

Summary

The focus of this walkthrough is to build on our barchart and make it interactive, but for real this time. In order to make this work, we have to do some data transformations using the downloaded version of Excel. Please note that the steps shown below are just *one way* of doing the types of data transformations that need to be completed to make our data more easily visualizable, there are other ways this can be accomplished!

Notes for instructors:

Example file is the “Dashboard3, SP25, Interactivity with Pivoted Data” file in the “IS457 Prep Materials (SP25)” Workspace in outlook.

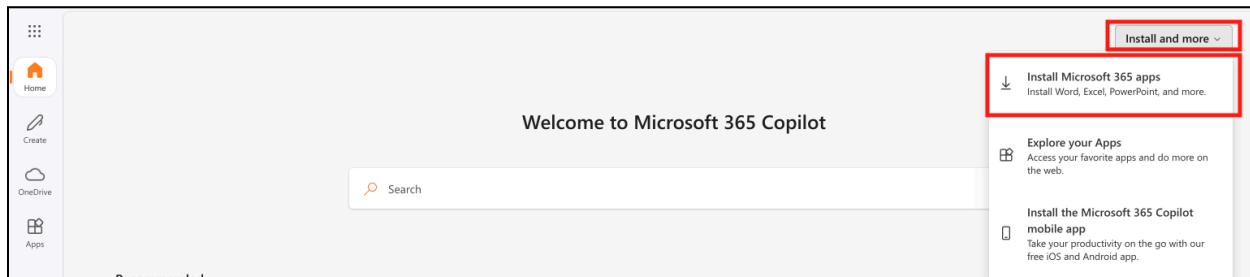
Be sure you are using the Chrome browser for this exercise! (Other browsers *may* work, but at present, Firefox is a bit buggy).

Important setup information

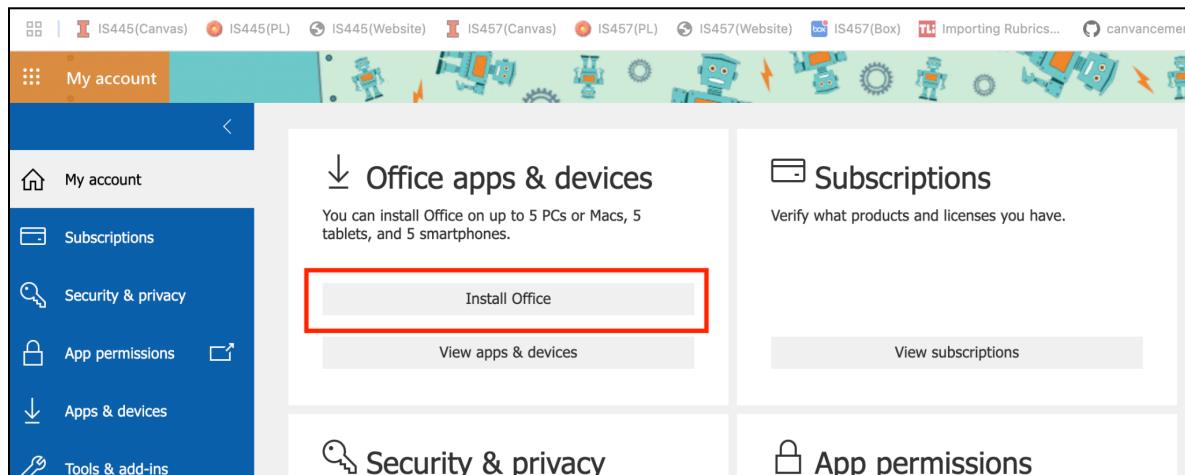
For this exercise, you will need to have Excel downloaded in order to use the Power Query tool.

To do this follow the [instructions on the WebStore](#) page for installing Microsoft Office. In particular:

1. Click on: go.illinois.edu/office365
2. Log in with your UIUC email address and credentials
3. Find “Install Office” or “Install and more” on the upper right of the screen and click on “Install Microsoft 365 apps”:



4. You can then click on the “Install Office” (or similar) button that pops up:



Excel should then be on your computer with an icon that looks something like:



And when you click on the icon, you should see a spreadsheet view such as:

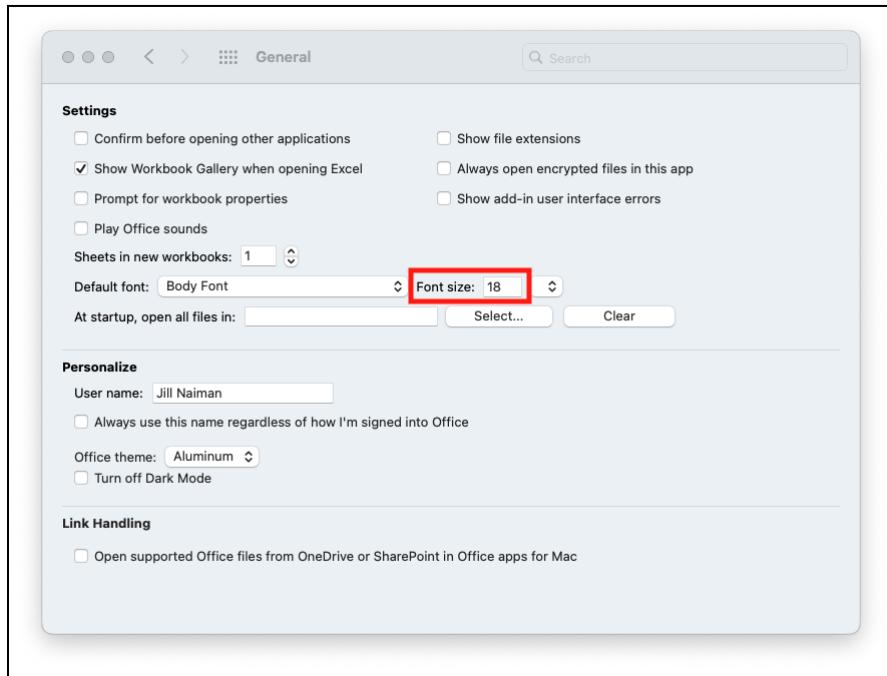
A screenshot of the Microsoft Excel application window titled 'Book2'. The window includes a ribbon bar with tabs like Home, Insert, Draw, etc., and various toolbars for formatting and data manipulation. The main area is a blank spreadsheet grid with columns labeled A through U and rows labeled 1 through 38. The status bar at the bottom indicates 'Sheet1' and 'Accessibility: Good to go'.

You are now set up to use Excel later in this Walkthrough.

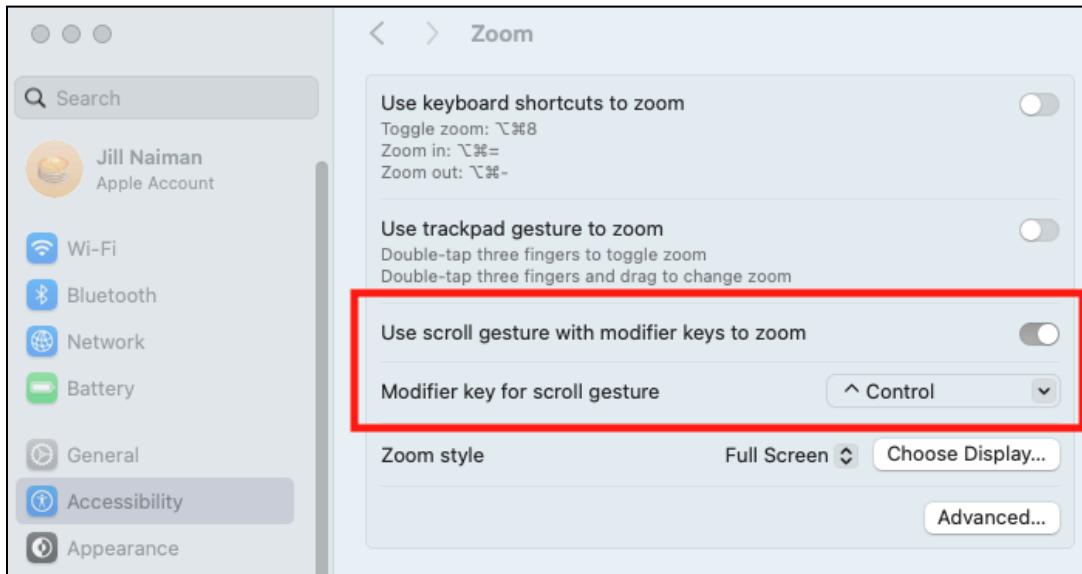
For Instructors:

The default toolbar/cells can be a small size. There are 2 options that can help.

