

DATA SOCIETY:

Data Analysis with Excel & PowerBI

Day 1

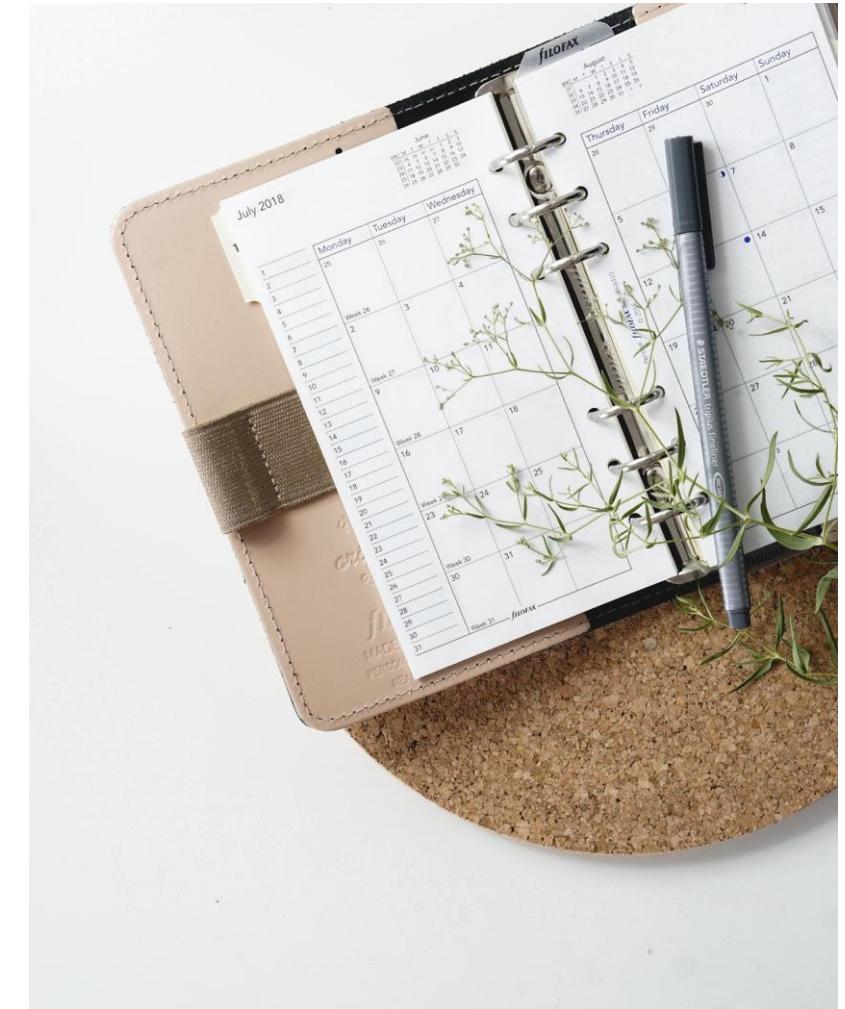
“One should look for what is and not what he thinks should be.”

- Albert Einstein



Welcome!

- Hours and breaks
 - 4 days
 - 9 am - 12 pm Eastern
 - 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.
- Stay on mute unless you are speaking-but feel free to unmute!!
- 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

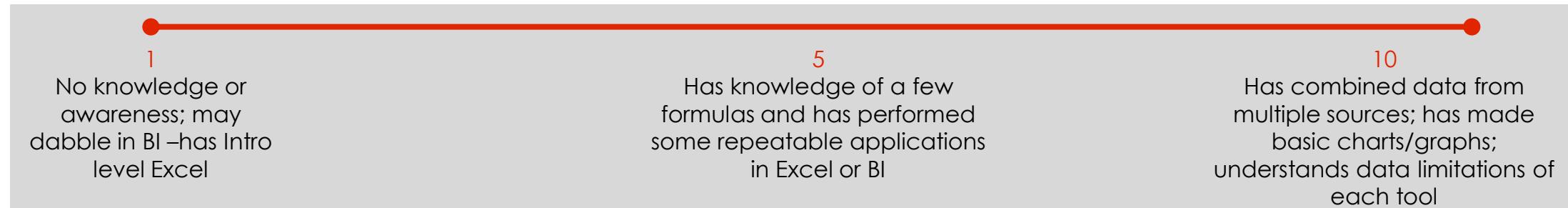
Data Society's mission is to *integrate Big Data and machine learning best practices across entire teams* and empower professionals to identify new insights

- 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

Outline for today

- 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

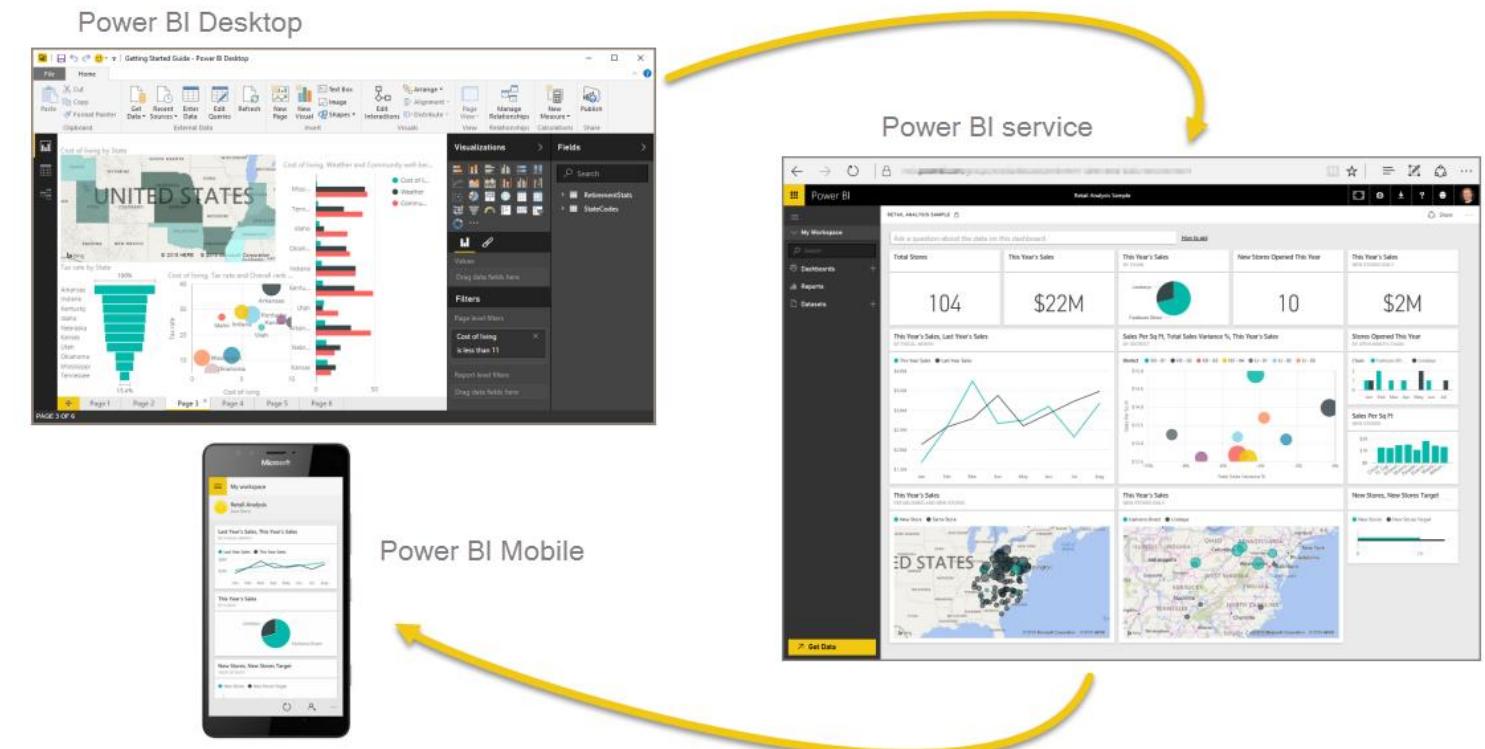
Power BI is a business analytics tool that allows you to:

- **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**

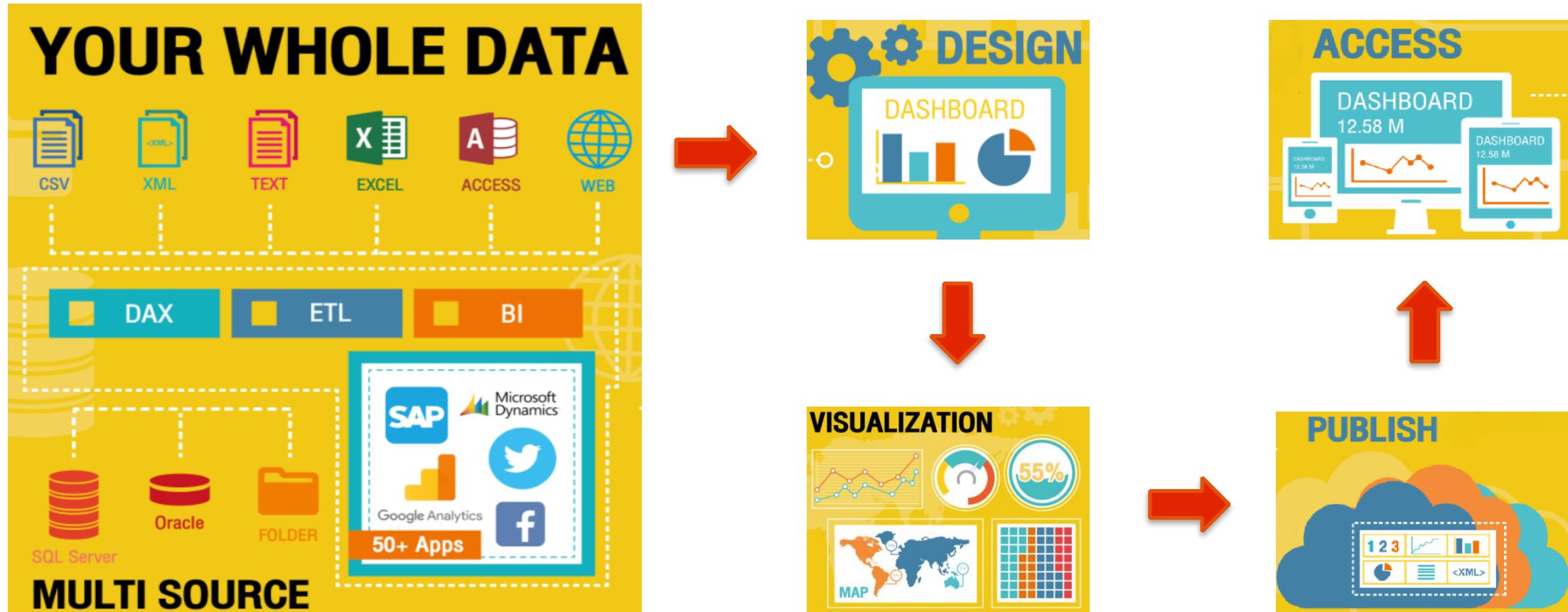


The ways you can use Power BI

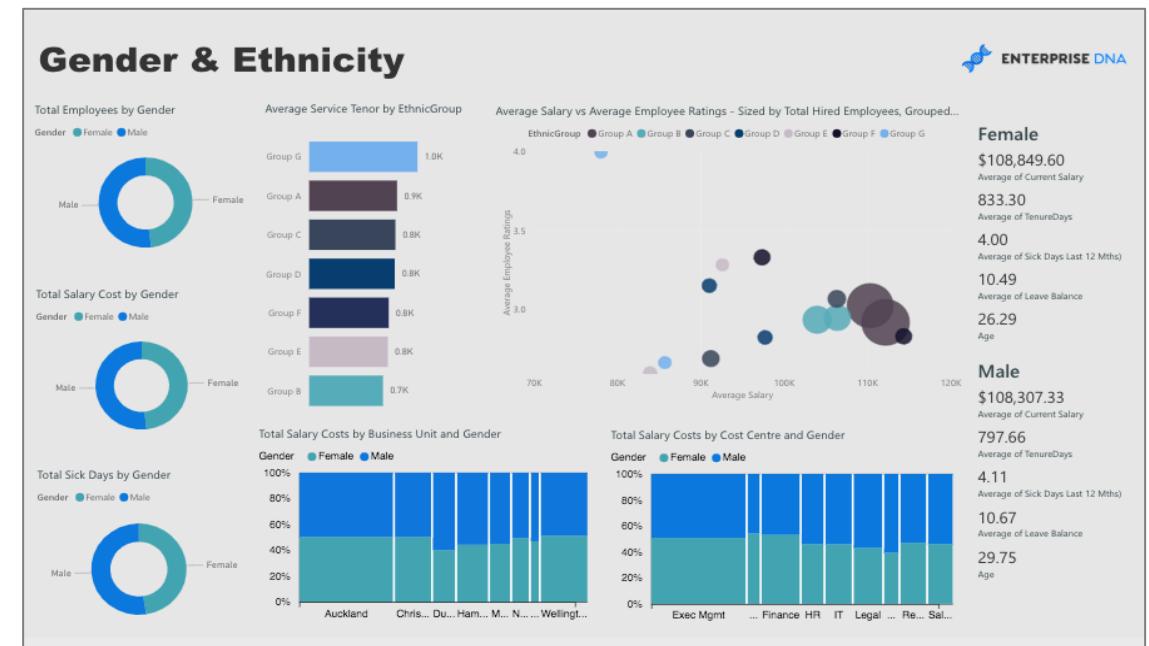
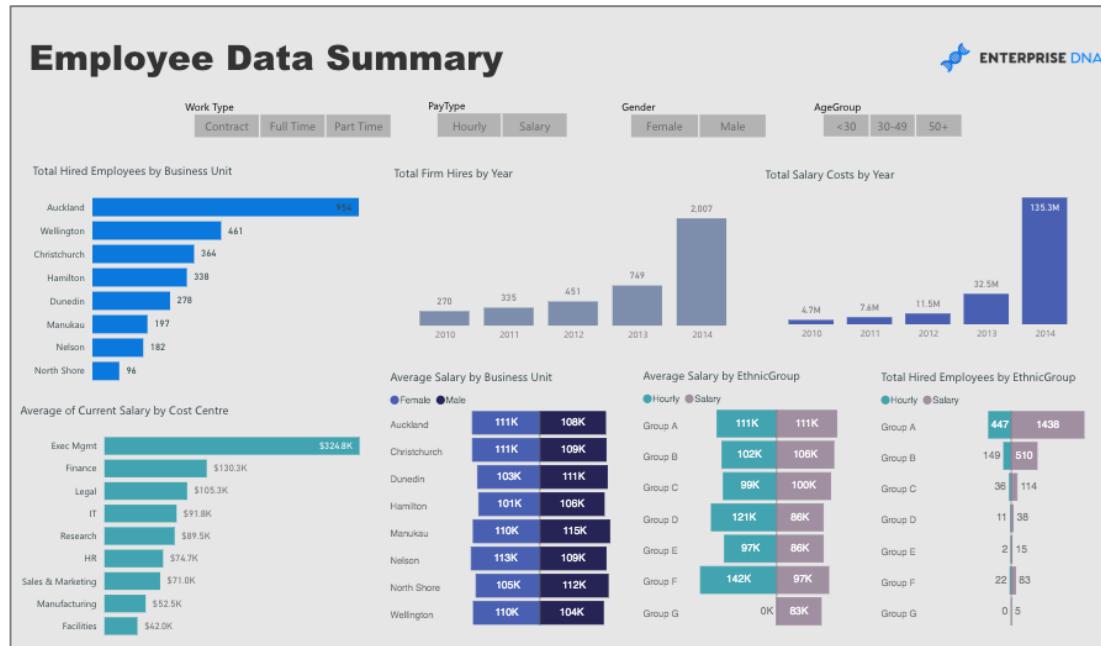
- **Power BI Desktop** is the platform where you can transform and shape data in addition to developing your model
- **Power BI Web Service** is where you go to publish reports to your organization and set up automatic data refresh. This ensures everyone has the latest information
- **Power BI Mobile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



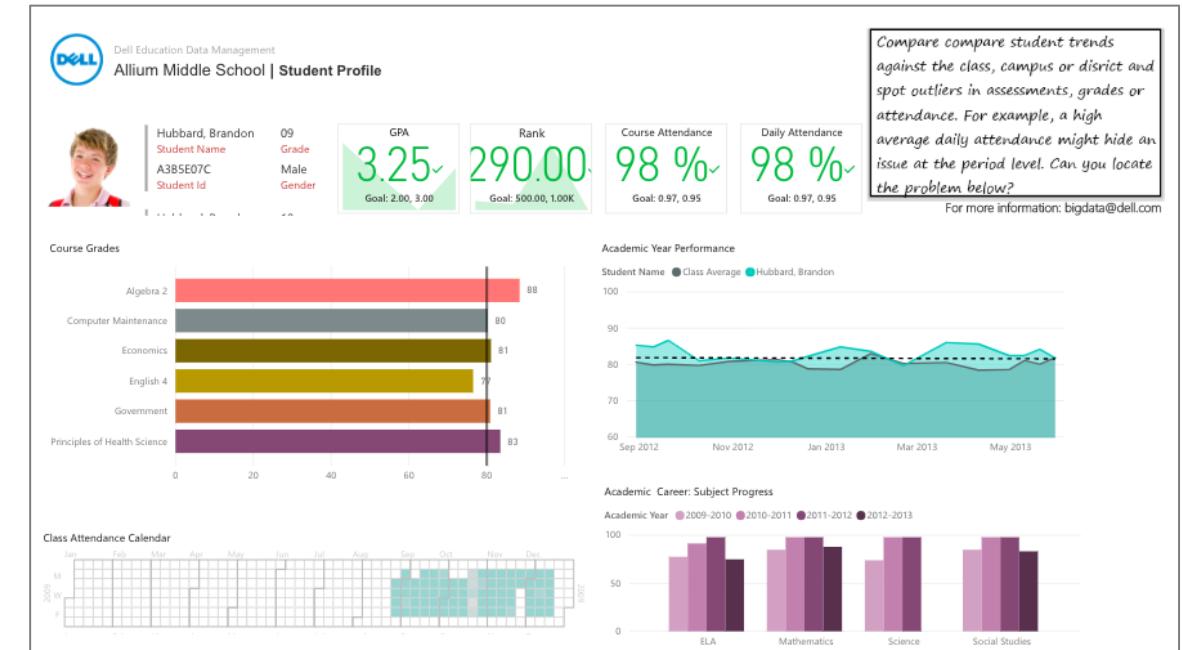
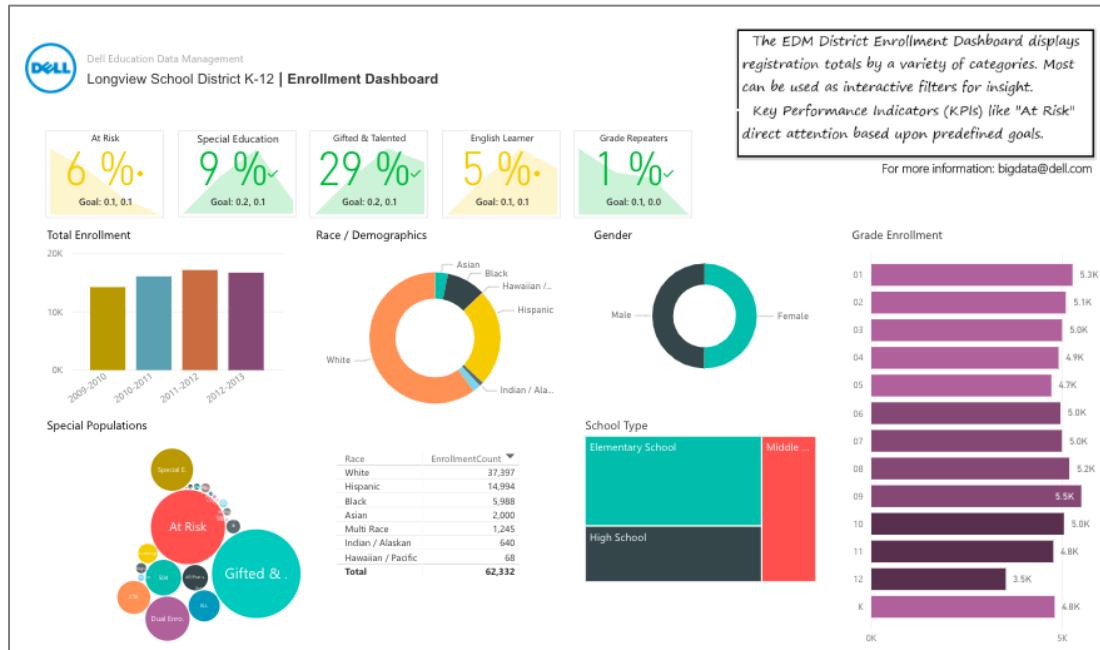
Logical structure of Power BI



Power BI for Human Resources



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

Year	Number of Pregnant Women Accessed PMTCT Services
2000	0M
2005	1M
2010	9M
2015	22M
2016	28M

Impact

318,237 Number of HIV Infections Averted

91,766 Number of Lives Saved due to ART

EGPAF/Ariel has provided over **29 million women** with services to prevent transmission of HIV

Indicator

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

Elizabeth Glaser Pediatric AIDS Foundation

Until no child has AIDS.

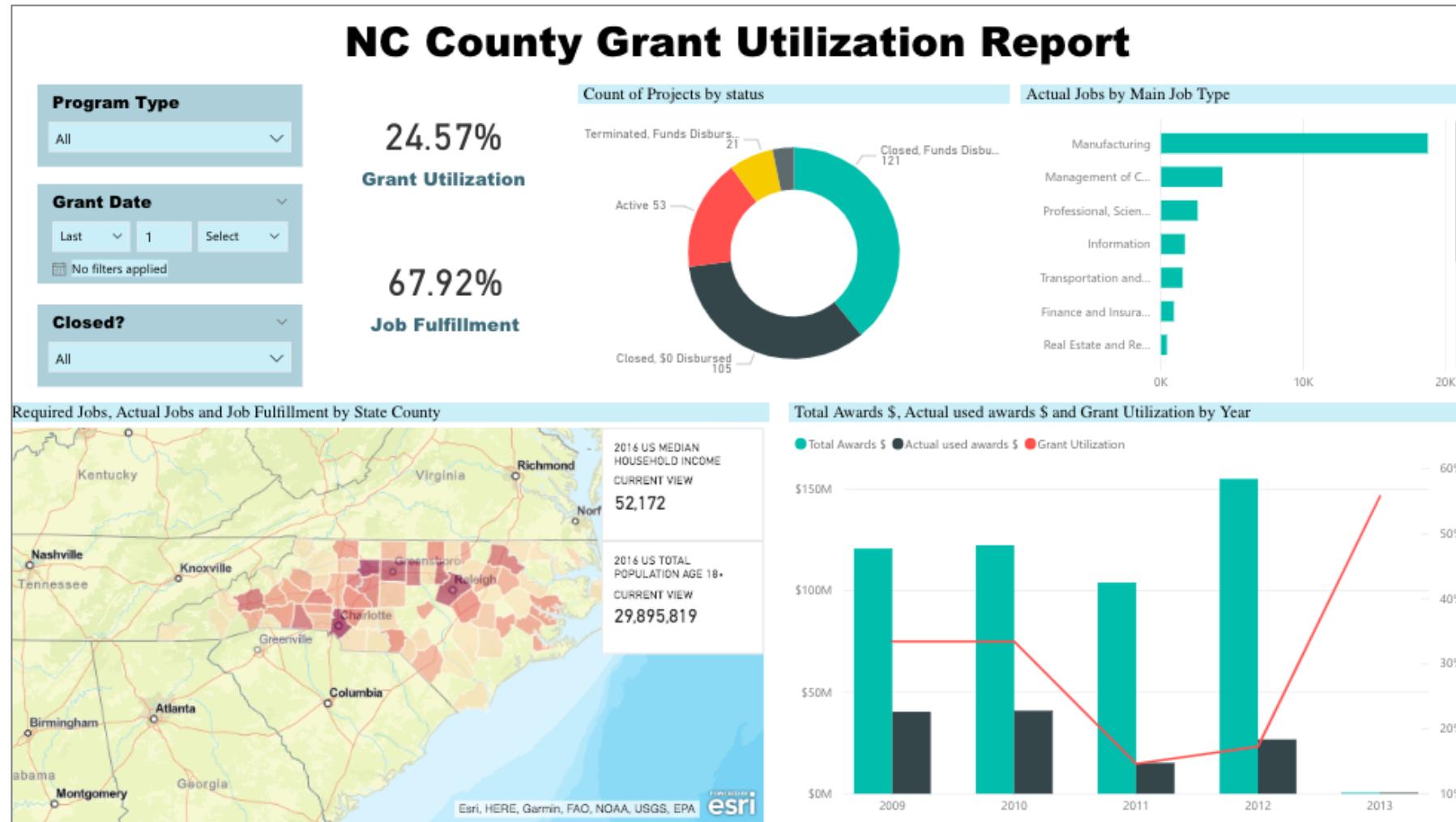


Elizabeth
Glaser
Pediatric AIDS
Foundation

Until no
child has
AIDS.

EGPAF Global Data Dashboard

Power BI for Finance

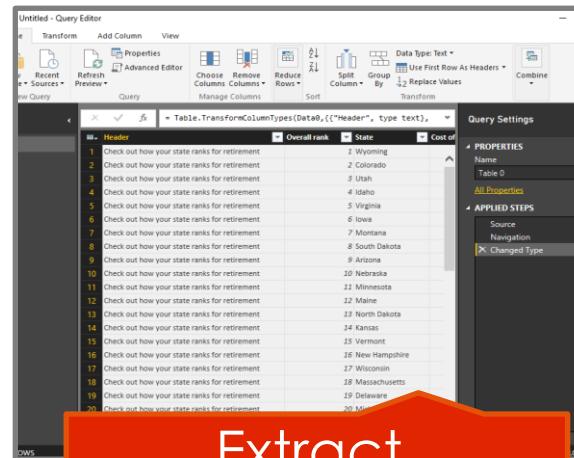


Outline for today

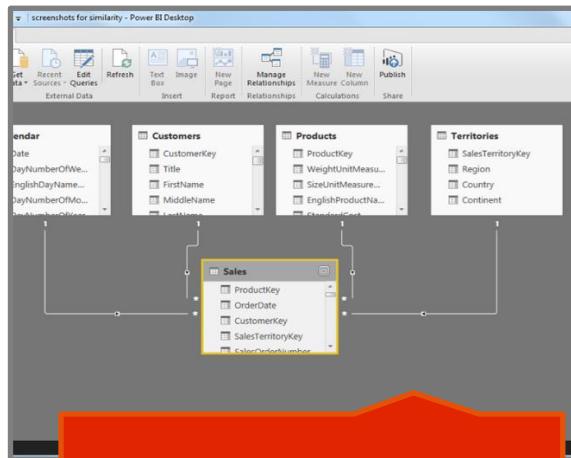
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- Review the four layers of Power BI
- Build your first BI report
- Visualization Types

The 4 Layers of Power BI

Model Developer

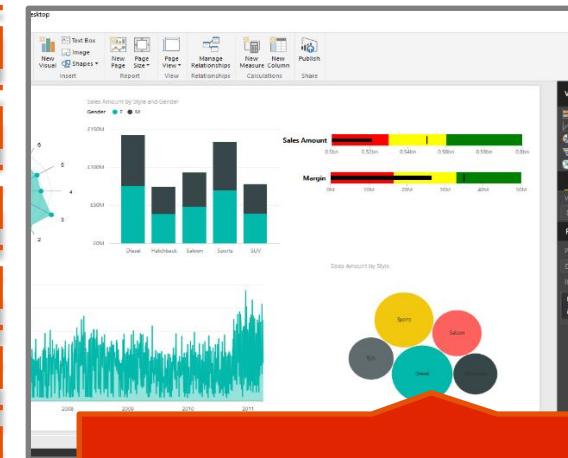


Extract,
Transform and
Load (ETL)

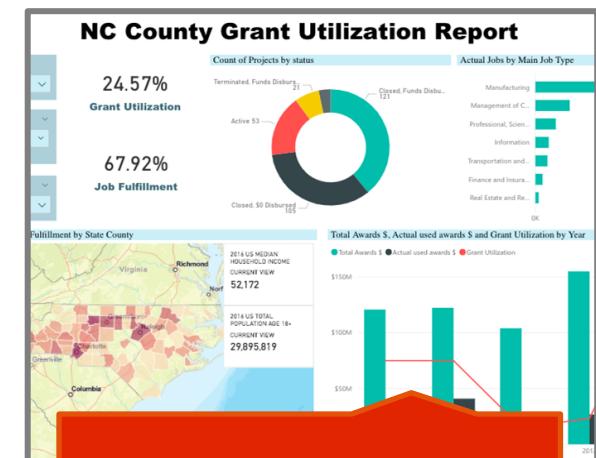


Data Modeling

Report Developer



Report Design



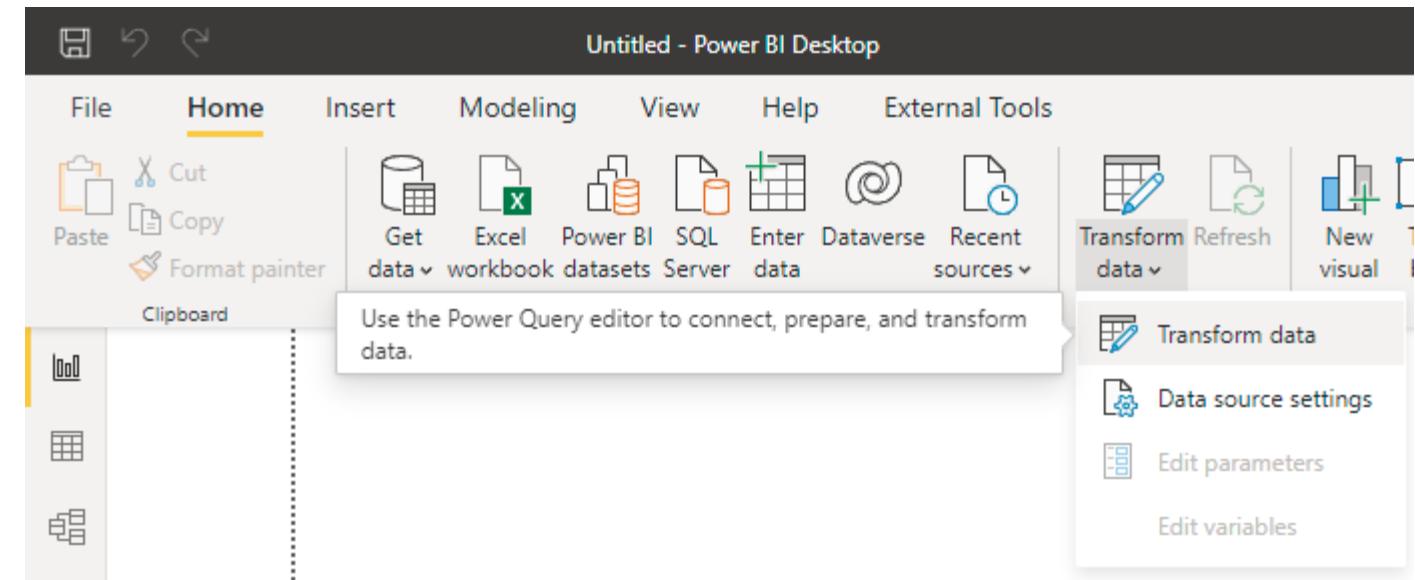
Web Portal

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

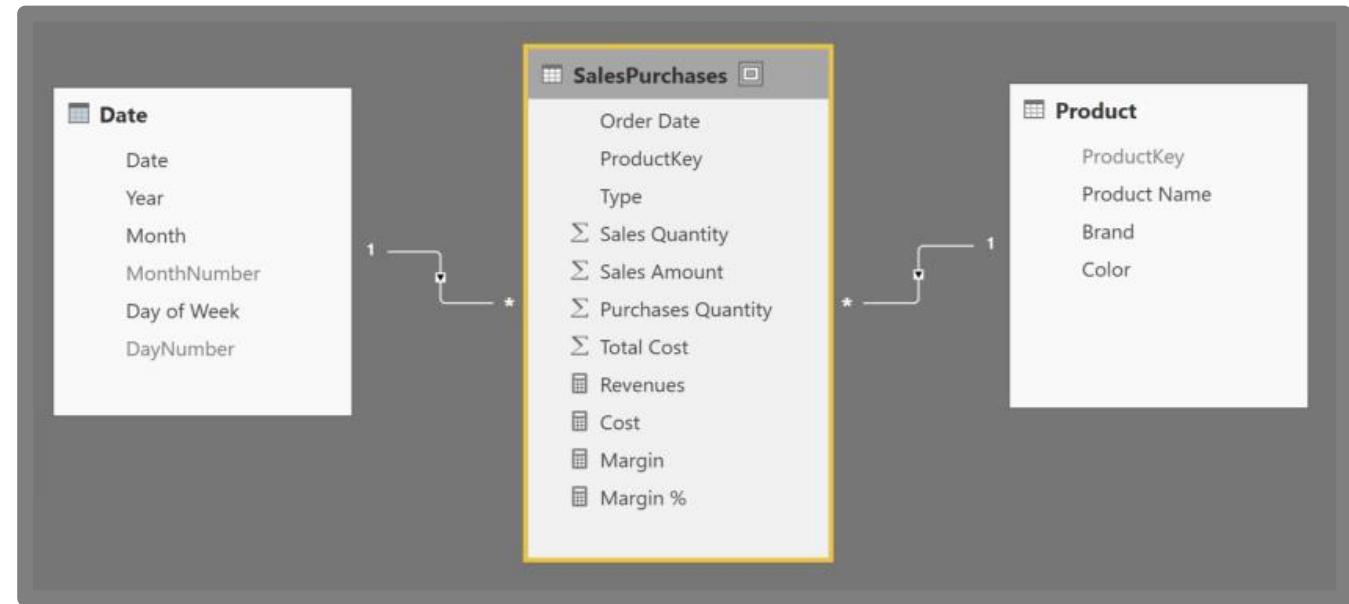
Power Query allows you to:

- Connect to various data sources
- Transform your data
- Create reports and develop insights

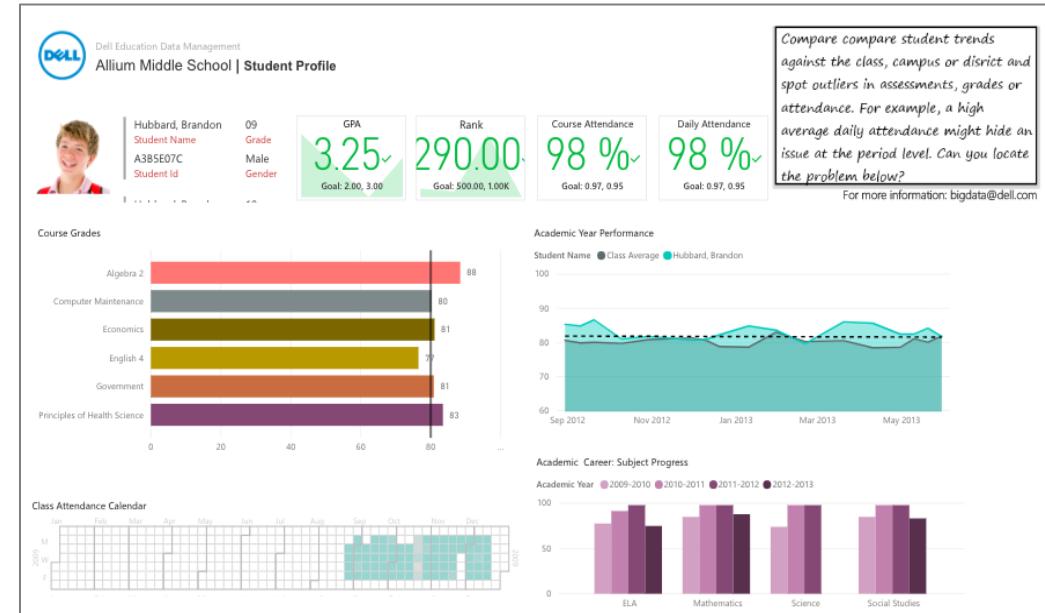
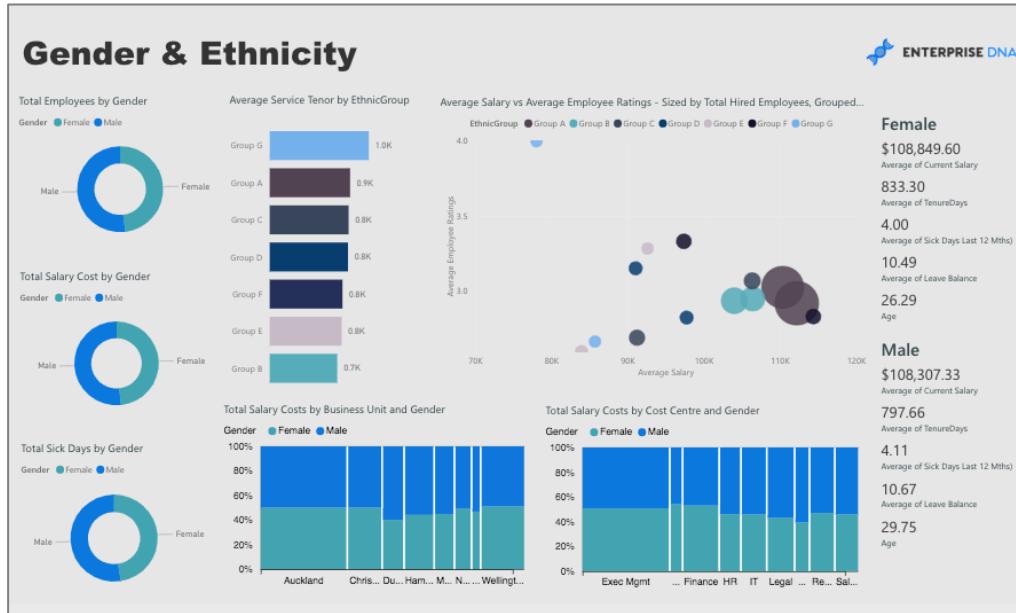


Layer 2: Data Modeling

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

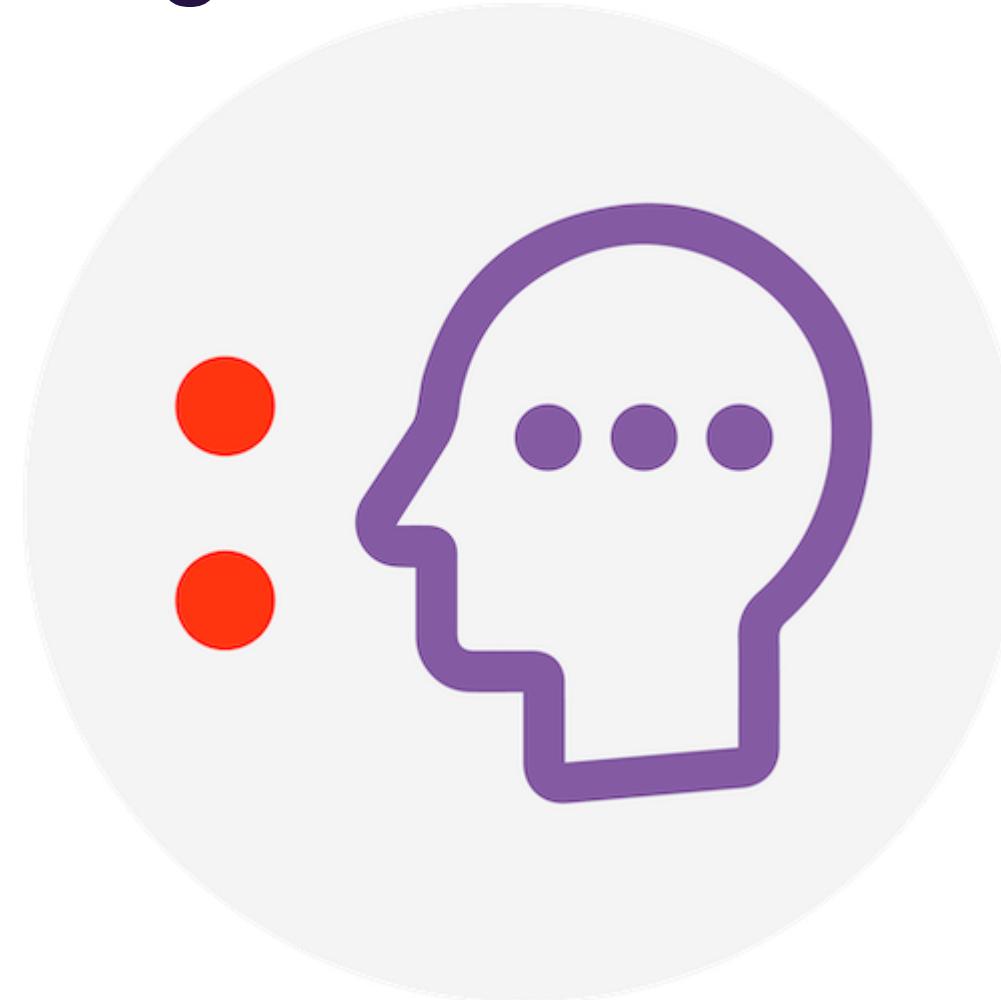


Layer 4: Web Portal

The screenshot shows the Power BI 'My workspace' interface. The left sidebar includes links for Home, Favorites, Recent, Create, Datasets, Goals, Apps, Shared with me, Learn, Workspaces, and My workspace (which is currently selected). The main area displays a list of items under 'All' (Content and Datasets + dataflows). The table has columns for Name, Type, Owner, Refreshed, Next refresh, and Endorsement.

Name	Type	Owner	Refreshed	Next refresh	Endorsement
Lab 2 Complete	Report	Bobby Lansing	4/28/22, 9:49:04 AM	—	—
Lab 2 Complete	Dataset	Bobby Lansing	4/28/22, 9:49:04 AM	N/A	—
Lab 3	Report	Bobby Lansing	4/28/22, 4:44:53 PM	—	—
Lab 3	Dataset	Bobby Lansing	4/28/22, 4:44:53 PM	N/A	—
Lab 5	Dashboard	Bobby Lansing	—	—	—

Day 1 - Knowledge Check 1



Outline for today

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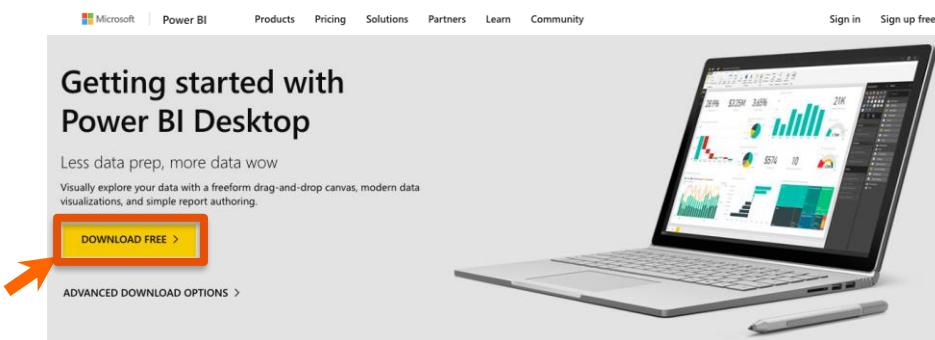
Objectives for Lab 1

- Make sure you have received the Microsoft credentials to login into Power BI
- Open Power BI Desktop (through Remote App) and login
- Upload data from “Data Cleanup” sheet of Grants Excel File
- Create a report
- Upload report to PowerBI.com ‘My workspace’

Refer to *Lab 1.pbix* in *Lab Files*

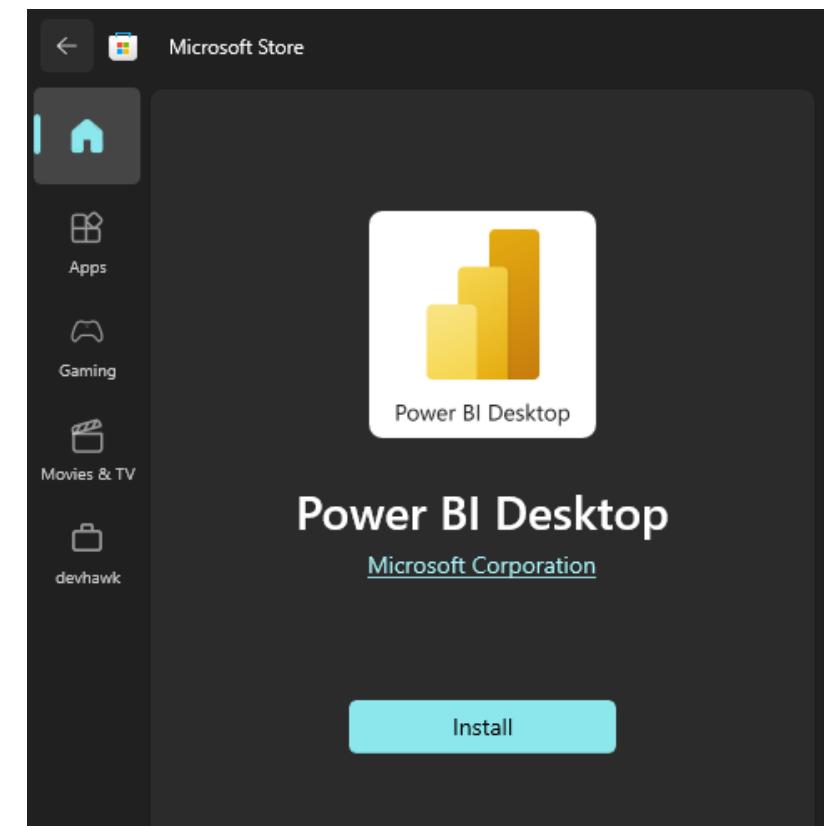
Download Power BI Desktop

Download from Microsoft.com



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

Microsoft Store Install



Sign in to Power BI account

The screenshot shows the Power BI Desktop application window. On the left, a dark sidebar displays the title "Power BI Desktop" and three menu items: "Get data", "Recent sources", and "Open other reports". The main content area is white and features a large circular user icon. Below the icon, the text "Collaborate and share" is followed by a description: "Sign in to publish your reports, access certified datasets, and share insights on organizational content in the Power BI service." A yellow "Get started" button is centered below this text. At the bottom of the main area, there is a link: "Want to buy a Power BI license? [Buy now](#)". To the right of the main content is a vertical yellow sidebar titled "WHAT'S NEW" which contains a brief update about recent improvements. Below it are sections for "POWER BI BLOG", "FORUMS", and "TUTORIALS", each with a brief description and a link.

Power BI Desktop

Get data

Recent sources

Open other reports

Collaborate and share

Sign in to publish your reports, access certified datasets, and share insights on organizational content in the Power BI service.

Get started

Want to buy a Power BI license? [Buy now](#)

WHAT'S NEW

Take a look at what's new and improved in Power BI in this month's update.

POWER BI BLOG

Keep up to date with the latest news, resources, and updates from the Power BI team.

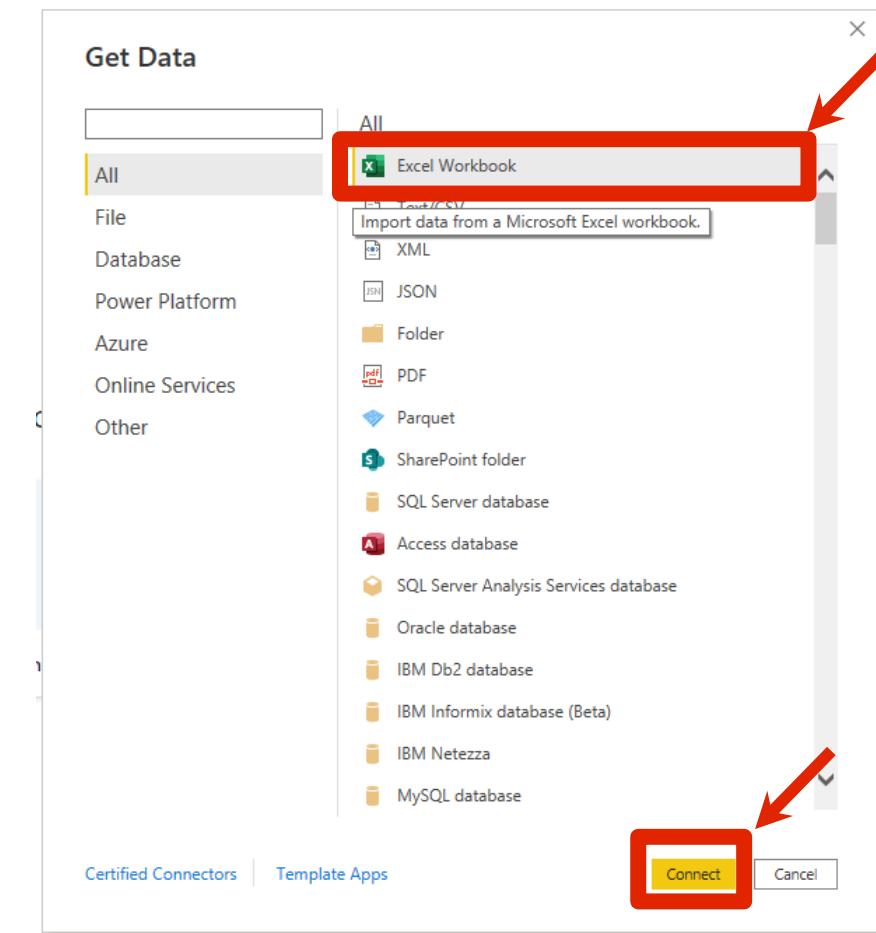
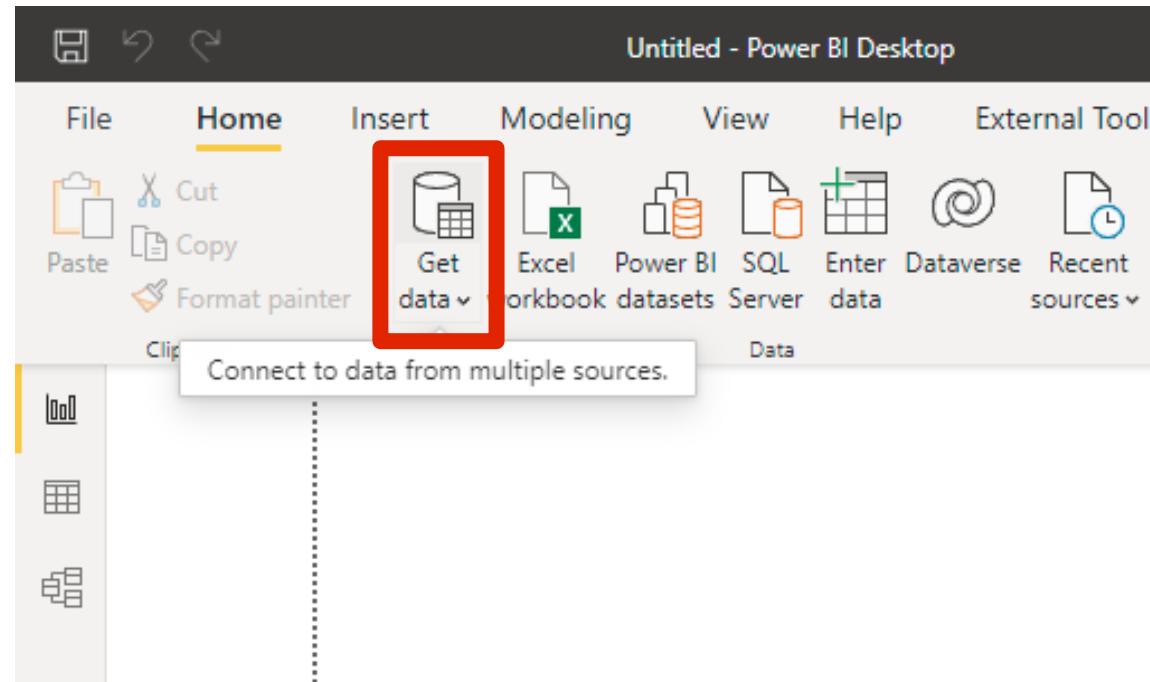
FORUMS

Visit the Power BI Forum to ask questions or interact with other users in the Power BI community.

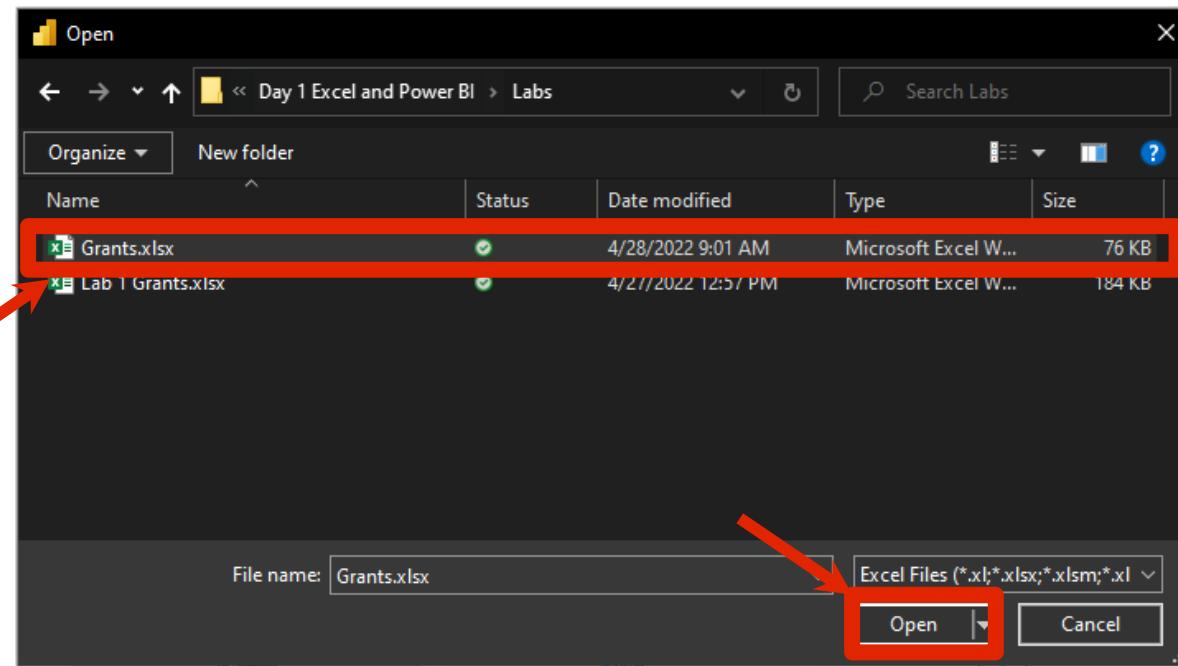
TUTORIALS

Ready to learn more about Power BI?

