

Dos and Don'ts of Data Visualization for the Web

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What's Happening Here?

- Dos and Don'ts of Data Viz in General
- Dos and Don'ts Specific to Web Visualizations
- Resources at Stanford

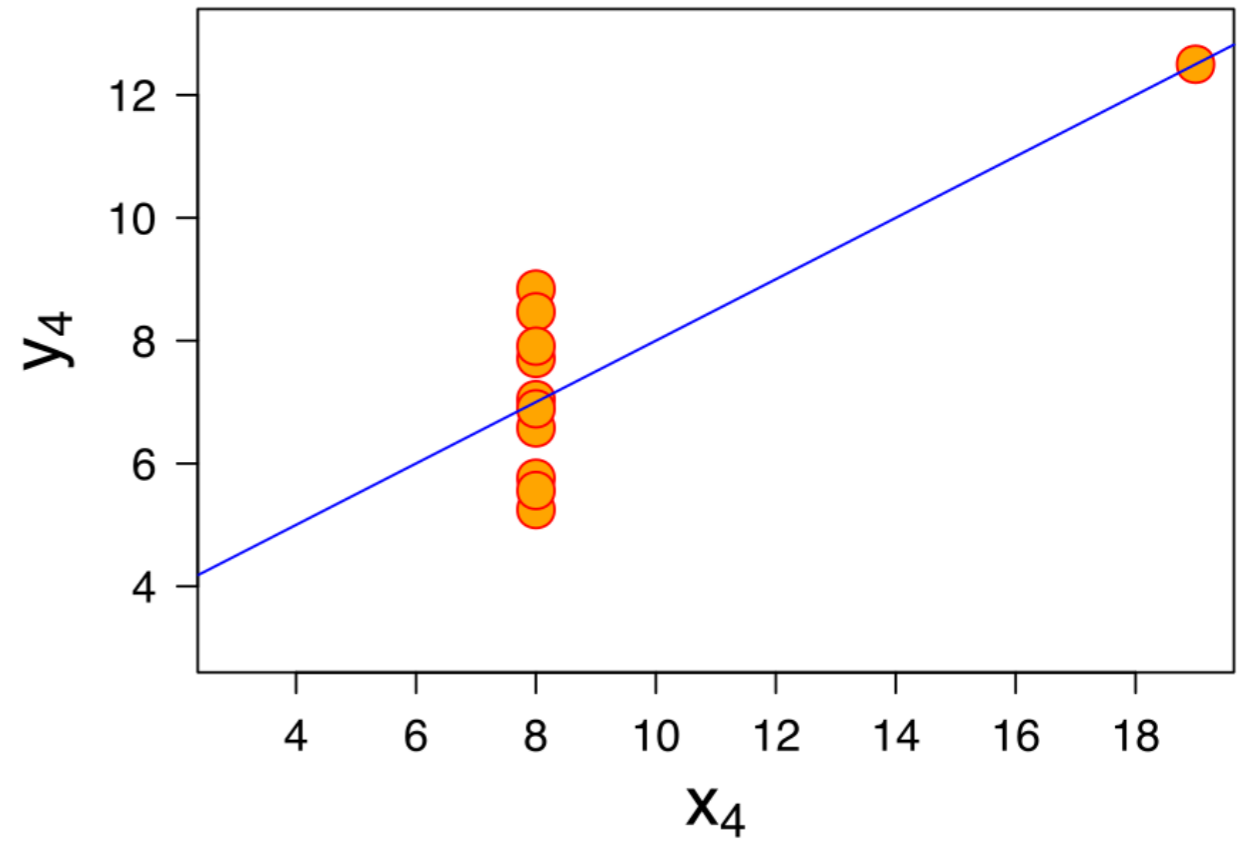
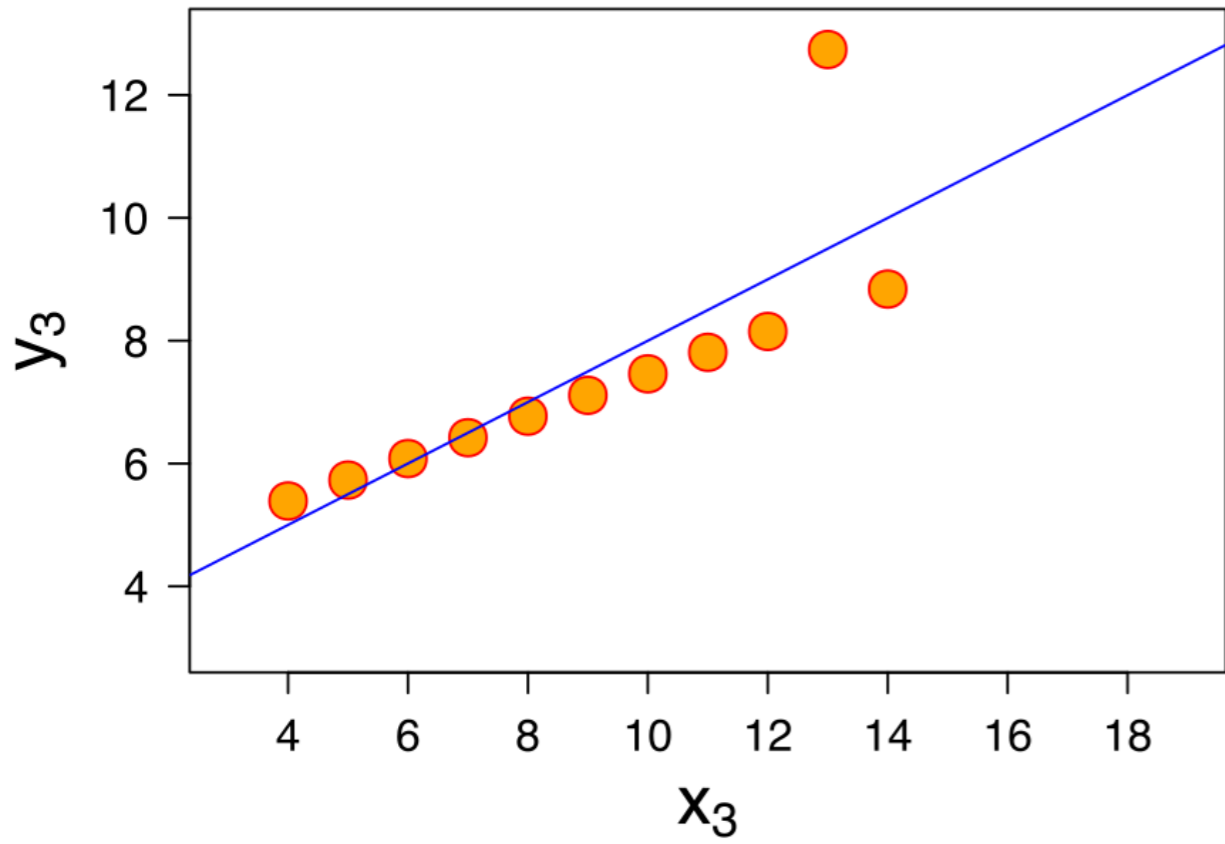
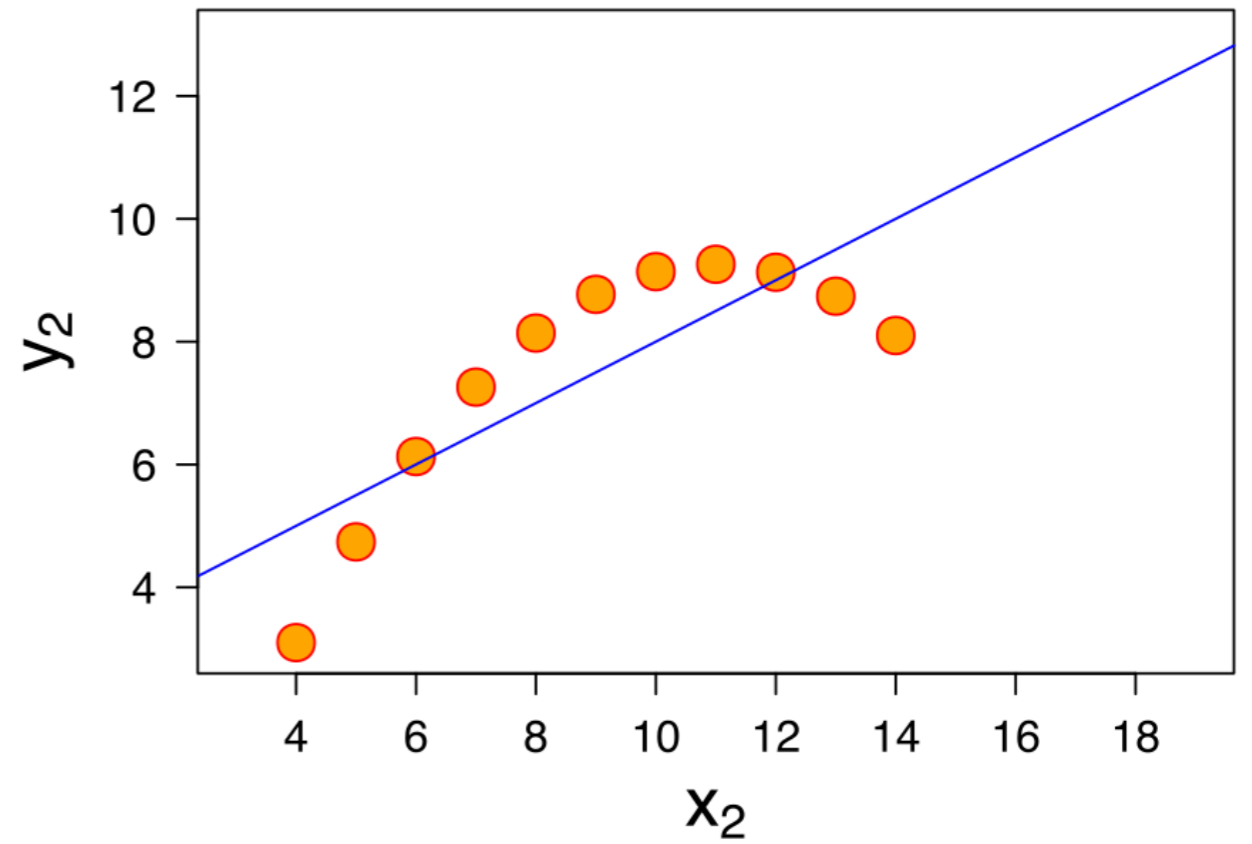
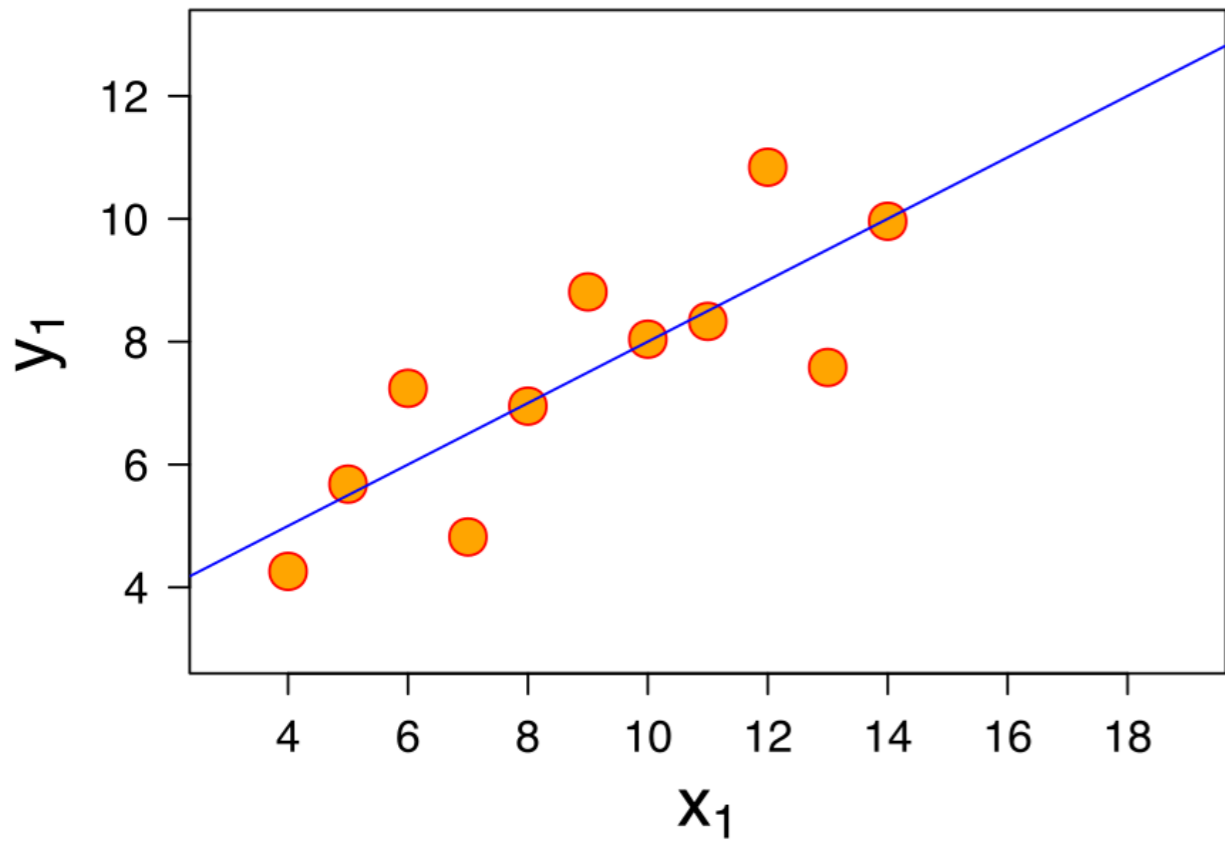
Why Visualize Data?



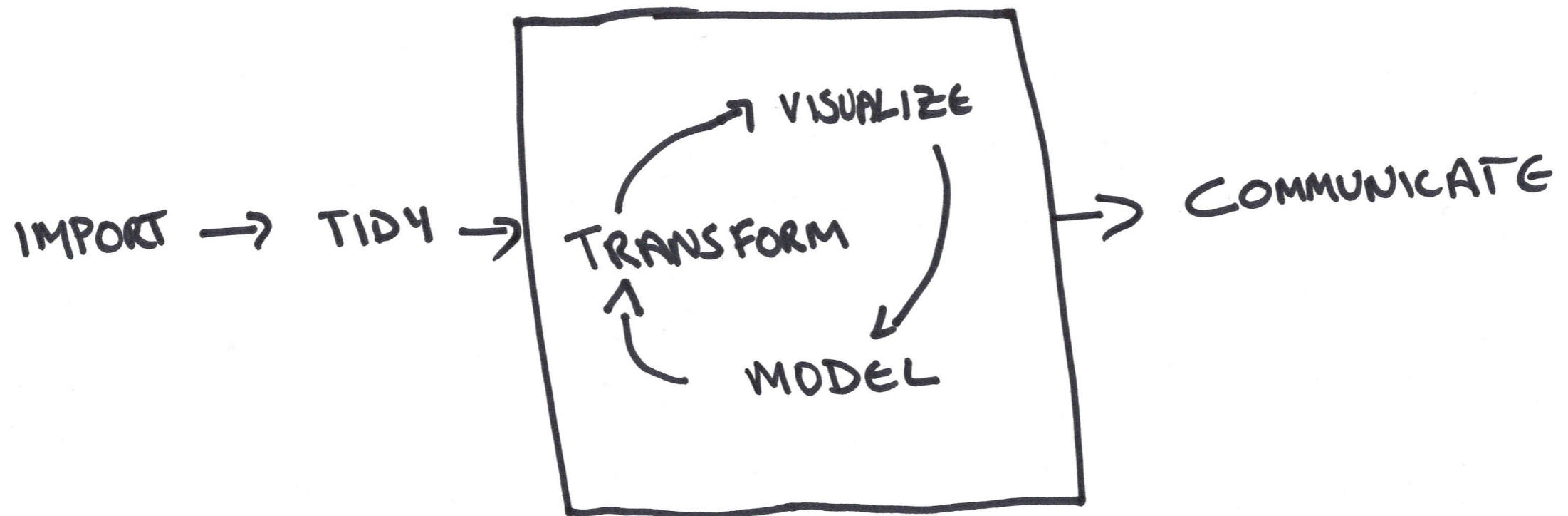
Anscombe's Quartet

1		2		3		4	
x	y	x	y	x	y	x	y
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89

Property	Value
Mean of x	9
Sample variance of x	11
Mean of y	7.50
Sample variance of y	4.125
Correlation between x and y	0.816
Linear regression line	$y = 3.00 + 0.500x$
Coefficient of determination of the linear regression	0.67



