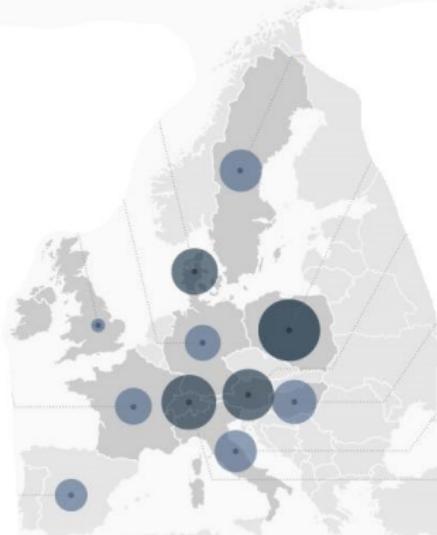


[- RULE #7 : USE AREAS -]

How to compare circles on maps?

L'extrême droite européenne en 2019

Résultats des partis d'extrême droite aux élections législatives (% des votants)



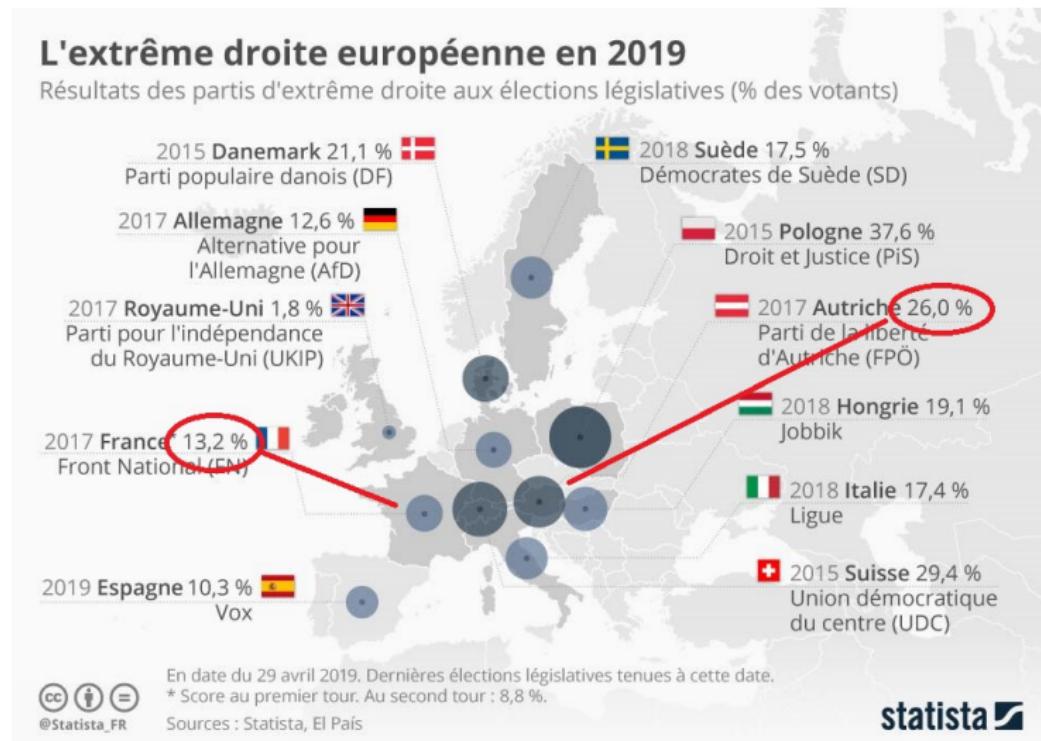
En date du 29 avril 2019. Dernières élections législatives tenues à cette date.

* Score au premier tour. Au second tour : 8,8 %.

Sources : Statista, El País

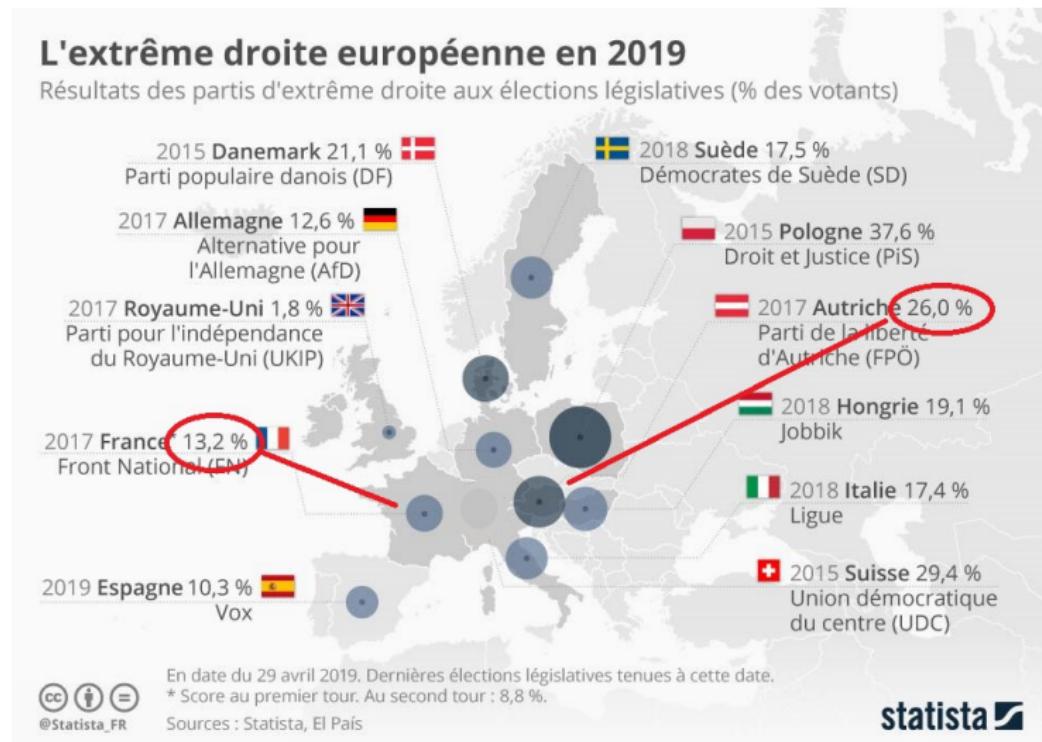
[- RULE #7 : USE AREAS -]

How to compare circles on maps?



[- RULE #7 : USE AREAS -]

How to compare circles on maps?



[- RULE #7 BIS : WORKS ALSO WITH SQUARES -]

If 100% of the US prisoners are represented by the big green square...what is the percentage for each group ?

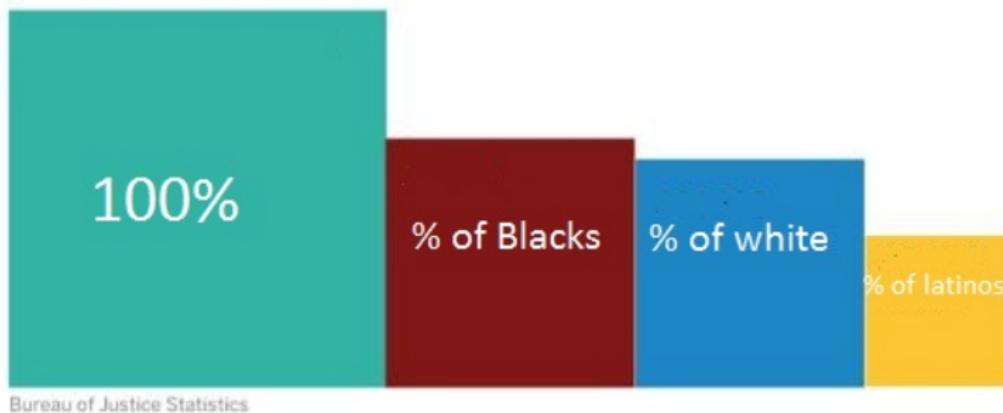


FIGURE – Ethic composition of prisoners in Jail in 2008 in the USA.
(*Le Monde* 5/12/2014)

[- RULE #7 BIS : WORKS ALSO WITH SQUARES -]

If 100% of the US prisoners are represented by the big green square...what is the percentage for each group ?

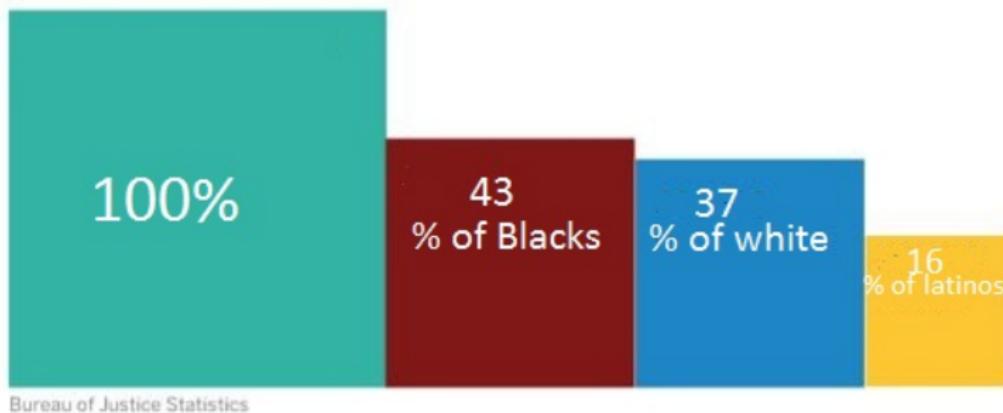
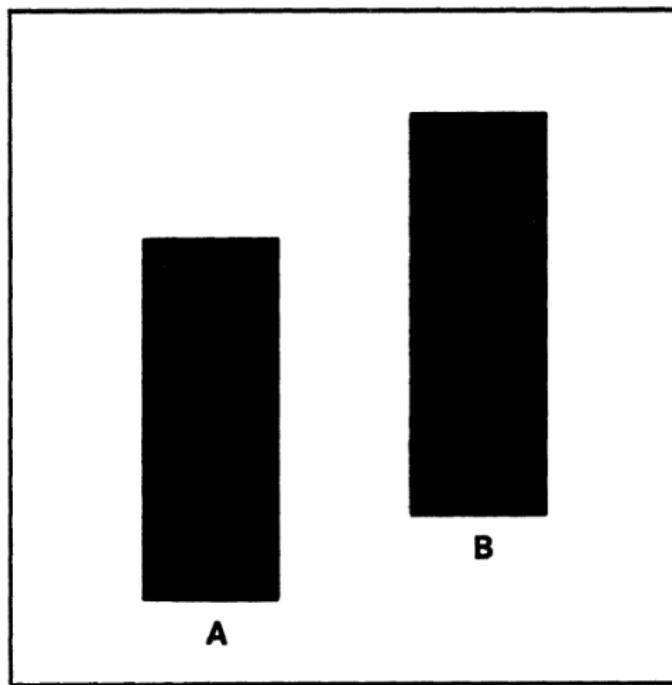


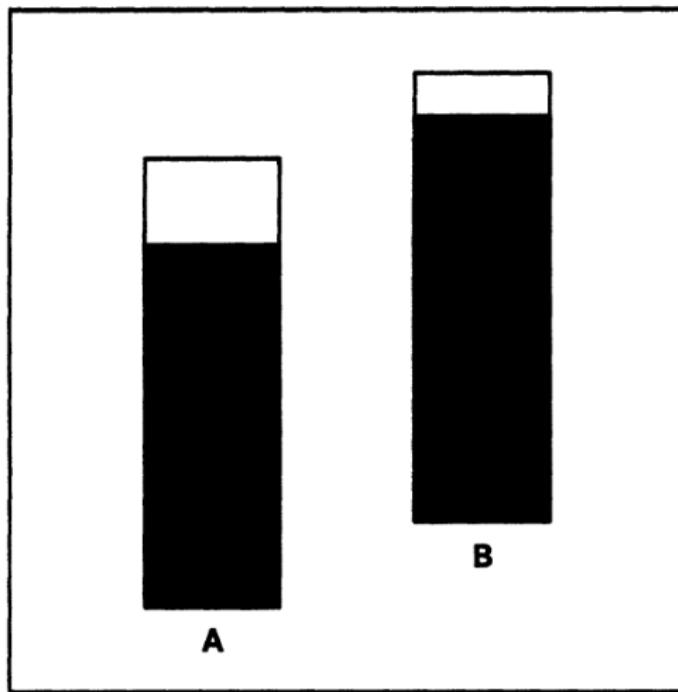
FIGURE – Ethic composition of prisoners in Jail in 2008 in the USA.
(*Le Monde* 5/12/2014)

[- RULE #8 : USE [UNALIGNED] BARS -]



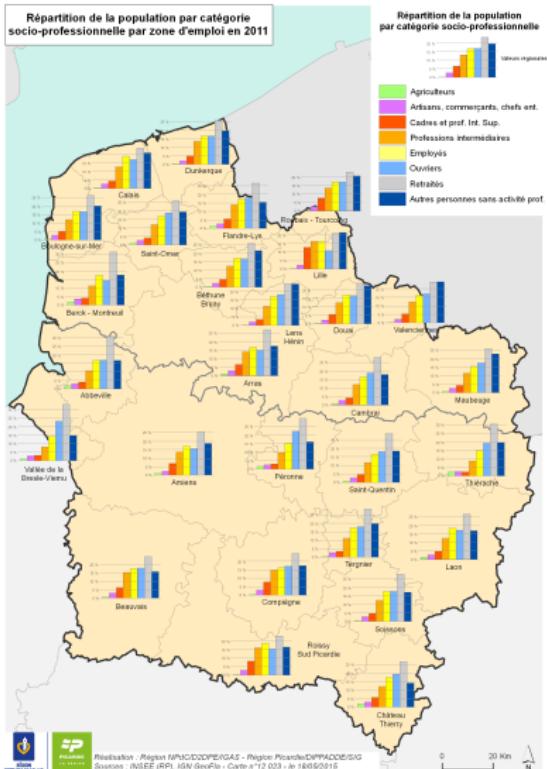
Source : Cleveland and McGill (1984)

[- RULE #8 : USE [UNALIGNED] BARS -]



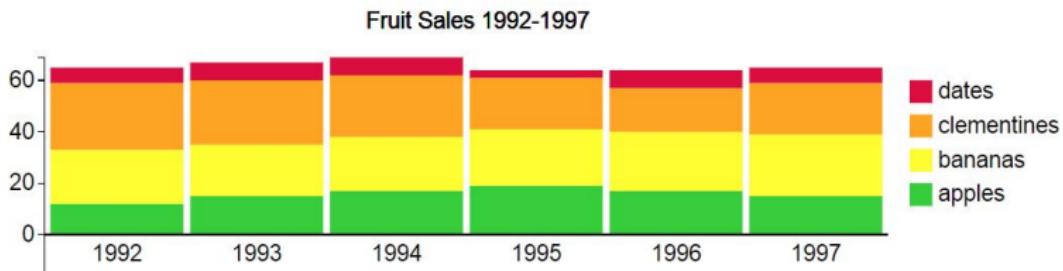
Source : Cleveland and McGill (1984)

[- RULE #8 : USE [UNALIGNED] BARS -]



Source : Cartothèque (haut de France)

[- RULE #8-BIS : USE STACKED BARCHARTS -]



[- SOLUTION #8-BIS : ALIGN THE BARS ! -]

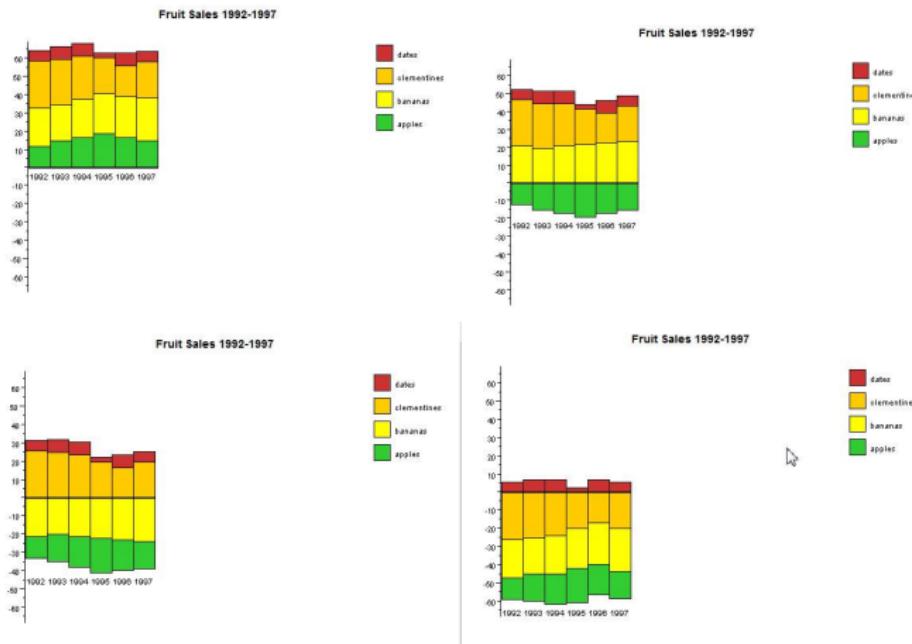
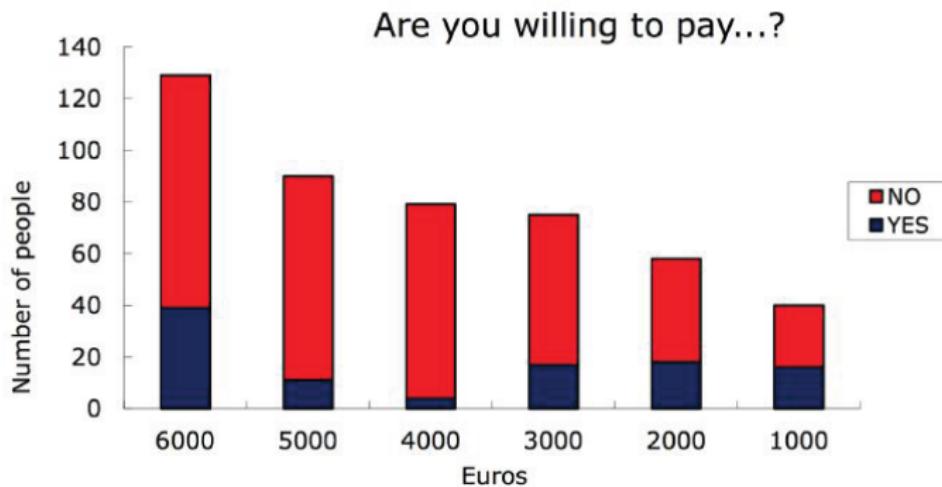


