

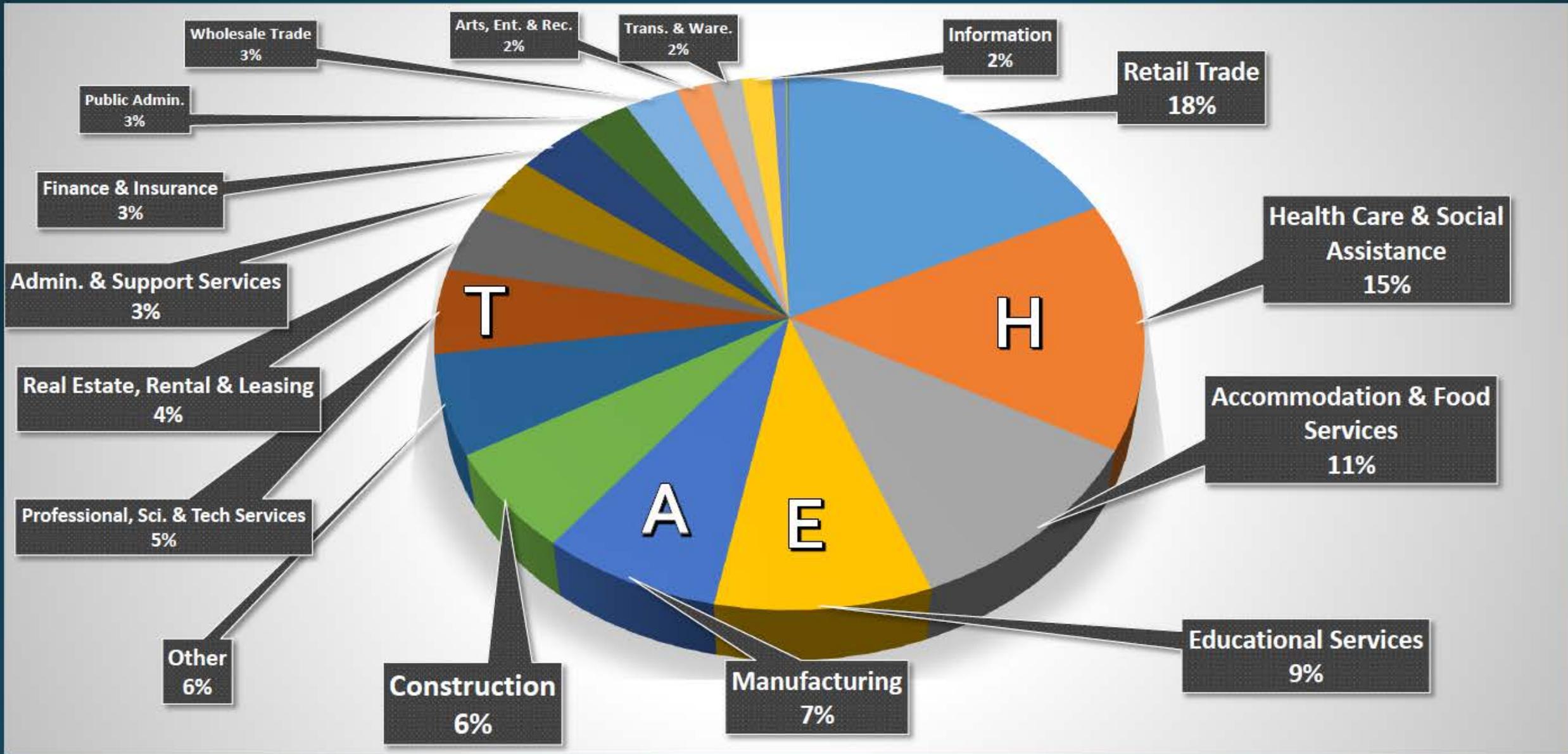
Presenting Data Effectively

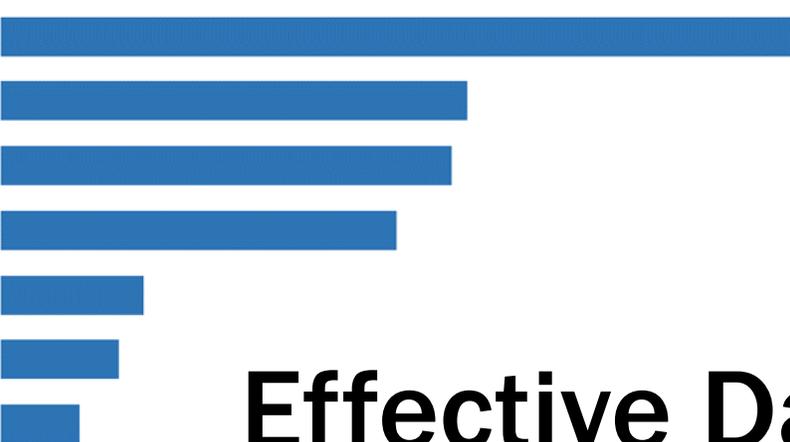
Basics of Data Visualization

NIGP Regional Conference 2018
Janet Woolum

Janet.Woolum@mesaz.gov

2015 - Mesa Industry Breakdown - By Number of Jobs

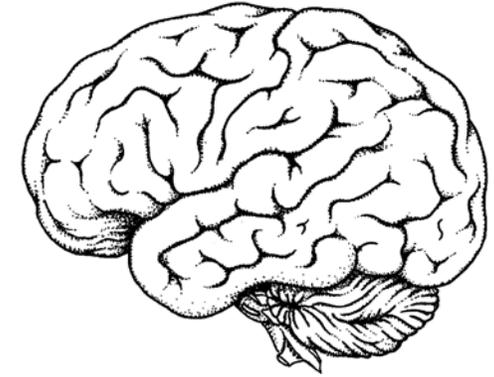




Effective Data Visualization

1. Easily understood and interpreted
2. Focuses attention on what matters
3. Tells a story

A Little Brain Science



Early
Attention



Working
Memory



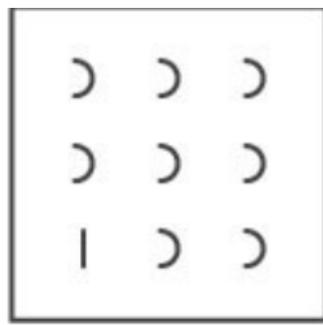
Long-Term
Memory

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

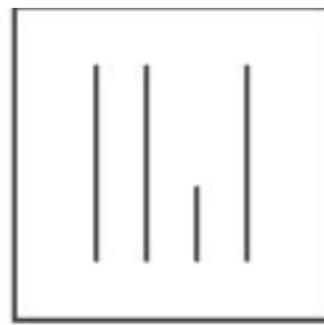
6	9	4	3	0	6	7	4	1	3
8	1	0	3	4	9	3	1	9	6
4	5	1	5	9	1	9	2	7	5
6	6	4	3	9	1	1	5	6	3
1	1	9	6	7	9	0	4	2	8
6	8	4	0	7	8	4	9	3	6



Orientation and collinearity



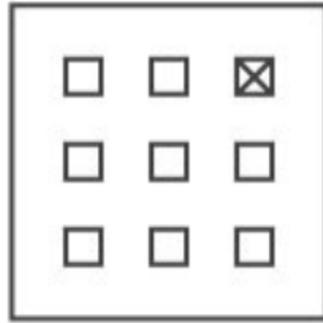
Curvature



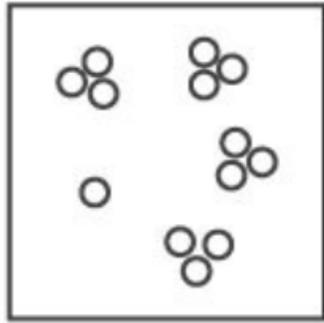
Length



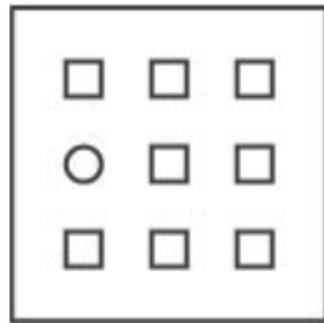
Width



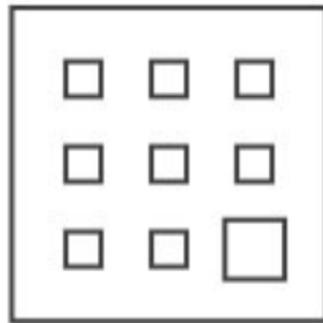
Added marks



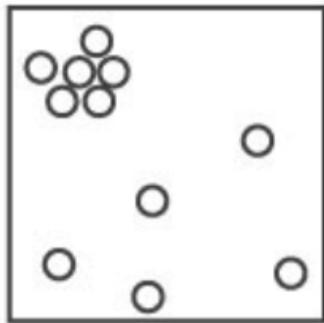
Numerosity



Shapes



Size



Spatial grouping

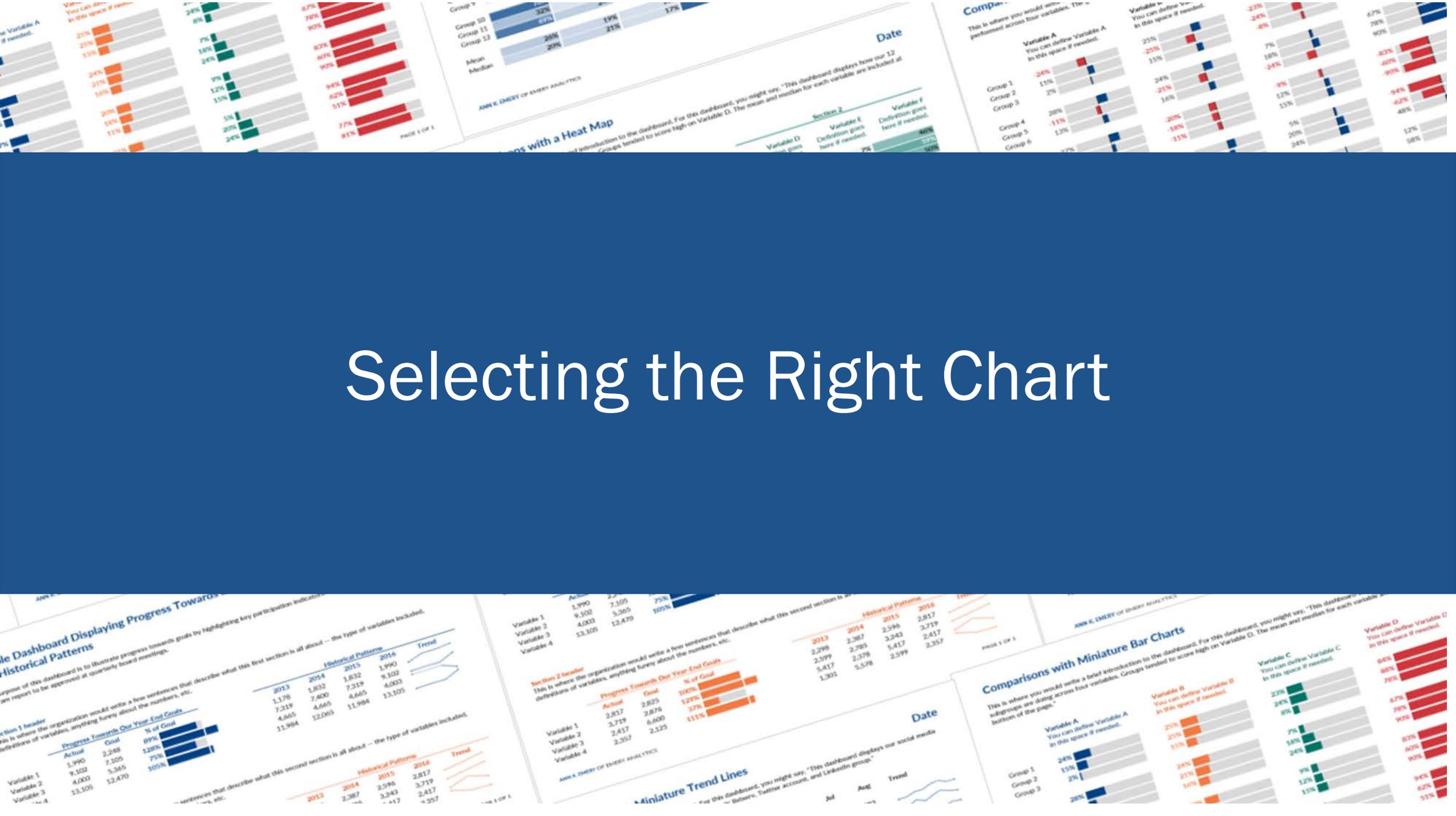
Planning Considerations: Analyze your Audience



Considerations

- Is the audience technical or not technical?
- How will the information be delivered to them?
- How many points in time do they need?
- What are the possible comparisons they might like to see?
- Are viewers expecting a story?

Selecting the Right Chart



What Kind of Data Do I Have?

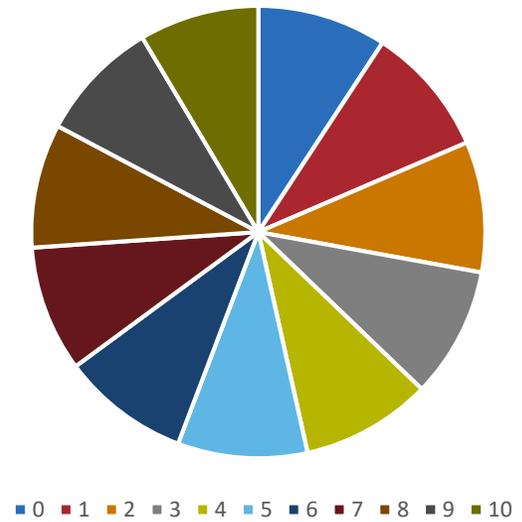
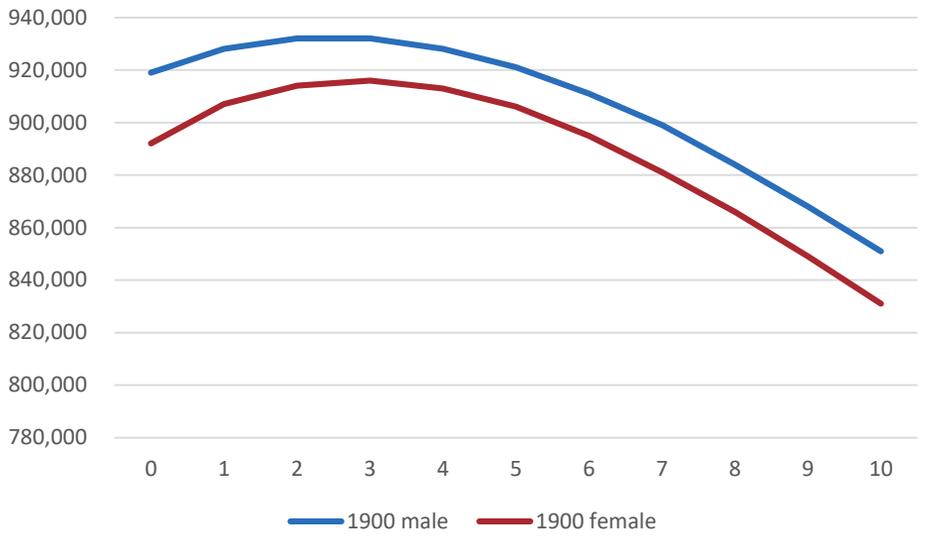
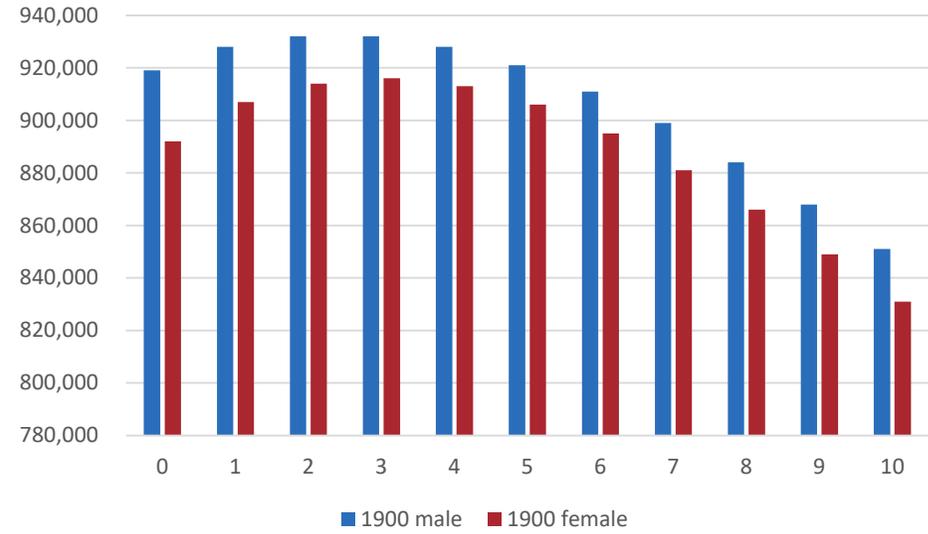
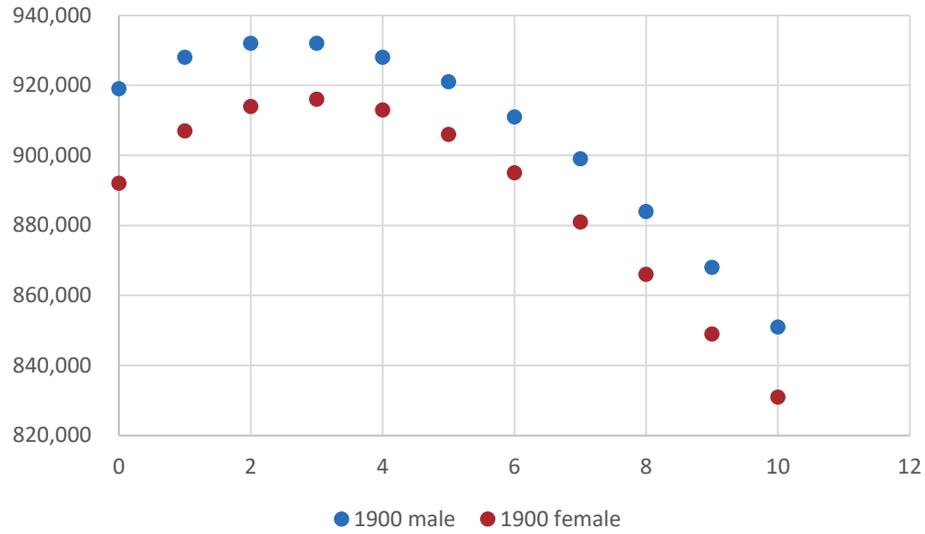
Categorical

One or more variables
No intrinsic order
Ex. Male and female

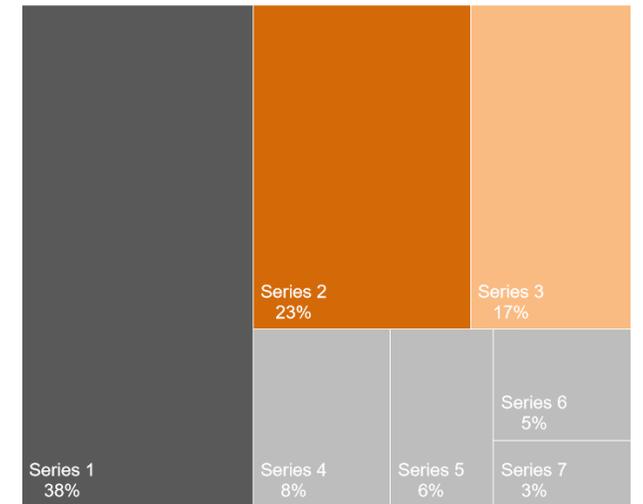
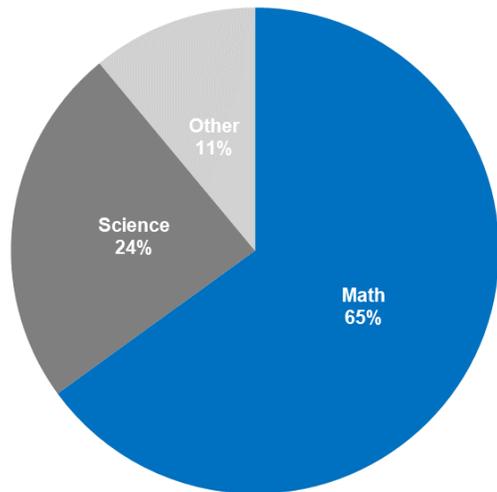
Ordinal

One or more variables
Clear ordering of variables
Ex. Low, medium, high

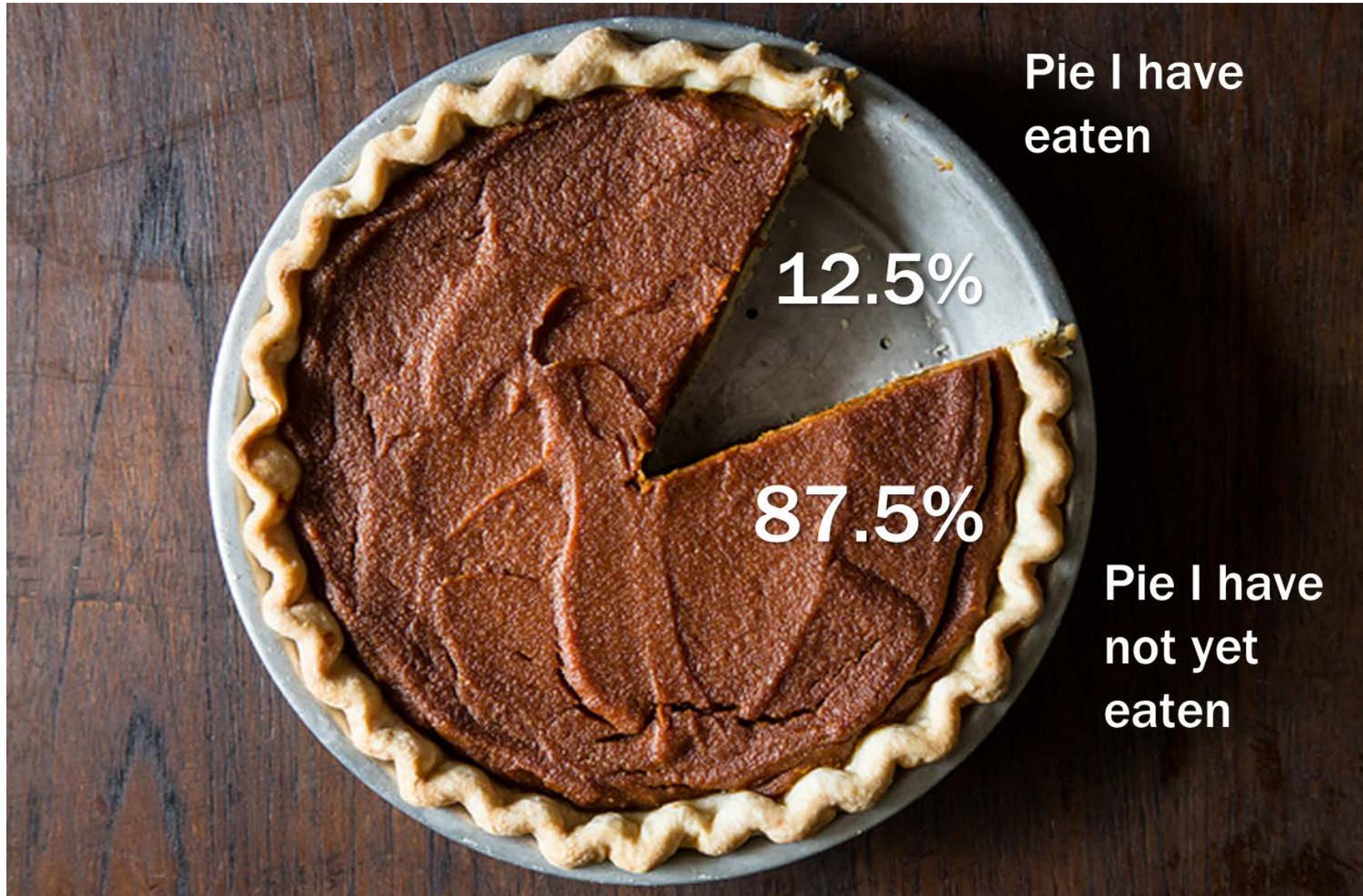
Which Chart do I Choose?



