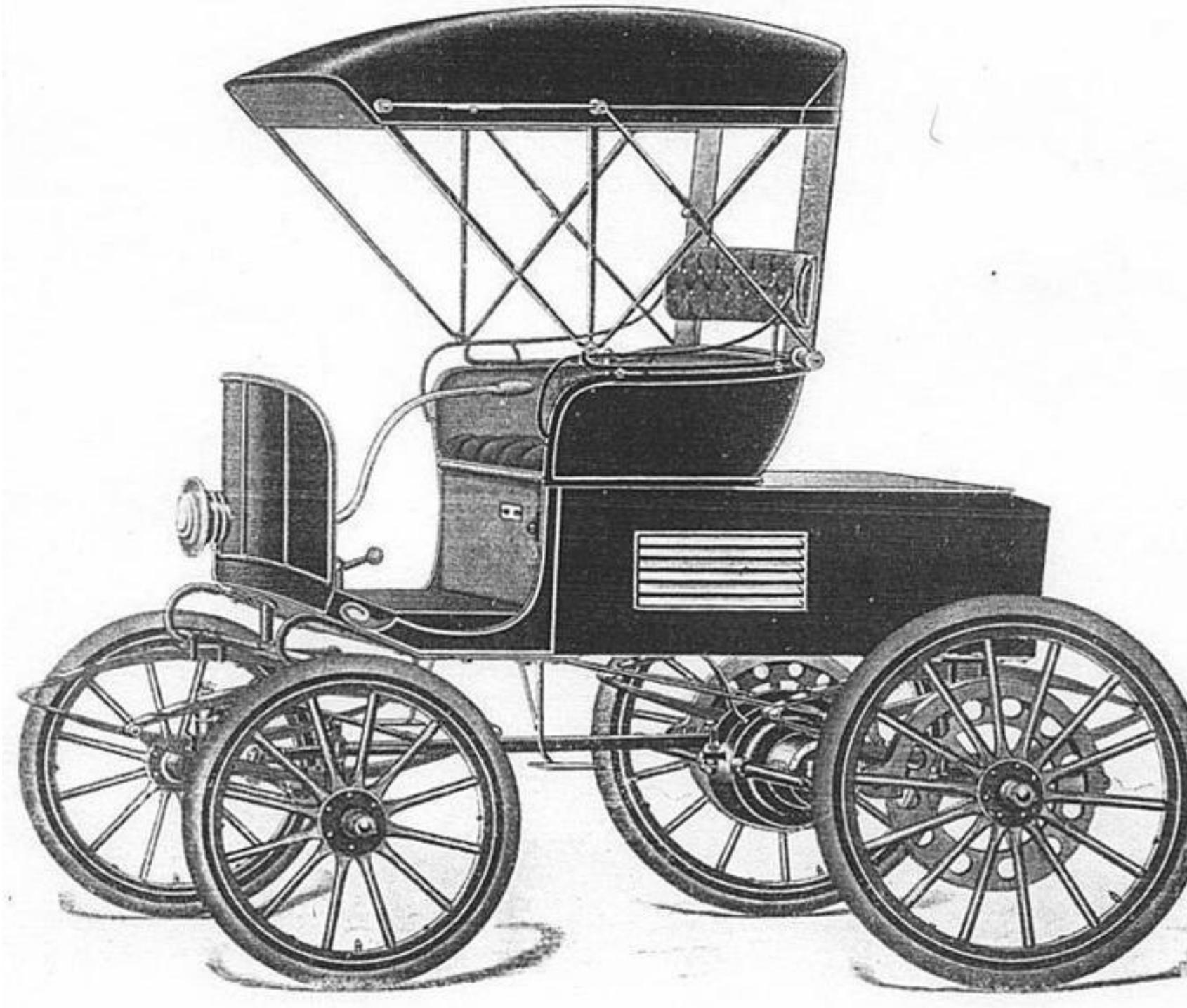


Taming Treacherous Data | DHSI 2018 | Day 1 AM | Deck 1

Introduction to Data Visualization

Information visualization is a set of technologies that use visual computing to **amplify human cognition** with abstract information. [. . .]



Information visualizations should *do for the mind what automobiles do for the feet.*

- Stuart Card, The Human-Computer Interaction Handbook, 539-542

A FEW DEFINITIONS

The graphic design community mostly uses two terms for the visual displays of information: **infographics** and **information design**. In a nutshell, infographics stand for visual displays in which graphics (illustrations, symbols, maps, diagrams, etc) together with verbal language communicate information that would not be possible otherwise. Infographics can range from early scientific illustrations of the human body to modern representations of how the brain functions, from early route maps and train schedules to the emblematic London subway map. Journalism as well as technical and pedagogical books employ established practices that traditionally have used infographics to explain complex information and tell stories. From the familiar weather map to visual explanations of natural phenomena and recent facts, infographics help us better understand the news around us.

Isabel Meirelles, “Design for Information”

Visual displays of information can be considered cognitive artifacts, in that they can complement and strengthen our mental abilities.²

I examine the visualizations in relation to the cognitive principles underlying them, which can be a combination of the following:

- to record information;
- to convey meaning;
- to increase working memory;
- to facilitate search;
- to facilitate discovery;
- to support perceptual inference;
- to enhance detection and recognition;
- to provide models of actual and theoretical worlds;
- to provide manipulation of data.

Isabel Meirelles, “Design for Information”

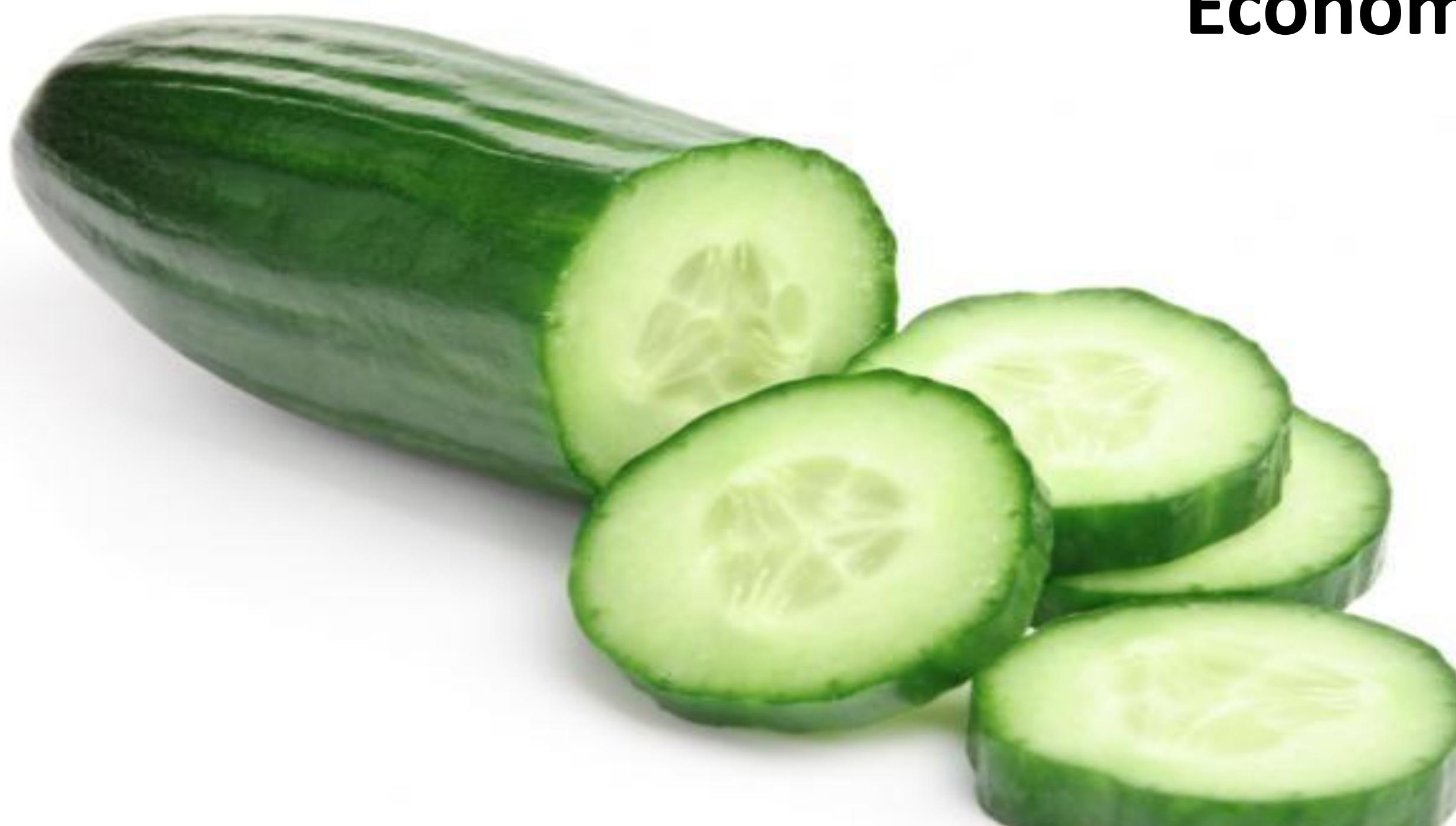
“Effective analytic
designs entail turning
thinking principles into
seeing principles.”

— *Edward Tufte*

Why Visualize
Data?

“Getting information from a table
is like extracting **sunbeams** from a
cucumber”

*misquote of A. Farquar and H. Farquar,
Economic and Industrial Delusions, 1891*



Vocabulary of Forms

Lines

The Long-term Future of Hits from 2013

GROWTH, DECAY-RATE OF 2013-RELEASED TRACKS ON SPOTIFY

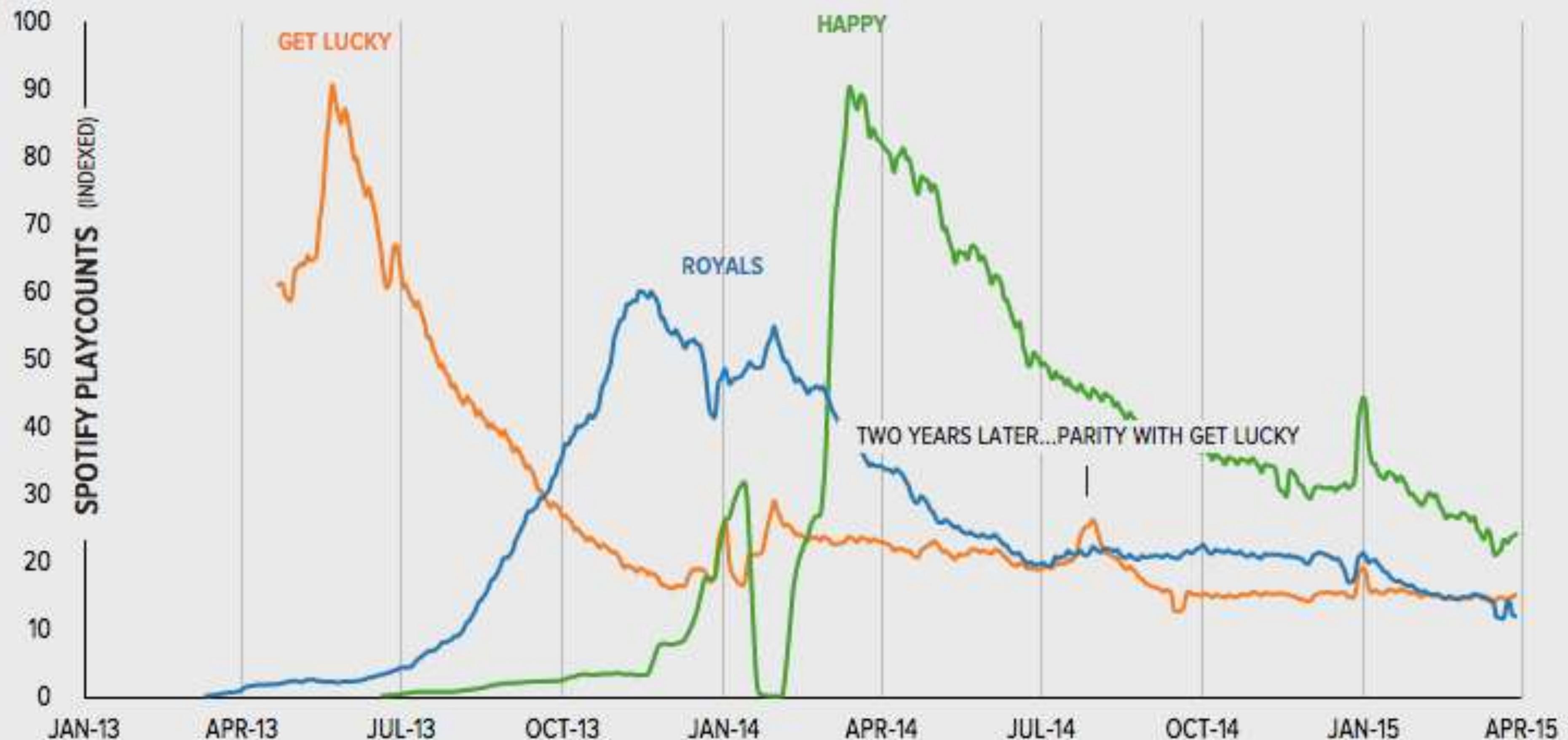
TRACKS WERE OFFICIALLY RELEASED IN 2013.