FIGURE – From Dix and Ellis (1998) example

See also the dynamic version

[- RULE #8-BIS : USE STACKED BARCHARTS -]

Kind of stupid example :



Source : The TSEconomics Journal (TSE)

[- RULE #9 : USE LINES (LOTS OF THEM !) -]

Observe this graphic carefully :

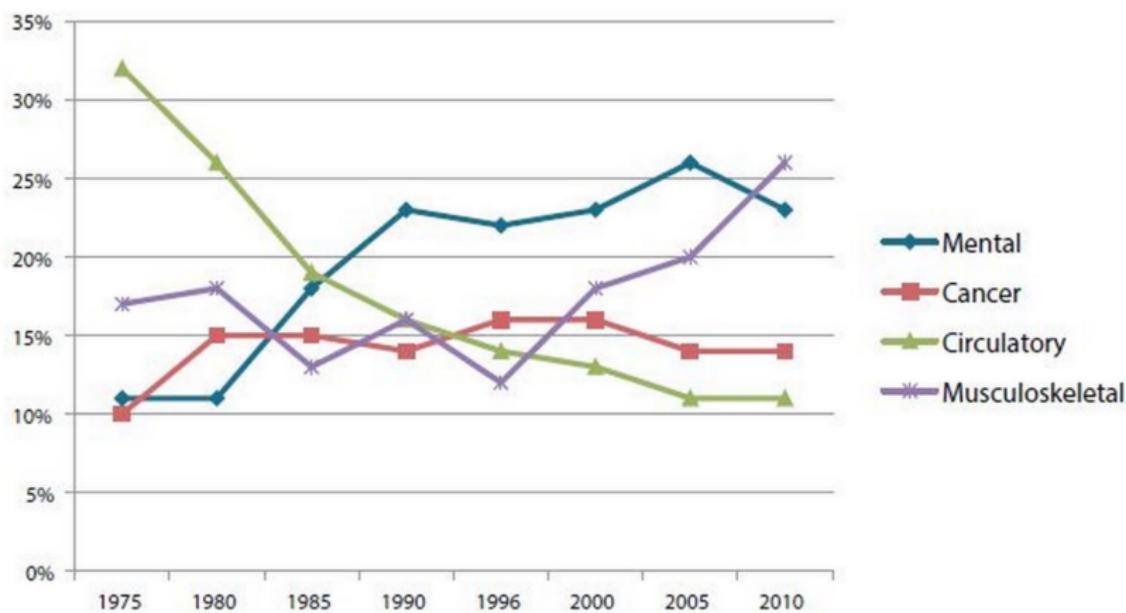


FIGURE – Major Cause of Worker Disability (1975-2010) (J. Schwabish, 2014).

LEGITIMATE QUESTIONS :

- ▶ in 2010, what is the major cause of disability ?

LEGITIMATE QUESTIONS :

- ▶ in 2010, what is the major cause of disability ?
- ▶ in 1975, what was the major cause of disability ?

LEGITIMATE QUESTIONS :

- ▶ in 2010, what is the major cause of disability ?
- ▶ in 1975, what was the major cause of disability ?
- ▶ In the recent years, which causes have increased/decreased the most ?

LEGITIMATE QUESTIONS :

- ▶ in 2010, what is the major cause of disability?
 - ▶ in 1975, what was the major cause of disability?
 - ▶ In the recent years, which causes have increased/decreased the most?
 - ▶ ...

LEGITIMATE QUESTIONS :

- ▶ in 2010, what is the major cause of disability?
 - ▶ in 1975, what was the major cause of disability?
 - ▶ In the recent years, which causes have increased/decreased the most?
 - ▶ ...
 - ▶ You do not remember a damn thing of this graph!

[- SOLUTION #9 : USE *small multiples* -]

**Initial DI Worker Awards by Major Cause of Disability—
Calendar Years 1975–2010
(Percent)**

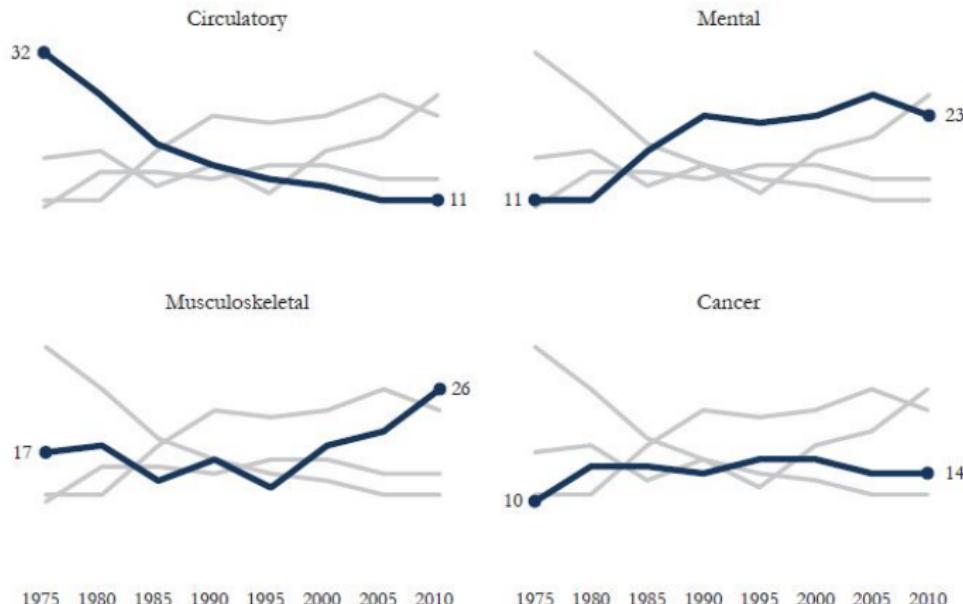
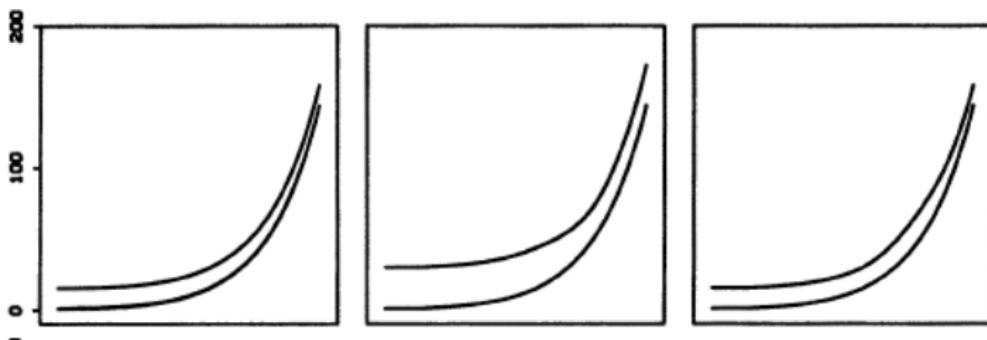


FIGURE – Major Cause of Disability - 1975-2010 (J. Schwabish, 2014).

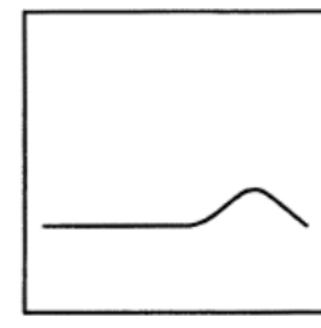
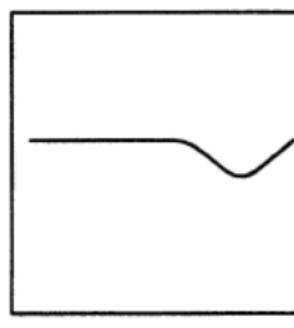
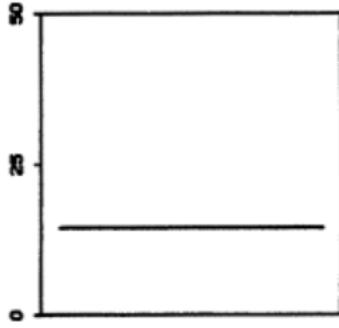
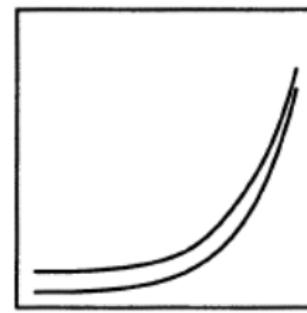
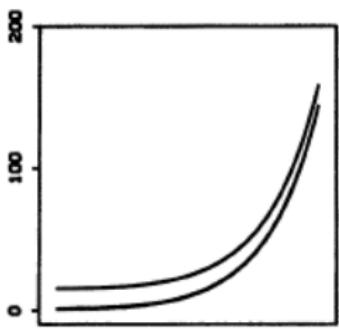
[- RULE #9BIS : USE LINES (COMPARE) -]

For each graph, compute the difference between the 2 lines.



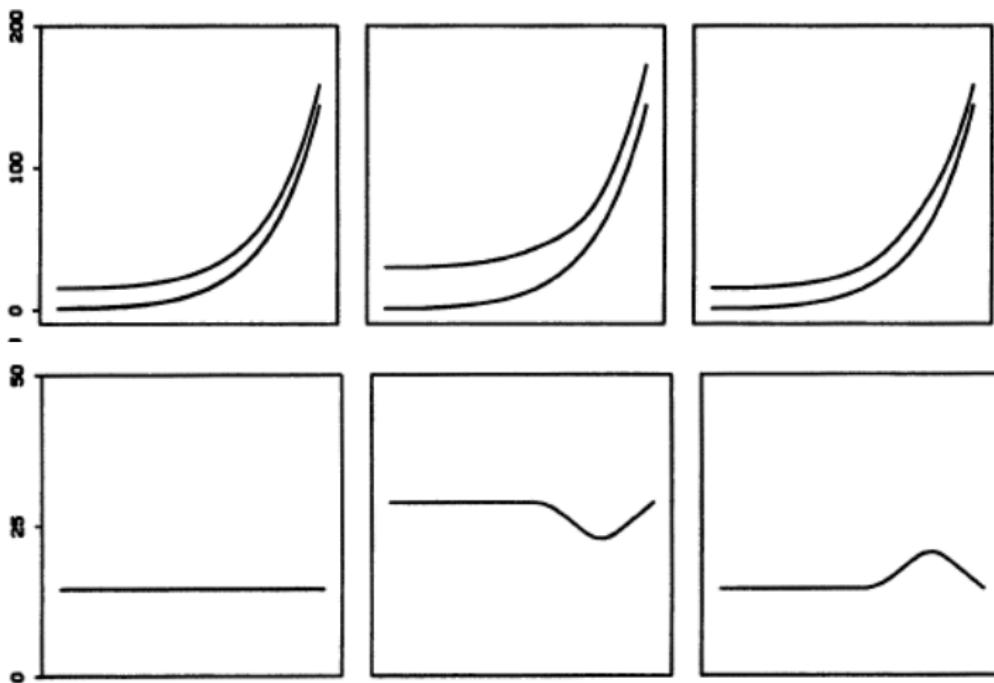
[- RULE #9BIS : USE LINES (COMPARE) -]

For each graph, compute the difference between the 2 lines.



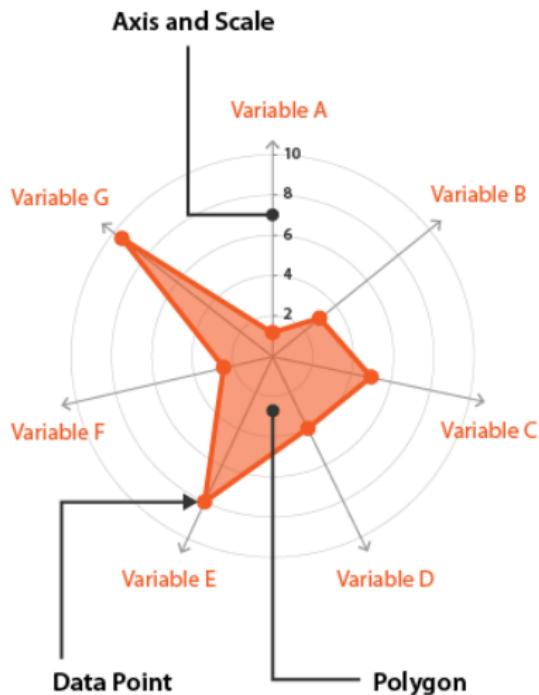
[- RULE #9BIS : USE LINES (COMPARE) -]

For each graph, compute the difference between the 2 lines.

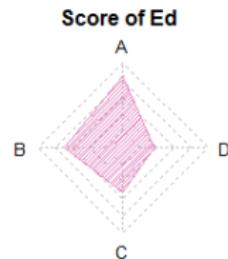
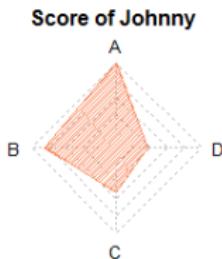
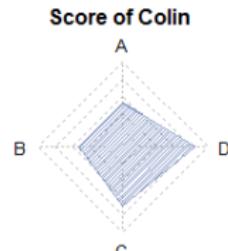
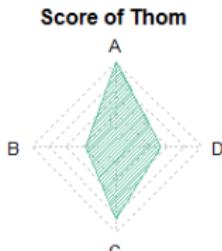


From Cleveland and McGill (1984)

[- RULE #10 : USE RADAR PLOTS (OR WEB PLOTS) -]

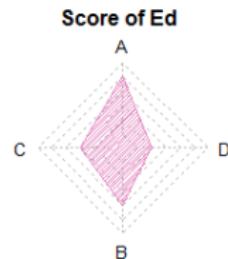
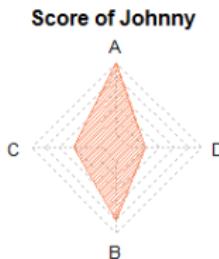
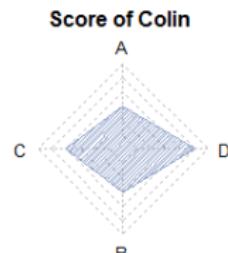
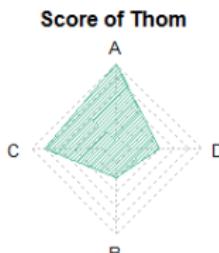


[- RULE #10 : USE RADAR PLOTS -]



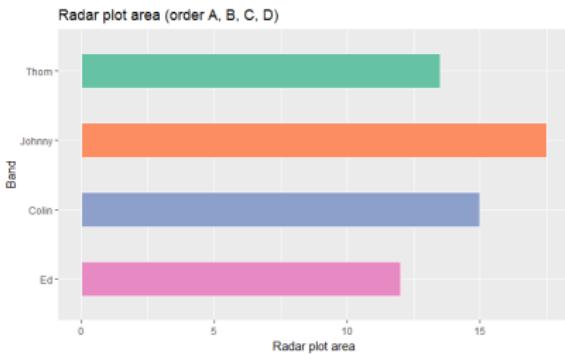
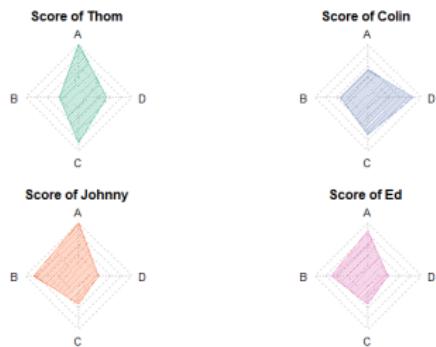
Source : Xtophe's blog: Why you should never use radar plots

[- RULE #10 : USE RADAR PLOTS -]



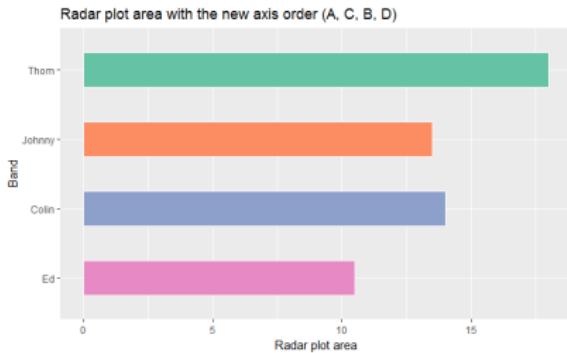
Source : Xtophe's blog: Why you should never use radar plots

[- RULE #10 : USE RADAR PLOTS -]



Source : Xtophe's blog: Why you should never use radar plots

[- RULE #10 : USE RADAR PLOTS -]



Source : Xtophe's blog: Why you should never use radar plots

[- SUPER RULE #1 : USE MAPS -]

Which are the biggest “countries” in the world (in surface)?