How to Visualize Data



How to Visualize Data



Data Dos

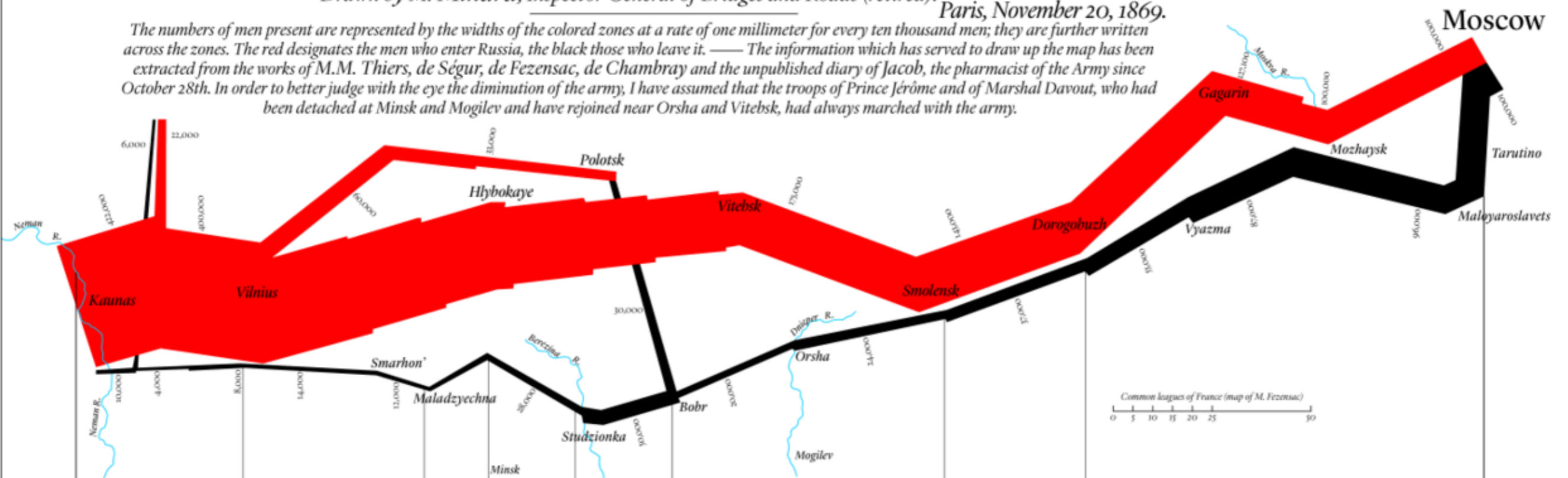
- Clean
- Complete
- Representative

Figurative Map of the successive losses in men of the French Army in the Russian campaign 1812 ~ 1813

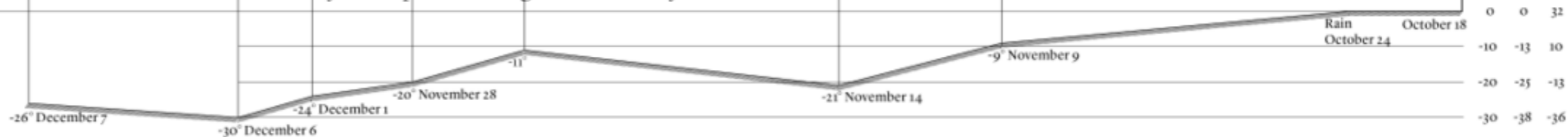
Drawn by M. Minard, Inspector General of Bridges and Roads (retired).

Paris, November 20, 1869.

The numbers of men present are represented by the widths of the colored zones at a rate of one millimeter for every ten thousand men; they are further written across the zones. The red designates the men who enter Russia, the black those who leave it. — The information which has served to draw up the map has been extracted from the works of M.M. Thiers, de Ségur, de Fezensac, de Chambray and the unpublished diary of Jacob, the pharmacist of the Army since October 28th. In order to better judge with the eye the diminution of the army, I have assumed that the troops of Prince Jérôme and of Marshal Davout, who had been detached at Minsk and Mogilev and have rejoined near Orsha and Vitebsk, had always marched with the army.



GRAPHIC TABLE of the temperature in degrees below zero of the Réaumur thermometer.

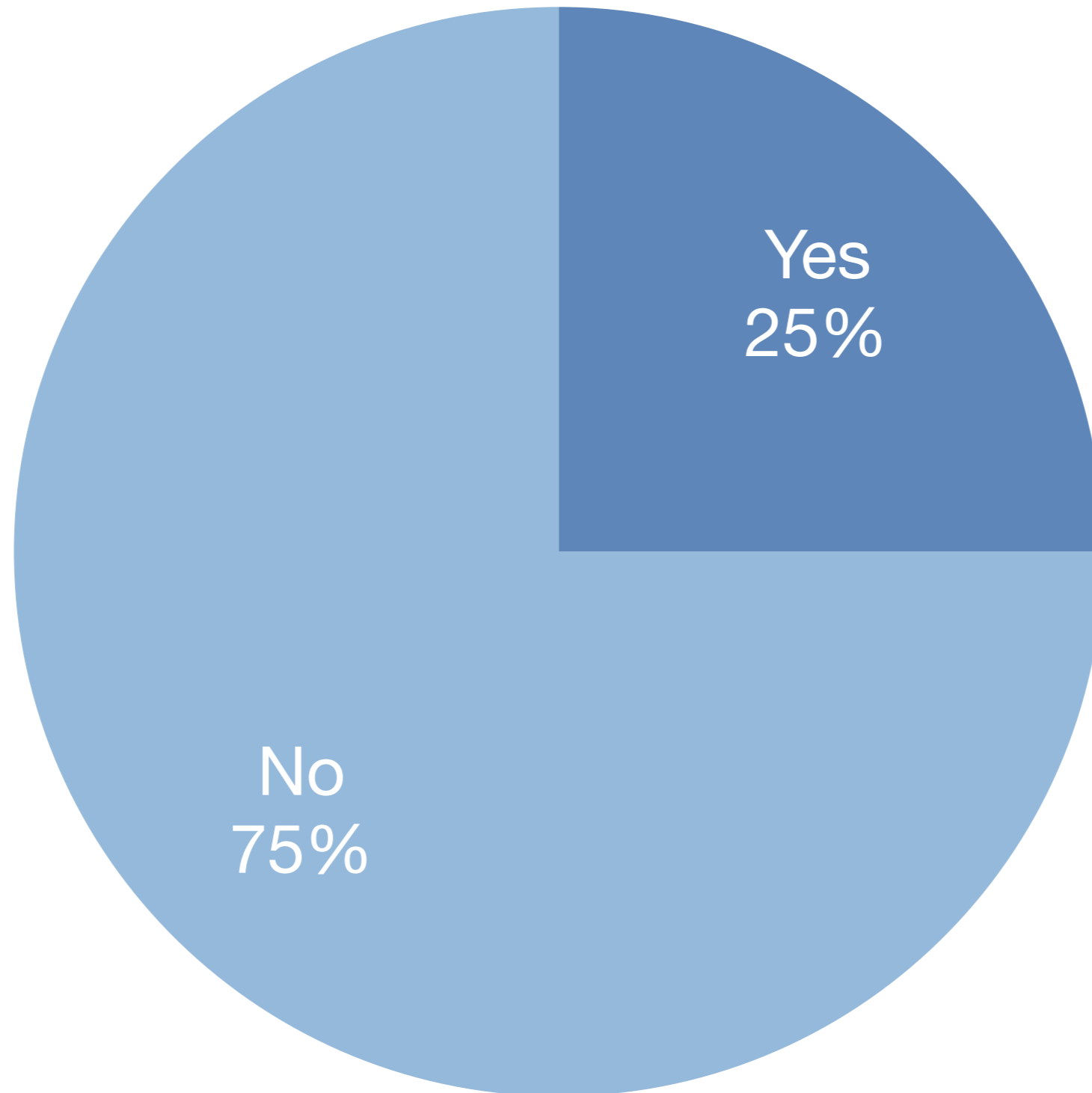


The Cossacks pass the frozen Neman at a gallop.

Pie Chart



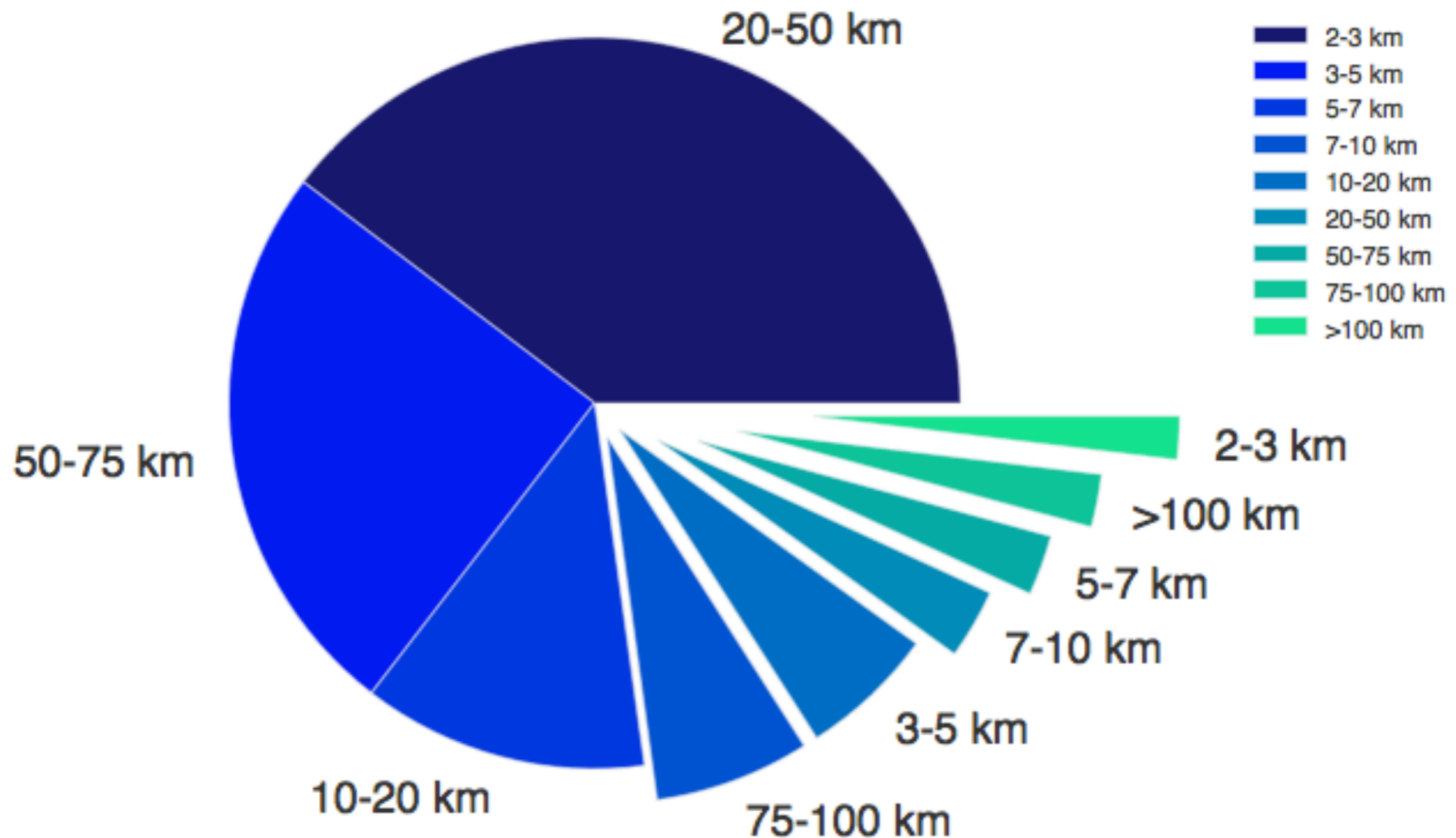
Do Use for Binary Data



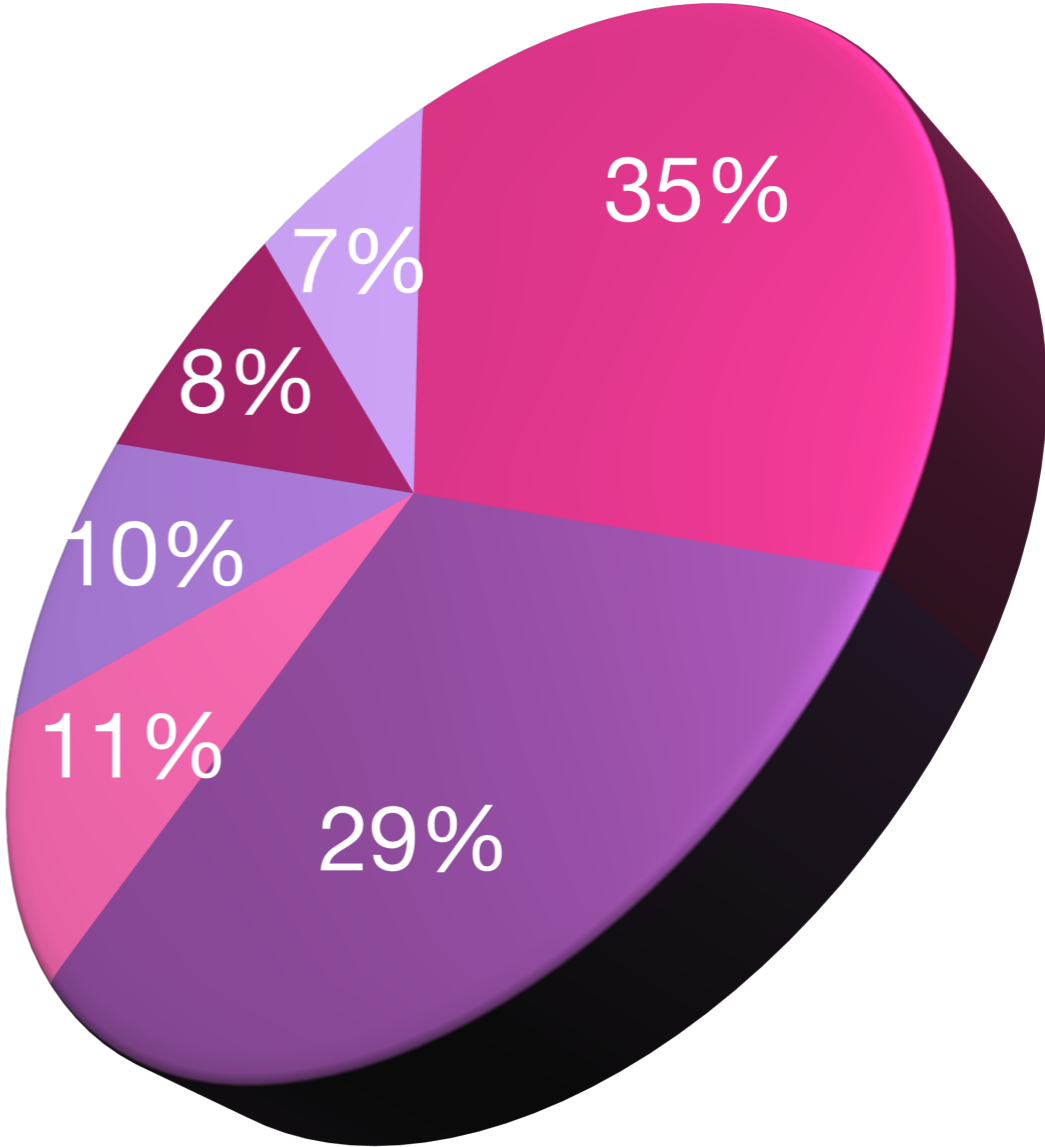
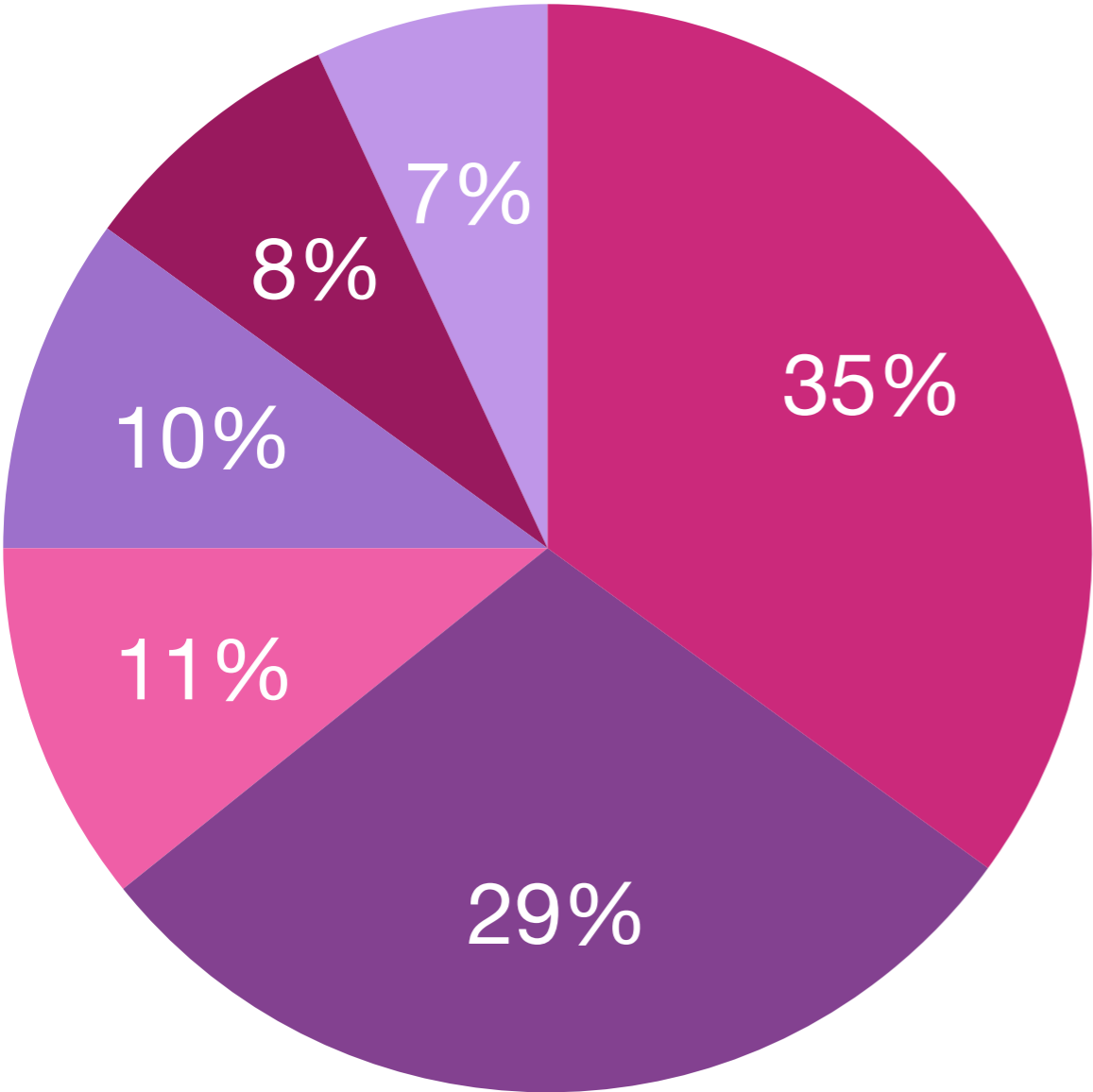
Do Place Pie in Sidebar



