C2ER | THE COUNCIL FOR COMMUNITY AND ECONOMIC RESEARCH

LMI Institute
Navigating the World of Labor Market Information

Data Visualization with Tableau

October 26-27, 2017
Sacramento, CA

Brittany Fong & Erol Yildirim

Agenda

Thursday Afternoon

- Data visualization best practices
- Common types of graph
- Overview of Tableau and the interface
- The foundations of Tableau visualizations (examples/exercises)
- Formatting and presenting Tableau visualizations

Friday

- Intermediate Tableau visualizations
- Creating interactive dashboards
- Formatting data for Tableau
- (time permitting) Group exercise

Data Visualization Best Practices

Data Visualization Process

Start with a question, what information are you trying to communicate? What is the goal of the visualization?

Data Visualization Process

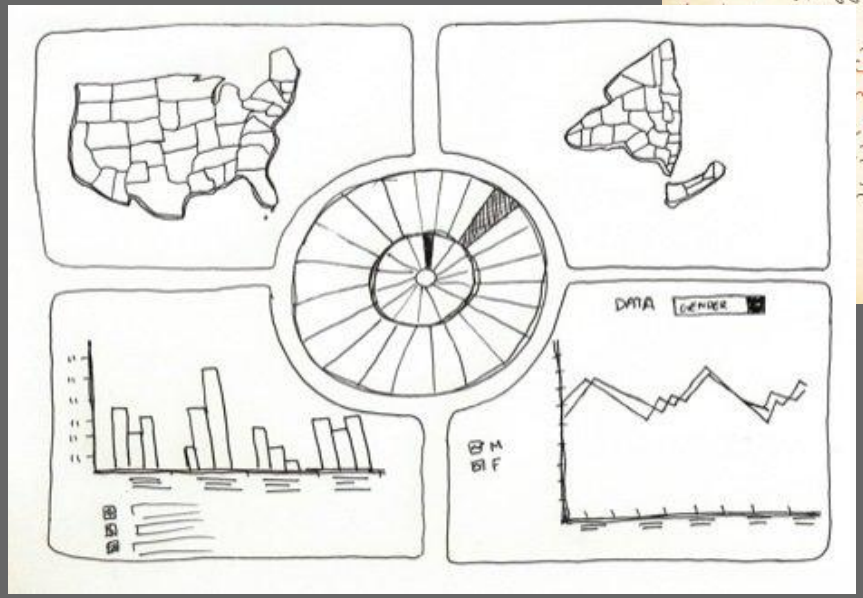
What data do you have available?
What level of detail does it go down to?
How can you use other data to supplement your data?

Who is your audience?

How detailed do they want to see the data?
Do they have a technical background?

Make a sketch (pencil & paper)

How will the visualization(s) be viewed? (desktop, mobile, print)



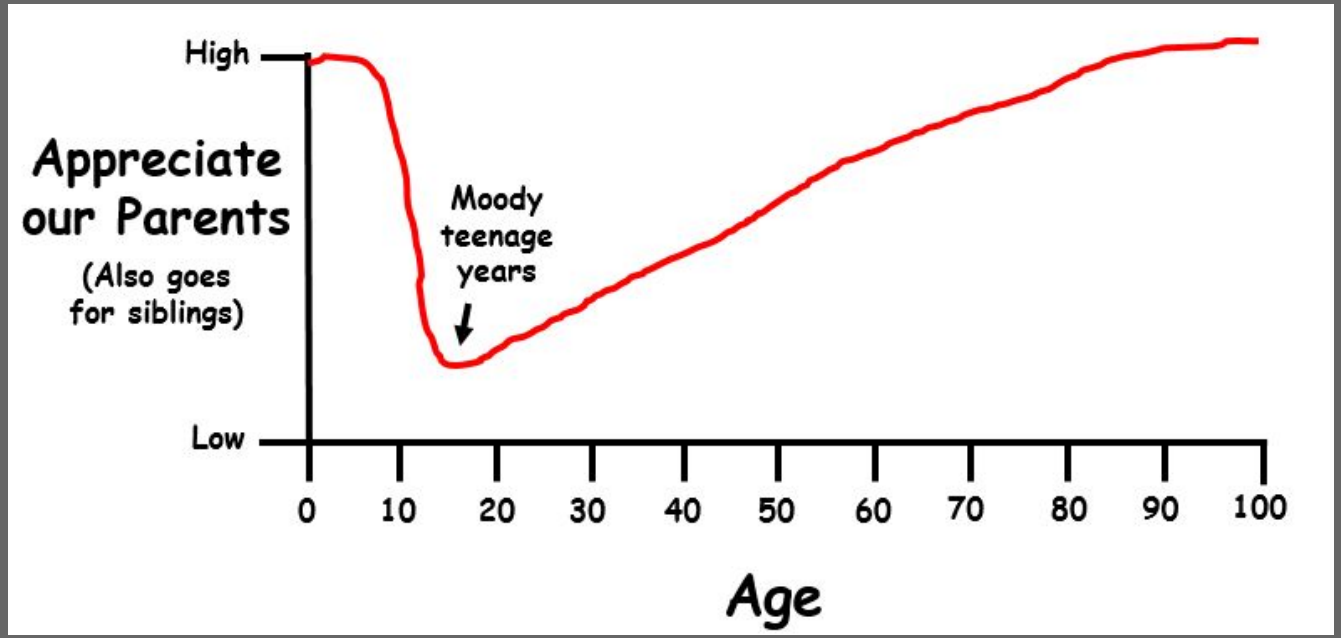
Common Data Visualization Graphs

Bar Graph

- Used for comparing categorical or time series points

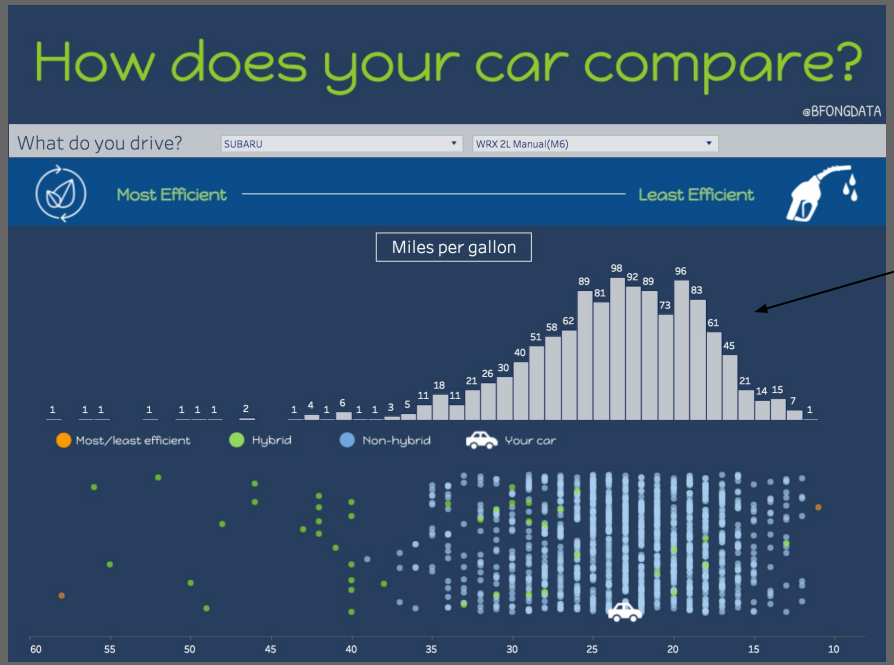
Line Graph

- Used for viewing trends over time



Histogram

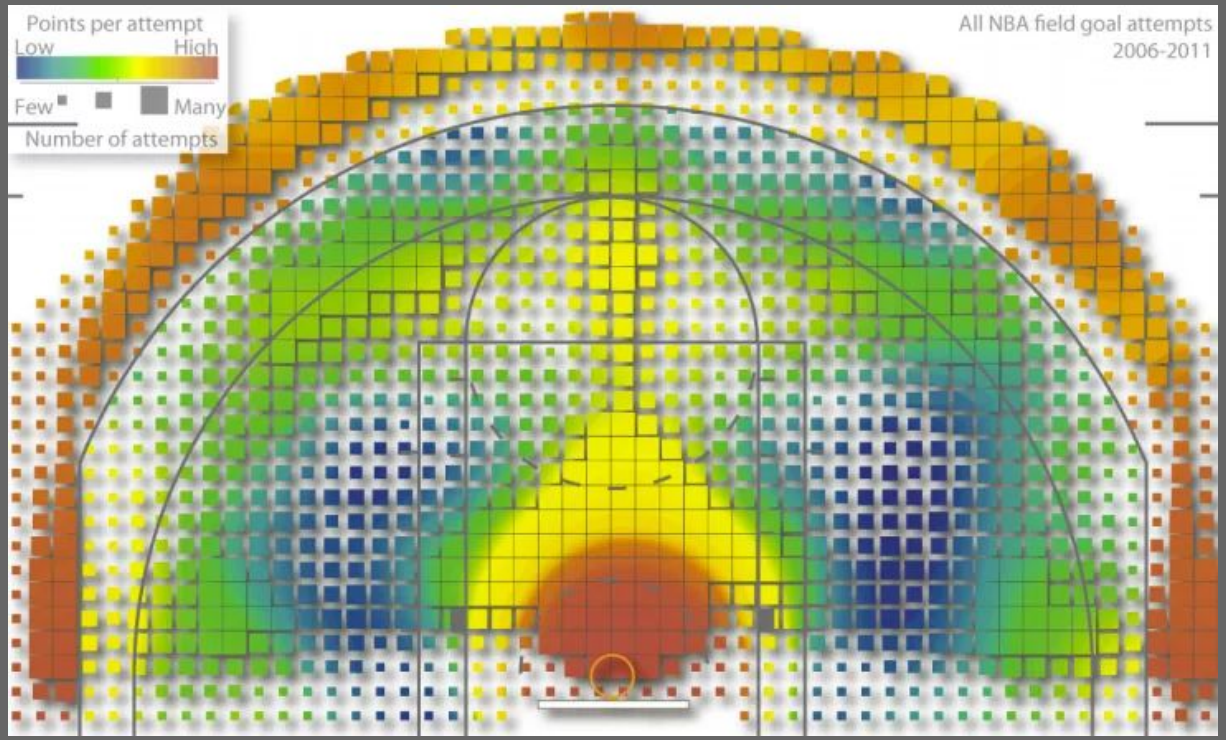
- Used for viewing frequency or distribution of a single measure



