



Displaying Data

University of Michigan
March 30, 2017

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viznetwork.com
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Introductions

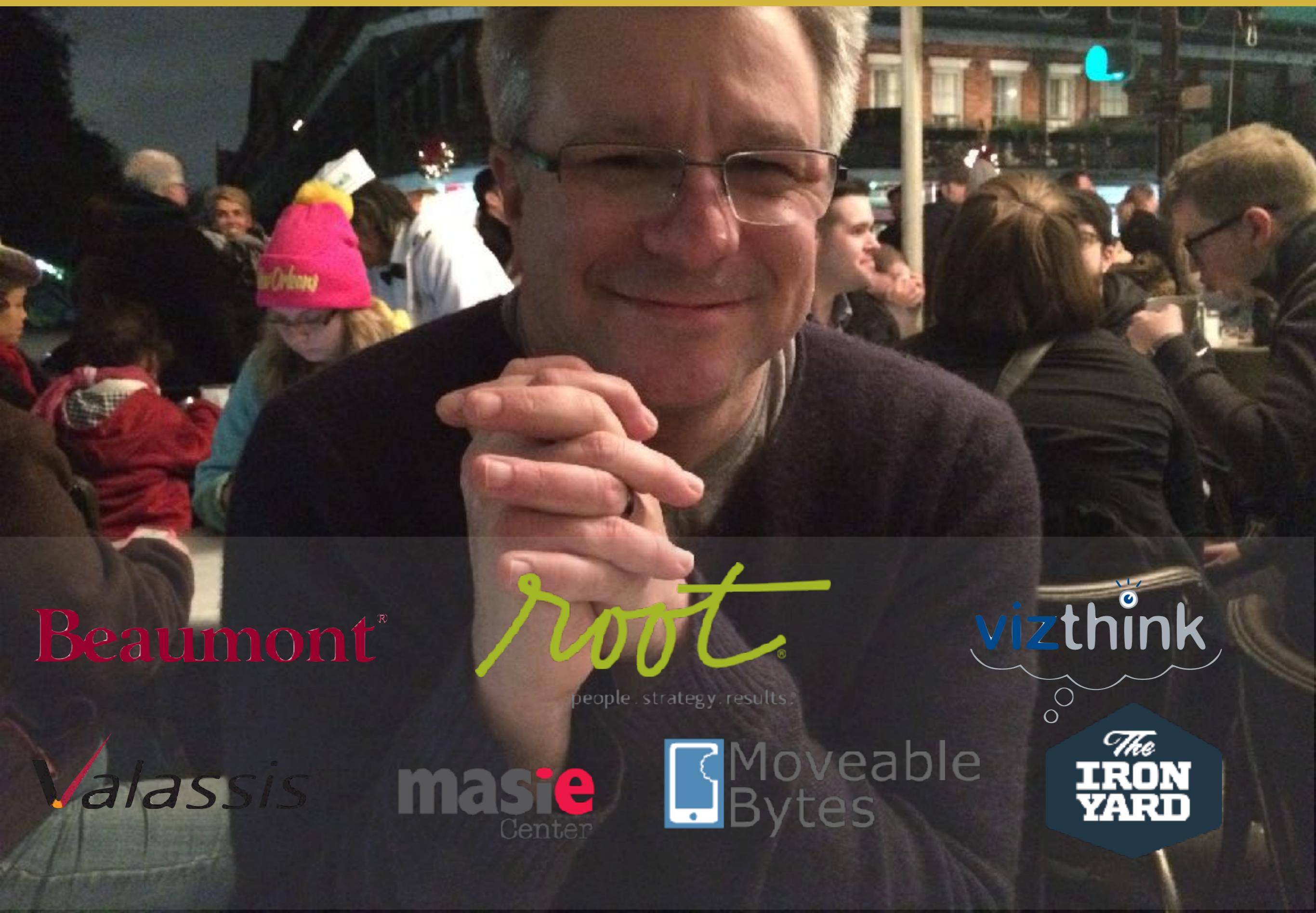
About Me



About Me



About Me



Beaumont[®]

Valassis

masie
Center

root[®]

people. strategy. results.



Moveable
Bytes

vizthink

The
**IRON
YARD**

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 a must-read and a must-use for how to use data to communicate clearly, elegantly, persuasively, and effectively, right from the start."

Jeff Jarvis, journalist, CUNY Graduate School of Journalism,
and author of *Geek's Guide to Writing News Stories for News*

INFORMATION DASHBOARD DESIGN

Show Me the Numbers

Designing Tables and Graphs to Enlighten



Stephen Few

Why Visualize Data?



PBS

KIDS

pbskids.org



PBS

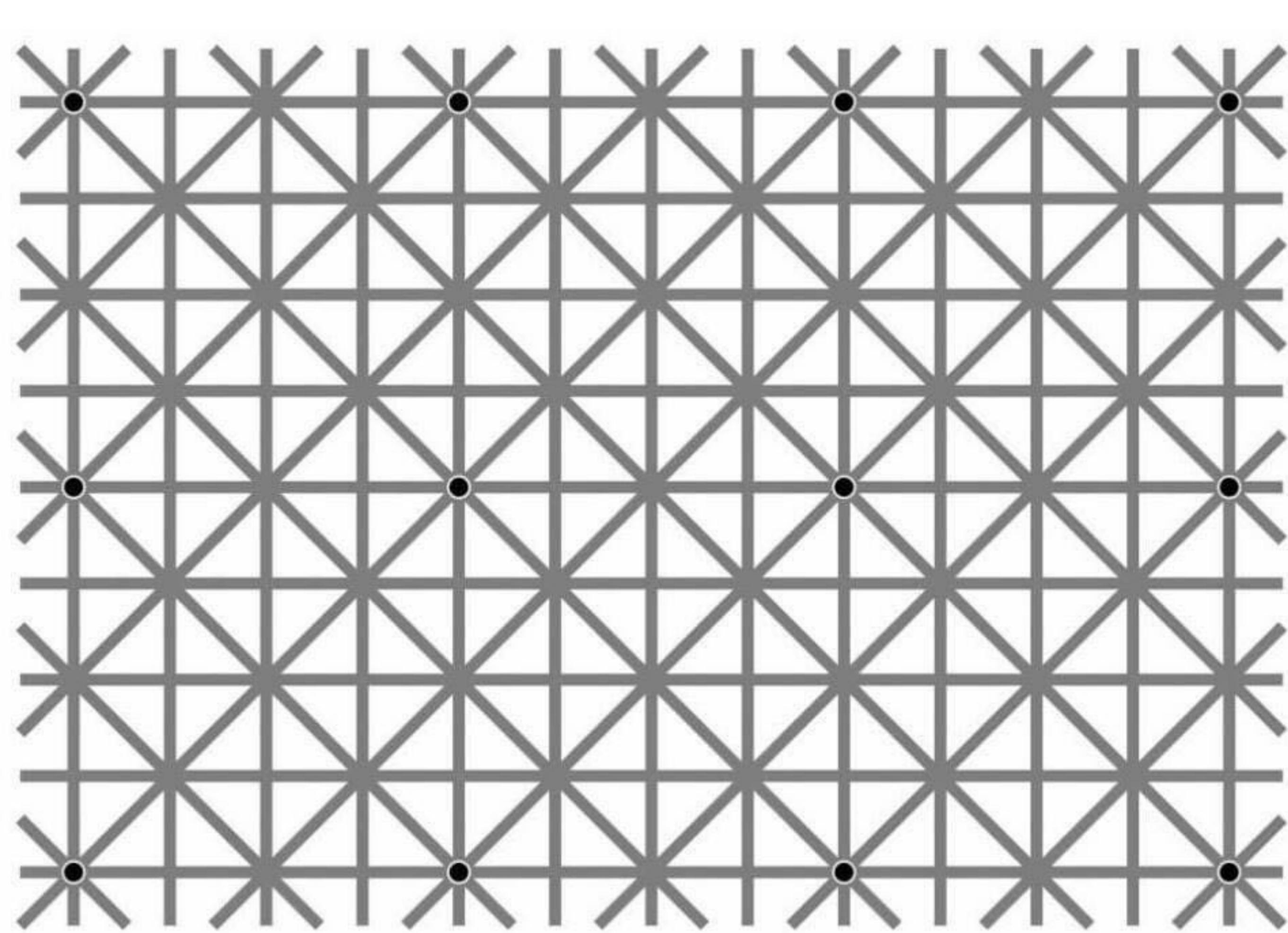
KIDS

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
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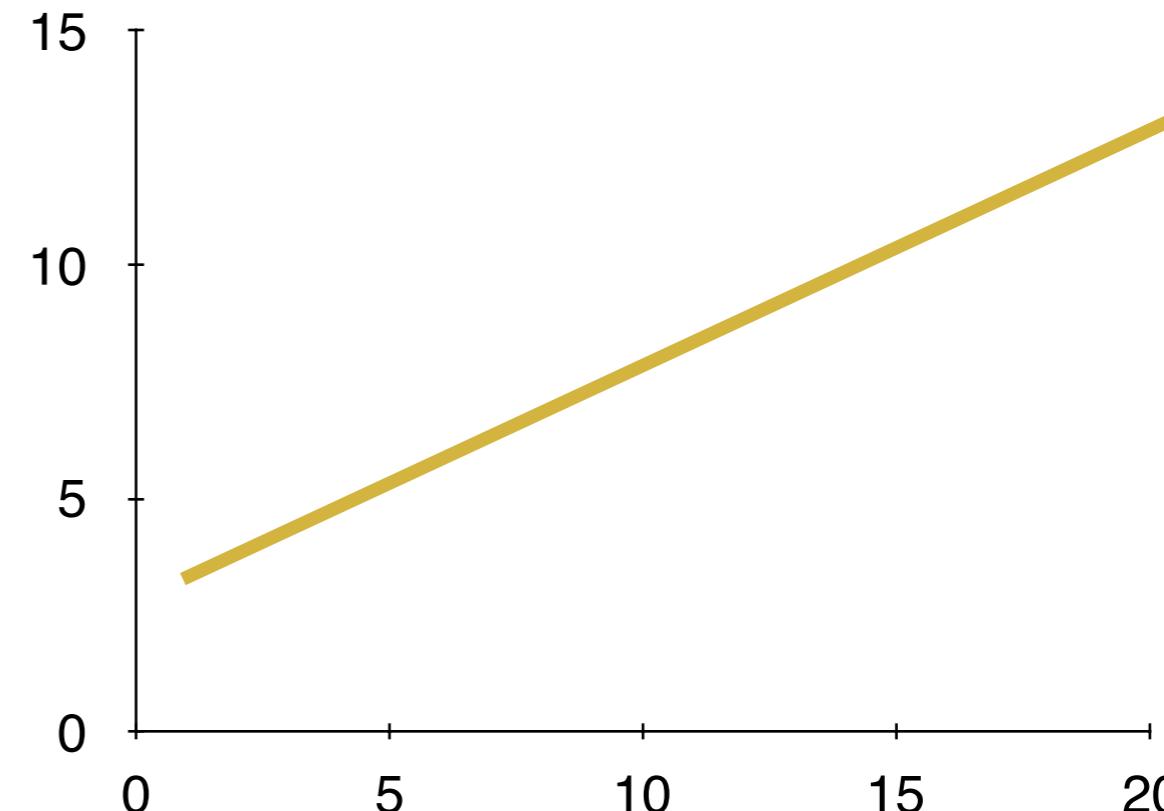
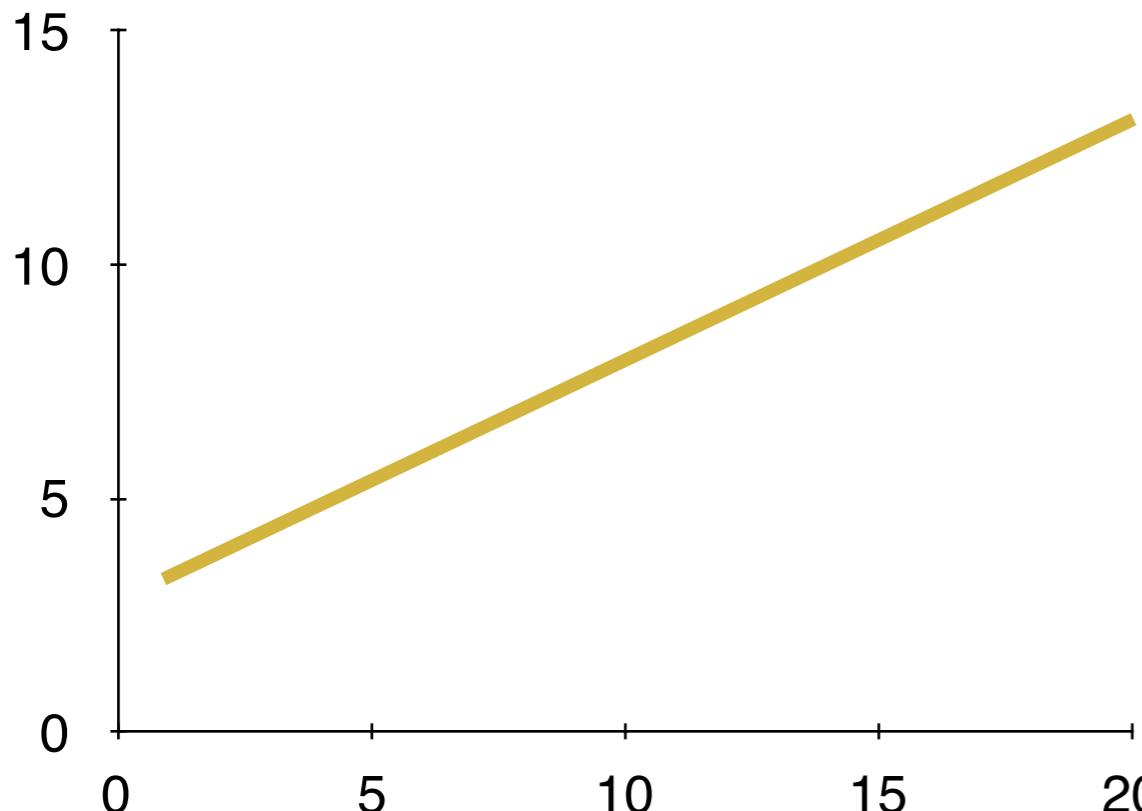
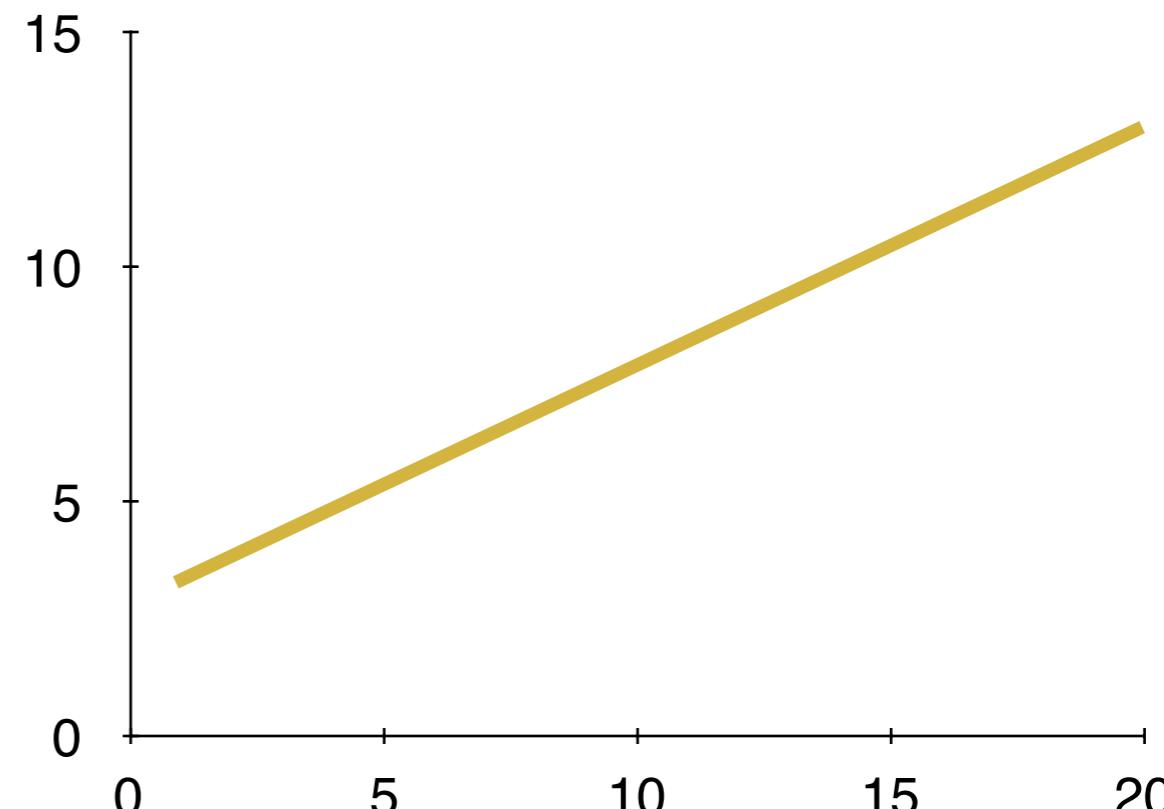
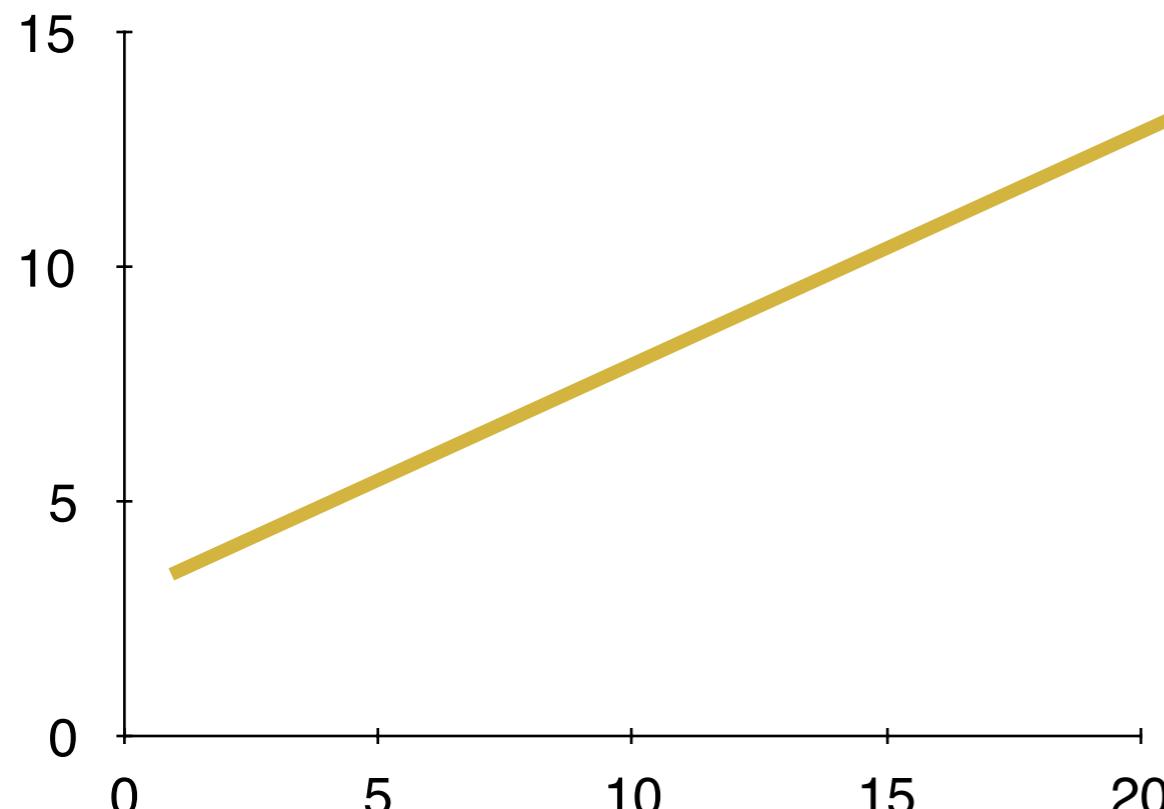
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2	5	8	9	8	7	6	2	4	5
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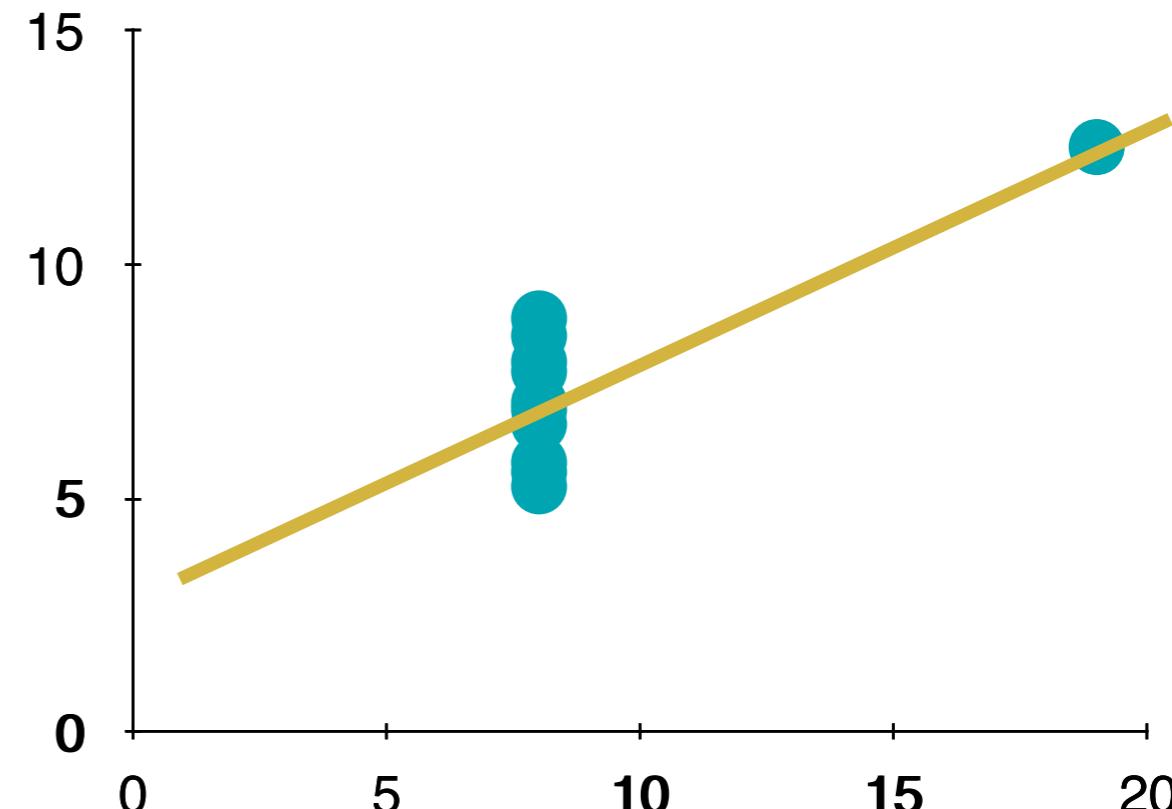
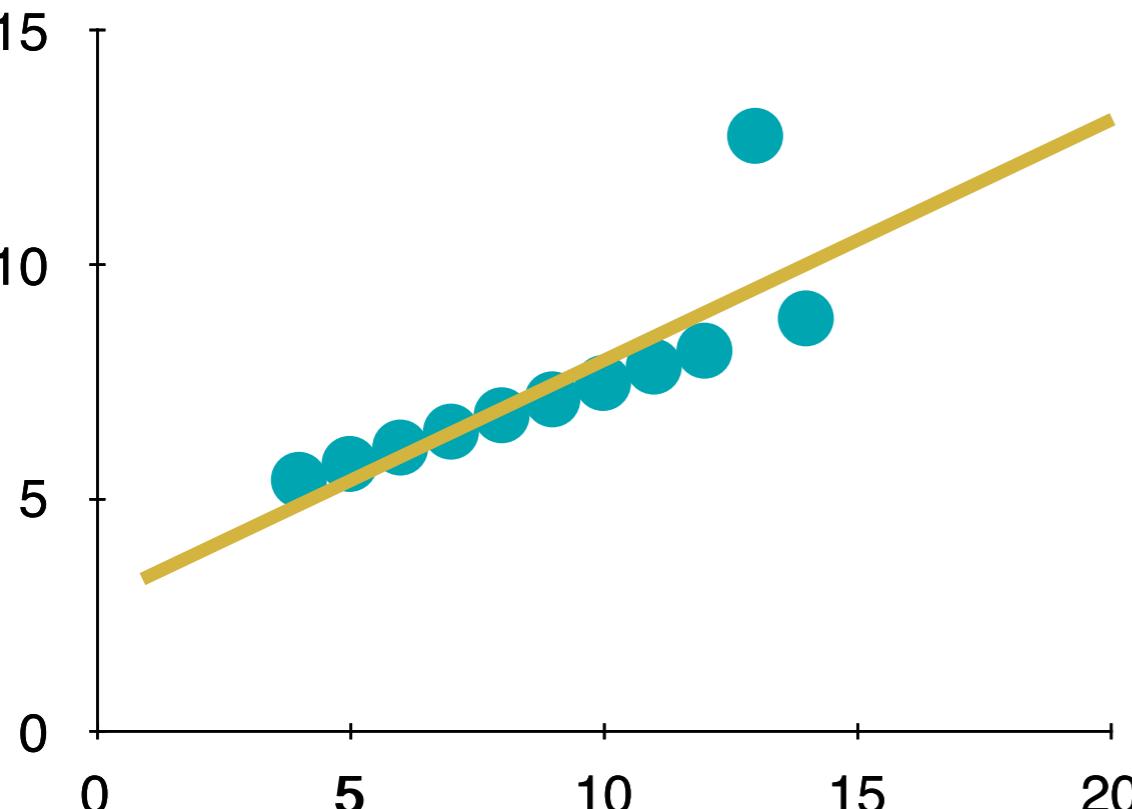
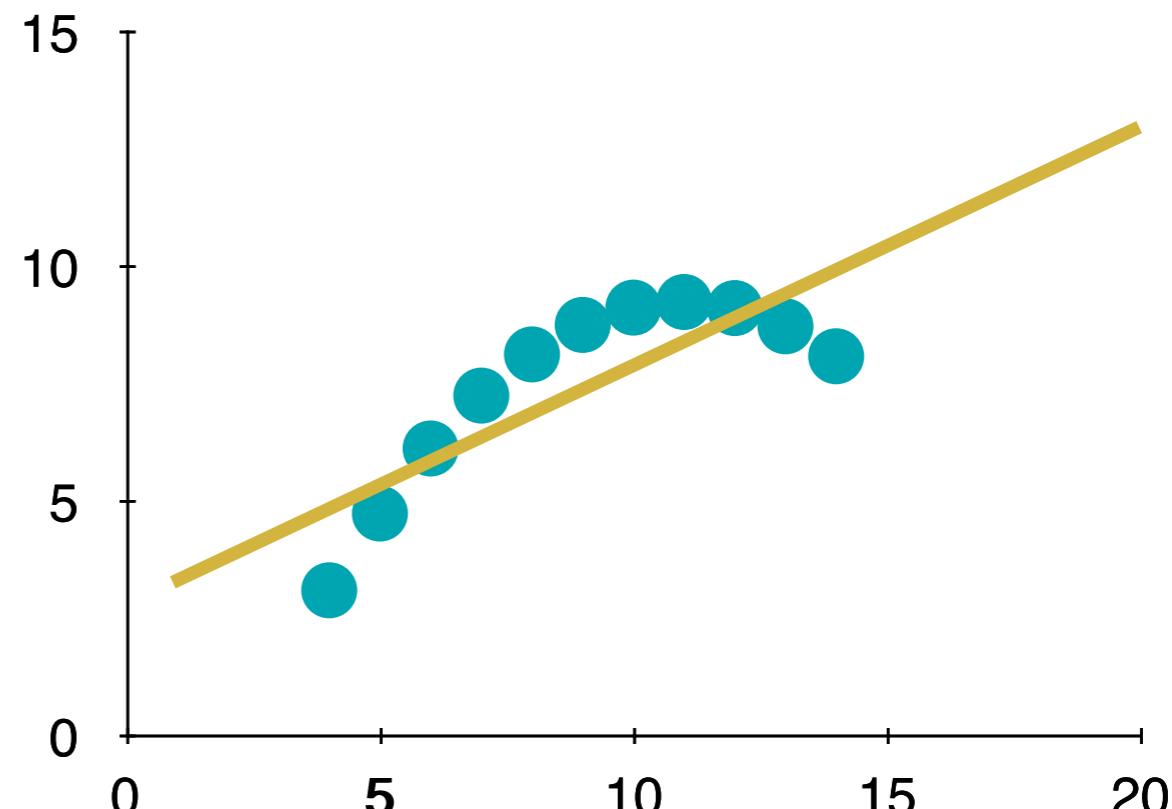
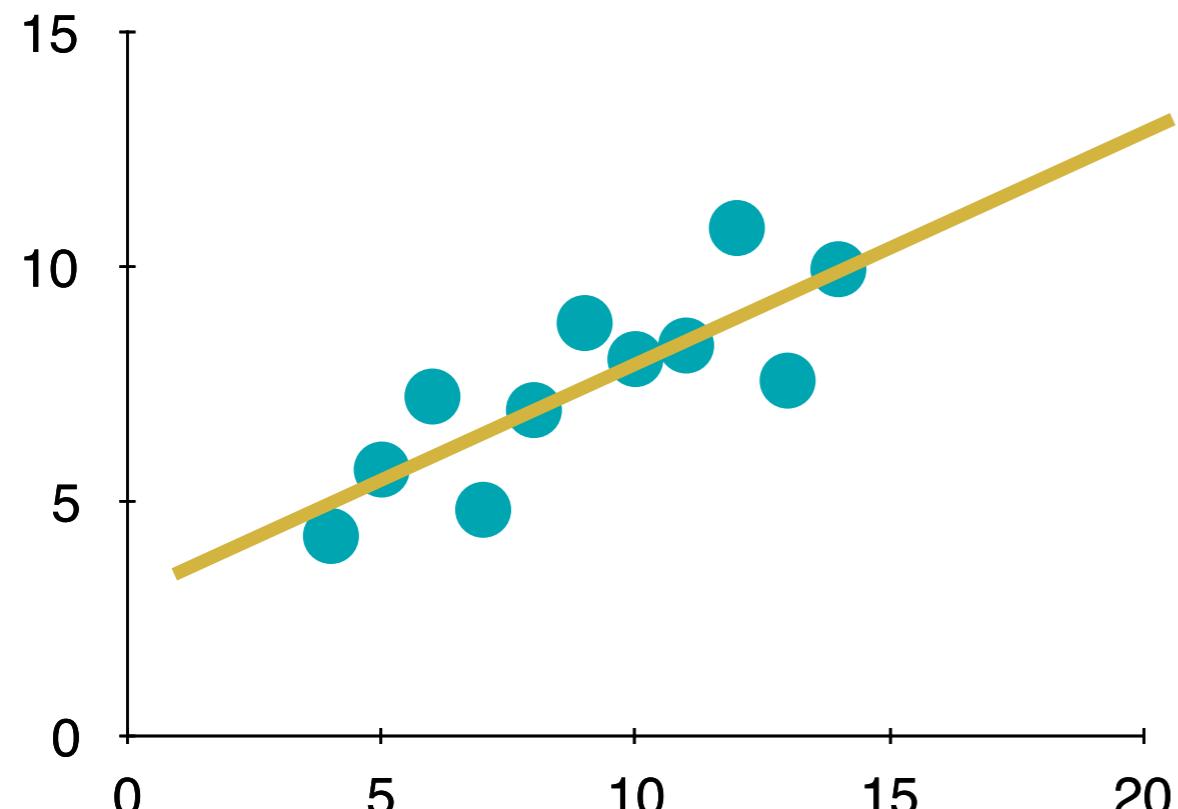
Why Visualize?

- ▶ 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?



Why Visualize Data?



Source: Anscombe's Quartet

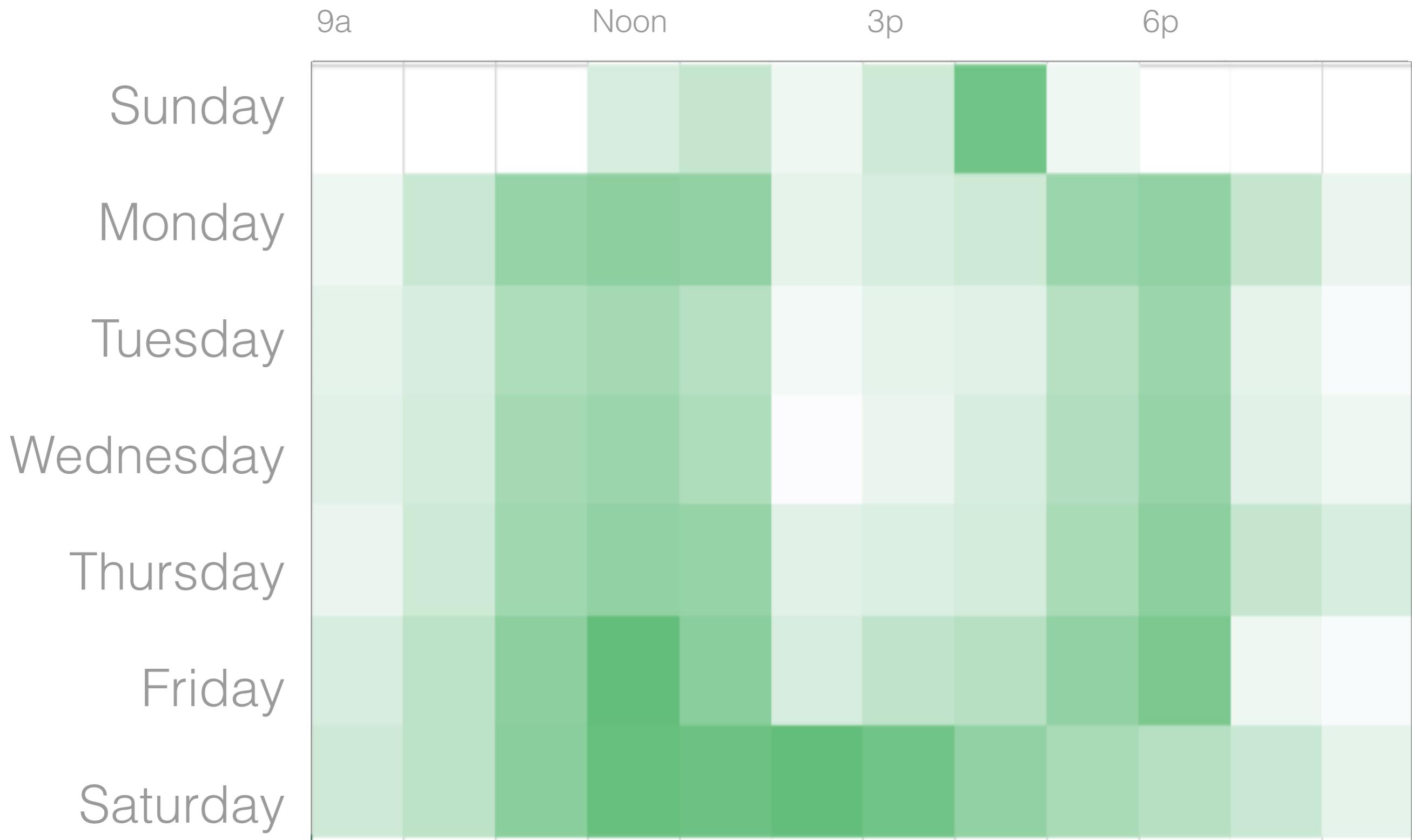
Why Visualize?

Store Arrivals

	9a			Noon			3p			6p	
Sunday				10	14	5	12	32	5		
Monday	5	13	24	26	25	7	10	12	23	25	14
Tuesday	7	10	19	21	17	4	7	8	17	23	7
Wednesday	8	11	21	23	19	2	6	10	18	24	8
Thursday	6	12	22	25	24	8	9	11	20	26	14
Friday	10	16	26	35	27	10	15	17	25	30	5
Saturday	12	16	27	34	33	35	32	25	20	17	13

Why Visualize?

Store Arrivals

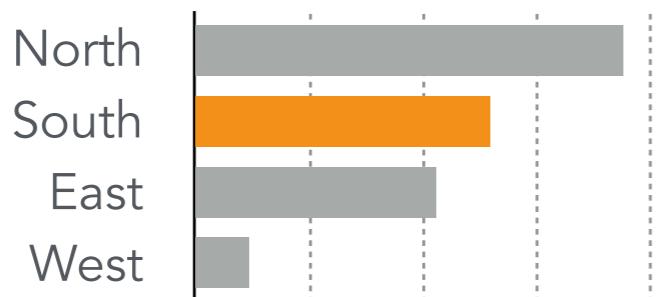


Why Not Visualize?

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

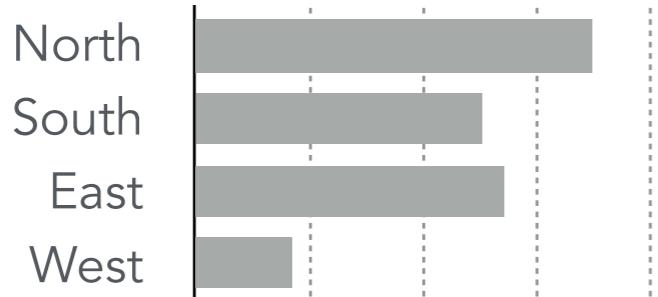
Sales by region

Widgets

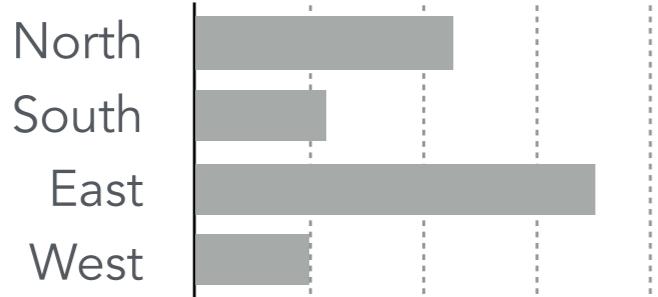


Sales by region

Gizmos



Whatsits



0 25 50 75 100

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

Addition

1	-512
24	thirty nine
5.93	5%

Types of Data

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%

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

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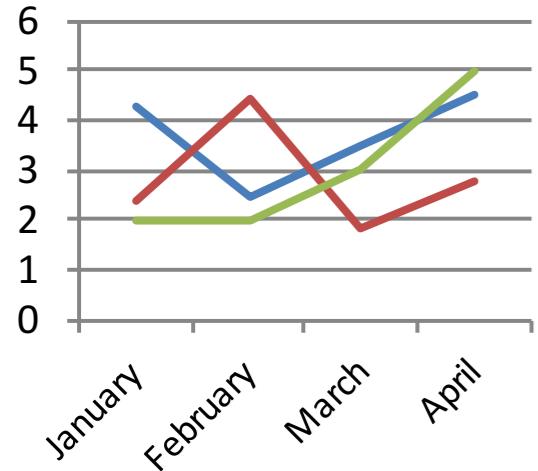
Addition

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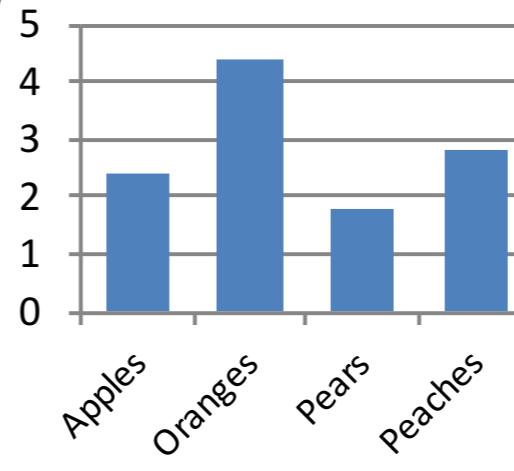
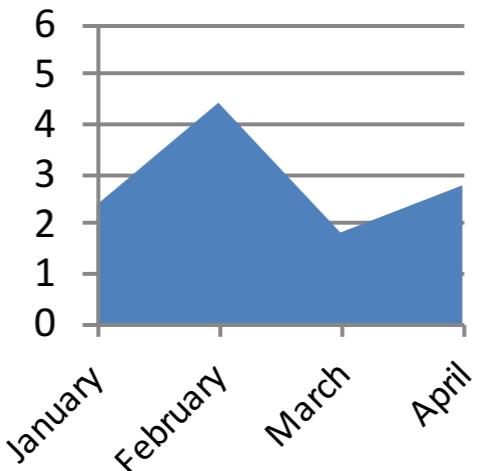
Music

Pictures/Video

10 Basic Ways to Display Data



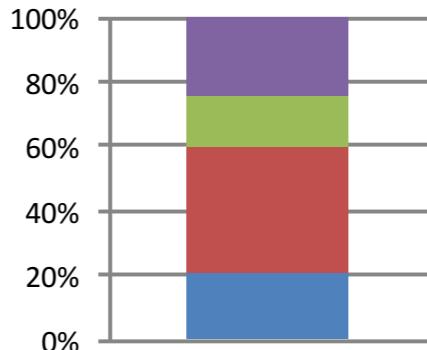
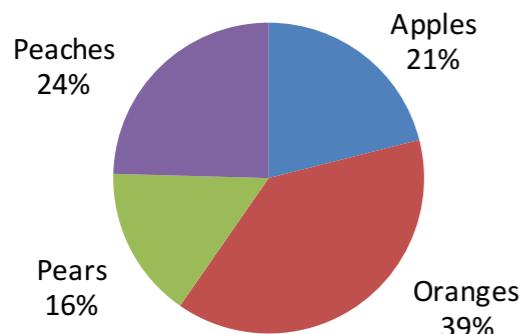
Series
(ordered)



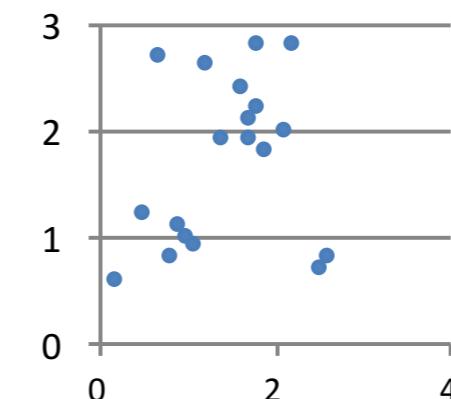
Sales
Apples
Oranges
Pears
Peaches

Apples
21%

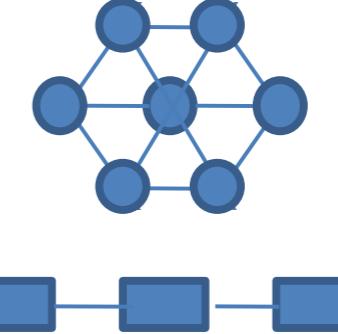
Value



Composition



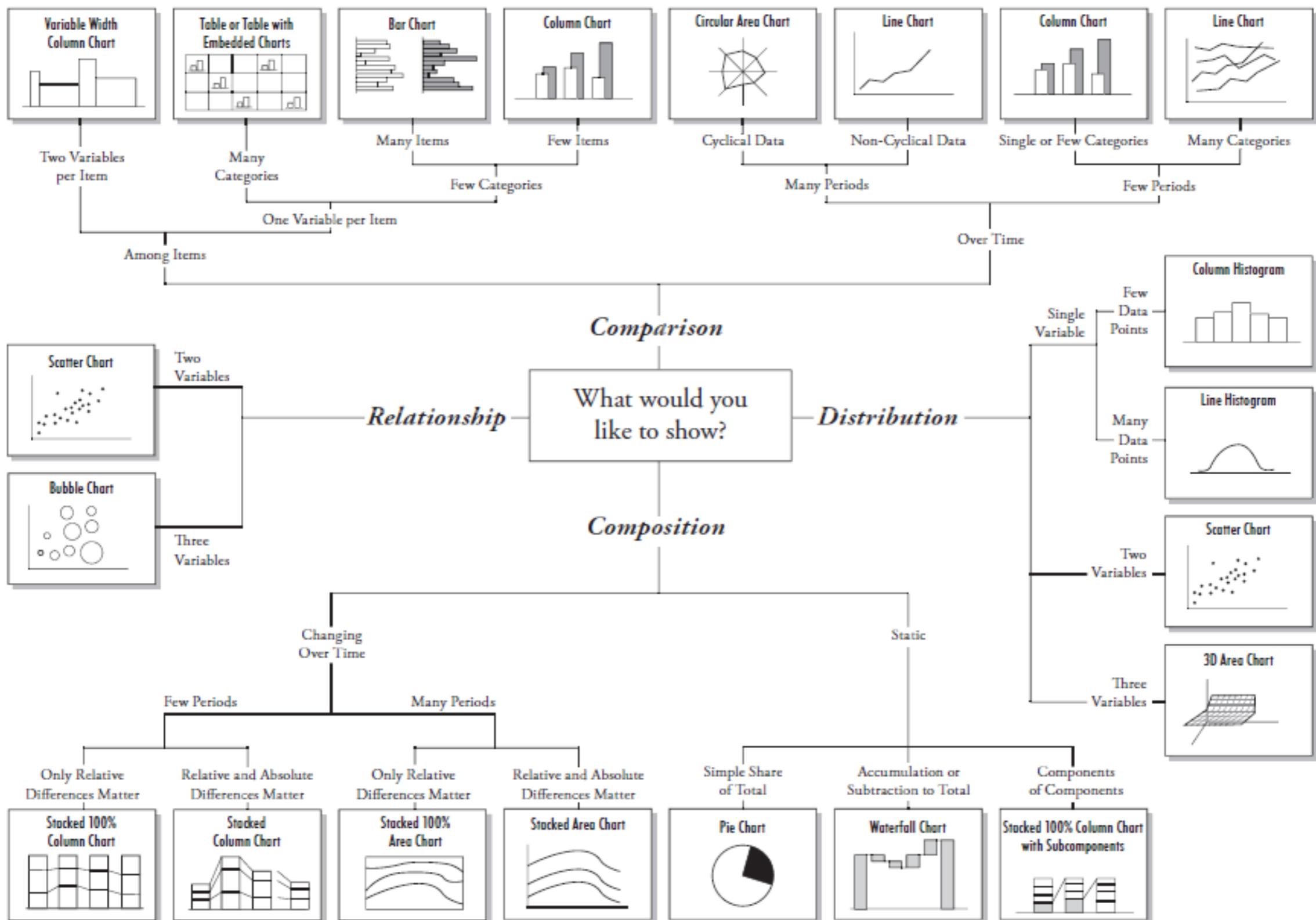
Relationship



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 Berlin residents with Non-German Citizenship

Legend: German, Asian, Other Ethnicities

Administrator Christian Behrens

Category InfoViz Patterns

- Display Patterns
- Proportions

Devices Laptop/PC

Modality Keyboard/Mouse

Status Best Practice

Relations specialization

- Rng 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.

Rationales

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 slices) they are a reliable way of

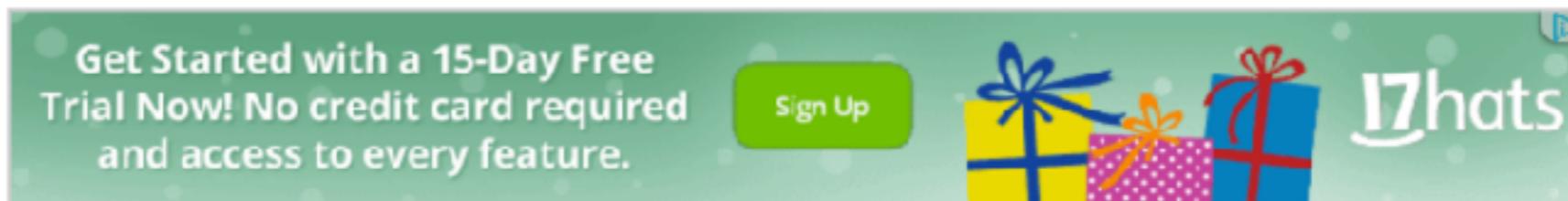
Community metadata

Views 399

Selecting Charts

The Data Visualisation Catalogue

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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



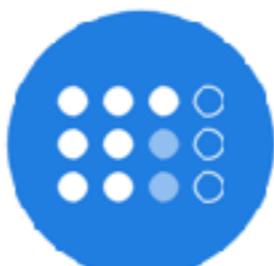
Connection Map



Donut Chart



Dot Map



Dot Matrix Chart



Flow Map



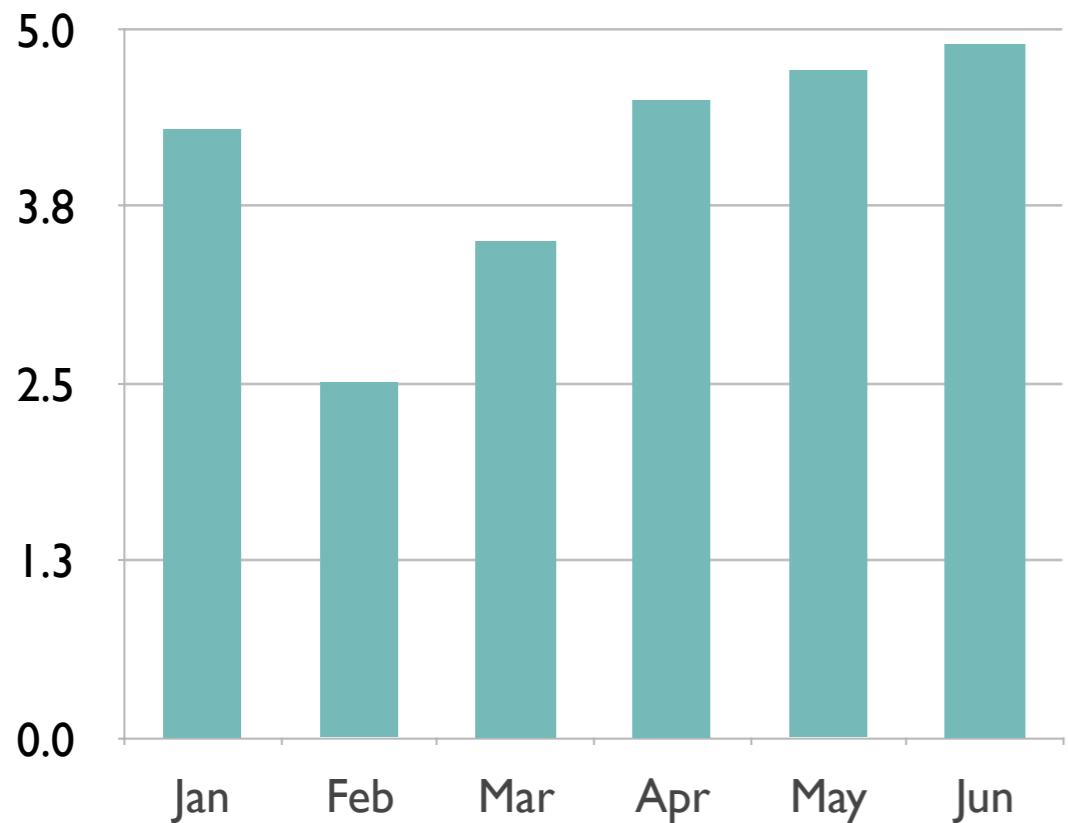
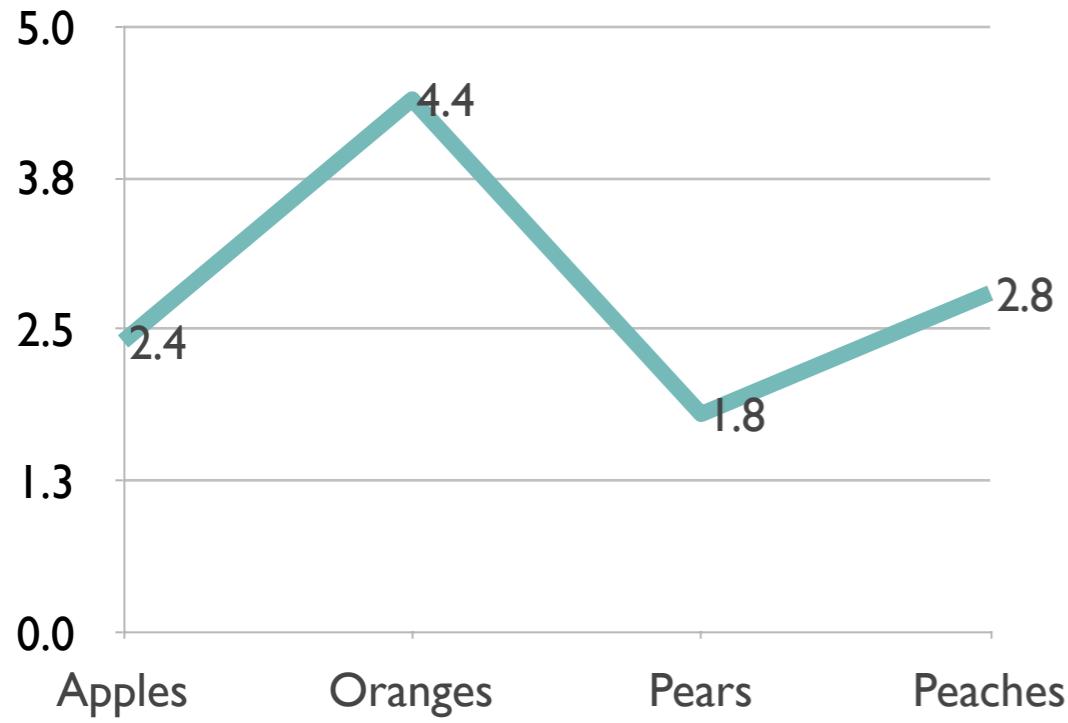
Histogram



