



Pie Charts and Other Chart Types

Adapted for CNIT 5700
Presented by Vetria L. Byrd
Assistant Professor
Computer Graphics Technology

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@HighVizAbility



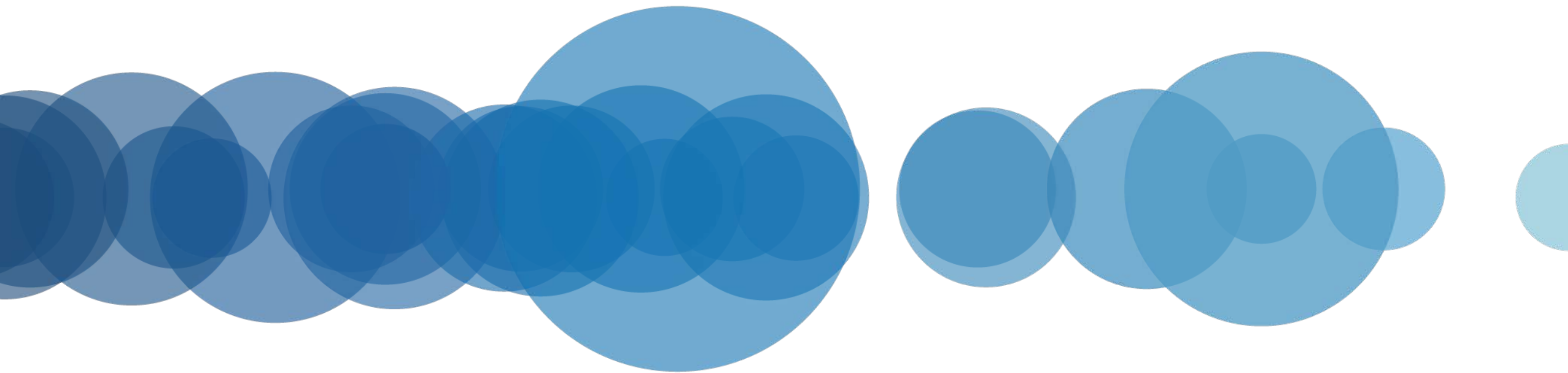
Goals

By completing the course modules, students will:

- Learn basic chart types
- Learn how chart types encode data and how they can be used
- Discuss problems with various chart types
- See examples of various chart types through compare and contrast



Chart Types



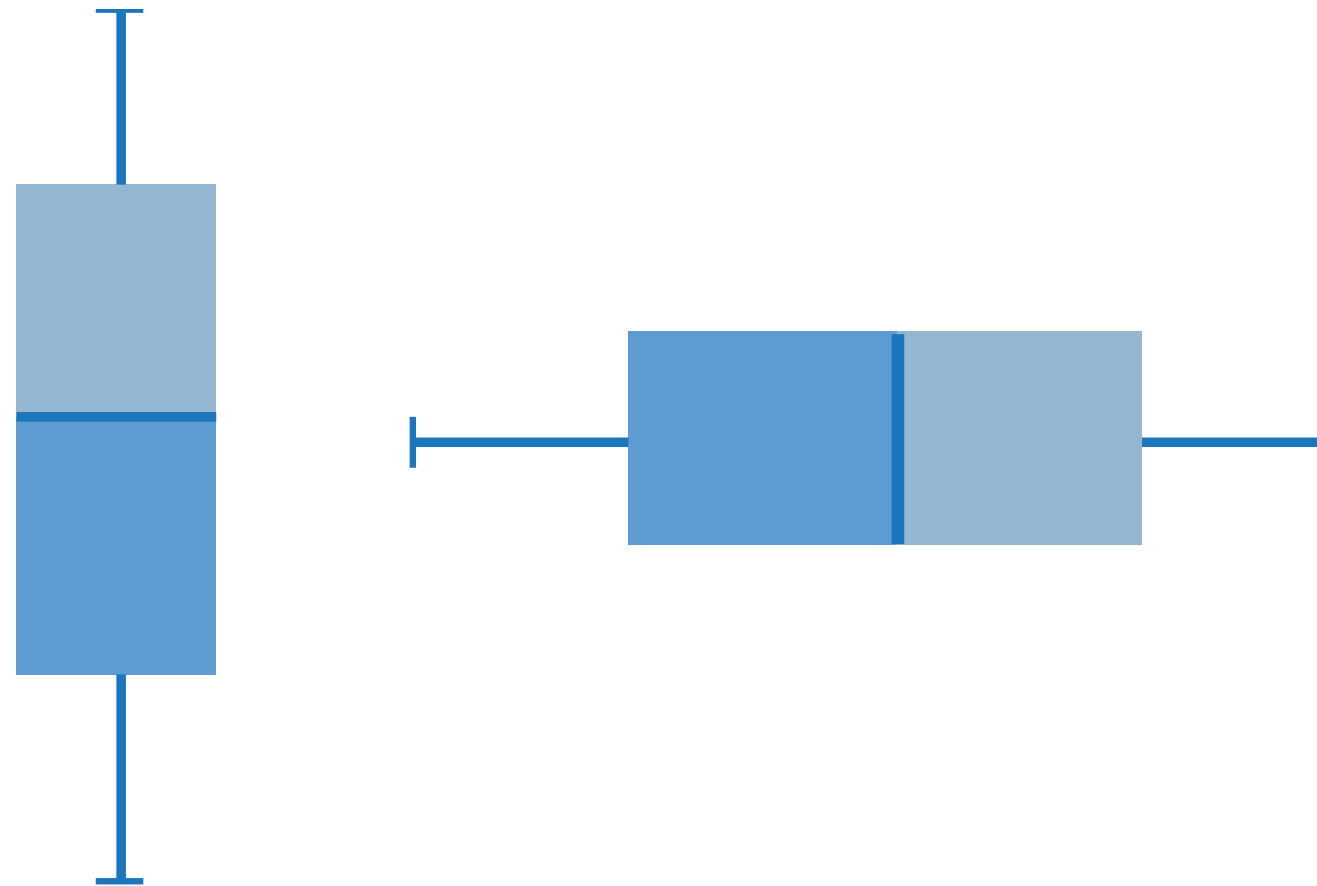
Bar Chart

encodes data using height/length of bar and shows categorical comparisons.



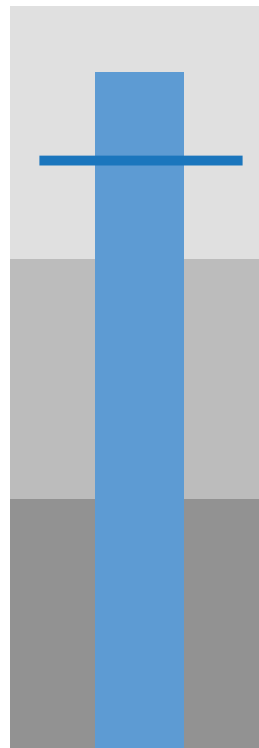
Box Plot

encodes data using position and height/length to show the distribution of the data.



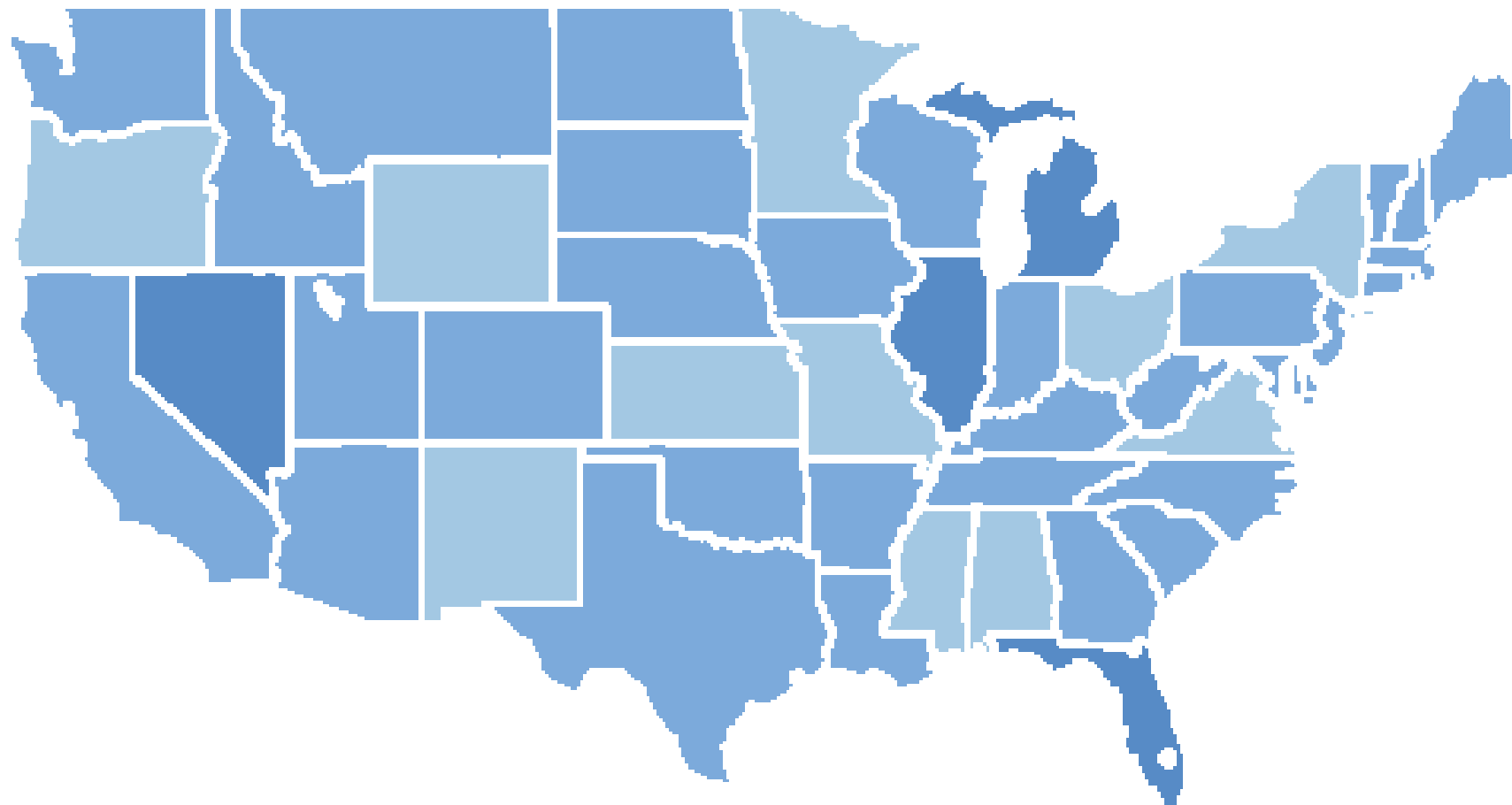
Bullet Graph

encodes data using length/height, position and color to show actual compared to target and performance bands.



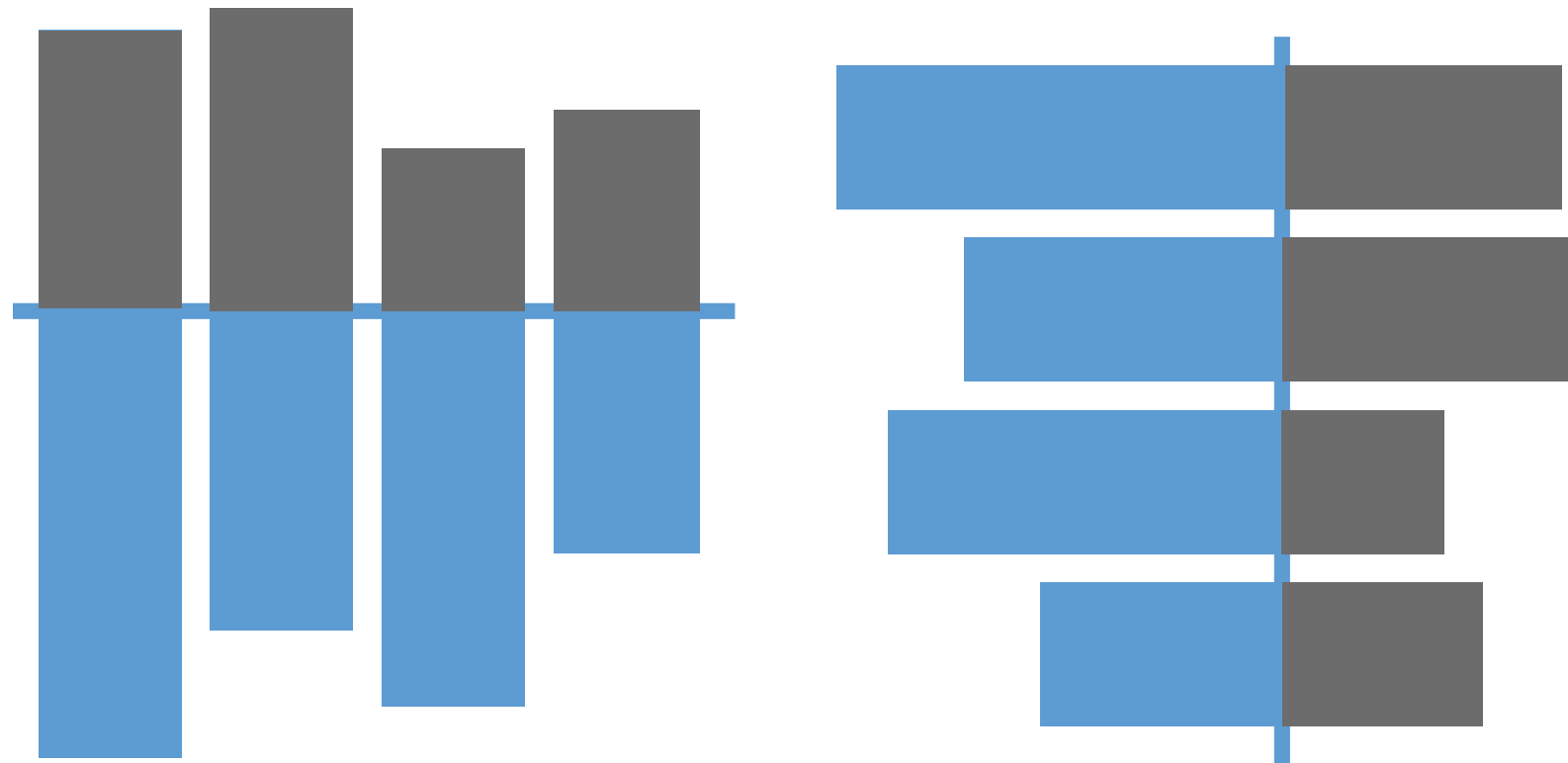
Choropleth Map (Shaded Map)

encodes data using color and position to show data geographically.



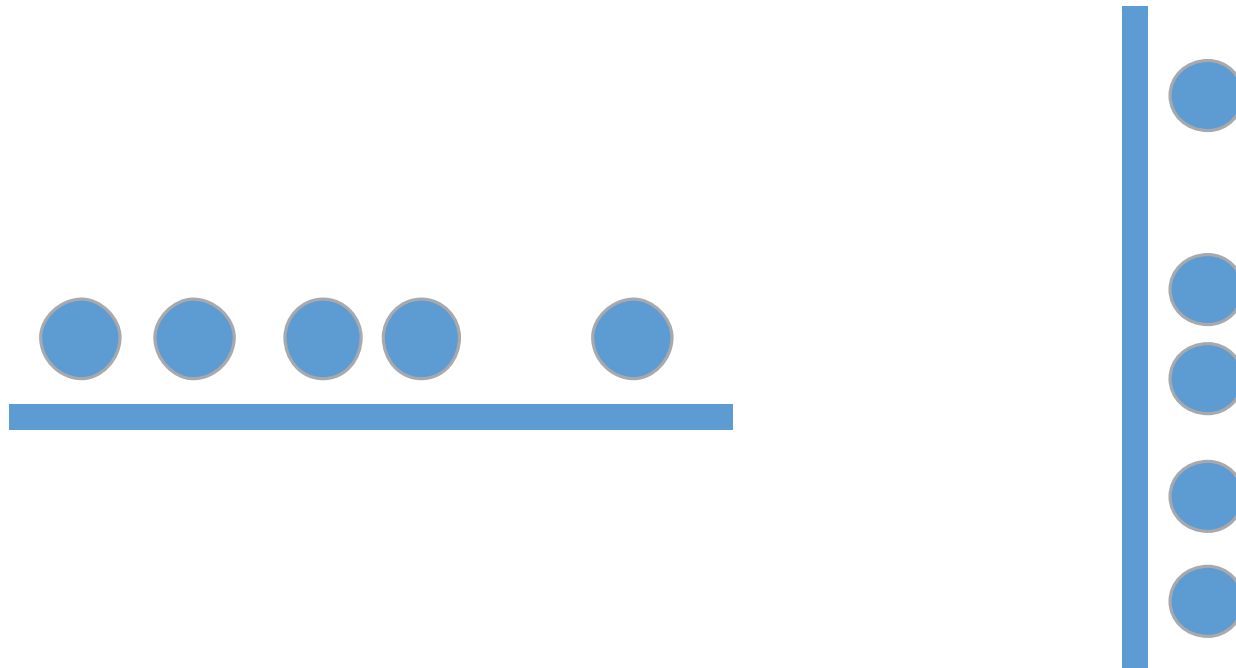
Diverging Bar Chart

encodes data using height/length of bar diverging from a midpoint to show categorical comparisons.



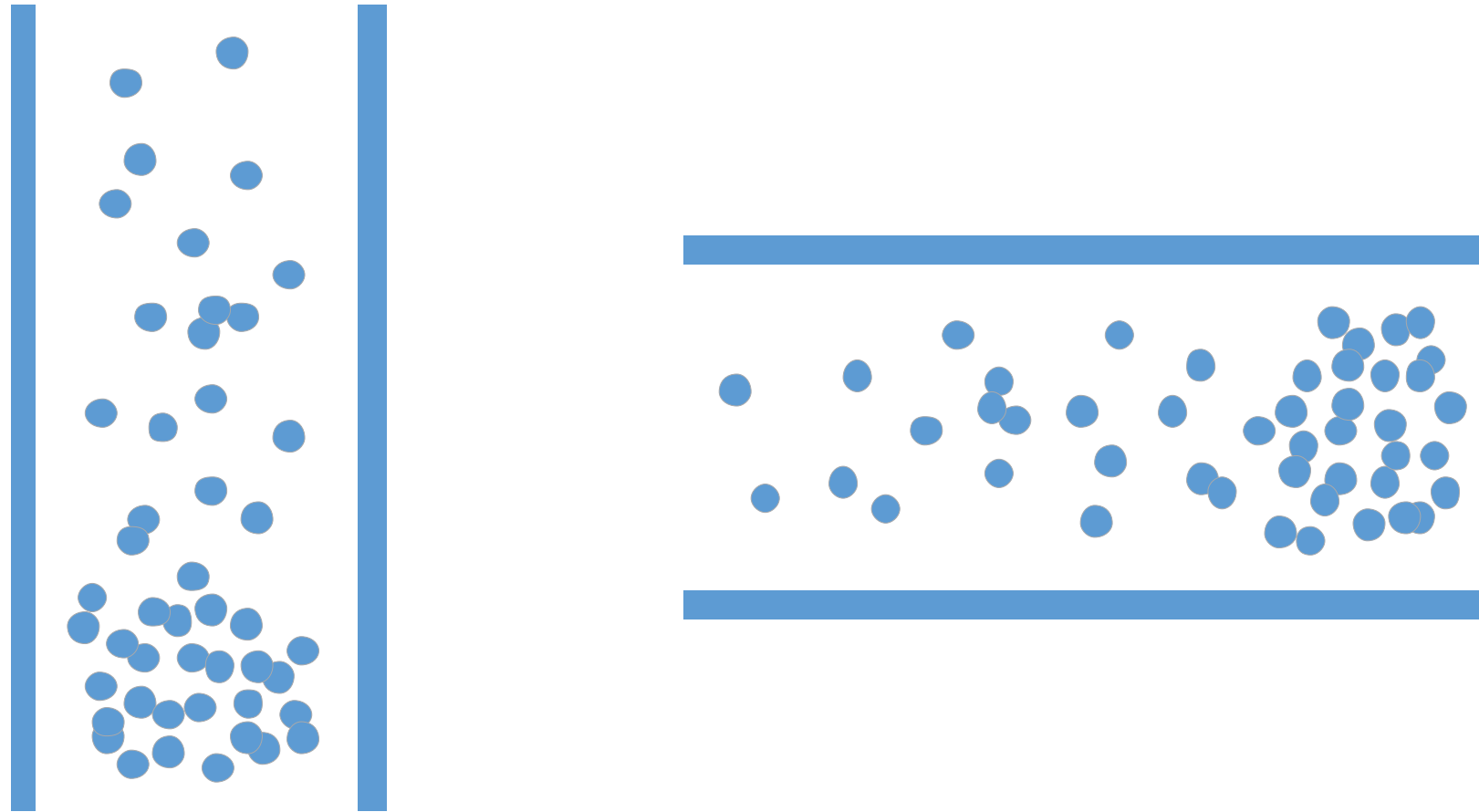
Dot Plot

encodes data using position to show the comparisons.



Dot Plot with Jitter

encodes data using position to show comparisons but offsets points randomly to reduce overlap of dots.



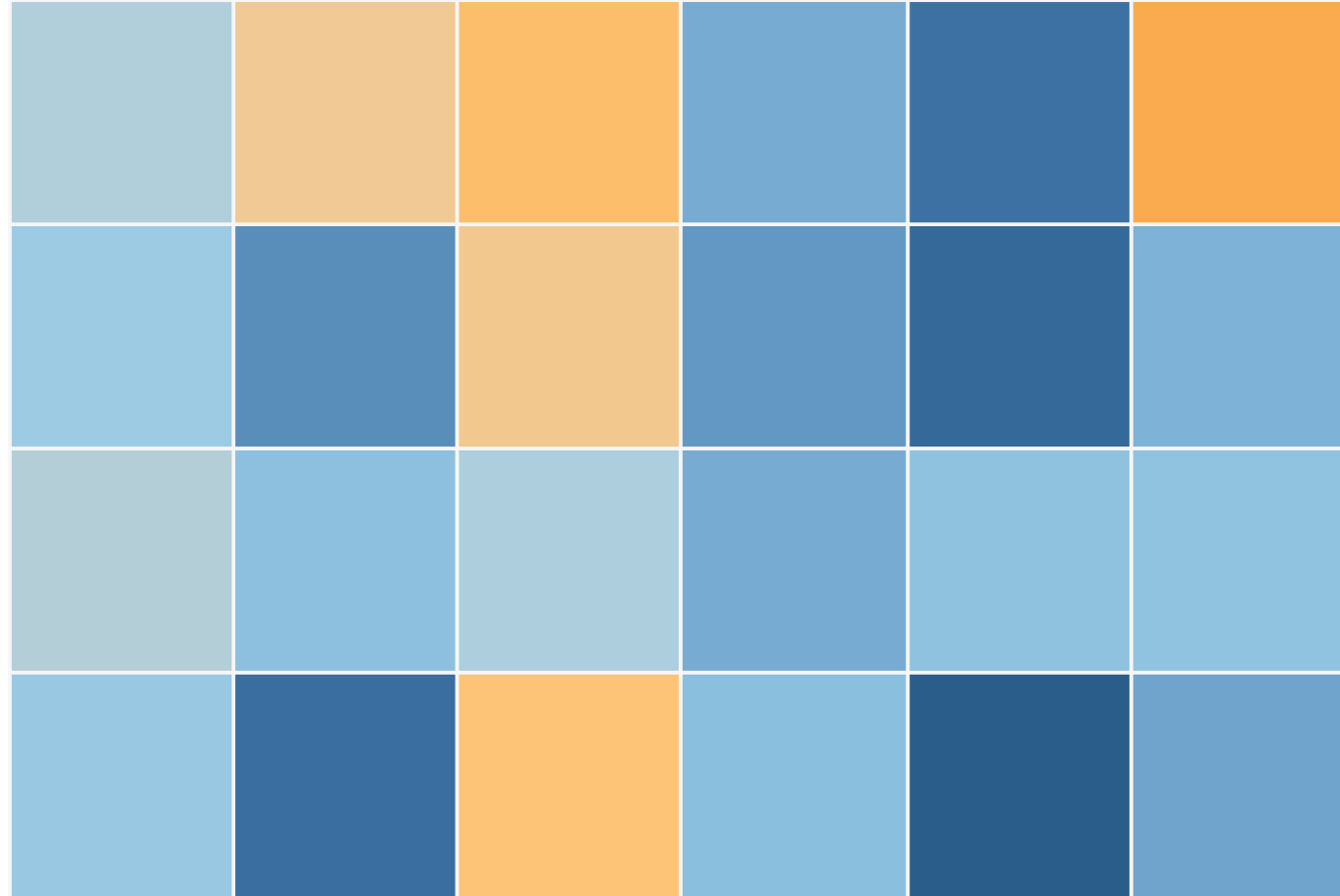
Gantt Chart

encodes data using length and position to show amount of work completed in segments of time.