Histogram

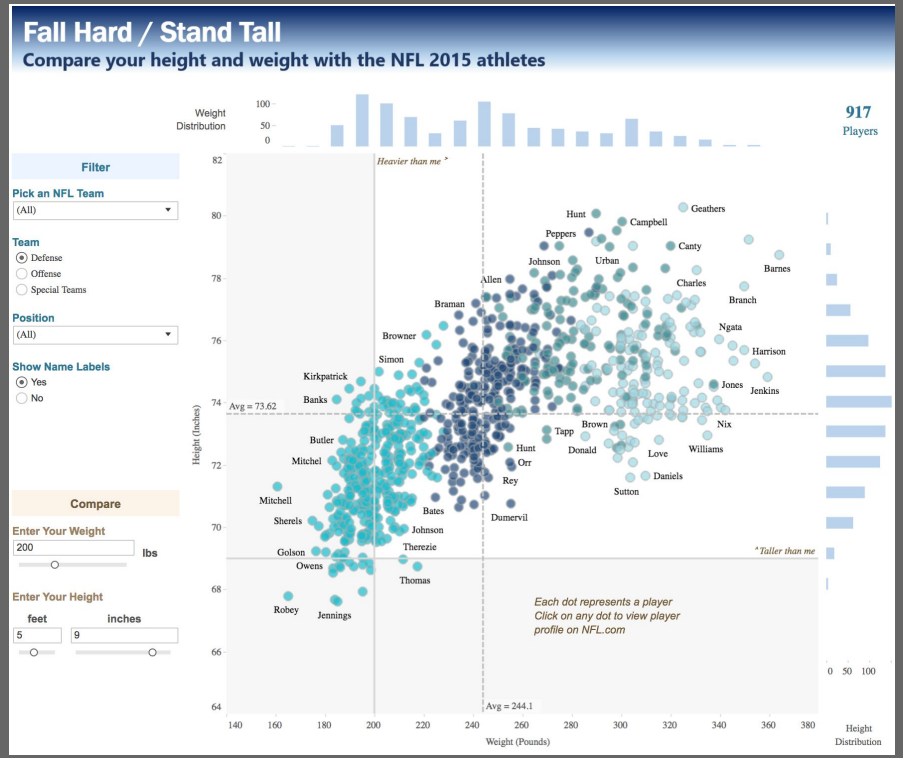
Heat Map

- Shows frequency represented by color



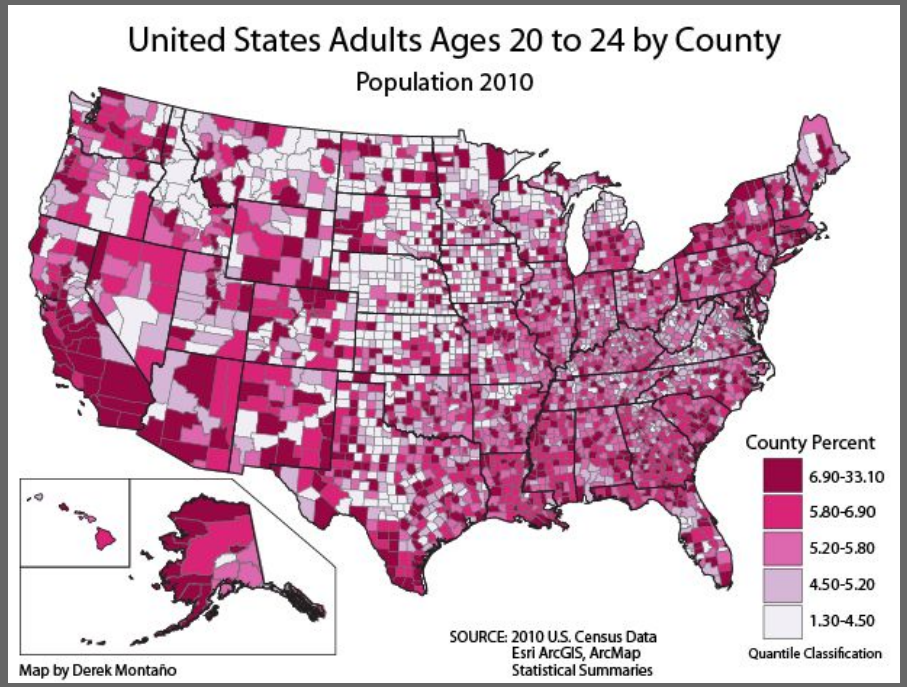
Scatterplot

- Compares two measures to see how they relate to each other



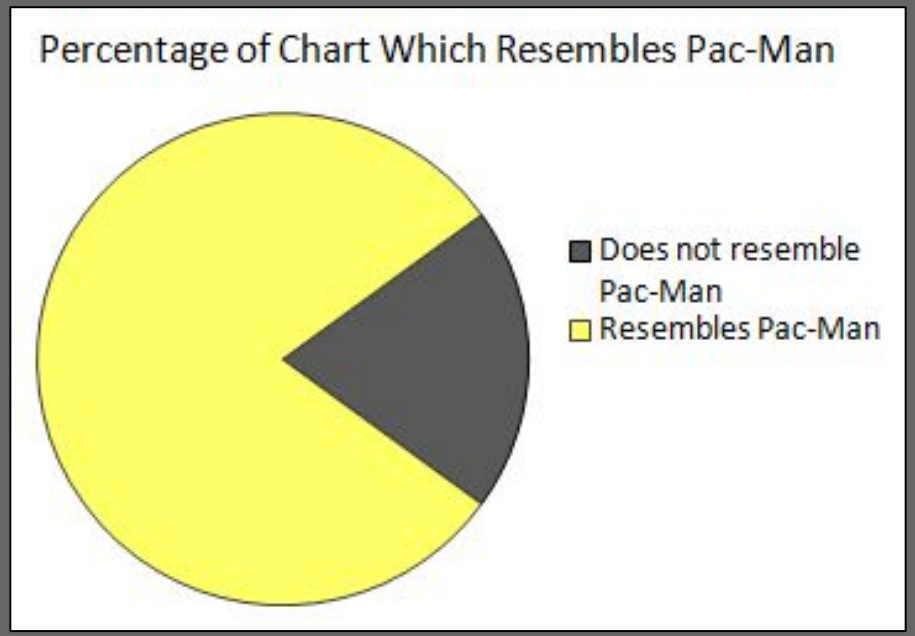
Choropleth Map

- Shading, color, or pattern on a geographic map



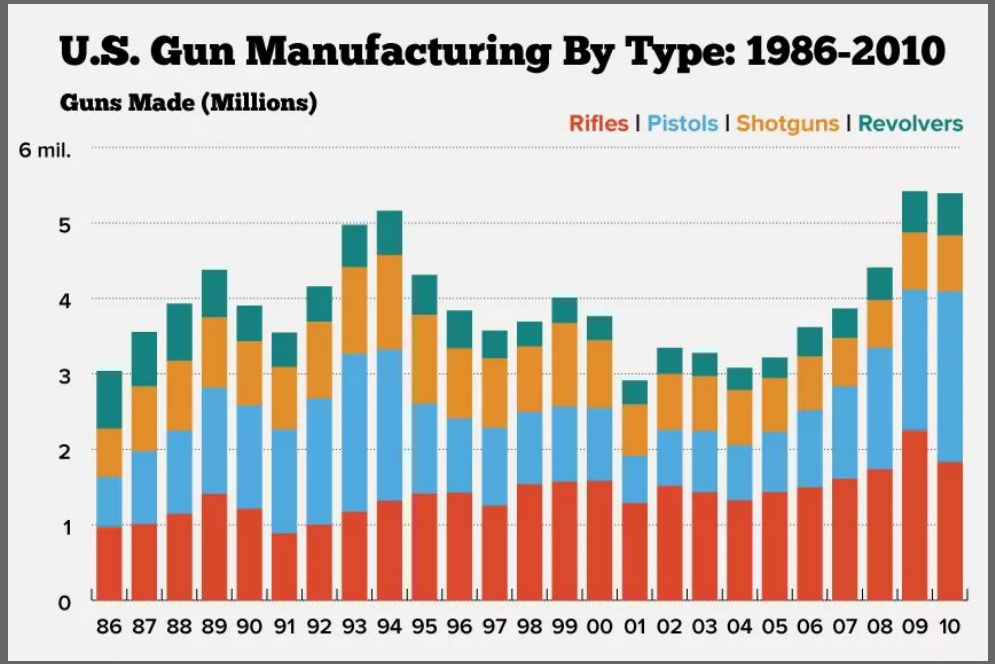
Pie Chart

- Used to compare parts to a whole
- Not good with small percentages or more than 4 categories



Stacked Bar Graph

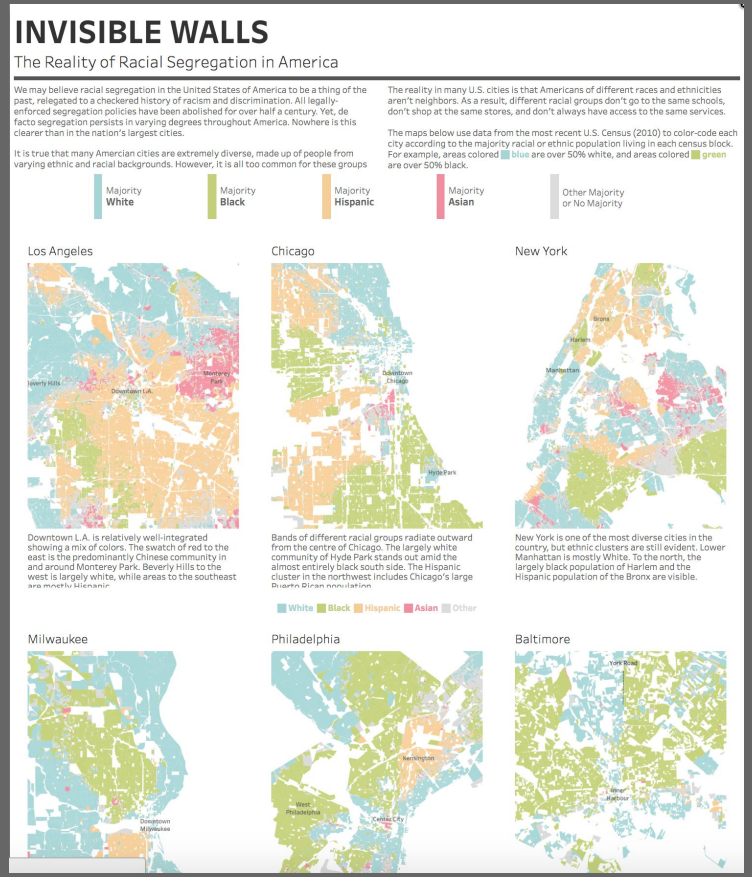
- Used to compare part to whole relationships
- Great alternative to a pie chart



Data Visualization Inspiration

- Tableau Public
- Journalism - The Upshot, Pro Publica, Washington Post, Five Thirty Eight
- Twitter - #dataviz
- Makeover Monday
- Dear Data

Data Visualization Inspiration



INVISIBLE WALLS

The Reality of Racial Segregation in America

We may believe racial segregation in the United States of America to be a thing of the past, relegated to a checkered history of racism and discrimination. All legally-enforced segregation policies have been abolished for over half a century. Yet, de facto segregation persists in varying degrees throughout America. Nowhere is this clearer than in the nation's largest cities.

It is true that many American cities are extremely diverse, made up of people from varying ethnic and racial backgrounds. However, it is all too common for these groups

The reality in many U.S. cities is that Americans of different races and ethnicities aren't neighbors. As a result, different racial groups don't go to the same schools, don't shop at the same stores, and don't always have access to the same services.

The maps below use data from the most recent U.S. Census (2010) to color-code each city according to the majority racial or ethnic population living in each census block. For example, areas colored blue are over 50% white, and areas colored green are over 50% black.

Majority **White** | Majority **Black** | Majority **Hispanic** | Majority **Asian** | Other Majority or No Majority

Los Angeles

Downtown L.A. is relatively well-integrated showing a mix of colors. The swatch of red to the east is the predominantly Chinese community in and around Monterey Park. Beverly Hills to the west is largely white, while areas to the southeast are mostly Hispanic

Chicago

Bands of different racial groups radiate outward from the centre of Chicago. The largely white community of Hyde Park stands out amid the almost entirely black south side. The Hispanic cluster in the northwest includes Chicago's large Puerto Rican population

New York

New York is one of the most diverse cities in the country, but ethnic clusters are still evident. Lower Manhattan is mostly White. To the north, the largely black population of Harlem and the Hispanic population of the Bronx are visible.

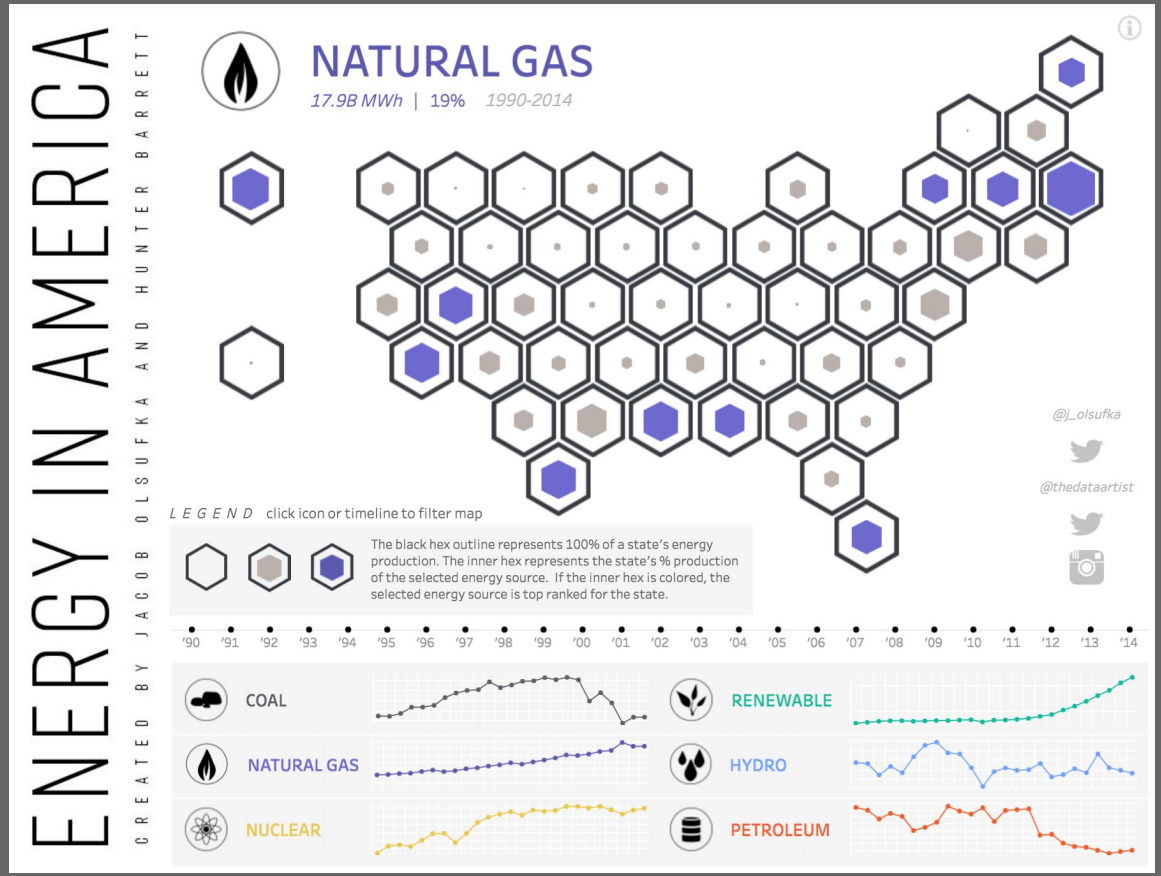
White | Black | Hispanic | Asian | Other