[- SUPER RULE #1 : USE MAPS -]

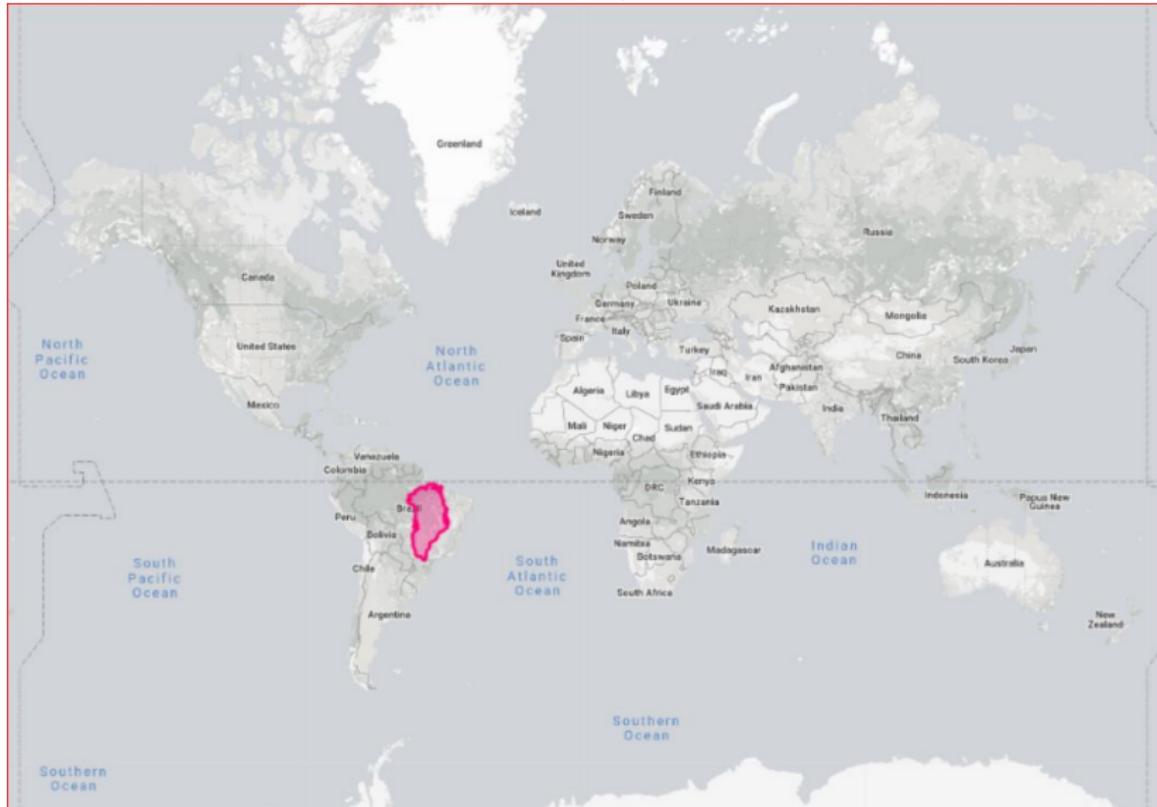
Is Greenland bigger than Brazil?





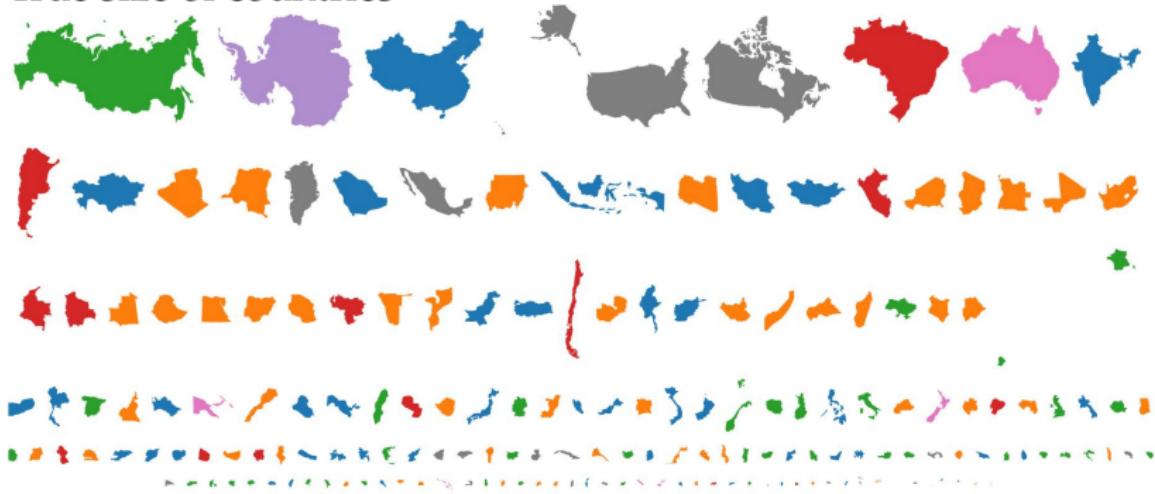
[- SUPER RULE #1 : USE MAPS -]

Solution : Greenland $\simeq 2.1 \text{ M km}^2$, Brazil $\simeq 8.5 \text{ M km}^2$!

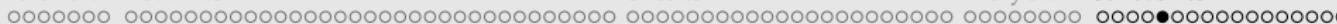


[- SUPER RULE #1 : USE MAPS -]

True size of countries

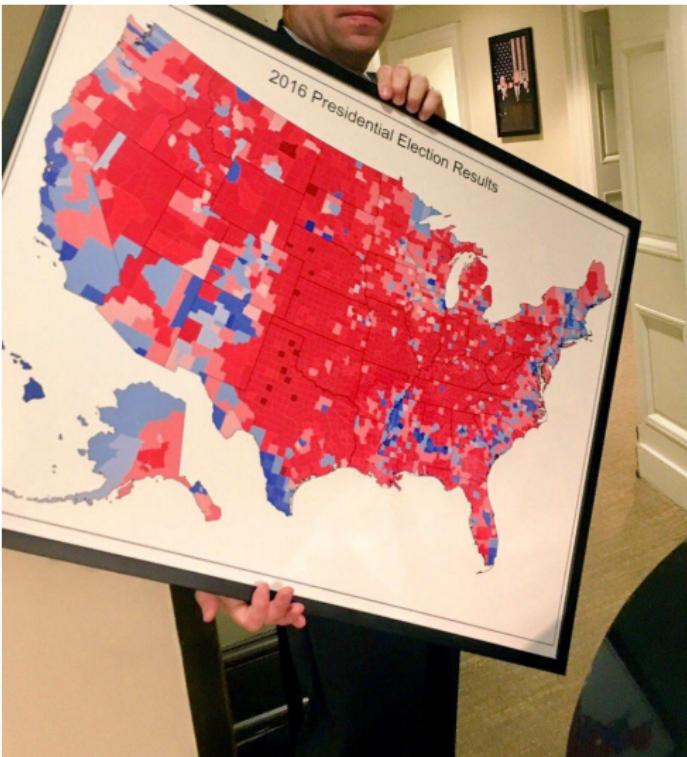


Source: <http://metrocosm.com/mercator/>, see also
<https://thetruesize.com/>



[- SUPER RULE #2 : USE ELECTORAL MAPS -]

Élections présidentielles aux USA en 2016 (par "counties")



[- SUPER RULE #2 : USE ELECTORAL MAPS -]

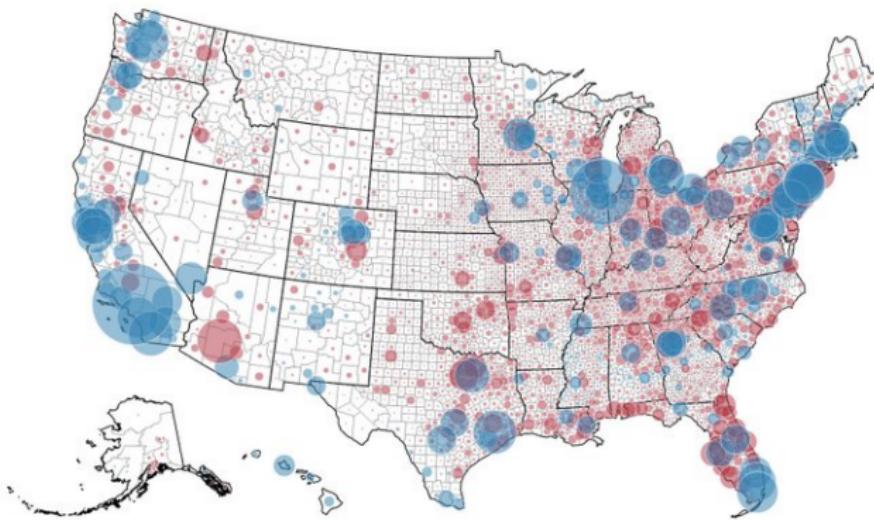
2016 US Election "map" (per *counties*)



Source : Lara Trump on Twitter (01/10/2019)

[- SUPER RULE #2 : USE ELECTORAL MAPS -]

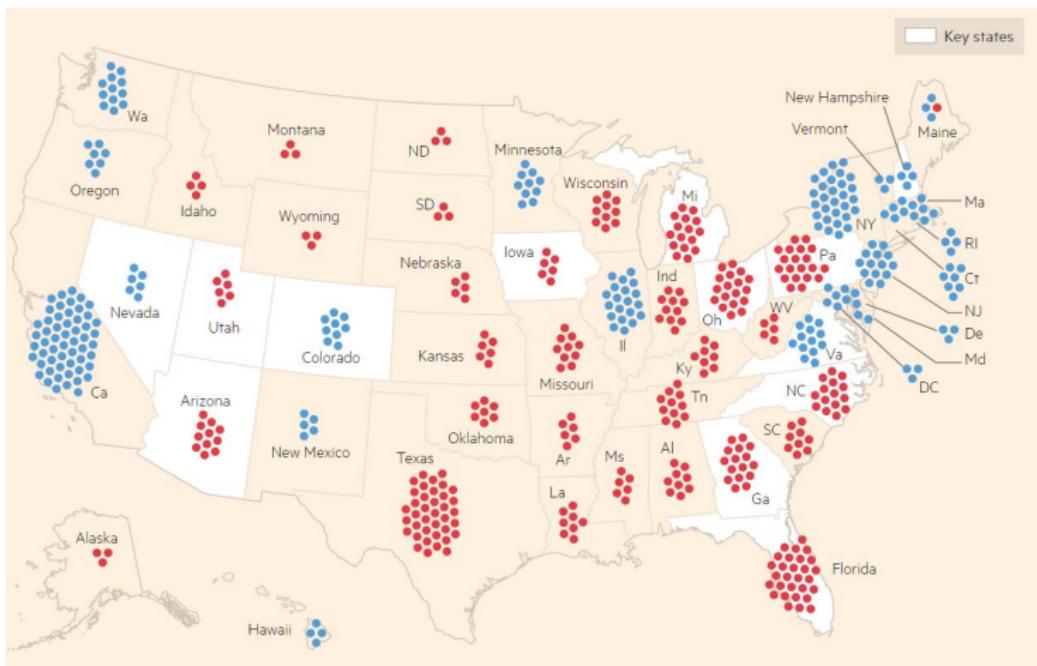
2016 US Election "map" (per *nb of votes*)



Source : @MInesCR (Twitter)

[- SUPER RULE #2 : USE ELECTORAL MAPS -]

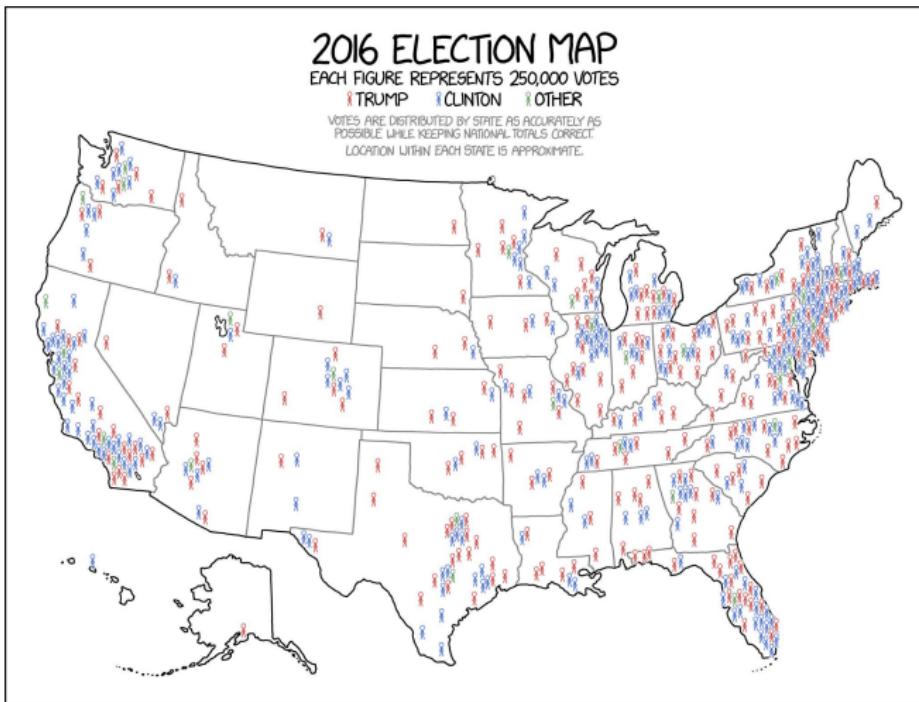
2016 US Election "map" (per *Nb of representatives*)



Source : *Financial Times*

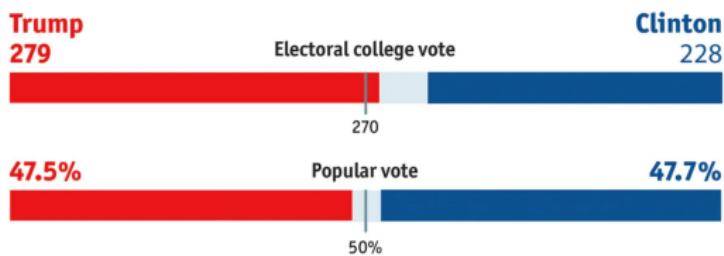
[- SUPER RULE #2 : USE ELECTORAL MAPS -]

2016 US Election "map" (nb of votes)

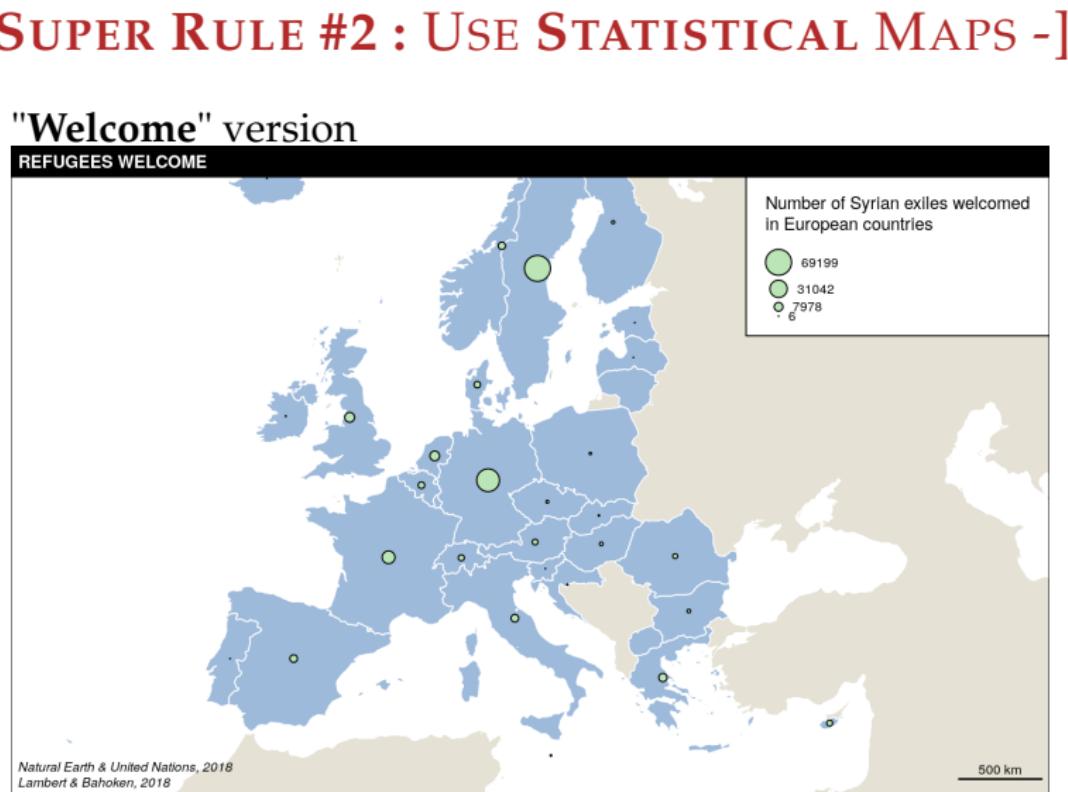


[- SUPER RULE #2 : USE ELECTORAL MAPS -]

