



CDS 6324

DATA VISUALIZATION

Lecture 6: Dashboard Design and Data Storytelling

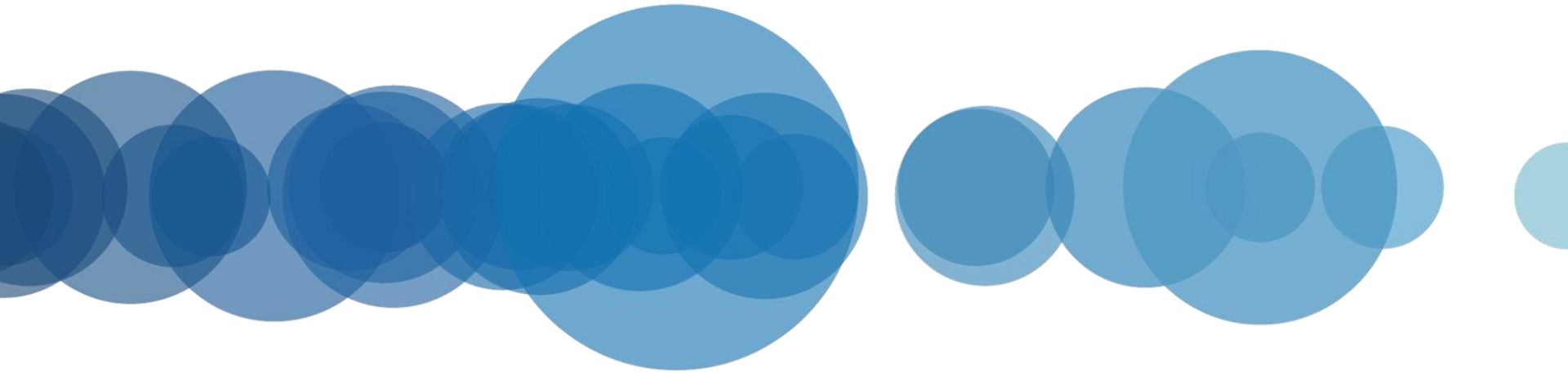
Compare and Contrast: Real-World Examples

Goals

By the end of this lecture, you should be able to:

- Compare and contrast real-world examples
- Explore redesigns to improve the visualization of the data
- Understand various issues encountered with certain chart types

Compare & Contrast

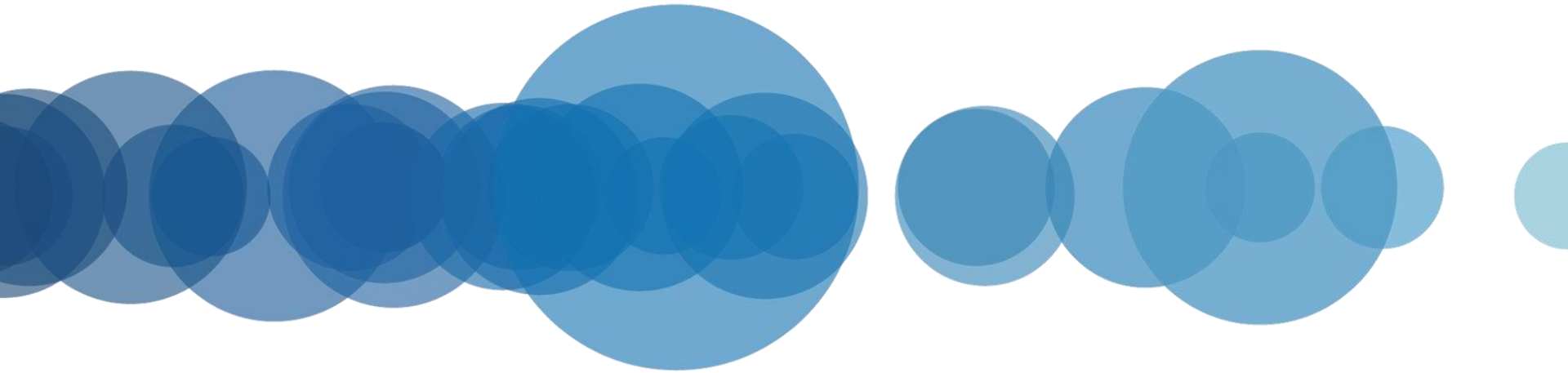


Remove

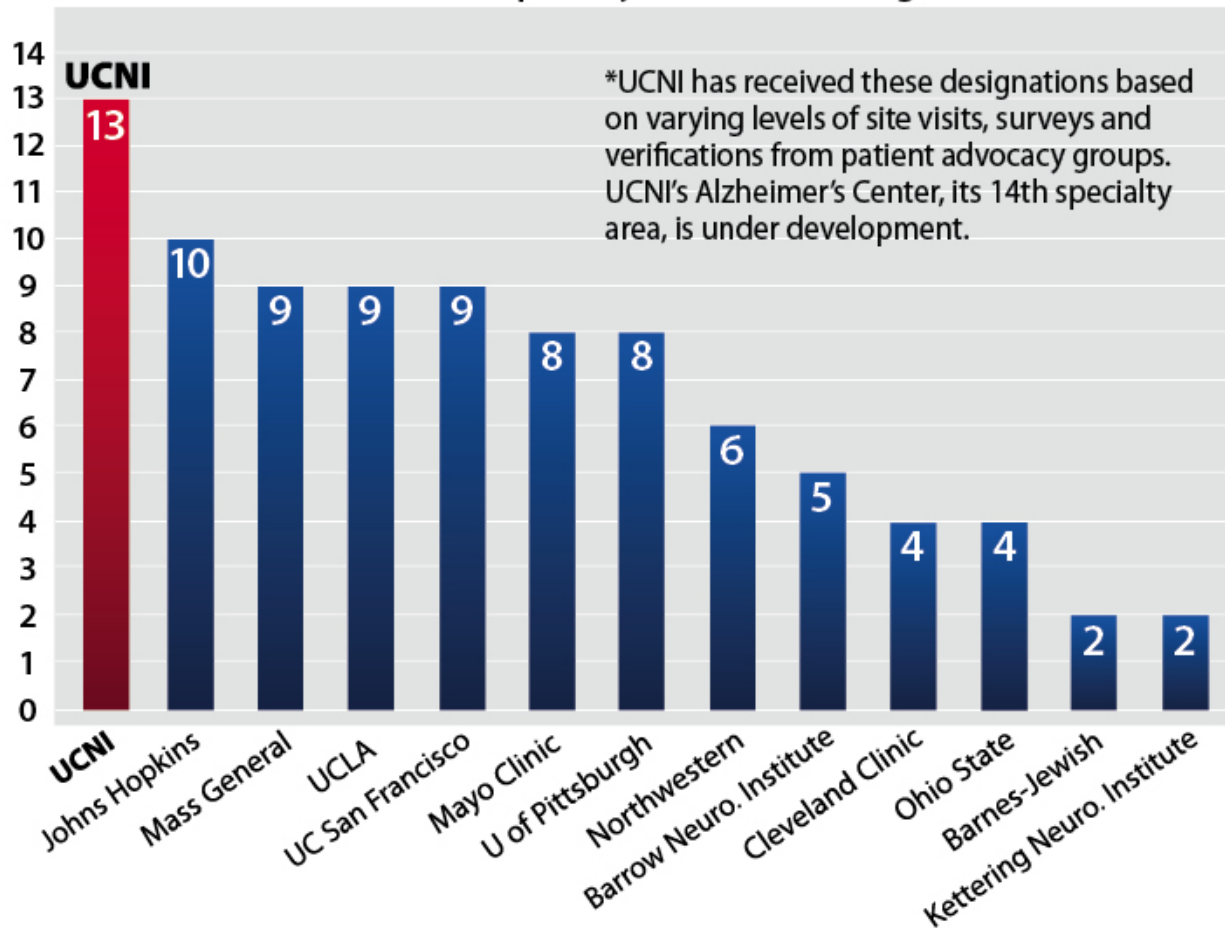
to improve
the **data tables** edition

Real-World Example

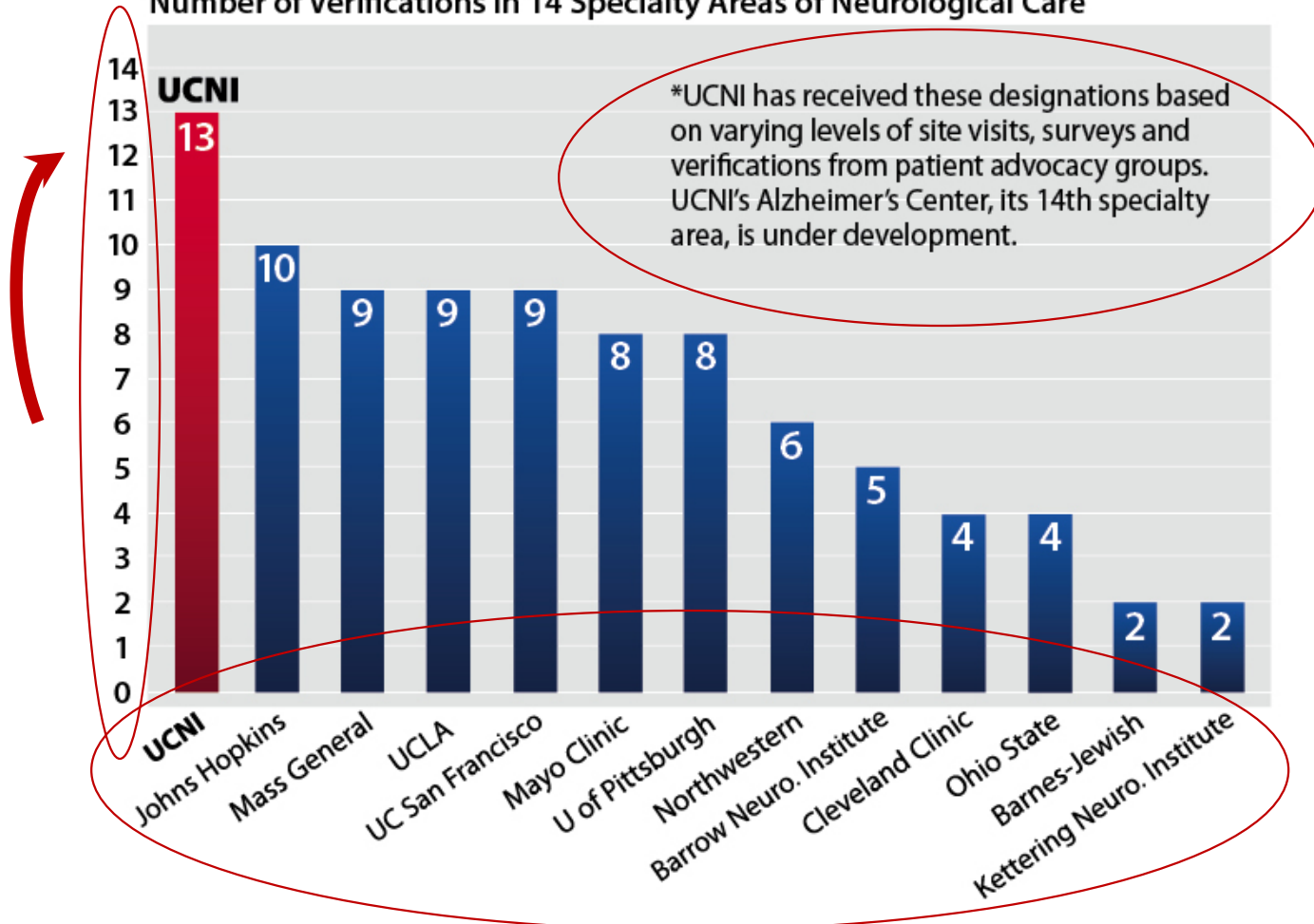
Highlight Table



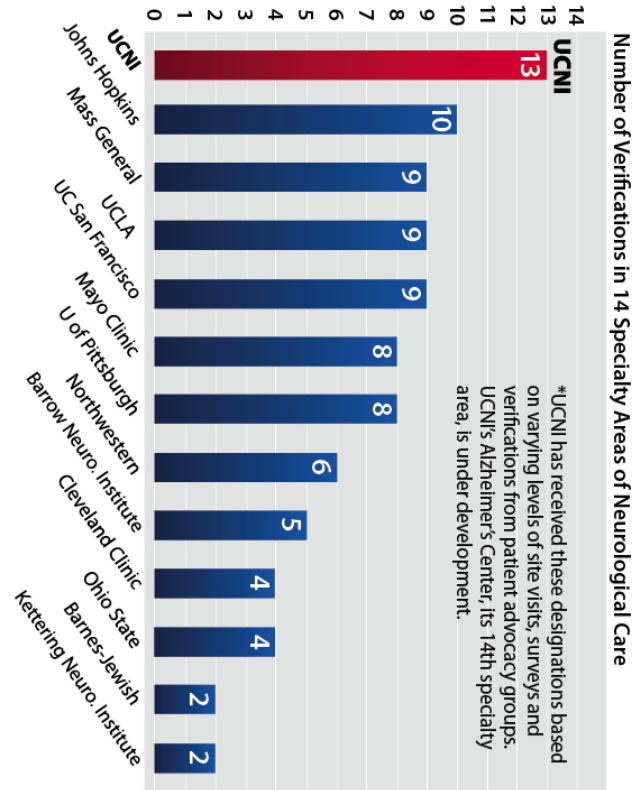
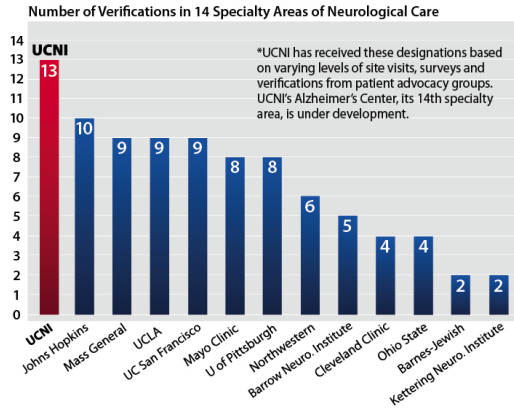
Number of Verifications in 14 Specialty Areas of Neurological Care



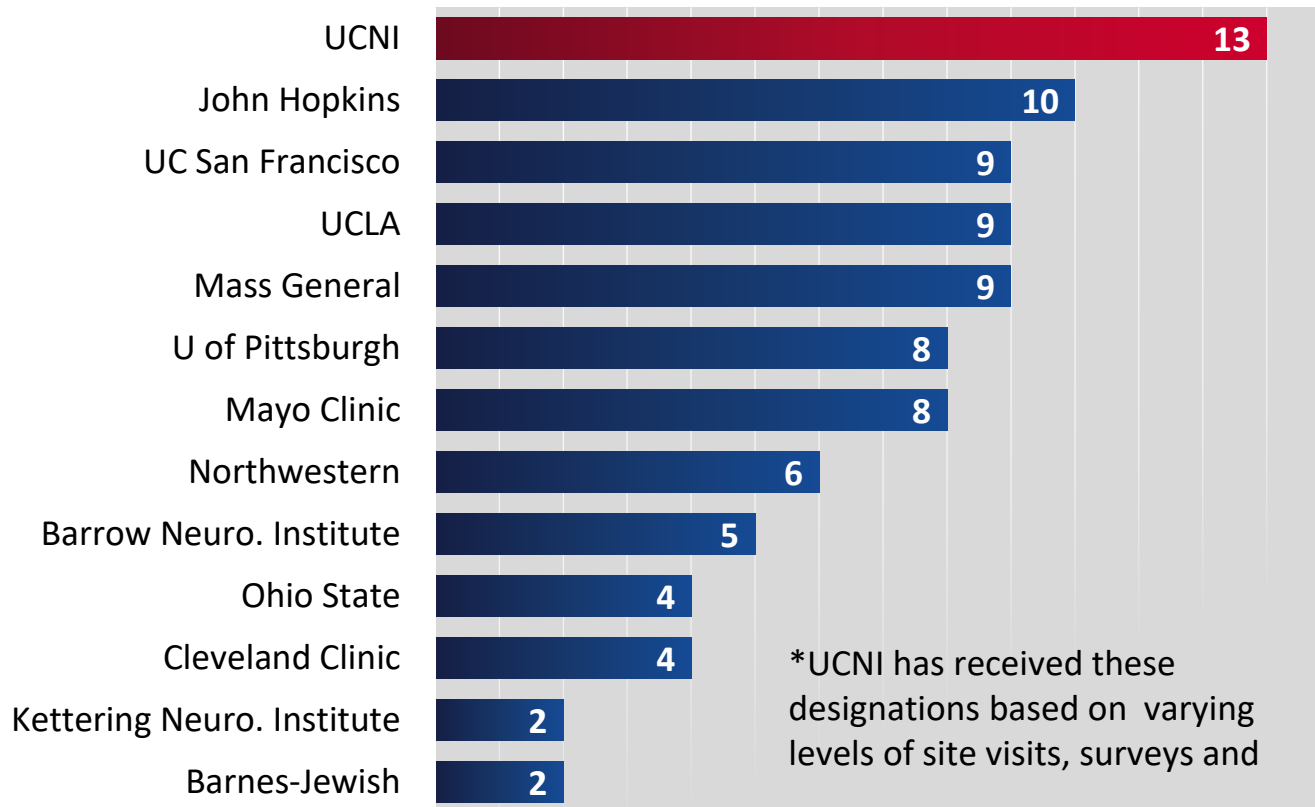
Number of Verifications in 14 Specialty Areas of Neurological Care



1. Make horizontal
2. Horizontal text
3. Remove Axis labels
4. Fix gridlines on top of paragraph
5. Change red color

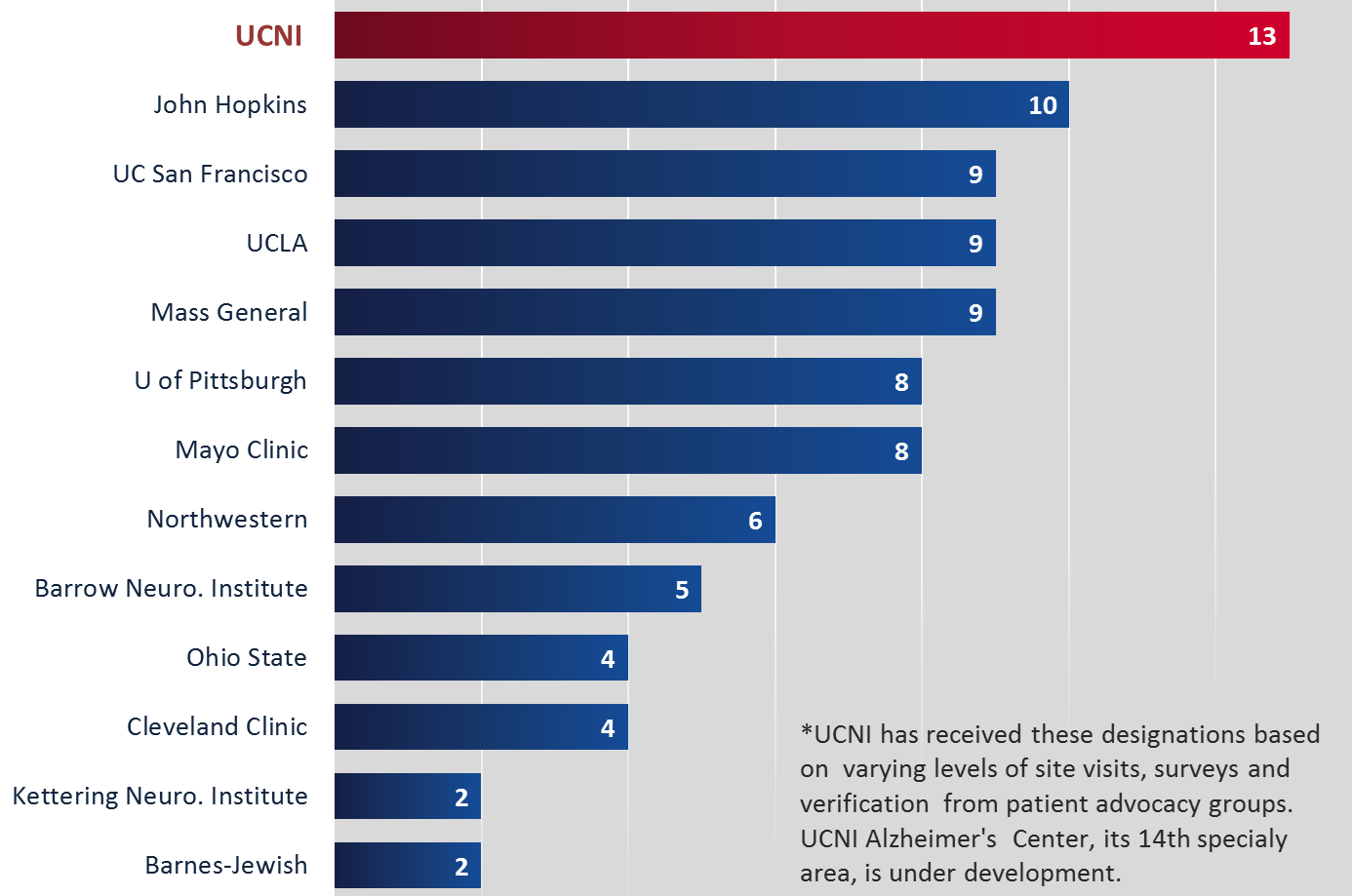


Number of Verifications in 14 Specialty Areas of Neurological Care

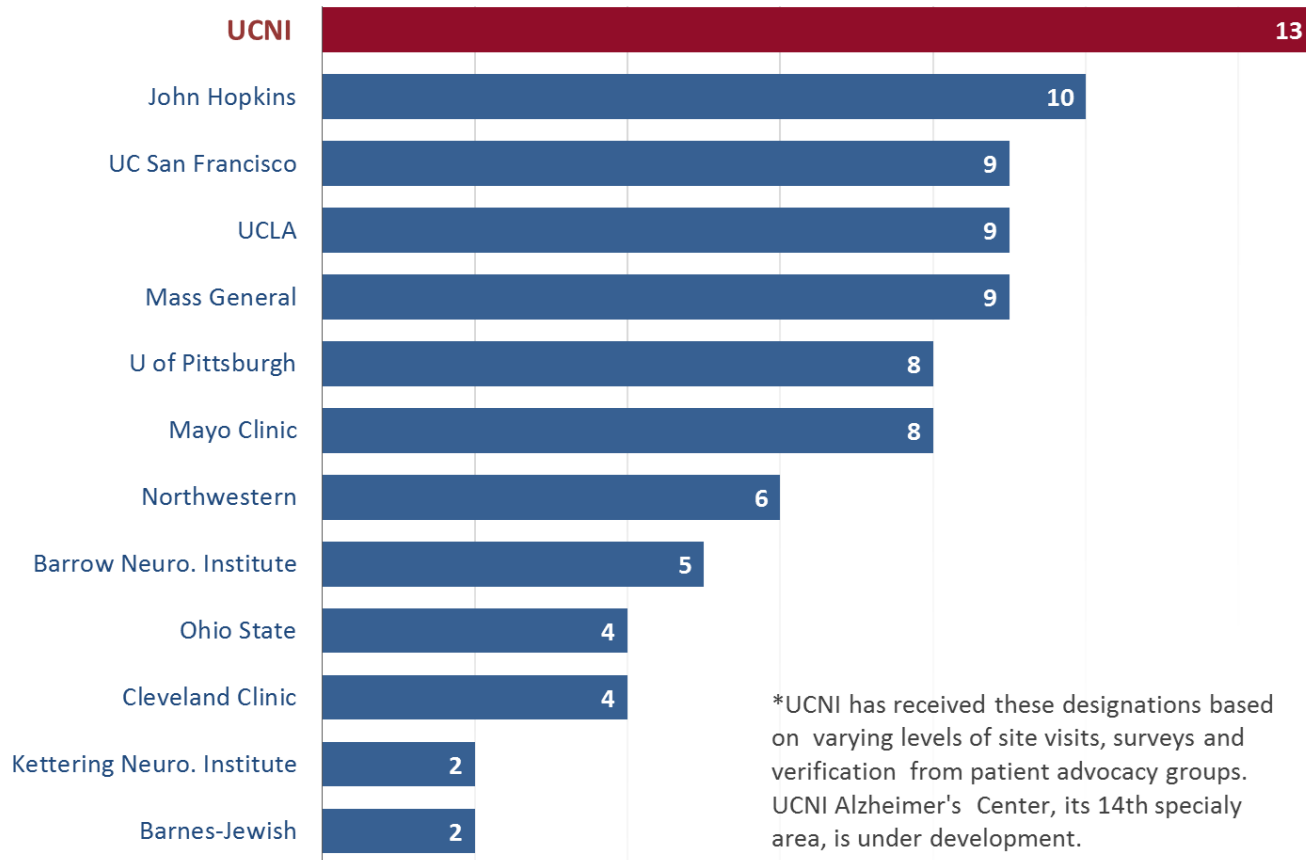




Number of Verifications in 14 Specialty Areas of Neurological Care



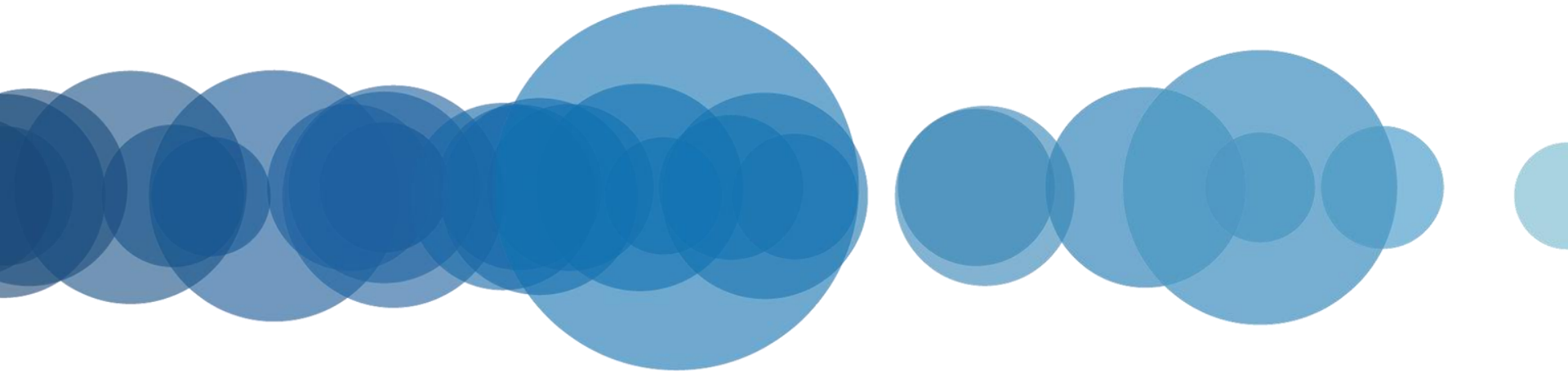
Number of Verifications in 14 Specialty Areas of Neurological Care



*UCNI has received these designations based on varying levels of site visits, surveys and verification from patient advocacy groups. UCNI Alzheimer's Center, its 14th specialty area, is under development.

