Supporting a Balanced, Modern and Ready Nation

Data Visualization

MORS CSAP

Tuesday, March 11, 2025

Walt DeGrange

Agenda

Selecting Graphics

- Instruction

Creating Graphics in Excel

- Instruction
- Guided practice / check for understanding
- Independent Practice & Assessment

Critique

- Guided practice / check for understanding

Selecting a graphic – considerations

- What story do you want to tell?
- Who is the audience?
- What types of data and limitations are you working with?

What is the goal of the visualization?

Precision

Show data in which **exact values** are important

Start with a table

Add formatting and sparklines to embed additional information

Relationship

Explore the **relationship** between variables

Start with a scatter plot

Play with color or size to show more information

Distribution

Explore the **distribution** of a variable– how a variable is dispersed / spread

Start with a histogram

For an alternate representation, try showing data in a box or violin plot

Composition

Explain composition / **parts of a whole**

Start with a bar plot

For an alternate representation or the display of subgroups, try showing data in a tree map. Use pie charts with care.

Show composition over time with a stacked area plot

Comparison

Compare multiple variables or multiple categories within a single variable

Start with a bar or line plot

Precision

- Exact values and underlying data are important
- Diverse audience – each viewer may want to explore different facets of data in detail

Top Ten Most Visited National Parks

Park Name	Total Visitors	Visitors 1904 - 2016
Golden Gate	611,031,225	
Natchez Trace	443,145,232	
Lake Mead	411,700,377	
George Washington Memorial Parkway	330,201,962	
Gateway	329,664,174	
Colonial	282,420,671	
Lincoln Memorial	238,620,382	
National Capital Parks	236,187,845	
Cape Cod	236,090,520	
Grand Canyon	205,486,894	

Precision – Tables

- Do:
  - Format! Apply color, font, and sparklines to help the user interpret data quickly
- Don't:
  - Skip comparison to other graphic representations. Make sure tables are used with care

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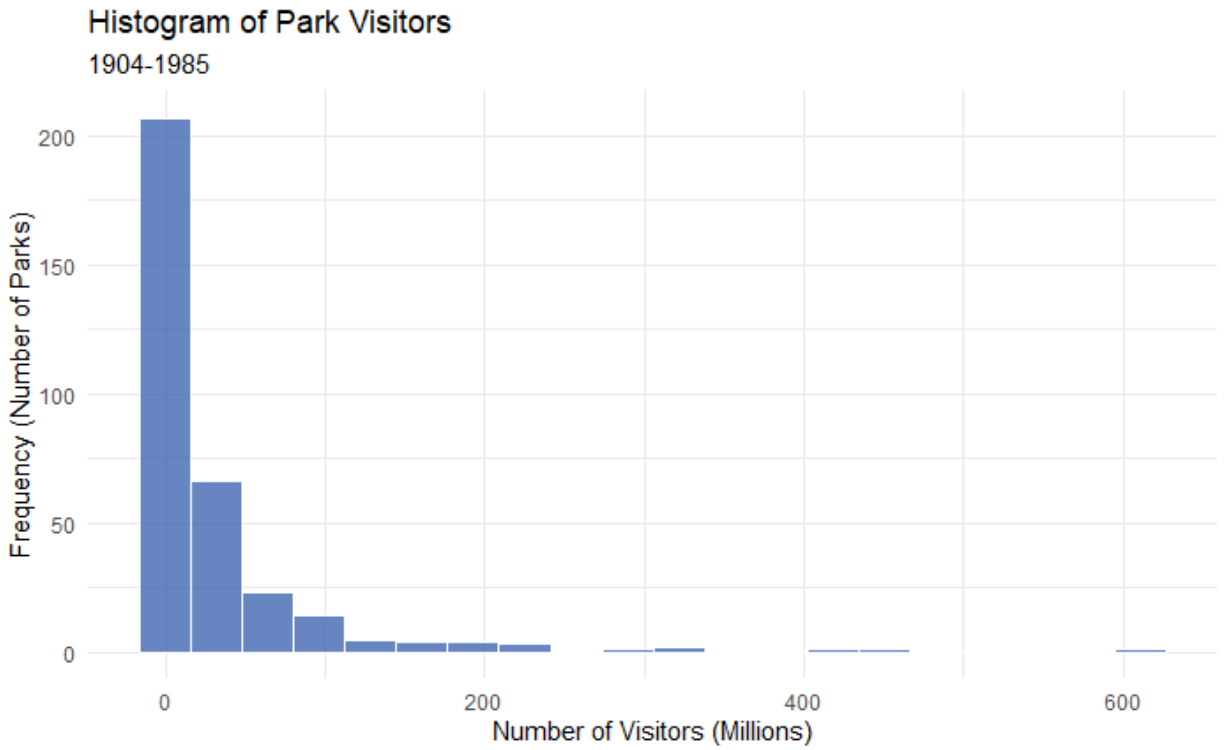
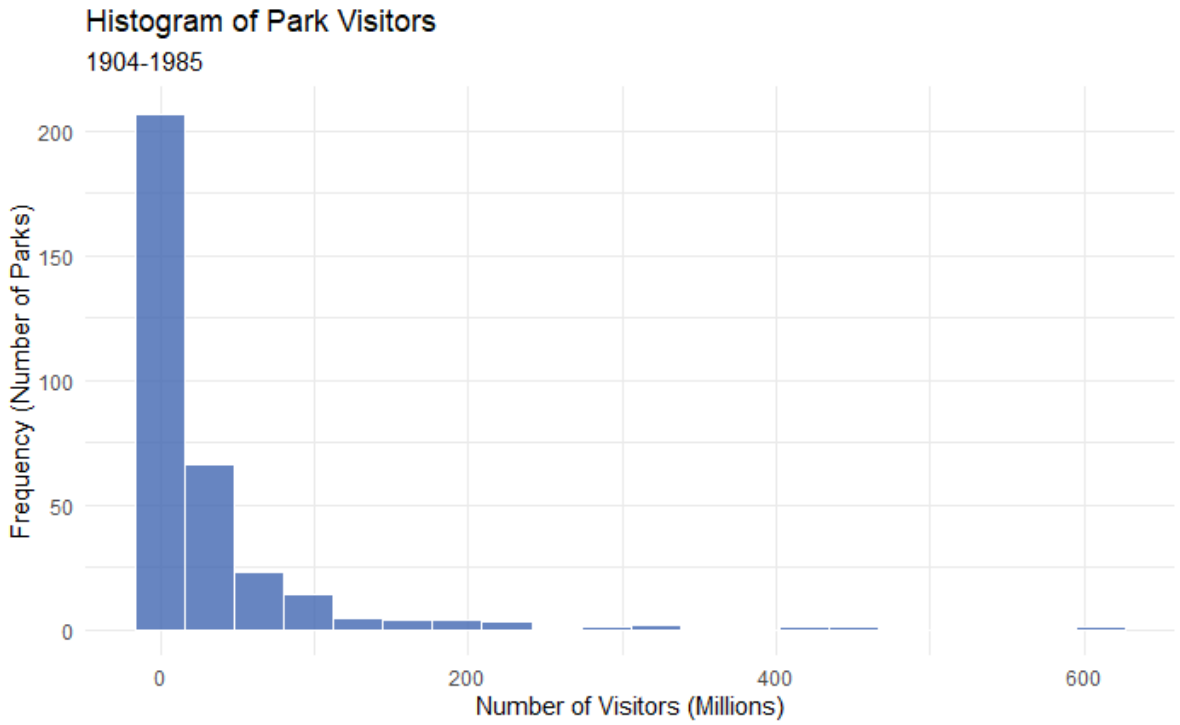
Distribution

- Explore the frequency distribution (shape) of a set of continuous data
- For one field, use a histogram
- To provide more information, try a box or violin plot



