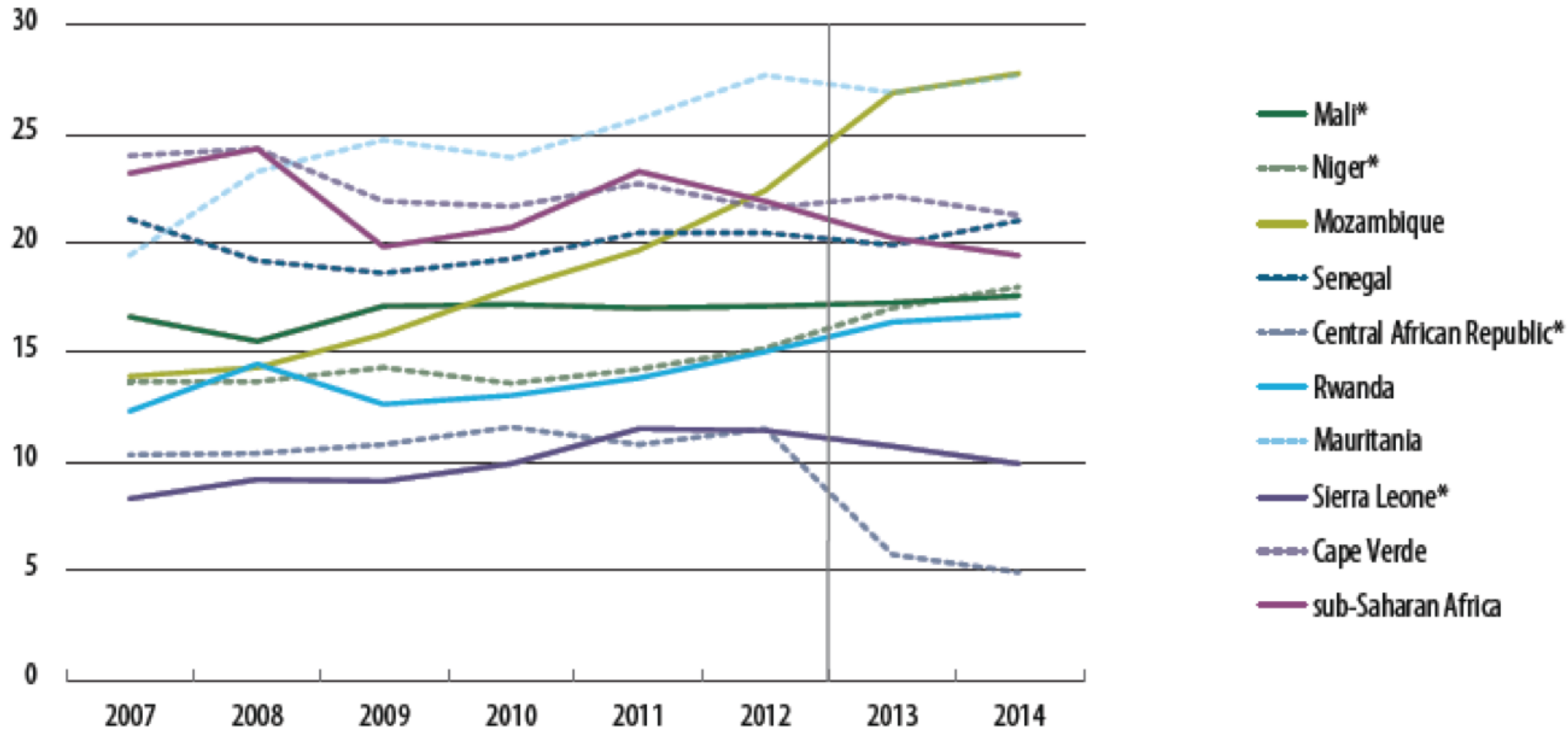


Sorting, integrating, separating

Figure 2

Revenue-to-GDP ratio evolution 2007-2014



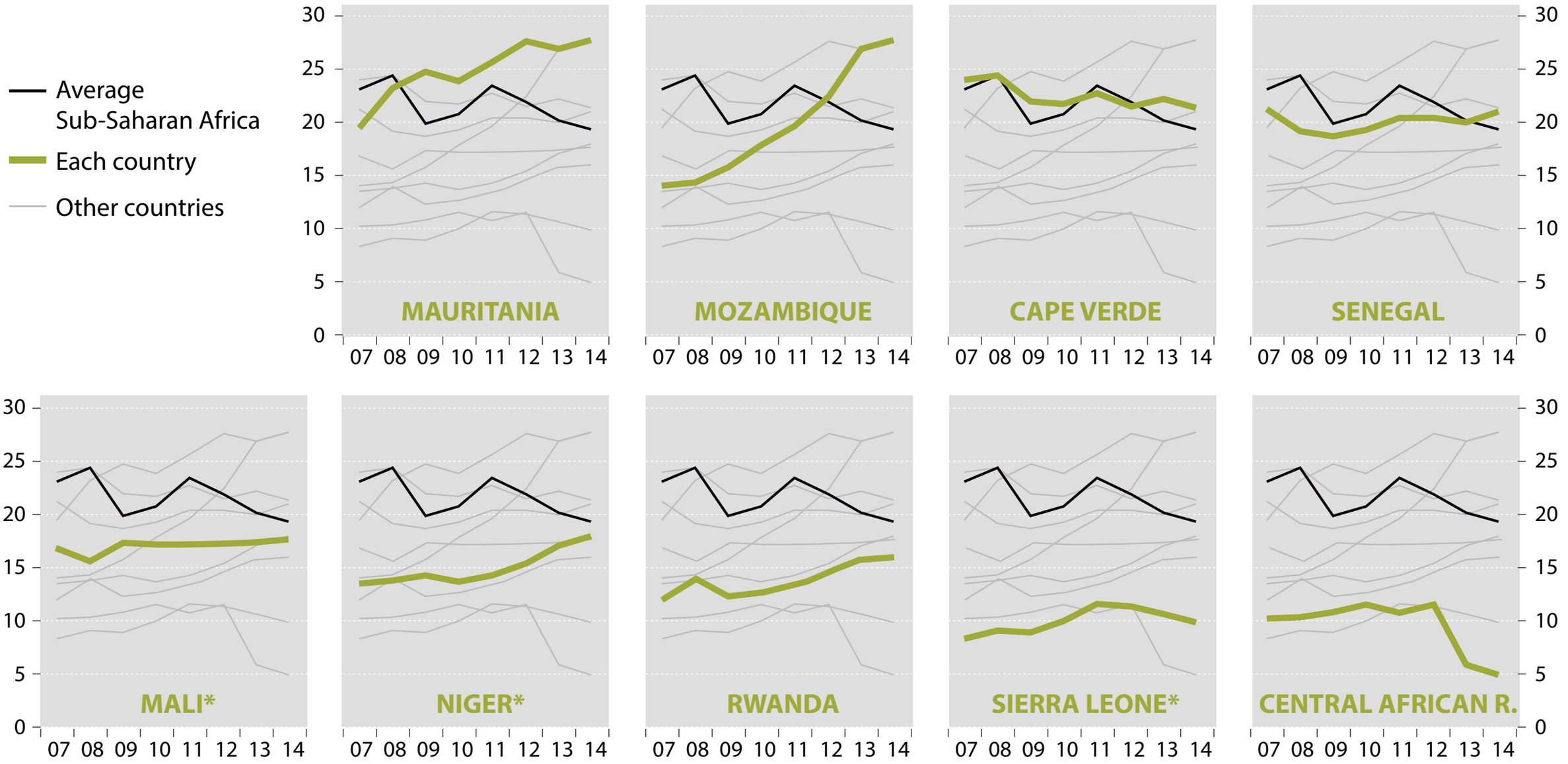
* Countries with DRM indicators.

Source: IMF Regional Economic Outlook, October 2015. Mauritania figures from African Economic Outlook 2012, 2014 and 2016 / European Court of Auditors (calculation).