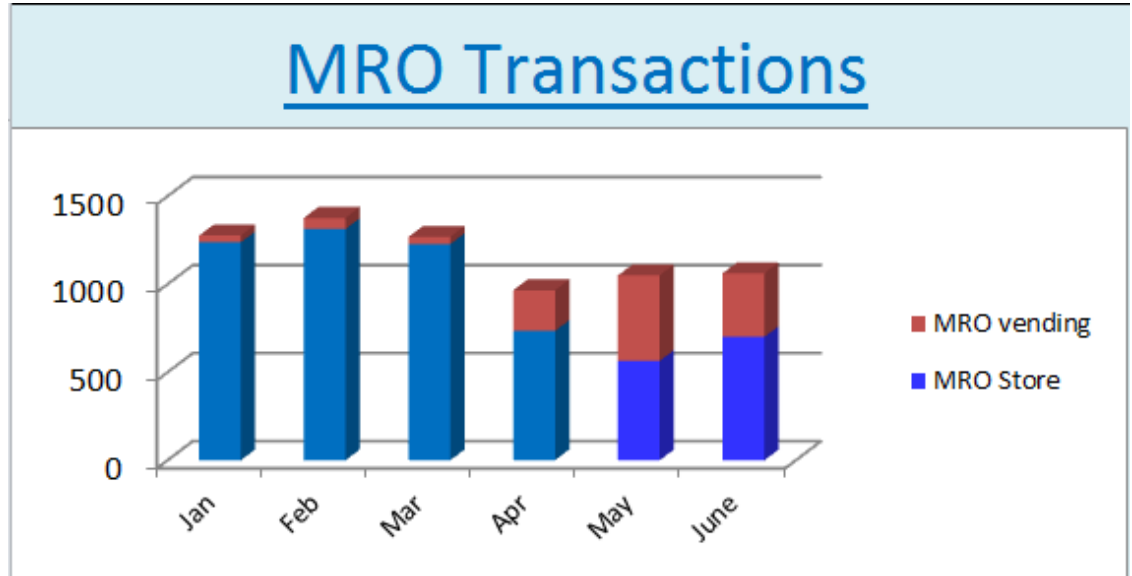
Real-World Example

Sales Comparison

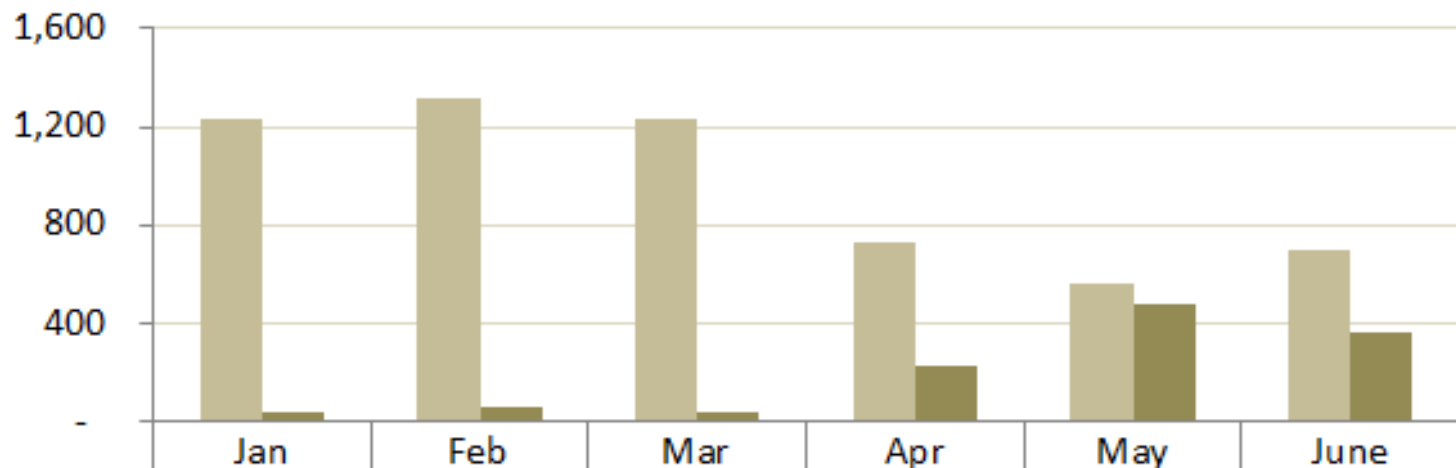


Design Issues

- Title Format
- Three Dimensional
- Axis Labels on Angle
- Dark Gridlines
- No Data
- Can't easily compare
- Color Choice
- Legend Space



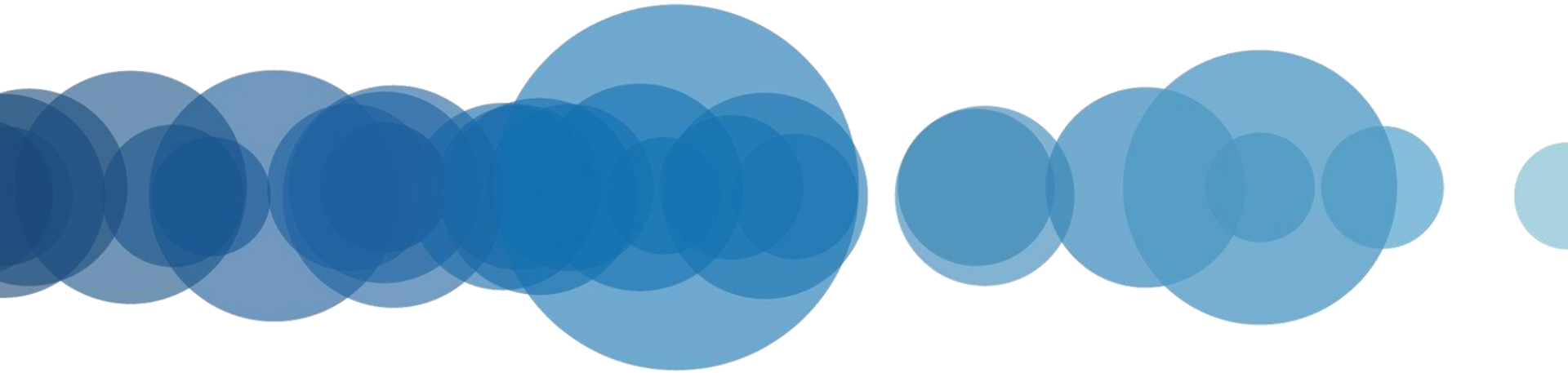
MRO Transactions



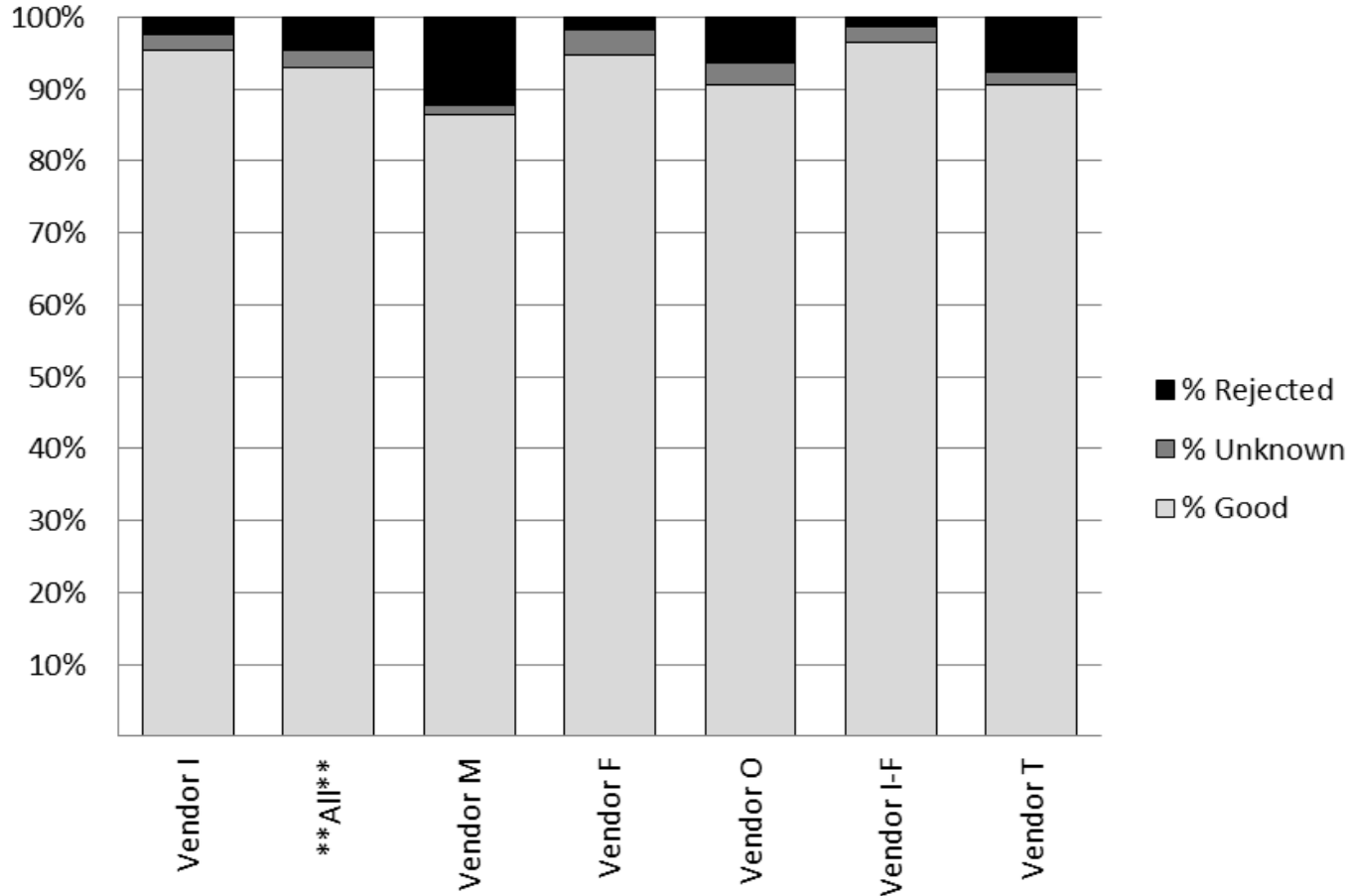
	Jan	Feb	Mar	Apr	May	June
MRO Store	1,237	1,313	1,227	734	564	700
MRO vending	39	63	41	231	485	362