2016 US Election : *raw numbers*



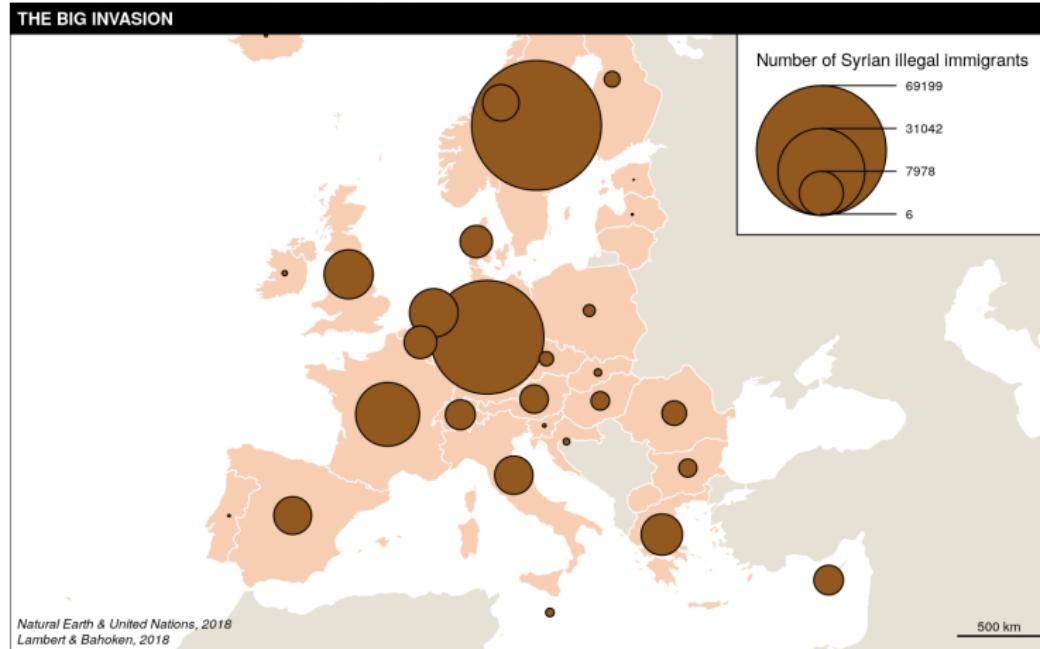
Source : Wikipedia



Source : Françoise BAHOKEN & Nicolas LAMBERT

[- SUPER RULE #2 : USE STATISTICAL MAPS -]

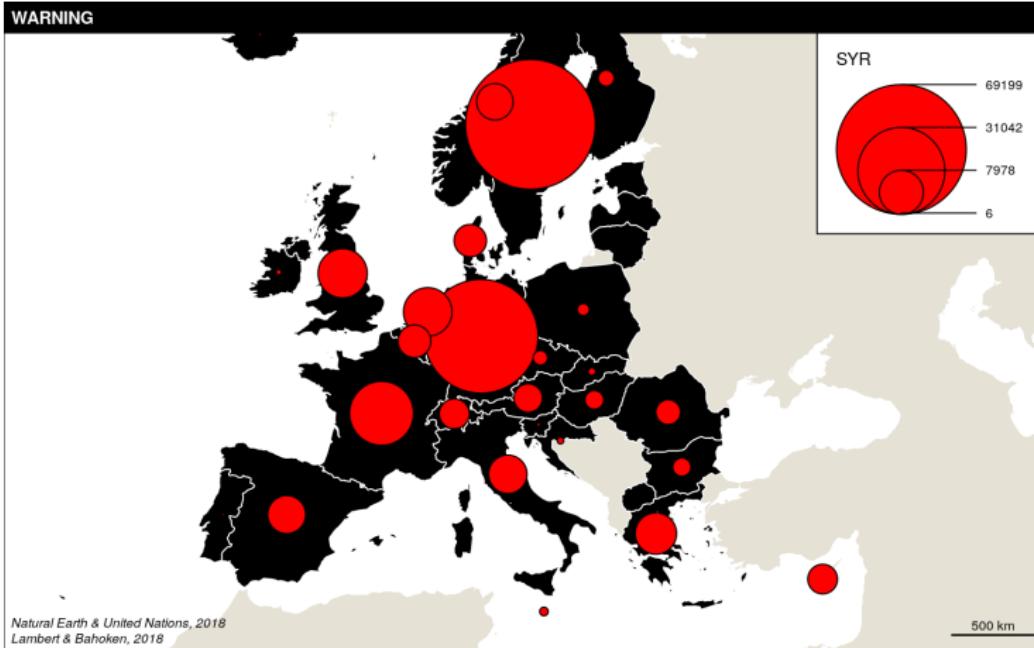
"Less welcome" version



Source : Françoise BAHOKEN & Nicolas LAMBERT

[- SUPER RULE #2 : USE STATISTICAL MAPS -]

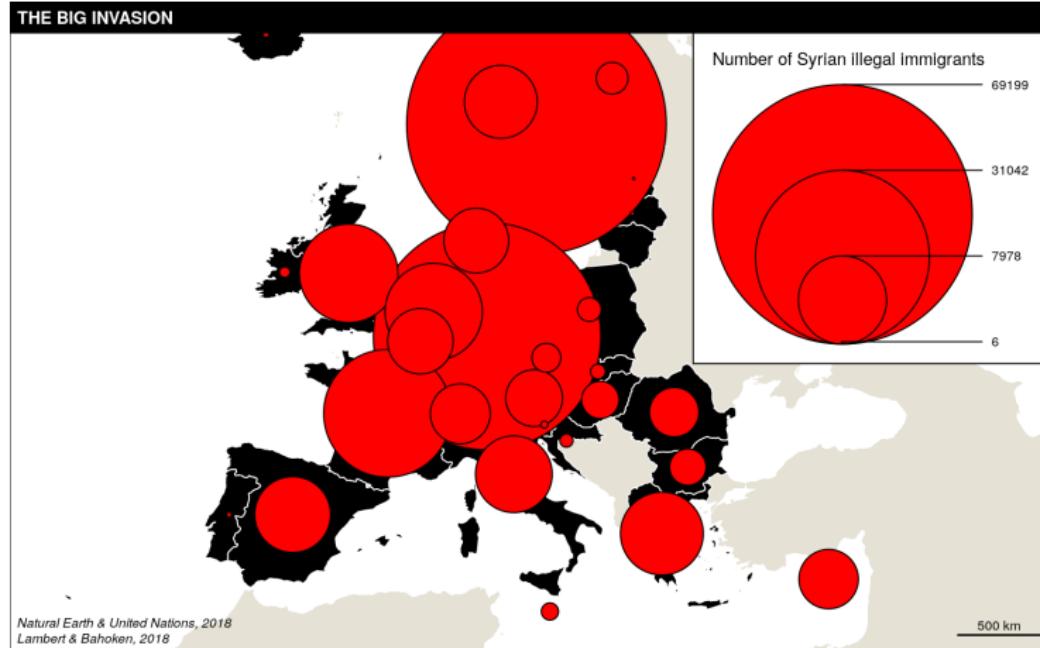
"Not welcome" version



Source : Françoise BAHOKEN & Nicolas LAMBERT

[- SUPER RULE #2 : USE STATISTICAL MAPS -]

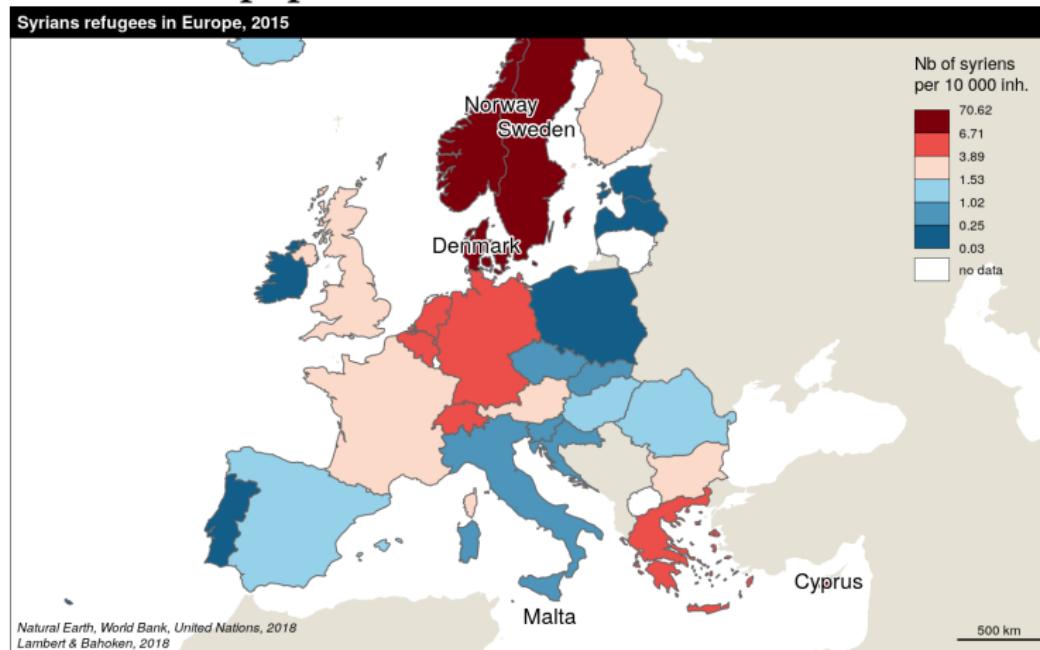
"Invasion" version



Source : Françoise BAHOKEN & Nicolas LAMBERT

[- SUPER RULE #2 : USE STATISTICAL MAPS -]

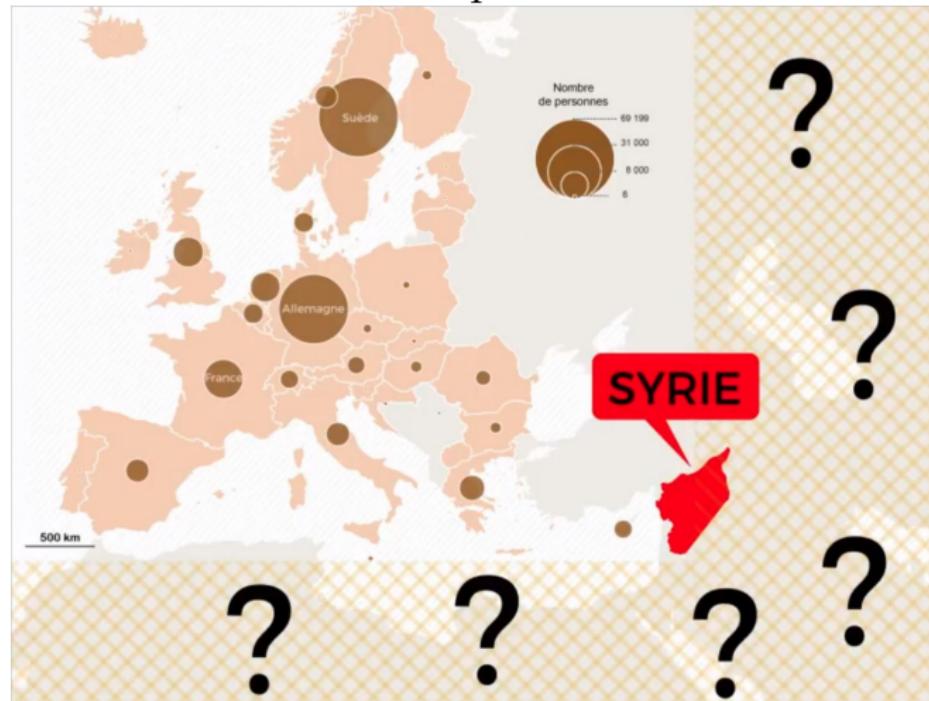
"Relative to population" version



Source : Françoise BAHOKEN & Nicolas LAMBERT

[- SUPER RULE #2 : USE STATISTICAL MAPS -]

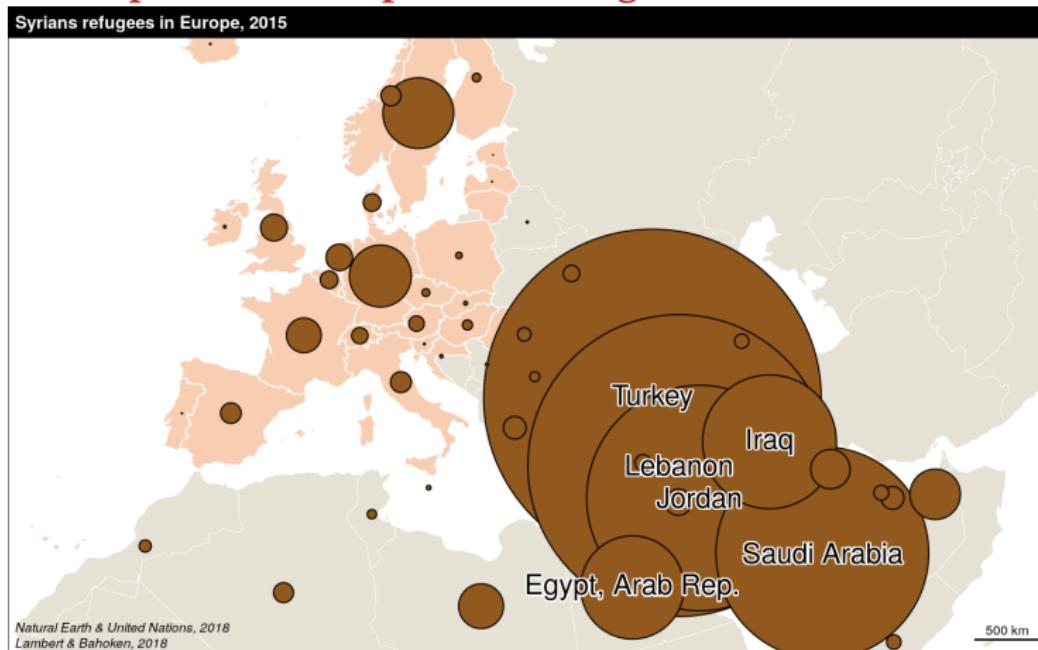
"All of this is a lie!" The picture is zoomed!



Source : Françoise BAHOKEN & Nicolas LAMBERT

[- SUPER RULE #2 : USE STATISTICAL MAPS -]

Be suspicious of maps, not of migrants!

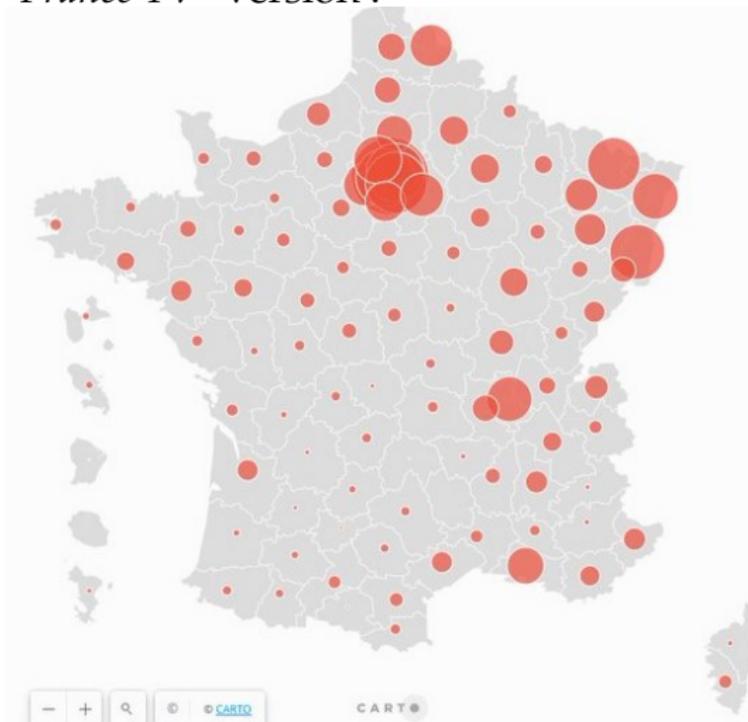


Source : Françoise BAHOKEN & Nicolas LAMBERT

[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

Covid-19- Visualizing death count (April 22)

"France TV" version :

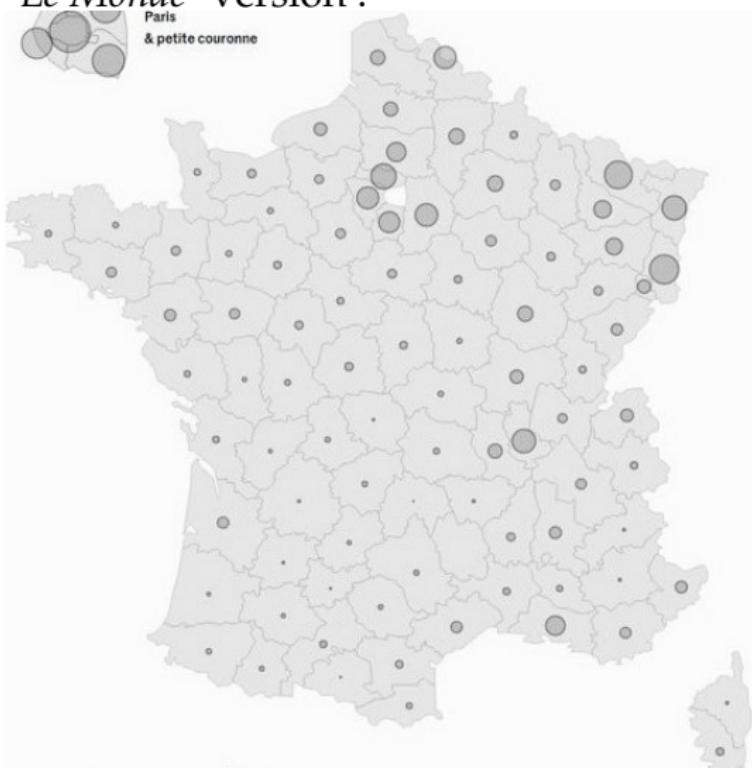


Source : France TV

[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

Covid-19- Visualizing death count (April 22)

"Le Monde" version :