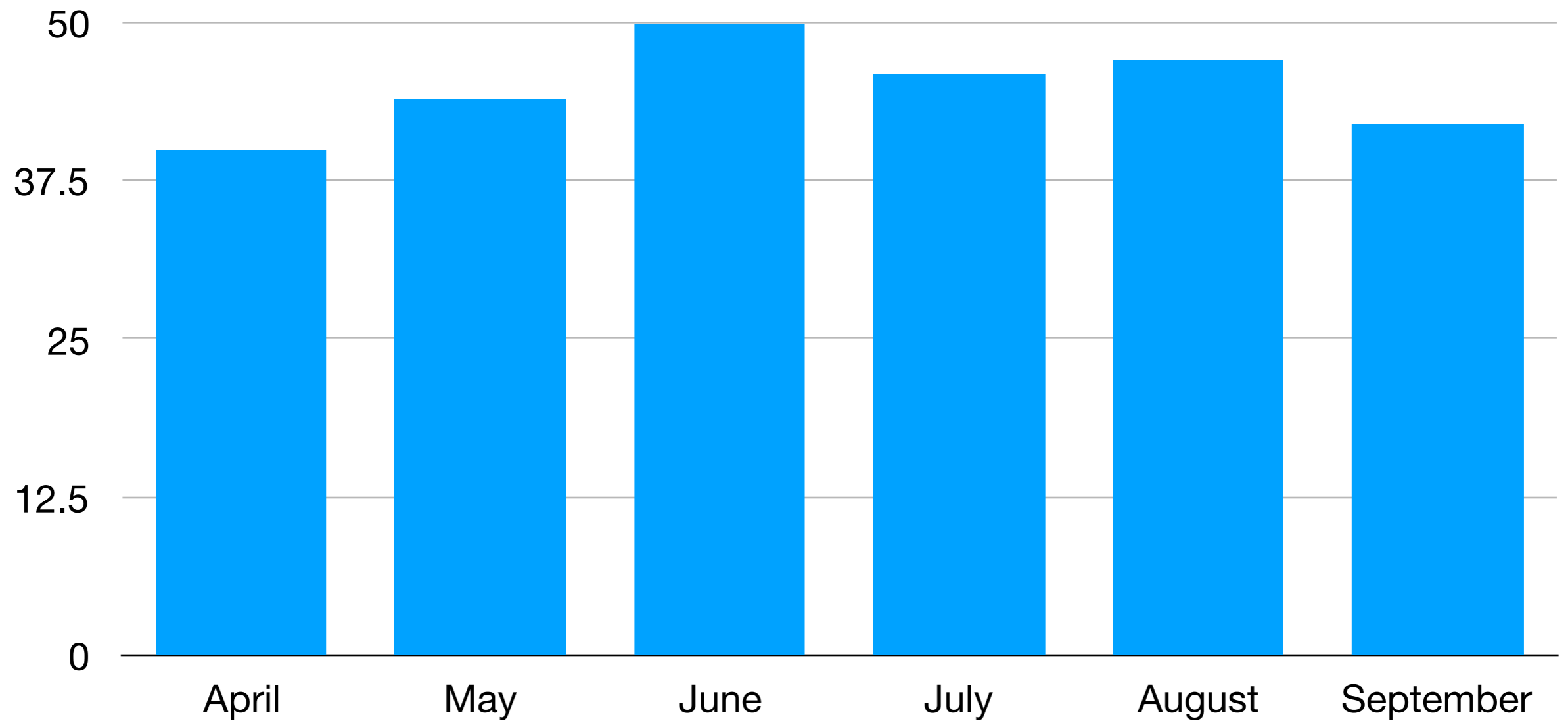
Don't Explode Slices



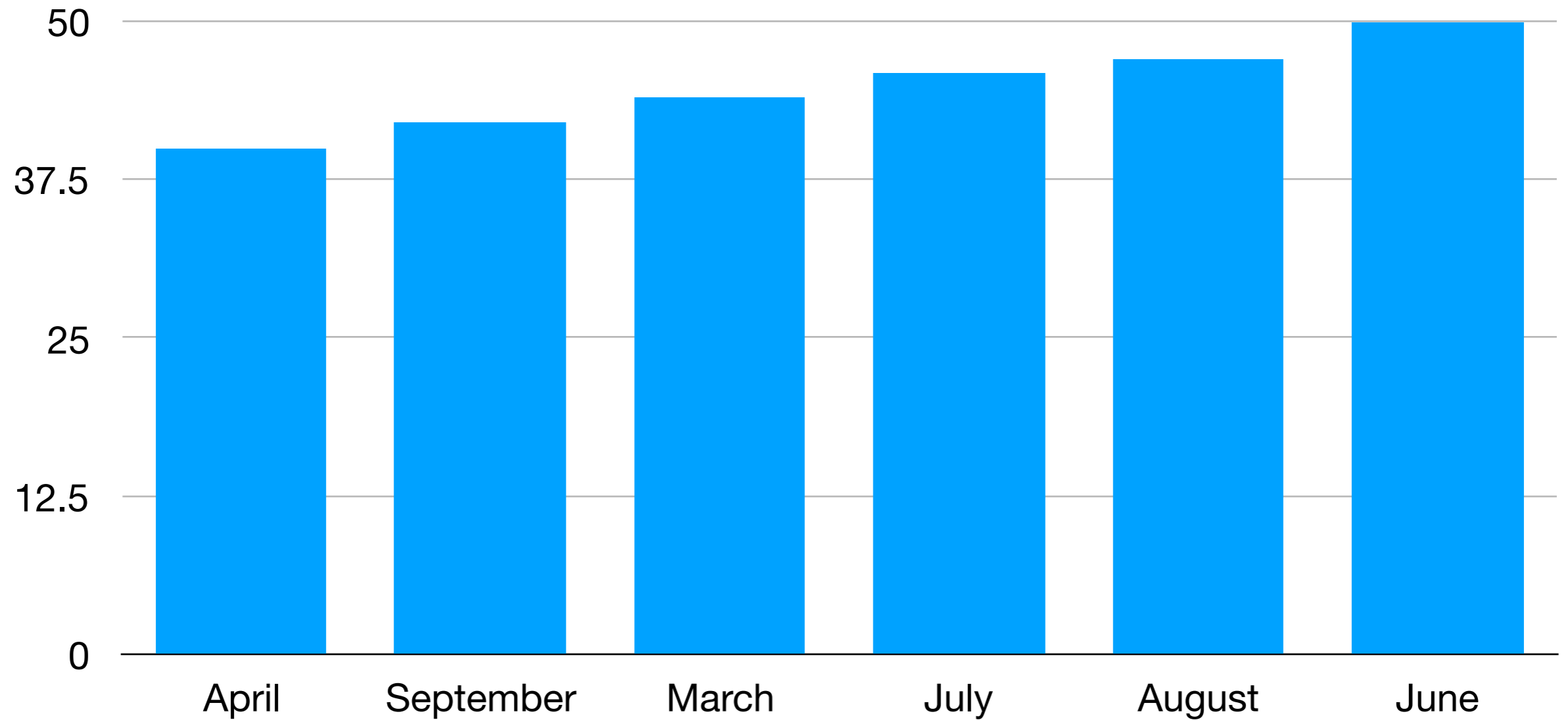
Don't Distort the Data



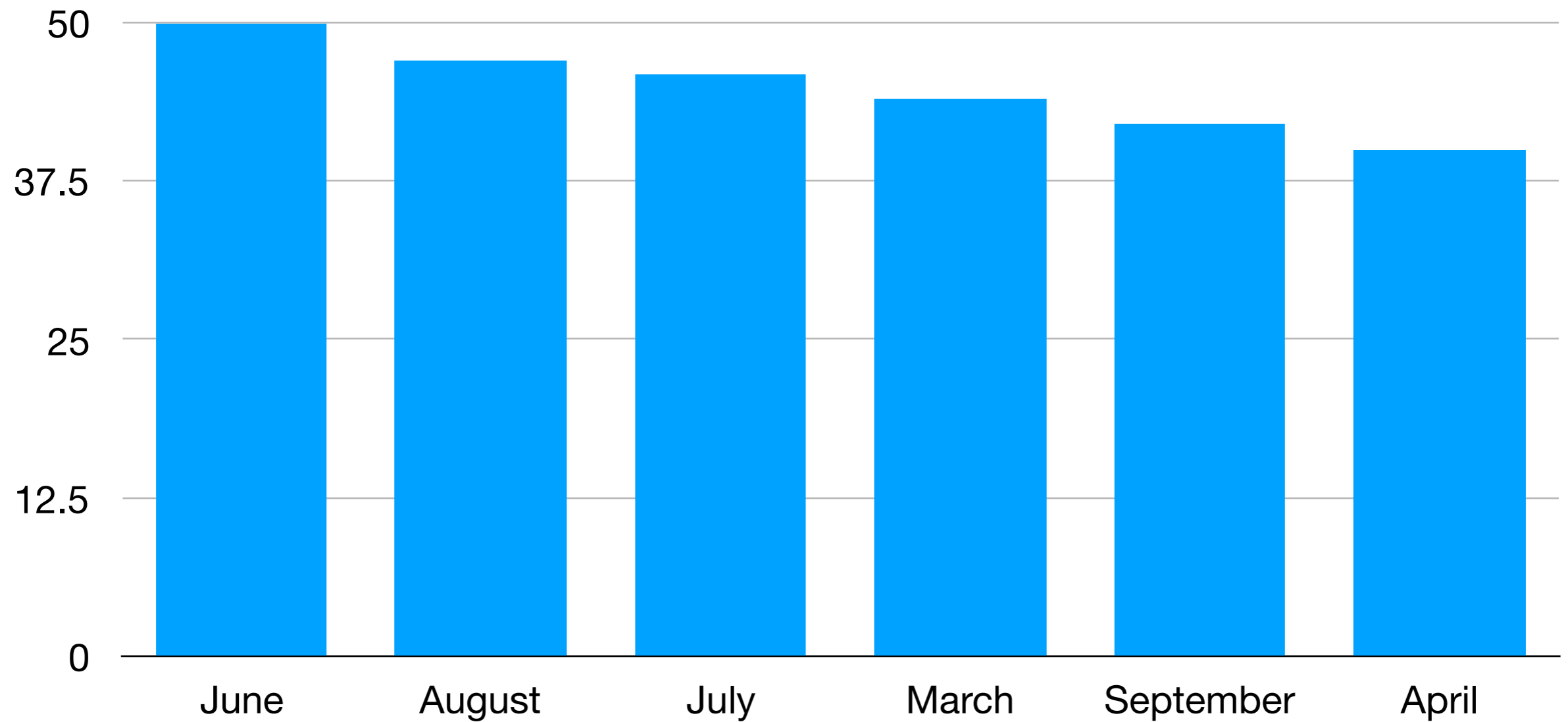
Bar Chart



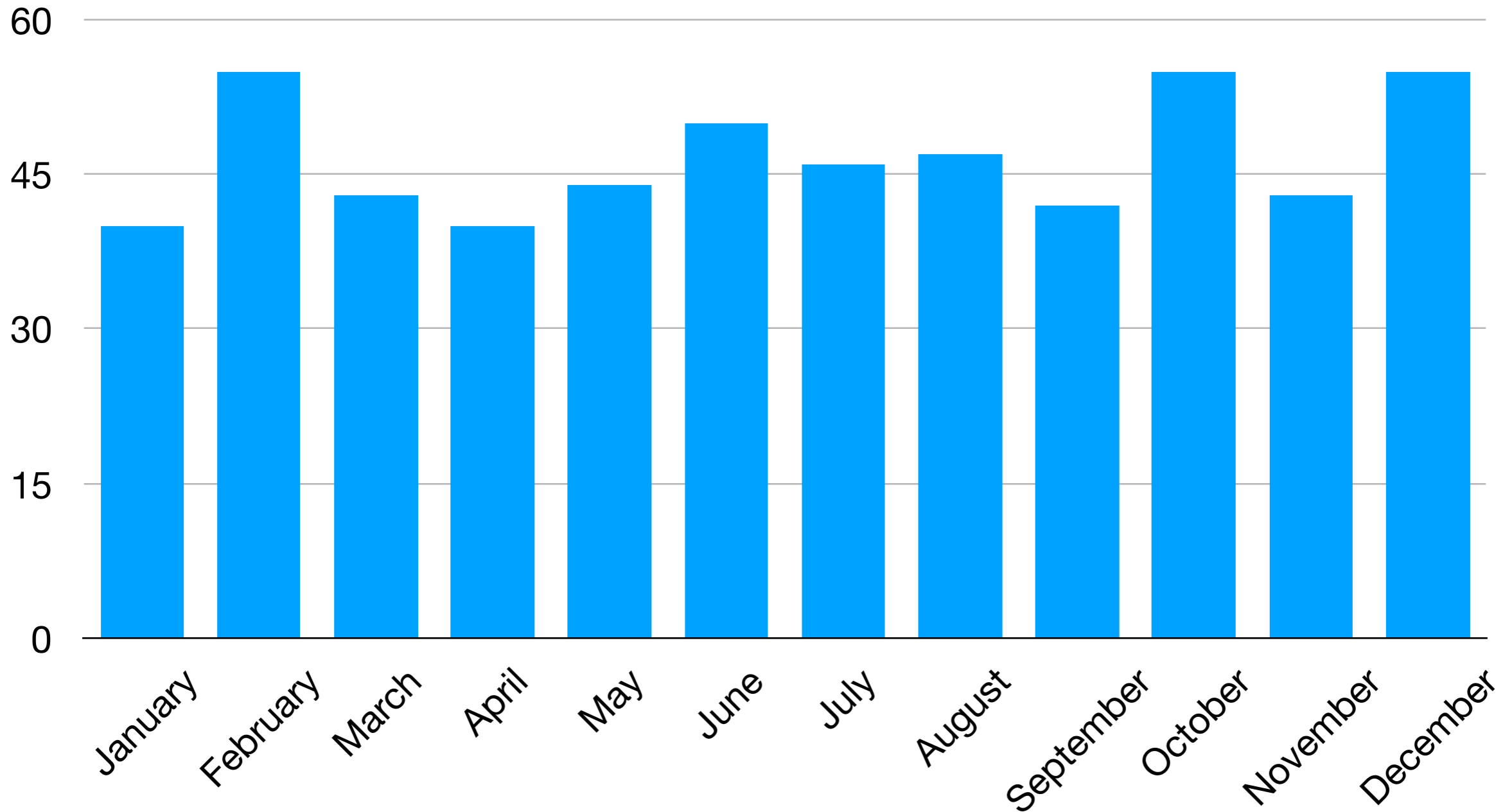
Sort Ascending



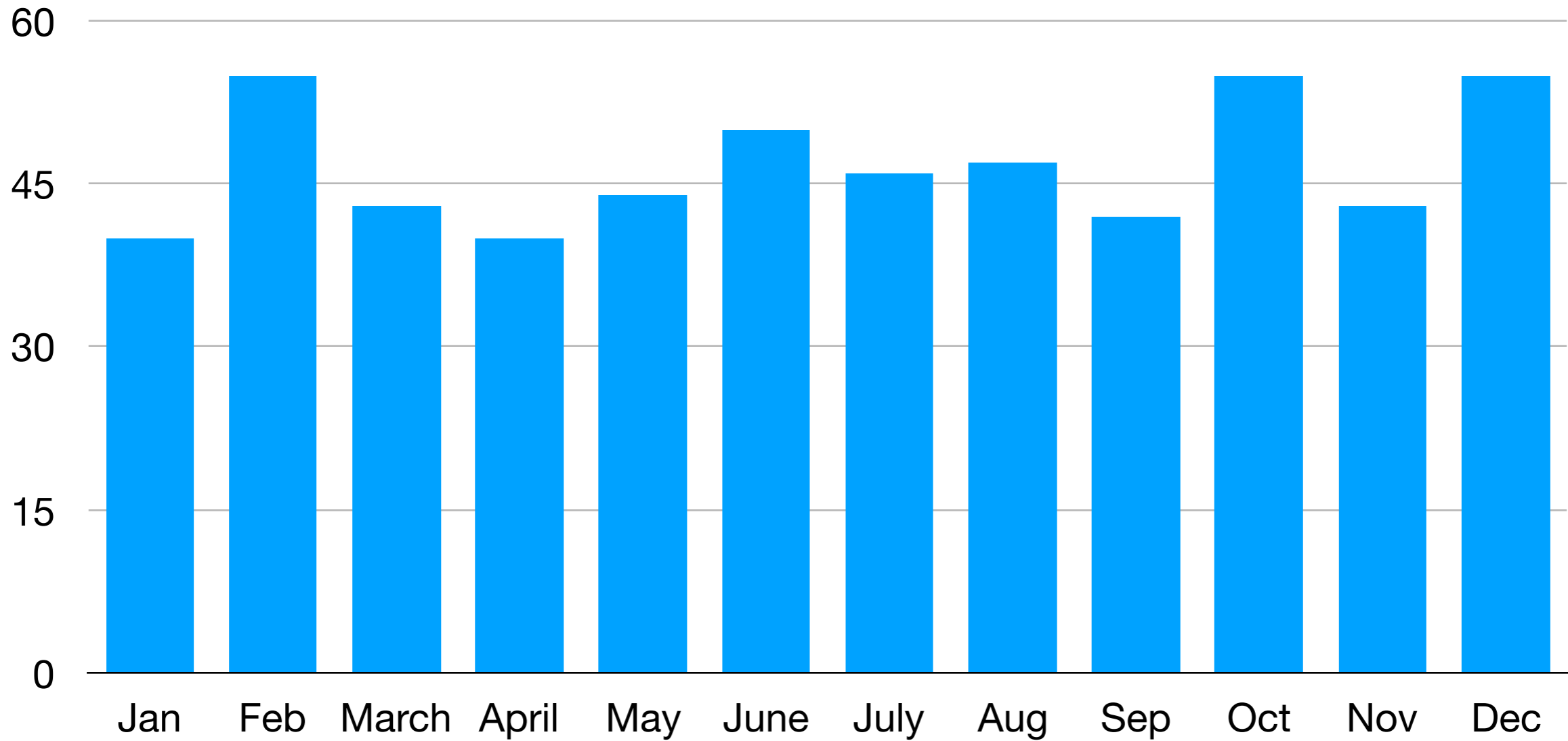
