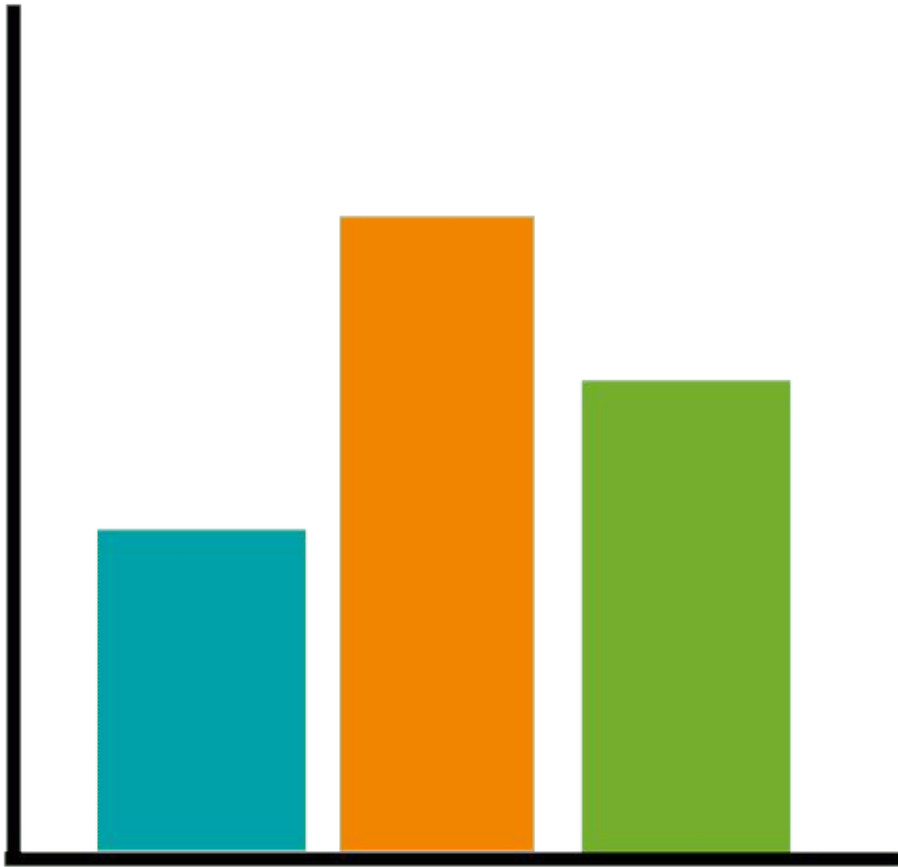
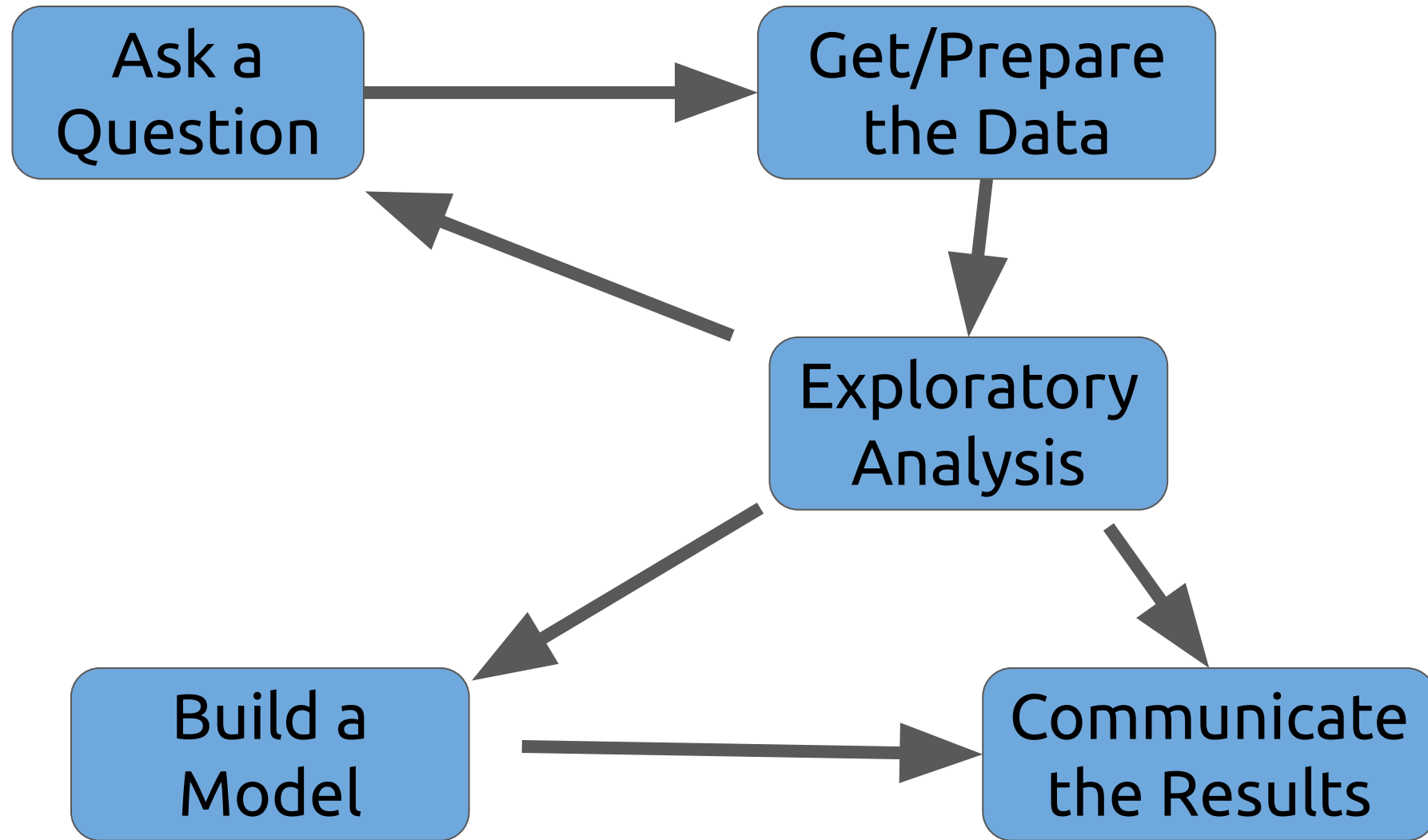
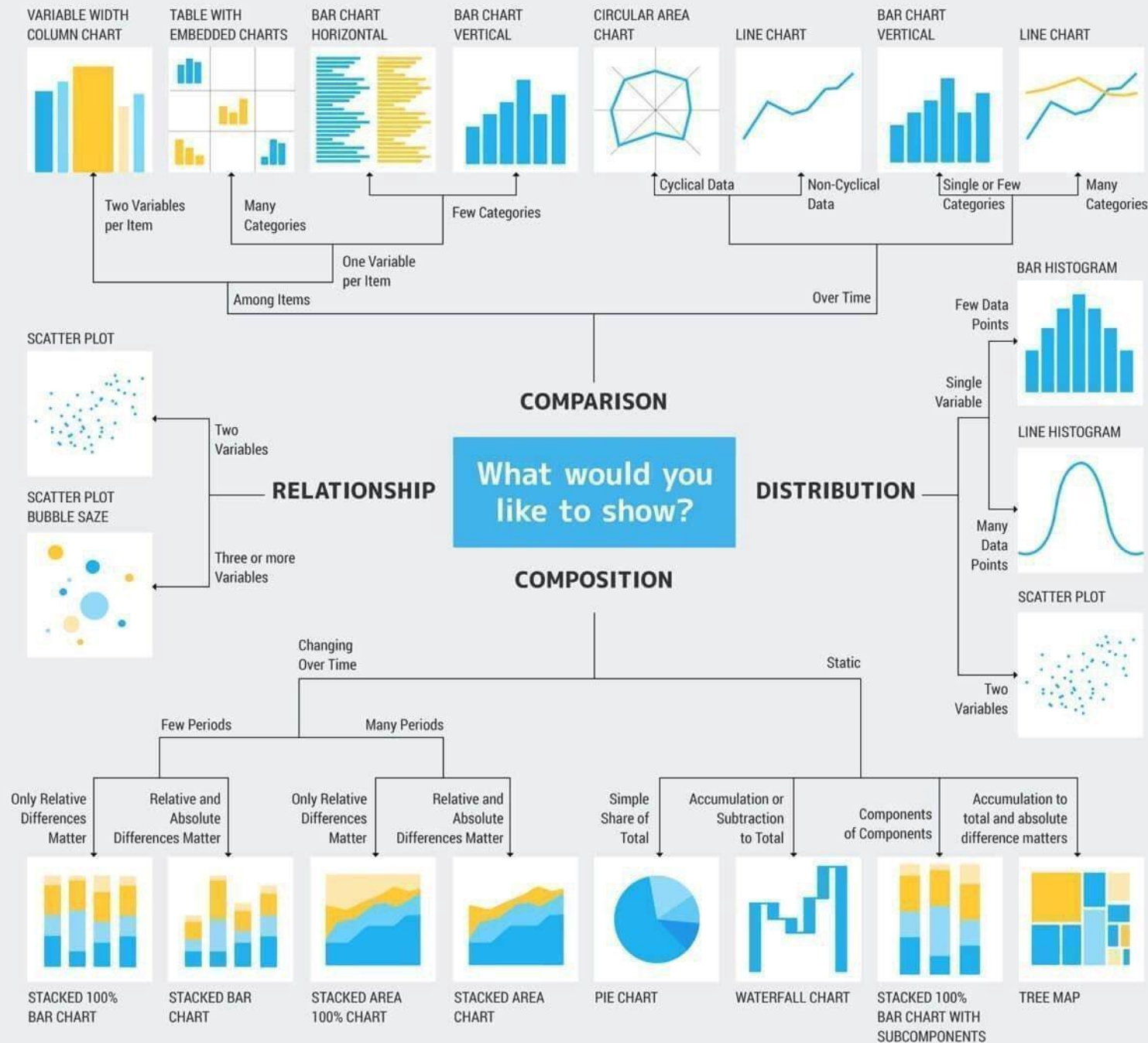


Data Visualization



The Data Science Process





Which Type of Plot Should I Use?