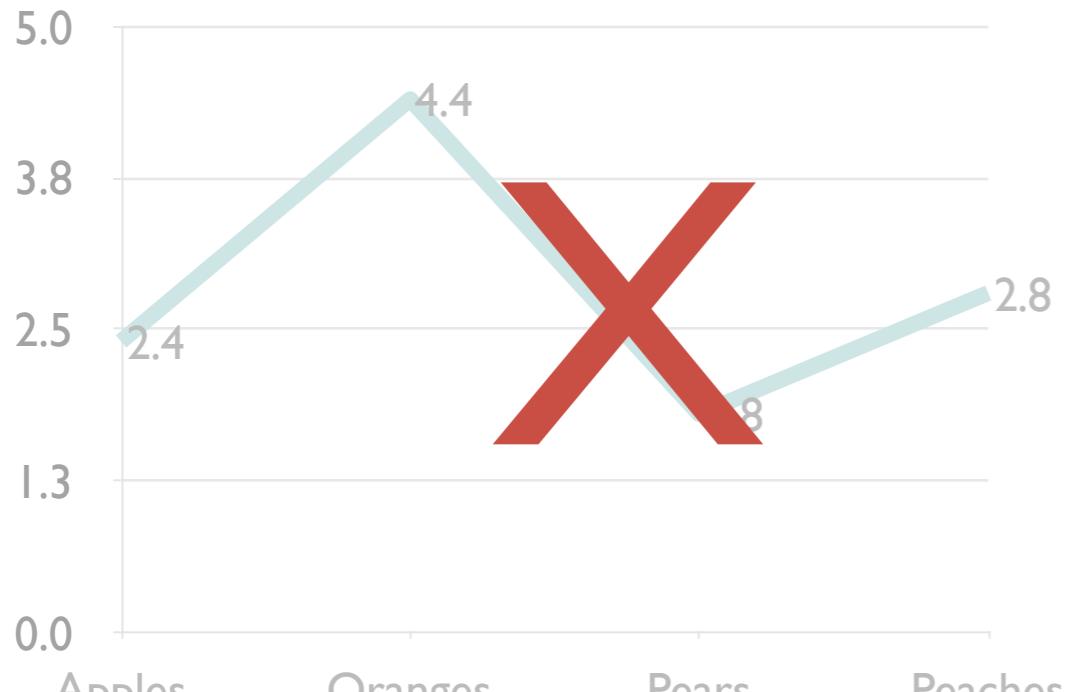
Illustration Diagram

Graph Basics

Type of Data



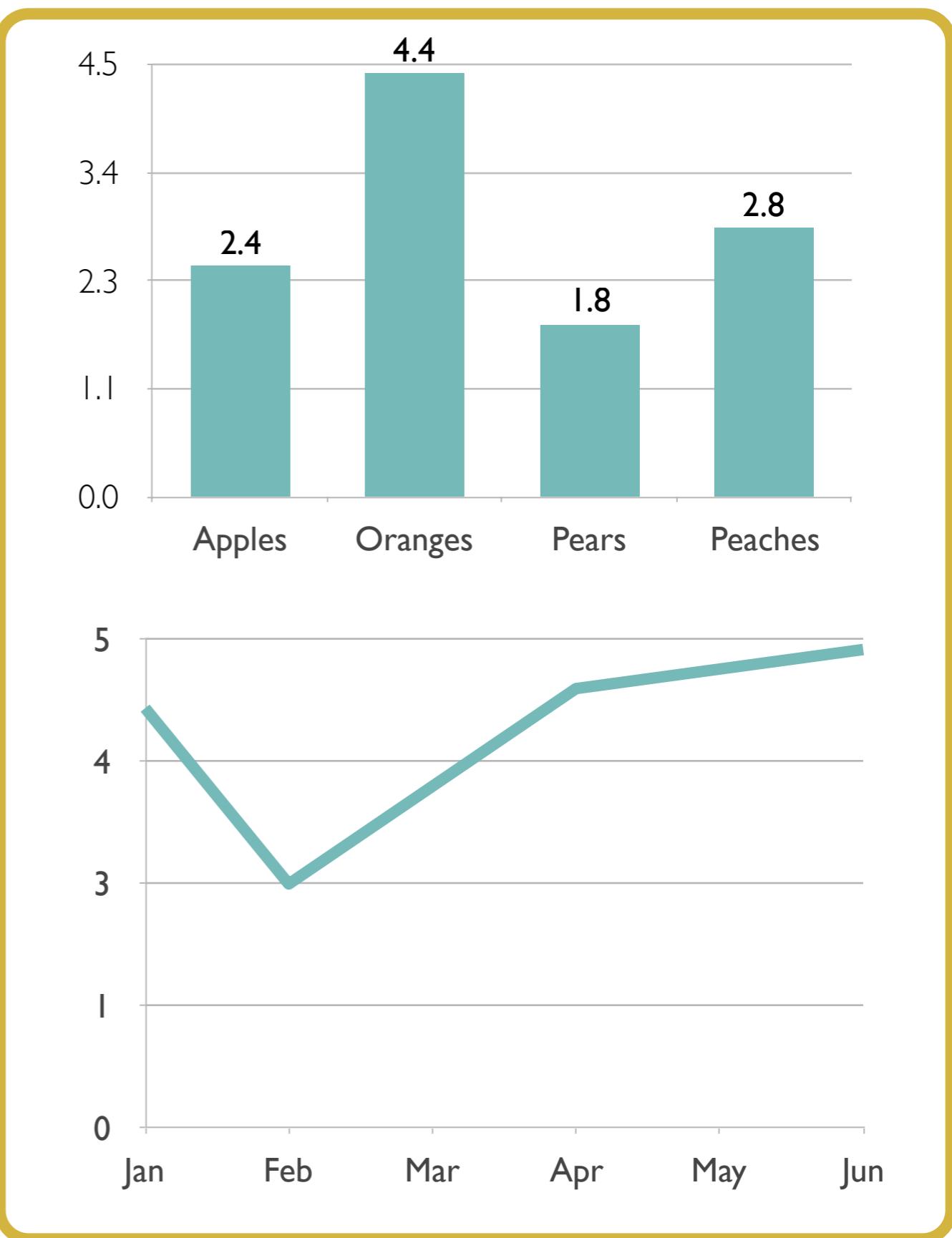
Type of Data



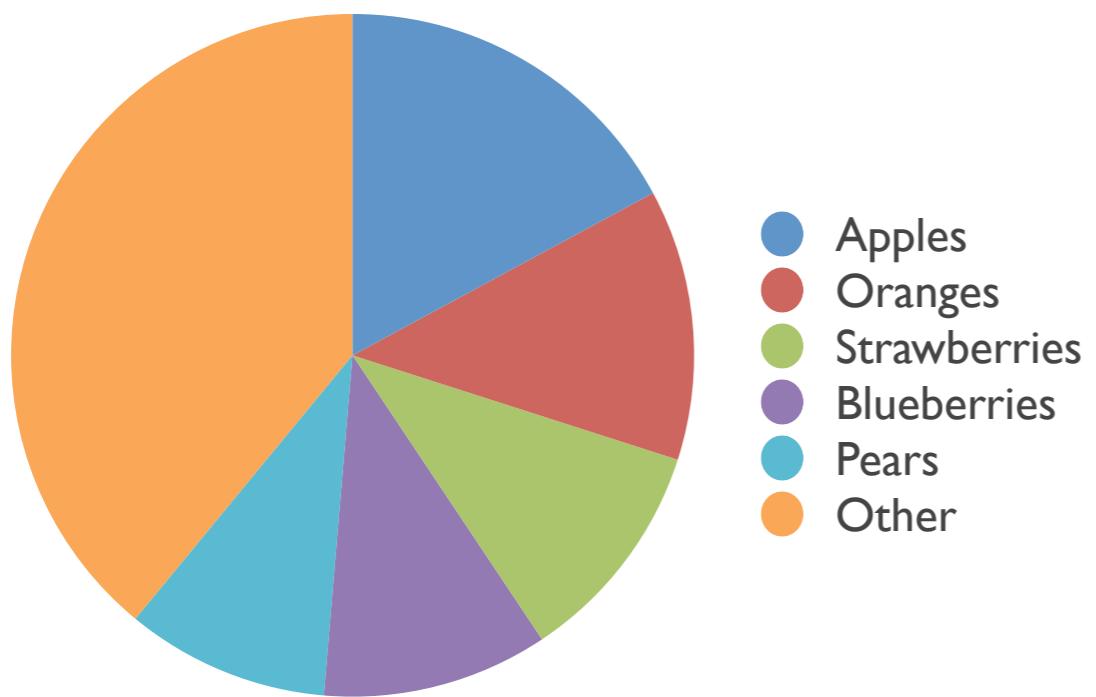
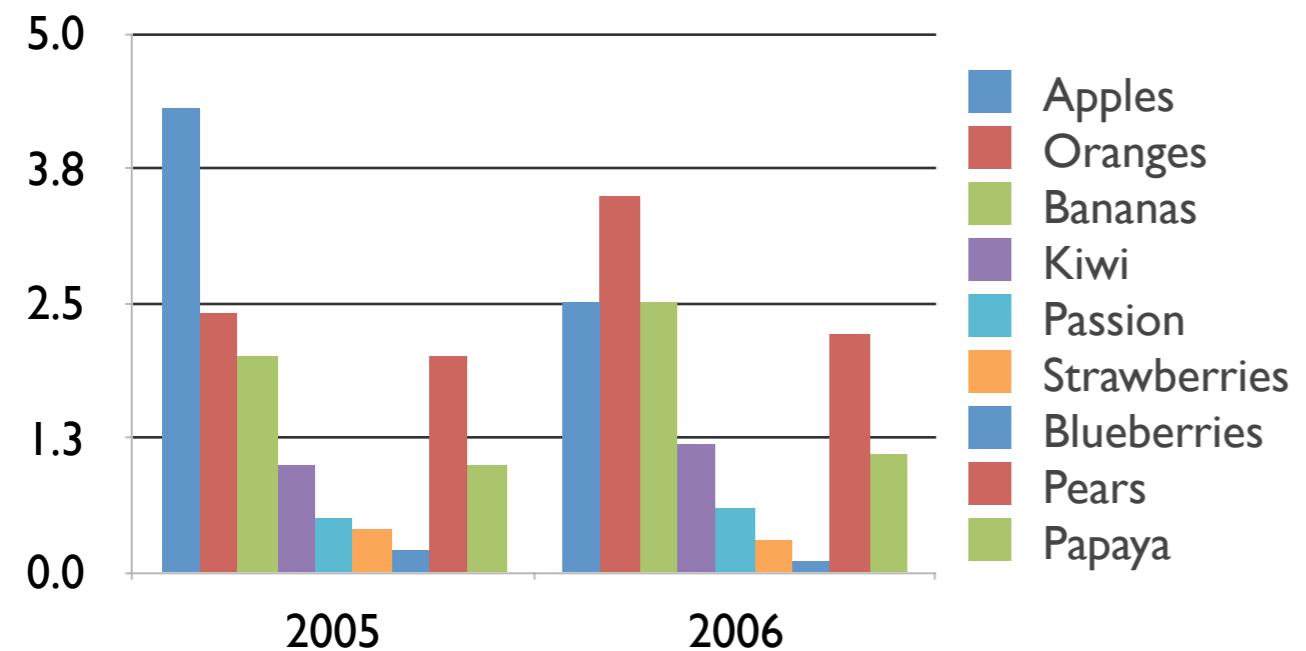
VS



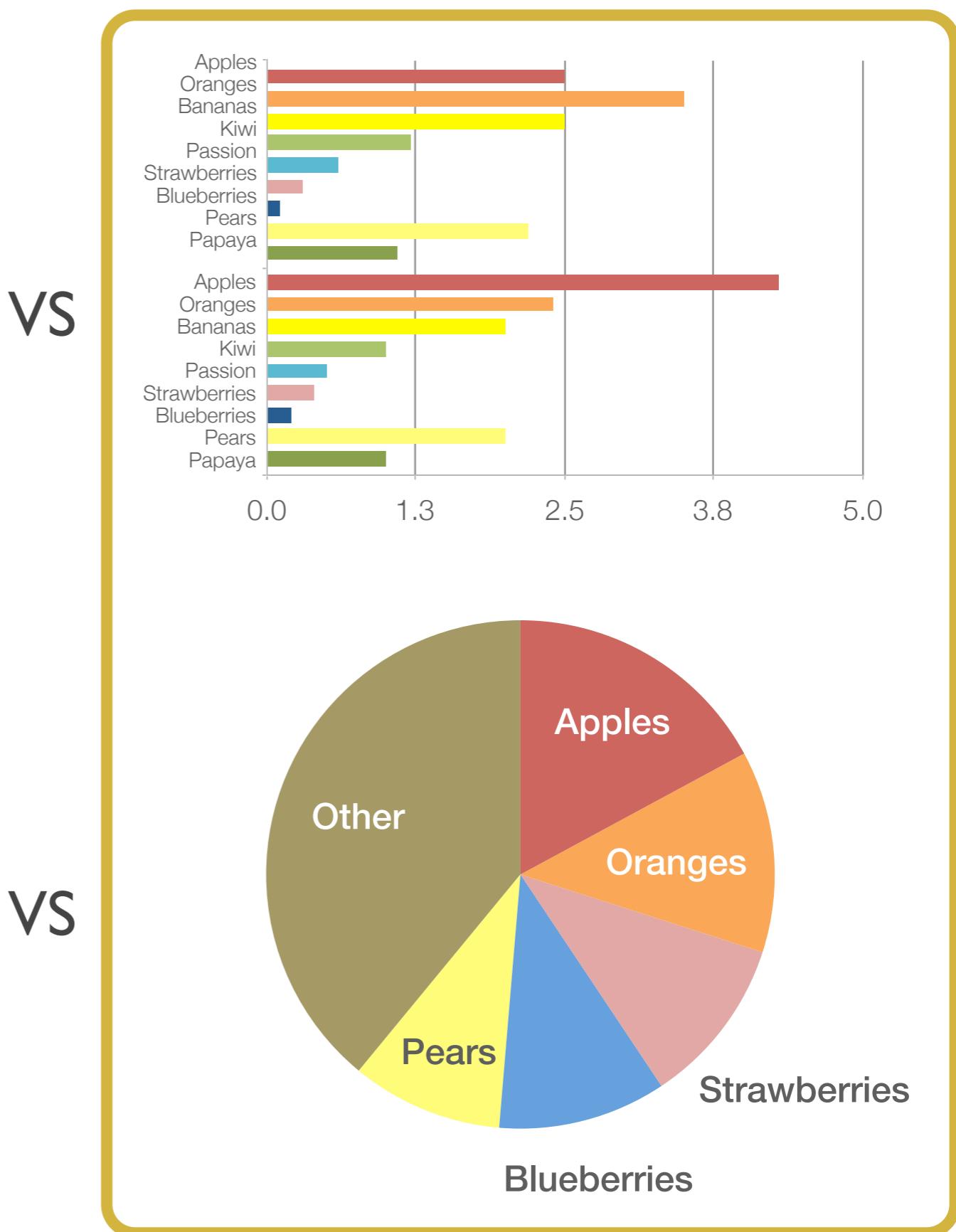
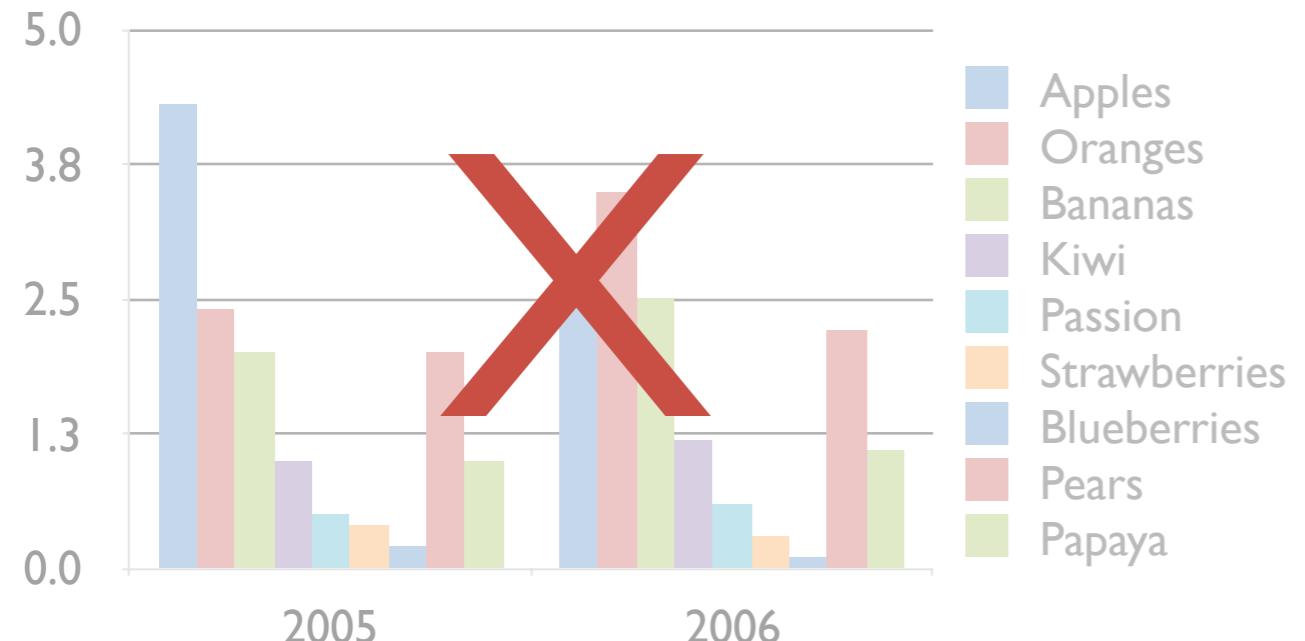
VS



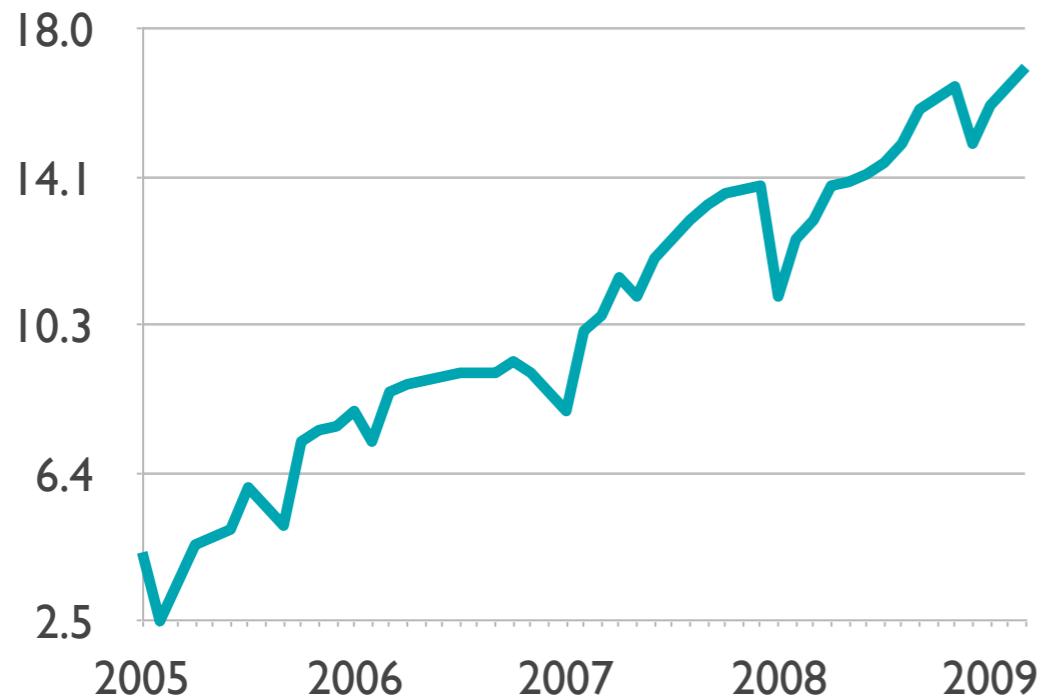
Legends



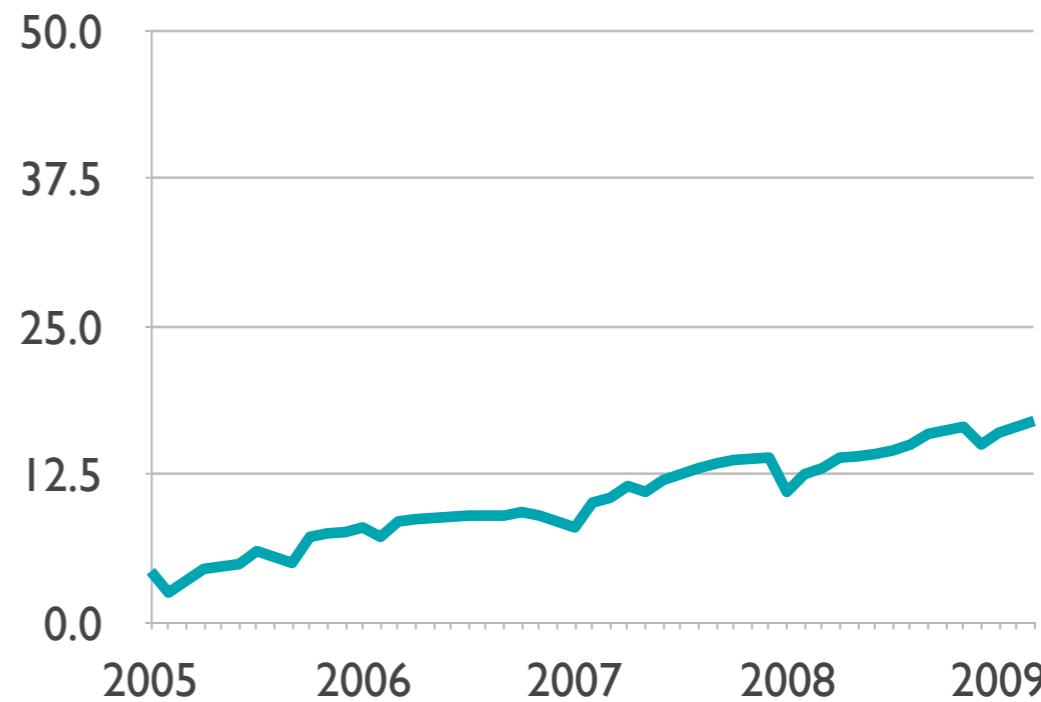
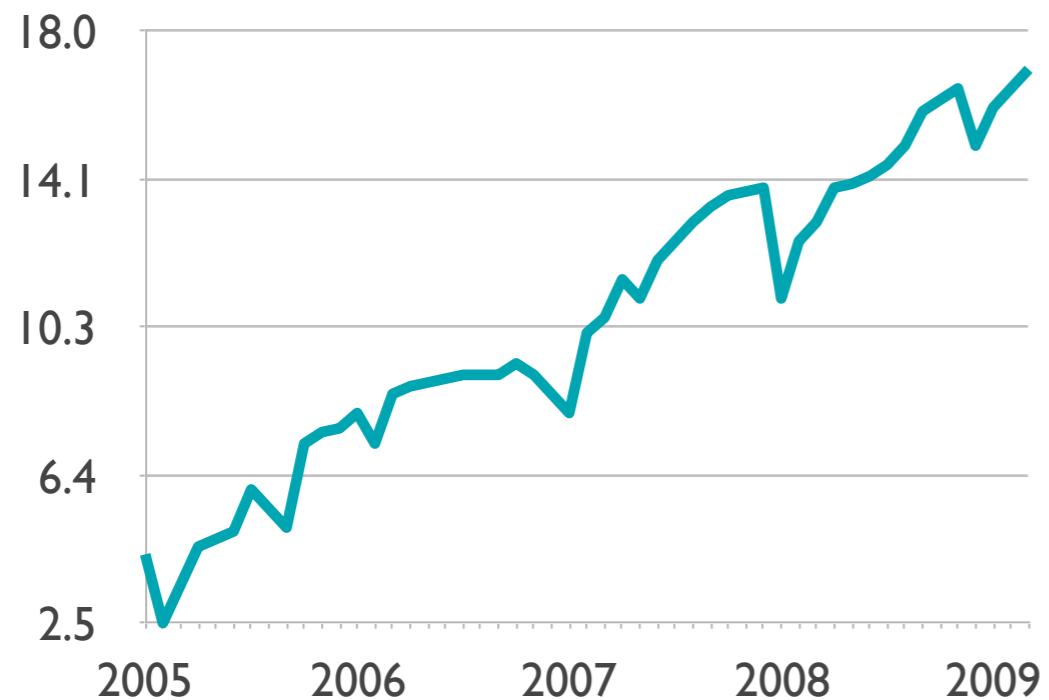
Legends



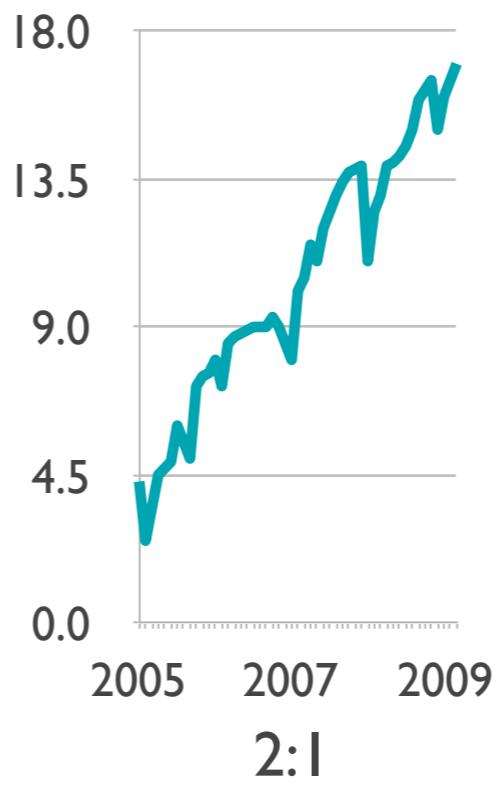
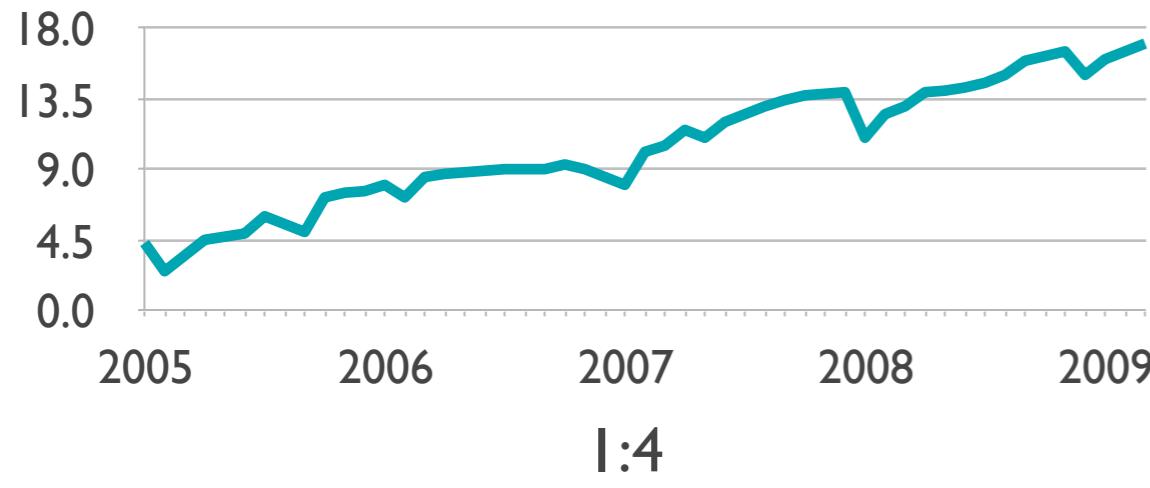
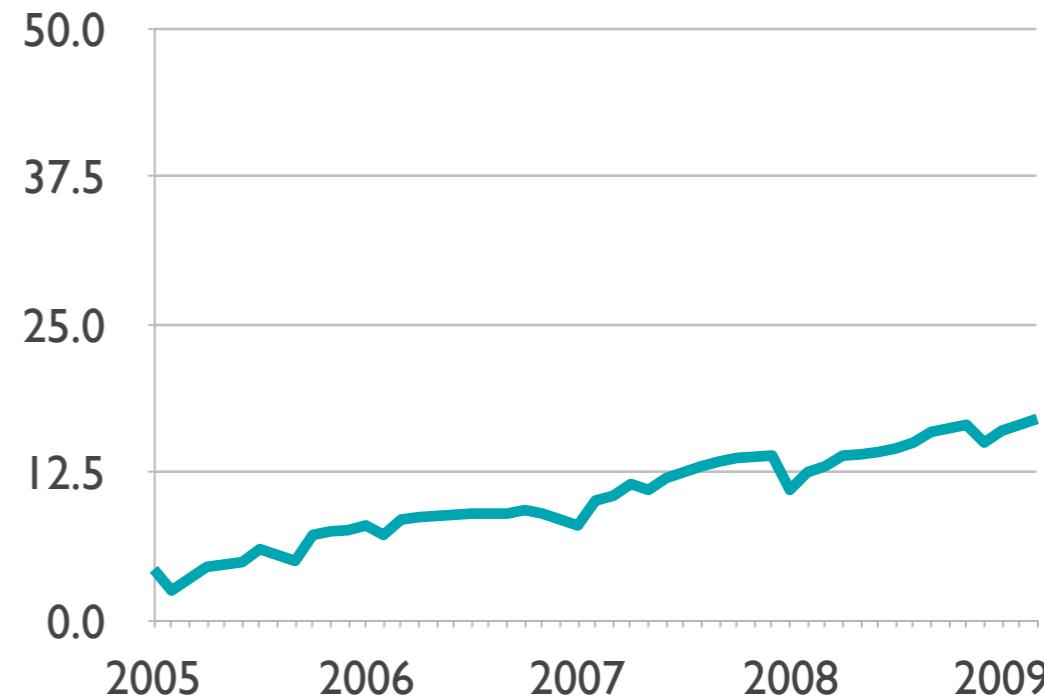
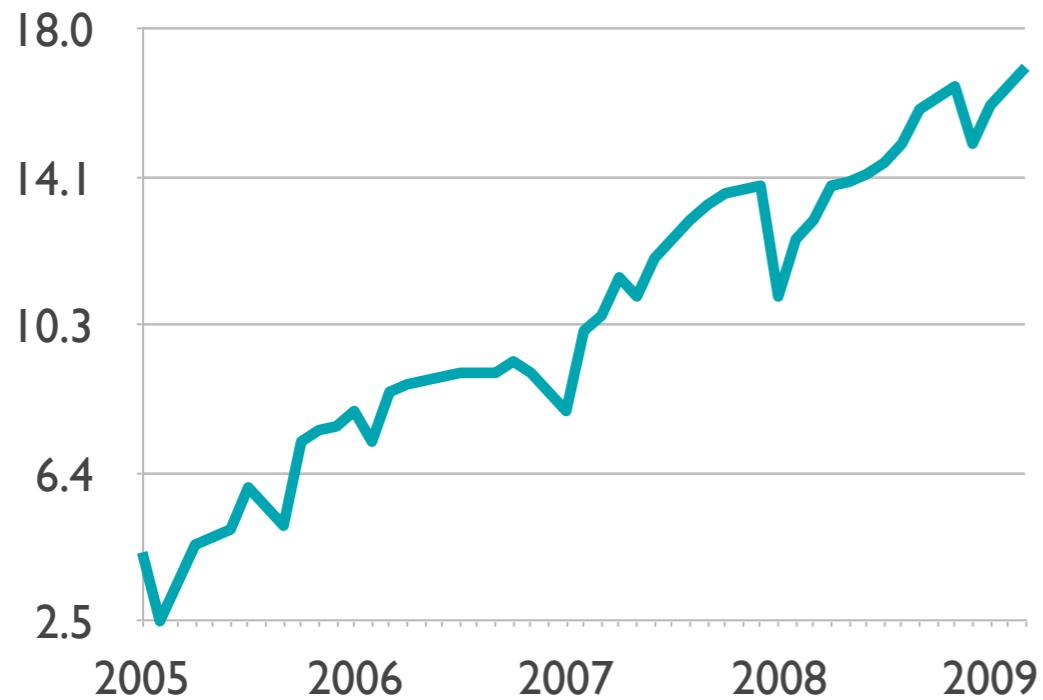
Range & Scale



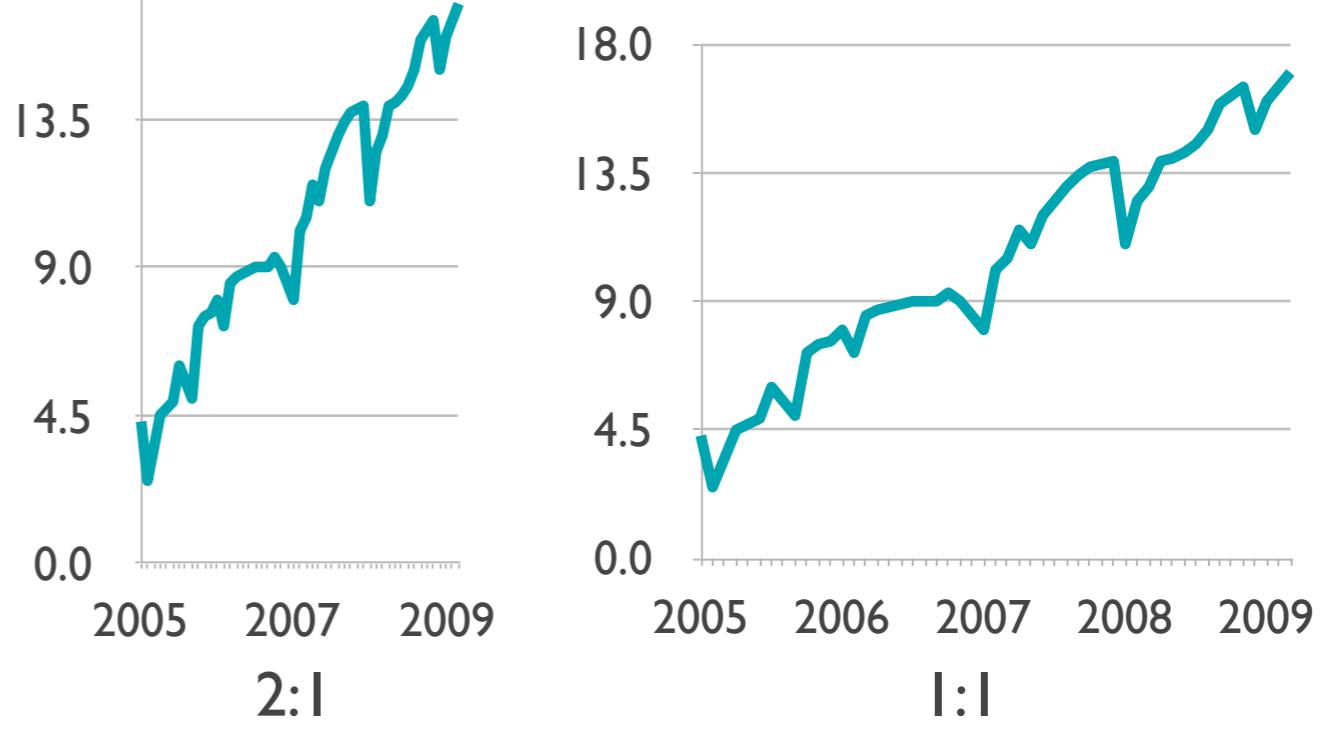
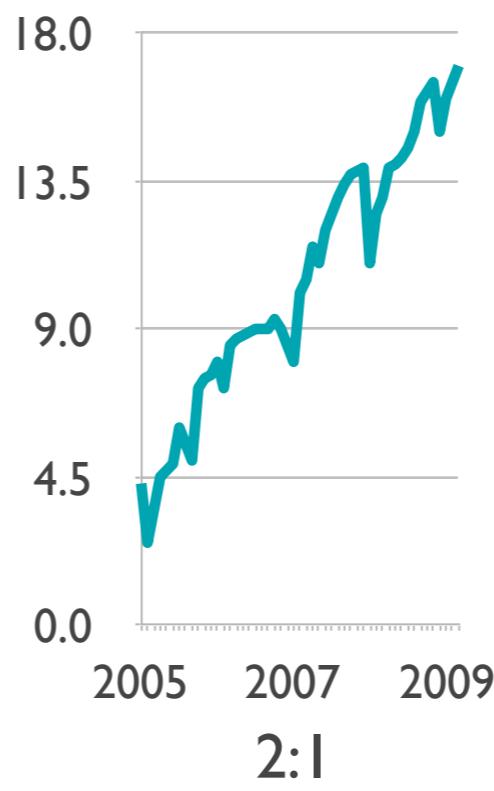
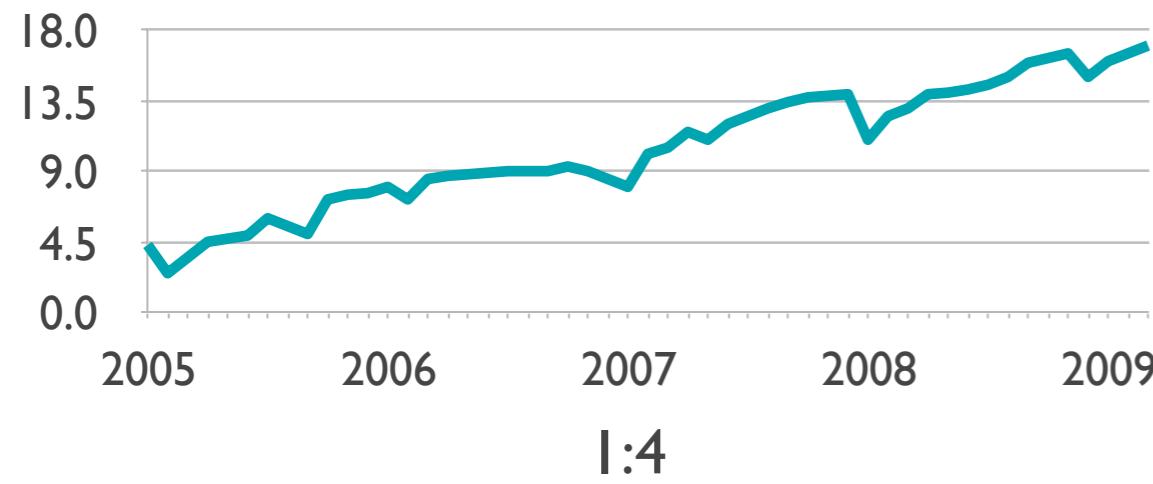
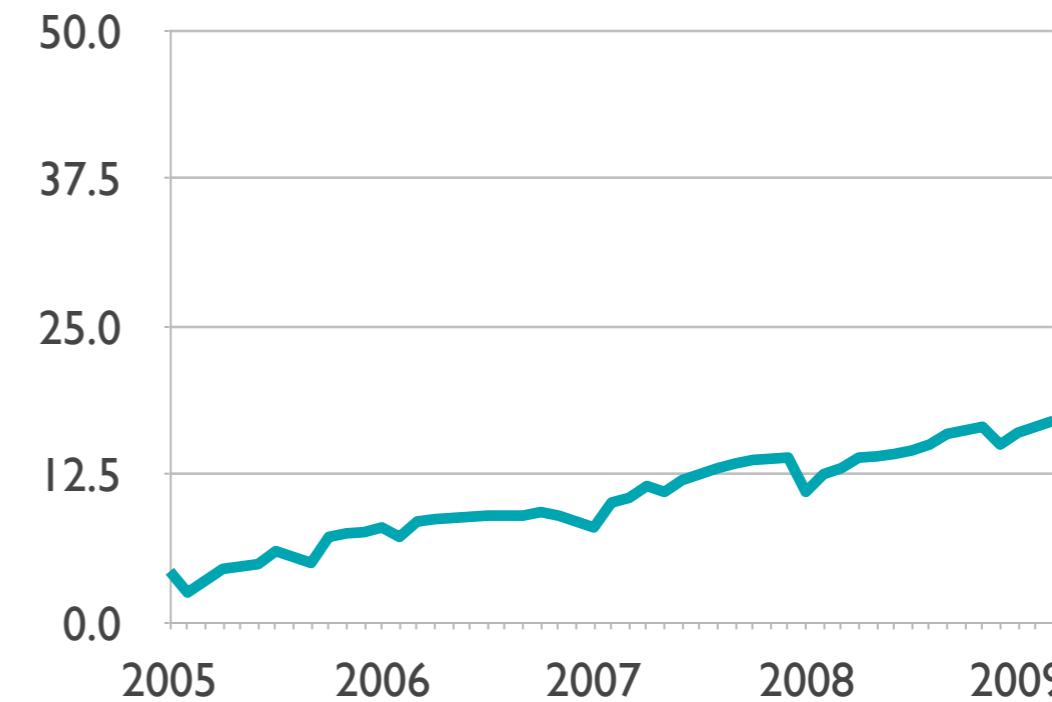
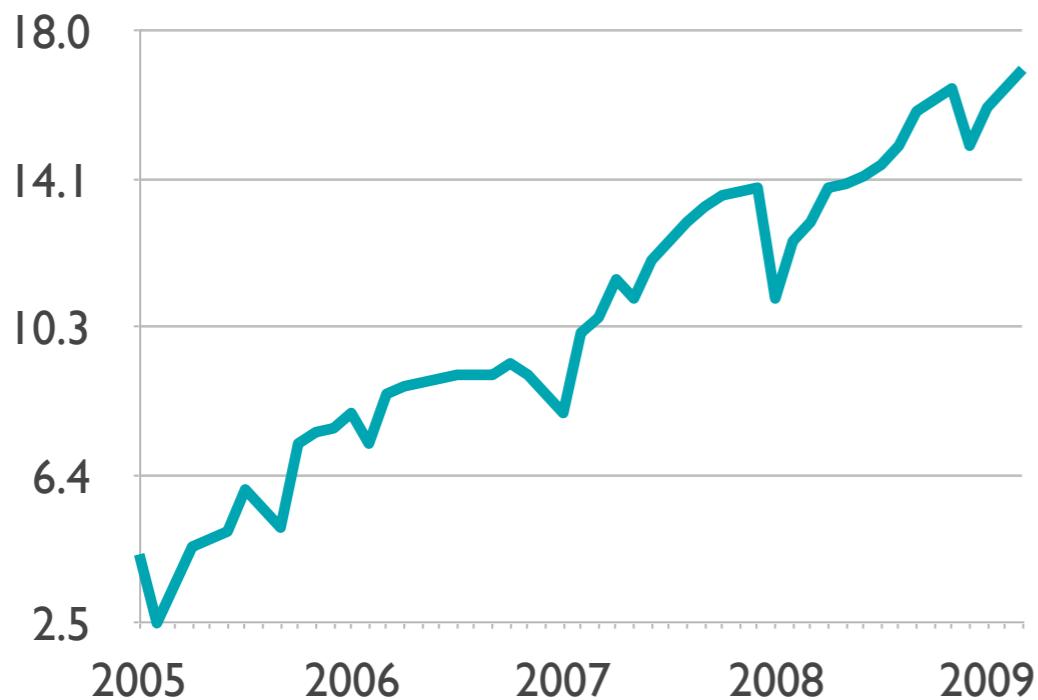
Range & Scale



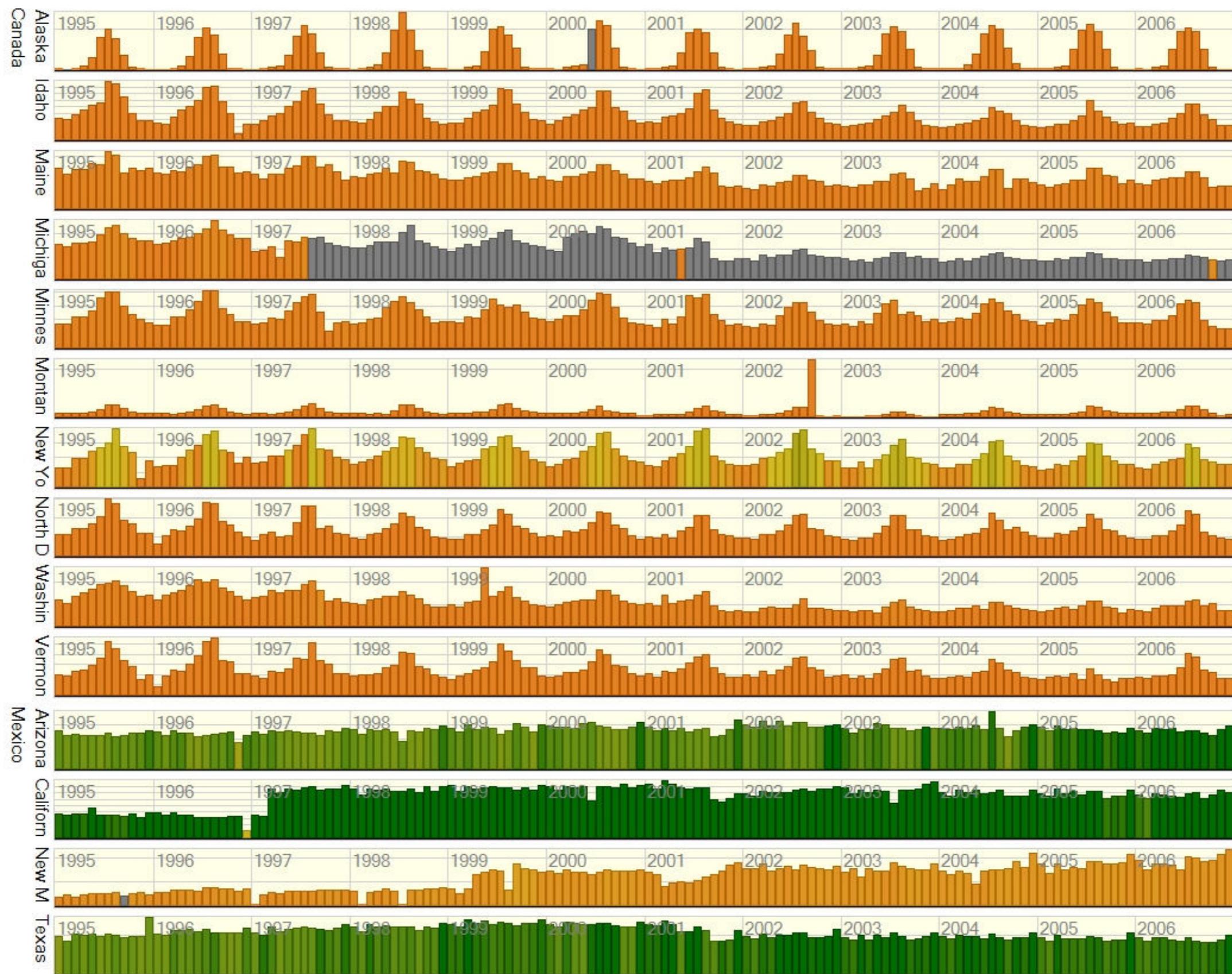
Range & Scale



Range & Scale

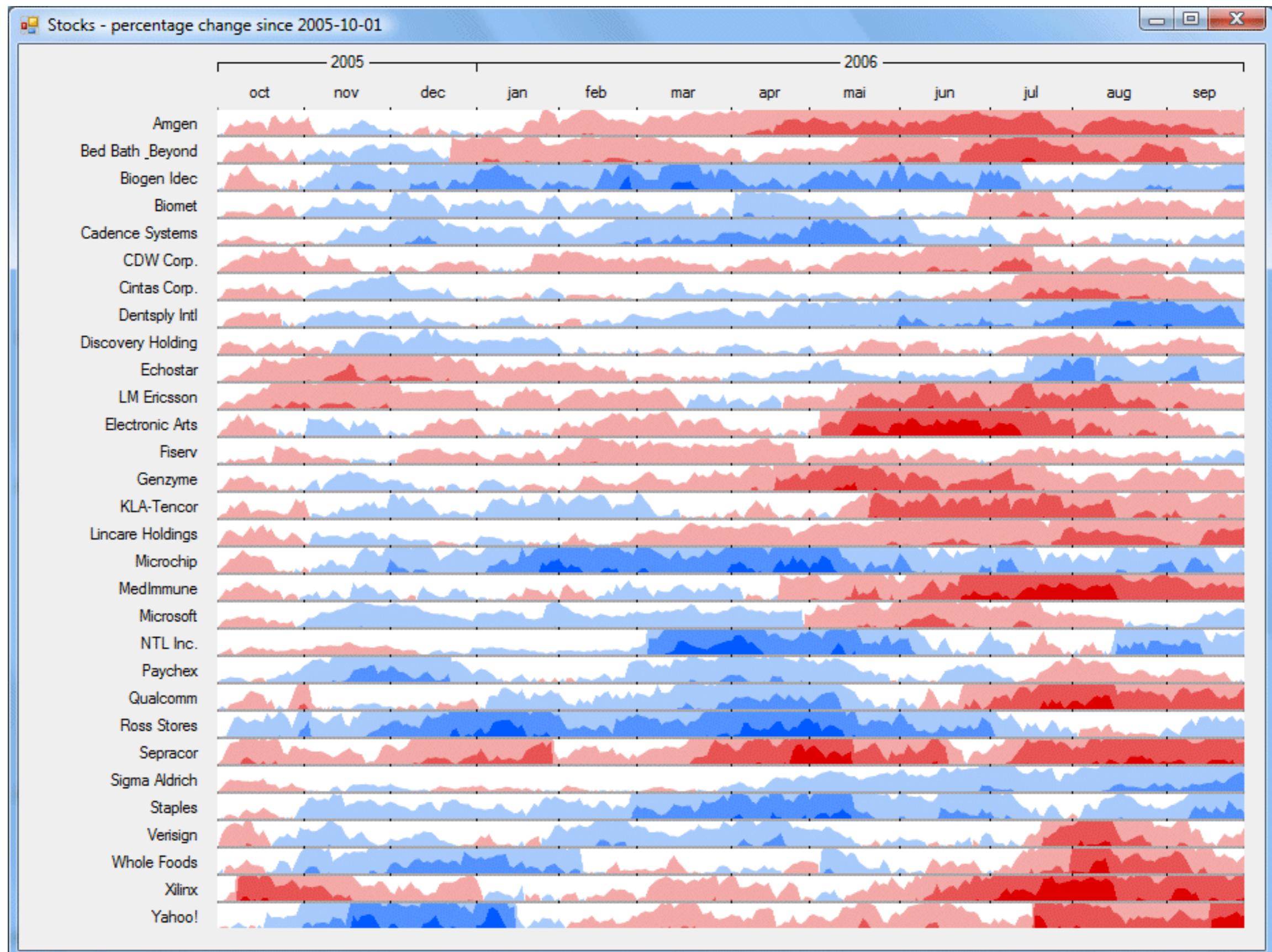


Amount of Data



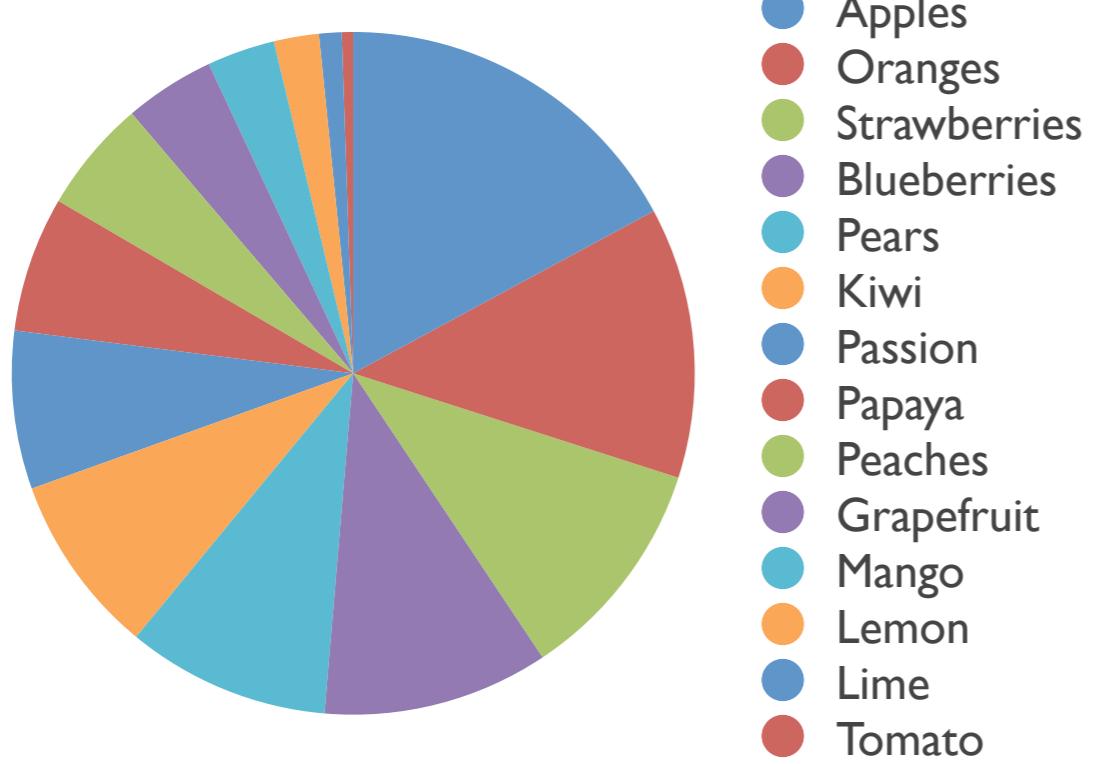
Source: Panopticon

Amount of Data

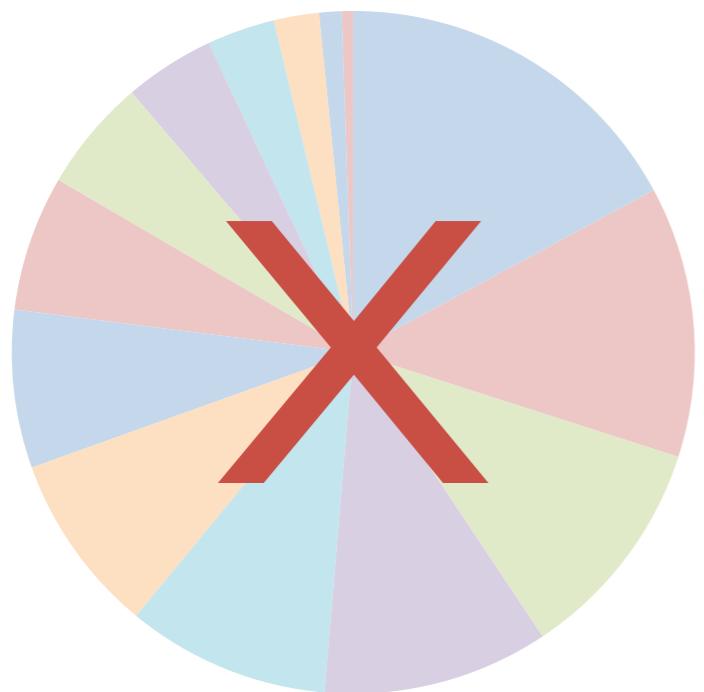


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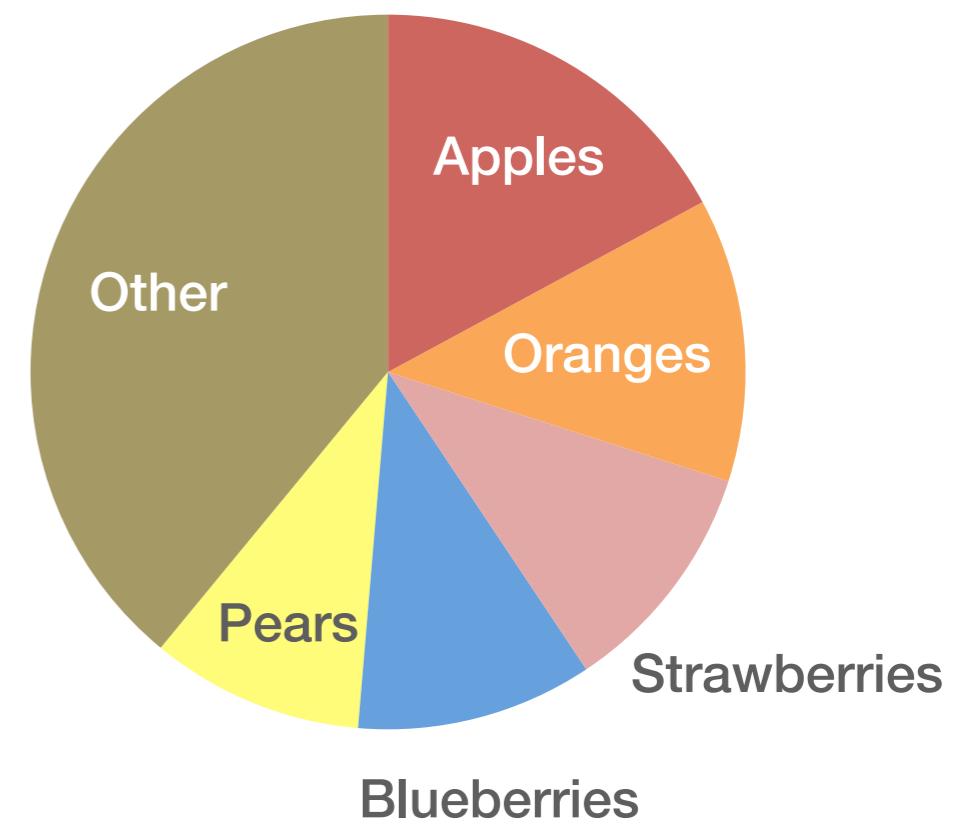