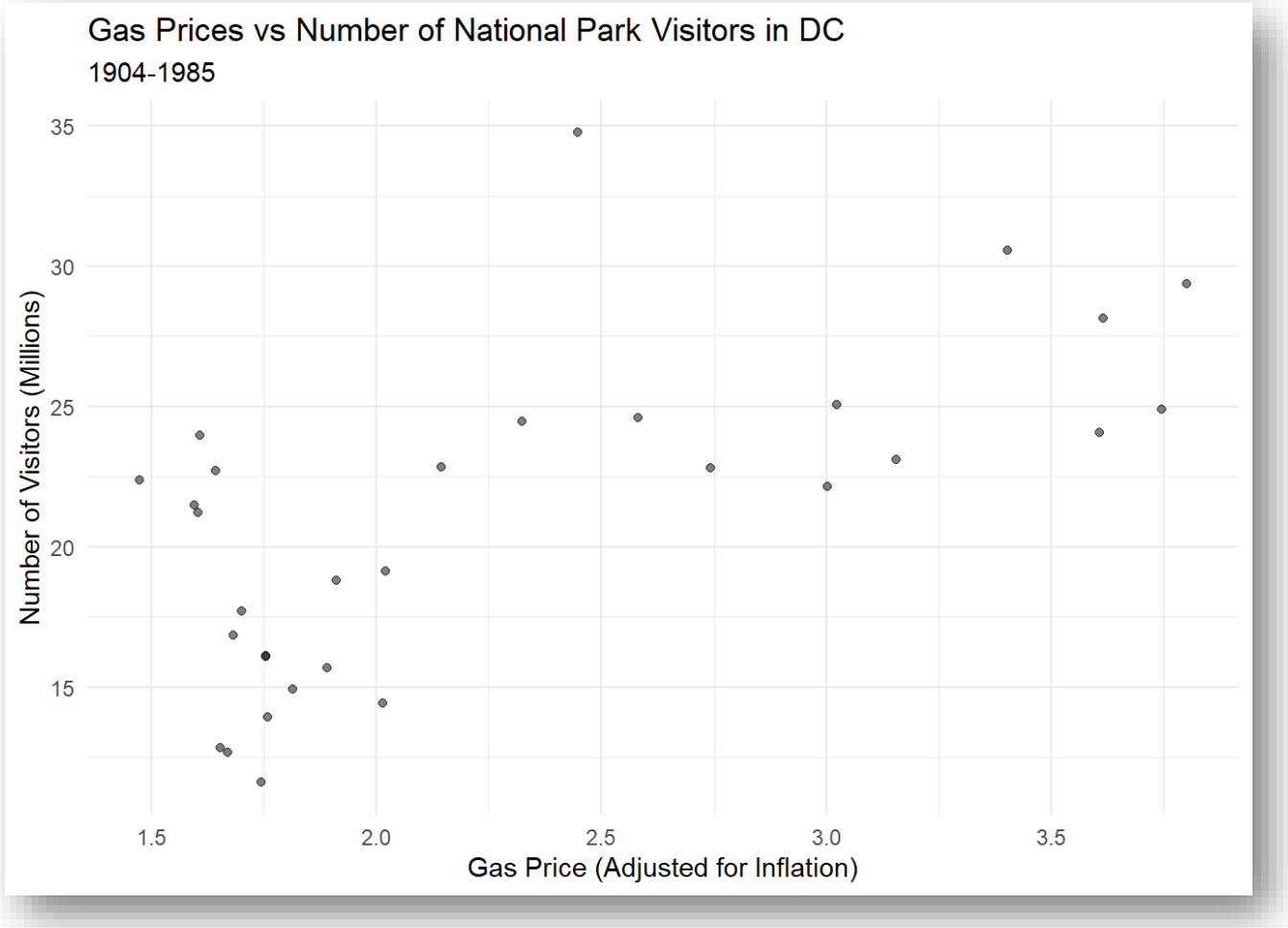
Distribution – Histogram

- Do:
  - Select the bin size to best show the shape of the data
- Don't:
  - Create bins of different sizes



