



# Displaying Data

University of Michigan  
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Tom Crawford  
[viznetwork.com](http://viznetwork.com)  
@viznetwork @thcrawford

# Introductions

# About Me



# About You

- ▶ What's your first name?
- ▶ What's your department?
- ▶ Where do you use/want to use data visualization?
- ▶ What do you hope to get out of this class?

# Today

- ✓ Introductions & Agenda
- Why Visualize Data?
- Selecting Charts & Graphs
- Graph Basics
- Parts of the Whole
- Text Values
- Geographic Data
- Concepts, Words & Relationships
- Encoding Data
- Storytelling, Data-Ink, & Icons
- Colors, Fonts, & Animation

<https://github.com/thcrawford/DisplayingData>



# the functional art

an introduction to  
information graphics  
and visualization

# the truthful art

data, charts, and maps  
for communication

alberto cairo

"Cairo sets the standard for how data should be understood, analyzed, and presented. The Truthful Art is both a manifesto and a manual for how to use data to accomplish clearly, elegantly, imaginatively, beautifully, and reliably, inform the public."

Jeff Jarvis, professor, CUNY Graduate School of Journalism,  
and author of Geeks Bearing Gifts: Inspiring New Futures for News

# INFORMATION DASHBOARD DESIGN

## Show Me the Numbers

Designing Tables and Graphs to Enlighten



Stephen Few

# Why Visualize Data?



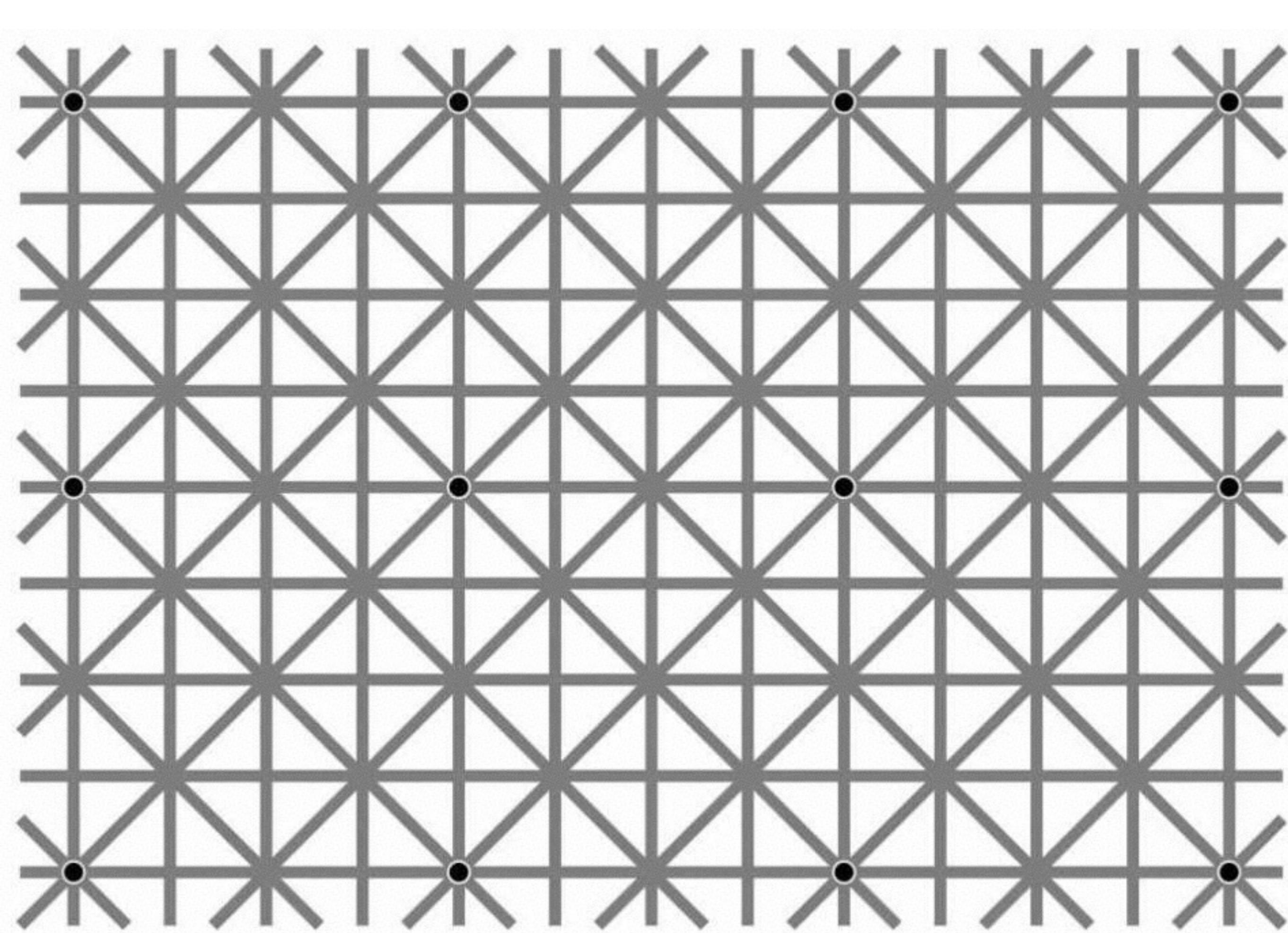
**PBS**

**KIDS**

[pbskids.org](http://pbskids.org)





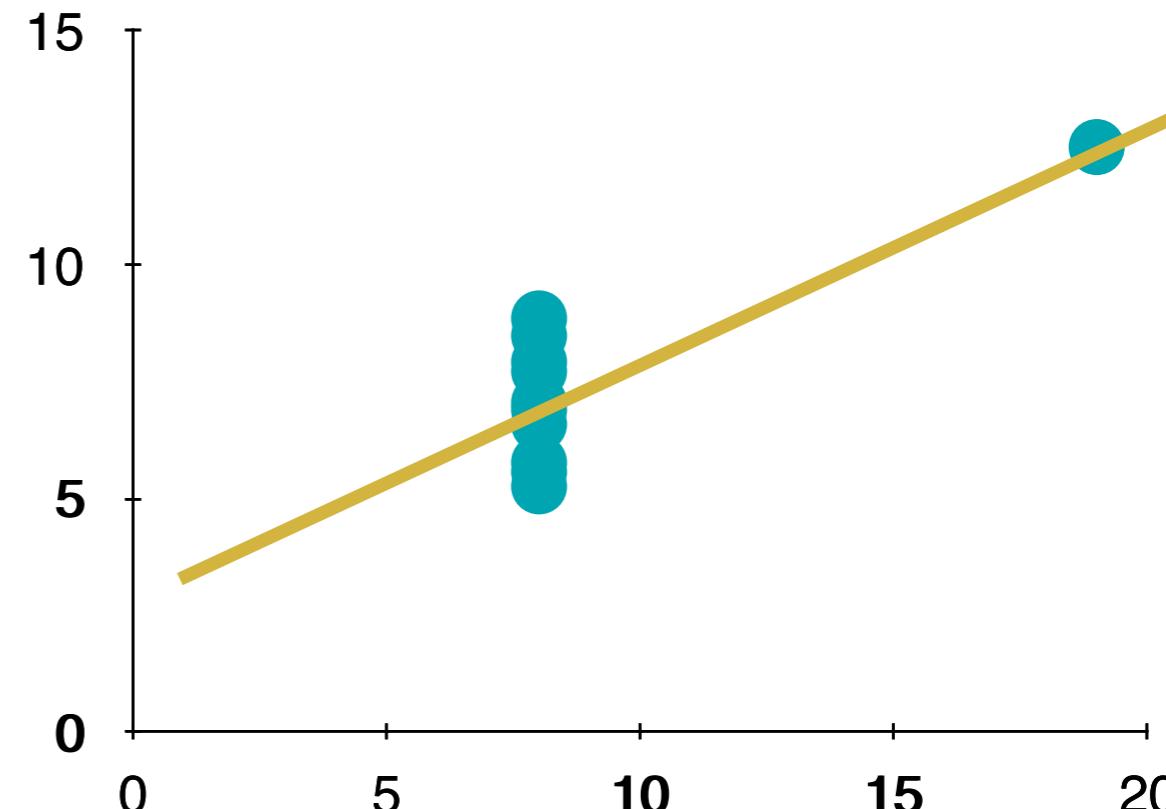
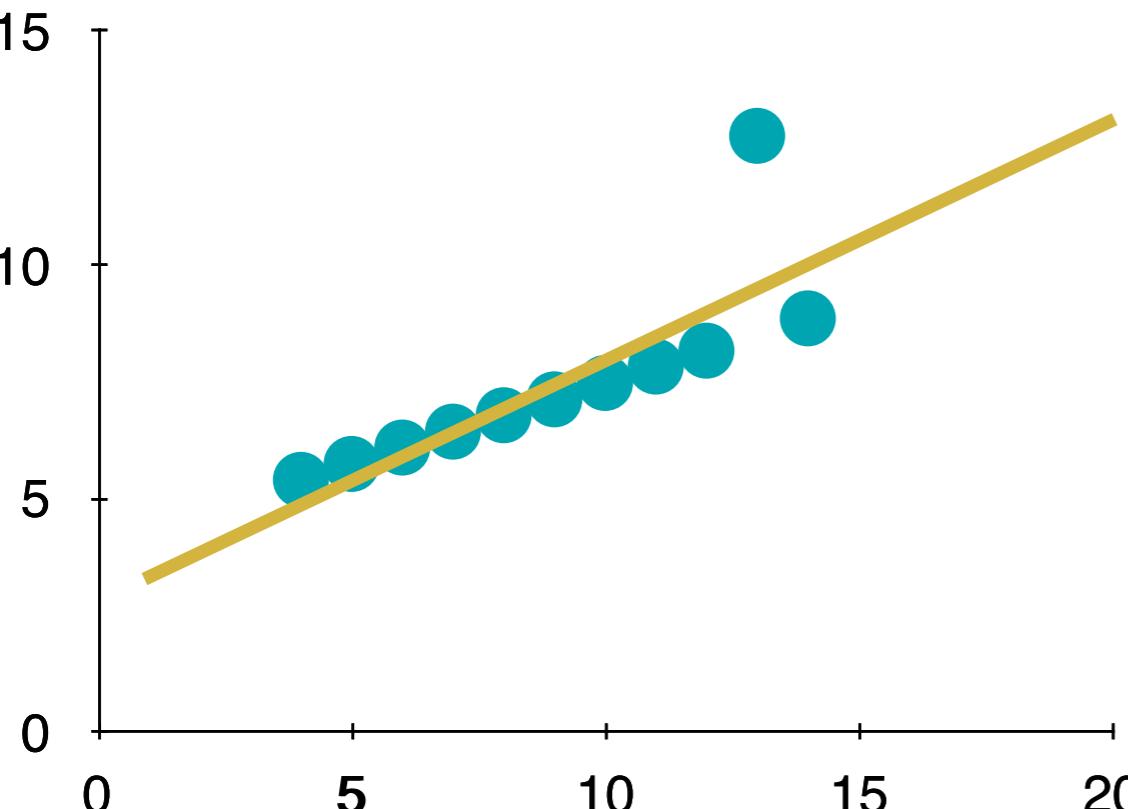
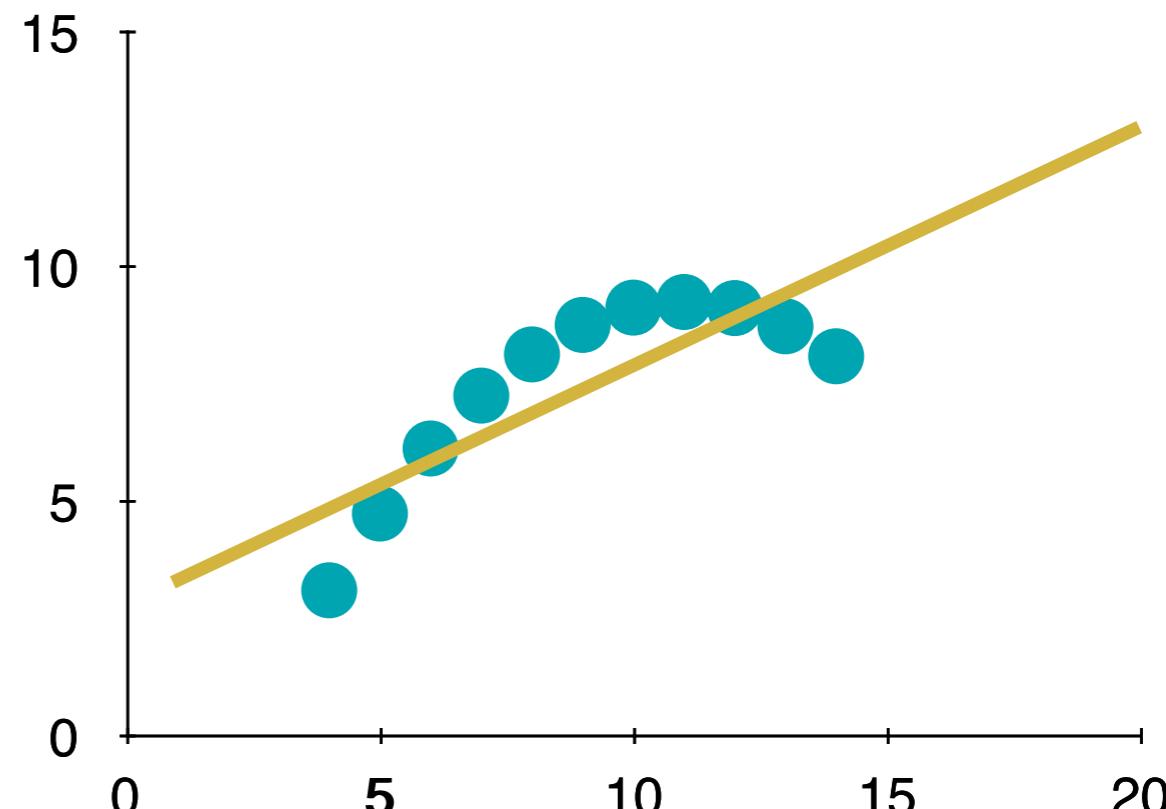
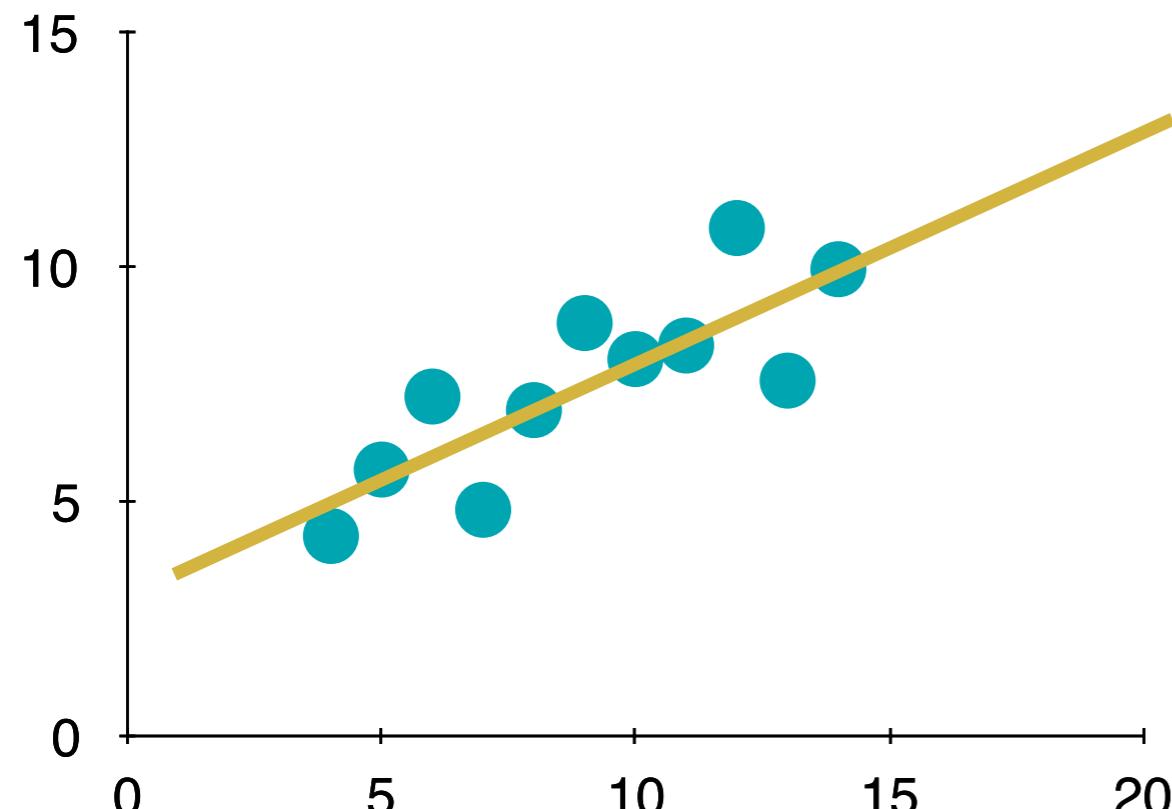


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6	7	9	2	4	1	5	6	6	7
8	4	3	1	4	9	7	8	5	9
3	4	2	5	7	2	5	3	1	8
7	9	1	3	4	6	2	5	9	1
3	2	4	3	5	5	2	5	1	4
9	8	7	1	2	3	4	3	2	1
2	5	8	9	8	7	6	2	4	5
9	2	3	5	2	8	7	5	6	4
1	2	3	7	9	4	2	3	2	1
8	6	4	2	1	3	5	7	9	8
4	4	2	4	9	8	1	3	2	4
5	7	6	4	1	3	1	2	5	9
1	3	7	9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

# Why Visualize?

- ▶ 4 Data Sets
- ▶ Each has:
  - Mean of X: 9
  - Sample Variance of X: 11
  - Mean of Y: 7.5
  - Correlation of X & Y: 0.816
  - Linear Regression Line:  $Y = 3.00 + 0.500X$

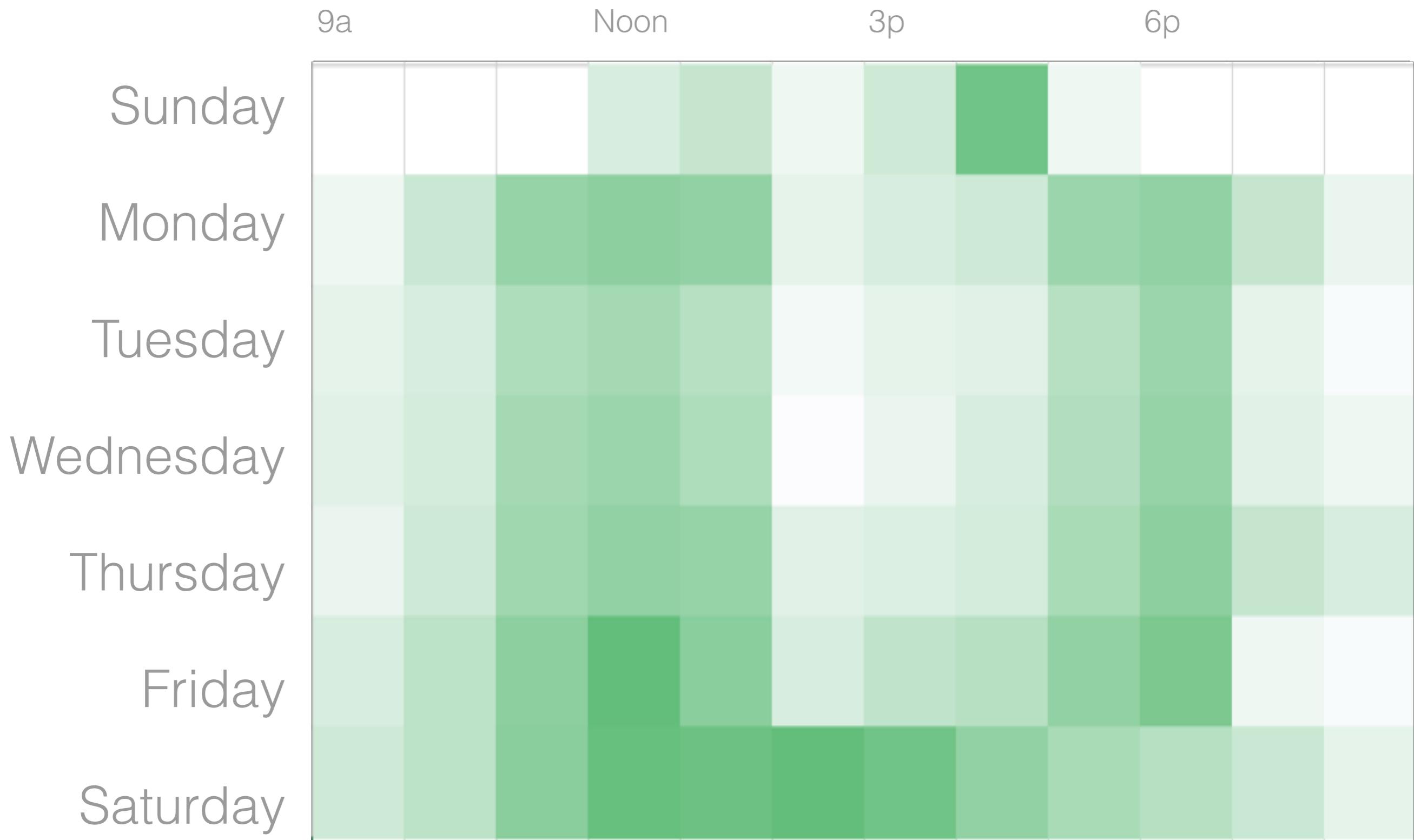
# Why Visualize Data?



Source: Anscombe's Quartet

# Why Visualize?

## Store Arrivals

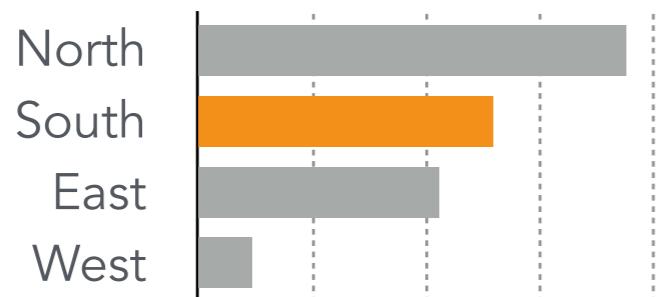


# Why Not Visualize?

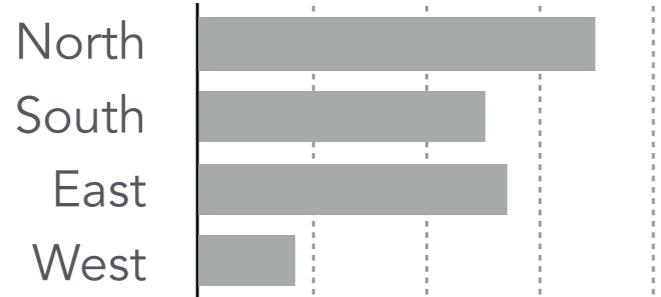
How many **Widgets** did the **South** region sell?

**Sales by region**

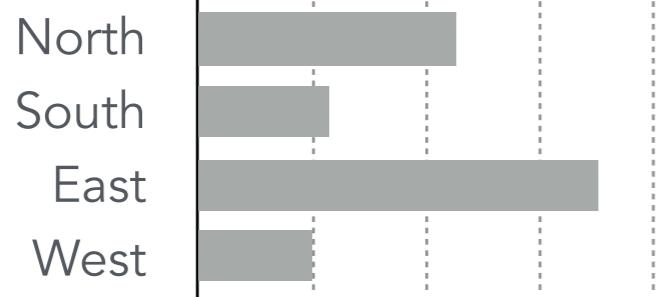
Widgets



Gizmos



Whatsits



**Sales by region**

Region	Widgets	Gizmos	Whatsits	TOTAL
North	94	87	57	238
South	65	63	29	157
East	53	68	38	159
West	12	21	25	58
TOTAL	224	239	149	612

# Selecting Charts & Graphs

# Types of Data

## Categories

Dog  
House  
President  
Flew  
Speak  
Written  
Red  
Large  
Beautiful

## Numbers

38°55'7"N 77°13'47"W  
Here  
Virginia  
4/24/2009  
July 4, 1776  
Yesterday  
Next week  
255.255.0.0  
google.com

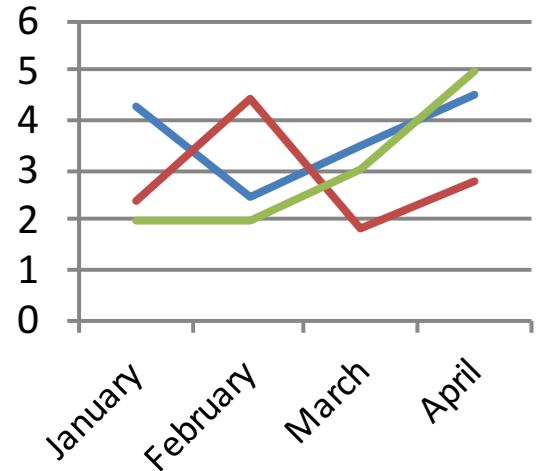
## Addition

1	-512
24	thirty nine
5.93	5%

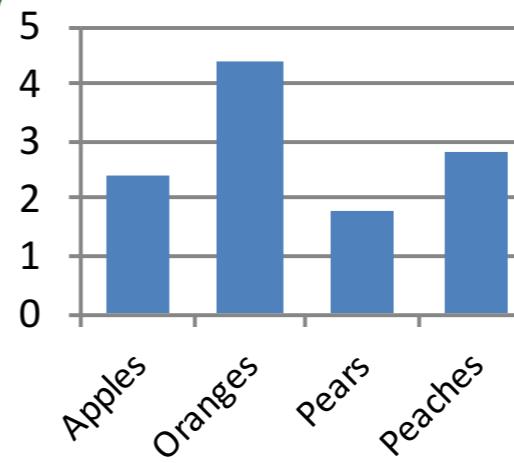
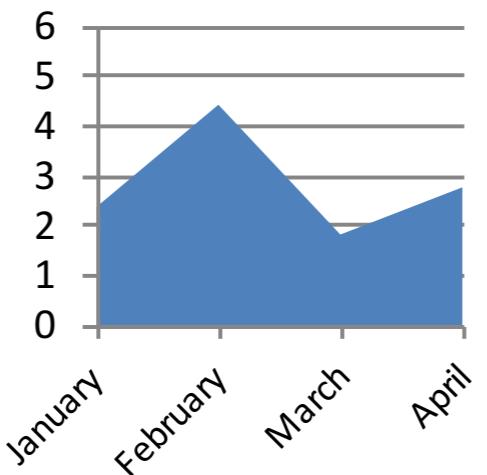
Music

Pictures/Video

# 10 Basic Ways to Display Data



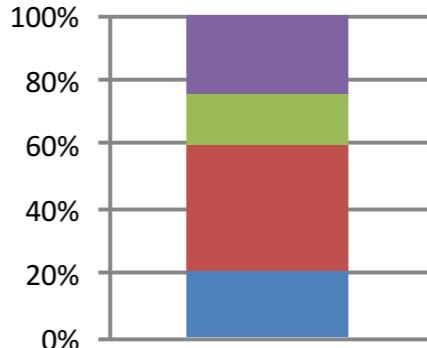
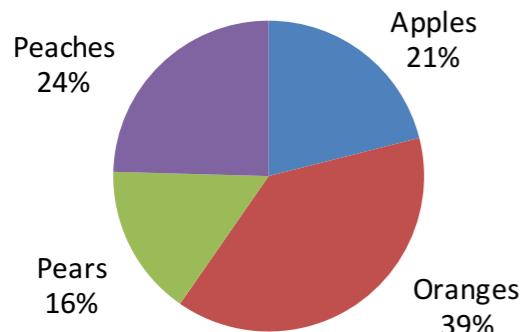
Series  
(ordered)



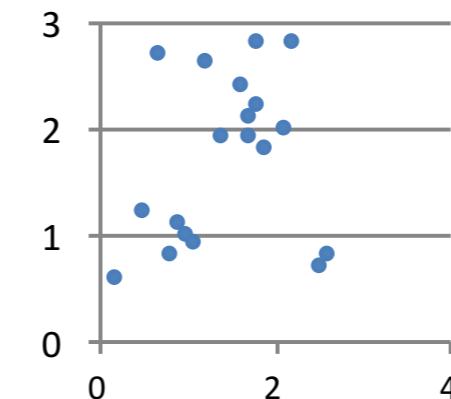
Sales
Apples
Oranges
Pears
Peaches

Apples  
21%

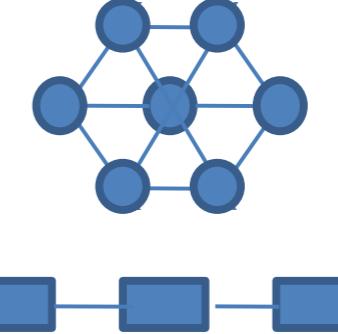
Value



Composition



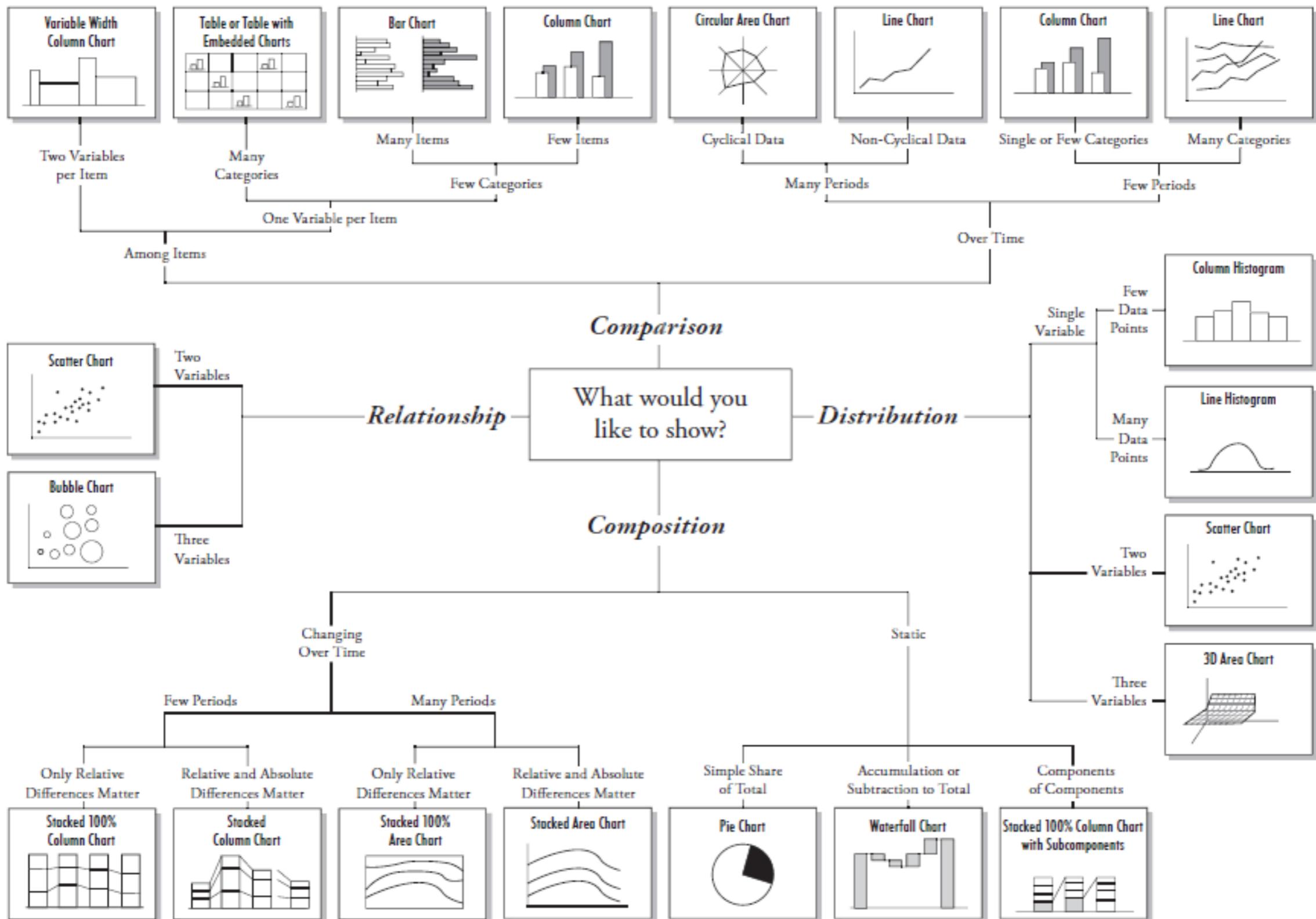
Relationship



Location

# Selecting Charts

## Chart Suggestions—A Thought-Starter



# Selecting Charts

Interface Design Patterns

Patterns Members Knowledge Base About  search pattern ▶

Simple Pie Chart: overview

INTERNATIONAL POPULATION 2005  
Proportional distribution of Austin residents with Non-German citizenship

Legend: Hispanic (dark grey), Asian (orange), Other Noncitizens (light grey), Noncitizen (yellow).

Administrator Christian Behrens

Category

- InfoViz Patterns
  - Display Patterns
  - Proportions

Devices

- Laptop/PC

Modality

- Keyboard/Mouse

Status

- Best Practice

Relations specialization

- Ring Chart

similarity

- Stacked Bar Chart
- Sankey Diagram

Description Discussion

Simple Pie Chart

Problem

A pie chart is a circular object divided into multiple polar segments. It displays the relative magnitude of several quantitative values compared to each other, or, in other words, the distribution of several values that belong to the same dataset. The full circle represents the total magnitude of this dataset, equal to 100 percent, while each segment stands for the magnitude of one particular variable. Segment area, arc length and arc angle of each segment are proportional to the value the segment represents. The segments of a pie chart are usually labeled with percentage numbers rather than total values (although they can feature both for the sake of understanding).

Data Basis

Use a pie chart to display a set of categorical items. Each item has a magnitude expressed as a proportional value against the total size of the dataset: The sum of all items' magnitudes is 100 percent.

Usage

Draw a circle. Divide it into slice-shaped segments between the center and the circle arc, one segment per data item. Assign one specific data item to each segment, and adjust the size of the segments by making each arc (or each arc angle) proportional to the percentage value of the respective item from your dataset. Label the chart segments accordingly.

Rationale

Pie charts give the reader a quick idea of the proportional distribution of data. The association between data and representation is evident: The bigger the piece, the larger the data chunk compared to the other ones. As pie charts belong to the most common infographics used in popular media (e.g. to display election results) and build upon a strong metaphor (the cake cut into pieces) they are a reliable way of

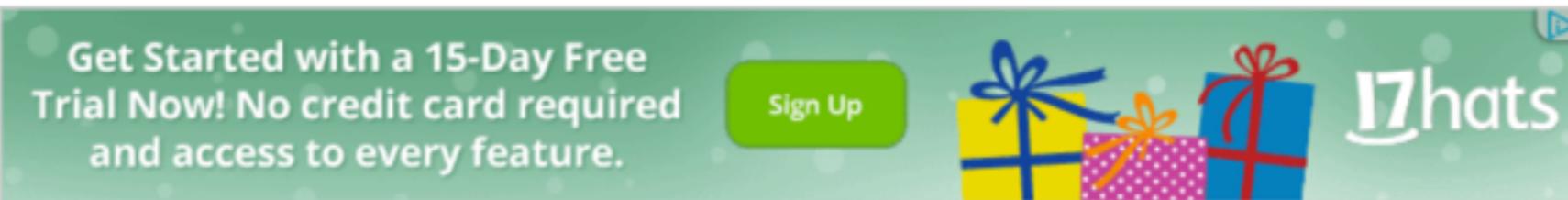
Community metadata

Views 399

# Selecting Charts

## The Data Visualisation Catalogue

About • Suggest • Shop • Resources



Search by Function

View by List



Arc Diagram



Area Graph



Bar Chart



Box & Whisker Plot



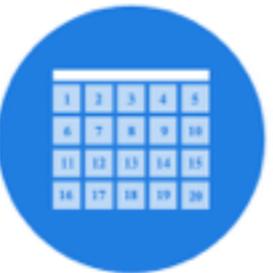
Brainstorm



Bubble Chart



Bubble Map



Calendar



Chord Diagram



Choropleth Map



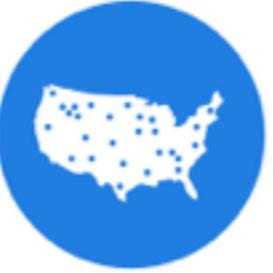
Circle Packing



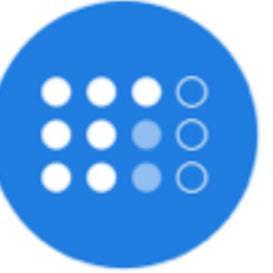
Connection Map



Donut Chart



Dot Map



Dot Matrix Chart



Flow Map



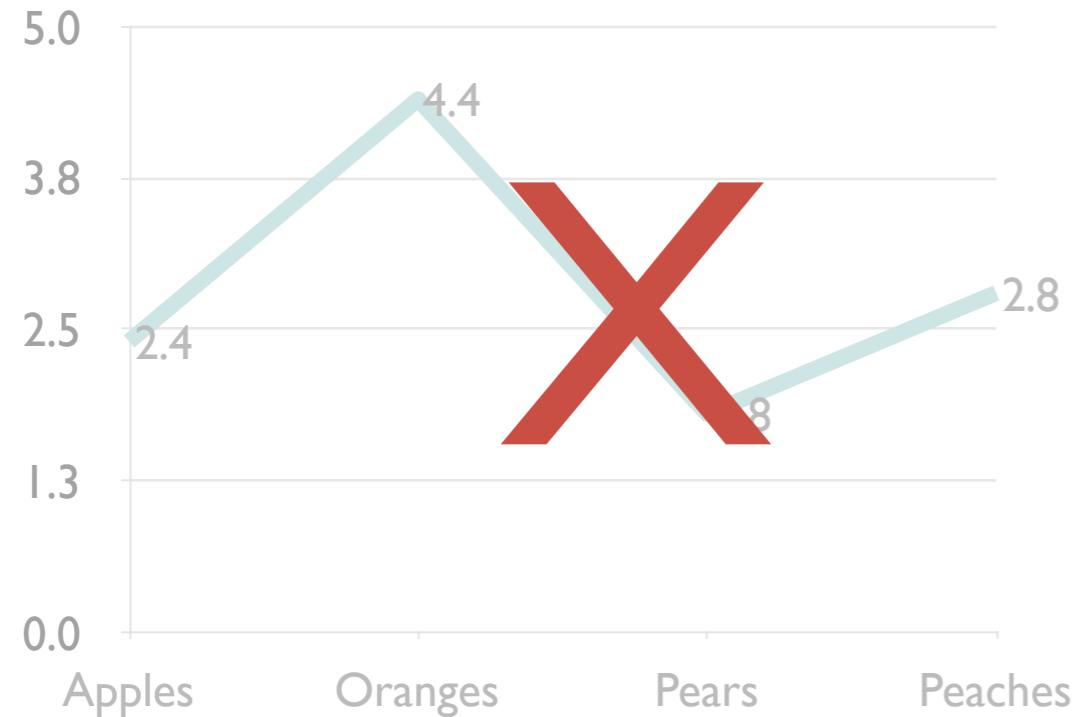
Histogram



Illustration Diagram

# Graph Basics

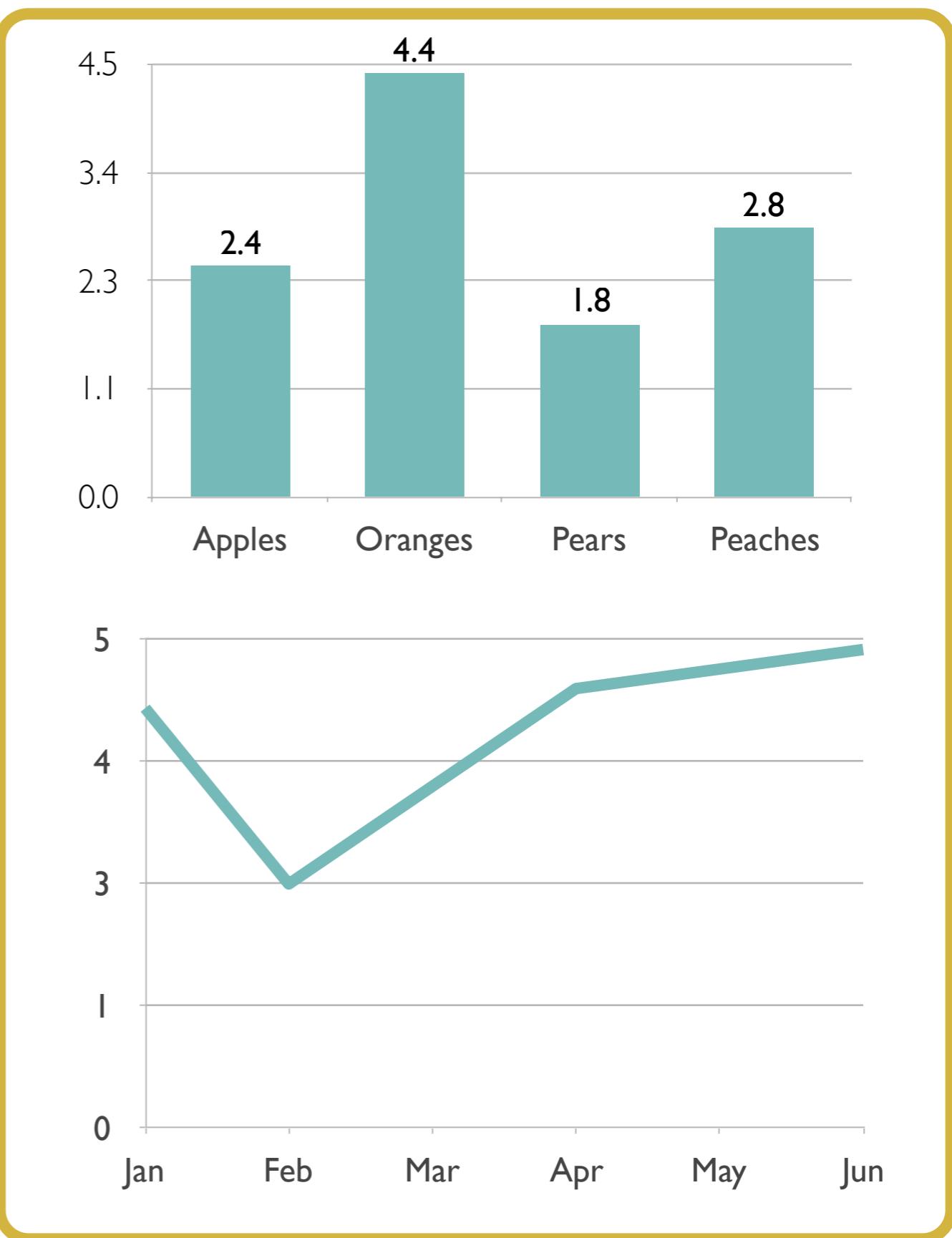
# Type of Data



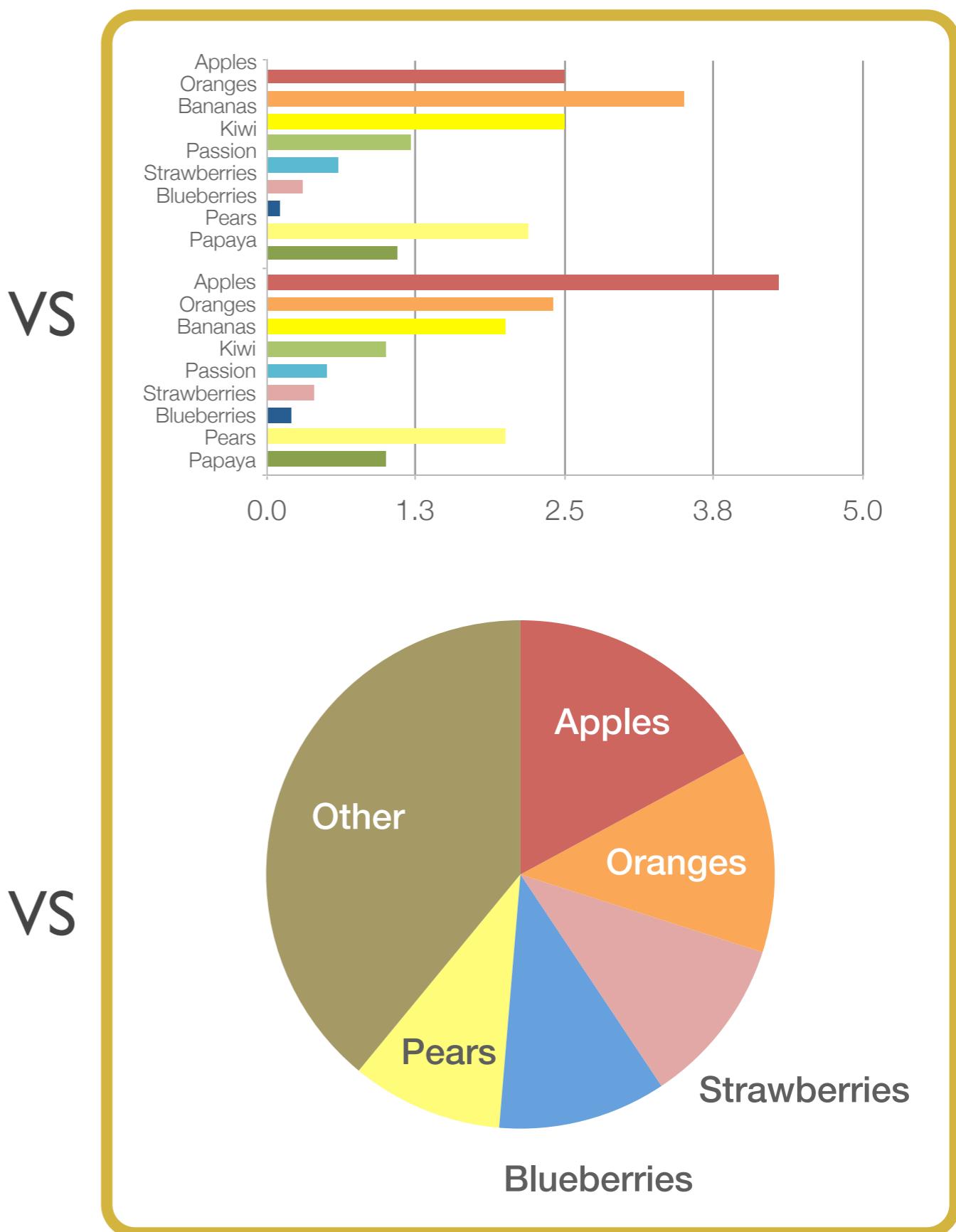
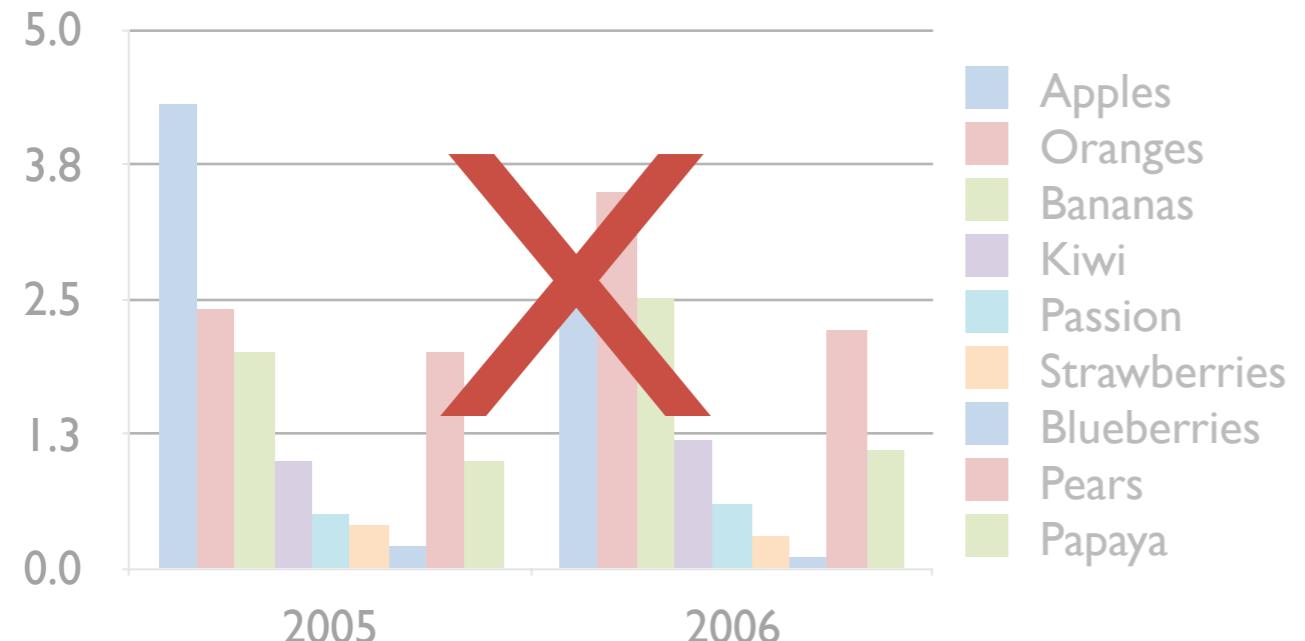
VS