Milwaukee

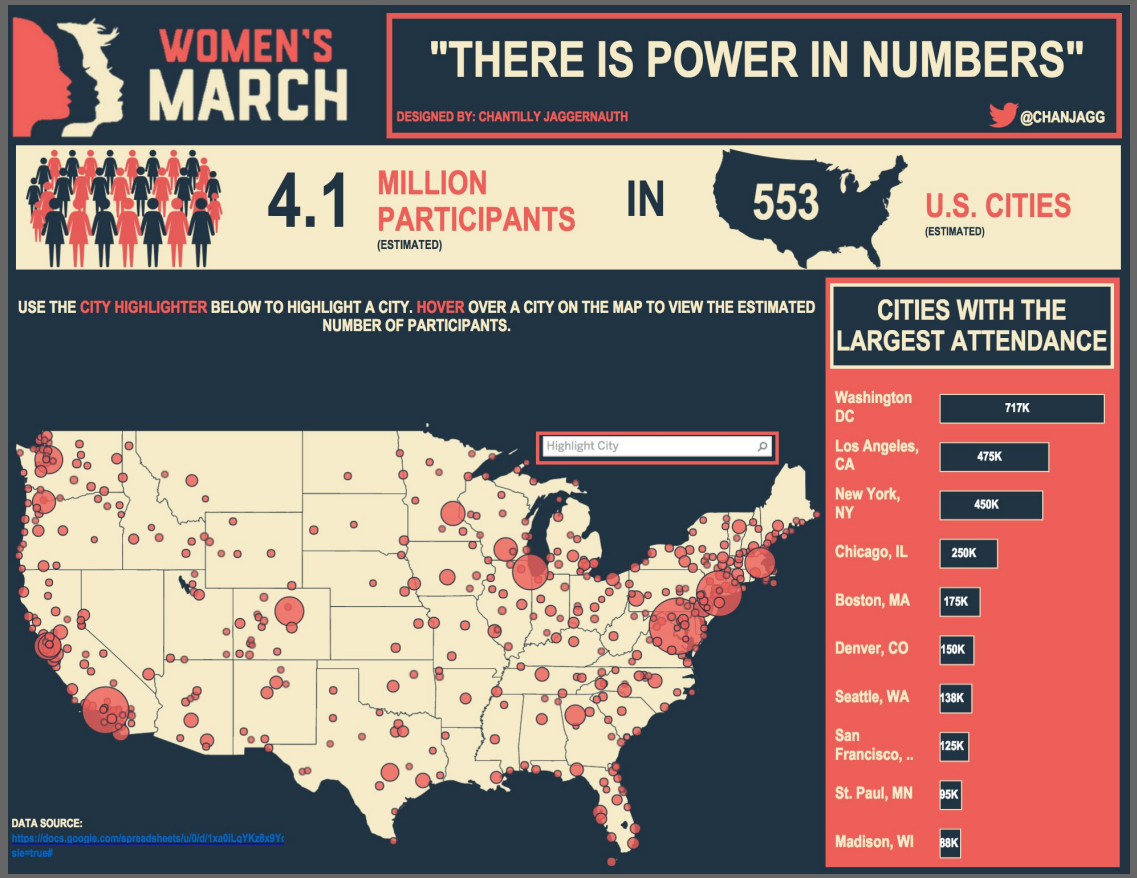
Philadelphia

Baltimore

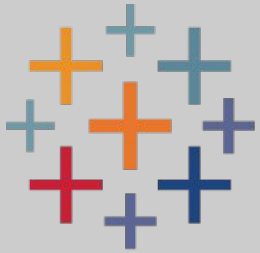
Data Visualization Inspiration



Data Visualization Inspiration



Welcome to



tableau®

SOFTWARE

What is Tableau?

Data visualization software that allows developers to build interactive dashboards that are easily updated with new data and can be shared with a wider audience

- Read-only application
- Connects to most data sources depending on level of license (public, personal, professional licenses)
- No coding experience necessary

The Tableau Suite

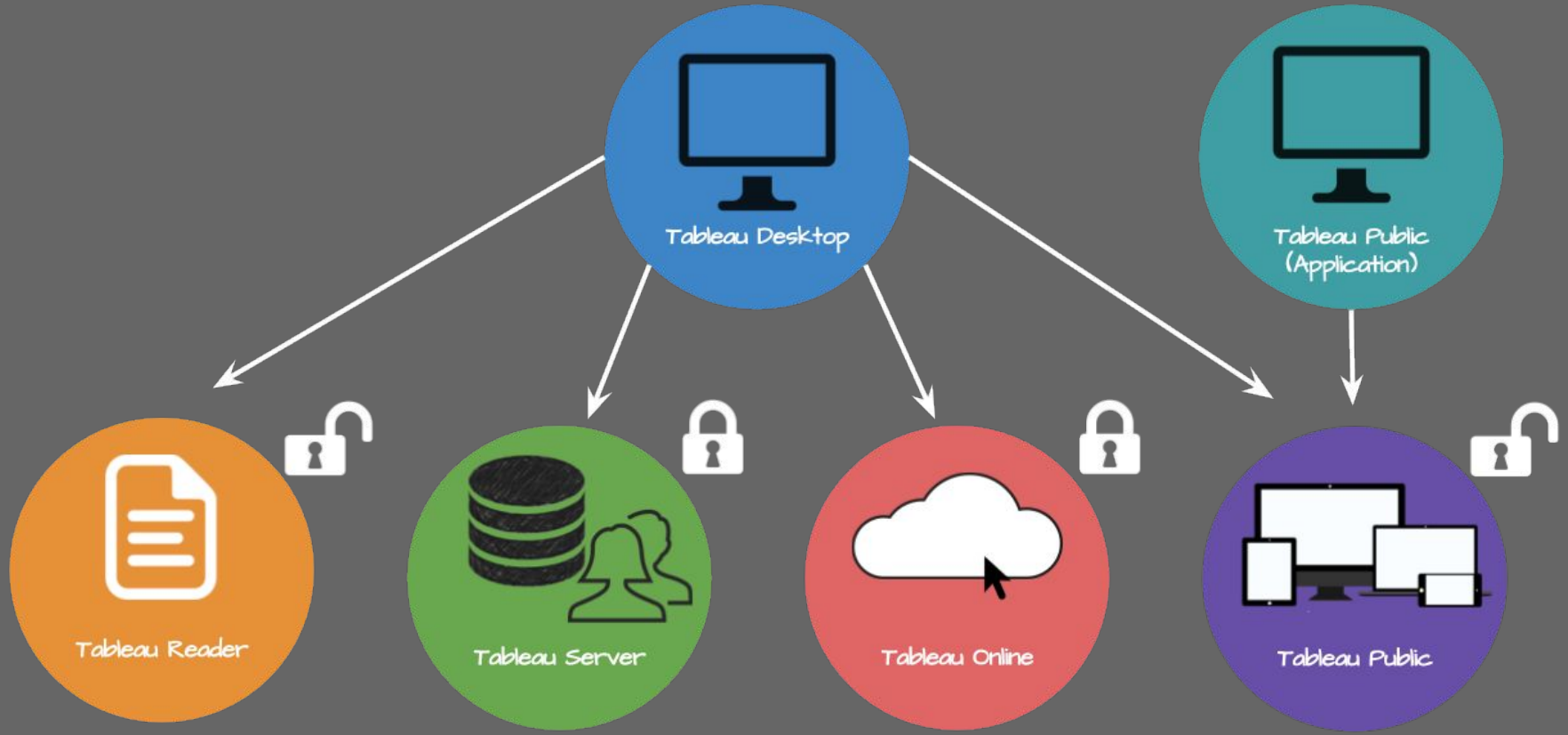


Tableau Data Connection Window

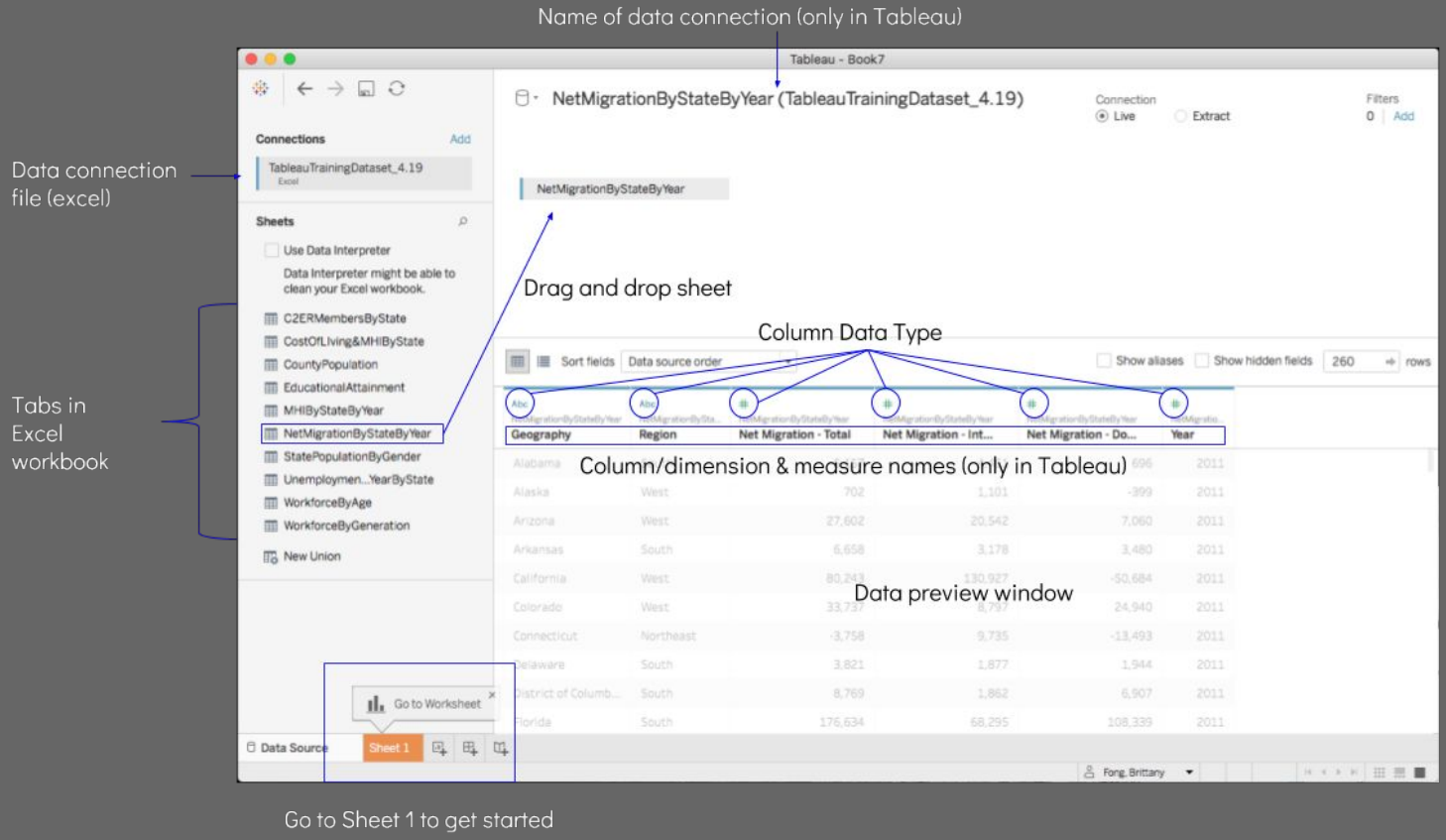
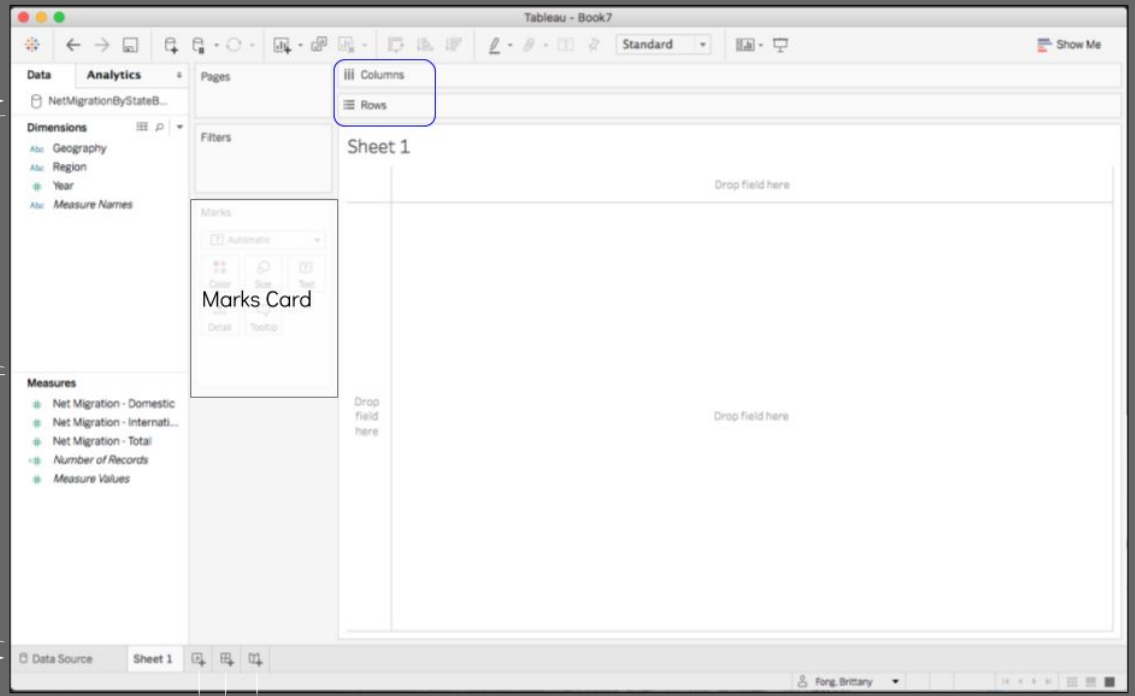


Tableau Sheet Canvas



Data Connection

Dimensions
- Ways to categorize data
- Dates

Measures
- Fields to calculate on (sum, avg...)

