

# DATA SOCIETY:

## Power BI Bootcamp

Day 1

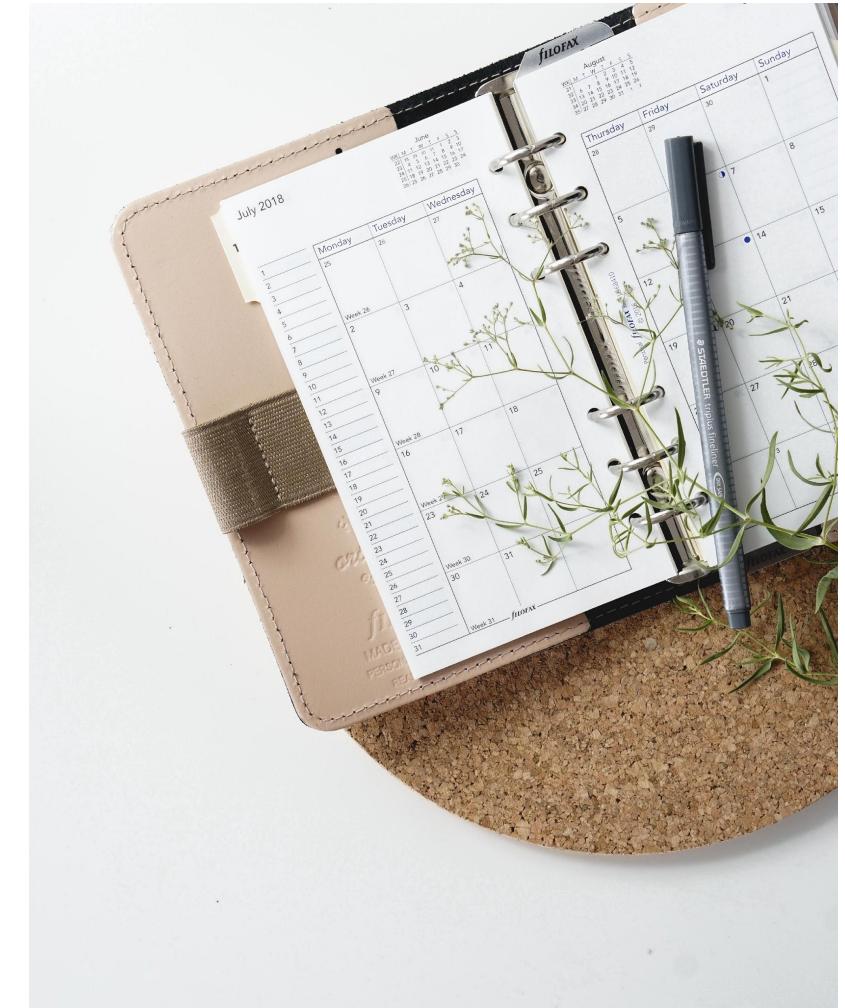
“One should look for what is and not what he thinks should be.”

- Albert Einstein



# Welcome!

- Hours and breaks
  - 4 days
  - 11 am - 2 pm
  - 1-2 short breaks each class
- Materials
  - PDF slide decks, Datasets, lab and exercise files



# Best practices for virtual classes

- Find a quiet place, free of as many distractions as possible. Headphones are recommended.
- Remove or silence alerts from cell phones, e-mail pop-ups, etc.
- Participate in activities and ask questions. This will be interactive!



# Who we are

Data Society's mission is to integrate Big Data and machine learning best practices across entire teams and empower professionals to identify new insights.

We provide:

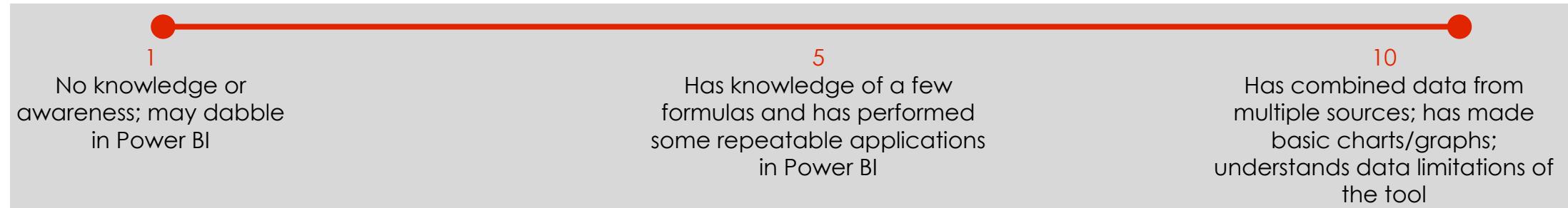
- High-quality data science training programs
- Customized executive workshops
- Custom software solutions and consulting services

Since 2014, we've worked with thousands of professionals to make their data work for them.



# Polling question

What do you rate your current Power BI literacy level on a scale of 1-10?



# Pre-Work for PowerBI

If needed, review the following:

- [Overview of Power BI Desktop](#) - 4 minutes
- [Getting started with Power BI Desktop](#) - 9 minutes
- [Connect to data sources in Power BI Desktop](#) - 8 minutes

# Agenda

- What is Power BI and business intelligence?
- Review the four layers of Power BI
- Build your first BI report
- Visualization Types

# What is BI and Power BI?

**Business Intelligence** is a set of techniques and tools for the acquisition and transformation of raw data into meaningful information for business analysis purposes

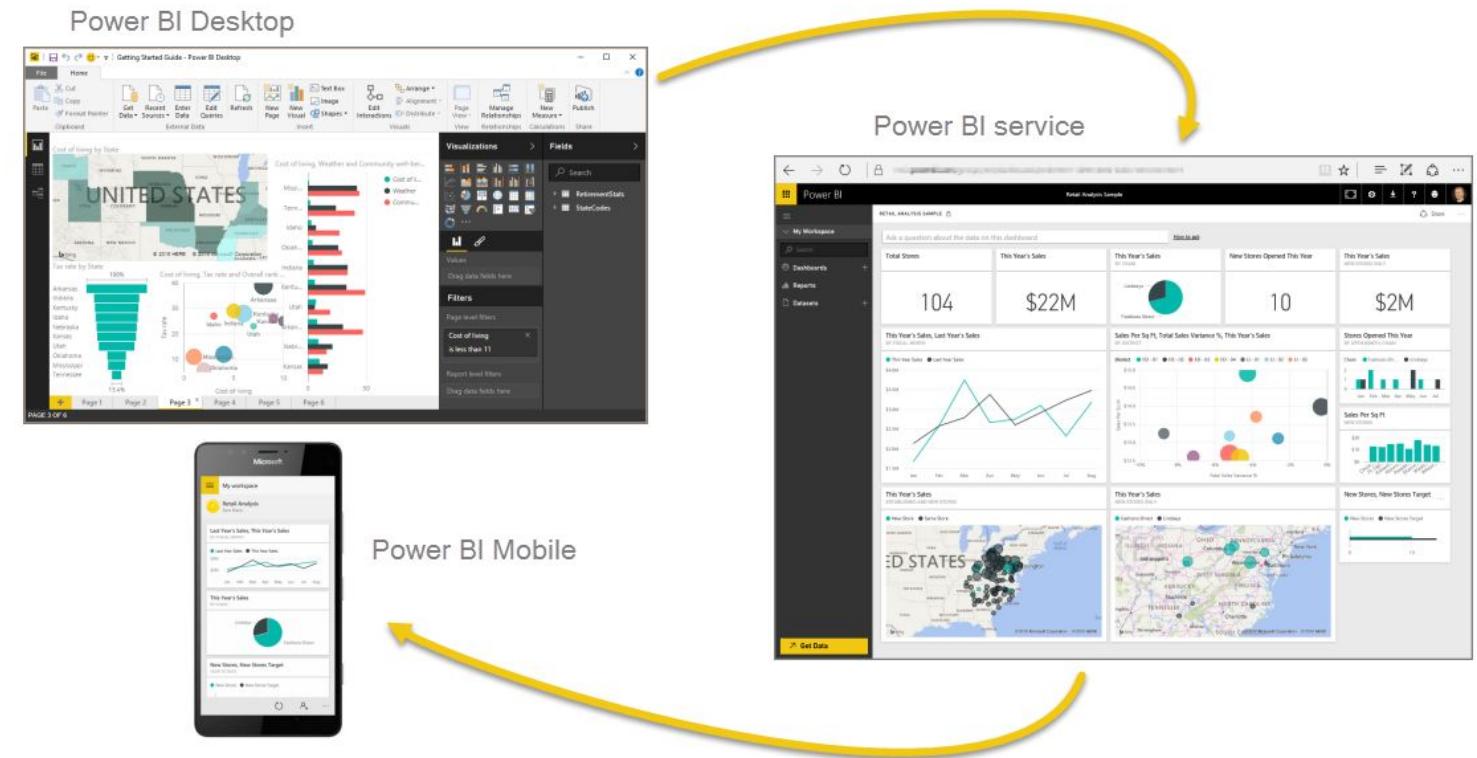
**Power BI** is a business analytics tool that allows you to:

- **Visualize** your data
- **Share** insights across your organization
- **Embed** insights in your **app or website**
- **Connect** to hundreds of data sources and bring your data to life with live customized **dashboards and interactive reports**

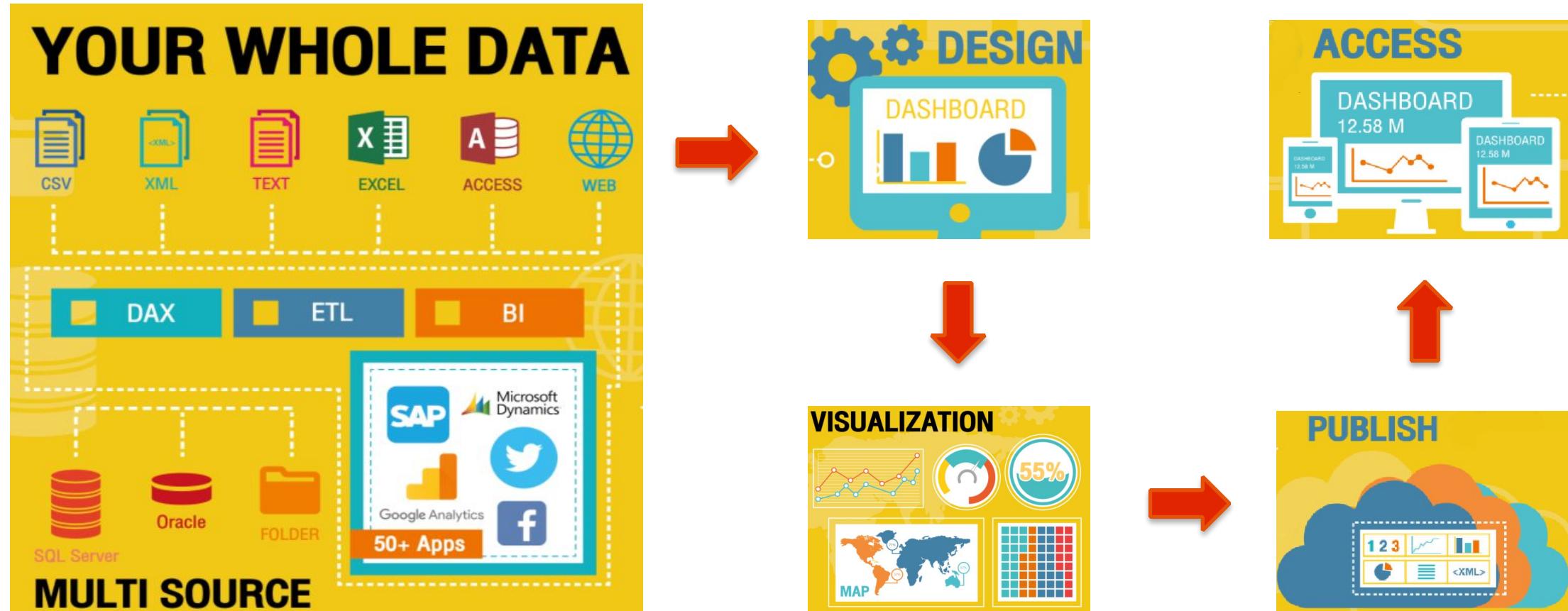


# The ways you can use Power BI

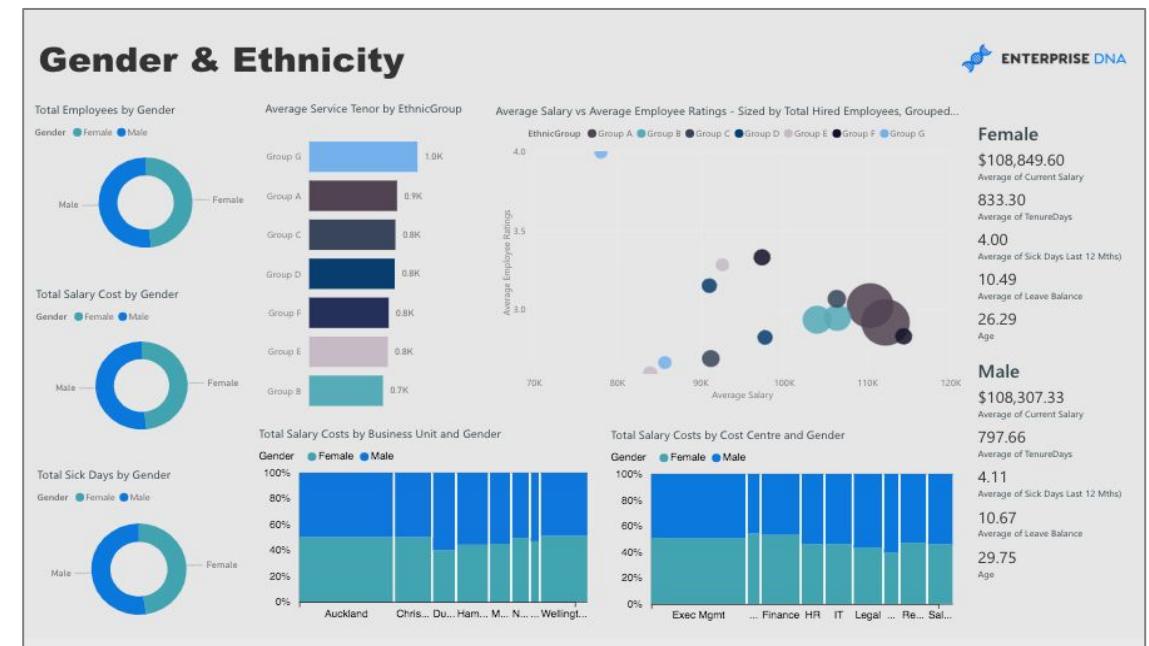
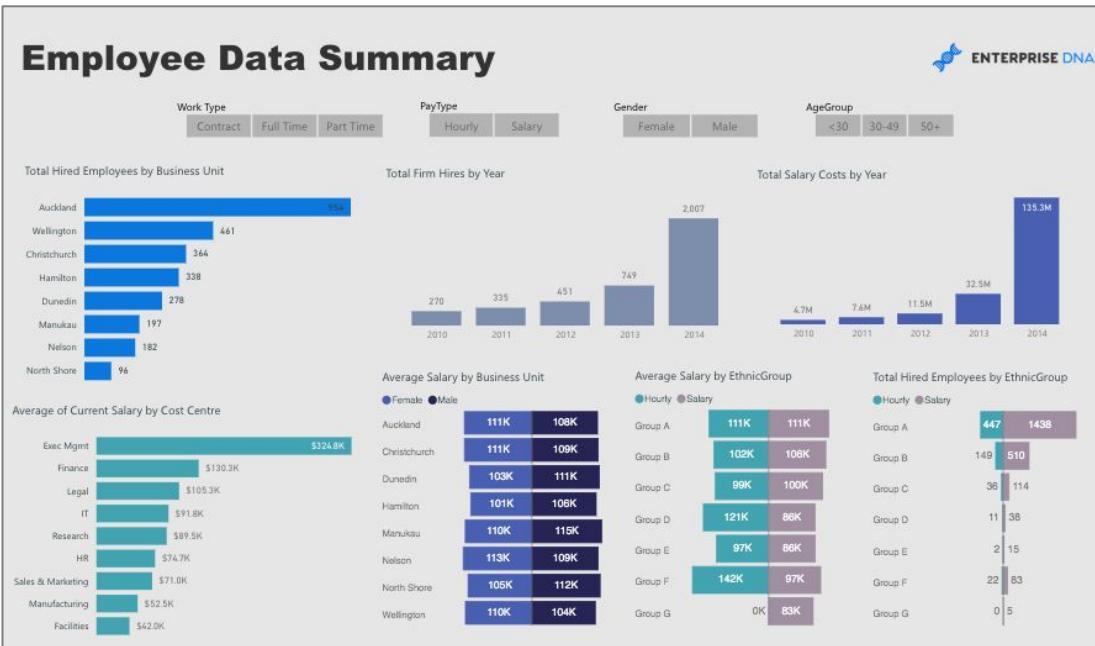
- **Power BI Desktop** is the platform where you can transform and shape data in addition to developing your model
- **Power BI Web Service** is where you go to publish reports to your organization and set up automatic data refresh. This ensures everyone has the latest information
- **Power BI Mobile app** allows you to connect to and interact with your cloud and on-premises data, reports and dashboards



# Logical structure of Power BI

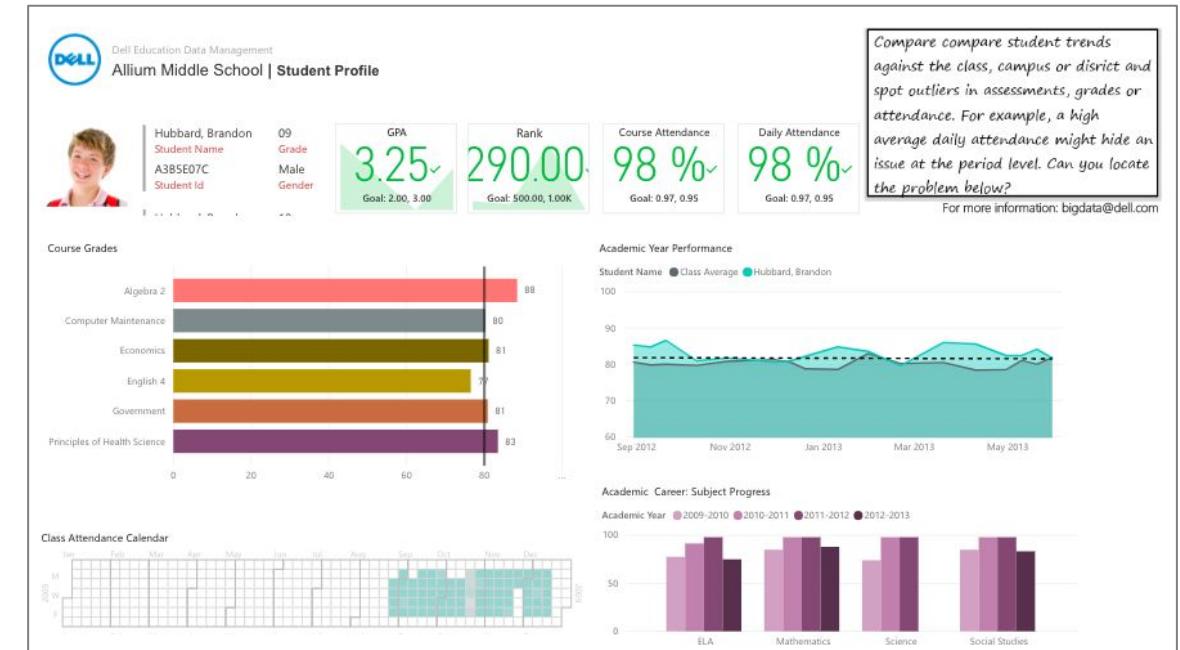
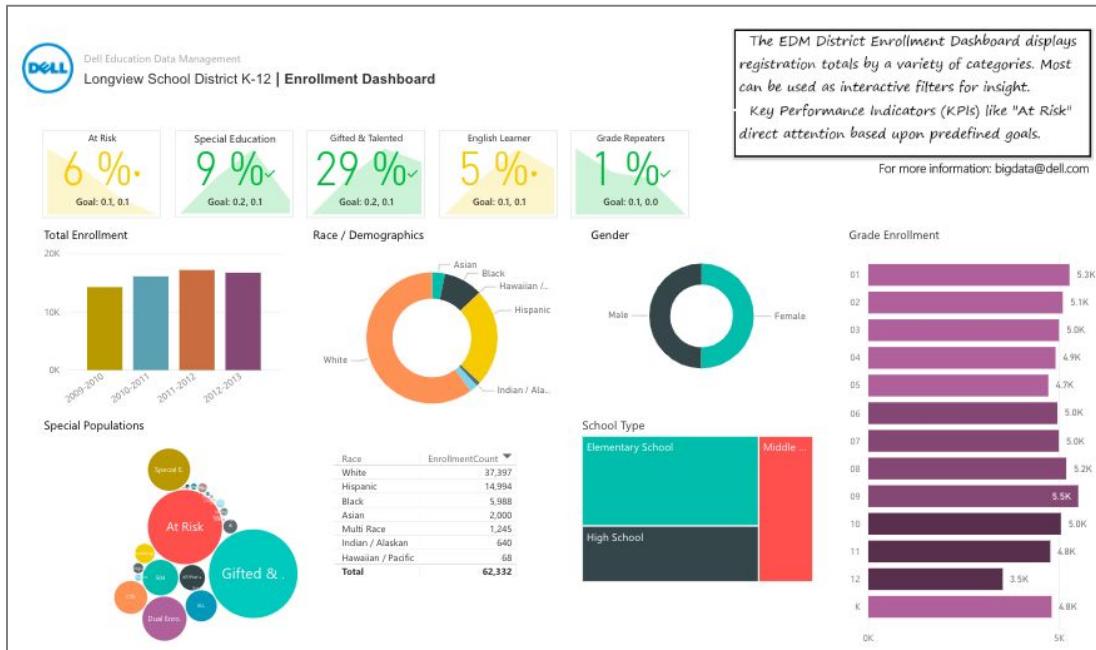


# Power BI for Human Resources



ENTERPRISE DNA

# Power BI for Education



Education Data Management

# Power BI for Healthcare

**EGPAF Globally**

Choose a country:

- Select all
- Cameroon
- Cote d'Iv...
- DRC
- Eswatini
- India
- Kenya
- Lesotho
- Malawi
- Mozamb...
- Rwanda
- Tanzania
- Uganda
- Zambia
- Zimbabwe

Pregnant Women Accessed PMTCT Services to Date

Indicator	Value
Children receiving ART	87,648
HIV-positive pregnant women who received ART to reduce the risk of MTCT (B+)	24,533
Individuals who received HIV testing Services (HTS) and received their test results	3,323,828
Pregnant women reached with PMTCT services to date	28,392,730
Estimated number of babies born HIV free due to EGPAF programs to date	318,237
Pregnant Women on ARV to date	1,707,258
Estimated number of lives saved through EGPAF's provision of ART	91,766
Adults receiving ART	1,529,184
Infants who received their first virologic test within 0-2 months	17,946
Individuals screened for TB	1,413,233

**Impact**

318,237 Number of HIV Infections Averted

91,766 Number of Lives Saved due to ART

 **Elizabeth Glaser Pediatric AIDS Foundation**

*Until no child has AIDS.*

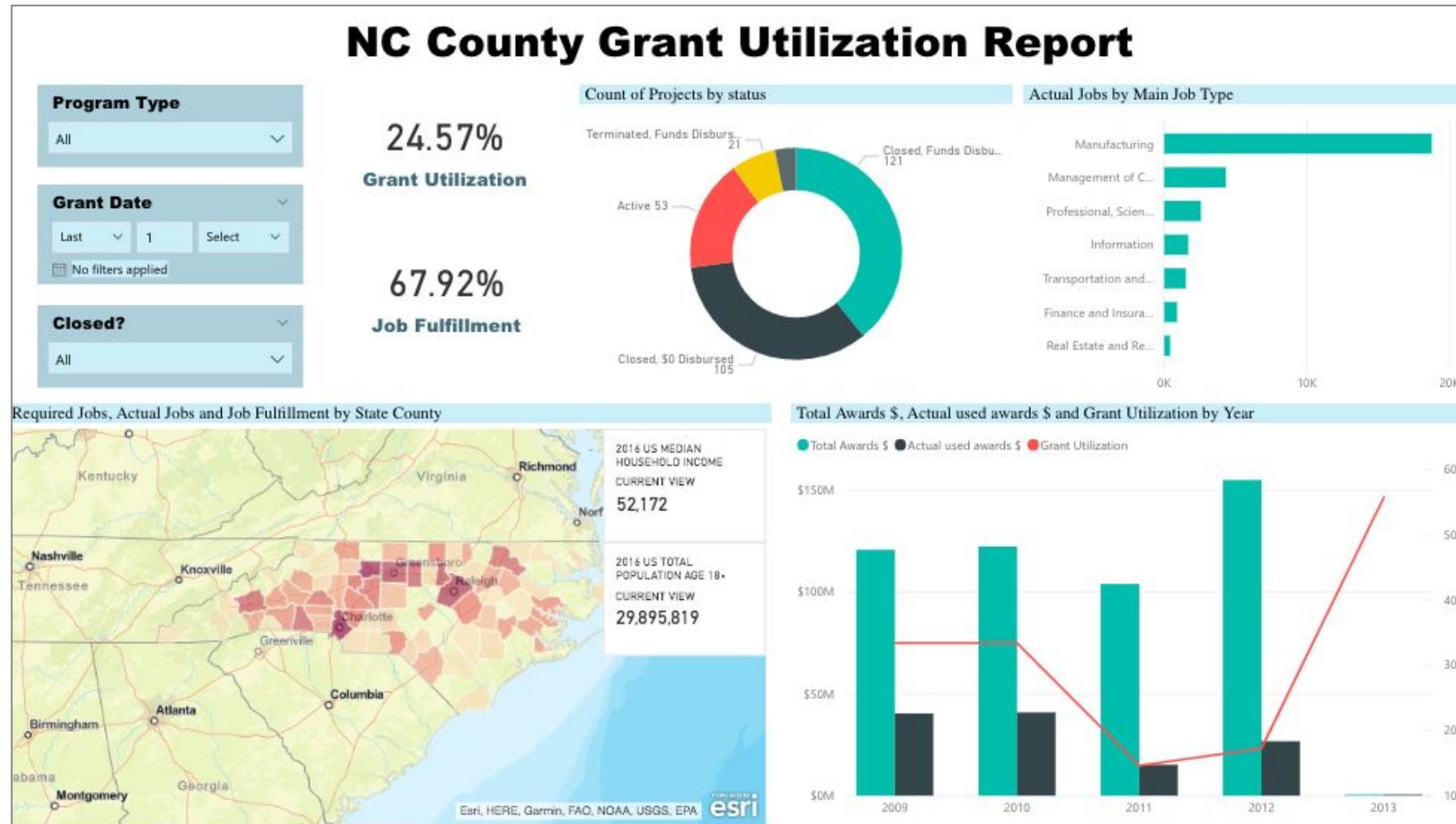


Elizabeth  
Glaser  
Pediatric AIDS  
Foundation

/ Until no  
child has  
AIDS.

EGPAF Global Data Dashboard

# Power BI for Finance

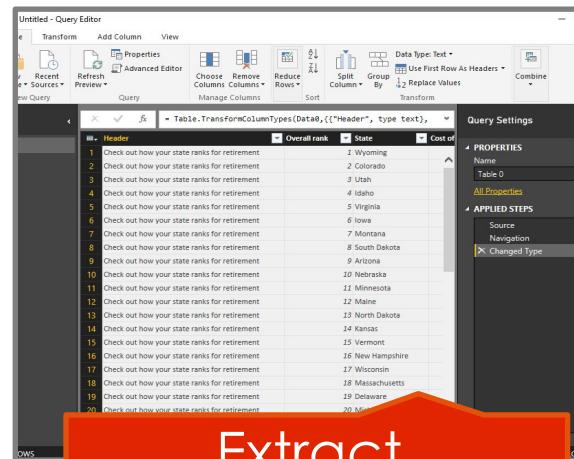


# Agenda

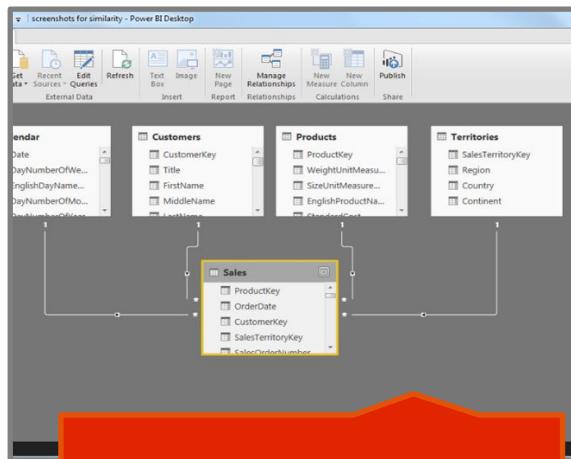
- What is Power BI and business intelligence?
- Review the four layers of Power BI
- Build your first BI report
- Visualization Types

# The 4 Layers of Power BI

## Model Developer

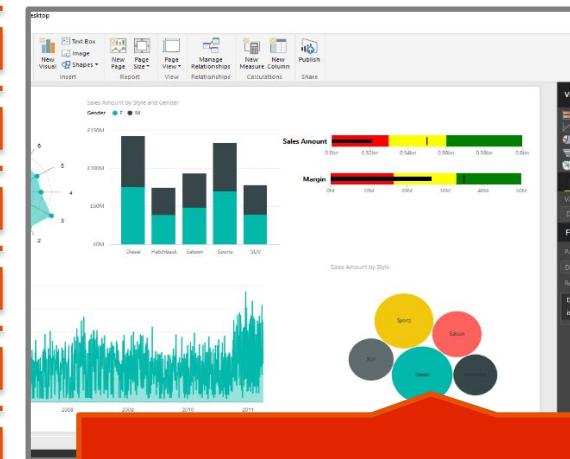


Extract,  
Transform and  
Load (ETL)

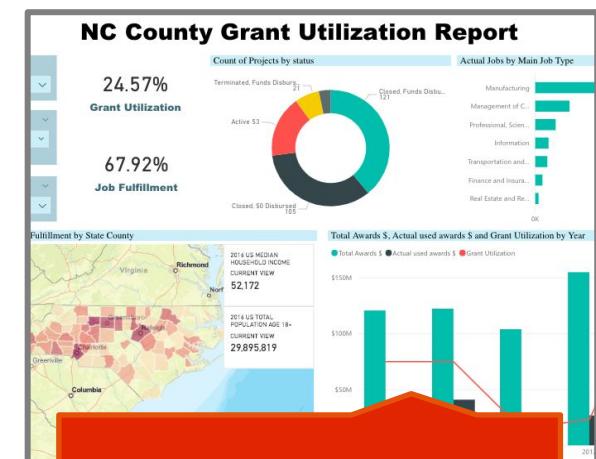


Data Modeling

## Report Developer



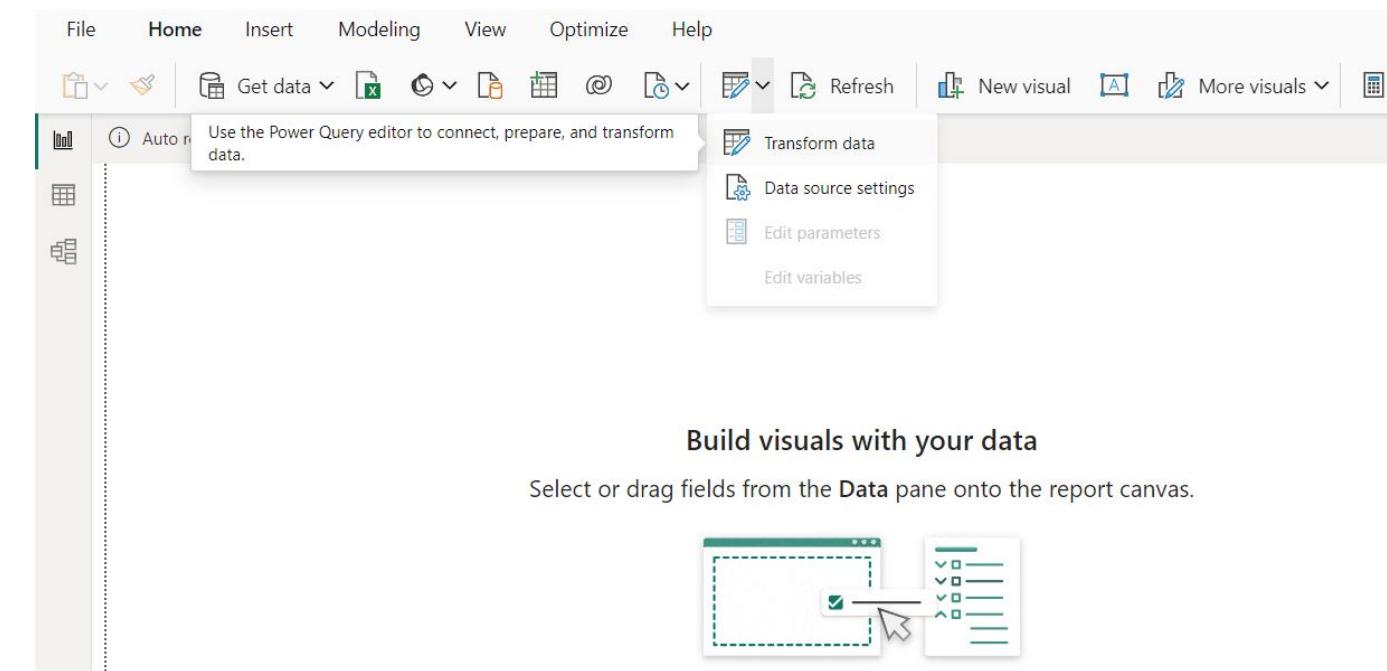
Report Design



Web Portal

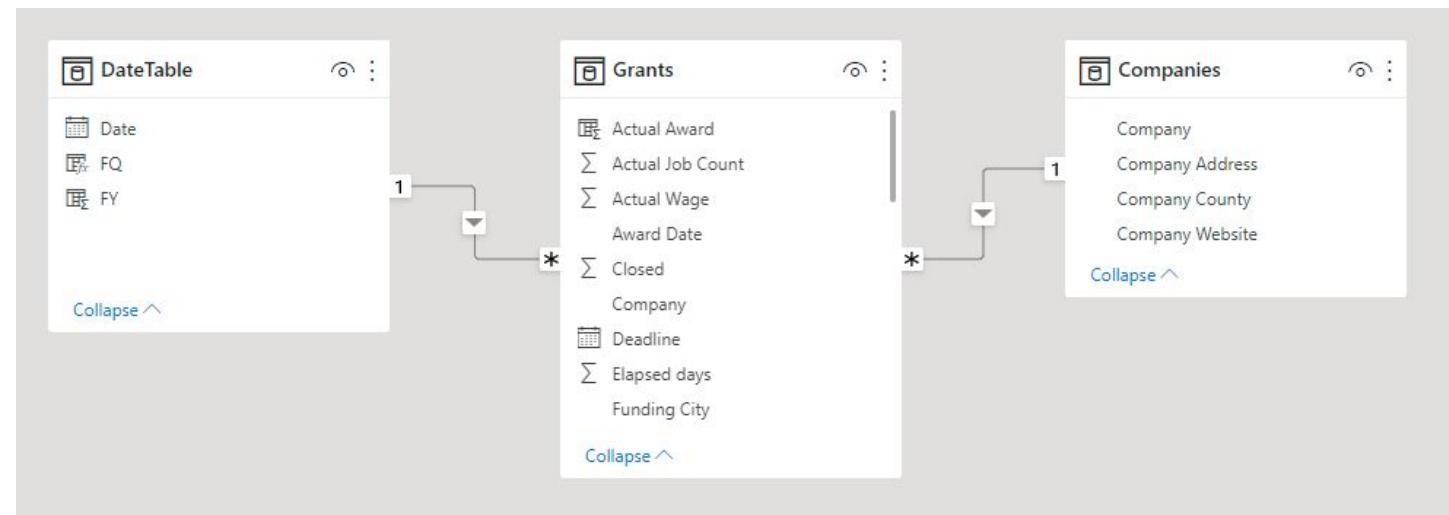
# Layer 1: Extract, Transform, Load (ETL)

- **ETL** is the process that **extracts** data from a different source system, **transforms** and **loads** the data into a data warehouse system
- **Power Query** is the ETL tool in Power BI, which allows you to:
  - Connect to various data sources
  - Transform your data



# Layer 2: Data Modeling

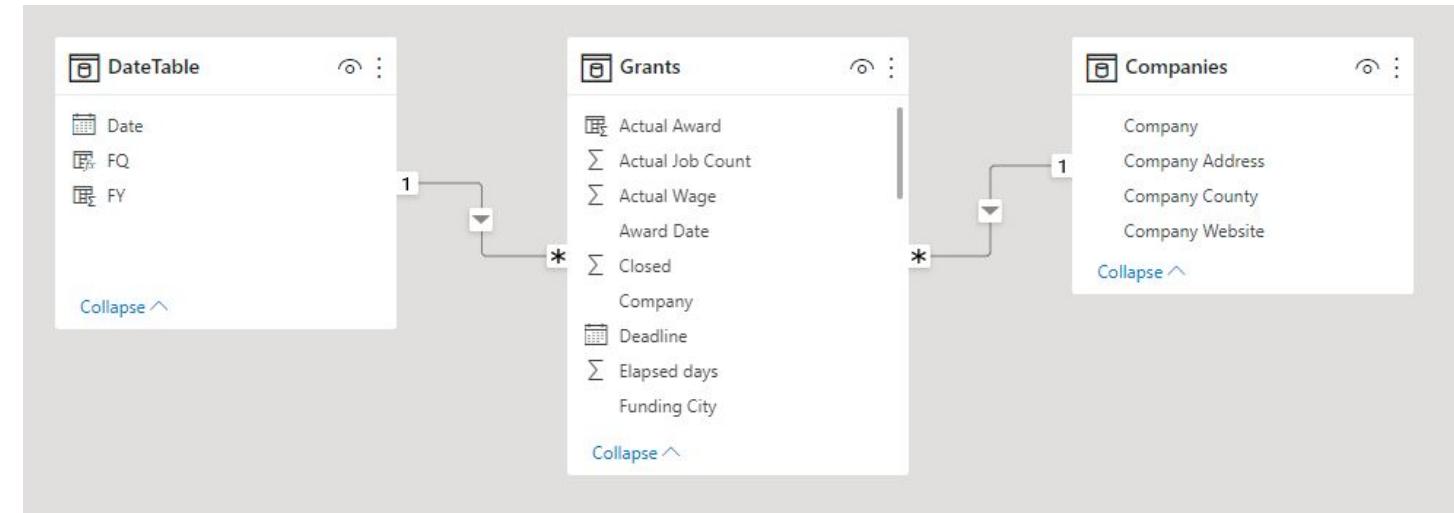
- **Data modeling** is the process of documenting systems through diagrams, text and symbols to represent how data needs to flow



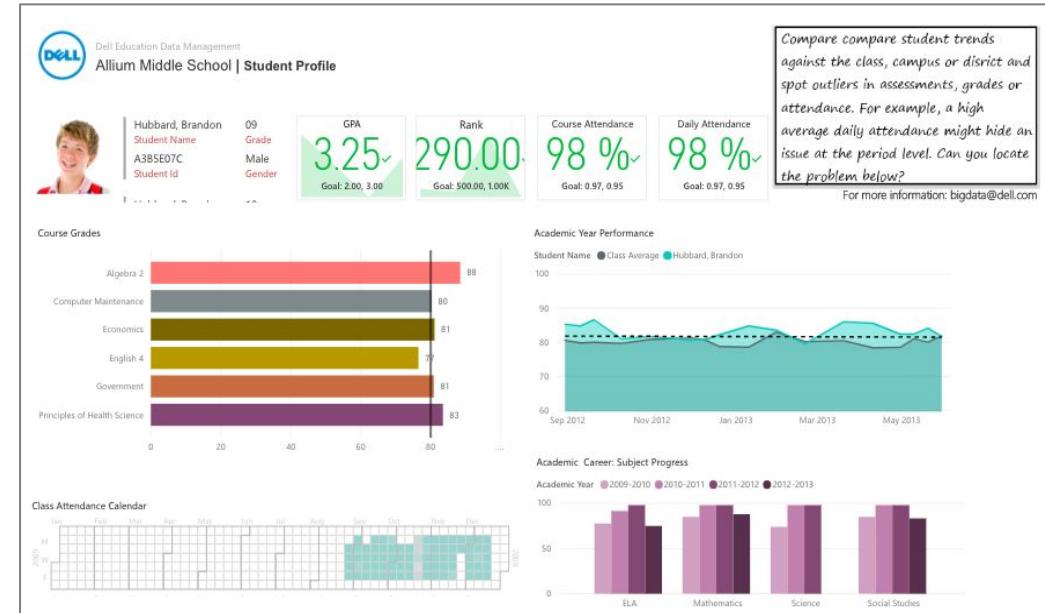
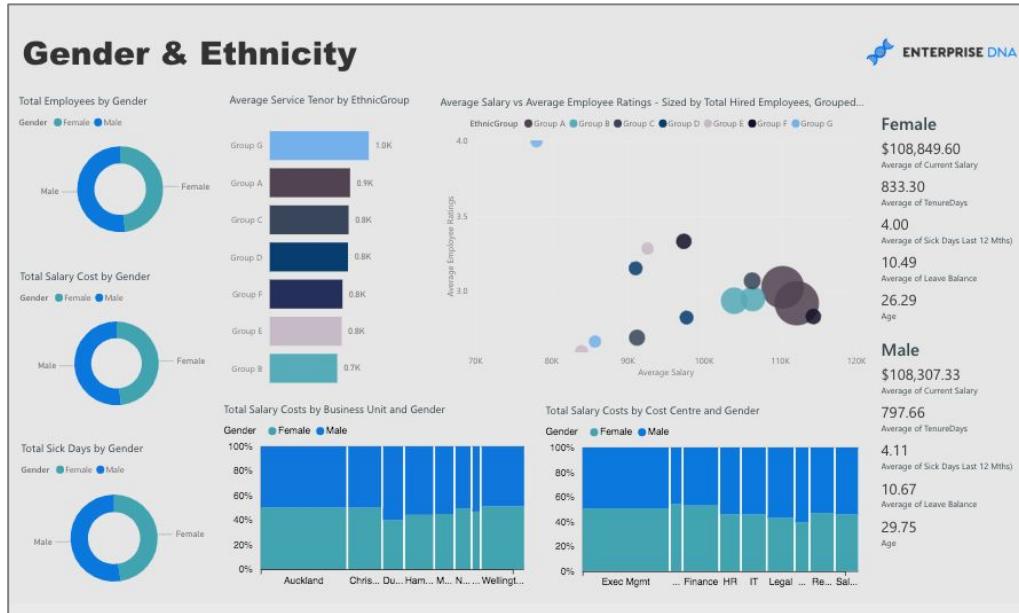
# Layer 2: Data Modeling

Data Modeling involves:

- Using multiple tables from multiple sources
- Combining tables in a way that creates a model that suits your needs
- Creating your own custom calculations and assigning new metrics to view specific segments of your data



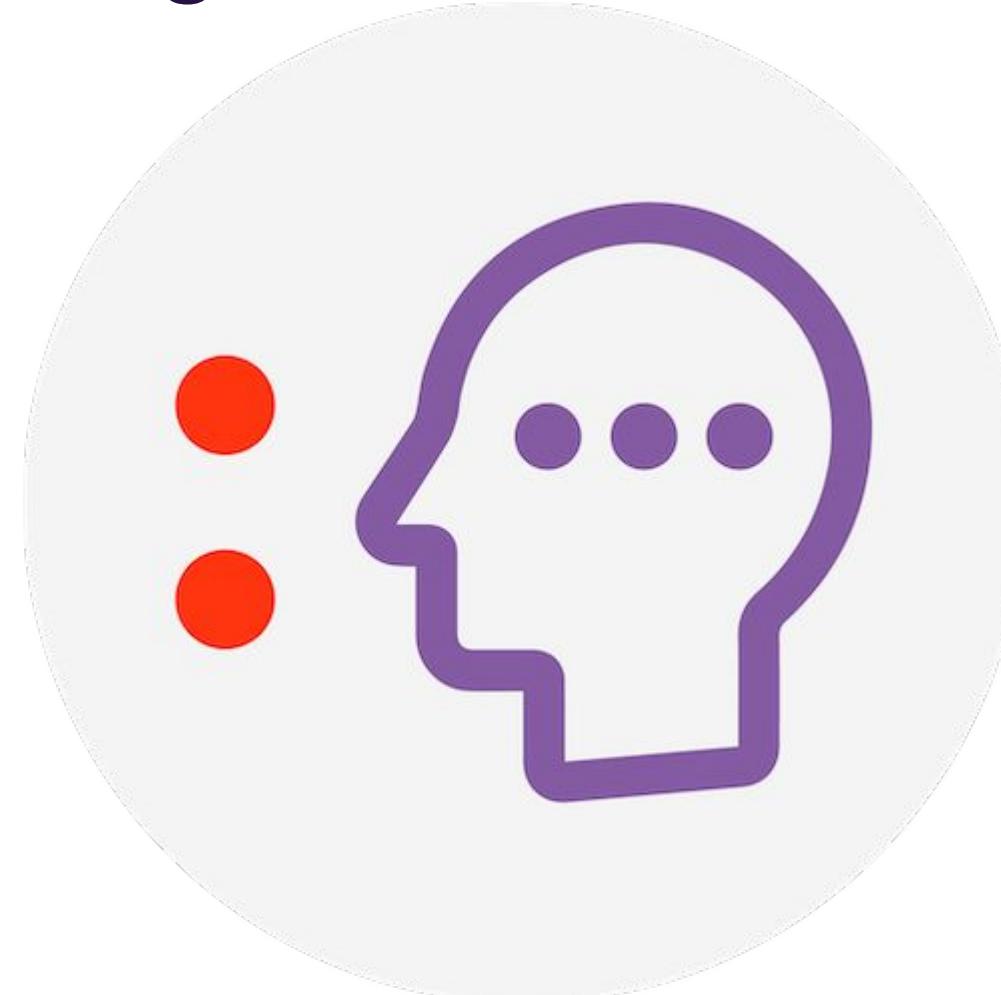
# Layer 3: Report Design



# Layer 4: Web Portal

The screenshot shows the Power BI Home page. On the left, a sidebar menu includes: Home, Create, Browse, OneLake data hub, Apps, Metrics, Monitoring hub, Workspaces, My workspace, and Power BI. The main area features a "Recommended" section with five cards: "Getting started with Power BI" (Explore basic Power BI concepts), "Explore this data story" (THE DEFINITIVE 100 MOST USEFUL PRODUCTIVITY TIPS), "Explore this data story" (Cancer Analytics Dashboard - Cancer statistics in the USA), "Getting started with Power BI" (Intro—What is Power BI?), and "Explore this data story" (Ranking Sports by Degree of Difficulty). Below this is a "Recent" section with three tabs: Recent (selected), Favorites, and My apps. A search bar at the top right says "Search" and "New items saved to: My workspace". At the bottom, a table lists recent items: PS314 - 20230912 (Report, opened 5 months ago, location My workspace, endorsement —, sensitivity —) and My workspace (Workspace, opened 5 months ago, location Workspaces, endorsement —, sensitivity —). A "Filter by keyword" and "Filter" button are also present.

# Day 1 - Knowledge Check 1



# Agenda

- What is Power BI and business intelligence?
- Review the four layers of Power BI
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# Lab 1



# Objectives for Lab 1

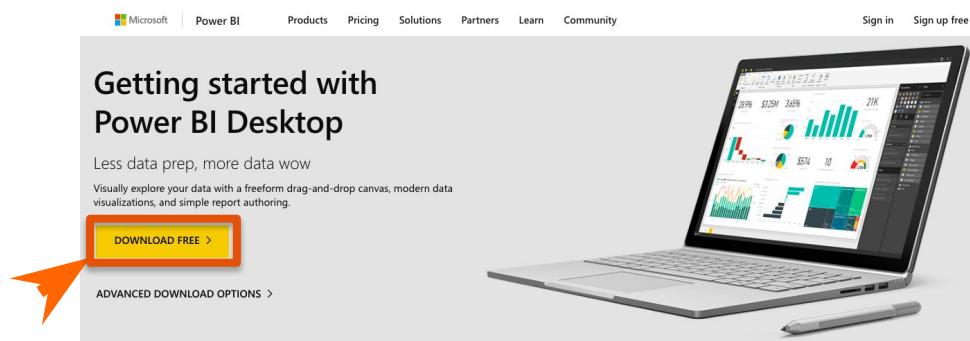
- Open Power BI Desktop (through Remote App) and login
- From the Labs folder upload data from “Grants” sheet of Grants Excel File
- Create a report named “Lab 1”
- Upload report to PowerBI.com ‘My workspace’

Refer to Lab 1.pbix in Lab Files



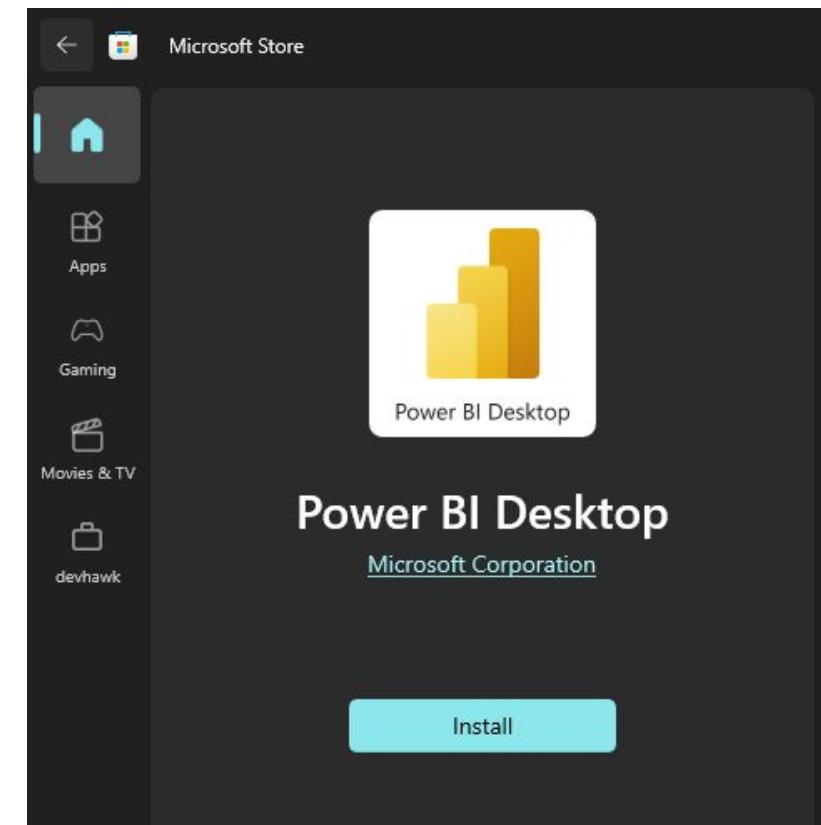
# Download Power BI Desktop

Download from Microsoft.com

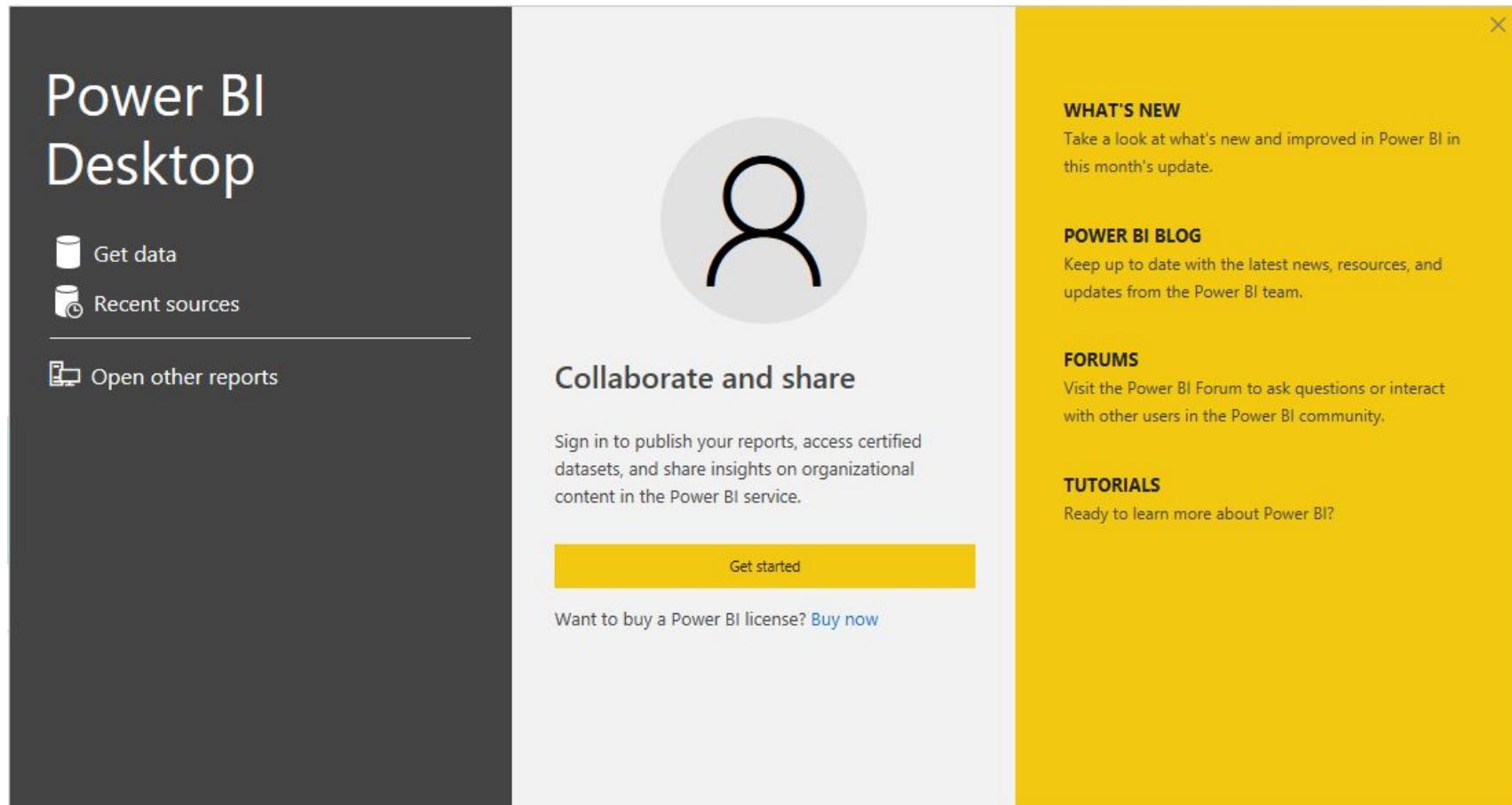


<https://www.microsoft.com/en-us/download/details.aspx?id=58494>

Microsoft Store Install

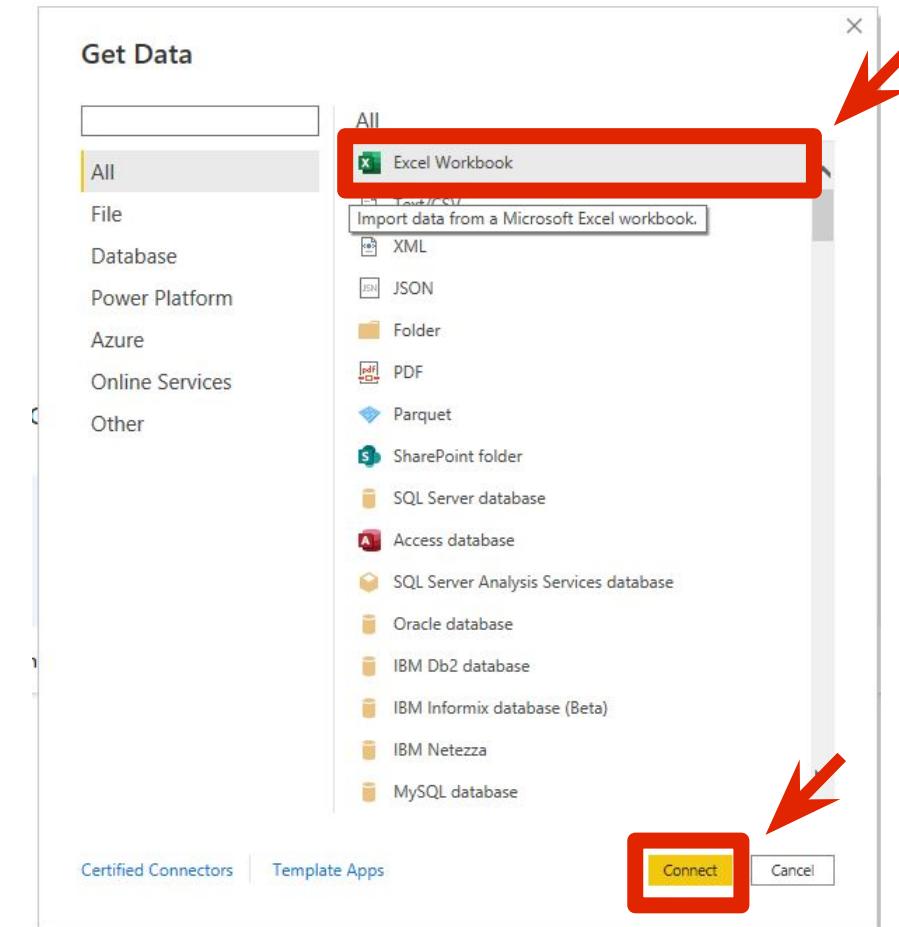
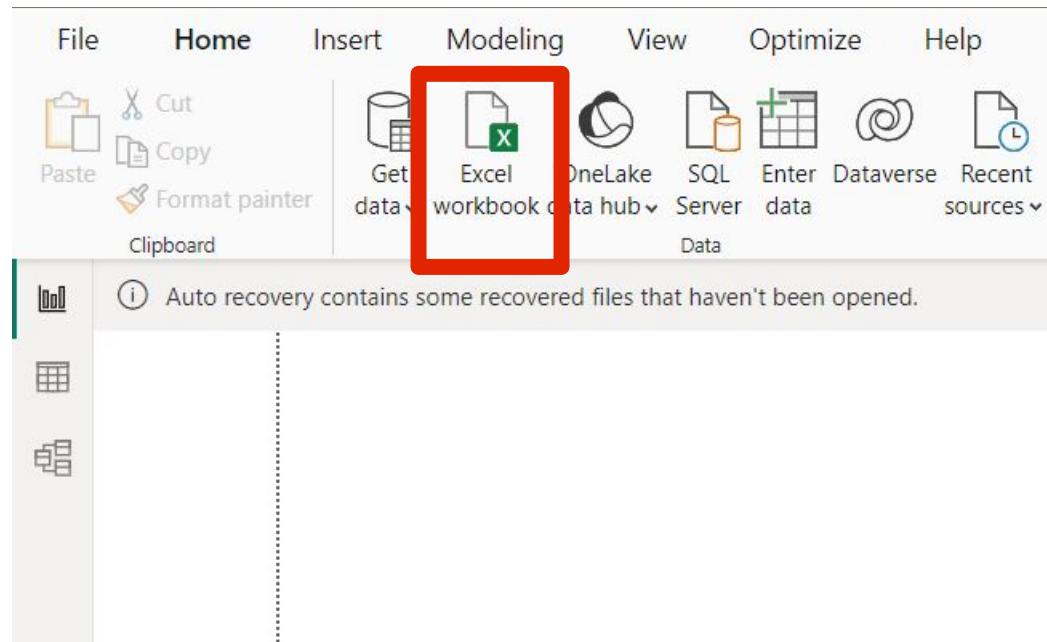


# Sign in to Power BI account

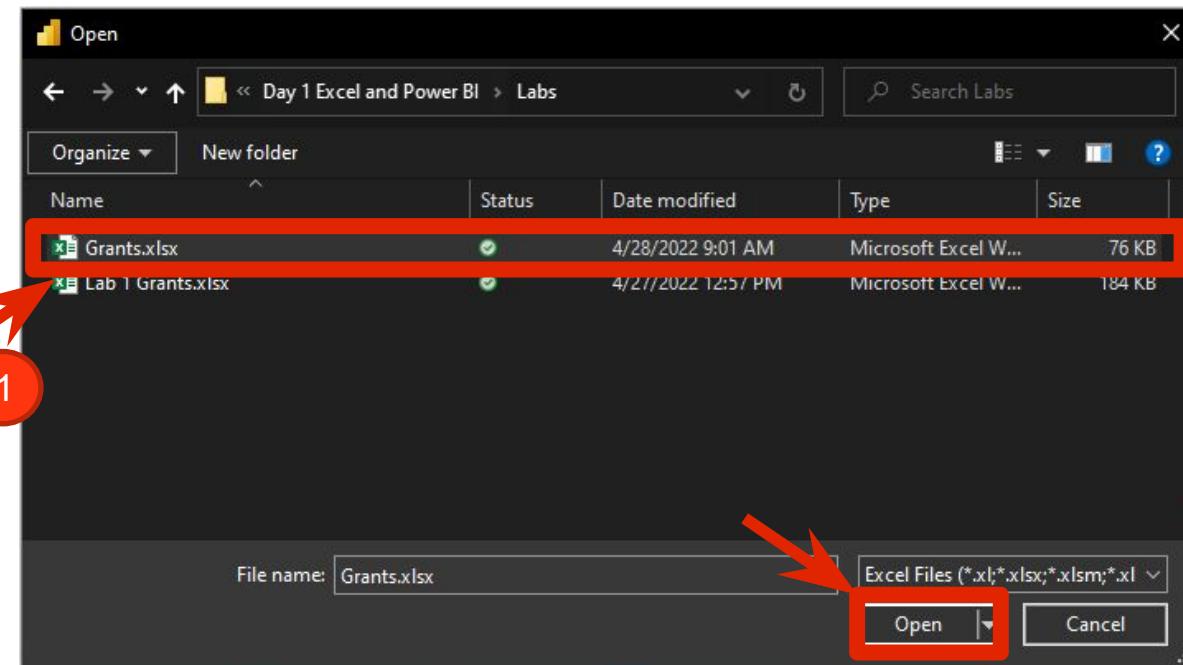


# Get data

Multiple ways to import



# Load data



Navigator

Display Options

Grants

Funding ID Program Award Date Company

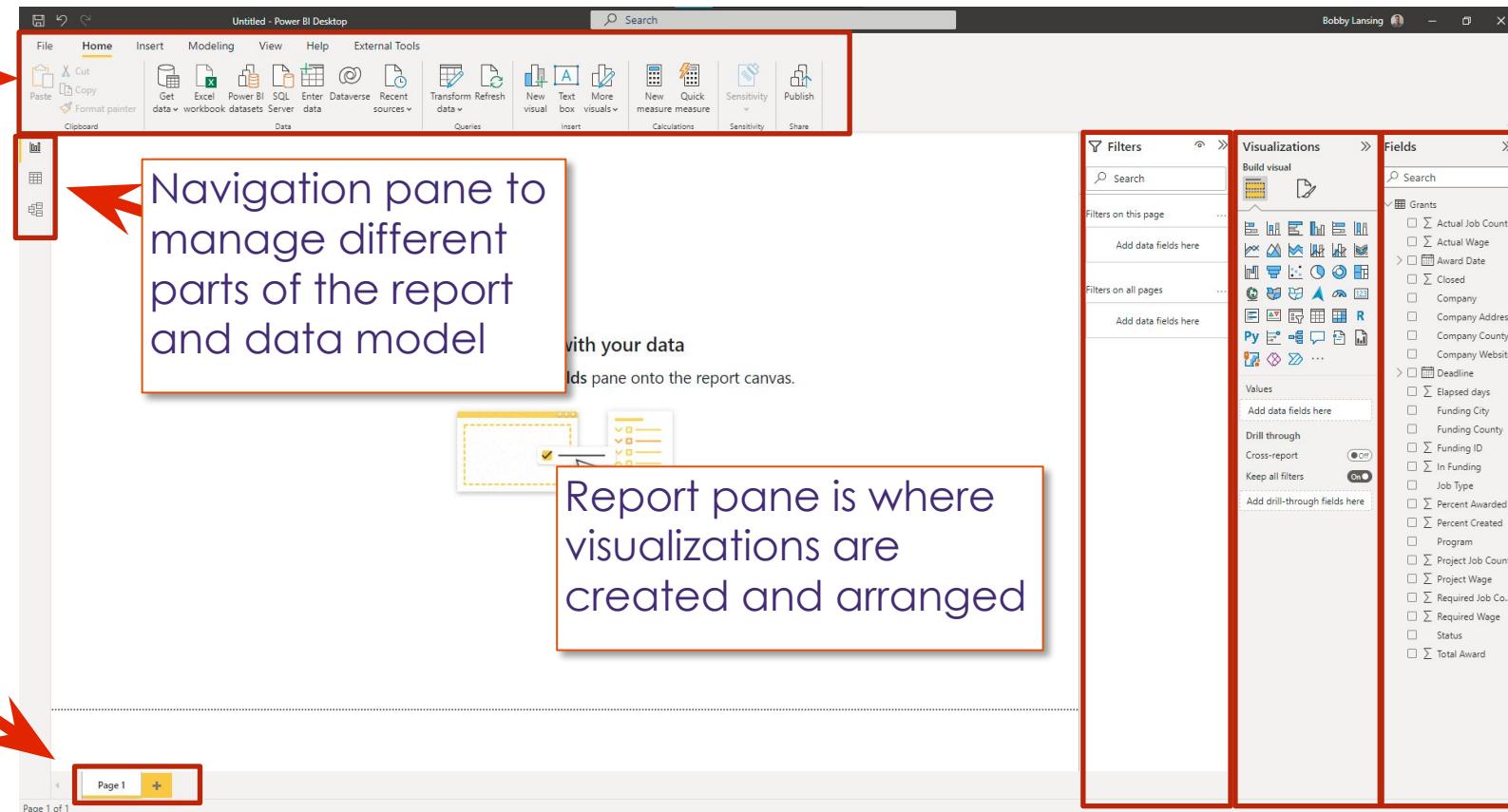
442	OneNC	5/17/2012	Plasticard Locktech International, LLP
236	OneNC	4/15/2010	United Furniture Industries NC, LLC
474	OneNC	9/21/2012	Global Textile Alliance, Inc.
198	OneNC	12/1/2009	SANS Technical Fibers, LLC
437	JDIG	4/20/2012	Ashley Furniture Industries, Inc. I
277	JDIG	9/20/2010	Cree, Inc. II
283	JDIG	10/4/2010	Novo Nordisk Pharmaceutical Industries, Inc. II
475	OneNC	10/1/2012	Bakers Waste Equipment, Inc.
352	OneNC	5/2/2011	The Roberts Company Fabrication Services, Inc.
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

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

Load Transform Data Cancel

# Power BI dashboard overview

Ribbon is essentially the main menu, where you can upload data to manage queries



Pages allows you to add pages

Navigation pane to manage different parts of the report and data model

Report pane is where visualizations are created and arranged

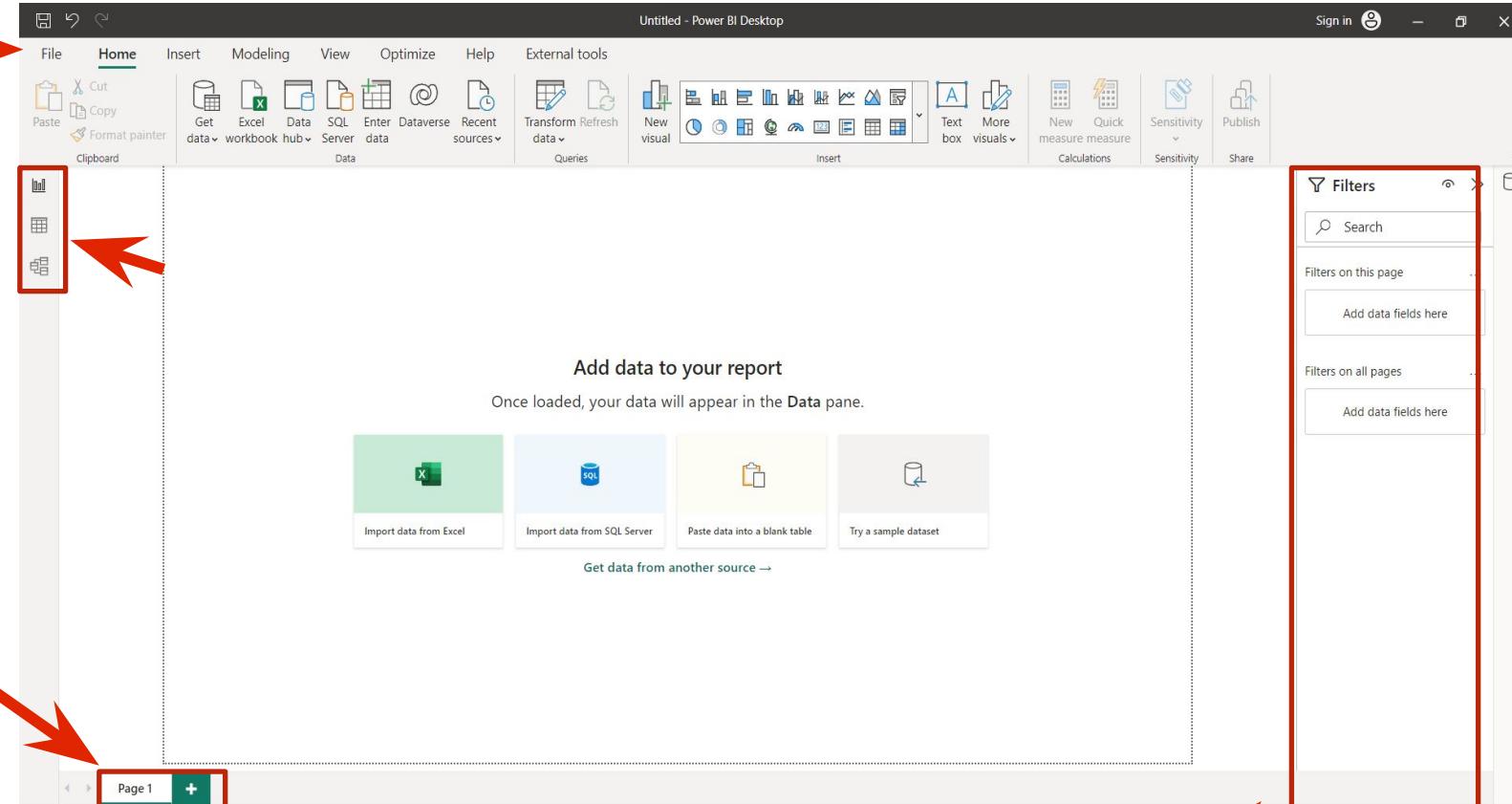
Filters pane allows you to add and edit filters at visual, page, and report levels

Visualization pane allows you to customize data colors, conditional formatting, title text, etc.