Sorting, integrating, separating

Figure 2

Revenue-to-GDP ratio evolution 2007-2014



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Whenever possible, integrate words and visuals

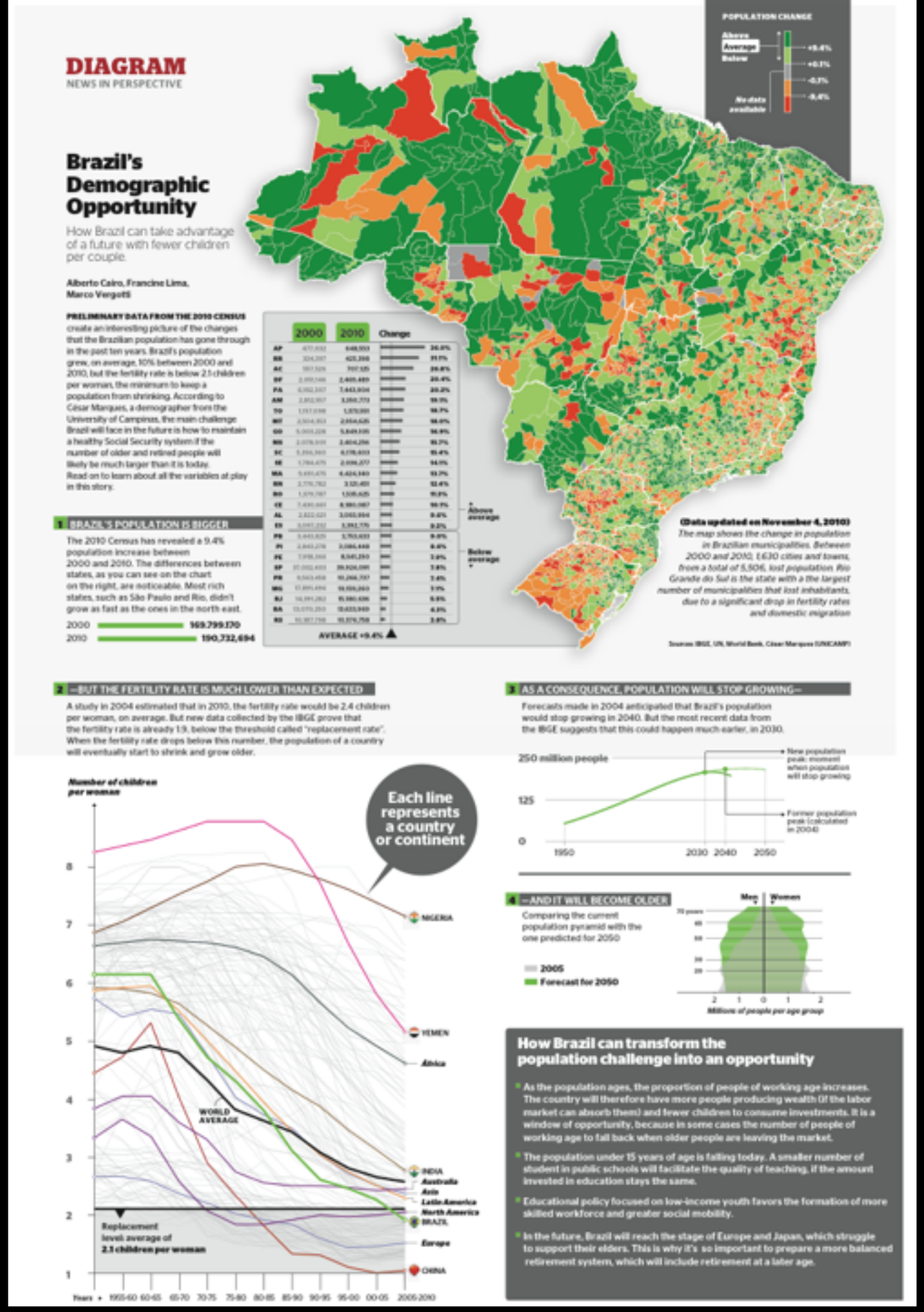

DIAGRAM
NEWS IN PERSPECTIVE

Brazil's Demographic Opportunity

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

Alberto Cairo, Francine Lima, Marco Vergotti

PRELIMINARY DATA FROM THE 2010 CENSUS create an interesting picture of the changes that the Brazilian population has gone through in the past ten 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 César 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 at play in this story.

1 BRAZIL'S POPULATION IS BIGGER

The 2010 Census has revealed a 9.4% population increase between 2000 and 2010. The differences between states, as you can see on the chart on the right, are noticeable. Most rich states, such as São Paulo and Rio, didn't grow as fast as the ones in the north east.

2000 169,799,170
2010 190,732,694

POPULATION CHANGE
Above Average / Below
+9.4%
+0.1%
-0.1%
-9.4%
No data available

2000 2010 Change

AVERAGE +9.4%

Above average
Below average

(Data updated on November 4, 2010)
The map shows the change in population in Brazilian municipalities. Between 2000 and 2010, 1,630 cities and towns, from a total of 5,506, lost population. Rio Grande do Sul is the state with the largest number of municipalities that lost inhabitants, due to a significant drop in fertility rates and domestic migration

Sources: IBGE, UN, World Bank, César Marques (UNICAMP)

2 —BUT THE FERTILITY RATE IS MUCH LOWER THAN EXPECTED

A study in 2004 estimated that in 2010, the fertility rate would be 2.4 children per woman, on average. But new data collected by the IBGE prove that the fertility rate is already 1.9, below the threshold called "replacement rate". When the fertility rate drops below this number, the population of a country will eventually start to shrink and grow older.

Number of children per woman

Each line represents a country or continent

NIGERIA
YEMEN
Africa
WORLD AVERAGE
INDIA
Australia
Asia
Latin America
North America
BRAZIL
Europe
CHINA

Replacement level: average of 2.1 children per woman

Years 1965-70 70-75 75-80 80-85 85-90 90-95 95-00 00-05 2005-2010

3 AS A CONSEQUENCE, POPULATION WILL STOP GROWING—

Forecasts made in 2004 anticipated that Brazil's population would stop growing in 2040. But the most recent data from the IBGE suggests that this could happen much earlier, in 2030.

250 million people
125
0
1950 2030 2040 2050
New population peak: moment when population will stop growing
Former population peak (calculated in 2004)

4 —AND IT WILL BECOME OLDER

Comparing the current population pyramid with the one predicted for 2050

2005
Forecast for 2050

Men Women
70 years
60
50
40
30
2 1 0 1 2
Millions of people per age group

How Brazil can transform the population challenge into an opportunity

- As the population ages, the proportion of people of working age increases. The country will therefore have more people producing wealth (if the labor market can absorb them) and fewer children to consume investments. It is a window of opportunity, because in some cases the number of people of working age to fall back when older people are leaving the market.
- The population under 15 years of age is falling today. A smaller number of student in public schools will facilitate the quality of teaching, if the amount invested in education stays the same.
- Educational policy focused on low-income youth favors the formation of more skilled workforce and greater social mobility.
- In the future, Brazil will reach the stage of Europe and Japan, which struggle to support their elders. This is why it's so important to prepare a more balanced retirement system, which will include retirement at a later age.

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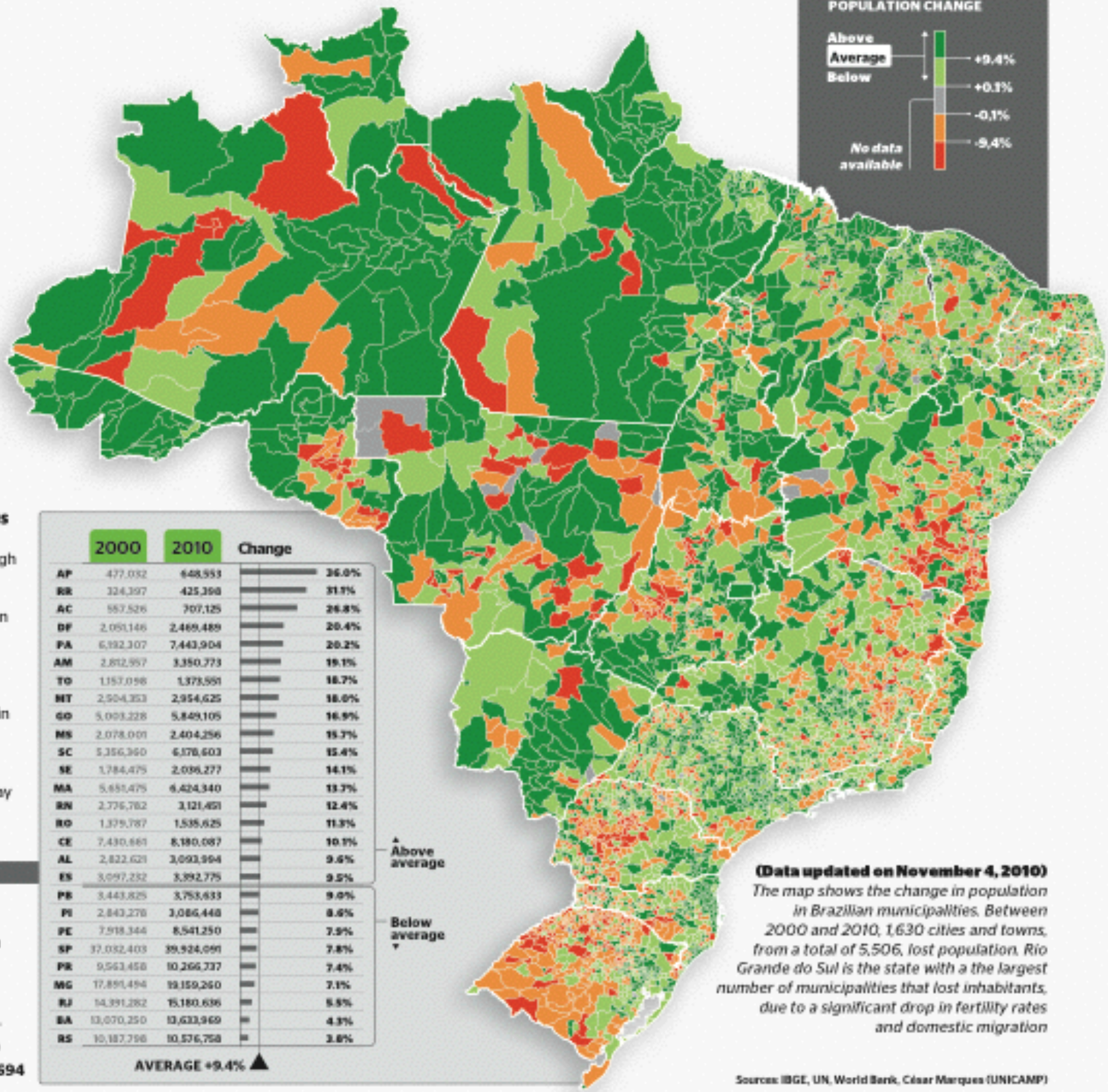