Back to data connection window

New story
New dashboard
New sheet

Dimensions vs Measures

- Dimensions are ways to categorize data
  - Examples: Dates, categories, groups, geographic locations, names
  - Tableau will “write”/”spell” these values out

- Measures are values that can be aggregated (sum, avg…)
  - Examples: dollars, units, seconds
  - Tableau will graph these values

The foundations of Tableau visualizations

- Text table
- Nested bar graph
- Line graph
- Shaded map

- Exercises
  - Text table
  - Bar graph
  - Line Graph

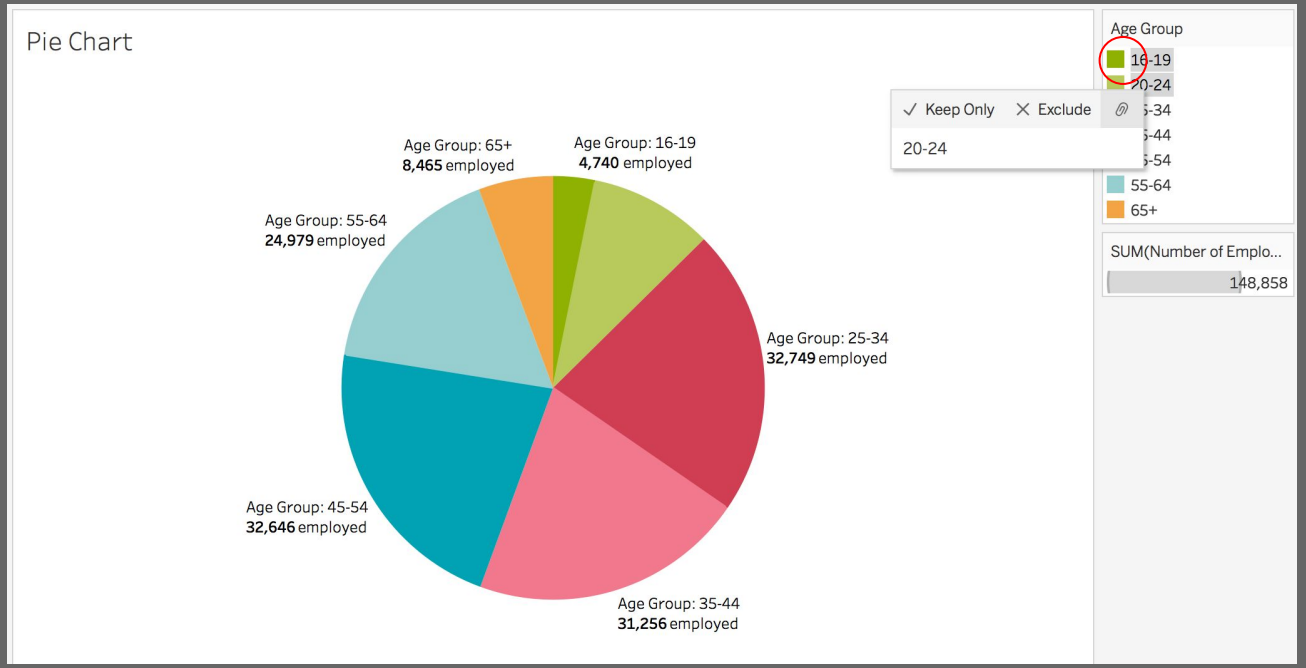
- Multi-line graph
- Stacked bar and groups
- Nested bar graph

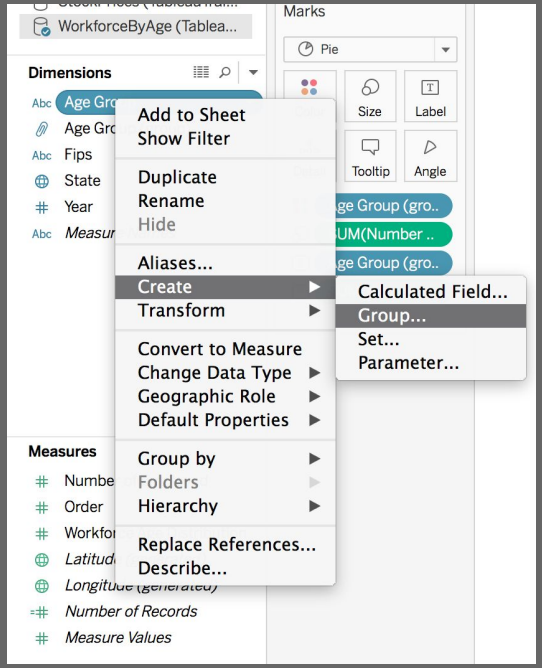
- Exercises
  - Bar graph & measure color
  - Multi-line graph

- Dashboards

Grouping Dimensions

OR





Saving & exporting your workbook

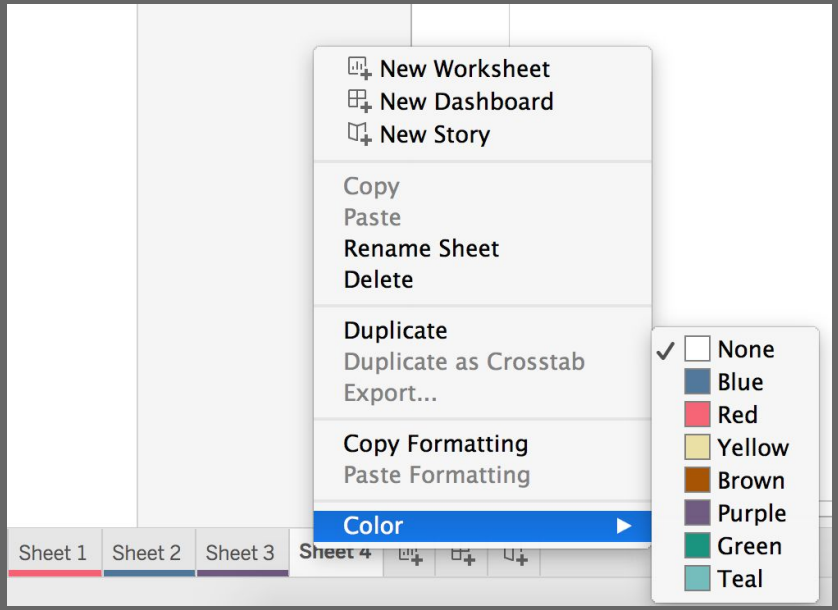
- Saving your workbook (packaged vs unpackaged)
  - Packaged (.twbx) - includes a snapshot of the data
  - Unpackaged (.twb) - need a version of the data
- Print to PDF
  - File > Print > PDF
- Export to Excel
  - Worksheet > Export > Data or Crosstab to Excel
- Copy & export images
  - Worksheet or Dashboard > Export > Image

Working Efficiently in Tableau

- Duplicating worksheets
  - Right click on tab > duplicate
- Copying worksheets
  - Right click on tab > copy
- Copying formatting from worksheets
  - Right click on tab > copy formatting

Organizing your Tableau workbook

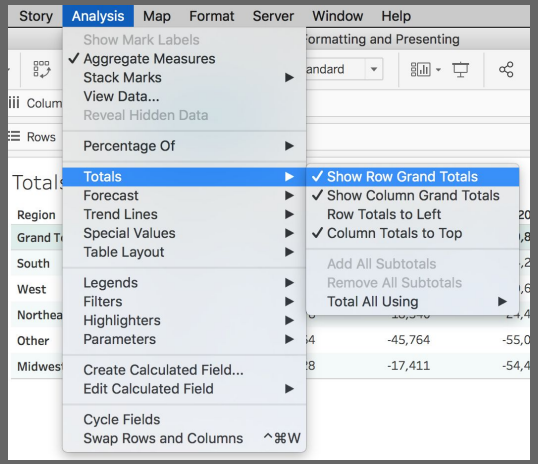
- Reordering worksheets
  - Drag tabs to reorder
- Changing tab colors
  - Right click on tab > Color



Formatting and presenting Tableau visualizations

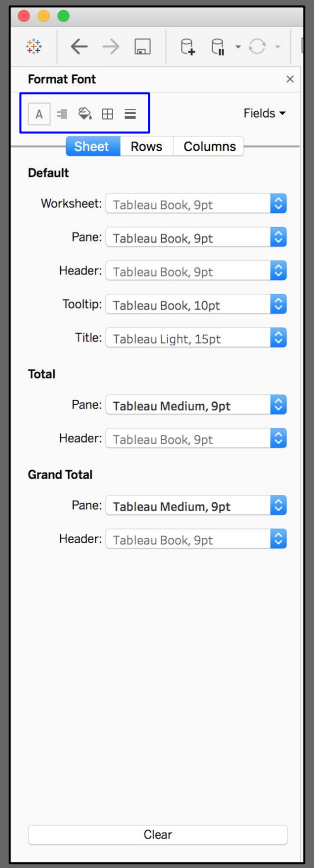
- Totals, formatting & sorting
- Filters, labels, color & hierarchy
- Reference line & hide labels
- Tooltips, colors & borders
- Reference line & axis label
- Continuous dates & aggregation
- Discrete dates

Totals



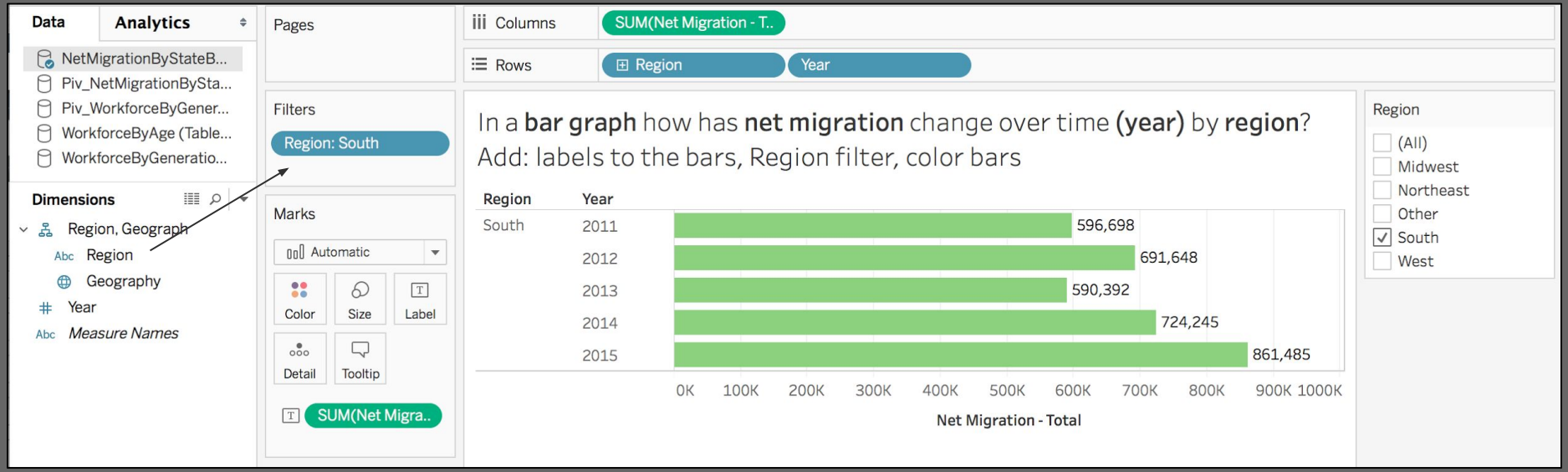
Region	2011	2012	2013	2014	2015	Grand Total
Grand Total	675,433	847,440	797,381	940,852	1,085,439	4,346,545
Midwest	-92,102	-73,328	-17,411	-54,450	-87,011	-324,302
Northeast	-29,190	578	18,540	-24,492	-25,203	-59,767
Other	-28,391	-38,364	-45,764	-55,092	-65,089	-232,700
South	596,698	691,648	590,392	724,245	861,485	3,464,468
West	228,418	266,906	251,624	350,641	401,257	1,498,846