Fields pane is where elements of your dataset live. They can be dragged to report pane or to filters

# Power BI dashboard overview

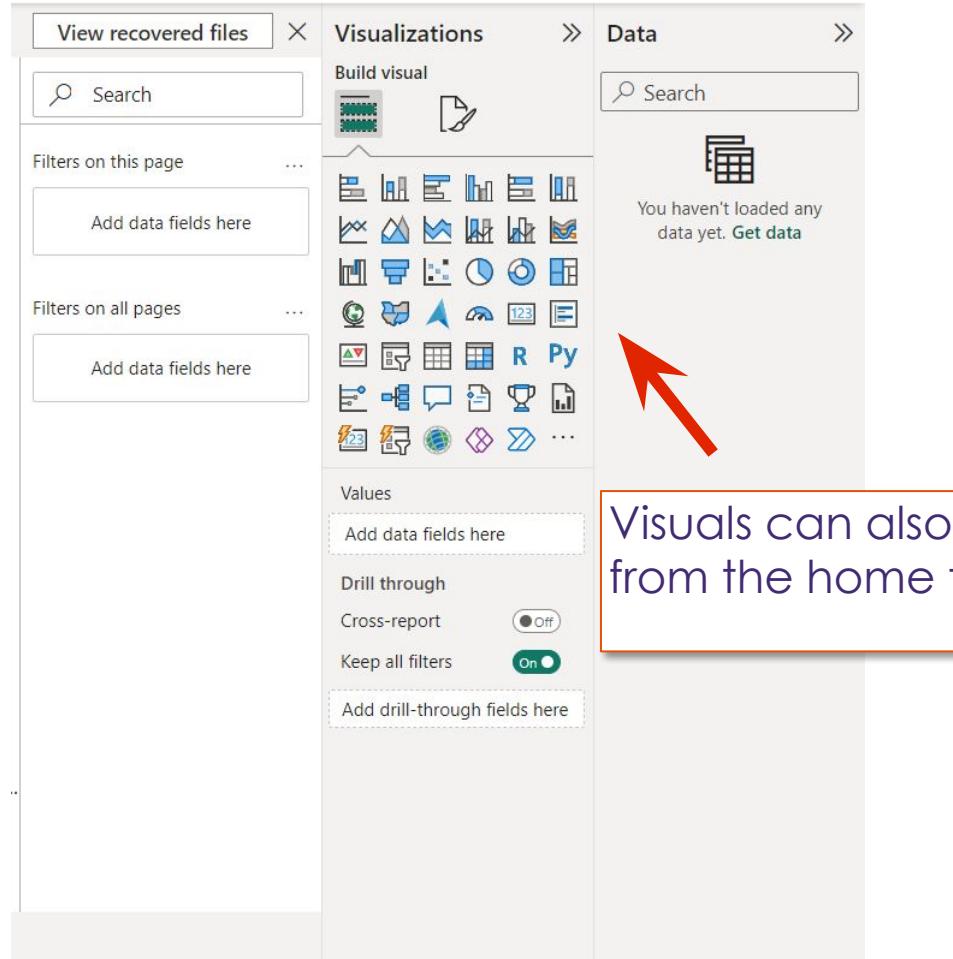
Ribbon is essentially the main menu, where you can upload data to manage queries



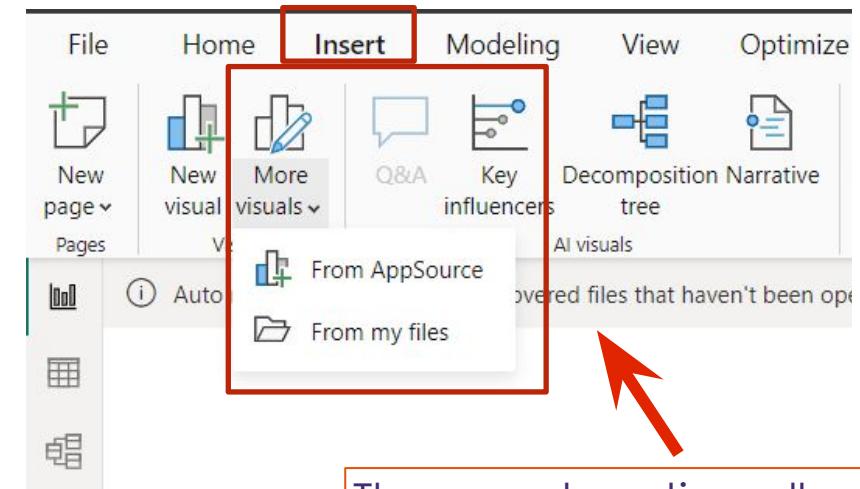
Pages allows you to add pages

Filters pane allows you to add and edit filters at visual, page, and report levels

# Power BI dashboard overview

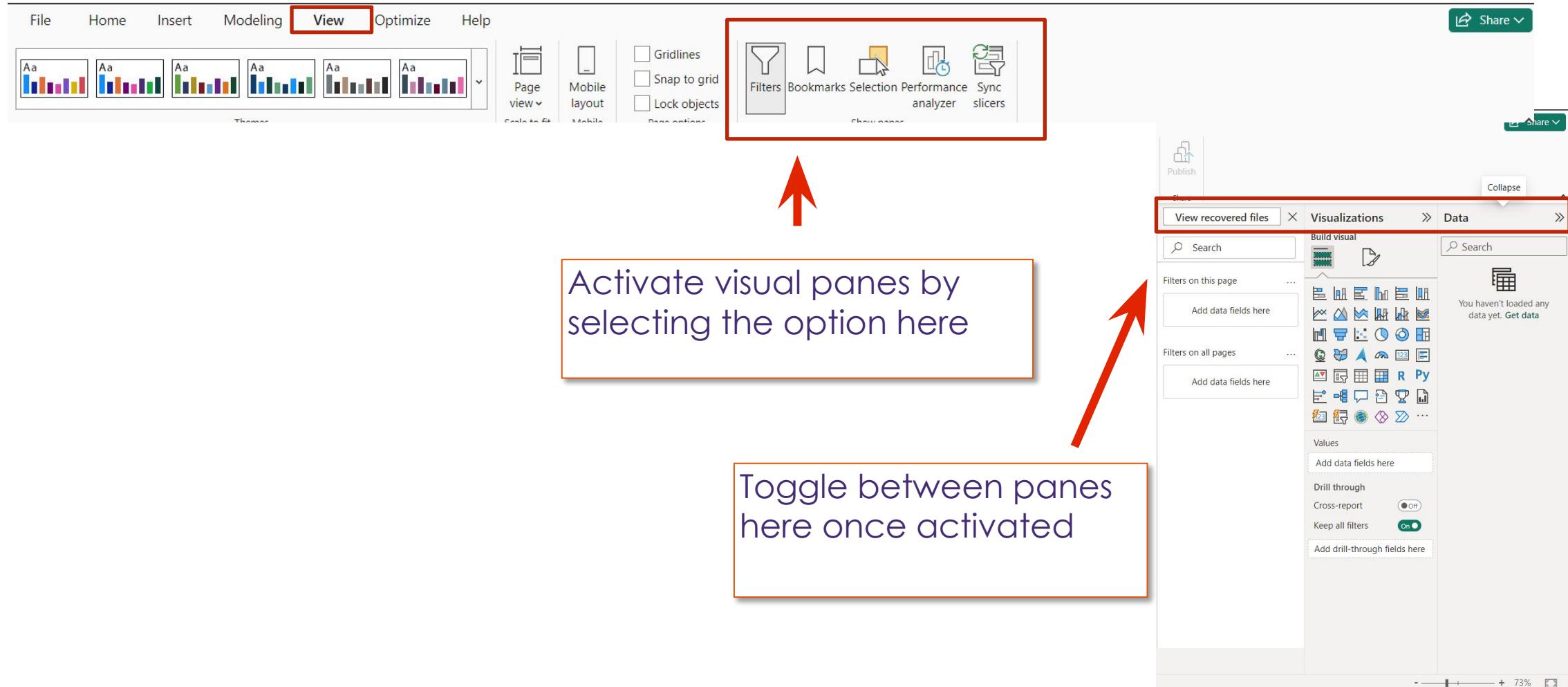


Visuals can also be accessed from the home tab



The report section allows you to download individualized visualization that haven't been push in production

# Power BI dashboard overview



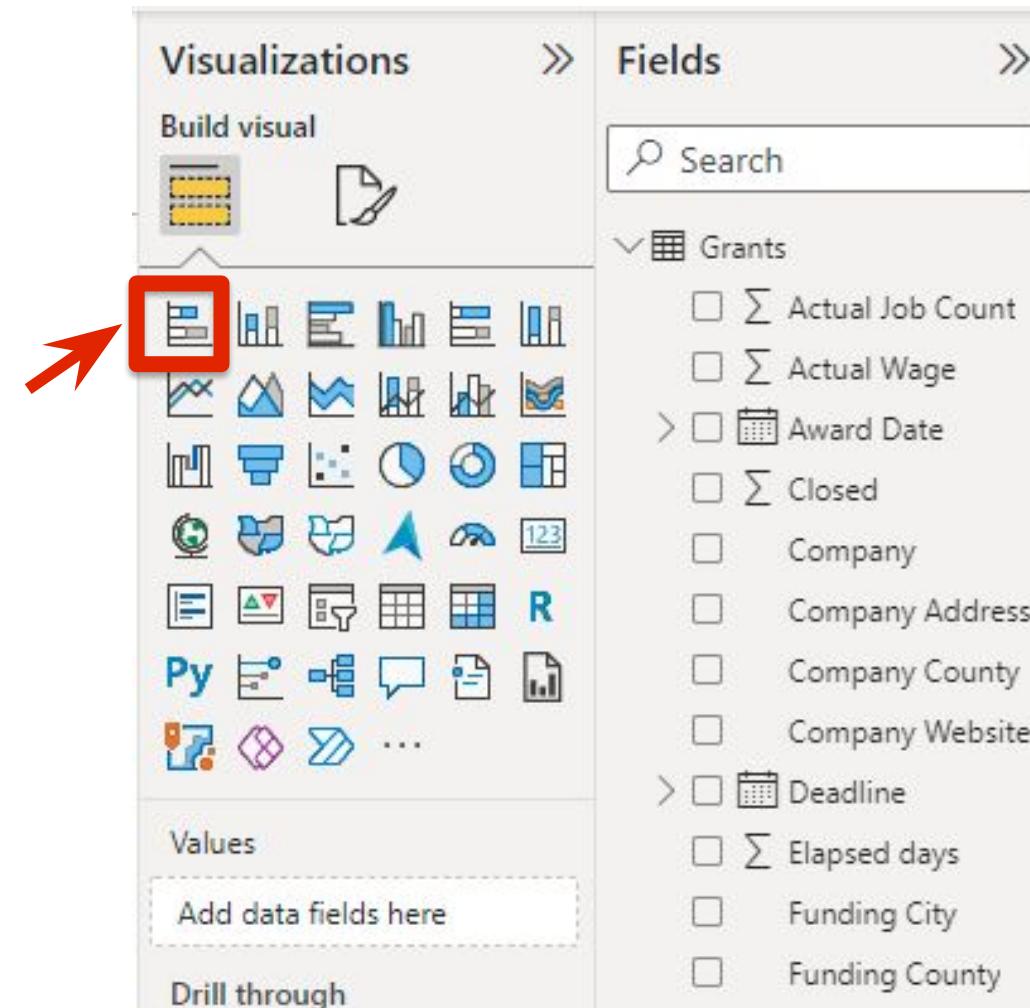
# North Carolina (NC) grant usage data

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:

- **Actual Job Count** by Funding County (bar chart)
- **Funding County** sorted by Actual Job Count
- **Award Date** as the slicer to select the needed time period

# Creating a bar chart



The screenshot shows the Power BI 'Visualizations' pane on the left and the 'Fields' pane on the right. In the 'Visualizations' pane, there is a grid of icons representing different types of charts and visualizations. One specific icon, which is a bar chart, is highlighted with a red box and a red arrow pointing to it from the left.

**Visualizations**

**Build visual**

**Fields**

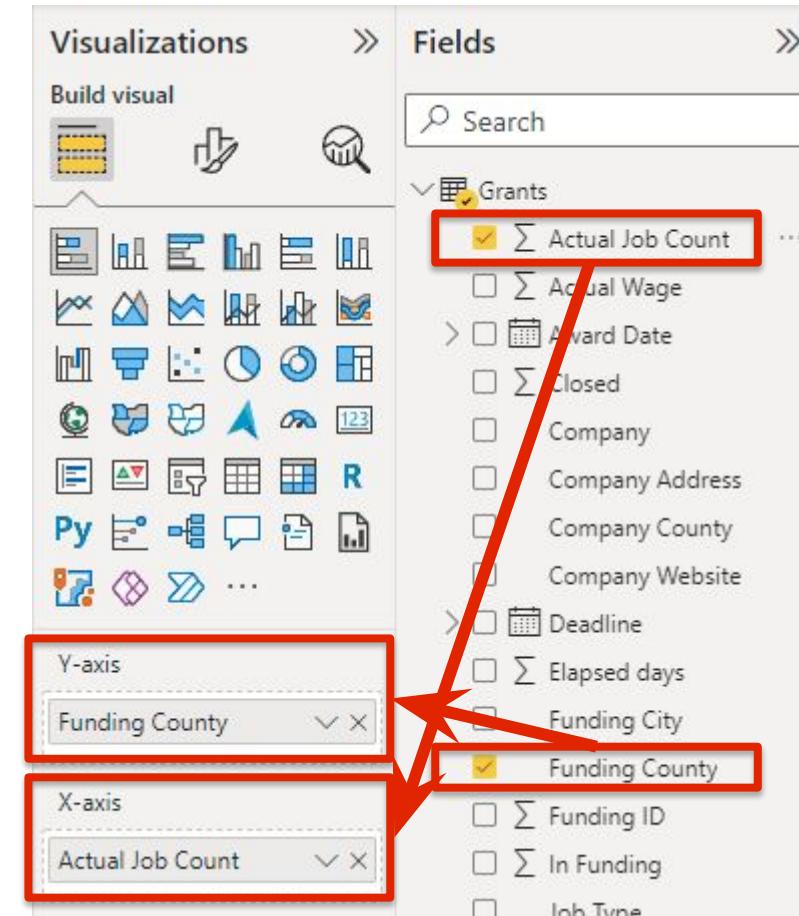
Search

Grants

- $\sum$  Actual Job Count
- $\sum$  Actual Wage
- >  Award Date
- $\sum$  Closed
- Company
- Company Address
- Company County
- Company Website
- >  Deadline
- $\sum$  Elapsed days
- Funding City
- Funding County

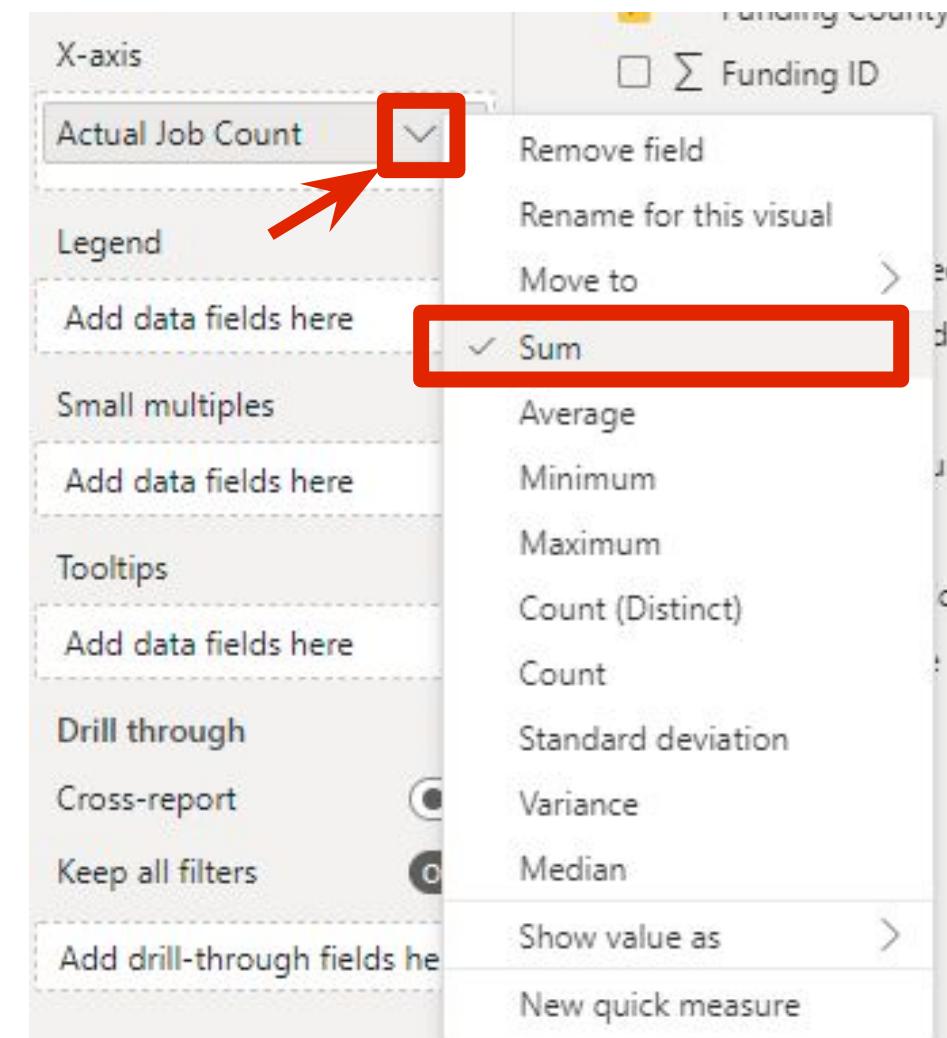
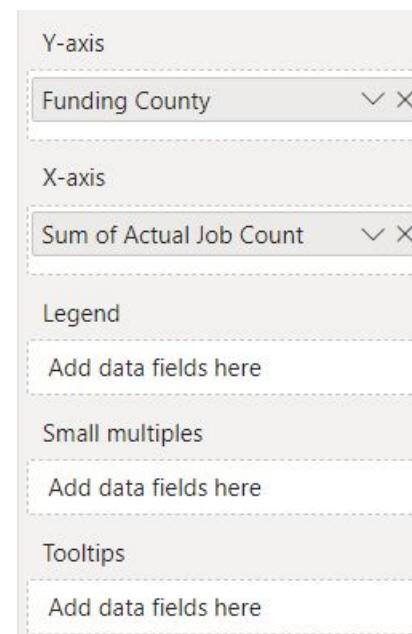
# Create your first Visualization

- Drag 'Actual Job Count' from the 'Grants' table in the 'FIELDS' pane on the right to the 'X-axis' section of the 'VISUALIZATIONS' pane
- Drag 'Funding County' from the 'Grants' table in the 'FIELDS' pane to the 'Y-axis' section of the 'VISUALIZATIONS' pane



# Sum of Actual Job Count

- Select SUM(Actual Job Count)
- Click the drop-down arrow in the 'X-axis' section and choose Sum



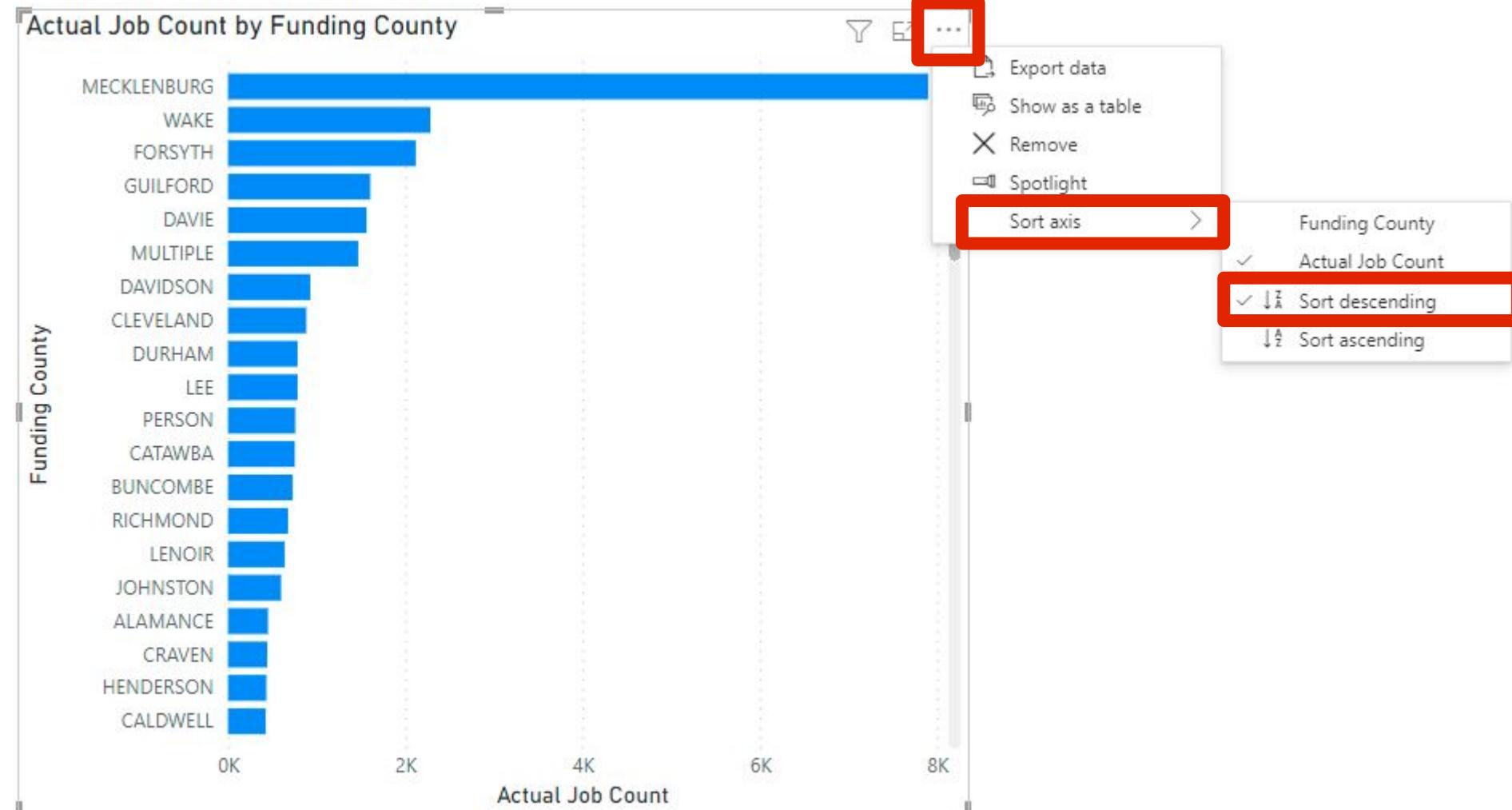
# Sorting by 'Actual Job Count'

- Drag 'Actual Job Count' from the 'Grants' table in the 'FIELDS' pane on the right to the 'X-axis' section of the 'VISUALIZATIONS' pane
- Drag 'Funding County' from the 'Grants' table in the 'FIELDS' pane to the 'Y-axis' section of the 'VISUALIZATIONS' pane

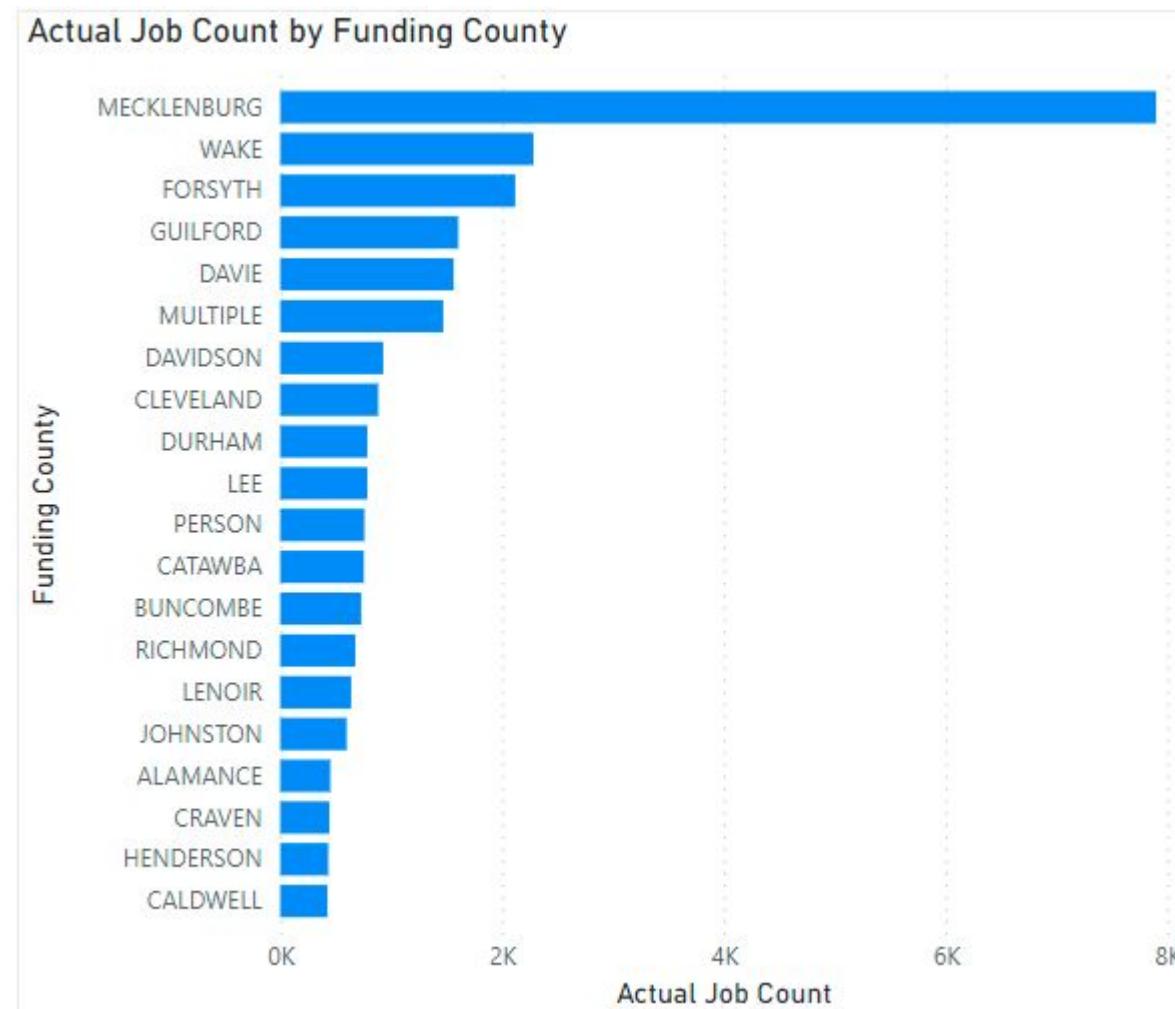
The screenshot shows the Power BI desktop application interface. On the left is the 'Visualizations' pane, which contains a grid of visualization icons and sections for 'Y-axis', 'X-axis', 'Legend', 'Small multiples', 'Add data fields here', 'Tooltips', and 'Drill through'. A red arrow points from the 'Sum of Actual Job Count' field in the 'X-axis' section towards the 'Data' pane. On the right is the 'Data' pane, which includes a search bar and a tree view of fields from the 'Grants' table. The 'Actual Job Count' and 'Funding County' fields are selected, indicated by checked checkboxes.

Field	Type	Status
Actual Job Count	Σ Sum	Selected
Actual Wage	Σ Sum	Not Selected
Award Date	Date	Not Selected
Closed	Boolean	Not Selected
Company	Text	Not Selected
Company Address	Text	Not Selected
Company County	Text	Not Selected
Company Website	Text	Not Selected
Deadline	Date	Not Selected
Elapsed days	Number	Not Selected
Funding City	Text	Not Selected
Funding County	Text	Selected
Funding ID	Number	Not Selected
In Funding	Boolean	Not Selected
Job Type	Text	Not Selected
Percent Awarded	Number	Not Selected
Percent Created	Number	Not Selected
Program	Text	Not Selected
Project Job Count	Σ Sum	Not Selected
Project Wage	Σ Sum	Not Selected
Required Job Counts	Σ Sum	Not Selected
Required Wage	Σ Sum	Not Selected

# Sort by Actual Job Count

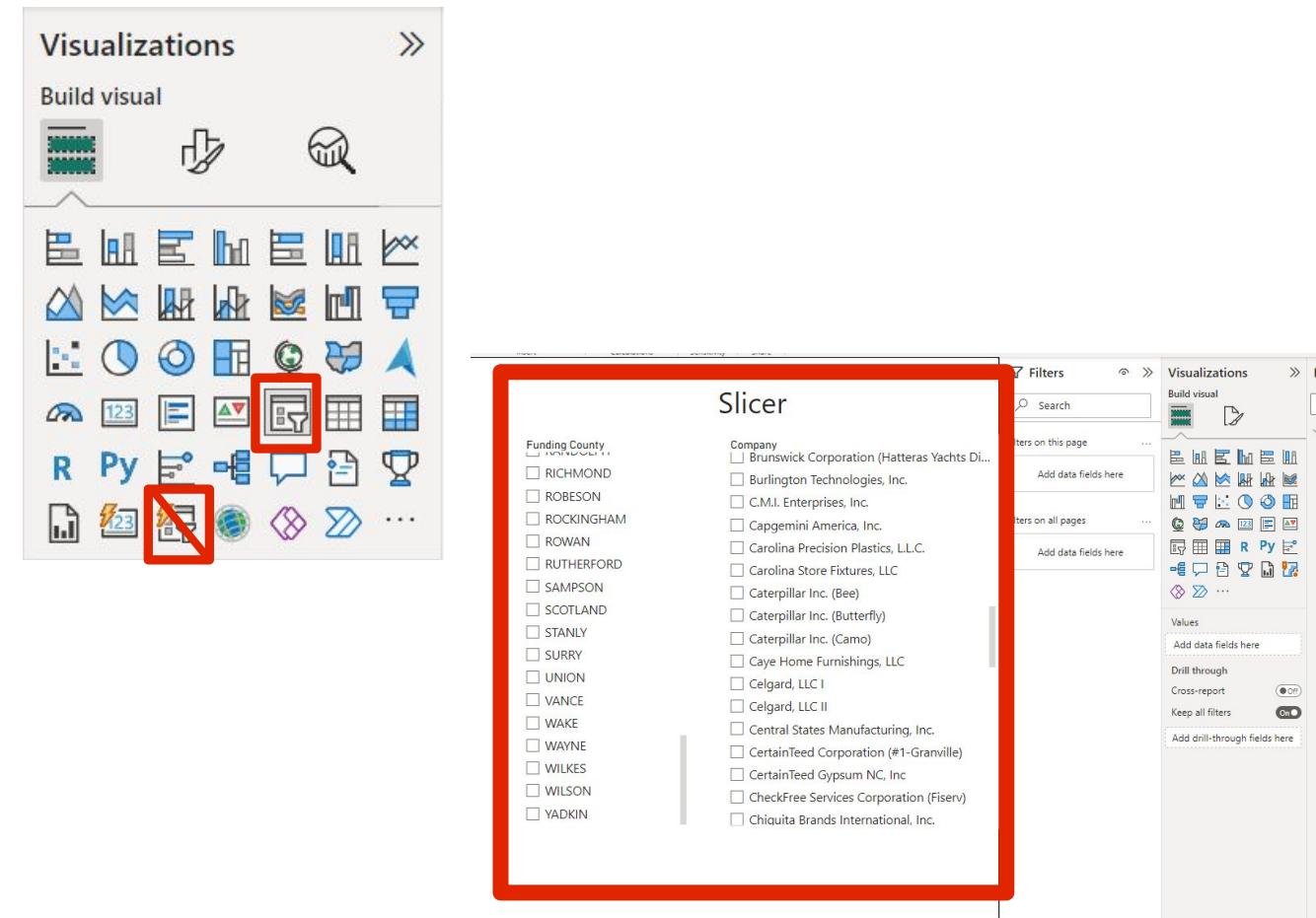


# Actual Job Count by funding county



# Power BI Slicer

- **Power BI slicer** filters the portion of the dataset shown in other visualizations in a report.
- Reasons to use a slicer:
  - Makes it easier to see the current filtered state
  - Easily dives into valuable and insightful ‘corners’ of the dataset
  - Creates more focused reports



# Add Award Date as Slicer

- Click on the empty space on the Canvas, make sure the bar chart is not selected!

The screenshot shows the Power BI Data view. On the left, there's a 'Visualizations' pane with various chart icons. In the center, there's a 'Data' pane with a search bar and a tree view of fields. A red box highlights the 'Field' section at the bottom left of the data pane, which contains a button labeled 'Add data fields here'. Another red box highlights the 'Award Date' field under the 'Grants' table, which is also selected. A red arrow points from the 'Add data fields here' button towards the 'Award Date' field.

The visual will provide you with a menu to add fields from your table by selecting + Add data

Visualizations > Data

Build visual

Search

Grants

- $\sum$  Actual Job Count
- Actual Job COUN...
- $\sum$  Actual Wage
- Award Date
- $\sum$  Closed
- Company
- Company Address
- Company County
- Company Website
- Deadline
- $\sum$  Elapsed days
- Funding City
- Funding County
- $\sum$  Funding ID
- $\sum$  In Funding
- Job Type

Field

Add data fields here

Drill-through

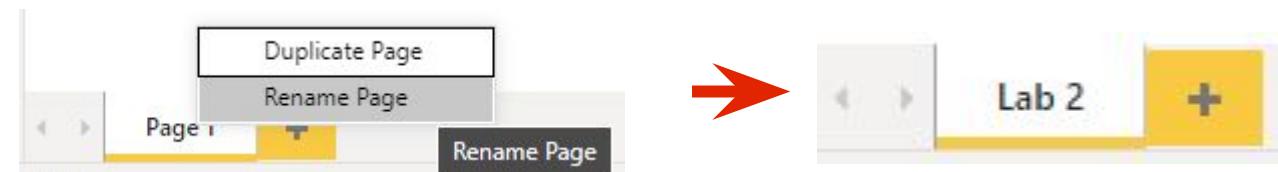
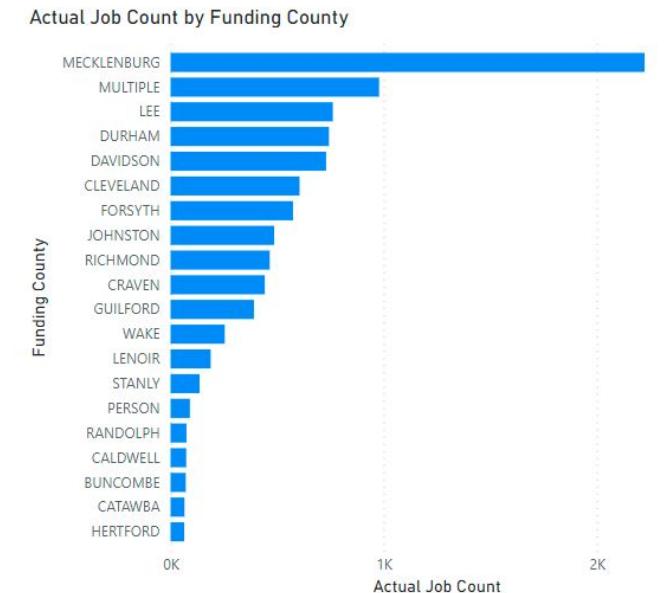
Cross-report  Off

Keep all filters  On

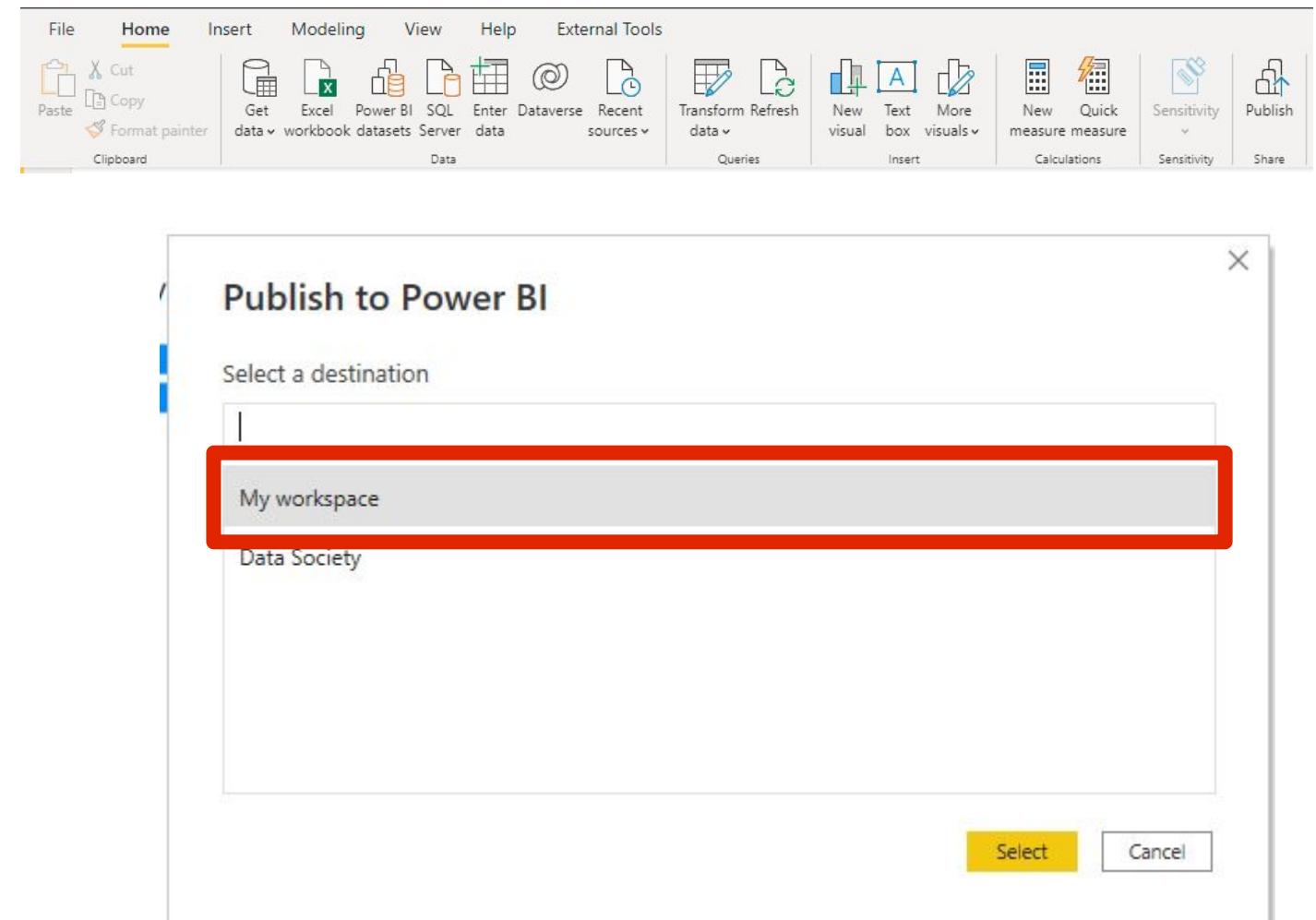
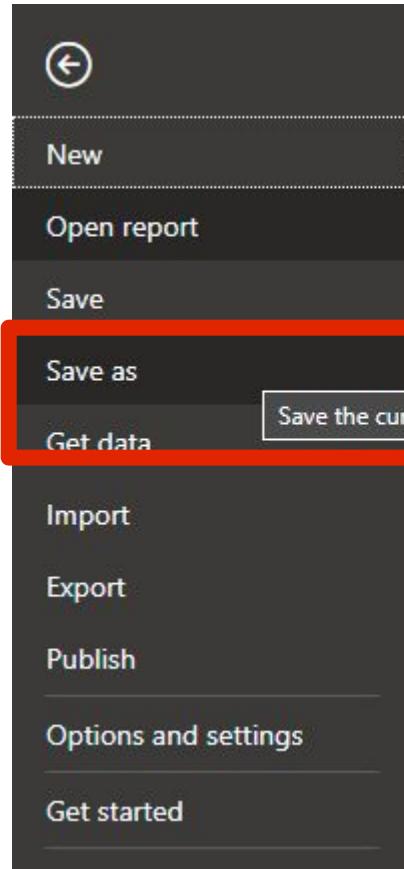
Add drill-through fields here

# Select the desired time period

- From 1/1/2010 to 12/31/2010, what were the top 10 counties that created the most jobs?
- What about 2011?
- When you're done exploring, rename the page to 'Lab 1'

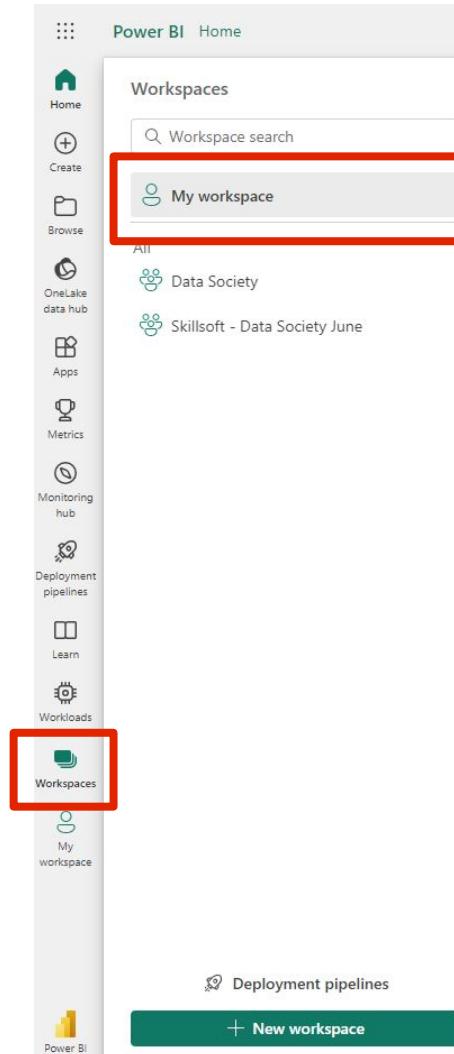


# Save and publish to Power BI Web service



# Check your report in PowerBI.com

- Sign in with your account at [app.powerbi.com](https://app.powerbi.com)
- Navigate to 'My Workspace', and then click on 'Reports' Tab



The screenshot shows the 'My workspace' report list. At the top, there are buttons for '+ New', 'Upload', and 'Workspace settings'. The table below has columns for Name, Type, Owner, Refreshed, Next refresh, Endorsement, and Sensitivity. There are two entries: 'Lab 1' (Report, Leonardo Palomera, 5/7/24, 10:18:33 AM) and 'Lab 1' (Semantic model, Leonardo Palomera, 5/7/24, 10:18:33 AM, N/A).

Name	Type	Owner	Refreshed	Next refresh	Endorsement	Sensitivity
Lab 1	Report	Leonardo Palomera	5/7/24, 10:18:33 AM	—	—	—
Lab 1	Semantic model	Leonardo Palomera	5/7/24, 10:18:33 AM	N/A	—	—

# View your report

Power BI My workspace Lab 2 Complete | Data updated 4/28/22

Award Date: 1/1/2010 - 12/31/2010

Reset to default Bookmarks View

Filters

Search

There aren't any filters to display.

### Actual Job Count by Funding County

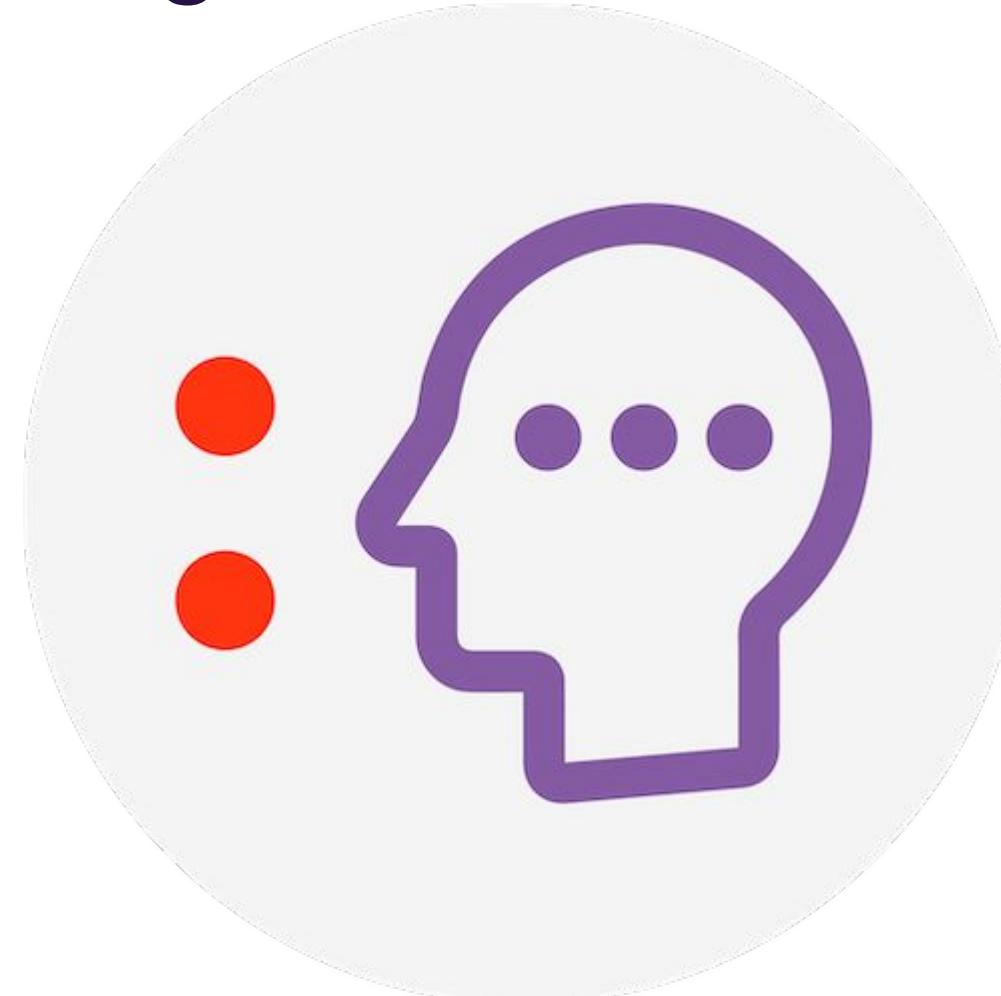
Funding County	Actual Job Count
MECKLENBURG	~2.2K
MULTIPLE	~1.2K
LEE	~1.0K
DURHAM	~800
DAVIDSON	~700
CLEVELAND	~600
FORSYTH	~500
JOHNSTON	~450
RICHMOND	~400
CRAVEN	~350
GUILFORD	~300
WAKE	~250
LENOIR	~200
STANLY	~150
PERSON	~100
RANDOLPH	~100
CALDWELL	~100
BUNCOMBE	~100
CATAWBA	~100
HERTFORD	~100

Get data Page 1 of 1

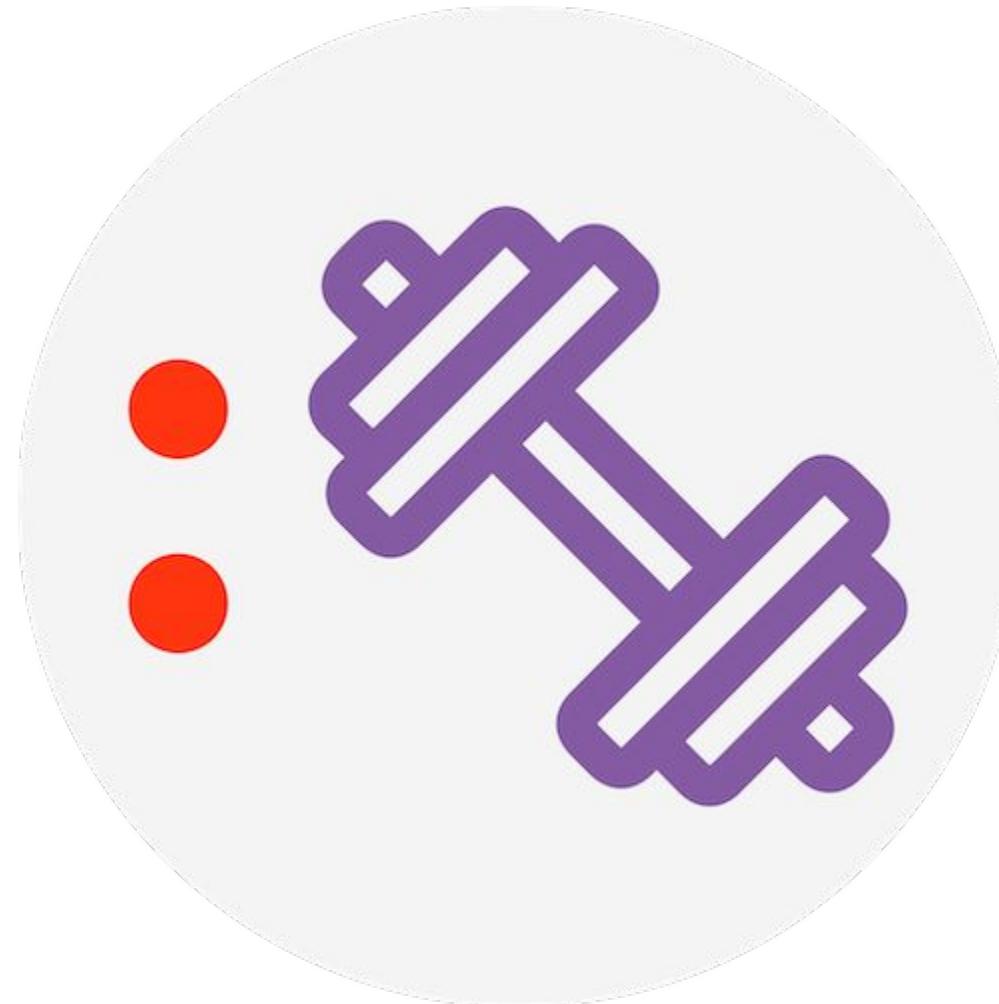
# End of Lab 1



# Day 1 - Knowledge Check 2

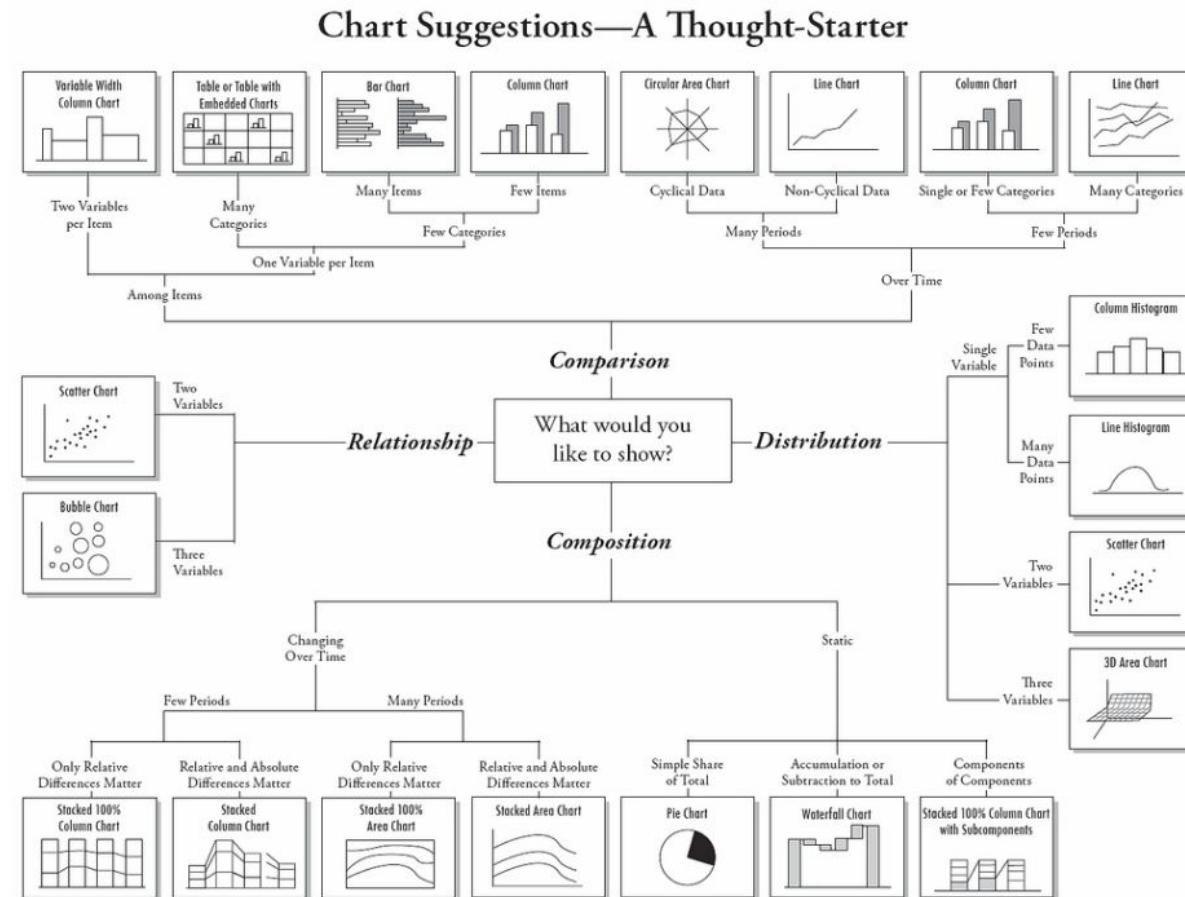


# Exercise 1



# Visualization Types

- Open the 'Visualization Types.pbix' file and explore different types of visualizations and their associated types of analysis



# Summary

Today we learned:

- What is Power BI and business intelligence?
- Review the four layers of Power BI
- Build your first BI report
- Visualization Types

# Tomorrow, we'll learn how to:

- Build a BI report with formatting techniques
- Build a complex BI report with interactive visualizations

# DATA SOCIETY:

## Power BI Bootcamp

Day 2

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

- Albert Einstein



# Welcome back!

- In the last class we introduced Power BI and learned how to create dashboards
- Check out these dashboards created in Power BI

In the chat, answer the following questions:

- Did any of these examples stand out to you?
- Which did you find the most relevant to how you plan to use Power BI?
- Which did you like the best?



