

PINO TROGU

COLLEGE OF LIBERAL & CREATIVE ARTS
SAN FRANCISCO STATE UNIVERSITY

DATA? TA-DA! TIPS FOR BETTER DATA VISUALIZATIONS

DATA SCIENCE WORKSHOP

WEDNESDAY, FEBRUARY 20, 2019, 4:00 PM TO 6:00 PM

ROOM 260, CREATIVE ARTS BUILDING

[go to last slide](#)

RULES AND EXAMPLES (1–16)

01 Use pencil and paper

Small Handbook of Information Design:
16 Principles for Better Data Visualizations



YES

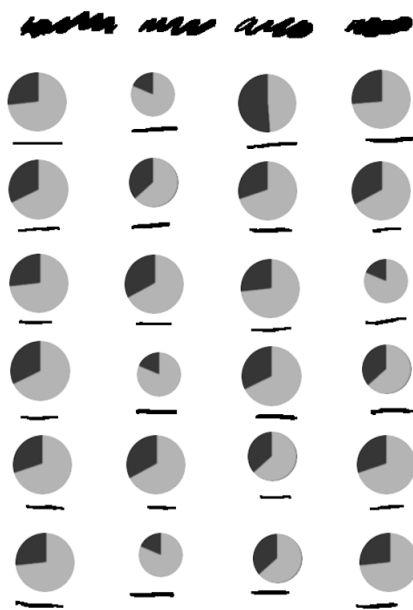


NO

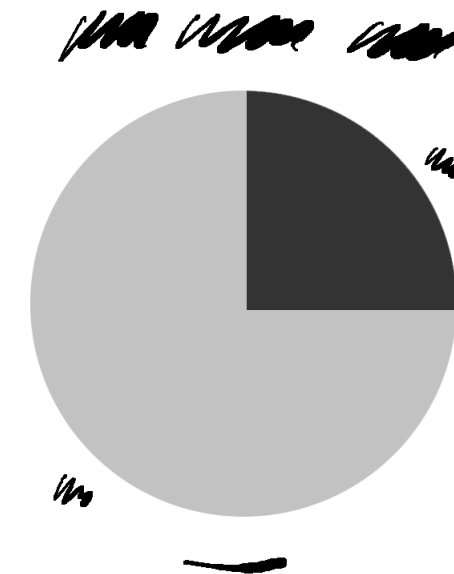
02 Content is first

| year | bracket | fed | state | fica | property | sales | corporate | overall |
|------|---------|---------|---------|---------|----------|---------|-----------|---------|
| 1980 | 1 | 0.02306 | 0.0041 | 0.0535 | 0.04467 | 0.04923 | 0.02754 | 0.20209 |
| 1980 | 2 | 0.07927 | 0.01276 | 0.07368 | 0.03457 | 0.03149 | 0.03084 | 0.2626 |
| 1980 | 3 | 0.11445 | 0.01925 | 0.08513 | 0.02995 | 0.02506 | 0.03103 | 0.30488 |
| 1980 | 4 | 0.13588 | 0.02287 | 0.08294 | 0.02908 | 0.02172 | 0.03288 | 0.32537 |
| 1980 | 5 | 0.1597 | 0.02654 | 0.07491 | 0.03004 | 0.01917 | 0.03649 | 0.34685 |
| 1980 | 6 | 0.18233 | 0.02888 | 0.064 | 0.02951 | 0.01799 | 0.04049 | 0.3632 |
| 1980 | 7 | 0.19944 | 0.03128 | 0.05037 | 0.03149 | 0.01624 | 0.04944 | 0.37827 |
| 1980 | 12 | 0.2324 | 0.02985 | 0.03618 | 0.04056 | 0.01072 | 0.0812 | 0.43091 |
| 1980 | 15 | 0.29113 | 0.02653 | 0.01098 | 0.0557 | 0.00529 | 0.09999 | 0.4896 |
| 1981 | 1 | 0.02909 | 0.00493 | 0.05851 | 0.04387 | 0.04713 | 0.02476 | 0.20829 |
| 1981 | 2 | 0.0851 | 0.01346 | 0.07865 | 0.03441 | 0.03055 | 0.02758 | 0.26975 |
| 1981 | 3 | 0.12037 | 0.02009 | 0.09156 | 0.0296 | 0.0241 | 0.02747 | 0.31318 |
| 1981 | 4 | 0.14412 | 0.02362 | 0.0905 | 0.02932 | 0.02088 | 0.0296 | 0.33803 |
| 1981 | 5 | 0.16341 | 0.02646 | 0.08242 | 0.03047 | 0.01846 | 0.03337 | 0.3546 |
| 1981 | 6 | 0.18578 | 0.02785 | 0.07007 | 0.03065 | 0.01704 | 0.03879 | 0.3702 |
| 1981 | 7 | 0.21417 | 0.02886 | 0.05839 | 0.02967 | 0.01536 | 0.04134 | 0.38779 |
| 1981 | 12 | 0.24037 | 0.03015 | 0.03826 | 0.04005 | 0.01089 | 0.06632 | 0.42604 |
| 1981 | 15 | 0.2817 | 0.01948 | 0.01349 | 0.04287 | 0.00553 | 0.08502 | 0.44809 |

| year | bracket | fed |
|------|---------|---------|
| 1980 | 1 | 0.02306 |



YES



NO

03 Do not draw graphs by hand

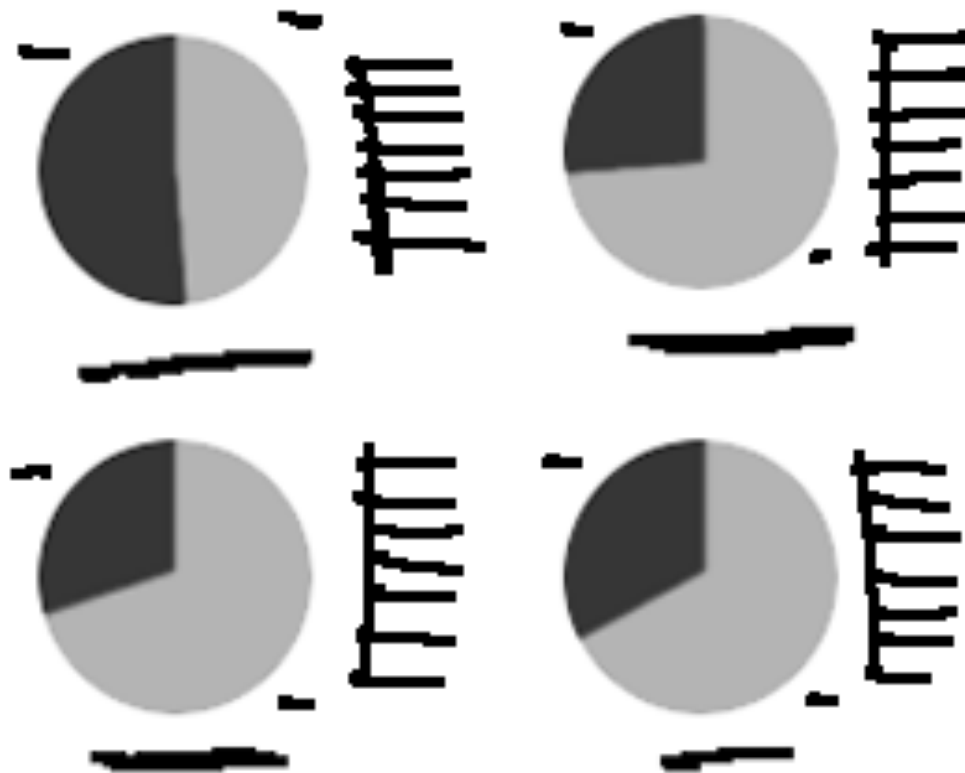
| year | bracket | fed | state | tax | property | sales | corporate | overall |
|------|---------|---------|---------|---------|----------|---------|-----------|---------|
| 1980 | 1 | 0.02306 | 0.0041 | 0.0535 | 0.04467 | 0.04923 | 0.02754 | 0.02029 |
| 1980 | 2 | 0.07927 | 0.01276 | 0.07368 | 0.03457 | 0.03149 | 0.03084 | 0.02626 |
| 1980 | 3 | 0.11445 | 0.01925 | 0.08113 | 0.02995 | 0.02506 | 0.03123 | 0.03488 |
| 1980 | 4 | 0.13588 | 0.02287 | 0.08294 | 0.02908 | 0.02172 | 0.03288 | 0.03257 |
| 1980 | 5 | 0.15597 | 0.02654 | 0.07491 | 0.03004 | 0.01917 | 0.03649 | 0.04685 |
| 1980 | 6 | 0.18333 | 0.02888 | 0.064 | 0.02951 | 0.01799 | 0.04040 | 0.0602 |
| 1980 | 7 | 0.19944 | 0.03128 | 0.05037 | 0.03149 | 0.01624 | 0.04944 | 0.07827 |
| 1980 | 12 | 0.2324 | 0.02985 | 0.03618 | 0.04056 | 0.01072 | 0.0812 | 0.43091 |
| 1980 | 15 | 0.29113 | 0.02653 | 0.01098 | 0.0517 | 0.00529 | 0.09999 | 0.4896 |
| 1981 | 1 | 0.02909 | 0.00493 | 0.05851 | 0.04387 | 0.04713 | 0.02476 | 0.02829 |
| 1981 | 2 | 0.0851 | 0.01346 | 0.07865 | 0.03441 | 0.03055 | 0.02728 | 0.02975 |
| 1981 | 3 | 0.12037 | 0.02009 | 0.09156 | 0.0296 | 0.0241 | 0.02747 | 0.03118 |
| 1981 | 4 | 0.14412 | 0.02362 | 0.0905 | 0.02932 | 0.02088 | 0.0296 | 0.03803 |
| 1981 | 5 | 0.16341 | 0.02646 | 0.08242 | 0.03047 | 0.01846 | 0.03337 | 0.0546 |
| 1981 | 6 | 0.18378 | 0.02785 | 0.07007 | 0.03065 | 0.01704 | 0.03879 | 0.0702 |
| 1981 | 7 | 0.21417 | 0.02886 | 0.05839 | 0.02967 | 0.01536 | 0.04134 | 0.08779 |
| 1981 | 12 | 0.24037 | 0.03015 | 0.03826 | 0.04005 | 0.01089 | 0.06632 | 0.42804 |
| 1981 | 15 | 0.2817 | 0.02948 | 0.01349 | 0.04287 | 0.00553 | 0.08502 | 0.48809 |

YES

| year | bracket | fed | state | tax | property | sales | corporate | overall |
|------|---------|---------|---------|---------|----------|---------|-----------|---------|
| 1980 | 1 | 0.02306 | 0.0041 | 0.0535 | 0.04467 | 0.04923 | 0.02754 | 0.02029 |
| 1980 | 2 | 0.07927 | 0.01276 | 0.07368 | 0.03457 | 0.03149 | 0.03084 | 0.02626 |
| 1980 | 3 | 0.11445 | 0.01925 | 0.08113 | 0.02995 | 0.02506 | 0.03123 | 0.03488 |
| 1980 | 4 | 0.13588 | 0.02287 | 0.08294 | 0.02908 | 0.02172 | 0.03288 | 0.03257 |
| 1980 | 5 | 0.15597 | 0.02654 | 0.07491 | 0.03004 | 0.01917 | 0.03649 | 0.04685 |
| 1980 | 6 | 0.18333 | 0.02888 | 0.064 | 0.02951 | 0.01799 | 0.04040 | 0.0602 |
| 1980 | 7 | 0.19944 | 0.03128 | 0.05037 | 0.03149 | 0.01624 | 0.04944 | 0.07827 |
| 1980 | 12 | 0.2324 | 0.02985 | 0.03618 | 0.04056 | 0.01072 | 0.0812 | 0.43091 |
| 1980 | 15 | 0.29113 | 0.02653 | 0.01098 | 0.0517 | 0.00529 | 0.09999 | 0.4896 |
| 1981 | 1 | 0.02909 | 0.00493 | 0.05851 | 0.04387 | 0.04713 | 0.02476 | 0.02829 |
| 1981 | 2 | 0.0851 | 0.01346 | 0.07865 | 0.03441 | 0.03055 | 0.02728 | 0.02975 |
| 1981 | 3 | 0.12037 | 0.02009 | 0.09156 | 0.0296 | 0.0241 | 0.02747 | 0.03118 |
| 1981 | 4 | 0.14412 | 0.02362 | 0.0905 | 0.02932 | 0.02088 | 0.0296 | 0.03803 |
| 1981 | 5 | 0.16341 | 0.02646 | 0.08242 | 0.03047 | 0.01846 | 0.03337 | 0.0546 |
| 1981 | 6 | 0.18378 | 0.02785 | 0.07007 | 0.03065 | 0.01704 | 0.03879 | 0.0702 |
| 1981 | 7 | 0.21417 | 0.02886 | 0.05839 | 0.02967 | 0.01536 | 0.04134 | 0.08779 |
| 1981 | 12 | 0.24037 | 0.03015 | 0.03826 | 0.04005 | 0.01089 | 0.06632 | 0.42804 |
| 1981 | 15 | 0.2817 | 0.02948 | 0.01349 | 0.04287 | 0.00553 | 0.08502 | 0.48809 |

NO

04 Do not enlarge numbers



55% BLA BLA

27% BLA BLA

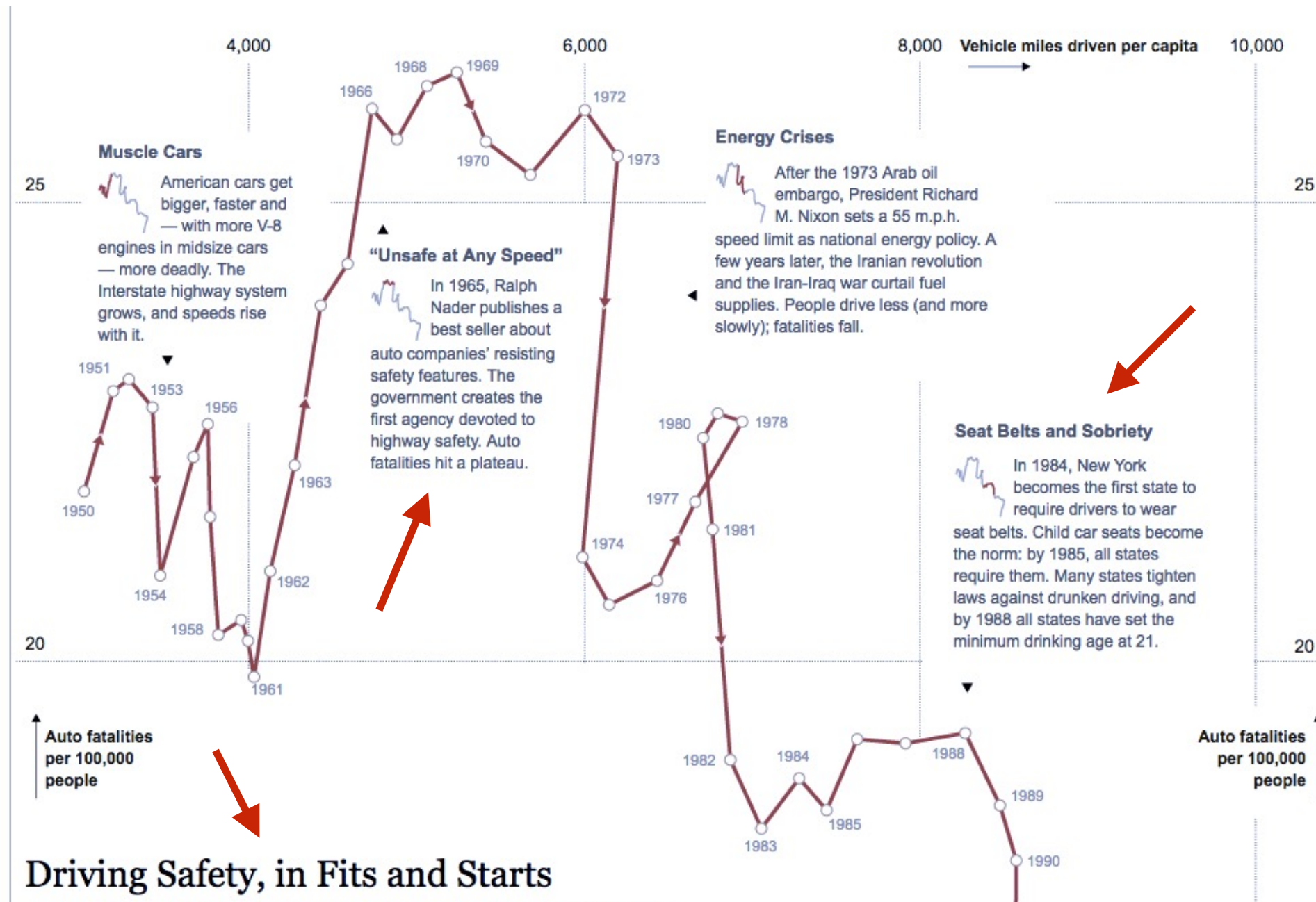
30% BLA BLA

35% BLA BLA

YES

NO

05 Use words, not just images



<http://www.nytimes.com/interactive/2012/09/17/science/driving-safety-in-fits-and-starts.html>

the annotation layer

By HANNAH FAIRFIELD
SEPT. 17, 2012
© 2012 The NYT Company

05 Use words, not just images

Driving Safety, in Fits and Starts

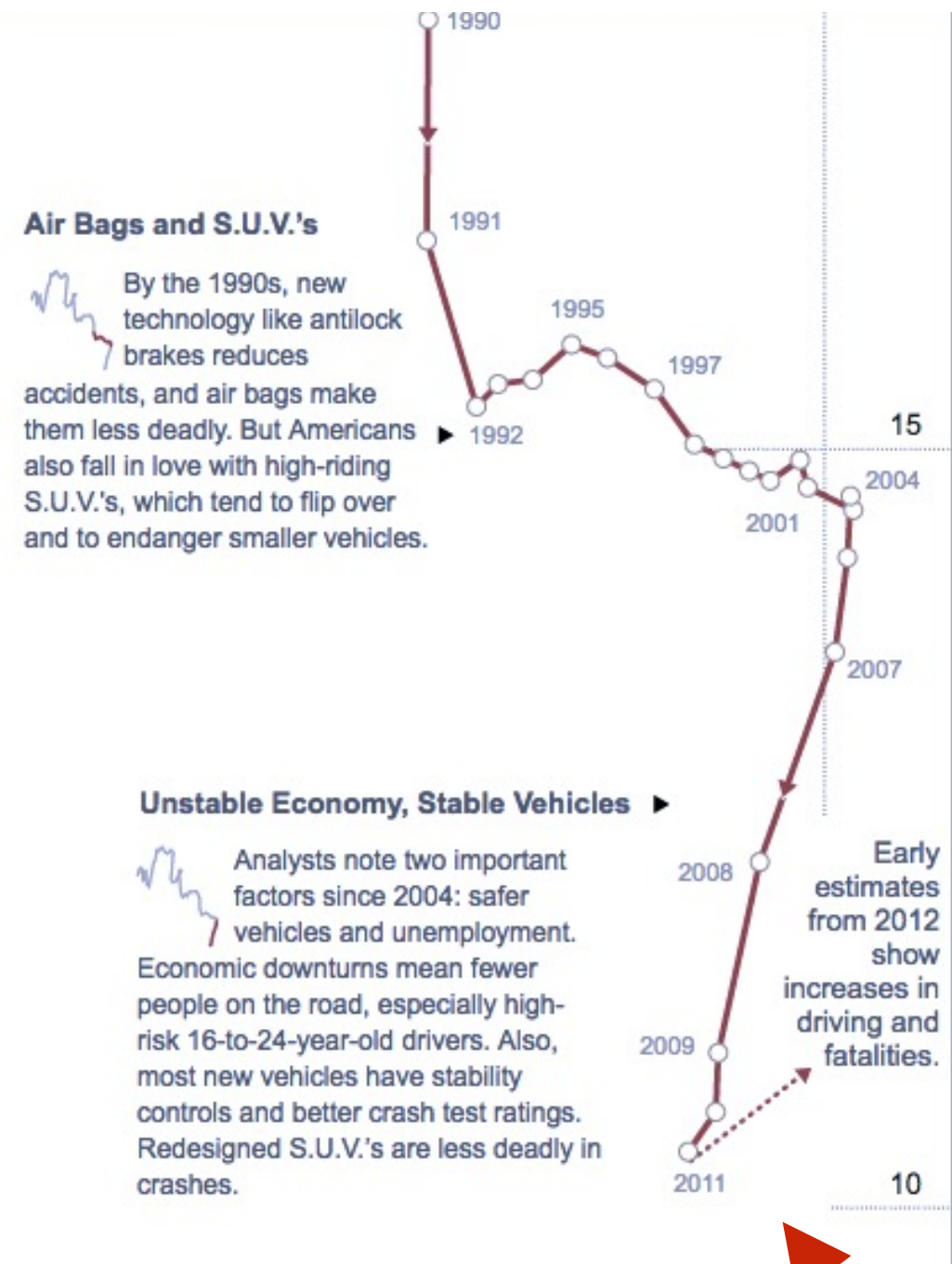
AMERICANS drive a staggering number of miles — close to three trillion every year, according to the government. (That is half a light-year, or 120 million trips around the world.) And although traffic accidents remain a major public safety problem, the biggest killer of people ages 5 to 34, vehicle travel is far safer than it was a few decades ago. Several factors appear to account for the sharp decline in fatalities. Technology (like anti-lock brakes and air bags) and road behavior (like wearing seat belts and driving sober) have both improved greatly since 1950. Americans almost always drive more each year than the previous one — at least until recently, when the recession curtailed road habits. And the auto fatality rate has been decreasing since the 1960s, when cars with massive engines carried their unbuckled passengers on primarily two-lane roads.

The safety data is usually charted as

deaths per miles traveled. But what happens when the metrics are teased apart, and familiar data is charted in an unfamiliar way?