FIND A TRACK:

Find an artist or track...

Clear All

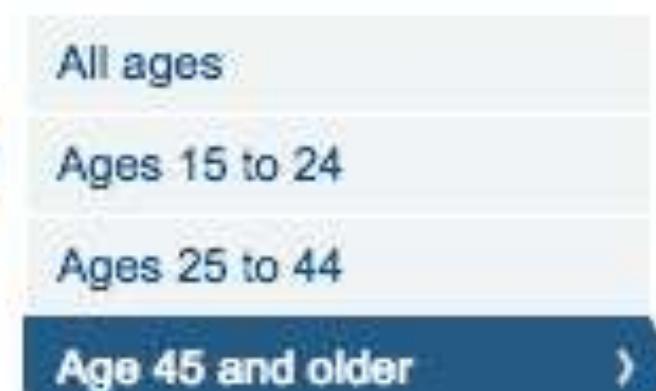
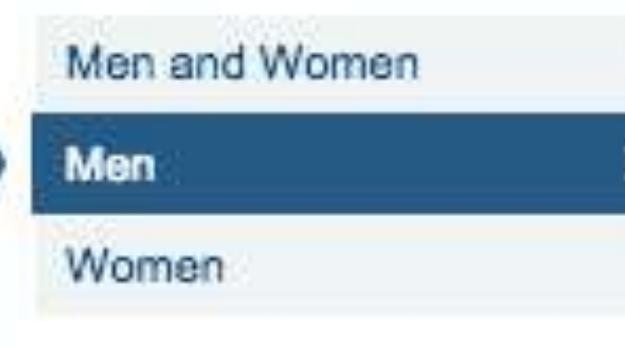
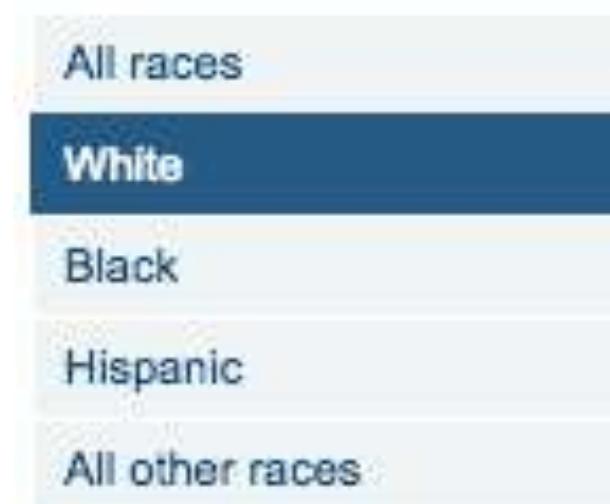
- Lorde - Royals
- Daft Punk - Get Lucky...
- OneRepublic - Counting...
- Lana Del Rey - Young a...
- Avicii - Wake me up...
- Robin Thicke - Blurred...
- Pink - Just Give Me a ...
- Calvin Harris - I Need...
- Justin Timberlake - Mi...
- Bastille - Pompeii...
- Bruno Mars - When I Wa...
- Miley Cyrus - We Can't...



Published: November 6, 2009

The Jobless Rate for People Like You

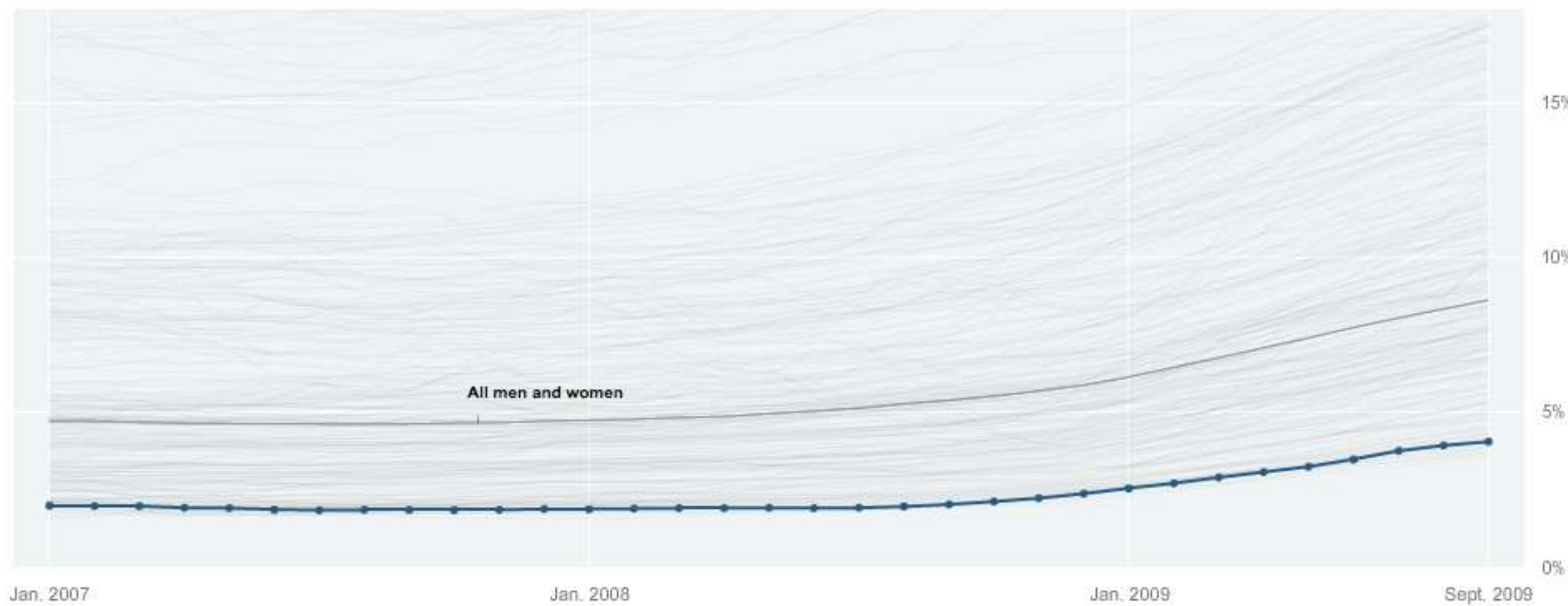
Not all groups have felt the recession equally.