# Agenda

- Build a BI report with formatting techniques
- Build a complex BI report with interactive visualizations

# Beginning of Lab 2



# Objectives for Lab 2

- Explore and employ a range of Power BI visualization options
- Identify the most suitable visualizations for different scenarios
- Gain hands-on experience in creating and refining visuals with Power BI



# North Carolina (NC) grant usage 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:

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

Consider the flowchart from yesterday 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 2 PBIX file from Labs folder
- Create another page called “Lab 2”

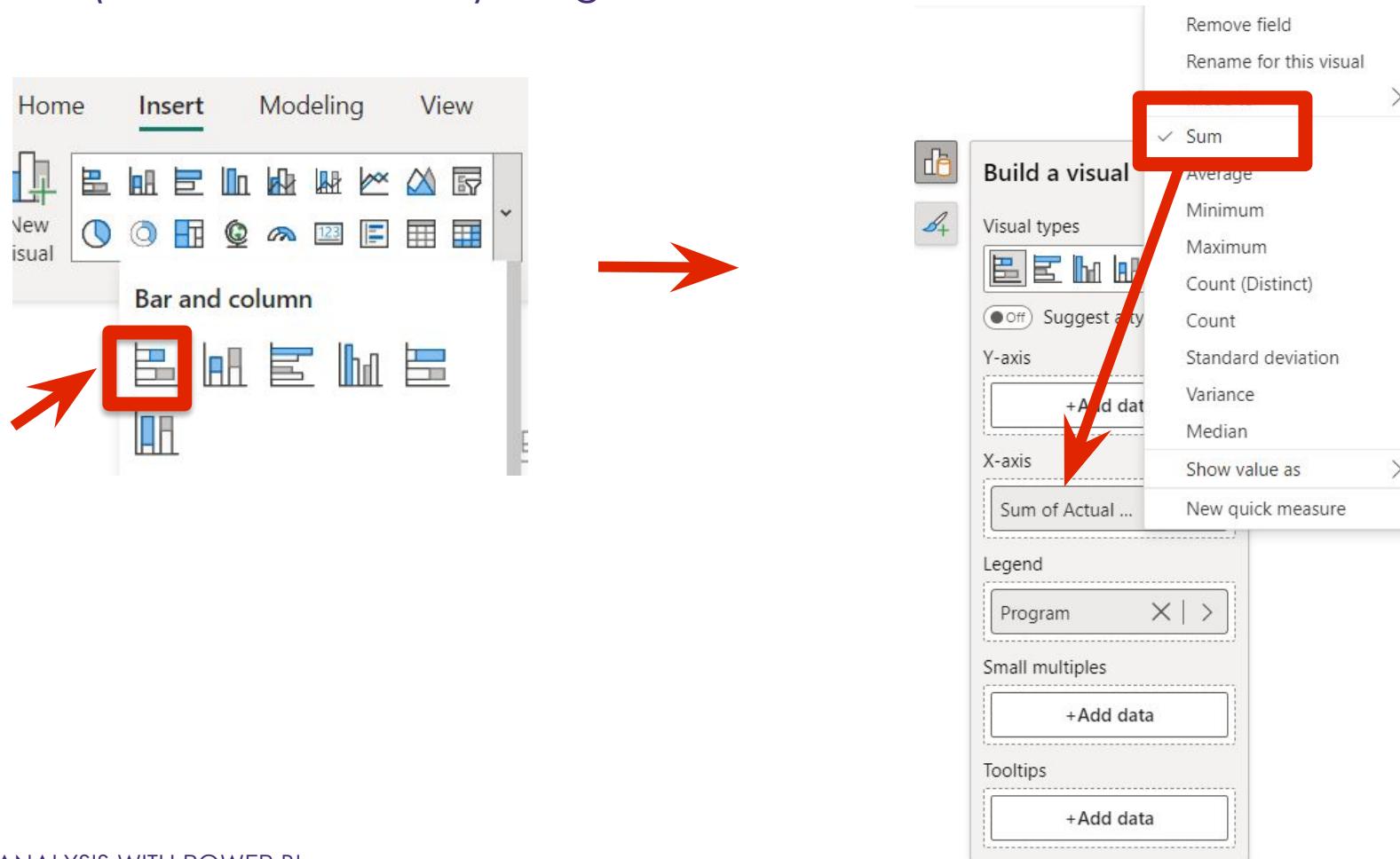


Open report



# Create a simple chart

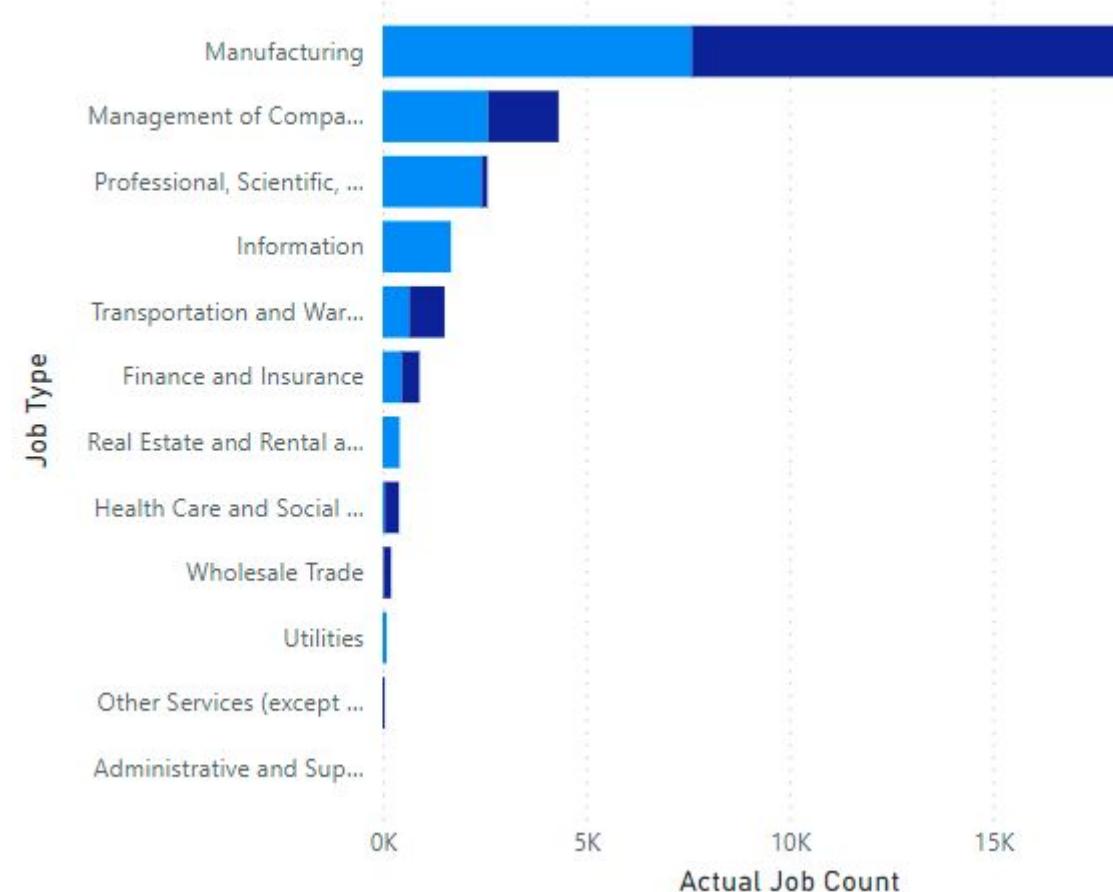
- Put 'Actual Job Count' in X-axis Field and 'Job Type' in Y-axis, and 'Program' in Legend
- Sum(Actual Job Count) -> right click on the field section and choose Sum



# Create a simple chart

Actual Job Count by Job Type and Program

Program ● JDIG ● OneNC



Visualizations

Build visual

Y-axis

X-axis

Legend

Small multiples

Tooltips

Drill through

Cross-report

Keep all filters

Add drill-through fields here

Data

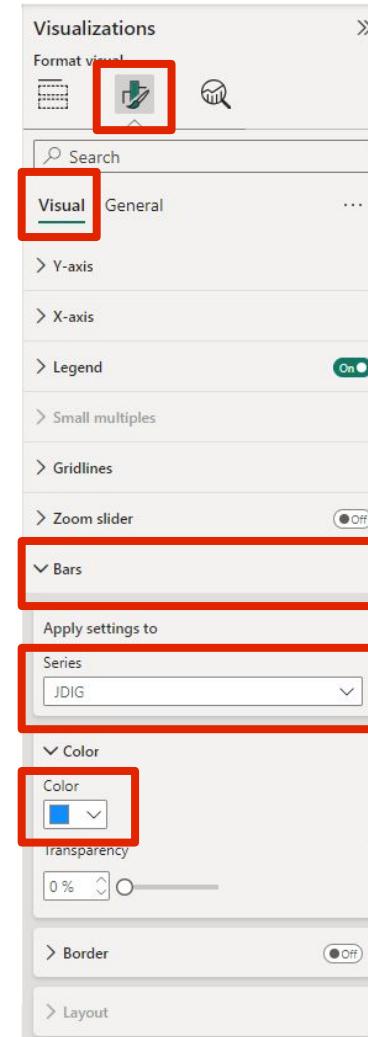
Search

Grants

- Actual Job Count
- Actual Wage
- Closed
- Company
- Company Address
- Company County
- Company Website
- Deadline
- Elapsed days
- Funding City
- Funding County
- Funding ID
- In Funding
- Job Type
- Percent Awarded
- Percent Created
- Program
- Project Job Count
- Project Wage
- Required Job Counts
- Required Wage
- Status
- Total Award

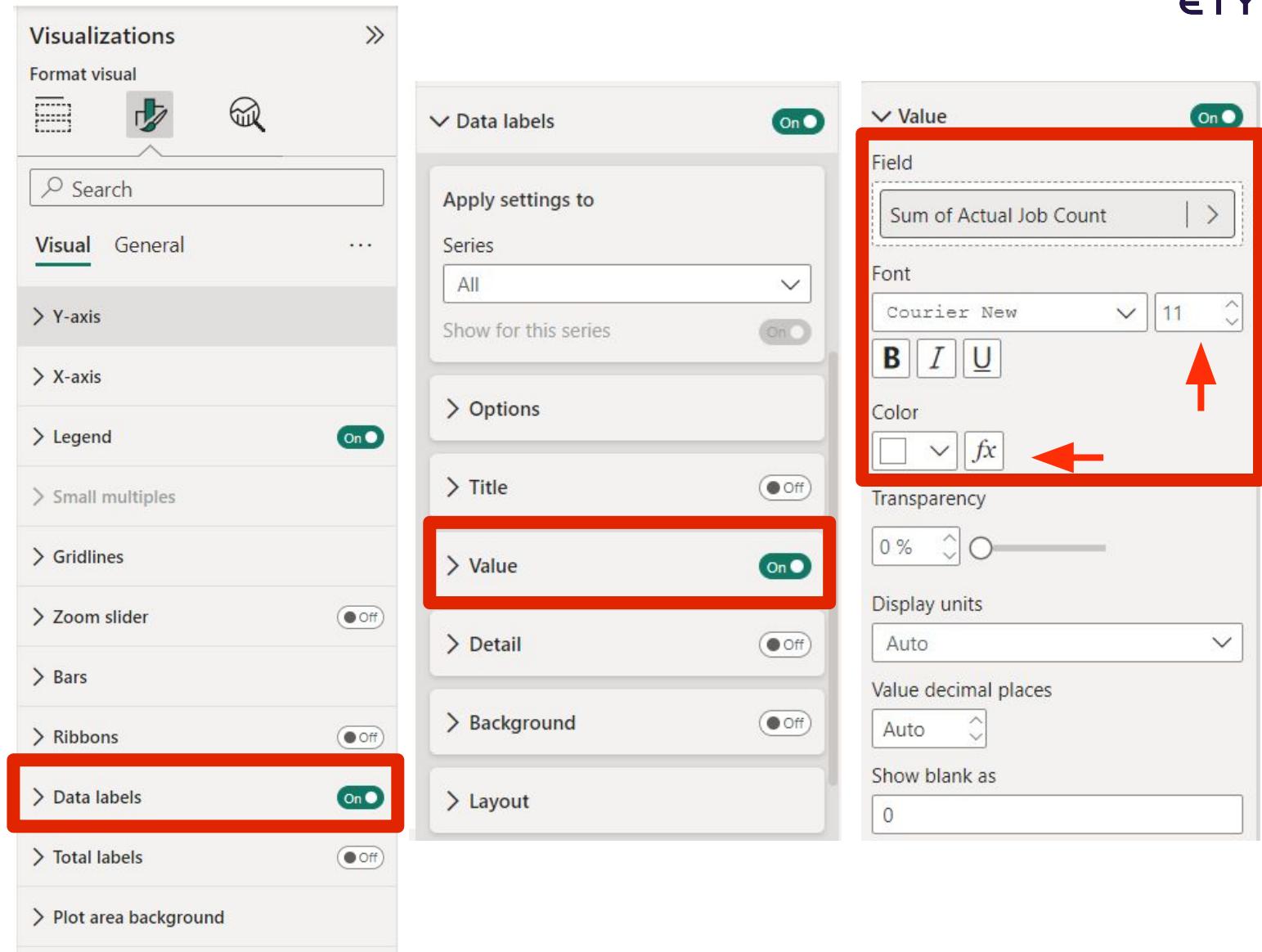
# Change your chart color

- Go to Format Tab in Visualizations, visual category
- Expand 'Bars' section and drop down to the attribute you want to change.
- Make the JDIG Color into Orange, OneNC color into Purple

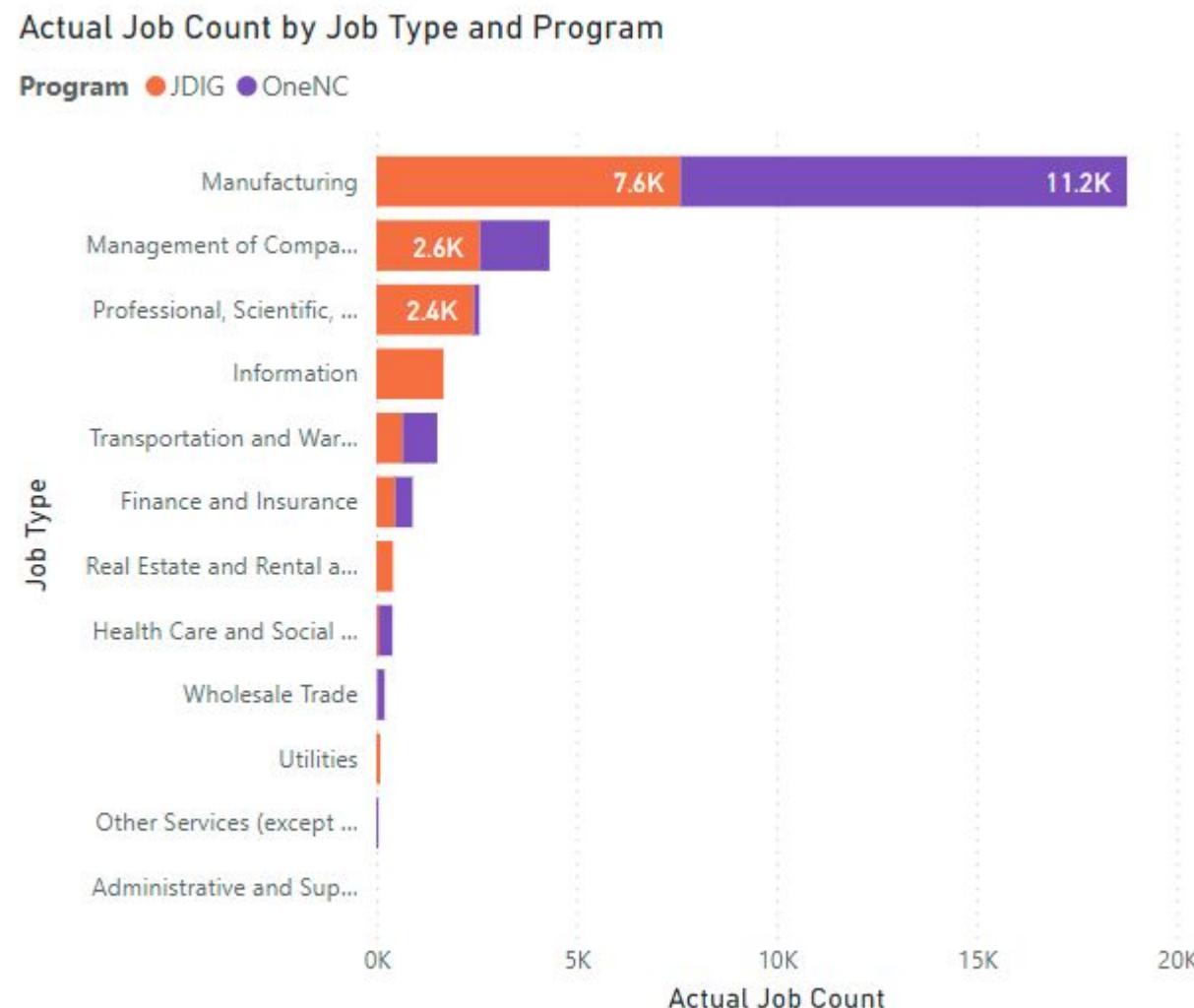


# Add data labels

- Go to Format Tab in Visualizations, Visual category
- Turn the 'Data labels' section on
- Expand 'Data labels' section
- Locate 'Value' section
- Make the color into white
- Text Size to be '11'

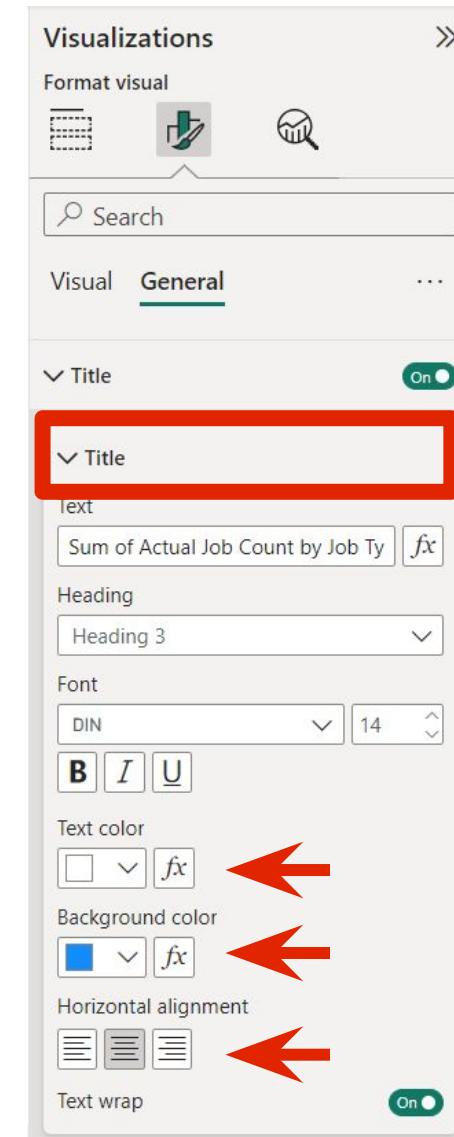


# Add data labels

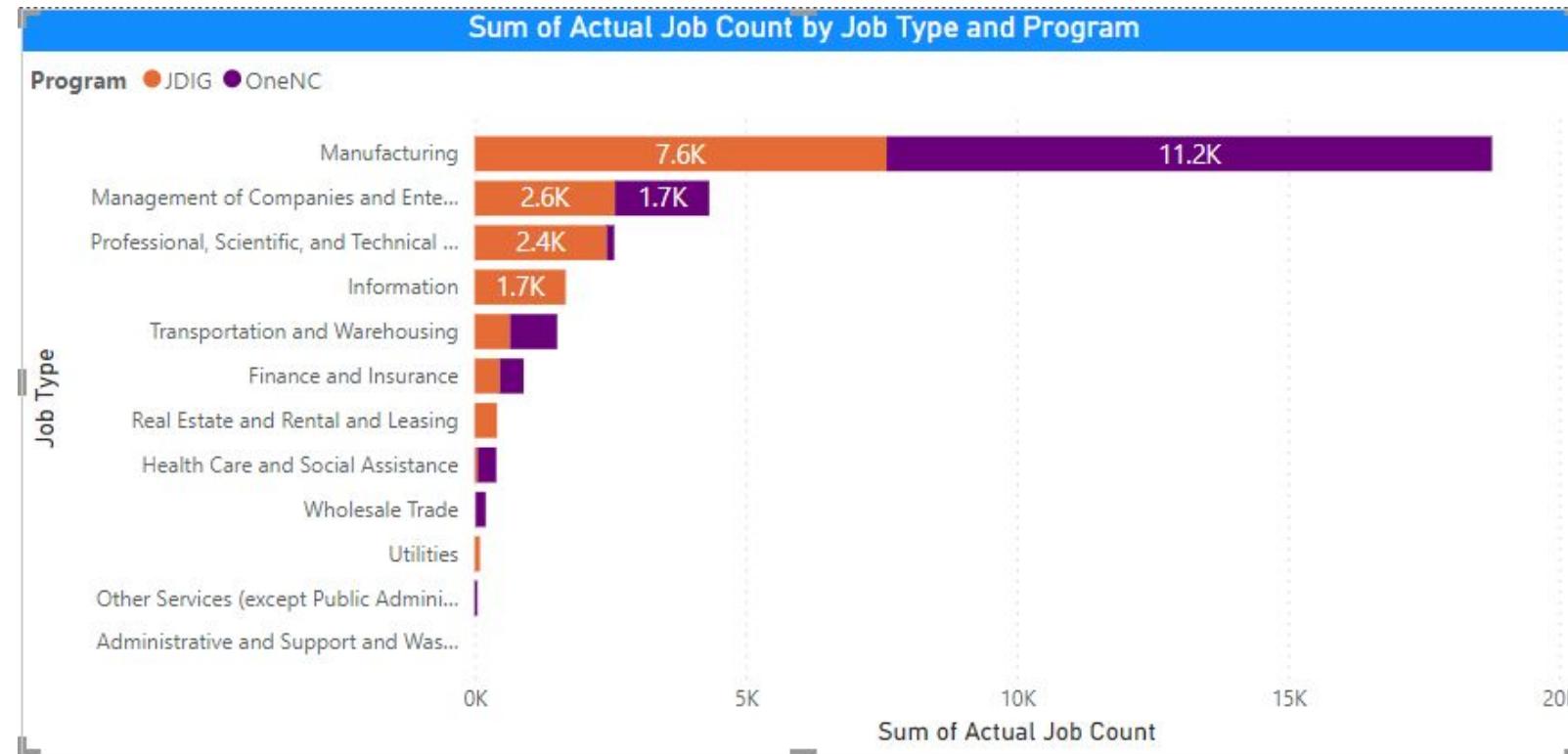


# Title formatting

- Go to Format Tab in Visualizations, General category
- Expand 'Title' section
- Make the font color into white, background color into blue
- Alignment to be centered

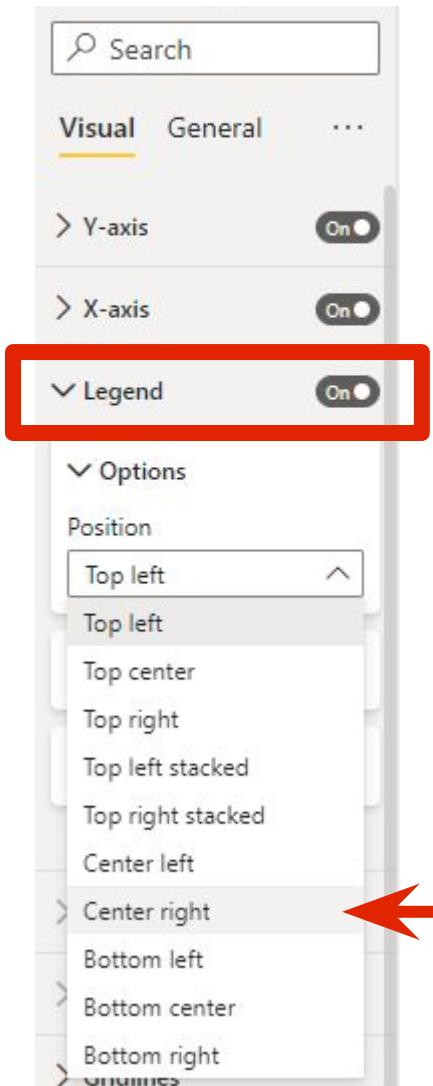


# Title formatting

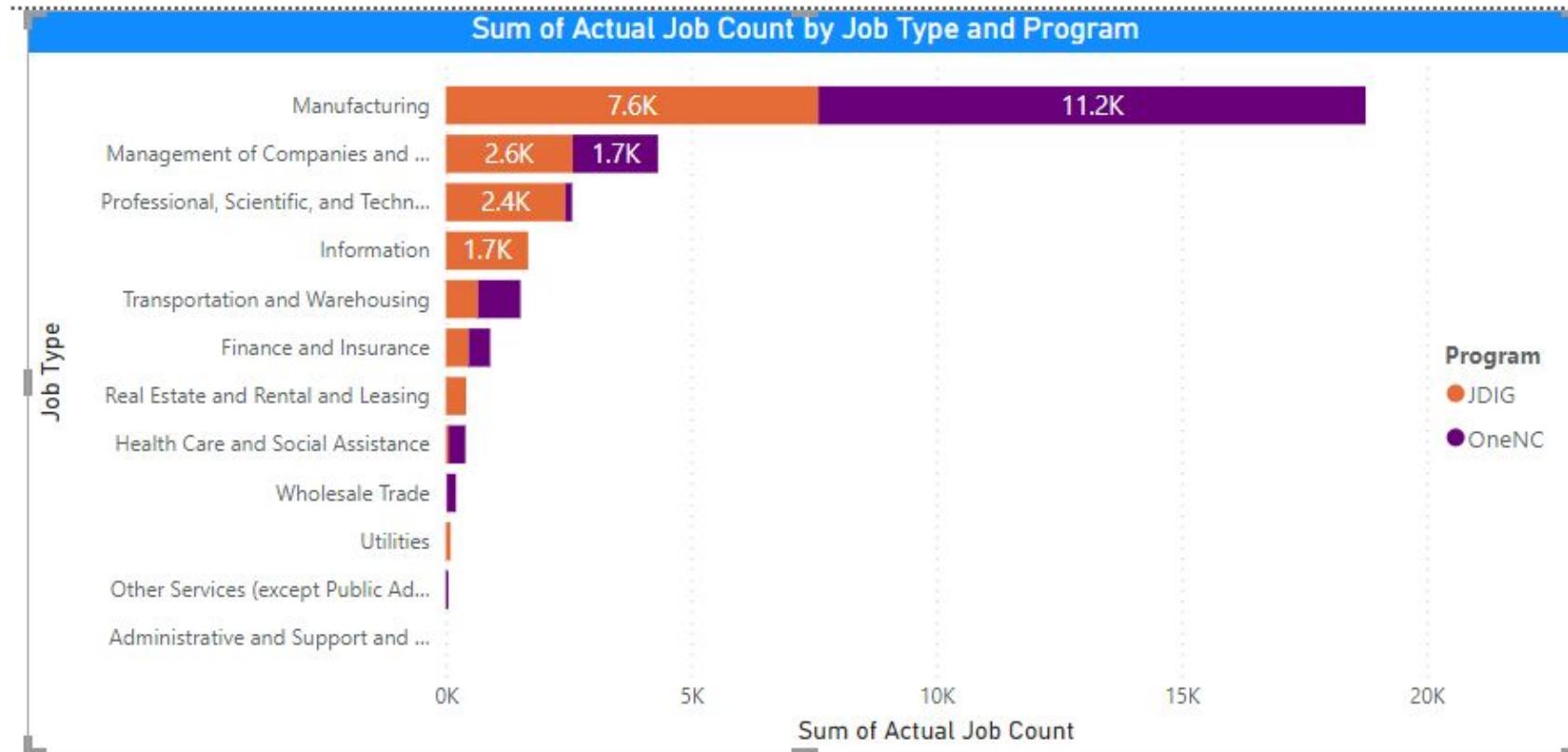


# Adjust your legend

- Go to Format Tab in Visualizations, visual category
- Expand 'Legend' section
- Position to be 'Center Right'

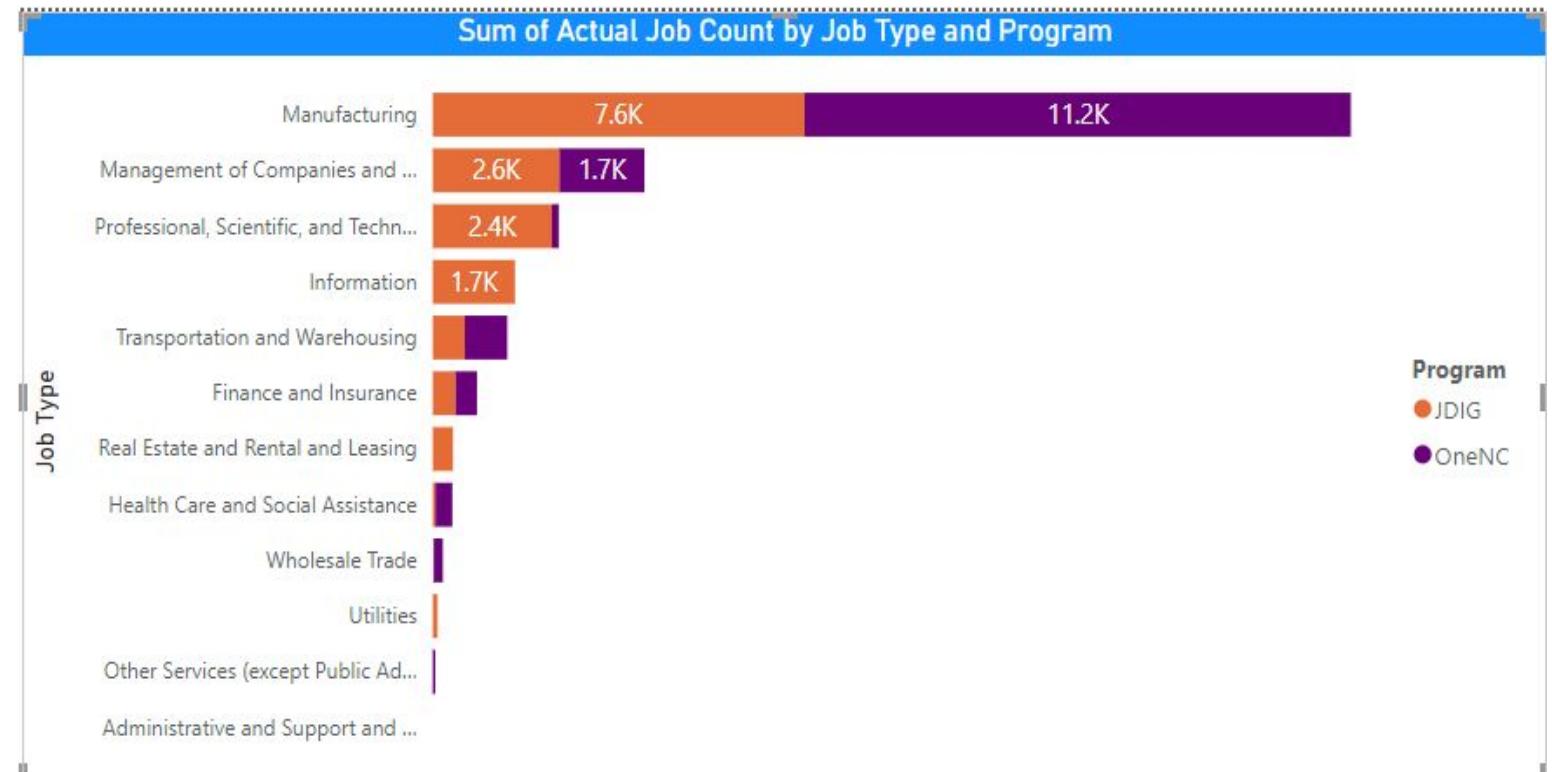
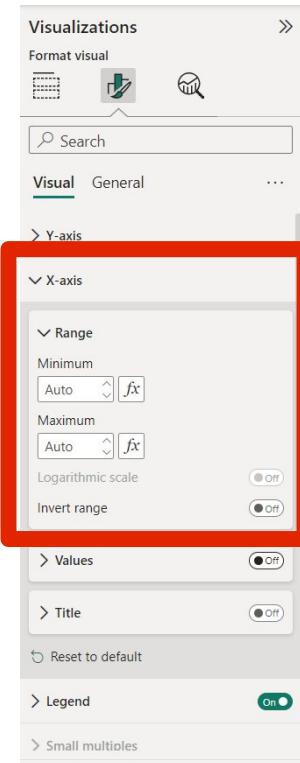


# Adjust your legend



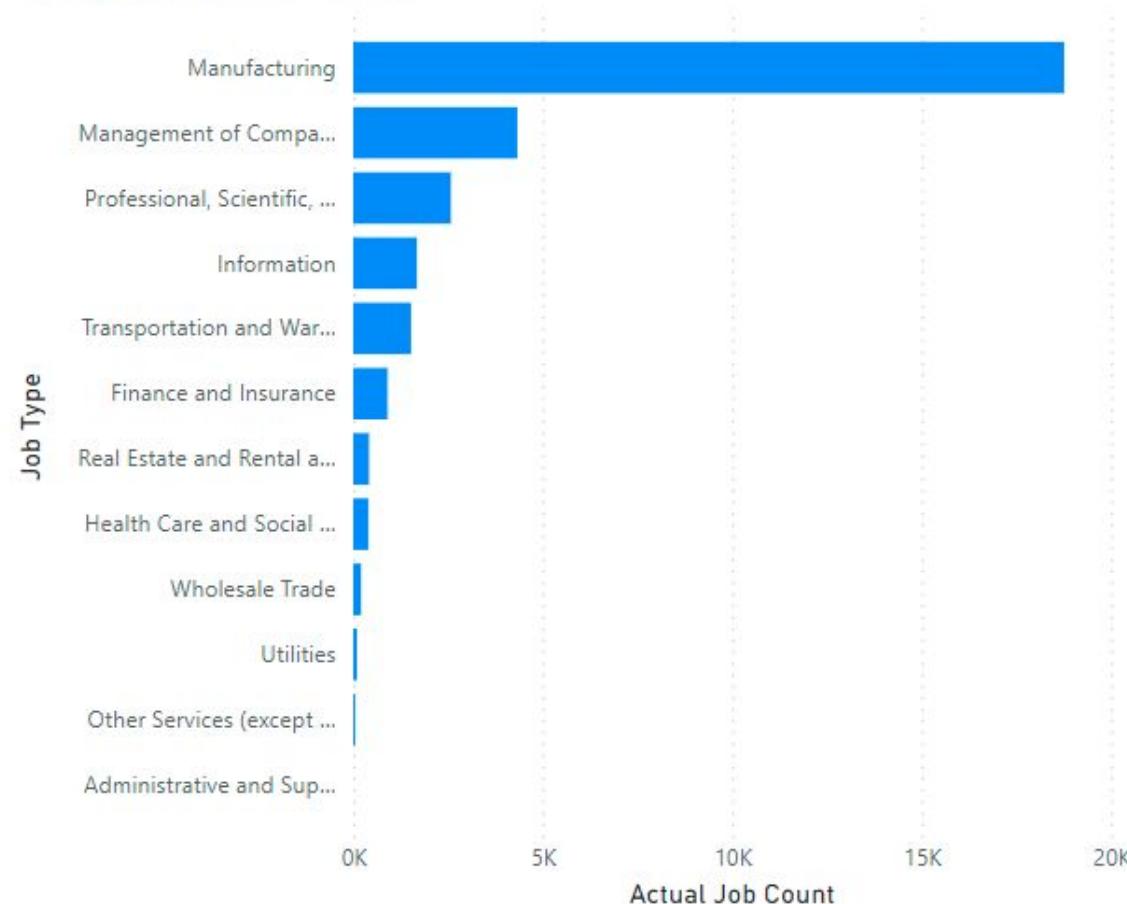
# Remove x-axis

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



# Add an Additional Chart

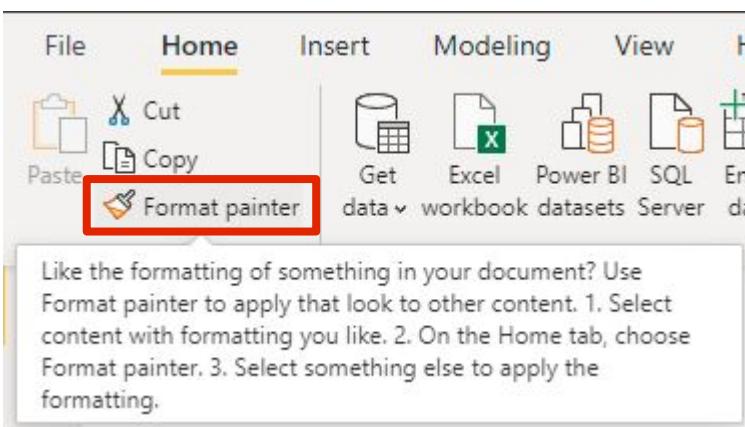
Actual Job Count by Job Type



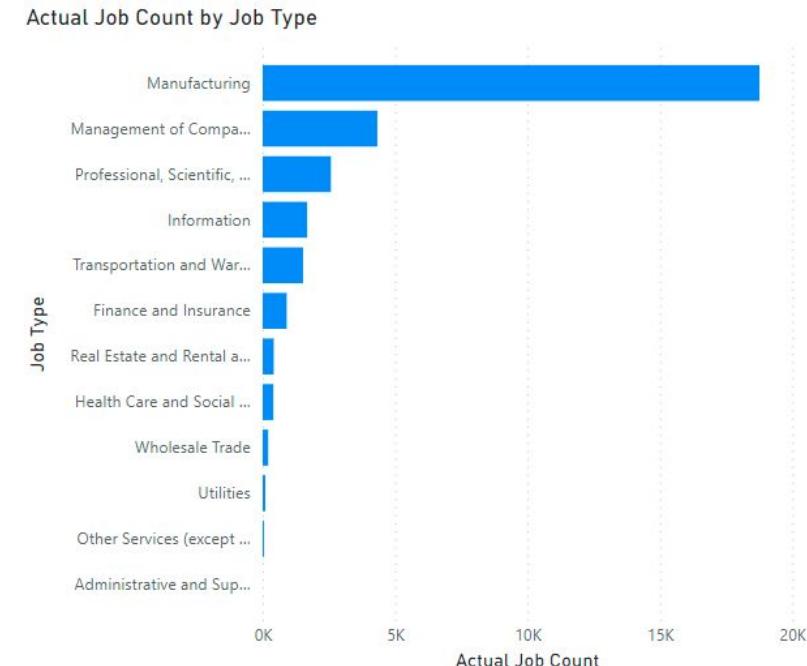
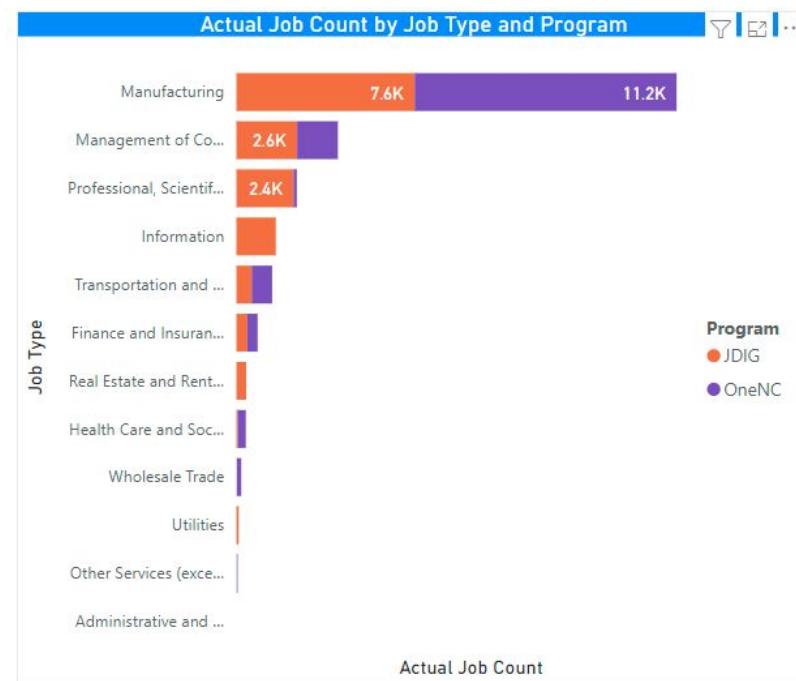
The screenshot shows the Power BI "Visualizations" pane on the left and the "Data" pane on the right. In the Visualizations pane, there are icons for various chart types like bar charts, line charts, and maps. In the Data pane, under the "Grants" section, the "Actual Job Count" field is selected and checked. The "Y-axis" is set to "Job Type" and the "X-axis" is set to "Sum of Actual Job Count". The "Legend" section has "Job Type" checked. The "Small multiples", "Toolips", and "Drill through" sections are empty. The "Cross-report" button is off. The "Keep all filters" button is on. The "Add drill-through fields here" section is empty.

# Format title the same way

- Use “Format Painter”



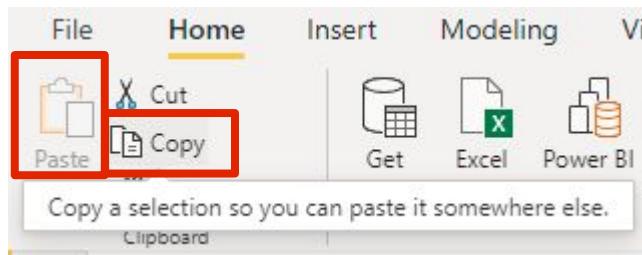
- Select the **first chart**
- Select “**Format Painter**”
- Select the **second (new) chart**



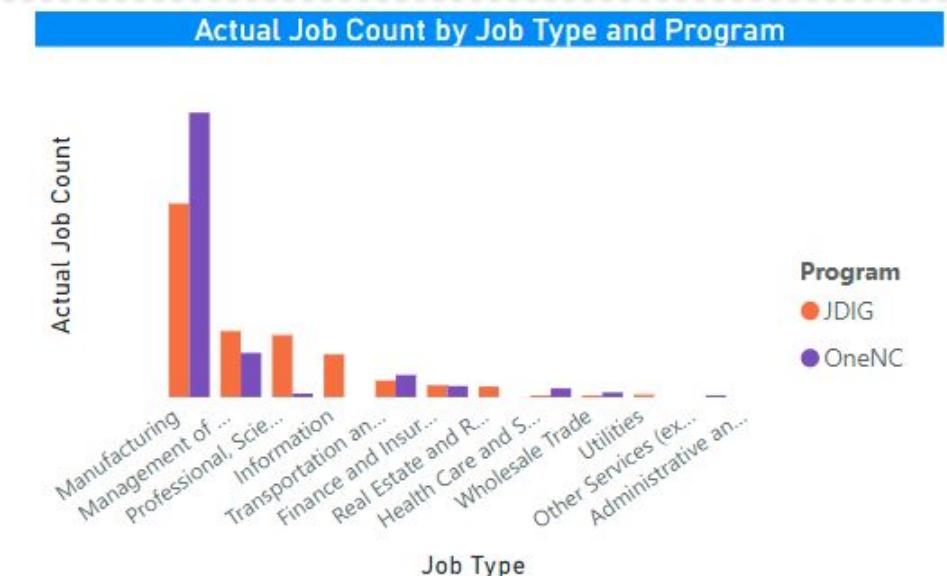
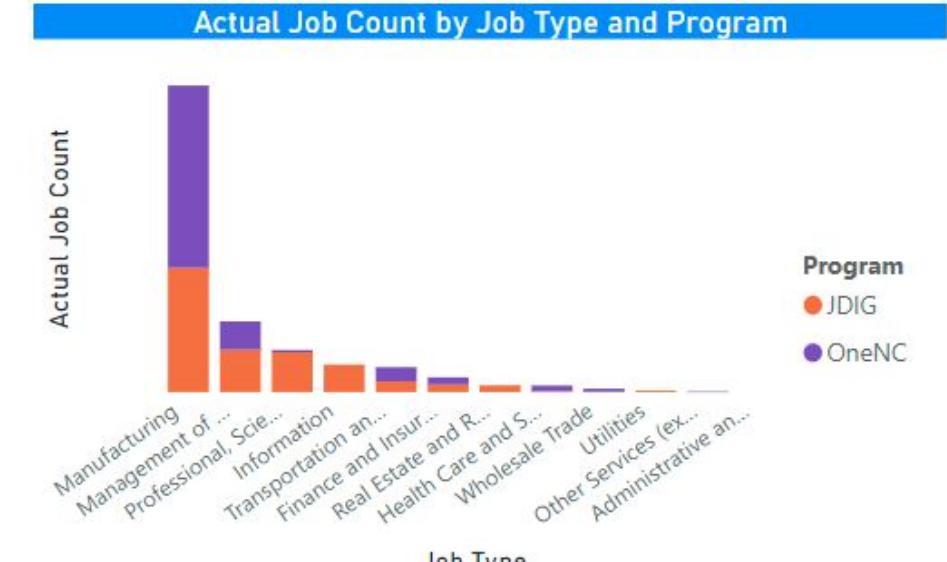
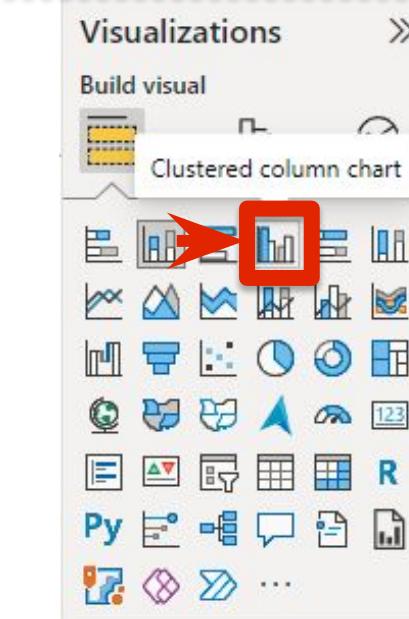
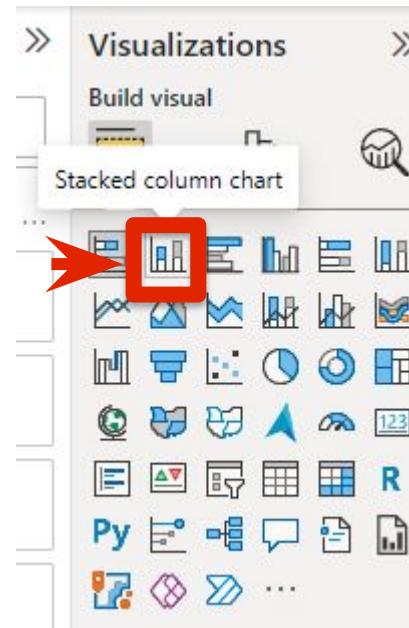
# Switching charts

- Copy / Paste chart

- Copy / Paste the Stacked Bar Chart to another area of the Canvas

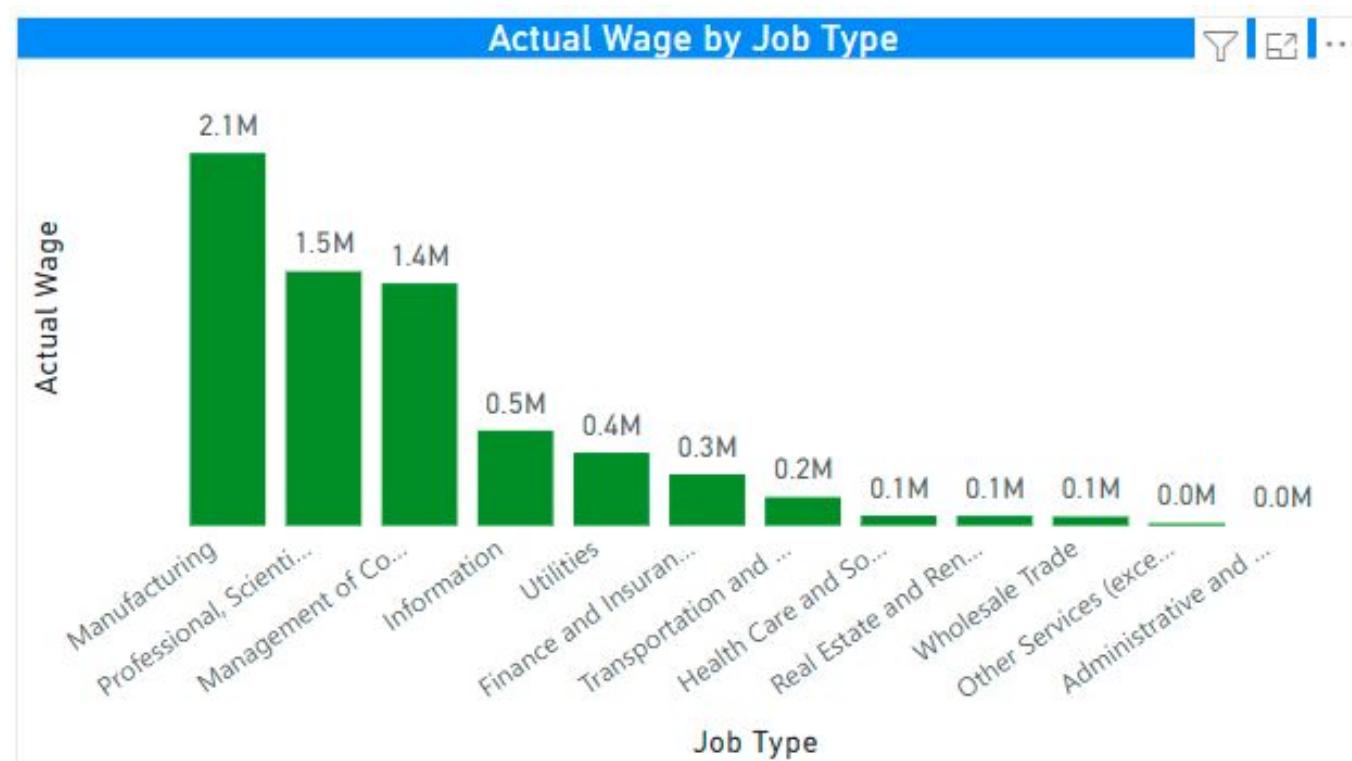


- Change the visual type to Clustered Column



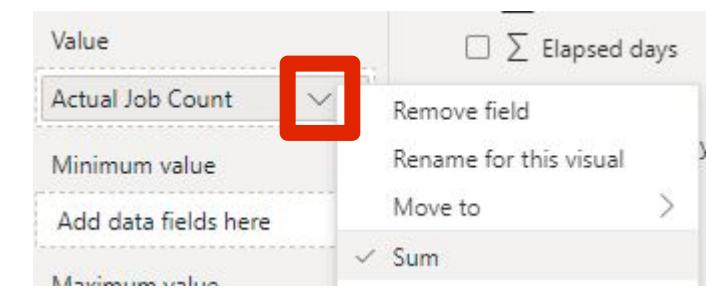
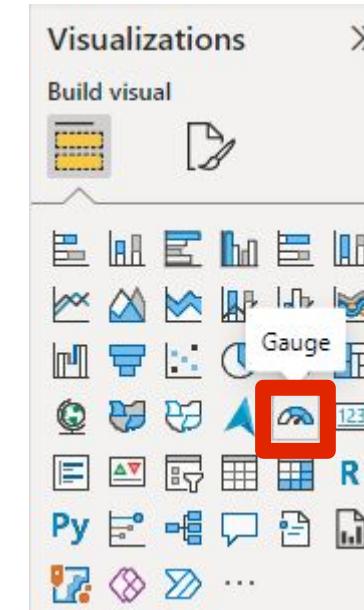
# Class practice

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



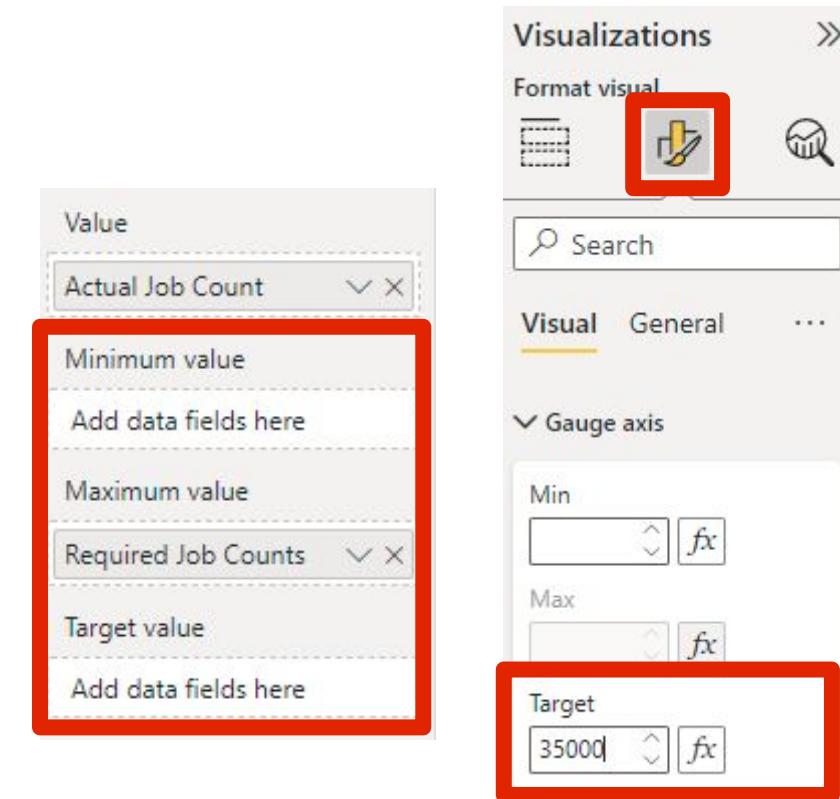
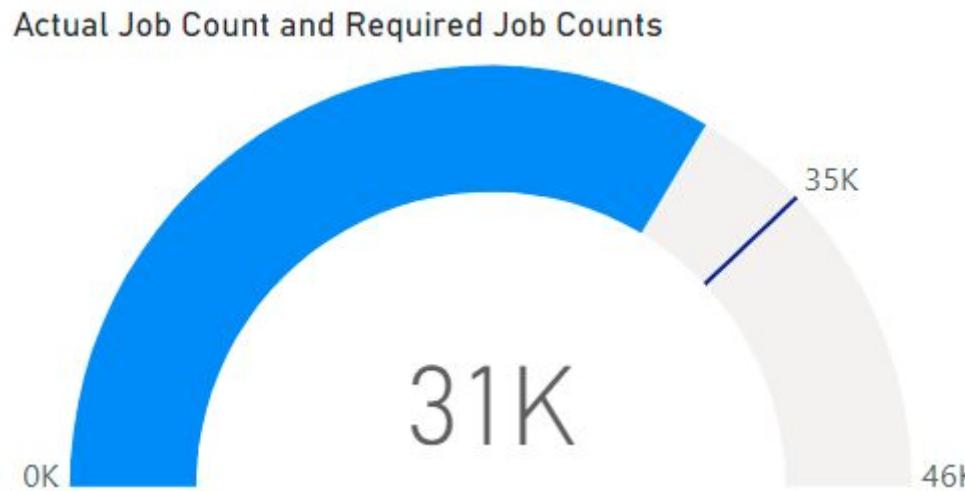
# Radial gauge charts

- A **radial gauge chart** has a circular arc and **displays a single value** that measure 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



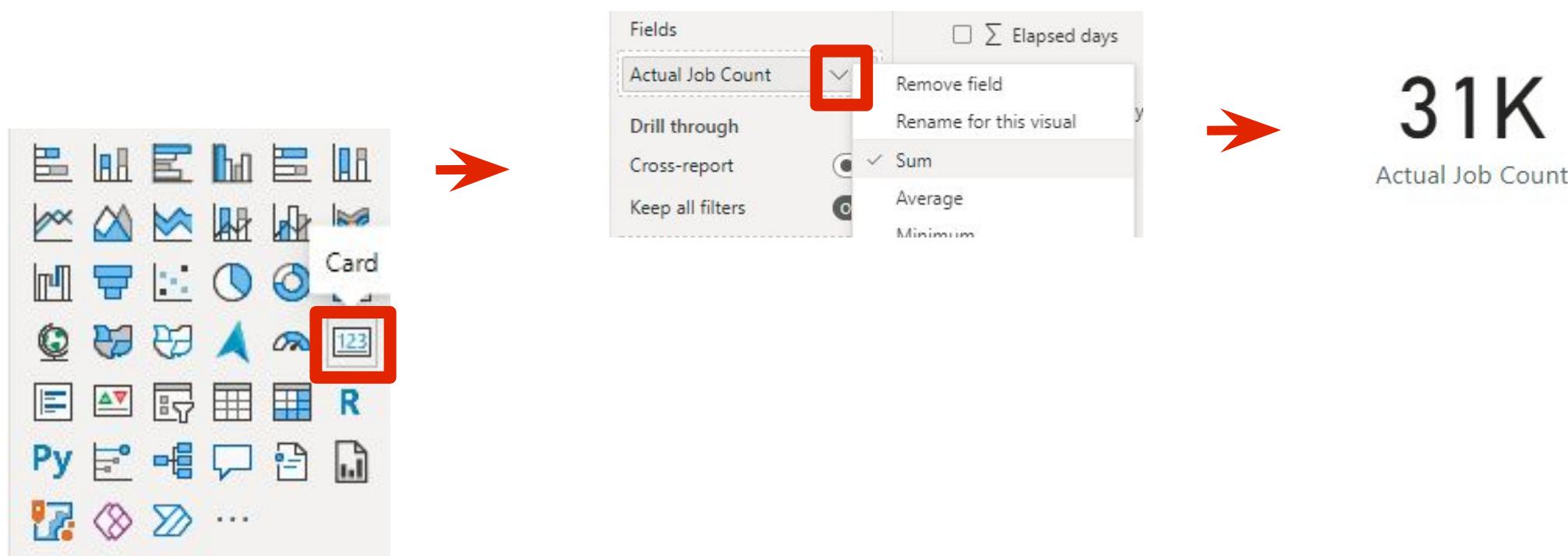
# Formatting options for radial gauge

- 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
- Set Target at 35,000



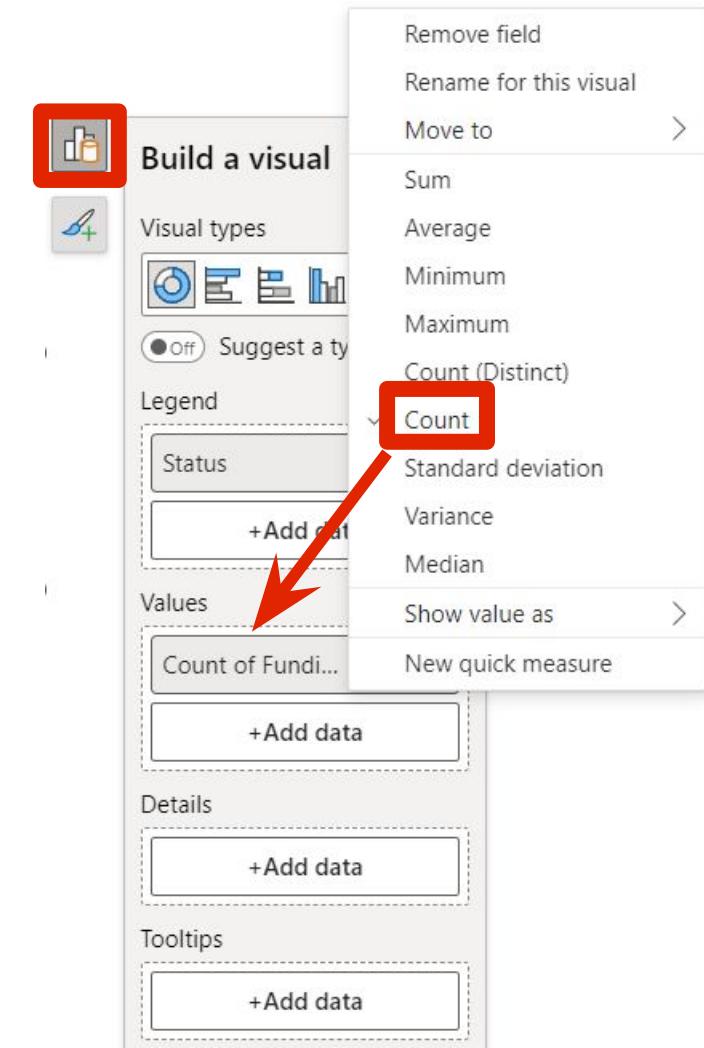
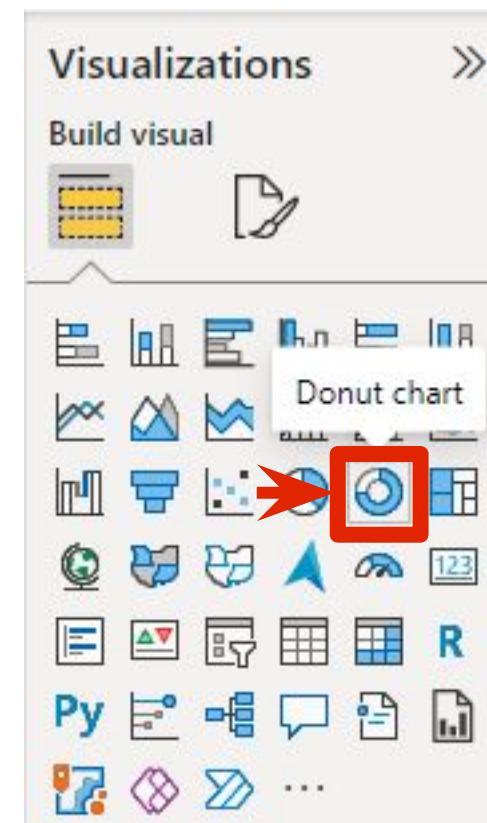
# Card visualization