	2000	2010	Change
AP	477,032	648,553	36.0%
RR	324,397	425,398	31.1%
AC	557,526	707,125	26.8%
DF	2,051,146	2,469,489	20.4%
PA	6,192,307	7,443,904	20.2%
AM	2,812,557	3,350,773	19.1%
TO	1,157,098	1,373,551	18.7%
MT	2,504,353	2,954,625	18.0%
GO	5,003,228	5,849,105	16.9%
MS	2,078,001	2,404,256	15.7%
SC	5,356,360	6,178,603	15.4%
SE	1,784,475	2,036,277	14.1%
MA	5,651,475	6,424,340	13.7%
RN	2,776,782	3,121,451	12.4%
RO	1,379,787	1,535,625	11.3%
CE	7,430,661	8,180,087	10.1%
AL	2,822,621	3,093,994	9.6%
ES	3,097,232	3,392,775	9.5%
PB	3,443,825	3,753,633	9.0%
PI	2,843,278	3,086,448	8.6%
PE	7,918,344	8,541,250	7.9%
SP	37,032,403	39,924,091	7.8%
PR	9,563,458	10,266,737	7.4%
MG	17,891,494	19,159,260	7.1%
RJ	14,391,282	15,180,636	5.5%
BA	13,070,250	13,633,969	4.3%
RS	10,187,798	10,576,758	3.8%

Above average
Below average
AVERAGE +9.4%

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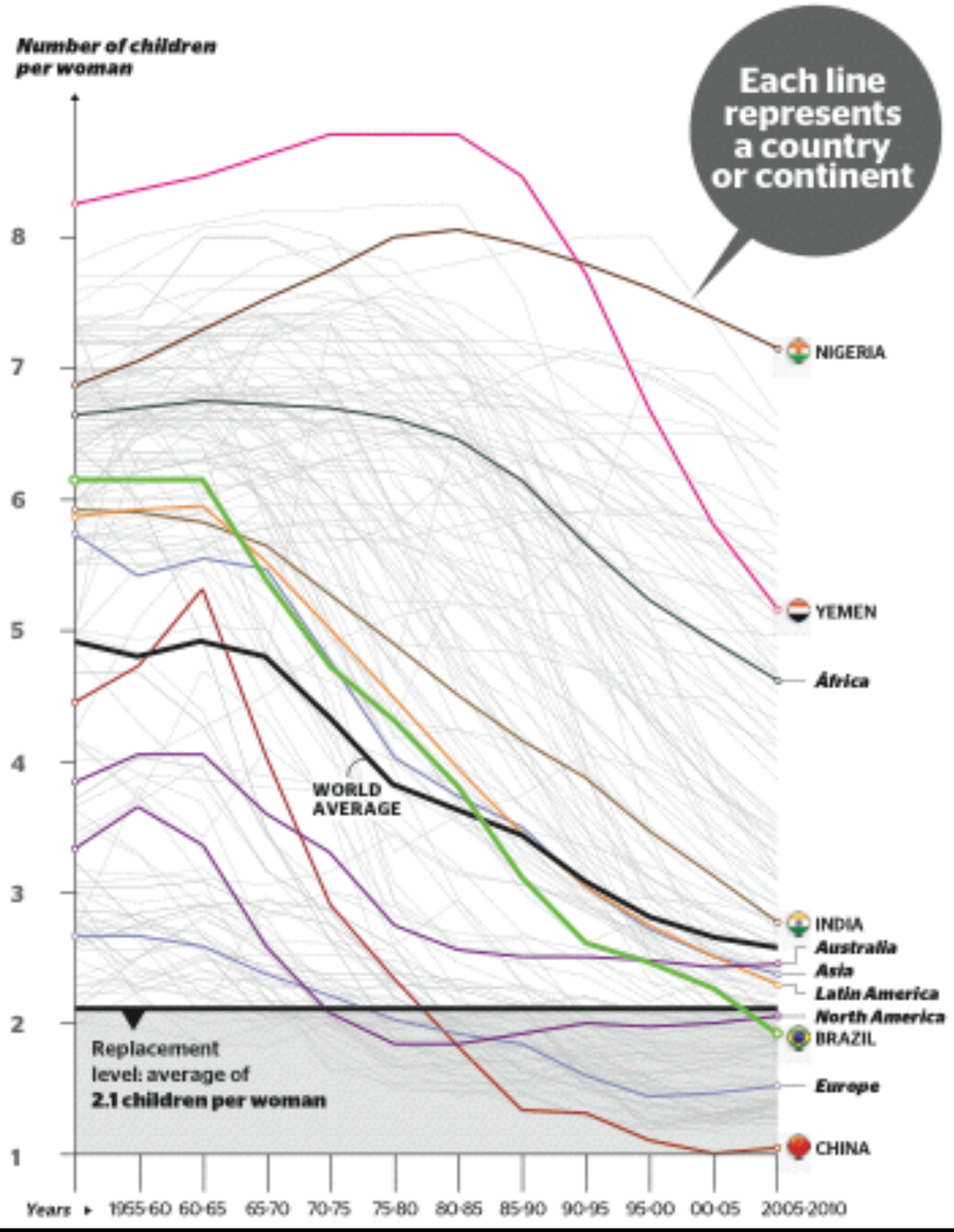

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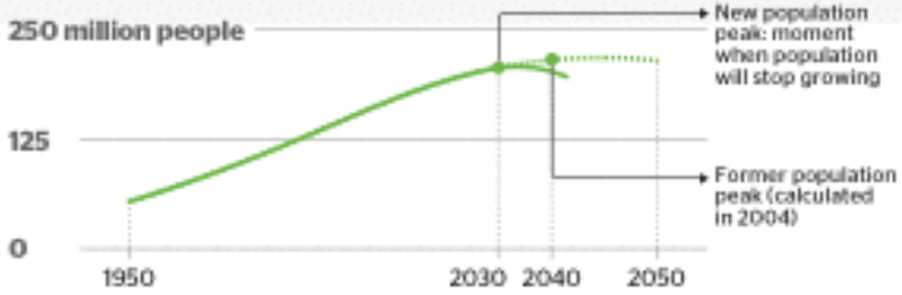
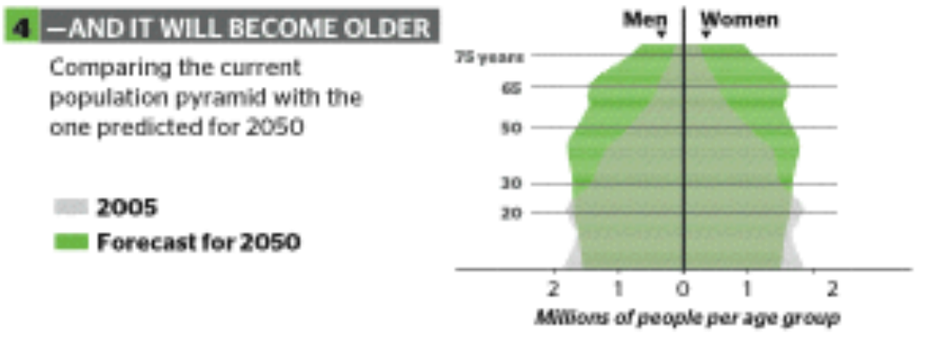