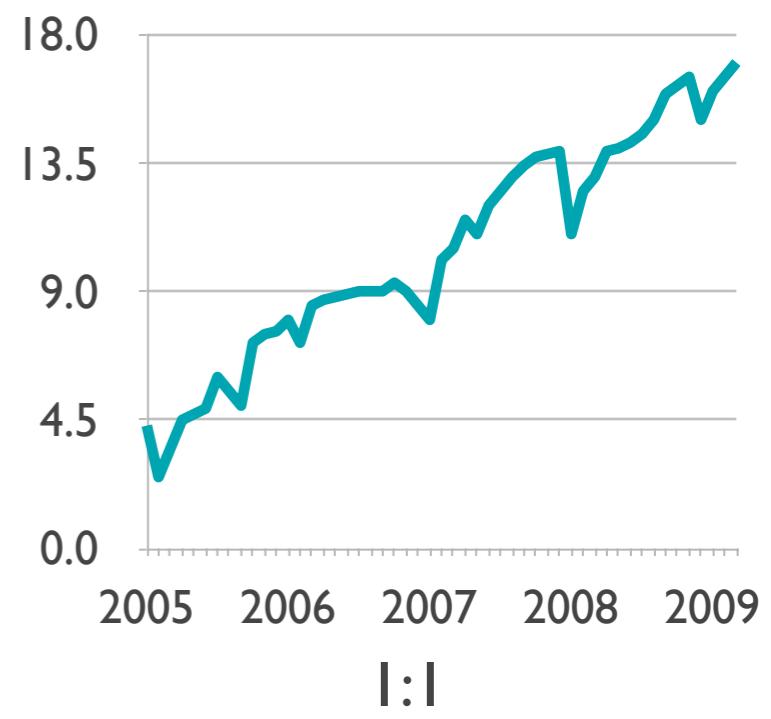
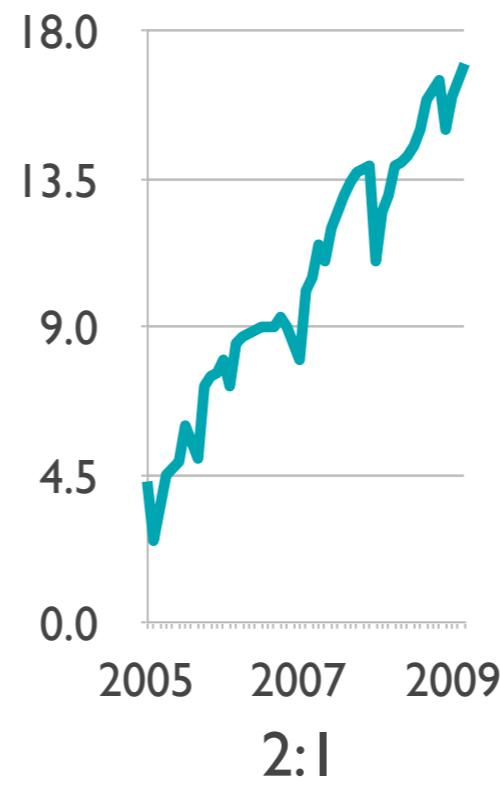
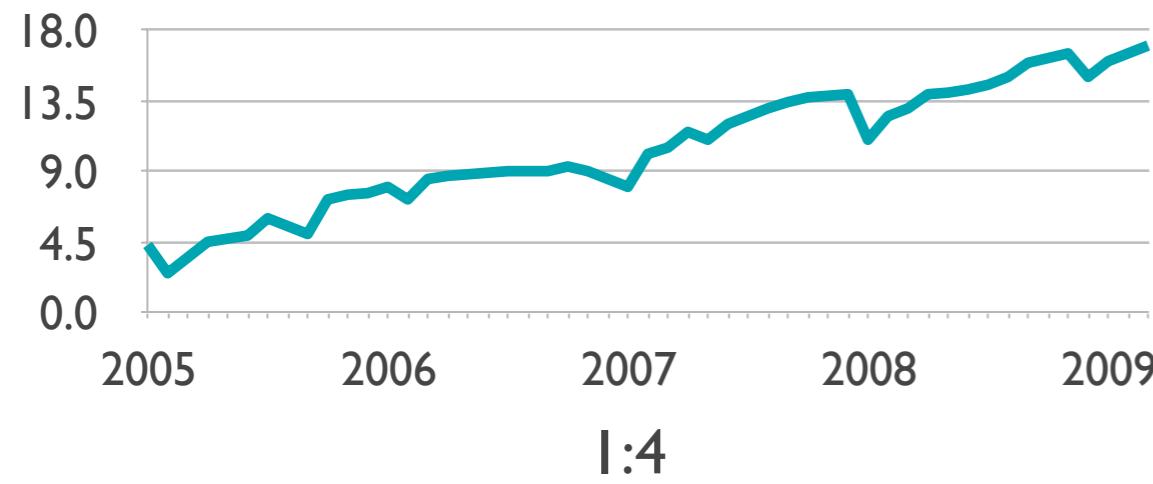
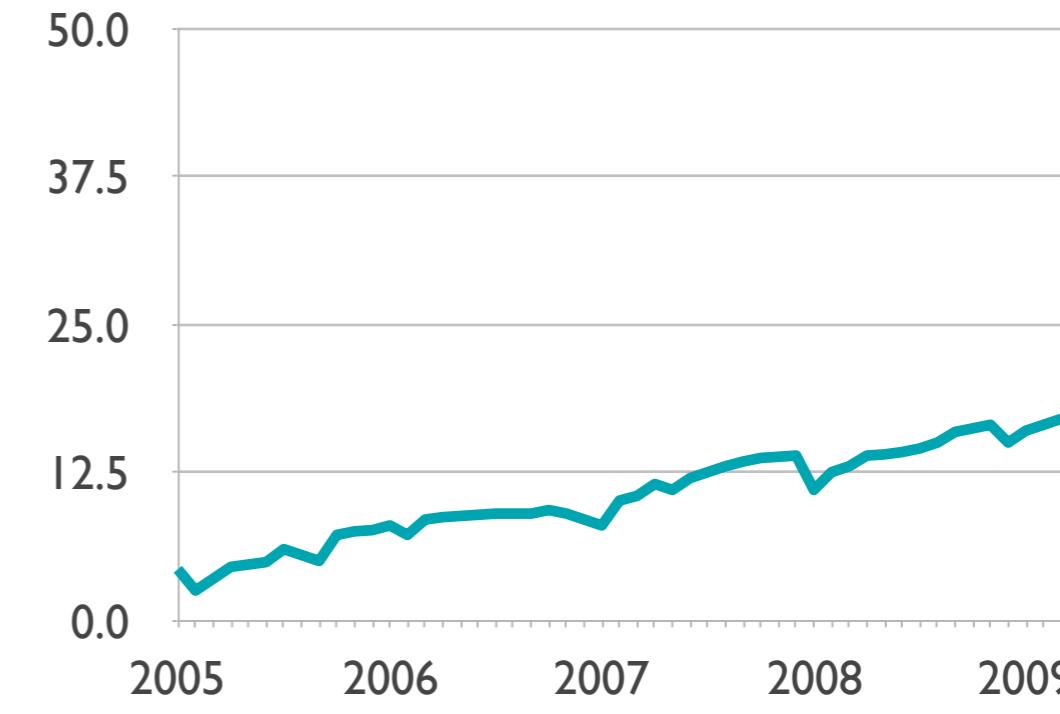
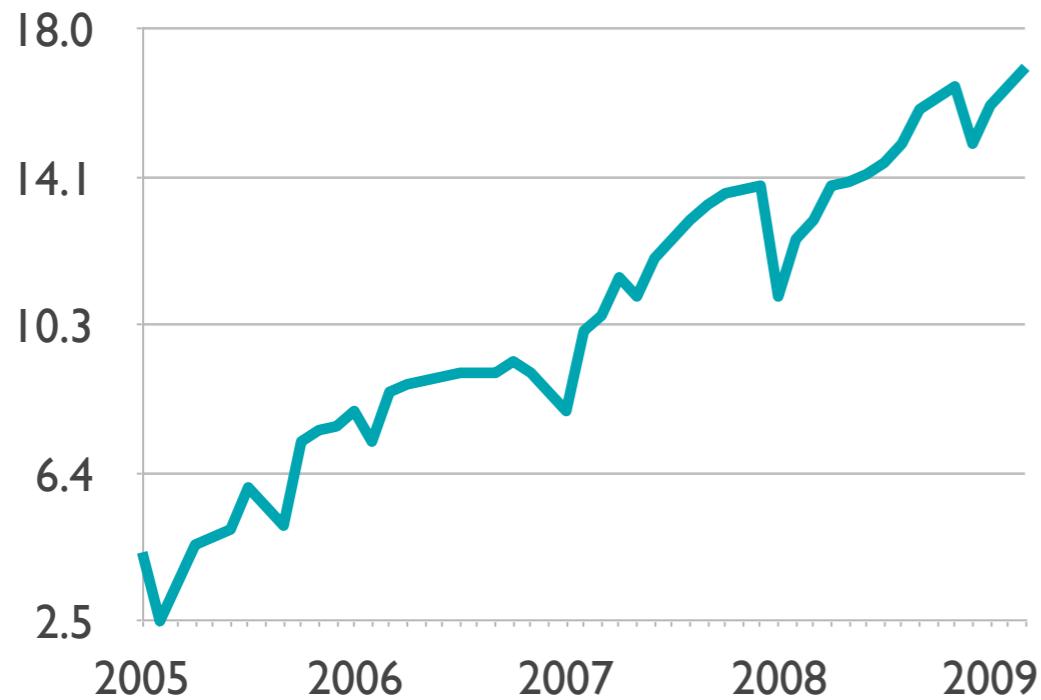
VS



# Legends



# Range & Scale

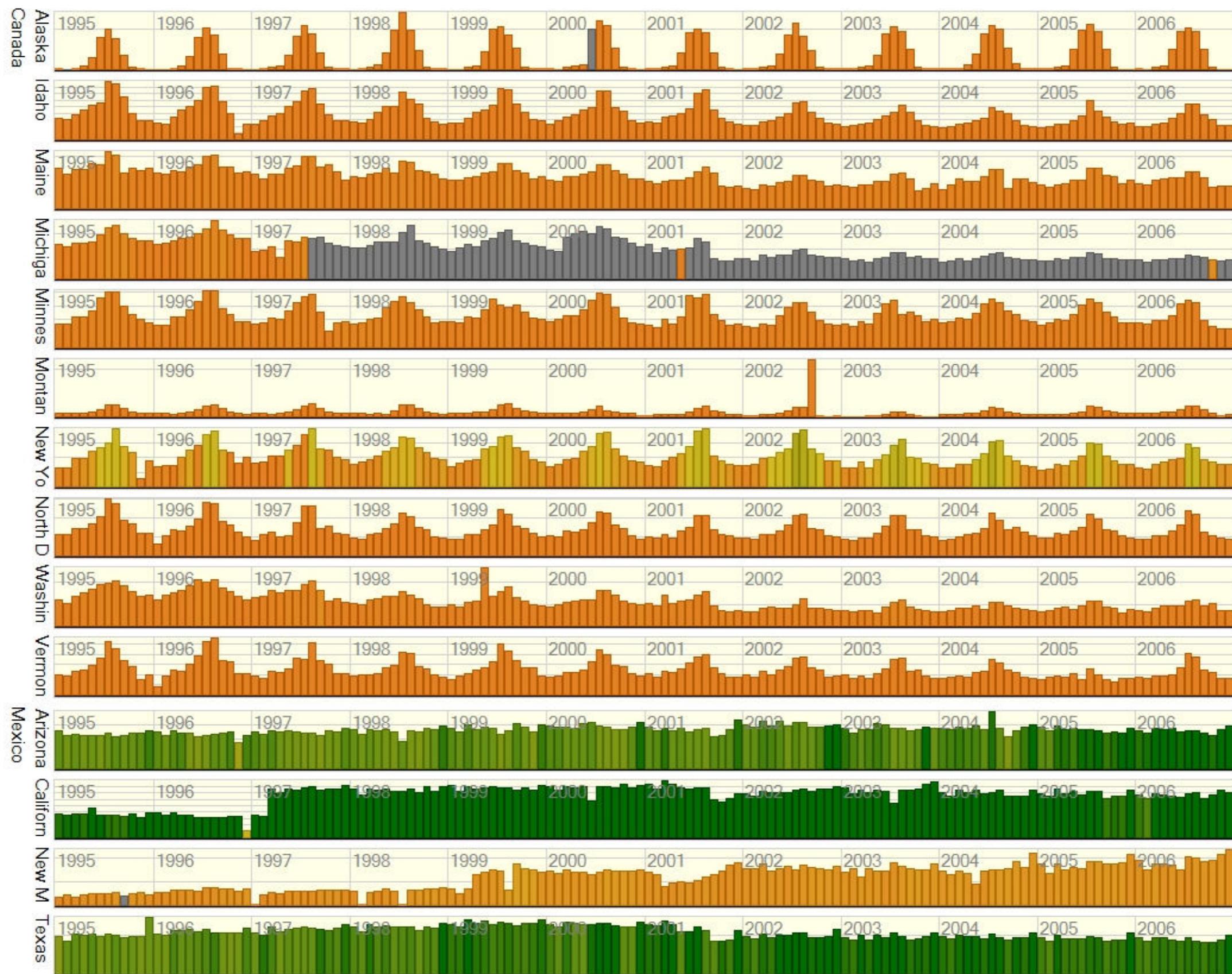


|:|

|:4

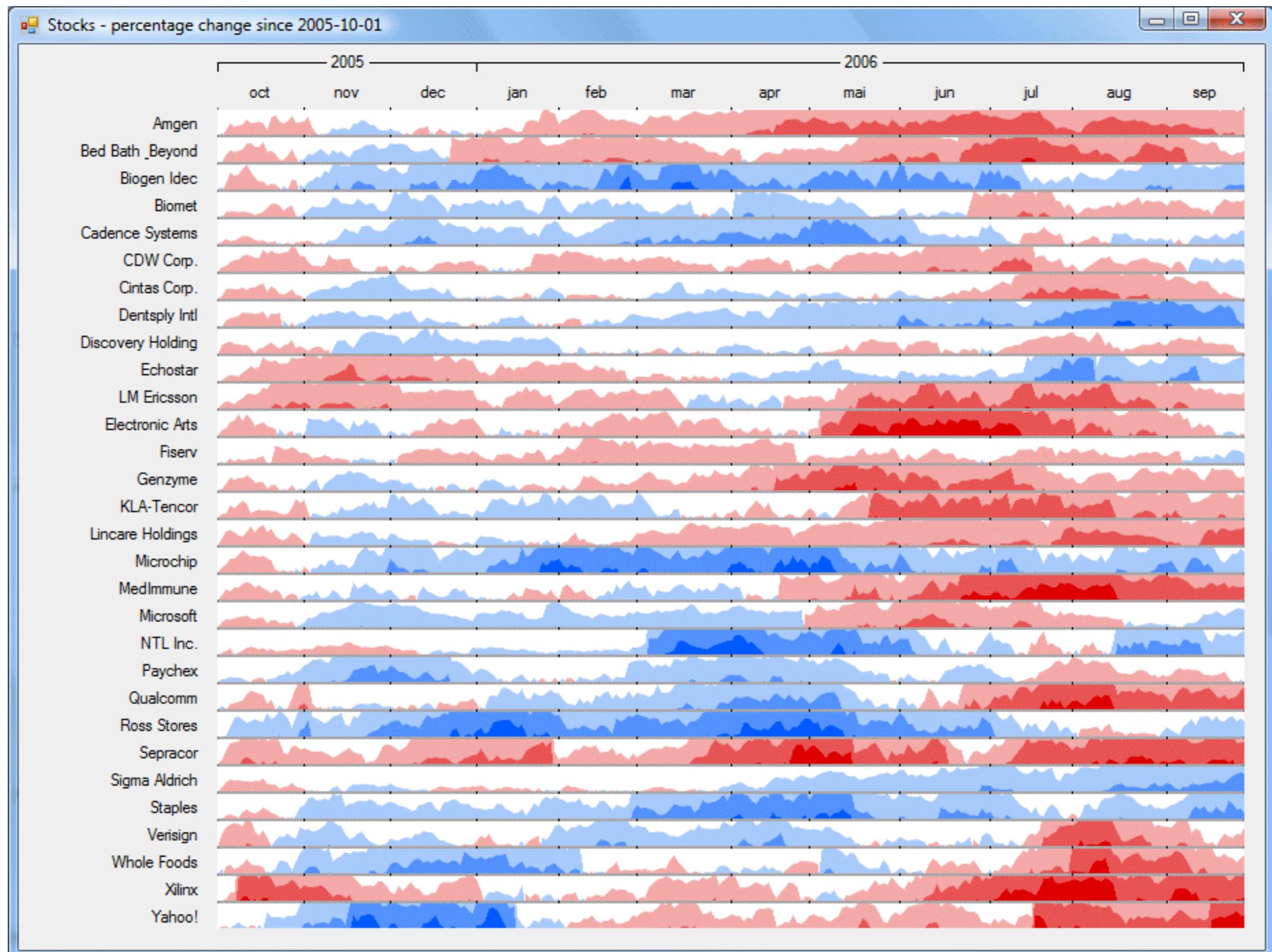
2:1

# Amount of Data



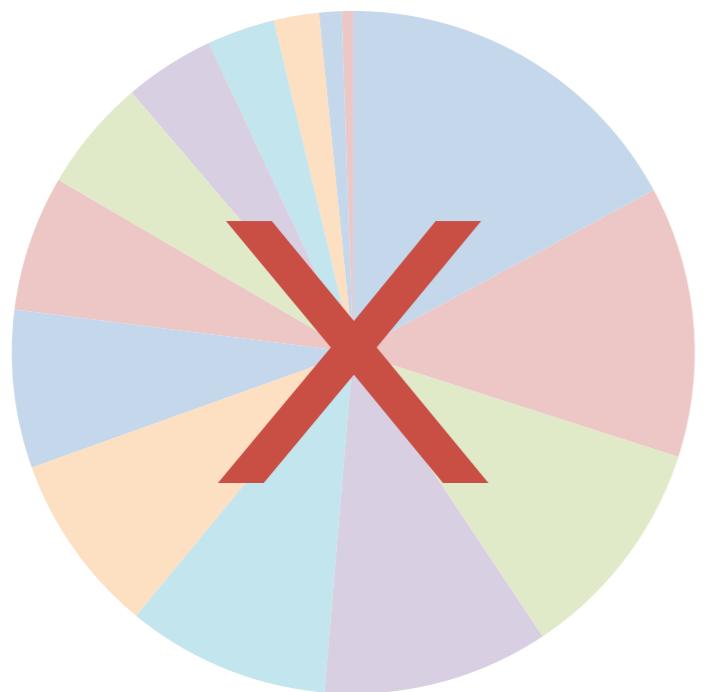
Source: Panopticon

# Amount of Data



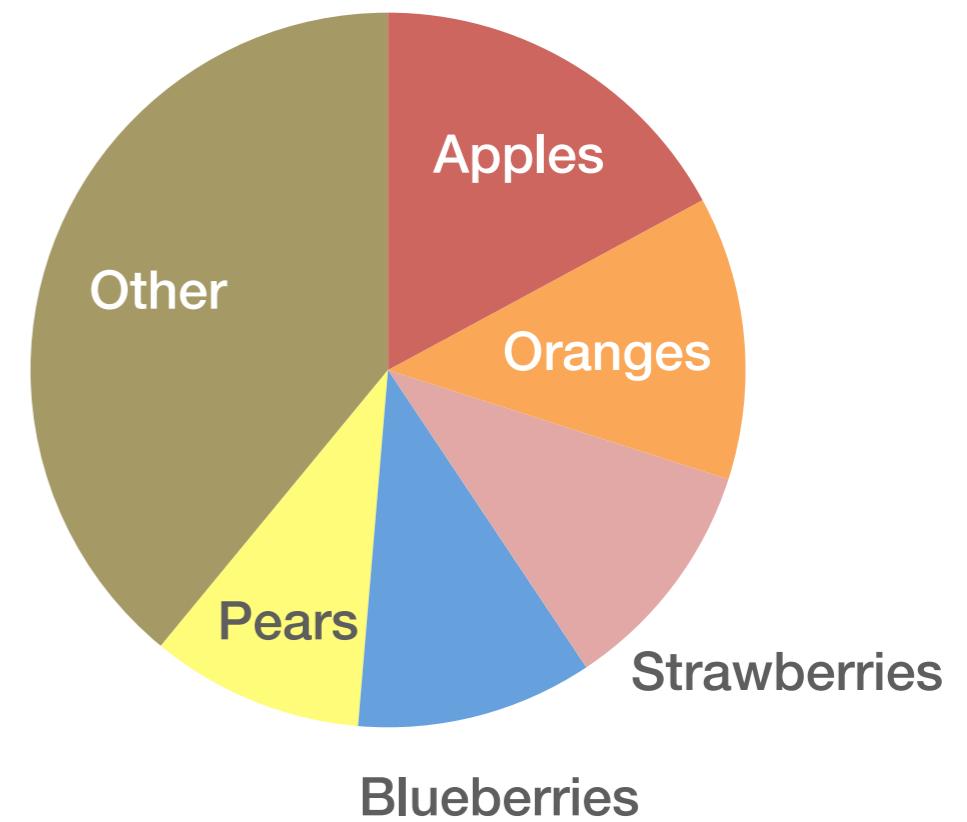
Source: Panopticon

# Amount of Data

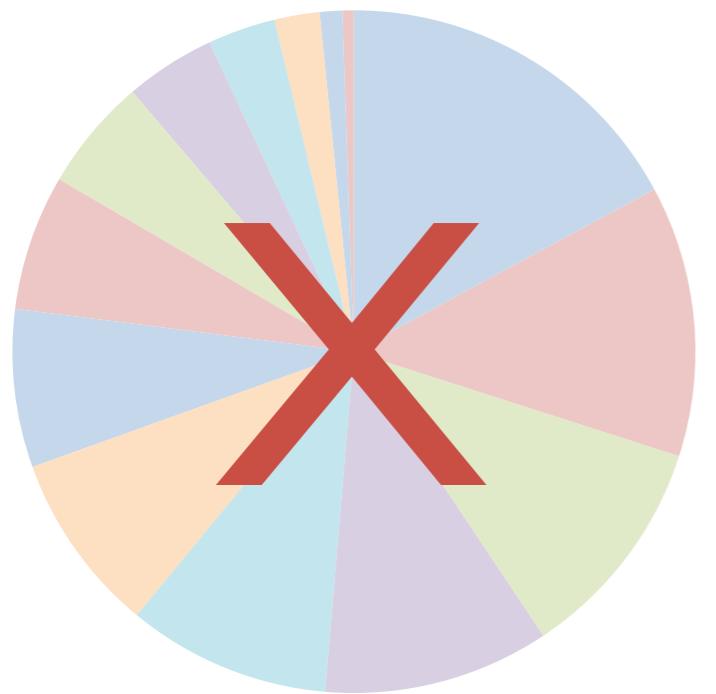


- Apples
- Oranges
- Strawberries
- Blueberries
- Pears
- Kiwi
- Passion
- Papaya
- Peaches
- Grapefruit
- Mango
- Lemon
- Lime
- Tomato

VS

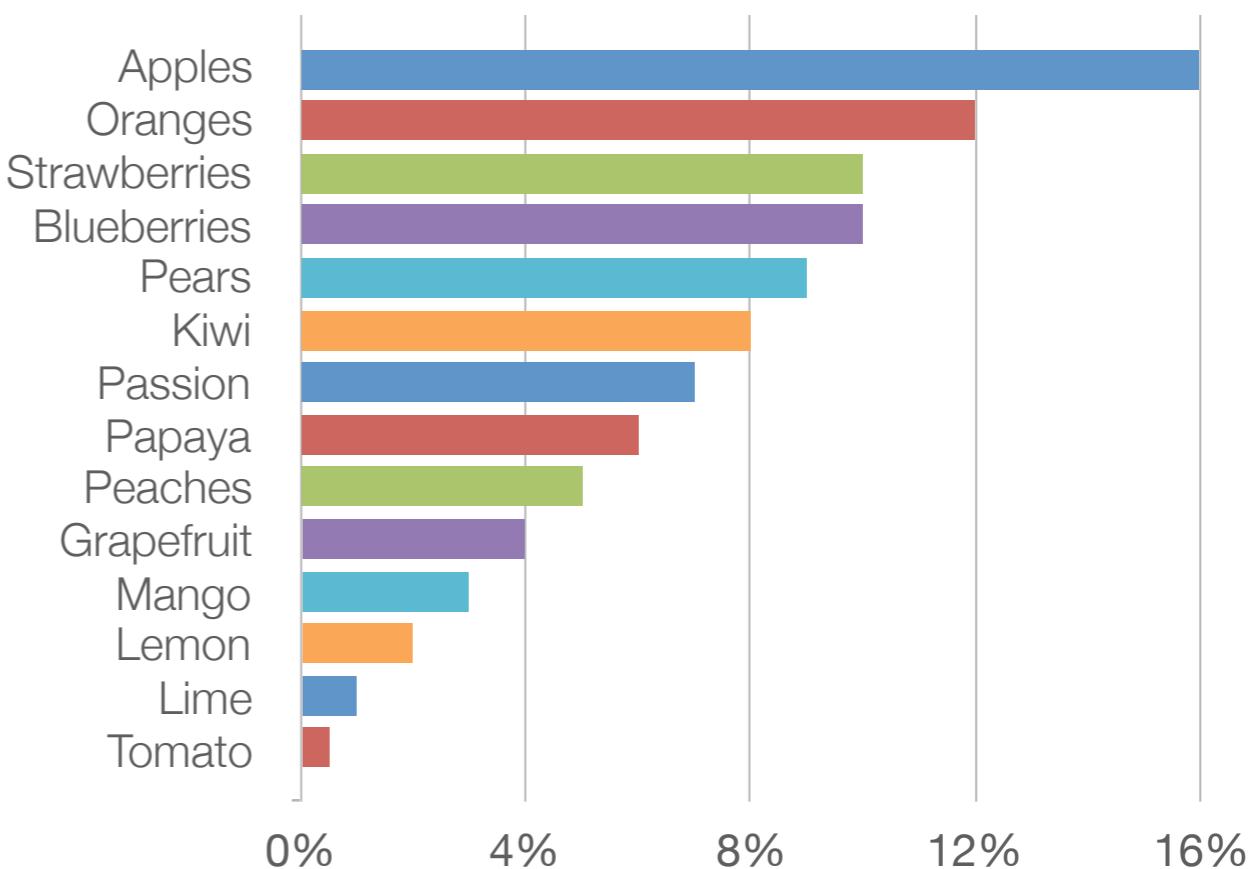


# Amount of Data



Apples  
Oranges  
Strawberries  
Blueberries  
Pears  
Kiwi  
Passion  
Papaya  
Peaches  
Grapefruit  
Mango  
Lemon  
Lime  
Tomato

VS



# Amount of Data

## [Health Statistics](#) > [Tobacco](#) > Adult male smokers (most recent) by country

VIEW DATA: [Totals](#)

[Definition](#)

[Source](#)

[!\[\]\(55b0a2686da11c3870ed1d6e9b9d2cd2\_img.jpg\) Printable version](#)

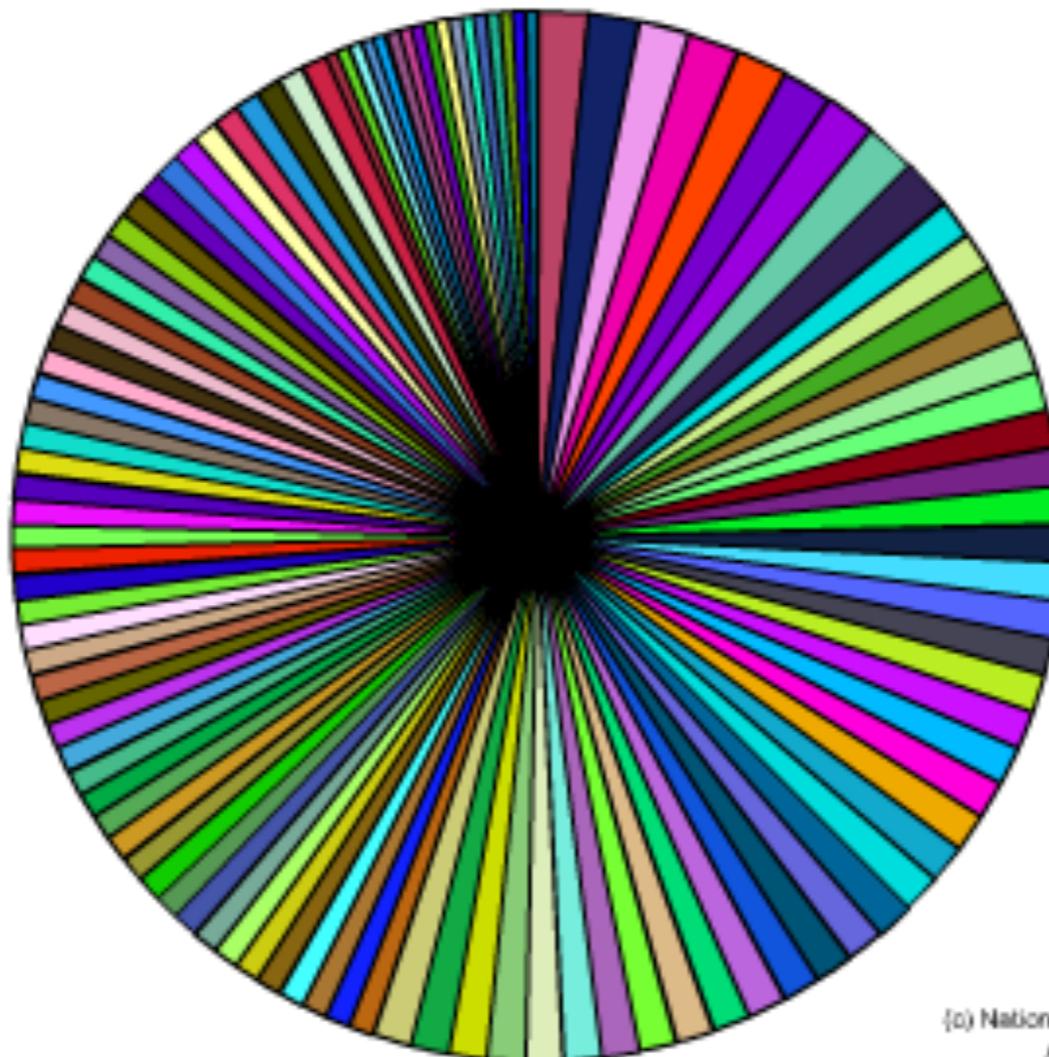
[Bar Graph](#)

[Pie Chart](#)

[Map](#)

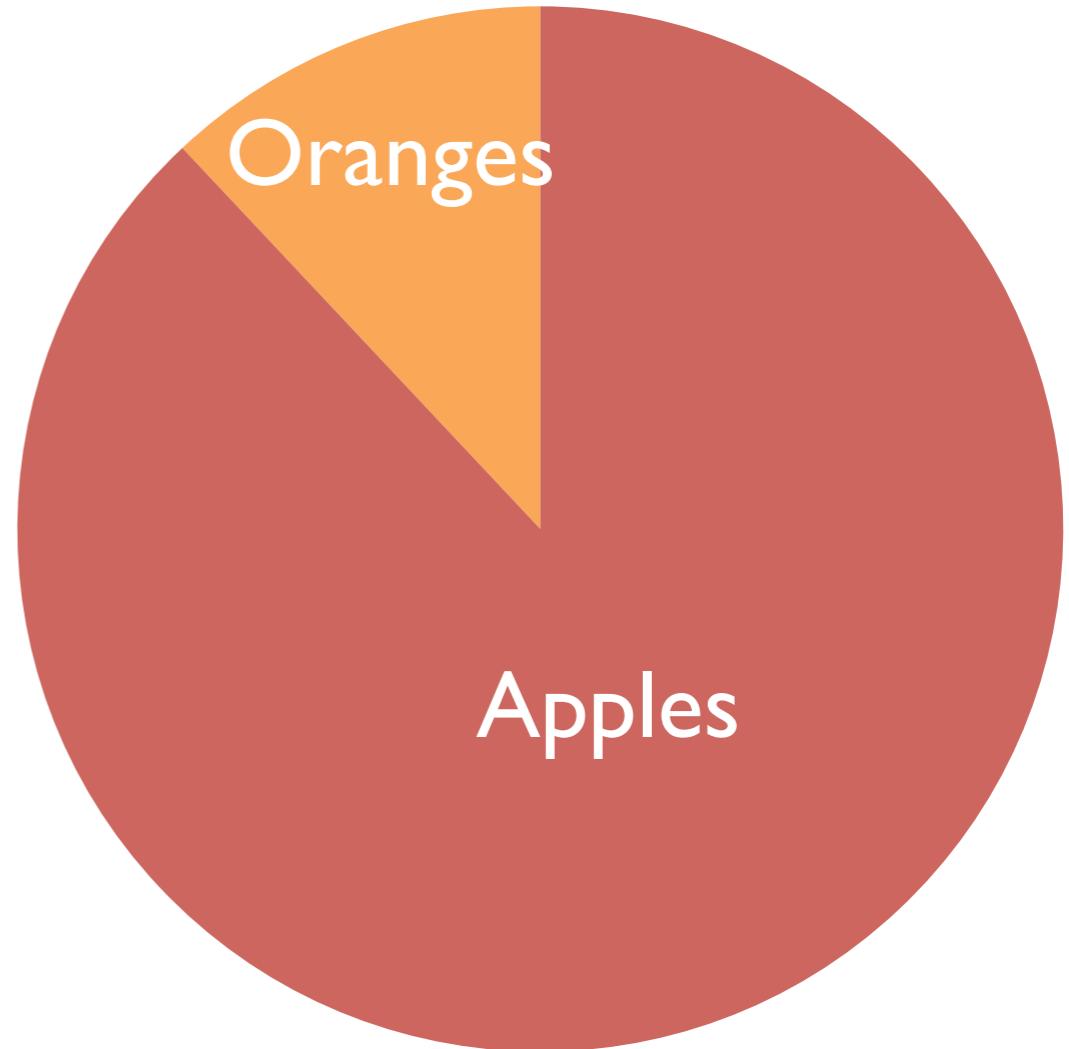
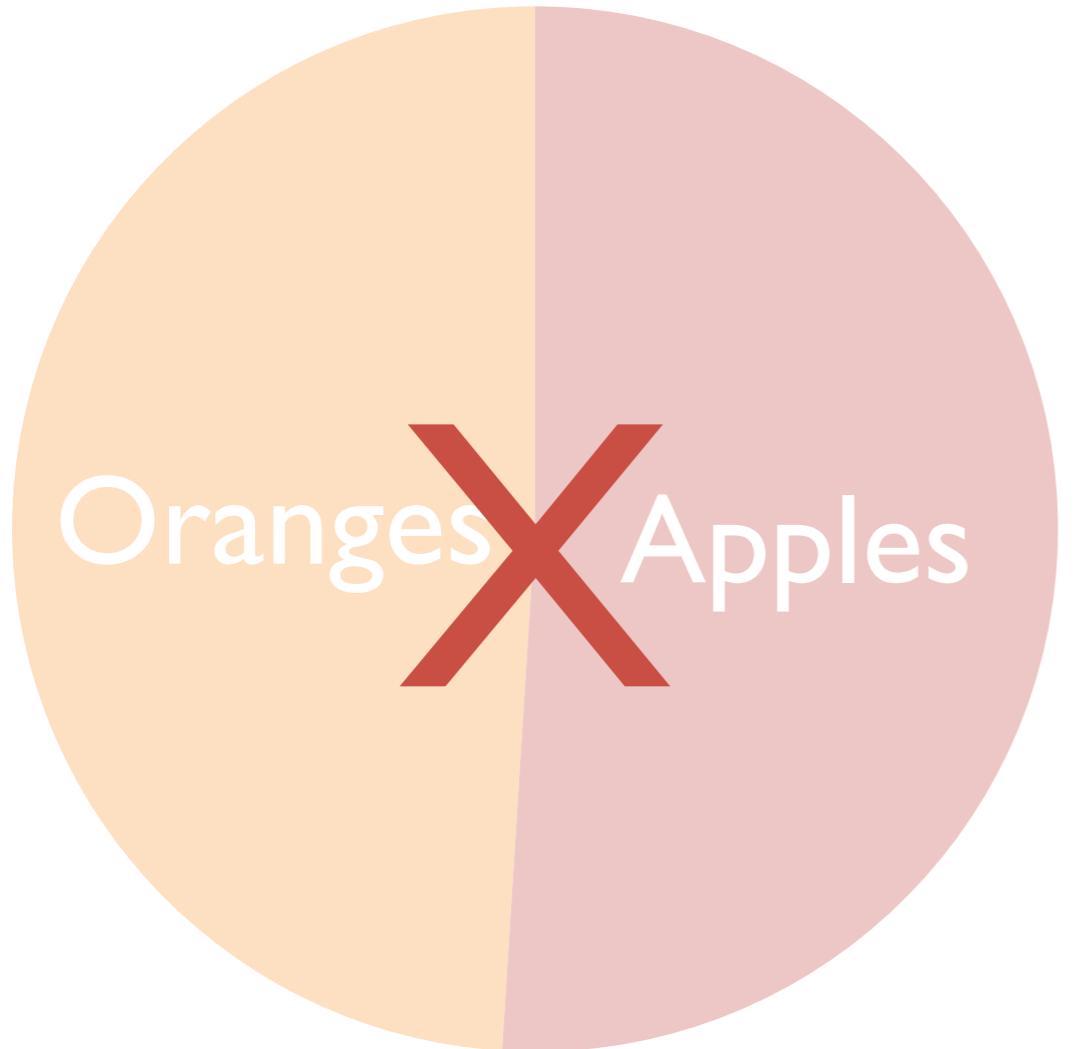
[Correlations](#)

Showing latest available data.



<a href="#">Mongolia</a>	1.5%
<a href="#">China</a>	1.4%
<a href="#">Kenya</a>	1.4%
<a href="#">Cambodia</a>	1.4%
<a href="#">Namibia</a>	1.4%
<a href="#">Armenia</a>	1.4%
<a href="#">Tonga</a>	1.3%
<a href="#">Romania</a>	1.3%
<a href="#">Tunisia</a>	1.3%
<a href="#">Nauru</a>	1.3%
<a href="#">Kazakhstan</a>	1.3%
<a href="#">Kyrgyzstan</a>	1.3%
<a href="#">Albania</a>	1.3%
<a href="#">Yemen</a>	1.3%
<a href="#">Turkey</a>	1.3%
<a href="#">Guinea</a>	1.3%
<a href="#">Indonesia</a>	1.3%
<a href="#">Niue</a>	1.3%
<a href="#">Djibouti</a>	1.2%
<a href="#">Kiribati</a>	1.2%

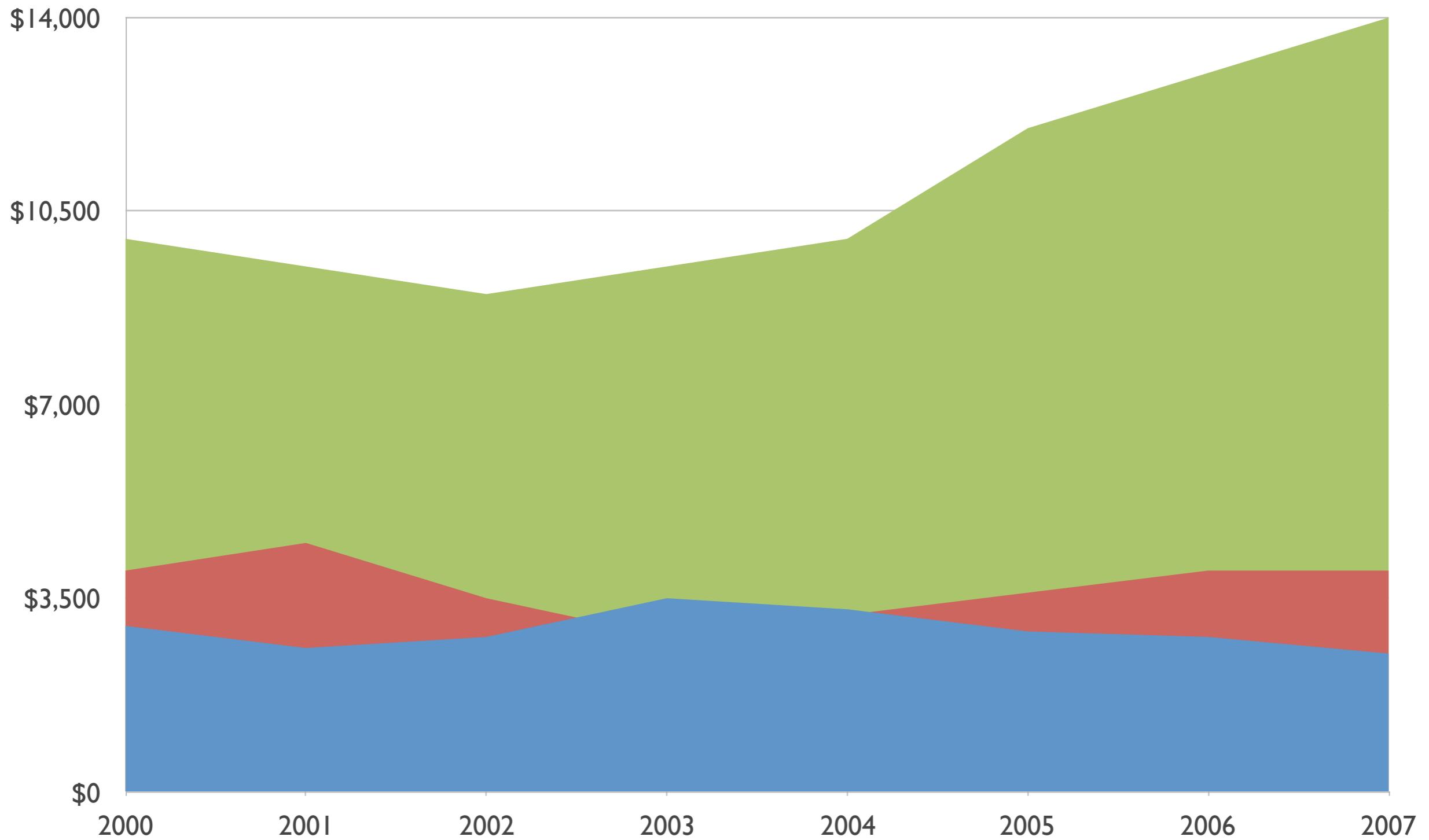
# Amount of Data



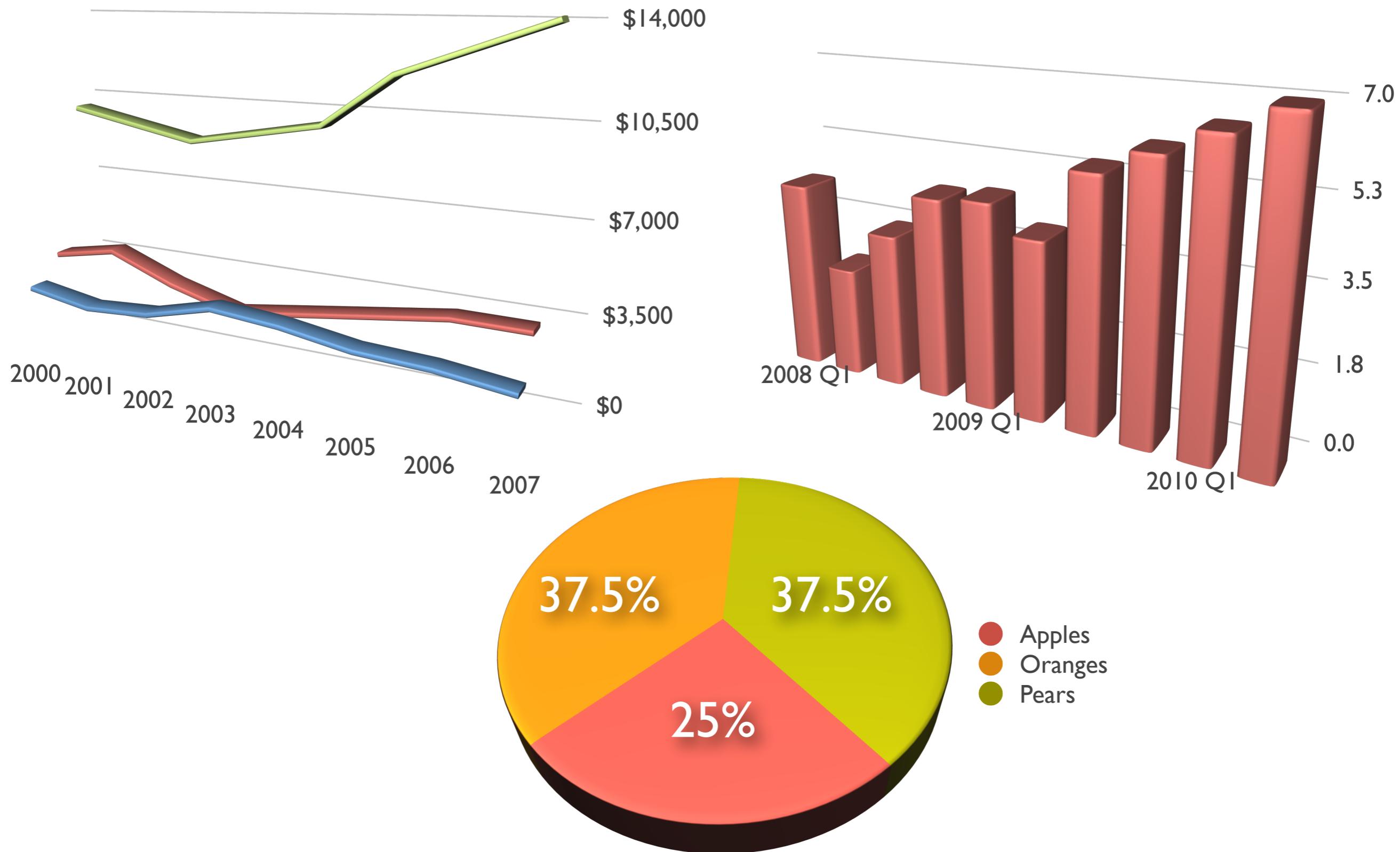
A large pile of ripe red apples with some green and yellow highlights, filling the entire background.