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



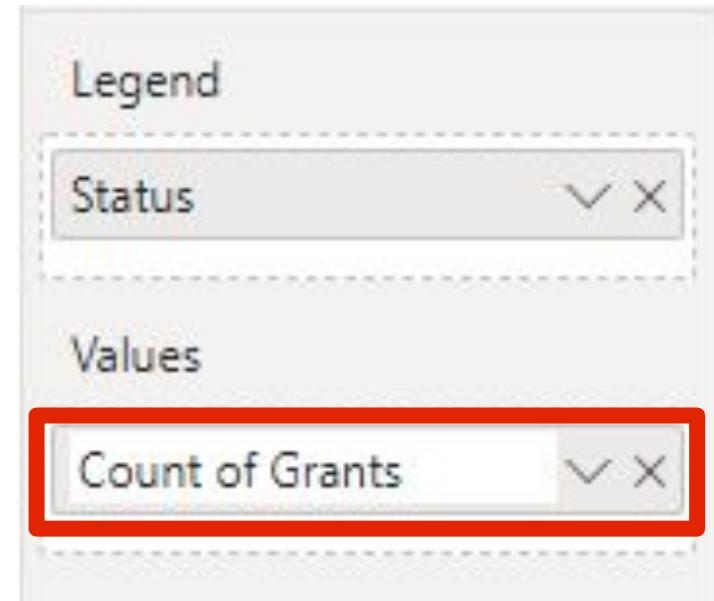
# Create a donut chart

- A donut 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



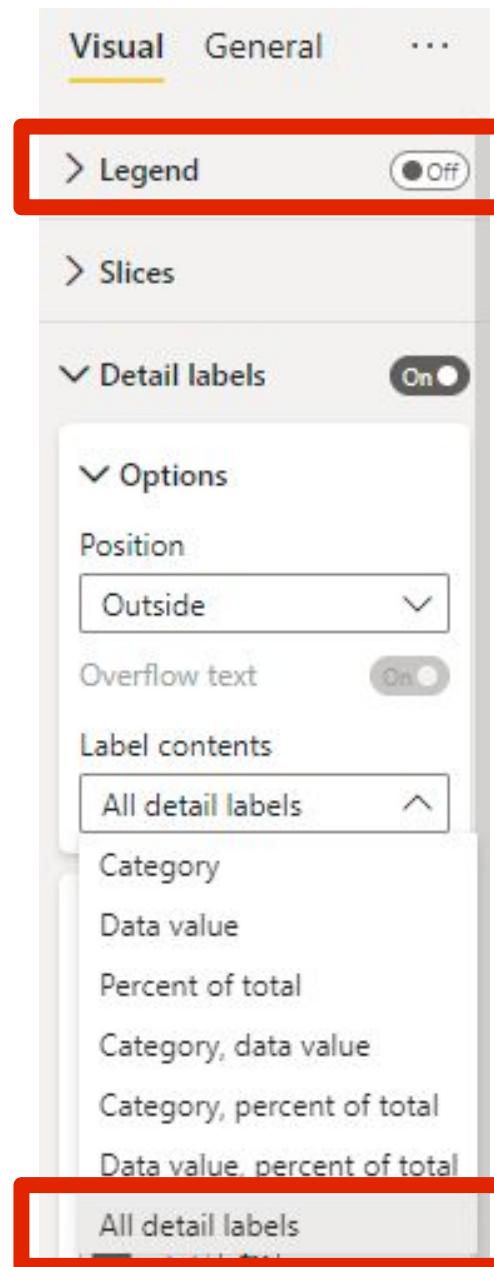
# Rename a field

- Double-click the field name in the Values well
- Type 'Count of Grants' and hit enter
- The field will be renamed, but just for the visual selected, NOT in the data model

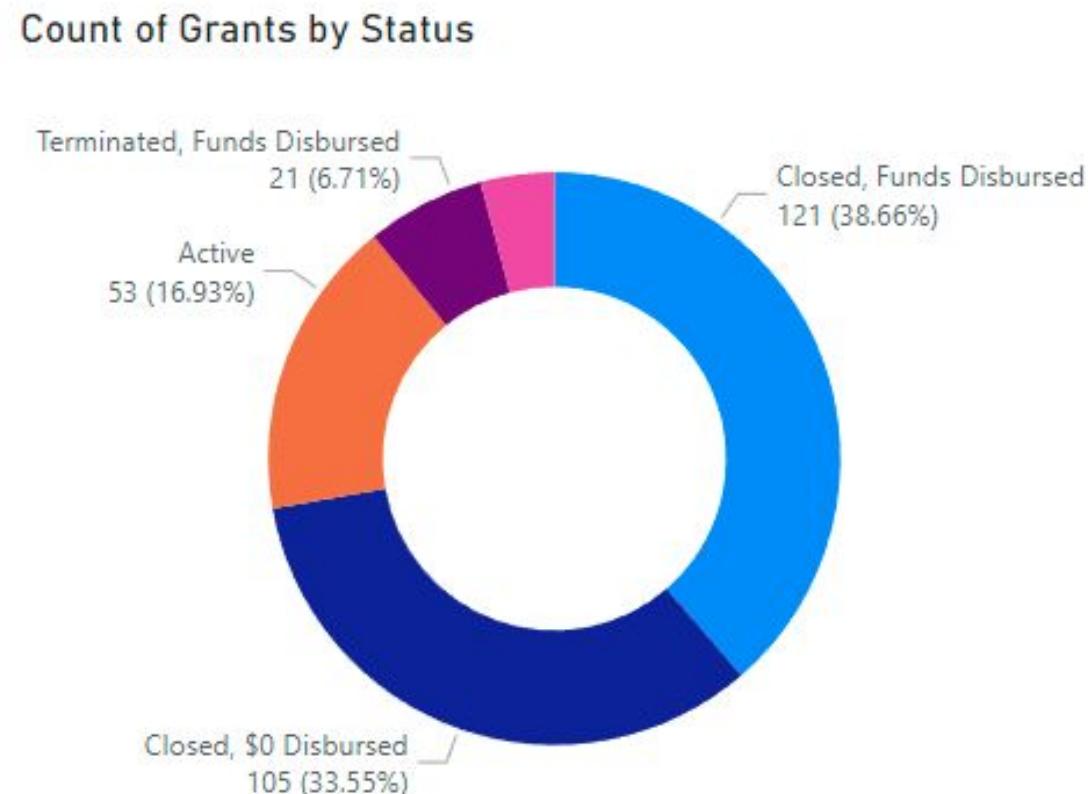


# Alter the Detail Labels

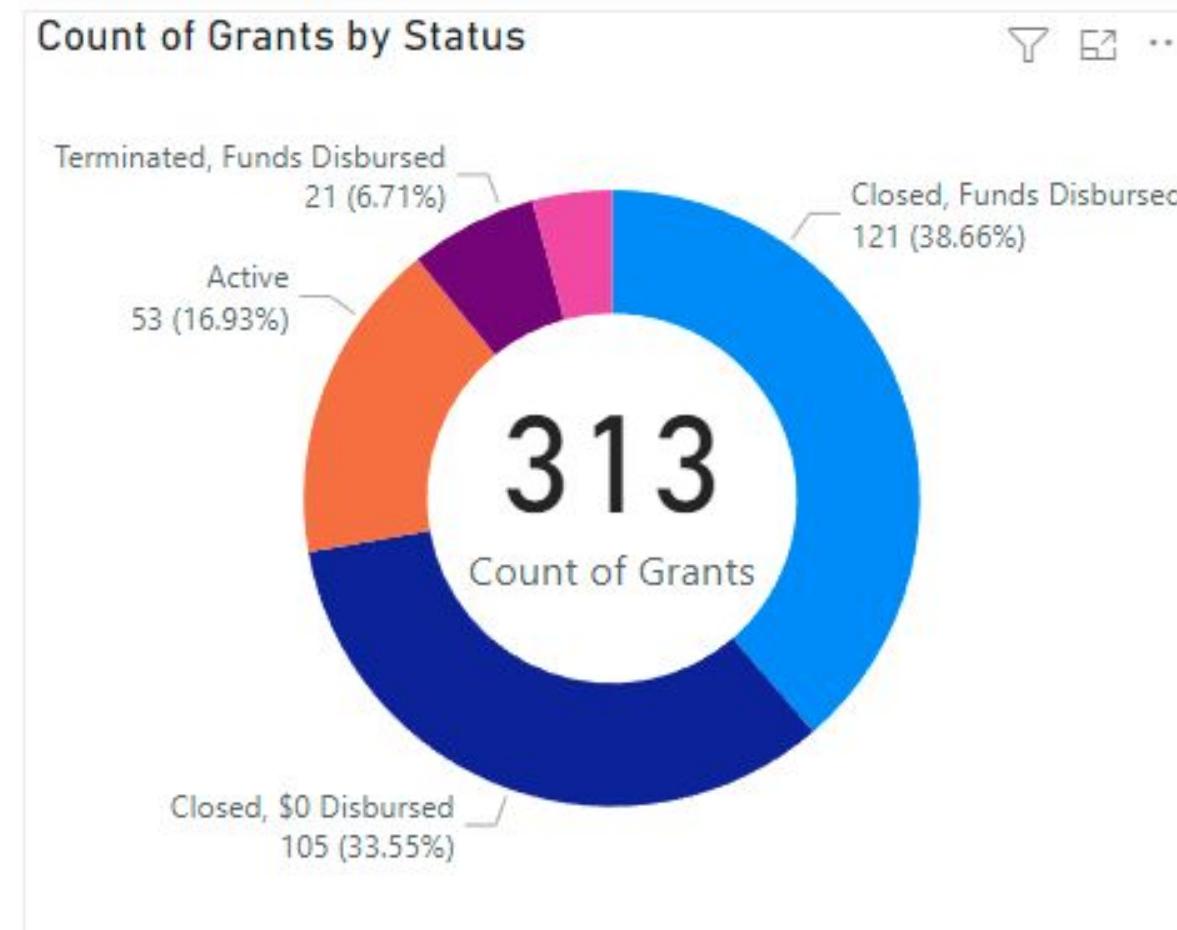
- In the Format tab, change Label contents to 'All detail labels'
- Turn off Legend



# Donut chart

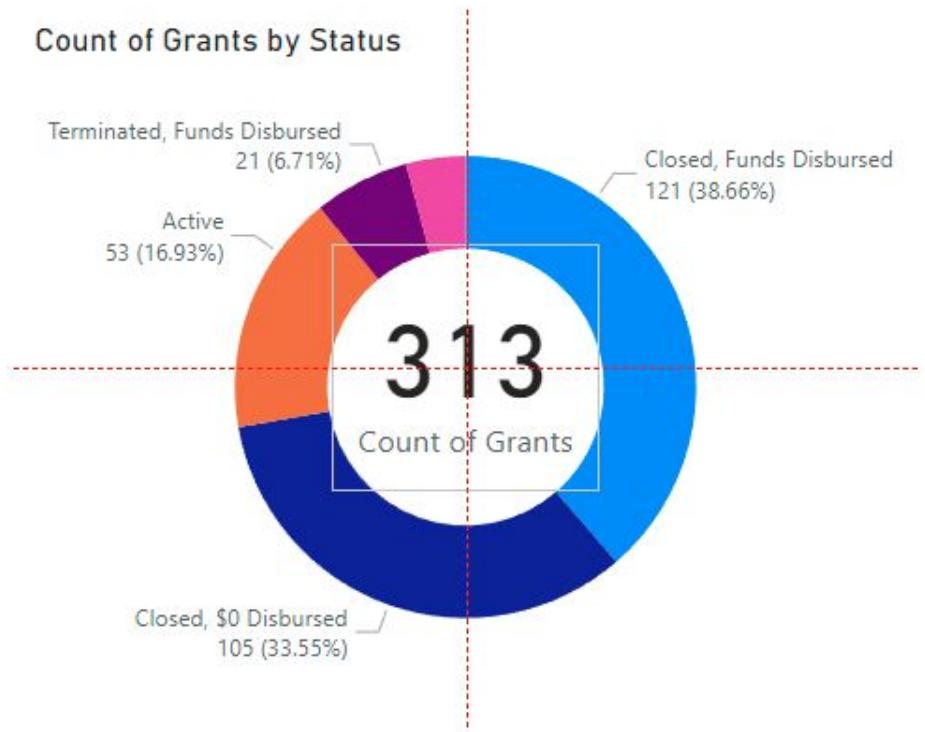
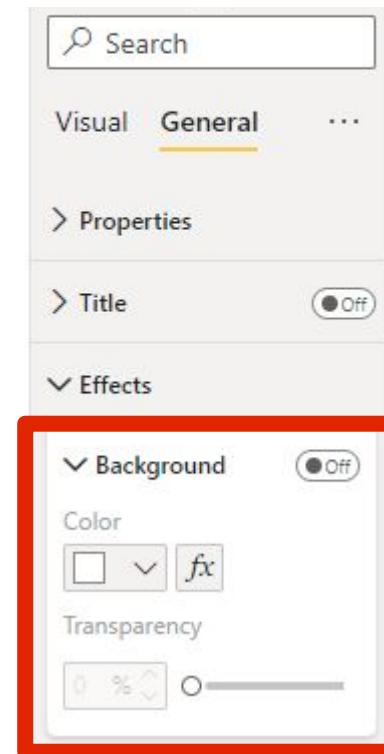


# Visual overlay example

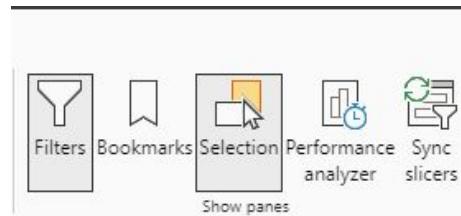


# Edit visual background

- Go to Format Tab, General category
- Turn off Background in the Effects section
- Center Card on Donut Chart

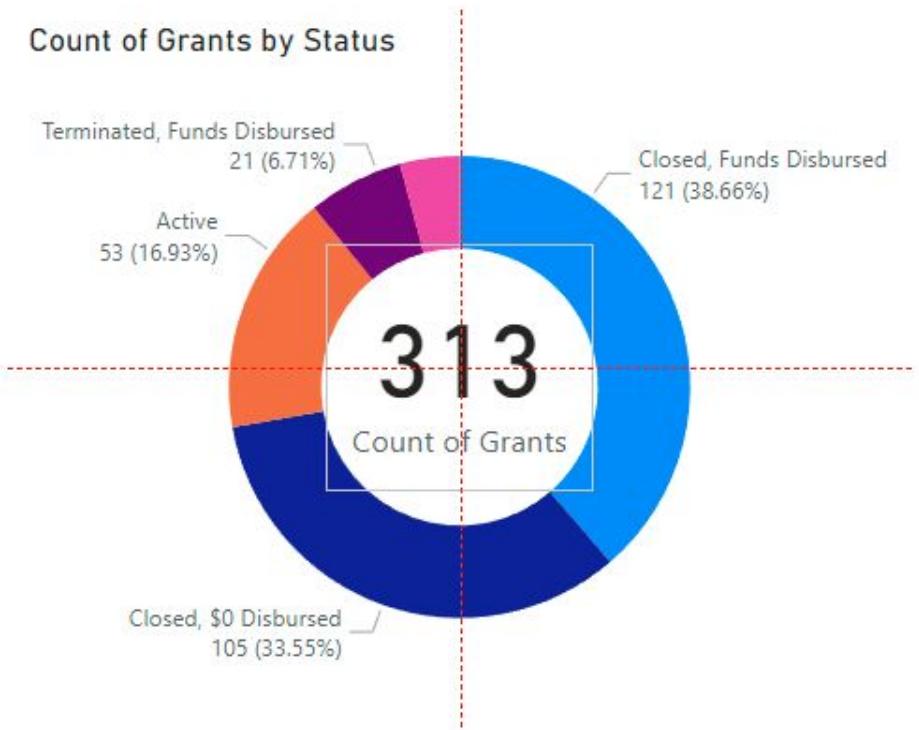


# Selection Show Panes



You'll need to arrange the Selection – Layer in order for the card to always appear

The screenshot shows the Power BI ribbon with the 'Show panes' icon selected. Below the ribbon, the 'Selection' pane is open, showing the 'Layer order' tab. It lists four items: 'Card', 'Count of Grants by Status', 'Sum of Actual Job Count', and 'Manufacturing Leads the Charge in Jobs'. The 'Card' item is at the top of the layer order.

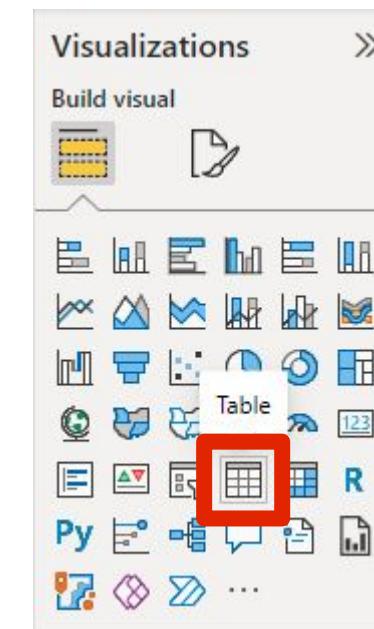


# Create a detail table

- Create a new Page called 'Grant Details'



- Create a 'Table' Visual



- From the data table, add all the fields listed

Columns		
Program	▼	X
Company	▼	X
Award Date	▼	X
Year		X
Quarter		X
Month		X
Day		X
Funding ID	▼	X
Status	▼	X
Actual Job Count	▼	X
Required Job Counts	▼	X

# 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
JDIG	Celgard, LLC II	2011	Qtr 3	July	25	1	Terminated, \$0 Disbursed	0	225

# Format award date

- Right Click on the field 'Award Date' field under 'Values' of 'Visualization' Pane and change the 'Date Hierarchy' to 'Award Date'

The screenshot shows the 'Build a visual' pane in Power BI. A red box highlights the 'Date Hierarchy' context menu for the 'Award Date' field, which includes options like 'Remove field', 'Move', 'New quick measure', 'Show items with no data', and 'Award Date'. A red arrow points from this menu to the resulting list of dates on the right.

Award Date
Thursday, September 09, 2010
Friday, March 20, 2009
Thursday, December 08, 2011
Monday, May 16, 2011
Wednesday, February 18, 2009
Friday, April 20, 2012
Monday, November 28, 2011
Thursday, December 16, 2010
Wednesday, May 06, 2009
Tuesday, July 20, 2010
Thursday, January 13, 2011
Wednesday, February 01, 2012
Thursday, August 05, 2010
Friday, July 30, 2010
Wednesday, January 20, 2010
Monday, July 25, 2011

# 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 09, 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 08, 2011	1	Terminated, Funds Disbursed	0	208
JDIG	AptarGroup, Inc.	Monday, May 16, 2011	1	Active	106	135
JDIG	ASCO Power Technologies, L.P.	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 06, 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 01, 2012	1	Terminated, Funds Disbursed	111	169
JDIG	Caterpillar Inc. (Butterfly)	Thursday, August 05, 2010	1	Active	421	293
JDIG	Caterpillar Inc. (Coho)	Friday, July 30, 2010	1	Terminated, Funds Disbursed	269	353
JDIG	Caterpillar Inc. I	Wednesday, January 20, 2010	1	Terminated, Funds Disbursed	199	260
JDIG	Caterpillar Inc. II	Monday, July 25, 2011	1	Terminated, \$0 Disbursed	0	225
JDIG	Cards International, Inc.	Tuesday, November 29, 2011	1	Terminated, Funds Disbursed	281	375
JDIG	Services (USA) Inc.	Thursday, June 03, 2010	1	Active	242	232



# Create a detail table

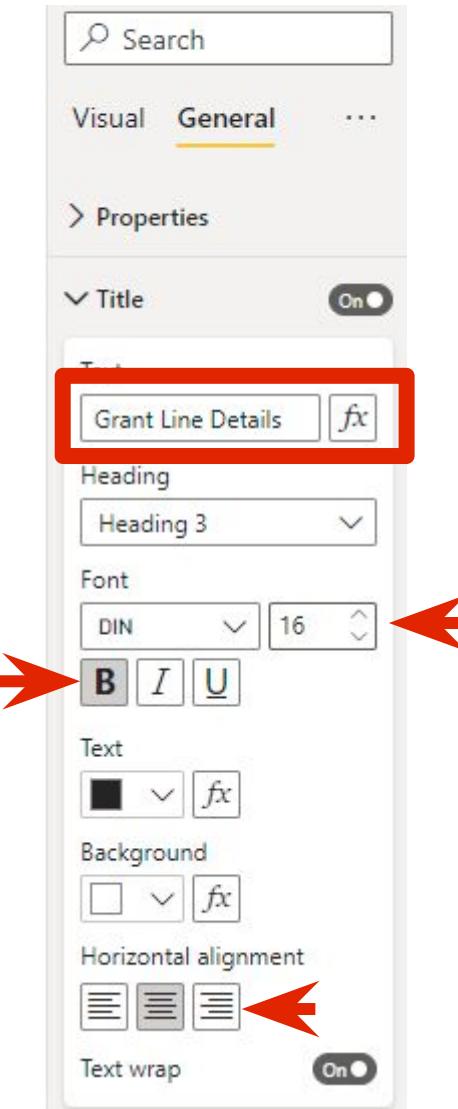
- Right Click on the 'Funding ID' field under 'Values' of 'Visualization' Panel and change the calculation method from 'Count' to 'Don't summarize'

The screenshot shows a context menu open over a 'Funding ID' field in a table visual. The menu includes options like 'More visuals', 'Q&A', 'Key influence', 'Remove field', 'Rename for this visual', 'Move', 'Add a sparkline', 'Conditional formatting', 'Remove conditional formatting', and 'Don't summarize'. A red box highlights the 'Don't summarize' option, and a red arrow points from it to the right.

Funding ID
273
146
409
355
142
437
404
306
157
257
316
422
263
259
213
376
406
247

# Add a table title

- Go to Format Tab, General category and turn 'Title' on
  - Put 'Grant Line Details' in Text
  - And text size to be '16'
  - Make the font bold
  - Align to center



# Conditional formatting

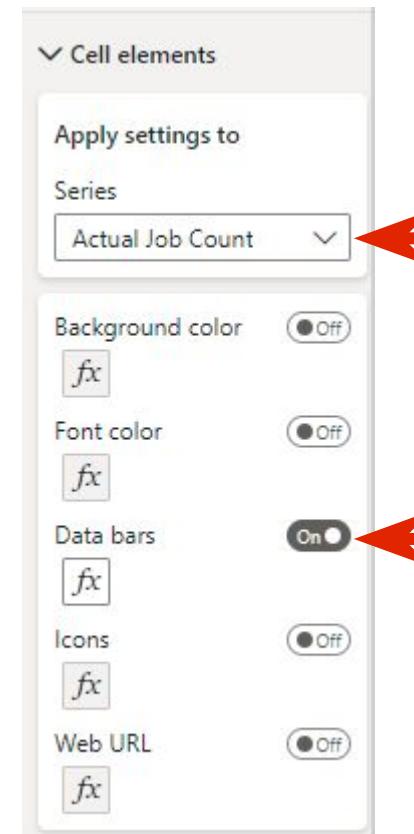
- Can we apply conditional formatting on 'Actual Job Count' column?

Grant Line Details						
Program	Company	Award Date	Funding ID	Status	Actual Job Count	Required Job Counts
JDIG	ABB Inc.	Thursday, September 09, 2010	273	Terminated, Funds Disbursed	156	130
JDIG	Ally Financial Inc. (f/k/a GMAC LLC)	Friday, March 20, 2009	146	Active	224	180
JDIG	American Roller Bearing Company of North Carolina	Thursday, December 08, 2011	409	Terminated, Funds Disbursed	0	208
JDIG	AptarGroup, Inc.	Monday, May 16, 2011	355	Active	106	135
JDIG	ASCO Power Technologies, L.P.	Wednesday, February 18, 2009	142	Terminated, Funds Disbursed	198	295
JDIG	Ashley Furniture Industries, Inc. I	Friday, April 20, 2012	437	Active	1229	468
JDIG	Avaya, Inc.	Monday, November 28, 2011	404	Terminated, \$0 Disbursed	0	135
JDIG	BAE Systems Shared Services Inc.	Thursday, December 16, 2010	306	Active	169	158
JDIG	Bayer CropScience LP	Wednesday, May 06, 2009	157	Active	139	128
JDIG	Brunswick Corporation (Hatteras Yachts Division)	Tuesday, July 20, 2010	257	Terminated, Funds Disbursed	221	315
JDIG	Capgemini America, Inc.	Thursday, January 13, 2011	316	Terminated, Funds Disbursed	255	495
JDIG	Caterpillar Inc (Bee)	Wednesday, February 01, 2012	422	Terminated, Funds Disbursed	111	169
JDIG	Caterpillar Inc (Butterfly)	Thursday, August 05, 2010	263	Active	421	293
JDIG	Caterpillar Inc (Cape)	Friday, July 30, 2010	259	Terminated, Funds Disbursed	269	353
JDIG	Cellular One Inc.	Wednesday, January 20, 2010	213	Terminated, Funds Disbursed	199	260
JDIG	Celent International, Inc.	Monday, July 25, 2011	376	Terminated, \$0 Disbursed	0	225
JDIG	Centrica International, Inc.	Tuesday, November 29, 2011	406	Terminated, Funds Disbursed	281	375
JDIG	Centrica Services (USA) Inc.	Thursday, June 03, 2010	247	Active	242	232
JDIG	Chesapeake Energy Inc.	Thursday, June 07, 2012	446	Active	532	286
JDIG	Clearwater Paper Corporation I	Thursday, June 10, 2010	248	Active	270	225
JDIG	Compass Group USA, Inc.	Monday, June 20, 2011	360	Terminated, \$0 Disbursed	0	180



# Conditional formatting for 'Actual Job Count'

- Go to the 'Format' tab, Visual category, 'Cell elements' section
- Select the 'Actual Job Count' field from Series
- Turn on the Data Bars
- Click the column header to sort large to small



# Formatted Grant Line Details Table

Grant Line Details						
Program	Company	Award Date	Funding ID	Status	Actual Job Count	Required Job Counts
JDIG	Ashley Furniture Industries, Inc. I	Friday, April 20, 2012	437	Active	1229	468
OneNC	Electrolux Home Products, Inc.	Wednesday, December 16, 2009	204	Closed, Funds Disbursed	745	574
JDIG	Electrolux Home Products, Inc. I	Wednesday, December 16, 2009	203	Active	625	590
JDIG	Siemens Energy, Inc. II (Cardinal)	Thursday, March 11, 2010	223	Active	569	660
OneNC	Honda Aircraft Company, LLC	Monday, October 10, 2011	386	Closed, Funds Disbursed	569	377
JDIG	Citrix Systems, Inc.	Thursday, June 07, 2012	446	Active	532	286
JDIG	Cree, Inc. II	Monday, September 20, 2010	277	Active	527	220
JDIG	Herbalife International of America, Inc. I	Wednesday, December 19, 2012	496	Active	493	444
OneNC	Herbalife International of America, Inc. I	Wednesday, December 19, 2012	498	Closed, Funds Disbursed	493	444
JDIG	EMC Corporation	Thursday, September 24, 2009	181	Active	489	357
JDIG	Red Hat, Inc. I	Monday, January 10, 2011	314	Active	472	180
OneNC	Siemens Energy, Inc. II (Cardinal)	Thursday, March 11, 2010	224	Closed, Funds Disbursed	471	420
OneNC	Smithfield-Kinston, LLC	Tuesday, November 08, 2011	395	Closed, Funds Disbursed	449	297
OneNC	CheckFree Services Corporation (Fiserv)	Tuesday, October 27, 2009	190	Closed, Funds Disbursed	438	377
JDIG	Hewitt Associates L.L.C. (d/b/a Aon Hewitt)	Wednesday, March 31, 2010	229	Active	431	417
JDIG	Caterpillar Inc. (Butterfly)	Thursday, August 05, 2010	263	Active	421	293
JDIG	Zenta Mortgage Services, LLC	Tuesday, December 22, 2009	206	Terminated, Funds Disbursed	414	902
OneNC	United Furniture Industries NC, LLC	Thursday, April 15, 2010	236	Closed, Funds Disbursed	354	135
JDIG	Sid Tool Co., Inc.	Wednesday, June 20, 2012	454	Active	352	360
OneNC	Sid Tool Co., Inc.	Wednesday, June 20, 2012	455	Active	352	360
OneNC	Laboratory Corporation of America Holdings	Wednesday, February 10, 2010	218	Closed, Funds Disbursed	344	311
OneNC	Caterpillar Inc. (Butterfly)	Thursday, August 05, 2010	265	Closed, Funds Disbursed	340	244
JDIG	Premier Healthcare Solutions, Inc.	Wednesday, October 14, 2009	188	Active	333	270
JDIG	Continental Automotive Systems, Inc. (Henderson)	Monday, July 20, 2009	173	Active	324	304
OneNC	Celgard, LLC I	Wednesday, January 20, 2010	214	Closed, Funds Disbursed	319	203
<b>Total</b>					<b>30931</b>	<b>46110</b>

# End of Lab 2



# Day 2 - Knowledge Check 1



# Agenda

- Build a BI report with formatting techniques
- Build a complex BI report with interactive visualizations

# Beginning of Lab 3



# Objectives for Lab 3

- Learn to use filters effectively to analyze your data
- Format visuals using slicers



# 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

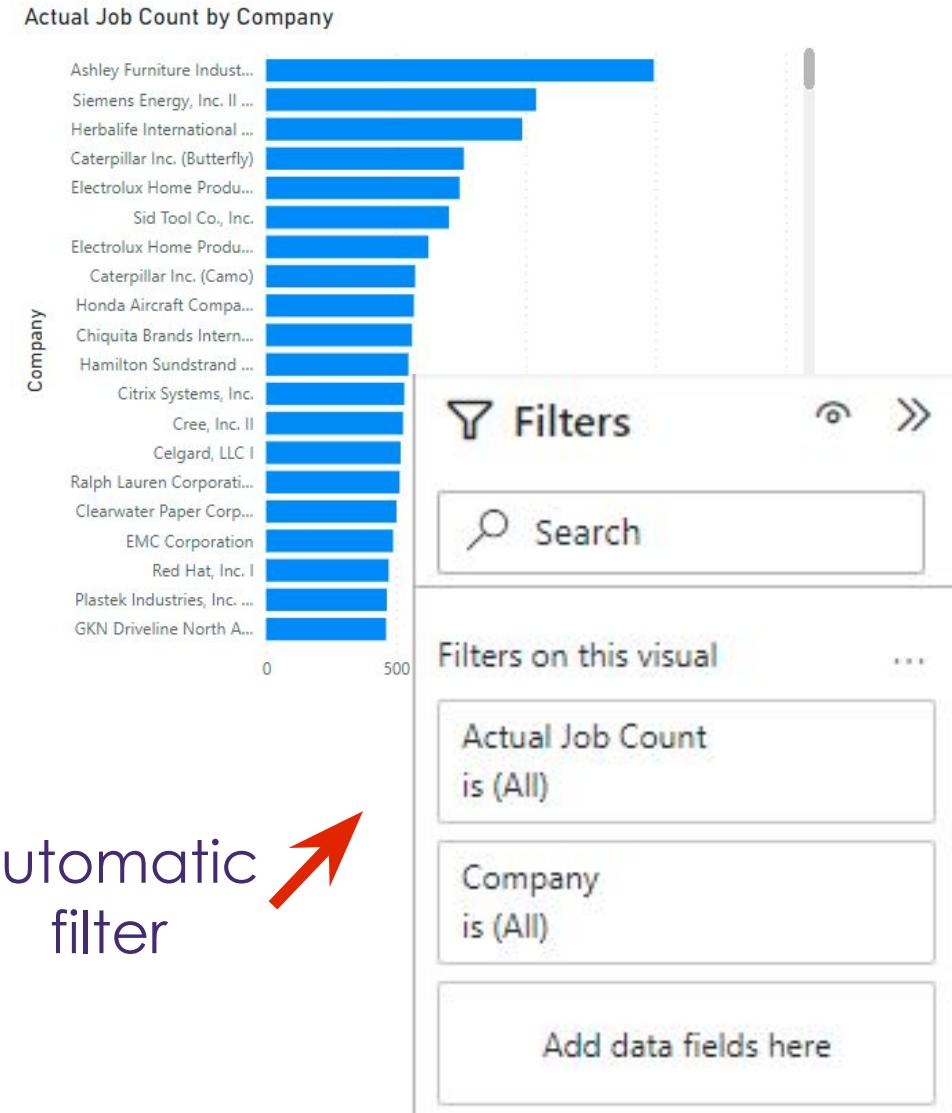
The NC state government gave \$400,000,000 in grant money from 2009 to 2013. The grant manager from the NC office of grants is interested to know how many jobs were created in each funded county from 2009 to 2013. With this information, the grants manager will be able to see where the grant money made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

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

- **Actual Job Count** by Company (bar chart)
- **Company** sorted by the Sum of Actual Job Count
- **Award Date** as a date hierarchy slicer to select the needed time period

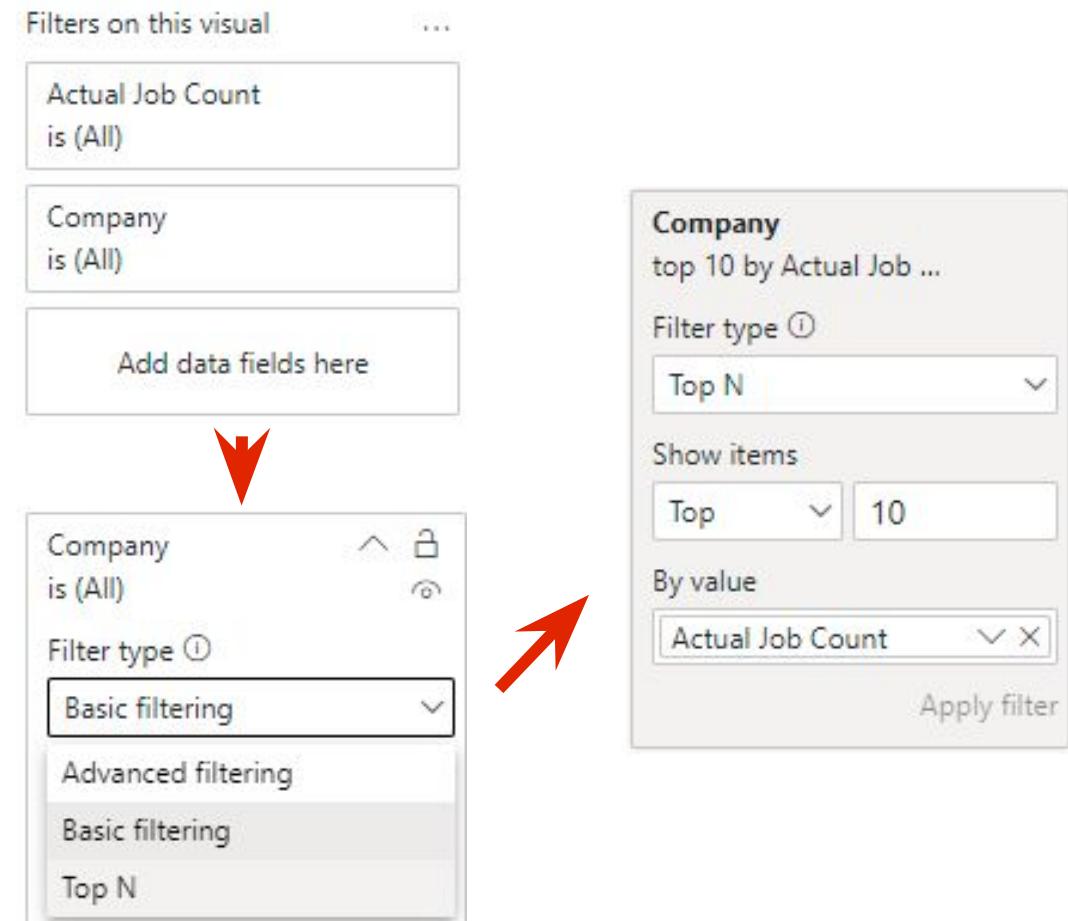
# Using Visual Filter

- **Visual level** filters are the most powerful filters in Power BI, exclusive of custom filter options that can be specified
- Click on the bar chart we just created
- Then go to the '**Filters**' Pane 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 settings or add new filters from the fields pane



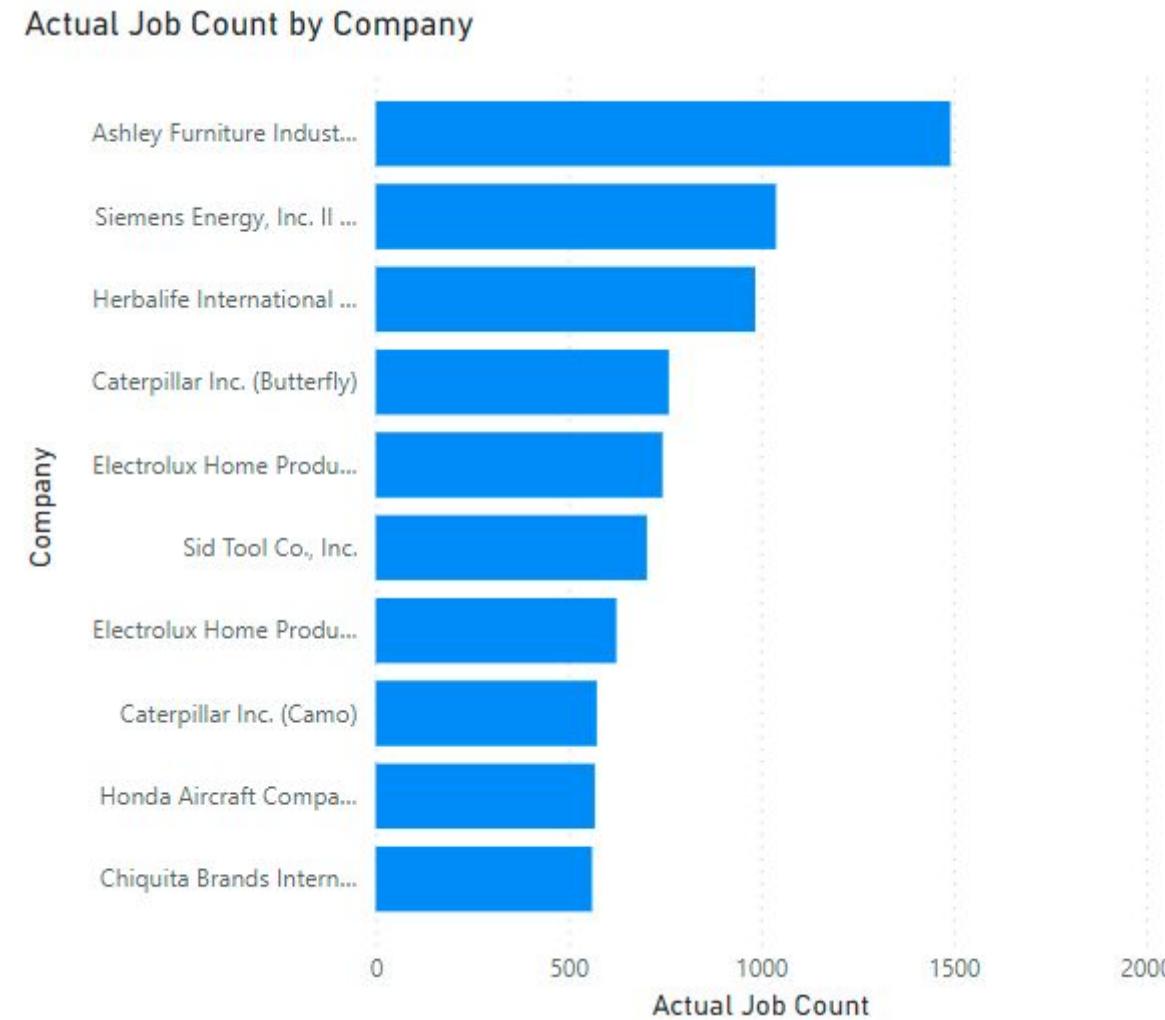
# Applying the filter

- Click on the drop-down arrow on the right of 'Company' 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 Pane to 'By value' well
- Click 'Apply filter'
- Rename visual to reflect Top 10 filter
- Rename the page to 'Company Review'



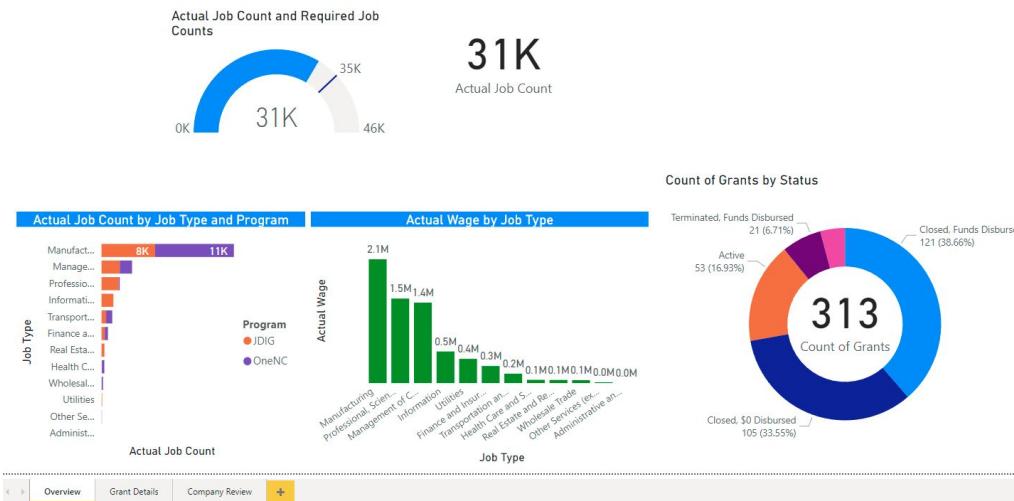
# Investigate the data

- Which top 10 Companies created the most jobs?



# Using a Page Level filter

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



**Filters** ✖️ ➡️

Search

**Filters on this page** ...

**Award Date**  
is (All)

**Filter type** ⓘ Basic filtering

Select all

Friday, February 06, 2009 1

Wednesday, February 08, 2009 1

Thursday, February 1, 2009 1

Monday, March 09, 2009 1

Friday, March 13, 2009 1

Friday, March 20, 2009 1

Wednesday, April 01, 2009 1

Require single selection

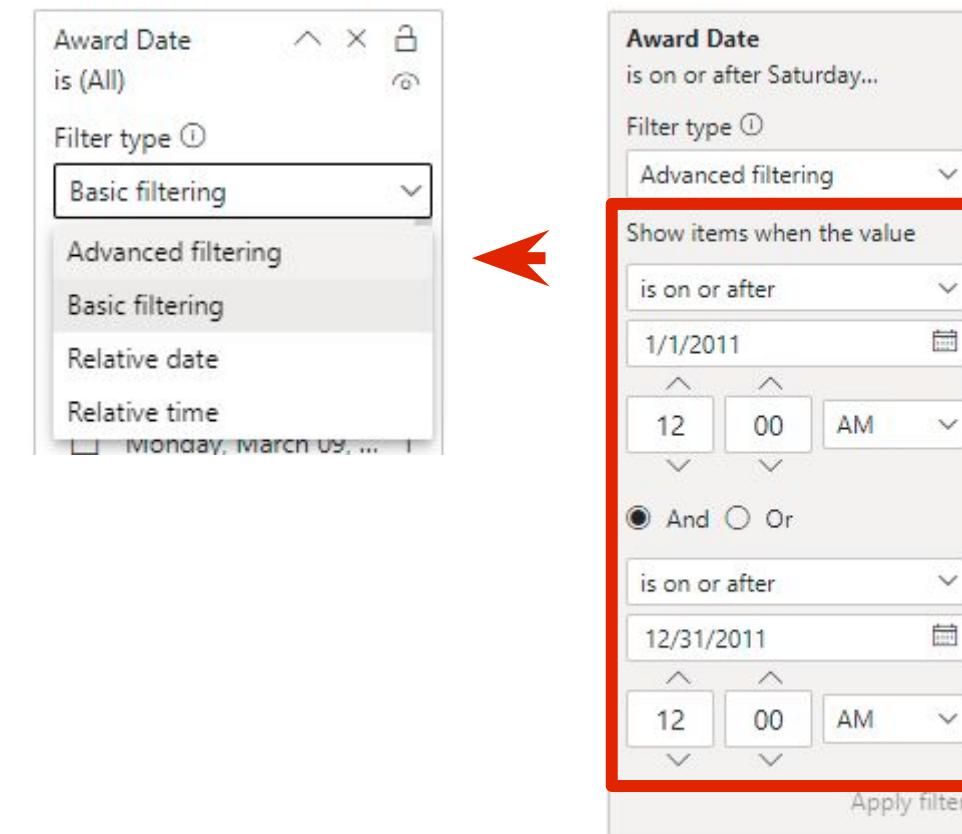
Add data fields here

**Filters on all pages** ...

Add data fields here

# Filter by 'Award Date'

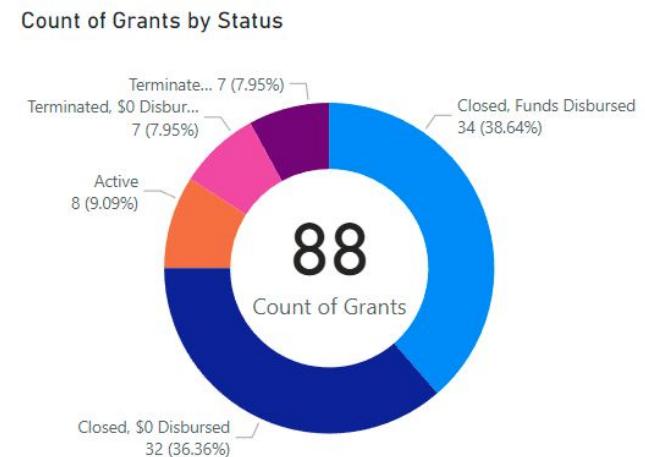
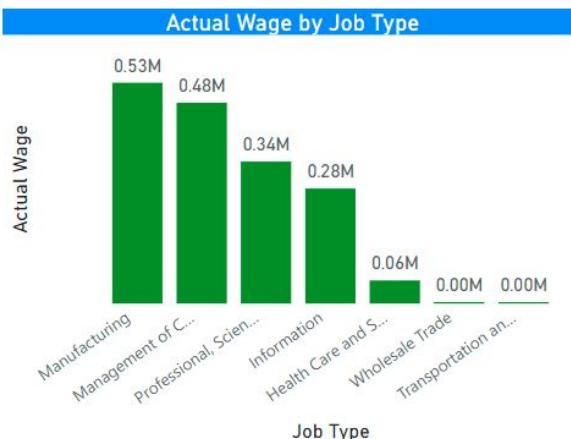
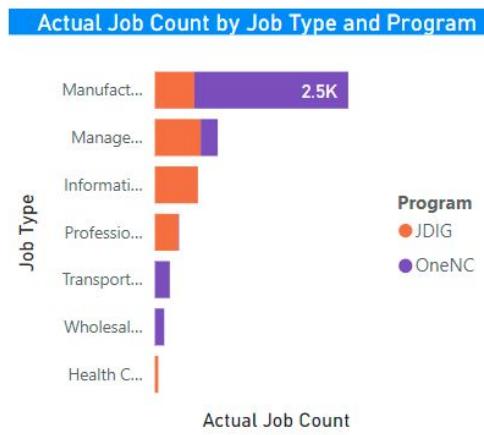
- Choose 'Advanced filtering' under Filter Type
- Put Show items when the value:  
Is on or after 1/1/2011  
And  
Is on or before 12/31/2011



# Filtered by 'Award Date'

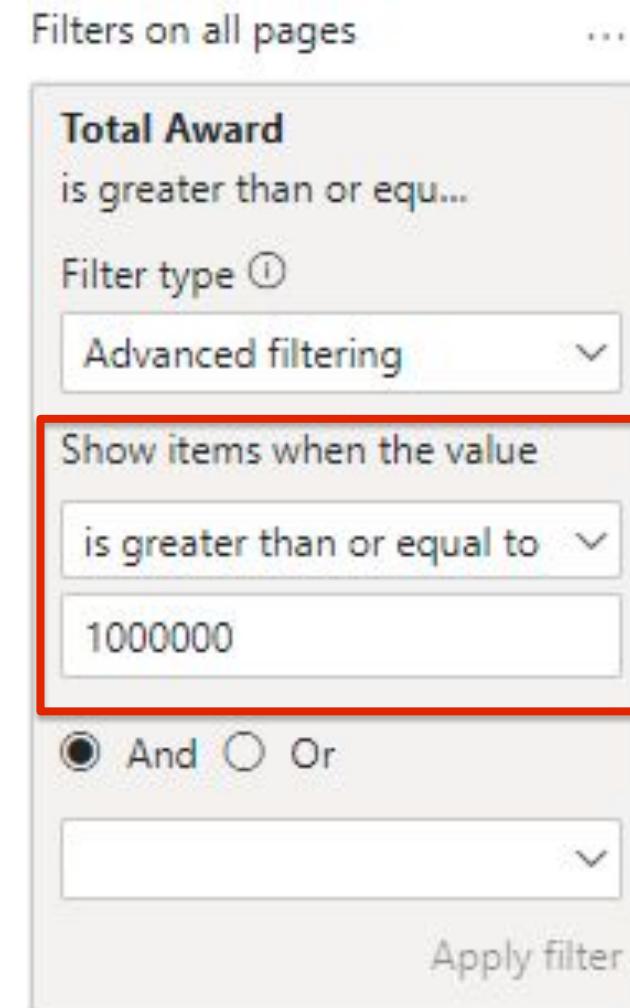


Grant utilization  
filtered by award  
time in 2011



# Using a Report Level filter

- Click on the Page 1
- 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 or equal to \$1,000,000

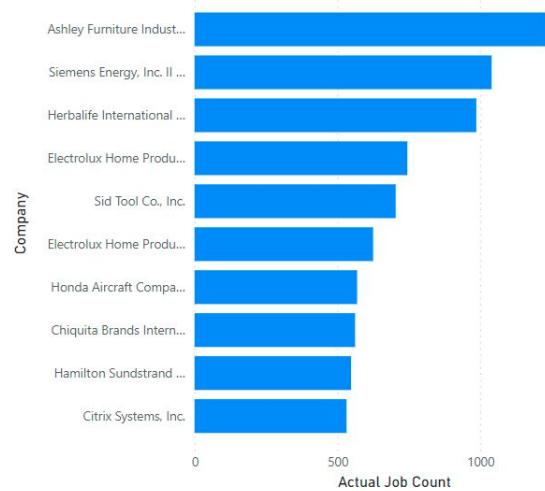


# Filtered by 'Total Award Amount'

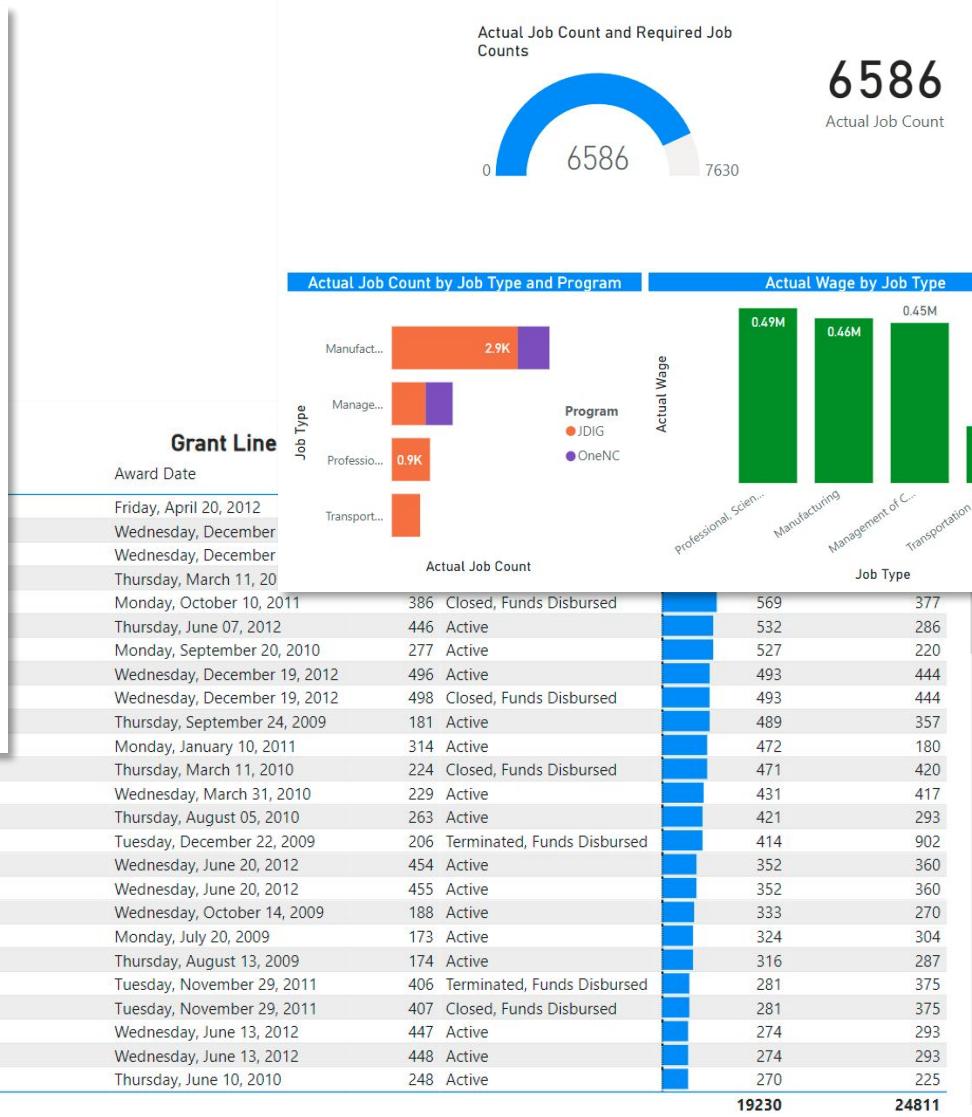
Year, Quarter, Month, Day ▾

- 2009
- 2010
- 2011
- 2012
- 2013

Actual Job Count by Company

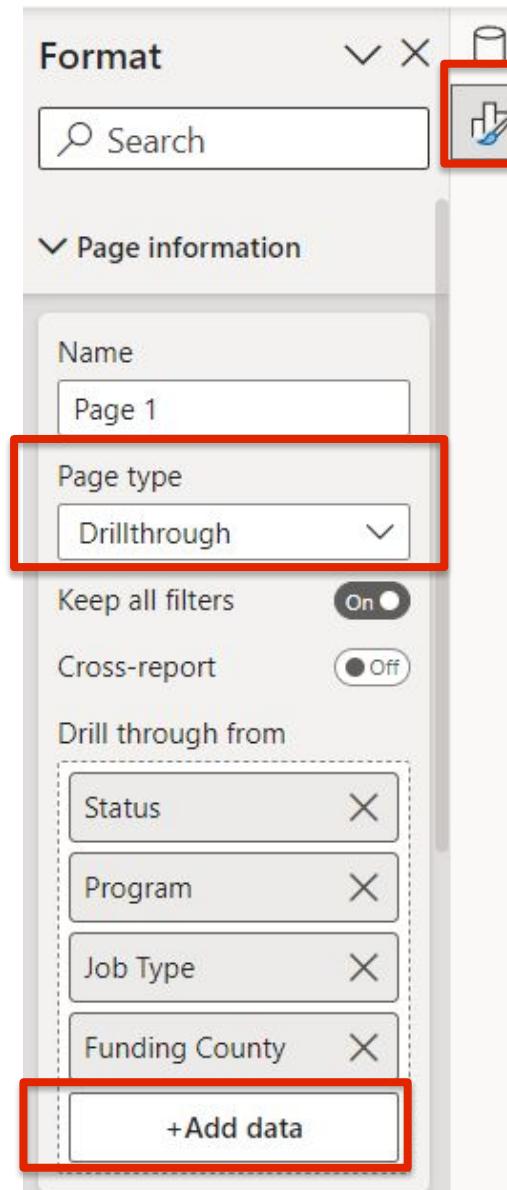


OneNC	Siemens Energy, Inc. II (Cardinal)
JDIG	Hewitt Associates L.L.C. (d/b/a Aon Hewitt)
JDIG	Caterpillar Inc. (Butterfly)
JDIG	Zenta Mortgage Services, LLC
JDIG	Sid Tool Co., Inc.
OneNC	Sid Tool Co., Inc.
JDIG	Premier Healthcare Solutions, Inc.
JDIG	Continental Automotive Systems, Inc. (Henderson)
JDIG	DB Global Technology, Inc. I
JDIG	Chiquita Brands International, Inc.
OneNC	Chiquita Brands International, Inc.
JDIG	Hamilton Sundstrand Corporation
OneNC	Hamilton Sundstrand Corporation
JDIG	Clearwater Paper Corporation I
<b>Total</b>	



# Using the Drill through filter

- You must change the page type from Standard to Drill under Page Information.
- Click on the page and go to the Format section of the page and change the page type to Drillthrough
- Select + Add data to add 'Status', 'Program', 'Job Type' and 'Funding Count' under the Drill Through filter section of the 'Grant Details' Table. So that the same fields in the 'Overview' page can control filtering the detail table



# Diving into data with Drillthrough

- Right-click on the 'Management of Companies' column of the 'Actual Wage by Job Type' column chart
- When you right-click, you can see the 'Drill through' capability



		Grant Line Details		
Program	Company	Award Date	Funding ID	Status
JDIG	Chiquita Brands International, Inc.	Tuesday, November 29, 2011	406	Terminated, Funds Disbursed
OneNC	Chiquita Brands International, Inc.	Tuesday, November 29, 2011	407	Closed, Funds Disbursed
JDIG	TWC Administration LLC (III)	Monday, July 11, 2011	368	Active
JDIG	ESA Management, LLC	Wednesday, March 30, 2011	335	Active
JDIG	LORD Corporation	Tuesday, July 12, 2011	369	Terminated, Funds Disbursed
JDIG	Compass Group USA, Inc.	Monday, June 20, 2011	360	Terminated, \$0 Disbursed
<b>Total</b>			<b>1038</b>	<b>1403</b>

Drill through

Cross-report

Keep all filters

Funding County  is (All)

Job Type  is Management of...

Program  is (All)

Status  is (All)

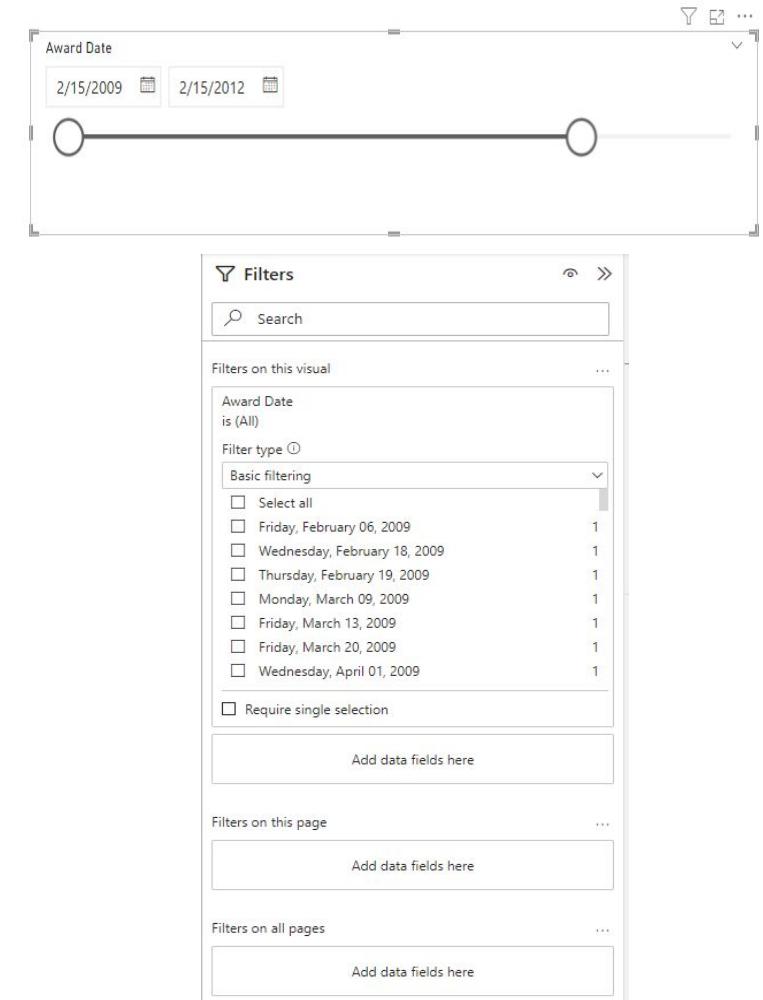
Award Date  is on or after Saturday...

# 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
  - Easily dive into valuable and insightful ‘corners’ of the dataset
  - Creates more focused reports

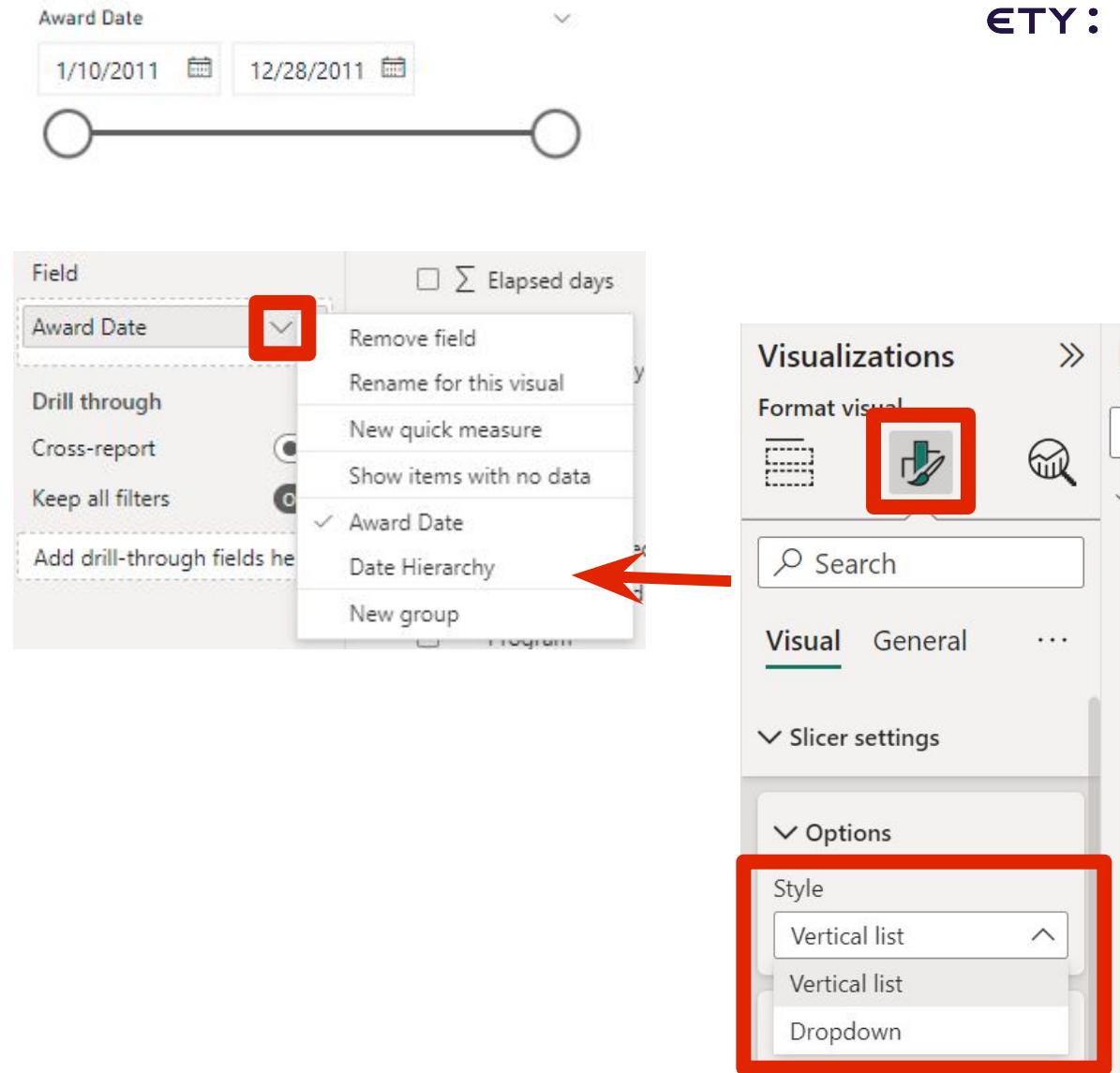
# Facts to remember about slicers

- By default, slicers on pages affect all the other visualizations on that page.
- As you choose values in the list and date sliders you 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.