<https://towardsdatascience.com/data-visualization-with-matplotlib-using-python-a7bfb4628ee3>

What is the purpose of this visualization?

Exploratory

Look for patterns/trends

Look for outliers or anomalies

Generate new questions

Determine what to do next

Explanatory

Present findings

Persuade or convince

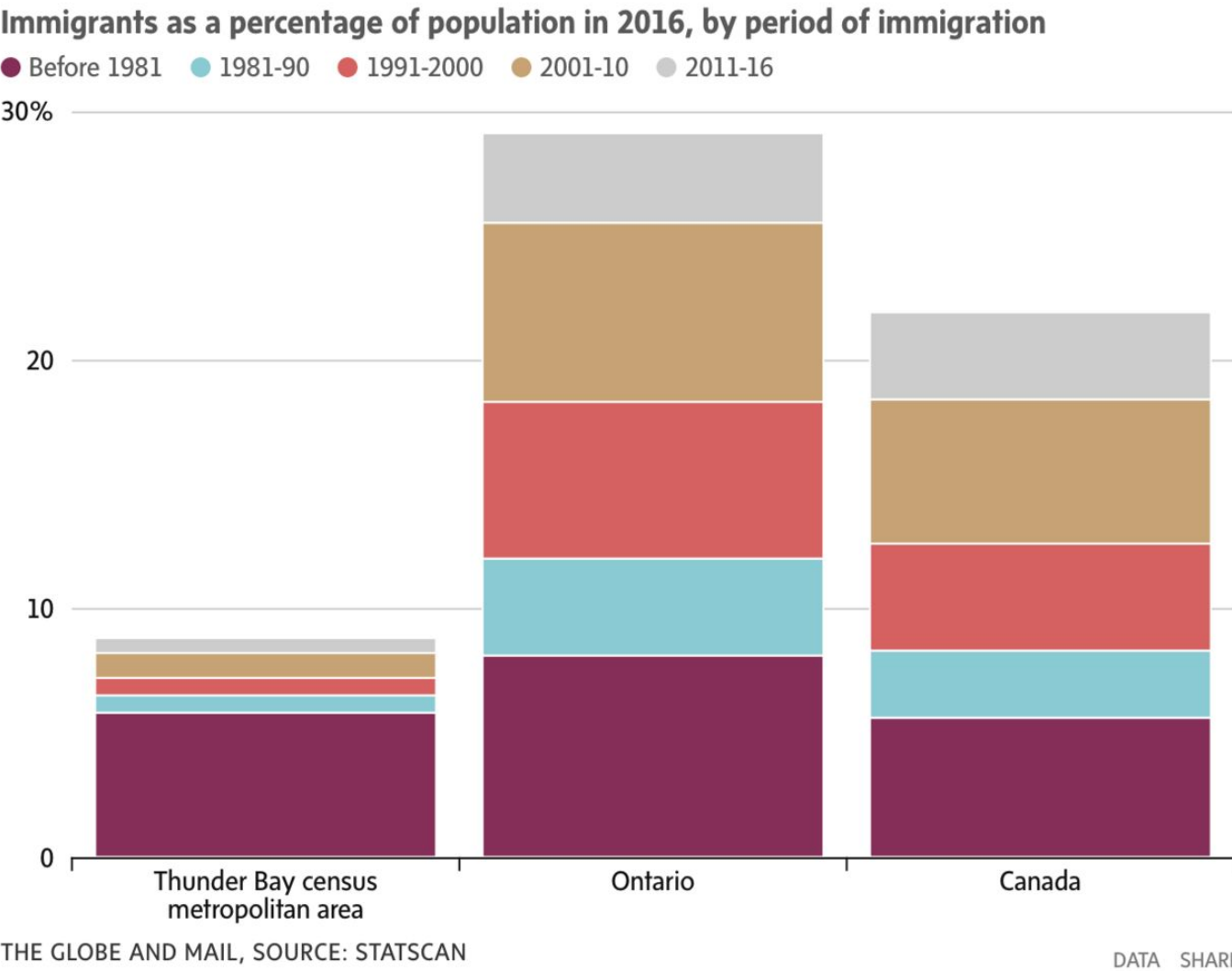
Tell a story

Provide evidence

General Data Visualization Recommendations

- Clear, detailed, and with a title and axis labels
- Simpler is almost always better
- Careful use of color
- Use correct proportions/scales
- Avoid 3D
- Shoot for a high data-ink ratio
- Avoid *chartjunk*
- Draw the audience's attention to important/relevant data

Clear, detailed, and thoroughly labeled



Simpler is Almost Always Better

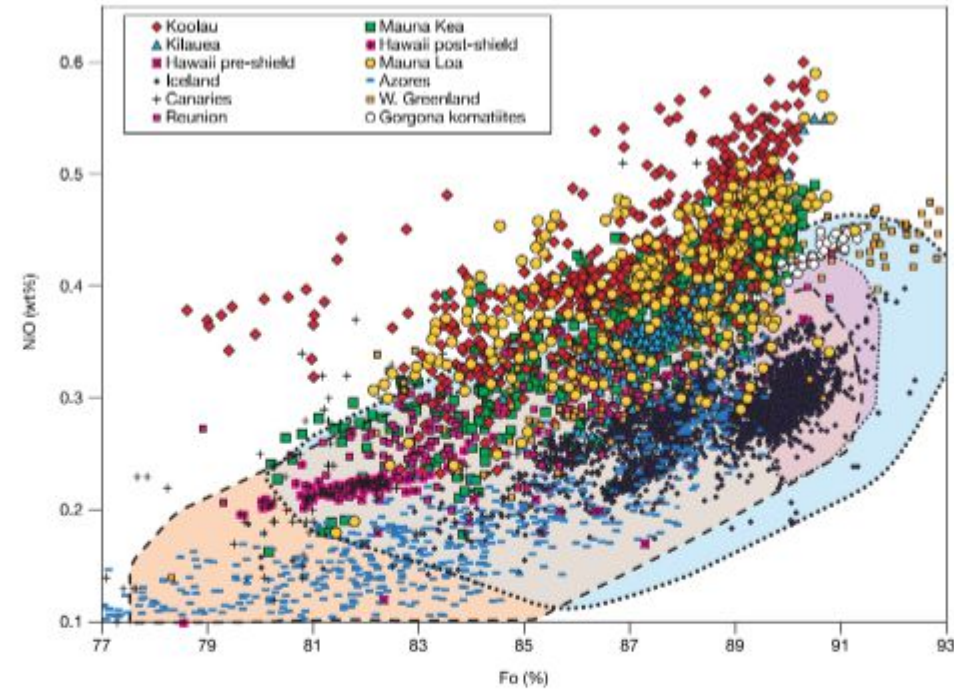
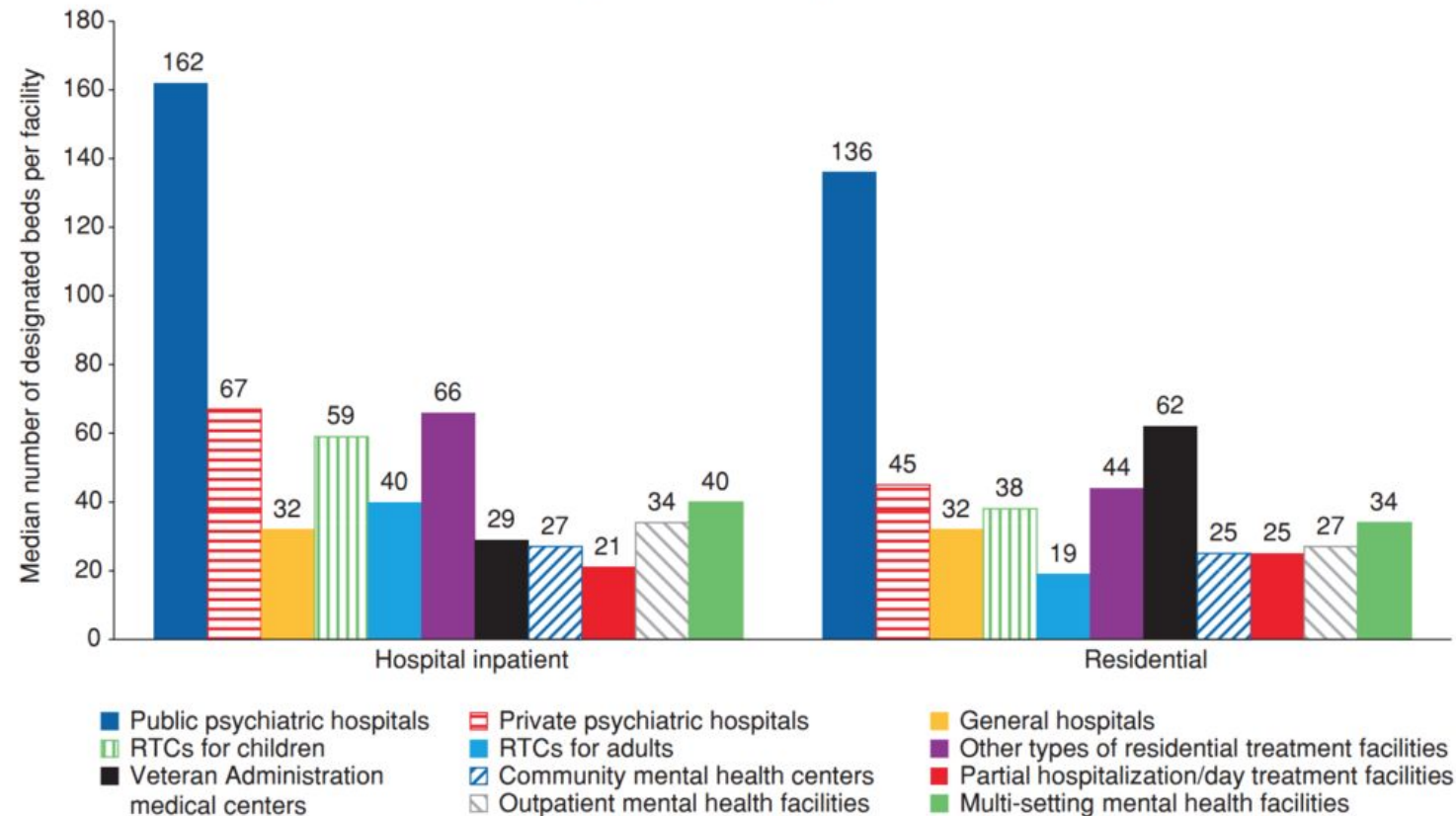