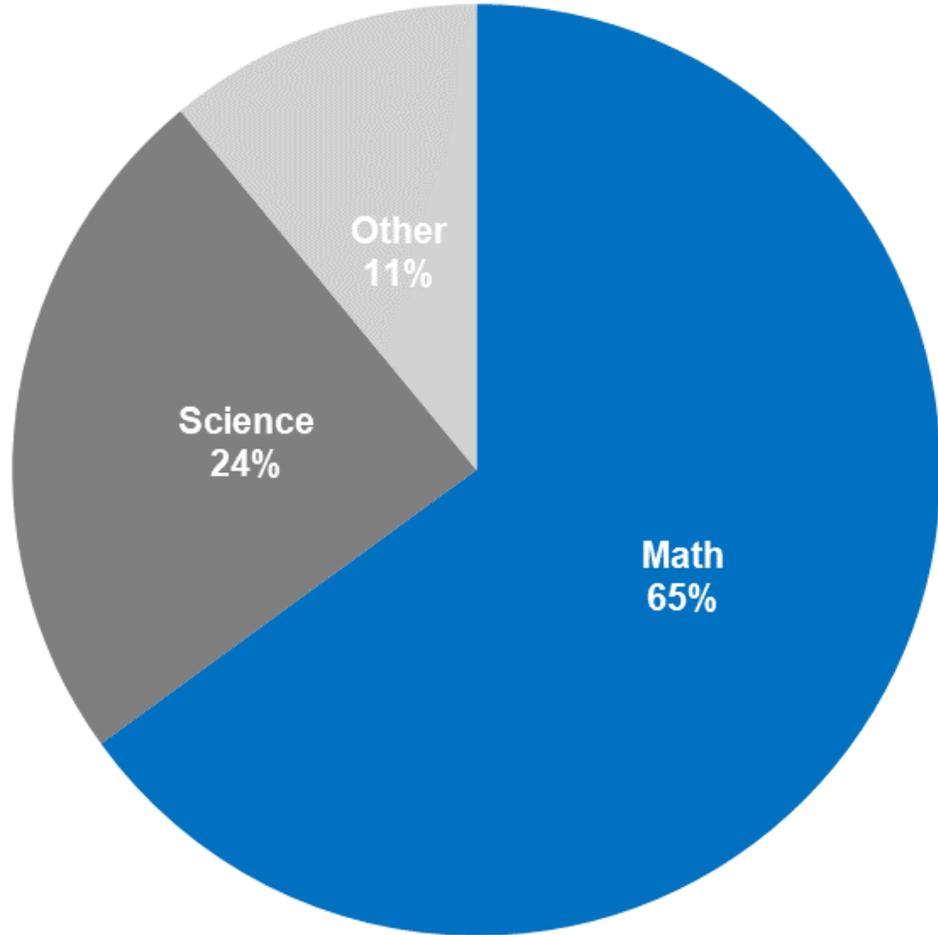
Part-to-Whole Patterns



Part-to-Whole Patterns



Part-to-Whole Patterns



✓ When to use

- ✓ Categorical data--order doesn't matter
- ✓ Proportional or percentage data
- ✓ Quick, overall impression

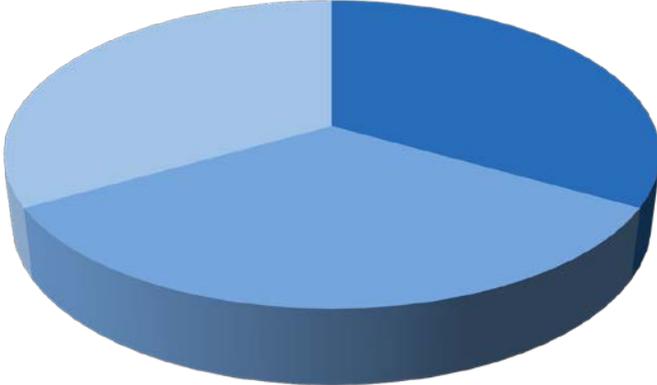
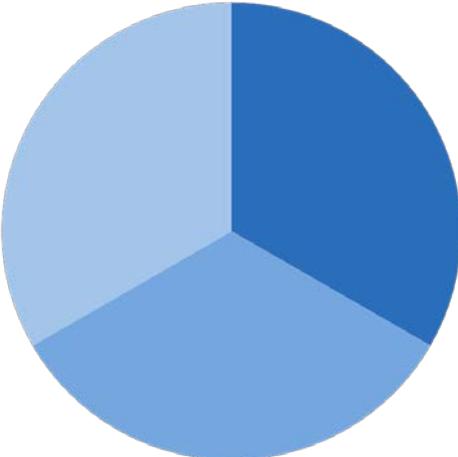
✓ Do:

- ✓ Calculate percentages: Everything adds up to 100%
- ✓ Use for single point in time
- ✓ Label in the chart

✓ Don't:

- ✓ Use negative percentages
- ✓ Use more than 5 slices
- ✓ Use 3-D, leader lines or legends

Just Say No to 3D!

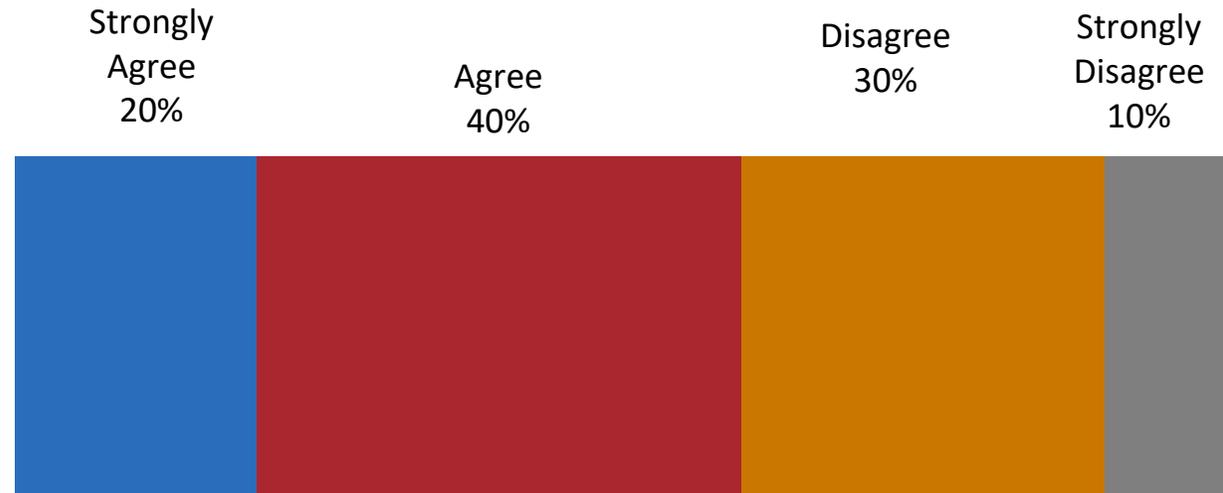
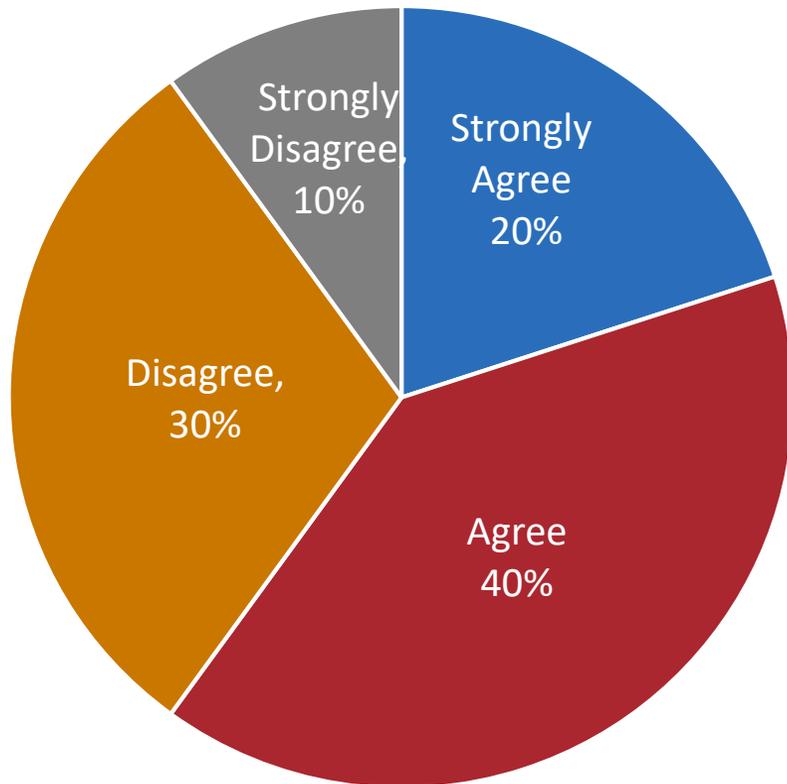


Actual Area

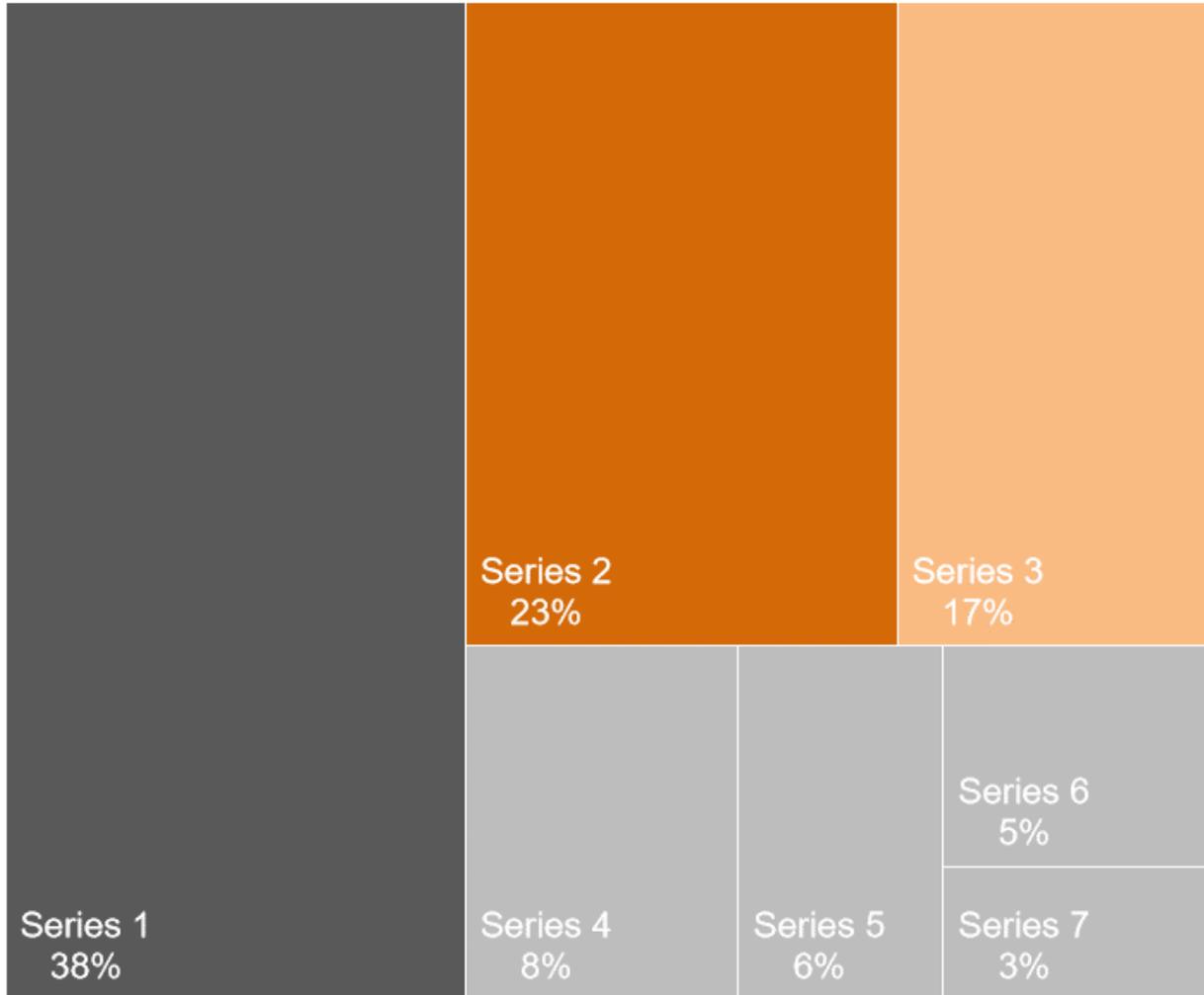


Part to Whole

Works best with categorical rather than ordinal data



Part-to-Whole Patterns



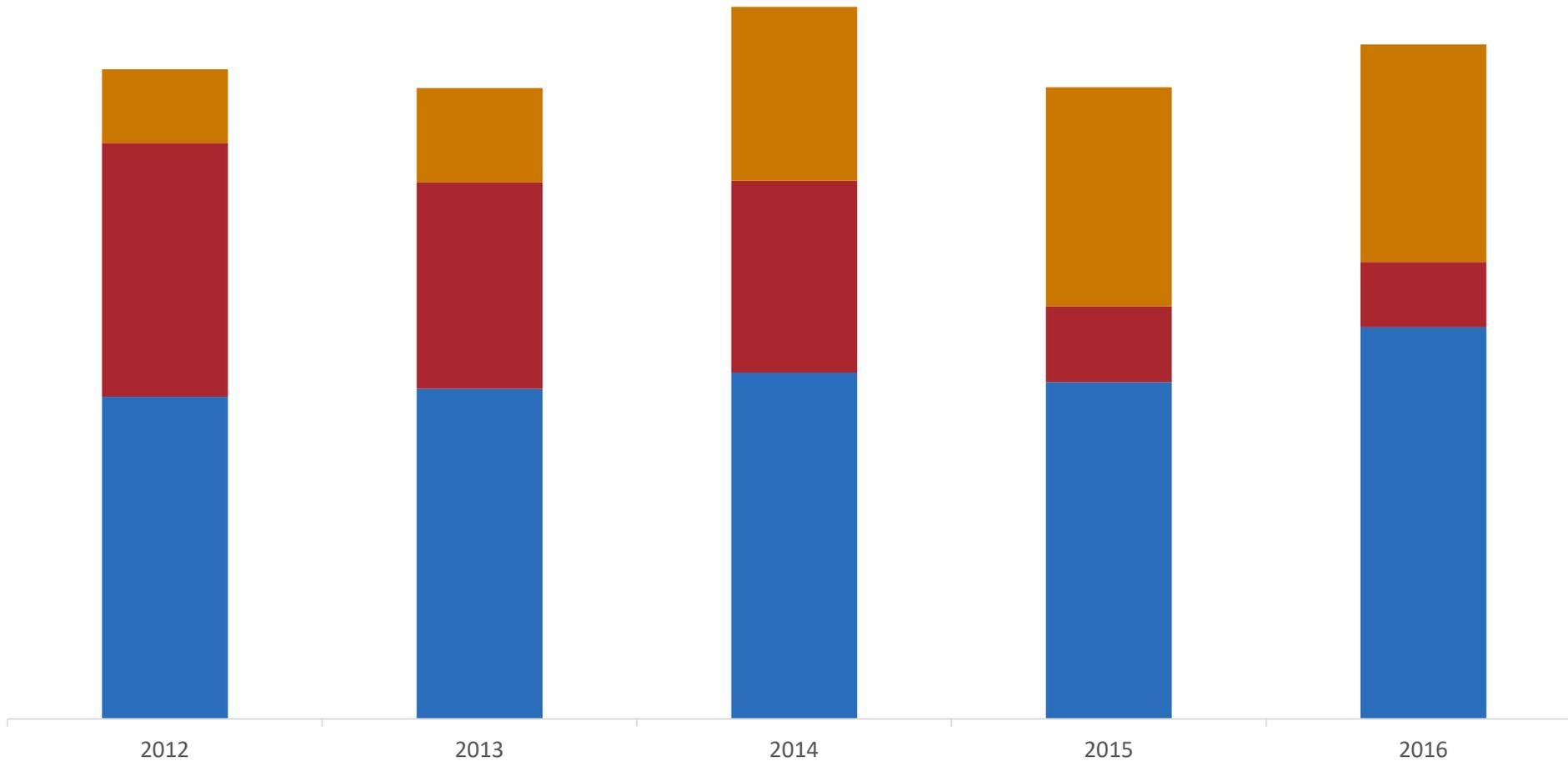
- ✓ When to use:
 - Display more slices than a pie
 - Nested data
 - Hierarchical data
 - When space is contained
- ✓ Do:
 - ✓ Use color to highlight
 - ✓ Use banners to display hierarchy
- ✓ Don't:
 - ✓ Use when there is a big difference in the magnitude of measured values
 - ✓ Use negative values

Tree Map

Part to Whole

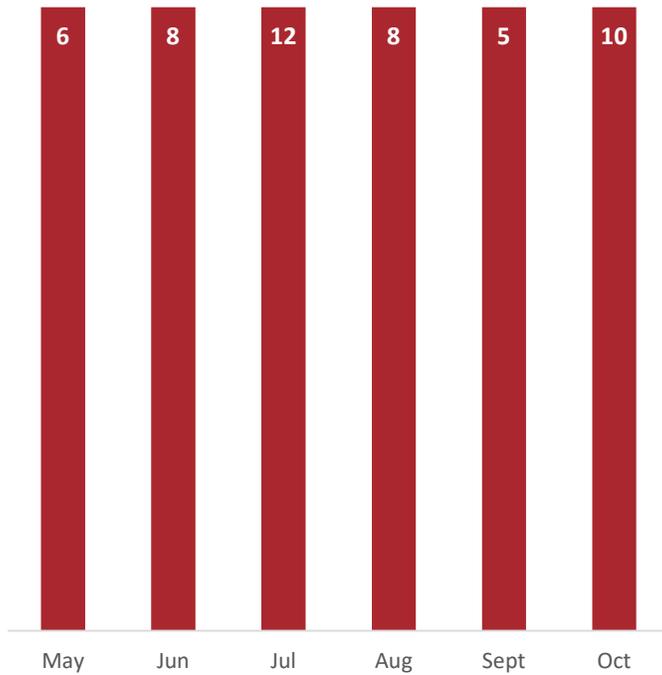
- ✓ When to use:
 - ✓ Display more slices than a pie
 - ✓ Nested data
 - ✓ Hierarchical data
 - ✓ When space is contained
 - ✓ When values can be aggregated
- ✓ Do:
 - ✓ Use color to highlight
 - ✓ Use banners to display hierarchy
- ✓ Don't:
 - ✓ Use when there is a big difference in the magnitude of measured values
 - ✓ Use negative values

Ticket Sale Types (Online, Phone, In Person) 2012-2016

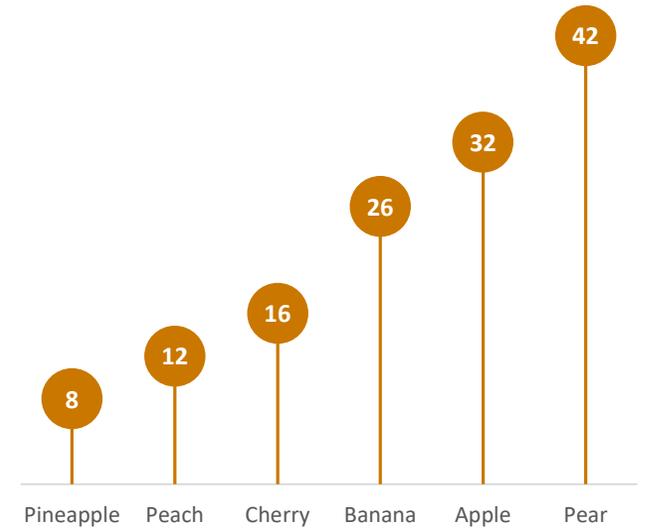
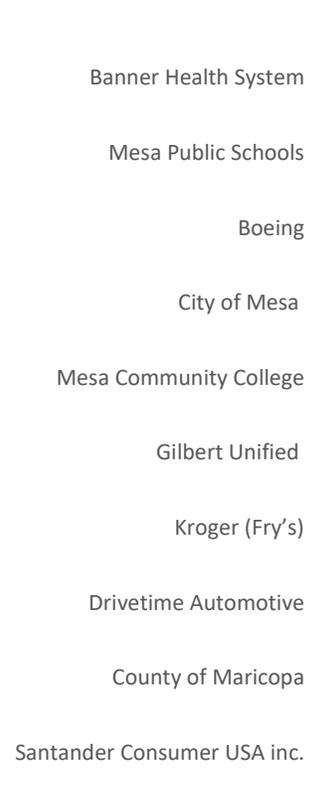


I want to compare overall ticket sales in each year as well as sales by ticket type

Compare a Few Categories

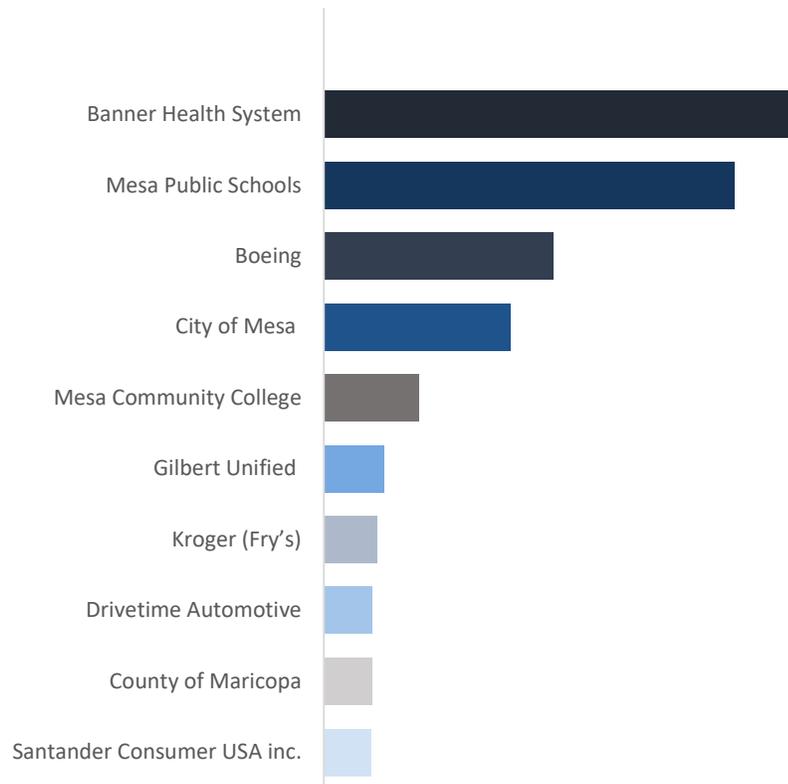


Top 10 Mesa Employers by Number of Employees

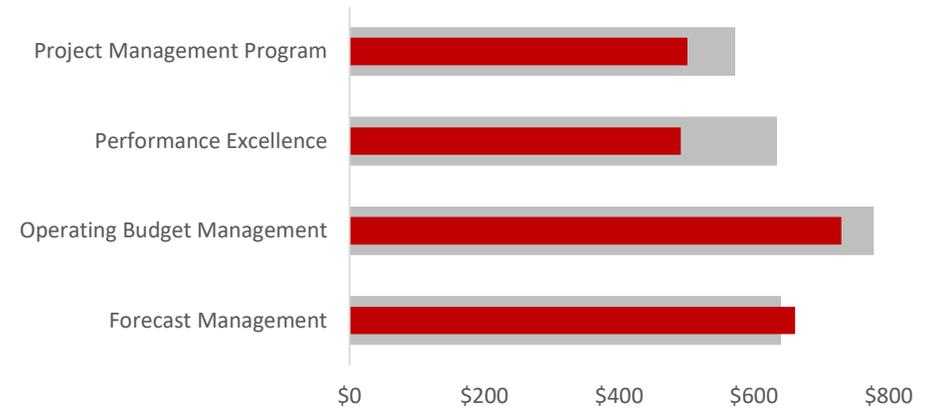


Comparing Categories

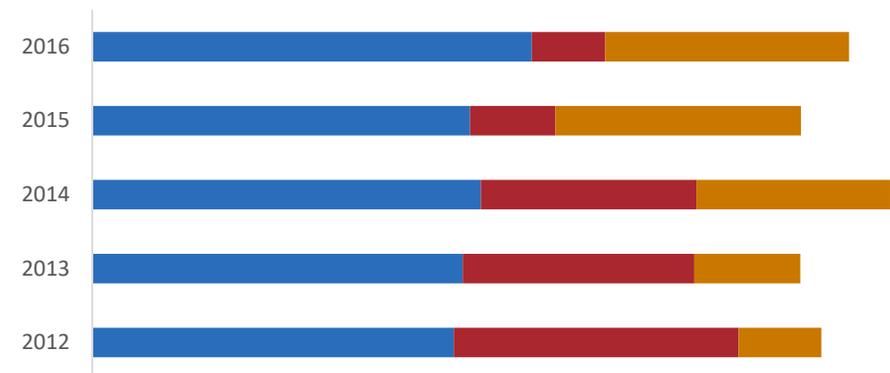
Top 10 Mesa Employers by Number of Employees



OMB FY '16-17 Actuals to Year End Estimates (in hundreds of thousands)