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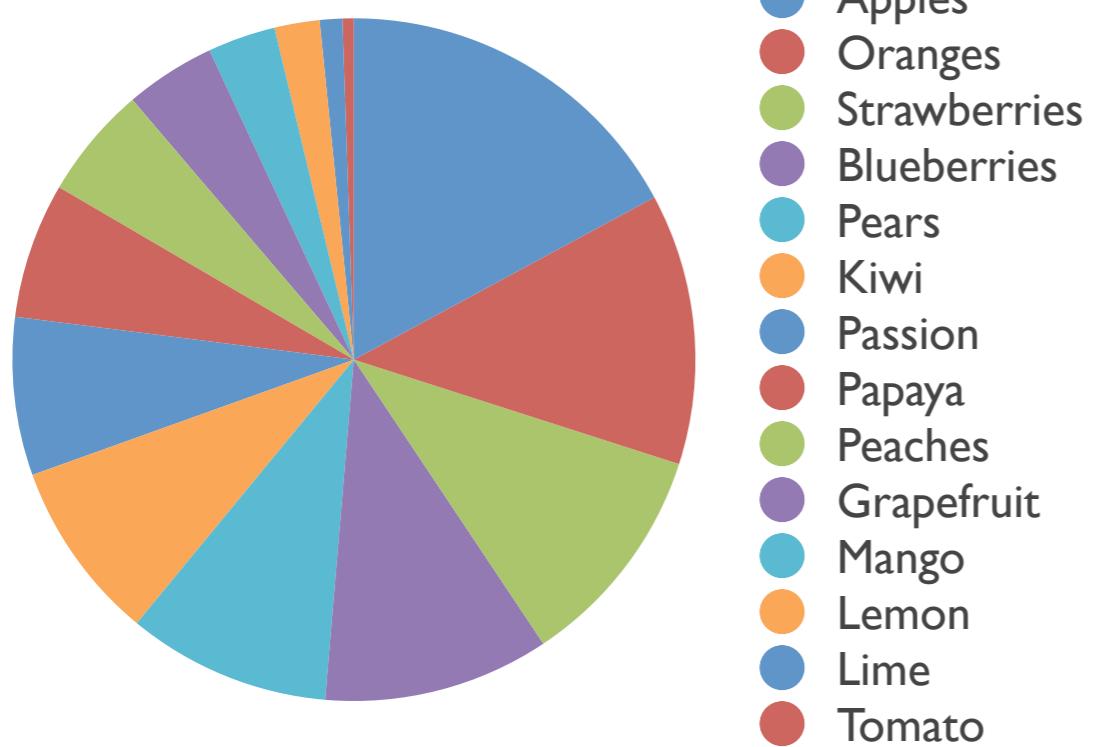


- Apples
- Oranges
- Strawberries
- Blueberries
- Pears
- Kiwi
- Passion
- Papaya
- Peaches
- Grapefruit
- Mango
- Lemon
- Lime
- Tomato

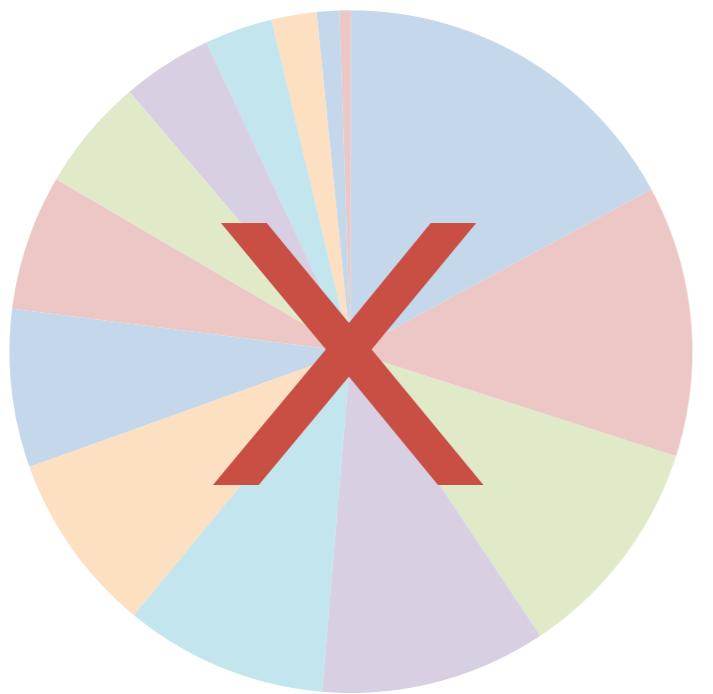
VS



Amount of Data

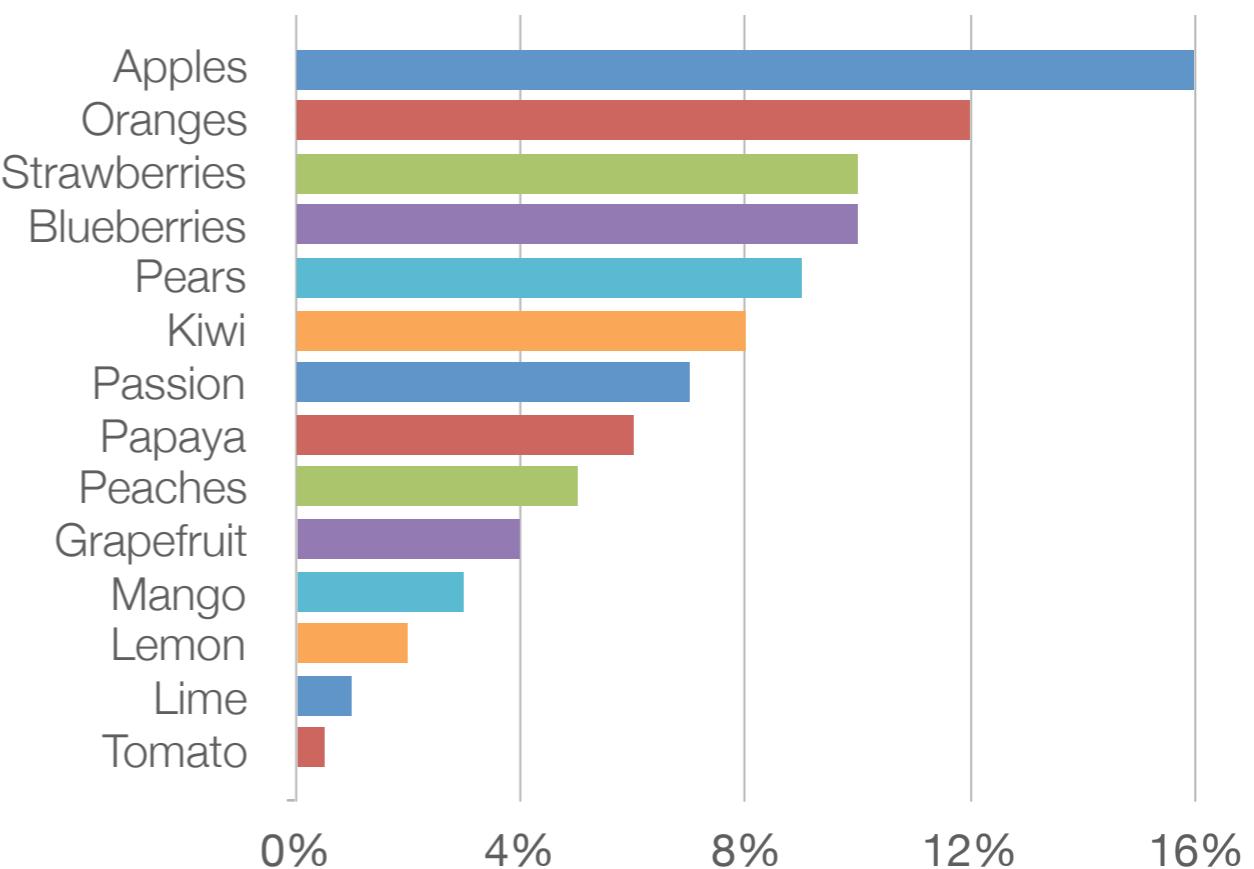


Amount of Data



- Apples
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- Peaches
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- Lime
- Tomato

VS



Amount of Data

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

VIEW DATA: [Totals](#)

[Definition](#)

[Source](#)

[!\[\]\(e83b2296dc4c9009963f494078a8a780_img.jpg\) Printable version](#)

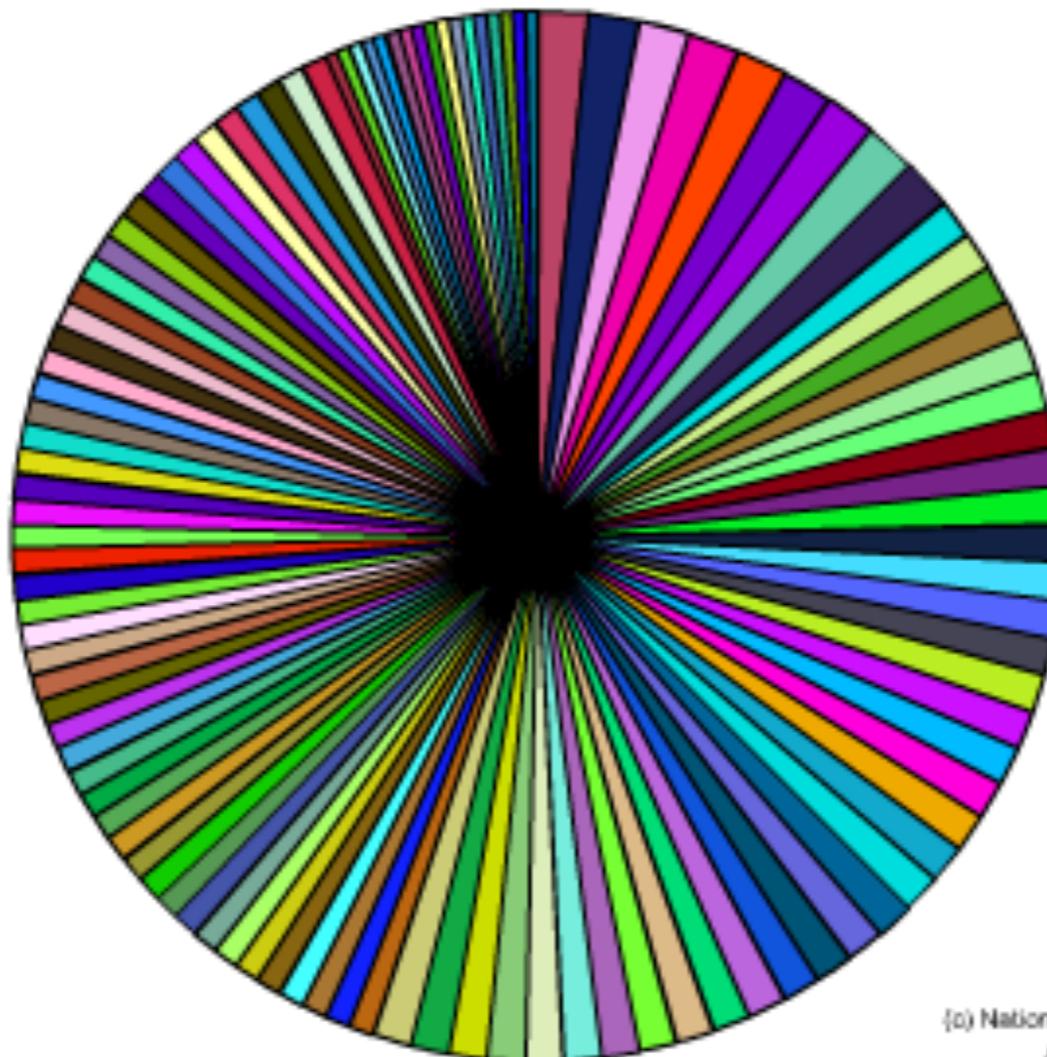
[Bar Graph](#)

[Pie Chart](#)

[Map](#)

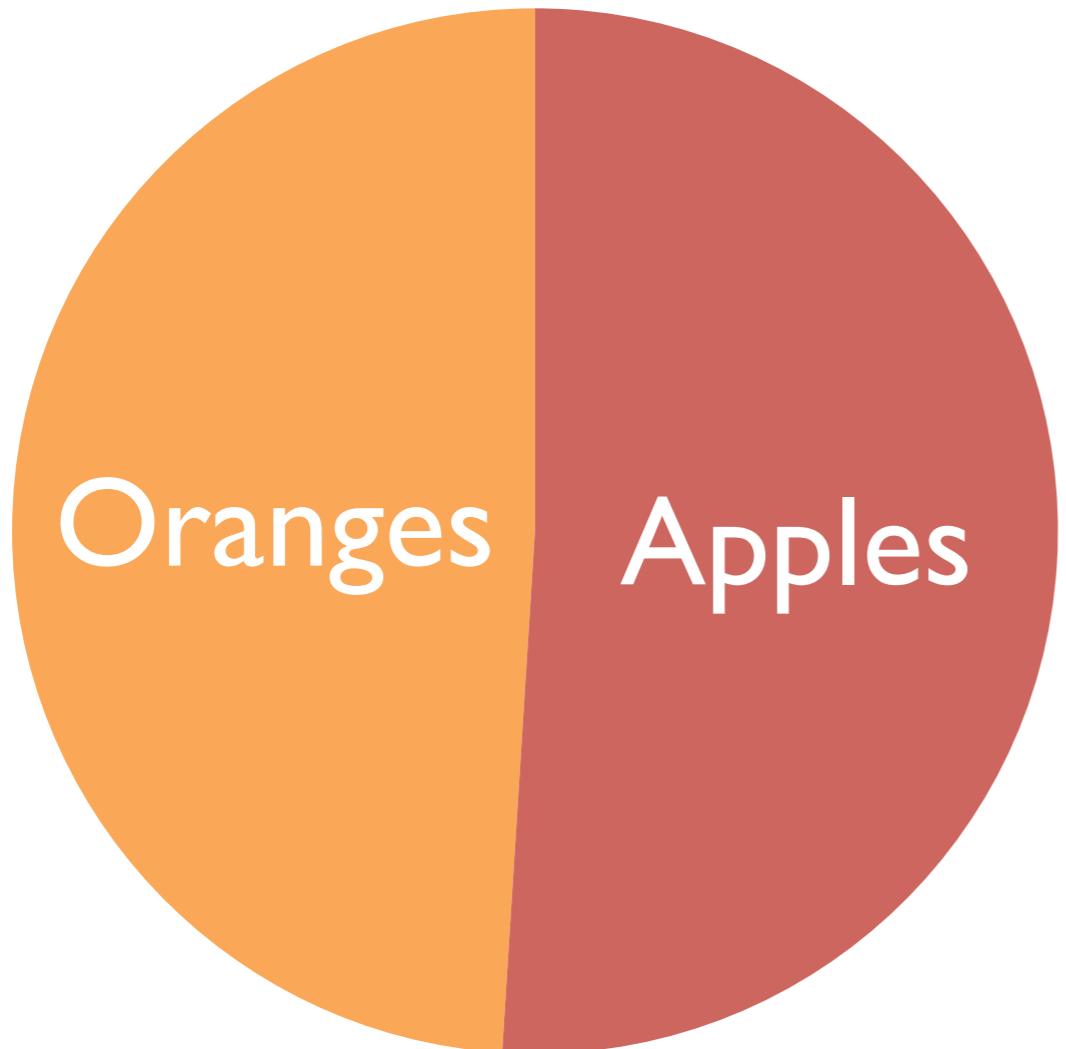
[Correlations](#)

Showing latest available data.

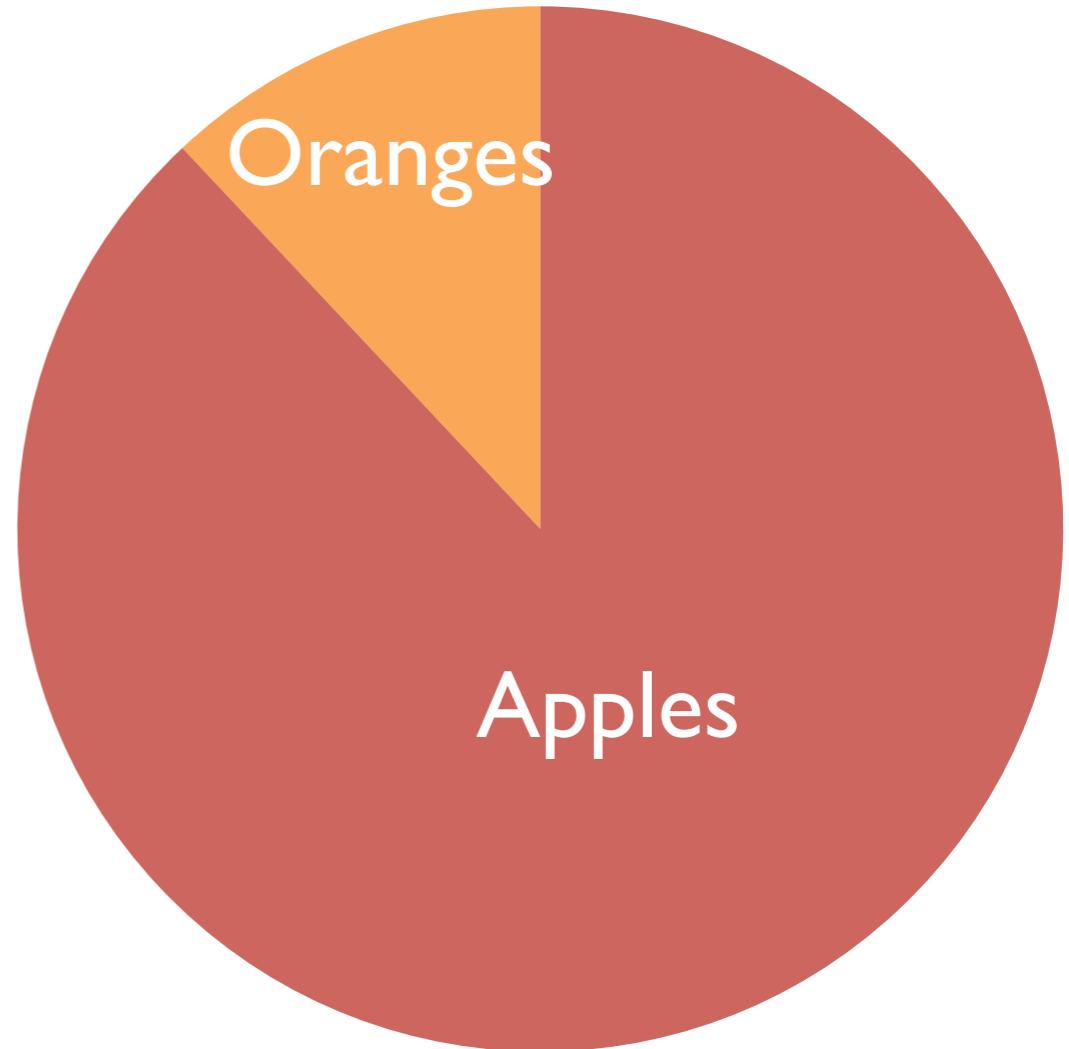
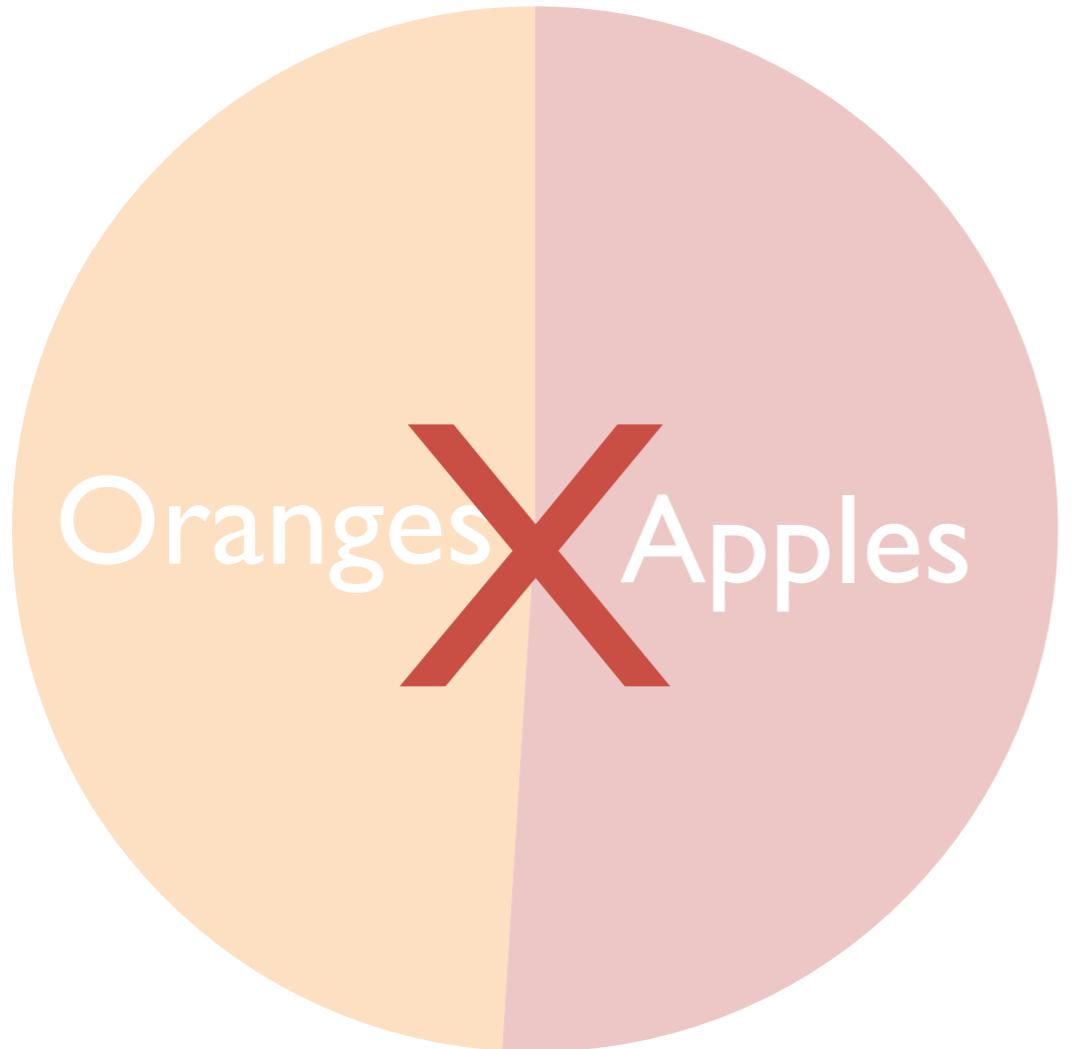


Mongolia	1.5%
China	1.4%
Kenya	1.4%
Cambodia	1.4%
Namibia	1.4%
Armenia	1.4%
Tonga	1.3%
Romania	1.3%
Tunisia	1.3%
Nauru	1.3%
Kazakhstan	1.3%
Kyrgyzstan	1.3%
Albania	1.3%
Yemen	1.3%
Turkey	1.3%
Guinea	1.3%
Indonesia	1.3%
Niue	1.3%
Djibouti	1.2%
Kiribati	1.2%

Amount of Data



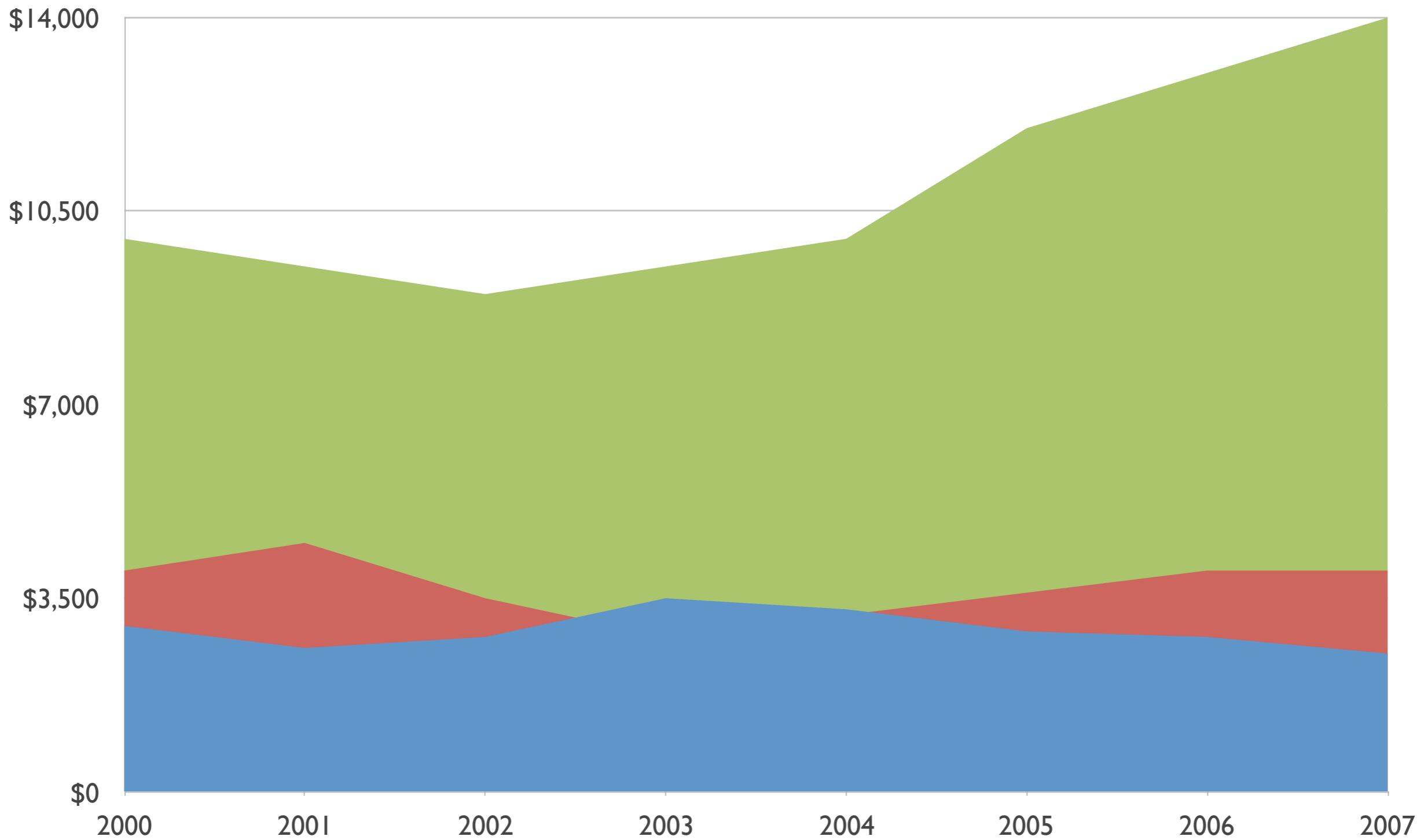
Amount of Data



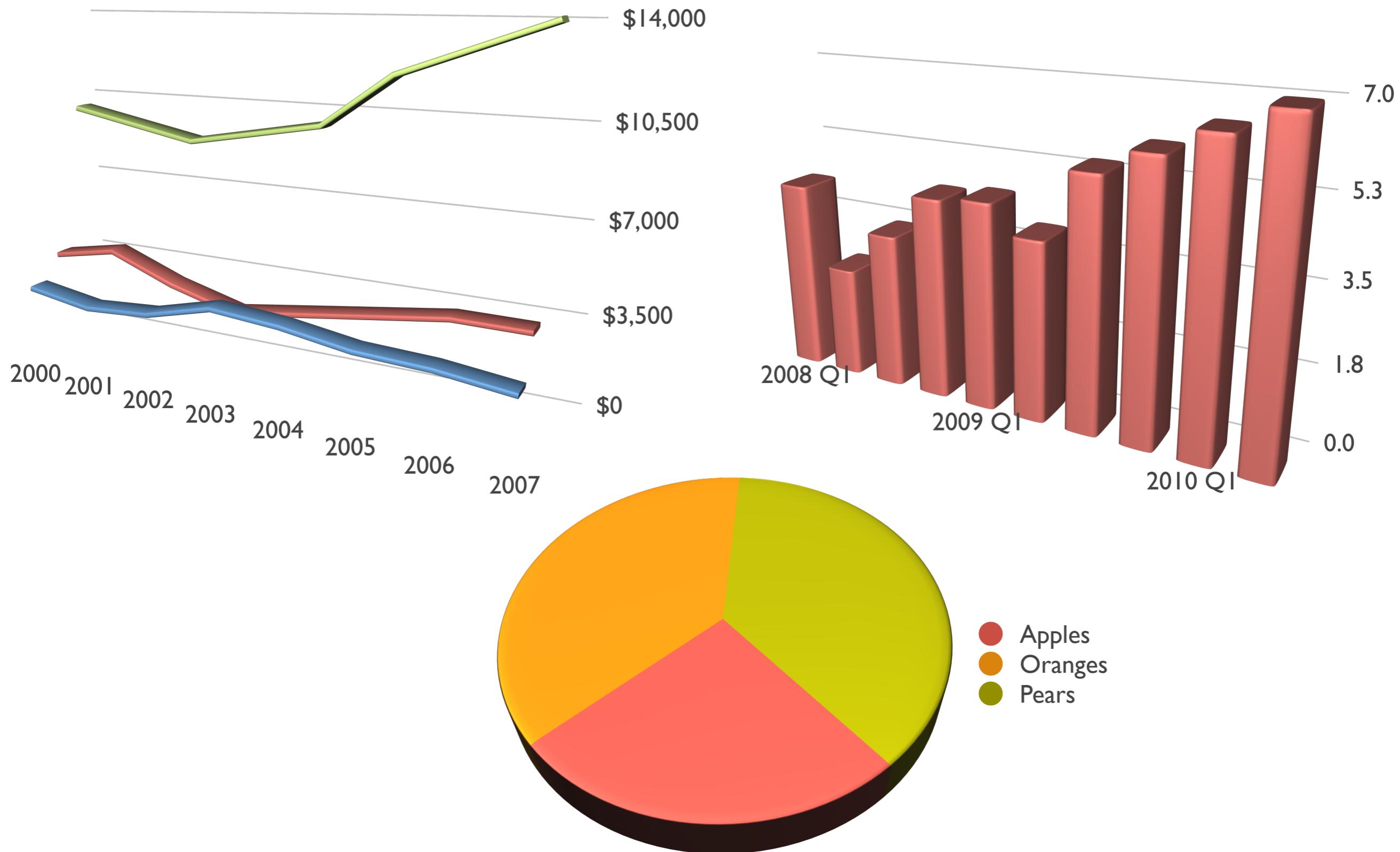
A large pile of ripe red apples with some green and yellow highlights, filling the entire background.

88%

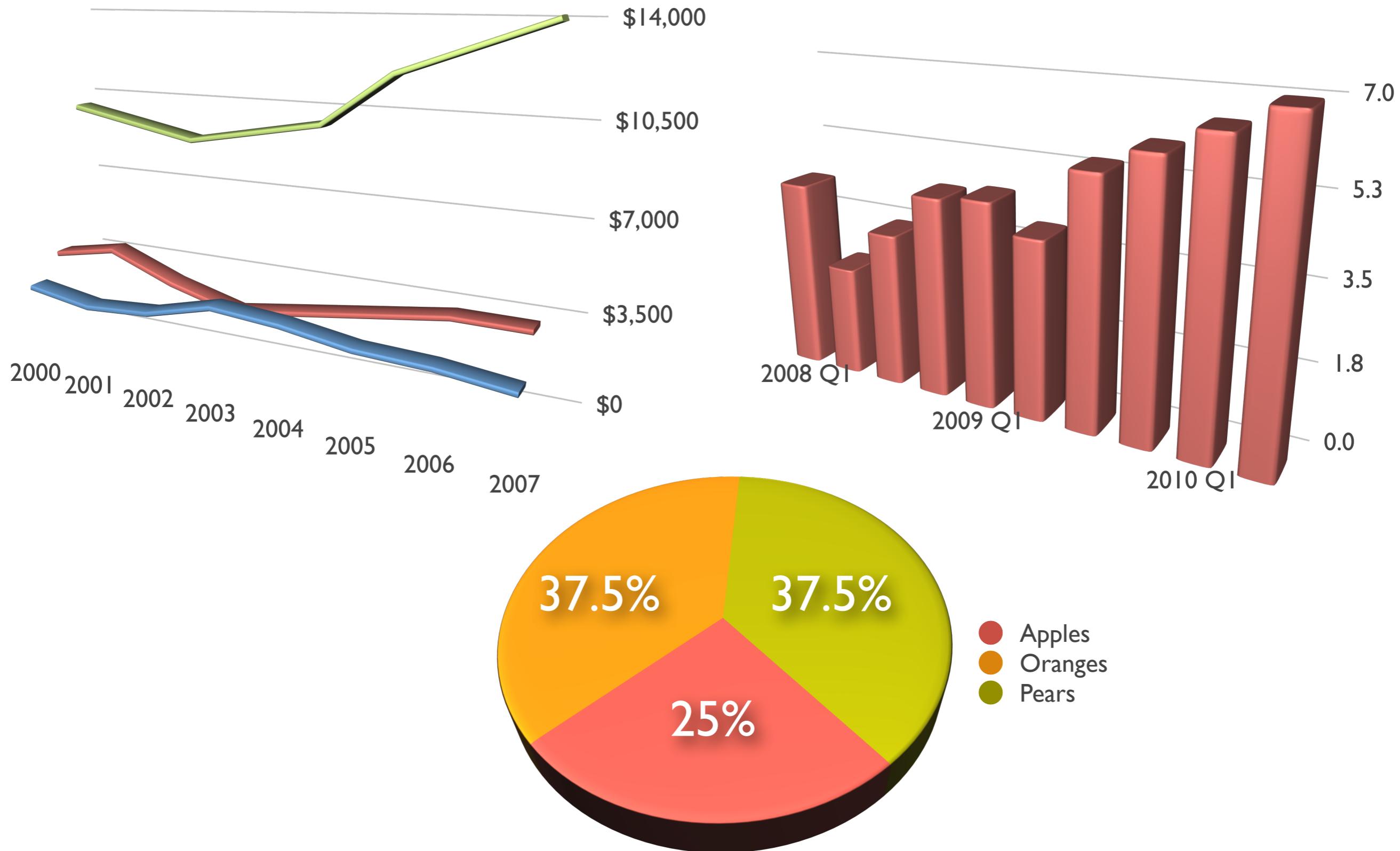
Danger Area



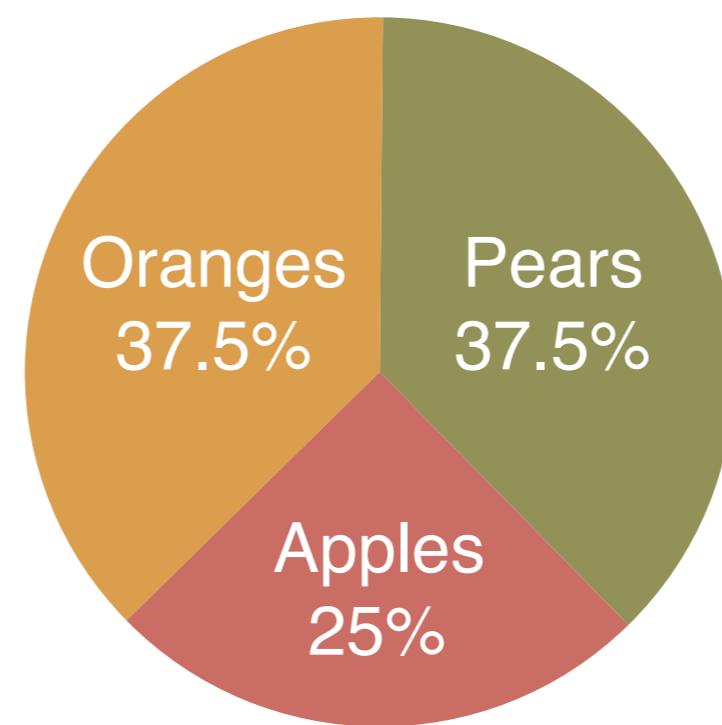
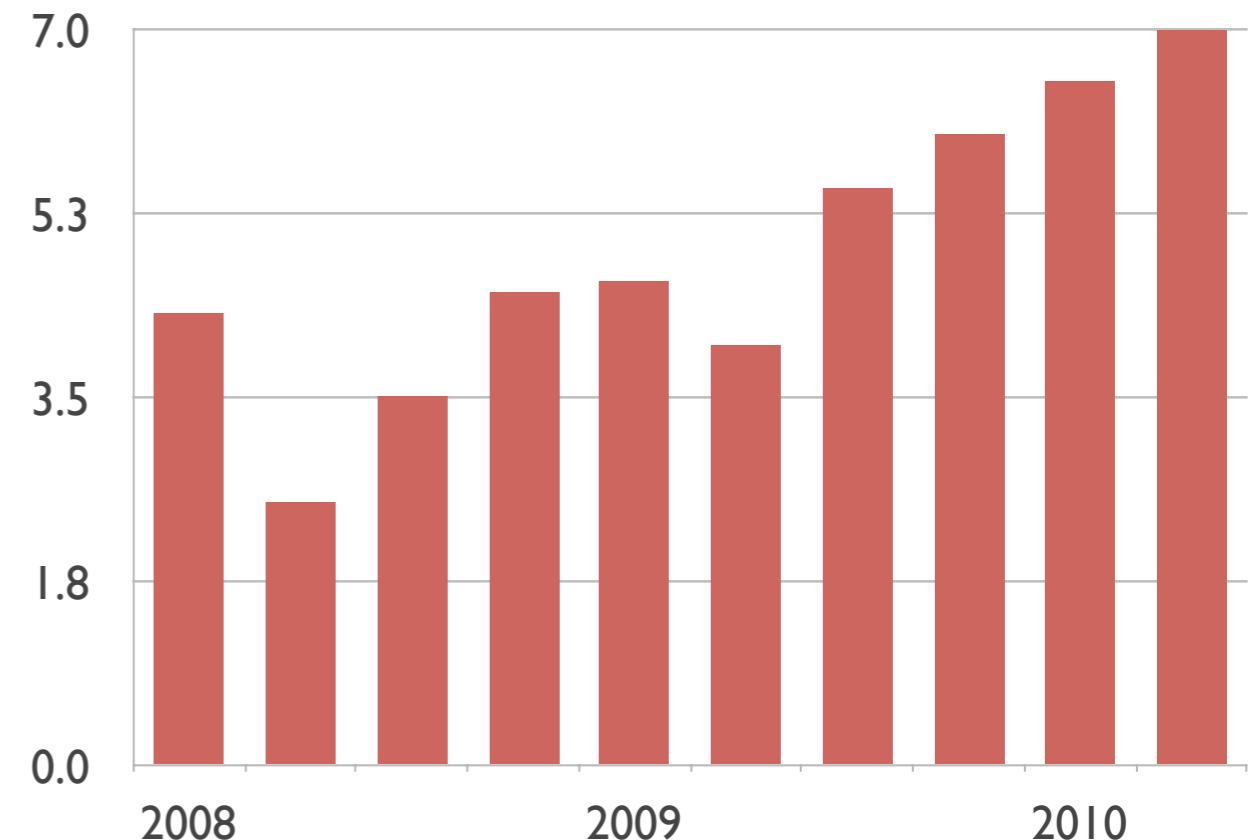
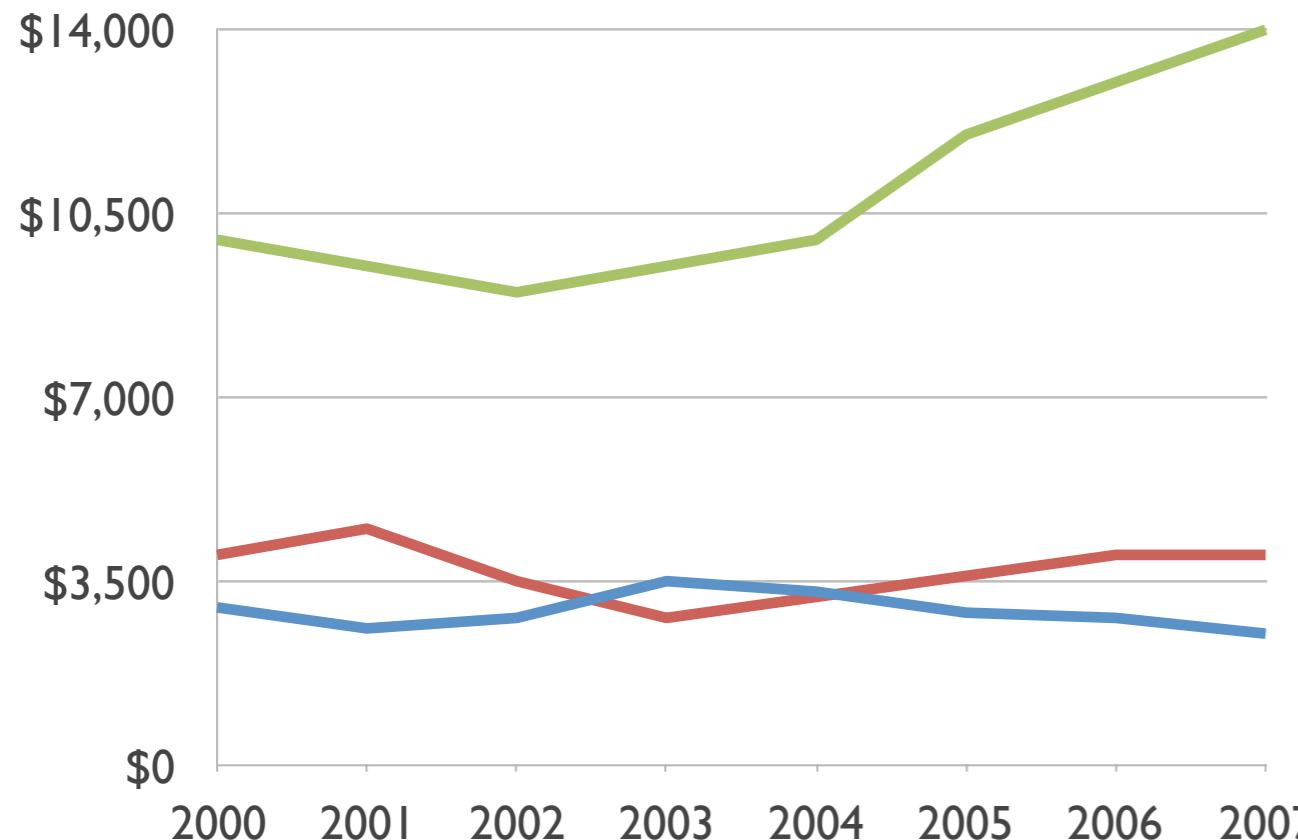
NEVER Use 3D



NEVER Use 3D



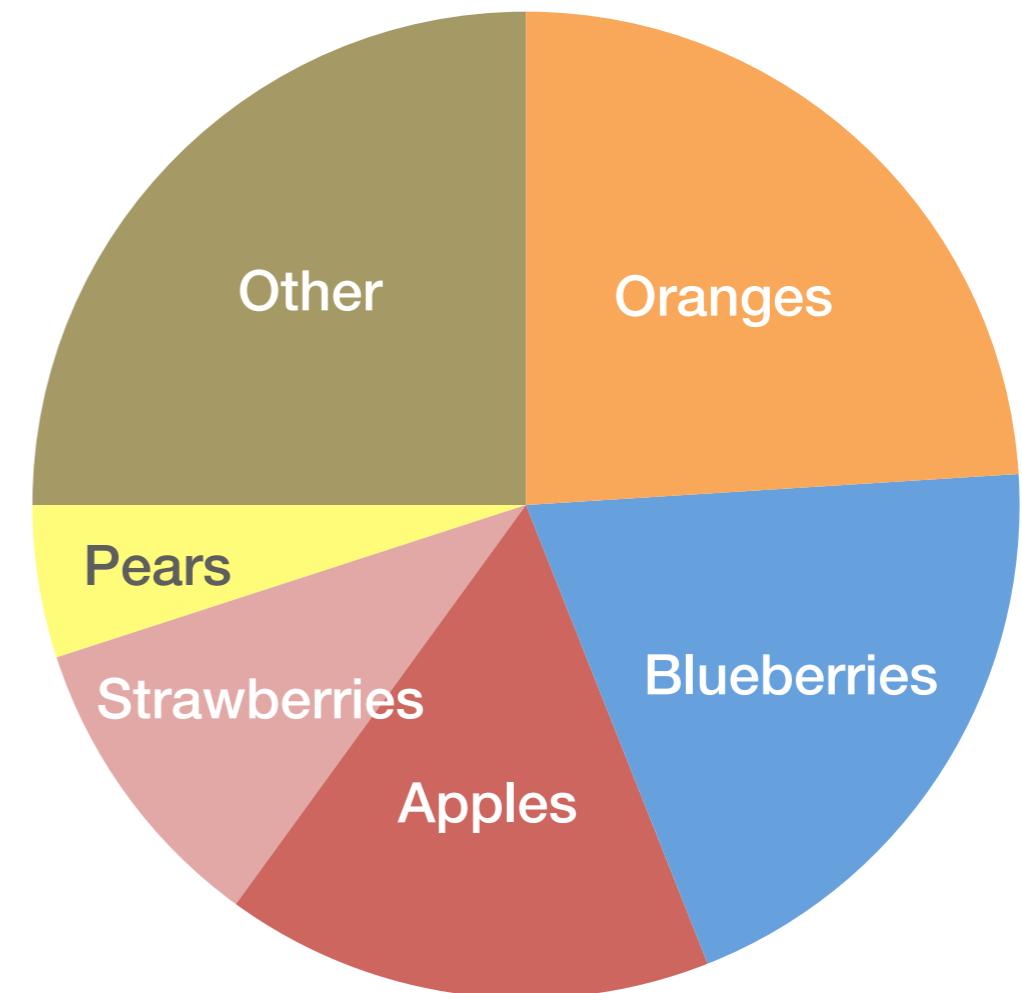
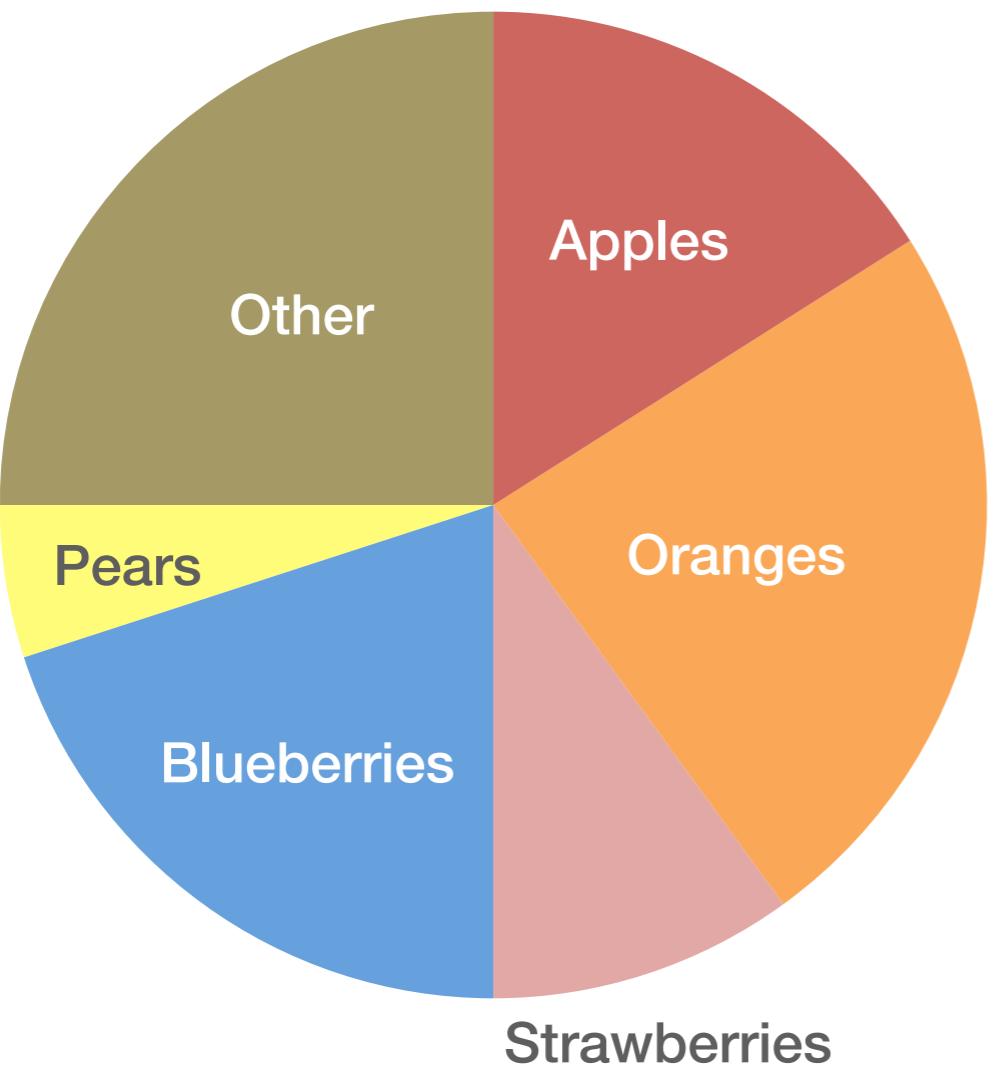
NEVER Use 3D



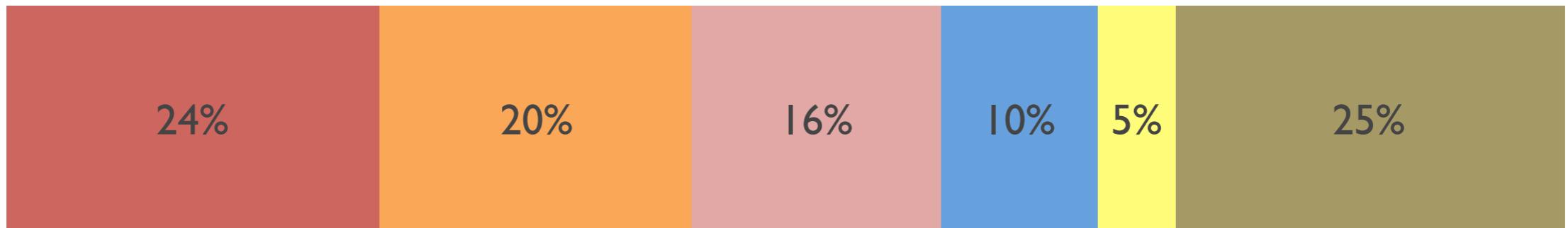
Parts of the whole



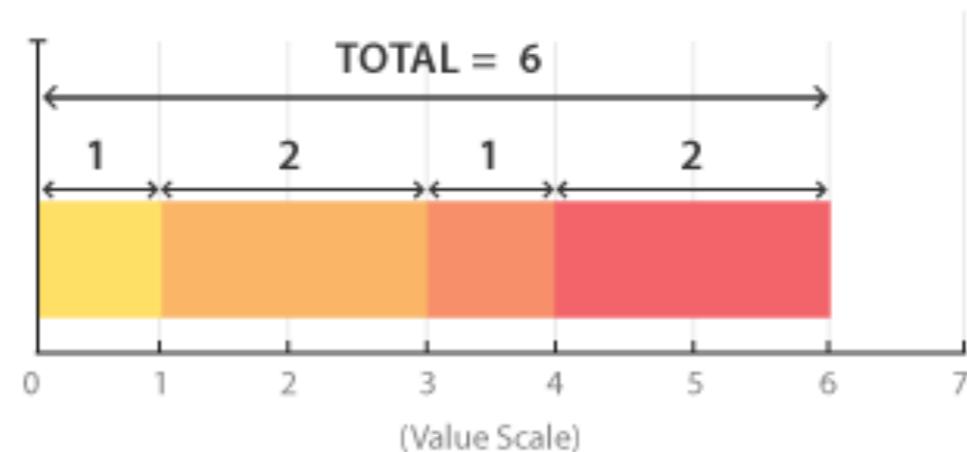
Order



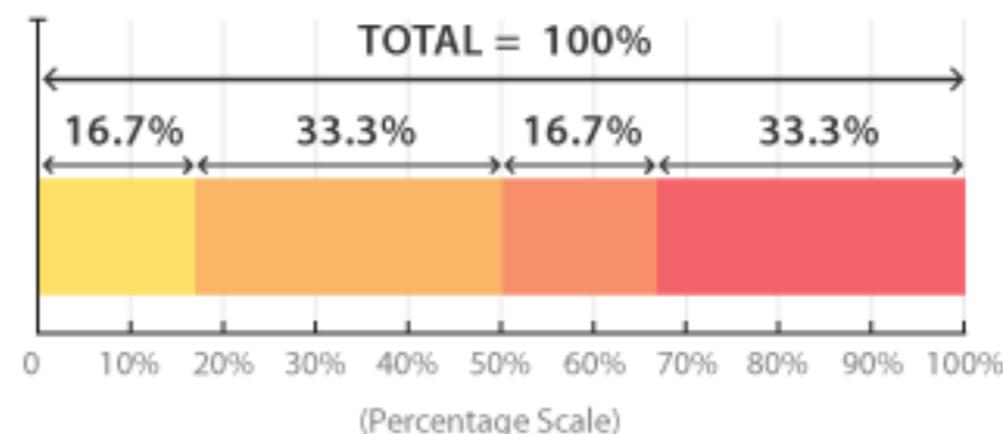
Stacked Bar Graph



Simple

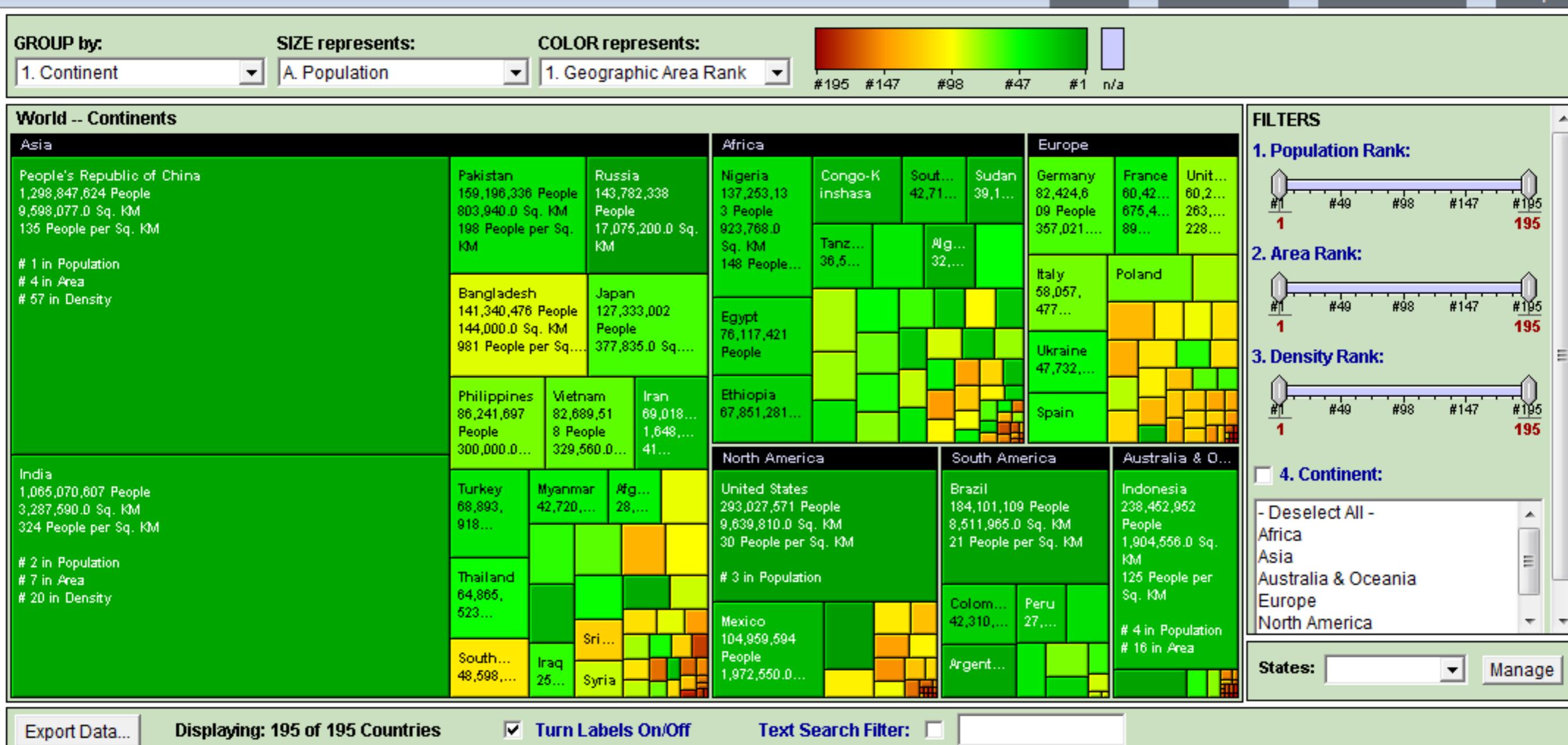


100%



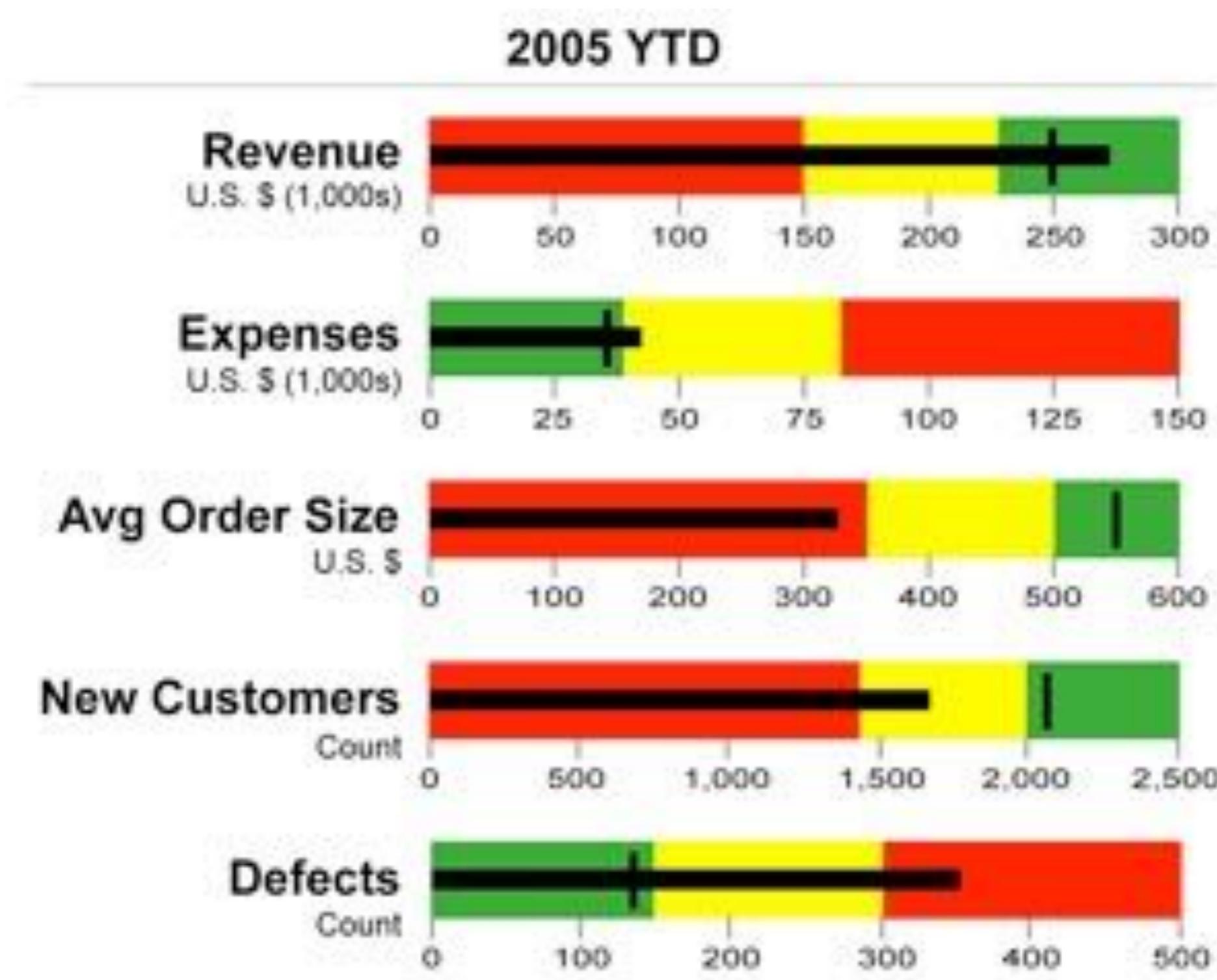
Tree Maps

World Population Statistics

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Bullet Graphs

Bullet Graphs



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
Your tax is—					
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
		Your tax is—						Your tax is—						Your tax is—			
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	3,000					
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 separa- tely	Head of a house- hold
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.