88%

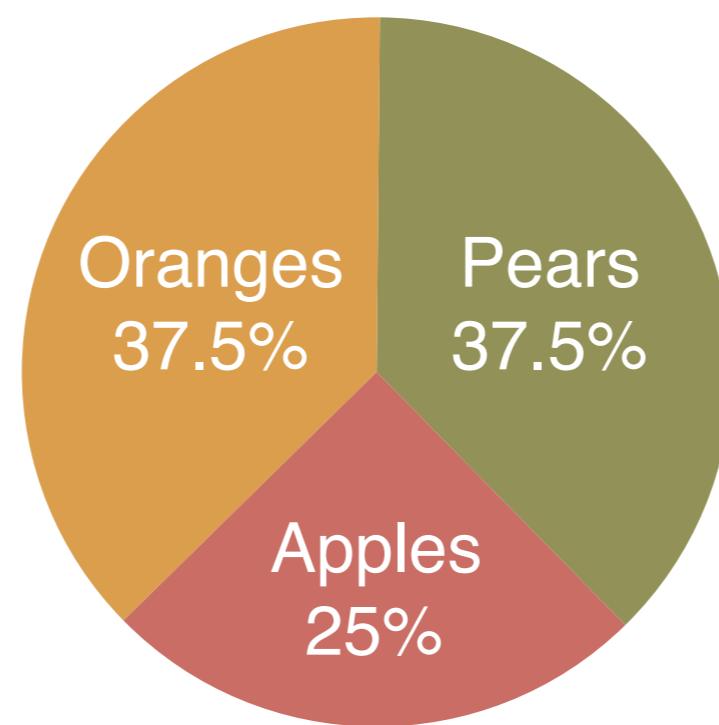
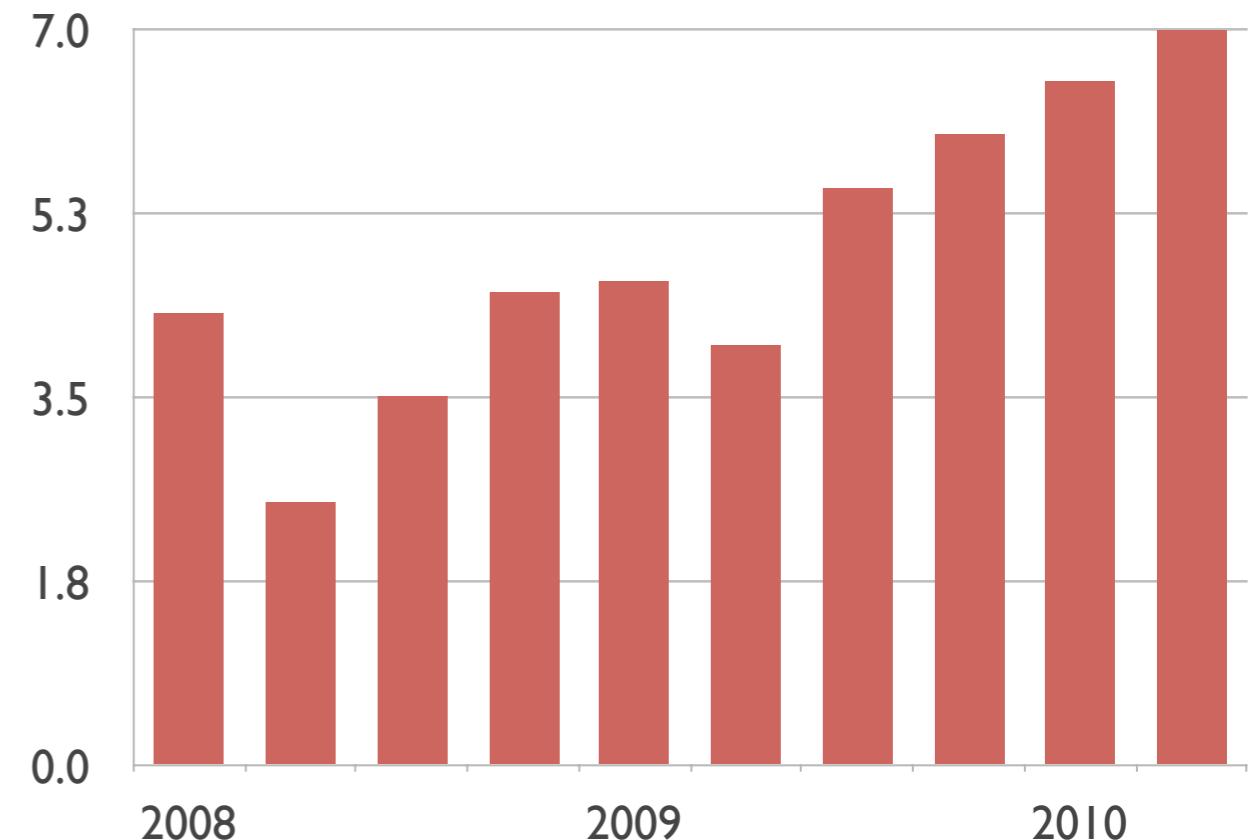
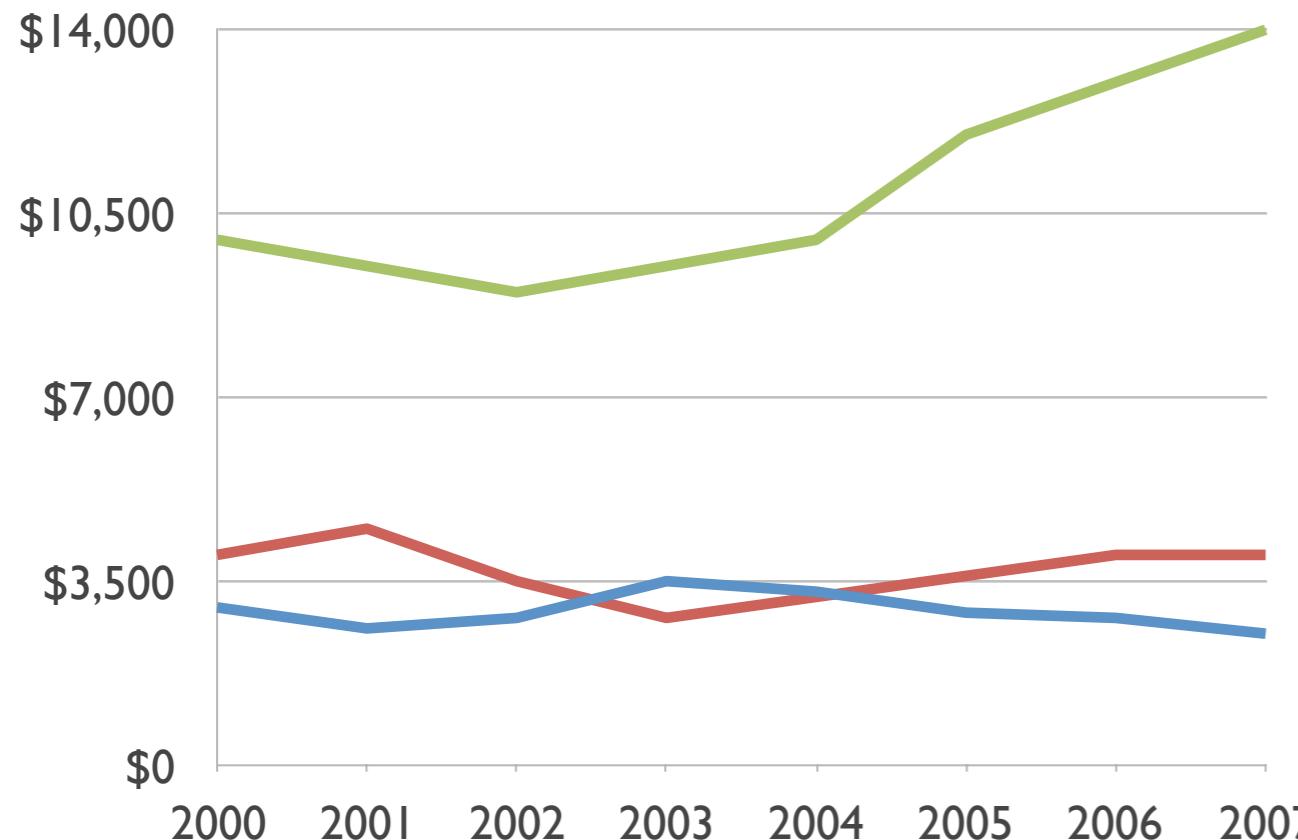
# Danger Area



# NEVER Use 3D



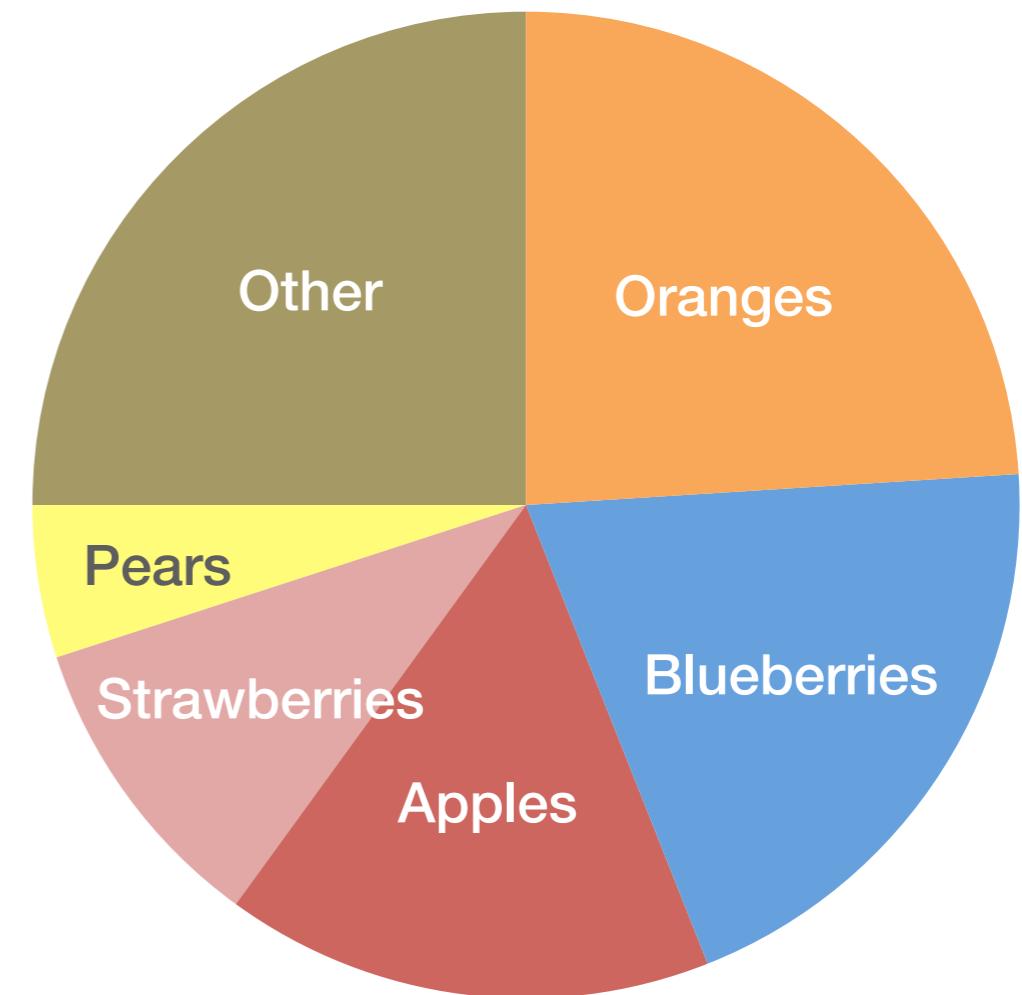
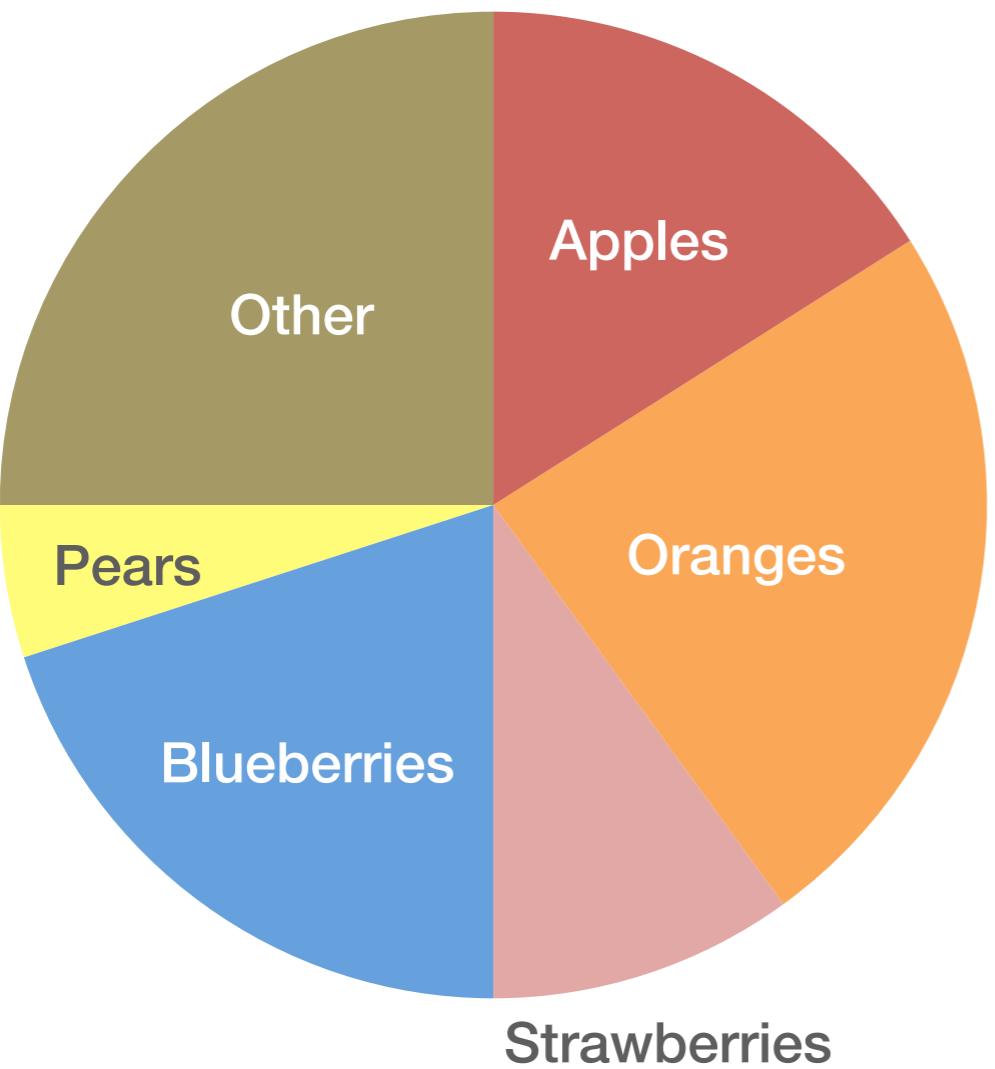
# NEVER Use 3D



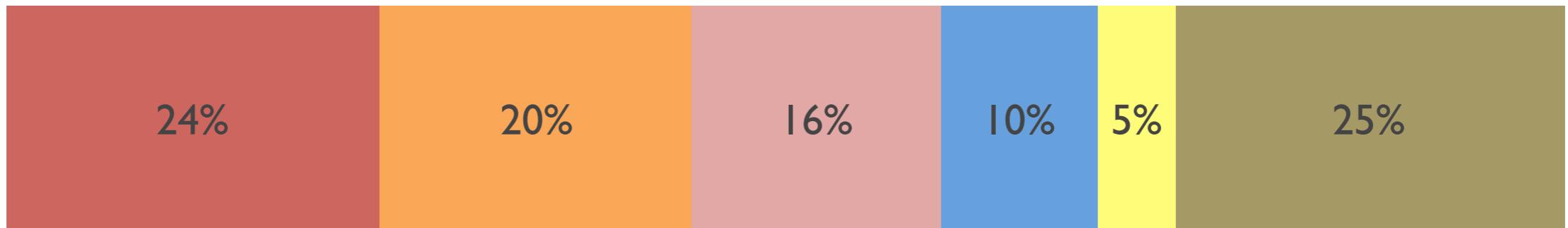
# Parts of the whole



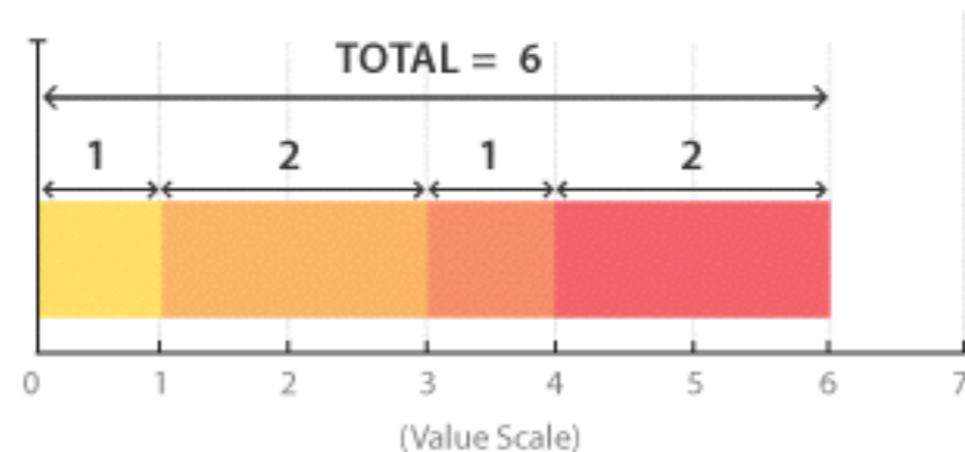
# Order



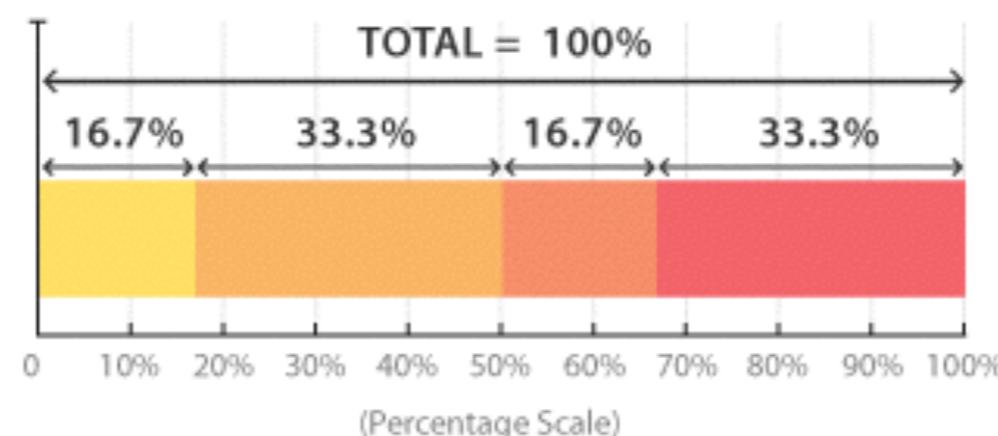
# Stacked Bar Graph



**Simple**

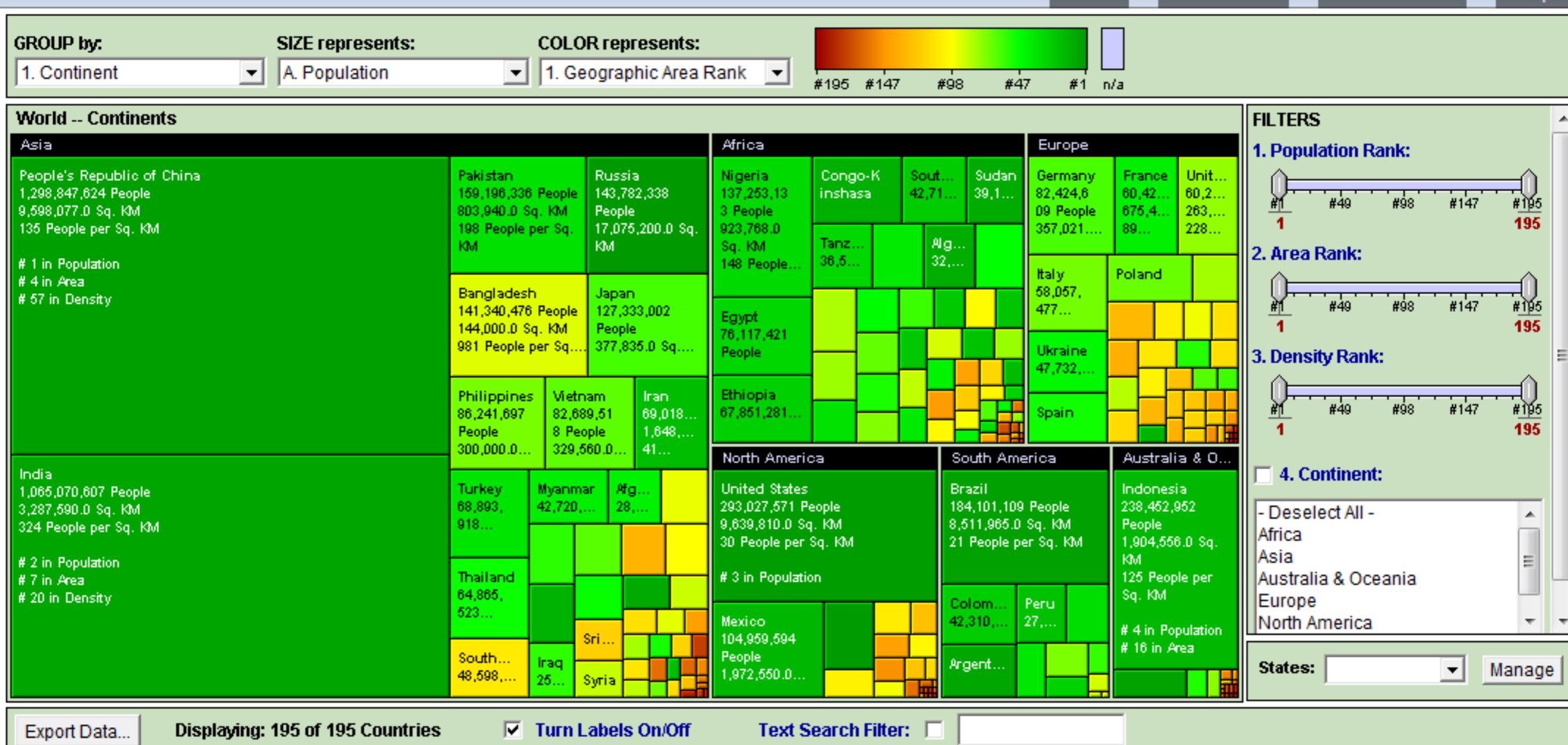


**100%**



# Tree Maps

## World Population Statistics

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[Help](#)


# Bullet Graphs

# Bullet Graphs

2005 YTD



# Text Values

# I Know You Can't Read This, But...

## 2010 Tax Table



See the instructions for line 44 on page 35 to see if you must use the Tax Table below to figure your tax.

**Example.** Mr. and Mrs. Brown are filing a joint return. Their taxable income on Form 1040, line 43, is \$25,300. First, they find the \$25,300–25,350 taxable income line. Next, they find the column for married filing jointly and read down the column. The amount shown where the taxable income line and filing status column meet is \$2,961. This is the tax amount they should enter on Form 1040, line 44.

**Sample Table**

At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
<b>Your tax is—</b>					
25,200	25,250	3,365	2,946	3,365	3,186
25,250	25,300	3,373	2,954	3,373	3,194
25,300	25,350	3,380	2,961	3,380	3,201
25,350	25,400	3,388	2,969	3,388	3,209

If line 43 (taxable income) is—		And you are—				If line 43 (taxable income) is—		And you are—				If line 43 (taxable income) is—		And you are—			
At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household	At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household	At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
		<b>Your tax is—</b>						<b>Your tax is—</b>						<b>Your tax is—</b>			
0	5	0	0	0	0	1,300	1,325	131	131	131	131	2,700	2,725	271	271	271	271
5	15	1	1	1	1	1,325	1,350	134	134	134	134	2,725	2,750	274	274	274	274
15	25	2	2	2	2	1,350	1,375	136	136	136	136	2,750	2,775	276	276	276	276
25	50	4	4	4	4	1,375	1,400	139	139	139	139	2,775	2,800	279	279	279	279
50	75	6	6	6	6	1,400	1,425	141	141	141	141	2,800	2,825	281	281	281	281
75	100	9	9	9	9	1,425	1,450	144	144	144	144	2,825	2,850	284	284	284	284
100	125	11	11	11	11	1,450	1,475	146	146	146	146	2,850	2,875	286	286	286	286
125	150	14	14	14	14	1,475	1,500	149	149	149	149	2,875	2,900	289	289	289	289
150	175	16	16	16	16	1,500	1,525	151	151	151	151	2,900	2,925	291	291	291	291
175	200	19	19	19	19	1,525	1,550	154	154	154	154	2,925	2,950	294	294	294	294
200	225	21	21	21	21	1,550	1,575	156	156	156	156	2,950	2,975	296	296	296	296
225	250	24	24	24	24	1,575	1,600	159	159	159	159	2,975	3,000	299	299	299	299
250	275	26	26	26	26	1,600	1,625	161	161	161	161	<b>3,000</b>					
275	300	29	29	29	29	1,625	1,650	164	164	164	164	3,000	3,050	303	303	303	303
300	325	31	31	31	31	1,650	1,675	166	166	166	166	3,050	3,100	308	308	308	308
325	350	34	34	34	34	1,675	1,700	169	169	169	169	3,100	3,150	313	313	313	313
350	375	36	36	36	36	1,700	1,725	171	171	171	171	3,150	3,200	318	318	318	318
375	400	39	39	39	39	1,725	1,750	174	174	174	174	3,200	3,250	322	322	322	322
400	425	41	41	41	41	1,750	1,775	176	176	176	176						

# Now You Can Read This

## 2010 Tax Table



See the instructions for line 44 on page 35 to see if you must use the Tax Table below to figure your tax.

If line 43 (taxable income) is —	And you are —				
At least	But less than	Single	Married filling jointly	Married filling sepa- rately	Head of a house- hold
Your tax is —					
0	5	0	0	0	0
5	15	1	1	1	1
15	25	2	2	2	2
25	50	4	4	4	4
50	75	6	6	6	6
75	100	9	9	9	9
100	125	11	11	11	11
125	150	14	14	14	14
150	175	16	16	16	16
175	200	19	19	19	19
200	225	21	21	21	21
225	250	24	24	24	24
250	275	26	26	26	26
275	300	29	29	29	29
300	325	31	31	31	31
325	350	34	34	34	34
350	375	36	36	36	36
375	400	39	39	39	39
400	425	41	41	41	41

Example. Mr. and Mrs. Powers' taxable income is \$1,325. They are married filing jointly. Their tax is \$131.
1,325
1,325
1,350
1,350
1,375
1,375
1,400

131

131

131

131

134

134

134

134

136

136

136

136

139

139

139

139

Sample Table

At least	But less than	Single	Married filling jointly	Married filling sepa- rately	Head of a house- hold
2,700	2,725	271	271	271	271
2,725	2,750	274	274	274	274
2,750	2,775	276	276	276	276
2,775	2,800	279	279	279	279
2,800	2,825	281	281	281	281
2,825	2,850	284	284	284	284
2,850	2,875	286	286	286	286
2,875	2,900	289	289	289	289
2,900	2,925	291	291	291	291
2,925	2,950	294	294	294	294
2,950	2,975	296	296	296	296
2,975	3,000	299	299	299	299

At least	But less than	Single	Married filling jointly	Married filling sepa- rately	Head of a house- hold
Your tax is —					
2,700	2,725	271	271	271	271
2,725	2,750	274	274	274	274
2,750	2,775	276	276	276	276
2,775	2,800	279	279	279	279
2,800	2,825	281	281	281	281
2,825	2,850	284	284	284	284
2,850	2,875	286	286	286	286
2,875	2,900	289	289	289	289
2,900	2,925	291	291	291	291
2,925	2,950	294	294	294	294
2,950	2,975	296	296	296	296
2,975	3,000	299	299	299	299

3,000

At least	But less than	Single	Married filling jointly	Married filling sepa- rately	Head of a house- hold
3,000	3,050	303	303	303	303
3,050	3,100	308	308	308	308
3,100	3,150	313	313	313	313
3,150	3,200	318	318	318	318
3,200	3,250	322	322	322	322



# Now You Can Really Read This

## 2010 Tax Table



See the instructions for line 44 on page 35 to see if you must use the Tax Table below to figure your tax.

Example: Mr. and Mrs.

<b>1,325</b>	<b>1,350</b>
<b>1,350</b>	<b>1,375</b>

<b>134</b>	<b>134</b>
<b>136</b>	<b>136</b>

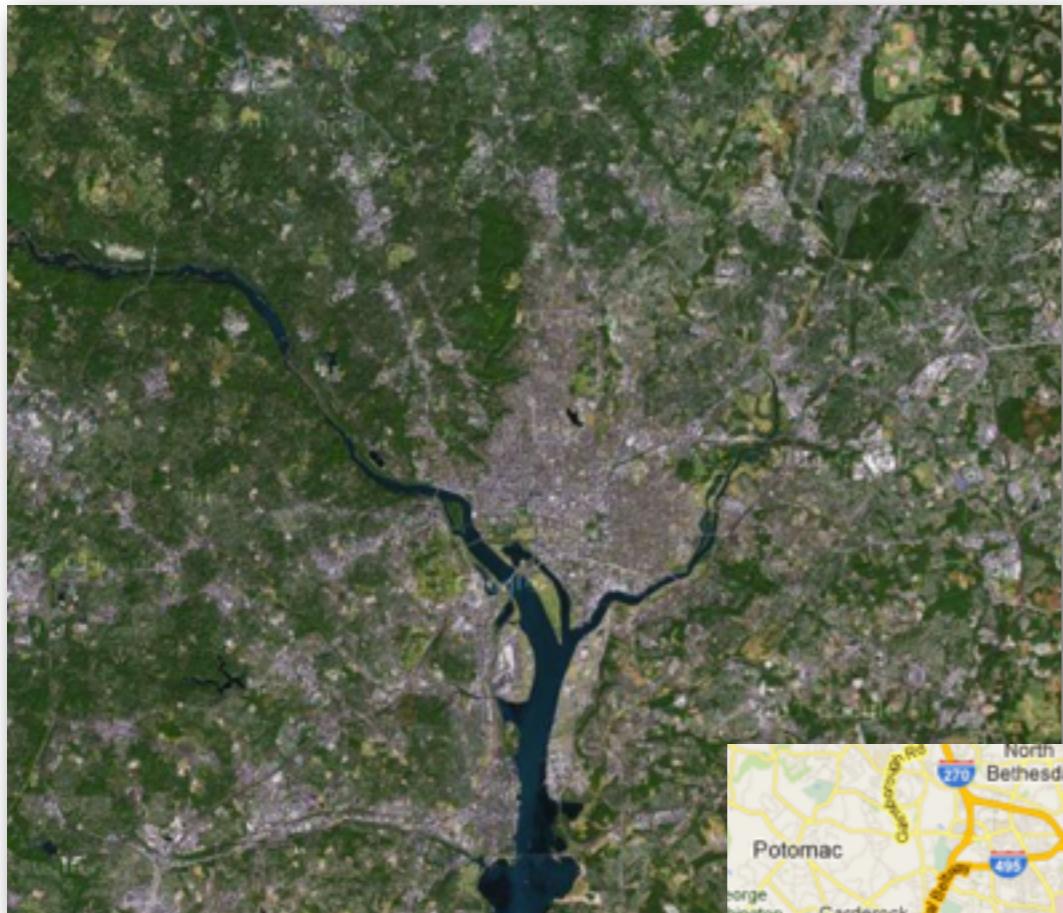
Sample Table

At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household

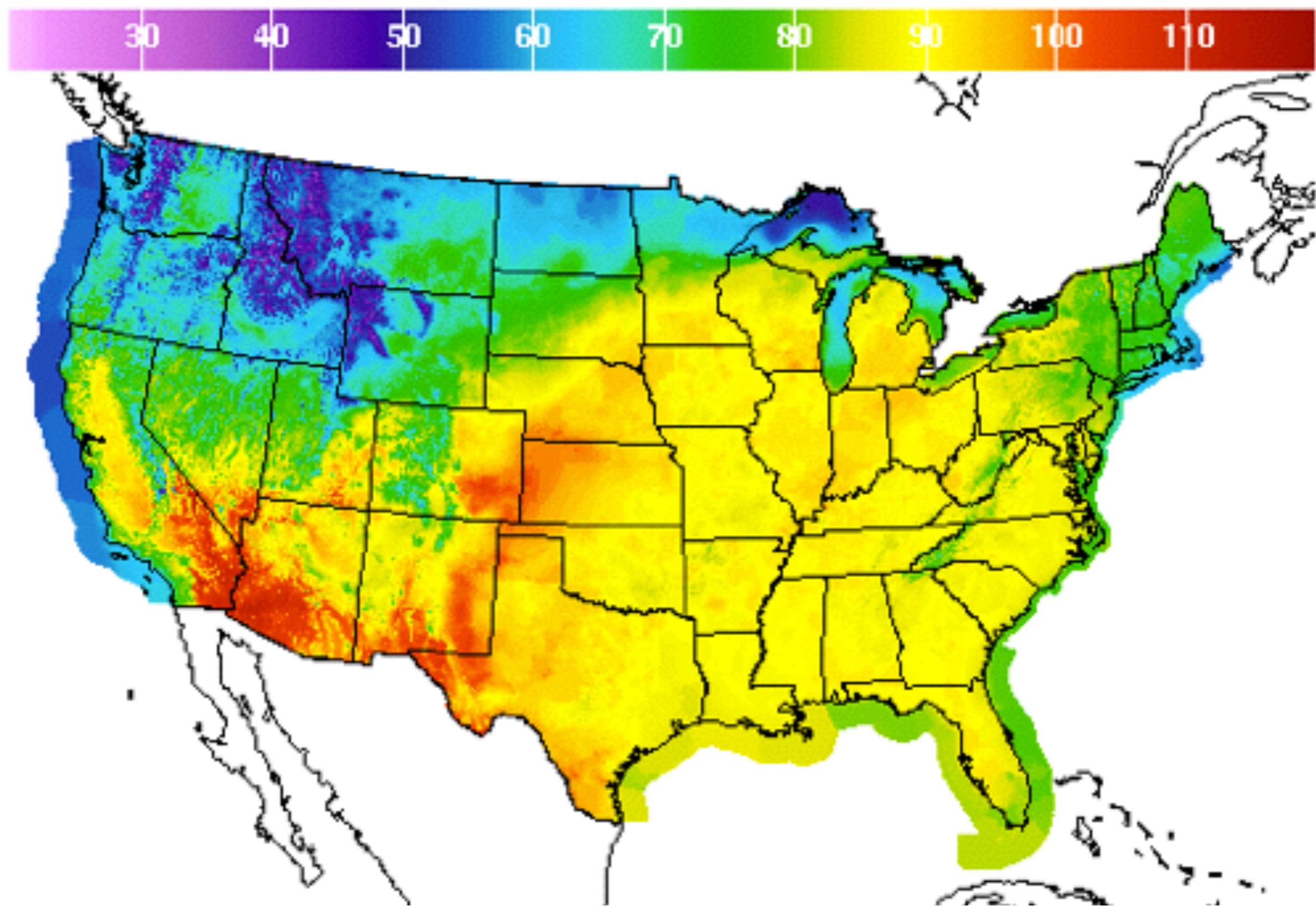
If line 43 (taxable income) is —		And you are —				Income —				And you are —				Income —			
At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household	At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household	At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
0	5	0	0	0	0	1,300	1,325	131	131	131	131	2,700	2,725	271	271	271	271
5	15	1	1	1	1	1,325	1,350	134	134	134	134	2,725	2,750	274	274	274	274
15	25	2	2	2	2	1,350	1,375	136	136	136	136	2,750	2,775	276	276	276	276
25	50	4	4	4	4	1,375	1,400	139	139	139	139	2,775	2,800	279	279	279	279
50	75	6	6	6	6	1,400	1,425	141	141	141	141	2,800	2,825	281	281	281	281
75	100	9	9	9	9	1,425	1,450	144	144	144	144	2,825	2,850	284	284	284	284
100	125	11	11	11	11	1,450	1,475	146	146	146	146	2,850	2,875	286	286	286	286
125	150	14	14	14	14	1,475	1,500	149	149	149	149	2,875	2,900	289	289	289	289
150	175	16	16	16	16	1,500	1,525	151	151	151	151	2,900	2,925	291	291	291	291
175	200	19	19	19	19	1,525	1,550	154	154	154	154	2,925	2,950	294	294	294	294
200	225	21	21	21	21	1,550	1,575	156	156	156	156	2,950	2,975	296	296	296	296
225	250	24	24	24	24	1,575	1,600	159	159	159	159	2,975	3,000	299	299	299	299
250	275	26	26	26	26	1,600	1,625	161	161	161	161						
275	300	29	29	29	29	1,625	1,650	164	164	164	164						
300	325	31	31	31	31	1,650	1,675	166	166	166	166						
325	350	34	34	34	34	1,675	1,700	169	169	169	169						
350	375	36	36	36	36	1,700	1,725	171	171	171	171						
375	400	39	39	39	39	1,725	1,750	174	174	174	174						
400	425	41	41	41	41	1,750	1,775	176	176	176	176						
												3,000					

# Geographic Data

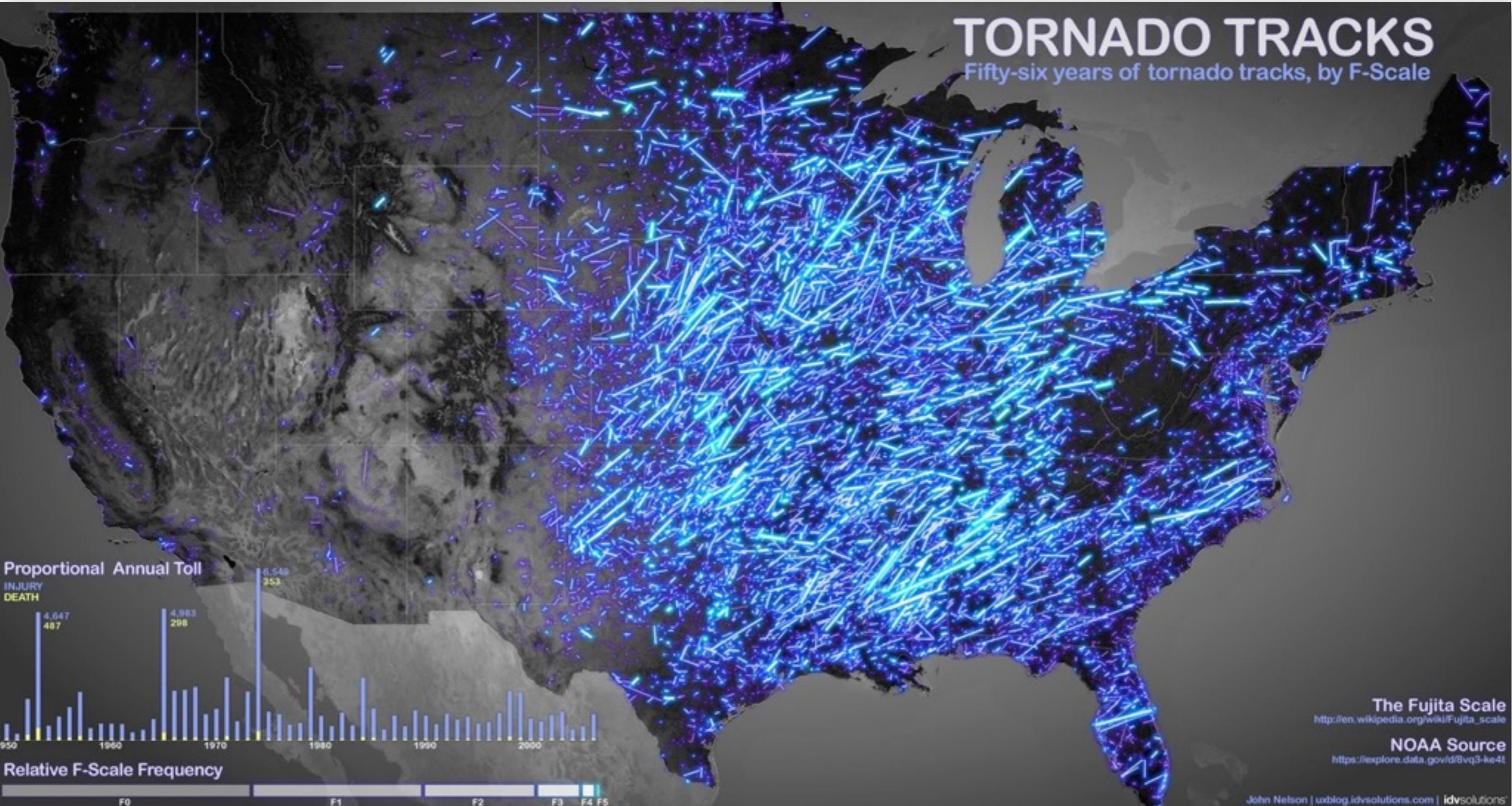
# What Accuracy is Needed?



# Spatial Data



# Spatial Data



# Spatial Data

## wind map

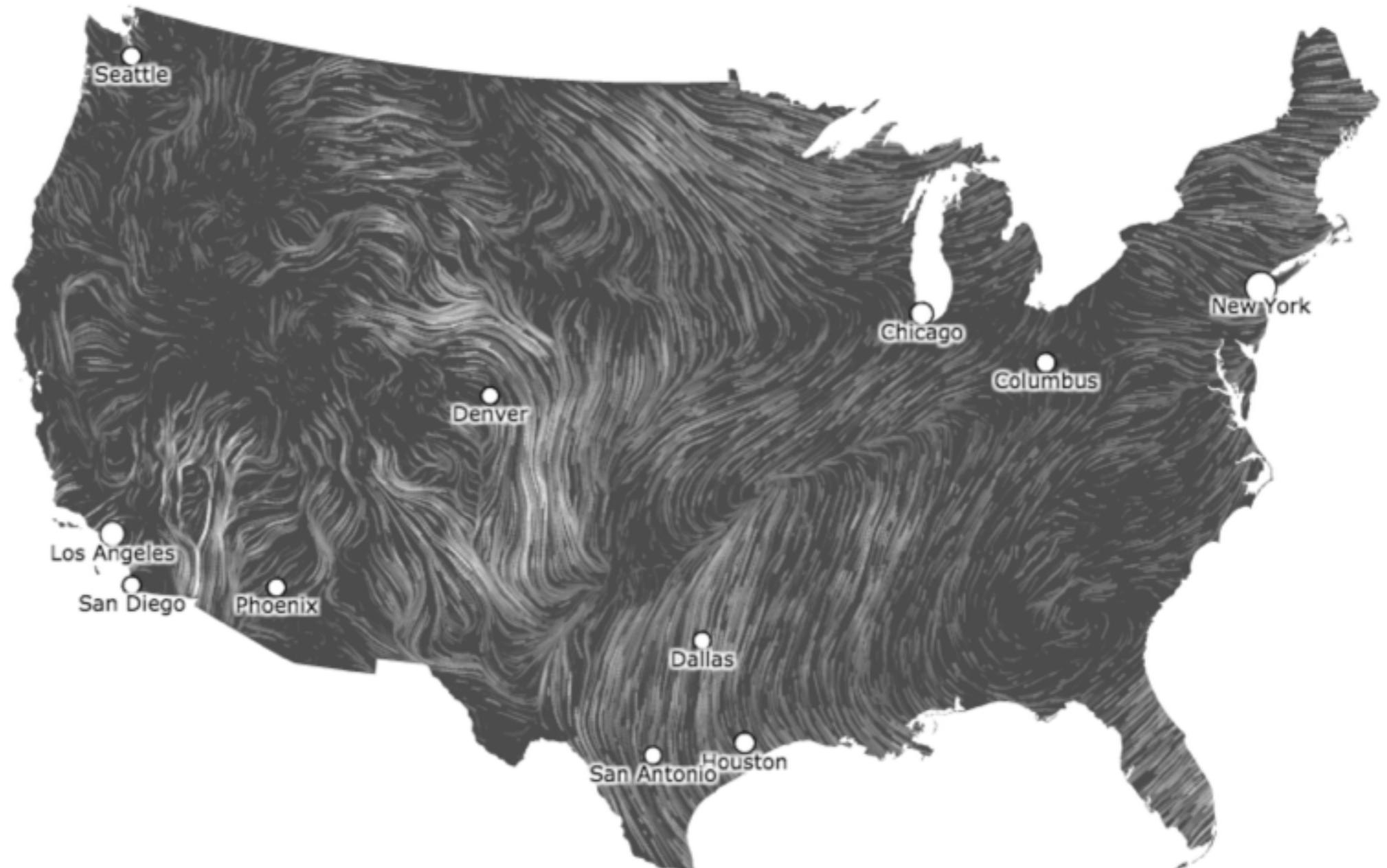
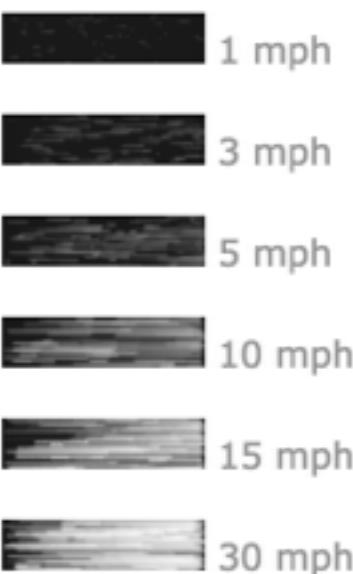
October 19, 2016

12:36 pm EST

(time of forecast download)

top speed: 31.3 mph

average: 7.9 mph



[All Shots](#)[3-Pointers](#)[Midrange](#)[Close Range](#)

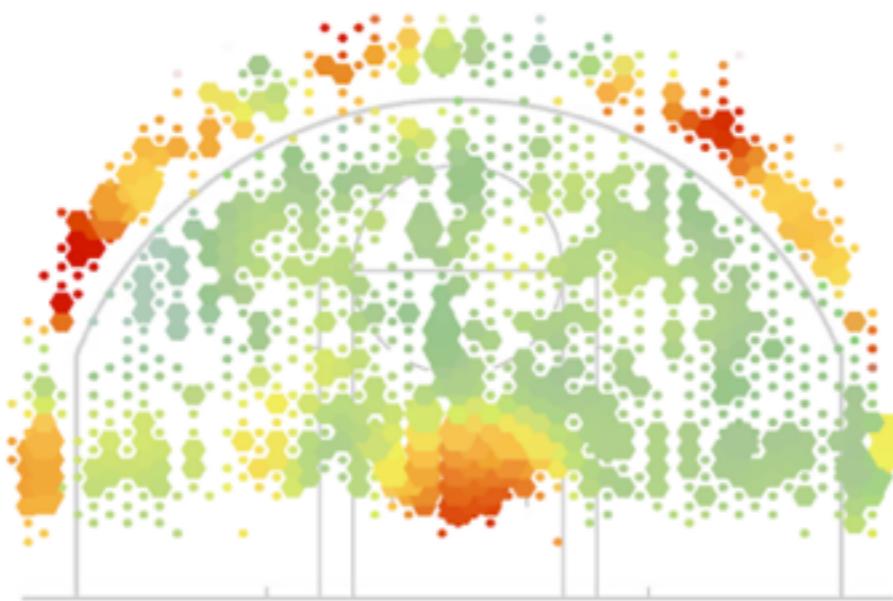
Number of attempts

Low   ◦   ○   □   High

Points per region

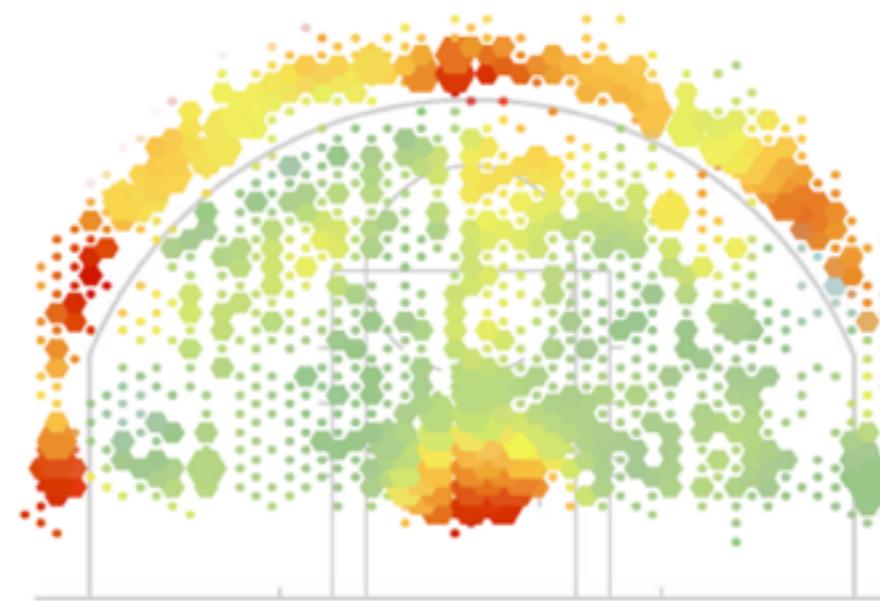
Low   ■   ▲   △   High

## Miami Heat

TOTAL SHOTS **5,209** | POINTS PER SHOT **1.01** | F.G. PERCENT **47%**

The Heat rely on player positioning to create isolation plays for LeBron James and Dwyane Wade, often on the left side. The Heat take many fewer 3-point shots than the Thunder.

## Oklahoma City Thunder

TOTAL SHOTS **5,228** | POINTS PER SHOT **1.03** | F.G. PERCENT **47.1%**

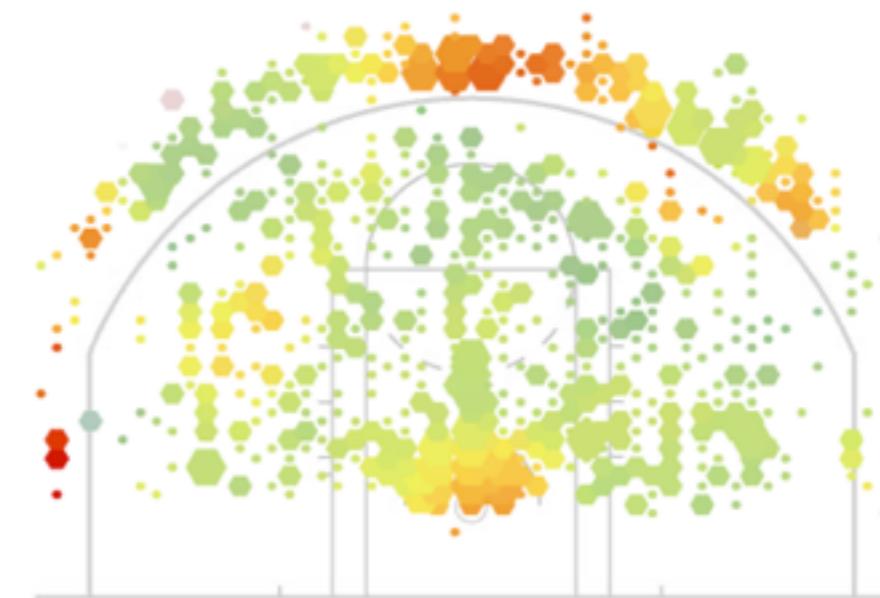
The Thunder are effective from almost any area on the court and shoot many more 3-point shots than the league average. Kevin Durant and James Harden are potent from the top of the arc.