Heat Map

encodes a data table using color to highlight the differences in the table without numbers.



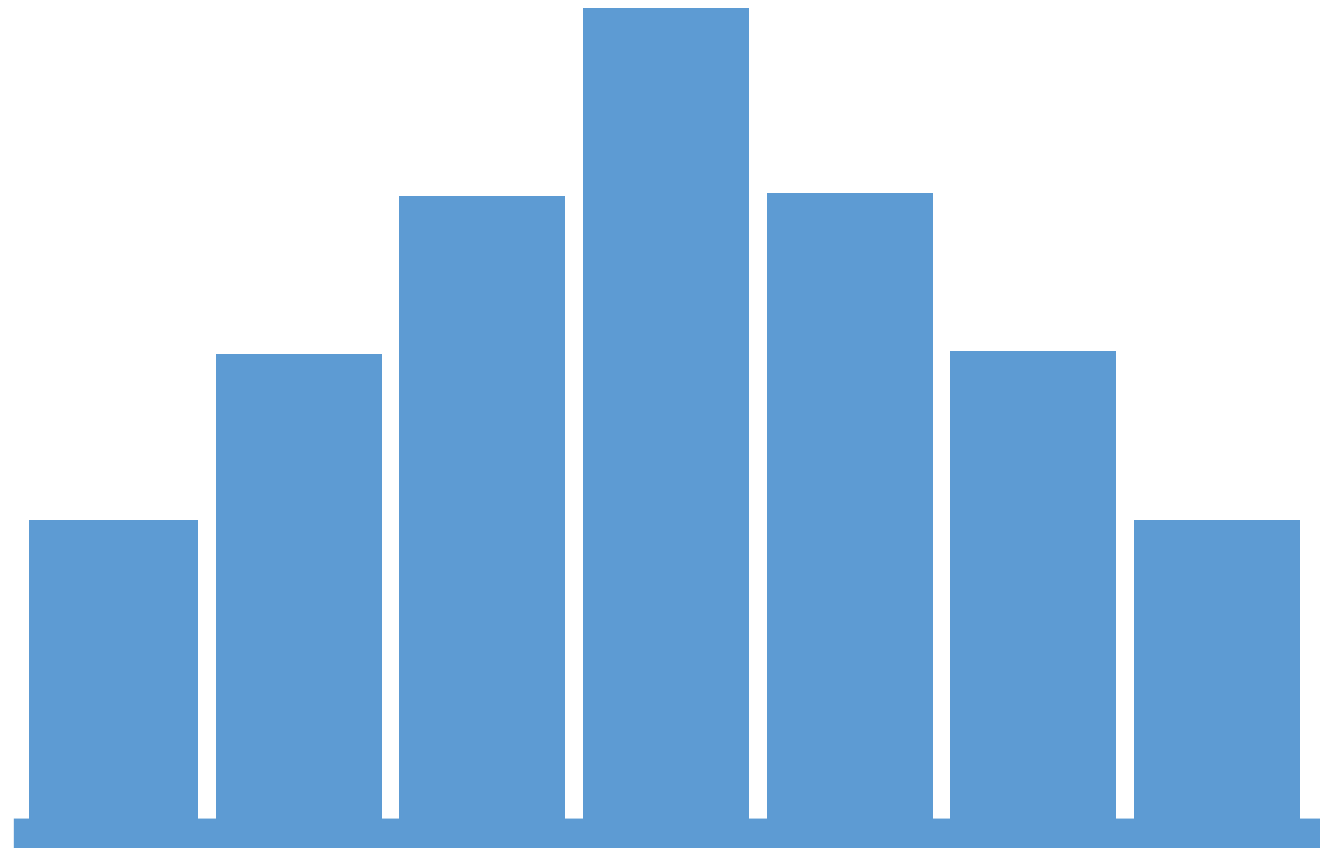
Highlight Table

encodes a data table using color to highlight the differences in the table numbers.

\$29,071	\$17,307	\$30,073
\$2,603	\$2,353	\$5,079
\$66,106	\$53,891	\$42,444
\$20,173	\$14,151	\$26,664
\$100,615	\$58,304	\$98,684
\$71,613	\$35,768	\$70,533
\$10,760	\$8,319	\$18,127
\$39,140	\$43,916	\$84,755

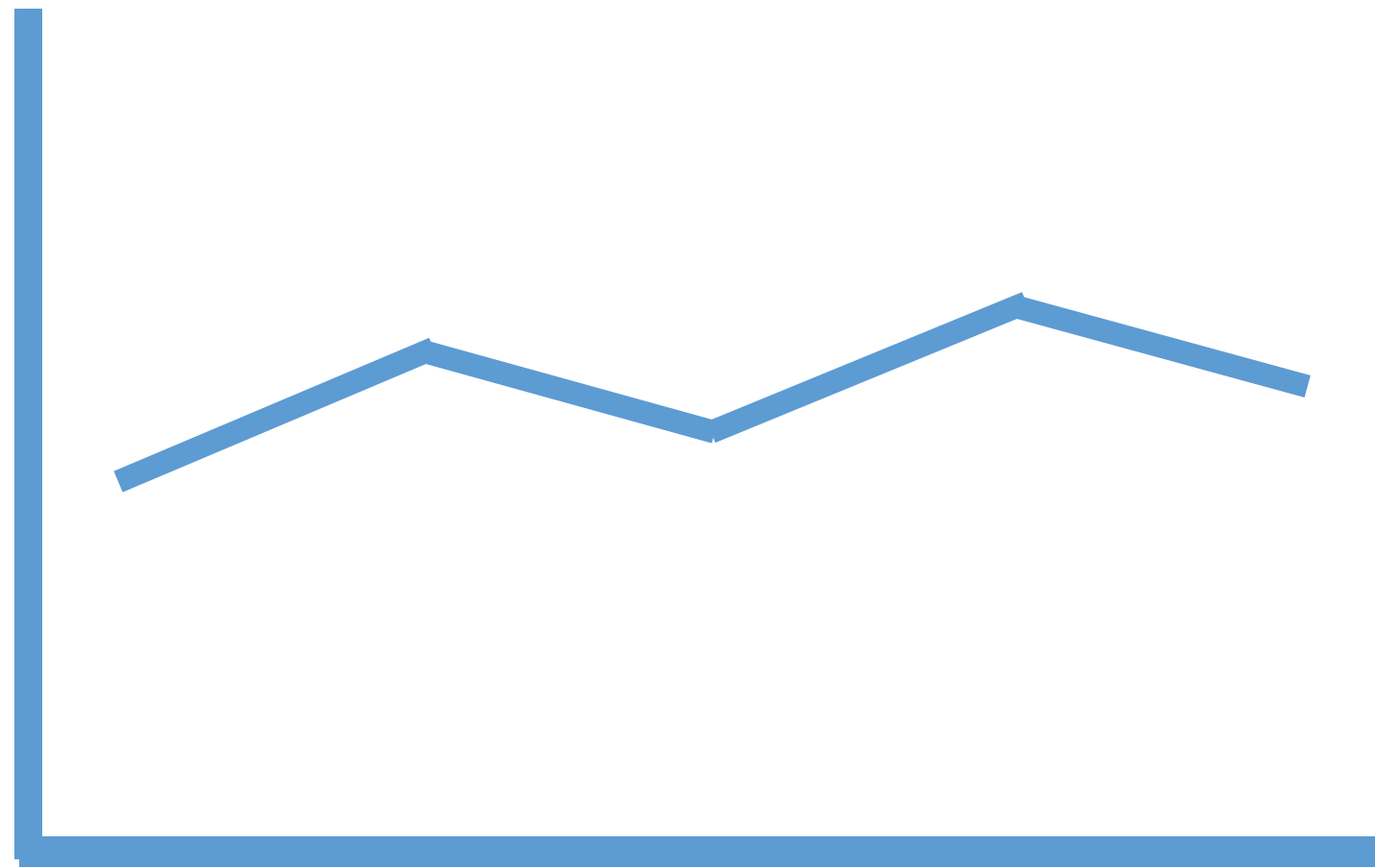
Histogram

encodes data using height and shows a distribution.



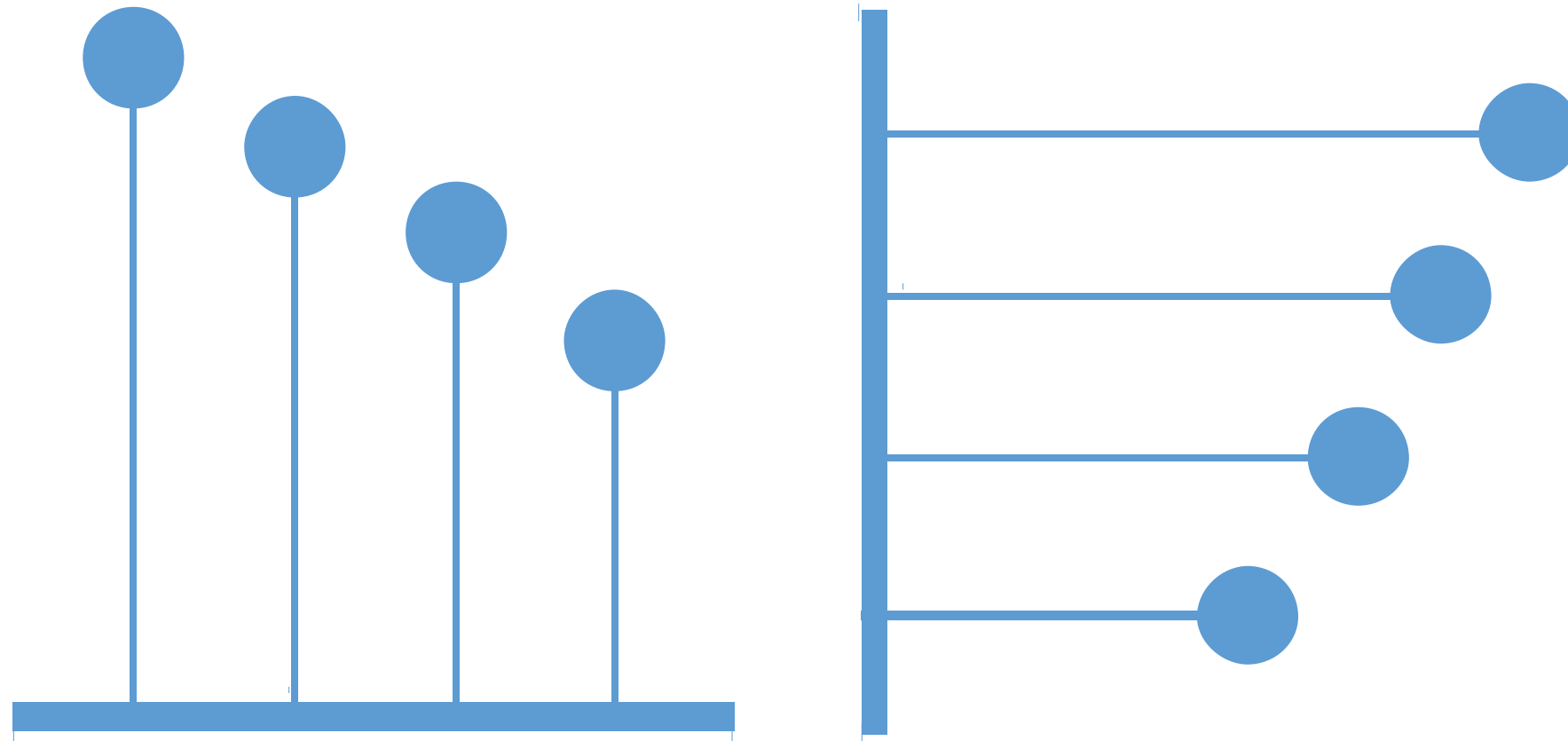
Line Chart

encodes data using position and often shows trend over time.



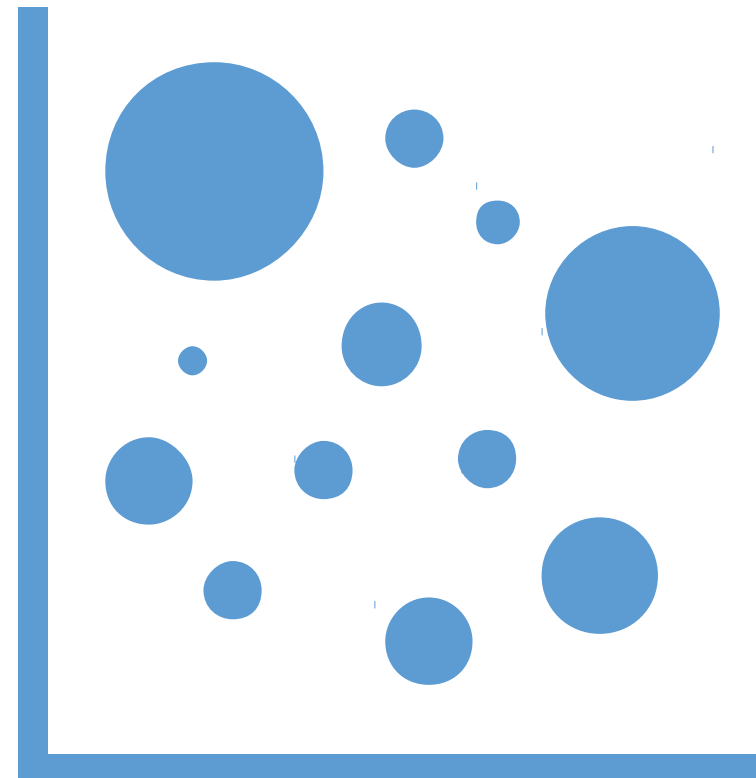
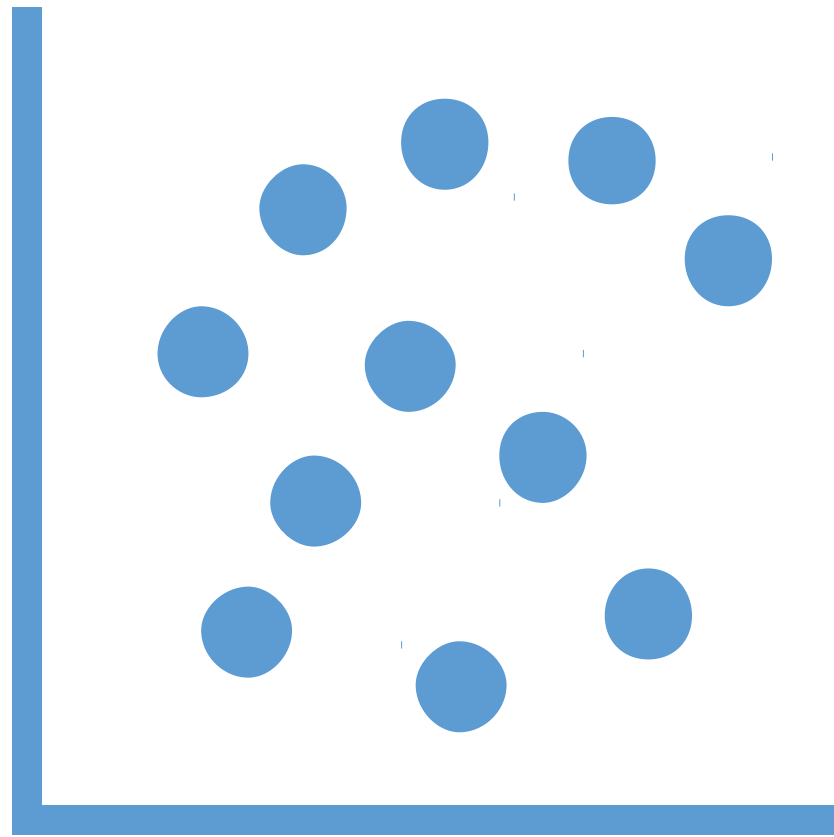
Lollipop Chart

encodes data using height or length of bar and shows categorical comparisons.



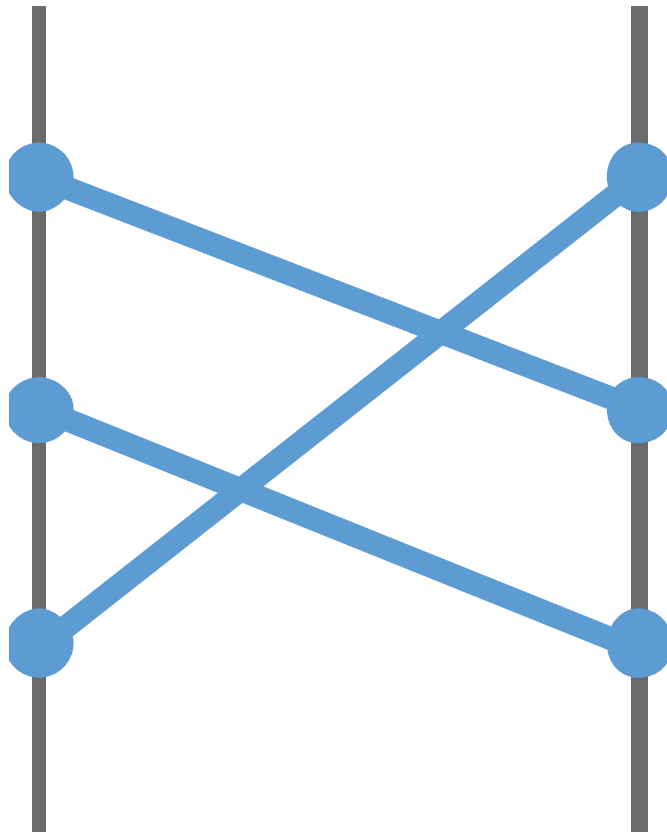
Scatter Plot

encodes data using position to show the relationship between two variables.
Size can also be used to show a secondary comparison.



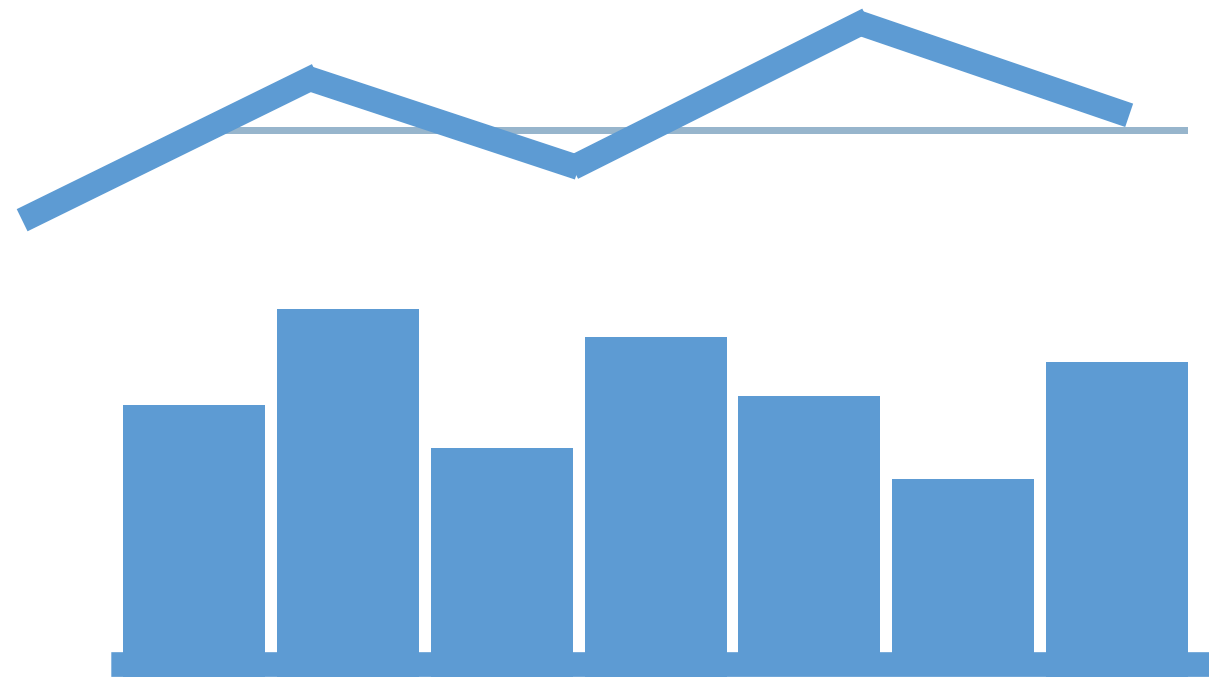
Slopegraph

encodes data using position to show quantitative comparison or rank, typically between two time periods.



Sparkline/Sparkbar

encodes data using position (line) or height/length (bar) in a small, word-sized graphic.



Stacked Bar Chart

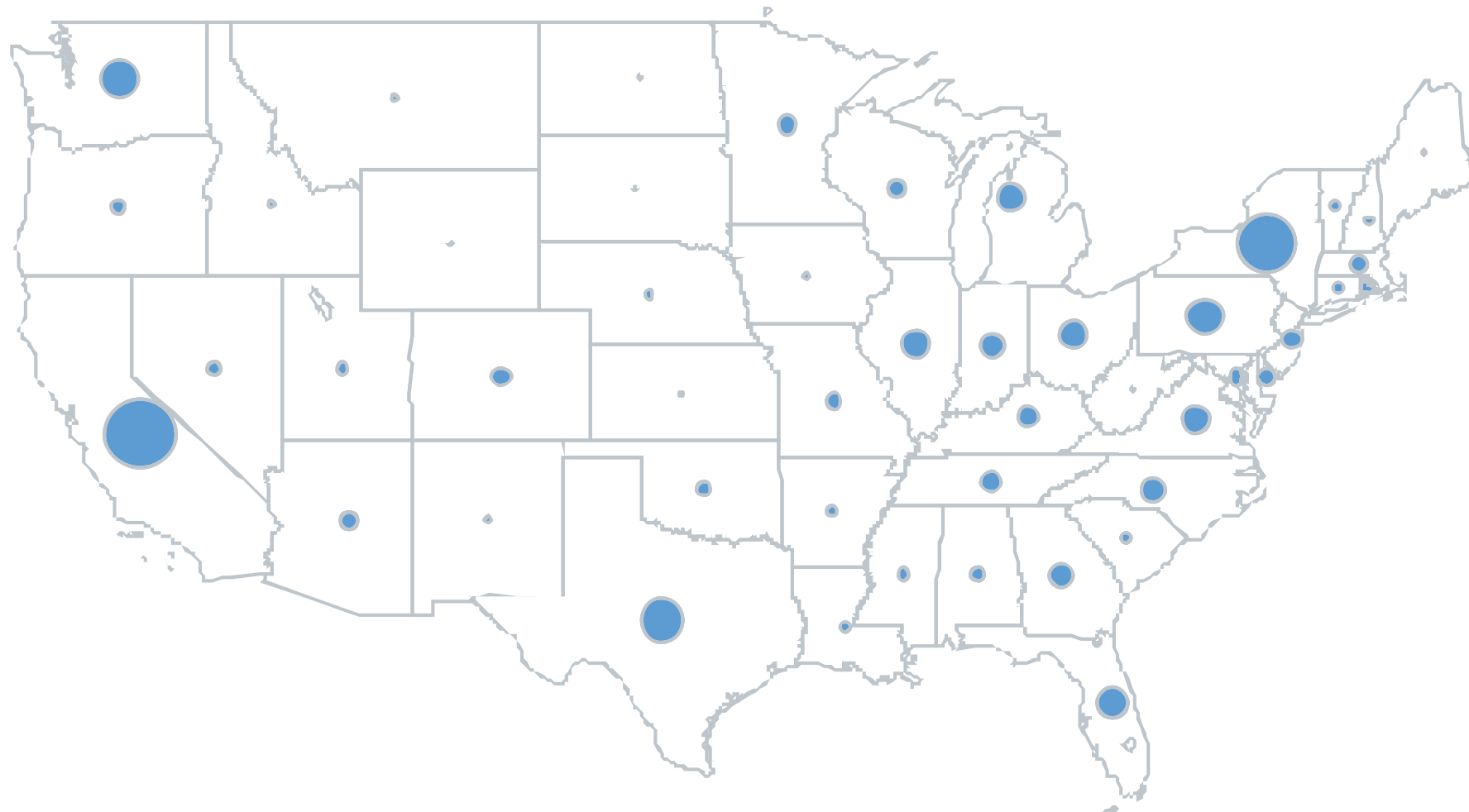
encodes data using height or length of bar and color by segment and shows categorical and part-to-whole comparisons.