4 —AND IT WILL BECOME OLDER

Comparing the current population pyramid with the one predicted for 2050



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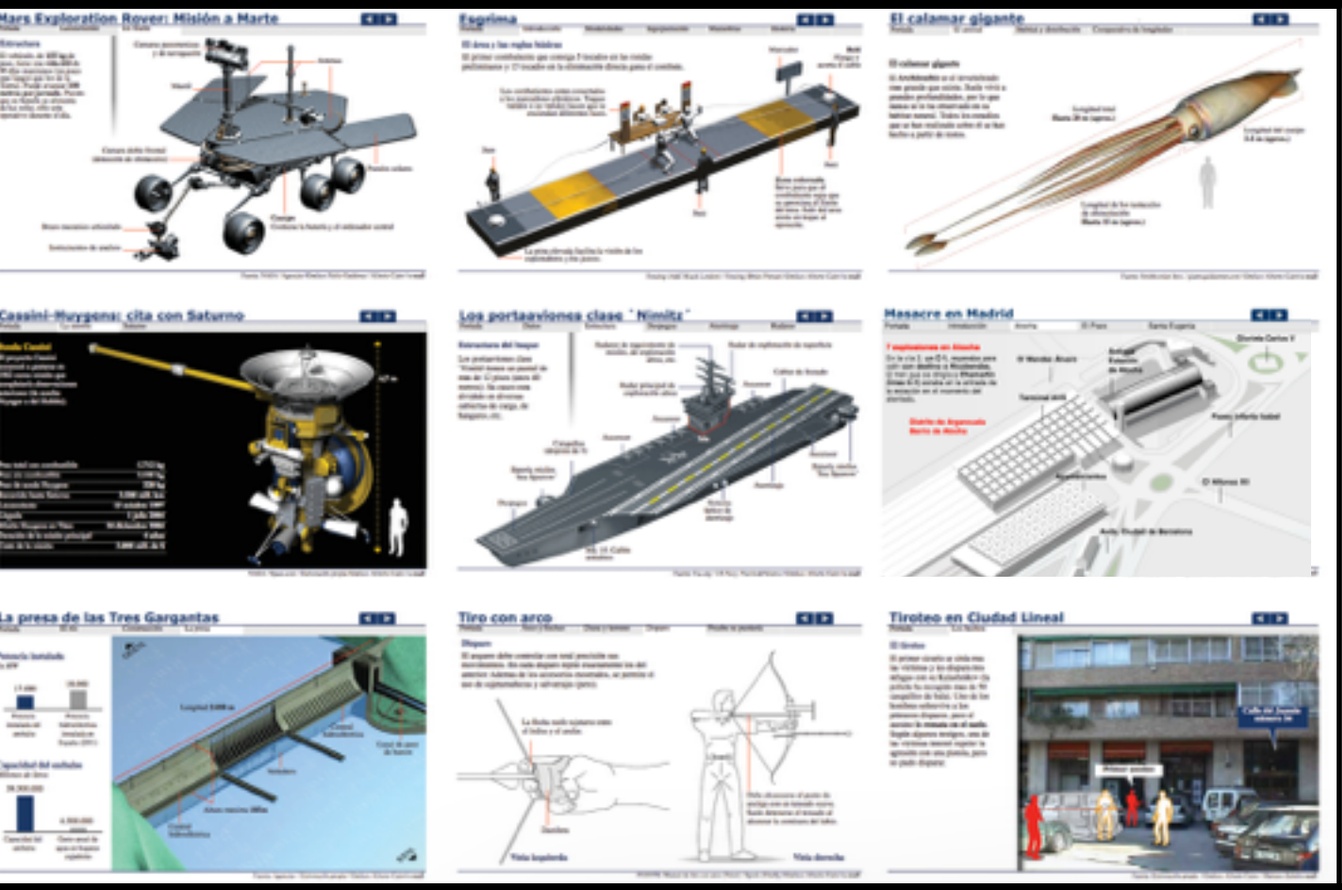
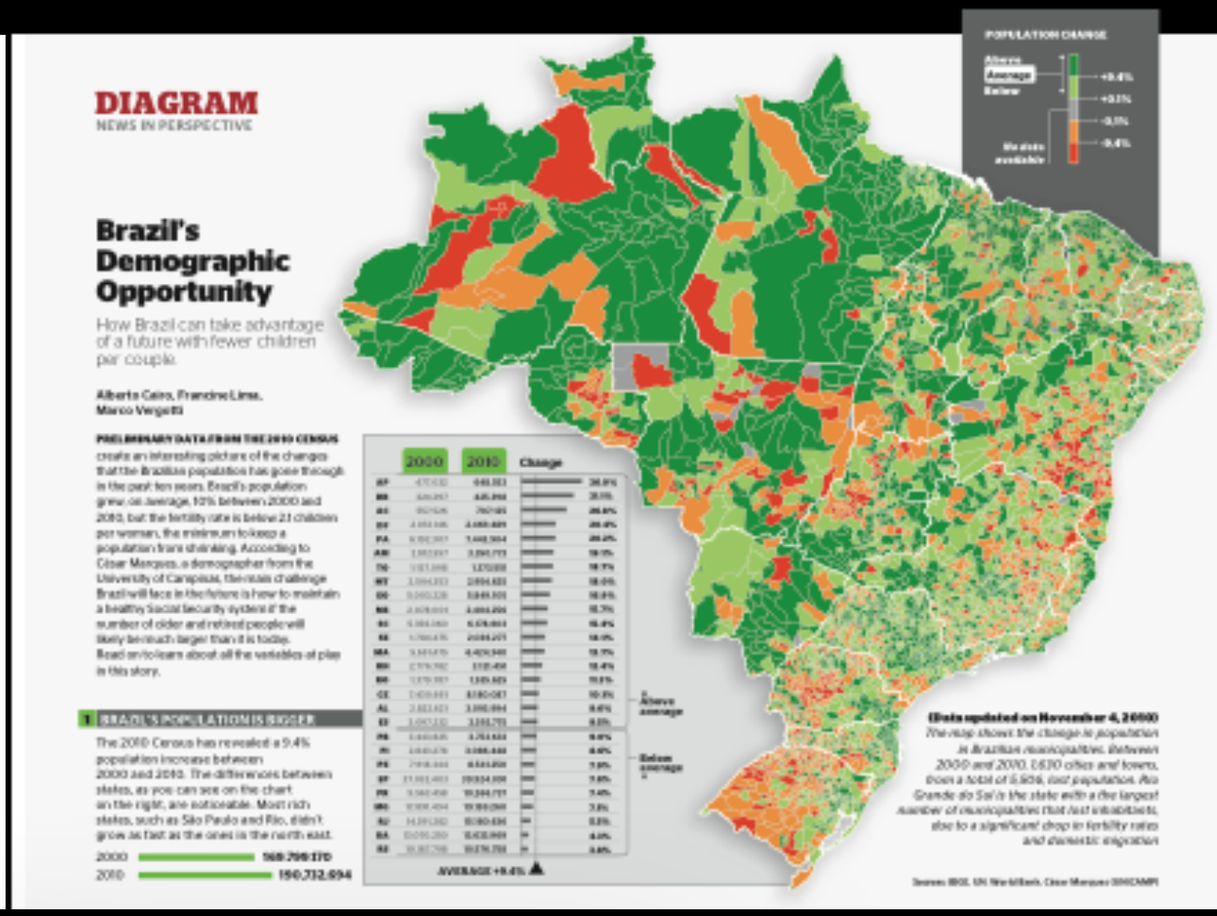
Turning the Tide

