

DATA SOCIETY:

Data Analysis with Excel & PowerBI

Day 2

“One should look for what is and not what he thinks should be.”

- Albert Einstein



Welcome Back



Recap

- While you wait for class to get started, **draft a "tweet"** of less than 280 characters that summarizes what you learned in the last session
- Share it in the chat box (and on Twitter too, if you like)

Exercise time: 5 min



Power BI Outline for today

- 1. Building a BI report with formatting techniques
- 2. Building a complex BI report with interactive visualizations
- 3. ETL layer: load data through Power Query
- 4. Implement data storytelling frameworks and techniques

North Carolina (NC) grant usage data

The NC state government distributed \$400,000,000 in grants during 2009 – 2013. Now the government report developer wants to look into NC grant distribution during 2009-2013.

The grant manager wants to see a Power BI report of:

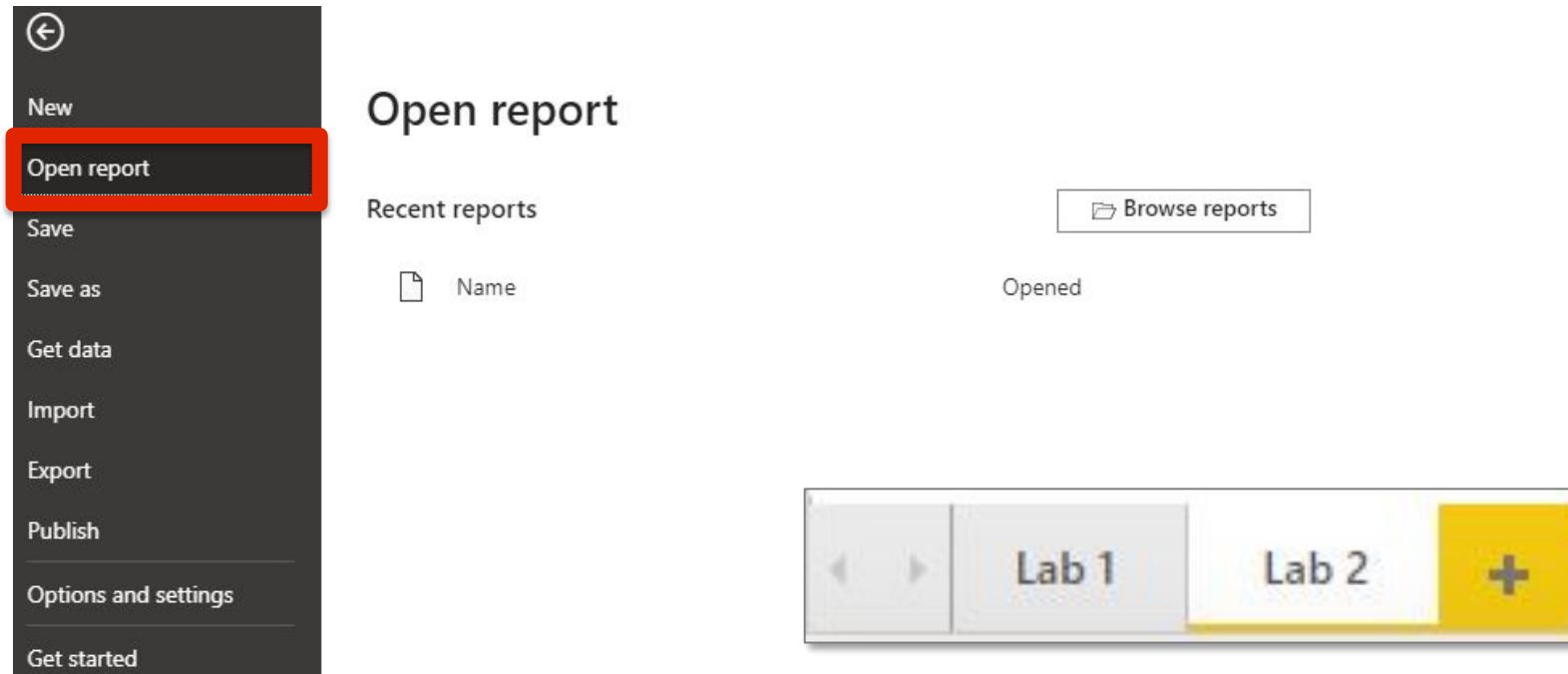
- 1. Actual Job count by job type and program
- 2. Program Status
- 3. Actual wage by job type
- 4. Funding county

[Here](#) is a flowchart to help you think through which type of chart to use for these reports.

Based on this, which charts would you use to display what the grant manager wants to see?

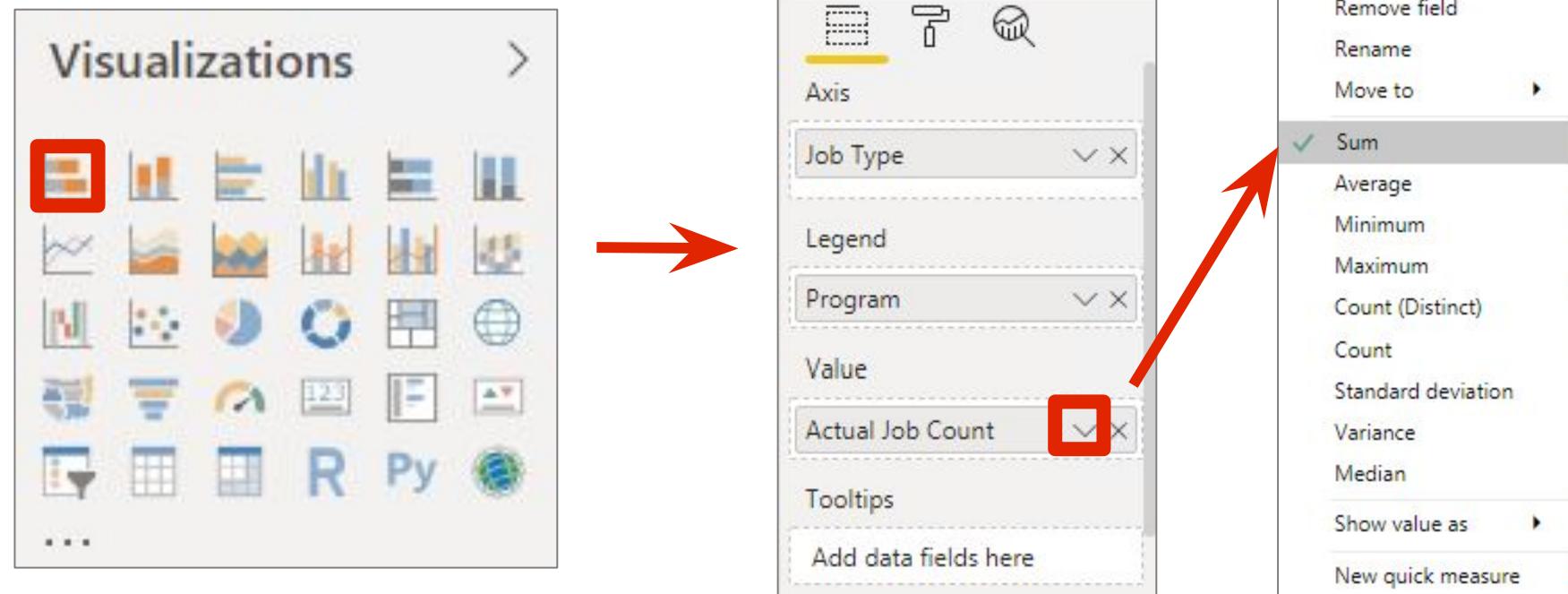
Create a simple chart

- Open the Lab 1 PBIX file from Lab 1, and create another page called “Lab 2”

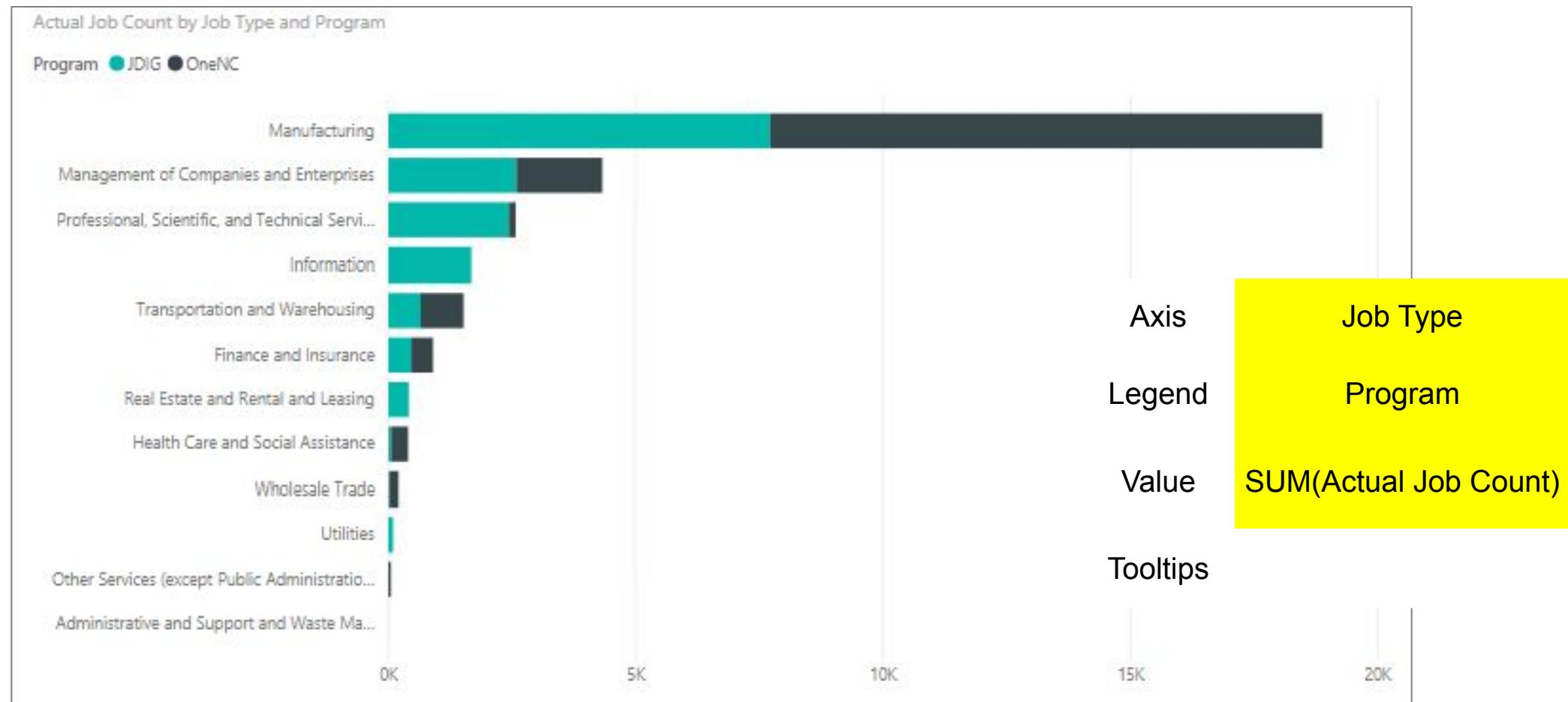


Create a simple chart

- Put 'Actual Job Count' in Value Field and 'Job Type' in Axis, and 'Program' in Legend
- Sum(Actual Job Count) -> click the triangle in under the 'Values' section and choose Sum

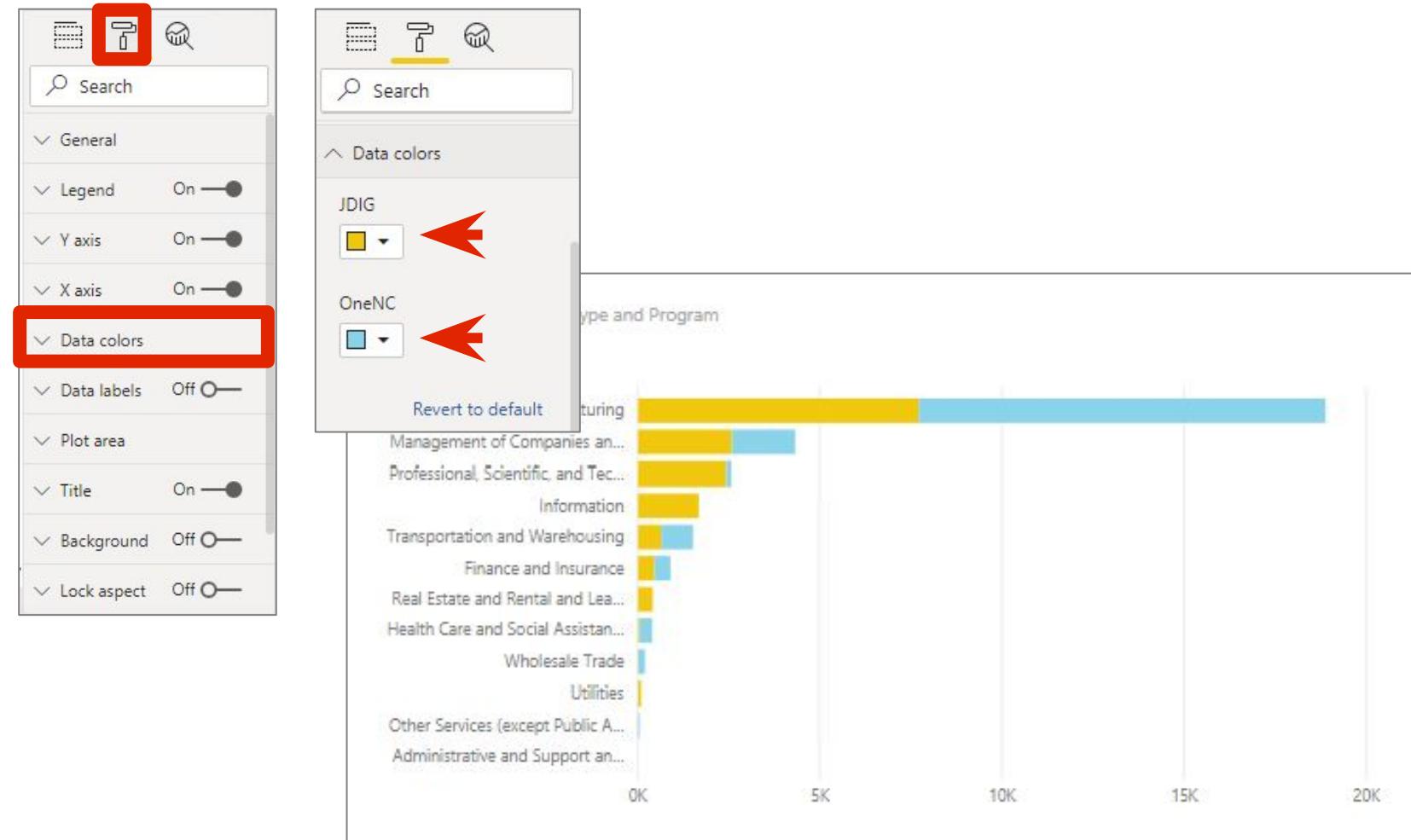


Create a simple chart



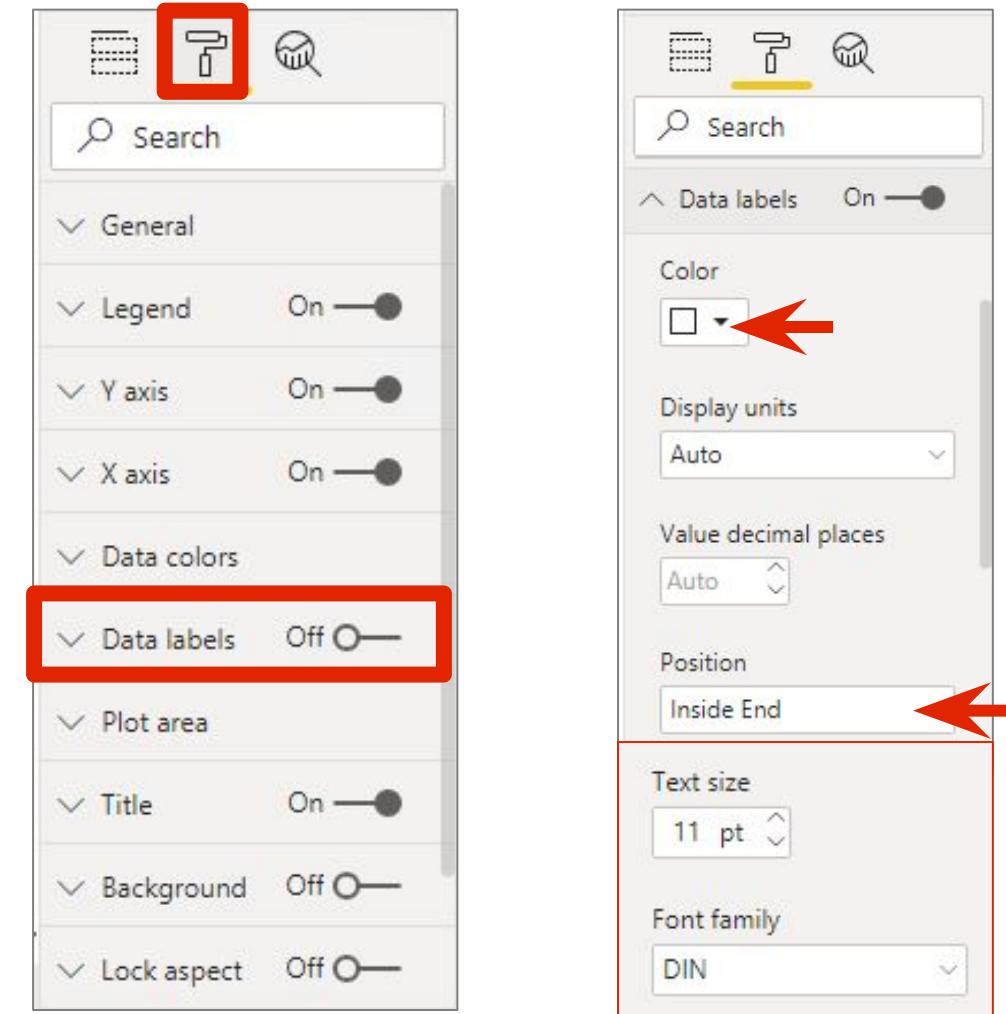
Change your chart color

- Go to Format Tab in Visualizations
- Expand 'Data colors' section
- Make the JDIG Color into yellow, OneNC color into blue

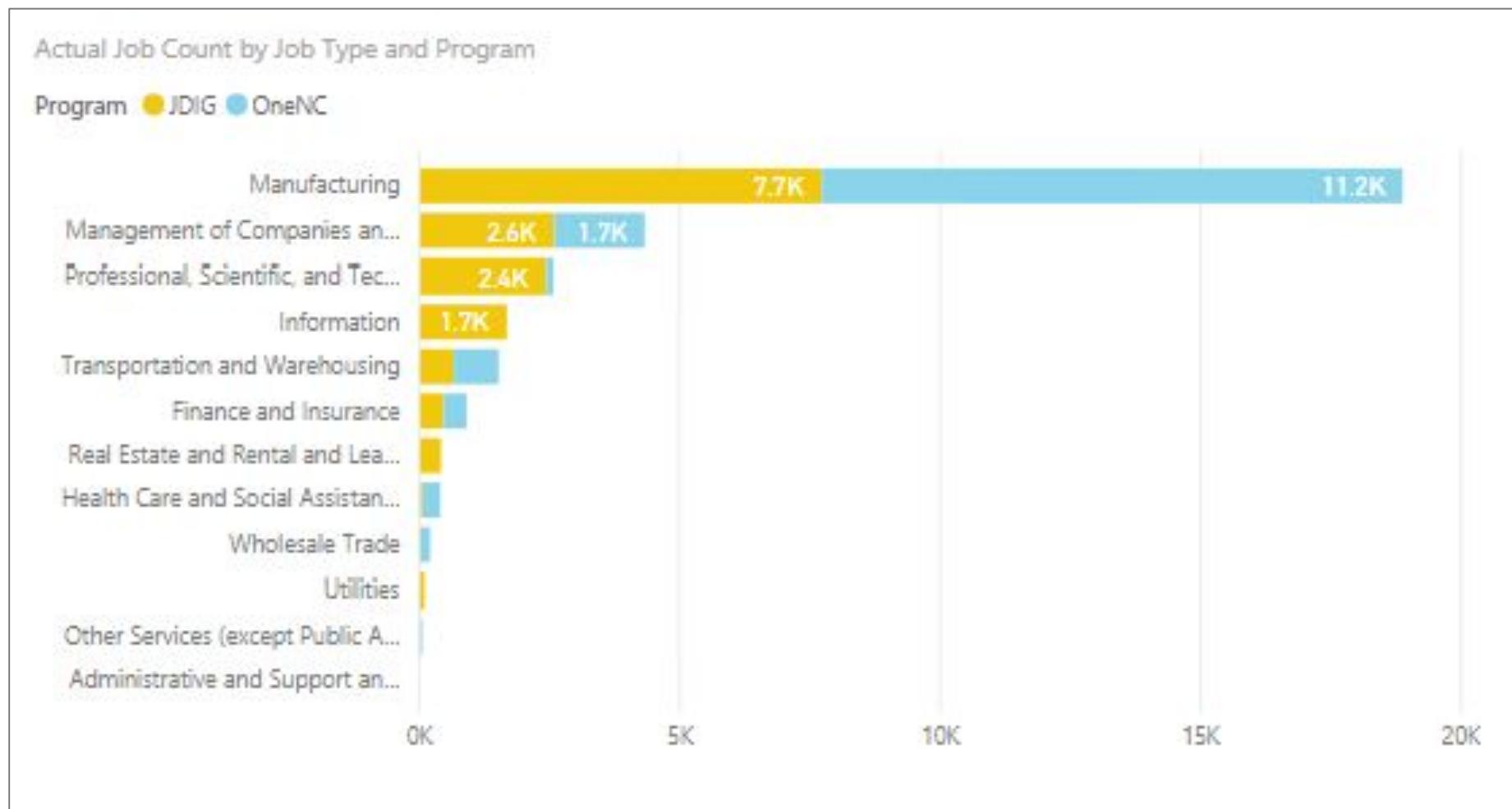


Add data labels

- Go to Format Tab in Visualizations
- Turn the 'Data labels' section on
- Expand 'Data labels' section
- Make the Data label color into white
- 'Position' to be 'Inside End'
- Text Size to be '11'

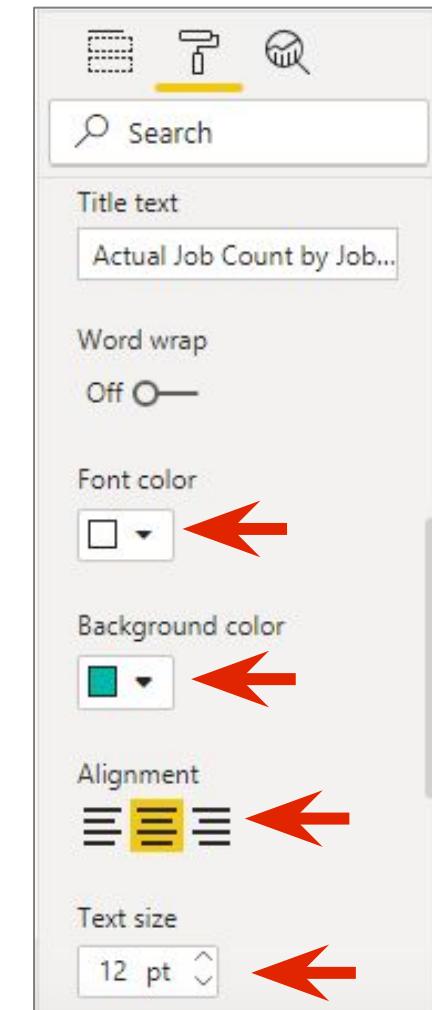
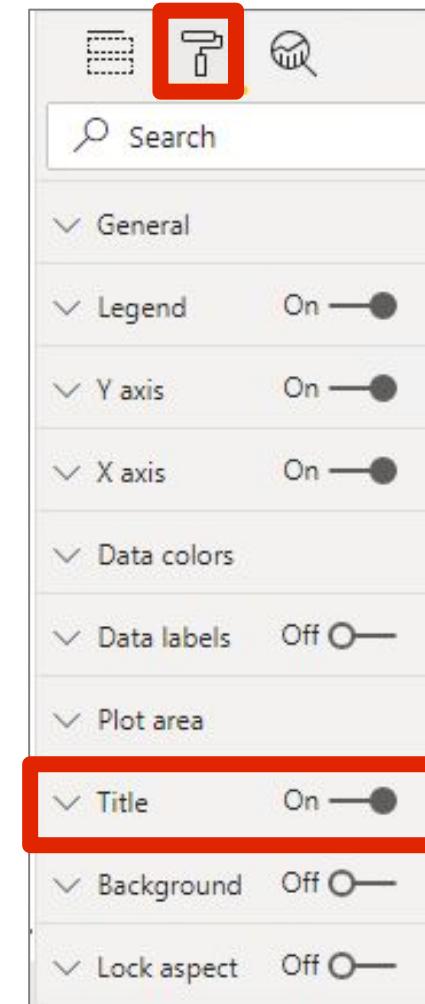


Add data labels

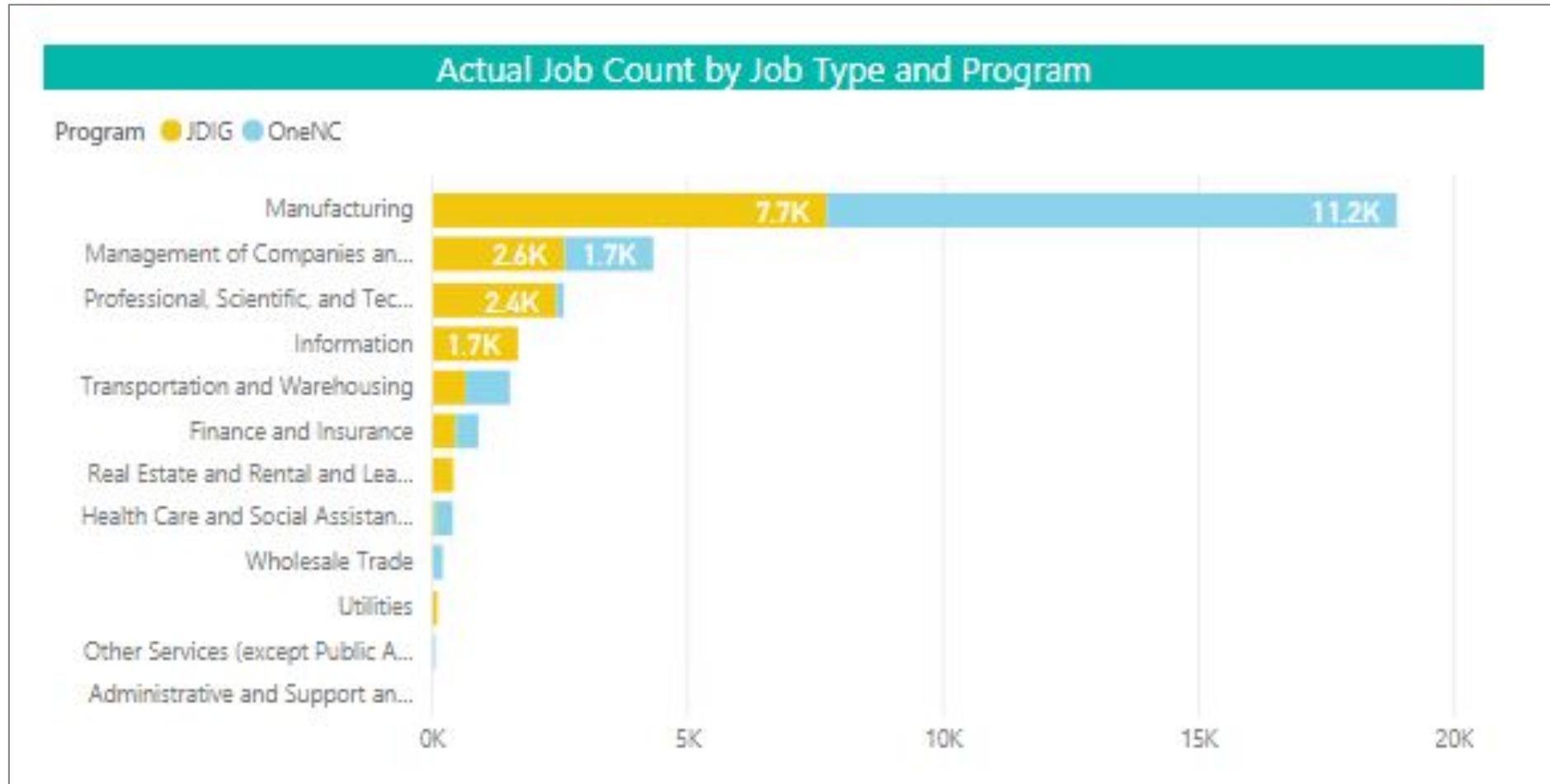


Title formatting

- Go to Format Tab in Visualizations
- Expand 'Title' section
- Make the font color into white, background color into green
- Alignment to be centered
- Text size to be '12' point font

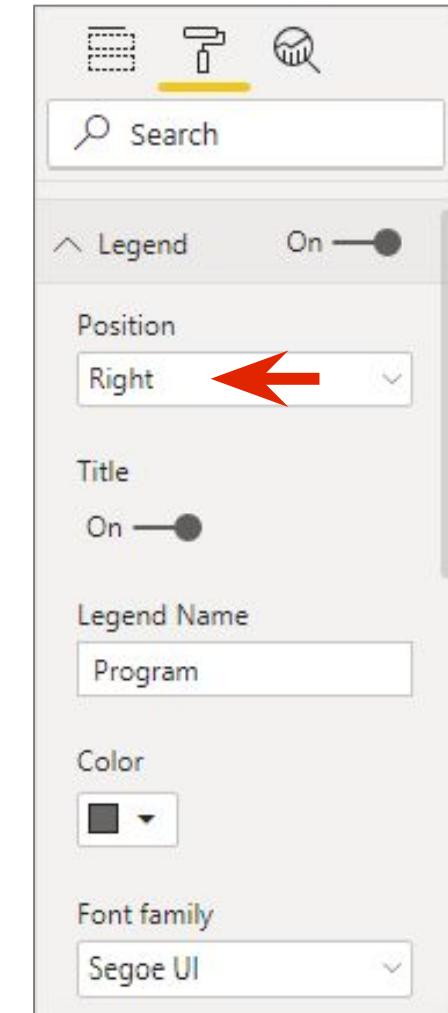
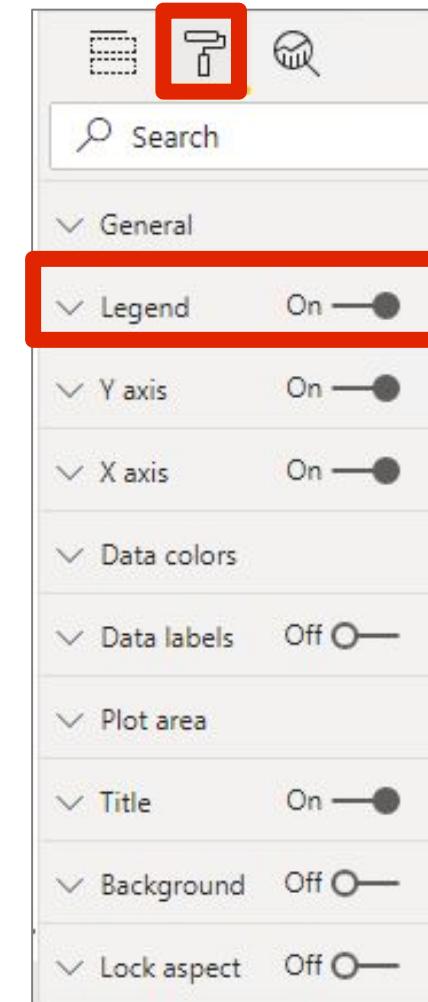