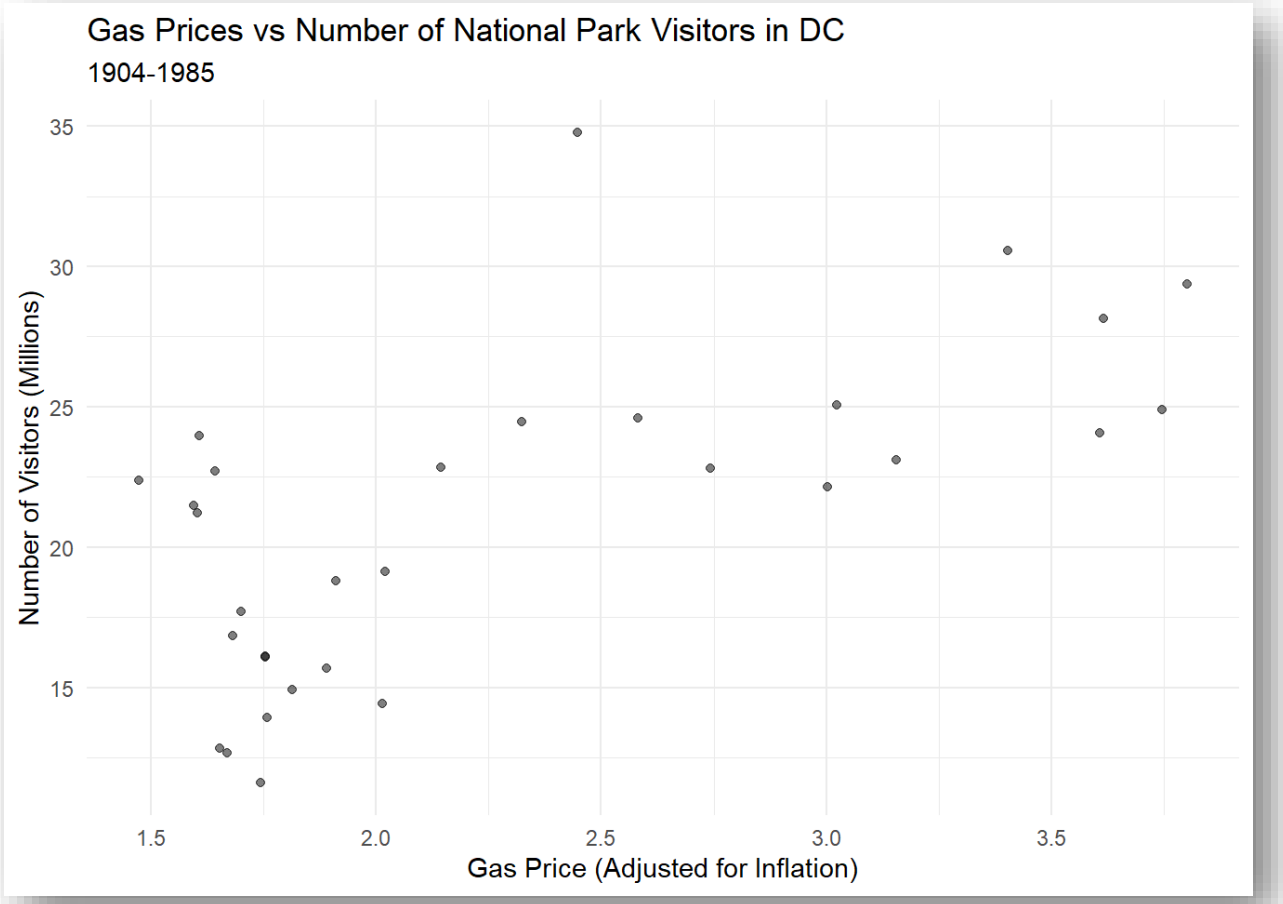
Relationship

- Show relationship between numerical variables



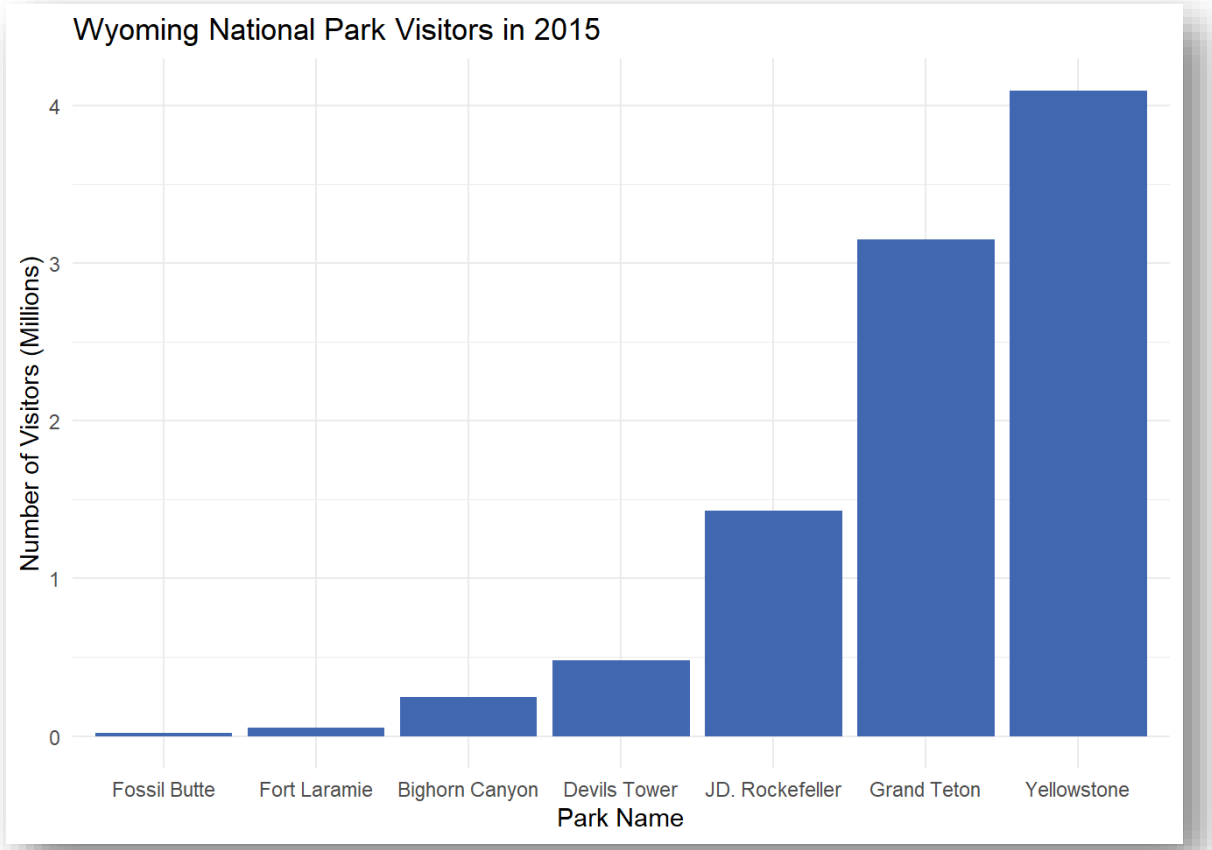
Relationship – Scatter Plot

- Do:
  - Use to plot relationship between numerical variables
- Don't:
  - Use a single scatterplot for three or more variables → Use multiple scatterplots instead



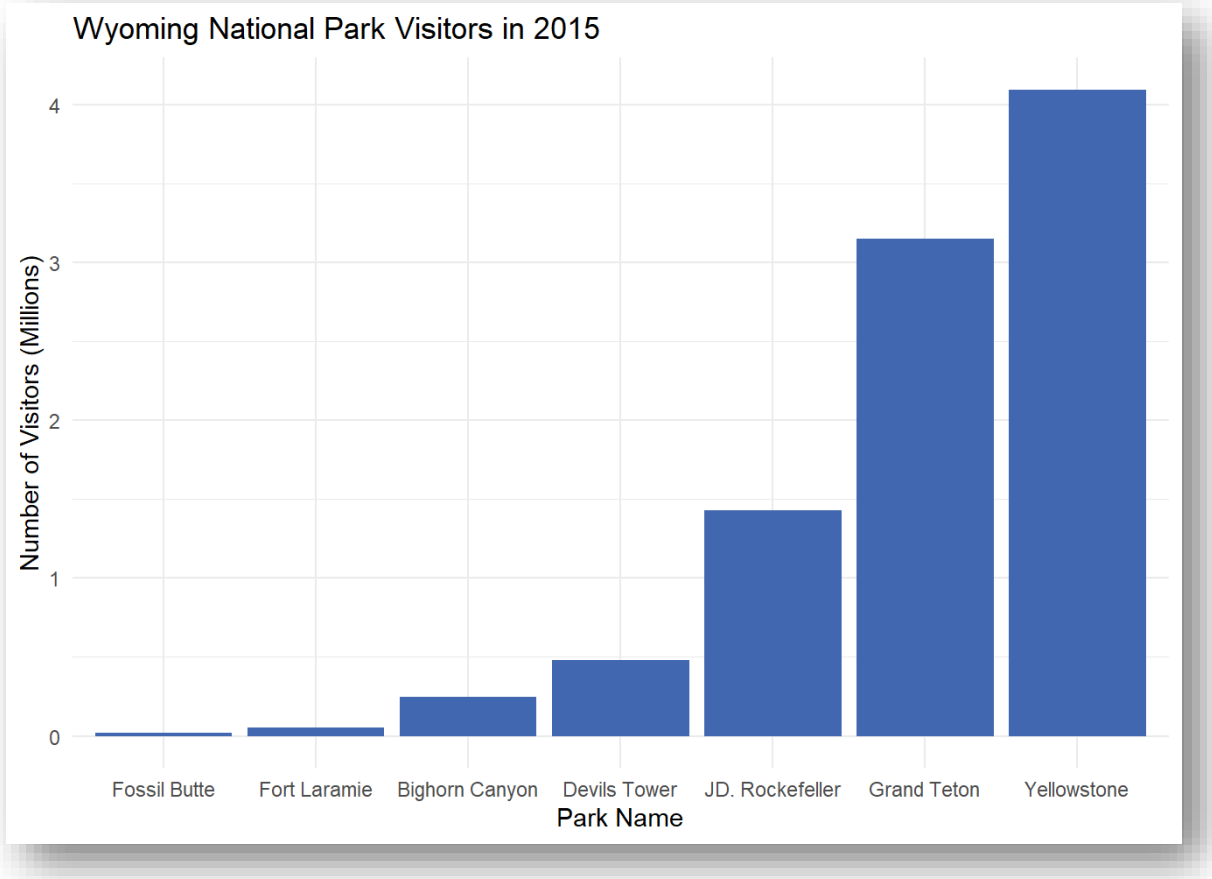
Comparison

- Perform a comparison among items or over time
- Bar plots and line charts are useful comparison tools