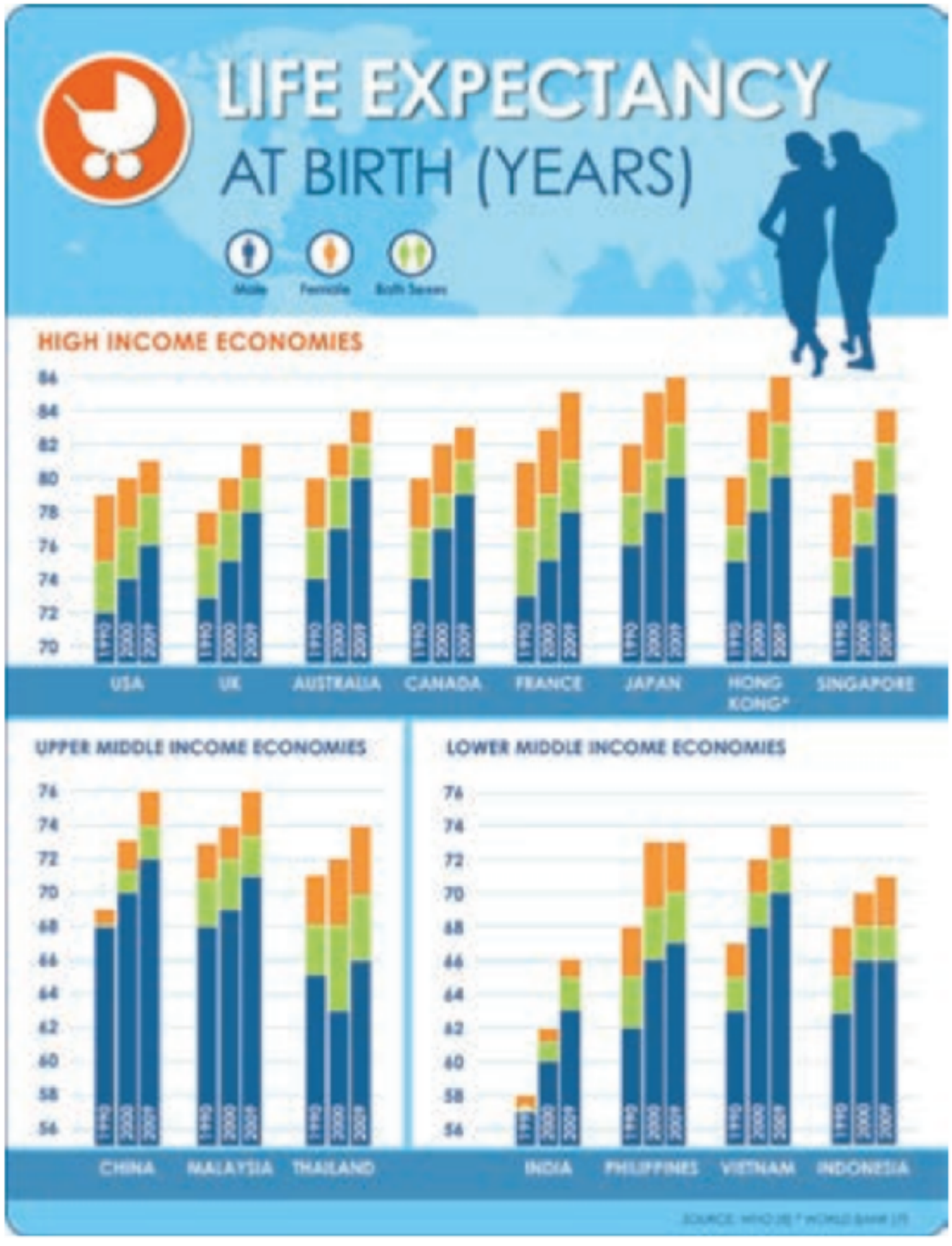
New Directions in Health Communication





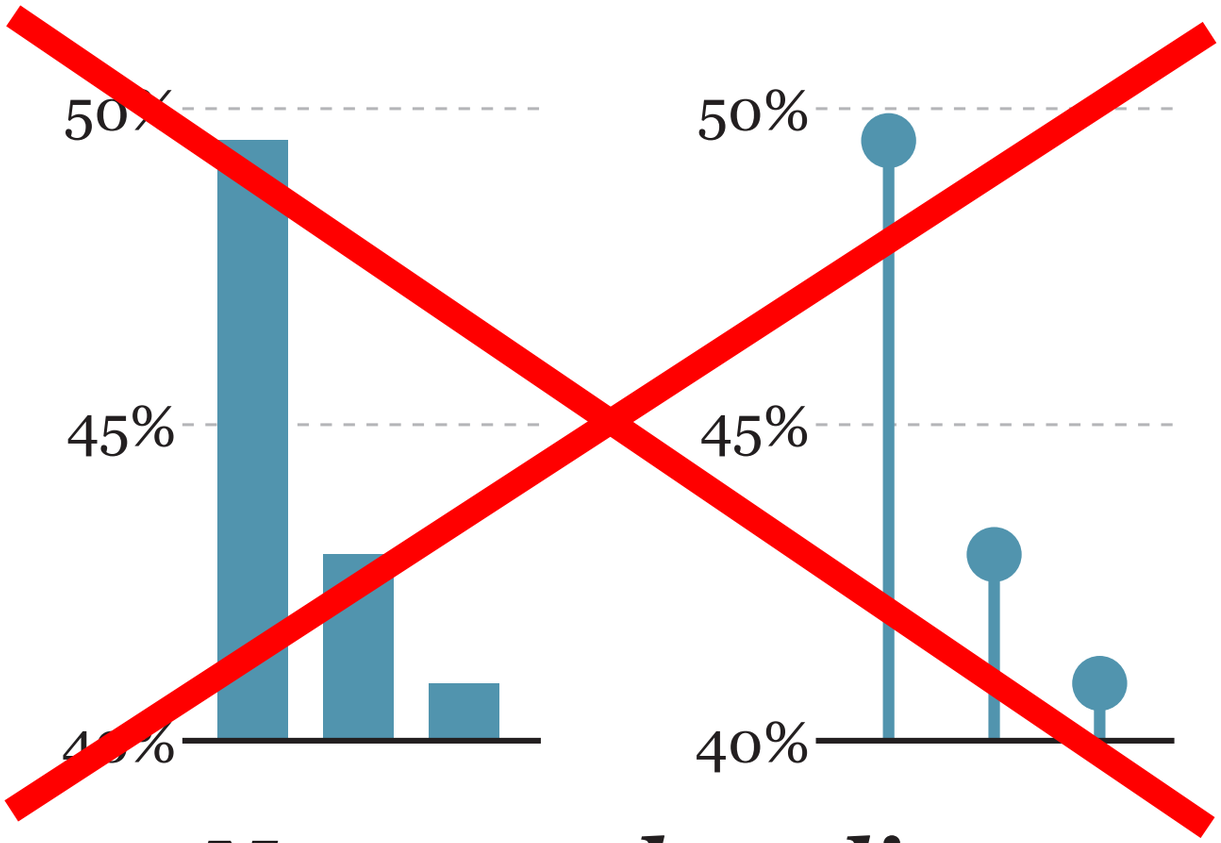
EXERCISE

Alberto Cairo, School of Communication, University of Miami

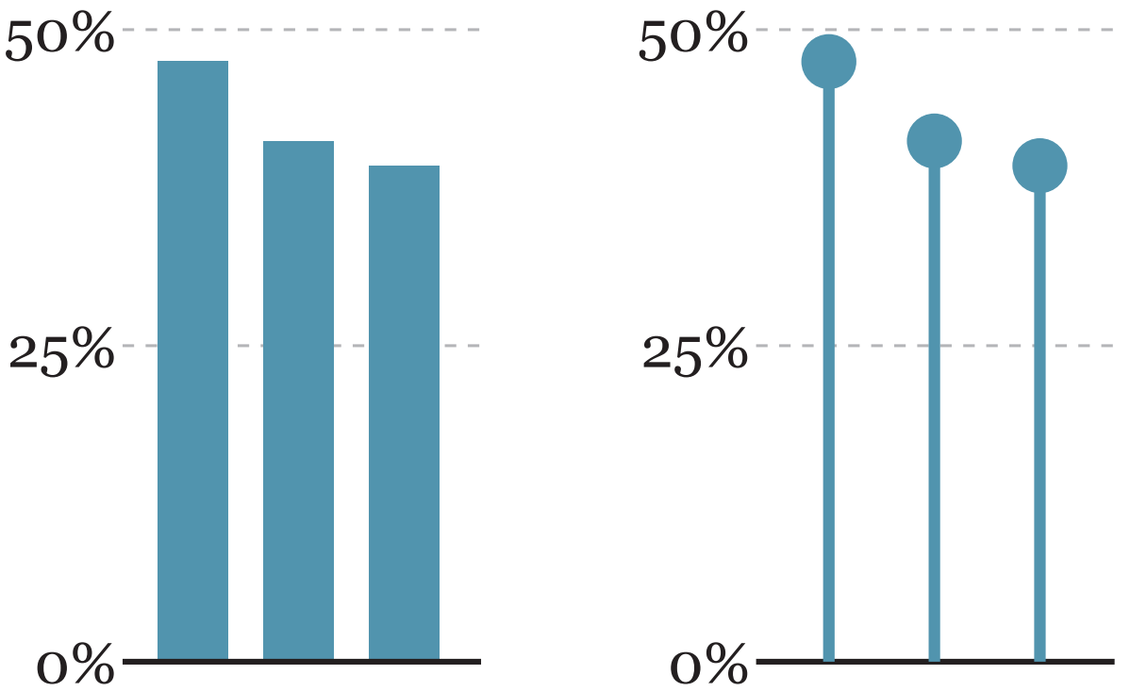


http://www.brookings.edu/~/media/press/books/2013/affordableexcellence/affordableexcellencepdf.pdf