* Caution be careful not to slice stacked charts into too many segments.

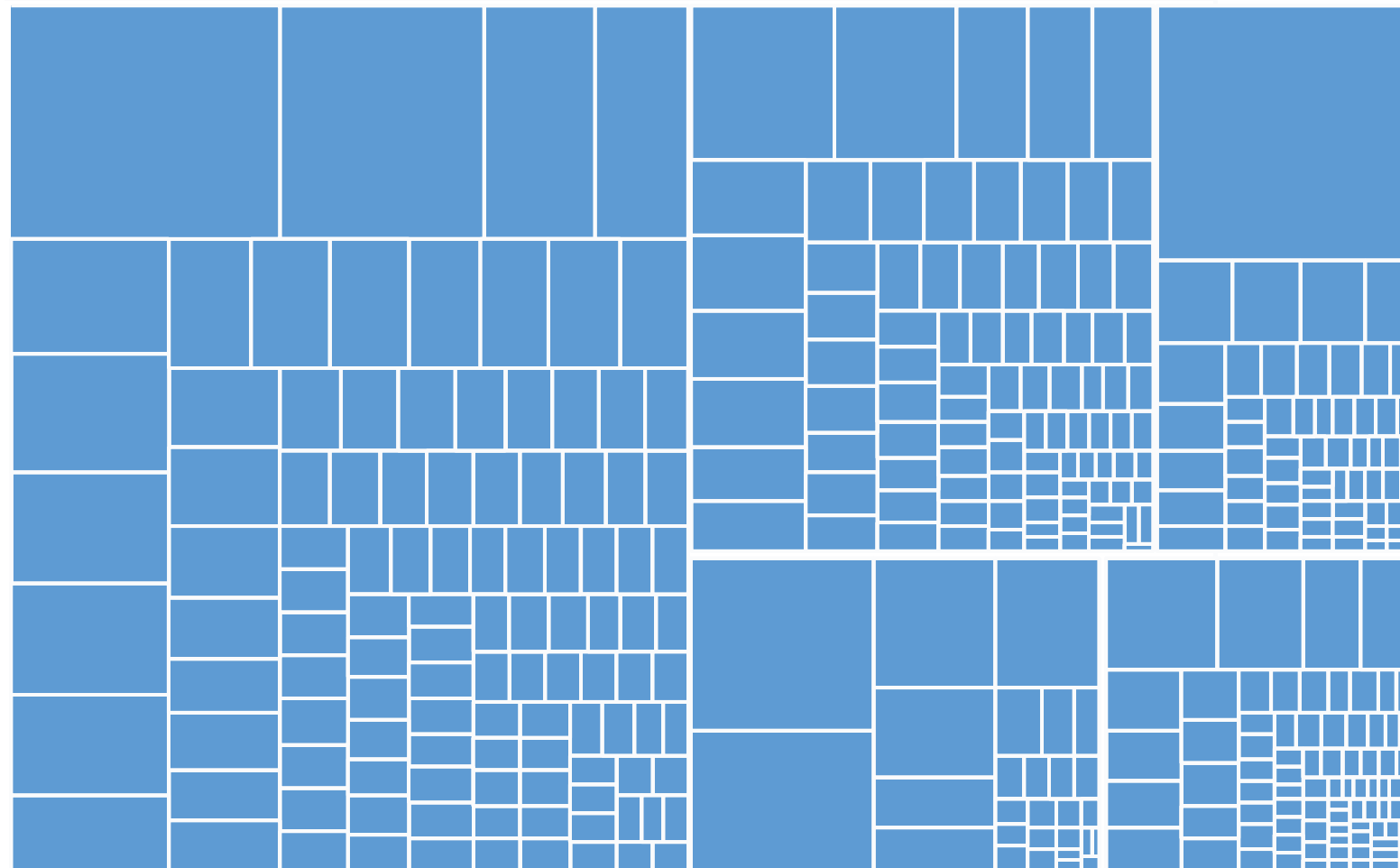
Symbol Map (Dot Map)

encodes data using position to show data geographically and can also use size to show quantitative data.



Treemap

encodes data using size and color and is useful for hierarchical data or when there are a very large number of categories to compare.



Waterfall Chart

encodes data using height and often color to show increase and decrease between time periods or categories.



Bubble Chart

encodes data using size of circle to show comparisons which is difficult for making precise quantitative comparisons.



* Caution this chart type is not recommended.

Concentric Circles

encodes data using arc and area to show comparisons but problematic for many reasons.



* Caution this chart type is not recommended.

Donut Chart

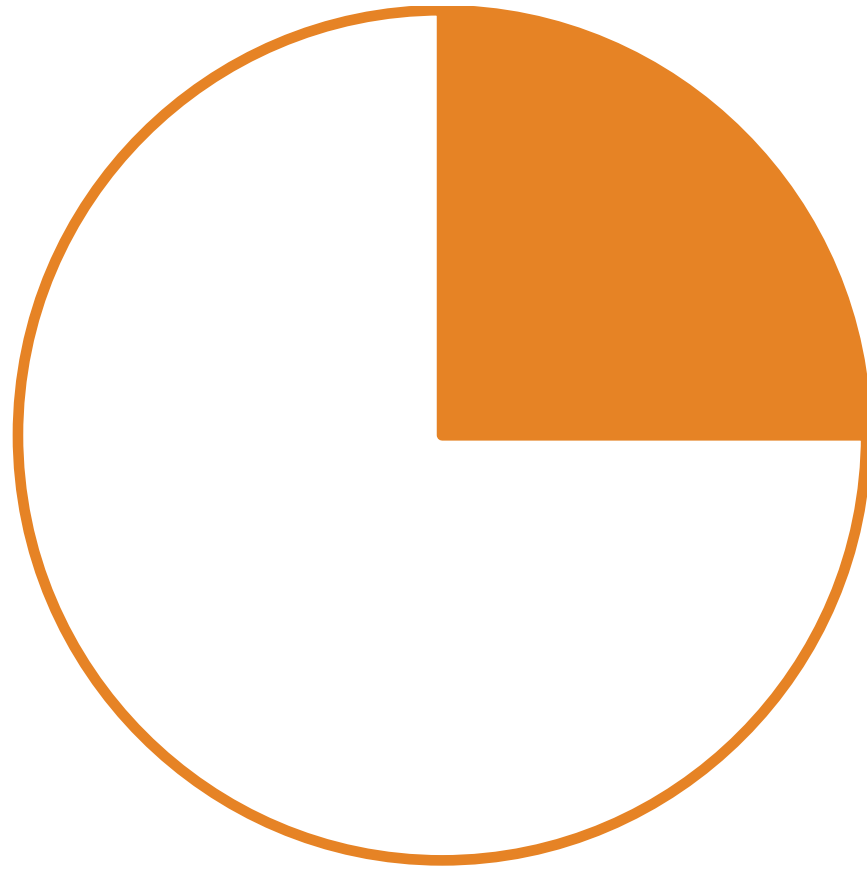
encodes data using arc and area to show a part-to-whole comparison but problematic for many reasons.



* Caution this chart type is not recommended.

Pie Chart

encodes data using angle, area and arc to show a part-to-whole comparison but problematic for many reasons.



* Caution this chart type is not recommended.

Word Cloud

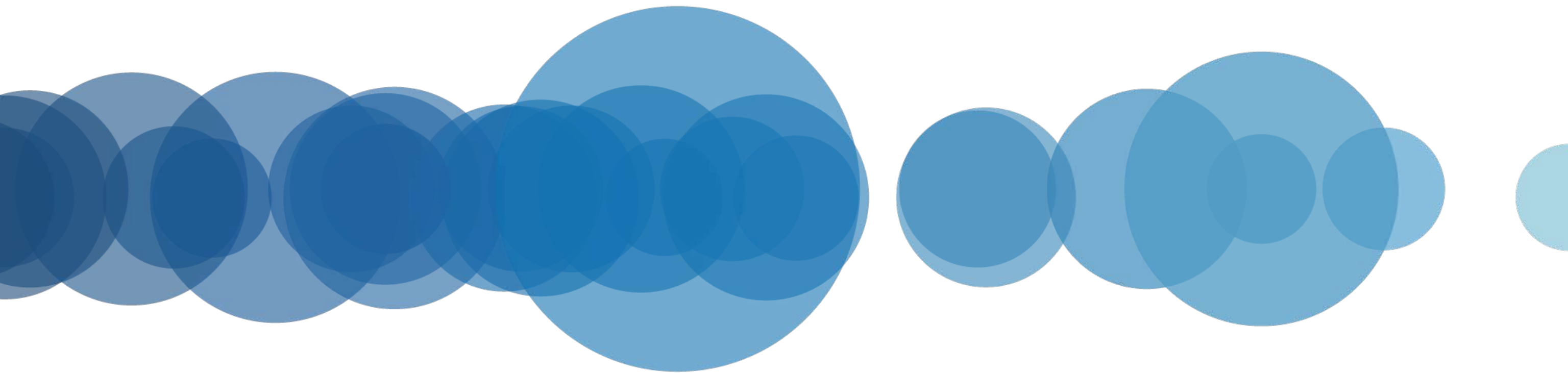
encodes data using size of word to show comparisons which is difficult for making precise quantitative comparisons.

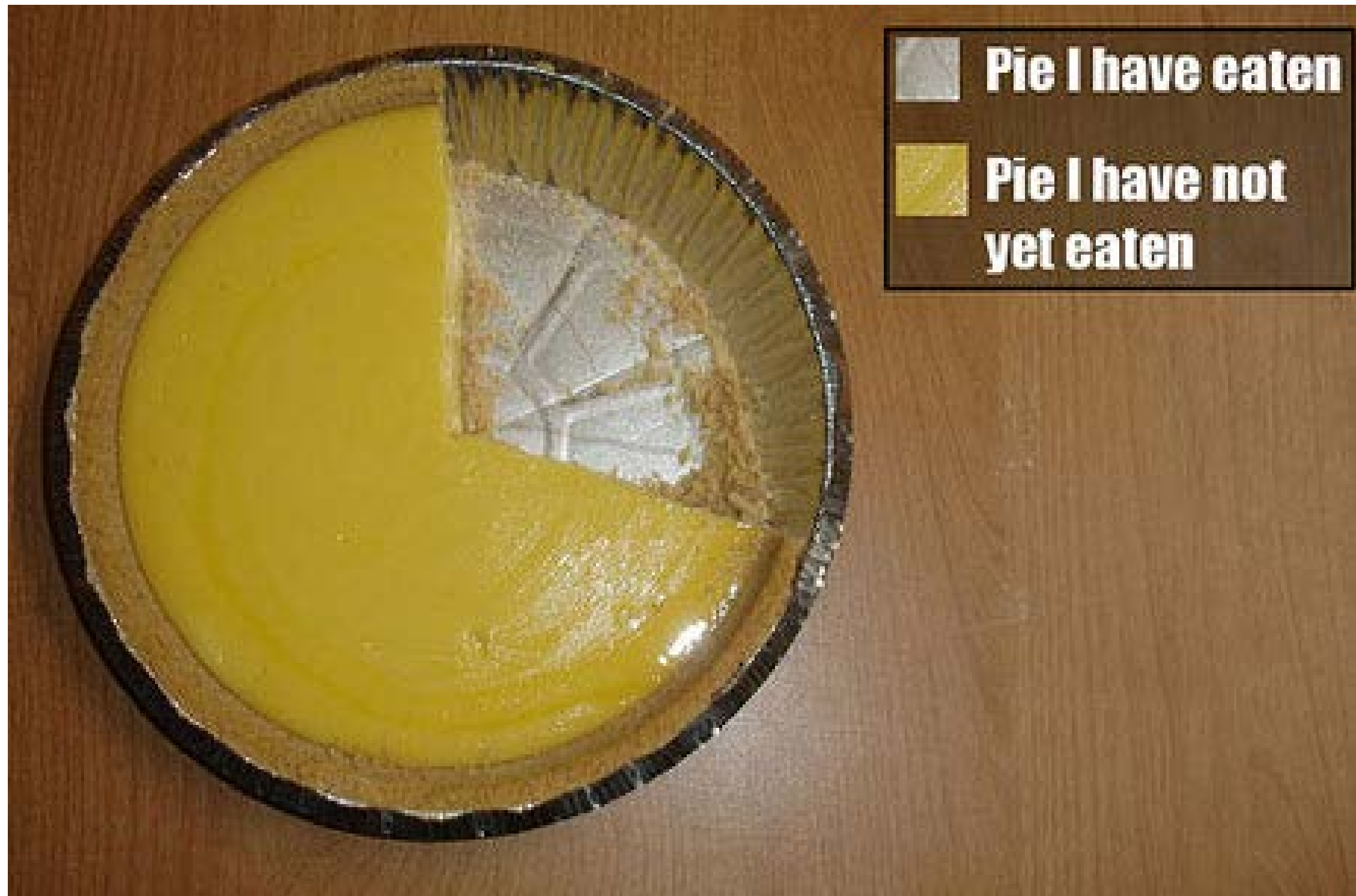


Least Many
Some Most
More Few

* Caution this chart type is not recommended.

Pie Charts





“Save the Pies for Dessert”- Stephen Few

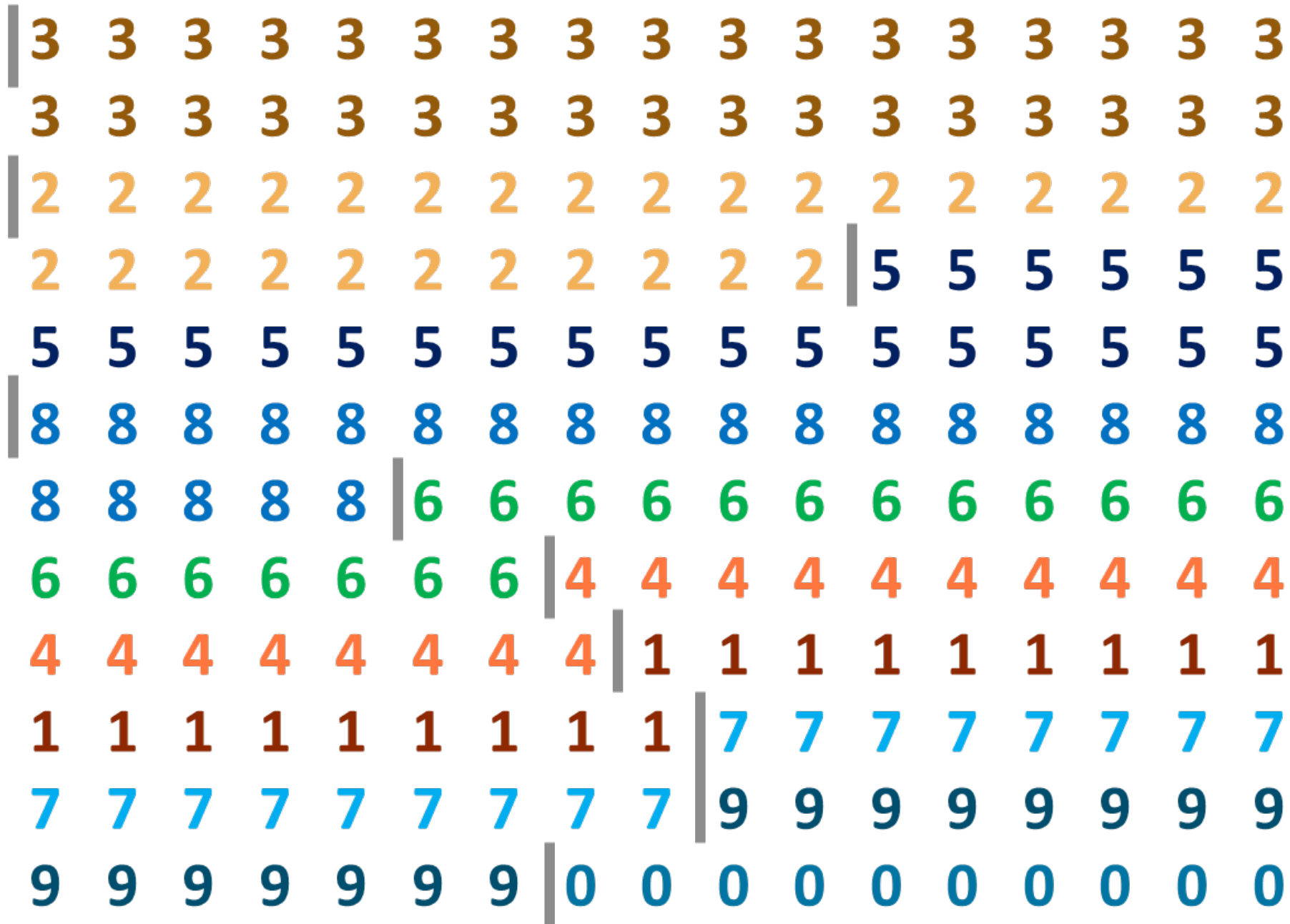
5	2	8	3	6	1	9	3	6	2	5	3	7	4	3	8	3
8	5	8	9	6	2	1	4	4	3	9	3	6	5	2	4	9
1	0	2	7	5	2	8	3	6	1	6	2	9	3	8	3	8
5	8	4	7	2	0	3	7	3	5	4	7	1	8	2	0	1
2	5	3	6	4	3	9	1	0	8	9	5	7	3	4	5	3
2	7	5	2	8	3	6	1	6	2	9	3	8	3	8	5	8
4	7	2	0	3	7	3	5	4	7	1	8	2	0	1	9	6
2	1	4	4	3	9	3	6	5	2	4	9	1	0	2	7	5
2	8	3	6	1	6	2	9	3	8	3	8	5	8	4	7	2
0	3	7	3	5	4	7	1	8	2	0	1	2	5	3	6	4
3	9	1	0	8	9	5	7	3	4	5	3	2	7	5	2	8
3	6	1	6	2	4	6	2	7	5	9	1	5	2	6	3	6

This is how a Pie Chart Represents the Data

3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
8	8	8	8	8	6	6	6	6	6	6	6	6	6	6	6	6
6	6	6	6	6	6	6	4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	7	7	7	7	7	7	7	7
7	7	7	7	7	7	7	7	7	9	9	9	9	9	9	9	9
9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0

Try to quickly compare the totals of any digits.

This is how a Pie Chart Represents the Data



Baseline moves based on previous # of Digits

This is how a Bar Chart Represents that Data

222222222222222222222222

555555555555555555555555

88888888888888888888888888888888

6666666666666666666

4444444444444444

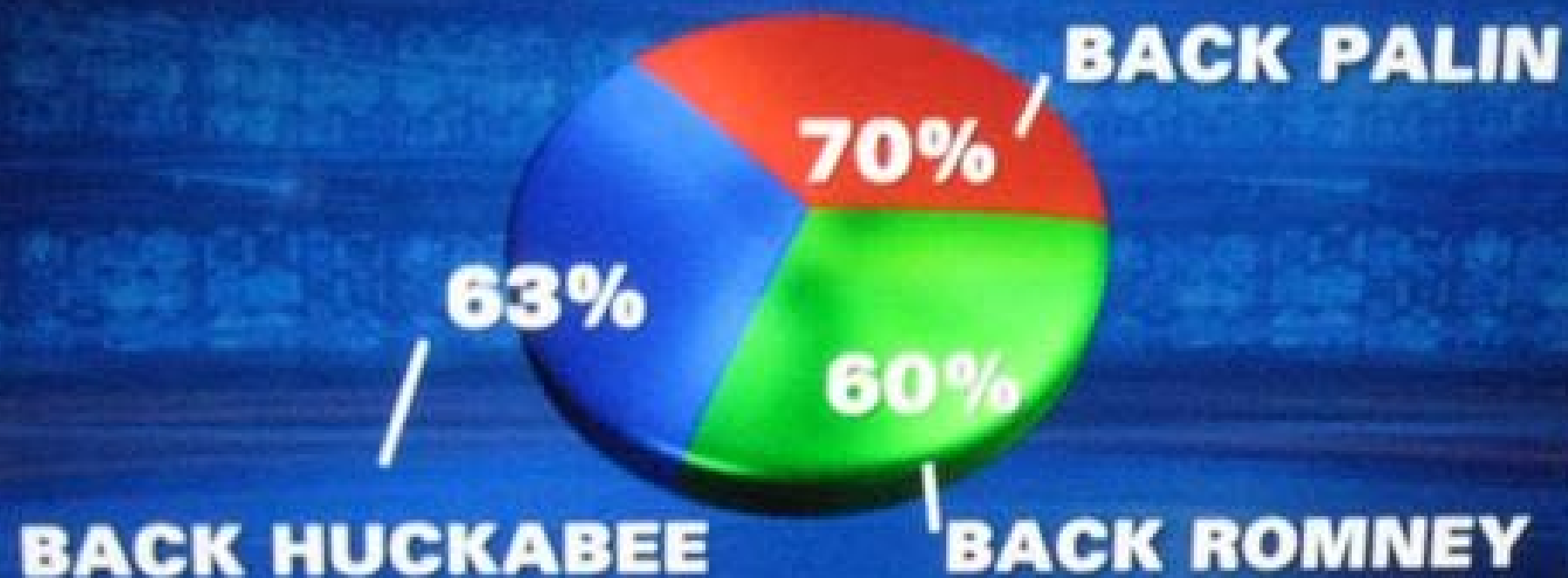
11111111111111

Easier comparison even without color encoding!