Comparison – Bar Plot

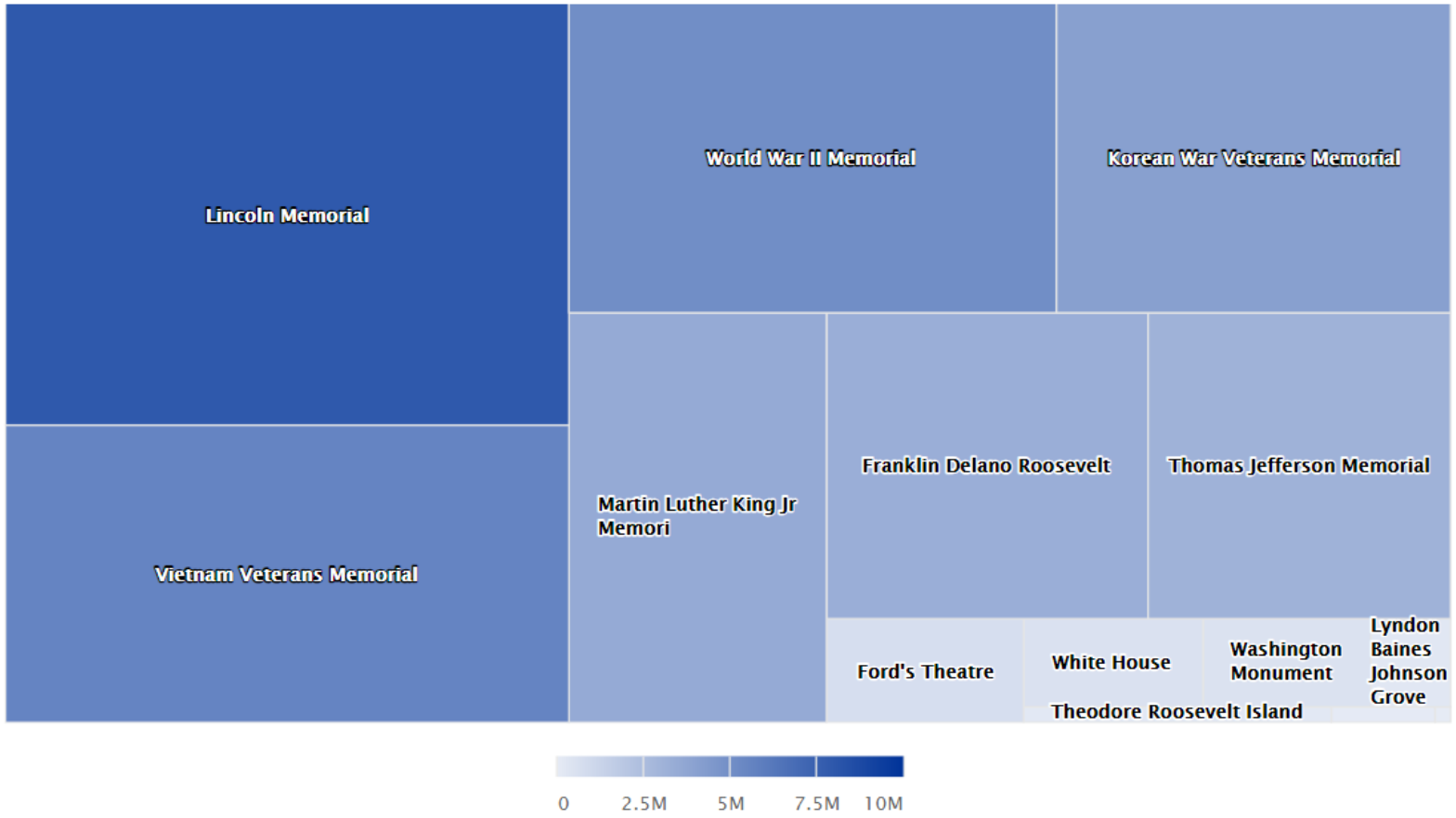
- Do:
  - Use to present comparisons of categorical data
- Don't:
  - Use to present relationships between numerical data



Composition

- Parts of a whole
- Visuals to consider:
  - Pie Charts
  - Tree Maps
  - Area Charts

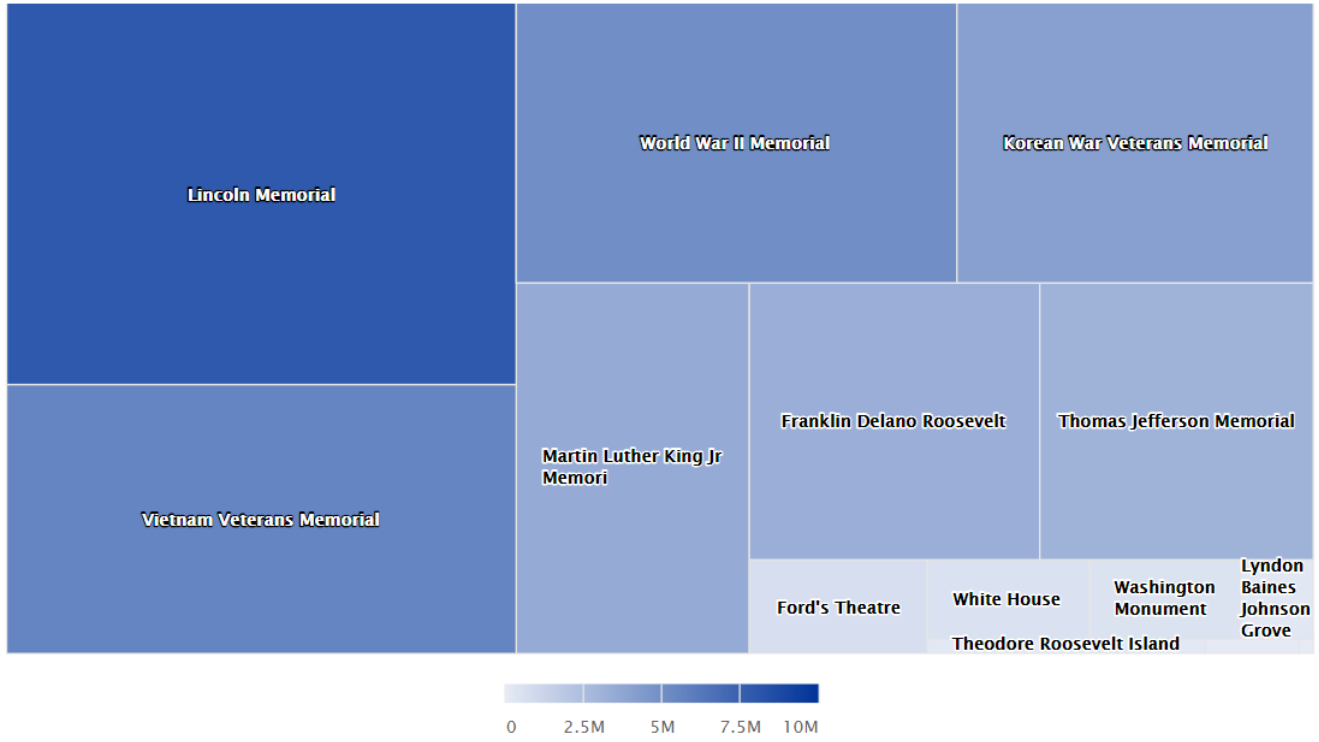
DC Park Visits in 2015

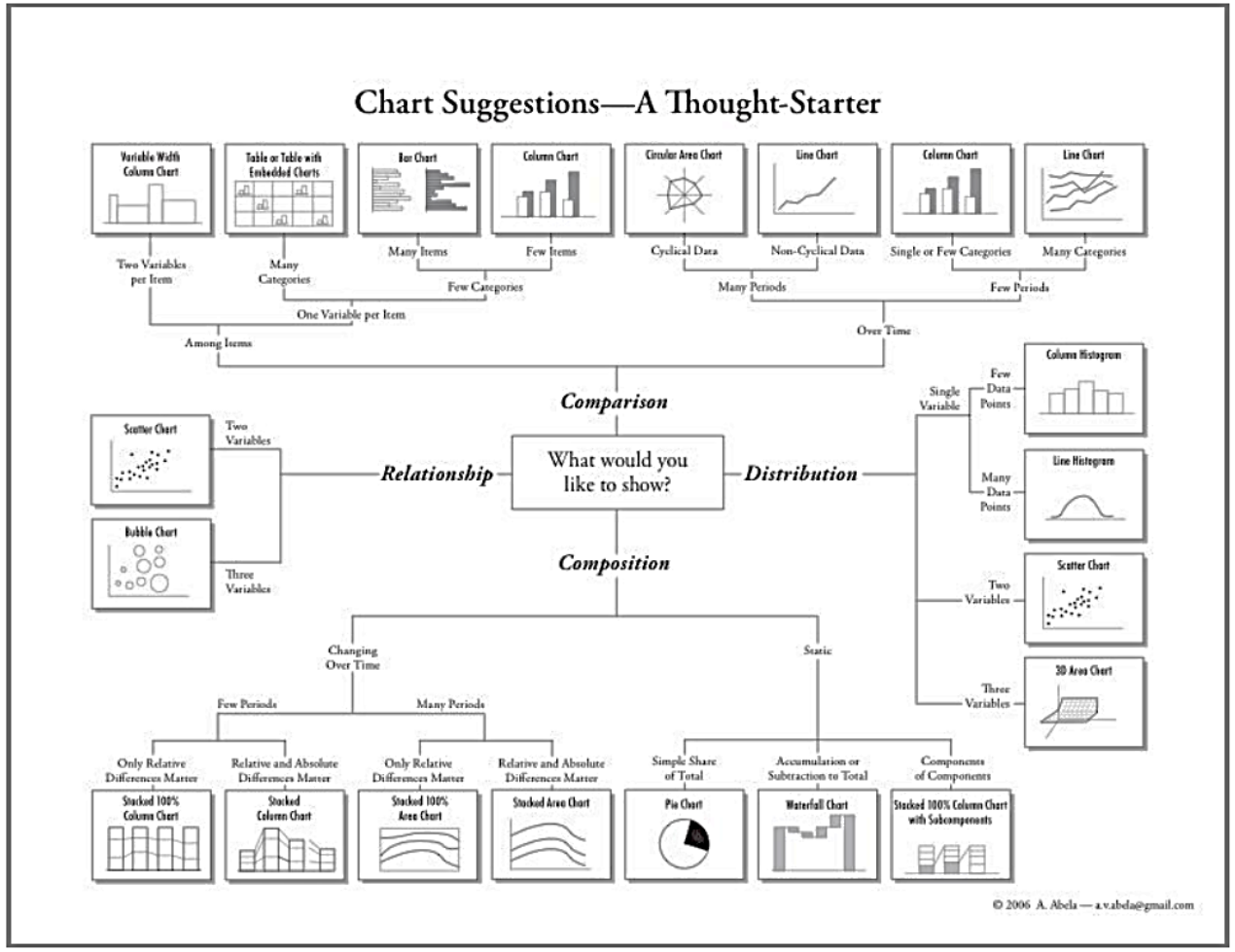


Composition – Tree Map

- Do:
  - Use tree maps for static data
  - Use color to represent groups and subgroups
- Don't:
  - Use with data with many categories

