



**2020 Education Innovation and Research (EIR) Project Directors
and Evaluators Technical Assistance Meeting**

Virtual Meeting | October 21–23, 2020

Data Visualization for Evaluation Findings

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Barbara Goodson (Principal Investigator)

Abt Associates



Linda Caswell



Role: i3 TA Liaison, EIR Evaluator



Background: Linda is a Senior Associate in Abt Associates' Social and Economic Policy division, with more than 15 years of experience conducting, managing, and providing technical assistance on evaluations of interventions and curricula aimed at improving student outcomes, particularly in the areas of language and literacy. She is currently a TA provider for two i3 grants and an evaluator for two EIR grants.



Agenda

- Introduction and overview
- Choosing your visualization: 10 options
- Formatting: 6 tips and tricks
- 5 ways data visualizations can be misleading
- Data visualization resources

Introduction and Overview

Data Visualizations: Storytelling with a Purpose

Visualizations are more than just pie charts and bar graphs



Can be internalized quickly



Highlight useful information, without the noise



More engaging and impactful



Make it easier to understand and retain important statistics

<https://www.tableau.com/learn/articles/data-visualization>

Table Versus Graph?

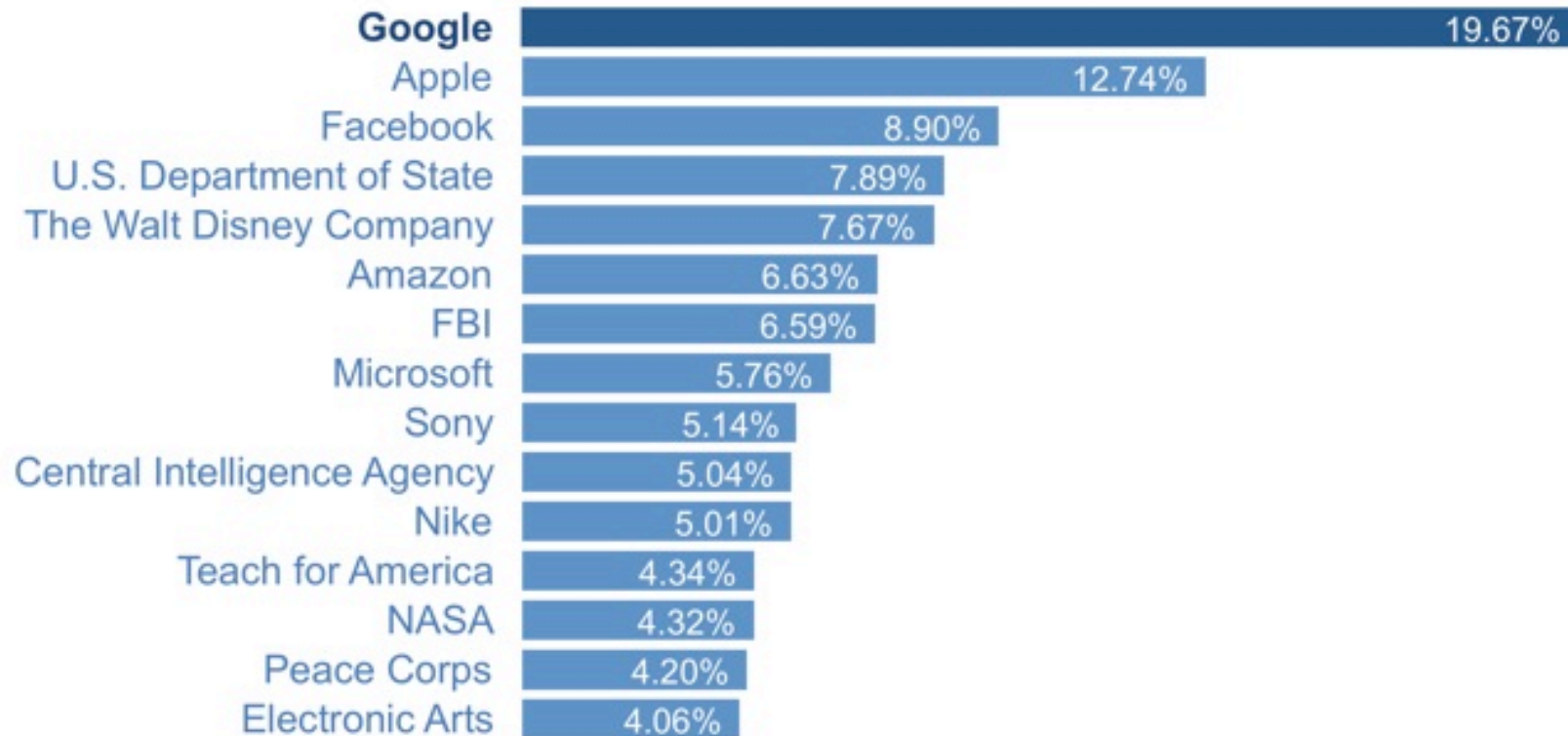
What's Your Dream Company?

Company	Rank	Percentage
Google	1	19.67%
Apple	2	12.74%
Facebook	3	8.90%
U.S. Department of State	4	7.89%
The Walt Disney Company	5	7.67%
Amazon	6	6.63%
FBI	7	6.59%
Microsoft	8	5.76%
Sony	9	5.14%
Central Intelligence Agency	10	5.04%

Graphic Version of Table Makes a Point

Ideal Employers for Young Workers: **Google leads the pack**

Survey results of 6,700 young professionals



The above represents the top 15 companies out of the 150 included in the survey. Companies not shown were chosen by <4% of survey respondents each. Data source: 2011 Universum survey.

Before You Visualize



Who's the audience? Technical or non-technical? What type of information would they find most useful?



In what format will these visuals be presented? Is it a report, memo, presentation, webinar?

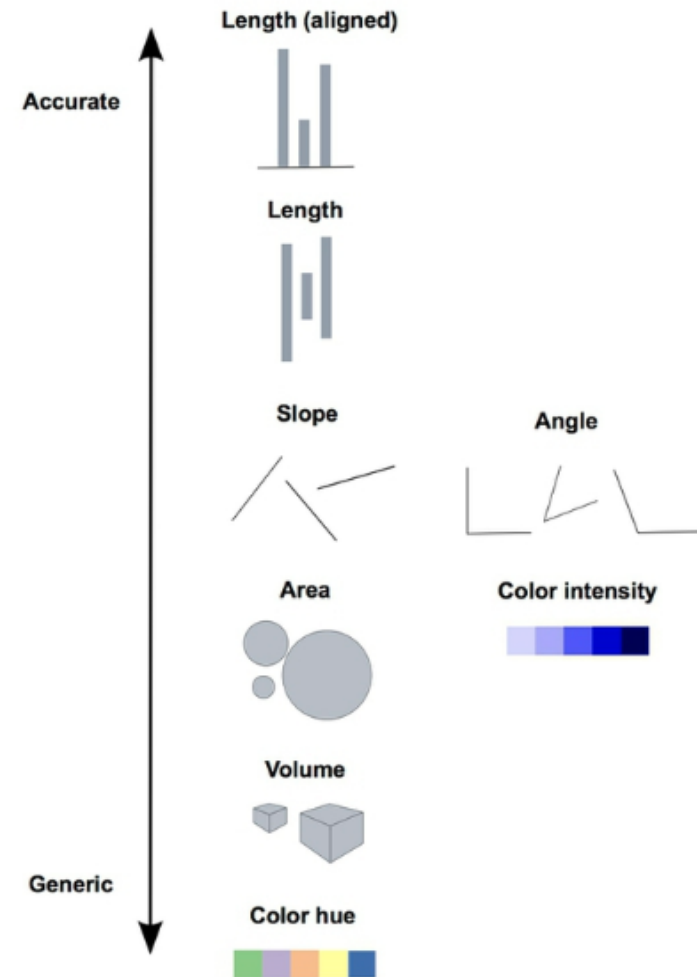


Clarify your story.

Choosing Your Visualization: 10 Options

Perceptions of Visualizations Differ

- Visualizations encode data using cues
- Quantitative data best perceived by aligned length
- Categorical data best represented by color and shape



Visualization source: <http://paldhous.github.io/ucb/2016/dataviz/week2.html>

1. Big Number + Icon

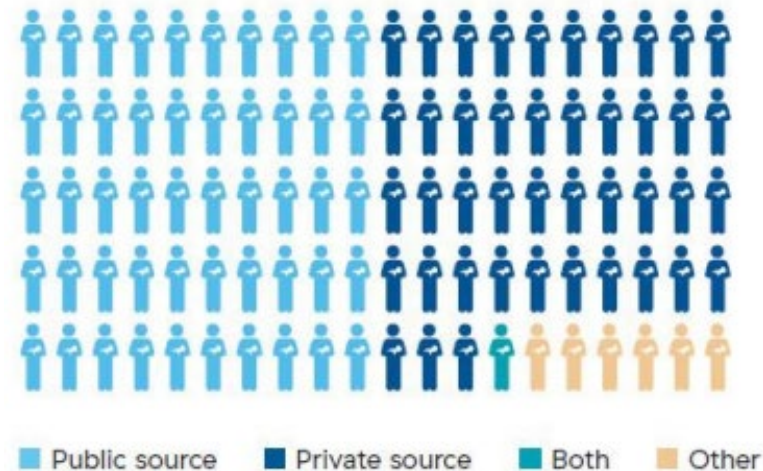
- Do:
 - Use when a single statistic is important
- Don't:
 - Overuse them
 - Use a complicated or unrepresentative icon



2. Icon Array: Pictogram

- Do:
 - Use when a single categorical statistic is important
 - Use when you are trying to visualize part of a whole
- Don't:
 - Use a complicated or unrepresentative icon

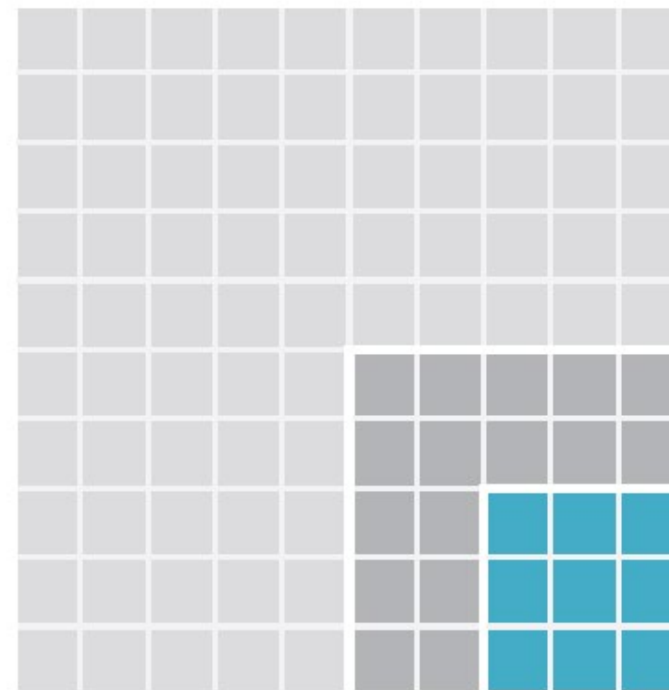
On average across the 24 priority countries and among all caregivers who sought sick child care outside the home, **50%** sought treatment or advice from public sector sources and **43%** from private sector sources.



2. Icon Array: Waffle Chart

- Do:
 - Use if the data are difficult to represent in an appropriate icon

Interview breakdown



Out of every 100
phone screens...

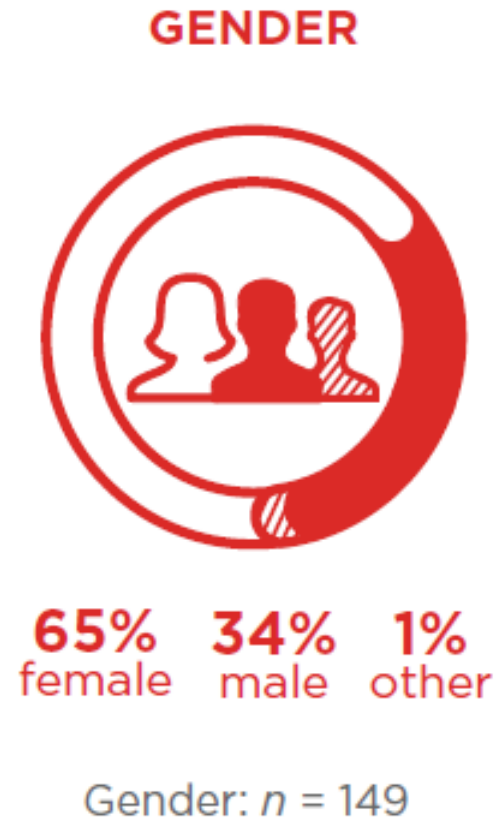
we bring **25**
candidates onsite
for interviews...

and
extend 9 offers.