Real-World Example

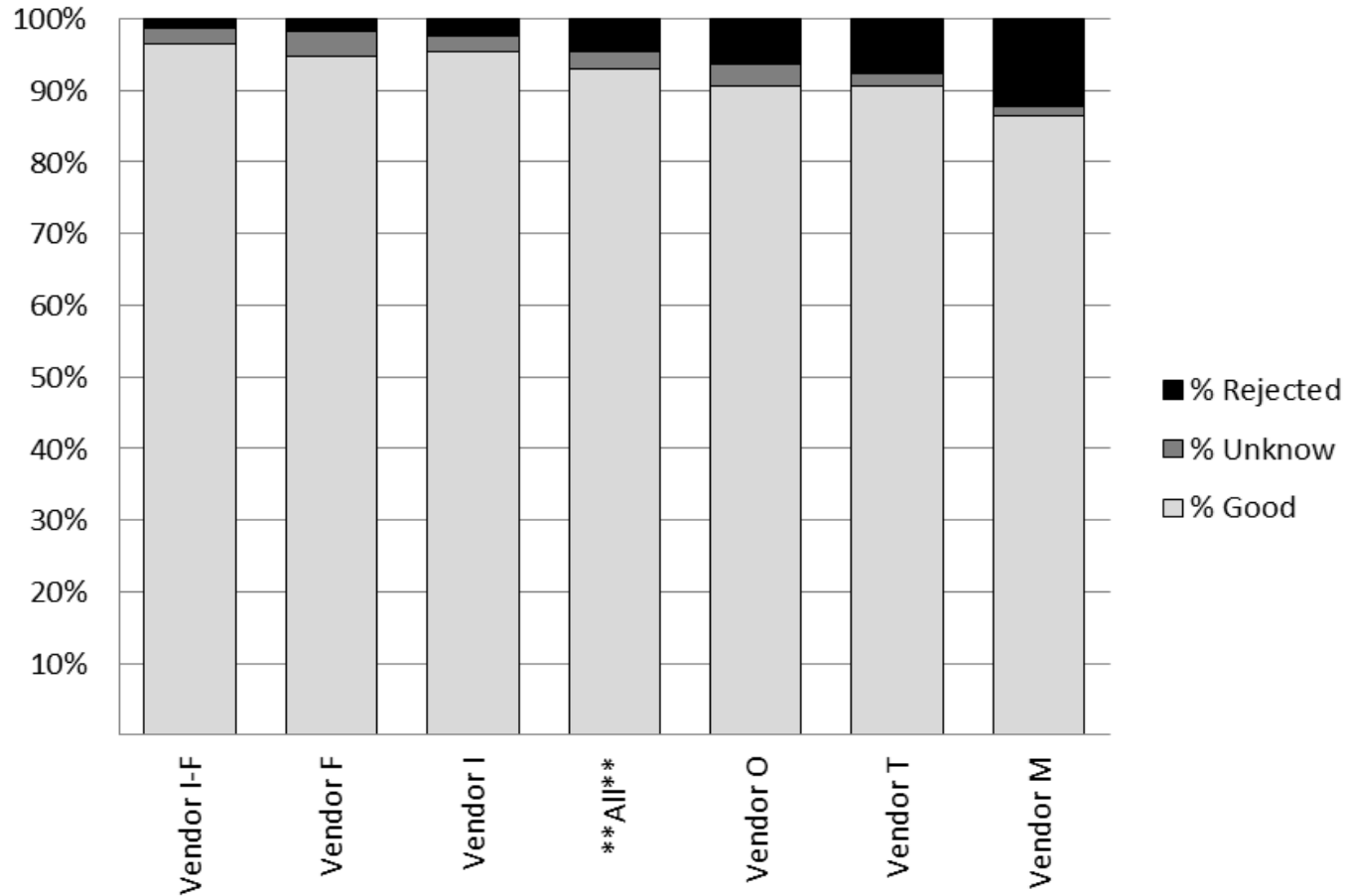
Comparing Vendors



Outcome Breakdown

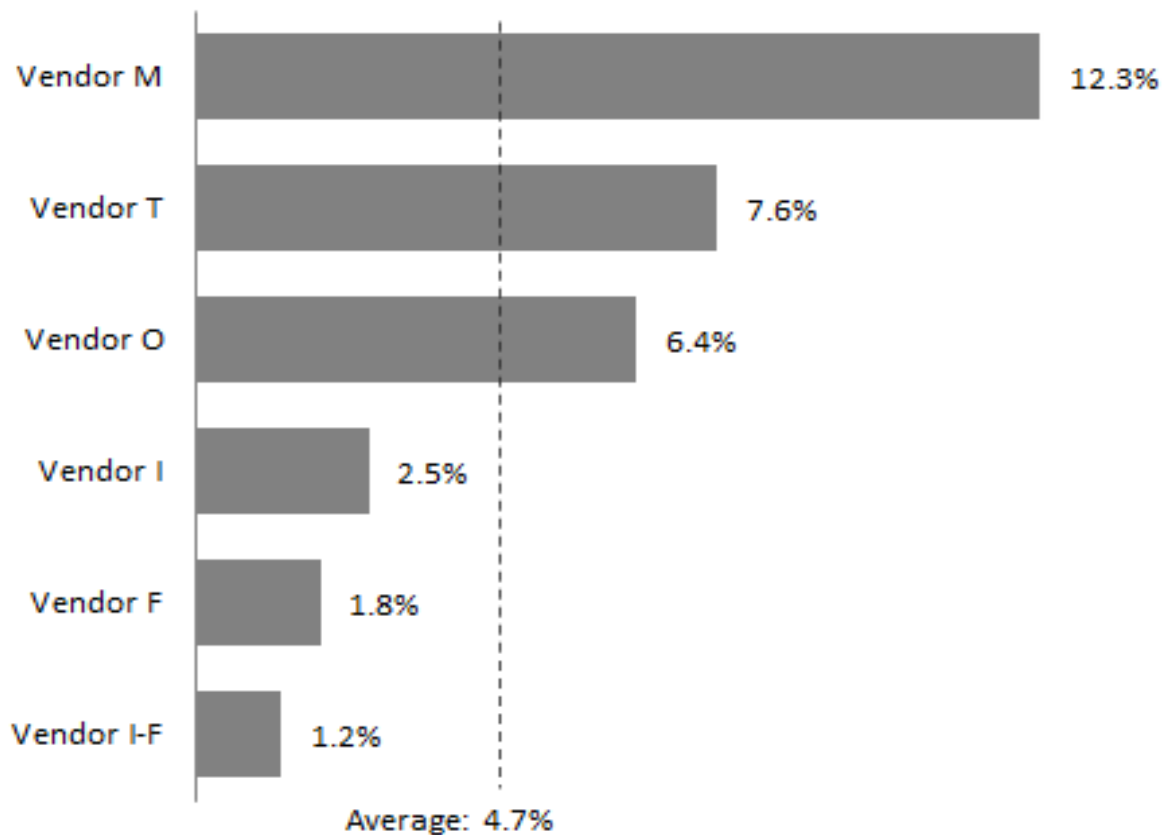


Outcome Breakdown



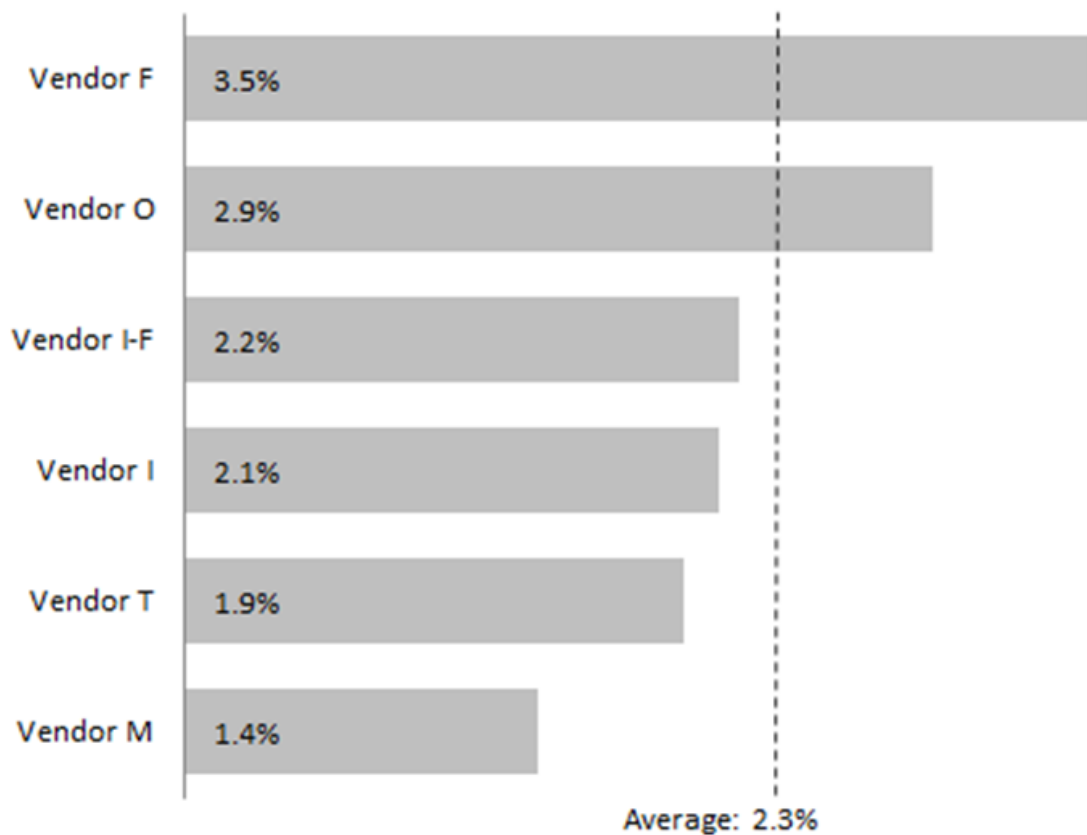
Outcome Breakdown

■ % Rejected

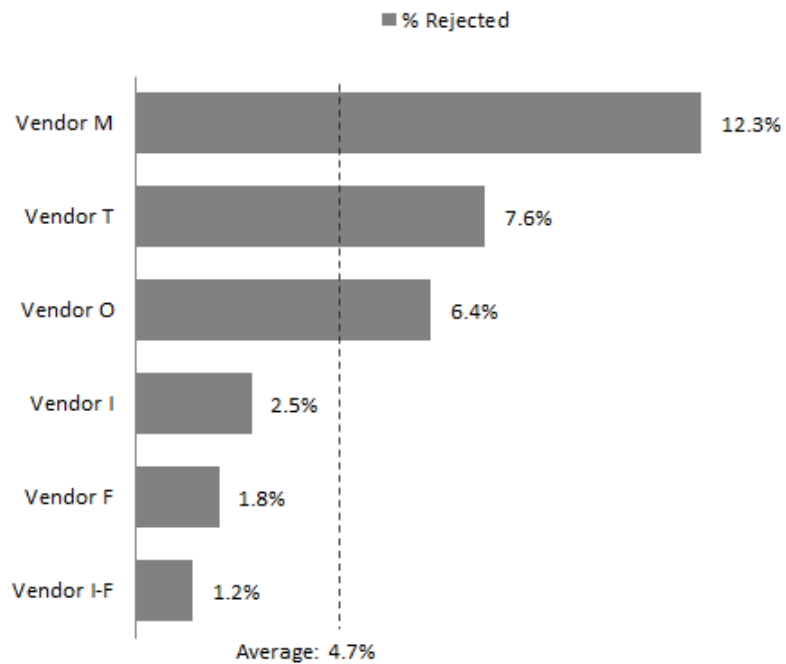


Outcome Breakdown

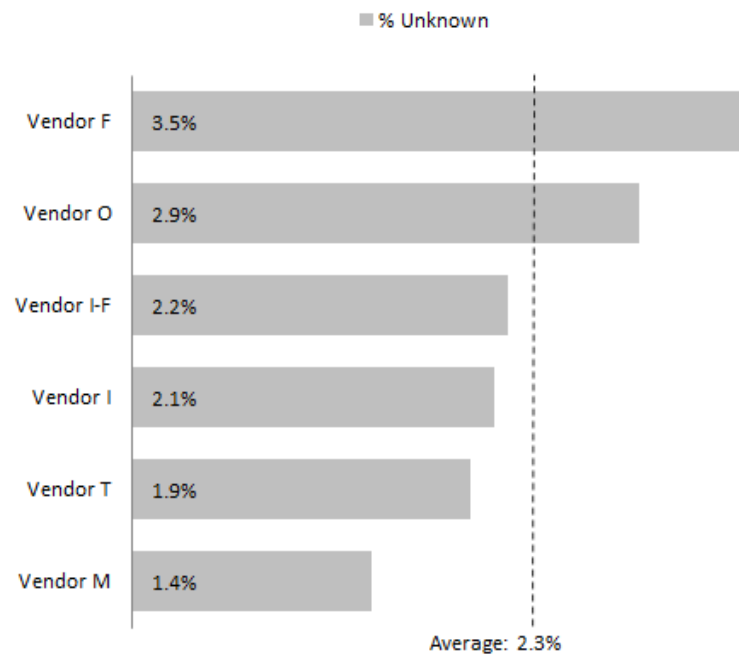
■ % Unknown



Outcome Breakdown

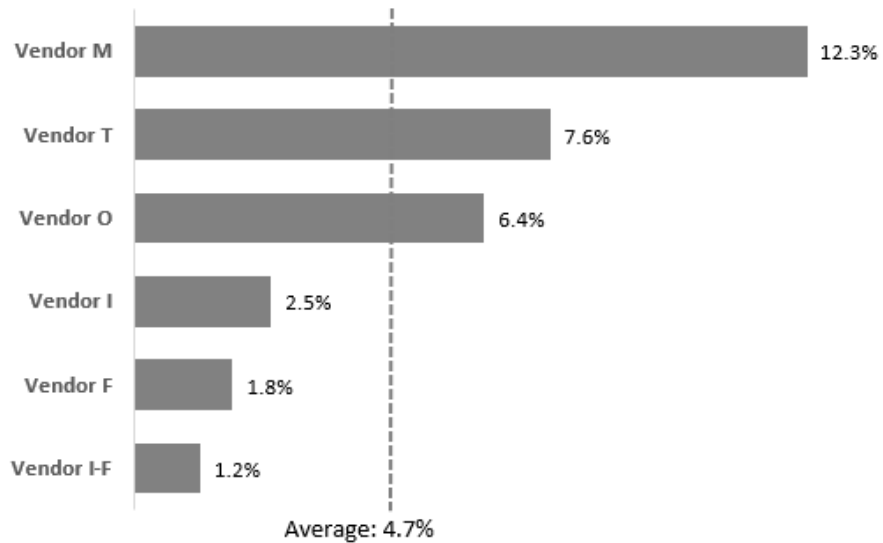


Outcome Breakdown



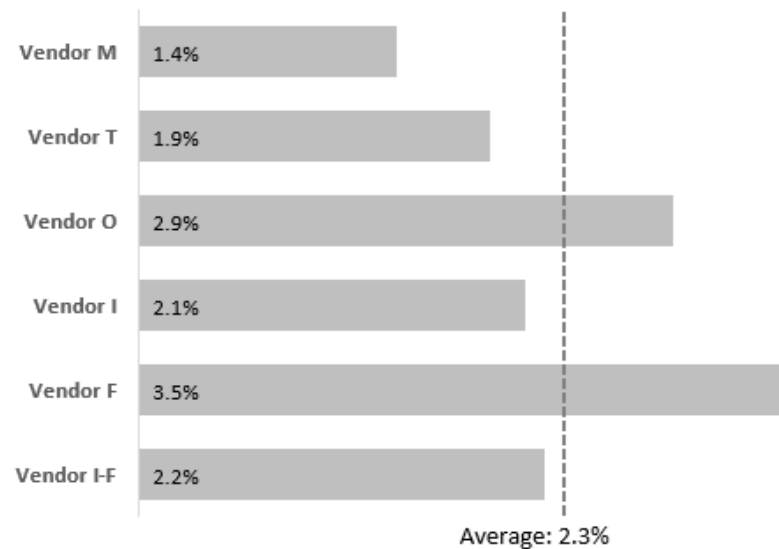
Outcome Breakdown

■ Rejected



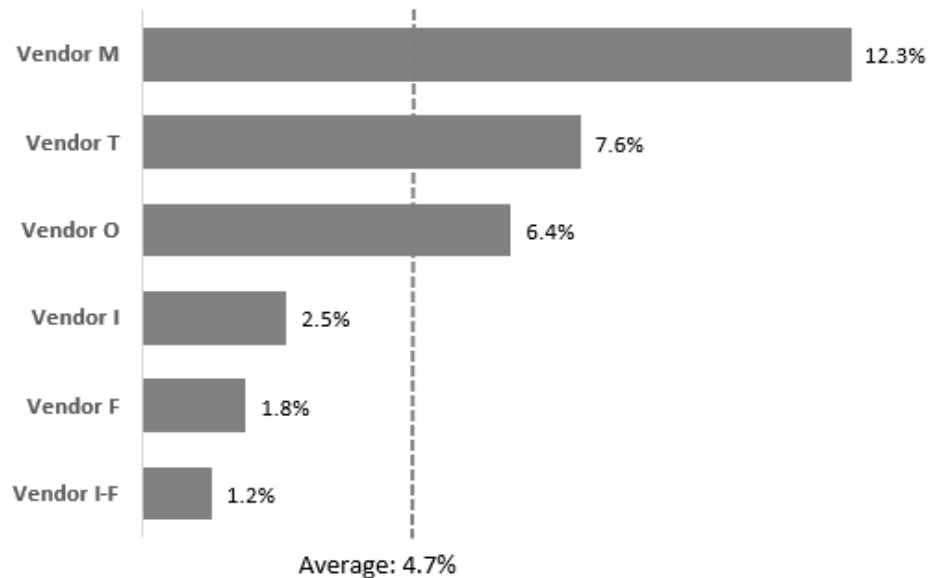
Outcome Breakdown

■ Unknown



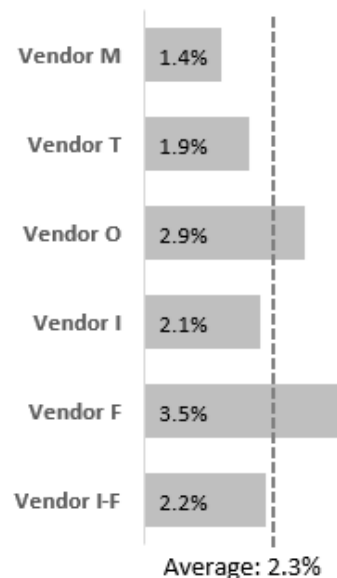
Outcome Breakdown

■ Rejected

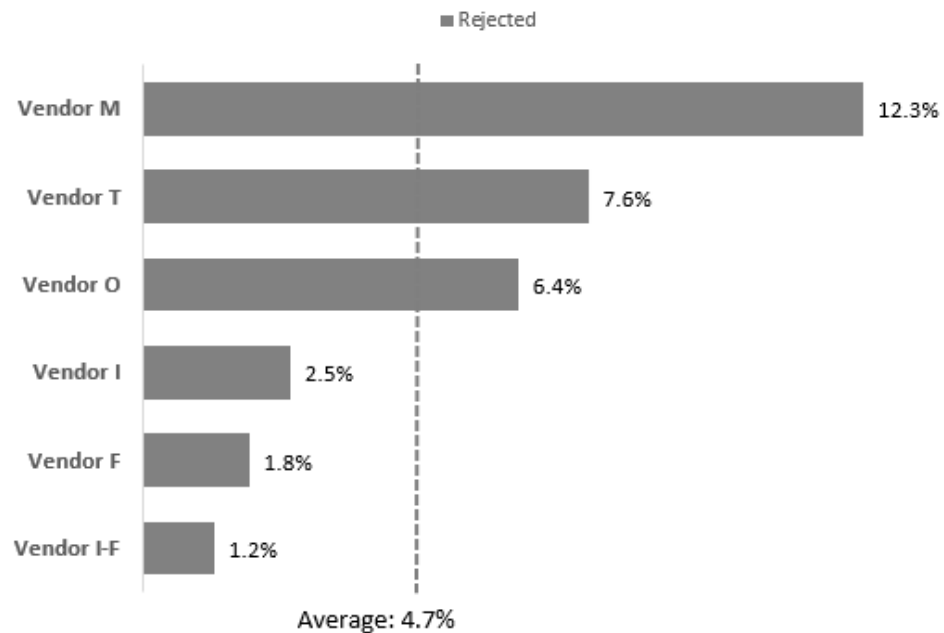


Outcome Breakdown

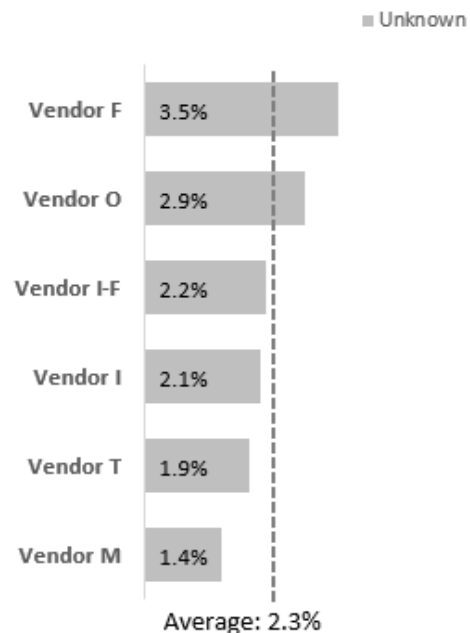
■ Unknown



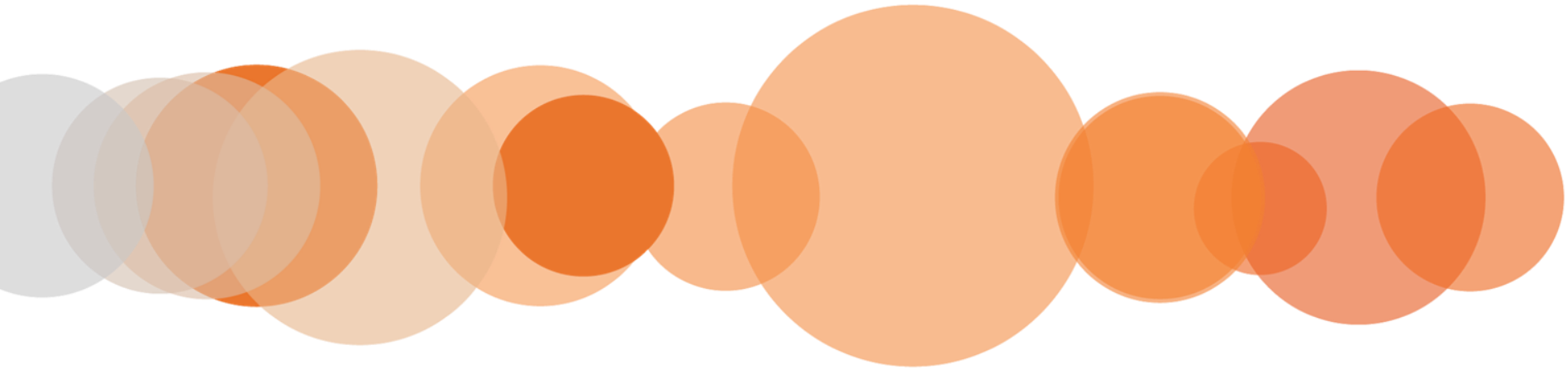
Outcome Breakdown



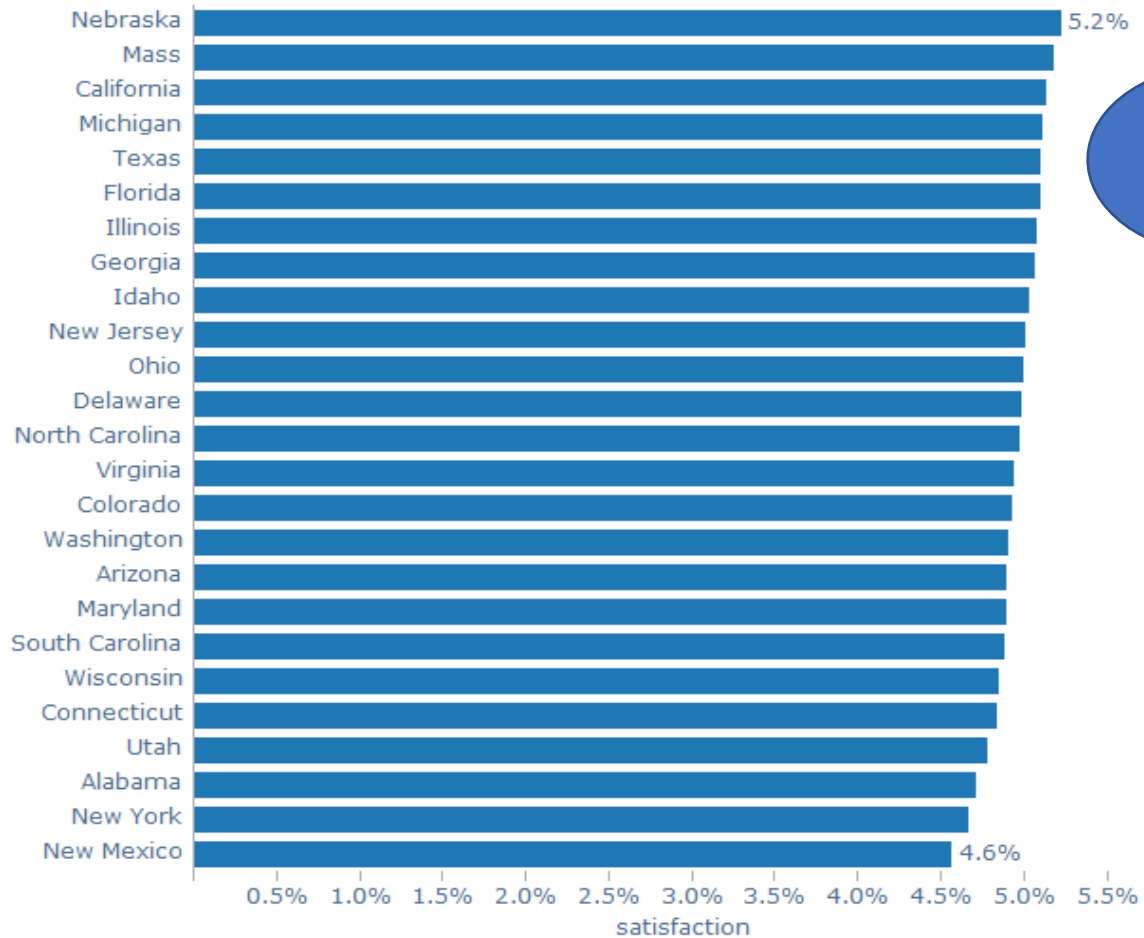
Outcome Breakdown



Bar Chart Issue

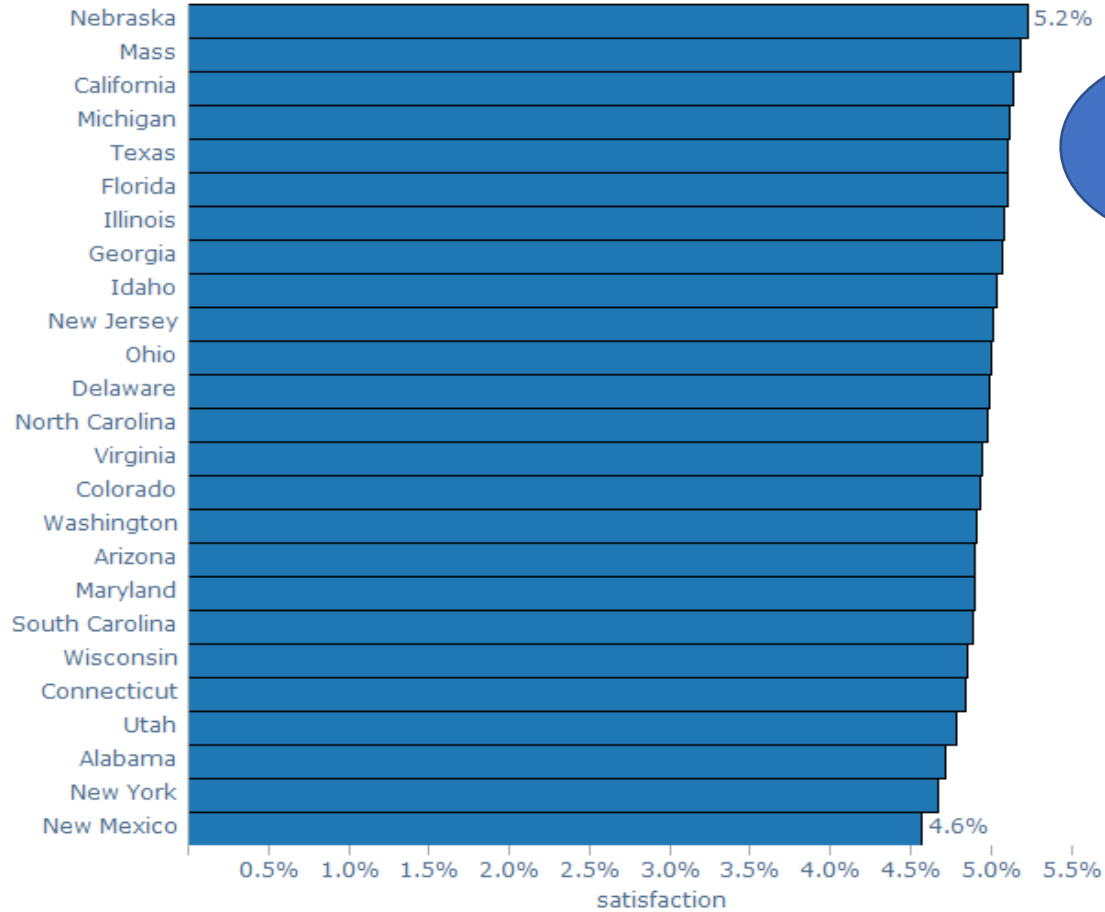


default bars

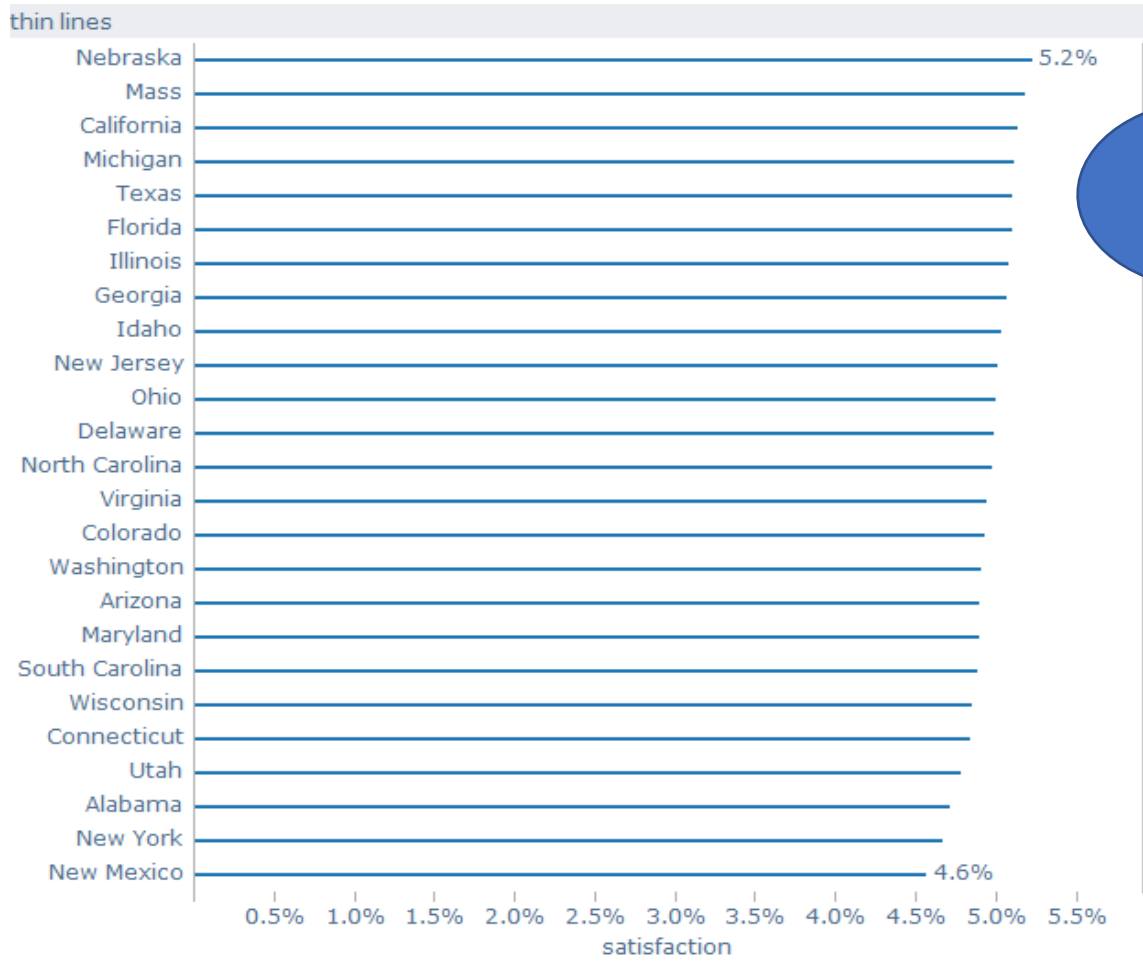


Moiré effect?

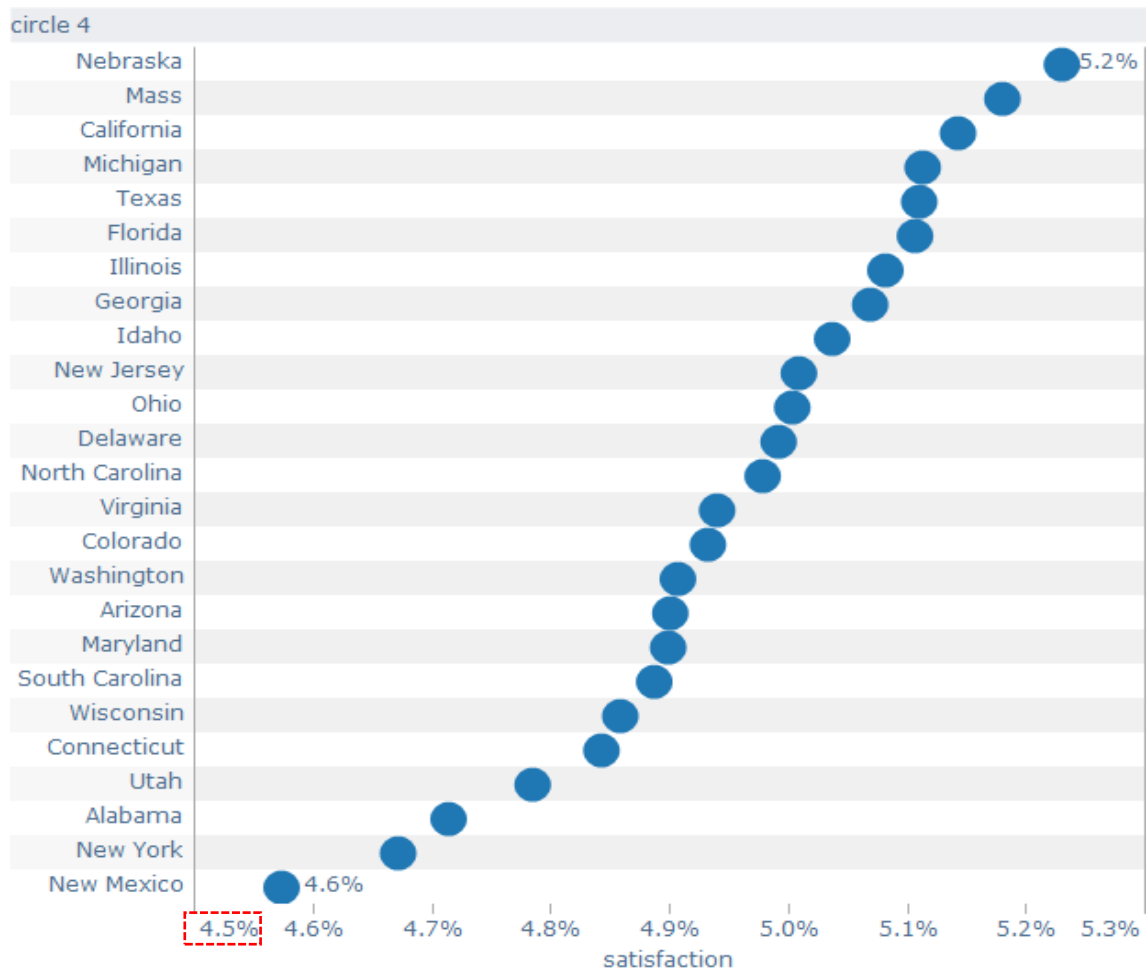
fat bars and borders

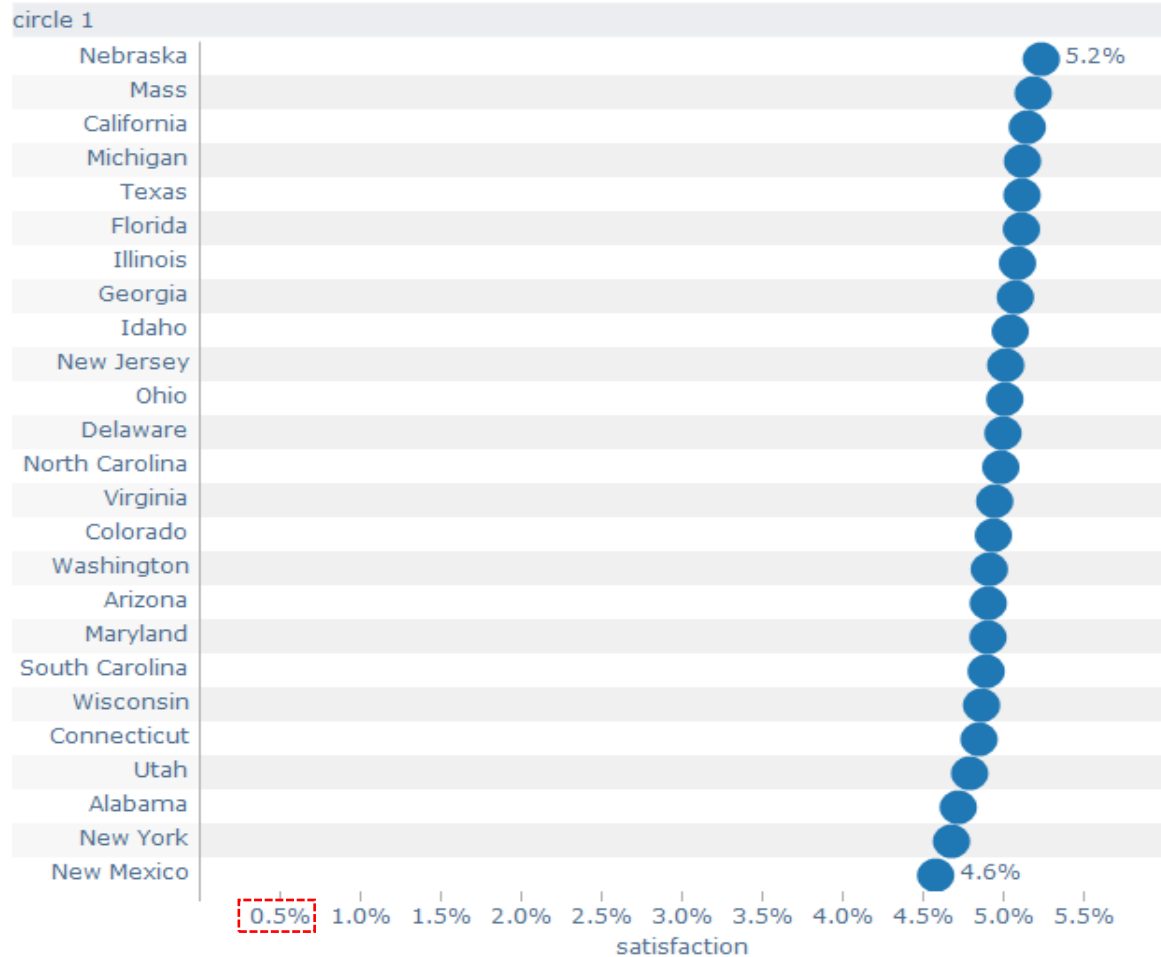


Moiré effect?