Get data



Load data

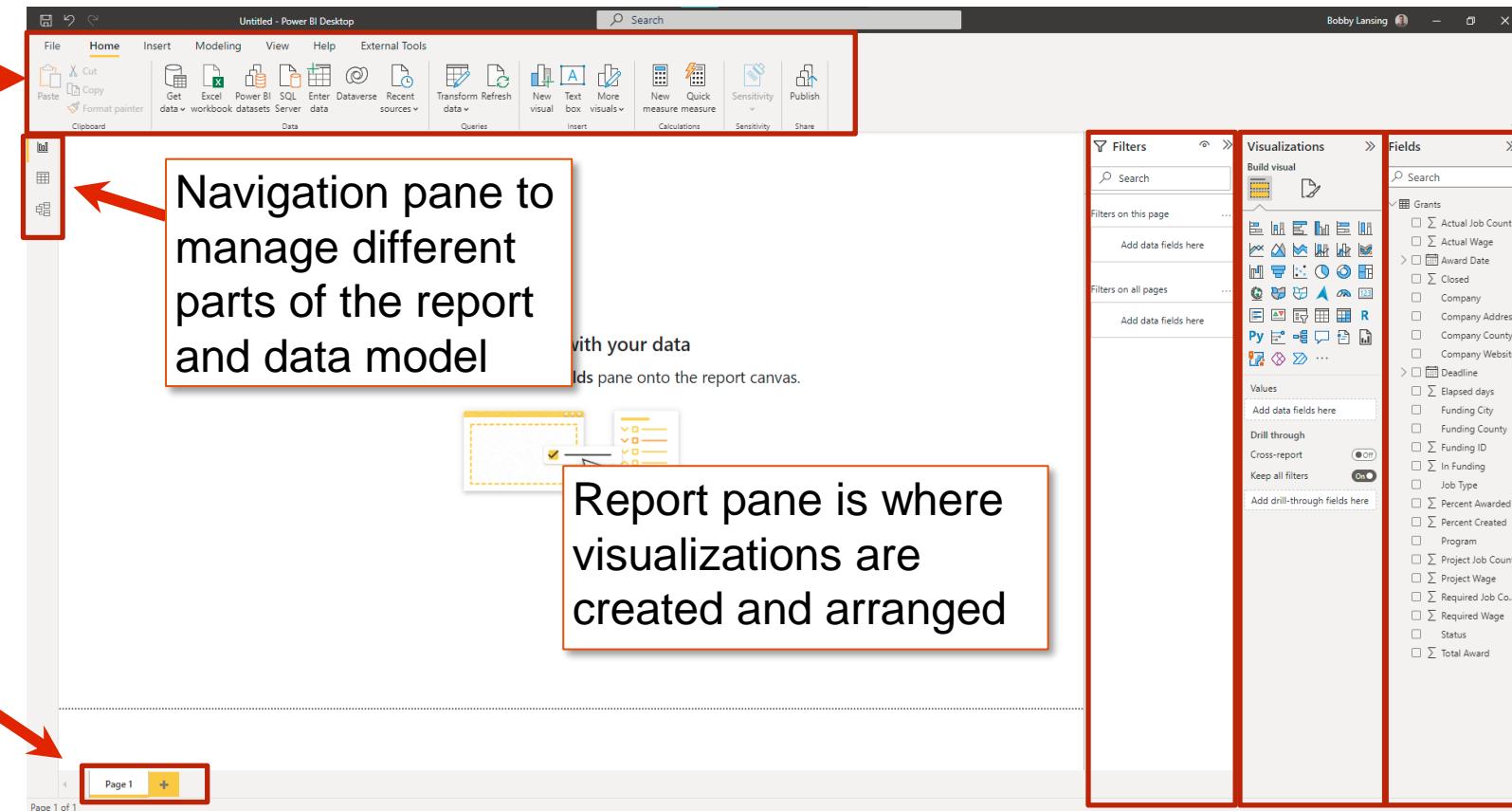


The screenshot shows the Power BI 'Navigator' pane. On the left, under 'Display Options', 'Grants.xlsx [2]' is expanded, showing 'Grants' with a checked checkbox. In the main area, a table titled 'Grants' is displayed with columns: Funding ID, Program, Award Date, Company, and Compa. A message at the bottom states: 'The data in the preview has been truncated due to size limits.' At the bottom right of the pane, the 'Load' button is highlighted with a red box.

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

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

Visualization pane allows you to customize with color, filters, etc.

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

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

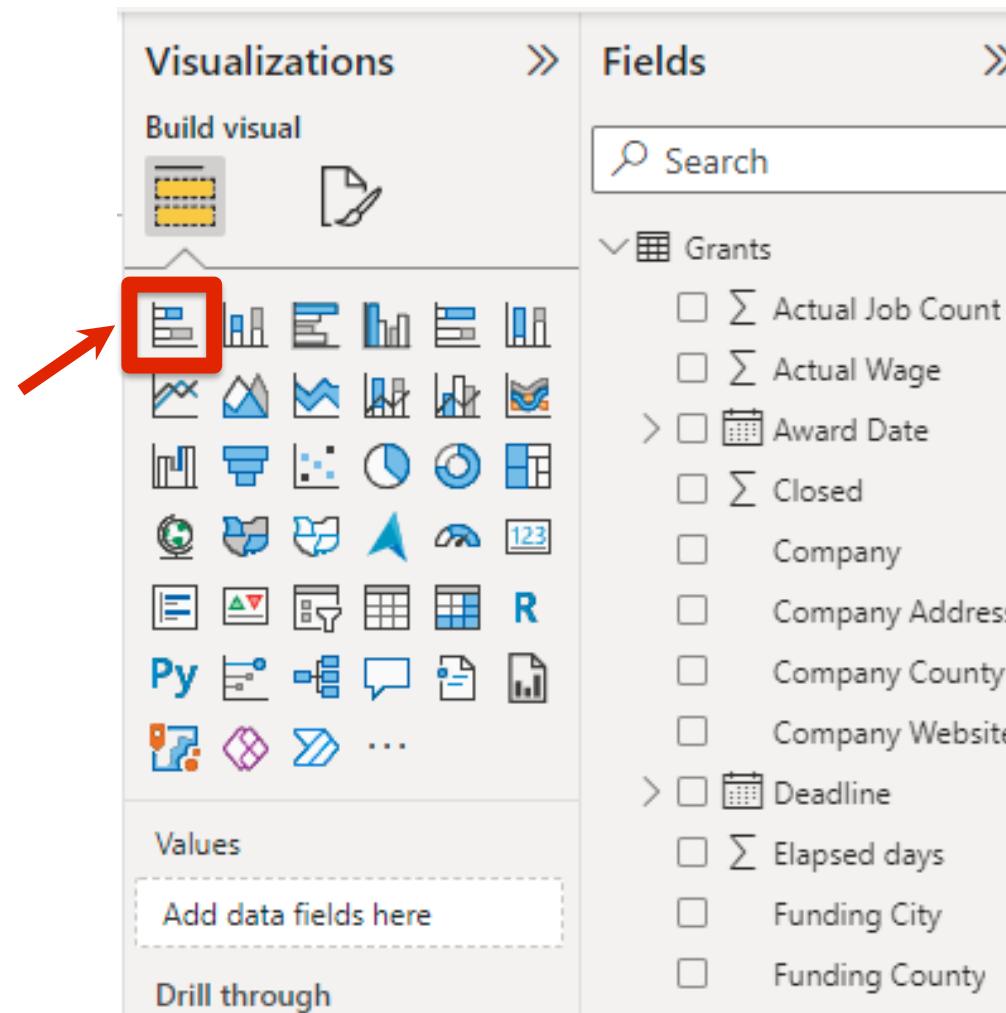
North Carolina (NC) grant usage data

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 interface with the 'Visualizations' pane open. The 'Build visual' section contains a grid of icons representing different chart types. The first icon in the top row, which is a bar chart, is highlighted with a red box and a red arrow pointing to it from the left.

Visualizations

Build visual

Values

Add data fields here

Drill through

Fields

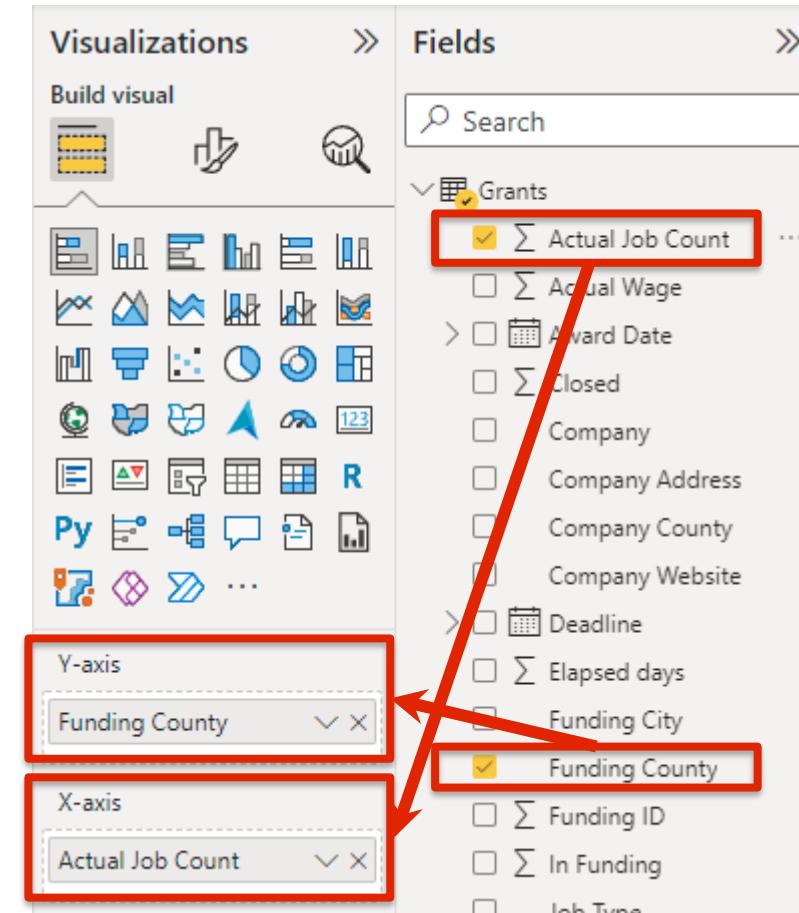
Search

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

Sorting by 'Actual Job Count'

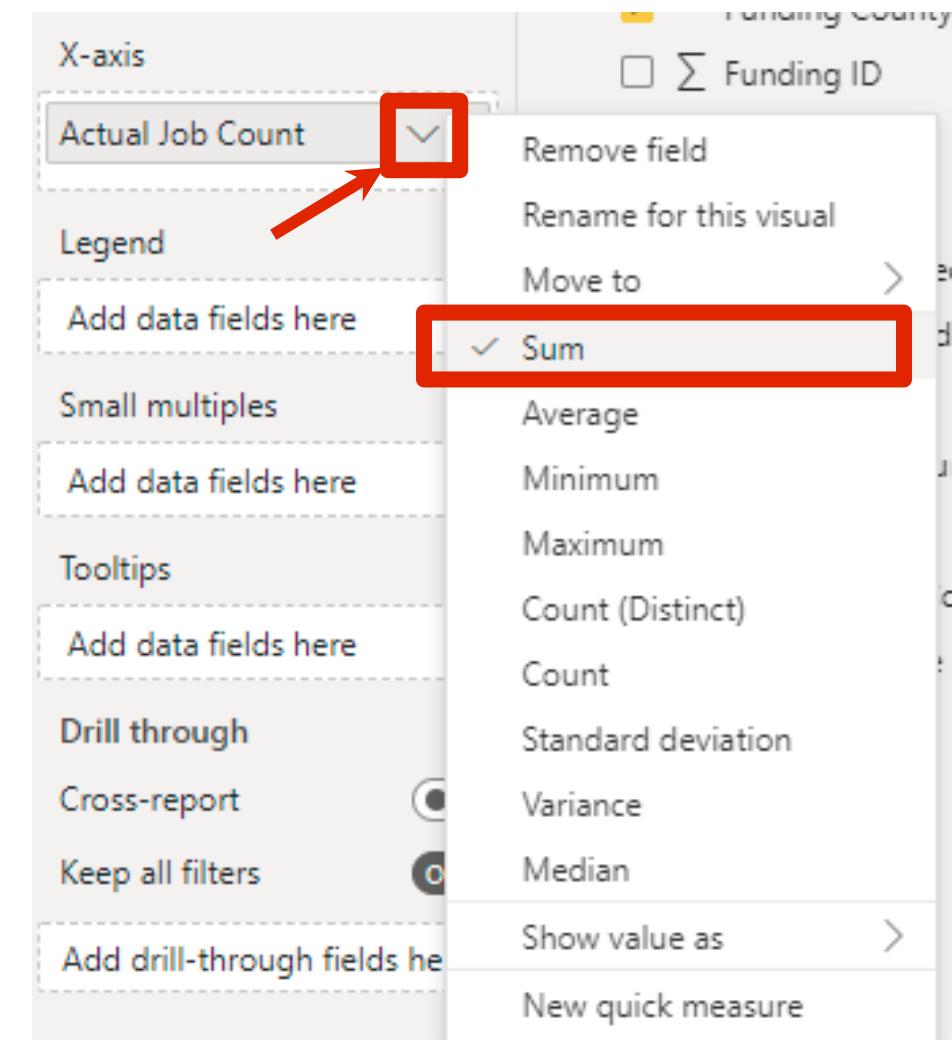
- Drag 'Actual Job Count' from the 'Grants' table in the 'FIELDS' pane on the right to the 'X-axis' section of the 'VISUALIZATIONS' pane
- Drag 'Funding County' from the 'Grants' table in the 'FIELDS' pane to the 'Y-axis' section of the 'VISUALIZATIONS' pane



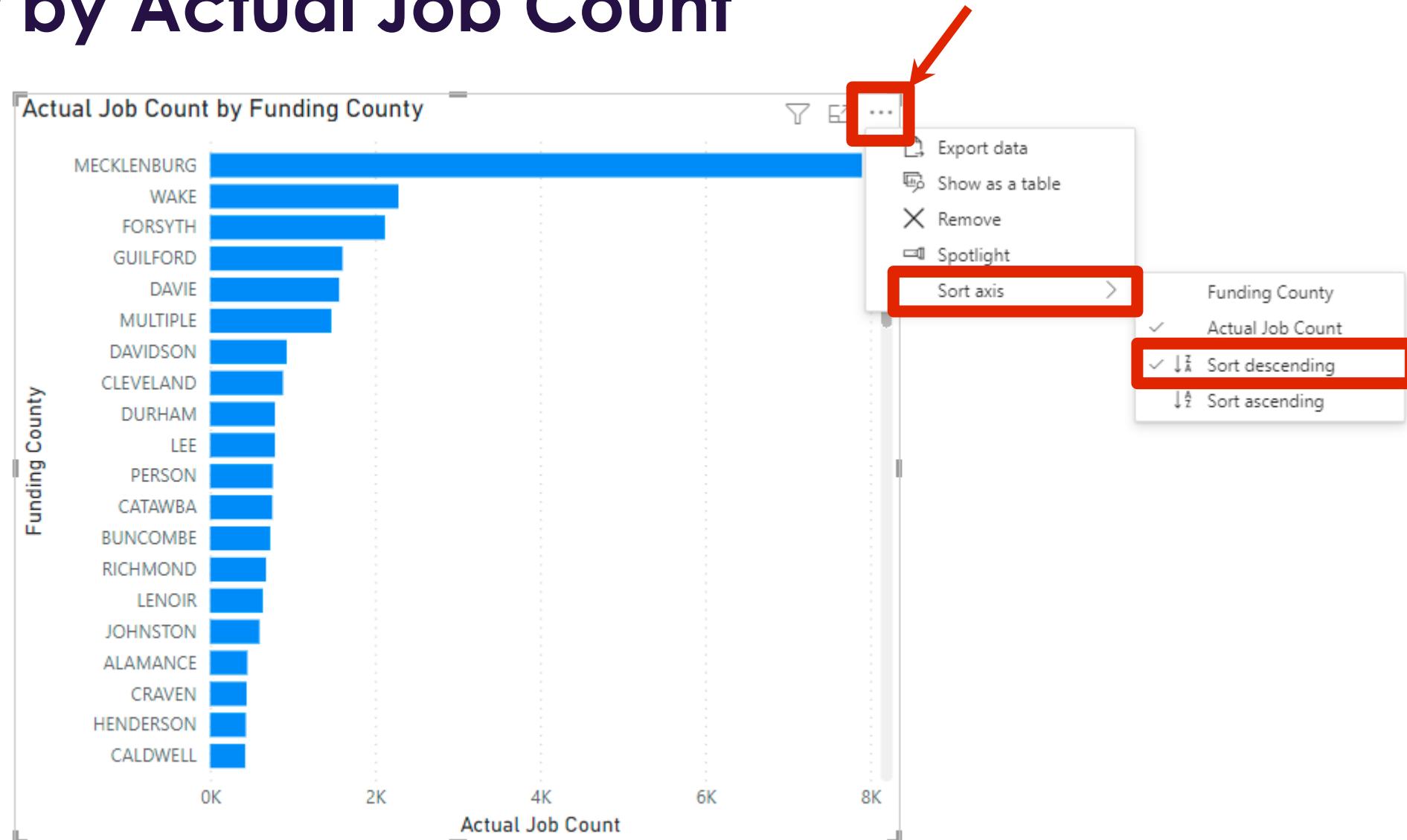
Sum of Actual Job Count

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

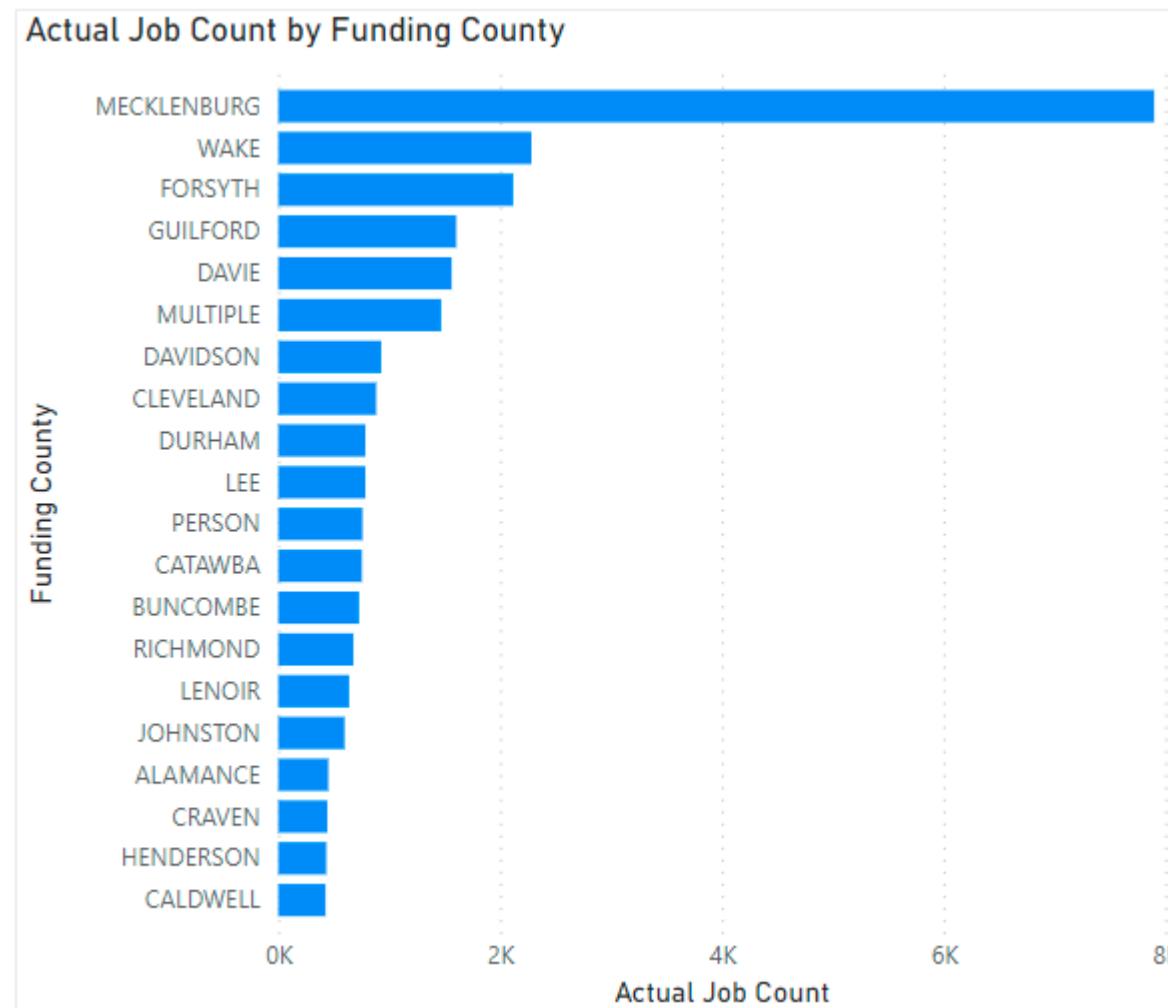
Axis	Funding County
Legend	
Value	SUM (Actual Job Count)
Tooltips	



Sort by Actual Job Count



Actual Job Count by funding county

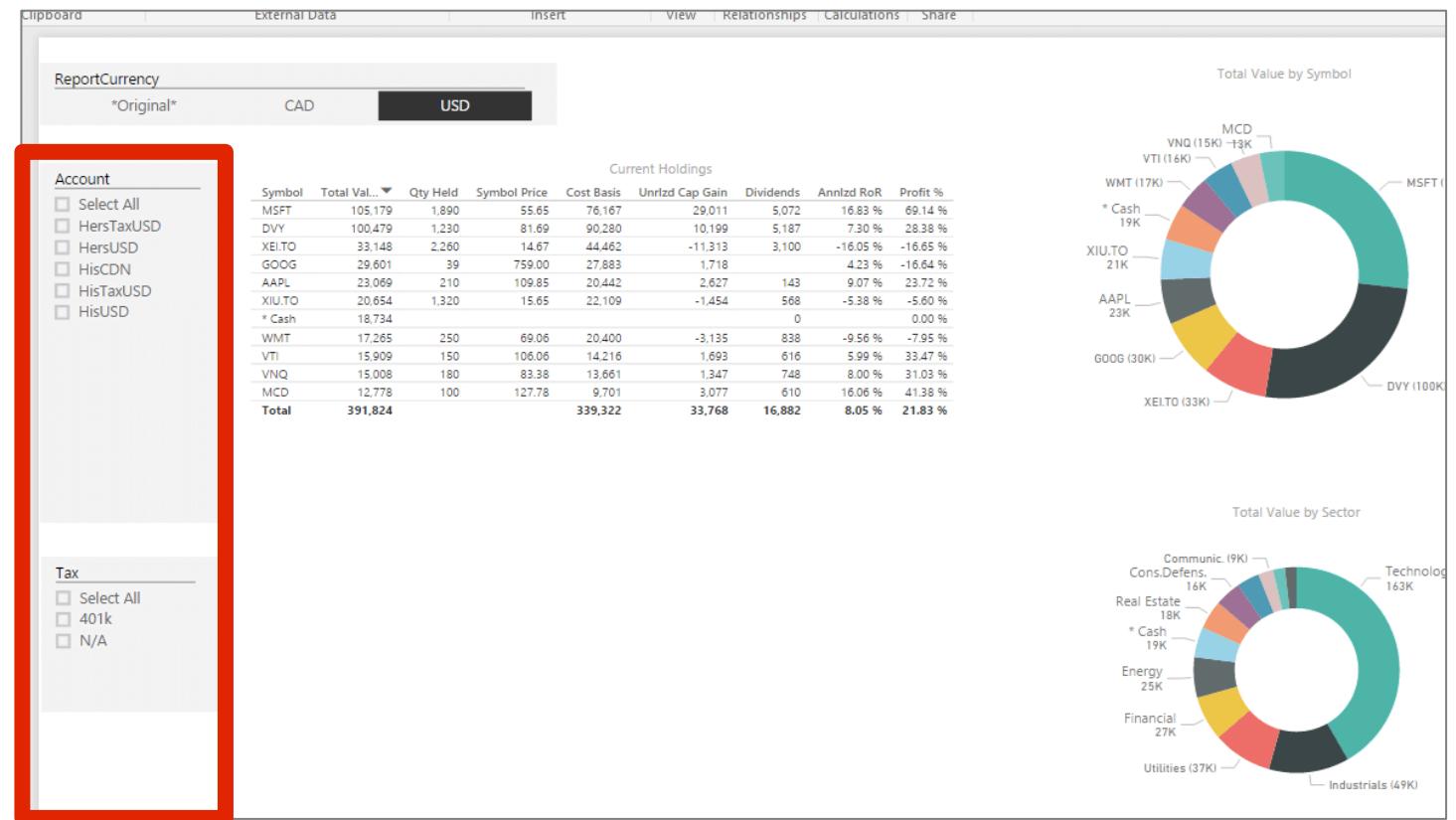


Power BI Slicer

- Power BI **slicer** filters the portion of the dataset shown in the other visualizations in a report

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



Add Award as Slicer

- Click on the empty space on the Canvas. Make sure the bar chart above is not selected!

Visualizations > Fields

Build visual

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

Visualizations > Fields

Build visual

Search

Grants

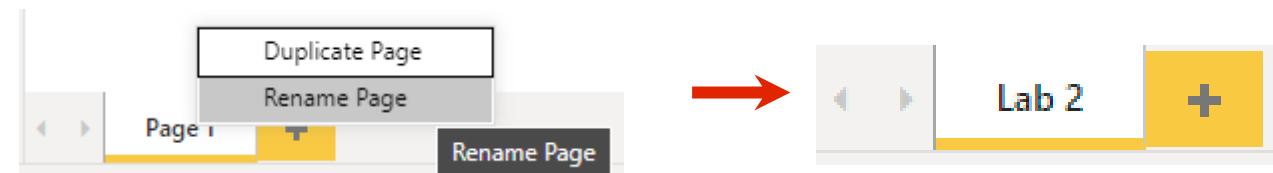
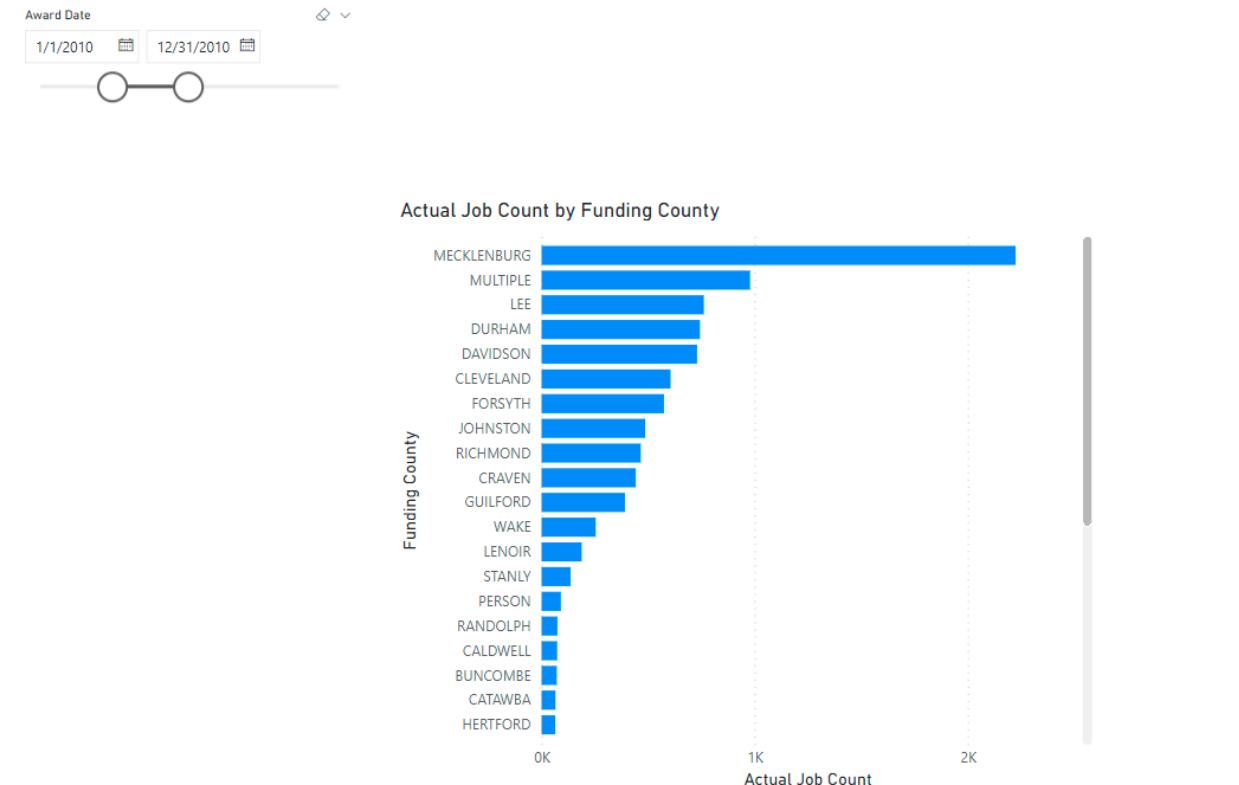
- \sum Actual Job Count
- \sum Actual Wage
- > Award Date
- \sum Closed
- Company
- Company Address
- Company County
- Company Website
- > Deadline
- \sum Elapsed days
- Funding City

Field

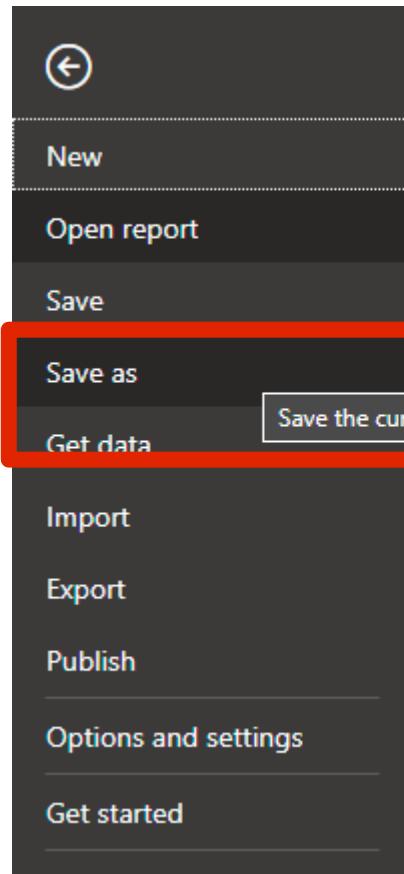
Award Date

Select the desired time period

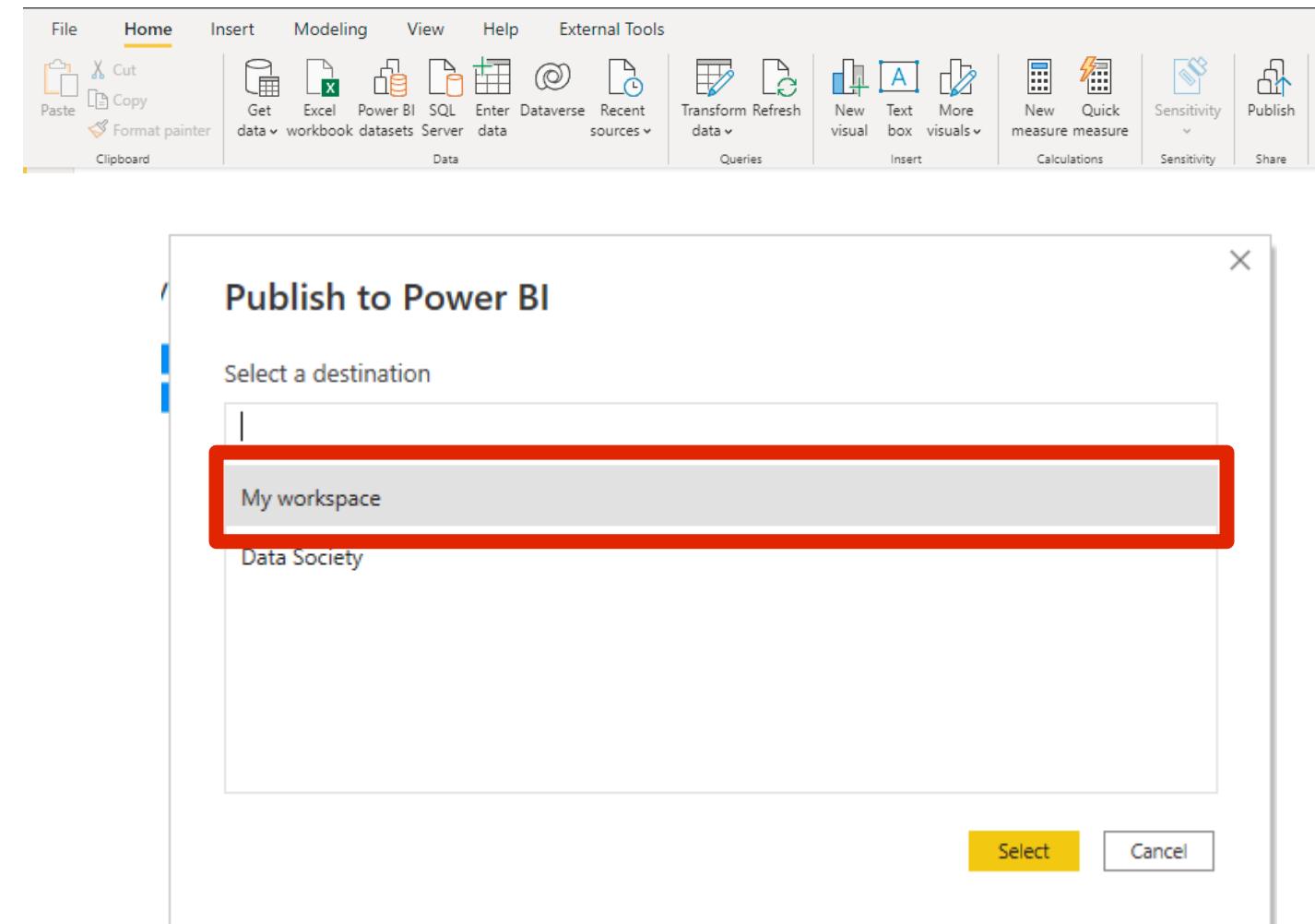
- From 1/1/2010 to 12/31/2010, what were the top 10 counties that created the most jobs?
- What about 2011?
- When you're done exploring, rename the page to 'Lab 1'



Save and publish to Power BI Web service

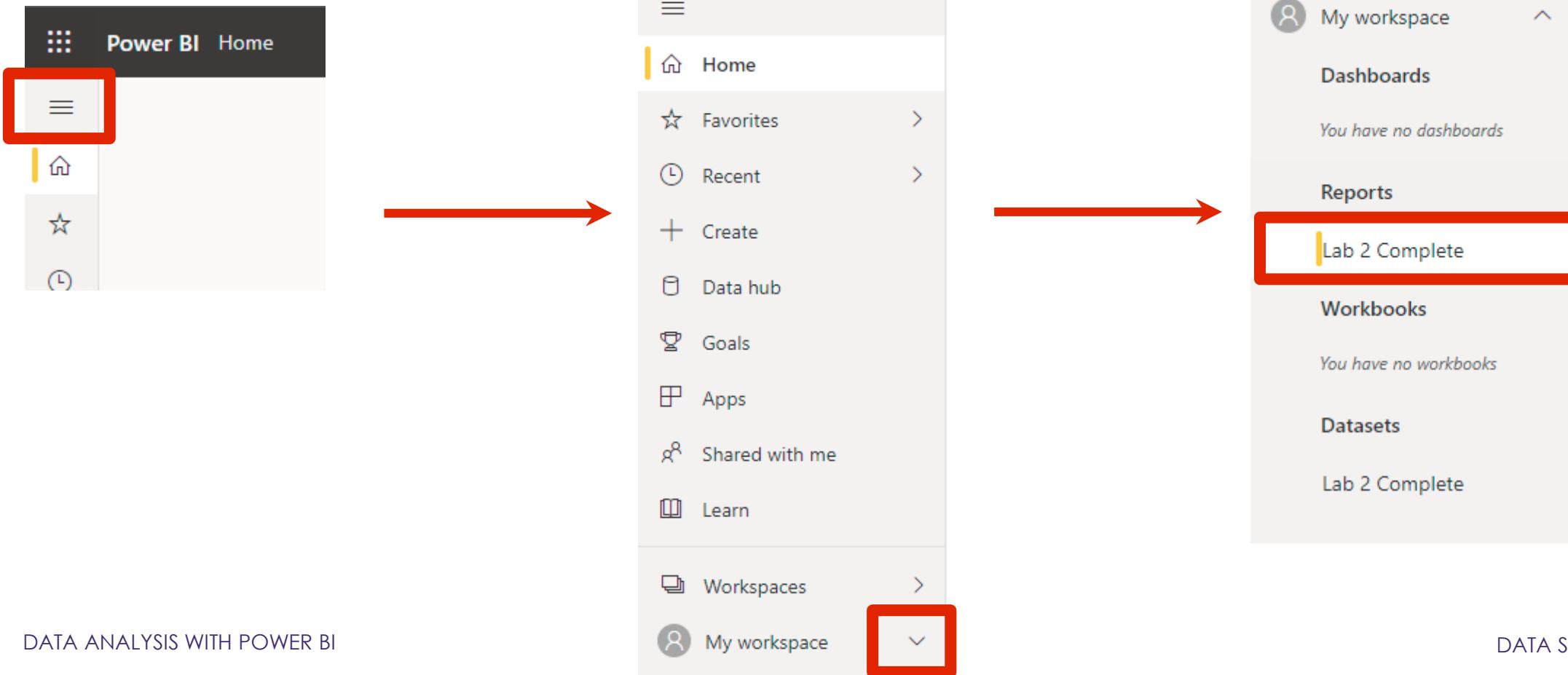


Open report



Check your report in PowerBI.com

- Sign in with your account at app.powerbi.com
- Navigate to 'My Workspace', and then click on 'Reports' Tab



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

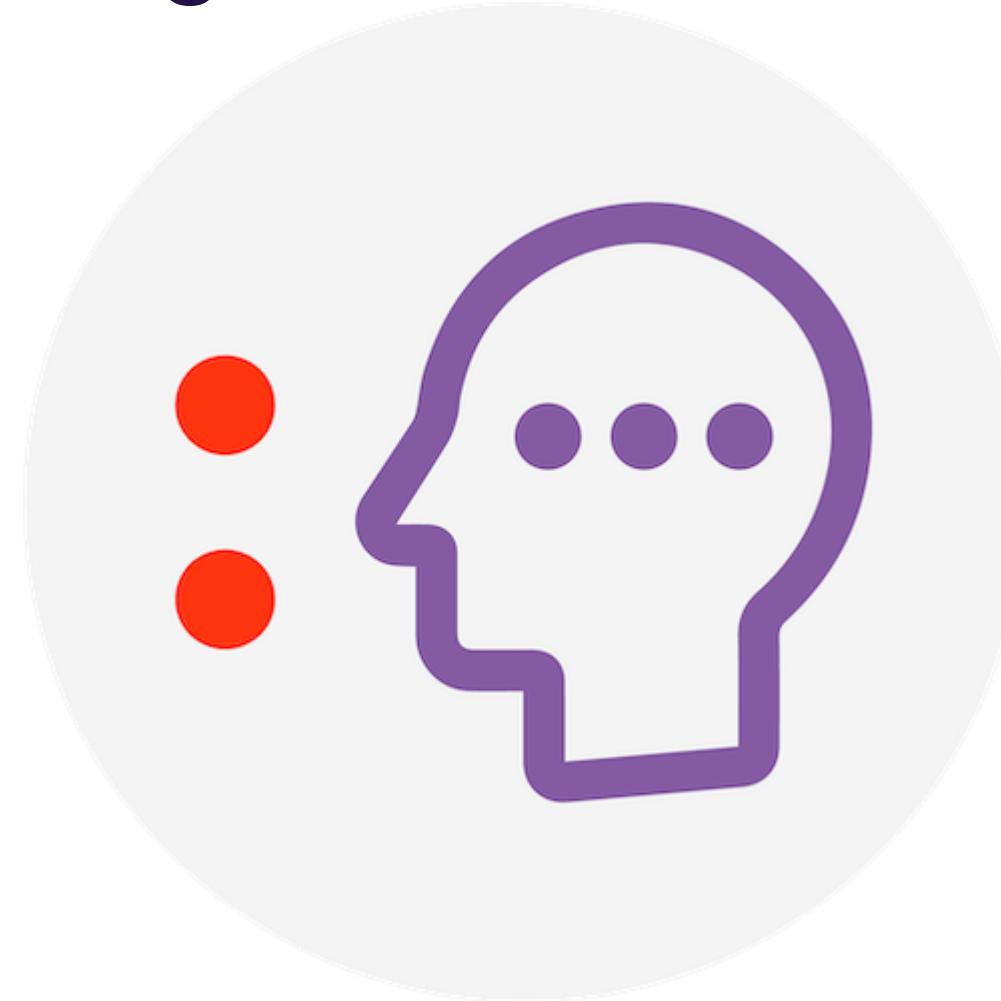
There aren't any filters to display.

Actual Job Count by Funding County

Funding County	Actual Job Count
MECKLENBURG	~2.2K
MULTIPLE	~1.8K
LEE	~1.5K
DURHAM	~1.4K
DAVIDSON	~1.3K
CLEVELAND	~1.2K
FORSYTH	~1.1K
JOHNSTON	~1.0K
RICHMOND	~900
CRAVEN	~800
GUILFORD	~700
WAKE	~600
LENOIR	~500
STANLY	~400
PERSON	~300
RANDOLPH	~200
CALDWELL	~150
BUNCOMBE	~100
CATAWBA	~80
HERTFORD	~60

Get data Page 1 of 1

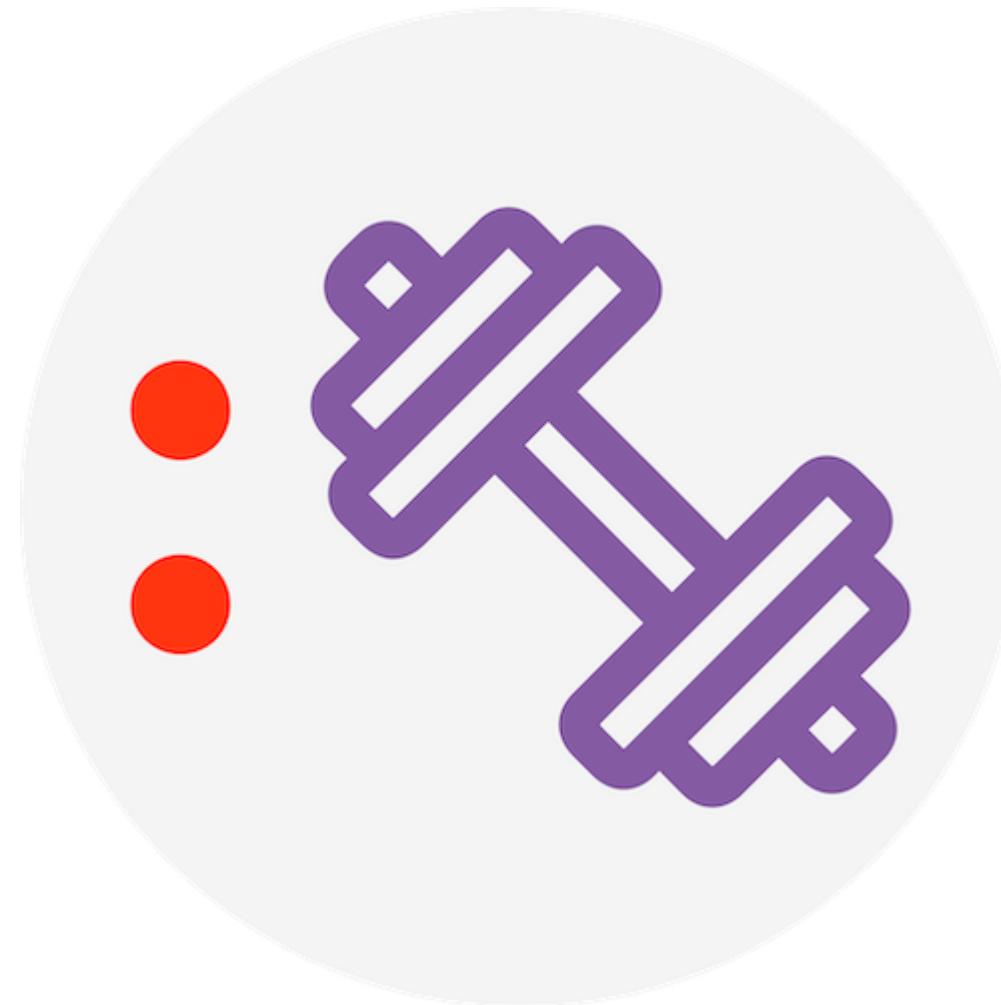
Day 1 - Knowledge Check 2



Lab 1

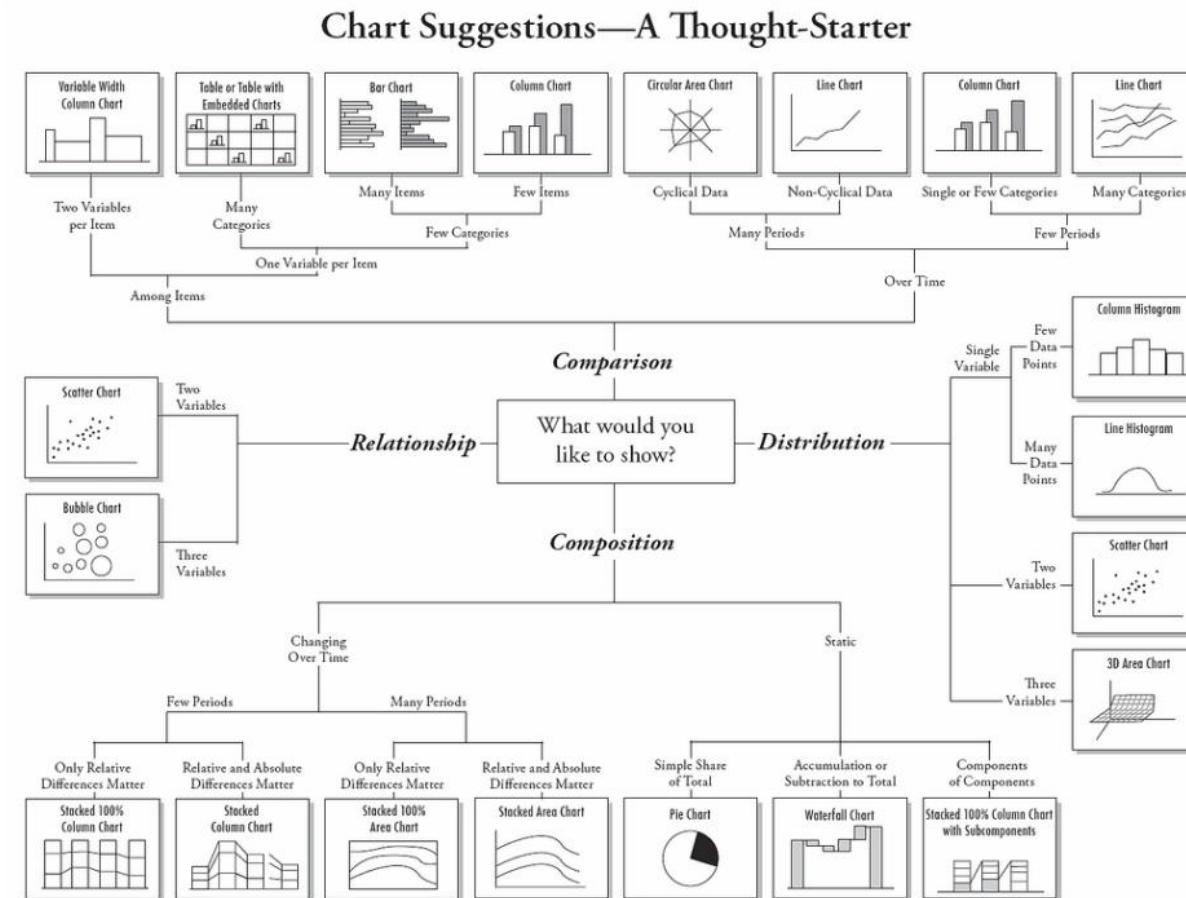


Exercise 1



Visualization Types

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



Congratulations!

- 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:

Data Analysis with Excel & PowerBI

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: <https://hevodata.com/learn/top-10-best-power-bi-dashboard-examples-in-2021/#top>
 - 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?

Outline for today

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

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

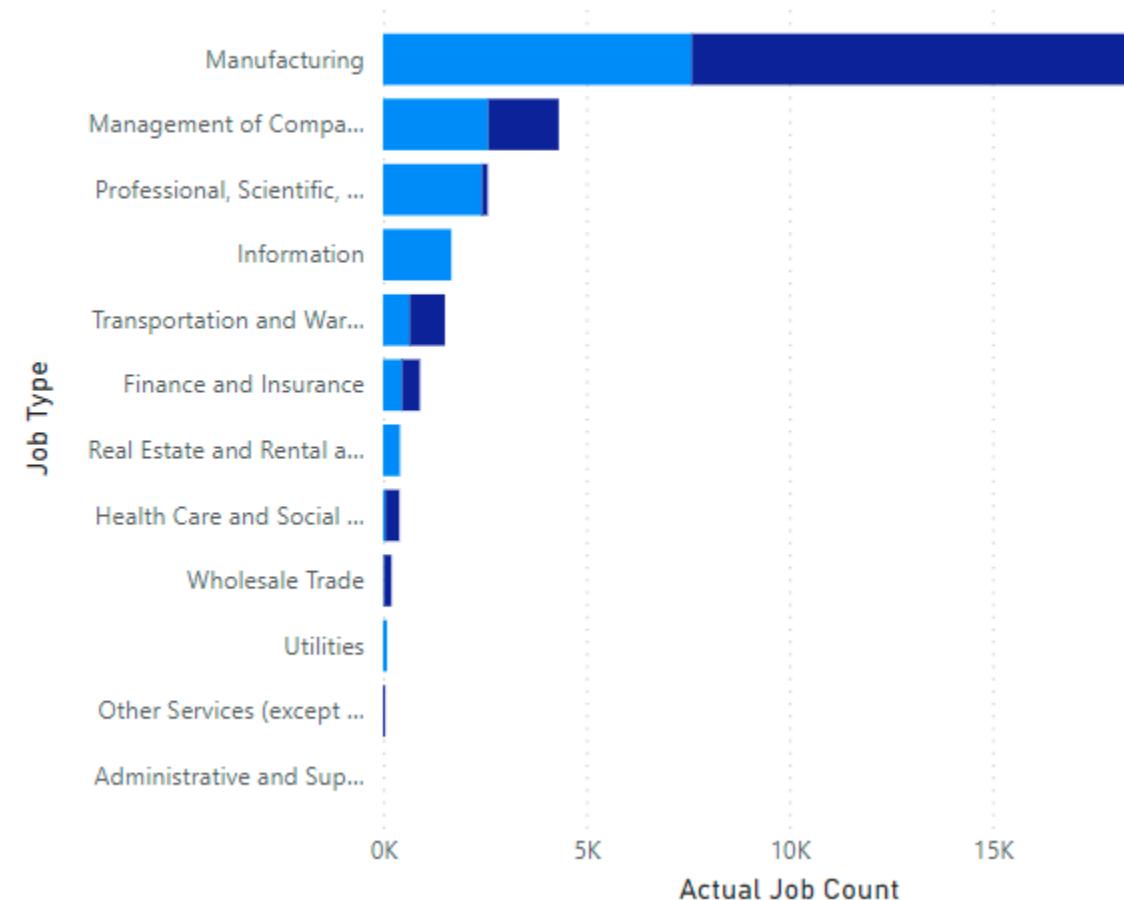
- Put 'Actual Job Count' in X-axis Field and 'Job Type' in Y-axis, and 'Program' in Legend
- Sum(Actual Job Count) -> click the triangle in under the 'Values' section and choose Sum

The image shows two screenshots of the Power BI interface. On the left, the 'Visualizations' pane is open, showing various chart types like Stacked bar chart, Line chart, and Map. A red box highlights the 'Stacked bar chart' icon. An arrow points from this pane to the right-hand settings screen. The right-hand screen shows the 'Y-axis' set to 'Job Type', the 'X-axis' set to 'Actual Job Count', and the 'Legend' set to 'Program'. Under 'Actual Job Count', there is a dropdown menu with a red box around it, showing options: 'Remove field', 'Rename for this visual', 'Move to', 'Sum' (which is checked with a checkmark), 'Average', and 'Minimum'. To the right of these options is a vertical scroll bar.