First, use “Excel → Preferences → General” to change the fontsize of the cells:



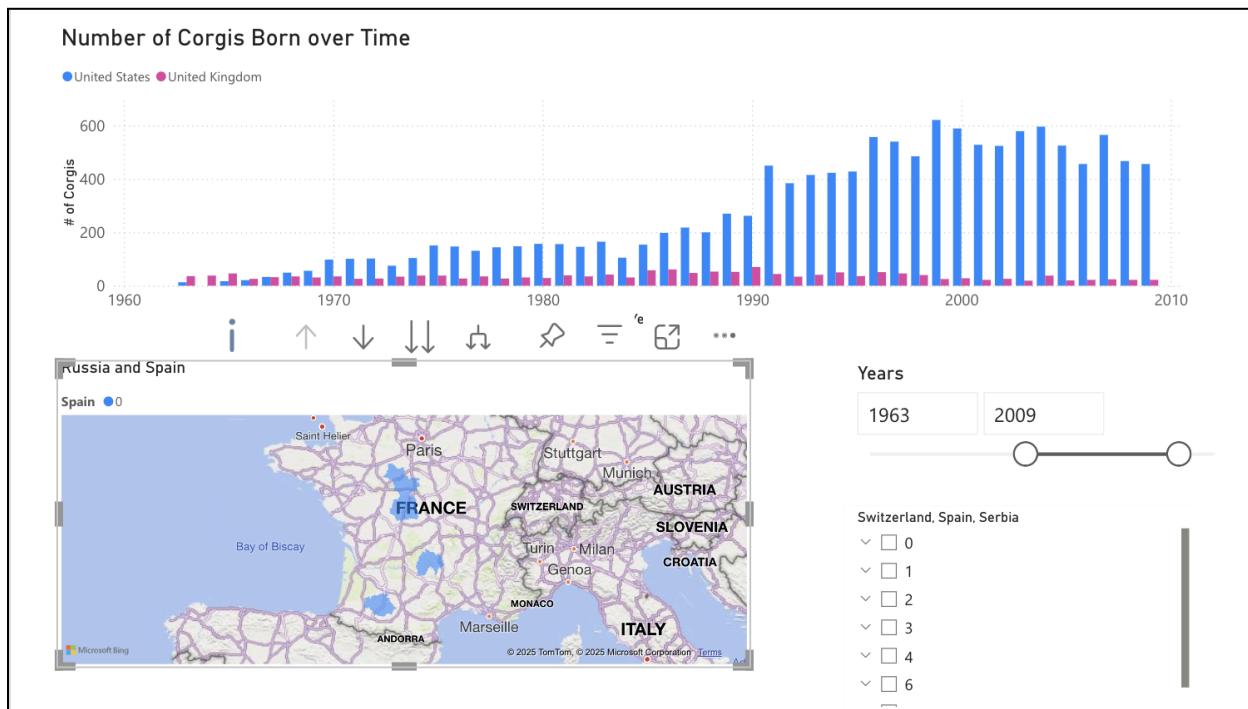
This does not help with the toolbar size (only cell size), but you can enable screen zoom with a set of keys (CTRL + scroll) on a Mac:



This way, you can at least zoom into specific elements on the toolbar.

Review from last time: Beginning Interactivity (original dataset)

Last time we added some interactivity, but not all of it worked in the way that we wanted:



In particular, we note that:

1. The Years slider doesn't take into account the "date" nature of the column (it doesn't make a huge difference here, but other datasets we work with may have full dates that we want to be able to deal with)
2. The map is not correct

To fix each of these, we need to transform our data before loading it into PowerBI for visualization.

Data Organization – What we have and what we need

Right now our data is stored in the following way with one column of Years and the rest of the columns representing the number of corgis born over time in each named (column) country:

A	B	C	D	E	F	G
1 Years	United States	Brazil	Russia	Japan	Vietnam	Germany
2 1917	0	0	0	0	0	0
3 1918	0	0	0	0	0	0
4 1919	0	0	0	0	0	0
5 1920	0	0	0	0	0	0
6 1921	0	0	0	0	0	0

We noted that the only interactivity that *kind* of worked was the Years slider – this is because “Years” is its own column. This tells us that instead of having a table with each Country with its own column name we want something more like the following:

	A	B	C
1	Date	Country	corgis born
2	1/1/17	United States	0
3	1/1/17	Brazil	0
4	1/1/17	Russia	0
5	1/1/17	Japan	0
6	1/1/17	Vietnam	0
7	1/1/17	Germany	0

The first thing to notice about this newly formatted table is that the “Years” has been transformed into a “Date” with proper date formatting (just like we did with GDS through Google Sheets).

The second thing we notice is that our countries and number of corgis born in each country has been “unwrapped” into one Country column, as has the number of corgis born. You can think of this as taking our original table and formatting such that for each unique combination of Date and Country, the number of corgis born for that Date and Country is listed in the “corgis born” column.

This is a format that “plays nicer” with PowerBI. Thinking ahead, a format like this allows us to plot the from 3 columns – Date, Country, and number of corgi’s born – and filter based on *conditions on these columns* (e.g. Country == United States, or, Date < 1/1/1950).

Reformatting Our Data with Power Query

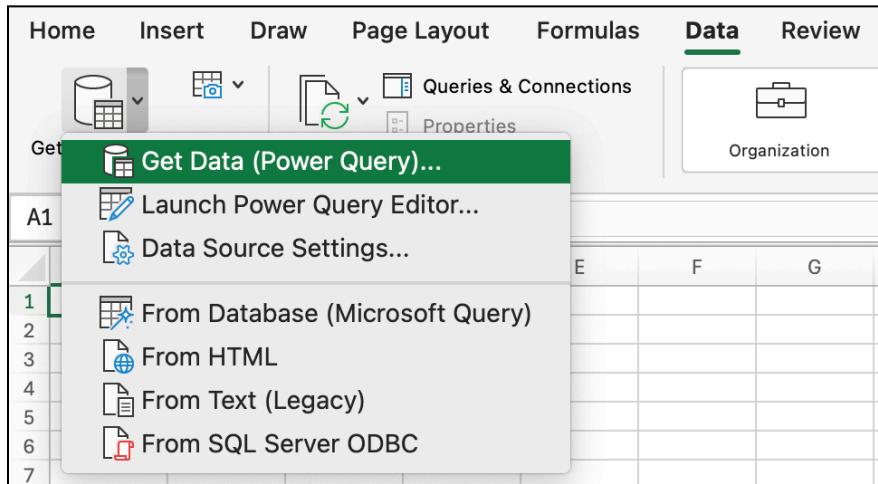
In this section, we will read in our original CSV file, and learn how to reformat it to the necessary format using Power Query.