UNEMPLOYMENT RATE,
12 MONTH AVG. ENDING SEPT. '09

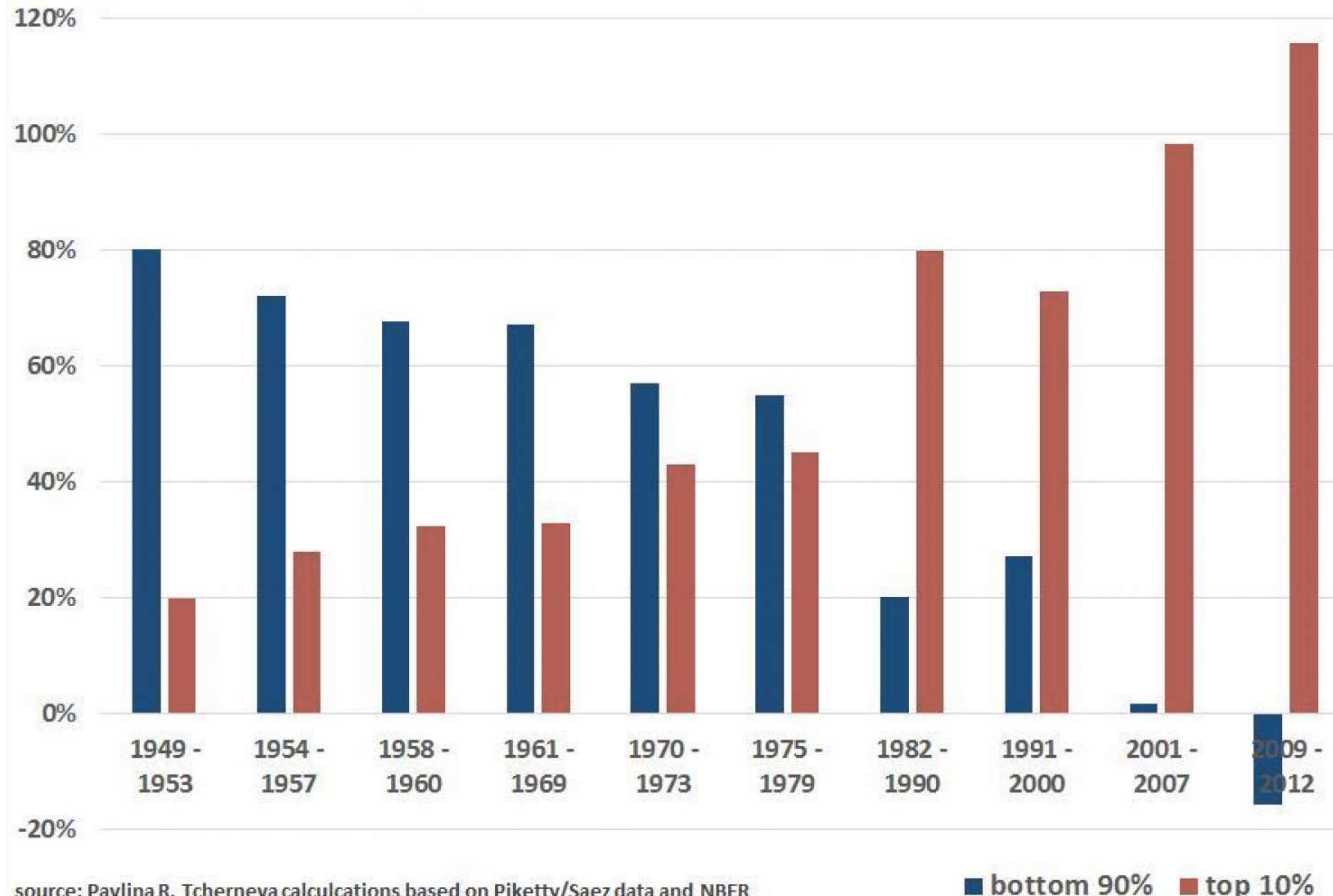
4.1%

For white men age 45 and older with
a college degree

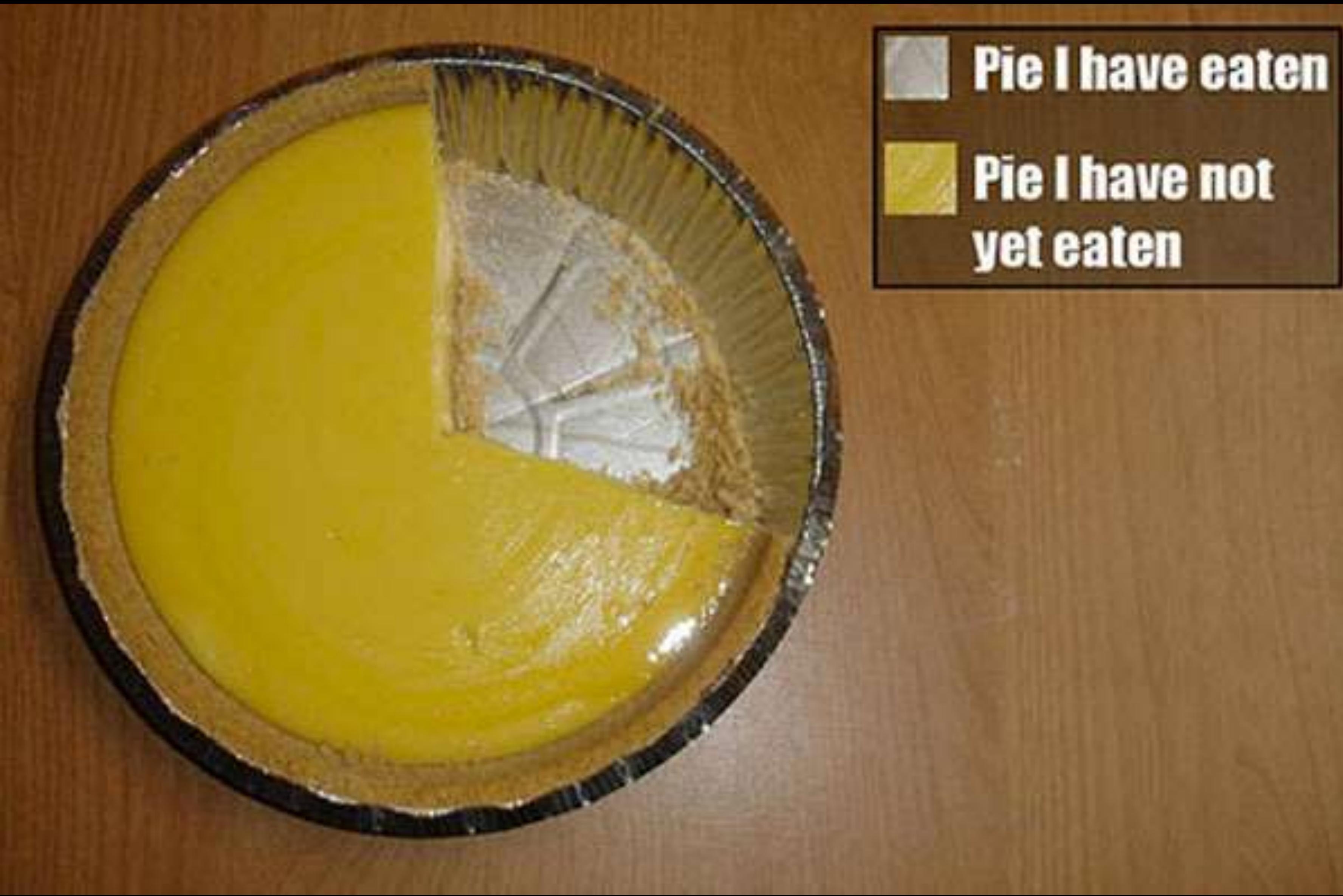


Bars

Distribution of Average Income Growth During Expansions



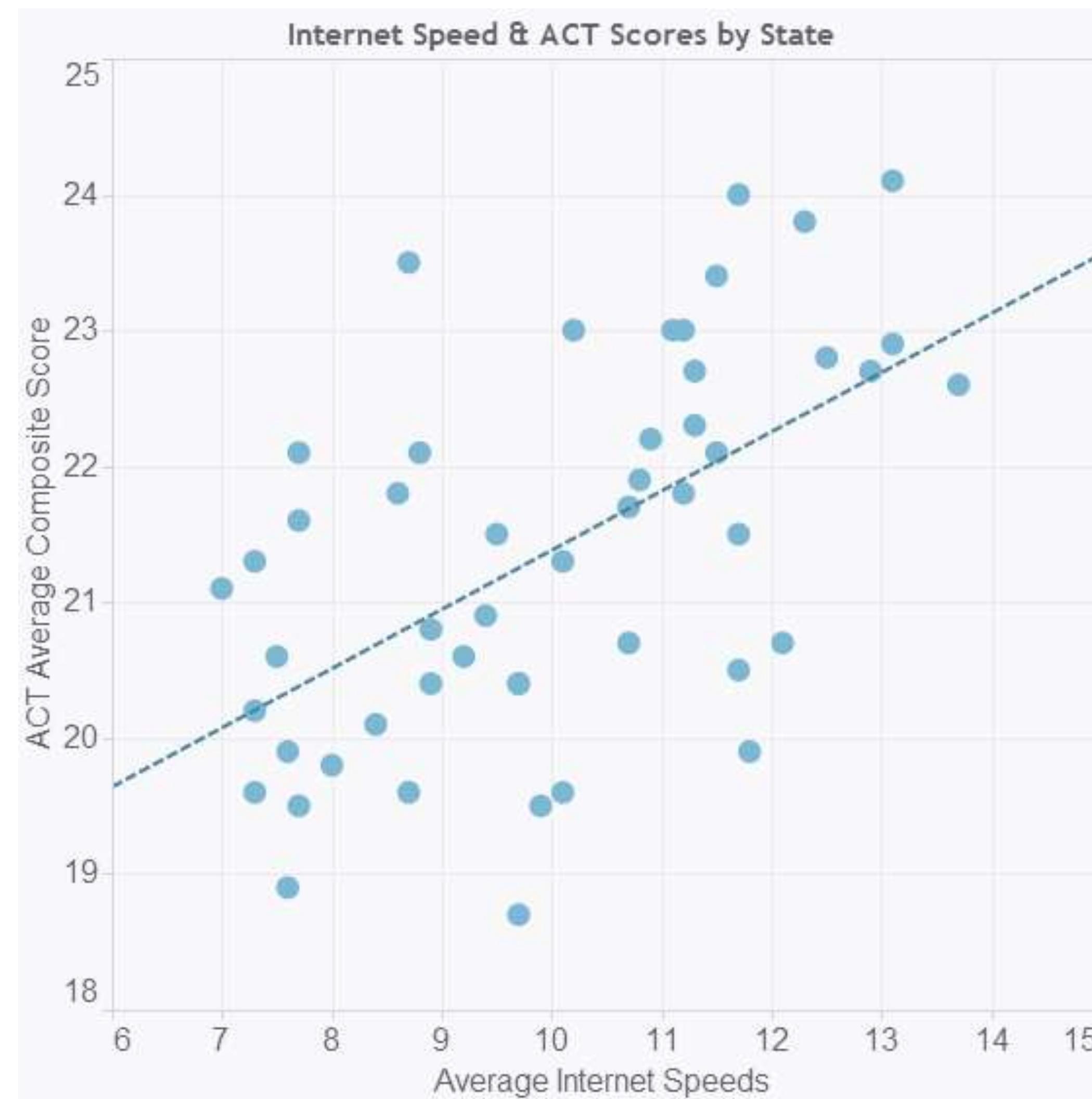
Pies



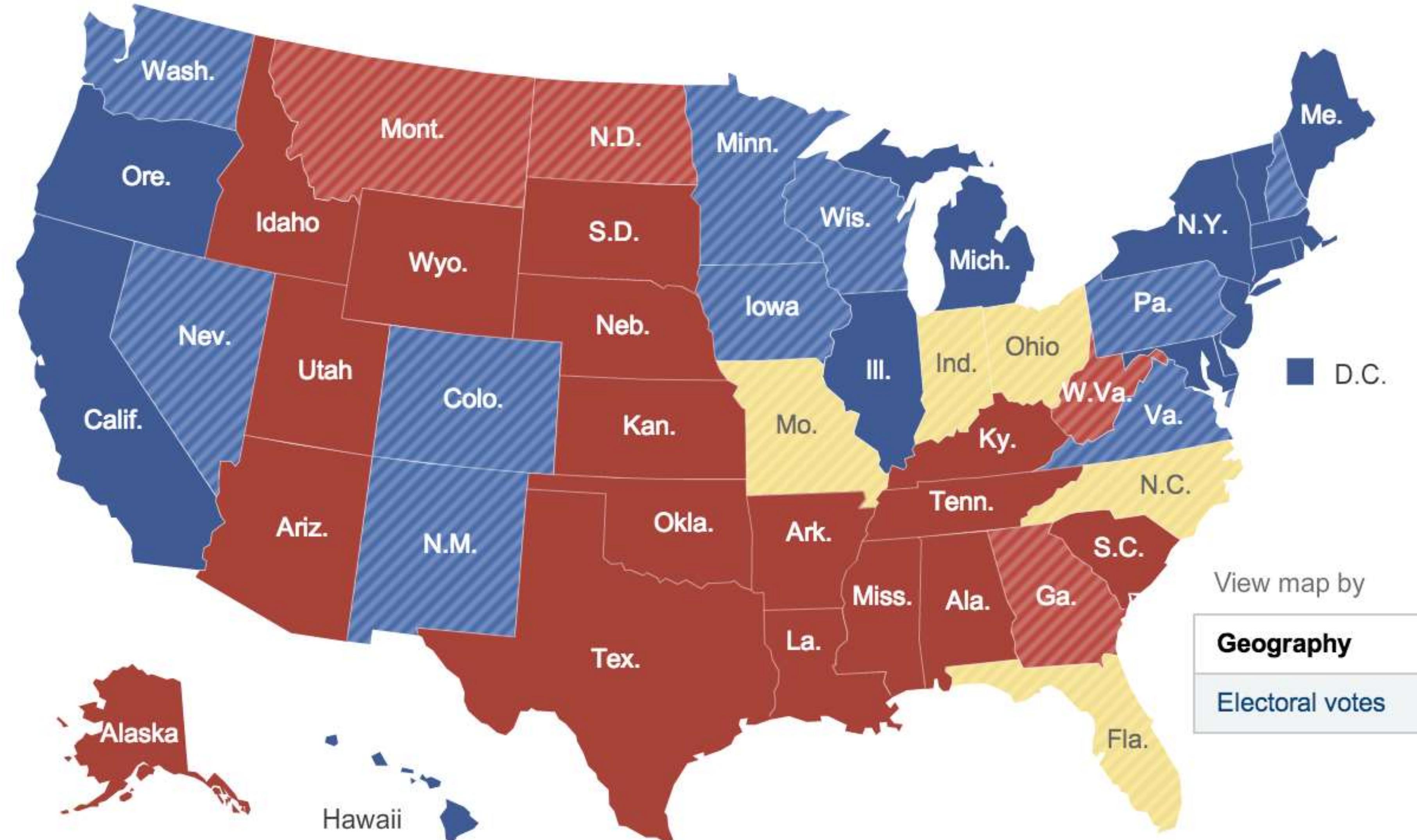
Pie I have eaten

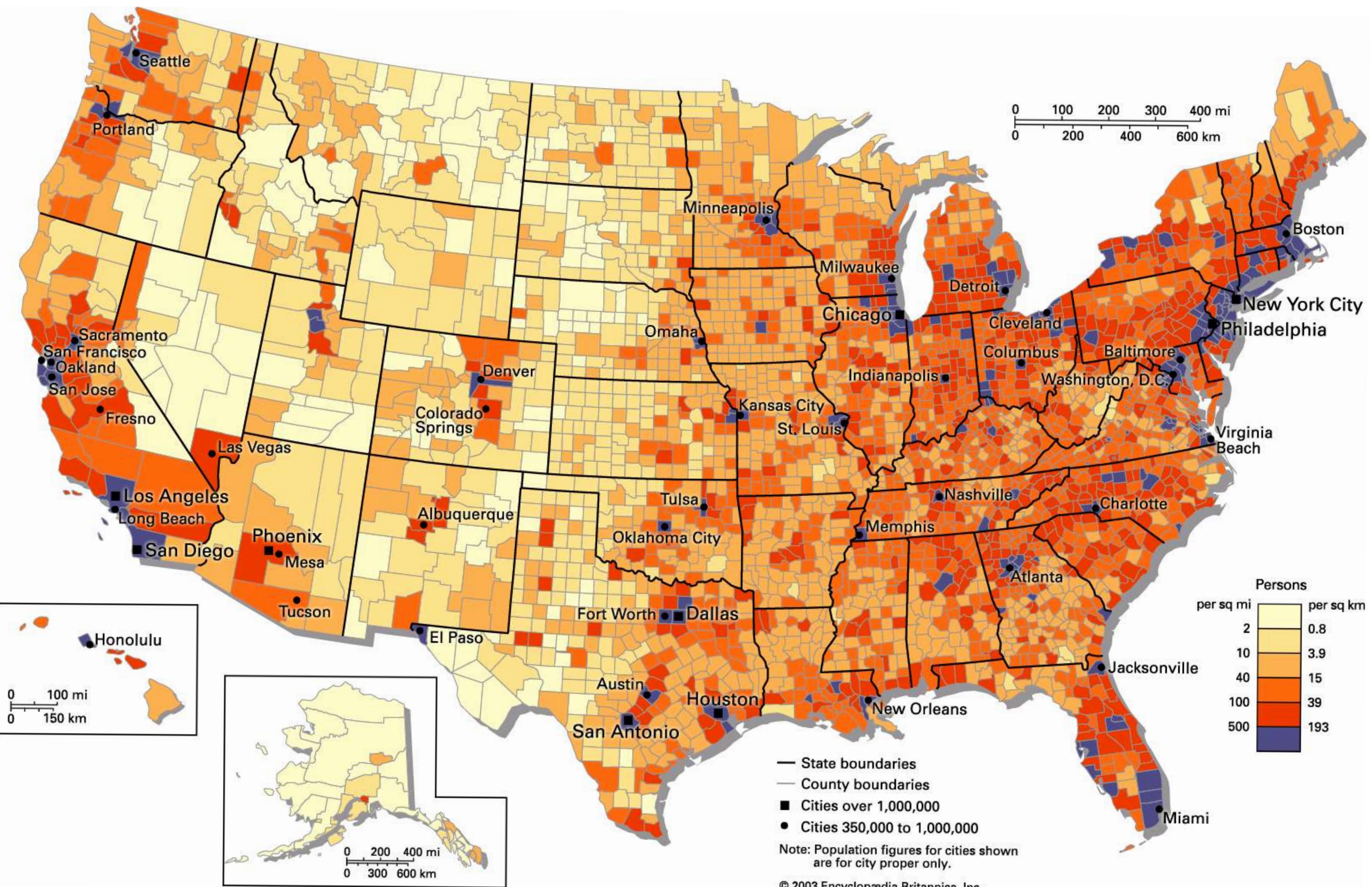
Pie I have not yet eaten

Scatterplots

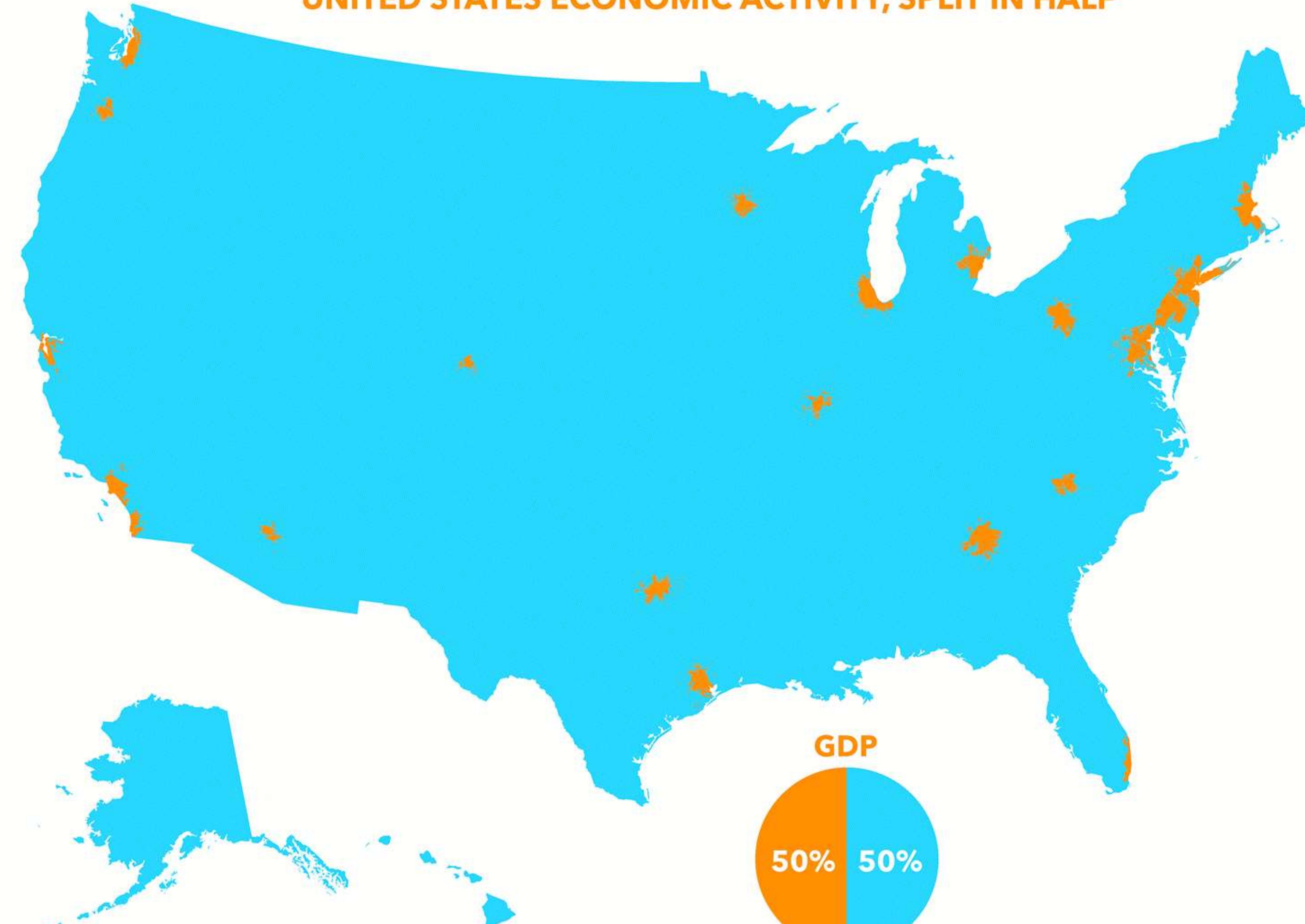


Choropleth





UNITED STATES ECONOMIC ACTIVITY, SPLIT IN HALF



Small Multiples



Recently Voted On

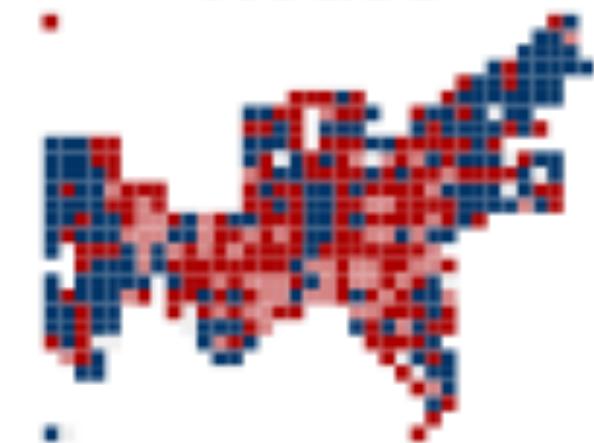
HR 4901 •

Passed the
House



S 1177 •

Passed the
House



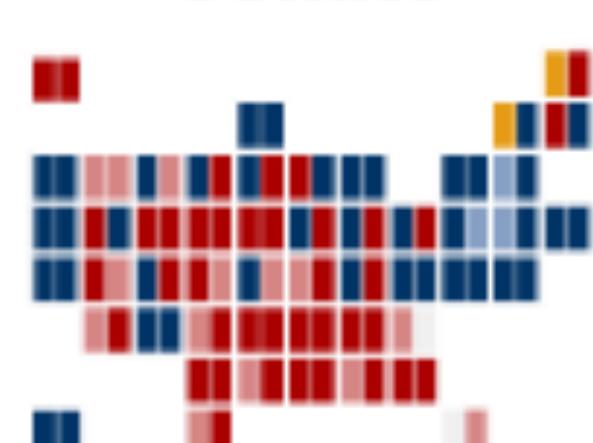
HR 10 •

Passed the
House



S.1177 •

Bill Passed the
Senate



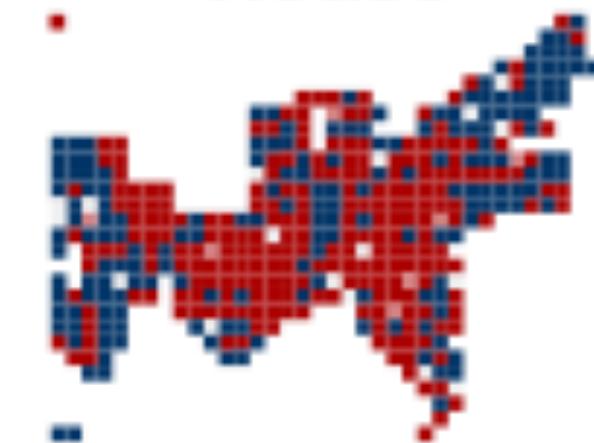
HR 5 •

Passed the
House



HR 1020 •

Passed the
House



**Sense-making
and communication**

Data Visualization is....

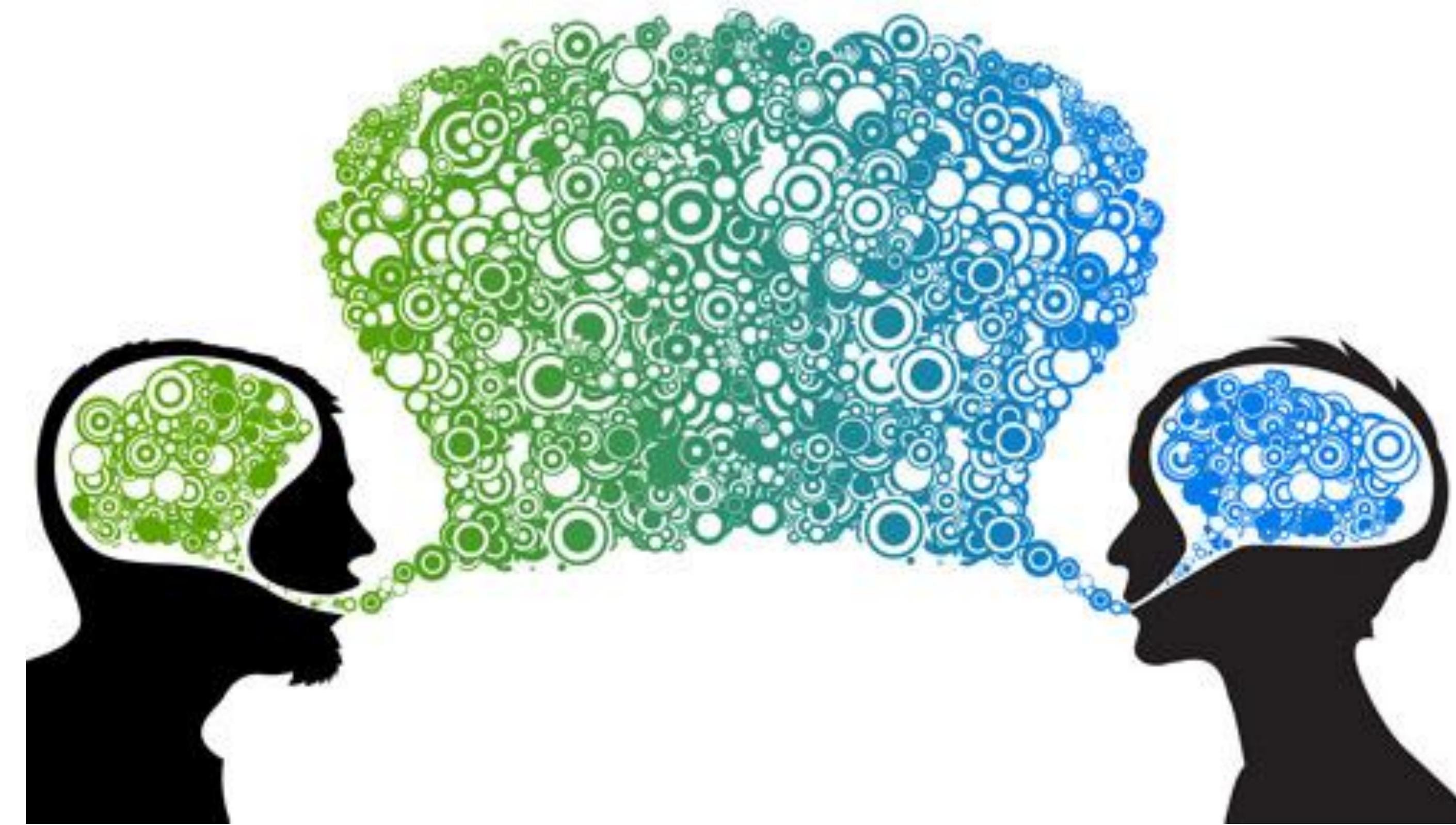