Create a simple chart

Actual Job Count by Job Type and Program

Program ● JDIG ● OneNC



Axis	Job Type
Legend	Program
Value	SUM(Actual Job Count)
Tooltips	

Change your chart color

- Go to Format Tab in Visualizations, visual category
- Expand 'Data colors' section
- Make the JDIG Color into Orange, OneNC color into Purple

The screenshot illustrates the process of changing chart colors in Power BI. It shows the 'Format your visual' ribbon tab selected, the 'Visual' settings pane, and a horizontal bar chart.

Format your visual ribbon tab: The 'Visual' tab is highlighted. A red box highlights the 'Format' icon (pencil) in the top-left corner of the ribbon.

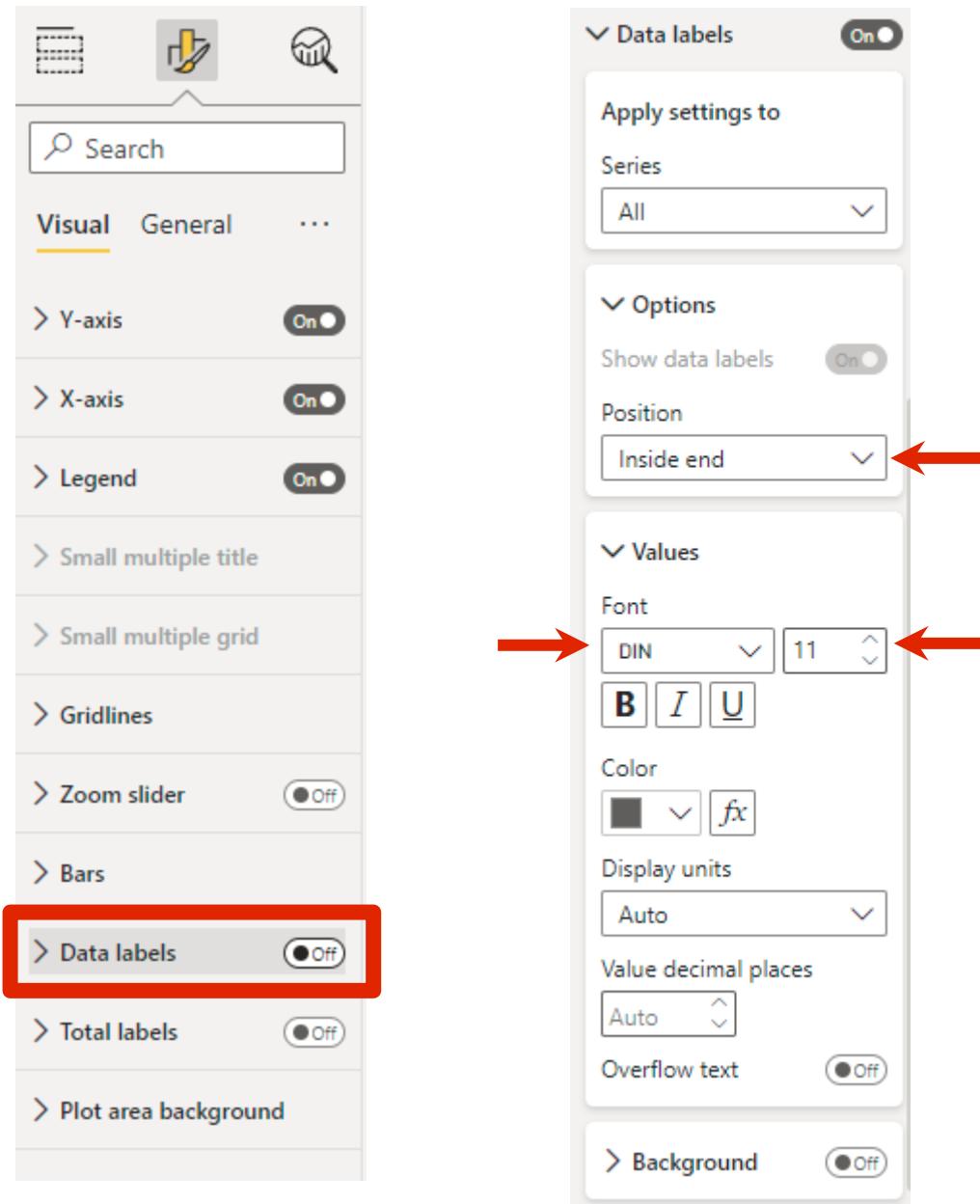
Visual settings pane: The 'Visual' tab is selected. The 'Data colors' section is expanded, showing two color swatches: one for 'JDIG' (orange) and one for 'OneNC' (purple). Red arrows point to the color swatches for JDIG and OneNC.

Horizontal Bar Chart: The chart is titled 'Actual Job Count by Job Type and Program'. The legend indicates 'Program' with orange for JDIG and purple for OneNC. The chart displays job counts for various industry categories. The x-axis is labeled 'Actual Job Count' with ticks at 0K, 5K, 10K, 15K, and 20K.

Job Type	Program	Actual Job Count (approx.)
Manufacturing	JDIG	8,500
Management of Comp...	JDIG	2,500
Professional, Scientific, ...	JDIG	2,000
Information	JDIG	1,500
Transportation and War...	JDIG	1,000
Finance and Insurance	JDIG	500
Real Estate and Rental a...	JDIG	300
Health Care and Social ...	OneNC	200
Wholesale Trade	OneNC	100
Utilities	OneNC	50
Other Services (except ...)	OneNC	100
Administrative and Sup...	OneNC	100

Add data labels

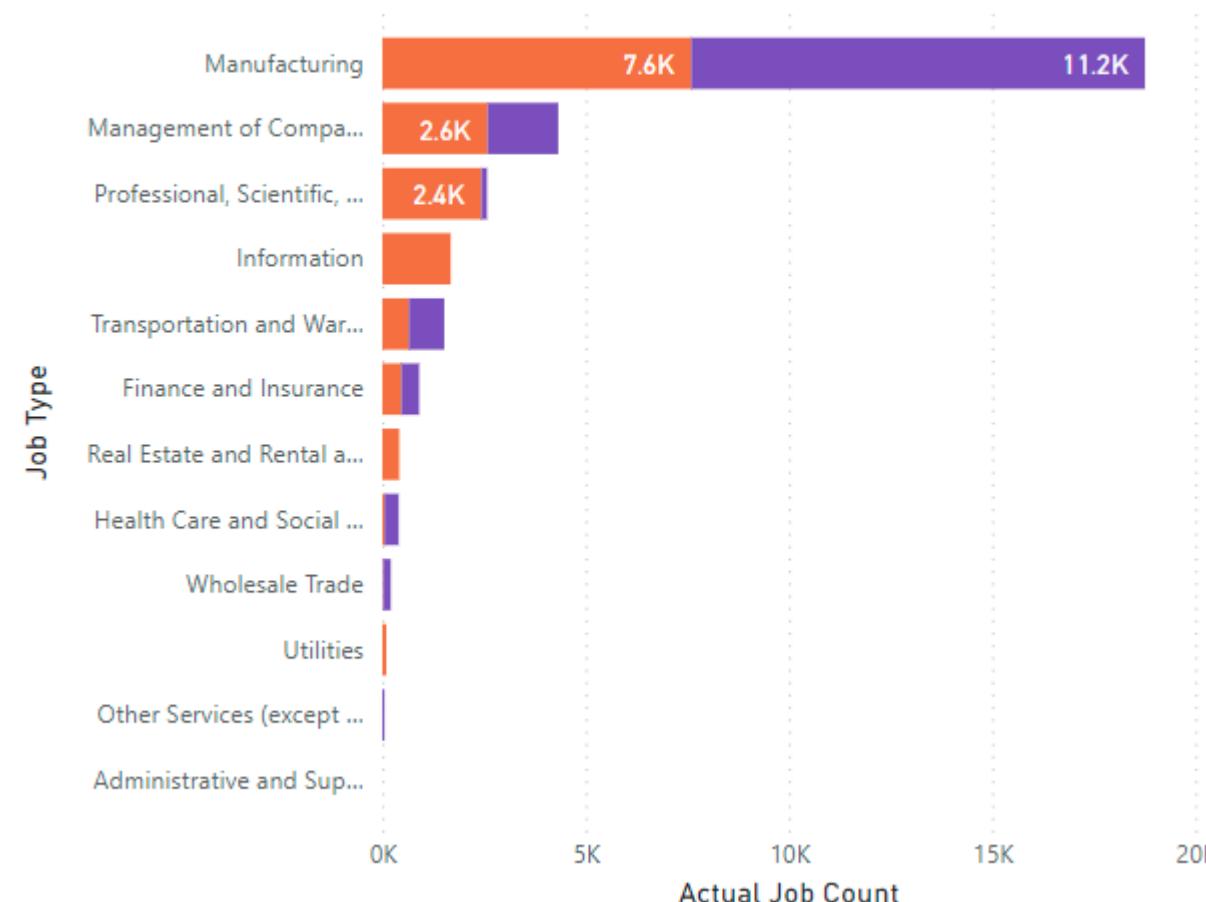
- Go to Format Tab in Visualizations, Visual category
- Turn the 'Data labels' section on
- Expand 'Data labels' section
- Make the Data label color into white
- 'Position' to be 'Inside End'
- Text Size to be '11'



Add data labels

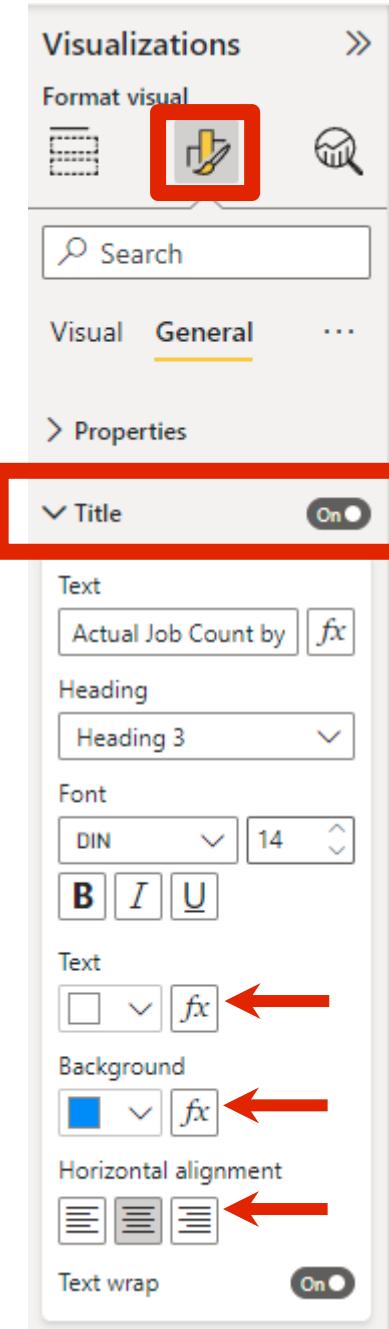
Actual Job Count by Job Type and Program

Program ● JDIG ● OneNC

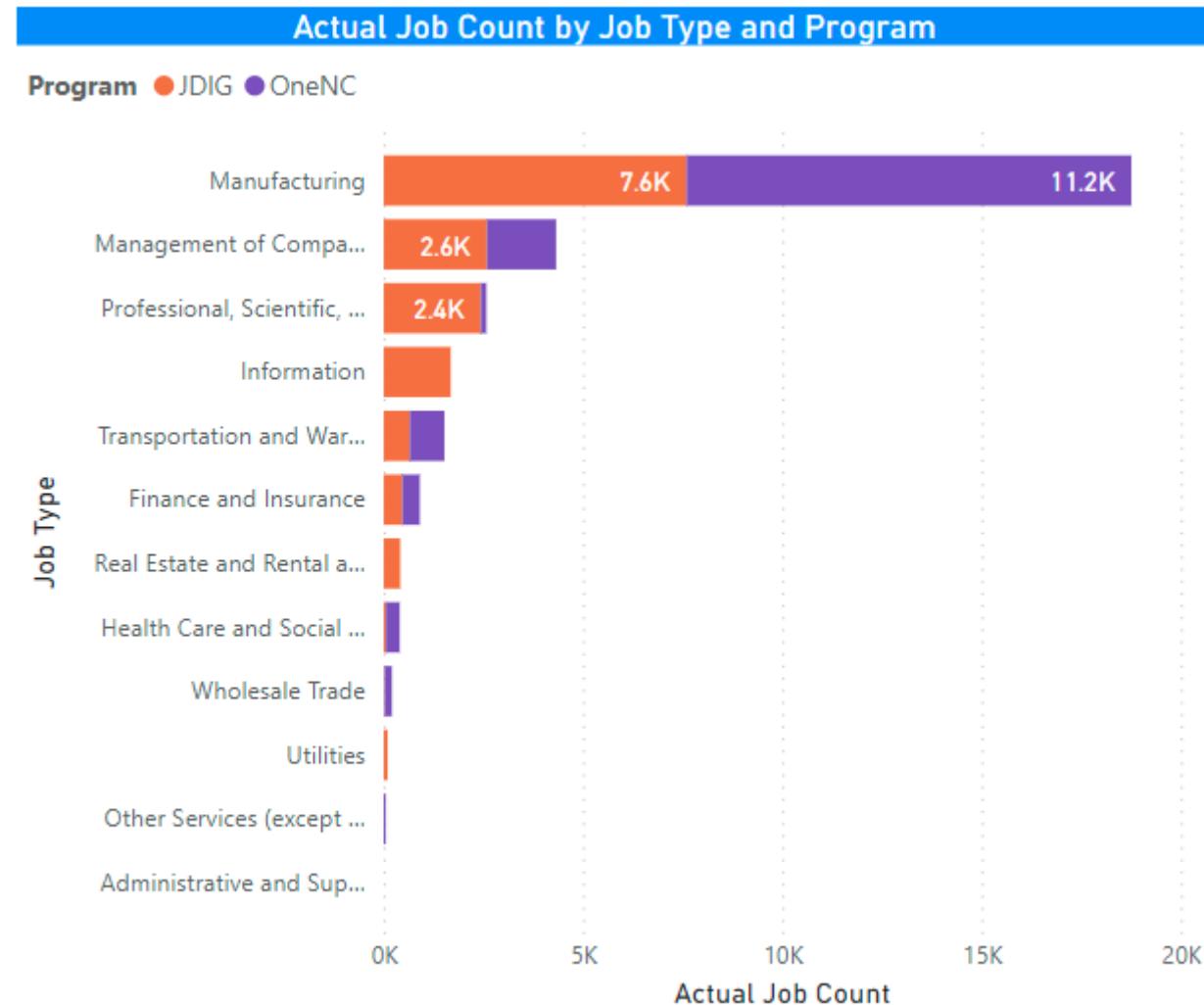


Title formatting

- 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

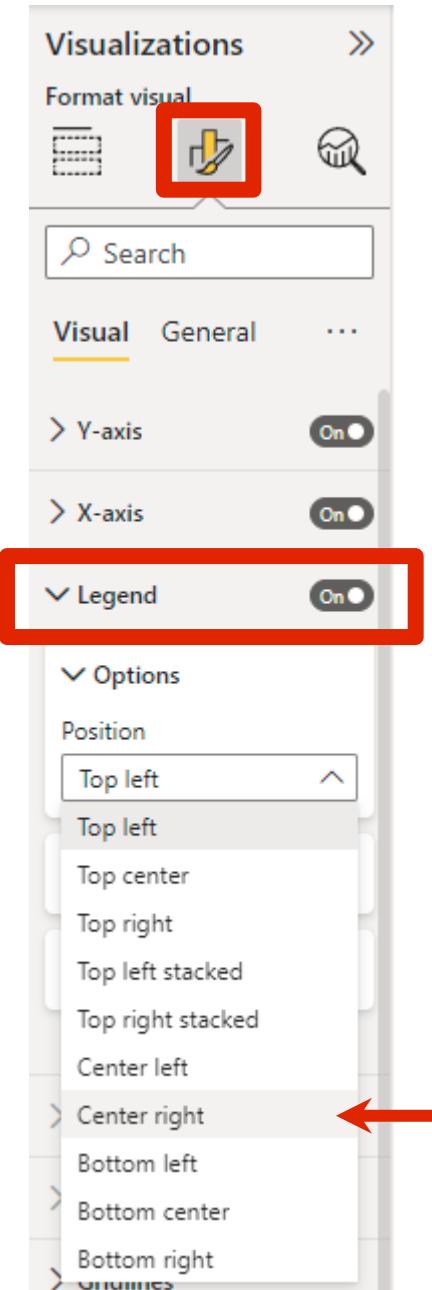


Title formatting

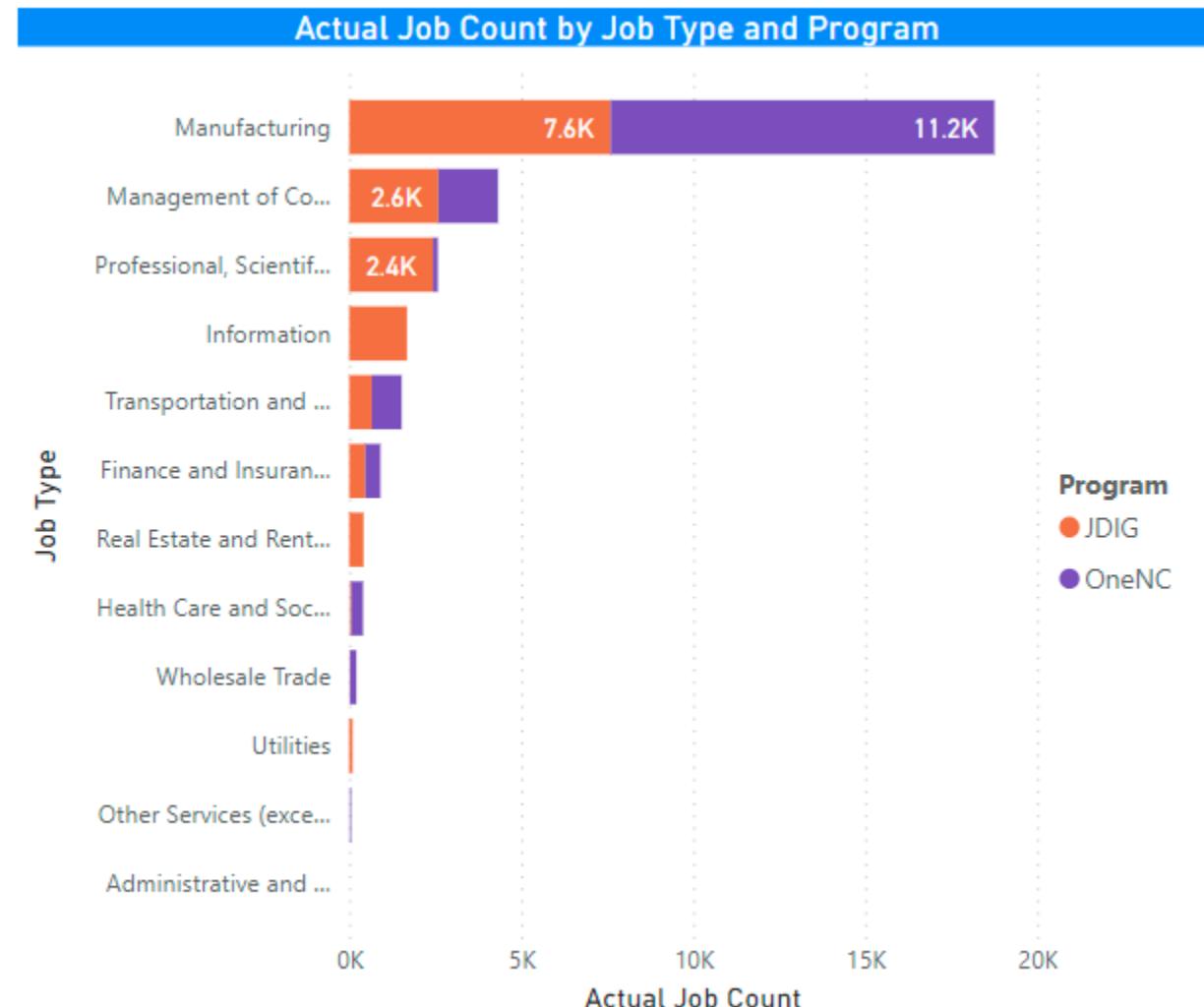


Adjust your legend

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

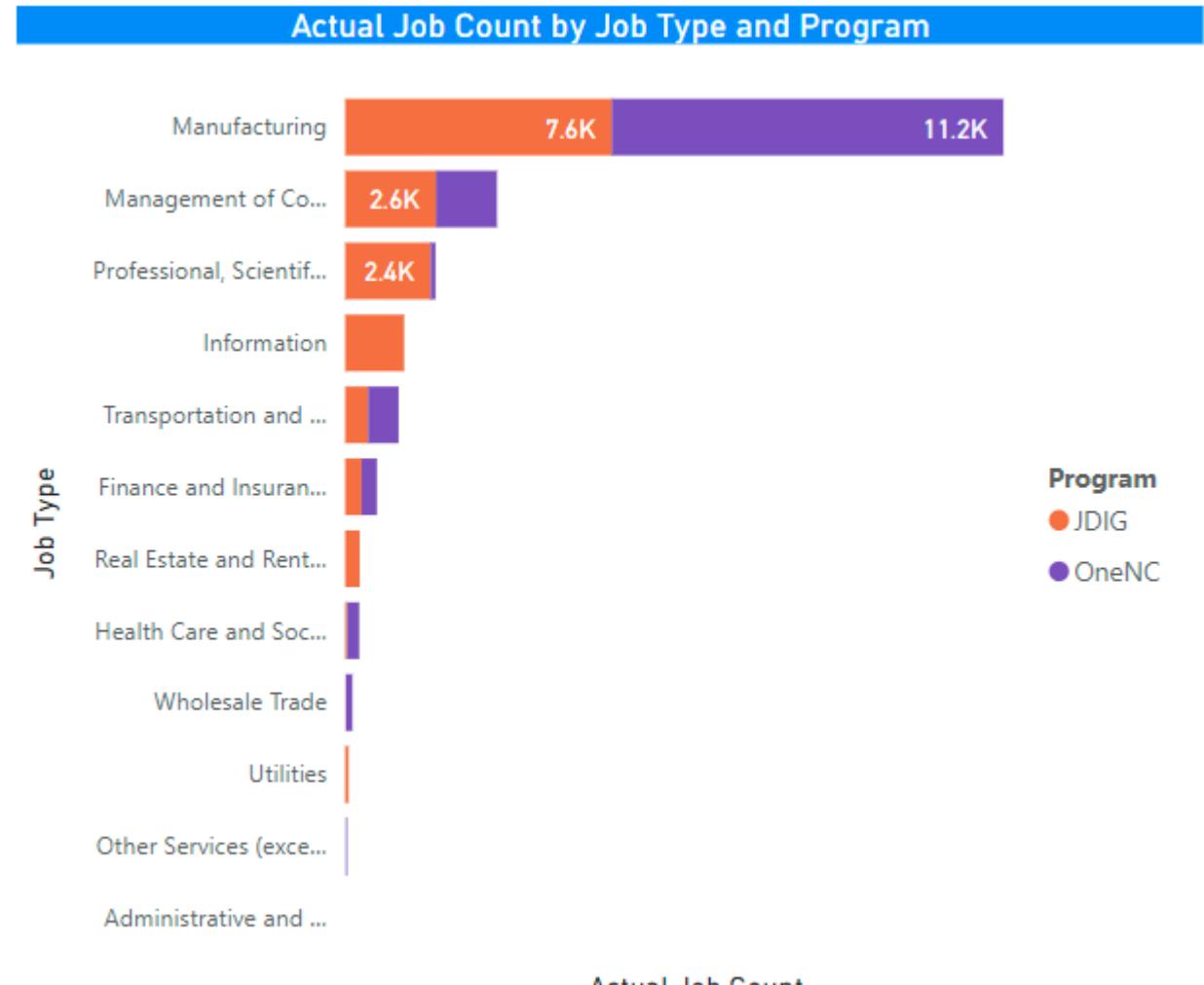
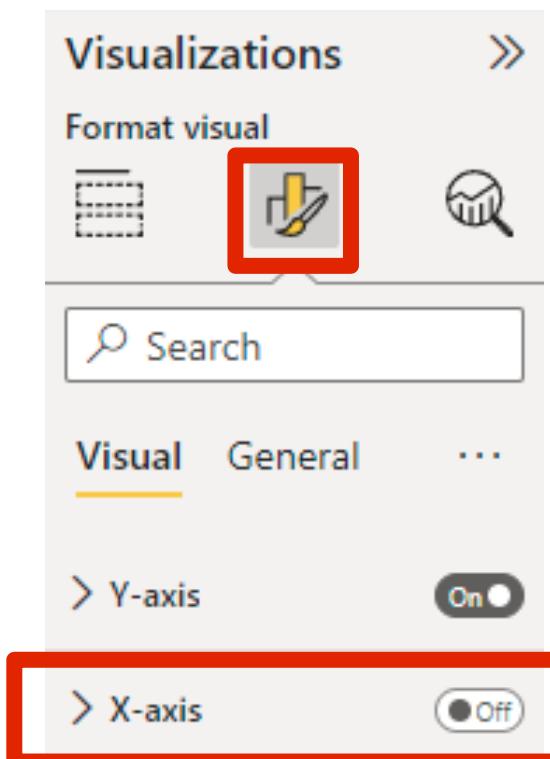


Adjust your legend



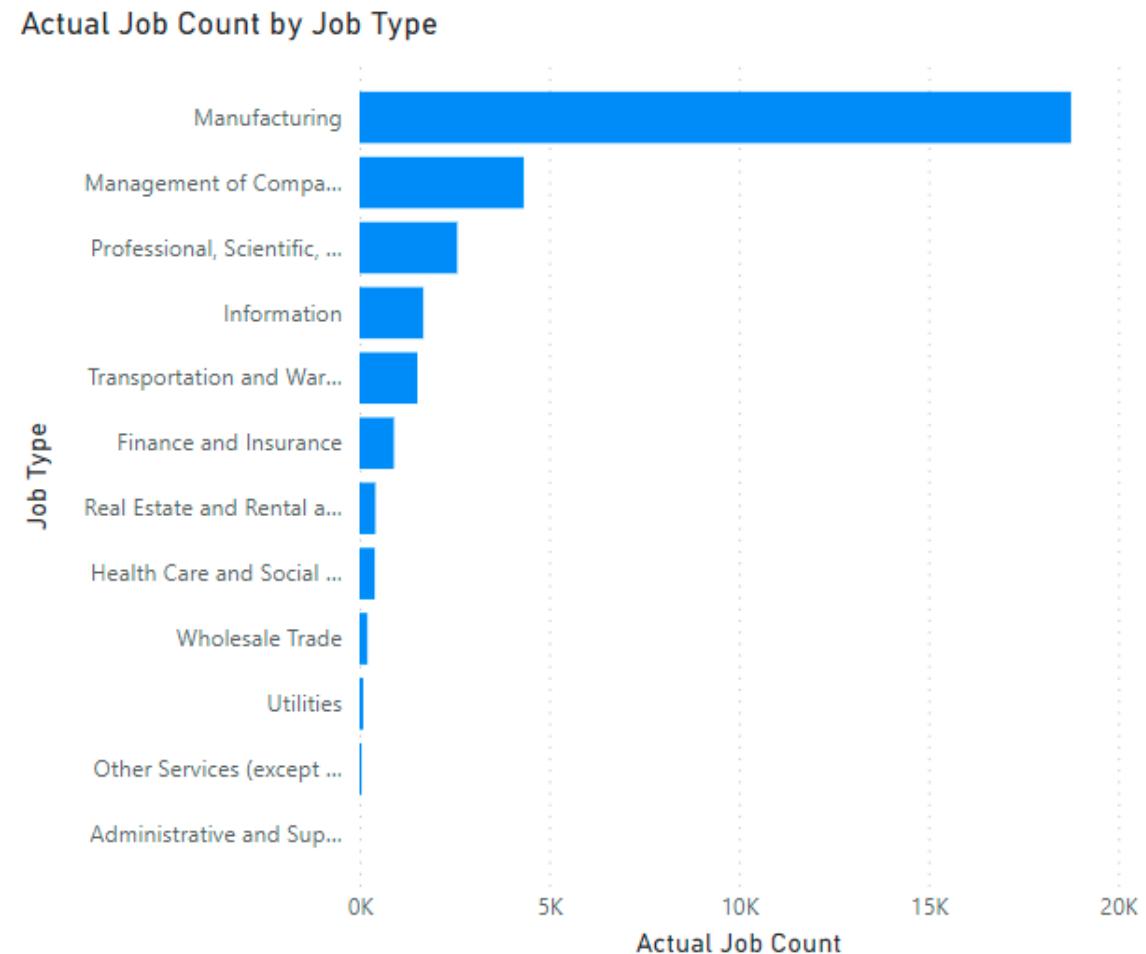
Remove x-axis

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



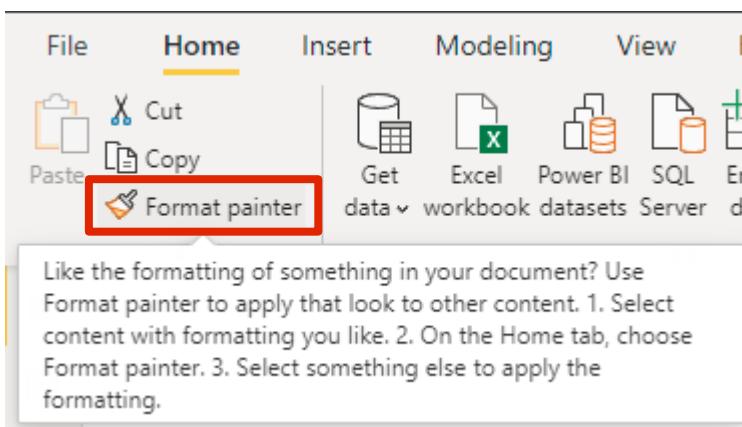
Add an Additional Chart

- Deselect the current chart
- Add a new bar chart
- Y-axis: Job Type
- X-axis: Actual Job Count

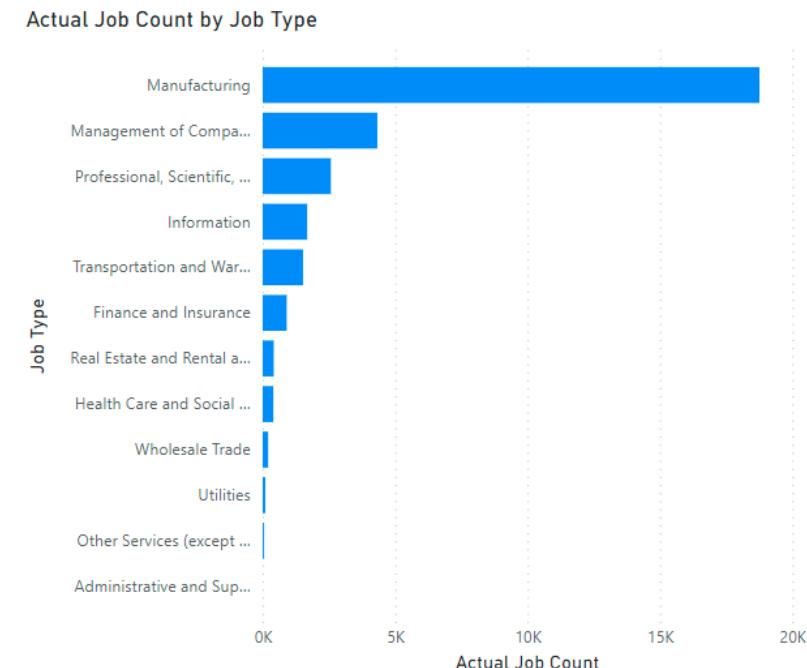
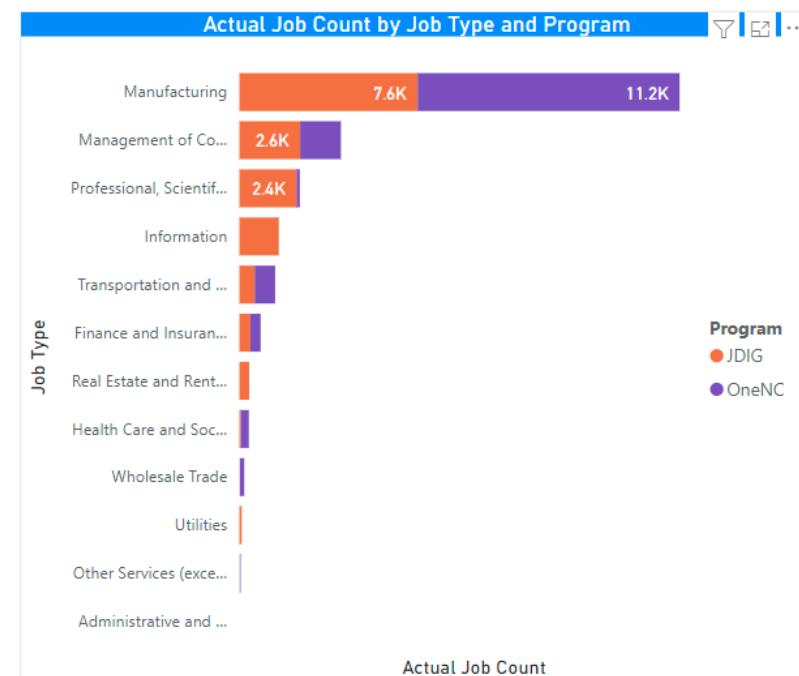


Format title the same way

- Use “Format Painter”

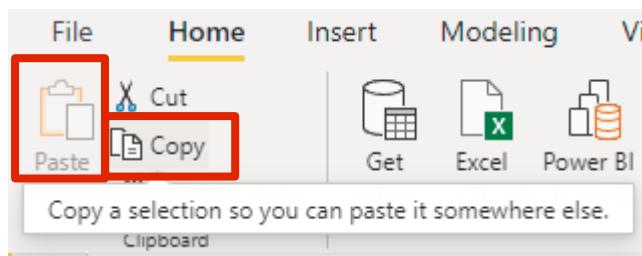


- Select the first chart
- Select “Format Painter”
- Select the second (new) chart

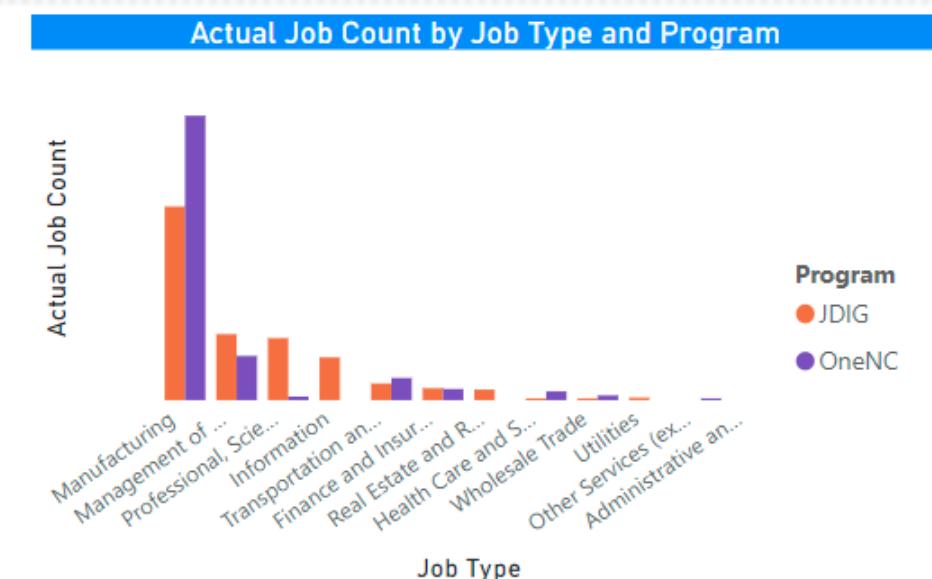
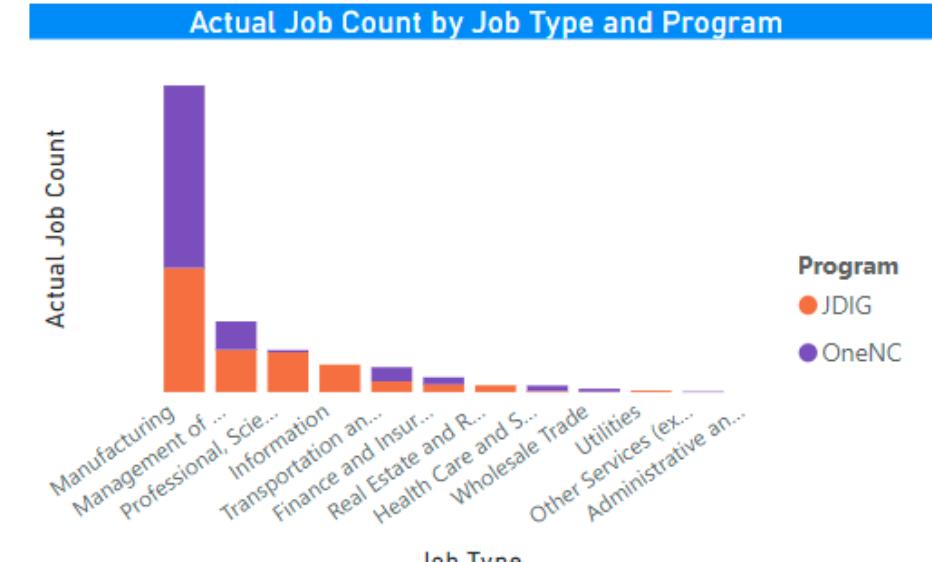
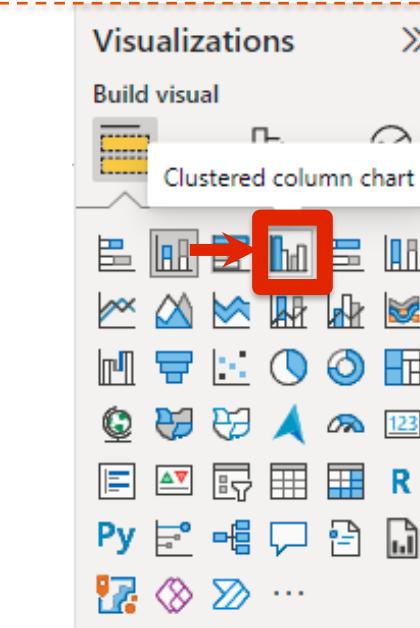
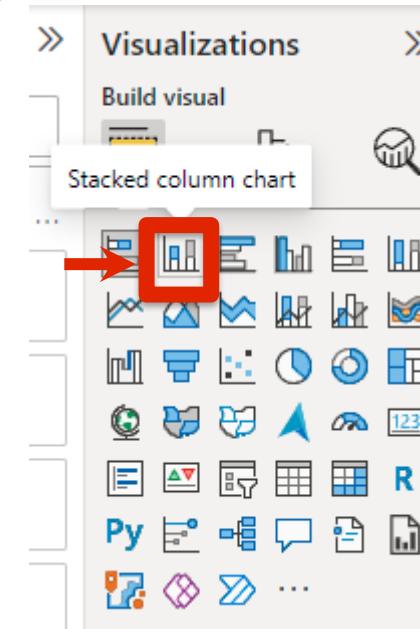


Switching charts

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

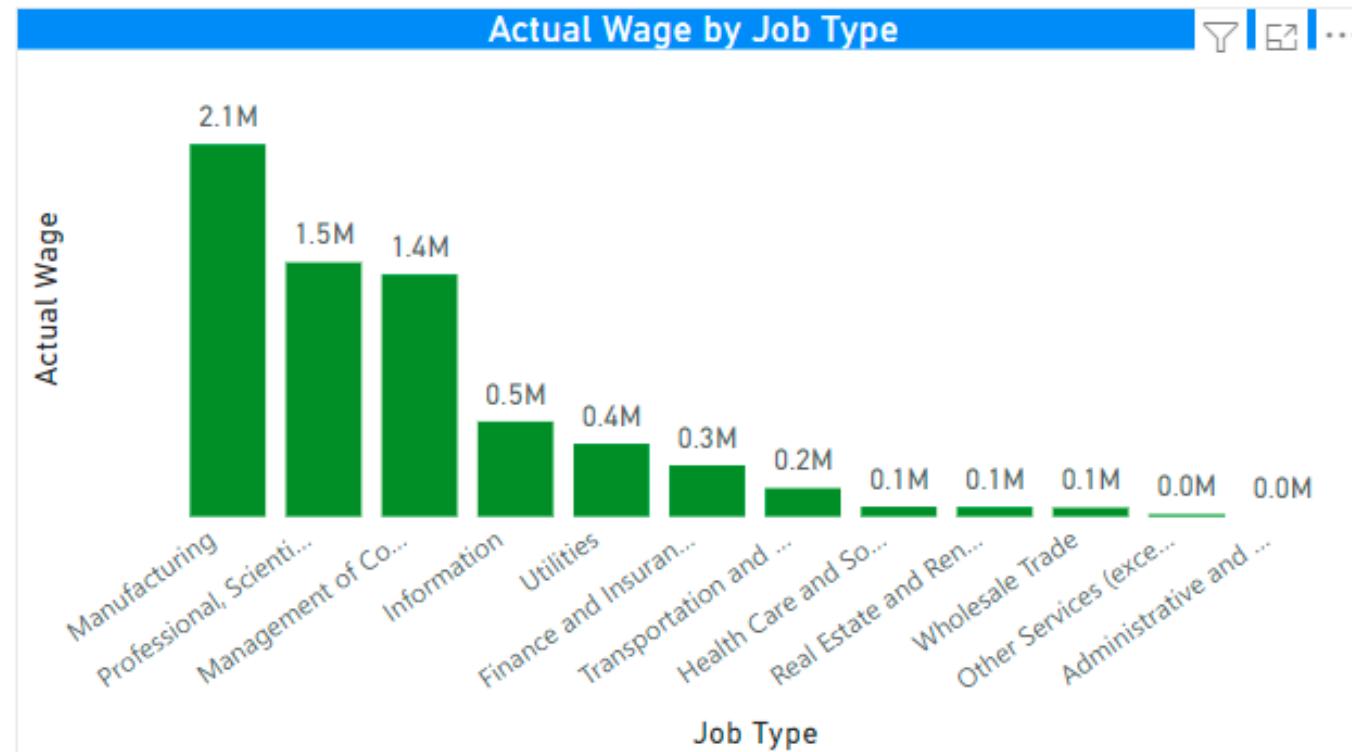


- Change the visual type to Clustered Column



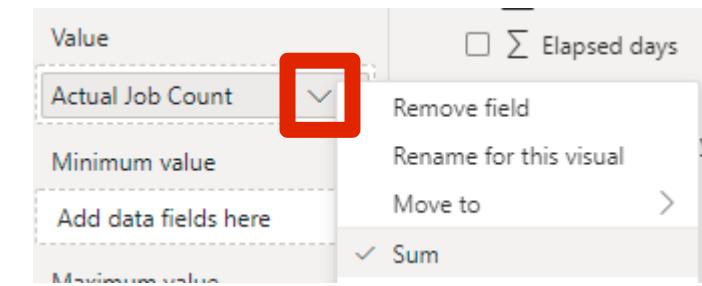
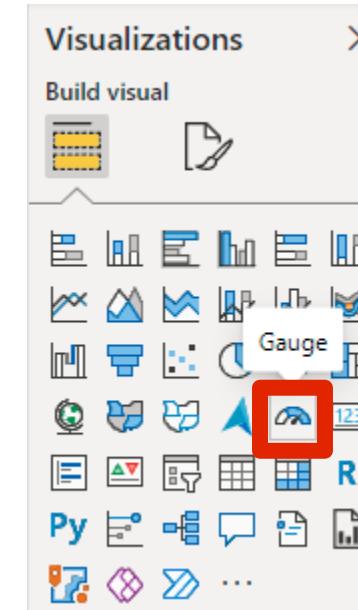
Class practice

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



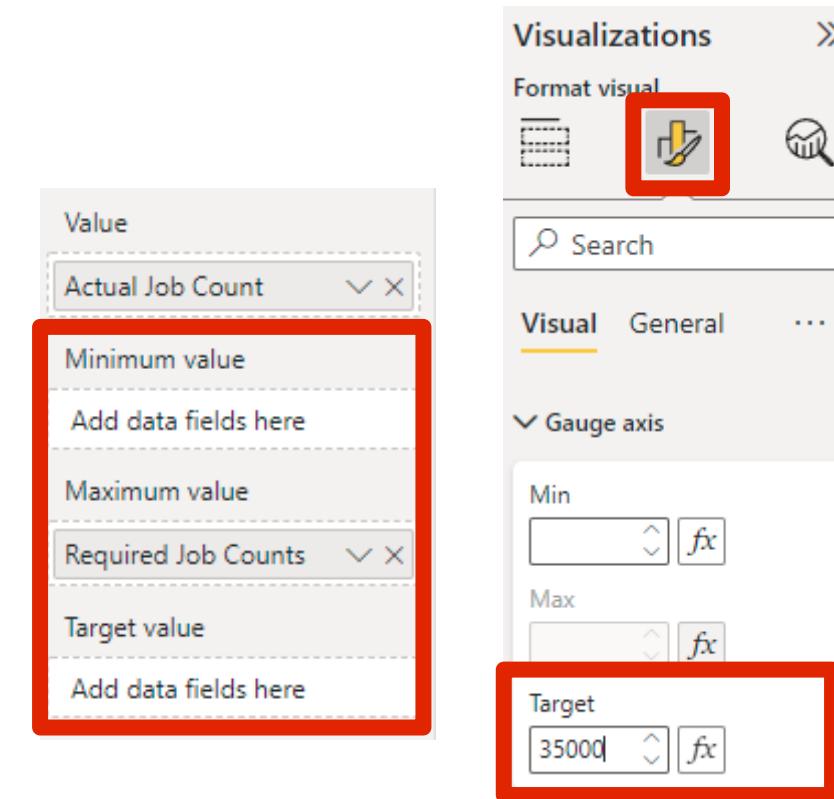
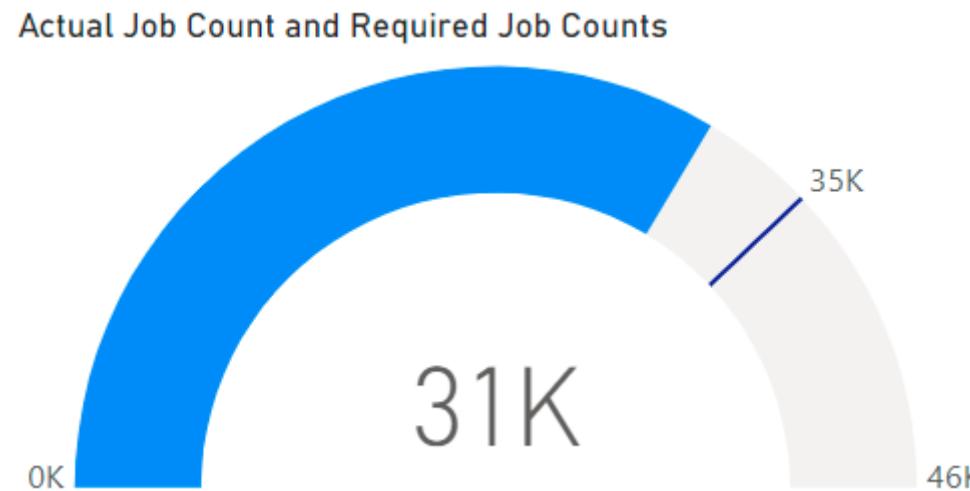
Radial gauge charts

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



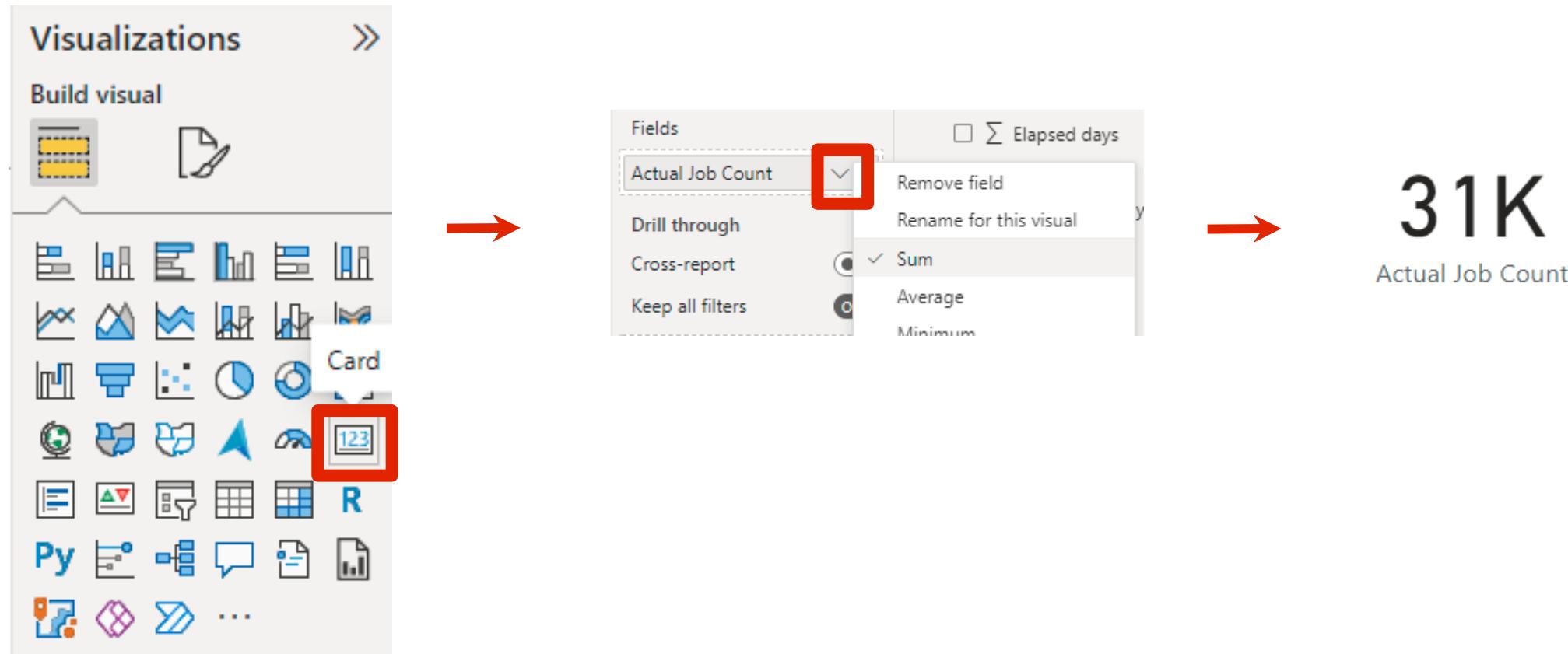
Formatting options for radial gauge

- You can add other fields to determine the maximum, minimum, and target value
- You can also use formatting options to customize these by just setting in a specific value
- Set Target at 35,000



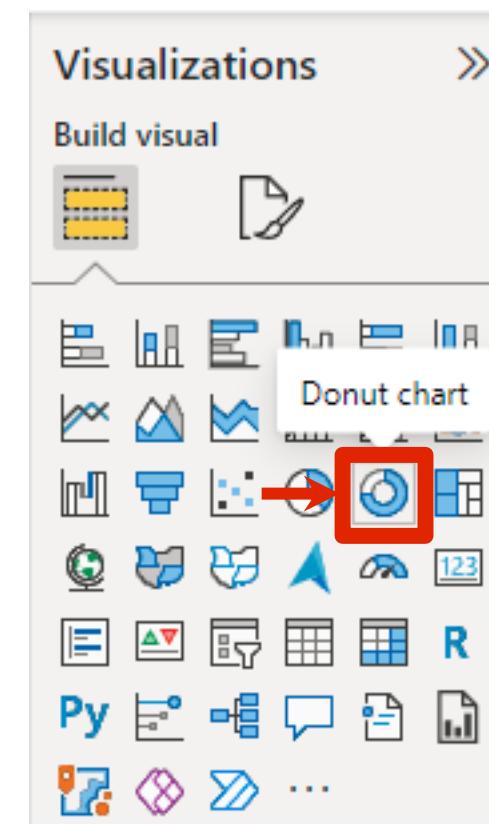
Card visualization

- 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

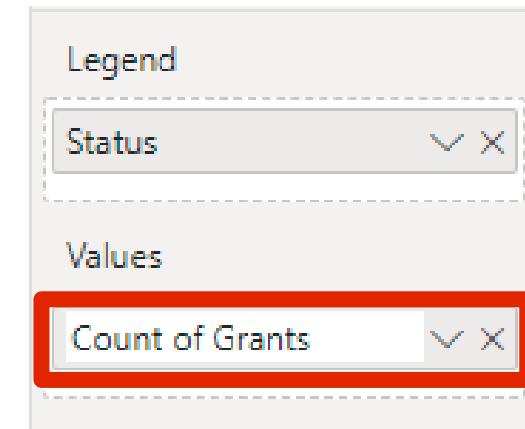
- A donut chart is like a pie chart in that it shows the relationship of parts to a whole
- The only difference is that the center is blank and allows space for a label or icon



The screenshot shows the 'Fields' pane for a donut chart. In the 'Values' section, 'Funding ID' is listed with a dropdown menu open. A red box highlights the dropdown arrow, and a red arrow points down to a context menu that includes options like 'Remove field', 'Rename for this visual', 'Move to', and various aggregation functions: Sum, Average, Minimum, Maximum, Count (Distinct), Count, Standard deviation, Variance, Median, Show value as, and New quick measure.