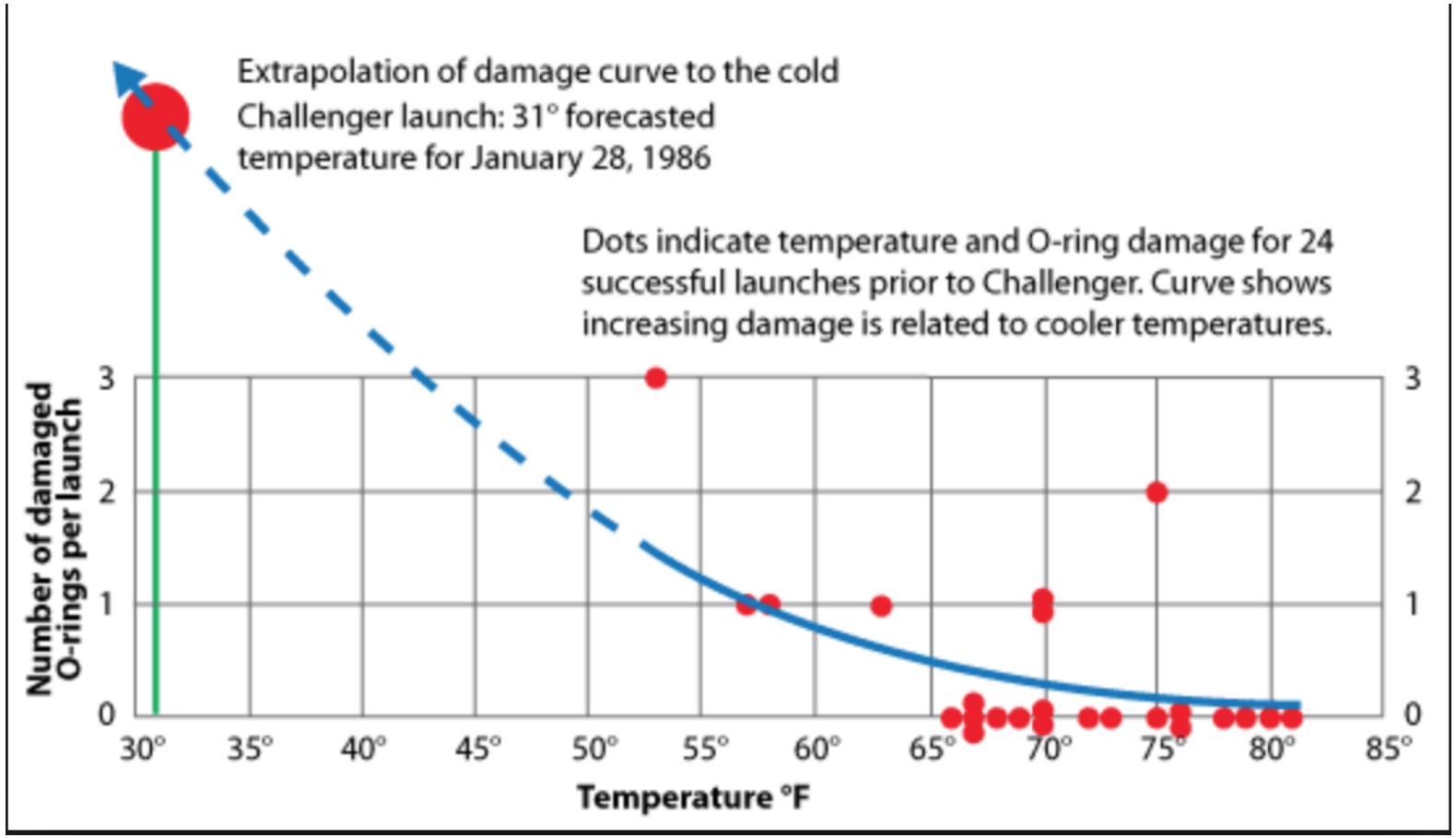
DC Park Visits in 2015





- We looked a just a few examples today. There are many more graphics to explore!

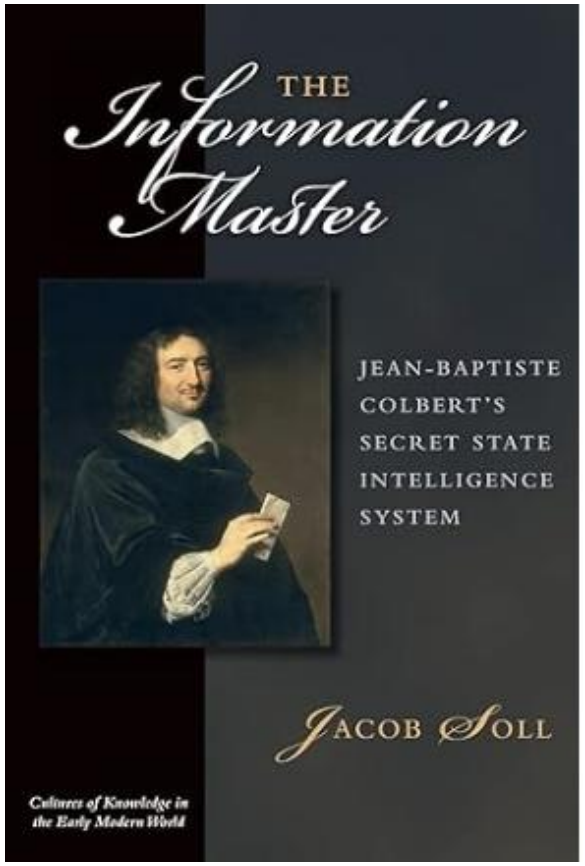
History of Data Visualization

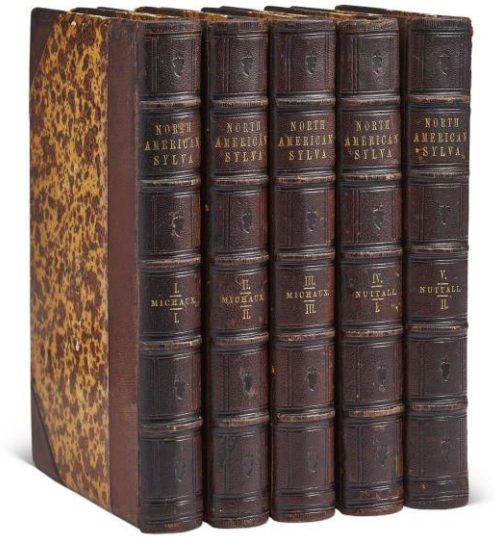


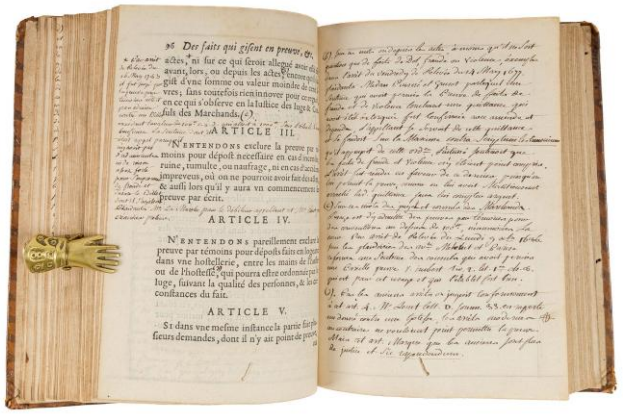
Challenger astronauts Ellison Onizuka (top row, from left), Christa McAuliffe, Gregory Jarvis, Judith Resnik, Michael J. Smith (bottom row, from left), Francis R. (Dick) Scobee and Ronald E. McNair likely struggled in vain to prevent their doom after surviving the initial shuttle explosion.