Title formatting

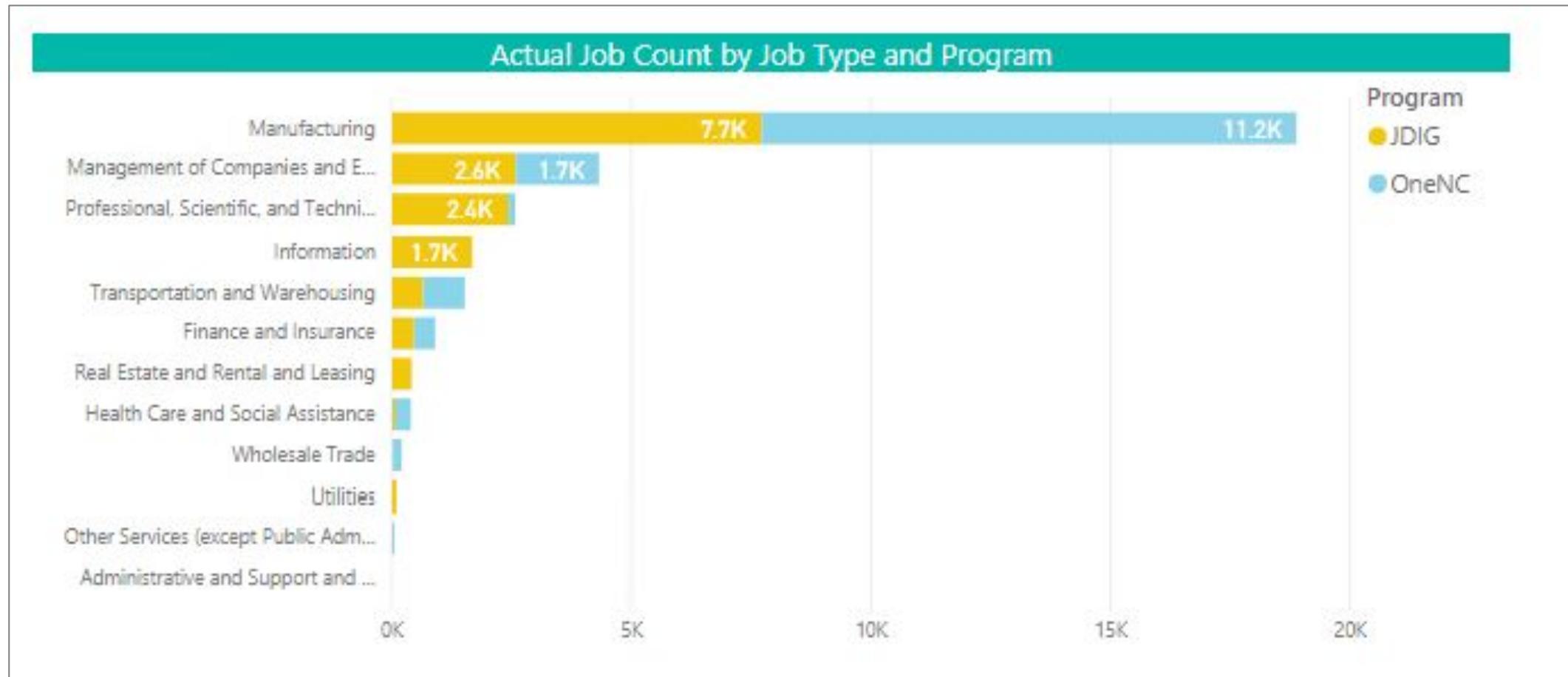


Adjust your legend

- Go to Format Tab in Visualizations
- Expand 'Legend' section
- Position to be 'Right'

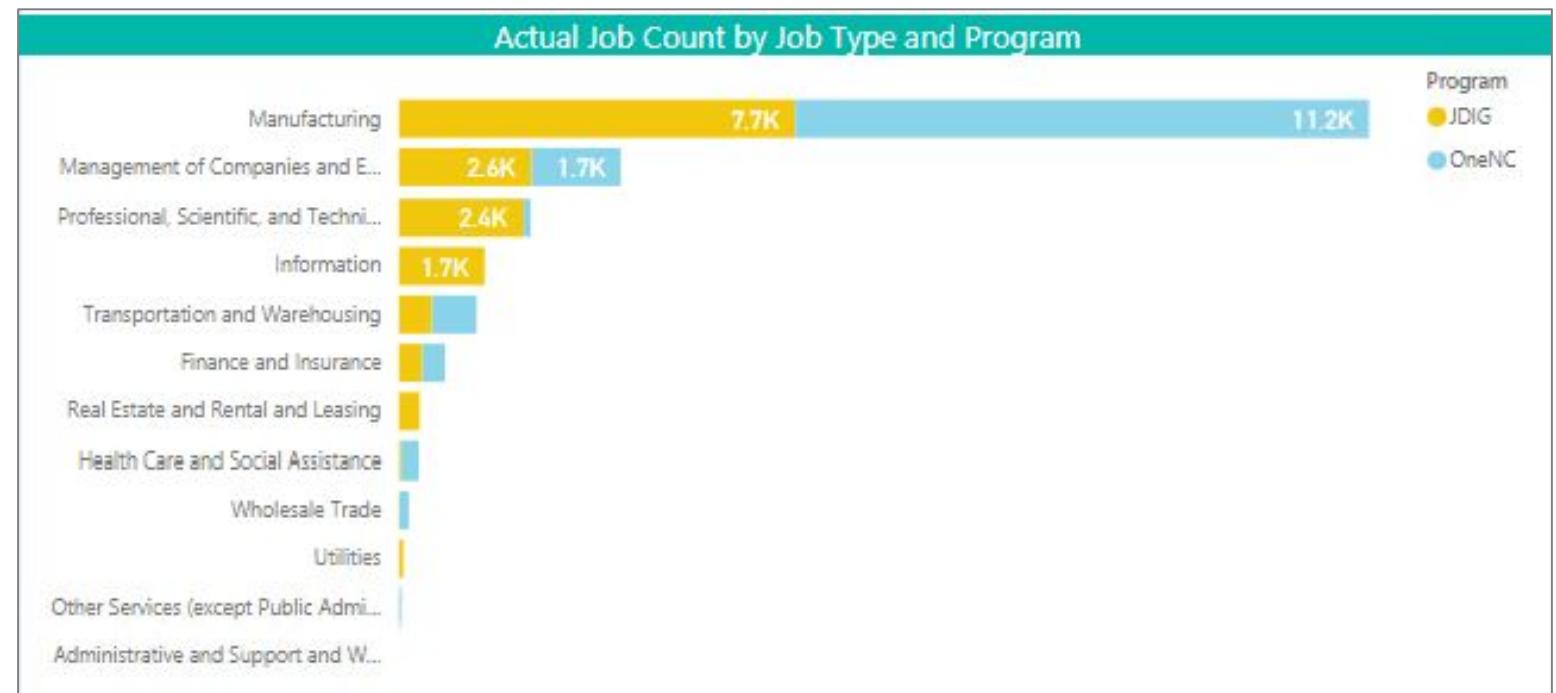
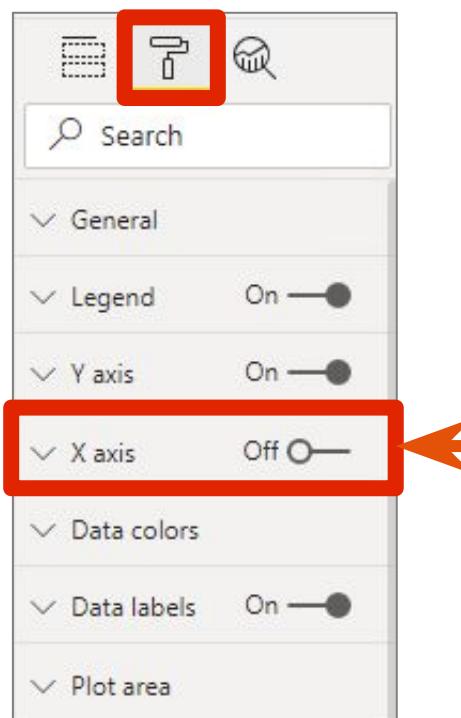


Adjust your legend



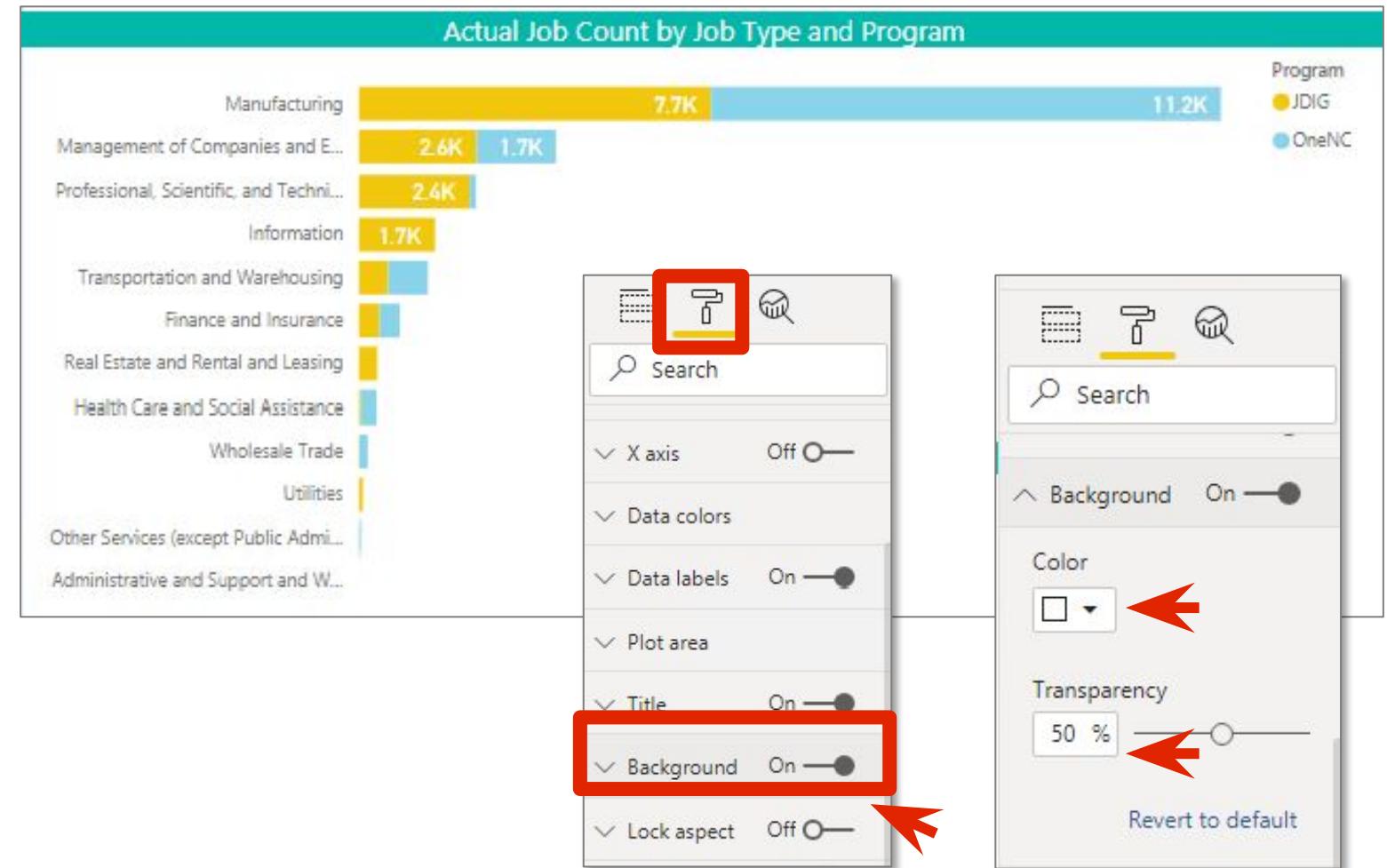
Remove x-axis

- Go to Format Tab in Visualizations, and turn off X axis



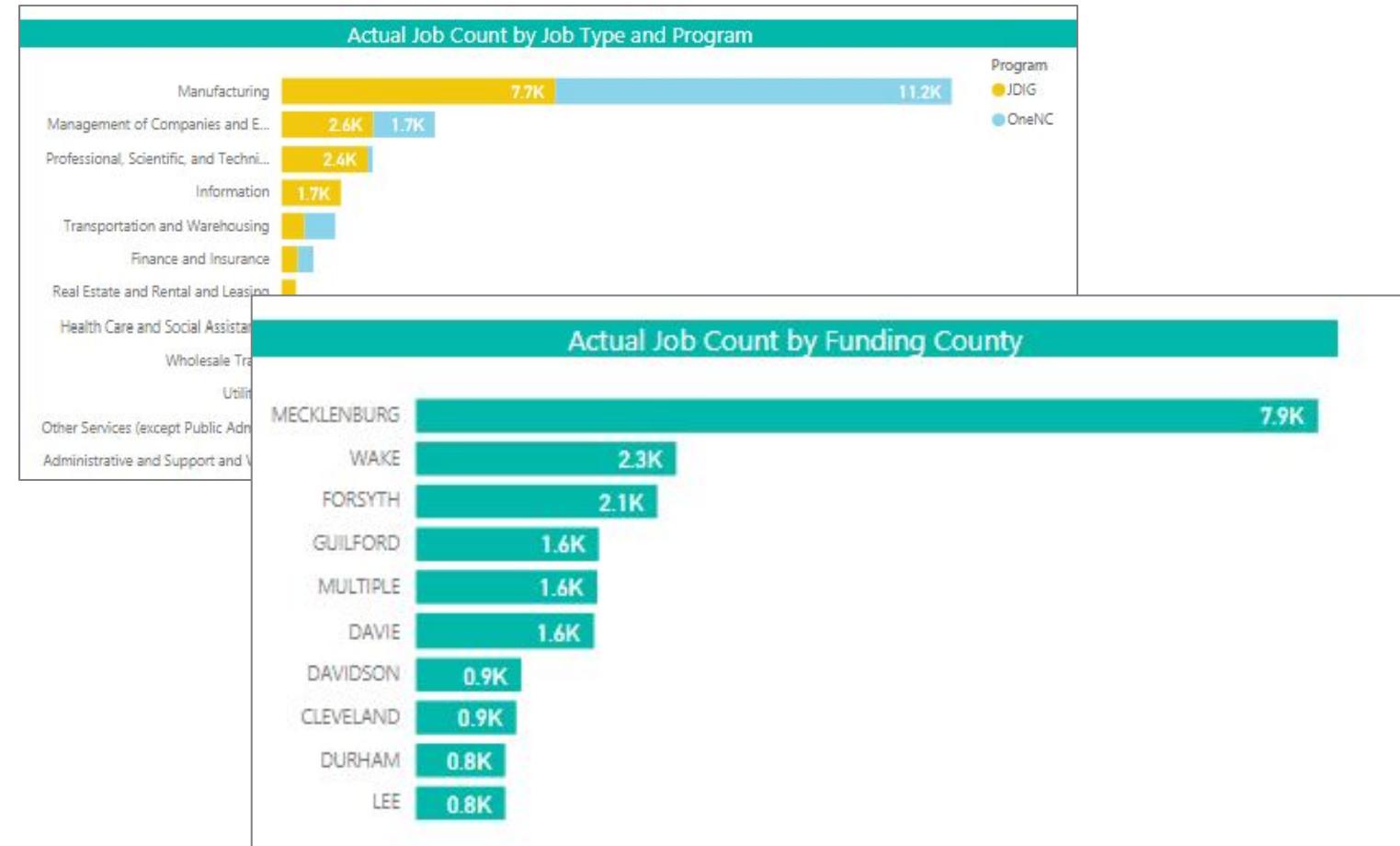
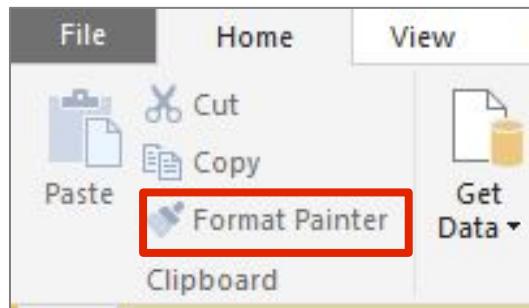
Add visual background

- Go to Format Tab and turn on Background
- Set the color to white, with 50% transparency



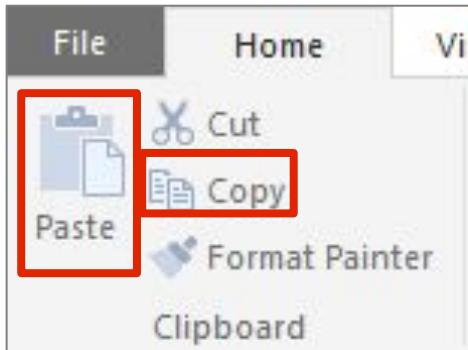
Format Lab 1 title the same way

- Use “Format Painter”

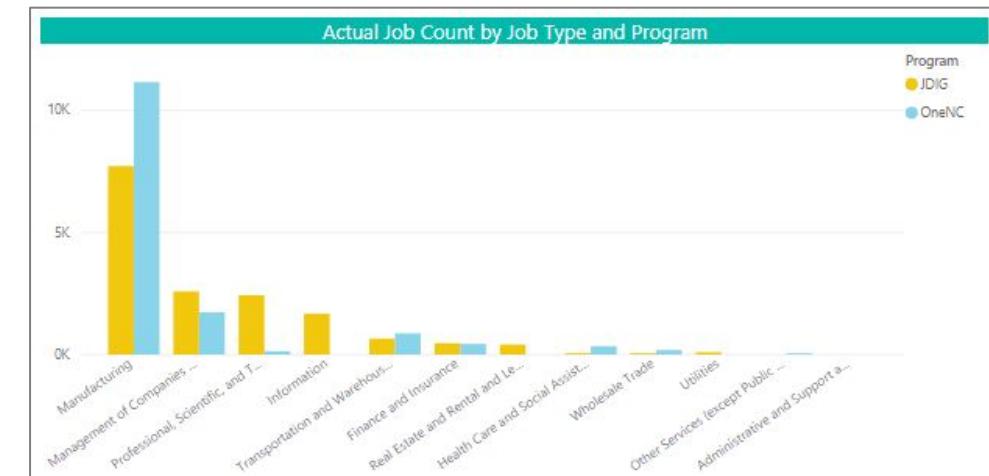
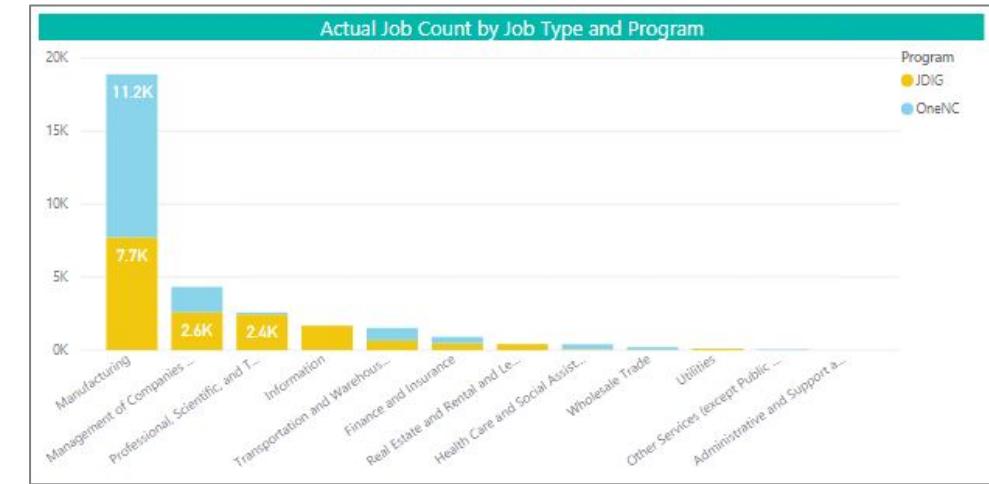
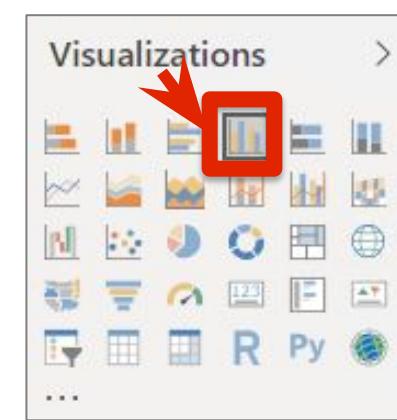
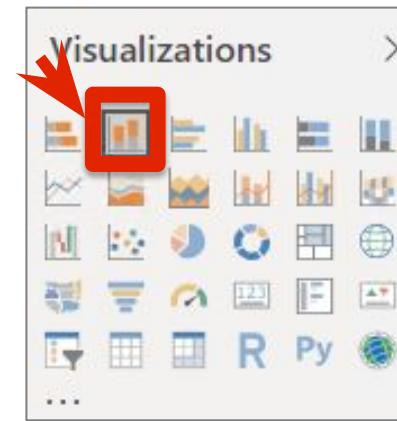


Switching charts

- Copy Paste chart
 - Copy paste the Bar Chart to the other areas of the Canvas



- Replace the visuals to another visual



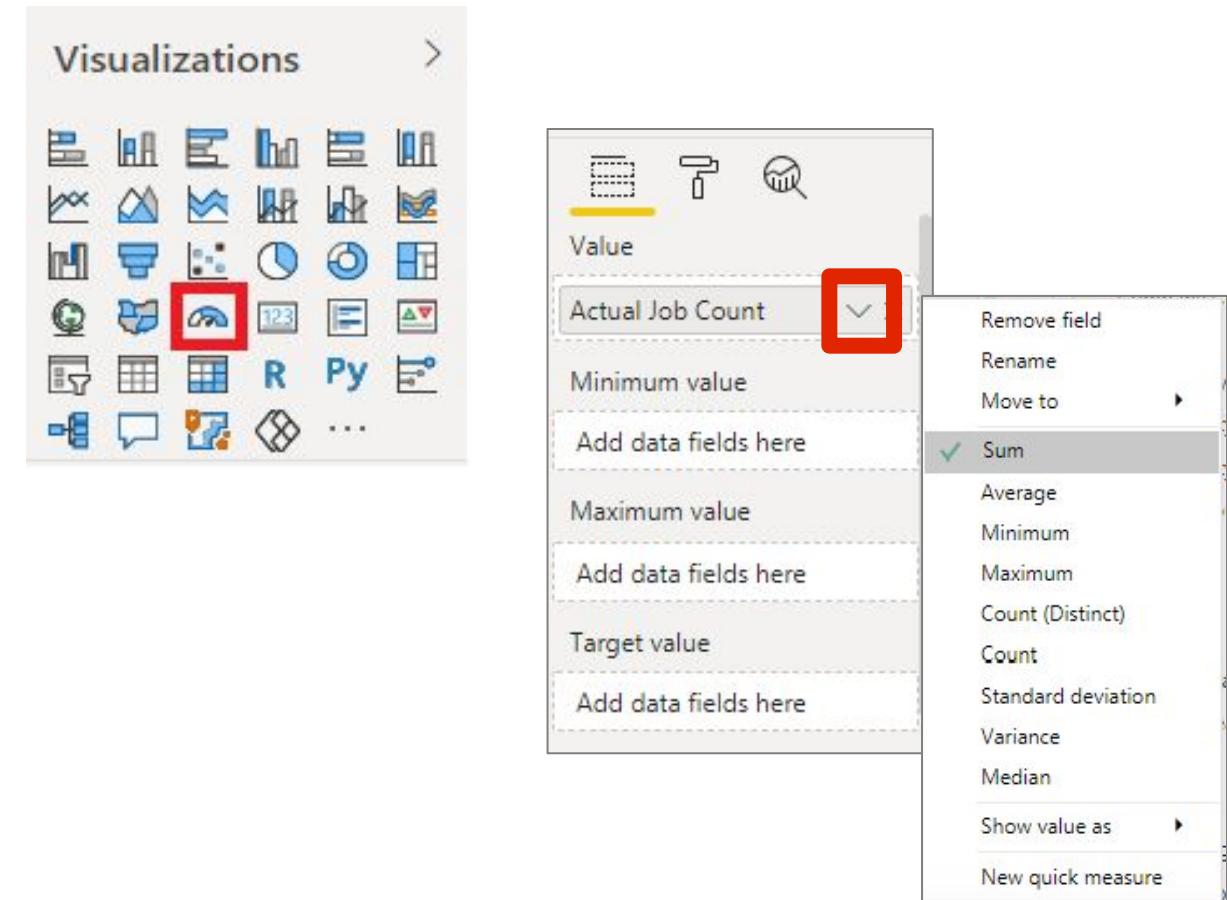
Class practice

- Create a bar chart of Actual Wage by Job type
- Format the chart to be visually appealing – get creative!



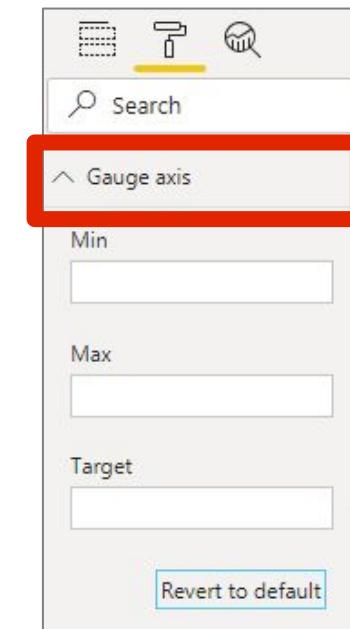
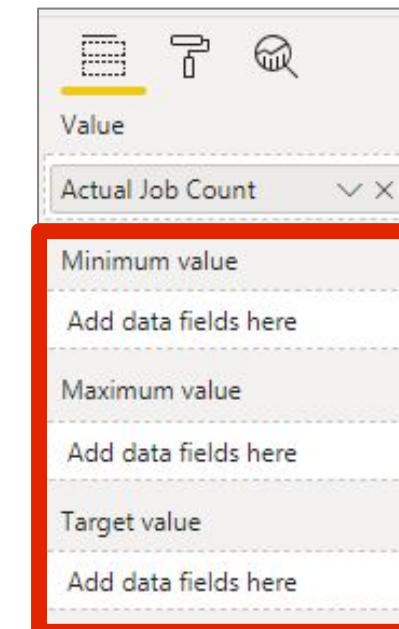
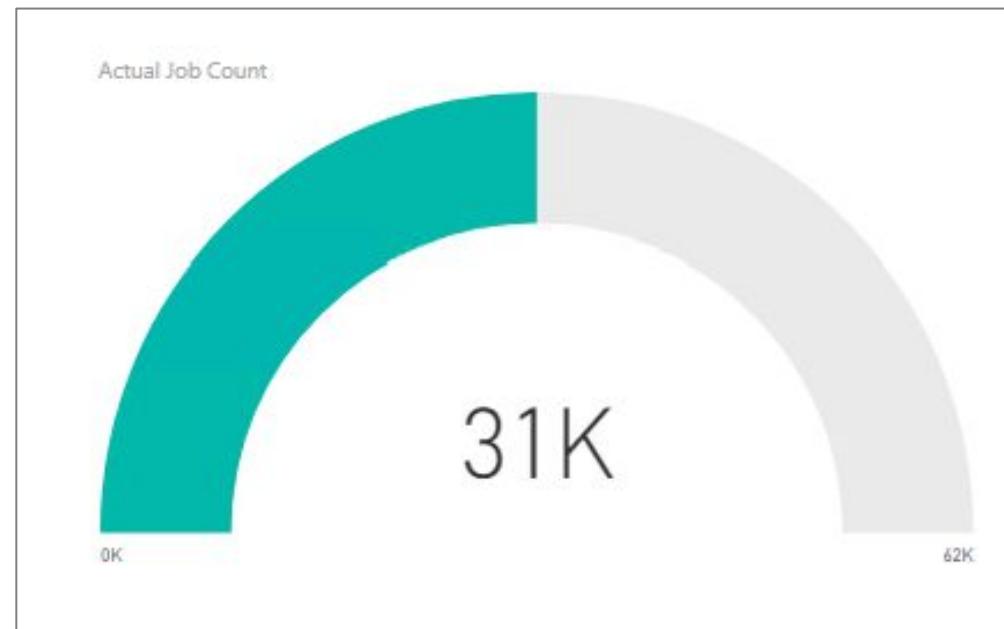
Radial gauge charts

- A **radial gauge chart** has a circular arc and displays a single value that measures progress towards a goal
- Gauges are a really good choice when you're building reports and want to show progress towards a goal like displaying actual job count



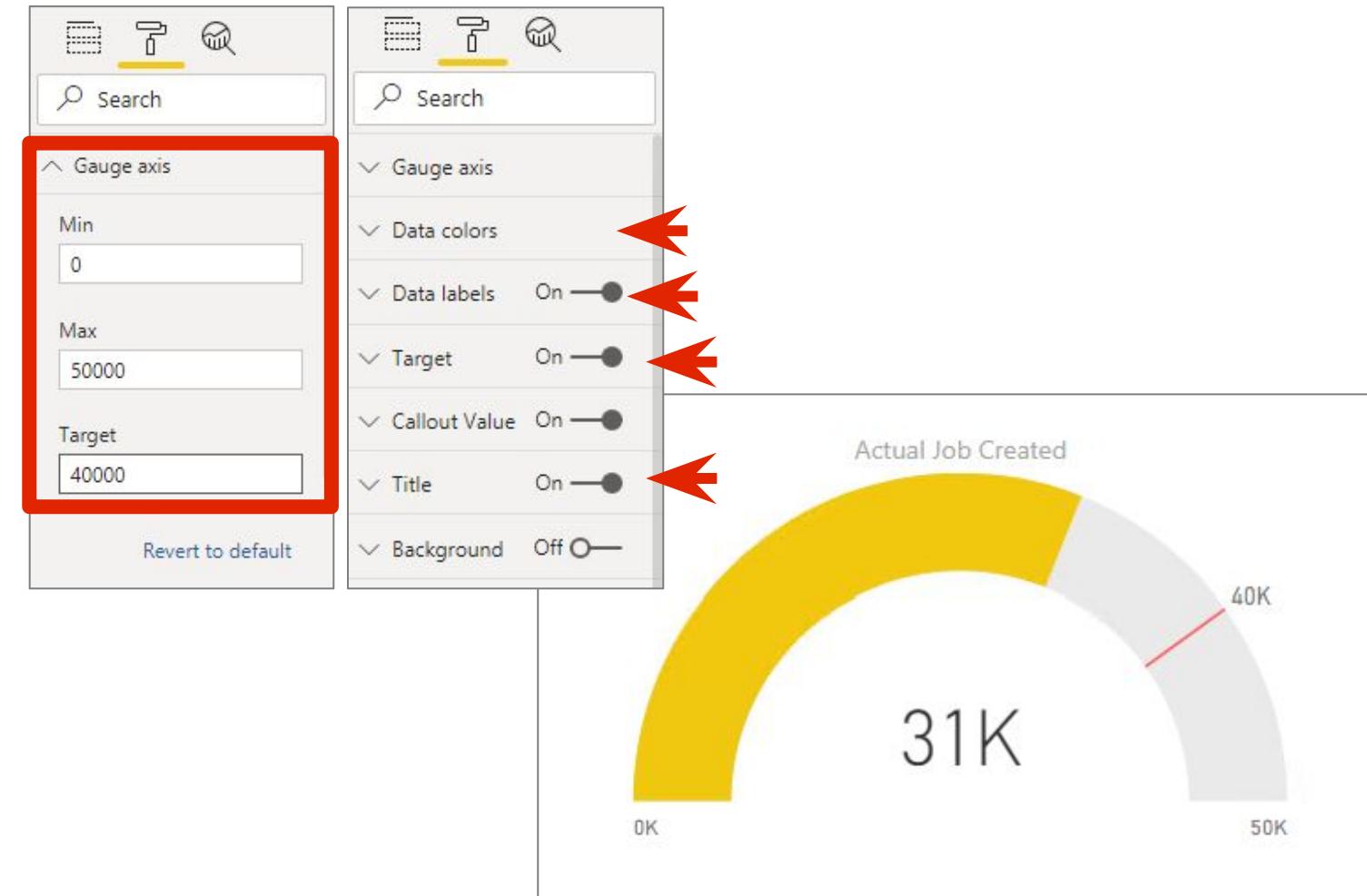
Formatting options for radial gauge

- You can add other fields to determine the maximum, minimum, and target value
- You can also use formatting options to customize these by just setting in a specific value