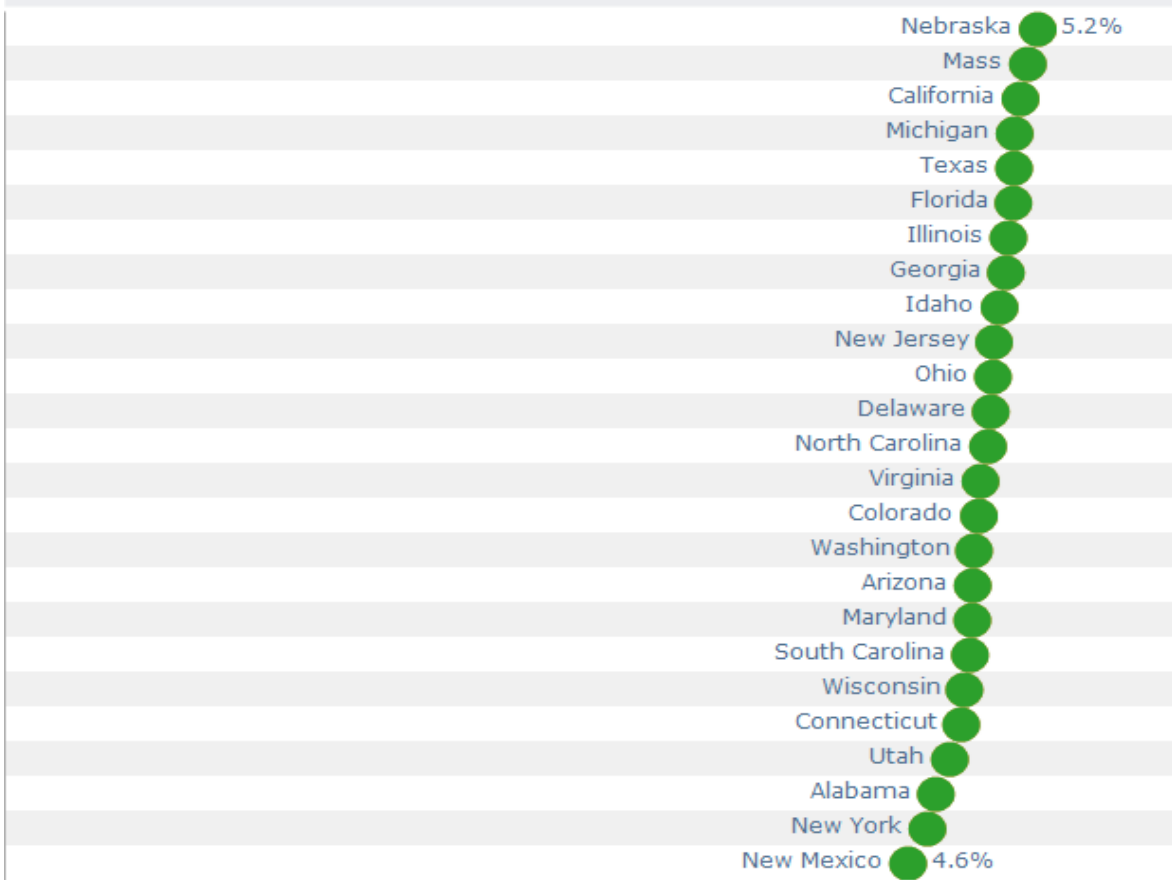


Moiré effect?

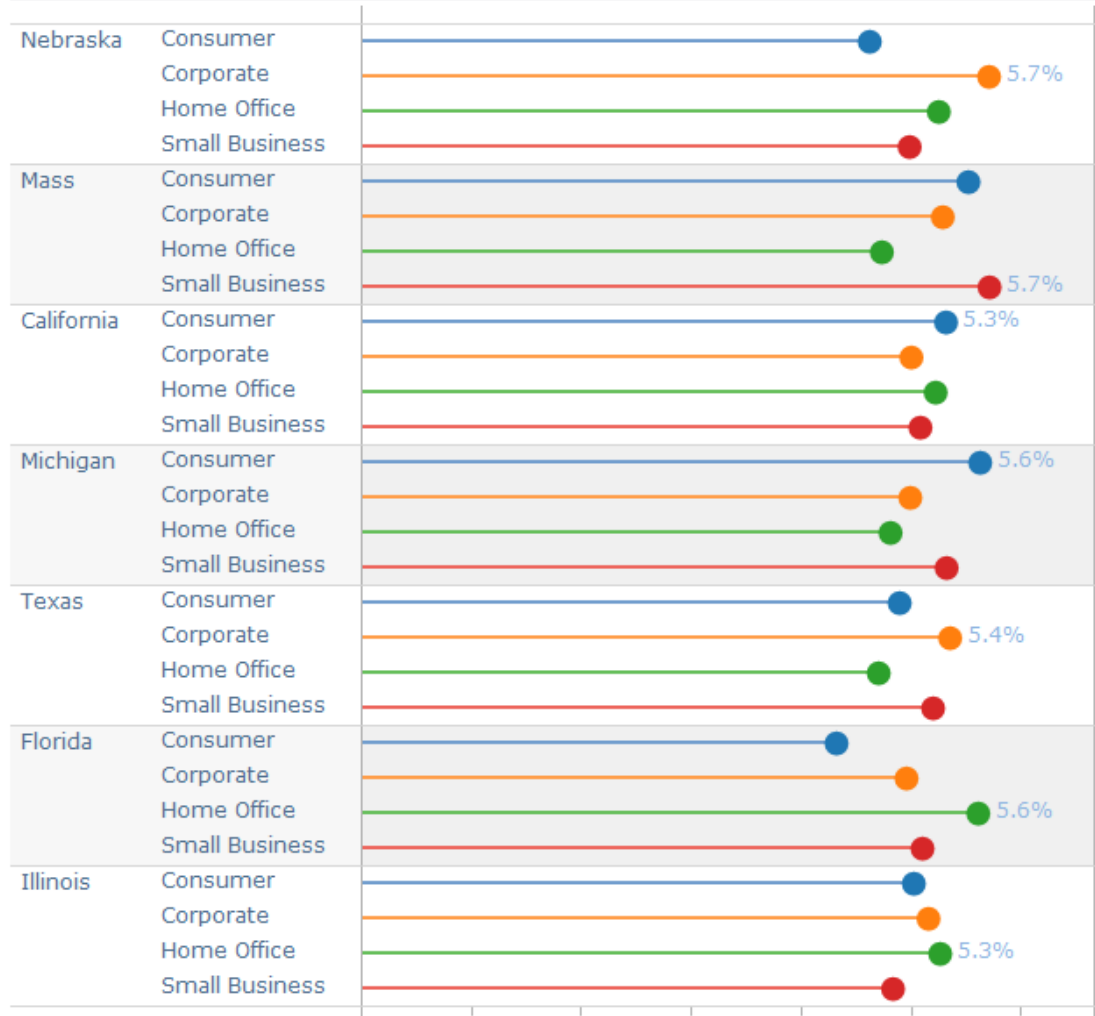




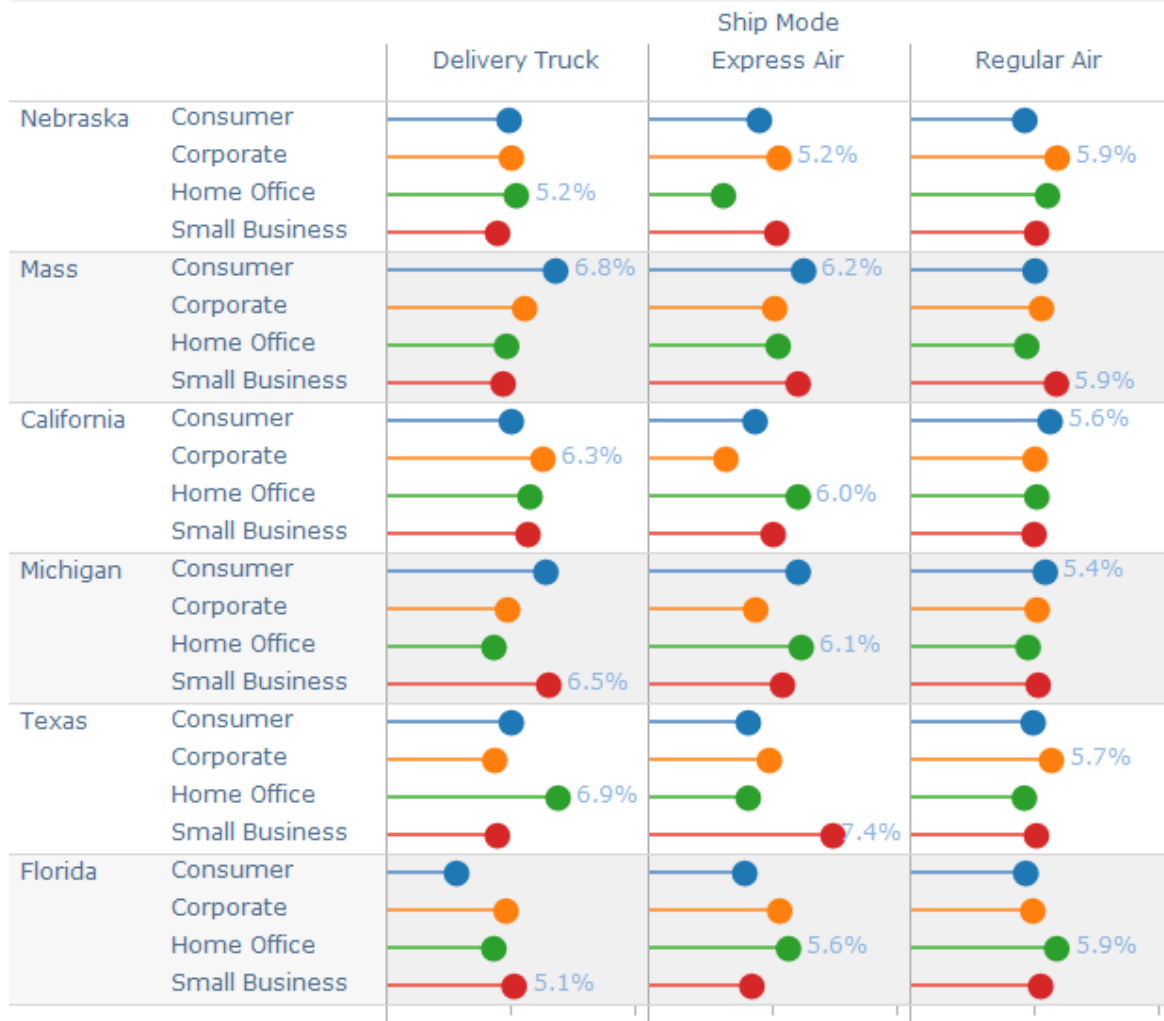
circle 3



Satisfaction rates



Satisfaction rates



#DearDuo View Review



10,911 Viz Views

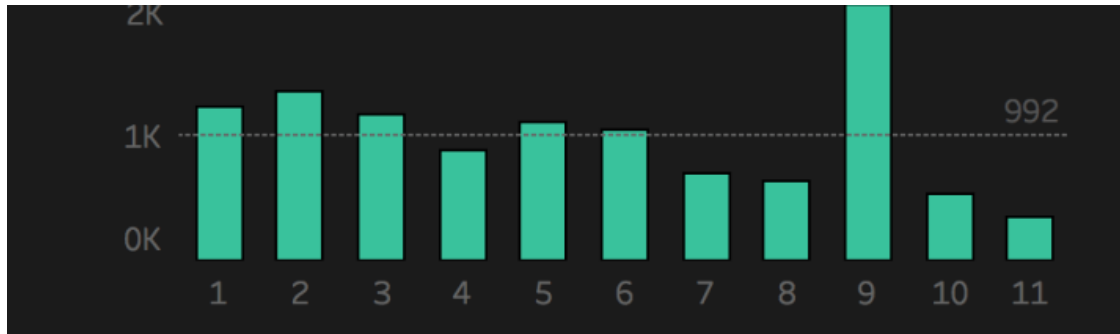
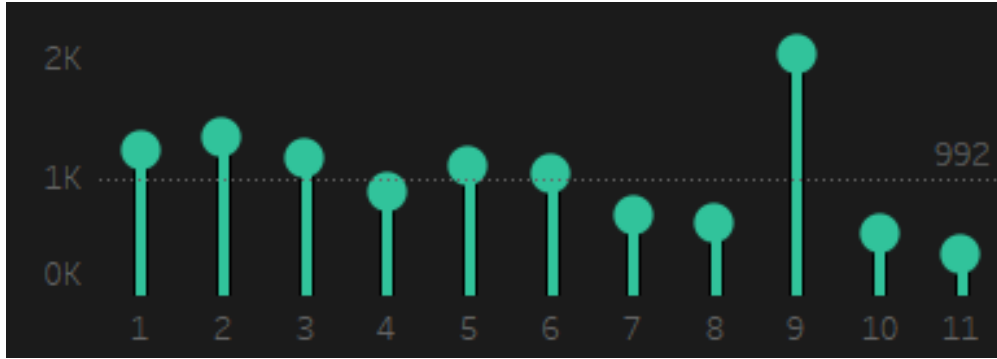


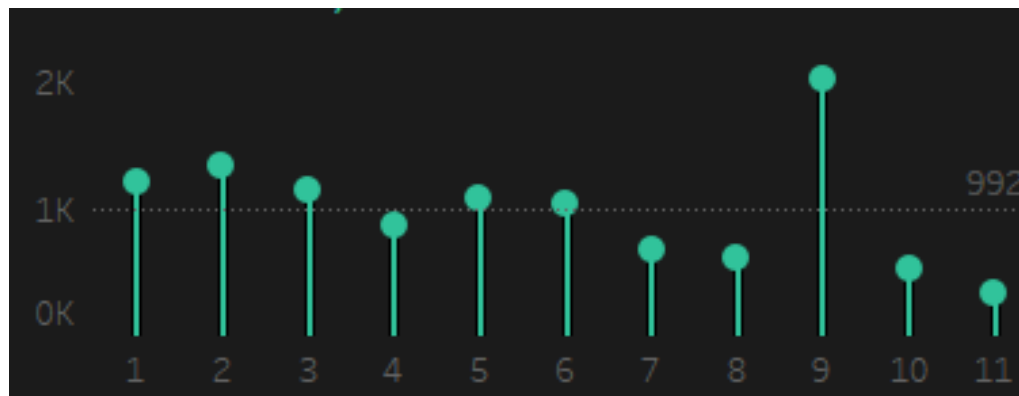
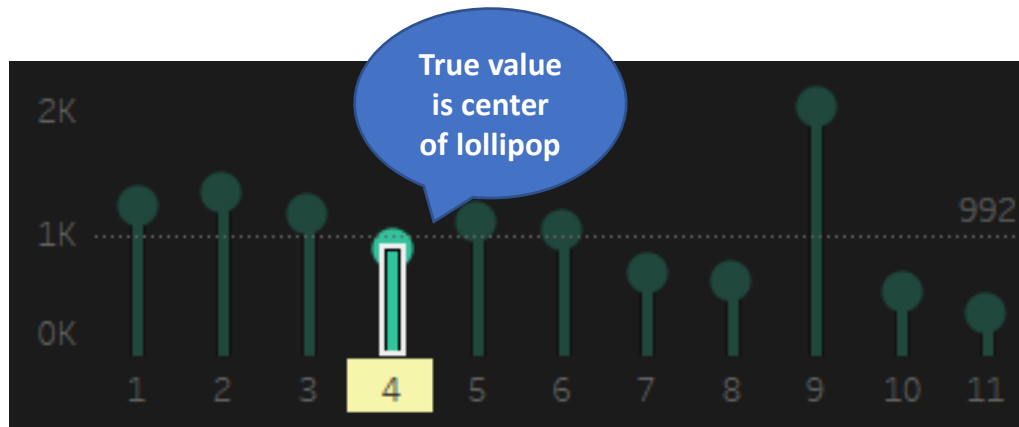
Dec 2016

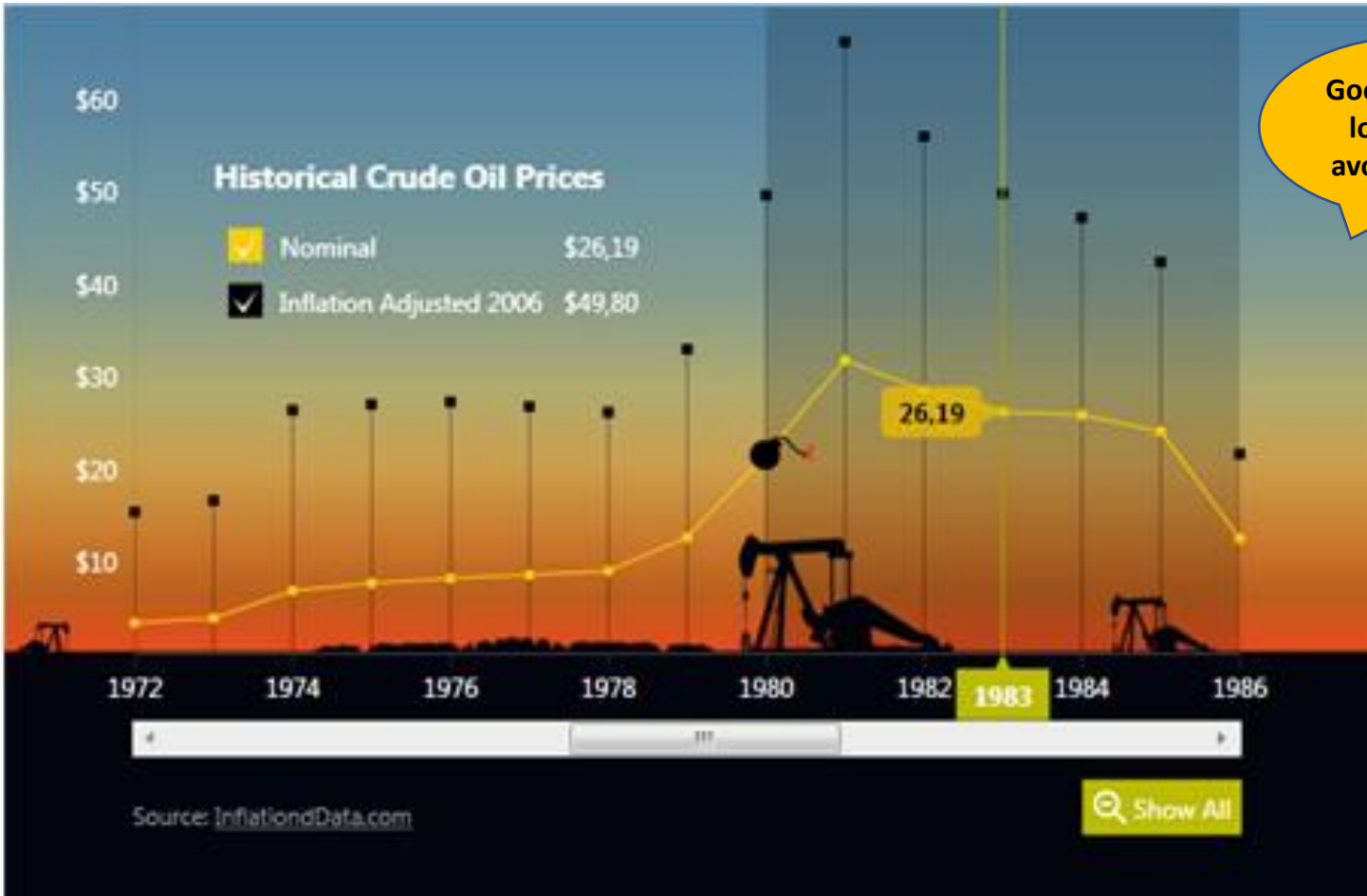
Visualized Music

874 Viz Views

The viz views were pretty consistent throughout the year. We expect the more recent vizzes to have more views. We haven't been around as long and so...



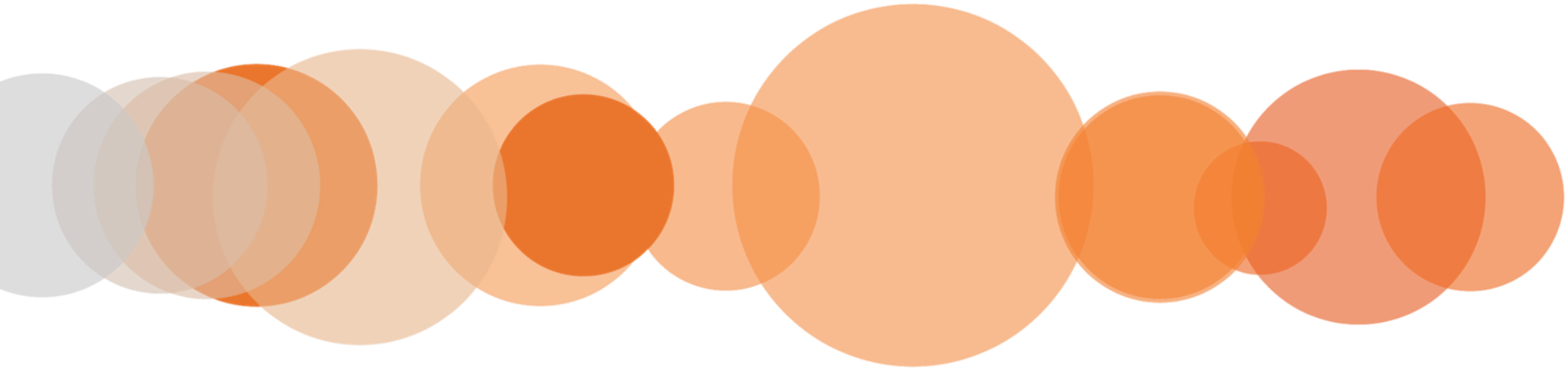




Good use of a lollipop to avoid clutter.