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

131
131
134
134
136
136
139
139

131
134
136
136
139
139

131
134
136
136
139
139

Sample Table

At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household
131	131	131	131	131	131
134	134	134	134	134	134
136	136	136	136	136	136
139	139	139	139	139	139

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

1,325	1,350
1,350	1,375

134	134
136	136

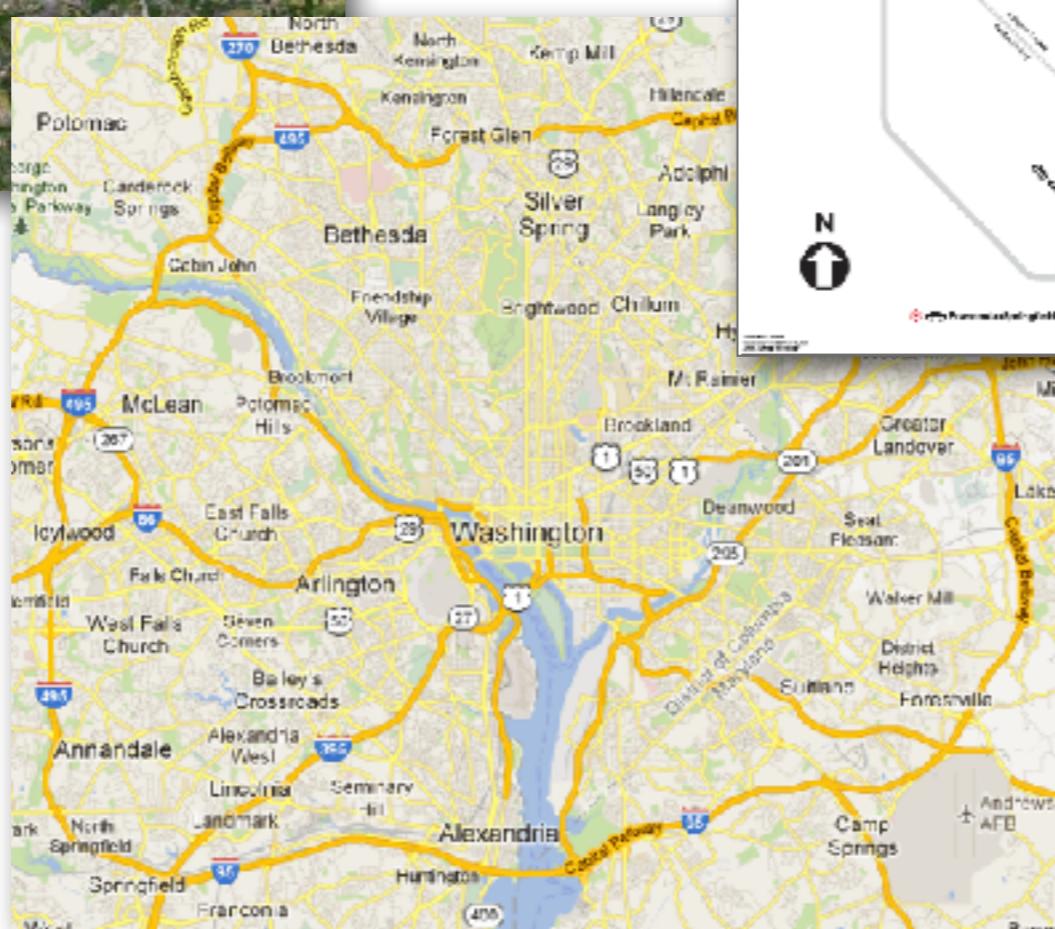
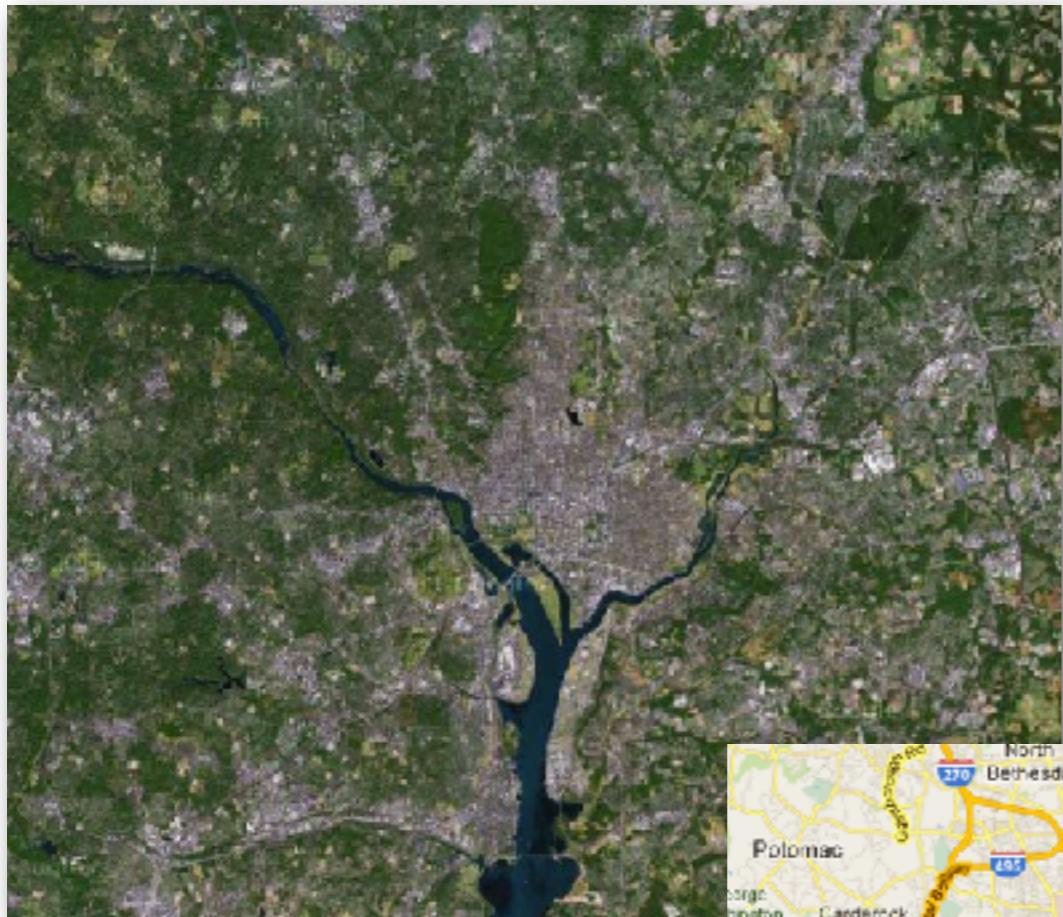
Sample Table

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

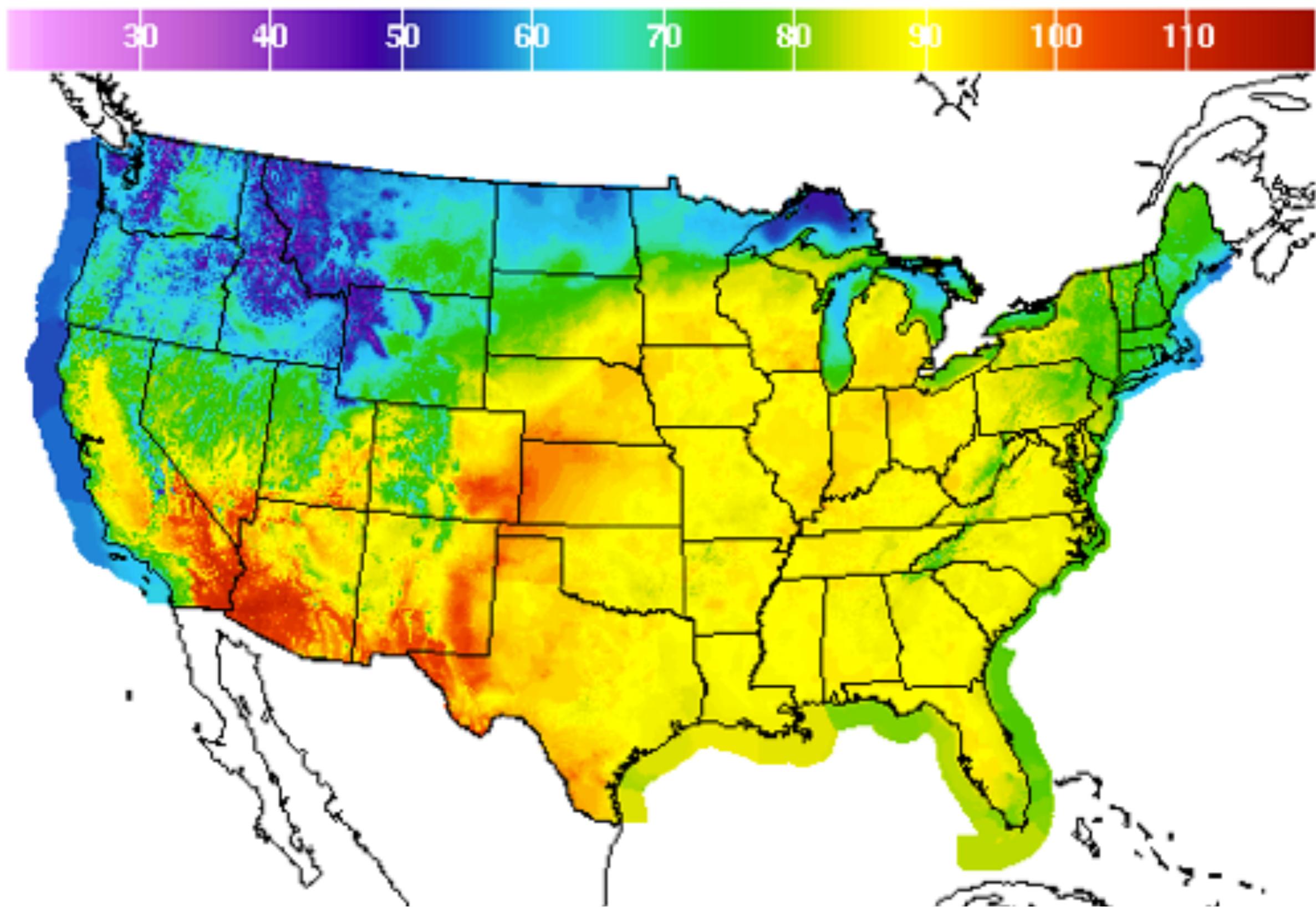
If line 43 (taxable income) is —		And you are —				Income —				And you are —				Income —			
At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household	At least	But less than	Single	Married filing jointly	Married filing separately	Head of a household	At least	But 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	3,000					
275	300	29	29	29	29	1,625	1,650	164	164	164	164	3,000					
300	325	31	31	31	31	1,650	1,675	166	166	166	166	3,000	3,050	303	303	303	303
325	350	34	34	34	34	1,675	1,700	169	169	169	169	3,050	3,100	308	308	308	308
350	375	36	36	36	36	1,700	1,725	171	171	171	171	3,100	3,150	313	313	313	313
375	400	39	39	39	39	1,725	1,750	174	174	174	174	3,150	3,200	318	318	318	318
400	425	41	41	41	41	1,750	1,775	176	176	176	176	3,200	3,250	322	322	322	322

Geographic Data

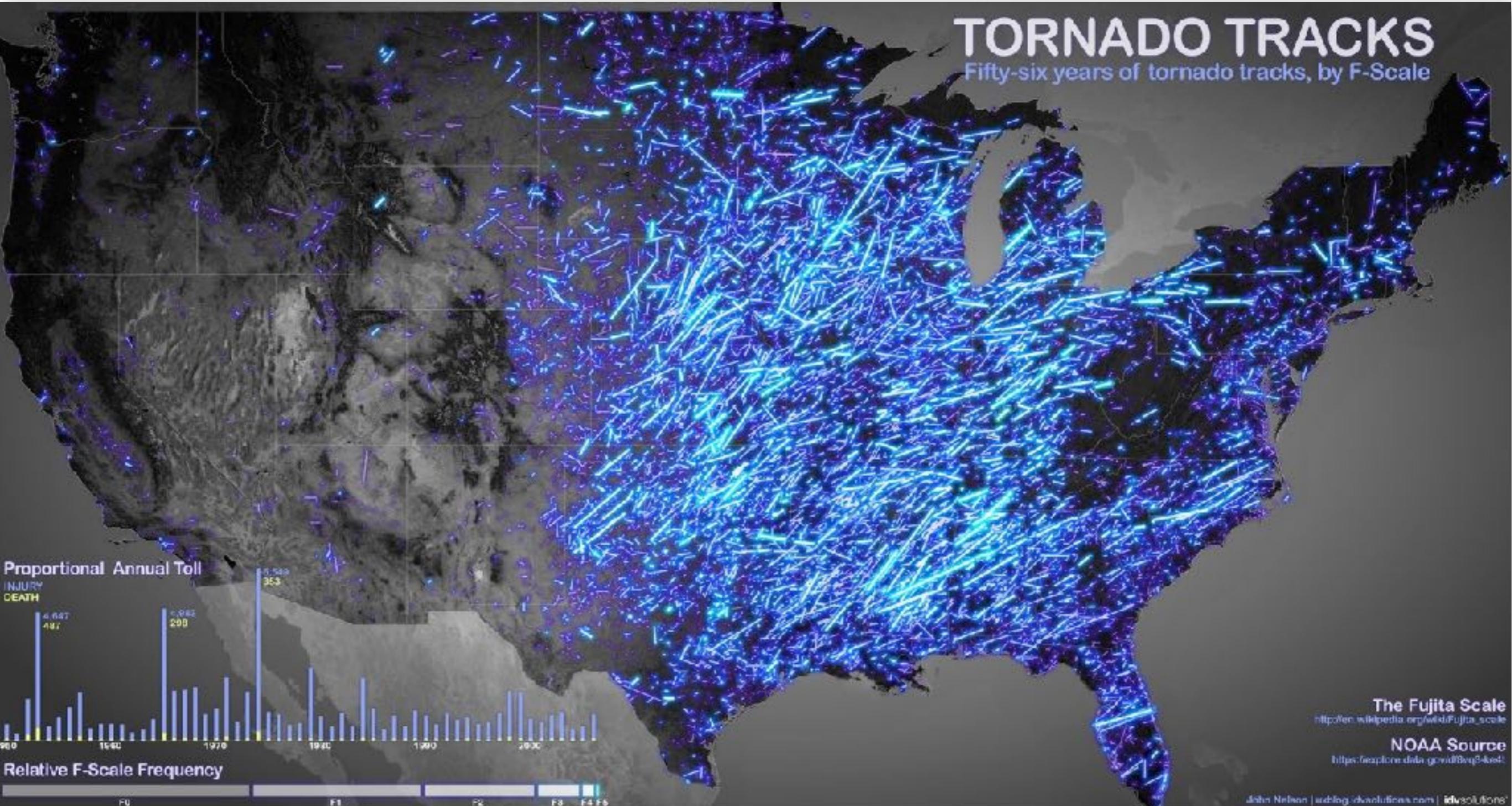
What Accuracy is Needed?



Spatial Data



Spatial Data



Spatial Data

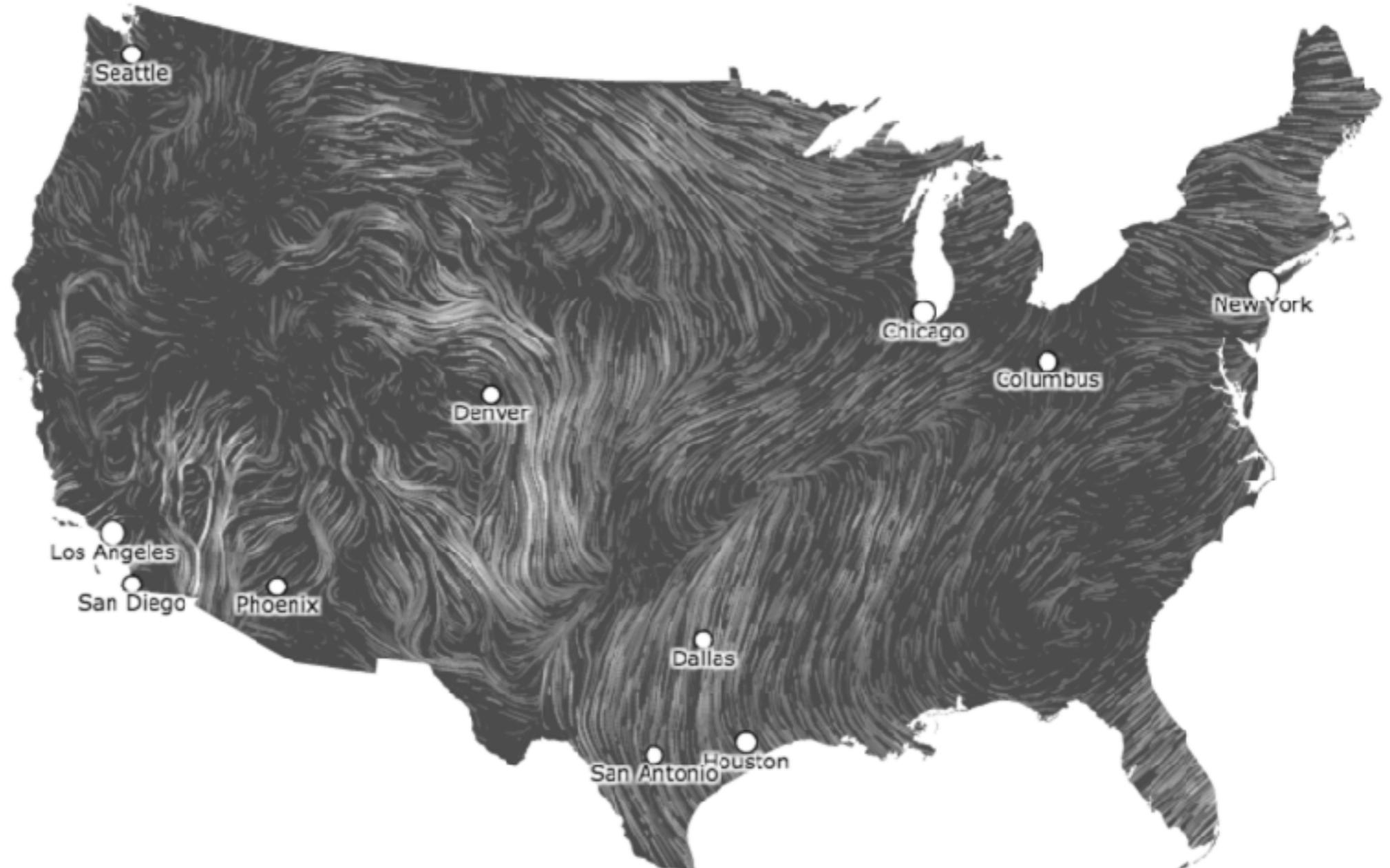
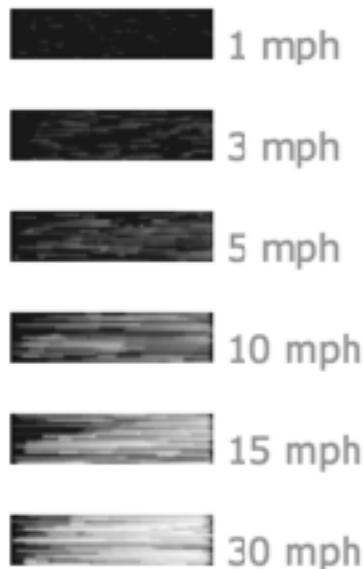
wind map

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

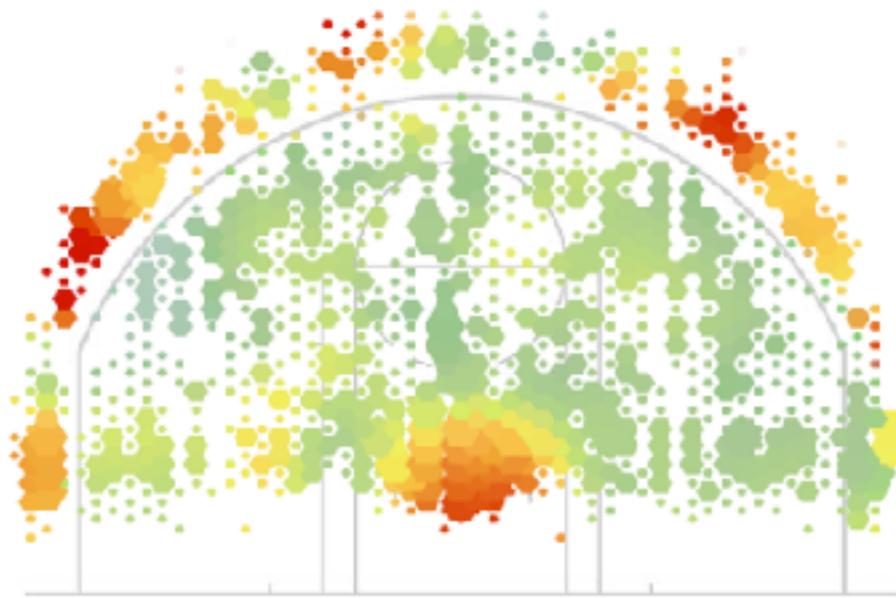
High

Points per region

Low

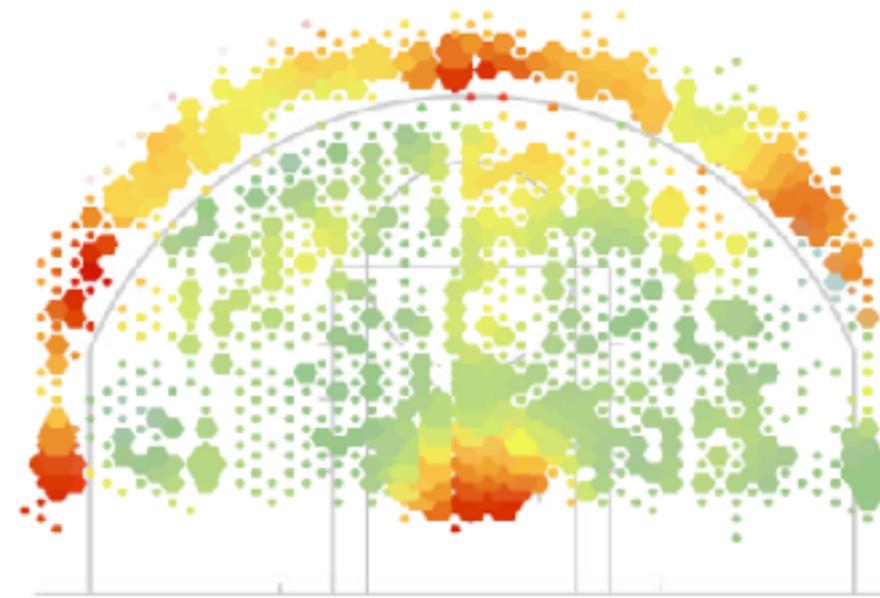
High

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%**

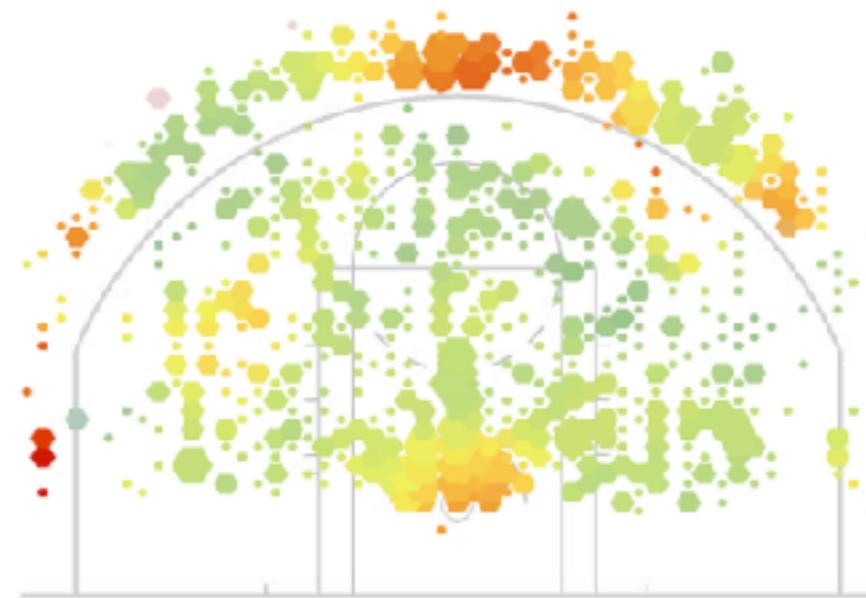
The Thunder are effective from almost any area on the court and shoot many more 3-point shots than the league average. Kevin Durant and James Harden are potent from the top of the arc.

LeBron James

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

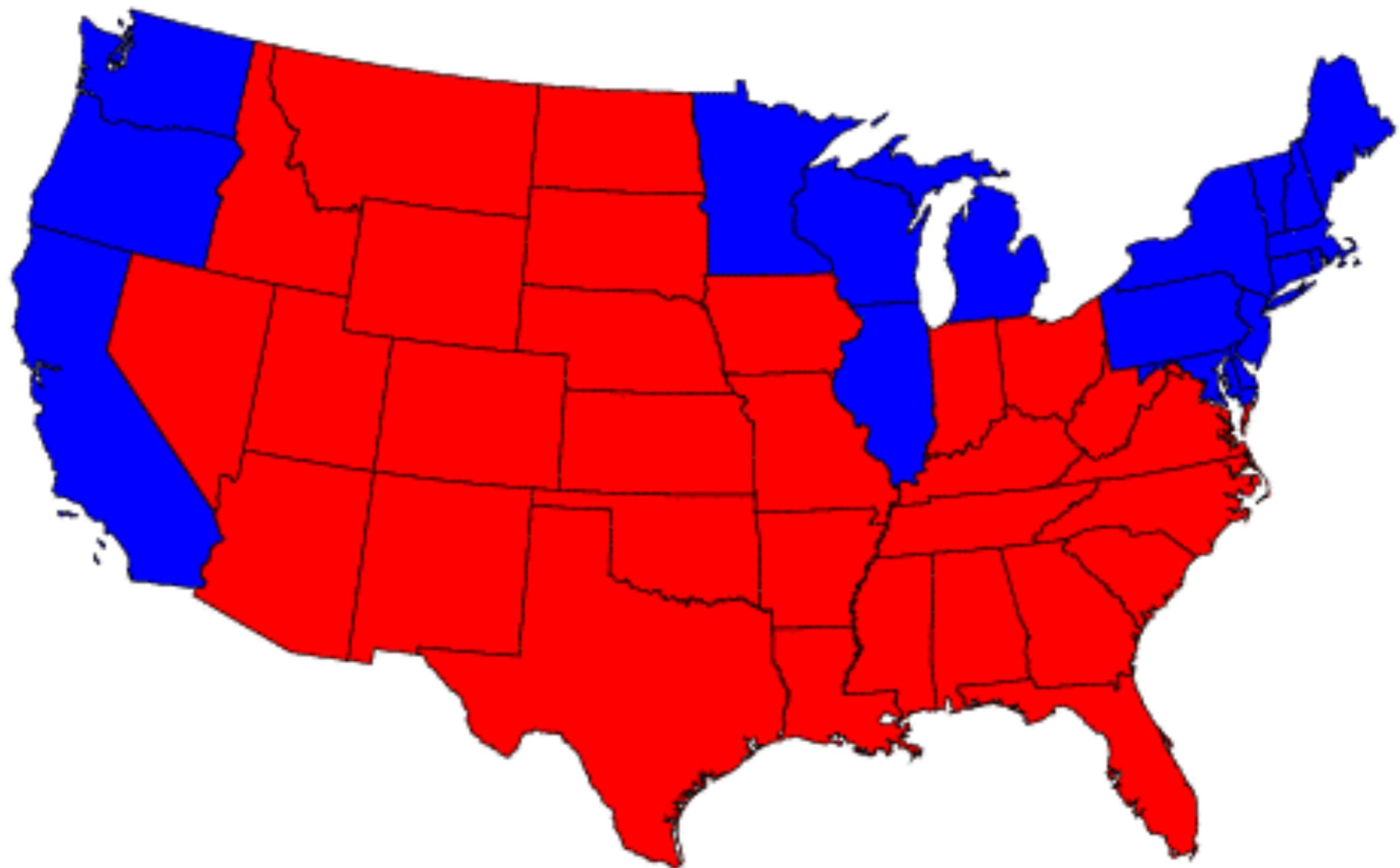
His athleticism and ball-handling create a lot of high-percentage shots near the basket. He prefers the wing locations beyond the 3-point line. His

Kevin Durant

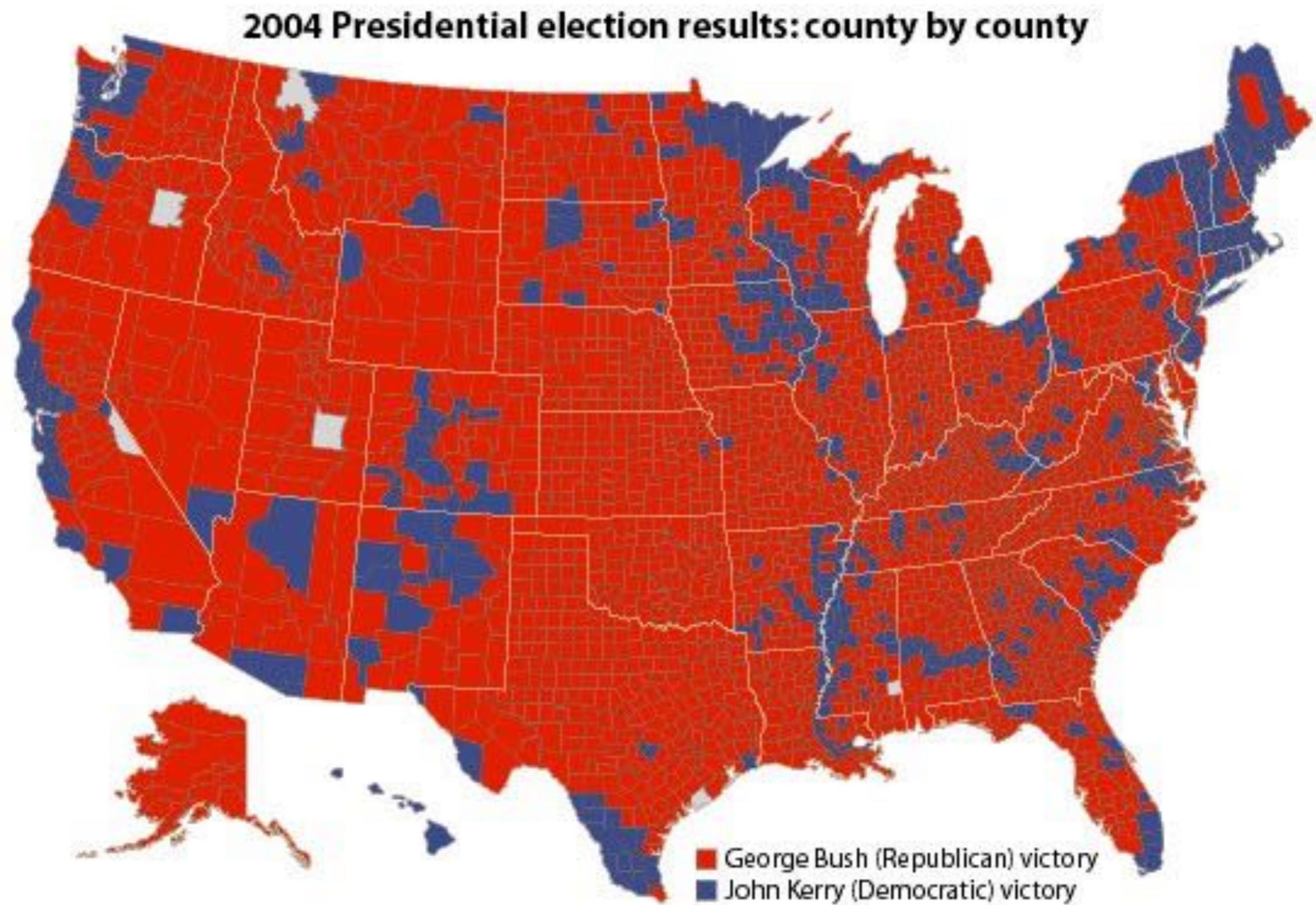
[VIEW: PHOTO](#) | [GRAPH](#)TOTAL SHOTS **1,296** | POINTS PER SHOT **1.09** | F.G. PERCENT **49.6%**

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.

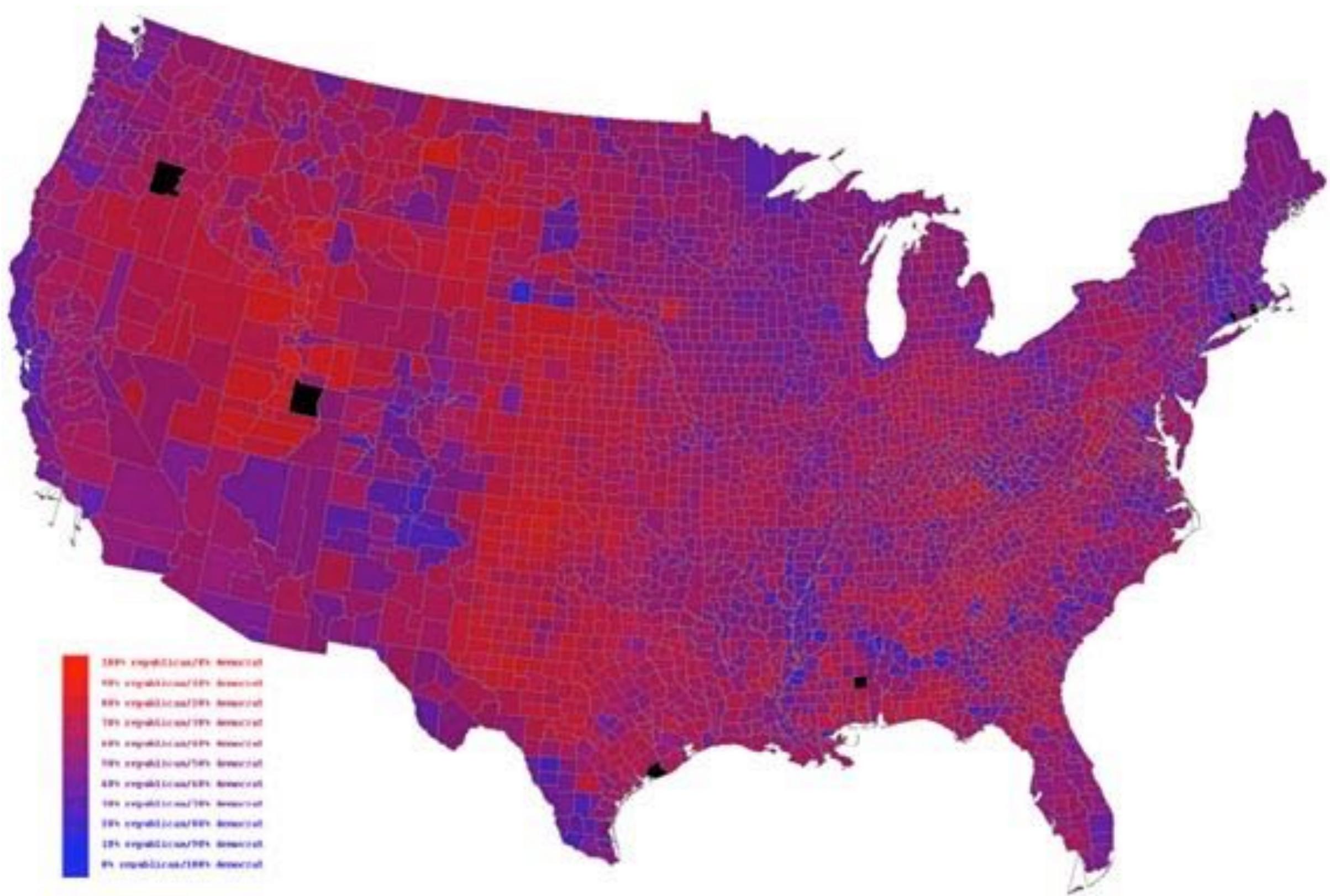
Non-Spatial Data



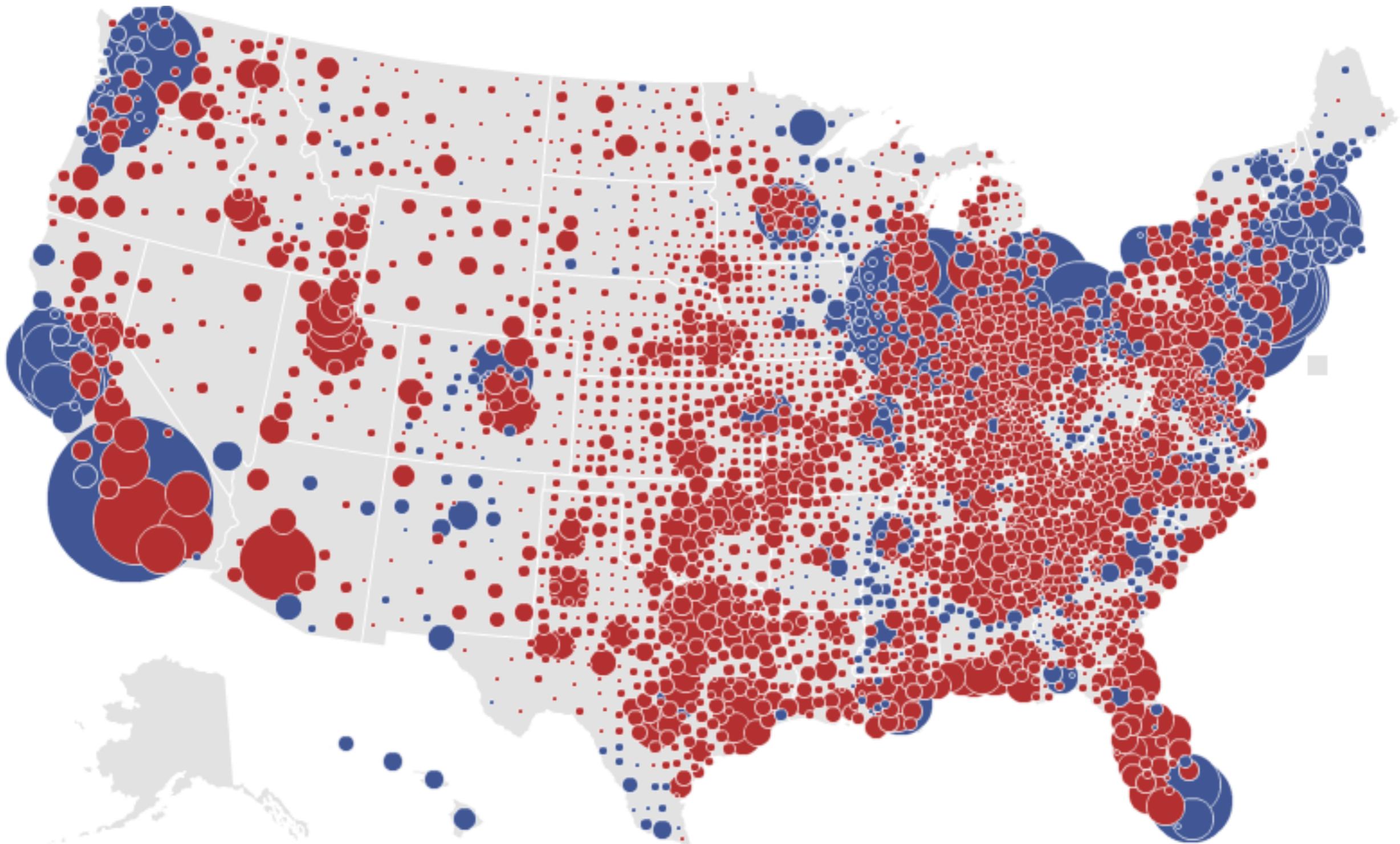
Non-Spatial Data



Non-Spatial Data

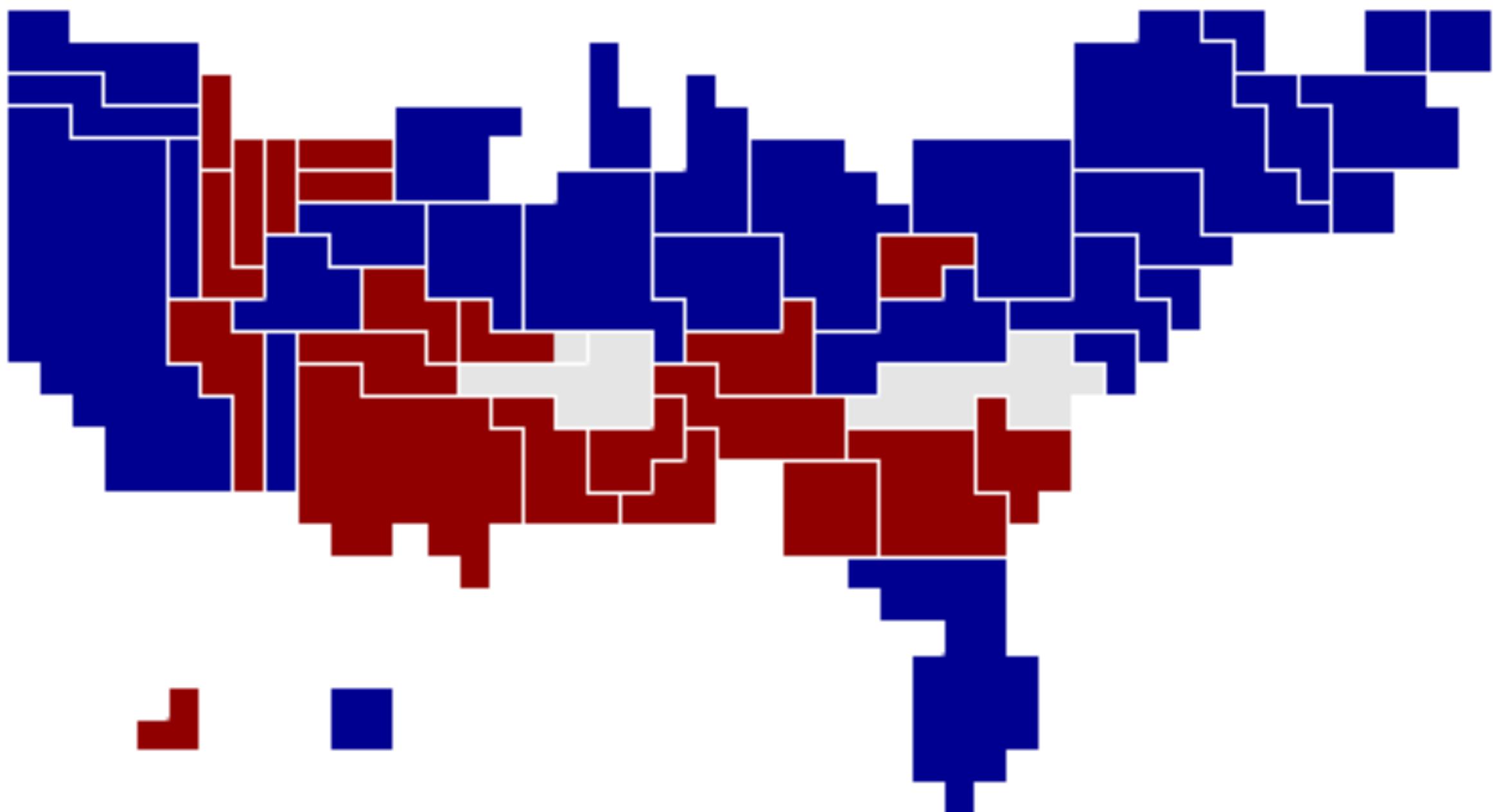


Non-Spatial Data



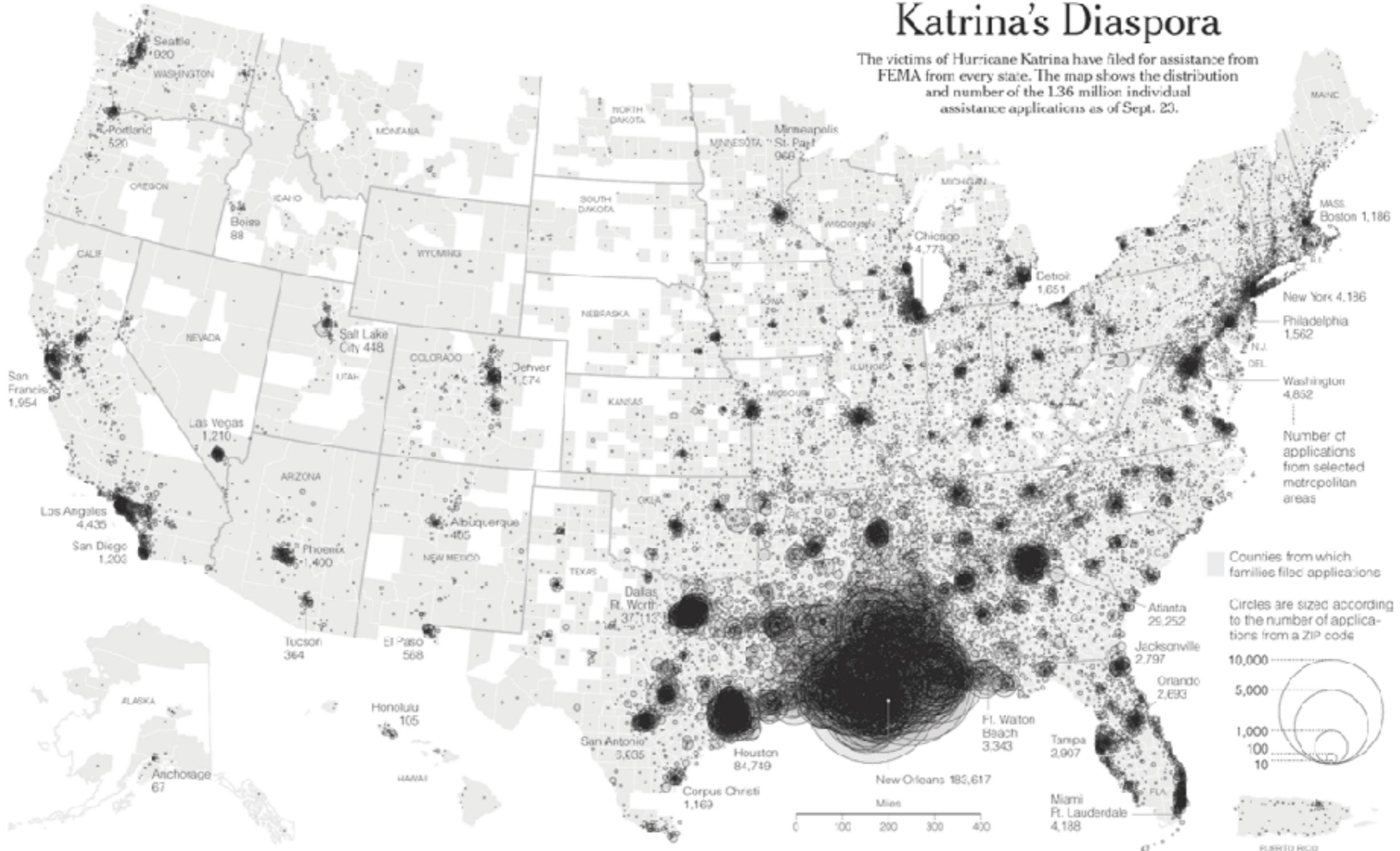
Non-Spatial Data

■ 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.



They are scattered through all 50 states, the District of Columbia and Puerto Rico — 523 in Utah, 1,114 in Kansas, 101 way out in Alaska. They are clustered by the thousands in large Southern cities like Dallas, Atlanta and Memphis, and huddled in handfuls in unlikely hamlets like Shell Knob, Mo. (pop. 1,393) and Fountain Run, Ky. (pop. 236).

Evacuees fled Hurricane Katrina and the floods that followed in caravans of cars and fleets of buses, on helicopters and chartered planes, by boat and, a few, on foot. A month after the storm, a map

emerges of where they landed, based on ZIP codes from which applications for aid were submitted to the Federal Emergency Management Agency as of Sept. 23.

Of 1,356,704 applications, 86 percent came from Louisiana, Mississippi, Texas and Alabama. But 35,519 families were more than 1,000 miles from the Gulf — among the farthest: one in Nome, Alaska, 3,931 miles from the French Quarter and another in Lihue, Hawaii, 4,279 miles away.

Residents of New Orleans, a city that was two-thirds black, seem to have flocked to the nation's African-American population

centers. On average, the applicants came from counties where blacks were 28 percent of the population, more than twice the national average.