Step 1: Download original CSV file

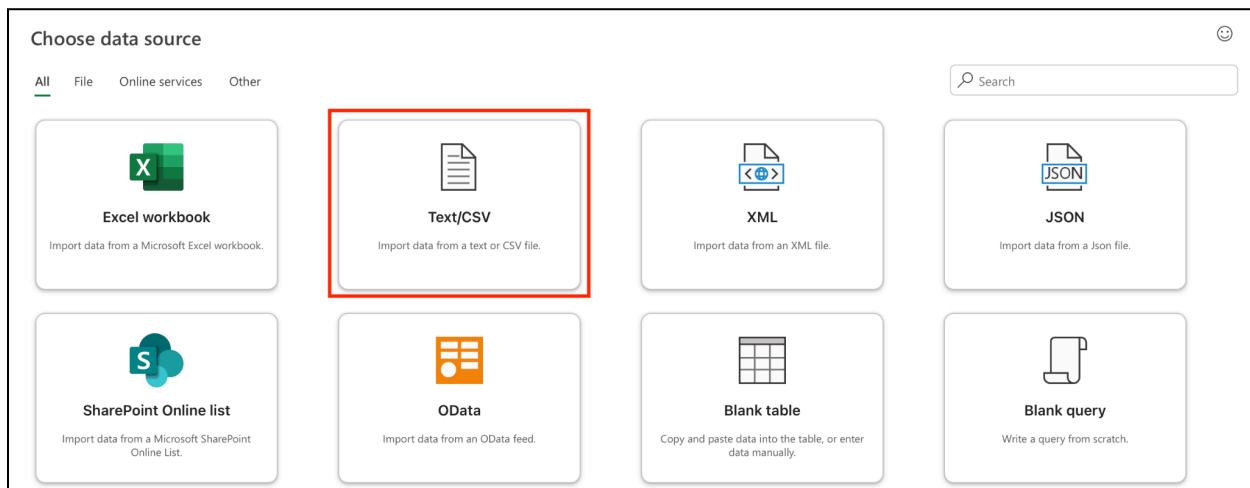
First, you will need the original dataset. You can download this by right-clicking on the following link and using “Save As”: [link here](#), or using the “Download” icon on the [github page](#) for this data, or downloading from the course Canvas site. Be sure to save this file locally as a “.csv” file (not a “.txt” file, or anything else).

Step 2: Import Data into Excel with Power Query

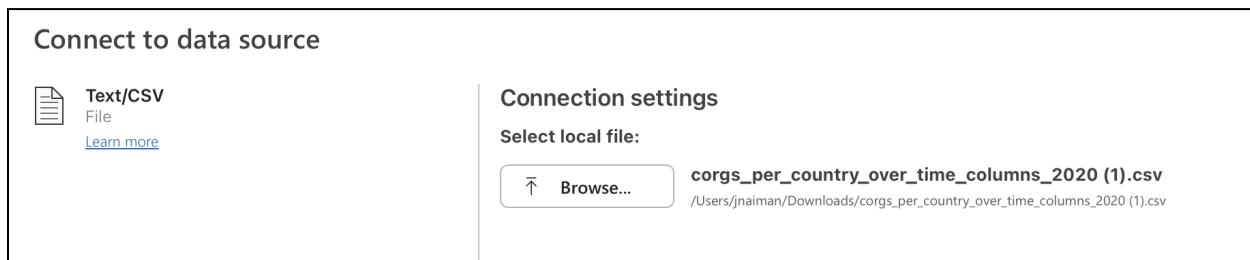
Open up an Excel spreadsheet and click on the “Data” tab at the top, and navigate to the “Get Data (Power Query)” drop down menu, finally select “Get Data (Power Query)...”:



Now click on the “Text/CSV” option when it pops up:



Browse and select your local download of the CSV file:



Then click on the green “Next” button at the bottom of the interface. This should give you the following preview of your data:

Preview file data

File path: /Users/jnaiman/Downloads/corgs_per_country_over_time_columns_2020 (1).csv

File origin: 65001: Unicode (UTF-8) Delimiter: Comma Data type detection: Based on first 200 rows

Years	United States	Brazil	Russia	Japan	Vietnam	Germany	France	United Kingdom	Italy	South Africa	Ukraine	Spain	Poland	Canada	Korea, North	Romania	Australia	Portugal	Belgium	Czech Republic
1917	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
1918	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1919	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1921	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1922	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1923	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
1924	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
1925	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	
1926	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	
1927	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	
1928	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	
1929	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	
1930	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	
1931	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	
1932	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	
1933	1	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	
1934	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	
1935	2	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0	0	
1936	1	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	
1937	1	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	
1938	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	
1939	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
1940	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
1941	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	
1942	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	

Back Cancel Transform data Load

Before doing any transformations, let's see what this looks like if we just hit the green "Load" button at the bottom right of the screen:

Home Insert Draw Page Layout Formulas Data Review View Automate Table

Table Name: corgs_per_co Summarize with PivotTable Remove Duplicates Convert to Range Insert Slicer Refresh Header Row Total Row Filter Button Banded Rows First Column Last Column Banded Columns

Years	United States	Brazil	Russia	Japan	Vietnam	Germany	France	United Kingdom	Italy	South Africa	Ukraine	Spain	Poland	Canada	Korea, North	Romania	Australia	Portugal	Belgium	Czech Republic
1917	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1918	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1919	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1921	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

This is basically just our CSV file, but color coded all fancy like, which is nice, but not exactly what we were going for.

We can edit our entry by clicking on the Data → Get Data (Power Query) → Launch Power Query Editor... set of buttons:

Home Insert Draw Page Layout Formulas Data Review

Get Data (Power Query)...

Launch Power Query Editor...

Data Source Settings...

From Database (Microsoft Query)

This should give us the following view of our data (which is also what we would get if we hit the “Transform data” button instead of the green “Load” button when we imported our data):

The screenshot shows the Microsoft Power Query Editor interface. The top ribbon has tabs for Home, Transform, Add column, View, and Help. The Home tab is selected. The ribbon also includes Close & load, Get data, Options, Manage parameters, Refresh, Advanced editor, Properties, Manage columns, Sort, and Transform buttons. The main area displays a query named "corgs_per_country_over...". The data table has 18 rows and 41 columns. The columns are labeled with years (1917-1933) and country names (United States, Brazil, Russia, Japan, Vietnam, Germany, France, United Kingdom, Spain, Italy). Most values are zero, except for some non-zero entries in the United States and United Kingdom columns. The "Query settings" pane on the right shows the following applied steps:

- Properties
- Name: corgs_per_country_over...
- Applied steps:
 - Source
 - Promoted headers
 - Changed column types (selected)

If you check out the “Query settings” panel on the right, you can click through each of the steps that were automatically applied to the data.

For example, the “promoted headers” step is where it is assumed that the top of our CSV file should be the names of each of our columns.

The "Query settings" pane is shown in a detailed view. It contains two sections:

- Properties**: Name is set to "corgs_per_country_over...".
- Applied steps**: A list of three steps:
 - Source
 - Promoted headers
 - Changed column types (highlighted with a red border)

Step 4: Transform the Data in Power Query

Now we will go step by step through the following transformations:

1. Create a date-type column from the Years column

Step 4.1: Format the Years Column

Right now, our Years column has a little “123” icon, which tells us that it is being treated as a number, not as a date-type object.

Let's walk through the steps to transform this.



First, we want to add a “fake” month and day to the beginning of this so it reads something like “01/01/2017” as this is the basic format that Excel/Power Query expects for date-type objects.

We will do this by “tacking on” the string “01/01/” to the front of each of our Years entries.

But first, we need to transform this from a number to a string in order to concatenate anything in front of it.

The screenshot shows the 'Applied steps' list in the Power Query Editor. The 'Changed column type' step is highlighted with a red box. The 'Text' icon in the list is also highlighted with a red box. The list includes steps like 'Decimal number', 'Currency', 'Whole number', 'Percentage', 'Date/Time', 'Date', 'Time', 'Date/Time/Zone', 'Duration', 'Text', 'True/False', 'Binary', and 'Using locale...'. The 'Text' step is the one we are focusing on.

Click on the little “123” and select the “Text” icon from the drop down.

I recommend clicking the “add type conversion as separate step” so that you can see this explicitly in the list of “Applied steps”:

The screenshot shows the 'Query settings' dialog in the Power Query Editor. The 'Applied steps' section is expanded, showing a list of steps: 'Source', 'Promoted headers', 'Changed column type', and 'Changed column type 1'. The 'Changed column type' step is highlighted with a red box.

With the full Years column selected, let's add a prefix to our newly-turned-to-a-string column:

The screenshot shows the Power Query Editor interface. The 'Transform' ribbon tab is selected. A context menu is open over the 'Years' column, listing options: 'lowercase', 'UPPERCASE', 'Capitalize Each Word', 'Trim', 'Clean', 'Add prefix', 'Add suffix', and 'Parse column'. The 'Add prefix' option is highlighted with a red box. The 'Format' button in the ribbon is also highlighted with a red box.