Sort Descending



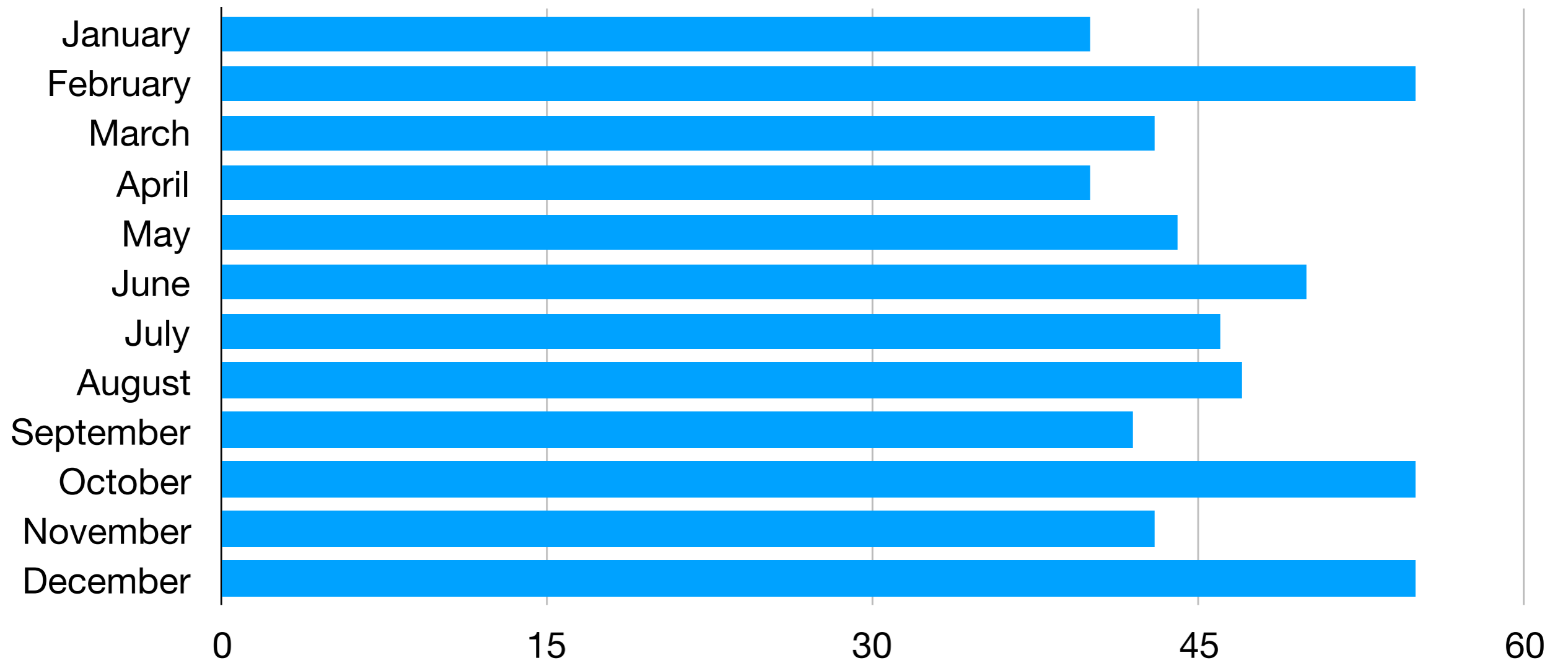
Do Use Horizontal Text



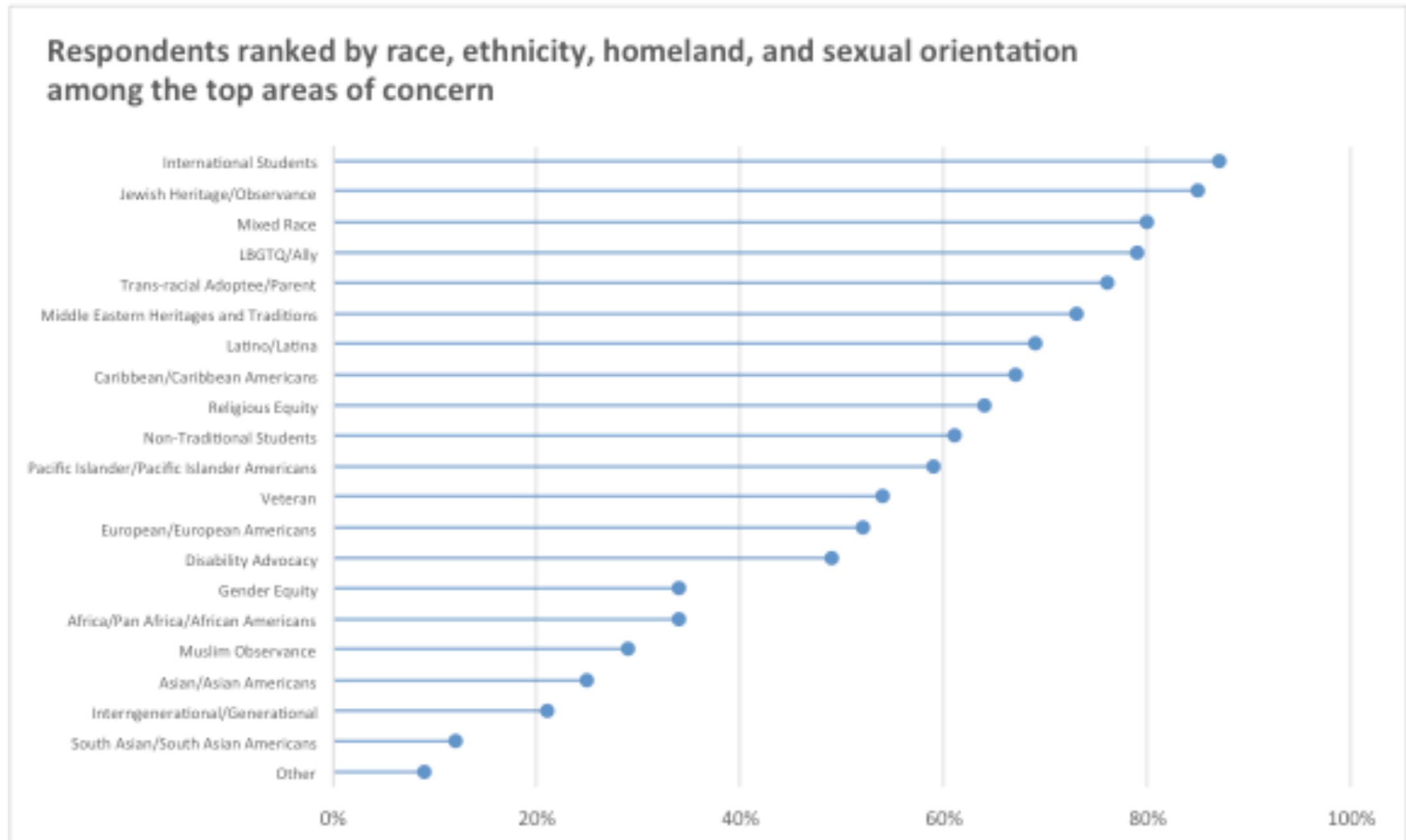
Do Use Horizontal Text



Bar Charts



Lollipop Chart



Do Start your Axis at Zero

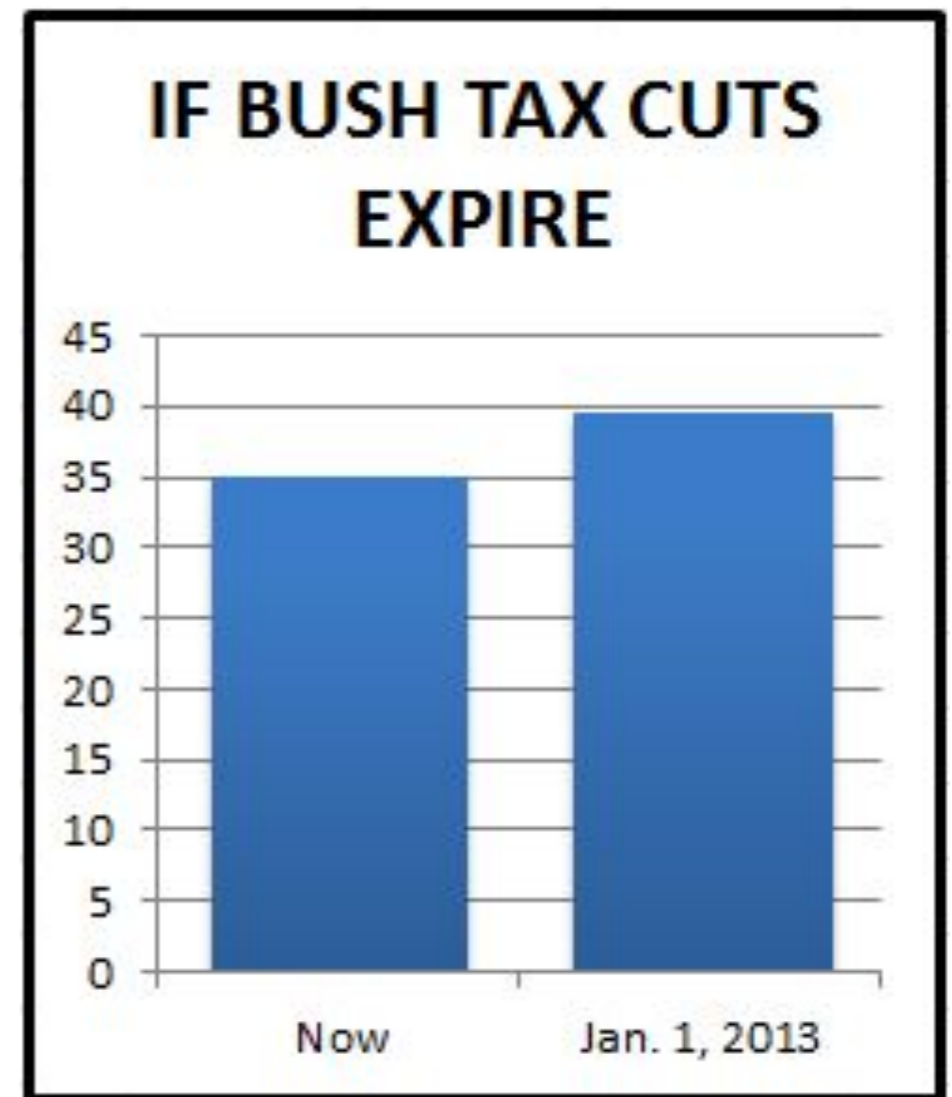
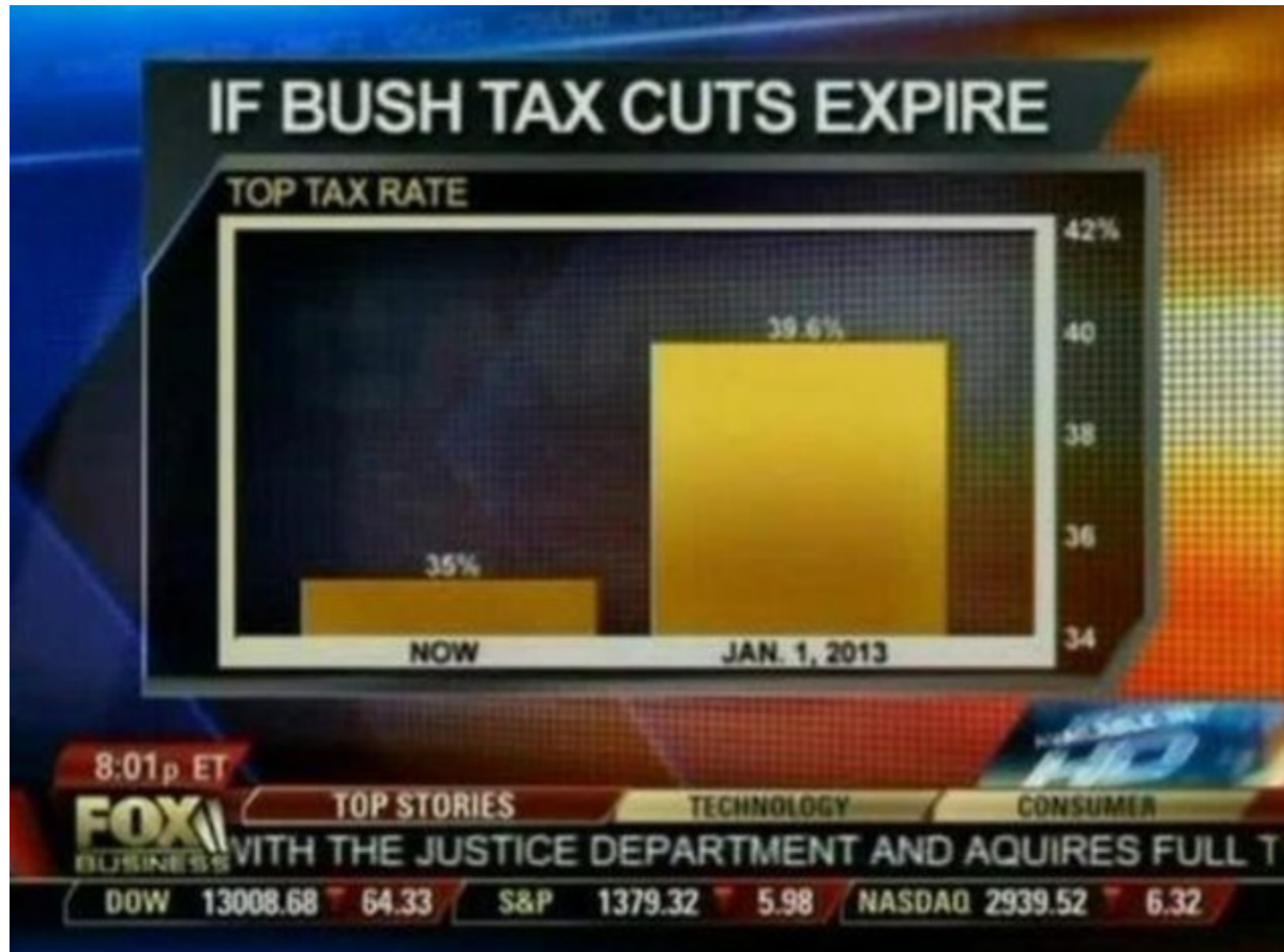