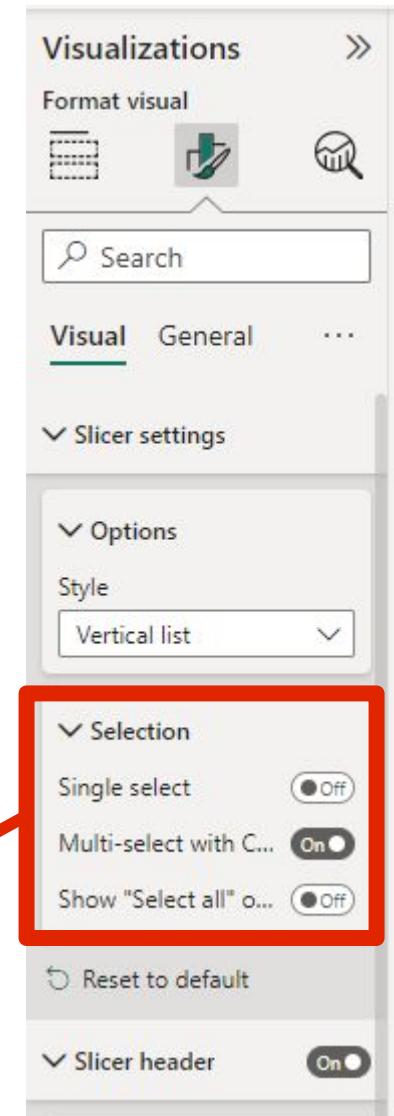
# Using slicers

- Create a slicer visual and add the Award Date field to it.
- Click the dropdown arrow to the right of the Award Date field name in the Field well.
- You can then change the date field to 'Date Hierarchy'
- Under "format", go to Visual and then Slicer settings.



# Formatting the visual with Slicer

- Clear Page-level date filters
- Review different formatting options
- Single select = radio button
  - 2011
- Multi-select with CTRL (default on) allows multiple selections holding down the CTRL key on the keyboard
  - 2011
  - 2011
- Show “Select all” option allows for easy select all, then hold down CTRL and deselect one or multiple



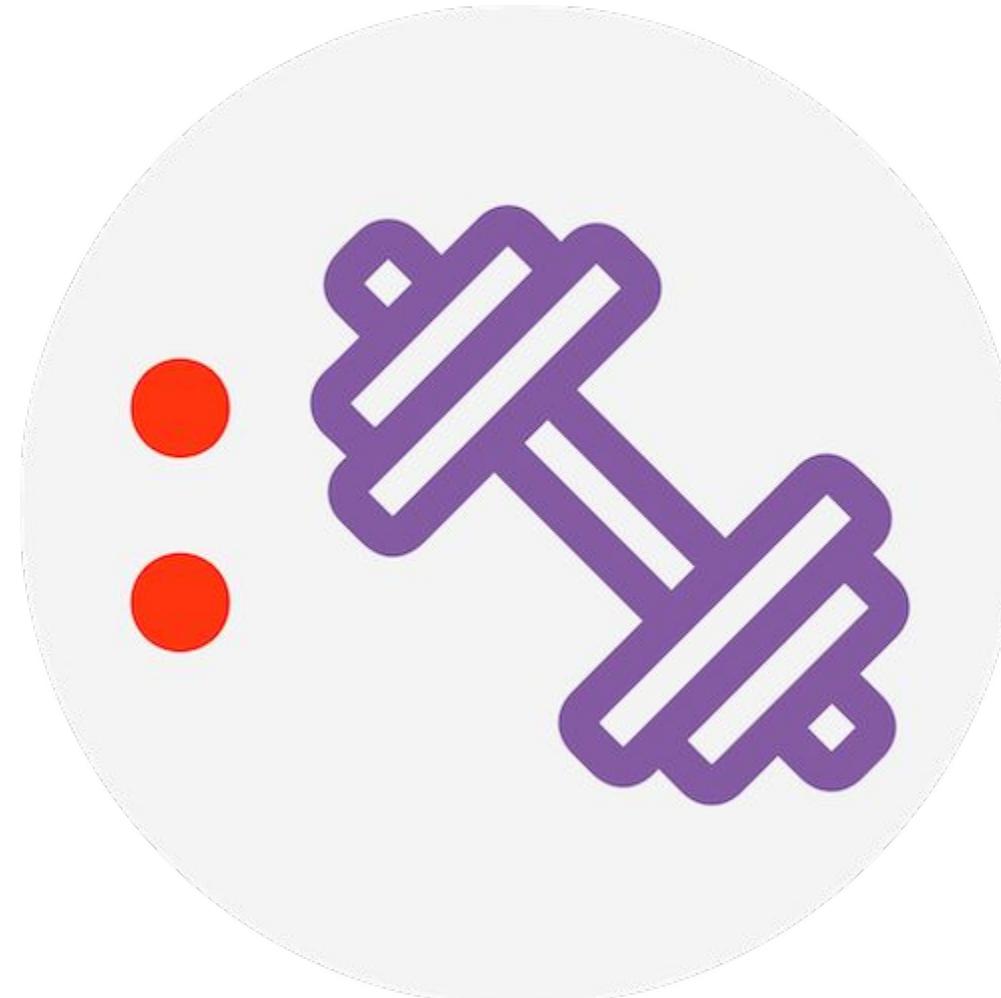
# End of Lab 3



# Day 2 - Knowledge Check 2



# Exercise 2



# Summary

Today you learned how to:

- Build a BI report with formatting techniques
- Build a complex BI report with interactive visualizations

# DATA SOCIETY:

## Power BI Bootcamp

Day 3

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

- Albert Einstein



# Chat Response

- While you wait for class to get started, draft a “X” (Commonly known as 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)



# Agenda

- Create custom and interactive visuals
- ETL layer: load data through Power Query
- Explain the functions of the Power BI web service

# Beginning of Lab 4



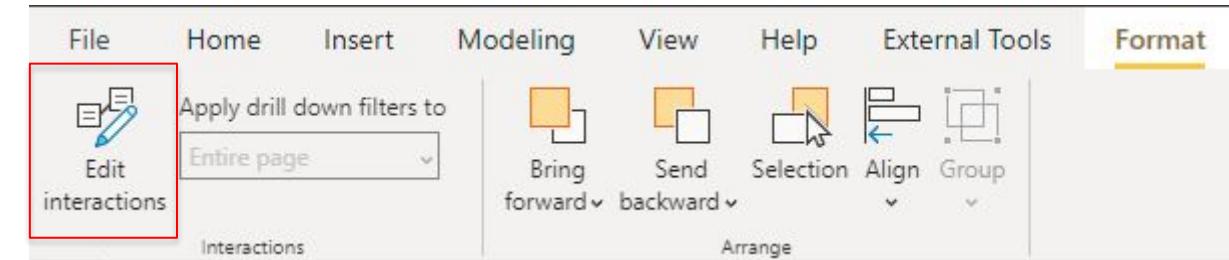
# Objectives for Lab 4

- Continue developing interactive reports
- Utilize report themes and aesthetics

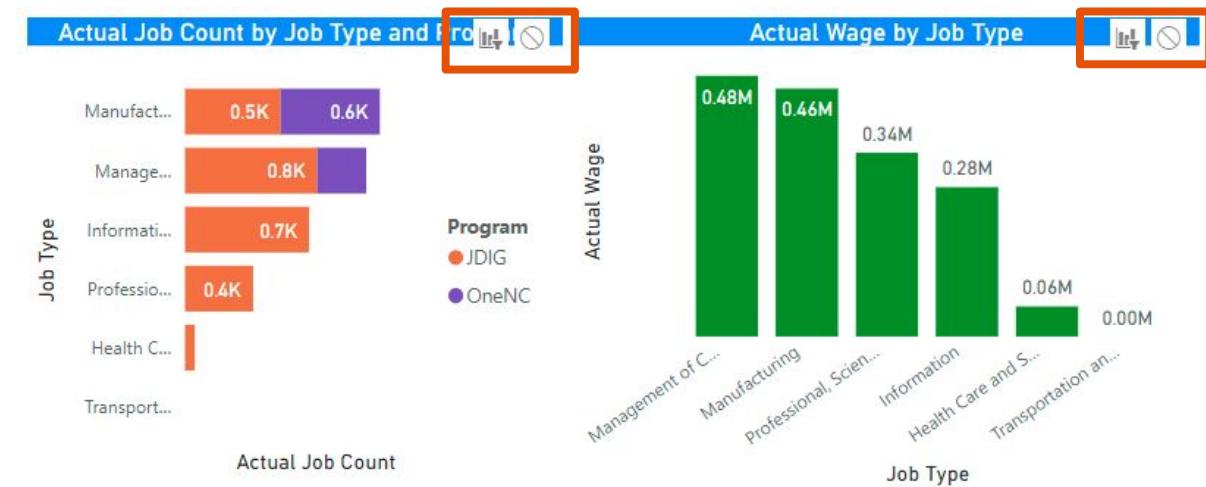


# Using interactive visuals

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

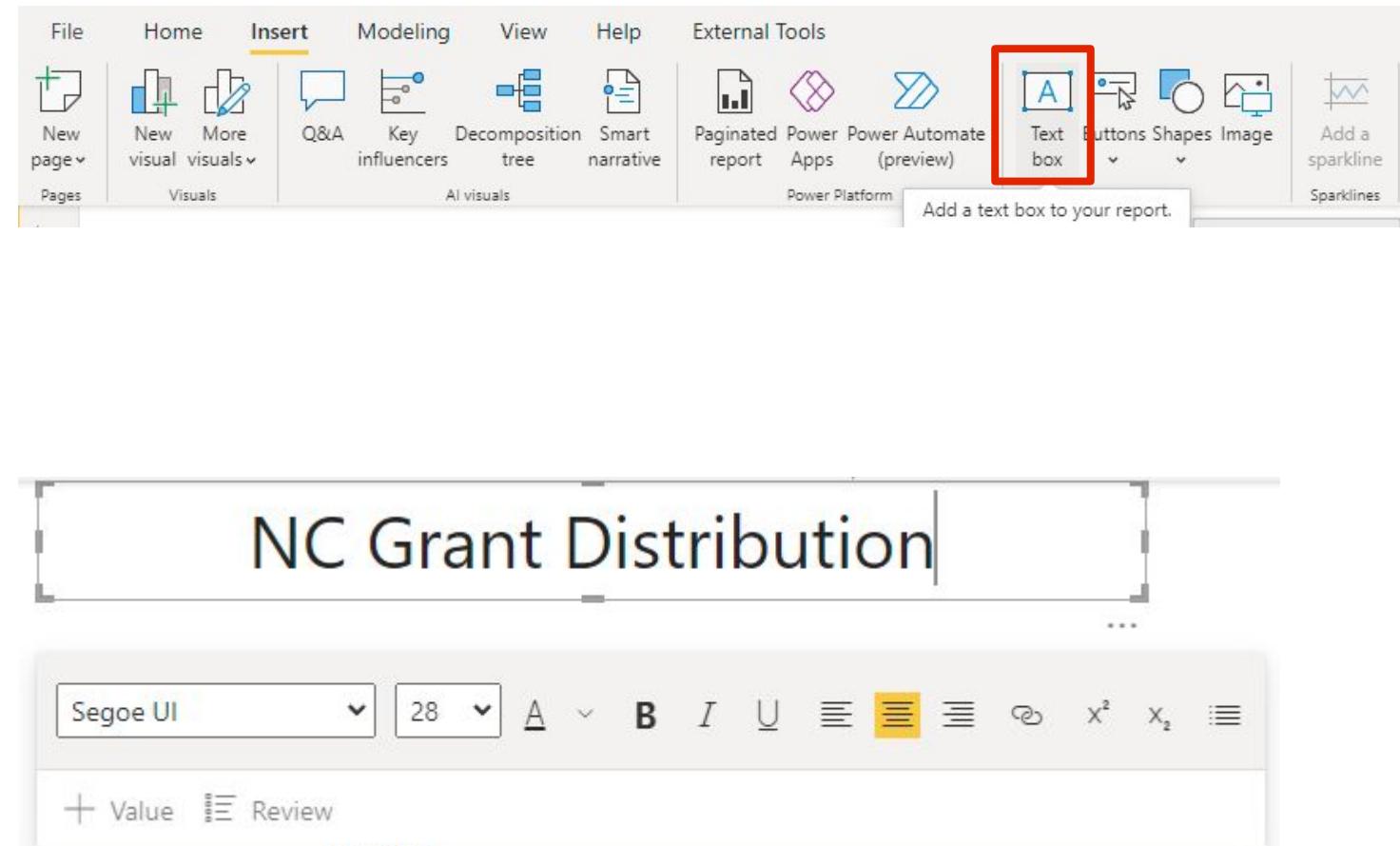


- You can turn interactive filtering on and off between visuals by enabling 'Edit Interactions' under Filter Tools
- Option to cross-filter or highlight
- If it should have no impact, select the no impact icon



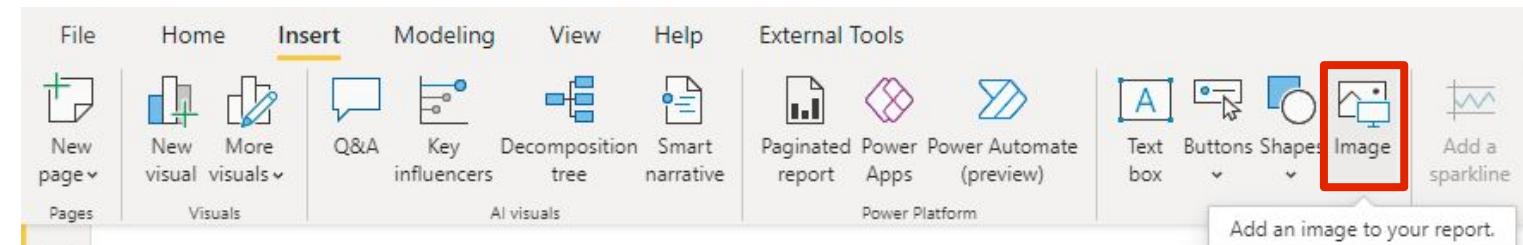
# Add page title

- By clicking on the 'Insert' tab of the Ribbon you can find 'Text box'.
- Select it to insert a 'Text box' as your title
- Drag the text box to the top center of the main canvas, and type in your title
- Format it to size 28 and center aligned

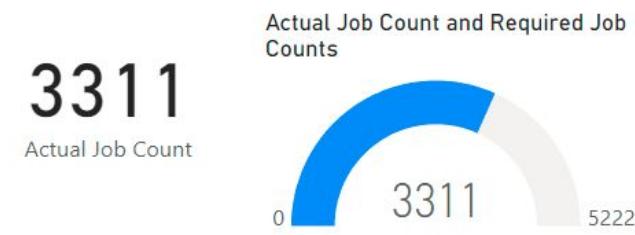


# Add logo

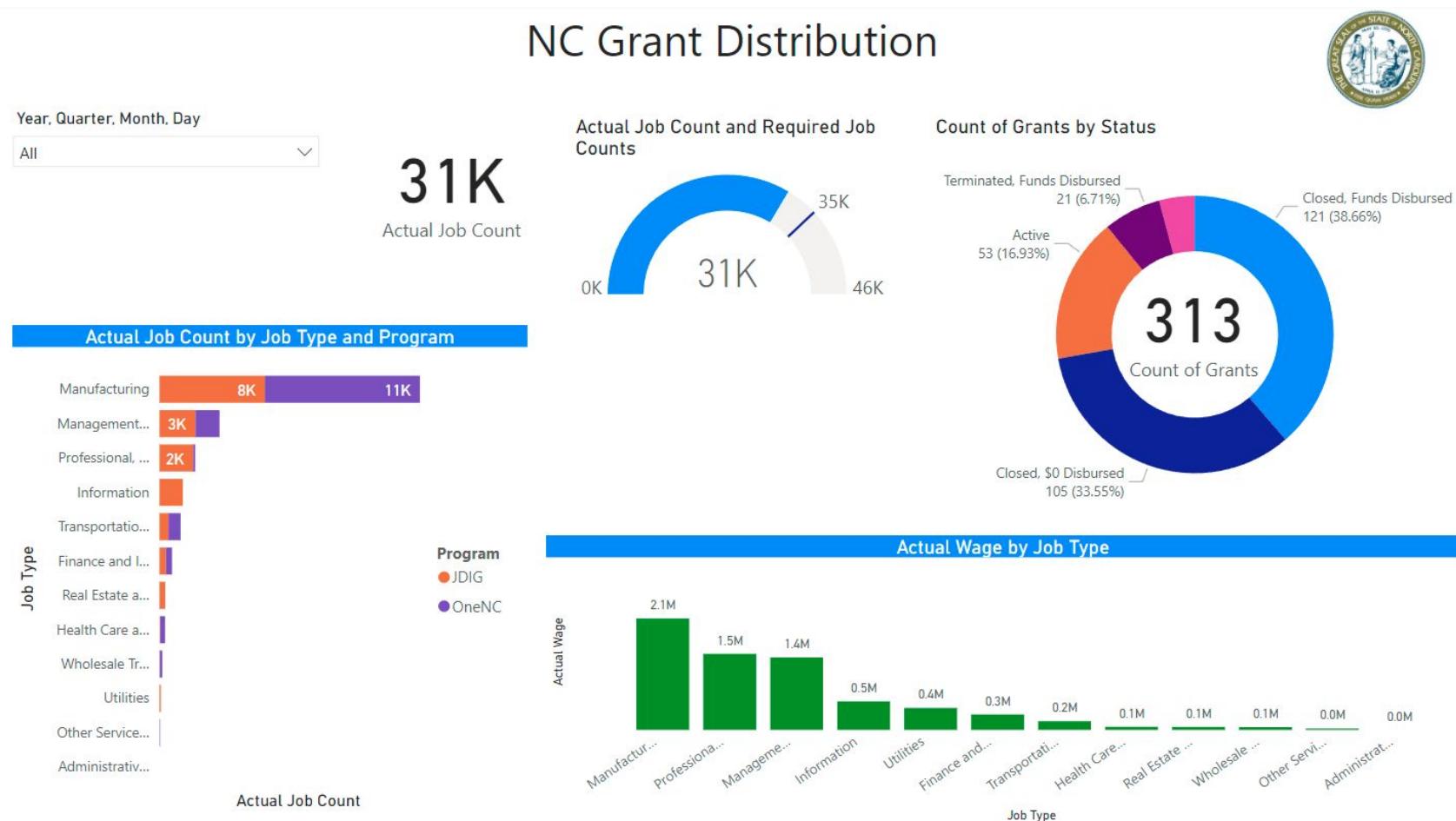
- On the ‘Insert’ tab of the Ribbon, click Image
- Navigate to the class files and select the NC state seal.jpg
- Resize and place it in the top right corner of the report



NC Grant Distribution

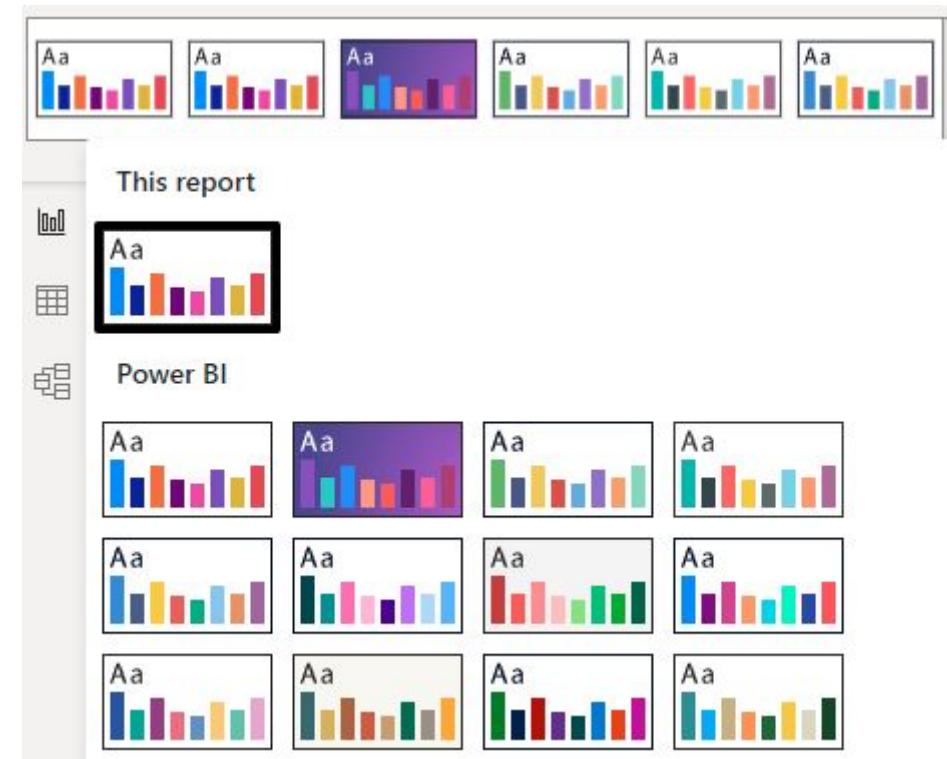


# Almost done!



# 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

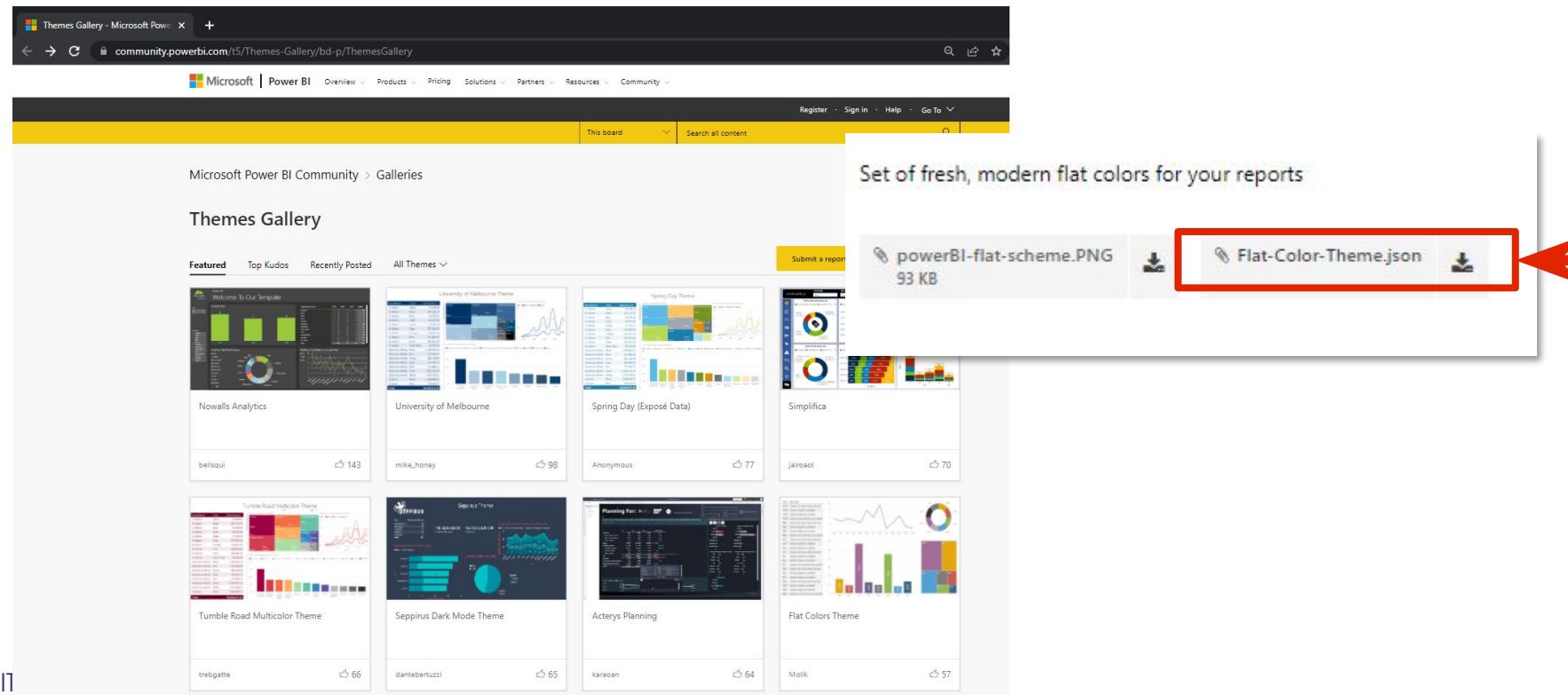


# Change your report theme

- Choose a theme you like from

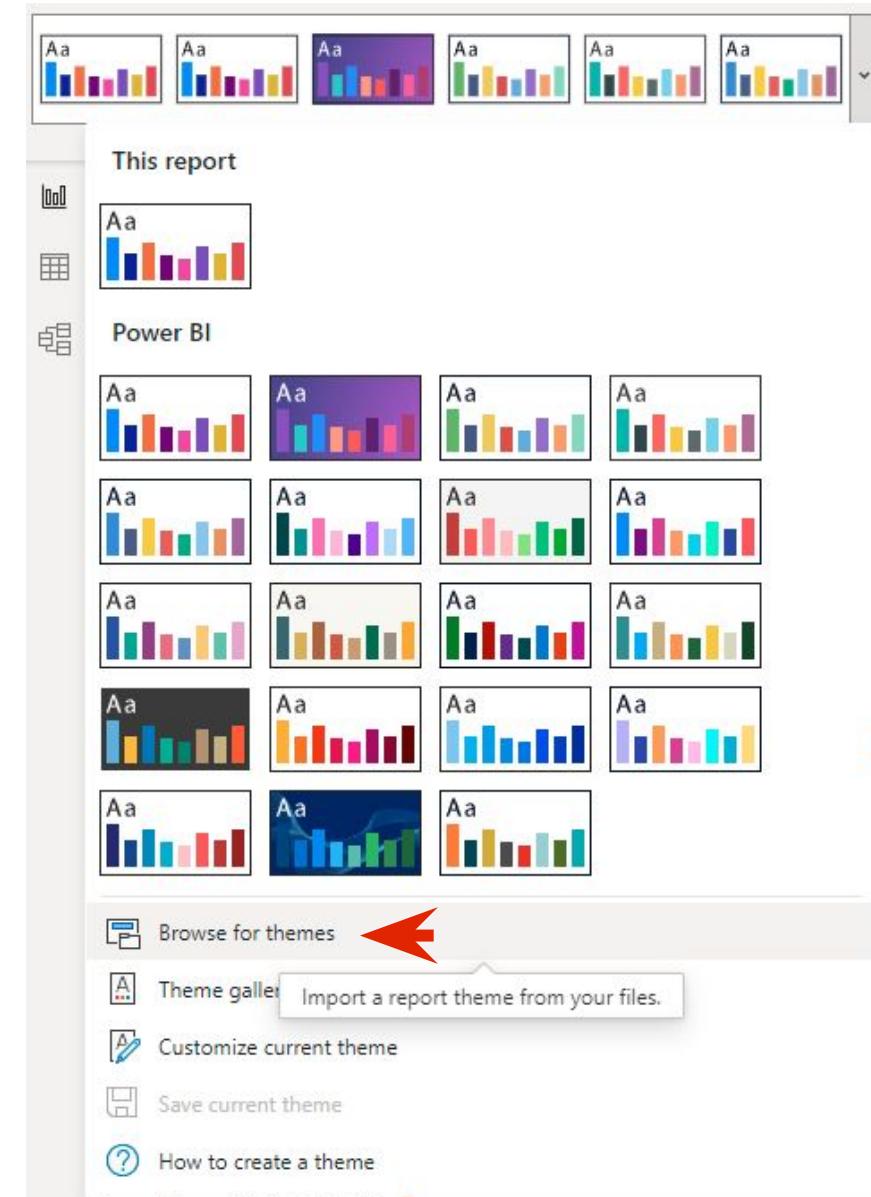
<https://community.powerbi.com/t5/Themes-Gallery/bd-p/ThemesGallery>

- Download the JSON file from the theme you choose

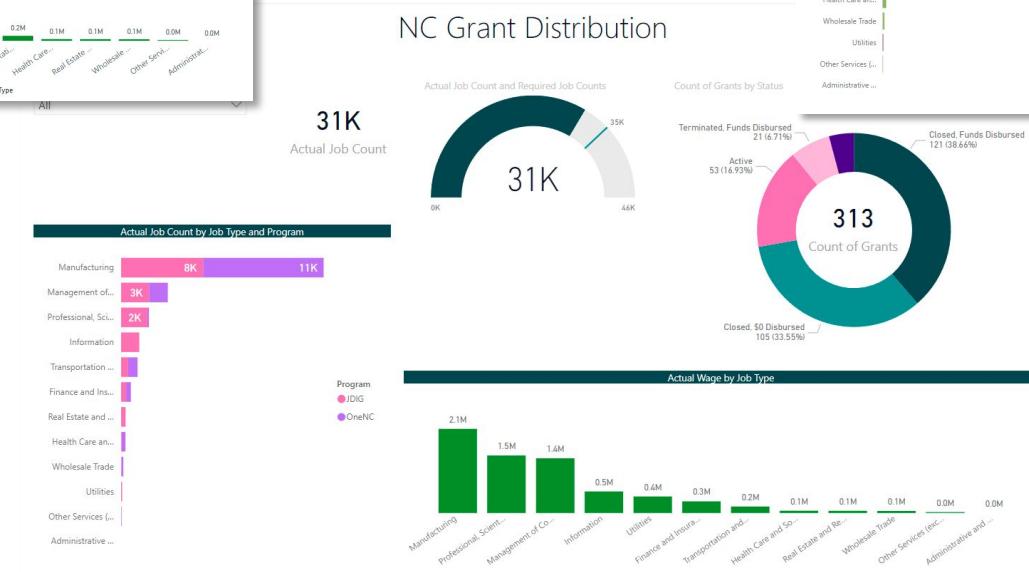
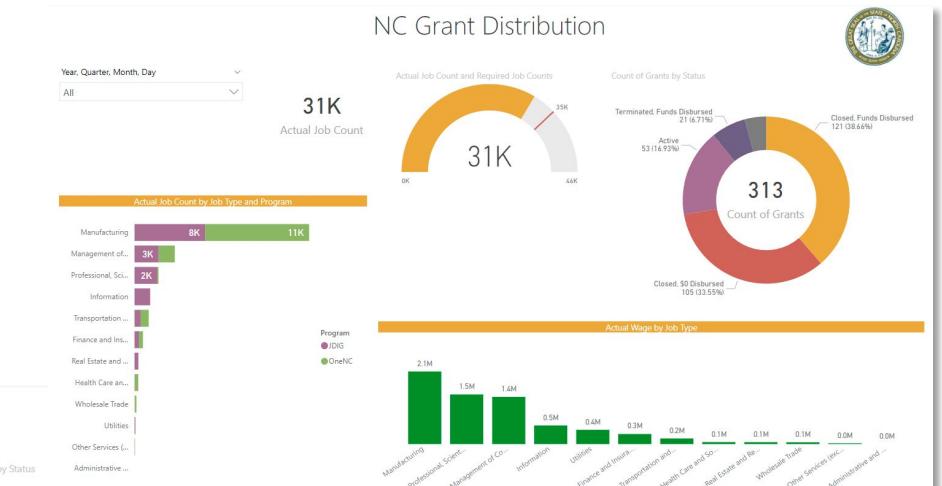
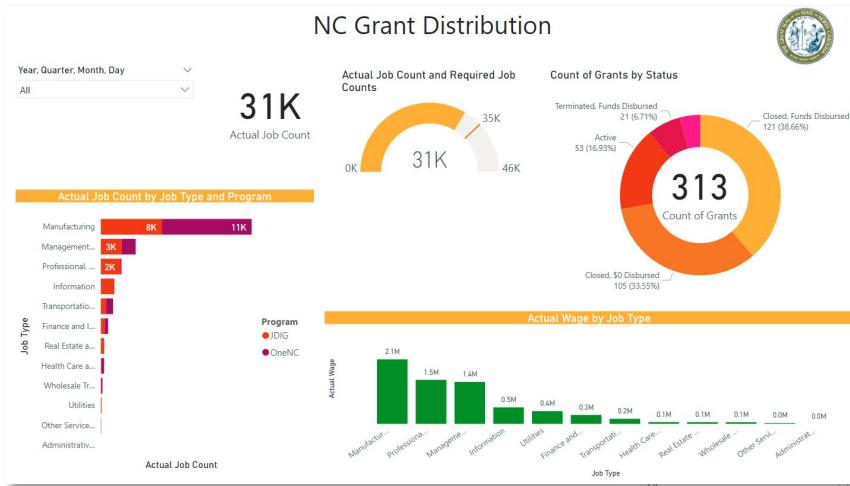


# Importing your theme

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



# Different theme examples



# Save Lab 4 as final report

- Save your report by choose 'File' -> 'Save as' to a new file 'Lab 4'
- Publish to the reporting server

# End of Lab 4



# Agenda

- Create custom and interactive visuals
- ETL layer: load data through Power Query
- Explain the functions of the Power BI web service

# Beginning of Lab 5



# Objectives for Lab 5 part 1

- Import data from an Excel workbook
- Navigate through Power Query Editor
- Perform numerous transformations
- Load data to the Power BI data model



# Power Query

## Power Query

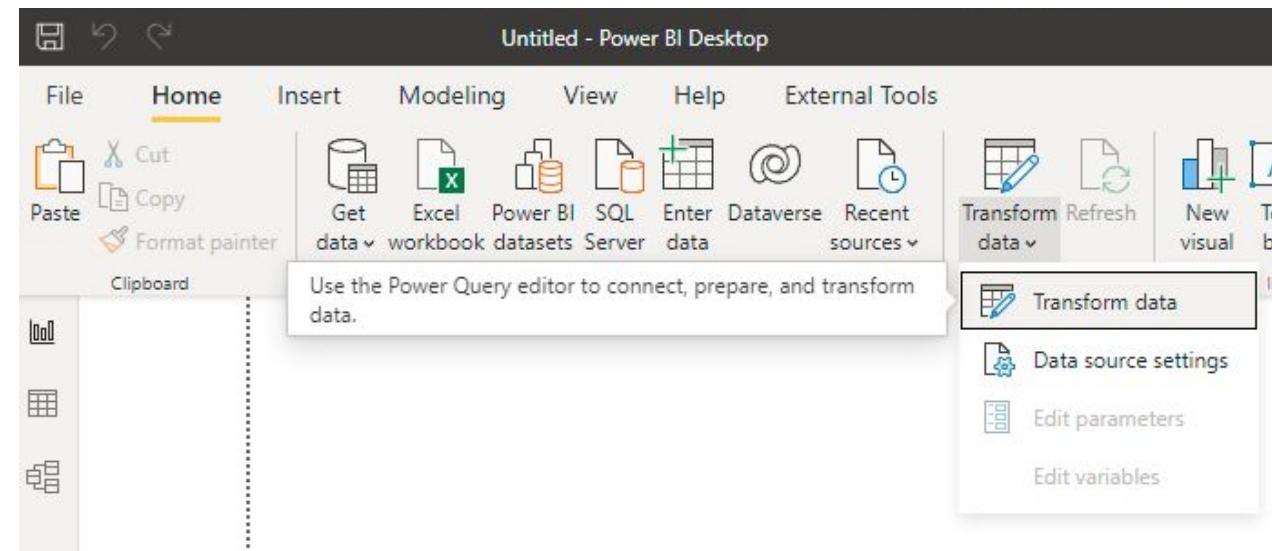
- The Microsoft Data Connectivity and Data Preparation technology
- Enables business users to seamlessly access data stored in hundreds of data sources
- Reshape it to fit their needs, with an easy to use, engaging and no-code user experience

## 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 Microsoft Power Query Editor window with several key features highlighted:

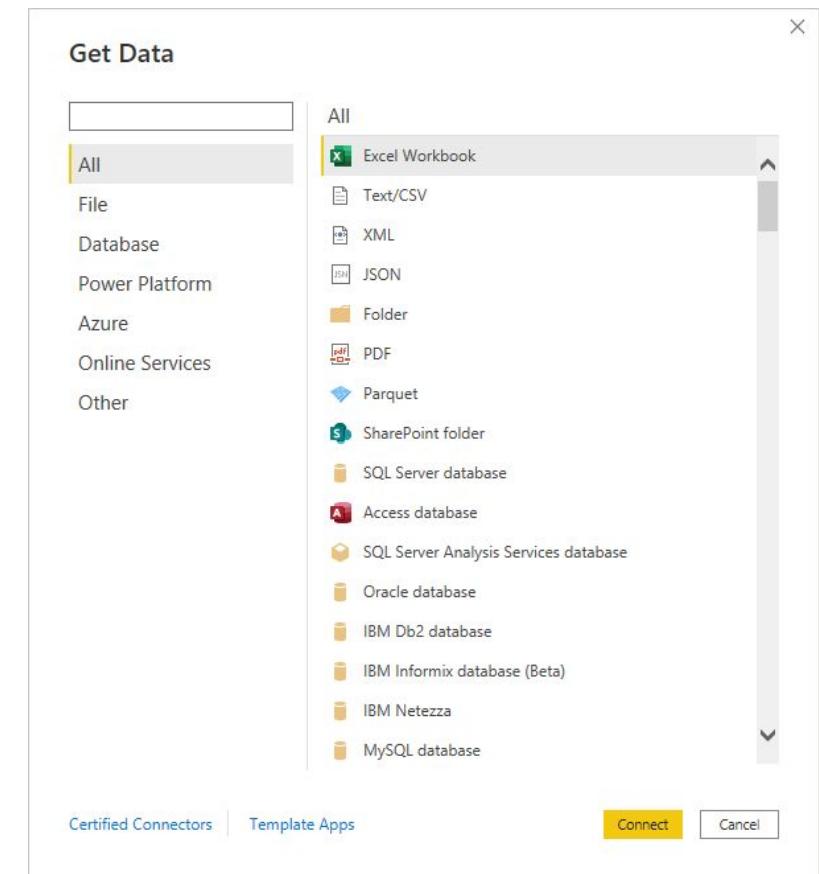
- Queries pane (Left):** Shows a list of available queries, with "Grants" selected. A red arrow points from the text below to this pane.
- Ribbon (Top):** Displays various Power Query commands like Close & Apply, New Source, Refresh, Manage Parameters, and Transform. A red arrow points from the text below to the "Transform" tab.
- Preview Pane (Center):** Shows a table of data with columns: Funding ID, Program, Award Date, Company, Company County, and Company Address. A red arrow points from the text below to this pane.
- Query Settings pane (Right):** Displays "Properties" (Name: Grants) and "Applied Steps" (Source, Navigation, Promoted Headers, Changed Type). A red arrow points from the text below to this pane.

**Annotations:**

- In the ribbon, buttons are active to interact with the data in the query** (points to the Transform tab)
- Queries are listed and available for selection, viewing, and shaping** (points to the Queries pane)
- In the center pane, data from the selected query is displayed and available for shaping** (points to the Preview pane)
- The Query Settings window appears, listing the query's properties and applied steps** (points to the Query Settings pane)

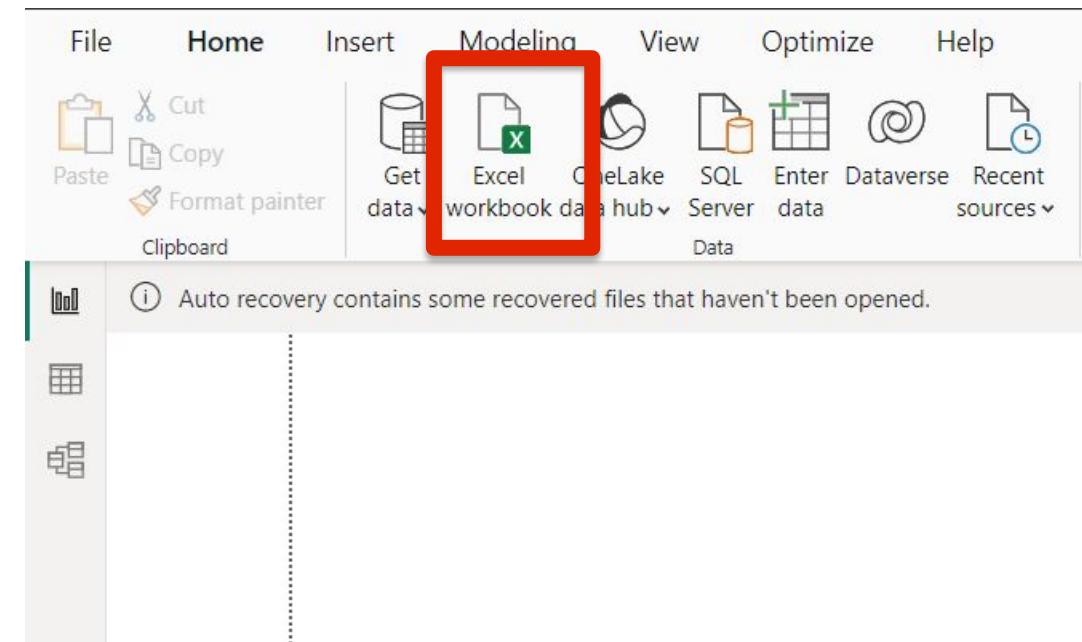
# Data source types in Power BI

- With Power BI Desktop, you can connect to data from many different sources
- In Power BI Desktop click Get Data
- In Power Query Editor click New Source
- Both provide the same data connections:
  - Excel
  - Text/CSV
  - XML
  - JSON
  - Folder
  - PDF
  - SharePoint Folder



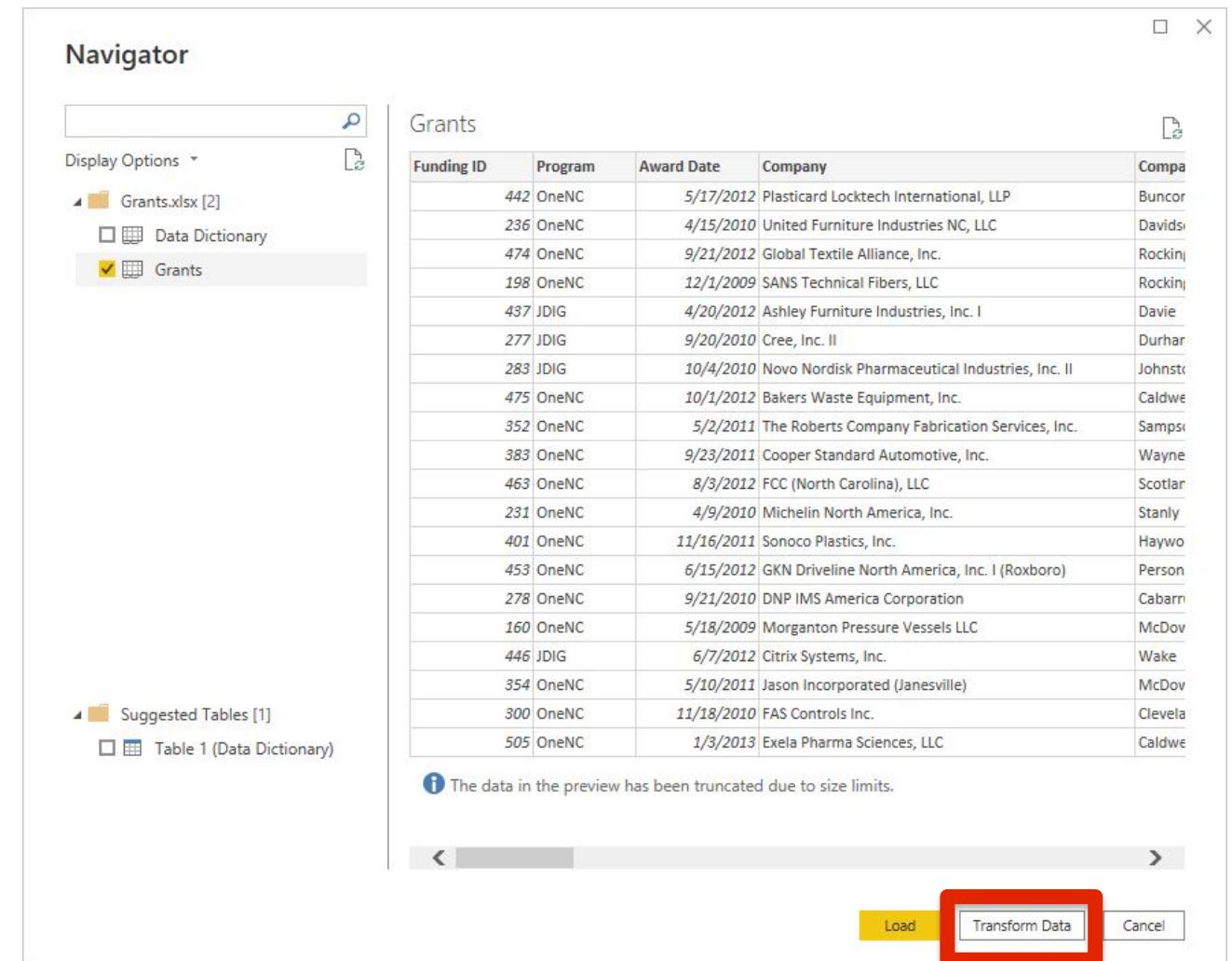
# Get data from Excel

- Start a **new** Power BI file
- Choose **get data** from the Home tab of the Ribbon
- Choose '**Excel**' then click 'Connect' 
- Navigate to your '**Grants.xlsx**' file in Labs folder and click on Open (the same dataset we used in previous lab)



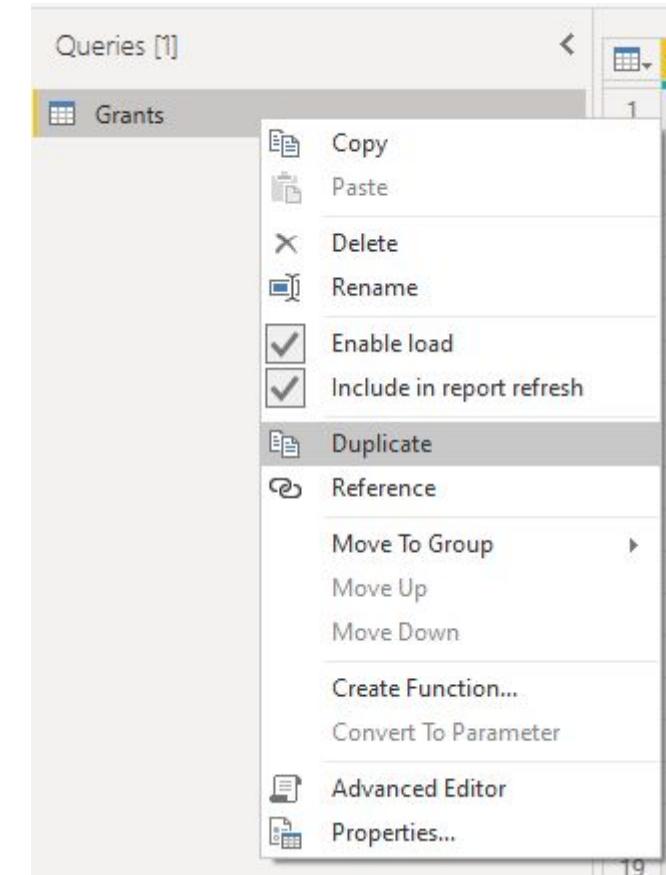
# Get data from Excel

- Check the box next to the Grants worksheet
- Review the preview data
- Click Transform Data in the bottom right corner



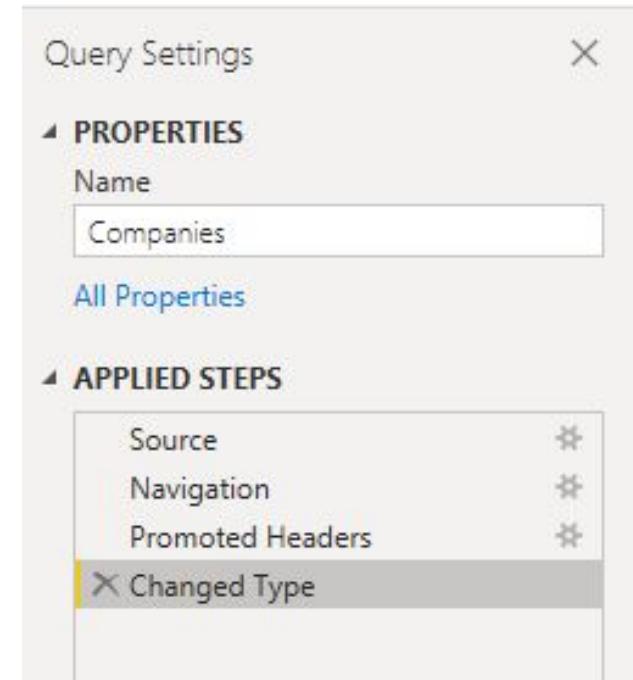
# Perform data transformation

- Duplicate the Grants query by right-clicking the query name, select Duplicate



# 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 '**Companies**'



# Perform data transformation

- We will only keep columns '**Company**', '**Company County**', '**Company Address**', '**Company Website**' in our data
- Click on '**Choose Columns**' and select those 4 columns and click OK
- Then the table has the other columns removed

The screenshot shows the Power Query Editor interface with the 'Home' tab selected. A red box highlights the 'Choose Columns' button in the ribbon. To the right, the 'Choose Columns' dialog box is open, showing a list of columns from a query named 'Companies'. The columns 'Company', 'Company County', 'Company Address', and 'Company Website' are checked, while others like 'Funding ID', 'Program', and 'Award Date' are unchecked. Below the dialog, the main Power Query Editor window displays the 'Companies' query with the four selected columns visible.

Column	Value
A <sup>b</sup> Company	Pig Change query name
1	1. National, LLP
2	2. United Furniture Industries NC, LLC
3	3. Global Textile Alliance, Inc.
4	4. SANS Technical Fibers, LLC
5	5. Ashley Furniture Industries, Inc. I
6	6. Cree, Inc. II
7	7. Novo Nordisk Pharmaceutical Industries, Inc. II
8	8. Bakers Waste Equipment, Inc.
9	9. The Roberts Company Fabrication Services, Inc.
10	10. Cooper Standard Automotive, Inc.
11	11. FCC (North Carolina), LLC
12	12. Michelin North America, Inc.
13	13. Sonoco Plastics, Inc.
14	14. GKN Driveline North America, Inc. I (Roxboro)
15	15. DNP IMS America Corporation

Queries [2]

Companies

Choose Columns

Choose the columns to keep

Search Columns

(Select All Columns)

Funding ID

Program

Award Date

Company

Company County

Company Address

Company Website

Job Type

Required Job Counts

Required Wage

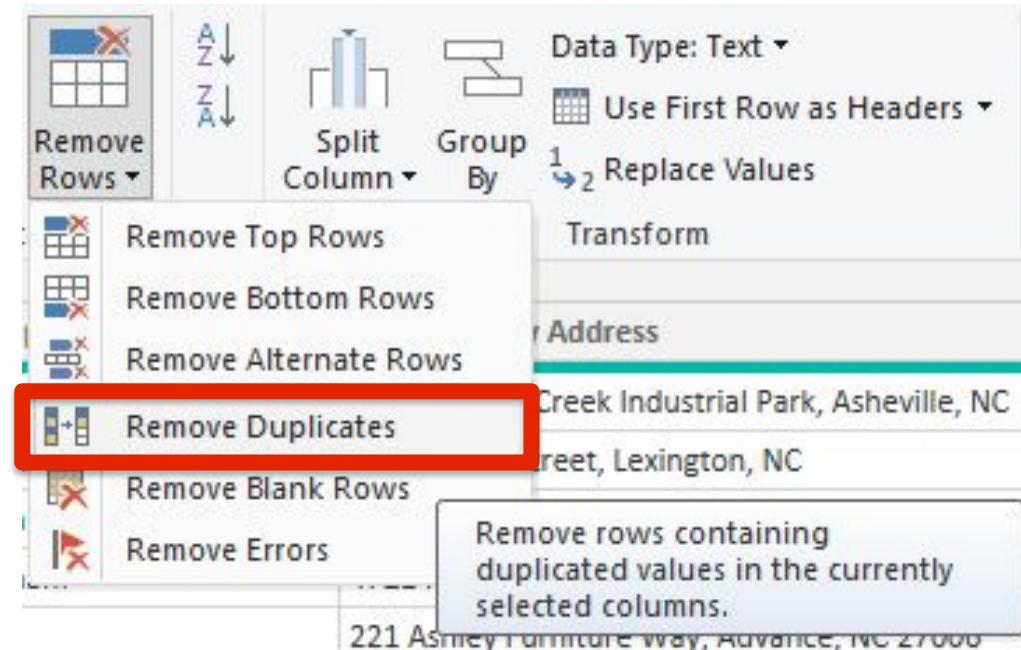
Status

Actual Job Count

Cancel

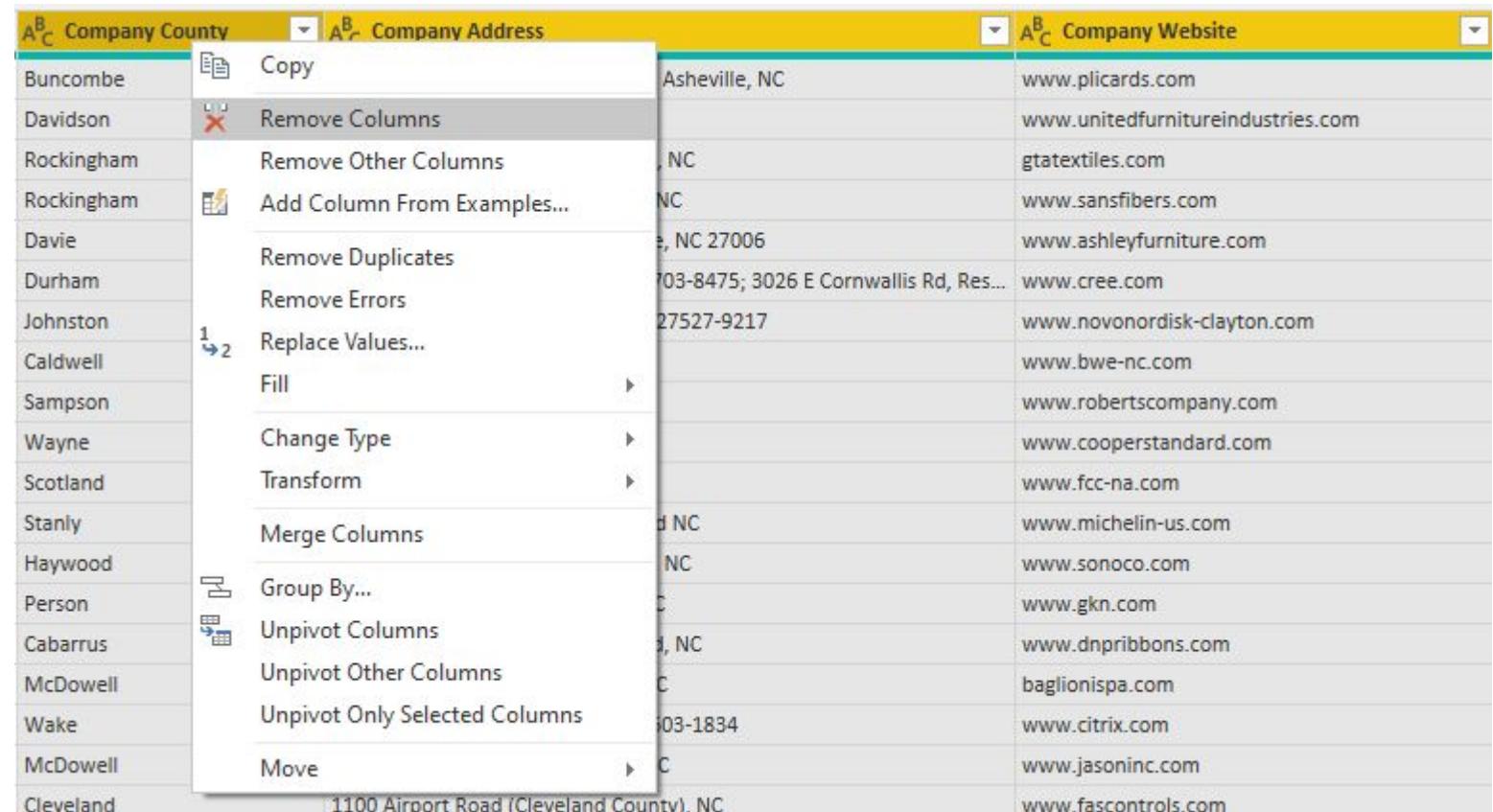
# Remove duplicates

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



# Remove columns

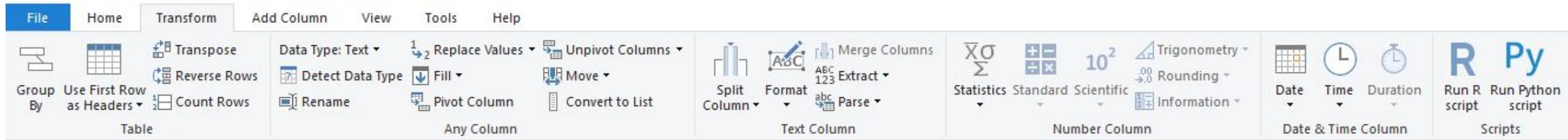
- Go back to the '**Grants**' query
- Select the '**Company County**', '**Company Address**', '**Company Website**' columns
- Right-click the column name and select '**Remove Columns**'



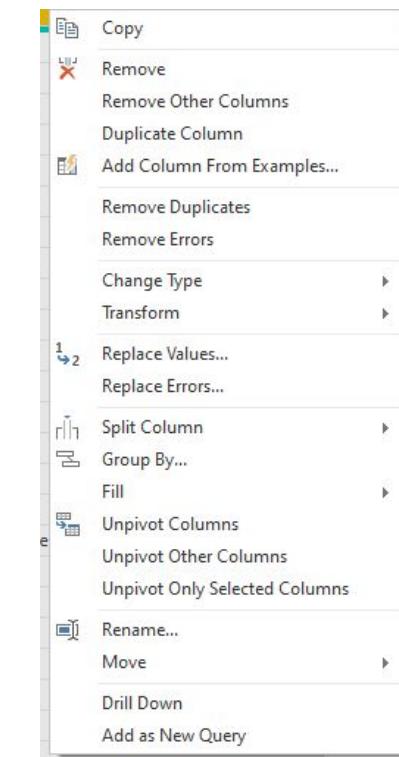
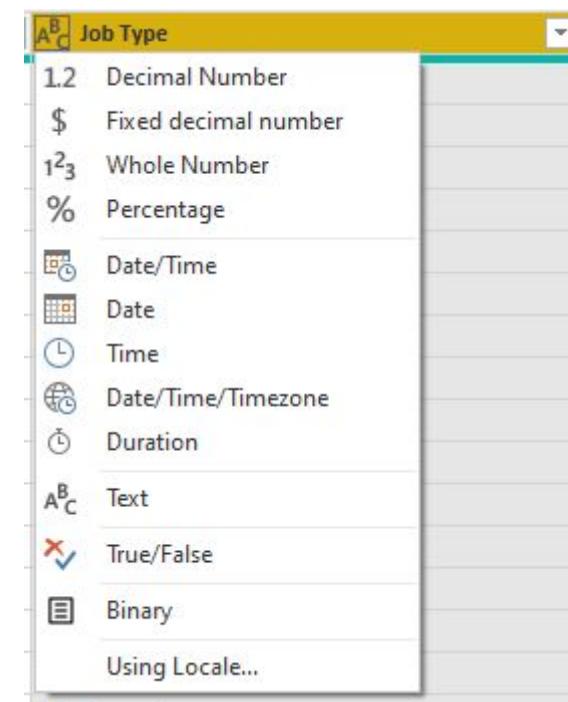
A screenshot of a Power BI data view showing a context menu. The menu items are: Copy, Remove Columns (which is highlighted), Remove Other Columns, Add Column From Examples..., Remove Duplicates, Remove Errors, Replace Values..., Fill, Change Type, Transform, Merge Columns, Group By..., Unpivot Columns, Unpivot Other Columns, Unpivot Only Selected Columns, and Move. The 'Remove Columns' option is the second item in the list.