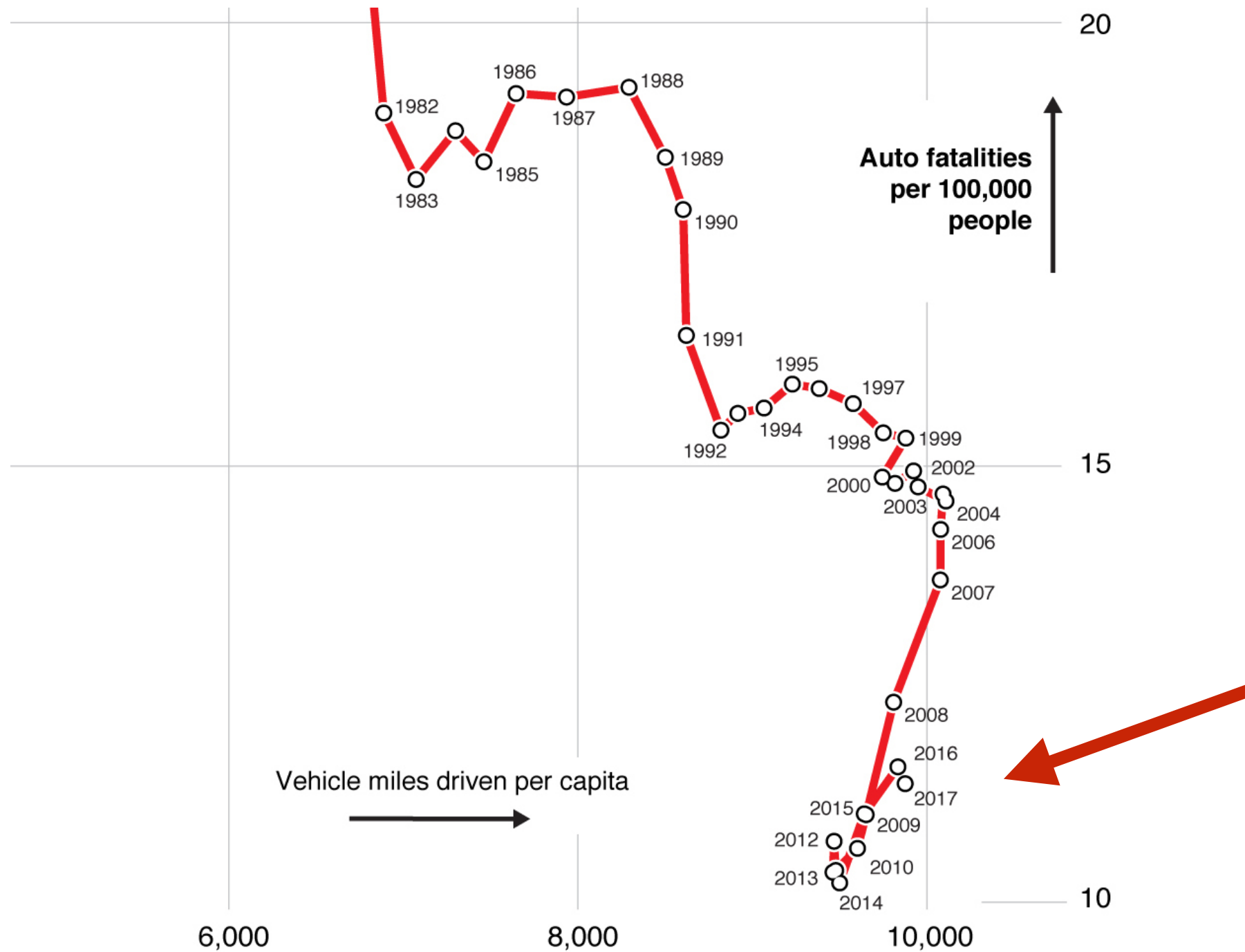
Plotting the two most important variables against each other — miles traveled versus deaths per 100,000 population — yields a pattern that looks like a plateau followed by a steep drop. It evokes the theory of punctuated equilibrium, proposed by the paleontologists Stephen Jay Gould and Niles Eldredge, which suggests that instead of continuous gradual evolution, change occurs abruptly after periods of virtual standstill.

“You see fatalities drop after a breakthrough in new technologies or behaviors, and then plateau until the next one,” said David L. Strickland, administrator of the National Highway Traffic Safety Administration. “It takes time for new safety technologies to work their way into the whole fleet of cars on the road.”



the annotation layer

05 Use words, not just images



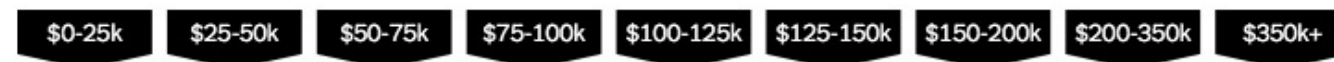
the annotation layer

https://static.trogu.com/documents/classes/523/2018/tutorials/nyt_driving_safety/driving_safety_scatterplot_tutorial_2022-04-18.pdf

06 Use small multiples

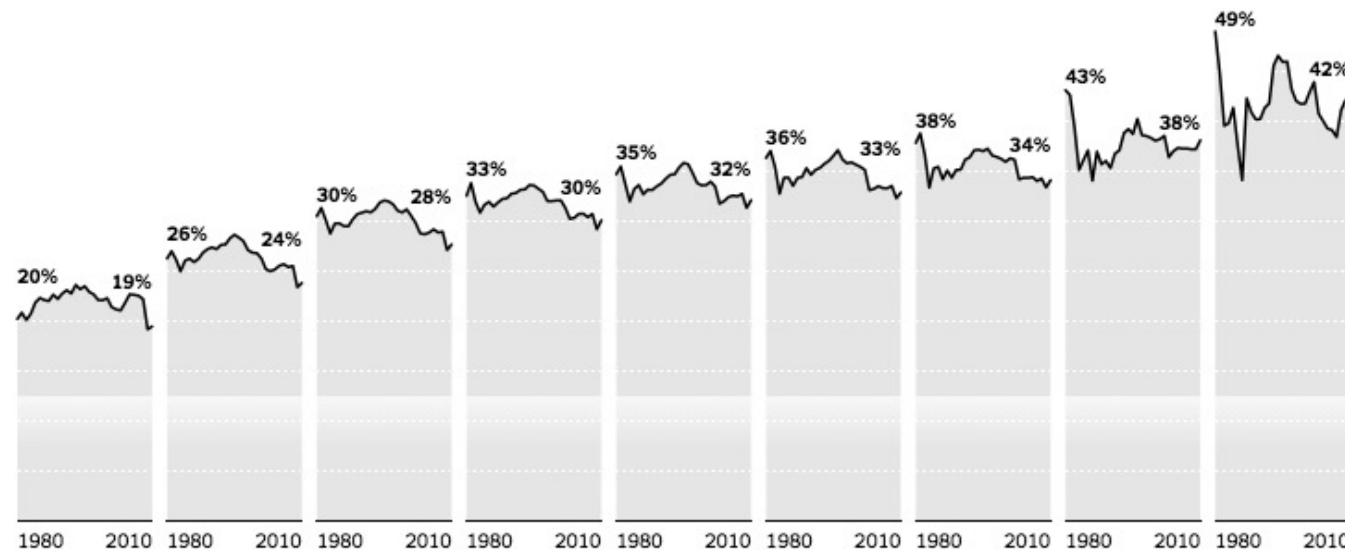
How the Tax Burden Has Changed

Most Americans paid less in taxes in 2010 than people with the same inflation-adjusted incomes paid in 1980, because of cuts in federal income taxes. At lower income levels, however, much of the savings was offset by increases in federal payroll taxes, state sales taxes and local property taxes. About half of households making less than \$25,000 saved nothing at all. [About the Data »](#) | [Related Article »](#)



Tax rates have fallen for most Americans, especially high earners.

Share of yearly income paid in federal, state and local taxes, by income bracket.



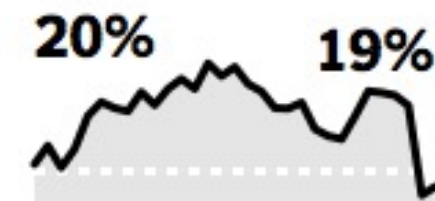
Average tax rates were lower for every income group in 2010 compared with 1980, but rates fluctuated during the intervening decades. Savings from federal income tax cuts in 1981 and 1986, under President Ronald Reagan, eroded as other taxes increased. New federal cuts in 2001 and 2003, under President George W. Bush, again reduced the total tax burden. Tax revenues rose in 2010 as the economy recovered from the recession.

<http://www.nytimes.com/interactive/2012/11/30/us/tax-burden.html>

YES

\$0-25k

Tax rates



1980 2010

NO

06 Use small multiples

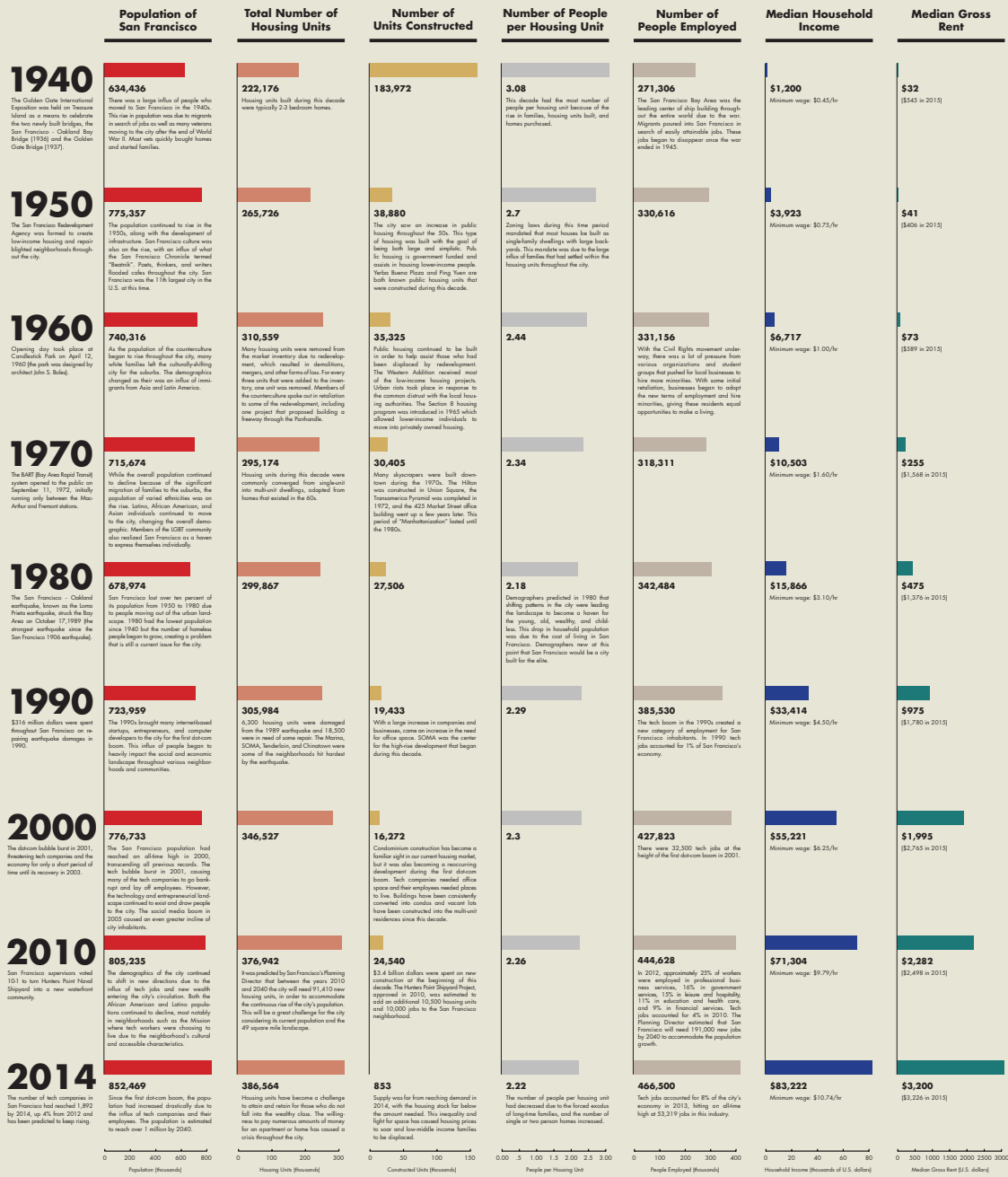
THE UPS & DOWNS OF SAN FRANCISCO LIVING

San Francisco housing statistics over time: the causes and effects of changing prices

Census Tract: San Francisco County

Census Content: Housing Statistics

Years: 1940 - 2014



possesses an architectural element, reflection of the topic of housing. The columns can be read either horizontally to better understand the given year or decade, or read vertically, to compare and contrast different years.

75 years. The graphs represent the found data and the text explores the causes and effects of the resulting data during the specific year and decade.

The overall appearance and aesthetic of the poster was inspired by census data sheets created from the 1970s. It is set up as a type of timeline, exhibiting data in columns to provide an easy way to examine the changing numbers. The poster also

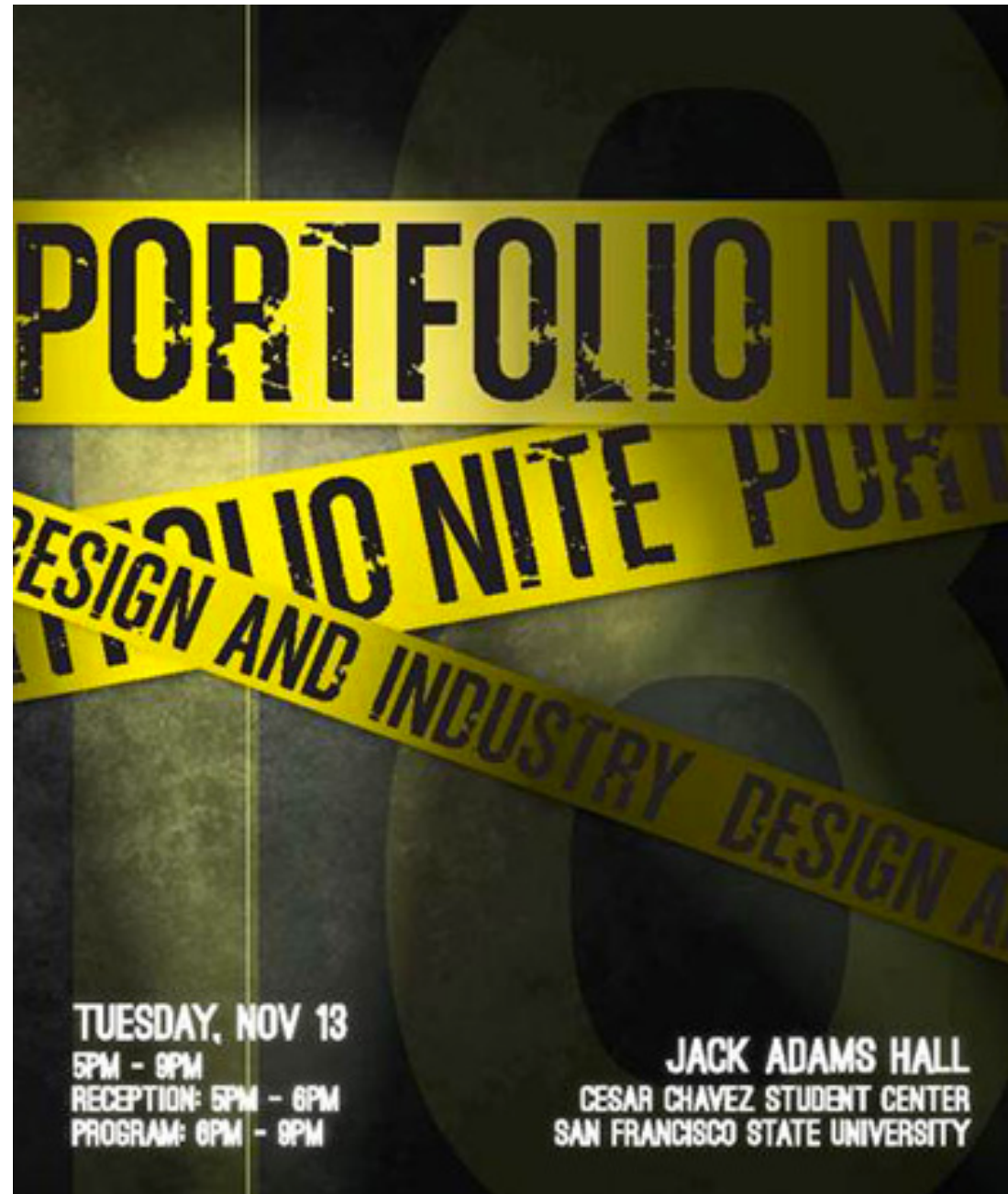
The current housing crisis in San Francisco has become a huge problem for the city and for most of the people living within it. Prices have drastically risen over the past few years due to a new influx of wealth. This new wealth has had a negative effect on long-time residents, local businesses, and communities throughout the city.

San Francisco has always been a city of change and development, both in positive and negative ways. The question of how we have gotten to this current state is common among city inhabitants. Housing, prices, and population have fluctuated in the past but have been steadily on the rise for over the past decade. The data below examines the population of San Francisco and its housing statistics for nearly the past

© 2015 HARLAN FROST

http://static.trogu.com/documents/classes/523/2015/posters_30x40/san_francisco_housing_frost.pdf

07 Do not bungle the meaning



SFSU DAI AIGA Chapter

NO

08 Do not create op-art

Do not make op-art (optical art) effects by using **bold condensed sans-serif fonts** where the strokes are the same width as the counters in the font and also the width of the spacing between the letters. This creates a very annoying, vibrating checkerboard effect. Do not use solid backgrounds, boxes, thick borders, or arbitrary bold type. If you are using solid backgrounds throughout, invert the whole image to see if it's better with the opposite values. On a Mac, use control-option-command-8 to instantly invert the colors of your screen on the computer. See if it would be better the other way around (black type on white background). If nothing is gained by the solid fills, then get rid of them.

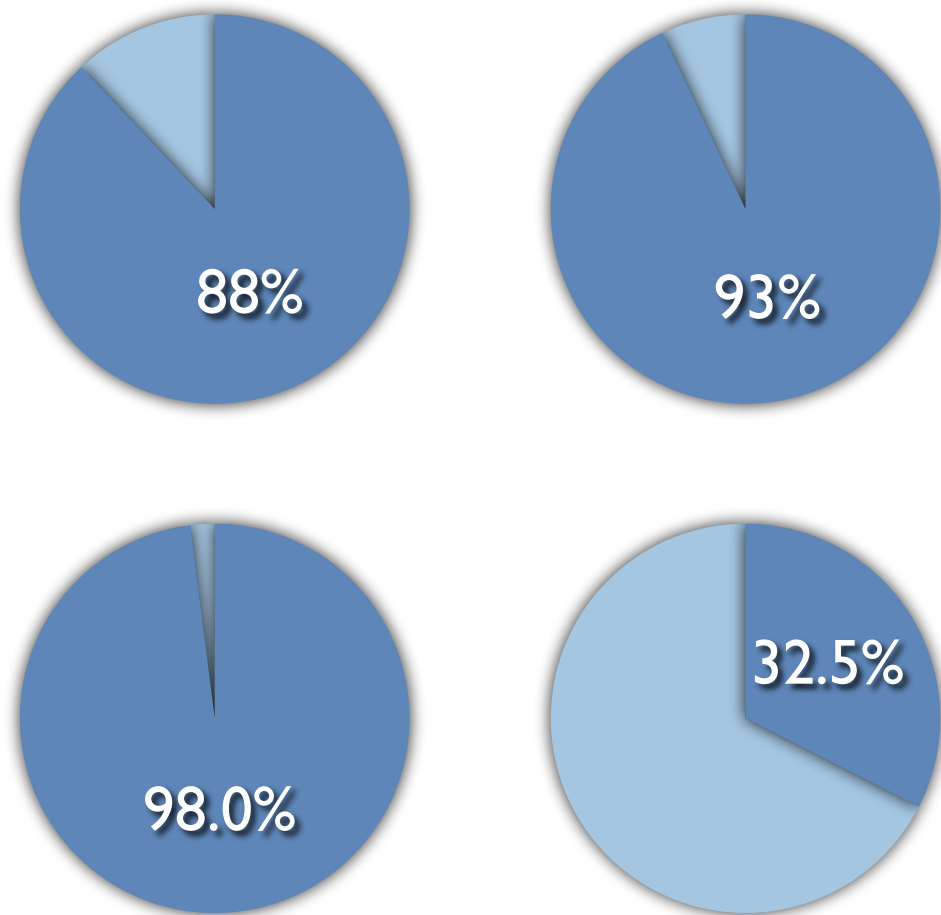
NO

08 Do not create op-art

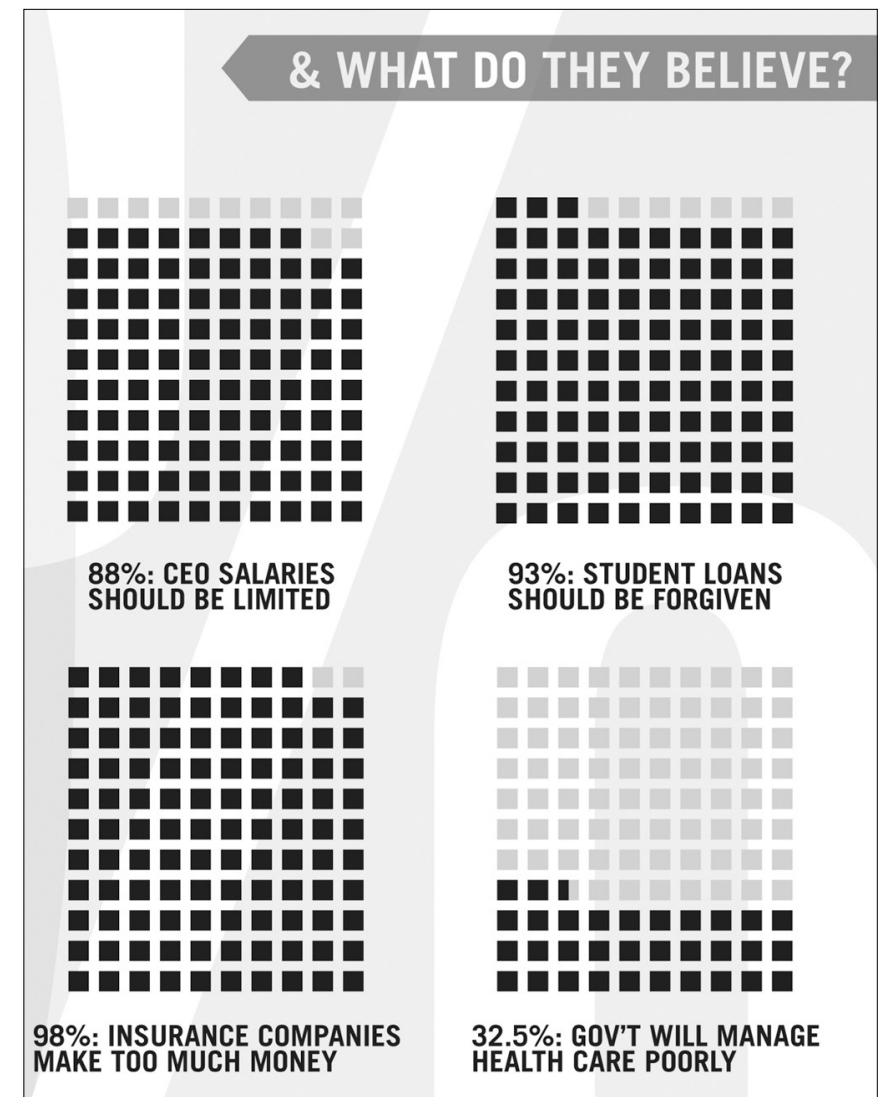
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NO

09 Do not use little dots for numbers



YES



Student project: J.L.