Scales



Non-zero baseline



Zero baseline

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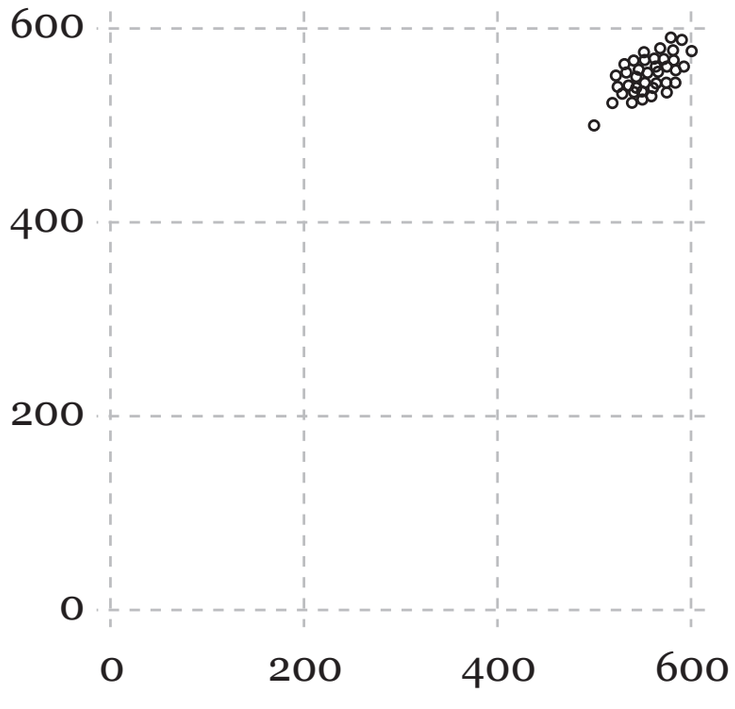
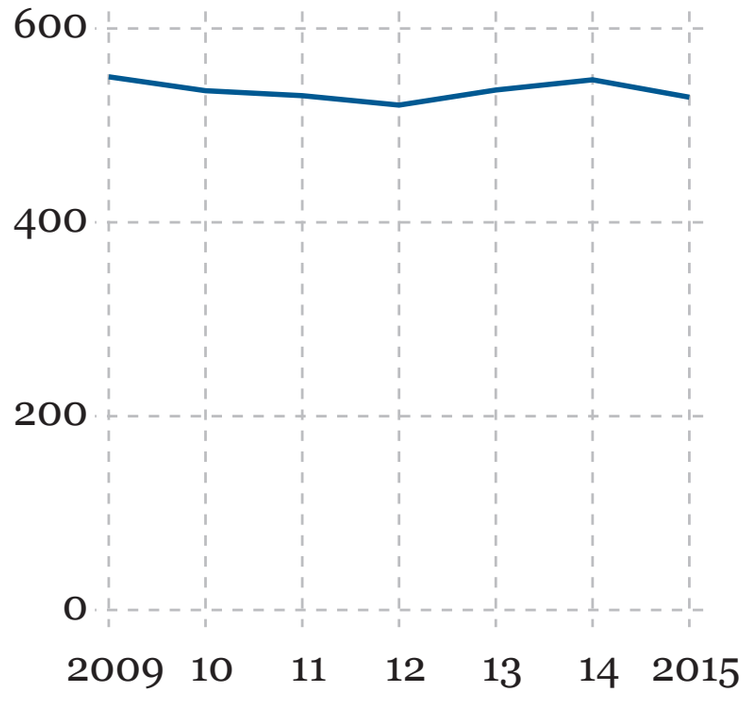
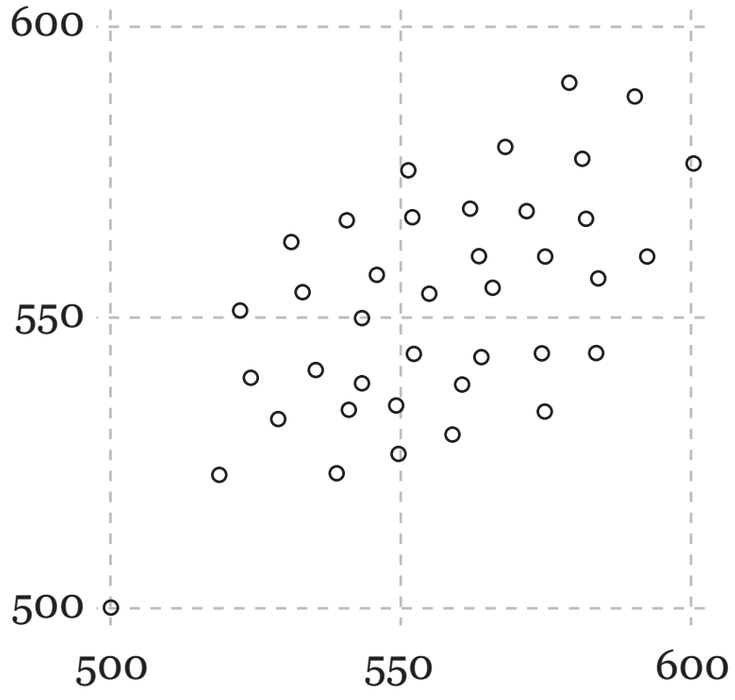
Scales