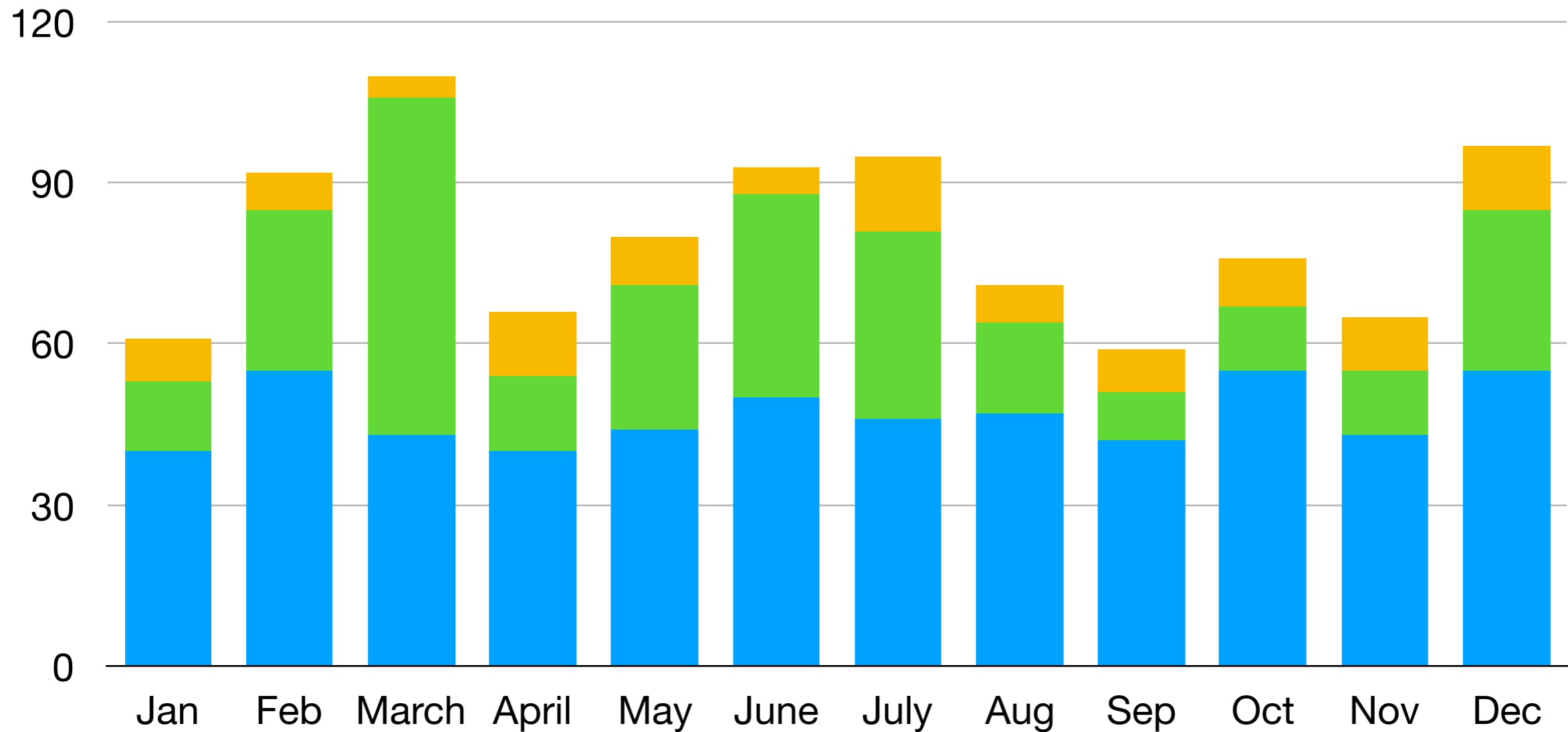
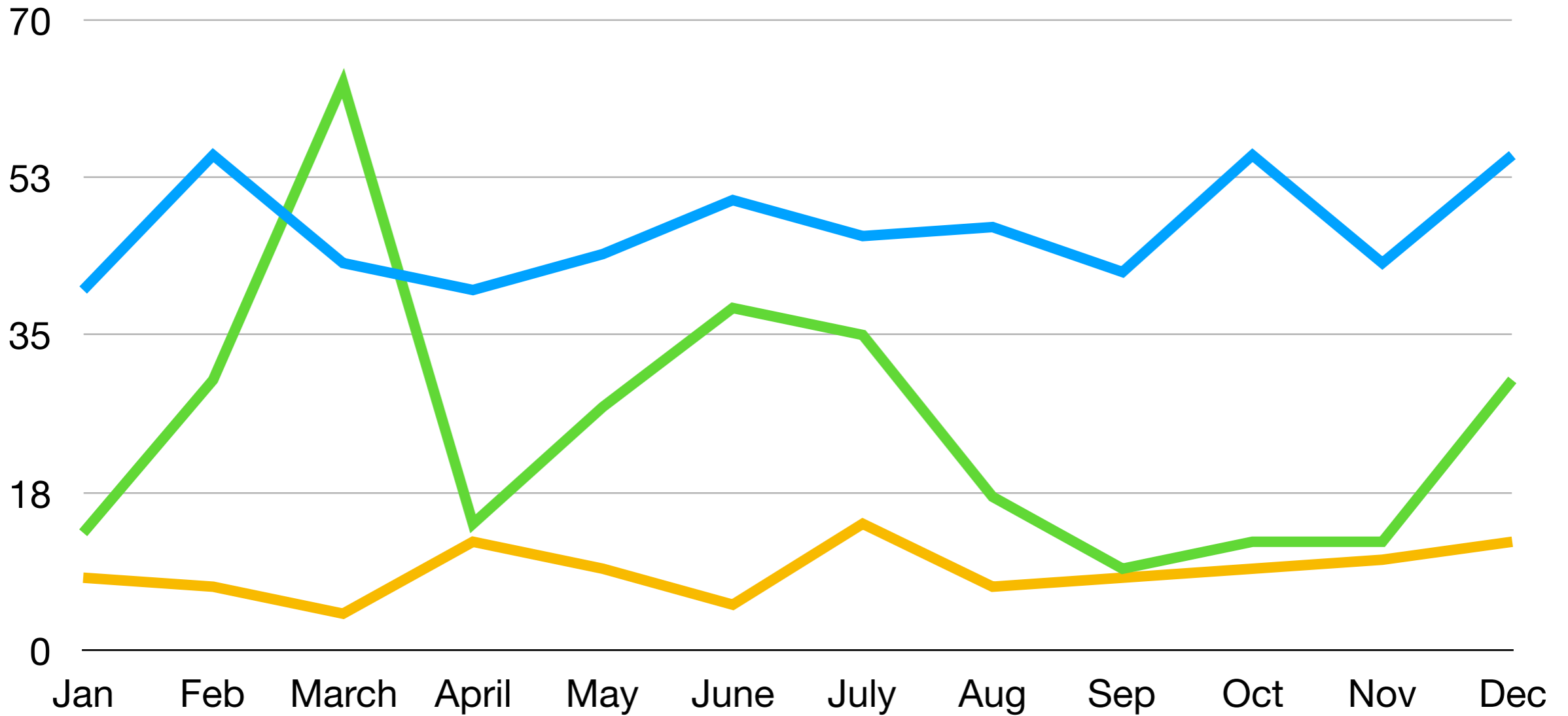


Image: [Media Matters, 7/31/12]

Stacked Bar Charts



Line Charts



Do Directly Label Data

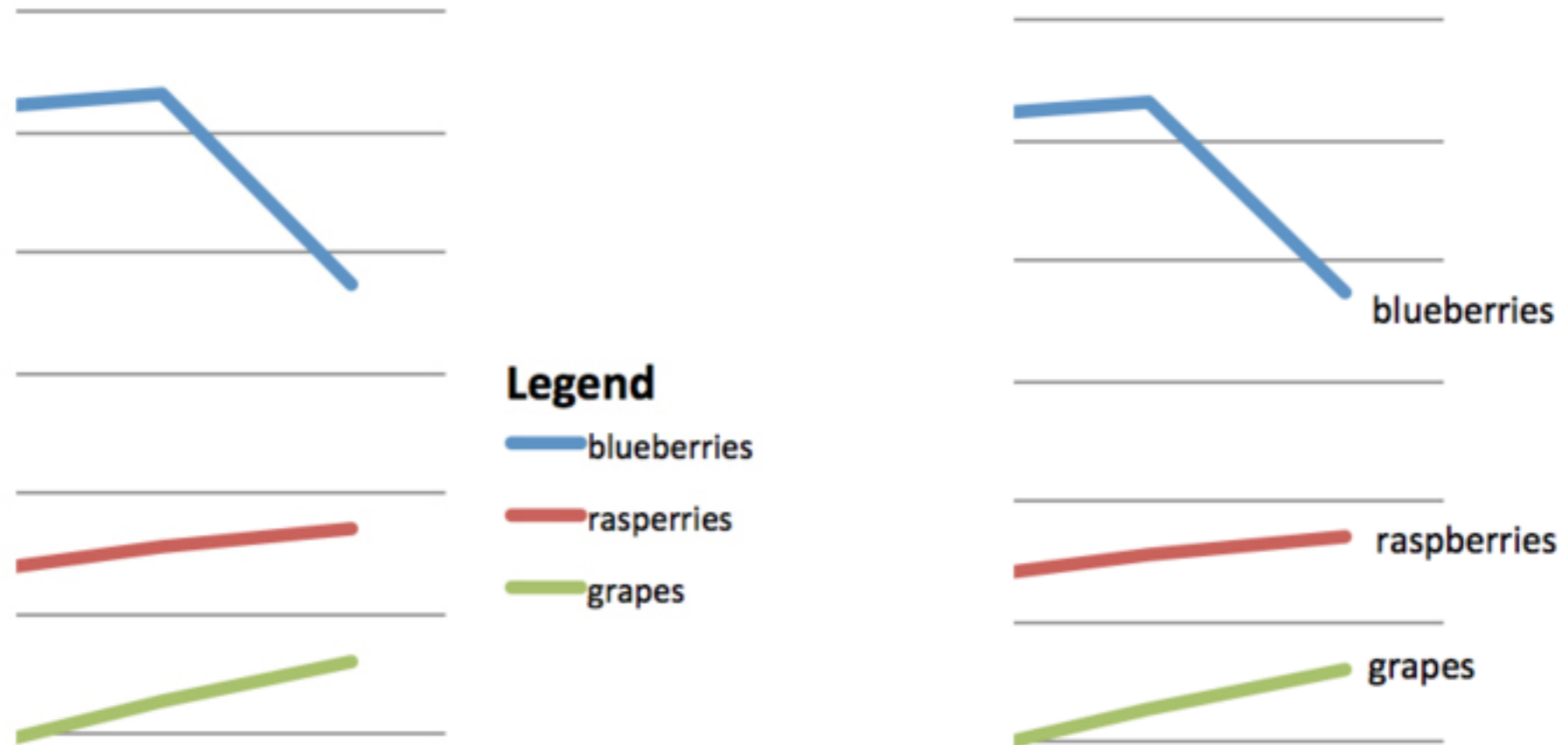
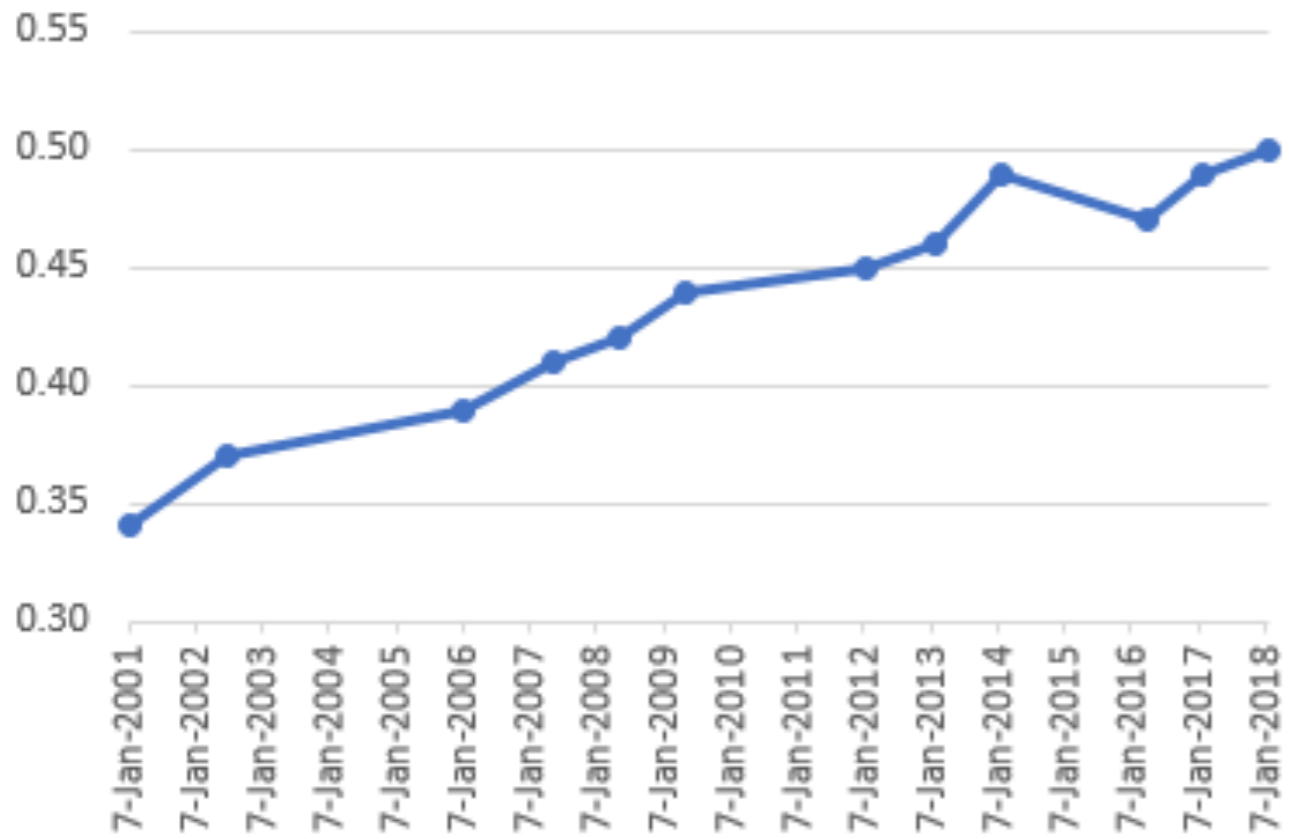