NO

09 Do not use little dots for numbers

*My problem is that
I have been persecuted
by an integer.*

GEORGE A. MILLER
MAGICAL NUMBER SEVEN, 1956



09 Do not use little dots for numbers

4-3-4-6-5-9-6-2-3

“chunks”

434-65-9623

09 Do not use little dots for numbers

1/3



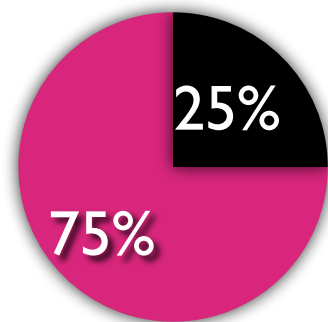
YES

NO

09 Do not use little dots for numbers

(chunk data)

(do not un-chunk data)



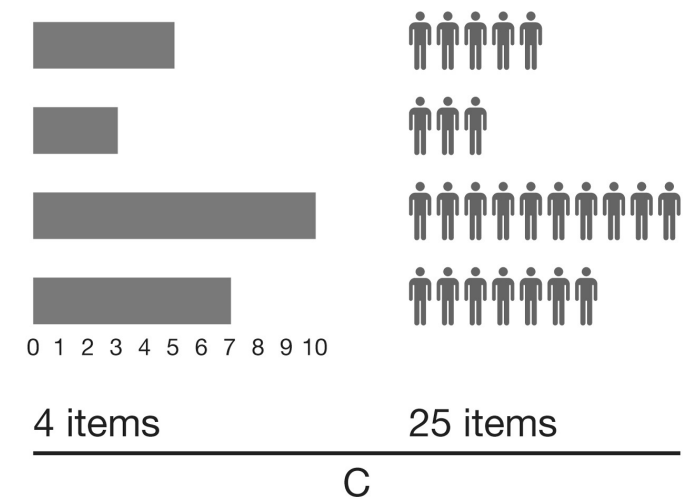
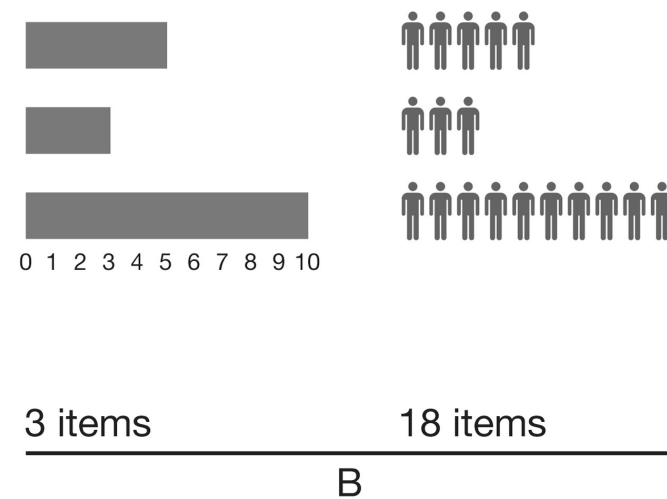
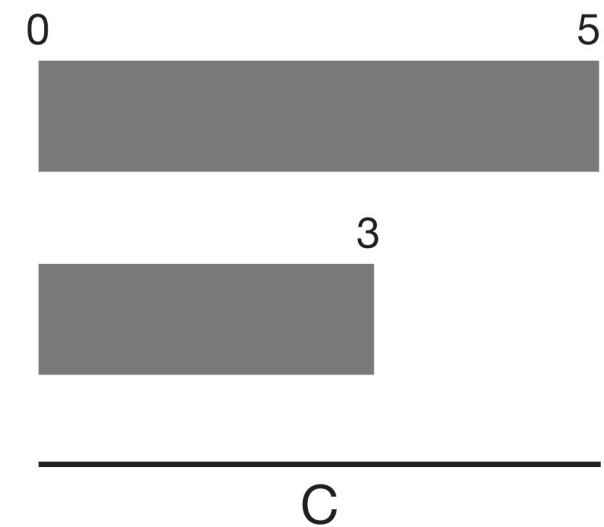
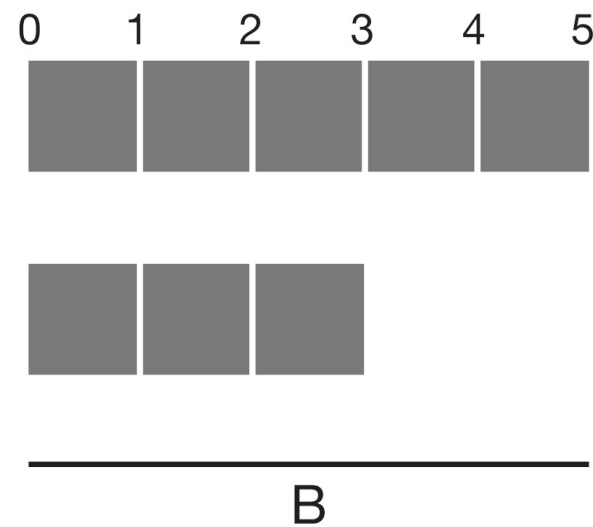
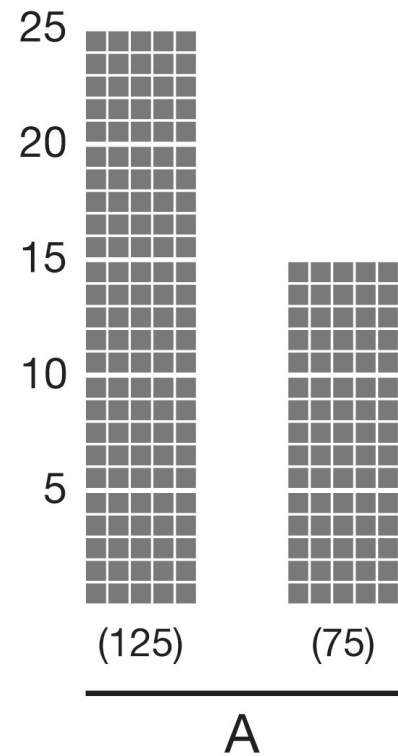
Student project: T. B.

3/4

YES

NO

09 Do not use little men for numbers



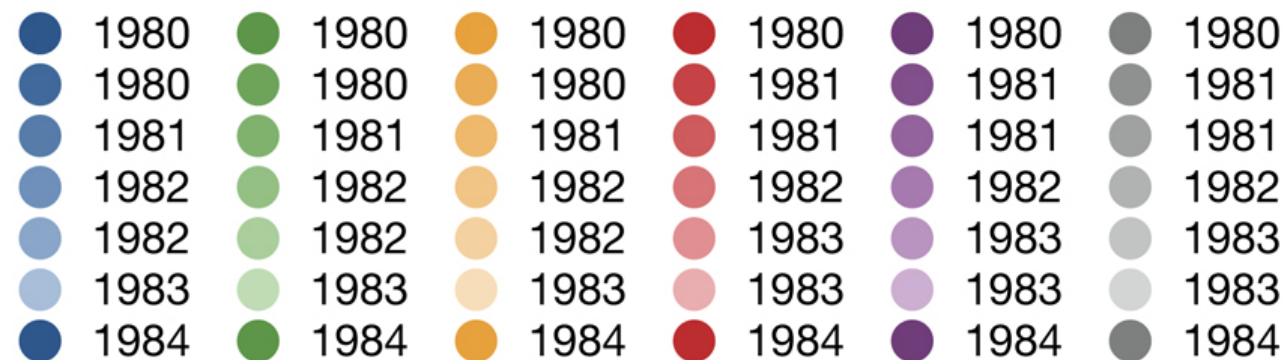
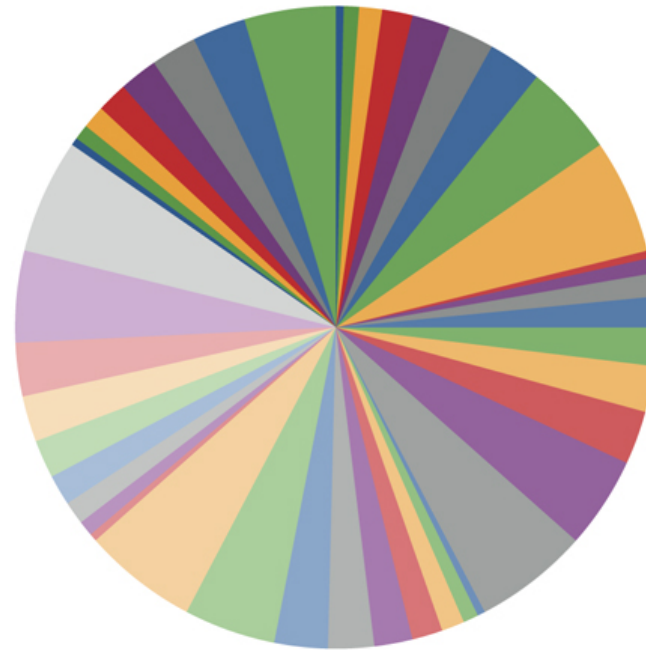
Trogu, Pino. "Counting But Losing Count: the Legacy of Otto Neurath's Isotype Charts"
Visible Language, 52.2, 2018

<http://static.trogu.com/documents/articles/neurath/VisibleLanguage-52-2-8-2018-p82-109-Trogu.pdf>

YES | NO

10 Do not use colors (to be memorized, or for sorting)

Taxes Chart



NO

10 Do not use colors (for ordered data)



NO



no intrinsic order



YES

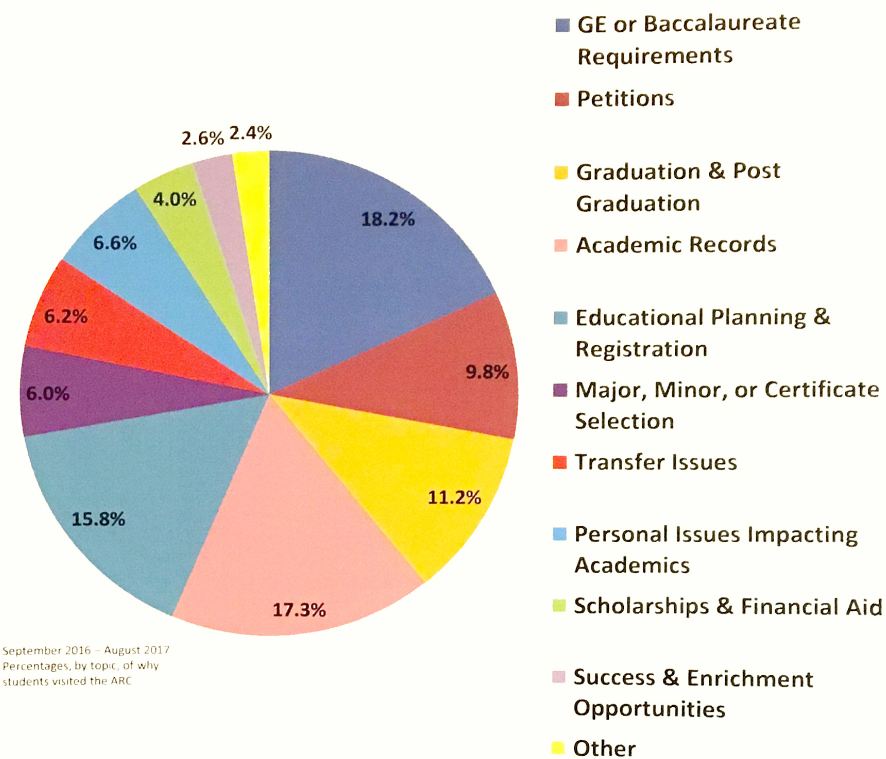


1 2 3 4 5 6 7

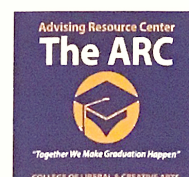
10 Do not use colors

NO

**We love advising students
on these topics:**



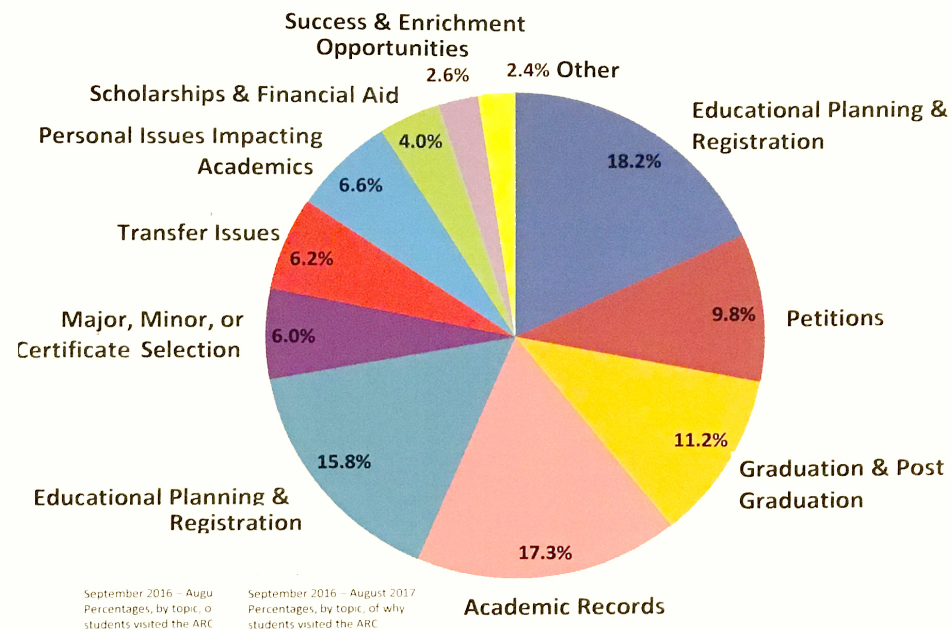
**Join your circle of peers.
Come for advising at the ARC!**



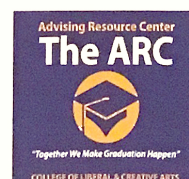
Advising Resource Center (ARC)
College of Liberal & Creative Arts
Humanities Building, Room 112
415-338-1486, achieve@sfsu.edu

10 Do not use colors

**We love advising students
on these topics:**



**Join your circle of peers.
Come for advising at the ARC!**

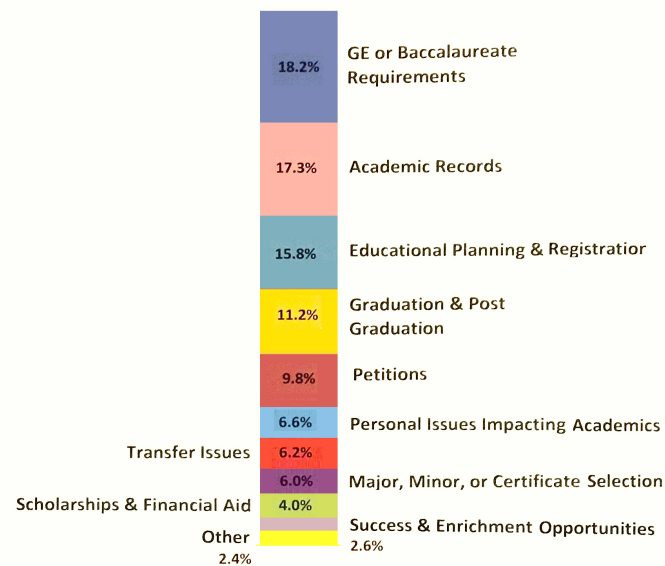


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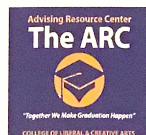
**Omit legend
whenever possible.**

10 Do not use colors

We love advising students on these topics:

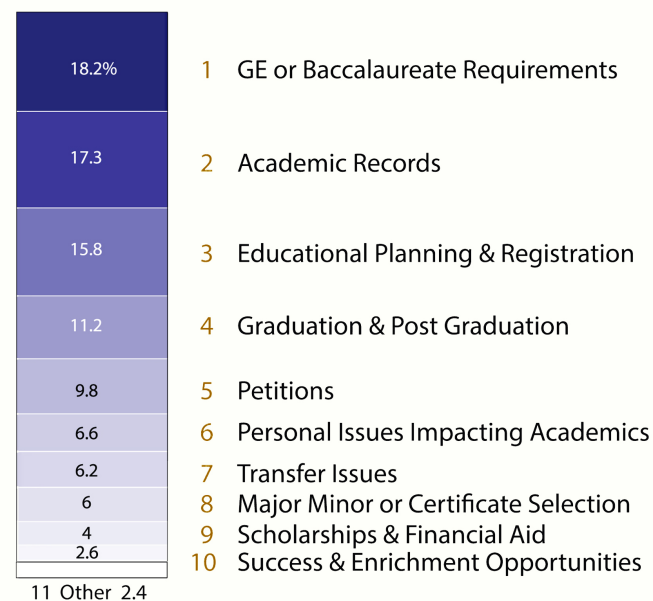


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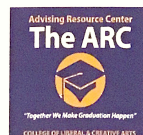


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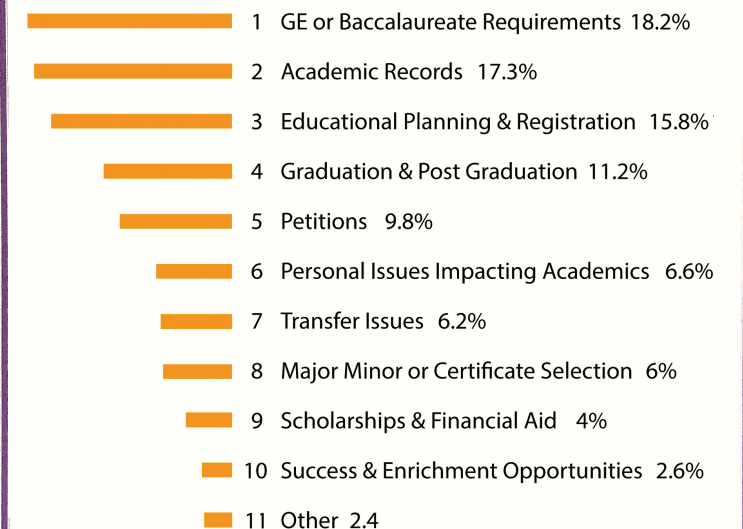


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Come for advising at the ARC!

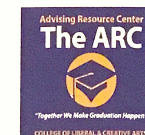


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We love advising students on these topics:



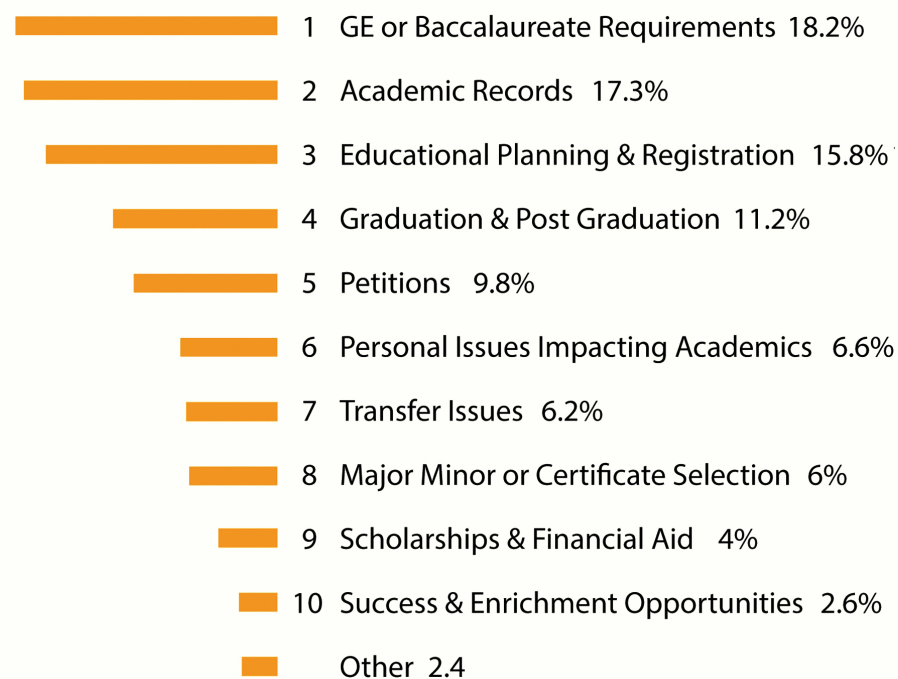
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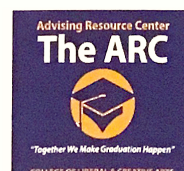
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10 Do not use colors

Top Ten Topics We Love Advising Students About:



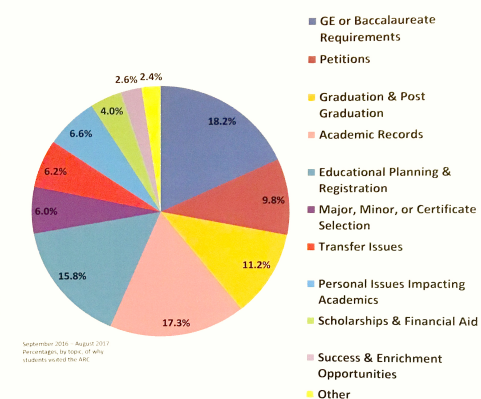
Join your circle of peers.
Come for advising at the ARC!



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Sometimes a word
is worth a thousand
colors.

We love advising students on these topics:

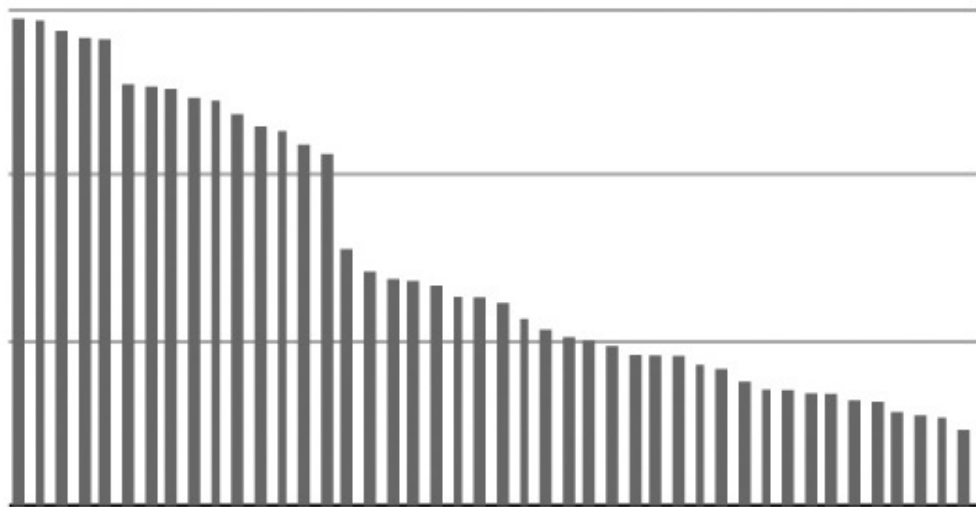


Join your circle of peers.
Come for advising at the ARC!