“graphical display of abstract information for two purposes: sense-making (also called data analysis) and communication”

– Stephen Few, *Data Visualization for Human Perception*



sense-making

17



communication

Sense-Making (Data Analysis)

LISTE N° 16 M

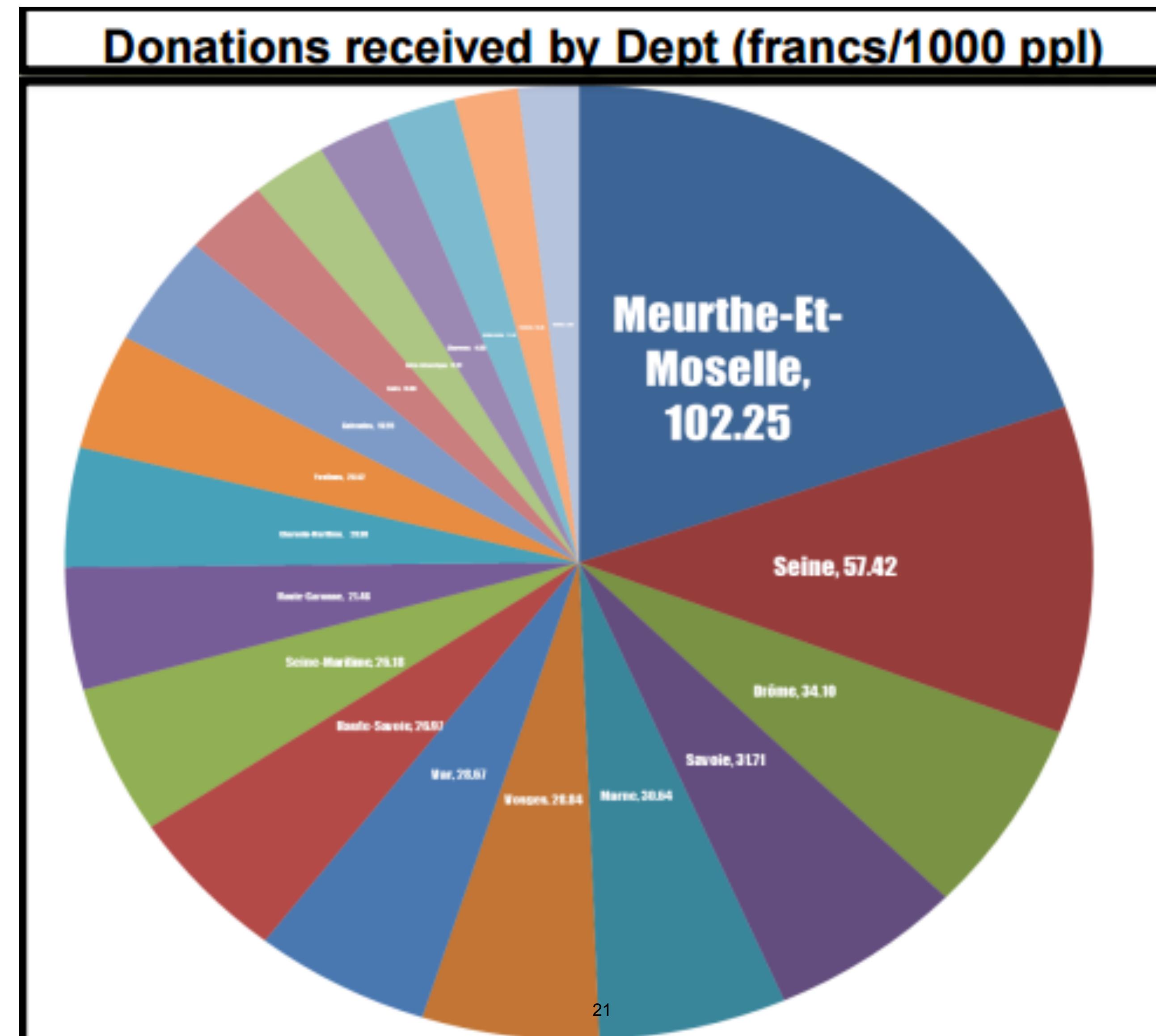
— M. H. Veron-Magot, négociant en vins de Champagne à Ay, 10 fr. 05. — Collecte dans un banquet républicain à Chilly (Seine-et-Loire), 5 fr. 94. — Collecte dans la commune de Sapondcourt (Haute-Saône), 9 fr. 90. — Collecte dans la commune de Beuliette (Haute-Saône), 7 fr. — MM. Deutz et Geidermann à Ay (Champagne), 25 fr. — Souscription du Régional de l'Orne (1^{re} liste), 250 fr. — Association amicale des auditeurs diplômés des cours Bamberger, 19, rue Blanche (souscription des sociétaires), 25 fr. — Le conseil municipal de Lyon (vote dans la séance du 25 juillet), 1,500 fr. — La commune de Nuverie (Haute-Saône) (souscription), 23 fr. 76. — L'école municipale Collinet, 27, rue Château-Landon, 10 fr.