Figure 1 Compositions of olivines from mantle-derived rocks. Blue field, peridotites from mantle xenoliths, orogenic massifs and ophiolites; purple field, oceanic abyssal peridotites; beige field, phenocrysts from mid-ocean-ridge basalts; light green field, overlap between peridotite and phenocryst fields; pink field, overlap between oceanic abyssal peridotites and phenocrysts from mid-ocean-ridge basalts. Most data are from our unpublished database (data of A.V.S. on Hawaii, D. Kuzmin on Iceland, V. Kamenetsky on Gorgona, I. Nikogosian and T. Elliott on the Azores, I. Nikogosian on the Canaries and Reunion and V. Batanova for olivines from mantle peridotites). Olivines of Archaean

komatiites from Belingwe show NiO contents only 0.02 wt% higher than Gorgona komatiites (L. Danyushevsky, personal communication) and follow the upper boundary of the mantle peridotite field (blue). Additional data are from the GEOROC and PETDB databases⁴⁶ (see Supplementary Information for major references) and from ref. 47. Olivines from shield-stage Hawaiian basalts vary significantly in Ni content at constant Fo, with the majority systematically enriched in Ni compared with olivine from mantle peridotites, komatiites and common basalts. Olivines from post-shield and pre-shield Hawaiian basalts are similar to peridotites and common basalts.

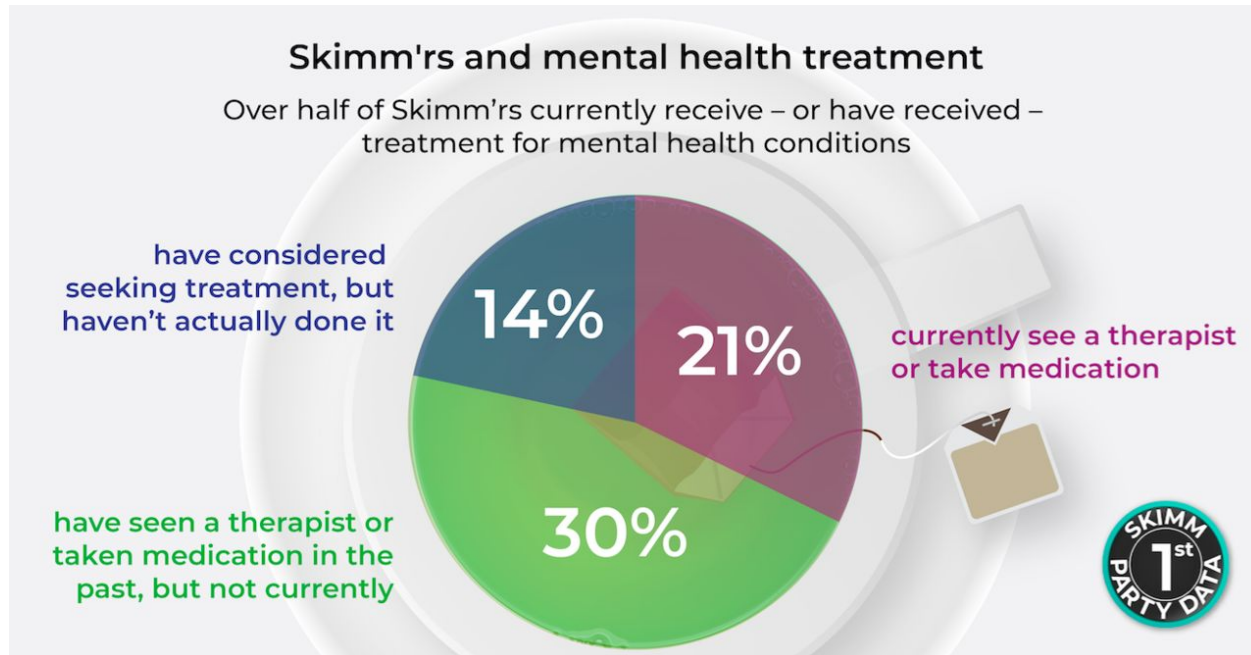
Simpler is Almost Always Better

Figure 2.6. Median number of designated beds for mental health treatment per facility, by service setting and facility type: April 29, 2016



SOURCE: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, National Mental Health Services Survey (N-MHSS), 2016.

Use correct proportions/scales



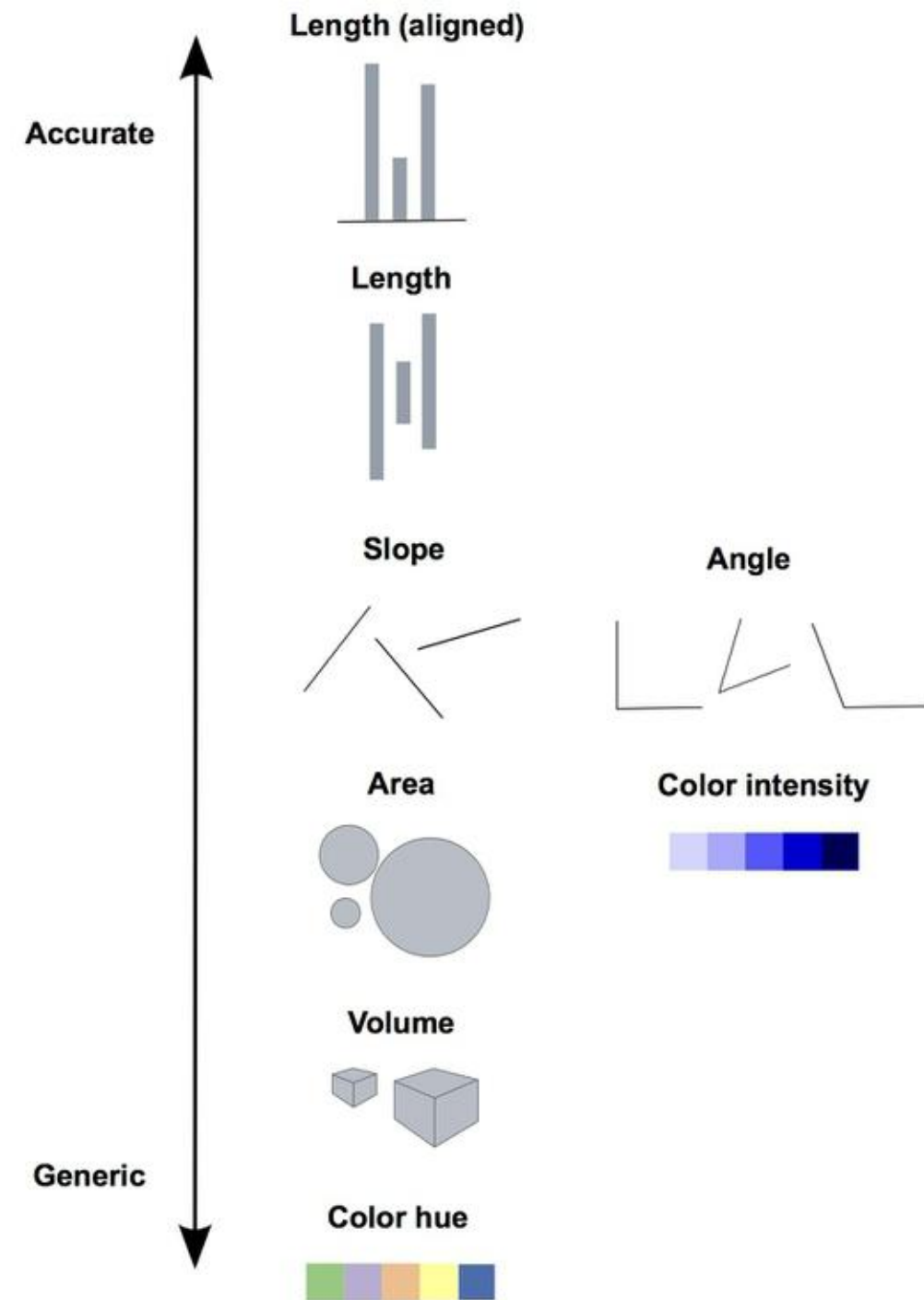
Effective Visualizations

Graphical Perception and Graphical Methods for Analyzing Scientific Data.