## LeBron James

[VIEW: PHOTO](#) | [GRAPH](#)TOTAL SHOTS **1,169** | POINTS PER SHOT **1.1** | F.G. PERCENT **53.1%**

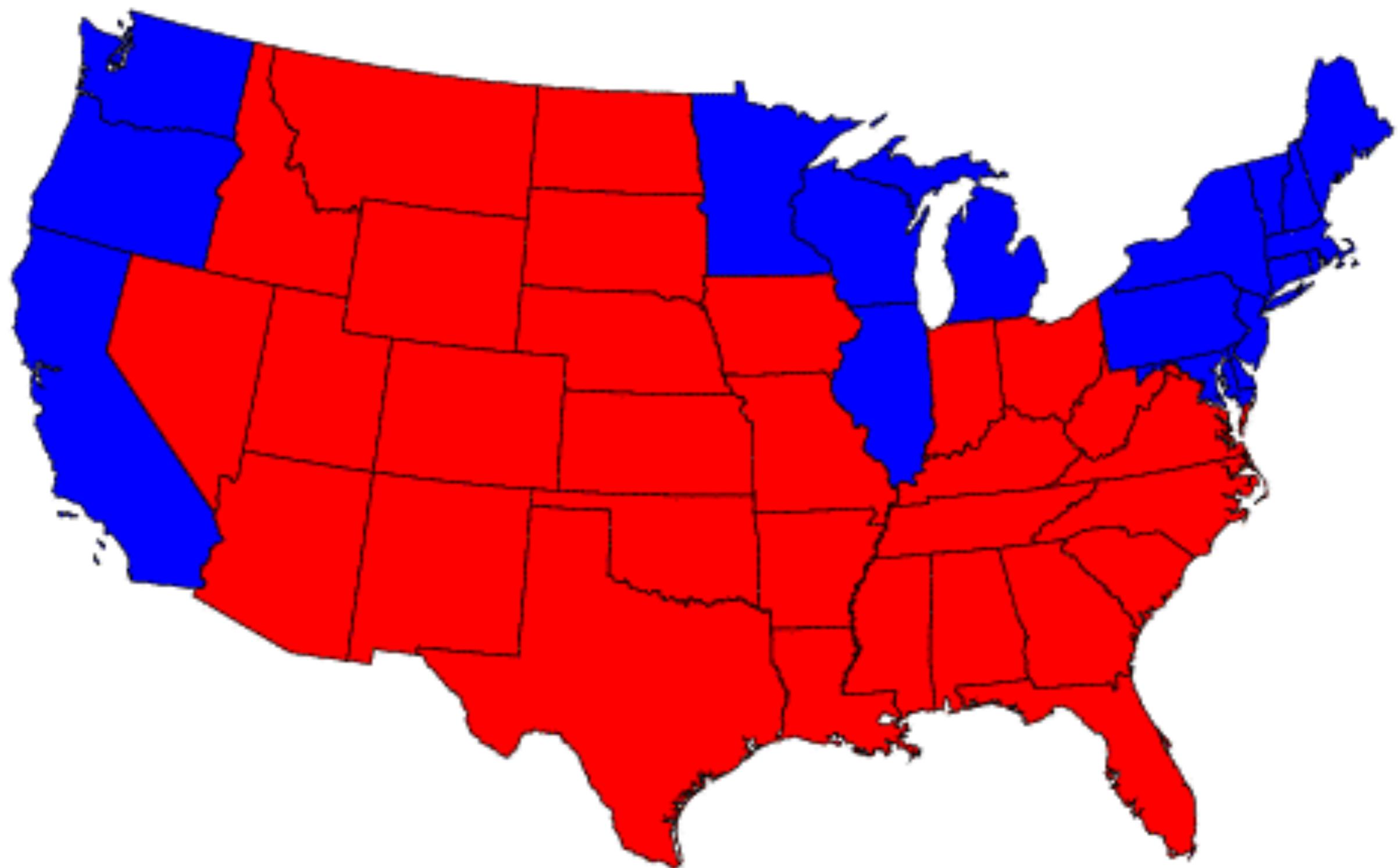
His athleticism and ball-handling create a lot of high-percentage shots near the basket. He prefers the wing locations beyond the 3-point line. His

## Kevin Durant

[VIEW: PHOTO](#) | [GRAPH](#)TOTAL SHOTS **1,296** | POINTS PER SHOT **1.09** | F.G. PERCENT **49.6%**

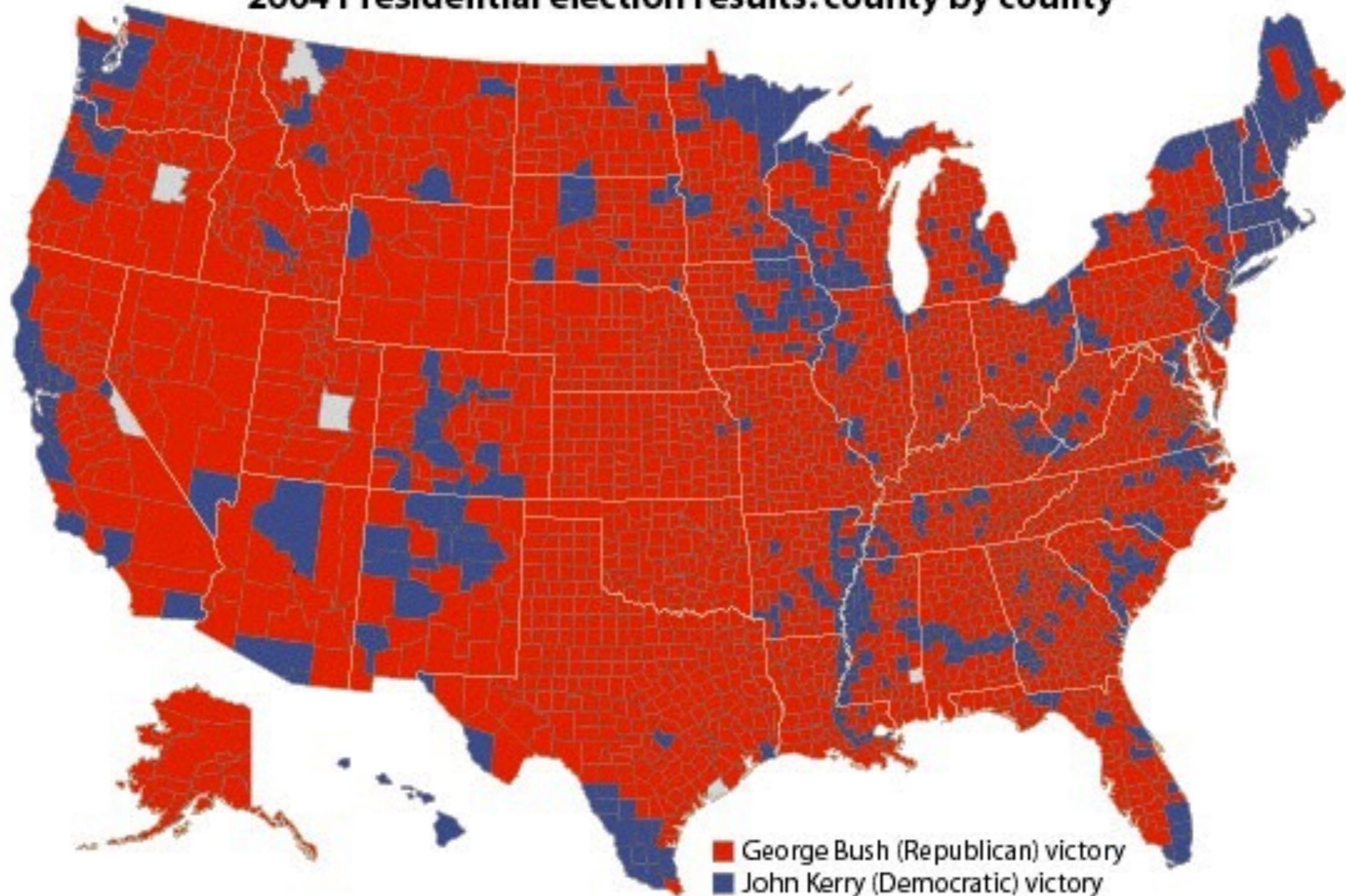
Despite his size, he is a very effective midrange shooter, taking nearly half his shots from that zone and another 25 percent from beyond the 3-point arc.

# Non-Spatial Data

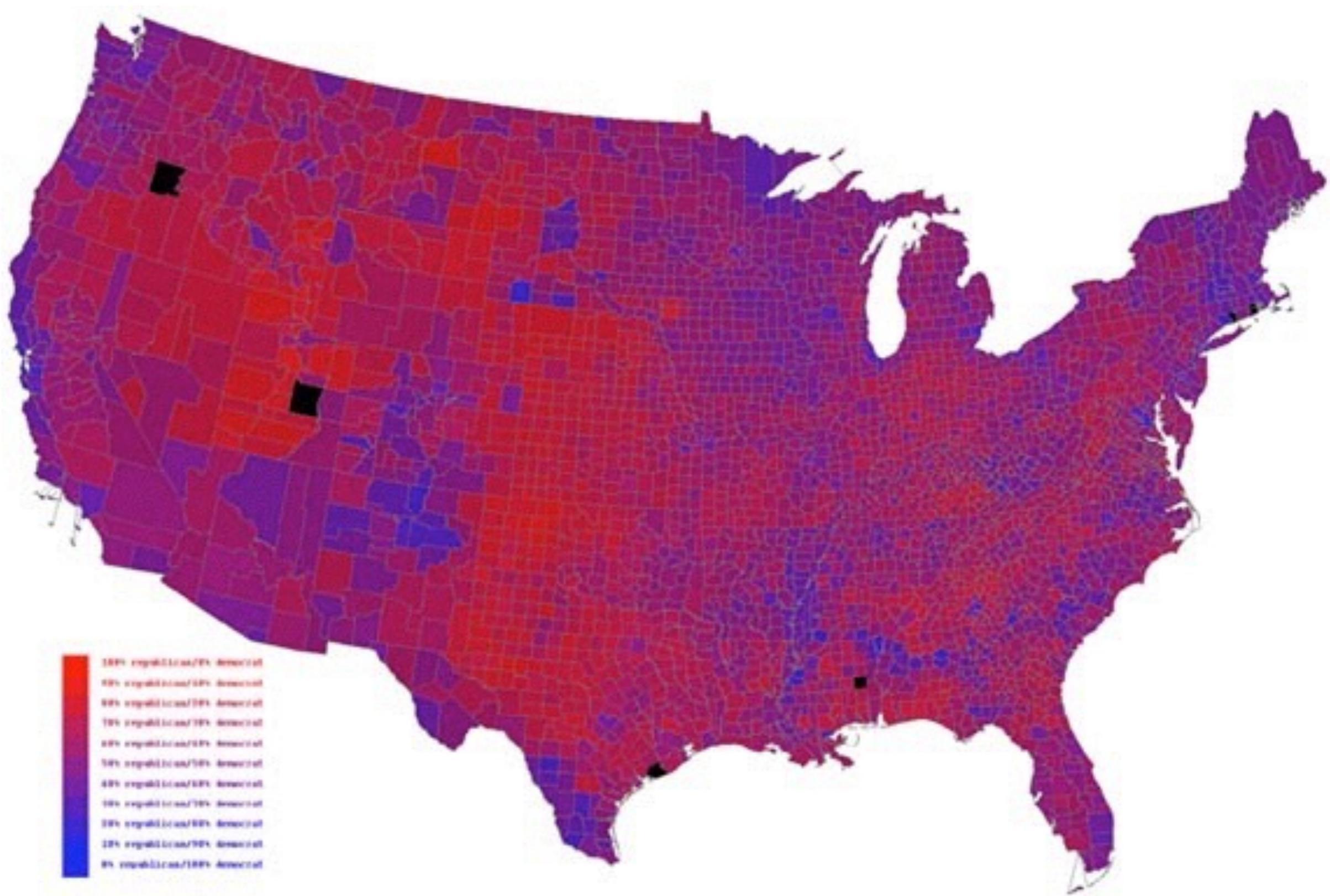


# Non-Spatial Data

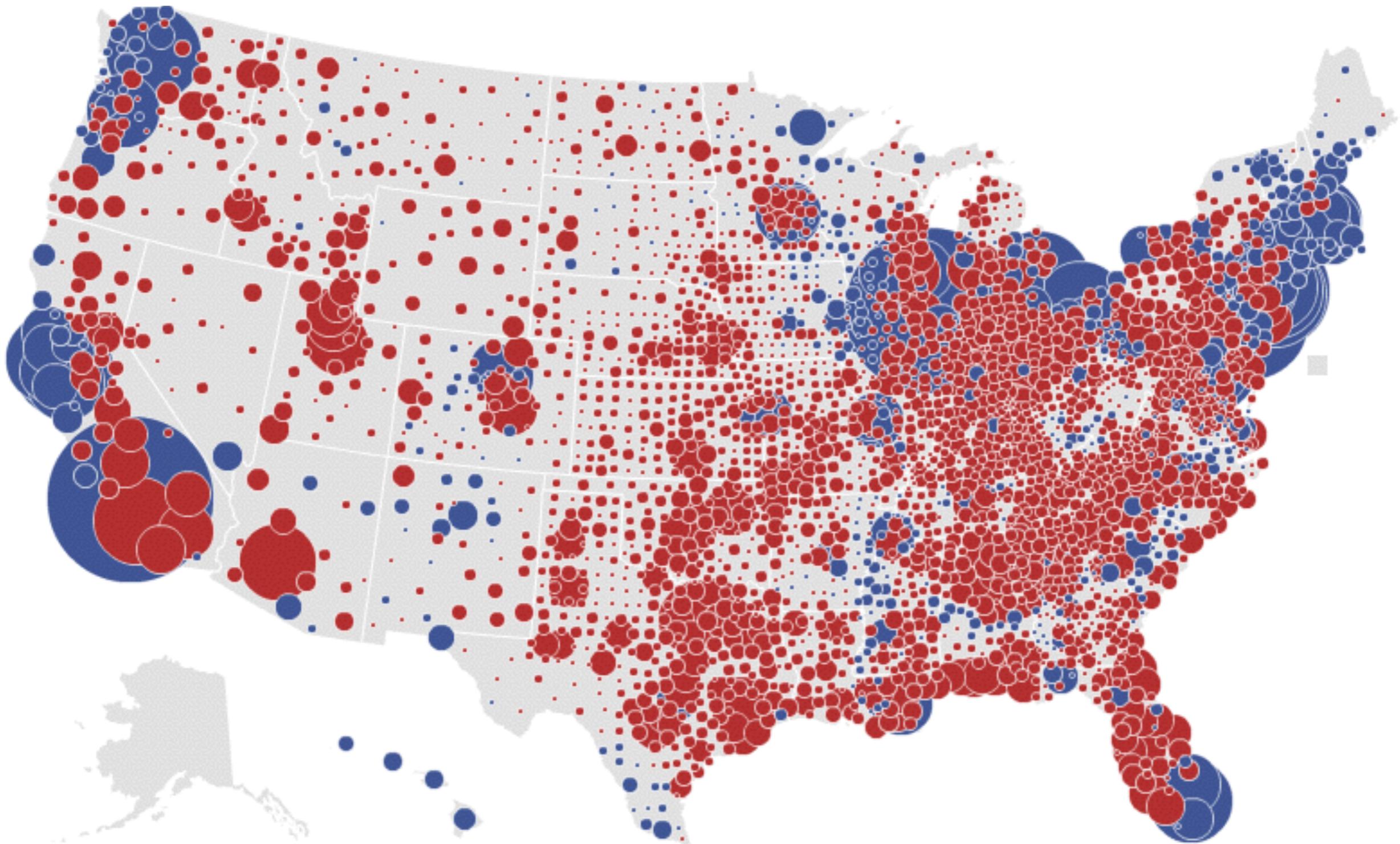
2004 Presidential election results: county by county



# Non-Spatial Data

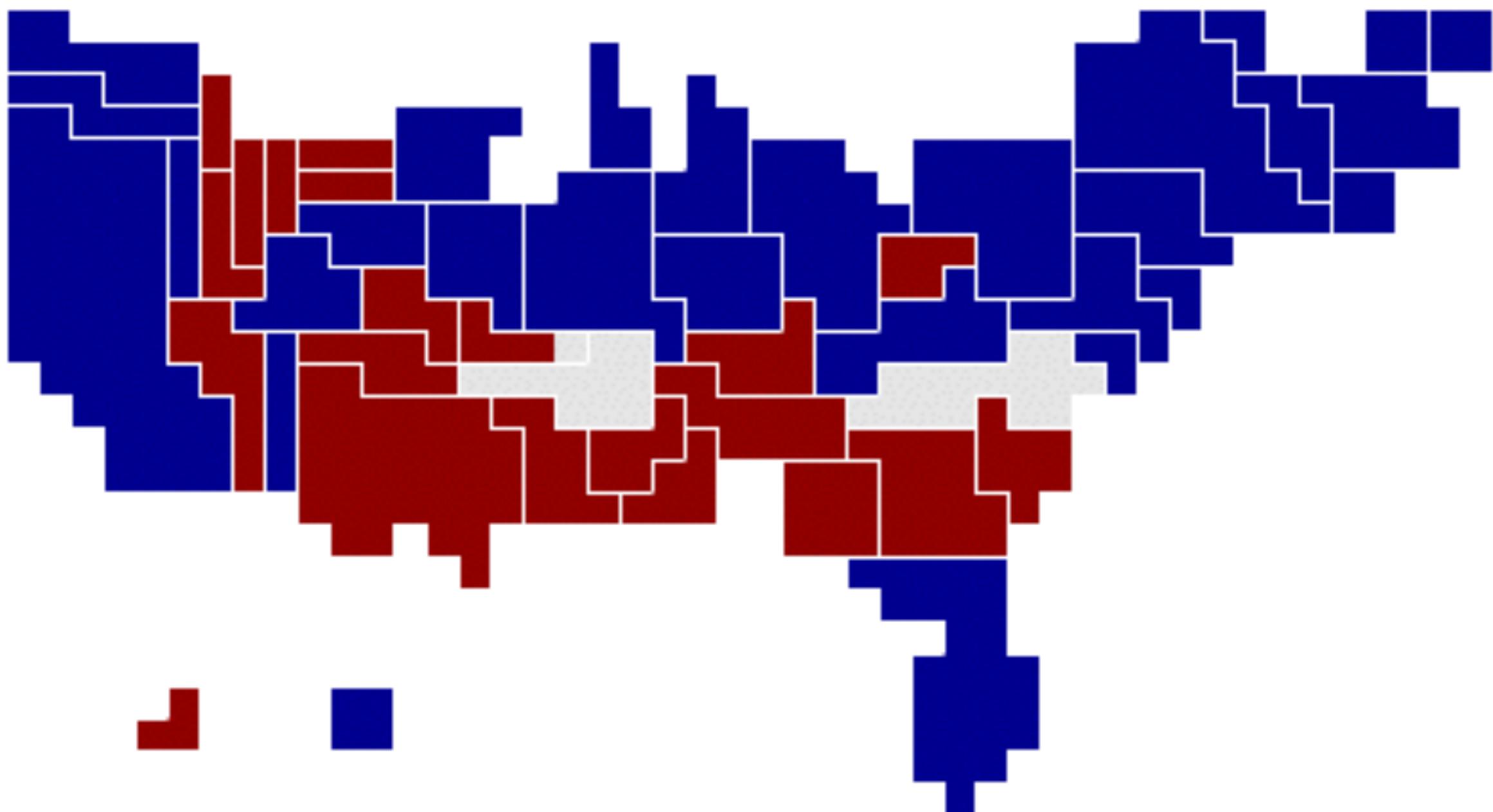


# Non-Spatial Data



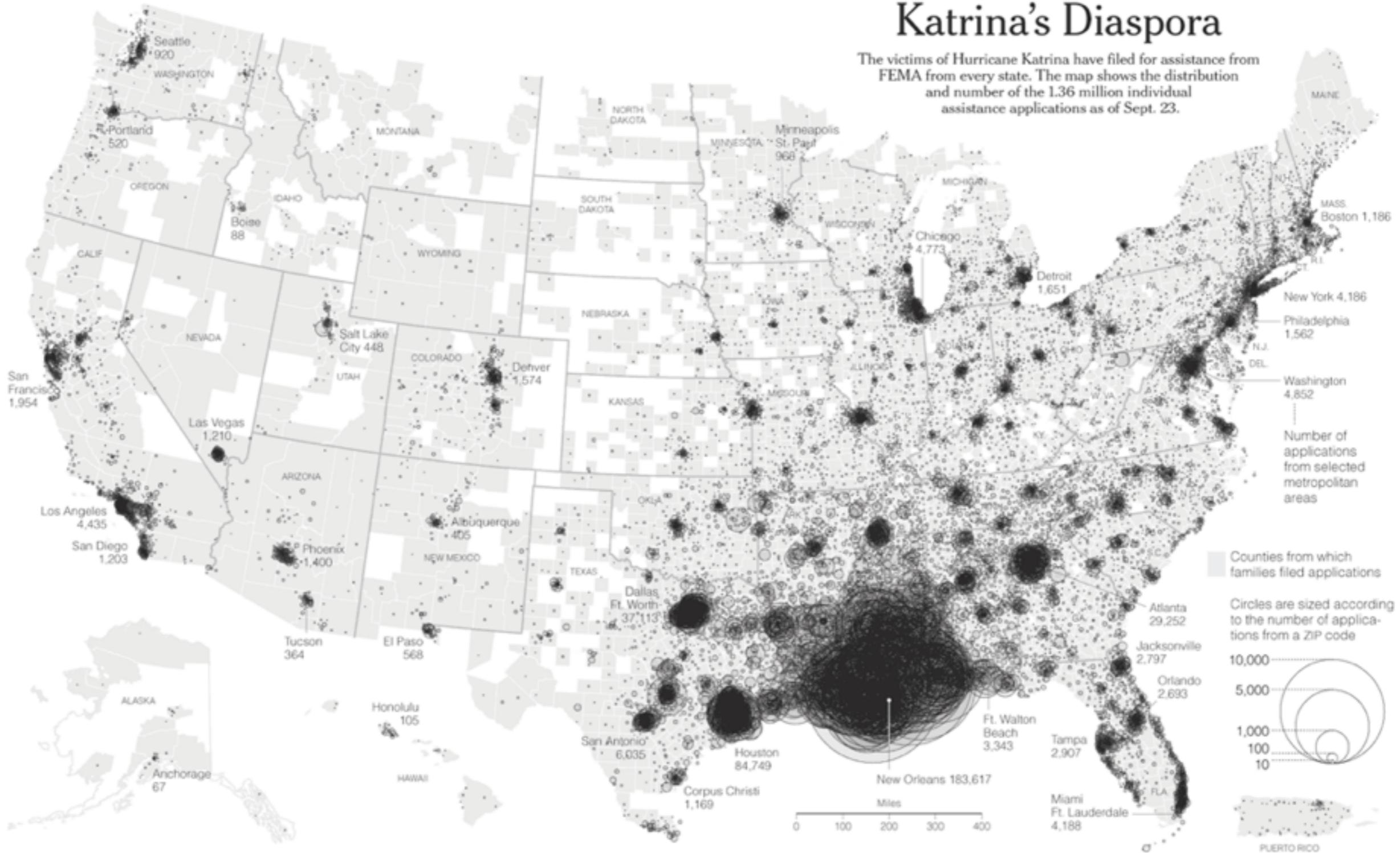
# Non-Spatial Data

■ Rep ■ Dem ■ 3rd Party ■ Partial Result ○ % precincts counted

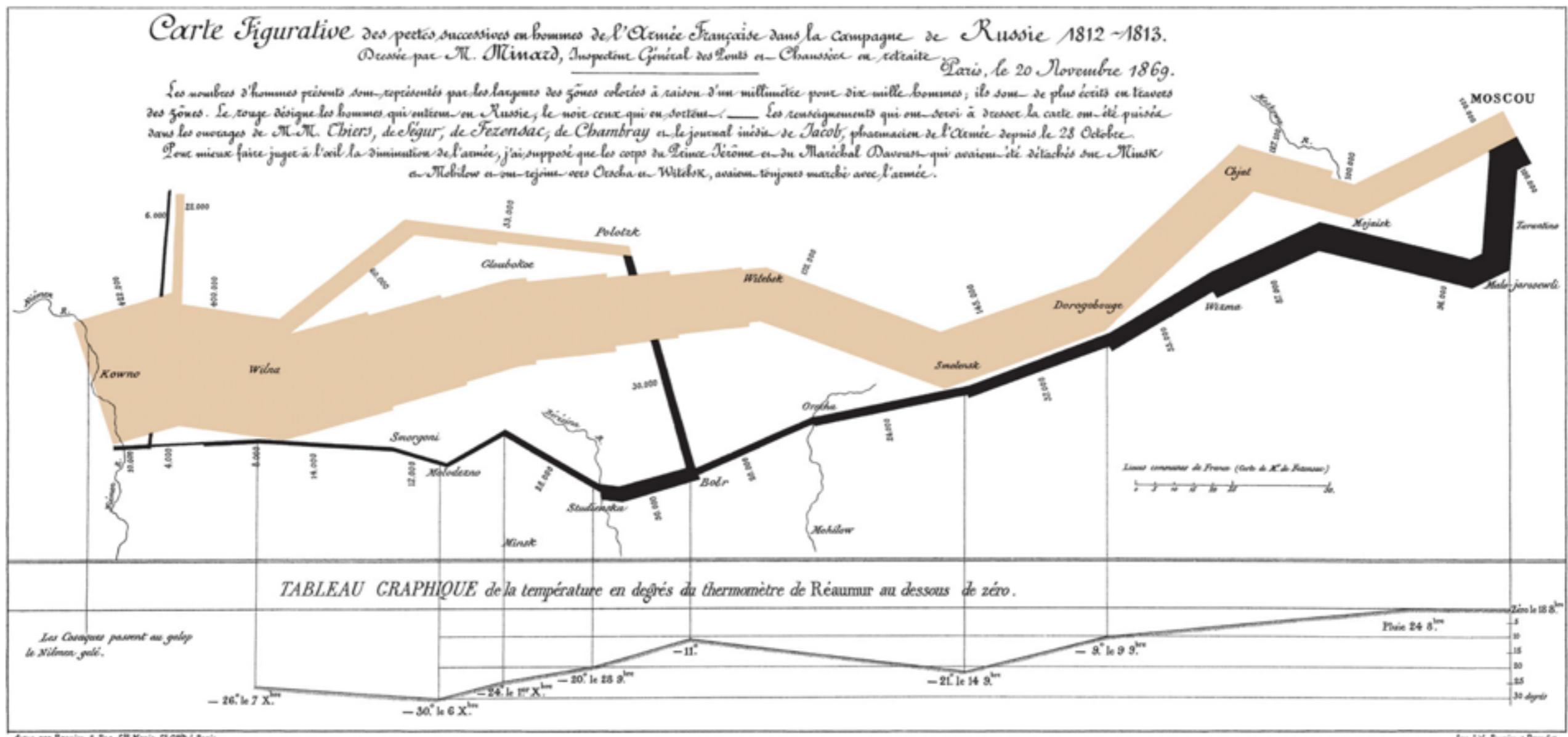


# Katrina's Diaspora

The victims of Hurricane Katrina have filed for assistance from FEMA from every state. The map shows the distribution and number of the 1.36 million individual assistance applications as of Sept. 23.

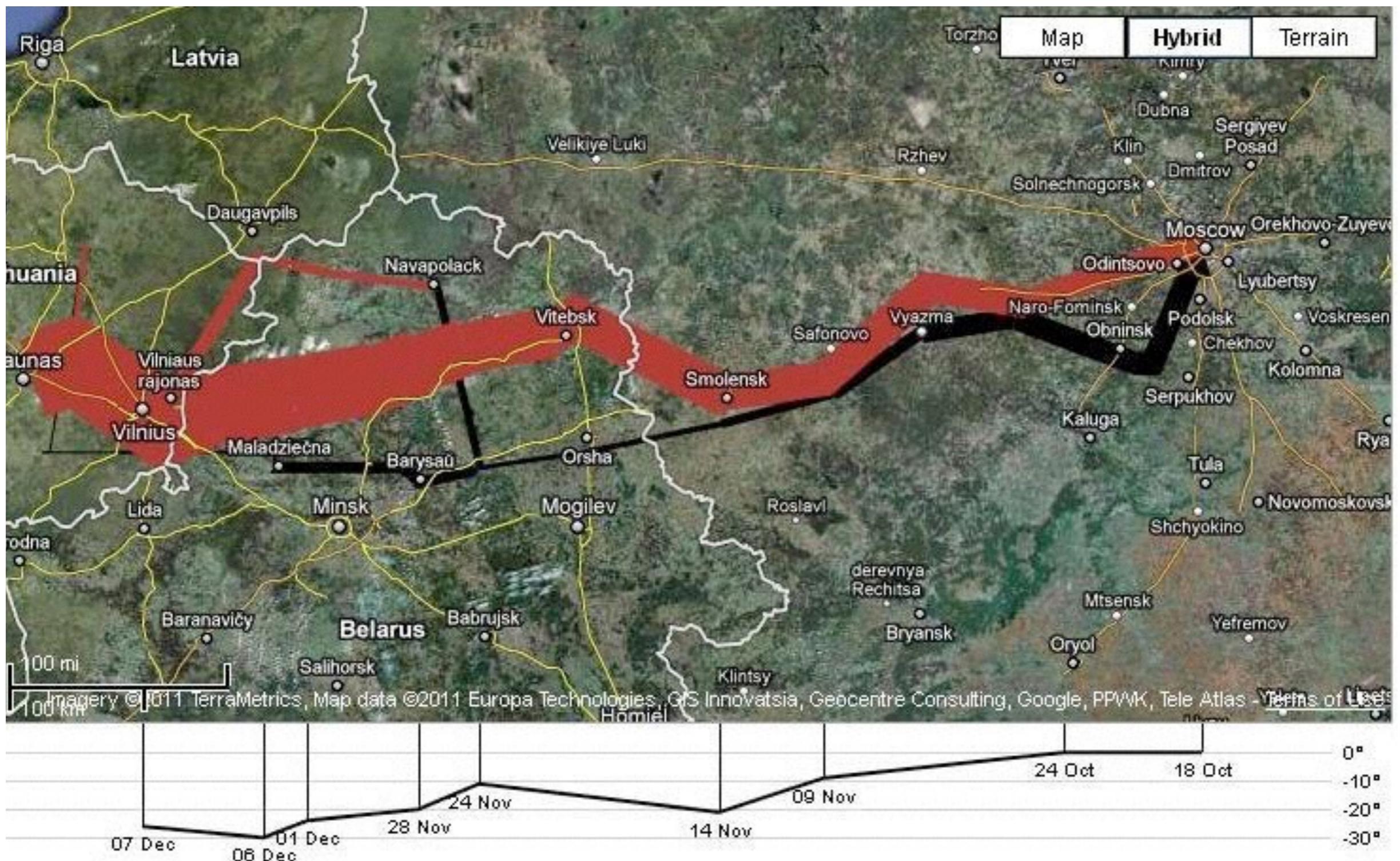


# Time Series Data

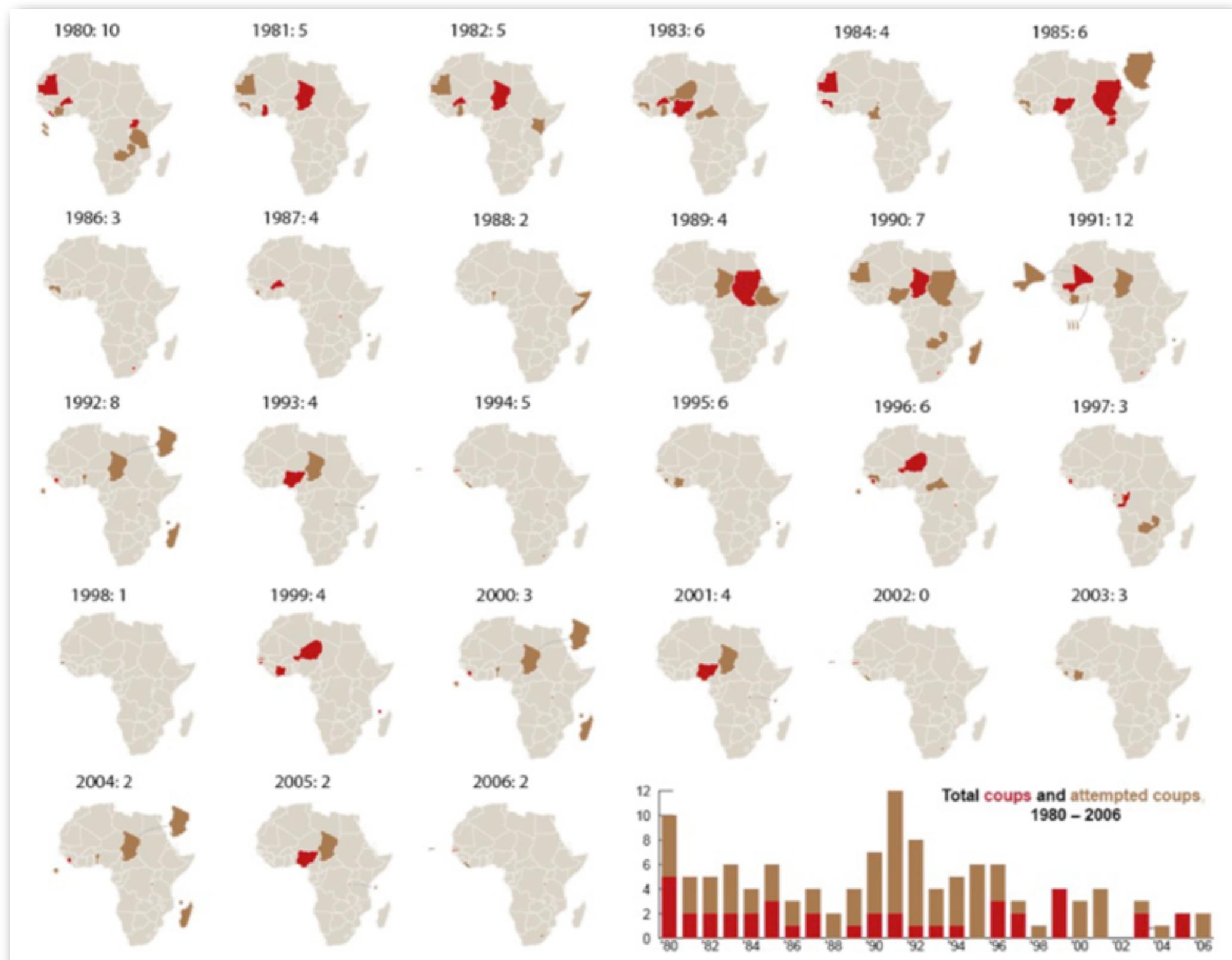


Source: Minard

# Time Series Data



# Time Series Data



Source: Karl Gude

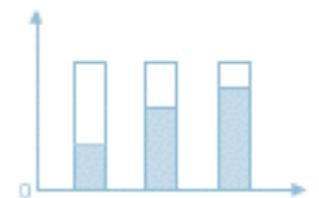
# Concepts

# Diagrams

## Abstract Concepts



## Realistic Concepts



### Flow

Linear

Circular

Divergent/Convergent

Multidirectional

### Structure

Matrices

Trees

Layers

### Cluster

Overlapping

Closure

Enclosed

Linked

### Radiate

From a point

With a core

Without a core

### Pictorial

Direction

Location

Reveal

Process

Influence

### Display Data

Comparison

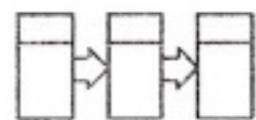
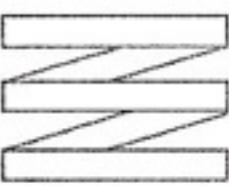
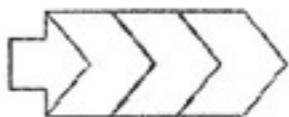
Trend

Distribution

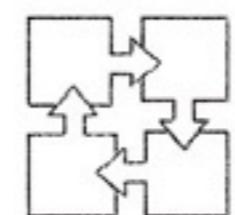
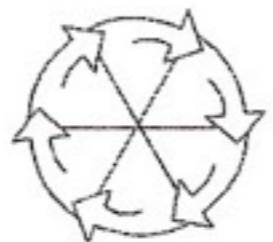
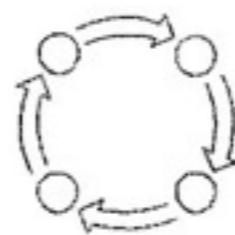
# Flow Diagrams

## Flow

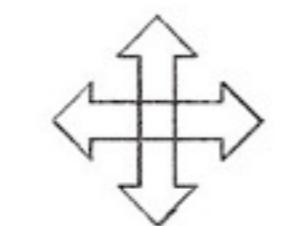
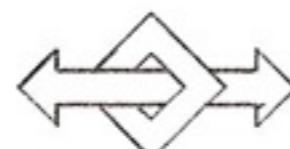
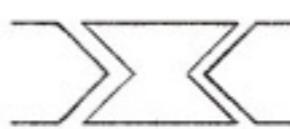
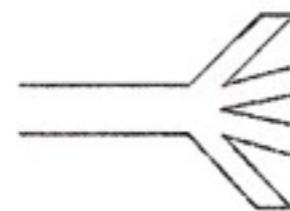
Linear



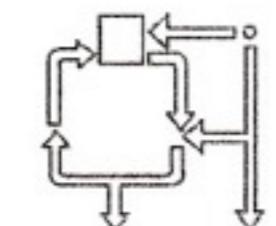
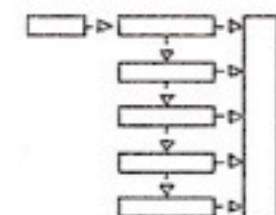
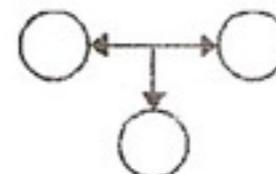
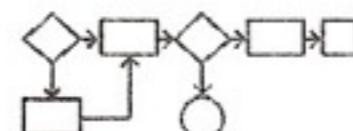
Circular



Convergent  
Divergent



Multi-  
directional

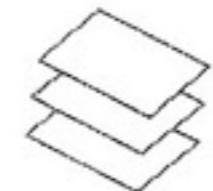
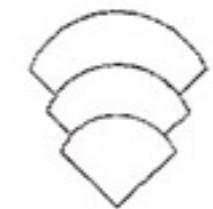


Source: slide:ology

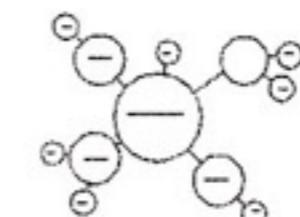
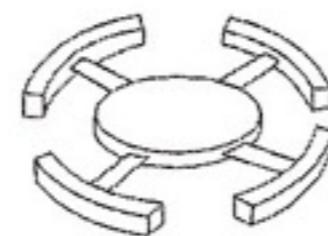
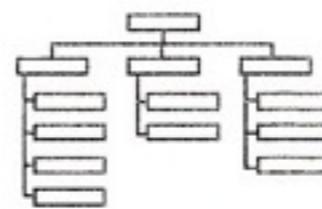
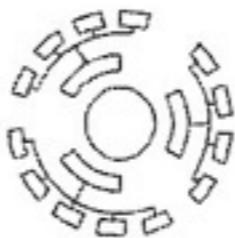
# Structure Diagrams

## Structure

Layers



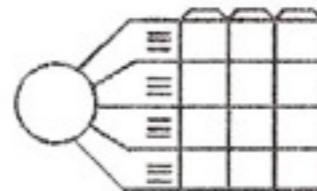
Trees



Matrices

-	-	-	-
-	•	•	•
-	•	•	•
-	•	•	•

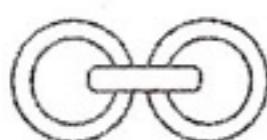
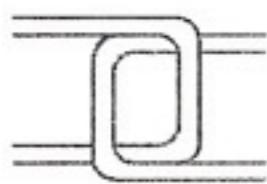
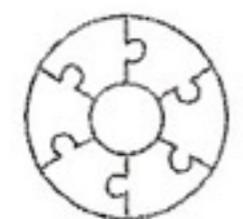
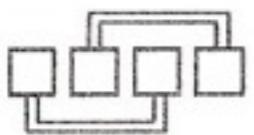
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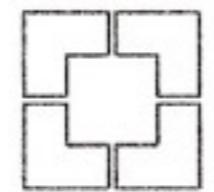
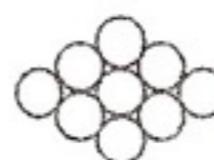
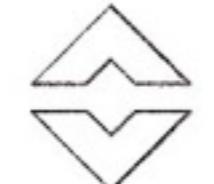
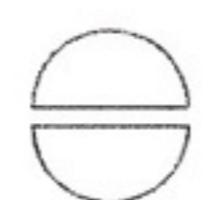
# Cluster Diagrams

## Cluster

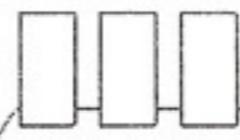
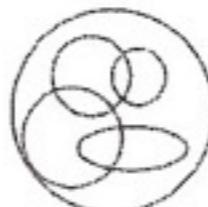
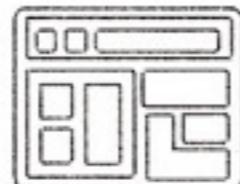
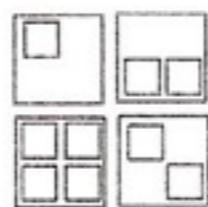
Linked



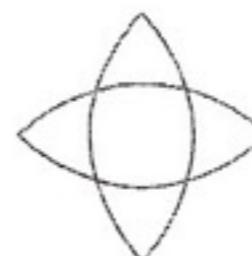
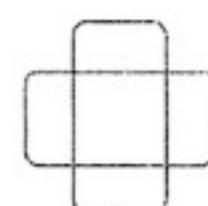
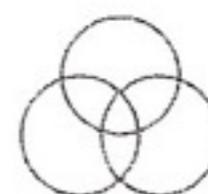
Closure



Enclosed



Overlapping

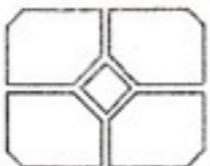
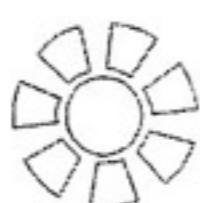
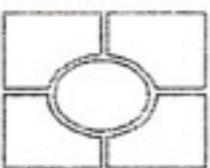
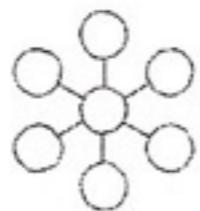


Source: slide:ology

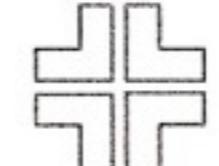
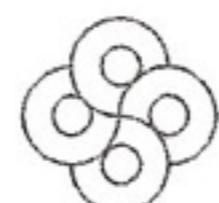
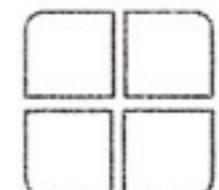
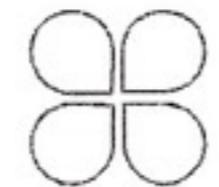
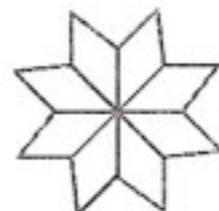
# Radiate Diagrams

## Radiate

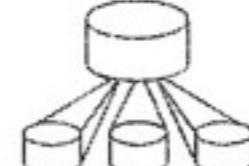
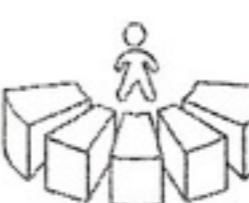
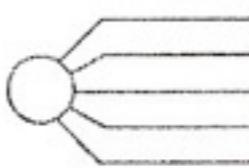
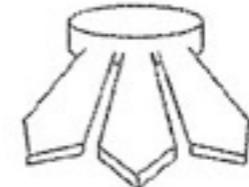
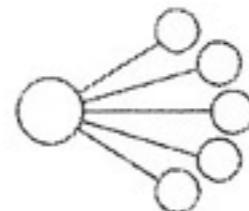
With  
a Core



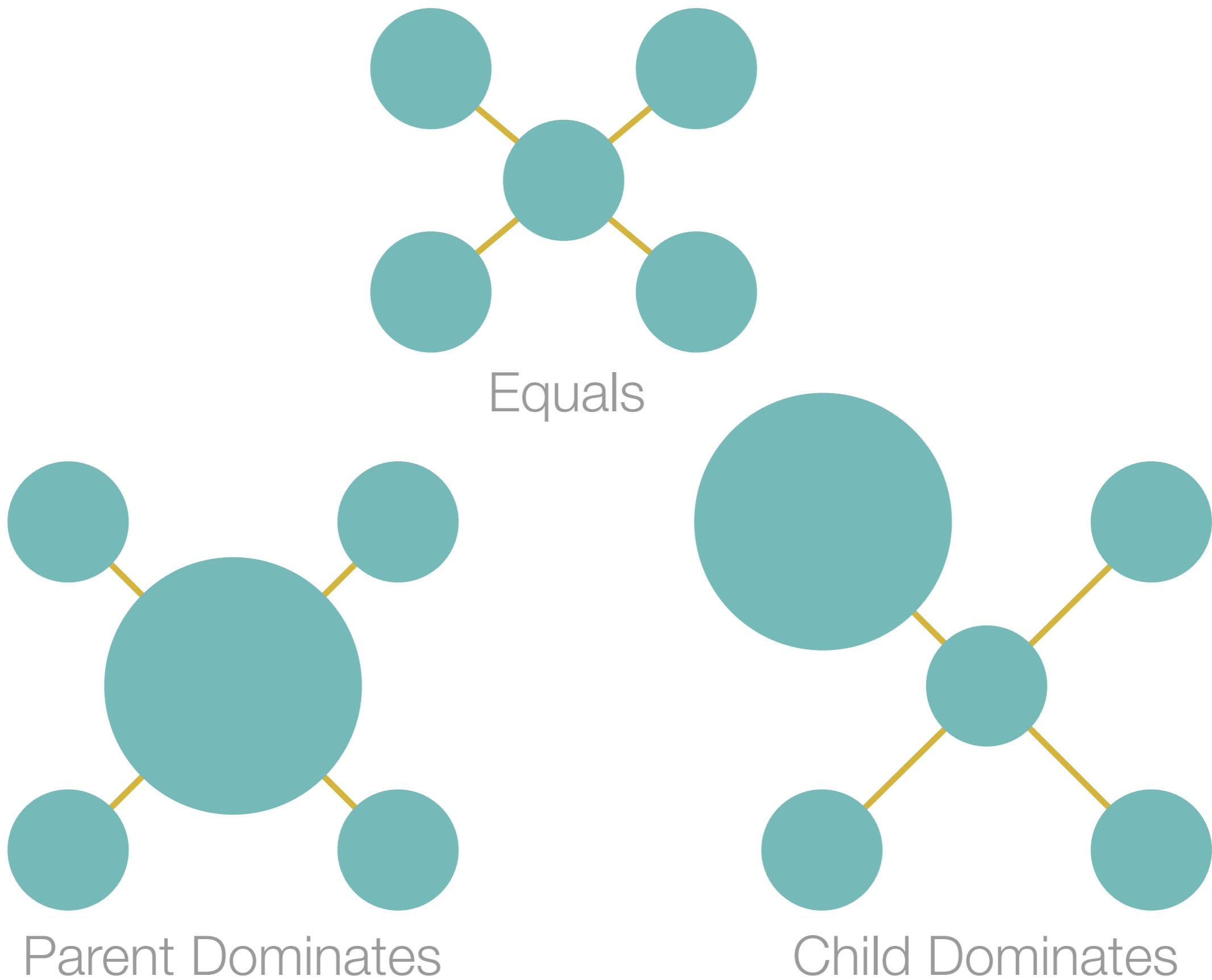
Without  
a Core



From  
a Point



# Change the Story



# Diagramming Tool

## Identify the relationship.

Choose from five categories.

### Flow >

Join

Network

Segment

Stack

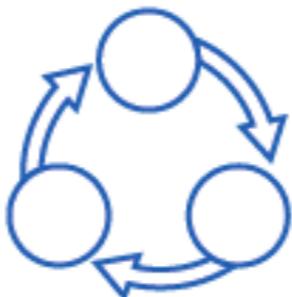
## Represent the relationship.

Select the subcategory that fits best.



Linear

Shapes flow linearly but not necessarily straight



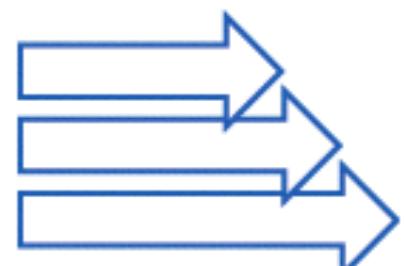
Loop

Shapes flow creating a closed loop



Merge/Divide

Shape separates from or combines with other shapes



Parallel

Shapes flow in a parallel direction where no shape intersects

## Pick a number.

Each node is one piece of data.