Baton Rouge, La., appears to be temporary home to 10 percent of evacuees, Houston 6.25 percent. But after the top 18 hubs, applicants are spread like the wind that whipped through their old neighborhoods: none of the other \$100-plus metropolitan areas has even 1 percent of the total.

Some 4,000 ZIP codes — among them Pocahontas, Miss.; Fremont City, Iowa; and Hope, Mich. — had just one applicant.

Applications by state

State	Applications	Percent
Louisiana	523,149	38.6%
Mississippi	363,340	26.3%
Texas	156,895	11.6%
Alabama	109,469	8.1%
Georgia	35,342	2.6%
Florida	31,005	2.3%
Tennessee	15,529	1.1%
Arkansas	11,027	0.8%
California	10,963	0.8%
Illinois	8,430	0.6%
Others	73,065	5.4%

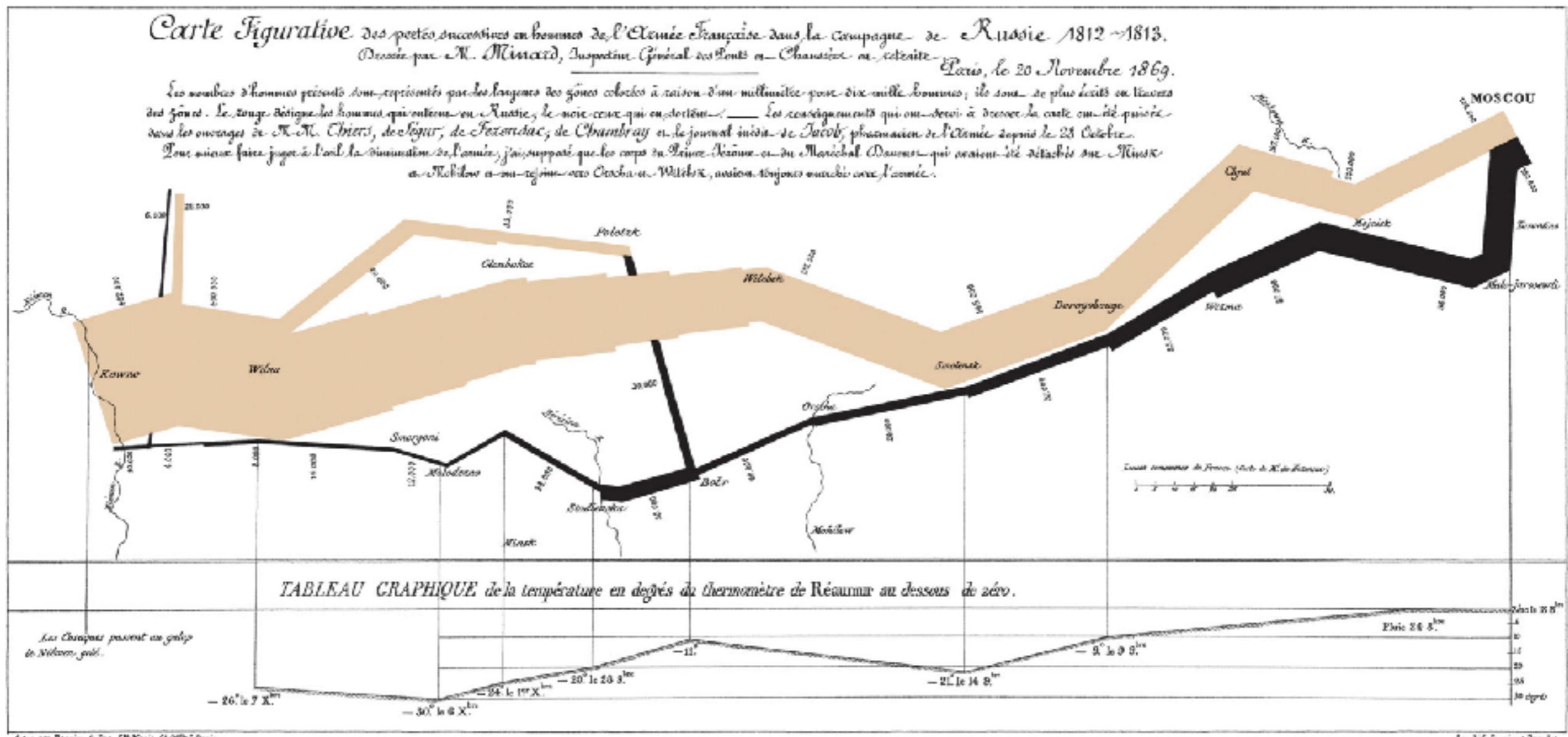
Applications by distance from New Orleans

Miles	Applicants	Percent
0-100	626,232	46.2%
100-200	338,080	24.9%
200-400	184,169	13.6%
400-800	143,497	10.6%
800-1,800	45,371	3.3%
1,600-3,200	13,403	1.0%
3,200+	232	0.0%

Distances could not be calculated for 0.4 percent of applications

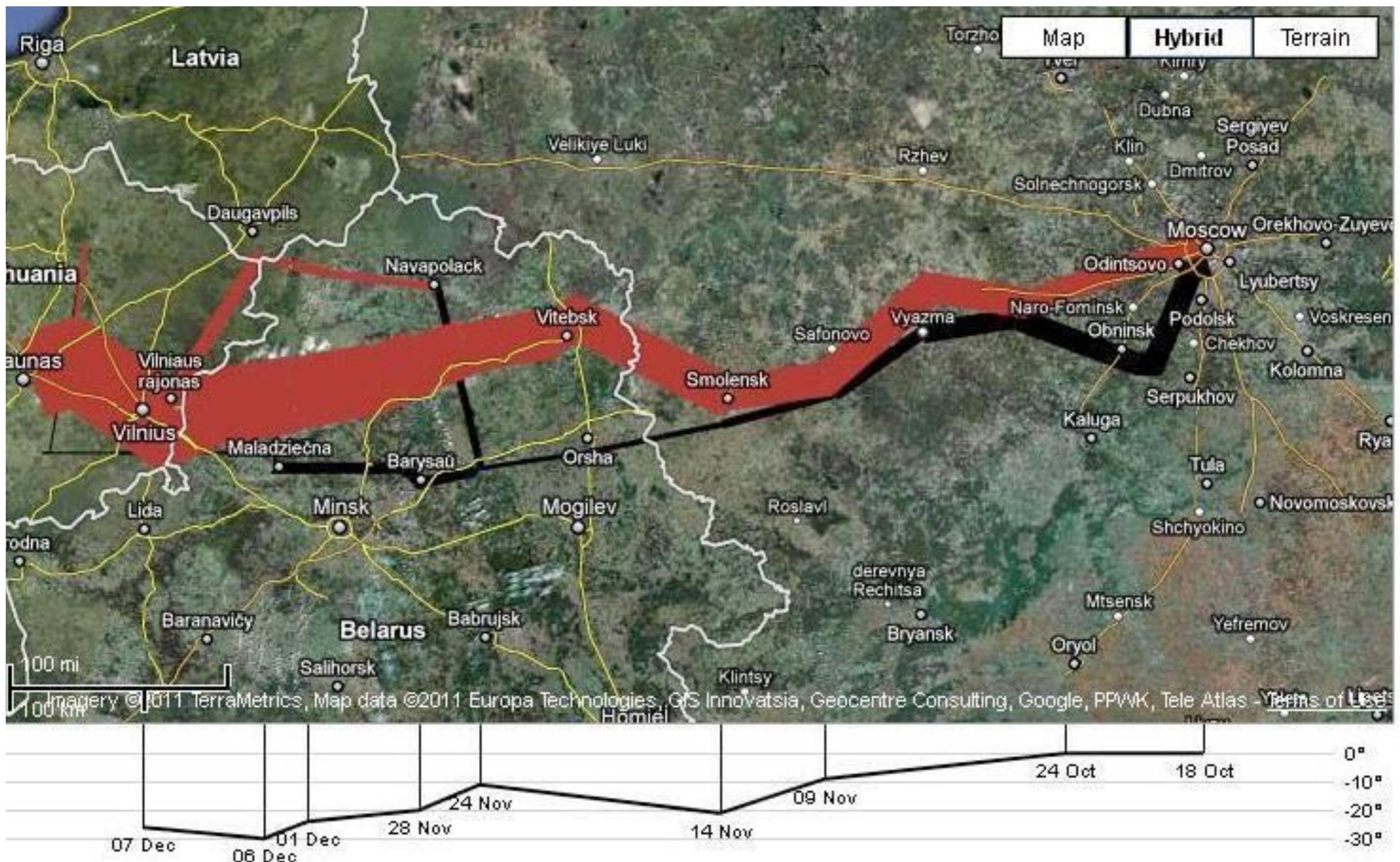
Sources: FEMA; Census Bureau; Queens College Sociology Department
Matthew Ericson, Archie Tsui and Jedi Wiggon/The New York Times

Time Series Data

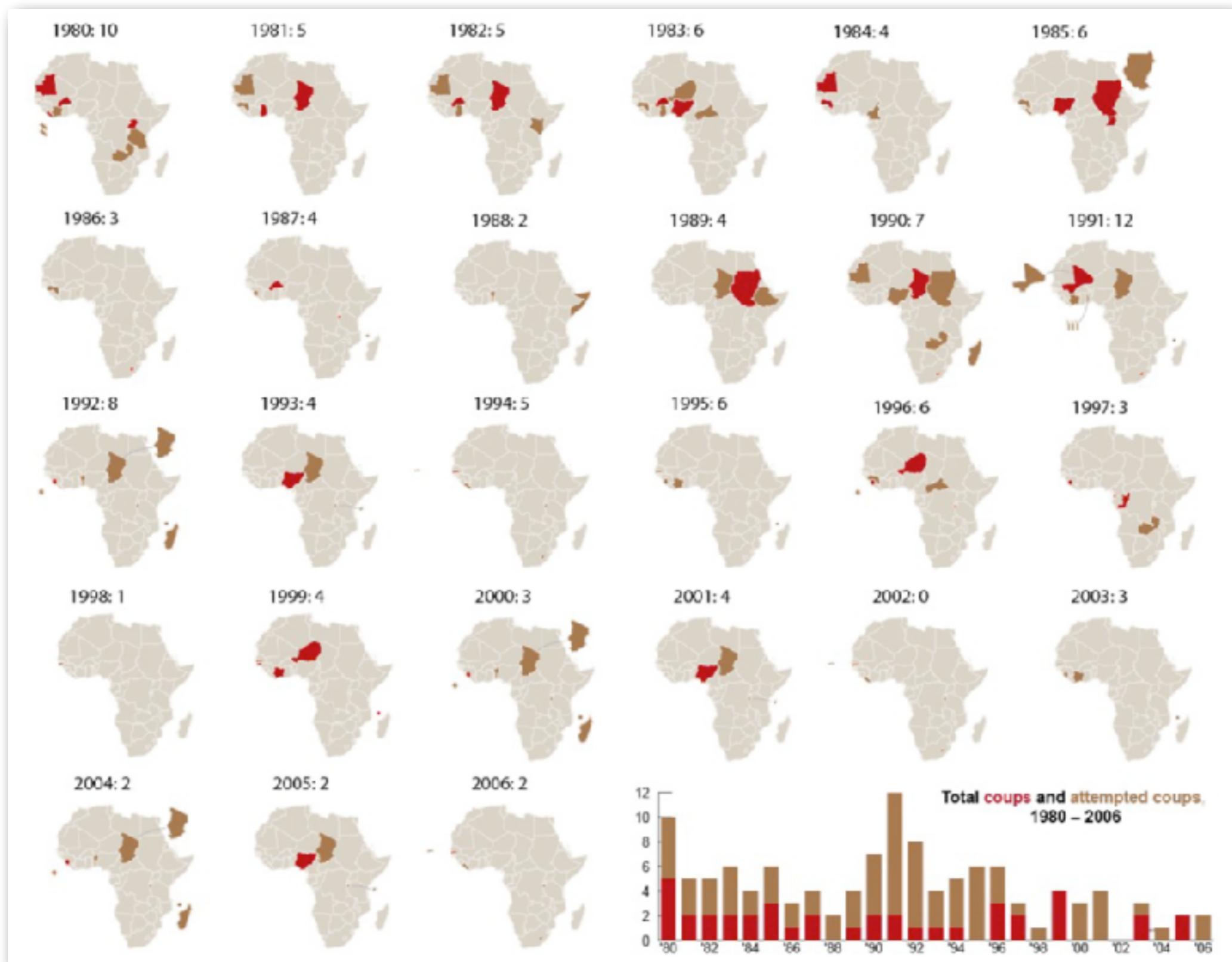


Source: Minard

Time Series Data



Time Series Data



Source: Karl Gude

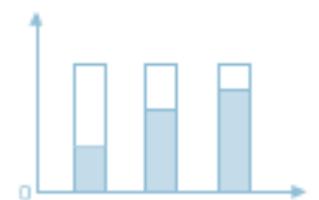
Concepts

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

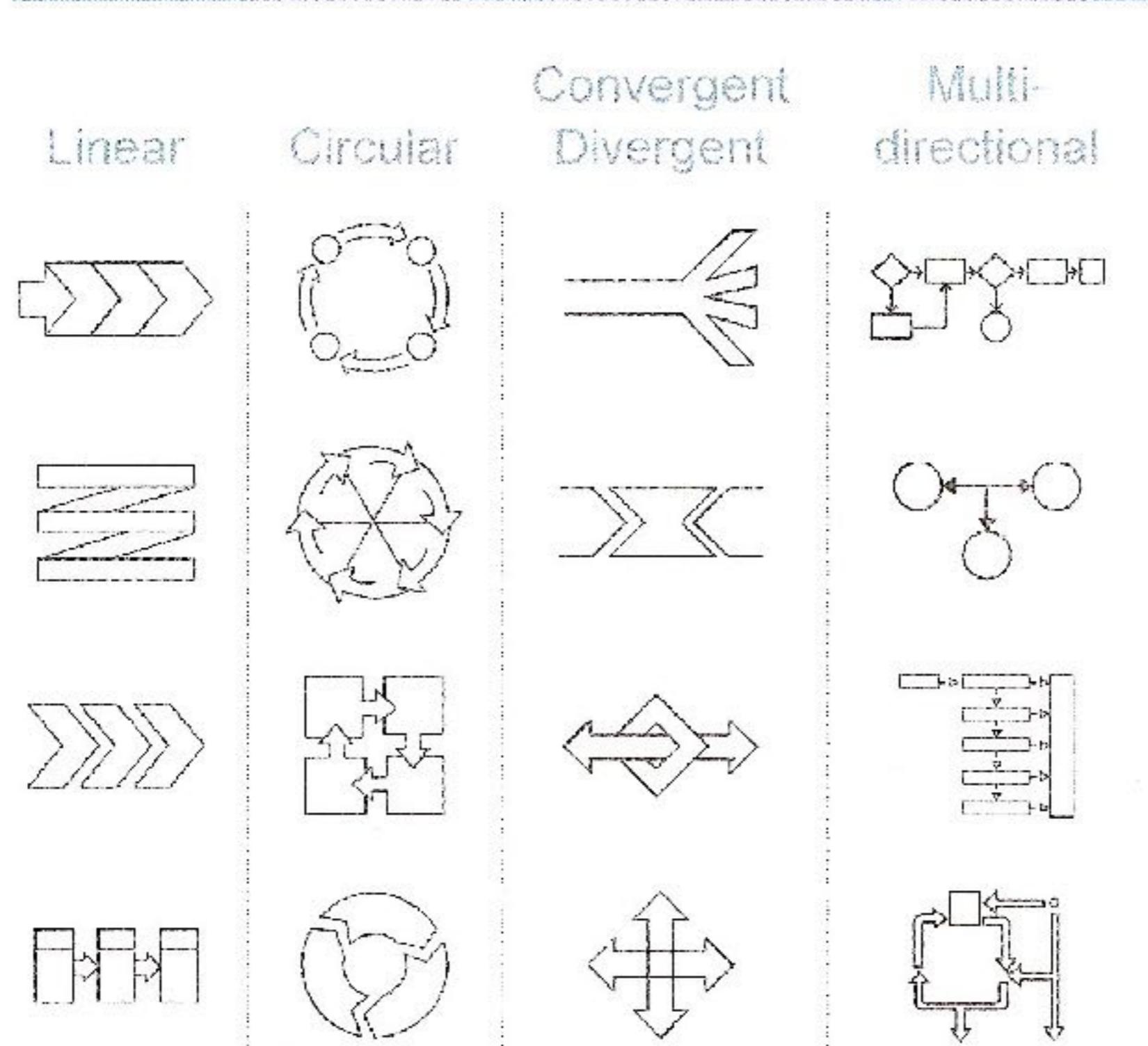
Direction
Location
Reveal
Process
Influence

Display Data

Comparison
Trend
Distribution

Flow Diagrams

Flow

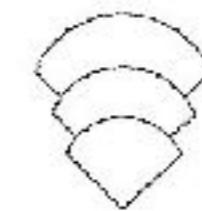
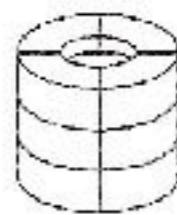


Source: slide:ology

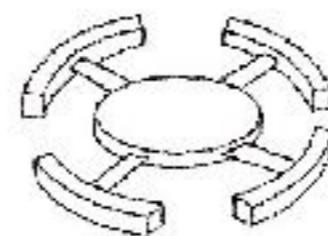
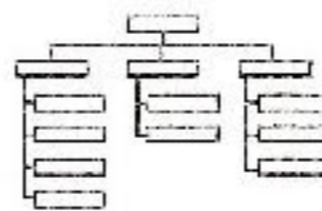
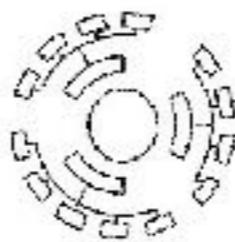
Structure Diagrams

Structure

Layers



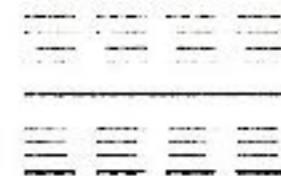
Trees



Matrices

-	-	-	-
-	*	*	*
1	*	*	*
-	*	*	*

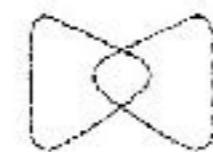
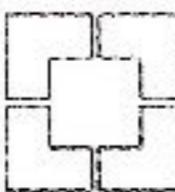
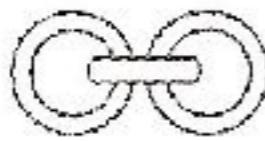
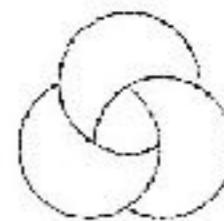
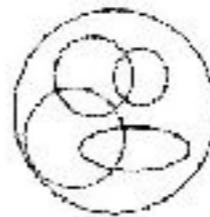
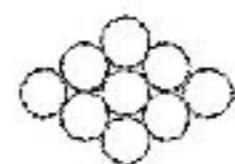
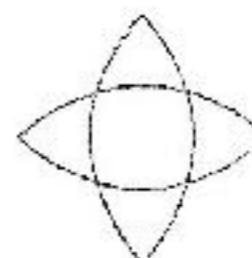
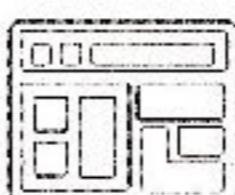
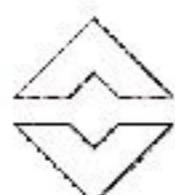
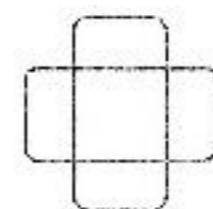
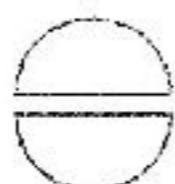
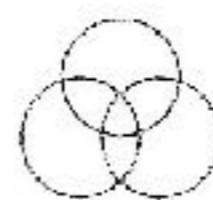
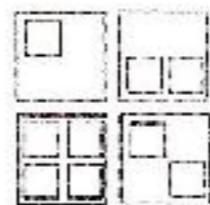
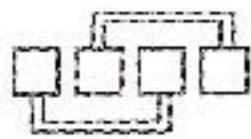
- Vertical grid
- Flat
- Depth-first
- Breadth-first
- Matrix



Cluster Diagrams

Cluster

Linked Closure Enclosed Overlapping

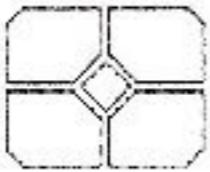
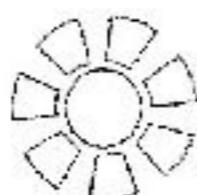
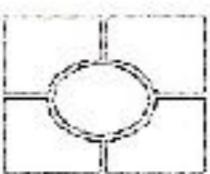
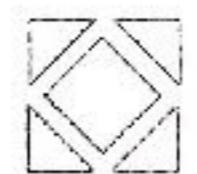
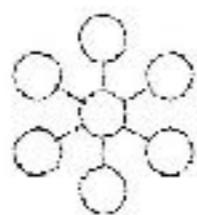


Source: slide:ology

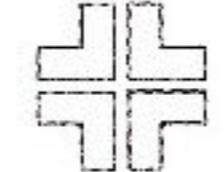
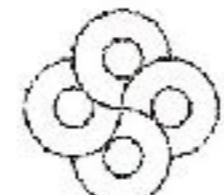
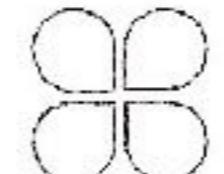
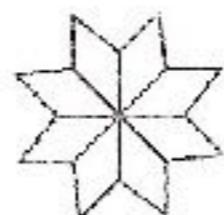
Radiate Diagrams

Radiate

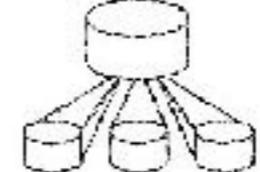
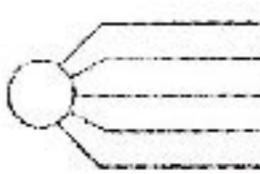
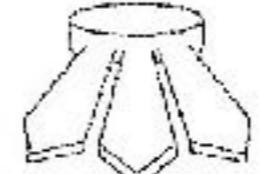
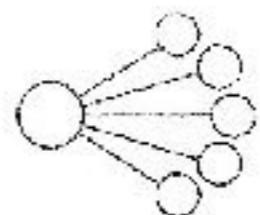
With
a Core



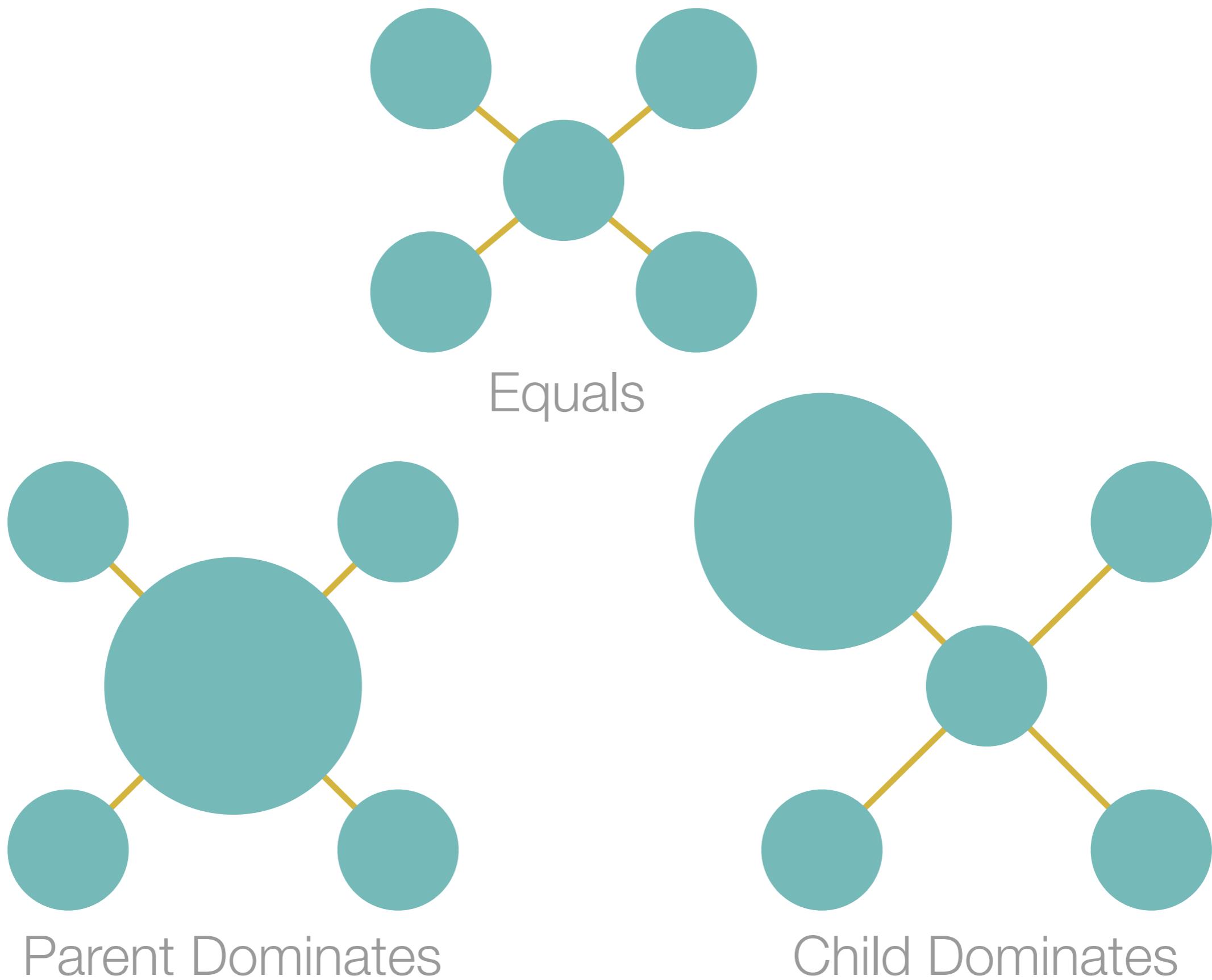
Without
a Core



From
a Point



Change the Story



Diagramming Tool

Identify the relationship.

Choose from five categories.

Flow >

Join

Network

Segment

Stack

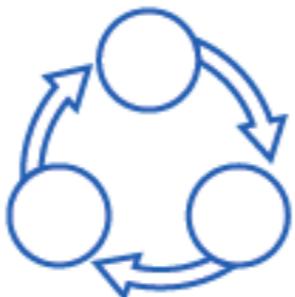
Represent the relationship.

Select the subcategory that fits best.



Linear

Shapes flow linearly but not necessarily straight



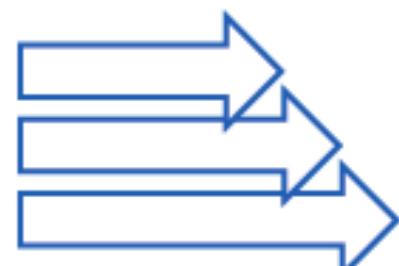
Loop

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)



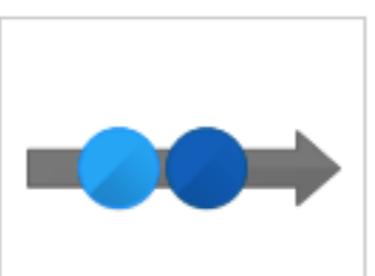
4 Nodes (280)



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

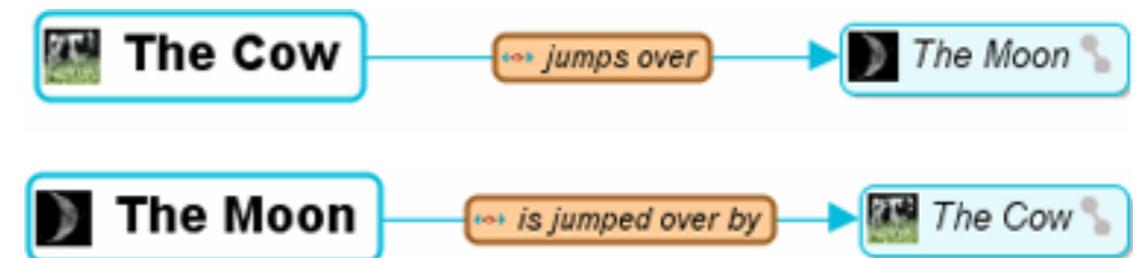
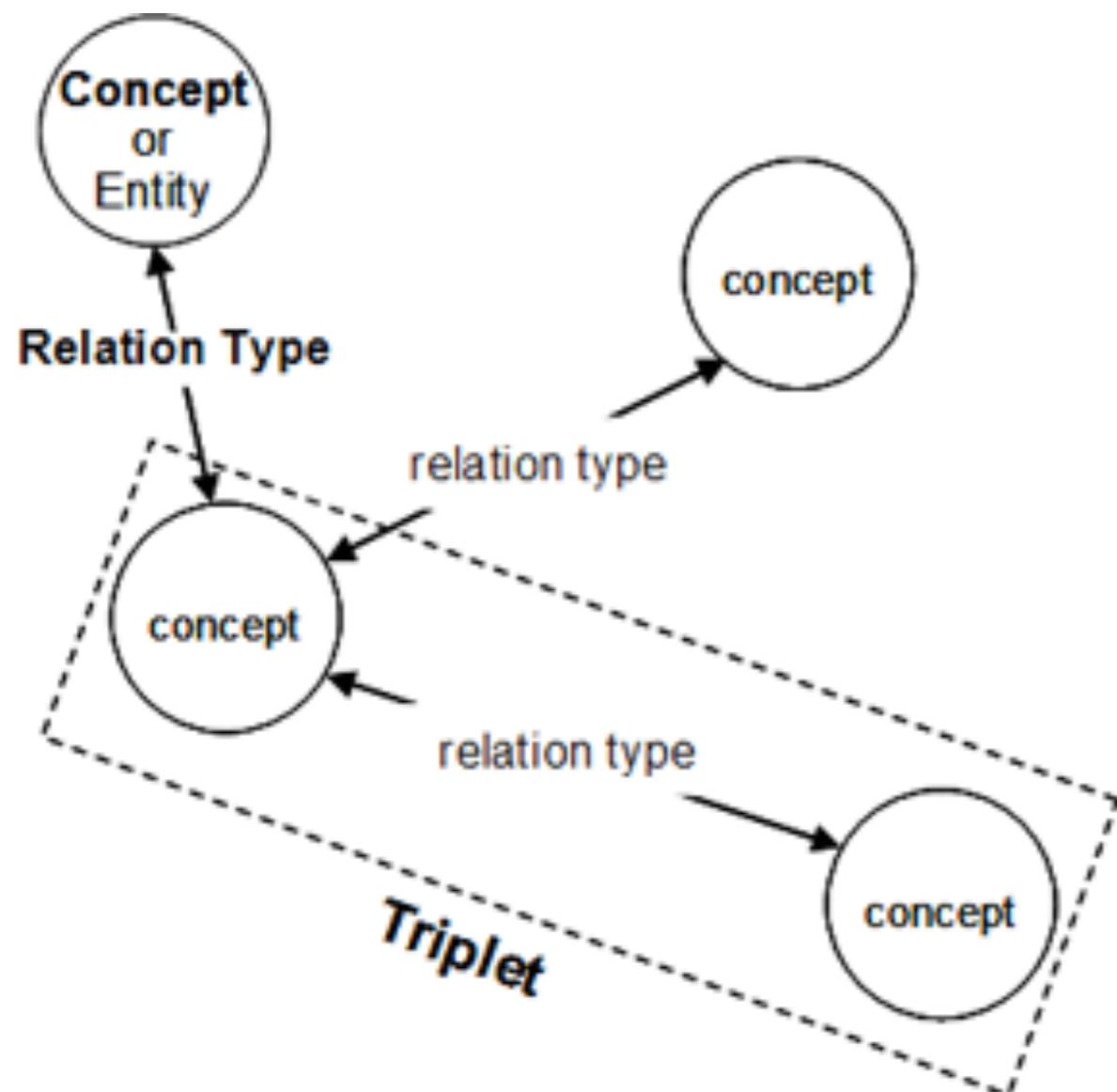
1 word 2 word Compare

Search:

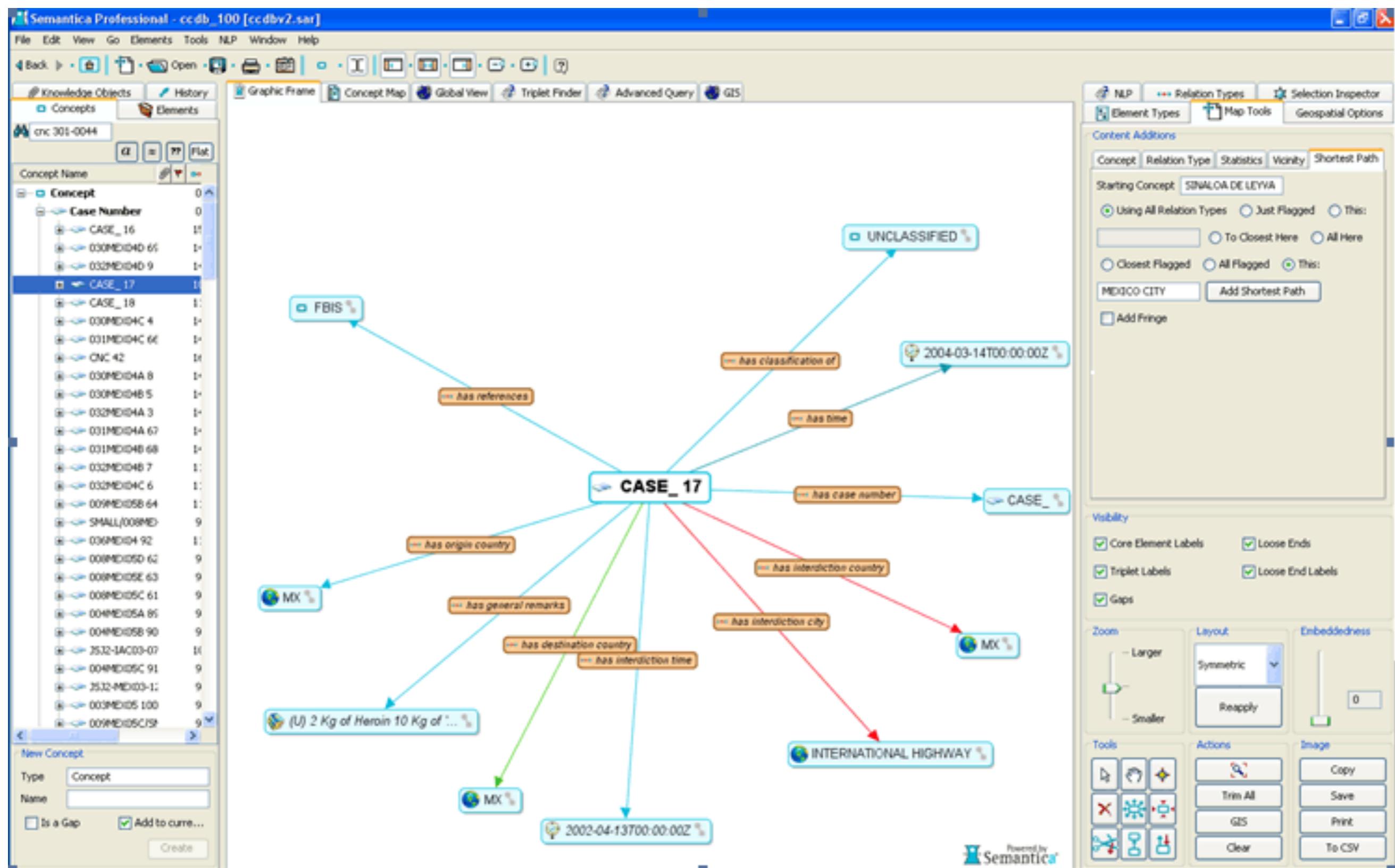
Showing 200 out of 1204

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

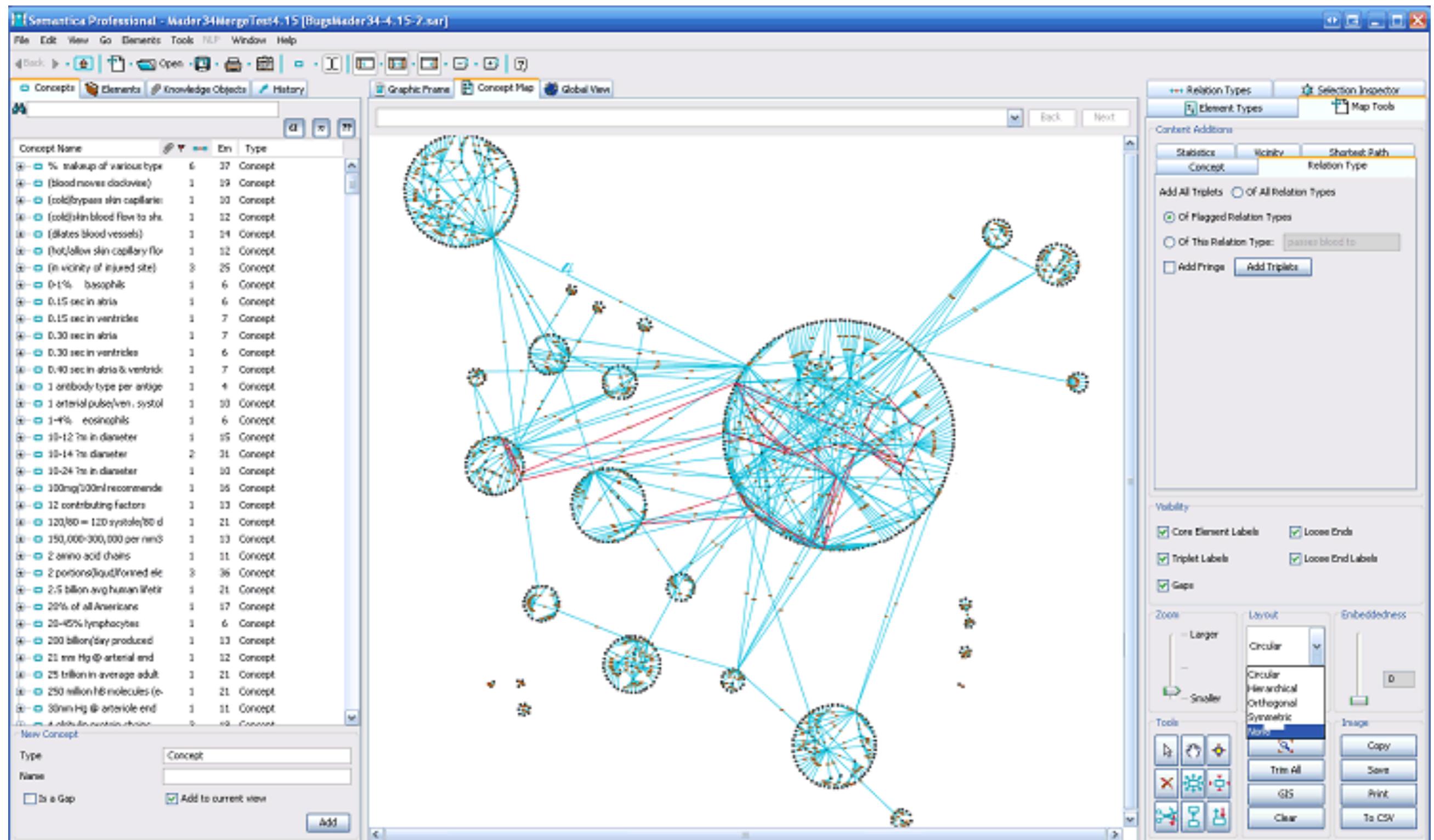


Concept Cloud



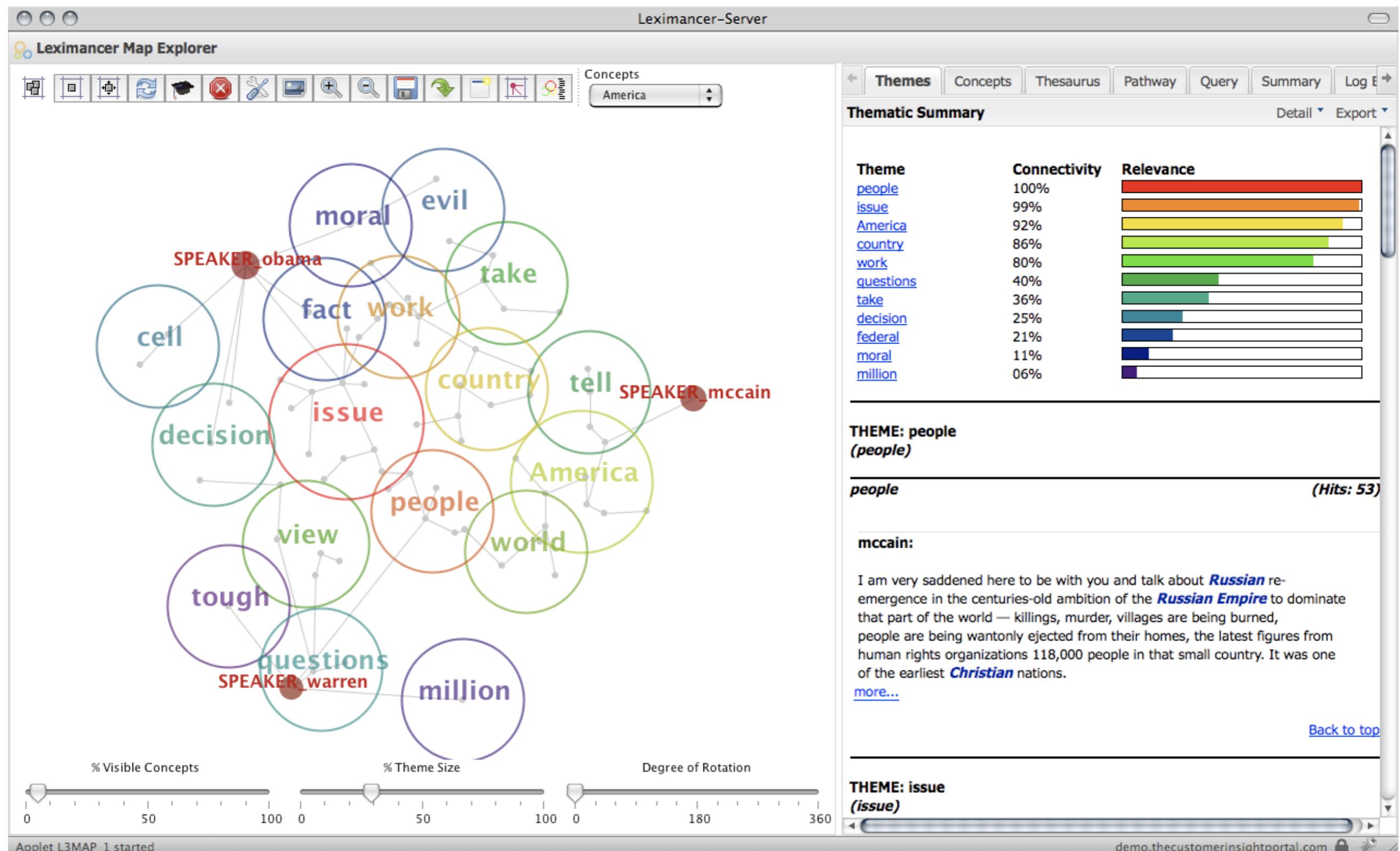
Source: Semantica

Concept Cloud



Source: Semantica

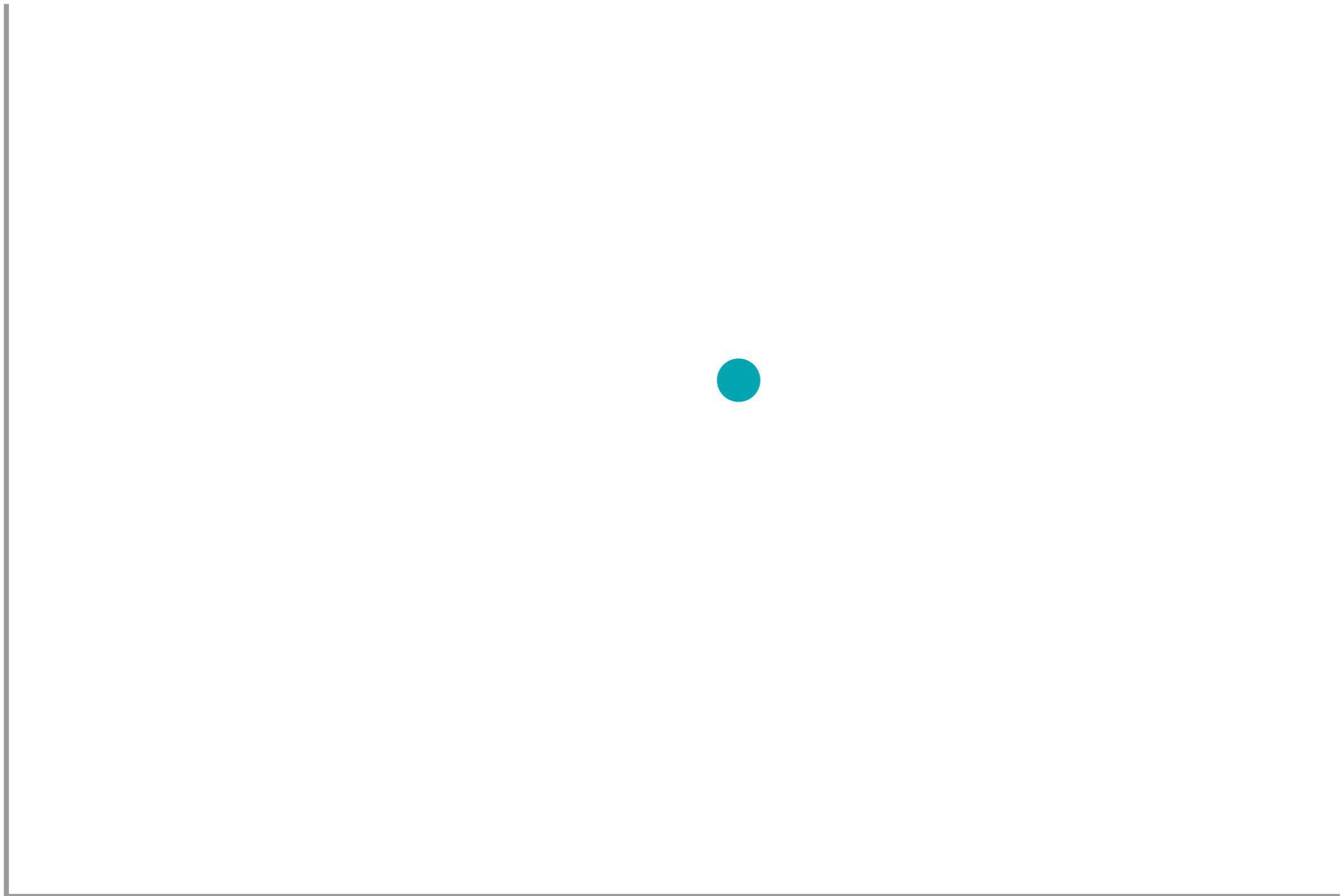
Concept Cloud



Source: Leximancer

Encoding Data

Position

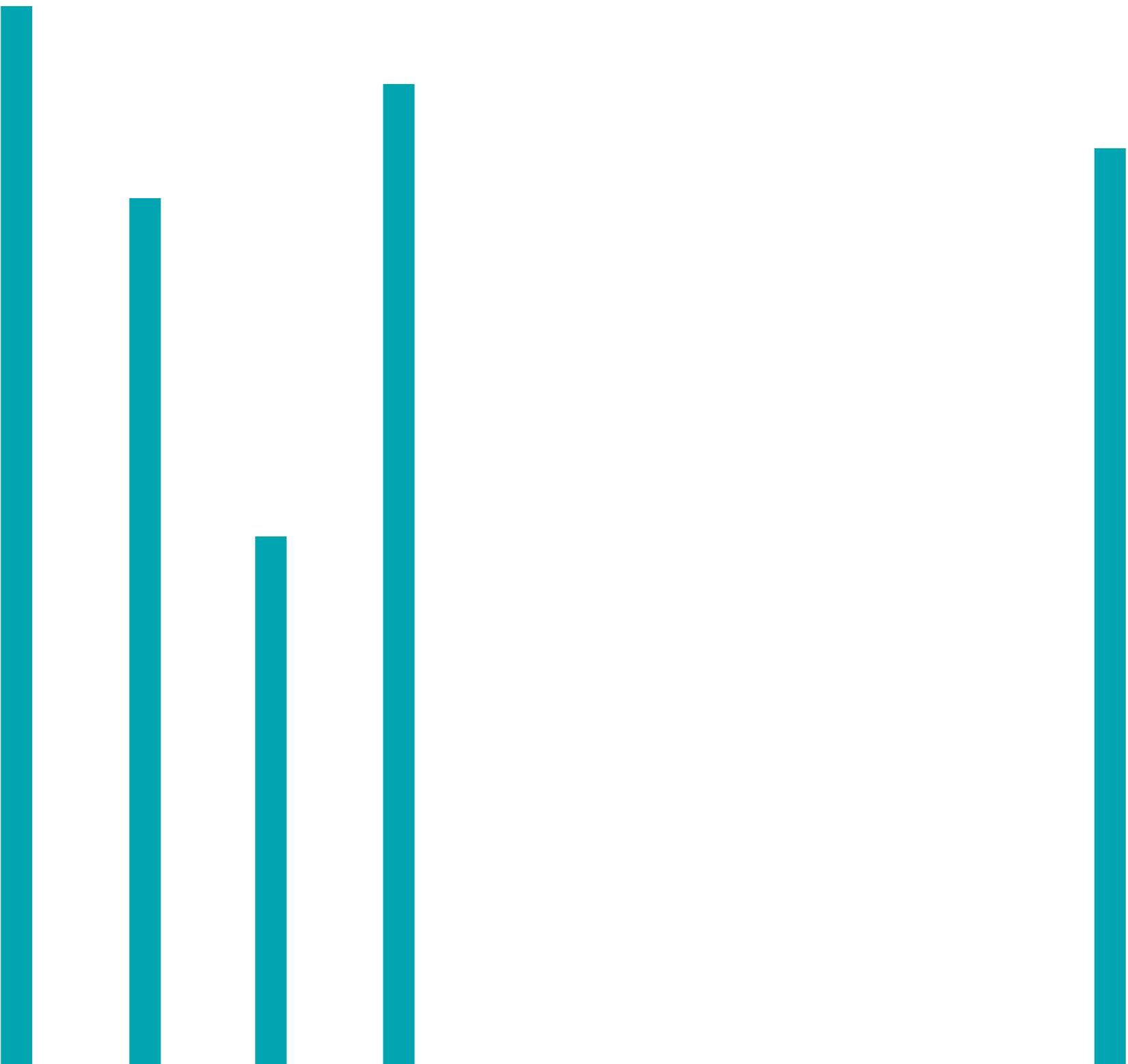


Variables: 1-4

Values: Infinite

Ordered: Yes

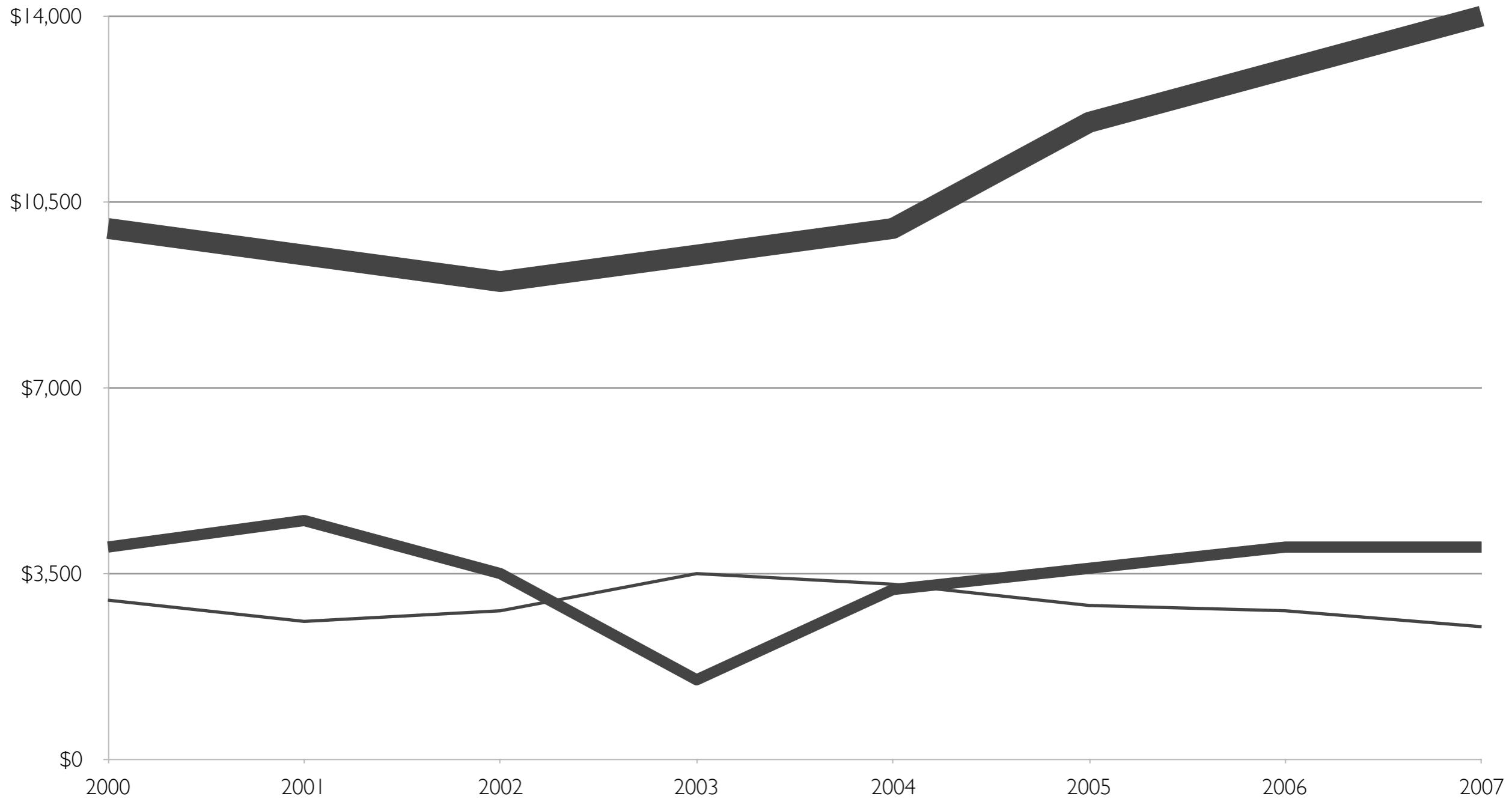
Length



Values: Infinite

Ordered: Yes

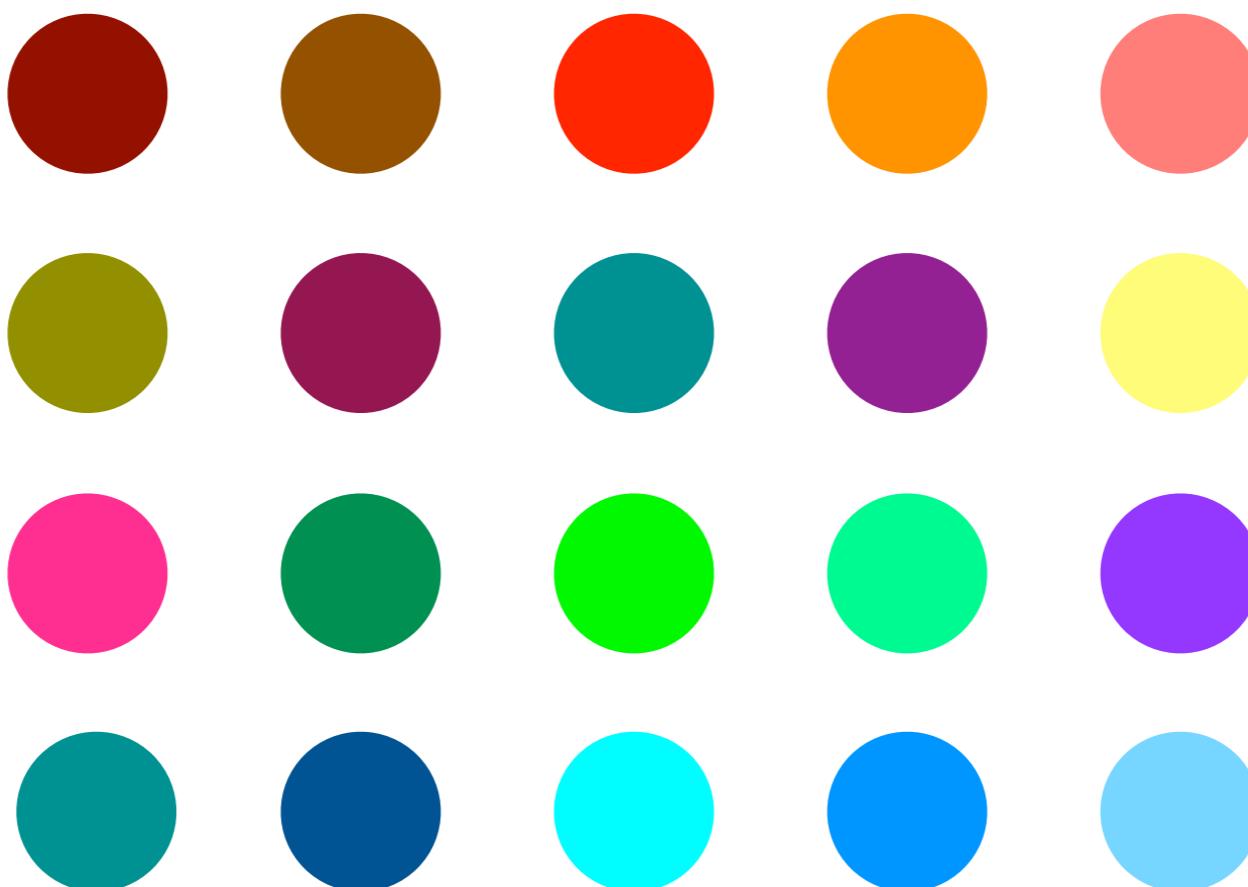
Width



Values: Practically Limited

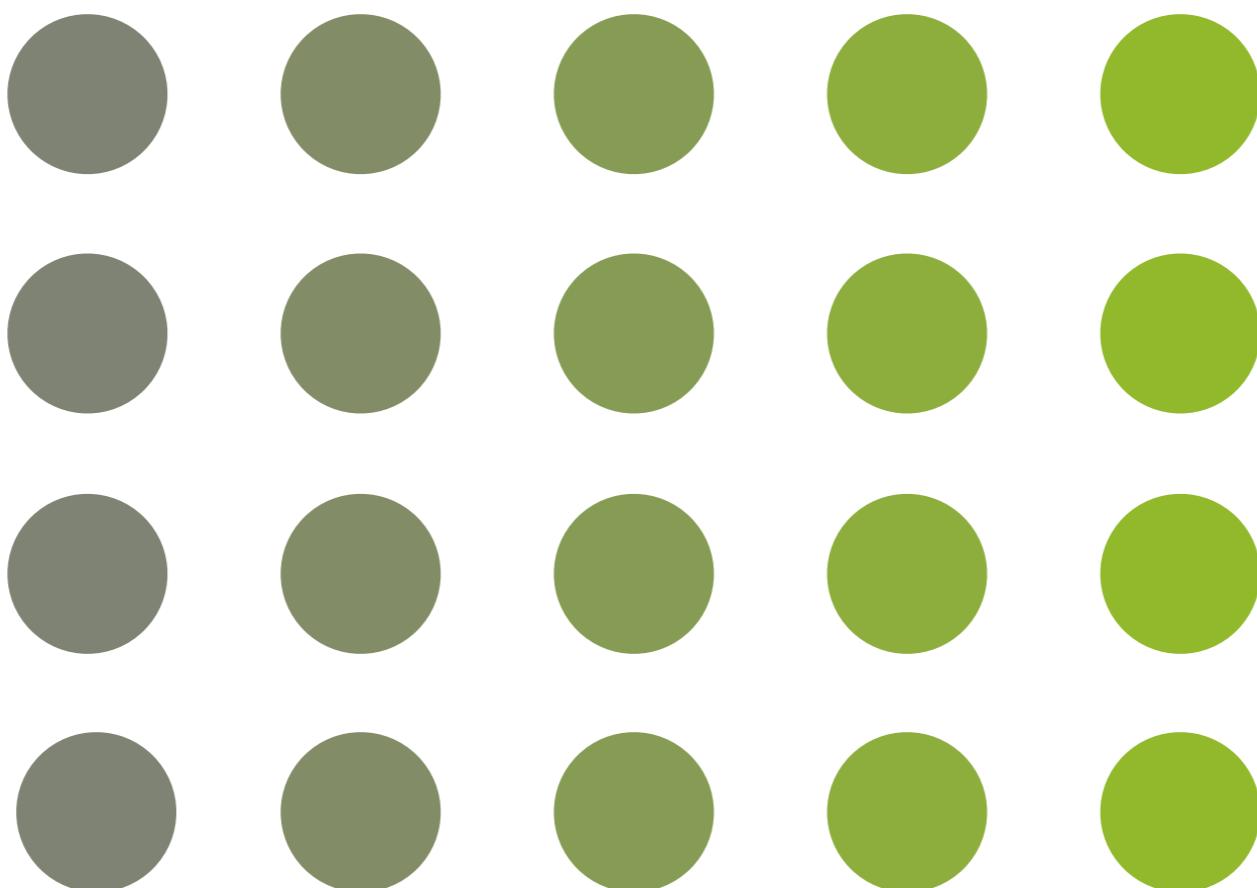
Ordered: Yes

Hue (Color)