A Problem with Scale

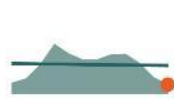
An Example from The Big Book of Dashboard



Power Plant Monitor

Trend

TOTAL CAPACITY



10,858 MW

SPINNING RESERVE



758 MW

WATER PRODUCTION



394 MIGD

TOTAL LOAD



6,646 MW

STANDBY RESERVE



1,847 MW

WATER EXPORT



356 MIGD

Local Metrics (Real-Time)

Target

 SYSTEM
FREQUENCY

54.43 HZ

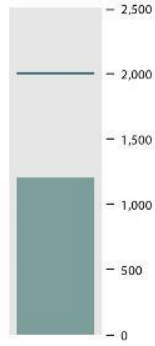
 AMBIENT
TEMP

37.0°C

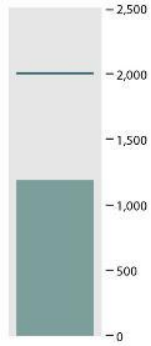
 RELATIVE
HUMIDITY

39.8%

NG TOTAL FLOW



GD HEAT RATE











REAL-TIME DATA FEED

Disabled

Details (All Locations)









LOCATION	CURRENT OUTPUT (KW)	EXPECTED OUTPUT (KW)	ACTUAL VS. EXPECTED	14-DAY TREND	LAST INSPECTION
1833 Appleby Line	350,370	420,453	83%		3 days
1833 Highway 4	3,374	3,917	86%		19 days ●
48 Davis Dr	5,058	5,602	90%		2 days
144 Howard Cavasos	655,698	714,991	92%		7 days
2 Jack Hanoka Dr	5,342	5,521	97%		13 days ●
22 Daybreak Dr	3,053	3,148	97%		7 days
1 Whitestone Rd	4,579	4,711	97%		2 days
1552 Flintrock Rd	5,342	5,488	97%		18 days ●
1335 County Line	5,087	5,210	98%		4 days
1 Jack Hanoka Dr	3,307	3,338	99%		12 days ●
1525 West Line	946,311	954,645	99%		4 days
1335 Omoo Rd	847,260	854,289	99%		3 days
18819 Guelph St	1,060,307	1,068,858	99%		15 days ●
1 Adam West Rd	652,373	650,426	100%		4 days
11820 Dover Tr	900,606	884,292	102%		6 days
15 Rural Rd	1,200,261	1,174,570	102%		4 days

Details (All Locations)

LOCATION	CURRENT OUTPUT (kW)	EXPECTED OUTPUT (kW)	ACTUAL VS. EXPECTED
1833 Appleby Line	350,370	420,453	 83 %
1833 Highway 4	3,374	3,917	 86 %
48 Davis Dr	5,058	5,602	 90 %
144 Howard Cavasos	655,698	714,991	 92 %
2 Jack Hanoka Dr	5,342	5,521	 97 %
22 Daybreak Dr	3,053	3,148	 97 %
1 Whitestone Rd	4,579	4,711	 97 %
1552 Flintrock Rd	5,342	5,488	 97 %









Source: *The Big Book of Dashboards* (Figure 9.9)

Details (All Locations)

LOCATION	CURRENT OUTPUT (kW)	EXPECTED OUTPUT (kW)		
1833 Appleby Line	350,370	420,453		83 %
1833 Highway 4	3,374	3,917		86 %
48 Davis Dr	5,058	5,602		90 %
144 Howard Cavasos	655,698	714,991		92 %
2 Jack Hanoka Dr	5,342	5,521		97 %
22 Daybreak Dr	3,053	3,148		97 %
1 Whitestone Rd	4,579	4,711		97 %
1552 Flintrock Rd	5,342	5,488		97 %

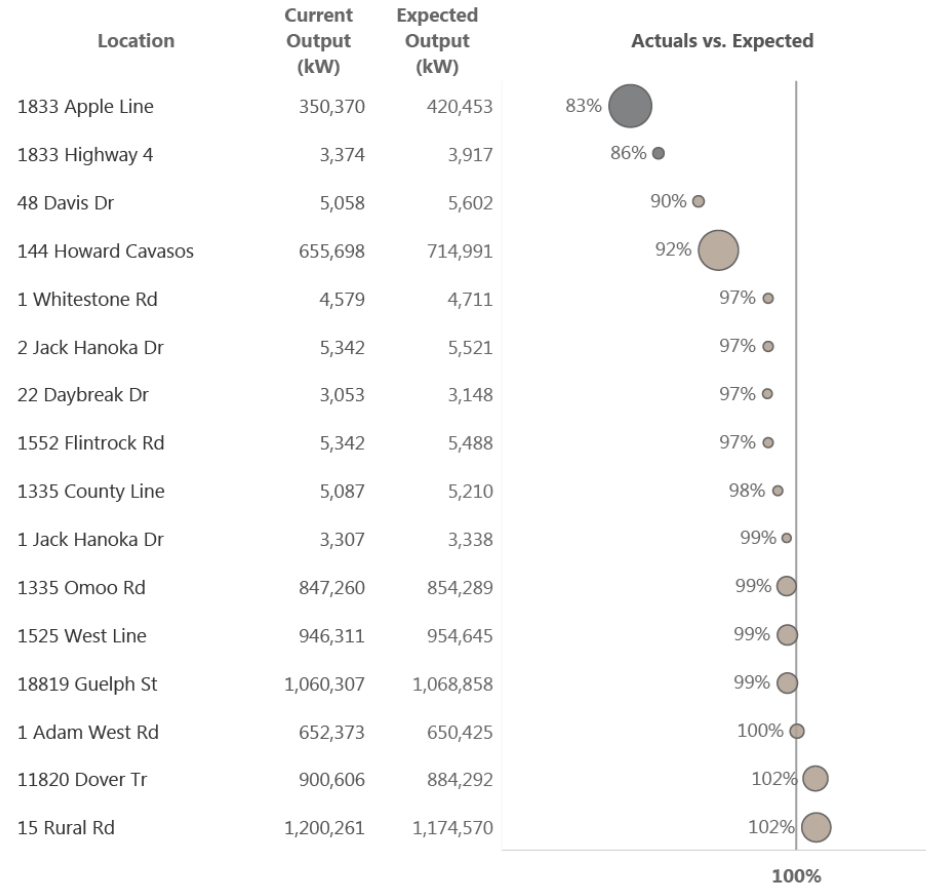
Source: *The Big Book of Dashboards* (Figure 9.10)

Details (All Locations)

LOCATION	CURRENT OUTPUT (kW)	EXPECTED OUTPUT (kW)	ACTUAL VS. EXPECTED
1833 Appleby Line	350,370	420,453	 83 %
1833 Highway 4	3,374	3,917	 86 %
48 Davis Dr	5,058	5,602	 90 %
144 Howard Cavasos	655,698	714,991	 92 %
2 Jack Hanoka Dr	5,342	5,521	 97 %
22 Daybreak Dr	3,053	3,148	 97 %
1 Whitestone Rd	4,579	4,711	 97 %
1552 Flintrock Rd	5,342	5,488	 97 %

Source: *The Big Book of Dashboards* (Figure 9.11)

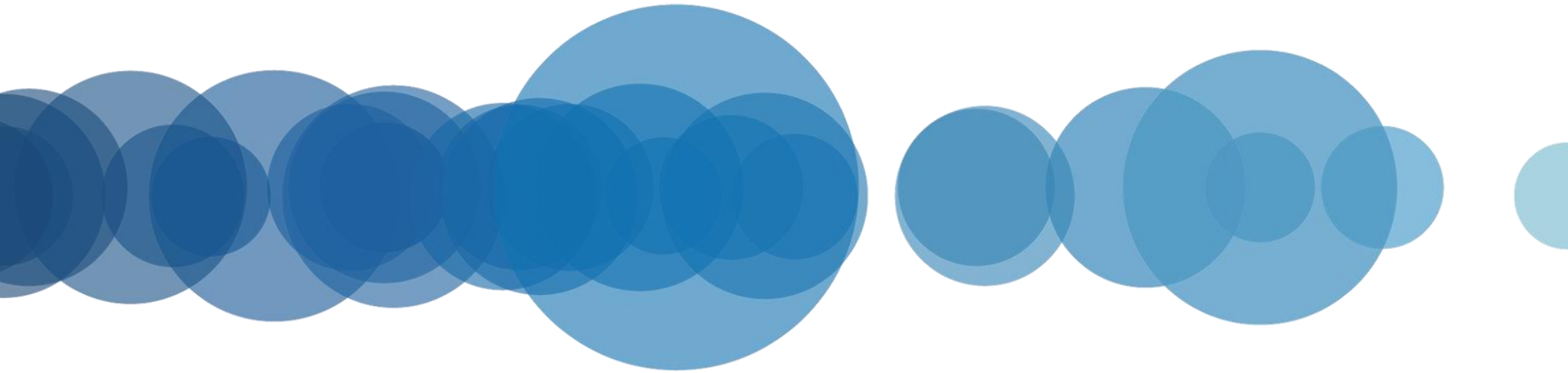
Details (All Locations)



Source: *The Big Book of Dashboards* (Figure 9.12)

Real-World Example

Kroger Investor Fact Book





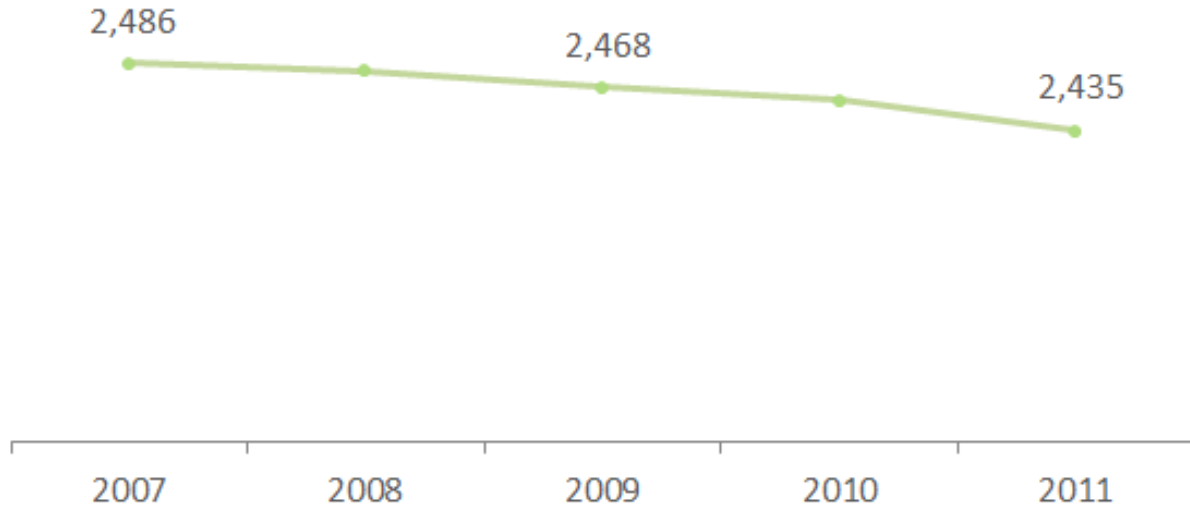
Kroger Pharmacy Growth?

What the data actually shows:

	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>
	77.8%	79.0%	79.5%	79.7%	80.0%	80.0%
Pharmacies	1,920	1,964	1,973	1,967	1,966	1,948
Stores	2,468	2,486	2,481	2,468	2,458	2,435

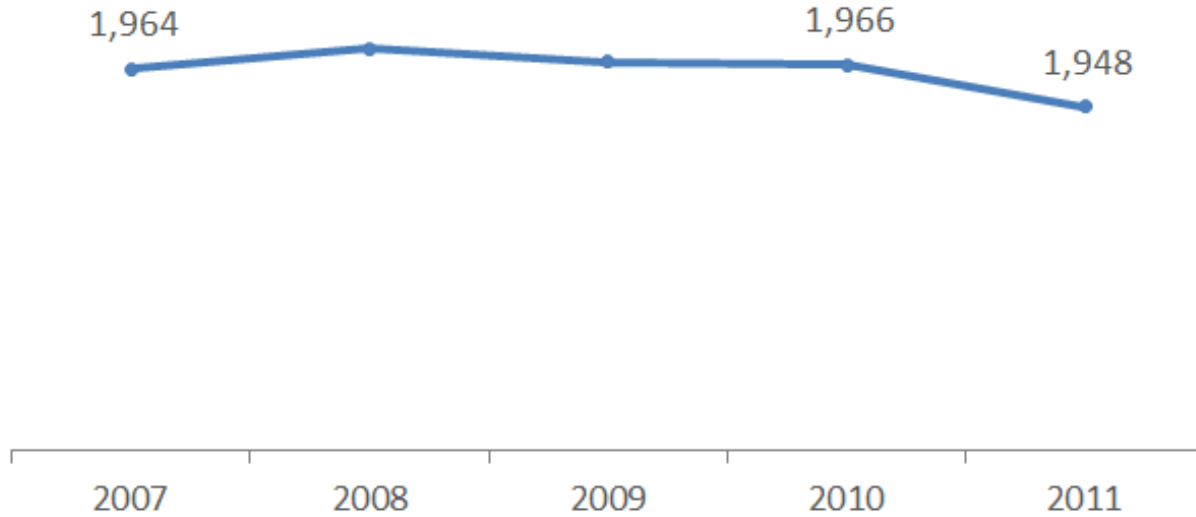
The Real Story

Total Number of Kroger Stores

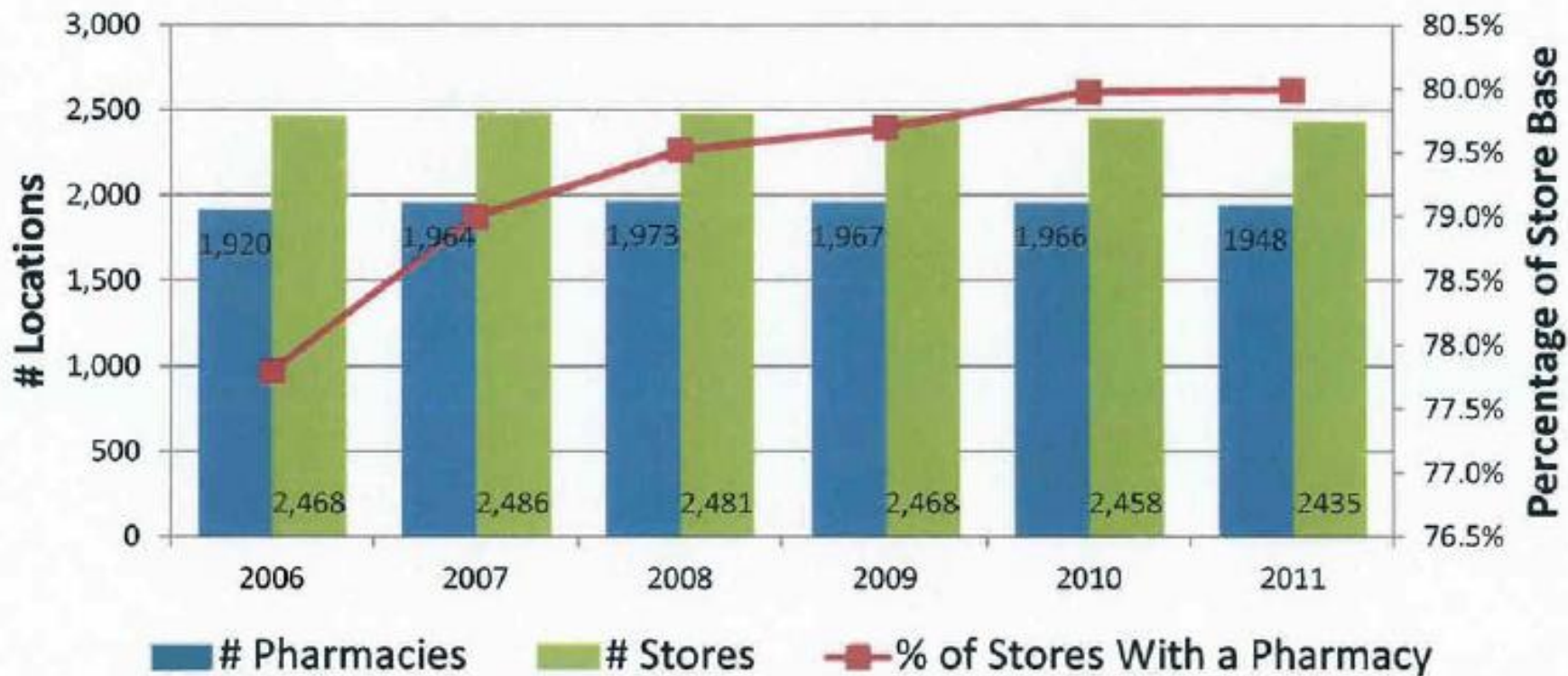


The Real Story

Total Number of Kroger Pharmacies



Kroger Pharmacy Growth





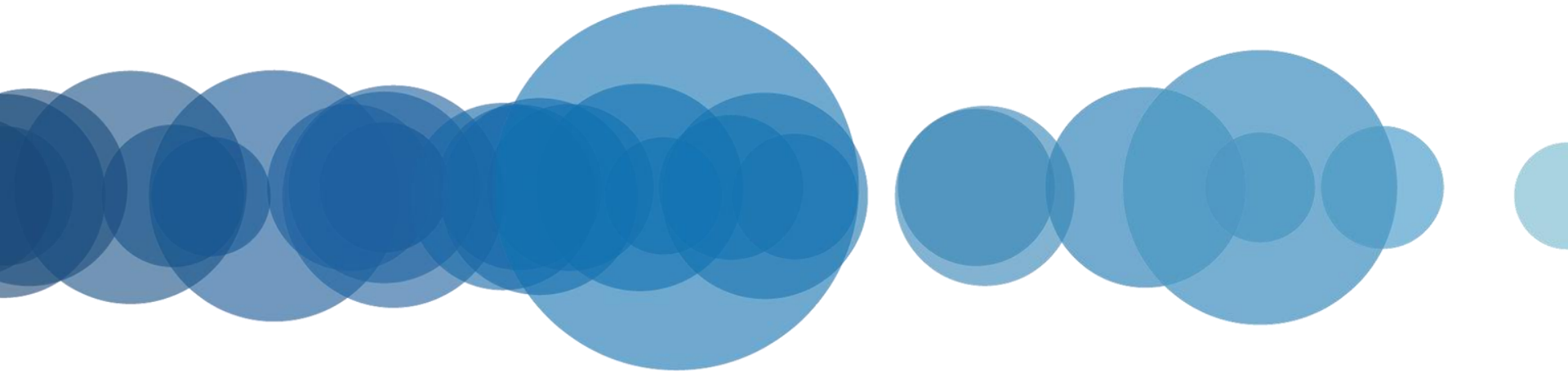
What is the real message?

1. From 2007 to 2010 Kroger closed stores that don't have pharmacies thus increasing the % of stores with a pharmacy.
2. Kroger has increased Pharmacy Sales from \$6.5B to \$7.3B with fewer stores and fewer pharmacies

They missed a very compelling Story
12% increase in Sales with Lower Costs!

Just for Fun

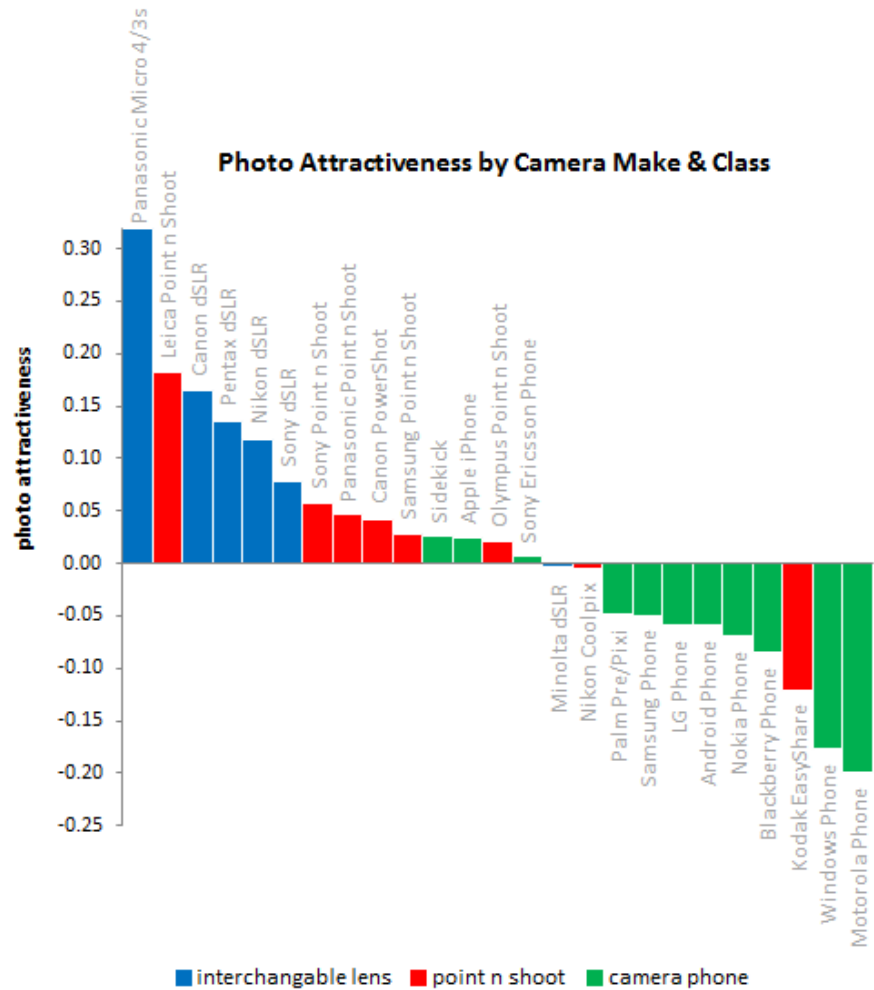
OkCupid



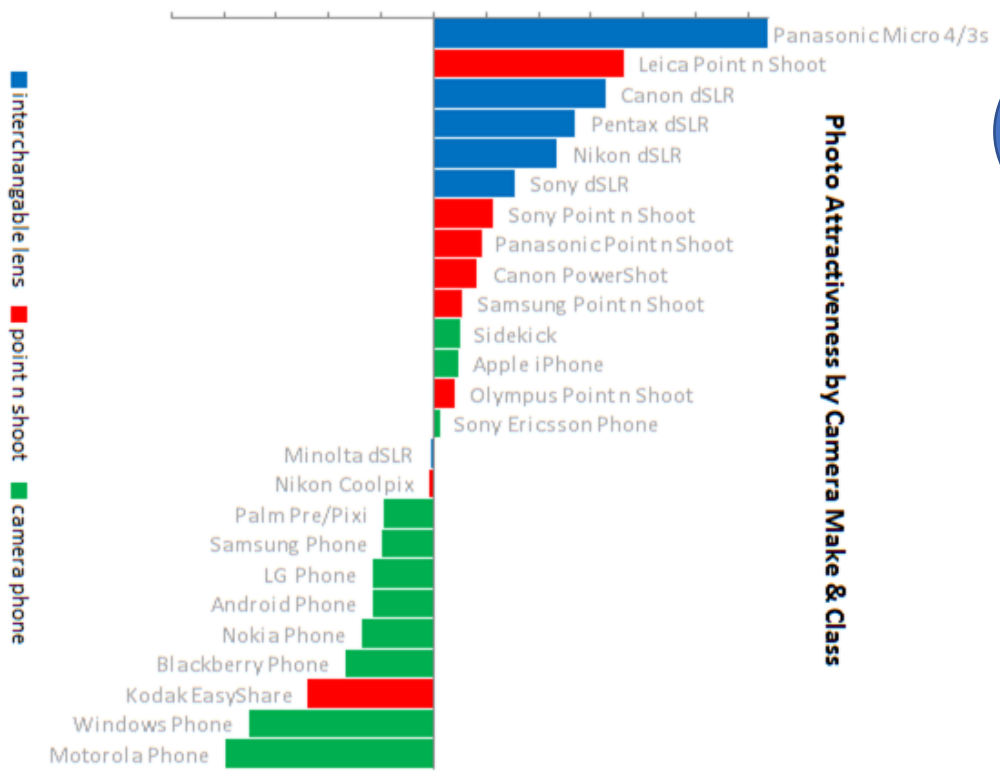
“Don’t be Ugly By Accident!”

OkCupid (blog.okcupid.com)

- Collected 552,000 examples of users pictures
- Asked people to rate their attractiveness
- Compared with the data from the camera

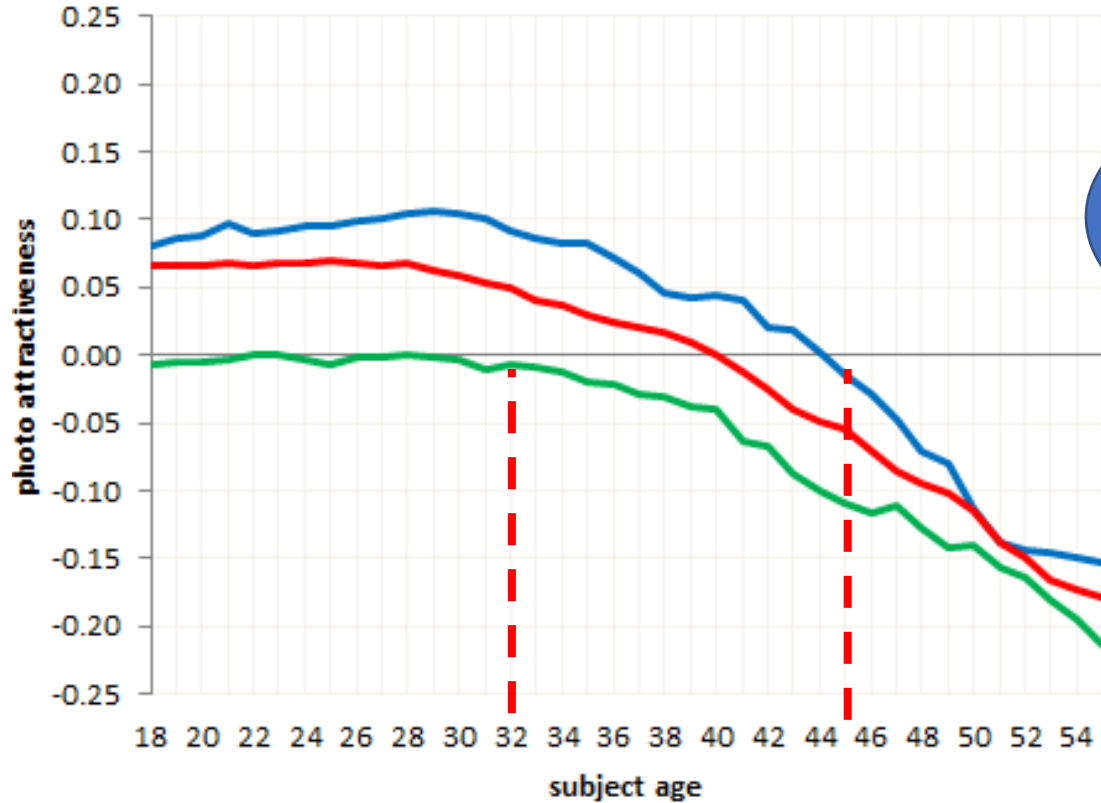


Source: OkCupid
(blog.okcupid.com)



rotated labels could easily be avoided by simply rotating the chart.