Remove
to improve
the **pie chart** edition

2012 PRESIDENTIAL RUN

GOP CANDIDATES



FOX

47'

SOURCE: OPINIONS

DYNAMIC

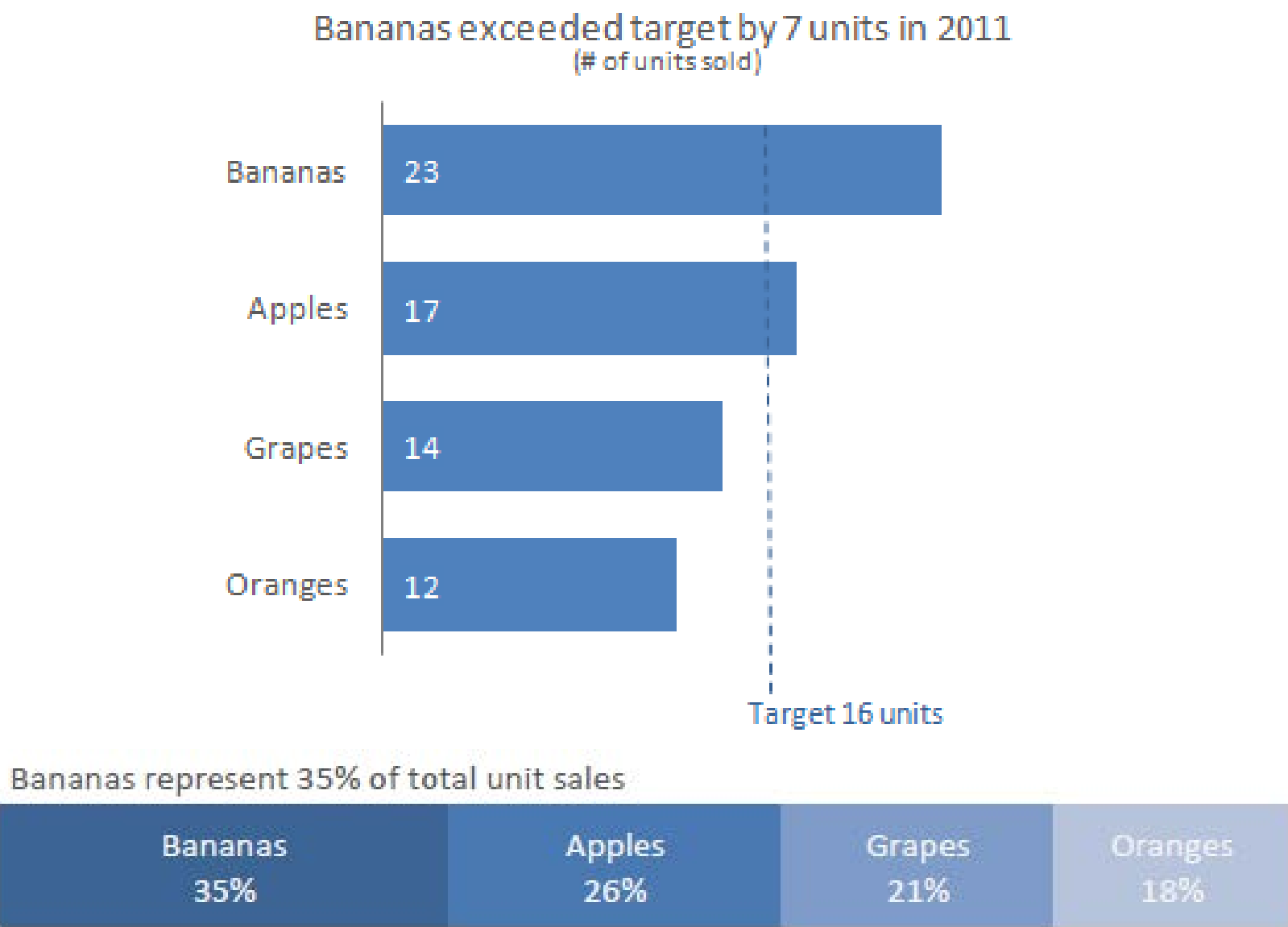
General Rules for Pie Charts

1. Don't Use Pie Charts

If you must break Rule #1 then:

2. Make sure it adds up 100%
3. Only a few categories
4. Start at noon and move clockwise
5. Largest to Smallest Values
6. Add Labels for %
7. Avoid 3D
8. Keep it Simple

Show part-to-whole relationship (in lieu of Pie Charts)



100% Stacked Bar Chart

Girl Scout Cookie Sales

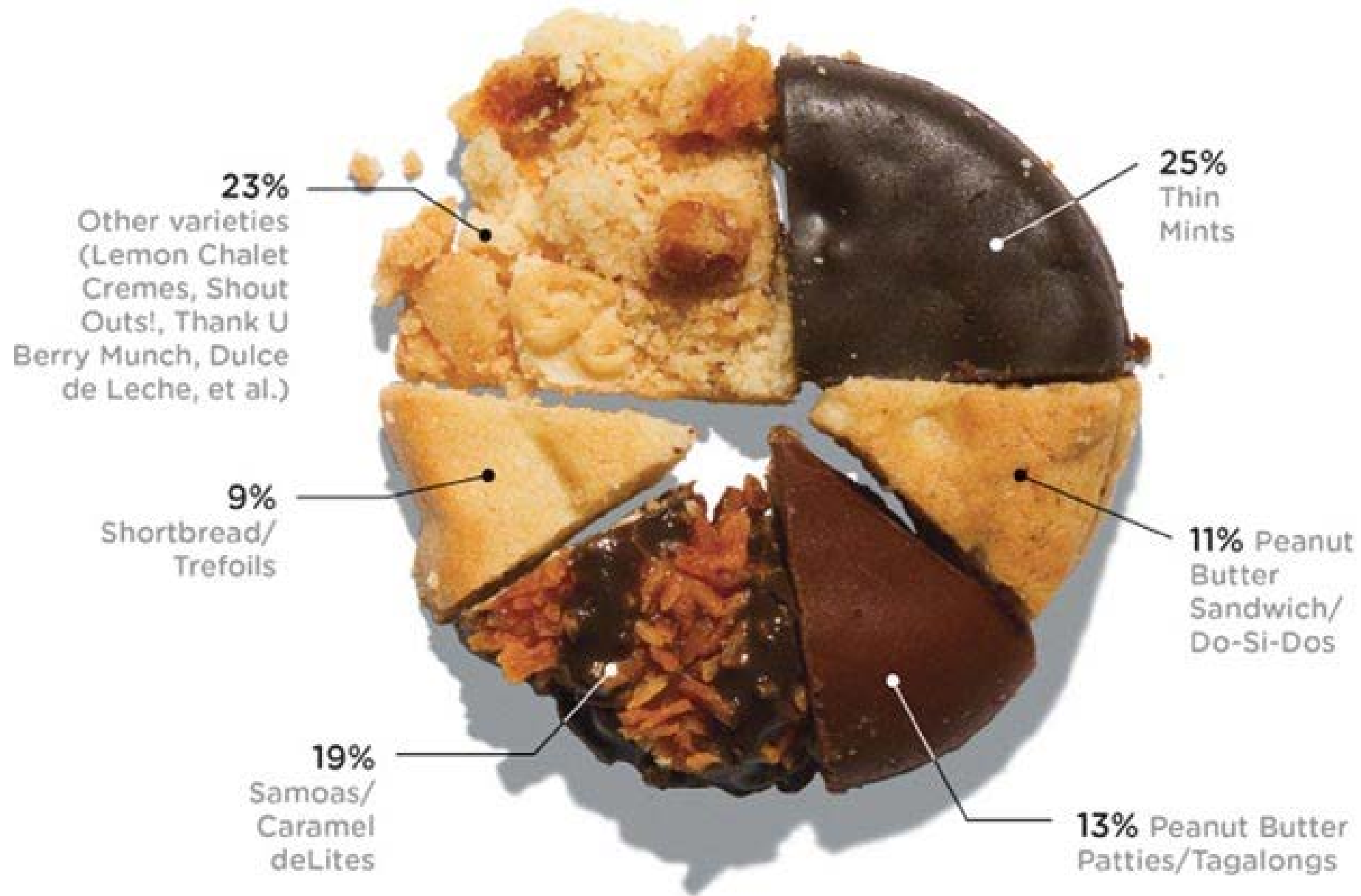
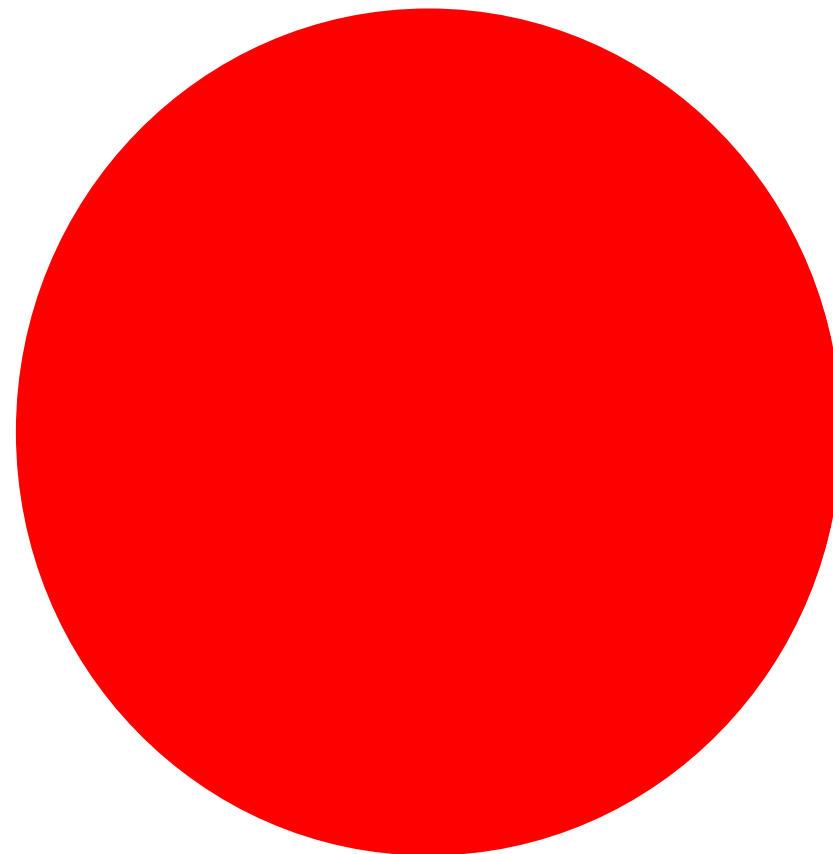


Photo: Celine Grouard

Source: www.wired.com/magazine/2011/08/st_datagirlscoutcookies

Pie Chart of Japan



■ Japan

Common Chart Types

Bar Chart - category comparison (with target line)

Line Chart - time series data

Flow Chart – process flow (also Swimlane diagram)

Bullet Graph – actual to target

Dot Plot or Strip Plot

Sparklines

Histogram

Map

100% Stacked Bar Chart (with caution)

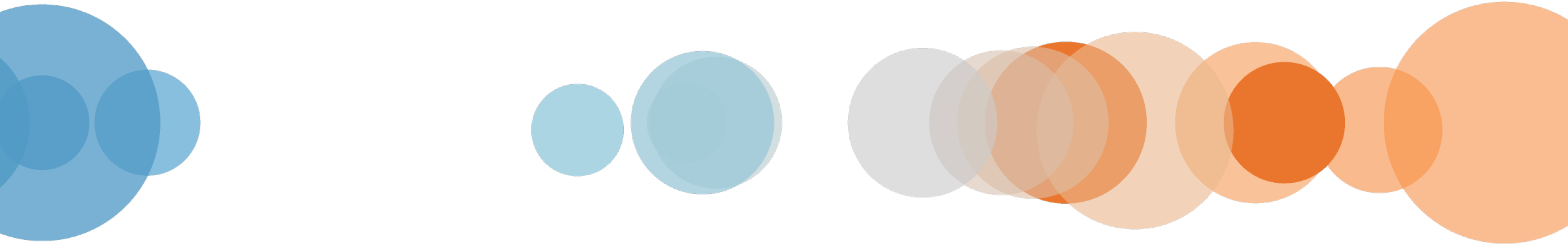
Scatter Plot – relationship/correlation

Box Plot – grouping with summaries

Area Chart (with caution)

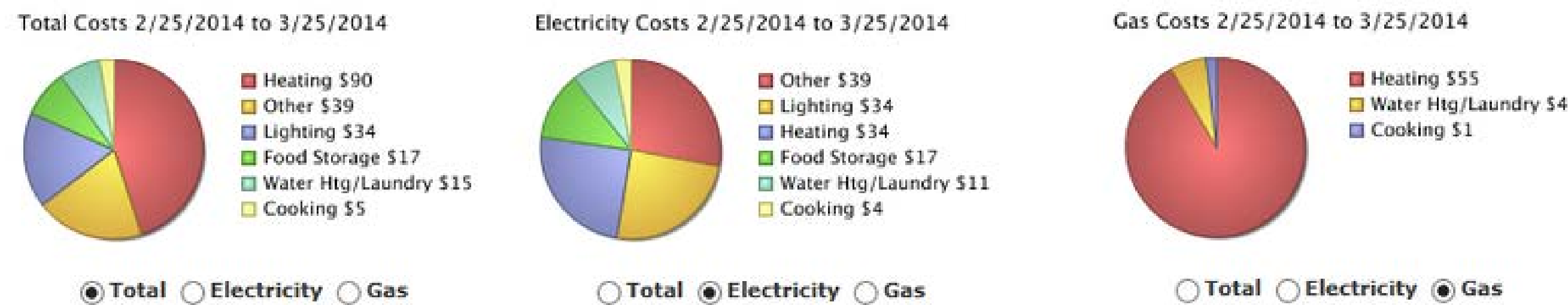
Control Charts (statistical process control)

Compare and Contrast



A Pie Chart Redesign

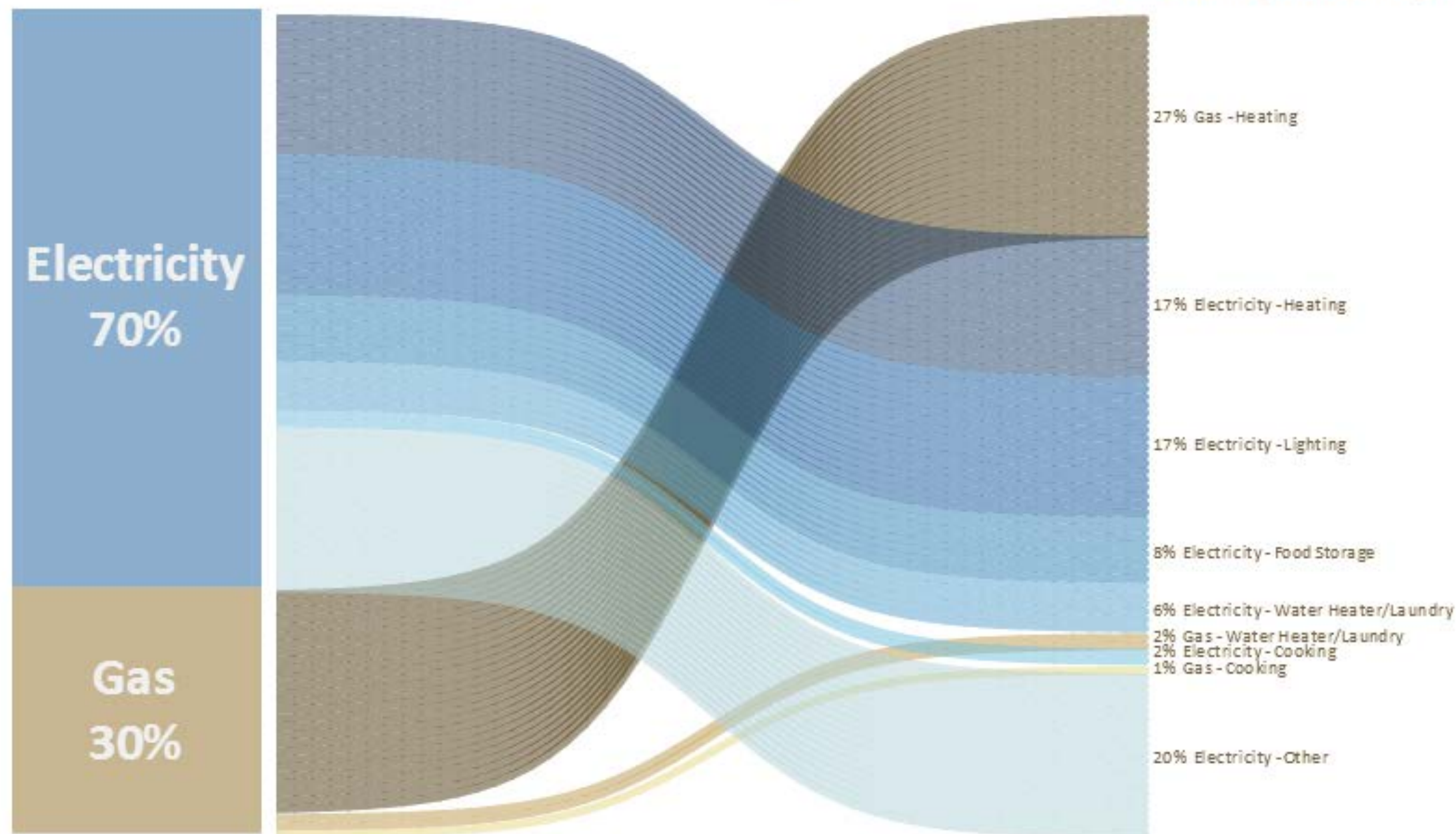
Original Version by Duke Energy



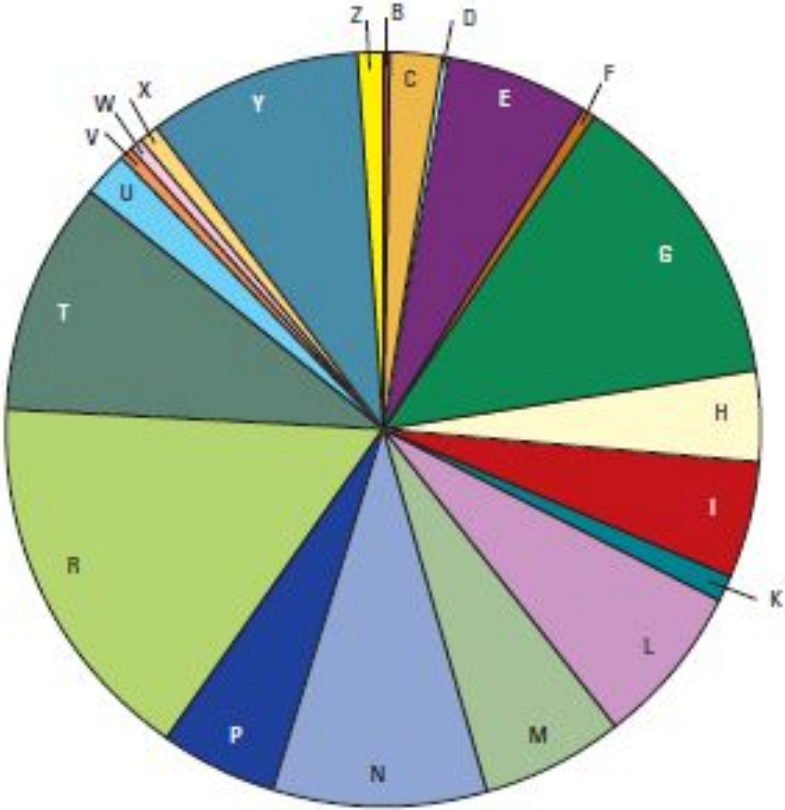
Redesigned Using a Sankey Diagram

My Monthly Energy Bill Redesigned

data + science
= transforming data to insight



If you indicated your debt collection agency used collection software, which type?

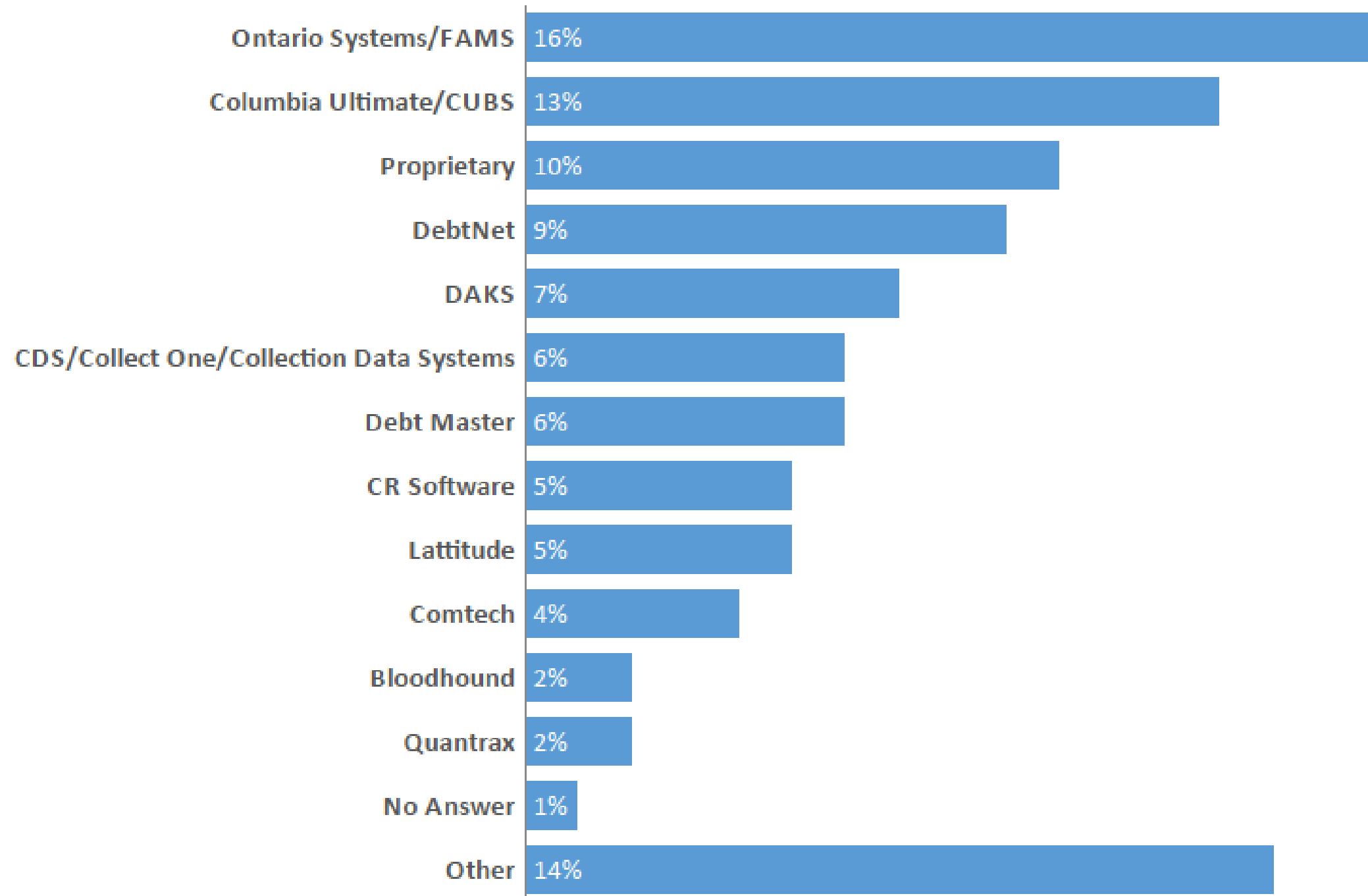


Base: 214 respondents

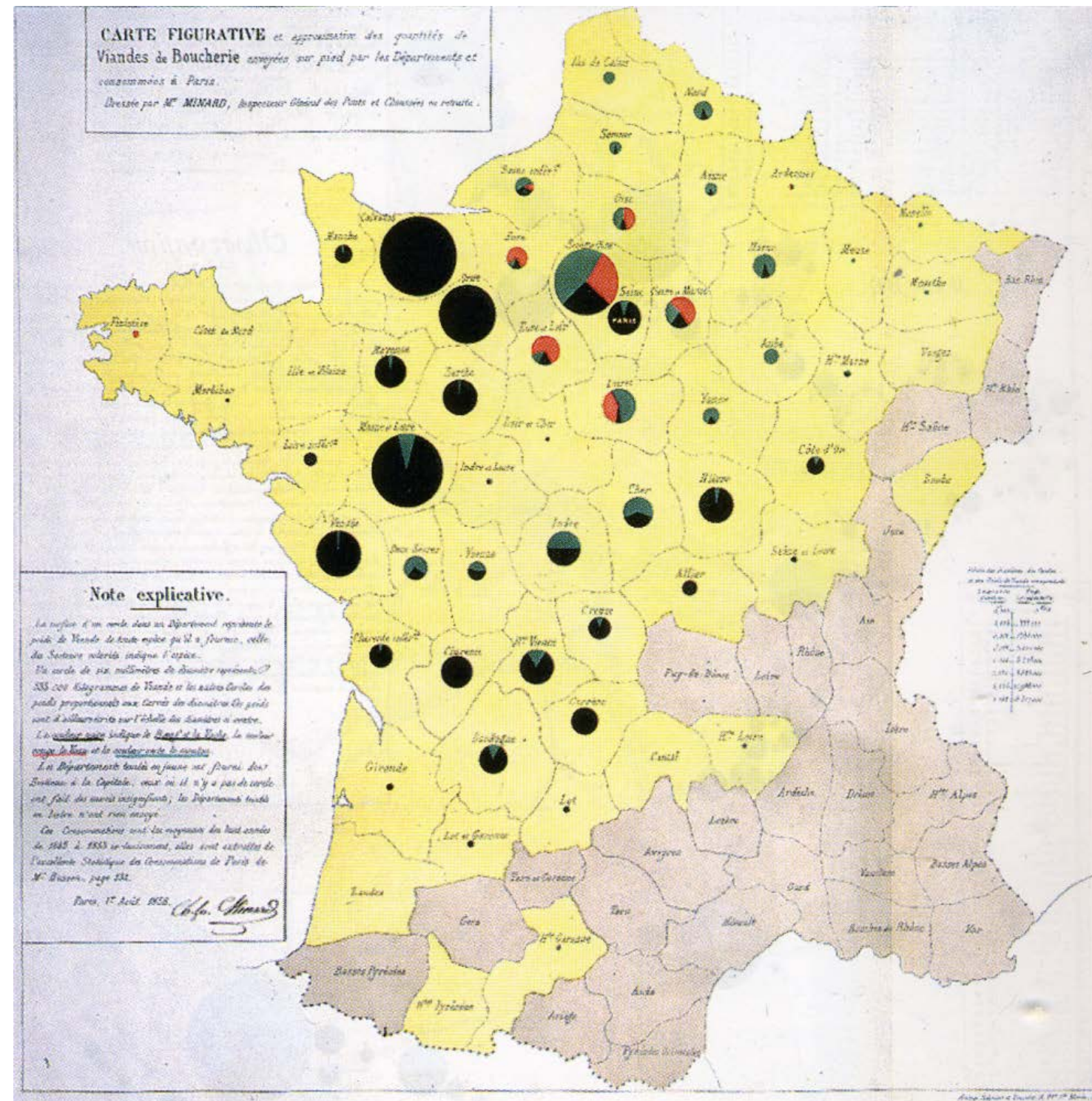
A	ADS	0 %	N	DebitNet	9 %
B	Advantage	<1 %	O	DTC	0 %
C	Bloodhound	2 %	P	Latitude	5 %
D	C.A.M.S.	<1 %	Q	Northridge Loan System	0 %
E	CDS/CollectOne/ Collection Data Systems	6 %	R	Ontario Systems/FAMS	16 %
F	Collection Master	<1 %	S	PaPlus	0 %
G	Columbia Ultimate/CUBS	13 %	T	Proprietary	10 %
H	Comtech	4 %	U	Quantrax	2 %
I	CR Software	5 %	V	RZ Designs	<1 %
J	Credit Soft	0 %	W	Unisource	<1 %
K	Cyclone	1 %	X	WinDebt	1 %
L	DAKCS	7 %	Y	Other	9 %
M	DebitMaster	6 %	Z	No Answer	1 %