Note, this might also look like:

The screenshot shows the Power Query ribbon with the 'Transform' tab selected. A context menu is open over the 'Years' column, listing options like 'lowercase', 'UPPERCASE', 'Capitalize Each Word', 'Trim', 'Clean', 'Add prefix', and 'Add suffix'. The 'Add prefix' option is currently selected.

Set the “fake” month and day prefix as:

The screenshot shows the Power Query ribbon with the 'Transform' tab selected. A 'Prefix' dialog box is open, prompting for a text value to add to the front of each value in the column. The input field contains '01/01/'. There are 'Cancel' and 'OK' buttons at the bottom of the dialog.

Hit “OK” and you should now see your updated data, and this “Added prefix” step to your Power Query view:

The screenshot shows the Power Query ribbon with the 'Transform' tab selected. The 'Applied steps' pane on the right shows a step named 'Added prefix'.

Finally, we can now use the default transformation of the Years column into a date-type object:

The screenshot shows a context menu open over the 'Years' column, listing various data type conversion options. The 'Date' option is highlighted with a red box.

Your new Power Query interface should show a little “Date” icon next to the Years column and this “changed column type 2” added to your “Applied steps” list:

The screenshot shows the Microsoft Power Query interface with the 'Transform' tab selected. A table named 'corgs_per_country_over...' is loaded. The 'Years' column has a date icon next to it, indicating it's been converted to a date type. The 'Applied steps' list on the right shows two steps: 'Added prefix' and 'Changed column type 2'.

Step 4.2: Unpivot the Table

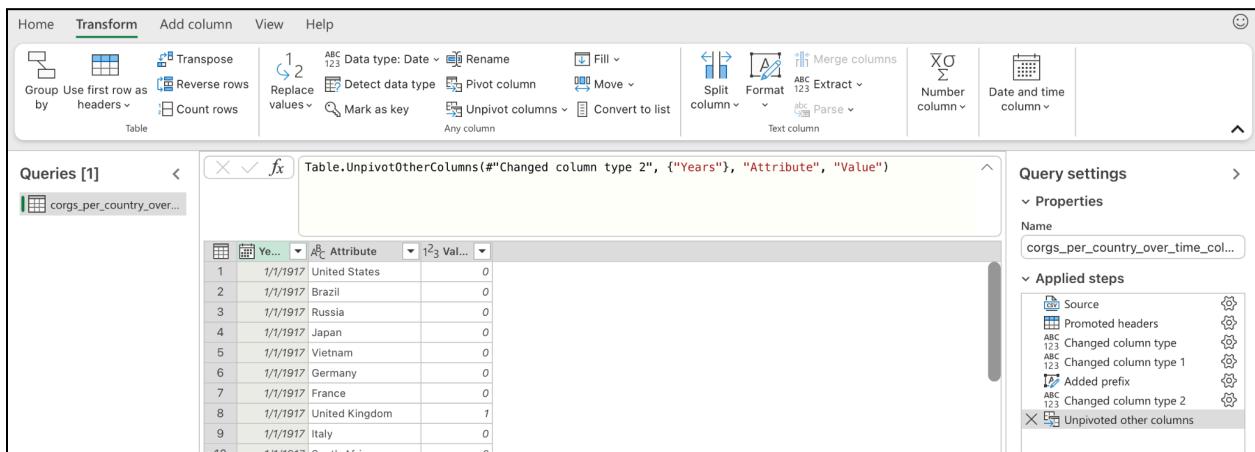
The last step we need to do is “unwrap” our data so it is in three columns of date, column, and # of corgis born. This will be accomplished by “unpivoting” our table around our newly reformatted “Years” column.

To do this, select the “Years” column and then select Unpivot columns → Unpivot other columns

The screenshot shows the Microsoft Power Query interface with the 'Transform' tab selected. A table is loaded with data from 'corgs_per_country_over_time.csv'. The 'Years' column is selected. A tooltip says "Unpivot other columns. Select all but the currently selected columns into attribute-value pairs." A dropdown menu for "Unpivot columns" is open, showing options: "Unpivot columns", "Unpivot other columns", and "Unpivot only selected columns". The "Unpivot other columns" option is highlighted with a red border.

This will “unwrap” the rest of the columns around the Years column.

Your data should now look like a long 3-column table and your “Applied steps” should include this unpivoting step:



The screenshot shows the Power BI 'Transform' ribbon with various tools for data manipulation. In the center, a query named 'corgs_per_country_over...' is displayed, showing a table with three columns: 'Year' (Date type), 'Attribute' (Text type), and 'Value' (Number type). The table contains data for nine countries. To the right, the 'Applied steps' pane is open, showing the sequence of steps taken to transform the data, with the 'Unpivoted other columns' step highlighted.

Step 4.3: Rename Columns

The final step in transforming our data will be to rename our columns into something that makes more sense than their default labels. You can just do this by clicking on each of the names and updating the names:

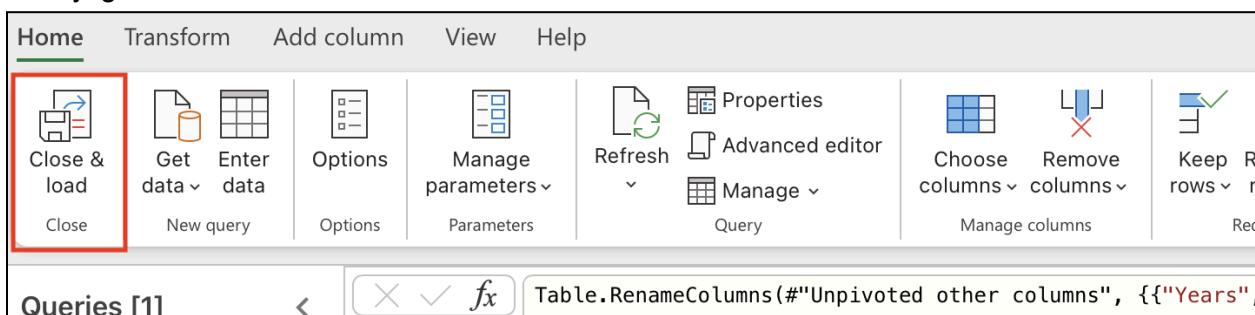


The screenshot shows the Power BI 'Data' view with a table containing four columns: 'Date' (Date type), 'Country' (Text type), and two unnamed columns labeled '1' and '2'. The first unnamed column is highlighted in green and labeled 'corgis born'. The data shows two rows: one for the United States with a value of 0, and one for Brazil with a value of 0.

Note: do **NOT** use non-text characters (e.g. a “#” or a “&”, and sometimes even numbers like “1”) in column names as this [can lead to issues for PowerBI to read your data](#).

Step 5: Load the Data into Excel

Finally, go to the “Home” tab, and hit the “Close & load” button:



The screenshot shows the Power BI 'Home' ribbon. The 'Close & load' button, which has a red box drawn around it, is located in the top-left corner of the ribbon bar. Below the ribbon, the 'Queries [1]' section is visible, showing the query name and a preview of the data.