View as: **Grid** List

Items per page: 16

1 Node (6)



2 Nodes (278)



3 Nodes (292)



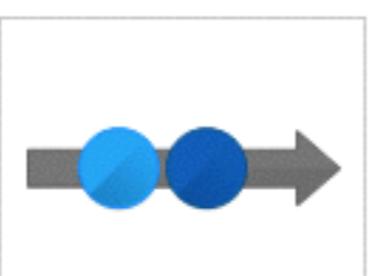
4 Nodes (280)



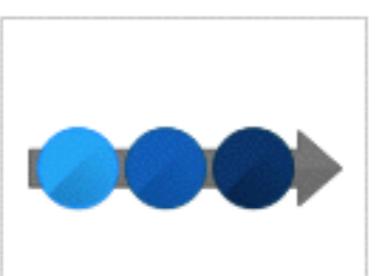
5 Nodes (274)



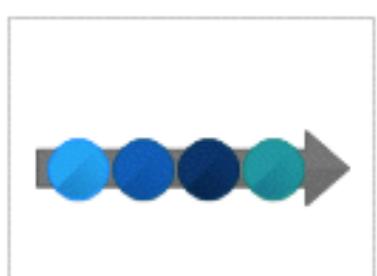
6 Nodes (255)



7 Nodes (0)



8 Nodes (2)



# Words & Relationships

# Word Cloud



# Word Cloud

## Visualizations : Obama's Speech to Congress, 022409 Tag Cloud of Two Words

Creator: VictoriaLHerring

Tags: speech obama

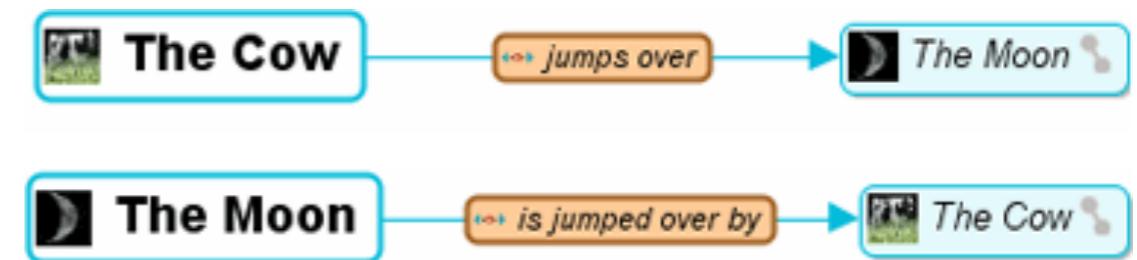
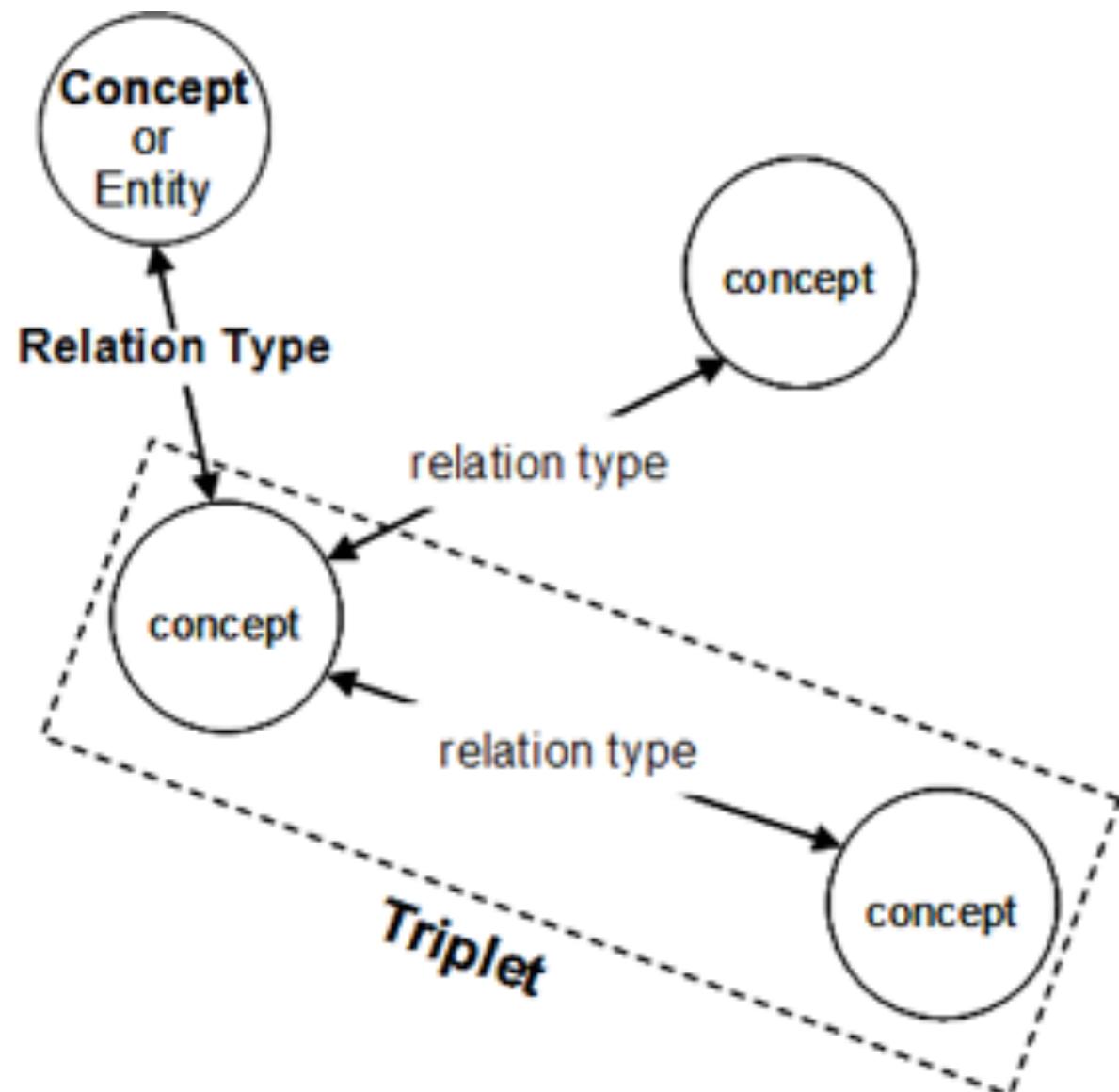
1 word  2 word  Compare

Search:

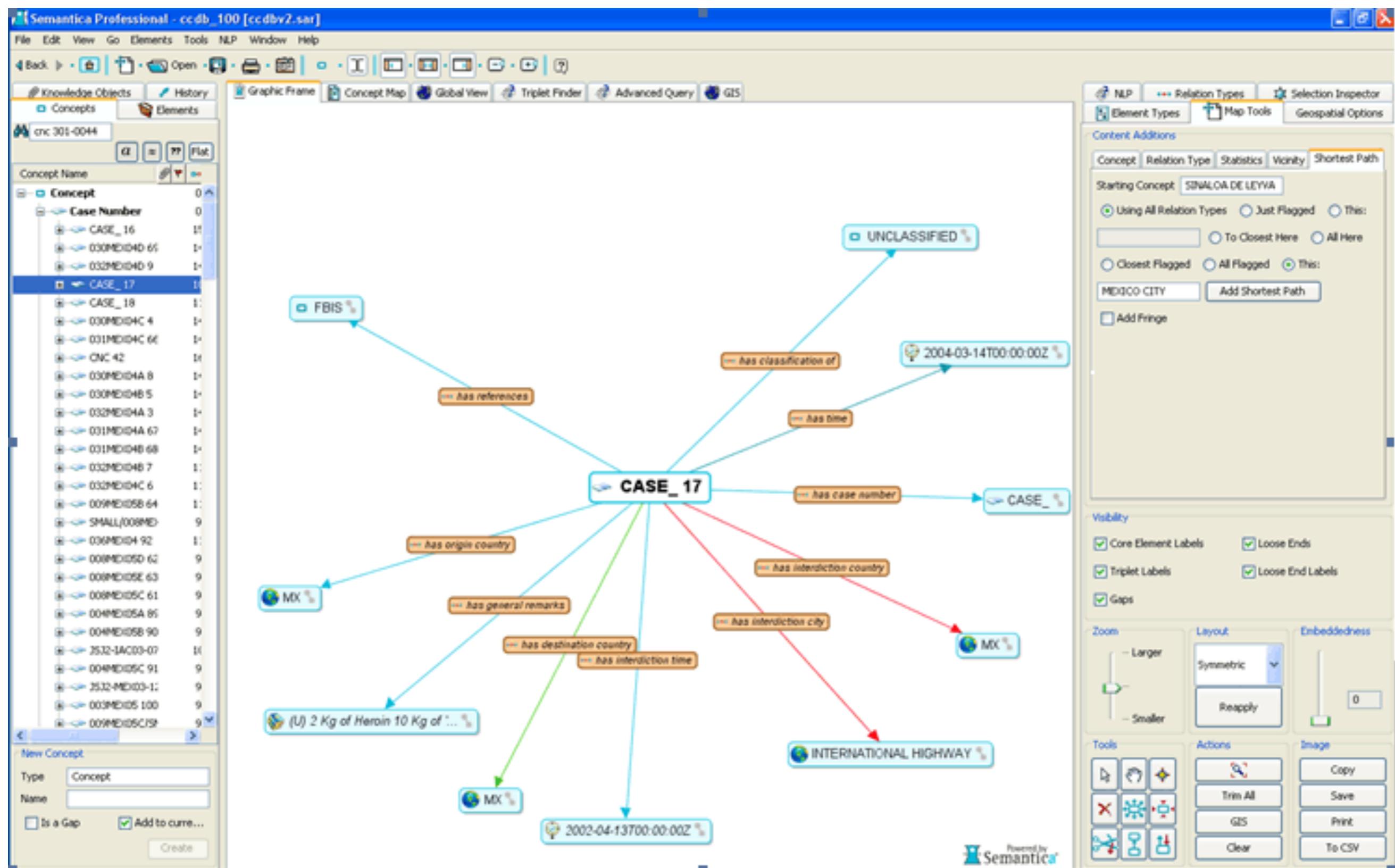
Showing 200 out of 1204

ability accountable act action address administration afford **america american americans** asked back bad banks begin begins bring budget build business businesses buy called **Care** century challenges chamber children clean college community compete comprehensive concern confidence confront congress cost costs country created credit **crisis** cut day days debt decade decisions **deficit** democrats depends difficult dollar dollars easy **economic economy education** effort end **energy** ensure entrepreneurs fact families family federal finally financial force forward foundation **future** global goal govern government great half **health** helping high higher history hold home homes hope housing inherited insurance invest investment iraq issue job **jobs** largest lay layoffs lead lending letter life loans long long-term longer lost made major **make** makes market medicare meet men million moment **money nation** national **new** opportunity part passed pay **people** place plan power president price private problem programs promise prosperity provide pushed **put** re-start receive recession **recovery reform** renewable republicans resources **responsibility** restore return **save school schools** sense serve simply single small solar solve speak **spend** spirit stand states step street struggling students support system **tax** taxpayer teacher technology **time times** today **tonight** training understand **united values** watching ways women words **work** workers working **world**