Source:
American
Collectors
Association

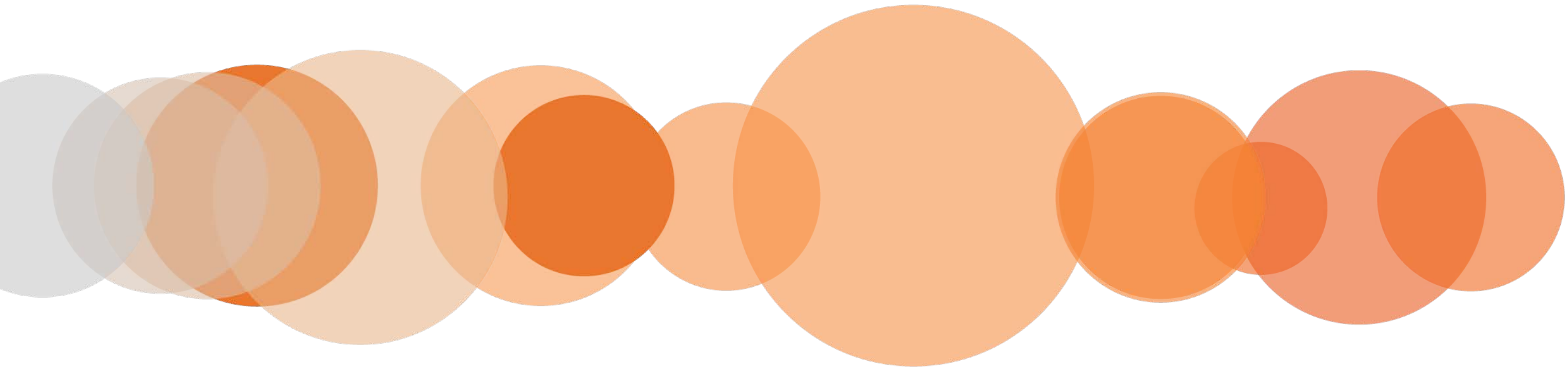
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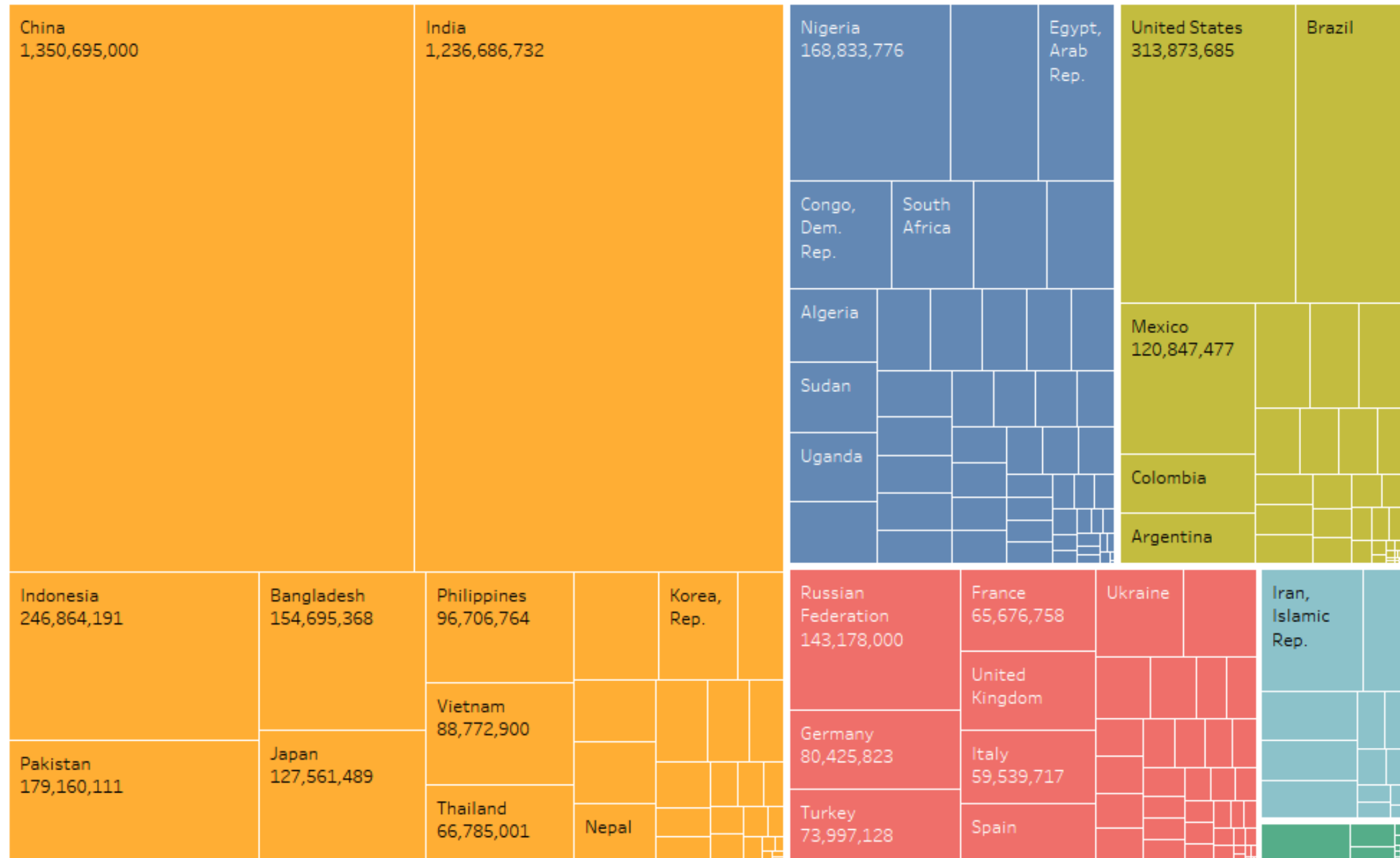
Pie Charts on a Map



Other Chart Types



World Poplotion in 2012



Region

Asia

Africa

The Americas

Europe

Middle East

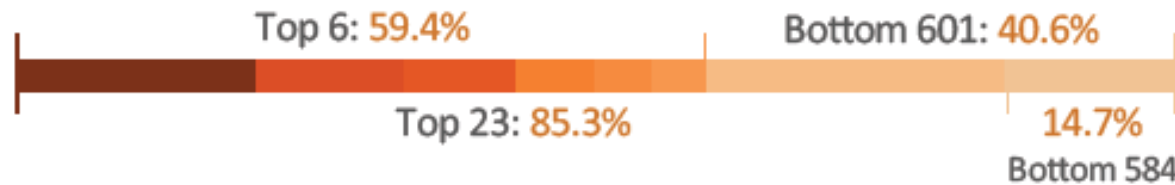
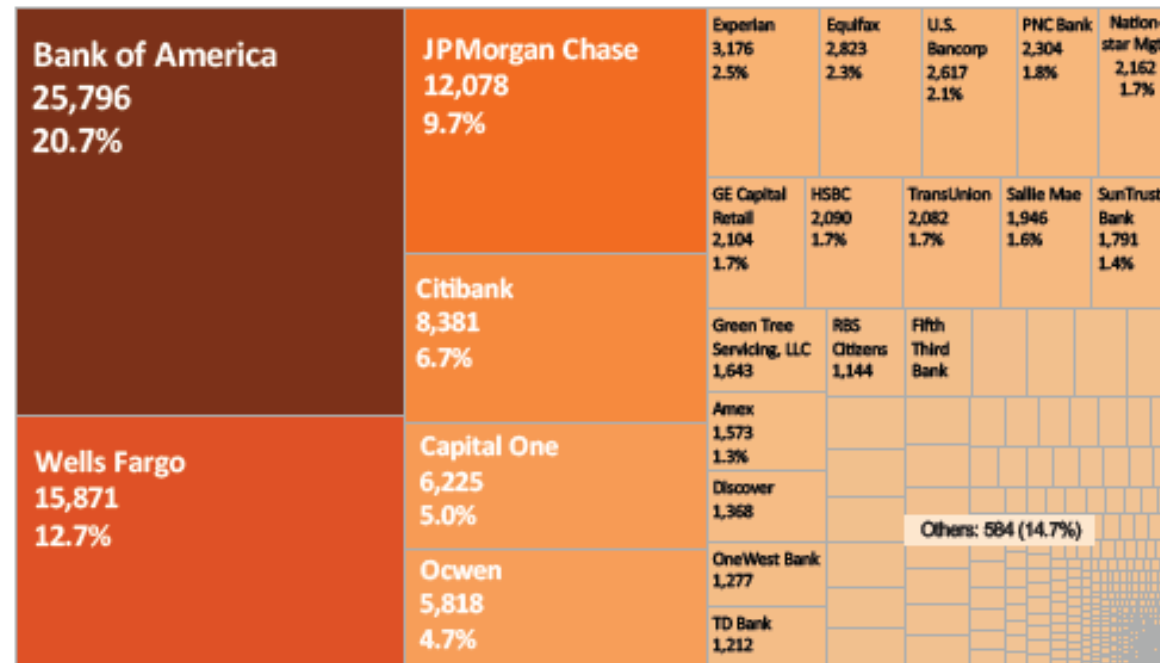
Oceania

CFPB Complaint Database

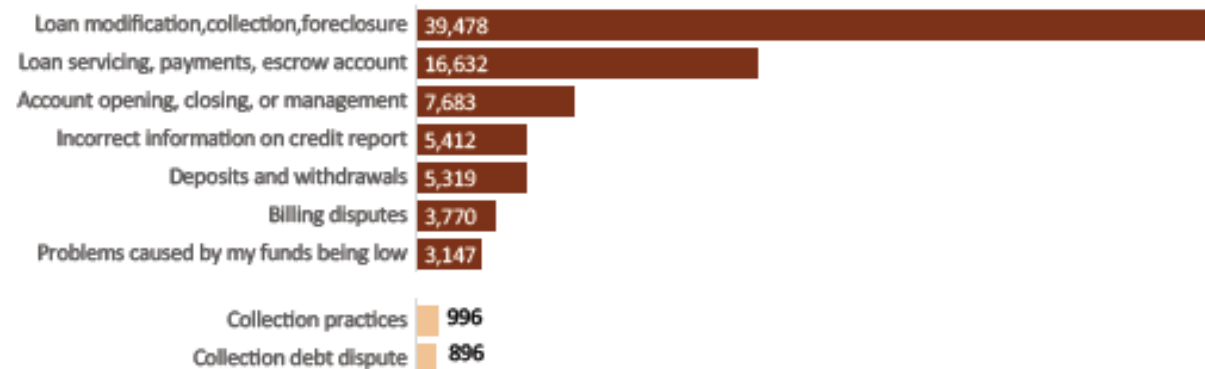
(11/30/2011 through 7/10/2011)

Total Complaints: **124,798**

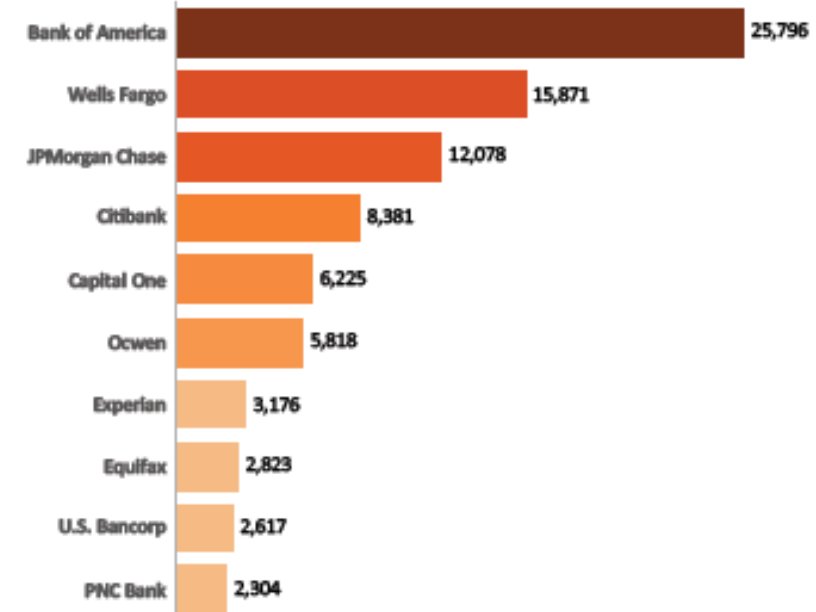
Total Companies: **607**



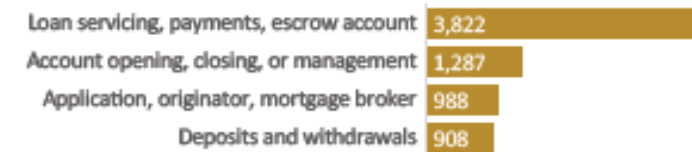
Top CFPB Complaints Compared to Collection Practices and Disputes



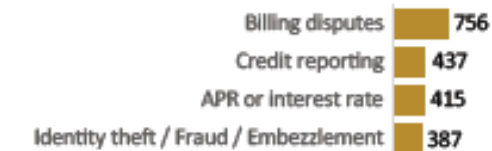
of Complaints for Top 10 Companies



Top CFPB Complaints for Bank of America



Top CFPB Complaints for Capital One



Top CFPB Complaints for Ocwen



Goooooooooooooooooaaaaaaal!

How long should the word "goal" be when you Tweet after your team scores?

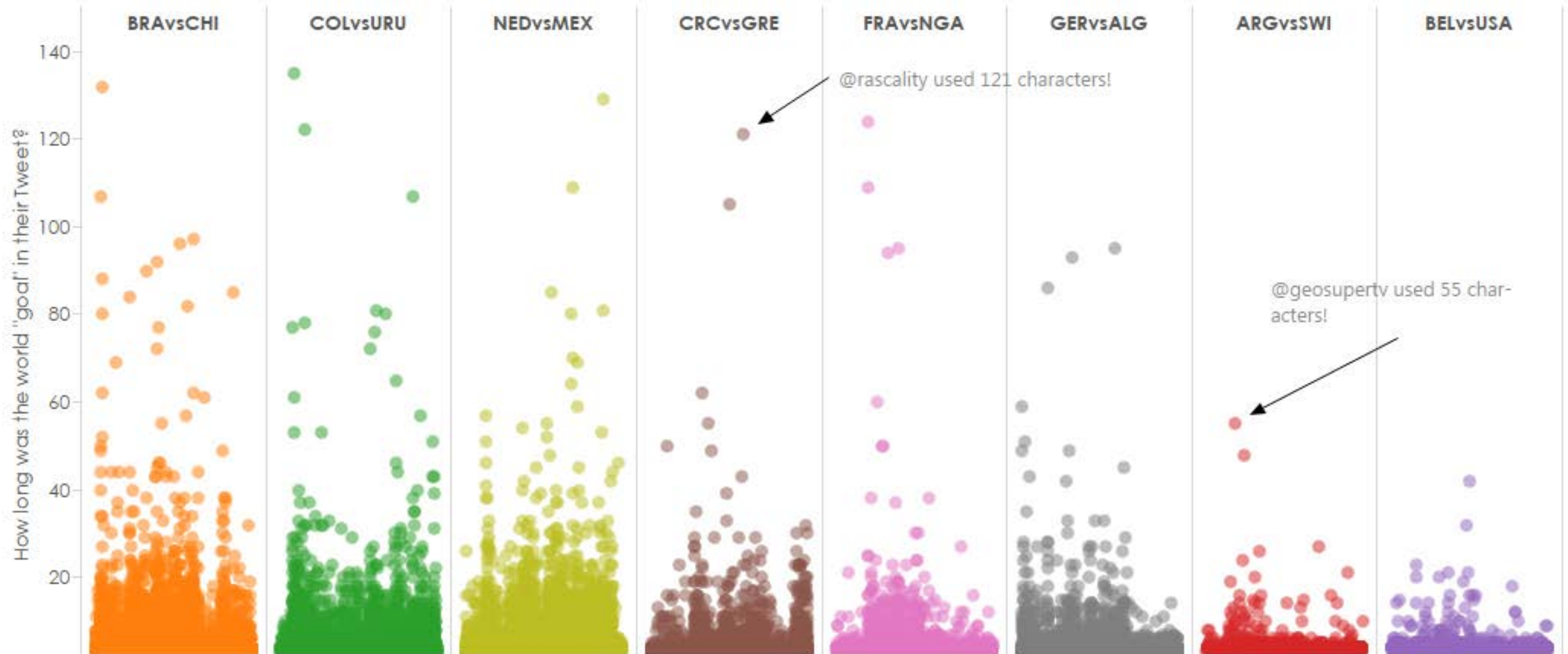
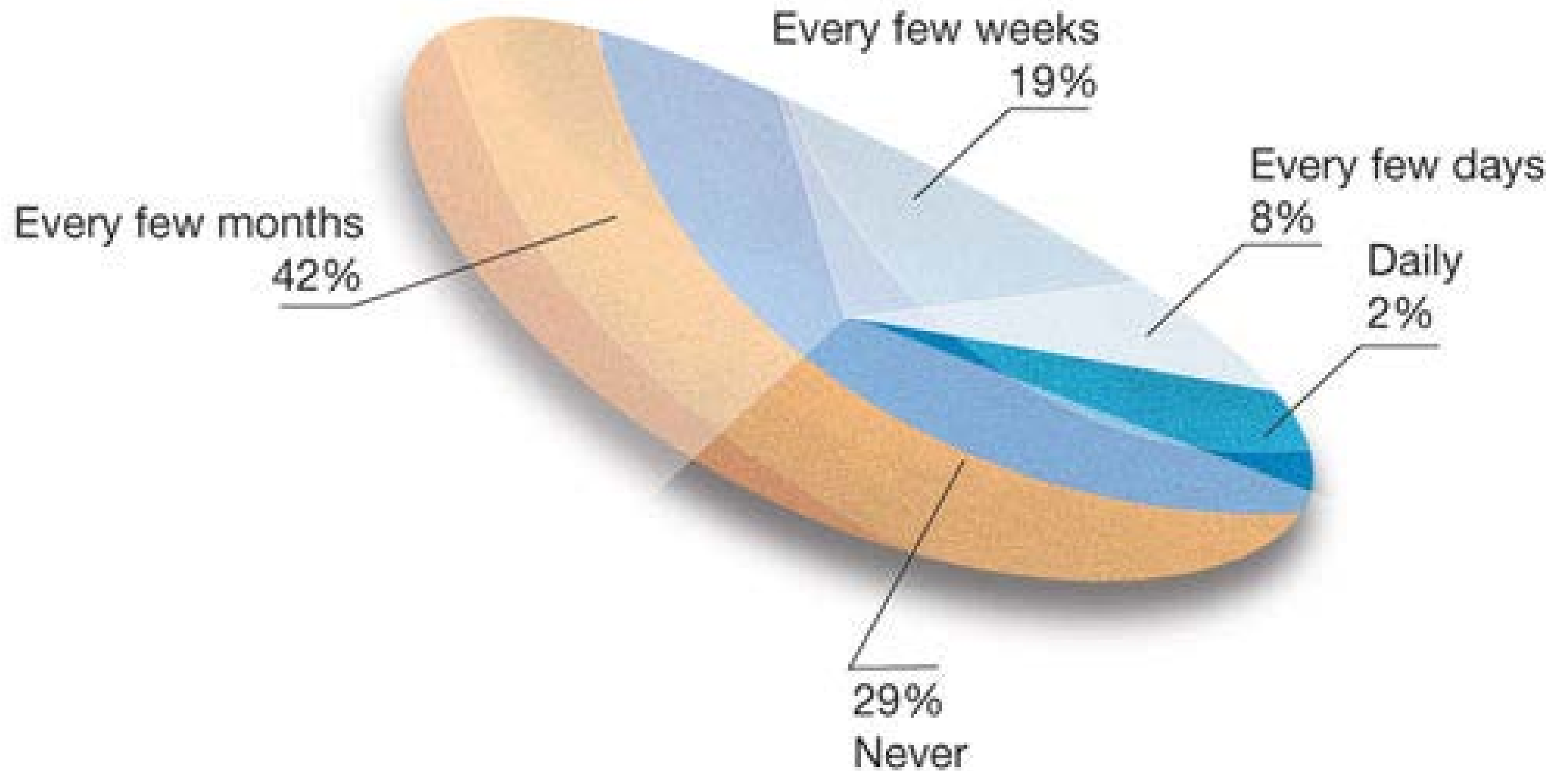
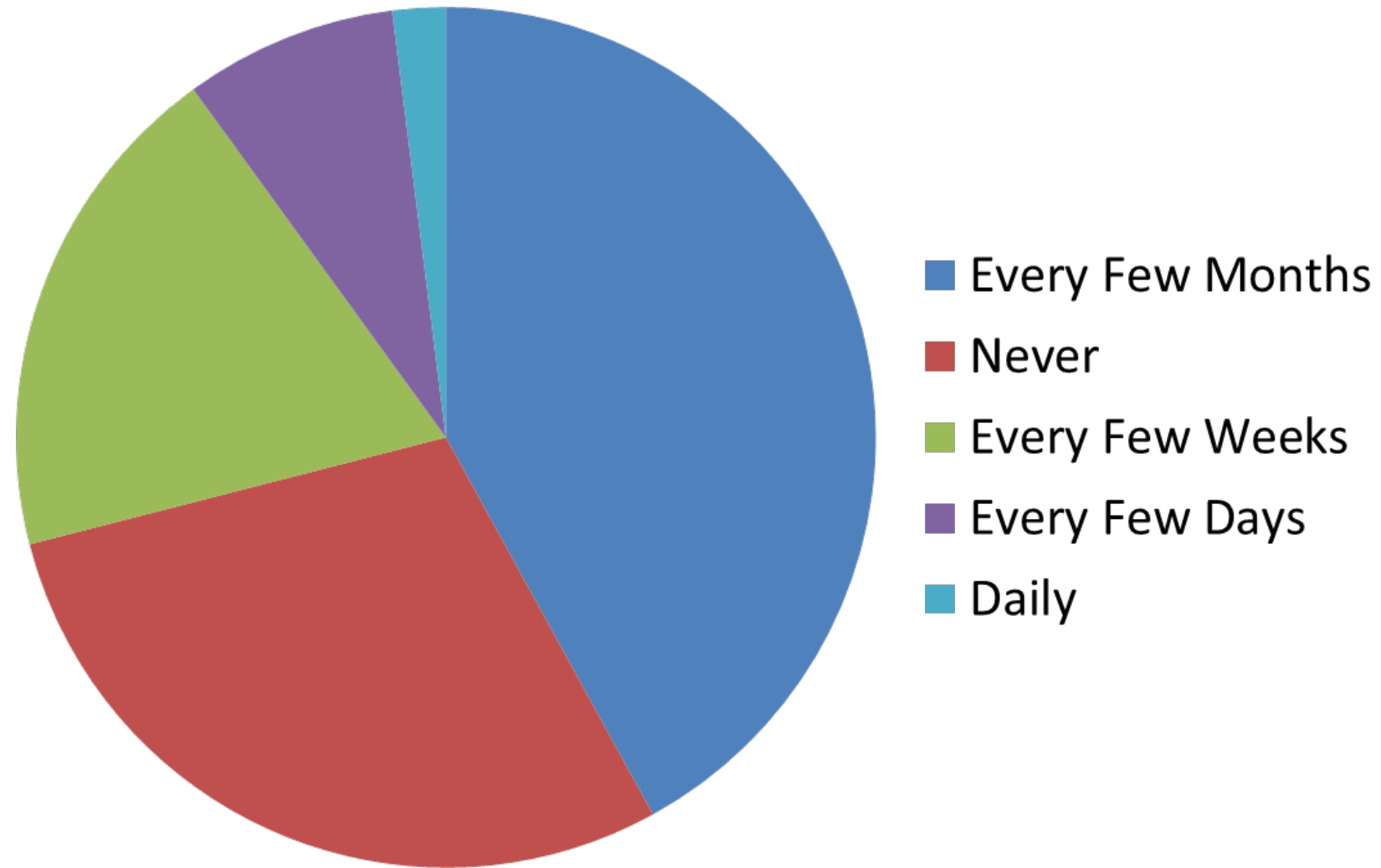
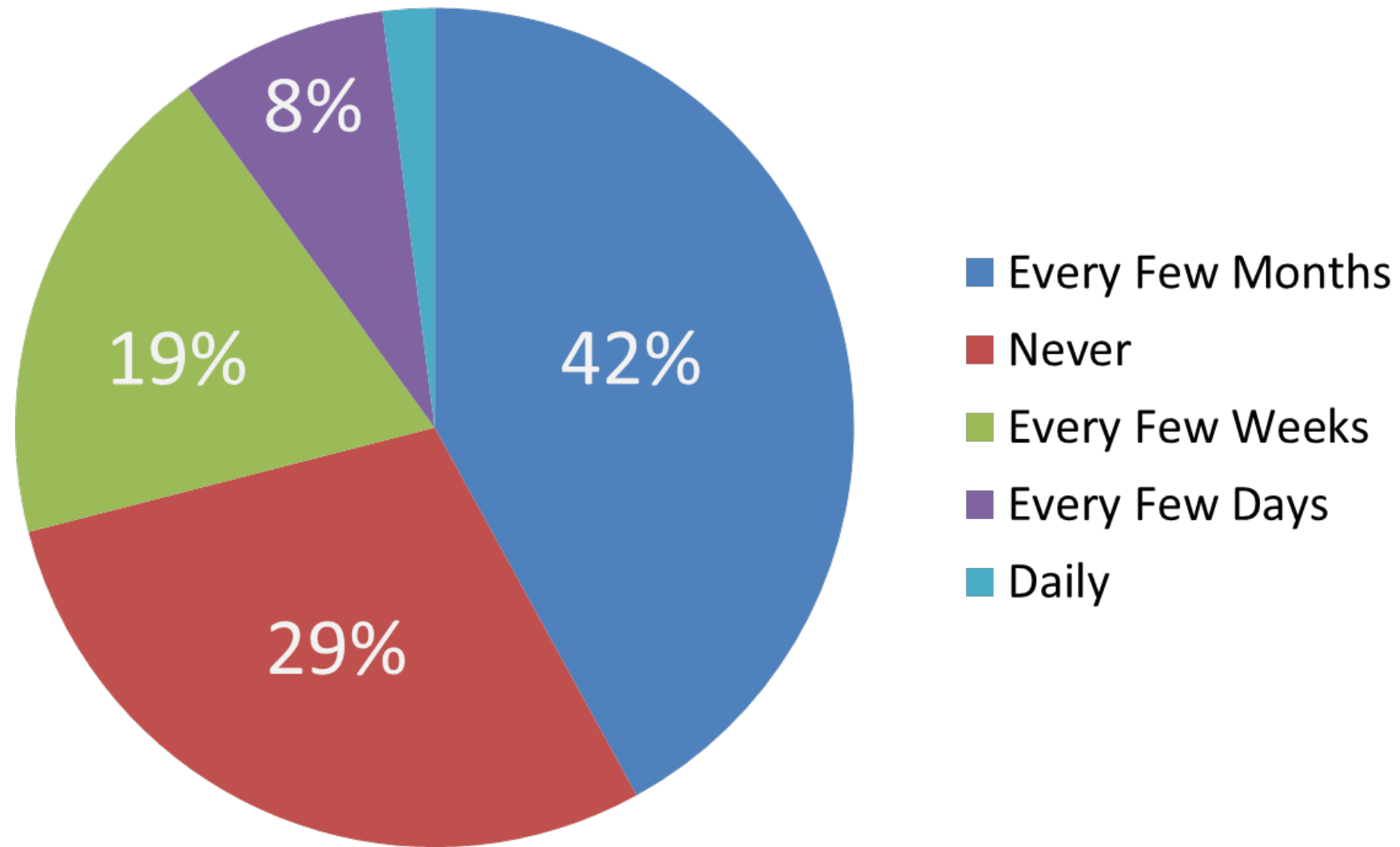


Chart shows the number of letters people use in the word "gol" or "goal" during the second round matches of the World Cup.