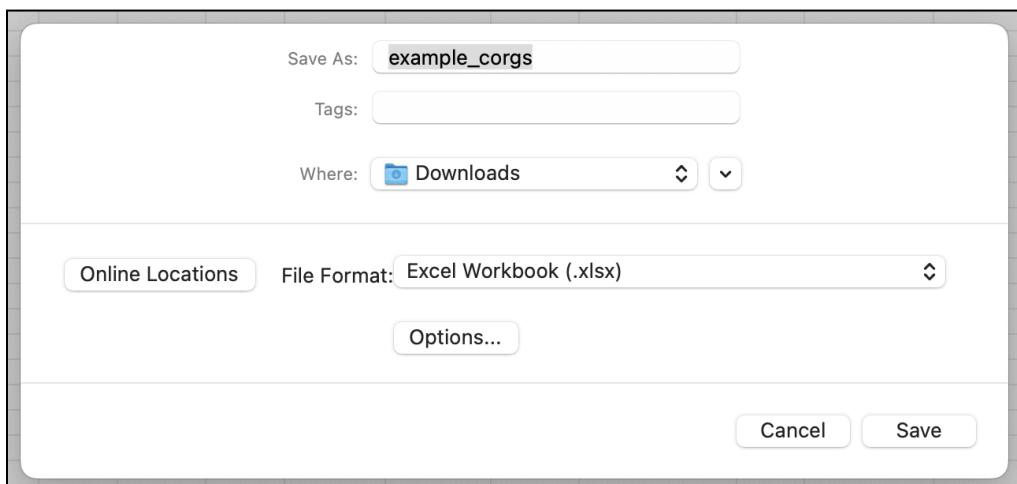
Your Excel spreadsheet should now look like:

	A	B	C	D	E	F
1	Date	Country	corgis born			
2	1/1/17	United States	0			
3	1/1/17	Brazil	0			
4	1/1/17	Russia	0			
5	1/1/17	Japan	0			

Saving your Data for PowerBI

One important final step is to save our new table – we can't forget this important step!

When we click save (or hit the “Save As” button) we are presented with some options:



It is perfectly fine to save locally! In fact, that is probably the easiest for this exercise.

You can also click on the “Online Locations” button and get an option to save in your “OneDrive”. If you use the later option, you’ll just need to be sure to get the link to that Excel

spreadsheet when we use this data in PowerBI (more on that in a moment). This can be a good option for folks working in a group with a shared OneDrive file – just be sure the instructors are able to access any files that you upload there!

Uploading New Data in PowerBI

Now, after all our hard work, let's visualize this data in PowerBI!

First, in your PowerBI workspace, create a new report:

The screenshot shows the PowerBI 'New item' creation interface. On the left, there's a sidebar with icons for Home, Create, Browse, OneLake, Apps, Metrics, Monitor, Learn, and a search bar. The main area has a title 'IS457 Prep Materials (SP25)' and a subtitle 'These are all of Jill's preps for teaching PowerBI in Spring 2025 for IS457'. Below this are buttons for '+ New item', 'New folder', and 'Import'. A 'Visualize data' section contains cards for 'Dashboard', 'Exploration (preview)', 'Report', 'Paginated Report (preview)', and 'Scorecard'. The 'Report' card is highlighted with a red box.

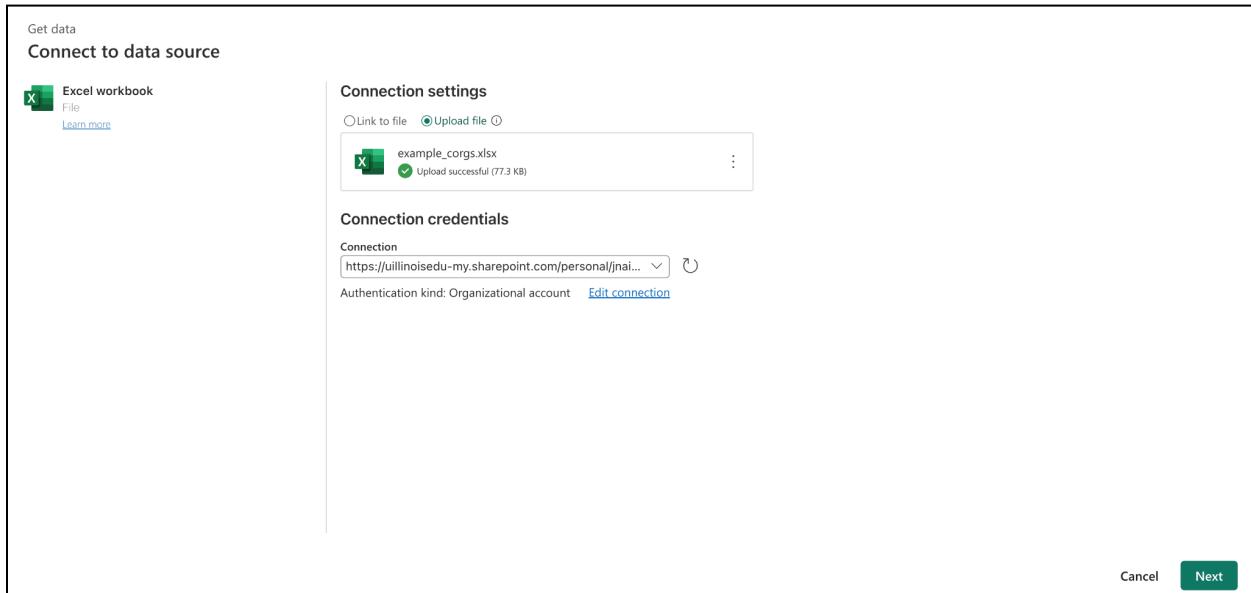
After selecting this, you'll want to select the “Excel (Preview)” option to upload your newly formatted data:

The screenshot shows the 'Build your first report' wizard. It features a header 'Build your first report' with three options: 'Add and prepare your data', 'Generate a premade report', and 'Customize to suit your needs'. Below is a preview of a dashboard with various charts. The main area is titled 'Add data to start building a report' and contains four options: 'Excel (Preview)' (highlighted with a red box), 'CSV (Preview)', 'Paste or manually enter data', and 'Pick a published semantic model'.

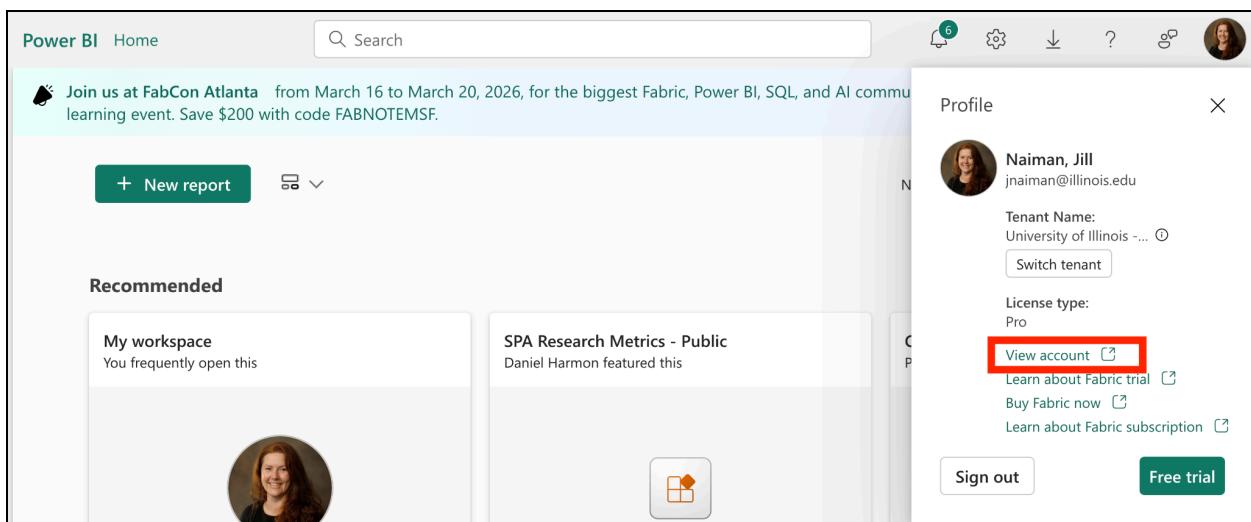
Now you can either select “Upload” or “Browse OneDrive”, depending on whether you saved online or locally:

The screenshot shows the 'Get data' configuration page. It has a title 'Connect to data source' and a 'Get data' section. Under 'Excel workbook', there are 'File' and 'Learn more' buttons. In the 'Connection settings' section, there are two radio buttons: 'Link to file' (selected) and 'Upload file'. A red box highlights the 'Upload file' button. Below are fields for 'File path or URL *' and a 'Next step' button.