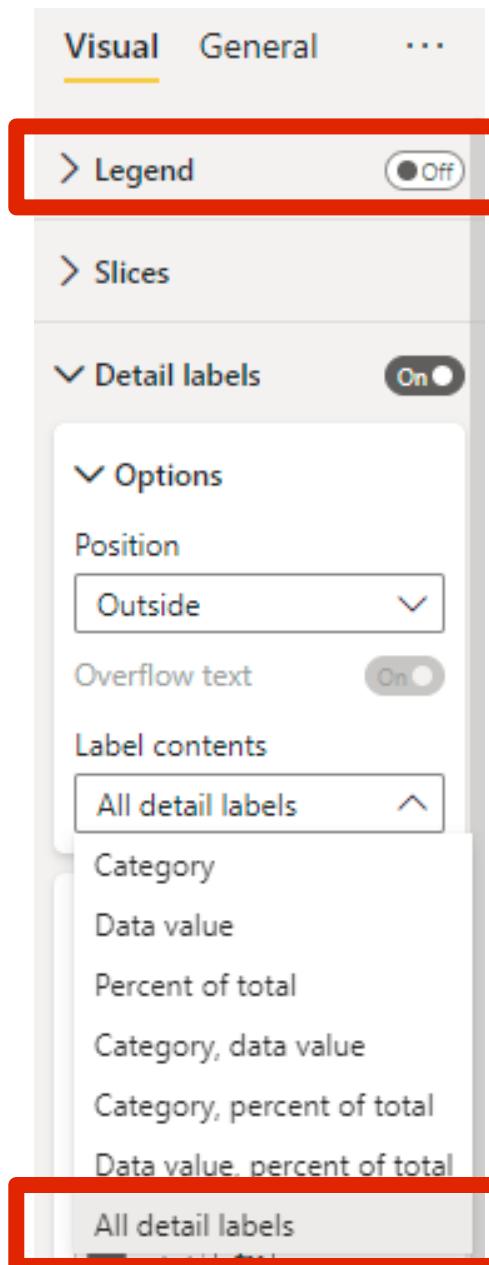
Rename a field

- 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



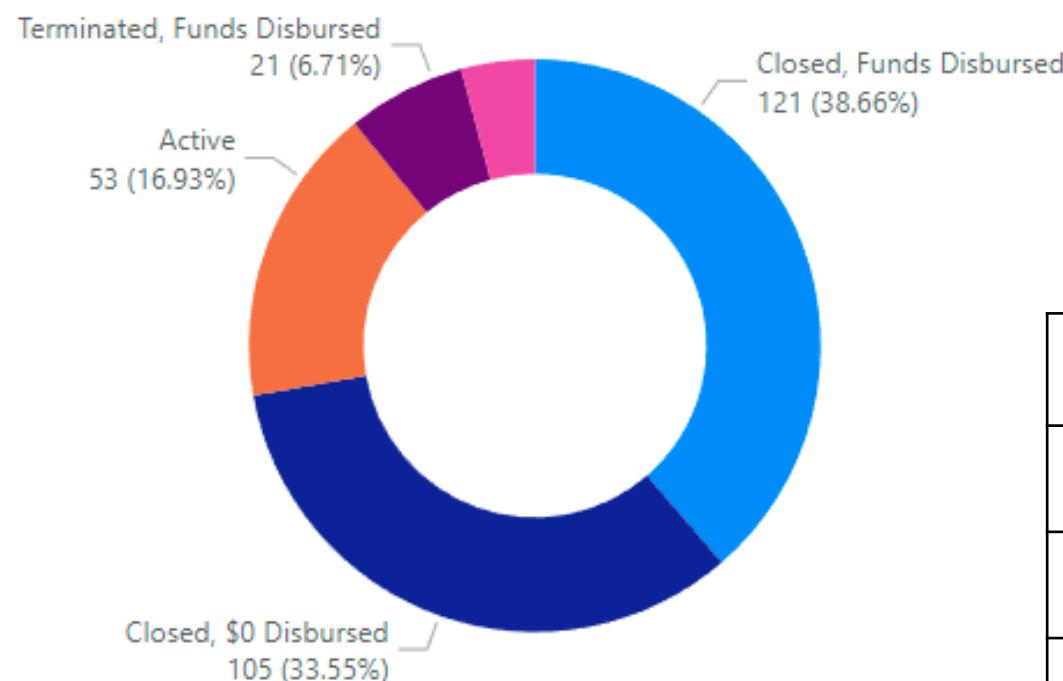
Alter the Detail Labels

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



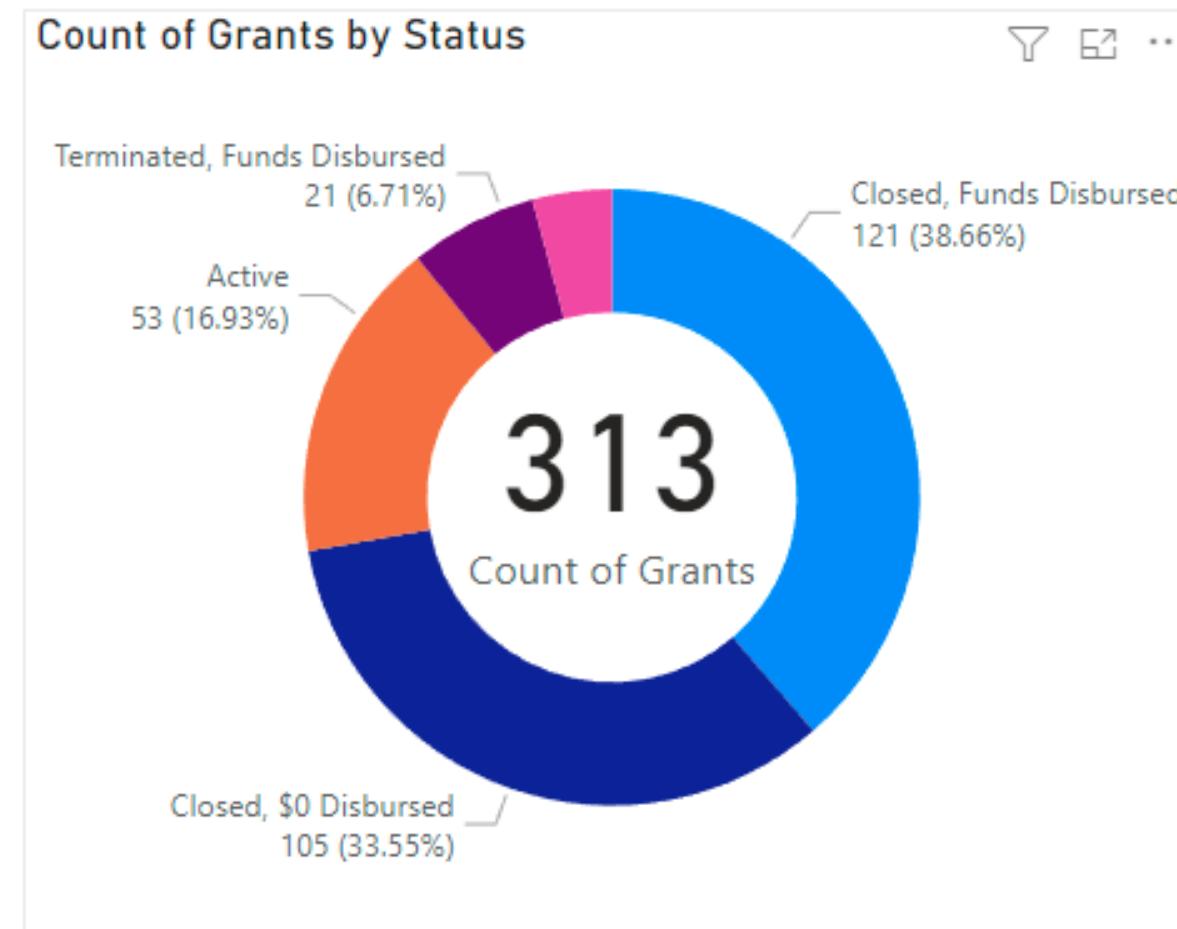
Donut chart

Count of Grants by Status



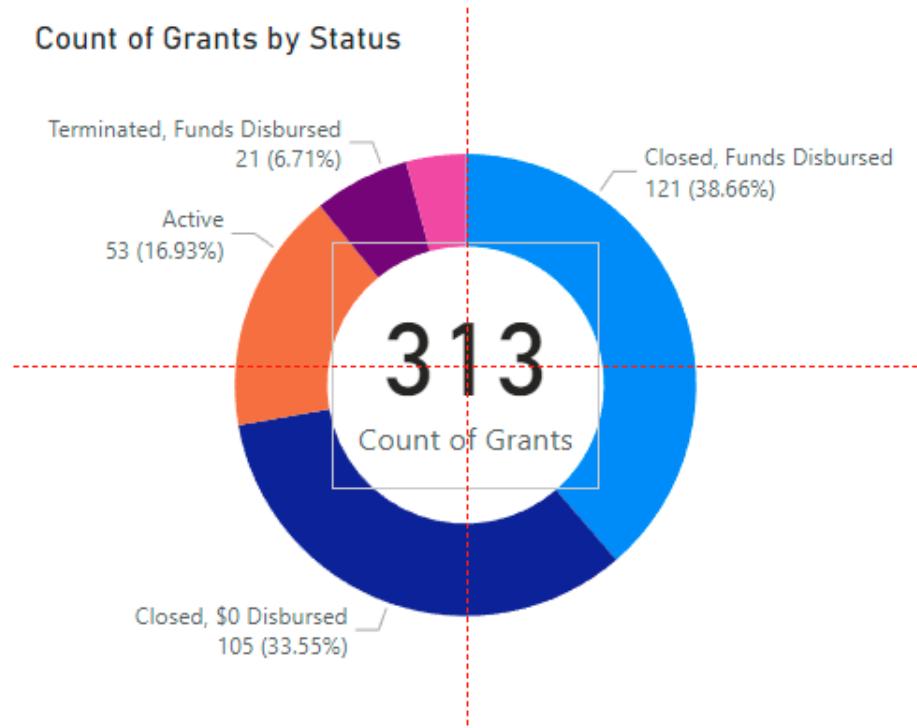
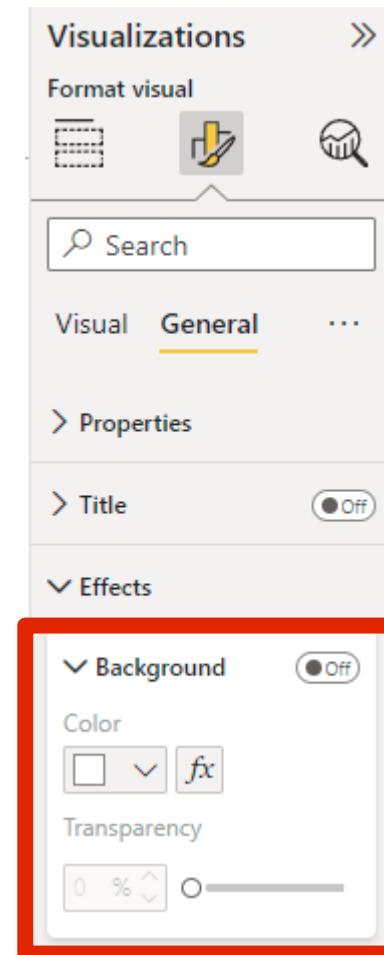
Legend	Status
Details	
Values	Count (Funding ID)
Tooltips	

Visual overlay example



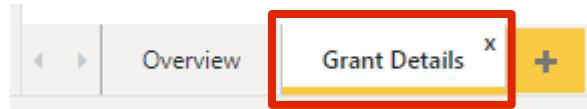
Edit visual background

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

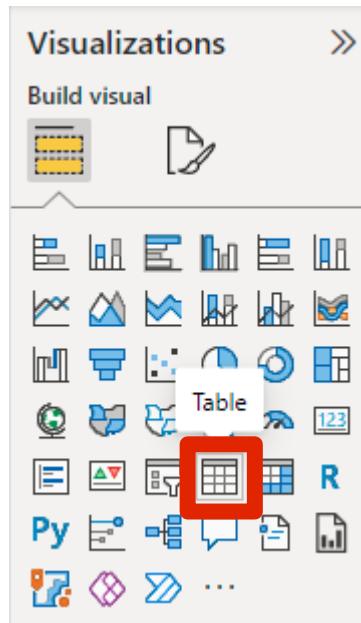


Create a detail table

- Create a new Page called 'Grant Details'



- Create a 'Table' Visual



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

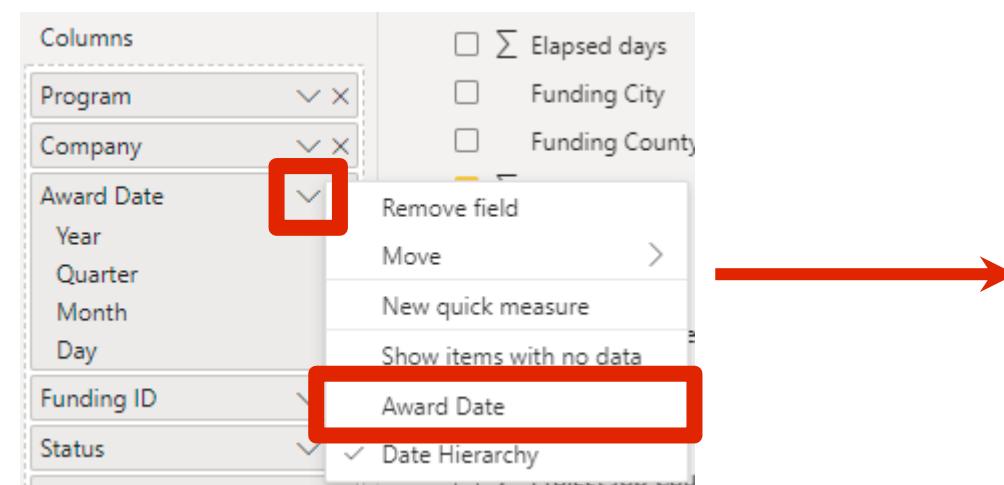
Values	Program
	Company
	Award Date
	Funding ID
	Status
	Actual Job Count
	Required Job Counts

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

- Click on the drop-down arrow by the 'Award Date' field under 'Values' of 'Visualization' Pane and change the 'Date Hierarchy' to 'Award Date'



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. (Dory)	Wednesday, January 20, 2010	1	Terminated, Funds Disbursed	199	260
JDIG	Caterpillar Inc. (Finn)	Monday, July 25, 2011	1	Terminated, \$0 Disbursed	0	225
JDIG	Caterpillar Inc. (Gills International, Inc.)	Tuesday, November 29, 2011	1	Terminated, Funds Disbursed	281	375
JDIG	Caterpillar Inc. (Services (USA) Inc.)	Thursday, June 03, 2010	1	Active	242	232



Create a detail table

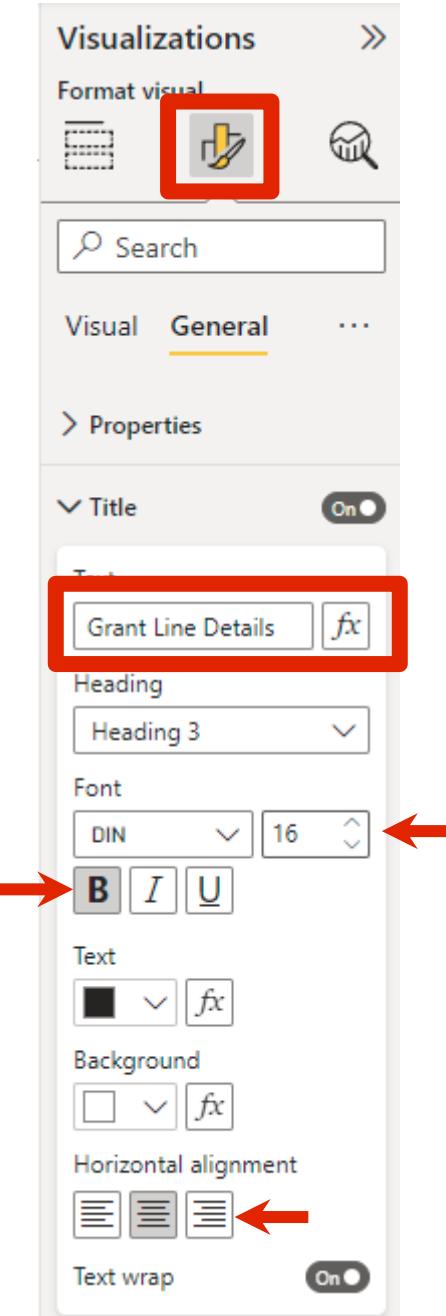
- Click on the triangle icon by the 'Funding ID' field under 'Values' of 'Visualization' Panel and change the calculation method from 'Count' to 'Don't summarize'

The screenshot shows the 'Values' panel in the Power BI visualization pane. A context menu is open over the 'Funding ID' field in the 'Columns' list. The menu items include: 'Remove field', 'Rename for this visual', 'Move', 'Add a sparkline', 'Conditional formatting', 'Remove conditional formatting', 'Don't summarize' (which is highlighted with a red box), 'Sum', 'Average', 'Minimum', 'Maximum', 'Count (Distinct)', 'Count' (which has a checkmark and is also highlighted with a red box), and 'Standard deviation'. A red arrow points from the 'Don't summarize' option 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



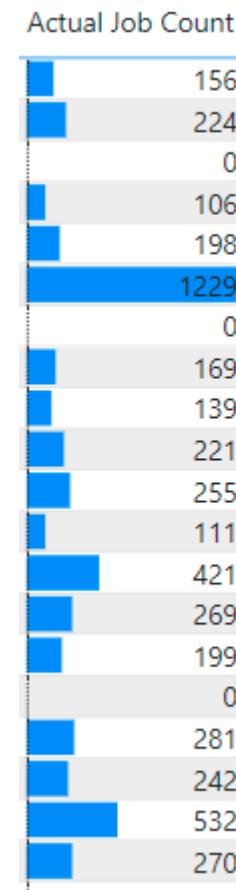
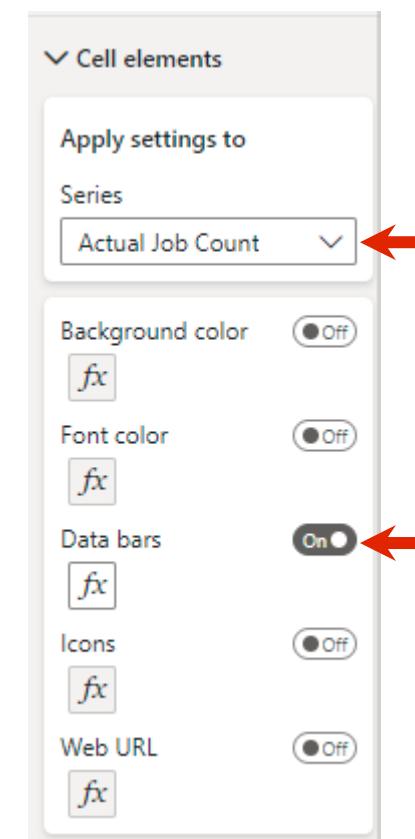
Conditional formatting

- 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. (Cap J)	Friday, July 30, 2010	259	Terminated, Funds Disbursed	269	353
JDIG	Caterpillar Inc. (Igala)	Wednesday, January 20, 2010	213	Terminated, Funds Disbursed	199	260
JDIG	Caterpillar Inc. (LII)	Monday, July 25, 2011	376	Terminated, \$0 Disbursed	0	225
JDIG	Caterpillar International, Inc.	Tuesday, November 29, 2011	406	Terminated, Funds Disbursed	281	375
JDIG	Caterpillar Services (USA) Inc.	Thursday, June 03, 2010	247	Active	242	232
JDIG	Caterpillar 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



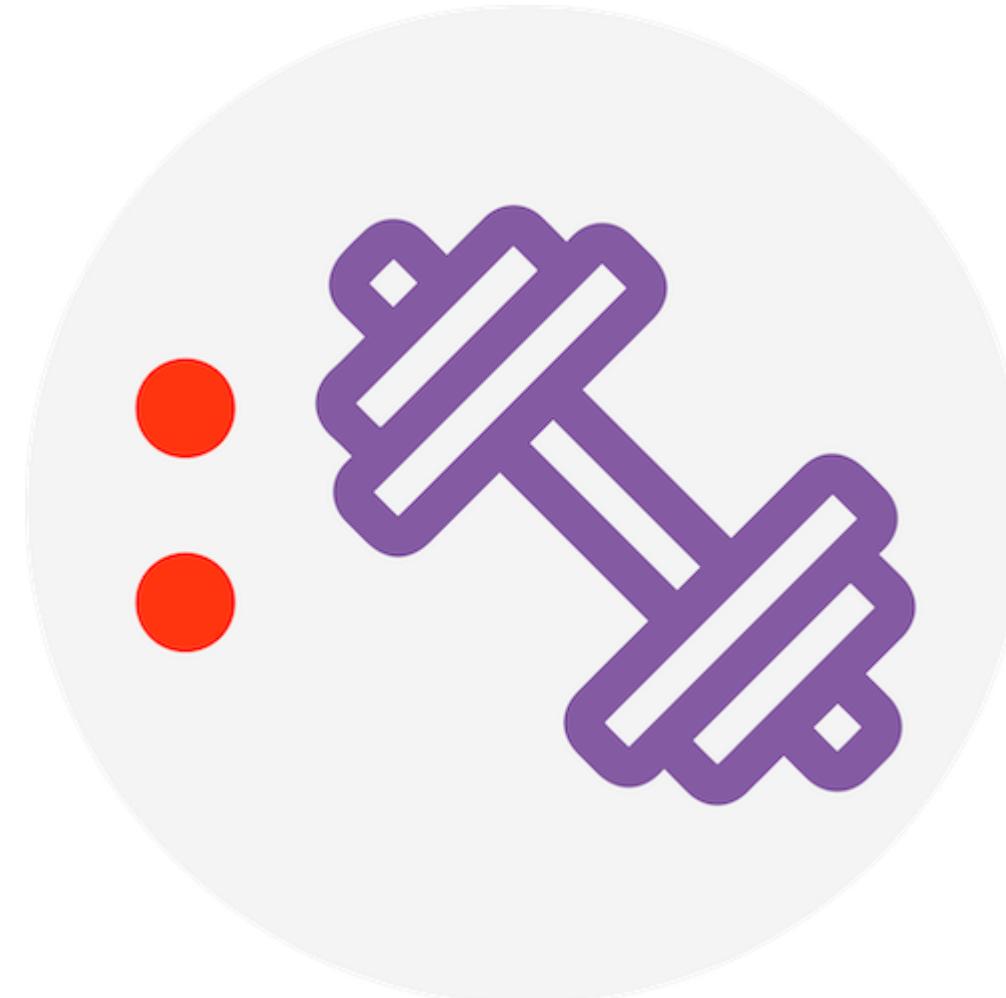
Formatted Grant Line Details Table

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
Total					30931	46110

Day 2 - Knowledge Check 1



Lab 2



Save Lab 2

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

Outline for today

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

Objectives for Lab 2: Continued

- Understanding and utilizing filters to analyze your data
- Learn how to create custom and interactive visuals

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

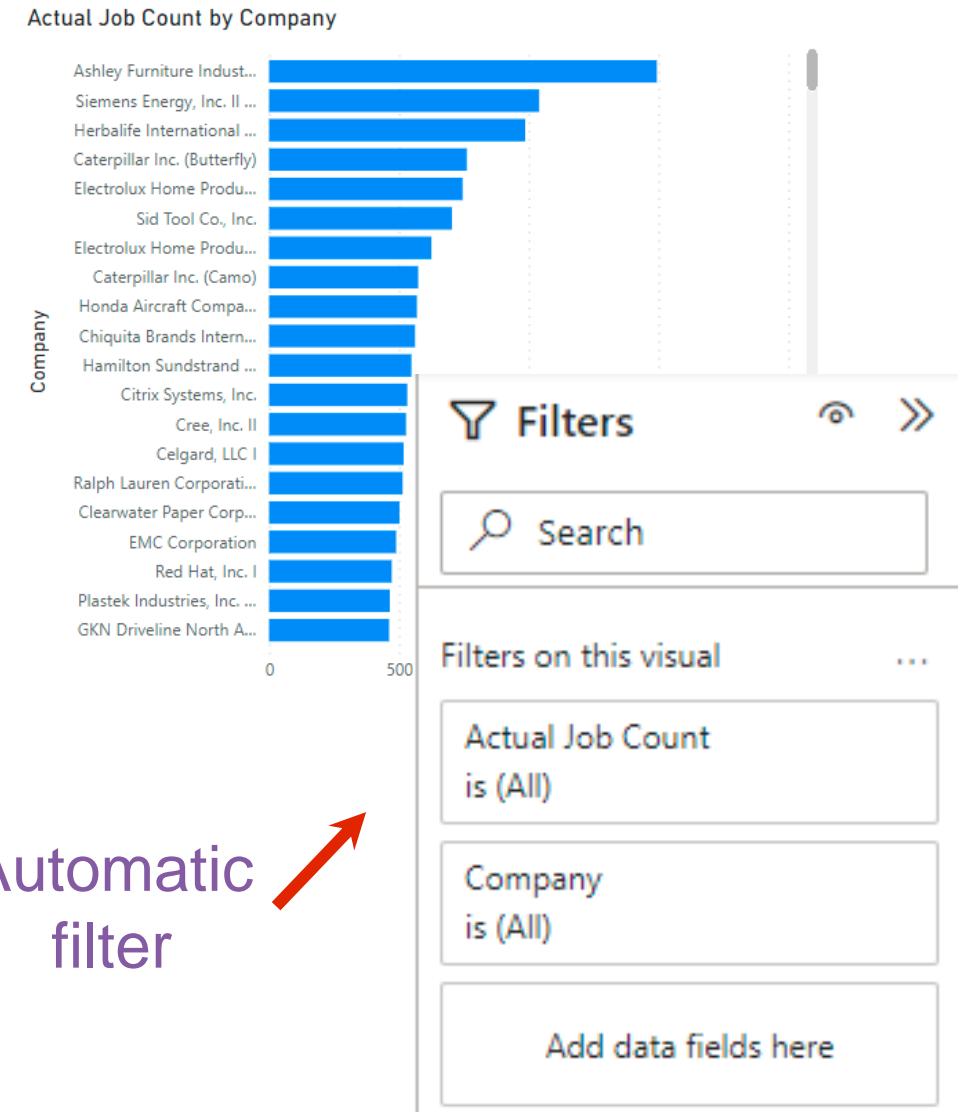
The NC state government gave \$400,000,000 in grant money from 2009 to 2013. The grant manager from the NC office of grants is interested to know how many jobs were created in each funded county from 2009 to 2013. With this information, the grants manager will be able to see where the grant money made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

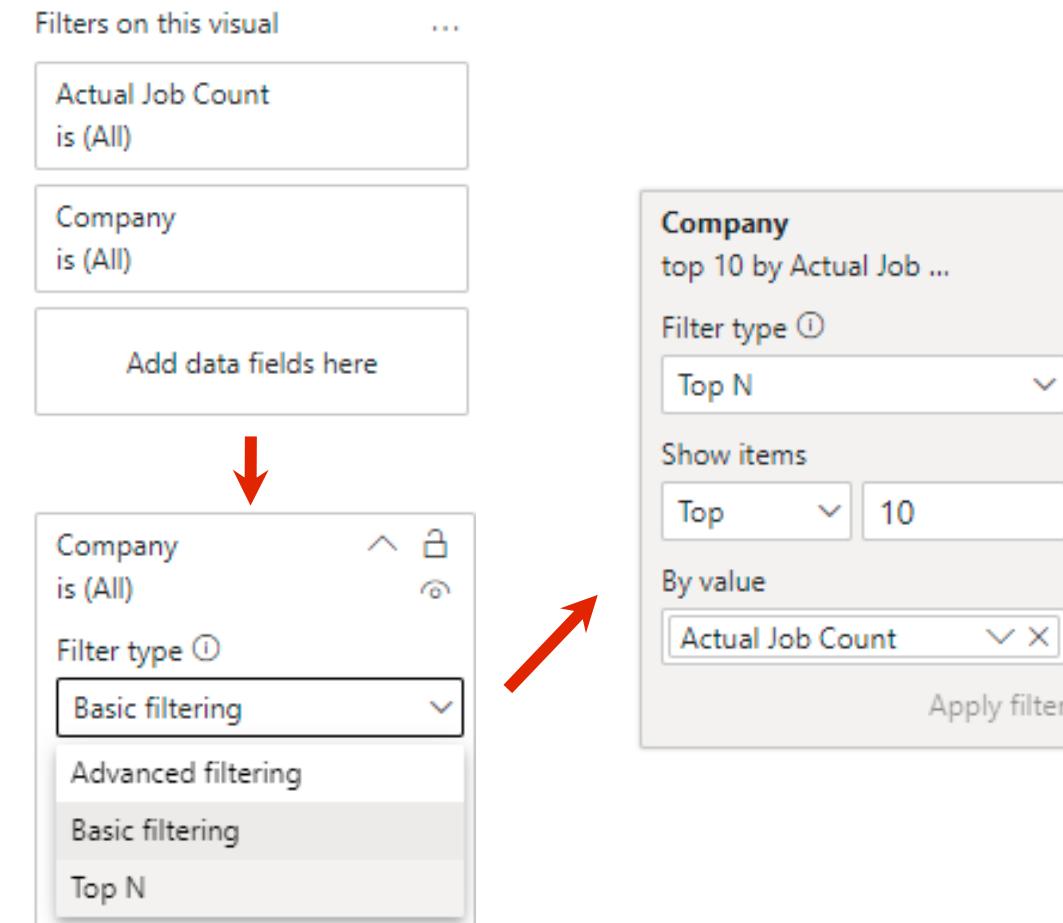
Using Visual Filter

- **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

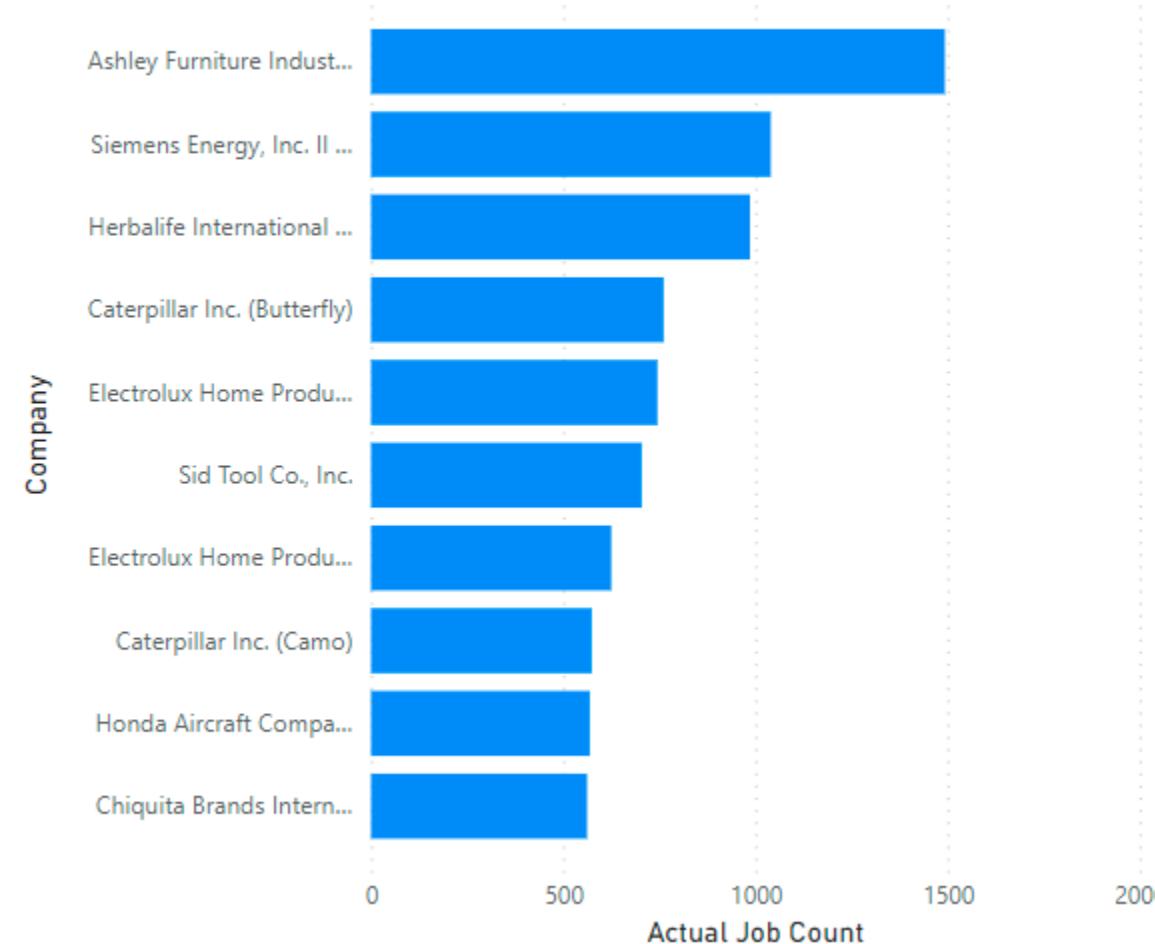
- Click on the drop-down arrow on the right of 'Company' in the Visual Level filters section
- Choose 'Top N' under Filter Type
- Then put 10 after 'Show Items:' Top
- Drag 'Actual Job Count' from Fields Pane to 'By value' well
- Click 'Apply filter'
- Rename visual to reflect Top 10 filter
- Rename the page to 'Company Review'



Investigate the data

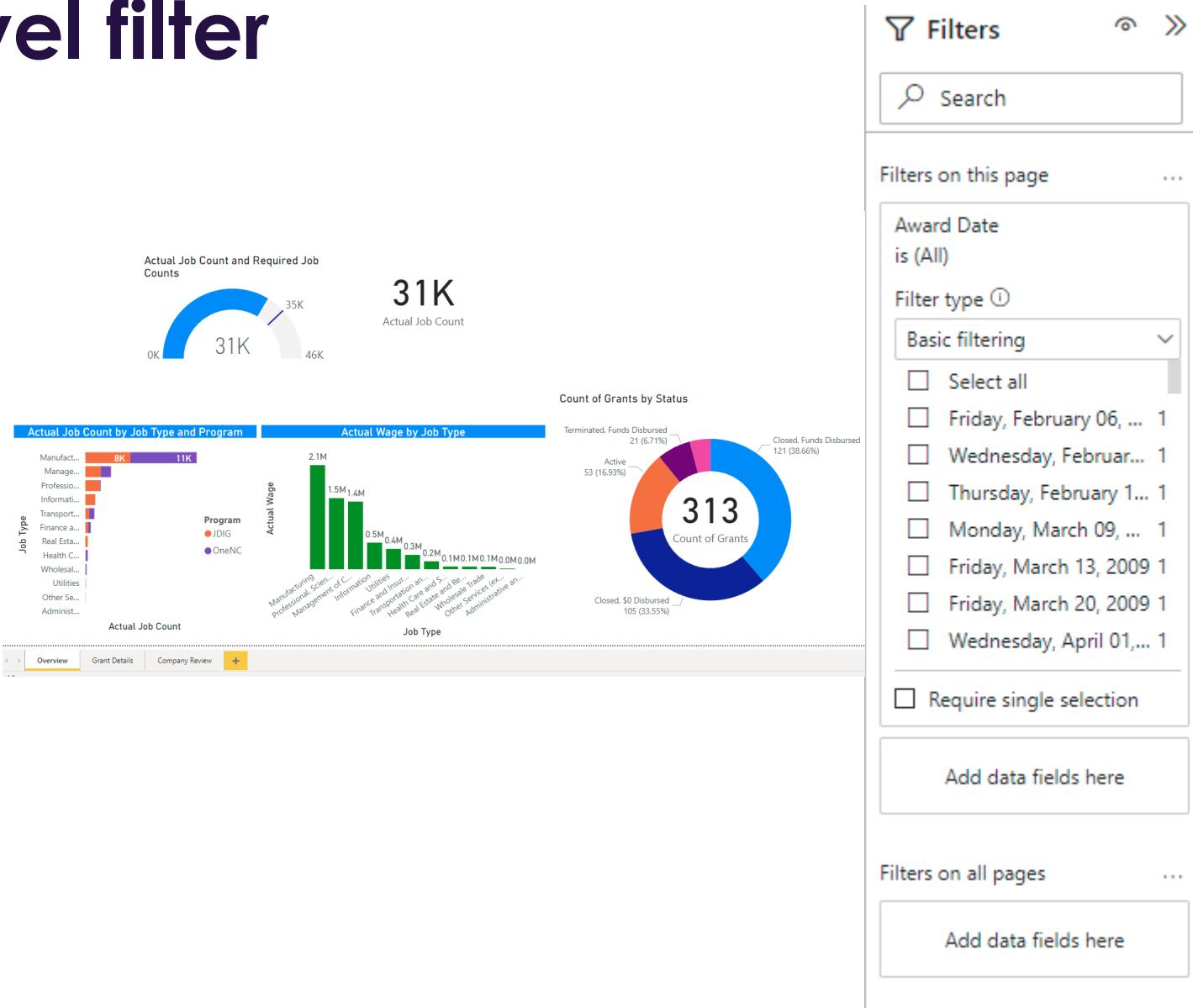
- Which top 10 Companies created the most jobs?

Actual Job Count by Company



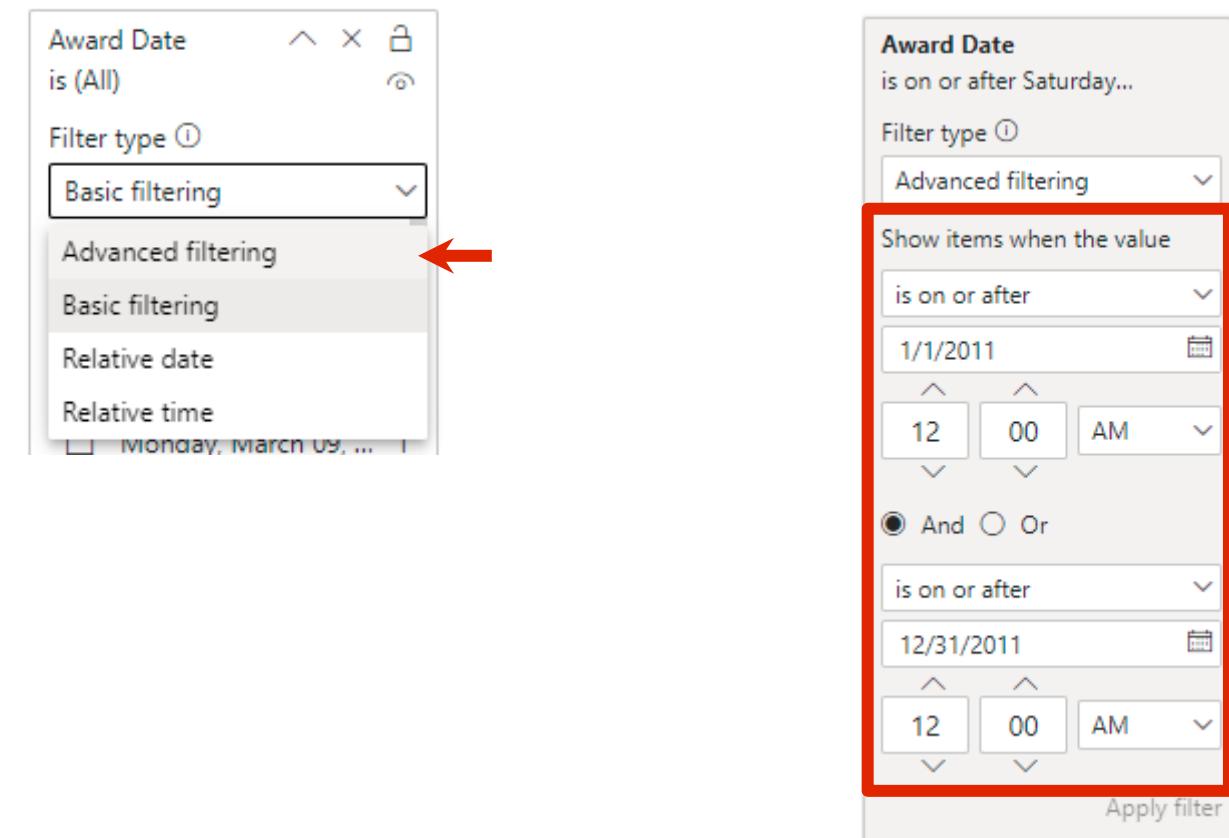
Using a Page Level filter

- 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'



Filter by 'Award Date'

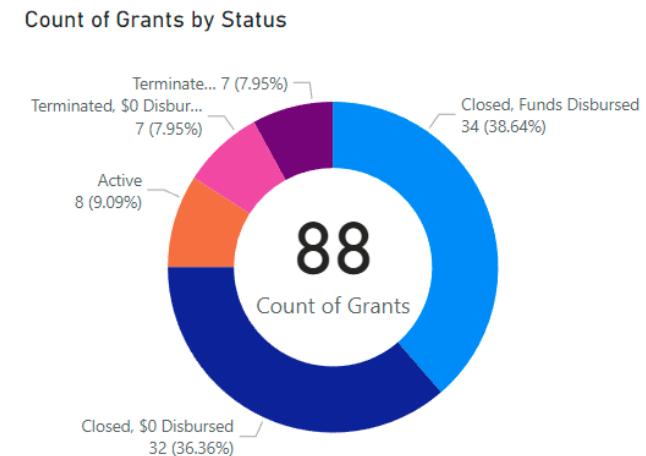
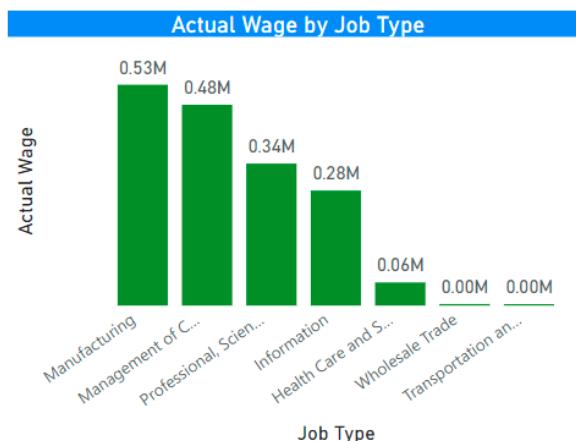
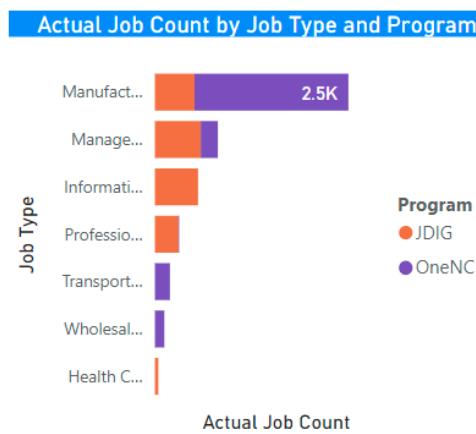
- Choose 'Advanced filtering' under Filter Type
- Put Show items when the value:
Is on or after 1/1/2011
And
Is on or before 12/31/2011



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

Filters on all pages ...

Total Award

is greater than or equ...

Filter type ⓘ

Advanced filtering

Show items when the value

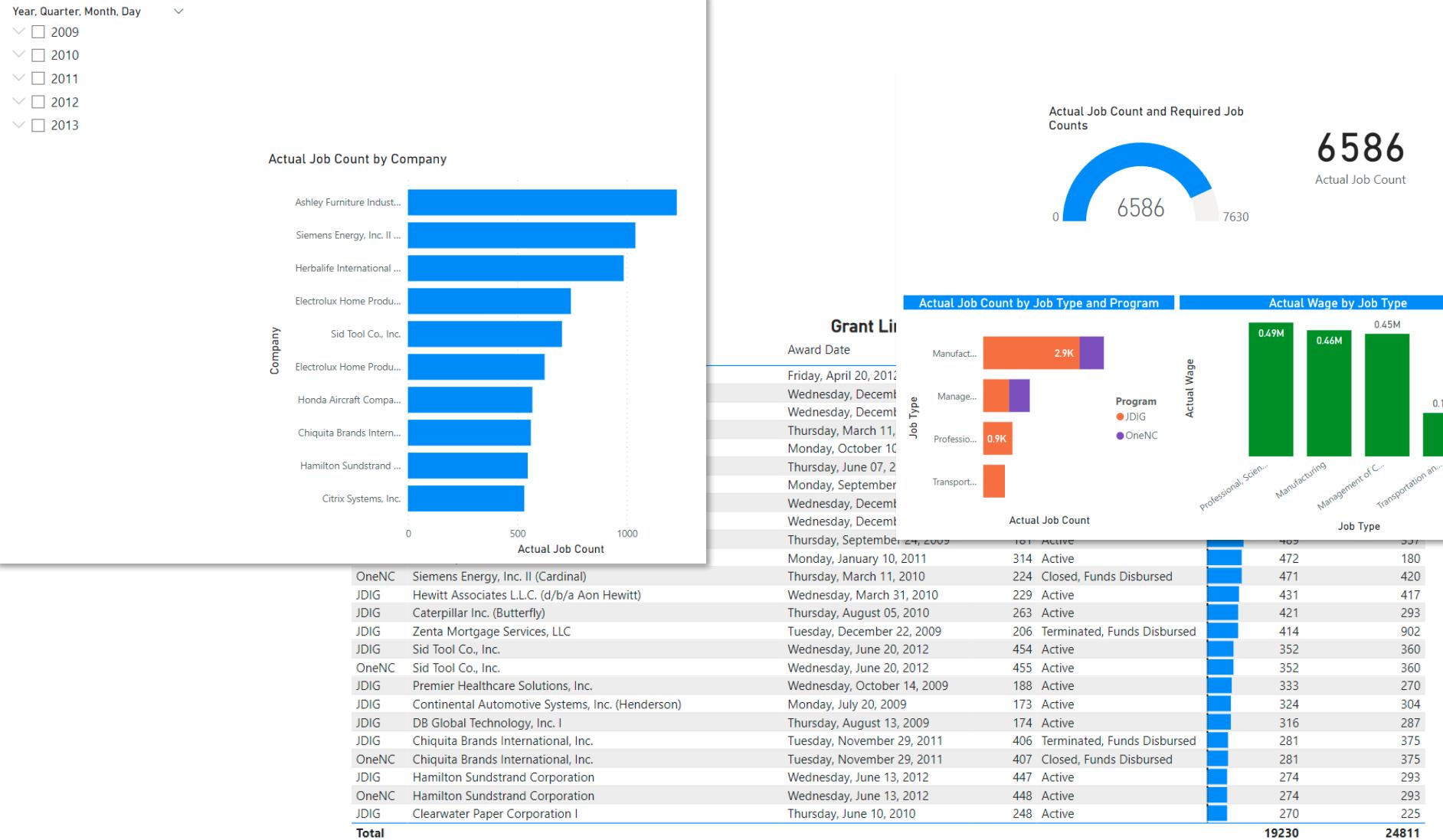
is greater than or equal to

1000000

And Or

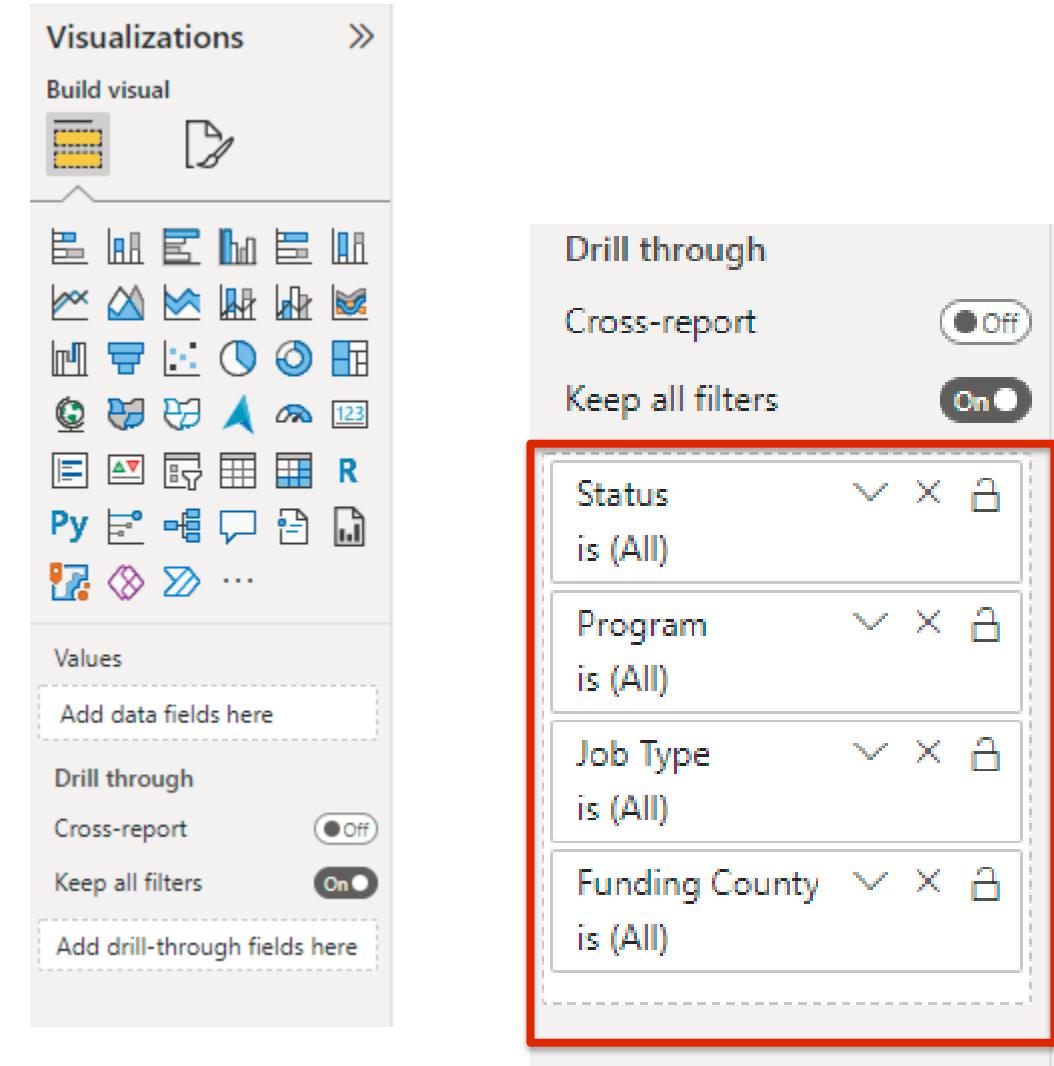
Apply filter

Filtered by 'Total Award Amount'



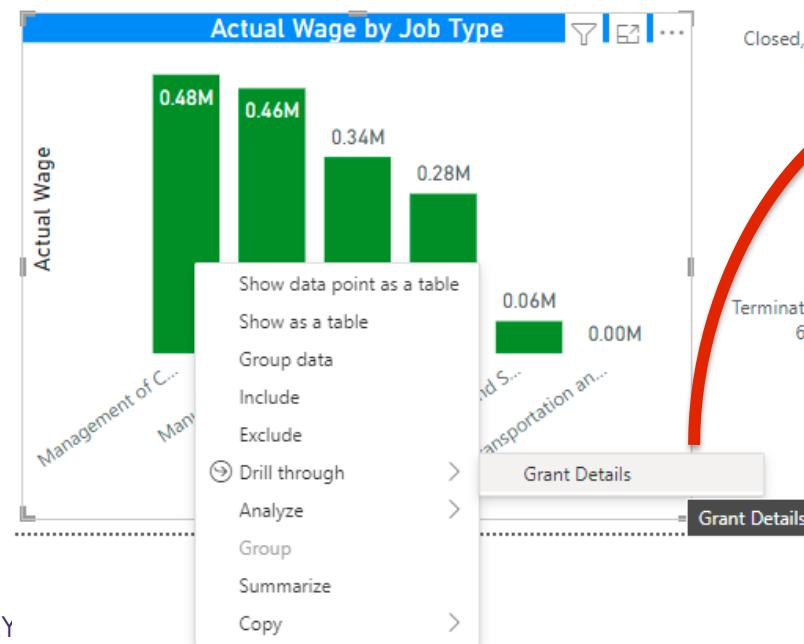
Using the Drill through filter

- Add Drill through filters to 'Grant Details' table Visual in the 'Grant Details' page
- Drill through filter is under the 'Visualization' panel. You can drag fields to this section just like other type of filter
- Drag 'Status', 'Program', 'Job Type' and 'Funding Count' under the 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	Actual Job Count	Required Job Counts
JDIG	Chiquita Brands International, Inc.	Tuesday, November 29, 2011	406	Terminated, Funds Disbursed	281	375
OneNC	Chiquita Brands International, Inc.	Tuesday, November 29, 2011	407	Closed, Funds Disbursed	261	375
JDIG	TWC Administration LLC (III)	Monday, July 11, 2011	368	Active	229	203
JDIG	ESA Management, LLC	Wednesday, March 30, 2011	335	Active	209	153
JDIG	LORD Corporation	Tuesday, July 12, 2011	369	Terminated, Funds Disbursed	38	117
JDIG	Compass Group USA, Inc.	Monday, June 20, 2011	360	Terminated, \$0 Disbursed	0	180
Total					1038	1403

Grant Line Details

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

JDIG Chiquita Brands International, Inc. Tuesday, November 29, 2011 406 Terminated, Funds Disbursed 281 375

OneNC Chiquita Brands International, Inc. Tuesday, November 29, 2011 407 Closed, Funds Disbursed 261 375

JDIG TWC Administration LLC (III) Monday, July 11, 2011 368 Active 229 203

JDIG ESA Management, LLC Wednesday, March 30, 2011 335 Active 209 153

JDIG LORD Corporation Tuesday, July 12, 2011 369 Terminated, Funds Disbursed 38 117

JDIG Compass Group USA, Inc. Monday, June 20, 2011 360 Terminated, \$0 Disbursed 0 180

Total 1038 1403

Drill through

Cross-report

Keep all filters

Funding County
 is (All)

Job Type
 is Management of...