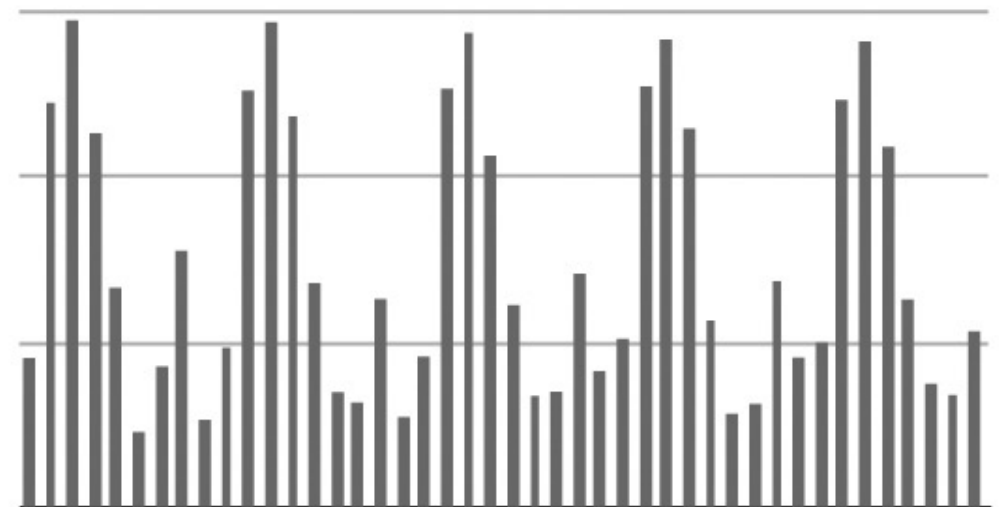


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11 Sort by value, not by category (alphabetical)



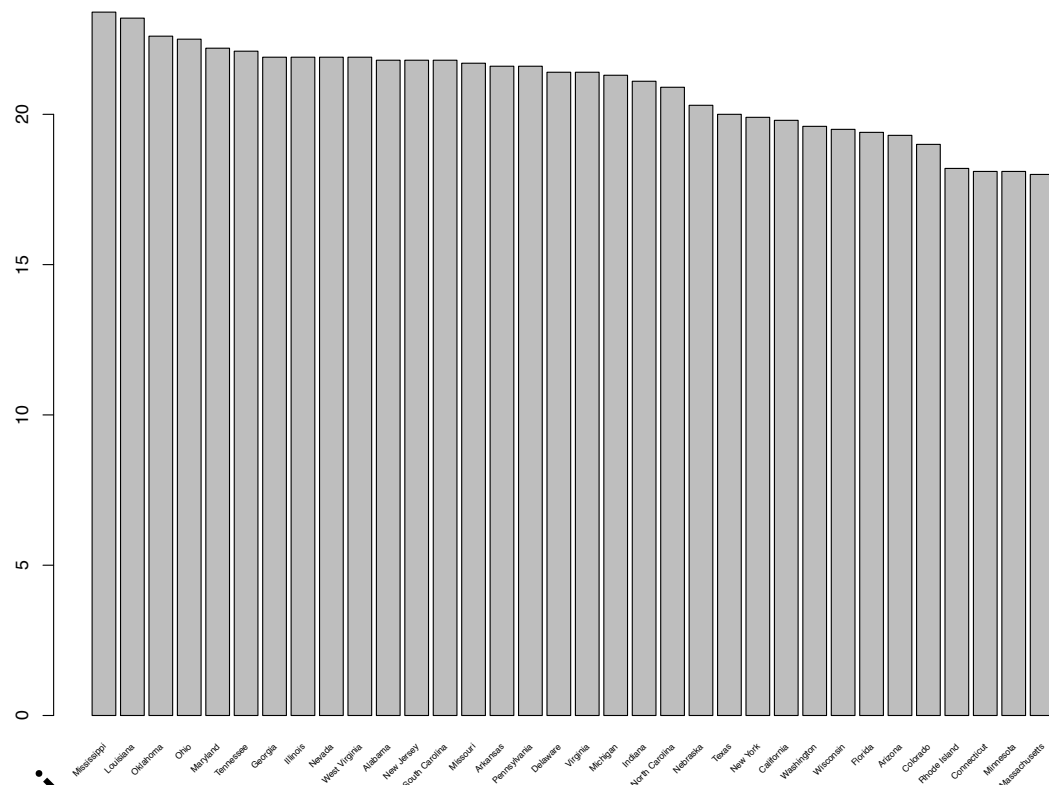
YES



NO

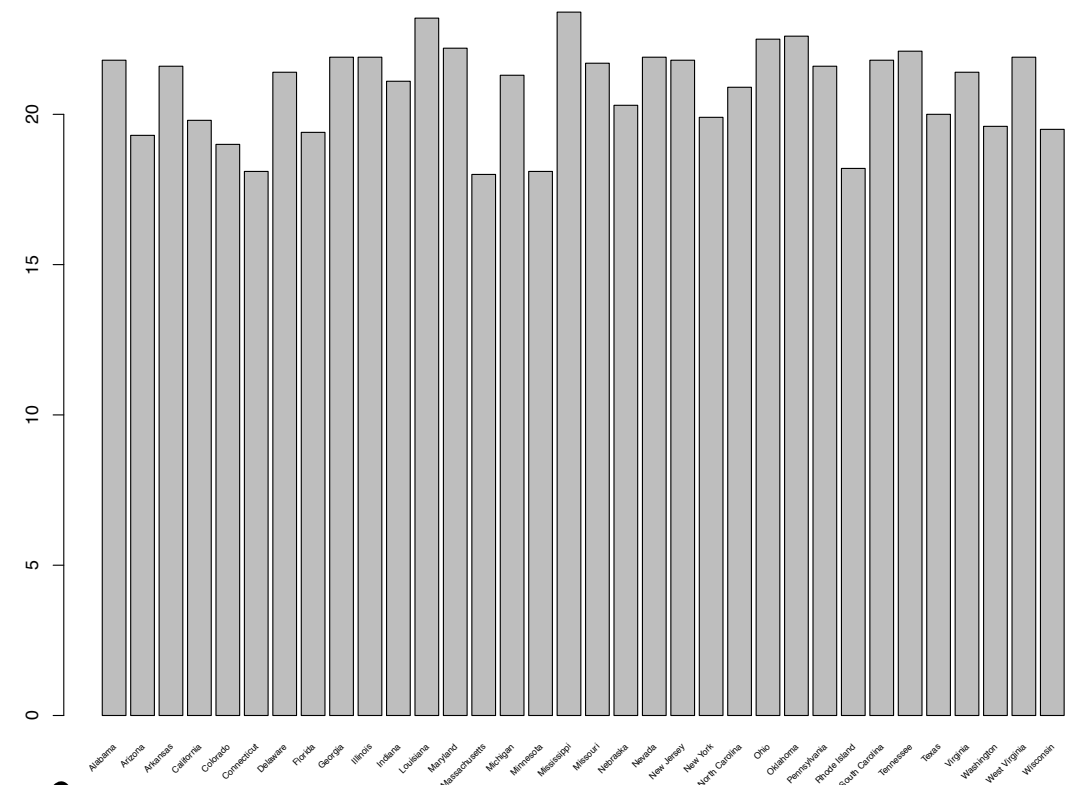
11 Sort by value, not by category (alphabetical)

Breast cancer mortality per 100K F pop. 2012–2016



YES

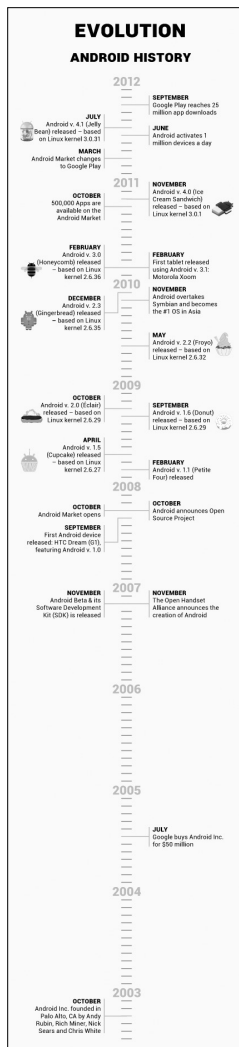
Breast cancer mortality per 100K F pop. 2012–2016



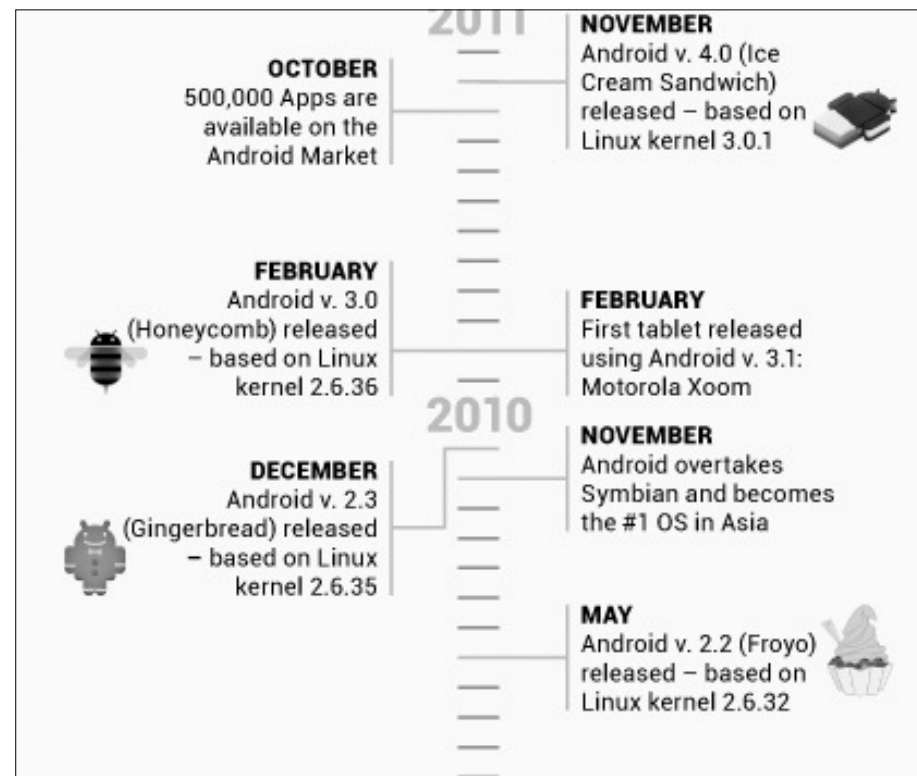
(Only 34 states shown)

NO

12 Equally space time intervals in timelines

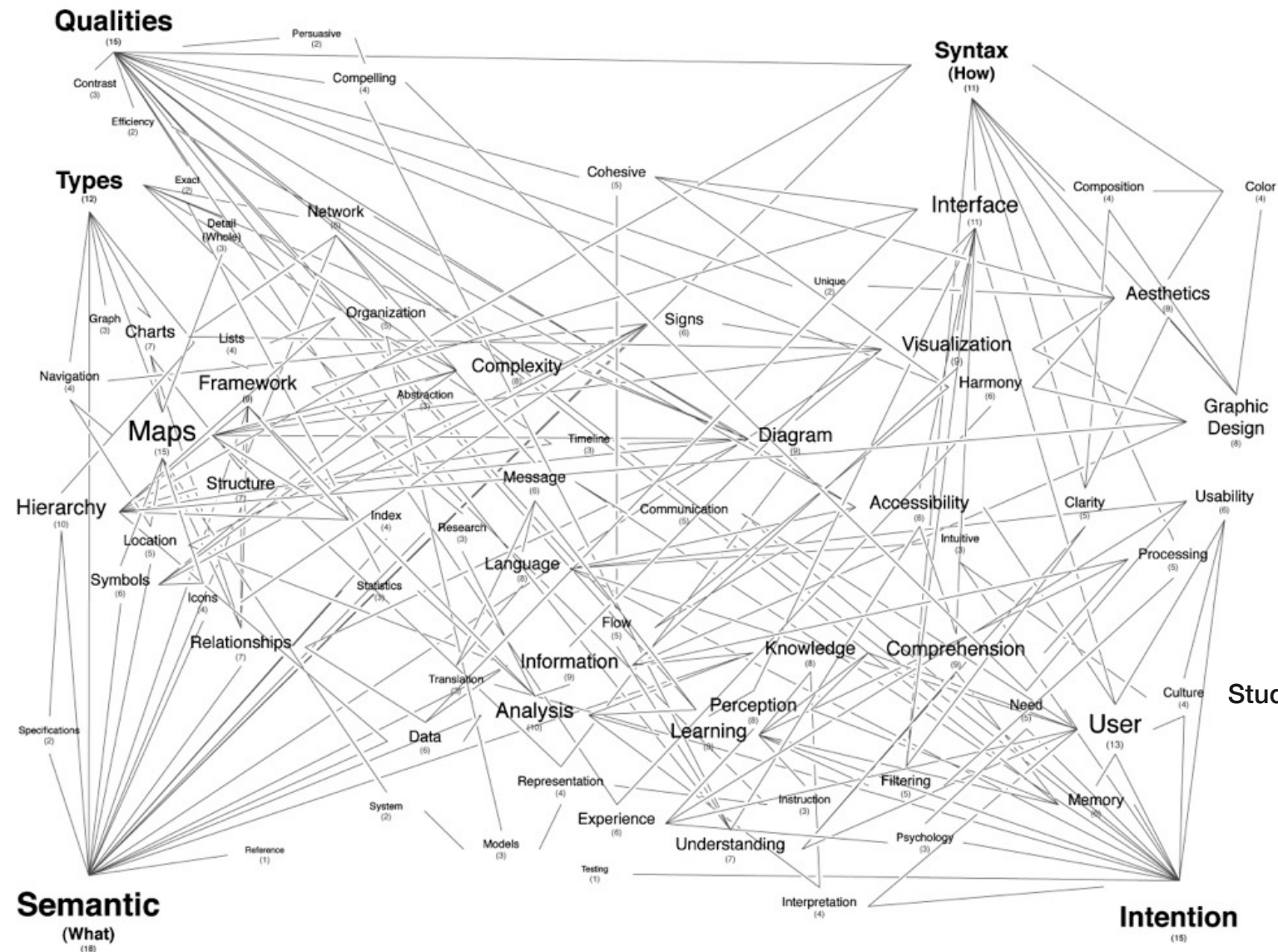


Student project: J.C.



YES

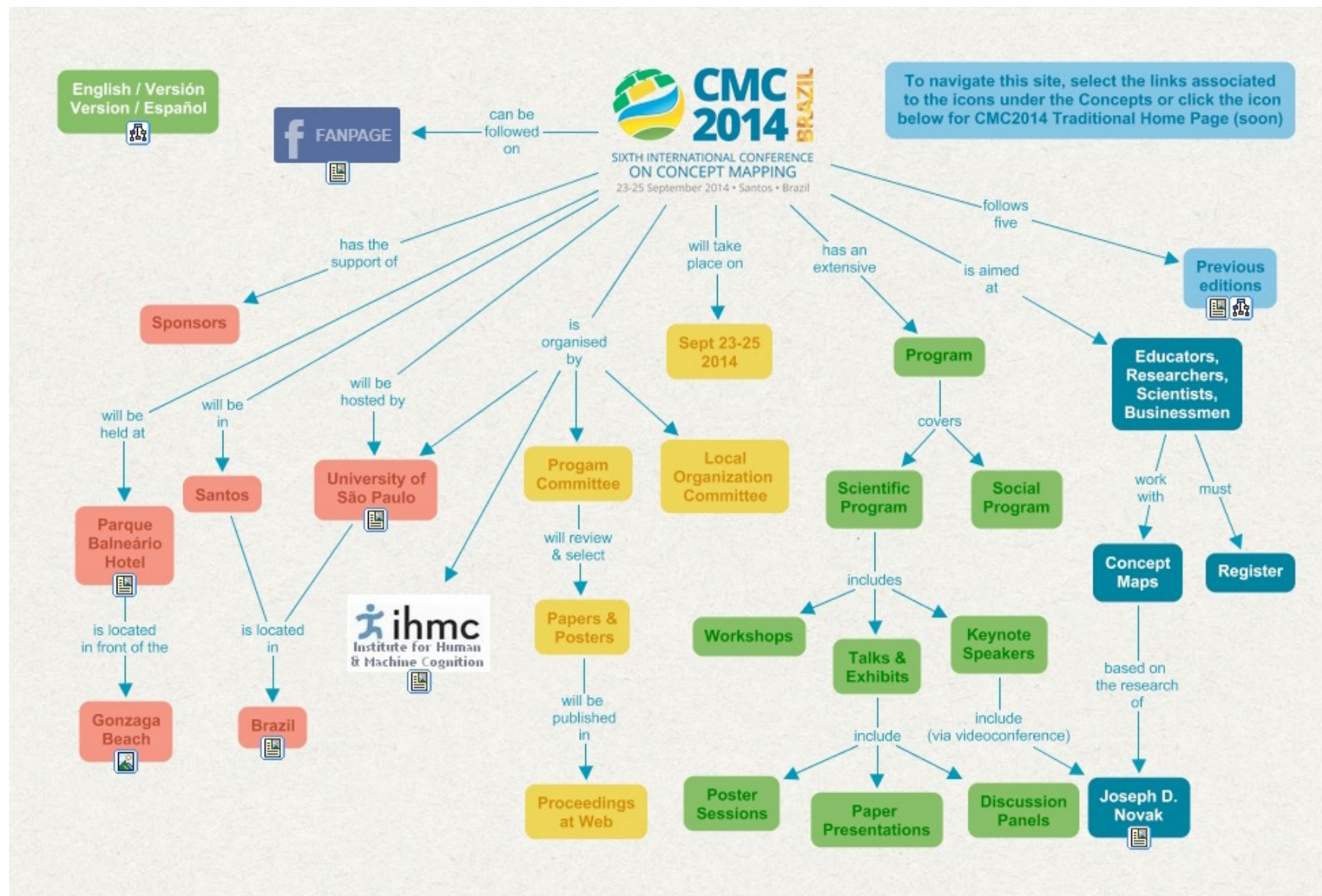
13 Avoid meaningless concept maps



Student project: N.M.

NO

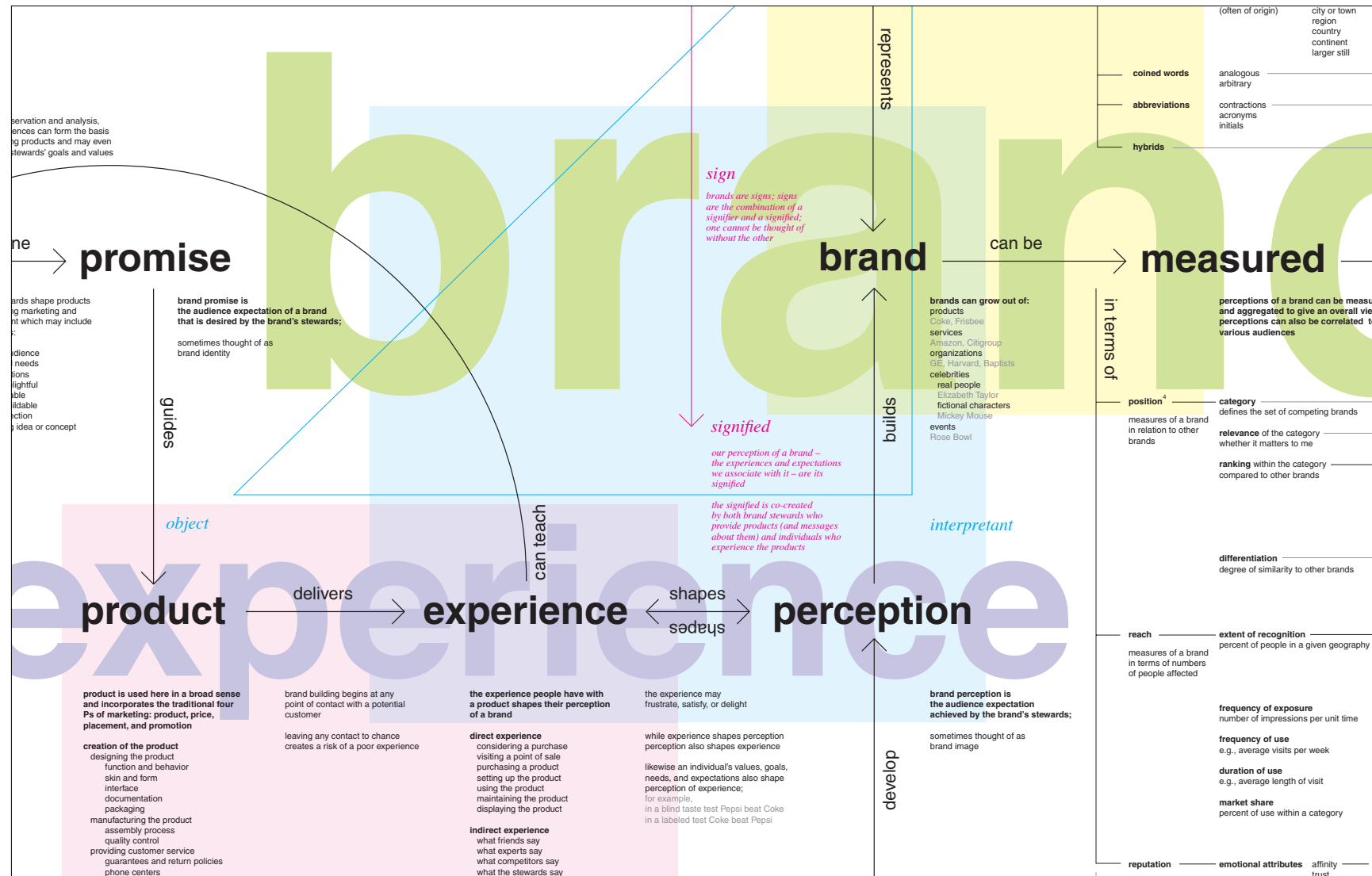
13 Avoid meaningless concept maps



<http://cmc.ihmc.us/>

NO

13 Avoid meaningless concept maps



<http://www.dubberly.com/concept-maps/a-model-of-brand.html>

NO

13 Avoid meaningless concept maps



y important sensible and tactile attributes, another, more
action of the reader's mental image of the book. This is
ords, the fixed sequence of words making up sentences,
ragraphs and so on, until the full complete book is