[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

Covid-19- Visualizing death count (April 22)
Comparing with same scale for circles

Carte du Monde



Carte du Monde - bis

Augmentation proportionnelle de la taille des bulles
20%



Carte FTV

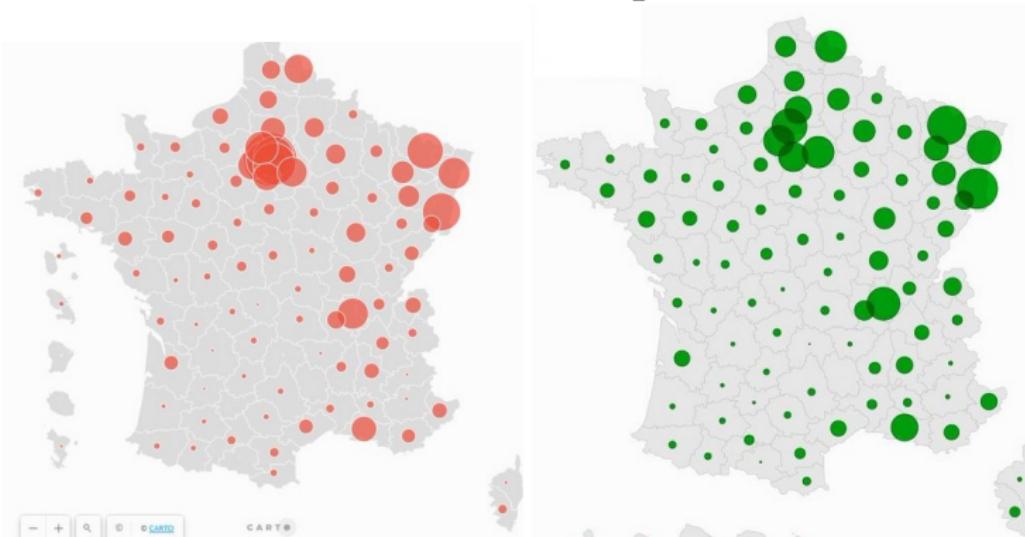
Nombre de décès à l'hôpital par département



Source : Santé publique France - Dernière mise à jour le 21 avril 2020

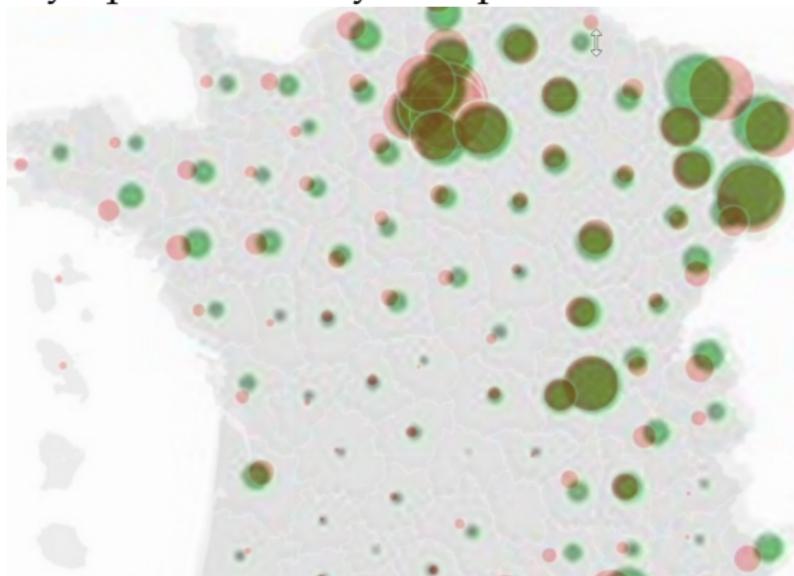
[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

Covid-19- Visualizing death count (April 22)
"France TV" vs *"Le Monde"* scaled up



[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

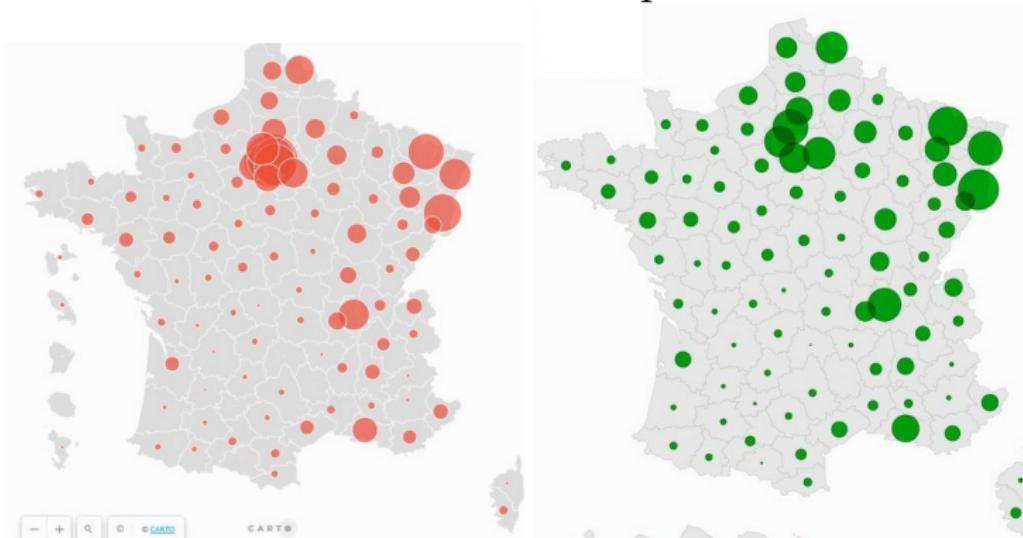
Covid-19- Visualizing death count (April 22)
My "quick and dirty" comparison



Source : Xtophe Bontemps (twitter)

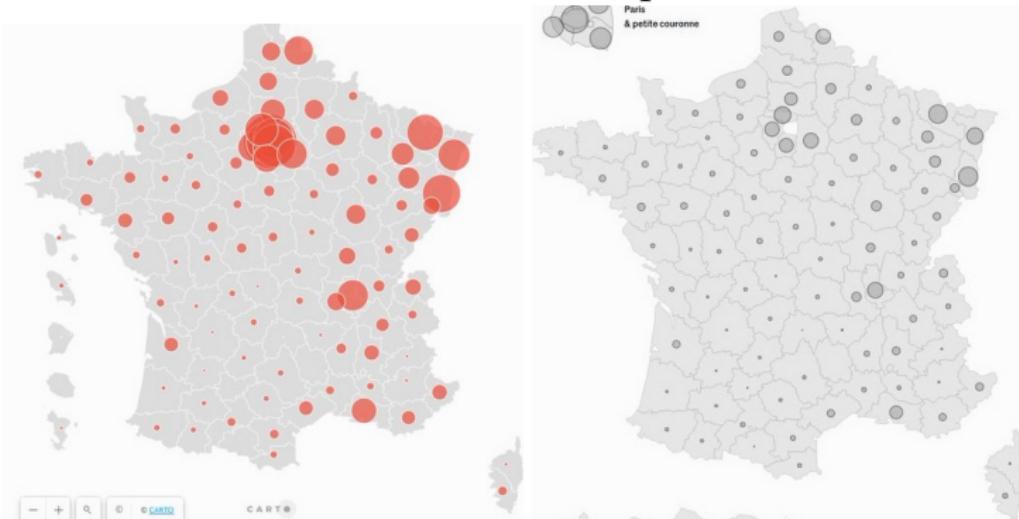
[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

Covid-19- Visualizing death count (April 22)
"France TV" vs "Le Monde scaled up"



[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

Covid-19- Visualizing death count (April 22) "France TV" vs "Le Monde scaled up"



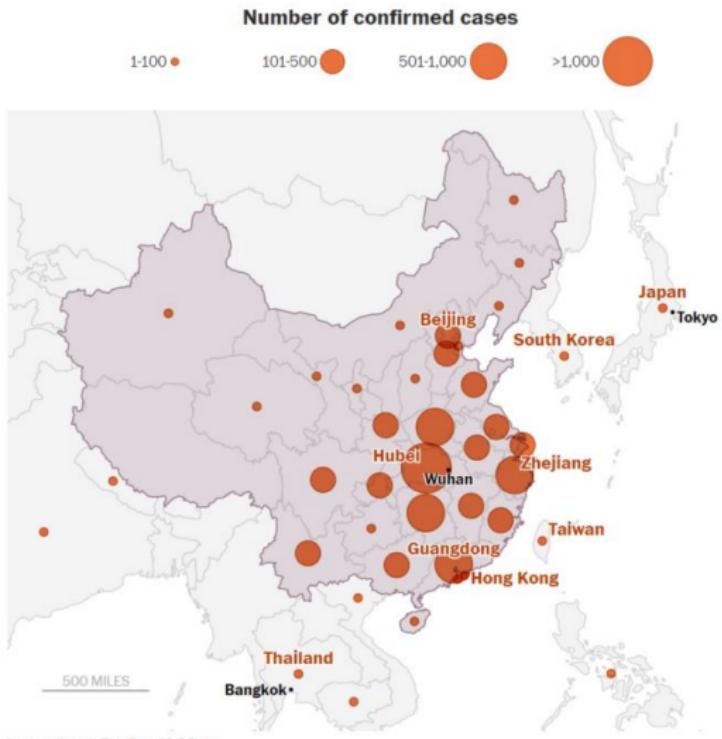
[- APPLYING SUPER RULE #2 : CORONAVIRUS -]



Source : John Hopkins CSSE

From Sylvain Genevois' blog

[- APPLYING SUPER RULE #2 : CORONAVIRUS -]



Source : Washington Post

From Sylvain Genevois' blog

[- APPLYING SUPER RULE #2 : CORONAVIRUS -]



Source : New York Times

From Sylvain Genevois' blog

[- APPLYING SUPER RULE #2 : CORONAVIRUS -]

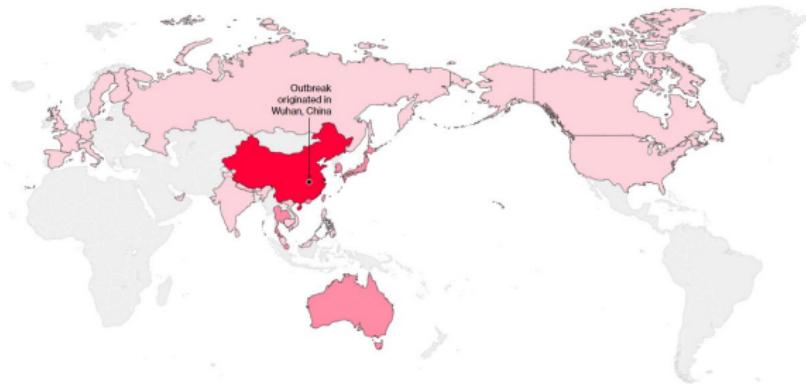
14,553 305

Confirmed cases worldwide

Deaths worldwide

Jurisdictions with cases confirmed as of February 2, 2020, 12:10 PM GMT+8

■ 1-9 ■ 10-99 ■ 100-999 ■ 1,000 or more



Source : Bloomberg From Sylvain Genevois' blog

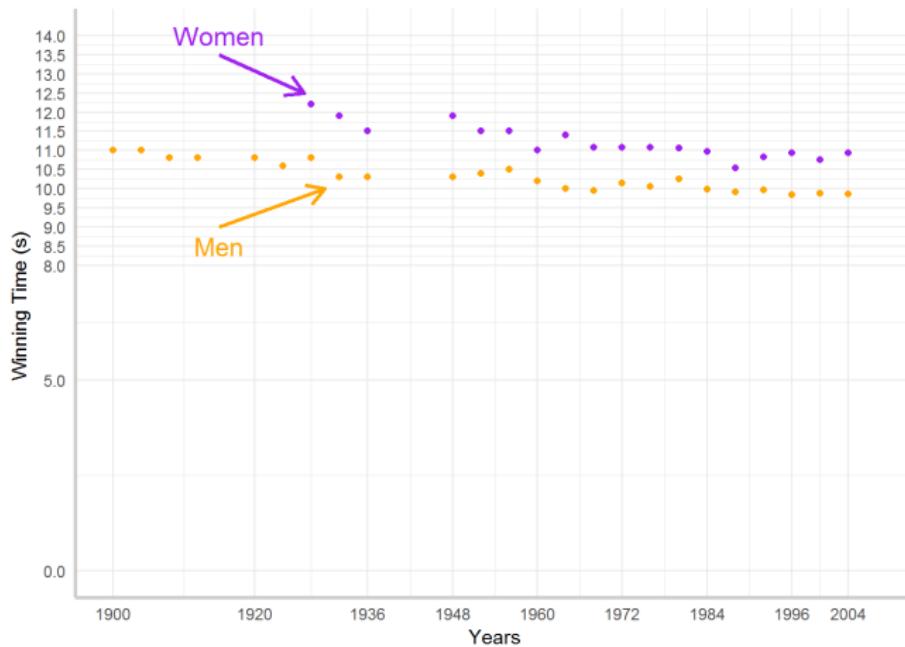
[- APPLYING SUPER RULE #2 : CORONAVIRUS -]



Source : Lies Breaker From Sylvain Genevois' blog

[- SUPER RULE #3 : EXTRAPOLATE -]

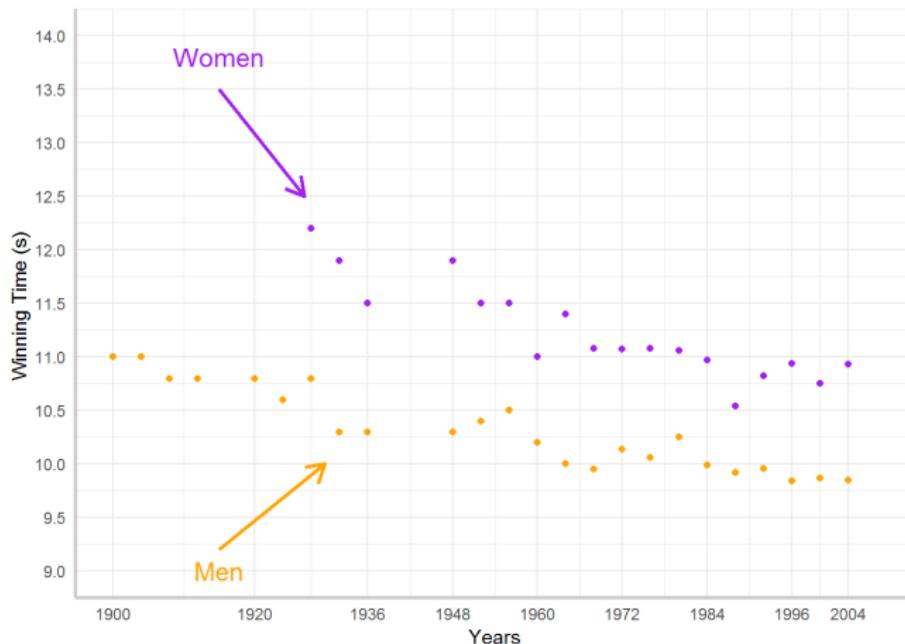
An example : The gender gap in 100-meters Olympics



Adapted from : Calling Bullshit

[- SUPER RULE #3 : EXTRAPOLATE -]

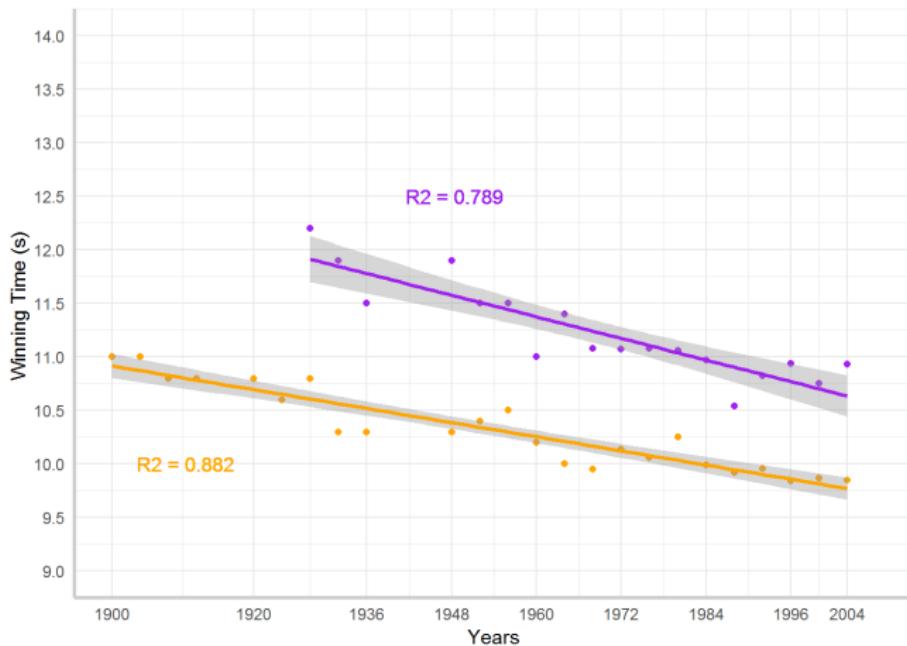
Let us reduce the y-axis scale



Adapted from : Calling Bullshit

[- SUPER RULE #3 : EXTRAPOLATE -]

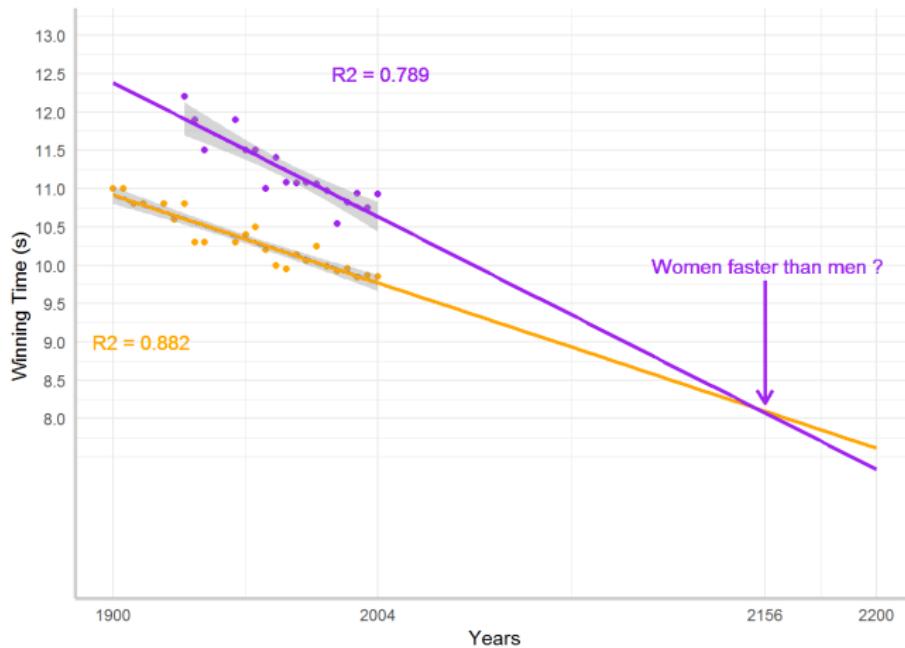
Now, let us draw a regression line



Adapted from : Calling Bullshit

[- SUPER RULE #3 : EXTRAPOLATE -]

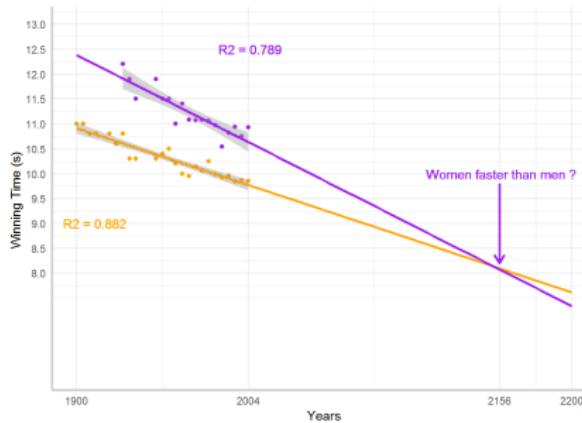
Extrapolate : Women will run faster in 2156!