Program
 is (All)

Status
 is (All)

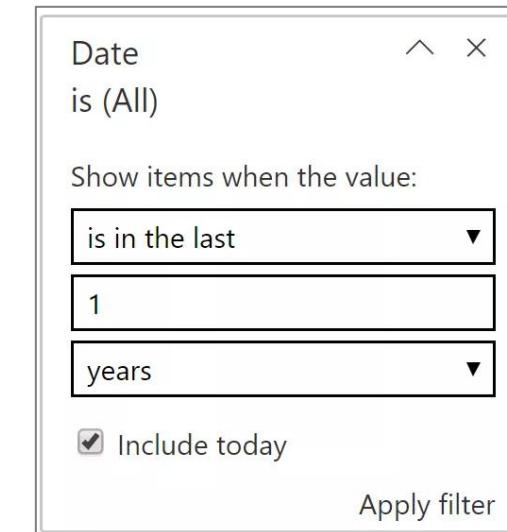
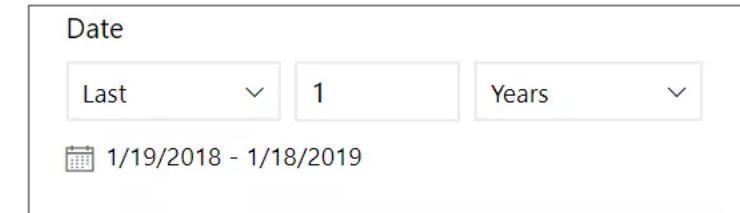
Award Date
 is on or after Saturday...

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

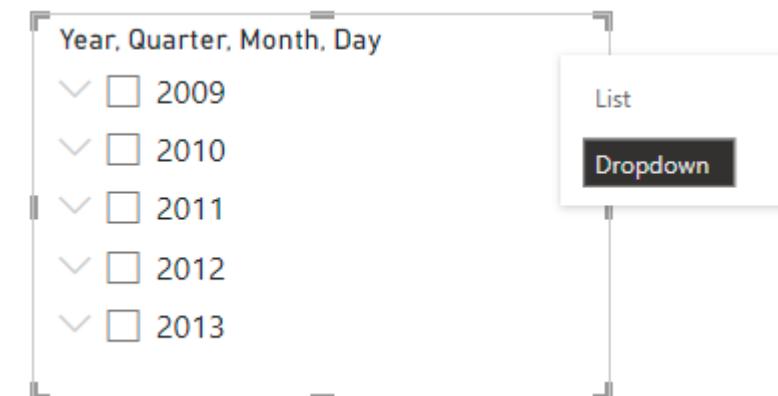
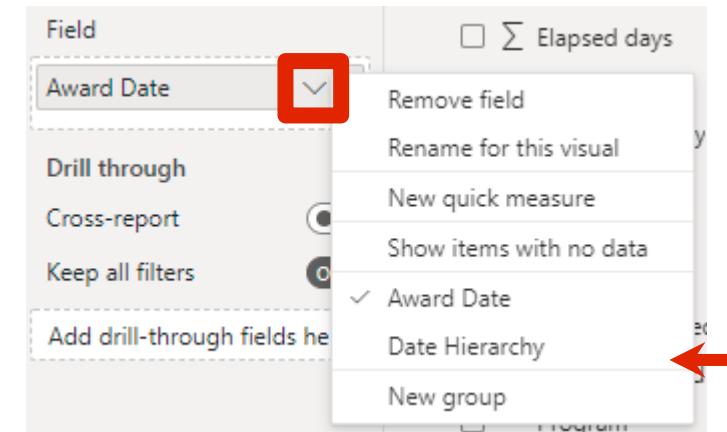
Facts to remember about slicers

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



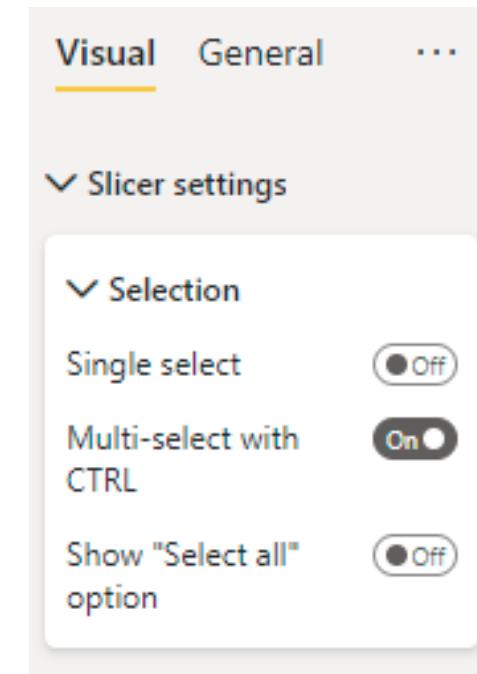
Using slicers

- Create a slicer visual and add the Award Date field to it
- Click the drop-down arrow to the right of the Award Date field name in the Field well
- You can then change the date field to 'Date Hierarchy'
- In the top right corner of the slicer, click the drop-down arrow and change the slicer type to Dropdown



Formatting the visual with Slicer

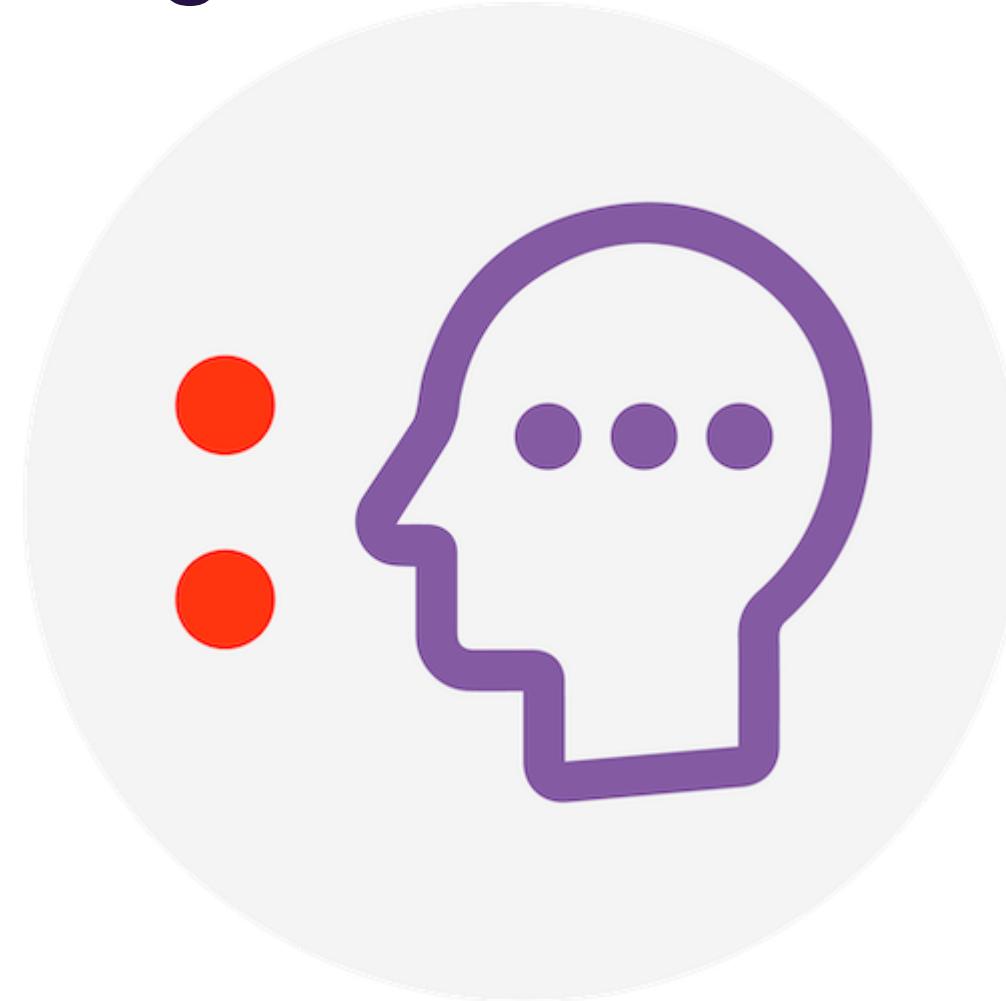
- Clear Page-level date filters
- Review different formatting options
- Single select = radio button
 - 2011
- Multi-select with CTRL (default on) allows multiple selections holding down the CTRL key on the keyboard
 - 2011
 - 2011
- Show “Select all” option allows for easy select all, then hold down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



A visual titled 'Year, Quarter, Month, Day' is displayed. A dropdown menu titled 'Multiple selections' is open, showing a list of years from 2009 to 2013. The 'Select all' checkbox is unchecked. The years 2009, 2010, 2011, 2012, and 2013 each have a checkbox next to them, with 2011 being checked.

Year
Select all
2009
2010
2011
2012
2013

Day 2 - Knowledge Check 2



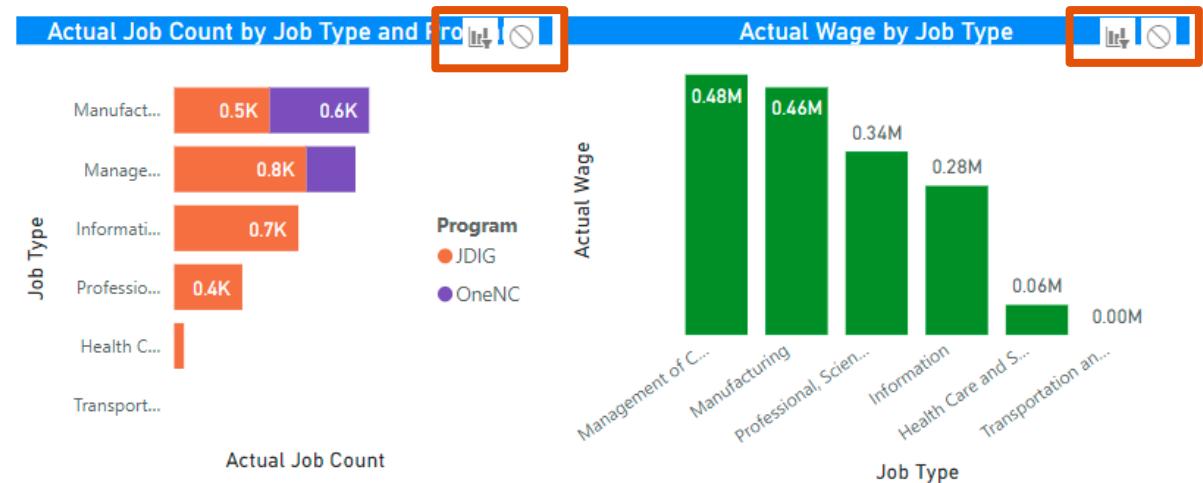
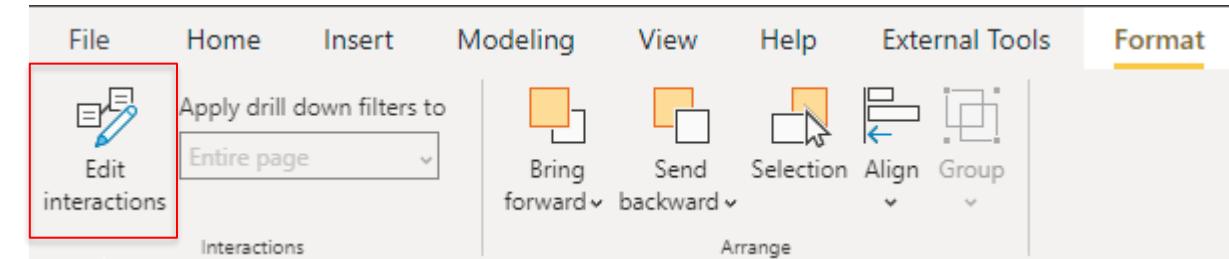
Objectives for Lab 2: Continued

- Understanding and utilizing filters to analyze your data
- Learn how to create custom and interactive visuals

Using interactive visuals

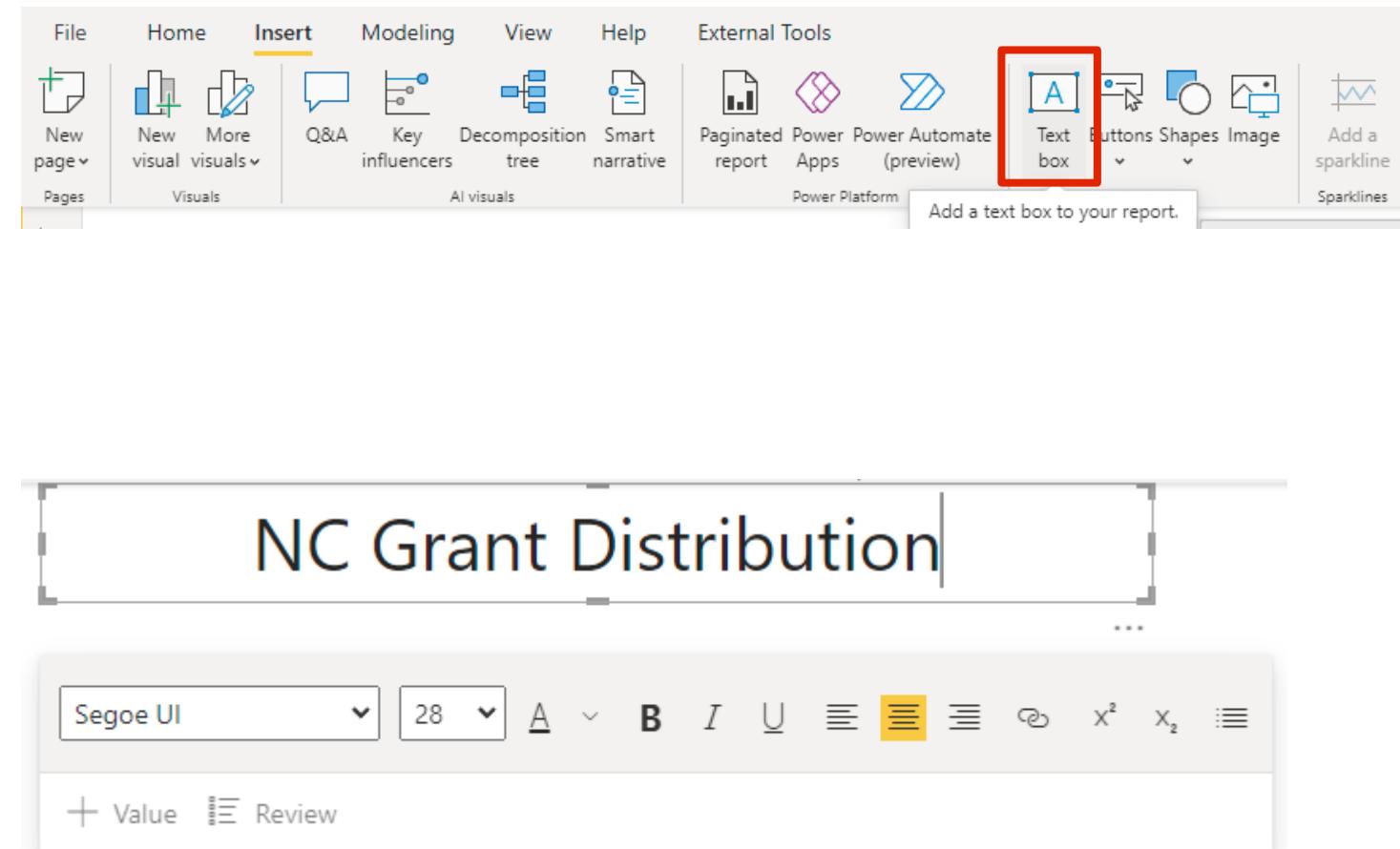
Interactive visuals give your audience an opportunity to explore and dig into your data

- 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 no impact icon



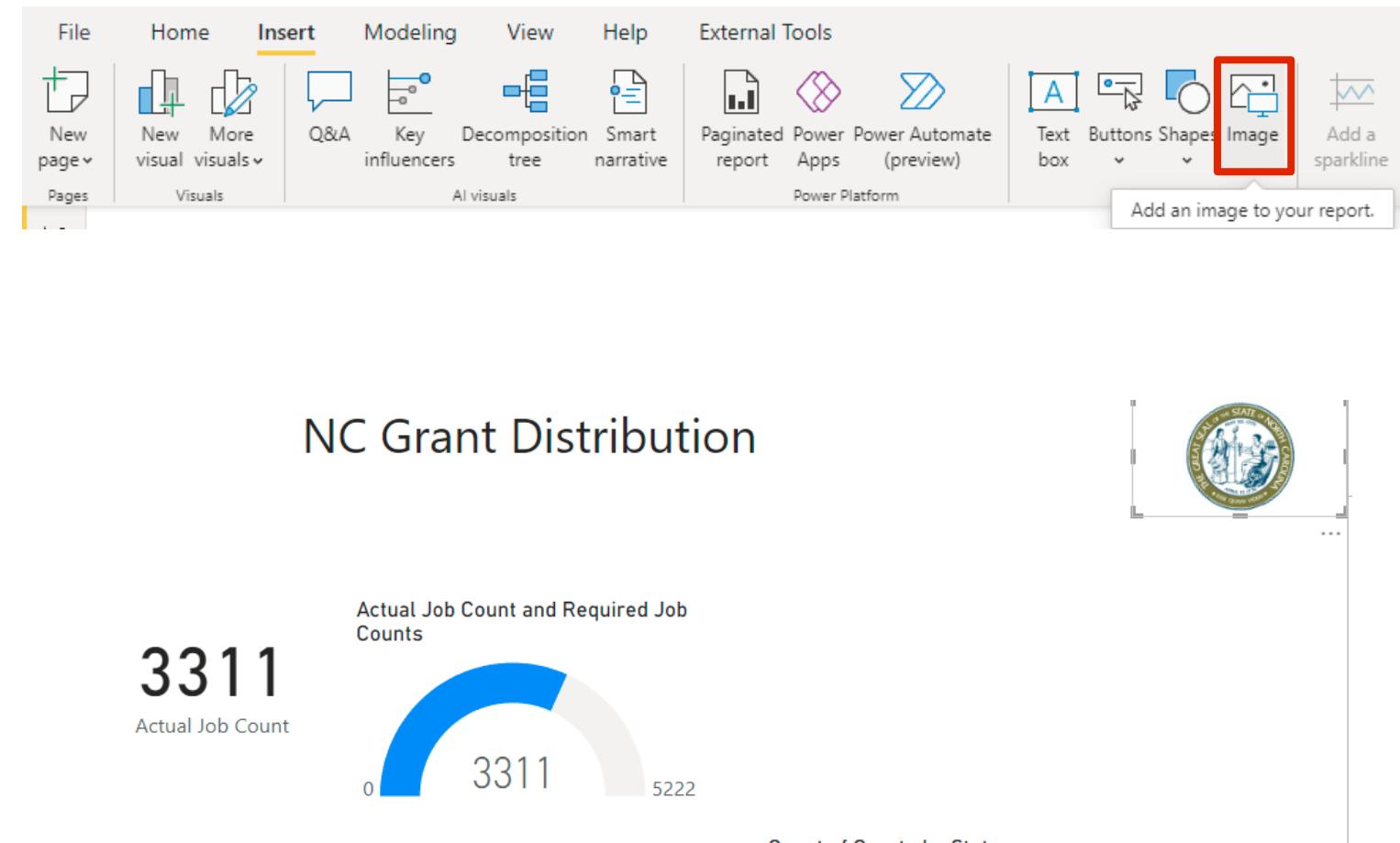
Add page title

- 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

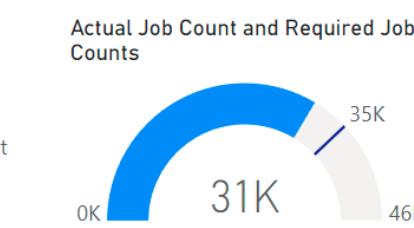
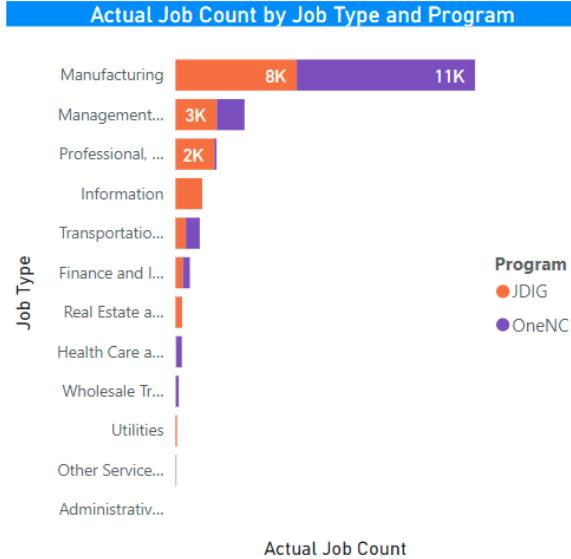
- On the 'Insert' tab of the Ribbon, click Image
- Navigate to the class files and select the NC state seal.jpg
- Resize and place it in the top right corner of the report



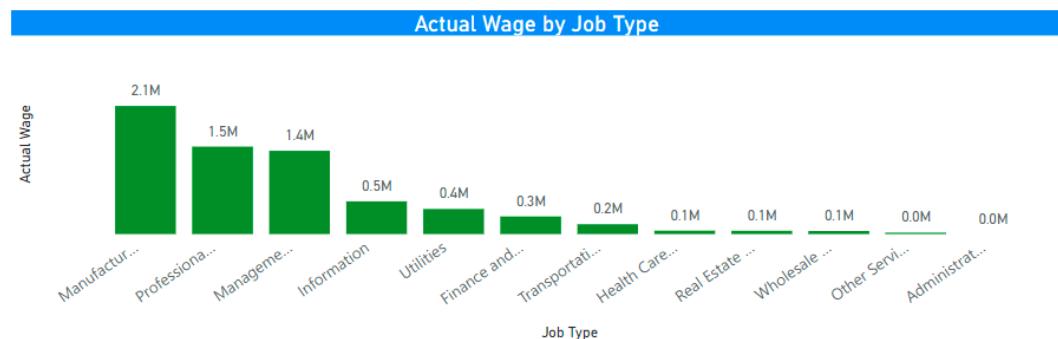
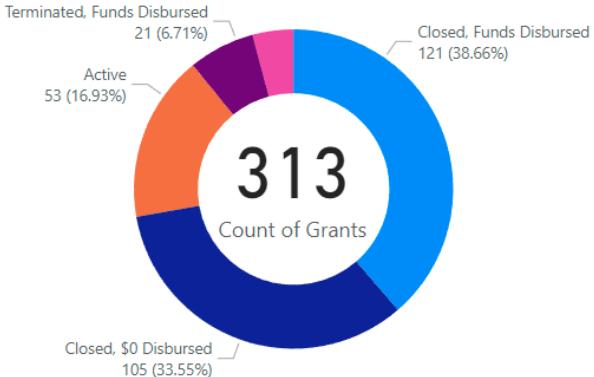
Almost done!

Year, Quarter, Month, Day
All

31K
Actual Job Count

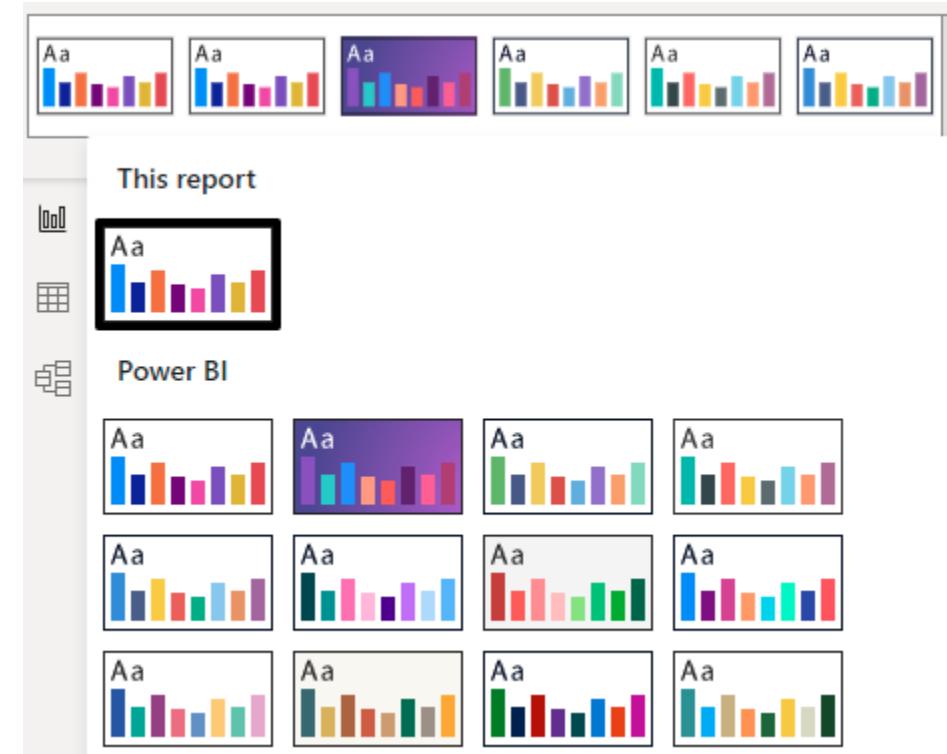


Count of Grants by Status



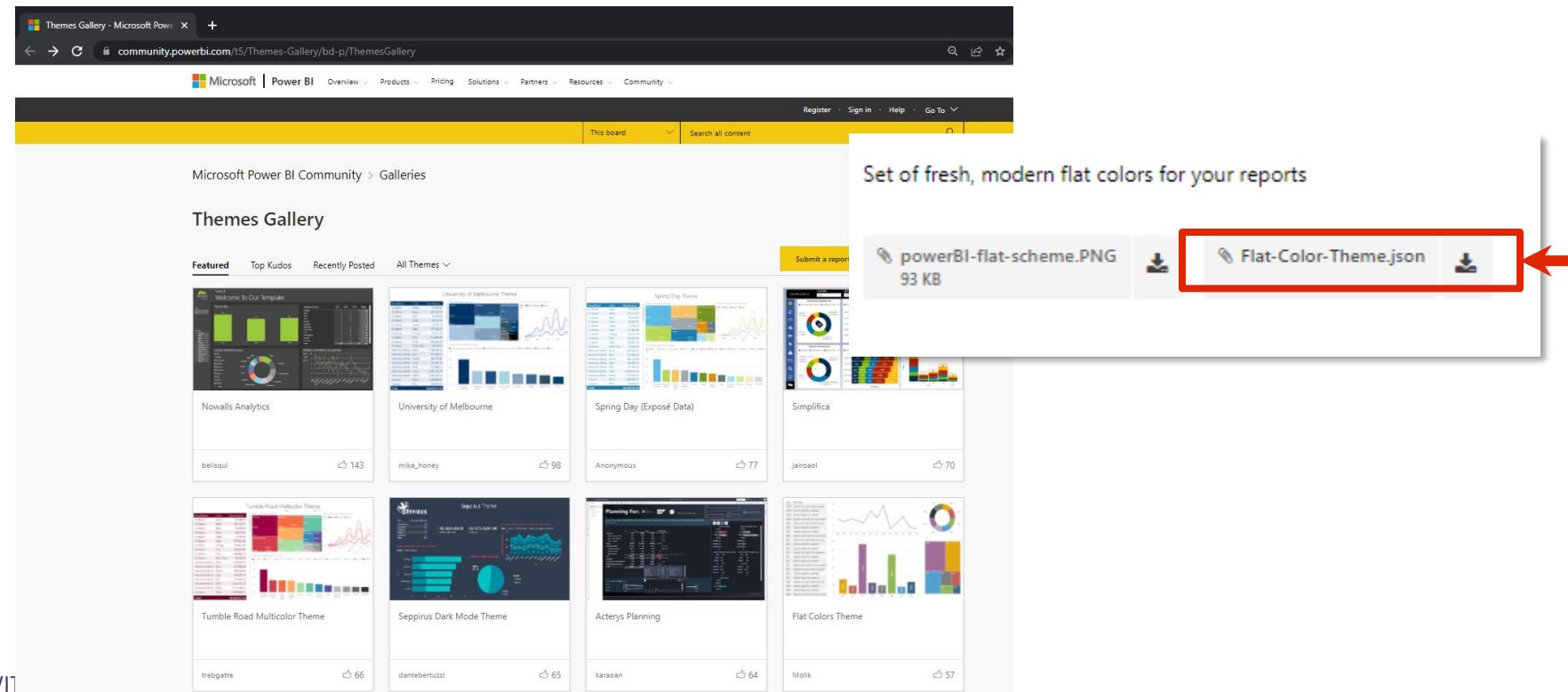
Power BI report themes

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



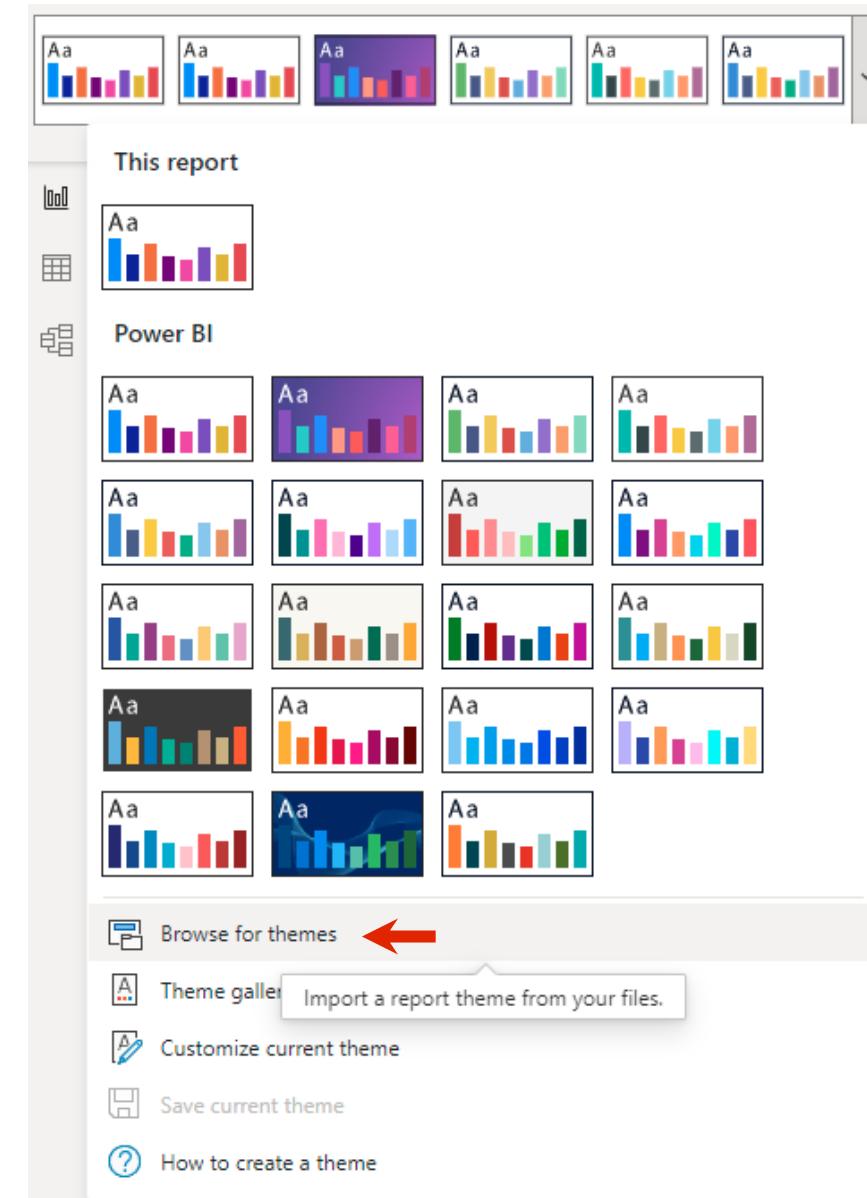
Change your report theme

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

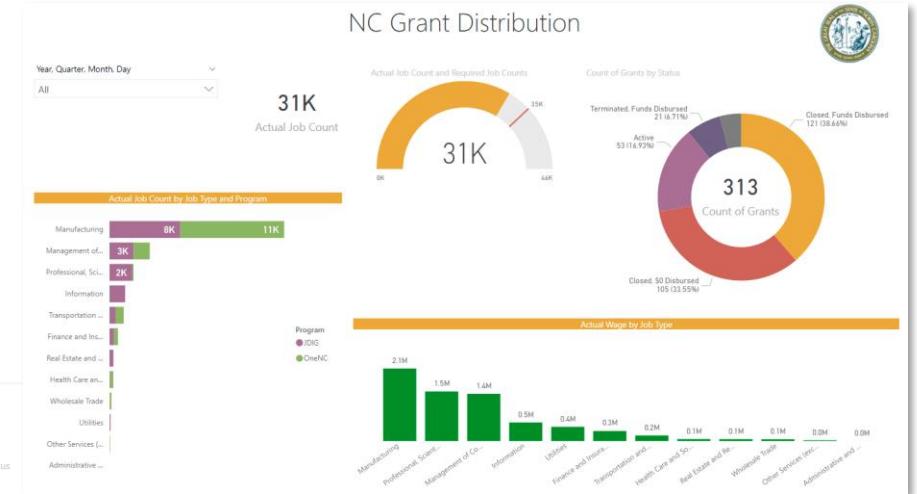
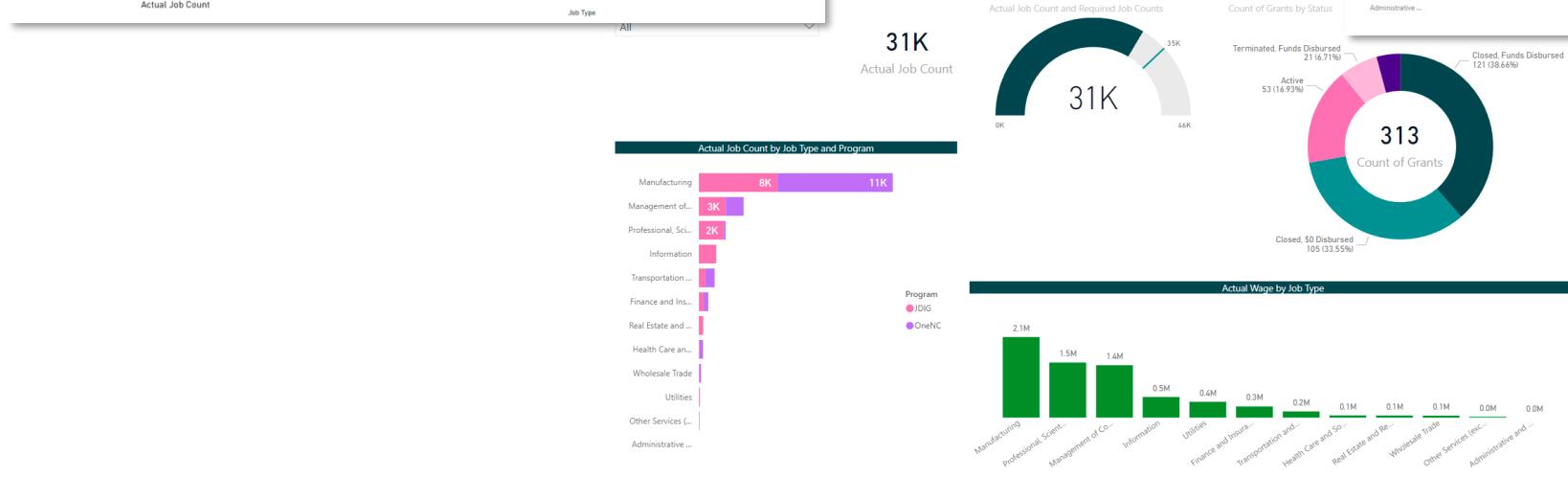
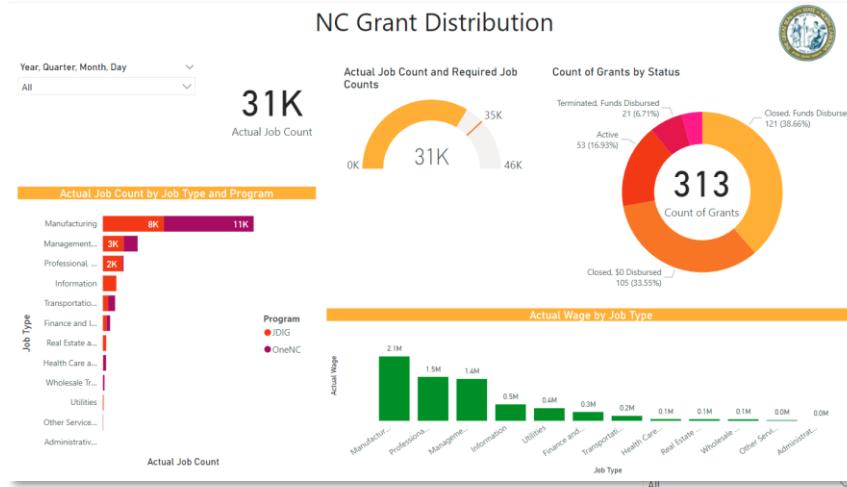


Importing your theme

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



Different theme examples



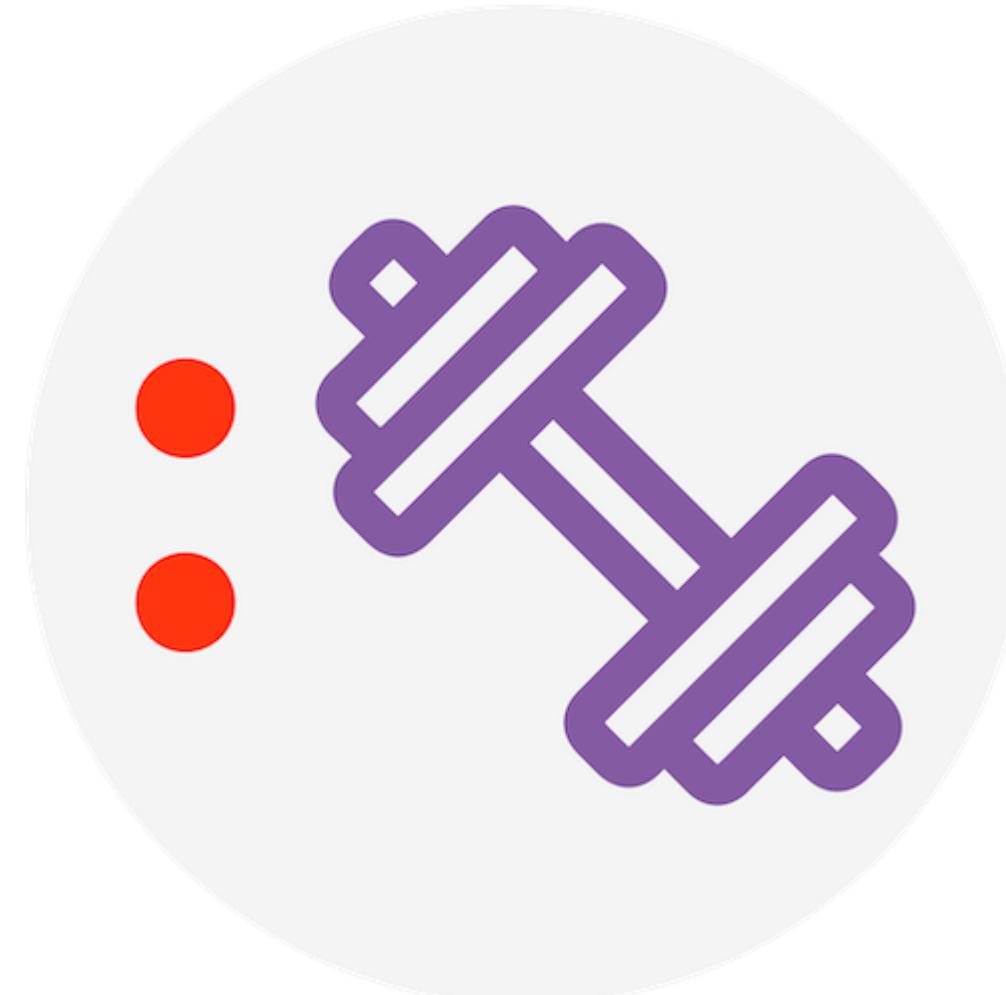
Save Lab 2 as final report

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

Lab 2 Continued



Exercise 2



Congratulations!

Today you learned how to:

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

DATA SOCIETY:

Data Analysis with Excel & PowerBI

Day 3

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

- Albert Einstein



Chat question

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



Power BI Outline for today

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

Objectives for Lab 3

- 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

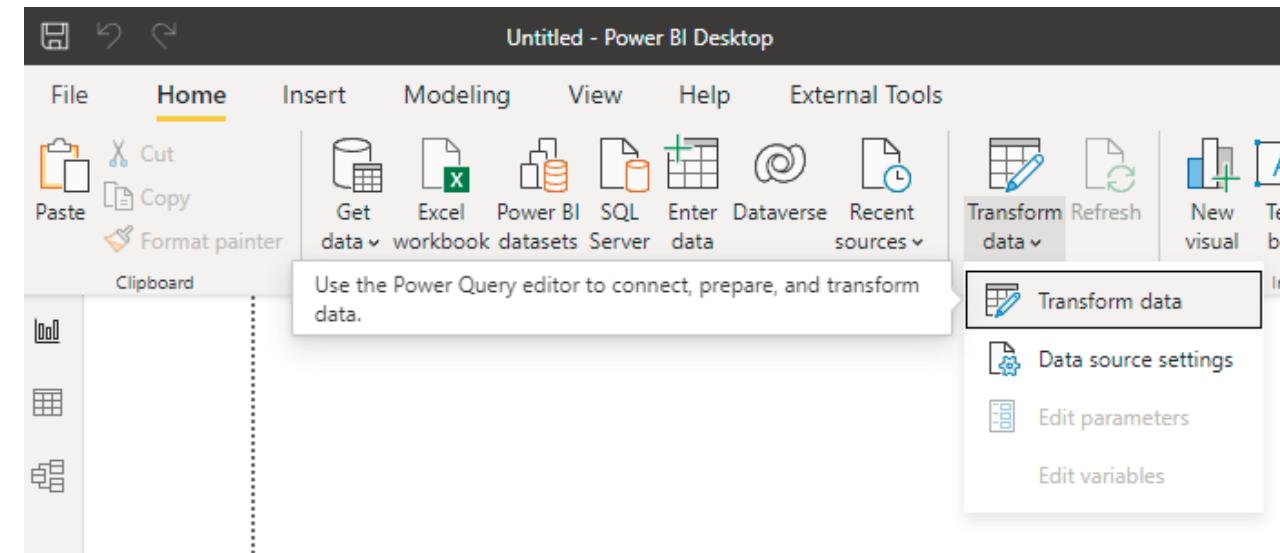
- The Microsoft Data Connectivity and Data Preparation technology
- Enables business users to seamlessly access data stored in hundreds of data sources
- Reshape it to fit their needs, with an easy to use, engaging and no-code user experience

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

Queries are listed and available for selection, viewing, and shaping

In the center pane, data from the selected query is displayed and available for shaping

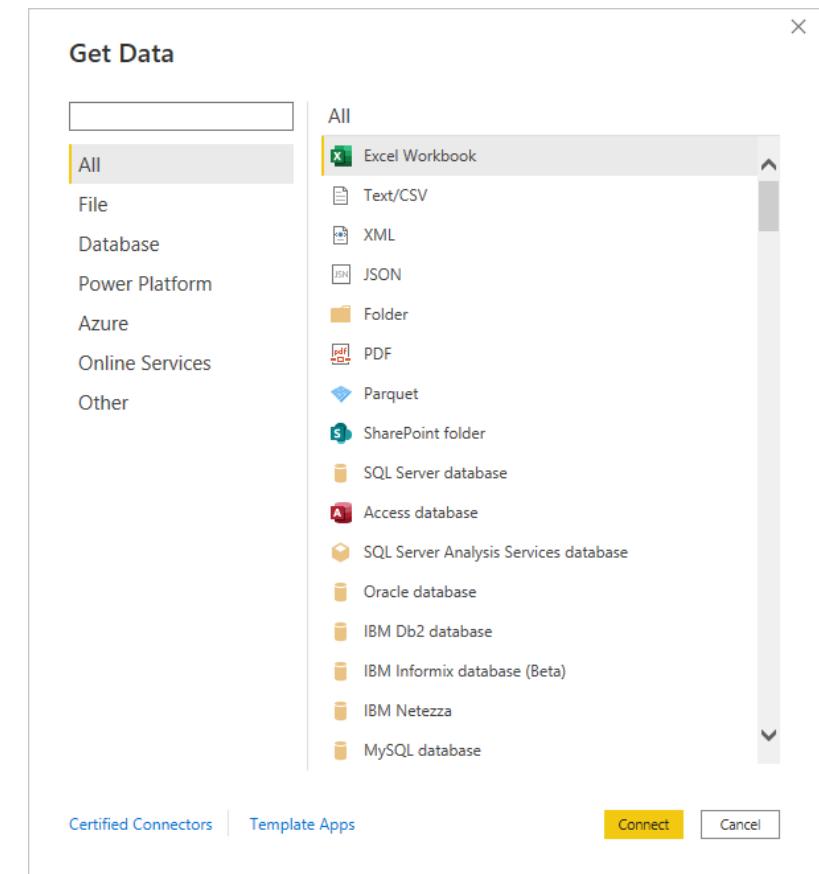
In the ribbon, buttons are active to interact with the data in the query

The Query Settings window appears, listing the query's properties and applied steps

Funding ID	Program	Award Date	Company	Company County	Company Address
1	442 OneNC	5/17/2012	Plasticard Locktech International, LLP		
2	236 OneNC	4/15/2010	United Furniture Industries NC, LLC		
3	474 OneNC	9/21/2012	Global Textile Alliance, Inc.		
4	198 OneNC	12/1/2009	SANS Technical Fibers, LLC		
5	437 JDIG	4/20/2012	Ashley Furniture Industries, Inc. I		
6	277 JDIG	9/20/2010	Cree, Inc. II		
7	283 JDIG	10/4/2010	Novo Nordisk Pharmaceutical Industries, Inc. II		
8	475 OneNC	10/1/2012	Bakers Waste Equipment, Inc.		
9	352 OneNC	5/2/2011	The Roberts Company Fabrication Services, Inc.		
10	383 OneNC	9/23/2011	Cooper Standard Automotive, Inc.		
11	463 OneNC	8/3/2012	FCC (North Carolina), LLC		
12	231 OneNC	4/9/2010	Mitchell North America, Inc.		
13	401 OneNC	11/16/2011	Sonoco Plastics, Inc.		
14	453 OneNC	6/15/2012	GKN Driveline North America, Inc. I (Roxboro)		
15	278 OneNC	9/21/2010	DNP IMS America Corporation		
16	160 OneNC	5/18/2009	Morganant Pressure Vessels LLC		
17	446 JDIG	6/7/2012	Citrix Systems, Inc.		
18	354 OneNC	5/10/2011	Jason Incorporated (Janesville)		
19	300 OneNC	11/18/2010	FAS Controls Inc.		
20	505 OneNC	1/3/2013	Exela Pharma Sciences, LLC		
21	395 OneNC	11/8/2011	Smithfield-Kinston, LLC		
22	386 OneNC	10/10/2011	Honda Aircraft Company, LLC		
23	471 JDIG	9/10/2012	Leviton Manufacturing Co., Inc.		
24	192 OneNC	11/9/2009	Richmond Specialty Yarns, LLC		
25	371 OneNC	7/18/2011	MVP Group International, Inc.		
26	289 OneNC				
27	272 OneNC				
28	468 OneNC				
29	251 OneNC				
30	181 JDIG				
31	335 JDIG				
32	304 OneNC				
33	274 OneNC				
34	361 OneNC				
35	420 OneNC				
36	171 OneNC				
37	146 JDIG				
38	385 OneNC				
39	188 JDIG				

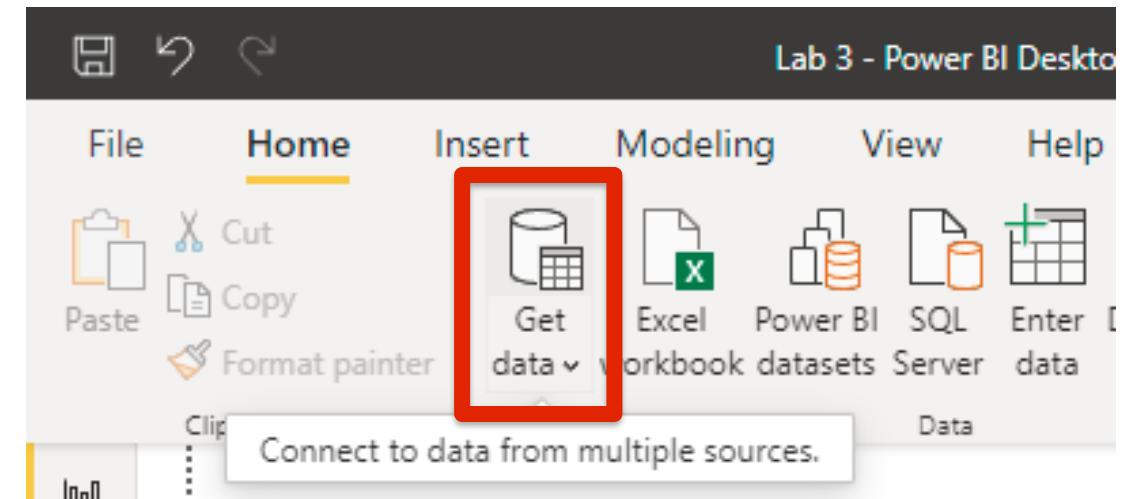
Data source types in Power BI

- 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

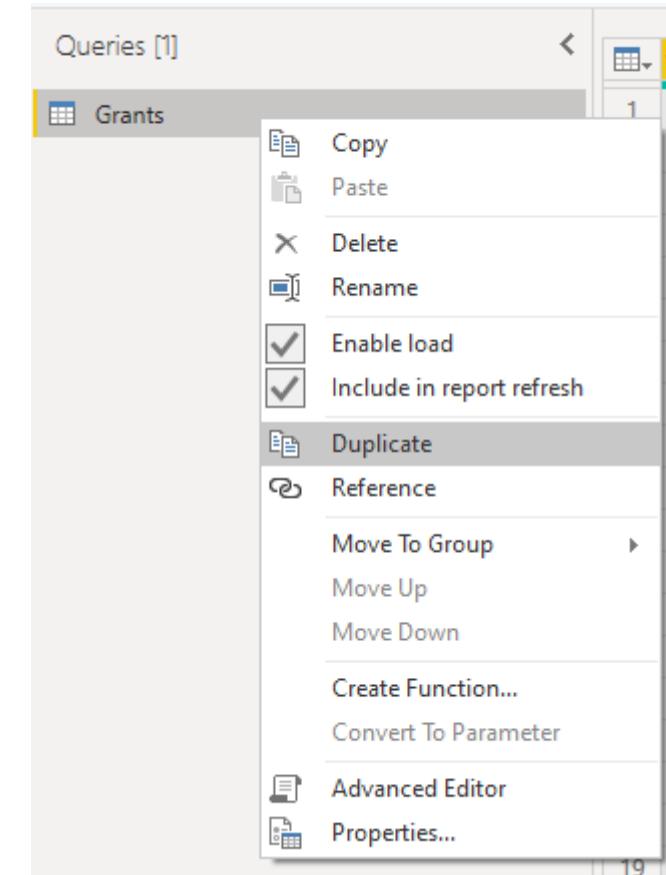
The screenshot shows the Power BI Navigator window. On the left, there's a sidebar with 'Display Options' and a search bar. Below it, under 'Grants.xlsx [2]', the 'Grants' worksheet is selected (indicated by a checked checkbox). Other options like 'Data Dictionary' and 'Suggested Tables [1]' are also listed. The main pane on the right shows a preview of the 'Grants' table with the following data:

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

A message at the bottom states: "The data in the preview has been truncated due to size limits." At the bottom right, there are buttons for 'Load', 'Transform Data' (which is highlighted with a red box), and 'Cancel'.