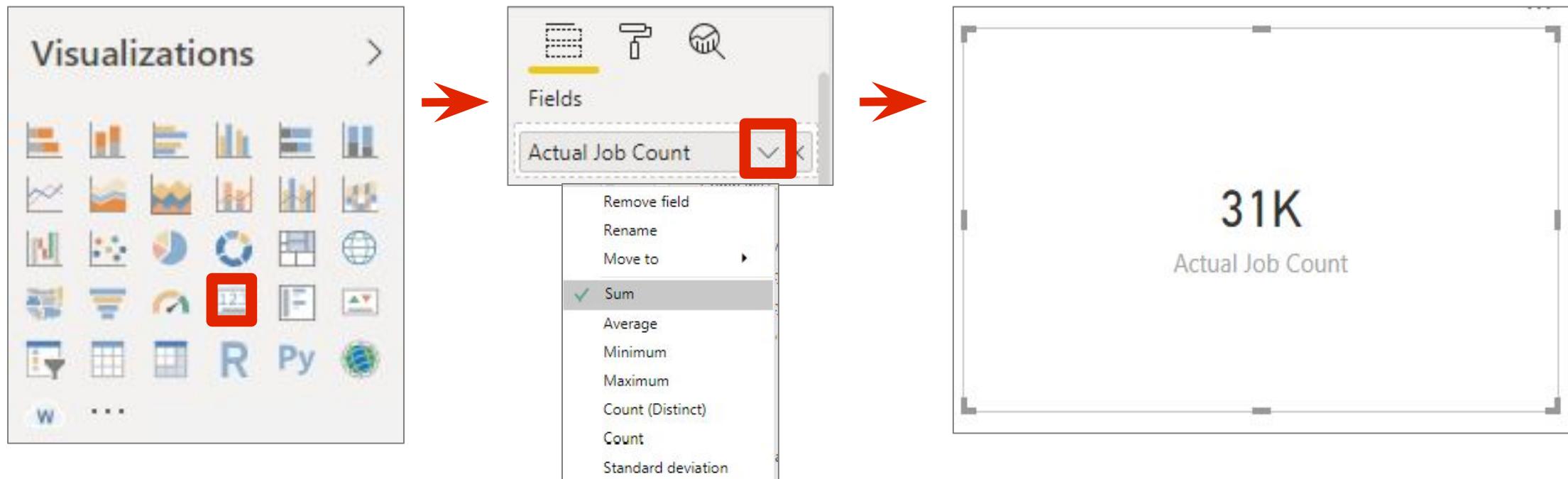
Setting your min, max and target

- Set minimum as 0
- Set maximum as 50,000
- Set target as 40,000

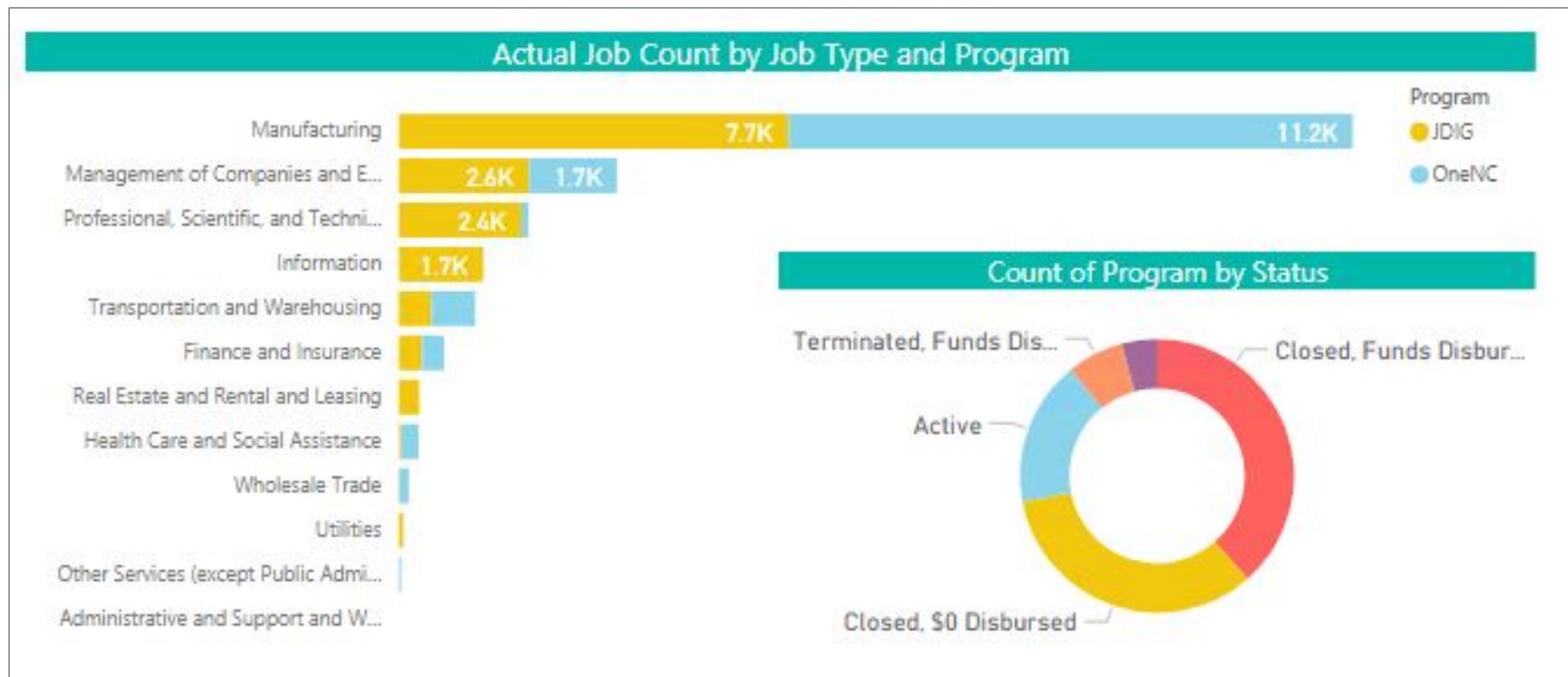


Card visualization

- A card can help you highlight a particular number or metric that you want your audience to see quickly and easily

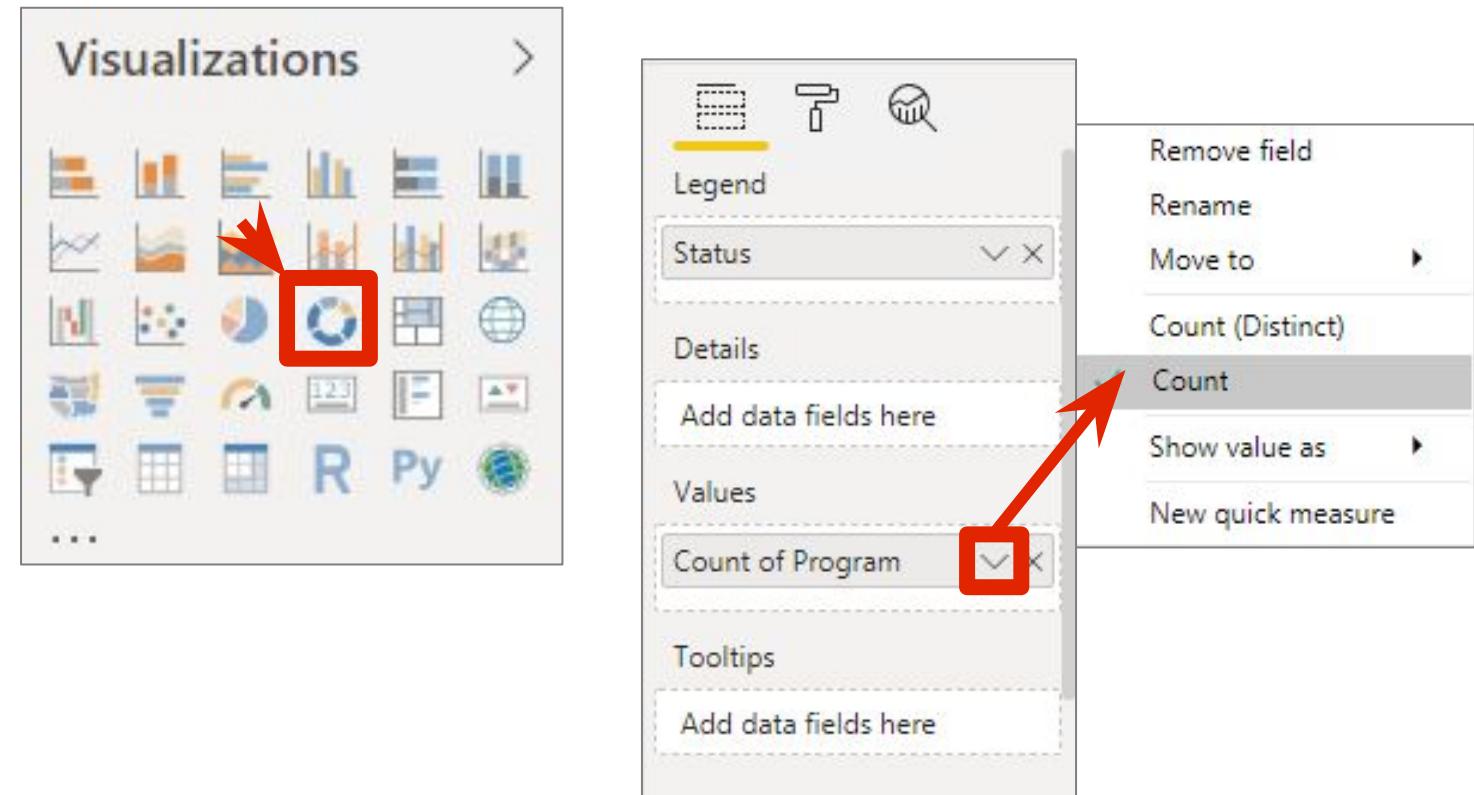


Visual overlay example

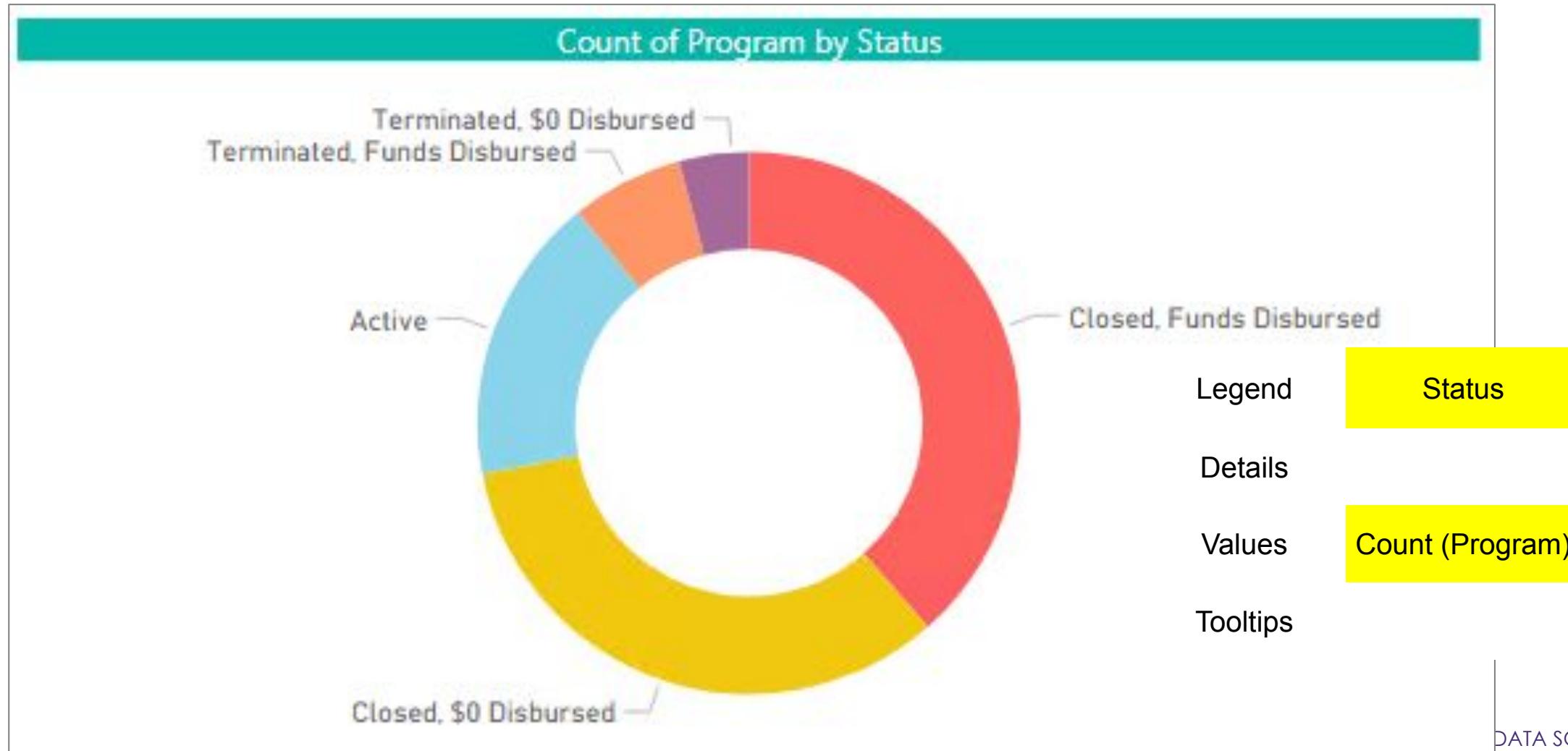


Create a doughnut chart

- A doughnut chart is like a pie chart in that it shows the relationship of parts to a whole
- The only difference is that the center is blank and allows space for a label or icon



Doughnut chart

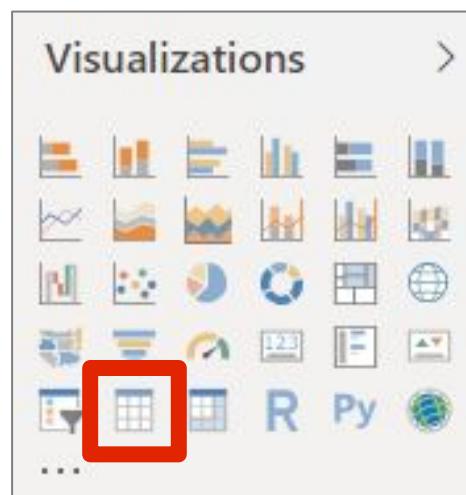


Create a detail table

- Create Another Page called 'Grant Details'



- Click on the blank area of the Canvas and then choose 'Table' Visual



The 'Values' pane is open, showing a list of fields categorized under the 'Values' tab. Fields listed include Program, Company, Award Date, Year, Quarter, Month, Day, Funding ID, Status, Actual Job Count, and Required Job Counts. Each field has a dropdown arrow and an 'X' button.

Program
Company
Award Date
Funding ID
Status
Actual Job Count
Required Job Counts

Values

Detail table

Program	Company	Year	Quarter	Month	Day	Funding ID	Status	Actual Job Count	Required Job Counts
JDIG	ABB Inc.	2010	Qtr 3	September	9	1	Terminated, Funds Disbursed	156	130
JDIG	Ally Financial Inc. (f/k/a GMAC LLC)	2009	Qtr 1	March	20	1	Active	224	180
JDIG	American Roller Bearing Company of North Carolina	2011	Qtr 4	December	8	1	Terminated, Funds Disbursed	0	208
JDIG	AptarGroup, Inc.	2011	Qtr 2	May	16	1	Active	106	135
JDIG	ASCO Power Technologies, L.P.	2009	Qtr 1	February	18	1	Terminated, Funds Disbursed	198	295
JDIG	Ashley Furniture Industries, Inc. I	2012	Qtr 2	April	20	1	Active	1229	468
JDIG	Avaya, Inc.	2011	Qtr 4	November	28	1	Terminated, \$0 Disbursed	0	135
JDIG	BAE Systems Shared Services Inc.	2010	Qtr 4	December	16	1	Active	169	158
JDIG	Bayer CropScience LP	2009	Qtr 2	May	6	1	Active	139	128
JDIG	Brunswick Corporation (Hatteras Yachts Division)	2010	Qtr 3	July	20	1	Terminated, Funds Disbursed	221	315
JDIG	Capgemini America, Inc.	2011	Qtr 1	January	13	1	Terminated, Funds Disbursed	255	495
JDIG	Caterpillar Inc. (Bee)	2012	Qtr 1	February	1	1	Terminated, Funds Disbursed	111	169
JDIG	Caterpillar Inc. (Butterfly)	2010	Qtr 3	August	5	1	Active	421	293
JDIG	Caterpillar Inc. (Camo)	2010	Qtr 3	July	30	1	Terminated, Funds Disbursed	269	353
JDIG	Celgard, LLC I	2010	Qtr 1	January	20	1	Terminated, Funds Disbursed	199	260

Format award date

- Click on the triangle icon by the 'Award Date' field under 'Values' of 'Visualization' Panel and change the 'Data Hierarchy' to 'Award Date' itself

The screenshot shows the 'Award Date' visualization panel on the left. A context menu is open over the 'Award Date' field, with the 'Date Hierarchy' option selected and highlighted with a red box. To the right of the visualization is a table of data.

Award Date
Friday, March 20, 2009
Monday, May 16, 2011
Friday, April 20, 2012
Thursday, December 16, 2010
Wednesday, May 6, 2009
Thursday, August 5, 2010
Thursday, June 3, 2010
Thursday, June 7, 2012
Thursday, June 10, 2010
Monday, July 20, 2009
Monday, September 20, 2010
Wednesday, October 26, 2011
Thursday, August 13, 2009
Wednesday, December 16, 2009
Thursday, September 24, 2009
Wednesday, March 30, 2011
Wednesday, December 19, 2012
Friday, June 15, 2012
Wednesday, June 13, 2012

Adjusting data formats

- How can we change the funding ID to a normal format?

Program	Company	Award Date	Funding ID	Status	Actual Job Count	Required Job Counts
JDIG	ABB Inc.	Thursday, September 9, 2010	1	Terminated, Funds Disbursed	156	130
JDIG	Ally Financial Inc. (f/k/a GMAC LLC)	Friday, March 20, 2009	1	Active	224	180
JDIG	American Roller Bearing Company of North Carolina	Thursday, December 8, 2011	1	Terminated, Funds Disbursed	0	208
JDIG	AptarGroup, Inc.	Monday, May 16, 2011	1	Active	106	135
JDIG	ASCO Power Technologies, LP.	Wednesday, February 18, 2009	1	Terminated, Funds Disbursed	198	295
JDIG	Ashley Furniture Industries, Inc. I	Friday, April 20, 2012	1	Active	1229	468
JDIG	Avaya, Inc.	Monday, November 28, 2011	1	Terminated, \$0 Disbursed	0	135
JDIG	BAE Systems Shared Services Inc.	Thursday, December 16, 2010	1	Active	169	158
JDIG	Bayer CropScience LP	Wednesday, May 6, 2009	1	Active	139	128
JDIG	Brunswick Corporation (Hatteras Yachts Division)	Tuesday, July 20, 2010	1	Terminated, Funds Disbursed	221	315
JDIG	Capgemini America, Inc.	Thursday, January 13, 2011	1	Terminated, Funds Disbursed	255	495
JDIG	Caterpillar Inc. (Bee)	Wednesday, February 1, 2012	1	Terminated, Funds Disbursed	111	169
JDIG	Caterpillar Inc. (Butterfly)	Thursday, August 5, 2010	1	Active	421	293
JDIG	Caterpillar Inc. (Camo)	Friday, July 30, 2010	1	Terminated, Funds Disbursed	269	353
JDIG	Cegard, LLC I	Wednesday, January 20, 2010	1	Terminated, Funds Disbursed	199	260
JDIG	Cegard, LLC II	Monday, July 25, 2011	1	Terminated, \$0 Disbursed	0	225
	Quaker Brands International, Inc.	Tuesday, November 29, 2011	1	Terminated, Funds Disbursed	281	375



Create a detail table

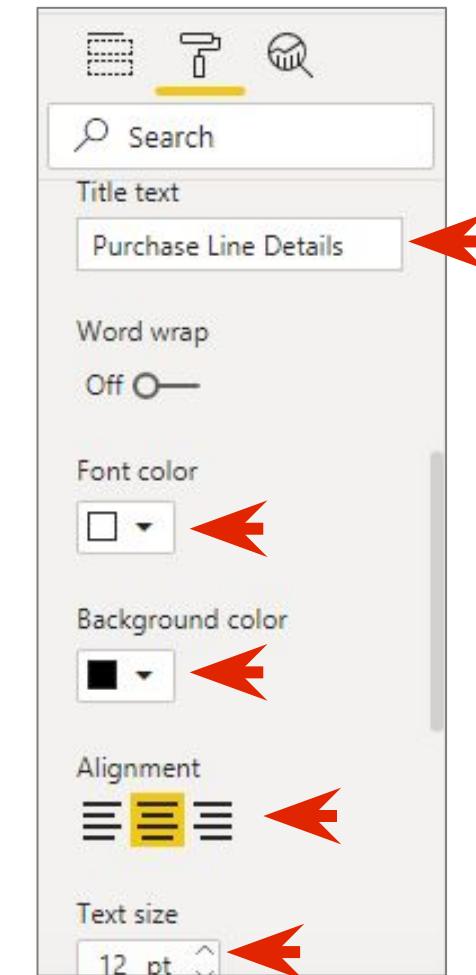
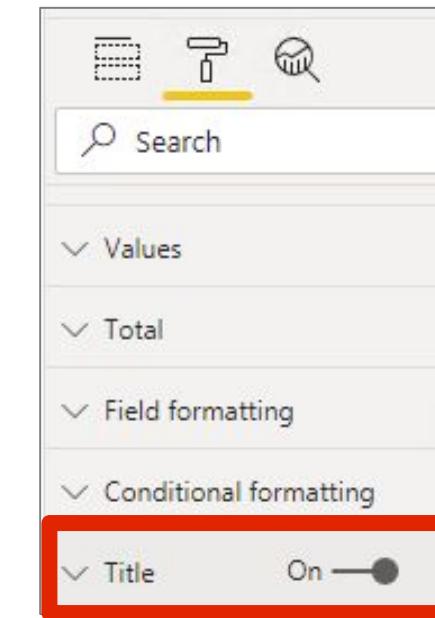
- Click on the triangle icon by the 'Funding ID' field under 'Values' of 'Visualization' Panel and change the calculation method from 'Count' to 'Don't summarize'

The screenshot illustrates the steps to create a detail table. On the left, the 'Values' panel shows fields: Program, Company, Award Date, Funding ID, Status, Actual Job Count, and Required Job Counts. The 'Funding ID' field has a triangle icon indicating it can be expanded. A red square highlights this icon. On the right, a context menu is open for the 'Funding ID' field, listing options like Remove field, Rename, Move, Conditional formatting, Remove conditional formatting, and several aggregation methods. The 'Count' option is checked with a green checkmark. The 'Don't summarize' option is highlighted with a red rectangle and a red arrow points to it from the left. To the far right, a table displays a list of Funding IDs.

Funding ID
146
355
437
306
157
263
247
446
248
173
277
390
174
203
181
335

Add a table title

- Go to Format Tab and turn 'Title' on
 - Put 'Purchase Line Details' in Title Text
 - Make the font color into white, background color into black
 - Alignment to be center
 - And text size to be '12'



Conditional formatting

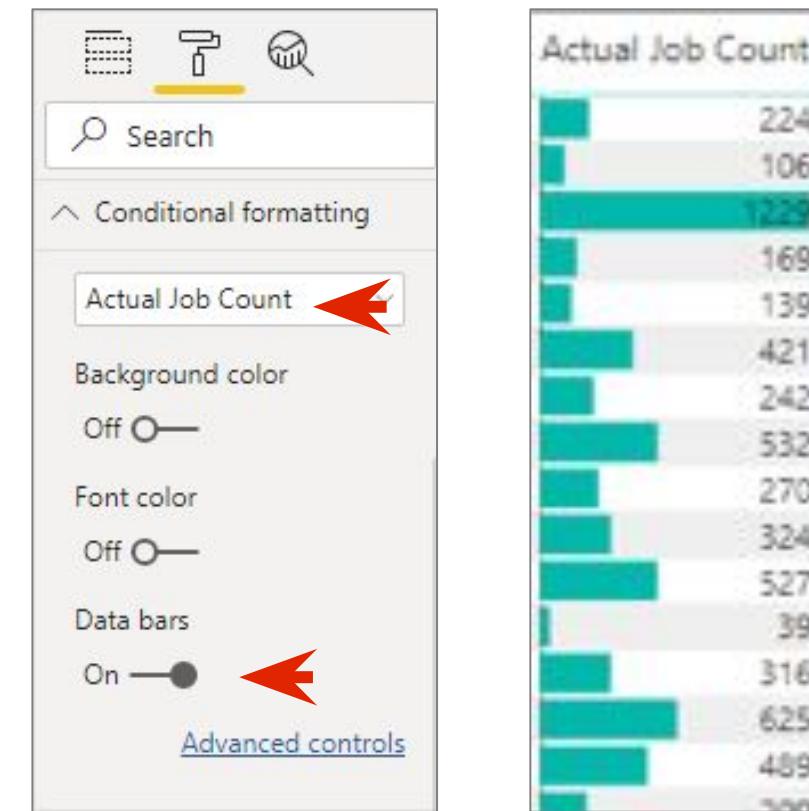
- Can we apply conditional formatting on 'Actual Job Count' column?

Purchase Line Details						
Program	Company	Award Date	Funding ID	Status	Actual Job Count	Required Job Counts
JDIG	Ally Financial Inc. (f/k/a GMAC LLC)	Friday, March 20, 2009	146	Active	224	180
JDIG	AptarGroup, Inc.	Monday, May 16, 2011	355	Active	106	135
JDIG	Ashley Furniture Industries, Inc. I	Friday, April 20, 2012	437	Active	1229	468
JDIG	BAE Systems Shared Services Inc.	Thursday, December 16, 2010	306	Active	169	158
JDIG	Bayer CropScience LP	Wednesday, May 6, 2009	157	Active	139	128
JDIG	Caterpillar Inc. (Butterfly)	Thursday, August 5, 2010	263	Active	421	293
JDIG	Citco Fund Services (USA) Inc.	Thursday, June 3, 2010	247	Active	242	232
JDIG	Citrix Systems, Inc.	Thursday, June 7, 2012	446	Active	532	286
JDIG	Clearwater Paper Corporation I	Thursday, June 10, 2010	248	Active	270	225
JDIG	Continental Automotive Systems, Inc. (Henderson)	Monday, July 20, 2009	173	Active	324	304
JDIG	Cree, Inc. II	Monday, September 20, 2010	277	Active	527	220
JDIG	Packaging USA, Inc.	Wednesday, October 26, 2011	390	Active	39	118
JDIG	Global Technology, Inc. I	Thursday, August 13, 2009	174	Active	316	287
JDIG	Microtex Home Products, Inc. I	Wednesday, December 16, 2009	203	Active	625	590
JDIG	ACI Corporation	Thursday, September 24, 2009	181	Active	489	357
JDIG	QA Management, LLC	Wednesday, March 30, 2011	335	Active	209	153



Conditional formatting for ‘Actual Job Count’

- In the ‘Format’ tab, you can also see the ‘Conditional Formatting’ option showed up
- In the column drop down list, choose ‘Actual Job Count’
- Turn on the Data Bars



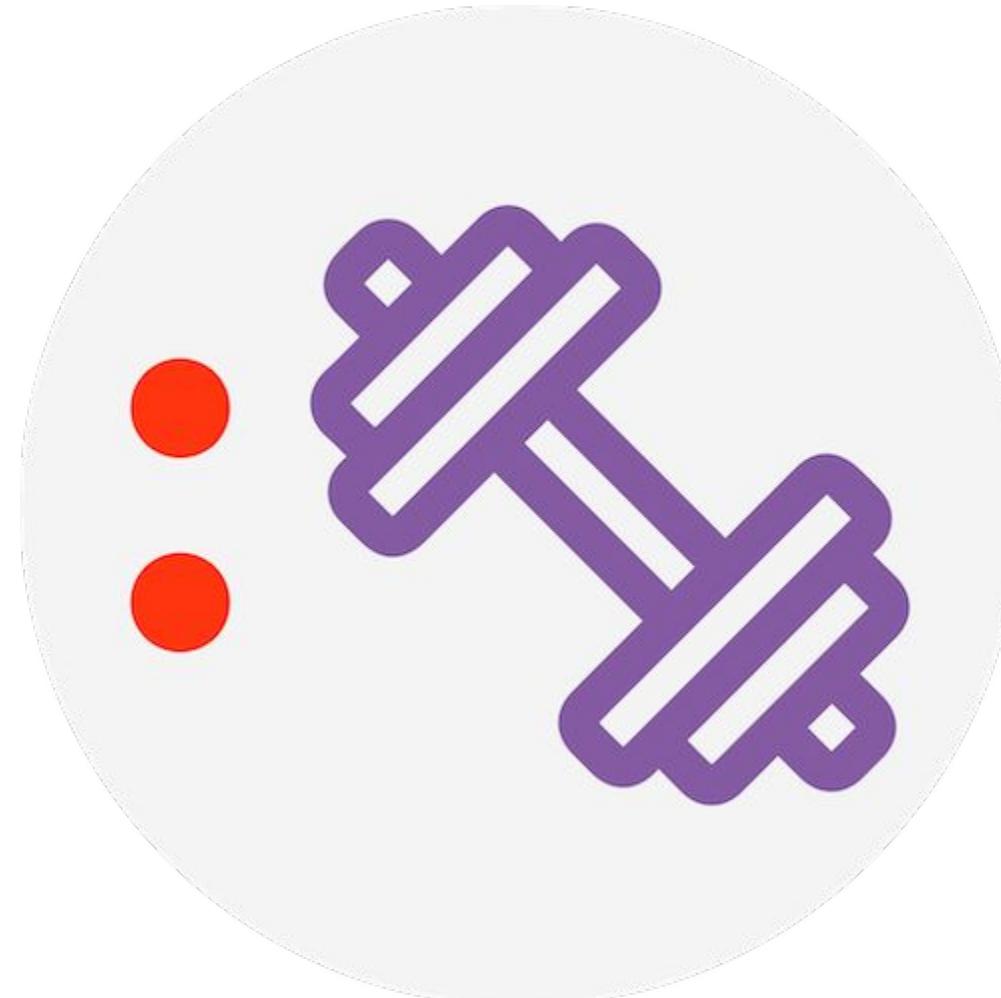
Formatted ‘Actual Job Count’

Purchase Line Details						
Program	Company	Award Date	Funding ID	Status	Actual Job Count	Required Job Counts
JDIG	Ally Financial Inc. (f/k/a GMAC LLC)	Friday, March 20, 2009	146	Active	224	180
JDIG	AptarGroup, Inc.	Monday, May 16, 2011	355	Active	106	135
JDIG	Ashley Furniture Industries, Inc. I	Friday, April 20, 2012	437	Active	1229	468
JDIG	BAE Systems Shared Services Inc.	Thursday, December 16, 2010	306	Active	169	158
JDIG	Bayer CropScience LP	Wednesday, May 6, 2009	157	Active	139	128
JDIG	Caterpillar Inc. (Butterfly)	Thursday, August 5, 2010	263	Active	421	293
JDIG	Citco Fund Services (USA) Inc.	Thursday, June 3, 2010	247	Active	242	232
JDIG	Citrix Systems, Inc.	Thursday, June 7, 2012	446	Active	532	286
JDIG	Clearwater Paper Corporation I	Thursday, June 10, 2010	248	Active	270	225
JDIG	Continental Automotive Systems, Inc. (Henderson)	Monday, July 20, 2009	173	Active	324	304
JDIG	Cree, Inc. II	Monday, September 20, 2010	277	Active	527	220
JDIG	CTL Packaging USA, Inc.	Wednesday, October 26, 2011	390	Active	39	118
JDIG	DB Global Technology, Inc. I	Thursday, August 13, 2009	174	Active	316	287
JDIG	Electrolux Home Products, Inc. I	Wednesday, December 16, 2009	203	Active	625	590
JDIG	EMC Corporation	Thursday, September 24, 2009	181	Active	489	357
JDIG	ESA Management, LLC	Wednesday, March 30, 2011	335	Active	209	153
JDIG	Gildan Yarns, LLC I	Wednesday, December 19, 2012	495	Active	165	153
JDIG	GKN Driveline North America, Inc. I (Roxboro)	Friday, June 15, 2012	452	Active	231	124
JDIG	Hamilton Sundstrand Corporation	Wednesday, June 13, 2012	447	Active	274	293
JDIG	Herbalife International of America, Inc. I	Wednesday, December 19, 2012	496	Active	493	444
JDIG	Hewitt Associates L.L.C. (d/b/a Aon Hewitt)	Wednesday, March 31, 2010	229	Active	431	417
JDIG	Husqvarna Professional Products, Inc.	Thursday, January 7, 2010	209	Active	169	144
JDIG	Inmar, Inc.	Thursday, April 26, 2012	440	Active	114	191
JDIG	Innovative Emergency Management, Inc.	Monday, December 14, 2009	200	Active	42	387
JDIG	JELD-WEN, inc. I	Thursday, December 13, 2012	493	Active	154	135
JDIG	Klausner Lumber Two LLC	Wednesday, December 19, 2012	497	Active	43	315
JDIG	Leviton Manufacturing Co., Inc.	Monday, September 10, 2012	471	Active	205	137
JDIG	Linamar North Carolina, Inc. I	Thursday, June 30, 2011	364	Active	189	327
JDIG	Linamar North Carolina, Inc. II	Thursday, June 21, 2012	456	Active	0	225
Total					31054	46225

Knowledge Check 1



Lab 2



Save Lab 2

- Save your report by choose 'File' -> 'Save as' to a new file 'Lab 2'
- In the next session, we will continue building on the Lab 2 report

Power BI Outline for today

- 1. Building a BI report with formatting techniques
- 2. Building a complex BI report with interactive visualizations
- 3. ETL layer: load data through Power Query
- 4. Implement data storytelling frameworks and techniques

Objectives for Lab 2: Continued

- Understanding and utilizing filters to analyze your data
- Learn how to create custom and interactive visuals
- Master visual alignment for your report layout

What is a filter?