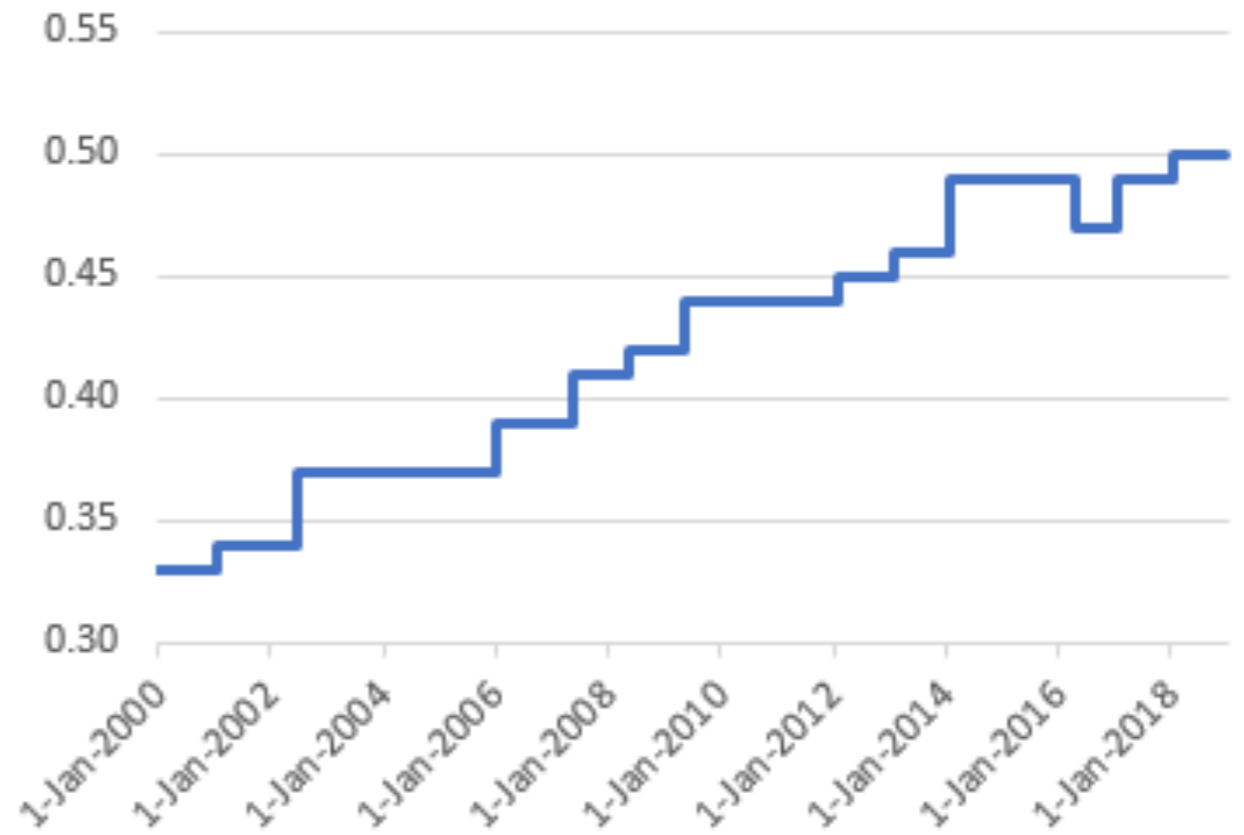
Image: storytellingwithdata.com

Stepped Line Charts

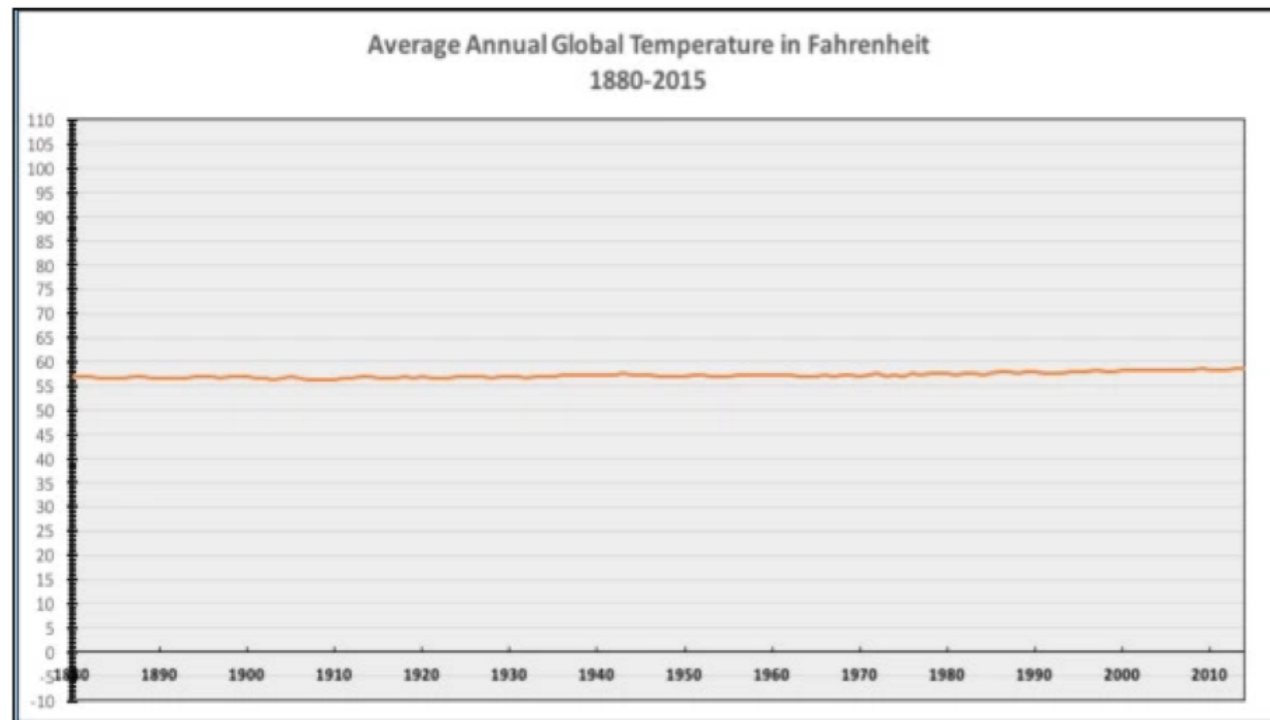
First Class Postage



First Class Postage

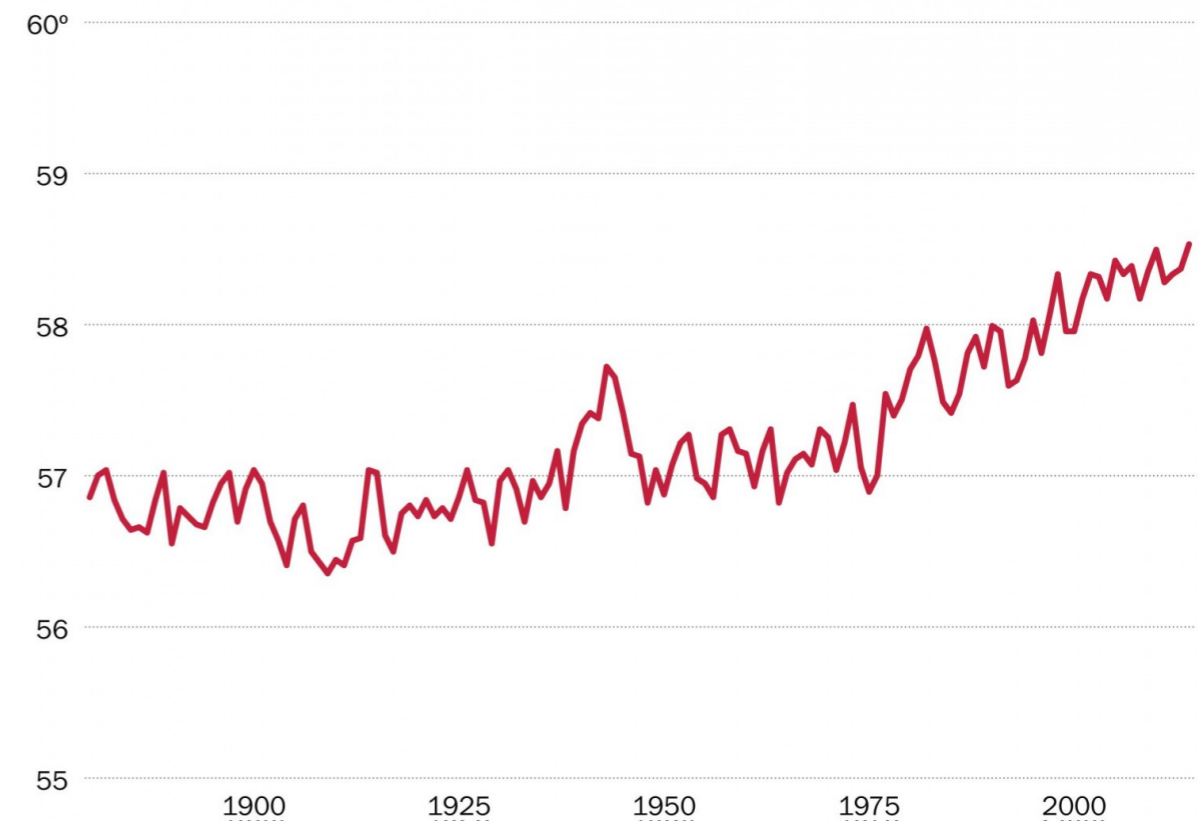


Do\Don't Cut the Y-Axis

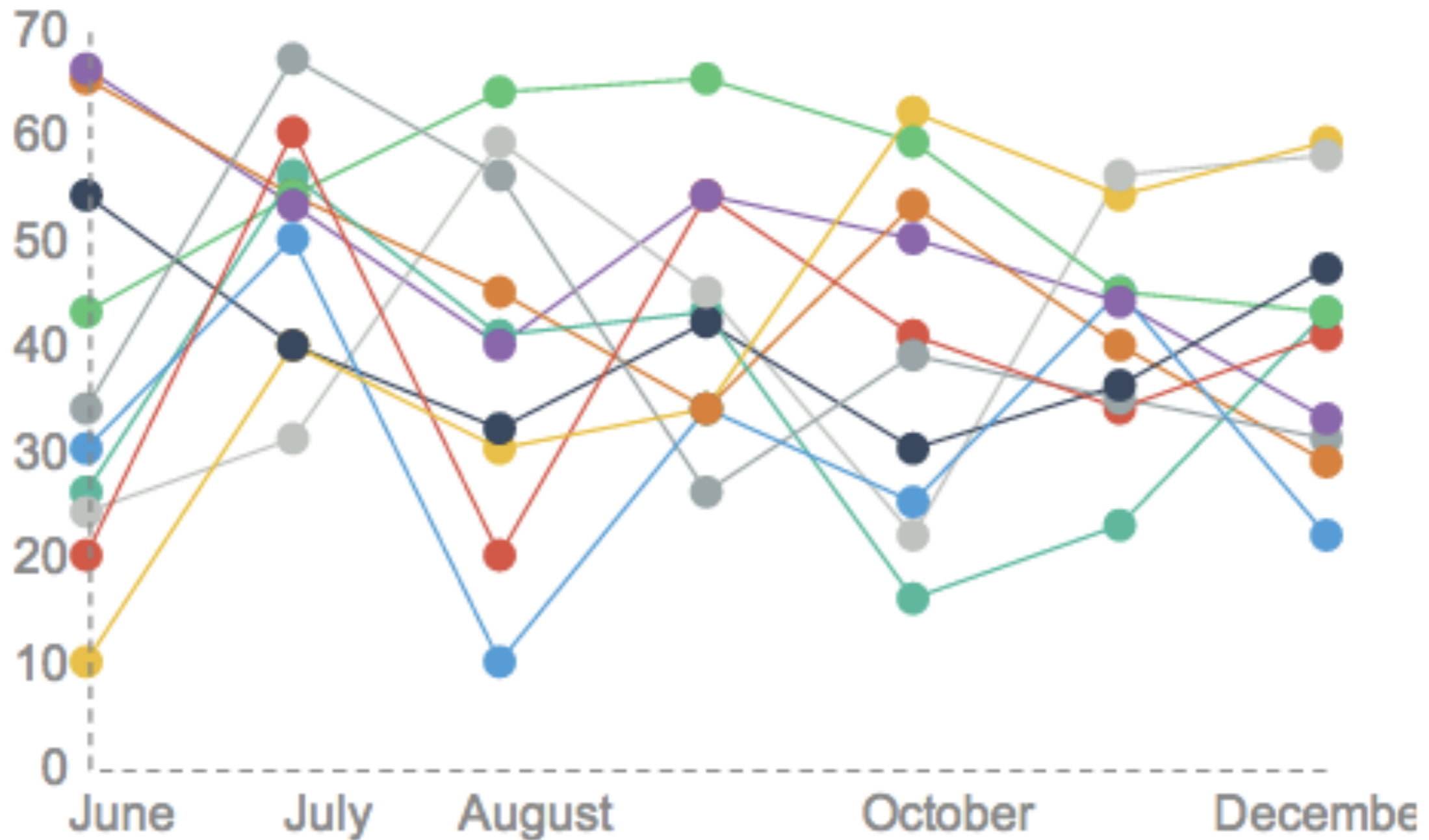


Average global temperature by year

Data from NASA/GISS.