Visualization source: Knaflic, C. (2015). *Storytelling with data: A data visualization guide for business professionals*

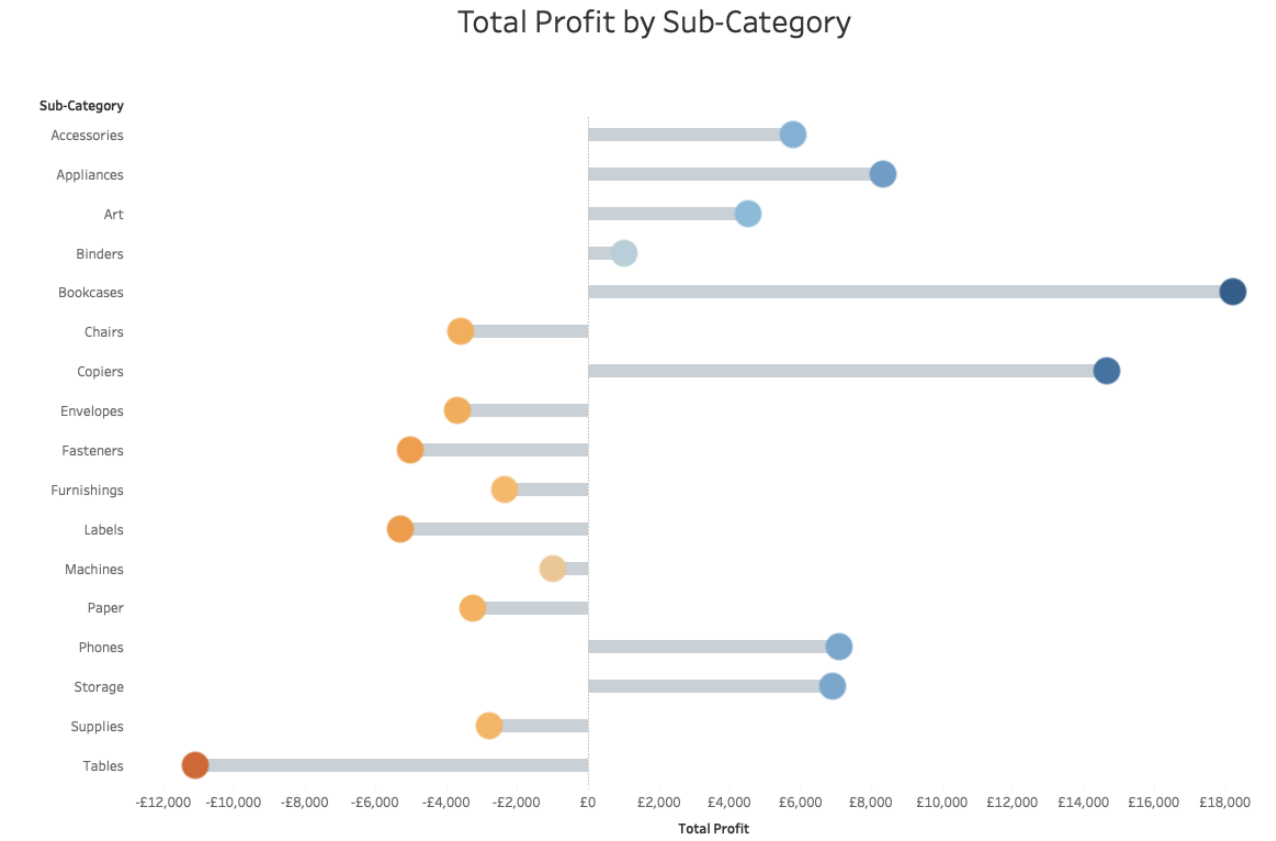
3. Donut and Pie Charts

- Do:
 - Use to show yes/no or parts of a whole
 - Use small multiples with caution
 - Use a side legend, instead of adding labels directly to each slice
- Don't:
 - Use if sum of categories \neq 100%
 - Use with more than three categories



4. Lollipop Chart

- Do:
 - Use when you have A LOT of categories/responses
 - Use if you want to highlight values on opposite sides of a scale
- Don't:
 - Exclude labels if endpoints are important



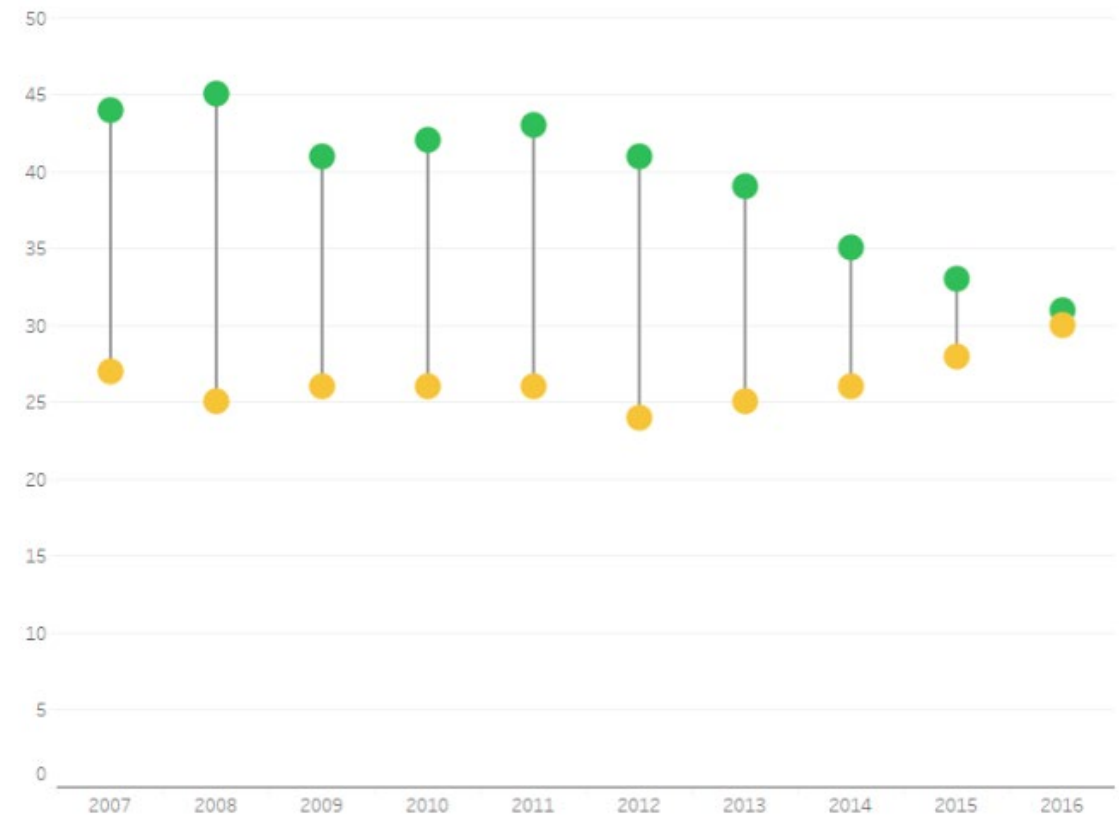
Visualization source: <https://creativewithdata.com/2019/05/31/title/>

5. Dumbbell Dot Plot

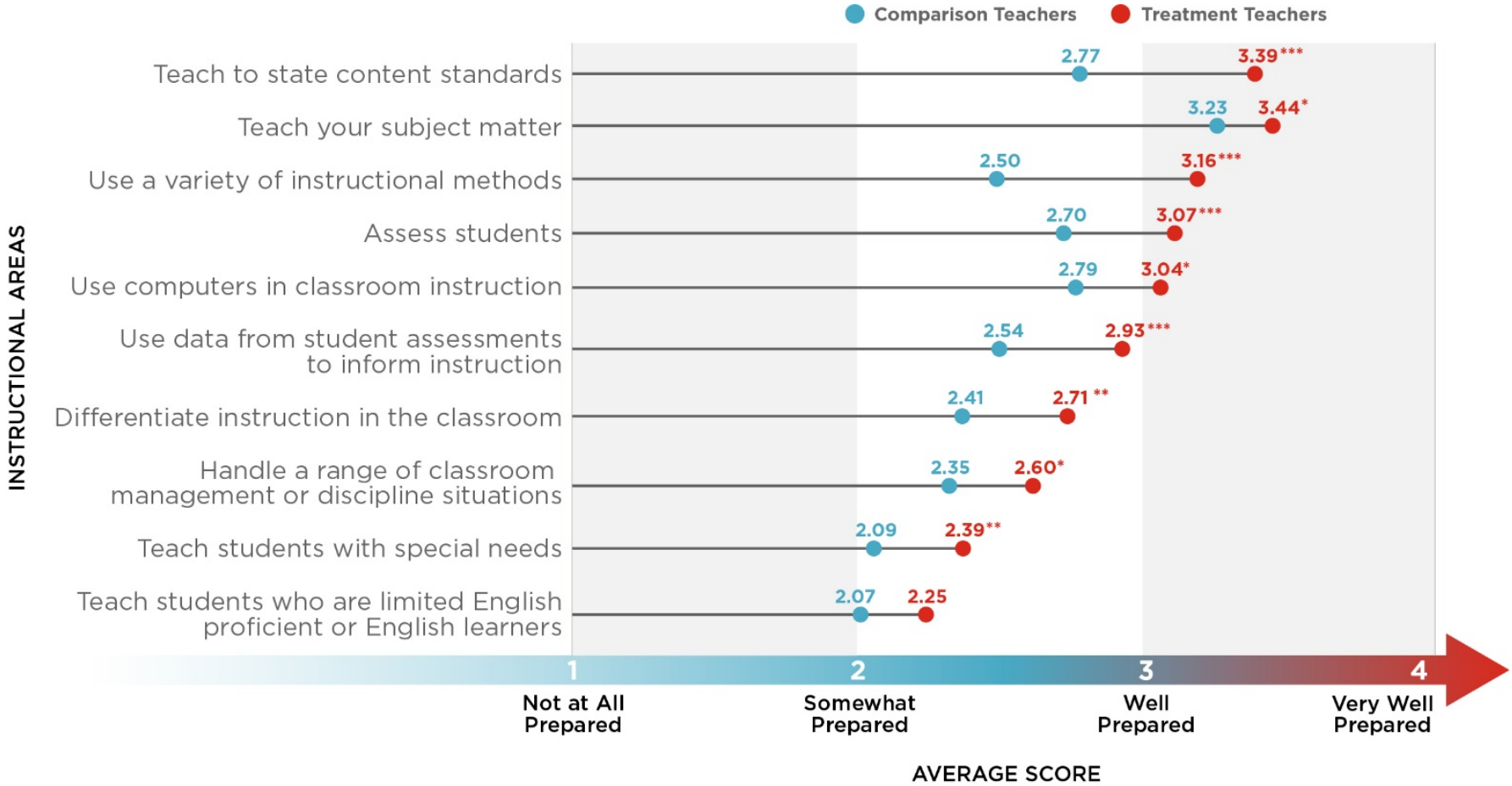
- Do:
 - Use when you are comparing two or more numbers (i.e., pre- vs. post-test; treatment vs. control)
 - Use when comparing different points in time
- Don't:
 - Clutter with too many comparisons

Visualization source: <https://www.pluralsight.com/guides/tableau-playbook-dumbbell-chart>

Bigger Slice
U.S. pizza chain market shares
Pizza Hut | Domino's



5. Dumbbell Dot Plot, Continued



6. Stacked Bar Chart: Simple, 100%

- Do:
 - Use to simultaneously compare totals and notice sharp changes at the response level
 - Use instead of a pie chart

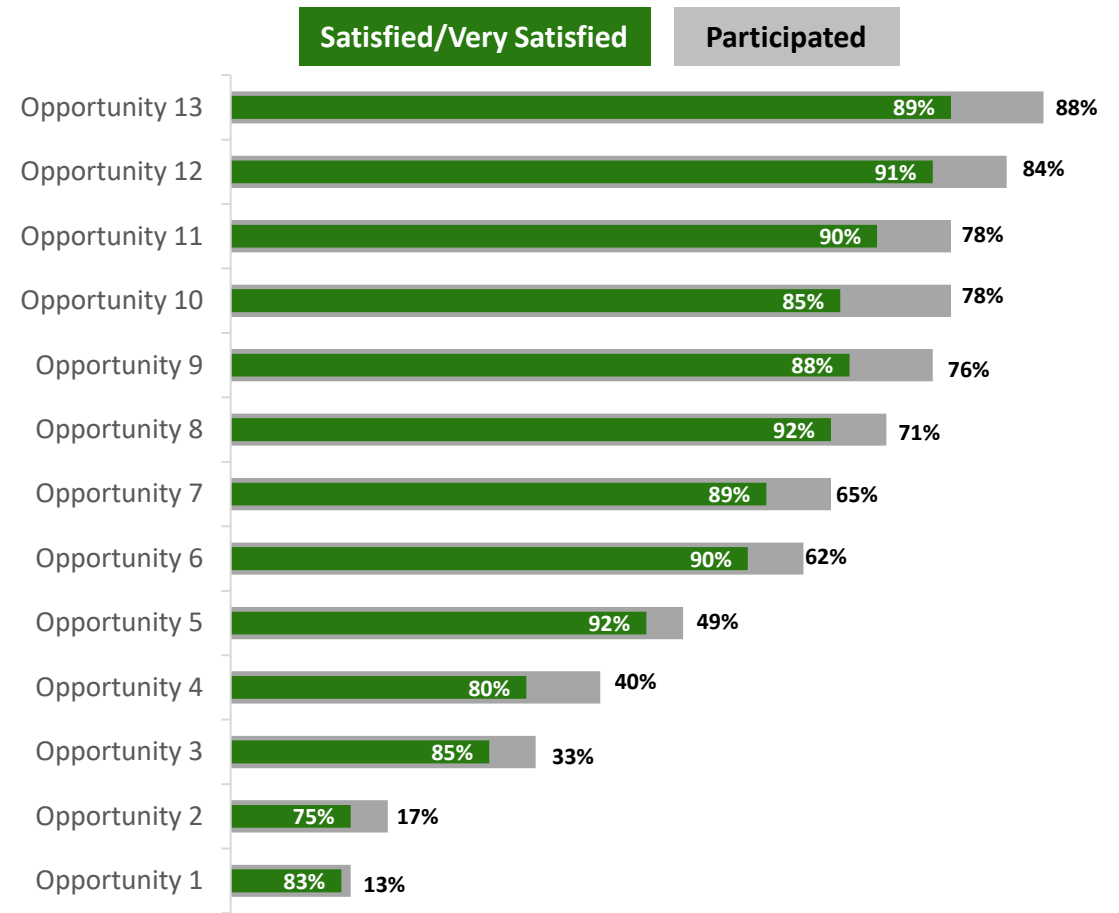
Percentage of sub-districts (through PTPD facilitators) providing outreach visits to villages on planning and budgeting