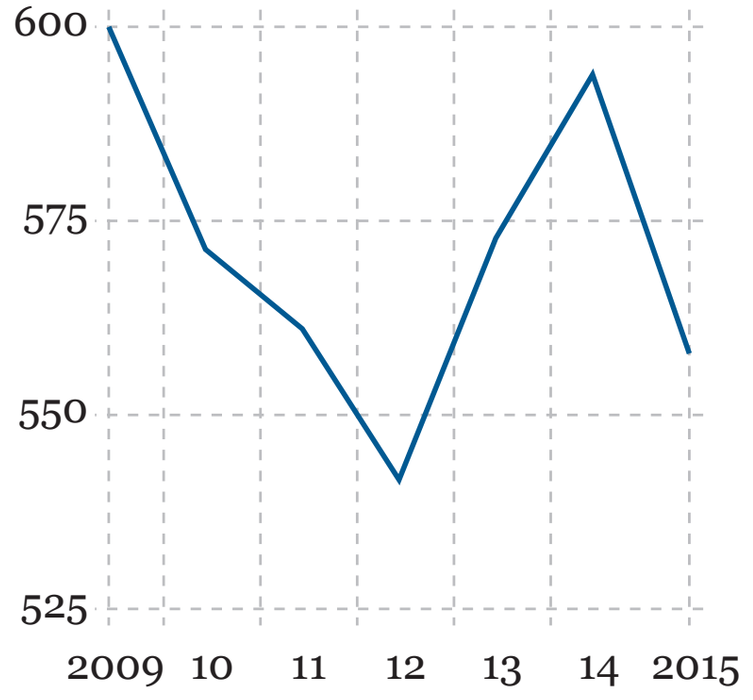
These two may be problematic

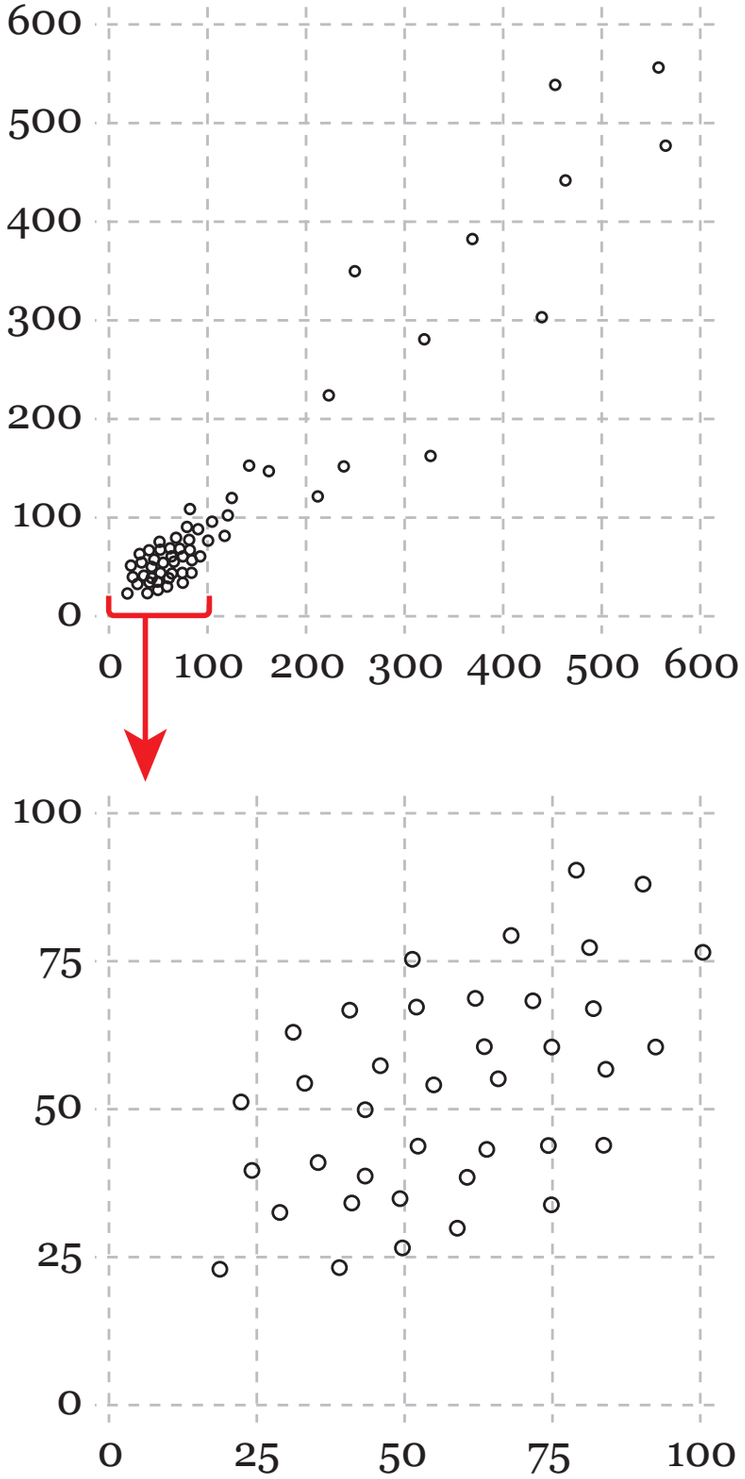


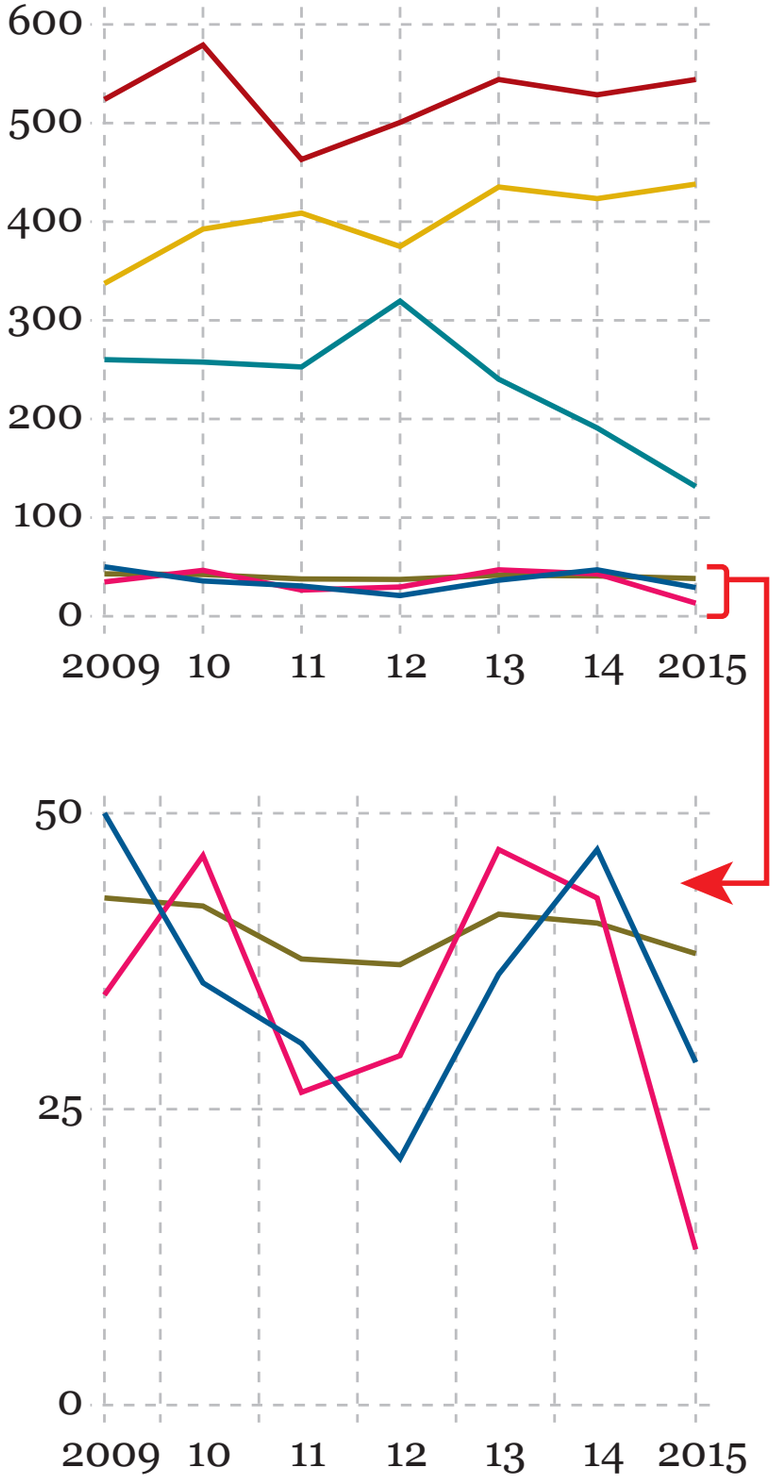


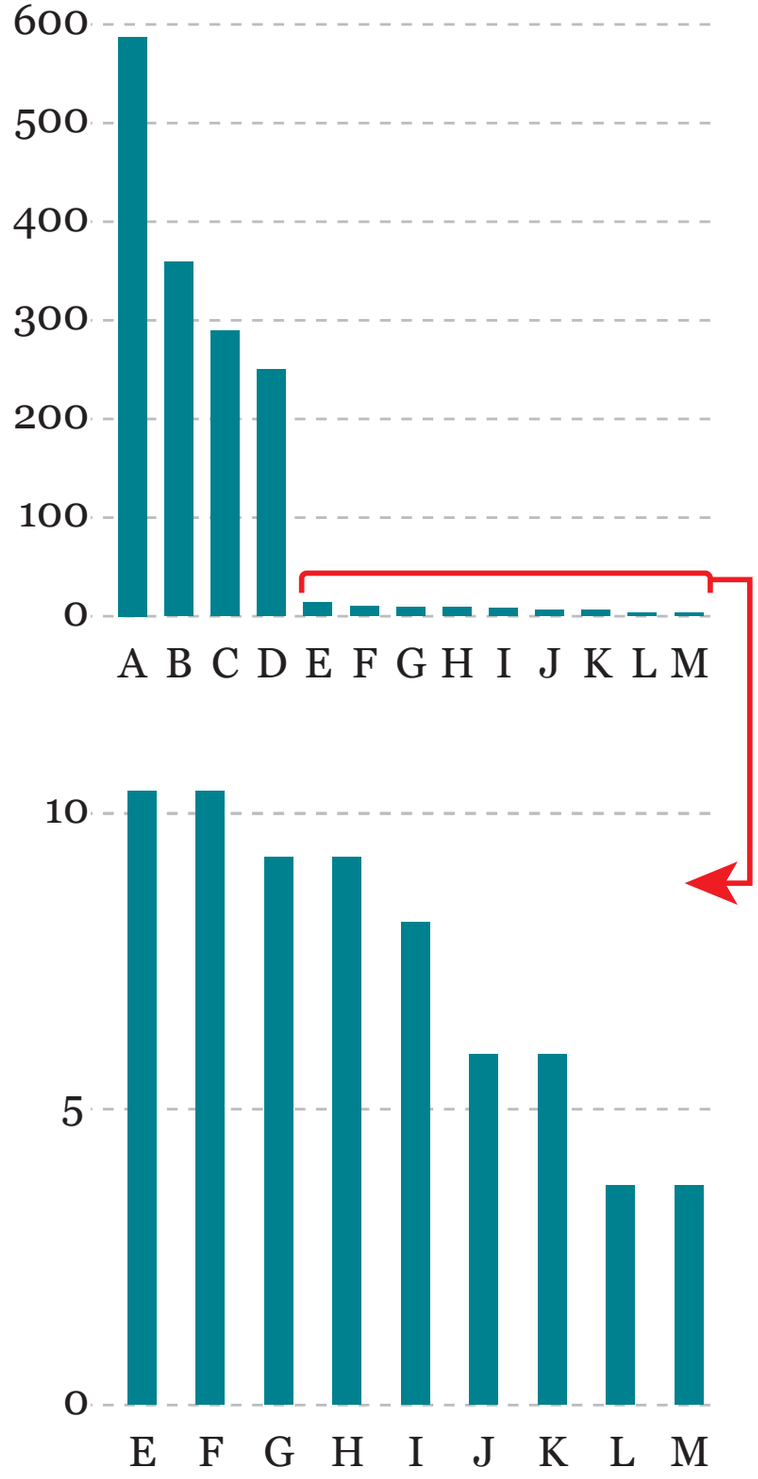
These two may be better











Possible solution to those cases when you have data that diverge a lot

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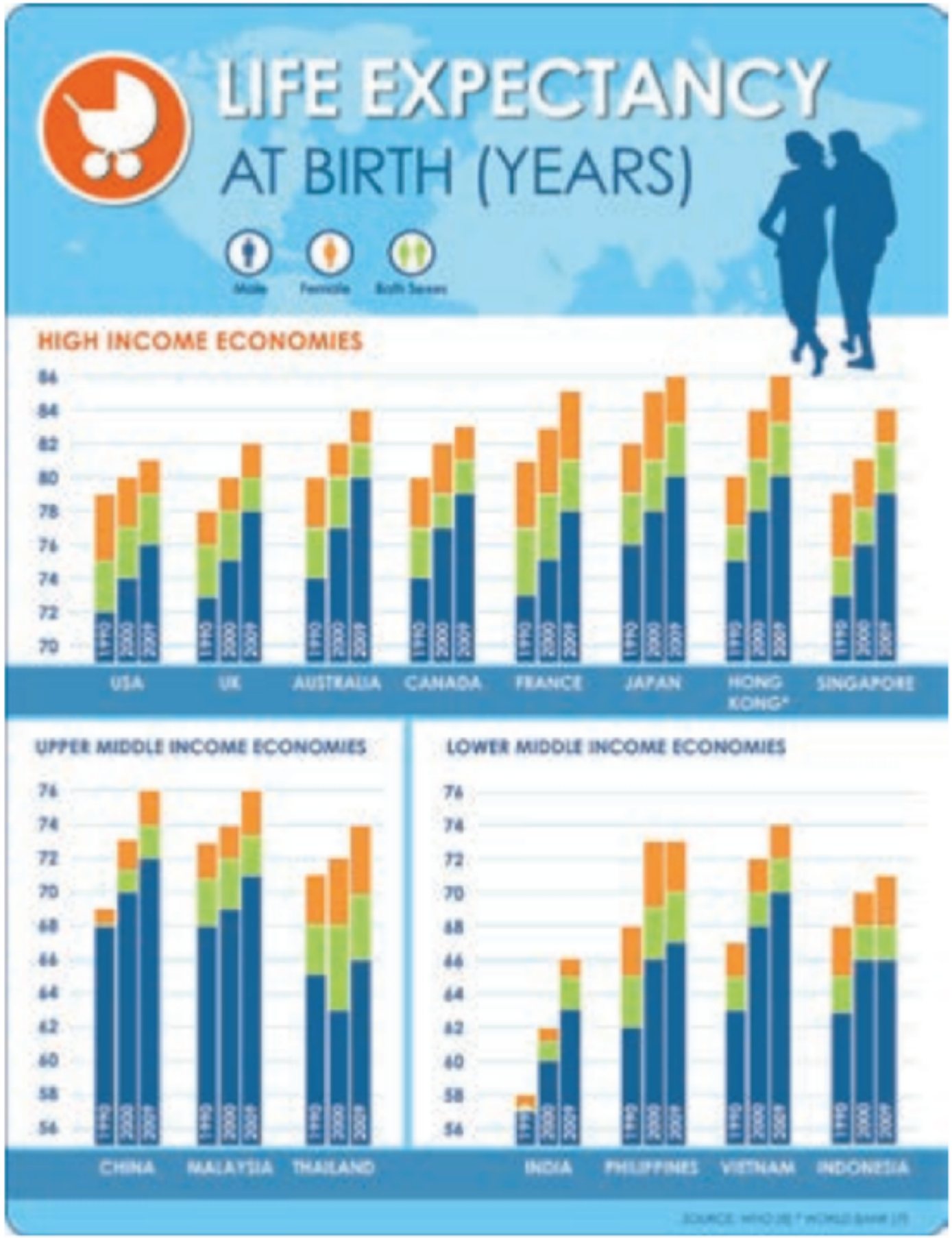