Adapted from : Calling Bullshit

[- SUPER RULE #3 : EXTRAPOLATE -]

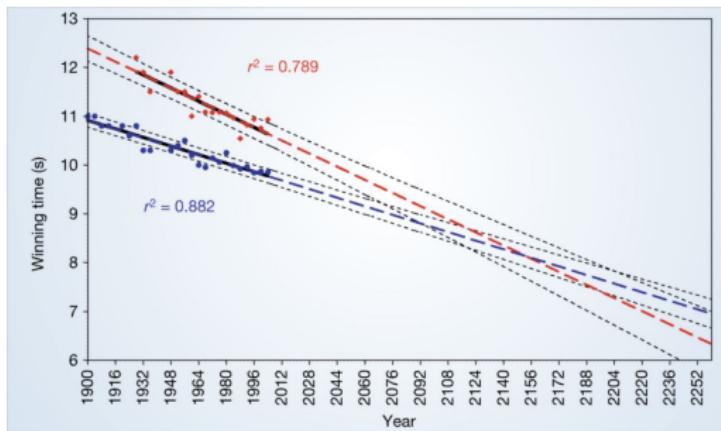
No journal will publish this !



Published as "*Momentous sprint at the 2156 Olympics?*", A. Tatem, C. Guerra, P. Atkinson & S. Hay, Nature (2004) 431,525

[- SUPER RULE #3 : EXTRAPOLATE -]

No journal will publish this!



Published as "Momentous sprint at the 2156 Olympics?", A. Tatem, C. Guerra, P. Atkinson & S. Hay, Nature (2004) 431,525

[- SUPER RULE #3 : EXTRAPOLATE -]

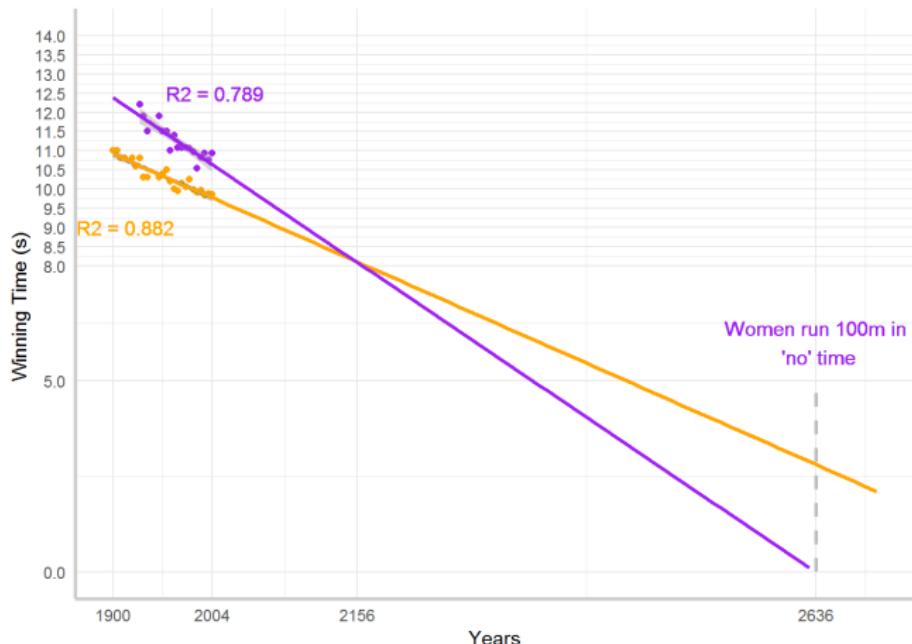
No journal will publish this!

The screenshot shows a journal article from the magazine 'nature'. The header features the word 'nature' in large white letters, with 'International journal of science' written below it. A 'MENU' button is located in the top-left corner of the header area. The main content area displays the following information:
Brief Communication | Published: 29 September 2004
Athletics
Momentous sprint at the 2156 Olympics?
Andrew J. Tatem ✉, Carlos A. Guerra, Peter M. Atkinson & Simon I. Hay
Nature 431, 525 (30 September 2004) | Download Citation ↴

Published as "*Momentous sprint at the 2156 Olympics?*", A. Tatem, C. Guerra, P. Atkinson & S. Hay, Nature (2004) 431,525

[- SUPER RULE #3 : JUST FOR FUN -]

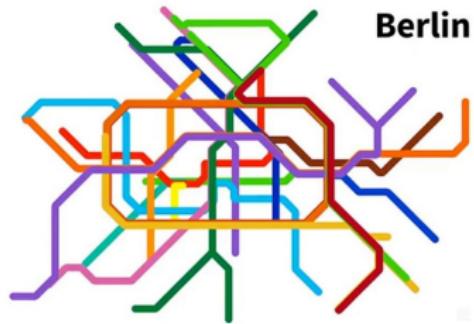
Reductio ad absurdum : Move forward : Year 2636!



Adapted from : Calling Bullshit

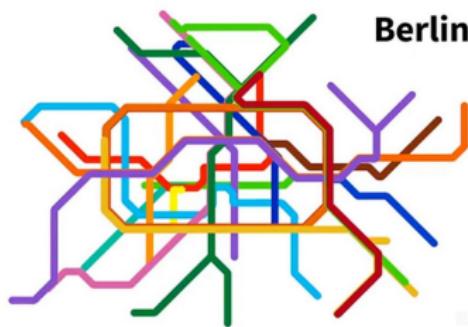
[- LYING FOR A GOOD REASON -]

There are many visualisation that transform the data for clarity : **Subway maps** for example

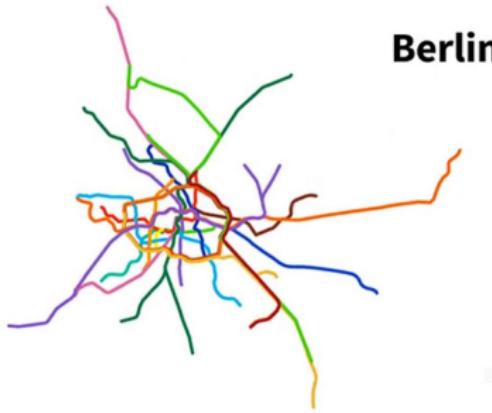


[- LYING FOR A GOOD REASON -]

There are many visualisation that transform the data for clarity : **Subway maps** for example



Berlin



Berlin

[- LYING FOR A GOOD REASON -]

Subway maps that match the physical reality are quite rare



Source Benjamin Schmidt

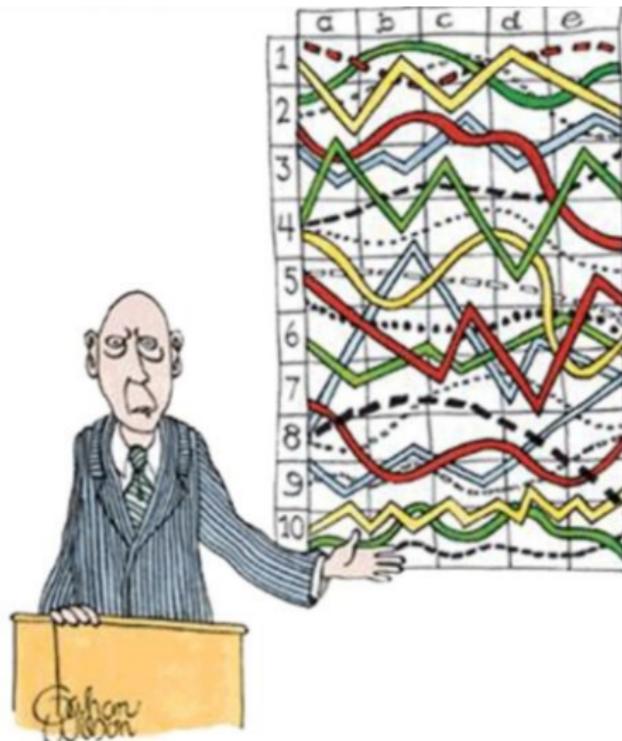
[- LYING FOR A GOOD REASON -]

Ski resort maps



Source Pierre Novat

[- BREAK -]



**"I'll pause
for a moment
so you can let
this information
sink in."**

[- COMFORTING LIES... -]



@Xtophe_Bontemps

<http://data.visualization.free.fr>

REFERENCES I



- Allen, E. A. and Erhardt, E. B. (2016). Visualizing Scientific Data. In Cacioppo, J. T., Tassinary, L. G., and Berntson, G. G., editors, *Handbook of Psychophysiology*, pages 679–697. Cambridge University Press, 4 edition.

REFERENCES II

- Buja, A., Cook, D., Hofmann, H., Lawrence, M., Lee, E.-K., Swayne, D. F., and Wickham, H. (2009). Statistical inference for exploratory data analysis and model diagnostics. *Philosophical Transactions of the Royal Society of London A : Mathematical, Physical and Engineering Sciences*, 367(1906) :4361–4383.
- Cairo, A. (2019). *How Charts Lie : Getting Smarter about Visual Information*. W. W. Norton.
- Cleveland, W. S., Diaconis, P., and McGill, R. (1982). Variables on scatterplots look more highly correlated when the scales are increased. *Science*, 216(4550) :1138–1141.
- Cleveland, W. S. and McGill, R. (1984). Graphical perception : Theory, experimentation, and application to the development of graphical methods. *Journal of the American Statistical Association*, 79(387) :531–554.
- Correll, M., Bertini, E., and Franconeri, S. (2019). Truncating the y-axis : Threat or menace ? *arXiv preprint arXiv :1907.02035*.
- Dix, A. and Ellis, G. (1998). Starting simple - adding value to static visualisation through simple interaction. In Eds. T. Catarci, M. F. Costabile, G. S. and Tarantino, L., editors, *Proceedings of Advanced Visual Interfaces*, pages 124–134. L’Aquila, Italy, ACM Press.

REFERENCES III

- Healy, K. (2019). *Data Visualization : A Practical Introduction*. Princeton University Press, Princeton.
- Huff, D. (1993). *How to Lie with Statistics*. W. W. Norton & Company.
- Isenberg, P., Bezerianos, A., Dragicevic, P., and Fekete, J.-D. (2011). A Study on Dual-Scale Data Charts. *IEEE Transactions on Visualization and Computer Graphics*, 17(12) :2469–2478.
- Kelleher, C. and Wagener, T. (2011). Ten guidelines for effective data visualization in scientific publications. *Environmental Modelling & Software*, 26(6) :822–827.
- Mateos-Planas, X. (2010). Demographics and the politics of capital taxation in a life-cycle economy. *American Economic Review*, 100(1) :337–63.
- Richland, L. E. and Burchinal, M. R. (2013). Early executive function predicts reasoning development. *Psychological Science*, 24(1) :87–92.
- Tufte, E. R. (2001). *The Visual Display of Quantitative Information*. Graphics Press, 2 edition.
- Vigen, T. (2015). *Spurious Correlations*. Hachette Books.

KEEP IN TOUCH!

Christophe

<http://data.visualisation.free.fr>

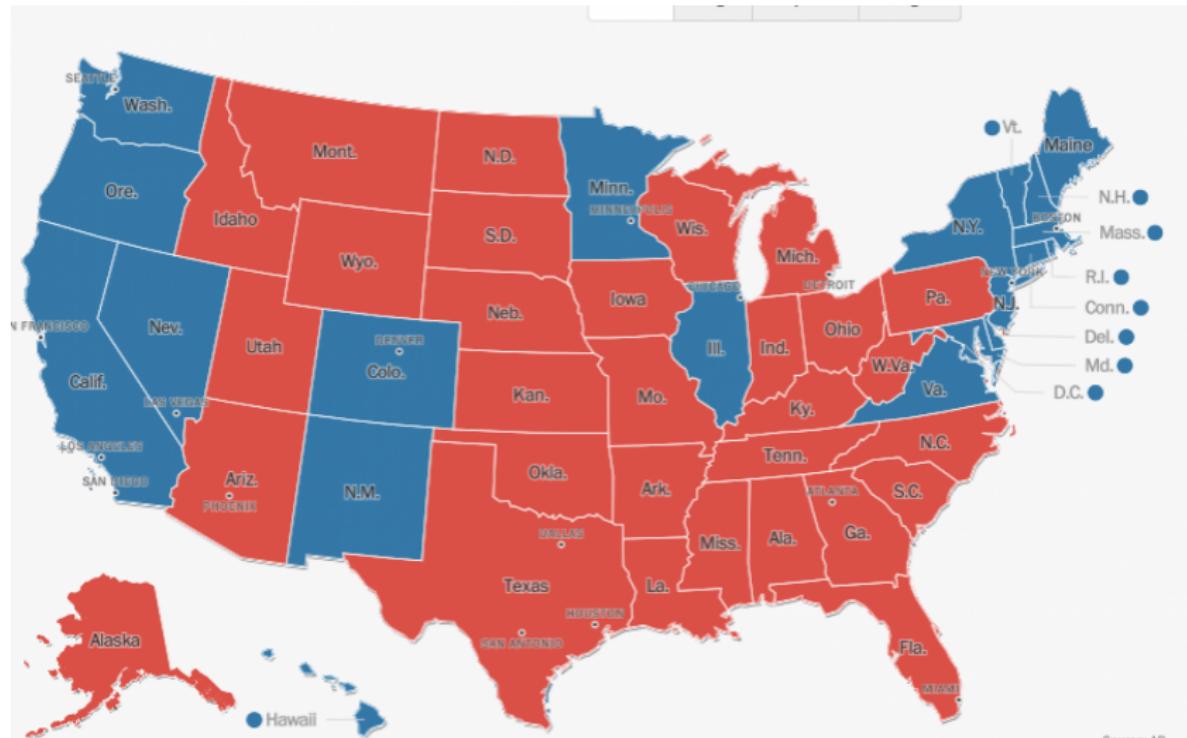


@Xtophe_Bontemps



[- SUPER RULE #3 : USE ELECTORAL MAPS -]

USA election : 2016 results as a map : Washington Post

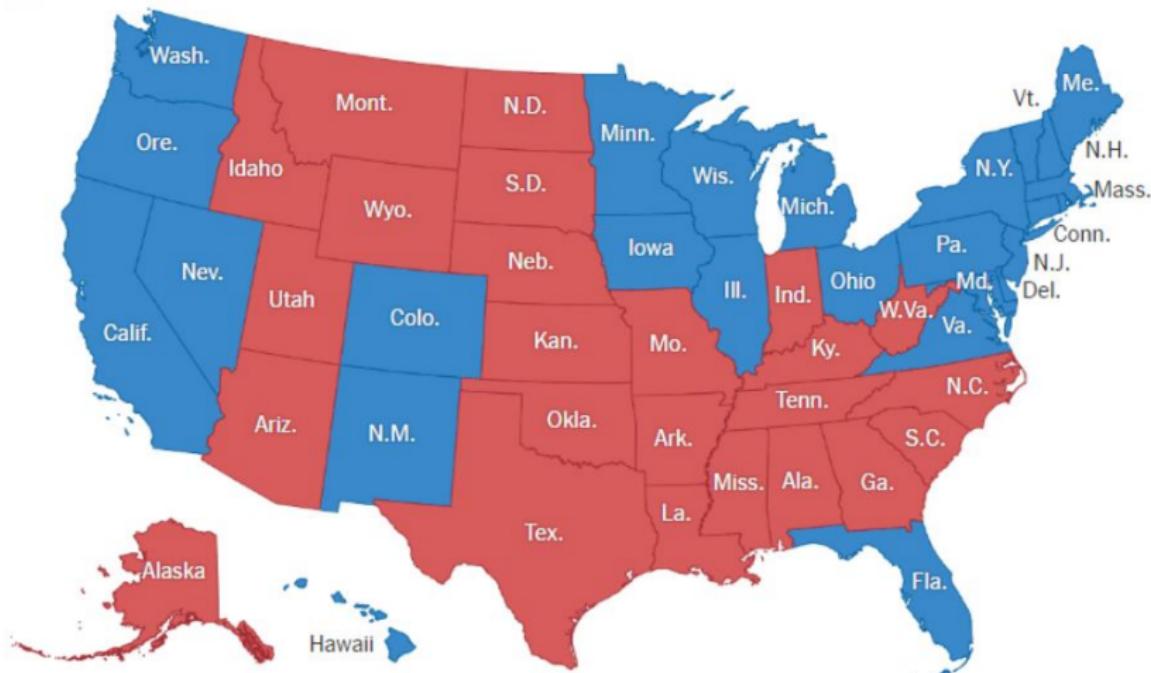


[- SUPER RULE #3 : USE ELECTORAL MAPS -]

USA election : 2012 results as a map : New York Time

The blue states reflect a total of 332 electoral votes for Barack Obama

■ Dem. ■ Rep.