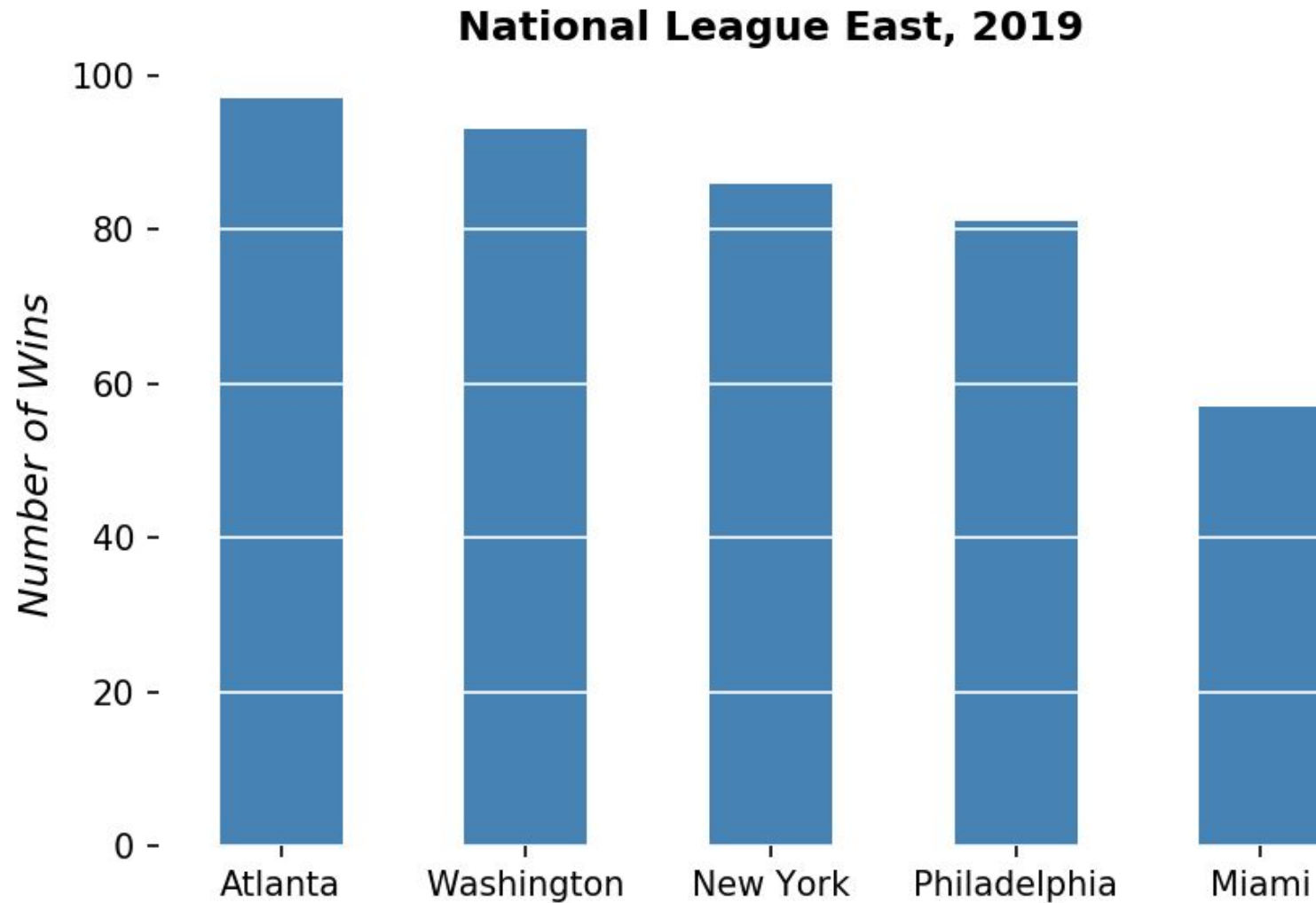
William S. Cleveland Robert McGill,
Science 30 Aug 1985

Studied how accurately people were able to perceive quantitative information, based on how it was presented.

<https://paldhous.github.io/ucb/2016/dataviz/week2.html>



Simple Comparisons: Bar Chart



Bar Chart Baselines Start at Zero



Bar Chart Baselines Start at Zero

See also <https://flowingdata.com/2015/08/31/bar-chart-baselines-start-at-zero/>

Difference of Weight vs. Day 1 Weight

Starting weight was 168 pounds.

POUNDS

10 —

8 —

6 —

4 —

2 —

0 —

-2 —

-4 —

This shifts focus to the weight difference and bar length represents something again.