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LIFE EXPECTANCY AT BIRTH IN 1990, 2000, and 2010

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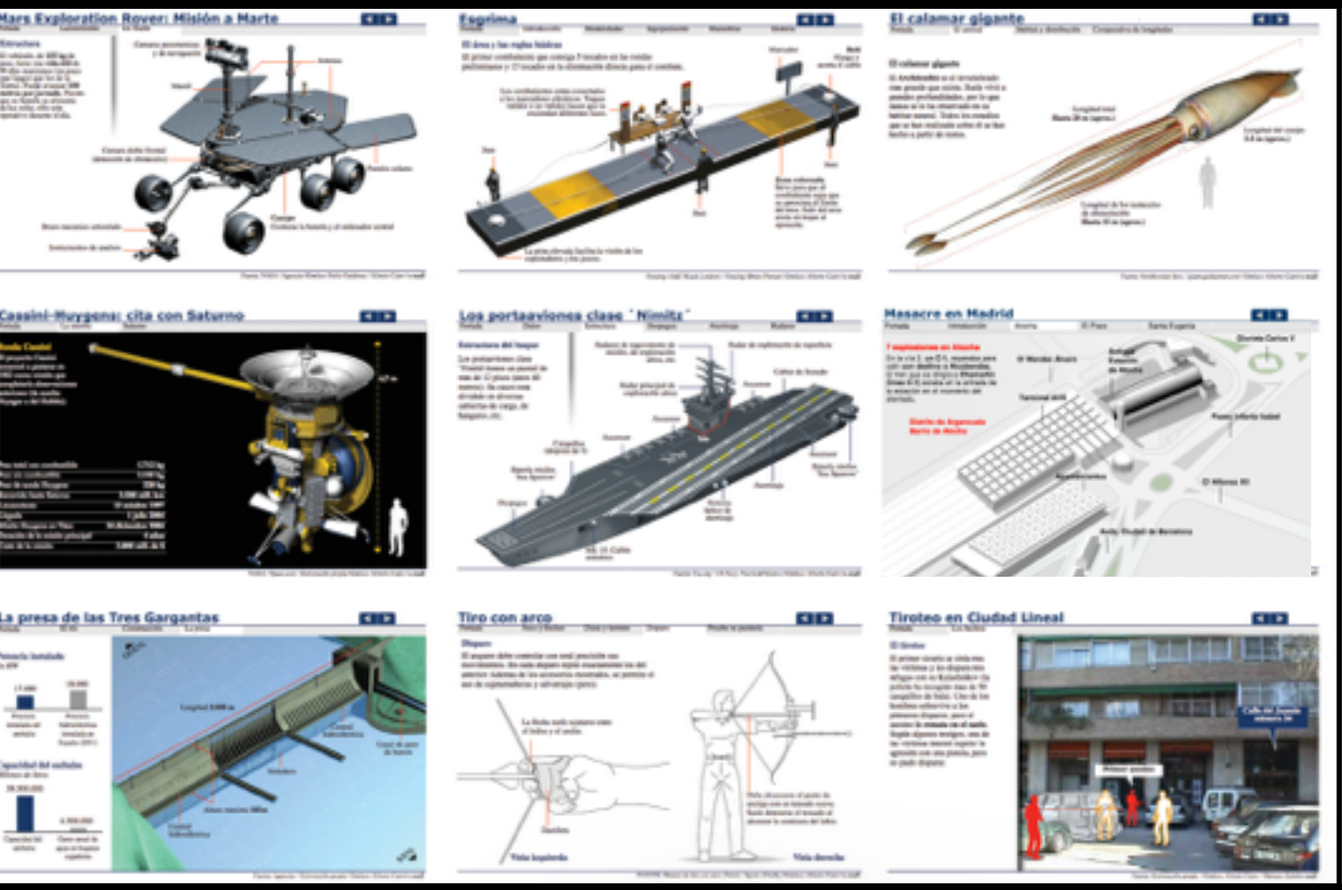

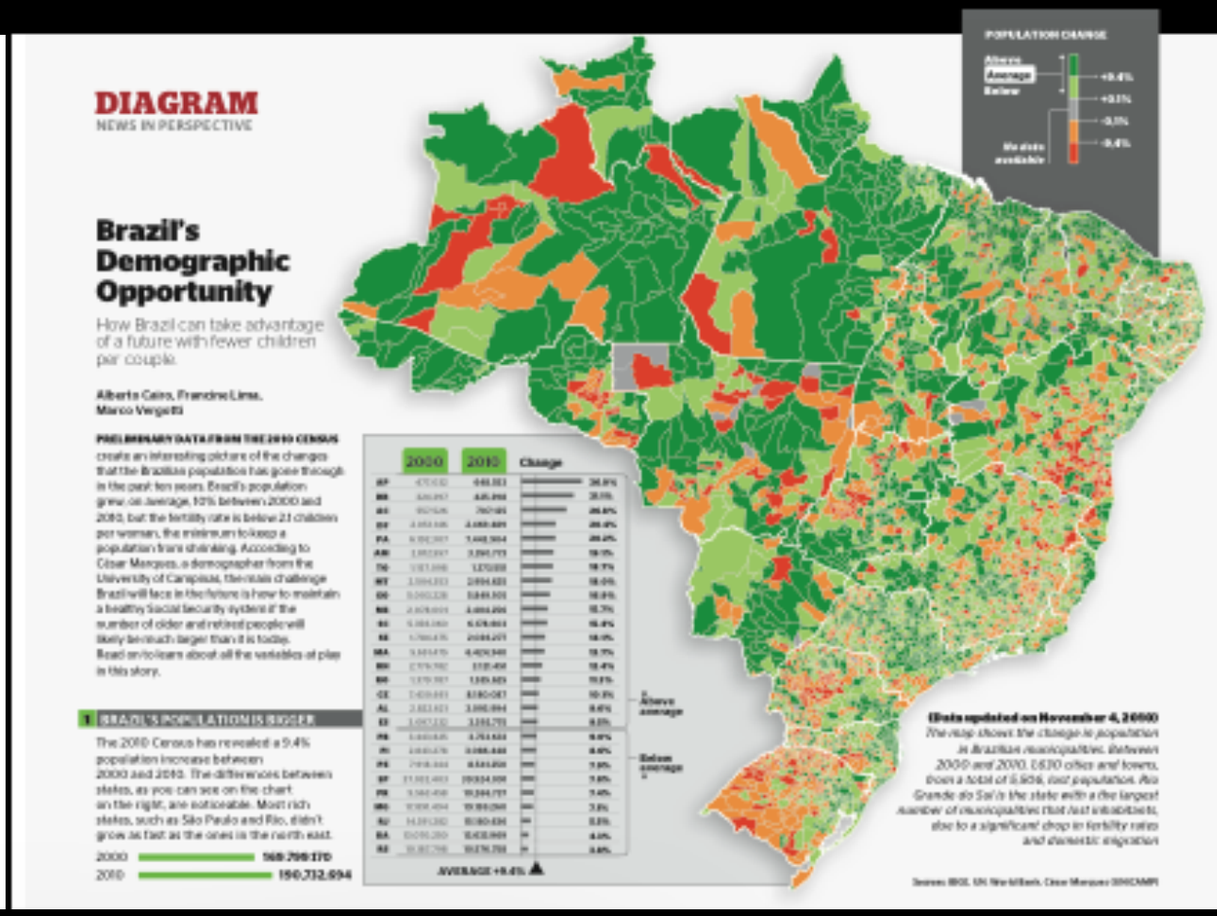

THANKS!

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