Assuming you are uploading from your local save of your XLSX file, you can click on the green “Next” button when your data has been uploaded successfully:



If you get a “OneDrive cannot link” error, you’ve got a few options. First, you can click on “view account” in the upper right corner or sign out and sign back in.



Or, you can just copy and paste the data using the “Paste and manual entry” option instead of uploading with Excel.

It is possible in your data preview that it will show you multiple queries/sheets to choose from – you can click through until you find the one that has the data in the format that we created with Power Query:

Get data

Choose data

Display options

Excel workbook [3]

- corgs_per_country_over_time...
- corgs_per_country_over_time...
- Sheet1

Date	Country	corgis born
1/1/1917	United States	0
1/1/1917	Brazil	0
1/1/1917	Russia	0
1/1/1917	Japan	0
1/1/1917	Vietnam	0
1/1/1917	Germany	0
1/1/1917	France	0
1/1/1917	United Kingdom	1
1/1/1917	Italy	0
1/1/1917	South Africa	0
1/1/1917	Ukraine	0
1/1/1917	Spain	0
1/1/1917	Poland	0
1/1/1917	Canada	0
1/1/1917	Korea, North	0
1/1/1917	Romania	0
1/1/1917	Australia	0
1/1/1917	Portugal	0
1/1/1917	Belgium	0
1/1/1917	Czech Republic	0
1/1/1917	Hungary	0

Back Cancel Create

Click on the “Create” button when you’ve found the right sheet.

You should now see our “usual” PowerBI interface, and if you expand the “Data” section, you’ll now see our newly-formatted columns:

Be sure to save this report before starting to add plots!

PowerBI Plot #1: Bar Chart with Interactive Sliders

After all of our hard work, we now have to remake our bar chart a little differently.

Data

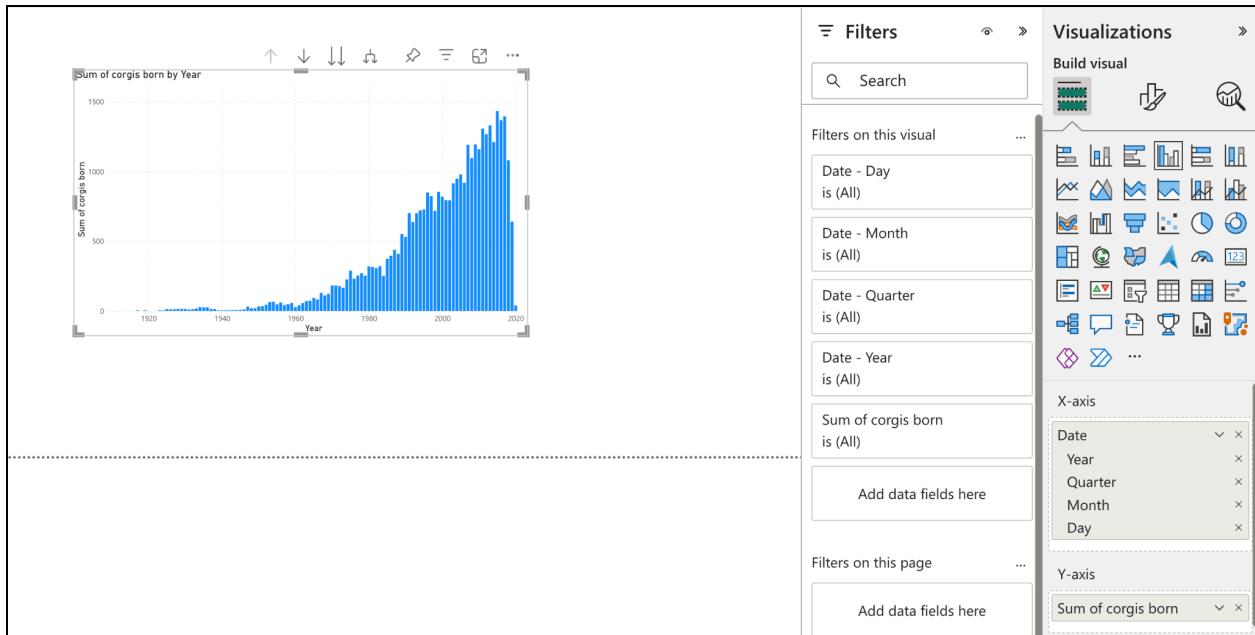
Search

corgs_per_country_ov...

- Σ corgis born
- Country

> Date

Let's first start by putting “Date” on the X-axis and “corgis born” on our Y-axis.



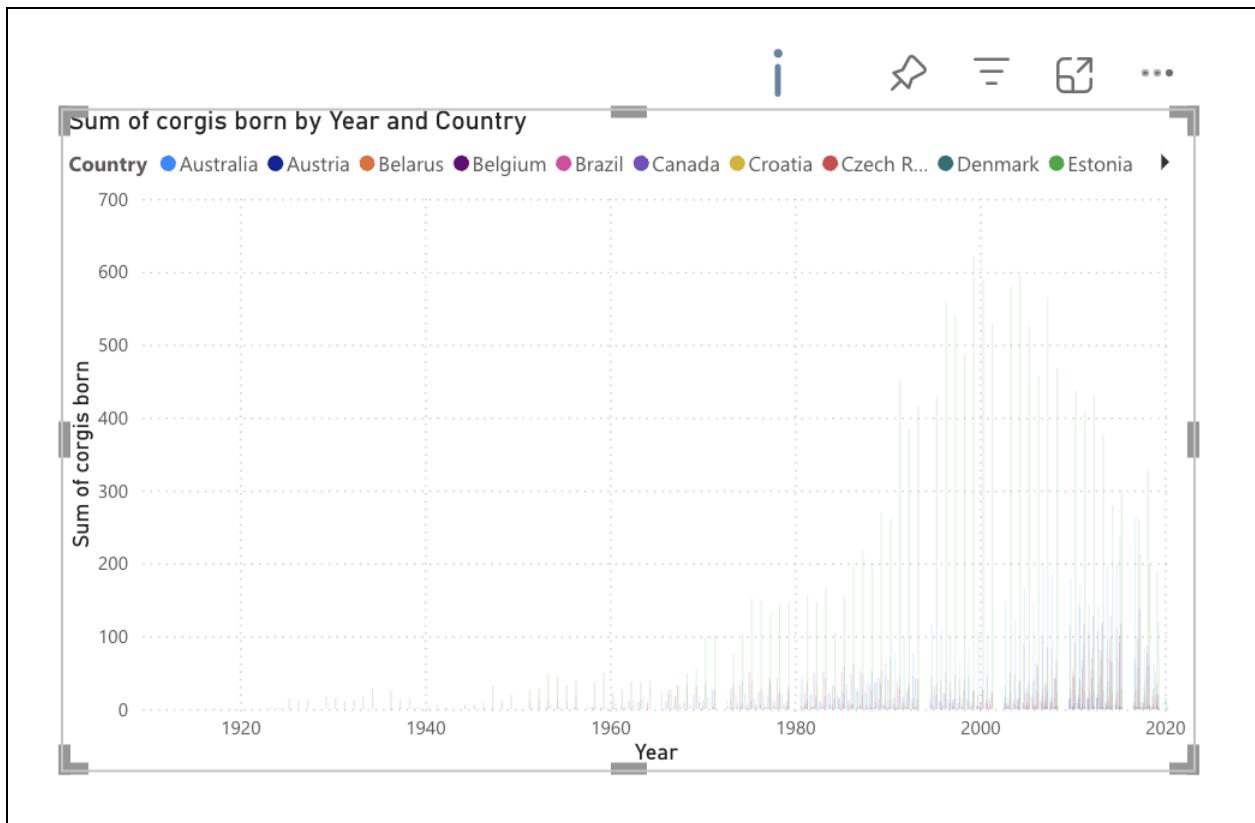
We note that we can select only the Year of our date, so let's do that now:



We note that by default, the total of *all* corgis born as a function of time is displayed. To display values per country, we can add the “Country” column as the field to our legend:



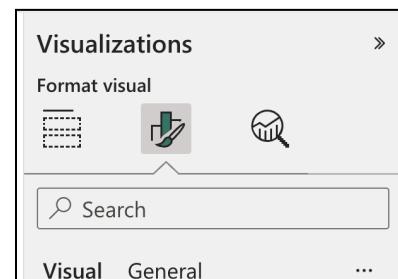
Now though, if we look at our plot, it is a MESS – this is because it is displaying *all* of the countries in our dataset with different colors:



Let's add a slicer to select just a subset of the columns to plot:

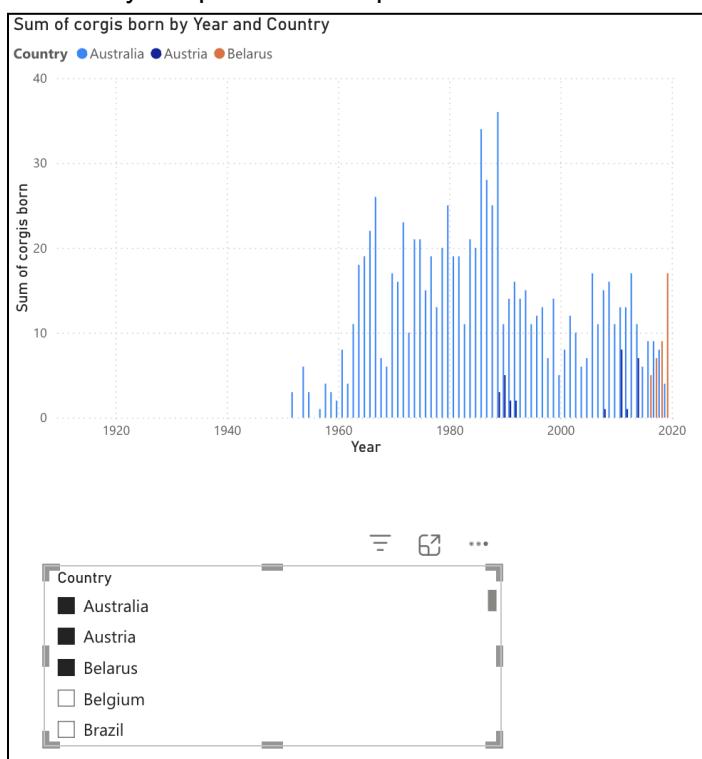
The screenshot shows a bar chart for the country 'Australia' with the Y-axis 'Sum of corgis born' ranging from 0 to 40. The X-axis 'Year' ranges from 1920 to 2020. A Slicer on the left allows filtering by country, with options for Australia, Austria, Belarus, Belgium, and Brazil. The 'Visualizations' pane on the right shows various chart types, and the 'Field' section has a 'Country' dropdown menu where 'Country' is selected.

We can click on the “Format visual” with our Slicer selected to see a few options. For example, we can use a dropdown menu instead of a vertical list if we want, or we can enable a “Select all” option.

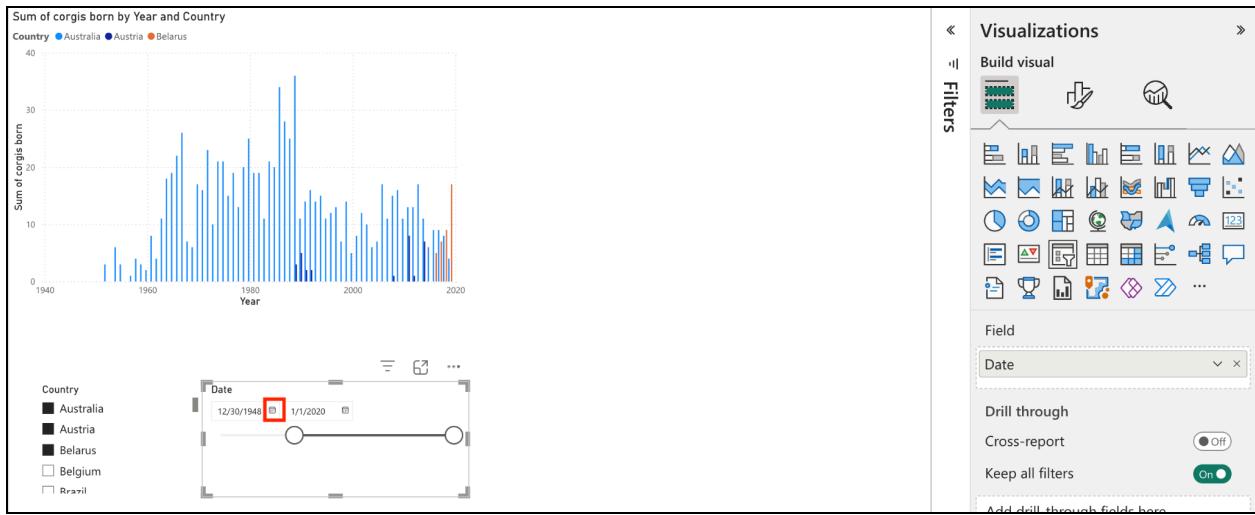


We note that we can select multiple countries by clicking on CTRL (or Command on a Mac):

Let's re-try our plot with multiple countries selected:



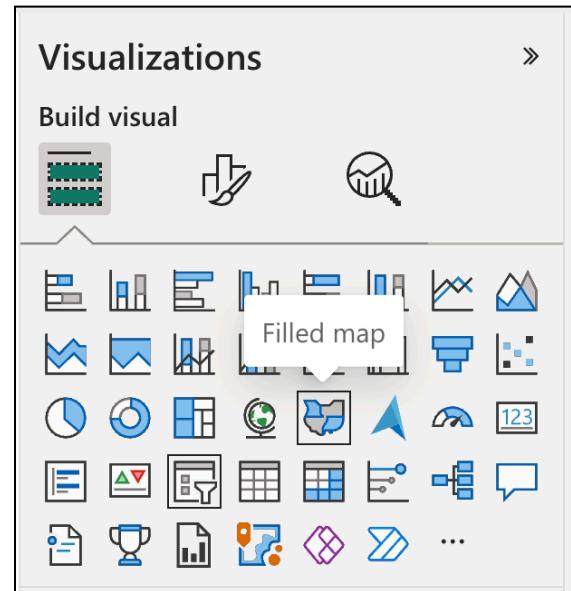
Neat! Let's also add a Slicer for our Date column as well for good measure:



We'll note that now we can click on the little calendar icon to get a calendar picker as well as use the scroll bar to select time ranges. This is because we have reformatted our "Years" to "Dates" as a date-type object.