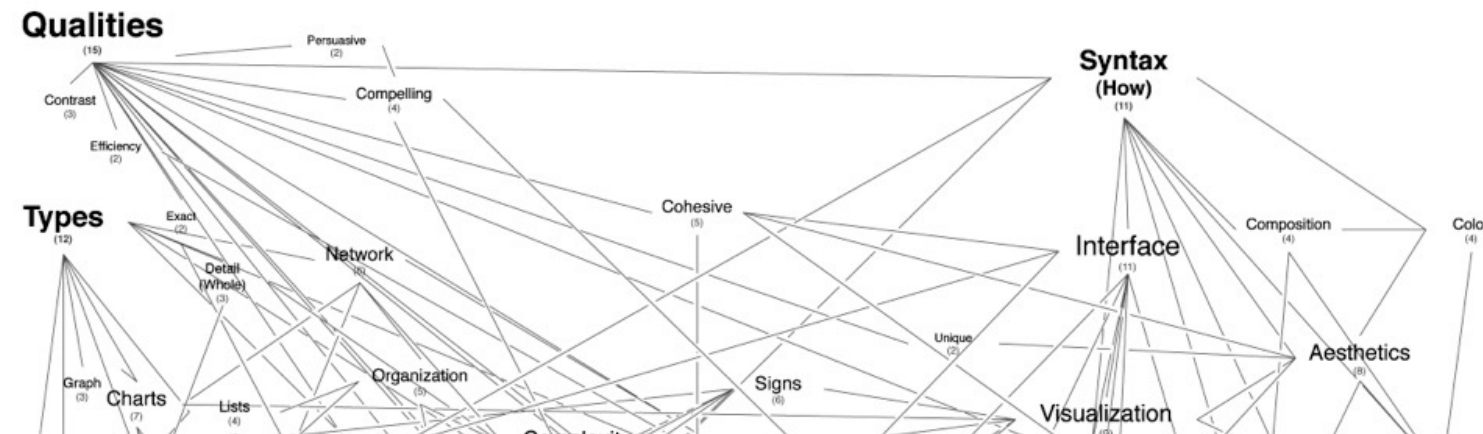
13 Avoid meaningless concept maps

*important distinction
between
langue & parole*

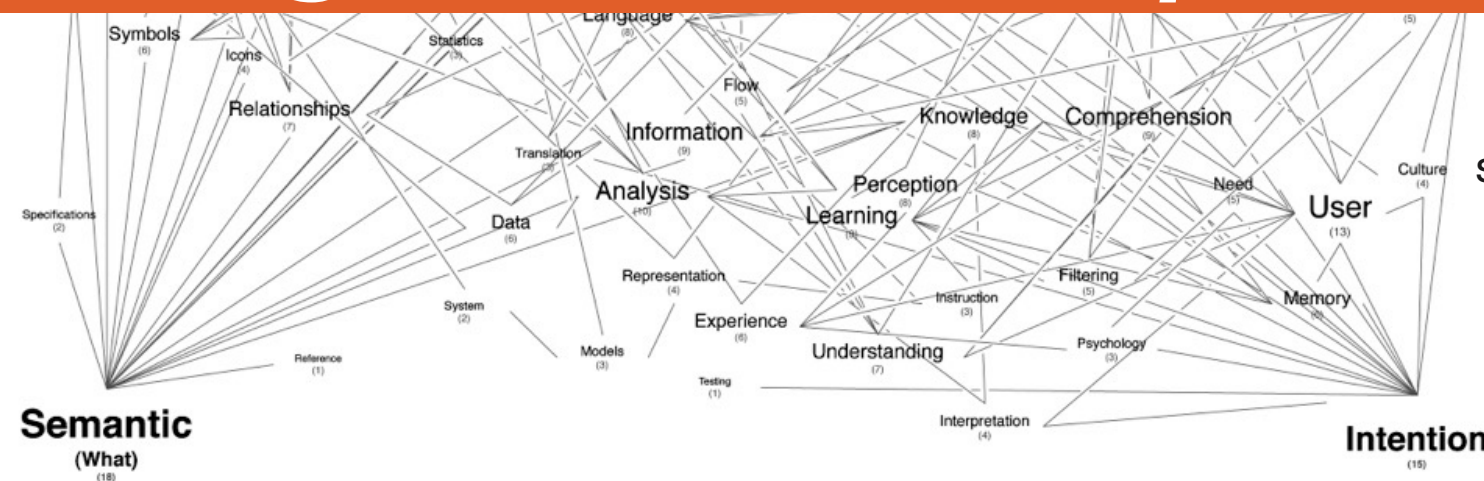
FERDINAND DE SAUSSURE
LINGUISTICS, 1906-11



13 Avoid meaningless concept maps



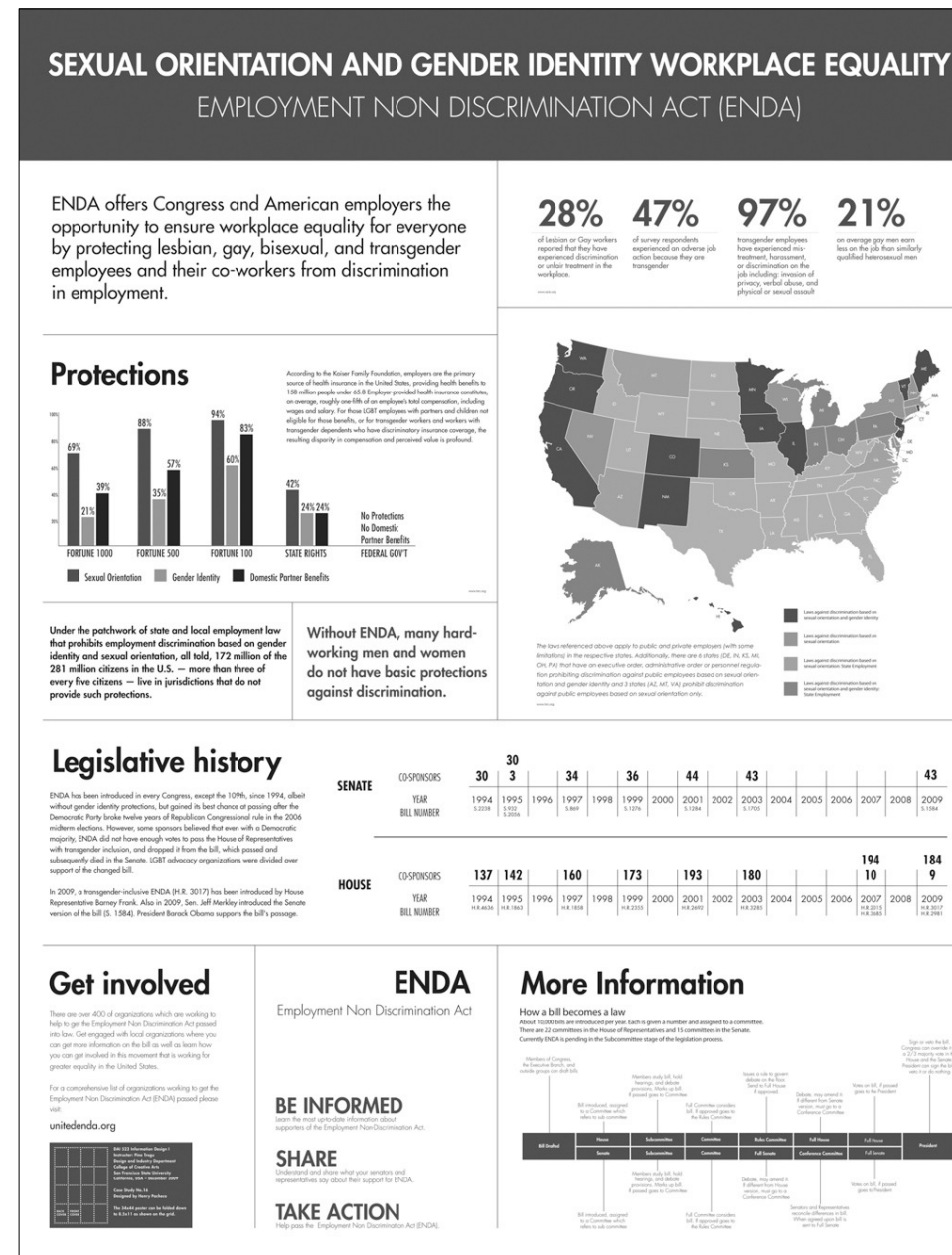
all langue and no parole



Student project: N.M.

NO

14 You can use small type



Student project: H.P.

YES

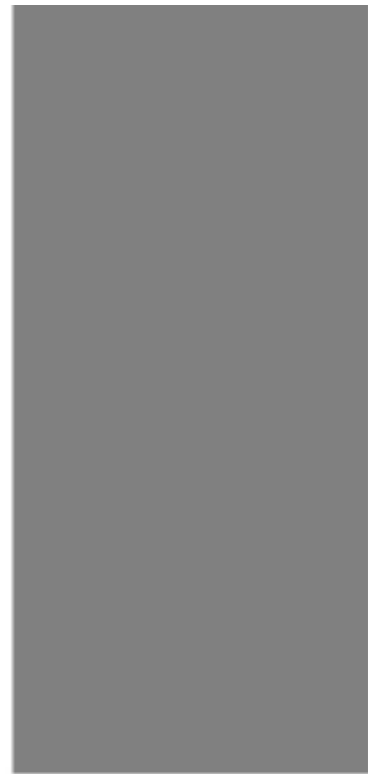
15 Do not screen type (for print)

Additional instructions, examples, and videos related to the assignments in this list may be found on iLearn. Many of the examples shown here are for reference only, you will be drawing your own objects and views as appropriate. 1 Milk carton orthographic 5pts Draw the six views of the milk carton using light lines for the projection lines between the views. Use darker lines for the actual object lines. Label each view: front, top, right side, bottom, left side, back. Draw a border around the sheet (1/2" from the edge) and a 3/4" title block at the bottom. Include the drawing name, drawing number, your name and the date. Draw thin guidelines for your lettering and labels. This is a freehand drawing. Practice keeping the lines straight, parallel, and even in thickness and value.

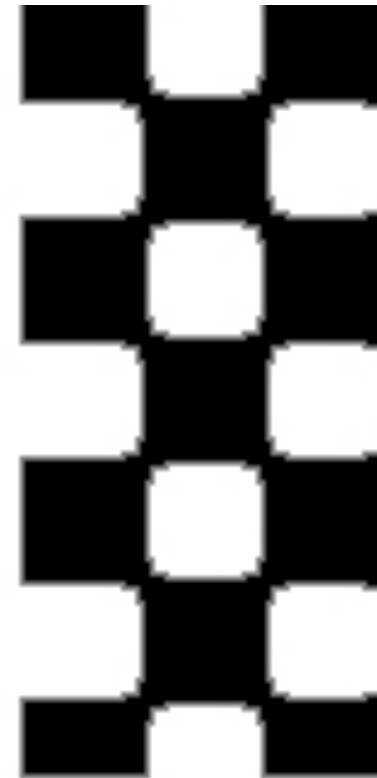
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NO

15 Do not screen type (for print)



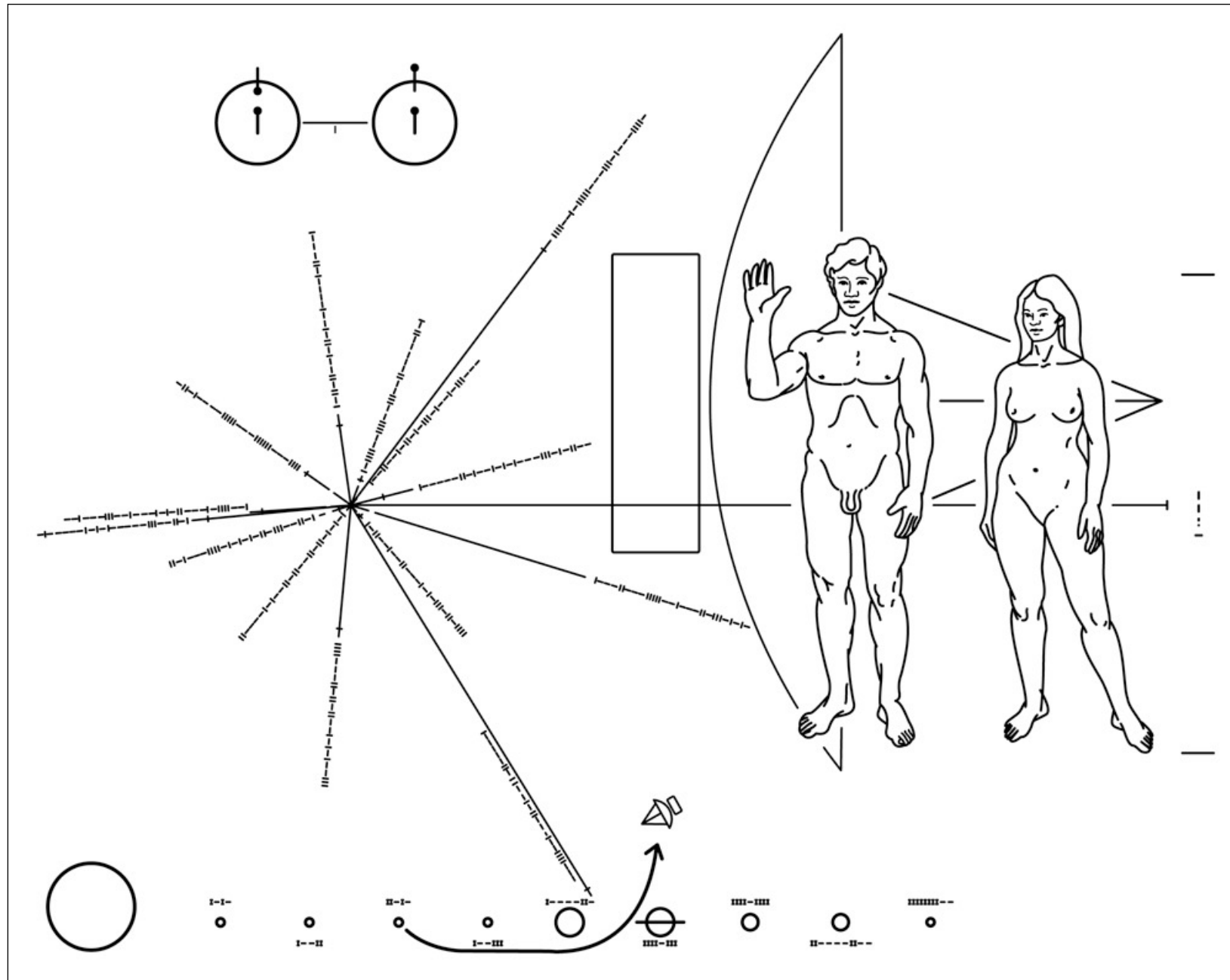
*50% black (gray)
(as seen on screen)*



*50% black (gray)
(as printed on paper)*

NO

16 Psychology of perception



http://en.wikipedia.org/wiki/Pioneer_plaque

16 Psychology of perception

Papers:

*Counting But Losing Count:
the Legacy of Otto Neurath's Isotype Charts*
bit.ly/2JlfkUo

The Four-Second Window
bit.ly/Ve2mph

*The Double Constraints of Convention and Cognition in
Successful Graphic Design*
bit.ly/12zLinL

OTHER EXAMPLES:

LINE

BAR

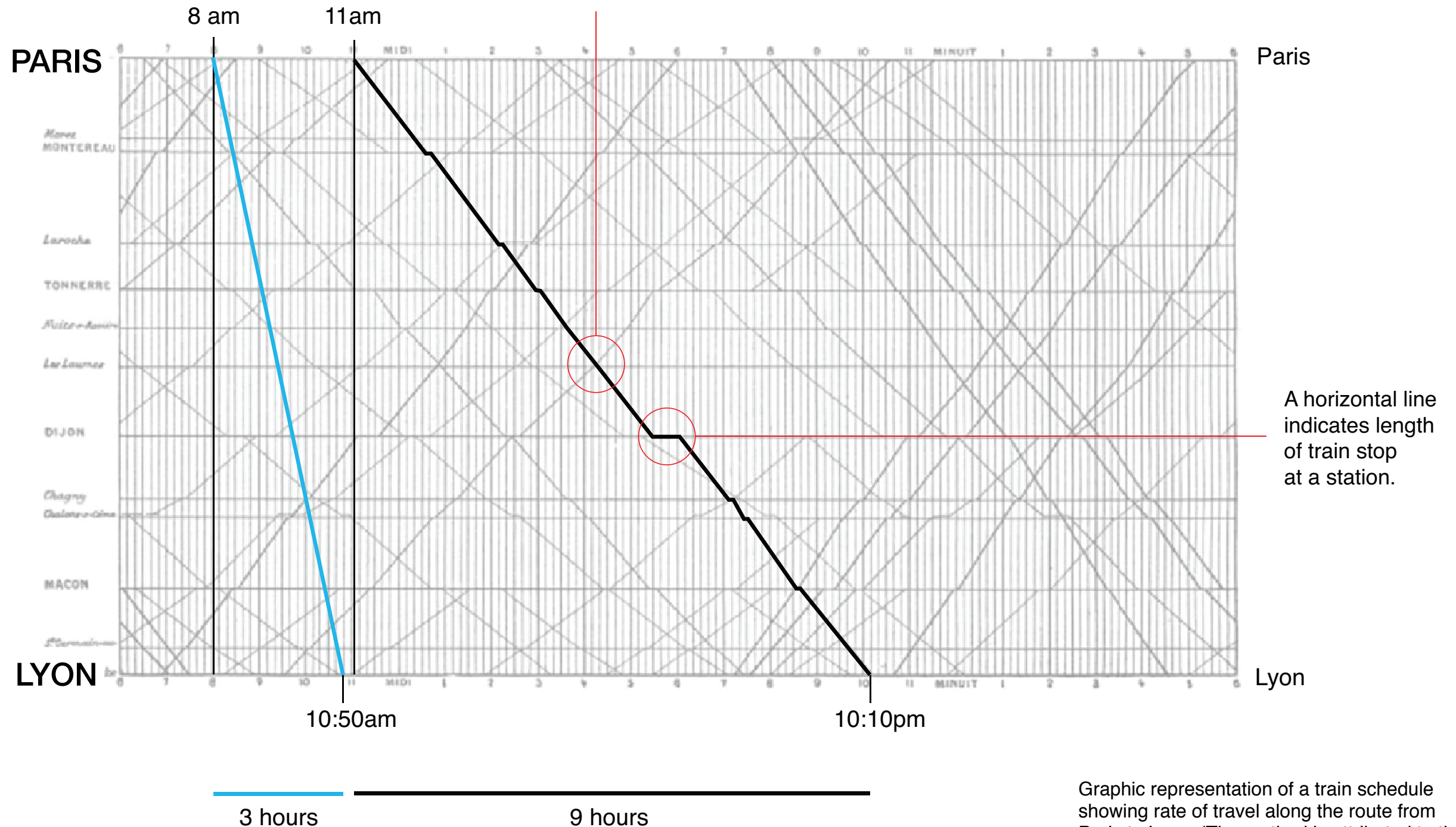
TREEMAP

SCATTER

Line

The intersection of two lines locates the time and place that trains going in opposite direction pass each other.

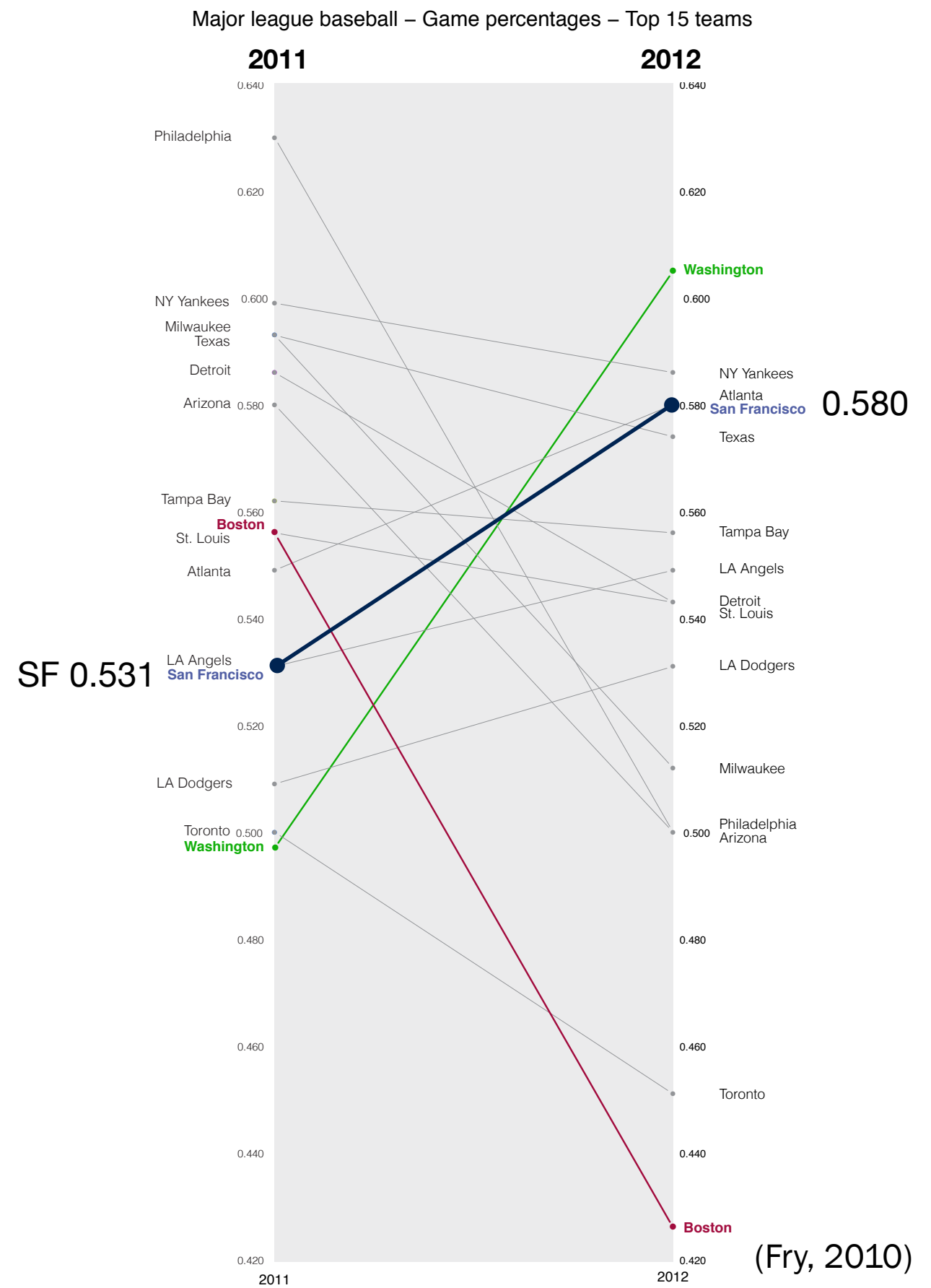
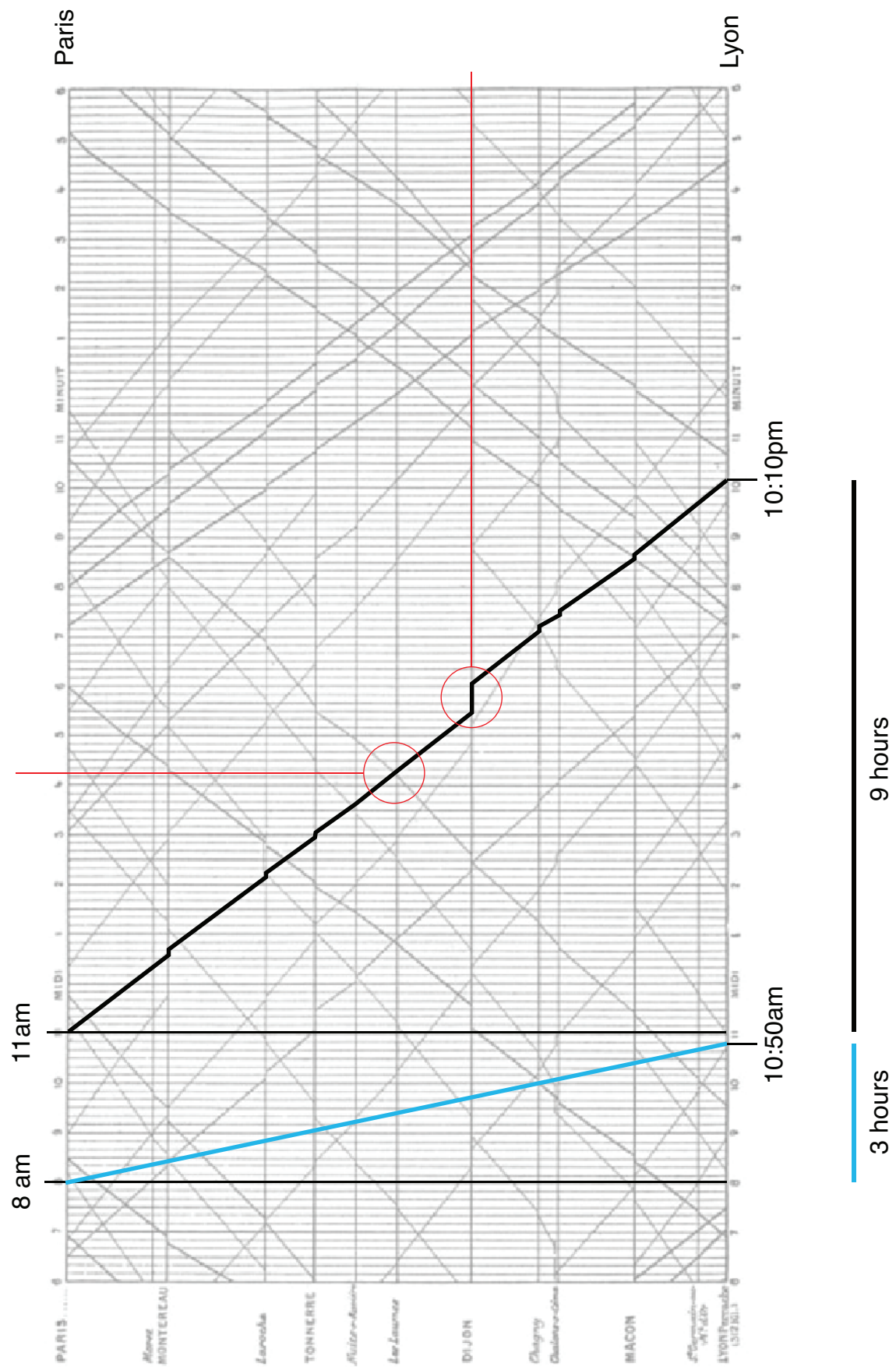
Graphical train schedule Paris-Lyon, 1885