Formatting Visualizations



- Fonts
- Alignment
- Shading
- Borders
- Lines

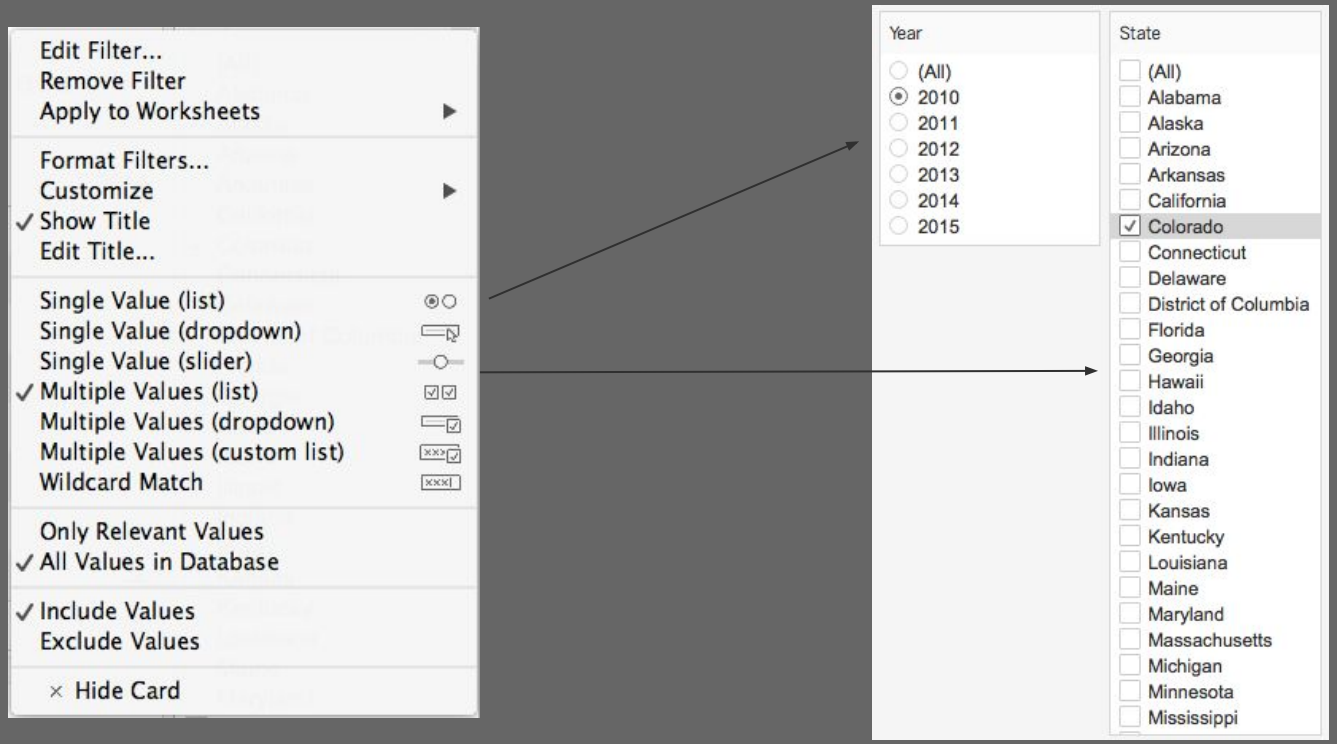
Adding Filters



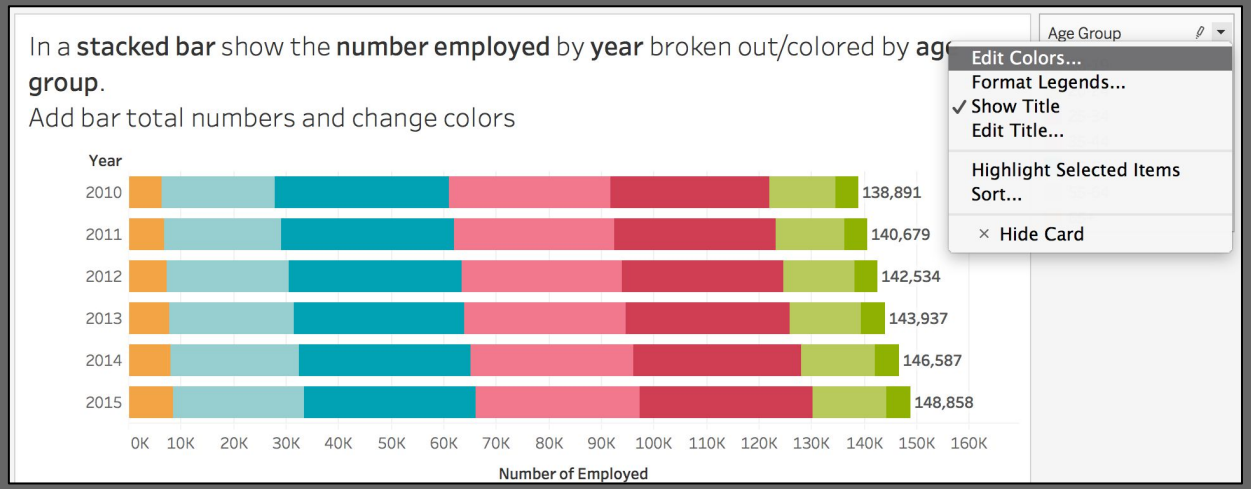
Add filters by dragging dimensions and/or measures to the filters shelf

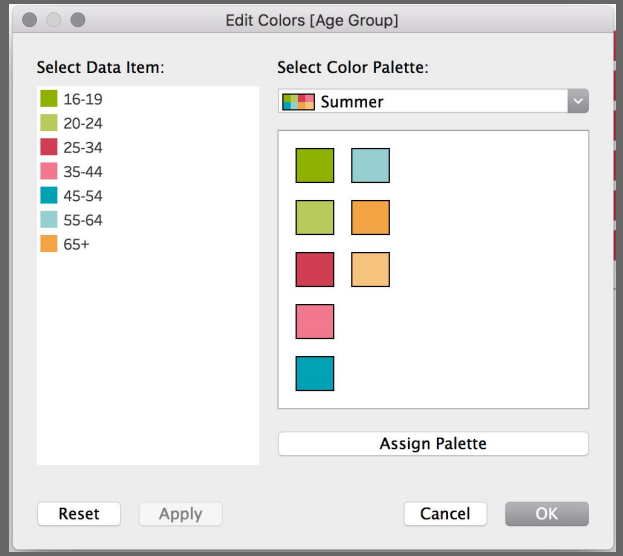
To show the filter: right click, show filter