Ticket Type Sales- Online, Phone, In Person

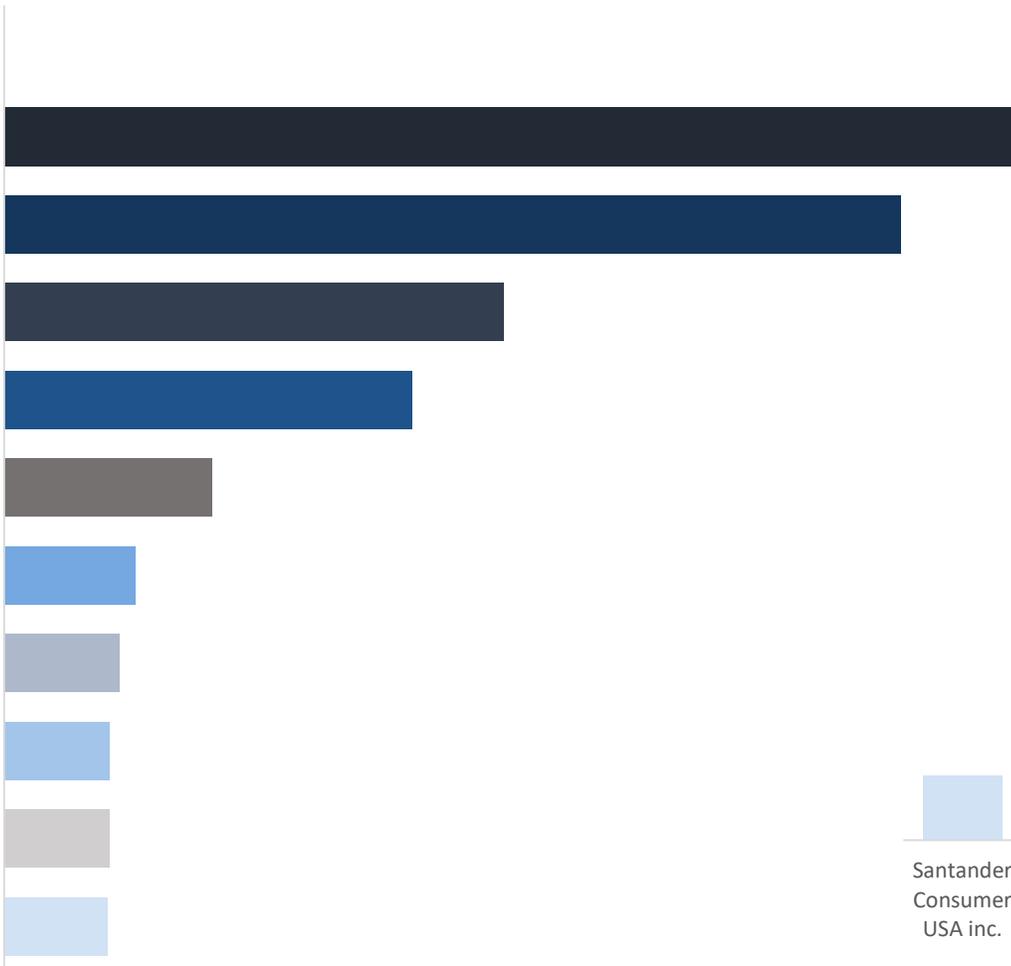


Bar Chart

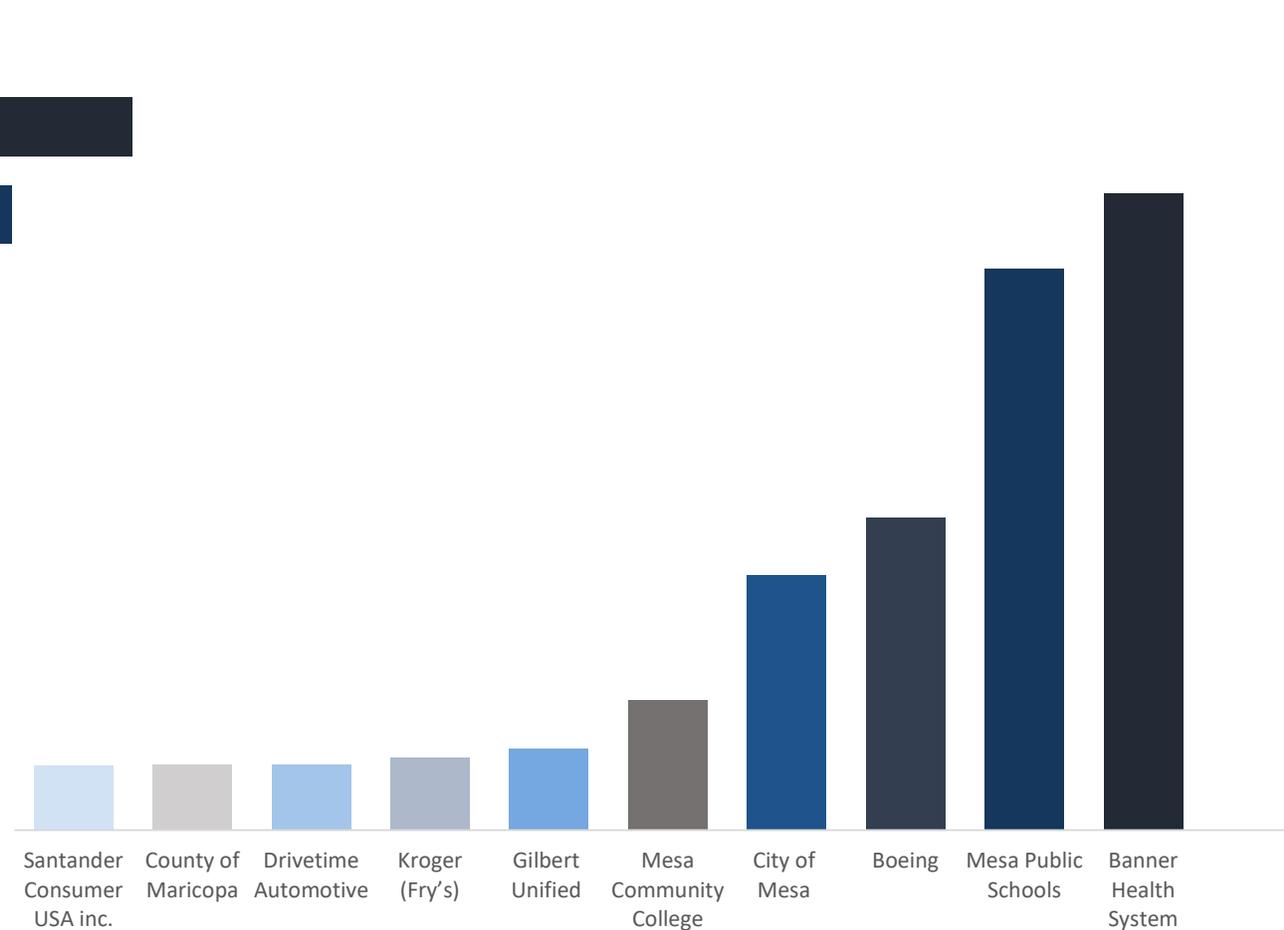
Comparing Categories

Top 10 Mesa Employers by Number of Employees

Banner Health System
Mesa Public Schools
Boeing
City of Mesa
Mesa Community College
Gilbert Unified
Kroger (Fry's)
Drivetime Automotive
County of Maricopa
Santander Consumer USA inc.



Top 10 Mesa Employers by Number of Employees



Overlapping Bar Chart

Comparing Categories

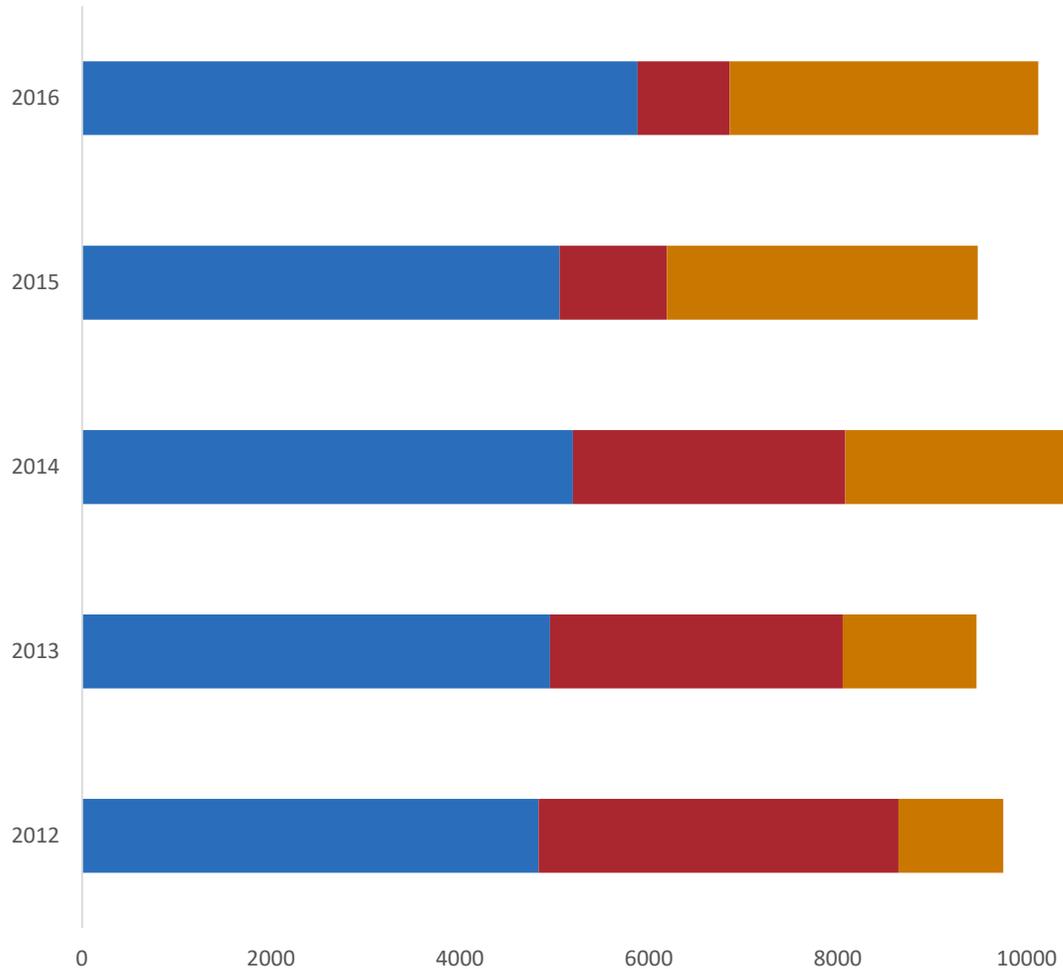
OMB FY '16-17 Actuals to Year End Estimates (in hundreds of thousands)



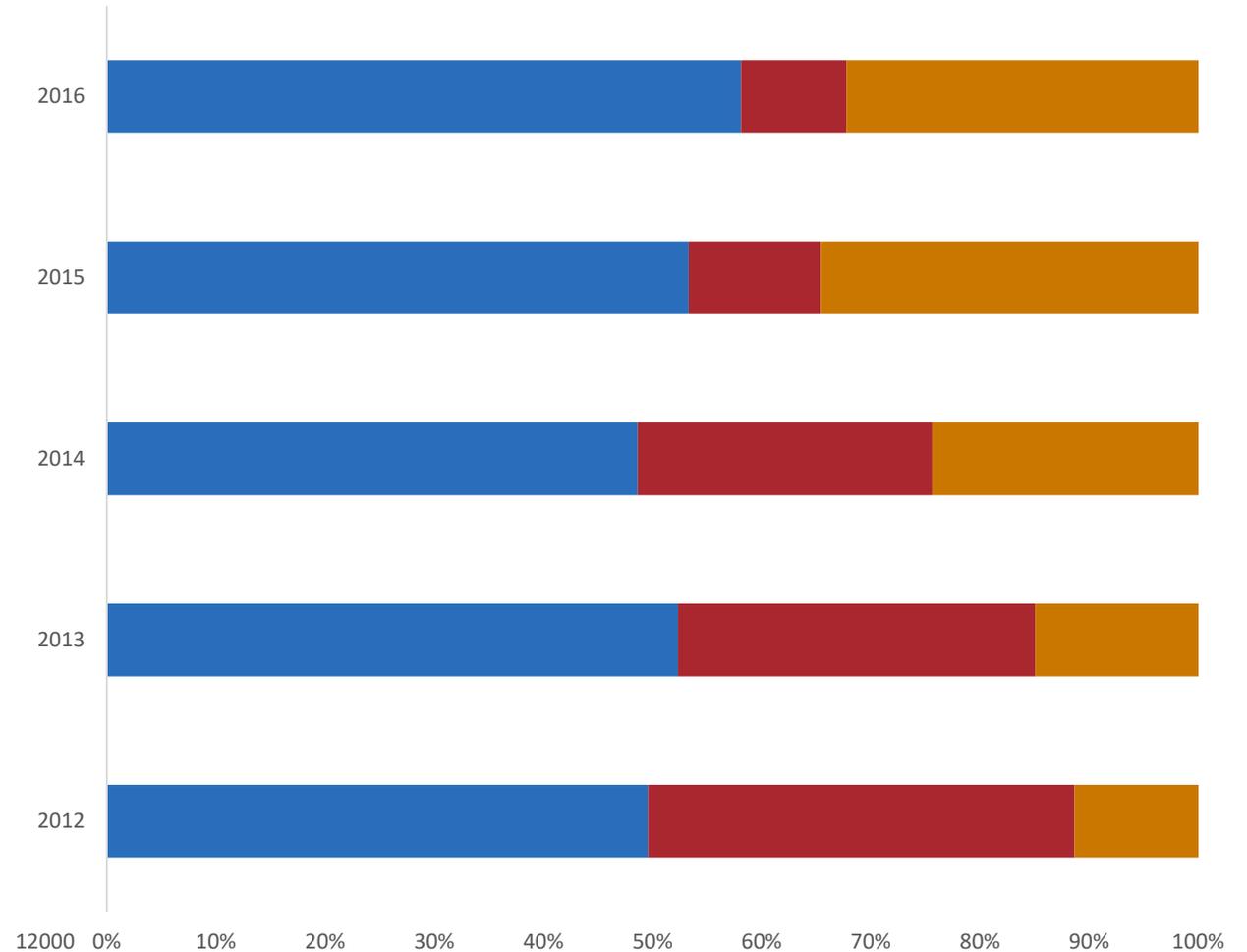
Stacked Bar Chart

Comparing Categories

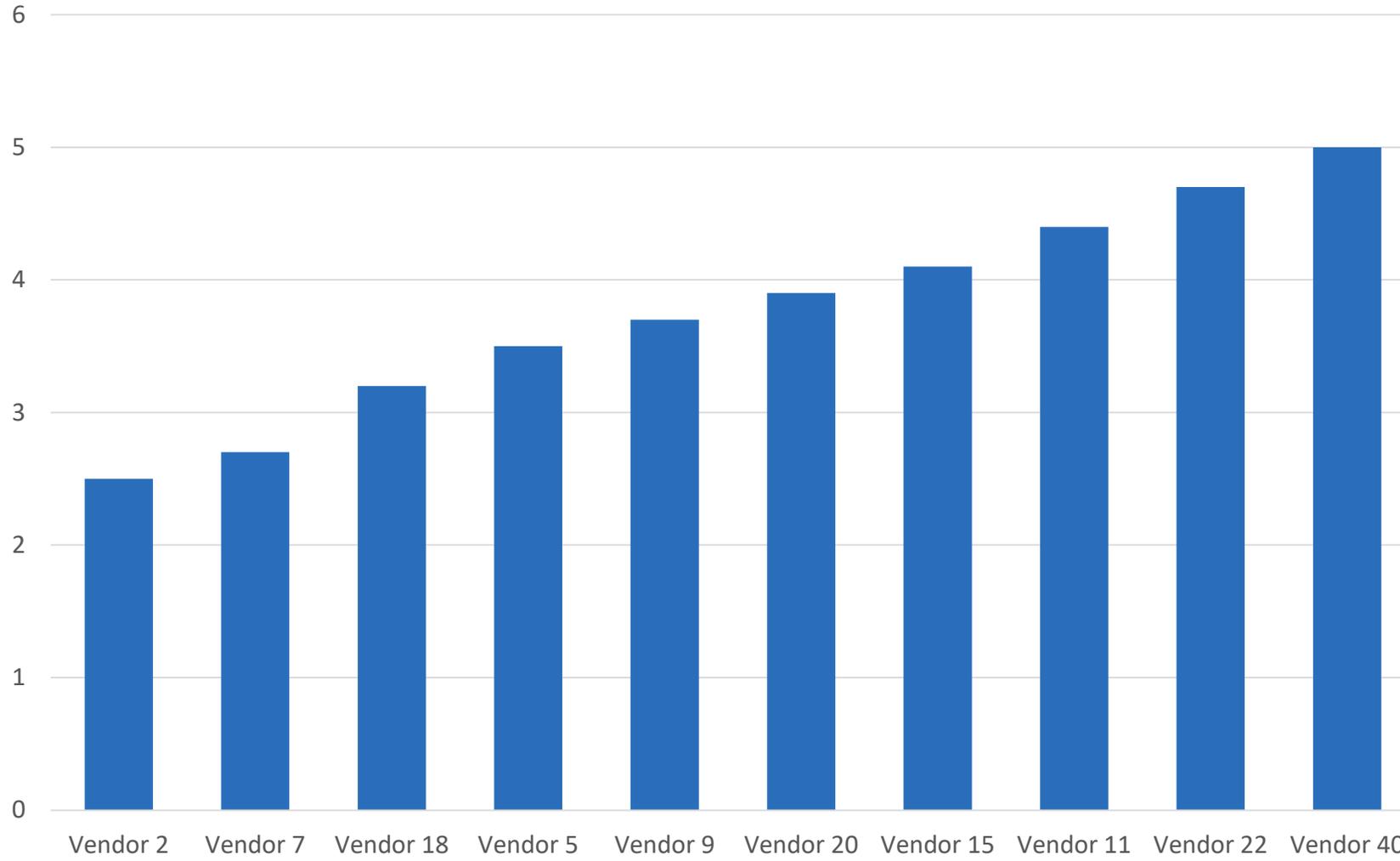
Ticket Type Sales- Online, Phone, In Person



Ticket Type Sales- Online, Phone, In Person

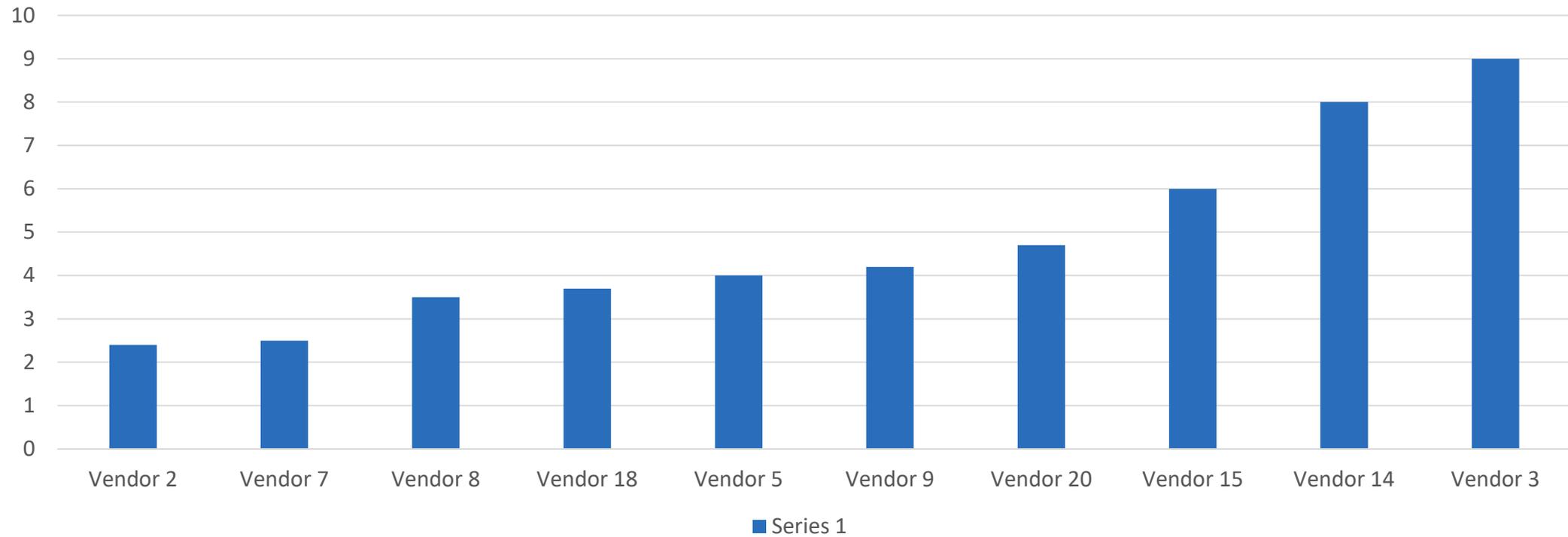


Top 10 Vendors



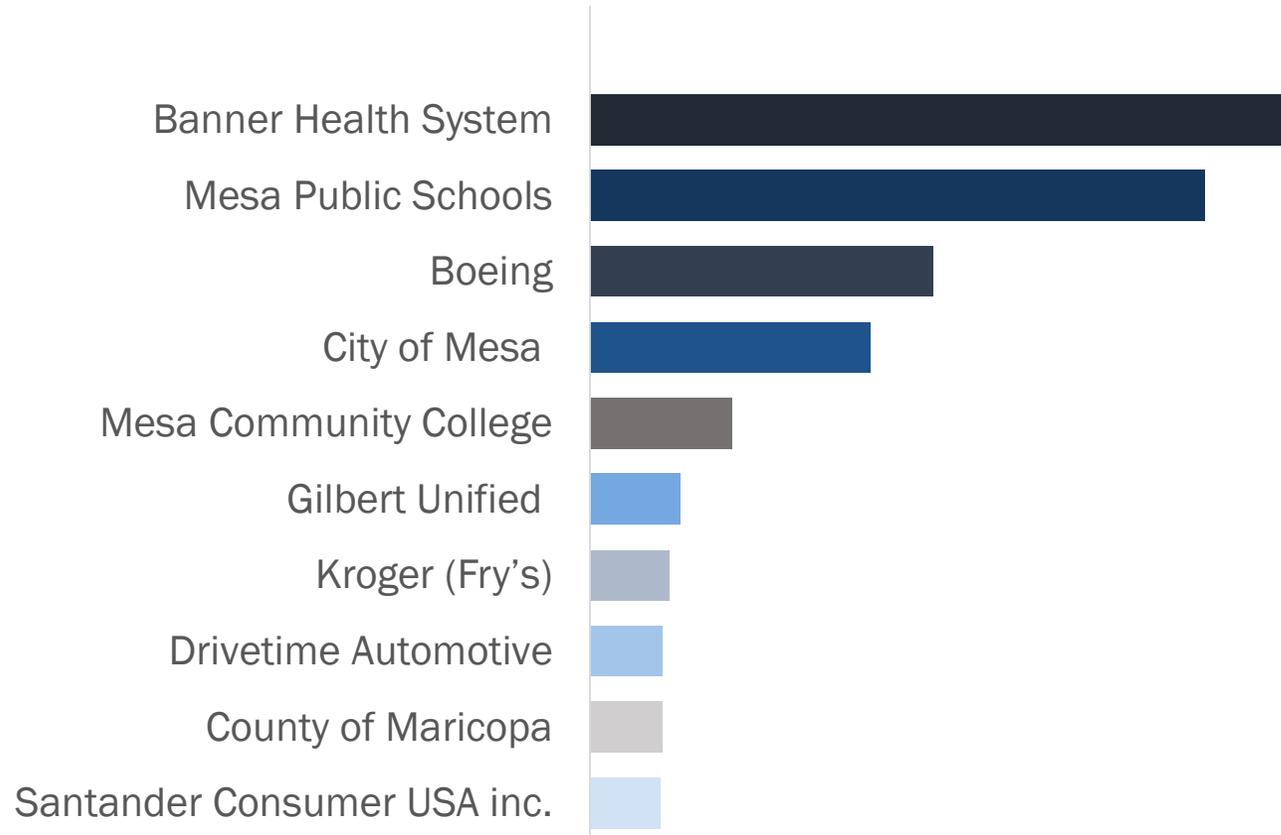
Compare a Few Categories

Top 10 Vendors – FY 2017



Compare a Few Categories

Top Vendors



✓ When to use:

- Nominal data- no order
- Compare values between groups

✓ Do:

- Display data in order from greatest to least
- Flip bars on their side with long titles
- Axis starts at zero
- Use labels rather than gridlines

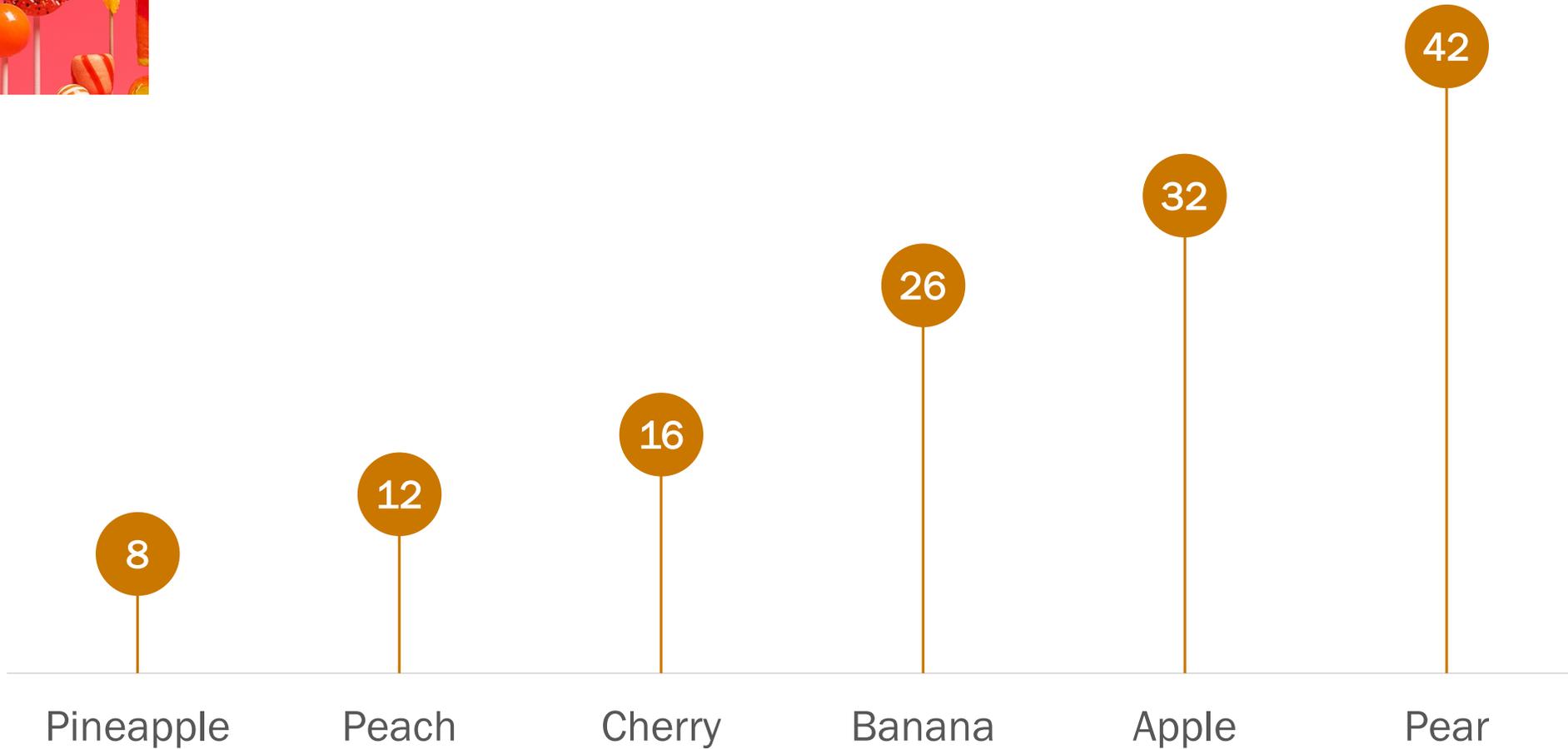
✓ Don't:

- Display more than 10 bars

Compare a Few Categories



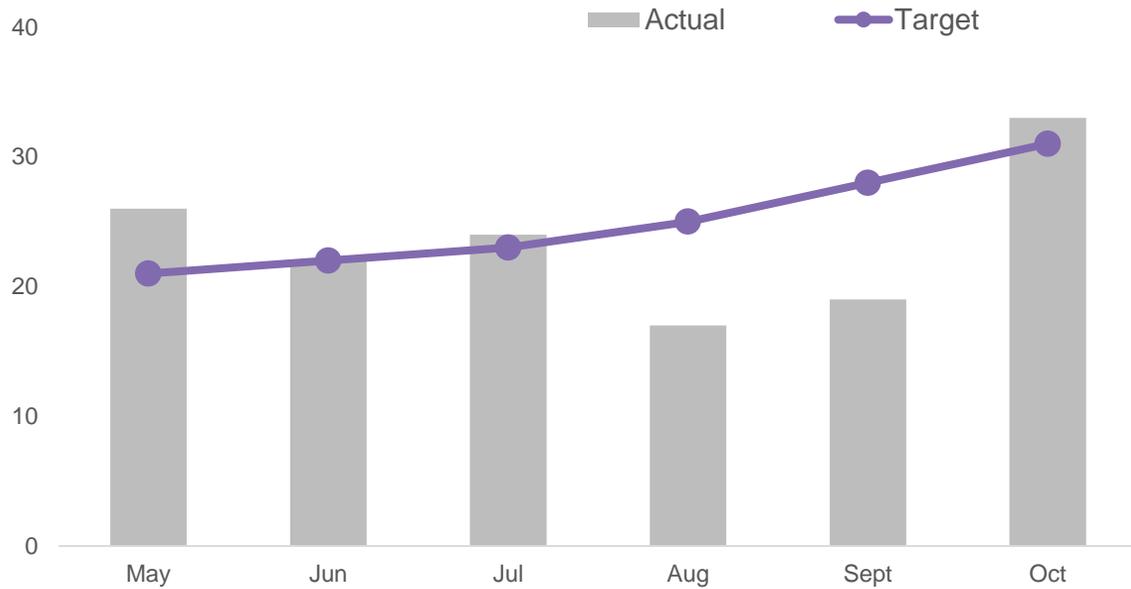
Lollipops



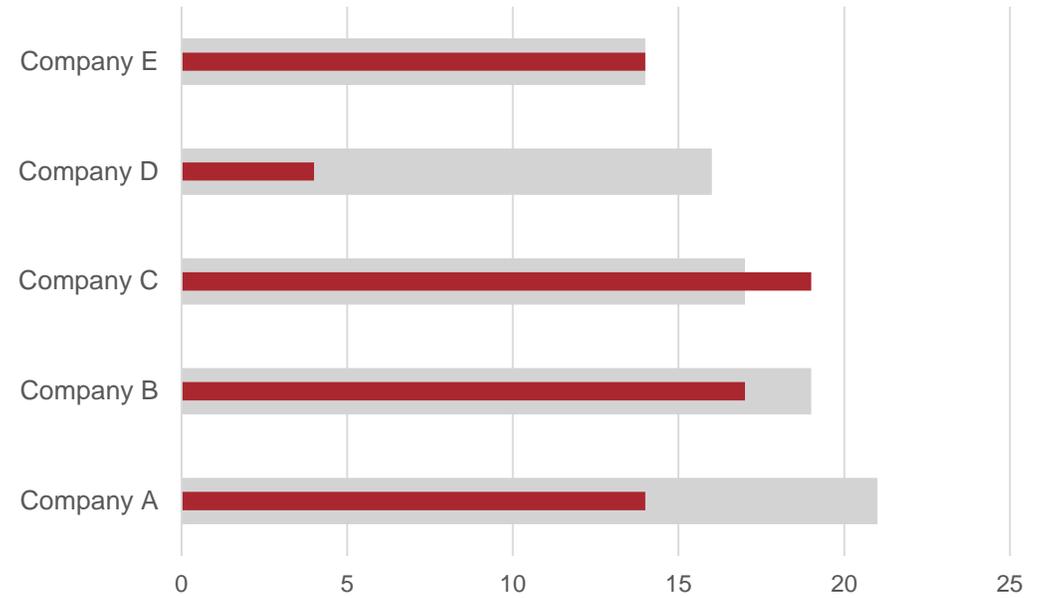
Progress toward Goals

Bar and Line

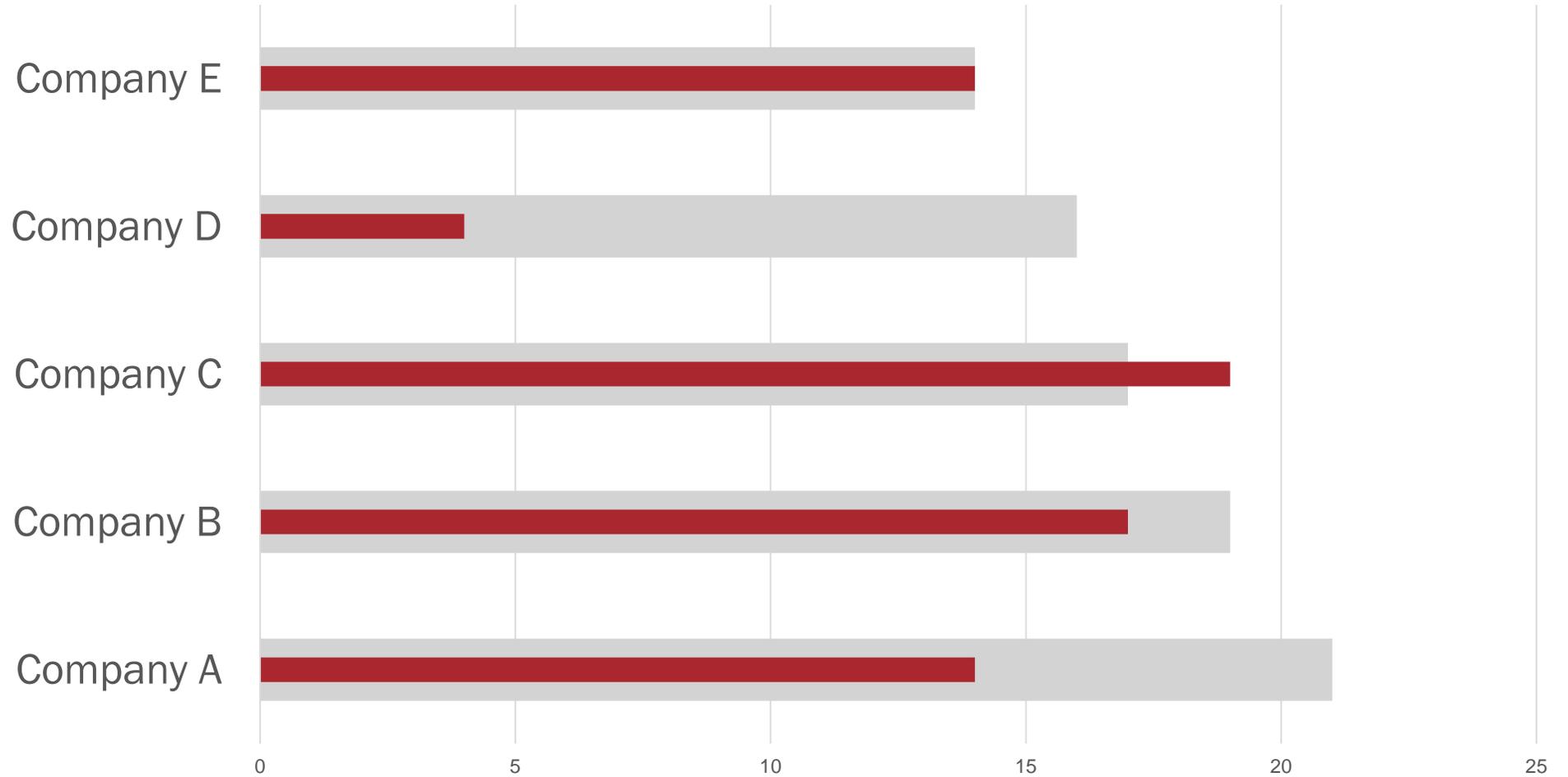
Products Sold



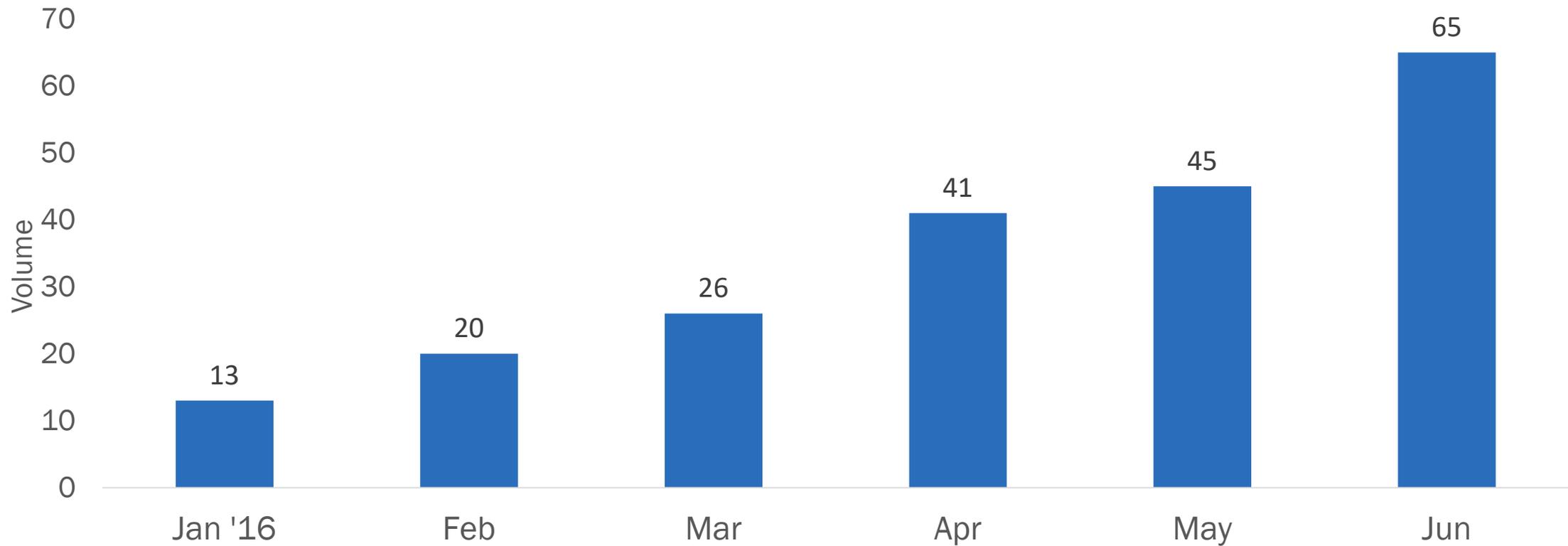
Overlapping Bar



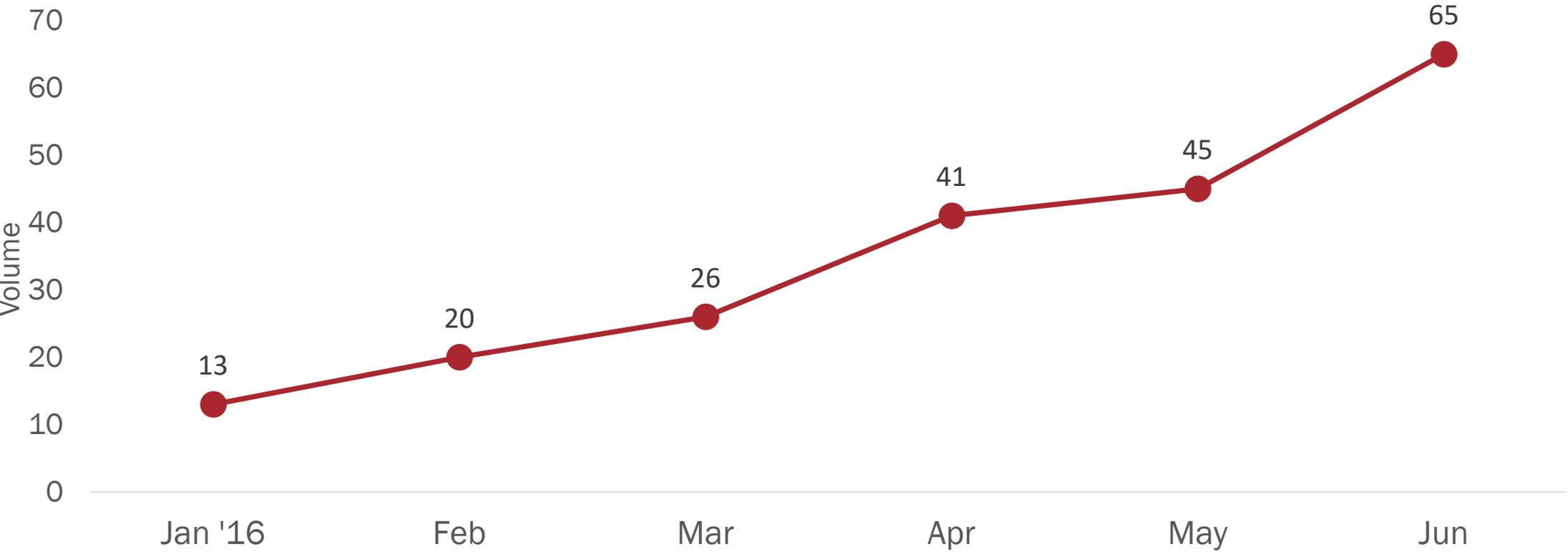
Progress toward Goals



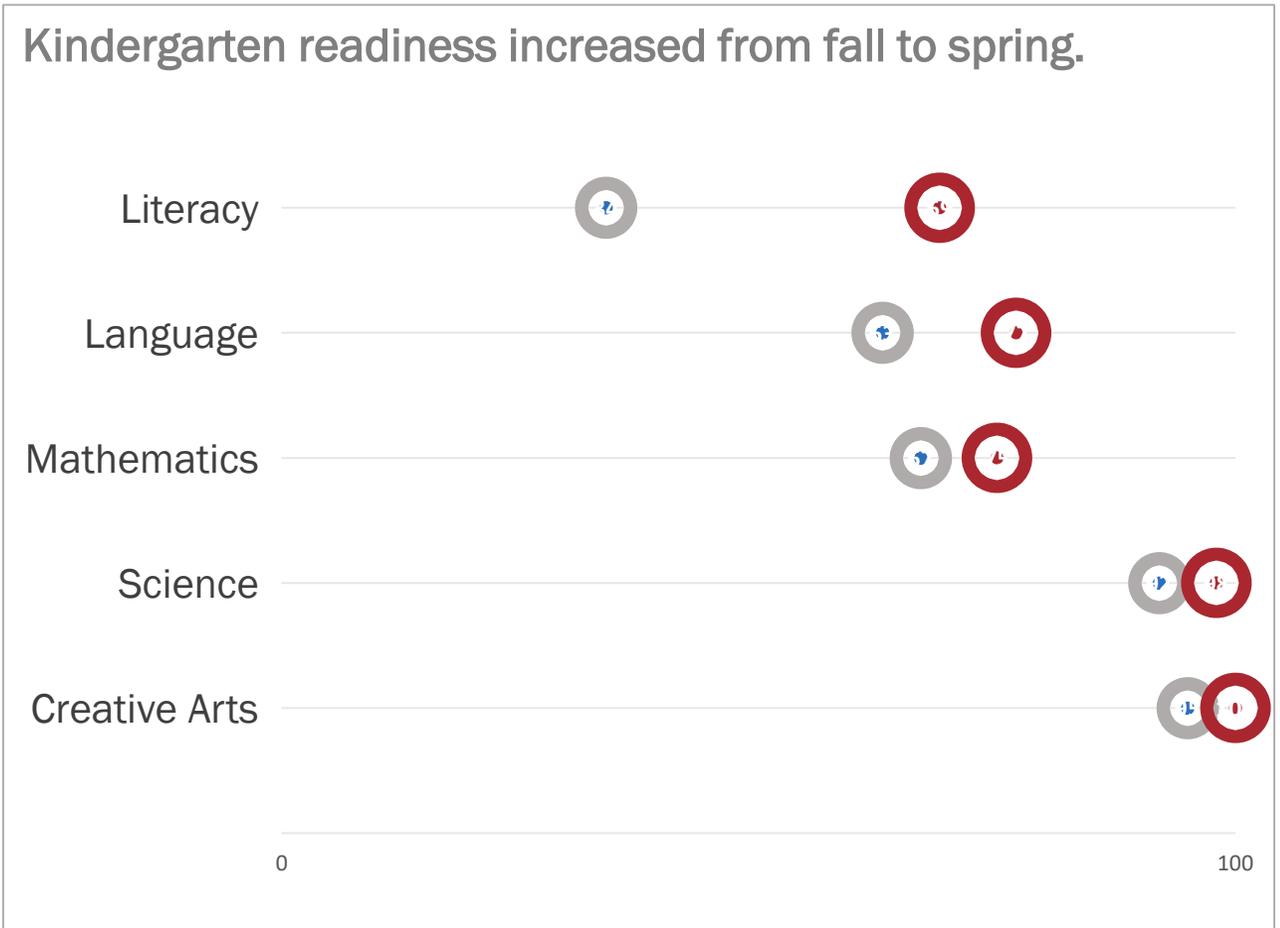
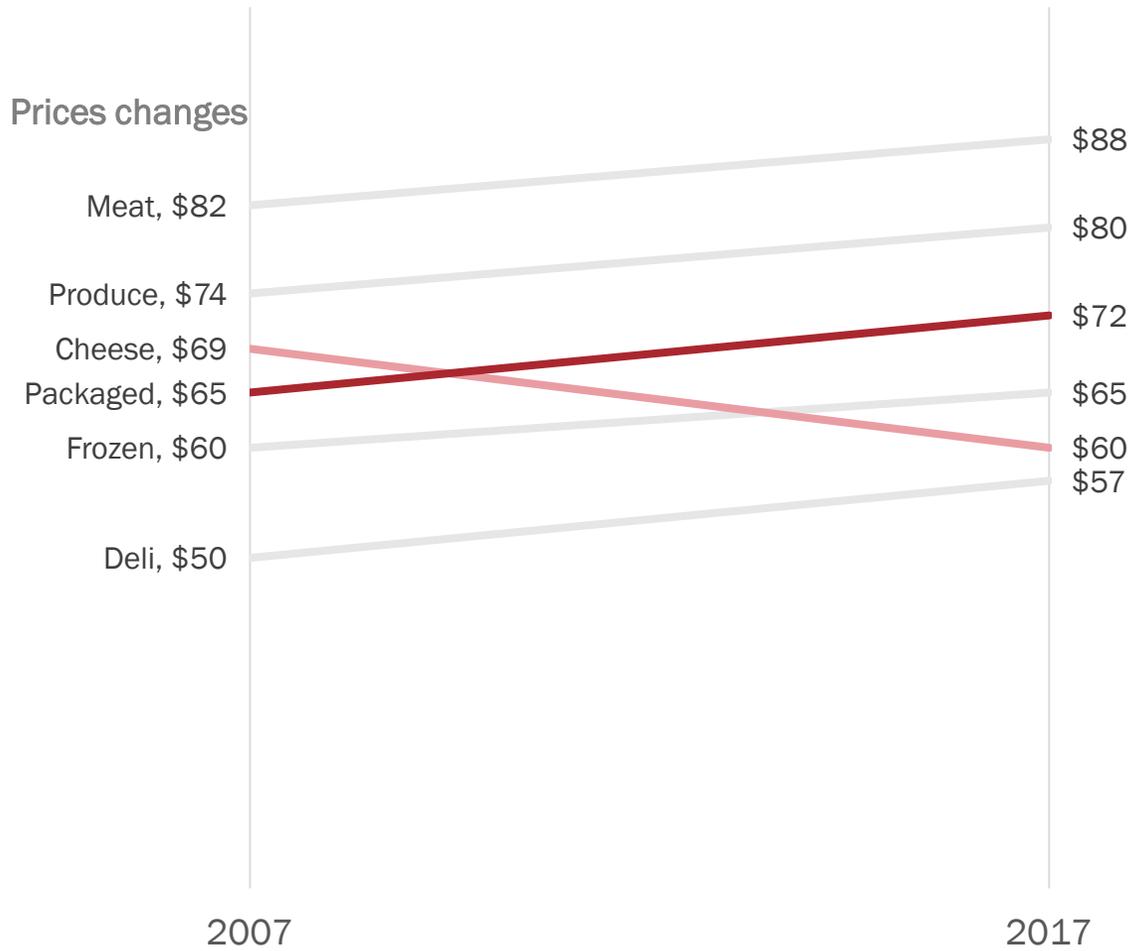
Time: Trend over Time



Time: Trend over Time



Time: Before / After



NBC2 VIEWER VOTE

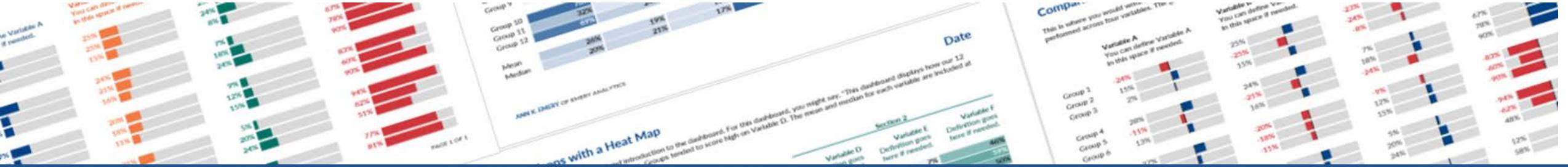
NBC-2.COM

HOW CONCERNED ARE YOU ABOUT THE ZIKA VIRUS?



88° 4:04

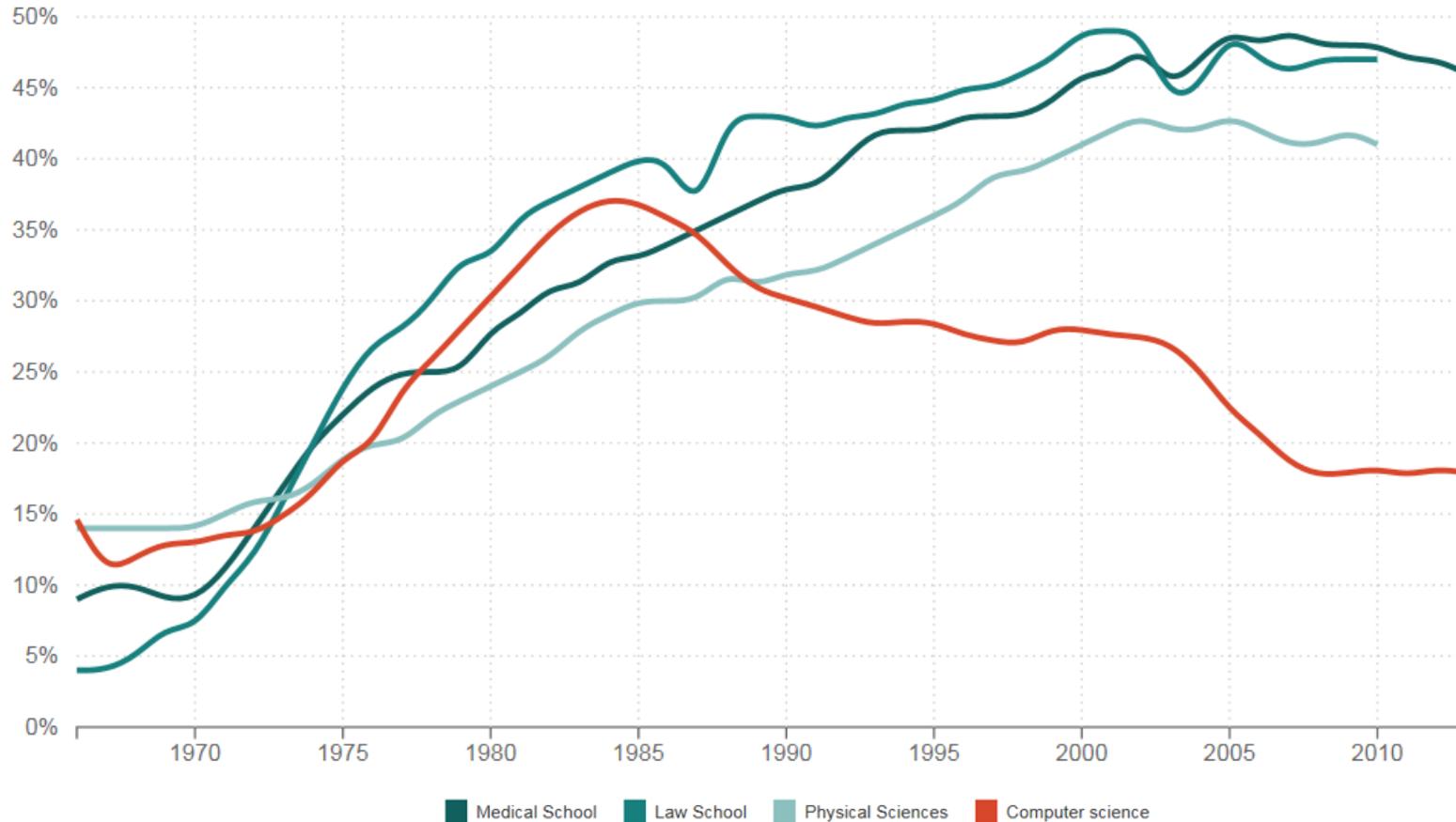
Easing the Cognitive Load: Declutter



What to do with the Legend?

What Happened To Women In Computer Science?