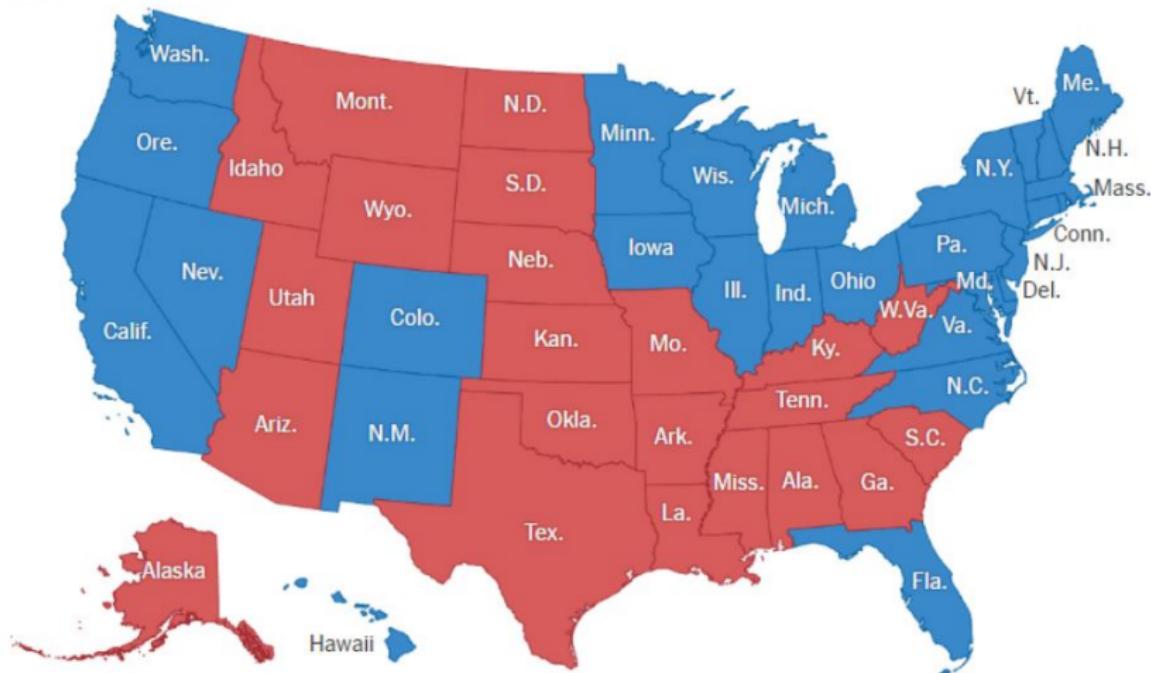


[- SUPER RULE #3 : USE ELECTORAL MAPS -]

USA election : 2008 results as a map : New York Time

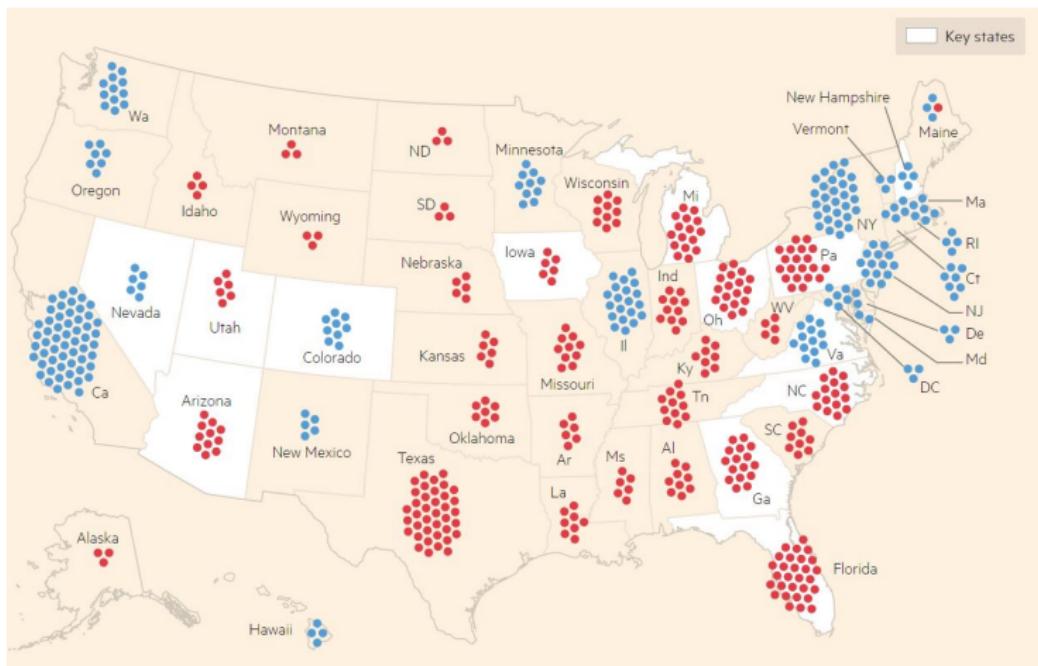
The blue states reflect a total of 365 electoral votes for Barack Obama

■ Dem. ■ Rep.



[- SUPER RULE #3 : USE ELECTORAL MAPS -]

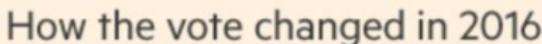
Maybe a better map? From *Financial Times* blog



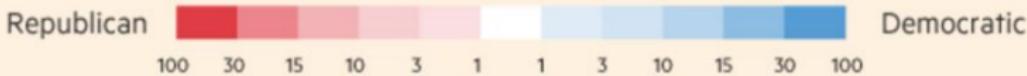
From *Financial Times*

[- SUPER RULE #3 : USE ELECTORAL MAPS -]

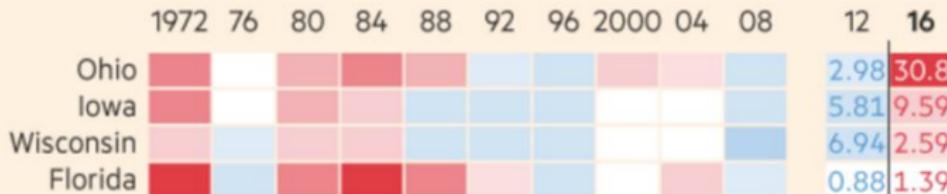
Maybe spatial information is not the most relevant!



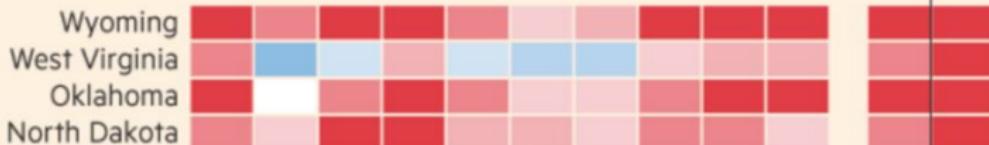
Presidential margins of victory by state, 1972–2016 (percentage points)



States that flipped between 2012 and 2016



States ordered by 2016 margin of victory of winning party





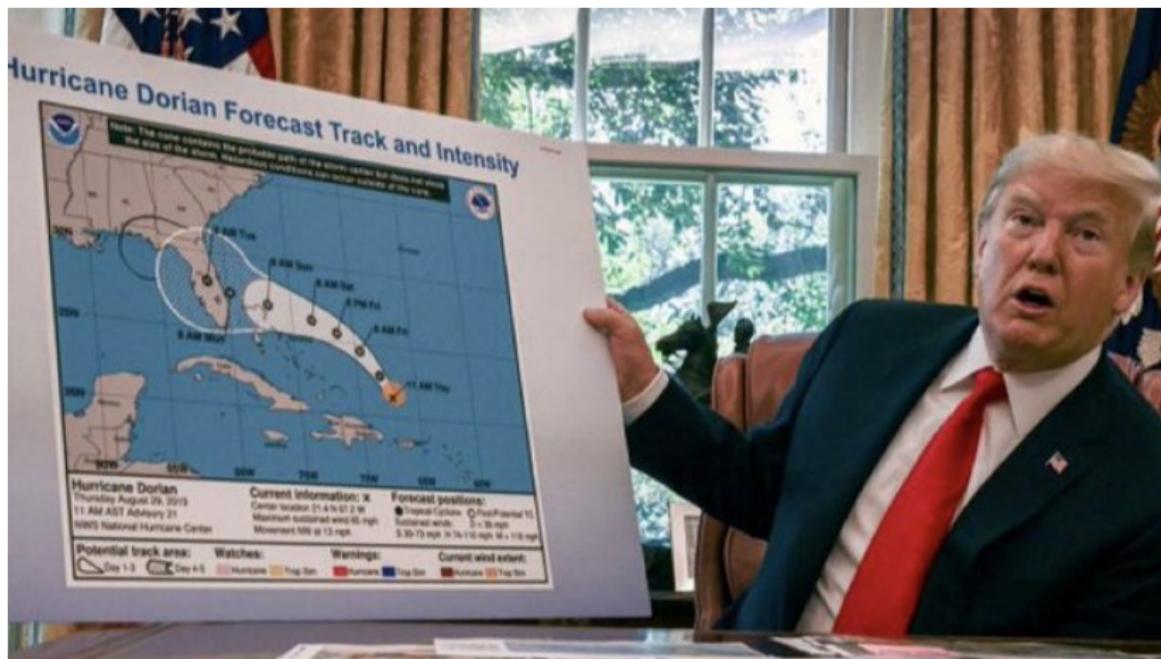
[- SUPER RULE #3 : USE ELECTORAL MAPS -]

Maybe spatial information is not the most relevant !





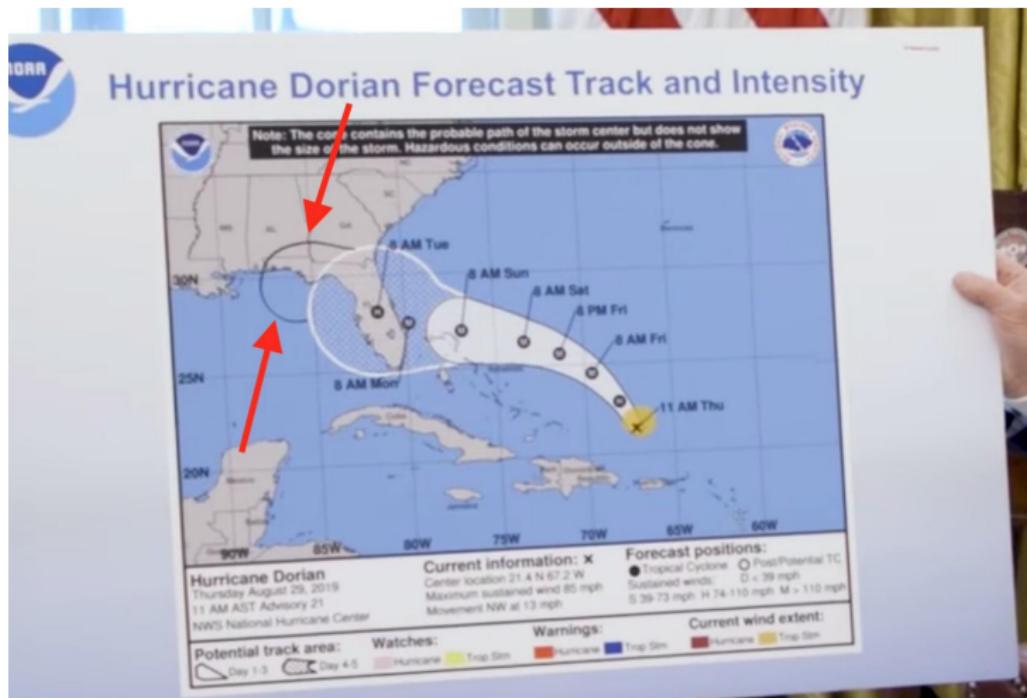
[- DIY -]



Source : Washington Post



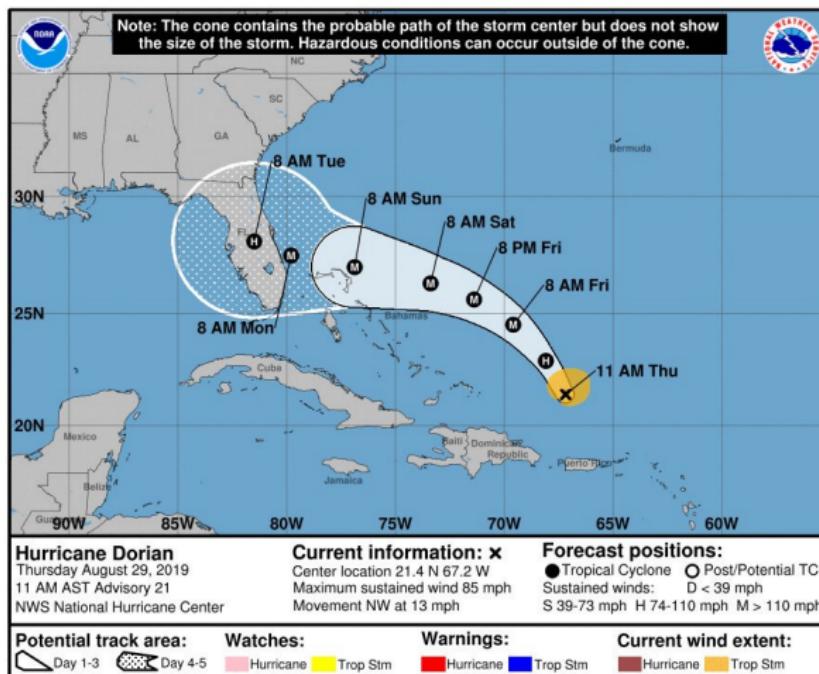
[- DIY -]



Source : Washington Post



[- DIY -]



Source : Washington Post

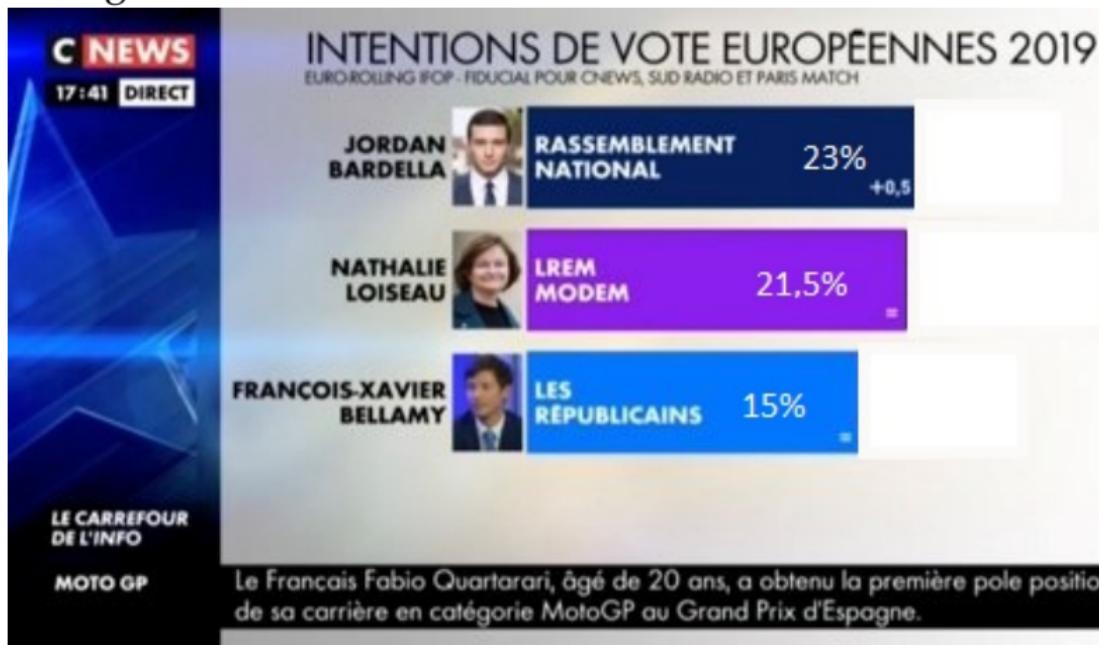
[- BE SUBTLE -]

Original



[- BE SUBTLE -]

Corrigé



[- BE SUBTLE -]

Original

La satisfaction à l'égard de l'action d'Emmanuel Macron (1/3)

■ D'une manière générale, êtes-vous satisfait ou pas de l'action du président de la République Emmanuel Macron ?