- Don't:
 - Have too many values stacked together

7. Overlapping Bar Chart

- Do:
 - Use when you have two inter-related statistics that you want to compare
 - Use to depict progress towards a goal or against a benchmark
 - Consider adding a target line if applicable



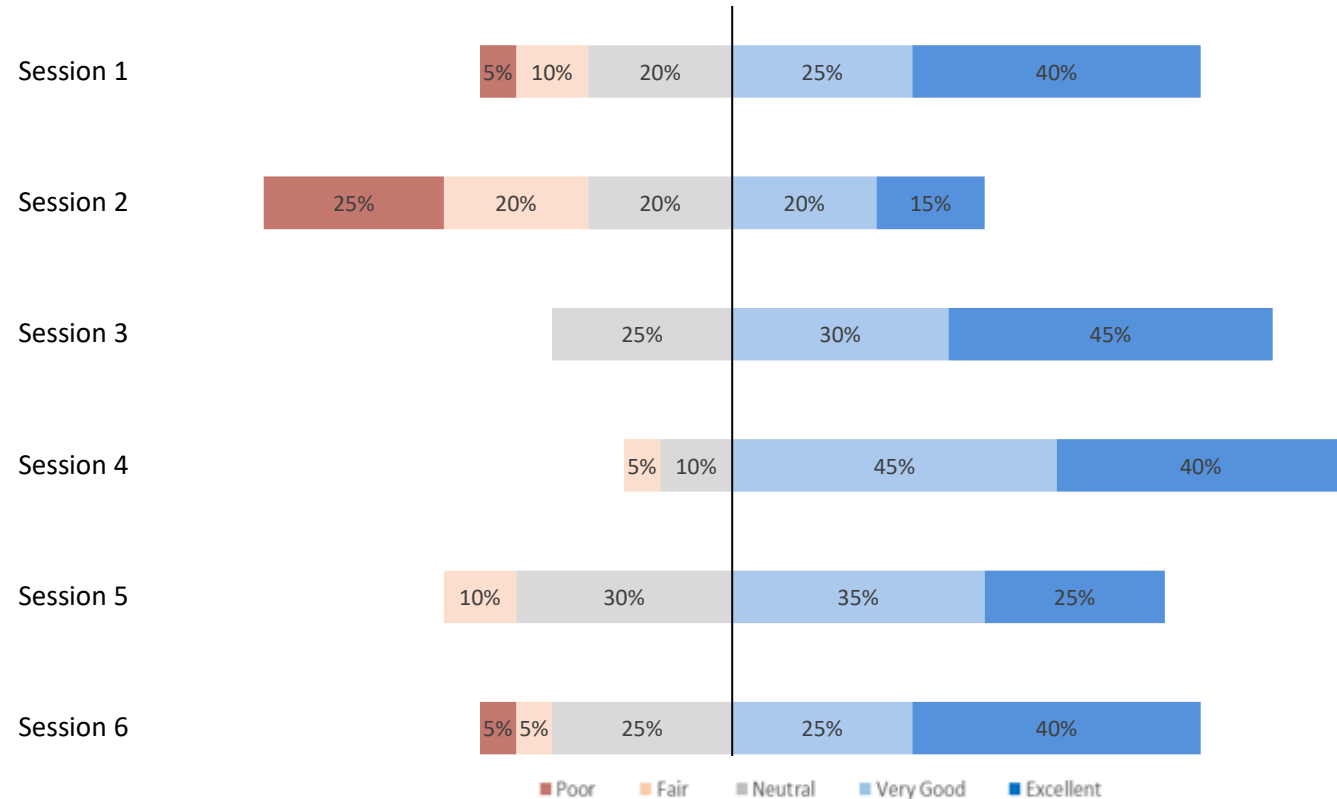
8. Diverging Stacked Bar Chart

■ Do:

- Use when you have Likert scales/survey data
- Mark the central baseline to tell your story

■ Don't:

- Have too many bars unless your goal is show an overall trend



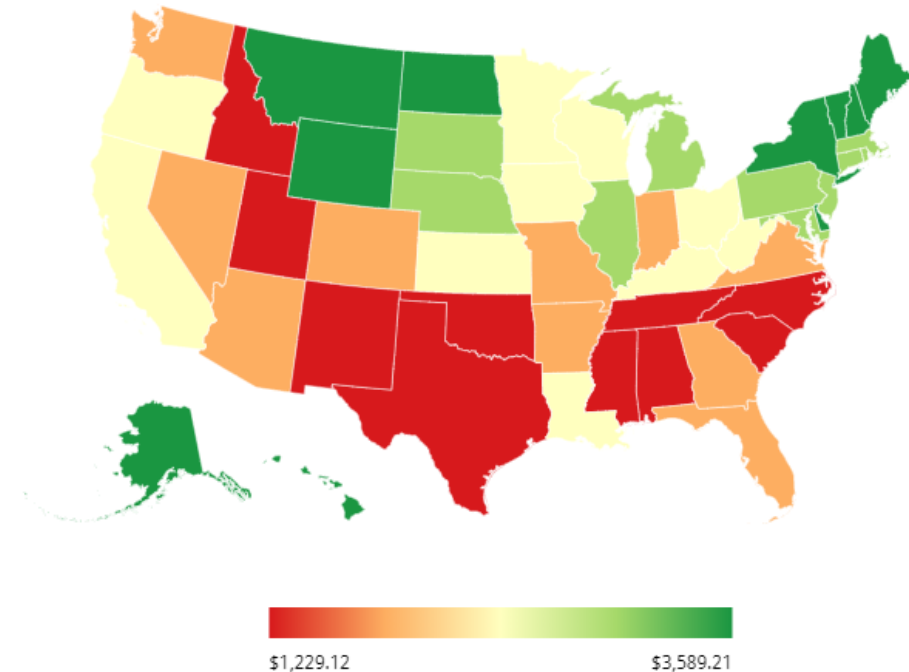
Visualization source: <https://www.alanapirrone.com.au/blog/tag/likert+scale>

9. Geographic Map: Choropleth Map

- Do:
 - Use when you want to highlight geographic differences or similarities
- Don't:
 - Use when you are interested in intra-regional variation
 - Use if your unit of analysis is not the regional unit shown

Title I funding per low-income child in 2017 by state

Vermont, Wyoming and North Dakota received substantially more Title I grant money per eligible child in FY2017 than other states.



Visualization source: <https://journalistsresource.org/studies/society/education/2020-census-title-i-maps/>

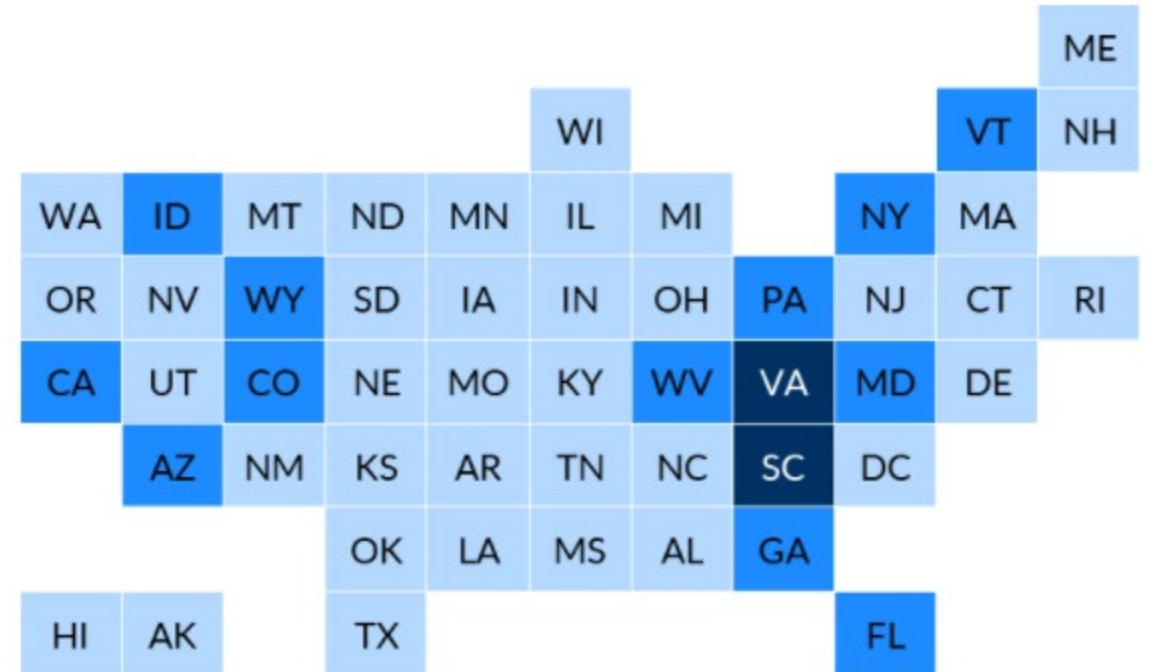
9. Geographic Map: Tile Square Map

- Do:

- Use when you want to equalize units that are geographically dissimilar
- Use any consistent shape (squares, hexagons)

- Don't:

- Use if the actual location and relation of regions to one another is important



Visualization source: https://www.flerlagetwins.com/2018/11/what-hex-brief-history-of-hex_68.html?m=1

10. Network: Flow or Diagram

- Do:
 - Use to show how things are interconnected
 - Can be directed (flow) or not (diagram)
 - Use with qualitative or quantitative data
- Don't:
 - Make it too complicated

Visualization Source: <http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan>

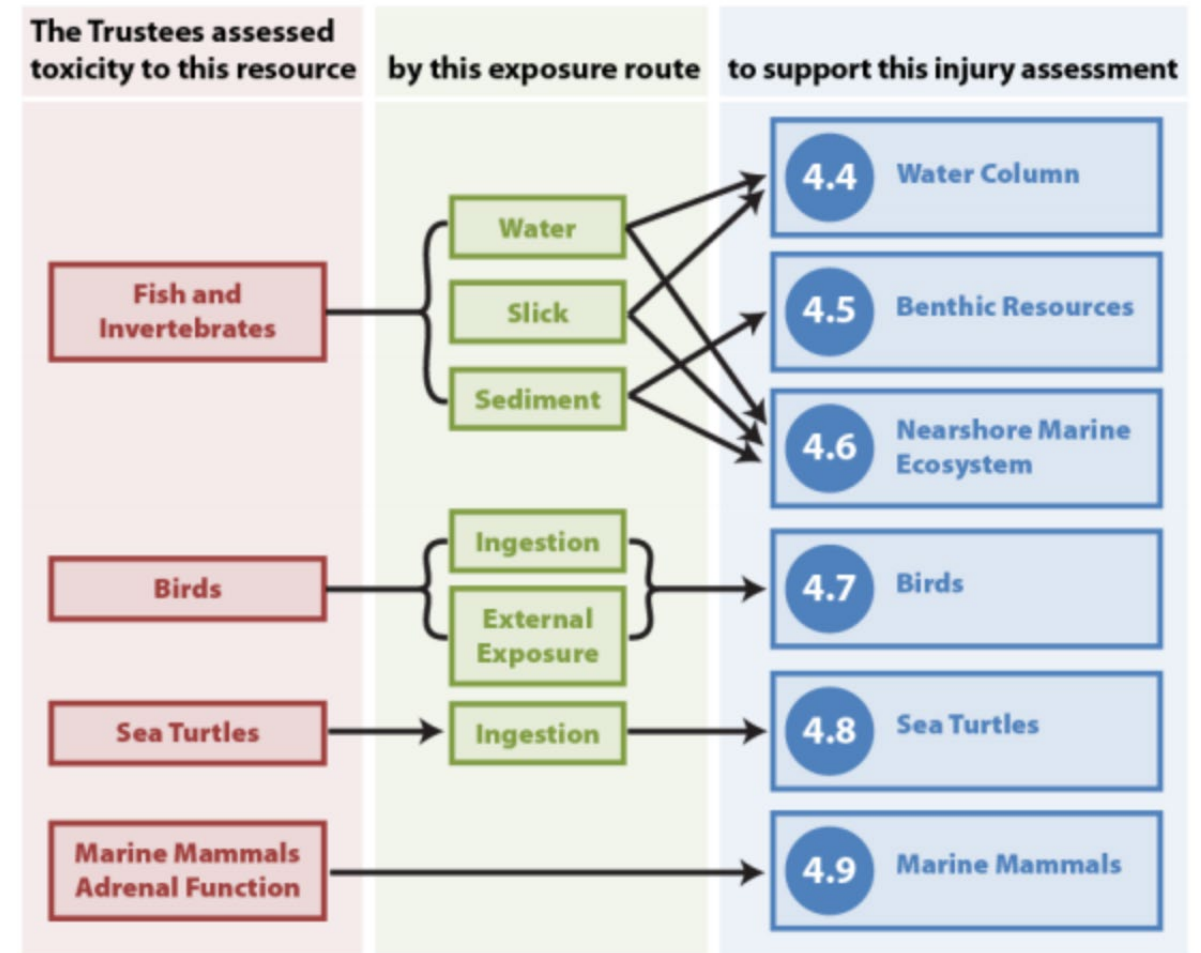


Figure 4.1-8. Use of toxicity information in the Trustees' injury assessment.