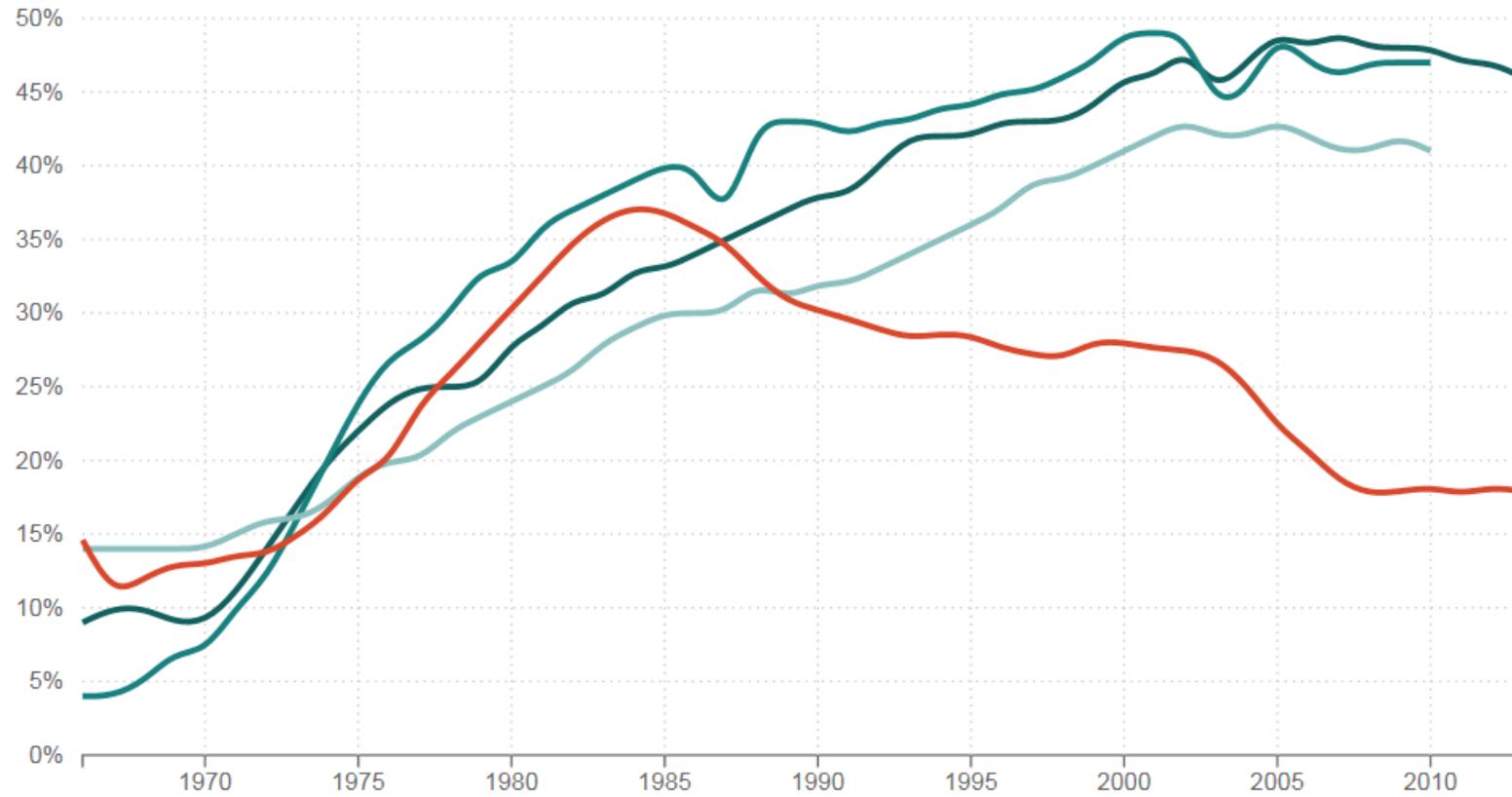
% Of Women Majors, By Field



What Happened To Women In Computer Science?

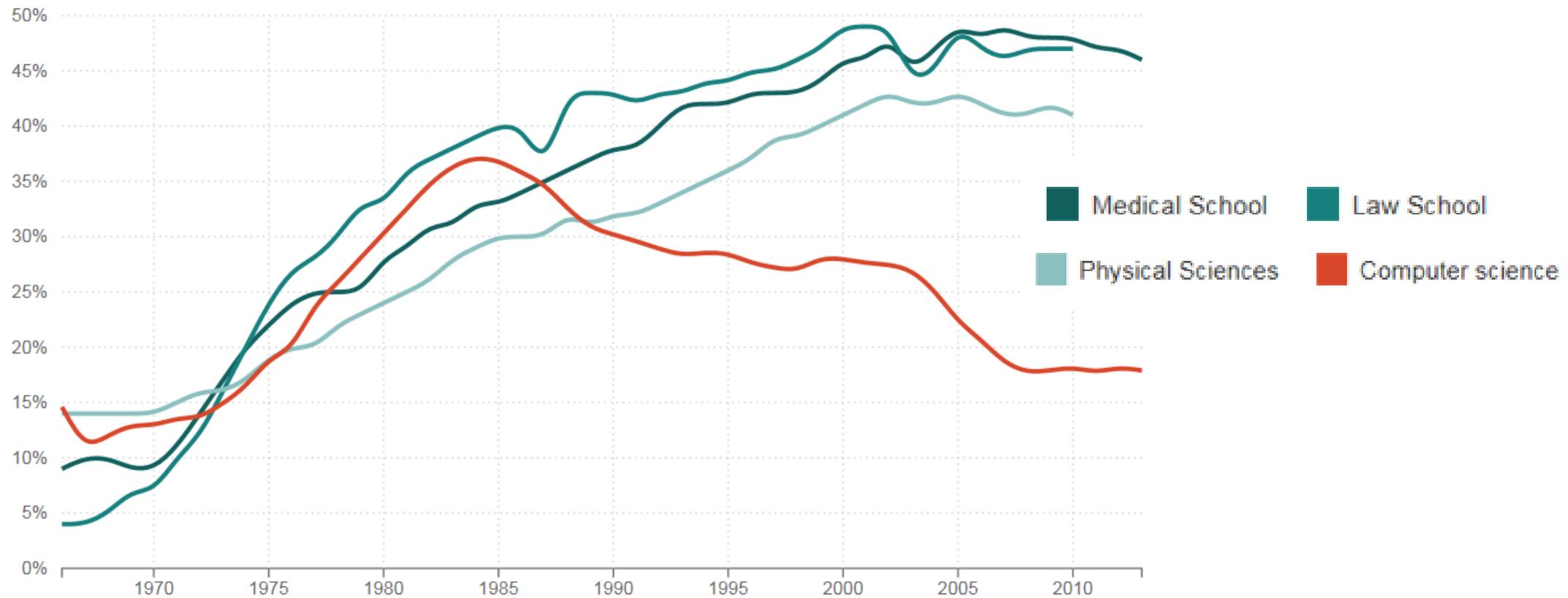
% Of Women Majors, By Field

Medical School Law School Physical Sciences Computer science



What Happened To Women In Computer Science?

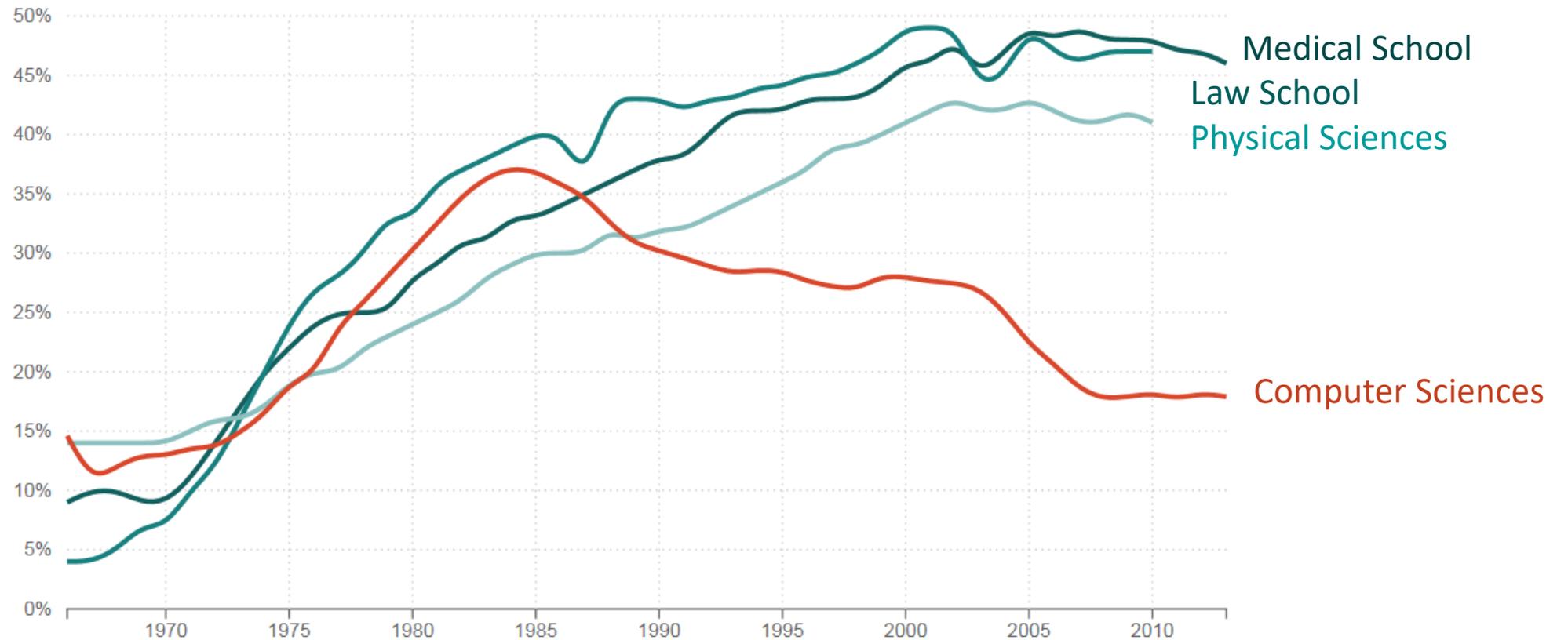
% Of Women Majors, By Field



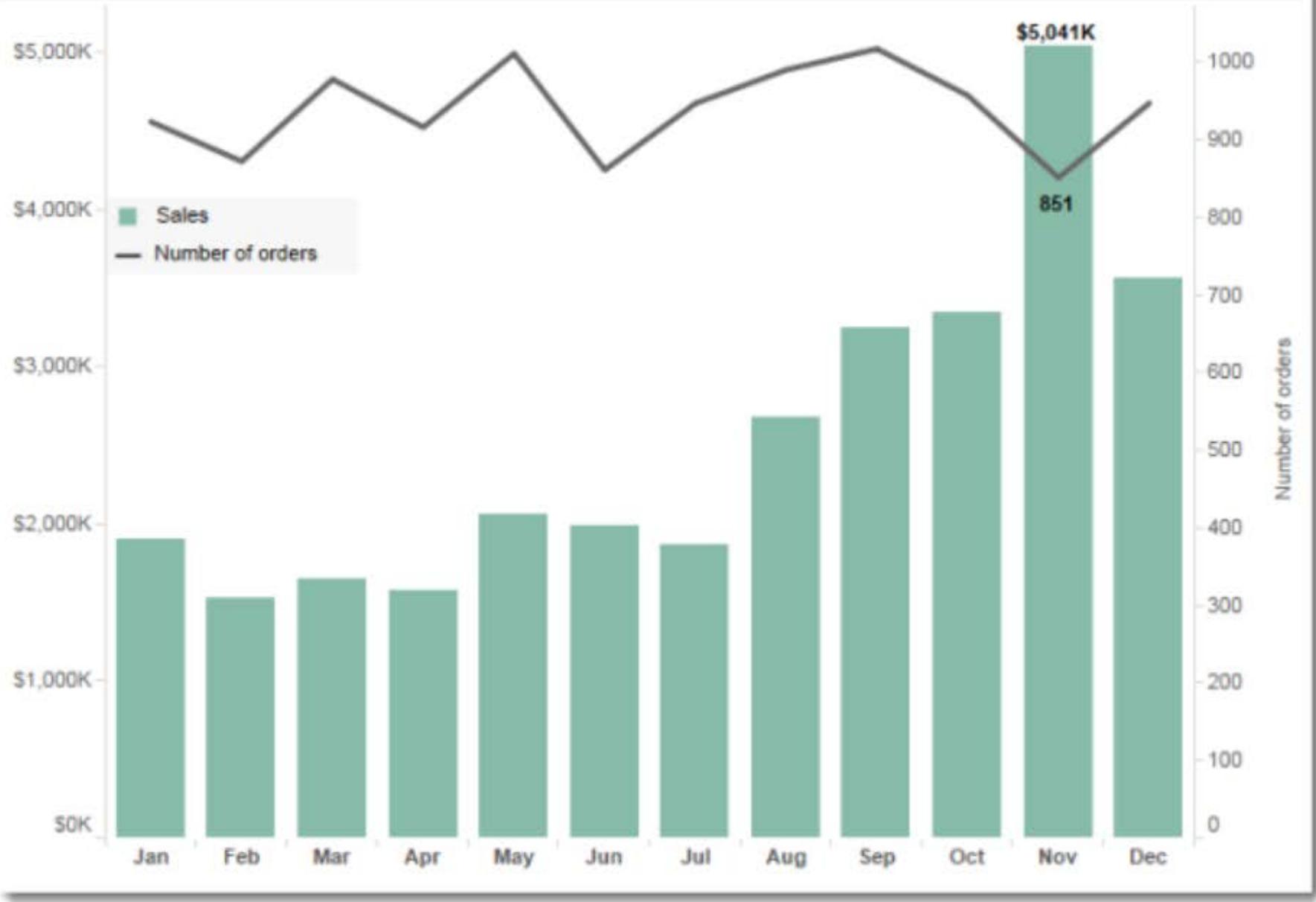
Label directly

What Happened To Women In Computer Science?

% Of Women Majors, By Field



Sales and Orders by Month (2010 - 2013)



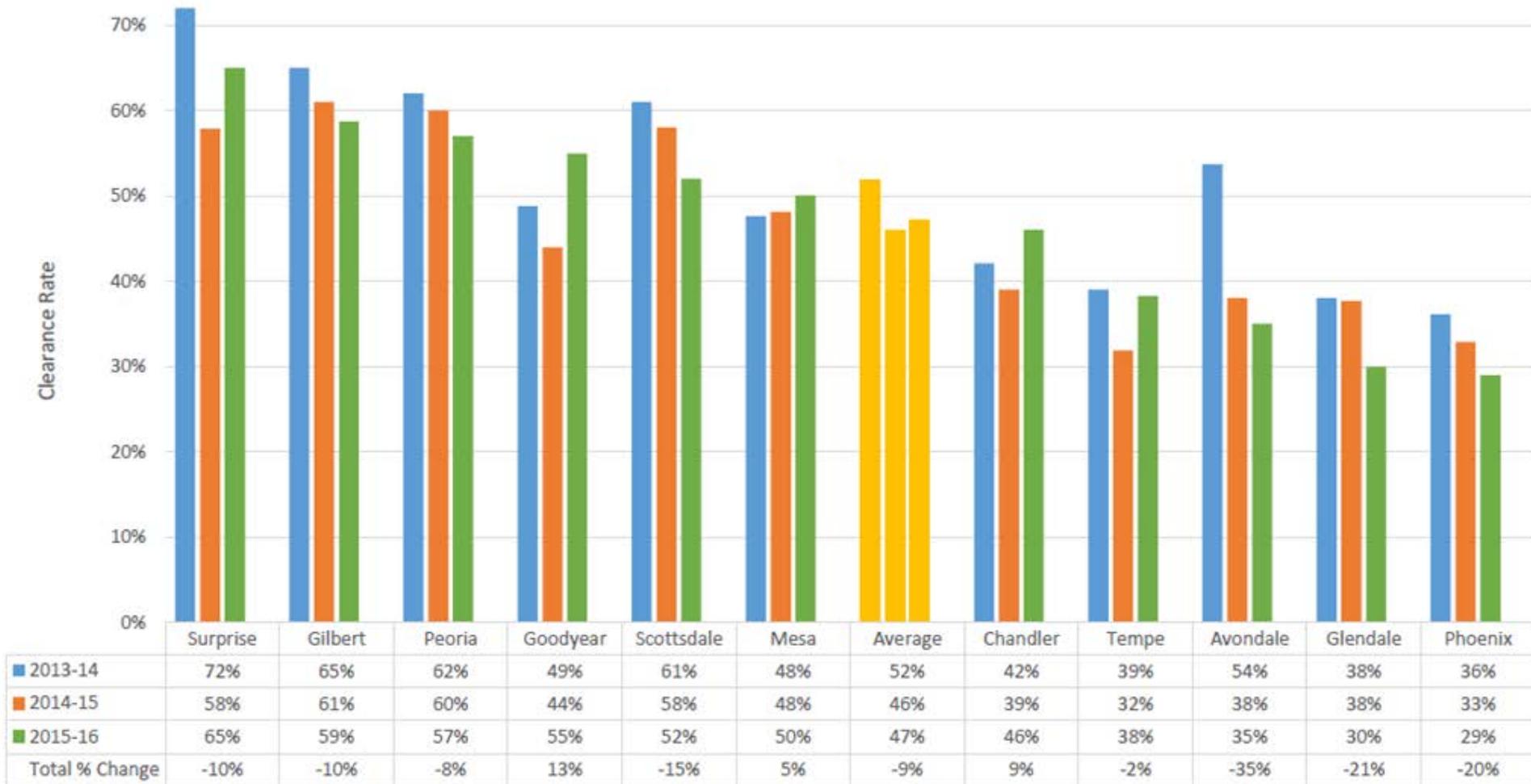
Use Dual Axis Carefully

Y-axis at zero

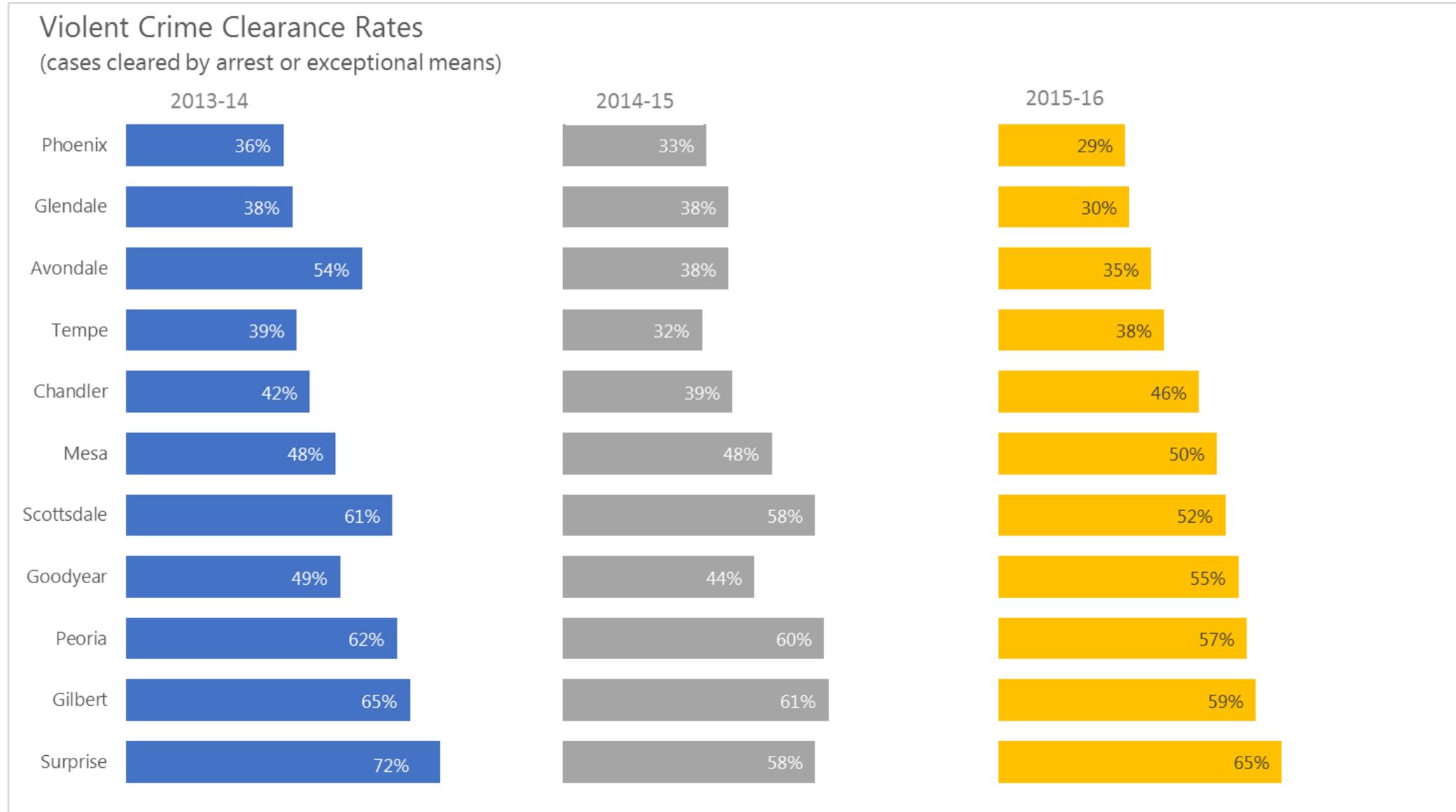
When you have too much data...

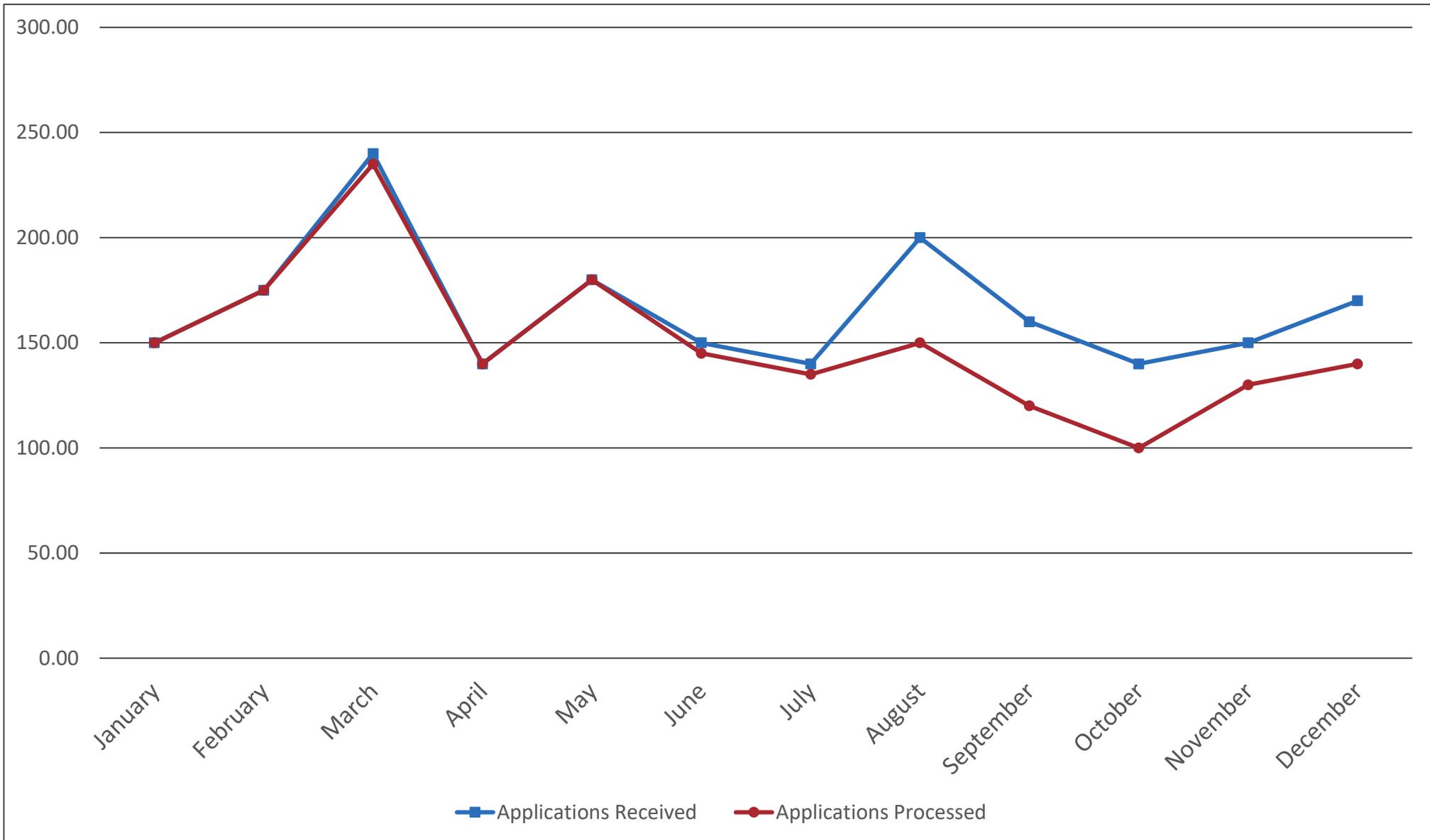
Violent Crime Clearance Rates

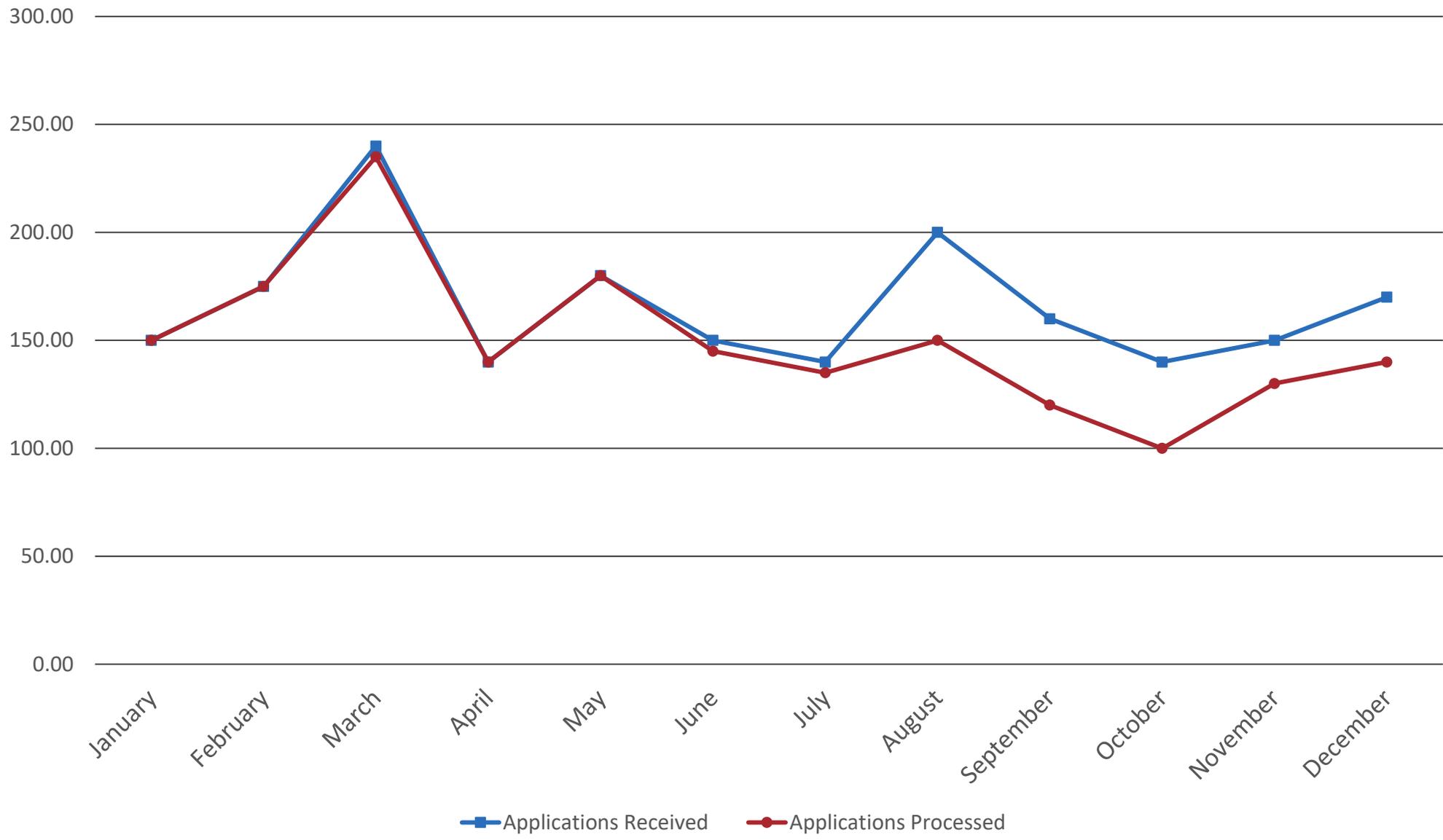
Clearance rates include cases cleared by arrest or exceptional means