# Concept Cloud

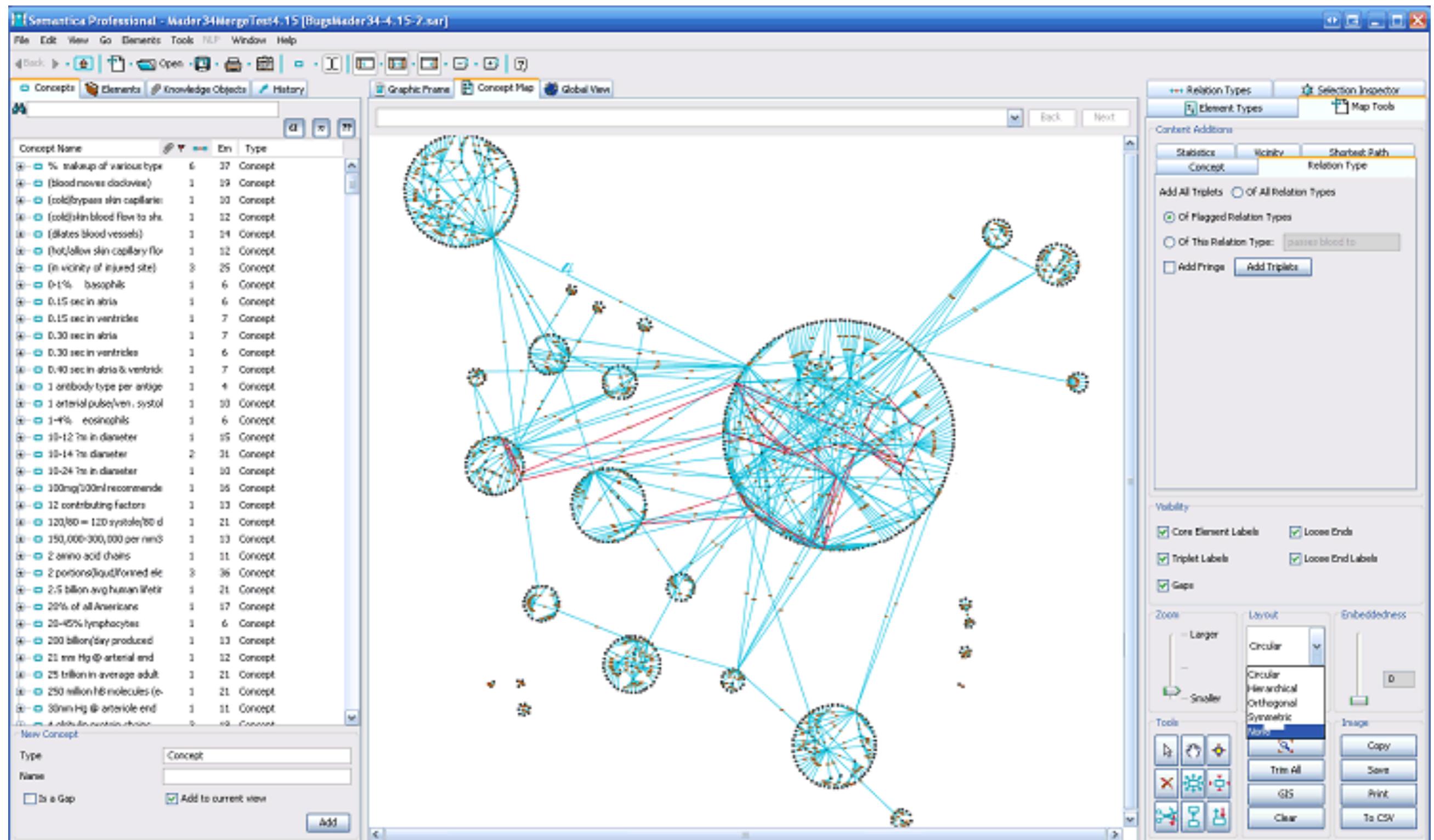


# Concept Cloud



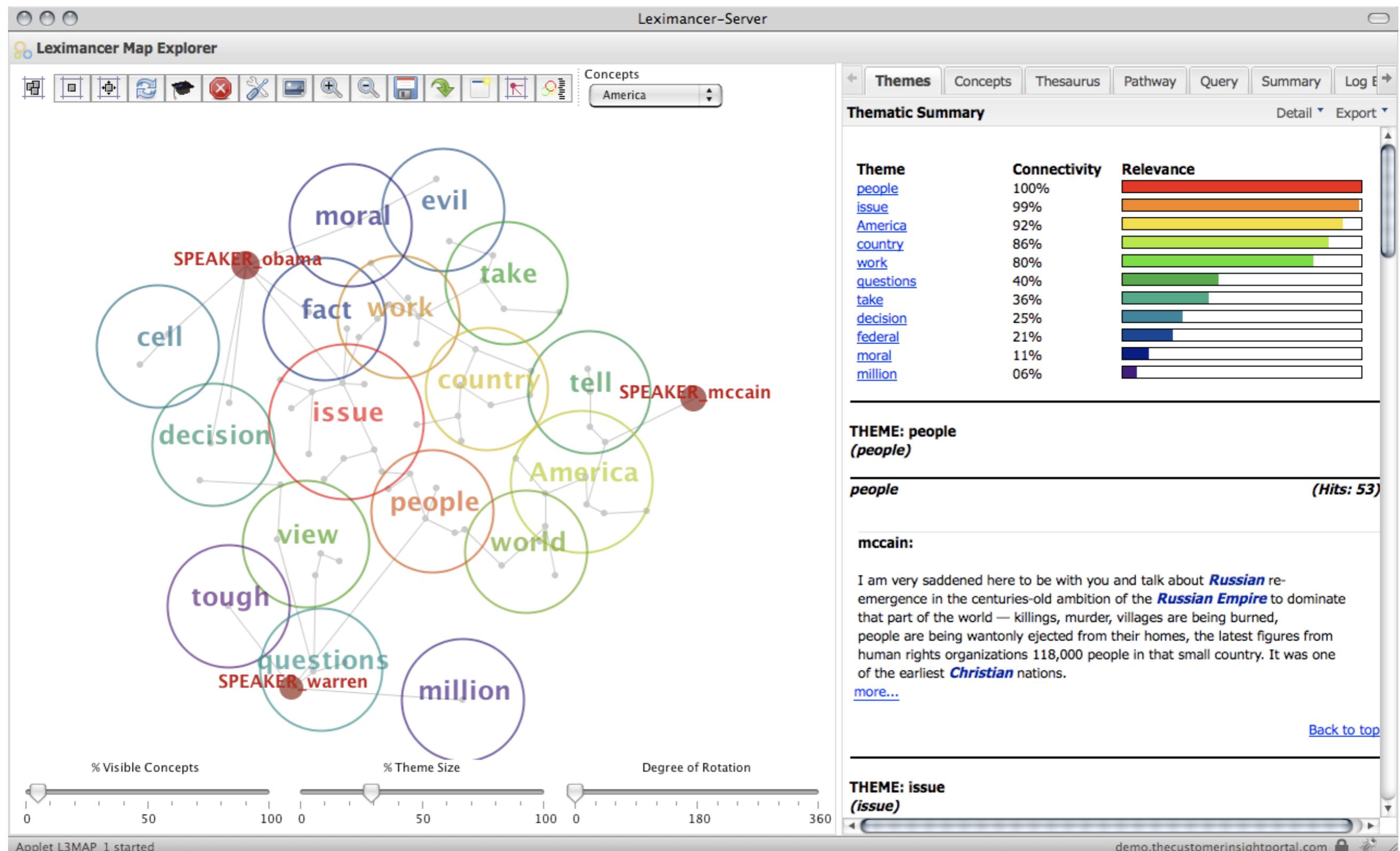
Source: Semantica

# Concept Cloud



Source: Semantica

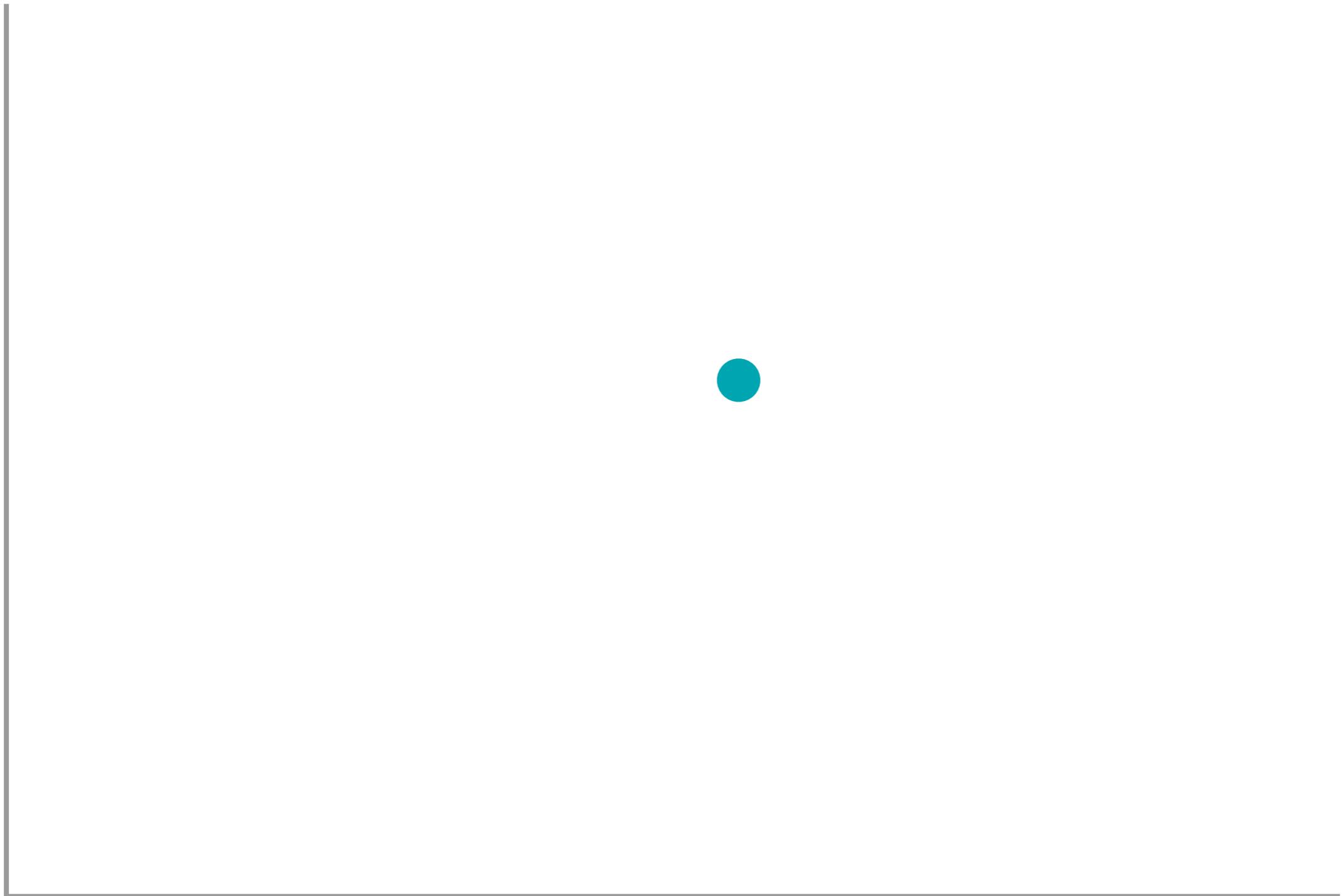
# Concept Cloud



Source: Leximancer

# Encoding Data

# Position

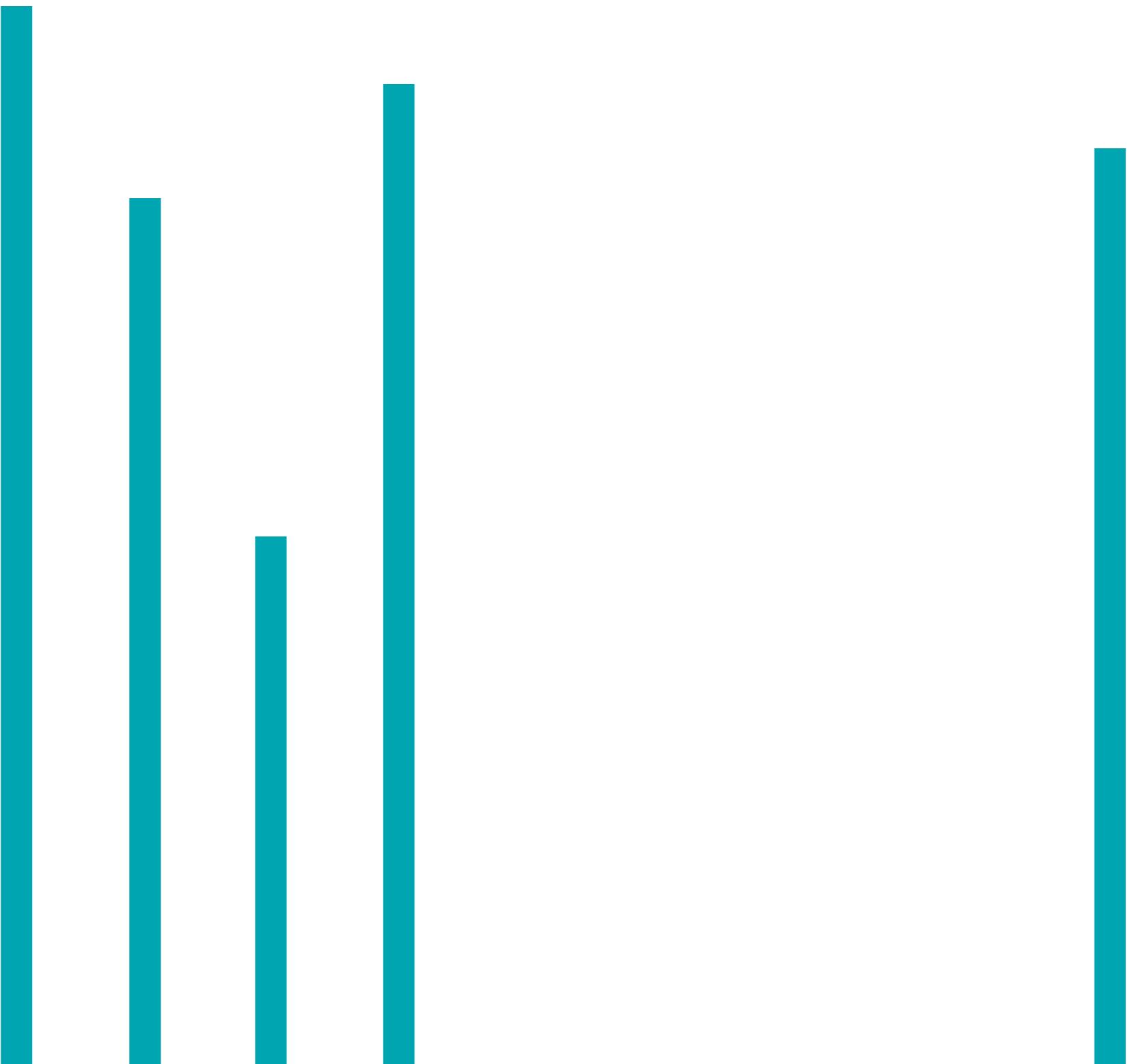


Variables: 1-4

Values: Infinite

Ordered: Yes

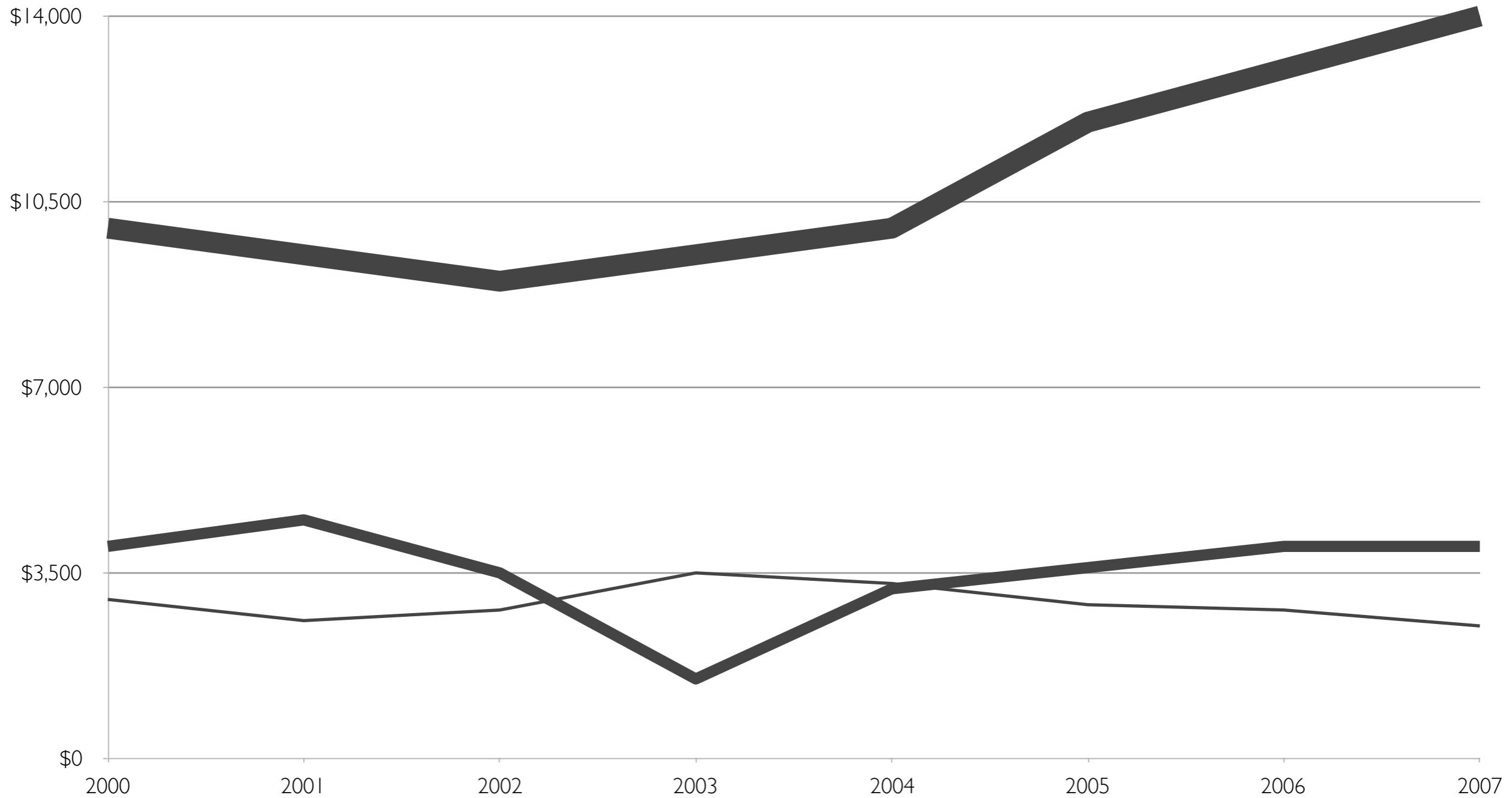
# Length



Values: Infinite

Ordered: Yes

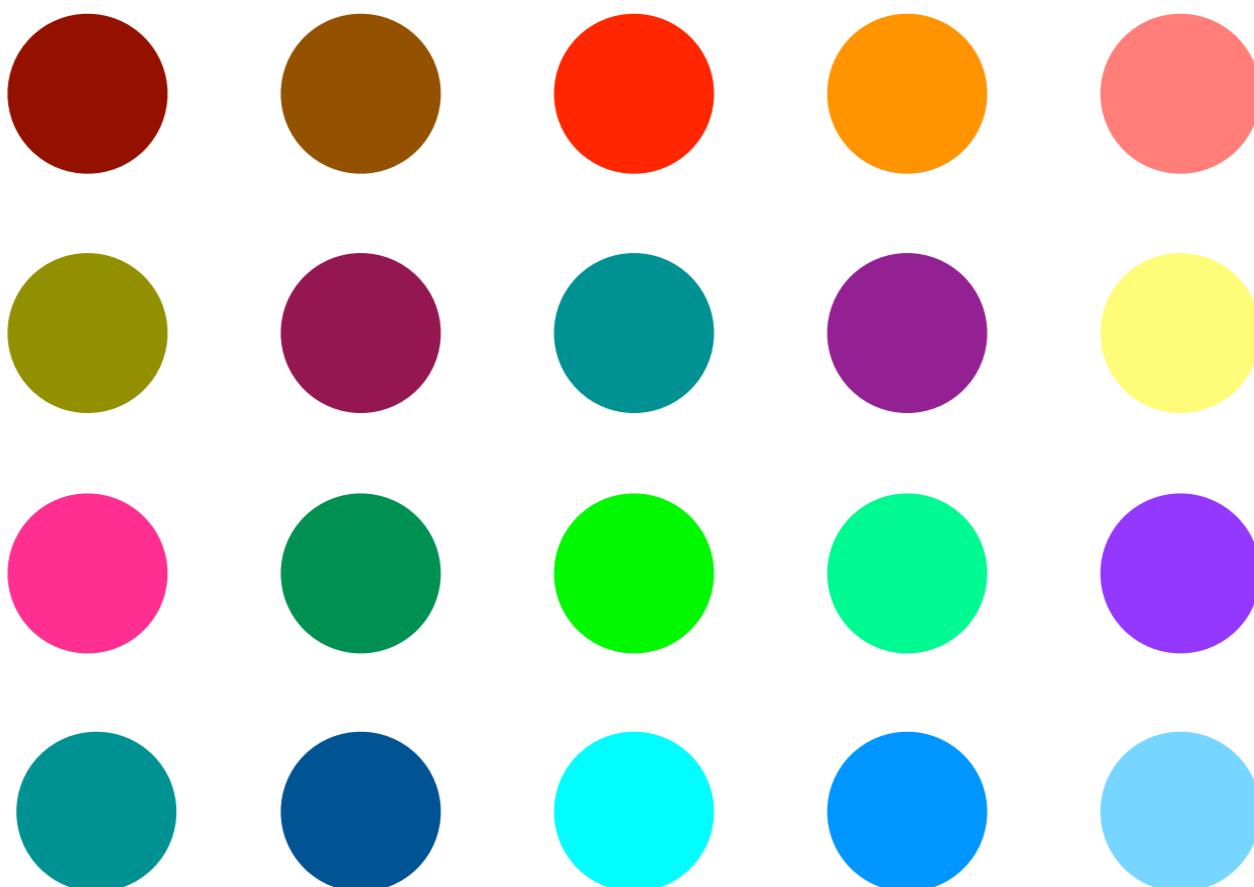
# Width



Values: Practically Limited

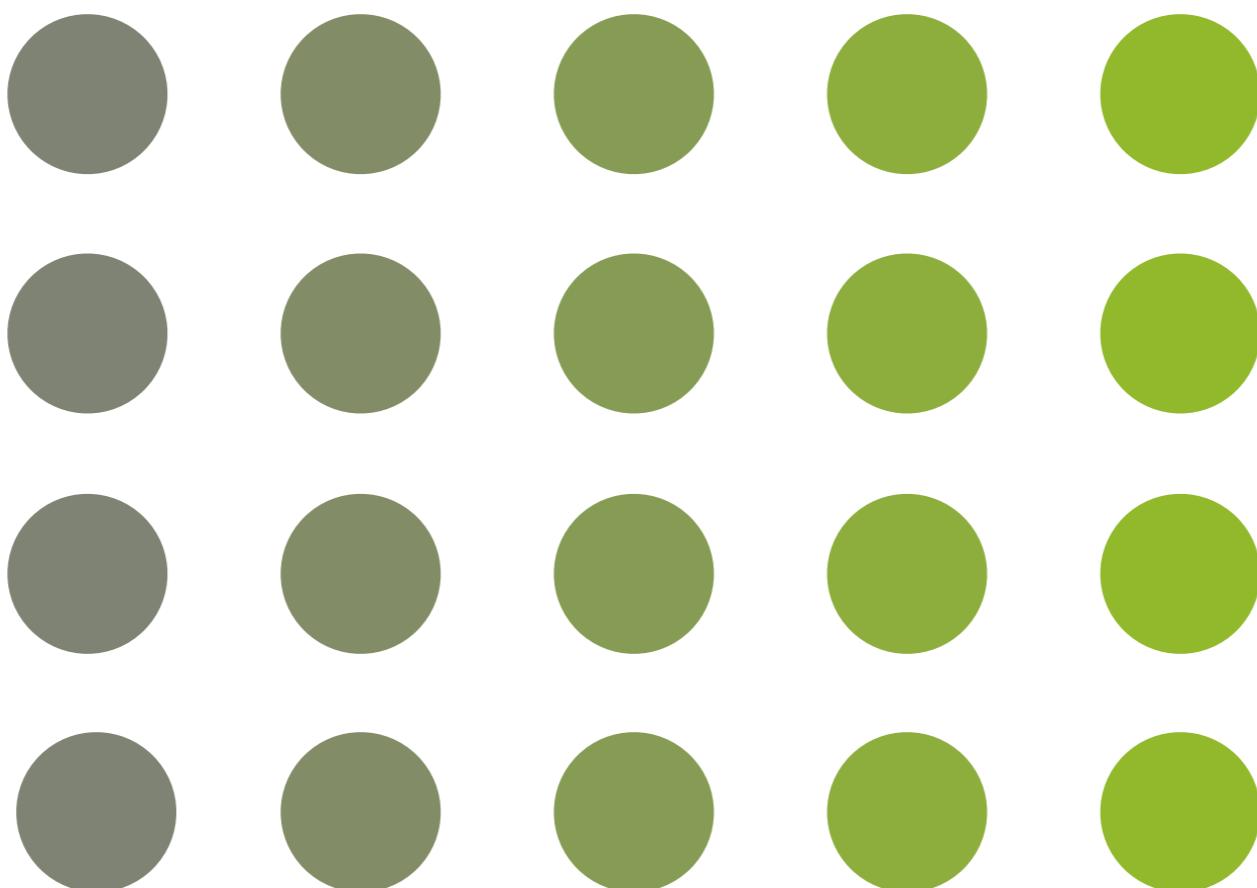
Ordered: Yes

# Hue (Color)



Values: Practically Limited  
Ordered: Not really

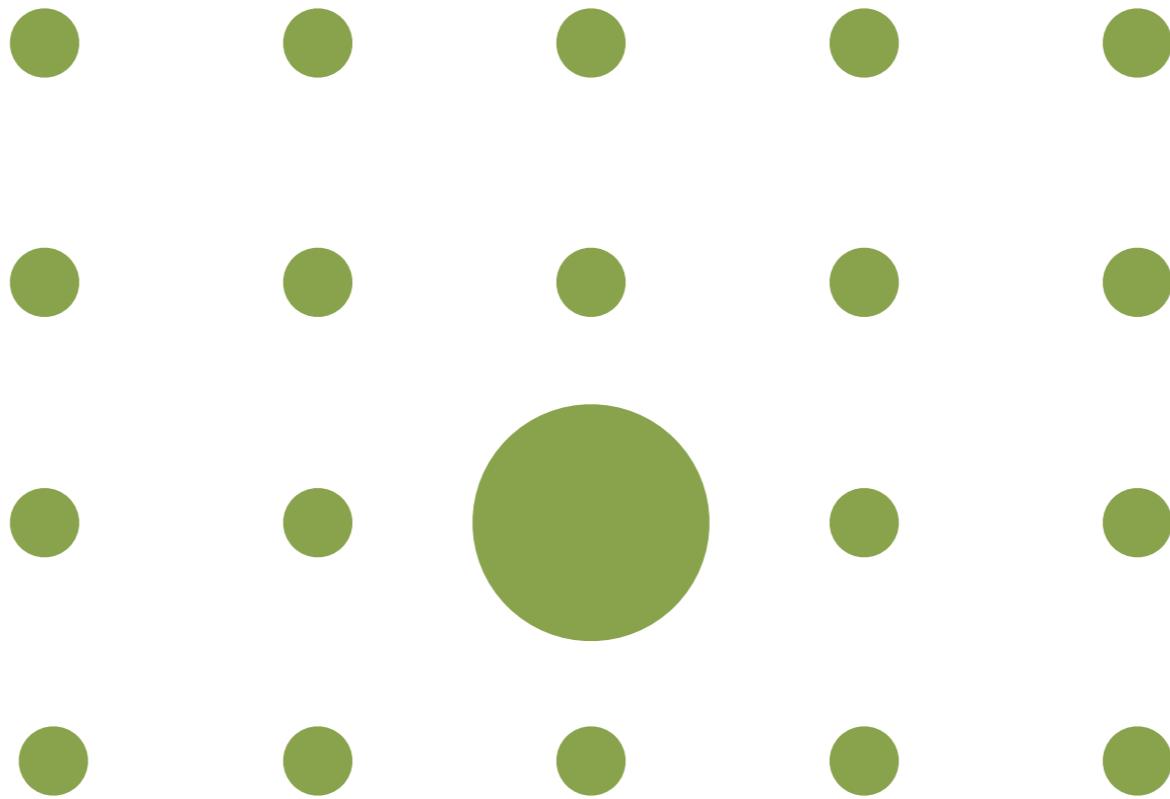
# Saturation/Intensity



Values: Practically Limited

Ordered: Yes

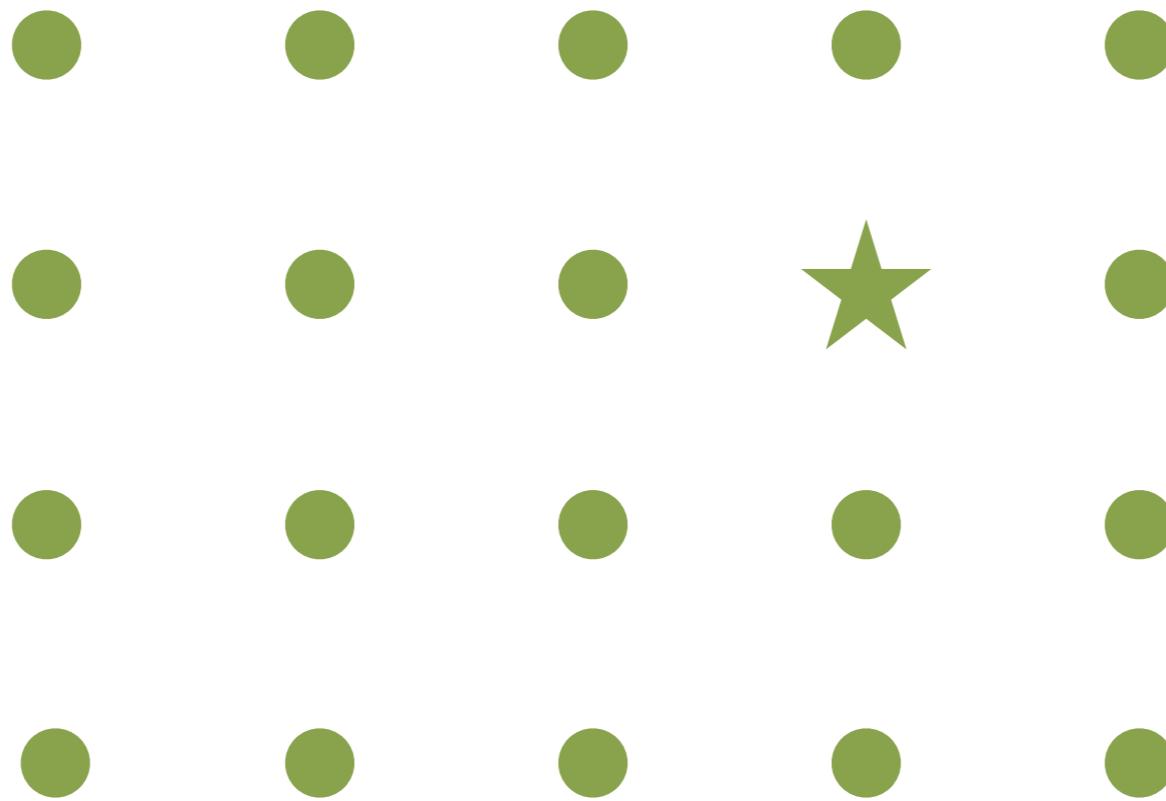
# Size



Values: Practically Limited

Ordered: Yes

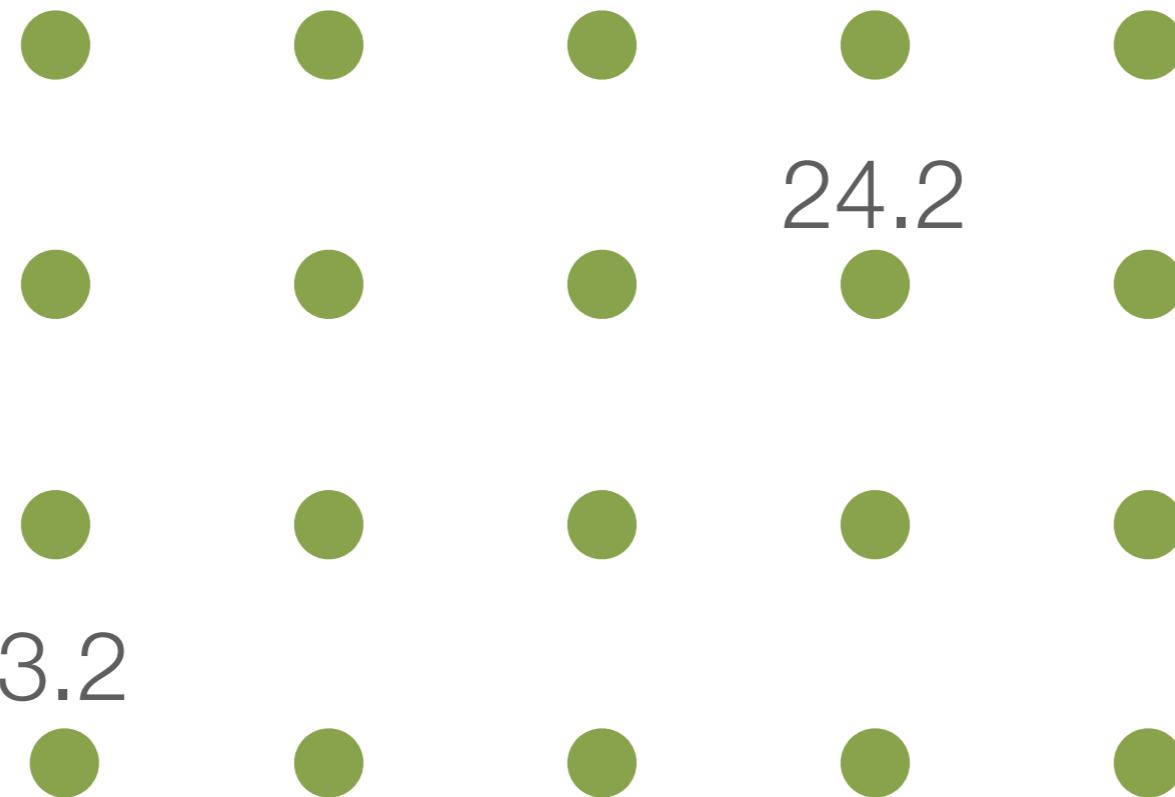
# Shape



Values: Practically Limited

Ordered: No

# Labels



Values: Infinite

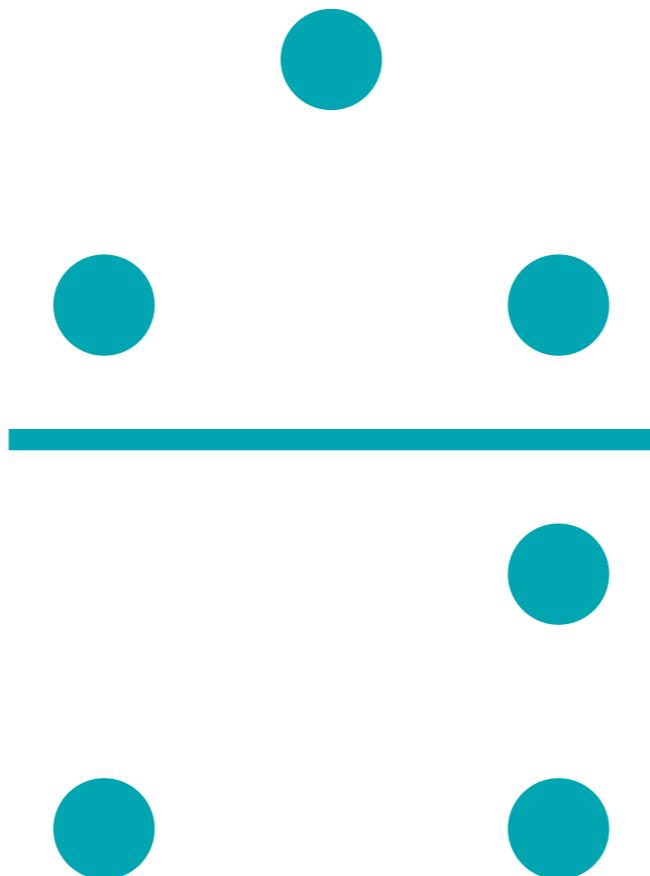
Ordered: Yes

# Orientation



Values: Practically Limited    Ordered: Possibly

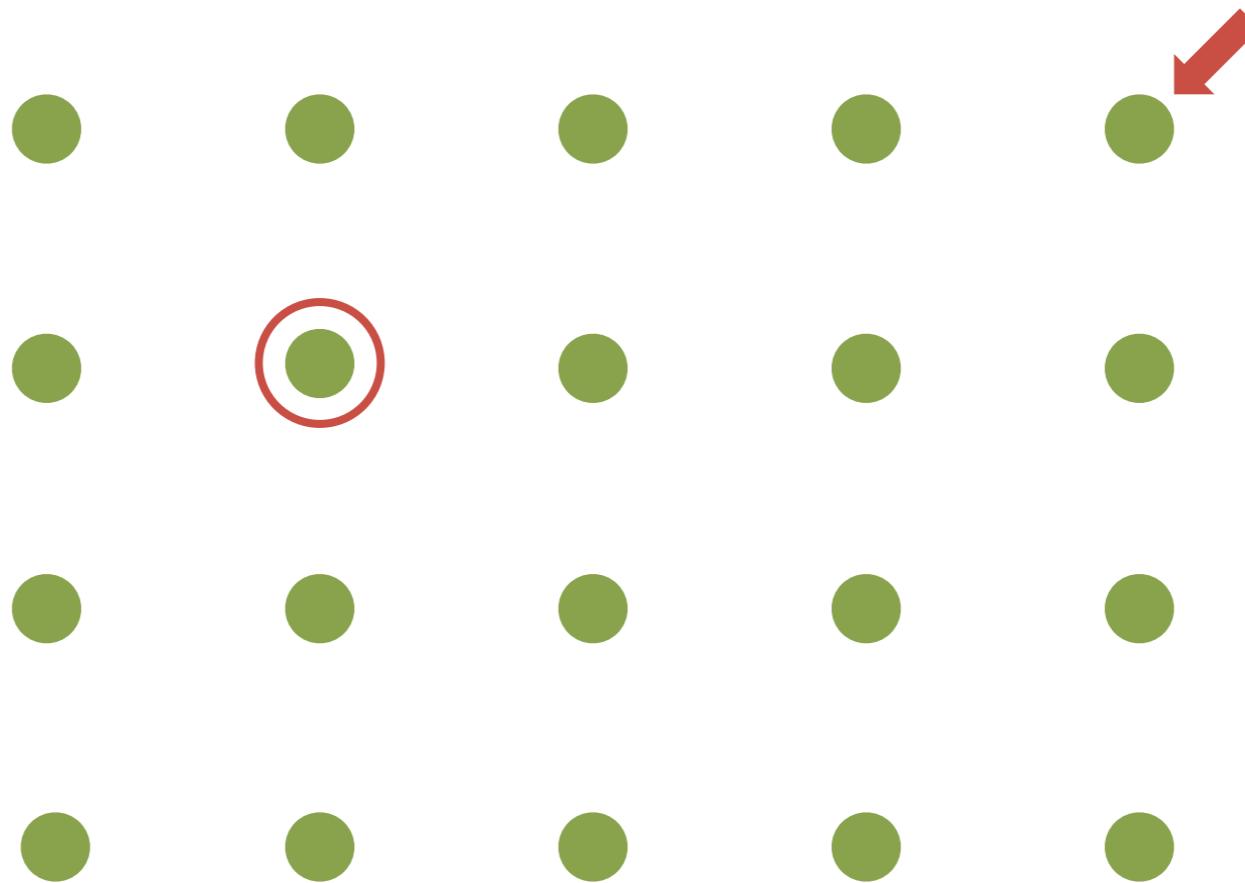
# Grouping



Values: Infinite

Ordered: Possibly

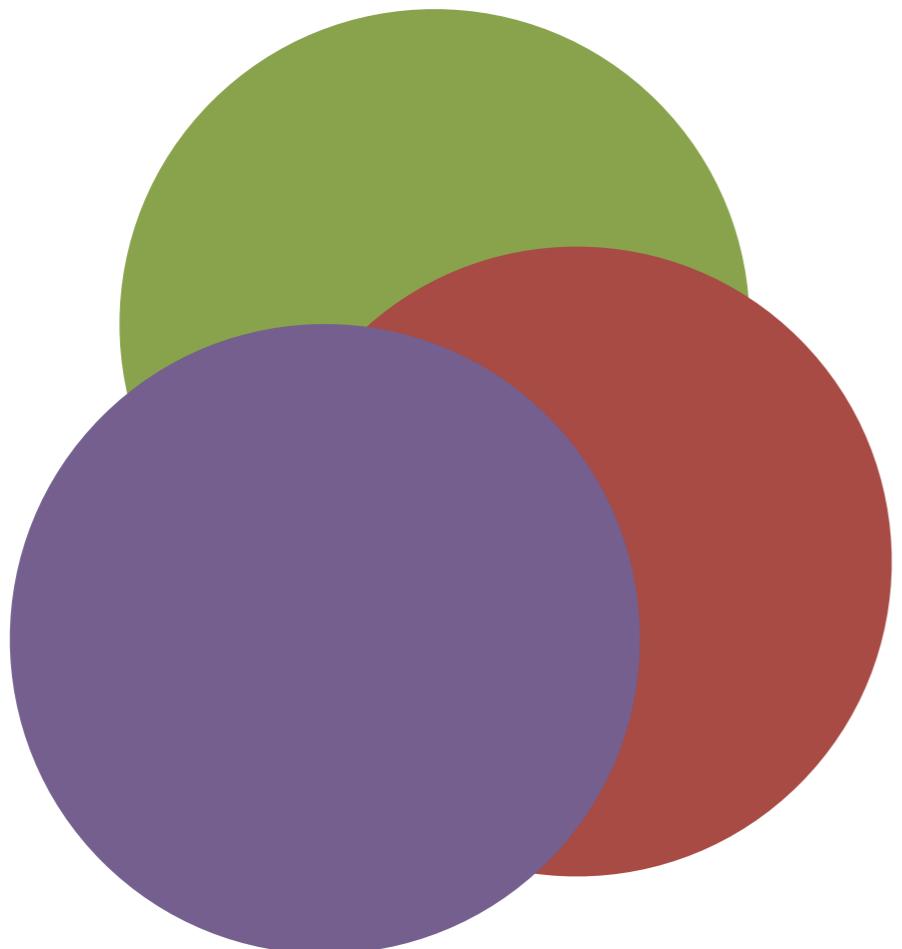
# Highlighting



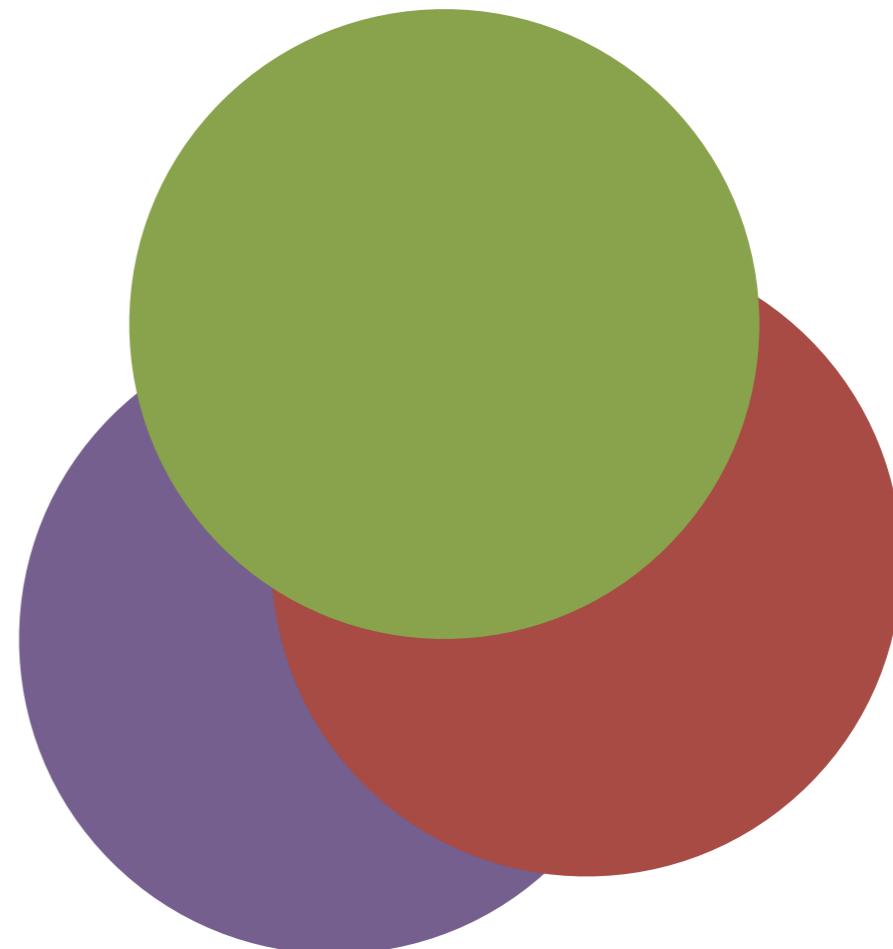
Values: Very Limited

Ordered: No

# Layers

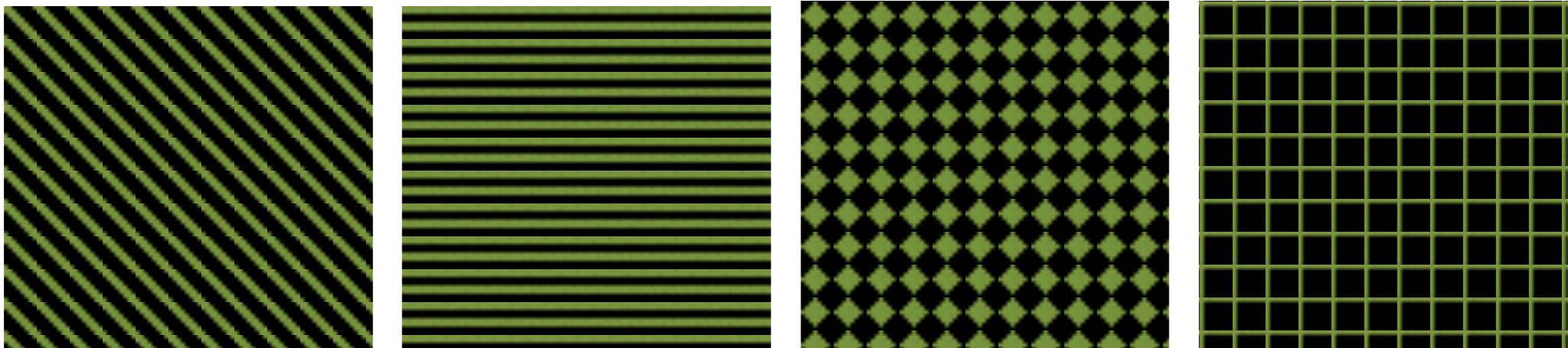


Values: Limited



Ordered: Yes

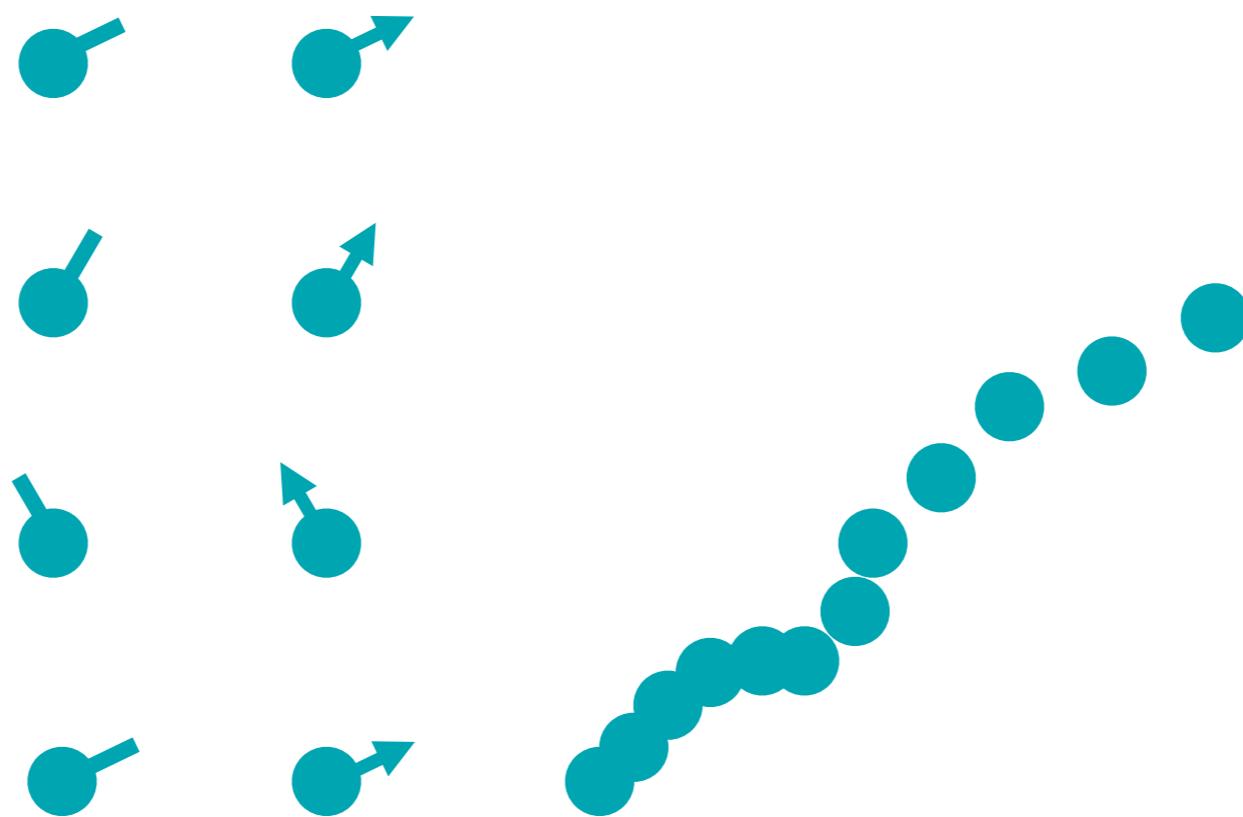
# Patterns



Values: Practically Limited

Ordered: No

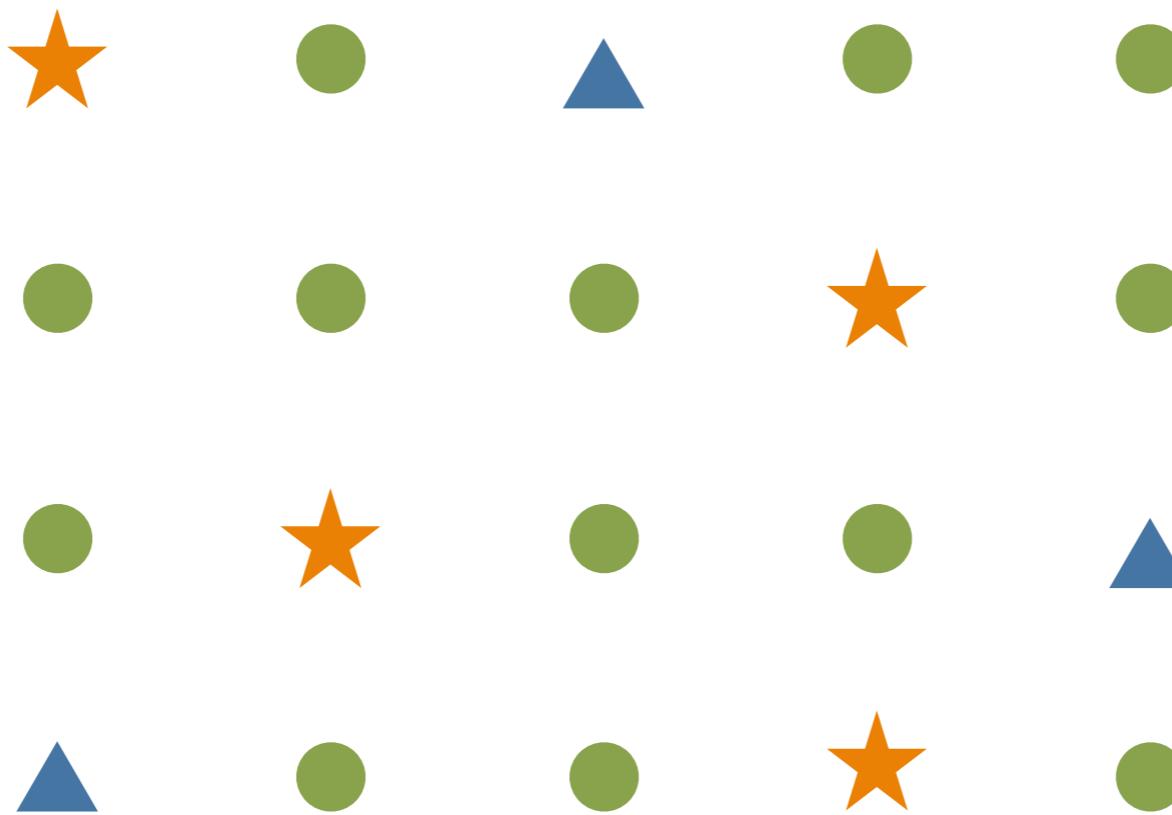
# Motion



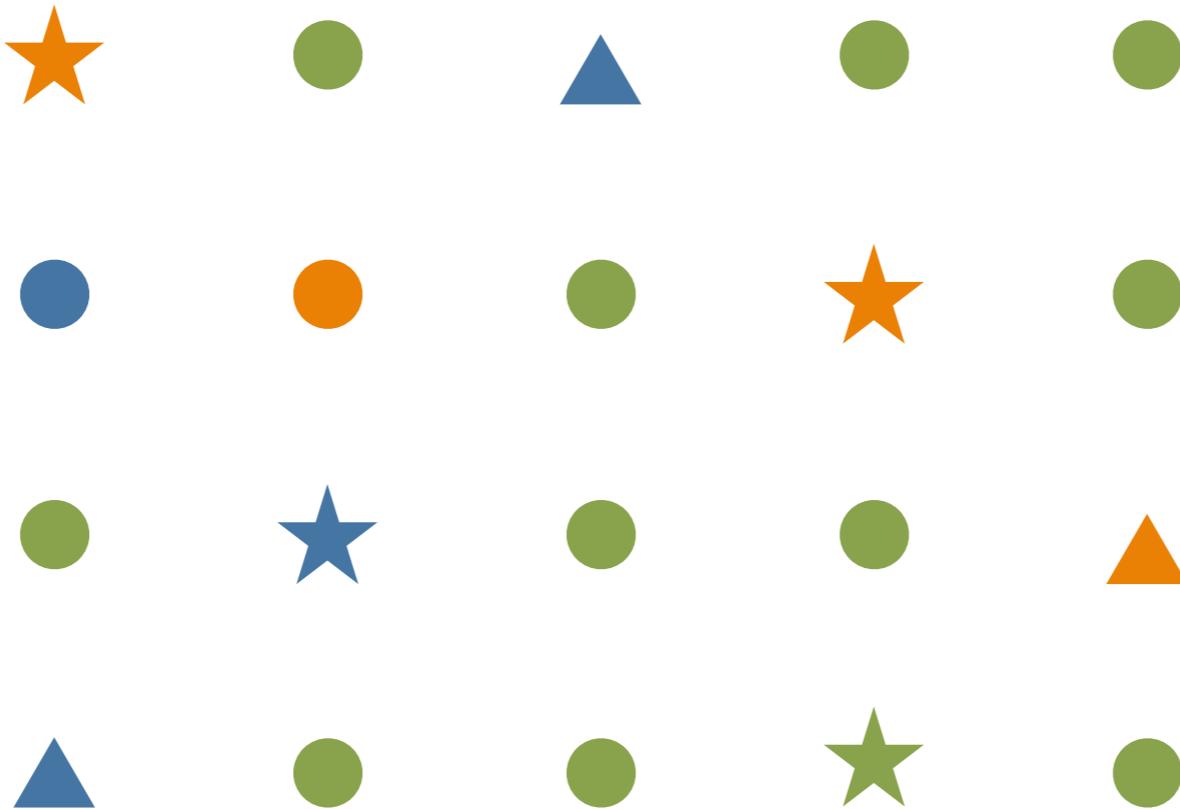
Values: Somewhat Limited

Ordered: Yes

# Redundant Encoding



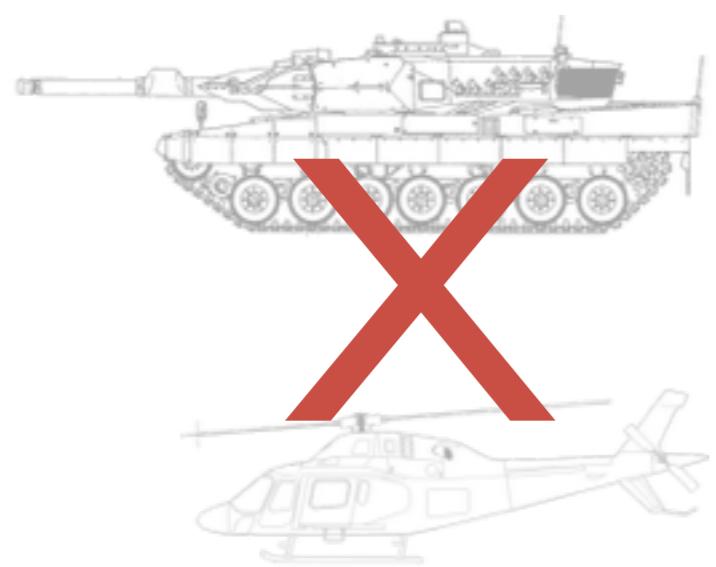
# Consistency



# Natural Encoding



VS

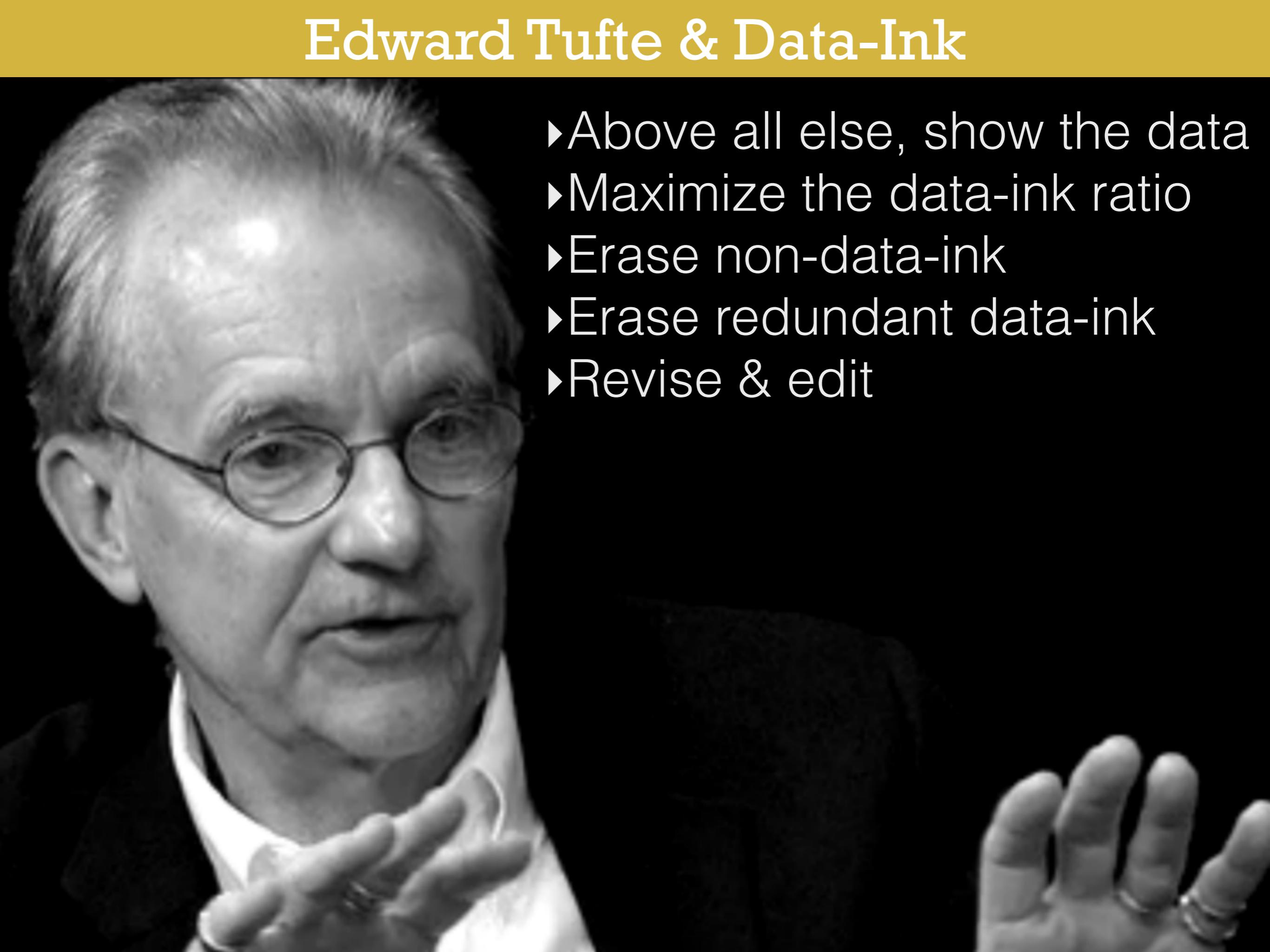


VS

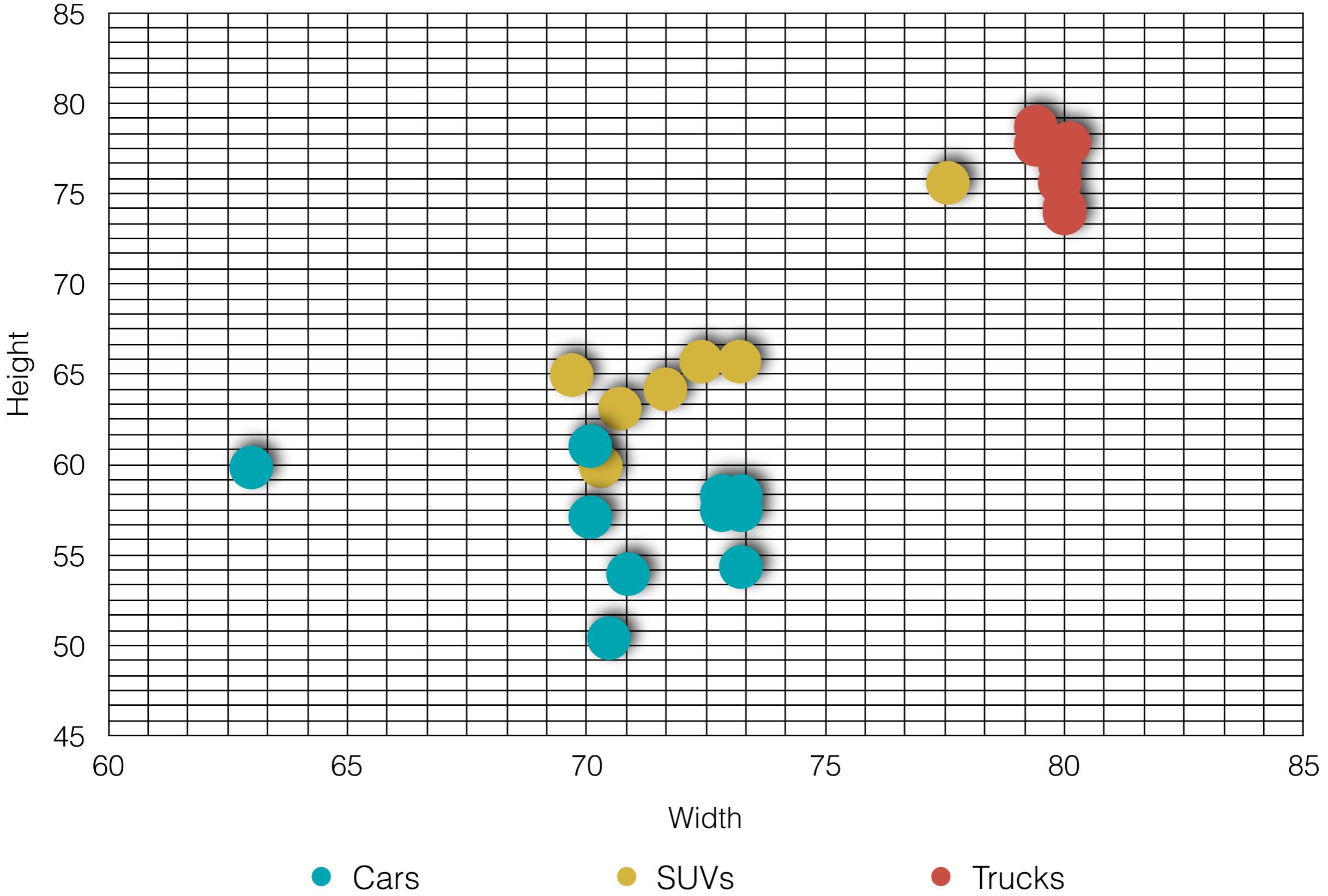


Data-Ink

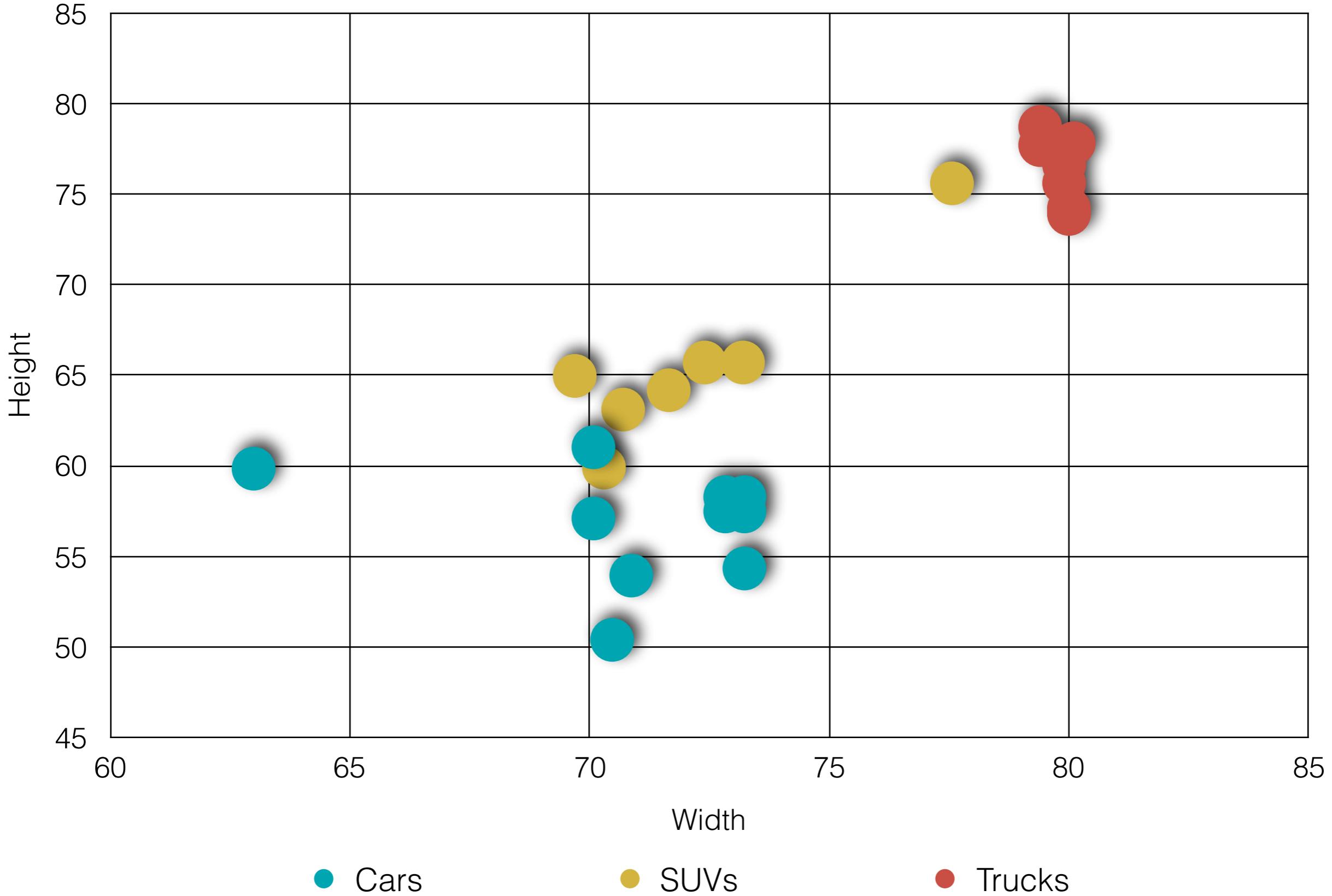
# Edward Tufte & Data-Ink

- 
- A black and white close-up photograph of Edward Tufte. He is an elderly man with thinning hair and glasses, resting his chin on his right hand. He is wearing a dark suit jacket over a white shirt. His left hand is visible on the right side of the frame.
- ▶ Above all else, show the data
  - ▶ Maximize the data-ink ratio
  - ▶ Erase non-data-ink
  - ▶ Erase redundant data-ink
  - ▶ Revise & edit