1986 - Rogers Commission Report

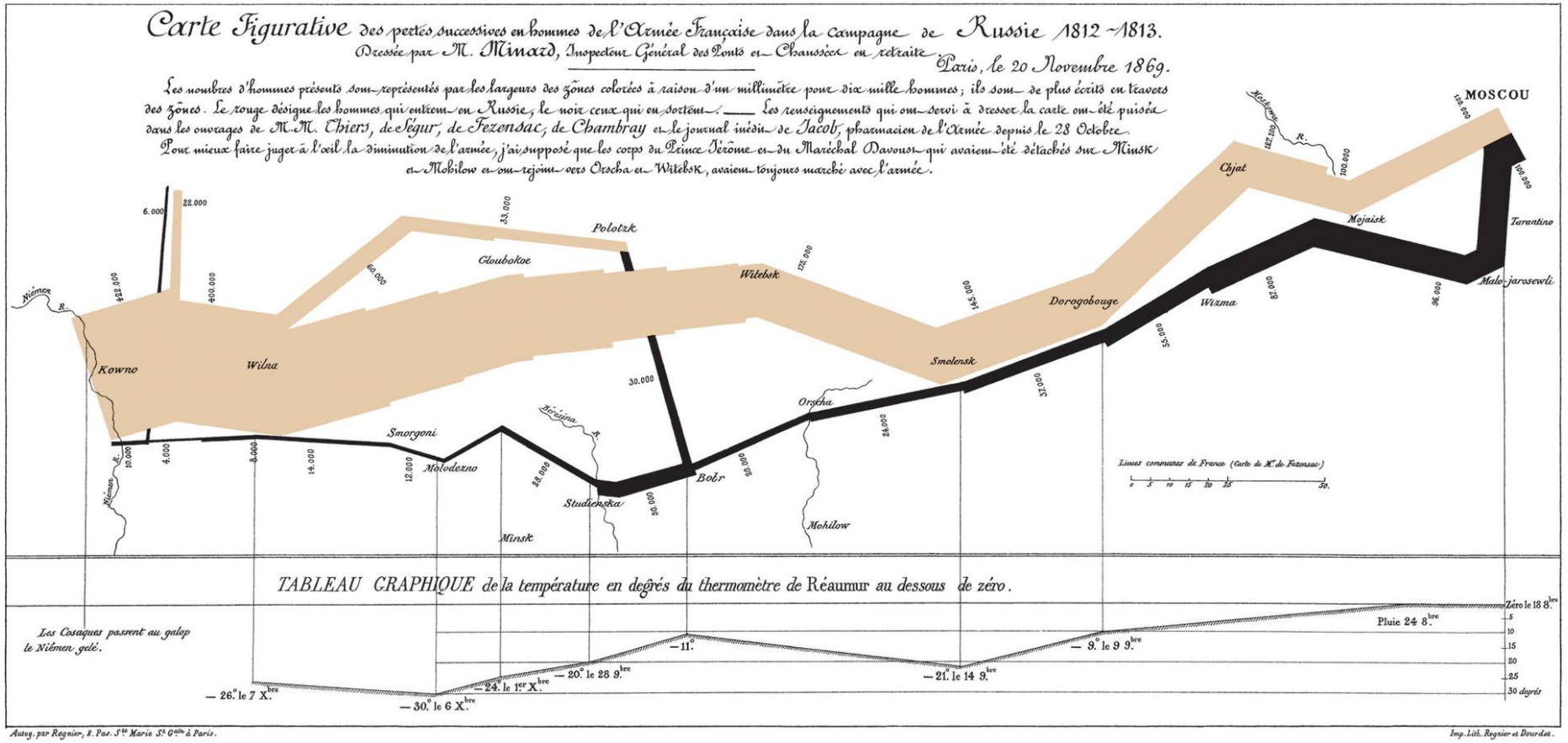
Putting Data in Context and Supporting Decisions