- The Power BI Report layer allows for the use of filters. Filter are used to filter the charts present in all pages of your report. This is a very helpful tool to narrow down your research interest to analyze a segment of your data
- In this section, we will learn about four types of filters:
 - 1. Visual Level Filters
 - 2. Page Level Filter
 - 3. Report Level Filter
 - 4. Drill through filter

Different types of filters

- **Visual Level:** filter a specific visual
- **Page Level:** filter an entire page (this is a type of filter which affects the entire visuals in one page)
- **Report Level:** filter an entire report (This is a type of filter which affects the entire visuals in all pages in one report)
- **Drill Through:** create a destination report page that focuses on a specific entity

Recap: North Carolina (NC) grant data

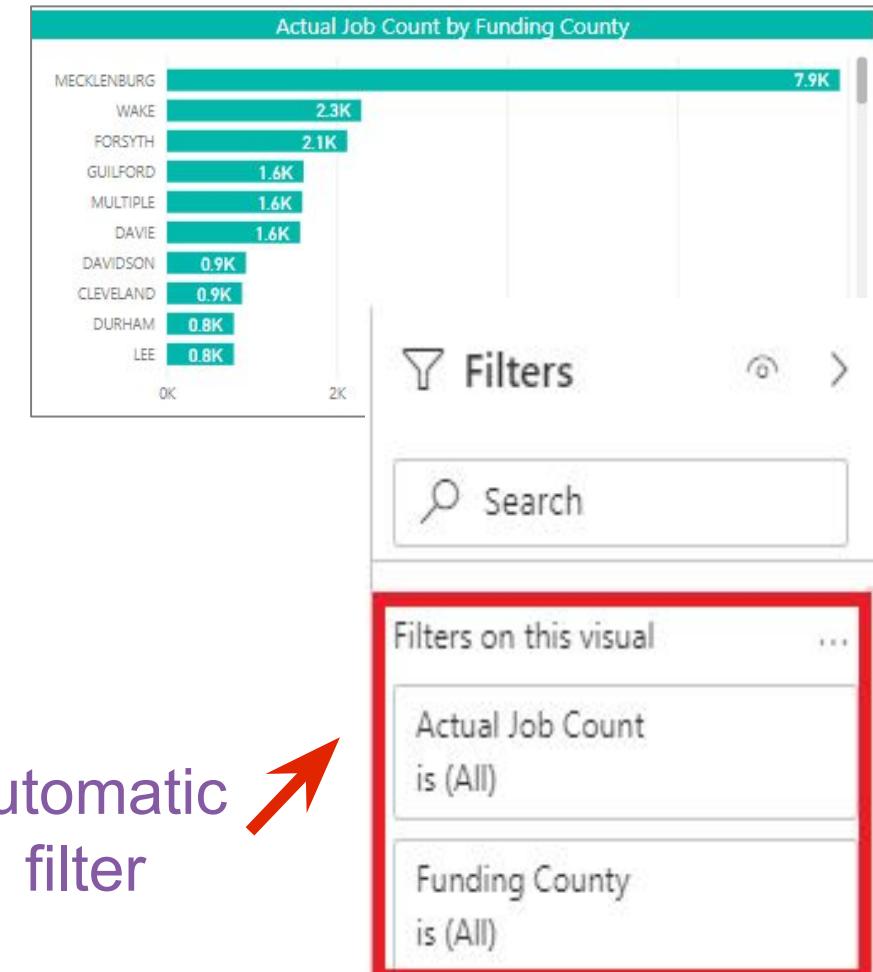
The NC state government gave \$400,000,000 in grant money from 2009 to 2013. The grant manager from the NC office of grants is interested to know how many jobs were created in each funded county from 2009 to 2013. With this information, the grants manager will be able to see where the grant money made the most impact

The grant manager wants to see a Power BI report of the following:

- **Distinct Count of Company** by Funding County (bar chart)
- **Funding County** by the count of Company, sorted
- **Award Date** as the slicer to select the needed time period

Using Visual Filter

- **Visual level** filters are the most powerful filters in Power BI, exclusive of custom filter options that can be specified
- Click on the '**Actual Job Count**' by '**Funding County**' bar chart we have created in lab 1
- Then go to '**Filters**' Panel and find '**Filters on this visual**' section
- You can see visual level filters have all the fields in the Bar chart and you can change filter setting to them or add new filters from the data model



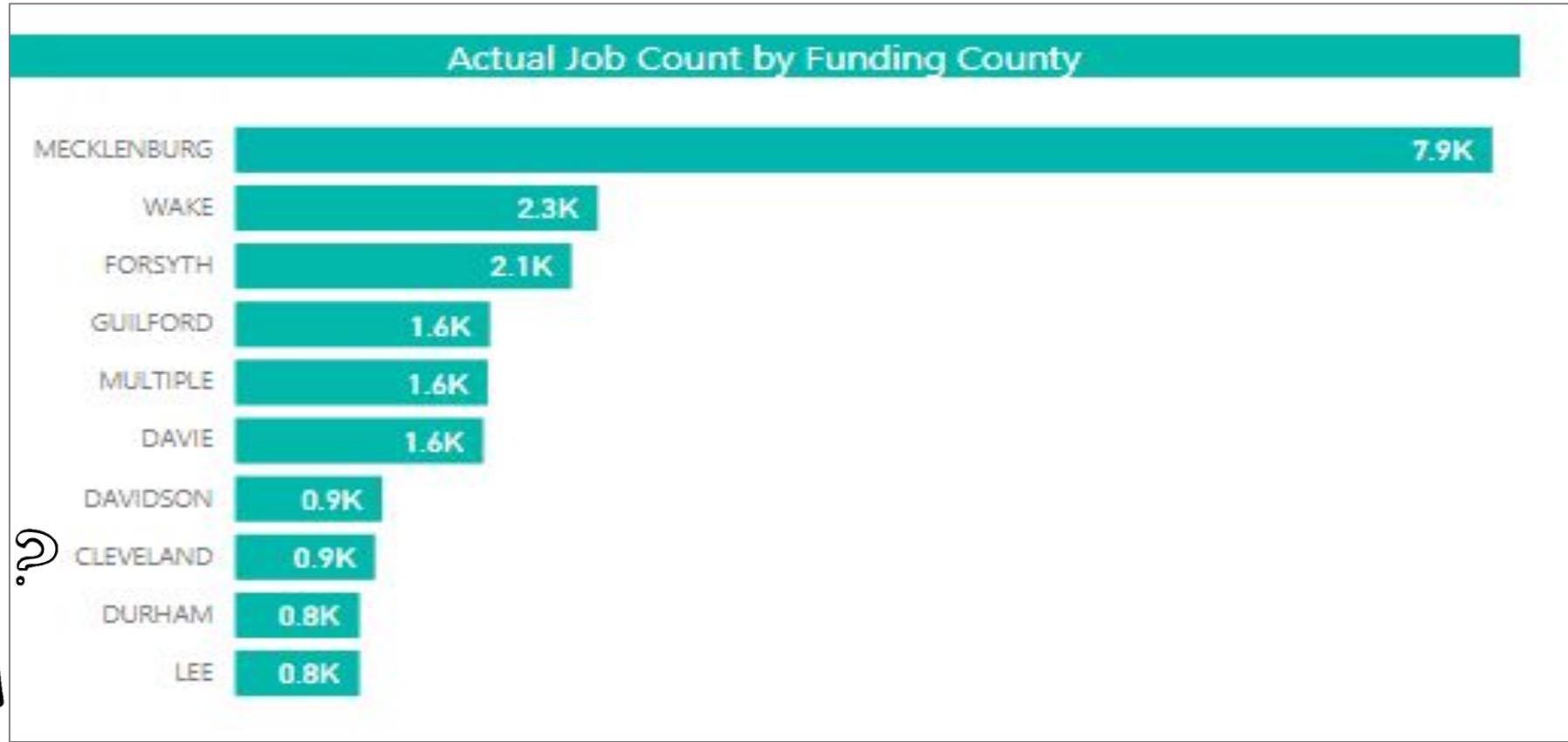
Applying the filter

- Click on the downward facing arrow on the right of 'Funding County' in the Visual Level filters section, Choose 'Top N' under Filter Type
- Then put 10 after 'Show Items:' Top
- Drag 'Actual Job Count' from Fields Panel to 'Under By value' section
- Don't forget to click on 'Apply filter'

The screenshot shows the 'Filters on this visual' pane and the 'Filter type' dropdown. In the 'Filters on this visual' pane, 'Actual Job Count' is set to 'is (All)' and 'Funding County' is set to 'is (All)'. The 'Funding County' field has a downward arrow icon highlighted with a red box. In the 'Filter type' dropdown, 'Top N' is selected. Below it, 'Show items:' is set to 'Top' with a value of 10. The 'By value' section shows 'Actual Job Count' selected with a green checkmark and 'Sum' checked. The 'Legend' panel on the right lists various aggregation functions: Sum (checked), Average, Minimum, Maximum, Count (Distinct), Count, Standard deviation, Variance, and Median.

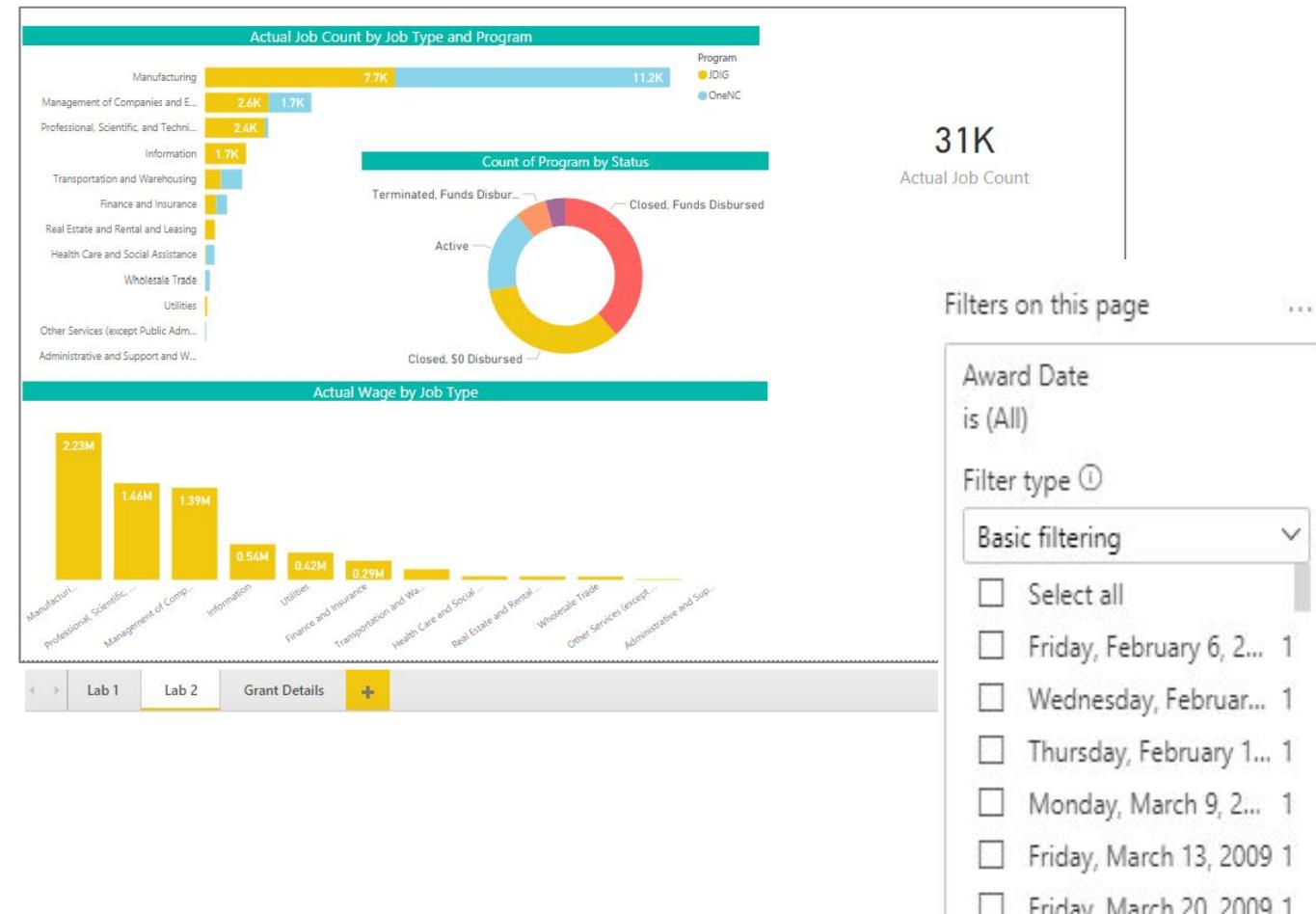
Investigate the data

- Which top 10 counties created the most jobs?



Using a Page Level filter

- Click on the Lab 2 Page we created in the last session
- Then, go to 'Filters' Panel and find 'Filters on this page' section
- Drag 'Award Date' in the 'Filters on this page'



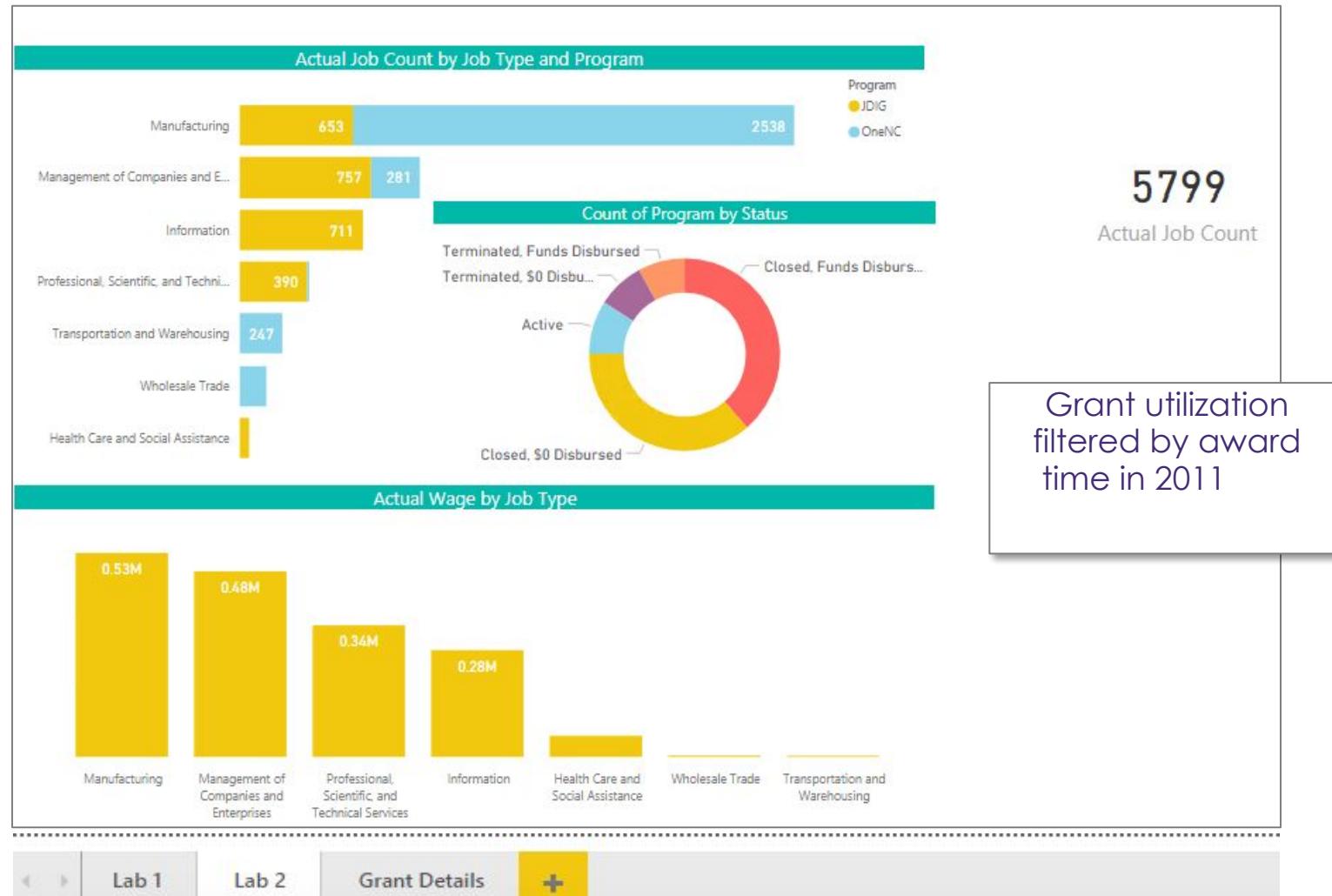
Filter by 'Award Date'

- Choose 'Advanced filtering' under Filter Type
- Put Show items when the value:
Is on or before 12/31/2011
And
Is on or after 1/1/2011

The screenshot illustrates the process of applying advanced filtering in Power BI. It shows three main components:

- Filters on this page**: A list of filters applied to the current page, including an "Award Date" filter set to "is (All)".
- Award Date Filter Context**: A detailed view of the "Award Date" filter. It shows the current filter type is "Basic filtering". A red box highlights the "Advanced filtering" option, which is selected and highlighted in blue.
- Global Filter Settings**: A large panel for setting filters across the entire report. It includes:
 - Filter type**: Set to "Advanced filtering".
 - Show items when the value:** Two conditions are defined:
 - is on or before**: Set to 12/31/2011 at 12:00 AM.
 - is on or after**: Set to 1/1/2011 at 12:00 AM.
 - And** radio button is selected.
 - Apply filter** button at the bottom right.

Filtered by 'Award Date'

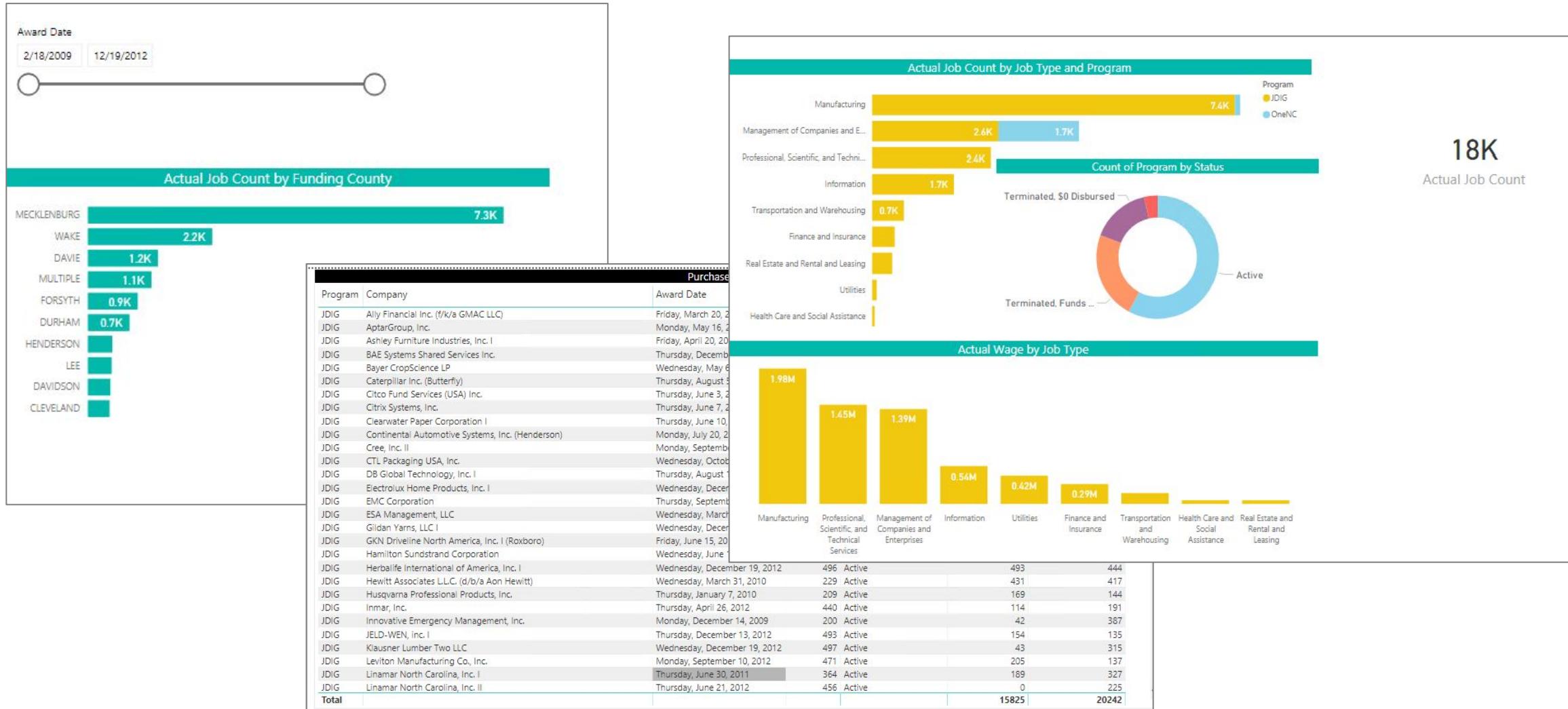


Using a Report Level filter

- Click on the Lab 2 Page
- Then go to 'Filter' panel and find 'Filter on all pages' section
- Drag 'Total Award' in the 'Filter on all pages'
- Now we can filter for items that are greater than \$1,000,000

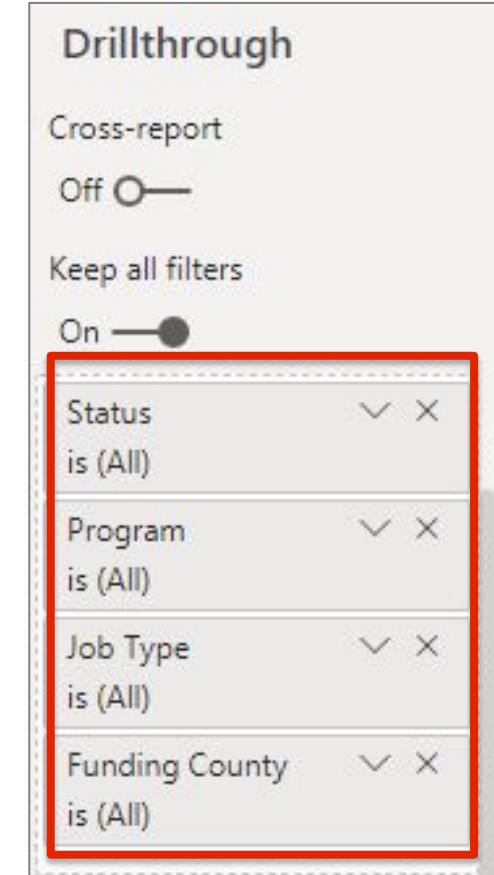
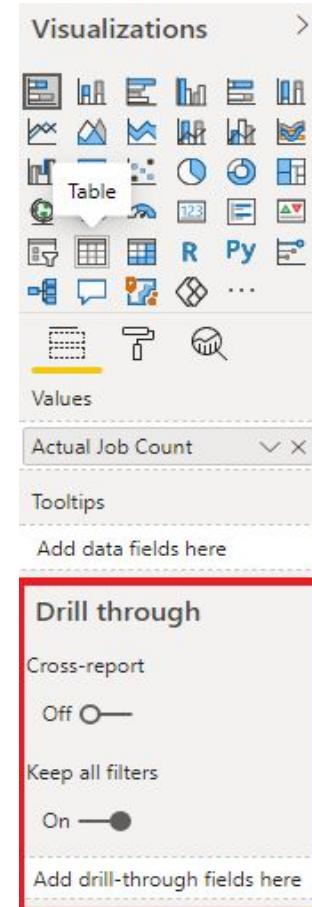
The screenshot shows the 'Report level filters' pane. At the top, it says 'Report level filters'. Below that, there's a section for 'Total Award' with the condition 'is greater than 1000000'. A dropdown menu 'Filter type' is open, showing 'Advanced filtering'. In the 'Advanced filtering' section, there's a red box around the 'Show items when the value:' section. This section contains a dropdown 'is greater than' set to '\$1,000,000' and radio buttons for 'And' and 'Or'. At the bottom right is a button 'Apply filter'.

Filtered by 'Total Award Amount'



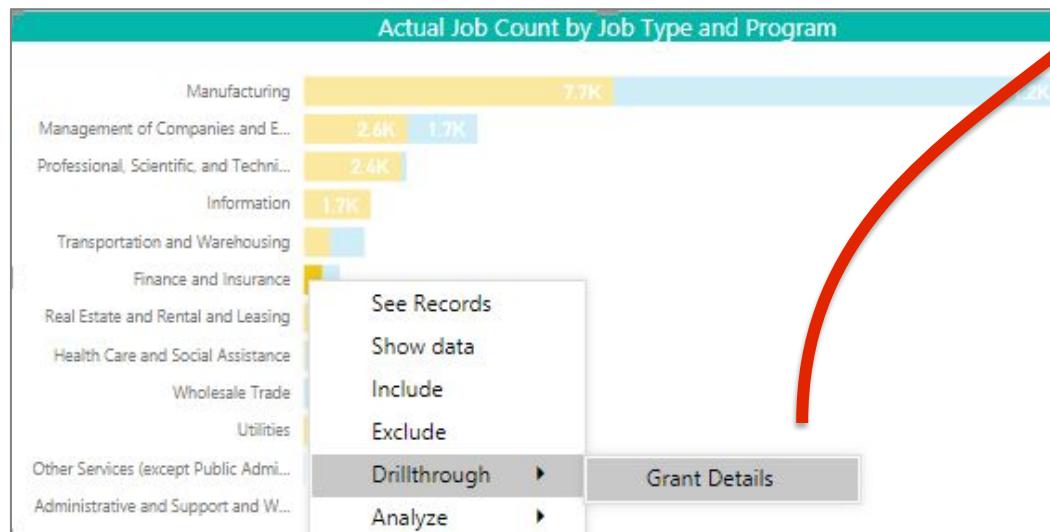
Using the Drillthrough filter

- Add Drillthrough filters to 'Grant Details' table Visual in the 'Grant Details' page
- Drillthrough filter is under the the 'Visualization' panel. You can drag fields to this section just like other type of filter
- Drag 'Status', 'Program', 'Job Type' and 'Funding Count' under the DRILLTHROUGH filter section of the 'Grant Details' Table. So that the same fields in the 'Main Page' can control filtering the detail table



Diving into data with Drillthrough

- Click on the 'Actual Job Count by Job Type and Program' bar chart
- When you right click, you can see the 'Drillthrough' capability



Drillthrough

Cross-report

Off

Keep all filters

On

Funding County

is (All)

Job Type

is Finance and Insuran...

Program

is JDIG

Status

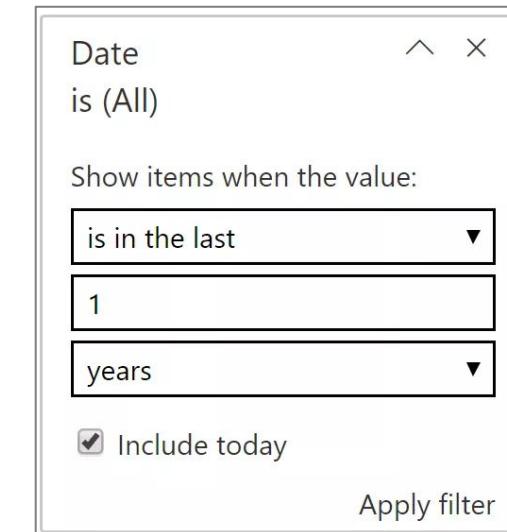
is (All)

Reintroducing the slicer

- Power BI slicer allows users to narrow the portion of the dataset shown in the other visualizations in a report
- Slicer = the visualization of a filter
- Reasons to use a slicer:
 - Makes it easier to see the current filtered state
 - Filters by columns that are unneeded and hidden in the data tables
 - Creates more focused reports

Facts to remember about slicers

- By default, slicers on pages affect all the other visualizations on that page
- As you choose values in the list and date sliders you just created, note the effects on the other visualizations. The filtered data is an intersection of the values selected in both slicers
- You can use **visual interactions** to exclude some page visualizations from being affected by others



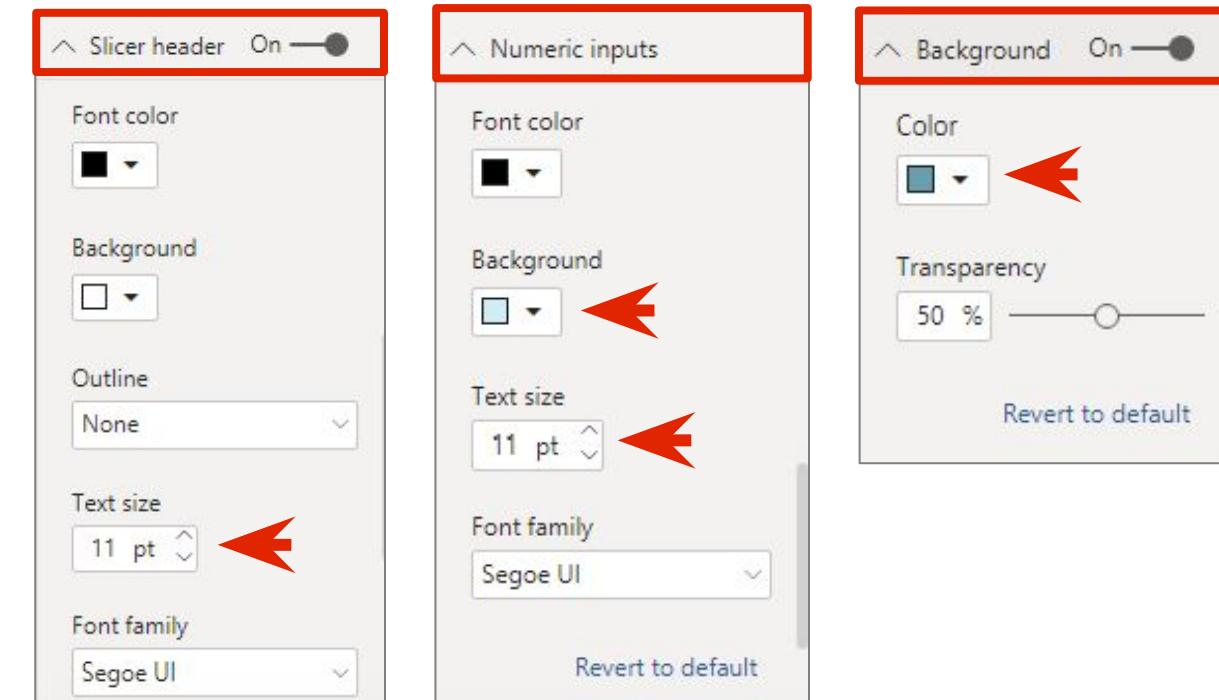
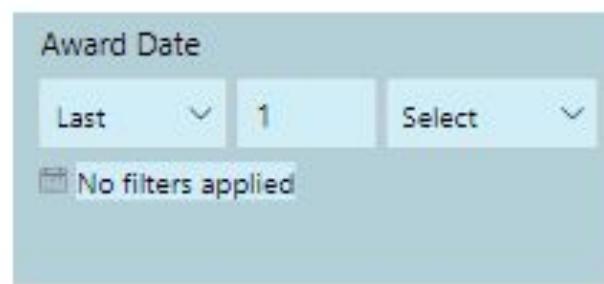
Using slicers

- Copy paste the date slicer we created in Lab 1 to Lab 2
- You can see a downward facing arrow on the top right corner of the slicer visual. Click on it
- You can then change the date slicer type to 'Relative' data range



Formatting the visual with Slicer

- Format the visual by changing the background setting under format tab of the visualization panel
- In the 'Format' tab, change Slicer header/ numeric inputs/ background



Knowledge Check 2



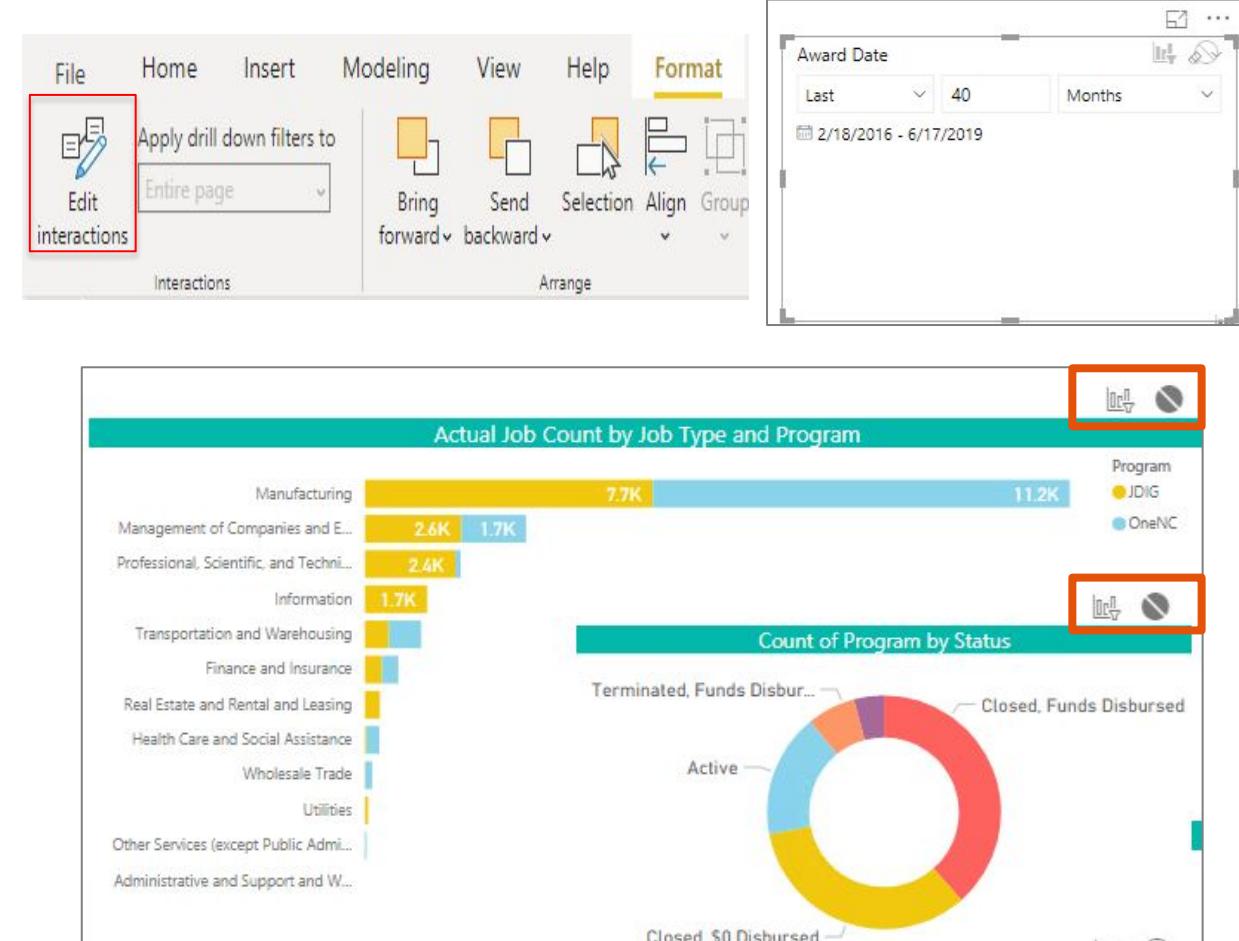
Objectives for Lab 2: Continued

- Understanding and utilizing filters to analyze your data
- Learn how to create custom and interactive visuals
- Master visual alignment for your report layout