Company County	Company Address	Company Website
Buncombe	Asheville, NC	www.plicards.com
Davidson	, NC	www.unitedfurnitureindustries.com
Rockingham	NC	gtatextiles.com
Rockingham	27006	www.sansfibers.com
Davie	703-8475; 3026 E Cornwallis Rd, Res...	www.ashleyfurniture.com
Durham	27527-9217	www.cree.com
Johnston		www.novonordisk-clayton.com
Caldwell		www.bwe-nc.com
Sampson		www.robertscompany.com
Wayne		www.cooperstandard.com
Scotland		www.fcc-na.com
Stanly	d NC	www.michelin-us.com
Haywood	NC	www.sonoco.com
Person	C	www.gkn.com
Cabarrus	NC	www.dnpribbons.com
McDowell	C	baglionispas.com
Wake	03-1834	www.citrix.com
McDowell	C	www.jasoninc.com
Cleveland	1100 Airport Road (Cleveland County), NC	www.fascontrols.com

# Review Other Transformations

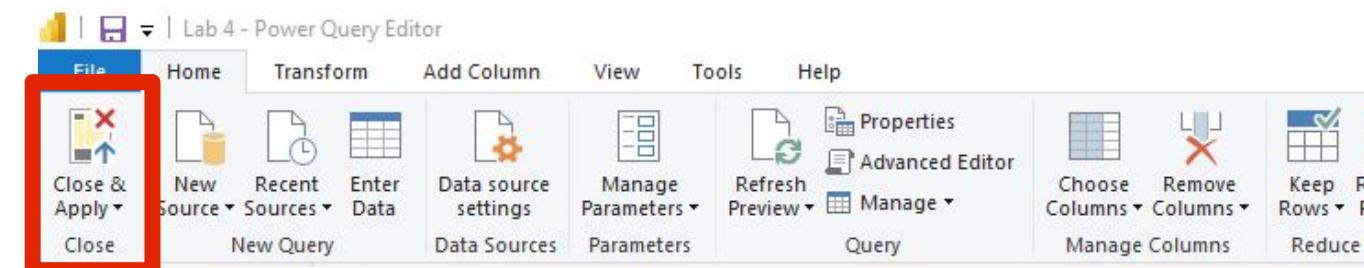
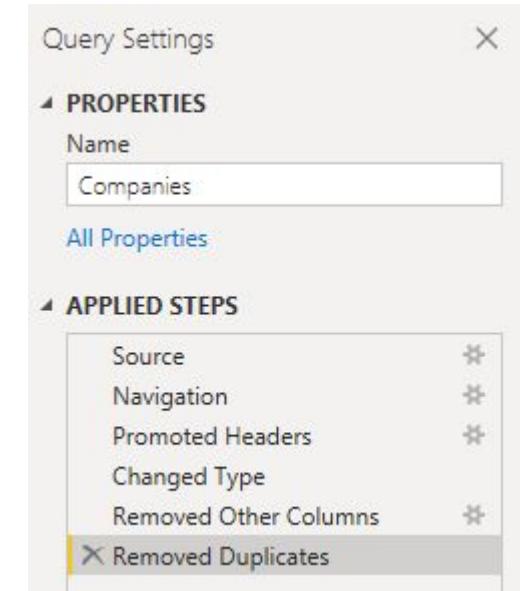


- Split Column
- Change Data Type
- Text Transforms
- Date/Time Transforms



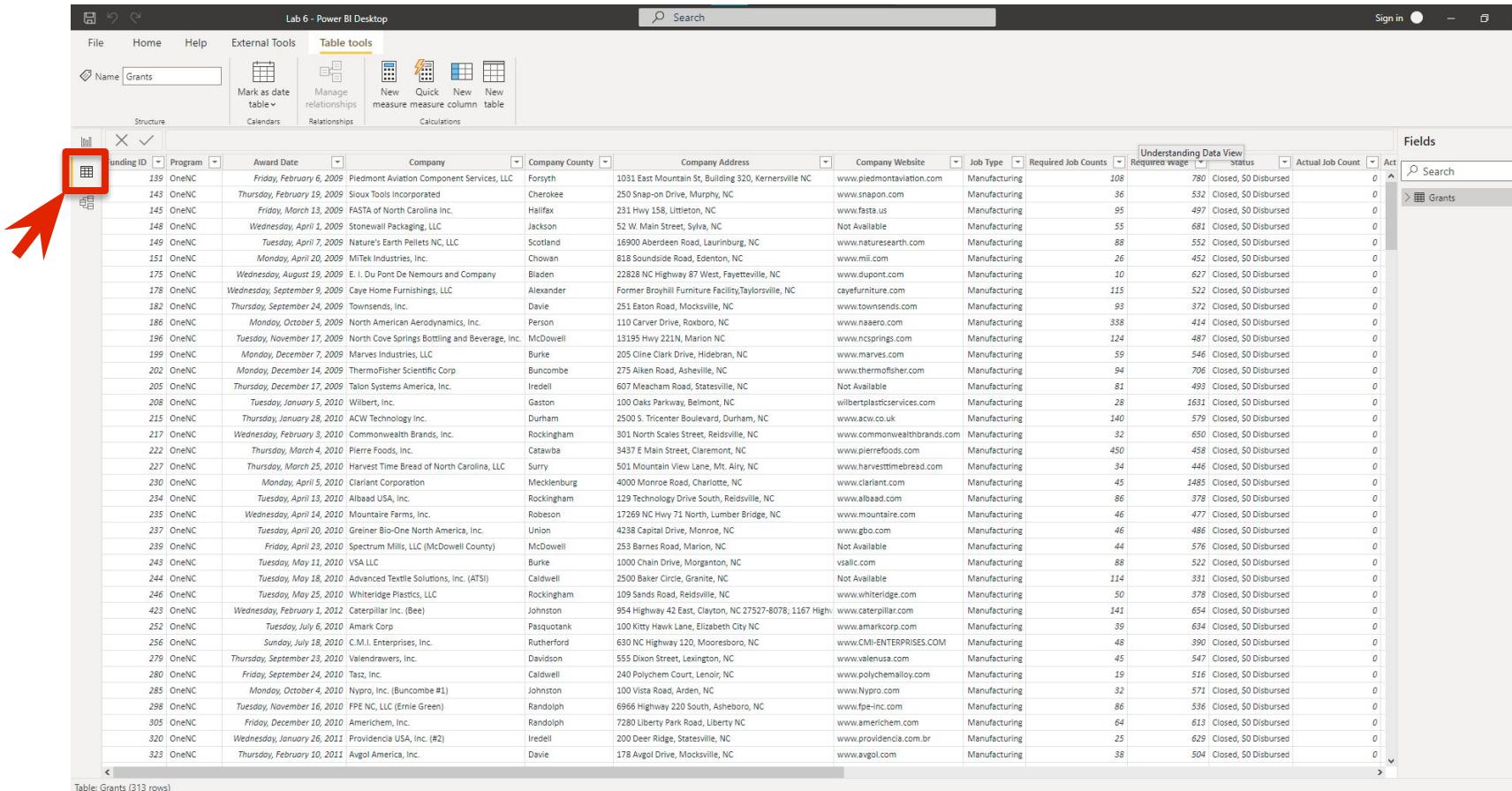
# Apply changes and save dataset

- 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**'



# Understanding Data View

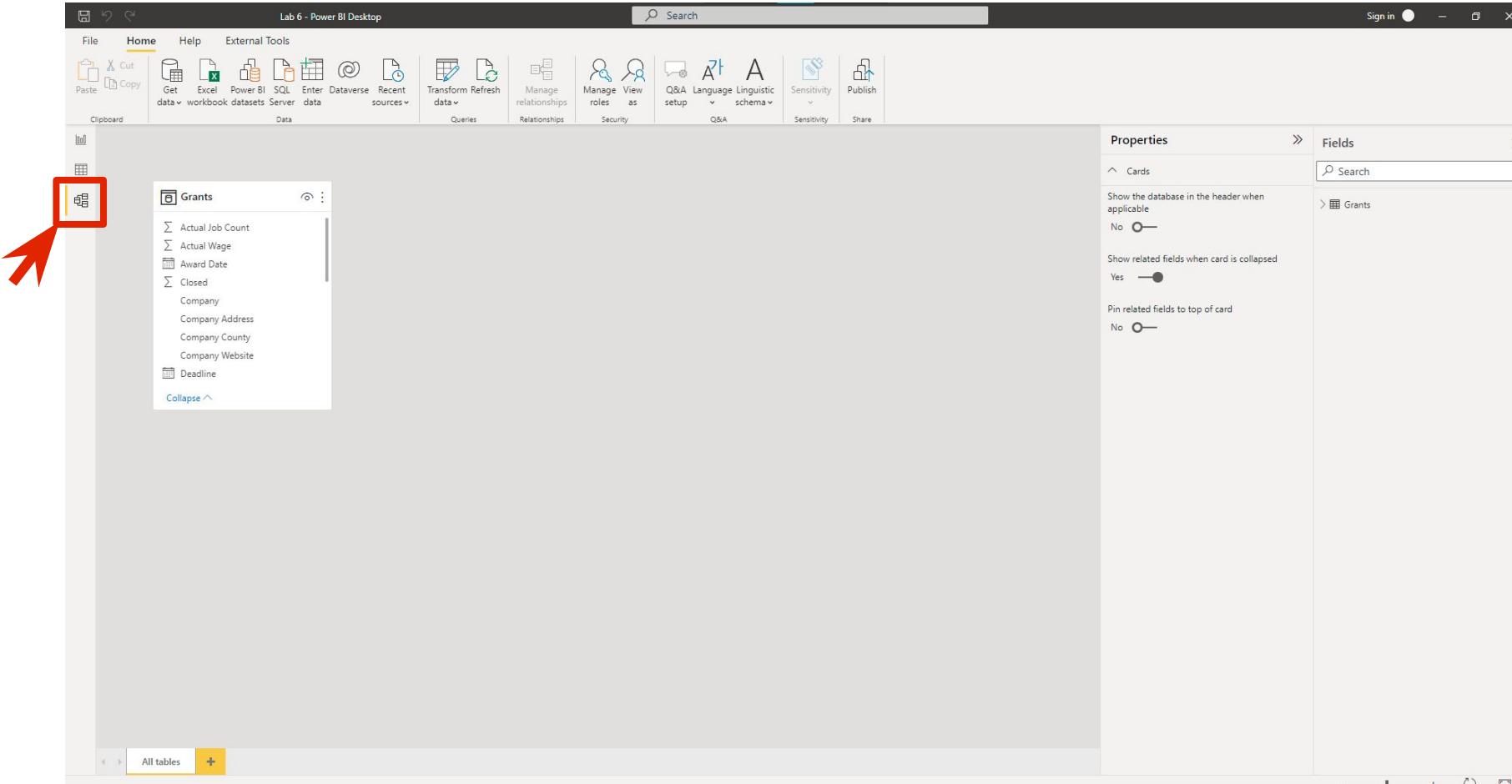
- **Data View** has all the tables in detailed table view (as opposed to Power Query in Edit Queries, Window which only provides data preview and does not store actual data)



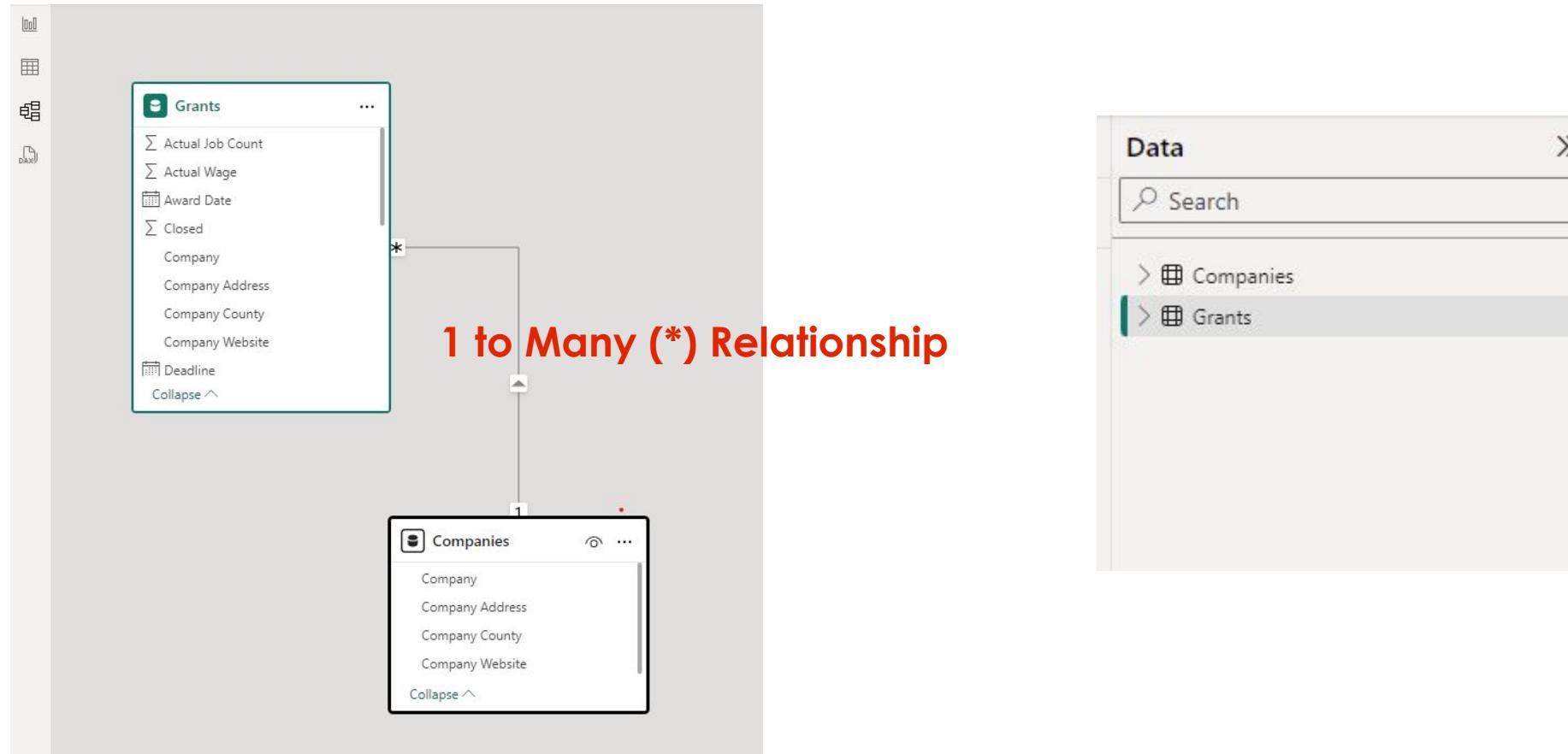
The screenshot shows the Power BI Desktop application window titled "Lab 6 - Power BI Desktop". The ribbon at the top has the "Table tools" tab selected, indicated by a yellow highlight. Below the ribbon, there's a toolbar with icons for "Name", "Mark as date table", "Manage relationships", "New measure", "Quick measure", "New column", and "New table". The main area displays a table titled "Grants" with 313 rows. The columns include: Funding ID, Program, Award Date, Company, Company County, Company Address, Company Website, Job Type, Required Job Counts, Understanding Data View (with sub-columns: Required wage, Status, Actual Job Count), and Action. The "Understanding Data View" section is highlighted with a yellow background. The "Fields" pane on the right lists the "Grants" table. At the bottom left, it says "Table: Grants (313 rows)".

# Understanding Model View

- Model View displays relationships between tables

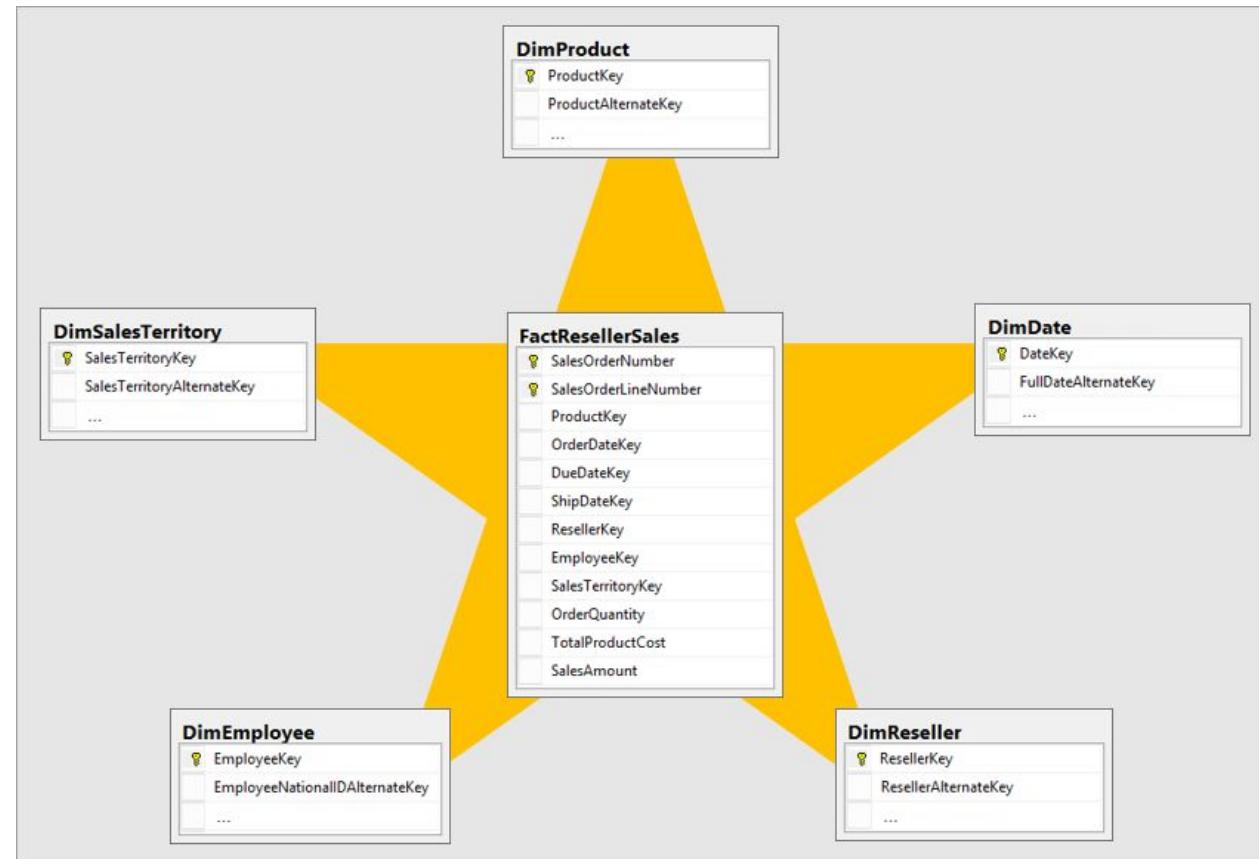


# A First Look at Model Relationships



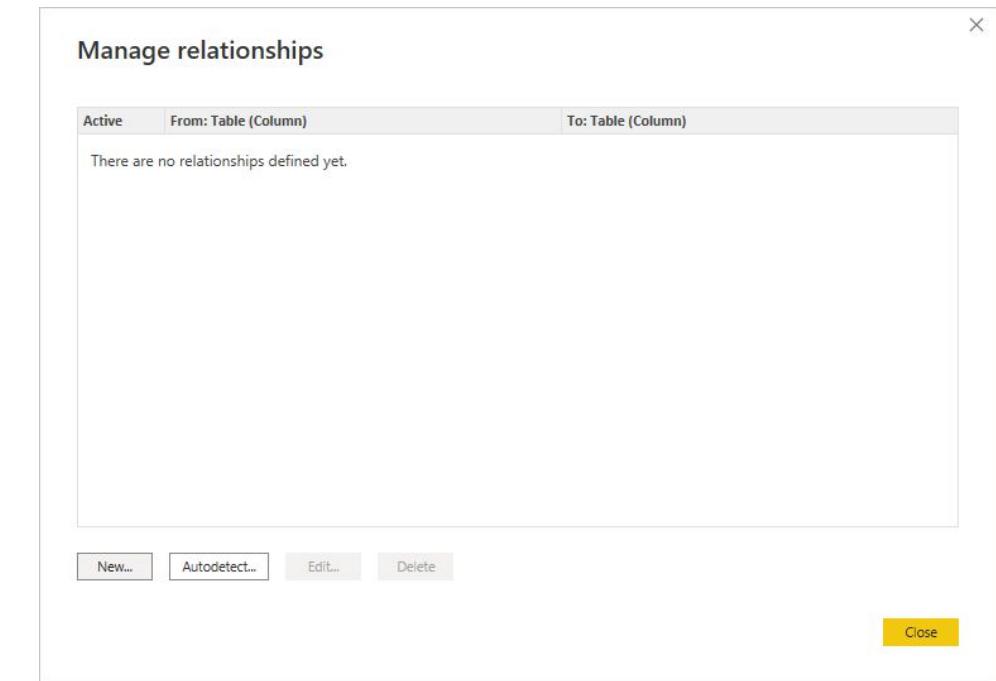
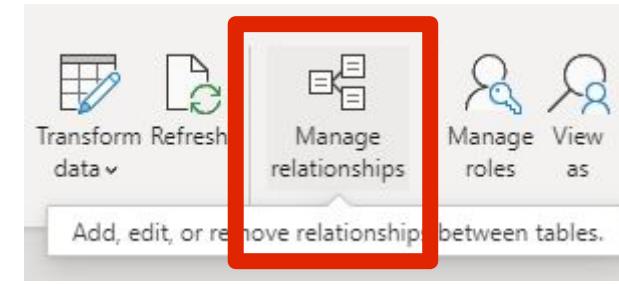
# Relationships

- Building relationships in Power BI allows analysts to document the data model of multiple tables in a report
- This allows analysts to avoid loading redundant data to data model
  - Better performance
  - Smaller file sizes
- Filters applied to one column of a table will propagate to filter rows in related tables (Dimension filters Fact)



# How to Create a Relationship

- Click the Model view button in the navigation pane
- Select Manage Relationships in the Home tab of the Ribbon
- Click New



# How to Create a Relationship

- Select Companies table in the first drop down
- Select Grants in the second drop down
- Highlight the “Company” column in each table
- Check cardinality and cross filter direction:
  - One to Many / Single



Create relationship

Select tables and columns that are related.

Companies

Company	Company County	Company Address	Company V
Plasticard Locktech International, LLP	Buncombe	605 Sweeten Creek Industrial Park, Asheville, NC	www.plicards.com
United Furniture Industries NC, LLC	Davidson	12 Hackney Street, Lexington, NC	www.unitedfurnit
Global Textile Alliance, Inc.	Rockingham	2361 Holiday Loop Road, Reidsville, NC	gtatextiles.com

Grants

Funding ID	Program	Award Date	Company	Job Type	Require
139	OneNC	Friday, February 6, 2009	Piedmont Aviation Component Services, LLC	Manufacturing	
143	OneNC	Thursday, February 19, 2009	Sioux Tools Incorporated	Manufacturing	
145	OneNC	Friday, March 13, 2009	FASTA of North Carolina Inc.	Manufacturing	

Cardinality

One to many (1:\*)

Cross filter direction

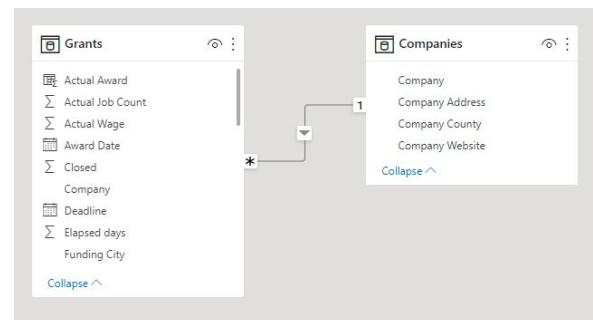
Single

Make this relationship active

Assume referential integrity

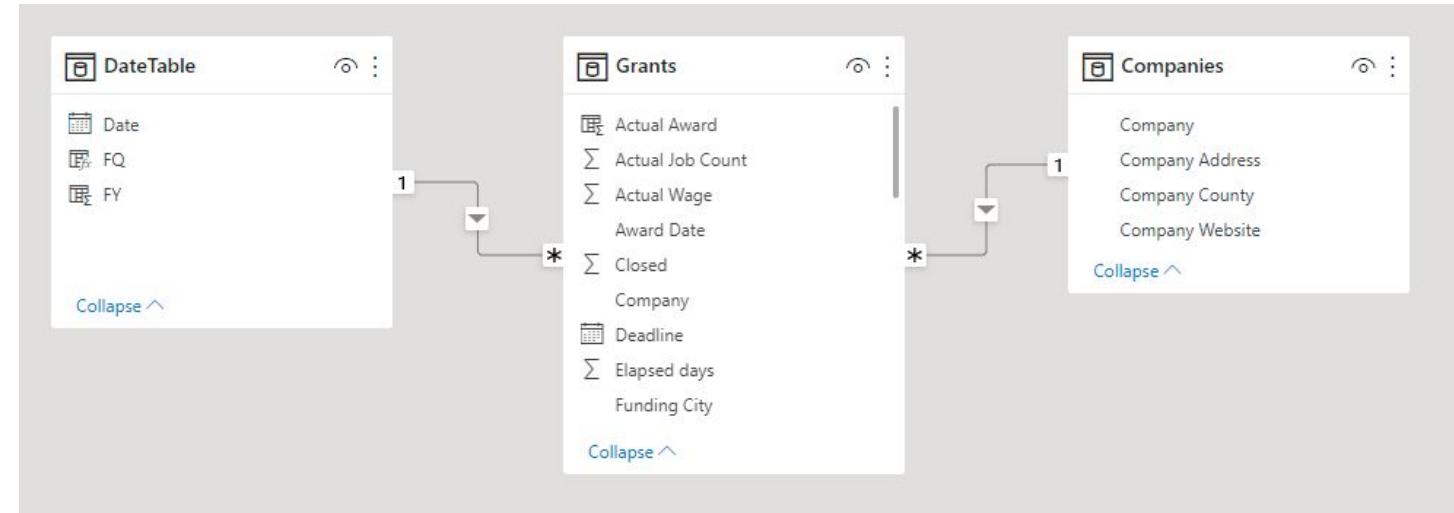
Apply security filter in both directions

OK Cancel



# How to Create a Relationship

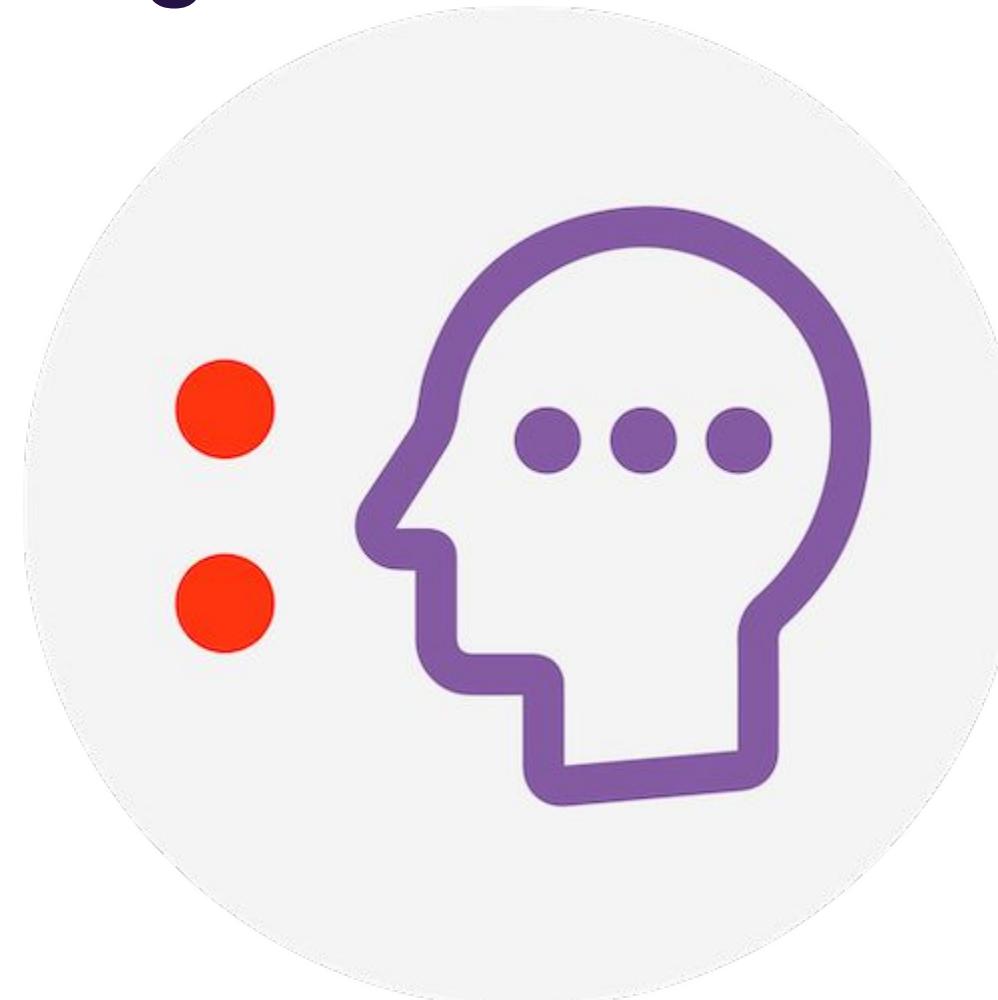
- Select New again
- Select DateTable in the first drop down 
- Select Grants in the second drop down
- Highlight DateTable[Date] and Grants[Award Date] columns
- Check cardinality and cross filter direction:
  - One to Many / Single



# Break; Lab 5 Will Continue



# Day 3 - Knowledge Check 1



# Agenda

- Create custom and interactive visuals
- ETL layer: load data through Power Query
- Explain the functions of the Power BI web service

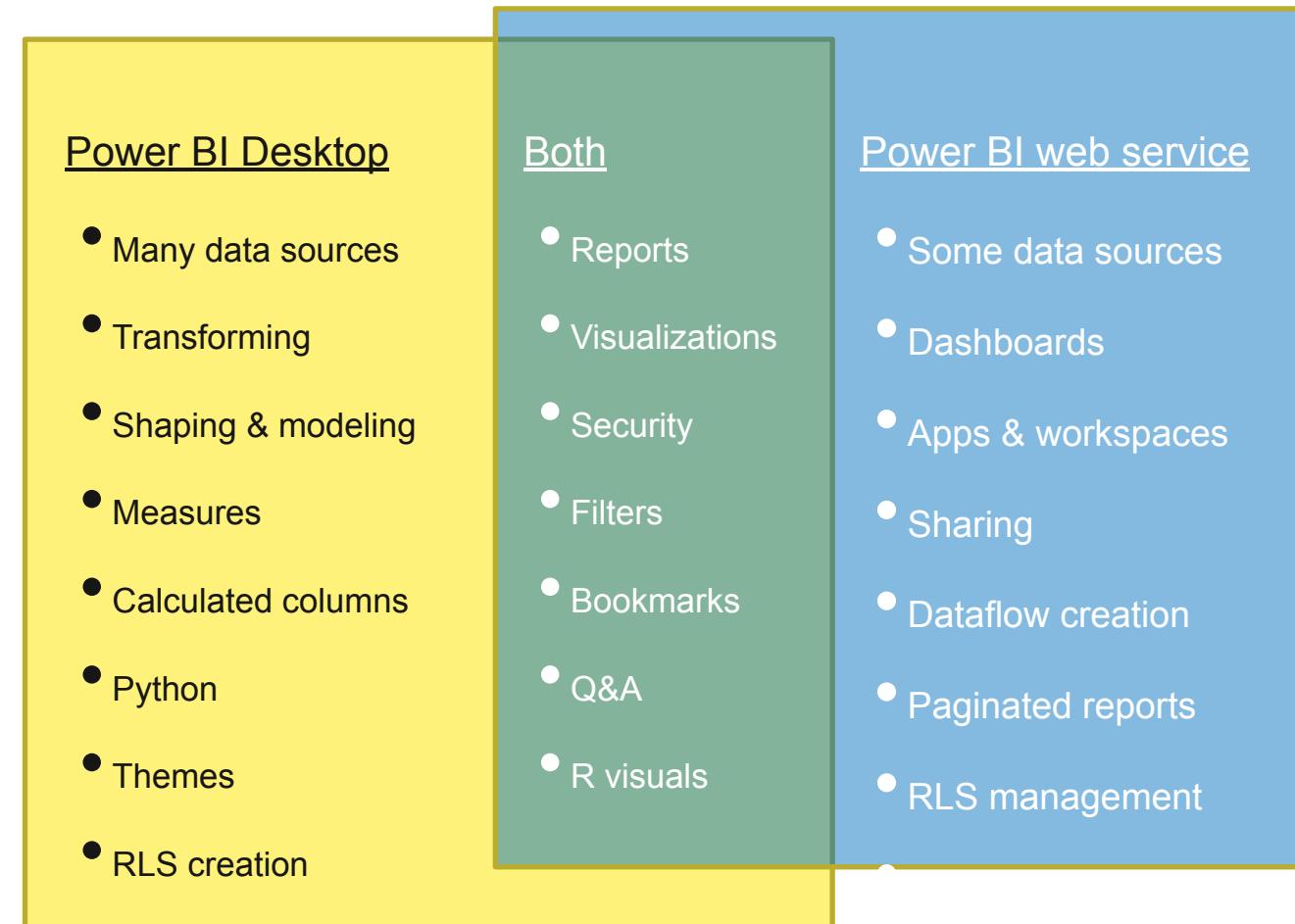
# Objectives for Lab 5 part 2

- Navigate through the Web Portal
- View and edit Reports online
- Adding reports to your favorites
- Build your dashboard



# Comparing Power BI desktop & Power BI service

- Power BI Desktop is a complete data analysis and report creation tool
- The Power BI web service is a cloud-based, online service for light report editing and collaboration for teams and corporations



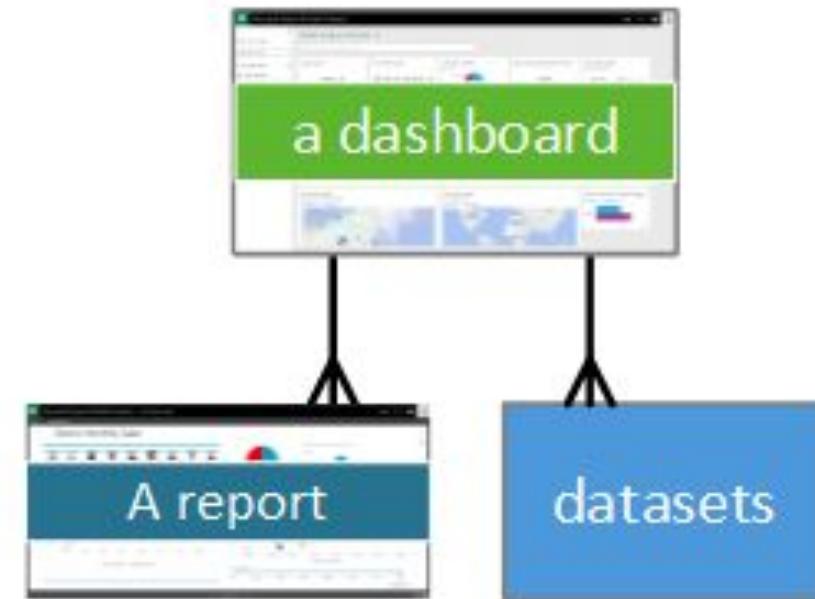
# Power BI's workspace built for collaboration

- Great place to collaborate with your colleagues on dashboards, reports, and datasets to create apps
- After you finish collaborating on your dashboards and reports with colleagues, then you package it as an app and distribute it
- By default, everyone will have 'My Workspace' to work with, you can also see all the workspaces shared with you



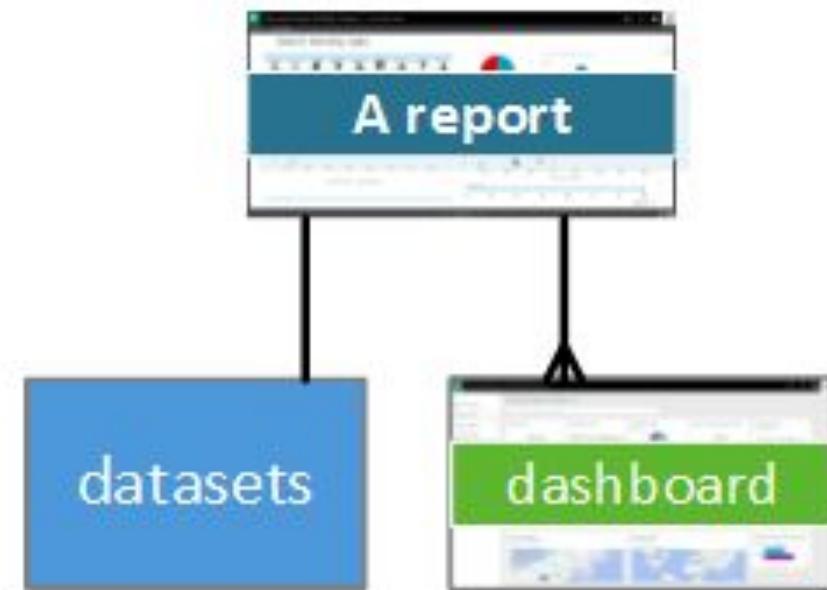
# Understanding your dashboard

- **Dashboard:** a Power BI dashboard is a single page, often called a canvas, that uses visualizations to tell a story. The visualizations you see on the dashboard are called tiles and are pinned to the dashboard by report designers
- ONE dashboard:
  - is associated with a single workspace
  - can display visualizations from many different datasets
  - can display visualizations from many different reports
  - can display visualizations pinned from other tools (for example, Excel)



# Understanding your report

- **Reports:** a Power BI report is a multi-perspective view into a dataset, with visuals that represent different findings and insights from that dataset
- **ONE report:**
  - is contained in a single workspace
  - can be associated with multiple dashboards within that workspace
  - can be created using data from one dataset. Power BI Desktop can combine more than one data source into a single dataset in a report, and that report can be imported into Power BI



# Understanding your workbook

- **Workbooks** are Excel files associated with this workspace. When you use 'Get data' with Excel files, you have the option to Import or Connect to the file
- When you choose connect, your workbook will appear in Power BI just like it would in Excel Online

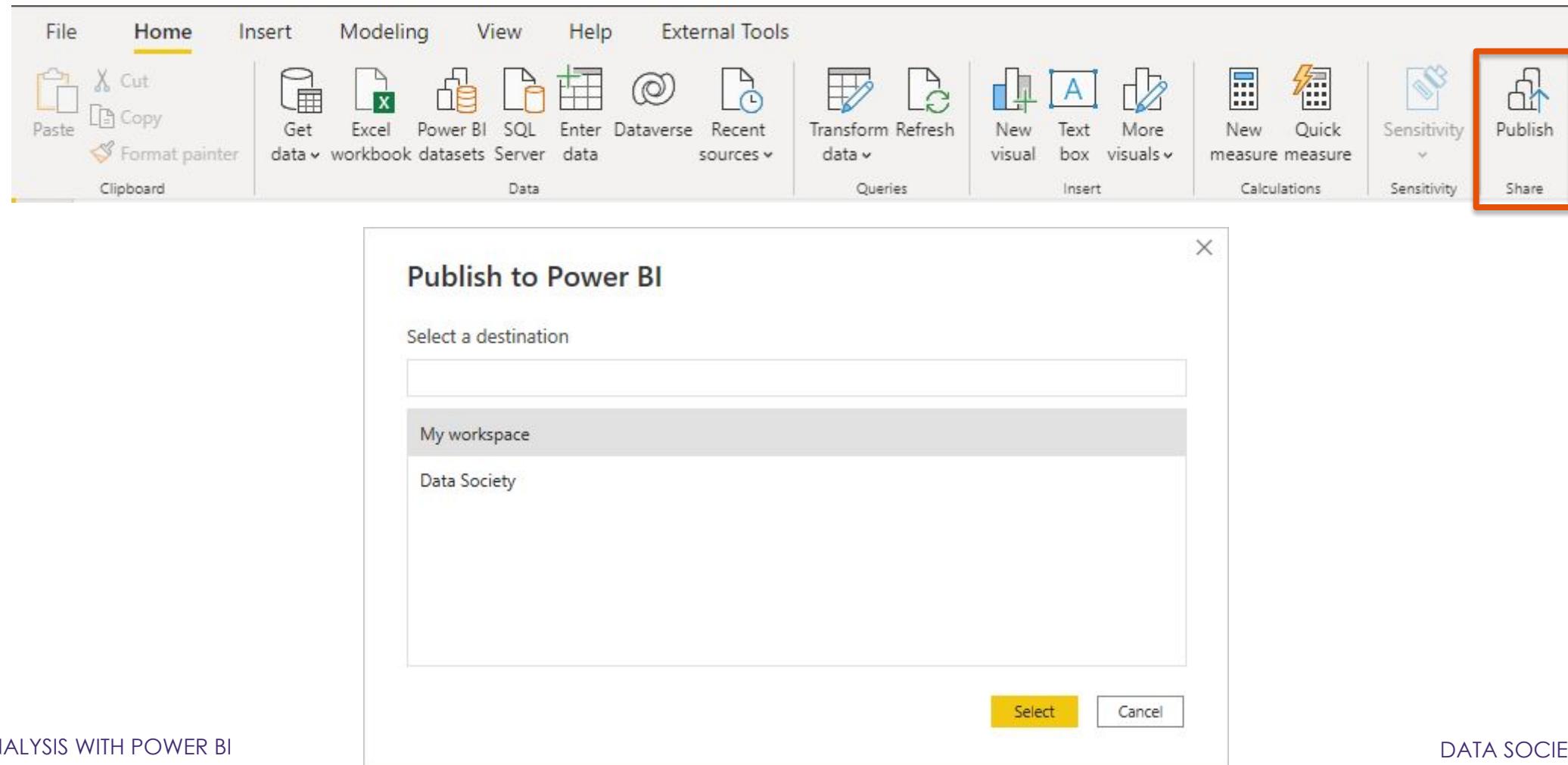
# Understanding your dataset

- **Dataset:** datasets are associated with workspaces and a single dataset can be part of many workspaces. When you open a workspace, the associated datasets are listed under the Datasets tab
- ONE dataset:
  - can be used over and over in one or in many workspaces
  - can be used in many different reports
  - visualizations from that one dataset can display on many different dashboards



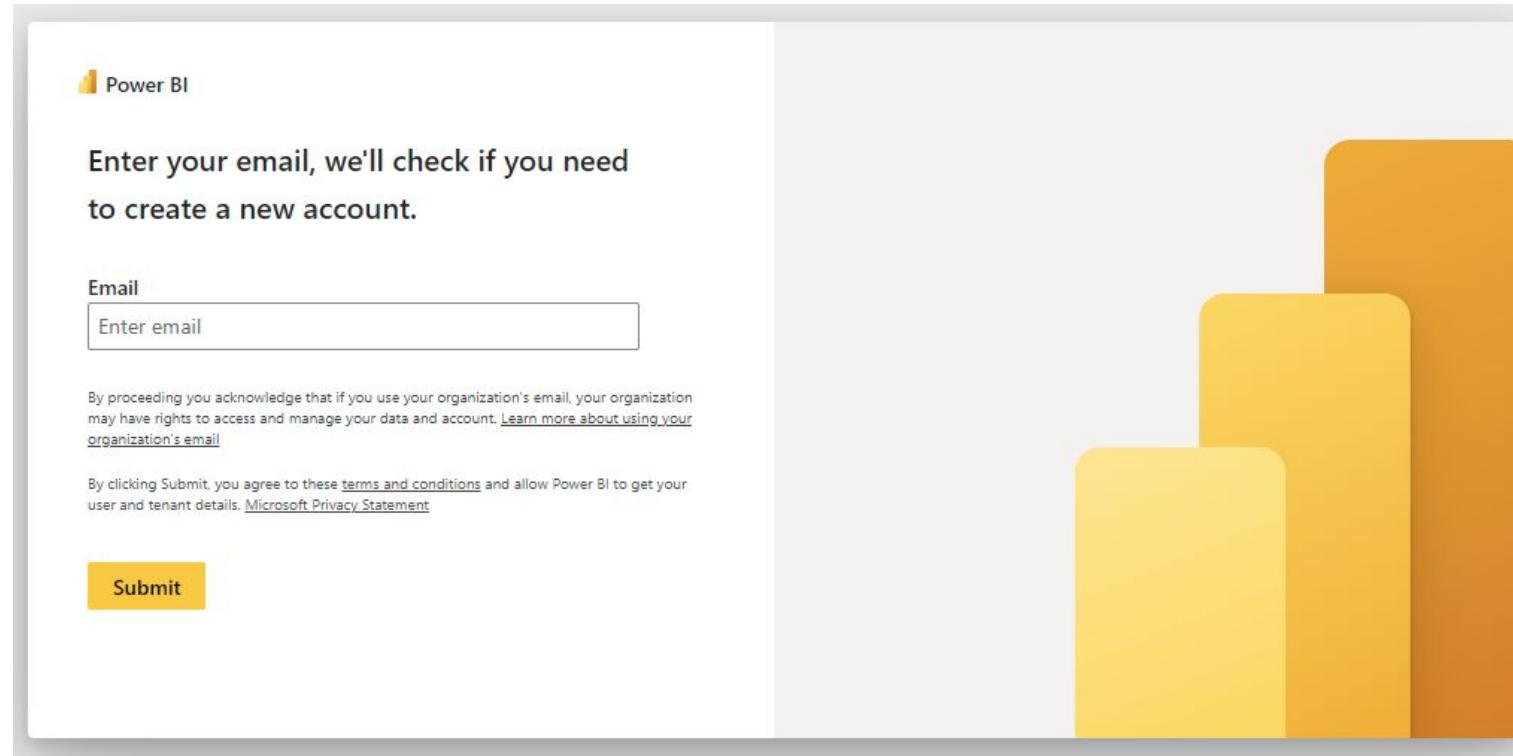
# Publishing reports

- You will need to use Power BI Desktop to publish a Power BI report



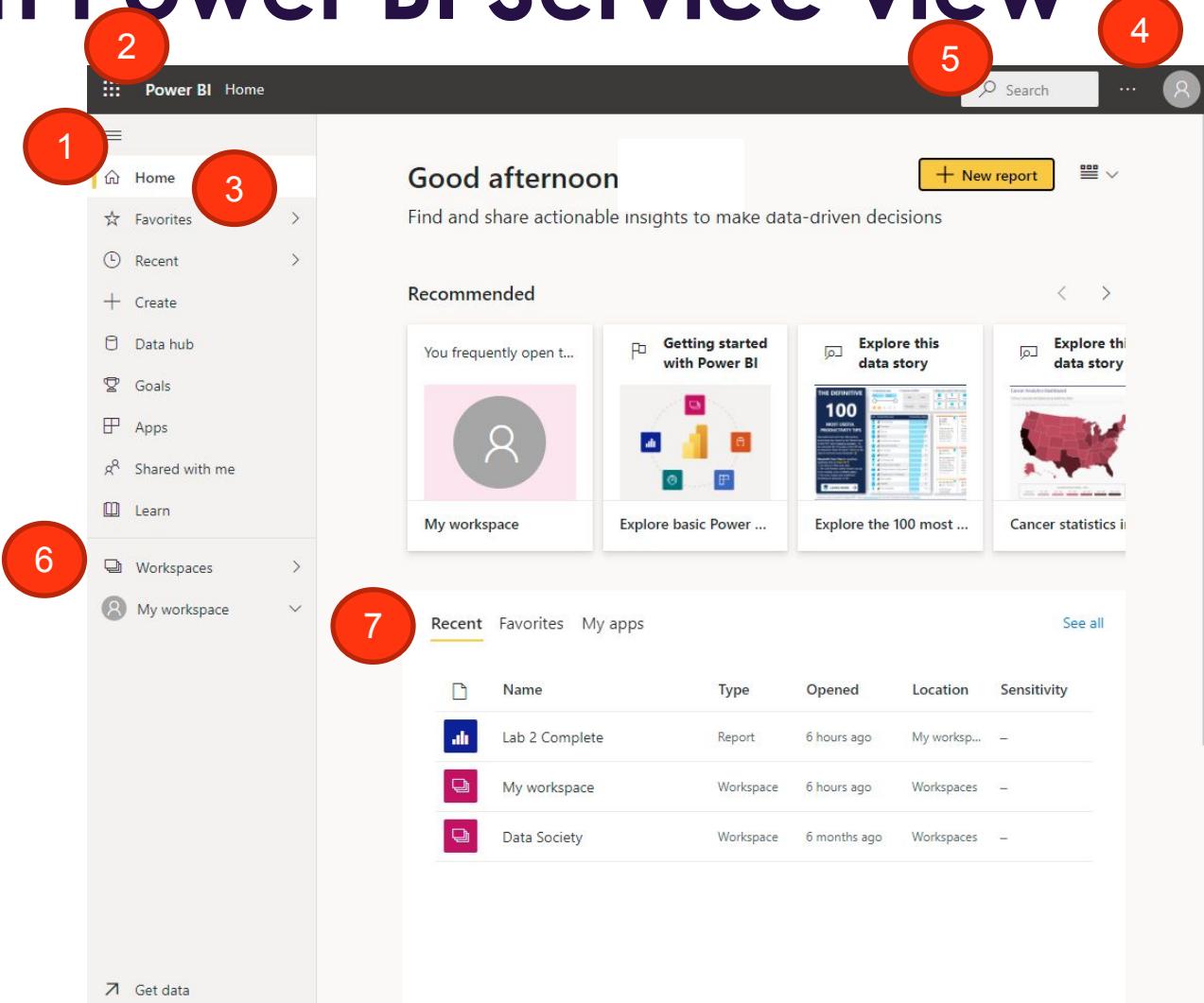
# Sign in to the Power BI Service

- Go to: <https://app.powerbi.com>
- Login with your account credentials



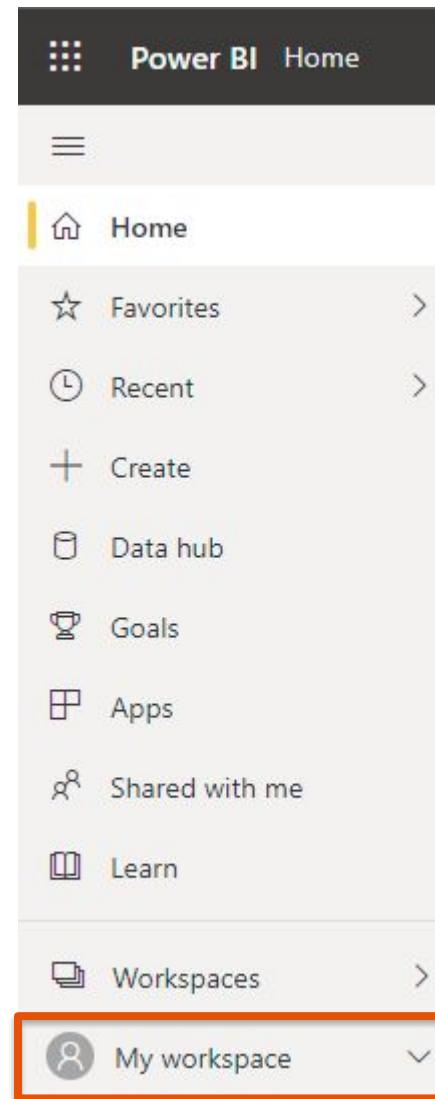
# Familiarizing yourself with Power BI Service view

- When you open the Power BI service in a browser, you start at your Home screen. Here are the elements you may see:
  - 1. Navigation pane (left pane)
  - 2. Office 365 app launcher
  - 3. Power BI home button
  - 4. Icon buttons, including settings, help, and feedback
  - 5. Search box
  - 6. Workspace content
  - 7. Favorite and frequent dashboards and reports



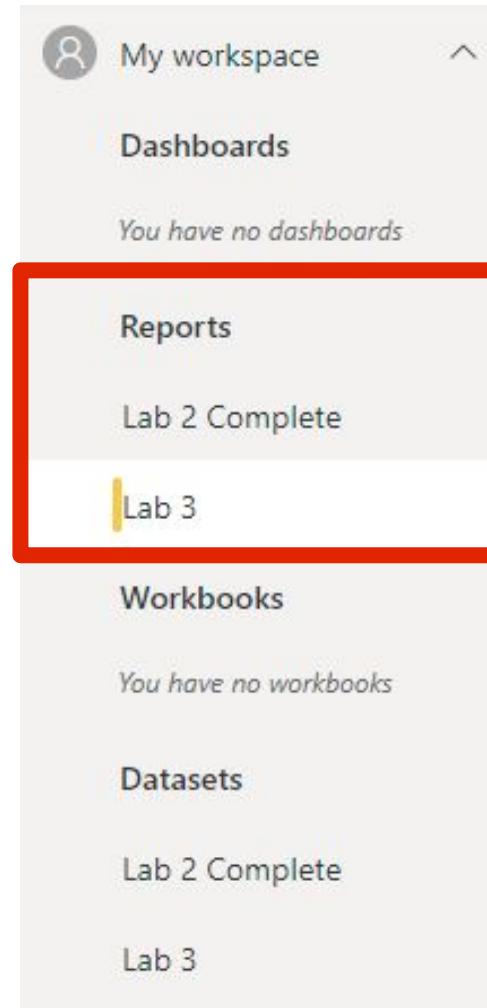
# Navigate to workspaces

- After logging in to Power BI, you can find workspaces in the left panel
- Let's choose the default “My Workspace” to start



# Navigate to workspaces

- You can see each workspace has 4 areas. They are Dashboard, Reports, Workbooks, Datasets



# Reports in Power BI Web Service

Pages Pane – allows you to navigate to different pages in the report

Action Bar – Download PBIX, Edit the report, Favorite, Fullscreen, etc.

NC Grant Distribution

Actual Job Count and Required Job Counts

Count of Grants by Status

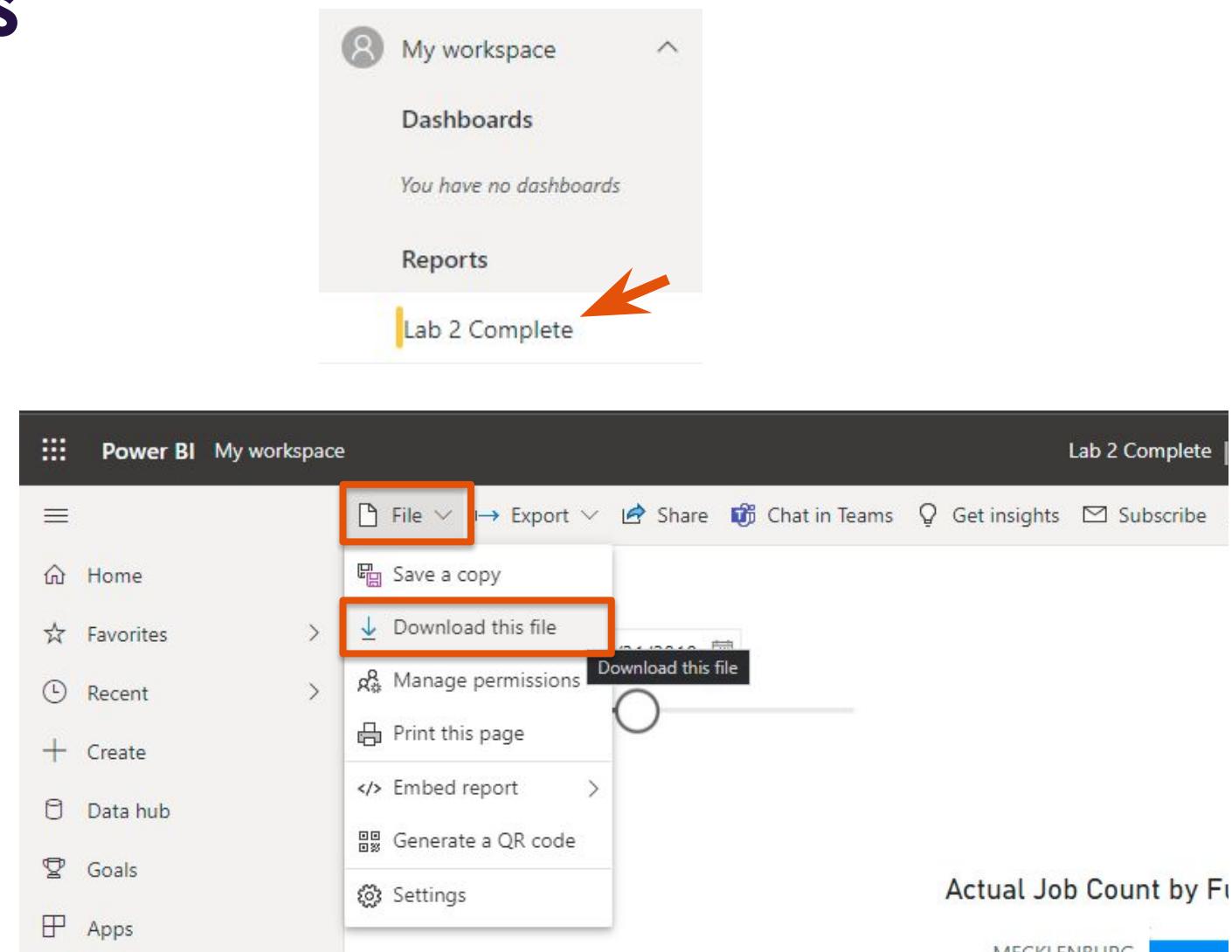
Actual Wage by Job Type

Filters pane – View and edit visual, page, and report-level filters

The screenshot shows the Power BI Web Service interface with a red border. On the left is a 'Pages' pane with 'Overview' selected, showing links to 'Grant Details' and 'Company Review'. The main area has a title 'NC Grant Distribution'. It includes a gauge chart 'Actual Job Count and Required Job Counts' with values 31K, 35K, and 46K, and a donut chart 'Count of Grants by Status' with a total of 313 grants. Below these are two bar charts: 'Actual Job Count by Job Type and Program' and 'Actual Wage by Job Type'. The 'Actual Job Count' chart shows counts for Manufacturing (8K), Management (3K), Professional (2K), Information, Transportation, Finance and I., Real Estate a., Health Care a., Wholesale Tr., Utilities, Other Service, and Administrativ. The 'Actual Wage' chart shows wages for Manufacturing (2.1M), Professional (1.5M), Management (1.4M), Information (0.5M), Utilities (0.4M), Finance and I. (0.3M), Transportation (0.2M), Health Care (0.1M), Real Estate (0.1M), Wholesale (0.1M), Other Service (0.0M), and Administration (0.0M). The top navigation bar includes File, Export, Share, Chat in Teams, Get insights, Subscribe, Edit, Reset to default, Bookmarks, View, and a star icon. The bottom right corner features the North Carolina state seal. A 'Filters' pane is visible on the right side of the main content area.

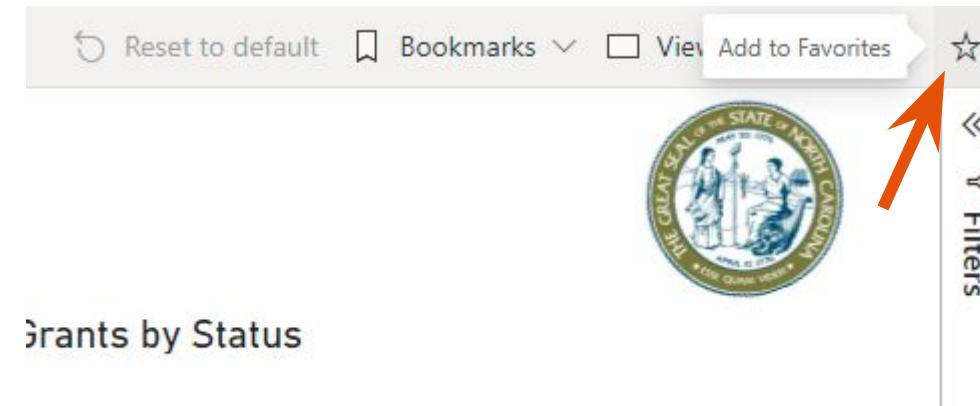
# Downloading reports

- Click into the report you want to download
- You can find the 'File' Drop Down on the Top right corner of the main area
- Click Download this file



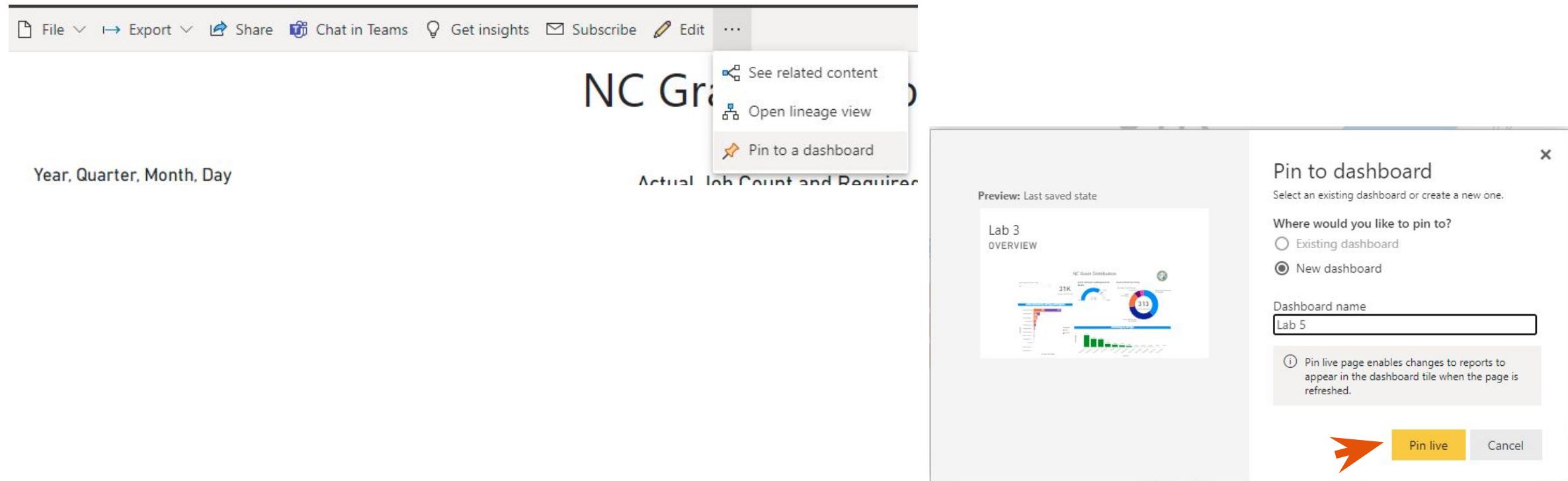
# Add to your favorites

- You can add any dashboard or report to your Favorites



# Pinning to your dashboard

- You can create a Dashboard from existing Reports in the same workspace
- Go to a report on your Workspace, and then find the Pin to a dashboard button
- Then you can pin your visual to an existing dashboard or a new dashboard

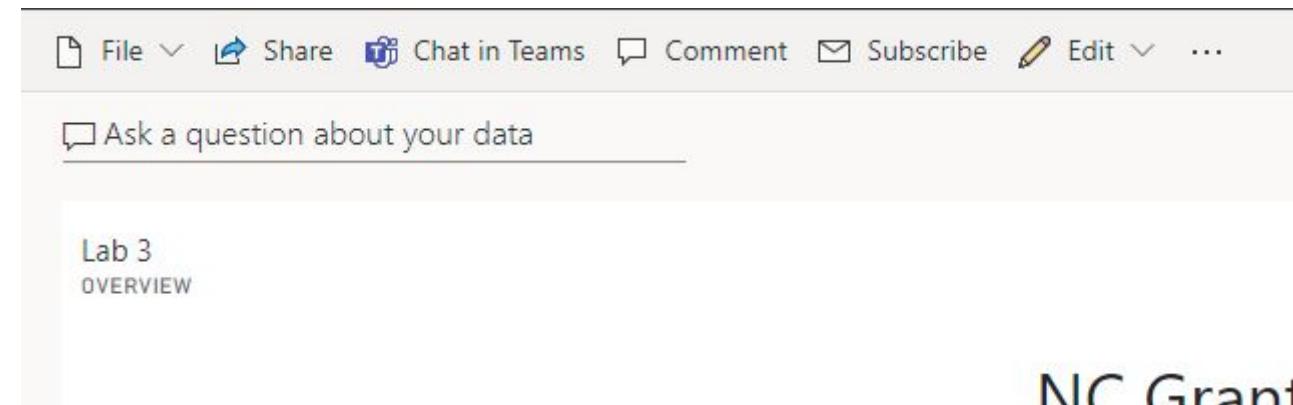


# Data Alerts

- You can set alerts to notify you when data in your dashboards changes beyond limits you set
- There are some restrictions to when Alerts can be set:
  - Alerts can only be set on tiles pinned from report visuals, and only on gauges, KPIs, and cards
  - Alerts only work on data that is refreshed
  - Alerts can be created on dashboards:
    - that you have created and saved in My workspace
    - that have been shared with you in a Premium capacity
    - in any workspace you can access, if you have a Power BI Pro license
- Since our data is static, we can follow [Microsoft's tutorial](#) to set alerts on a sample dashboard

# Subscriptions

- Subscriptions help keep track of dashboards
- Power BI will email a snapshot to specified email addresses
- Subscriptions require a Power BI Pro or Premium License



# Subscriptions

- Frequency can be customized: daily, weekly, or when the data refreshes

Subscribe

Enter email addresses

( Specify at least one email address)

Subject

Subject

Include an optional message...