Sense-Making (Data Analysis)

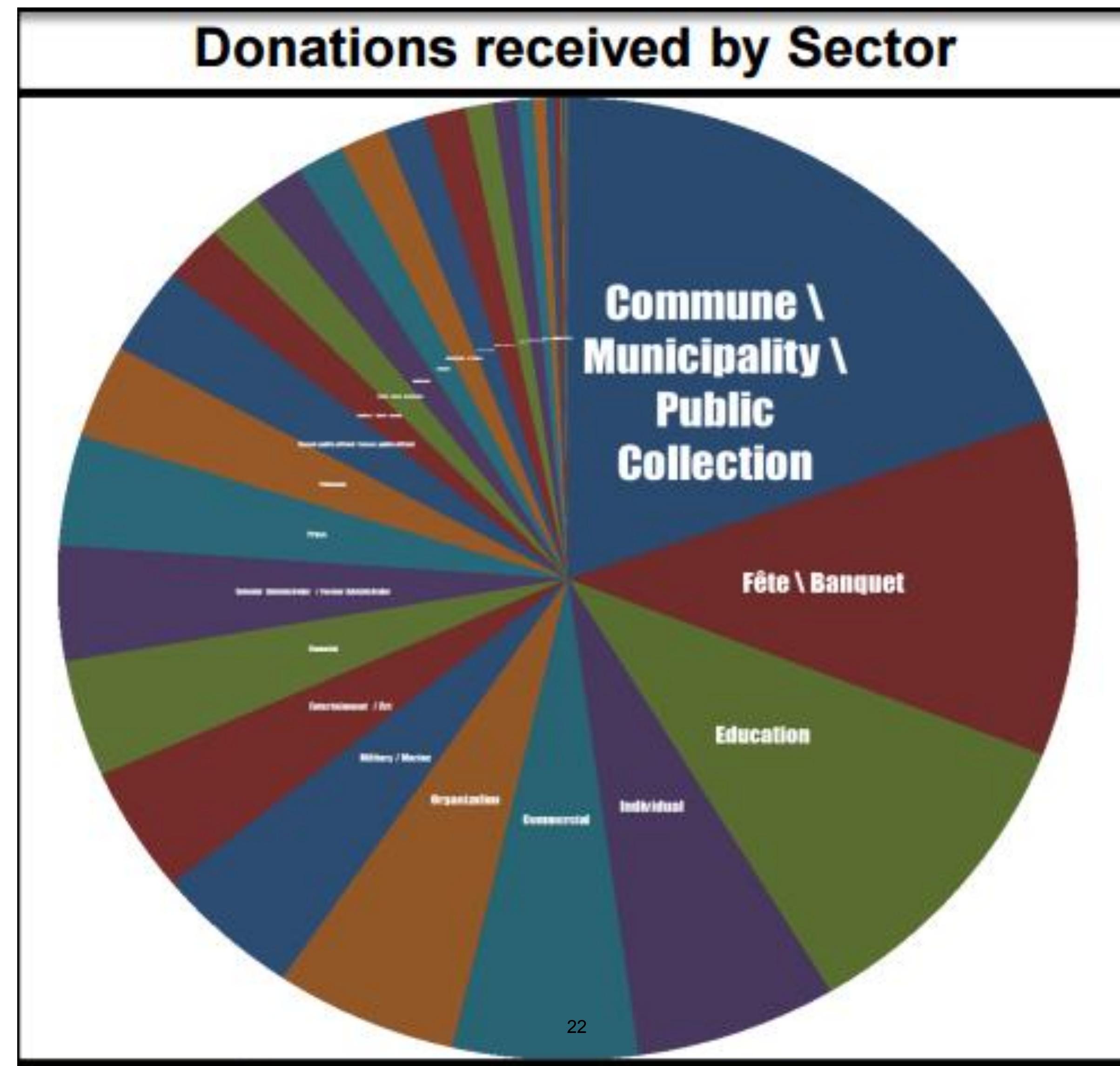


Geo-located donations plotted²⁰ within France using Gephi

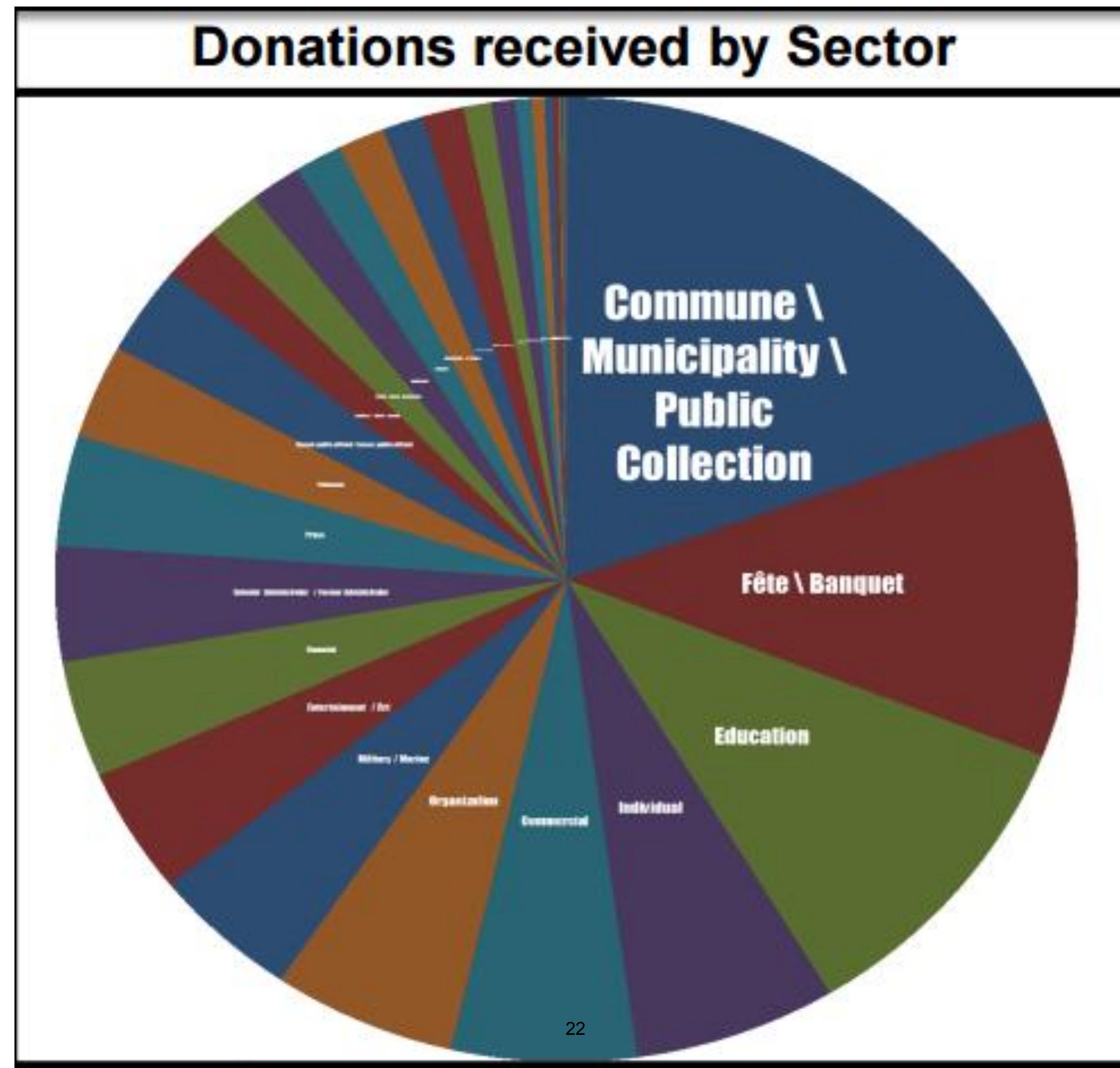
Sense-Making (Data Analysis)



Sense-Making (Data Analysis)



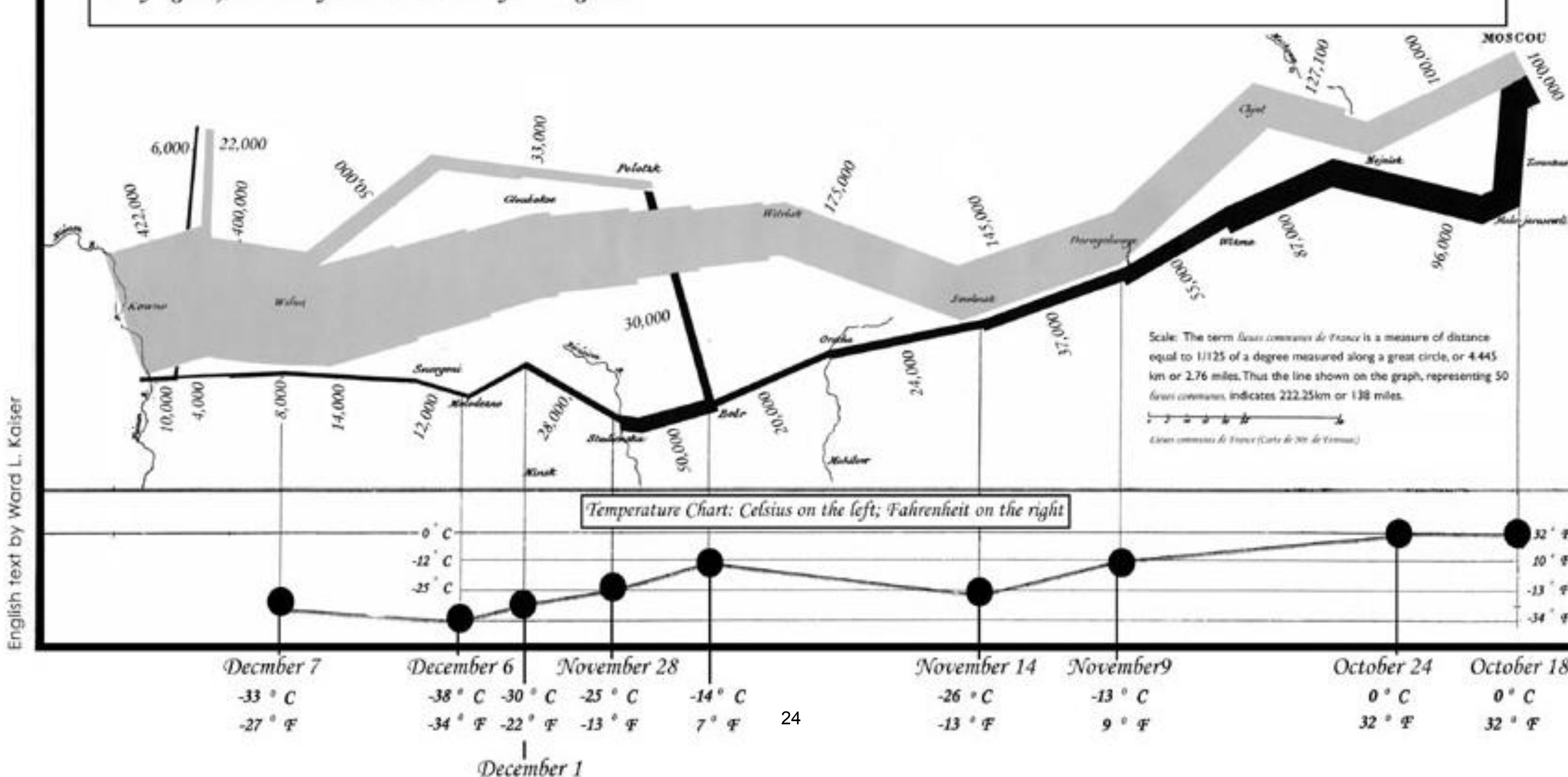
Communication (Story-telling)



*Map representing the losses over time of French army troops during the Russian campaign, 1812-1813.
Constructed by Charles Joseph Minard, Inspector General of Public Works retired.*

Paris, 20 November 1869

The number of men present at any given time is represented by the width of the grey line; one mm. indicates ten thousand men. Figures are also written besides the lines. Grey designates men moving into Russia; black, for those leaving. Sources for the data are the works of messrs. Thiers, Segur, Fezensac, Chambray and the unpublished diary of Jacob, who became an Army Pharmacist on 28 October. In order to visualize the army's losses more clearly, I have drawn this as if the units under prince Jerome and Marshall Davoust (temporarily separated from the main body to go to Minsk and Mikilow, which then joined up with the main army again), had stayed with the army throughout.