Using interactive visuals

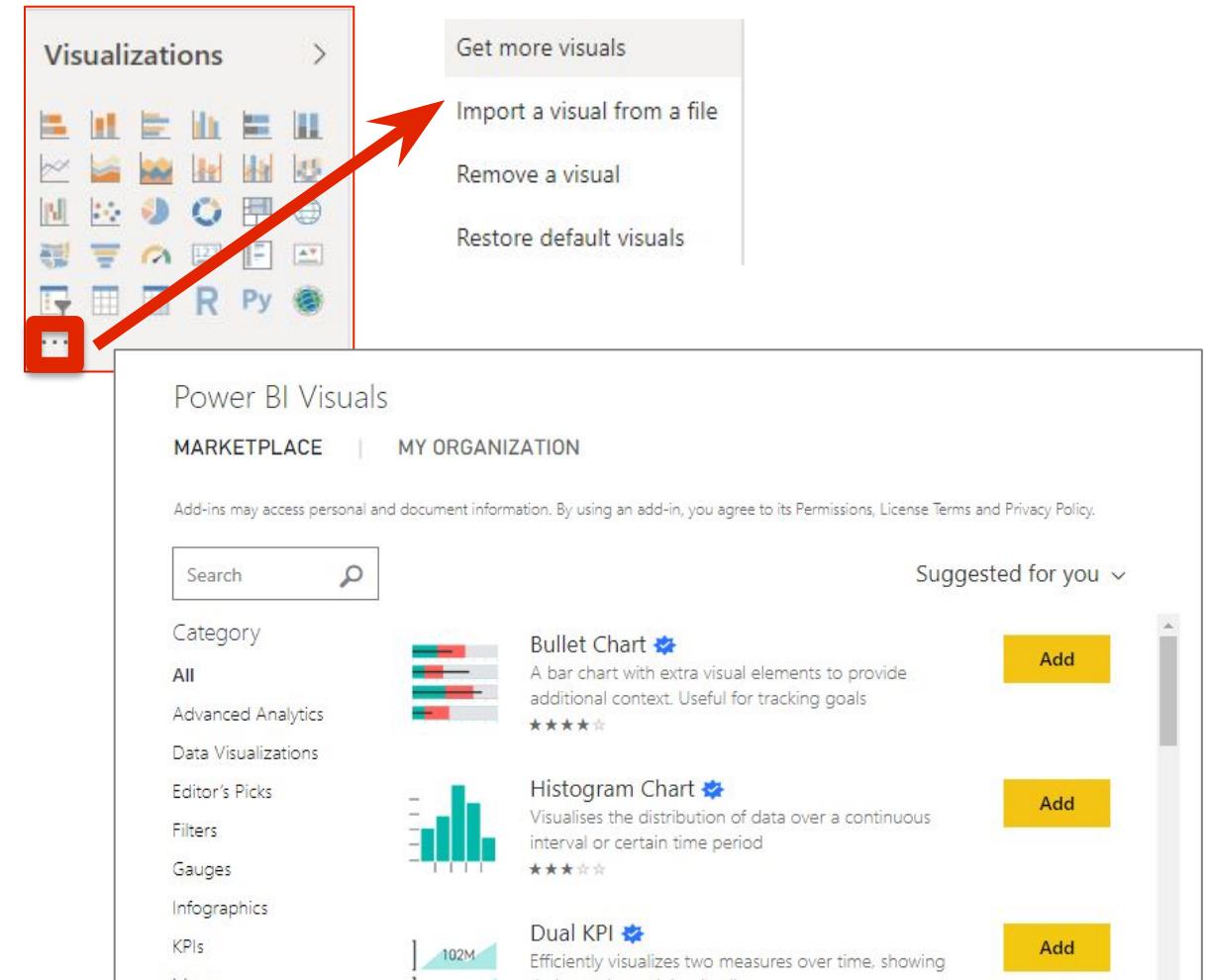
Interactive visuals give your audience an opportunity to explore and dig into your data

- You can turn interactive filtering on and off between visuals by enabling 'Edit Interactions' under Filter Tools
- If it should cross-filter the visualization, select the filter icon
- If it should have no impact, select the no impact icon no impact icon



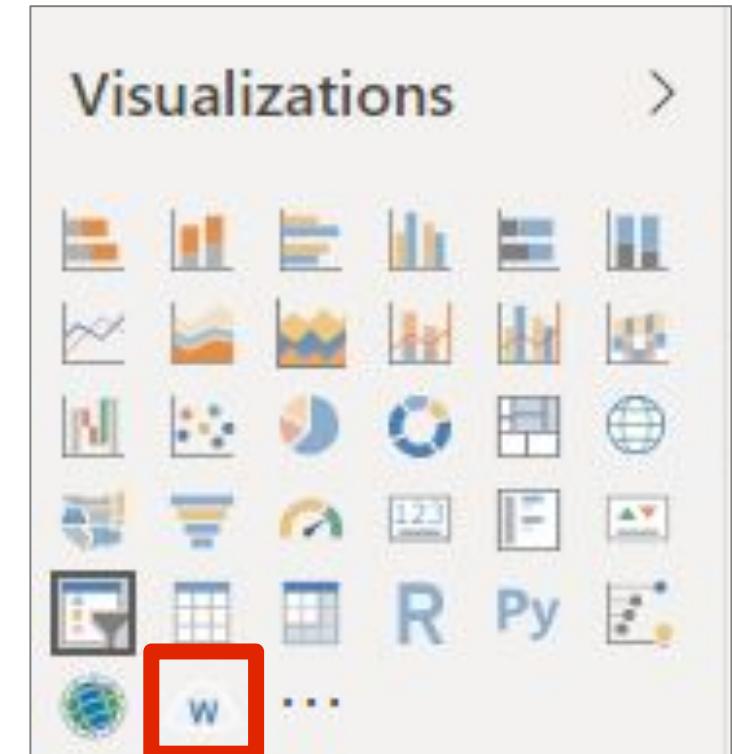
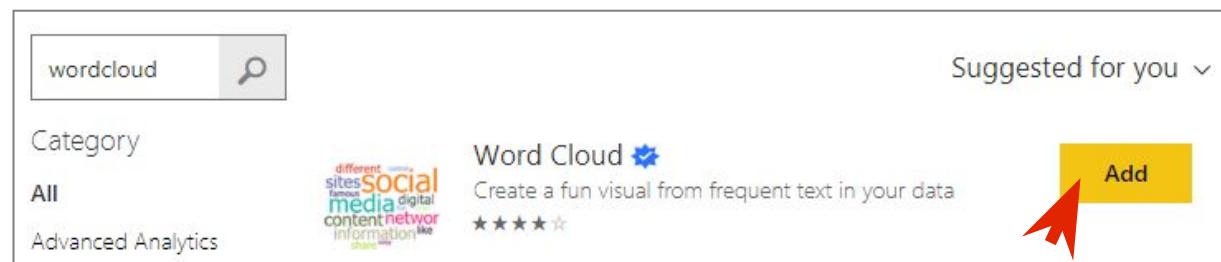
Add new visuals from marketplace

- You can add new visualizations by selecting the '...' from **Visualizations** panel.
- Select '**Get more visuals**'
- Many of the visualizations from the Marketplace are free!



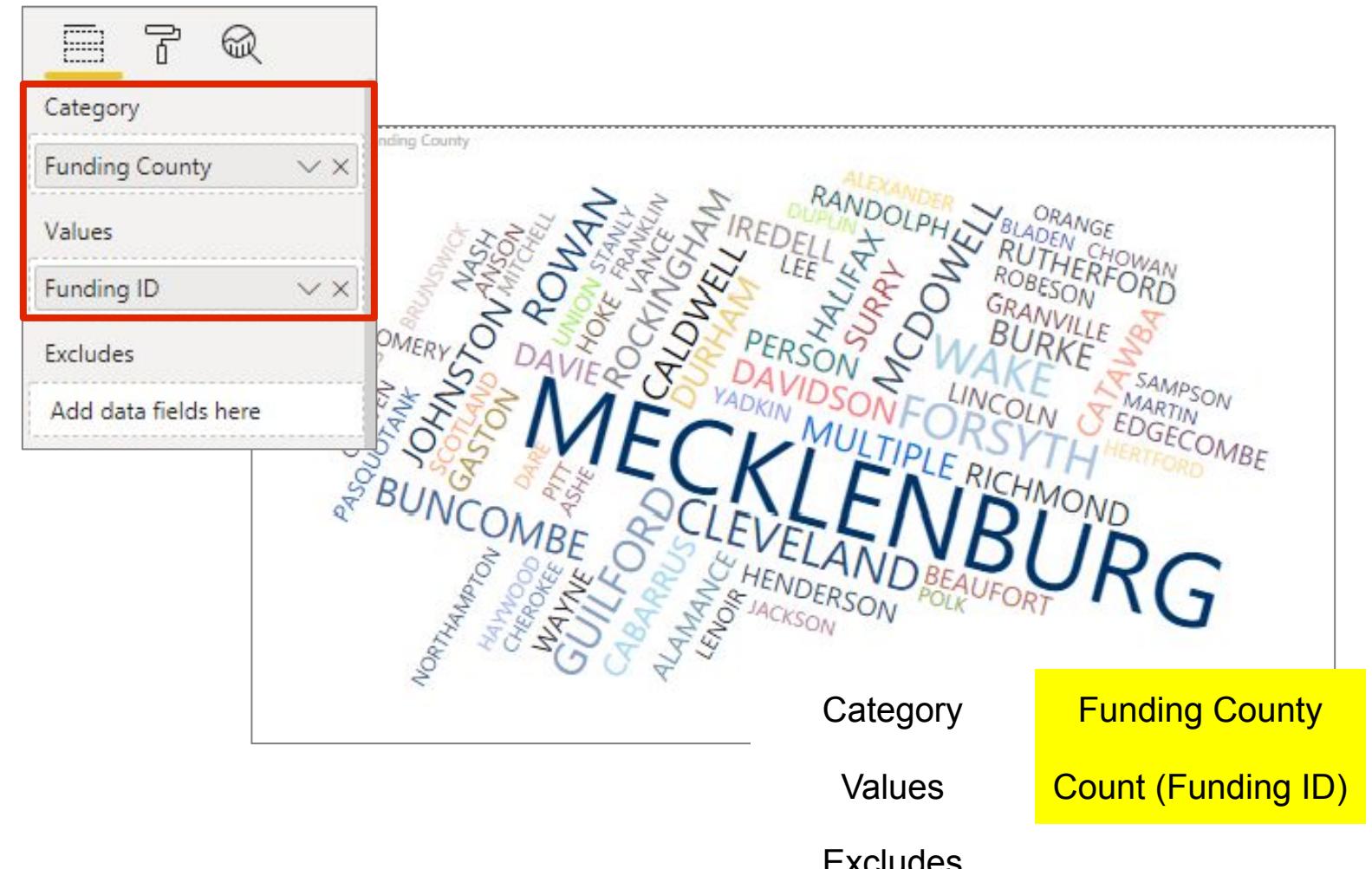
Import new visual

- Let's import 'Word Cloud' visual by clicking on 'Add' button



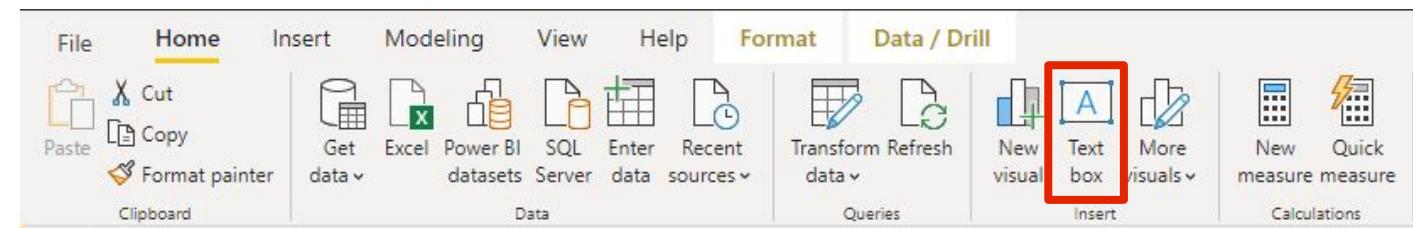
Add new visual to your report

- Create a new visual by choosing this newly added ‘Word Cloud’ visual
 - Put ‘Funding County’ to the category field
 - Put Count(Funding ID) to the value field

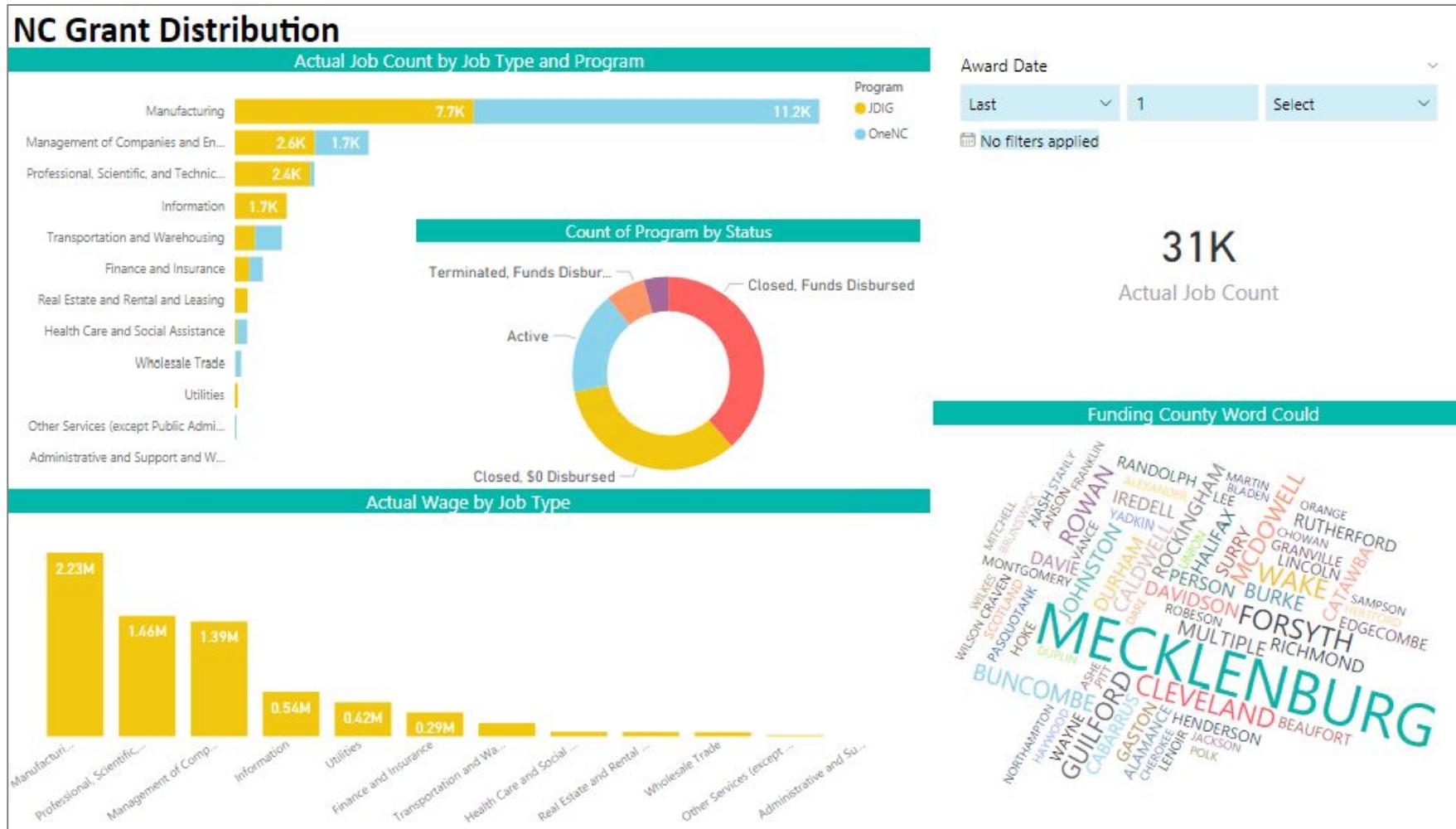


Add page title

- By clicking on the 'Home' table on the top tool bar and you can find 'Text box'. Select it to insert a 'Text box' as your title
- Drag the text box to the top left of the main canvas, and type in your title

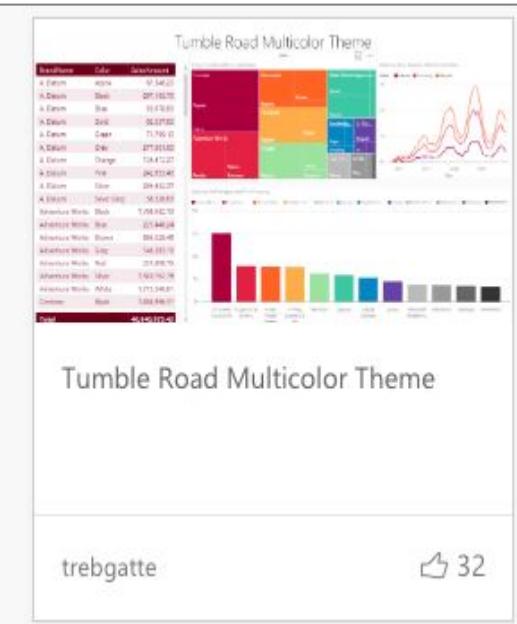
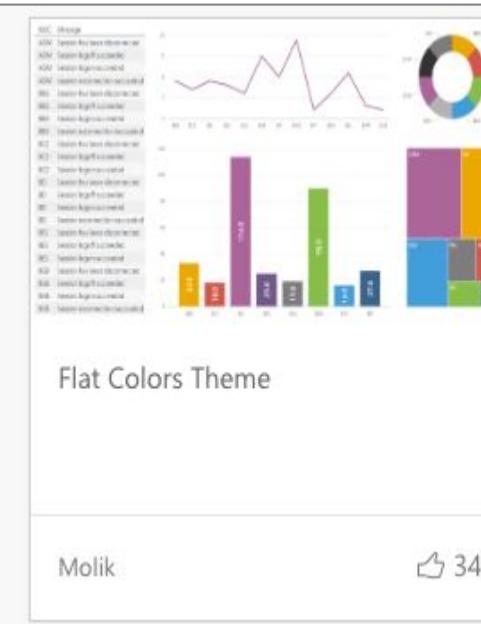
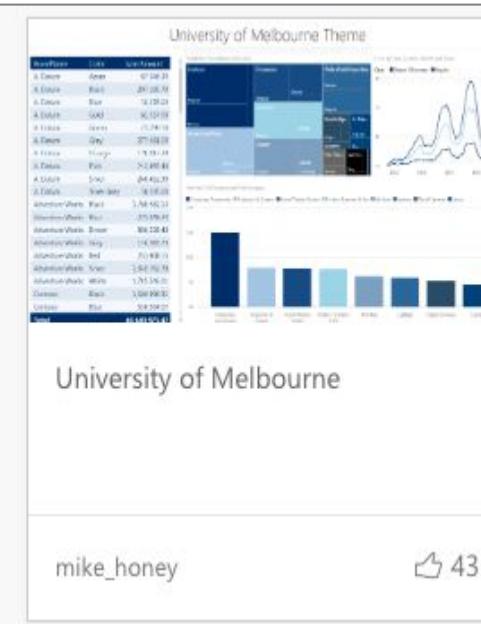


Almost done!



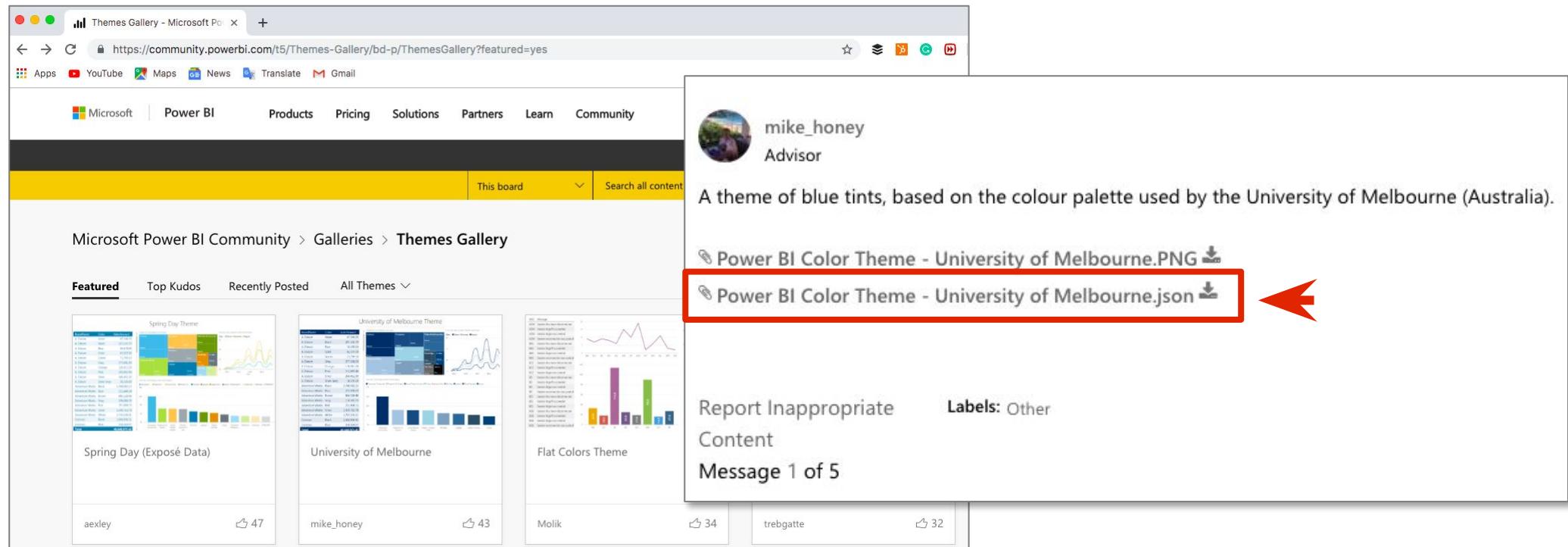
Power BI report themes

- You can apply a color theme to your entire **report** with **report themes**
- When you apply a report theme, all visuals in your report use the colors from your selected theme



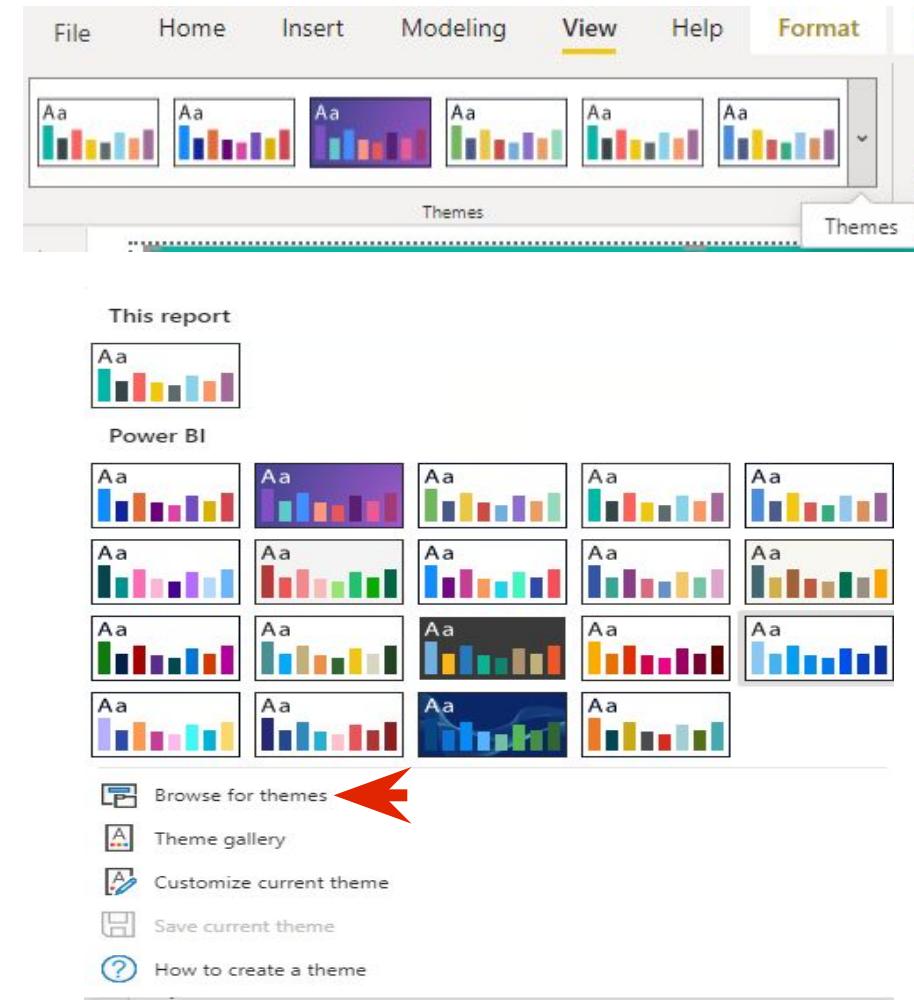
Change your report theme

- Choose a theme you like from
<https://community.powerbi.com/t5/Themes-Gallery/bd-p/ThemesGallery>
- Download the .Json file from the theme you choose

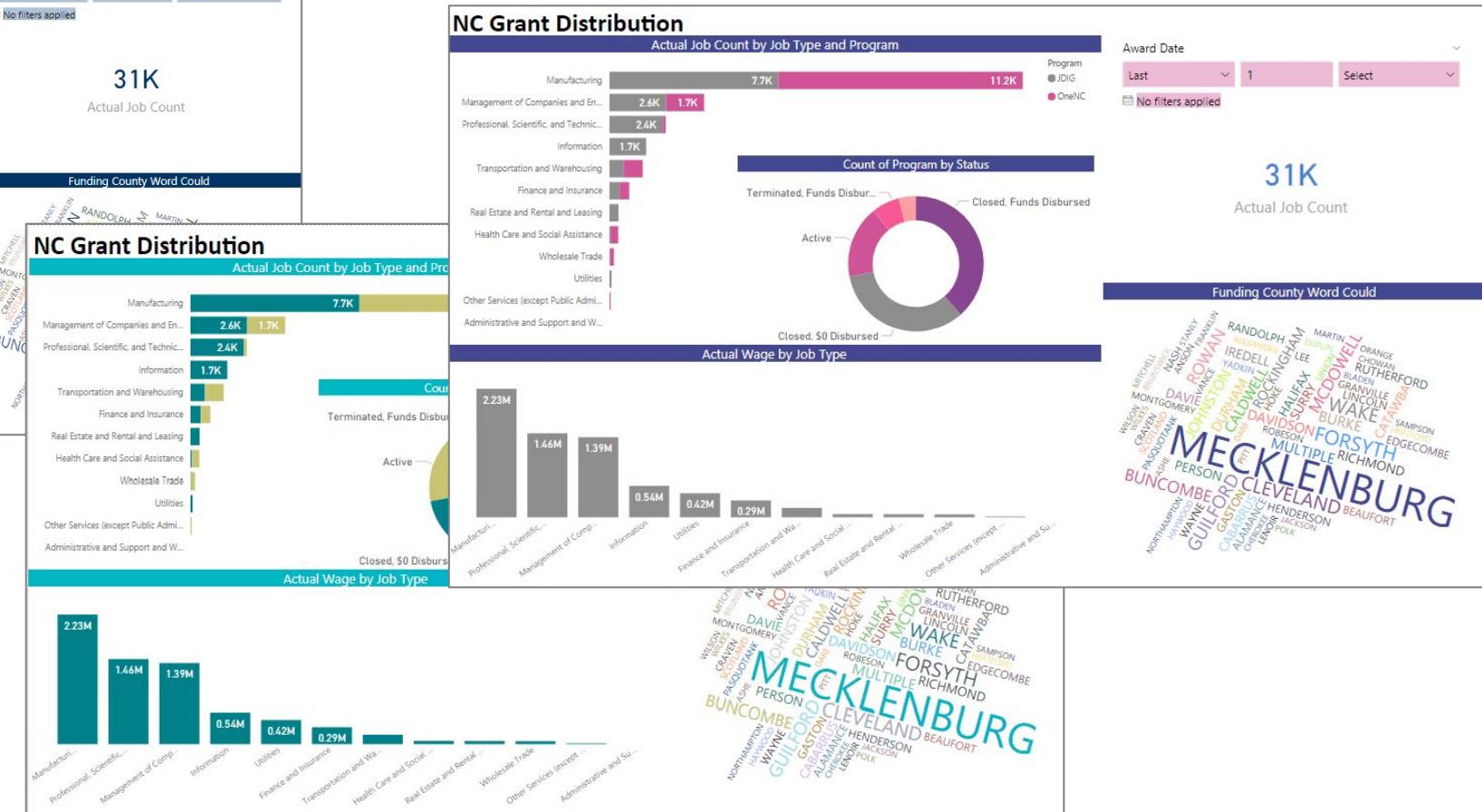
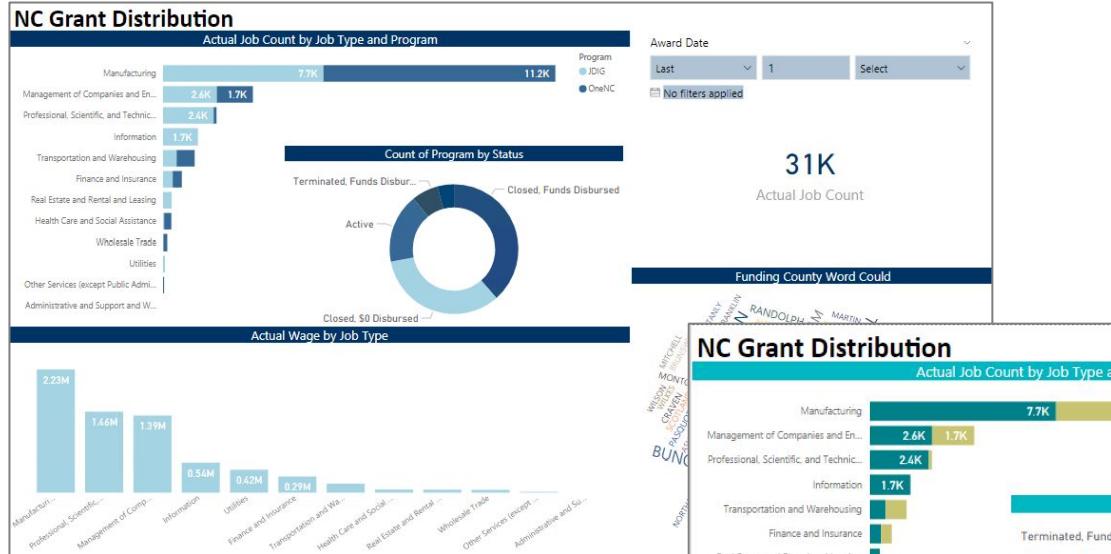


Importing your theme

- In Power BI desktop, under View tool bar, click on down arrow under the themes section
- Then choose 'Browse for themes' and find the JSON file you downloaded

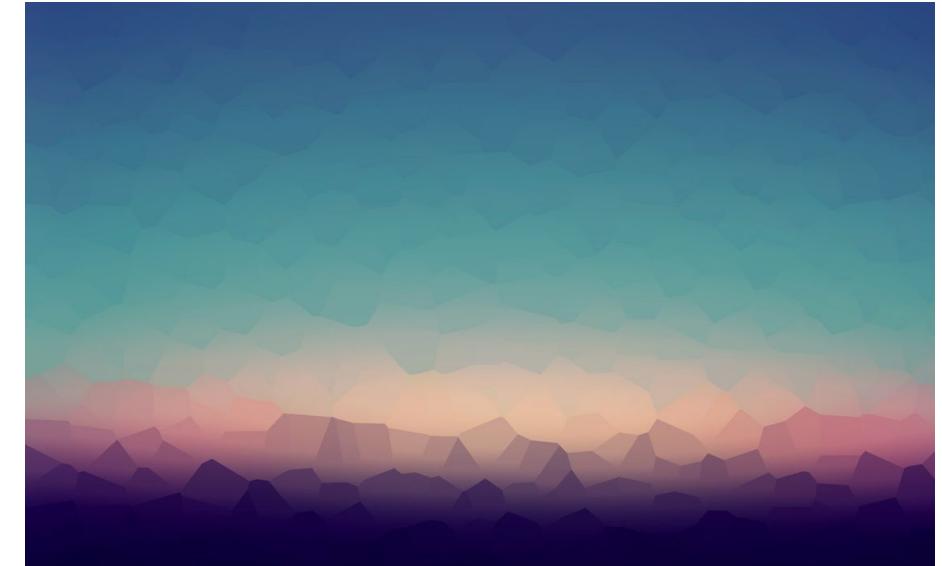
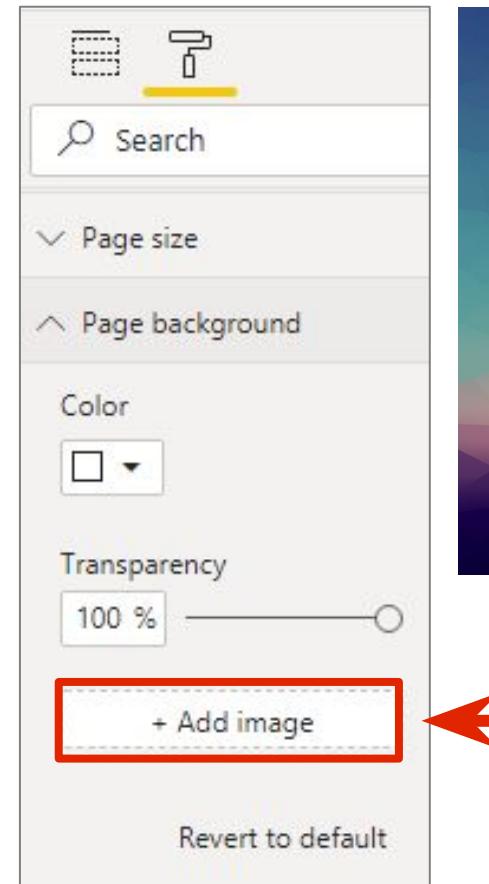