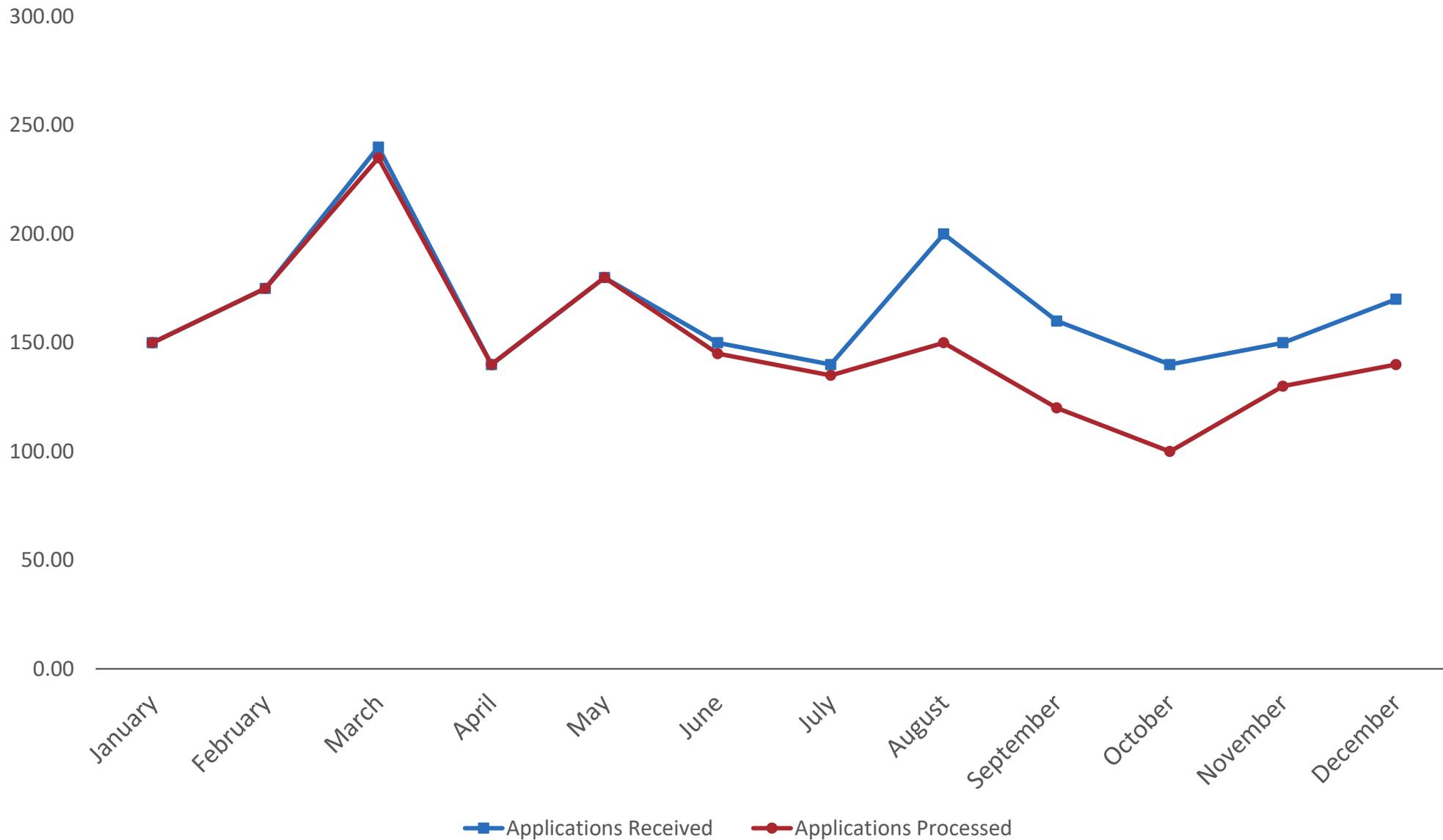


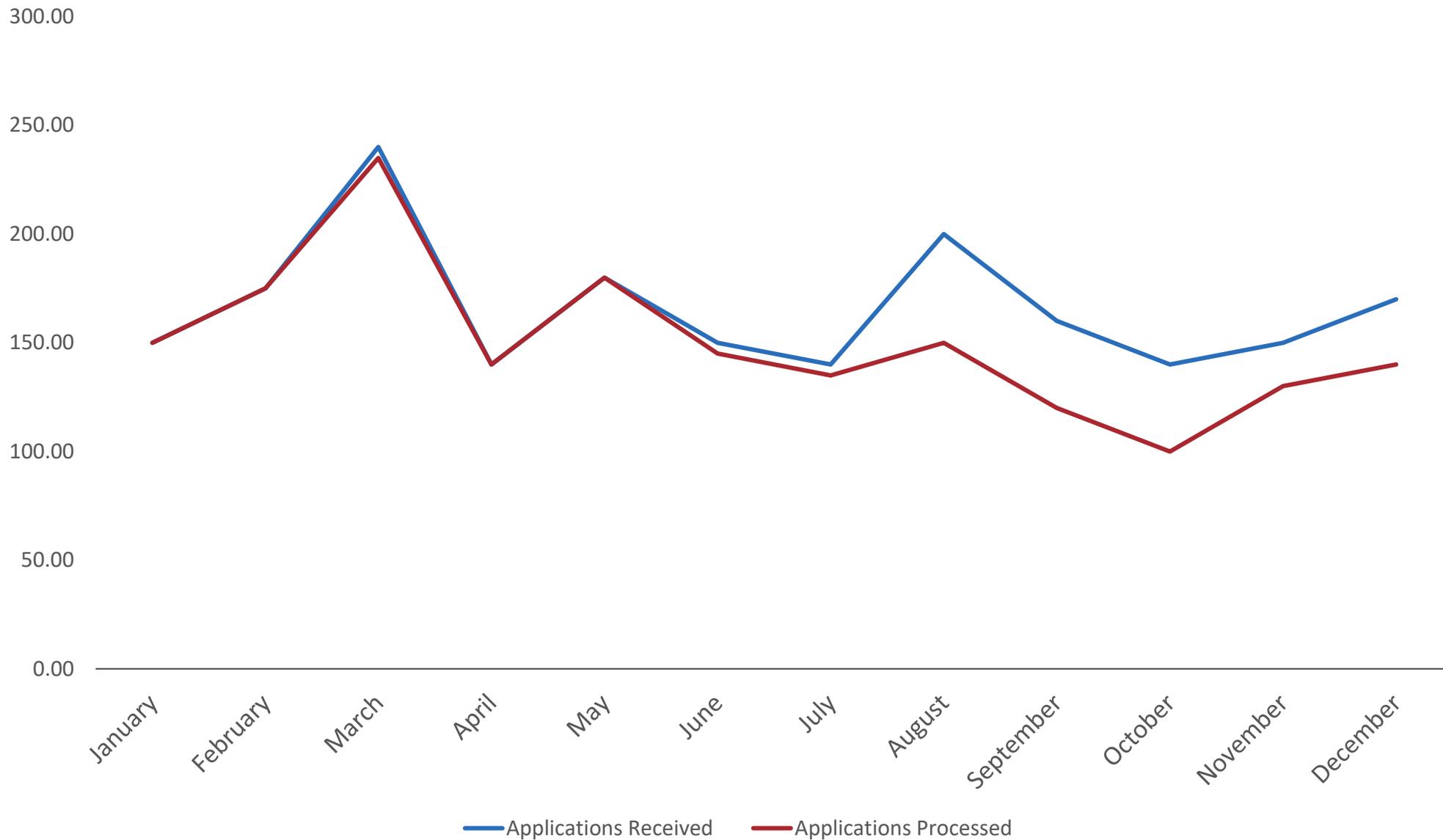
...split into small multiples

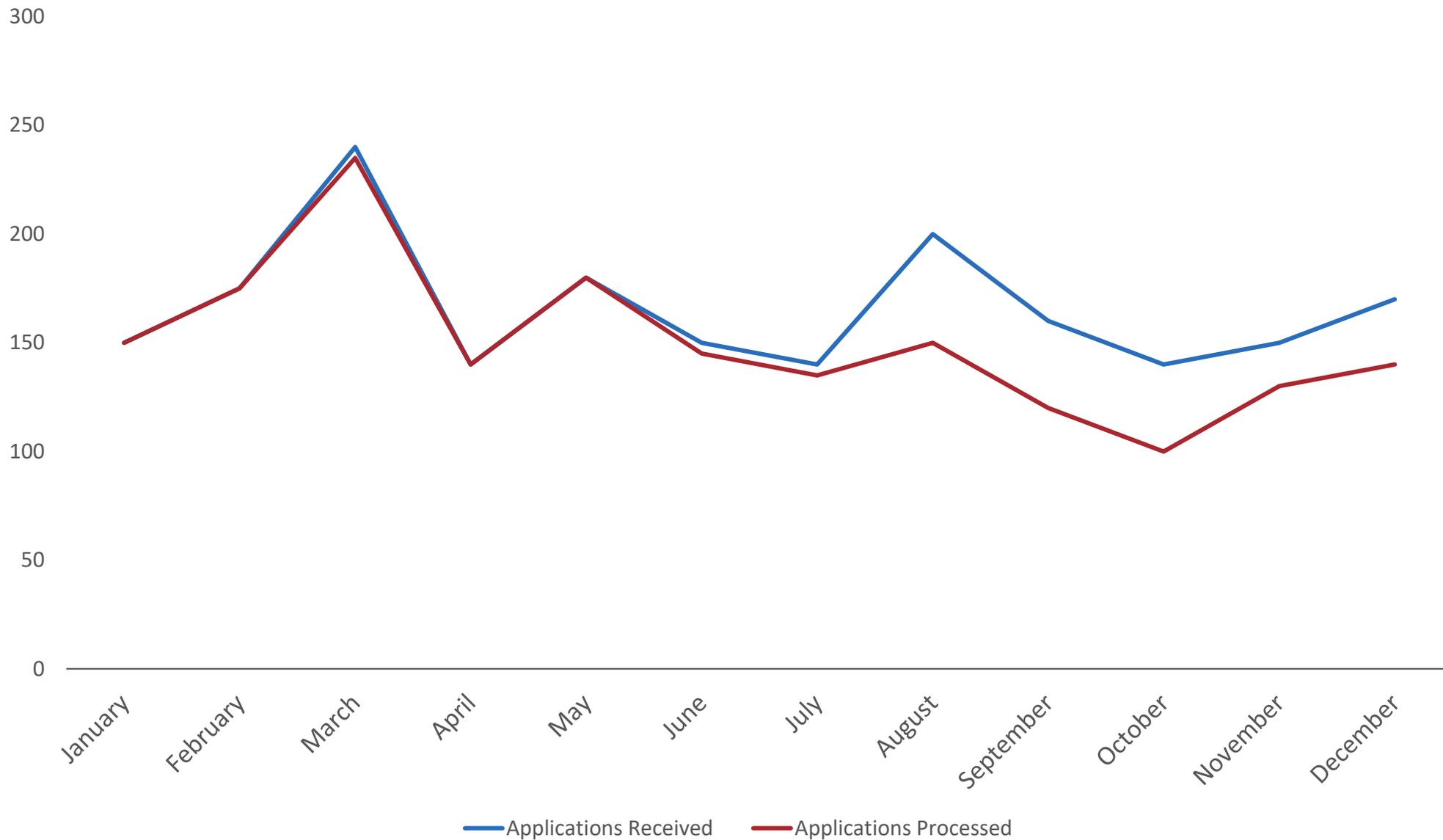


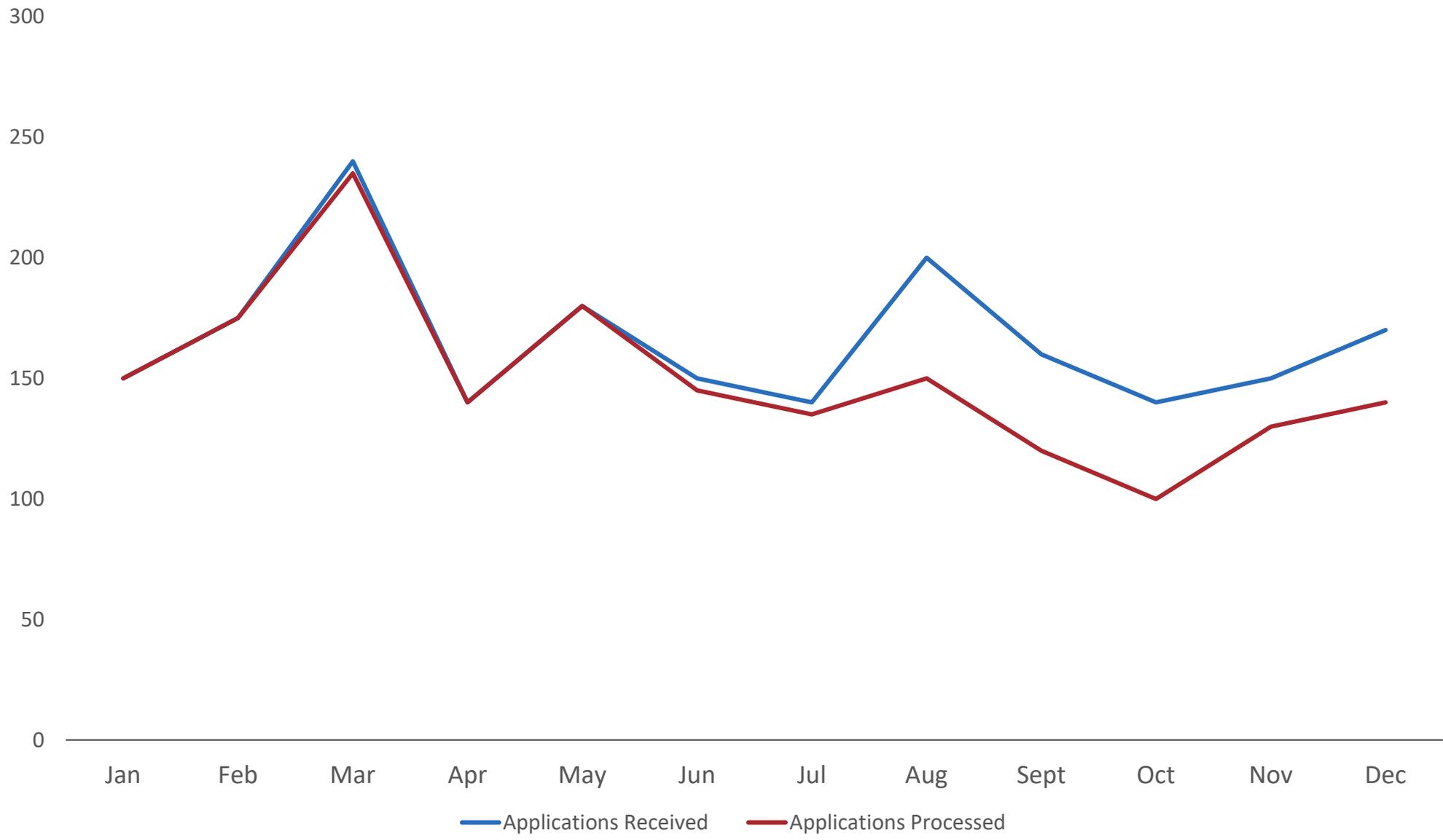


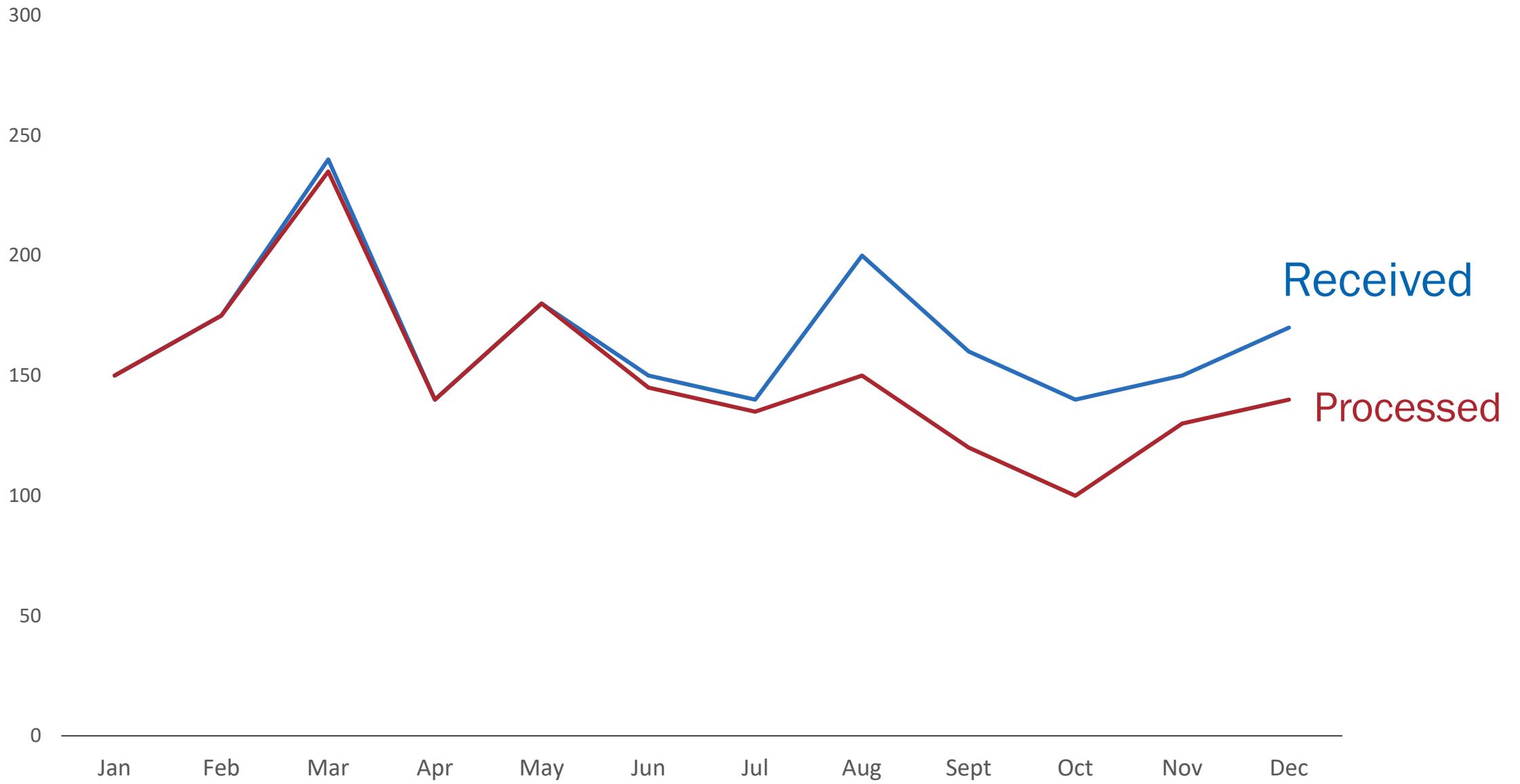




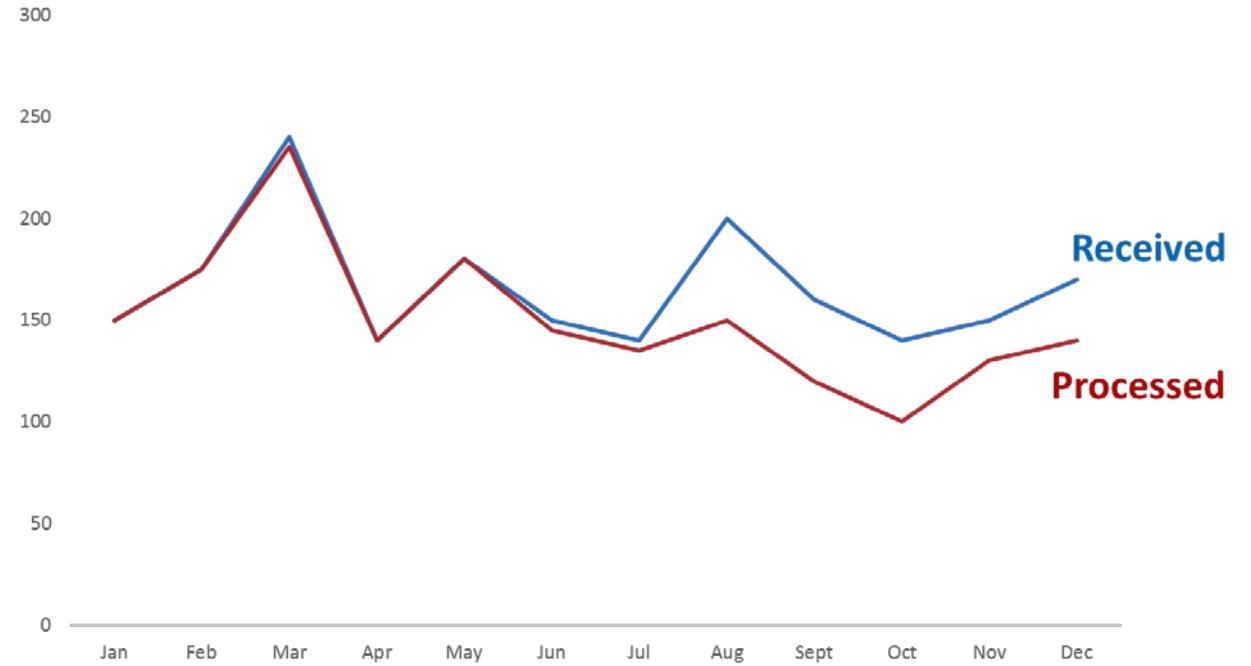
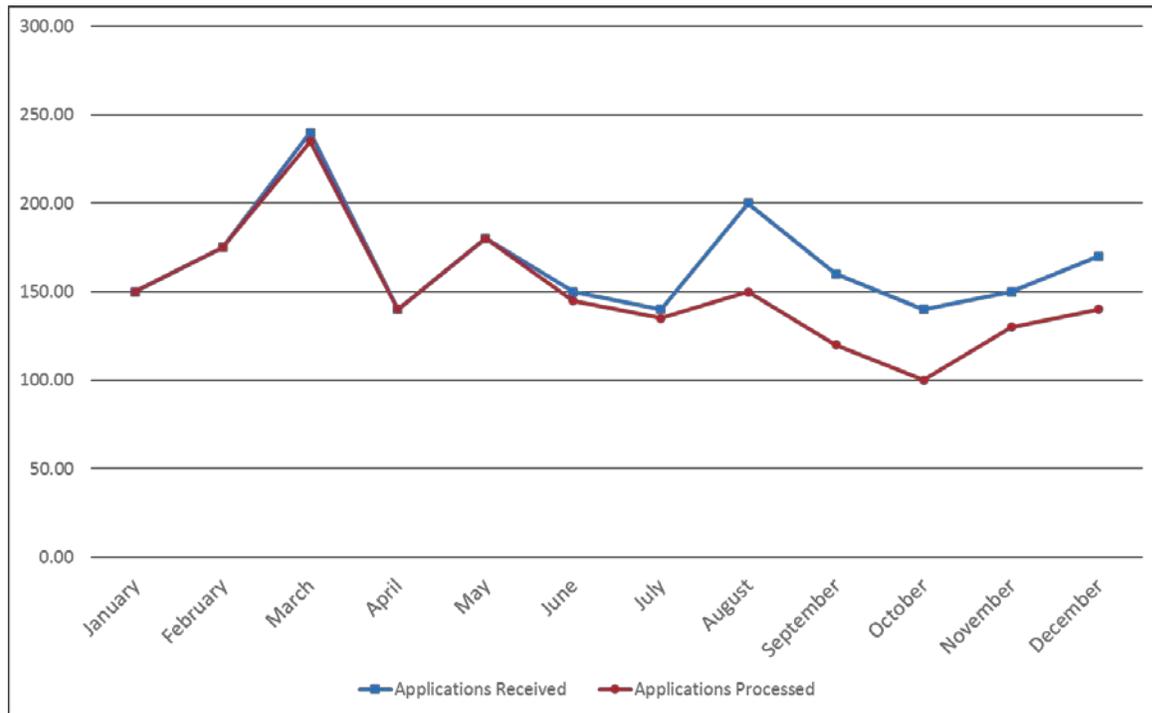








Cluttered / Decluttered



Strategically Draw Attention (to where you want it to go)



Emphasize with Color

Where are your eyes drawn to first?