WEIGHT GAIN

WEIGHT LOSS

Day 1

20

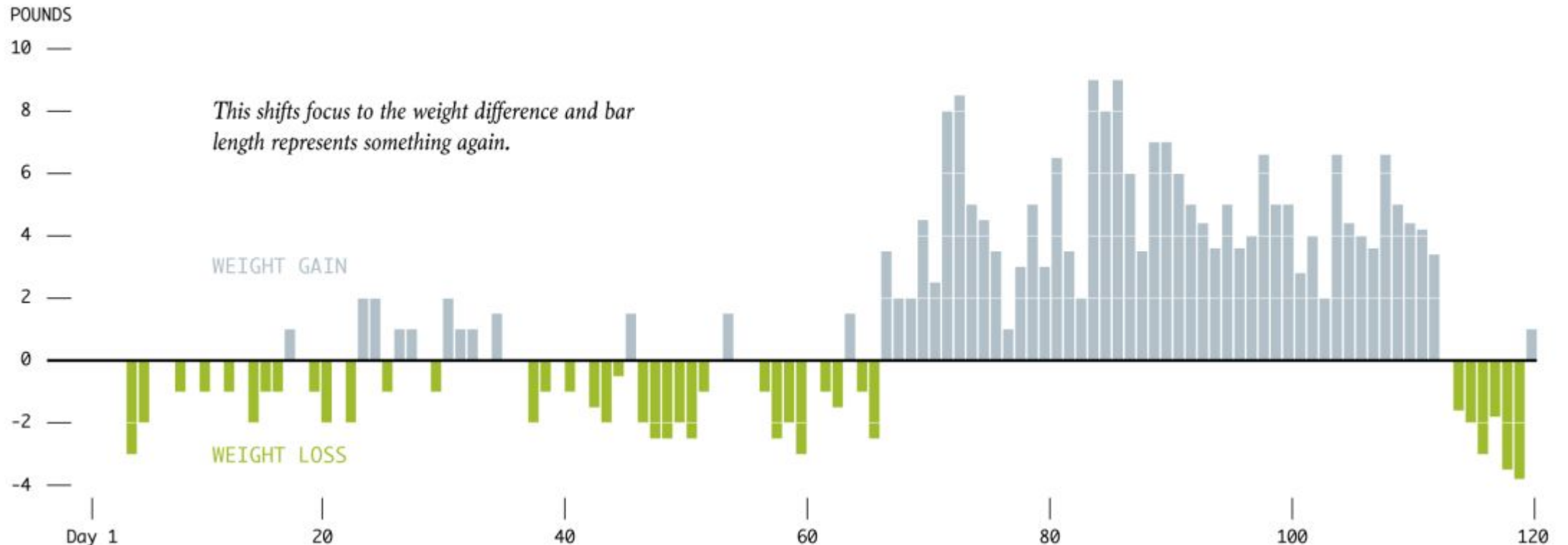
40

60

80

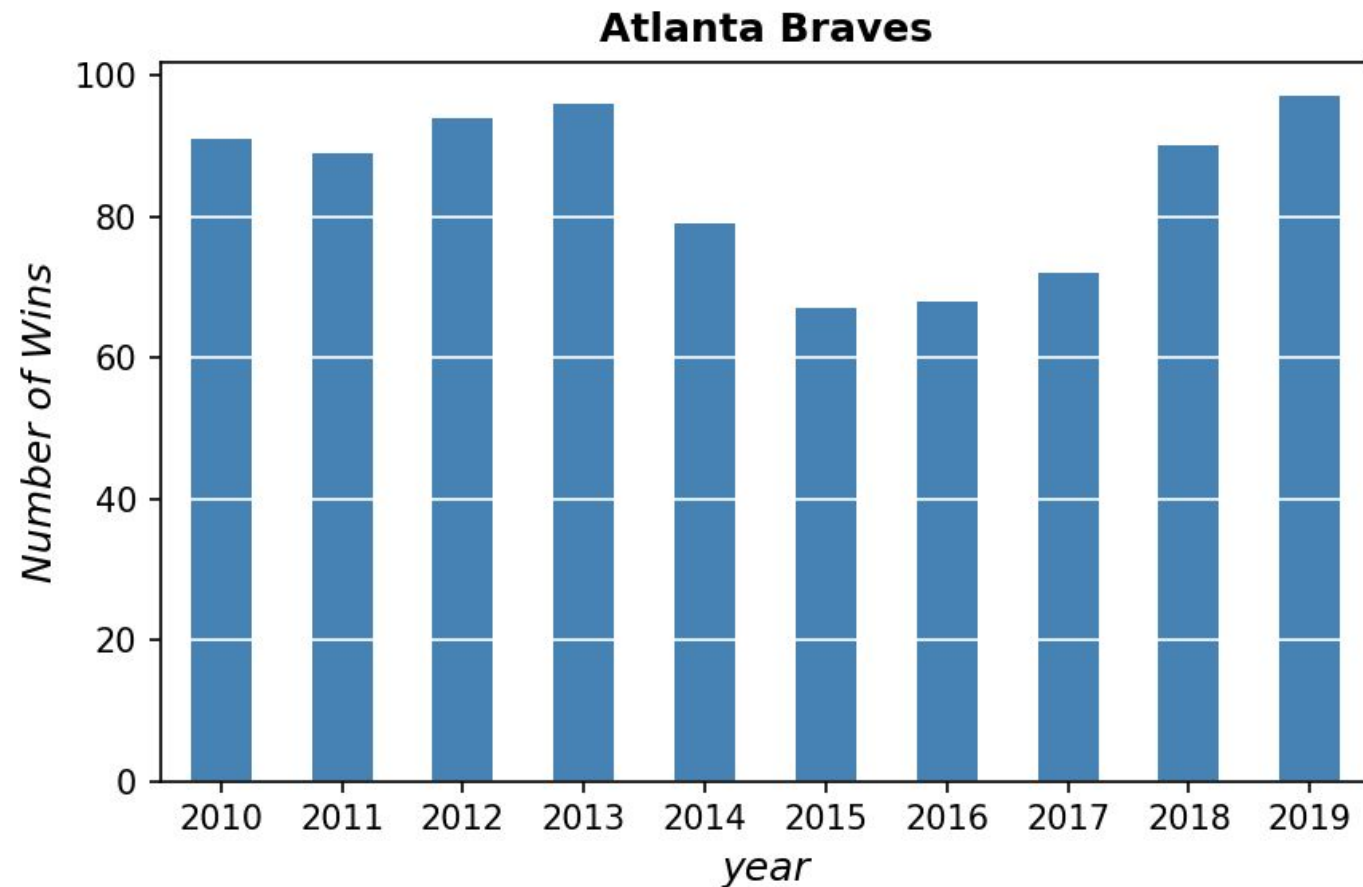
100

120



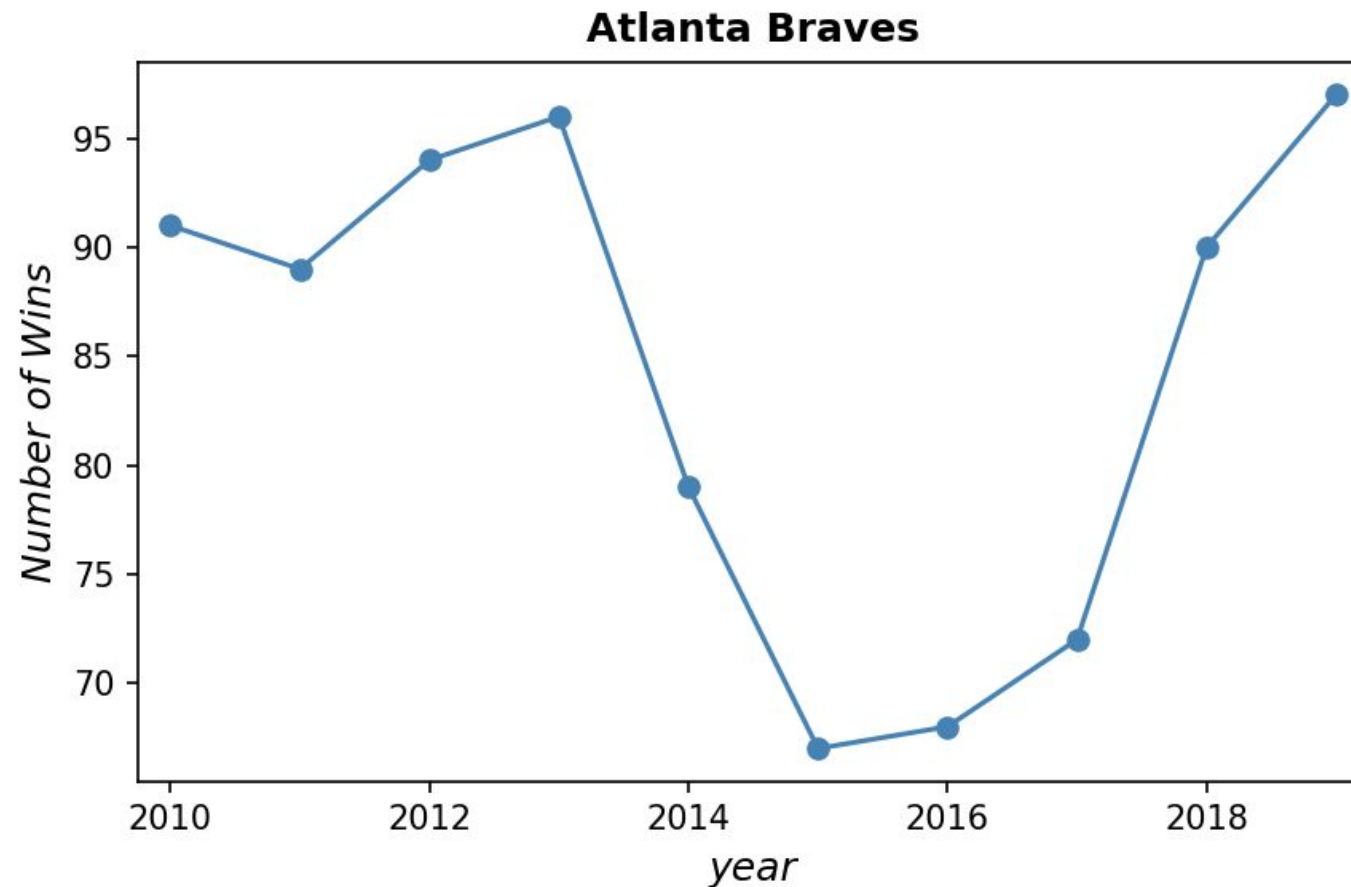
Comparisons: change over time

Can use a bar/column chart (as long as baseline is zero)

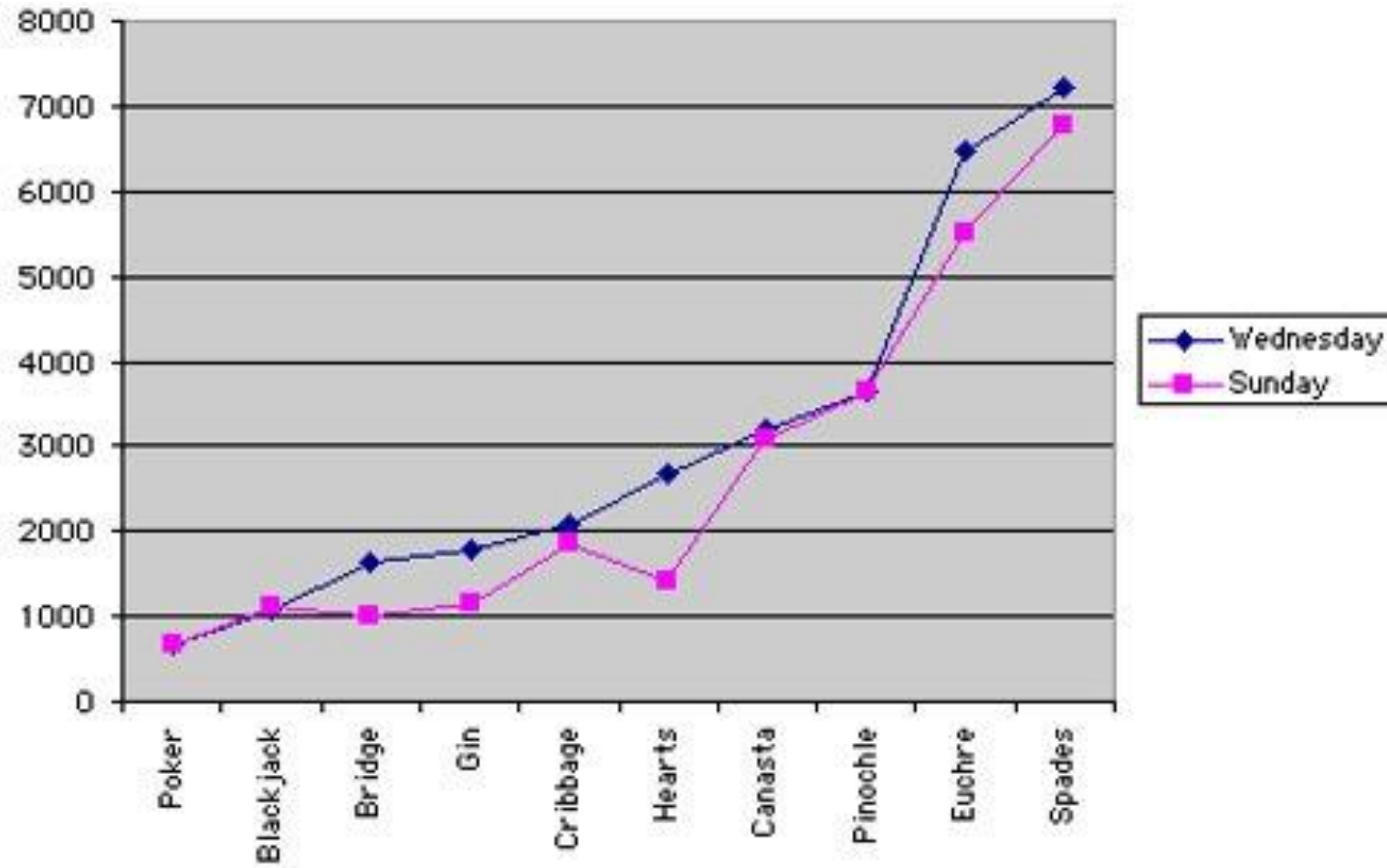


Comparisons: change over time

Often, line charts are more effective.

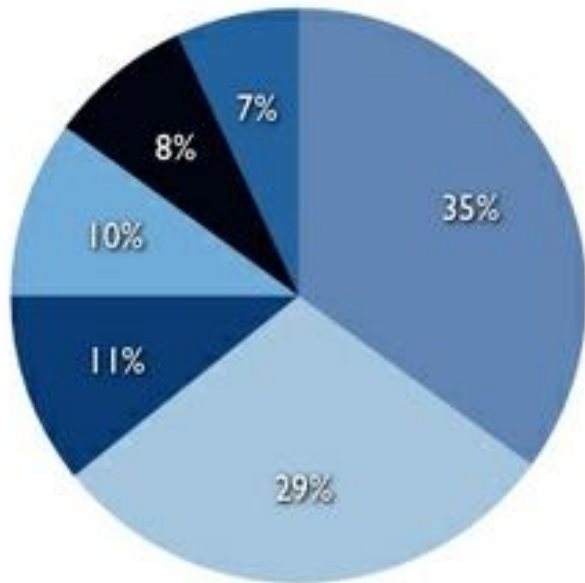


Comparisons: change over time

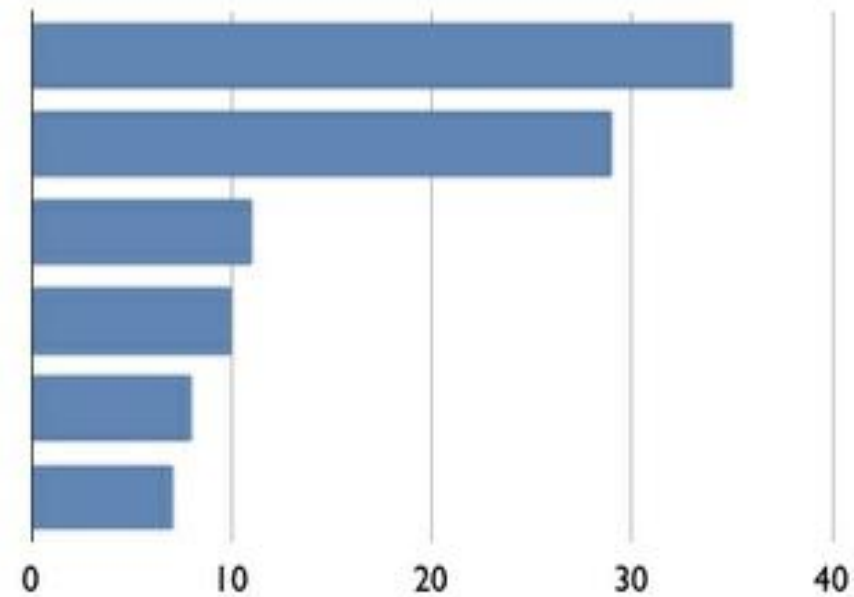


Composition/Parts of the Whole

Grudge Match



VS.