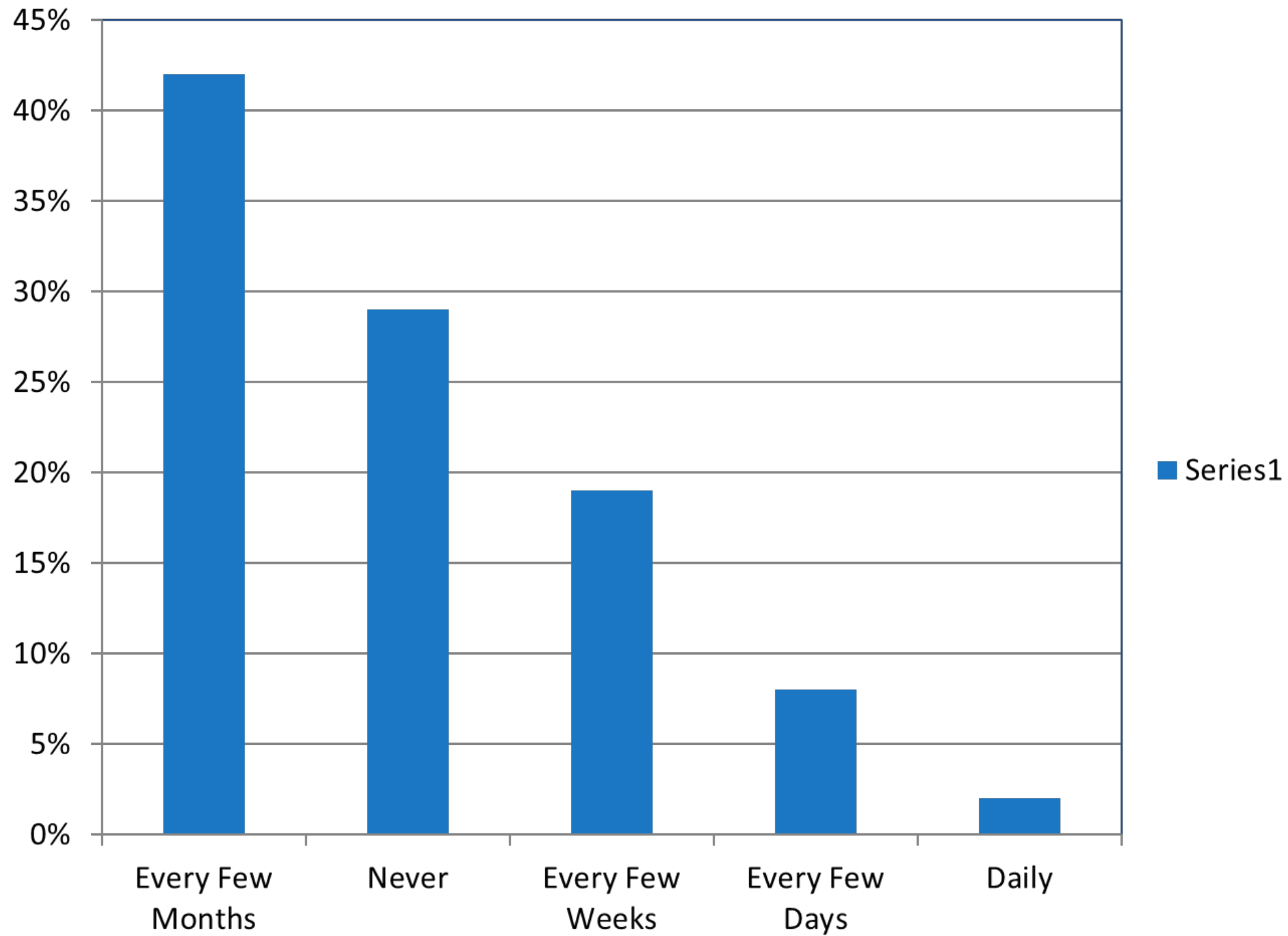


Default in Excel

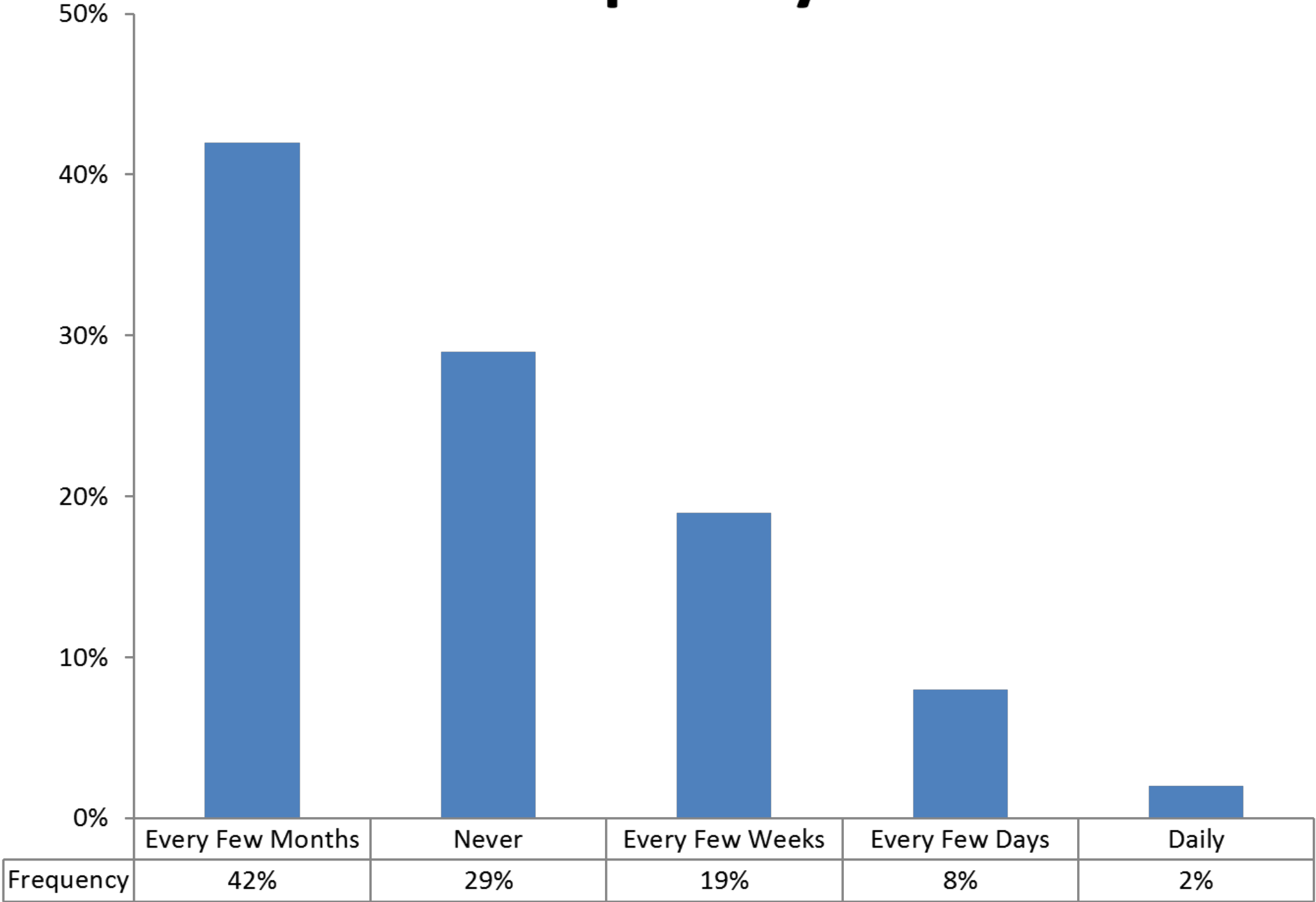




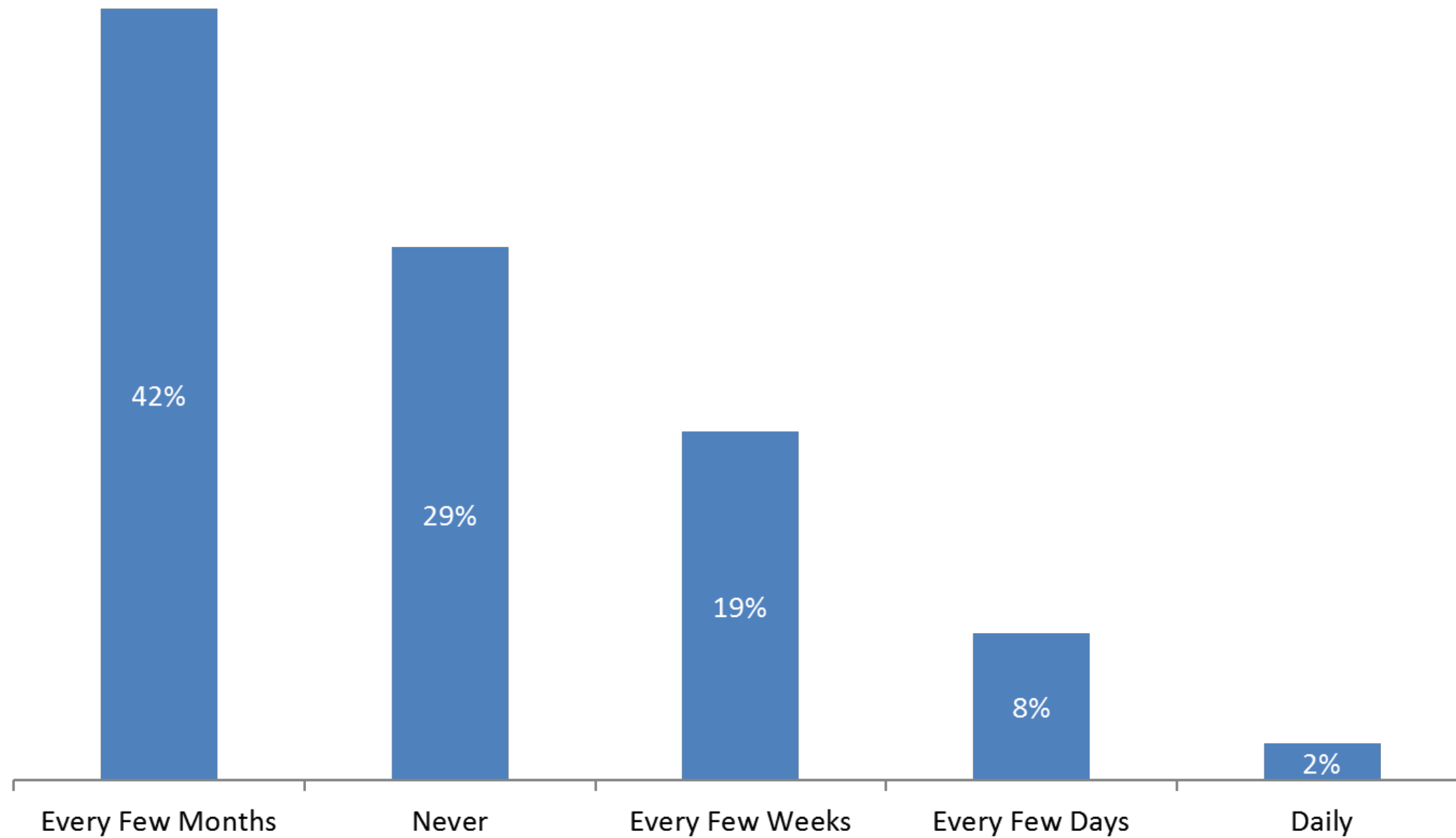
Default in Excel



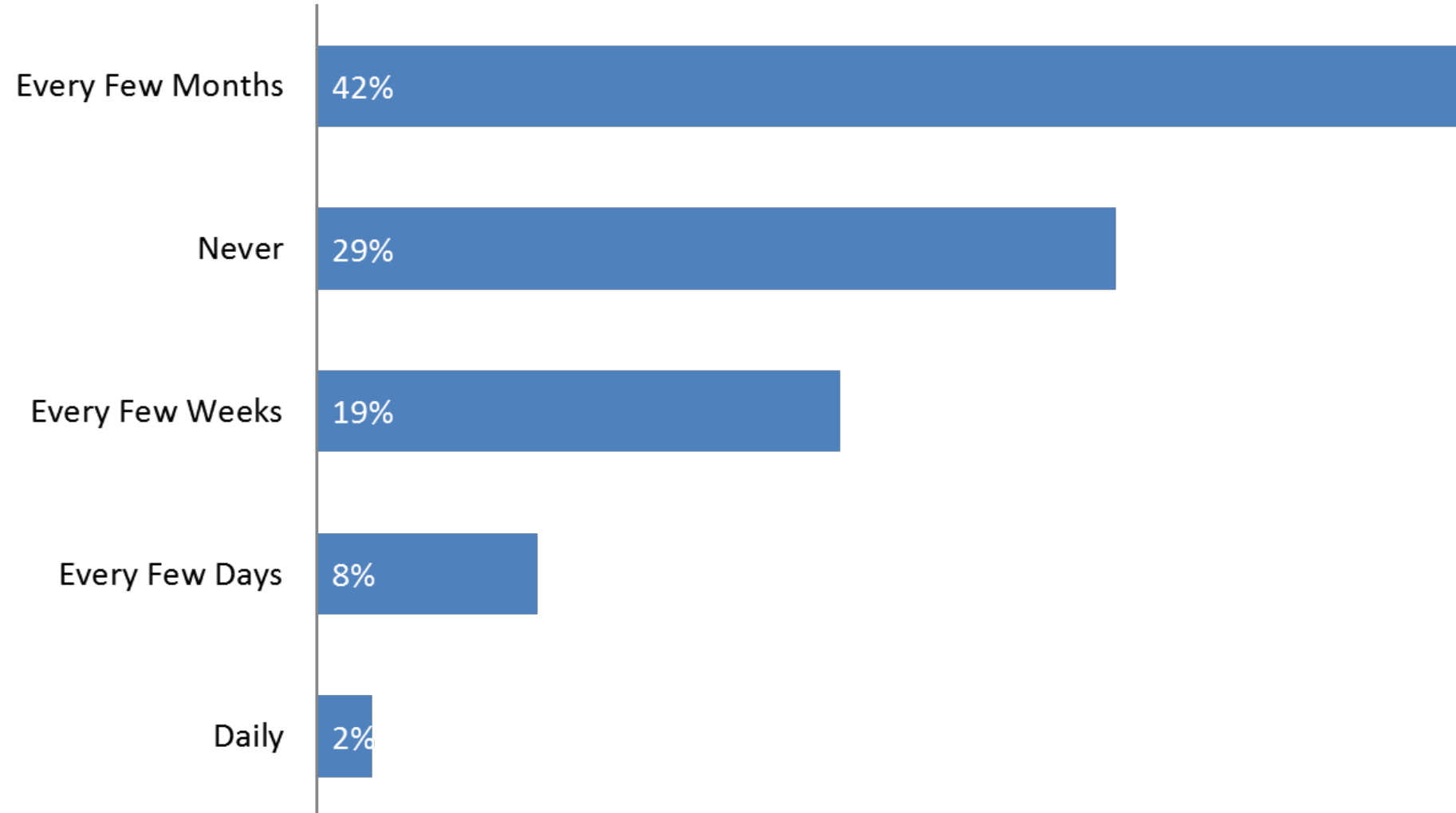
Frequency



Frequency

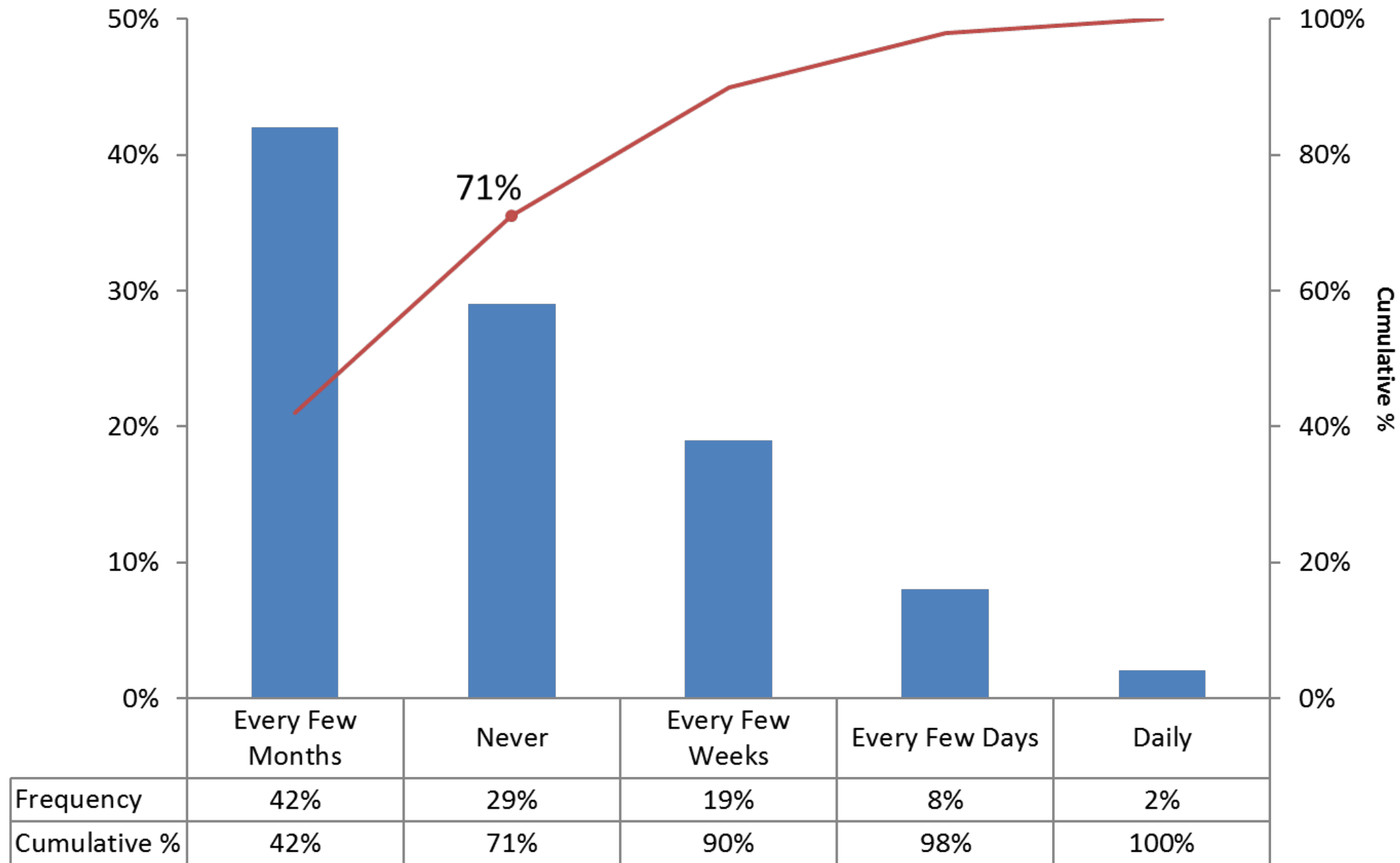


Frequency



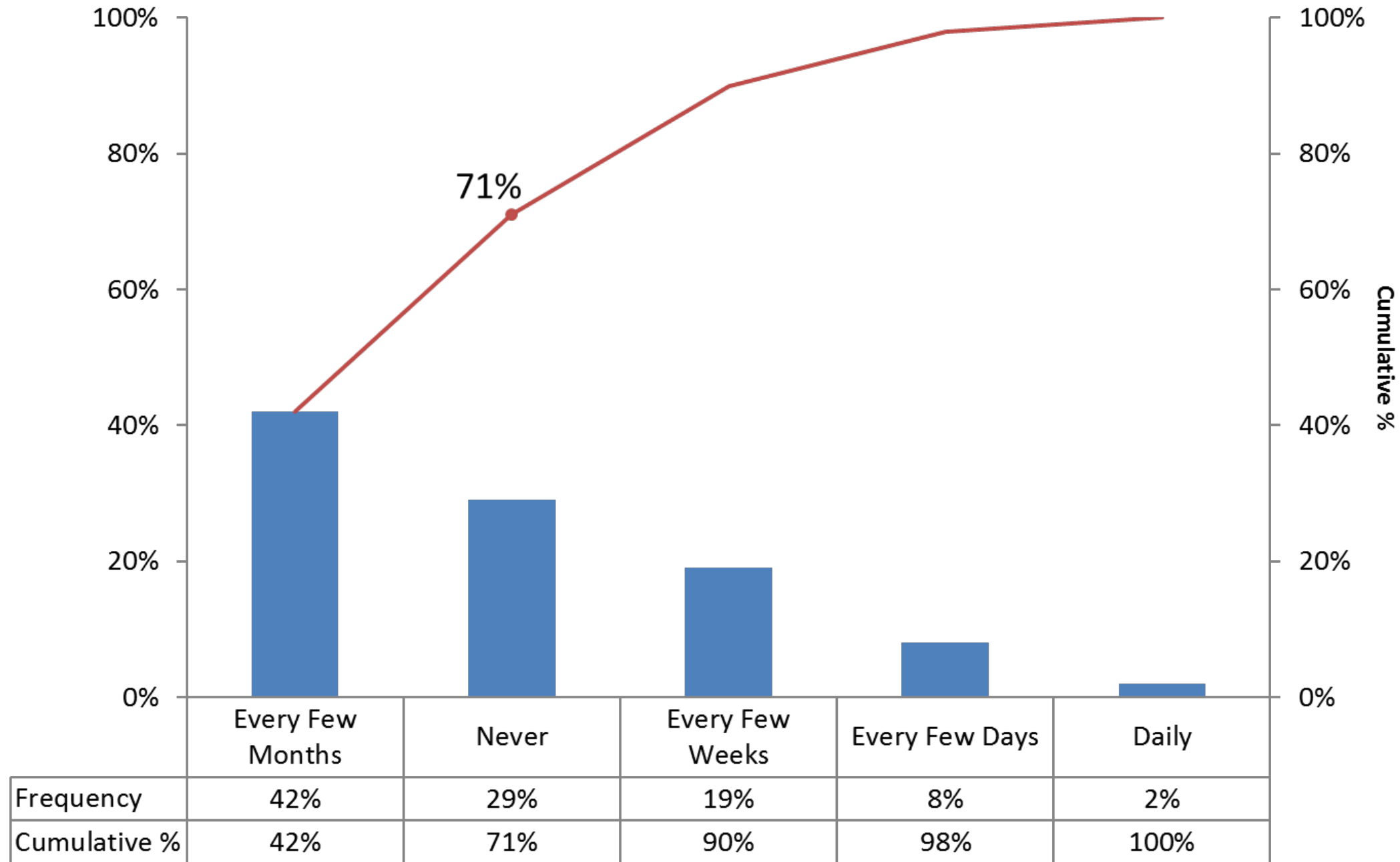
Frequency

71% of occurrences are caused by low frequency



Frequency

71% of occurrences are caused by low frequency



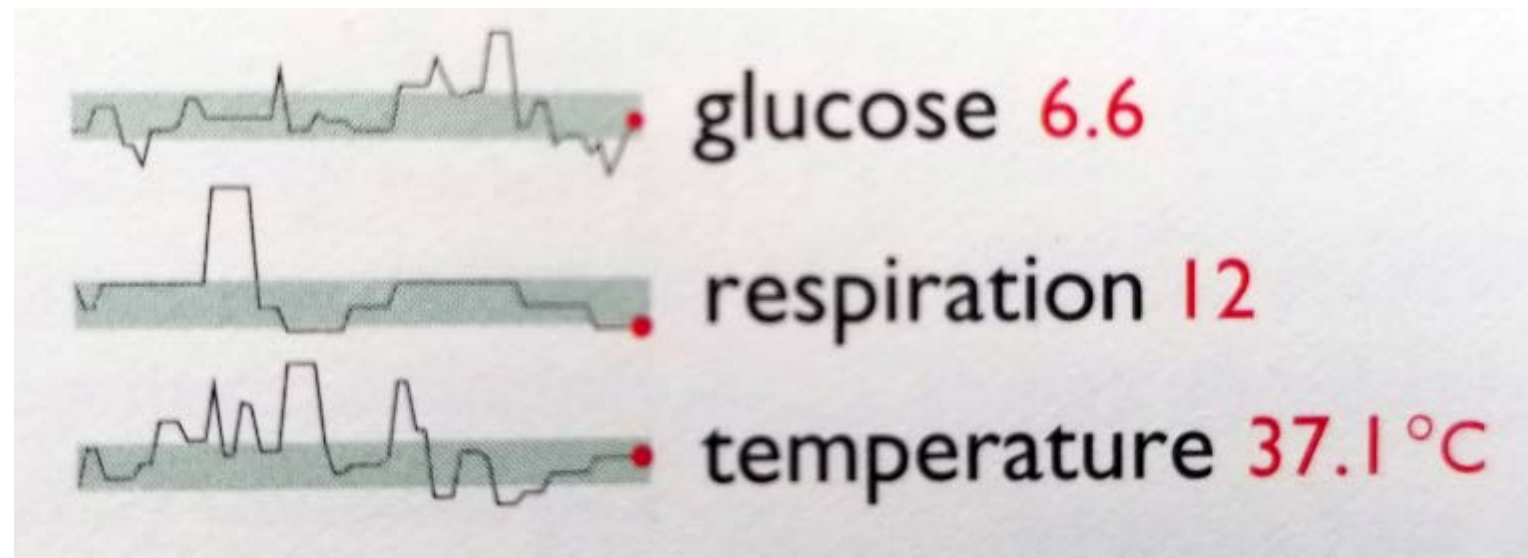
Sparklines

- Invented by Edward Tufte

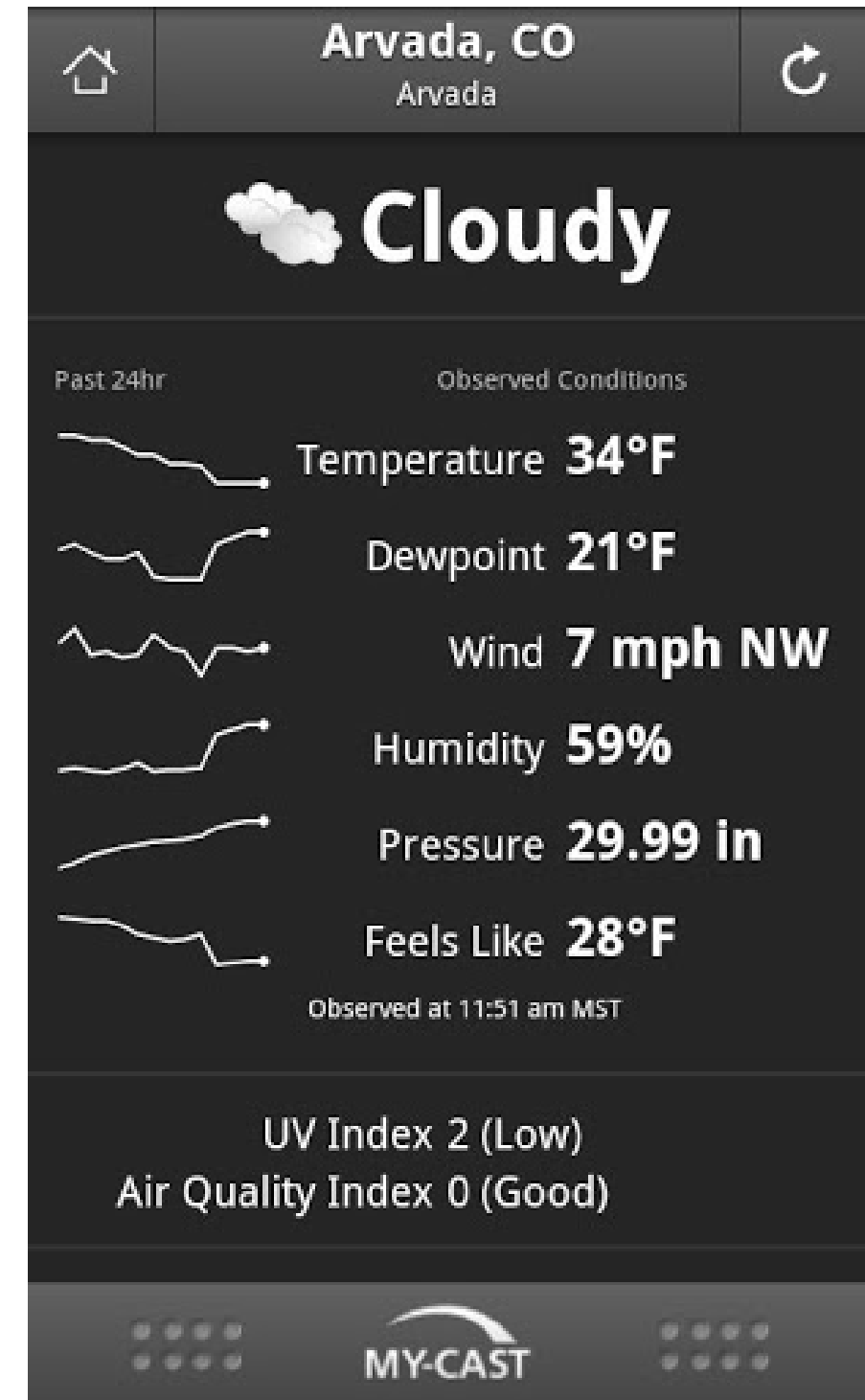


Sparklines

- Small, high-resolution graphics embedded in a context of words, numbers, images. Sparklines are data-intense, design-simple, word-sized graphics.



Sparklines



Sparktweets



■■■■■■■■■■ Last 12 months of the U.S. unemployment rate, which rose to 9% in April. More data: <http://on.wsj.com/jkZPs9>


@indians record 2011 to date:



#sparktweet

'11 US Budget [■=\$20B]: MassTransit __
Airports __ Highways ■ | Defense

— | #sparktweet #gov20 #opengov

Fresh data on world primary energy use by %: Oil 34.77, Coal 29.36, NG 23.76 Nuke 5.47, Hydro 6.63 | spark: 

@pkedrosky @alexkerin

@timhaines how hard I was laughing