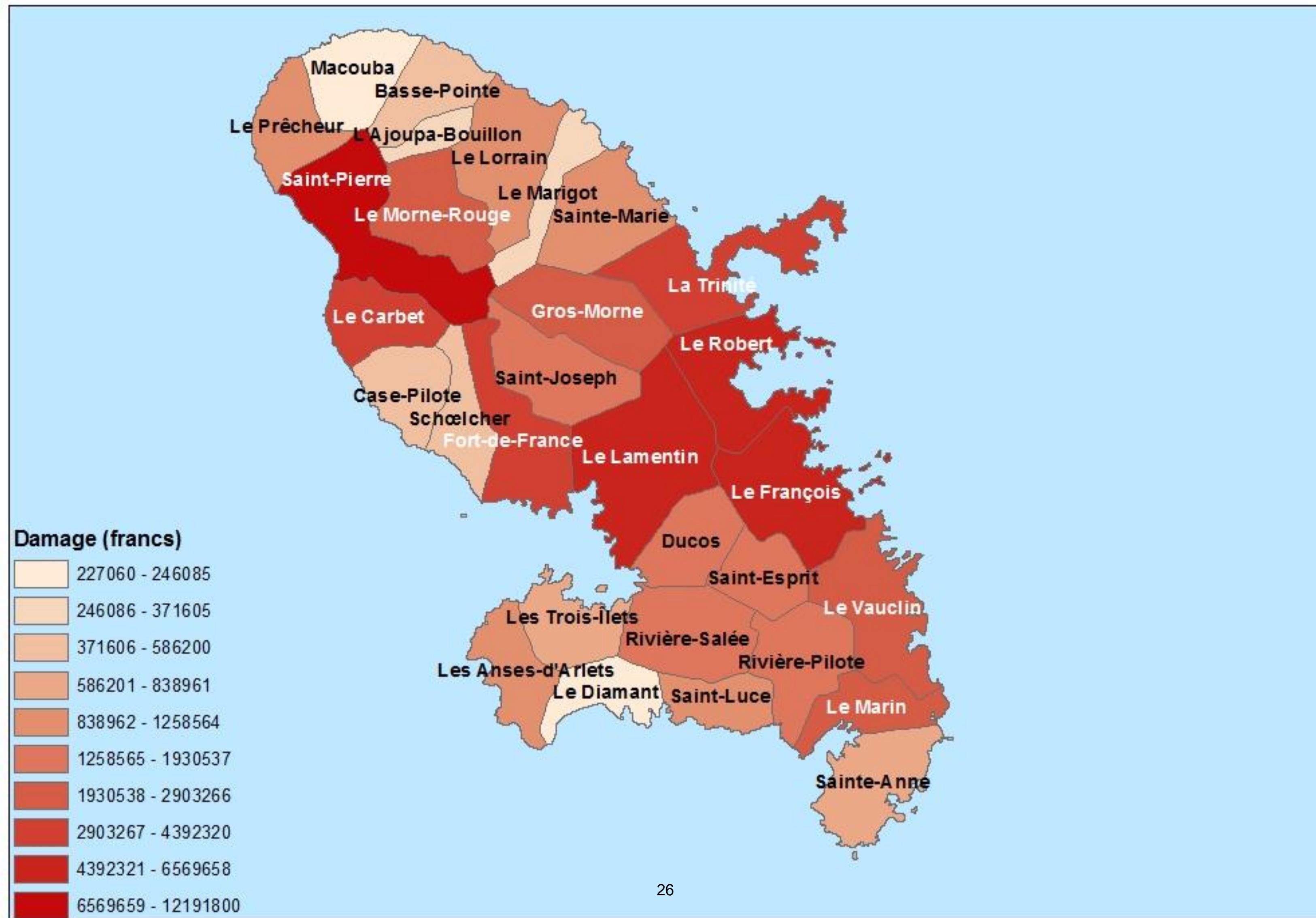


Communication (Story-telling)

COMMUNE	FRANCS
Saint Pierre	12,191,800
Lamentin	6,569,658
Le Francois	5,665,200
Le Robert	5,407,100
Fort-de-France	4,392,320
La Trinite	4,166,756
Gros-Morne	2,903,266
Marin	2,658,720
Vauclin	2,386,000
Morne-Rouge	2,357,000

Damage by Commune (Top 10)
Martinique, 1891 Hurricane

Total Damage by Commune (1891 Hurricane)

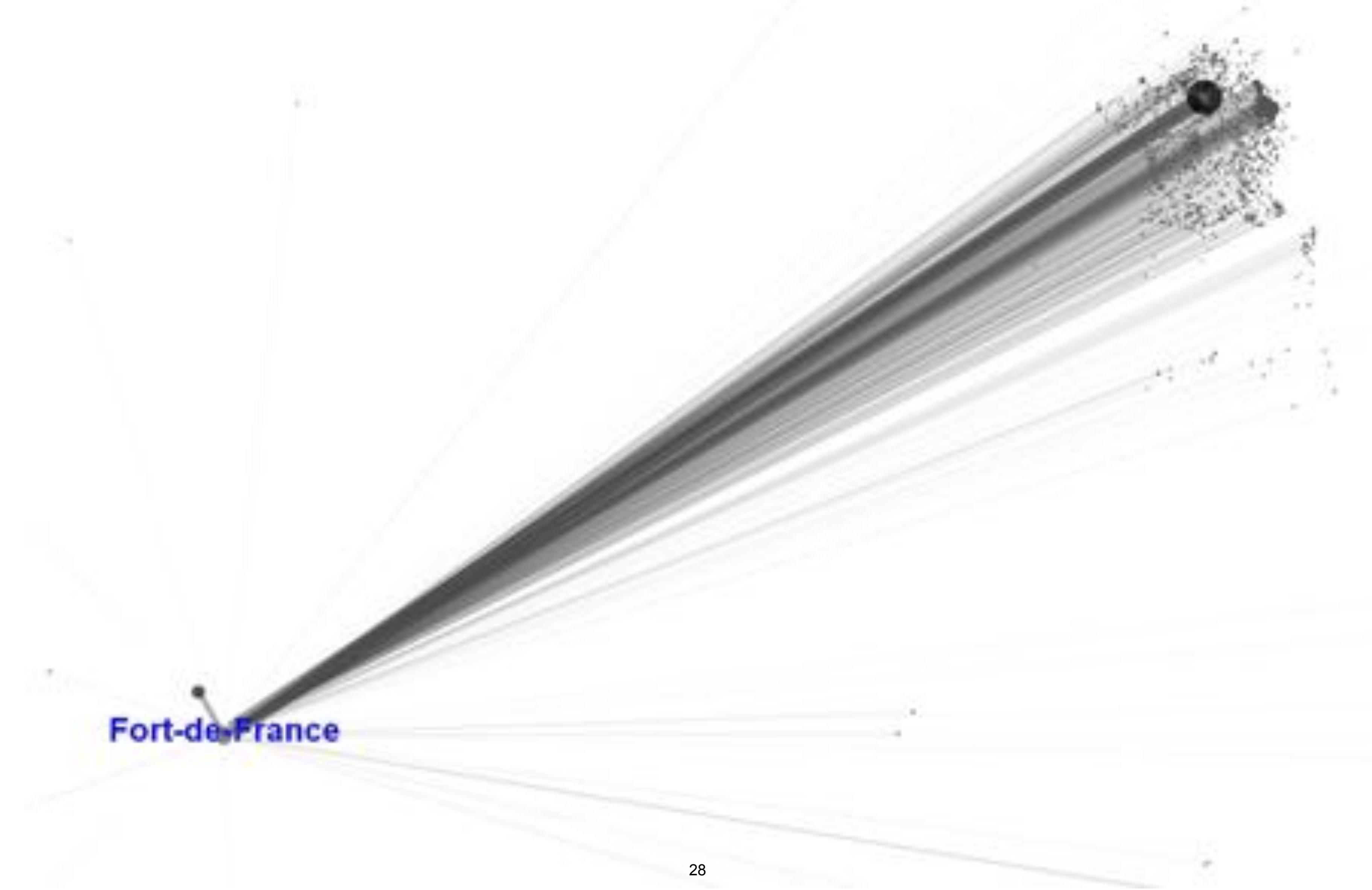


Communication (Story-telling)



Geo-located donations plotted²⁷ within France using Gephi

Communication (Story-telling)