The cities between Paris and Lyon are spaced proportionally according to the distance between them. Arrival and departures are located along the horizontal. The slope of the lines reflect the speed of the train: the more vertical the line, the faster the train. Compare an express train which took 9 hours to complete the trip in 1885 (black line) with a TGV (*train à grand vitesse*) which took 3 hours in 1981 (blue line).

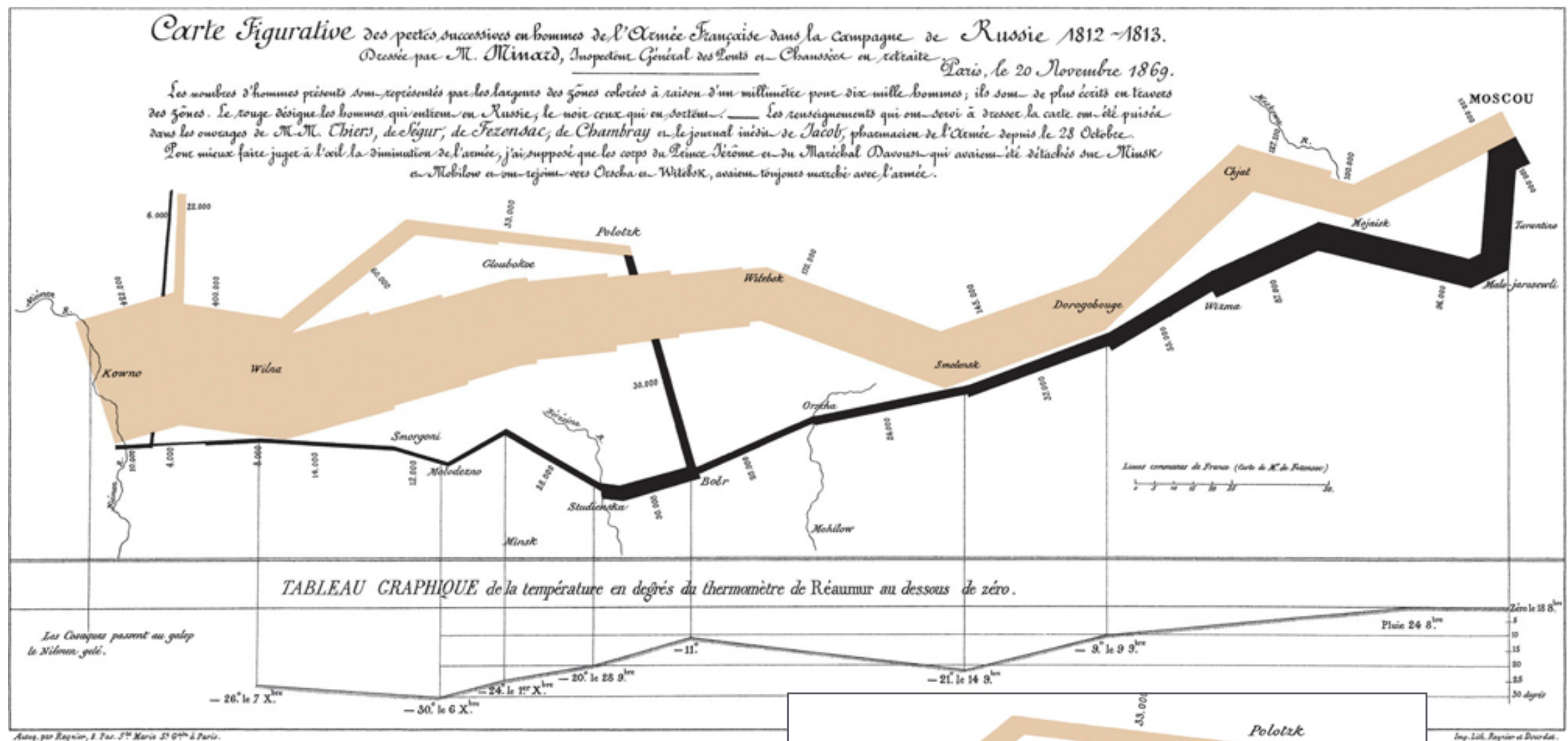
Graphic representation of a train schedule showing rate of travel along the route from Paris to Lyon. (The method is attributed to the French engineer Ibry)- Etienne-Jules Marey (1830-1904), France.

E.J. Marey, *La Méthode Graphique* (Paris, 1885). p. 20



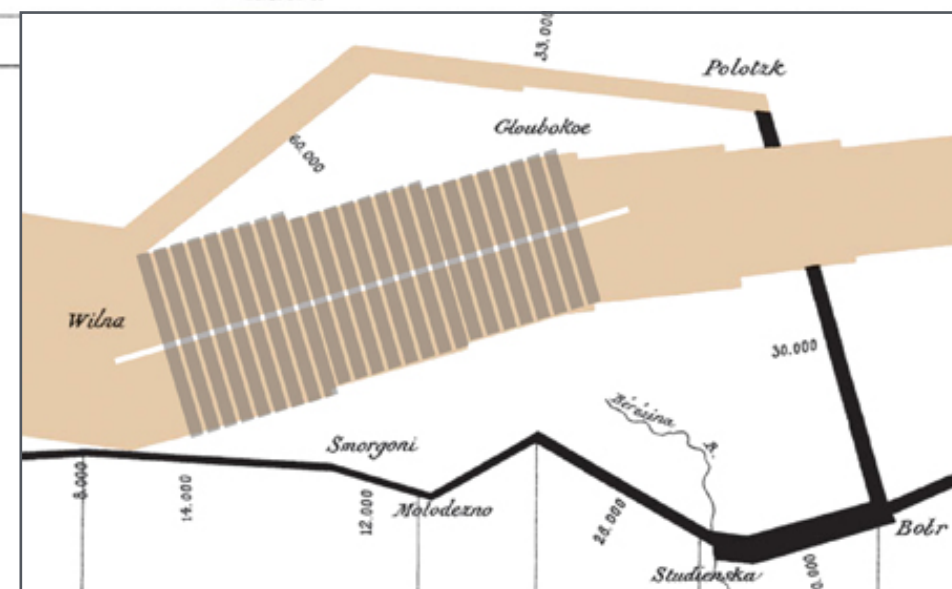
Line/Bar

Charles Minard 1781-1870



Minard's flow map graphic of Napoleon's March on Moscow (called "the best graphic ever produced" by Tufte).
 The "thickness" of the line indicates the size of the army (from 442,000 in 1812 to 10,000 in 1813. See [Tufte](http://www.math.yorku.ca/SCS/Gallery/re-minard.html), p.40

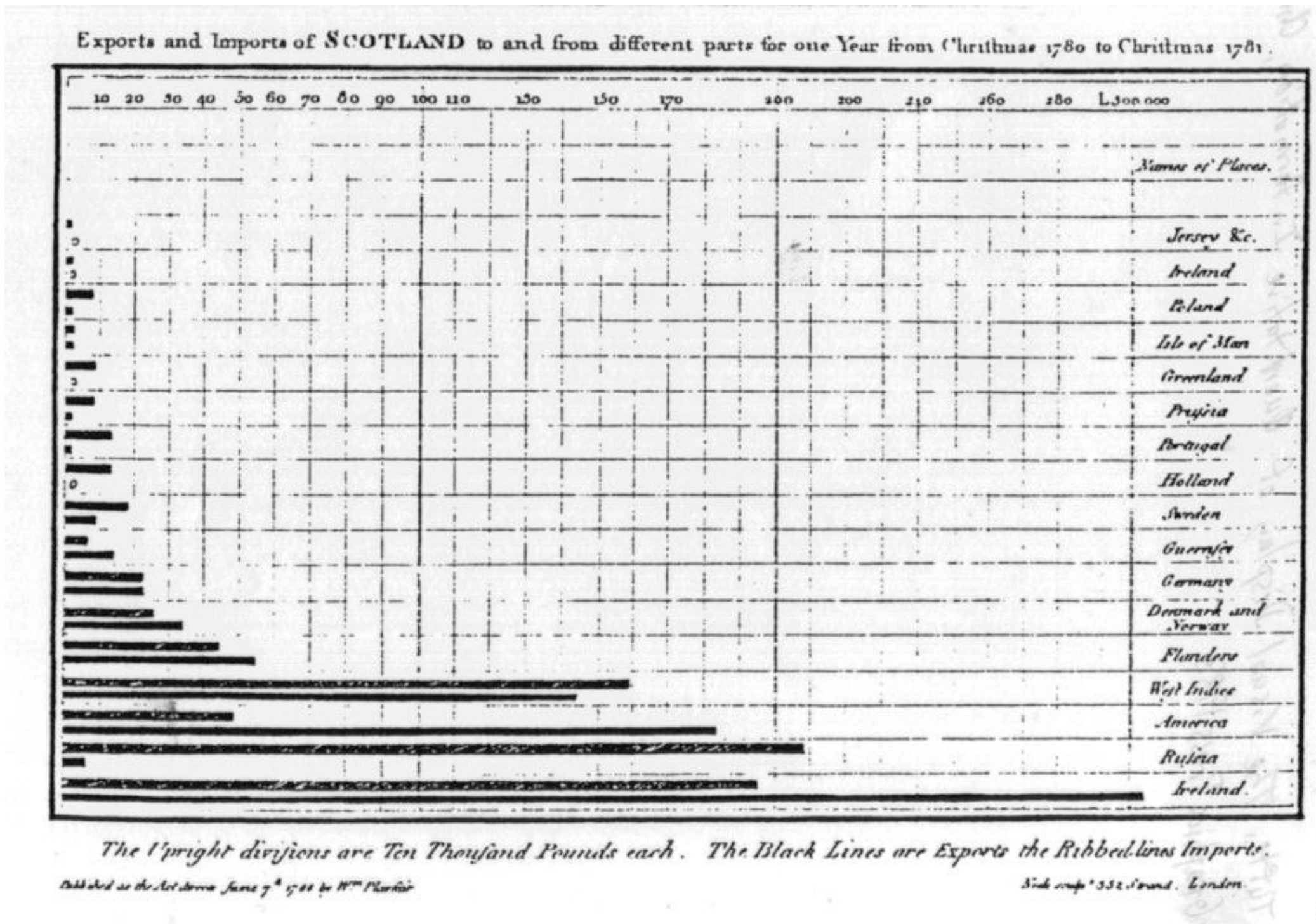
<http://www.math.yorku.ca/SCS/Gallery/re-minard.html>



(Trogu, 2013)

Bar

William Playfair 1759-1823



First known bar chart (1786). Import and export to and from Scotland in 1781 for 17 countries.

Bar in D3

<https://observablehq.com/@mbostock>

<https://bost.ocks.org/mike/>

Academia is an Iceberg

Authors of the most read papers in biology who are also on LinkedIn

Move the cursor over the bars to see specific information about each author.

Jun Wang

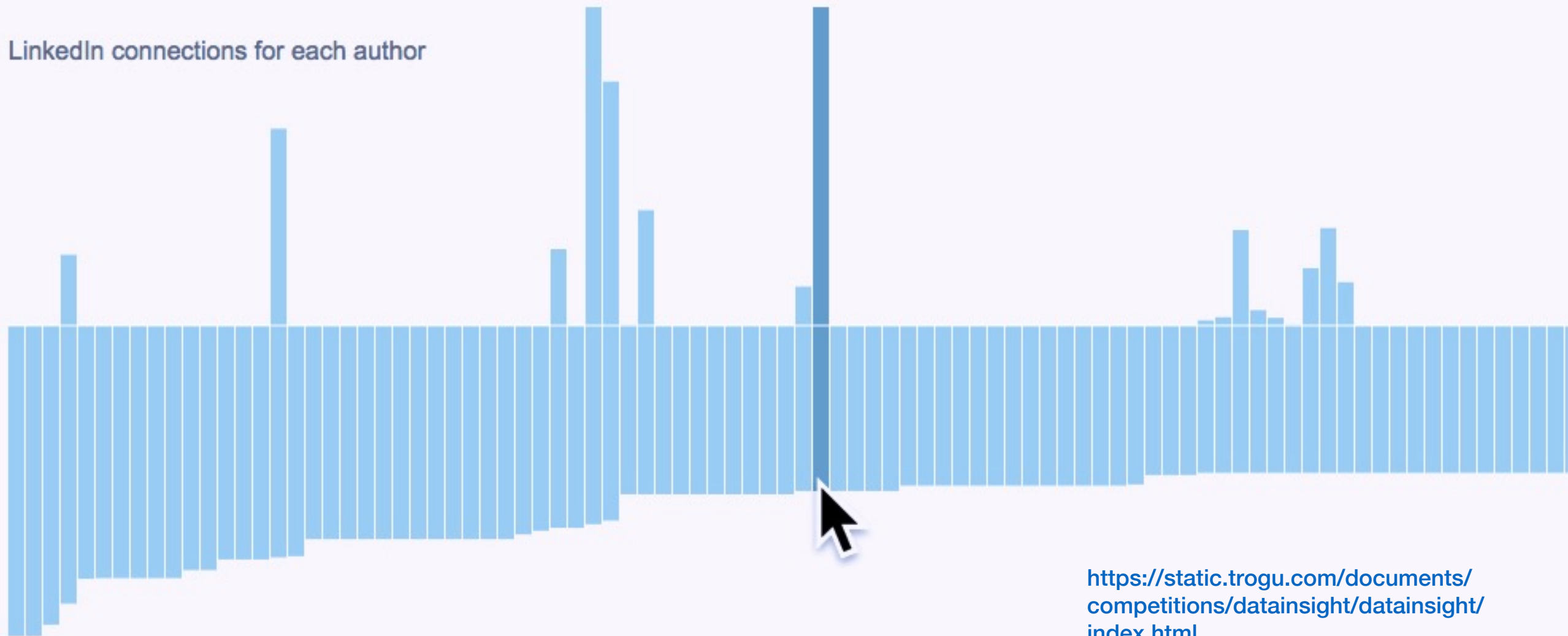
Readers: **455**

LinkedIn connections: **500**

<http://www.linkedin.com/pub/jun-wang/3/9aa/98a>

BUT! There are **7** matching results from LinkedIn...

LinkedIn connections for each author



<https://static.trogu.com/documents/competitions/datainsight/datainsight/index.html>

(Caviglia, Gunn & Trogu, 2011)

Treemap

The New York Times

February 25, 2007

Truck Sales Slip, Tripping Up Chrysler

Over the past few years, Chrysler executives said they were following the lead of Toyota and Honda, focusing on vehicles that met the needs of their customers. But as American consumers turned away from large trucks and S.U.V.'s in 2006, Chrysler continued to churn out big vehicles, which are now sitting unsold at dealerships across the country.

READING THE CHART

Boxes are scaled proportionally according to number of cars sold in 2006



Change in sales from 2005 to 2006



SALES CHANGE '05 TO '06

◀ TRUCKS, VANS, S.U.V.'S | CARS ▶

Chrysler Group -7.0%

Trucks/vans/S.U.V.'s 1.6 million
Cars 0.5 million

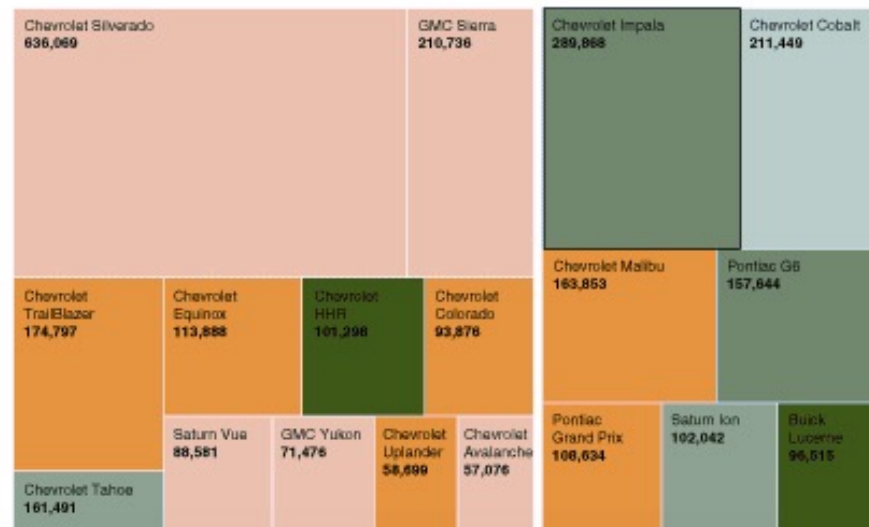
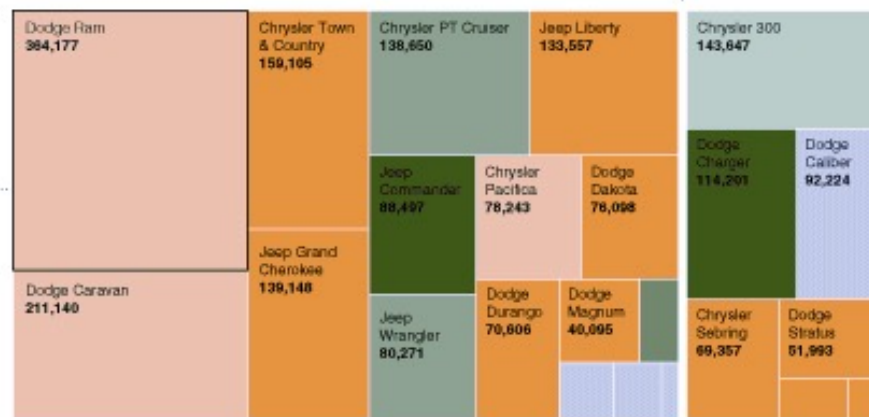
Pickups, minivans and S.U.V.'s made up 76 percent of Chrysler's sales, which left it vulnerable when consumers shifted to cars.



General Motors -8.7%

Trucks/vans/S.U.V.'s 2.5 million
Cars 1.6 million

G.M. introduced new versions of its large S.U.V.'s in late 2005, hoping they would bolster sales. Instead, sales of big vehicles were hurt when gas prices climbed. One of the few standouts was the Chevrolet HHR, new in 2005.



◀ TRUCKS, VANS, S.U.V.'S | CARS ▶



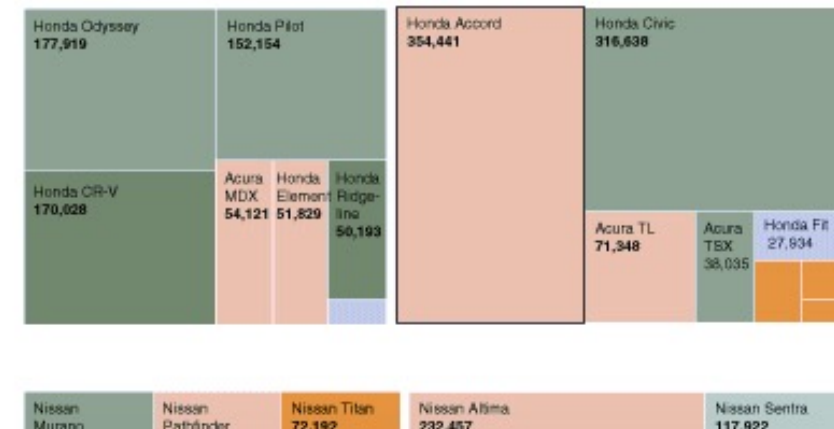
Toyota +12.5%

Trucks/vans/S.U.V.'s 1.1 million
Cars 1.5 million

Toyota rolled out a new version of the Camry, and once again it was the country's best-selling car.



Corolla sales also jumped, along with gas prices. Toyota could not escape the decline in sales of supersized S.U.V.'s like its Sequoia.



Honda +3.2%

Trucks/vans/S.U.V.'s 0.7 million
Cars 0.8 million

Like the Corolla, the small Honda Civic did well. But the Accord stalled. Buyers, it seems, are waiting for the new version to be released this year.