before and after reading that tweet
#SparkTweet

My enthusiasm for @PJHarveyUK 's new album:  #sparktweet

Small Multiples

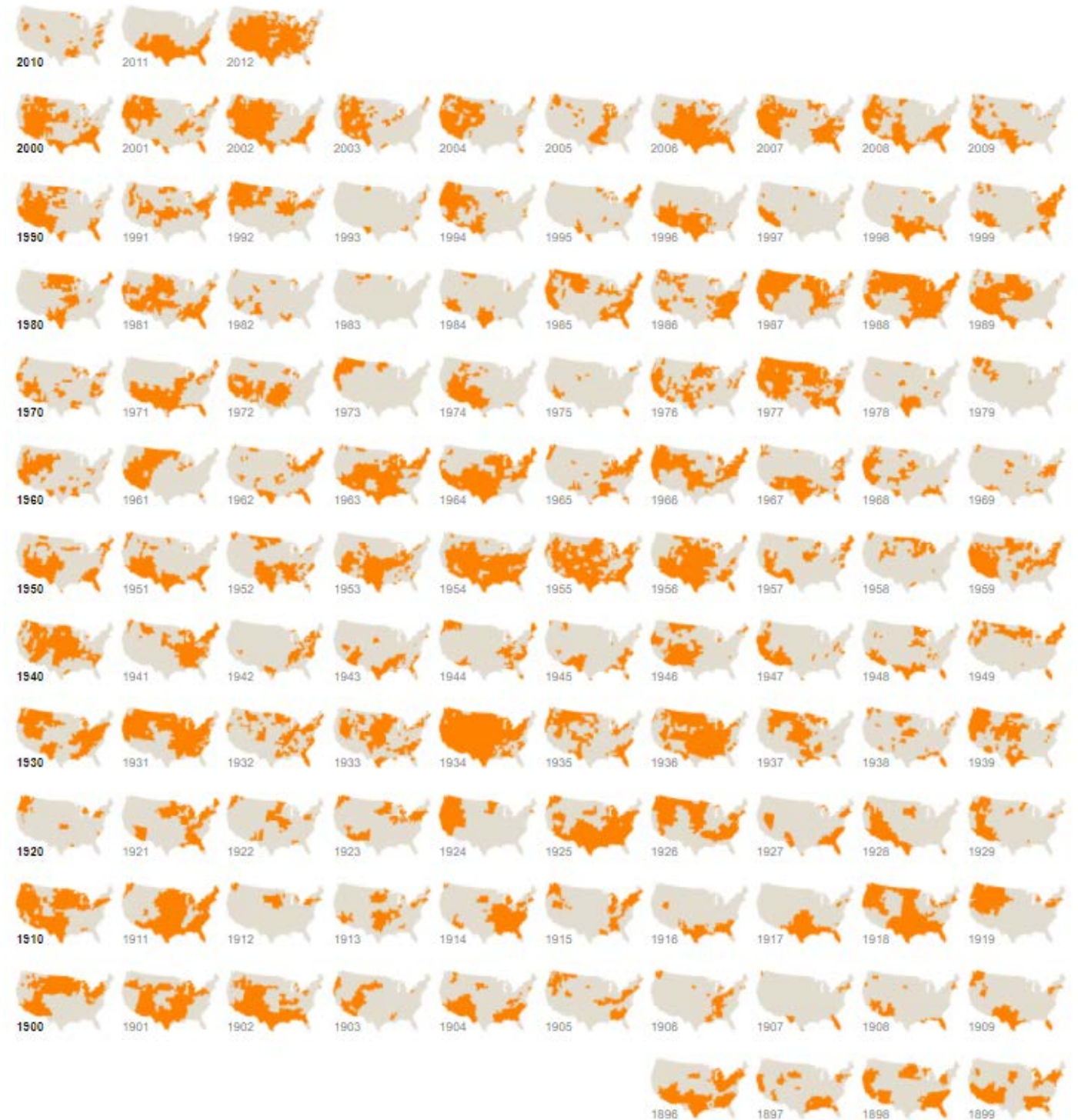
Invented by Edward Tufte

"Illustrations of postage-stamp size are indexed by category or a label, sequenced over time like the frames of a movie, or ordered by a quantitative variable not used in the single image itself."

Source: <http://www.nytimes.com/interactive/2012/07/20/us/drought-footprint.html>

Drought's Footprint

More than half of the country was under moderate to extreme drought in June, the largest area of the contiguous United States affected by such dryness in nearly 60 years. Nearly 1,300 counties across 29 states have been declared federal disaster areas. Areas under moderate to extreme drought in June of each year are shown in orange below. [Related Article »](#)



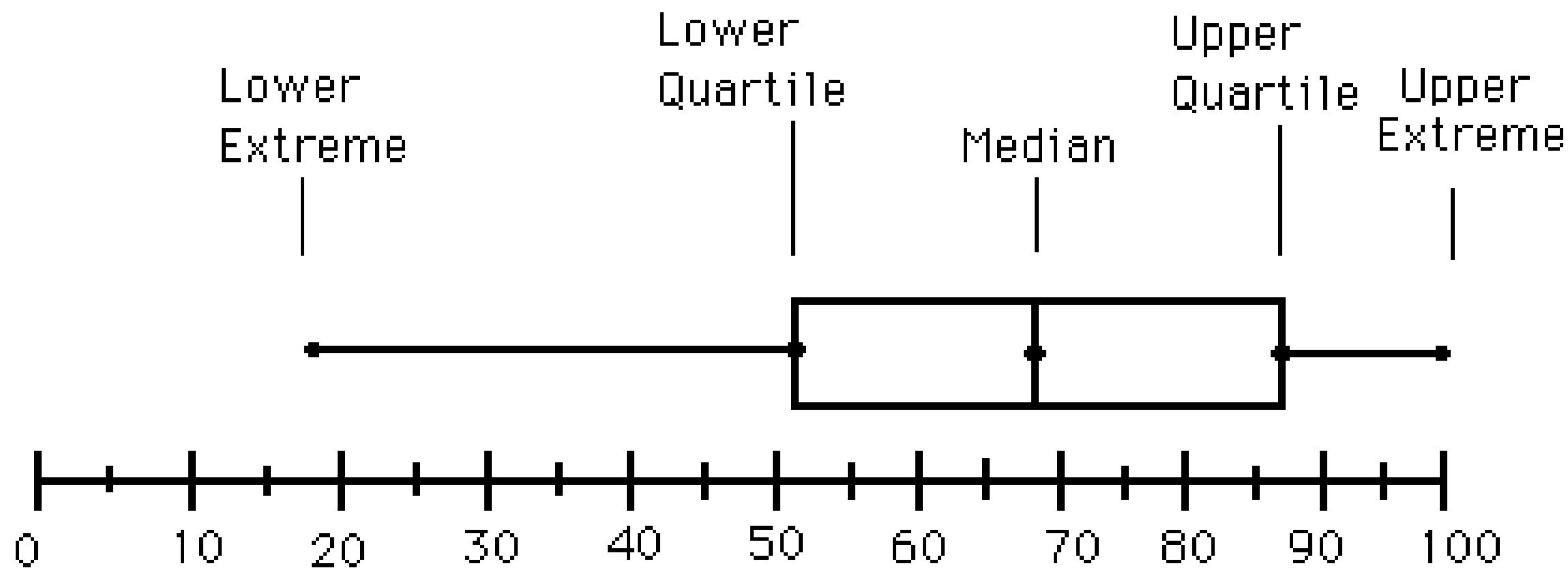
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Source: <http://www.nytimes.com/interactive/2012/07/20/us/drought-footprint.html>

Box and Whiskers or Box Plot (Tukey):



Box Plot vs. PDF

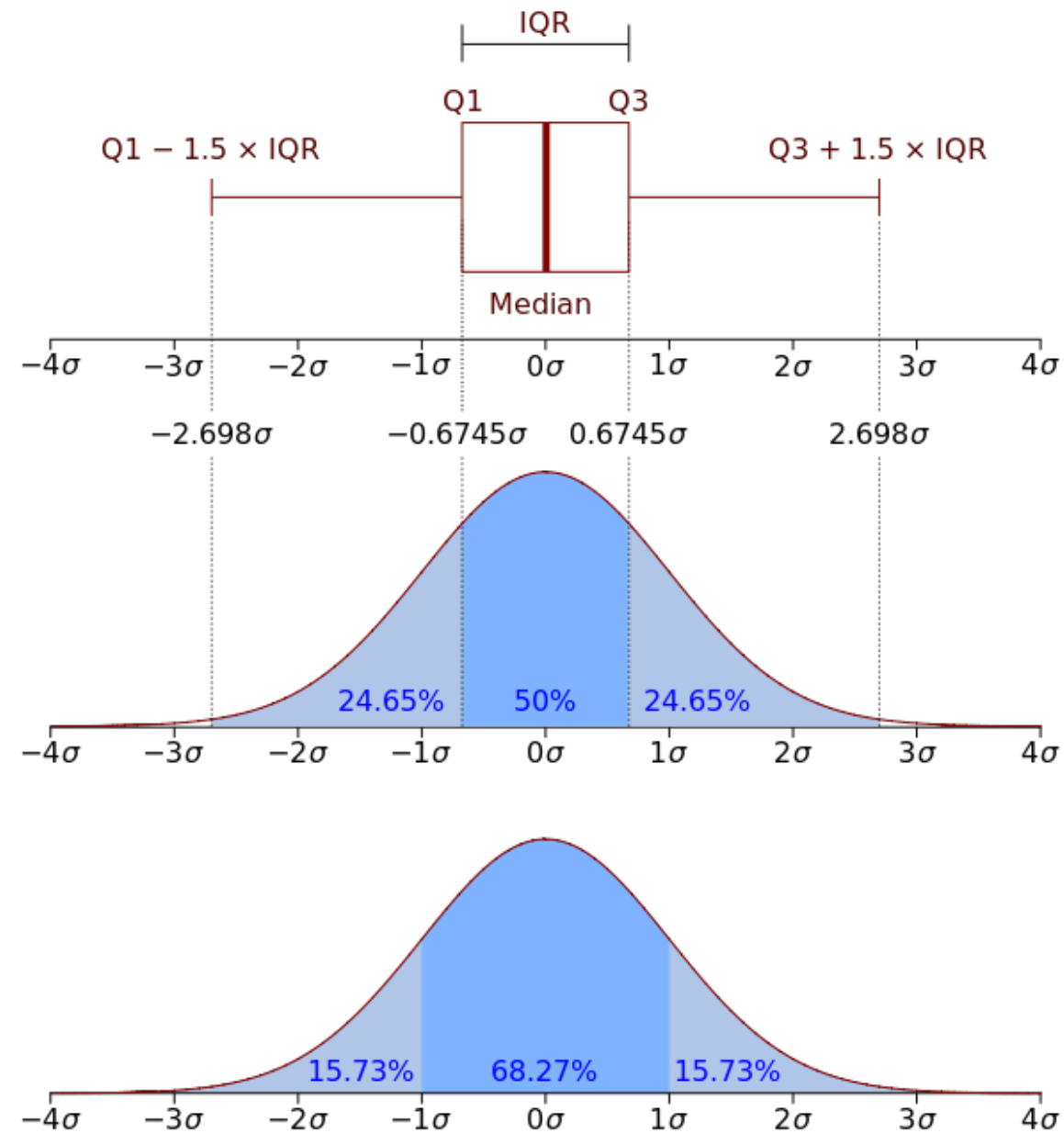
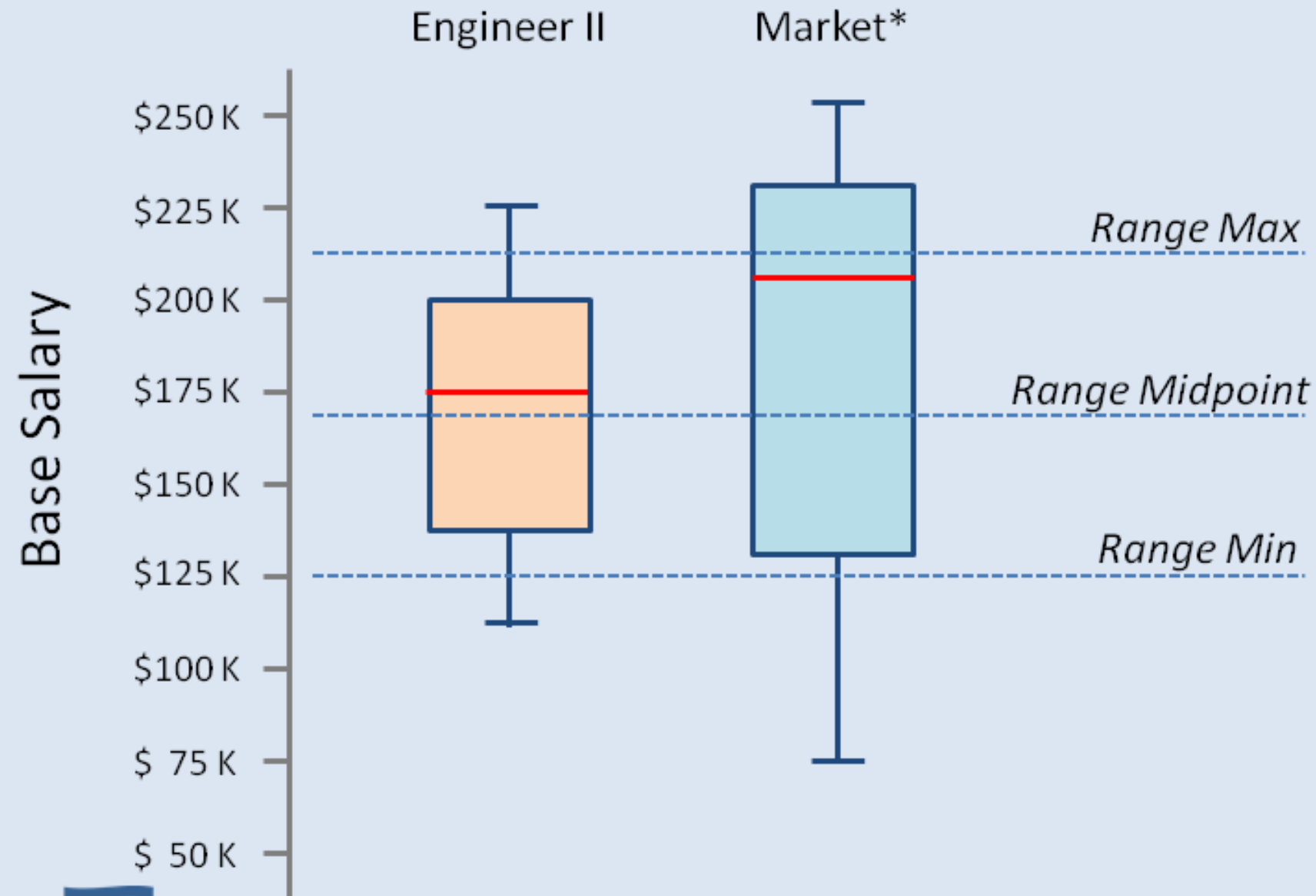
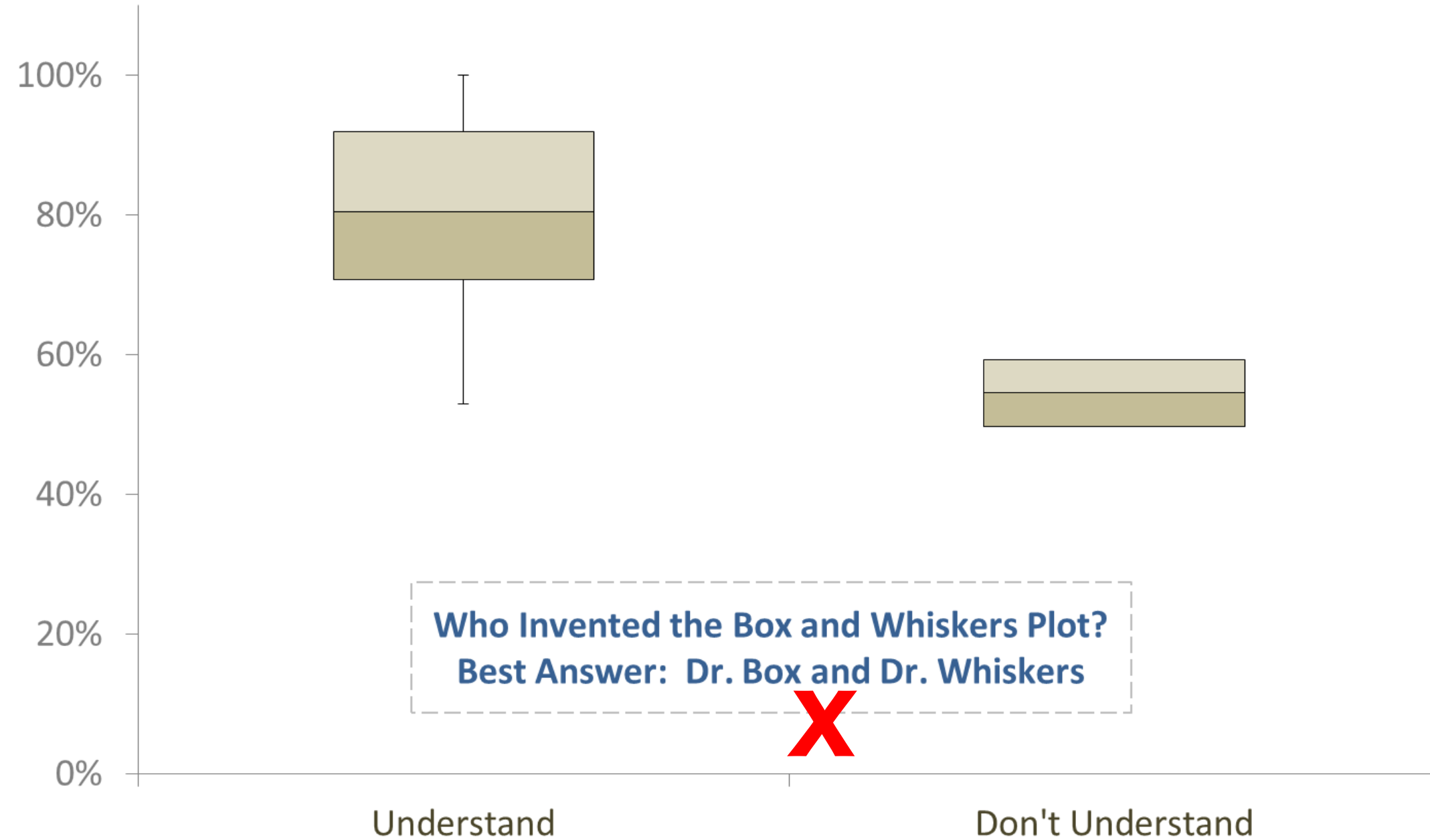