Perception

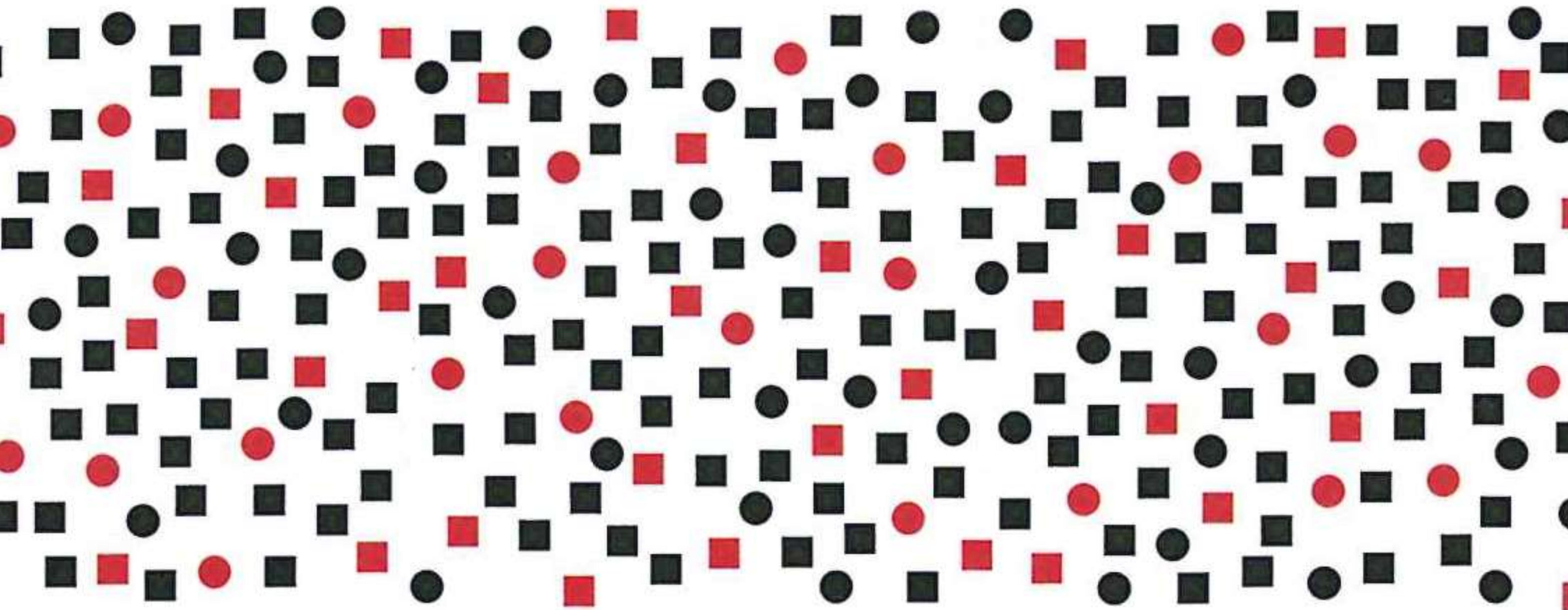
Chunking

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798



Mirielles, Ware

Communication Strategies

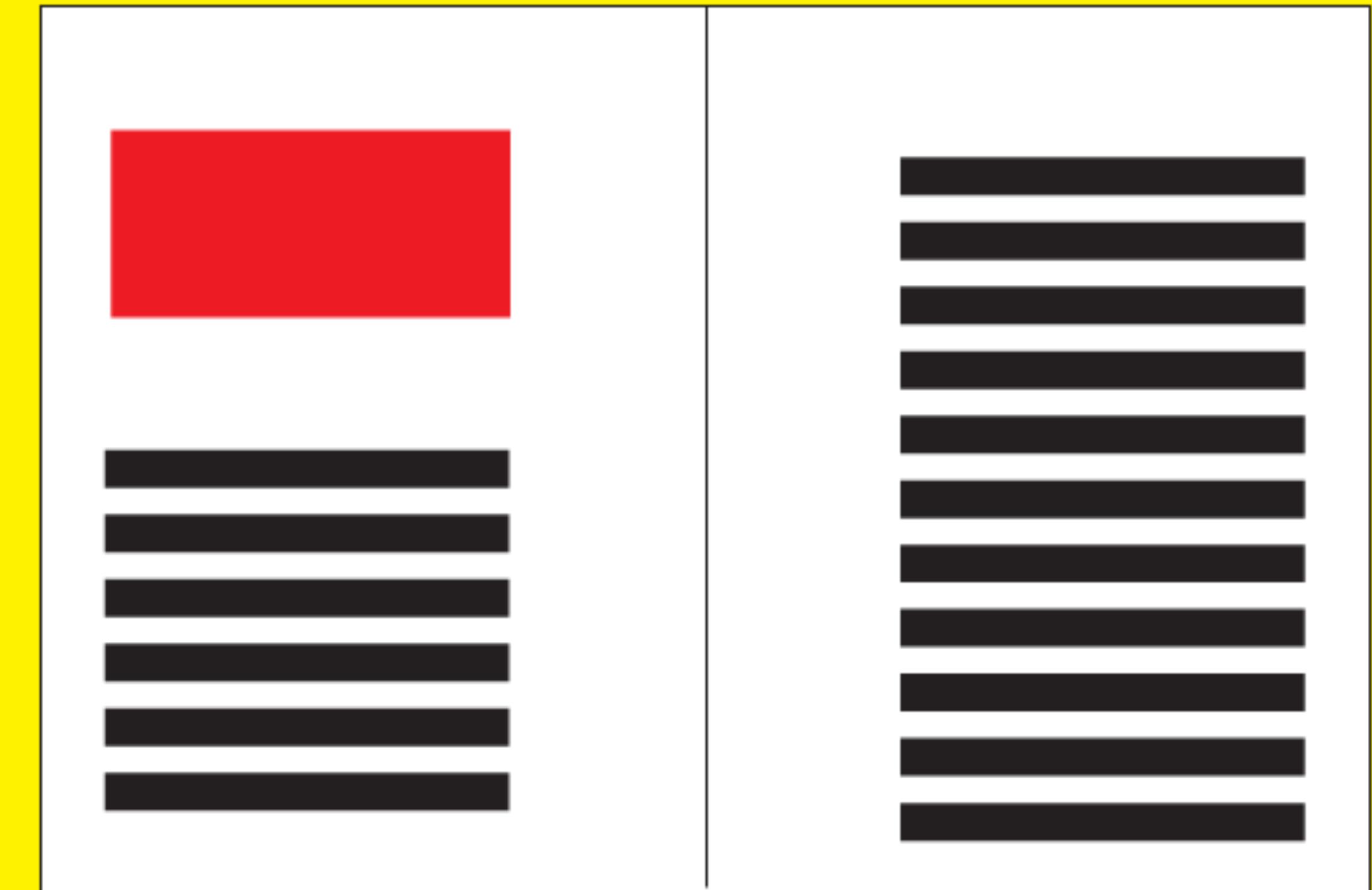
Visual hierarchy

Organizing information so
the most important details are read first



Position and size

Positioning an element in the entry hotspot, while also altering its size and introducing spacing, establishes its dominance in the hierarchy.

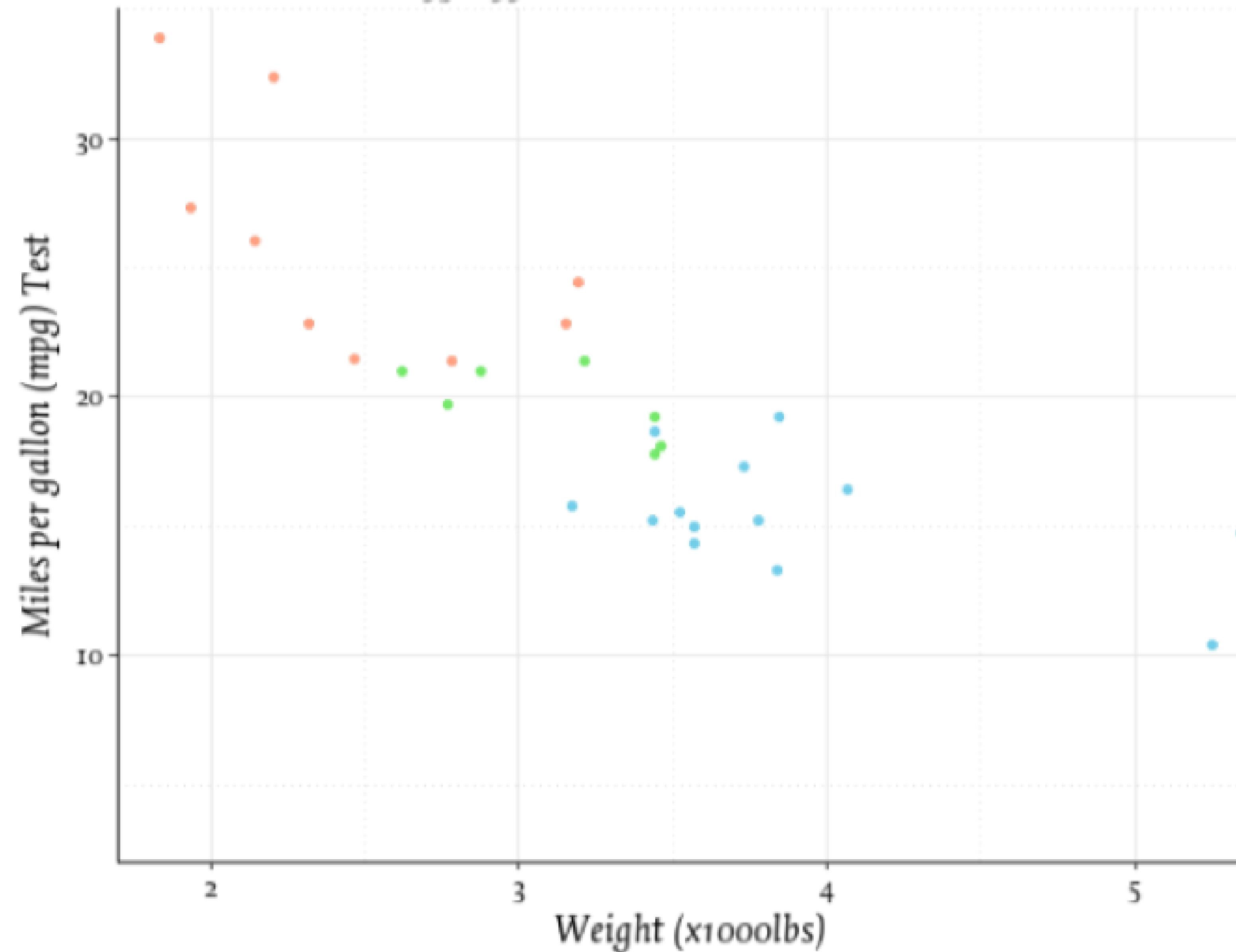


Position, size and emphasis

A final technique is to add extra emphasis to an element to cement its position at the top of the hierarchy – as seen in the use of colour above.