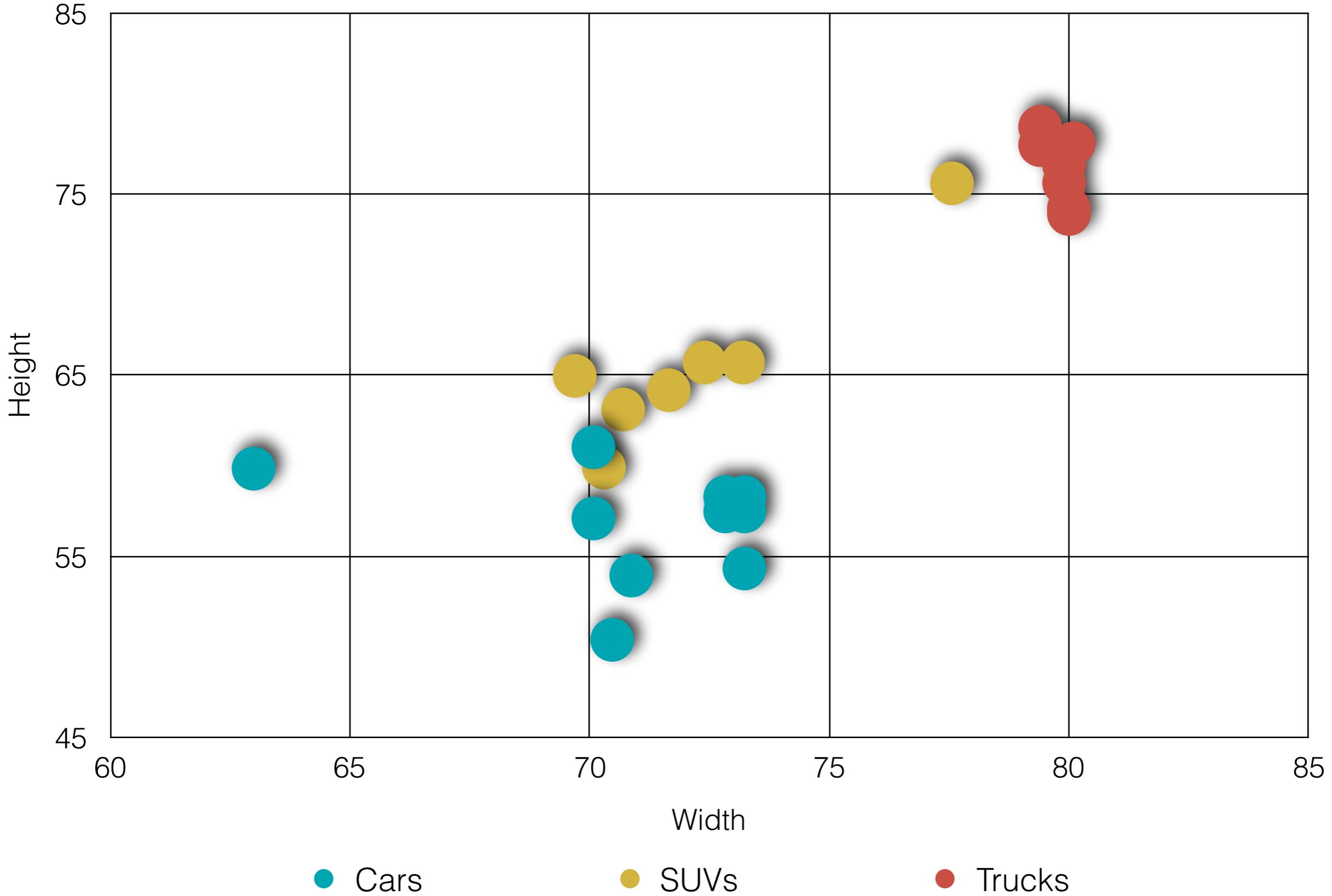
# Vehicle Heights & Widths



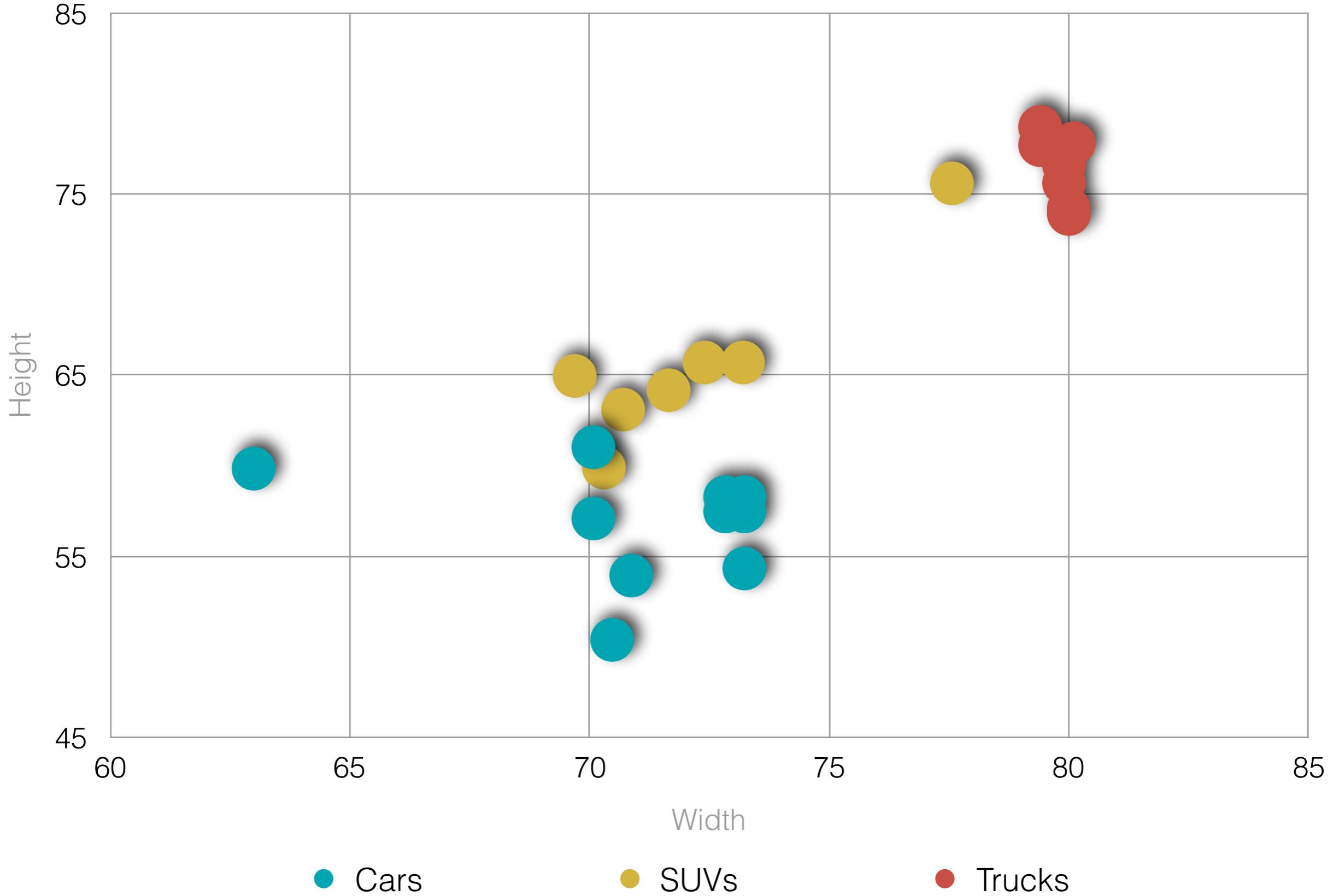
# Vehicle Heights & Widths



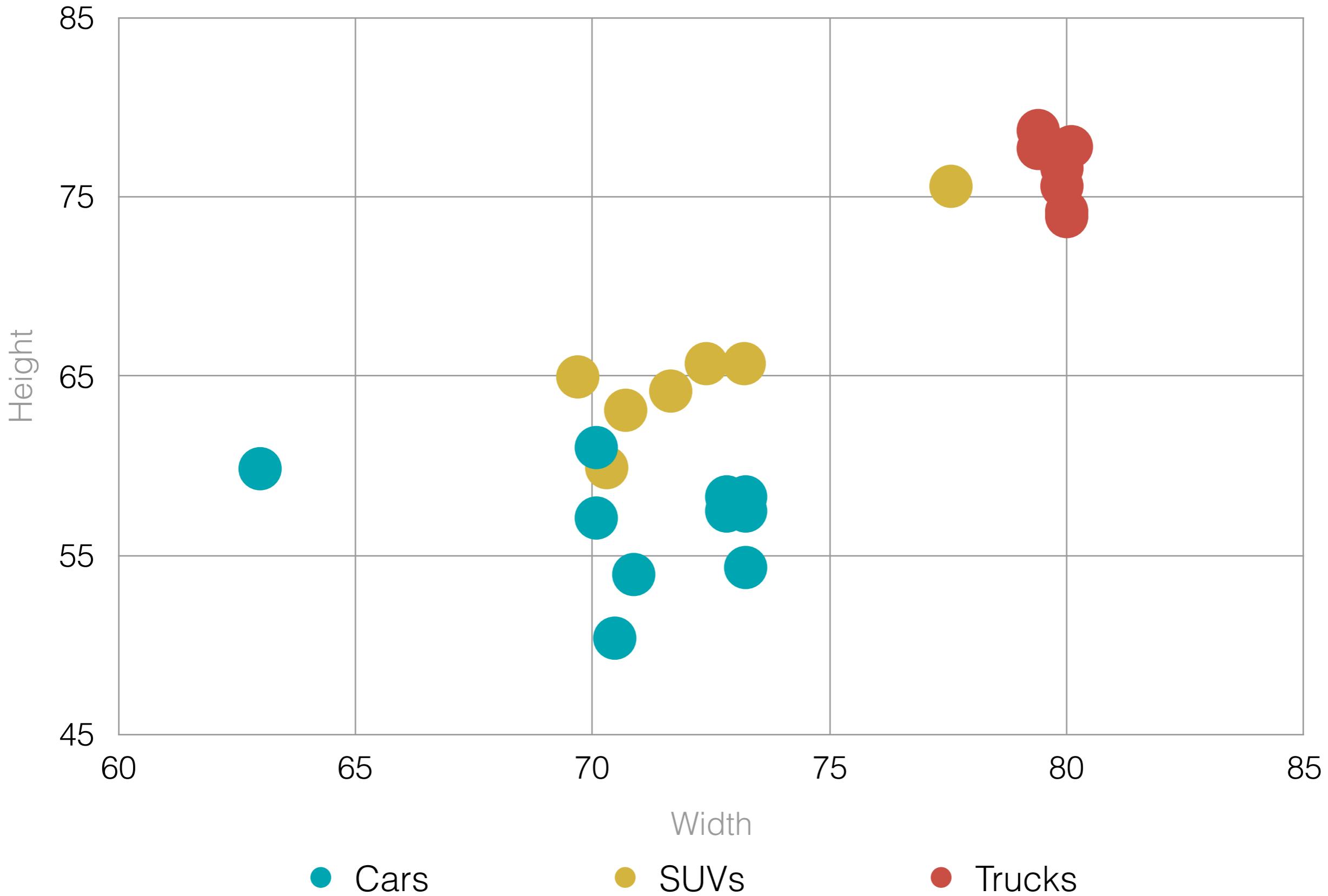
# Vehicle Heights & Widths



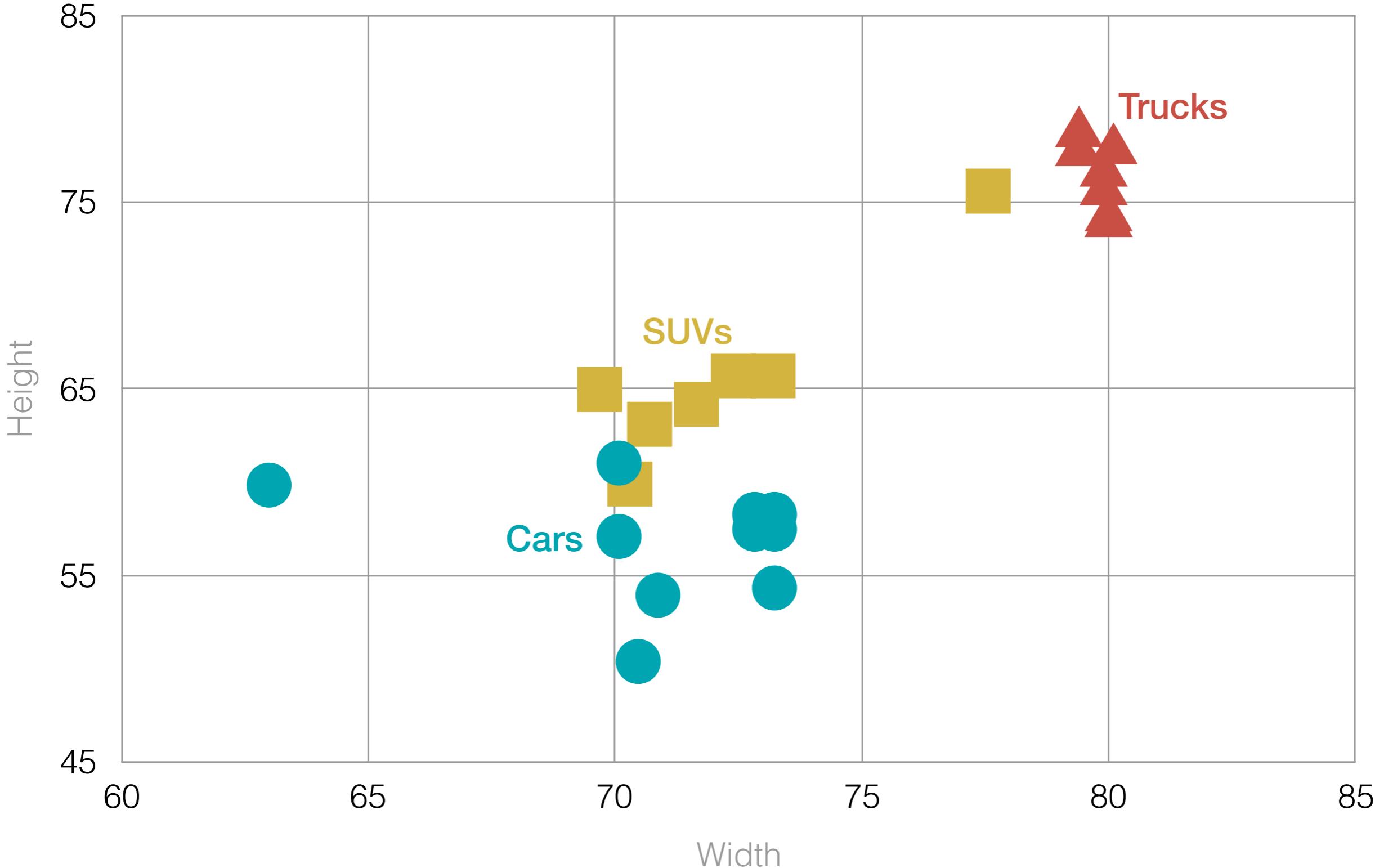
# Vehicle Heights & Widths



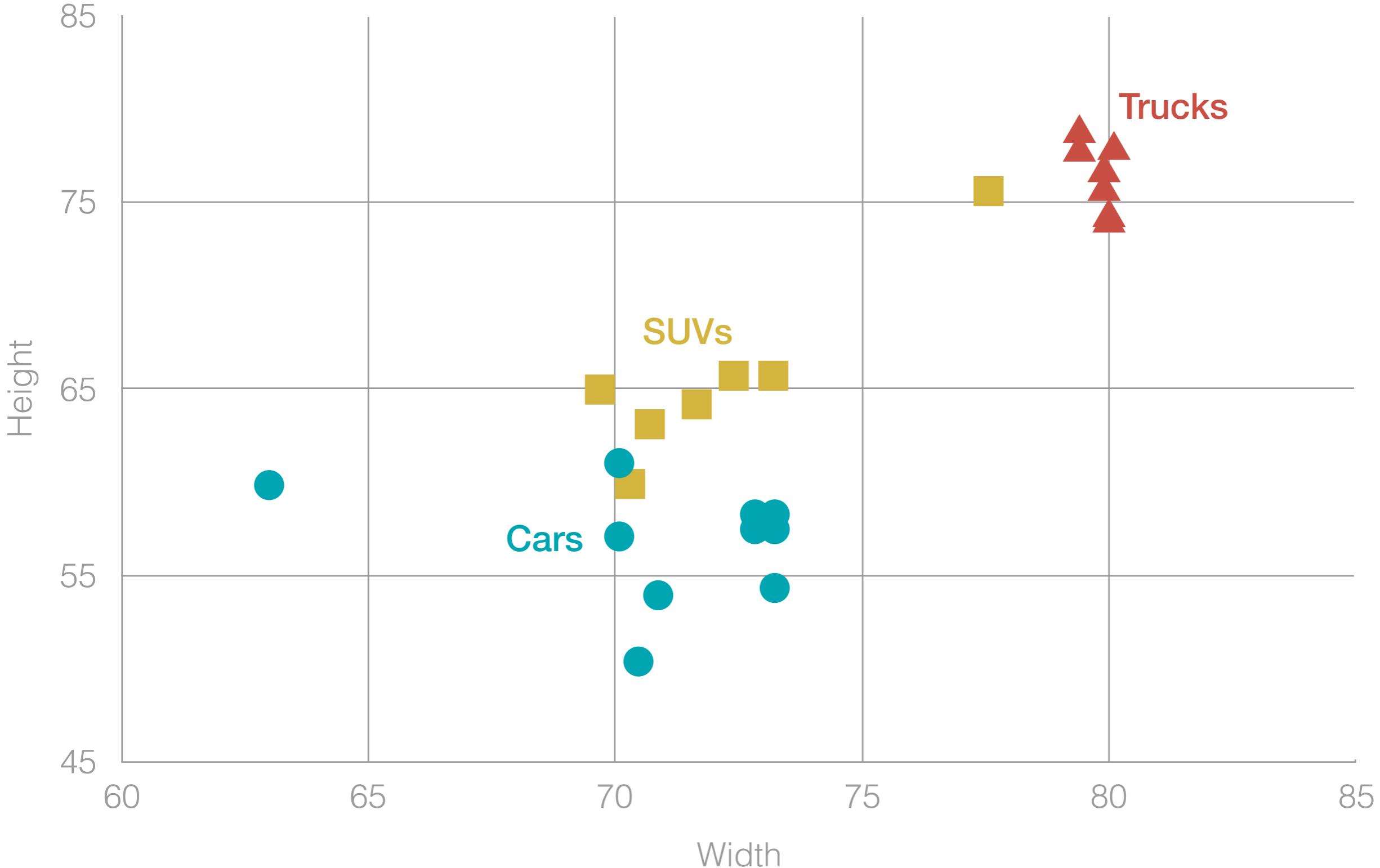
# Vehicle Heights & Widths



# Vehicle Heights & Widths



# Vehicle Sizes



# Storytelling

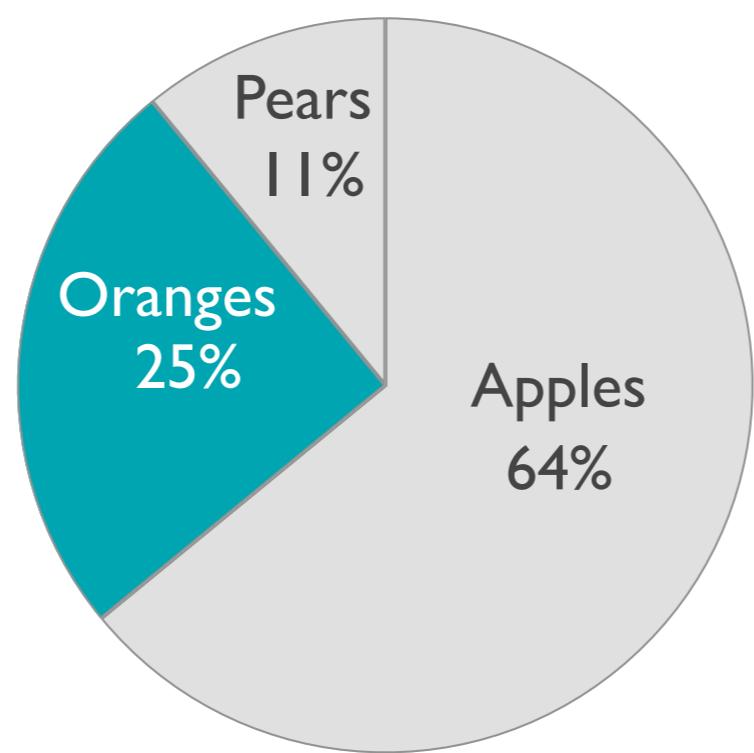
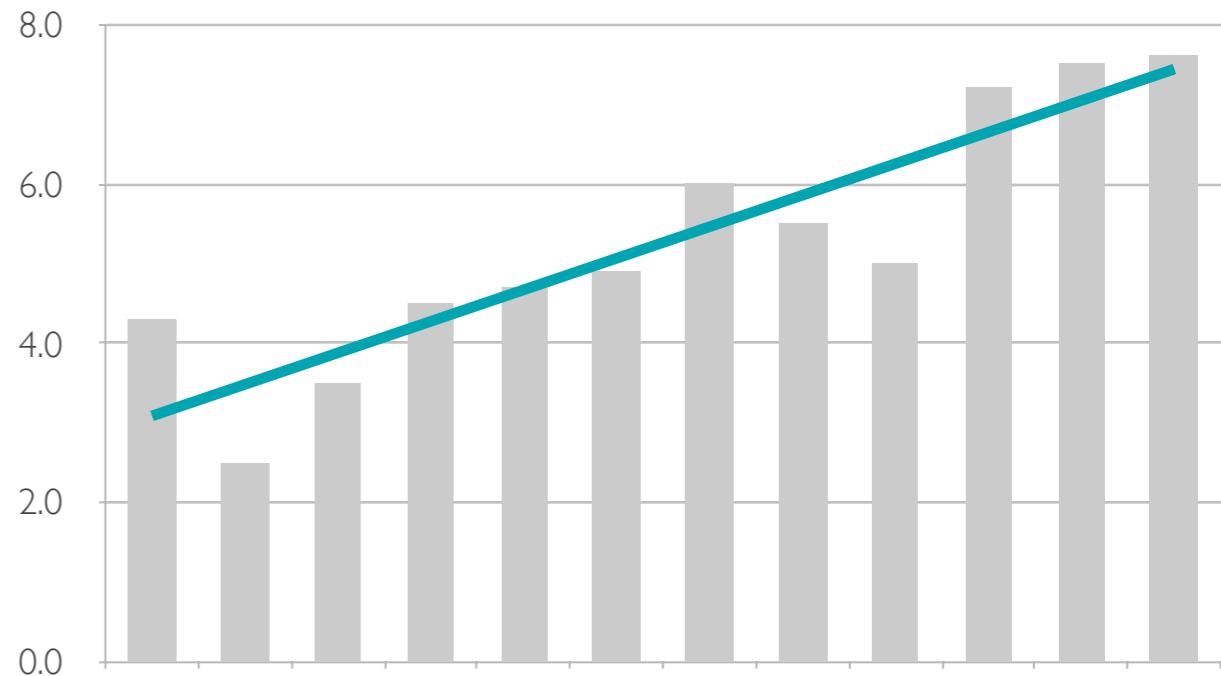
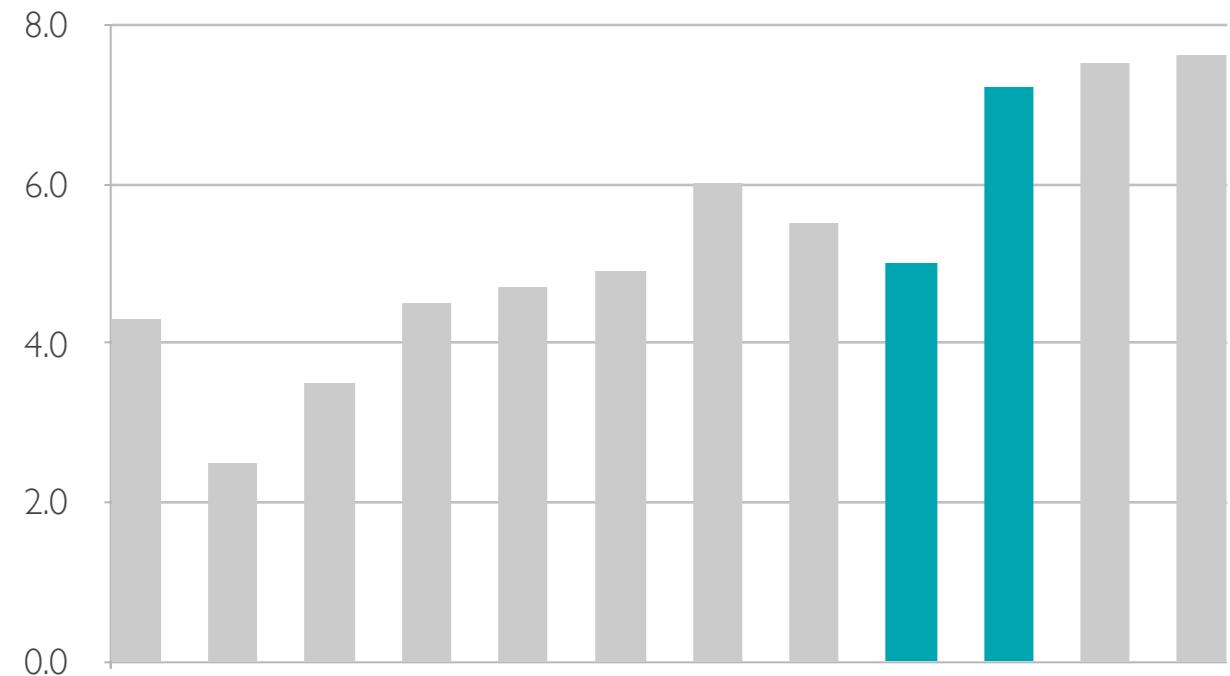
# Tell Your Story

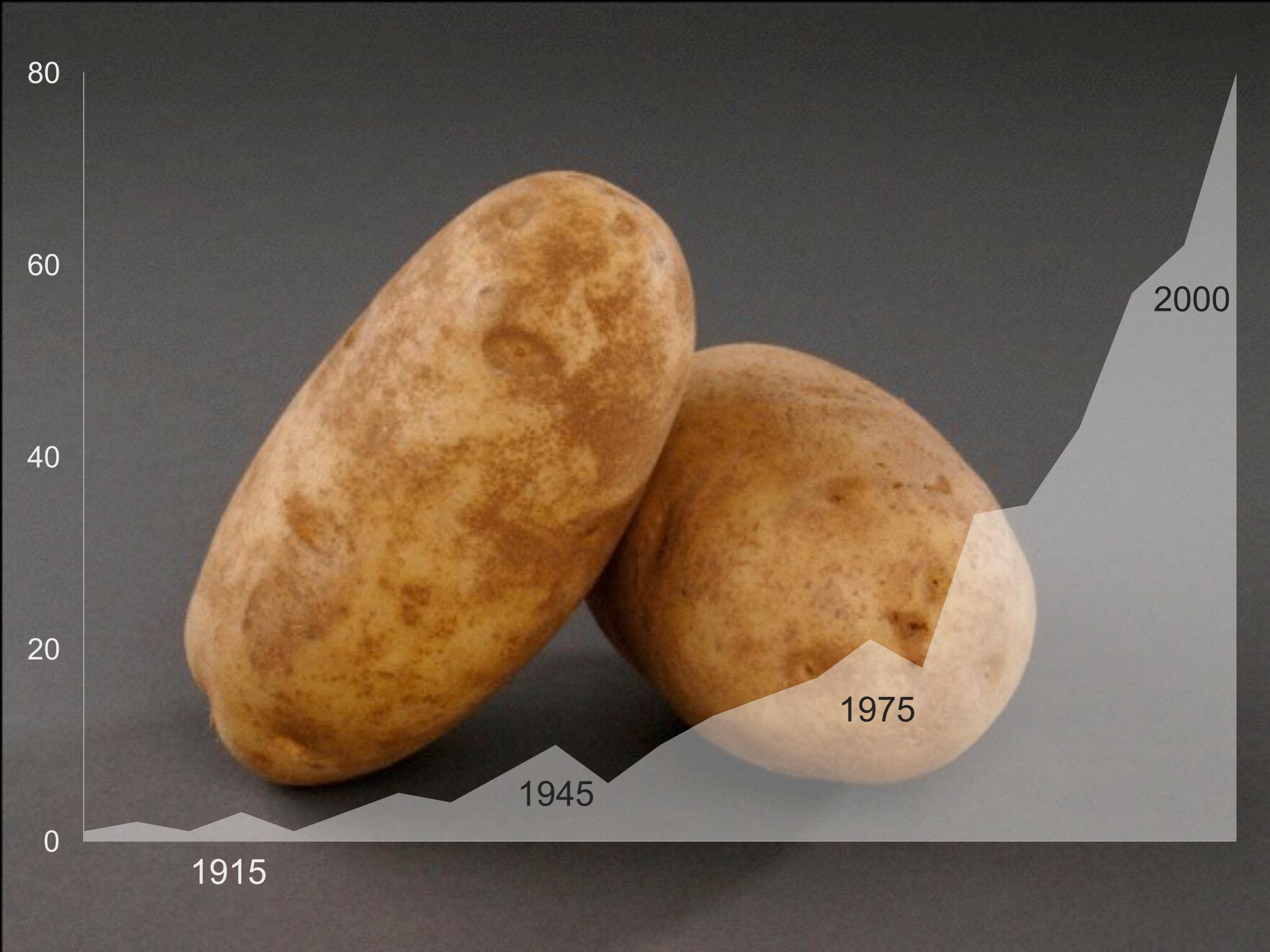
The screenshot shows a Microsoft Excel spreadsheet titled "Ratio Analysis" for "BURGER KING WORLDWIDE INC". The spreadsheet is organized into several sections:

- Ratio Analysis**: A yellow header row.
- Company Name**: BURGER KING WORLDWIDE INC.
- Fiscal Year End Date**: 2006/06/01 to 2022/06/01.
- Annual Growth Rates**: Includes Sales, Assets, Common Equity, Earnings, Free Cash Flow to Investors, and Sustainable Growth Rate.
- Profitability**: Return on Equity, Return on Equity (b4 non-recurring), and Return on Net Operating Assets.
- Basic Dupont Model**: Net Profit Margin, x Total Asset Turnover, x Total Leverage, and = Return on Equity.
- Advanced Dupont Model**: Net Operating Margin, x Net Operating Asset Turnover, = Return on Net Operating Assets, Net Borrowing Cost (NBC), Spread (RNOA - NBC), Financial Leverage (LEV), and ROE = RNOA + LEV\*Spread.
- Margin Analysis**: Gross Margin, EBITDA Margin, EBIT Margin, Net Operating Margin (b4 non-rec.), and Net Operating Margin.
- Turnover Analysis**: Net Operating Asset Turnover, Net Working Capital Turnover, Avge Days to Collect Receivables, Avge Inventory Holding Period, Avge Days to Pay Payables, and PP&E Turnover.
- Analysis of Leverage**: Long-Term Capital Structure.

The spreadsheet uses conditional formatting to highlight specific values in various colors (e.g., green, orange, red). The ribbon at the top shows tabs for Home, Layout, Tables, Charts, SmartArt, Formulas, Data, and Review. The formula bar at the bottom indicates the current cell is B8.

# Tell Your Story





80

60

40

20

0

1915

1945

1975

2000

# Tell Your Story: Before

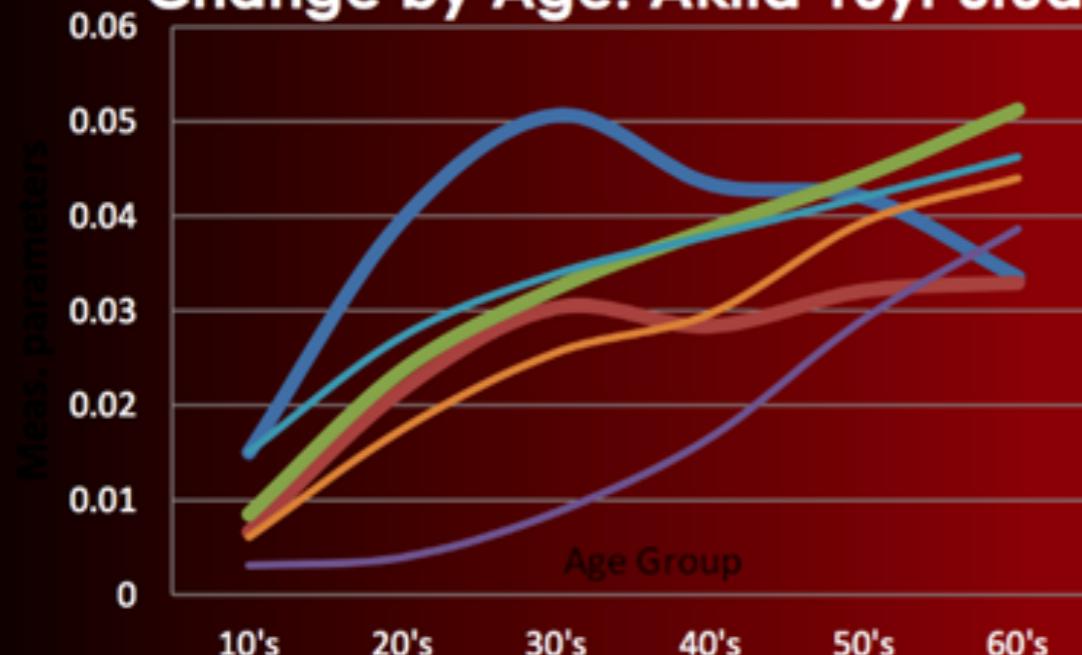
## TOP 3 FEATURES WITH BIGGEST SKIN DEVIATION

TEXTURE

VISIBLE  
PORES

INNER  
RESILIENCE

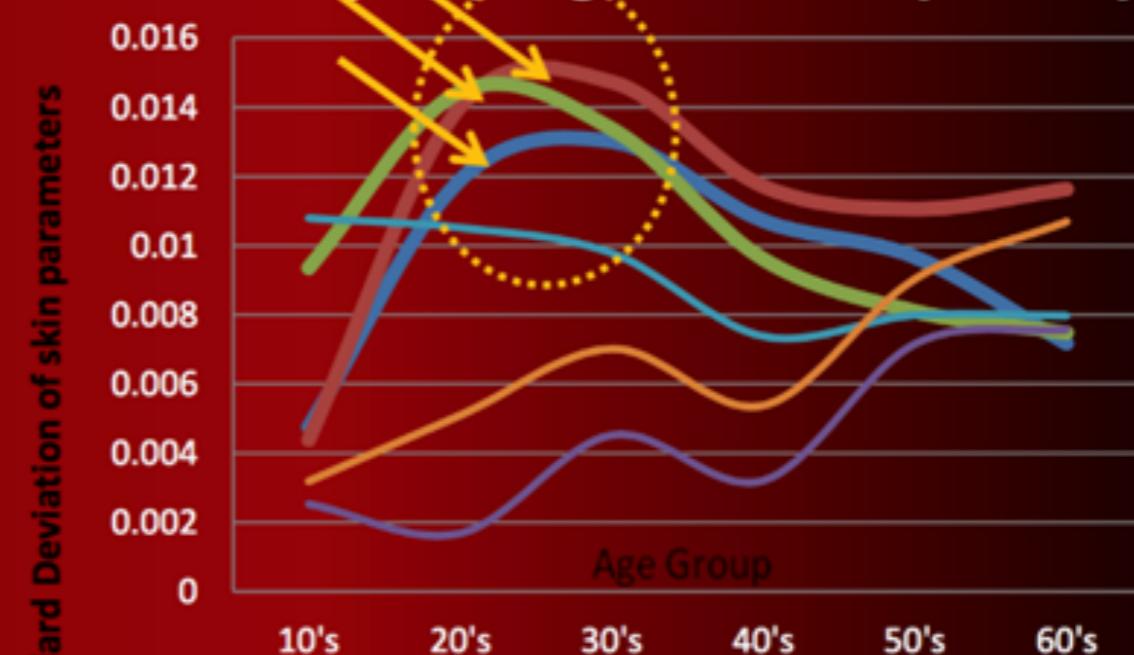
1) Skin Appearance Average Change by Age: Akita 10yr Study



Pore Area Fract.  
Inner Resilience  
Radiance (0-6)

Texture Area Fraction  
Wrinkle Area Fraction  
Spot Area Frac.

2) Skin Appearance Deviation Change by Age: Akita 10yr Study



Pore Area Fract.  
Inner Resilience  
Radiance

Texture Area Fraction  
Wrinkle Area Fraction  
Spot Area Frac.

# Tell Your Story: After

Her skin looks  
like she's

**20**

AFTER 10 YEARS  
OF USING SK-II  
PRODUCTS



40  
year  
old



40  
year  
old

Her skin looks  
like she's

**45**

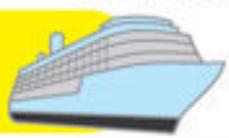
AFTER NOT  
USING SK-II  
PRODUCTS

# Icons

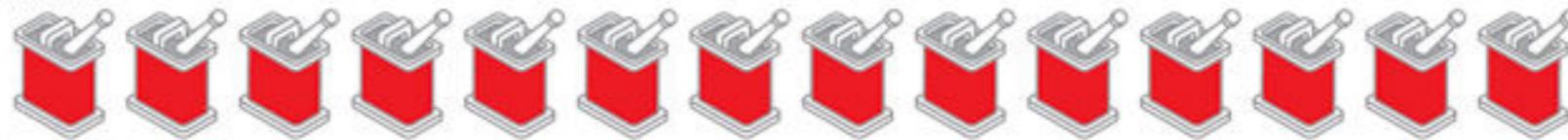
## GETTING AROUND: FUEL USE OF VARIOUS MODES OF TRANSPORTATION

HOW MANY GALLONS OF FUEL PER PASSENGER DOES IT TAKE TO COVER A DISTANCE OF 350 MILES?

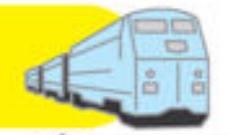
### Cruise Ship



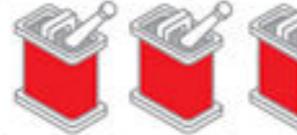
2915 Capacity  
.009 Miles per gallon  
121 Gallons per mile  
10:56 Time to travel 350 miles at 32 mph



### Amtrak



300 Capacity  
.46 Miles per gallon  
2.17 Gallons per mile  
04:22 Time to travel 350 miles at 80 mph



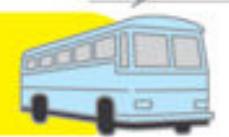
### Boeing 737



175 Capacity  
.42 Miles per gallon  
2.4 Gallons per mile  
00:37 Time to travel 350 miles at 566 mph



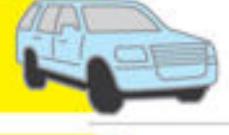
### Motor Coach



50 Capacity  
5 Miles per gallon  
.2 Gallons per mile  
05:50 Time to travel 350 miles at 60 mph



### Average SUV



5 Capacity  
21 Miles per gallon  
.048 Gallons per mile  
05:50 Time to travel 350 miles at 60 mph



### Average Sedan



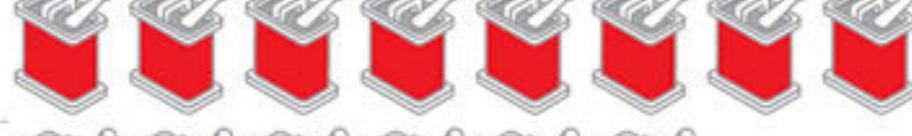
4 Capacity  
27 Miles per gallon  
.037 Gallons per mile  
05:50 Time to travel 350 miles at 60 mph



### Average Hybrid



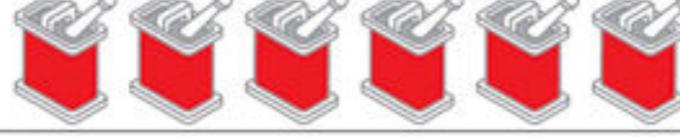
4 Capacity  
46 Miles per gallon  
.022 Gallons per mile  
05:50 Time to travel 350 miles at 60 mph



### Motorcycle



1 Capacity  
56 Miles per gallon  
.017 Gallons per mile  
05:50 Time to travel 350 miles at 60 mph



### Bicycle



1 Capacity  
912 Miles per gallon (caloric conversion)  
.001 Gallons per mile (caloric conversion)  
23:20 Time to travel 350 miles at 15 mph



### Walking



1 Capacity  
211 Miles per gallon (caloric conversion)  
.005 Gallons per mile (caloric conversion)  
100 Time to travel 350 miles at 3.5 mph



----- FUEL USAGE for driver alone

----- FUEL USAGE for driver plus one passenger

----- FUEL USAGE for driver plus three passengers

WHOPPER with cheese is 770 calories.  
EATMEN neither endorses or denounces the  
consumption of Whoppers.

WE'RE EFFICIENT One gallon of gas equals  
approximately 31,000 calories. We only need  
about 2,000 calories a day.

CYCLIST A 175-pound rider, biking 15 miles  
per hour, and burning .049 calories per  
pound per minute.

WALKER A 175-pound pedestrian, walking at  
3.5 miles per hour, and burning .035 calories  
per pound per minute.

NOTE Capacity, fuel economy, and speed  
numbers are, in some cases, averages or  
estimates.

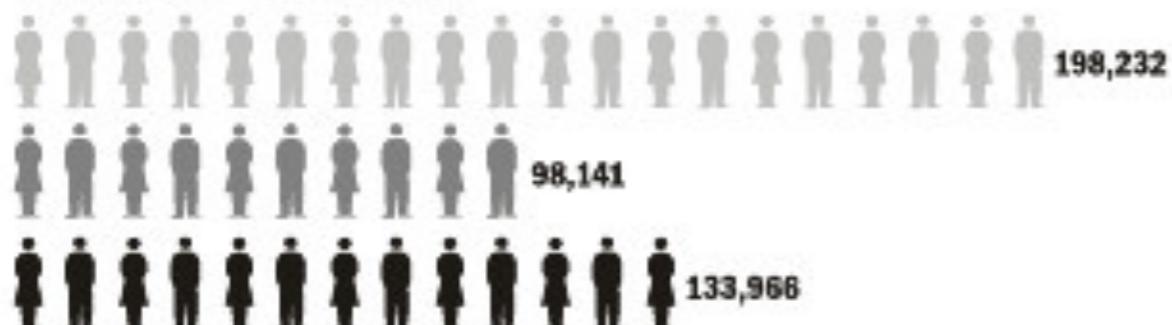
good.is  
Transparency

# REBUILDING PROGRESS IN NEW ORLEANS

BEFORE HURRICANE KATRINA      1 YEAR LATER      2 YEARS LATER

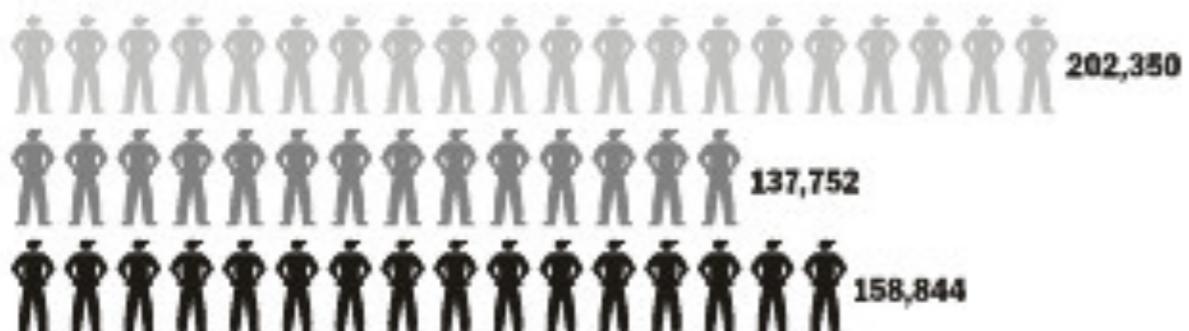
## Households

Actively receiving mail in Orleans Parish



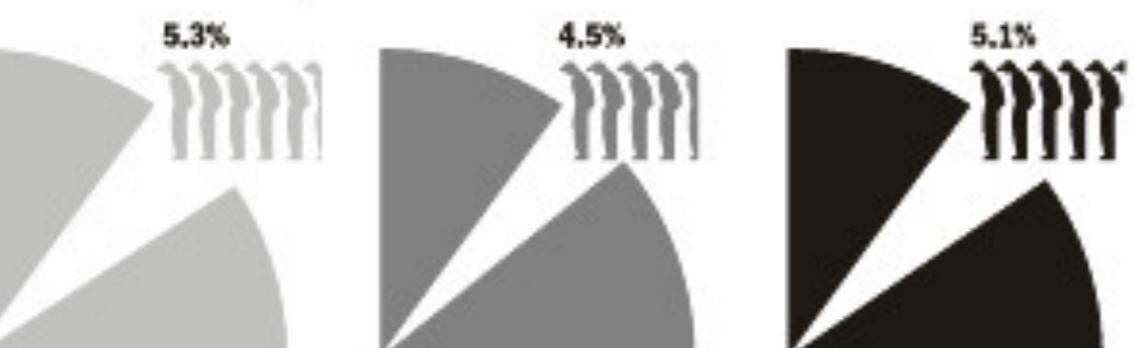
## Labor force

In Orleans Parish



## Unemployment

Rate in New Orleans metropolitan area



## House prices

Average sale price, June, in Orleans Parish



## Buses

Operational in Orleans Parish



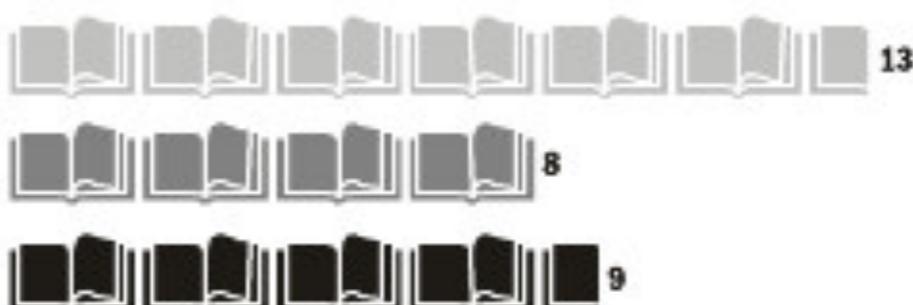
## Air passenger traffic

Arriving & departing at Louis Armstrong International Airport, June



## Libraries

Open in Orleans Parish



## Hospitals

Operational in Orleans Parish



## NO ESCAPE FOR TENANTS

Average Manhattan rents in October

Non-doorman buildings

Doorman buildings

\$2,151

Studio

\$2,751

\$2,991

One-bedroom

\$3,787

\$4,069

Two-bedroom

\$5,627

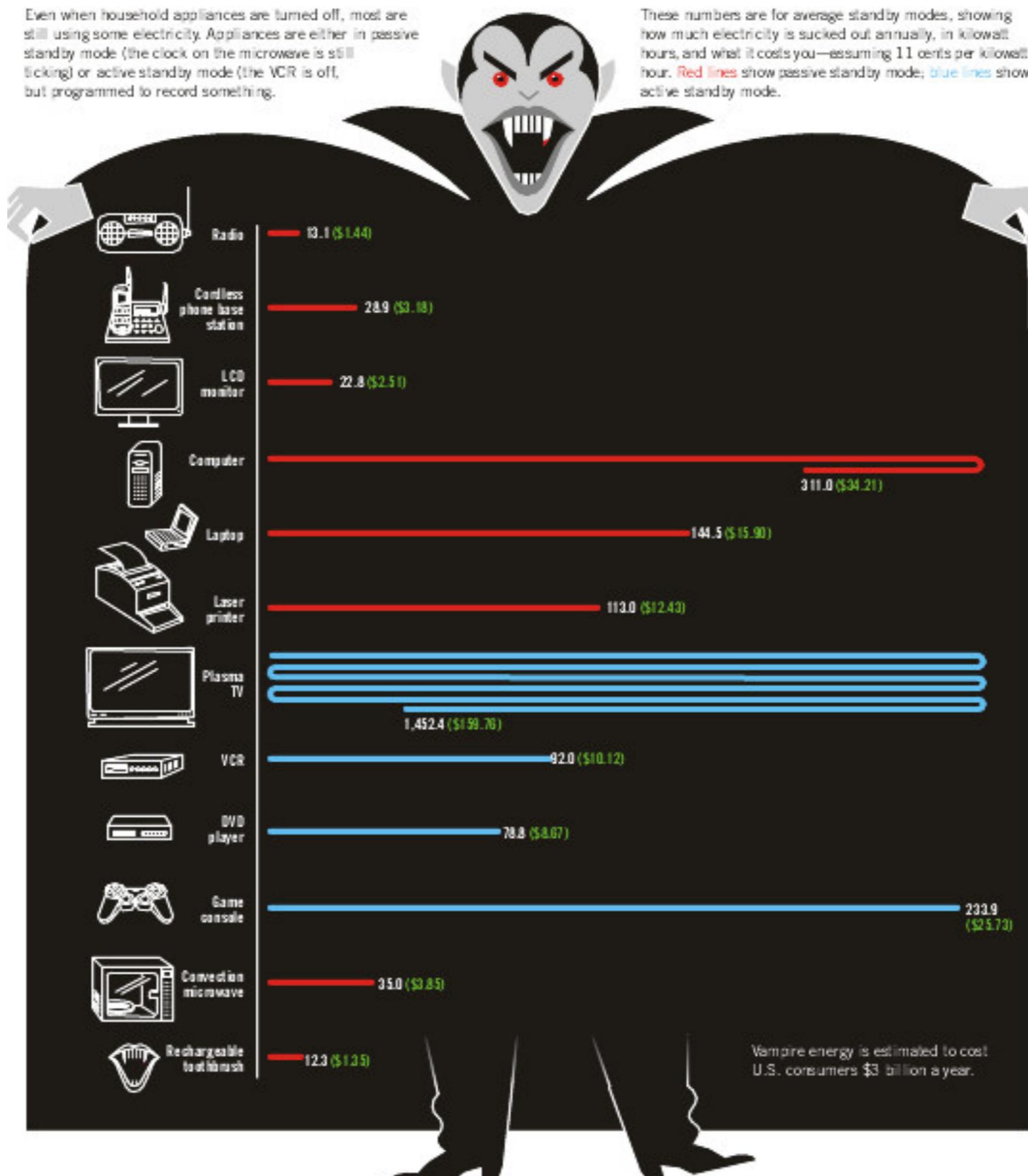


Source: Nigel Holmes

## Vampire Energy

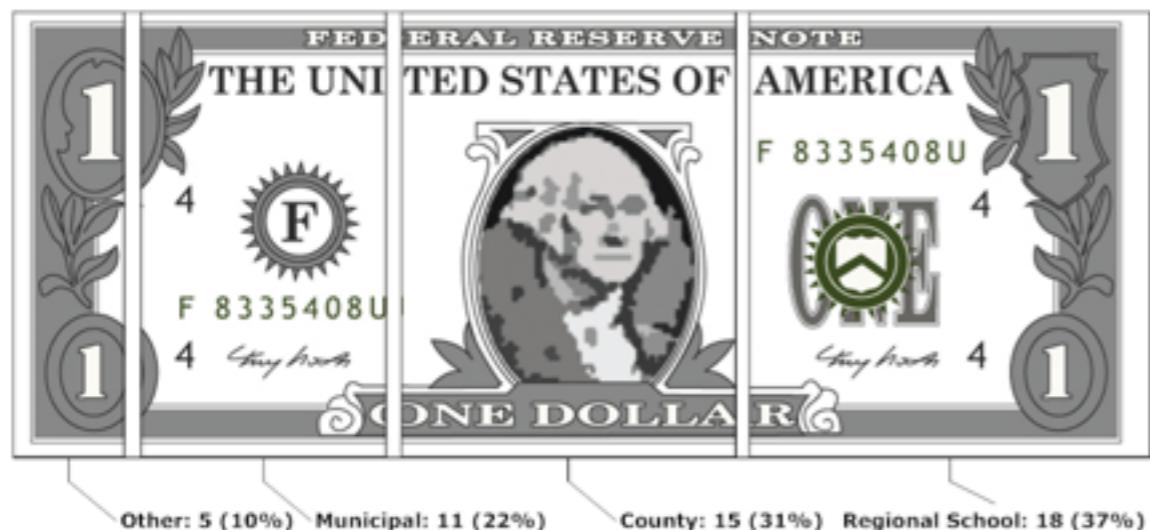
Even when household appliances are turned off, most are still using some electricity. Appliances are either in passive standby mode (the clock on the microwave is still ticking) or active standby mode (the VCR is off, but programmed to record something).

These numbers are for average standby modes, showing how much electricity is sucked out annually, in kilowatt hours, and what it costs you—assuming 11 cents per kilowatt hour. **Red lines** show passive standby mode; **blue lines** show active standby mode.

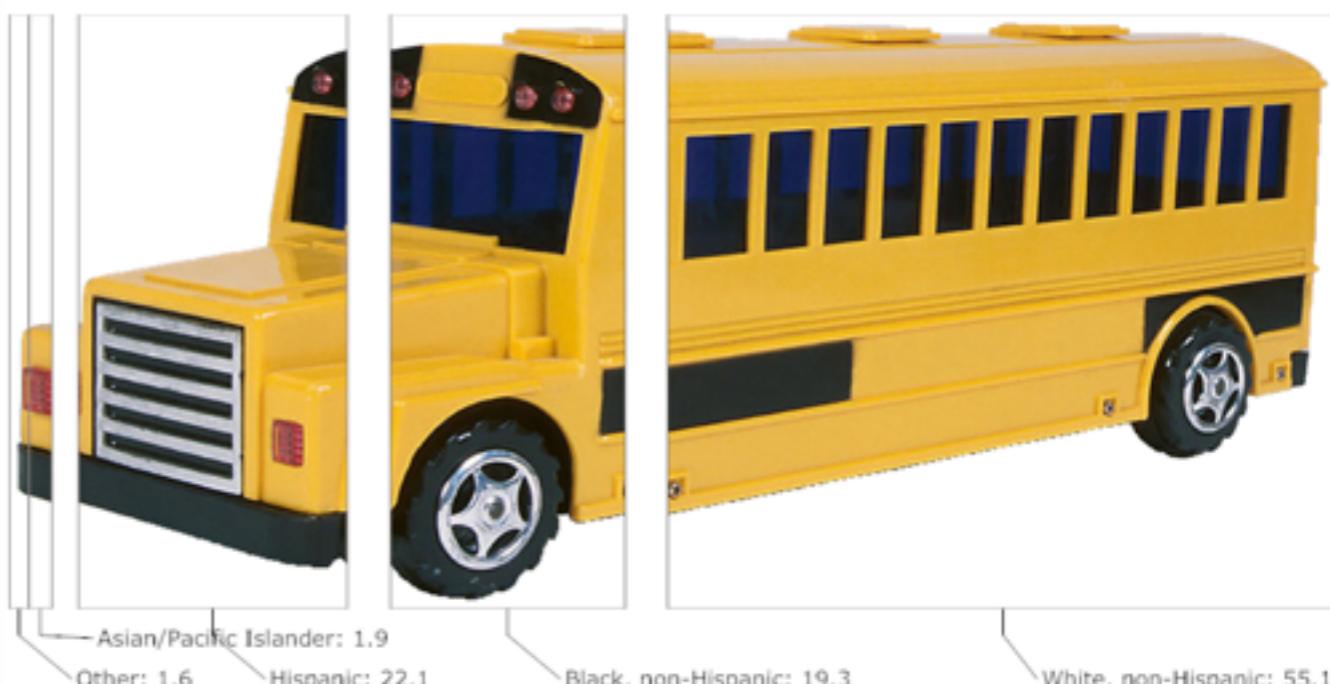


Source: Nigel Holmes

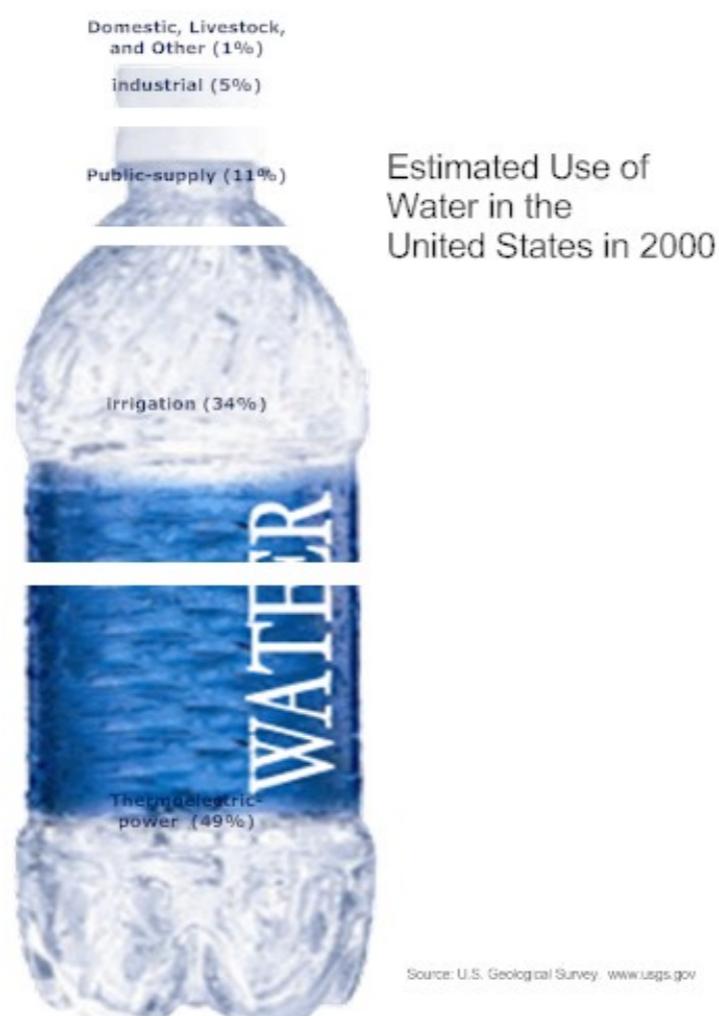
## How Your Tax Dollars Are Spent



Dropout Rates of 15- through 24-year-olds  
who dropped out of grades 10–12,  
by background characteristics: October 2001

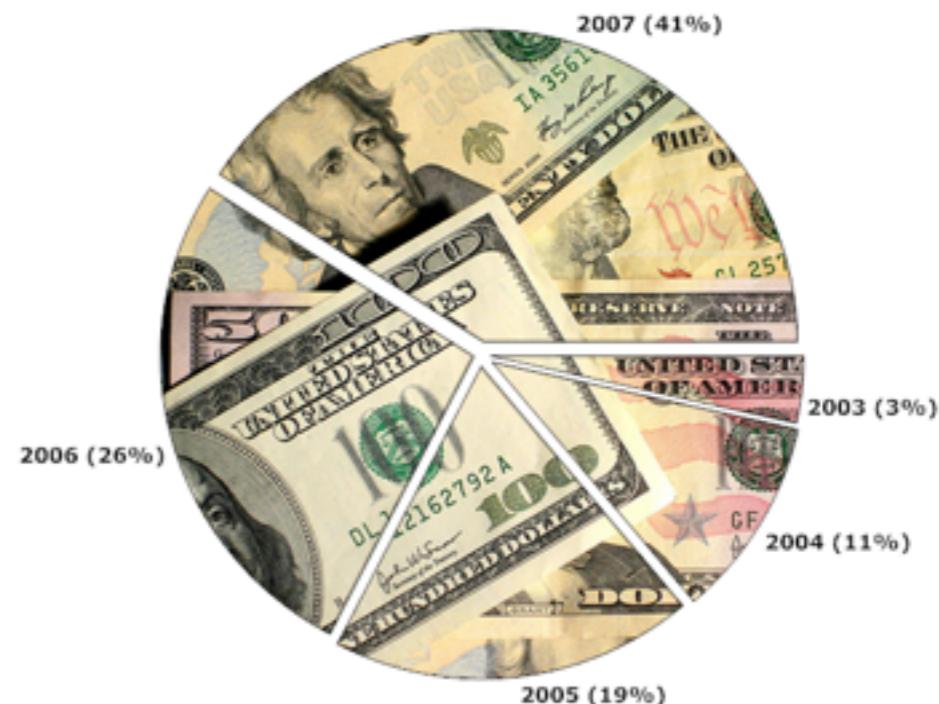


Source: National Center for Education Statistics. nces.ed.gov



Source: U.S. Geological Survey. www.usgs.gov

## Assets Under Management



Source: SmartDraw

# Color

# Visual Cues: Color for Search



# Visual Cues: Color for Emotion



Identity

(colourlovers.com)



(montyne.com)

Symbolism



Metaphor

(Jay Shultz - deviantart.com)



Mood

# High Contrast Colors

Very High  
Contrast

Very High  
Contrast

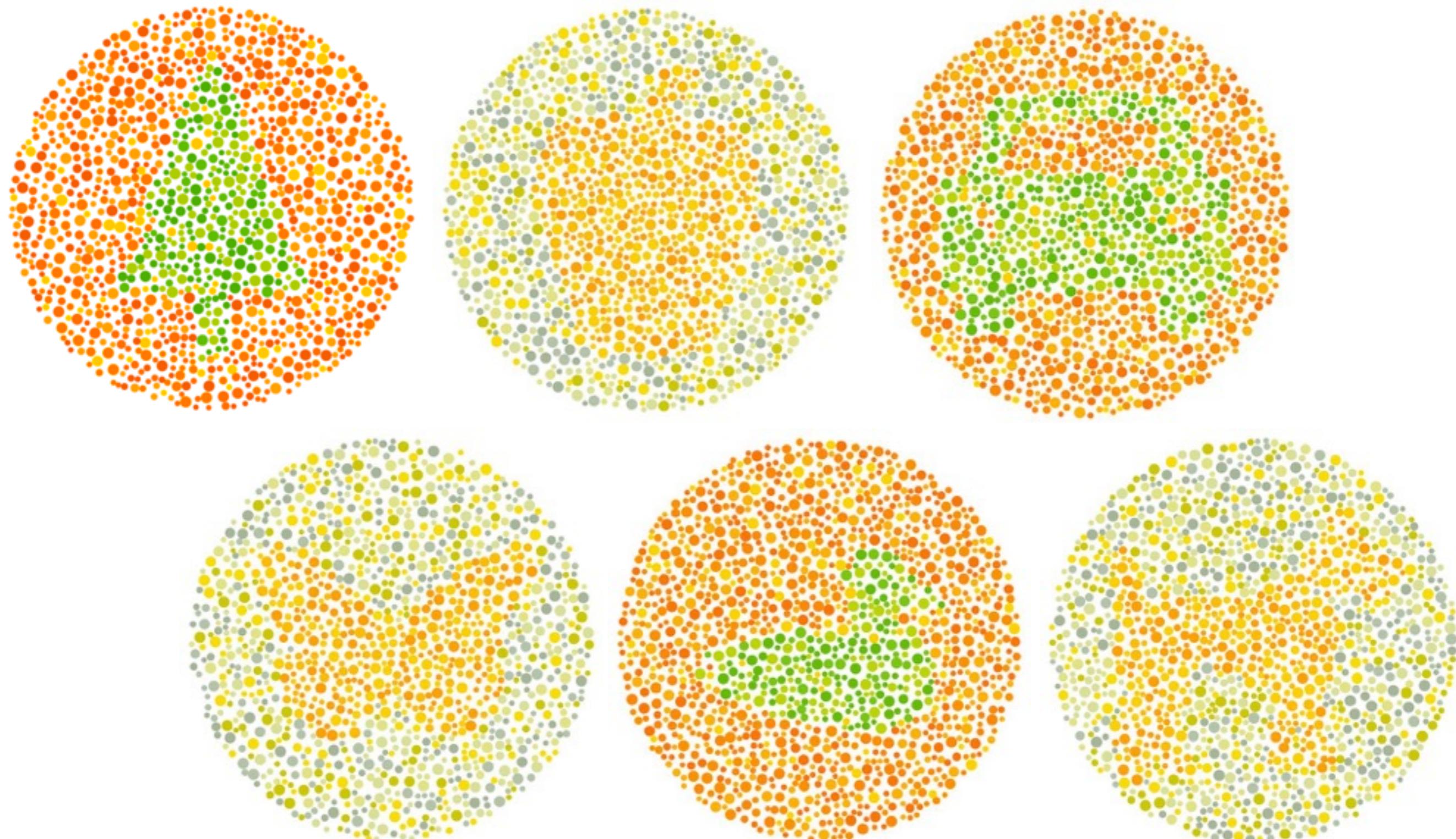
Medium  
Contrast

Medium  
Contrast

Low Contrast

Very Low  
Contrast

# Pay Attention to Color Blindness



# Selecting Colors



# Selecting Colors

English ▾

Like it? ▾

Paletton Live Colorizer

Mobile [scheduled]

More apps [scheduled]



< UNDO

REDO >

RESET

RANDOMIZE...

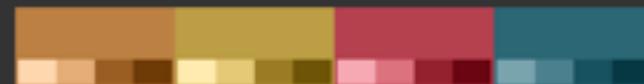
MORE INFO ▾



Adjacent colors (4-colors)

with complement

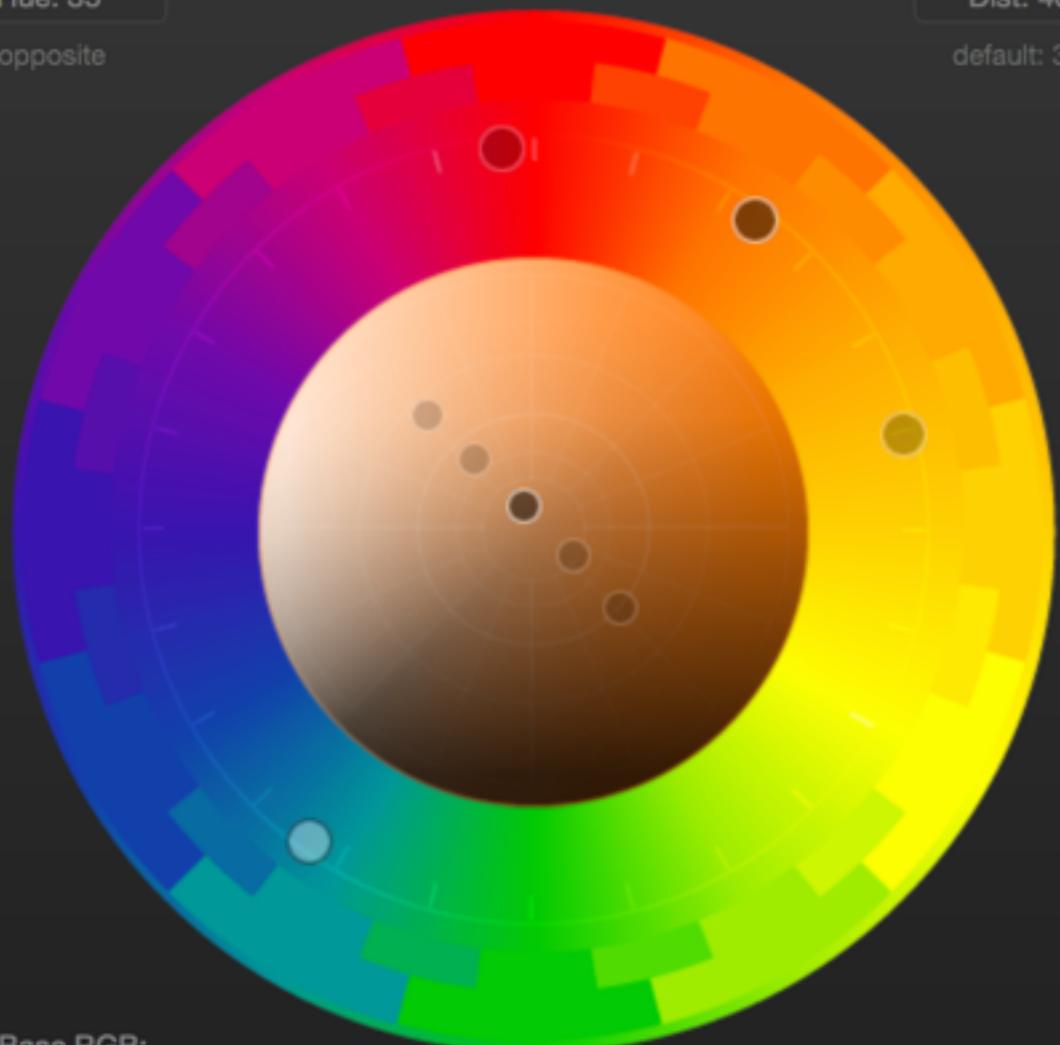
My Palette:



Share palette ▾

Hue: 35°

opposite



Dist: 40°

default: 30°



Base RGB:

BC8044

Fine Tune...