(Amand Cox, The New York Times, 2007)

https://archive.nytimes.com/www.nytimes.com/imagepages/2007/02/25/business/20070225_CHRYSLER_GRAPHIC.html

Coordinates system

☞ Ecce formulam, vsum, atque
structuram Tabularum Ptolomæi, cum quibusdam locis, in
quibus studiosus Geographiæ se satis exercere poreft.

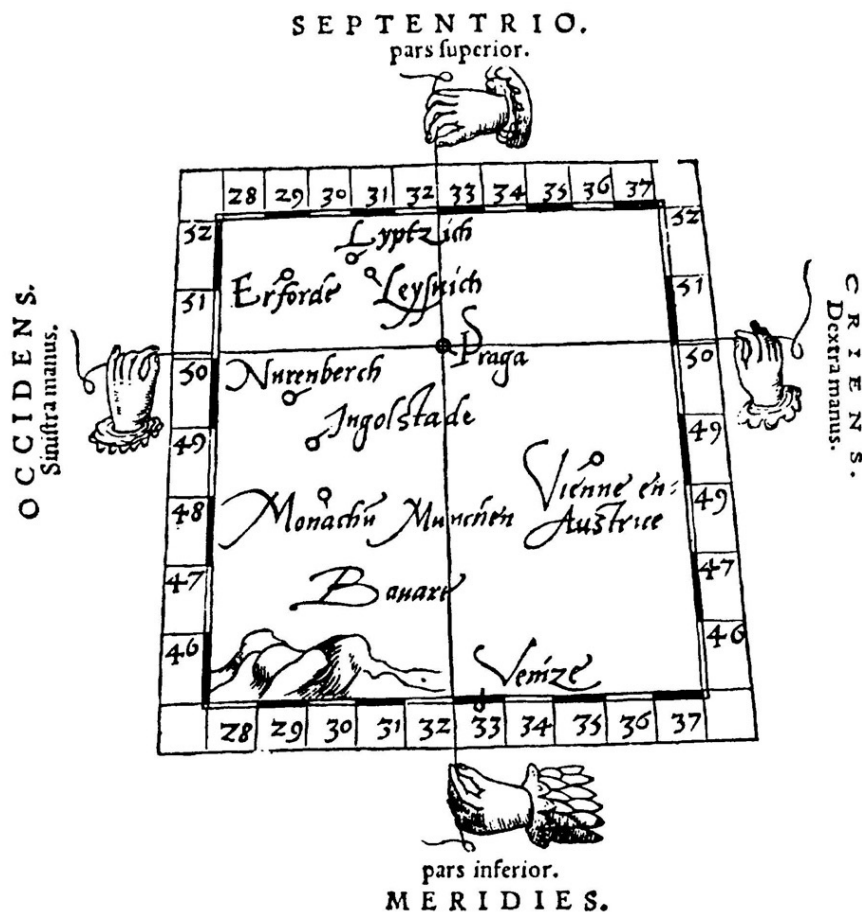
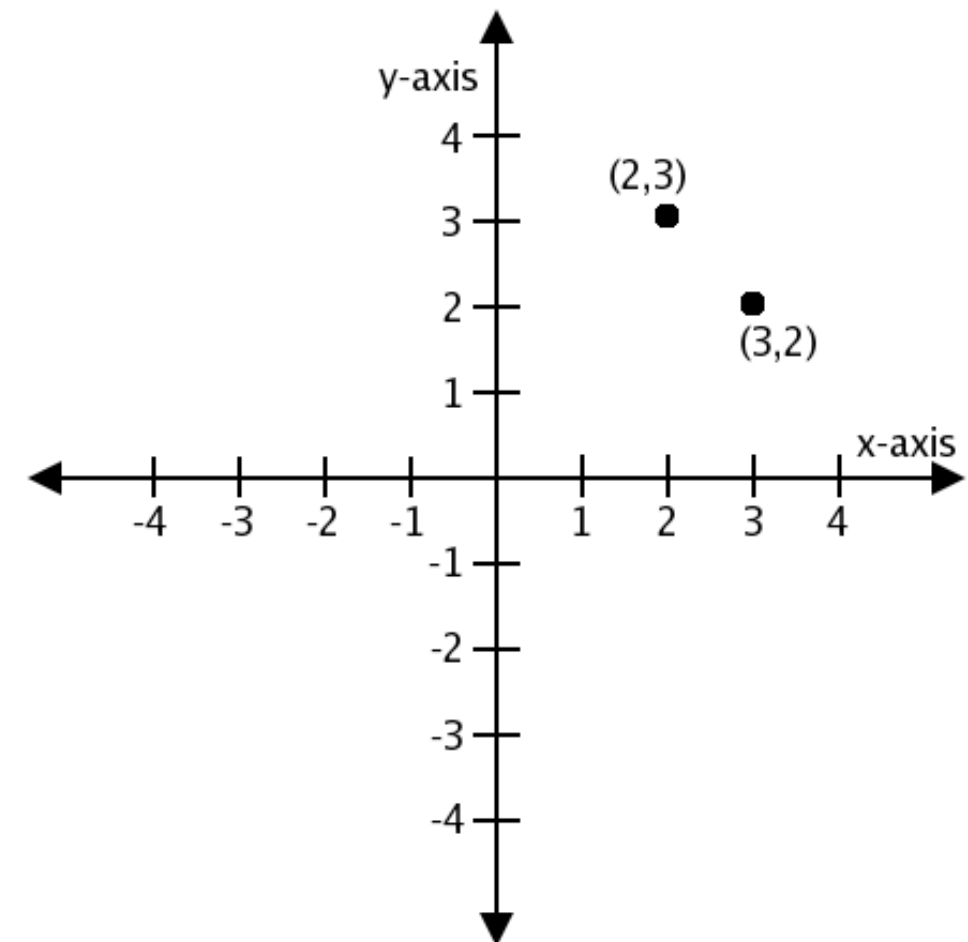


Illustration from Apianus' 1546
edition of [Cosmographia](#).

Descartes 1596-1650



Cartesian coordinates system (1637)

Scatterplot

More information about US presidential elections.

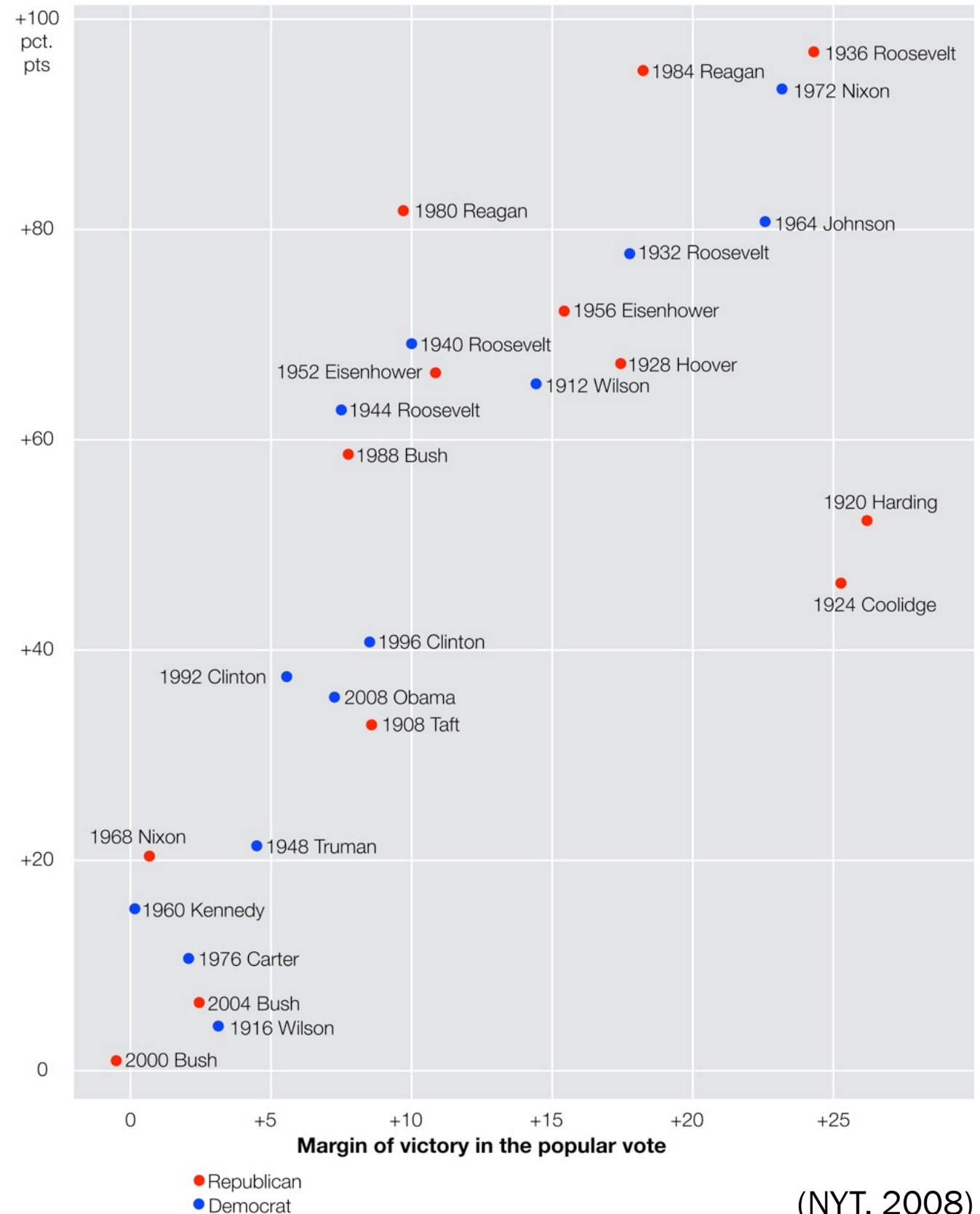
[Election map](#). (NY Times)

Tabular data used for the scatterplot at left
(margin of victory in percentage points).

Winner pop.vote (%) Elec.College (%)

| | | |
|-----------------|-------|------|
| 2008 Obama | 7.27 | 35.6 |
| 2004 Bush | 2.46 | 6.5 |
| 2000 Bush | -0.51 | 1 |
| 1996 Clinton | 8.51 | 40.8 |
| 1992 Clinton | 5.56 | 37.6 |
| 1988 Bush | 7.72 | 58.6 |
| 1984 Reagan | 18.21 | 95.2 |
| 1980 Reagan | 9.74 | 81.8 |
| 1976 Carter | 2.06 | 10.6 |
| 1972 Nixon | 23.15 | 93.5 |
| 1968 Nixon | 0.7 | 20.4 |
| 1964 Johnson | 22.58 | 80.6 |
| 1960 Kennedy | 0.17 | 15.6 |
| 1956 Eisenhower | 15.4 | 72.4 |
| 1952 Eisenhower | 10.85 | 66.4 |
| 1948 Truman | 4.48 | 21.5 |
| 1944 Roosevelt | 7.5 | 62.8 |
| 1940 Roosevelt | 9.96 | 69.2 |
| 1936 Roosevelt | 24.26 | 97 |
| 1932 Roosevelt | 17.76 | 77.8 |
| 1928 Hoover | 17.41 | 67.2 |
| 1924 Coolidge | 25.22 | 46.3 |
| 1920 Harding | 26.17 | 52.2 |
| 1916 Wilson | 3.12 | 4.4 |
| 1912 Wilson | 14.44 | 65.3 |
| 1908 Taft | 8.53 | 33 |

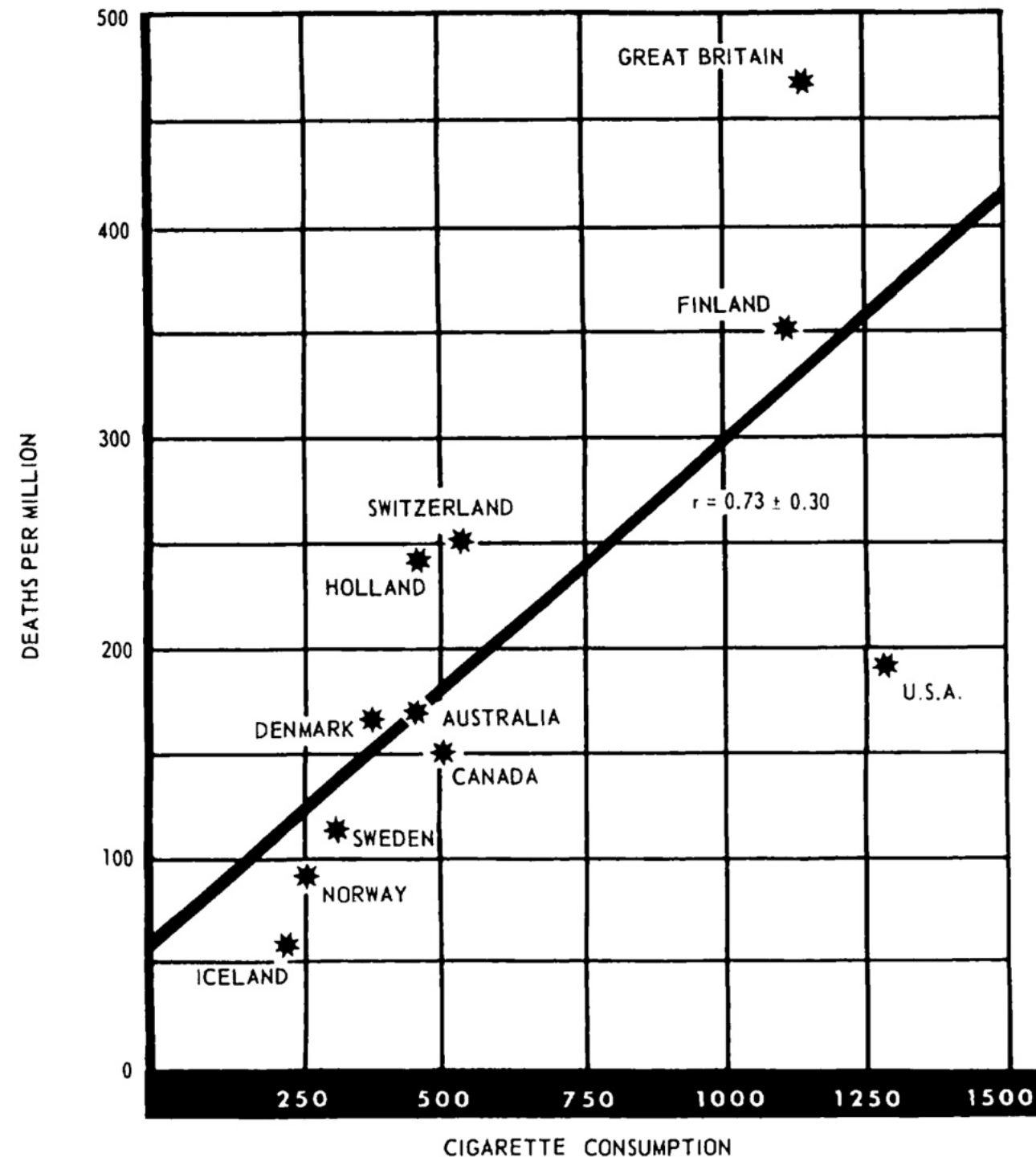
Margin of victory in the Electoral College *Elections since 1908*



(NYT, 2008)

Scatterplot

CRUDE MALE DEATH RATE FOR LUNG CANCER
IN 1950 AND PER CAPITA CONSUMPTION OF
CIGARETTES IN 1930 IN VARIOUS COUNTRIES.

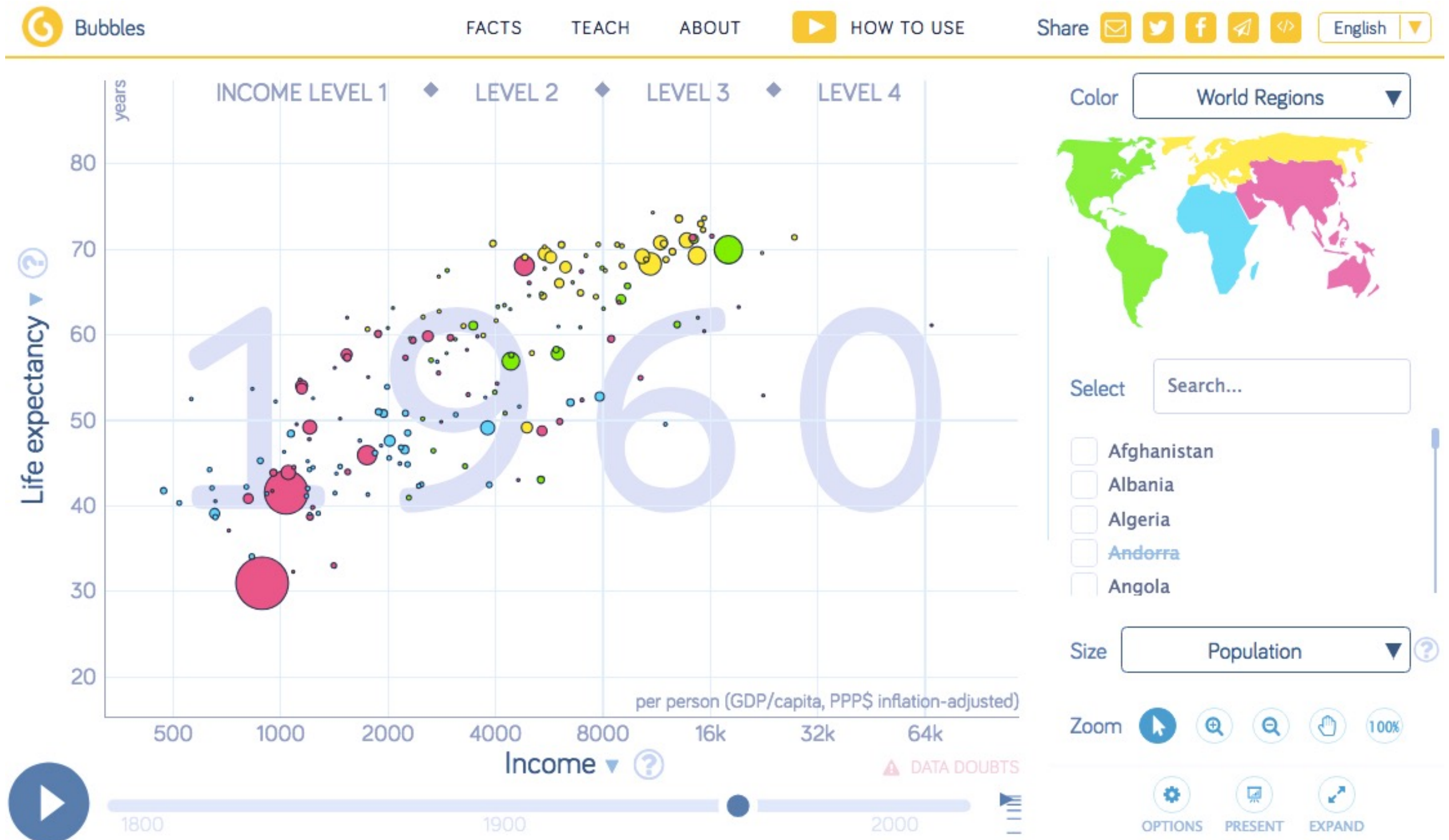


Report of the Advisory
Committee to the Surgeon
General. *Smoking and Health*
(Washington. D.C., 1964), p.
176; based on R. Doll,
"Etiology of Lung Cancer,"
Advances in Cancer Research,
3 (1955). 1-50.

From *The Visual Display of
Quantitative Information* [Tufte](#),
p.46-47.