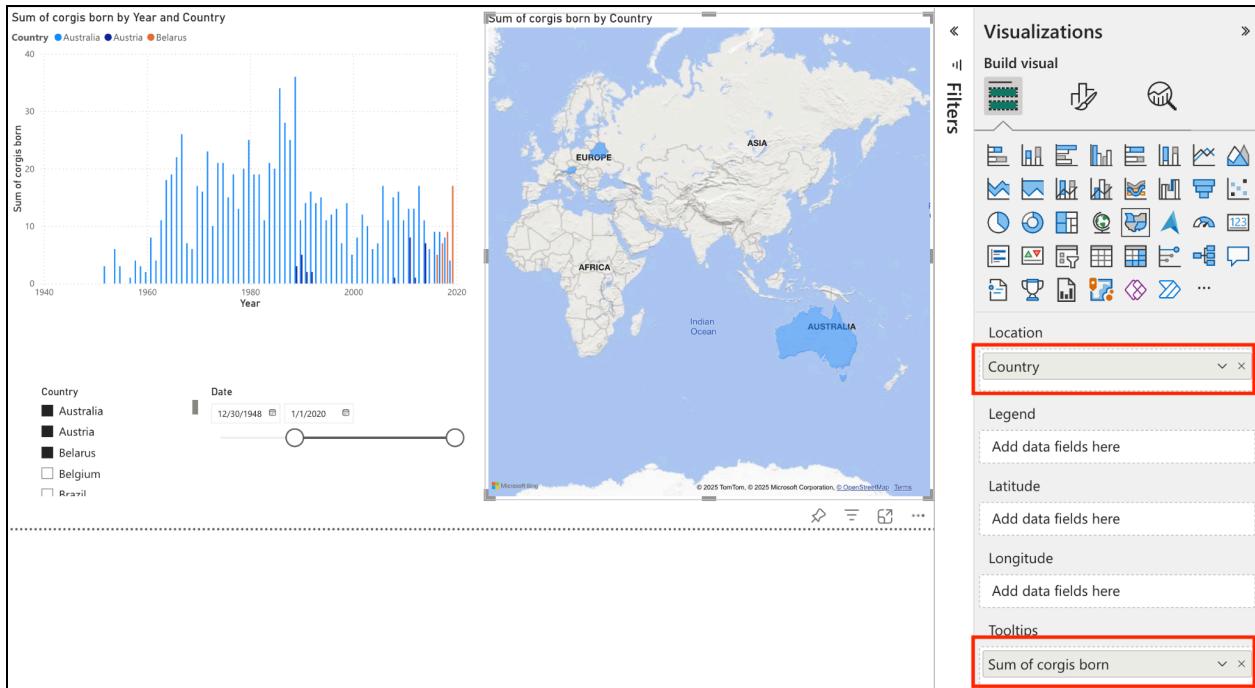
PowerBI Plot #2: Filled World Map

Let's finish up our new dashboard by adding in a world map to show where the countries are in relation to each other.



There are several map options, but let's click the "Filled map" (aka chloropheth) map option:

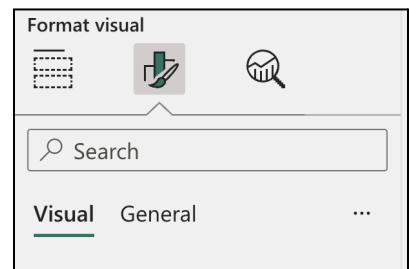
Add the "Country" column as the Location, and add the "corgis born" column to the tool tips (it will automatically change to "Sum of corgis born"):



We notice that the 3 countries highlighted by our Country slicer show up on our map and if we hover over one of the selected countries, the total number of corgis born in that country appears:

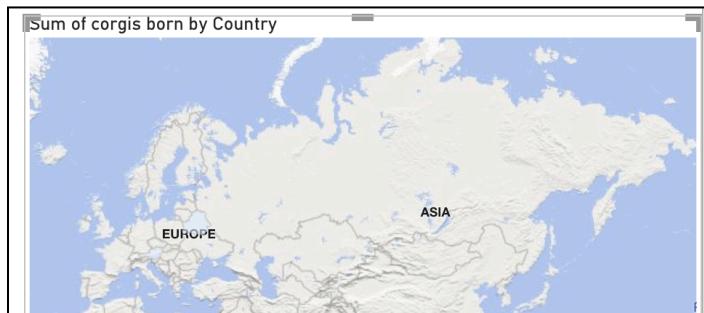
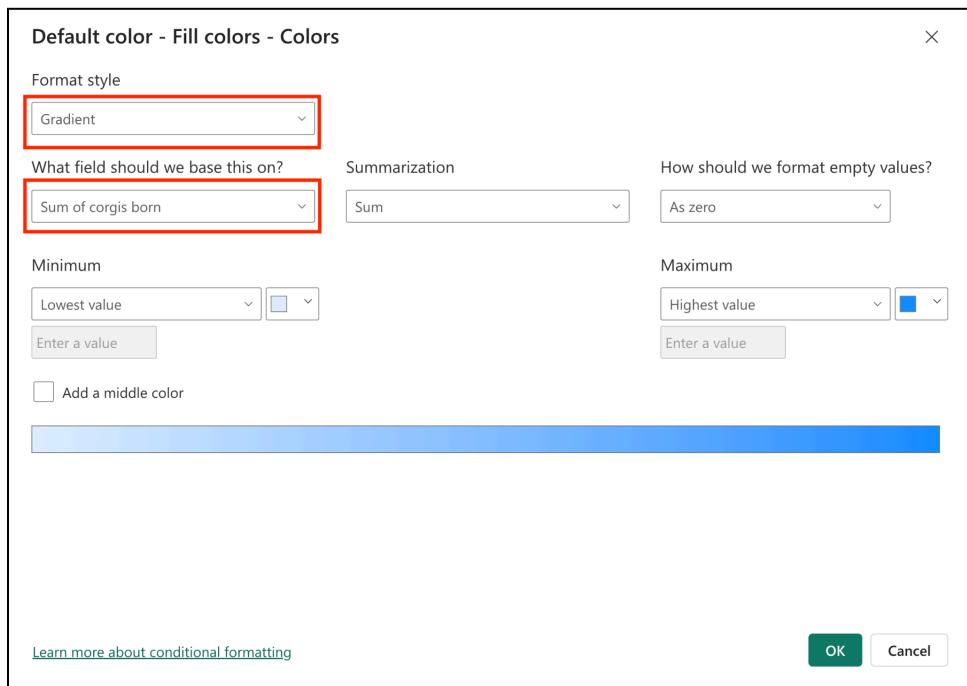


The last thing we want to do is to map the number of corgis born not just to the tooltip, but also to a color gradient displayed on the map.



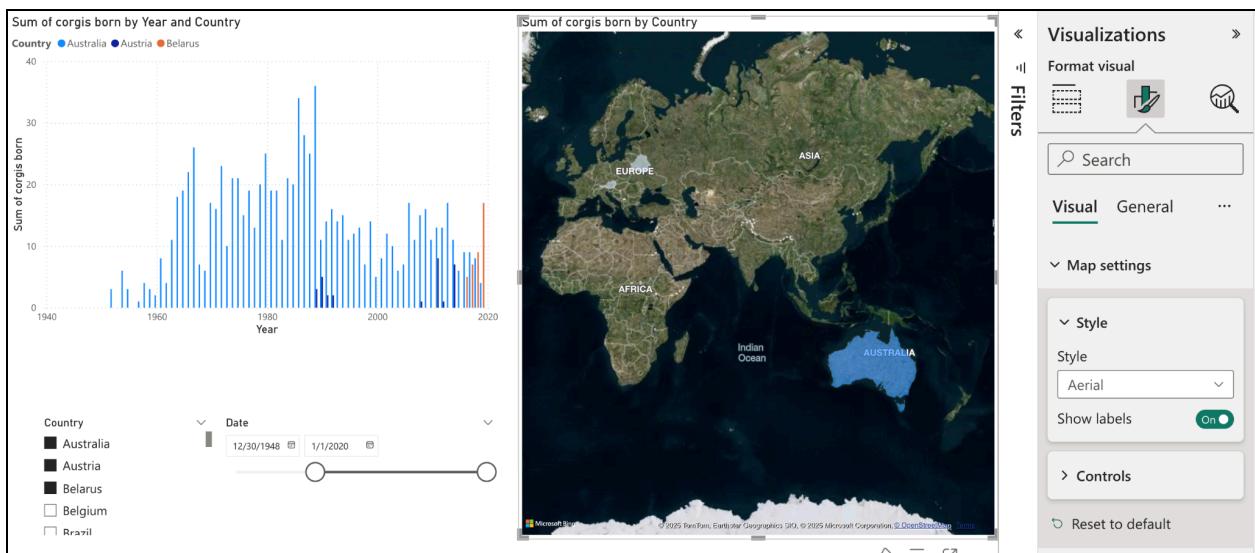
To do this, we need to apply [conditional formatting](#). First, click on the “Format visual” tab and then expand the “Colors” dropdown. You should see a “fx” type symbol – this means “function” or where we can make the colors follow a function of one of our variables:

Once you click on this button, you’ll see some options for how to format the color style. Select “Gradient” and expand the data entry to be able to select “corgis born” as the field to base the colormap on:



While this map now shows the color as a function of the number of corgis born in total in each country, it is hard to see on the current default map:

Try something like “Dark” or “Aerial” style under the Map settings visual formatting options to make an easier to parse map:



There are several other steps that we should take before calling this our “final” dashboard including things like: updating font sizes, changing x/y axis and title names, etc. These are left as an exercise for the reader.