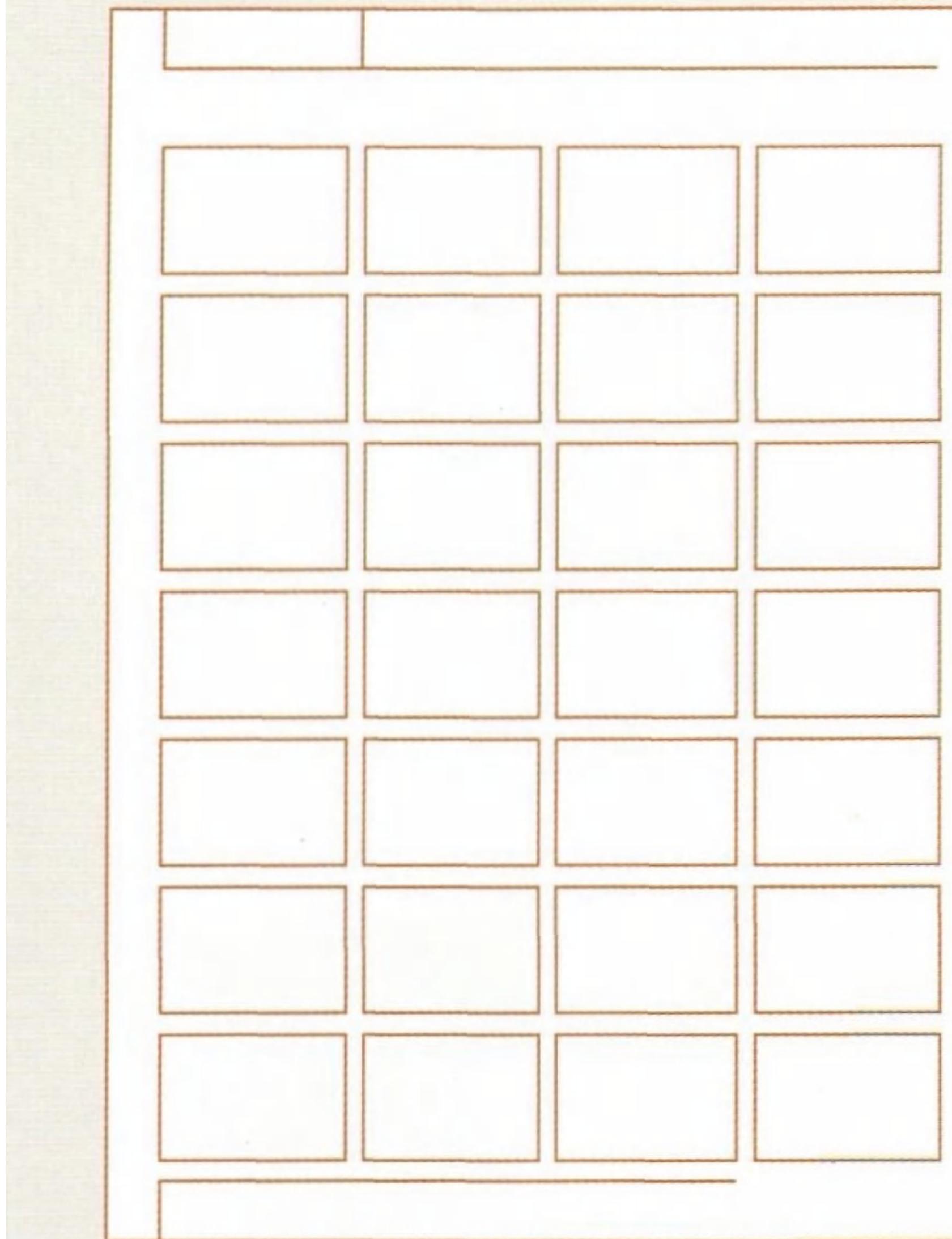
Weight vs Horsepower of Cars

Models built between 1952-1992



Visual consistency

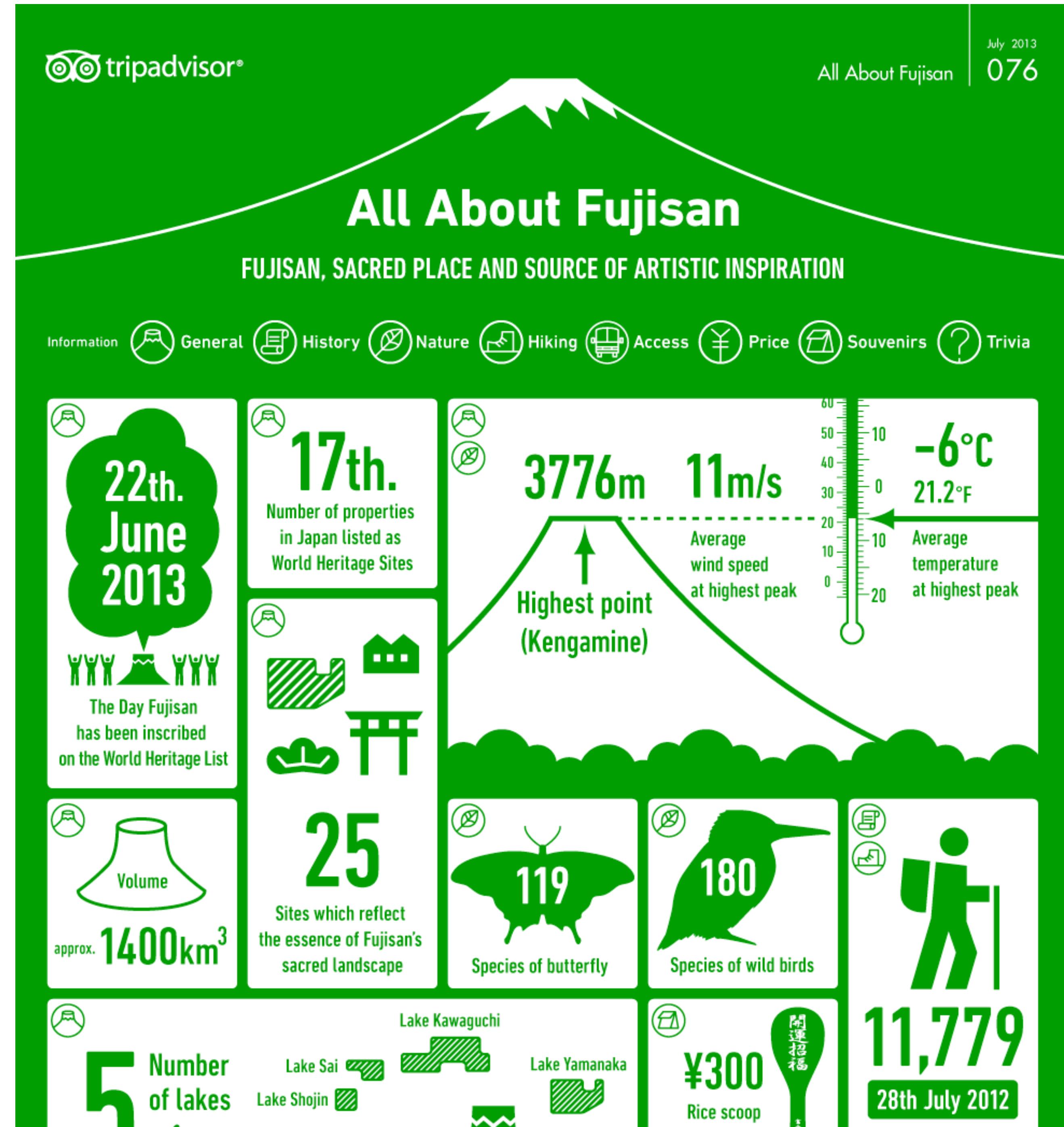
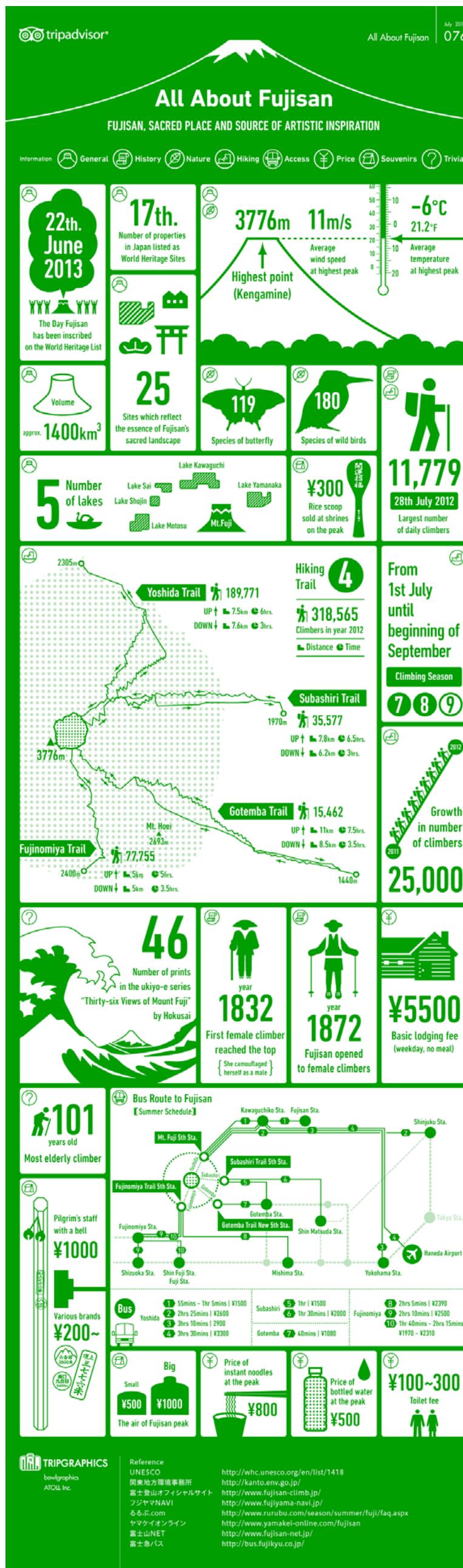
Repeated use of positions, sizes, and colors
makes information easier to understand



Visual conventions

Follow visual standards of the

format you are creating



A SIP OF SODA: HOW SOFT DRINKS IMPACT YOUR HEALTH

ASTHMA

Sodium benzoate, found in sodas, is used as a preservative (microbial control) in foods. Sodium preservatives add sodium to the diet and reduce the availability of potassium. Some reported reactions to sodium benzoate include recurring urticaria (rash), asthma, and eczema.

Each day 11 Americans die from asthma



The annual cost of asthma to the healthcare system is estimated to be nearly \$18 billion



KIDNEY ISSUES

Colas contain high levels of phosphoric acid, which has been linked to kidney stones and other renal problems.

You are more likely to get kidney stones if you are:



SUGAR OVERLOAD

Twenty minutes after drinking a soda, your blood sugar spikes, causing an insulin burst. Your liver responds to this by turning any sugar into fat.

Forty minutes later, caffeine absorption is complete. Your pupils dilate; your blood pressure rises; as a response, your liver dumps more sugar into your bloodstream. The adenosine receptors in your brain are now blocked, preventing drowsiness.

45 minutes later, your body ups your dopamine production, stimulating the pleasure centers of your brain. This is physically the same way heroin works, by the way.

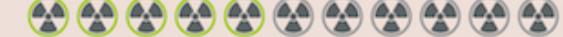
OBESITY

The relationship between soft drink consumption and body weight is so strong that researchers calculate that for each additional soda consumed, the risk of obesity increases 1.6 times.

70% of cardiovascular disease is related to obesity



42% of breast and colon cancer is diagnosed in obese individuals



30% of gall bladder surgery is related to obesity



DISSOLVES TOOTH ENAMEL

Sugar and acid in soft drinks easily dissolve tooth enamel. When tooth decay reaches the nerve, the root, and the area at the base of the tooth, the tooth may die and, if left untreated, an abscess can develop.

HEART DISEASE

Most soft drinks contain high fructose corn syrup, a sweetener that's recently come under considerable scrutiny. High fructose corn syrup has been associated with an increased risk of metabolic syndrome, a condition associated with an elevated risk of both diabetes and heart disease.

In 2006, more than one in every four deaths were caused by heart disease.



REPRODUCTIVE ISSUES

Soft drink cans are coated with a resin that contains BPA (bisphenol-A). This is the same cancer causing chemical found in plastic baby bottles, water bottles, and plastic containers that wreaks havoc on the endocrine system, potentially causing premature puberty and reproductive abnormalities.

99.9% of plastic bottles contain BPA.

OSTEOPOROSIS

Soft drinks contain phosphoric acid and a high phosphate diet has been associated with bone breakdown and an increased risk of osteoporosis. When phosphorus is excreted in the urine, it takes calcium with it, depriving the bones and the rest of the body of this important mineral.

Eighty percent of those affected by osteoporosis are women. Twenty percent are men.

INCREASED RISK OF DIABETES

Those who drink more soda have an 80% increased risk of developing Type 2 diabetes.

Approximately 1 in 10 health care dollars is spent on diabetes



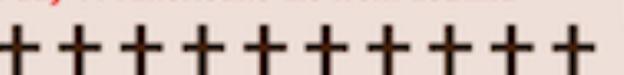
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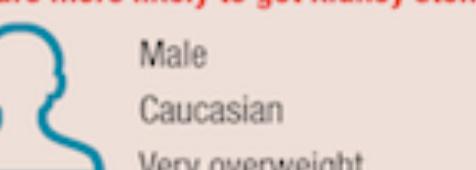
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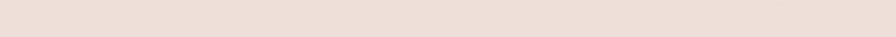
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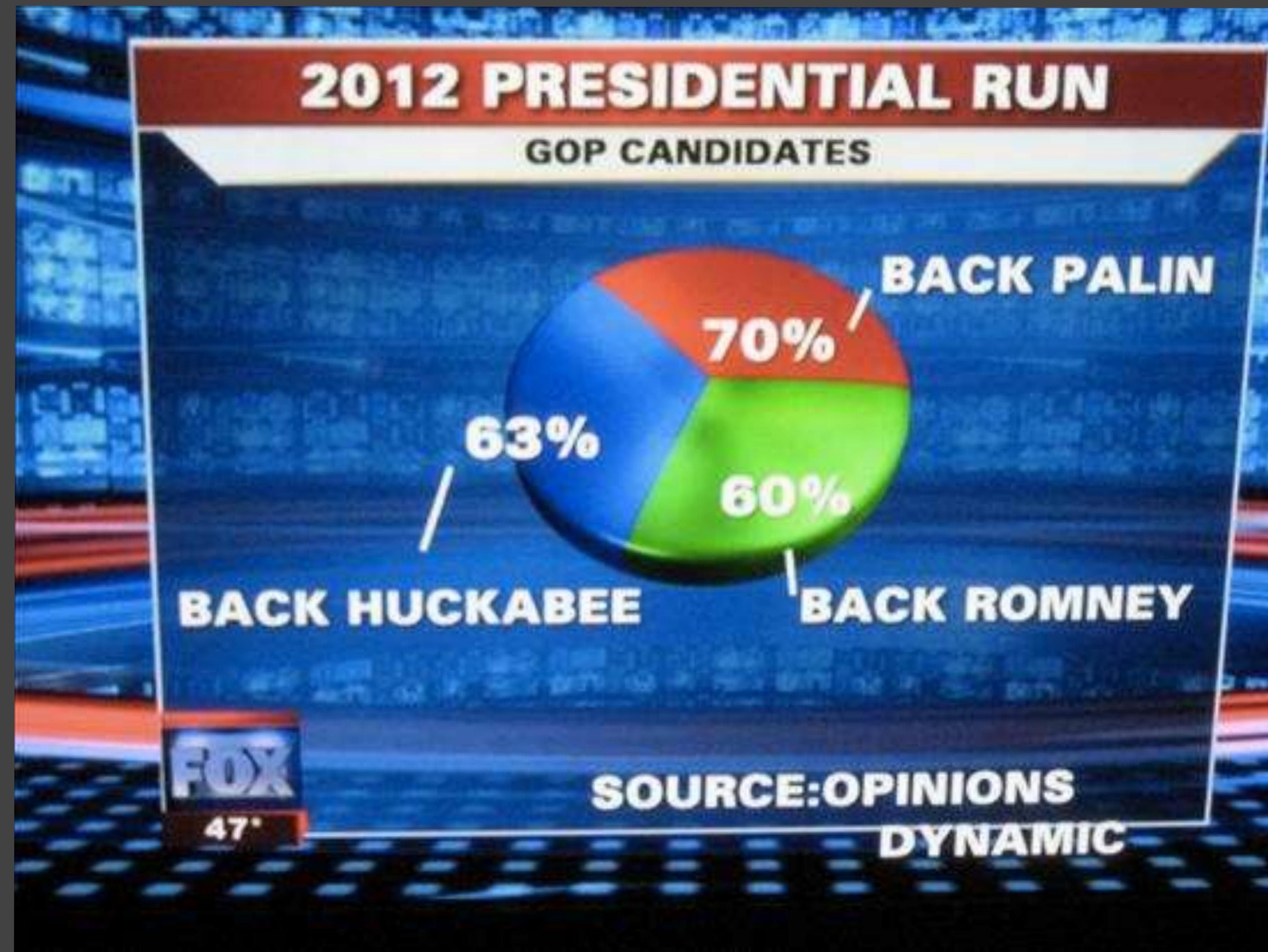


Sources: AssociatedContent.com | Waterforlifeusa.com | Ionizers.org | NYTimes.com | Helium.com | AAFA.org | KidneyFund.org | CDC.gov | Nutrition.Suite101.com | AmericanHeart.org | Chetday.com | NOF.org | Information provided by TermLifeInsurance.org

term
LIFE
insurance

Proportional ink

Visualized data points do not take more ink
proportionally than the numbers
they represent



Simplicity

As few visual details as necessary

Less colors, less lines, less effects