Values: Practically Limited
Ordered: Not really

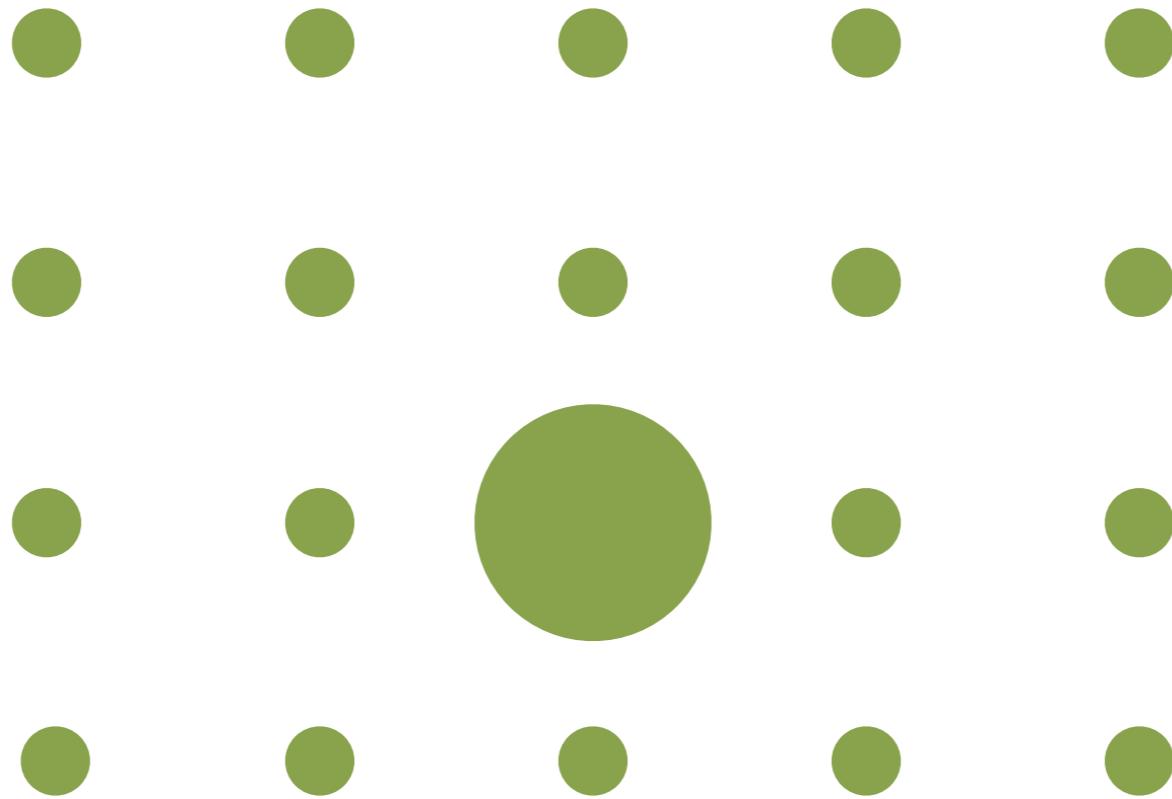
Saturation/Intensity



Values: Practically Limited

Ordered: Yes

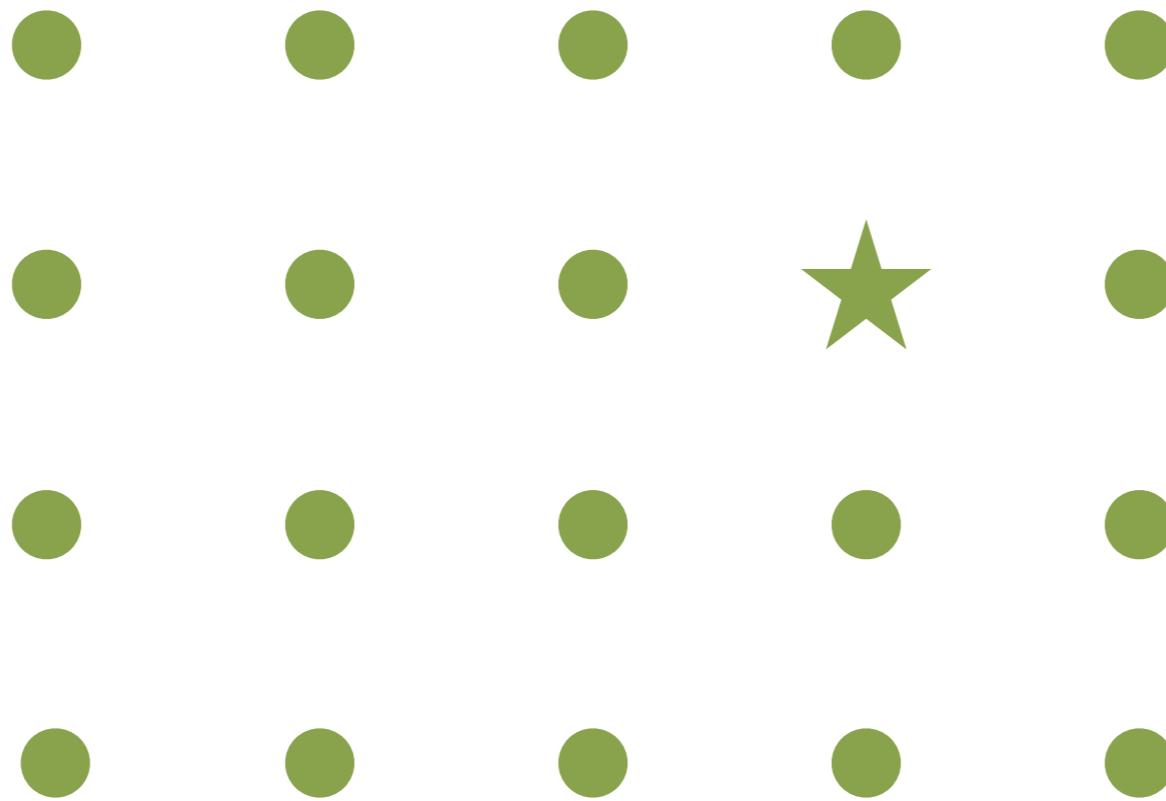
Size



Values: Practically Limited

Ordered: Yes

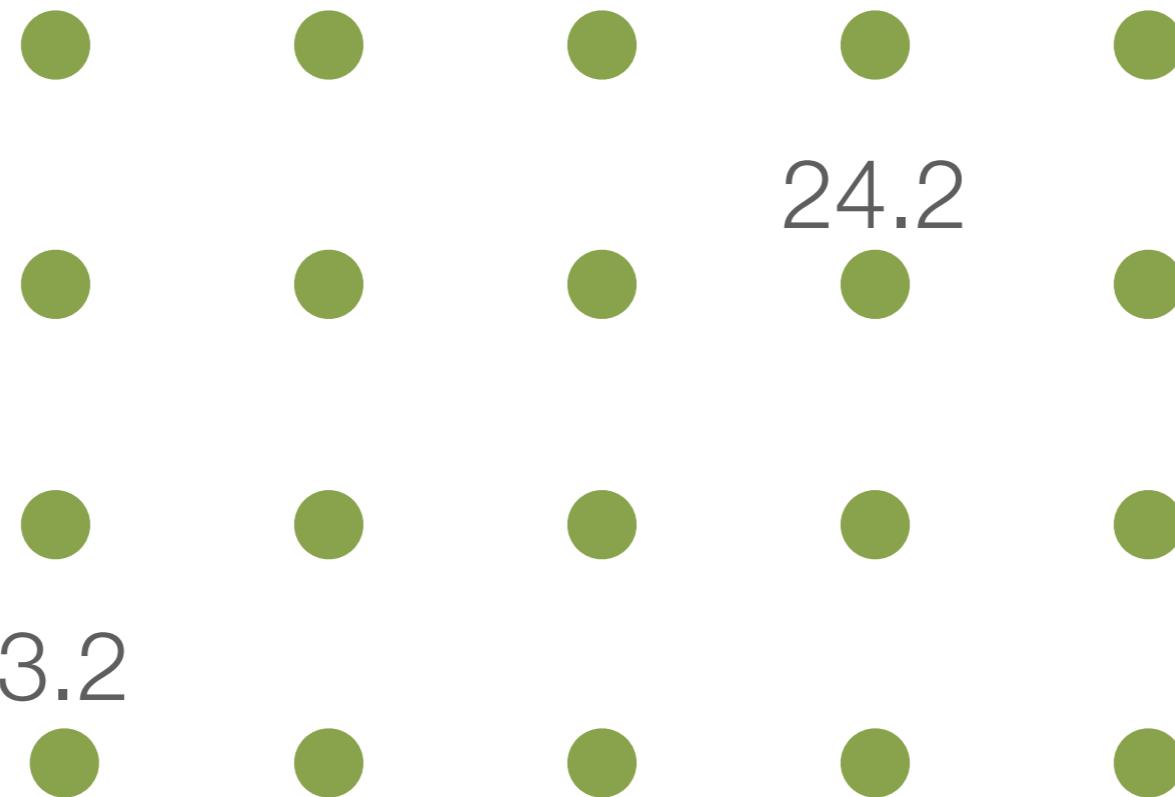
Shape



Values: Practically Limited

Ordered: No

Labels



Values: Infinite

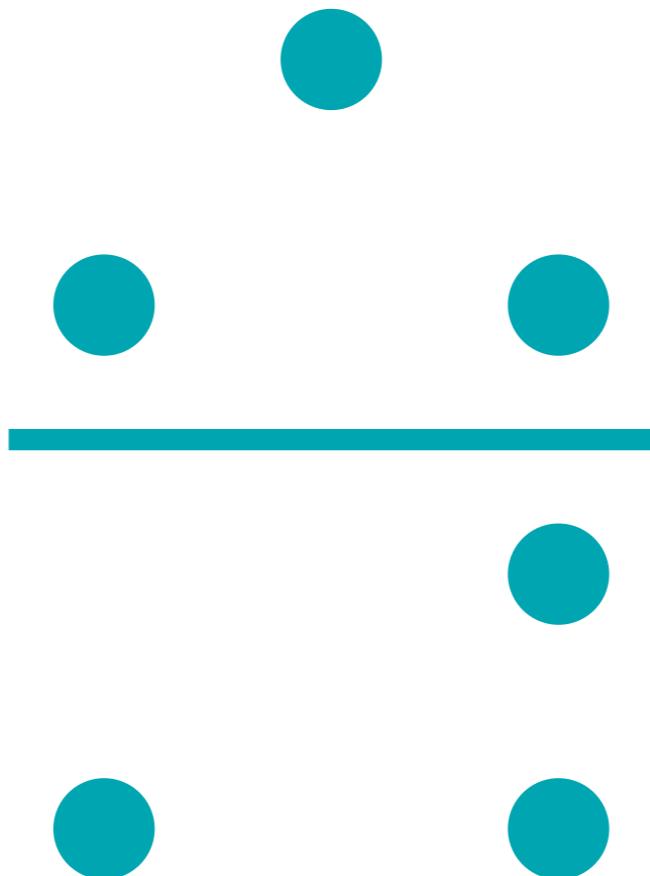
Ordered: Yes

Orientation



Values: Practically Limited Ordered: Possibly

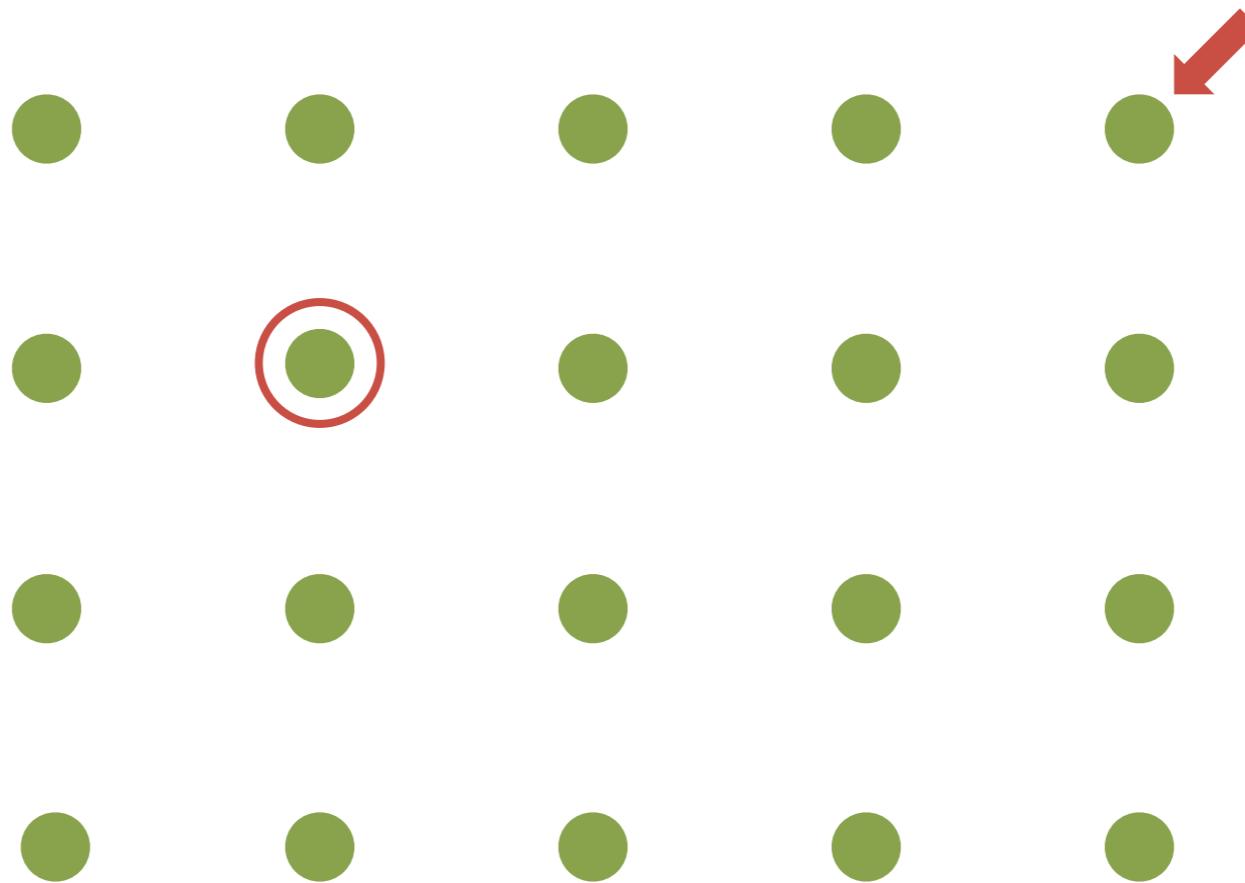
Grouping



Values: Infinite

Ordered: Possibly

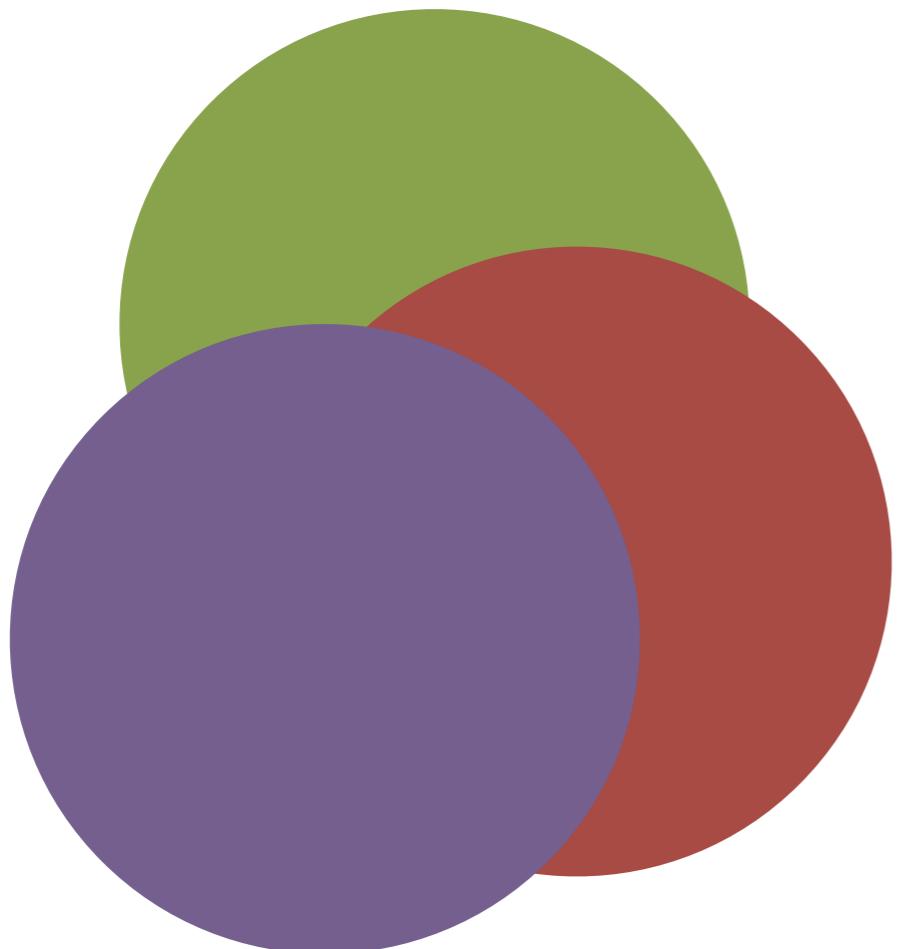
Highlighting



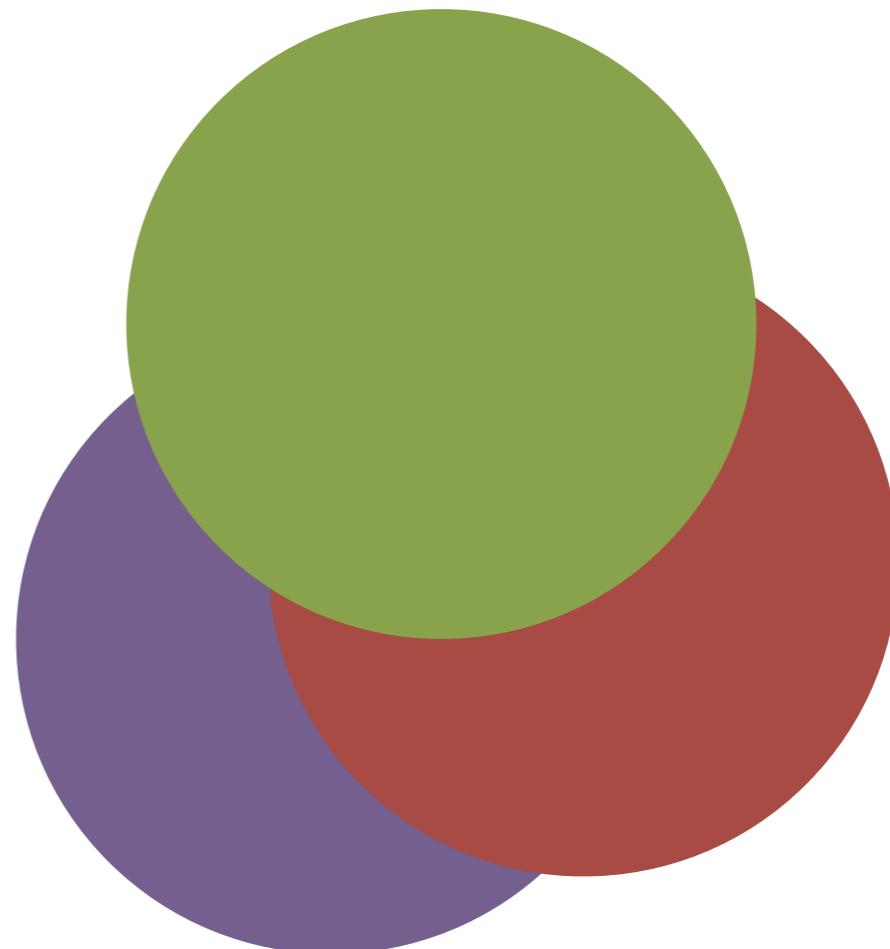
Values: Very Limited

Ordered: No

Layers

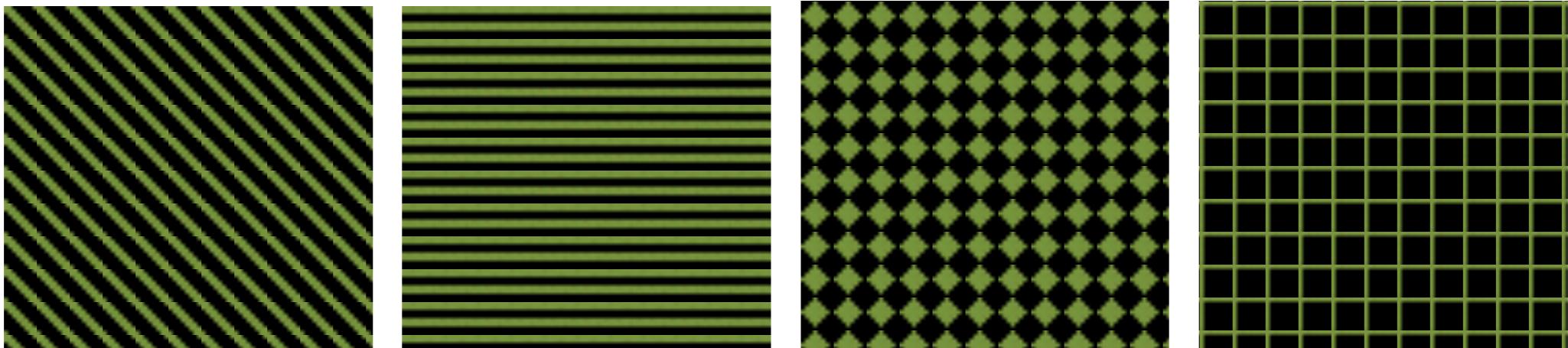


Values: Limited



Ordered: Yes

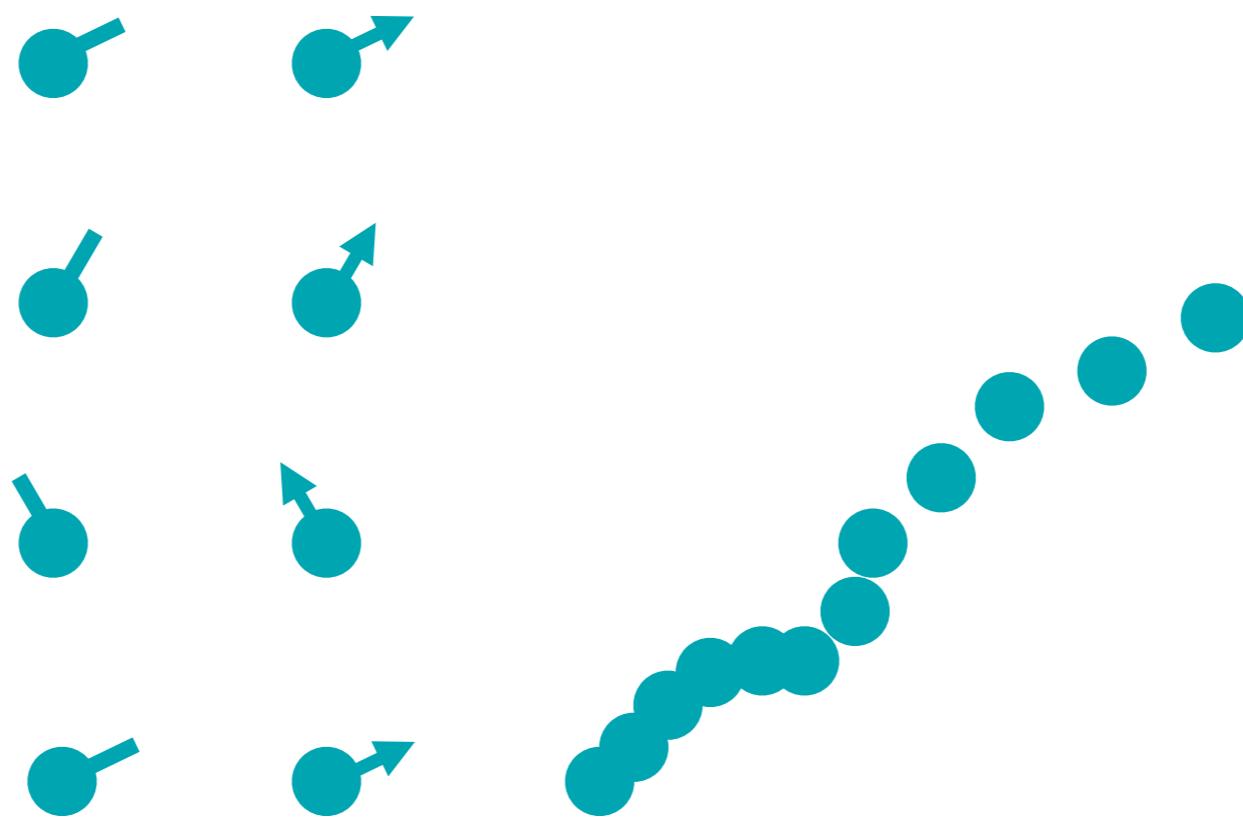
Patterns



Values: Practically Limited

Ordered: No

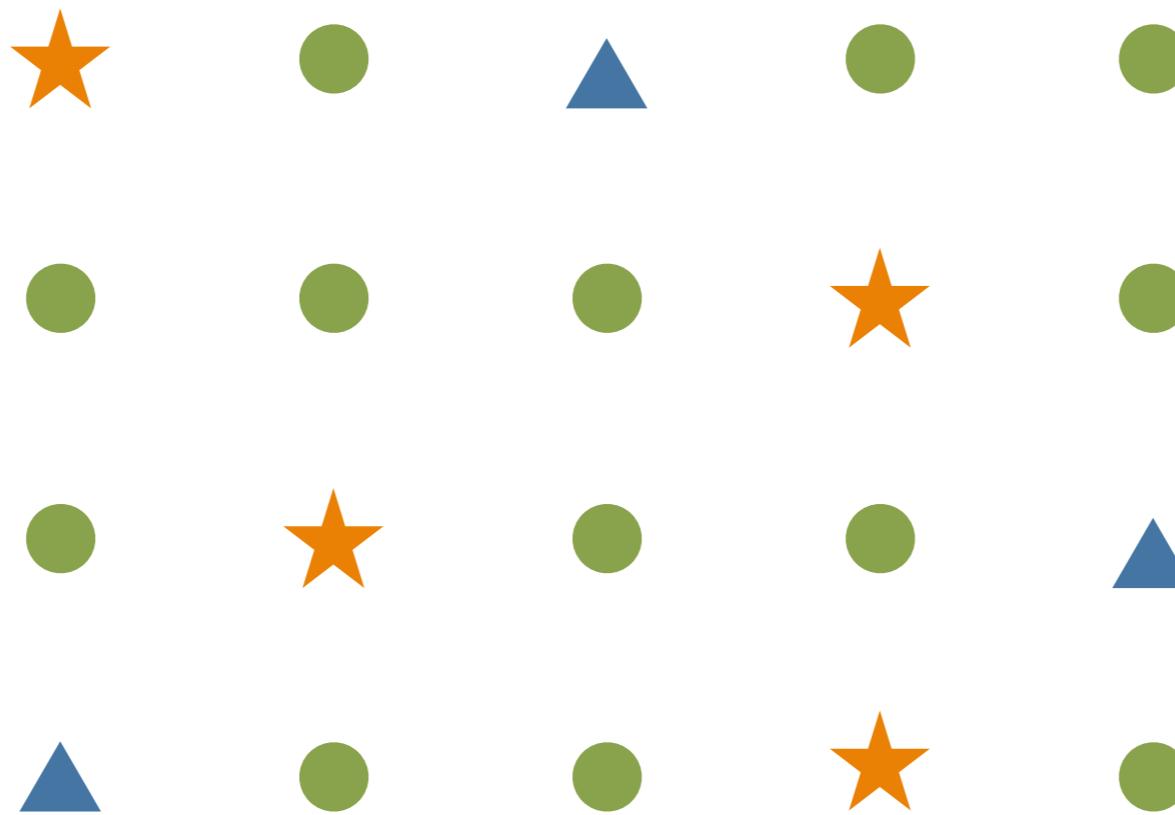
Motion



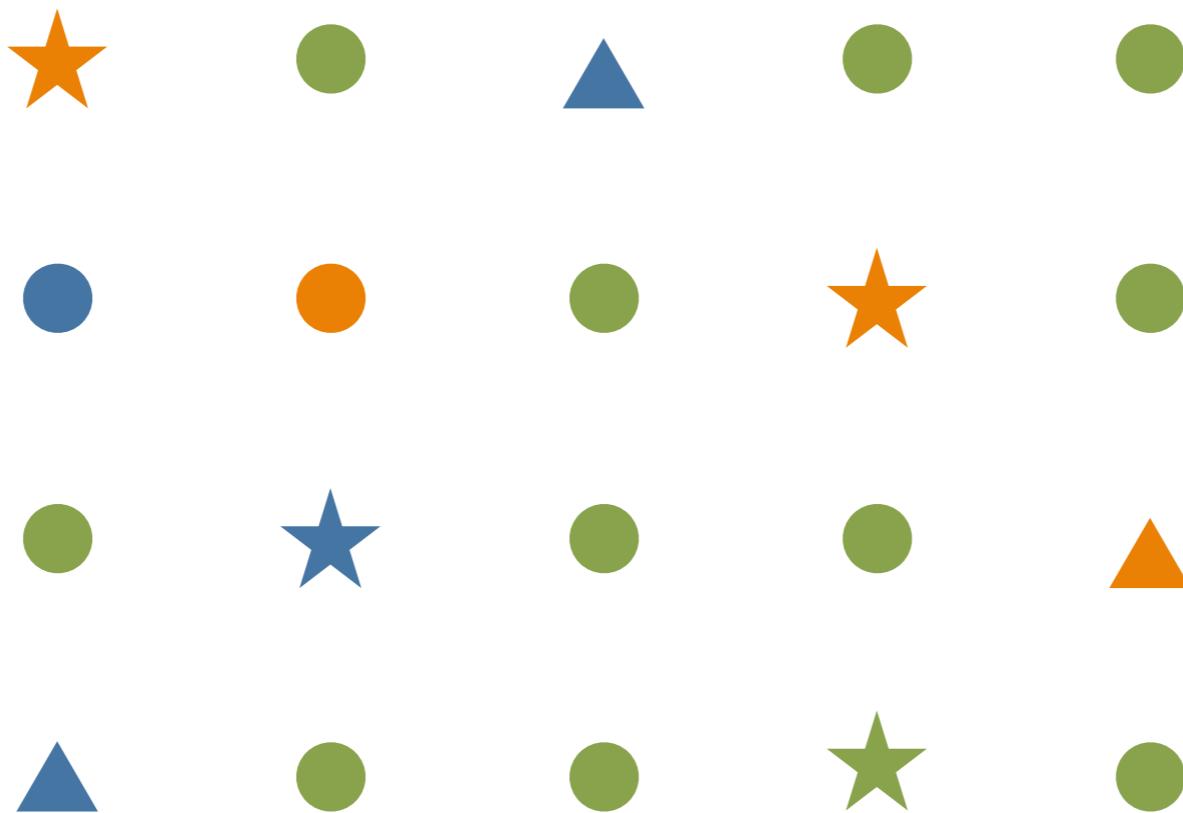
Values: Somewhat Limited

Ordered: Yes

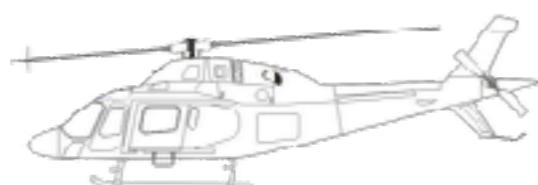
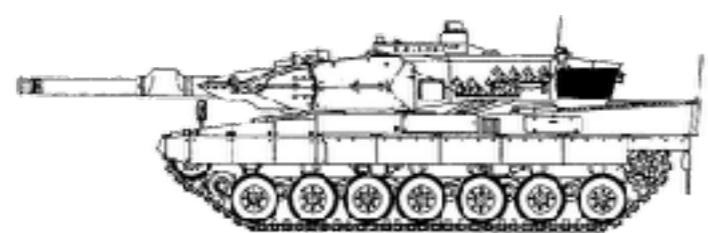
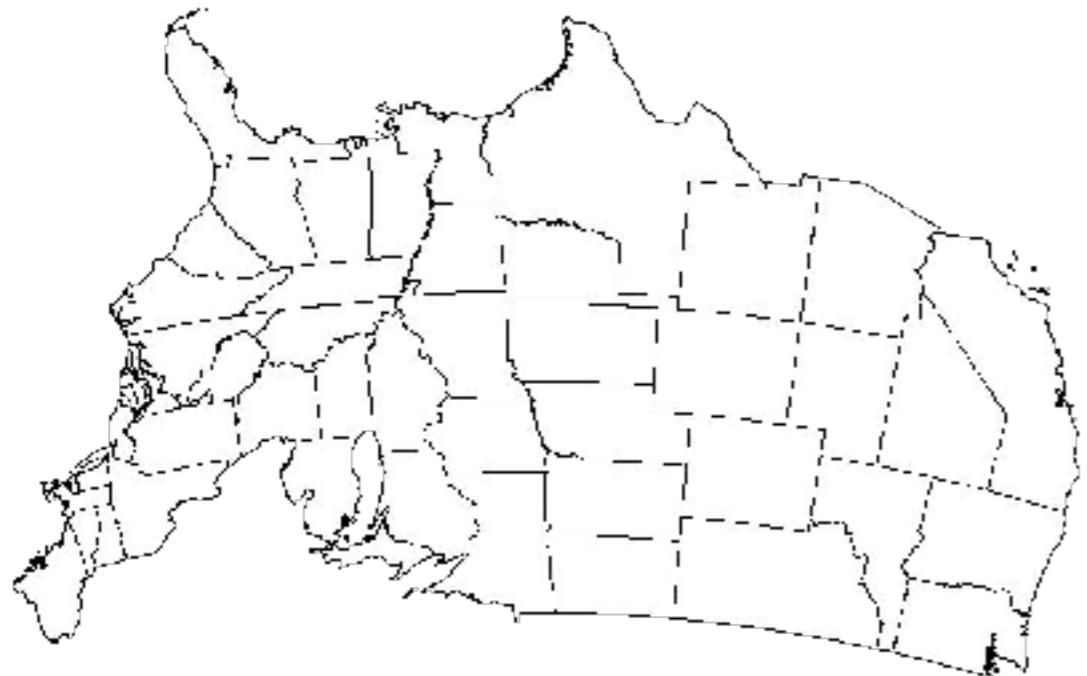
Redundant Encoding



Consistency



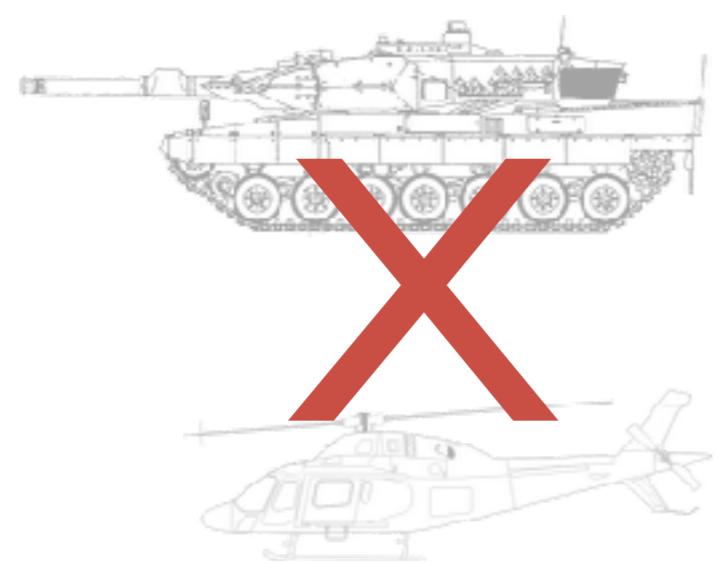
Natural Encoding



Natural Encoding



VS

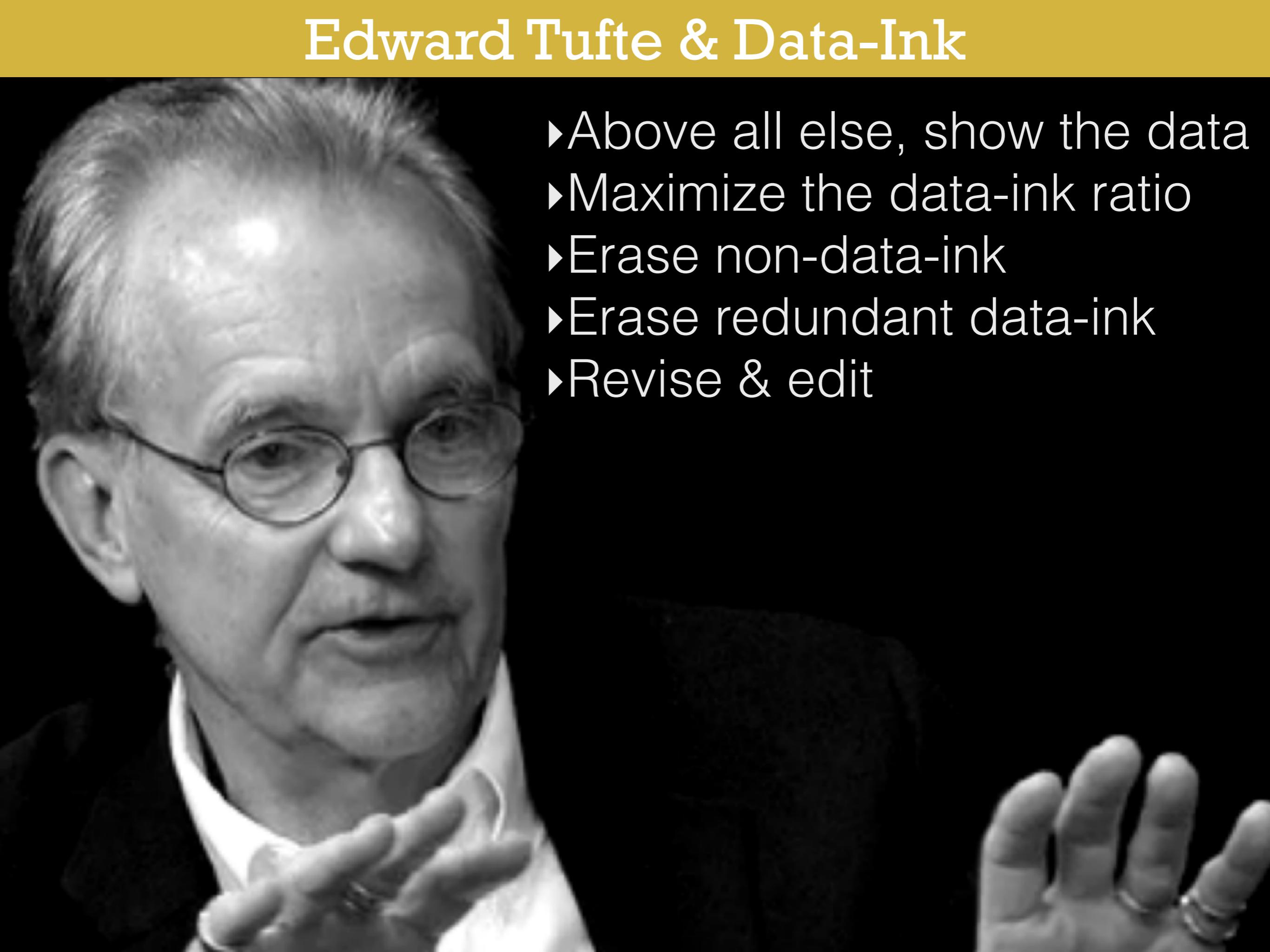


VS

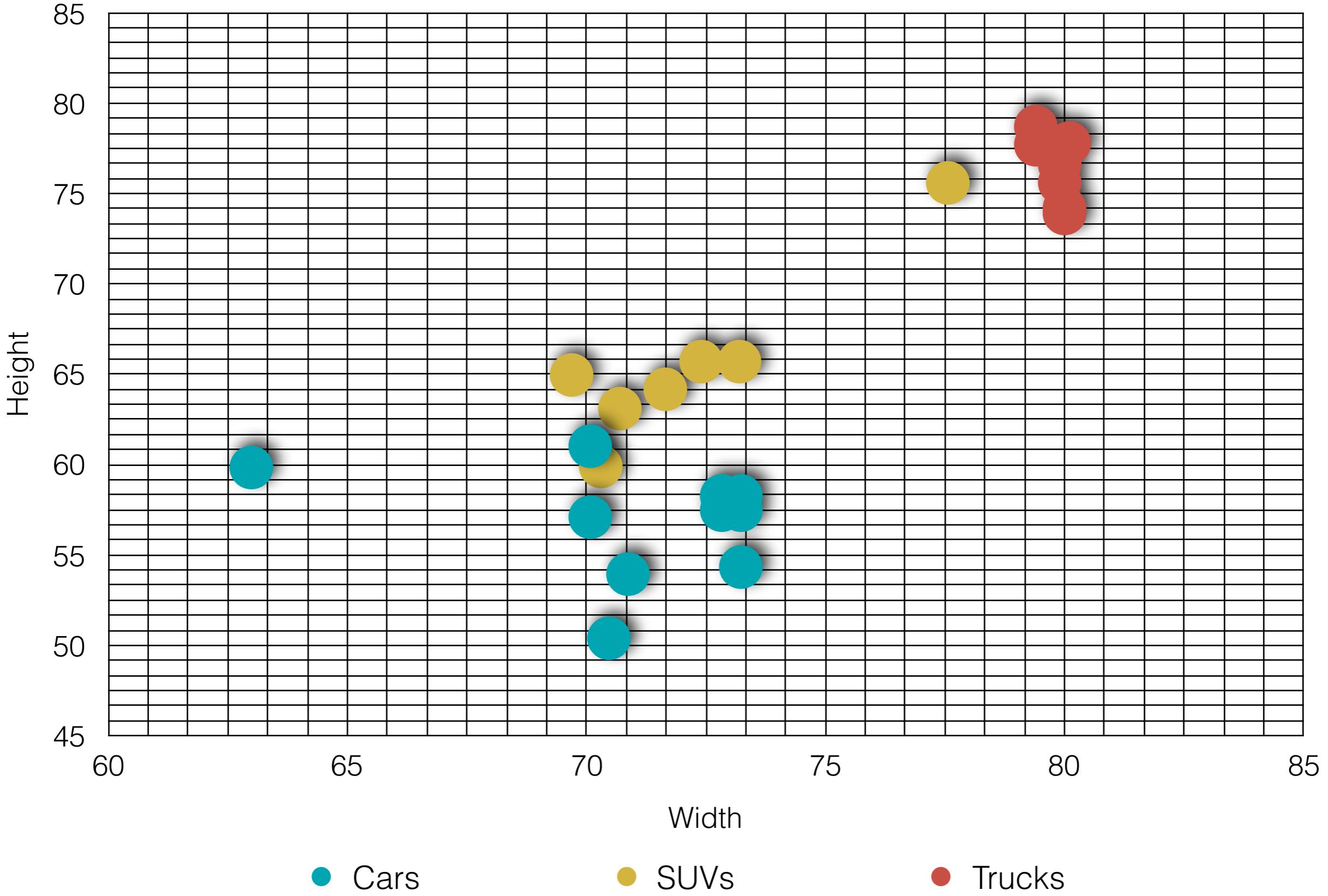


Data-Ink

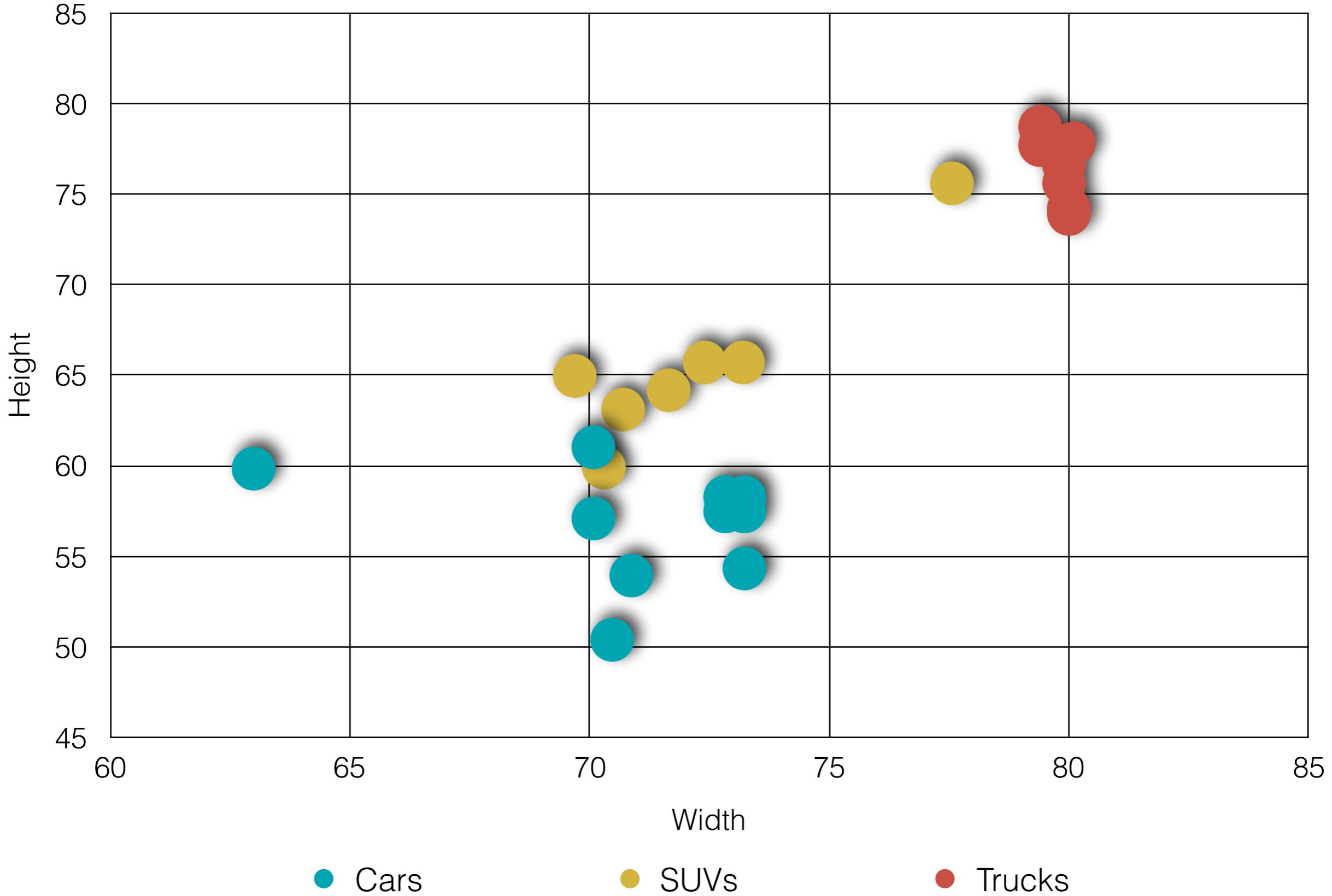
Edward Tufte & Data-Ink

- 
- A black and white photograph of Edward Tufte, an elderly man with glasses, resting his chin on his hand. He is wearing a dark suit and a white shirt. The background is dark.
- ▶ Above all else, show the data
 - ▶ Maximize the data-ink ratio
 - ▶ Erase non-data-ink
 - ▶ Erase redundant data-ink
 - ▶ Revise & edit