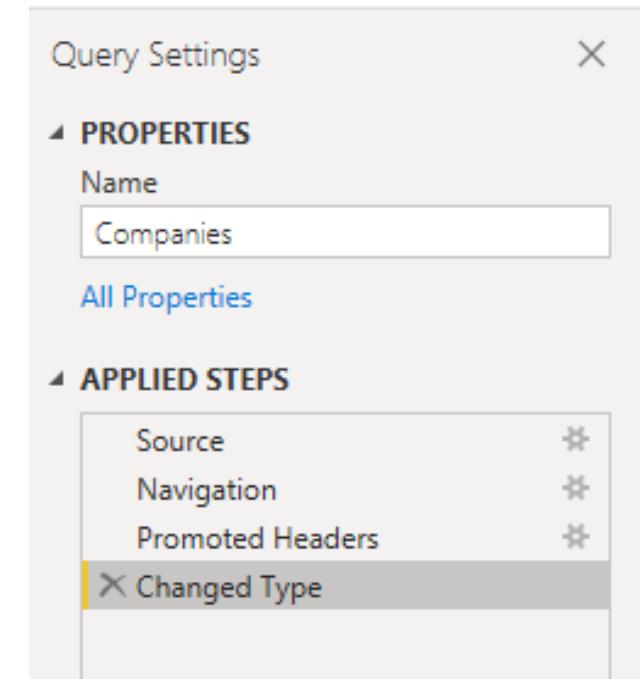
Perform data transformation

- 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

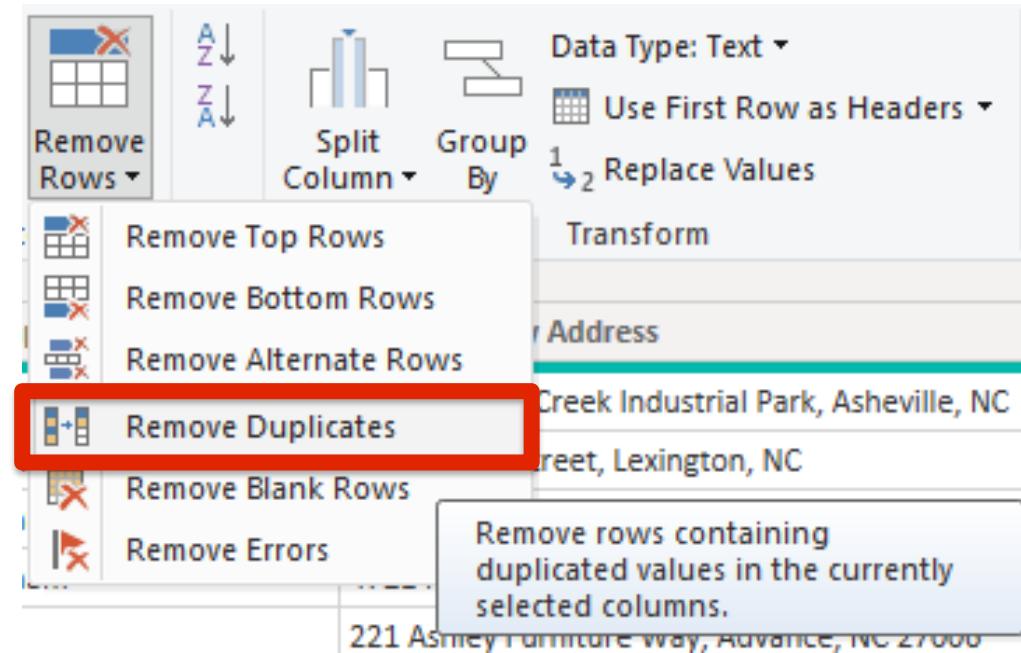
- We will only keep columns '**Company**', '**Company County**', '**Company Address**', '**Company Website**' in our data
- Click on '**Choose Columns**' and select those 4 columns and click OK
- Then the table has the other columns removed

The screenshot shows the Microsoft Power Query Editor interface. At the top, the ribbon tabs are visible: File, Home, Transform, Add Column, View, Tools, and Help. The 'Home' tab is selected. On the far right of the ribbon, there is a 'Choose Columns' button, which is highlighted with a red box. Below the ribbon, the 'Queries [2]' pane shows two queries: 'Companies' and 'Grants'. The main area displays a table with four columns: 'Company', 'Company County', 'Company Address', and 'Company Website'. The rows list various companies and their details. To the right of the table, a 'Choose Columns' dialog box is open, listing all available columns with checkboxes. Several checkboxes are checked, corresponding to the columns in the table: 'Company', 'Company County', 'Company Address', and 'Company Website'. Other columns like 'Funding ID', 'Program', 'Award Date', etc., have checkboxes that are not checked.

Company	Company County	Company Address	Company Website
PiG Change query nameational, LLP	Buncombe	605 Sweeten Creek Industrial Park, Asheville, NC	www.picards.com
United Furniture Industries NC, LLC	Davidson	12 Hackney Street, Lexington, NC	www.unitedfurnitureindustries.com
Global Textile Alliance, Inc.	Rockingham	2361 Holiday Loop Road, Reidsville, NC	gtatextiles.com
SANS Technical Fibers, LLC	Rockingham	4721 NC Highway 770, Stoneville, NC	www.sansfibers.com
Ashley Furniture Industries, Inc. I	Davie	221 Ashley Furniture Way, Advance, NC 27006	www.asheyfurniture.com
Cree, Inc. II	Durham	4600 Silicon Drive, Durham, NC 27703-8475, 3026 E Cornwallis Rd, Res...	www.cree.com
Novo Nordisk Pharmaceutical Industries, Inc. II	Johnston	3612 Powhatan Road, Clayton, NC 27527-9217	www.novonordisk-clayton.com
Bakers Waste Equipment, Inc.	Caldwell	1808 Norwood St. SW, Lenoir, NC	www.bwe-nc.com
The Roberts Company Fabrication Services, Inc.	Sampson	133 Fortines Road, Winterville, NC	www.robertscompany.com
Cooper Standard Automotive, Inc.	Wayne	308 Fedelon Trail, Goldsboro, NC	www.cooperstandard.com
FCC (North Carolina), LLC	Scotland	16700 Airport Rd, Maxton, NC	www.fcc-nc.com
Michelin North America, Inc.	Stanly	South Stanly School Road, Norwood NC	www.michelin-us.com
Sonoco Plastics, Inc.	Haywood	288 Howell Mill Road, Waynesville, NC	www.sonoco.com
GKN Driveline North America, Inc. I (Roxboro)	Person	6400 Durham Road, Timberlake, NC	www.gkn.com
DNP IMS America Corporation	Cabarrus	4524 Enterprise Drive NW, Concord, NC	www.dnpribbons.com

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**'



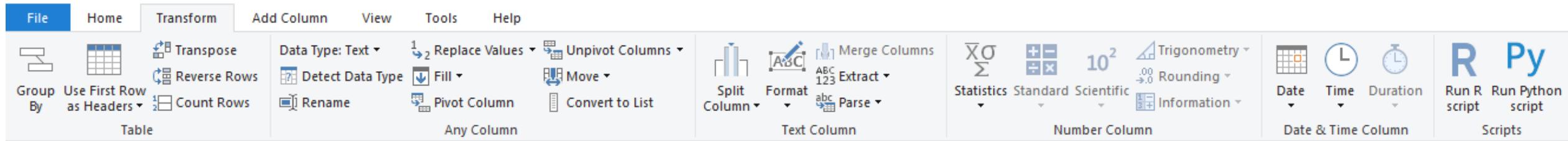
Remove columns

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

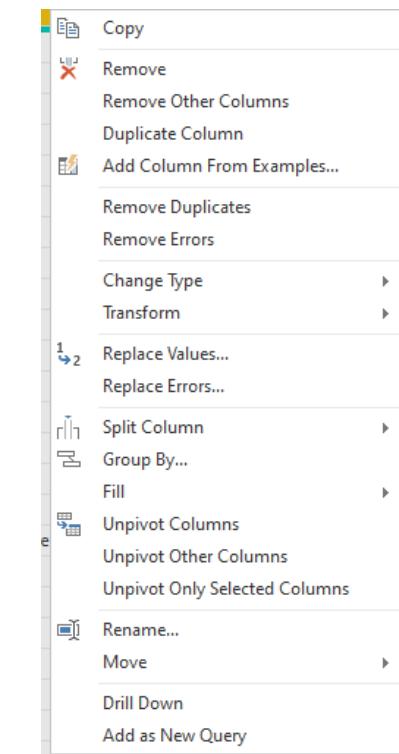
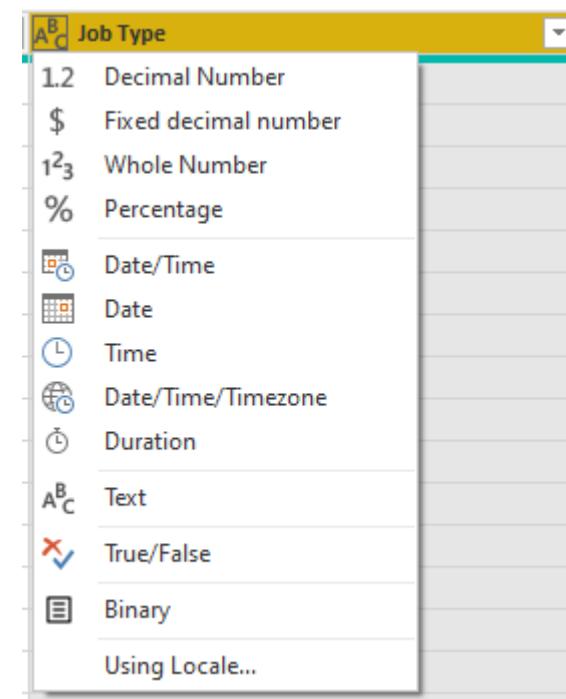
A screenshot of a Power BI data view showing three columns: 'Company County', 'Company Address', and 'Company Website'. A context menu is open over the first row of the 'Company County' column, with 'Remove Columns' highlighted. The menu also includes options like Copy, Remove Other Columns, Add Column 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.

Company County	Company Address	Company Website
Buncombe	Asheville, NC	www.plicards.com
Davidson	, NC	www.unitedfurnitureindustries.com
Rockingham	NC	gtatextiles.com
Rockingham	e, NC 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	603-1834	www.citrix.com
McDowell	C	www.jasoninc.com
Cleveland	1100 Airport Road (Cleveland County), NC	www.fascontrols.com

Review Other Transformations

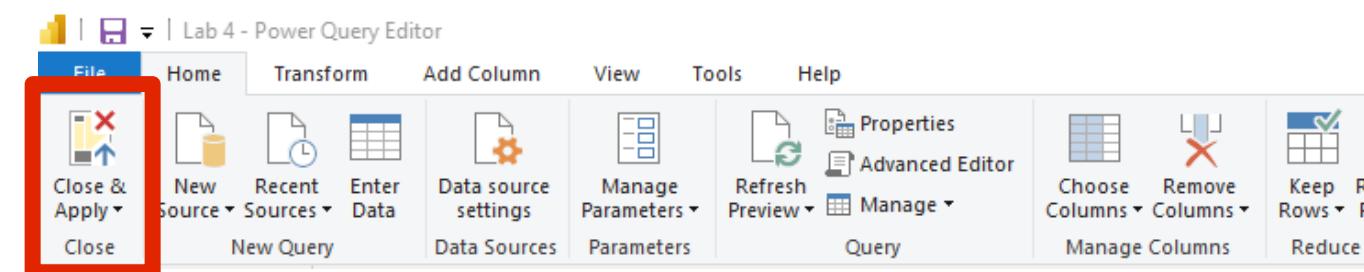
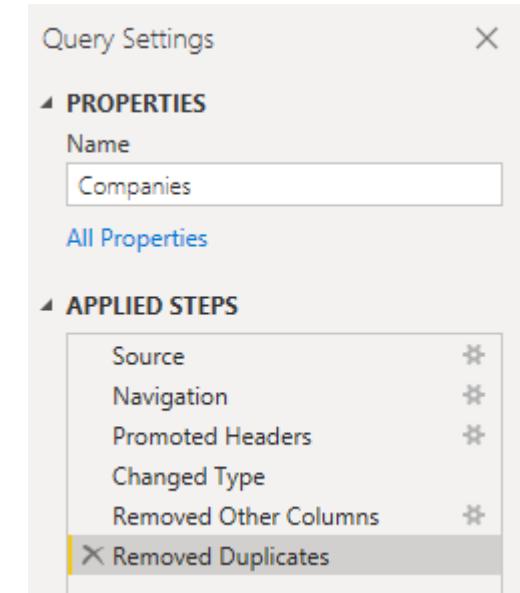


- Split Column
- Change Data Type
- Text Transforms
- Date/Time Transforms



Apply changes and save dataset

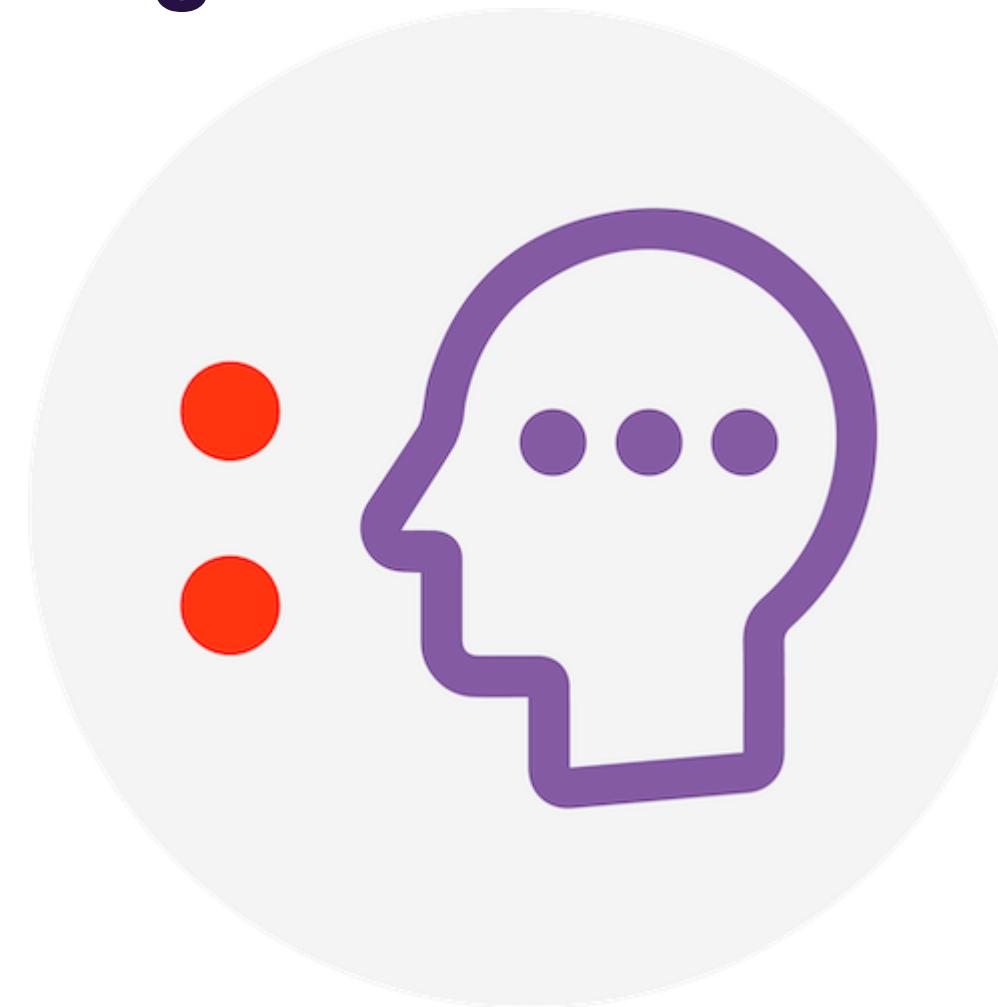
- In the **Query Settings**, you can easily 'Navigate' to the previous steps and reverse the steps sequence
- After all the data source changes are done, you can click on '**Close & Apply**' to apply the changes to the original dataset
- Make sure to save the current file by choosing '**File**' -> '**Save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



Lab 3



Day 3 - Knowledge Check 1



Power BI Outline for today

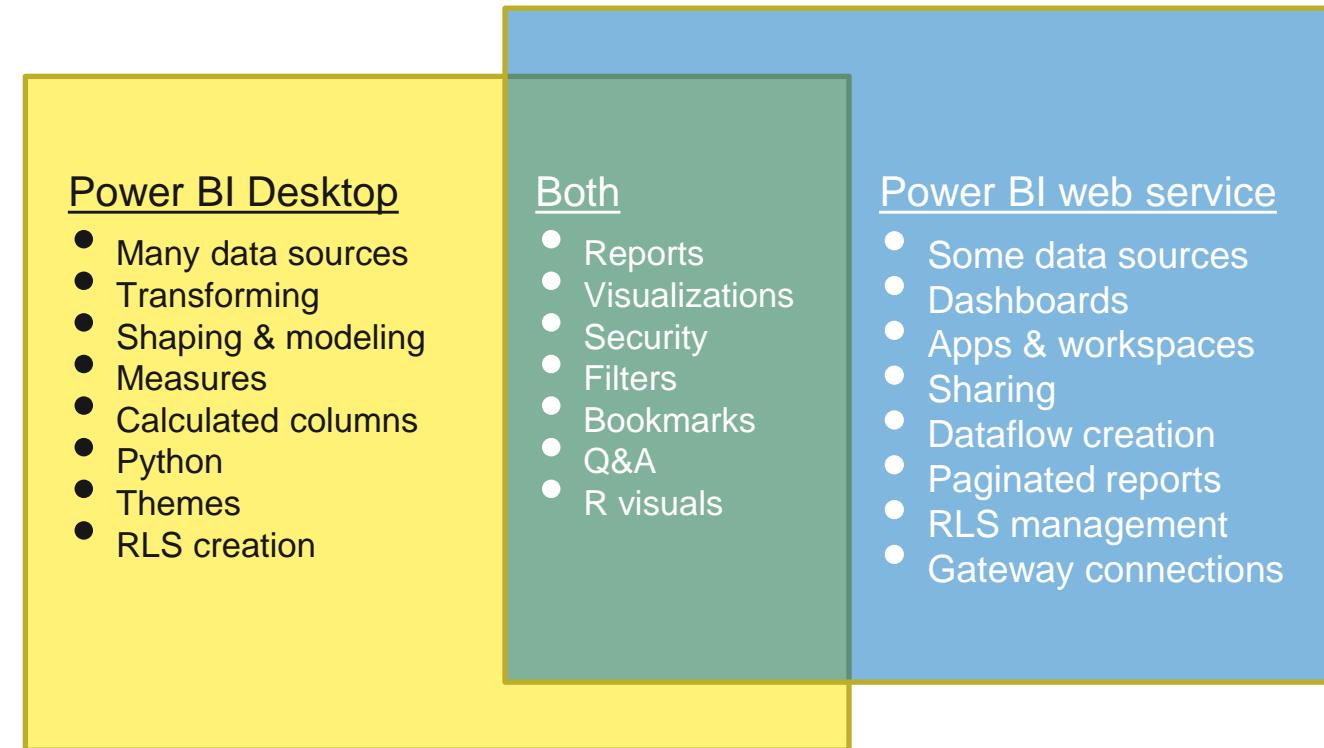
- ETL layer: load data through Power Query
- Explain the functions of the Power BI web service

Objectives for Lab 4

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

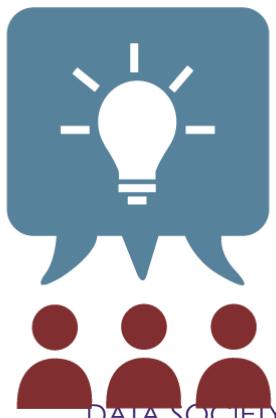
Comparing Power BI desktop & Power BI service

- 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



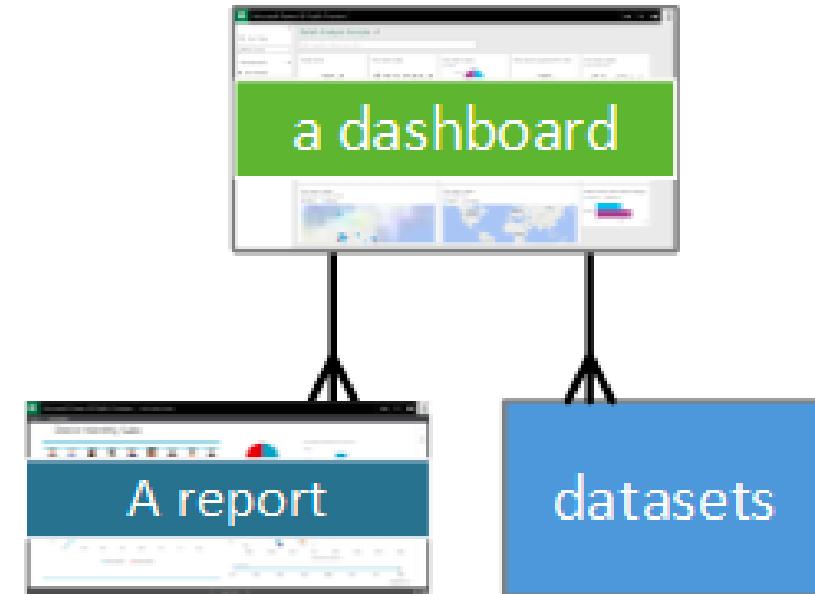
Power BI's workspace built for collaboration

- 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



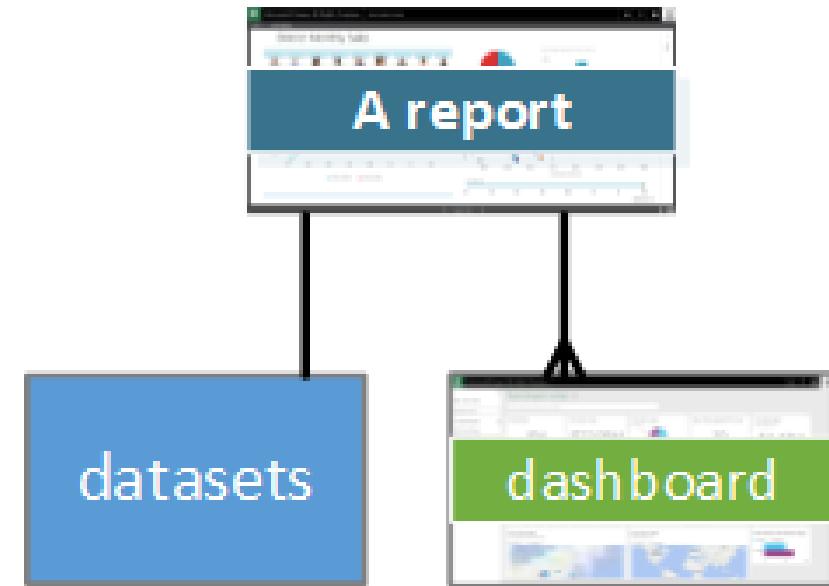
Understanding your dashboard

- **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

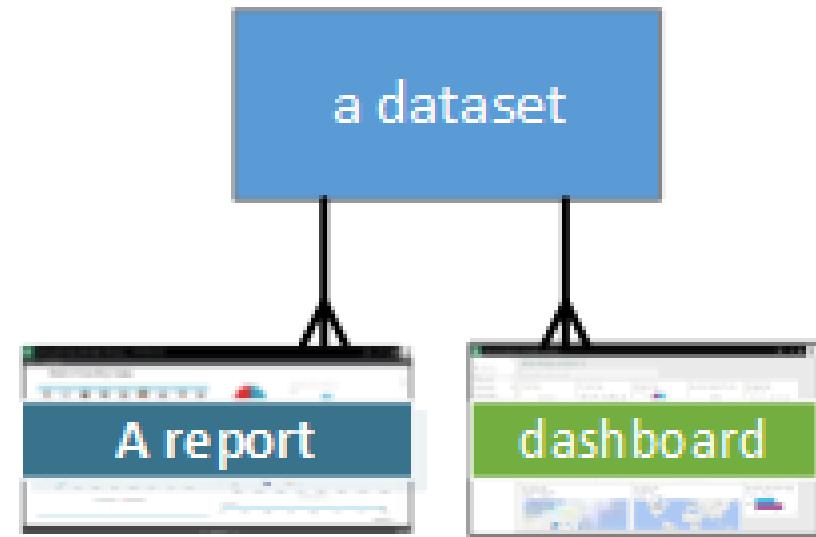


Understanding your workbook

- 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

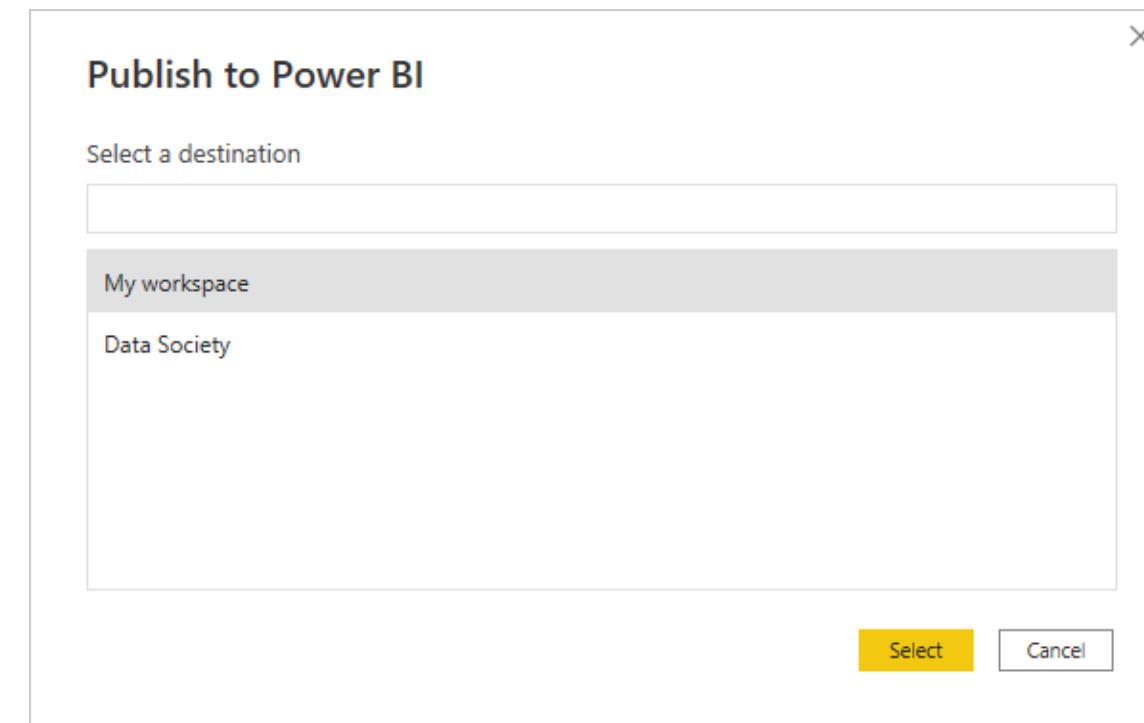
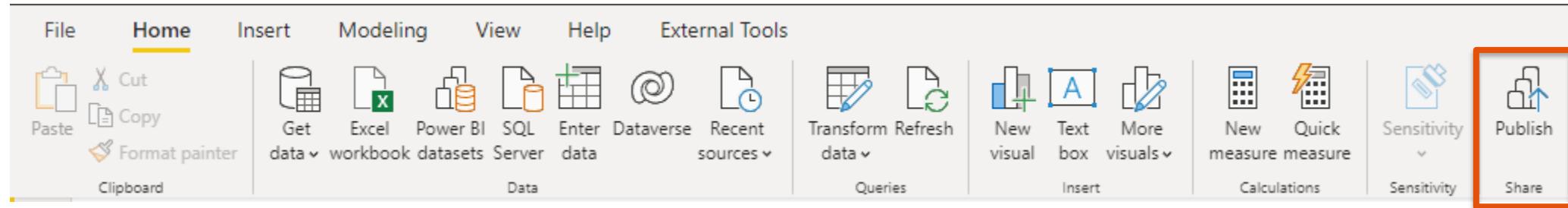
Understanding your dataset

- **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



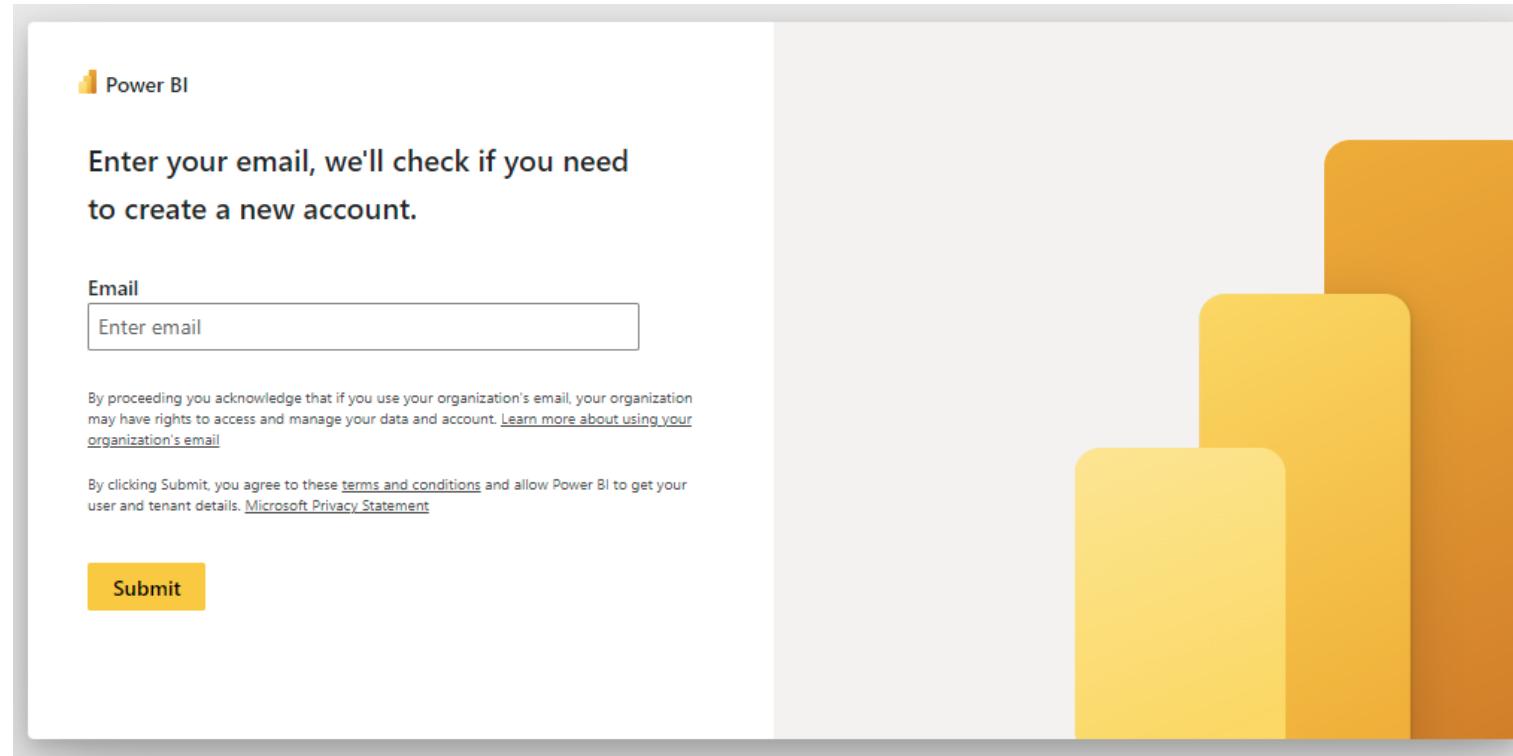
Publishing reports

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



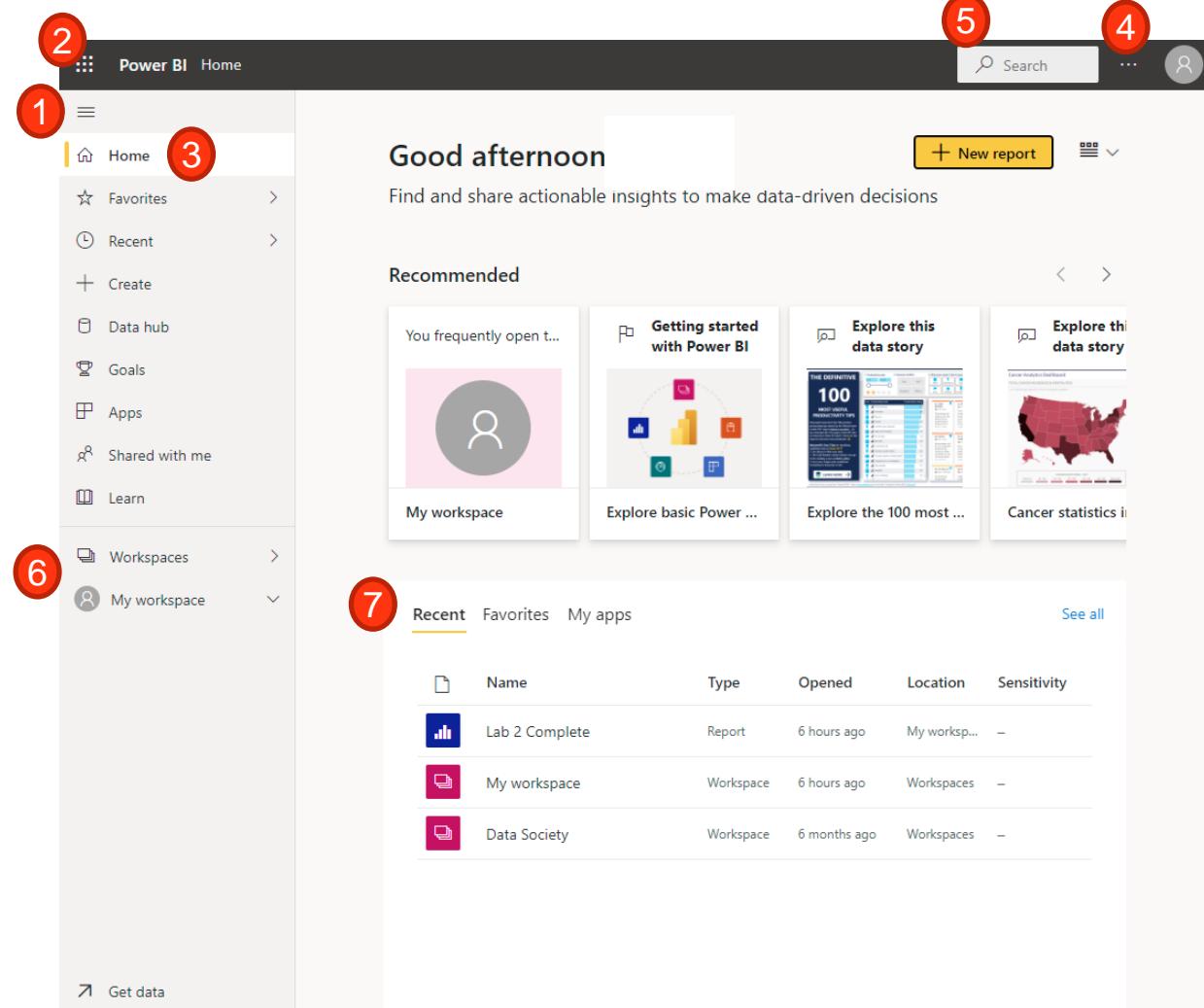
Sign in to the Power BI Service

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



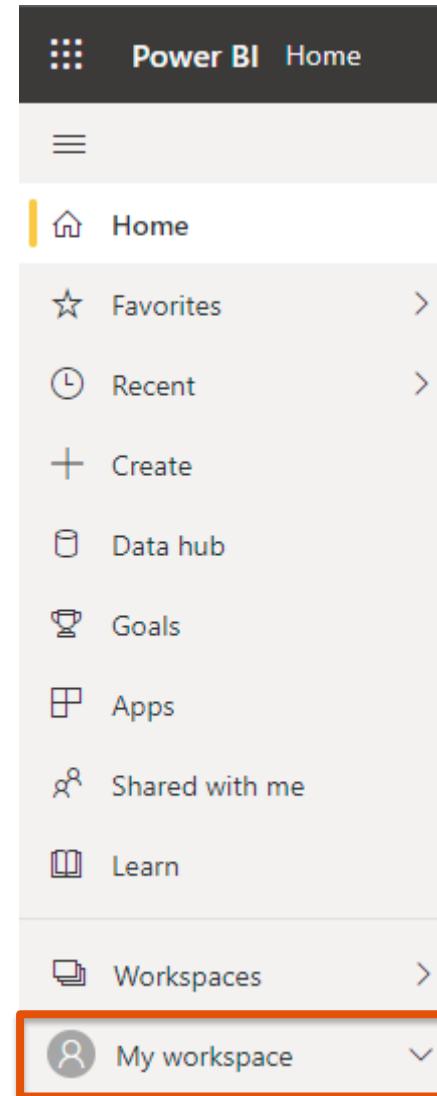
Familiarizing yourself with Power BI Service view

- 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



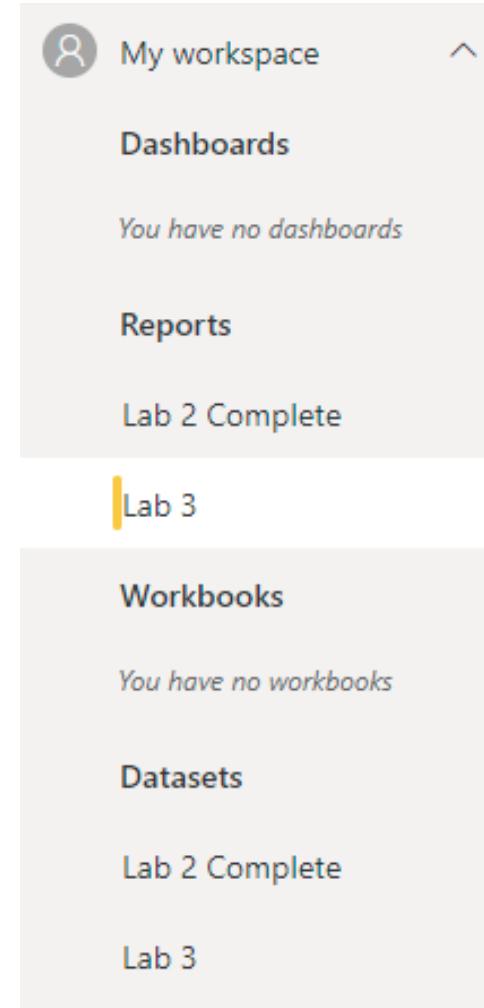
Navigate to workspaces

- 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

The screenshot illustrates the Power BI Web Service interface with several key components highlighted by red arrows and boxes:

- Pages Pane** (left): Allows you to navigate to different pages in the report. It includes links for Overview, Grant Details, and Company Review, along with a Year, Quarter filter set to All.
- Action Bar** (top center): Provides quick access to download PBIX, edit the report, favorite it, and view it in fullscreen.
- Visual Details** (center):
 - Actual Job Count by Job Type and Program**: A horizontal bar chart showing job counts for various programs across different job types. For example, Manufacturing has 8K and 11K for JDIG and OneNC respectively.
 - Actual Job Count**: A large blue text element indicating 1K job count.
 - Actual Wage by Job Type**: A vertical bar chart showing actual wages for various job types. The highest wage is 2.1M for Manufacturing.
 - Count of Grants by Status**: A donut chart showing the count of grants categorized by status: Active (53), Closed, Funds Disbursed (121), Closed, \$0 Disbursed (105), and Terminated, Funds Disbursed (21). The total count is 313.
- Filters pane** (right): View and edit visual, page, and report-level filters.

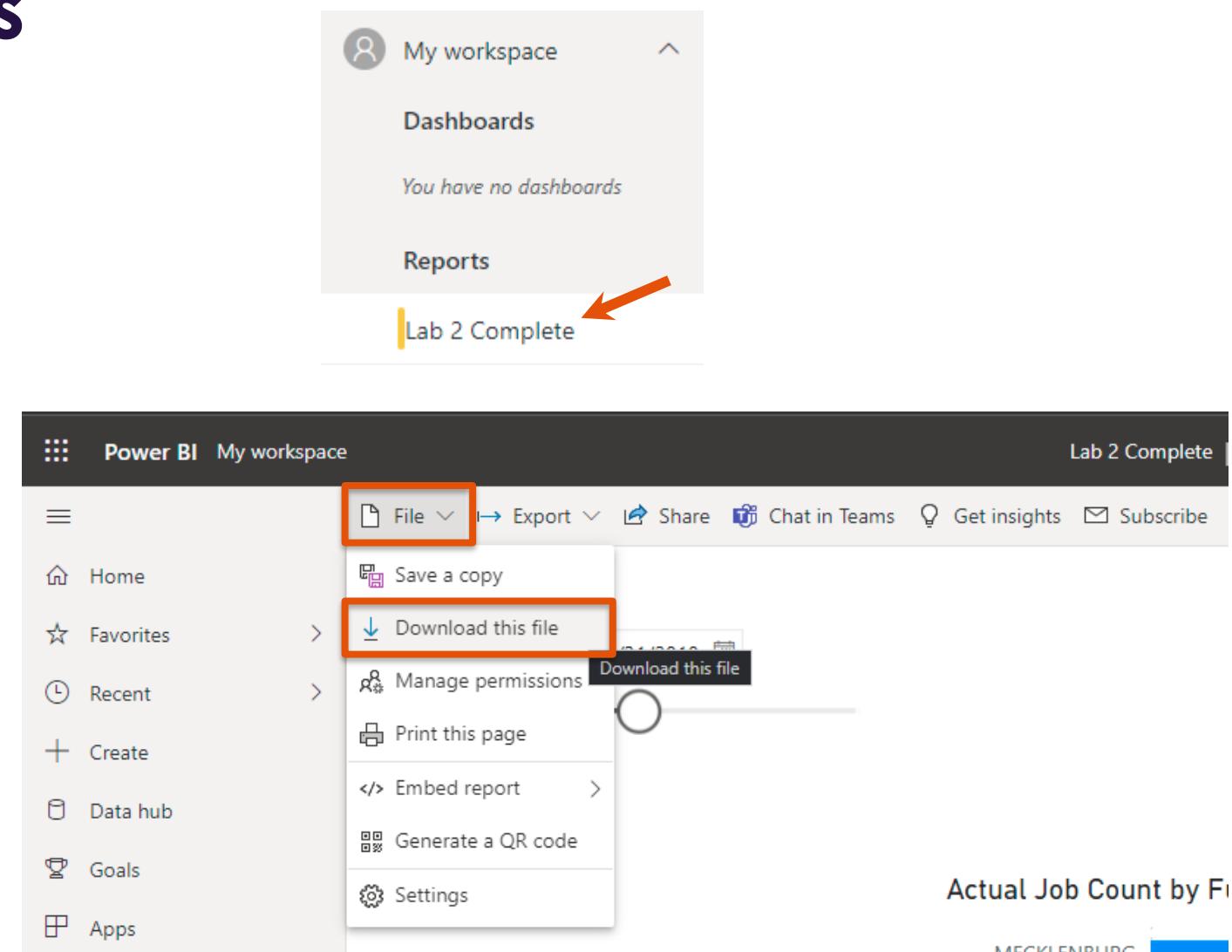
Pages Pane – allows you to navigate to different pages in the report

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

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

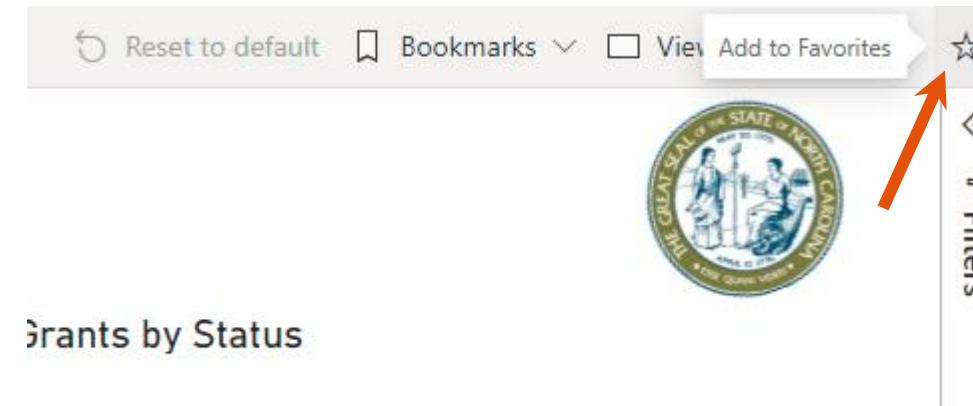
Downloading reports

- 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



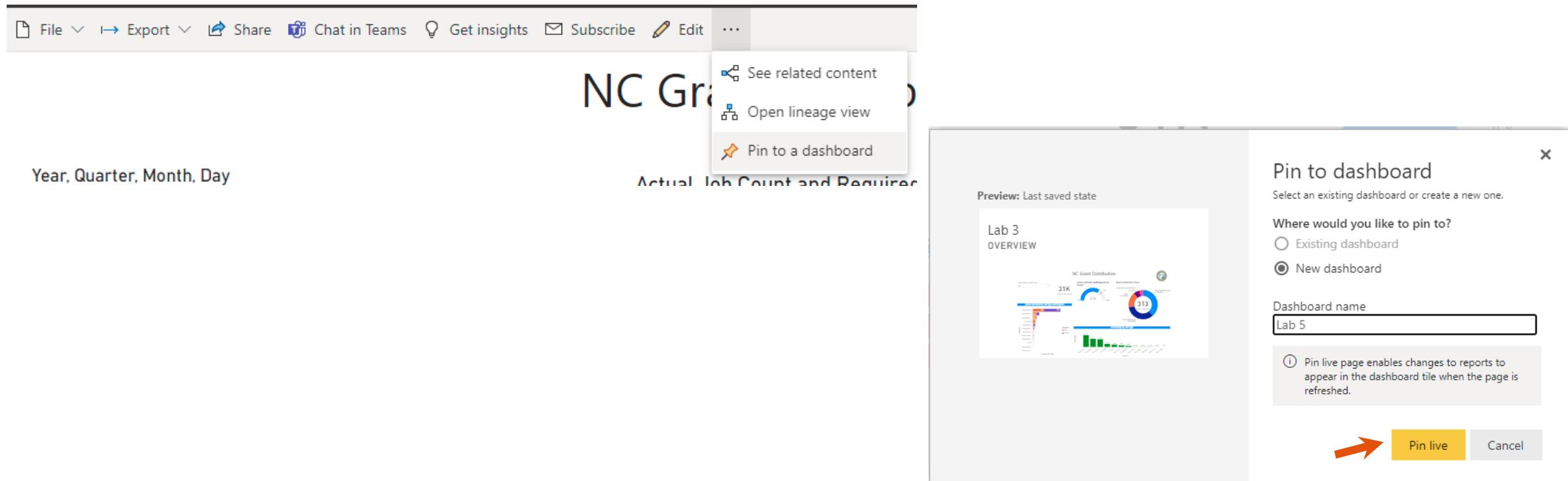
Add to your favorites

- 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

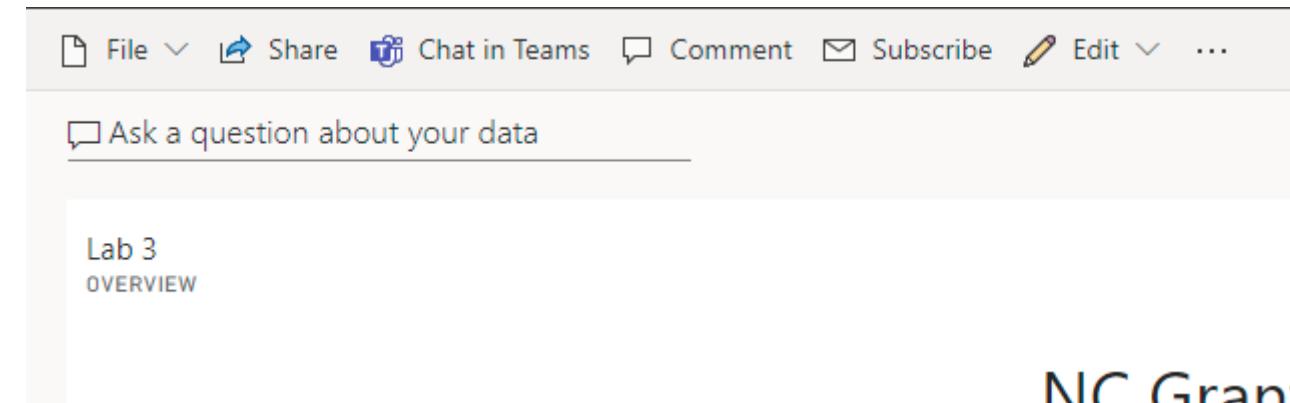


Data Alerts

- 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)

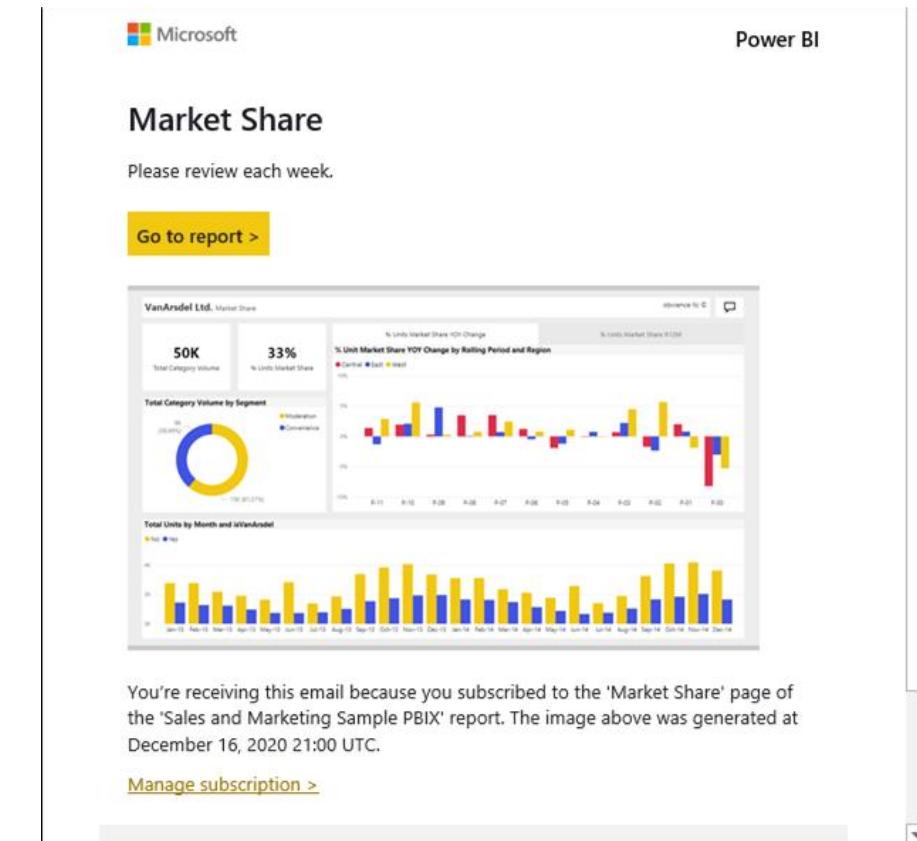
Start date End date

Also Include

Access to this dashboard

Link to dashboard in Power BI

[Manage all subscriptions](#)



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

My workspace

+ New ▾

All Content Datasets + dataflows

Name	Type
Lab 2 Complete	Report
Lab 2 Complete	Dataset

Schedule refresh

Keep your data up to date

Configure a data refresh schedule to import data from the data source

On

Refresh frequency

Daily

Time zone

(UTC-05:00) Eastern Time (US and Ca)

Time

4	00	AM	X
8	00	AM	X
10	00	AM	X
11	00	AM	X
12	00	PM	X
2	00	PM	X
4	00	PM	X
6	00	PM	X

Send refresh failure notifications to

Dataset owner

These contacts:

Enter email addresses

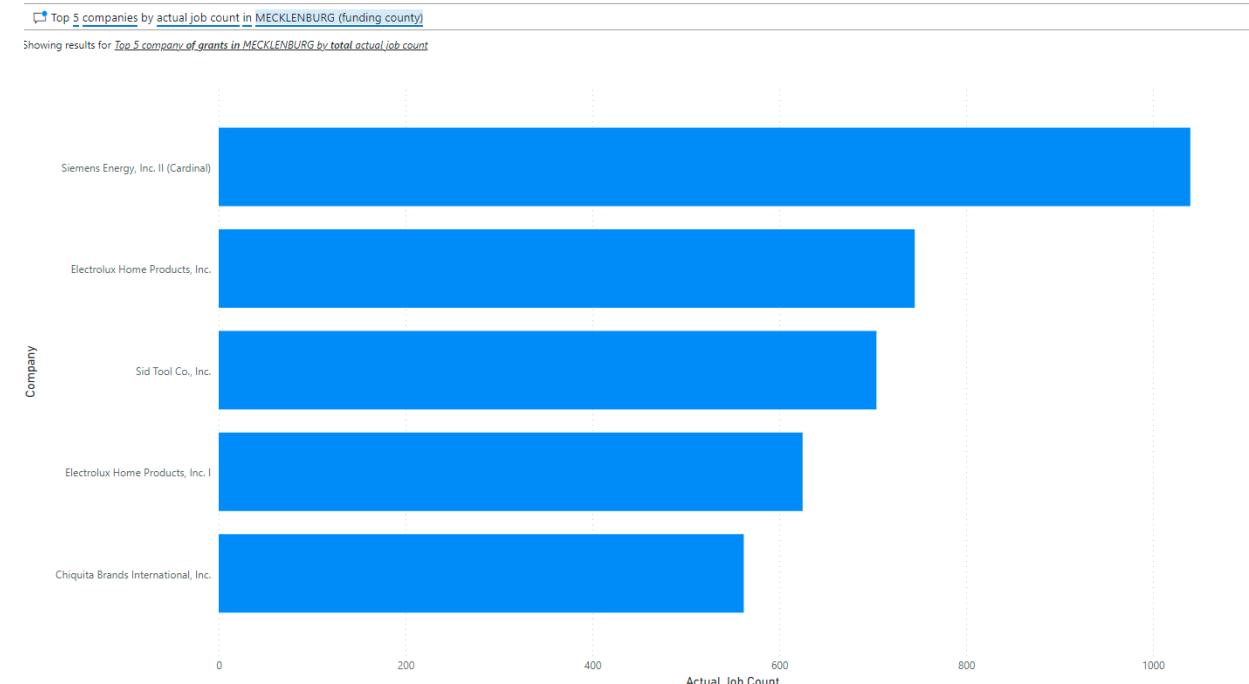
Apply Discard

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

A screenshot of a Power BI dashboard interface. At the top, there is a navigation bar with icons for File, Share, Chat in Teams, Comment, Subscribe, Edit, and more. Below the navigation bar is a search bar with the placeholder text "Ask a question about your data".