Vision simulation ▾

COLORS

PRESETS

PREVIEW ▾

EXAMPLES...

TABLES / EXPORT...

# Selecting Colors

Adobe Color CC

Create

Explore

My Themes

SIGN IN

Save

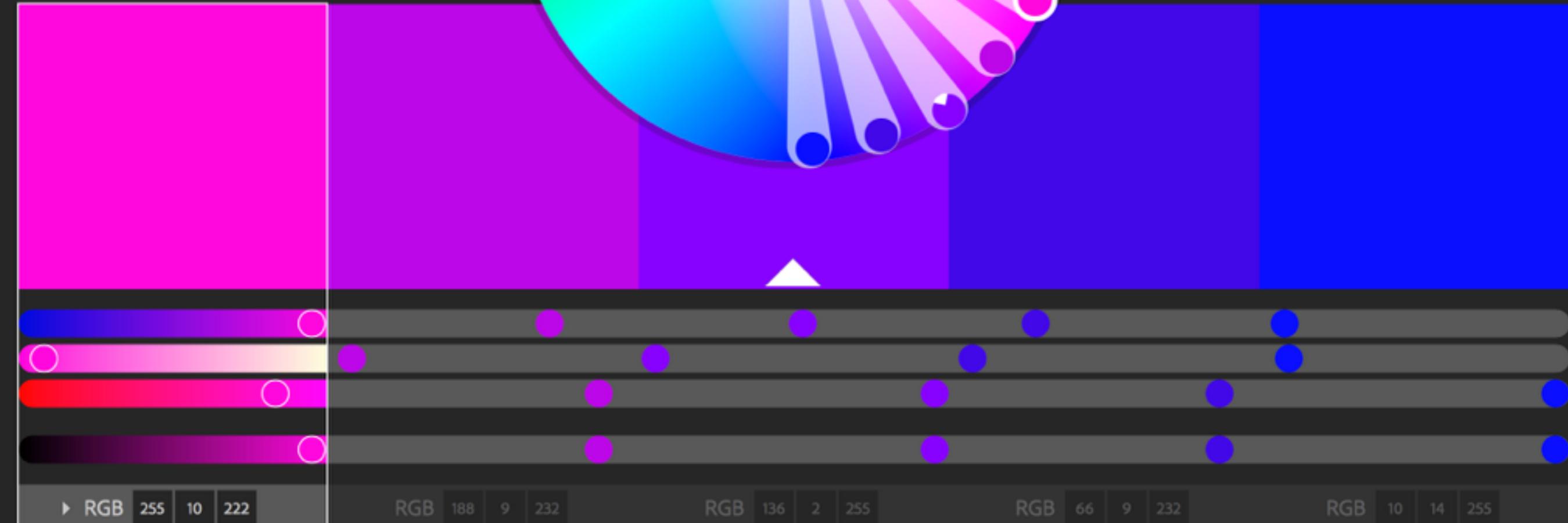
My Color Theme 



Color Rule



Analogous



# Fonts

Slide Titles

Major Point

Minor point

If in doubt, use the monitor size rule

# Font Type Face

Major Point

Major Point

Major Point

Major Point

Major Point

# Font Type Face

*Major Point*

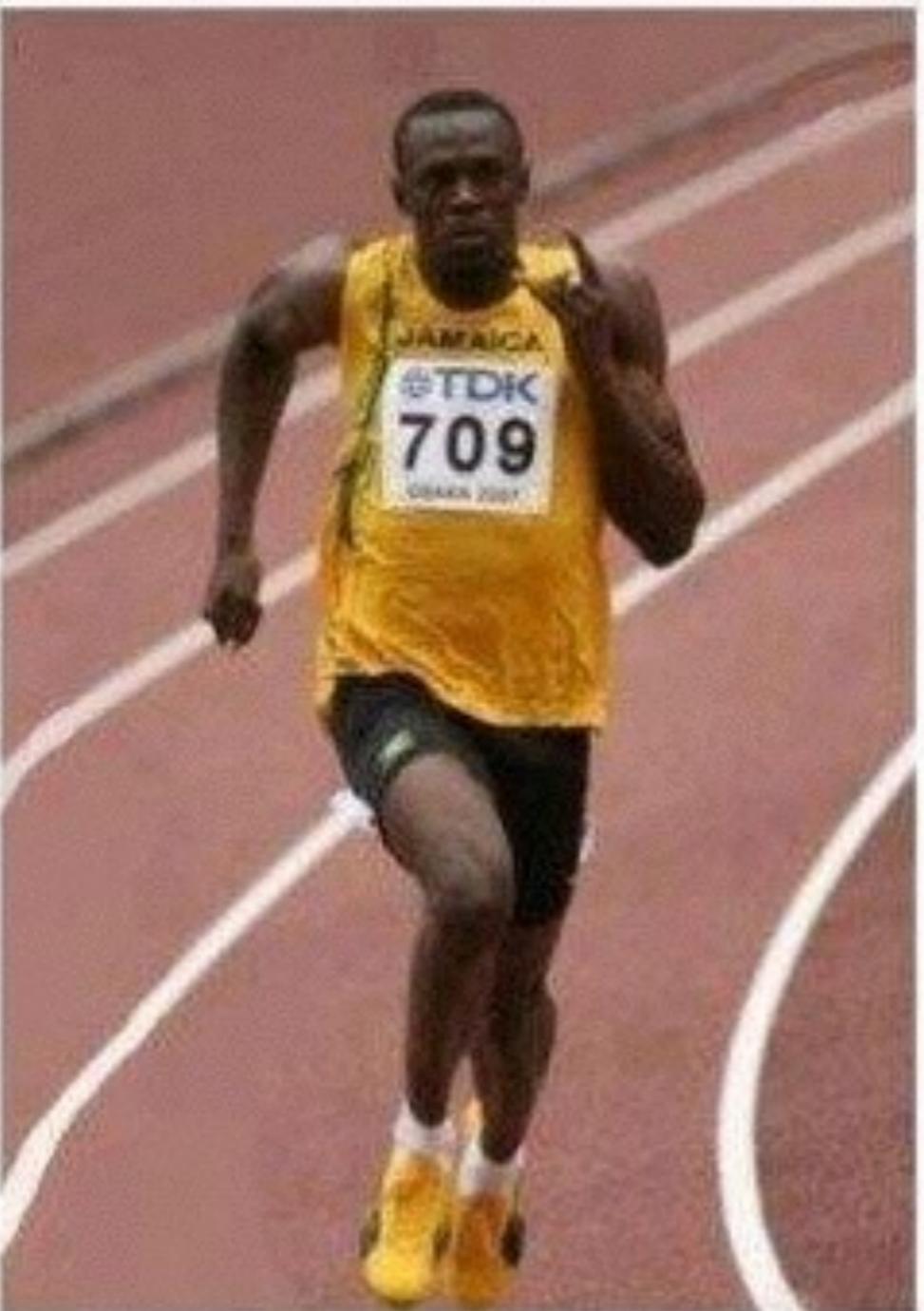
Major Point

Major Point

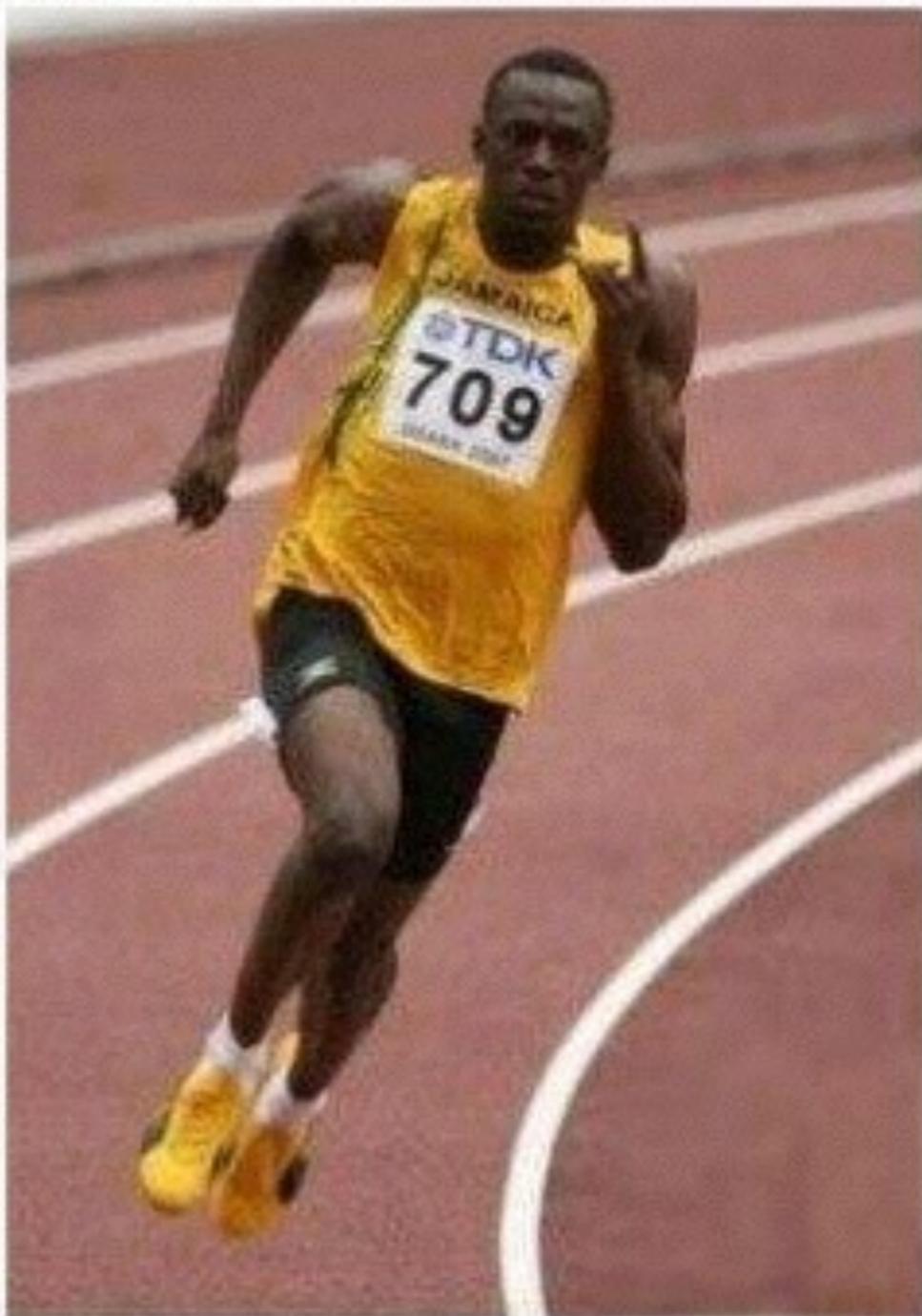
Major Point

Major Point

# Font Type Face



USAIN **BOLD**



USAIN *ITALIC*

# Font Combination



**Find the perfect font combo  
for your next project.**

Select a starter font



# Font Inspiration

## typespiration

// treating typography with respect

[home](#) / [about](#) / [request invite](#) / [login](#) /  [rss](#)

**most recent** / featured / designers

 51  824  78  537  18

#

菲利普斯 1月， 20

# Snow White

White is her skin, not hint of sun  
Black is her hair; that's coming undone  
Green is her eyes; brighter than safaris  
Red as a rose is her lips. Sweet as nectar

*hy and Sweet, Innocent to the core.*

She will mark you for shore  
The queen of the realm.

—by LEXIE NIGHT

## Anti-wrinkle Inje

Dermal Filler is an injection that gently restores facial structure. Facial tissue loss is one of the key factors in aging. Dermal fillers can help to rejuvenate the skin.

MY DEAR, MY DEAR, MY DEAR  
YOU DO NOT KNOW ME BUT I KNOW YOU

NOW LET ME TELL YOU ABOUT THE FEELINGS  
WHEN I TALK, OR MAKE SOME SORT OF AT-

DAMN I WISH I WASN'T SUCH A L  
'CAUSE THEN I WOULD LET YOU KNOW THAT

THE ONLY LYING I WOULD DO IS IN THE B  
TEN I SIGNED SINCERELY THE ONE WHO LO

THE LETTER CAME BACK THREE DAYS  
RETURN TO SENDER - DANNY

**F**ix the detective, ha  
which Passepartout  
delaying his departure f  
consulted the priests of

Owing to the delay caused by Fix and the priests reached the town, and his servant, the magistrate

8

Maecenas a orci sit amet i  
sagittis vestibulum

Ut eti nunc, iaculis egert vestibulum ut, volutpat vel lorem. Curabitur a augue enim! I  
suade faecibus lectus at laoreet! Integer semper nisi non mauris ornare imperdiet, i  
dignissim sagittis vehicula in, varius porta nisi. Fusce quis mauris eros. Praesent aliquip  
Pellentesque vestibulum cursus enim sit amet porttitor. Sed quis nisi nisi. Nullam sollicitudin  
vulputate a porta tortor egestas. Sed non ante non diam consequuntur tempus. Vivamus  
peritior nulla dictum ac pretium nibh adipiscing. Nulla convallis viverra placerat! Pe  
rmitto tristique semeneos et netus et malesuada fames ac turpis egestas. [Read more](#)

**AUTHOR**

## CATEGORIES

## COMMENTS

In old time  
helped on  
whose daughter

But the youngest was s  
has seen so much, was

“  
The best and  
most beautif  
things in the

# Animation

> 3,600 years old



1600BC

0AD

Today



Today

1440



0AD

> 3,600 years old

1600BC

Child survival (%)

99.7

99.5

99

97

95

90

1975

1980 1985 1990 1995 2000 2005

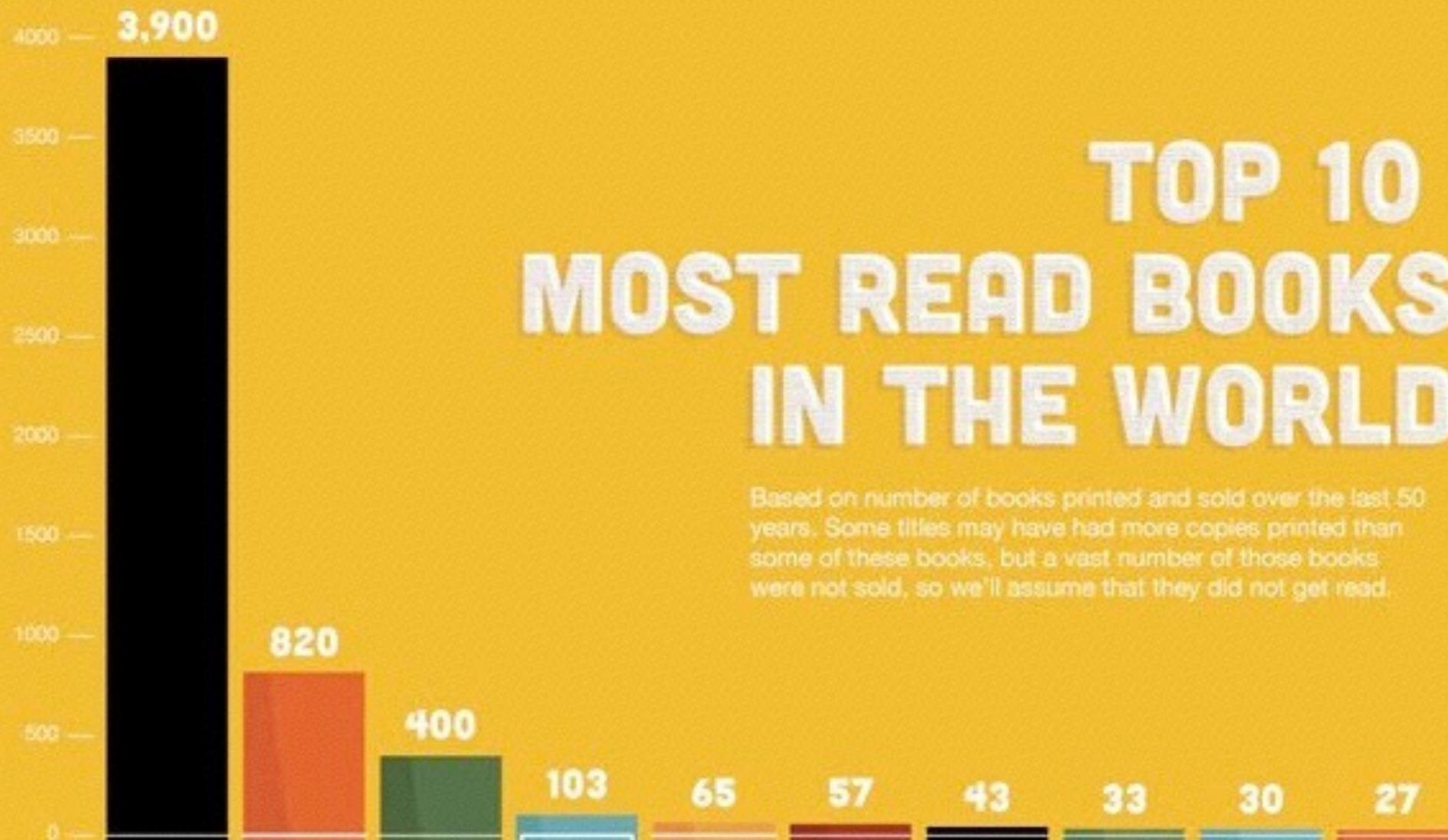
GDP per capita (\$)

\$50 000

\$50 000

TED

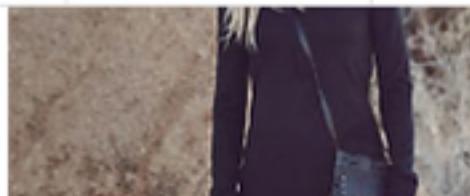
# How to Lie with Charts & Graphs





NFL / Mountain Dew

From Heinz' wiener dogs to Ryan Reynolds' Hyundai ad to Puppymonkeybaby, this year's ads were upbeat and, at times, hysterical.



Here are 10 of the most talked-about ads of the night. Vote for which one you like in our poll (and watch all the ads below)!

Thank You Kate Hudson - We  
Felt So Comfortable  
Fabletics

## Poll Results - What was your favorite Super Bowl ad?

[More from TODAY.com](#)

Audi – David Bowie

1062  
Votes



Mountain Dew – Puppymonkeybaby

1311  
Votes

Marilyn Dafoe? Marilyn Monroe?  
Snickers' hilarious Super Bowl a

Doritos – Ultrasound

5815 Votes

advertisement

Budweiser – The Bud Light Party

517  
Votes

IT'S CASH BACK  
WITH A CASH BACK  
ENCORE.

Hyundai – Ryan Reynolds

1209  
Votes

THE CITI®  
DOUBLE CASH CARD.

1% ON YOUR PURCHASES + 1% AS YOU PAY FOR THEM



# **Headline News**

**Headline News**

**25,255,000\*\***

**MSNBC**

**24,933,000\*\***

**Fox News**

**24,278,000\*\***

**Headline News is watched by more Adults 25-54 each month than MSNBC or Fox News.**

**Headline News**

25,255,000

**MSNBC**

24,933,000

**Fox News**

24,278,000

**Headline News**

25,255,000

**MSNBC**

24,933,000

**Fox News**

24,278,000

# OBAMACARE ENROLLMENT

7,100,000

ACTUAL  
ENROLLMENT

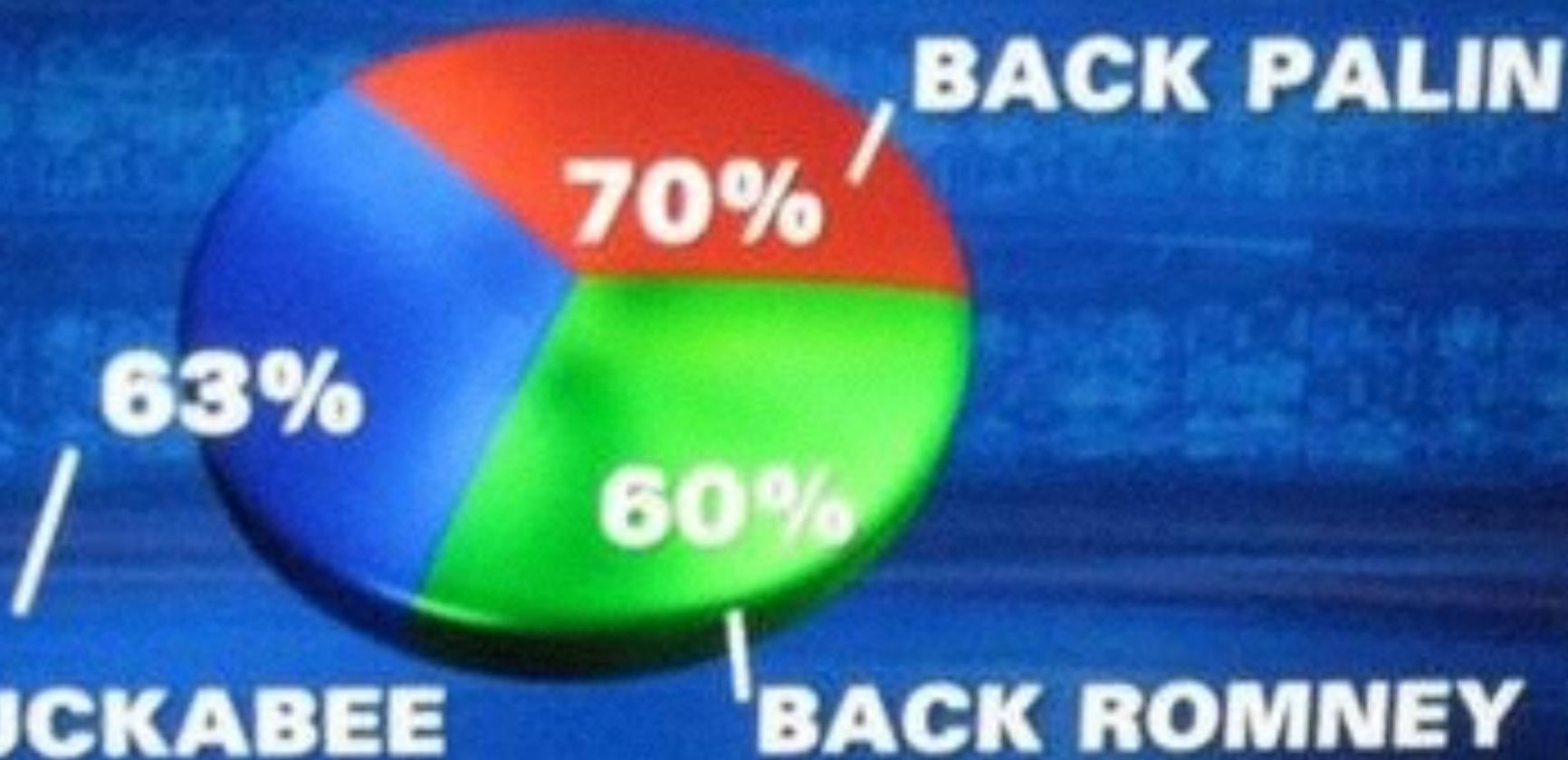
7,000,000

GOAL



# 2012 PRESIDENTIAL RUN

GOP CANDIDATES



SOURCE: OPINIONS

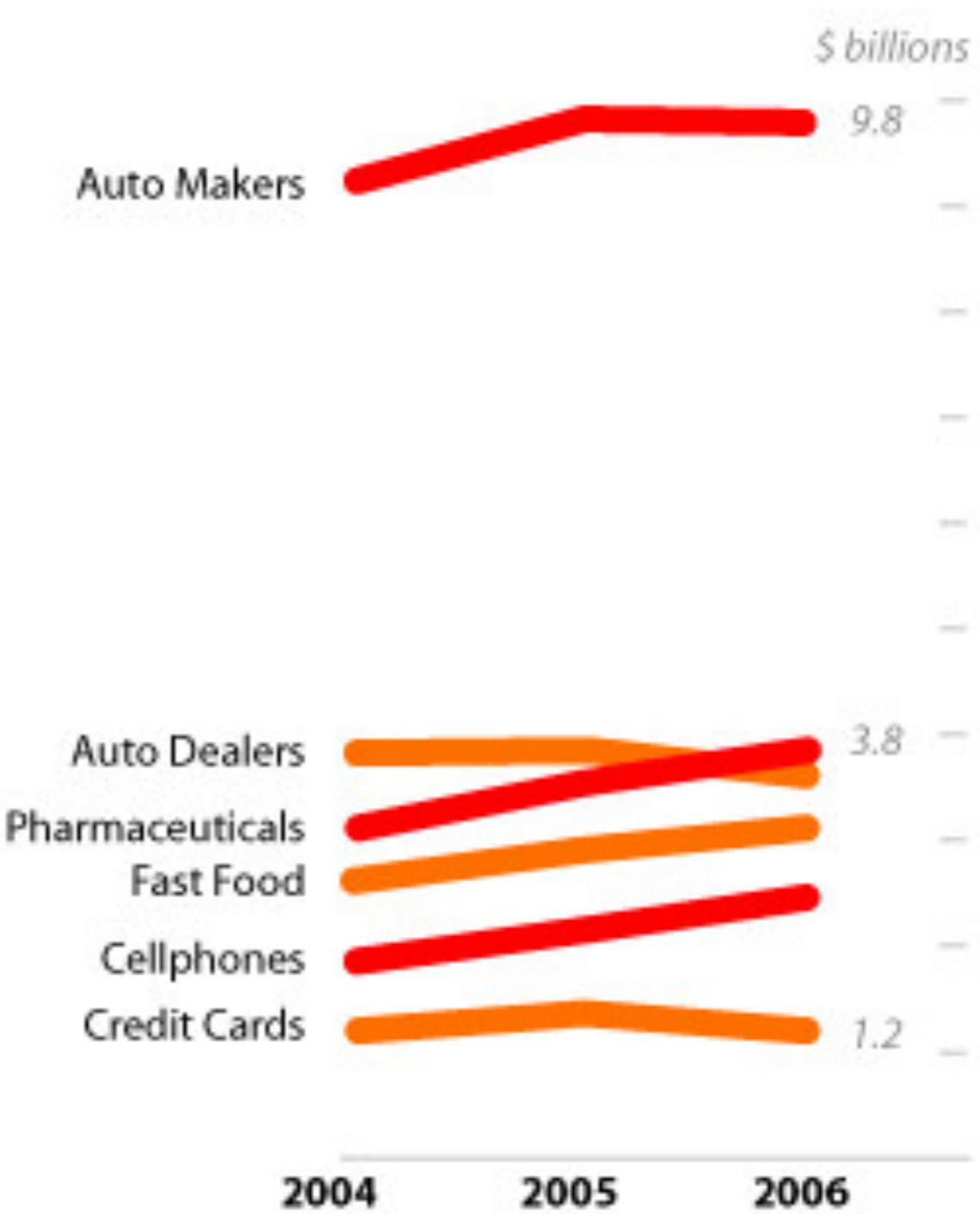
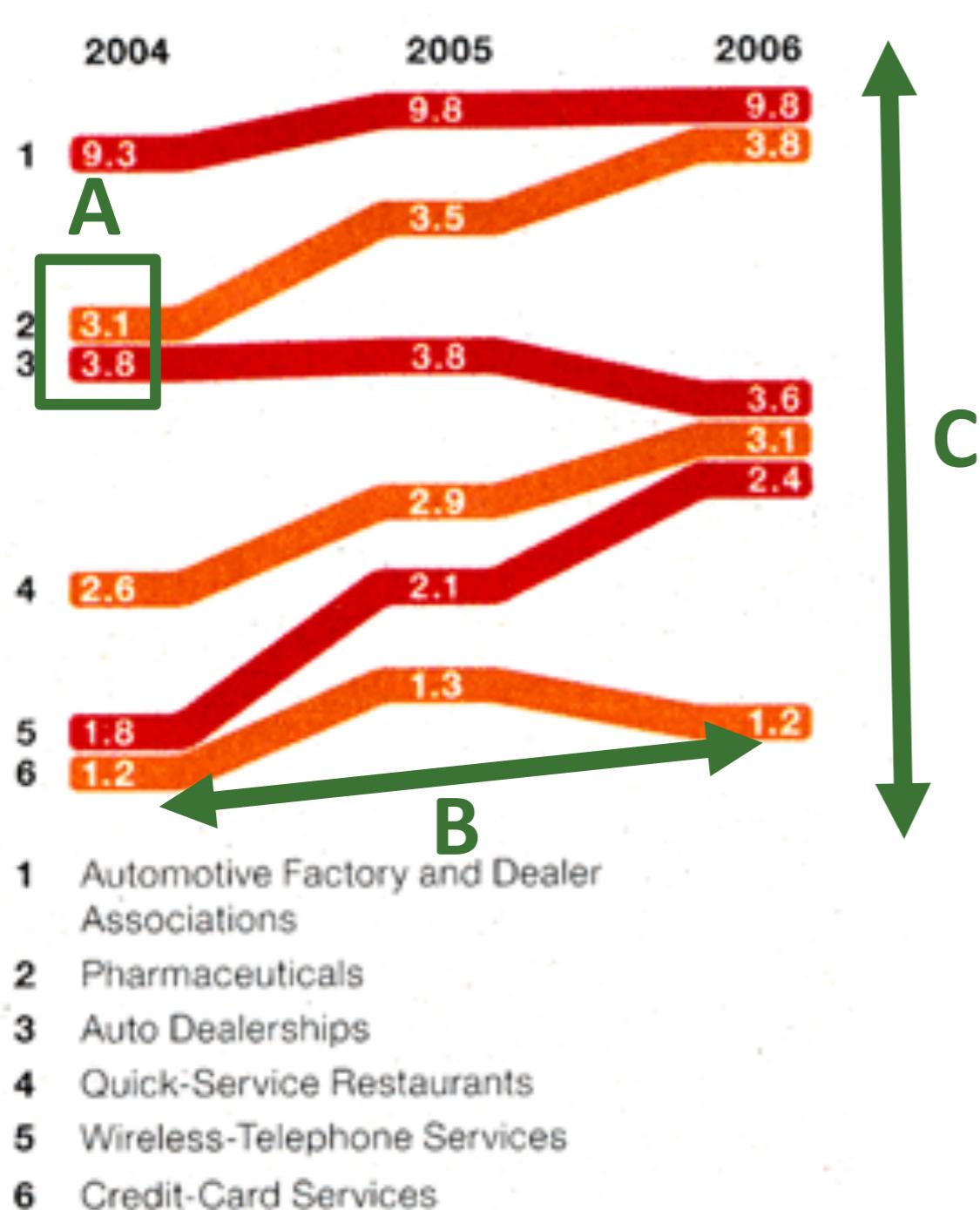
DYNAMIC

FOX

47°

## THE AD BUYERS

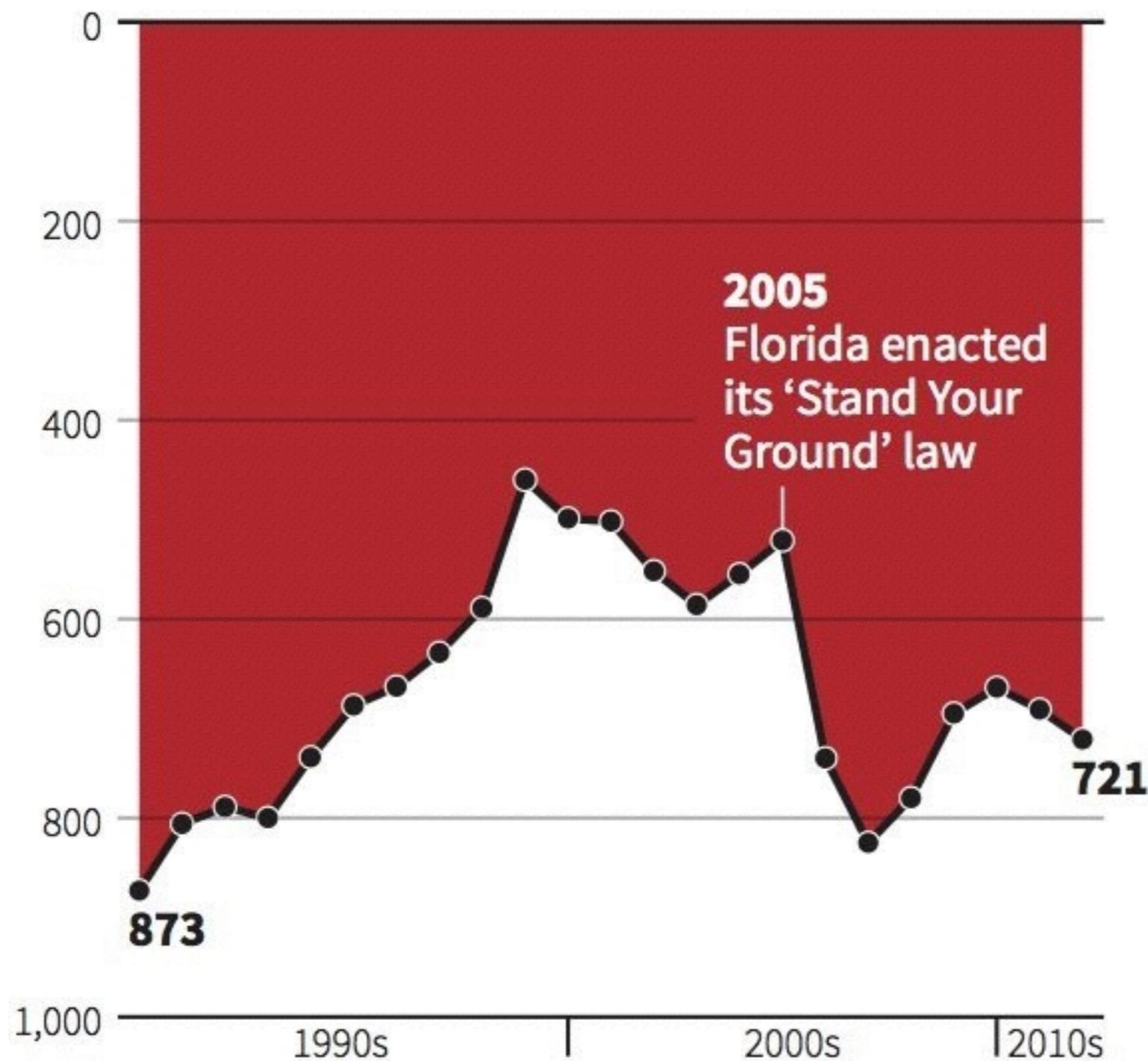
Advertising spending by selected major industries, in billions.



Source: Nielsen Monitor-Plus, a service of  
Nielsen Media Research  
Chart by Catalogtree

# Gun deaths in Florida

Number of murders committed using firearms

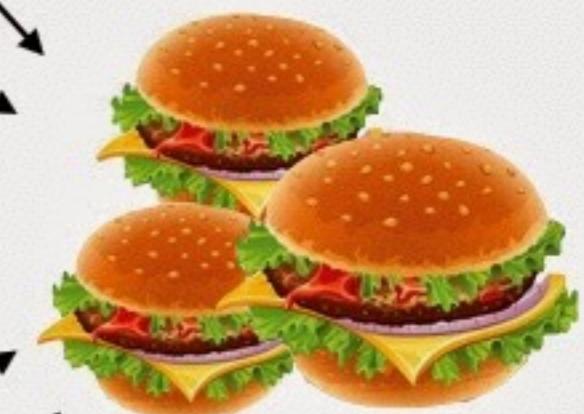
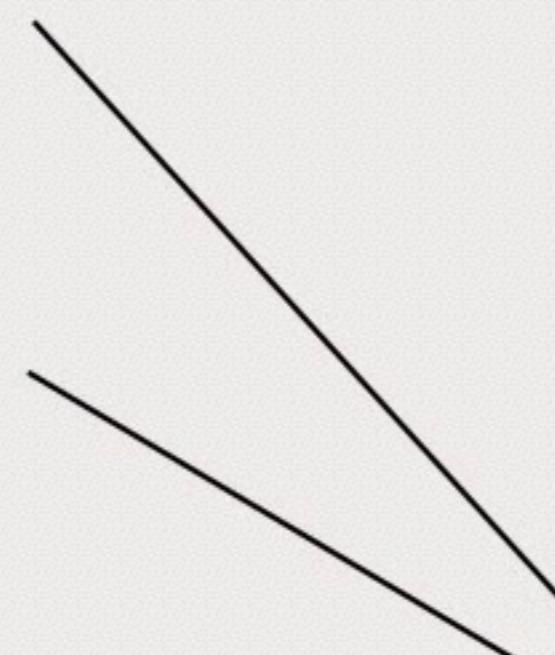
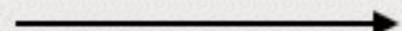
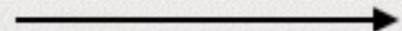
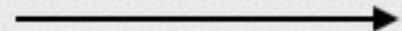


**2005**  
Florida enacted  
its 'Stand Your  
Ground' law

Source: Florida Department of Law Enforcement

MAP

REDUCE



# WTF Visualizations

Visualizations that make no sense.

For a discussion of what is wrong with a particular visualization, tweet at us [@WTFViz](#).

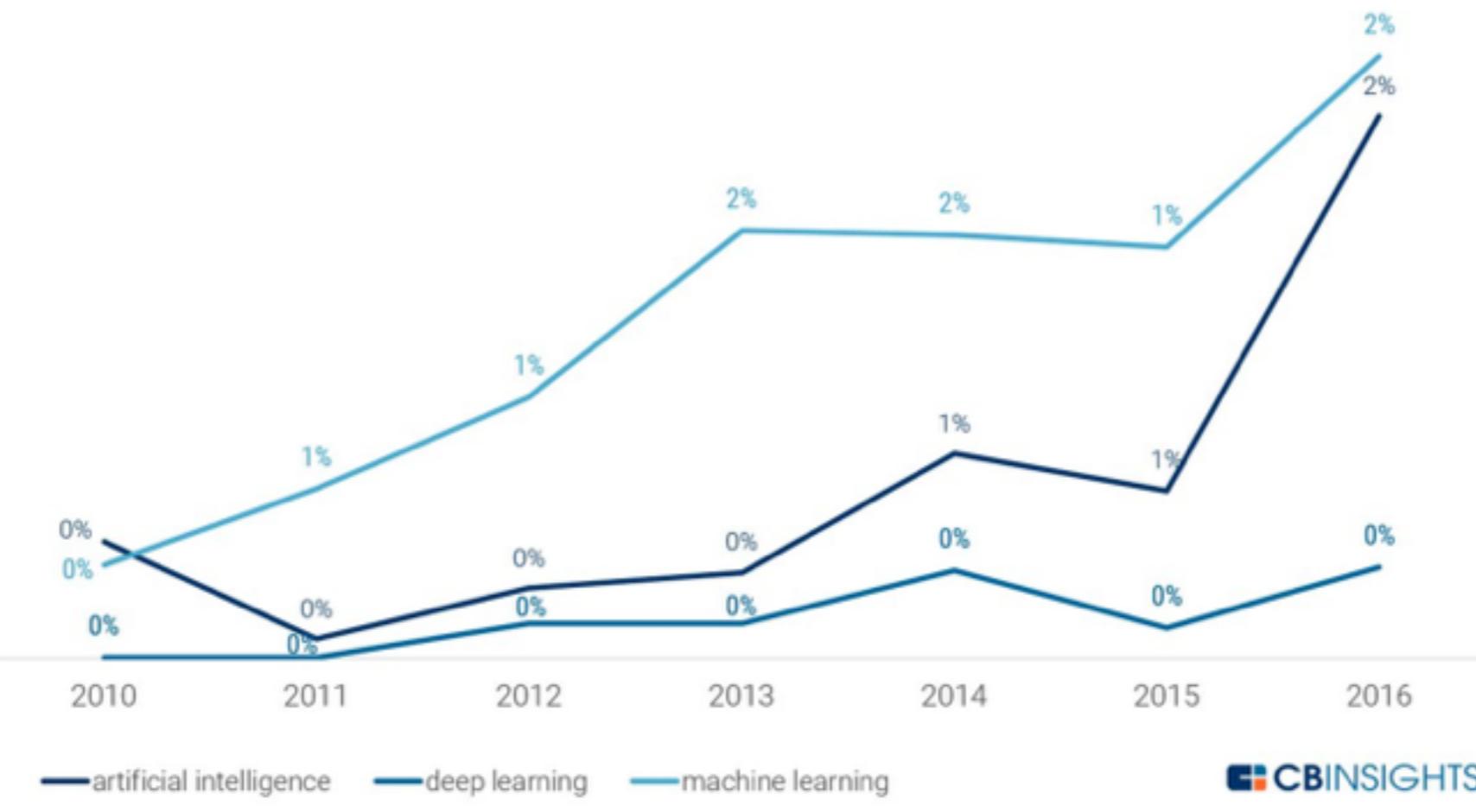
[Submit a WTFViz you found.](#)

[SUBMIT](#)    [ARCHIVE](#)



## LEARNING HOW TO LEARN

Percentage of VC-backed companies with certain words in their company description over time



The largest 0% ... (from @minamaxir)

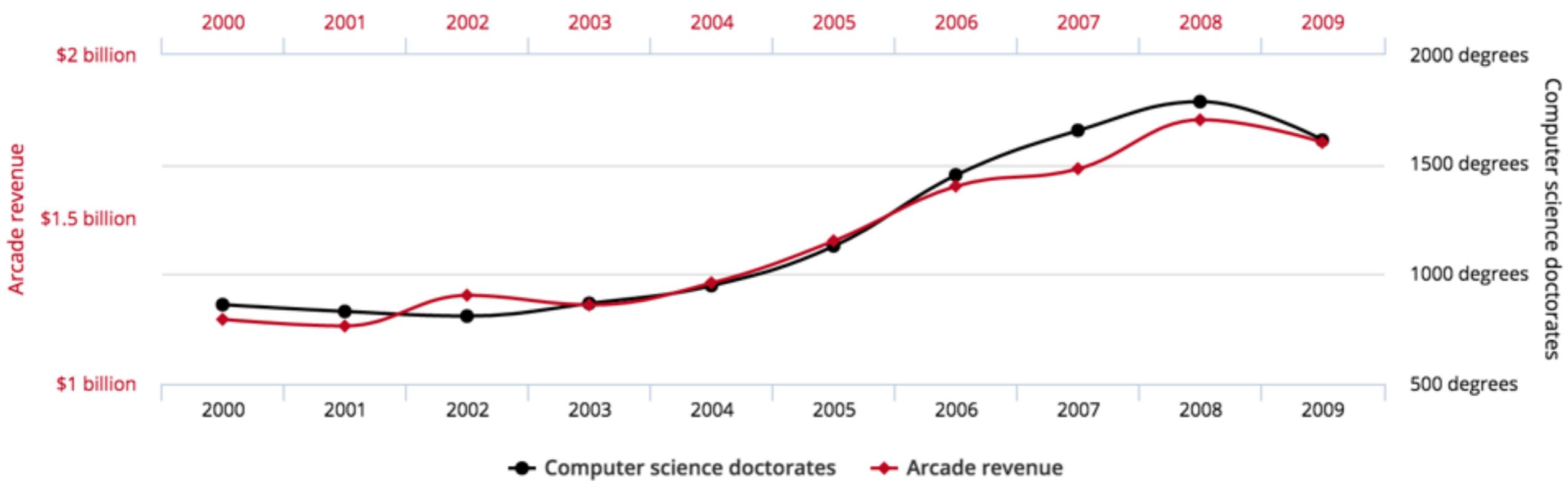
[Submit a Viz that makes you go WTF?!](#)

Source: viz.wtf



# Total revenue generated by arcades correlates with Computer science doctorates awarded in the US

Correlation: 98.51% ( $r=0.985065$ )



Data sources: U.S. Census Bureau and National Science Foundation

[tylervigen.com](http://tylervigen.com)

Source: [tylervigen.com/spurious-correlations](http://tylervigen.com/spurious-correlations)

# Exercises

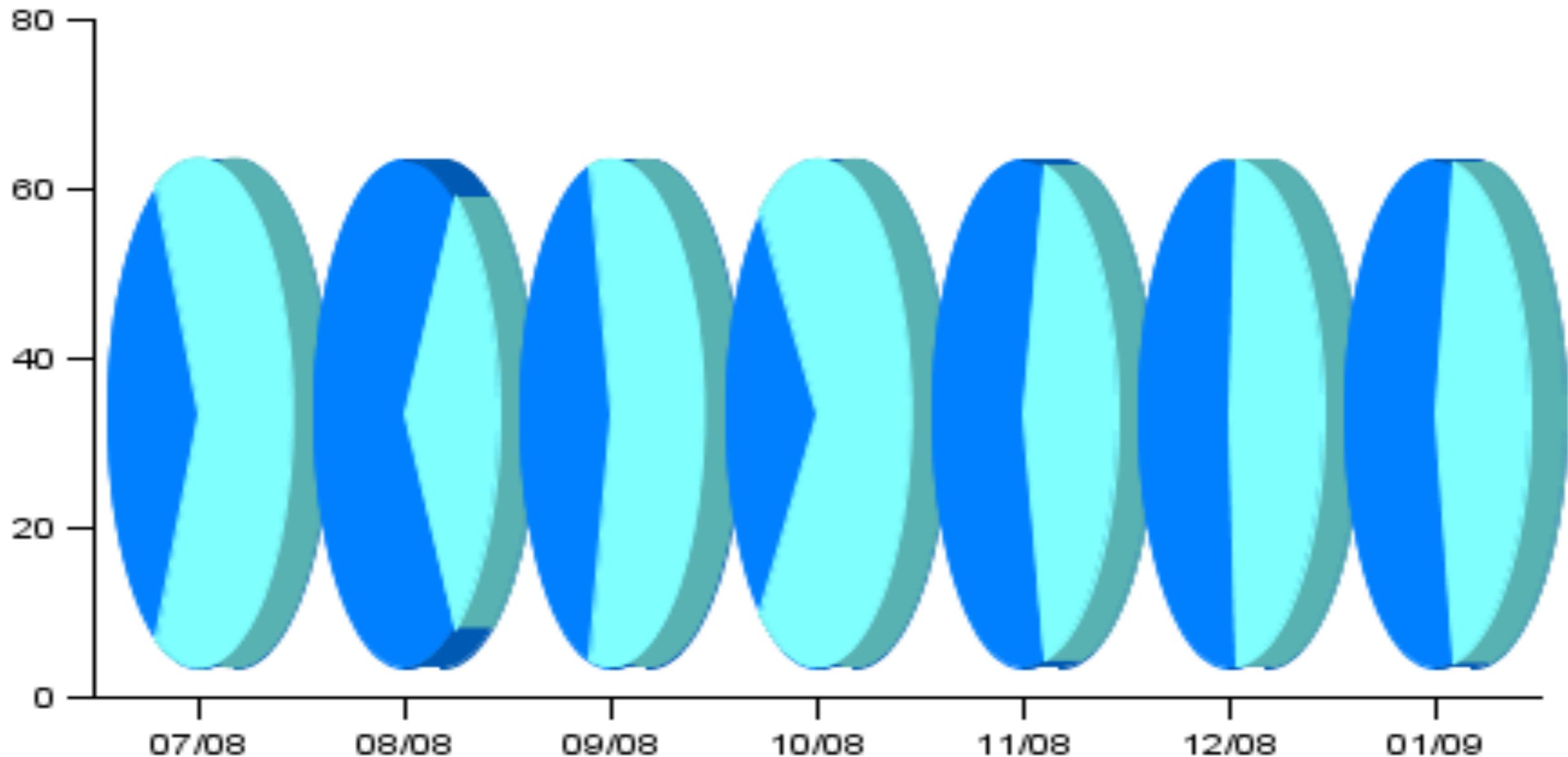
# Exercise

Country  
Corruption Ranking  
Coups – Successful  
Coups – Attempted  
Debt % of GDP  
College Graduates as % of Population  
Health as % of Population  
% Millionaires

...over 20 Years, all data is available,  
accurate, and consistent

# Exercise

## **Single Series - Vertical - 10 Pixel Depth w/Pie Vertical Bars**



# Tom Crawford

 thcrawford

 @thcrawford  
@viznetwork

 viznetwork.com