Types of Filters



Changing Legend Colors



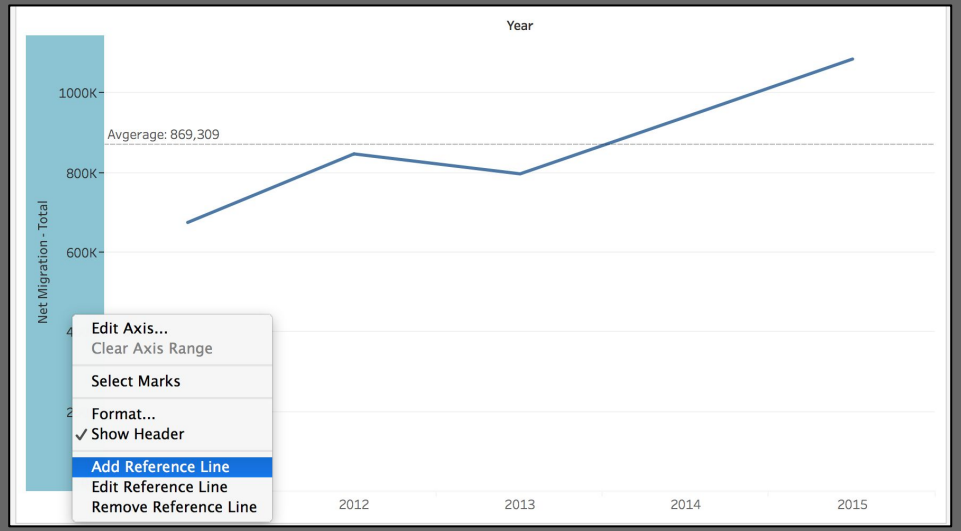


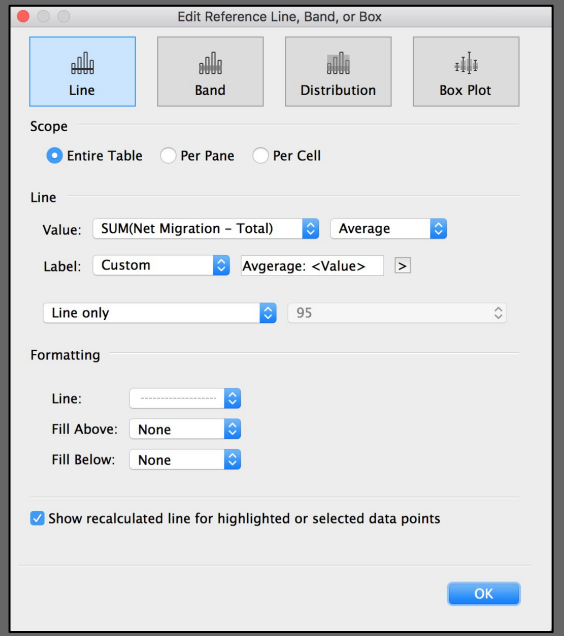
Right click on legend, edit colors

Click on the palette drop down to see more options

Click “assign palette” or assign the color manually

Adding Reference Lines

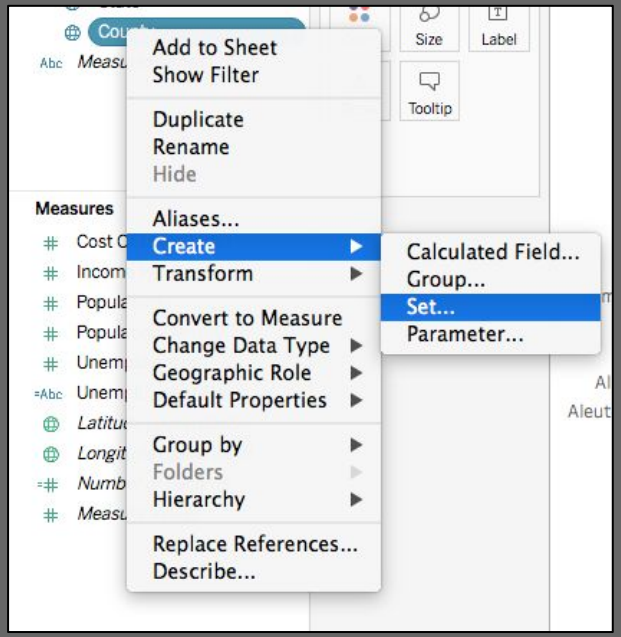


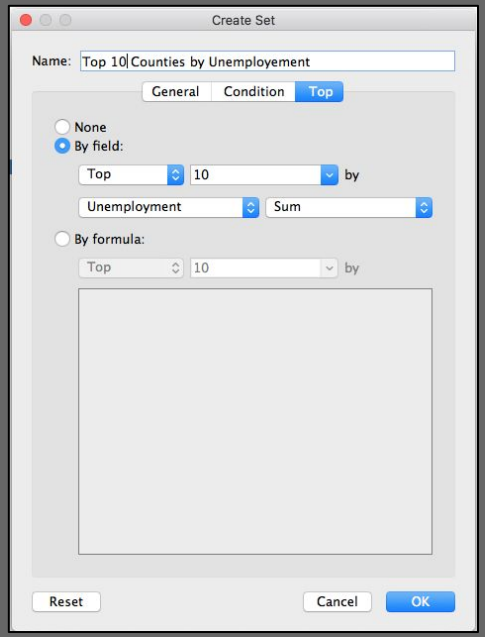


Right click on the axis, add reference line

Click on the analytics pane and drag reference line to graph

Creating Sets





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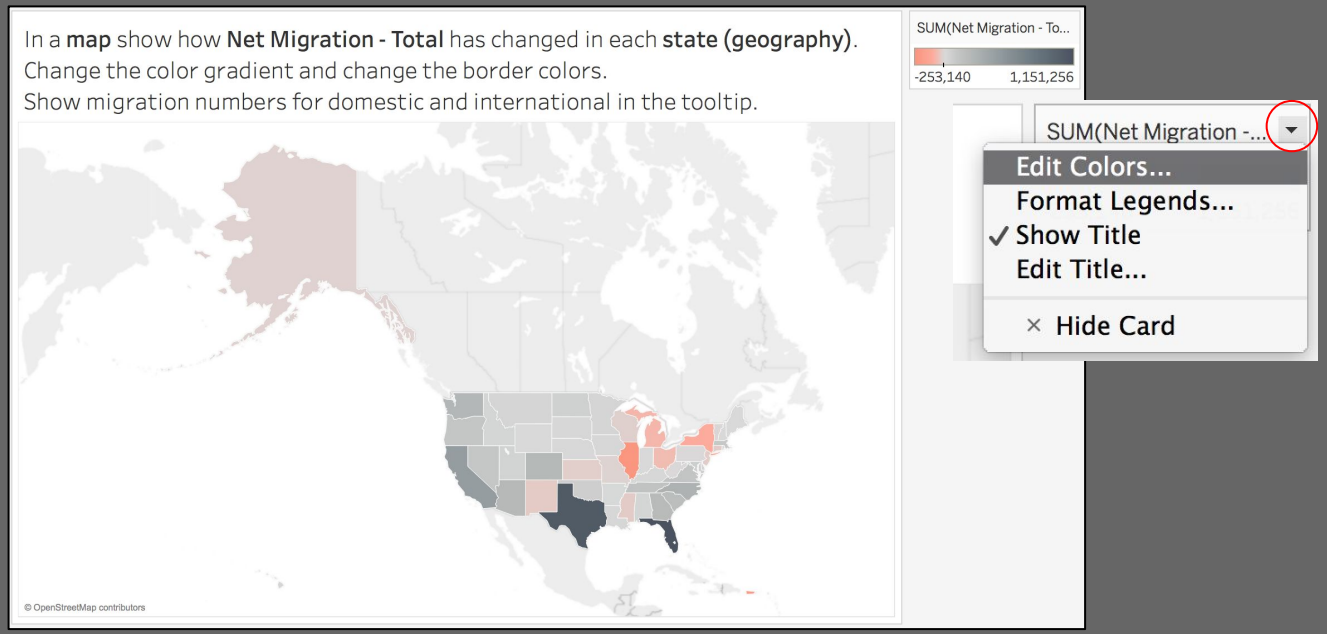
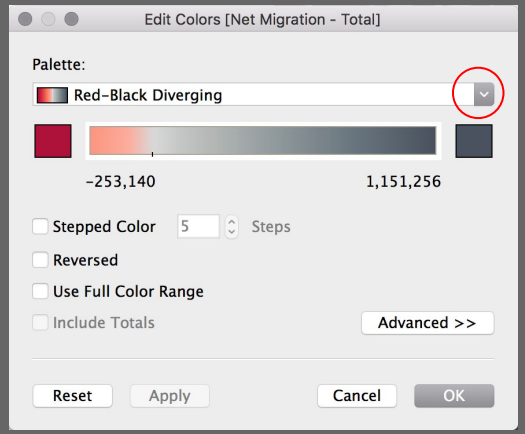




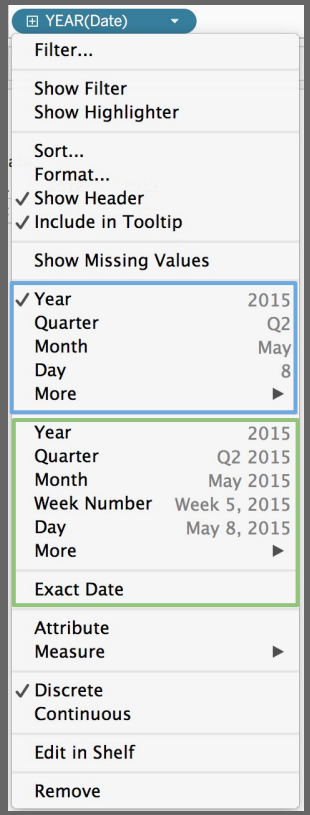
Right click on legend, edit colors

Click on the palette dropdown to see more options

Working with Dates in Tableau

Discrete Dates

Datepart or just that part of the date
Ex: Month will add up all the "May"s in the data, used for year over year comparisons



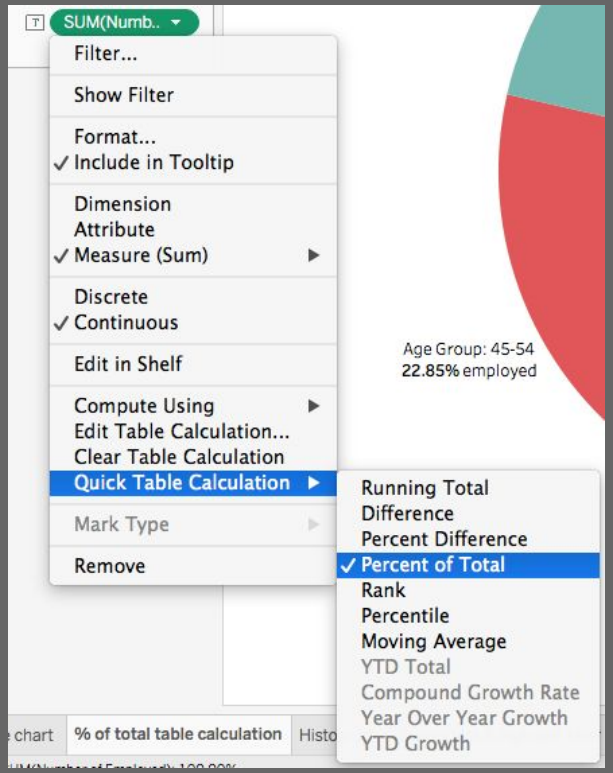
Continuous Dates

That part of the date and the hierarchy
Ex: May 2015 will be a different point than May 2016

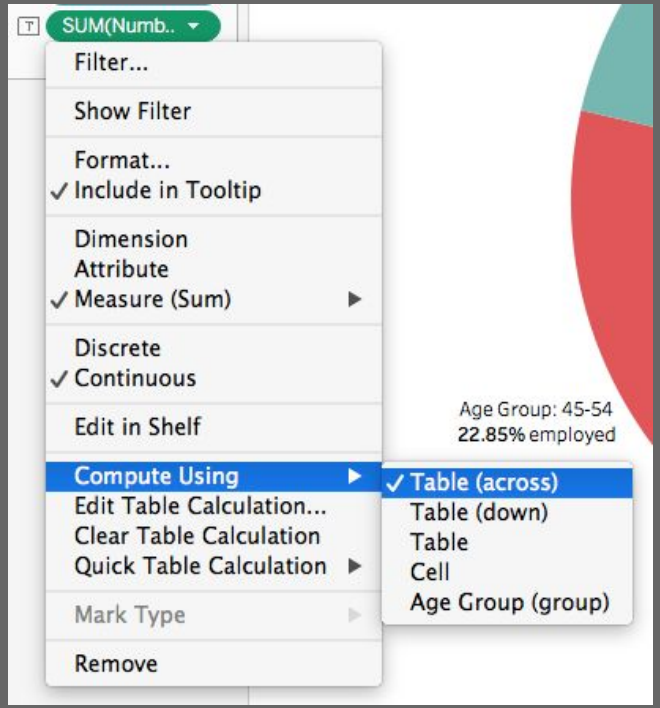
Intermediate Tableau Visualizations

- Tree map
- Pie chart
- % of total table calculation
- Histogram
- Scatterplot & highlight filter
- Box plot
- Clusters
- Highlight table
- Calendar highlight table
- Difference table calculation
- Multiple marks
- Dual axis
- Multi-measure text table
- Basic calculations
- Parameter calculations
- String calculations
- Logical calculations
- Bullet graph

Table Calculations



Depending on the complexity of your calculation and visualization you may need to edit the "**compute using**".



Measure Names & Measure Values

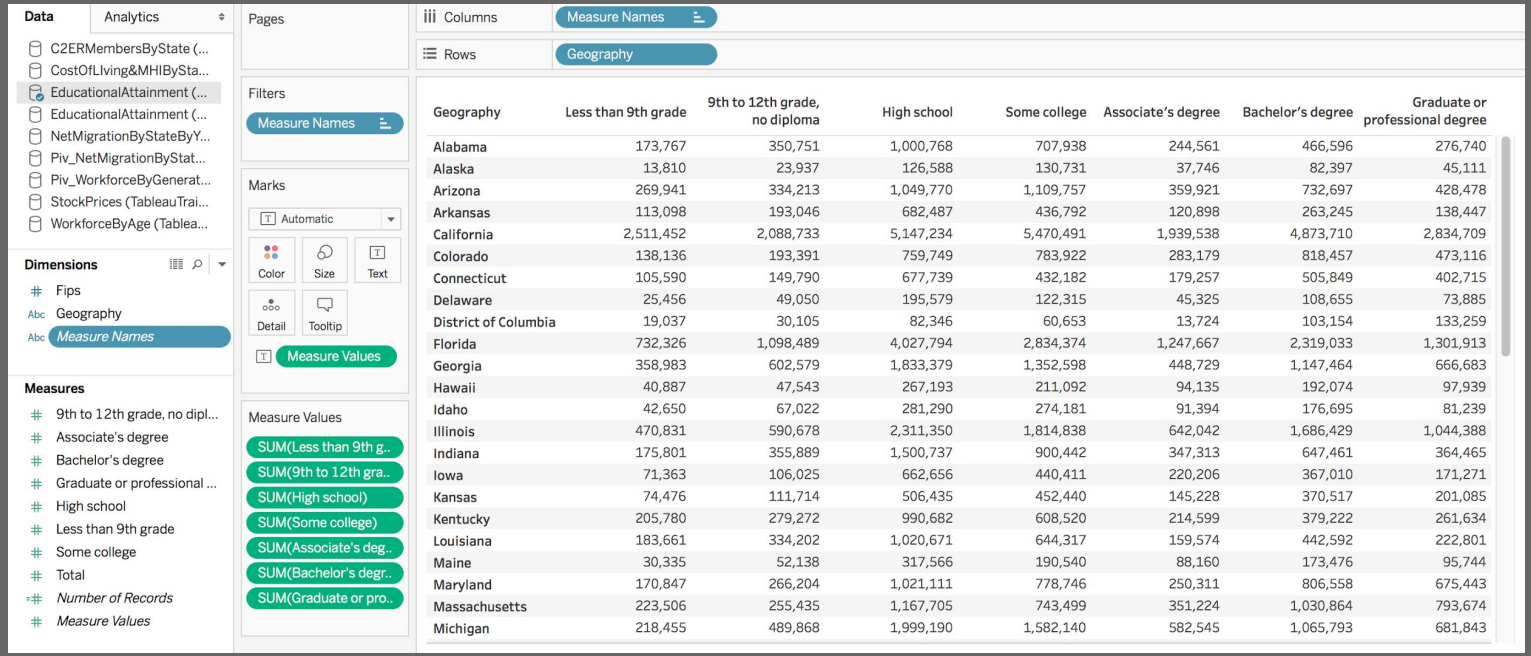
Measure Names

Geography	Less than 9th grade	9th to 12th grade, no diploma	High school	Some college	Associate's degree	Bachelor's degree	Graduate or professional degree
Alabama	173,767	350,751	1,000,768	707,938	244,561	466,596	276,740
Alaska	13,810	23,937	126,588	130,731	37,746	82,397	45,111
Arizona	269,941	334,213	1,049,770	1,109,757	359,921	732,697	428,478
Arkansas	113,098	193,046	682,487	436,792	120,898	263,245	138,447
California	2,511,452	2,088,733	5,147,234	5,470,491	1,939,538	4,873,710	2,834,709
Colorado	138,136	193,391	759,749	783,922	283,179	818,457	473,116
Connecticut	105,590	149,790	677,739	432,182	179,257	505,849	402,715
Delaware	25,456	49,050	195,579	122,315	45,325	108,655	73,885
District of Columbia	19,037	30,105	82,346	60,653	13,724	103,154	133,259
Florida	732,326	1,098,489	4,027,794	2,834,374	1,247,667	2,319,033	1,301,913
Georgia	358,983	602,579	1,833,379	1,352,598	448,729	1,147,464	666,683
Hawaii	40,887	47,543	267,193	211,092	94,135	192,074	97,939
Idaho	42,650	67,022	281,290	274,181	91,394	176,695	81,239
Illinois	470,831	590,678	2,311,350	1,814,838	642,042	1,686,429	1,044,388
Indiana	175,801	355,889	1,500,737	900,442	347,313	647,461	364,465