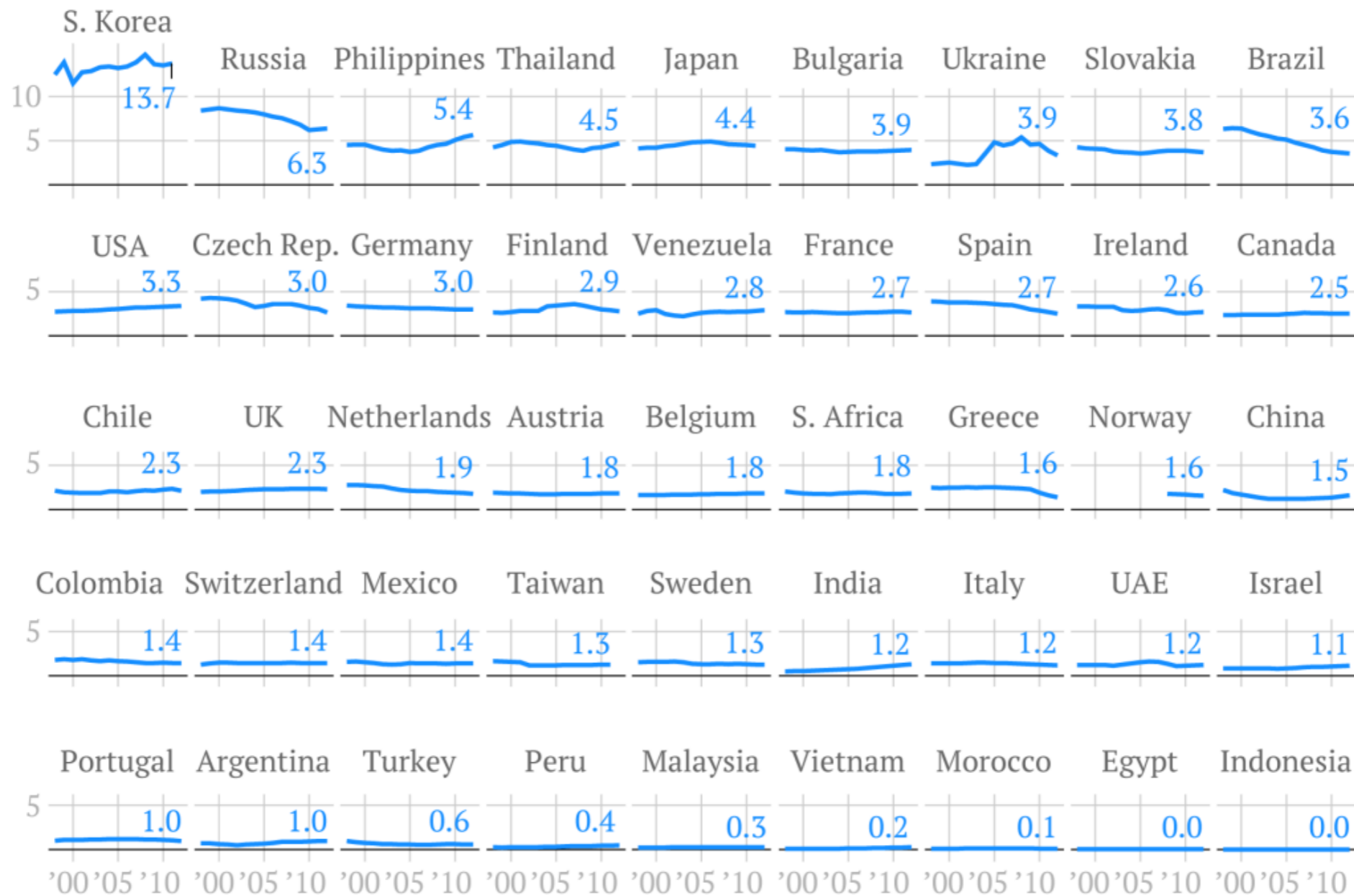
Do Limit # of Lines



Small Multiple

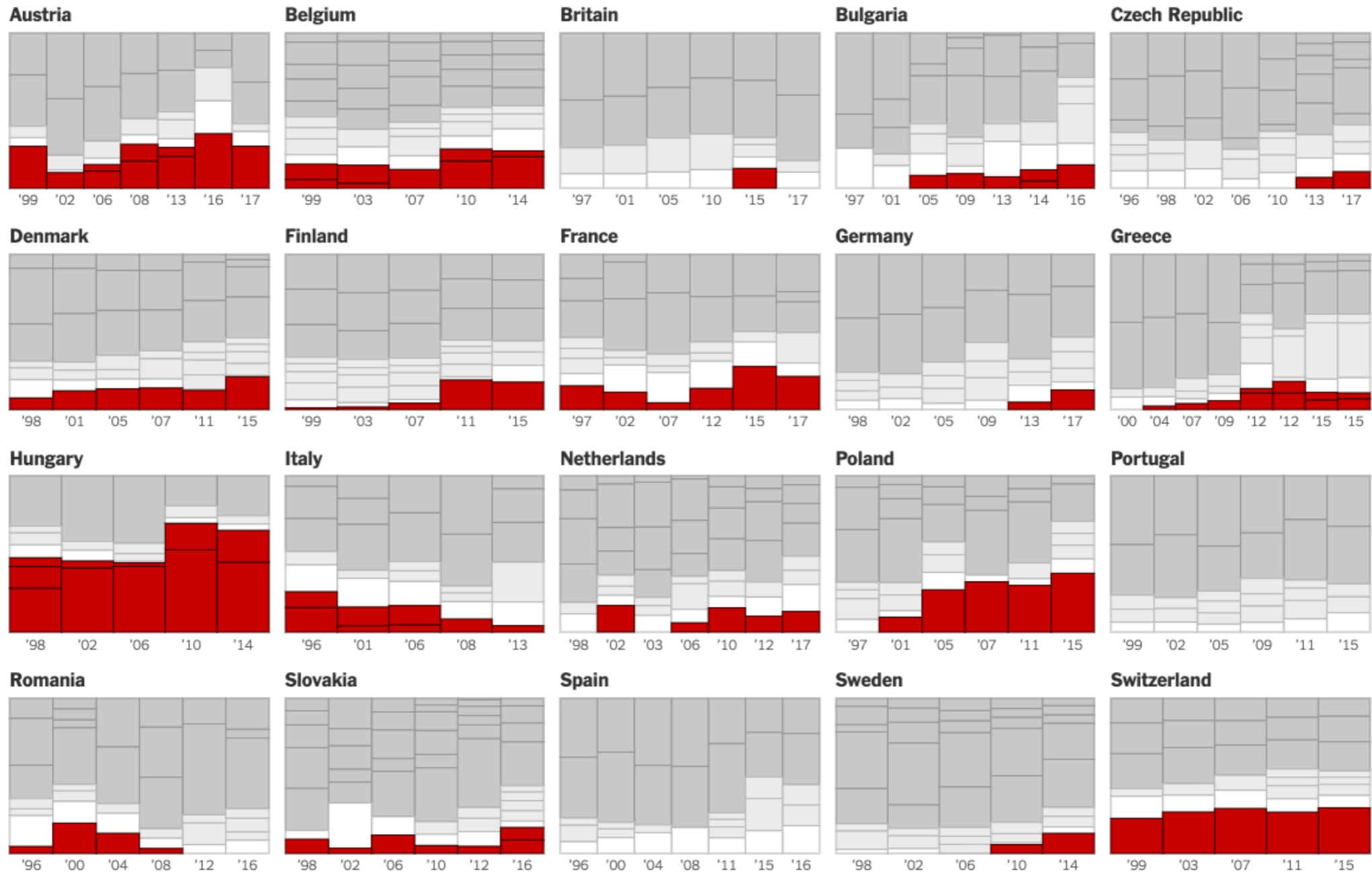
The average amount of liquor consumed by a person of drinking age

Shots per week of any spirit



Small Multiple

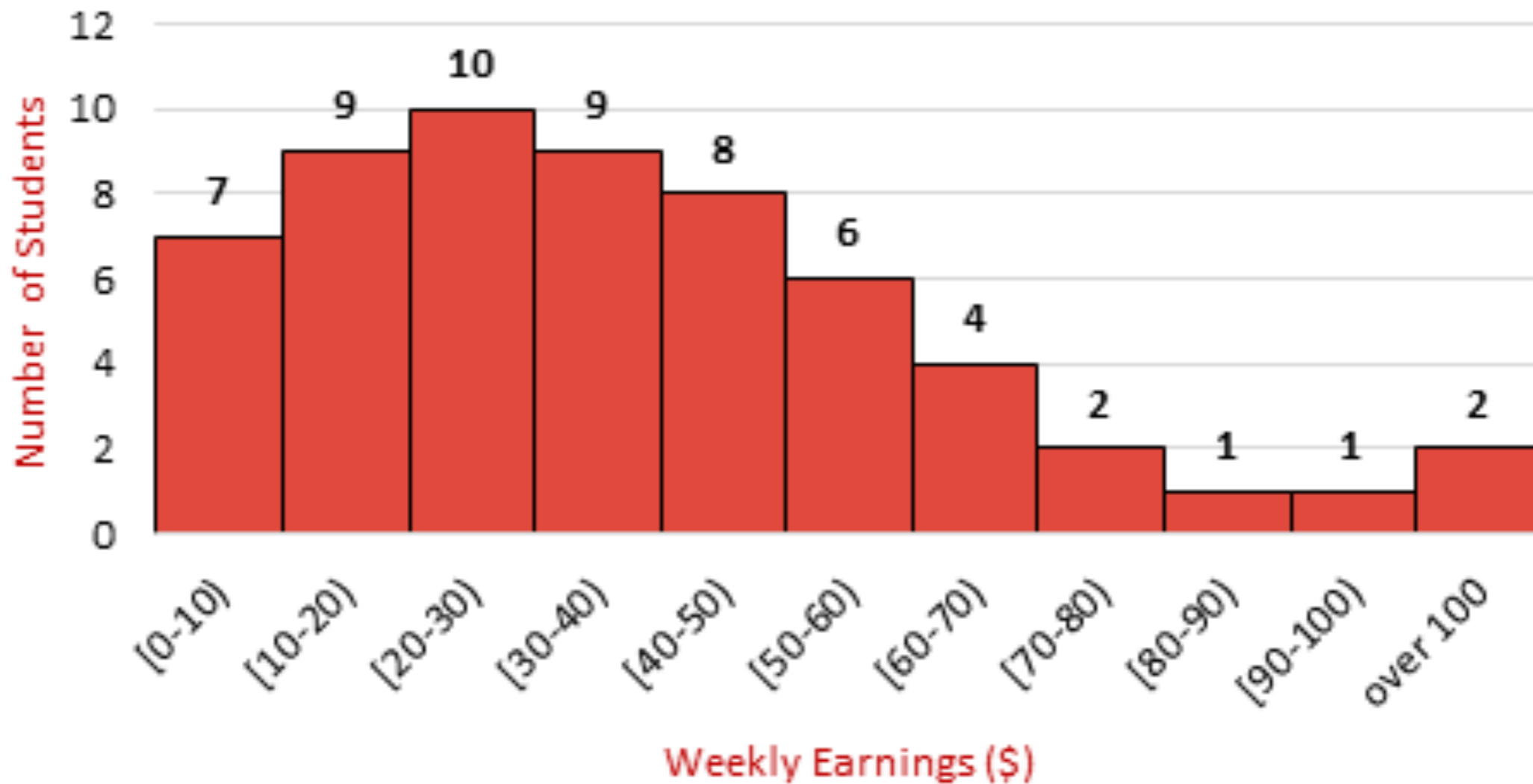
Party ideology in parliamentary elections* Center-left, center-right Other parties Right-wing and far-right



*The 2016 presidential elections in Austria and Bulgaria and the 2015 French regional elections are included to add a more recent result for those countries.

Histogram

Weekly Earnings of Students Ages 13-17

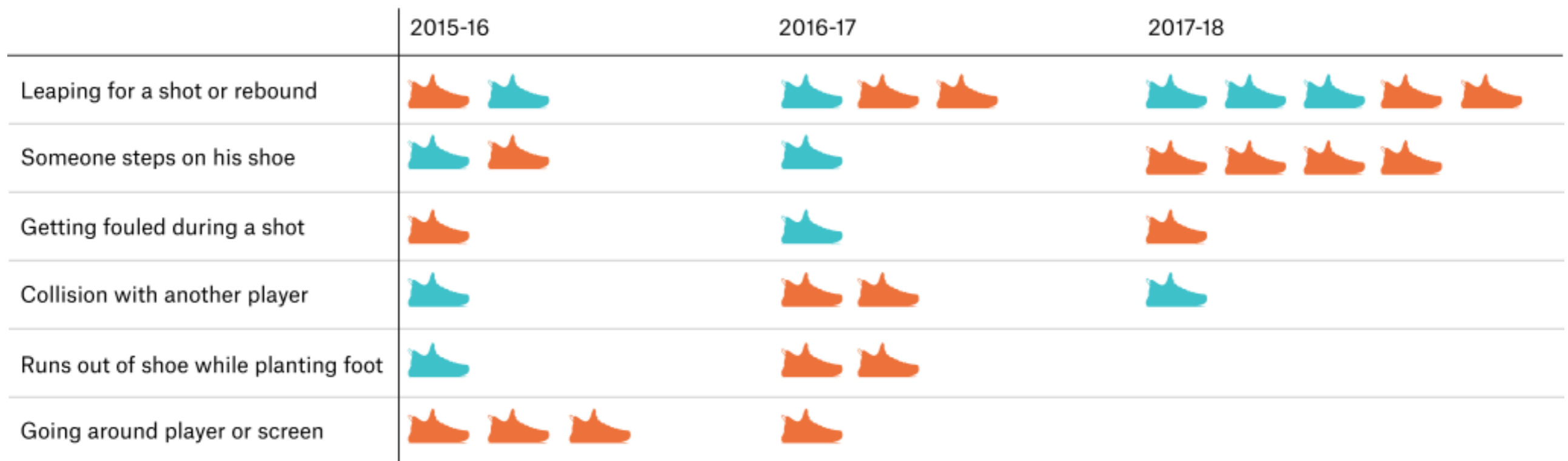


Pictograms

When the KDs come off

Every time Kevin Durant lost his shoes during a game since the 2015-16 season

 RIGHT  LEFT



As of May 29, 2018.

Image: FiveThirtyEight.com



Chart Resource Demo

<https://ft-interactive.github.io/visual-vocabulary/>

<https://www.data-to-viz.com/>

On Fonts

- Avoid Fancy Fonts
- Horizontal Text When Possible
- Use font size and strength to establish hierarchy

Do Test Your Viz

- Show it Around
- Testers Representative of your Audience
- Testers with Low-Vision

Data Viz on the Web

- How to put your Viz on the Web
 - An Image with your Viz
 - Draw a Viz Using Software
- What's different?
 - Data
 - Meta Tags
 - Potential for User Engagement

Web Visualizations

- Accessibility
- Responsiveness
- Interactivity
- Animation

Content Must Be...

- **Perceivable** – Information and user interface components must be presentable to users in ways they can perceive.
- **Operable** – User interface components and navigation must be operable.
- **Understandable** – Information and the operation of user interface must be understandable.
- **Robust** – Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

Accessibility

“All non-text content that is presented to the user has a text alternative that serves the equivalent purpose.”

*– Web Content Accessibility Guideline **1.1.1***

Do Use Alt text

- Be Concise
- Don't Say it's an Image
- Link to Machine-Readable File of the Data
- End with a full stop.

<https://axesslab.com/alt-texts/>

Do Use Aria for `<canvas>` and `<svg>`

```
<canvas id="can" height="400" width="650" role="img" aria-label="Bar Chart Depicting Global Unemployment. Values in Millions from 0 to 12000. Data from www.worldbank.org."> </canvas>
```

Do Research Color



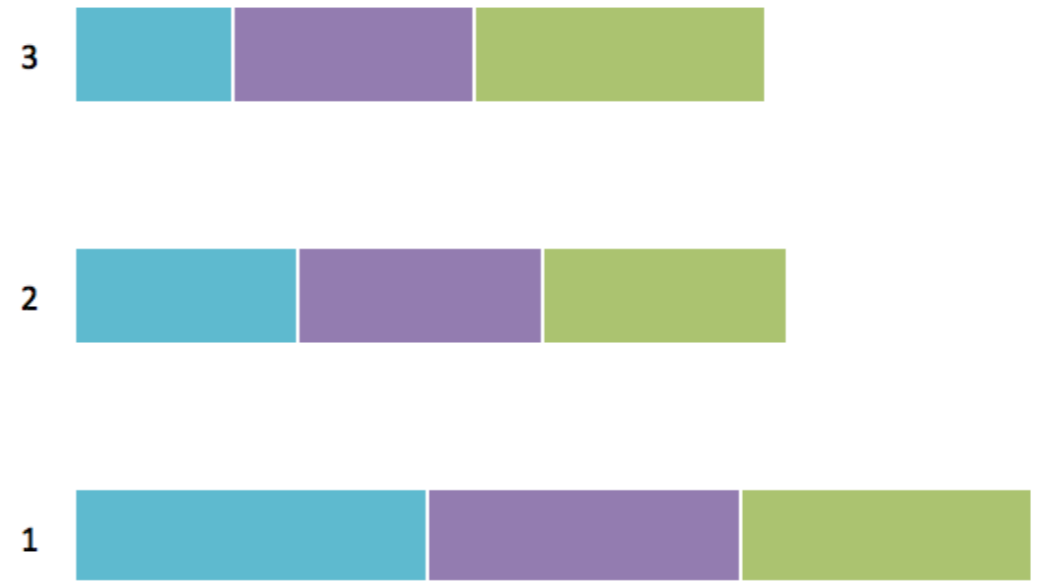
Images: [The Consumer Financial Protection Bureau](#)