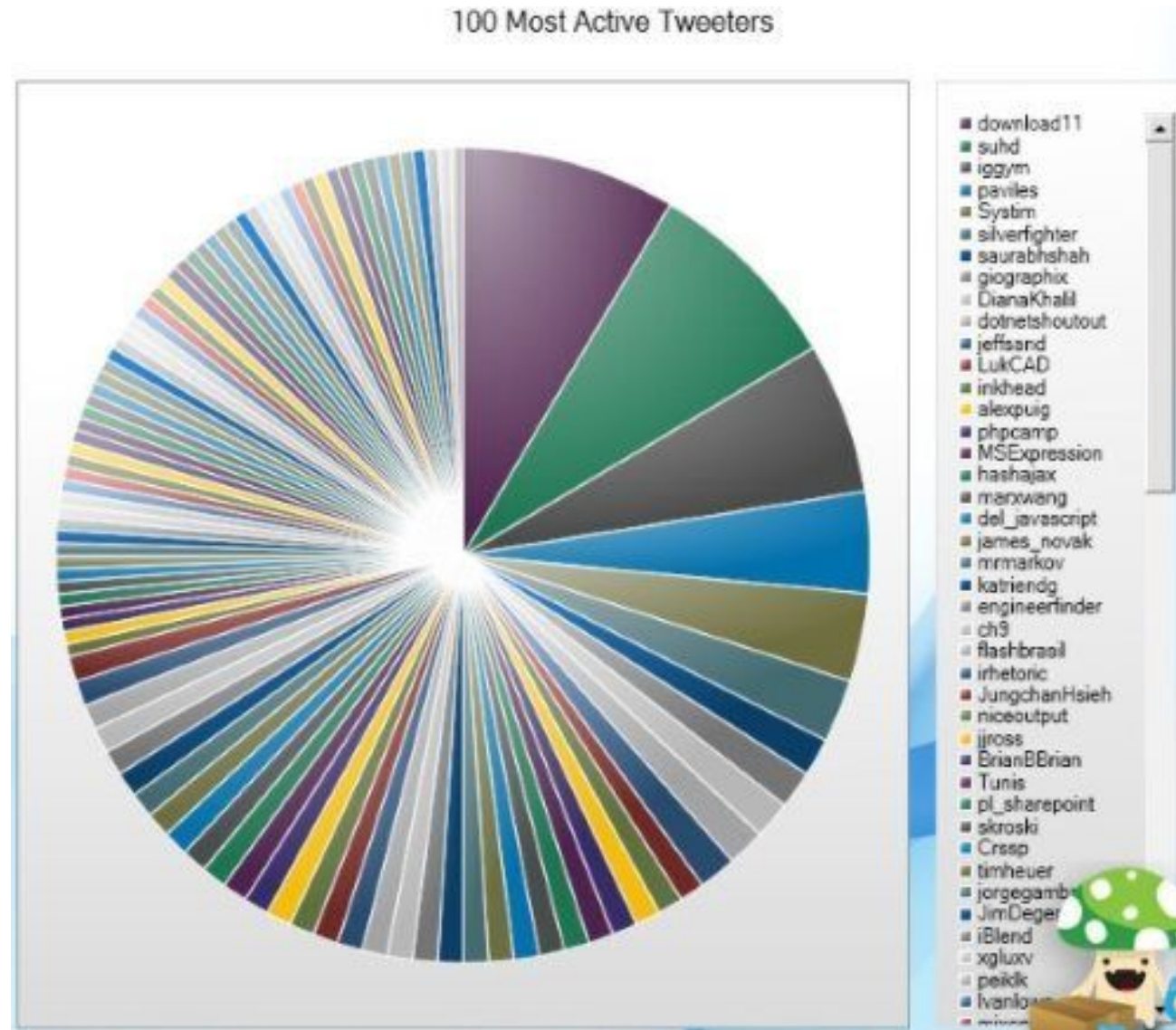


<https://paldhous.github.io/ucb/2016/dattaviz/week2.html>

Pie Charts - 3 or Fewer Categories



Pie Charts - 3 or Fewer Categories



THINK
PROGRESS

2012 PRESIDENTIAL RUN

GOP CANDIDATES

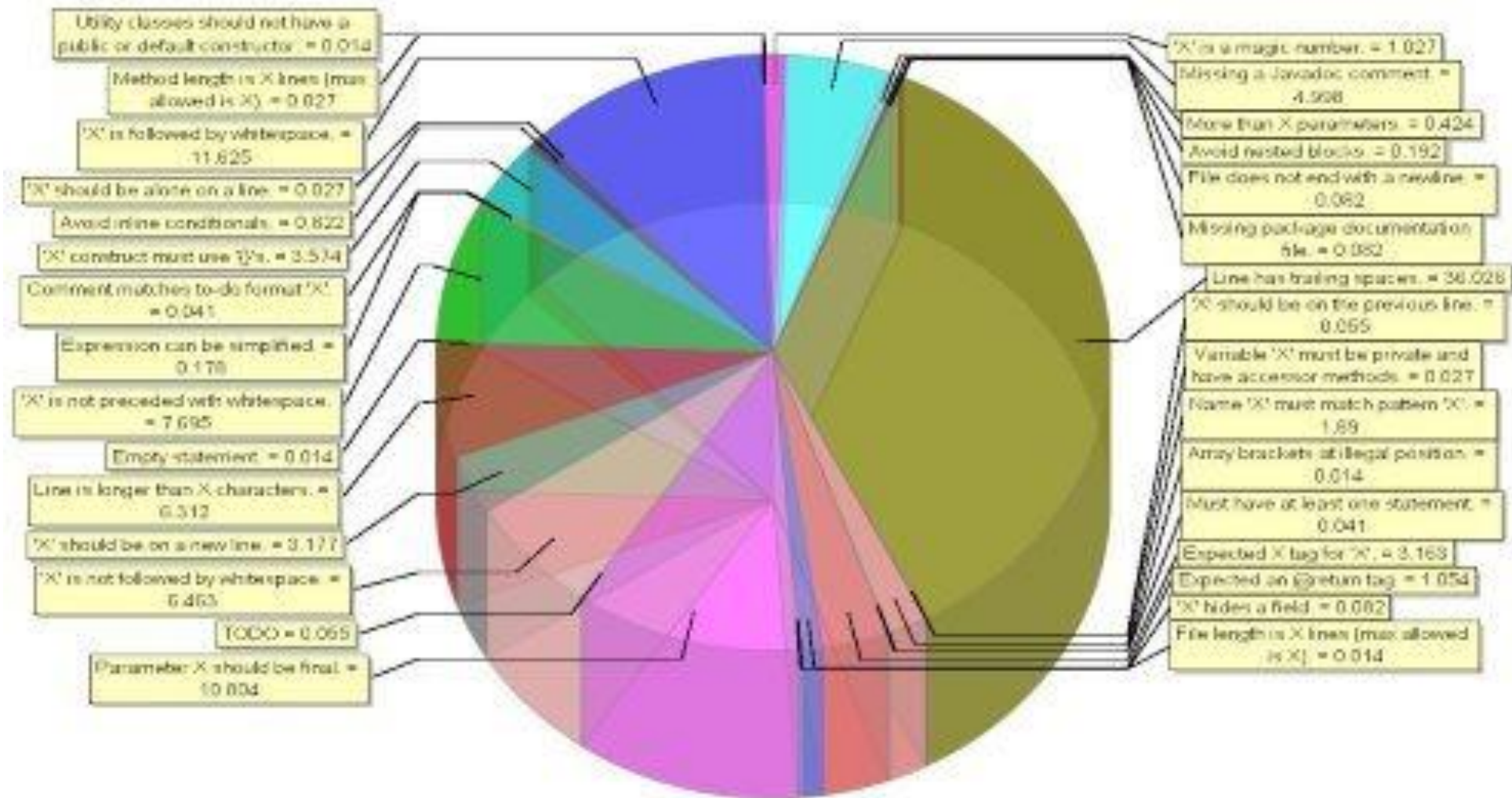


FOX
5:17 PM

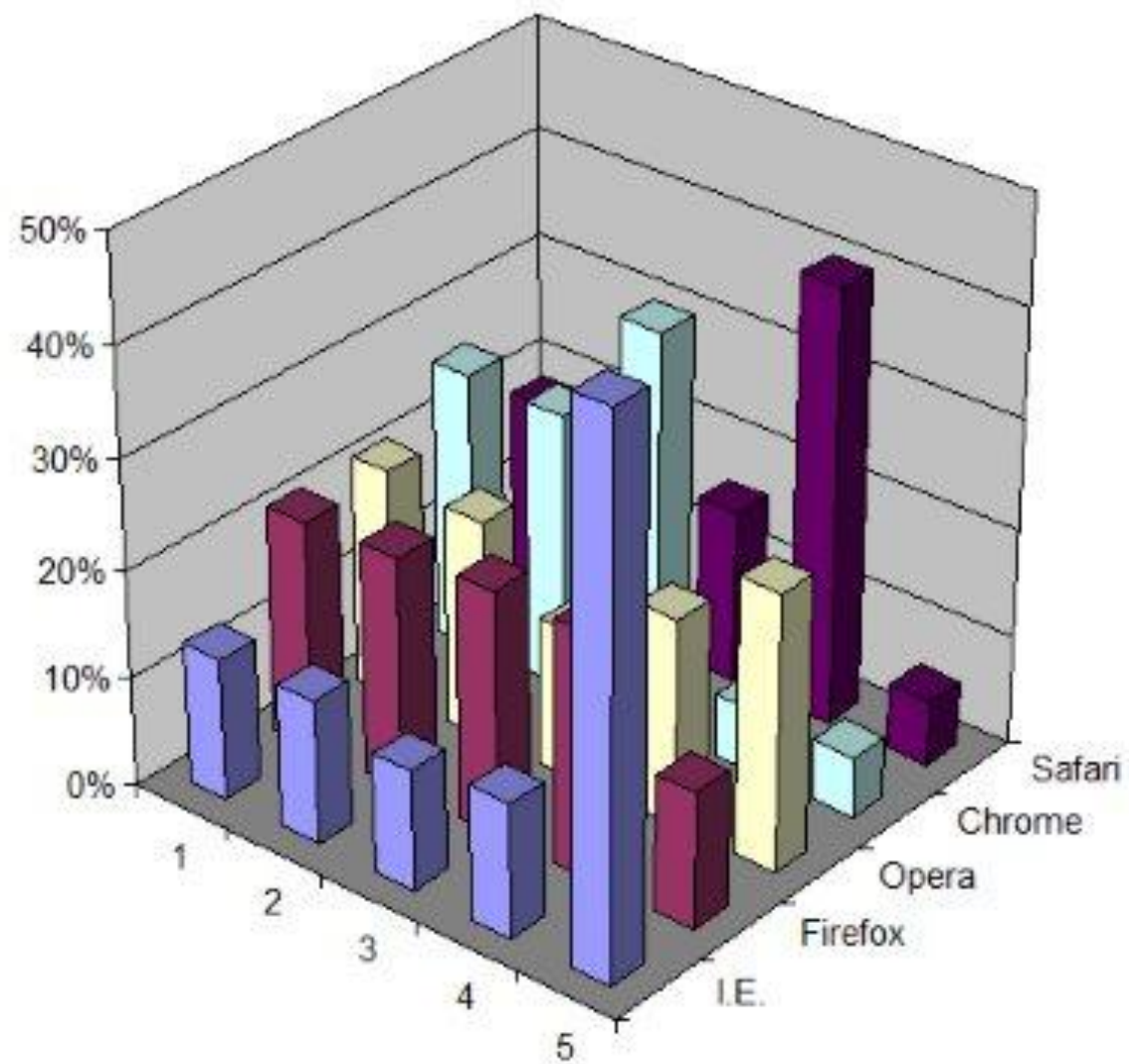
SOURCE: OPINIONS

DYNAMIC

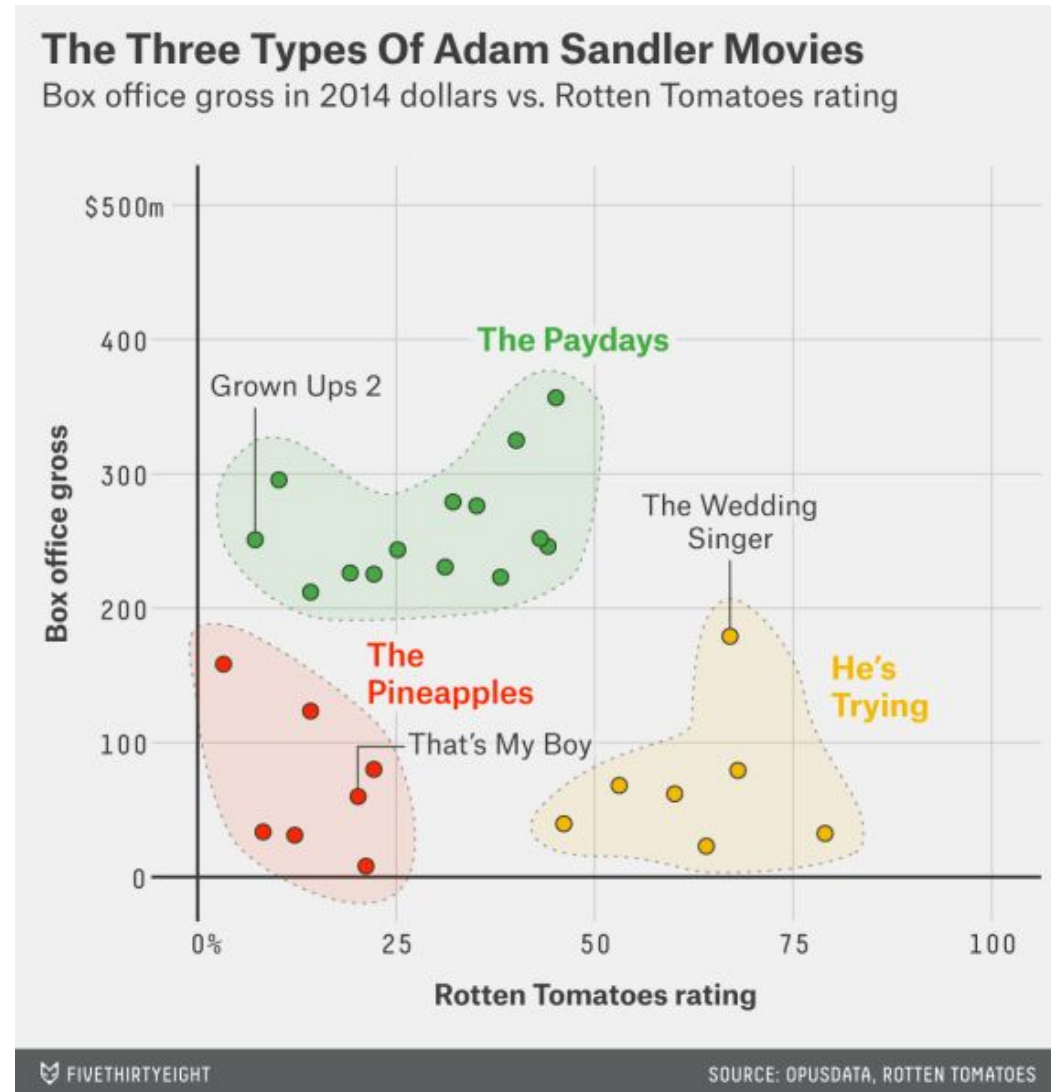
Avoid 3D



Avoid 3D



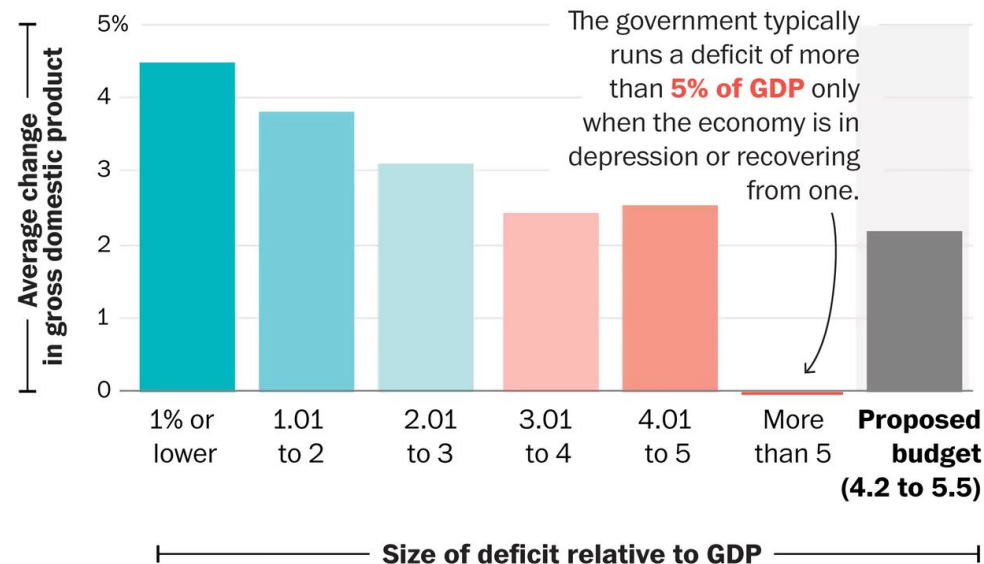
Relationship Between Variables - Scatter Plot