Formatting: 6 Tips and Tricks

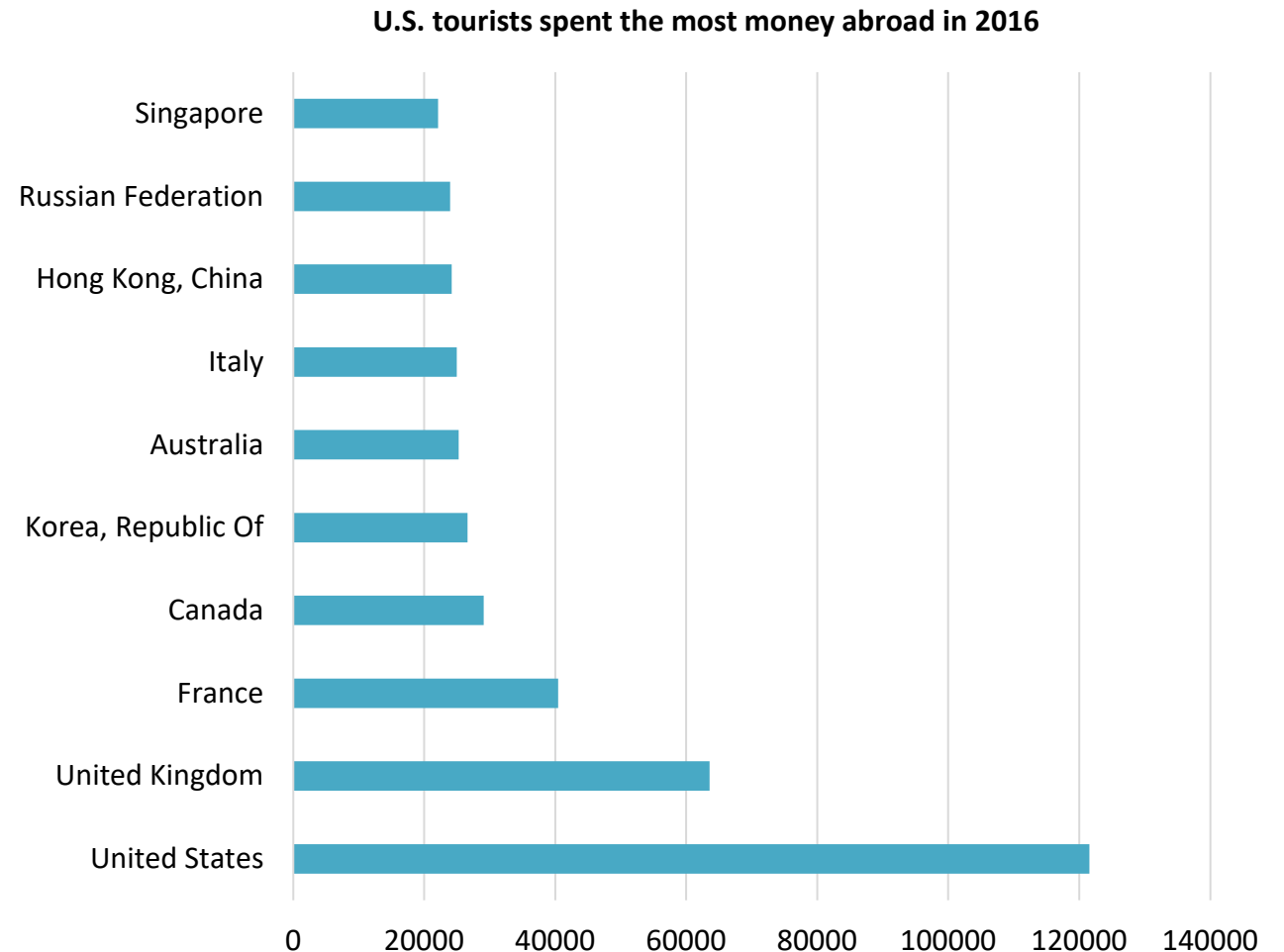
Example Bar Chart Before Formatting



Data source: https://knoema.com/atlas/topics/Tourism/Outbound-Tourism-Indicators/Outbound-tourism-travel?action=export&gadget=tranking-container&utm_medium=watermark&utm_source=xlsx

1. Make an Active Title

- Write an “active” title that describes the main point you are trying to make
- Keep it short (6 to 12 words, or one line in a report)
 - Note any nuances in text, an exhibit note, or during your presentation

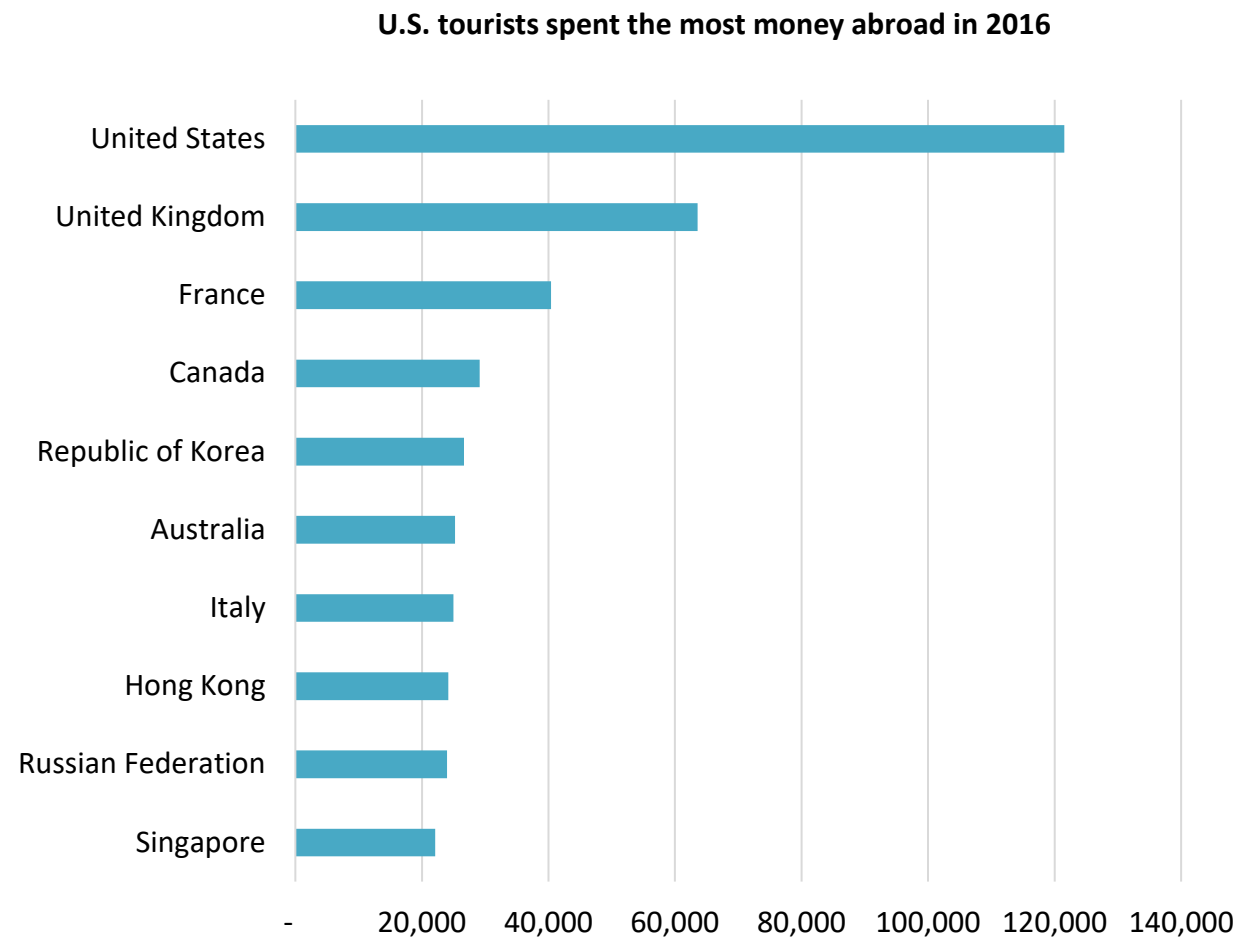


2. Intentionally Order Your Data

- Intentionally order your data

- You can group by:

- Frequency
- Time period
- Alphabetically



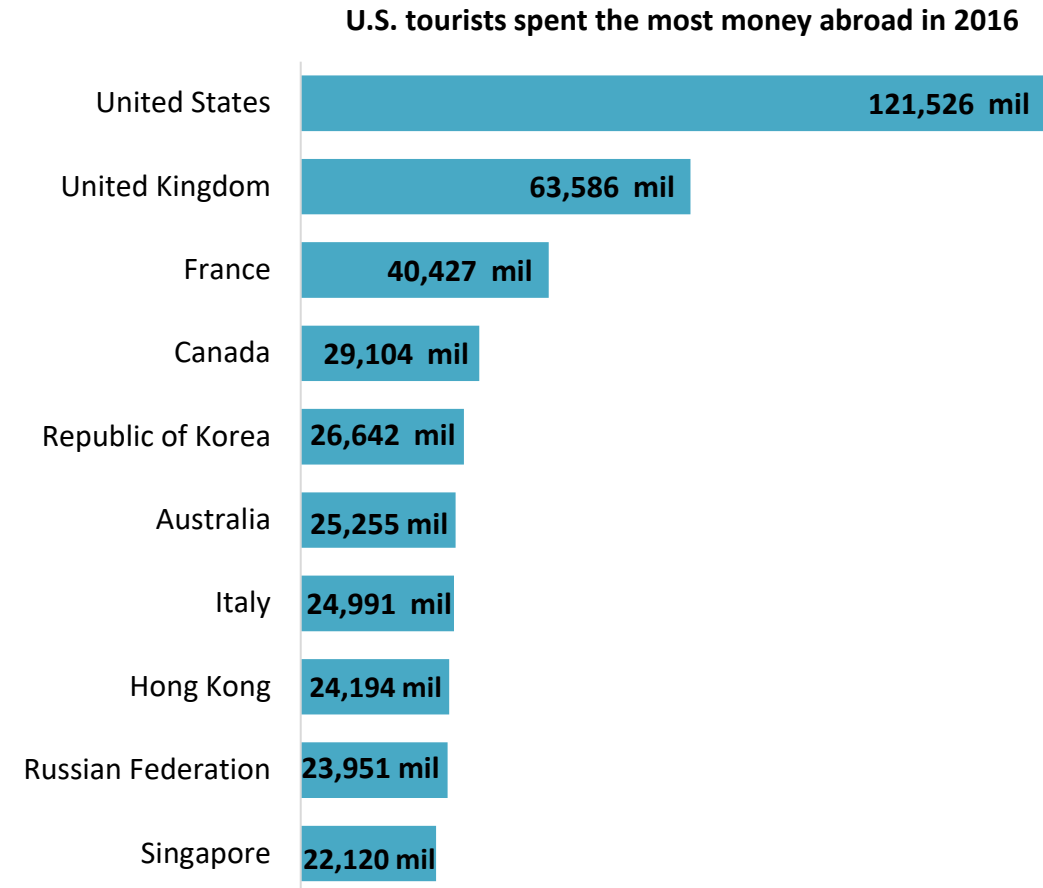
3. Unclutter Your Visuals

- Delete or minimize grid lines
- Consider deleting your axis line and instead use numeric labels
 - The exception is line graphs