Measure Values

Measure Names & Measure Values

Measure Names



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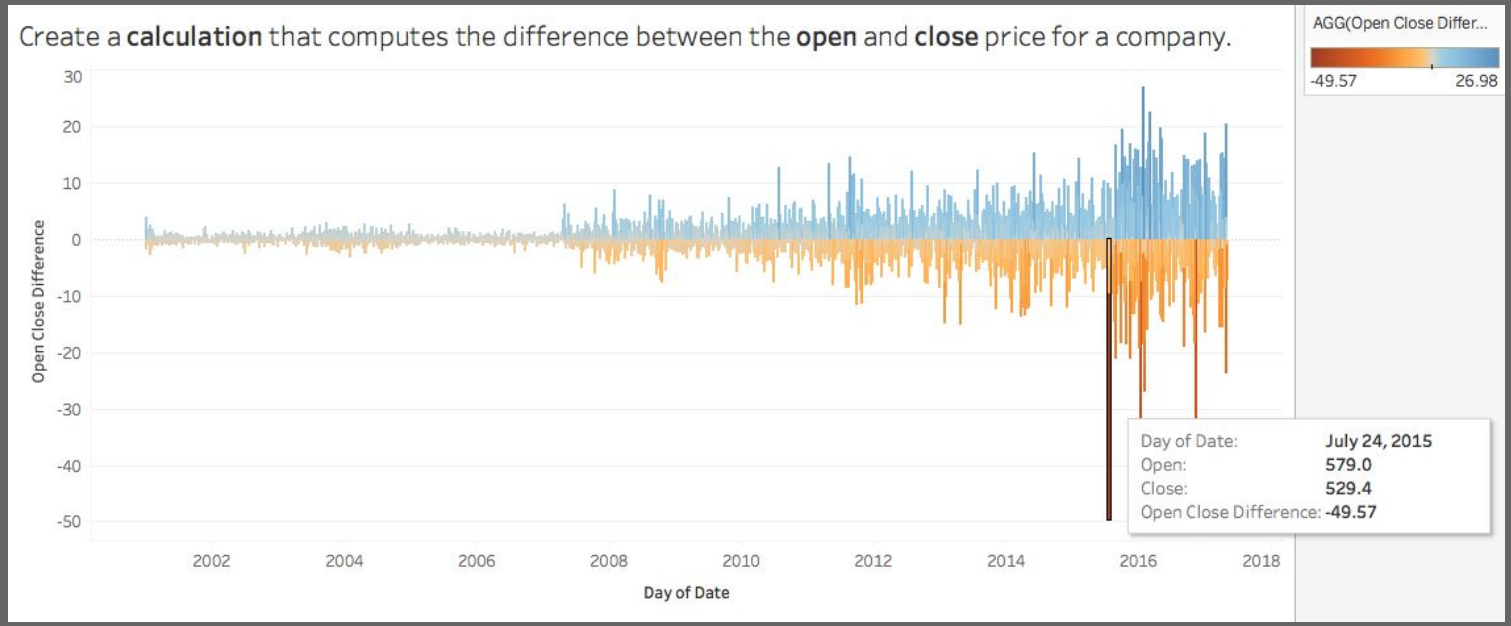
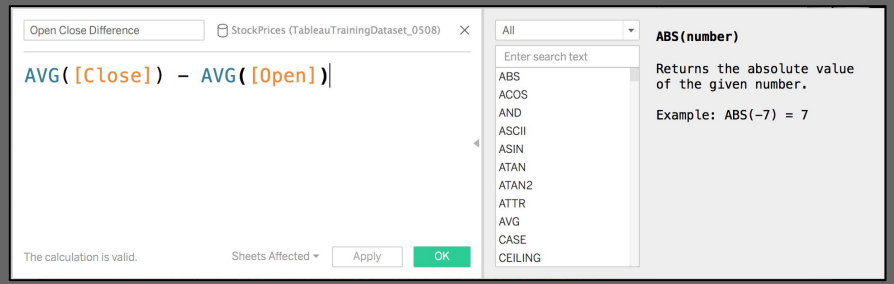
Illinois	470,831	590,678	2,311,350	1,814,838	642,042	1,686,429	1,044,388
Indiana	175,801	355,889	1,500,737	900,442	347,313	647,461	364,465
Iowa	71,363	106,025	662,656	440,411	220,206	367,010	171,271
Kansas	74,476	111,714	506,435	452,440	145,228	370,517	201,085
Kentucky	205,780	279,272	990,682	608,520	214,599	379,222	261,634
Louisiana	183,661	334,202	1,020,671	644,317	159,574	442,592	222,801
Maine	30,335	52,138	317,566	190,540	88,160	173,476	95,744
Maryland	170,847	266,204	1,021,111	778,746	250,311	806,558	675,443
Massachusetts	223,506	255,435	1,167,705	743,499	351,224	1,030,864	793,674
Michigan	218,455	489,868	1,999,190	1,582,140	582,545	1,065,793	681,843

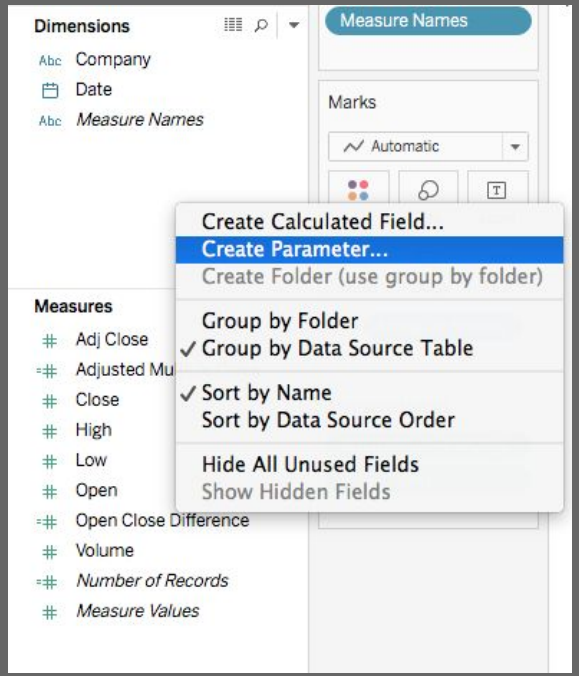
Measure Values

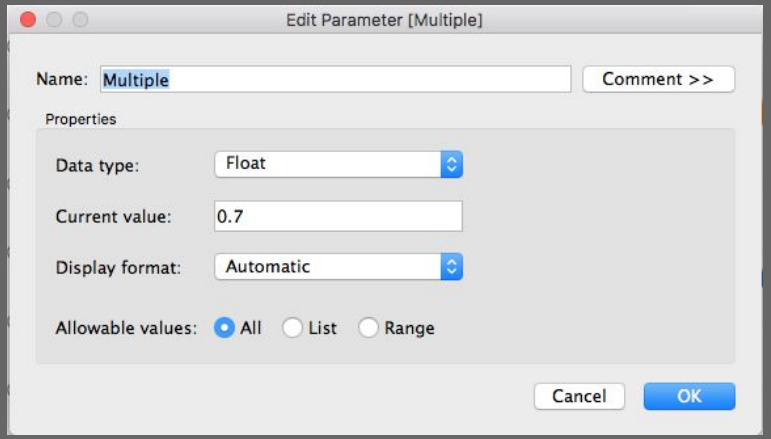
Calculations

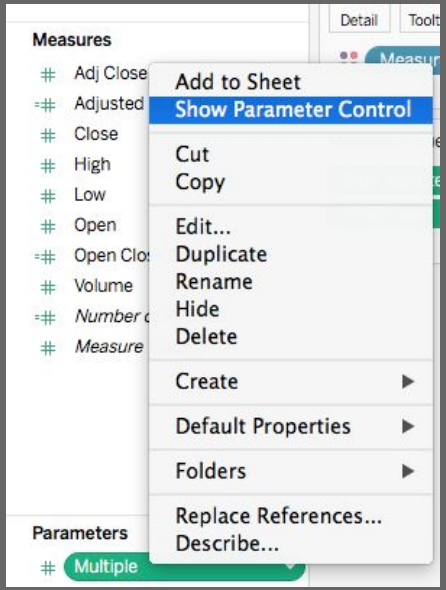




Parameters


Dimensions
Abc Company
Date
Abc Measure Names
Measure Names
Marks
Automatic
Create Calculated Field...
Create Parameter...
Create Folder (use group by folder)
Group by Folder
Group by Data Source Table
Sort by Name
Sort by Data Source Order
Hide All Unused Fields
Show Hidden Fields
Measures
Adj Close
Adjusted Mu
Close
High
Low
Open
Open Close Difference
Volume
Number of Records
Measure Values


Edit Parameter [Multiple]
Name: Multiple
Comment >>
Properties
Data type: Float
Current value: 0.7
Display format: Automatic
Allowable values: All List Range
Cancel
OK

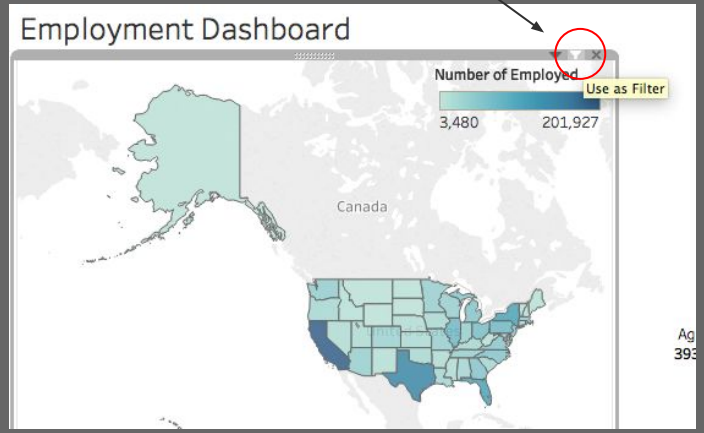

Measures
Adj Close
Adjusted
Close
High
Low
Open
Open Clos
Volume
Number
Measure
Add to Sheet
Show Parameter Control
Cut
Copy
Edit...
Duplicate
Rename
Hide
Delete
Create
Default Properties
Folders
Replace References...
Describe...
Parameters
Multiple

Interactive Tableau Dashboards

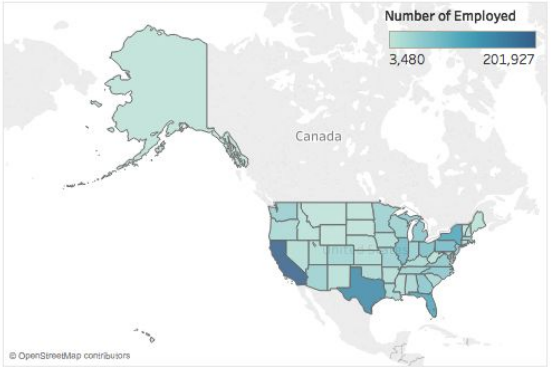
- Floating dashboard objects
- Dashboard actions
- Dashboard filters

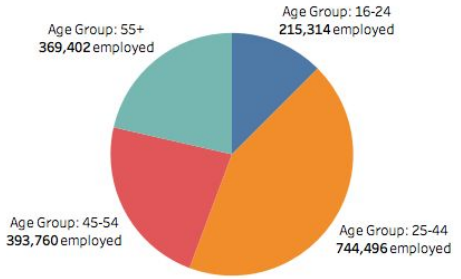
Dashboard Actions

Dashboard Action



Employment Dashboard





Age Group	2010	2011	2012	2013	2014	2015
16-19	8,752	8,690	8,854	8,918	9,116	9,480
20-24	25,364	26,222	26,828	27,198	27,846	28,046
25-34	60,382	61,422	61,436	62,488	64,074	65,498
35-44	61,244	60,906	61,180	61,298	62,056	62,512
45-54	66,302	66,100	65,778	65,052	65,236	65,292
55-64	43,216	44,640	46,498	47,556	48,872	49,958
65+	12,522	13,378	14,494	15,364	15,974	16,930
Total	277,785	281,354	285,072	287,870	293,170	297,694
Grand Total	555,567	562,712	570,140	575,744	586,344	595,410