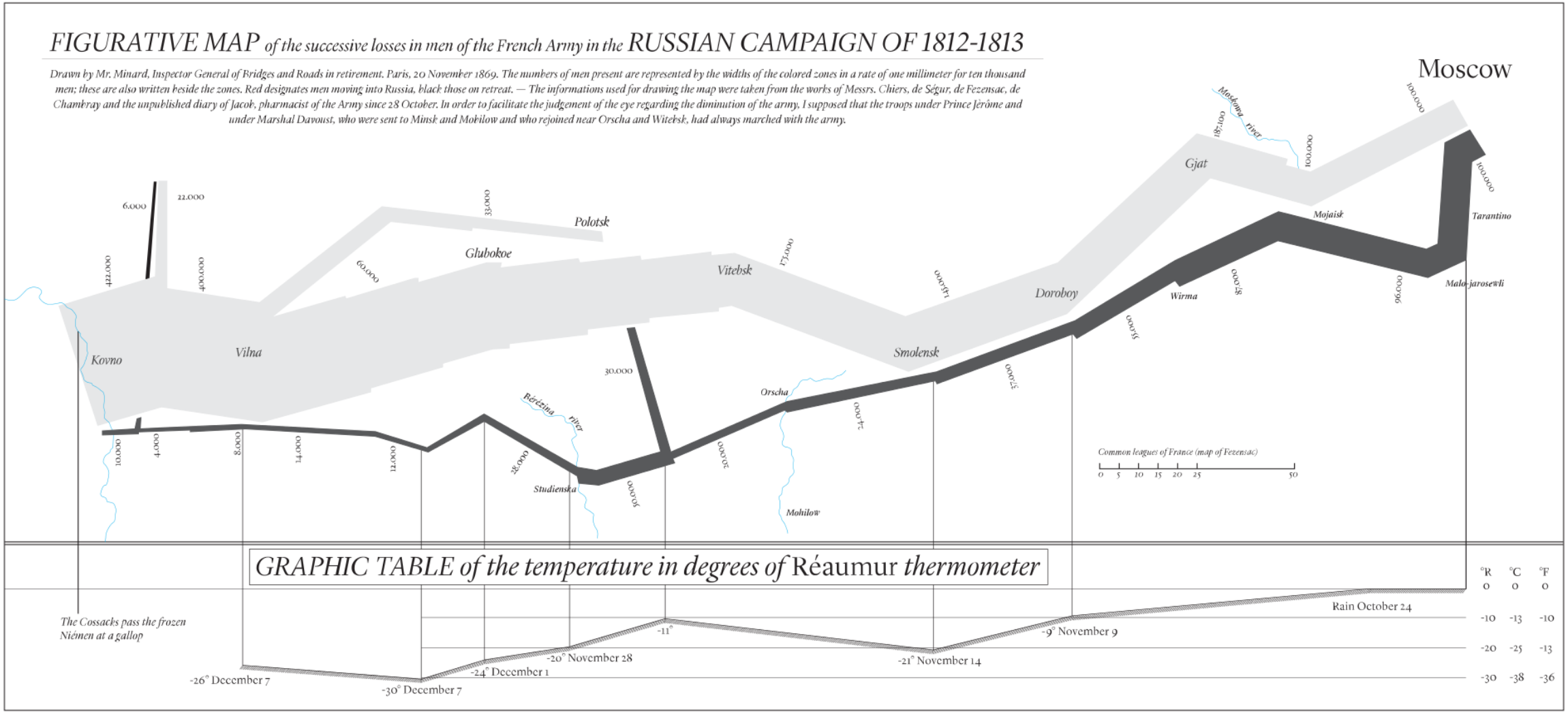




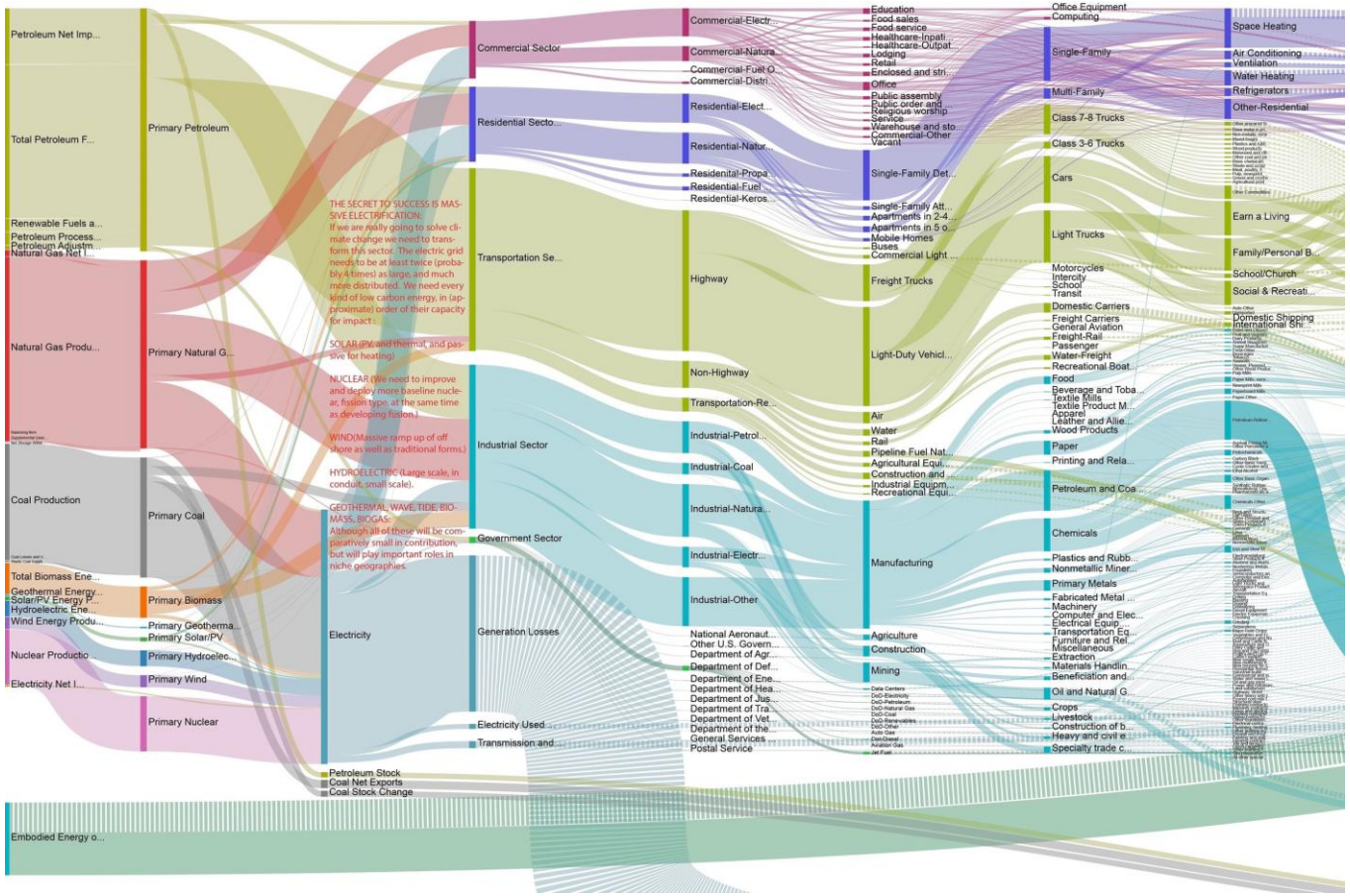
First Minister of State (1661-1683)
Comptroller-General of Finances (1665-1683)
Secretary of state of the navy (1668-1683)



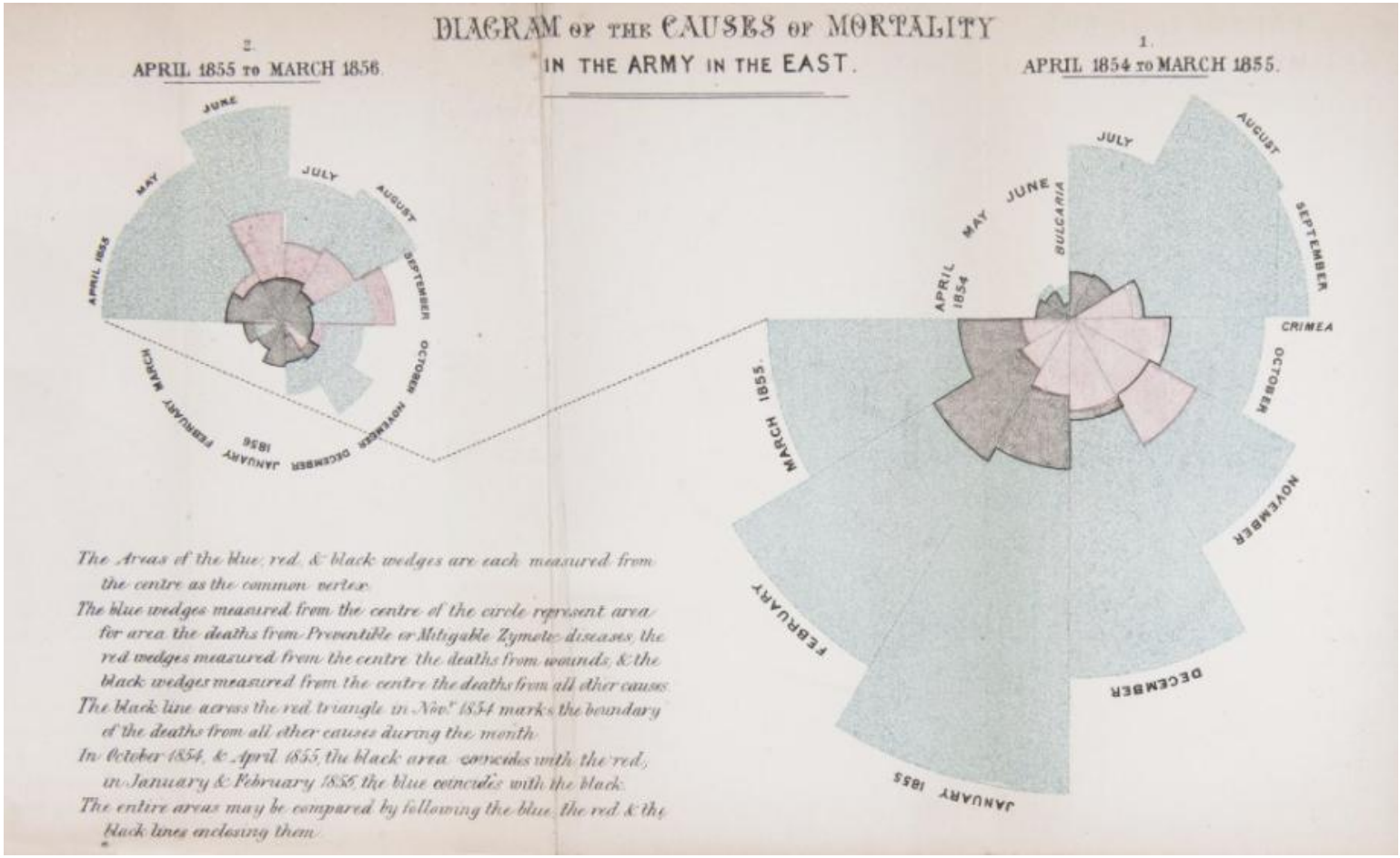
1869 - [Charles Joseph Minard]