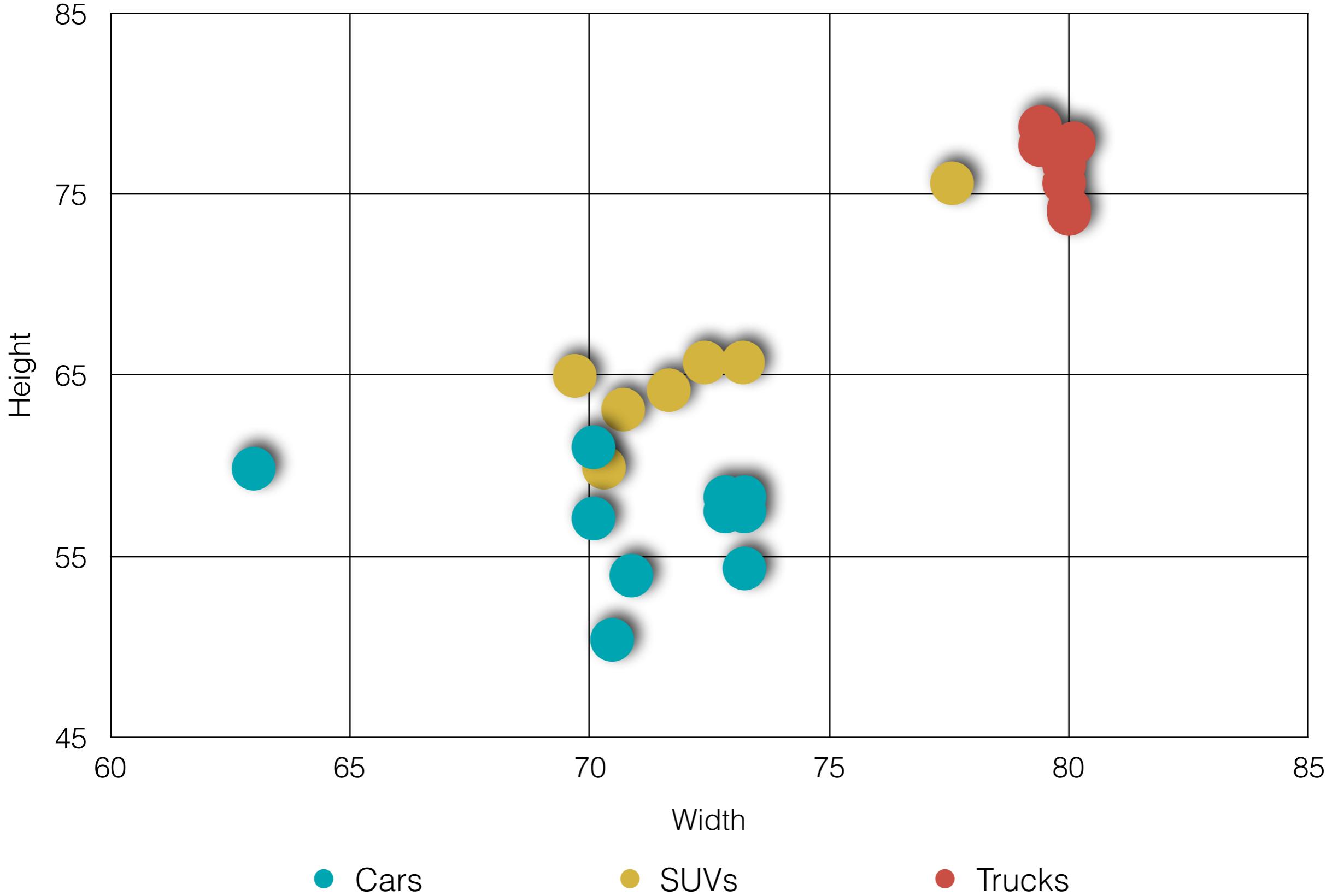
Vehicle Heights & Widths



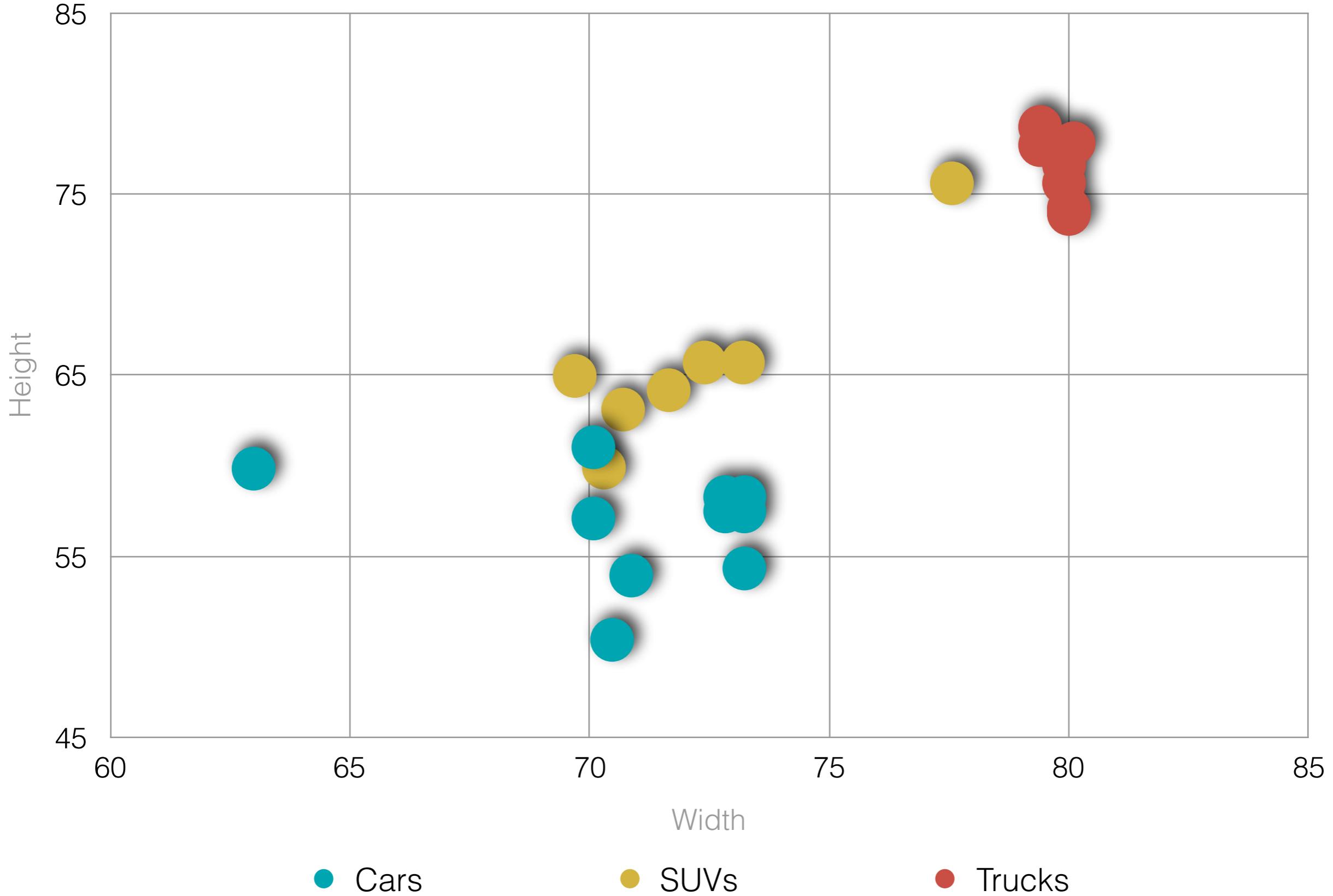
Vehicle Heights & Widths



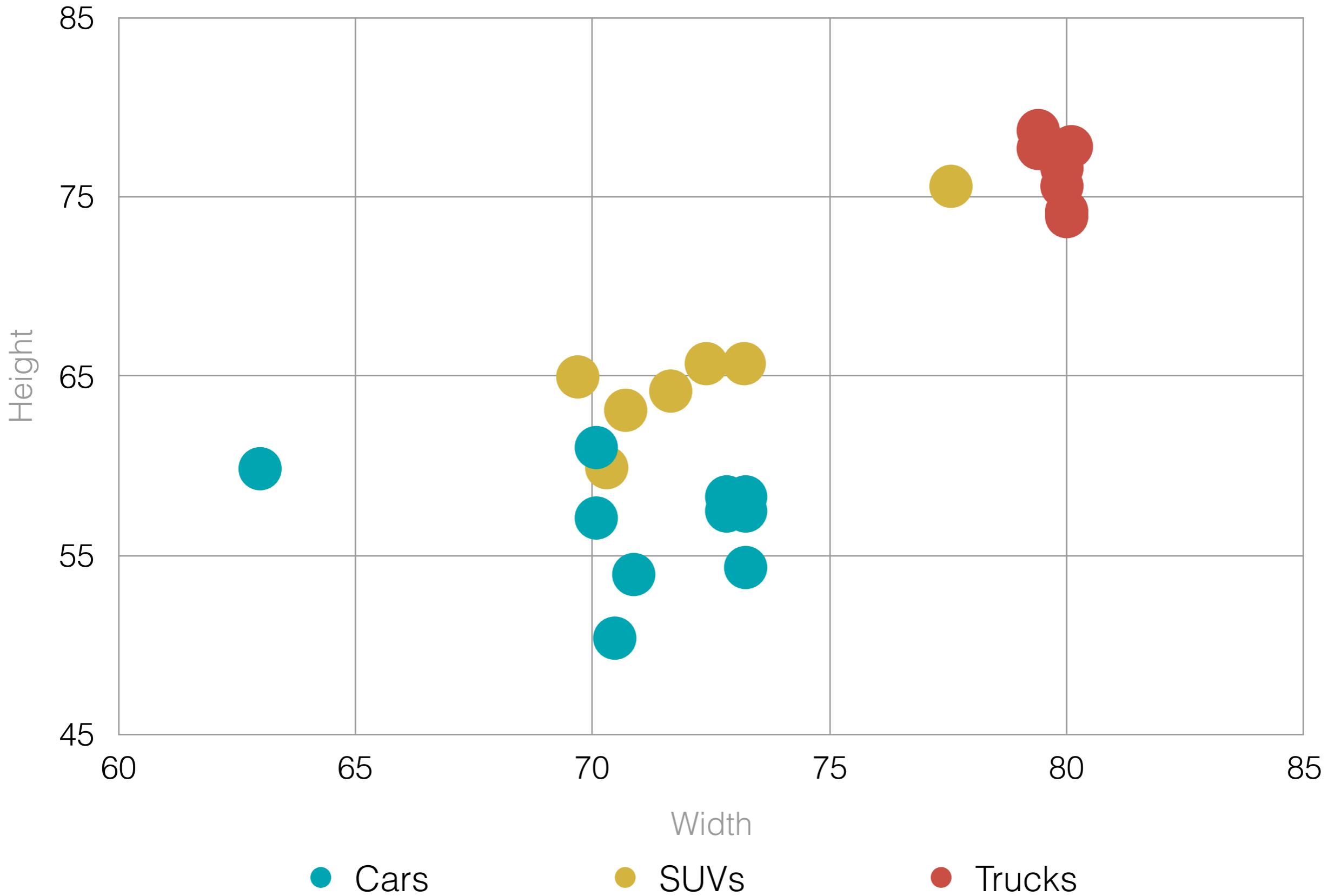
Vehicle Heights & Widths



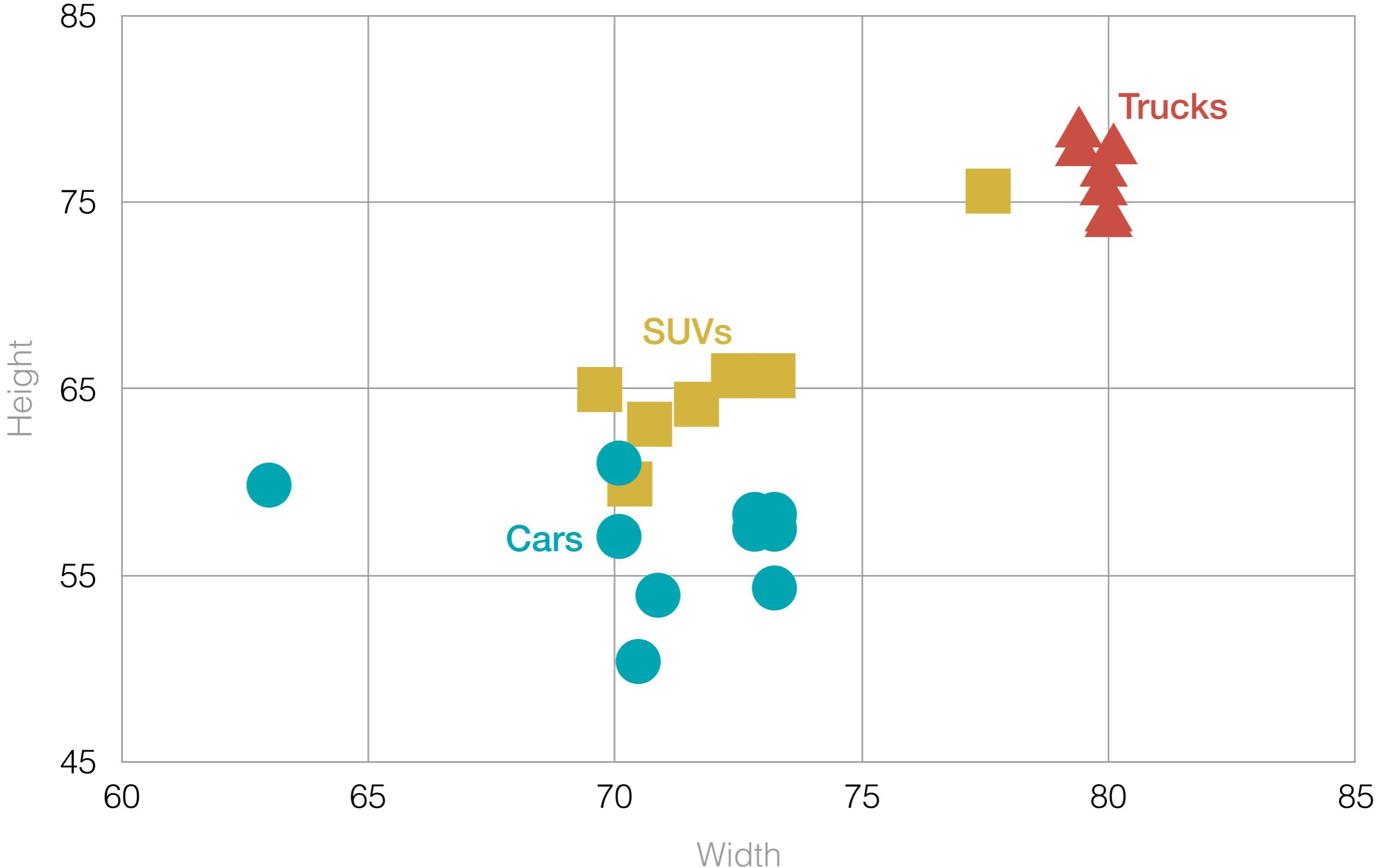
Vehicle Heights & Widths



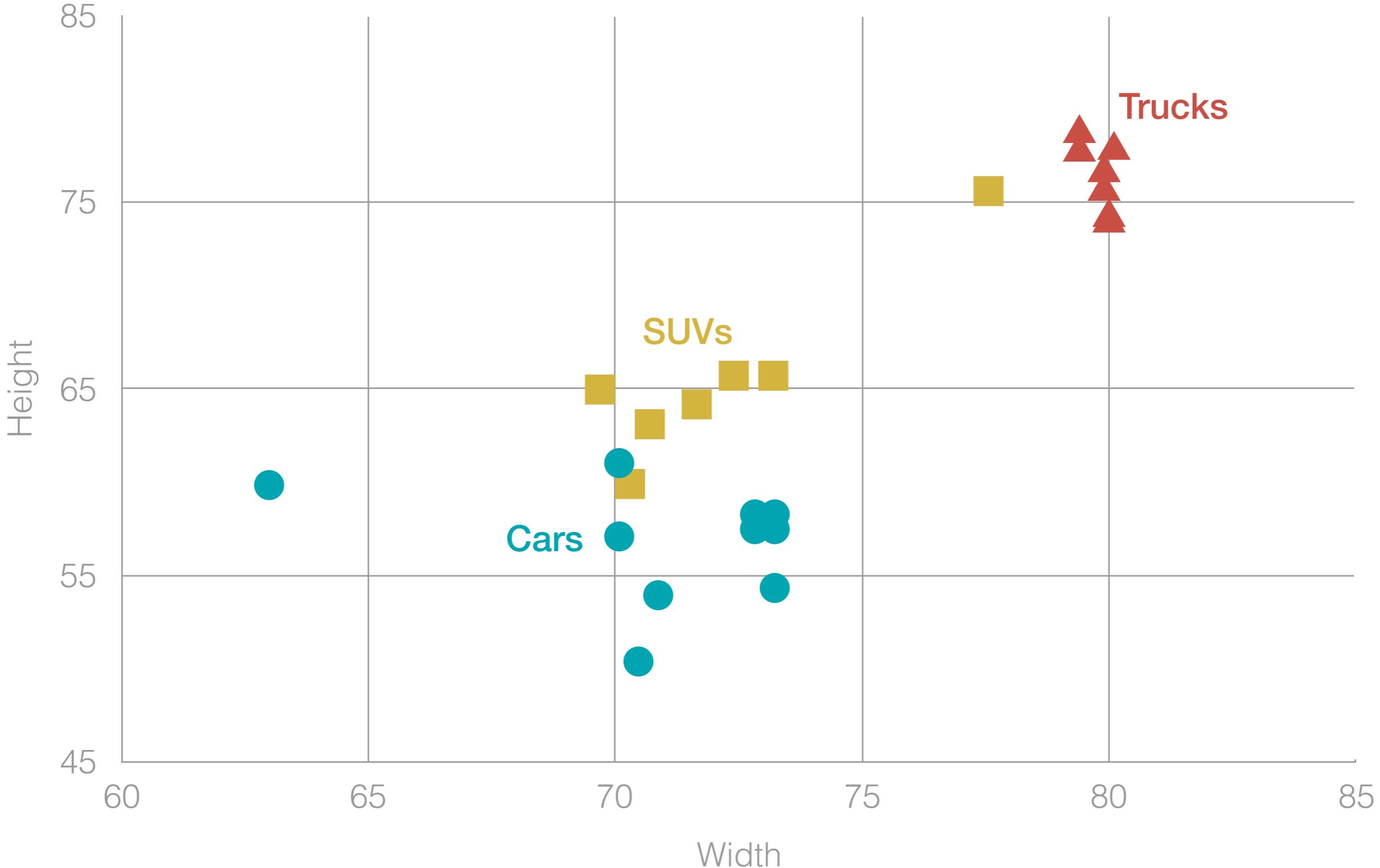
Vehicle Heights & Widths



Vehicle Heights & Widths



Vehicle Sizes



Storytelling

Tell Your Story

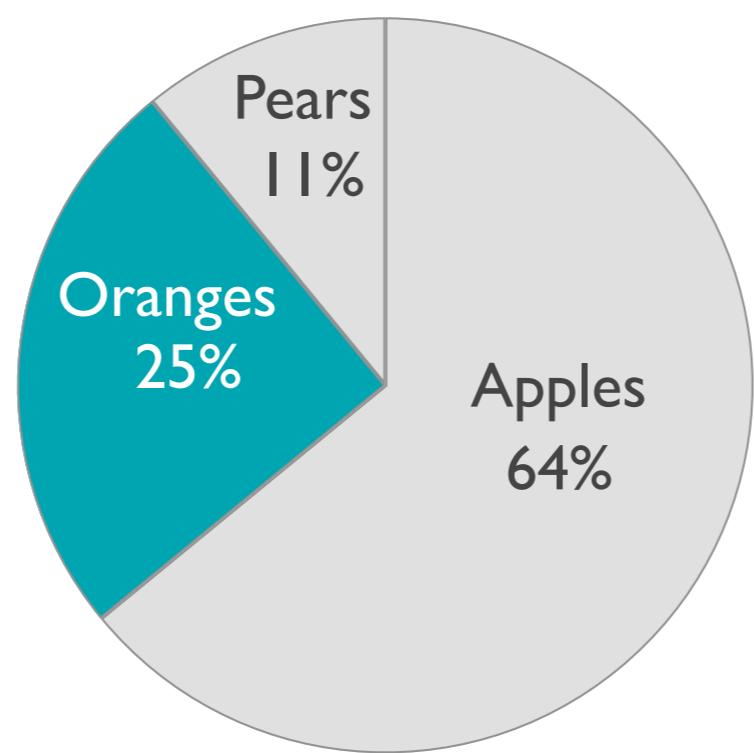
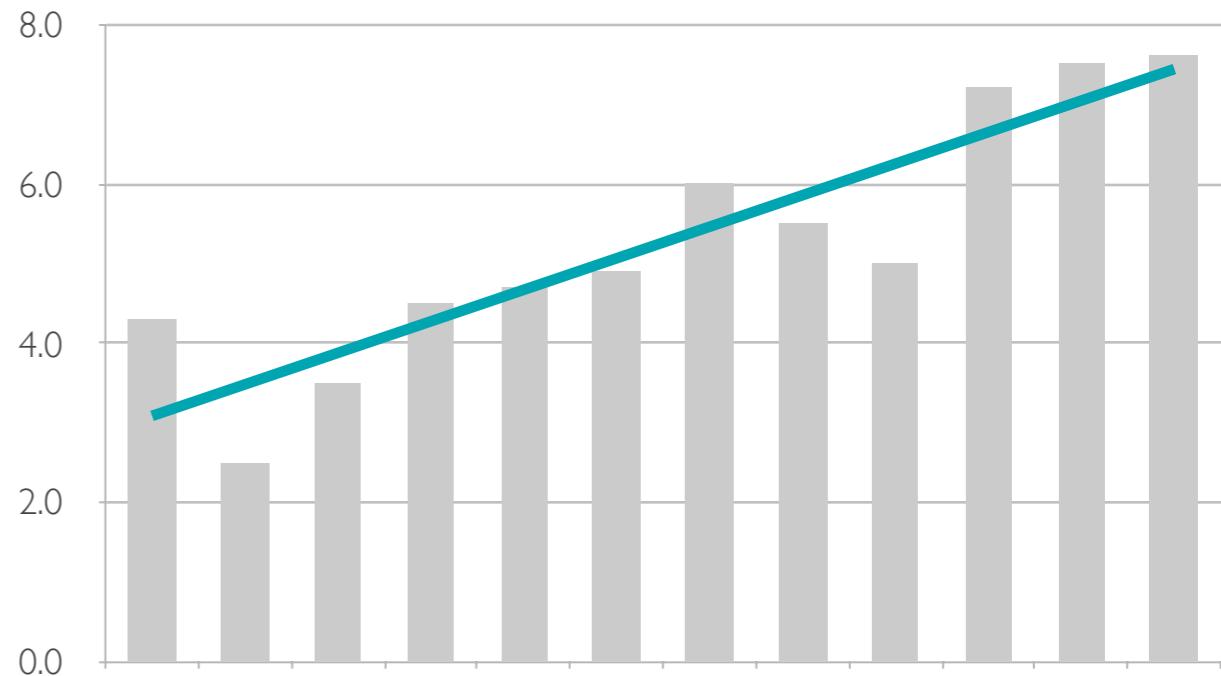
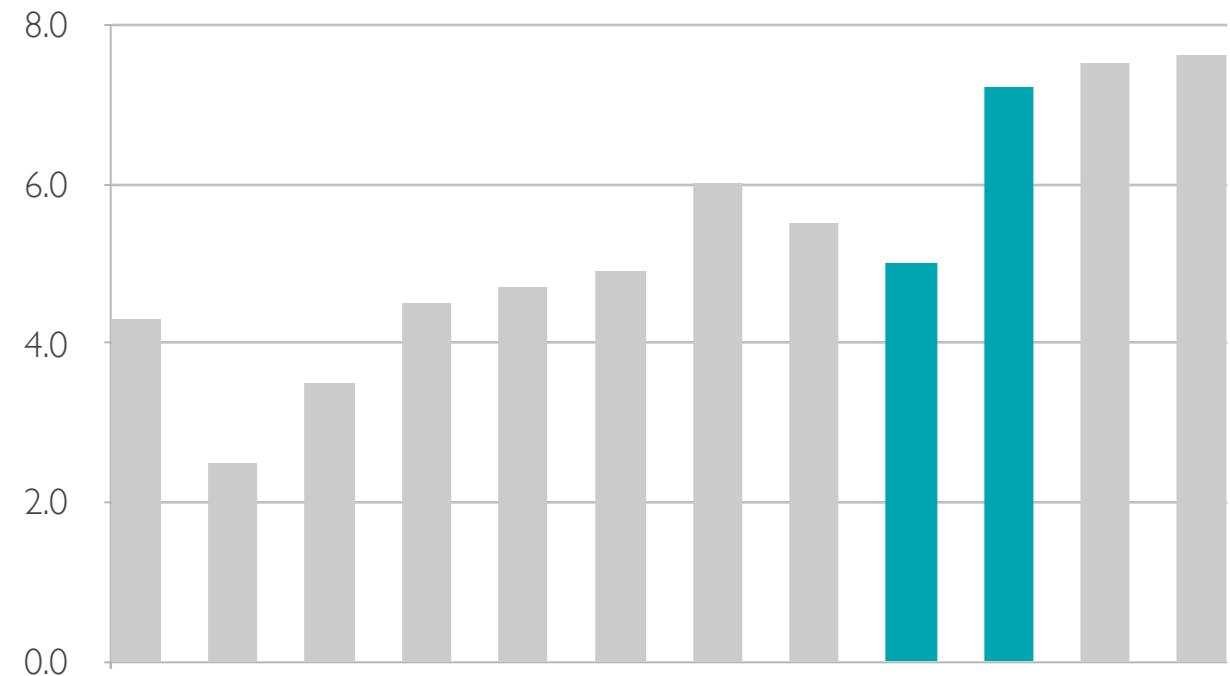
This screenshot shows a Microsoft Excel spreadsheet titled "Ratio Analysis" for Burger King Worldwide Inc. The spreadsheet includes various financial ratios and metrics across multiple years from 2006 to 2023.

Key Sections:

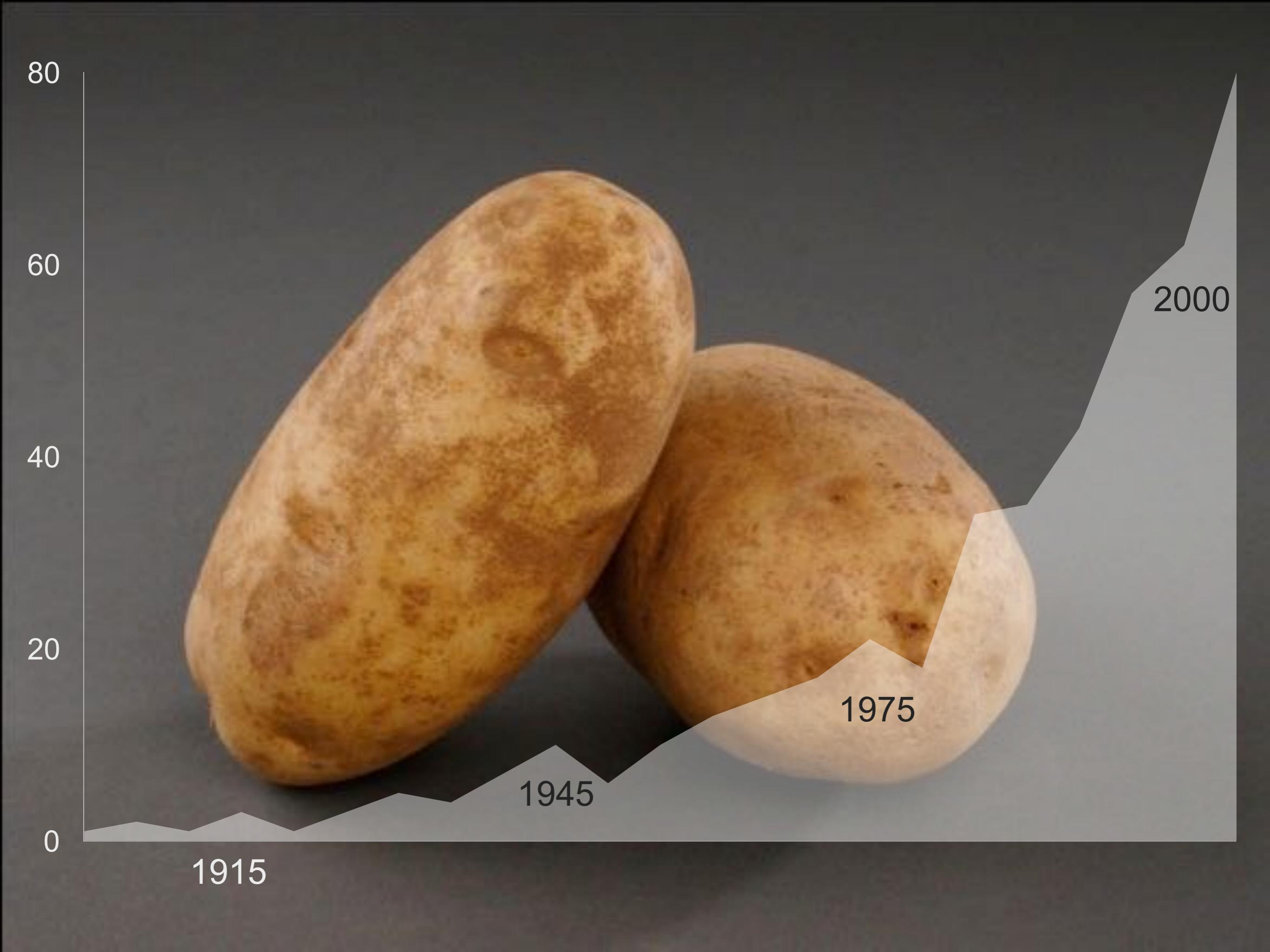
- Company Name:** BURGER KING WORLDWIDE INC
- Fiscal Year End Date:** Actual (2006/06/01 to 2023/06/01), Forecast (2011/06/01 to 2023/06/01)
- Annual Growth Rates:** Sales, Assets, Common Equity, Earnings, Free Cash Flow to Investors, Sustainable Growth Rate
- Profitability:** Return on Equity, Return on Equity (b4 non-recurring), Return on Net Operating Assets
- Basic Dupont Model:** Net Profit Margin, Total Asset Turnover, Total Leverage, Return on Equity
- Advanced Dupont Model:** Net Operating Margin, Net Operating Asset Turnover, Return on Net Operating Assets, Net Borrowing Cost (NDC), Spread (RNOA - NDC), Financial Leverage (LEV), ROE = RNOA + LEV*Spread
- Margin Analysis:** Gross Margin, EBITDA Margin, EBIT Margin, Net Operating Margin (b4 non-rec.), Net Operating Margin
- Turnover Analysis:** Net Operating Asset Turnover, Net Working Capital Turnover, Avg Days to Collect Receivables, Avg Inventory Holding Period, Avg Days to Pay Payables, PP&E Turnover
- Analysis of Leverage:** Long-Term Capital Structure

Formatting: The spreadsheet uses conditional formatting with color coding for different ranges of values. The "Format" tab in the ribbon is visible at the top, showing options for cells, styles, and themes.

Tell Your Story







80

60

40

20

0

1915

1945

1975

2000

Tell Your Story: Before

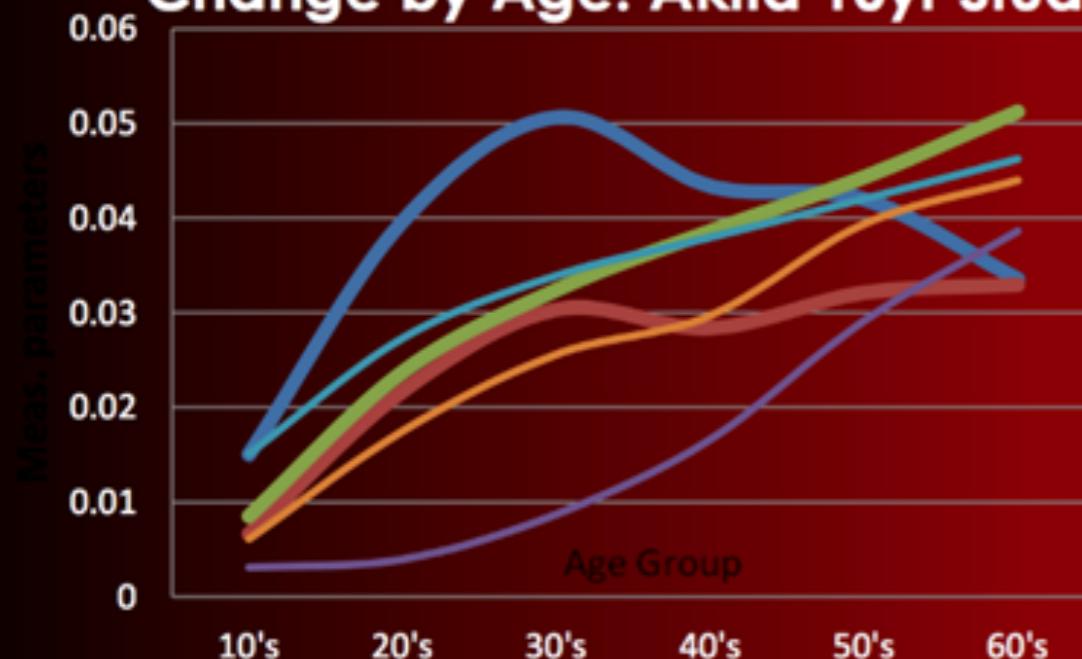
TOP 3 FEATURES WITH BIGGEST SKIN DEVIATION

TEXTURE

VISIBLE
PORES

INNER
RESILIENCE

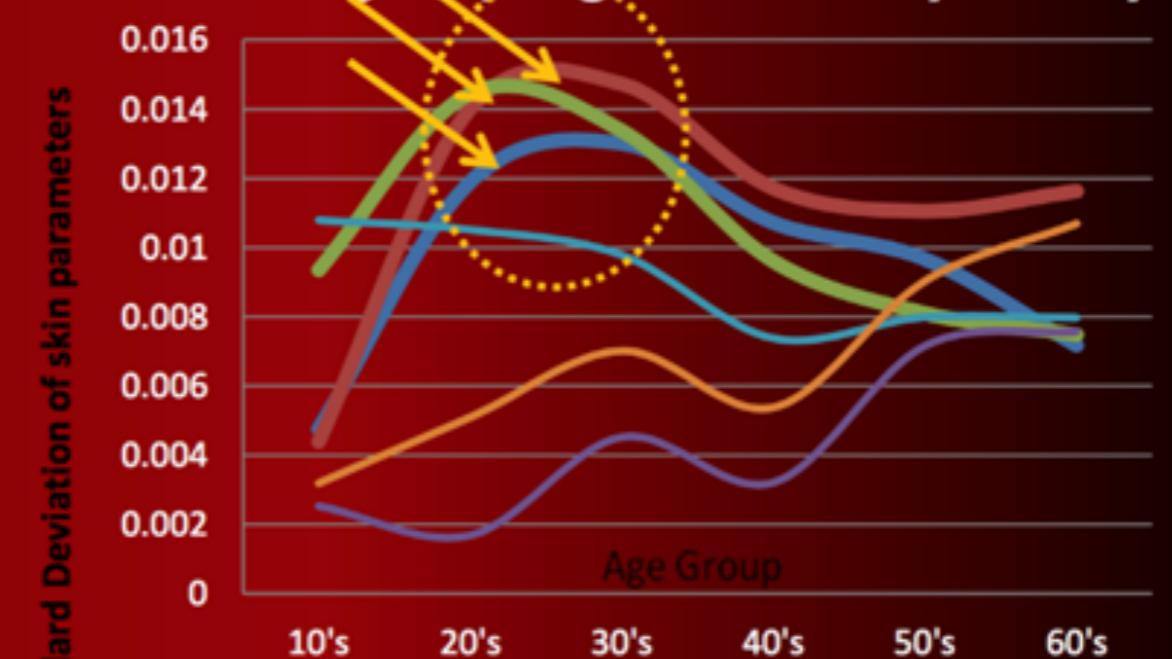
1) Skin Appearance Average Change by Age: Akita 10yr Study



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

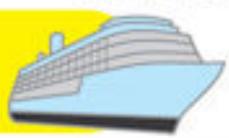
AFTER NOT
USING SK-II
PRODUCTS

Icons

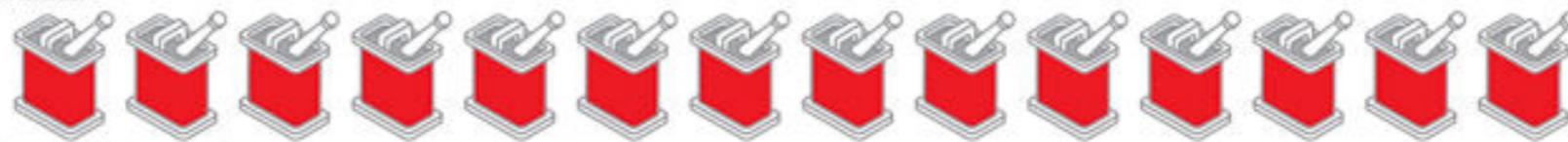
GETTING AROUND: FUEL USE OF VARIOUS MODES OF TRANSPORTATION

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

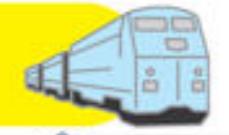
Cruise Ship



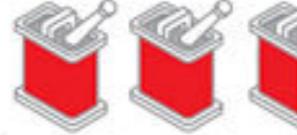
2915 Capacity
.009 Miles per gallon
121 Gallons per mile
10:56 Time to travel 350 miles at 32 mph



Amtrak



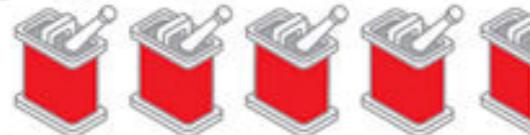
300 Capacity
.46 Miles per gallon
2.17 Gallons per mile
04:22 Time to travel 350 miles at 80 mph



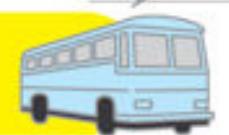
Boeing 737



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



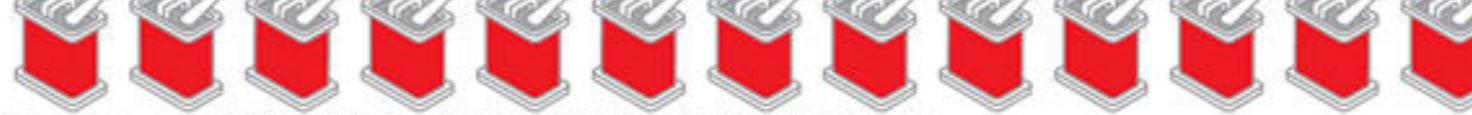
5 Capacity
21 Miles per gallon
.048 Gallons per mile
05:50 Time to travel 350 miles at 60 mph



Average Sedan



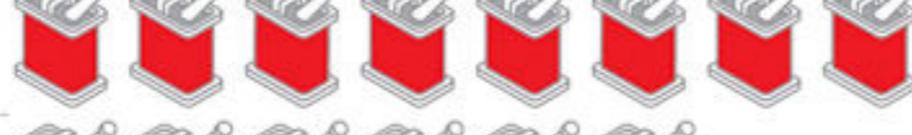
4 Capacity
27 Miles per gallon
.037 Gallons per mile
05:50 Time to travel 350 miles at 60 mph



Average Hybrid



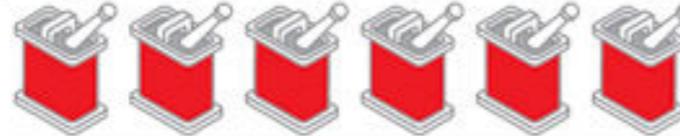
4 Capacity
46 Miles per gallon
.022 Gallons per mile
05:50 Time to travel 350 miles at 60 mph



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.

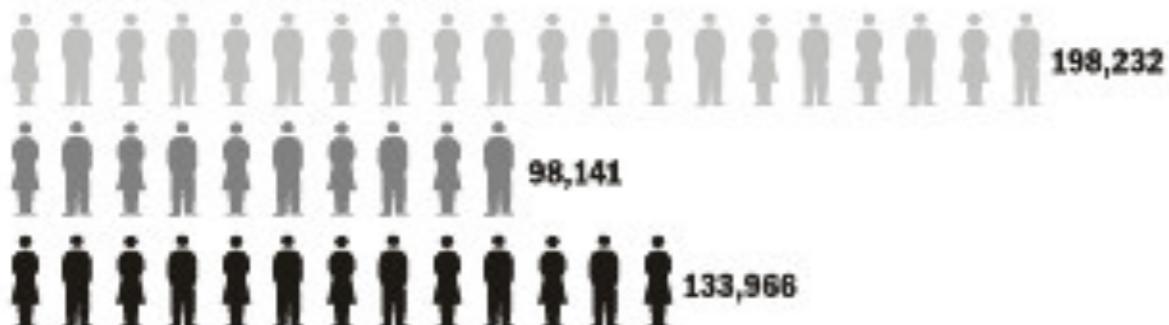
good.is
Transparency

REBUILDING PROGRESS IN NEW ORLEANS

BEFORE HURRICANE KATRINA 1 YEAR LATER 2 YEARS LATER

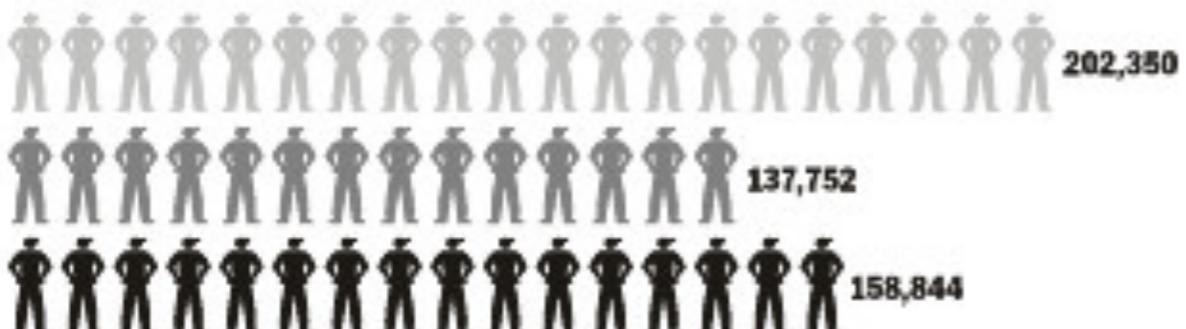
Households

Actively receiving mail in Orleans Parish



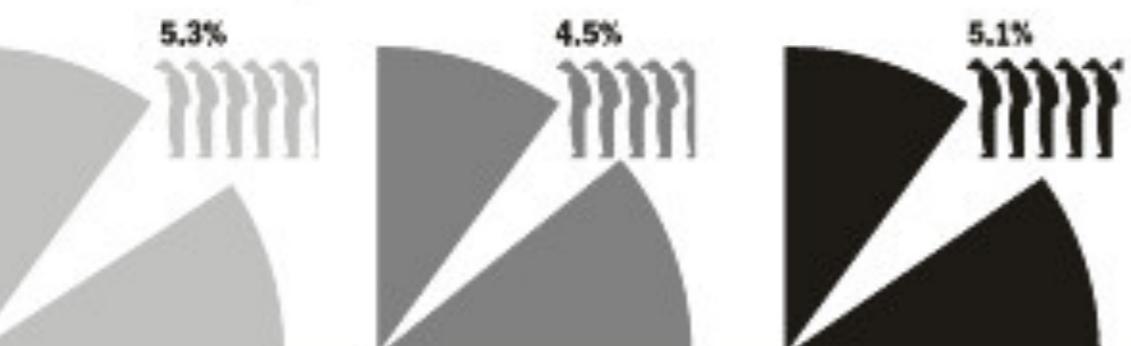
Labor force

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

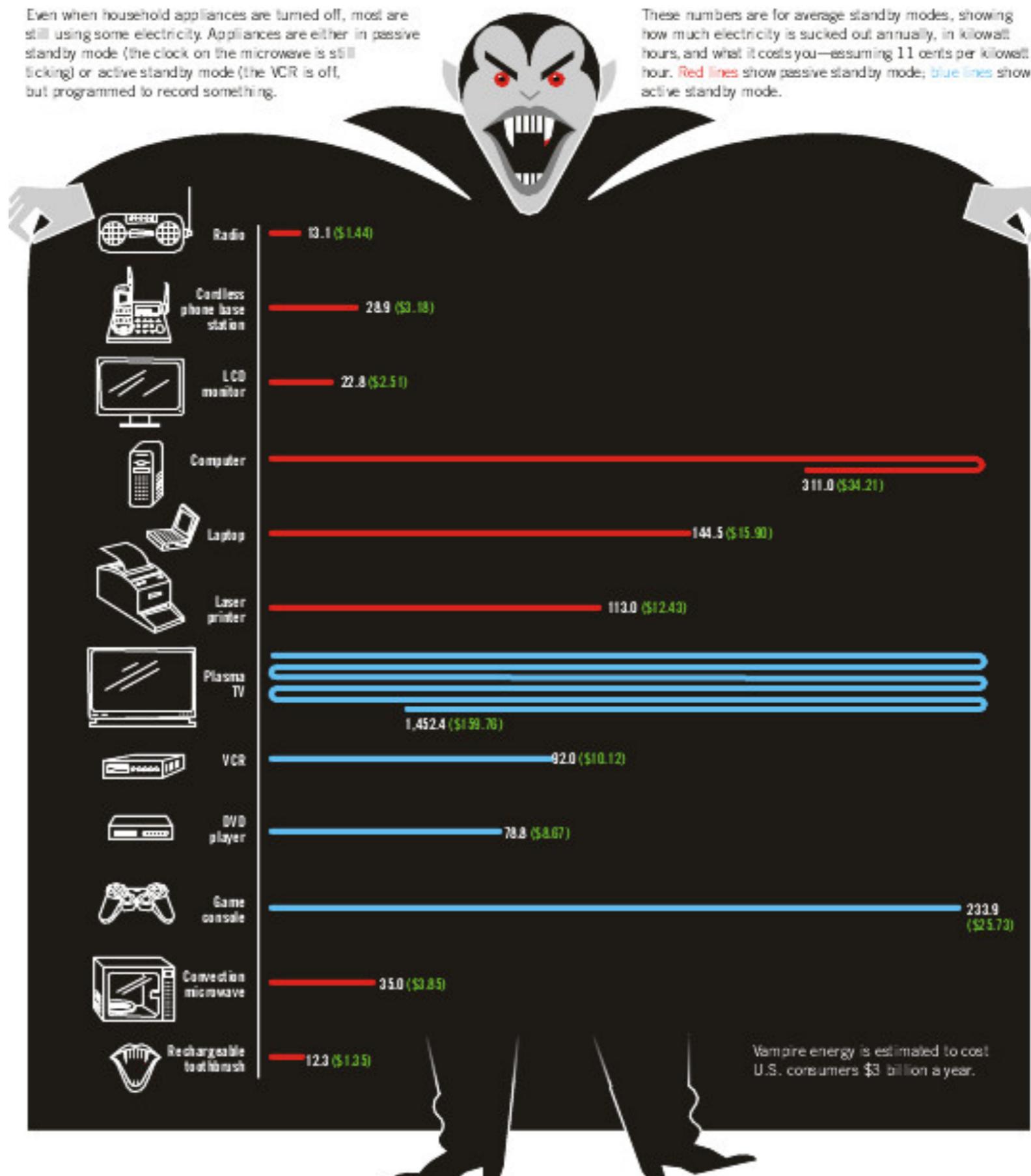


Source: Nigel Holmes

Vampire Energy

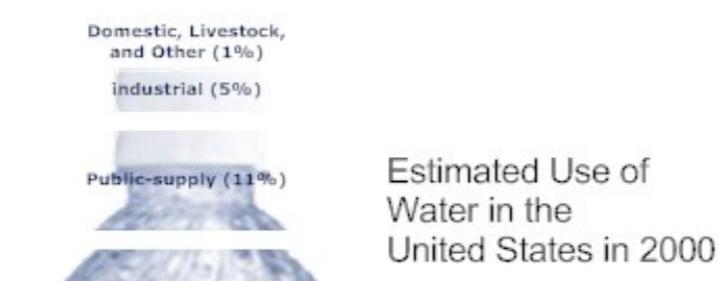
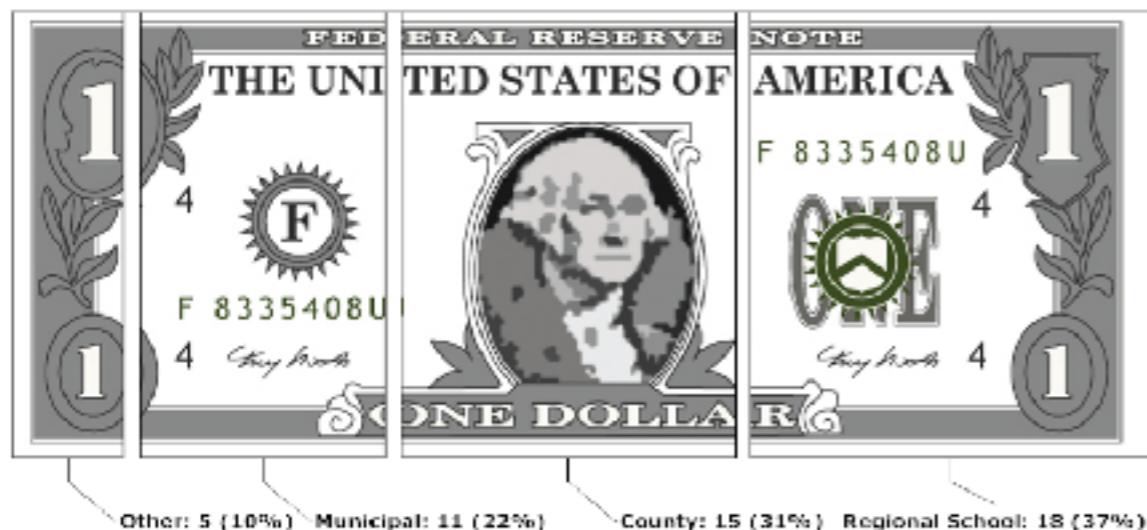
Even when household appliances are turned off, most are still using some electricity. Appliances are either in passive standby mode (the clock on the microwave is still ticking) or active standby mode (the VCR is off, but programmed to record something).

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.