Photo Attractiveness by Camera Class

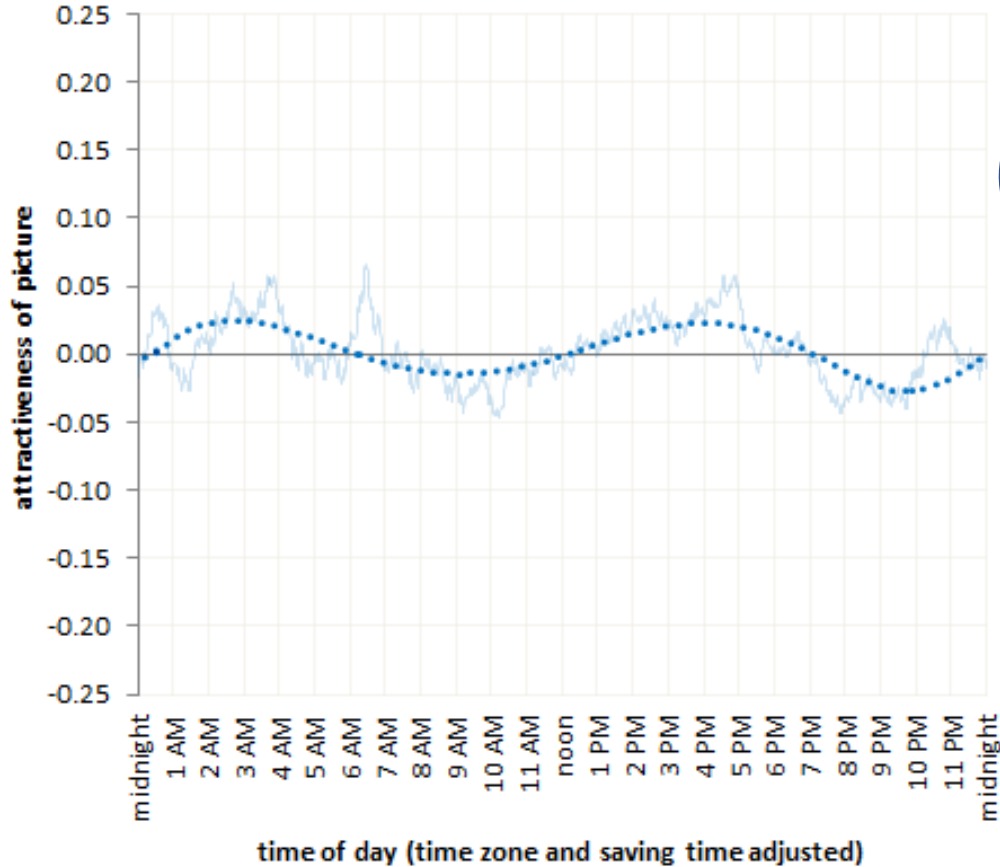


Type of camera becomes less of a factor.

interchangeable lens point n shoot camera phone

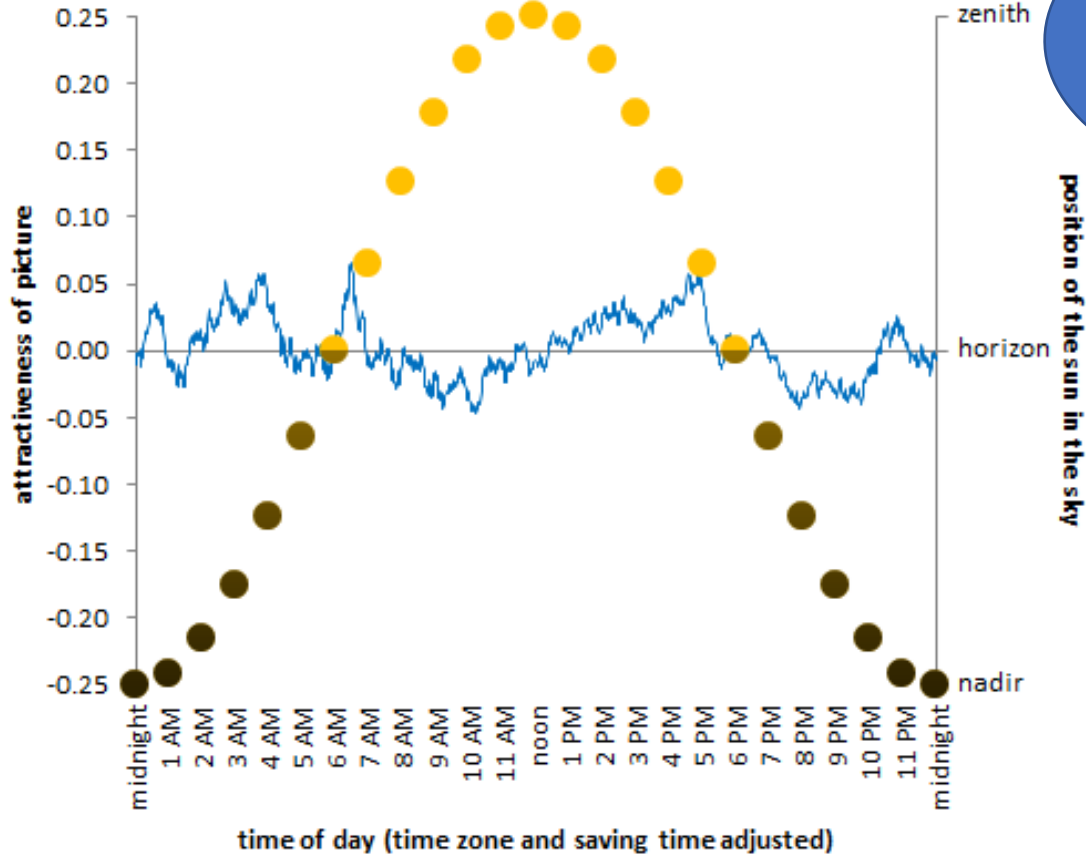
Source: OkCupid (blog.okcupid.com)

Photo Attractiveness by Time Taken



“Peak attractiveness” appears to be 6:30am and 5pm. Low points seem to be 2am, 10am and 8pm.

Sunrise, Sunset, and Photo Attractiveness



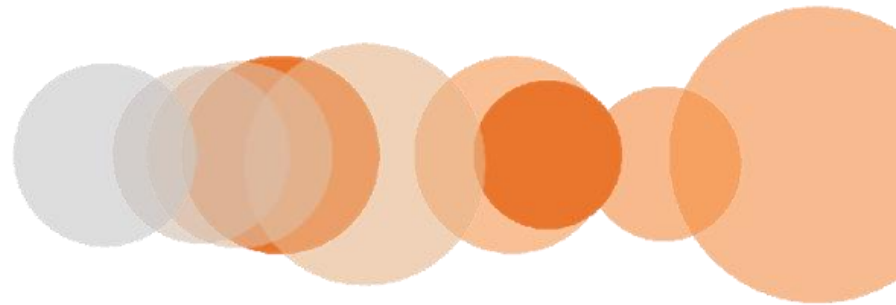
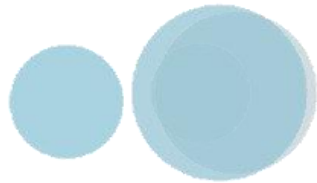
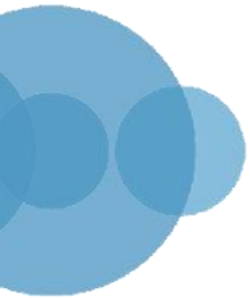
They plotted these peaks along with the sunrise and sunset. Best times to take a picture ?



What did we learn from OkCupid?

Take your profile picture with an SLR camera without the flash at 6:30am or 5pm for your best chance of being considered attractive.

Design Examples

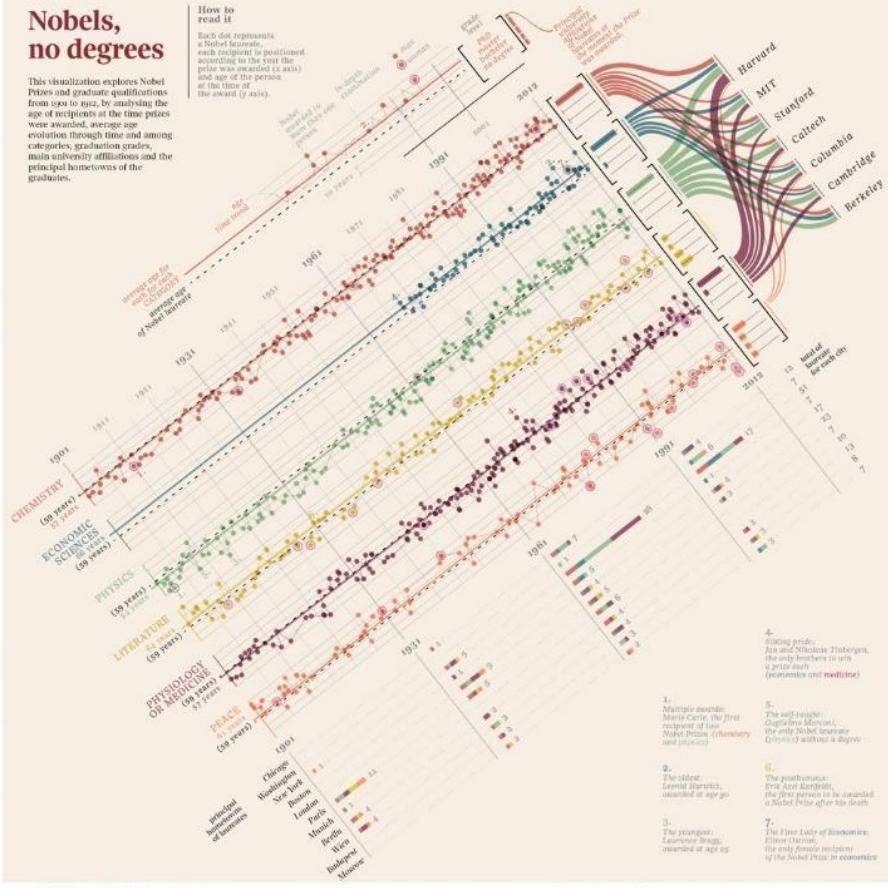


Nobels, no degrees

This visualization explores Nobel Prizes and graduate qualifications from 1901 to 2019, by analyzing the age of recipients at the time prizes were awarded, average age, evolution through time and among categories, graduation grades, main university affiliations and the principal hometowns of the graduates.

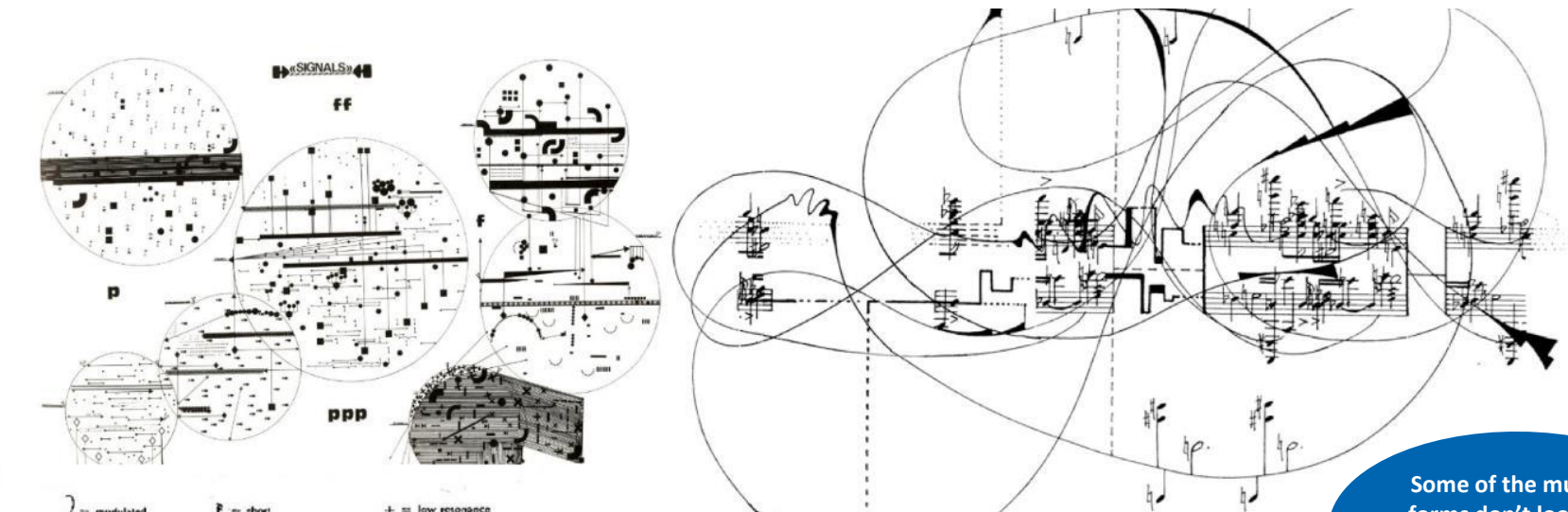
How to read it

Each dot represents a Nobel laureate, each recipient is positioned according to the year the prize was awarded (x axis) and age of the person at the time of the award (y axis).



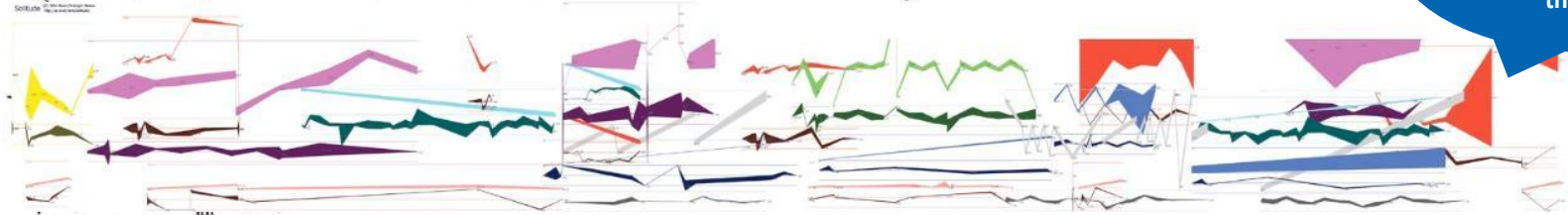
Winner of the Information is Beautiful Award

Georgia plays piano and is inspired by various forms of musical notation



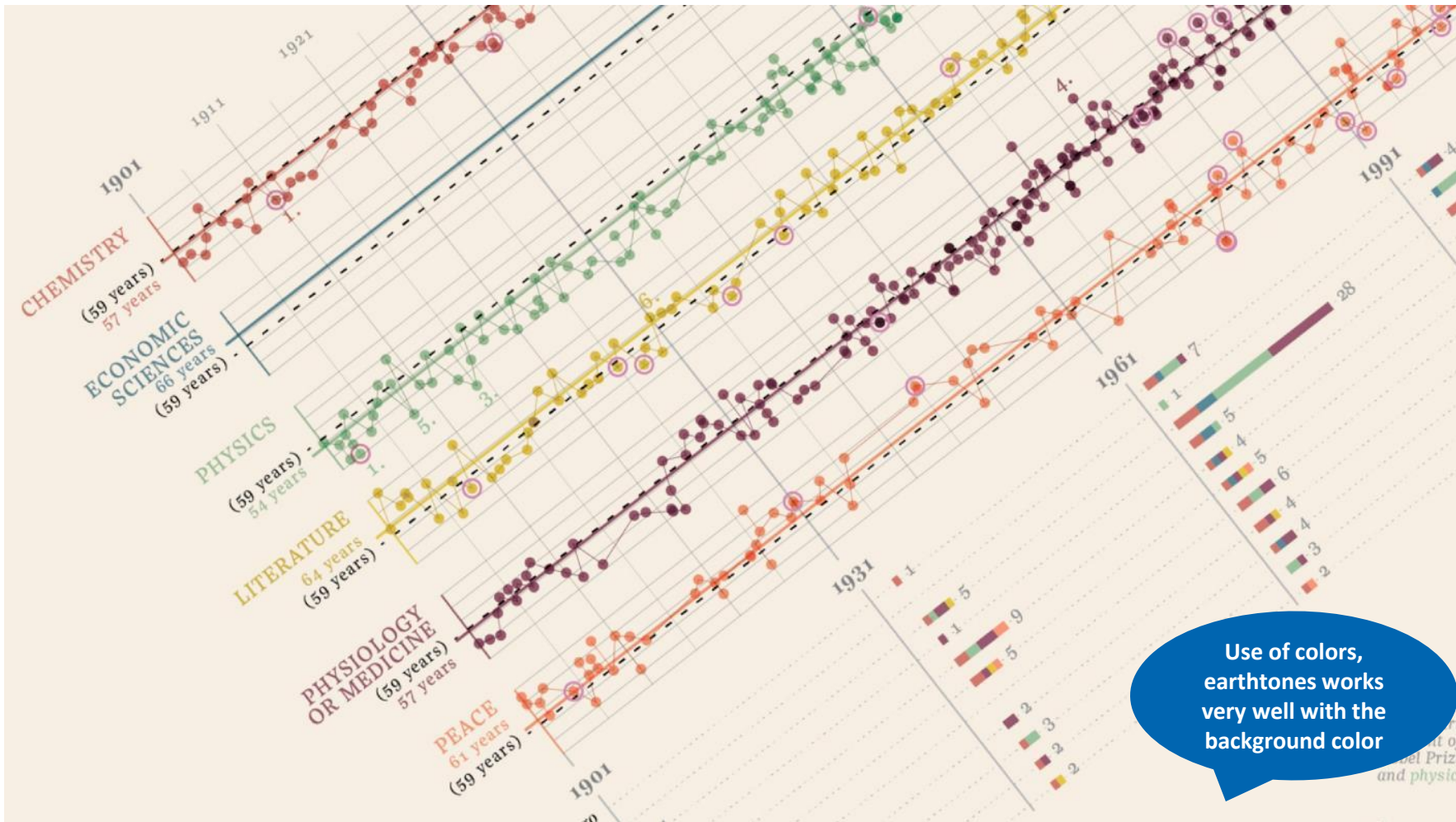
Some of the musical forms don't look like traditional music, but they are

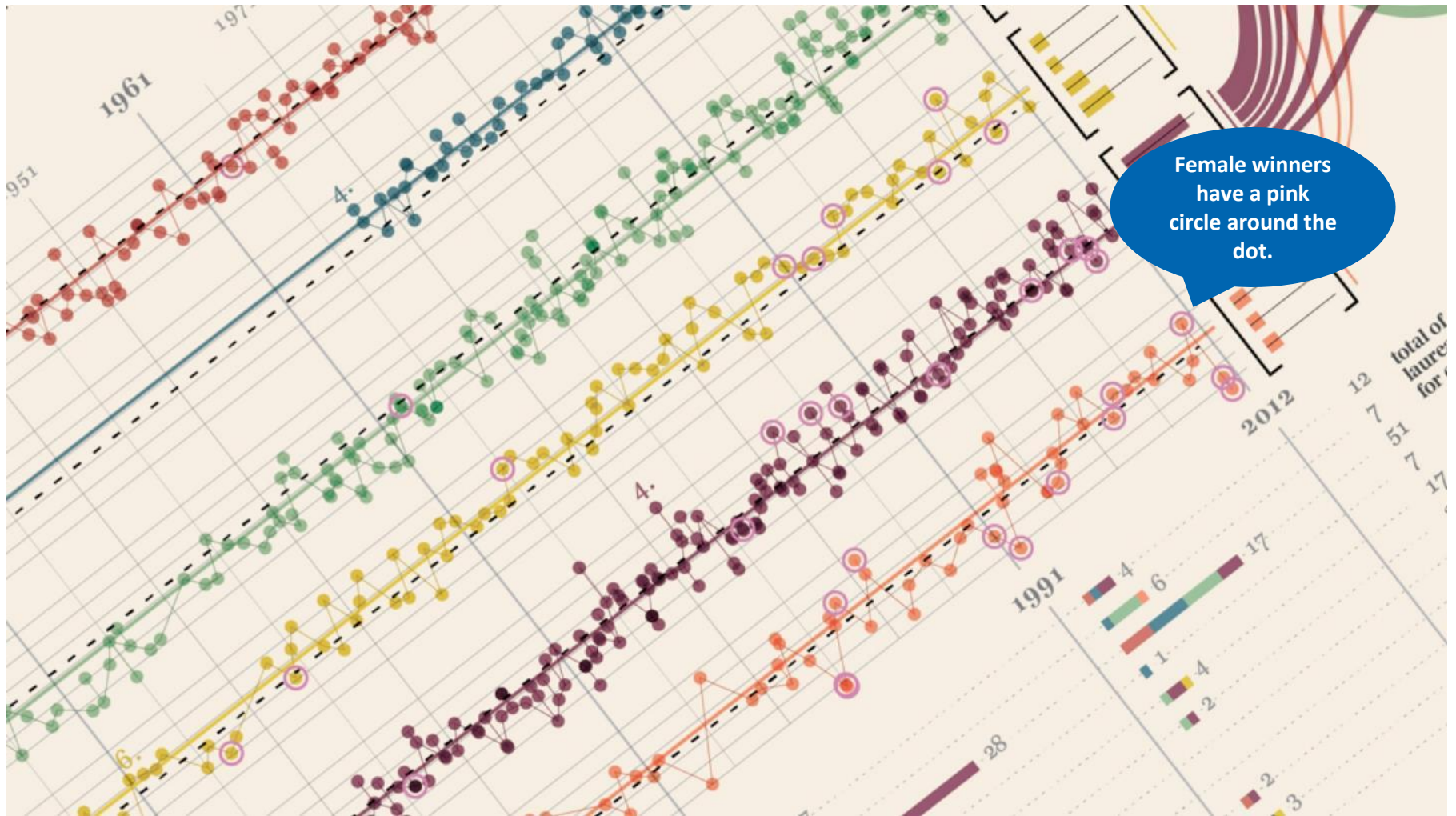
~ = modulated f = short + = low resonance
 □ = directly after a long sound V = sudden



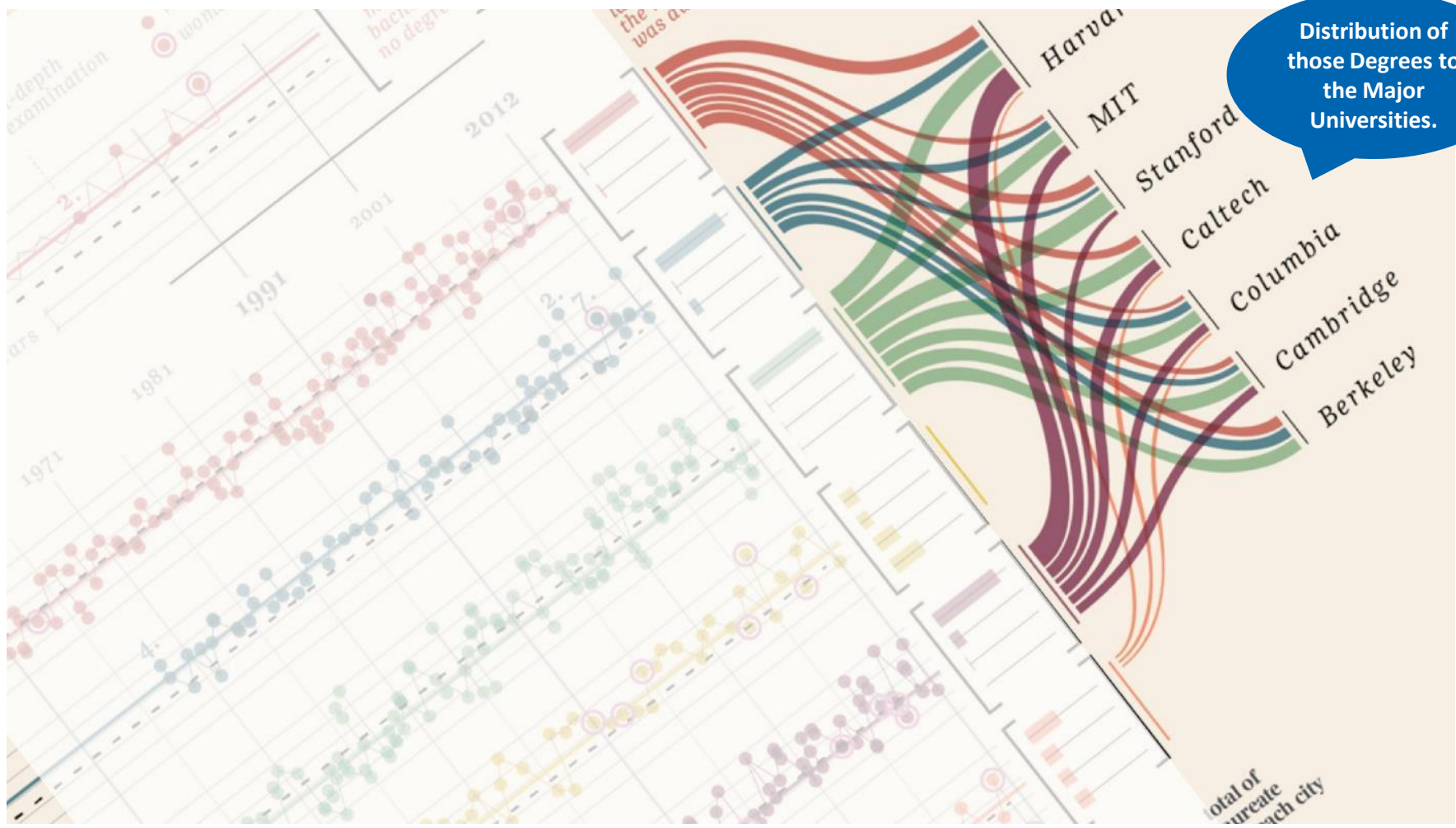
— = level | | = play simultaneously with the next two sounds
 [= concerted and resonant ~ = vibrato
 * = intricate ~ = slack ☉ = dirty

(fascination)
graphic music notations



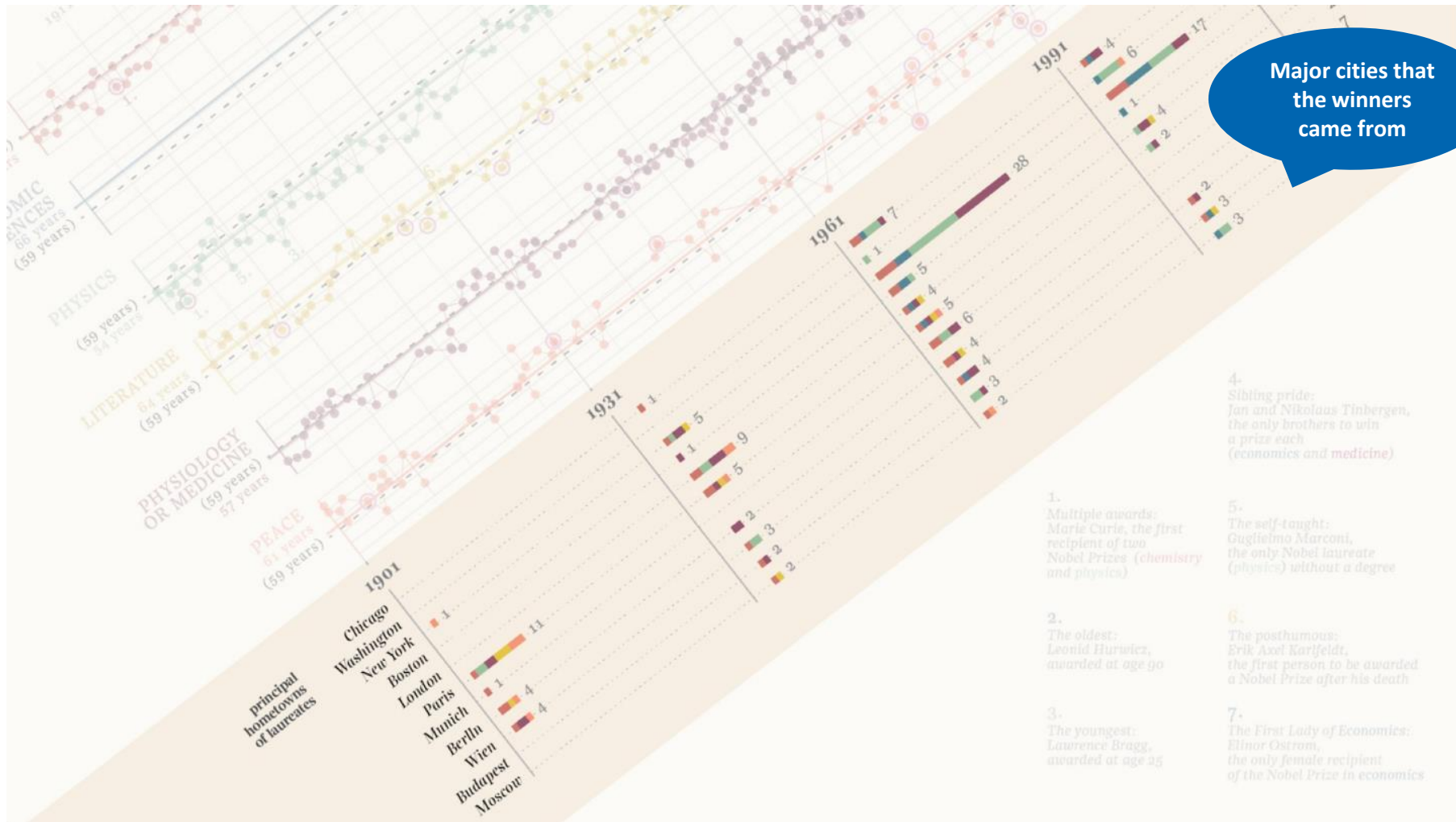


Female winners have a pink circle around the dot.