Frequency

Daily

Sun  Mon  Tue  Wed  Thu  Fri  Sat

Scheduled Time

3  00  PM  (UTC-05:00) Eastern Time (US & Canada)

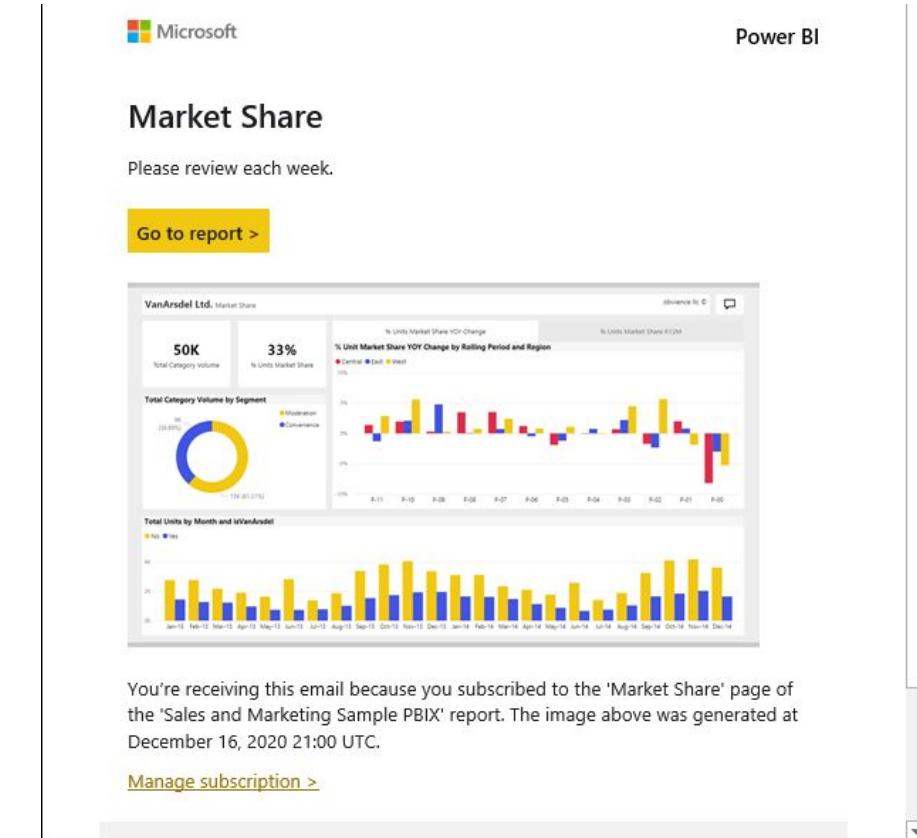
Start date  End date

Also Include

Access to this dashboard

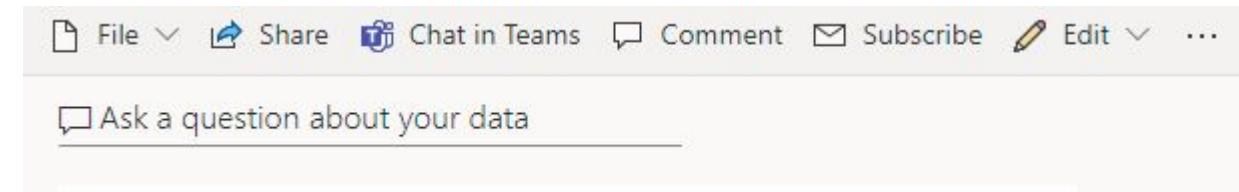
Link to dashboard in Power BI

[Manage all subscriptions](#)

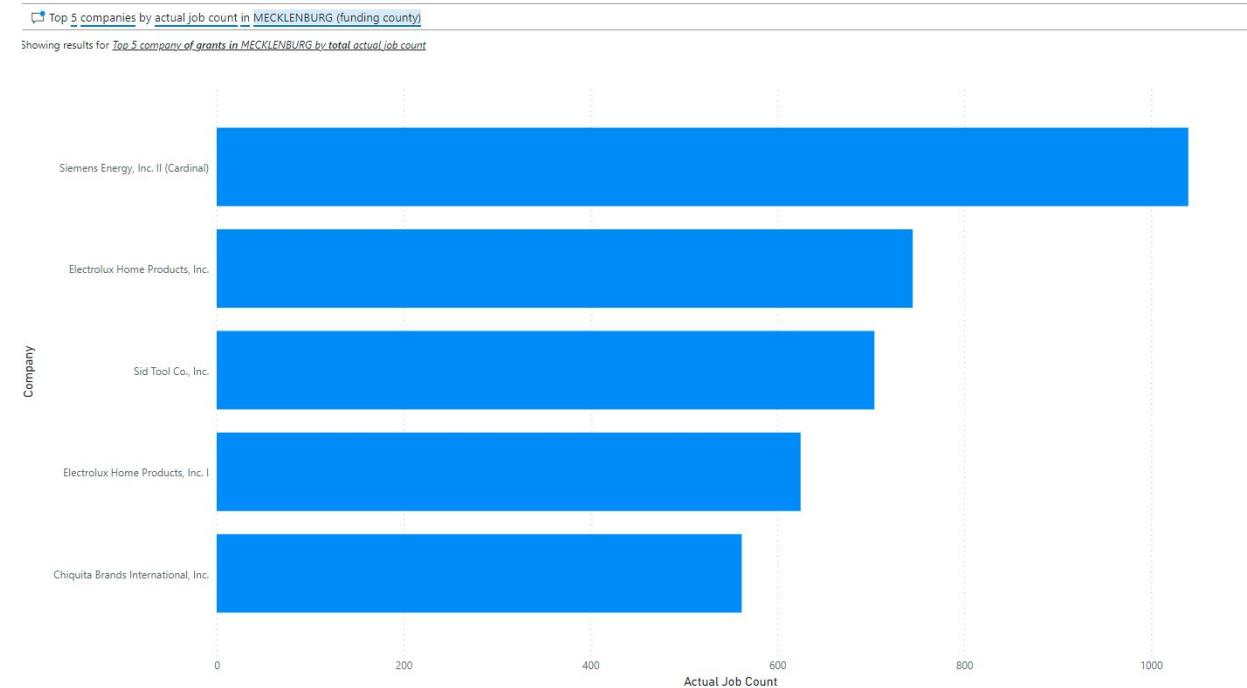


# Q&A in Dashboards

- You can ask questions of your dataset using the Q&A feature
- These questions are written in an English-like syntax
- This is useful for ad-hoc queries and data exploration
- Power BI will return a formatted visual in response to the question, which can be pinned to the dashboard or edited further using the familiar Fields and Visualizations panes



Top 5 companies by actual job count in MECKLENBURG (funding county)



# Schedule refresh on datasets

- Knowing how to refresh your dataset is critical in delivering the most accurate results
- Go to the 'Datasets' tab of the workspace and click on the 'Schedule Refresh' button
- From here, you can set the Gateway connection (connector to the underlining data source). If your data is locally in your server, then gateway is where Power BI cloud service can connect to your on-premise local data
- If your data is online or is in the cloud, the gateway is not needed

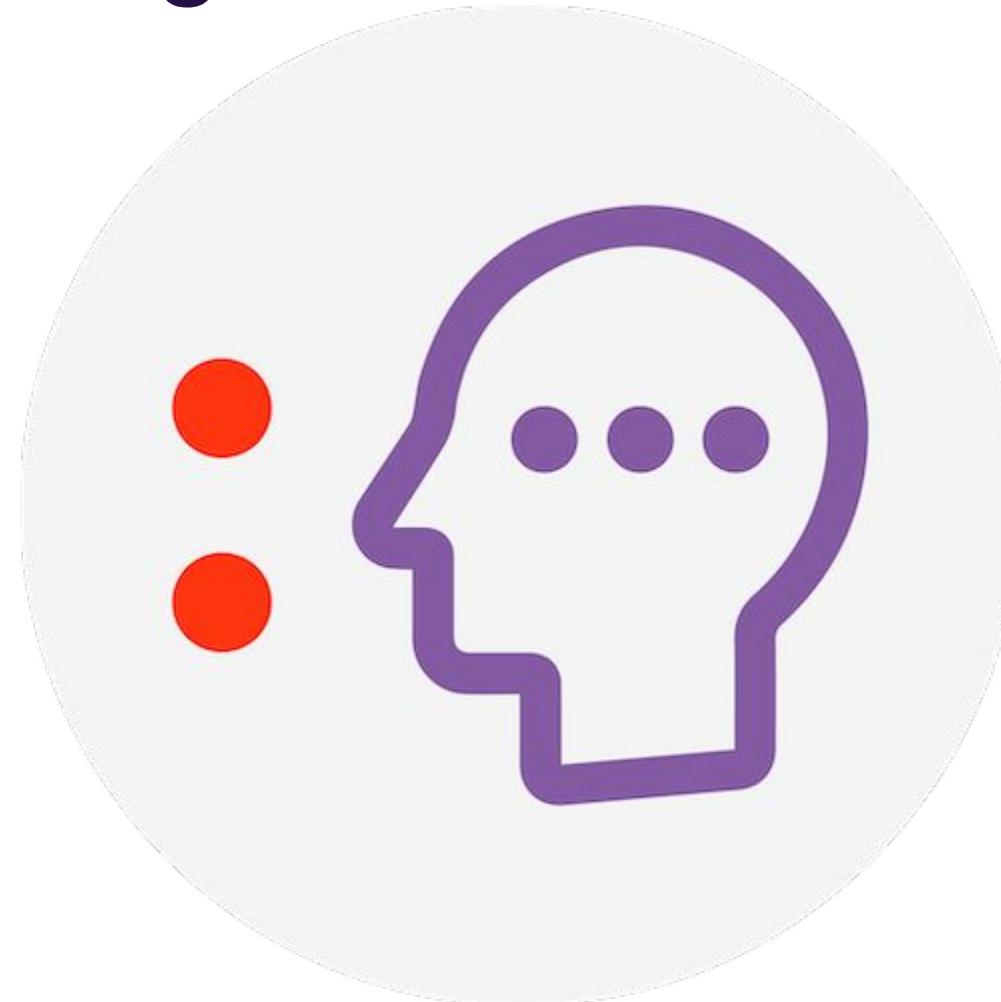
The screenshot shows the Power BI 'My workspace' interface. The 'Datasets + dataflows' tab is selected. A dataset named 'Lab 2 Complete' is listed. The 'Schedule refresh' button in the ribbon is highlighted with a red box. The 'Schedule refresh' configuration pane is open on the right, showing the following settings:

- Scheduled refresh**: Keep your data up to date. On.
- Refresh frequency**: Daily.
- Time zone**: (UTC-05:00) Eastern Time (US and Ca).
- Time**:
  - 4 : 00 AM
  - 8 : 00 AM
  - 10 : 00 AM
  - 11 : 00 AM
  - 12 : 00 PM
  - 2 : 00 PM
  - 4 : 00 PM
  - 6 : 00 PM
- Send refresh failure notifications to**:
  - Dataset owner
  - These contacts:  
Enter email addresses
- Buttons**: Apply, Discard.

# End of Lab 5



# Day 3 - Knowledge Check 2



# Summary

Today we learned about:

- ETL layer: load data through Power Query
- Functions of the Power BI web service

# Tomorrow, we'll learn how to:

- Continue Data Modeling
- Implement data storytelling frameworks and techniques
- Program in DAX programming language

# DATA SOCIETY:

## Power BI Bootcamp

Day 4

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

- Albert Einstein



# Agenda

- Advanced Data Modeling
- Implement data storytelling frameworks and techniques
- Program in Power BI using DAX language to manipulate data

# Last Second Request



Can you please add a visual map for each of the counties?

# Beginning of Lab 6



# Objectives for Lab 6

- Continue to utilize Power Query as a data manipulation tool.
- Build a Map visualization.



# Create map visual

- Flip back to 'Report' view, add a 'Filled map'

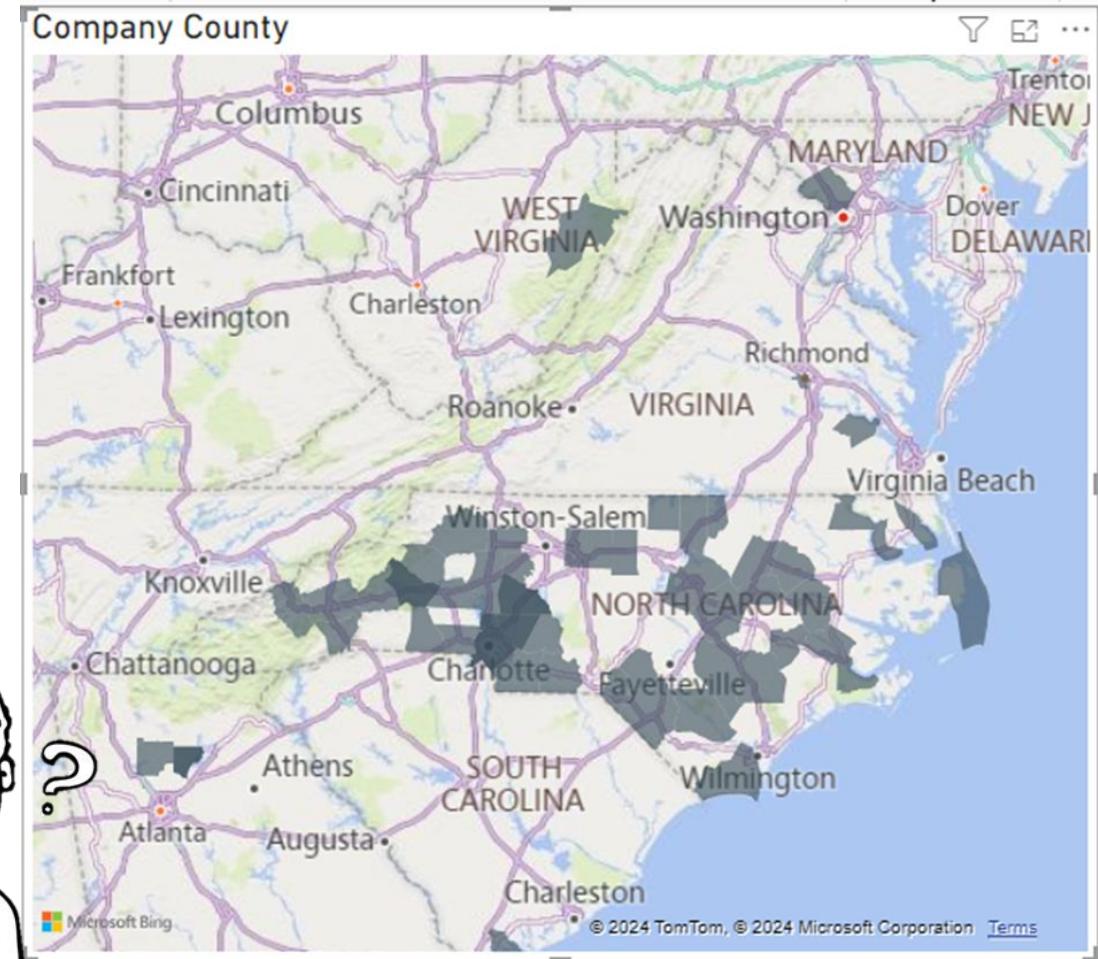


- Drag our new calculated column 'State County' from 'Grants' table to the Location field and drag 'Total Actual Jobs' to the Tooltips field of the map visual.



# Quick Solution

- Power BI does not always give you what you expect
- Maps especially can be real finicky, especially when dealing with counties.
- At times you will have to add additional information for Power BI to get it just right
- Let's Learn How



# Custom Columns

The screenshot shows the Power BI desktop application. The ribbon at the top has 'File', 'Home', 'Transform', 'Add Column', 'View', 'Tools', and 'Help'. Under 'Add Column', there is a 'Custom Column' icon, which is highlighted with a red box. Below the ribbon is a 'Queries [2]' pane containing 'Grants' and 'Companies'. The main area displays a table with columns 'Funding County' and 'Category'. The 'Funding County' column shows a distribution of 93% Valid, 0% Error, and 7% Empty. The 'Category' column lists 11 distinct values: BUNCOMBE, DAVIDSON, ROCKINGHAM, ROCKINGHAM, DAVIE, DURHAM, JOHNSTON, CALDWELL, PITT, WAYNE, and SCOTLAND.

## Custom Column

Add a column that is computed from the other columns.

New column name

Custom column formula

```
= [Funding County] & " County, NC"
```

Available columns

- Funding ID
- Program
- Award Date
- Company
- Company County
- Company Address
- Company Website

<< Insert

Learn about Power Query formulas

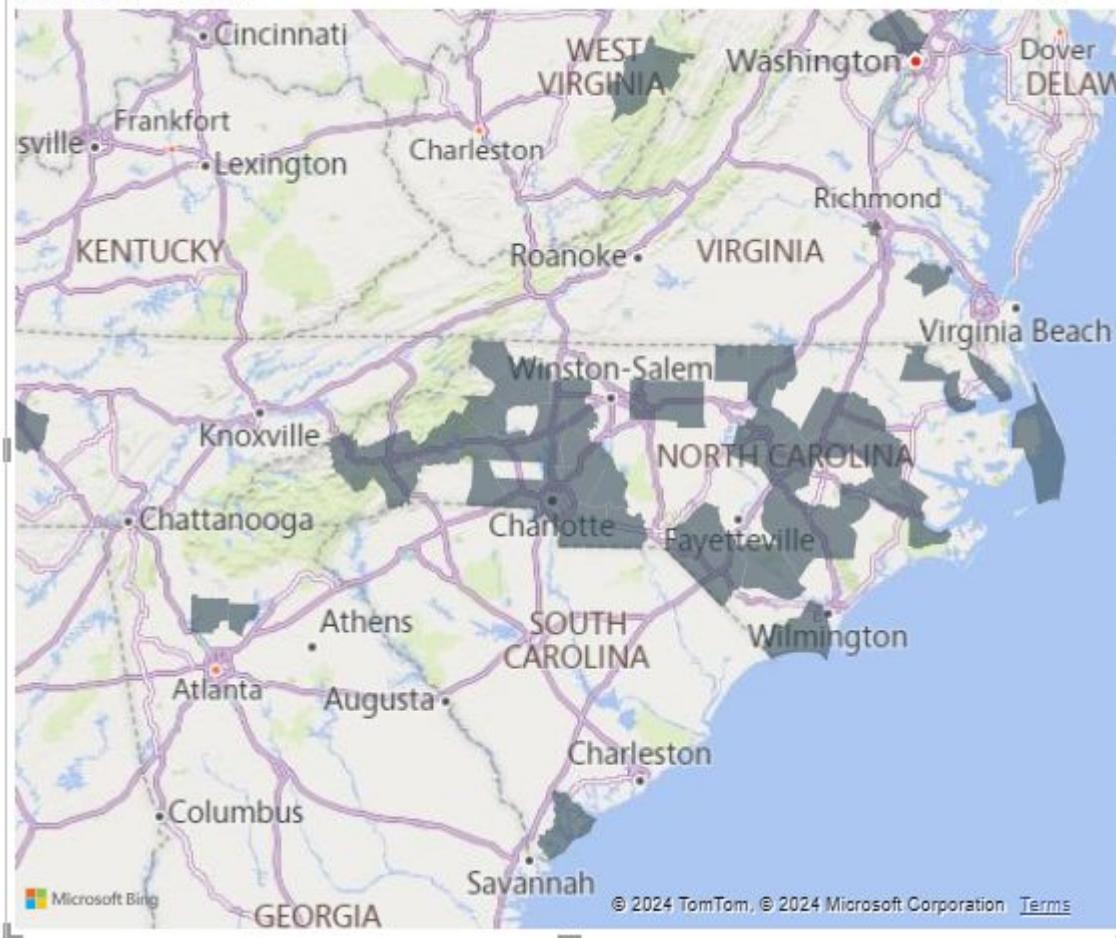
✓ No syntax errors have been detected.

OK

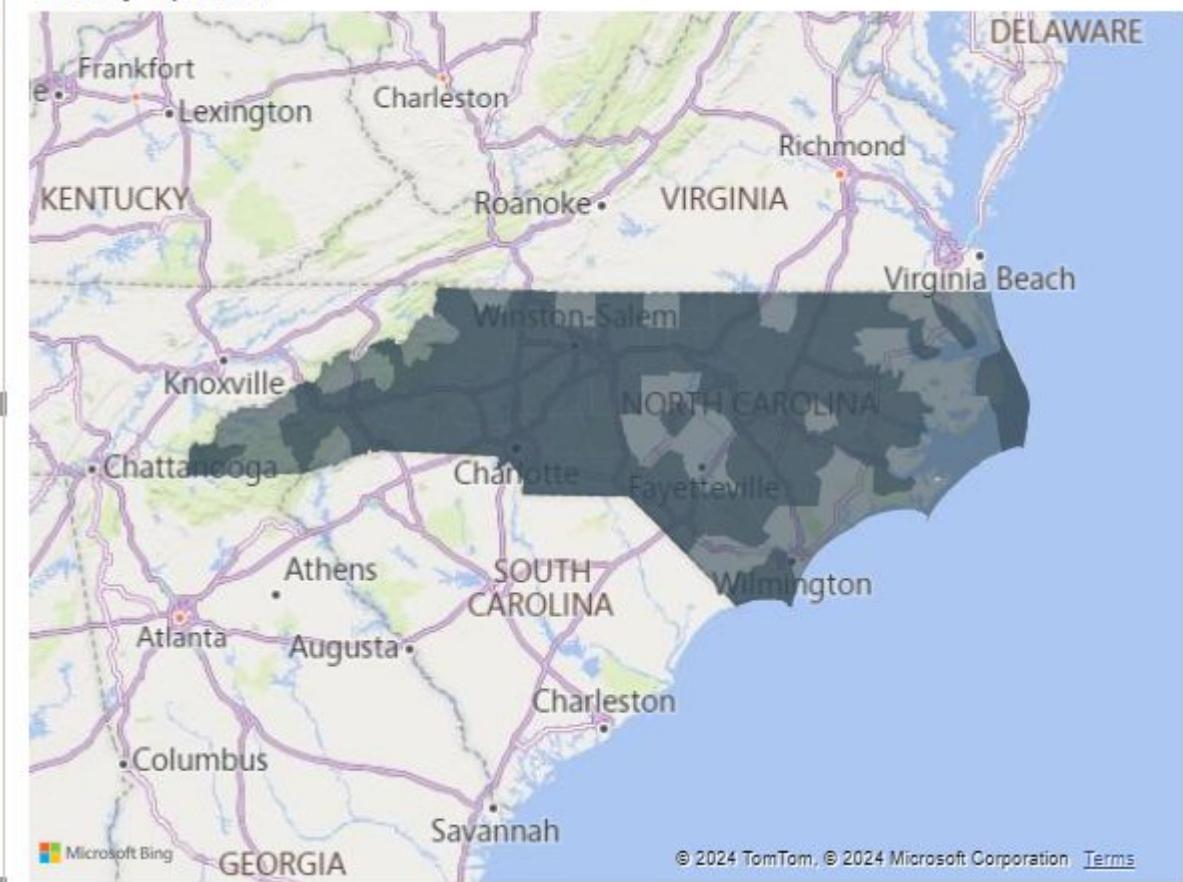
Cancel

# Correction Made

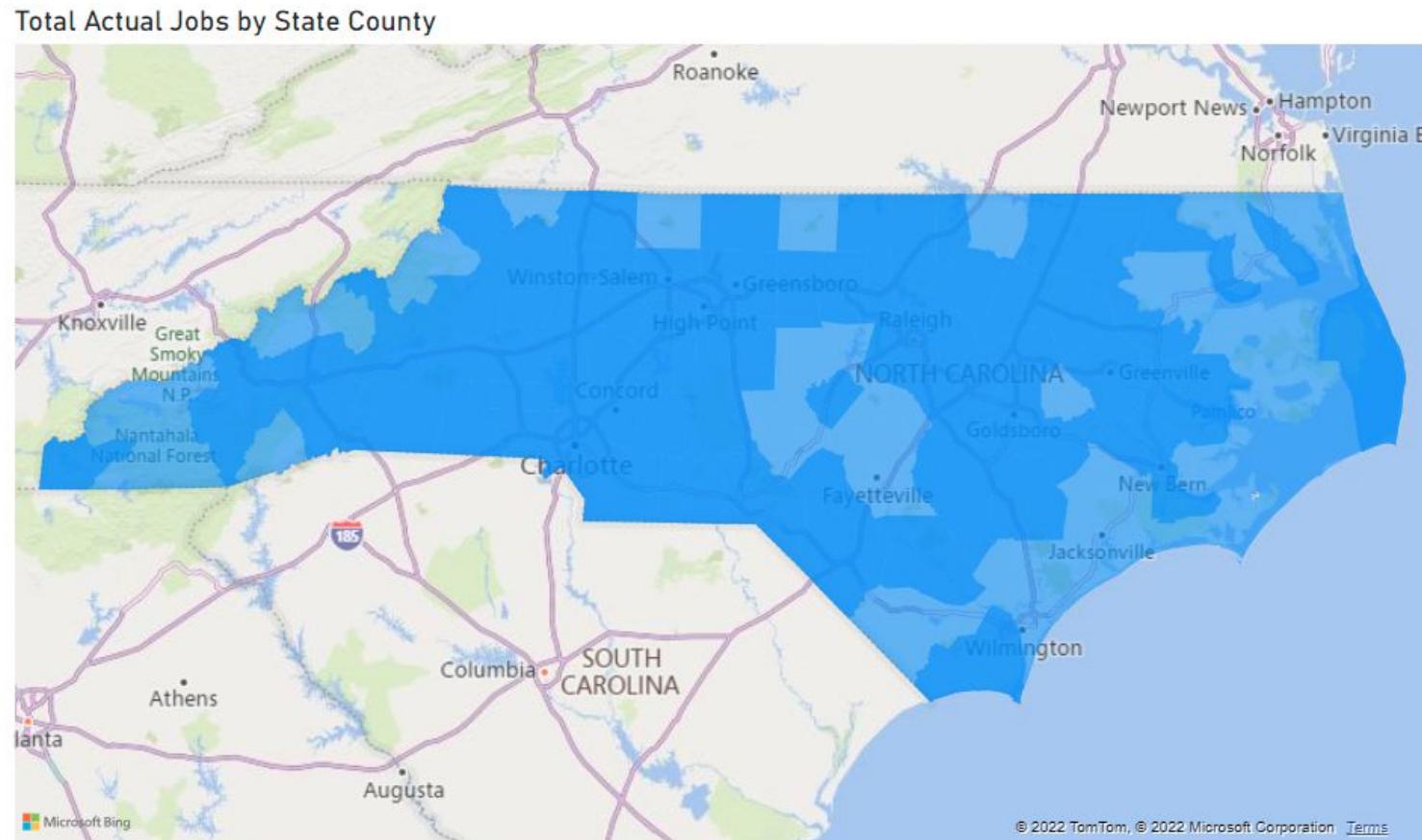
Funding County



County Updated



# Adding Variety to Maps



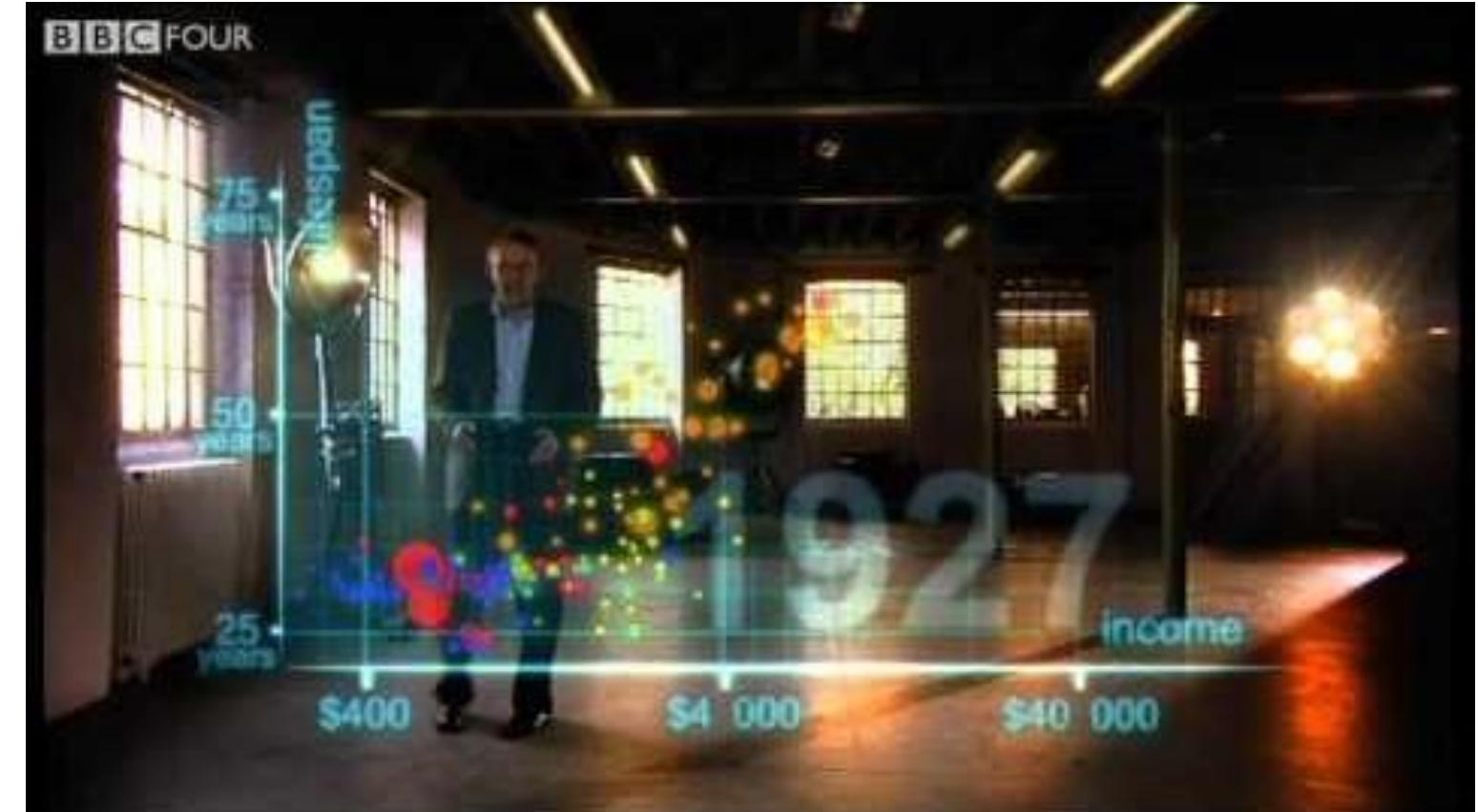
Can we add more information to this map?

# Agenda

- Advanced Data Modeling
- Implement data storytelling frameworks and techniques
- Program in Power BI using DAX language to manipulate data
-

# Warm up: 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 visualization important?

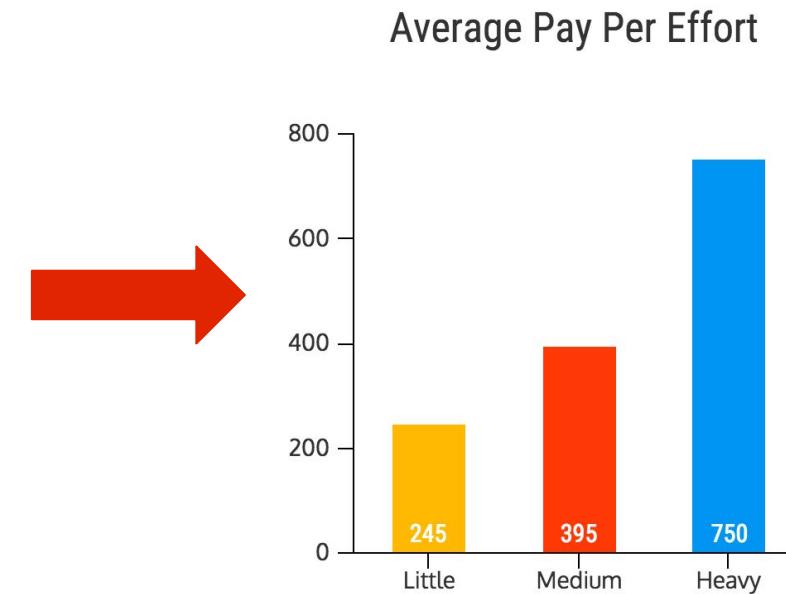
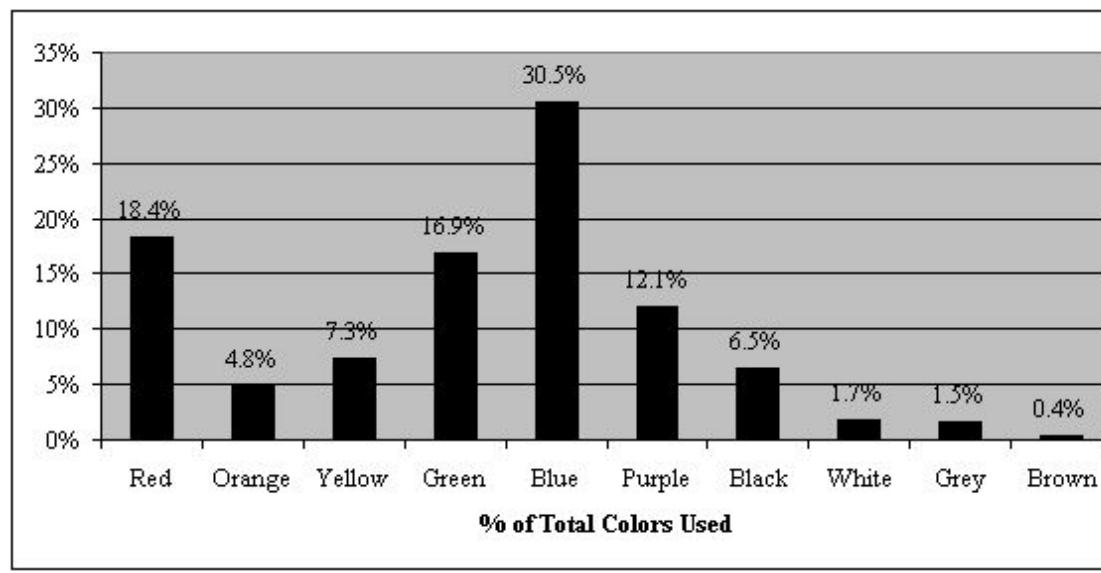
- To provide valuable insights, visualization must be interpretable and relevant
- To give a visual or graphical representation of data/concepts
- To communicate ideas. We are visual by nature and visualizations are a form of communication
- Provide an accessible way to see and understand trends, outliers,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

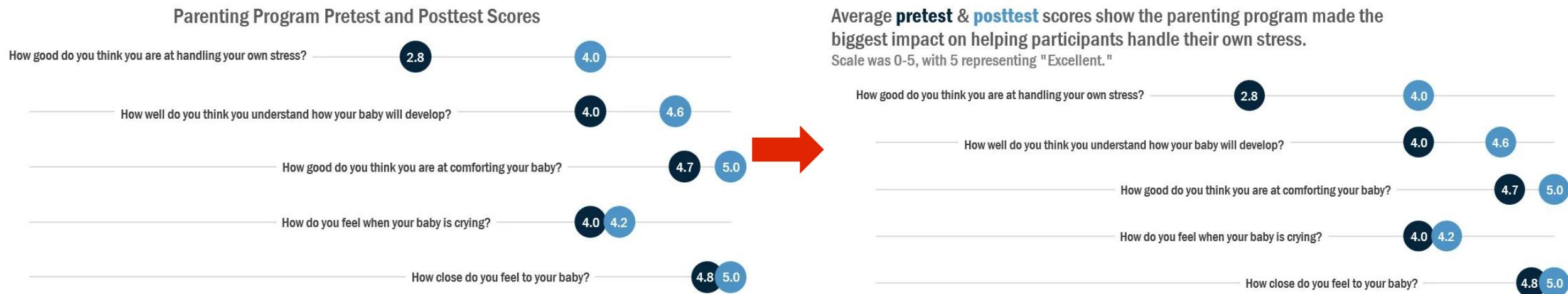
# Color

- 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



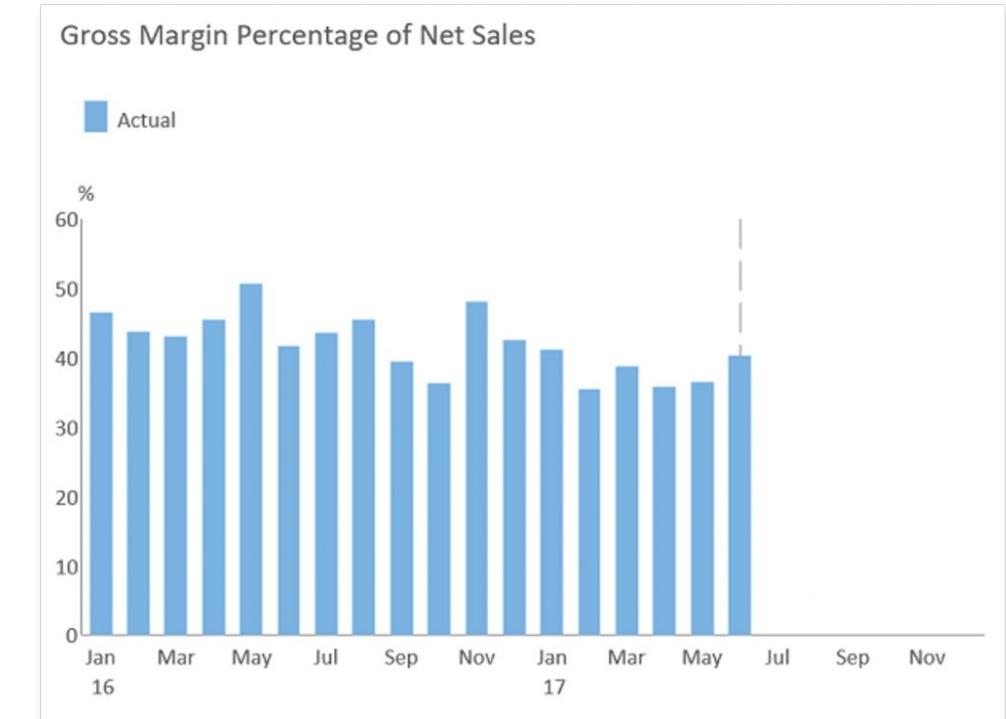
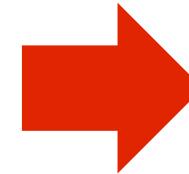
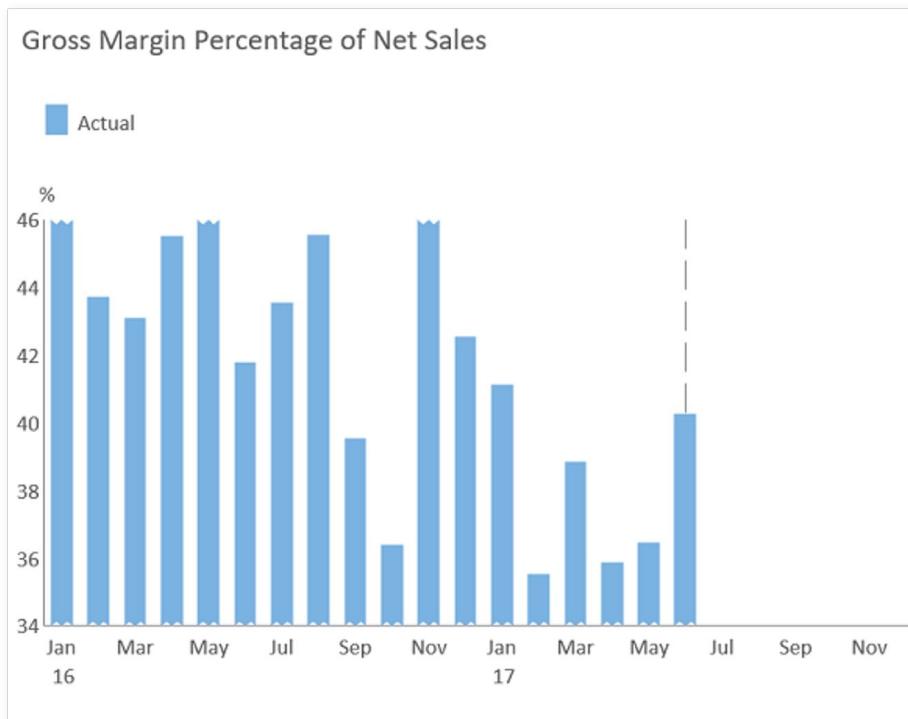
# Text and tables

- 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



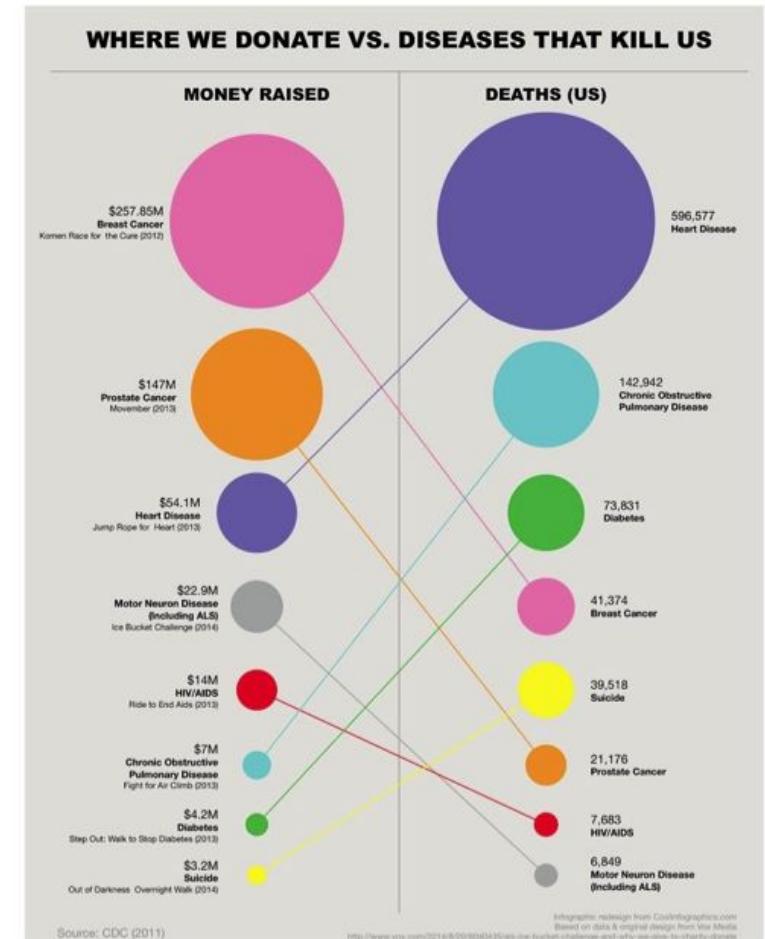
# Data Integrity

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

Original Design

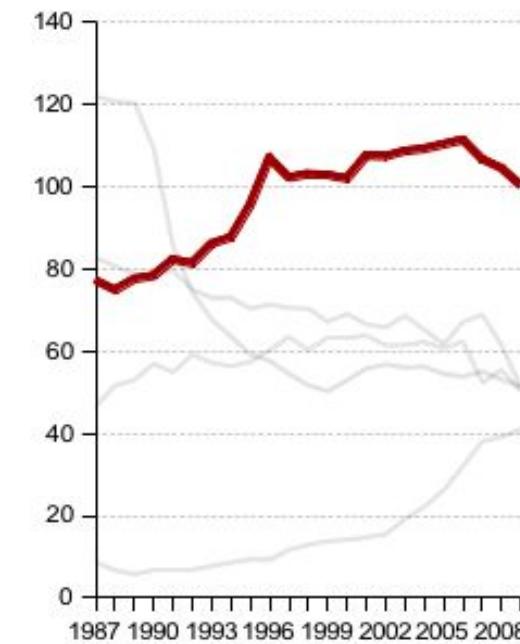
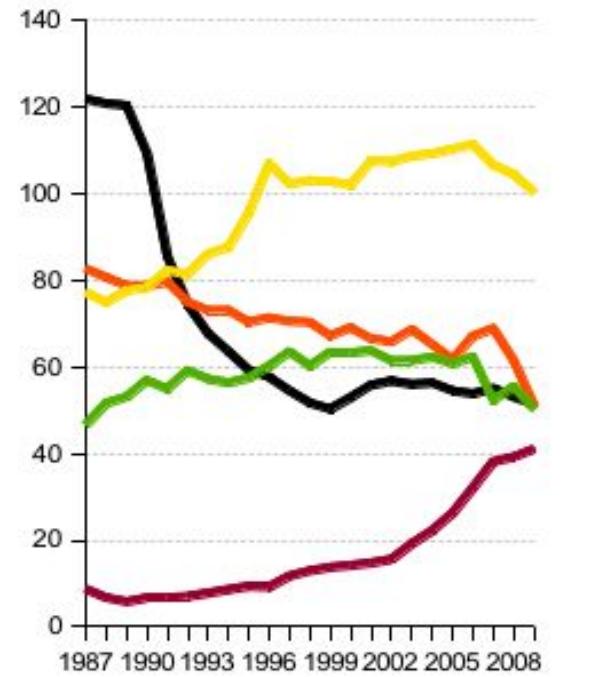


Corrected Design



# 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.'**



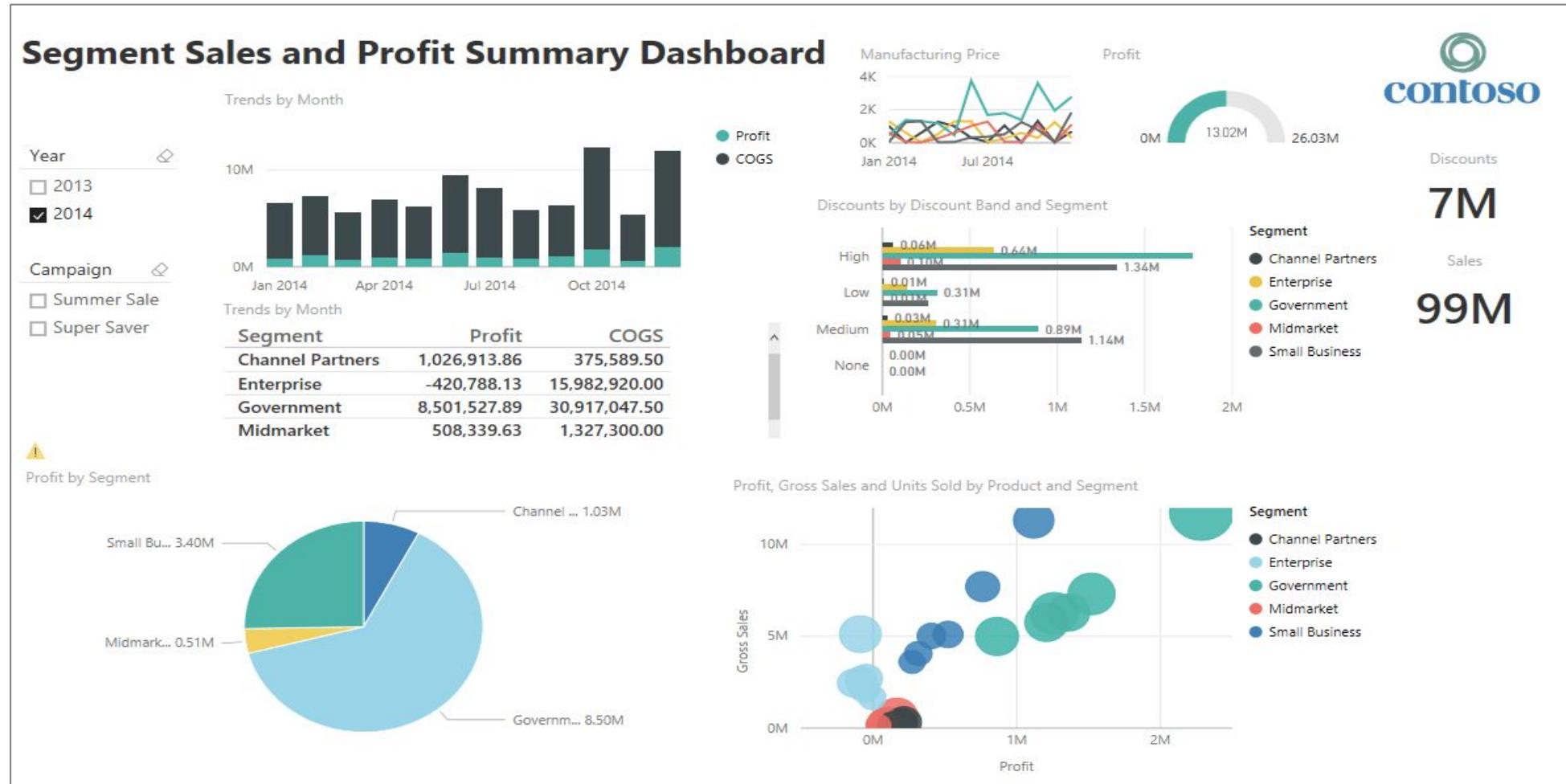
# Design principles checklist

- 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) 

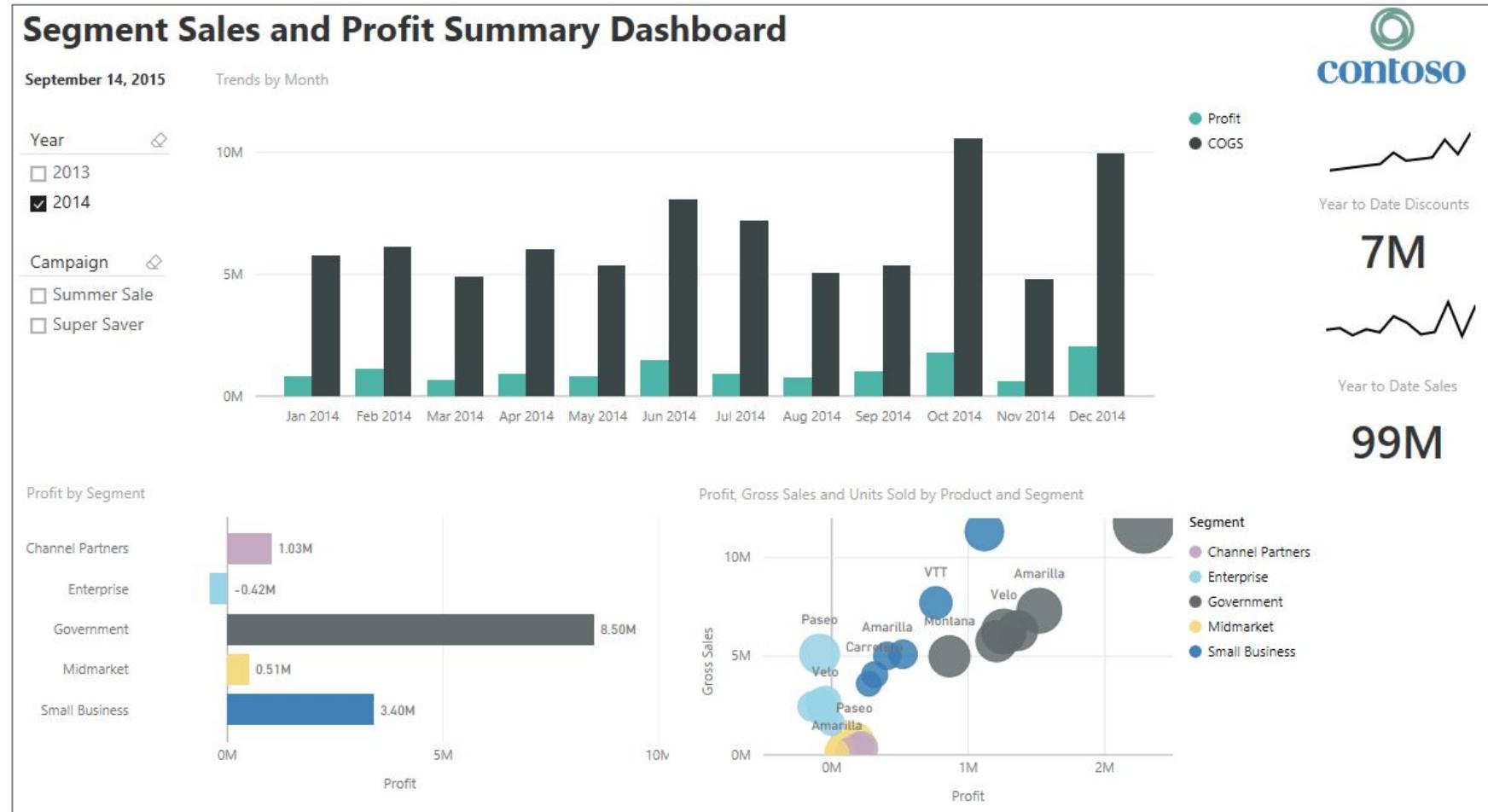
# Which dashboard is better?

## Dashboard 1



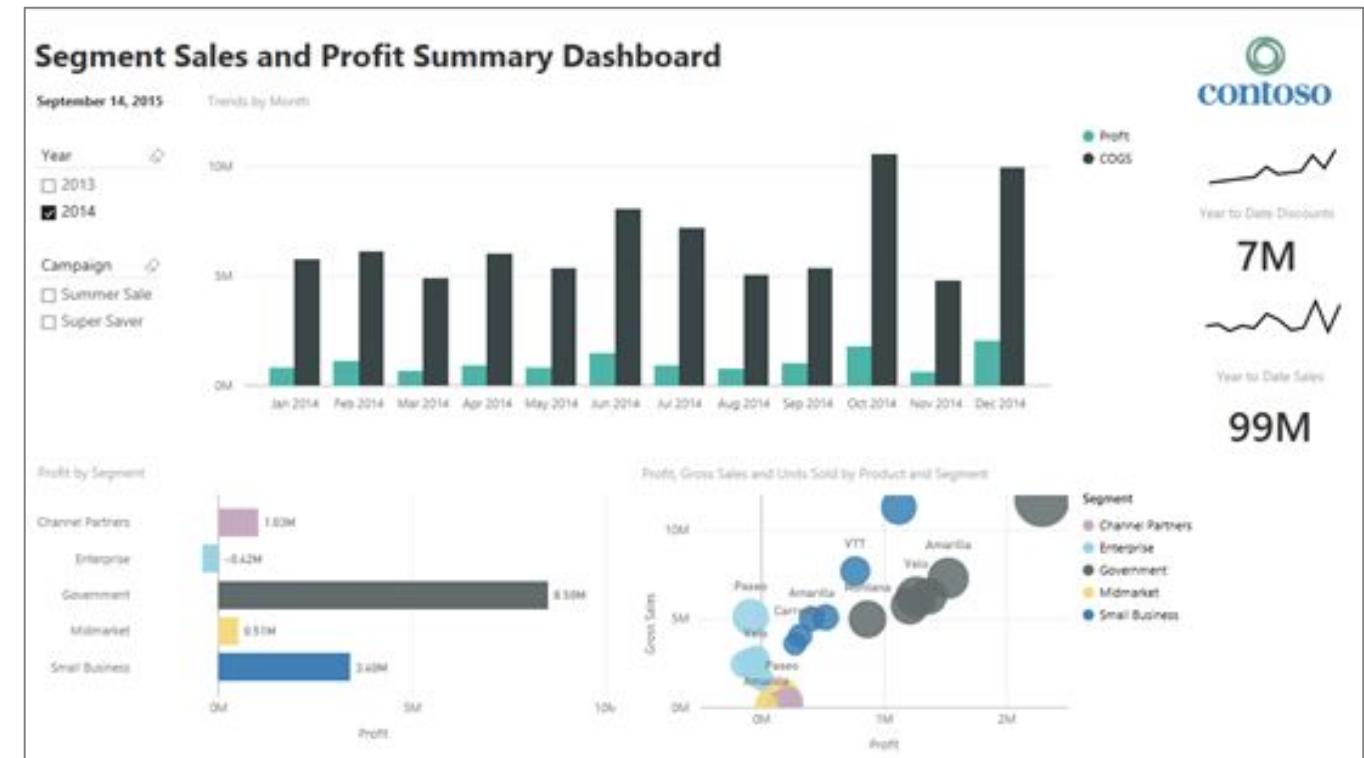
# Which dashboard is better?