Different theme examples

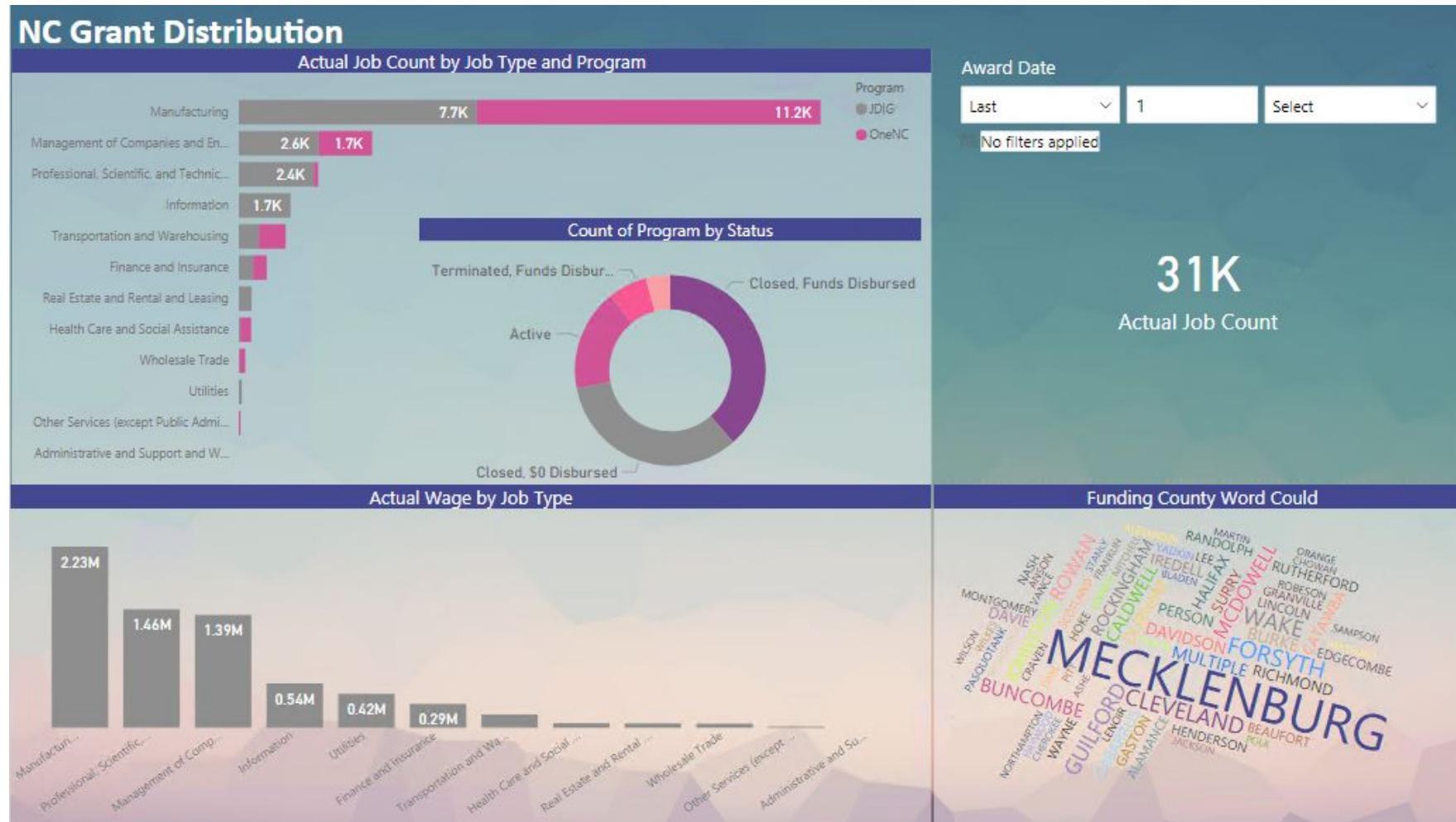


Adding a page background

- Click on any white space of your report and go to visualization panel and click on the format tab
- Upload the image



Report with added background



Objectives for Lab 2: Continued

- Understanding and utilizing filters to analyze your data
- Learn how to create custom and interactive visuals
- Master visual alignment for your report layout

Using bookmarks

- Can I present the visuals in my report in a PowerPoint style?

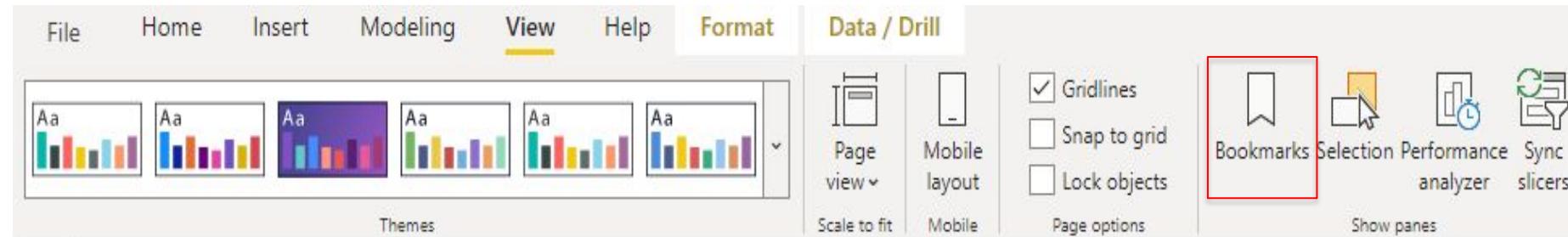


The screenshot illustrates the use of bookmarks in Power BI. On the left, there's a dashboard titled 'Overall rank by State' featuring a bar chart and a map of the United States. Below it is a chart titled 'Weather, Cost of living, Health care quality, Crime rate and Tax rate' with multiple series. A pink arrow labeled '1' points from the top of the dashboard to the 'BOOKMARKS' pane on the right. The 'BOOKMARKS' pane lists several bookmarked items: Overview, Top ten rankings, Weather comparisons, Cost of living comparison, Ten most challenging, Ten worst-weather states, and Summary findings. A second pink arrow labeled '2' points from the bottom center of the dashboard to the 'Overview' bookmark in the pane. A third pink arrow labeled '3' points from the bottom center of the pane back to the 'Overview' bookmark. At the bottom of the pane, there's a link 'Learn how to create and edit bookmarks'.

Yes, by using bookmarks!

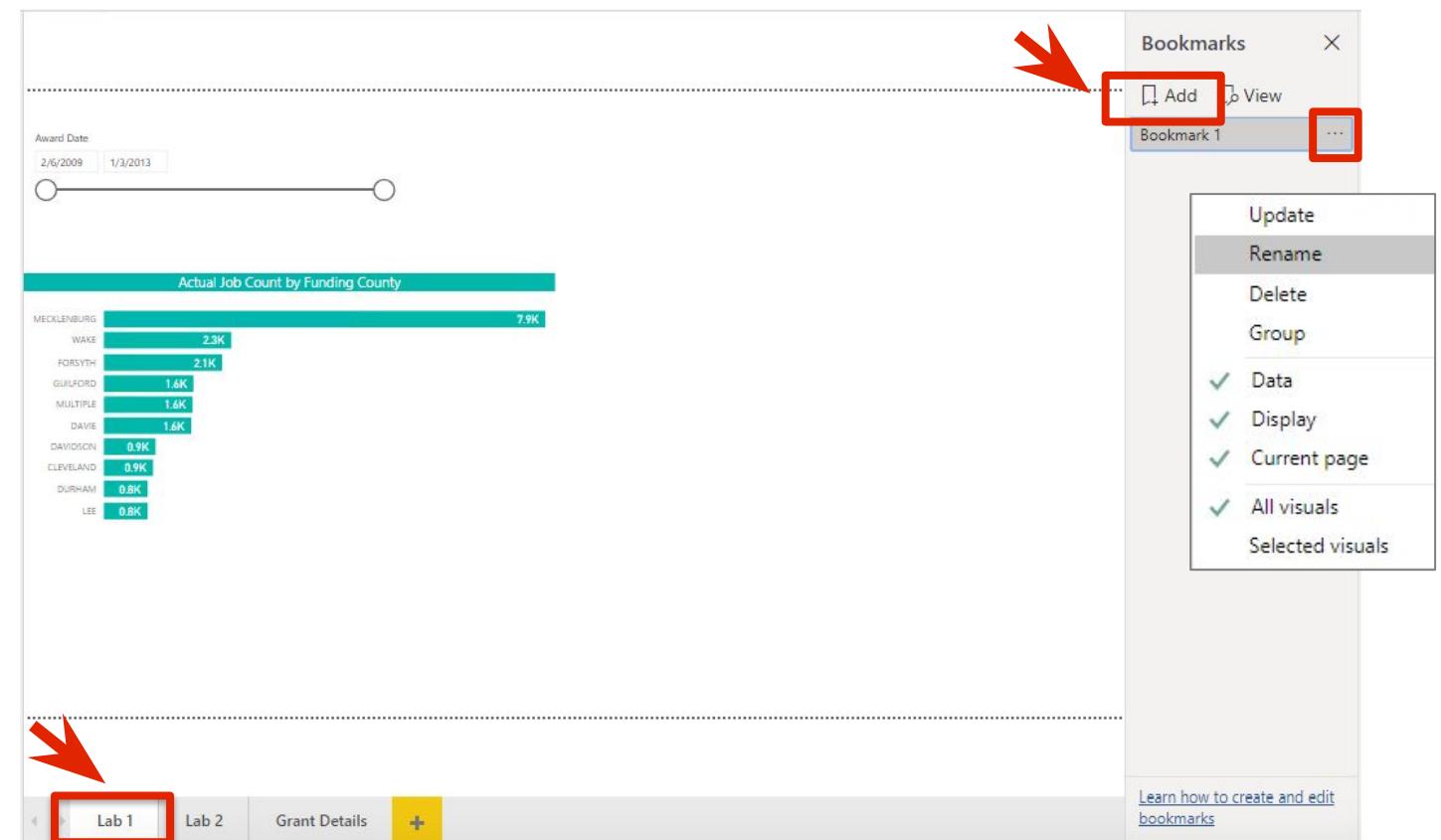
Using bookmarks for presentation

- **Bookmarks** helps you capture the currently configured view of a report page, including filtering, so you can share it with others
- You can create a collection of bookmarks and arrange them in your desired order to highlight insights or the story you want to tell with your visuals
- Select the ‘View’ ribbon, then select the box for ‘Bookmarks Pane’



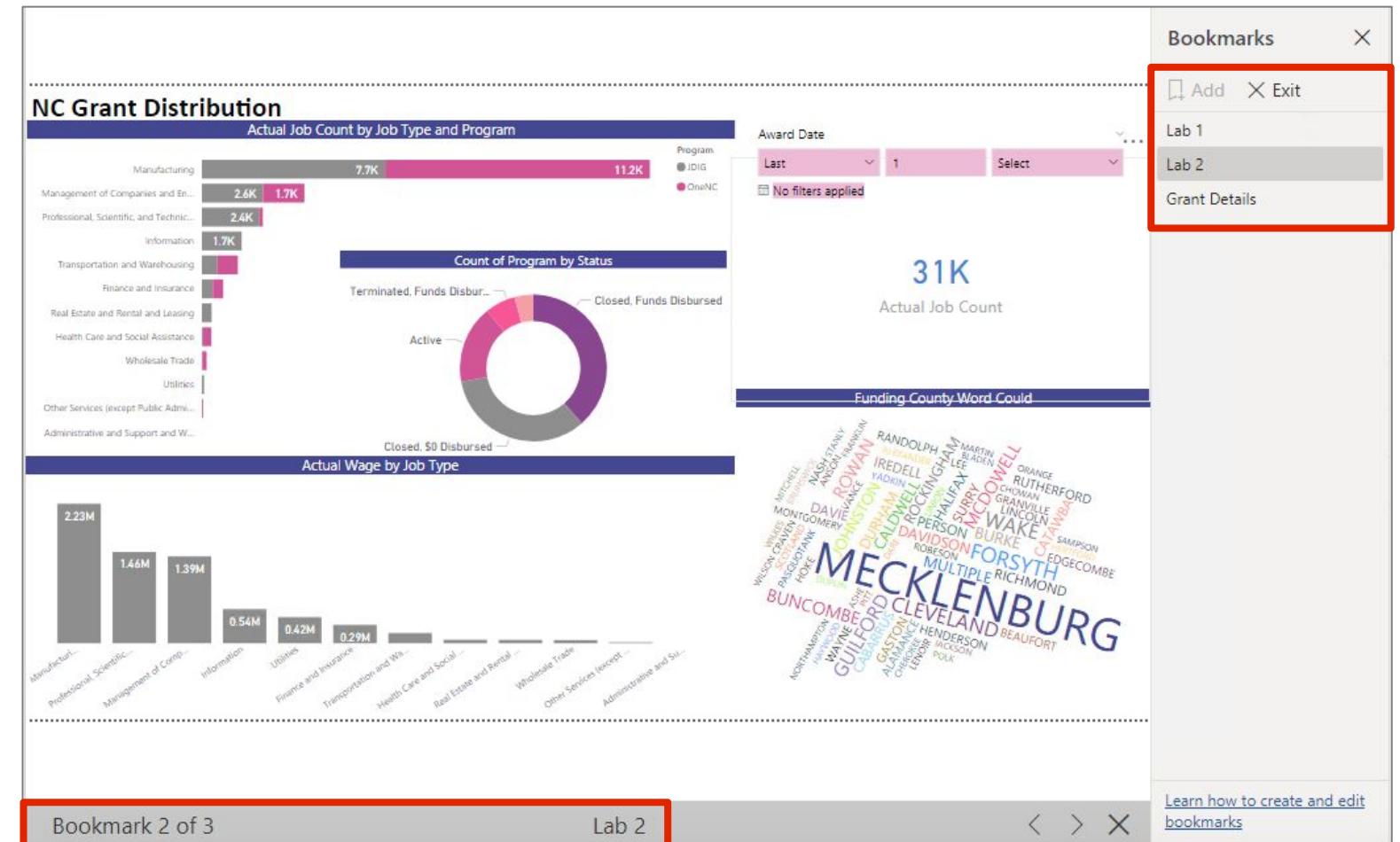
Using bookmarks for presentation

- Click on the Lab 1 page, select 'Add from the Bookmarks' pane to add a bookmark
- Select the ellipses next to the bookmark's name, rename the bookmark as Lab 1



Add Lab 2 to bookmarks

- Repeat the process for Lab 2
- Select 'Add' from the Bookmarks pane to add a bookmark, and then rename as Lab 2
- Click on the 'Grant Details' page, select 'Add' from the Bookmarks pane, and then rename as Grant Details
- Click on 'View' to view the report with bookmarks



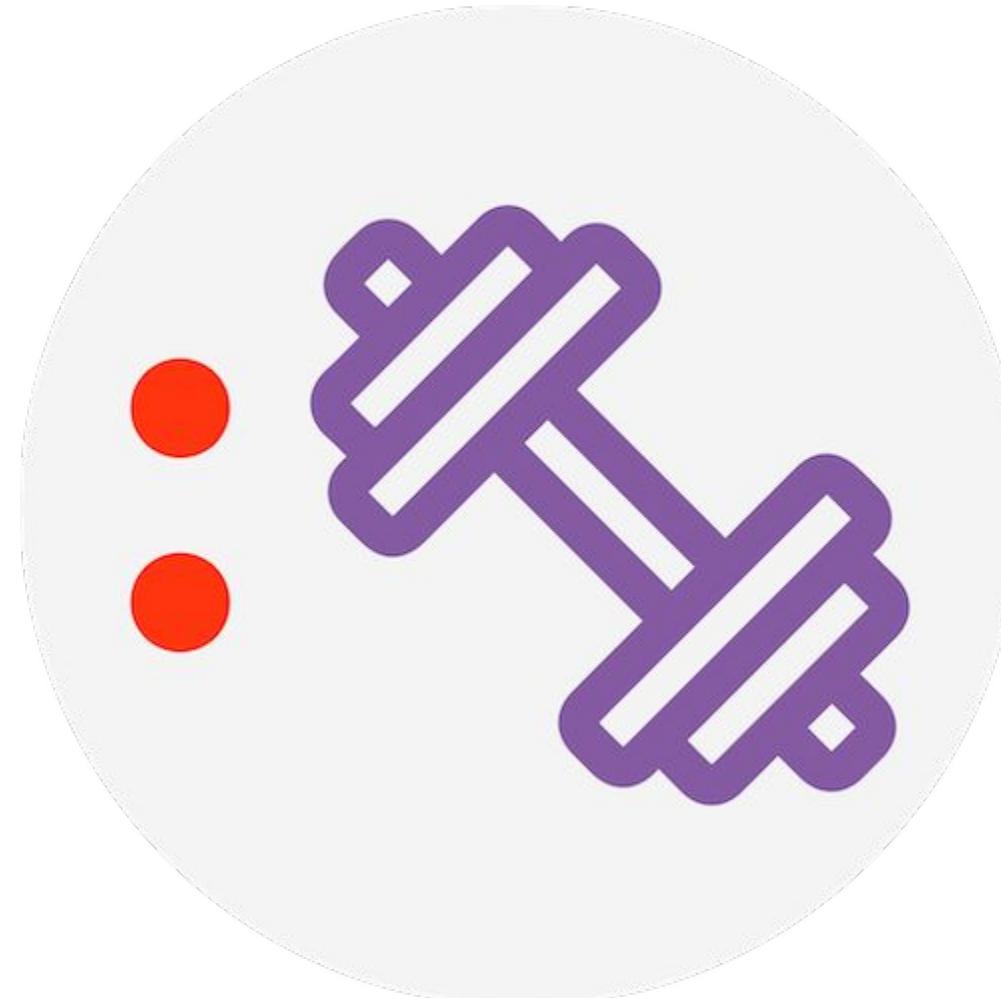
Save Lab 2 as final report

- Save your report by choose 'File' -> 'Save as' to a new file 'Lab 2'
- Publish to the reporting server

Lab 2 Continued



Lab 2 Exercise



Power BI Outline for today

- 1. Building a BI report with formatting techniques
- 2. Building a complex BI report with interactive visualizations
- 3. ETL layer: load data through Power Query
- 4. Implement data storytelling frameworks and techniques

Power Query

Power Query

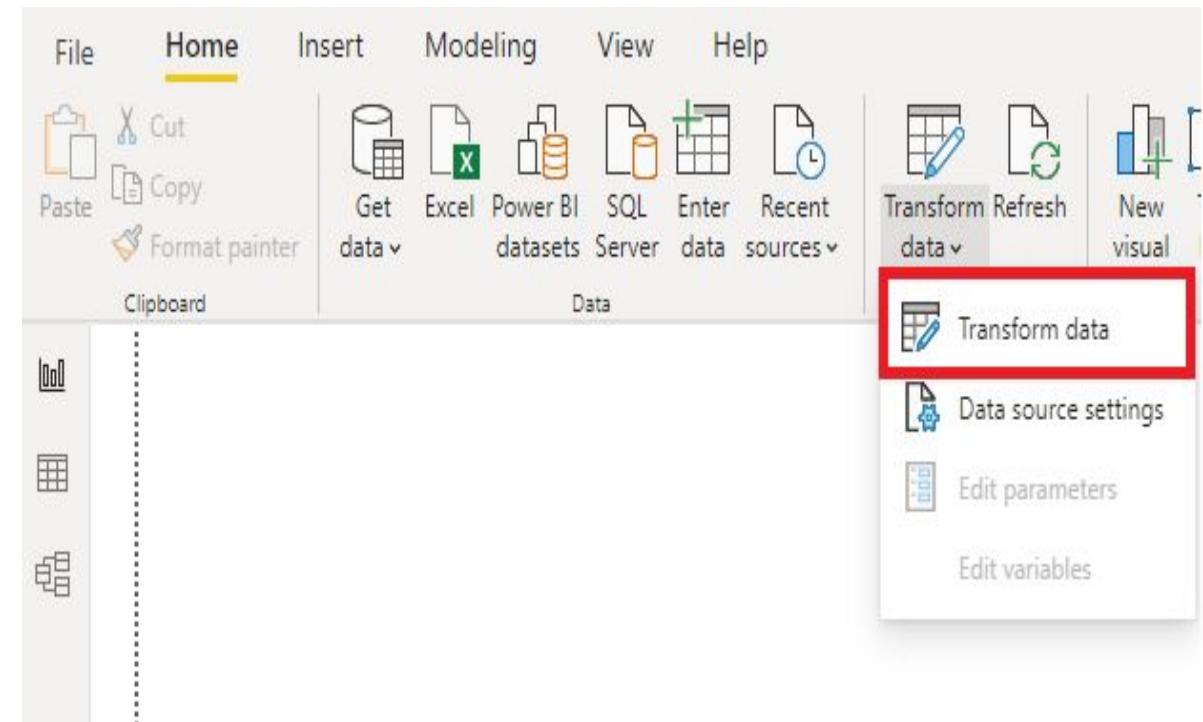
- The Microsoft Data Connectivity and Data Preparation technology
- Enables business users to seamlessly access data stored in hundreds of data sources
- Reshape it to fit their needs, with an easy to use, engaging and no-code user experience

Power Query Editor

- The primary data preparation experience
- Allowing users to apply over 300 different data transformations by previewing data and selecting transformations in the user experience
- These data transformation capabilities are common across all data sources, regardless of the underlying data source limitations

Launching ‘Power Query Editor’

- **ETL >** Extract, transform and load
- **Power Query** is made available in **Power BI Desktop** through **Power Query Editor**.
- To launch Power Query Editor, select **Transform data** from the **Home** tab of Power BI Desktop.



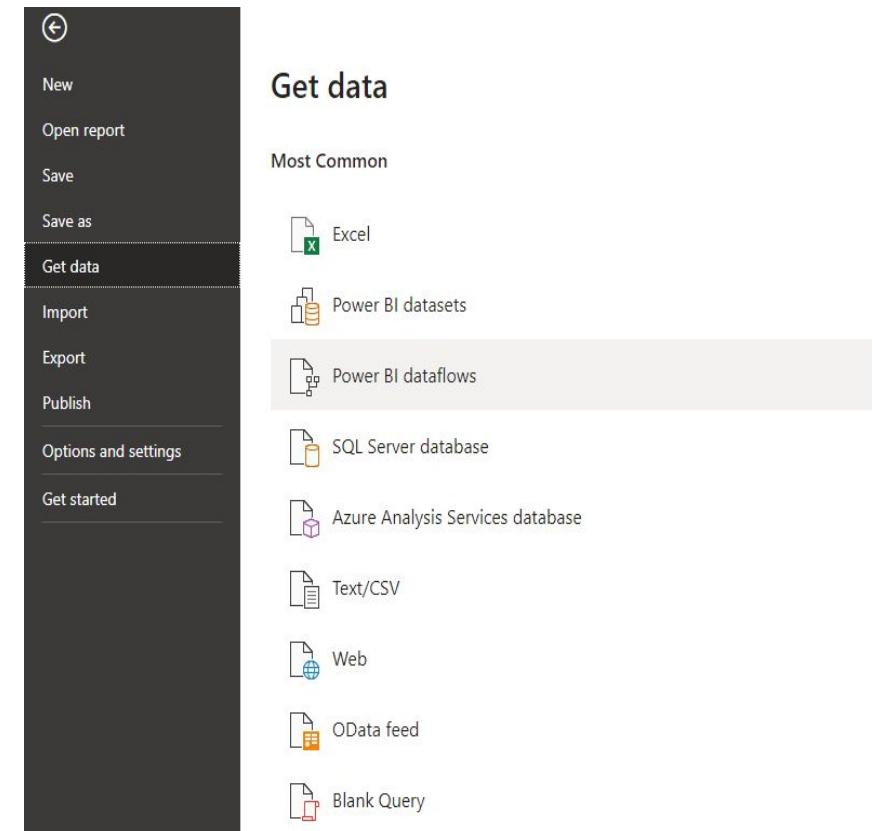
ETL layer of Power BI

The screenshot shows the Power Query Editor interface with several key components highlighted by red boxes and arrows:

- Queries [1]**: A list of available queries, with "Grants" selected. A callout box states: "Queries are listed and available for selection, viewing, and shaping".
- Center Pane**: Displays the data from the selected query ("Grants"). A callout box states: "In the center pane, data from the selected query is displayed and available for shaping".
- Ribbon Buttons**: A group of buttons on the ribbon bar, including Close & Apply, New Source, Refresh, Properties, and Transform. A callout box states: "In the ribbon, buttons are active to interact with the data in the query".
- Query Settings Window**: A sidebar window titled "QUERY SETTINGS" listing "Properties" (Name: Grants) and "Applied Steps" (Source, Navigation, Changed Type). A callout box states: "The Query Settings window appears, listing the query's properties and applied steps".

Data source types in Power BI

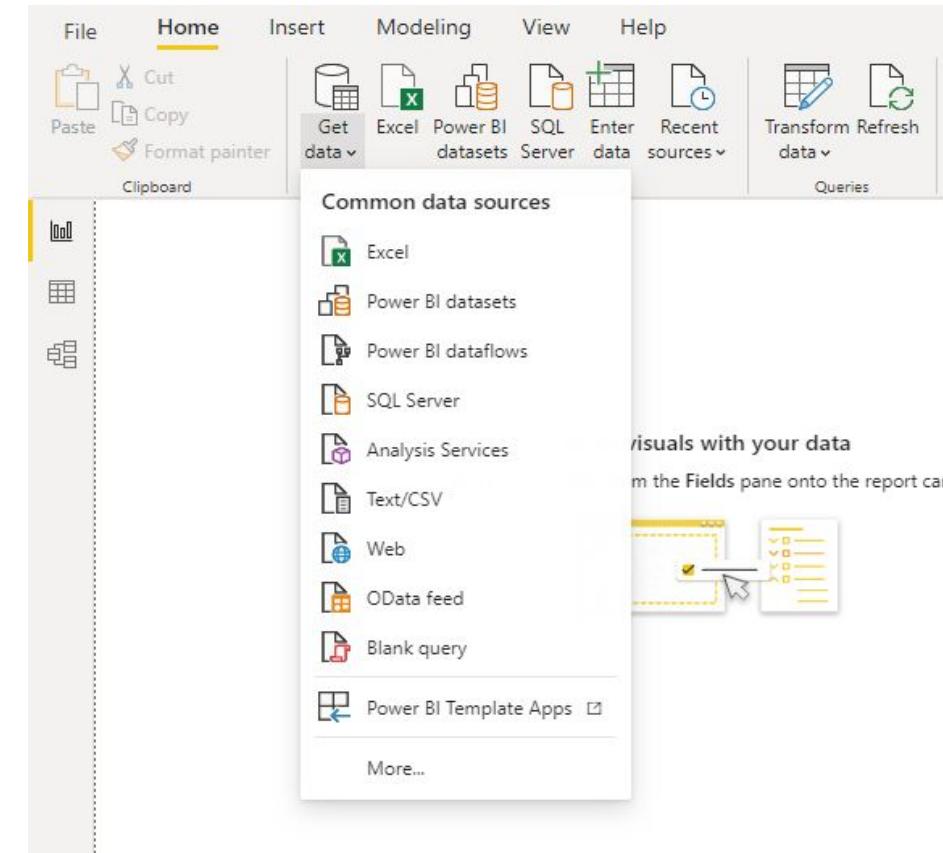
- With Power BI Desktop, you can connect to data from many different sources
- The File > Get Data provides the following data connections:
 - Excel
 - Text/CSV
 - XML
 - JSON
 - Folder
 - PDF
 - SharePoint Folder



Data source options

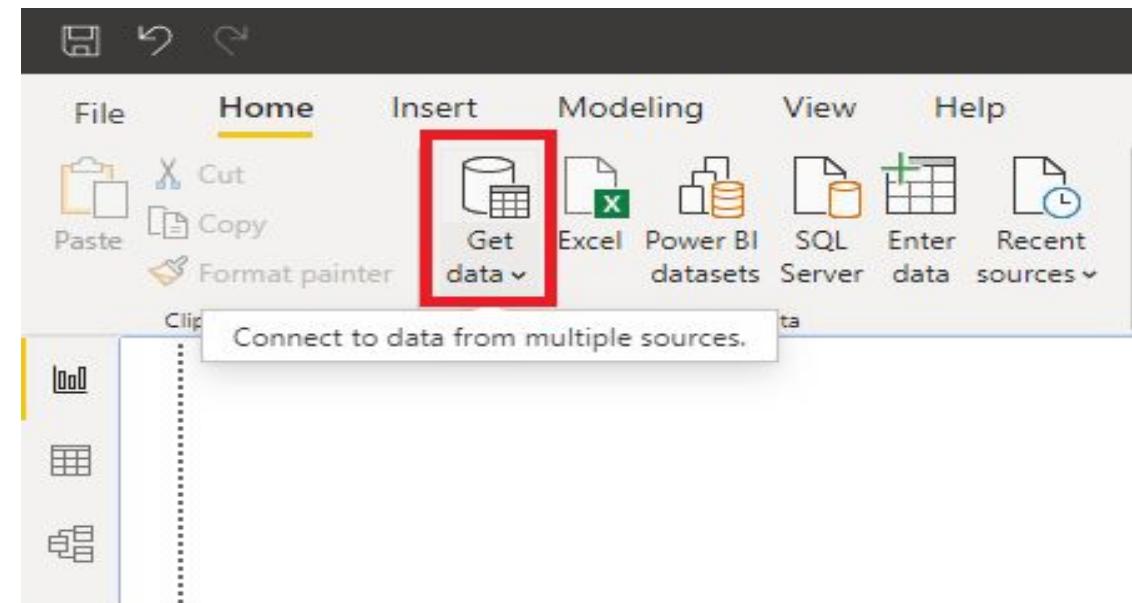
- Power BI can connect to many different data sources
- By clicking on **Get Data**, you can see a list of the **Most Common** data sources
- In addition to those, you can also connect to Hadoop, Azure, R and Python, many others!

Take 5 minutes to explore the different data sources – which ones are you most likely to use?