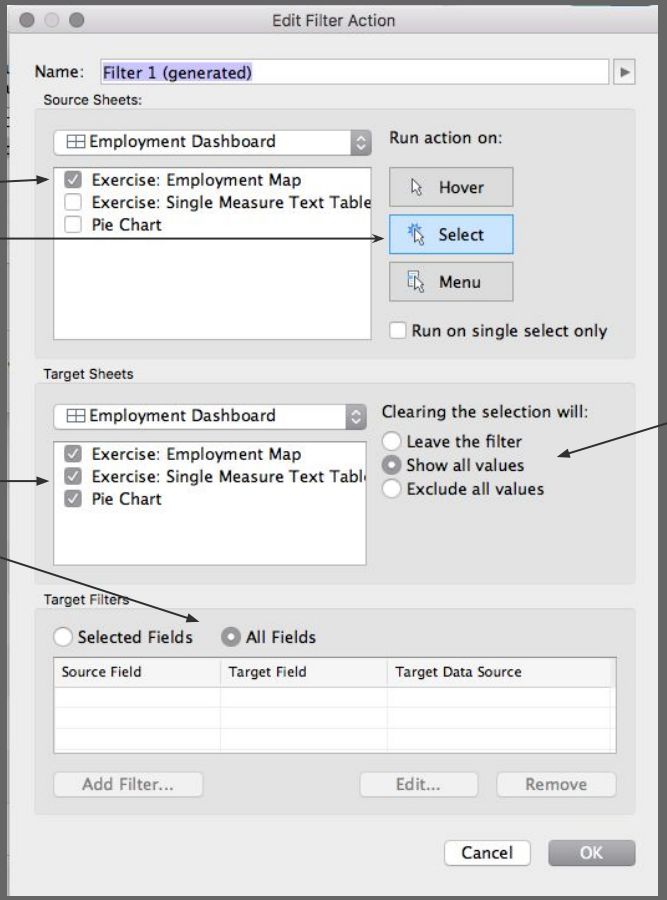
Dashboard Actions

Top Menu bar, Dashboard -> Actions

When I click on:
Exercise: Employment Map

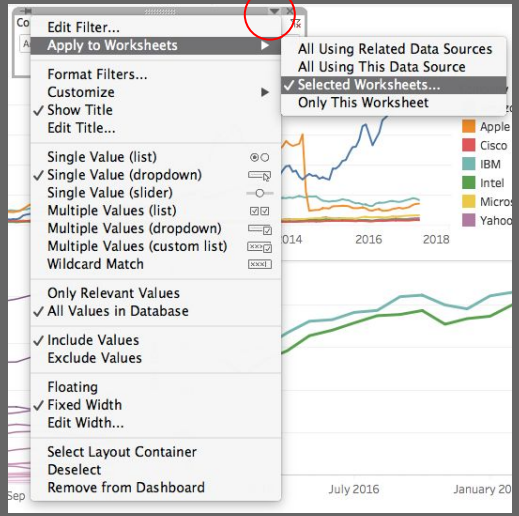
I want these sheets
to filter on “all”

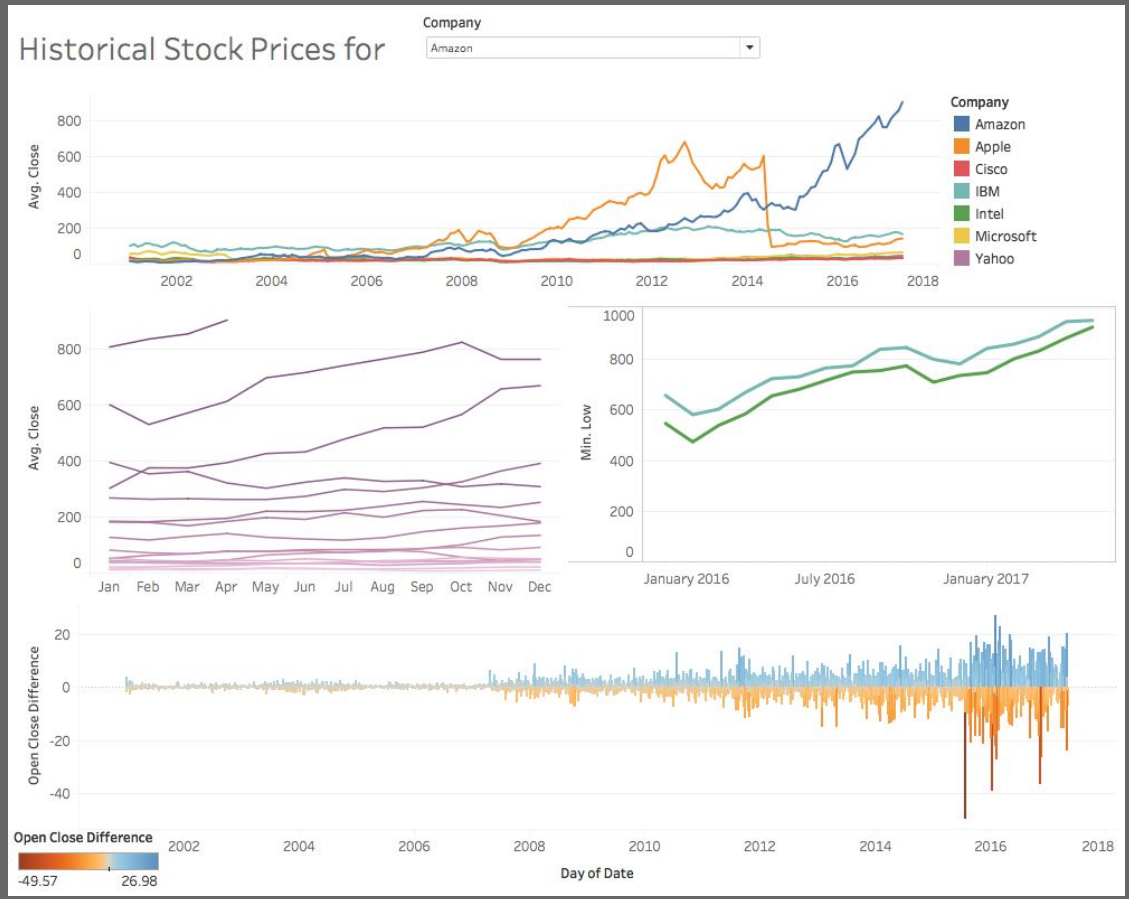
When I un-select I want all
the values to show



Dashboard Filters

Apply filter to multiple sheets

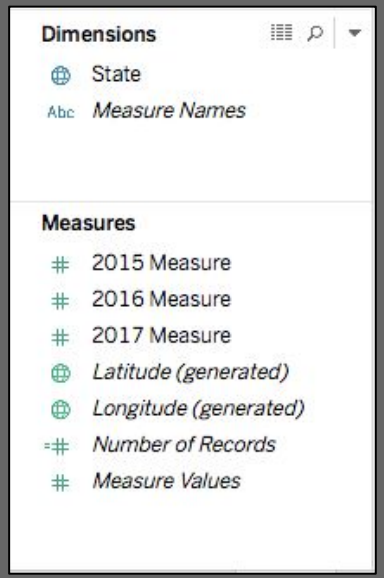




Formatting data for Tableau

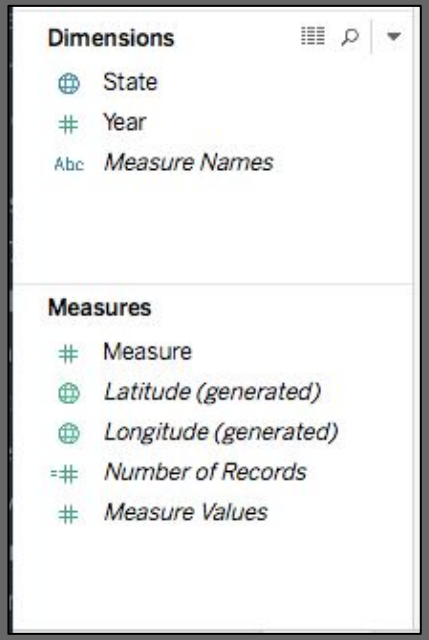
Wide Data

State	2015 Measure	2016 Measure	2017 Measure
Alabama	0.789727804	0.787265102	0.929815228
Alaska	0.069223539	0.849489417	0.325685068
Arizona	0.458744699	0.225397942	0.112235825
Arkansas	0.472020611	0.269102644	0.922918379
California	0.807769941	0.433524907	0.416775096
Coloradao	0.355480568	0.007733955	0.499048116



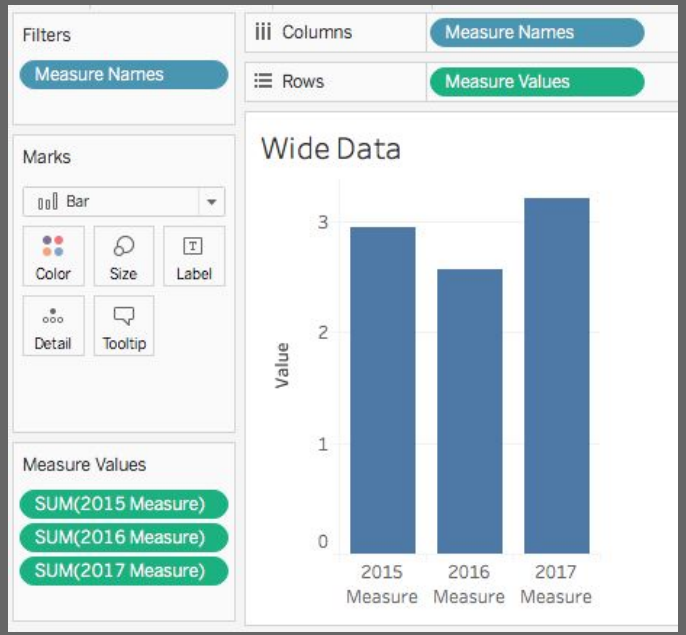
Tall Data

State	Year	Measure
Alabama	2015	0.789727804
Alaska	2015	0.069223539
Arizona	2015	0.458744699
Arkansas	2015	0.472020611
California	2015	0.807769941
Coloradao	2015	0.355480568
Alabama	2016	0.787265102
Alaska	2016	0.849489417
Arizona	2016	0.225397942
Arkansas	2016	0.269102644
California	2016	0.433524907
Coloradao	2016	0.007733955
Alabama	2017	0.929815228
Alaska	2017	0.325685068
Arizona	2017	0.112235825
Arkansas	2017	0.922918379
California	2017	0.416775096
Coloradao	2017	0.499048116

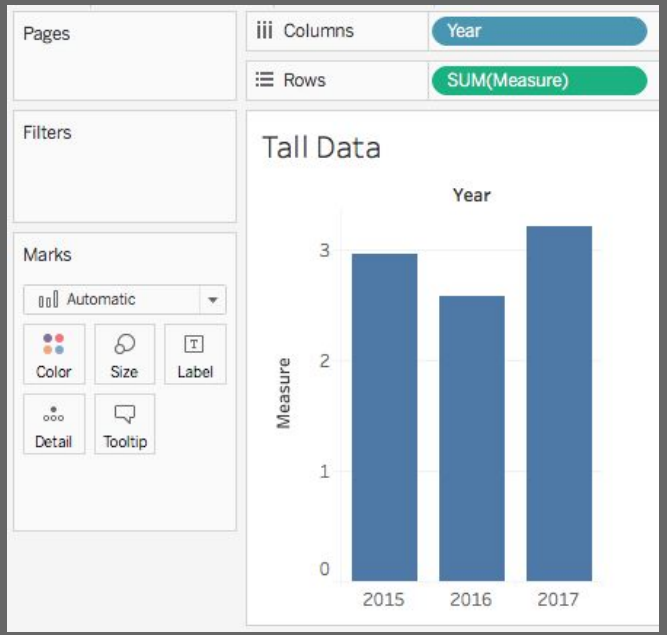


Formatting data for Tableau

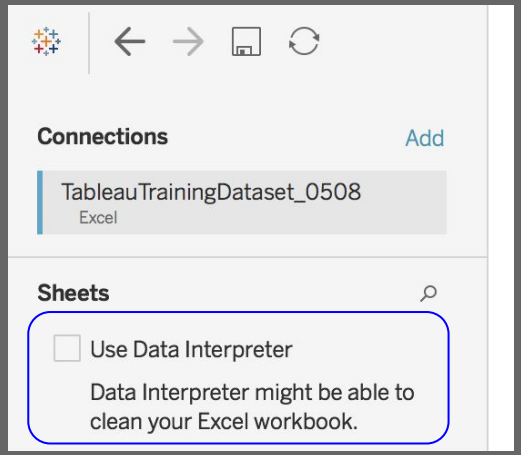
Wide Data

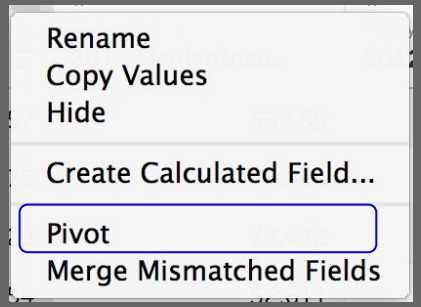


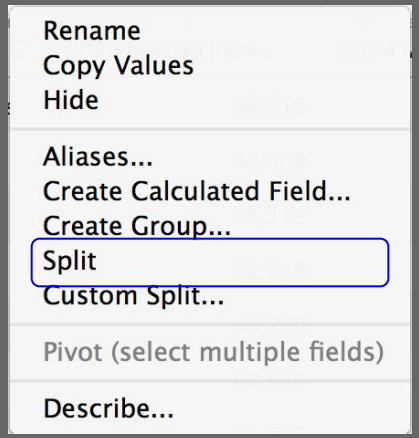
Tall Data



Preparing Your Data in Tableau







- Data interpreter
- Tall vs wide data

Group Exercise

Create a dashboard(s) in a small group with 3+ sheets using one of the following data sets. Publish your dashboard(s) to Tableau Public.

- Olympic Medal Winners
- Superbowl data
- TSA dangerous items FY15
- Craft brewery cans
- Instacart grocery orders
- World food prices (WFPVAM.xls)
- Data.gov
- Pick your own!