Distribution of those Degrees to the Major Universities.

total of
create
each city



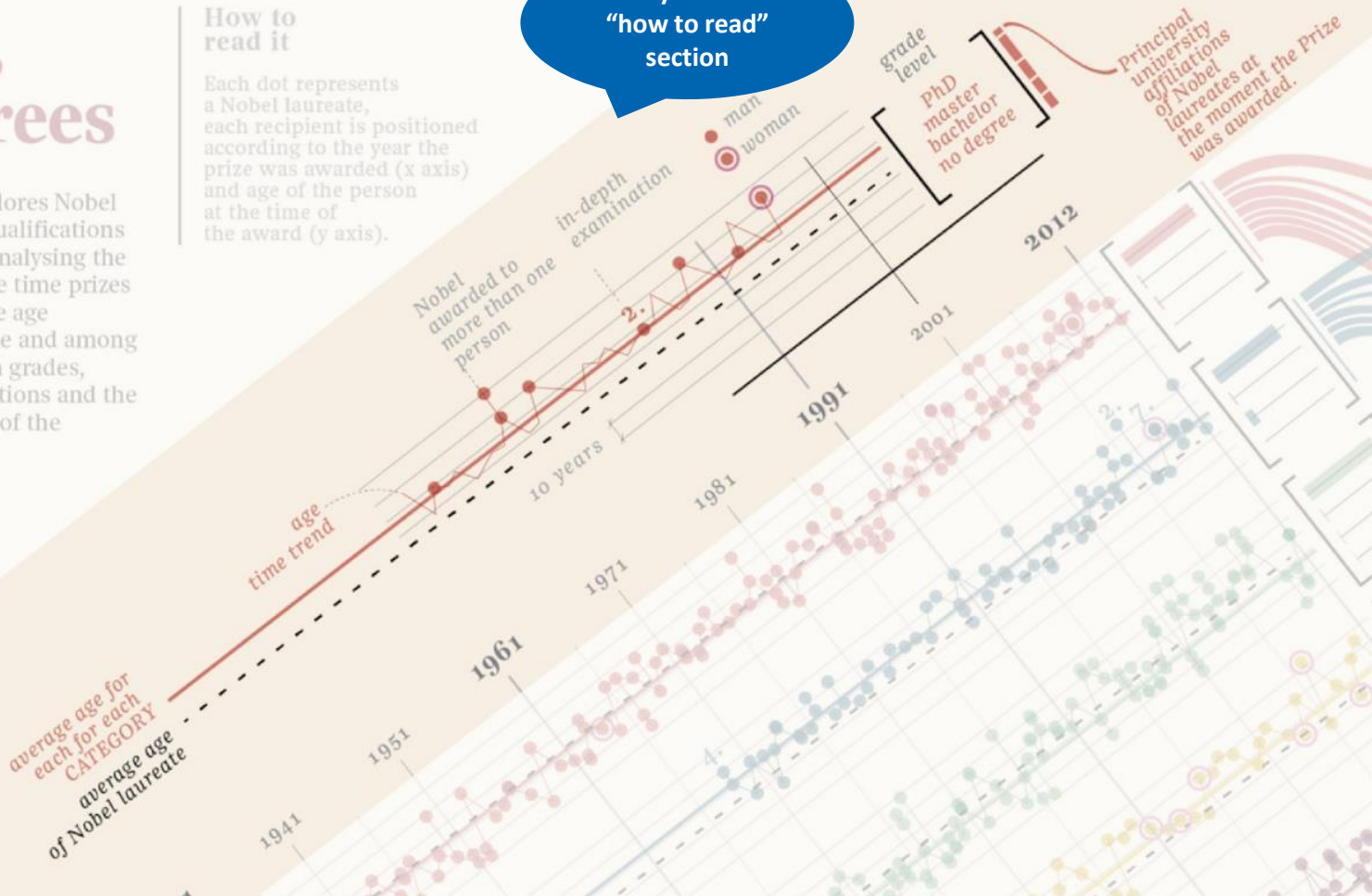
Nobels, no degrees

This visualization explores Nobel Prizes and graduate qualifications from 1901 to 1912, by analysing the age of recipients at the time prizes were awarded, average age evolution through time and among categories, graduation grades, main university affiliations and the principal hometowns of the graduates.

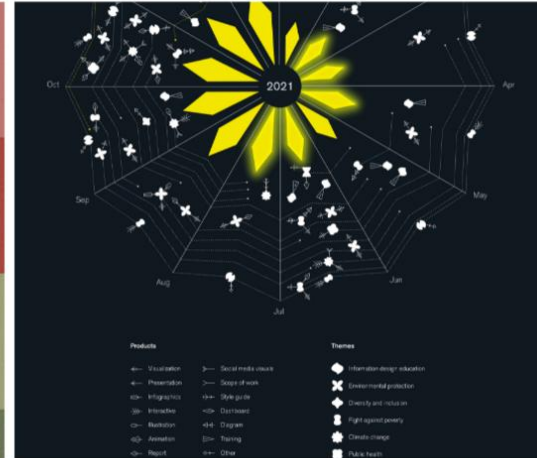
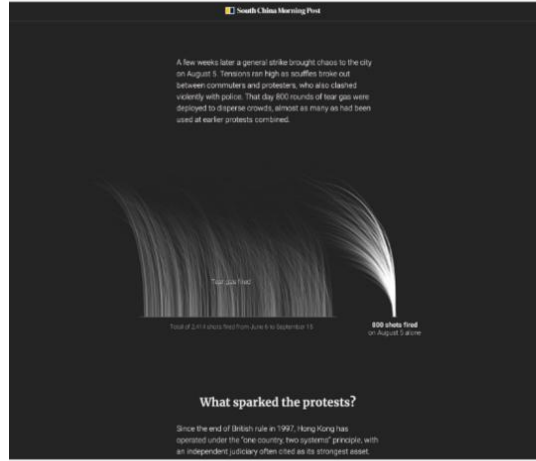
How to read it

Each dot represents a Nobel laureate, each recipient is positioned according to the year the prize was awarded (x axis) and age of the person at the time of the award (y axis).

a very detailed
"how to read"
section




Information is Beautiful Awards 2022





Dashboard



A dashboard is a visual display of the **most important information** needed to achieve **one or more objectives**; **consolidated and arranged** on a **single screen** so the information can be monitored **at a glance**.

Stephan Few, Information Dashboard Design, 2006

Dashboard

- Present information through visuals to achieve specific objectives
- Communicate insights quickly and effectively
- Presented using text and graphics
 - emphasis on graphics
- Effective dashboard supports quick
 - visual scanning
 - comprehension
- Good design
 - understanding of visual perception



Types of Dashboard

Strategic Dashboard

- Monitor the execution of strategic objectives
- Aim: align organization around shared strategic goals
- Executives and senior management
 - Quick overview to monitor business health and opportunities
 - Focus: high level performance measures
- Static snapshots (daily, weekly, or monthly), not real-time data
- Simple visual displays

HR ATTRITION DASHBOARD



SHOW ONLY ATTRITION



Attrition Retention

Click data point(s) to filter dashboard.

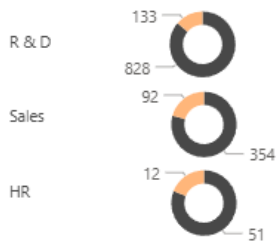
OVERVIEW (27 May, 2021 to 08 May, 2022)

19.2%
ATTRITION RATE

237
TOTAL ATTRITION

1,233
CURRENT EMPLOYEES

DEPARTMENT



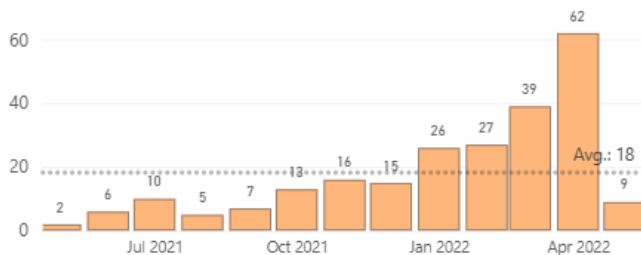
JOB ROLE

Laboratory Technician	62	197
Sales Executive	57	269
Research Scientist	47	245
Sales Representative	33	50
Human Resources	12	40

ATTRITION TREND

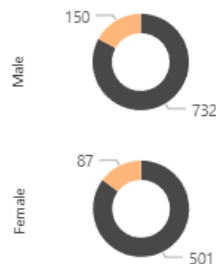
▼ 85.5% vs previous month

SELECT PERIOD: W M Q Y

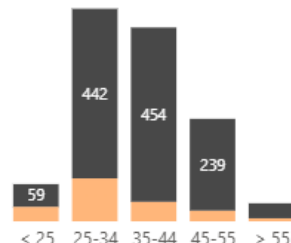


DEMOGRAPHICS

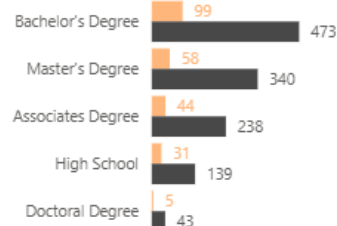
GENDER



AGE GROUP



EDUCATION



SURVEY SCORE

Score >>

1 2 3 4

Environment Satisfaction

Attrition	72	43	62	60
Retention	212	244	391	386

Job Involvement

Attrition	28	71	125	13
Retention	55	304	743	131

Job Satisfaction

Attrition	66	46	73	52
Retention	223	234	369	407

Relationship Satisfaction

Attrition	57	45	71	64
Retention	219	258	388	368

Work Life Balance

Attrition	25	58	127	27
Retention	55	286	766	126

RECENT ATTRITION

EMP ID: ATTR. DATE:

E_1
Sales Executive
Sales
Attrition date: 30 Apr, 2022
Avg. Satisfaction Score: 2.2
Performance Rating: 3
Monthly Income: \$5,993
Salary Hike: 11%

E_1004
Research Scientist
R & D
Attrition date: 31 Jul, 2021
Avg. Satisfaction Score: 2.4
Performance Rating: 3
Monthly Income: \$2,132
Salary Hike: 11%

E_1010
Attrition date: 04 Mar, 2022

Tactical Dashboard

- Track departmental processes and projects
- Performance comparison – budgets, forecast, past results
- Support progress monitoring over medium-term period
- Updated daily or weekly with detailed and summarized data
- Focus on analysis

4/14/2026

Last Day of Sales

Daily Sales vs Budget

Year To Date (1/1/2026-4/14/2026)

Select Region

Yesterday

Current Month To Date

Year To Date

Last 30 Days

Last 90 Days

Last 365 Days

Previous Year

Units Sold

9,566

Budget: **10,110**

% Var: **-5.4%**

Profit

€ 728,431

Budget: **760,058**

% Var: **-4.2%**



Emma



Michael



Tom



Anna



Roland



Emma Area North

Map



Bar

4/14/2026

Last Day of Sales

Units Sold

1,774

Profit

€ 129,851

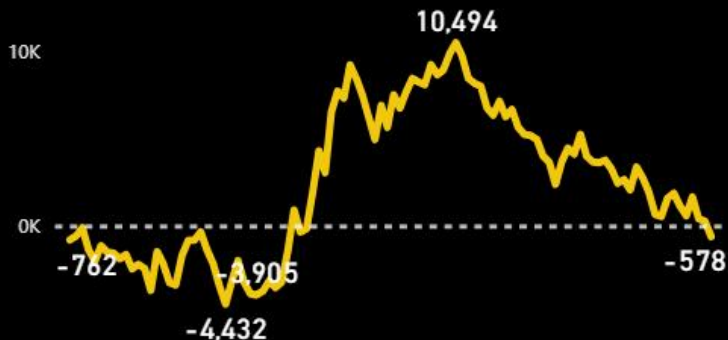
Budget: 1,720

% Var: 3.1%

Budget 130,429

% Var: -0.4%

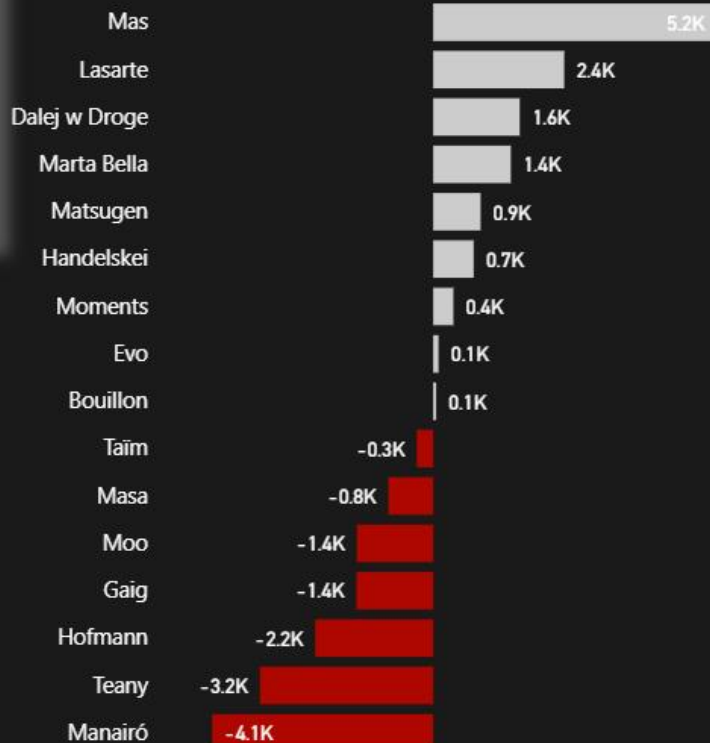
Cumulative Variance vs Target



Units Sold Profit (€) 2026 Mar 2026 Apr 2026

Right click to Drillthrough Customer

Below Target



Yesterday

Current Month To Date

Year To Date

Last 30 Days

Last 90 Days

Last 365 Days

Previous Year

EXCE LAB

Operational Dashboard

- Monitor core operational process and daily activities
- Real-time or near real-time view of operations (updated intra-day)
- Details, lightly summarized information
- Focus on process indicators
- Monitoring and immediate action
- Simple displays with alerts to flag performance issues

Today

137

Orders

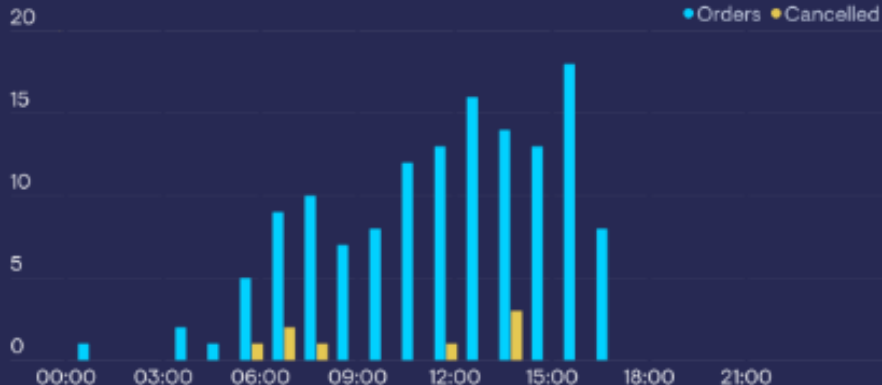
▲ 35 vs same day last week

\$21.8K

Revenue

▲ \$5.6k vs same day last week

Orders today



Processing

43

unfulfilled orders

Avg fulfilment time (past 7d)



23

returns to be processed

Past 30 days

2,822

Orders

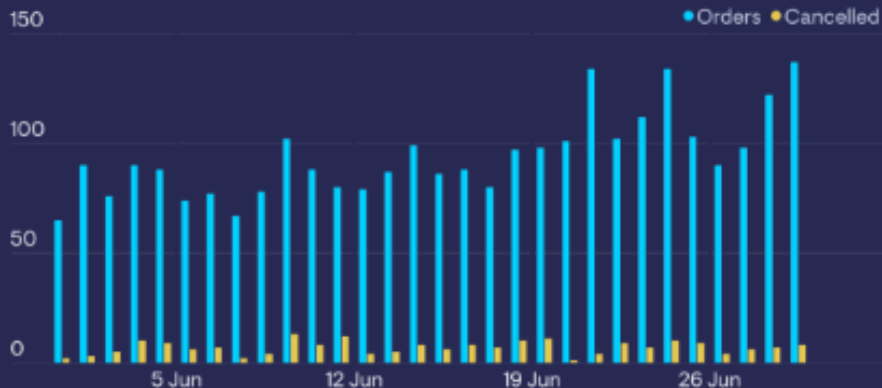
▲ 834 vs last month

\$448.7K

Revenue

▲ \$132.6k vs last month

Orders this month



Analytical Dashboard

- In-depth data exploration to uncover patterns, anomalies, insights, and root causes
- Focus on data comparison and investigation
 - Ex: why performance changes occur
- Advance charts that allows exploration

Pre and Post Marketing Campaign Insights

Campaign to Customers



Customer Credit Scores

660 785



Customer Age

25 53



Effects of Campaigning on Average Monthly Spend



232

Total New Card Signups

12.11K

Total Transactions

667

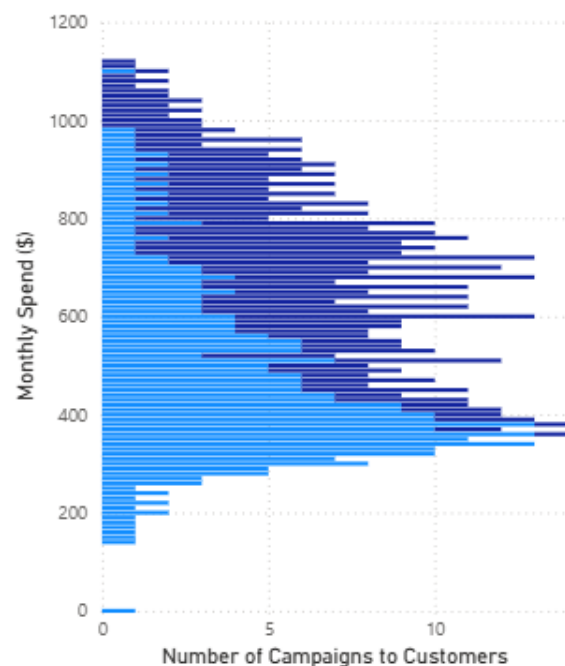
Active Customers

668

Total Campaign Exposures

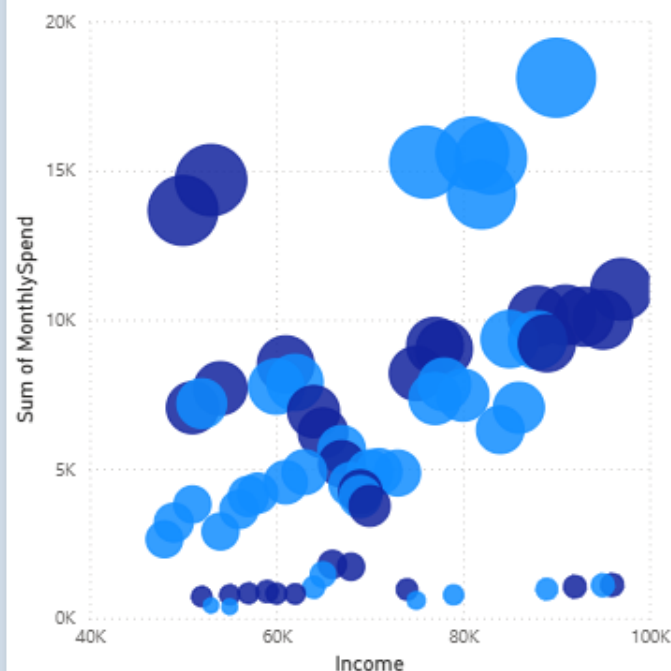
Spend Lift by Campaign Count (Pre vs. Post)

Campaign ● Before ● After



Acquisition Impact: Spend & Activity by Income Tier


New Card Signup ● 0 ● 1



Data Storytelling



Don't simply show your data
—tell a story with it!



What is data storytelling?

What is data storytelling?

Data Visualization

- Graphical representation of data using charts, graphs, maps, etc.
- Make complex data easier to understand, interpret quickly, find trends and patterns in data

Data Storytelling

- Combining data, visuals, and narratives
- Effectively communicate insights - influence decisions, create understanding and engage audience

What is data storytelling?

Data storytelling:

Explaining why sales dropped in Q3 using a timeline chart, customer feedback, and a narrative about market trends.



Data Visualization:

A bar chart showing monthly sales figures.