4. Strategically Place Minimal Labels

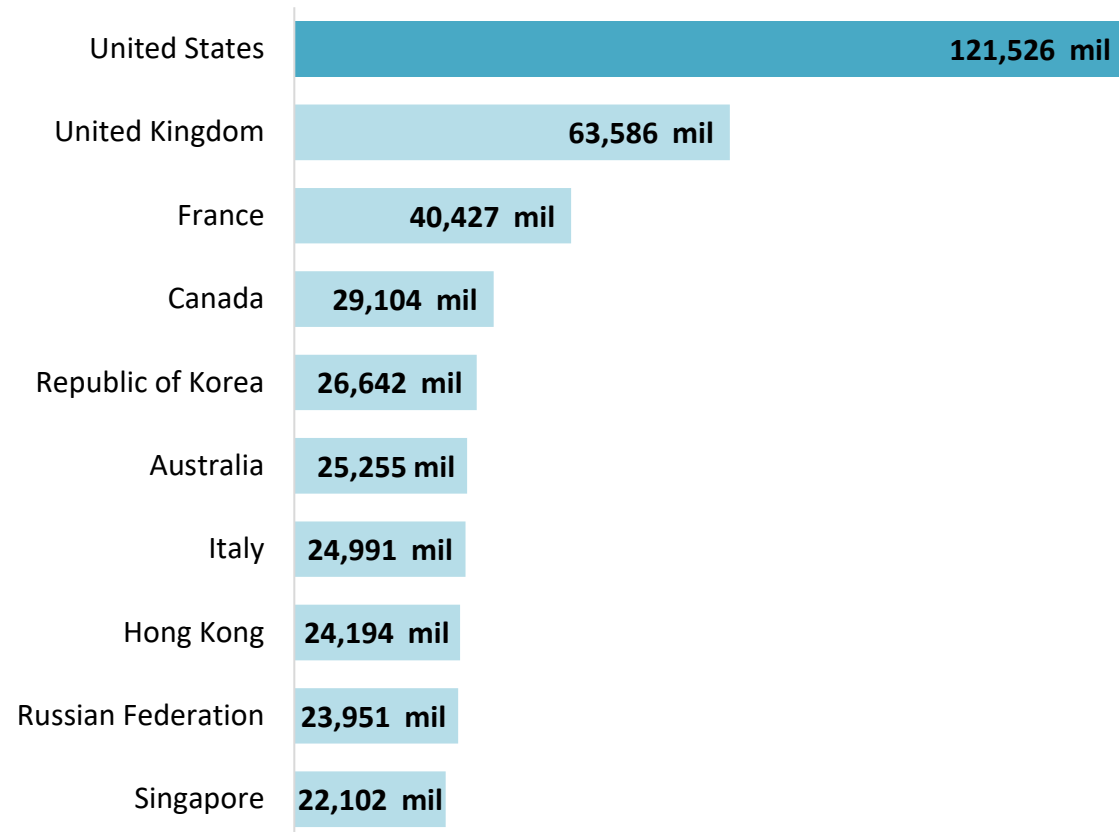
- Think about placement for easiest understanding
 - Should always be horizontal
- Minimize to the extent possible
 - If possible, annotate each slice/bar/point directly
 - Use as few decimal points as possible, but be consistent
 - Avoid redundancy – only use a label once



5. Color

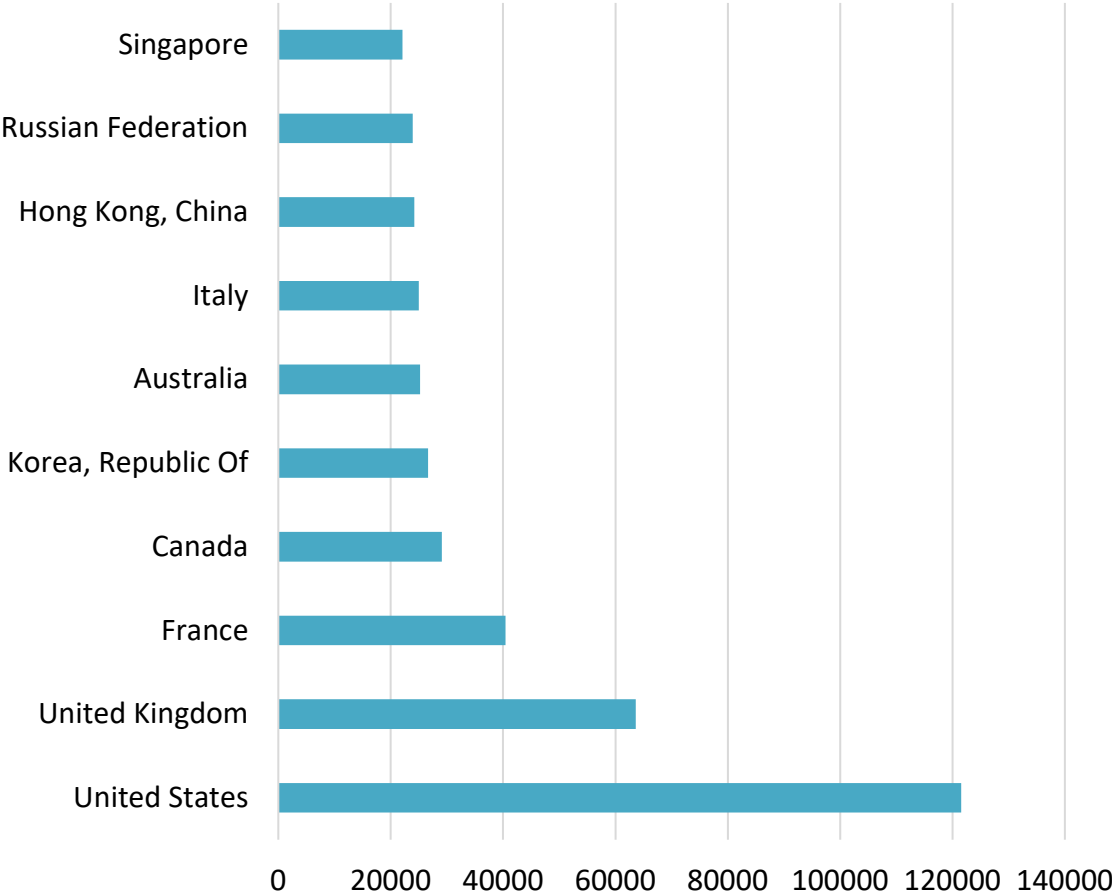
- Choosing color:
 - Use similar colors to represent the same data
 - Use gradients of the same color
 - Use color to highlight important numbers
- Greyscale and color blindness
- Color sets tone

U.S. tourists spent the most money abroad in 2016



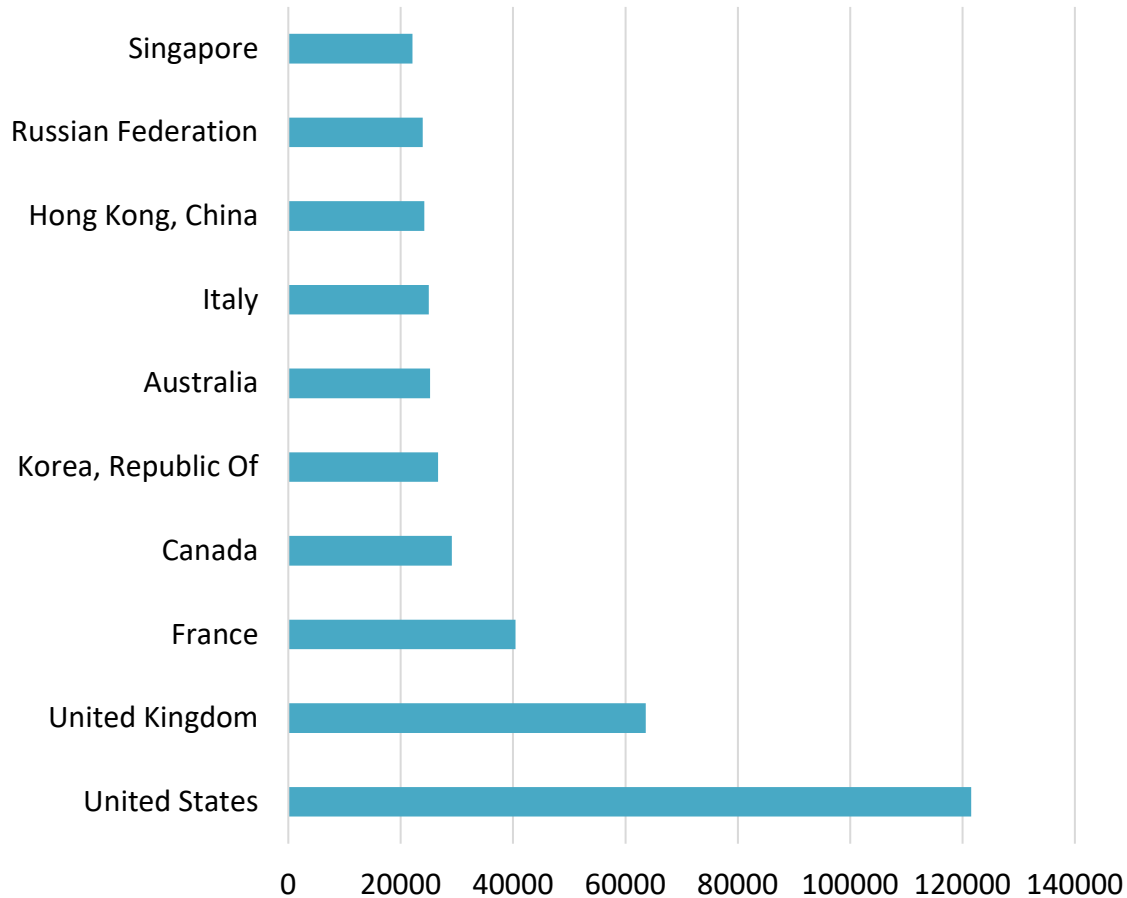
Comparison – Original vs. Revised

Money spent abroad in millions, 2016

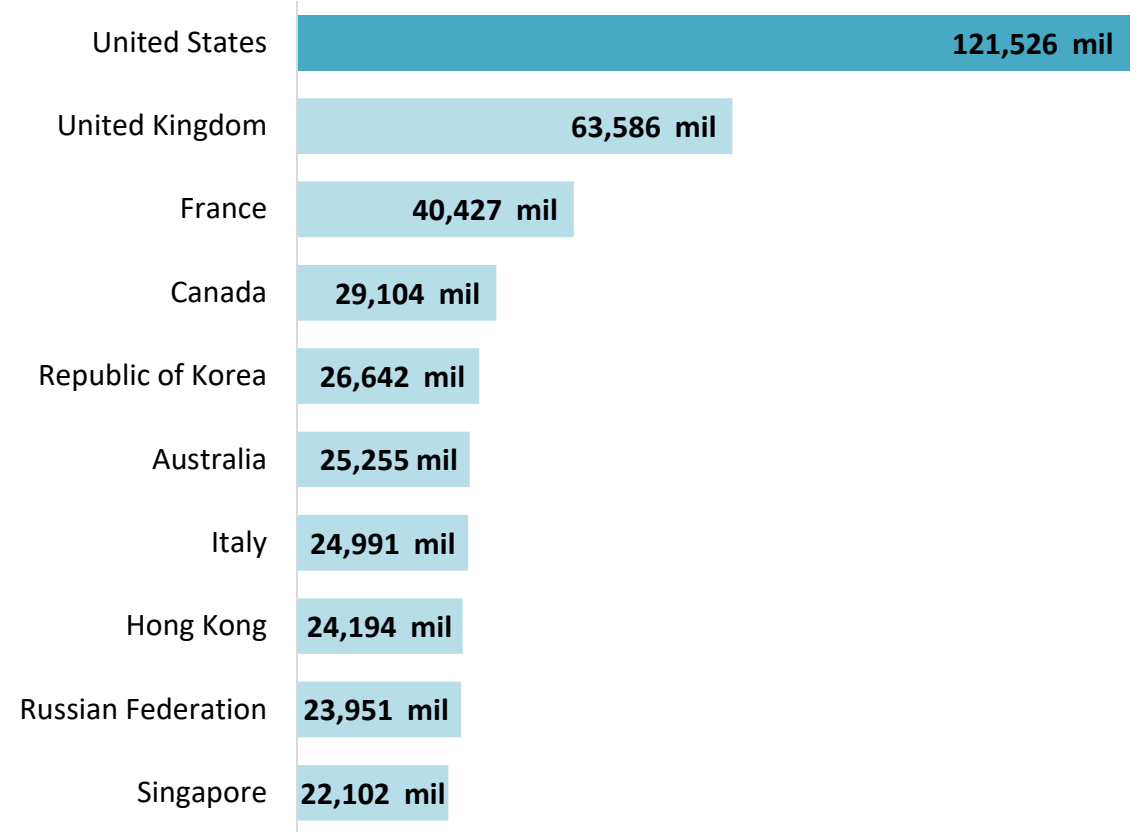


Comparison – Original vs. Revised

Money spent abroad in millions, 2016



U.S. tourists spent the most money abroad in 2016



6. All Fonts Are Not Created Equal

- Different fonts can evoke emotion and have personality

Happy

Happy

Trustworthy

Trustworthy

- Choice of fonts can impact readability and legibility

The quick brown fox
jumps over the lazy dog.

The quick brown fox
jumps over the lazy dog.

Legible

LEGIBLE?