Relationship Between Variables - Scatter Plot

Strange time for a stimulus

What annual **economic growth** averaged under various deficit-to-GDP ratios, since 1967



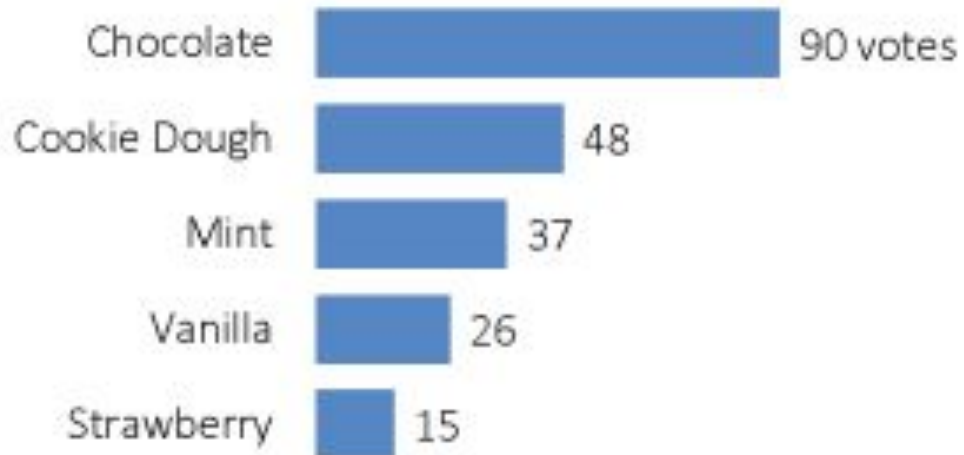
Notes: To capture the environment in which the budget was set, deficit-to-GDP ratios are compared with the economic climate of the prior fiscal year. GDP growth is adjusted for inflation and seasonality. Indicators for the current budget are based on the average of available data in fiscal 2017 and 2018 years. Fiscal years end in September.