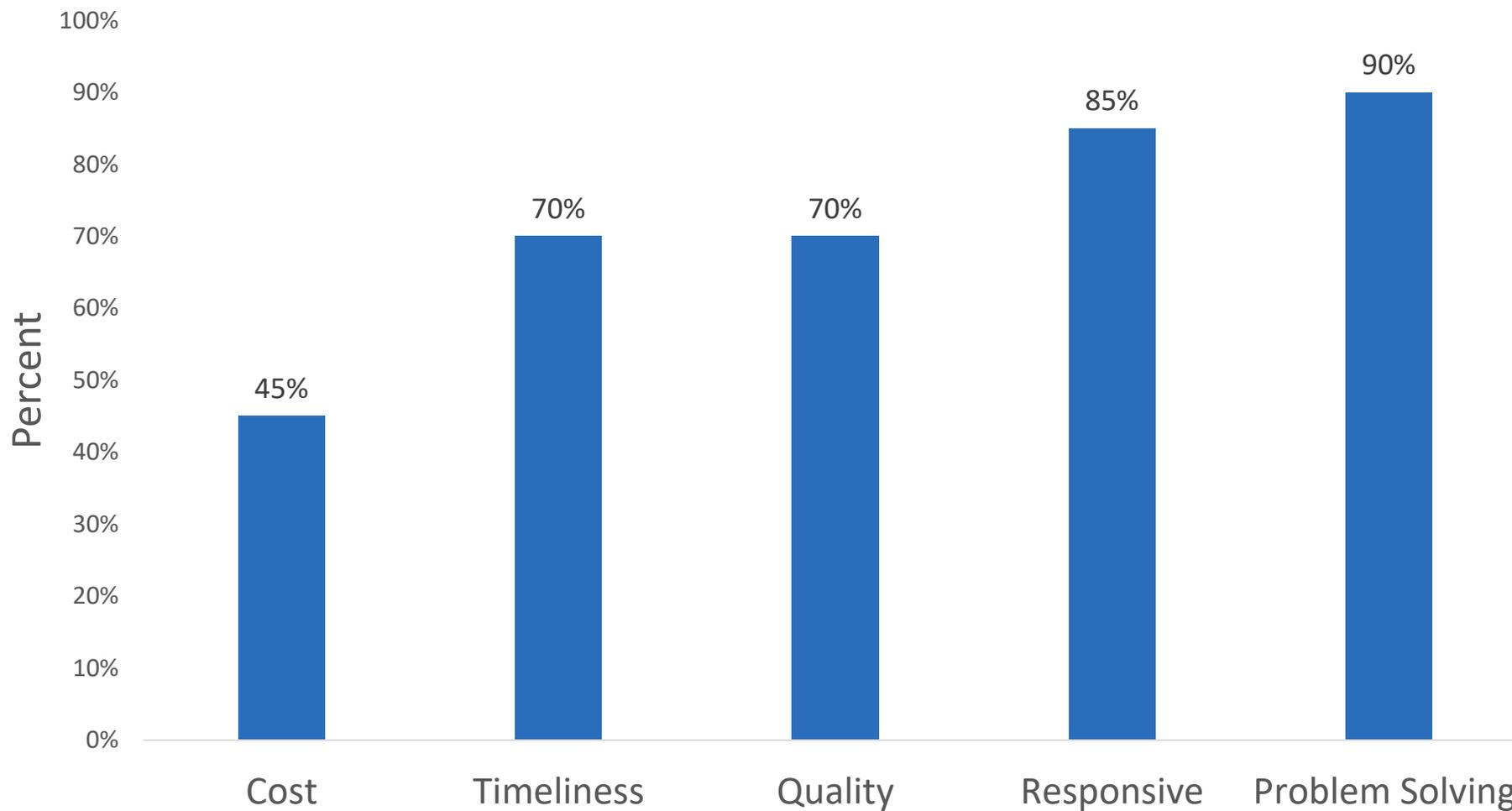






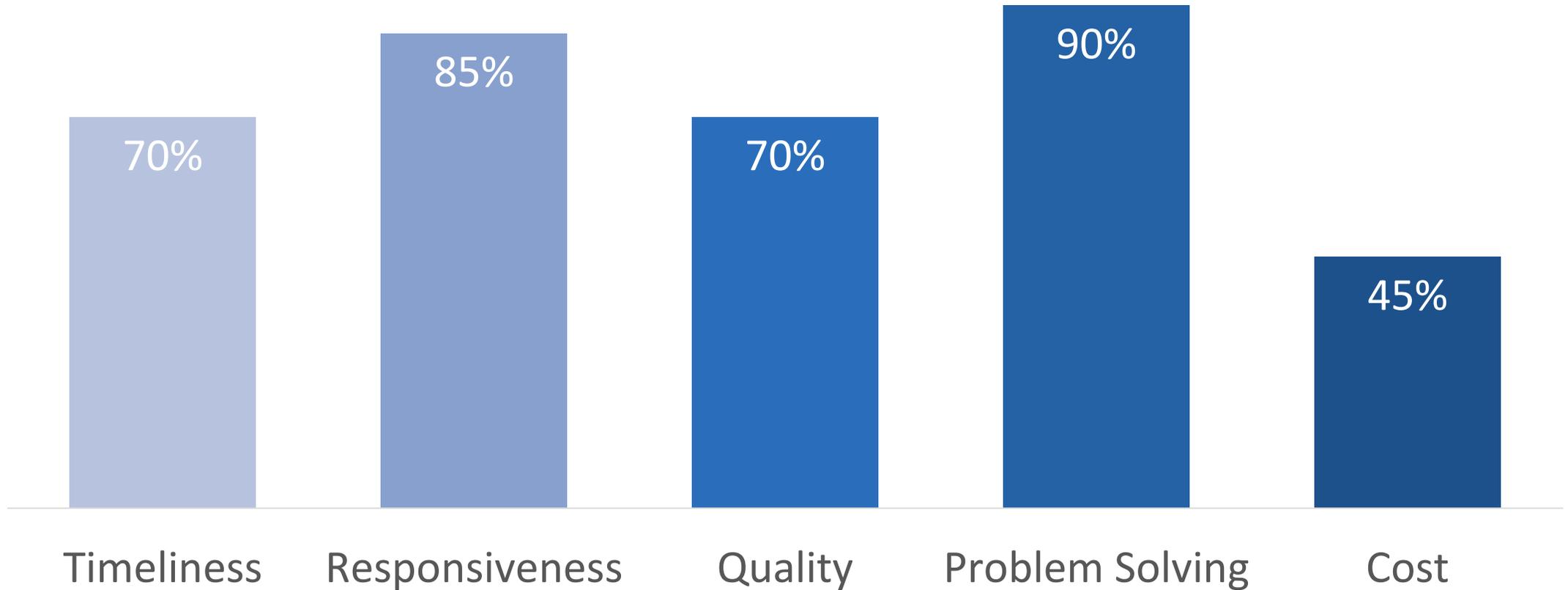
Annual Customer Survey

(percent of responses favorable)



Annual Customer Survey: Results Overview

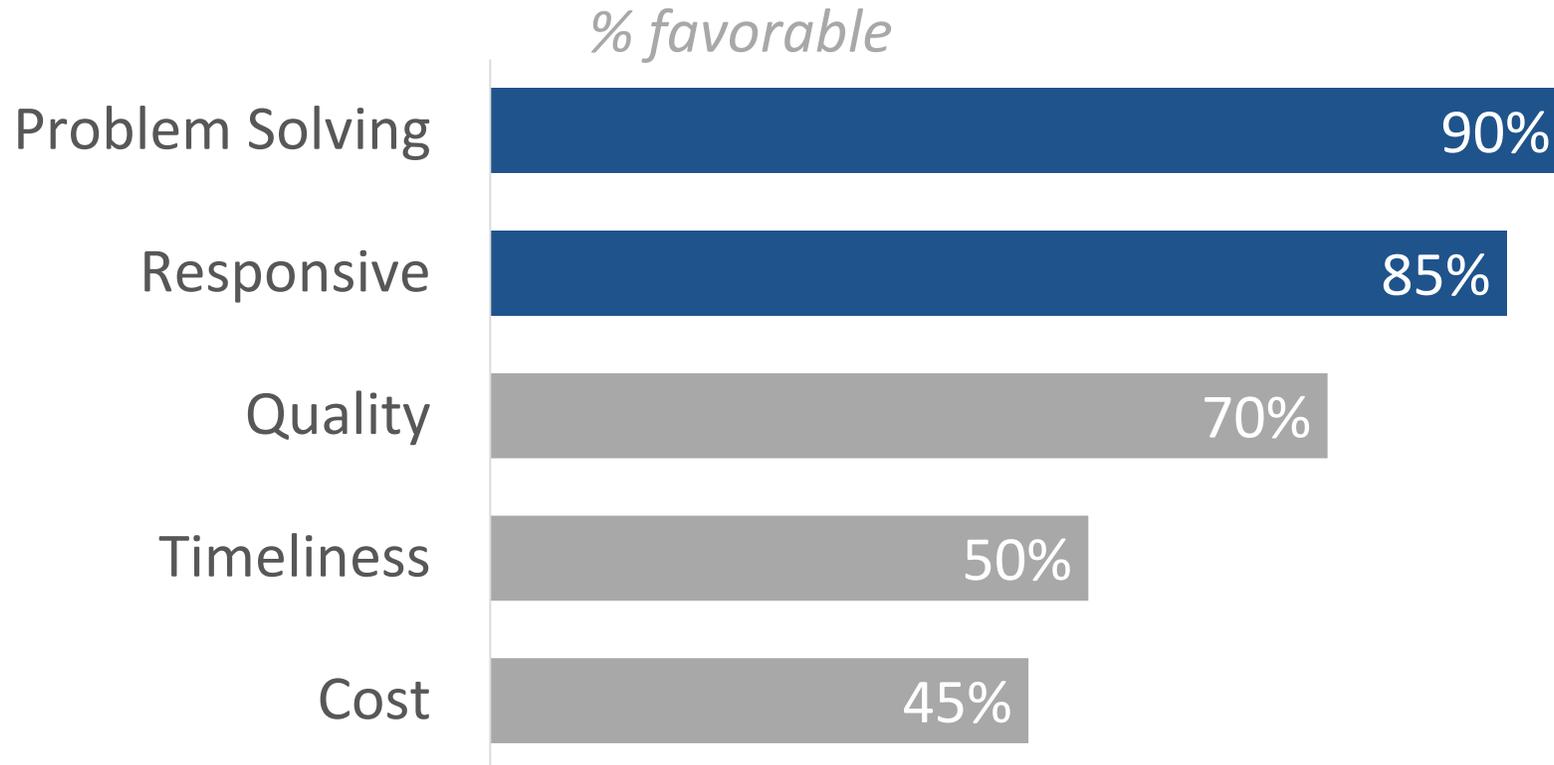
% favorable



Celebrate our Success!

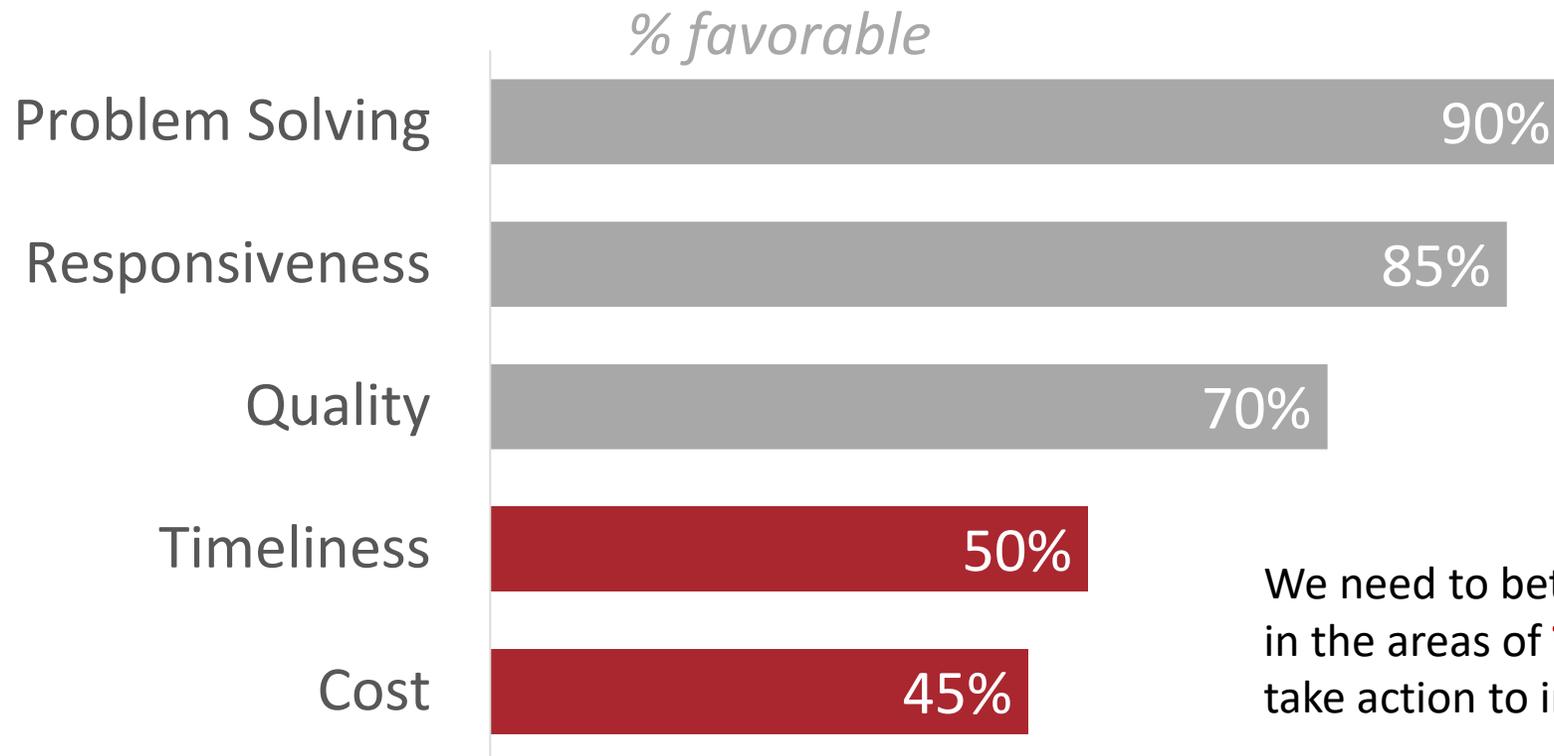
Survey Respondents are highly satisfied with Procurement Services **Problem Solving** and **Responsiveness**

Annual Customer Survey: Results Overview



...However there also are **areas in need of change**.

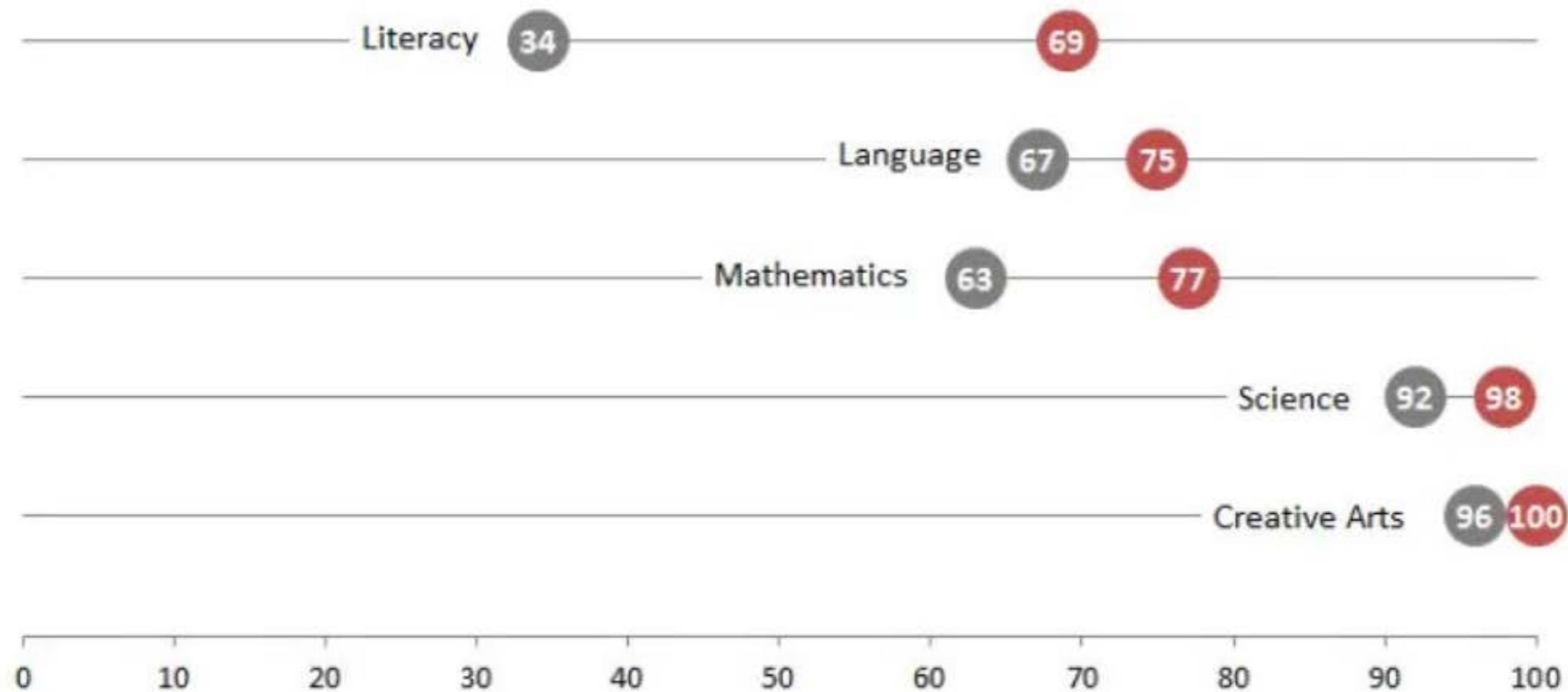
Annual Customer Survey: Results Overview



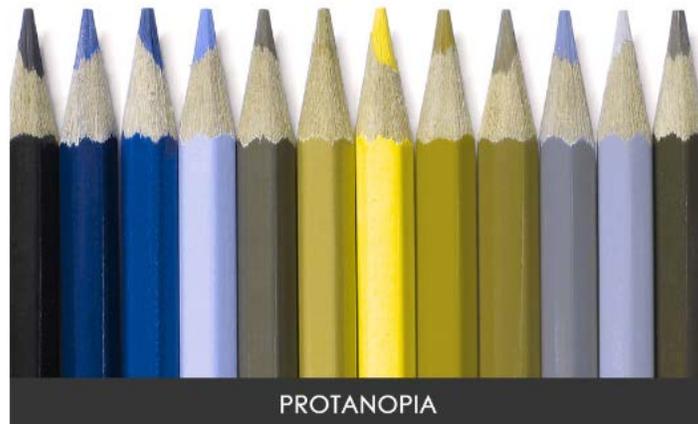
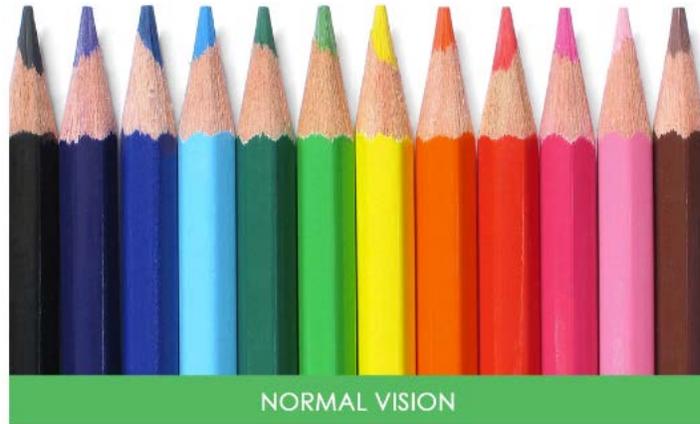
We need to better understand low scores in the areas of **Timeliness** and **Cost**, and take action to improve where we can

Kindergarten readiness increased between Fall and Spring.

Minimum entry requirement: 65% in all areas.



Ensure legibility for colorblindness

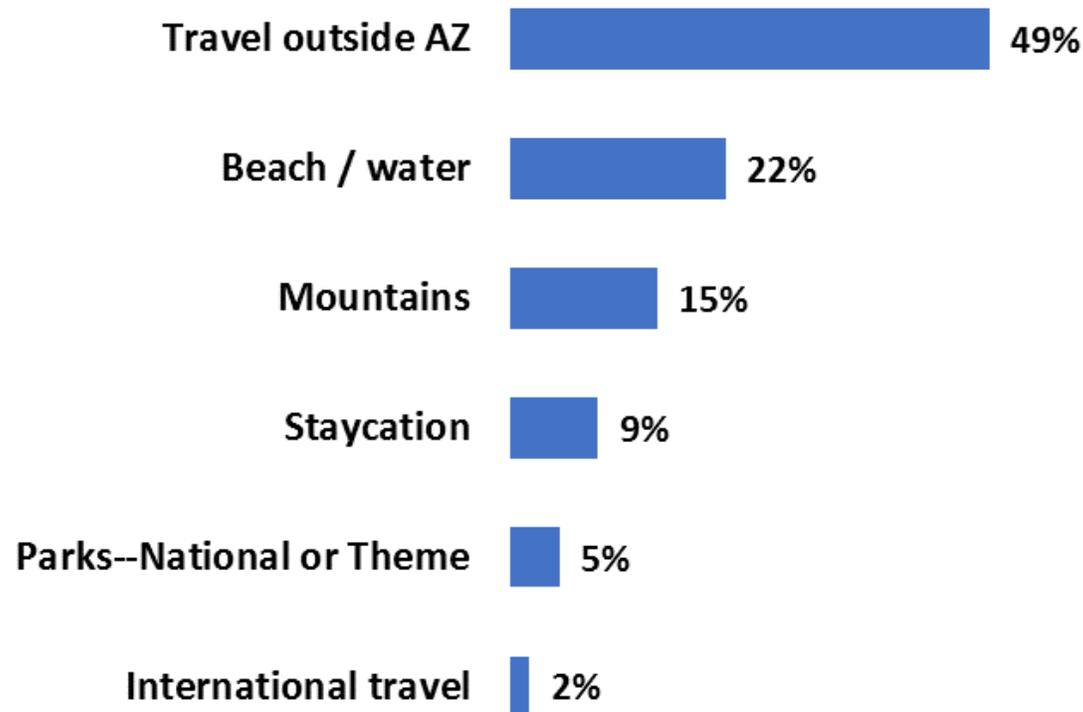


Tell a Story

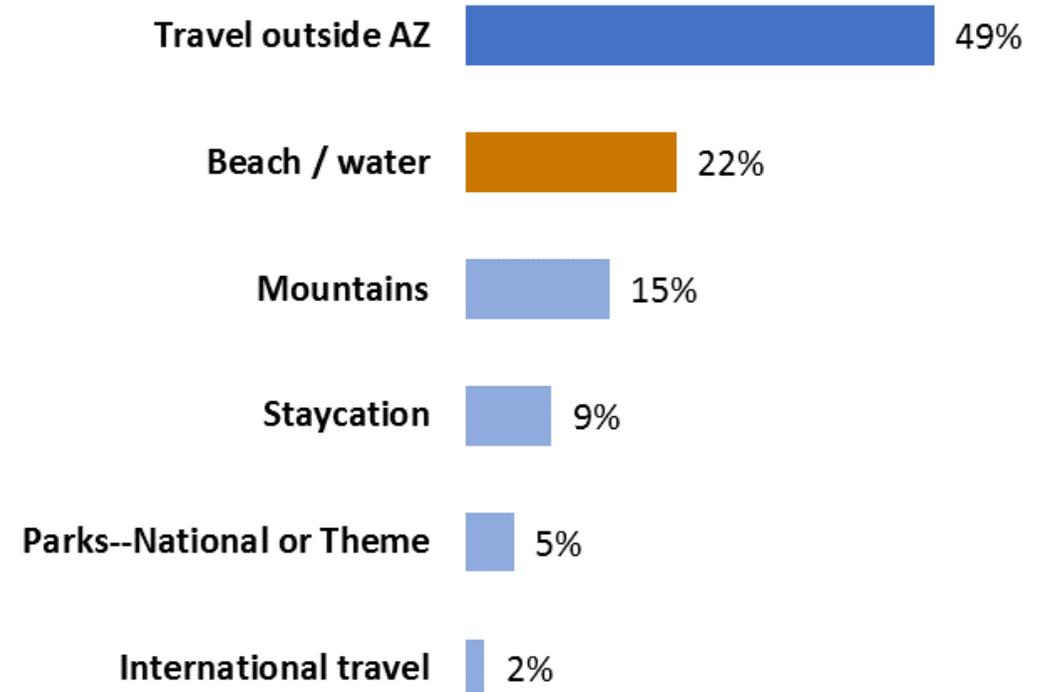


Present as-is, or tell a story

Preferences to escape the Arizona summer heat based on a survey of staff in July 2017 training class.



Travel outside AZ to visit friends / family and **go to the beach** were the most favorite things to do to escape the Arizona summer heat among COM staff surveyed.