PAS SATISFAIT
49%

**NI SATISFAIT,
NI INSATISFAIT**
34%

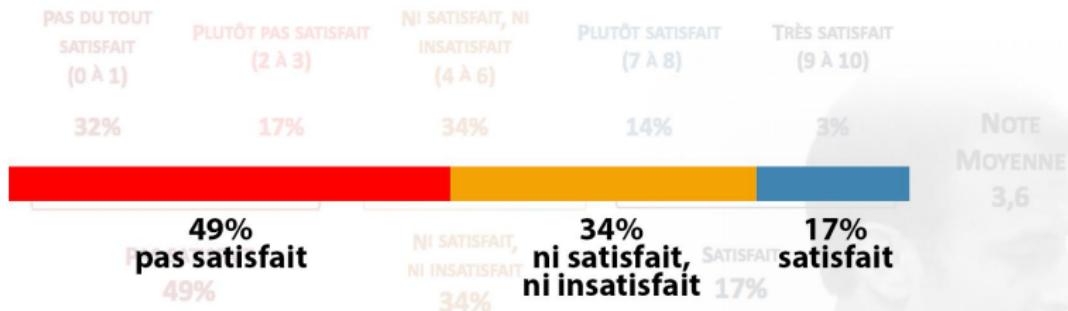
SATISFAIT
17%

[- BE SUBTLE -]

Corrigé

La satisfaction à l'égard de l'action d'Emmanuel Macron (1/3)

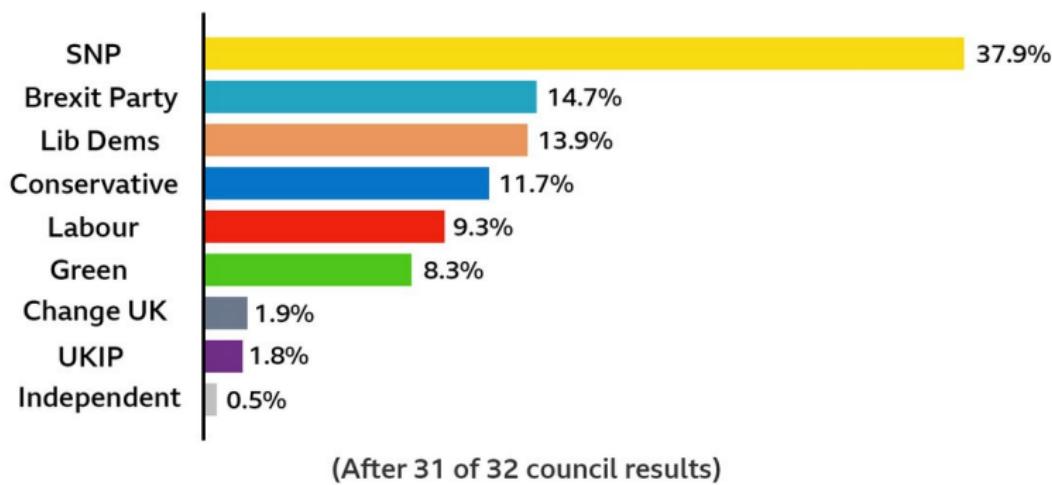
■ D'une manière générale, êtes-vous satisfait ou pas de l'action du président de la République Emmanuel Macron ?



[- BE SUBTLE -]

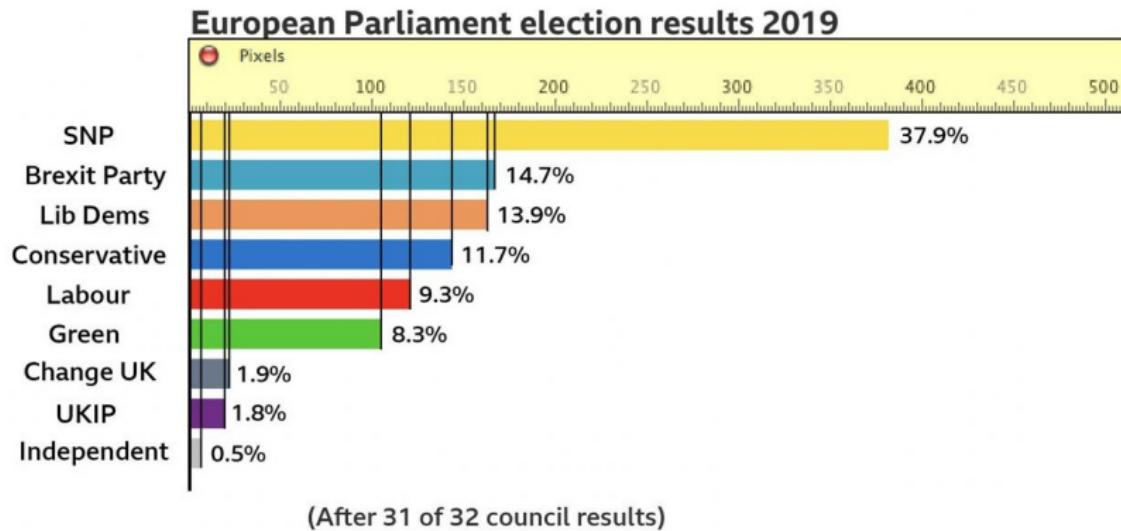
Original

European Parliament election results 2019
Percentage of votes won in Scotland



[- BE SUBTLE -]

Détection

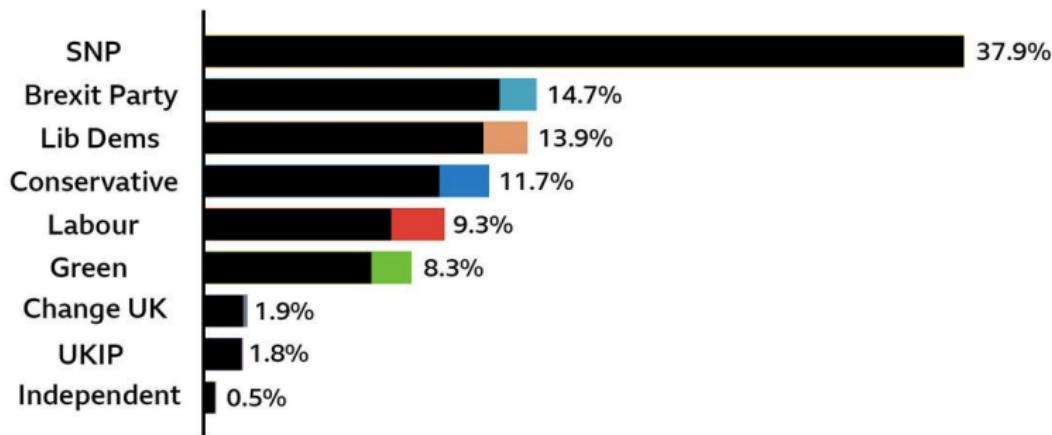


[- BE SUBTLE -]

Correction

European Parliament election results 2019

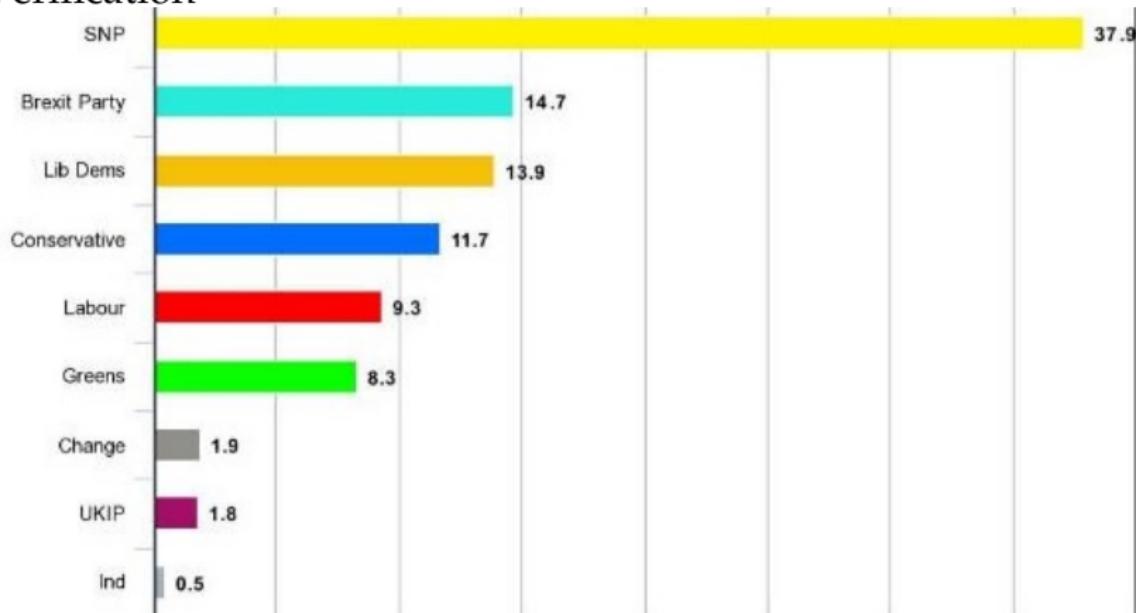
Percentage of votes won in Scotland



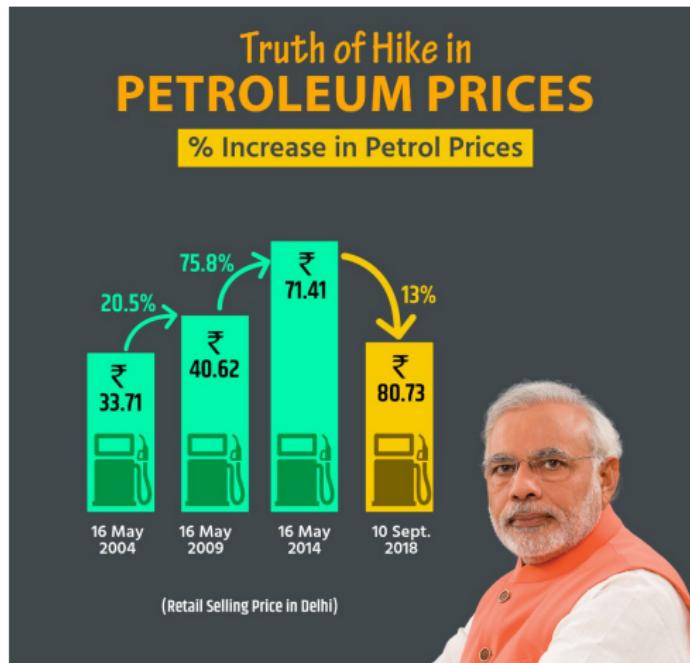
(After 31 of 32 council results)

[- BE SUBTLE -]

Vérification

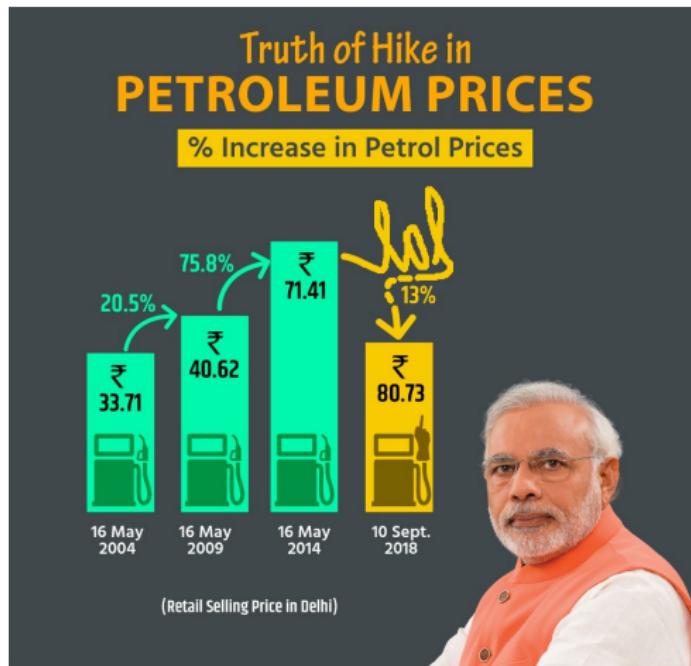


[- BE SUBTLE (OR NOT) -]

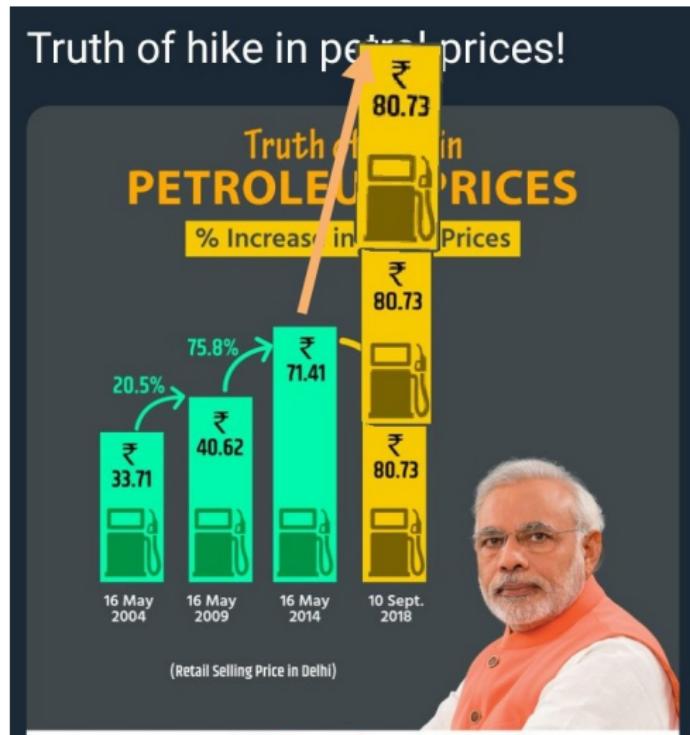


Original

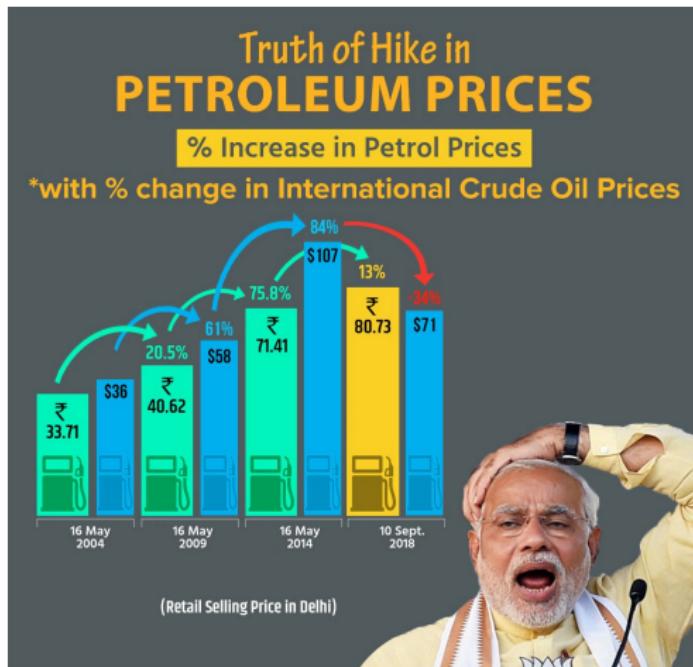
[- BE SUBTLE (OR NOT) -]



[- BE SUBTLE (OR NOT) -]

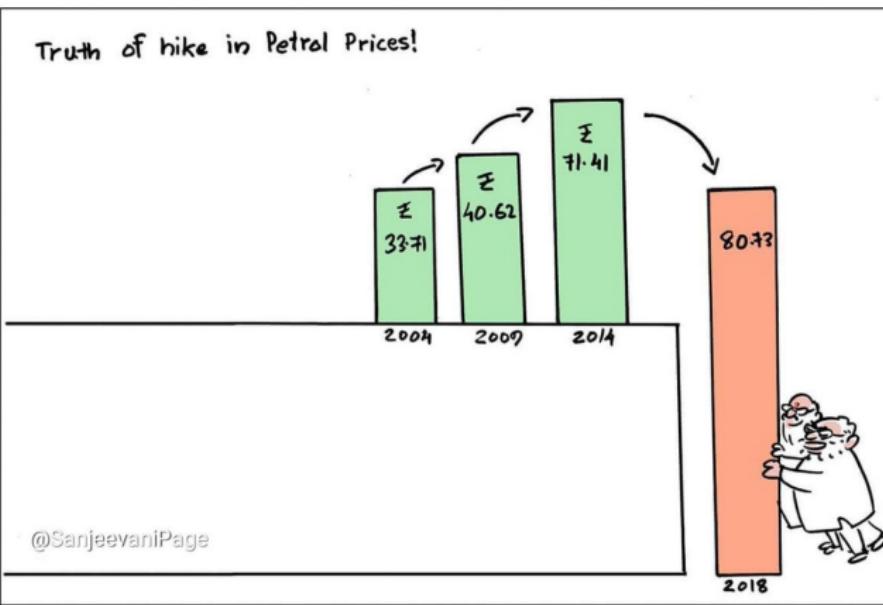


[- BE SUBTLE (OR NOT) -]



Justification!

[- BE SUBTLE (OR NOT) -]



[- BE SUBTLE (OR NOT) -]

Les chiffres ne trompent pas...