Sources: Commerce Department (GDP); Congressional Budget Office (historical deficit); Committee for a Responsible Federal Budget (deficit forecasts, budget changes)

THE WASHINGTON POST

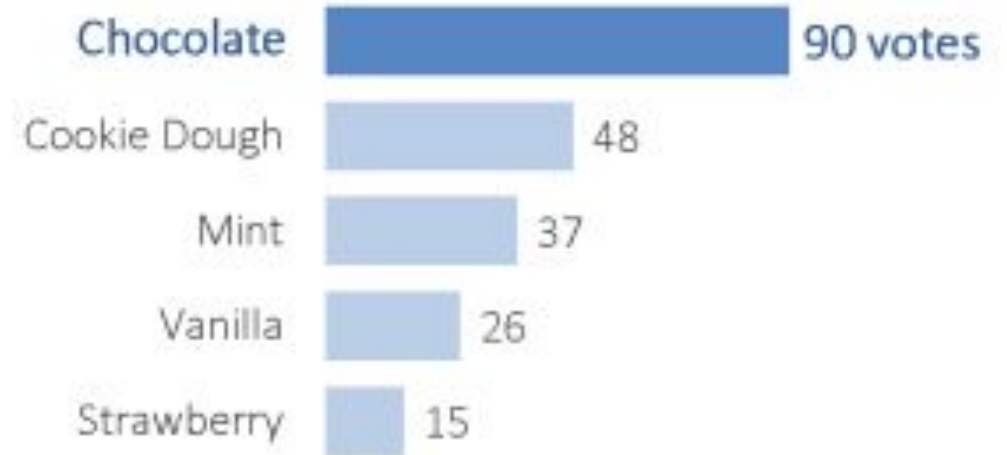
Draw the Viewer to Important Information

Ice cream flavor preferences based on 2014 survey of elementary school students (n=216)



or

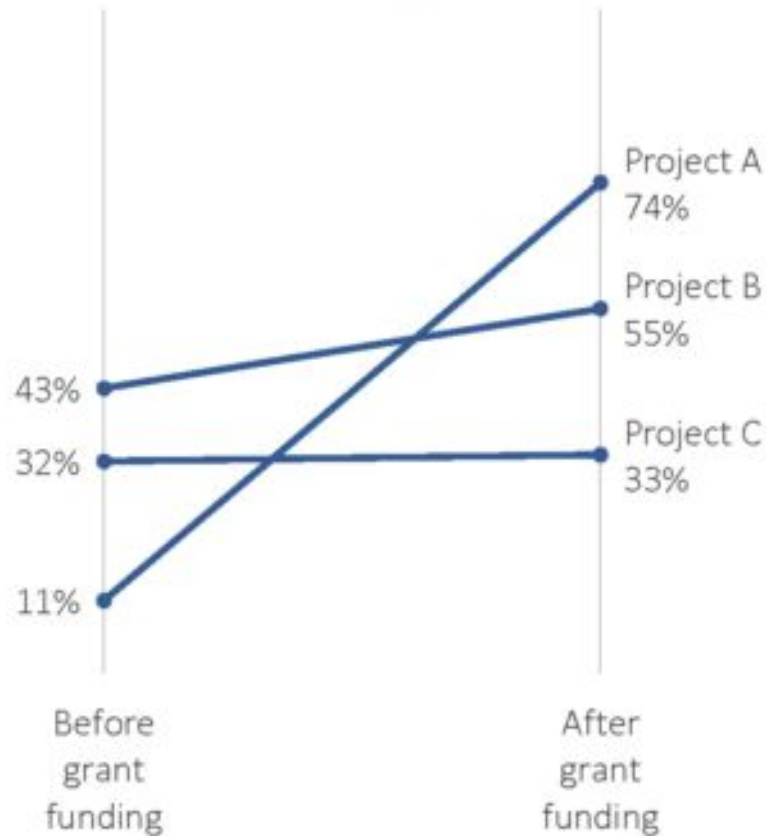
Chocolate was most popular flavor
among elementary students surveyed



Source: 2014 survey of elementary school students (n=216)

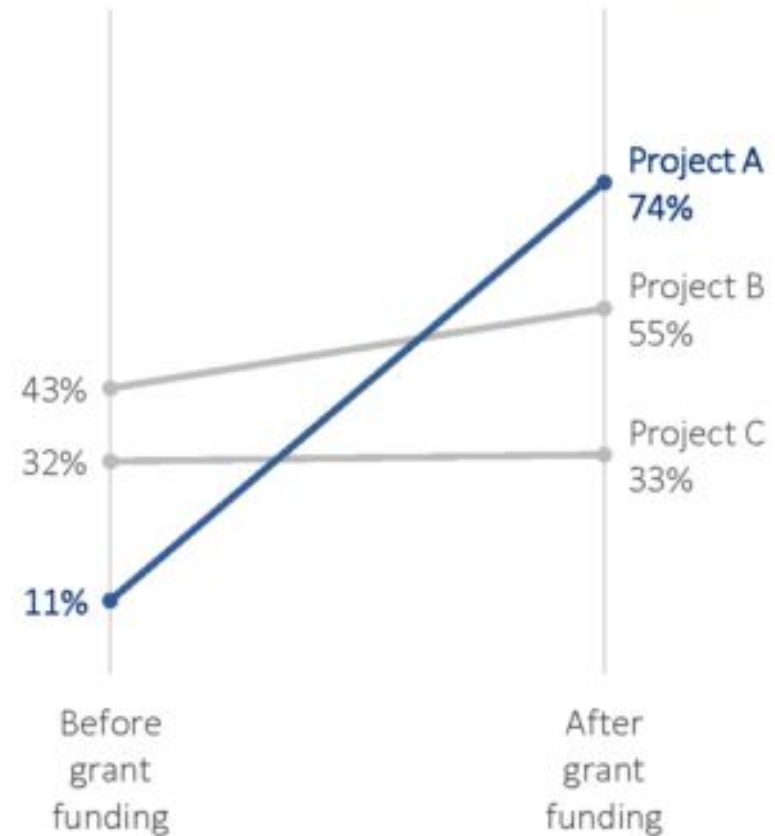
Draw the Viewer to Important Information

Project results before and after implementation of grant



or

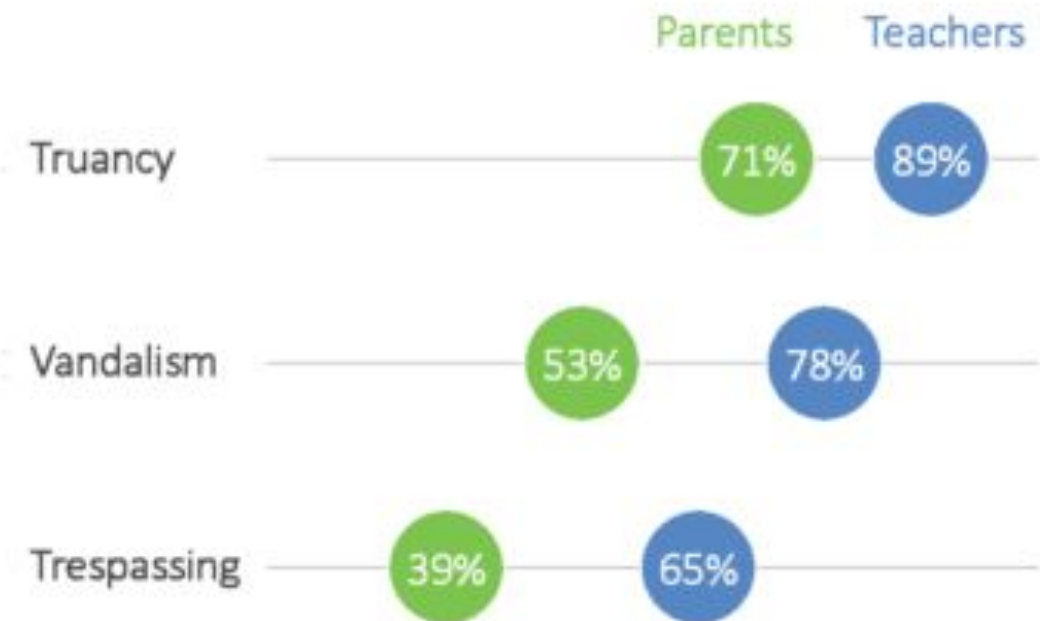
Project A had the greatest gains after the four-year grant funding



Draw the Viewer to Important Information

2014-15 school safety survey results

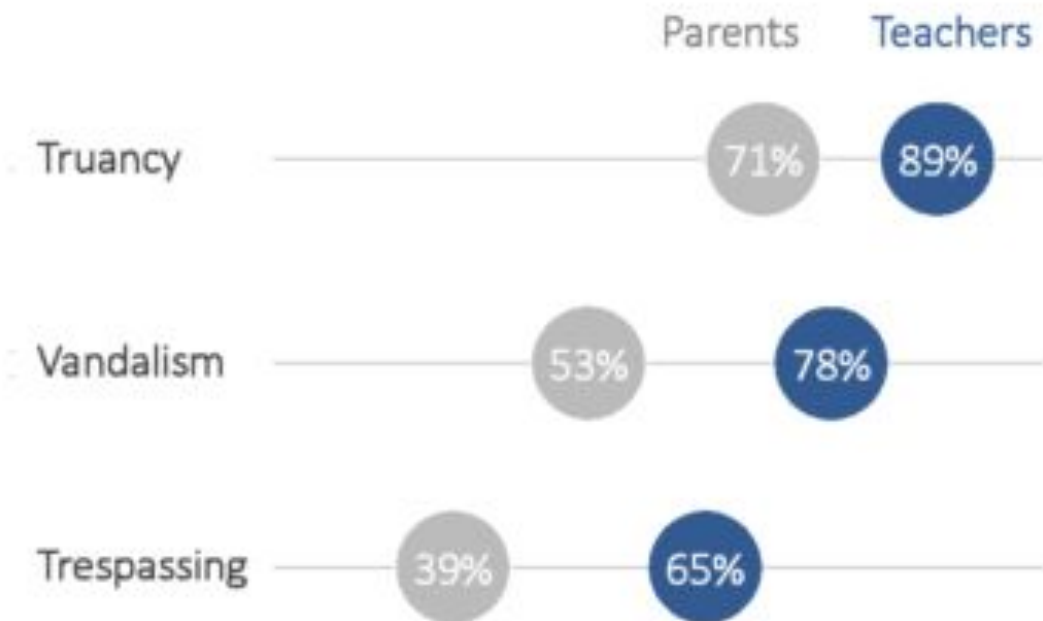
% of parents and teachers indicating that each factor is a “pressing need” that should be addressed



or

2014-15 school safety survey results

Teachers were more likely than parents to indicate that truancy, vandalism, and trespassing are “pressing needs” that should be addressed.



Recommendations for Presentations

- Be highly selective in the number of visualizations you show.
- Think “What story am I trying to tell/what do I want my audience to take away?”
- Keep your visualizations very simple and to the point.
- Don’t make your audience work.
- Give you audience time to digest your visualization.