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



Day 3 - Knowledge Check 2



Congratulations!

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

Tomorrow, we'll learn how to:

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

DATA SOCIETY:

Data Analysis with Excel & PowerBI

Day 4

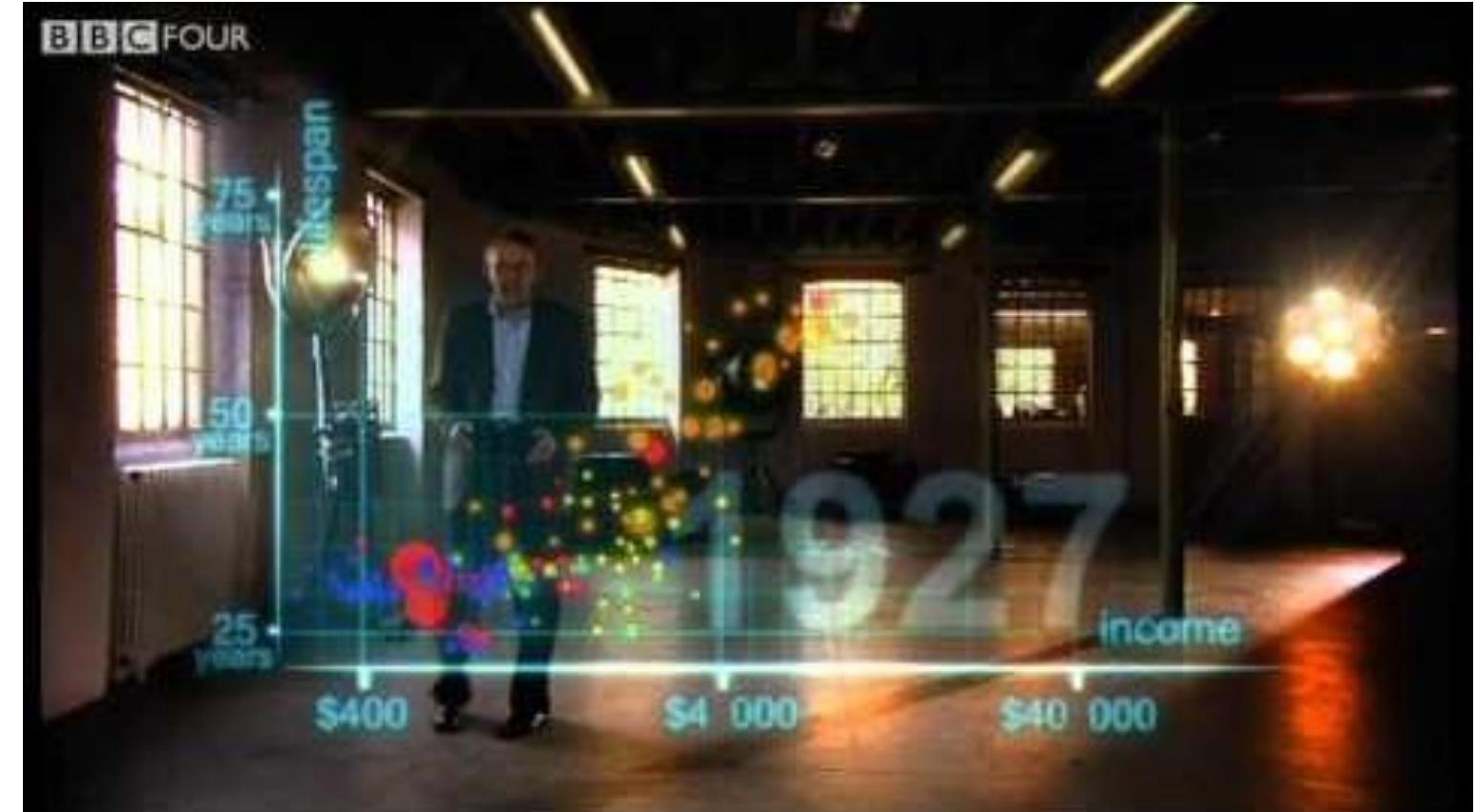
“One should look for what is and not what he thinks should be.”

- Albert Einstein



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=jbkSRLYSojq>



Outline for today

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

Why is visualization important?

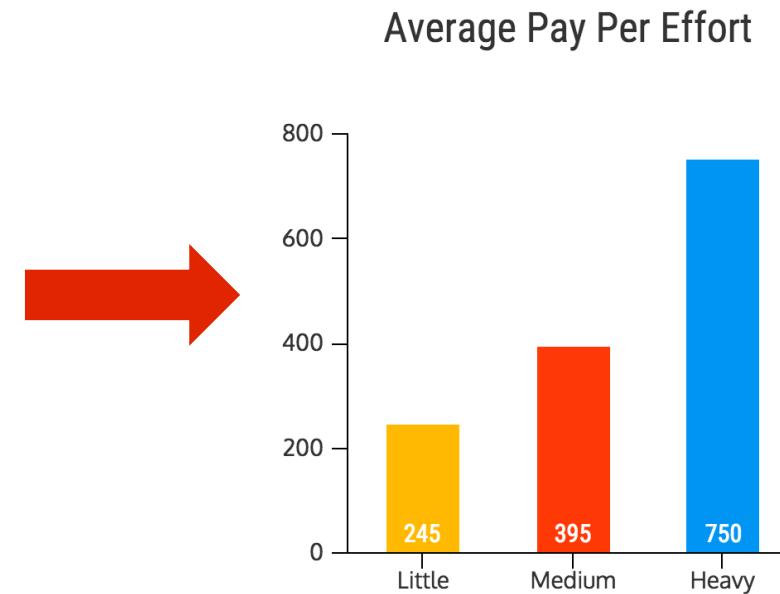
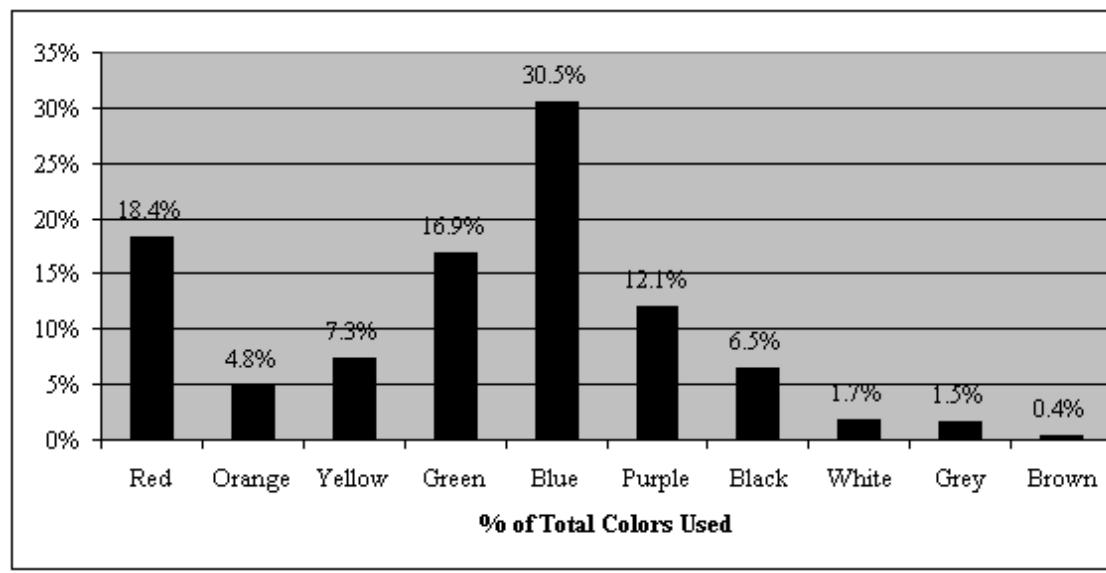
- To provide valuable insights, visualization must be interpretable and relevant
- To give a visual or graphical representation of data/concepts
- To communicate ideas. We are visual by nature and visualizations are a form of communication
- Provide an accessible way to see and understand trends, outliers,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

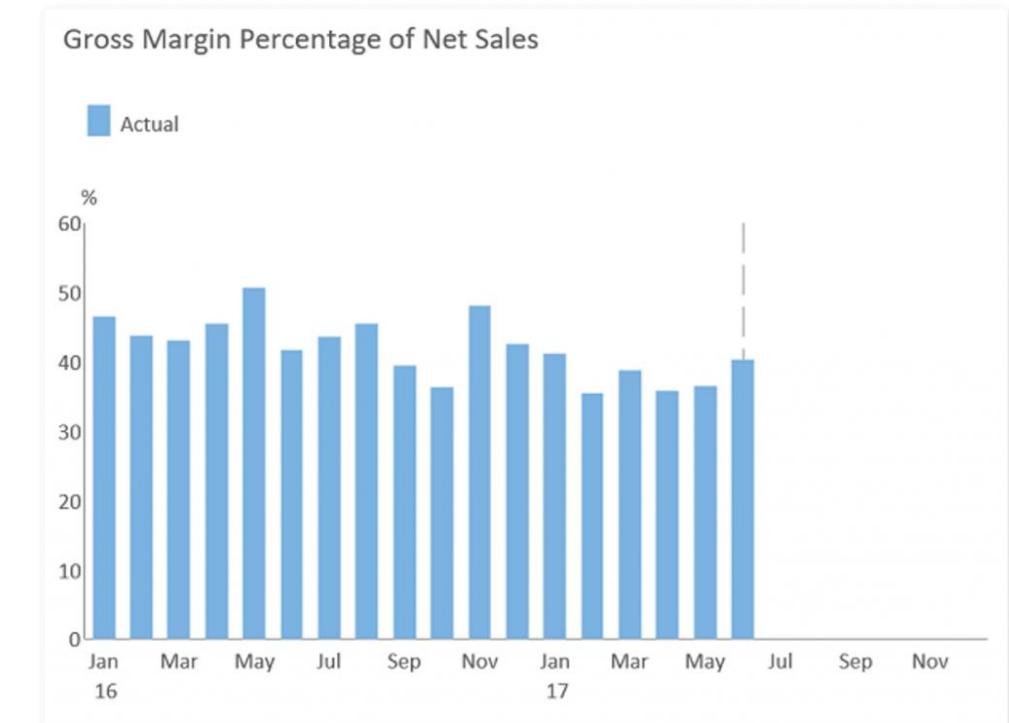
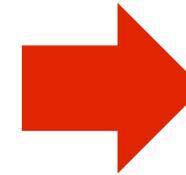
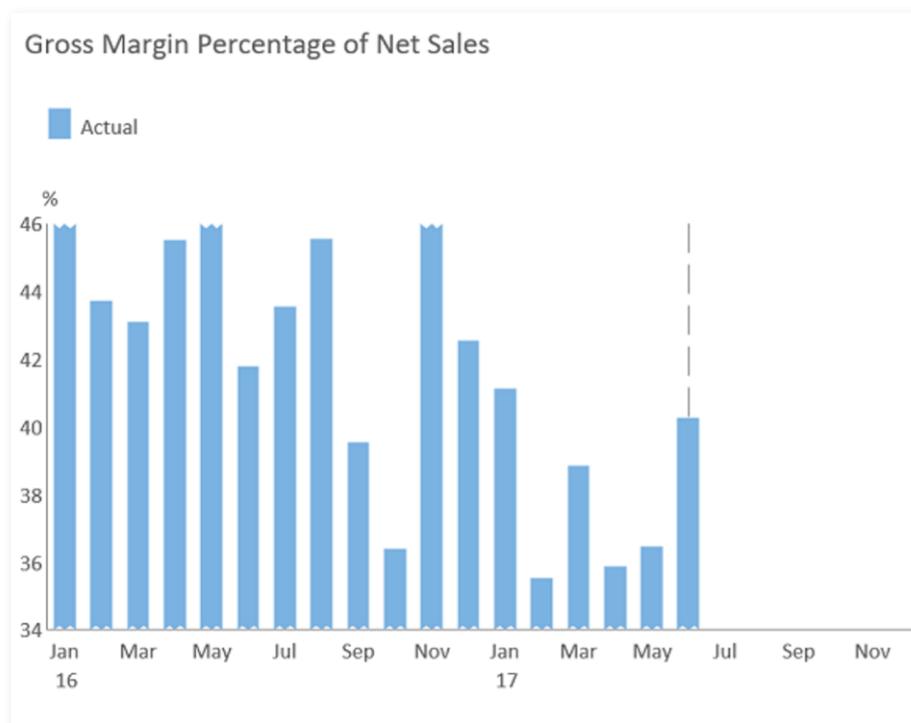


Average **pretest** & **posttest** scores show the parenting program made the biggest impact on helping participants handle their own stress.
Scale was 0-5, with 5 representing "Excellent."



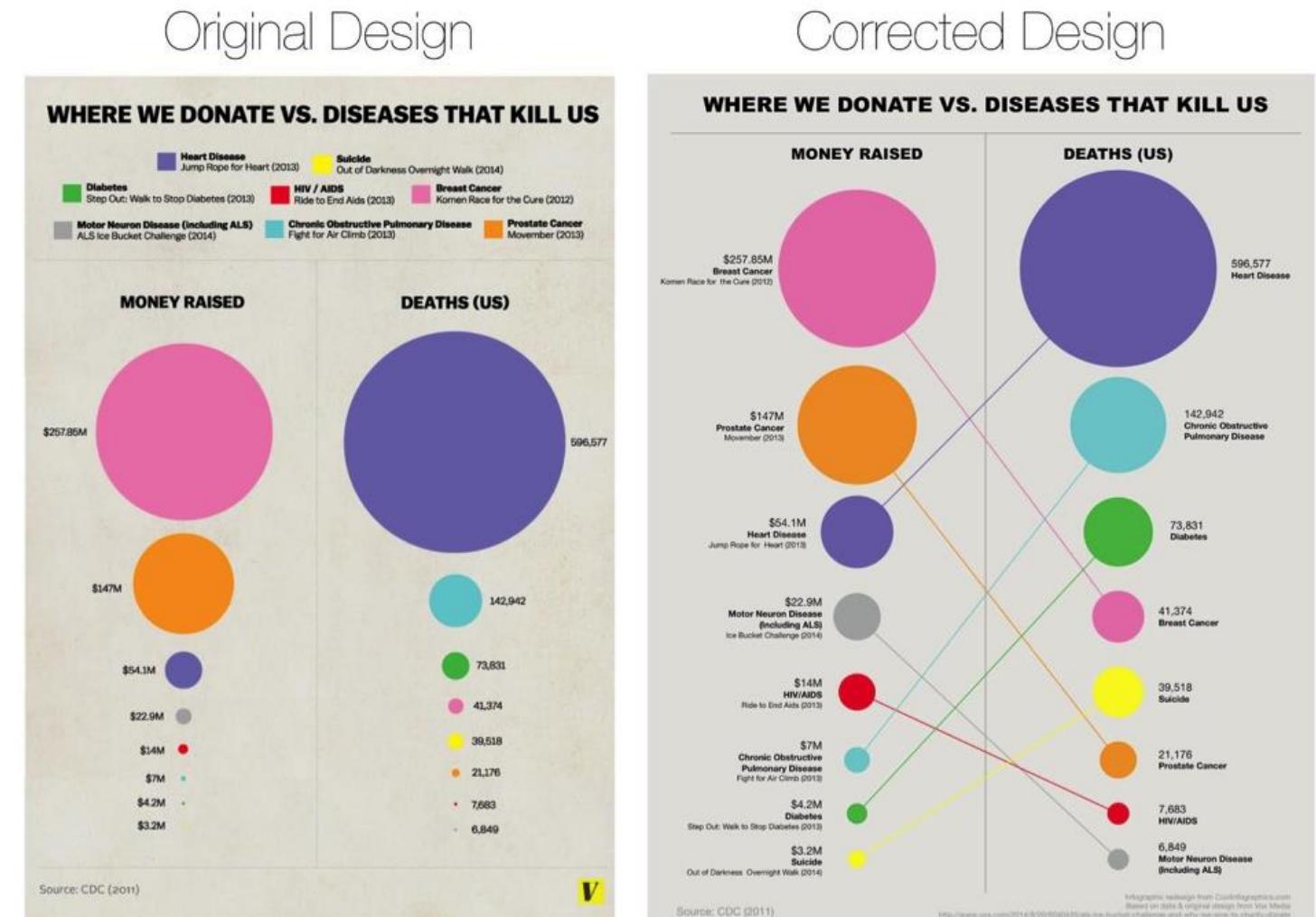
Scales

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



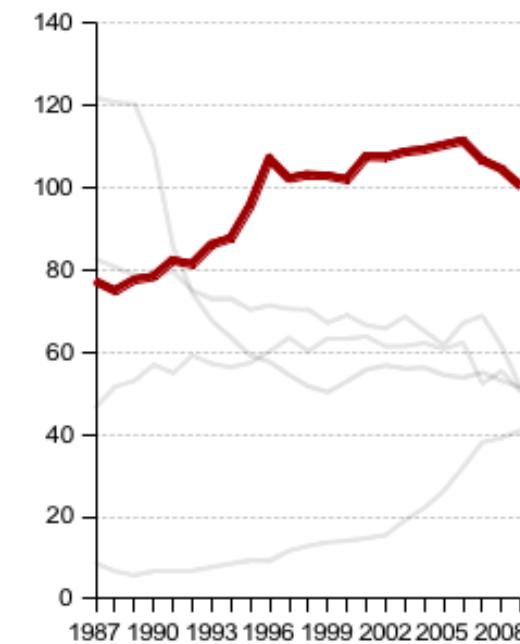
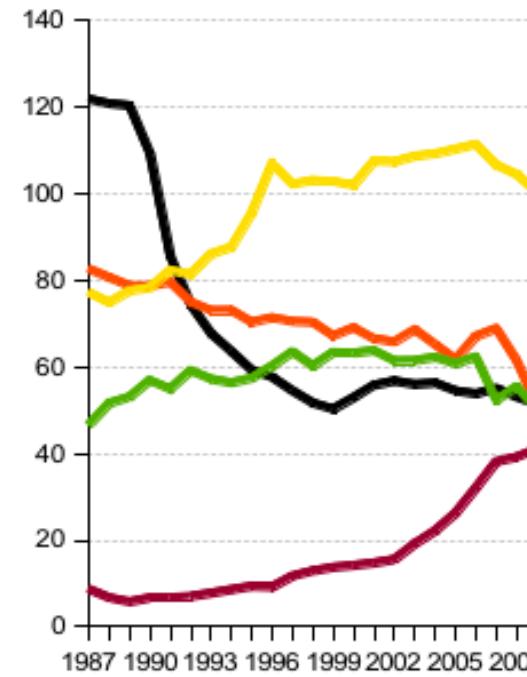
Data Integrity

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



Data density

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



Data richness/Attribution

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

Whatever happened to this statistic?

'More than 80% of dentists recommend Colgate.'



Design principles checklist

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

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

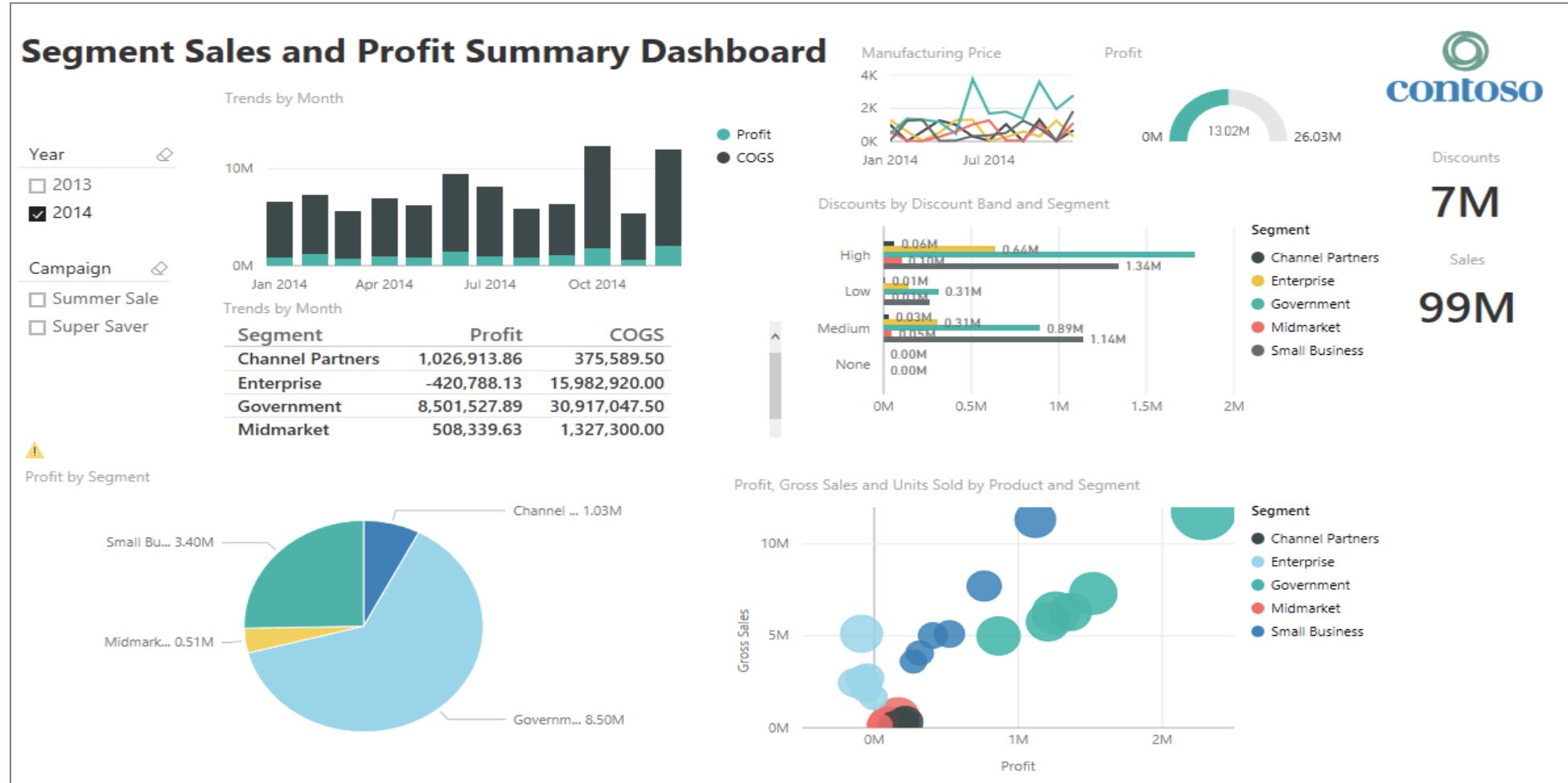
Data storytelling

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



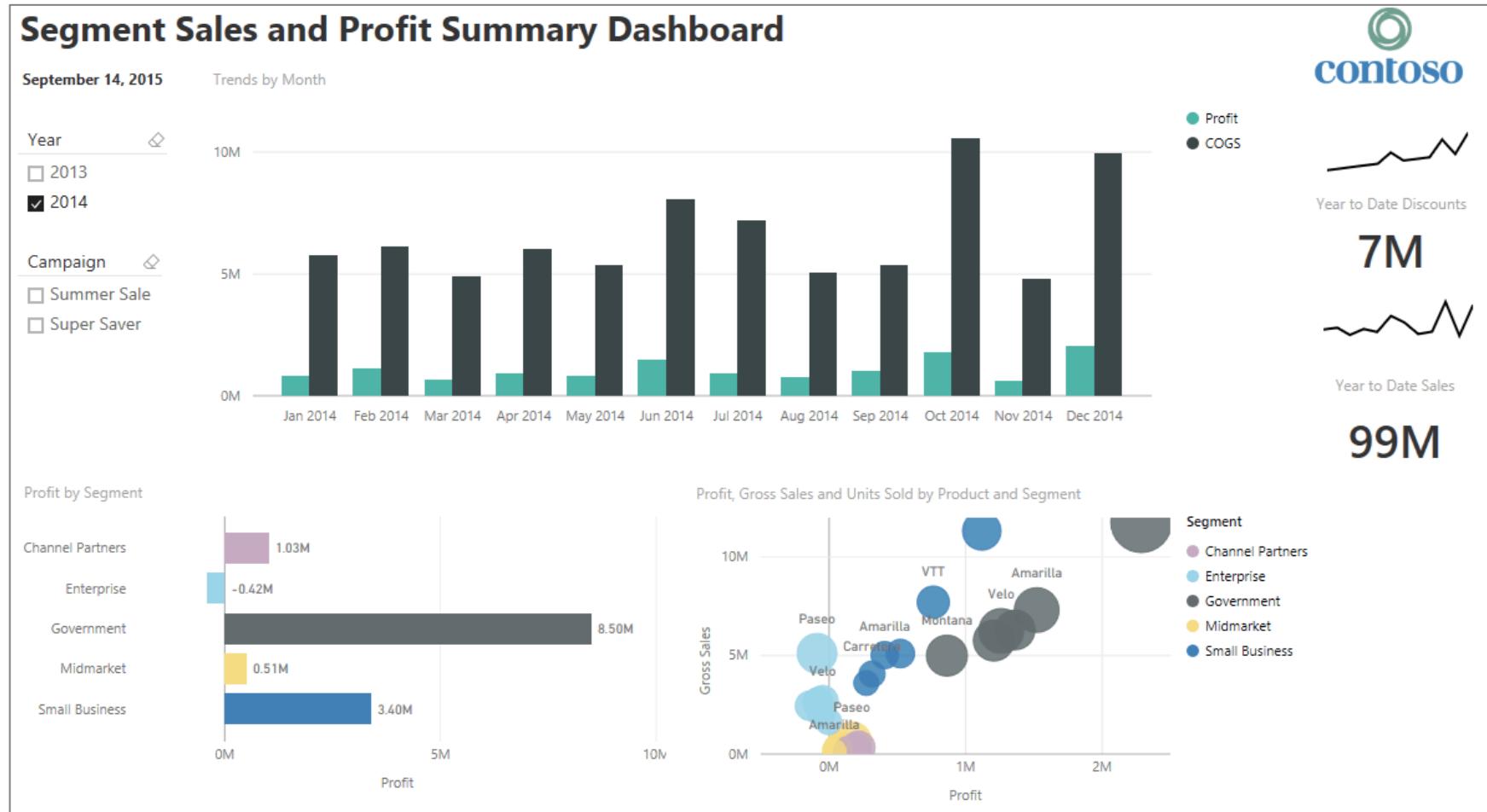
Which dashboard is better?

Dashboard 1



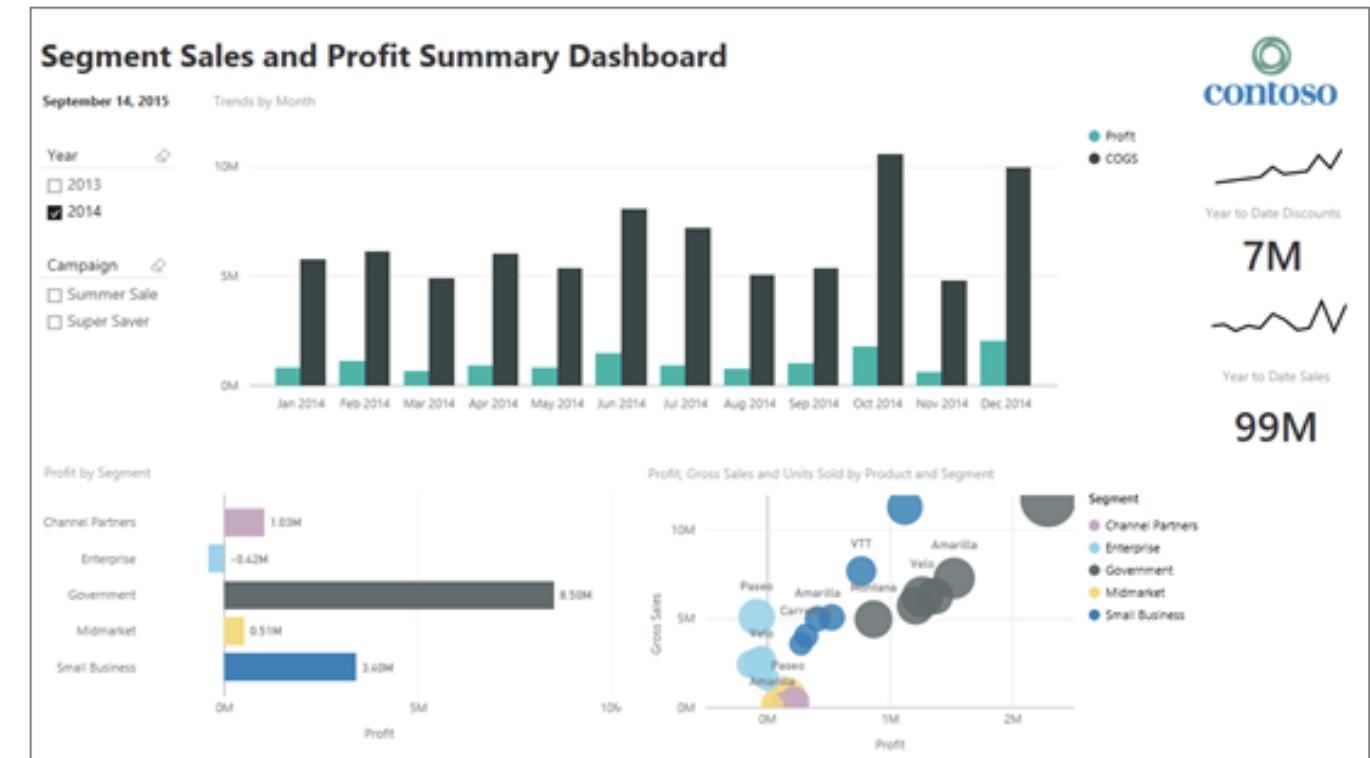
Which dashboard is better?

Dashboard 2



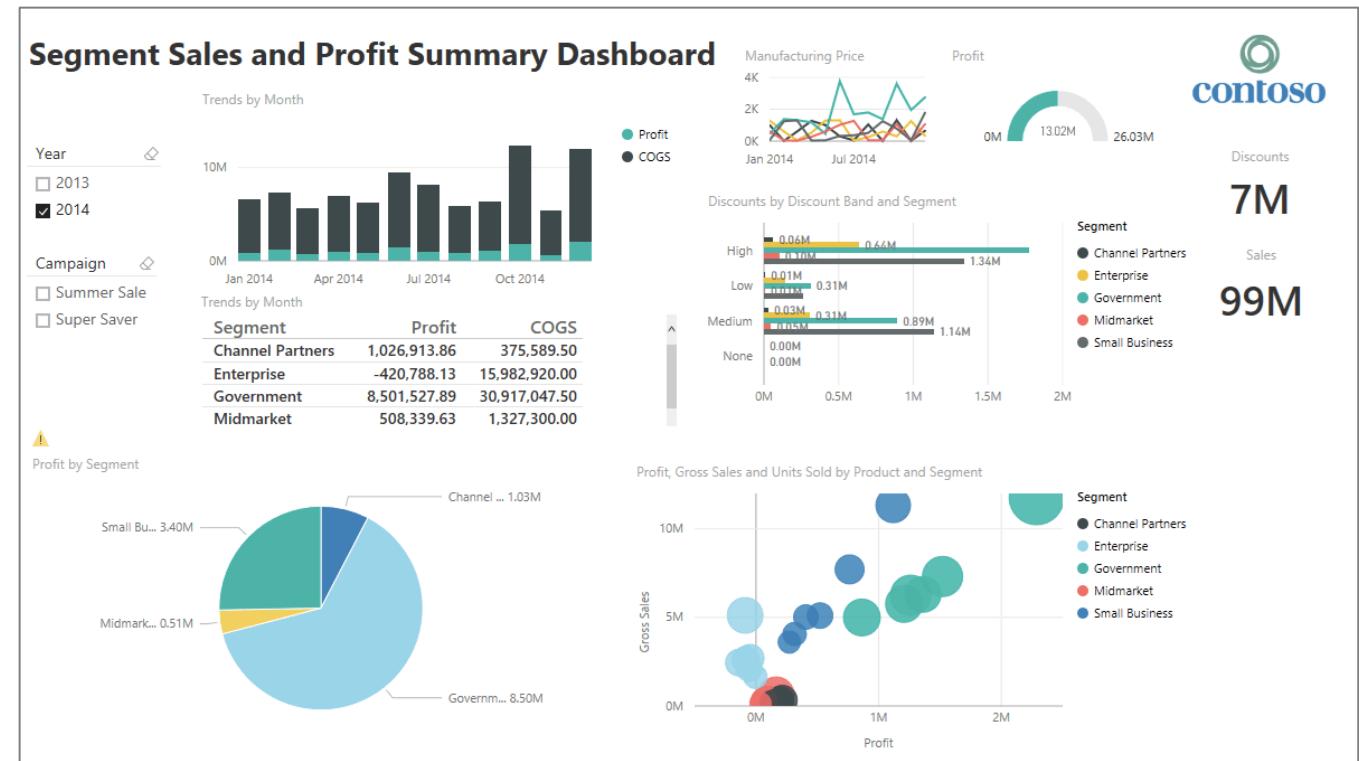
Dashboard 2!

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



Why isn't Dashboard 1 as effective?

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



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

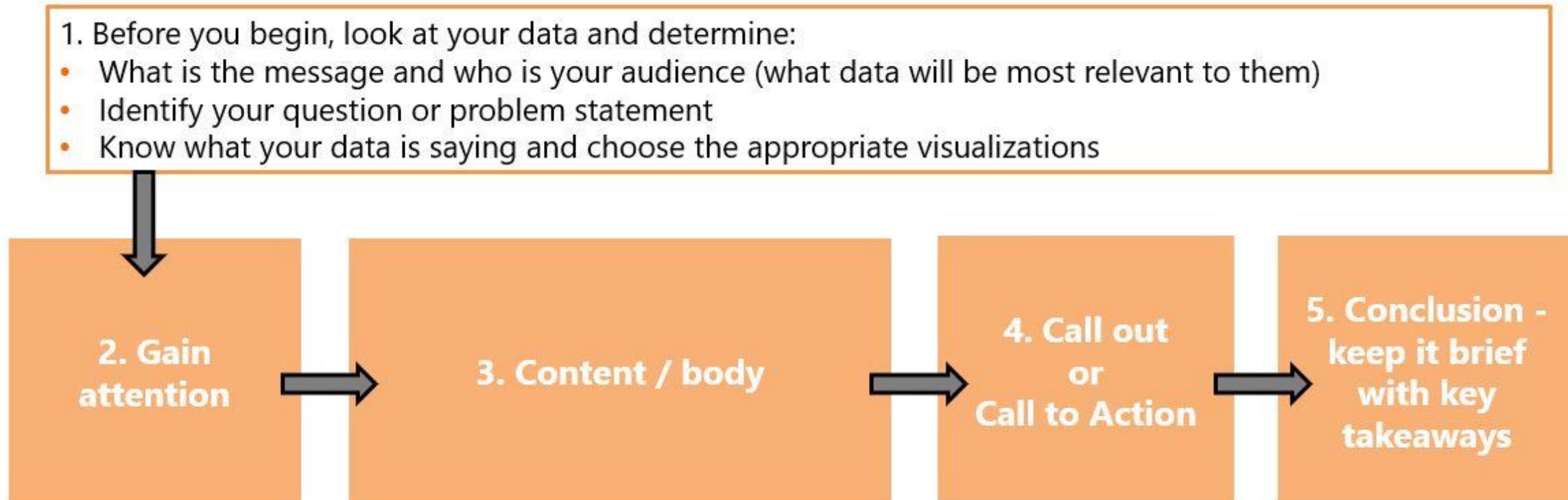
Data storytelling - George Roumeliotis

- 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



Outline for today

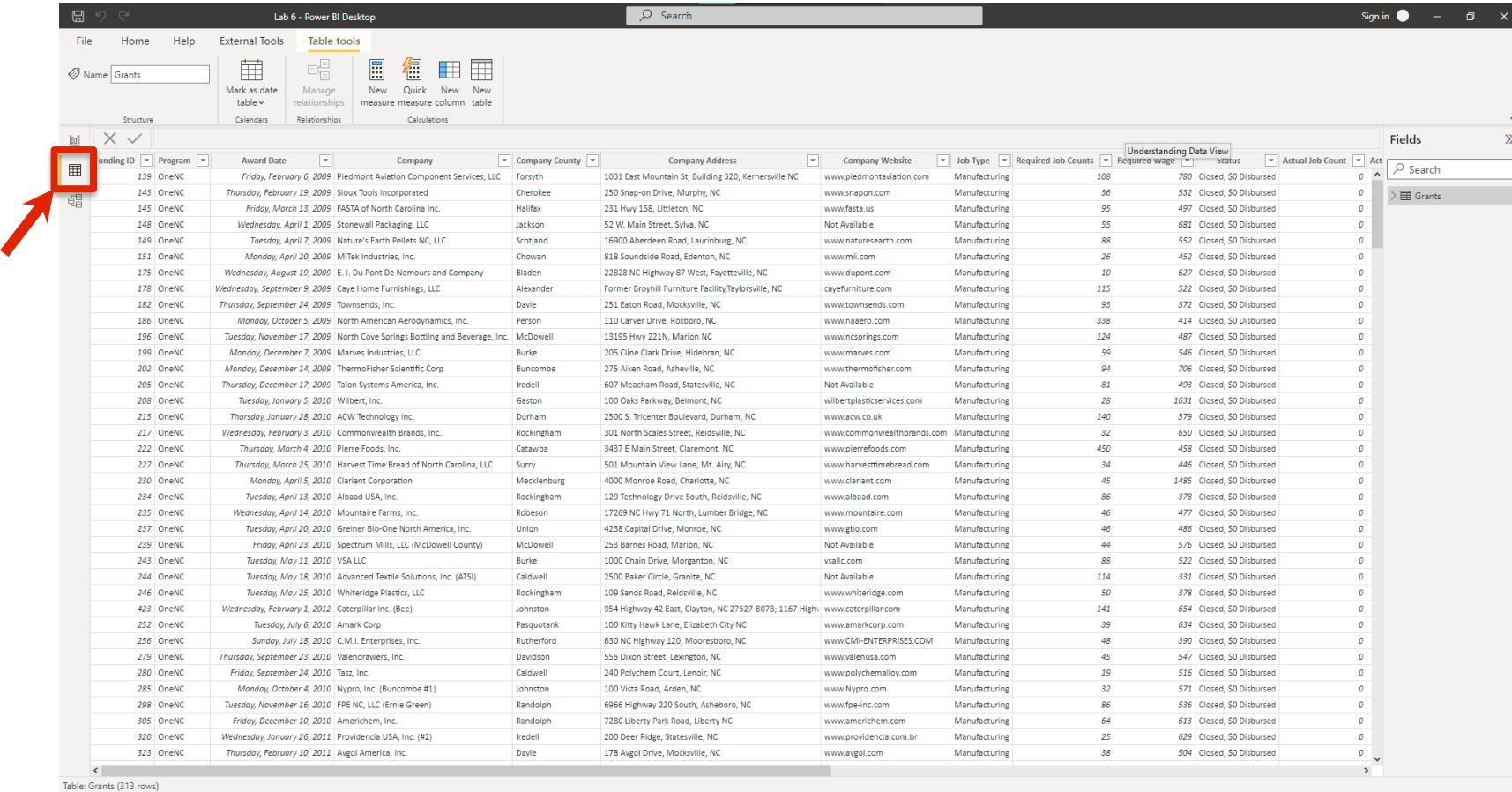
- Implement data storytelling frameworks and techniques
- Program in Power BI using DAX language to manipulate data

Objectives for Lab 5

- Navigate through the 3 Power BI data modeling components in Power BI Desktop
- Introduction to Power BI Formulas (DAX)
- Introduction to Measures
- Introduction to Calculated Columns
- Understanding Relationships between tables

Understanding Data View

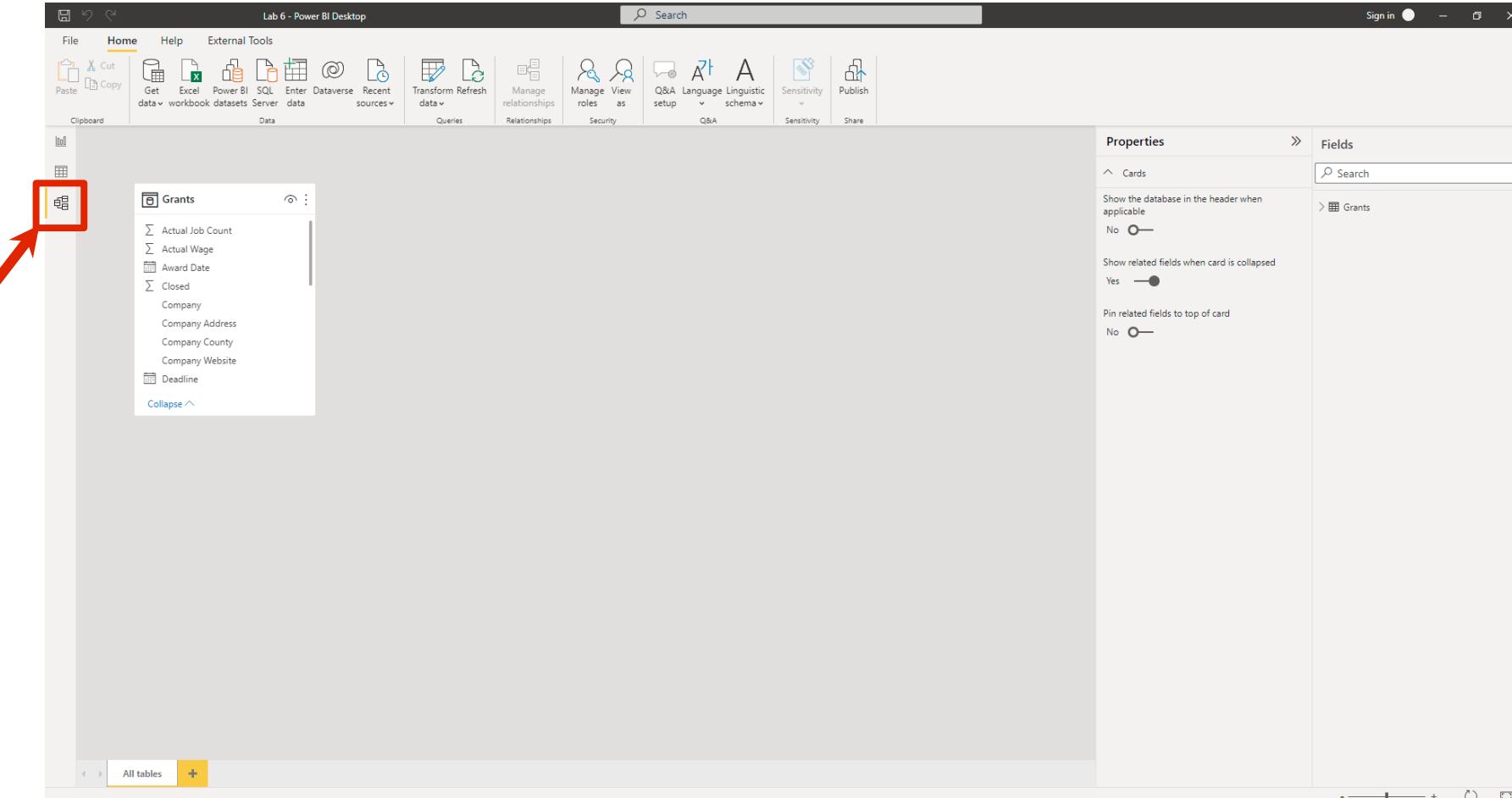
- Data View has all the tables in detailed table view (as opposed to Power Query in Edit Queries, Window which only provides data preview and does not store actual data)



The screenshot shows the Power BI Desktop interface with the title bar "Lab 6 - Power BI Desktop". The ribbon is active with the "Table tools" tab selected. In the "Structure" section of the ribbon, there is a "New table" icon highlighted with a red arrow. The main area displays a table named "Grants" with 313 rows. The columns include Funding ID, Program, Award Date, Company, Company County, Company Address, Company Website, Job Type, Required Job Counts, and various status metrics like Required wage, Status, Actual Job Count, and Action. The table is sorted by Required Job Counts. The bottom left corner of the table area shows the text "Table: Grants (313 rows)".

Understanding Model View

- Model View displays relationships between tables



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

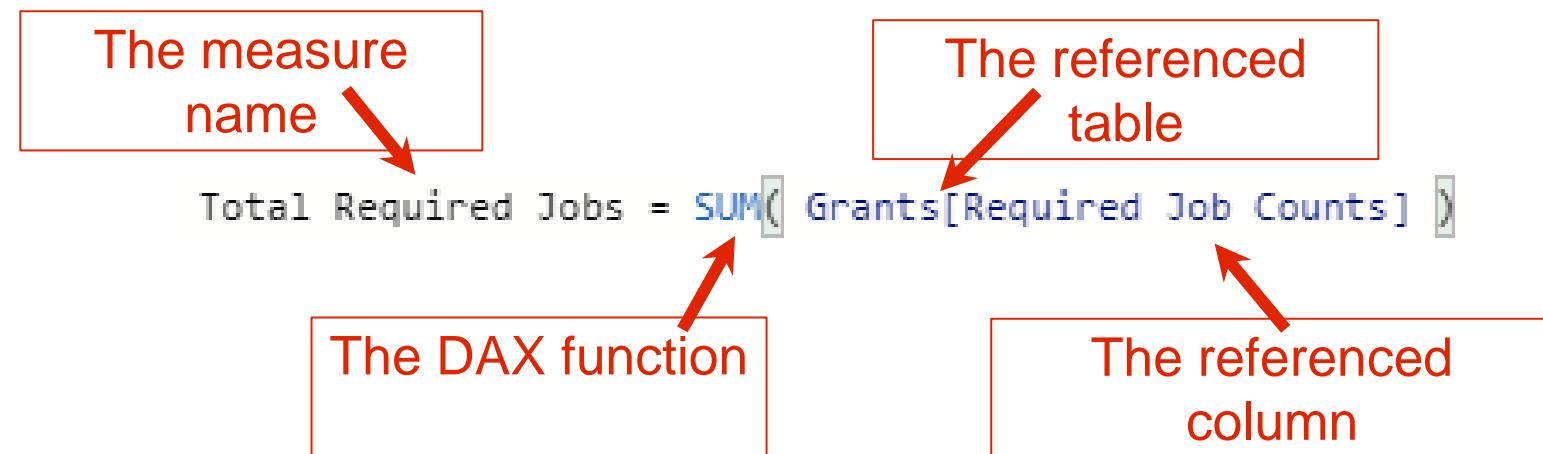
Calculate ‘total required jobs’

- 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



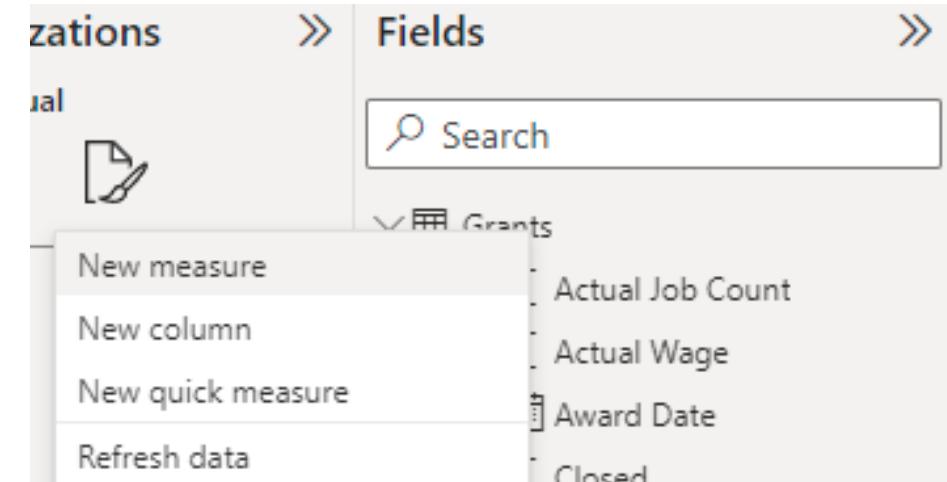
DAX Formula Syntax

- 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

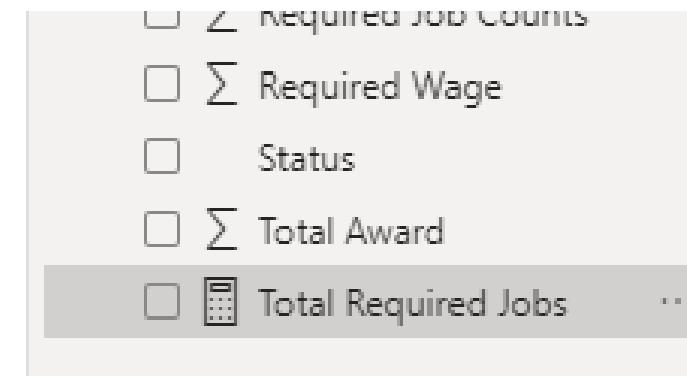
- Open 'Lab 5.pbix' file in Labs folder
- In Report view, in the field list, right-click on the Grants table, and then click New Measure
- In the formula bar, replace Measure by typing a new measure name:
 - Total Required Jobs
- After the equals sign, type:
 - `SUM(Grants[Required Job Counts])`



X ✓ 1 Total Required Jobs = `SUM(Grants[Required Job Counts])`

Measure added

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



Calculate ‘closed required jobs’

Isn't this measure doing the same thing as if I were to just add the Required Job Counts field to my report?

Yes but, there's a good reason to create our own measure that sums up values from the field: we can use it as an argument in other formulas!

Now, we are going to create a new measure to calculate **the total required jobs for the closed grants**



What is the logic for this calculation?

Using the CALCULATE function

- **CALCULATE** = Evaluates an expression in a context that is modified by the specified filters
- **CALCULATE(<expression>, <filter1>, <filter2>...)**
- You'll use the CALCULATE function to filter the amounts we want to sum by an argument we pass to the CALCULATE function.

Parameters	
Term	Definition
expression	The expression to be evaluated.
filter1, filter2, ...	(optional) A comma separated list of Boolean expression or a table expression that defines a filter.

Closed required jobs formula

- In the formula bar, replace Measure by typing a new measure name
Closed Required Jobs
- Then, type:
CALCULATE([Total Required Jobs], Grants[Closed]=1)
- Click the checkmark in the formula bar or press Enter to validate the formula and add it to the model
- Your formula should now look like this:

```
1 Closed Required Jobs = CALCULATE( Grants[Total Required Jobs], Grants[Closed] = 1 )
```

Tip: Type the first few letters and the rest will show up automatically, use tab to auto complete

Measure created with DAX

- You did it! You just created a measure using DAX, and not an easy one at that
- What this formula will do is calculate the total required jobs for the closed grants, depending on the filters applied in a report

```
1 Closed Required Jobs = CALCULATE( Grants[Total Required Jobs], Grants[Closed] = 1 )
```



Filters narrow down what will be calculated. In this case, you selected one filter as an argument.

Calculate closed required jobs

- Let's put [Total Required Jobs] and our [Closed Required Jobs] measures in a clustered bar chart's X-axis, and then add Company field in the Y-axis



Lab 5



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 ↗

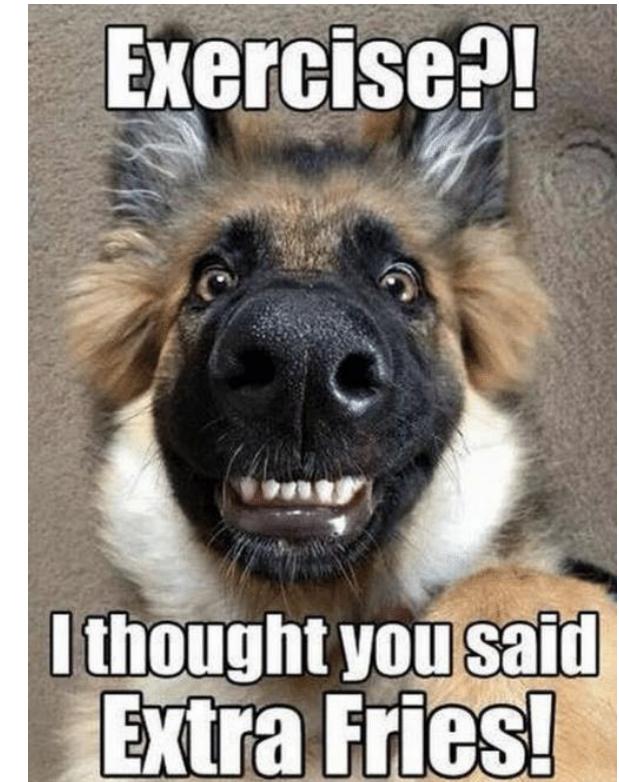
Returns the average (arithmetic mean) of all the numbers in a column.