FIGURATIVE MAP of the successive losses in men of the French Army in the RUSSIAN CAMPAIGN OF 1812-1813
Drawn by Mr. Minard, Inspector General of Bridges and Roads in retirement. Paris, 20 November 1869. The numbers of men present are represented by the widths of the colored zones in a rate of one millimeter for ten thousand men; these are also written beside the zones. Red designates men moving into Russia, black those on retreat. — The informations used for drawing the map were taken from the works of Messrs. Chiers, de Ségur, de Fezensac, de Chambray and the unpublished diary of Jacob, pharmacist of the Army since 28 October. In order to facilitate the judgement of the eye regarding the diminution of the army, I supposed that the troops under Prince Jérôme and under Marshal Davoust, who were sent to Minsk and Mohilow and who rejoined near Orscha and Witebsk, had always marched with the army.
Moscow
Gjat
Mojaisk
Tarantino
Malo-jarosewli
Wirma
Doroboy
Smolensk
Orscha
Vitebsk
Glubokoe
Polotsk
Kovno
Vilna
Studienska
Mohilow
Moskowa river
Bérézina river
Common leagues of France (map of Fezensac)
0 5 10 15 20 25 50
GRAPHIC TABLE of the temperature in degrees of Réaumur thermometer
°R °C °F
0 0 0
-10 -13 -10
-20 -25 -13
-30 -38 -36
The Cossacks pass the frozen Niémen at a gallop
-26° December 7
-30° December 7
-24° December 1
-20° November 28
-11°
-21° November 14
-9° November 9
Rain October 24

Supporting a Balanced, Modern and Ready Nation

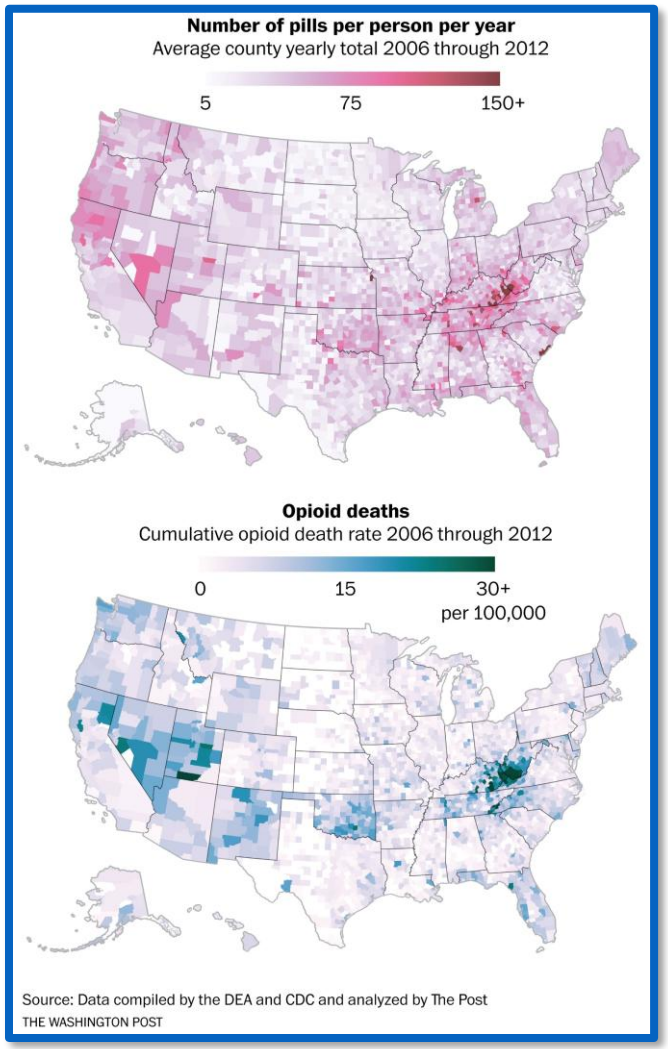


https://www.otherlab.com/blog-posts/us-energy-flow-super-sankey



Science Museum. “Florence Nightingale: The Pioneer Statistician.” Accessed October 20, 2021. https://www.sciencemuseum.org.uk/objects-and-stories/florence-nightingale-pioneer-statistician.

1858 - John Snow



NCHS Data Brief, Number 395, December 2020

Data table for Figure 4. Number of deaths, percentage of total deaths, and age-adjusted death rates for the 10 leading causes of death in 2019: United States, 2018 and 2019

Rank[1]	Cause of death (based on *International Classification of Diseases, 10th Revision* [ICD–10])		2018 Number	2018 Percent	2018 Rate[2]	2019 Number	2019 Percent	2019 Rate[2]
…	All causes		2,839,205	100.0	723.6	2,854,838	100.0	715.2
1	Diseases of heart	(I00–I09,I11,I13,I20–I51)	655,381	23.1	163.6	659,041	23.1	161.5
2	Malignant neoplasms	(C00–C97)	599,274	21.1	149.1	599,601	21.0	146.2
3	Accidents (unintentional injuries)	(V01–X59,Y85–Y86)	167,127	5.9	48.0	173,040	6.1	49.3
4	Chronic lower respiratory diseases	(J40–J47)	159,486	5.6	39.7	156,979	5.5	38.2
5	Cerebrovascular diseases	(I60–I69)	147,810	5.2	37.1	150,005	5.3	37.0
6	Alzheimer disease	(G30)	122,019	4.3	30.5	121,499	4.3	29.8
7	Diabetes mellitus	(E10–E14)	84,946	3.0	21.4	87,647	3.1	21.6
8	Nephritis, nephrotic syndrome and nephrosis	(N00–N07,N17–N19,N25–N27)	51,386	1.8	12.9	51,565	1.8	12.7
9	Influenza and pneumonia	(J09–J18)	59,120	2.1	14.9	49,783	1.7	12.3
10	Intentional self-harm (suicide)	(*U03,X60–X84,Y87.0)	48,344	1.7	14.2	47,511	1.7	13.9
…	All other causes	(residual)	744,312	26.2	…	758,167	26.6	…

… Category not applicable.
*Code not included in ICD–10.
[1]Based on number of deaths.
[2]Deaths per 100,000 U.S. standard population.
SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

https://www.washingtonpost.com/graphics/2019/investigations/opioid-pills-overdose-analysis/

76 billion opioid pills: Newly released federal data unmasks the epidemic

10 biggest prescription opioid distributors, 2006-2012

DISTRIBUTOR	NUMBER OF PILLS	MARKET SHARE
McKesson Corp.	14,107,192,480	18.4%
Walgreens	12,636,815,170	16.5%
Cardinal Health	10,709,959,627	14.0%
AmerisourceBergen	8,952,844,625	11.7%
CVS	5,909,410,160	7.7%
Walmart	5,255,663,660	6.9%
Smith Drug Co.	1,348,619,950	1.8%
Rite Aid	1,314,386,010	1.7%
Kroger	1,231,379,170	1.6%
H. D. Smith	1,142,193,715	1.5%

States with most prescription opioids per person, 2006-2012

STATE	TOTAL PILLS	ANNUAL PILLS/PERSON
West Virginia	853,486,419	67
Kentucky	1,901,662,933	63
South Carolina	1,832,404,451	58
Tennessee	2,519,779,625	58
Nevada	1,002,583,755	55
Oklahoma	1,403,265,597	54
Alabama	1,703,752,770	52
Oregon	1,336,351,877	51
Indiana	2,123,674,419	47
Delaware	276,177,276	45

10 biggest prescription opioid manufacturers, 2006-2012

MANUFACTURER	NUMBER OF PILLS	MARKET SHARE
SpecGx	28,863,435,081	37.7%
Actavis Pharma	26,476,395,830	34.6%
Par Pharmaceutical	11,996,780,871	15.7%
Purdue Pharma	2,492,496,319	3.3%
Amneal Pharmaceuticals	2,257,973,121	2.9%
Teva Pharmaceuticals USA	686,276,053	0.9%
KVK Tech	580,825,207	0.8%
West-Ward Pharmaceuticals	384,200,988	0.5%
Kaiser Foundation Hospitals	366,492,050	0.5%
Endo Pharmaceuticals	297,306,324	0.4%

Learn More

- Alexander, M., Kusleika, R. and Walkenbach, J. **Excel 2019 Bible**. Wiley Press. 2018.
- "The Information Master: Jean-Baptiste Colbert's Secret State Intelligence System (Cultures Of Knowledge In The Early Modern World): Soll, Jacob: 9780472034642: Amazon.Com: Books." https://www.amazon.com/dp/0472034642?ref=ppx_yo2ov_dt_b_fed_asin_title.