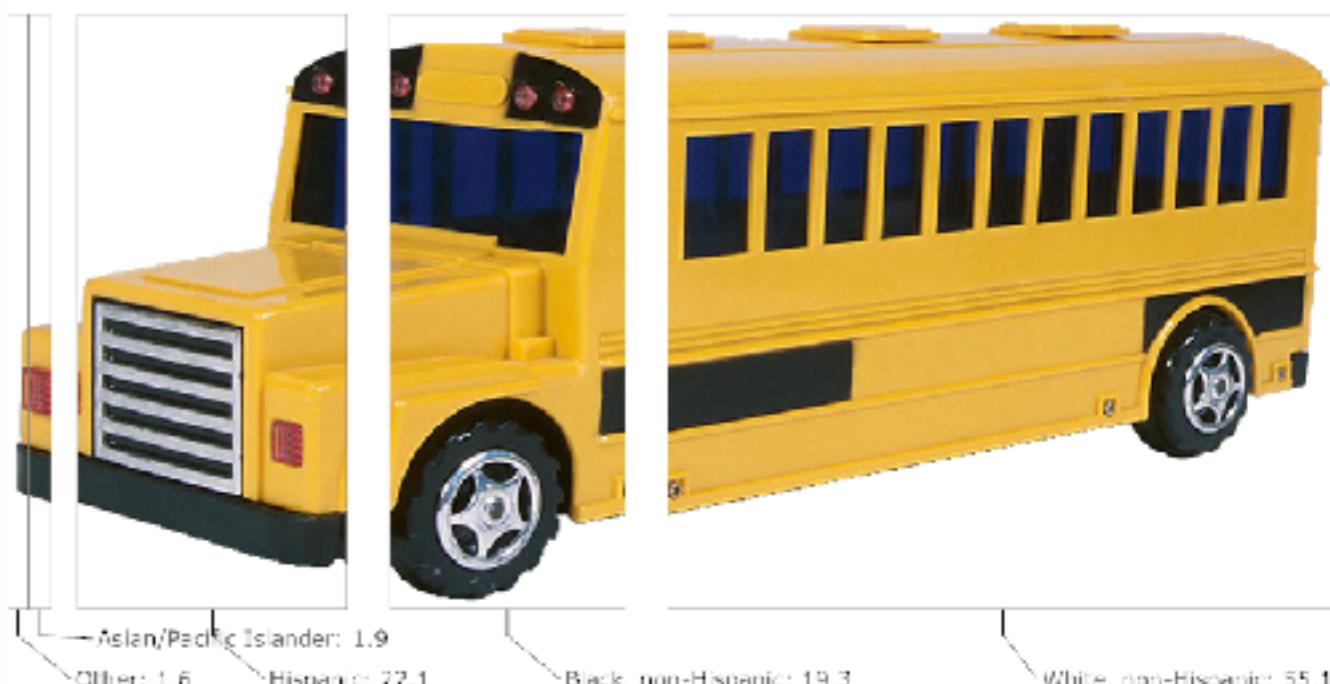
Source: Nigel Holmes

How Your Tax Dollars Are Spent



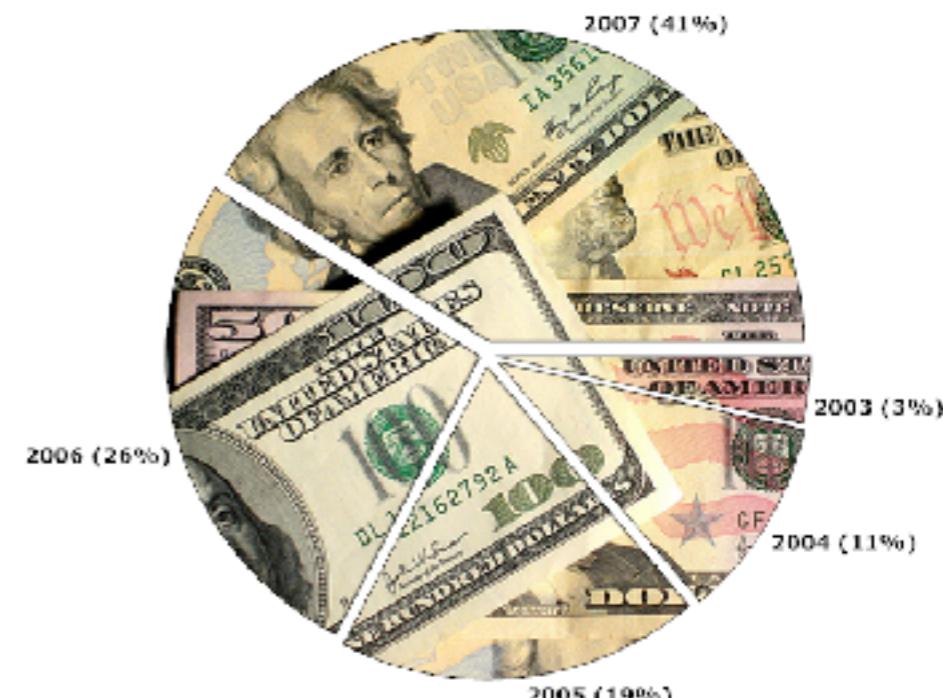
Source: U.S. Geological Survey. www.usgs.gov

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

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

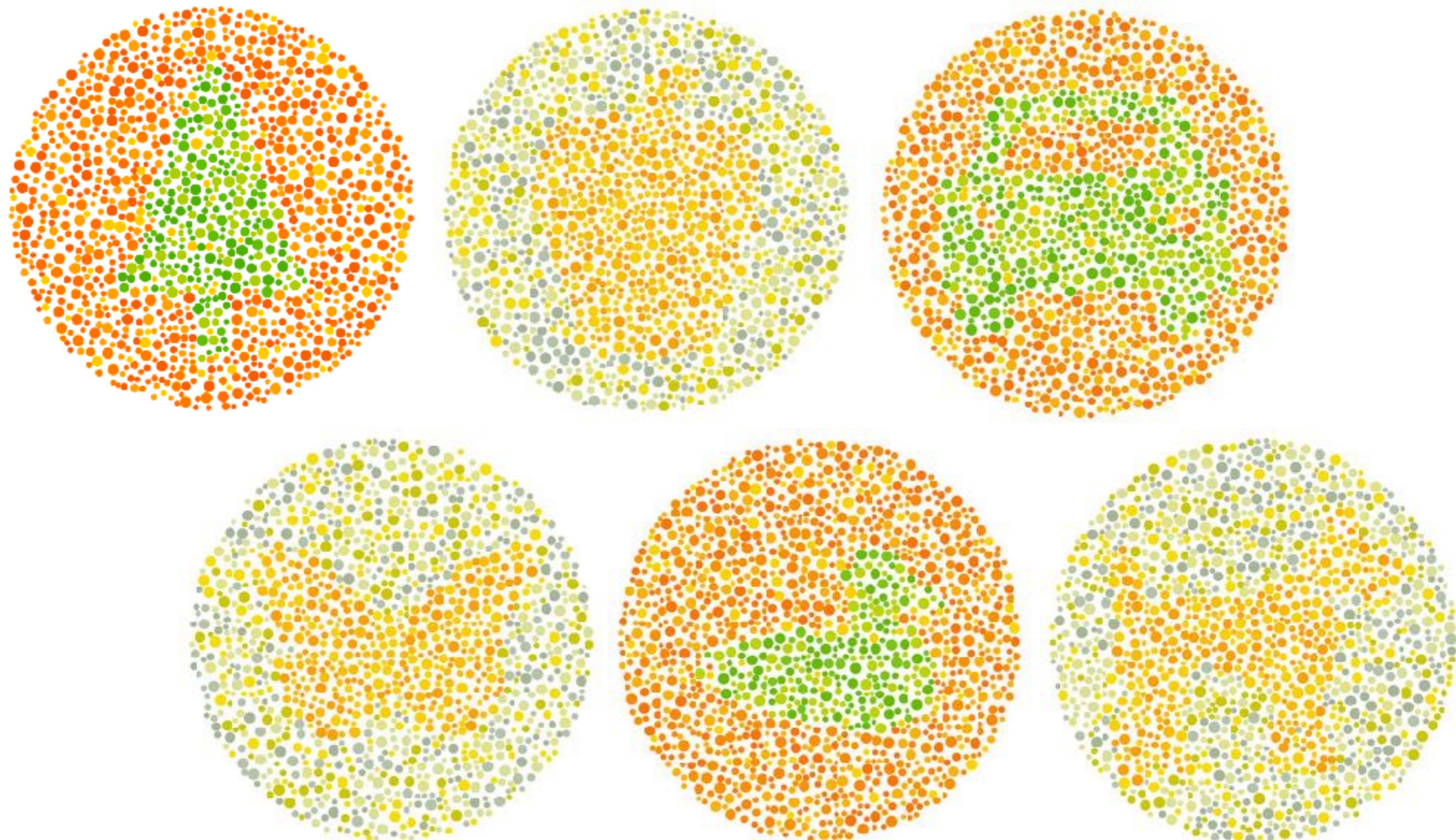
Medium
Contrast

Medium
Contrast

Low Contrast

Very Low
Contrast

Pay Attention to Color Blindness



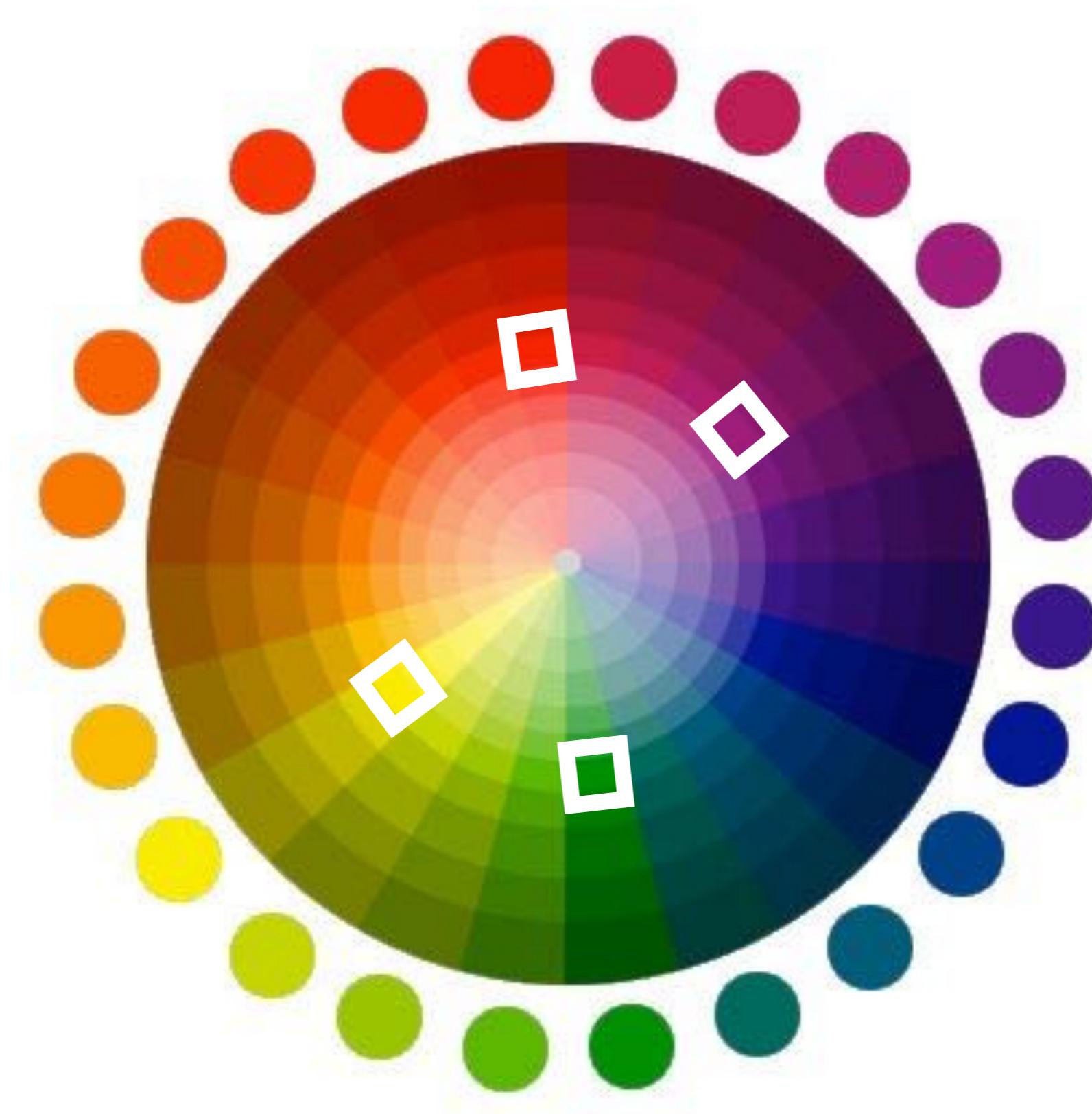
Selecting Colors



Selecting Colors



Selecting Colors



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

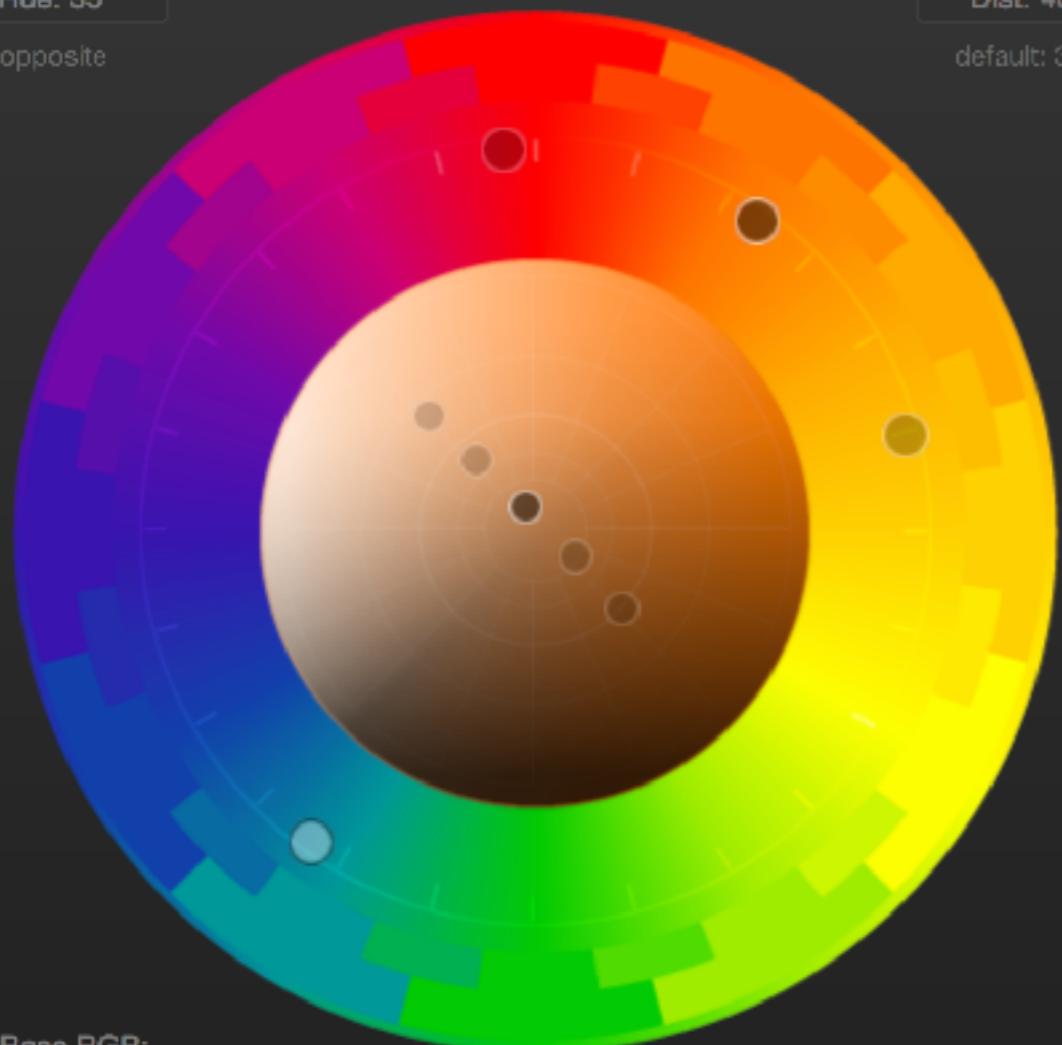
My Palette:



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



RGB 255 10 222

RGB 188 9 232

RGB 136 2 255

RGB 66 9 232

RGB 10 14 255

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

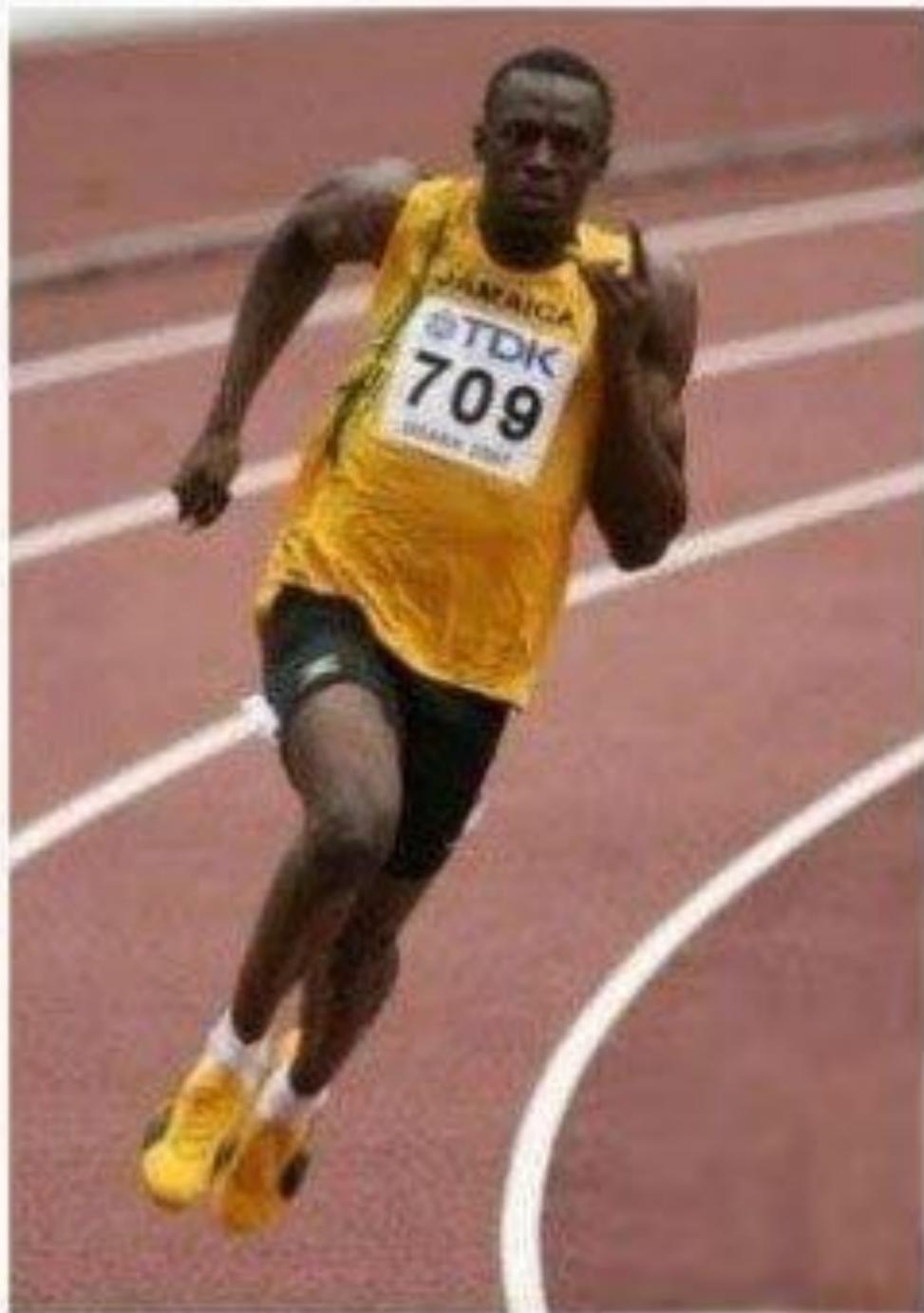
Major Point

Major Point

Font Type Face

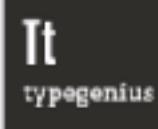


USAIN **BOLD**



USAIN *ITALIC*

Font Combination



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

Select a starter font



Animation



Today

> 3,600 years old



1600BC

0AD

Today



Today

1440

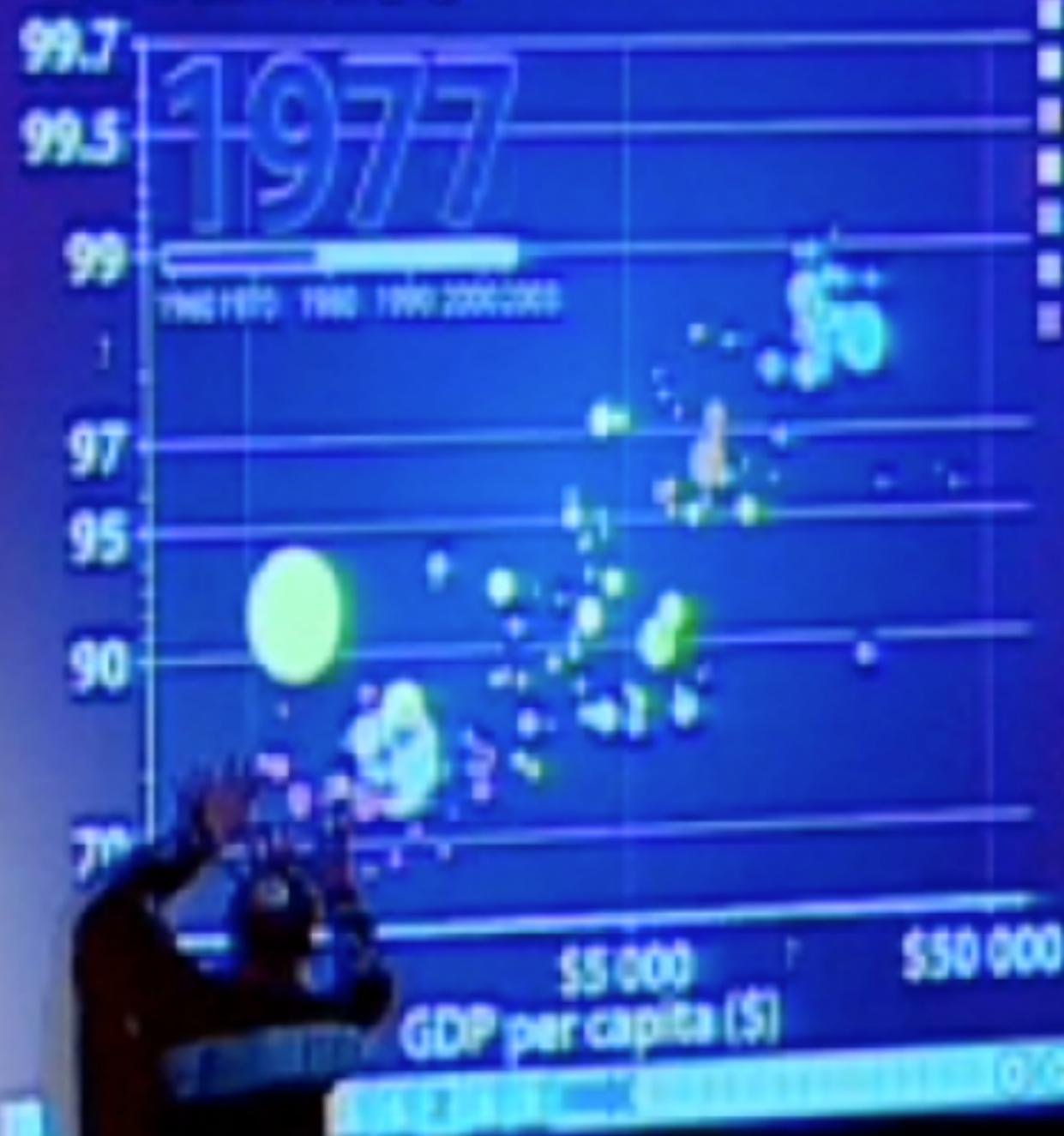


0AD

> 3,600 years old

1600BC

Child survival (%)

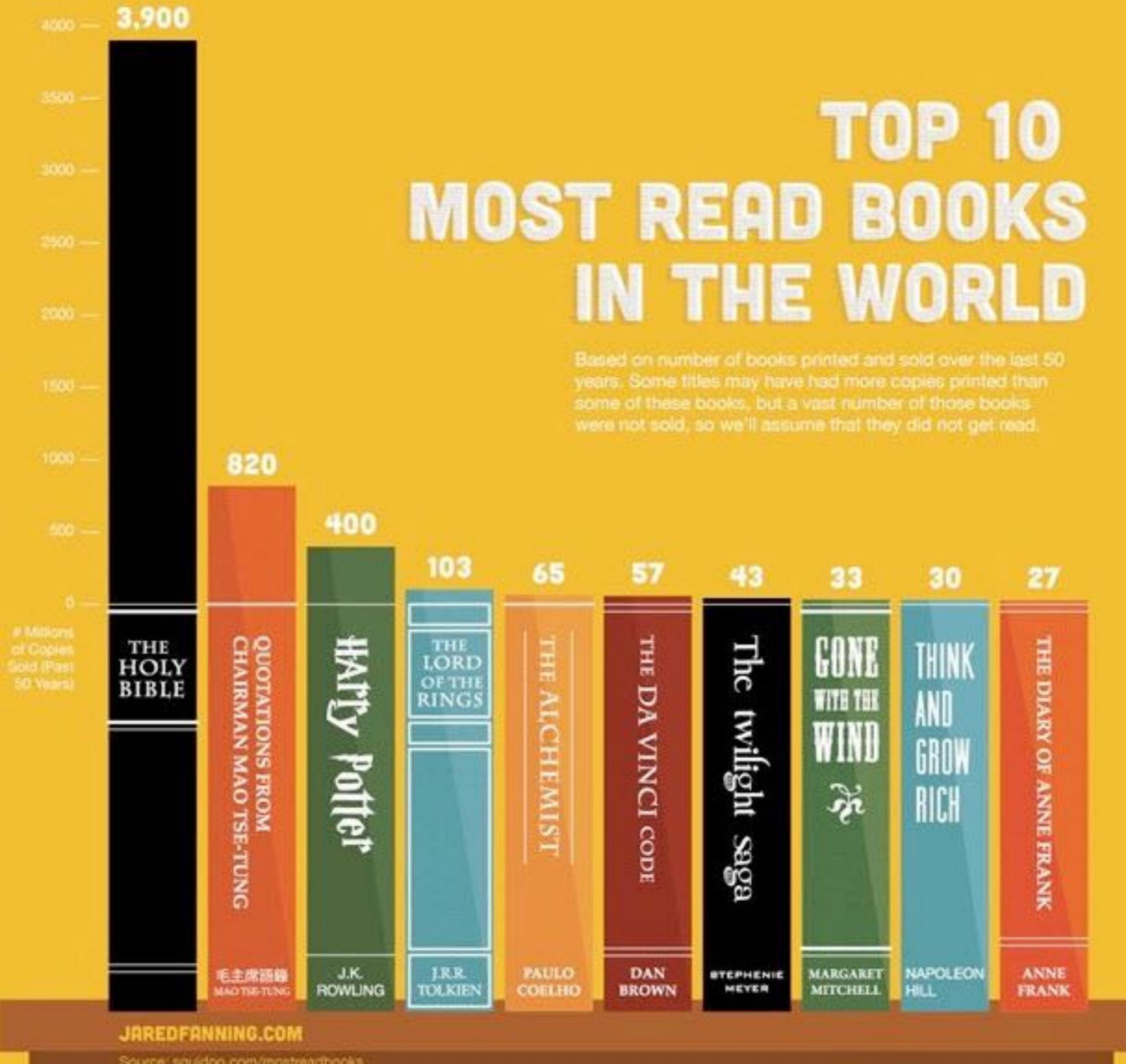


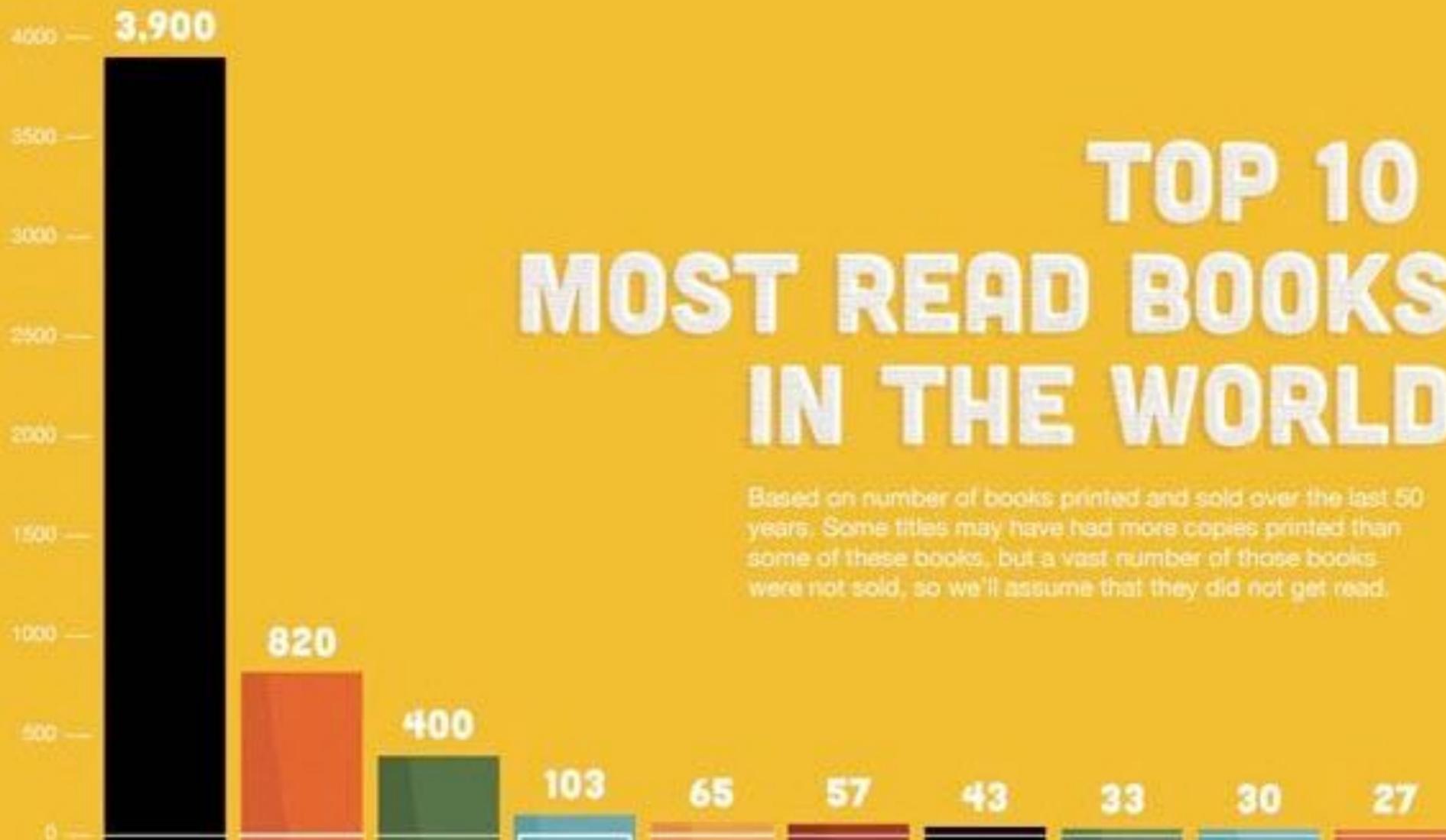
TED

How to Lie with Charts & Graphs

TOP 10 MOST READ BOOKS IN THE WORLD

Based on number of books printed and sold over the last 50 years. Some titles may have had more copies printed than some of these books, but a vast number of those books were not sold, so we'll assume that they did not get read.







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

Budweiser – The Bud Light Party

517
Votes

Hyundai – Ryan Reynolds

1209
Votes

advertisement

IT'S CASH BACK
WITH A CASH BACK
ENCORE.

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

Headline News

25,255,000

MSNBC

24,933,000

Fox News

24,278,000

OBAMACARE ENROLLMENT

7,100,000

ACTUAL
ENROLLMENT

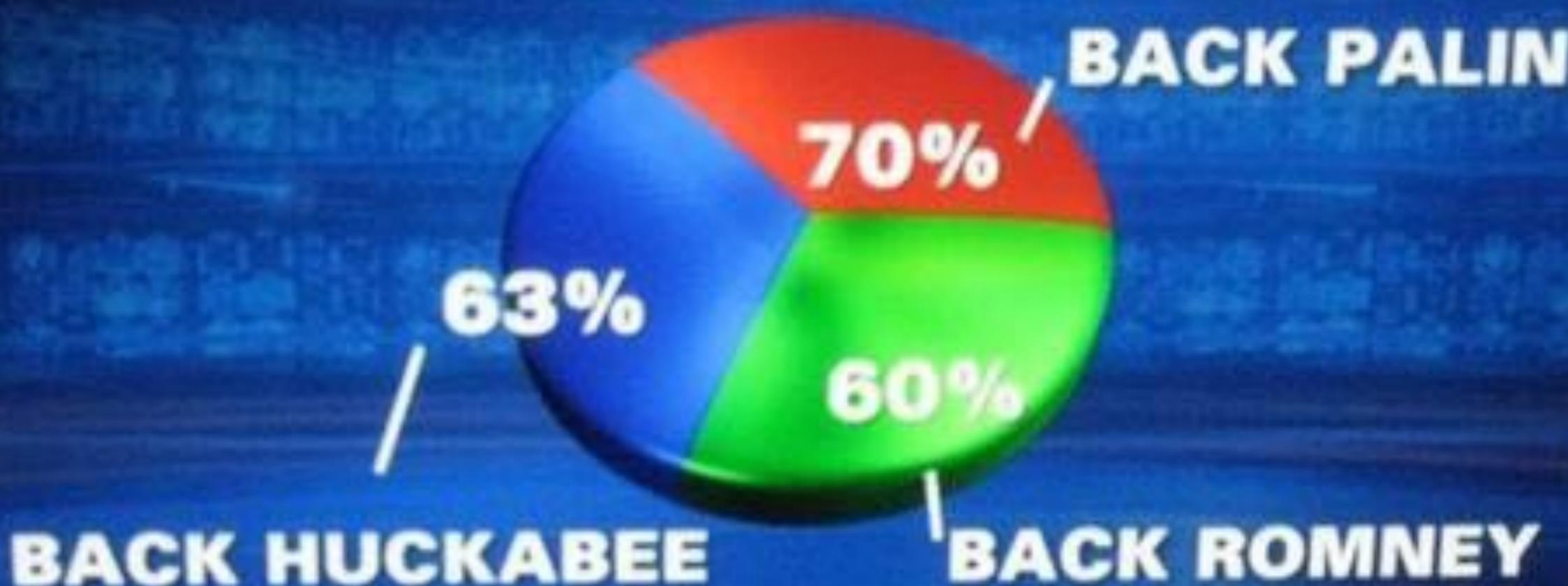
7,000,000

GOAL



2012 PRESIDENTIAL RUN

GOP CANDIDATES

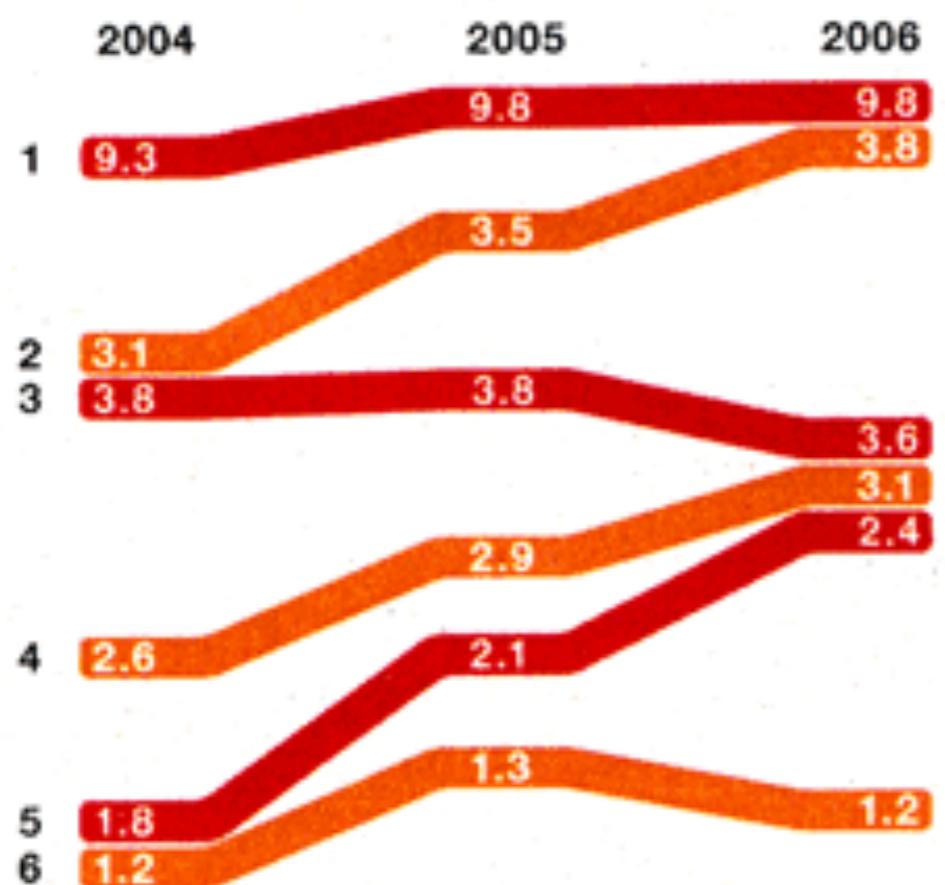


SOURCE: OPINIONS
DYNAMIC



THE AD BUYERS

Advertising spending by selected major industries, in billions.

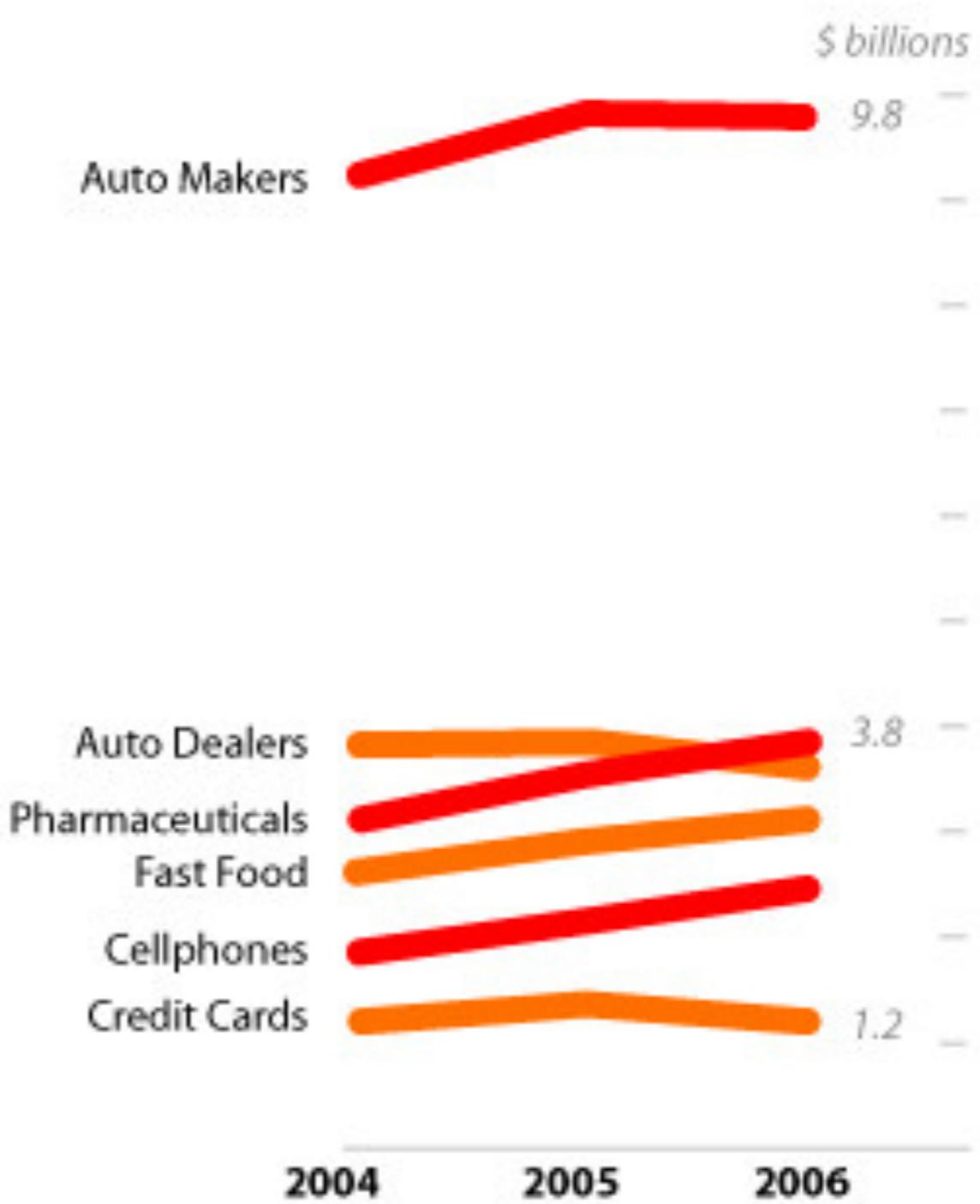
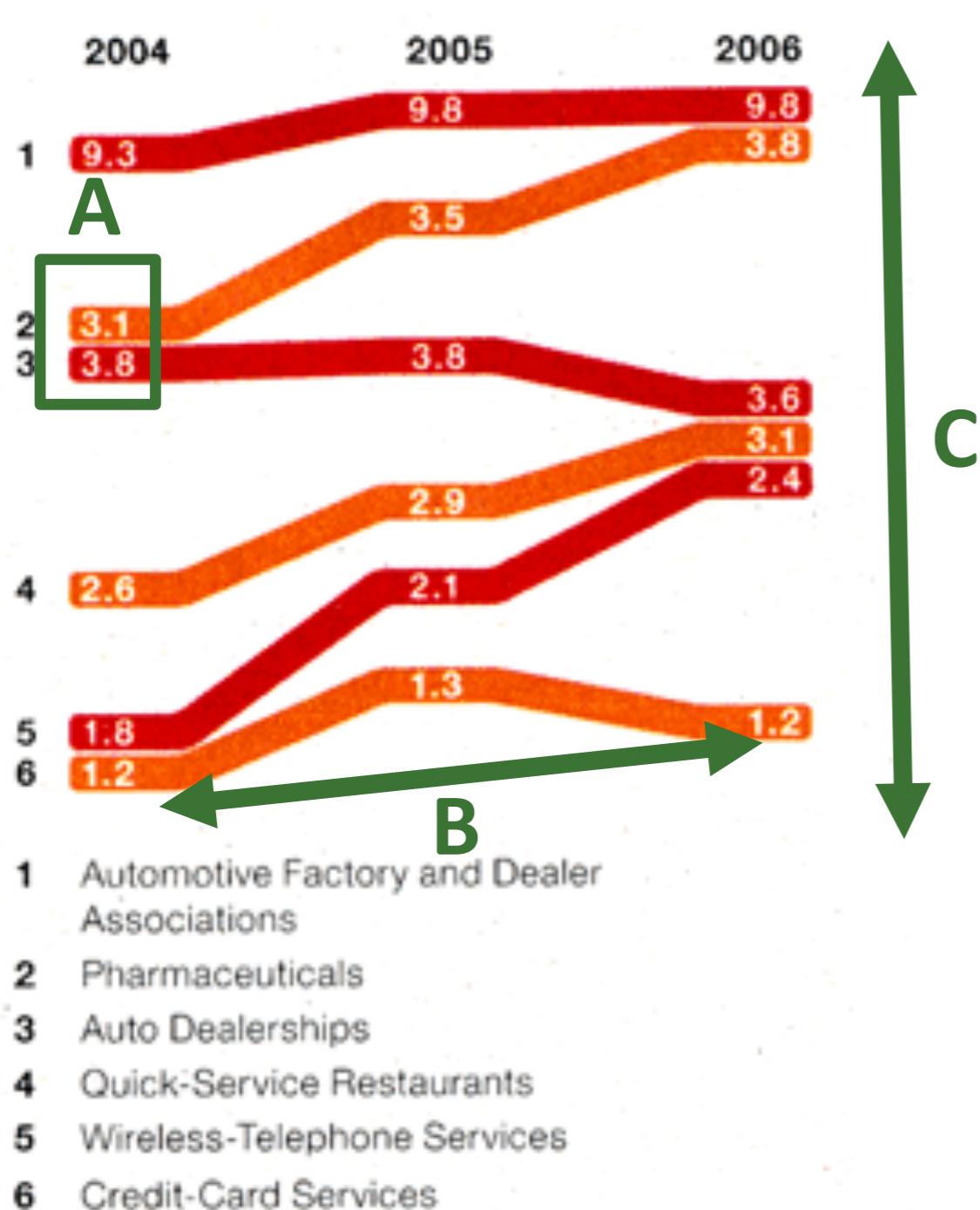


- 1 Automotive Factory and Dealer Associations
- 2 Pharmaceuticals
- 3 Auto Dealerships
- 4 Quick-Service Restaurants
- 5 Wireless-Telephone Services
- 6 Credit-Card Services

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

THE AD BUYERS

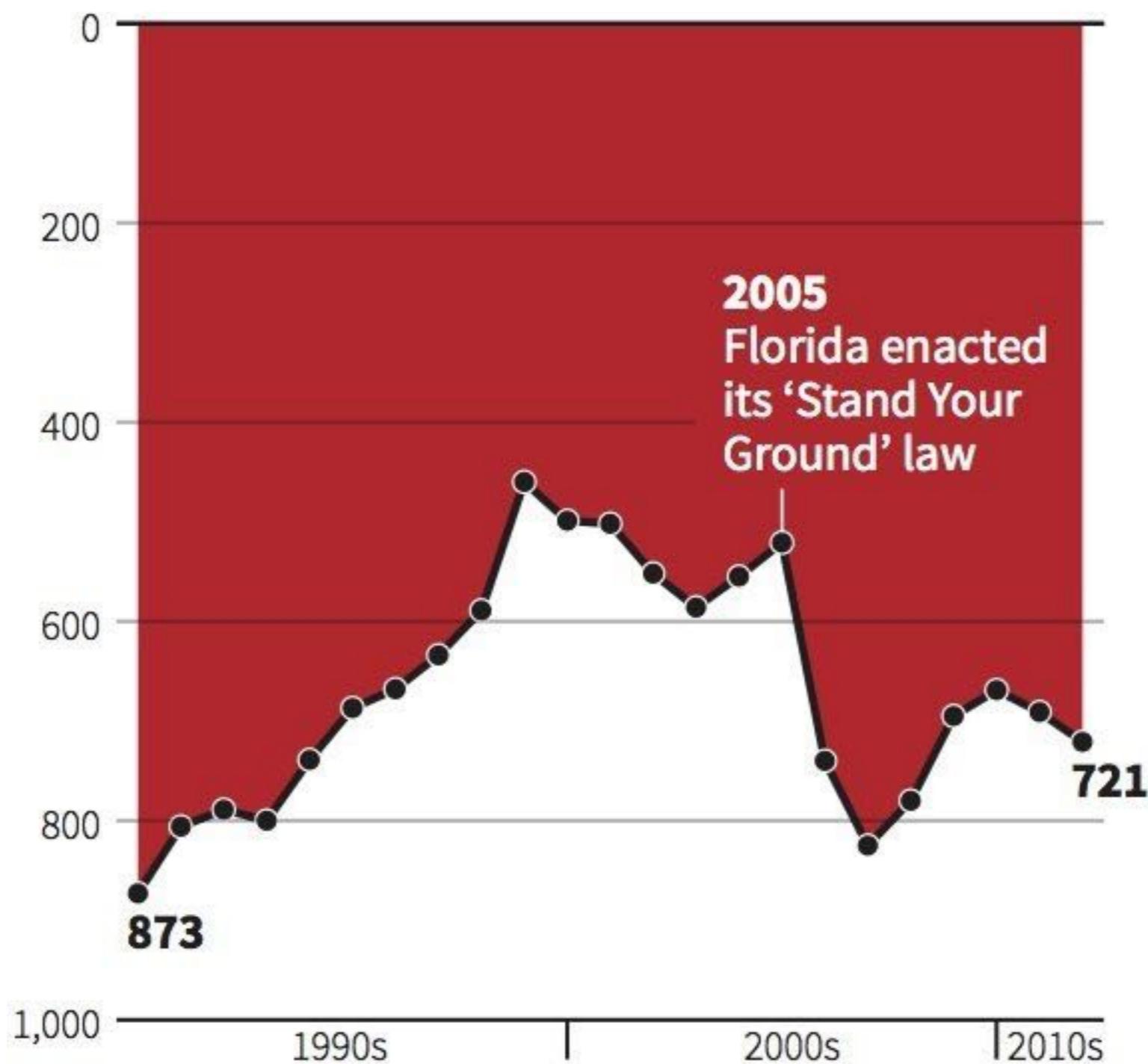
Advertising spending by selected major industries, in billions.



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

Gun deaths in Florida

Number of murders committed using firearms



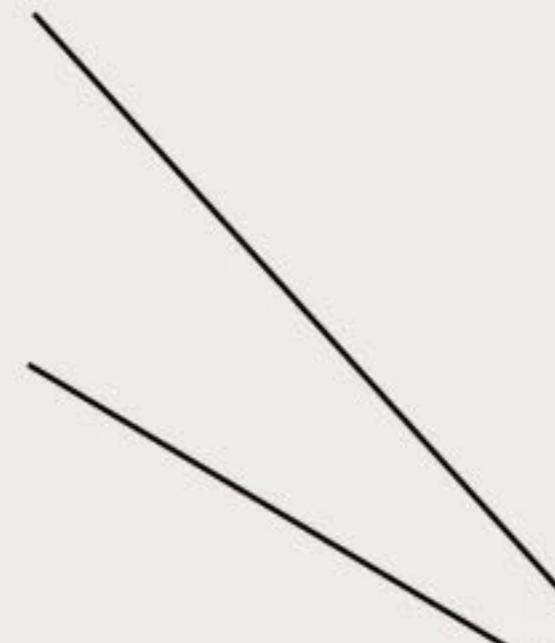
2005
Florida enacted
its 'Stand Your
Ground' law

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](#).

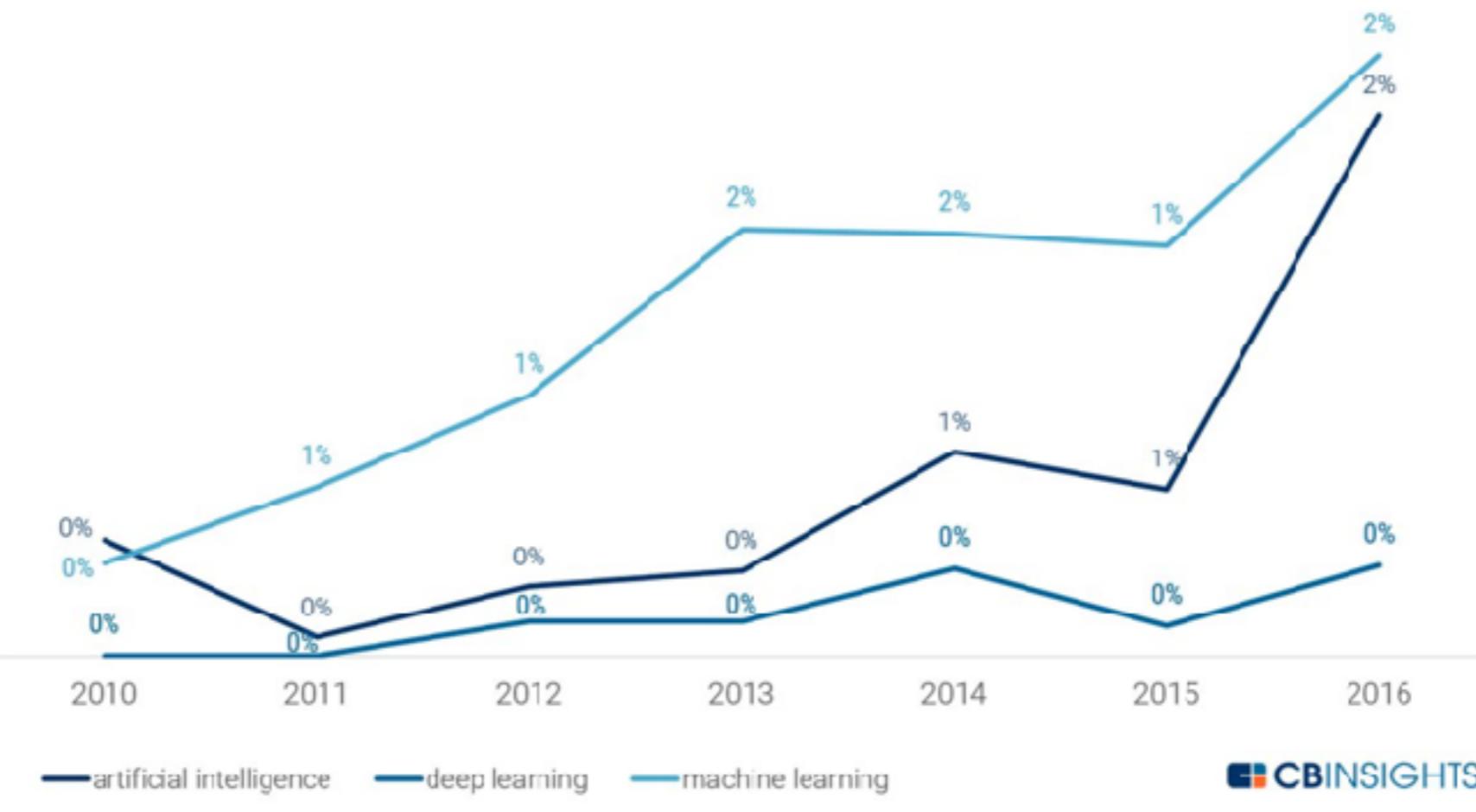
[Submit a WTFViz you found.](#)

[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](#))

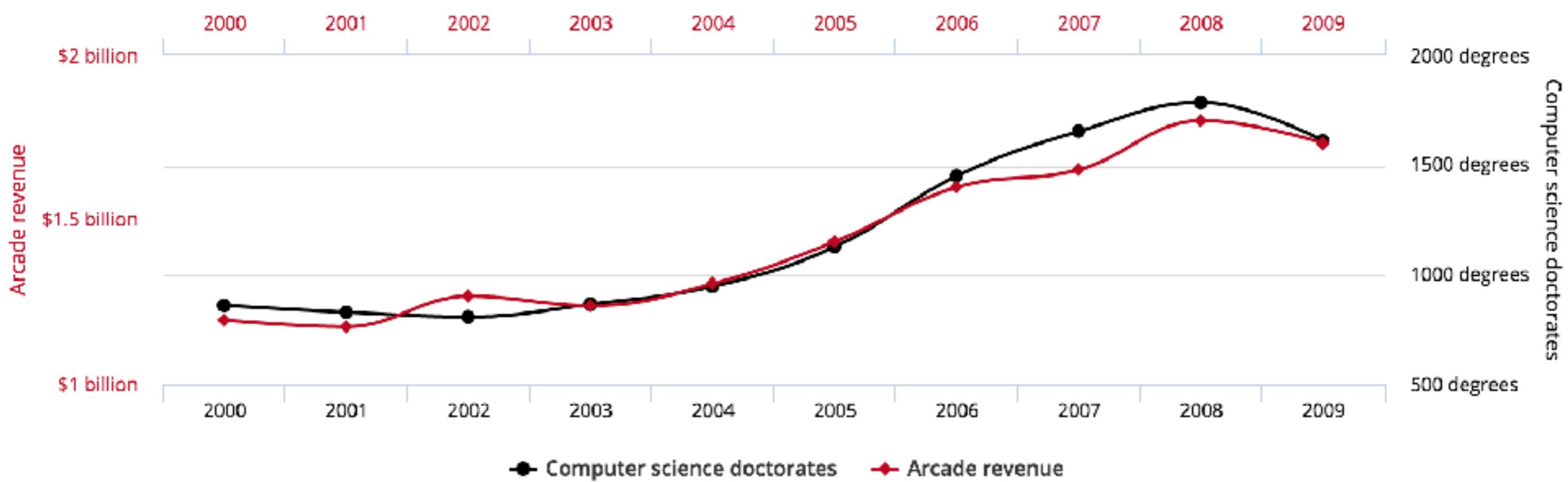
Submit a Viz that makes you go WTF?!

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

Source: tylervigen.com/spurious-correlations

Exercises

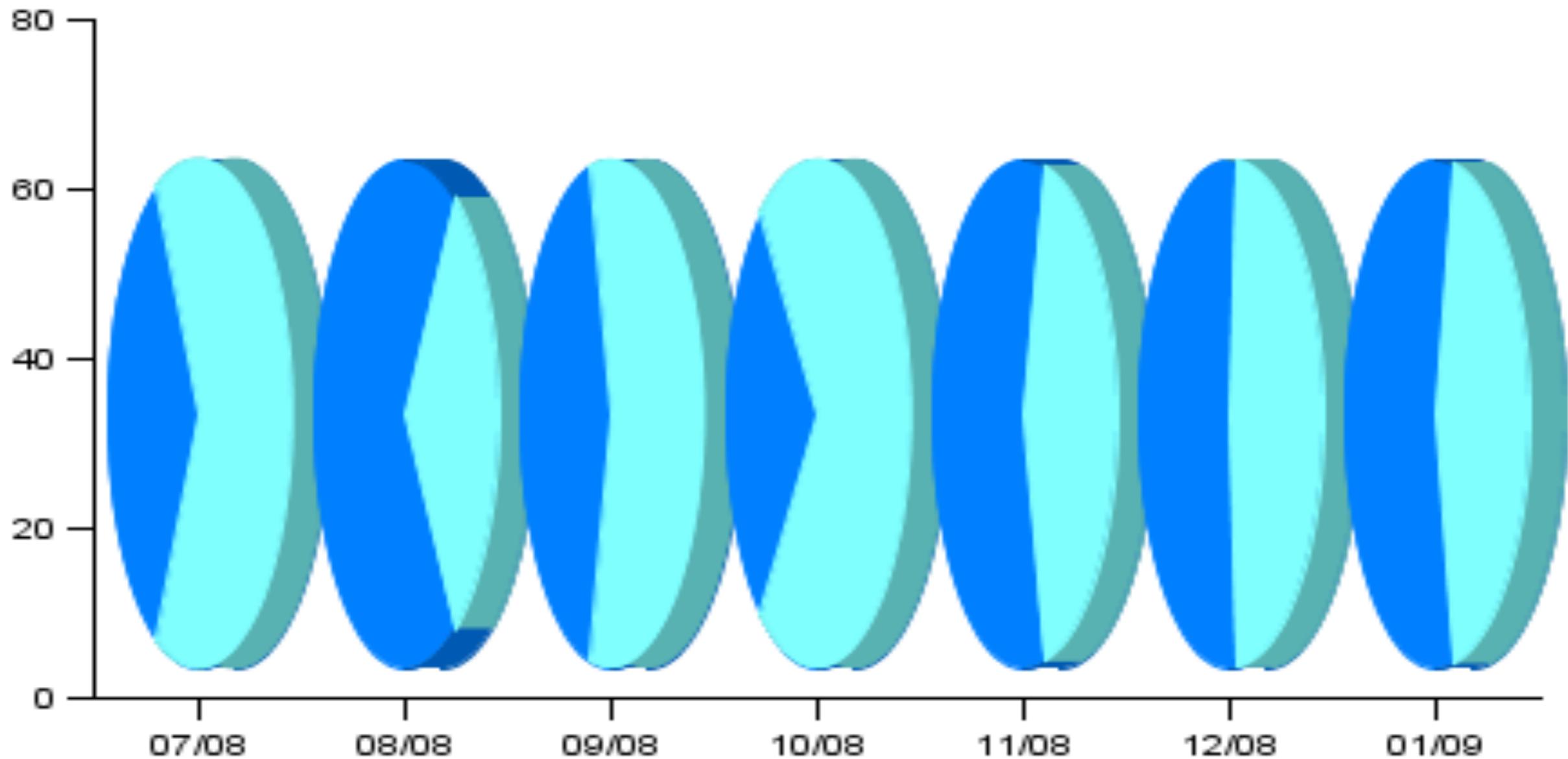
Exercise

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