## Dashboard 2



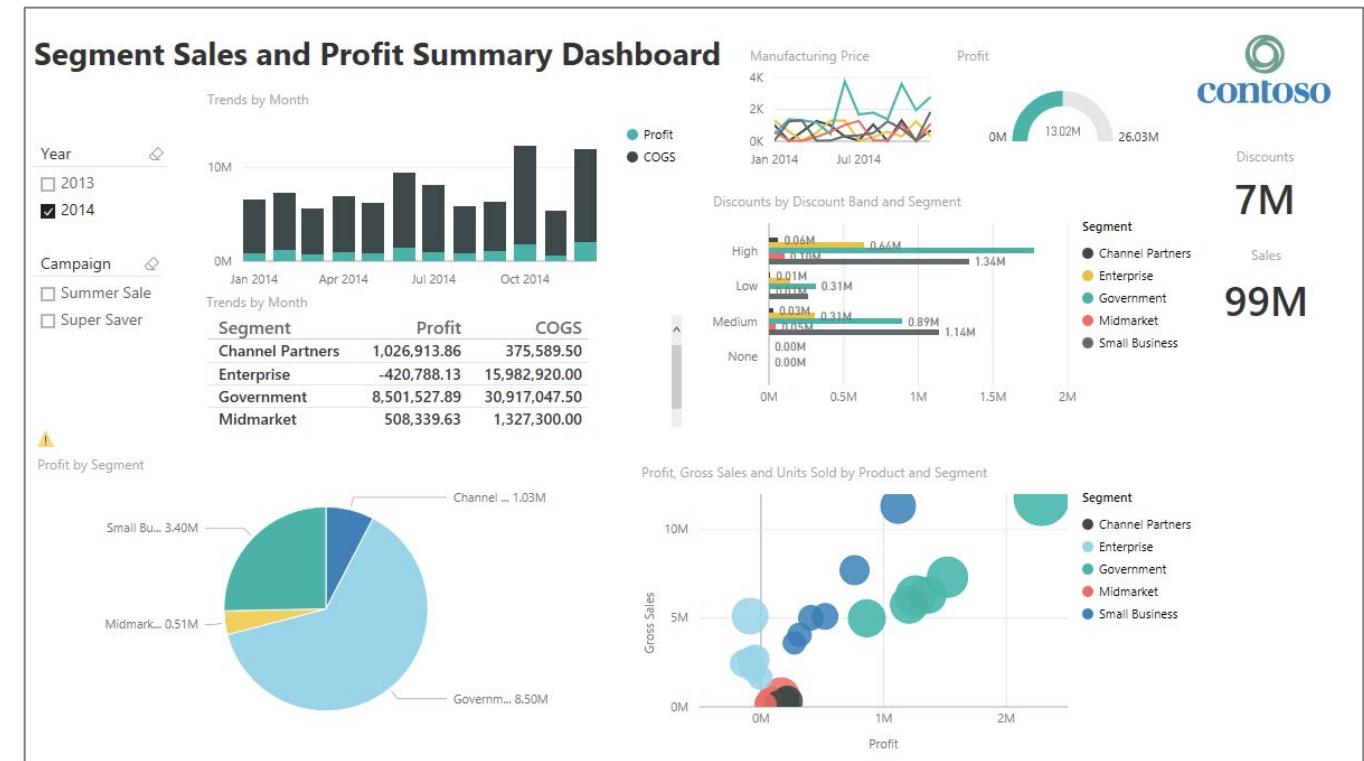
# Dashboard 2

- 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



# Data storytelling

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



# 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

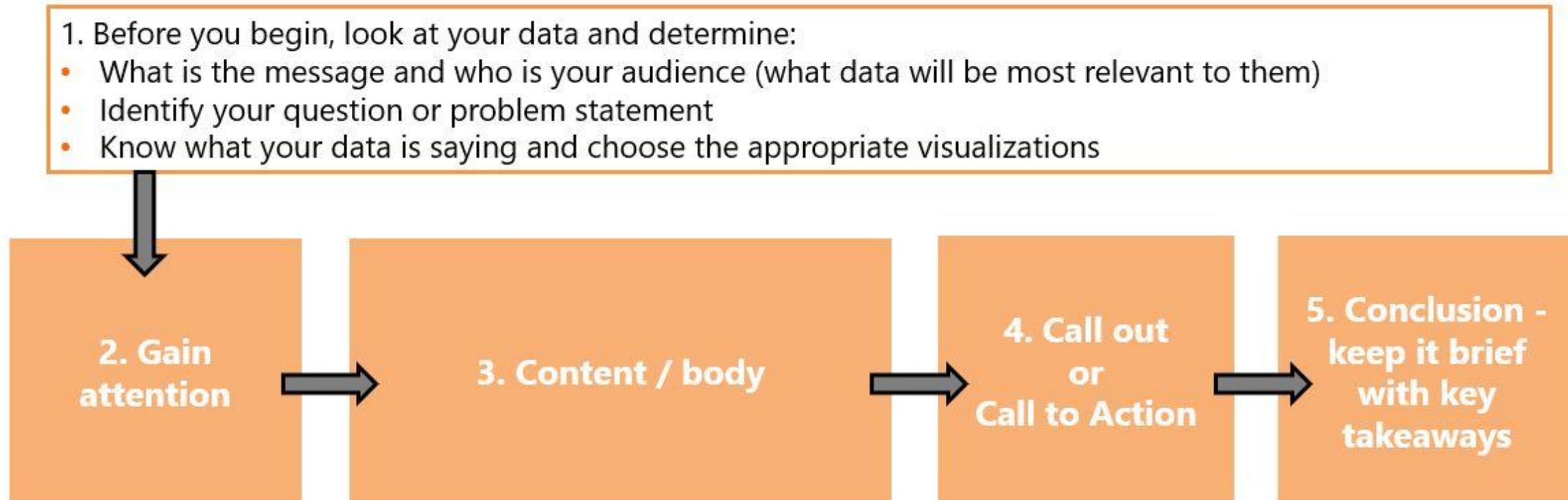
# Data storytelling - George Roumeliotis

- 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

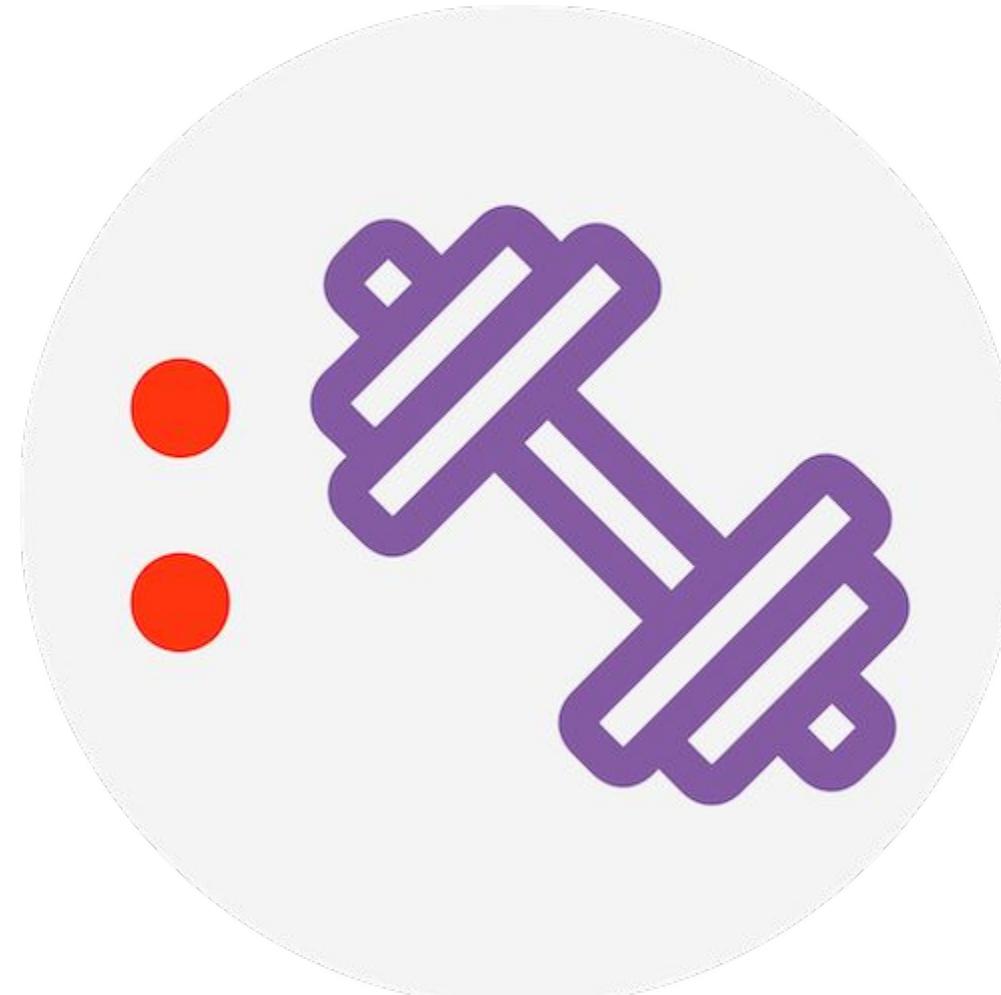
- Narrative framework graphic organizer



# Day 4 - Knowledge Check 1



# Exercise 3



# Agenda

- Advanced Data Modeling
- Implement data storytelling frameworks and techniques
- Program in Power BI using DAX language

# Introduction to Power BI Formulas (DAX)

- Data Analysis Expressions (DAX) is a formula language that works with relational data in Power BI Desktop
- DAX has a library of over 200 functions, operators, and constructs, providing immense flexibility in creating formulas to calculate results for just about any data analysis need
- There are 3 places you can use DAX:
  - Measures
  - Calculated columns
  - Calculated table

# Introduction to measures

- The calculated results of measures are always changing in response to interaction with your reports, allowing for fast and dynamic ad-hoc data exploration
- It does not store precalculated results in the data model, instead it **hosts the logic definition of how you want to calculate the result**
- For example, you can define a measure using the SUM function against a data field and then use the measure in any visual which will dynamically change the result based on the filter context
- Filter context is determined by Y-axis, X-axis, Legend, Slicers, Visual, Page, and Report-level filters

# Calculate ‘total required jobs’

- The grant officer wants to know the total number of required jobs
- The total required jobs is the sum of required job counts for each grant
- This is important insight for him to know, as it affects mid-grant reviews. Based on a ratio of actual vs required jobs, the grant officer can allocate additional money based on performance



# Beginning of Lab 7



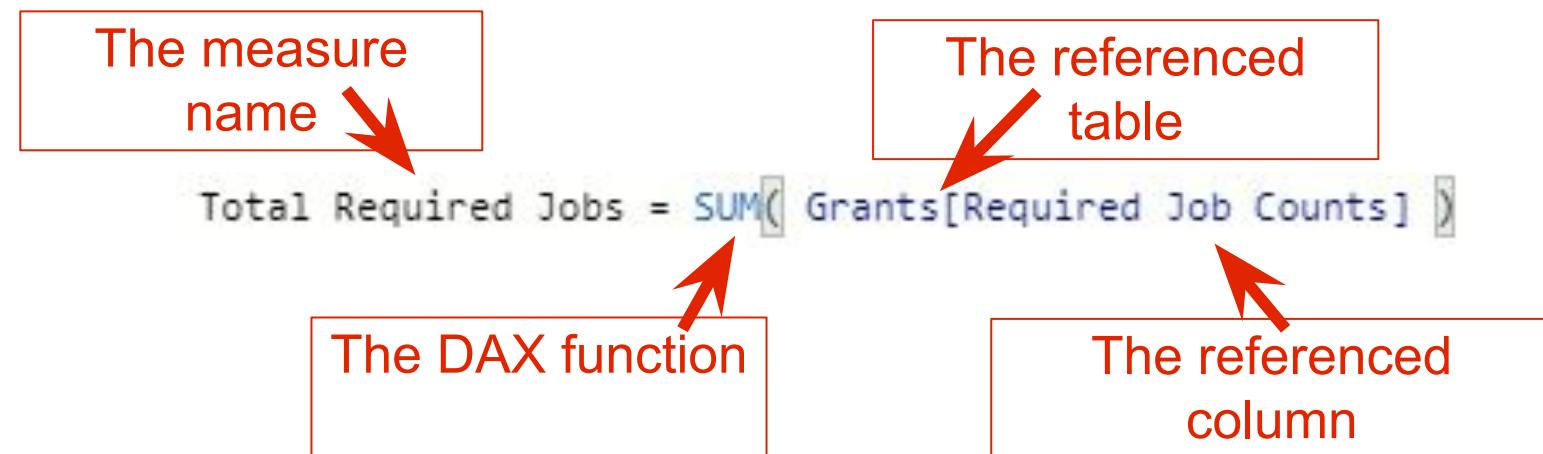
# Objectives for Lab 7

- Introduce Power BI Formulas (DAX)
- Introduce Measures
- Introduce Calculated Columns



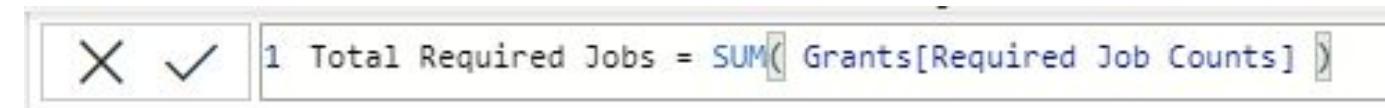
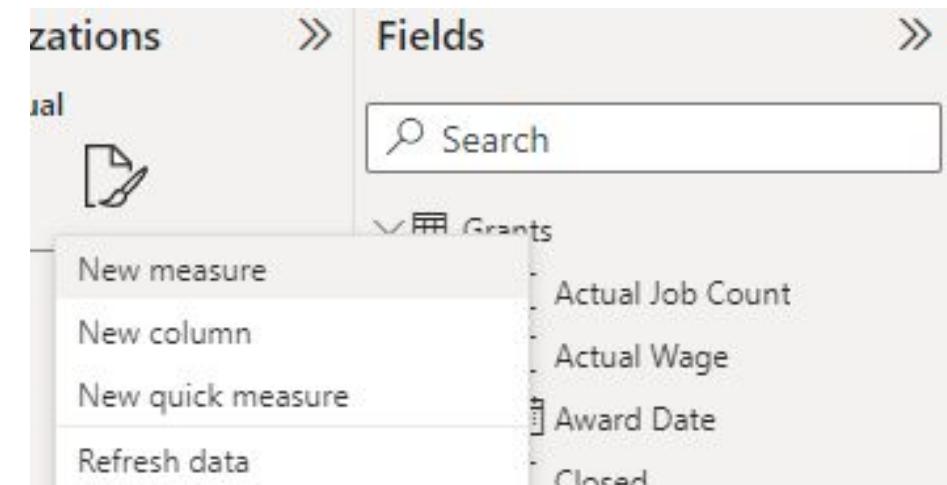
# DAX Formula Syntax

- For example, let's look at a simple DAX formula for a measure > Adds up all of the numbers in the Grants[Required Job Counts] column
- Parentheses () surround an expression containing one or more arguments.



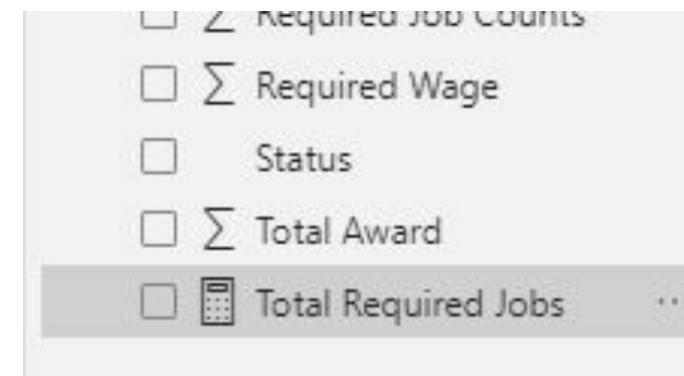
# Create your first measure formula

- Open 'Lab 6 Start.pbix' file in Labs folder
- In Report view, in the field list, right-click on the Grants table, and then click New Measure
- In the formula bar, replace Measure by typing a new measure name:
  - Total Required Jobs
- After the equals sign, type:
  - SUM( Grants[Required Job Counts])



# Measure added

- In the 'Fields' pane, you should see the new measure added under 'Grants' table



# Exercise: calculate ‘Average Project Wage’

- Exercise: Calculate Average Project Wage and create visualization
- Hint: DAX function > AVERAGE

## AVERAGE

12/09/2018 • 2 minutes to read • Contributors  

Returns the average (arithmetic mean) of all the numbers in a column.

### Syntax

DAX	 Copy
AVERAGE(<column>)	

### Parameters

Term	Definition
column	The column that contains the numbers for which you want the average.

# Step 1: calculate ‘Average Project Wage’

- AVERAGE > Returns the average (arithmetic mean) of all the numbers in a column
- AVERAGE(<column>)

Parameters	
Term	Definition
column	The column that contains the numbers for which you want the average.

# Step 2: calculate 'Average Actual Wage'

- Right click on 'Grants' table and add a New measure  
 $\text{Average Actual Wage} = \text{AVERAGE}(\text{Grants[Actual Wage]})$
- Under the 'Grants' table, a new field called 'Average Actual Wage' can be found

X ✓ 1 Average Actual Wage = AVERAGE( Grants[Actual Wage] )

Fields >>

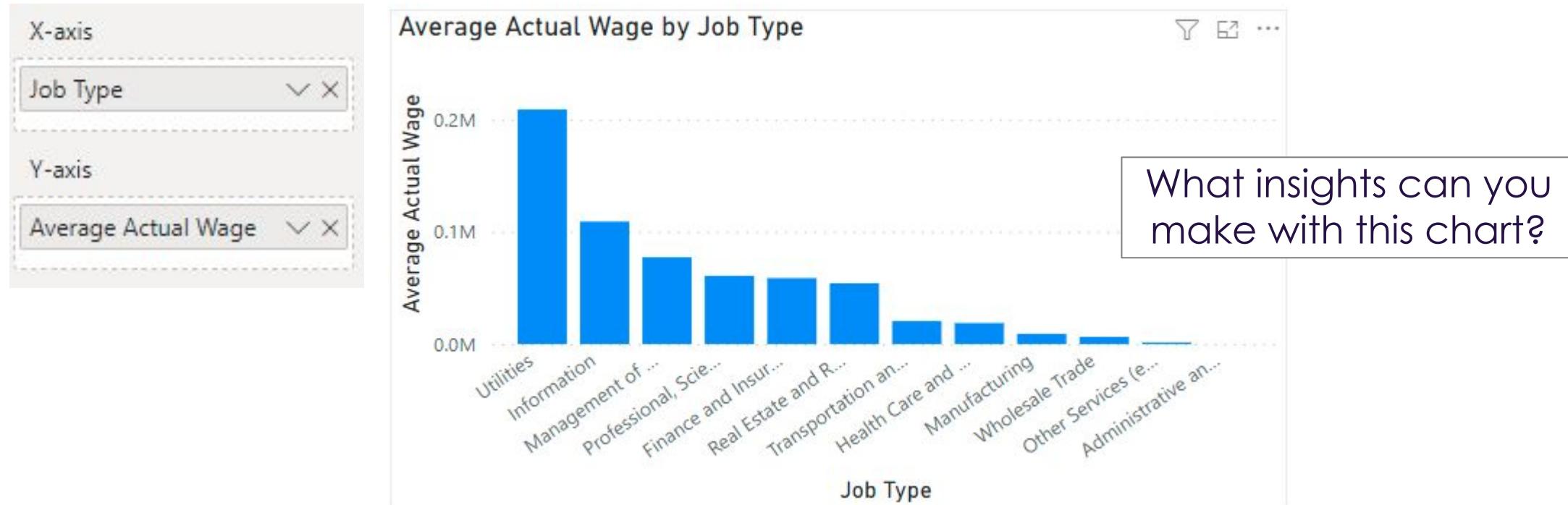
Search

Grants

- $\sum$  Actual Job Count
- $\sum$  Actual Wage
- $\text{Average Actual Wage}$

# Step 3: visualize in 'Reports' pane

- Let's put [Average Actual Wage] measure in a column chart's Y-axis, and then add [Job Type] field in the X-axis



# Formatting your measure

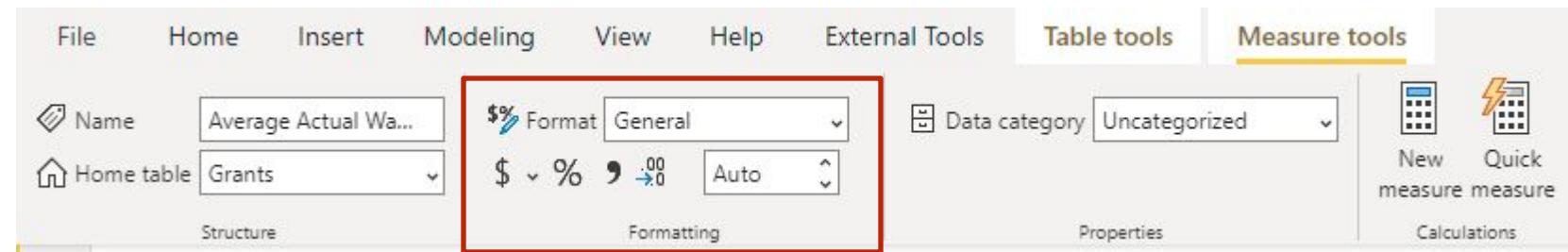
- Hover on the column chart, you can see the 'Average Actual Wage' for the 'Job Type' you choose. You will find the value of Average Project Wage is in decimal



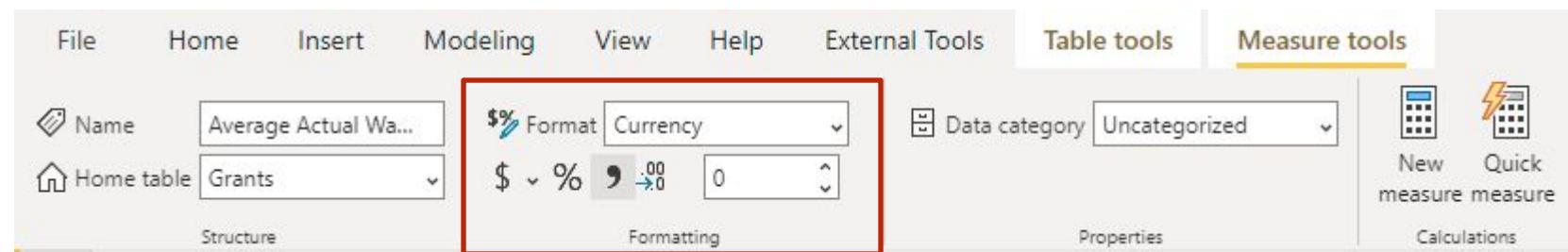
How can we change the decimal value into currency?

# Measure formatting

- Click on the Average Actual Wage measure in the 'Fields' pane and then look for the 'Measure Tools' tab in the Ribbon. You will see the Formatting section there

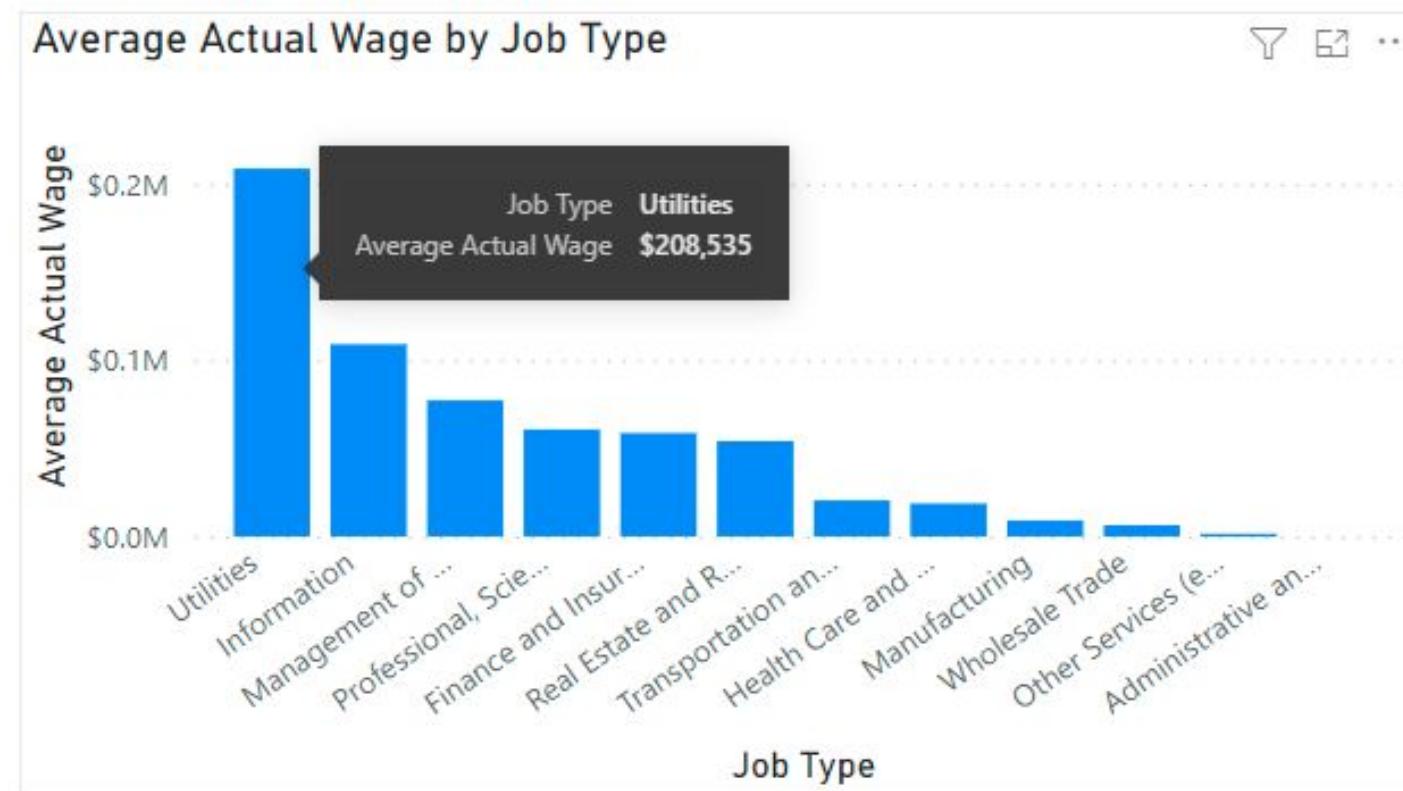


- Click on Format > 'Currency'
- Type 0 in the decimal field and hit enter



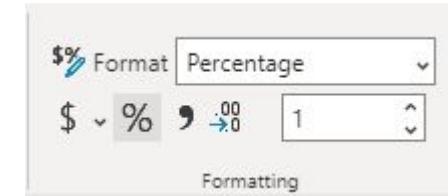
# Changed to currency

- Hover back to the column chart, you will find the value format changed to currency without decimal points



# Calculate closed job fulfillment

Measure Formula	Format
Way 1: Closed Job Fulfillment = [Actual Jobs] / [Required Jobs]	Percentage
Way 2: Closed Job Fulfillment = DIVIDE( [Closed Actual Jobs], [Closed Required Jobs], 0 )	Percentage



# Introduction to calculated columns

Unlike measure, calculated columns are DAX syntax applied on physical table by adding physical calculated columns

Properties of calculated columns:

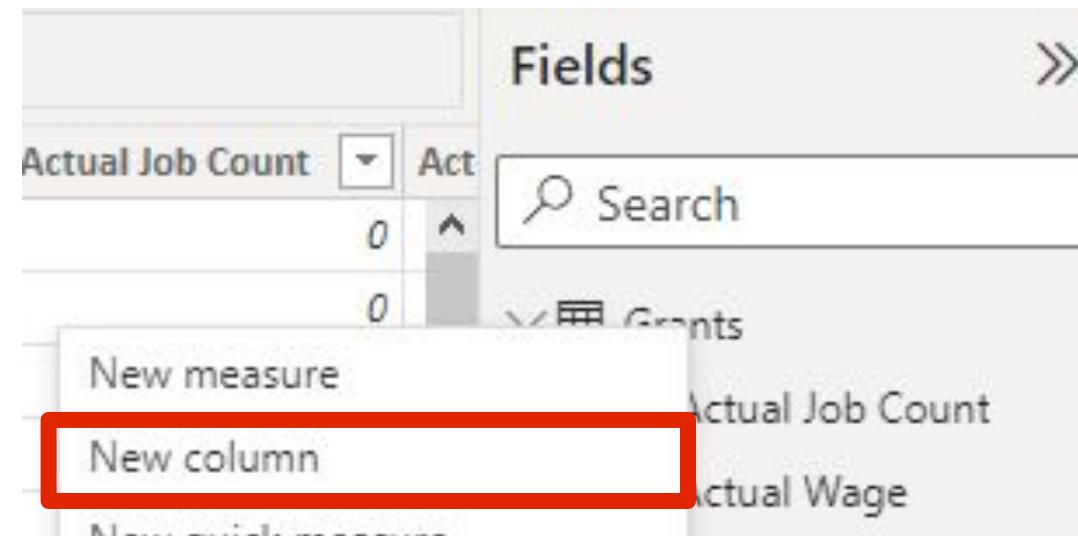
- Each row in a calculated column shares the same formula
- No “A1” Style Reference, only table and column reference
- Stored statically with the file
- You can think of Power BI as ‘Excel Formulas+’. Easy to learn from beginning and become more powerful as you learn more

# Logical Columns vs Physical Columns

- Measure > logical column
- If you navigate to the 'Data' section on the left side of Power BI desktop window, you won't see the measure in the physical data
- Calculated column > physical column
- If you navigate to the 'Data' section on the left side of Power BI desktop window, you will see the new column in the physical data

# Create new column

- Go to the Data view, right-click on the 'Grants' table in the Fields pane and select 'New column' then the formula bar will show up under the ribbon



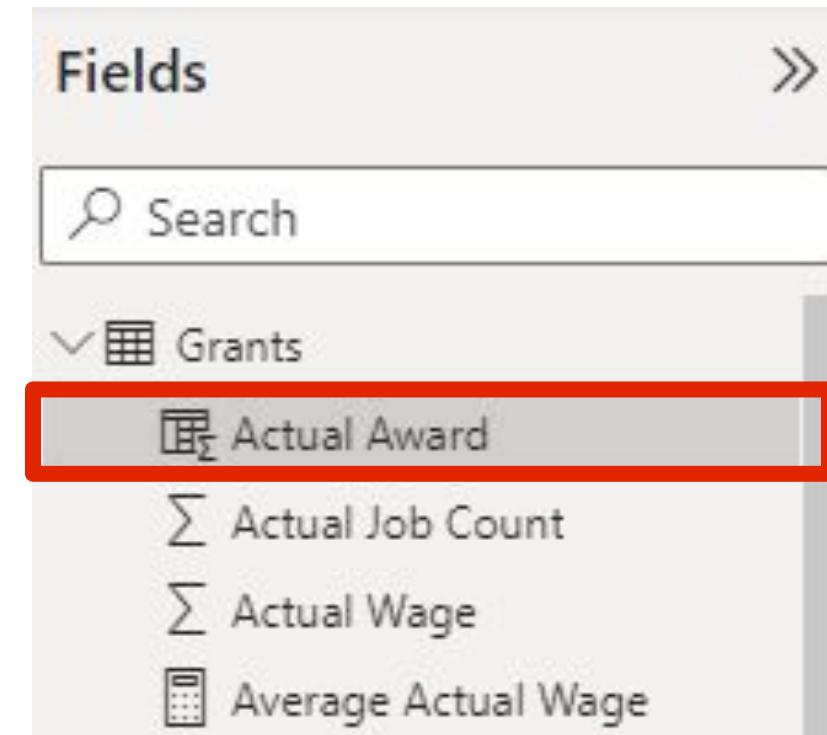
# Create 'Actual Award' column

- Multiply Total Award by Percent Awarded

Calculated Column Formula	Format
Actual Award = Grants[Percent Awarded] * Grants[Total Award]	Currency

# 'Actual Award' column

- You will see a new column has been added under 'Grant' table
- It has a unique icon in front of it to distinguish against other original source columns



# Calculate actual used award

- How can we calculate **Actual Used Awards**?

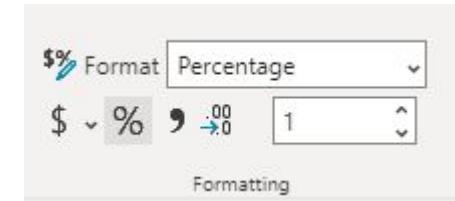
Measure Formula	Format
Total Award Amount =	Currency
Total Actual Award =	Currency
Actual Used Award =	Percentage

# Calculate actual used award

Measure Formula	Format
Total Award Amount = <code>SUM( Grants[Total Award] )</code>	Currency
Total Actual Award = <code>SUM( Grants[Actual Award] )</code>	Currency
Actual Used Award = <code>DIVIDE( Grants[Total Actual Award], Grants[Total Award Amount], 0 )</code>	Percentage

# Visualize actual used award

- Visualize in a card



24.5%

Actual Used Award

# Create calculated columns

We are going to create a map visual with calculated columns

- Although we have county field, we cannot use it in the map visual because county names in United States are not unique
- In order to make each county unique, we will incorporate state with county
- We'll add a new column in 'Grants' table which has **County name combine with State name**



Map of every Springfield in the US

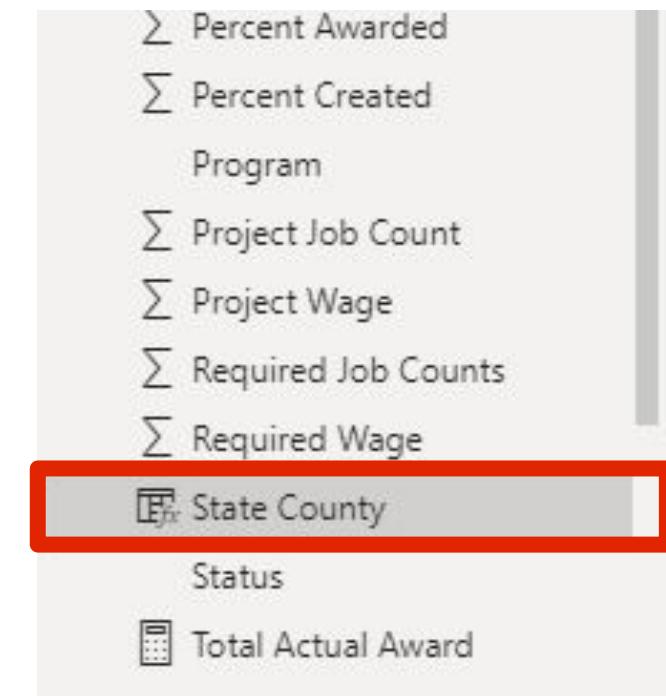
# Create 'State County' column

- The CONCATENATE () Function Syntax: = CONCATENATE(<text1>, <text2>)
- The CONCATENATE function joins two text strings into one text string

Calculated Column Formula	Format
State County = CONCATENATE( Grants[Funding County], " County NC" )	Text

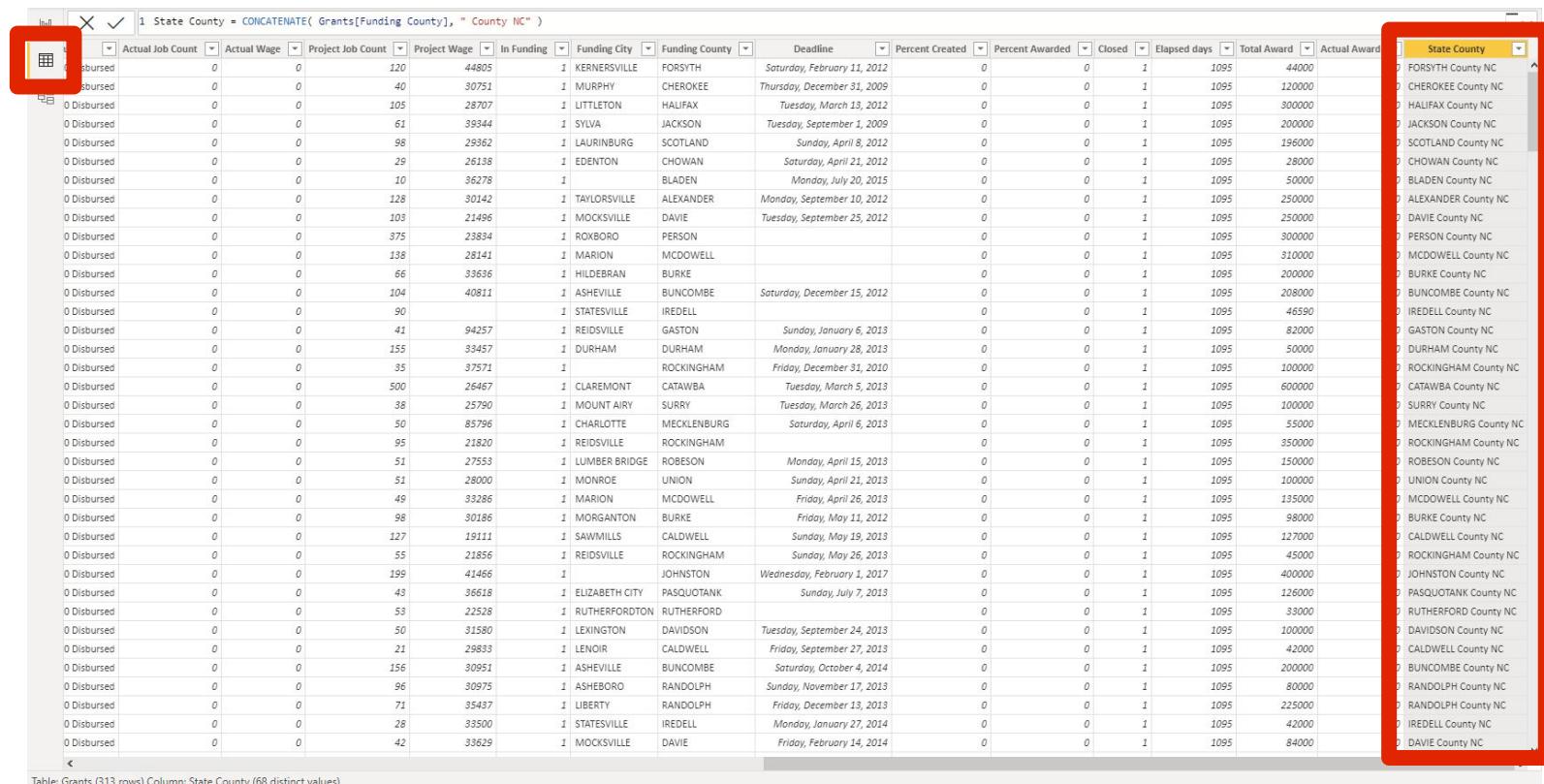
# 'State County' column

- You will see a new column has been added under 'Grant' table
- It has a unique icon in front of it to distinguish against other original source columns



# 'State County' column

- You can see the new column 'State County' in the Data view of the Grants table, just like all other columns of data



The screenshot shows the Power BI Data View interface with the 'Grants' table selected. A red box highlights the 'State County' column, which is defined by the formula `1 State County = CONCATENATE(Grants[Funding County], " County NC")`. The table contains 313 rows of grant data, including columns for Actual Job Count, Actual Wage, Project Job Count, Project Wage, In Funding, Funding City, Funding County, Deadline, Percent Created, Percent Awarded, Closed, Elapsed days, Total Award, and Actual Award. The 'State County' column lists various North Carolina counties, such as Forsyth, Murphy, Cherokee, Halifax, etc., followed by 'County NC'. The right side of the interface shows the Power BI Data Model pane.

	Actual Job Count	Actual Wage	Project Job Count	Project Wage	In Funding	Funding City	Funding County	Deadline	Percent Created	Percent Awarded	Closed	Elapsed days	Total Award	Actual Award	State County
0 Disbursed	0	0	120	44805	1	KERNERSVILLE	FORSYTH	Saturday, February 11, 2012	0	0	1	1095	44000		FORSYTH County NC
0 Disbursed	0	0	40	30751	1	MURPHY	CHEROKEE	Thursday, December 31, 2009	0	0	1	1095	120000		CHEROKEE County NC
0 Disbursed	0	0	105	28707	1	LITTLETON	HALIFAX	Tuesday, March 13, 2012	0	0	1	1095	300000		HALIFAX County NC
0 Disbursed	0	0	61	39344	1	SYLVA	JACKSON	Tuesday, September 1, 2009	0	0	1	1095	200000		JACKSON County NC
0 Disbursed	0	0	98	29362	1	LAURINBURG	SCOTLAND	Sunday, April 8, 2012	0	0	1	1095	196000		SCOTLAND County NC
0 Disbursed	0	0	29	26138	1	EDENTON	CHOWAN	Saturday, April 21, 2012	0	0	1	1095	28000		CHOWAN County NC
0 Disbursed	0	0	10	36278	1	BLADEN		Monday, July 20, 2015	0	0	1	1095	50000		BLADEN County NC
0 Disbursed	0	0	128	30142	1	TAYLORSVILLE	ALEXANDER	Monday, September 10, 2012	0	0	1	1095	250000		ALEXANDER County NC
0 Disbursed	0	0	103	21496	1	MOCKSVILLE	DAVIE	Tuesday, September 25, 2012	0	0	1	1095	250000		DAVIE County NC
0 Disbursed	0	0	375	28384	1	ROXBORO	PERSON		0	0	1	1095	300000		PERSON County NC
0 Disbursed	0	0	138	28141	1	MARION	MCDOWELL		0	0	1	1095	310000		MCDOWELL County NC
0 Disbursed	0	0	66	33636	1	HILDEBRAND	BURKE		0	0	1	1095	200000		BURKE County NC
0 Disbursed	0	0	104	40811	1	ASHEVILLE	BUNCOMBE	Saturday, December 15, 2012	0	0	1	1095	208000		BUNCOMBE County NC
0 Disbursed	0	0	90	1	STATESVILLE	IREDELL		0	0	1	1095	46590		IREDELL County NC	
0 Disbursed	0	0	41	94257	1	REIDSVILLE	GASTON	Sunday, January 6, 2013	0	0	1	1095	82000		GASTON County NC
0 Disbursed	0	0	155	33457	1	DURHAM	DURHAM	Monday, January 28, 2013	0	0	1	1095	50000		DURHAM County NC
0 Disbursed	0	0	35	37571	1		ROCKINGHAM	Friday, December 31, 2010	0	0	1	1095	100000		ROCKINGHAM County NC
0 Disbursed	0	0	500	26467	1	CLAREMONT	CATAWBA	Tuesday, March 5, 2013	0	0	1	1095	600000		CATAWBA County NC
0 Disbursed	0	0	38	25790	1	MOUNT AIRY	SURRY	Tuesday, March 26, 2013	0	0	1	1095	100000		SURRY County NC
0 Disbursed	0	0	50	85796	1	CHARLOTTE	MECKLENBURG	Saturday, April 6, 2013	0	0	1	1095	55000		MECKLENBURG County NC
0 Disbursed	0	0	95	21820	1	REIDSVILLE	ROCKINGHAM		0	0	1	1095	350000		ROCKINGHAM County NC
0 Disbursed	0	0	51	27553	1	LUMBER BRIDGE	ROBESON	Monday, April 15, 2013	0	0	1	1095	150000		ROBESON County NC
0 Disbursed	0	0	51	28000	1	MONROE	UNION	Sunday, April 21, 2013	0	0	1	1095	100000		UNION County NC
0 Disbursed	0	0	49	33286	1	MARION	MCDOWELL	Friday, April 26, 2013	0	0	1	1095	135000		MCDOWELL County NC
0 Disbursed	0	0	98	30186	1	MORGANTON	BURKE	Friday, May 11, 2012	0	0	1	1095	98000		BURKE County NC
0 Disbursed	0	0	127	19111	1	SAWMILLS	CALDWELL	Sunday, May 19, 2013	0	0	1	1095	127000		CALDWELL County NC
0 Disbursed	0	0	55	21856	1	REIDSVILLE	ROCKINGHAM	Sunday, May 26, 2013	0	0	1	1095	45000		ROCKINGHAM County NC
0 Disbursed	0	0	199	41466	1		JOHNSTON	Wednesday, February 1, 2017	0	0	1	1095	400000		JOHNSTON County NC
0 Disbursed	0	0	43	36618	1	ELIZABETH CITY	PASQUOTANK	Sunday, July 7, 2013	0	0	1	1095	126000		PASQUOTANK County NC
0 Disbursed	0	0	53	22528	1	RUTHERFORDTON	RUTHERFORD		0	0	1	1095	33000		RUTHERFORD County NC
0 Disbursed	0	0	50	31580	1	LEXINGTON	DAVIDSON	Tuesday, September 24, 2013	0	0	1	1095	100000		DAVIDSON County NC
0 Disbursed	0	0	21	29833	1	LENOIR	CALDWELL	Friday, September 27, 2013	0	0	1	1095	42000		CALDWELL County NC
0 Disbursed	0	0	156	30951	1	ASHEVILLE	BUNCOMBE	Saturday, October 4, 2014	0	0	1	1095	200000		BUNCOMBE County NC
0 Disbursed	0	0	96	30975	1	ASHEBORO	RANDOLPH	Sunday, November 17, 2013	0	0	1	1095	80000		RANDOLPH County NC
0 Disbursed	0	0	71	35437	1	LIBERTY	RANDOLPH	Friday, December 13, 2013	0	0	1	1095	225000		RANDOLPH County NC
0 Disbursed	0	0	28	33500	1	STATESVILLE	IREDELL	Monday, January 27, 2014	0	0	1	1095	42000		IREDELL County NC
0 Disbursed	0	0	42	33629	1	MOCKSVILLE	DAVIE	Friday, February 14, 2014	0	0	1	1095	84000		DAVIE County NC

Table: Grants (313 rows) Column: State County (68 distinct values)

# Filtering

- Filter the MULTIPLE County NC Field in the Visual Level Filters
- Expand the 'State County' filter card
- Check 'Select All', then deselect 'MULTIPLE County NC'



Can we add more information to this map?

Filters

Search

Filters on this visual

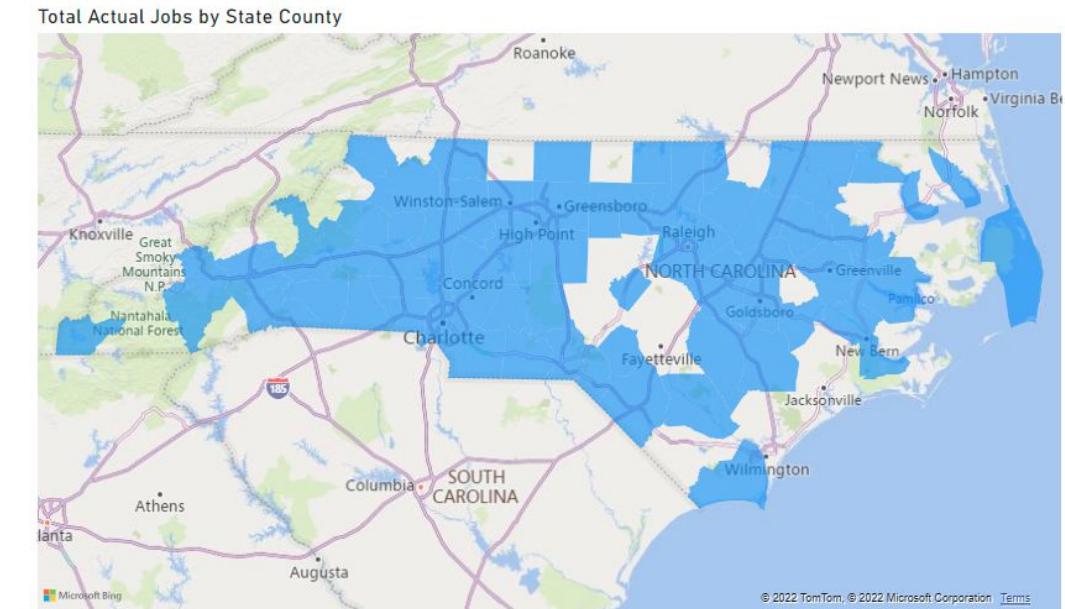
**State County**  
is not MULTIPLE Coun...

Filter type ⓘ  
Basic filtering

Search

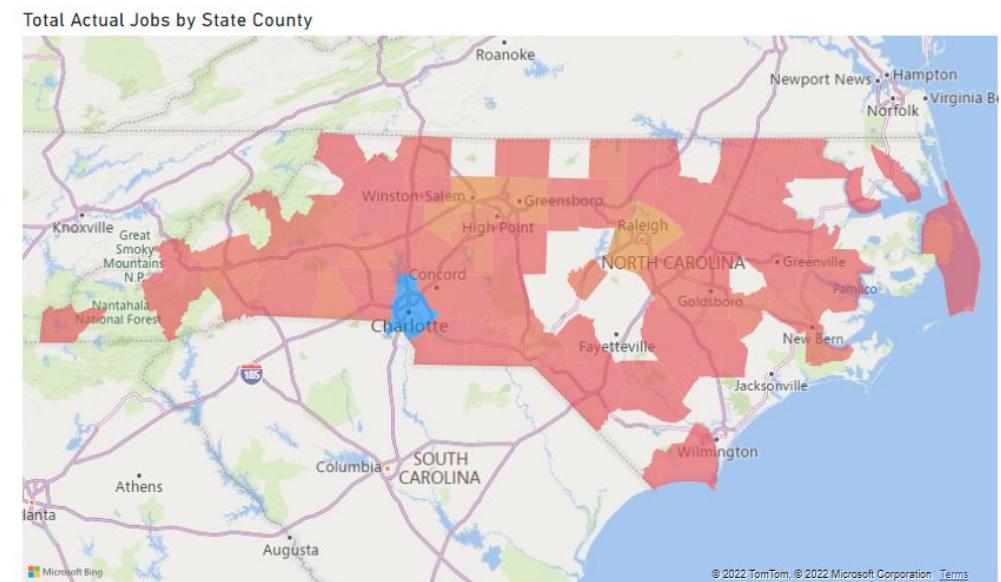
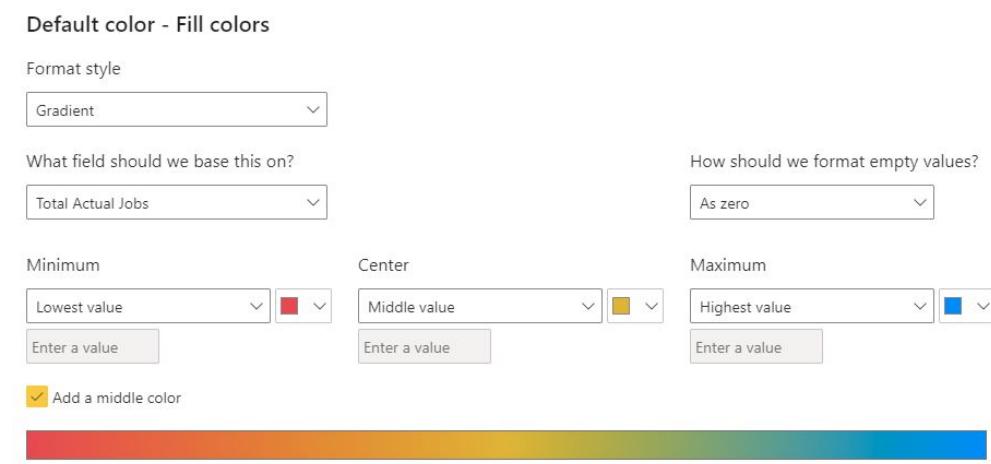
- MITCHELL County NC 1
- MONTGOMERY Cou... 2
- MULTIPLE County NC 7
- NASH County NC 3
- NORTHHAMPTON Co... 1
- ORANGE County NC 1
- RALEIGH COUNTY 7

Require single selection



# Conditional Formatting

- In the Format tab, Visual category, expand the Fill Colors section
- Click the 
- Format Style: Gradient
- Field based on: Total Actual Jobs
- Add a middle color
- Lowest Value Color: Red
- Middle Value Color: Yellow
- Highest Value Color: Blue
- Click OK



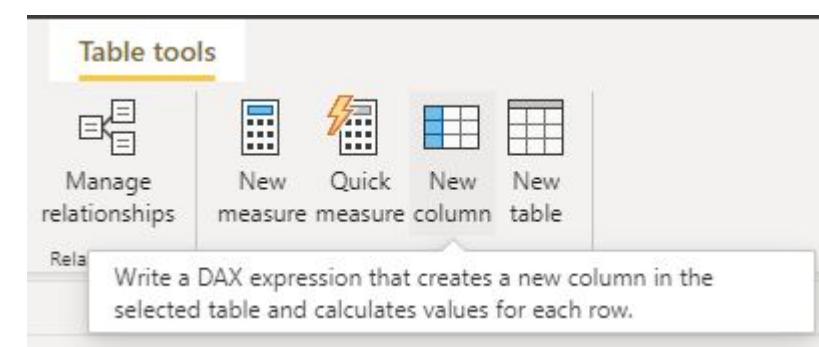
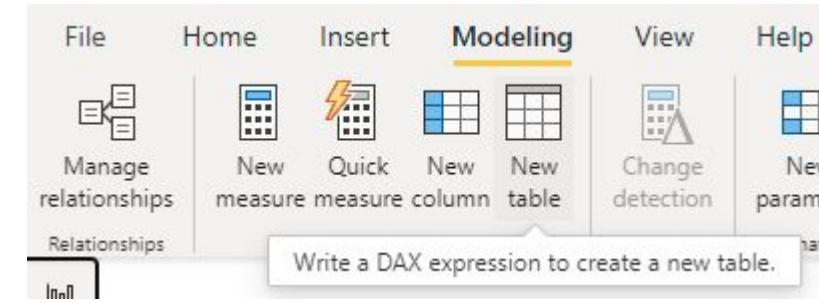
# Creating a Calculated Table

- Fiscal Year date table will allow us to filter and group by Fiscal Year and Quarter
- On the Modeling tab of the Ribbon, select “New table”

```
DateTable = CALENDAR( "10-1-2008", "9-30-2013" )
```

- On the Table tools tab of the Ribbon select “New column”

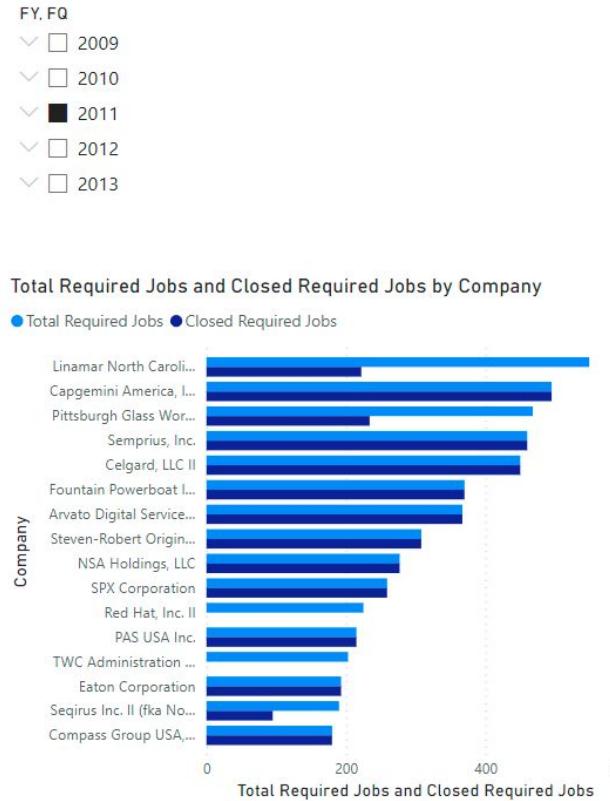
```
FY = IF( MONTH( DateTable[Date] ) >= 10,  
        YEAR( DateTable[Date] ) + 1,  
        YEAR( DateTable[Date] ) )
```



Date	FY
10/1/2008 12:00:00 AM	2009
10/2/2008 12:00:00 AM	2009
10/3/2008 12:00:00 AM	2009
10/4/2008 12:00:00 AM	2009
10/5/2008 12:00:00 AM	2009
10/6/2008 12:00:00 AM	2009
10/7/2008 12:00:00 AM	2009
10/8/2008 12:00:00 AM	2009
10/9/2008 12:00:00 AM	2009

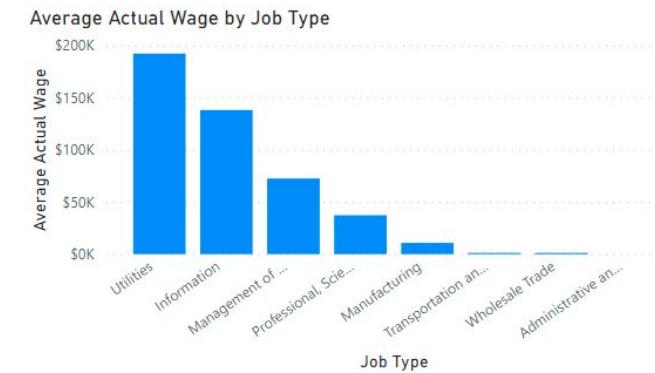
# Relationship Results

- Create a slicer with FY, FQ in an ad-hoc hierarchy
- Select FY 2011, notice the differences in the various visuals
- The DateTable is filtered to
  - FY column = 2011
- Which filters the Grants to
  - Award Date between
    - 10/1/2010 and 9/30/2011



19.3%  
Actual Used Award

38.1%  
Closed Job Fulfillment



# Fiscal Quarters

- SWITCH Function:
  - Evaluates an expression against a list of values and returns one of multiple possible result expressions.
- Create another New column

```
FQ = SWITCH( TRUE(),
MONTH( DateTable[Date] ) >= 10, "Q1",
MONTH( DateTable[Date] ) >= 7, "Q4",
MONTH( DateTable[Date] ) >= 4, "Q3",
MONTH( DateTable[Date] ) >= 1, "Q2",
"Other" )
```

**Syntax**

DAX

```
SWITCH(<expression>, <value>, <result>[, <value>, <result>]...[, <else>])
```

**Parameters**

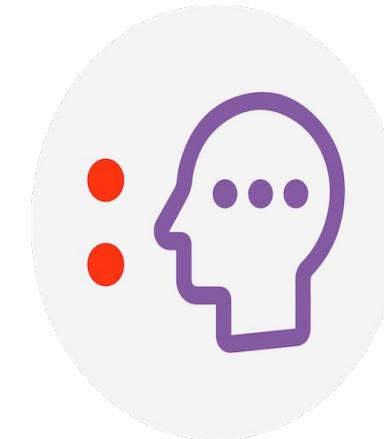
Term	Definition
expression	Any DAX expression that returns a single scalar value, where the expression is to be evaluated multiple times (for each row/context).
value	A constant value to be matched with the results of <i>expression</i> .
result	Any scalar expression to be evaluated if the results of <i>expression</i> match the corresponding <i>value</i> .
else	Any scalar expression to be evaluated if the result of <i>expression</i> doesn't match any of the <i>value</i> arguments.

Date	FY	FQ
10/1/2008 12:00:00 AM	2009	Q1
10/2/2008 12:00:00 AM	2009	Q1
10/3/2008 12:00:00 AM	2009	Q1
10/4/2008 12:00:00 AM	2009	Q1
10/5/2008 12:00:00 AM	2009	Q1
10/6/2008 12:00:00 AM	2009	Q1
10/7/2008 12:00:00 AM	2009	Q1
10/8/2008 12:00:00 AM	2009	Q1
10/9/2008 12:00:00 AM	2009	Q1

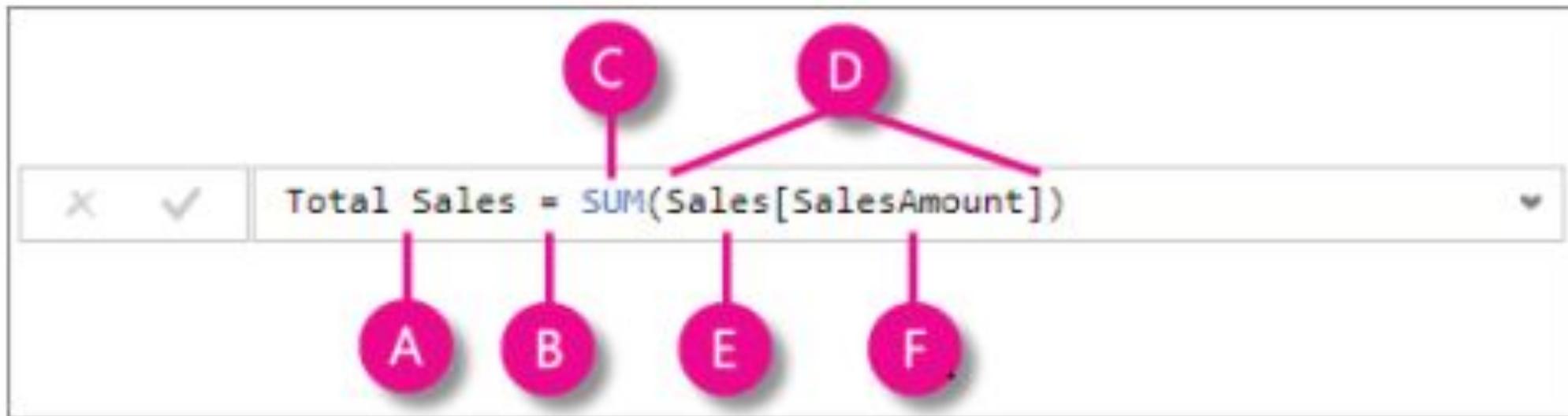
# End of Lab 7



# Day 4 - Knowledge Check 2



- In the poll, choose the correct interpretation for each letter



# Conclusions

- Power BI is a business analytics service that delivers insights to enable fast, informed decisions.
- You can:
  - Transform data into stunning visuals and share them with colleagues on any device.
  - Visually explore and analyze data—on-premises and in the cloud—all in one view.
  - Collaborate on and share customized dashboards and interactive reports.
  - Scale across your organization with built-in governance and security.

# Congratulations!

- Implement data storytelling frameworks and techniques
- Program in Power BI using DAX language to manipulate data

# Power BI Community and helpful links

- <https://community.powerbi.com/> ask questions
- <https://ideas.powerbi.com/forums/265200-power-bi-ideas> create and vote ideas
- <https://www.youtube.com/channel/UCy2rB gj4M1tzK-urTZ28z cA> beginner to intermediate  
Youtube
- <https://powerpivotpro.com/> beginner to intermediate
- <https://SQLBI.com/> intermediate to advanced
- <https://www.gapminder.org/fw/world-health-chart/> interactive video for visualization

# DATA SOCIETY:

Congratulations!



# Appendix for help with Storytelling

# 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

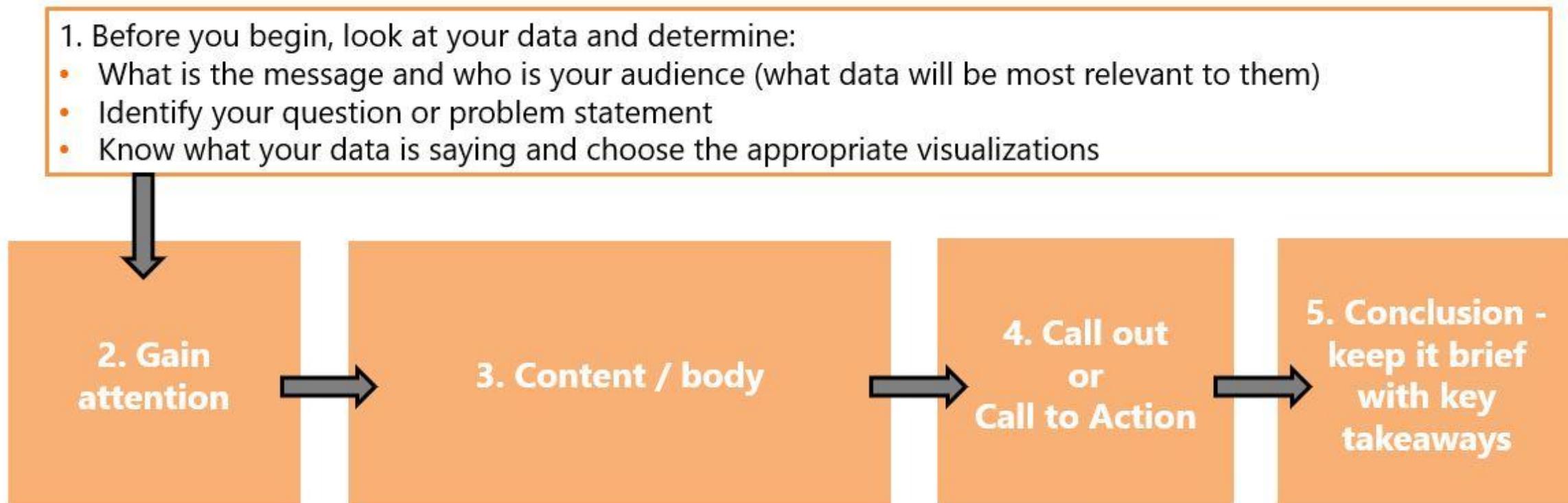


# 5 tips for your data presentation

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



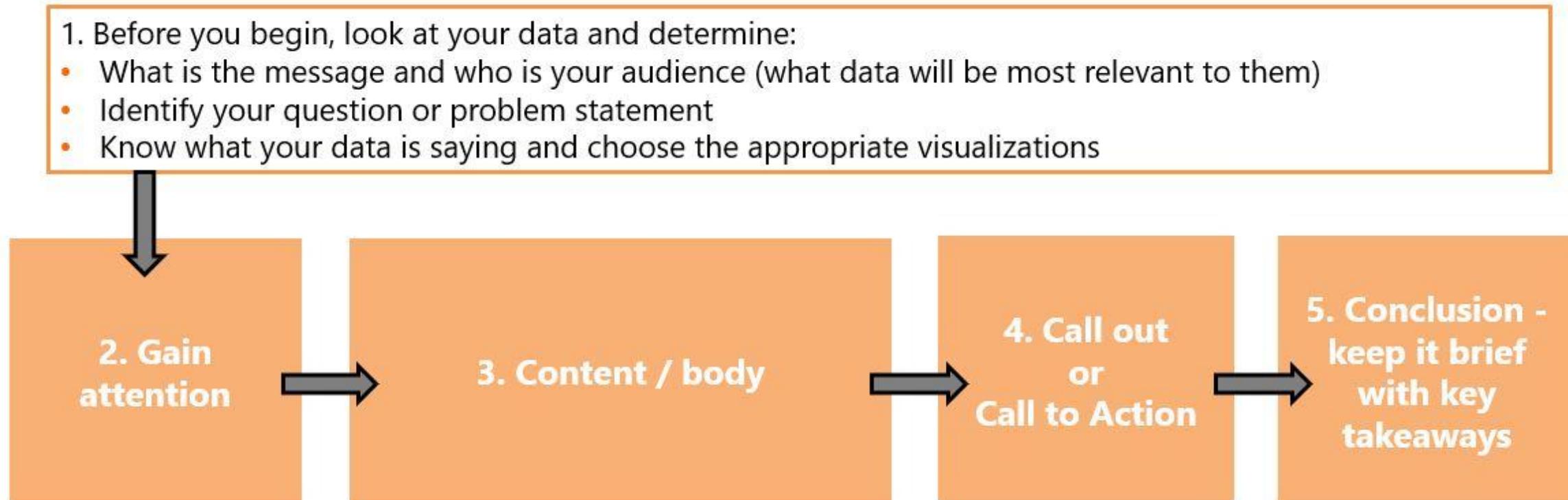
# Step 4: Call to action

- 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



# DATA SOCIETY:

Thank you!