Core Elements of Data Storytelling



Narrative – structure of data story (how information is organized into storyline)

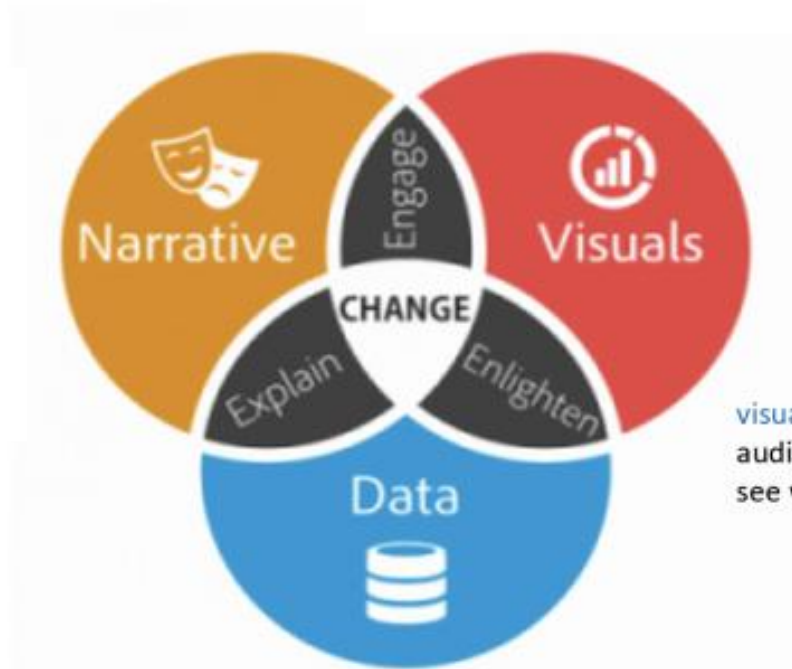


Effectivedatastorytelling.com

Visuals– scenes of data story (help audience to see patterns / anomalies/ trends)

Data – foundation of data story

Core Elements of Data Storytelling

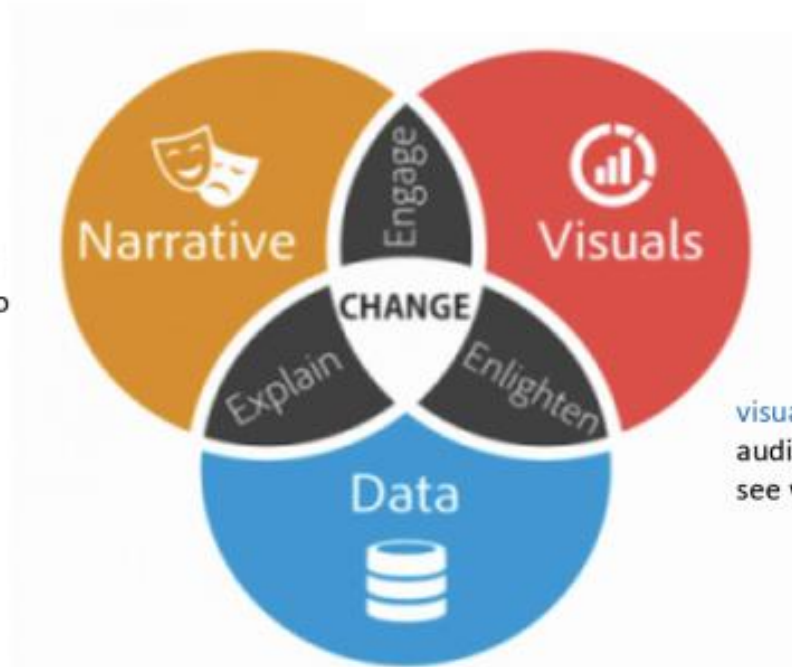


visuals + data, they can **enlighten** the audience to insights that they wouldn't see without charts or graphs.

Key Elements of Data Storytelling



narrative + data, it helps to **explain** to your audience what's happening in the data and why a particular insight is important. Ample context and commentary is often needed to fully appreciate an insight. visualizations.



visuals + data, they can **enlighten** the audience to insights that they wouldn't see without charts or graphs.

Core Elements of Data Storytelling



narrative and visuals are merged together, they can **engage** or even entertain an audience.

narrative + data, it helps to **explain** to your audience what's happening in the data and why a particular insight is important. Ample context and commentary is often needed to fully appreciate an insight. visualizations.



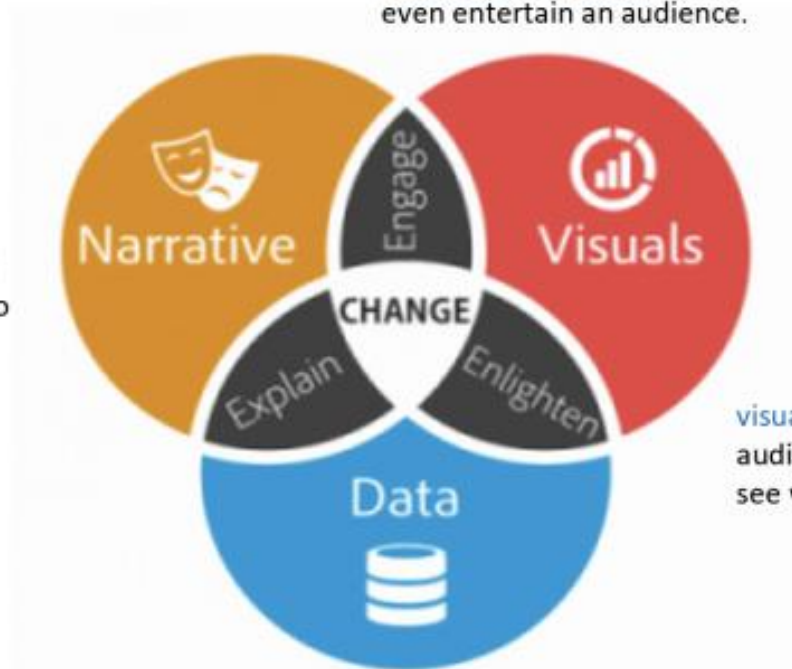
visuals + data, they can **enlighten** the audience to insights that they wouldn't see without charts or graphs.

Core Elements of Data Storytelling



narrative and visuals are merged together, they can **engage** or even entertain an audience.

narrative + data, it helps to **explain** to your audience what's happening in the data and why a particular insight is important. Ample context and commentary is often needed to fully appreciate an insight. visualizations.



visuals + data, they can **enlighten** the audience to insights that they wouldn't see without charts or graphs.

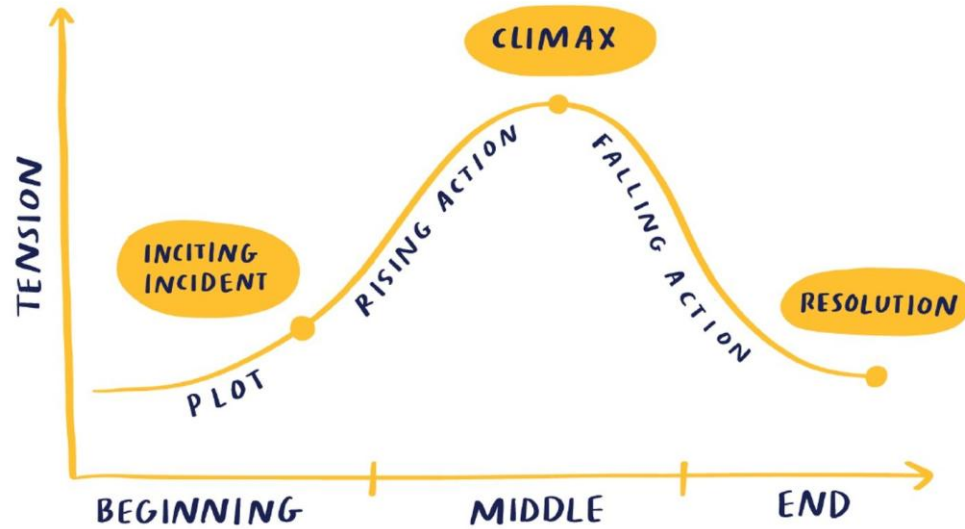
Combining the right visuals and narrative with the right data, a data story that can **influence and drive change**.



ThePhoto by PhotoAuthor is licensed under CCYSA.



Structure of a story





Telling the Story



Attract



Engage



Punchline



Laws of Attraction

- Identify theme
- Know your audience
- Determine purpose
- Set the tone
- Keep it simple





Rules of Engagement

- Interactive vs. non-interactive
- Choice of visualizations
- Pay attention to size, colors, space
- Purposeful arrangement
- Walk audience through the story (how you deliver)



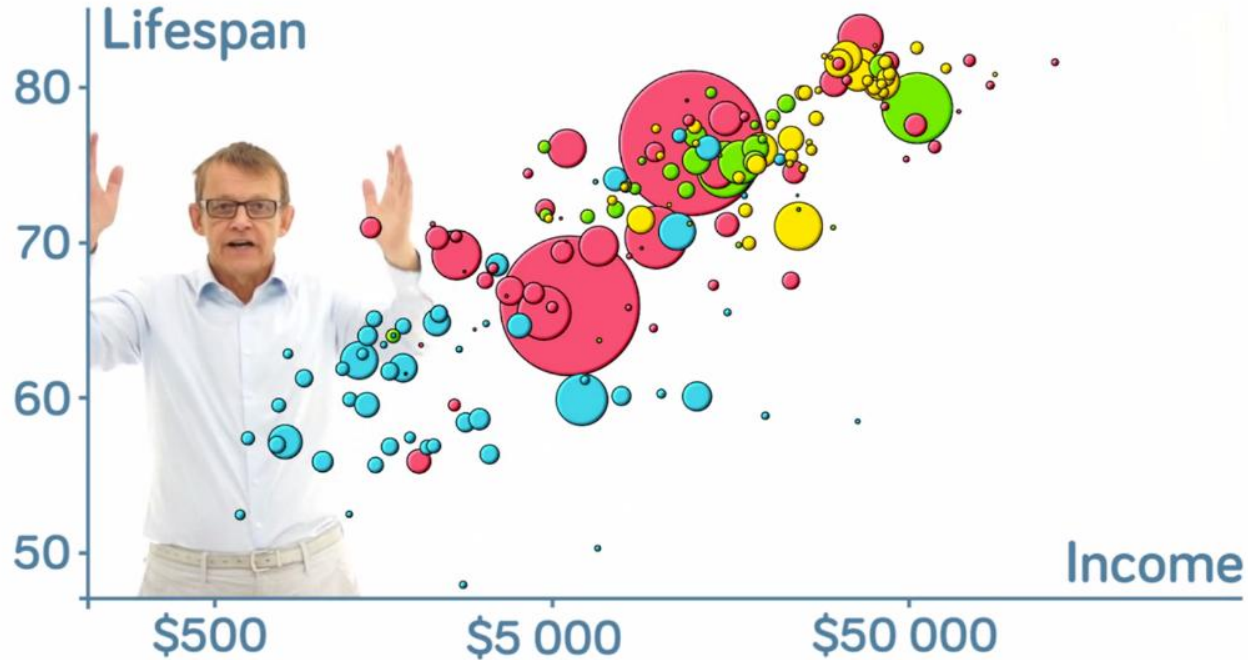


Give 'Em the Punchline

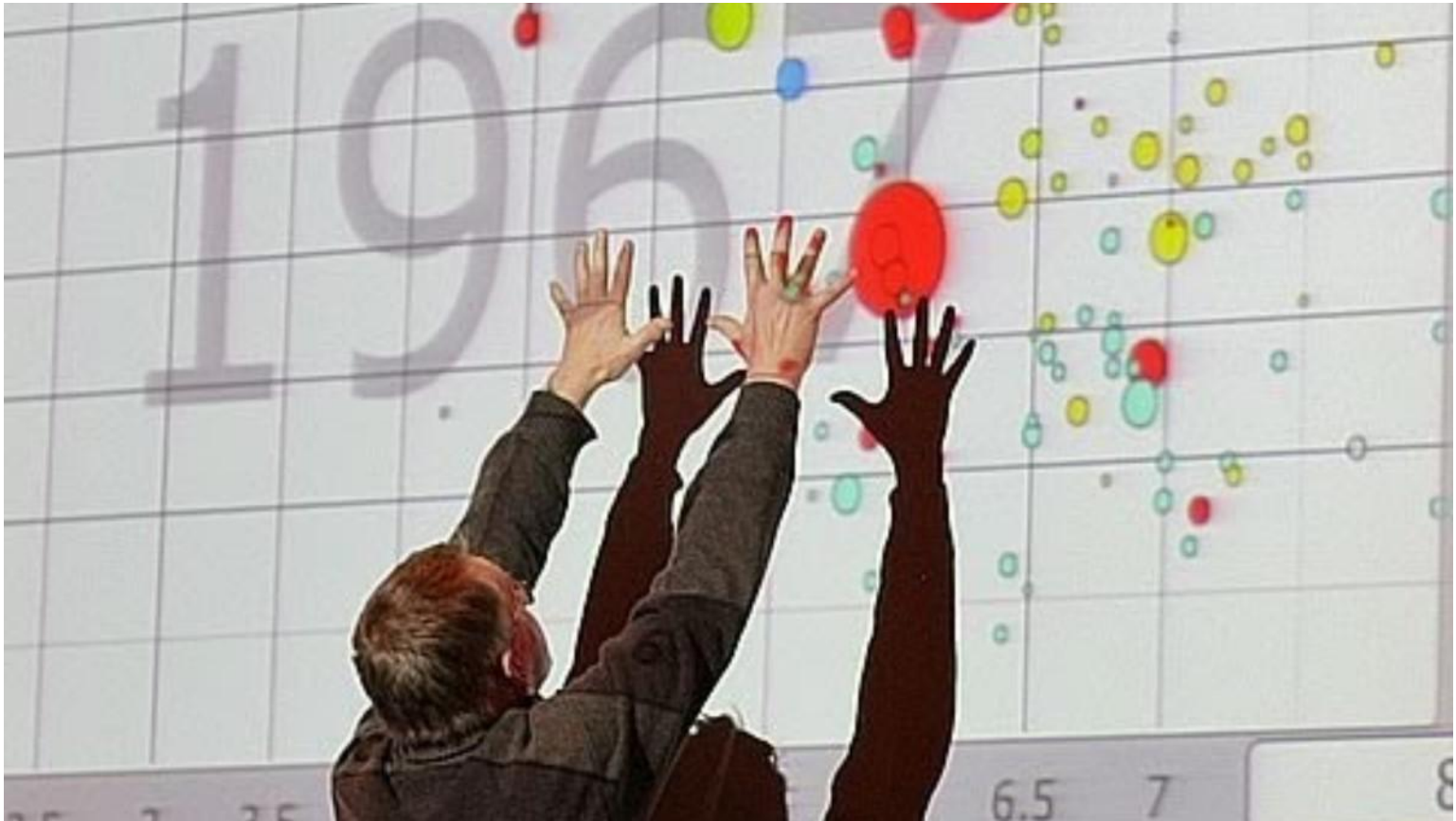
- Conclude clearly
- Place your conclusion strategically
 - Chronologically
 - Lead with the punchline
- Make a lasting impression



“The Best Stats You’ve Ever Seen”



[The best stats you've ever seen - Hans Rosling](#)



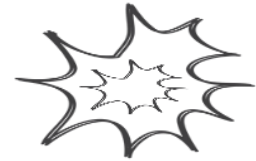
Hans Rosling Presentation Breakdown



Attract



Engage



Punchline

Are we really not smarter than chimpanzees?

Debunk third world myths

Show why preconceived notions are wrong

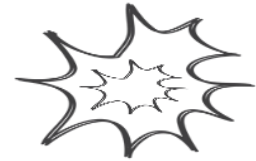
Hans Rosling Presentation Breakdown



Attract



Engage



Punchline

Animation of countries' progress over the course of 200 years

Walks us through journey

Highlight key historical events that audience may relate to

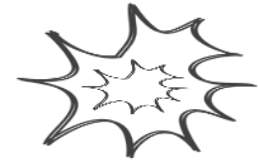
Hans Rosling Presentation Breakdown



Attract



Engage



Punchline

We need to have open, searchable databases to allow people to see reality

Promote a fact-based view of the world

“Numbers have an important story to tell. They rely on you to give them a clear and convincing voice.”

Stephen Few

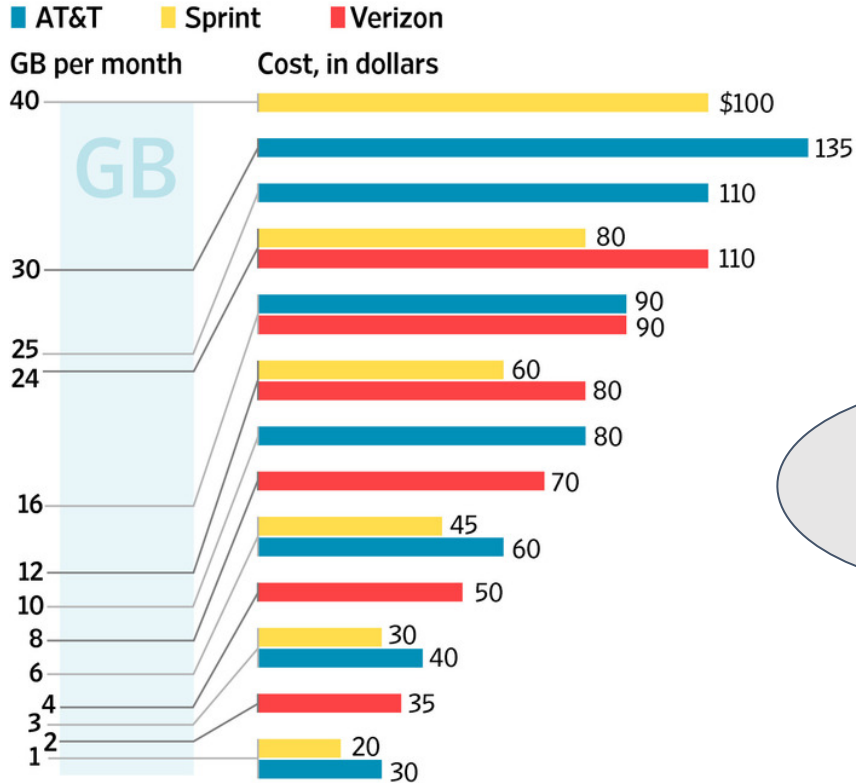




Example: Redesign

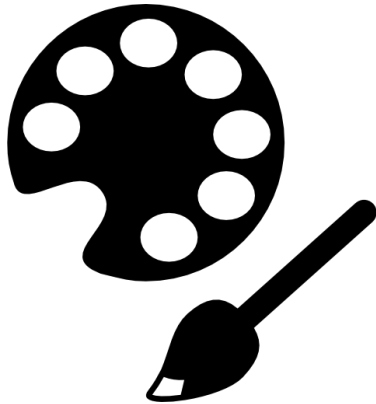
Buying in Buckets

AT&T, Verizon and Sprint charge the same \$20 per phone but have different data allowance levels. Comparison isn't easy.



What's the best deal for a consumer?

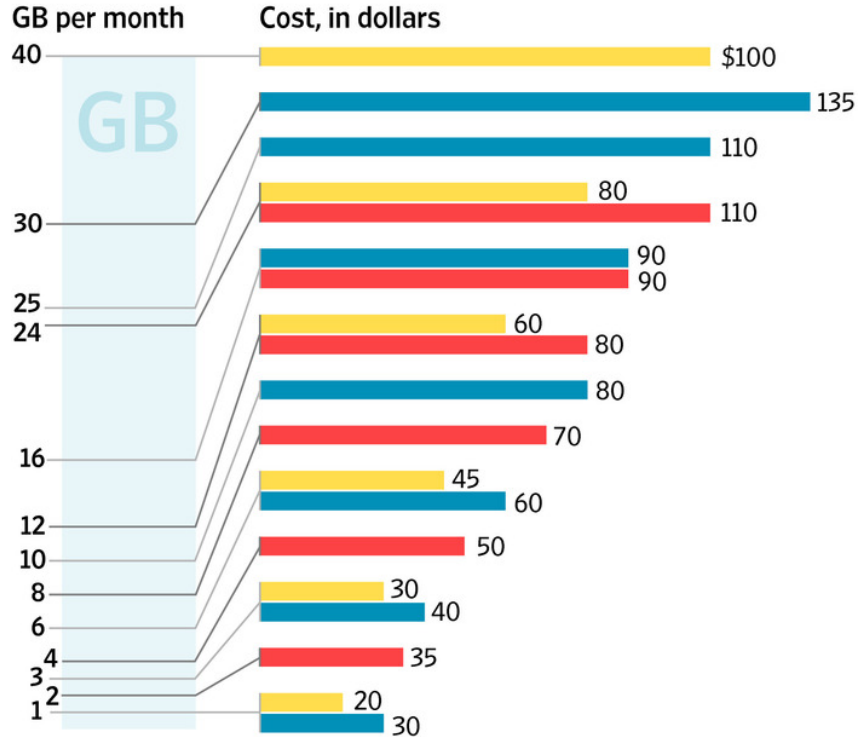
Let's Re-Design!



Buying in Buckets

AT&T, Verizon and Sprint charge the same \$20 per phone but have different data allowance levels. Comparison isn't easy.

■ AT&T ■ Sprint ■ Verizon



Sources: the companies

THE WALL STREET JOURNAL.

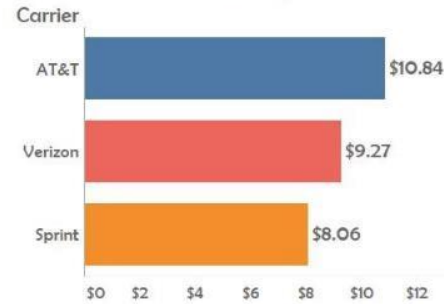
PlanID	Carrier	Dollars	GB	Average Price per GB
1	Sprint	20	1	20.00
2	AT&T	30	1	30.00
3	Verizon	35	2	17.50
4	Sprint	30	3	10.00
5	AT&T	40	3	13.33
6	Verizon	50	4	12.50
7	Sprint	45	6	7.50
8	AT&T	60	6	10.00
9	Verizon	70	8	8.75
10	AT&T	80	10	8.00
11	Sprint	60	12	5.00
12	Verizon	80	12	6.67
13	AT&T	90	16	5.63
14	Verizon	90	16	5.63
15	Sprint	80	24	3.33
16	Verizon	110	24	4.58
17	AT&T	110	25	4.40
18	AT&T	135	30	4.50
19	Sprint	100	40	2.50

Data Plan Comparison Across Carriers

Data Allowance vs. Plan Price

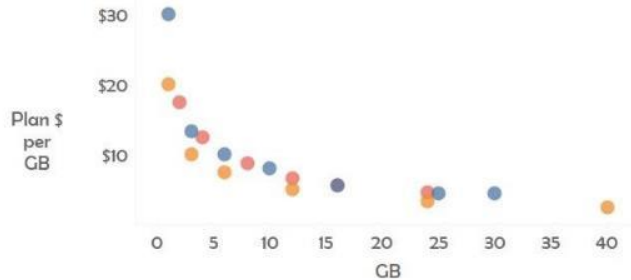


Average Price per GB



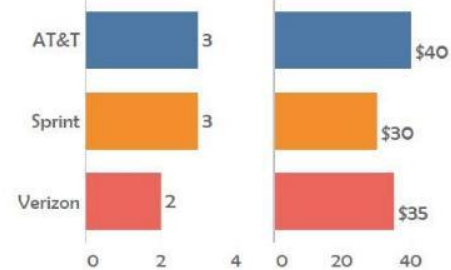
For the Ultimate Bargain Hunter

Get the best bang for your buck with a high data allowance plan



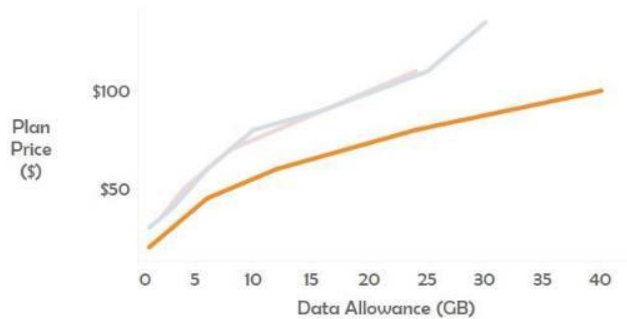
Waste Not, Want Not

People on average use 2-3 GB per month, compare plans for average consumption



Want a Cheap Data Plan? Choose Sprint

Data Allowance vs. Plan Price

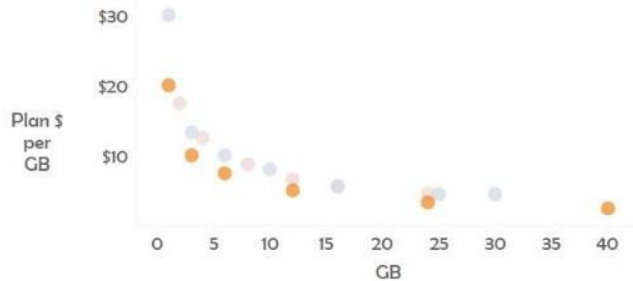


Average Price per GB



For the Ultimate Bargain Hunter

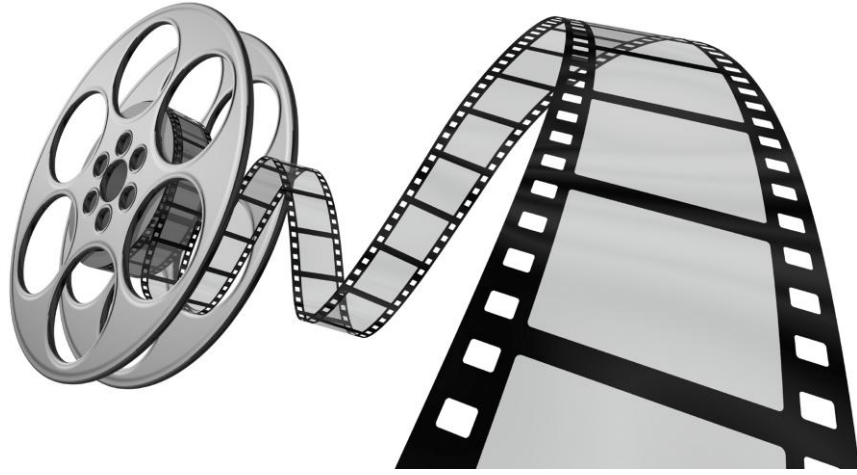
Sprint's 24 GB and 40 GB data plans give the best bang for your buck - only \$3 per GB



Waste Not, Want Not

People on average use 2-3 GB per month
Sprint has the best plan for the typical user





Watch the videos
Guided Independent Learning

Personal Training Program Dashboard

ALL

Center A

Center B

Center C

Center D

Trainer

All

Last refreshed: 19-SEP-2022

Data through: 18-SEP-2022

from dashboard

196

Completed
1st Session

165

Completed
2nd Session

75

Completed
3rd Session

to

action-inspiring story



✗ BEFORE



✓ AFTER



SAME DATA!



End of Lecture