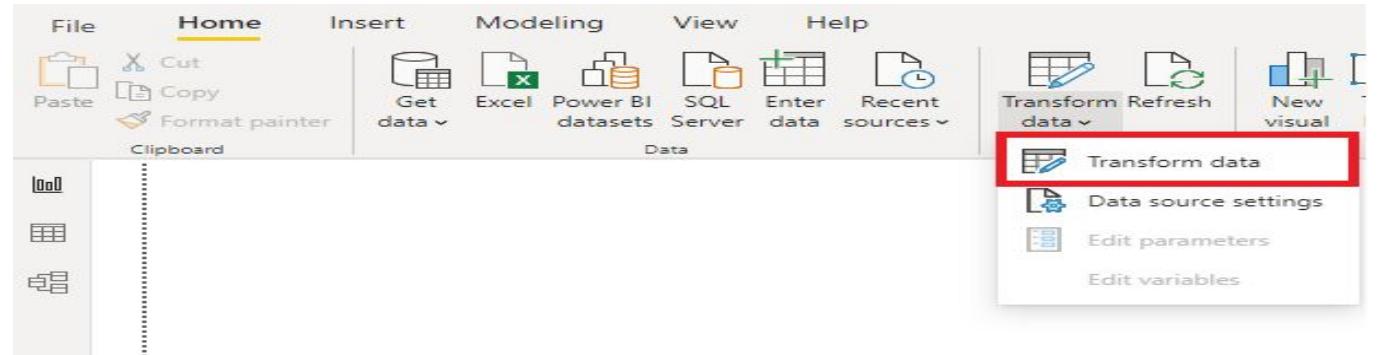
Get data from Excel

- Start a **new** Power BI file
- Choose **get data** from the top right of the Tool Bar
- Choose '**Excel**' then click 'Connect'
- Navigate to your '**Grants**' file in lab 4 folder and click on Open (the same dataset we used in previous lab)



Edit queries

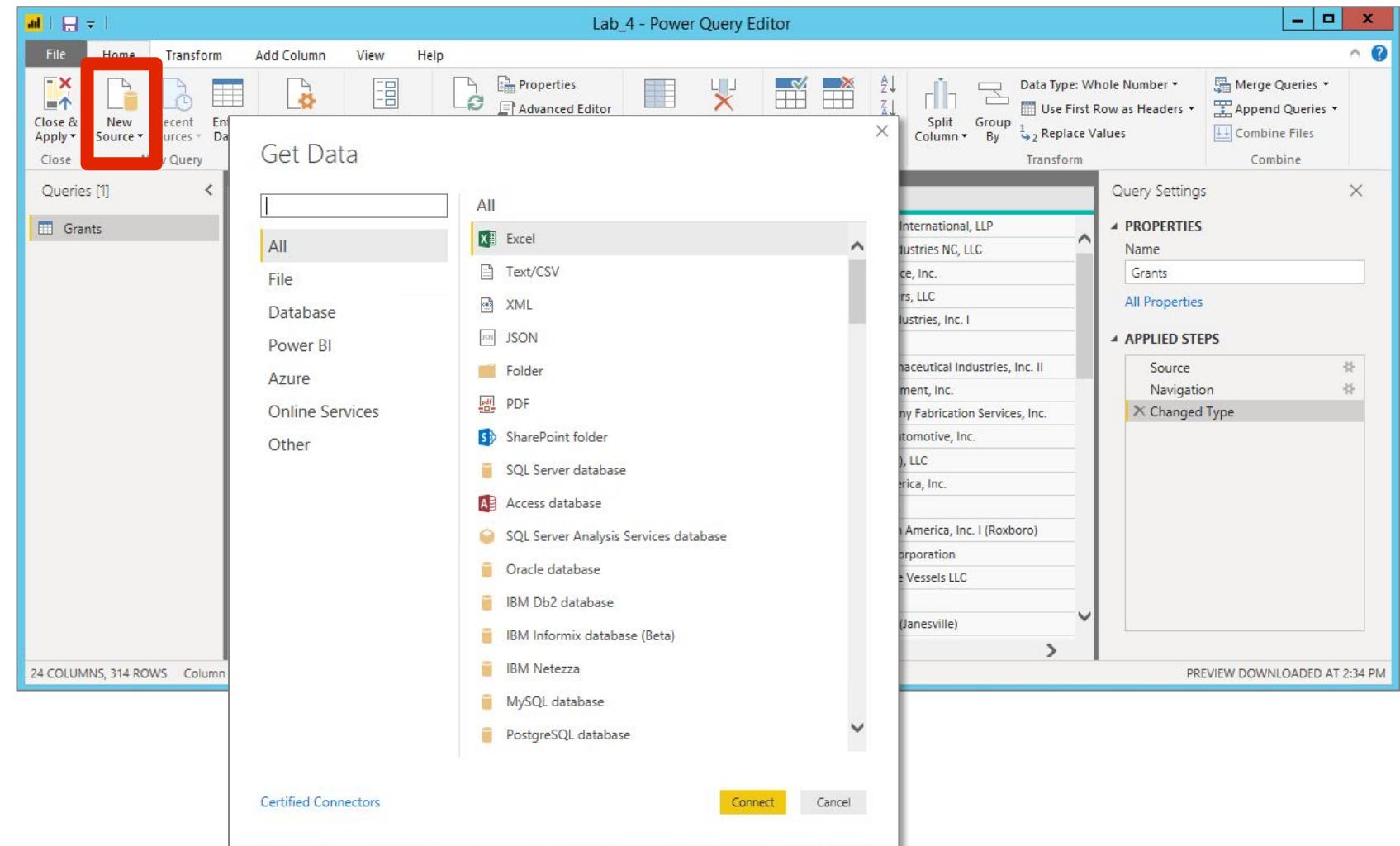
- Click on the '**Transform data**' on the tool bar under Home
- Then the **Power Query Editor** window will pop up



The screenshot shows the 'Power Query Editor' window with the title 'Lab_4 - Power Query Editor'. The ribbon at the top includes 'File', 'Home', 'Transform' (which is selected and highlighted in blue), 'Add Column', 'View', and 'Help'. Below the ribbon, there are various tools and settings like Close & Apply, New Source, Refresh, Data Sources, Manage Parameters, Refresh Preview, Advanced Editor, Properties, and Transform. The main area shows a table with four columns: 'Funding ID', 'Program', 'Award Date', and 'Company'. The table has 19 rows of data. The 'Properties' pane on the right shows a query named 'Grants'. The 'Applied Steps' pane shows a step named 'Changed Type'. At the bottom, it says '24 COLUMNS, 314 ROWS' and 'Column profiling based on top 1000 rows'. The status bar at the bottom right says 'PREVIEW DOWNLOADED AT 2:34 PM'.

'New Source' to upload data

- Click on 'New Source' under Home tab. Then choose Excel
- Find the **Lab 2 Data.xlsx** file under lab 2 folder



Open the data

- Click on Open, then choose '**Sheet 1**' then 'OK'

Sheet1
Preview downloaded on Wednesday, December 9, 2020

Funding ID	Program	Award Date	Company
442	OneNC	5/17/2012	Plasticard Locktech International, LLP
236	OneNC	4/15/2010	United Furniture Industries NC, LLC
474	OneNC	9/21/2012	Global Textile Alliance, Inc.
198	OneNC	12/1/2009	SANS Technical Fibers, LLC
437	JDIG	4/20/2012	Ashley Furniture Industries, Inc. I
277	JDIG	9/20/2010	Cree, Inc. II
283	JDIG	10/4/2010	Novo Nordisk Pharmaceutical Industries, Inc
475	OneNC	10/1/2012	Bakers Waste Equipment, Inc.
352	OneNC	5/2/2011	The Roberts Company Fabrication Services,
383	OneNC	9/23/2011	Cooper Standard Automotive, Inc.
463	OneNC	8/3/2012	FCC (North Carolina), LLC
231	OneNC	4/9/2010	Michelin North America, Inc.
401	OneNC	11/16/2011	Sonoco Plastics, Inc.
453	OneNC	6/15/2012	GKN Driveline North America, Inc. I (Roxboro)
278	OneNC	9/21/2010	DNP IMS America Corporation
160	OneNC	5/18/2009	Morganton Pressure Vessels LLC
446	JDIG	6/7/2012	Citrix Systems, Inc.
354	OneNC	5/10/2011	Jason Incorporated (Janesville)
300	OneNC	11/18/2010	FAS Controls Inc.
505	OneNC	1/3/2013	Exela Pharma Sciences, LLC

i The data in the preview has been truncated due to size limits.

OK Cancel

Funding ID	Program	Award Date	Company	Comp
442	OneNC	5/17/2012	Plasticard Locktech International, LLP	Buncor
236	OneNC	4/15/2010	United Furniture Industries NC, LLC	Davids
474	OneNC	9/21/2012	Global Textile Alliance, Inc.	Rockin
198	OneNC	12/1/2009	SANS Technical Fibers, LLC	Rockin
437	JDIG	4/20/2012	Ashley Furniture Industries, Inc. I	Davie
277	JDIG	9/20/2010	Cree, Inc. II	Durhai
283	JDIG	10/4/2010	Novo Nordisk Pharmaceutical Industries, Inc. II	Johnst
475	OneNC	10/1/2012	Bakers Waste Equipment, Inc.	Caldwi
352	OneNC	5/2/2011	The Roberts Company Fabrication Services, Inc.	Samps
383	OneNC	9/23/2011	Cooper Standard Automotive, Inc.	Wayne

Perform data transformation

- We will only keep columns '**Company**', '**Company County**', '**Company Address**', '**Website**' and '**elapsed days**' in our data

The screenshot shows the Microsoft Power Query Editor interface. At the top, the ribbon has tabs like File, Home, Transform, Add Column, View, and Help. The Home tab is selected. On the far right of the ribbon, there is a red box highlighting the 'Manage Columns' section, which contains 'Choose Columns' and 'Remove Columns' buttons. Below the ribbon, the 'Queries [1]' pane shows a table with three columns: 'Company', 'Company County', and 'Company Address'. The table lists various company names and their corresponding county and address. To the right of the table is a 'Choose Columns' dialog box. This dialog box has a title 'Choose Columns' and a subtitle 'Choose the columns to keep'. It includes a 'Search Columns' input field and a list of columns with checkboxes. Several checkboxes are checked: 'Company', 'Company County', 'Company Address', and 'Website'. Other columns like 'Funding ID', 'Program', 'Award Date', 'Job Type', etc., have unchecked boxes. At the bottom of the dialog are 'OK' and 'Cancel' buttons, and a status bar at the bottom right says 'Changed Type' and 'Removed Other Columns'.

Company	Company County	Company Address
Plasticard Locktech International, LLP	Buncombe	605 Sweeten Creek Industrial Park, Asheville, NC
United Furniture Industries NC, LLC	Davidson	12 Hackney Street, Lexington, NC
Global Textile Alliance, Inc.	Rockingham	2361 Holiday Loop Road, Reidsville, NC
SANS Technical Fibers, LLC	Rockingham	4721 NC Highway 770, Stoneville, NC
Ashley Furniture Industries, Inc. I	Davie	221 Ashley Furniture Way, Advance, NC 27006
Cree, Inc. II	Durham	4600 Silicon Drive, Durham, NC 27703-8475; 3026 E Corr
Novo Nordisk Pharmaceutical Industries, Inc. II	Johnston	3612 Powhatan Road, Clayton, NC 27527-9217
Bakers Waste Equipment, Inc.	Caldwell	1808 Norwood St. SW, Lenoir, NC
The Roberts Company Fabrication Services, Inc.	Sampson	133 Forlives Road, Winterville, NC
Cooper Standard Automotive, Inc.	Wayne	308 Fedelon Trail, Goldsboro, NC
FCC (North Carolina), LLC	Scotland	16700 Airport Rd., Maxton, NC
Michelin North America, Inc.	Stanly	South Stanly School Road, Norwood NC
Sonoco Plastics, Inc.	Haywood	288 Howell Mill Road, Waynesville, NC
GKN Driveline North America, Inc. I (Roxboro)	Person	6400 Durham Road, Timberlake, NC
DNP IMS America Corporation	Cabarrus	4524 Enterprise Drive NW, Concord, NC

- Then the table has the other columns removed

Change query name

- You can change the name of your query by changing the name on the Query Settings panel
- Here we **rename** the query as '**NC Company Data**'

The screenshot shows the Power BI Query Editor interface. On the left is a table with three columns: 'Company', 'Company County', and 'Company Address'. The table contains 16 rows of company information from North Carolina. On the right is the 'Query Settings' pane, which includes sections for 'PROPERTIES' (Name set to 'NC Company Data') and 'APPLIED STEPS' (listing 'Source', 'Navigation', 'Promoted Headers', 'Changed Type', and 'Removed Other Columns').

#	A ^B Company	A ^B Company County	A ^B Company Address
1	Plasticard Locktech International, LLP	Buncombe	605 Sweeten Creek Industrial Park, Asheville, NC
2	United Furniture Industries NC, LLC	Davidson	12 Hackney Street, Lexington, NC
3	Global Textile Alliance, Inc.	Rockingham	2361 Holiday Loop Road, Reidsville, NC
4	SANS Technical Fibers, LLC	Rockingham	4721 NC Highway 770 , Stoneville, NC
5	Ashley Furniture Industries, Inc. I	Davie	221 Ashley Furniture Way, Advance, NC 27006
6	Cree, Inc. II	Durham	4600 Silicon Drive, Durham, NC 27703-8475; 3026 E Cornwallis Rd, Res...
7	Novo Nordisk Pharmaceutical Industries, Inc. II	Johnston	3612 Powhatan Road, Clayton, NC 27527-9217
8	Bakers Waste Equipment, Inc.	Caldwell	1808 Norwood St. SW, Lenoir, NC
9	The Roberts Company Fabrication Services, Inc.	Sampson	133 Fortunes Road, Winterville, NC
10	Cooper Standard Automotive, Inc.	Wayne	308 Fedelon Trail, Goldsboro, NC
11	FCC (North Carolina), LLC	Scotland	16700 Airport Rd., Maxton, NC
12	Michelin North America, Inc.	Stanly	South Stanly School Road, Norwood NC
13	Sonoco Plastics, Inc.	Haywood	288 Howell Mill Road, Waynesville, NC
14	GKN Driveline North America, Inc. I (Roxboro)	Person	6400 Durham Road, Timberlake, NC
15	DNP IMS America Corporation	Cabarrus	4524 Enterprise Drive NW, Concord, NC
16	Morganton Pressure Vessels LLC	McDowell	1 Alfredo Baglioni Drive, Marian, NC

Remove nulls

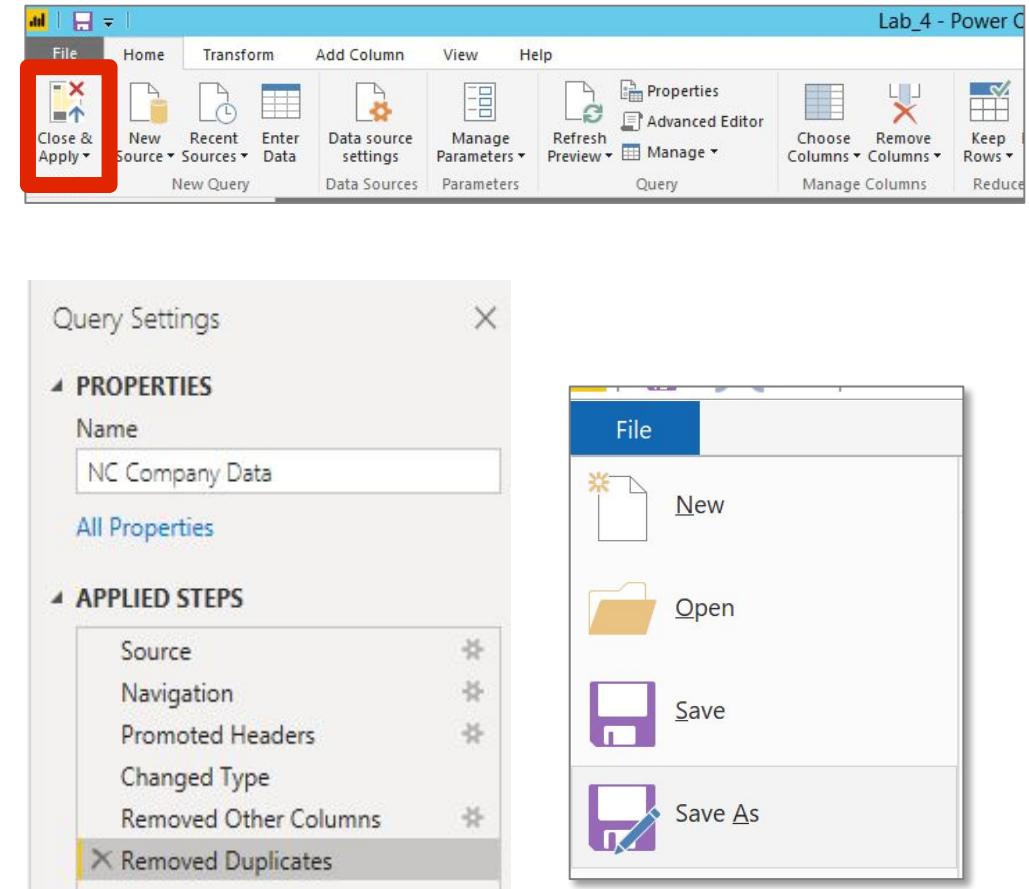
- You can see that in the table, we still have a lot of duplicate records
- Click on the '**Remove Rows**' button in the header, then choose '**Remove Duplicates**'

The screenshot shows the Microsoft Power BI desktop interface. The ribbon at the top is set to the 'Home' tab. In the center, there is a data table titled 'NC Company Data'. A context menu is open over the first row of the table, with the 'Remove Duplicates' option highlighted. The 'APPLIED STEPS' pane on the right shows a step named 'Removed Duplicates'.

Rank	Company Name	Address
1	Plasticard Locktech International, LLP	Mountain Creek Industrial Park, Asheville, NC
2	United Furniture Industries NC, LLC	Kneet Street, Lexington, NC
3	Global Textile Alliance, Inc.	Holiday Loop Road, Reidsville, NC
4	SANS Technical Fibers, LLC	Highway 770, Stoneville, NC
5	Ashley Furniture Industries, Inc. I	Davie
6	Cree, Inc. II	Durham
7	Novo Nordisk Pharmaceutical Industries, Inc. II	Johnston
8	Bakers Waste Equipment, Inc.	Caldwell
9	The Roberts Company Fabrication Services, Inc.	Sampson
10	Cooper Standard Automotive, Inc.	Wayne
11	FCC (North Carolina), LLC	Scotland
12	Michelin North America, Inc.	Stanly
13	Sonoco Plastics, Inc.	Haywood

Apply changes and save dataset

- In the **Query Settings**, you can easily 'Navigate' to the previous steps and reverse the steps sequence
- After all the data source changes are done, you can click on '**Close & Apply**' to apply the changes to the original dataset
- Make sure to save the current file by choosing '**File**' -> '**Save As**' and save the file as '**NC Company Data**'



Knowledge Check 3



Power BI Outline for today

- 1. Building a BI report with formatting techniques
- 2. Building a complex BI report with interactive visualizations
- 3. ETL layer: load data through Power Query
- 4. Implement data storytelling frameworks and techniques

Why is visualization important?

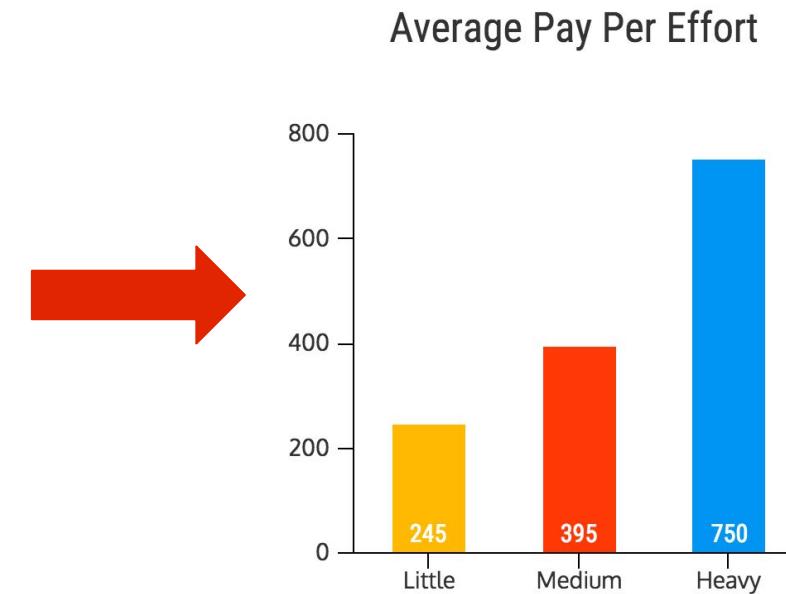
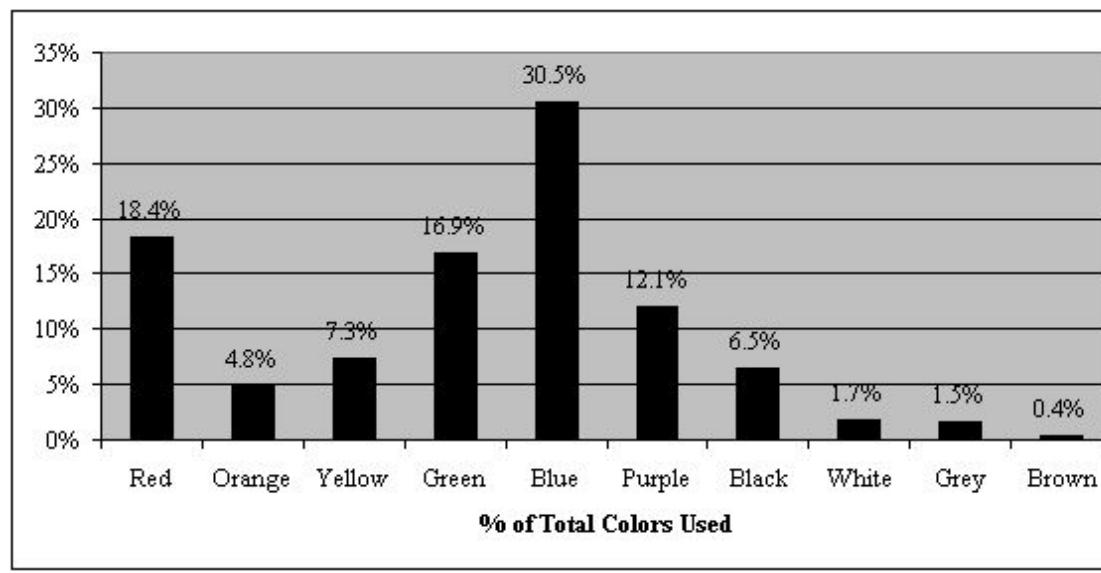
- To provide valuable insights, visualization must be interpretable and relevant
- To give a visual or graphical representation of data/concepts
- To communicate ideas. We are visual by nature and visualizations are a form of communication
- Provide an accessible way to see and understand trends, outliers, and patterns in data
- Confirm a hypothesis about the data

Visualizing data: design principles

- What are the design standards to create interpretable and readable data graphics?
- In the following slides, we will go into the key design principles for data visualization

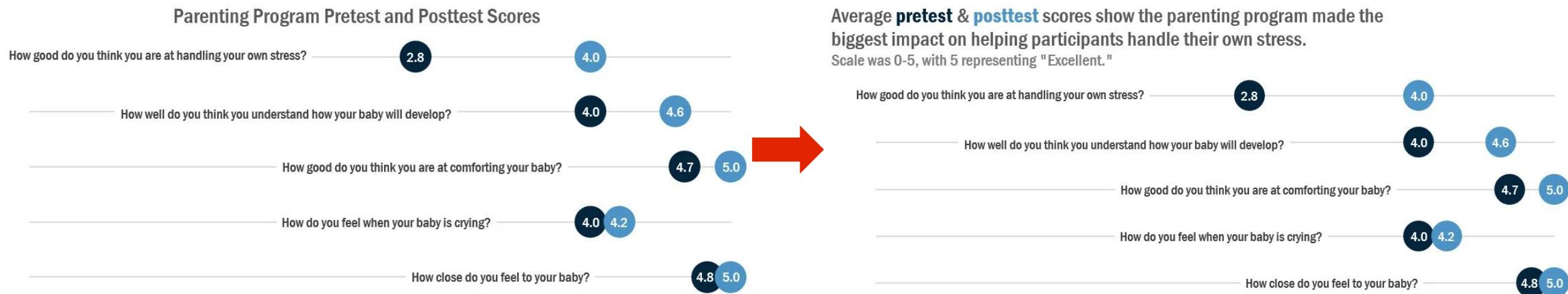
Color

- Use color only when it related to differences in the data. Ensure high contrast values to be mindful of color-blindness and other visual sensitivities



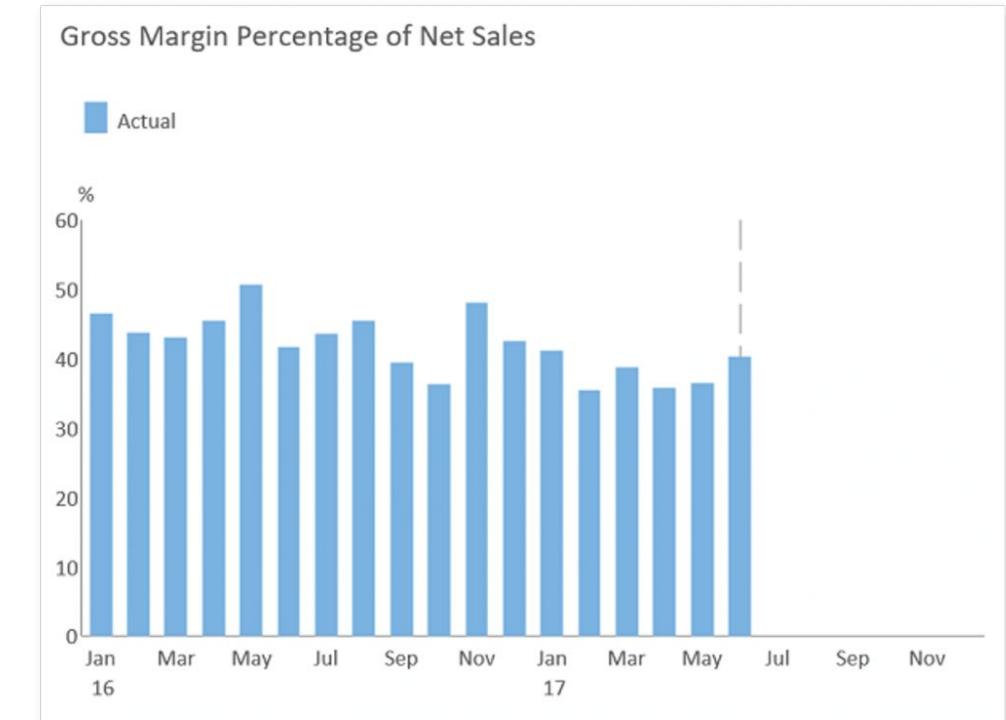
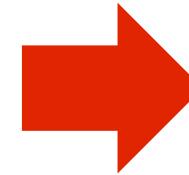
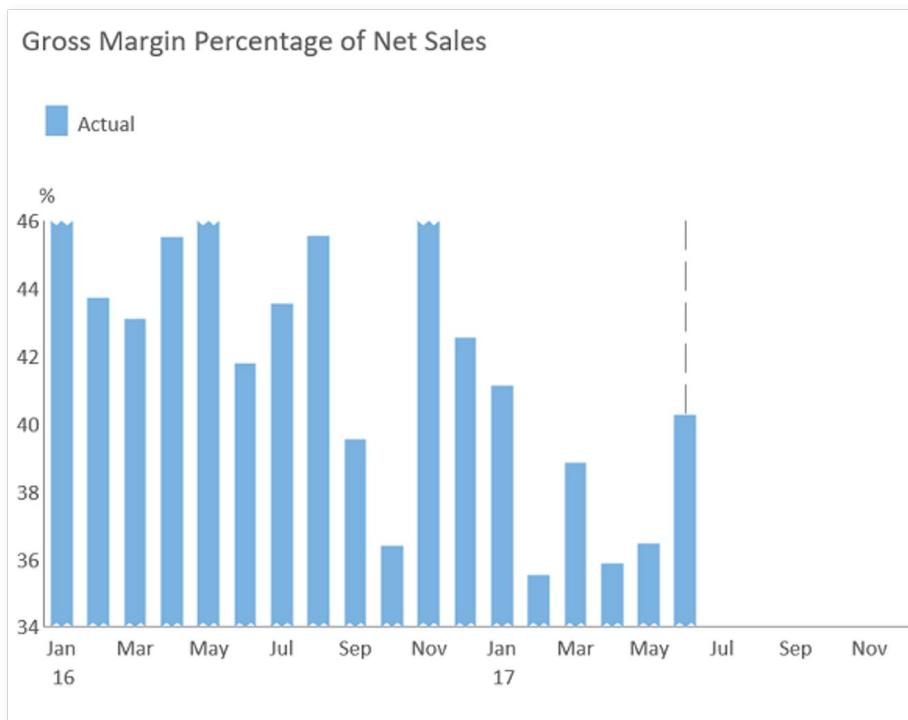
Text and tables

- Descriptions can guide your readers and communicate key insights. Use legends when necessary, make sure to label axes and include a heading



Scales

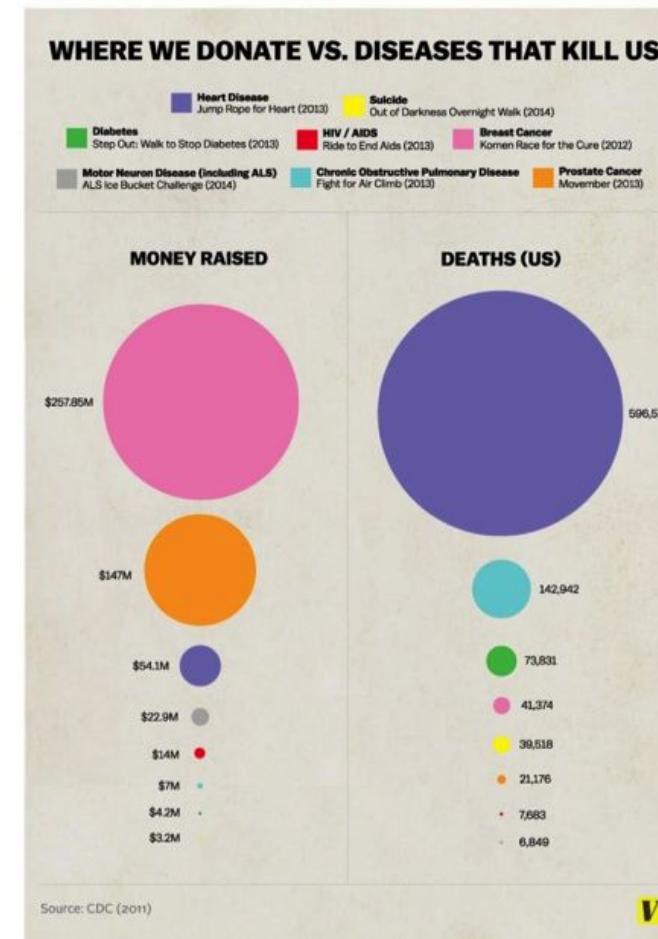
- Use natural increments on your axes (1, 2, 3; 0, 100, 200, 300); make sure that the scales are proportionate and intuitive



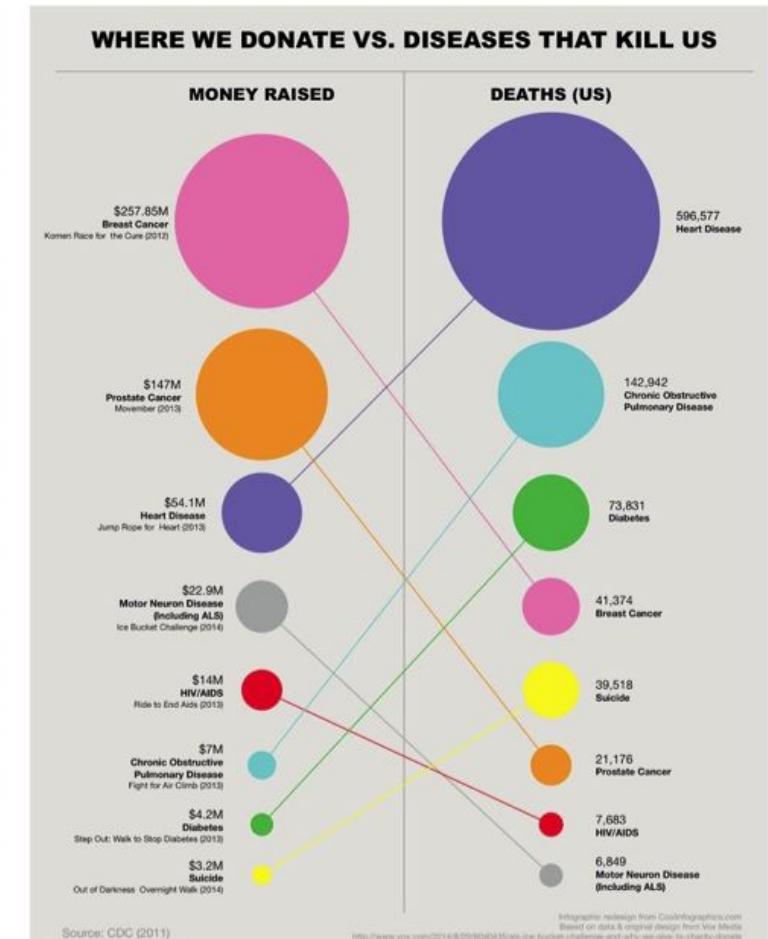
Data Integrity

- Keep comparative data truthful
- Be mindful of "lying with stats"

Original Design

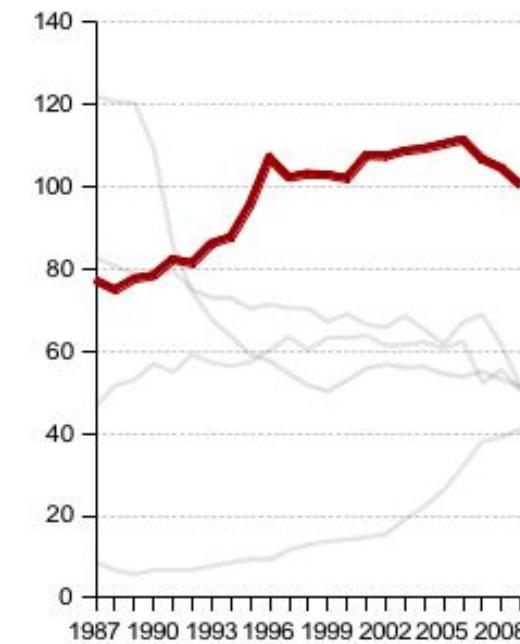
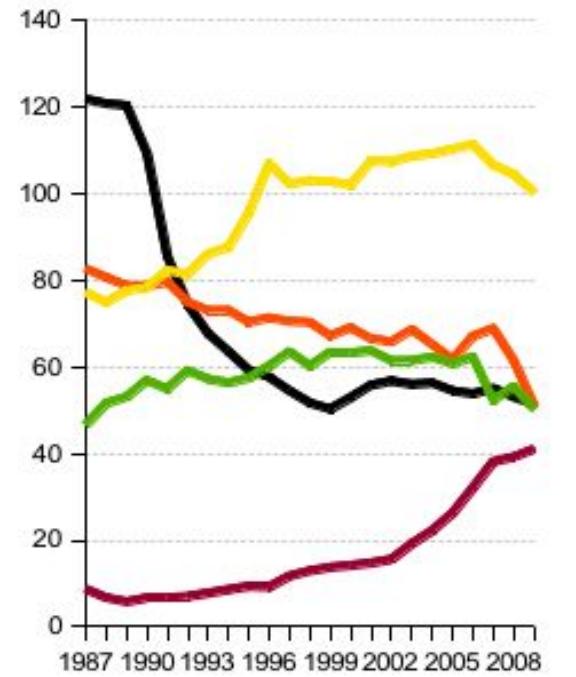


Corrected Design



Data density

- Don't present too much data on a single chart / graph



Data richness/Attribution

- Is your data high-quality from reliable sources and accurate?
(Always Include Citations)
- Turns out Colgate cherry-picked the information from a general health study—ALL market toothpastes were recommended equally

Whatever happened to this statistic?