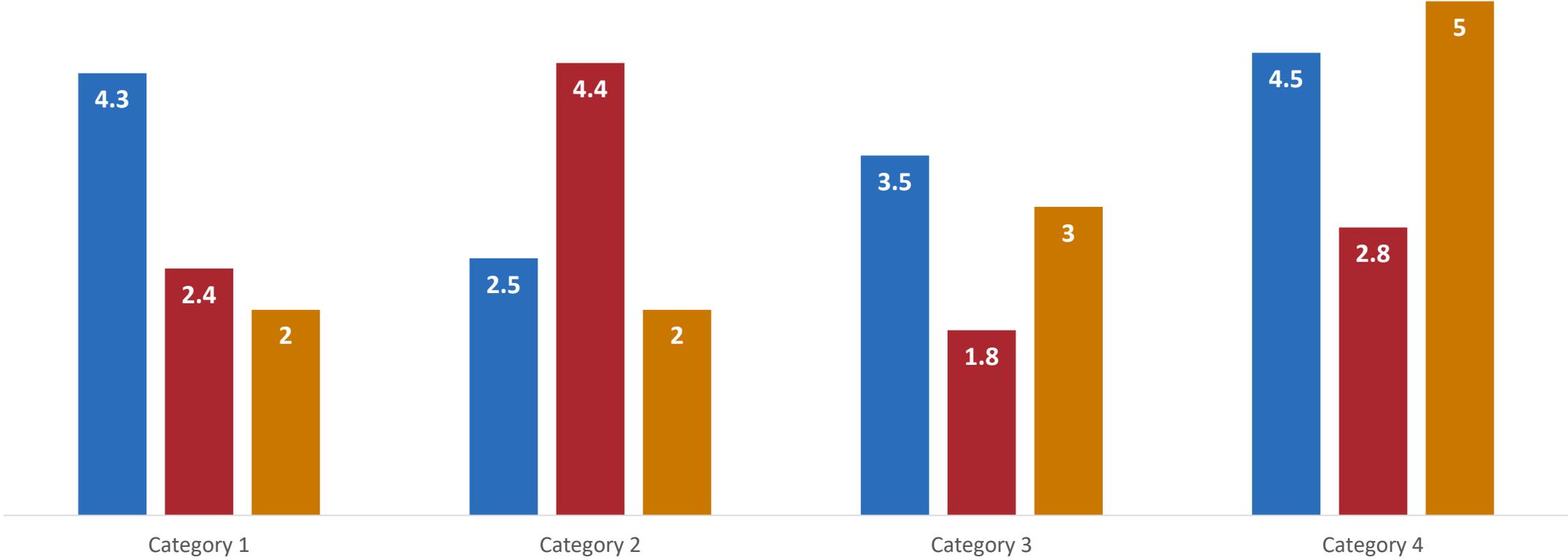


titles, subtitles, annotations

“strong titles are the biggest bang for your buck”

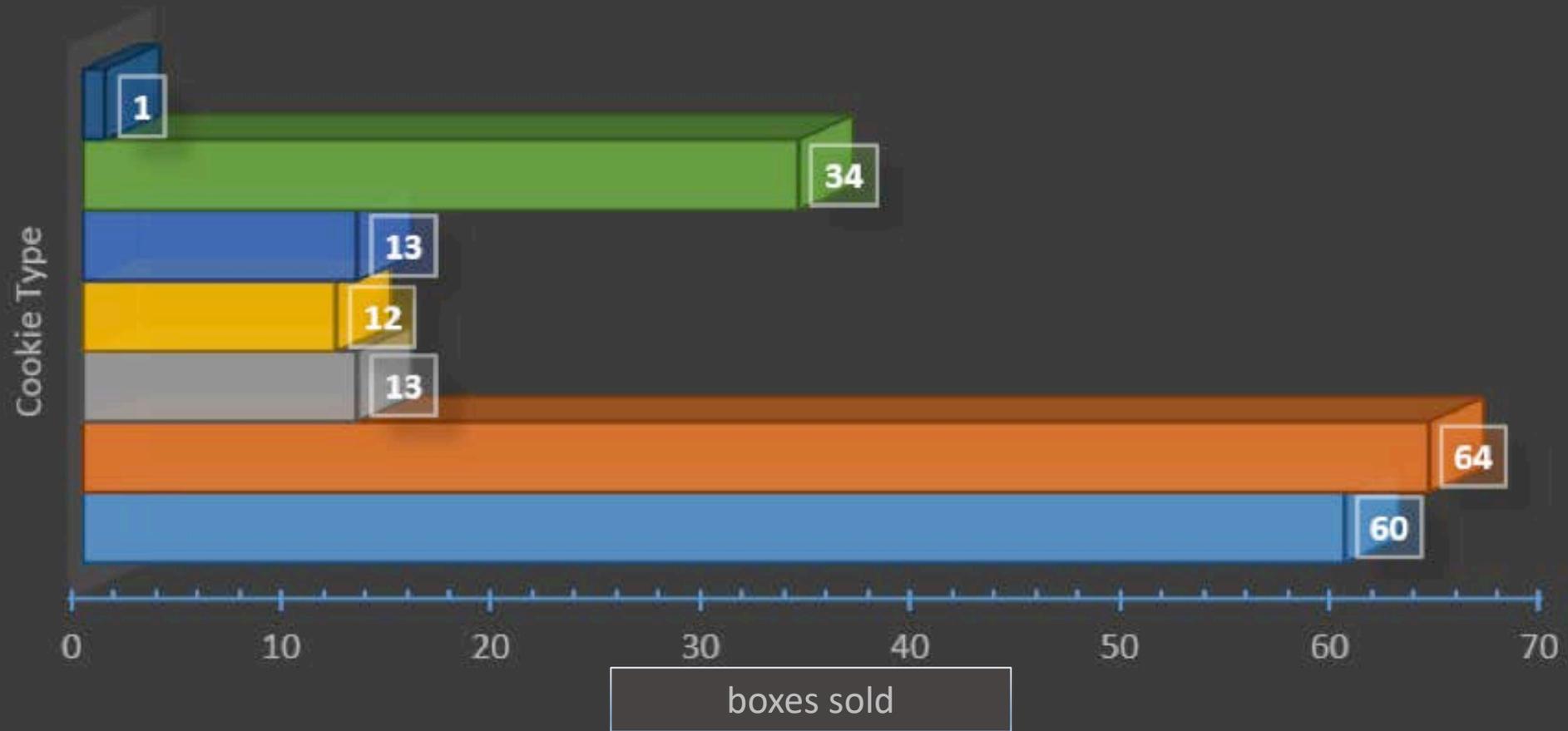
--Stephanie Evergreen

Chart Title



FAVORITE GIRL SCOUT COOKIES

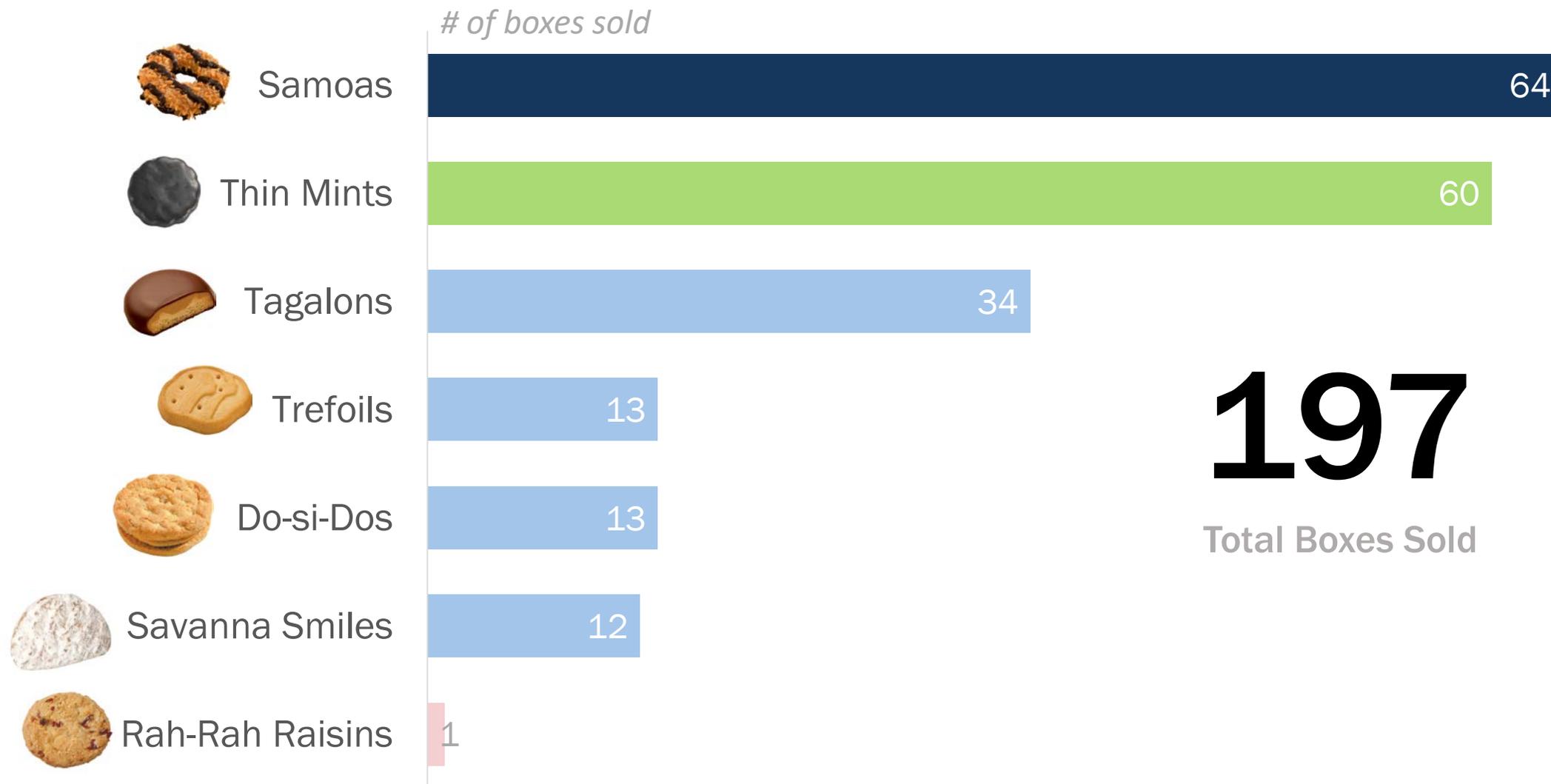
Rah-Rah Raisins Tagalons Trefoils Savanna Smiles Do-si-Dos Samoas Thin Mints



This year in our neighborhood, Girl Scout Cookie sales remained strong.

Samoas were the most popular cookies, while **Thin Mints** came in a close second.

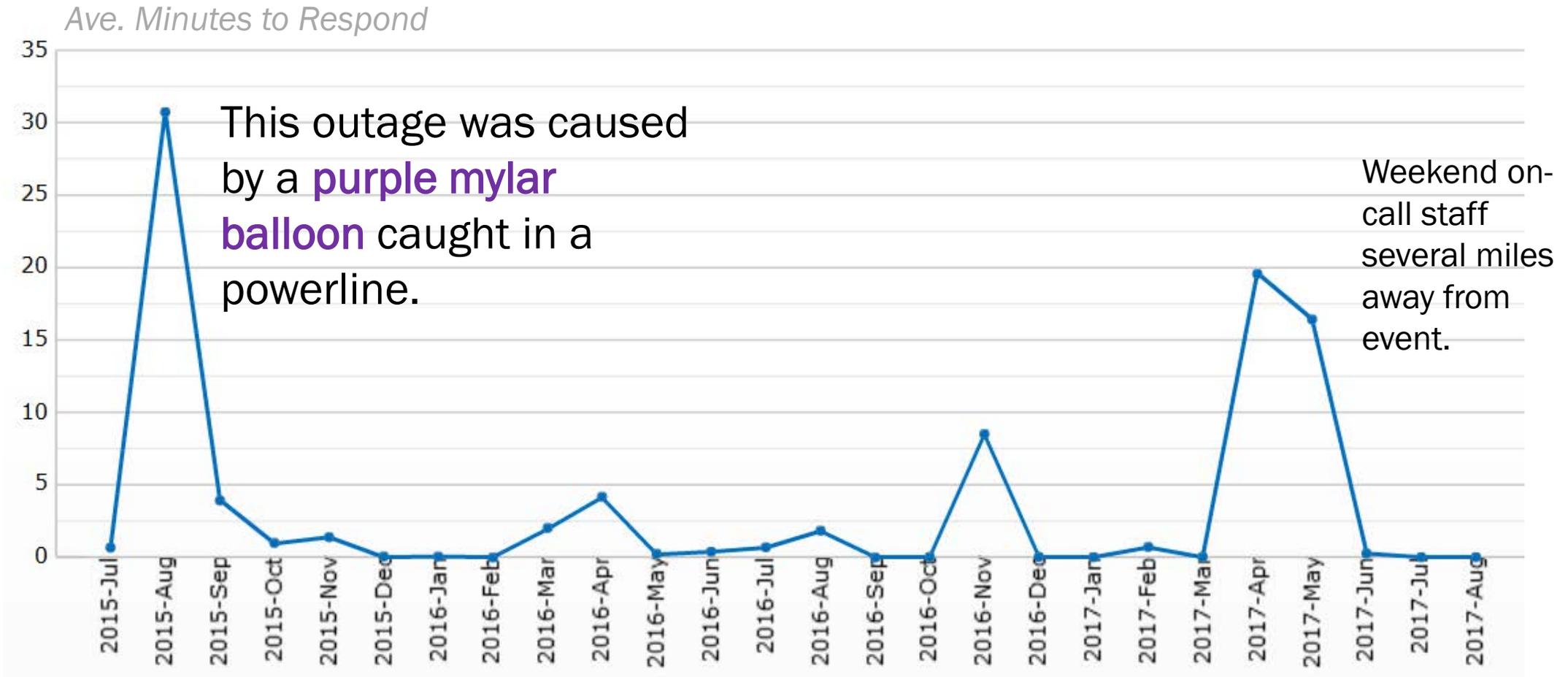
Not too much “rah rah” for the **Rah-Rah Raisins**.



197
Total Boxes Sold

Responding to Power Disruptions

Electric service customers may experience power disruptions throughout the year, however, those are rare events. When they do happen, Energy Resources Department responds in a timely manner.

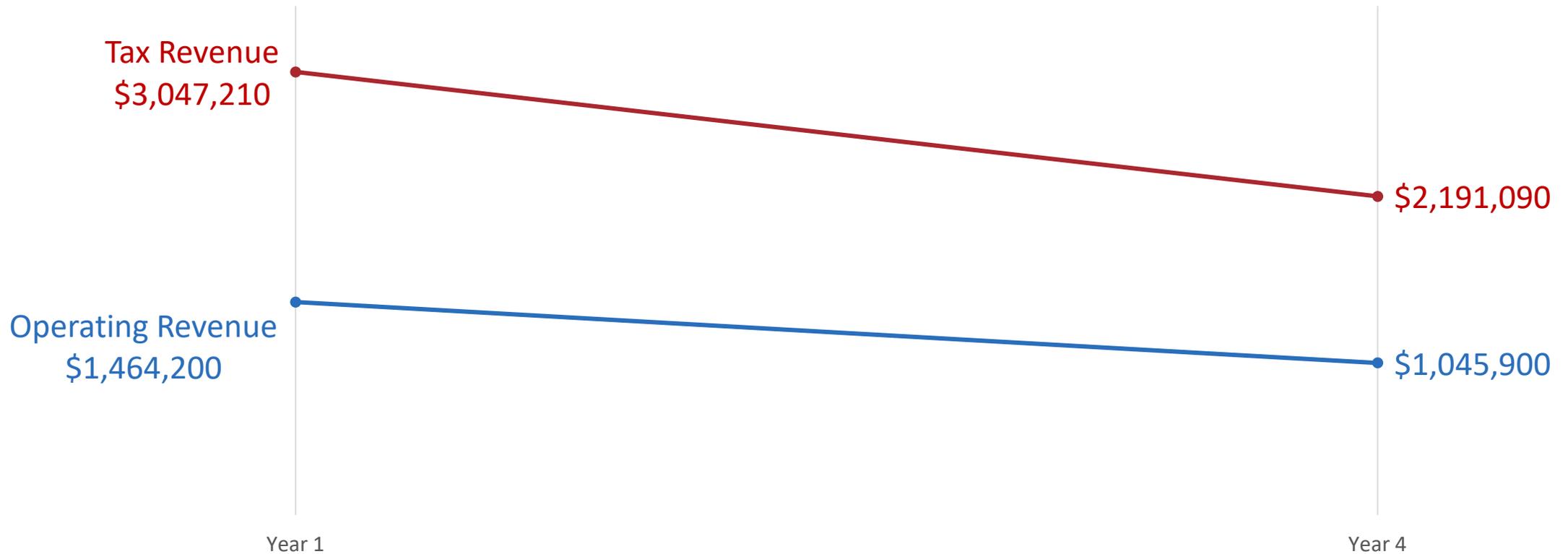


Before / After Makeovers

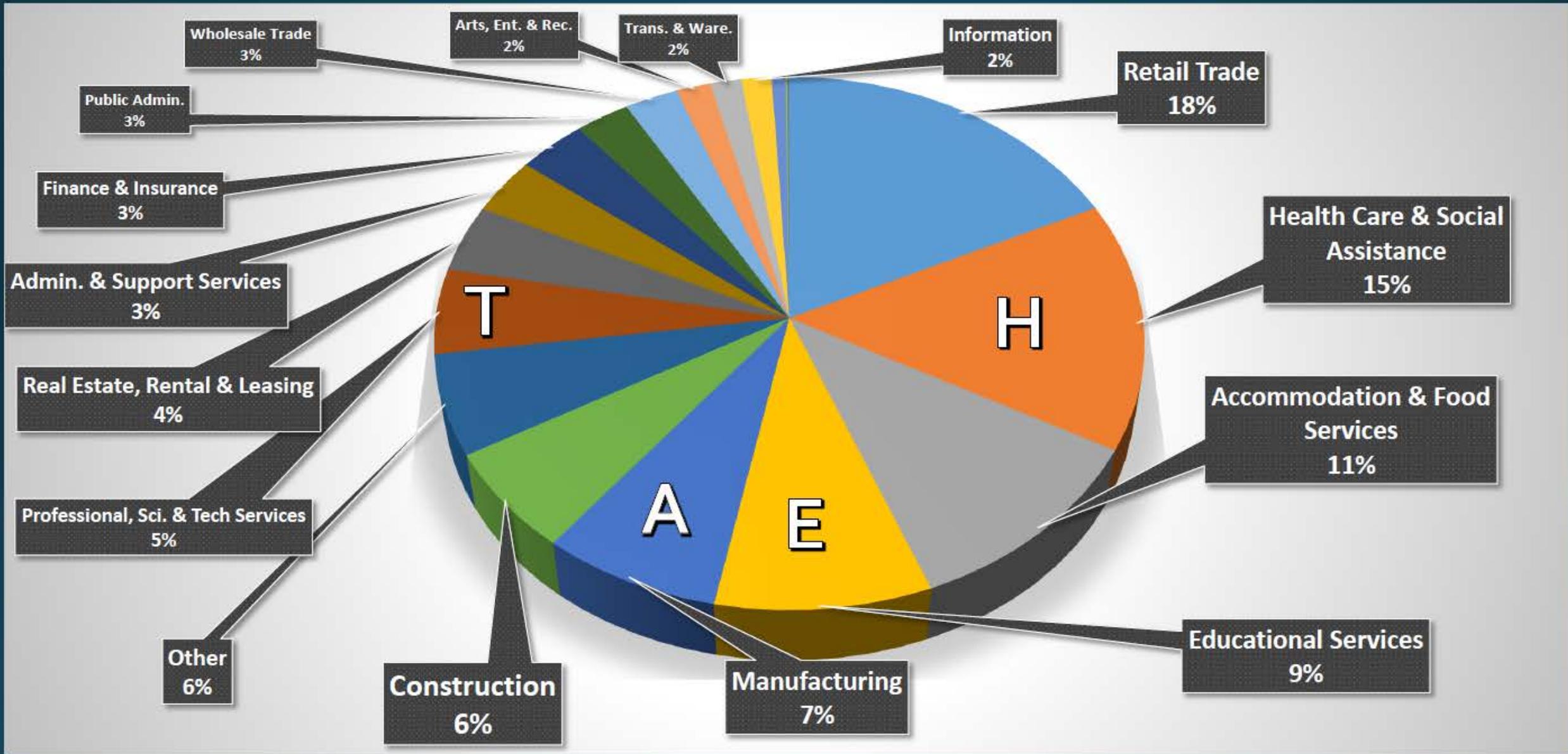


Building a Baseball Park

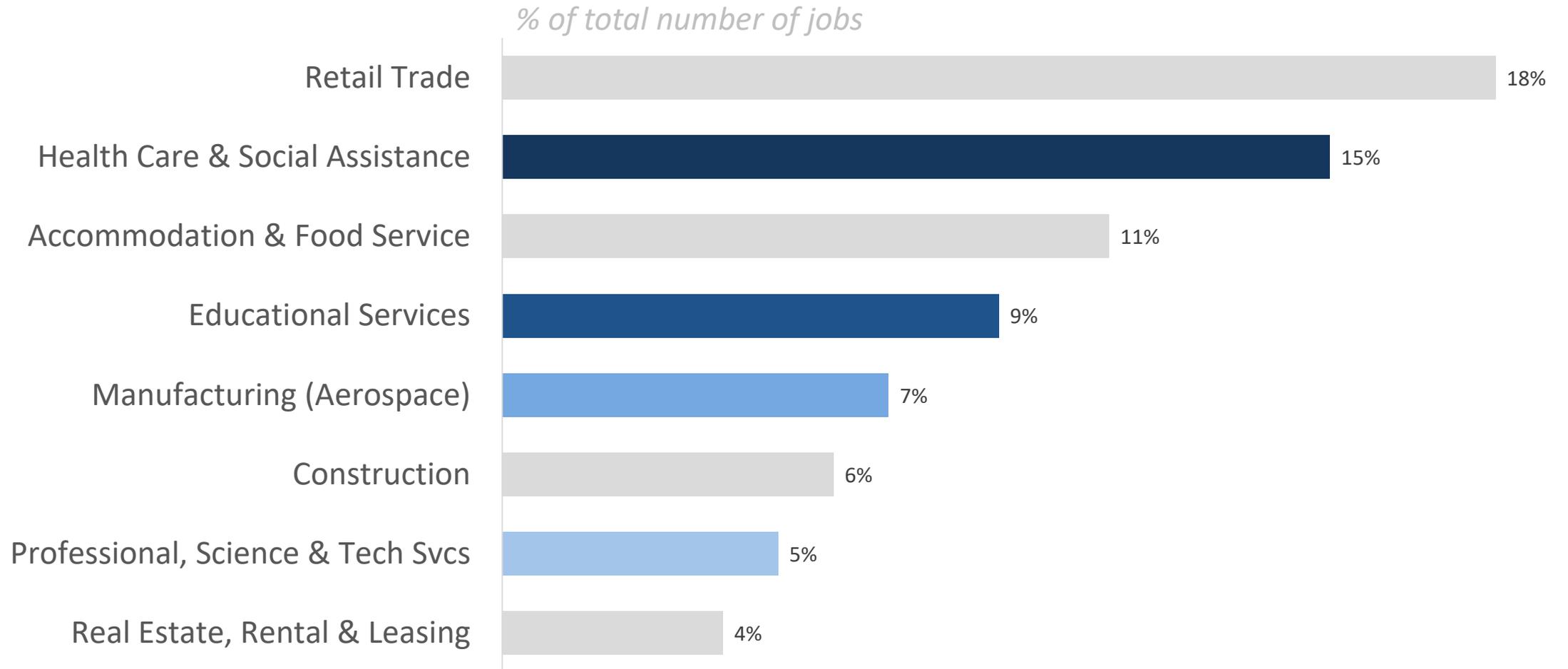
In the most recent long-term revenue estimates for the new baseball park currently under construction, annual revenues (post-construction) received from on-going **Operations** and from **Tax** collections are **projected to drop significantly** from Year 1 to Year 10.



2015 - Mesa Industry Breakdown - By Number of Jobs



Mesa's Economic Development focuses on growing four industry sectors: **Health Care**, **Educational Services**, **Manufacturing (Aerospace)**, and **Science & Tech Services**. In 2015, these were among the top industry sectors in terms of percent of total jobs.



Effective communication with data is premised on:

simplicity

(complex notions simplified to save time for audience);

transparency

(visual honesty and responsibility in sourcing);

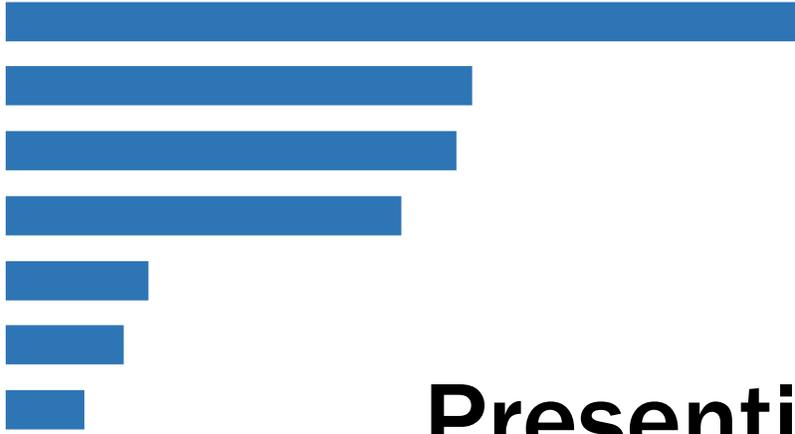
sociability

(easily shared and improved);

creativity

(design that is memorable and understandable)

Source: Edelman Group, 2015



**Presenting data effectively is about
your audience and your message**

**Capture their attention,
and inspire action**

Questions?

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Dark Desert Highway



- on a dark desert highway
- cool wind in my hair
- warm smell of colitas
- rising up through the air
- up ahead in the distance
- I saw a shimmering light
- my head grew heavy
- and my sight grew dim
- I had to stop for the night
- there she stood in the doorway
- I heard the mission bell
- and I was thinking to myself
- this could be heaven or

Thank you!

Presenting Data Effectively

NIGP Regional Conference 2018

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