Scatterplot

Hans Rosling – *Factfulness*

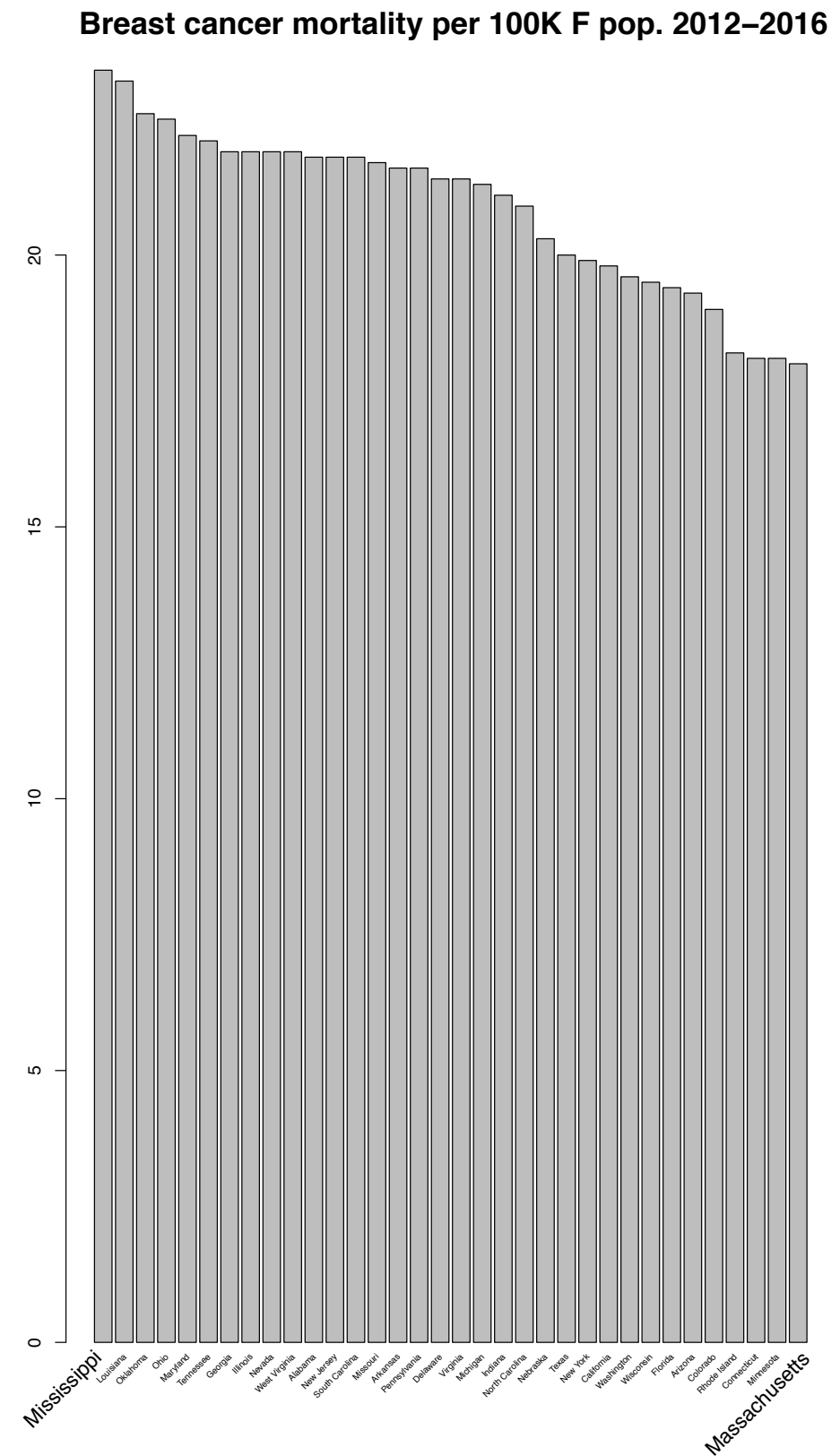
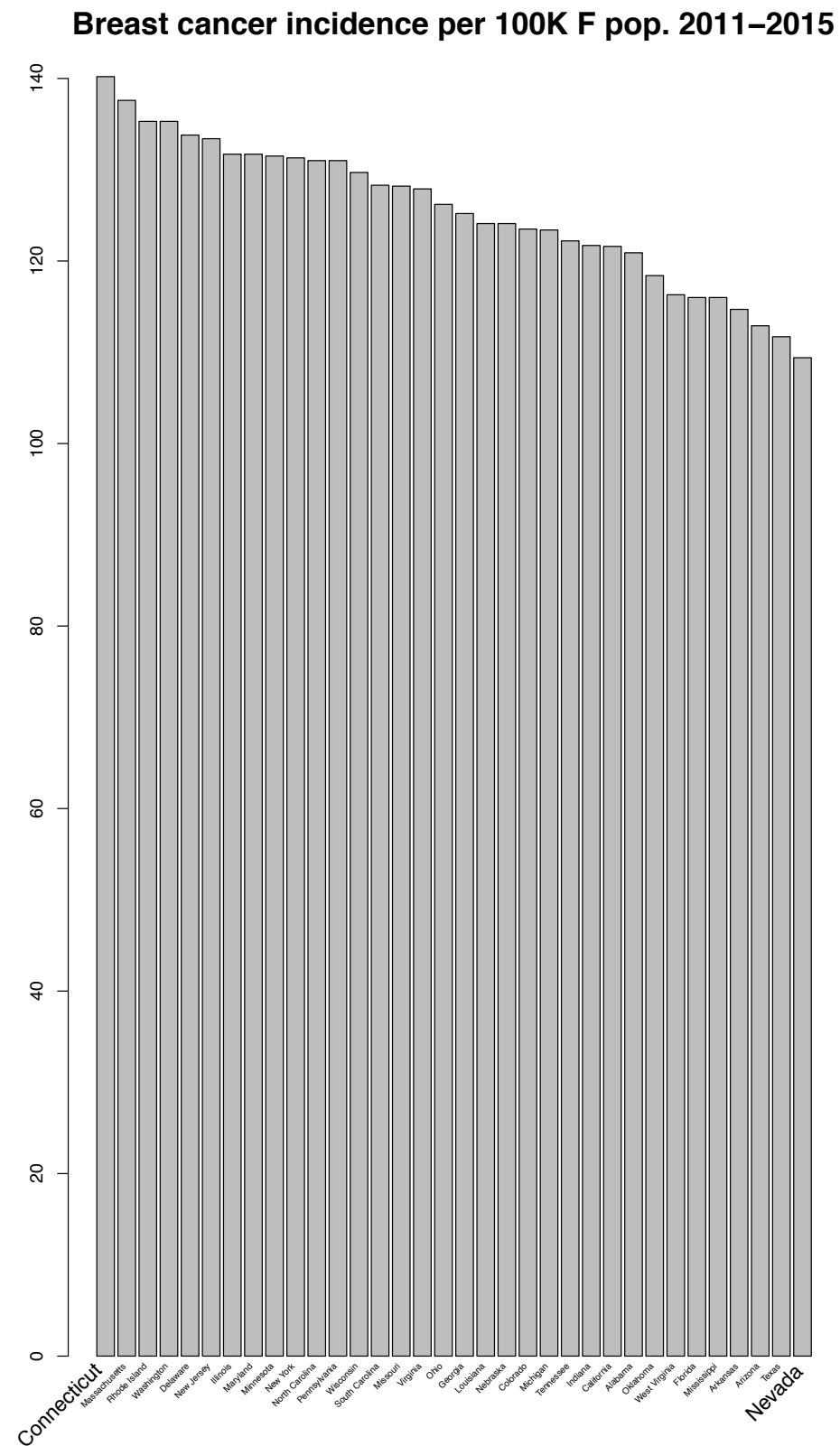


<https://www.gapminder.org>

[https://www.gapminder.org/tools/#\\$chart-type=bubbles](https://www.gapminder.org/tools/#$chart-type=bubbles)

https://www.ted.com/talks/hans_rosling_at_state

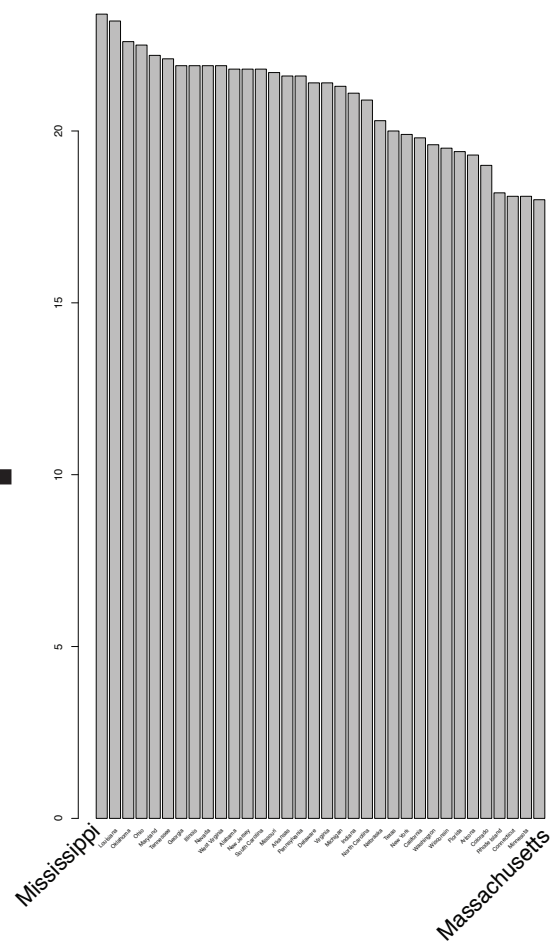
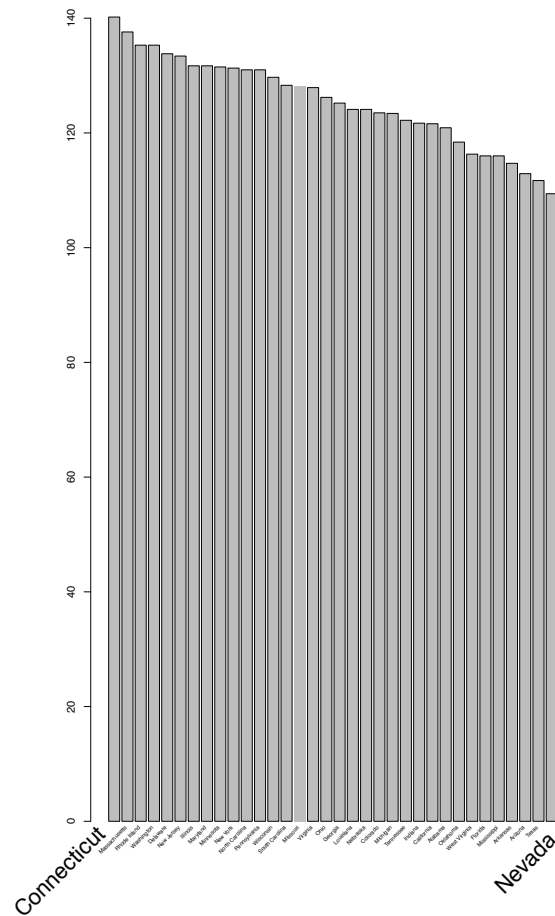
Bars to Scatterplots



Bars to Scatterplots

**Breast cancer incidence
per 100K F pop.
2011–2015**

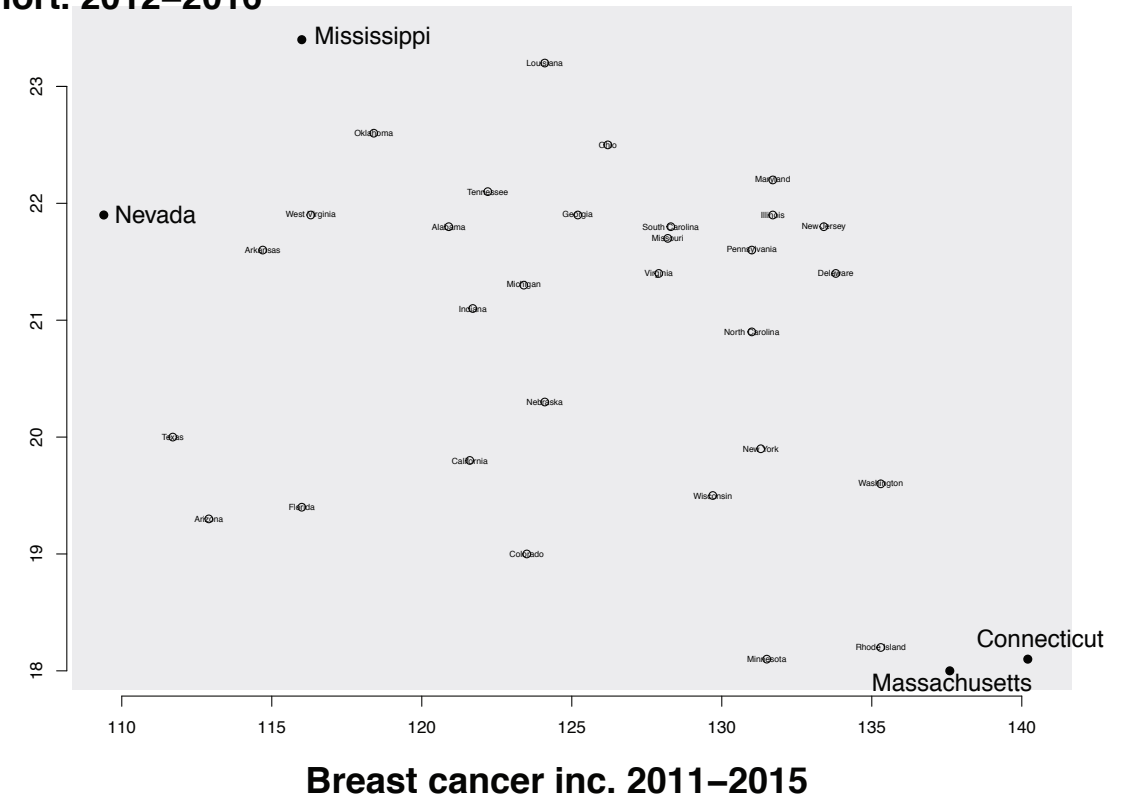
**Breast cancer mortality
per 100K F pop.
2012–2016**



+

=

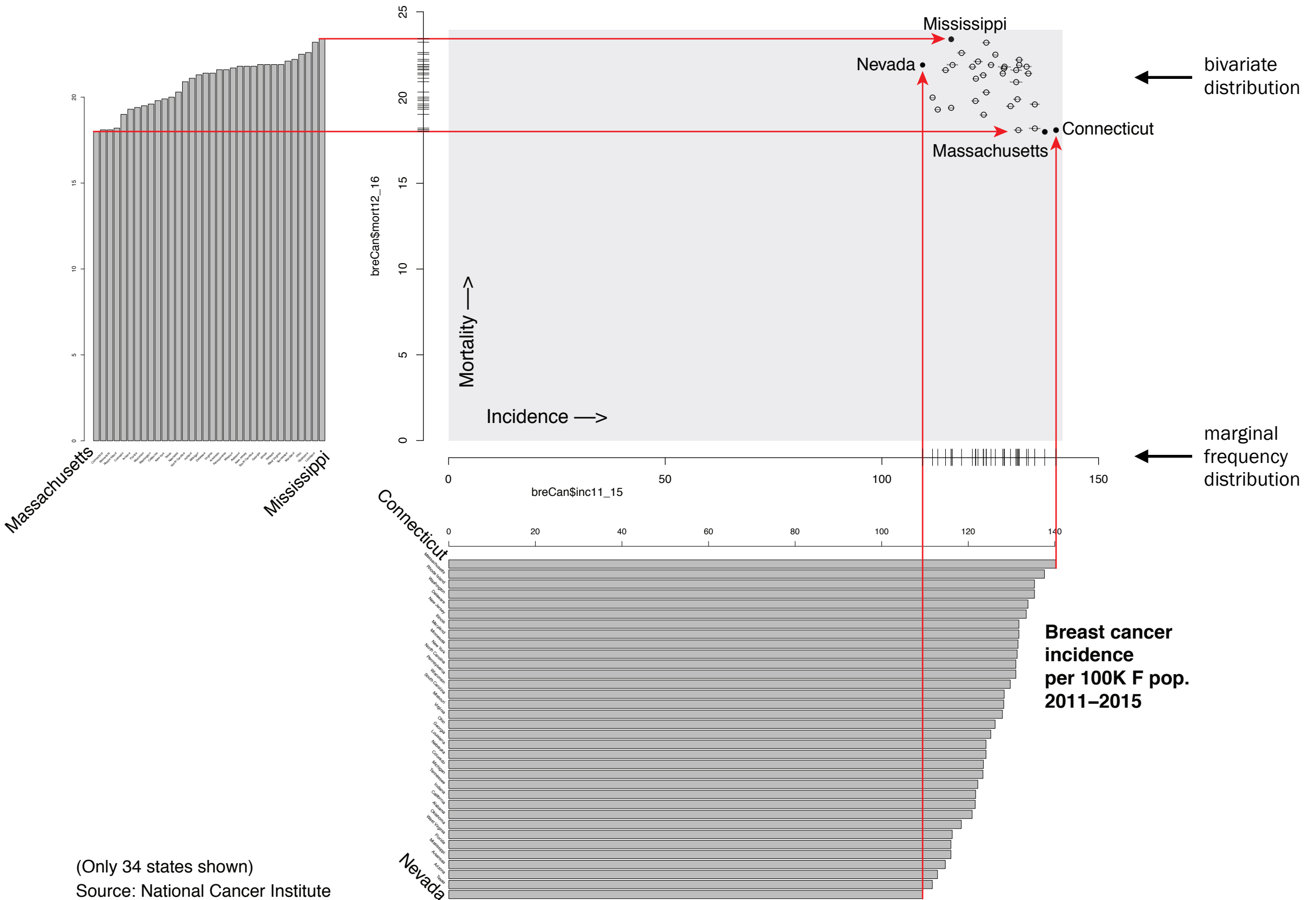
**Breast cancer
mort. 2012–2016**



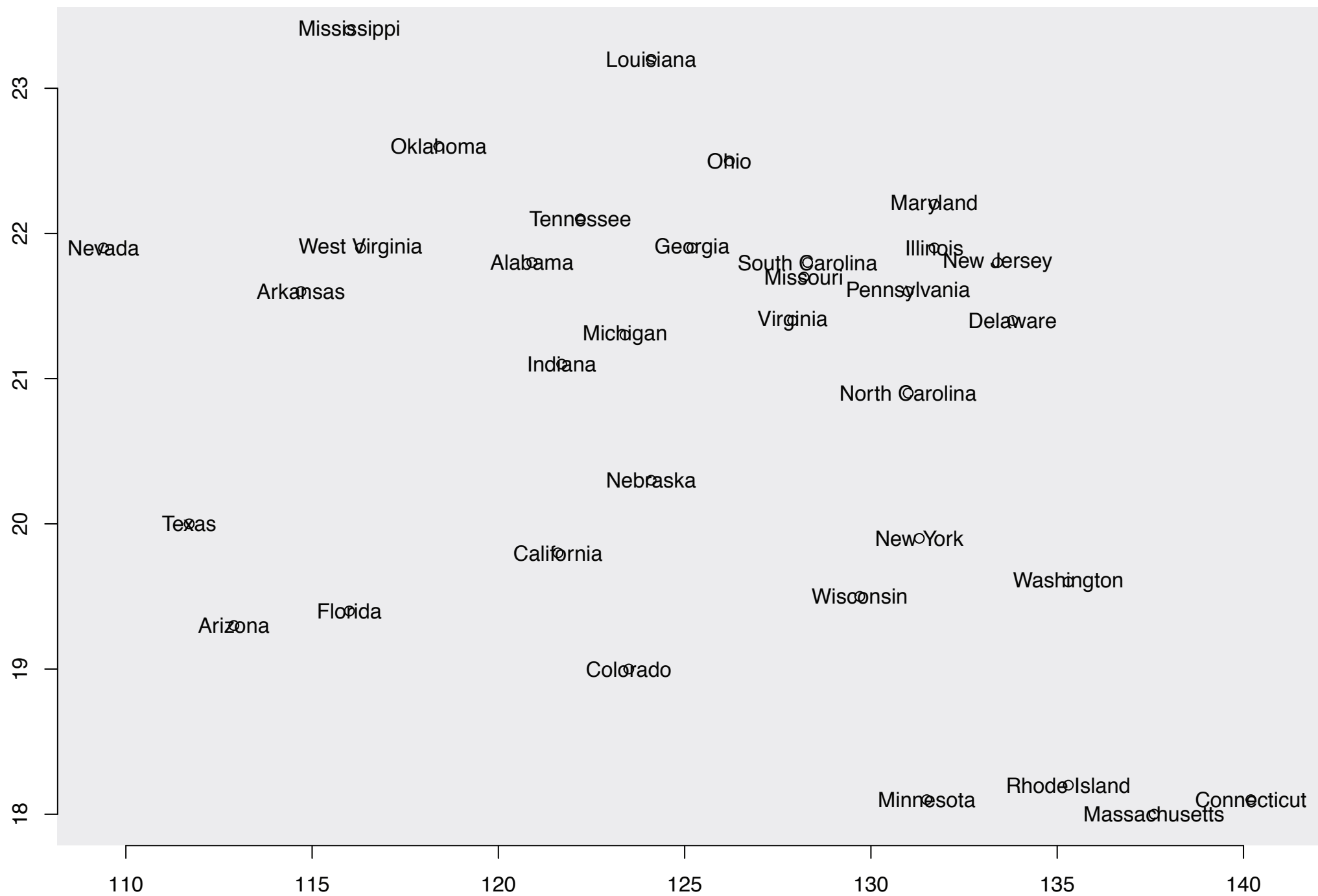
(Only 34 states shown)

Source: National Cancer Institute

**Breast cancer
mort. per 100K
F. pop 2012–2016**



Breast cancer mort. 2012–2016

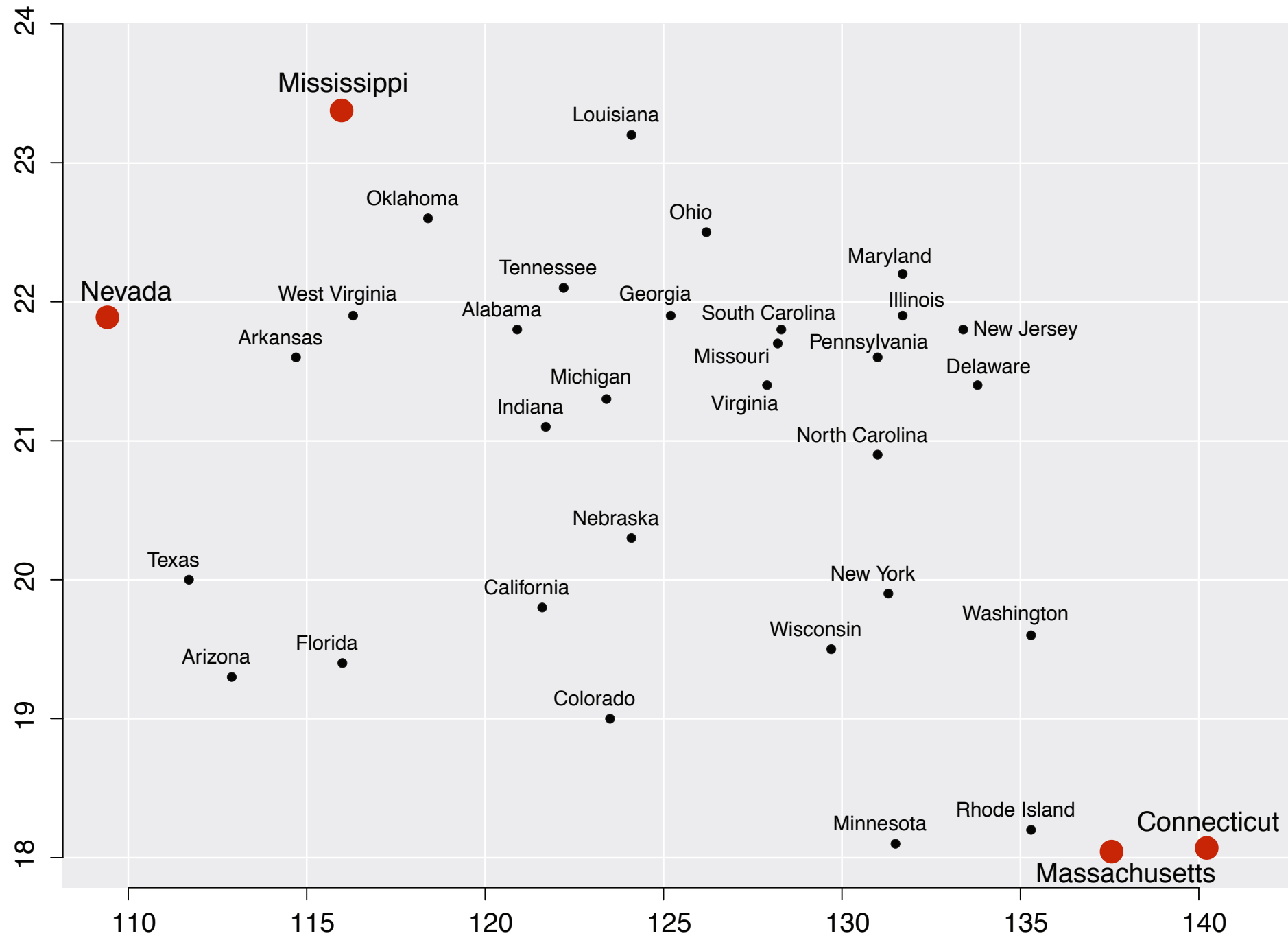


Source: National Cancer Institute

Breast cancer inc. 2011–2015

(Only 34 states shown)

**Breast cancer mortality
per 100K F. pop.
2012–2016**



Source: National Cancer Institute

**Breast cancer incidence
per 100K F. pop. 2011–2015**

(Only 34 states shown)

Thank You!

Pino Trogu

trogu@sfsu.edu

**Small Handbook of Information Design:
16 Principles for Better Data Visualizations**

**Booklet and online version
of small handbook:**

<https://res.trogu.com/dataviz/handbook/>

[go to first slide](#)