<https://venngage.com/blog/how-to-choose-fonts/>

5 Ways Data Visualizations Can Be Misleading

1. Showing a Limited Range of Potential Scores

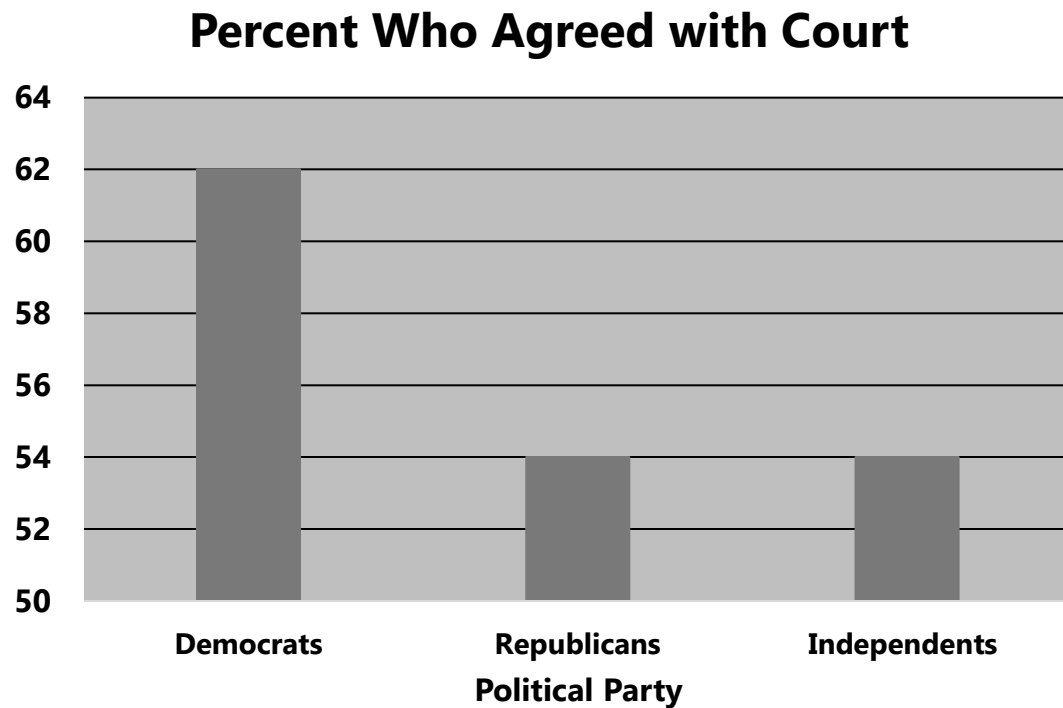
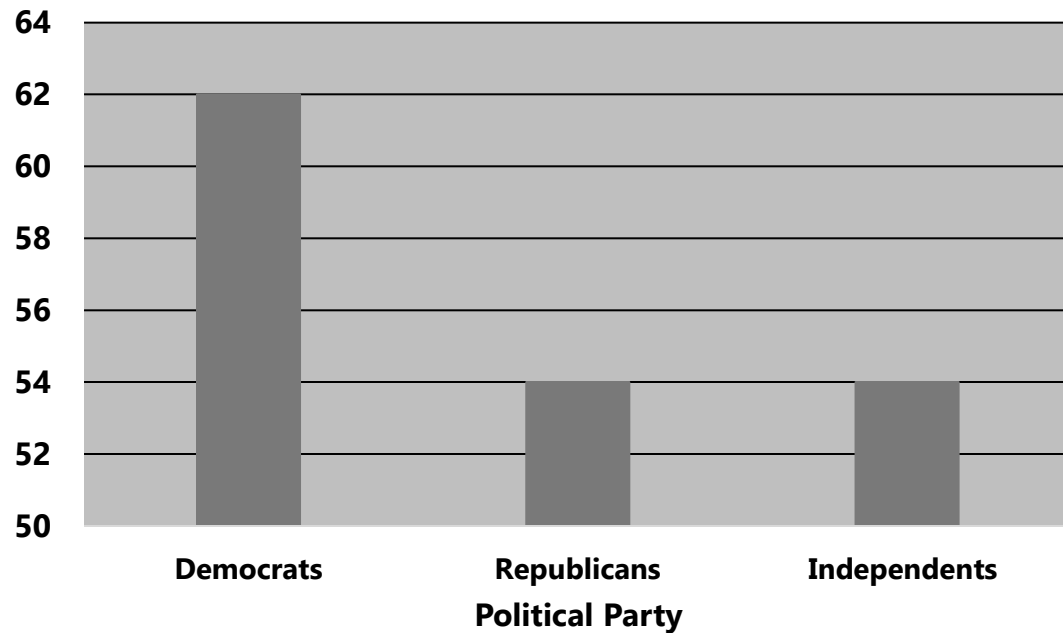


Image: Western Reserve Public Media

1. Showing a Limited Range of Potential Scores

Percent Who Agreed with Court



Percent Who Agreed With Court

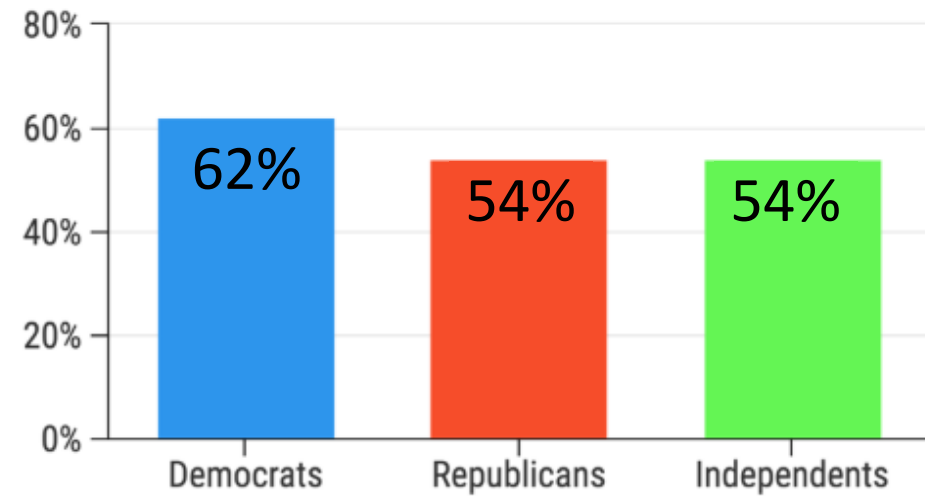
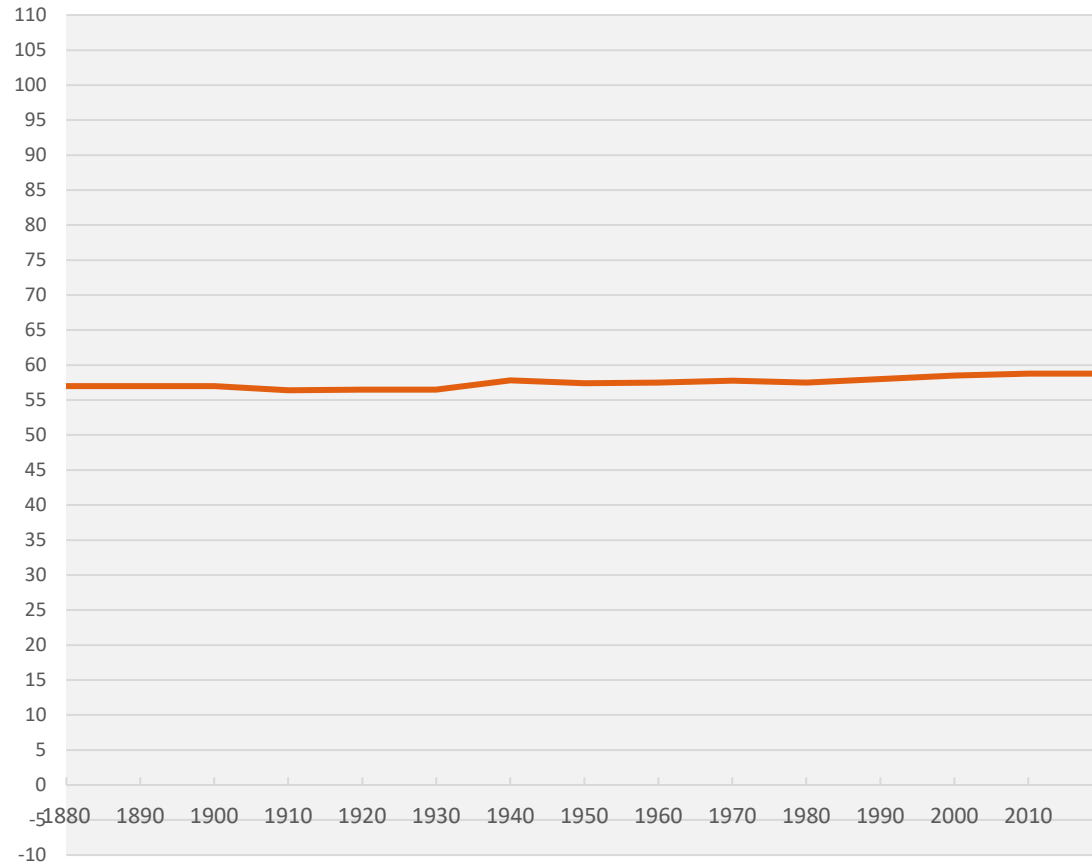