Syntax

```
DAX
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>)

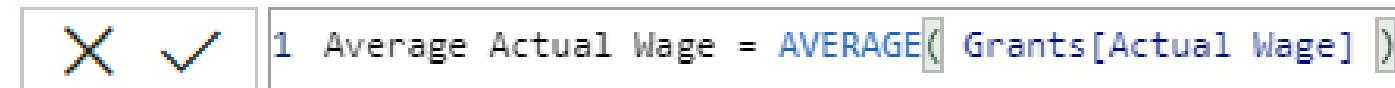
Parameters	
Term	Definition
column	The column that contains the numbers for which you want the average.

Step 2: calculate 'Average Actual Wage'

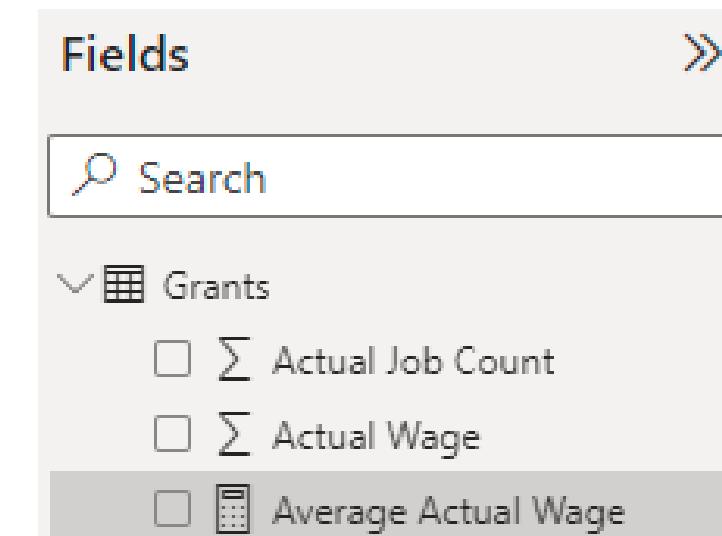
- Right click on 'Grants' table and add a New measure

Average Actual Wage = AVERAGE(Grants[Actual Wage])

- Under the 'Grants' table, a new field called 'Average Actual Wage' can be found

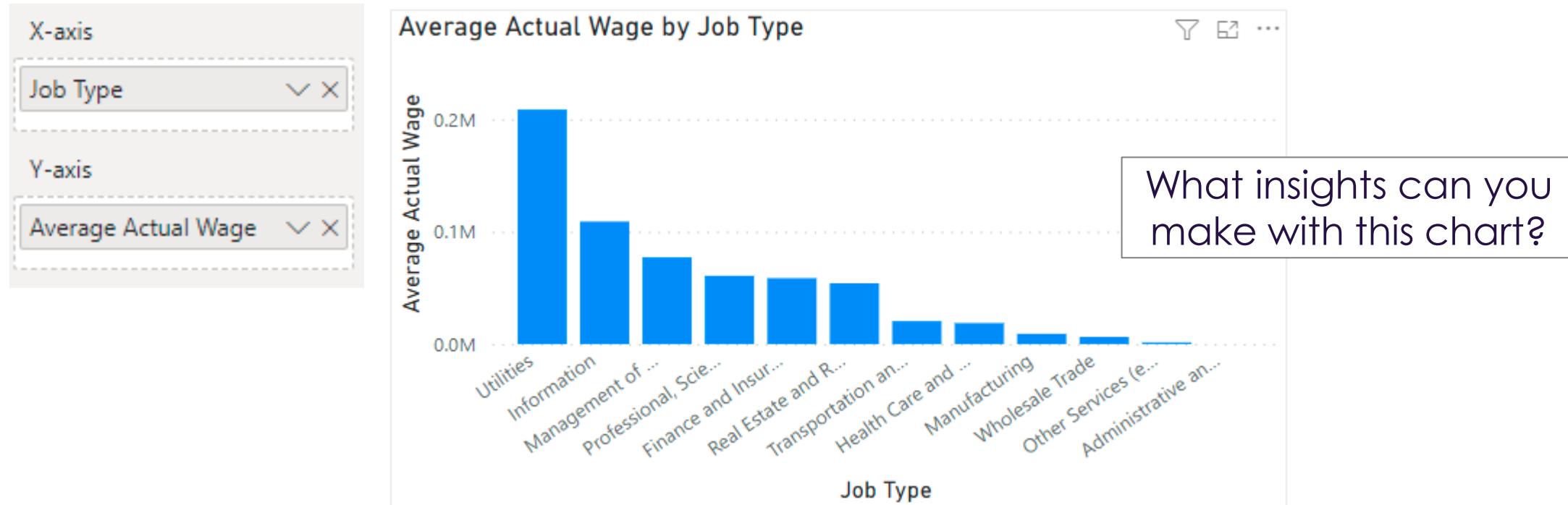


The screenshot shows the Power BI formula bar with a red 'X' and green checkmark icon. The text input field contains the formula: 1 Average Actual Wage = AVERAGE(Grants[Actual Wage]).



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

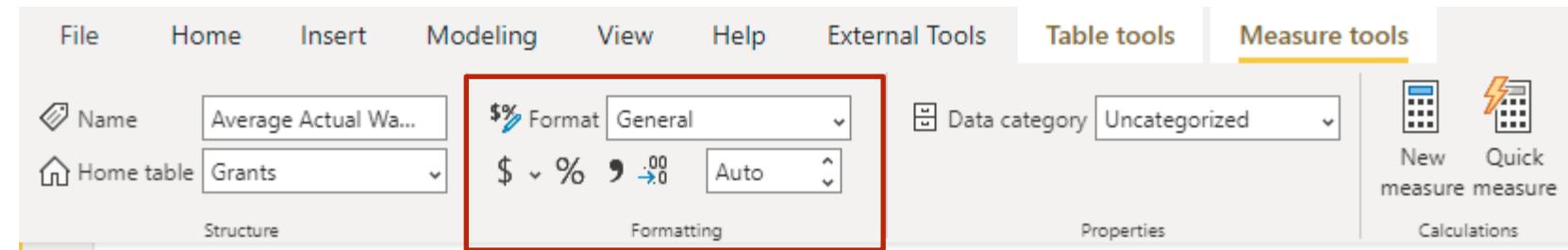
- Hover on the column chart, you can see the 'Average Actual Wage' for the 'Job Type' you choose. You will find the value of Average Project Wage is in decimal



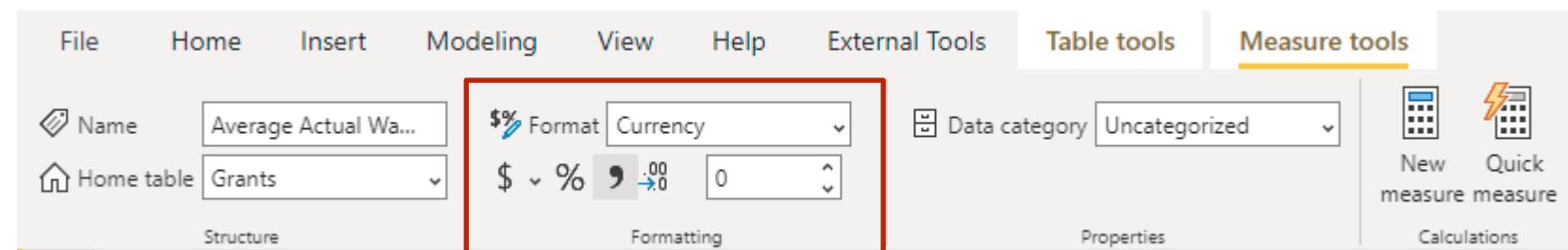
How can we change the decimal value into currency?

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

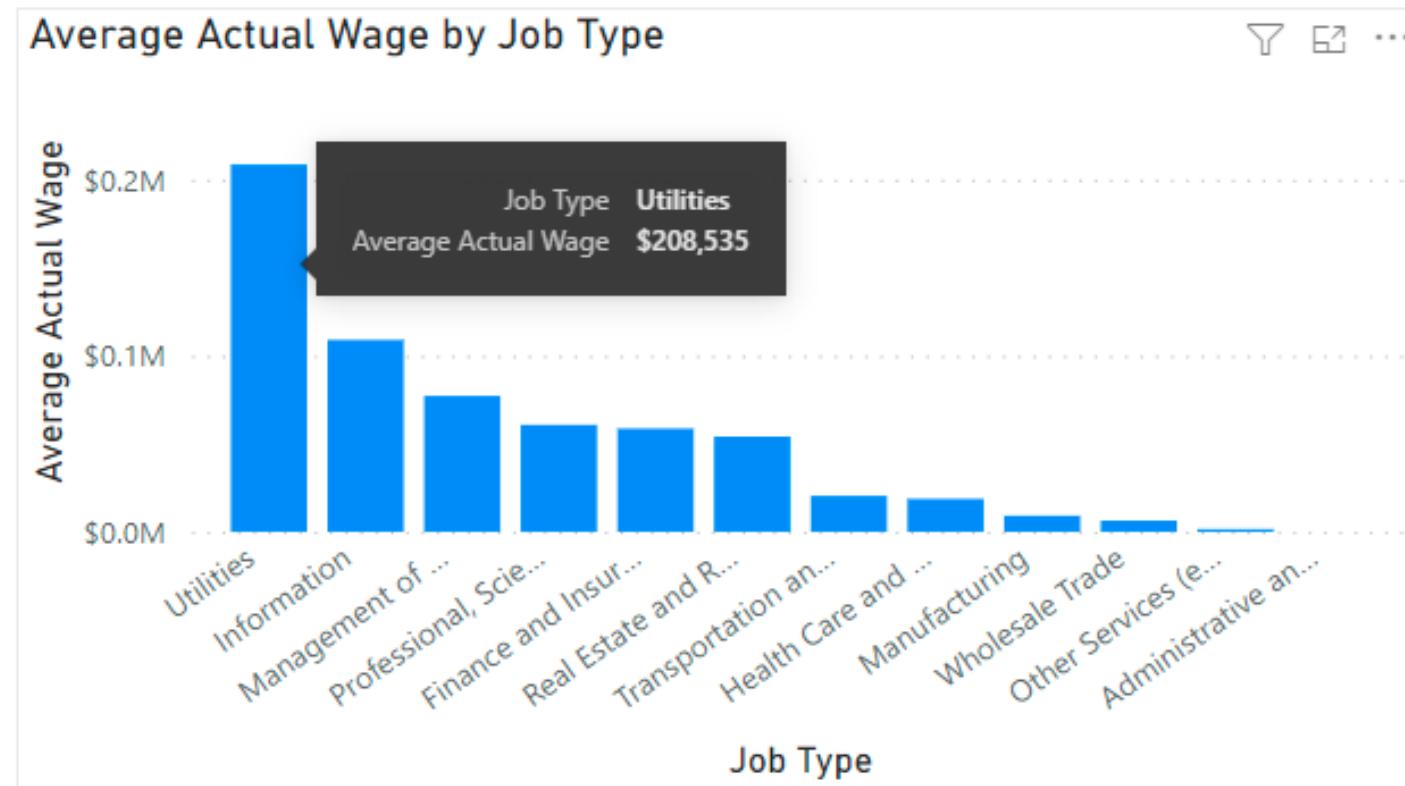


- Click on Format > ‘Currency’
- Type 0 in the decimal field and hit enter



Changed to currency

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



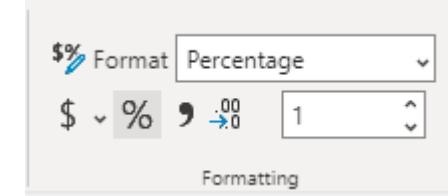
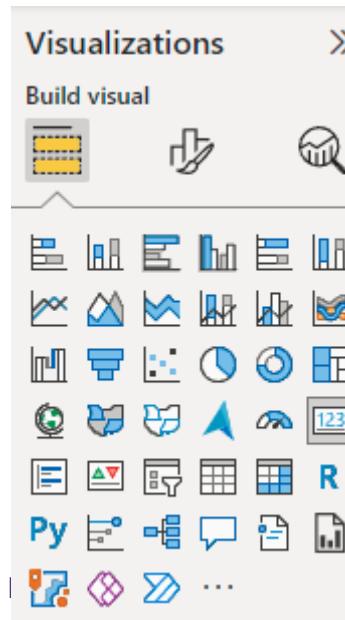
Calculate closed grant job fulfillment

- Let's calculate grant job fulfillment for the closed grants
- Closed Job Fulfillment = Closed Actual Jobs / Closed Required Jobs

Measure Formula	Format
Total Actual Jobs = SUM(Grants[Actual Job Count])	Whole Number
Closed Actual Jobs = CALCULATE([Total Actual Jobs], Grants[Closed] = 1)	Whole Number

Calculate closed job fulfillment

Measure Formula	Format
Way 1: Closed Job Fulfillment = [Closed Actual Jobs] / [Closed 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:

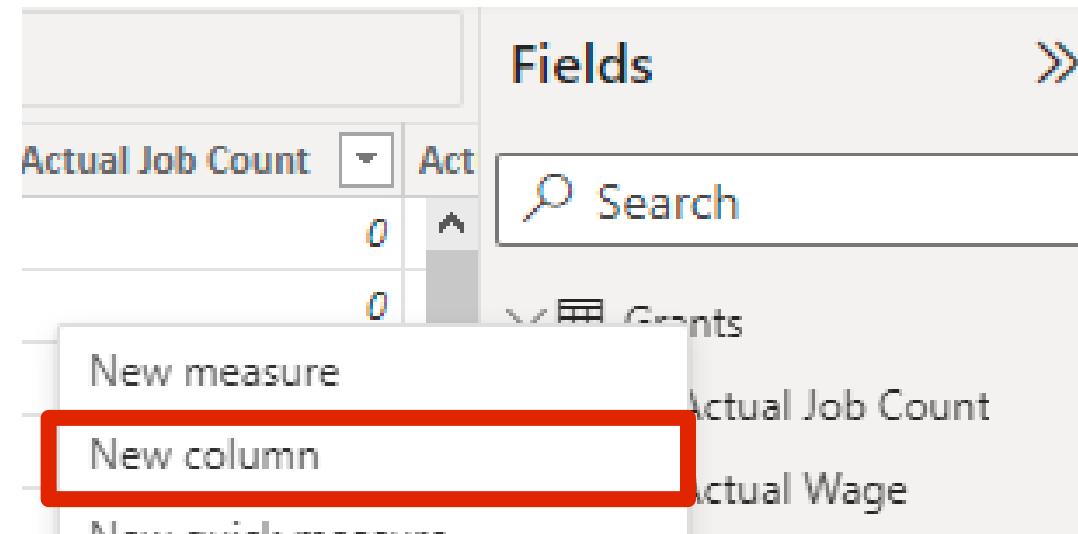
- Each row in a calculated column shares the same formula
- No “A1” Style Reference, only table and column reference
- Stored statically with the file
- You can think of Power BI as ‘Excel Formulas+’. Easy to learn from beginning and become more powerful as you learn more

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



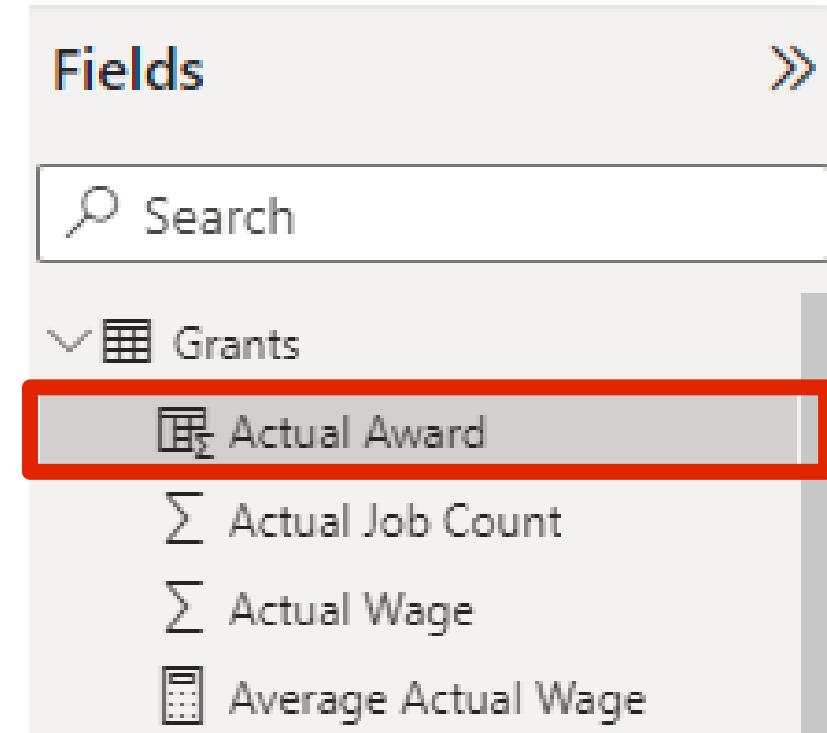
Create 'Actual Award' column

- Multiply Total Award by Percent Awarded

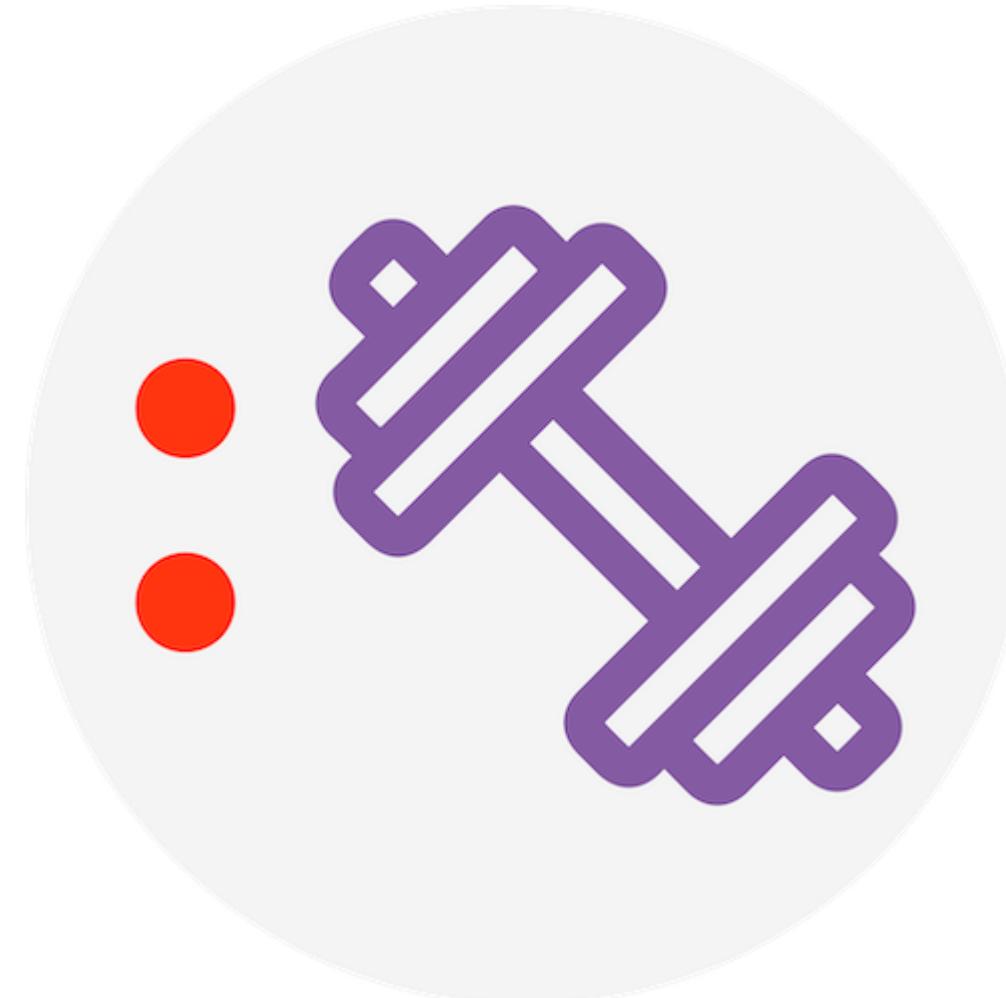
Calculated Column Formula	Format
Actual Award = Grants[Percent Awarded] * Grants[Total Award]	Currency

'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



Exercise 3



Calculate actual used award

- How can we calculate Actual Used Awards?

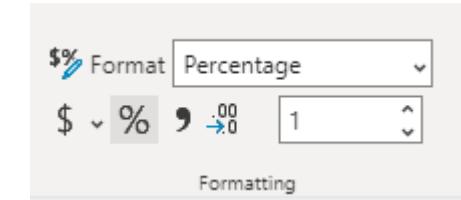
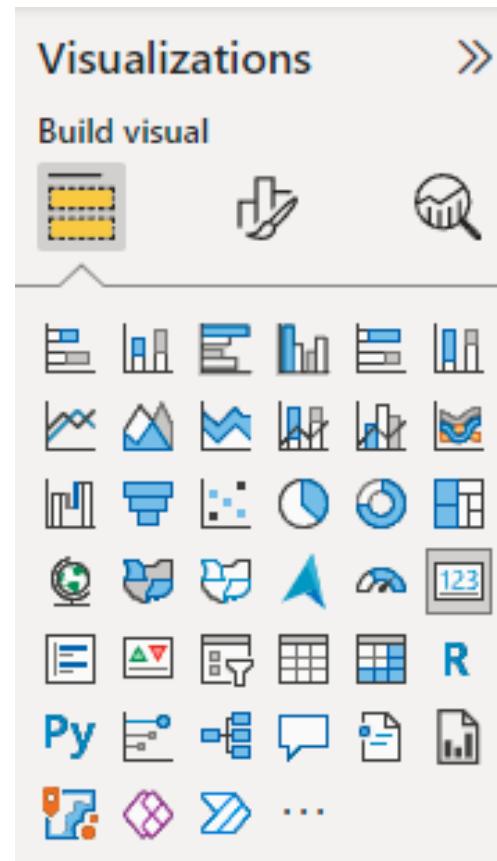
Measure Formula	Format
Total Award Amount =	Currency
Total Actual Award =	Currency
Actual Used Award =	Percentage

Calculate actual used award

Measure Formula	Format
Total Award Amount = SUM(Grants[Total Award])	Currency
Total Actual Award = SUM(Grants[Actual Award])	Currency
Actual Used Award = DIVIDE([Total Actual Award], [Total Award Amount], 0)	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

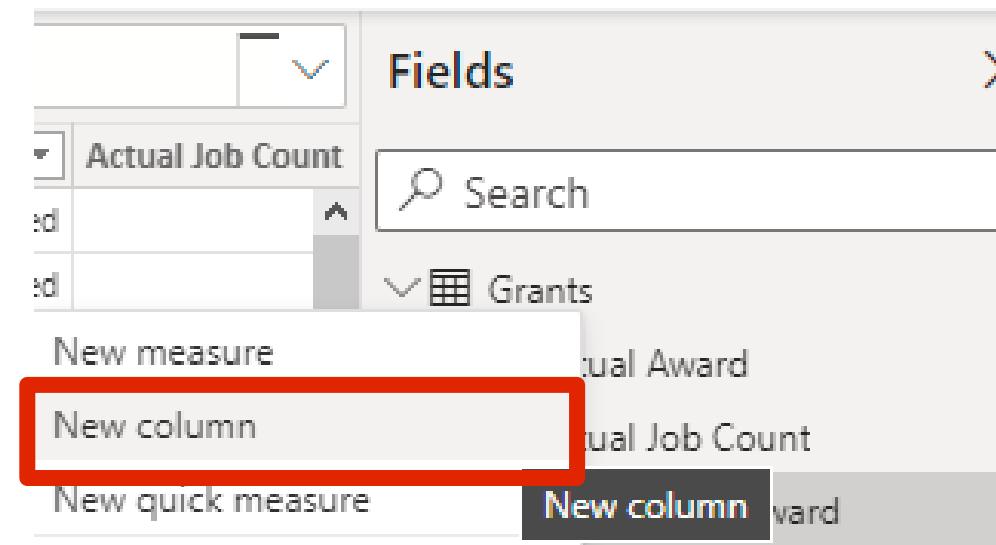
- Although we have county field, we cannot use it in the map visual because county names in United States are not unique
- In order to make each county unique, we will incorporate state with county
- We'll add a new column in 'Grants' table which has **County name combine with State name**



Map of every Springfield in the US

Create new column

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



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

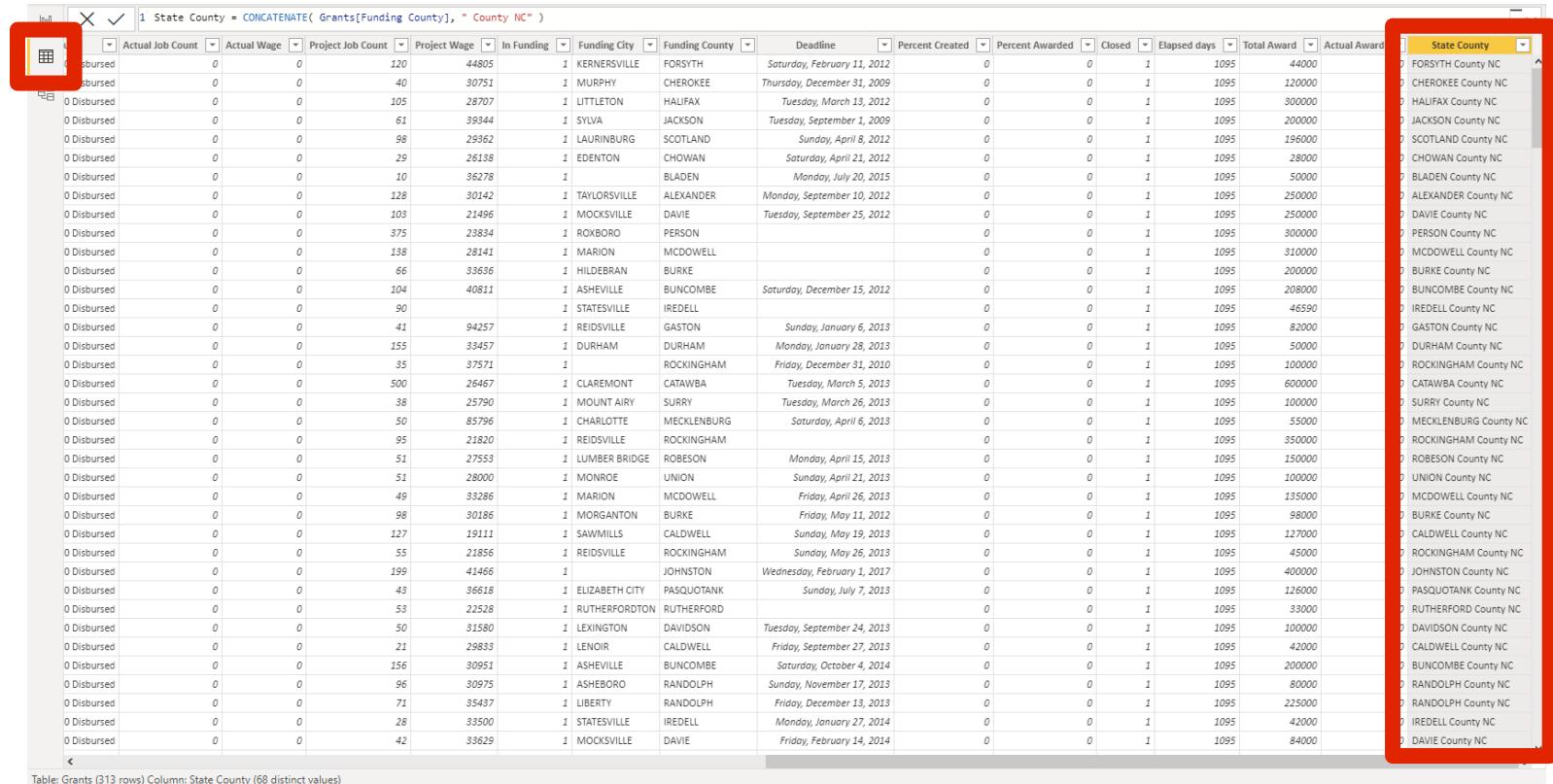
'State County' column

- 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

Σ	Percent Awarded
Σ	Percent Created
	Program
Σ	Project Job Count
Σ	Project Wage
Σ	Required Job Counts
Σ	Required Wage
	State County
	Status
	Total Actual Award

'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



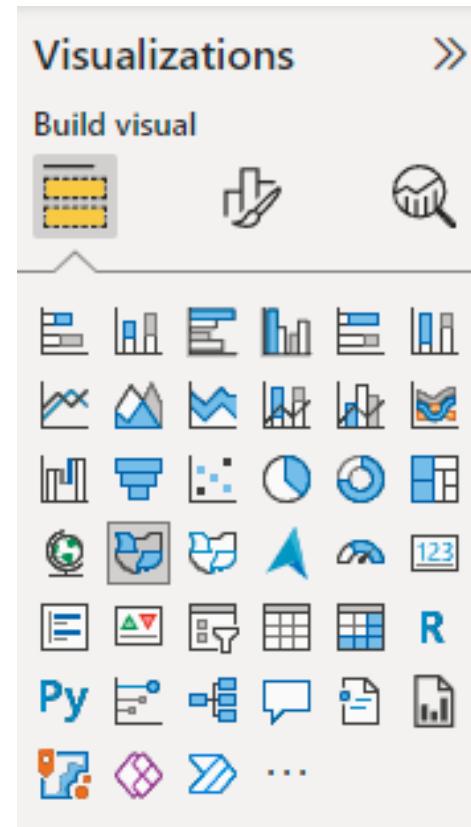
The screenshot shows the Power BI Data View interface with the 'Grants' table selected. A red box highlights the 'State County' column in the top row. The table contains 313 rows and 22 columns, including 'Actual Job Count', 'Actual Wage', 'Project Job Count', 'Project Wage', 'In Funding', 'Funding City', 'Funding County', 'Deadline', 'Percent Created', 'Percent Awarded', 'Closed', 'Elapsed days', 'Total Award', 'Actual Award', and 'State County'. The 'State County' column is defined as a calculated column: `1 State County = CONCATENATE(Grants[Funding County], " County NC")`. The right pane of the interface shows a list of distinct values for the 'State County' column.

	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	0 FORSYTH County NC	
0 Disbursed	0	0	40	30751	1	MURPHY	CHEROKEE	Thursday, December 31, 2009	0	0	1	1095	120000	0 CHEROKEE County NC	
0 Disbursed	0	0	105	28707	1	LITTLETON	HALIFAX	Tuesday, March 13, 2012	0	0	1	1095	300000	0 HALIFAX County NC	
0 Disbursed	0	0	61	39344	1	SYLVA	JACKSON	Tuesday, September 1, 2009	0	0	1	1095	200000	0 JACKSON County NC	
0 Disbursed	0	0	98	29362	1	LAURINBURG	SCOTLAND	Sunday, April 8, 2012	0	0	1	1095	196000	0 SCOTLAND County NC	
0 Disbursed	0	0	29	26138	1	EDENTON	CHOWAN	Saturday, April 21, 2012	0	0	1	1095	28000	0 CHOWAN County NC	
0 Disbursed	0	0	10	36278	1	BLADEN		Monday, July 20, 2015	0	0	1	1095	50000	0 BLADEN County NC	
0 Disbursed	0	0	128	30142	1	TAYLORSVILLE	ALEXANDER	Monday, September 10, 2012	0	0	1	1095	250000	0 ALEXANDER County NC	
0 Disbursed	0	0	103	21496	1	MOCKSVILLE	DAVIE	Tuesday, September 25, 2012	0	0	1	1095	250000	0 DAVIE County NC	
0 Disbursed	0	0	375	23834	1	ROXBORO	PERSON		0	0	1	1095	300000	0 PERSON County NC	
0 Disbursed	0	0	138	28141	1	MARION	MCDOWELL		0	0	1	1095	310000	0 MCDOWELL County NC	
0 Disbursed	0	0	66	33636	1	HILDEBRAN	BURKE		0	0	1	1095	200000	0 BURKE County NC	
0 Disbursed	0	0	104	40811	1	ASHEVILLE	BUNCOMBE	Saturday, December 15, 2012	0	0	1	1095	208000	0 BUNCOMBE County NC	
0 Disbursed	0	0	90	1	STATESVILLE	IREDELL		0	0	1	1095	46590	0 IREDELL County NC		
0 Disbursed	0	0	41	94257	1	REIDSVILLE	GASTON	Sunday, January 6, 2013	0	0	1	1095	82000	0 GASTON County NC	
0 Disbursed	0	0	155	33457	1	DURHAM	DURHAM	Monday, January 28, 2013	0	0	1	1095	50000	0 DURHAM County NC	
0 Disbursed	0	0	35	37571	1		ROCKINGHAM	Friday, December 31, 2010	0	0	1	1095	100000	0 ROCKINGHAM County NC	
0 Disbursed	0	0	500	26467	1	CLAREMONT	CATAWBA	Tuesday, March 5, 2013	0	0	1	1095	600000	0 CATAWBA County NC	
0 Disbursed	0	0	38	25790	1	MOUNT AIRY	SURRY	Tuesday, March 26, 2013	0	0	1	1095	1000000	0 SURRY County NC	
0 Disbursed	0	0	50	85796	1	CHARLOTTE	MECKLENBURG	Saturday, April 6, 2013	0	0	1	1095	55000	0 MECKLENBURG County NC	
0 Disbursed	0	0	95	21820	1	REIDSVILLE	ROCKINGHAM		0	0	1	1095	350000	0 ROCKINGHAM County NC	
0 Disbursed	0	0	51	27553	1	LUMBER BRIDGE	ROBESON	Monday, April 15, 2013	0	0	1	1095	150000	0 ROBESON County NC	
0 Disbursed	0	0	51	28000	1	MONROE	UNION	Sunday, April 21, 2013	0	0	1	1095	100000	0 UNION County NC	
0 Disbursed	0	0	49	33286	1	MARION	MCDOWELL	Friday, April 26, 2013	0	0	1	1095	135000	0 MCDOWELL County NC	
0 Disbursed	0	0	98	30186	1	MORGANTON	BURKE	Friday, May 11, 2012	0	0	1	1095	98000	0 BURKE County NC	
0 Disbursed	0	0	127	19111	1	SAWMILLS	CALDWELL	Sunday, May 19, 2013	0	0	1	1095	127000	0 CALDWELL County NC	
0 Disbursed	0	0	55	21856	1	REIDSVILLE	ROCKINGHAM	Sunday, May 26, 2013	0	0	1	1095	45000	0 ROCKINGHAM County NC	
0 Disbursed	0	0	199	41466	1		JOHNSTON	Wednesday, February 1, 2017	0	0	1	1095	400000	0 JOHNSTON County NC	
0 Disbursed	0	0	43	36618	1	ELIZABETH CITY	PASQUOTANK	Sunday, July 7, 2013	0	0	1	1095	126000	0 PASQUOTANK County NC	
0 Disbursed	0	0	53	22528	1	RUTHERFORDTON	RUTHERFORD		0	0	1	1095	33000	0 RUTHERFORD County NC	
0 Disbursed	0	0	50	31580	1	LEXINGTON	DAVIDSON	Tuesday, September 24, 2013	0	0	1	1095	100000	0 DAVIDSON County NC	
0 Disbursed	0	0	21	29833	1	LENOIR	CALDWELL	Friday, September 27, 2013	0	0	1	1095	42000	0 CALDWELL County NC	
0 Disbursed	0	0	156	30951	1	ASHEVILLE	BUNCOMBE	Saturday, October 4, 2014	0	0	1	1095	200000	0 BUNCOMBE County NC	
0 Disbursed	0	0	96	30975	1	ASHEBORO	RANDOLPH	Sunday, November 17, 2013	0	0	1	1095	80000	0 RANDOLPH County NC	
0 Disbursed	0	0	71	35437	1	LIBERTY	RANDOLPH	Friday, December 13, 2013	0	0	1	1095	225000	0 RANDOLPH County NC	
0 Disbursed	0	0	28	33500	1	STATEVILLE	IREDELL	Monday, January 27, 2014	0	0	1	1095	42000	0 IREDELL County NC	
0 Disbursed	0	0	42	33629	1	MOCKSVILLE	DAVIE	Friday, February 14, 2014	0	0	1	1095	84000	0 DAVIE County NC	

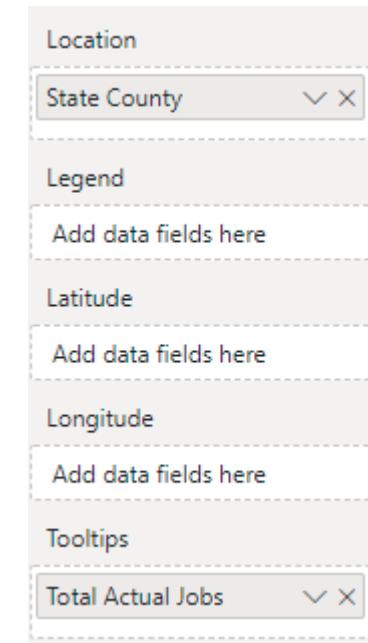
Table: Grants (313 rows) Column: State County (68 distinct values)

Create map visual

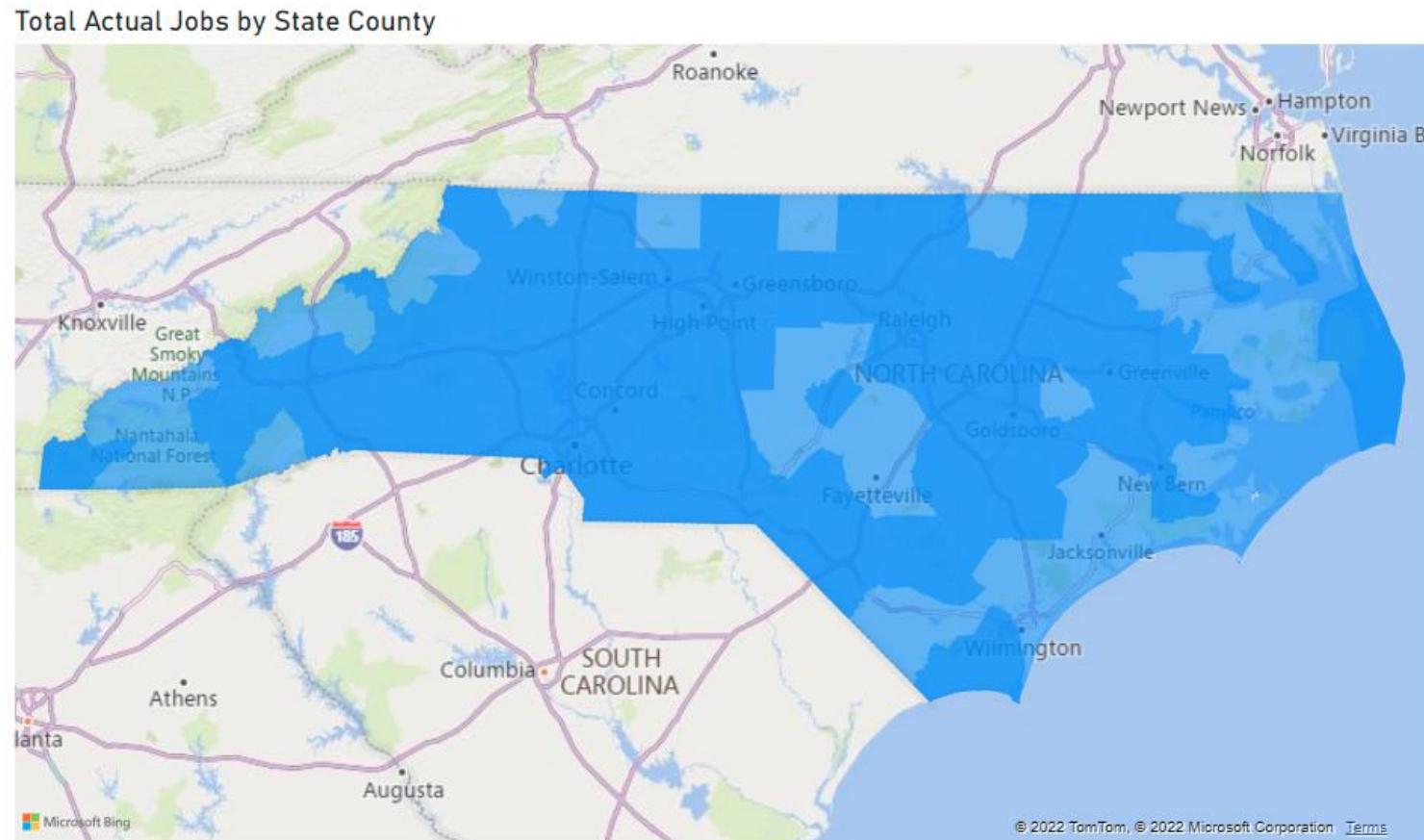
- Flip back to 'Report' view, add a 'Filled map'



- 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.



Create map visual



Can we add more information to this map?

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

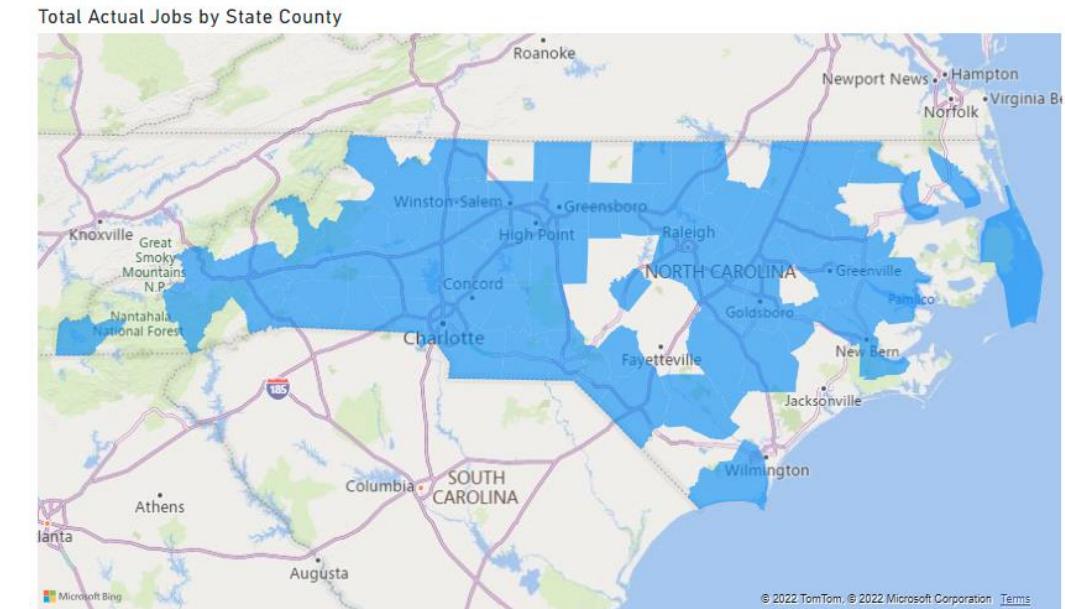
State County
is not MULTIPLE Coun...

Filter type ⓘ
Basic filtering

Search

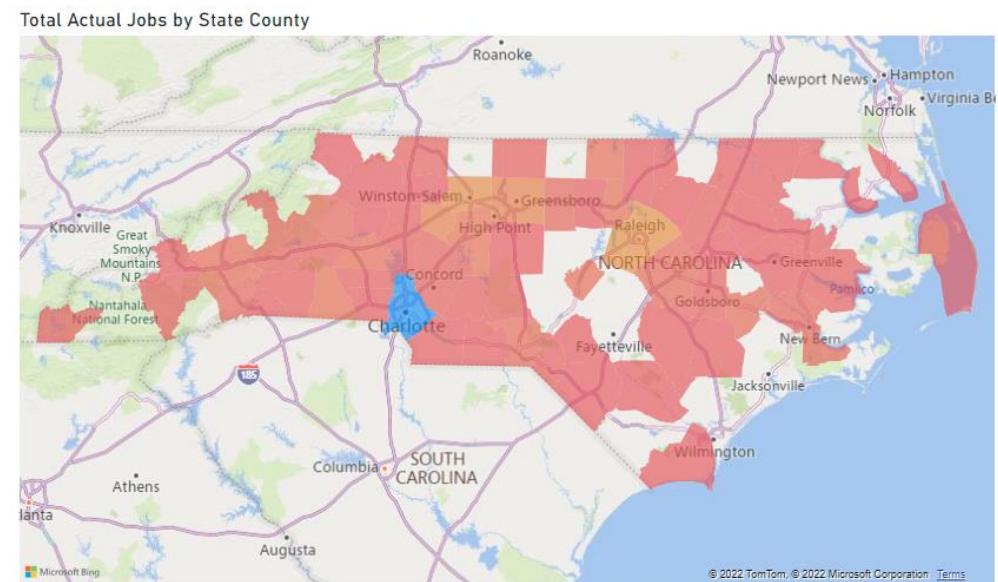
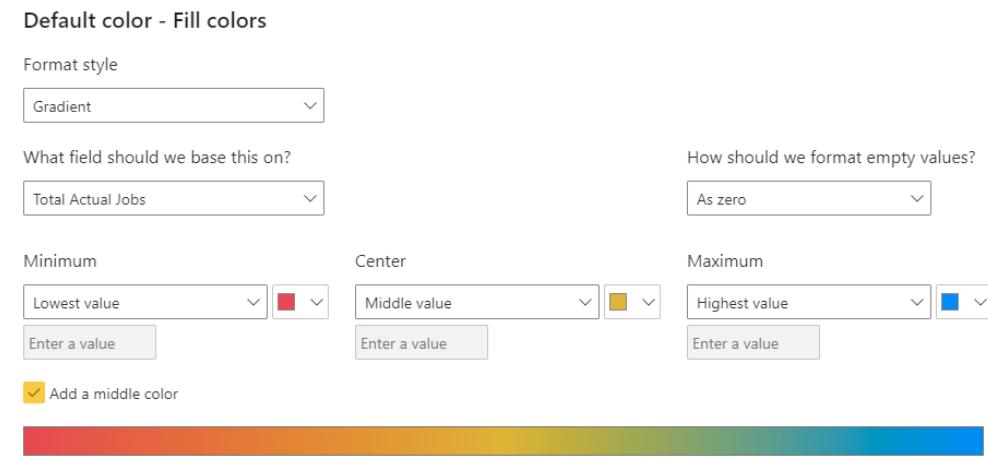
- MITCHELL County NC 1
- MONTGOMERY Cou... 2
- MULTIPLE County NC 7
- NASH County NC 3
- NORTHHAMPTON Co... 1
- ORANGE County NC 1
- PASQUOTANK Co... 4

Require single selection



Conditional Formatting

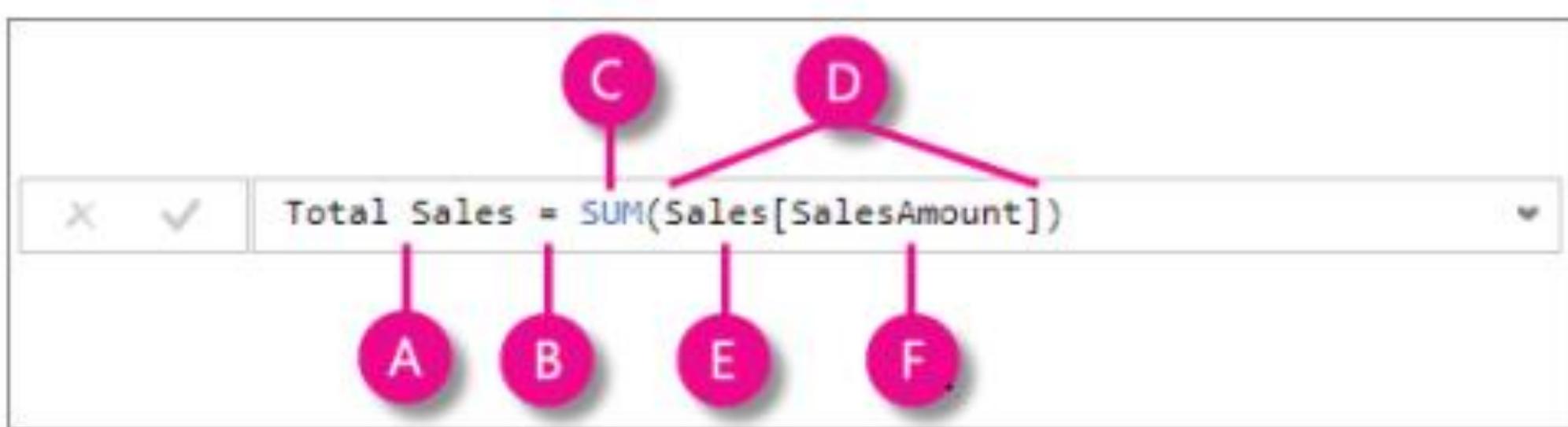
- In the Format tab, Visual category, expand the Fill Colors section
- Click the *fx* button 
- Format Style: Gradient
- Field based on: Total Actual Jobs
- Add a middle color
- Lowest Value Color: Red
- Middle Value Color: Yellow
- Highest Value Color: Blue
- Click OK



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.

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/UCy2rBqj4M1tzK-urTZ28zcA> 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

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/UCy2rBqj4M1tzK-urTZ28zcA> 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

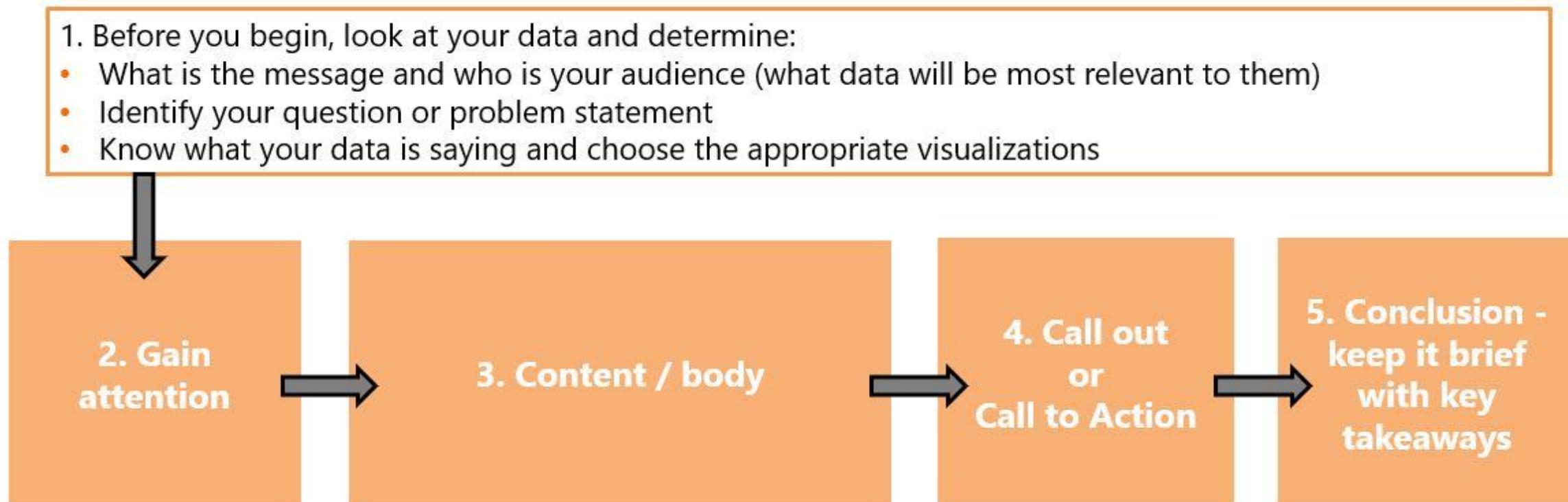


5 tips for your data presentation

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



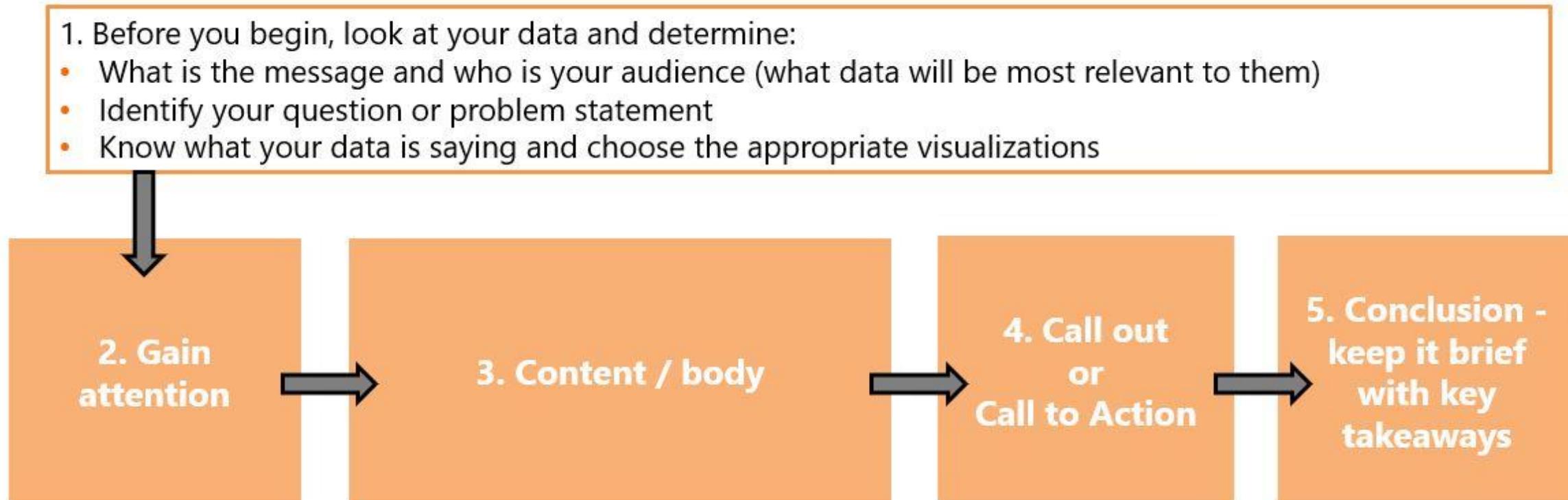
Step 4: Call to action

- 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!