'More than 80% of dentists recommend Colgate.'

Design principles checklist

- Think through these principles as you're building your visualization!

- 1. Use color to highlight differences 
- 2. Make text and tables legible 
- 3. Use appropriate scales 
- 4. Ensure shapes / visuals are comparative 
- 5. Highlight only the data you want to display 
- 6. Make sure data quality is accurate(with attribution) 

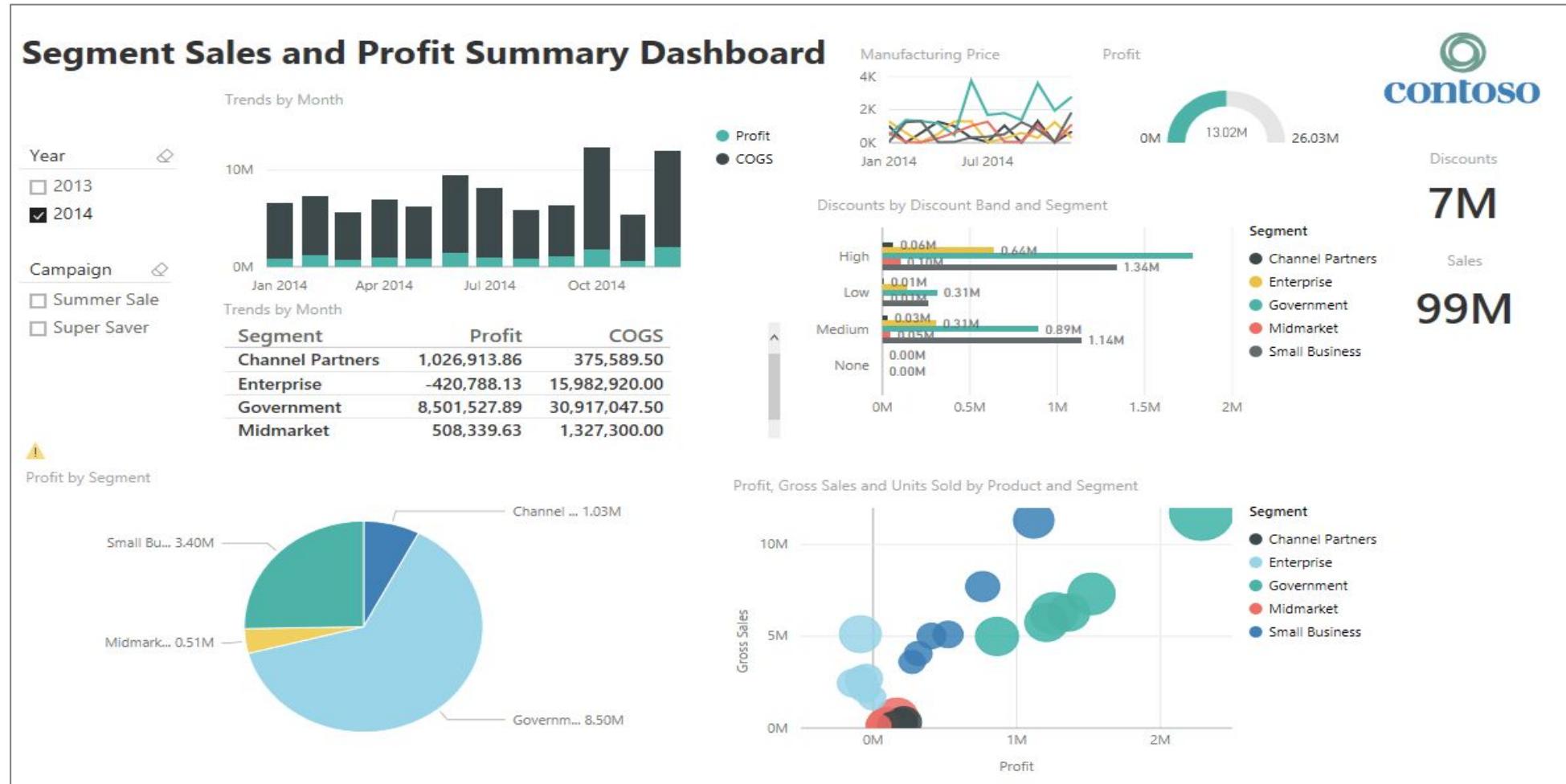
Data storytelling

- Translate data into actions or business outcomes while engaging your audience
- How can data visualizations be used to tell a story?



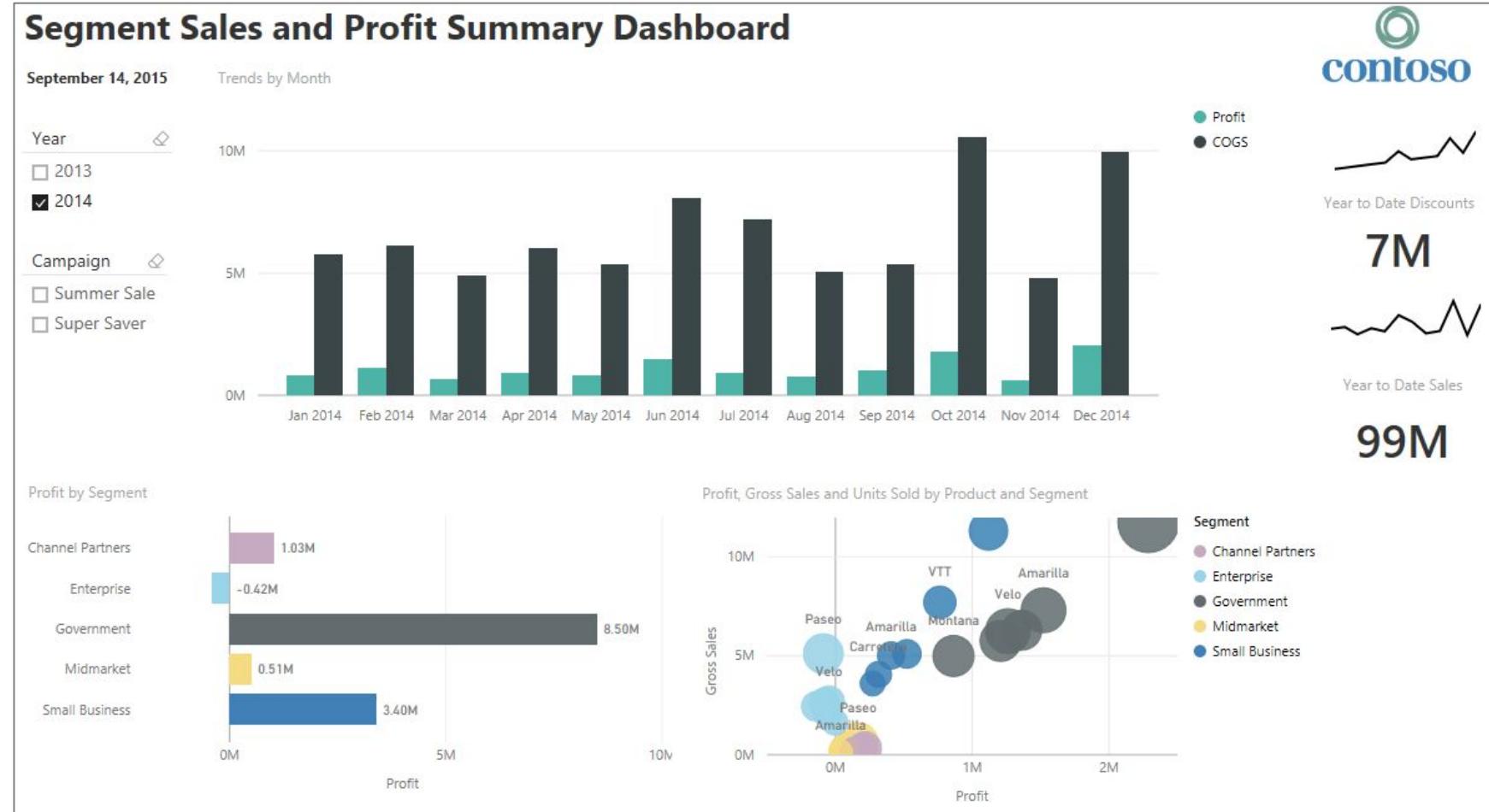
Which dashboard is better?

Dashboard 1



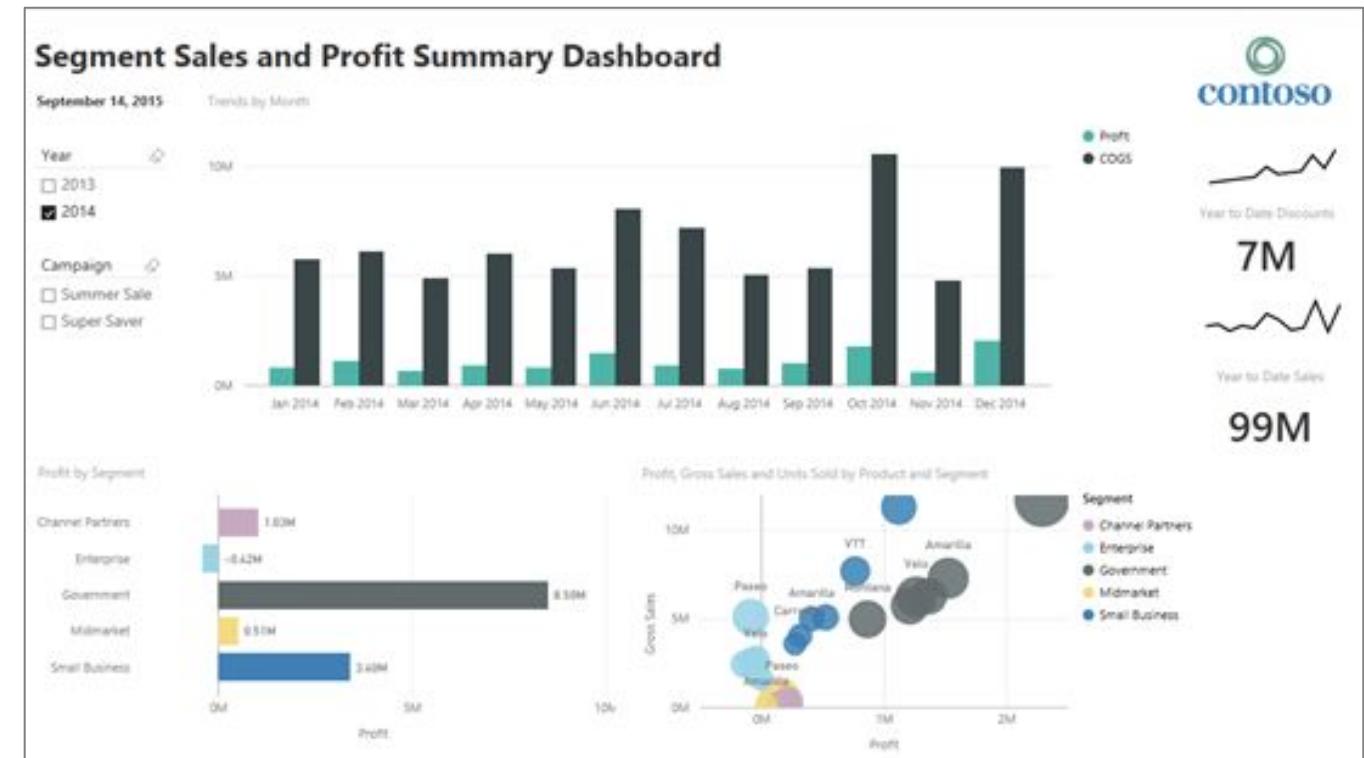
Which dashboard is better?

Dashboard 2



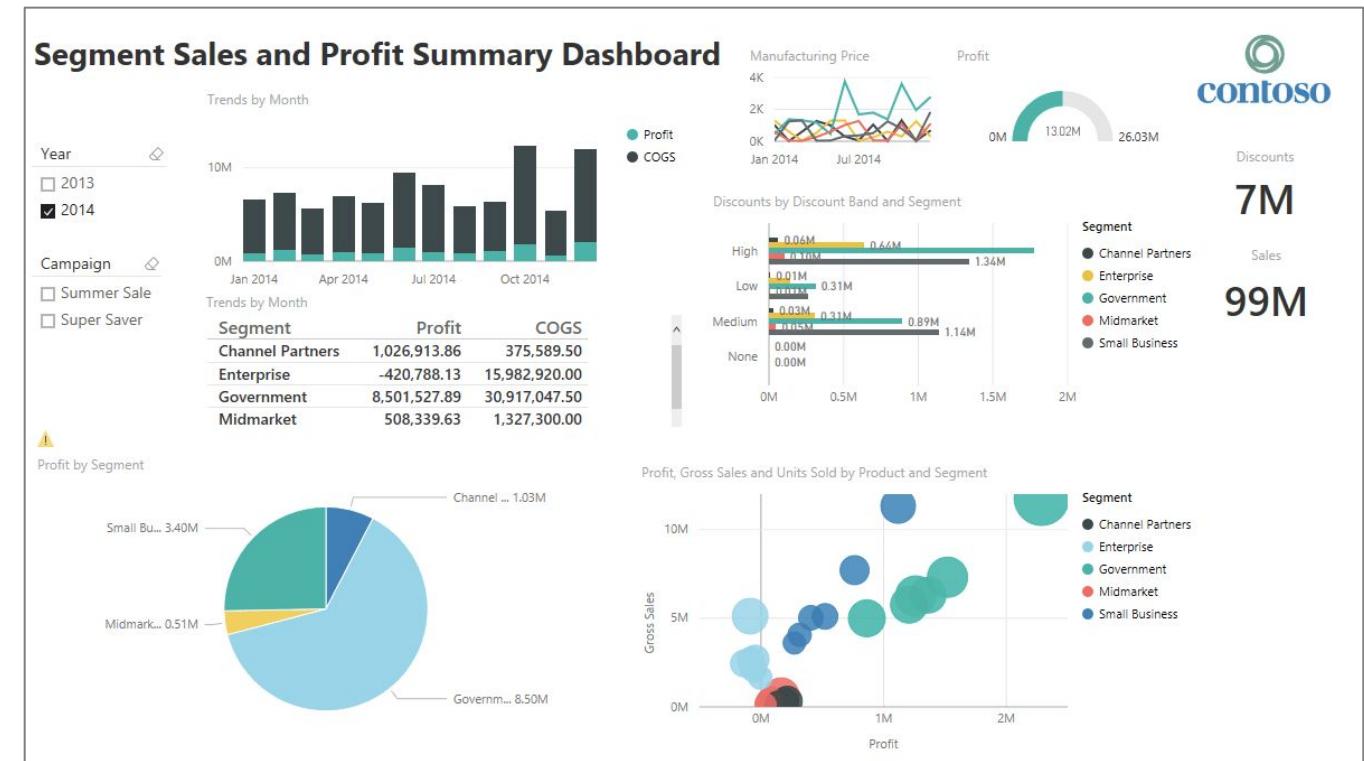
Dashboard 2!

- Reduced information overload
- All information nicely fits within the screen without scrolling
- Segment colors are consistent
- The '**Profit by Segment**' bar chart clearly shows the negative Enterprise results now
- The scatter chart adds perspective at a glance with regards to the product performance within a segment



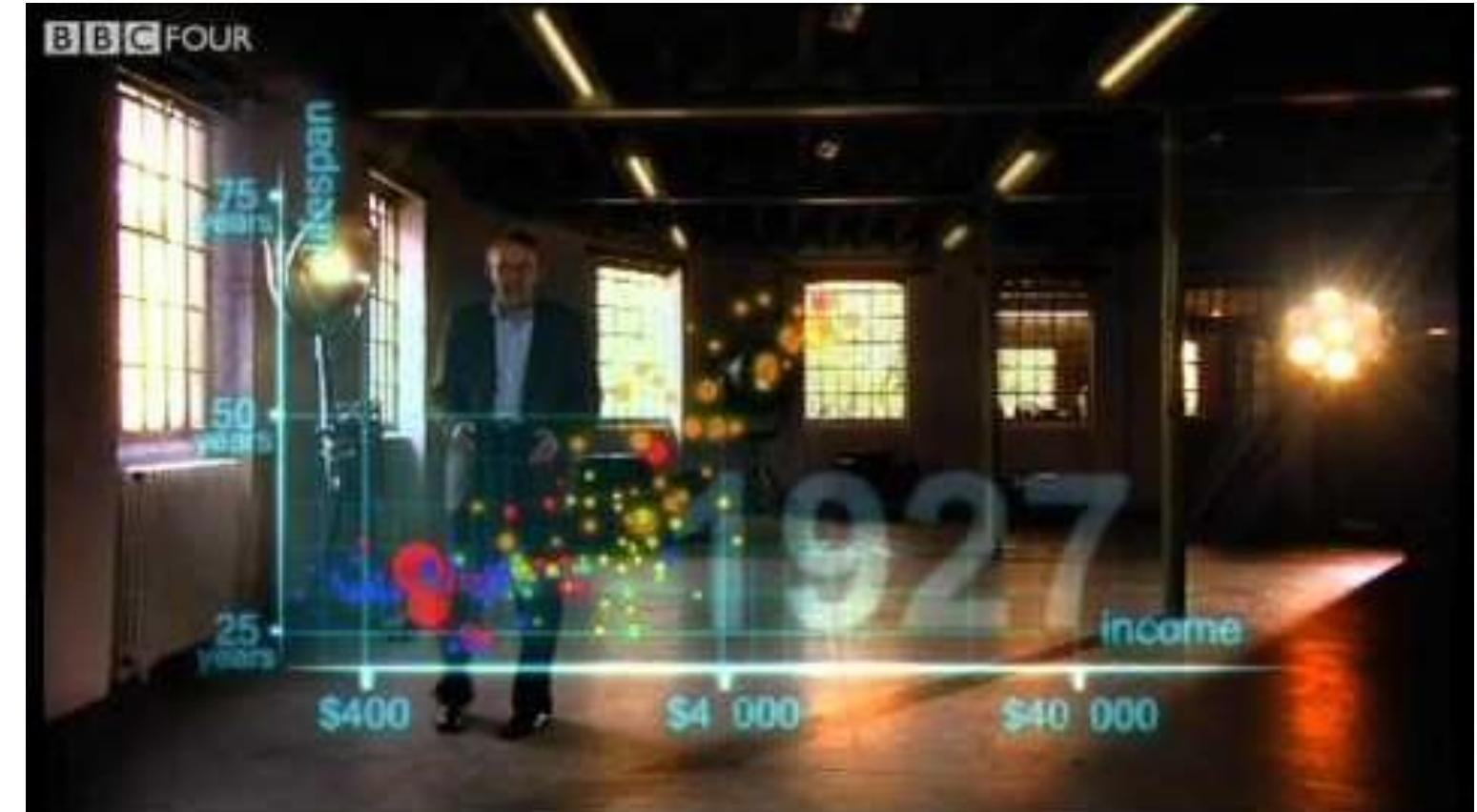
Why isn't Dashboard 1 as effective?

- Too much information and inconsistent segment colors
- The pie chart fails to communicate the negative Enterprise results
- The '**Manufacturing Price**' line chart is way too small and has no legend
- The '**Discount Bands bar chart**' has unnecessary labels
- The table with the scroll bar in the middle of the screen does not add any value



Hans Rosling visualization video

- 200 Countries, 200 Years, 4 Minutes - The Joy of Stats - BBC Four (narrative framework)
- <https://www.youtube.com/watch?v=jbkSRLYSojo>



Why is storytelling important?

- Regardless of your role, **you are a communicator first and foremost**. Data is worthless if you don't communicate it properly. Great analysis must also have great storytelling
- Never assume that the results will speak for themselves. Stories always trump statistics alone, and communicating insights from data clearly, requires a structured approach
- Let's look at two frameworks you can use

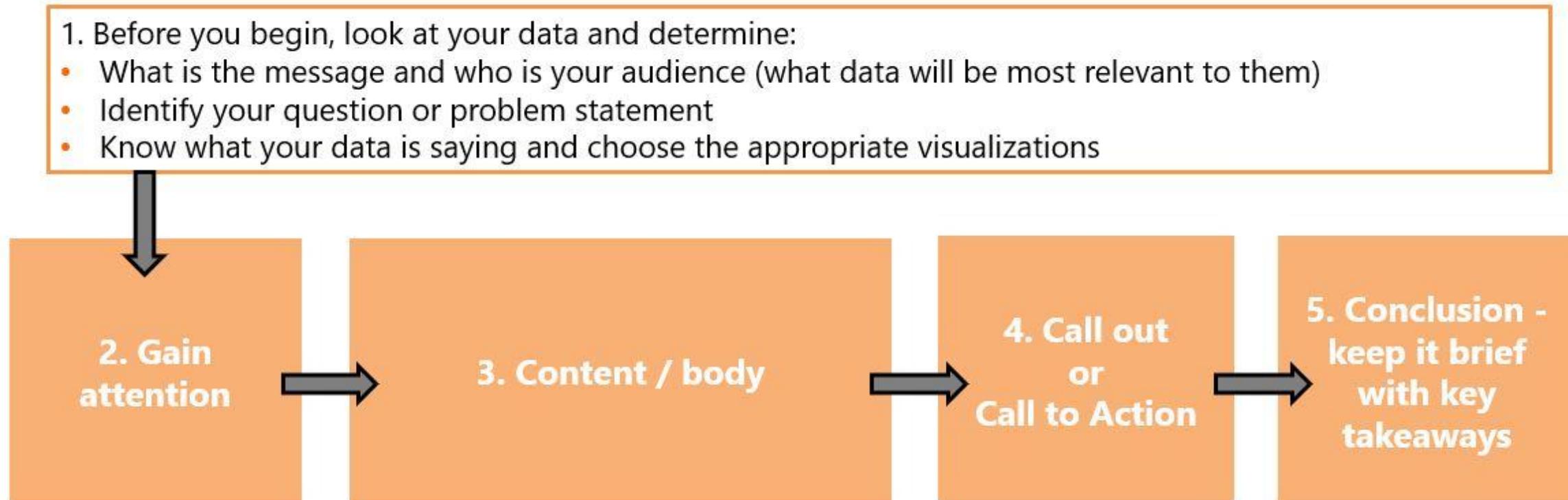
Data storytelling - George Roumeliotis

- Current Airbnb data science manager and was head of a data science group at Intuit
- For projects, he developed a business story framework for communicating about each analysis:
 - 1. My understanding of the business problem
 - 2. How will I measure the business impact?
 - 3. What data is available?
 - 4. The initial solution hypothesis
 - 5. The solution
 - 6. The business impact of the solution



Step 1: Preparing key metrics

- Narrative framework graphic organizer

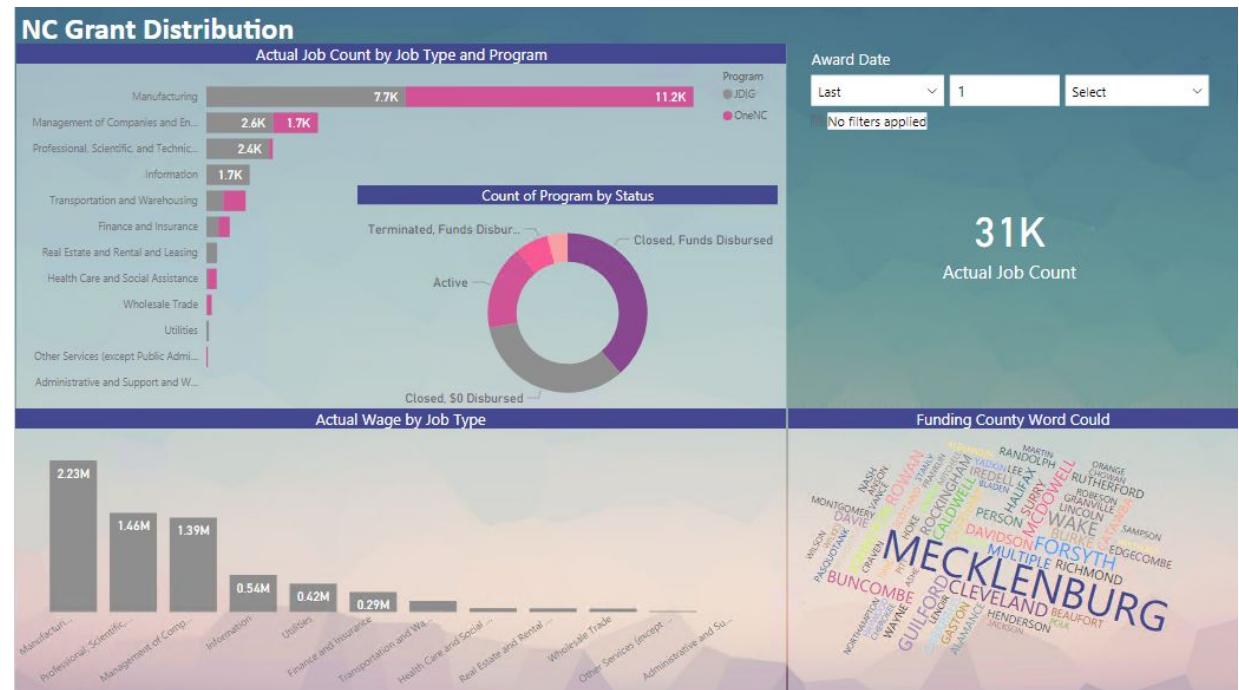


Knowledge Check 4



Practice your storytelling!

- Inspect your dashboard and find a piece of data that is interesting or surprising to you
- Take 10 minutes to modify your dashboard and sketch out the key points that you want to present (see some tips in the appendix)
- We will spend 15 minutes taking turns presenting to your small group tomorrow morning



Data visualization prep and analysis

- Before you can start analysis and making visualizations, you should start with a clear problem statement
- Once you have a clear problem statement, you can follow the process below for data analysis and prep, and then explore data visually

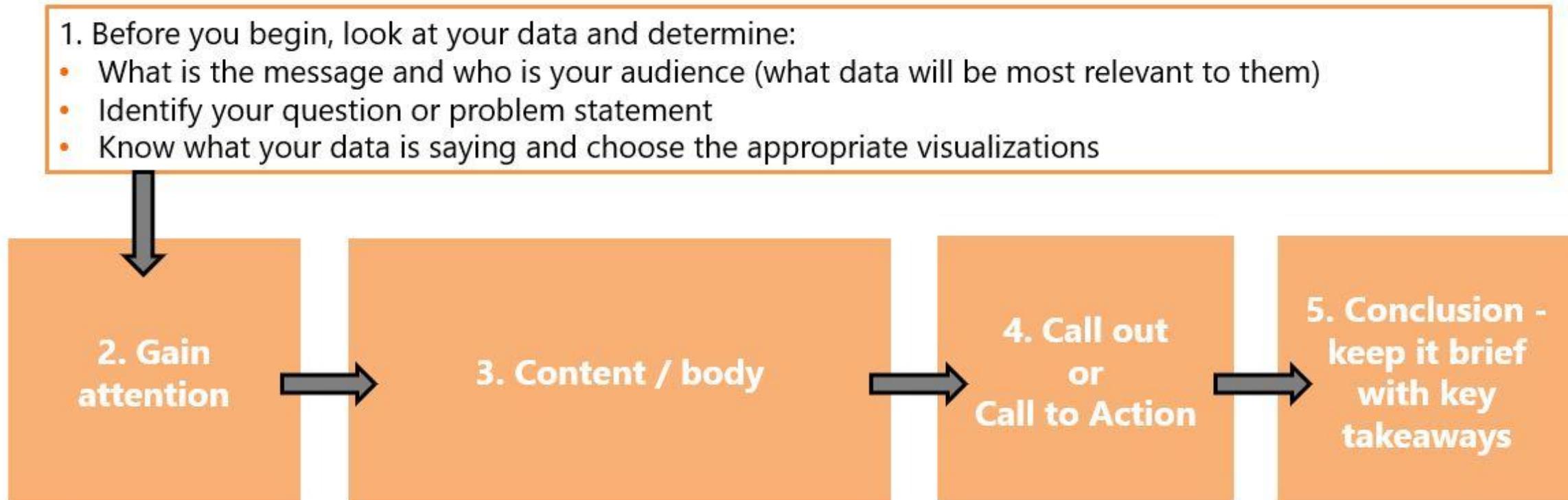


5 tips for your data presentation

- 1. Explain what the data axes mean (this is a part of orienting your audience)
- 2. Explain what the value of the data points mean
- 3. Explain the level of detail presented
- 4. Explain what data points they should be focusing on
- 5. As noted in the previous graphic organizer, always end with a key takeaway based on the visualization(s)

Step 1: Preparing key metrics

- Narrative framework graphic organizer



Step 2: Gain attention

- Headline/heading
- Pose a problem or ask a question
- Tell a story within your story



Step 3: Use relevant content knowledge

- Stimulate prior knowledge
- Present content and appropriate data visuals
- Have planned questions and key points
- Compare, contrast and connect
- Add supporting evidences



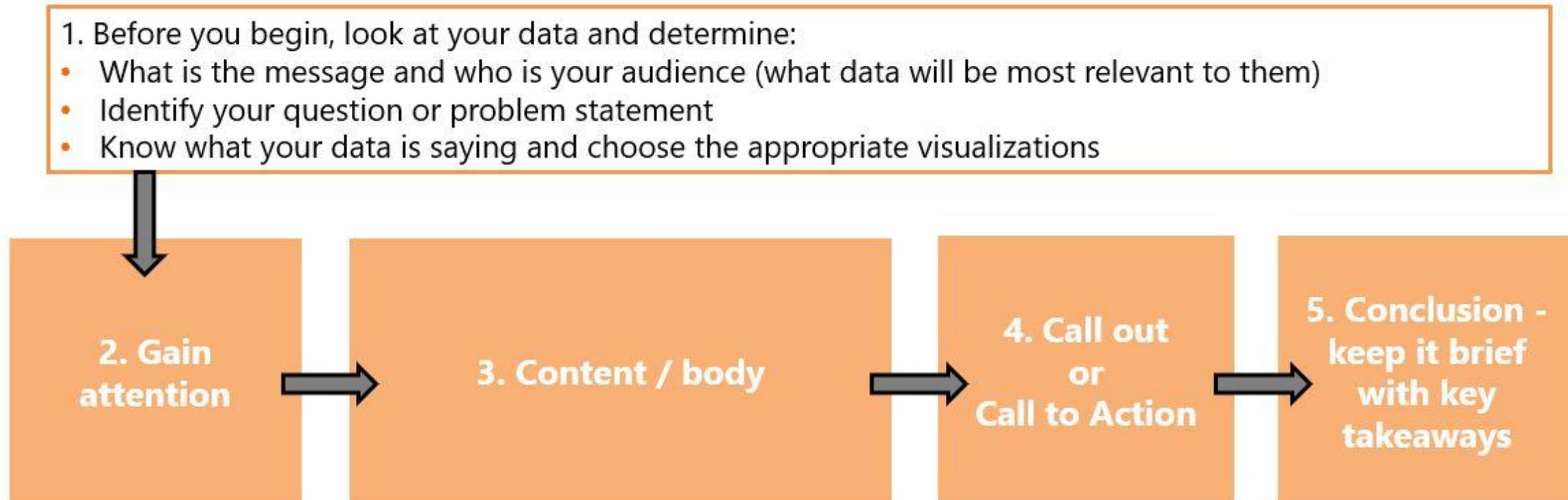
Step 4: Call to action

- Propose a solution
- Describe benefits of your solution



Step 5: Conclusion

- Keep it brief and make it actionable!



Final note on 508 compliance

- **Section 508**, an amendment to the United States Workforce Rehabilitation Act of 1973, is a **federal law mandating that all electronic and information technology developed, procured, maintained, or used by the federal government be accessible to people with disabilities.**
- Internally: Power BI has Tab menu, keyboard shortcuts and audio accessibility
- Any outward facing data sharing or visualizations shared from the agency must follow 508 Compliance requirements:
 - Don't rely on color as a differentiating factor
 - Use contextual and descriptive text for links and buttons (variables, relationships, axes and CODE)
 - Use text, not images, in titles and navigational elements



Congratulations!

- 1. Building a complex BI report with interactive visualizations
- 2. Sneak peek on ETL layer: load data through Power Query
- 3. Implement data storytelling frameworks and techniques

Tomorrow, we'll learn how to:

- 1. Import a variety of data sources into Power BI
- 2. Program in DAX programming language
- 3. Build an interactive map in Power BI