Image: Western Reserve Public Media

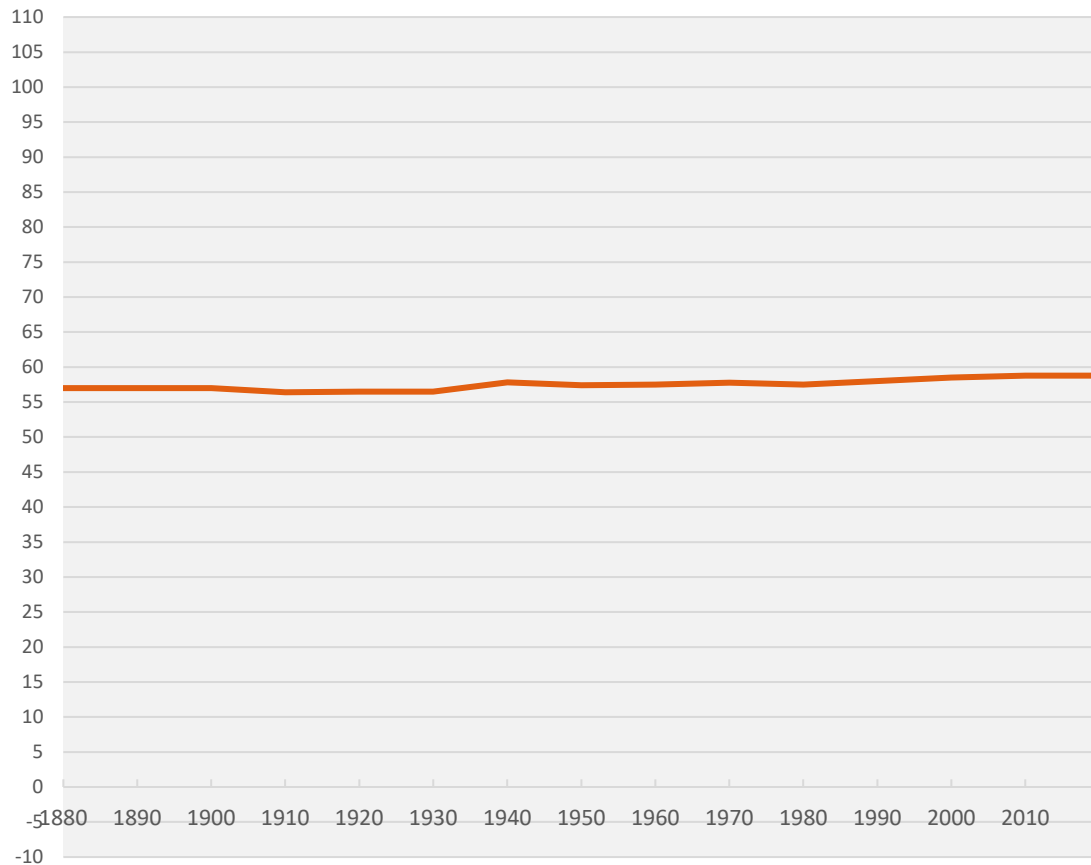
2. Manipulating the y-axis

**Average Annual Global Temperature in Fahrenheit
1880-2015**



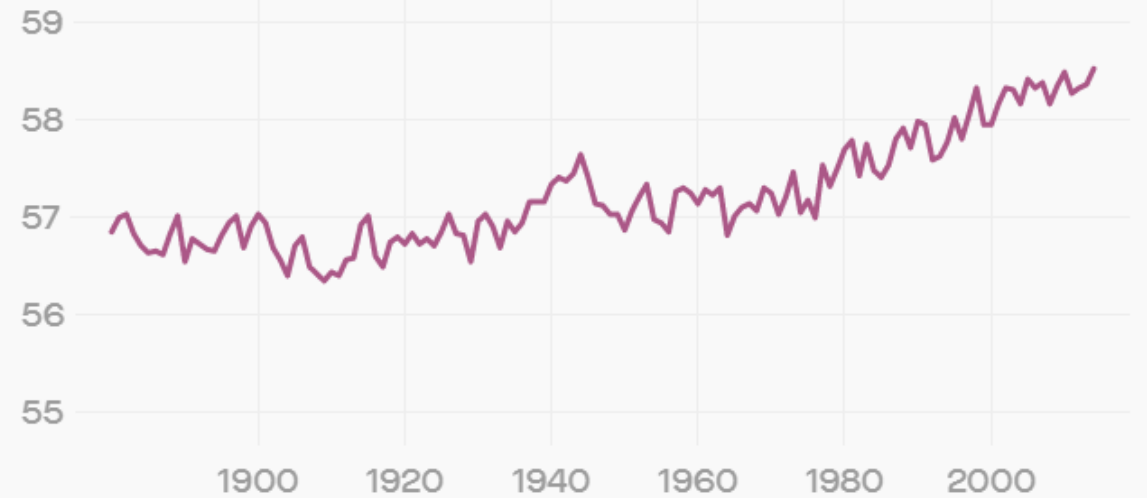
2. Manipulating the y-axis

**Average Annual Global Temperature in Fahrenheit
1880-2015**



Average global temperature, 1880 to 2014

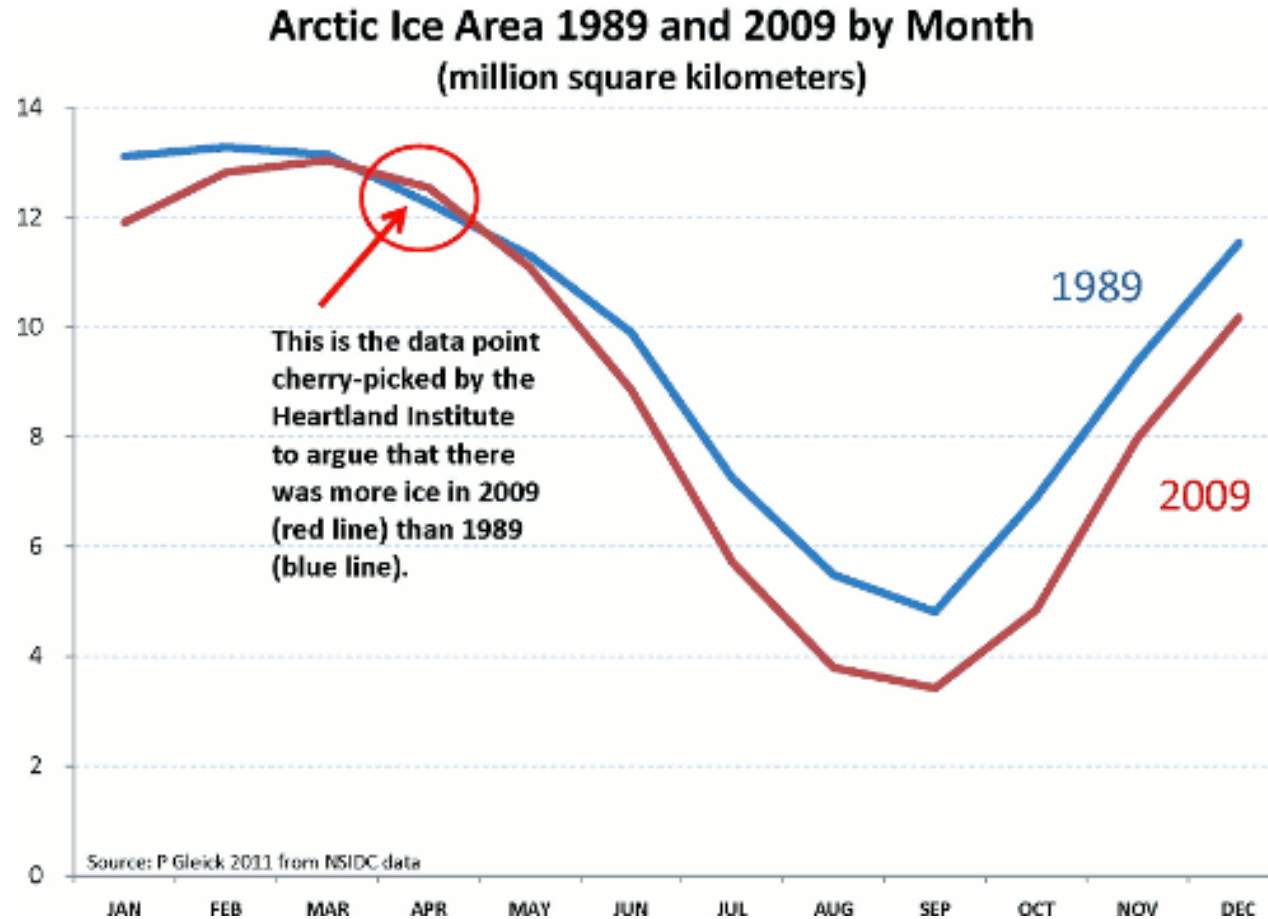
60° fahrenheit



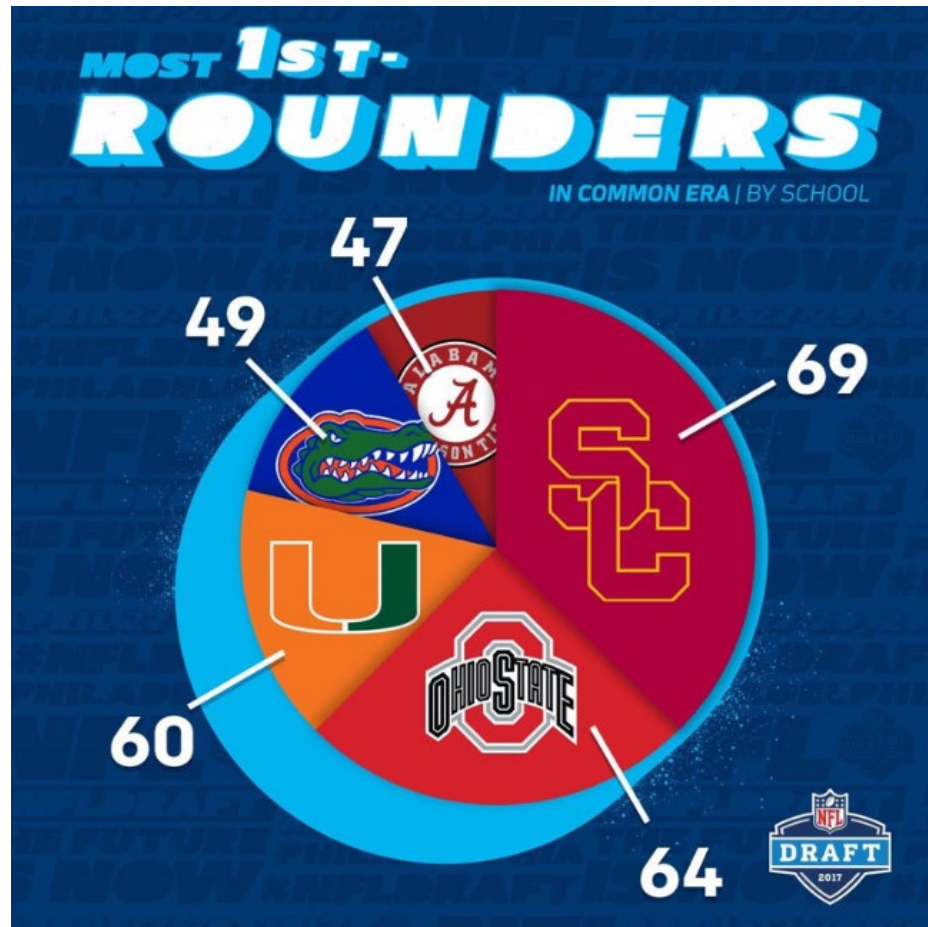
Δ T L Δ S | Data: NASA

Share

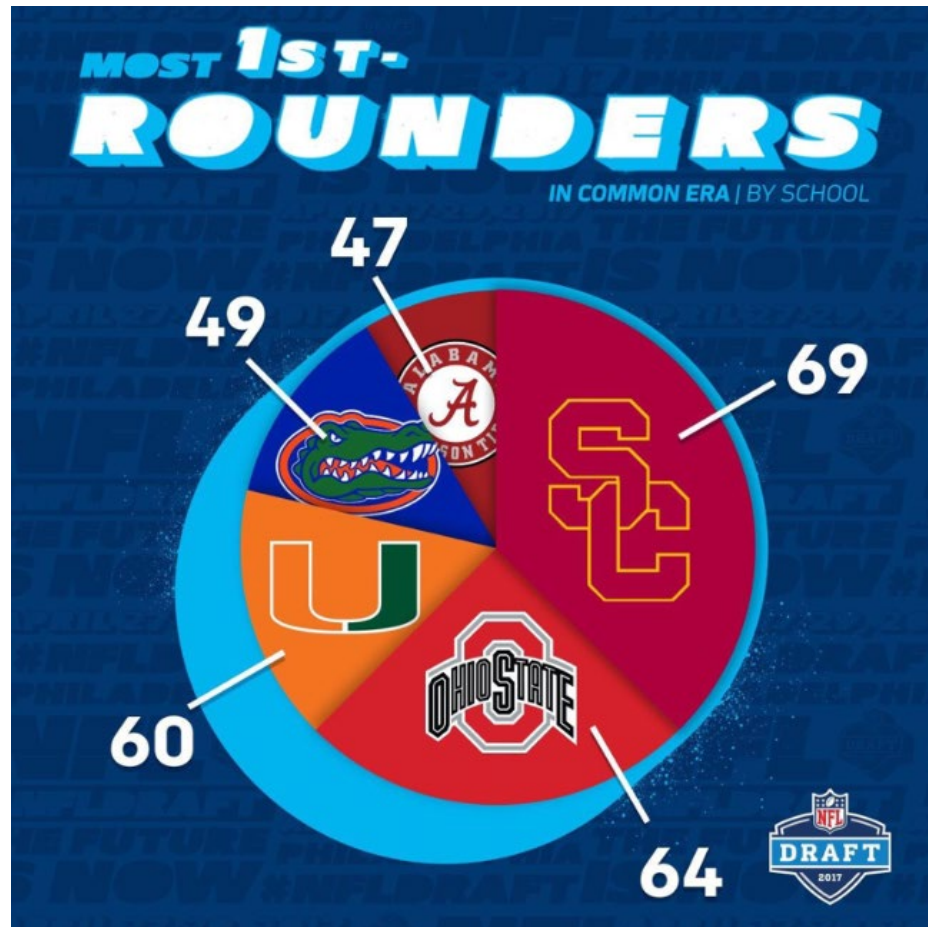
3. Cherry-picking the Data



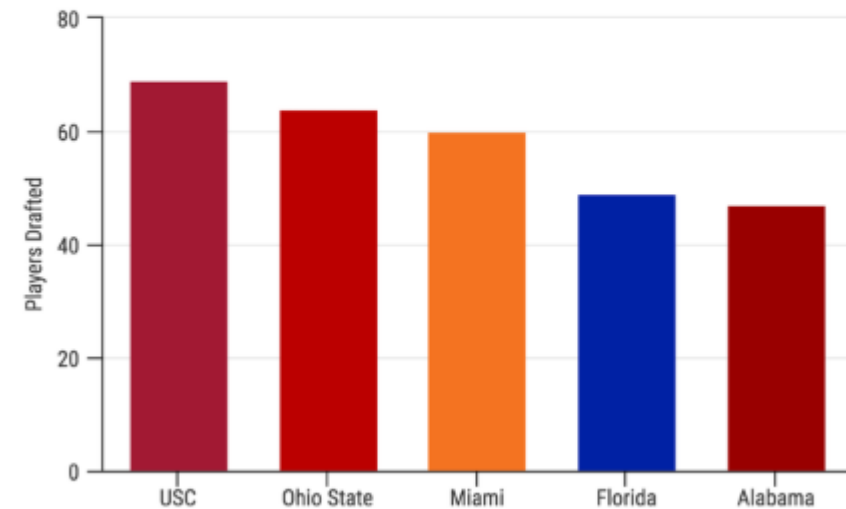
4. Using the Wrong Type of Chart



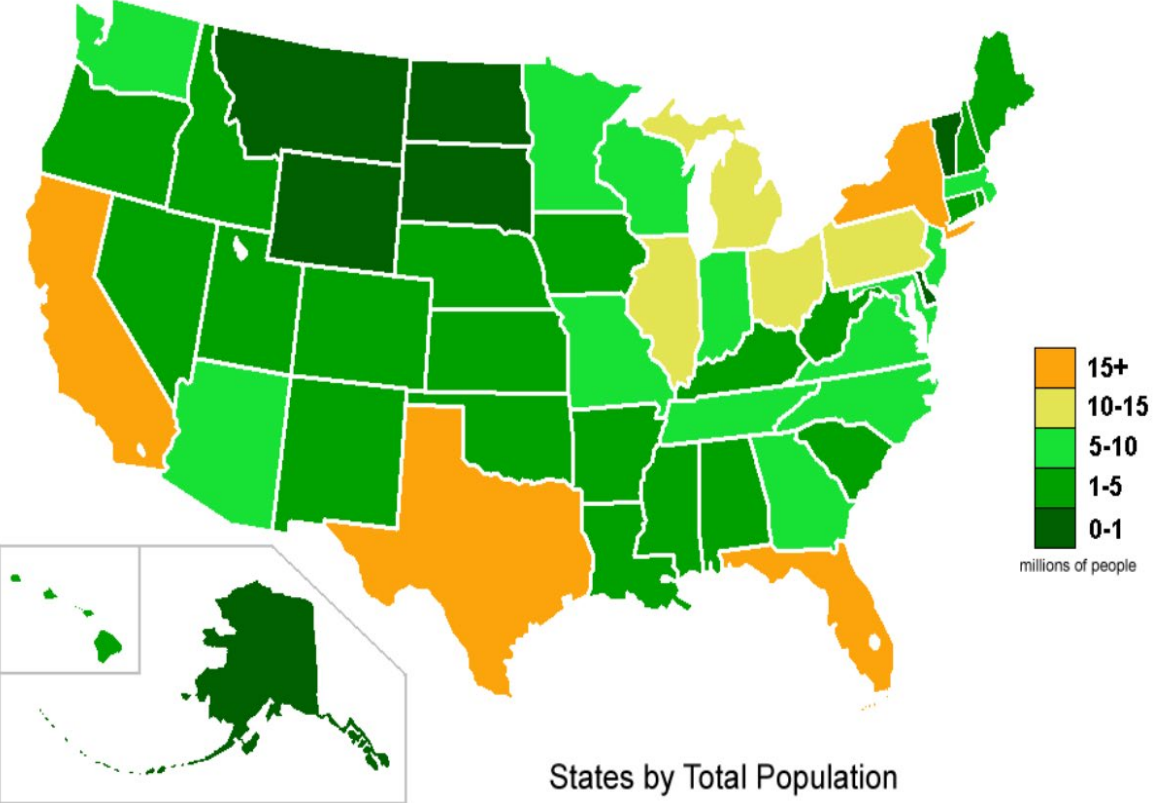
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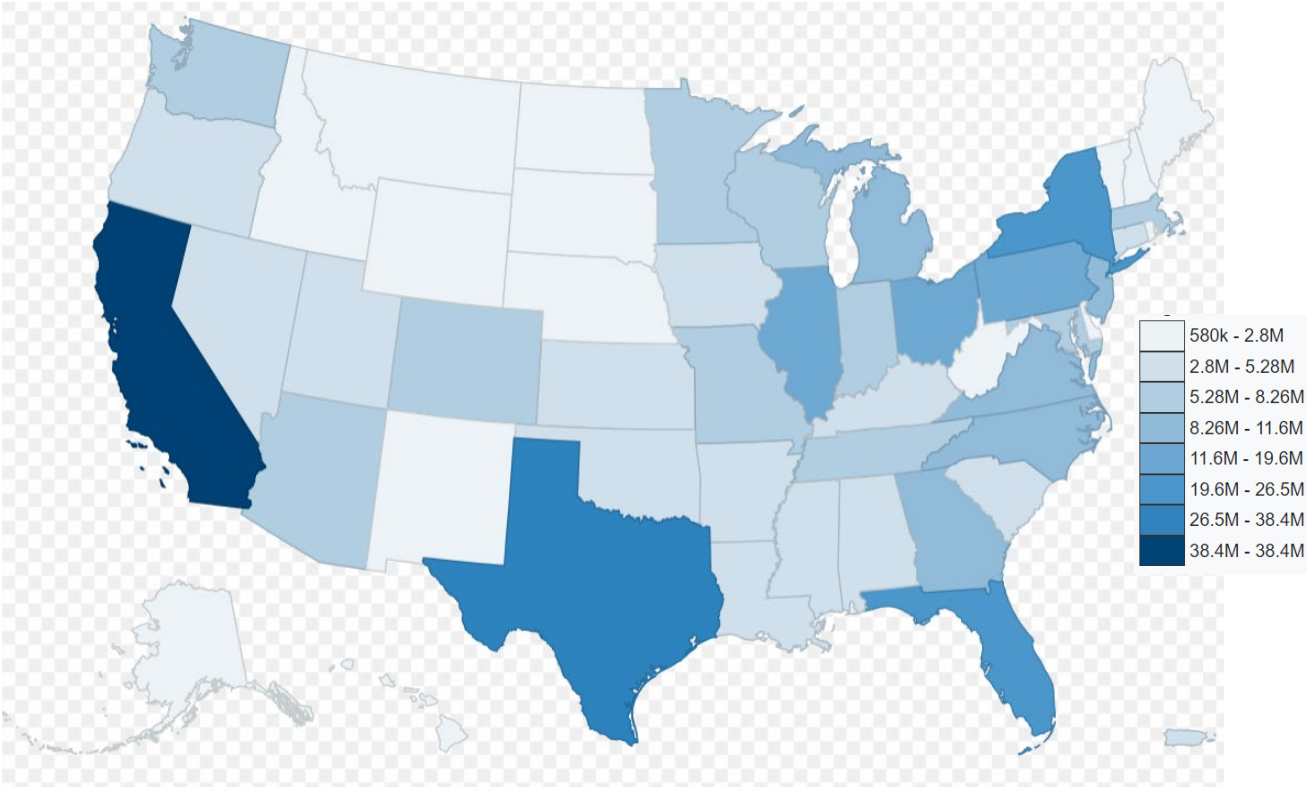
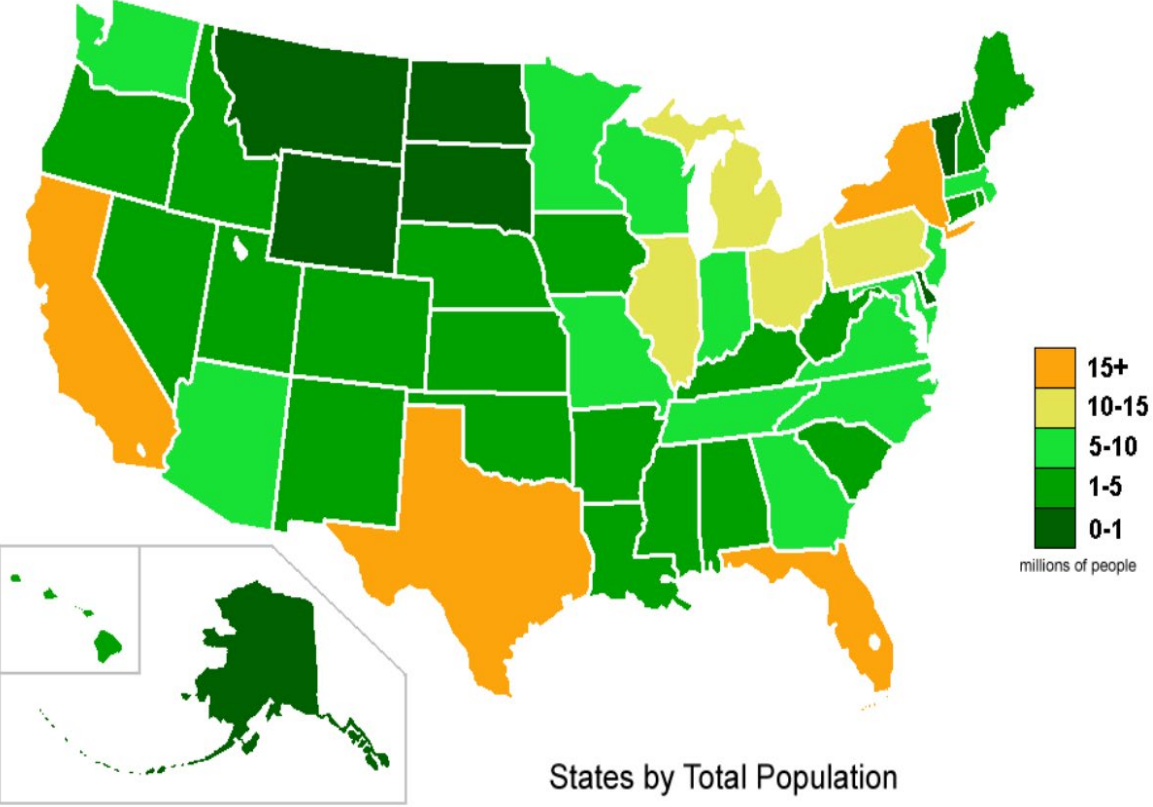
Most Players Drafted In The First Round



5. Going Against Conventions



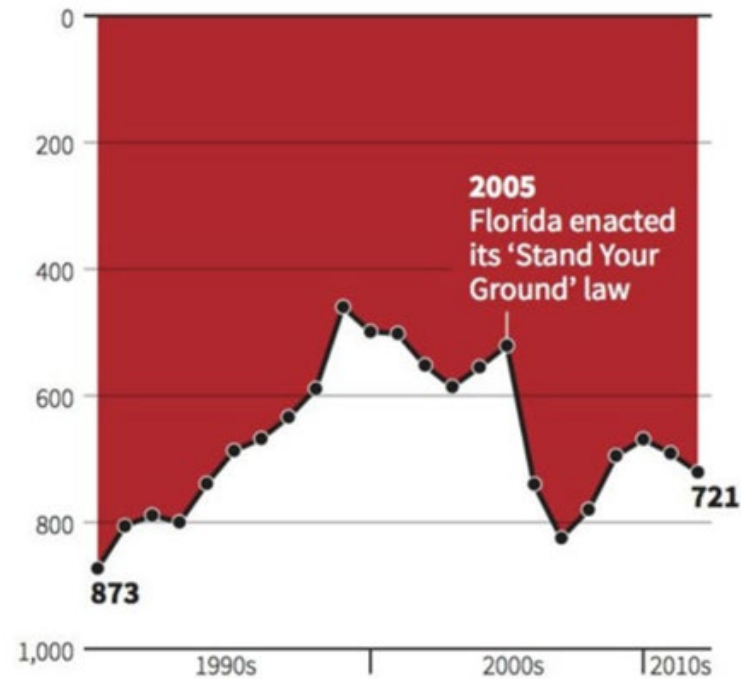
5. Going Against Conventions



5. Going Against Conventions, Continued

Gun deaths in Florida

Number of murders committed using firearms



Source: Florida Department of Law Enforcement

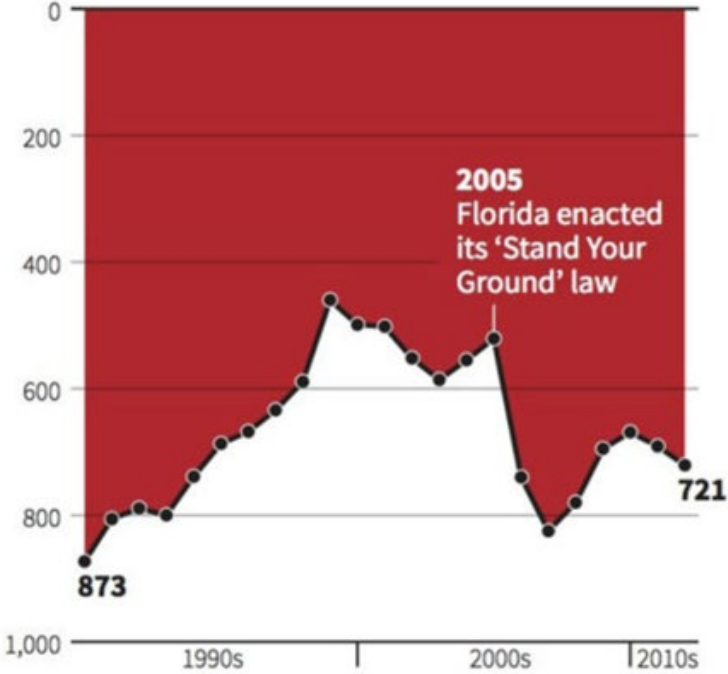
C. Chan 16/02/2014

REUTERS

5. Going Against Conventions, Continued

Gun deaths in Florida

Number of murders committed using firearms

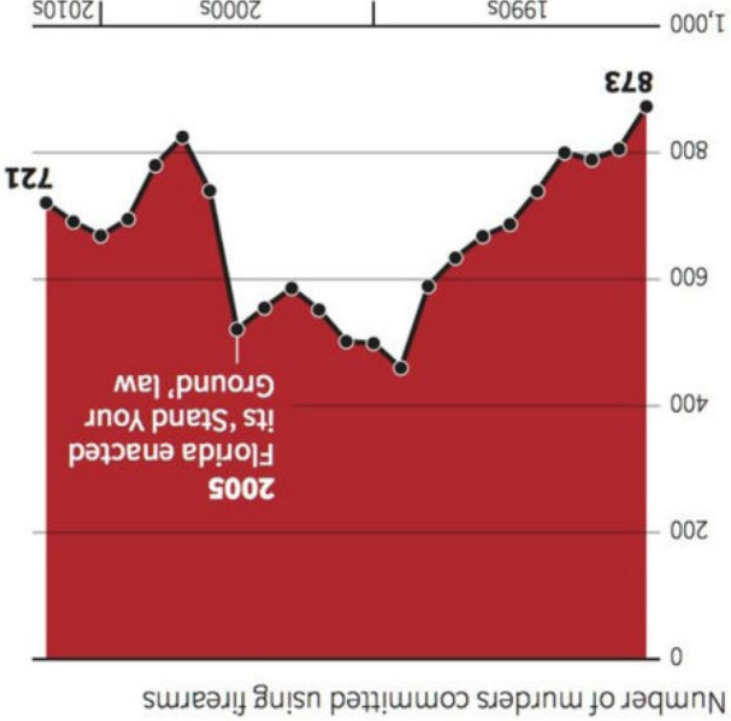


Source: Florida Department of Law Enforcement

C. Chan 16/02/2014



Source: Florida Department of Law Enforcement
C. Chan 16/02/2014
REUTERS



Gun deaths in Florida

Number of murders committed using firearms