Do Use Whitespace

No line



White divider line



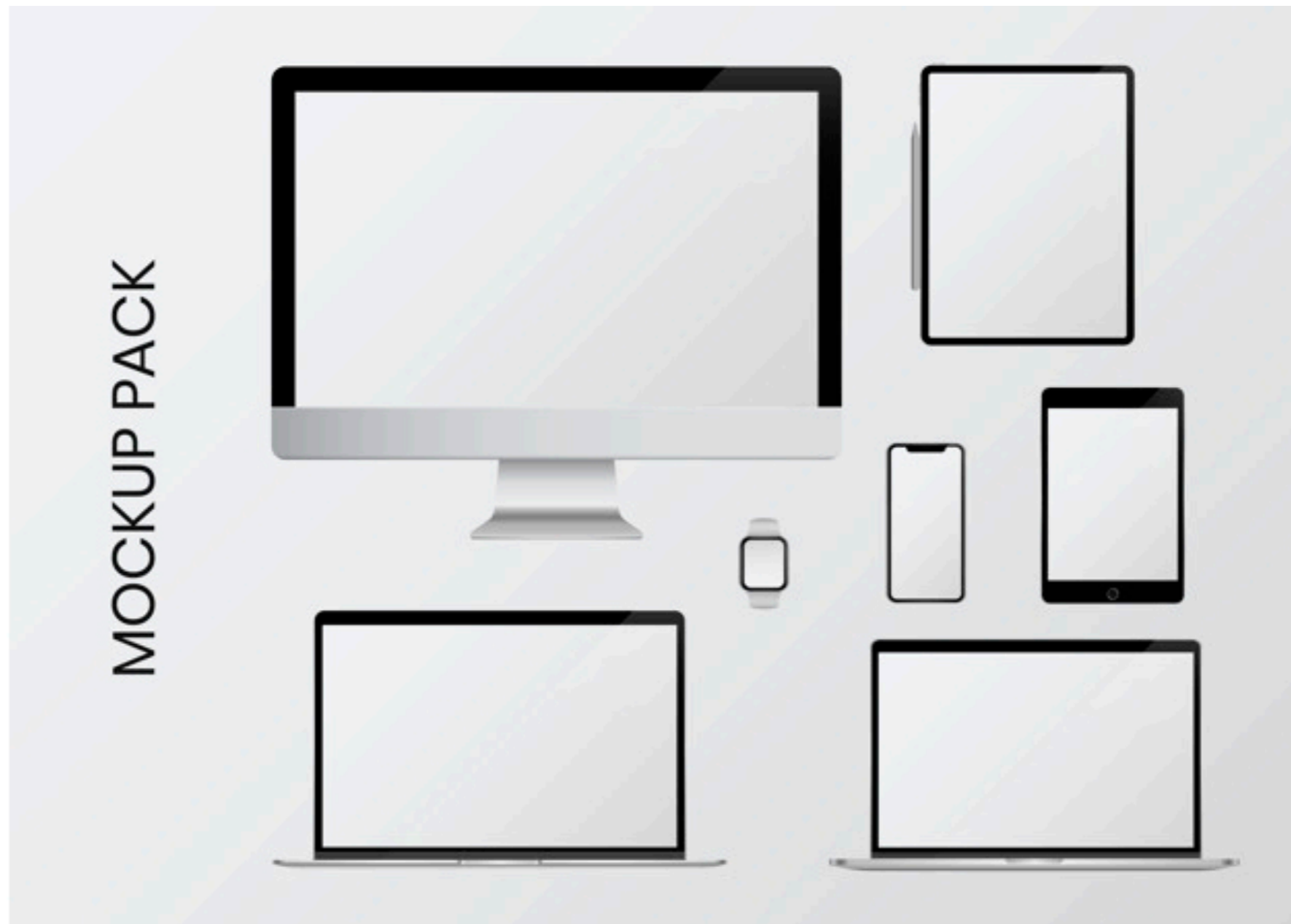
Do Use Interaction Acceleration Techniques

- <https://mbostock.github.io/d3/talk/20111116/airports.html>

Do Test for Accessibility

- Test with a Screen Reader
- Person with Low-Vision/Color-Blind as Tester
- Viz Interactivity Responds to Voice Commands
- Run in High-Contrast Mode
- Use Emulators

Do Make Your Viz Responsive



Do/Don't Mobile-First

- Mobile-First or Desktop-First?

Do Use Analytics

StatCounter Global Stats
Desktop vs Mobile vs Tablet Market Share Worldwide from Apr 2018 - Apr 2019

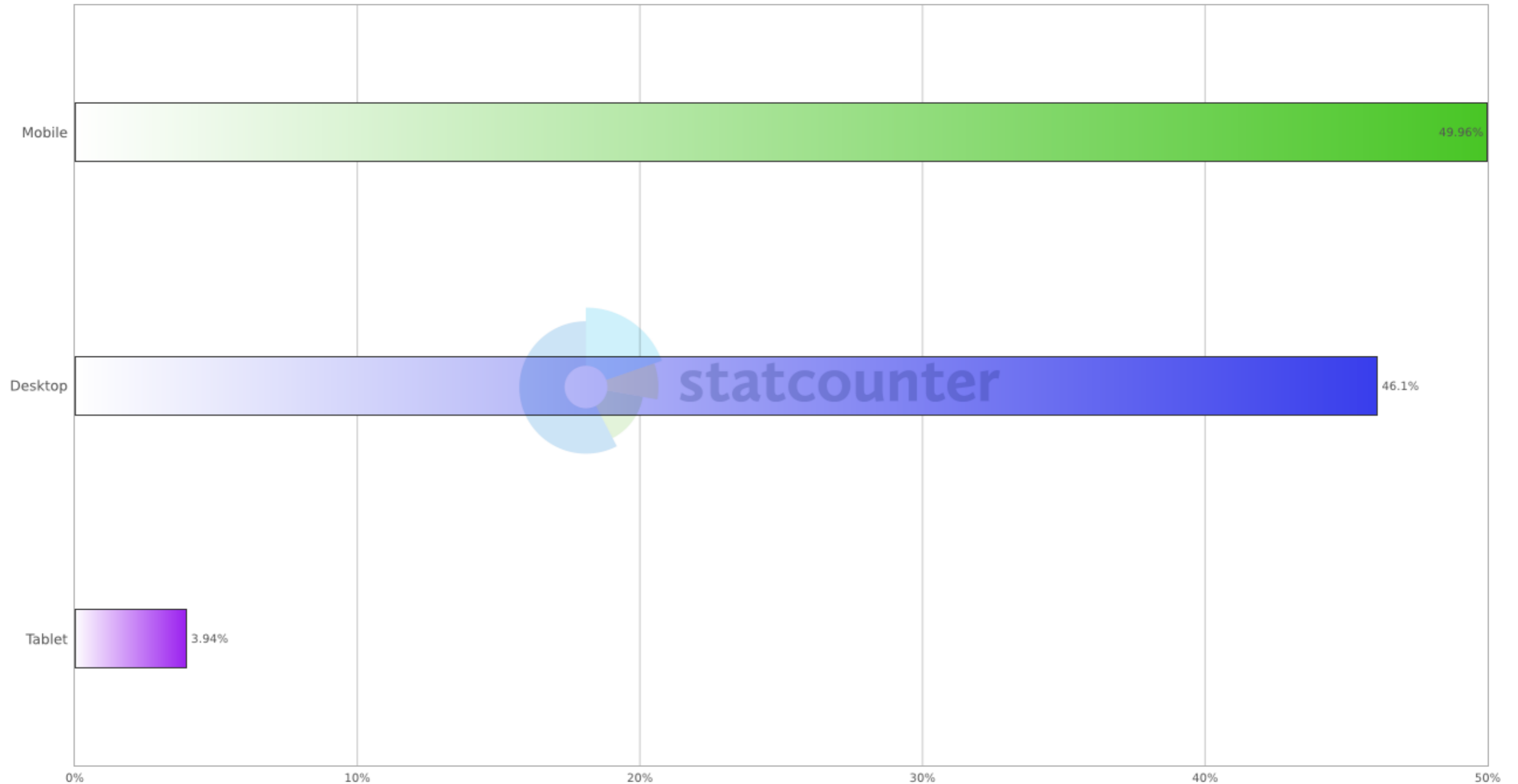


Image: <http://gs.statcounter.com/>

Do Use Flexbox

- Or Another Grid

Do Use Interactivity

Demo

<https://bl.ocks.org/jasondavies/raw/1341281/>

Do Make It Obvious

- Build on existing mental models and design patterns of interaction

Demo

<https://galaxy-of-covers.interactivethings.io/>

Animations

- Do Ask “Is This Needed”?
- Do Use Sparingly (esp on Mobile)
- Use CSS for transitions instead of JS or API

Do Test for the Web

- Different Devices
- Different Browsers
- Test Every Line of Code
- Do some Data Throttling for Mobile

Resources At Stanford

Audit a DV Class

[2014-2015](#) [2015-2016](#) [2016-2017](#) [2017-2018](#) **2018-2019**

go

Browse
by subject...

Schedule
view...



1 - 10 of 43 results for: **data visualization**

[printer friendly page](#)

Library

- Reference Materials
- Pragmatic Workshops
- Walk-in Consulting

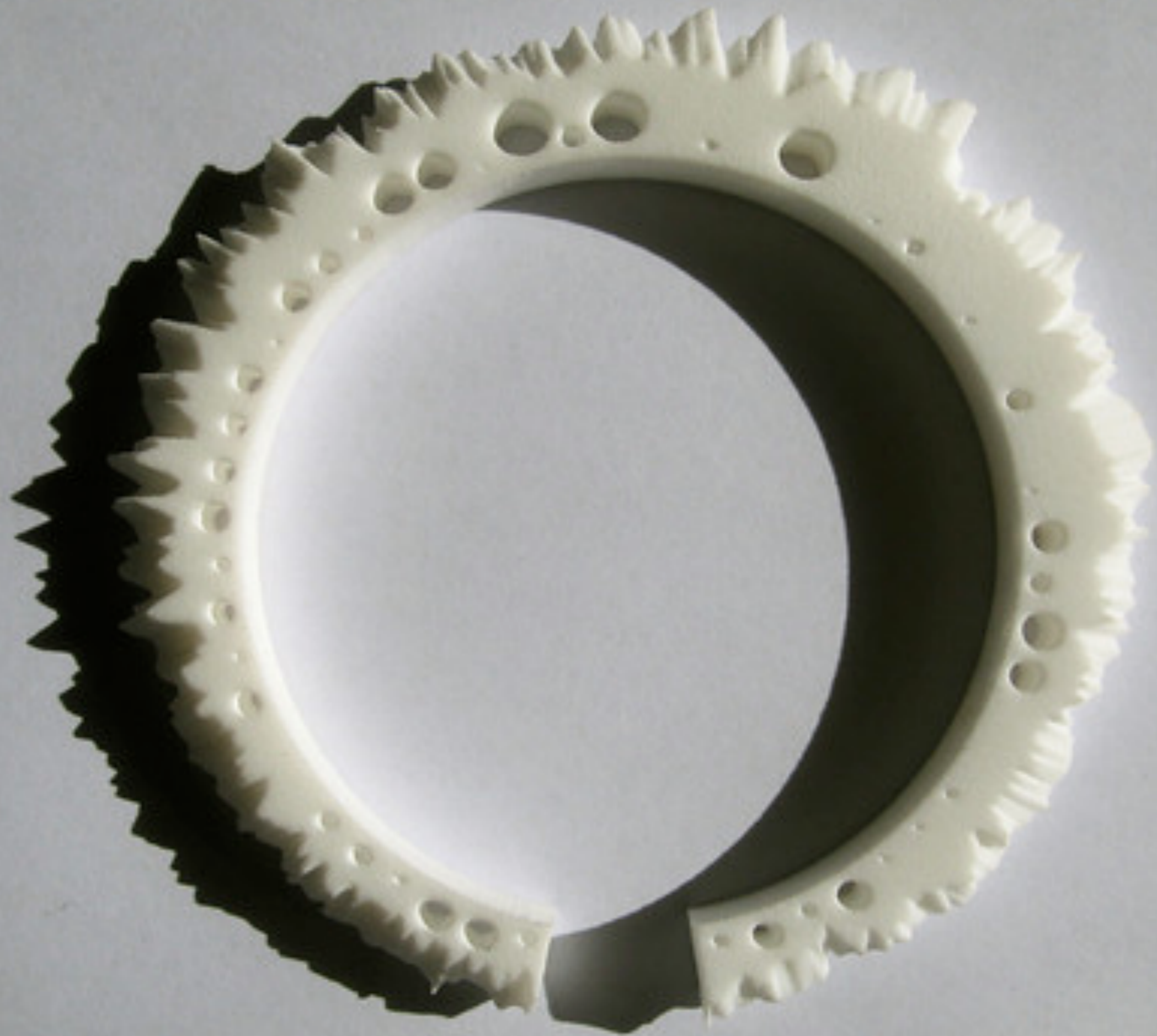
Community



1505-stanfordstaff0190_kylebarnesgroupwalking_crop_600x370png

Visualizing Out Of The Box









People of Oxford!
What actions did you take last week
to contribute to a sustainable future?

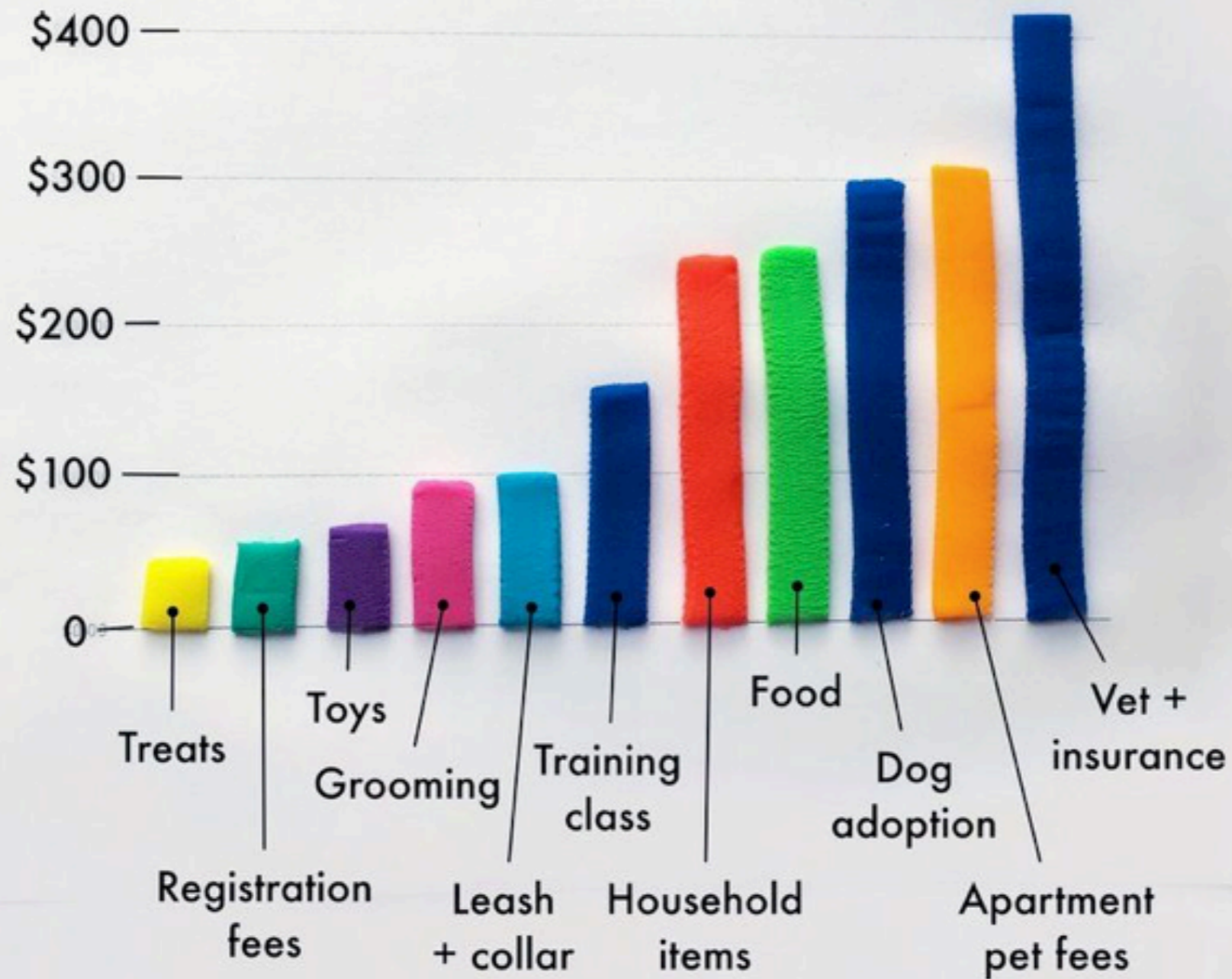
Pick the badge(s) that say what you have done or what's on your mind.



#Ihelpedsomeone #Ididnothing #Iconsumedless
#Iinvestedinmyplace #Ispokeup @mao_gallery

\$1,897
cost of dog over
the first 2 months

#DayDohViz





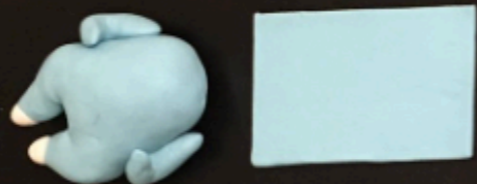
Deep fried turkey



Spatchcock
turkey



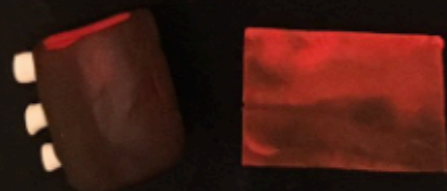
Roast turkey
defrosted



Roast turkey
frozen



Goose



Prime rib roast

#DayDohViz



WE'RE DONE