Fig. 3 – Comparing Two Distributions

Market Comparison



Exam Grades for Data Visualization Students who Understand a Box and Whiskers Plot

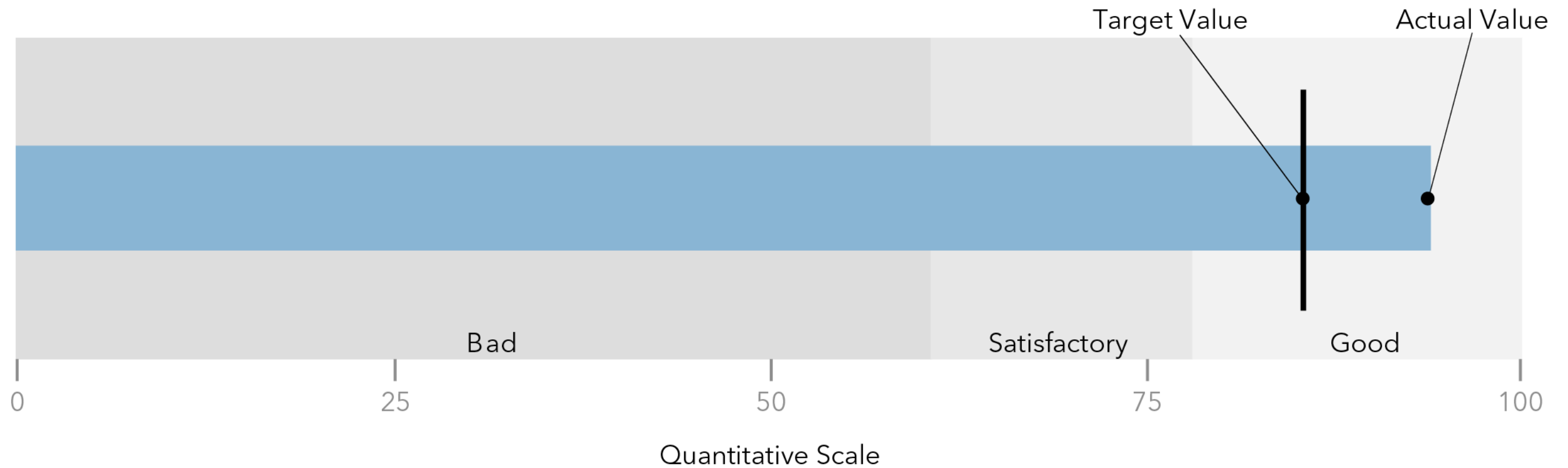


Bullet Graph (invented by Stephen Few)

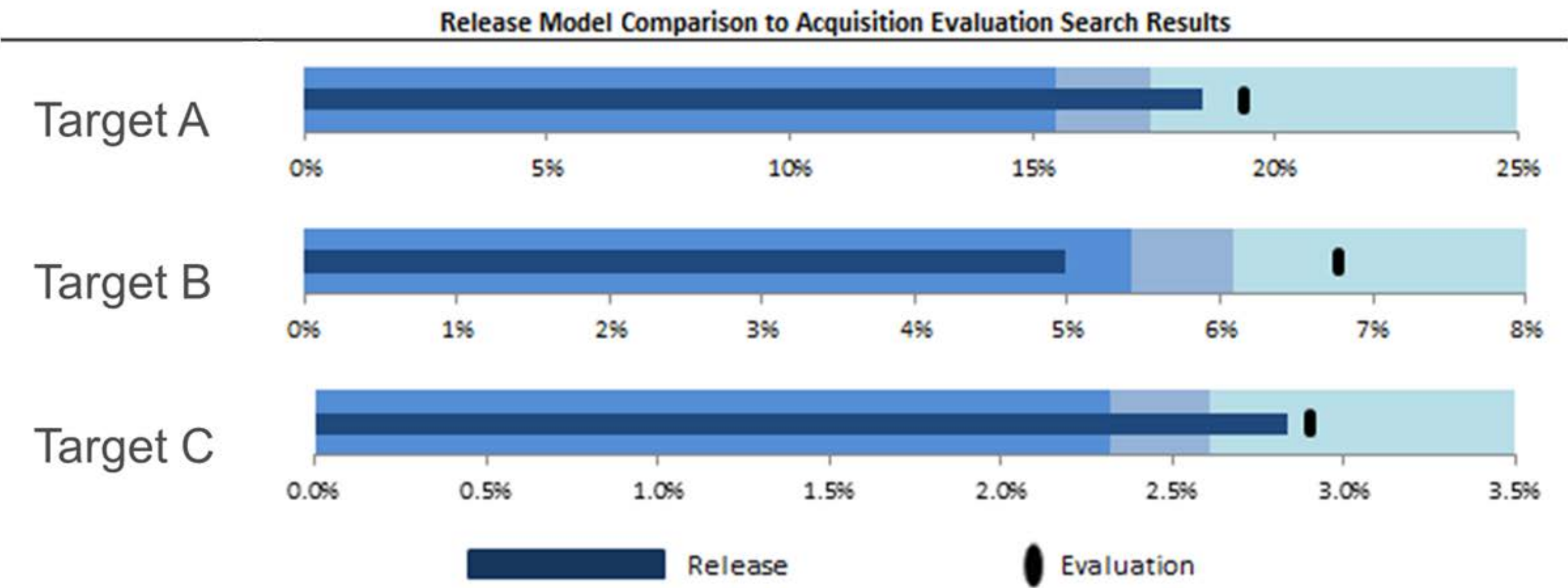


Source: Public Domain
https://en.wikipedia.org/wiki/Bullet_graph#/media/File:Bullet_graphs_multiple.png

How to read a Bullet Graph:



Bullet Graph (invented by Stephen Few)

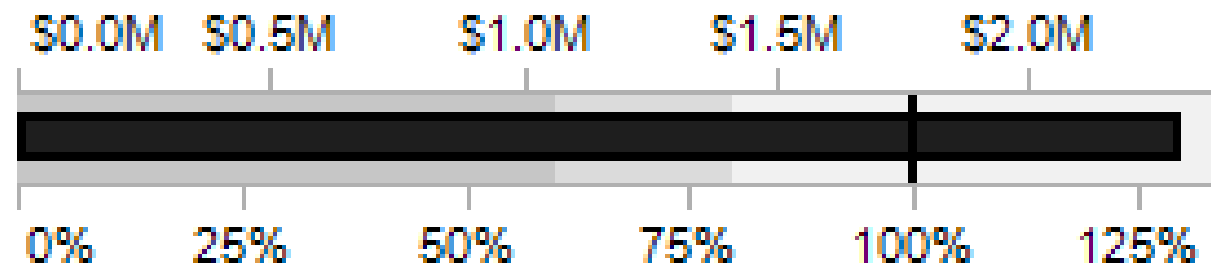


Variations on the Bullet Chart

Just actual to target
Easier to understand

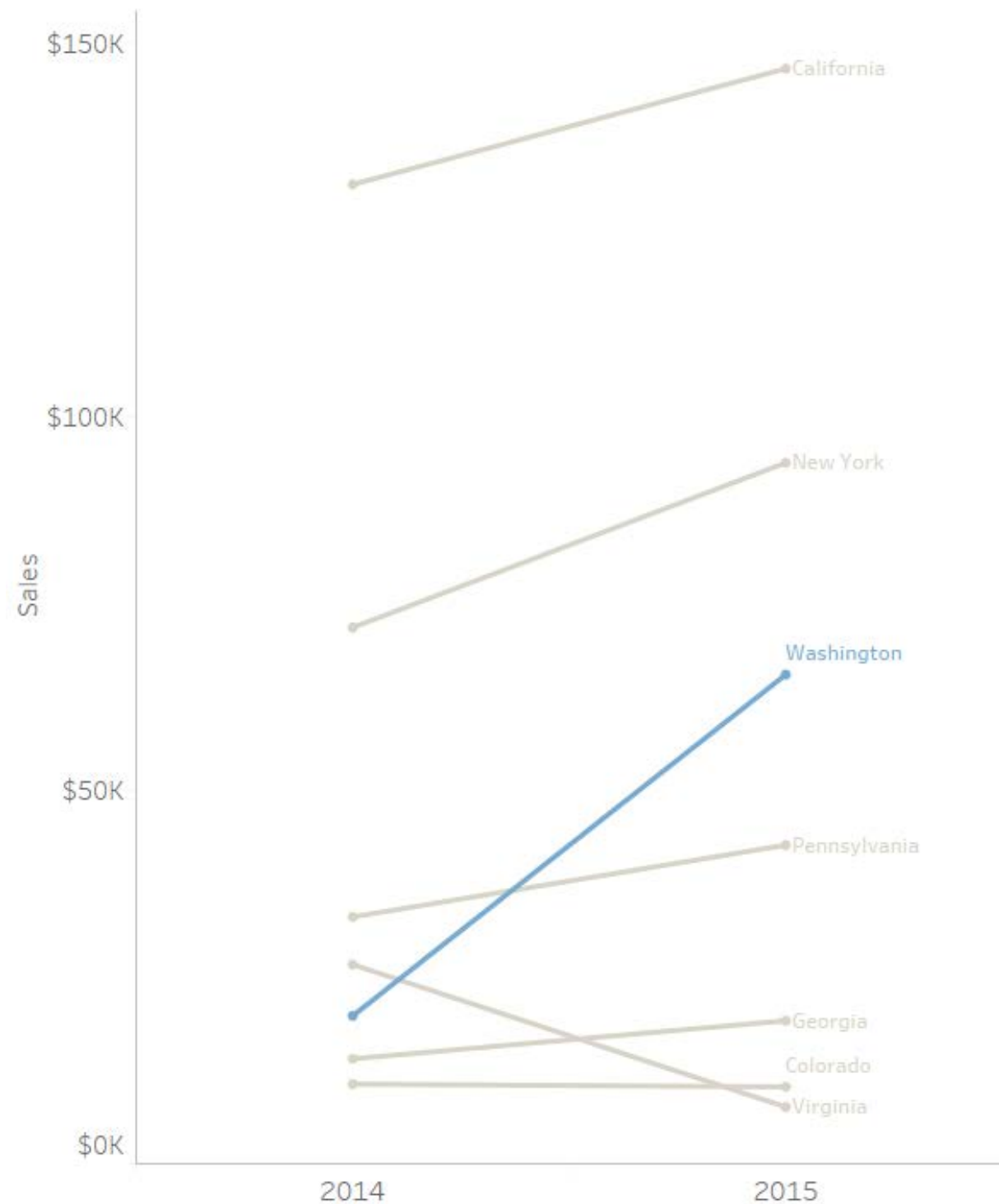


Shows both value and %



Slopegraph

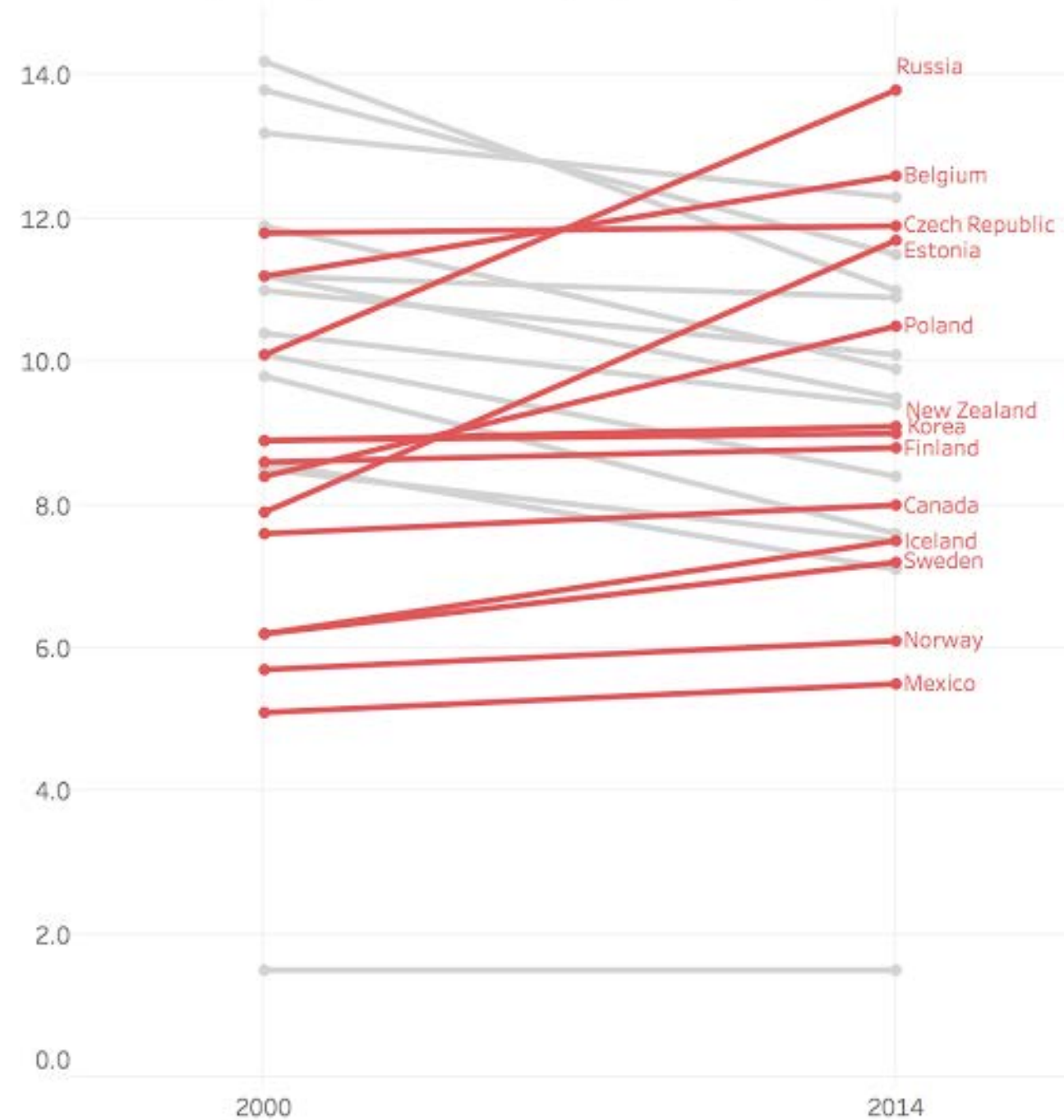
Sales by State, 2014-2015



Source: *The Big Book of Dashboards* (Figure 1.21)

Which OECD countries consumed **more alcohol** per person in 2014 than in 2000?

Annual consumption of pure alcohol in liters, per person, aged 15 years old and over.

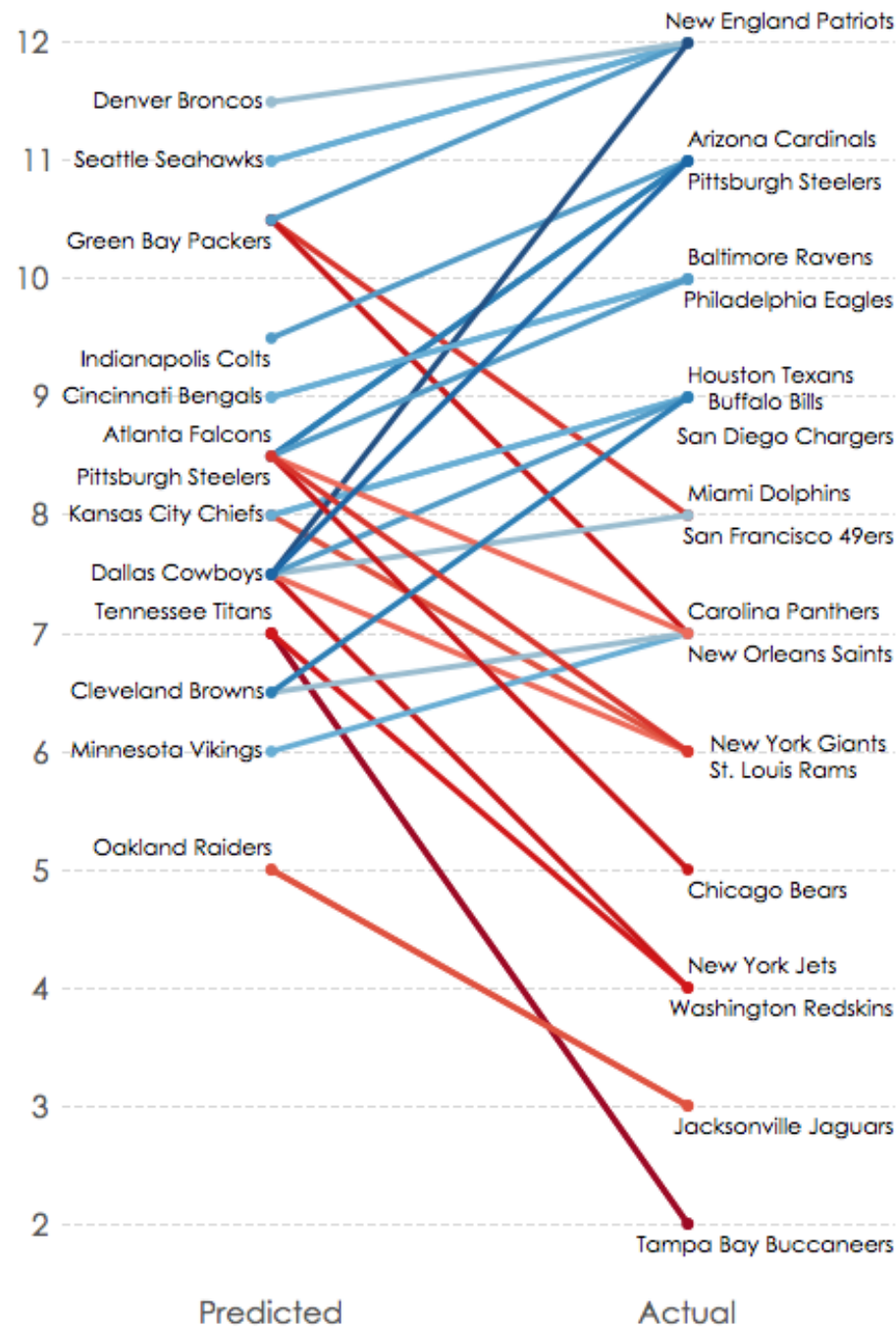




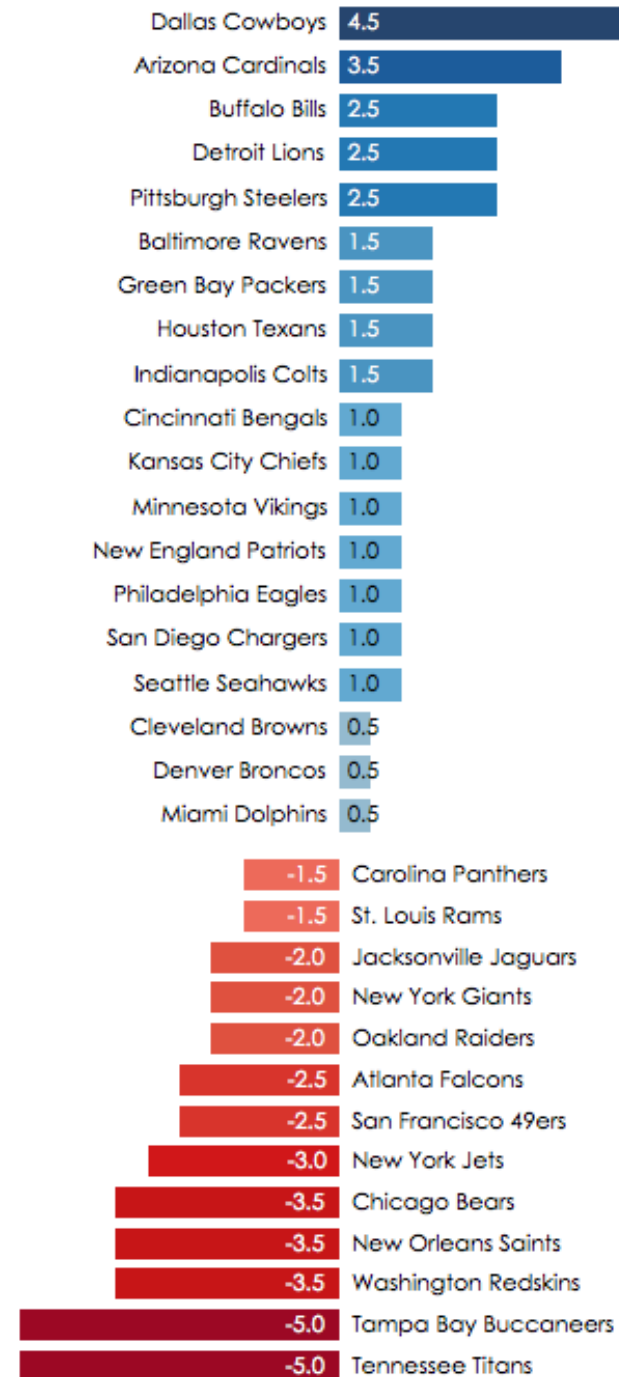
Which NFL Teams Were the Biggest Overachievers and Underachievers in 2014?

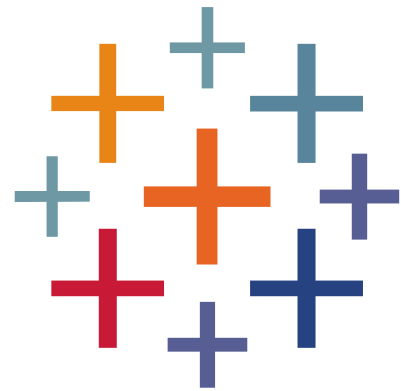
Click any team to highlight

Predicted vs. Actual Wins



Amount of Over/Underachievement





+ able au[®]