Data Visualization Resources

Data Visualization Resources



■ Graph Types:

- <https://datavizproject.com/>
- <https://www.data-to-viz.com/>
- <https://depictdatastudio.com/charts/>
- <https://www.alanapirrone.com.au/>
- <http://www.bdbanalytics.ir/media/1123/storytelling-with-data-cole-nussbaumer-knaflic.pdf>
- Effective Data Visualizations: The Right Chart for the Right Data by Stephanie Evergreen

■ Formatting:

- The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, and Figures by Dona M Wong
- Stephanie Evergreen's Data Visualization [Checklist](#)

Data Visualization Resources, Continued



■ Other Webinars:

- Learning Data Visualization (4hrs) <https://www.linkedin.com/learning/learning-data-visualization-3/welcome?u=77842946>
- Data Visualization Storytelling (1h45m) covered somewhat in his overall course <https://www.linkedin.com/learning/data-visualization-storytelling/welcome?u=77842946>
- Picking the Right Chart for your Data (1h 30m) <https://www.linkedin.com/learning/picking-the-right-chart-for-your-data/welcome?u=77842946>
- Data Visualizations for Data Analysts (Intermediate level, 1h 30m) <https://www.linkedin.com/learning/data-visualization-for-data-analysts/welcome?u=77842946>
- Data Visualization: Best Practices <https://www.linkedin.com/learning/data-visualization-best-practices/welcome?u=77842946>
- Data Visualization Tips and Tricks: <https://www.linkedin.com/learning/data-visualization-tips-and-tricks/welcome?u=77842946>

Questions



Contact

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