

**Data Literacy, Data Analysis, and Data Visualization Skills Matter a Great Deal for Today's Undergraduate and Graduate Students:** **Let's explore a hands-on data visualization practice!**

Given that data are being created and stored on an unprecedented scale, a strong data analytical skillset would be a notable plus for career-oriented students in the “Era of Data Ubiquity” (quotes Mitchell Stevens). Having strong skills in data literacy, data analysis, and data visualization can help both undergraduate and graduate students (who will be tomorrow's business practitioners and business leaders) make informed decisions using data. These skills can give them the ability to make “data-based decisions.”

Tableau is a data visualization software tool that allows users to create interactive charts, graphs, and dashboards from their data. It is meant to help people understand and analyze their data more effectively. Tableau is used by many types of organizations to make better decisions using their data. It can be connected to various data sources (e.g., Microsoft Excel, Microsoft Access, PDF files, Statistical files) and enables users to easily create visualizations by dragging and dropping elements. The insights generated by Tableau can be shared with others. Please **watch a 2:19 minute Tableau Introduction video** if you have little idea about the power of Tableau: [https://www.tableau.com/why-tableau/what-is-tableau?creative=&cq\\_cmp=1695532942&cq\\_net=g&cq\\_plac=#video](https://www.tableau.com/why-tableau/what-is-tableau?creative=&cq_cmp=1695532942&cq_net=g&cq_plac=#video)

Who can benefit from data literacy training? According to a Tableau blog, anyone can benefit from data literacy training, especially (1) business professionals, (2) organizations, (3) informed citizens, and (4) students. Feel free to check the details on a 2022 blog by Sue Kraemer (<https://tabsoft.co/3imKLY>).

The screenshot shows the Tableau website at [tableau.com/blog/build-your-data-skills-data-literacy-trail-trailhead](https://tableau.com/blog/build-your-data-skills-data-literacy-trail-trailhead). The page title is "Build Your Data Skills with the Data Literacy Trail on Trailhead". The header includes navigation links for "Why Tableau", "Products", "Solutions", "Resources", and "Partners". A "BUY NOW" button is visible on the right. The main content area features a bio for Sue Kraemer, Senior Data Skills Curriculum Strategy Manager, Tableau, posted on August 4, 2022. Below the bio is a quote from her: "The future speaks data—do you? Despite data skills being the most in-demand skill in today's (and tomorrow's) job market, there's still a data literacy gap." Further down, there is a section about the Trailhead training available in multiple languages.

## Build Your Data Skills with the Data Literacy Trail on Trailhead

Get the data skills you need to ask the right questions, make better decisions, and grow your career with this free training, available in 8 languages.



Sue Kraemer  
Senior Data Skills Curriculum Strategy Manager, Tableau  
August 4, 2022

SHARE:



The future speaks data—do you? Despite data skills being the most in-demand skill in today's (and tomorrow's) job market, there's still a data literacy gap.

Get the training you need to ask the right questions, make better decisions, and grow your career. Start building your data skills—for free—with the [Build Your Data Literacy Trail on Trailhead](#). In support of our ongoing mission to help people everywhere see and understand data, the Trail is now available in [Japanese](#), [German](#), [French](#), [Spanish](#) (Mexico), [Portuguese](#) (Brazil), [Simplified Chinese](#), and [Korean](#).

In this hands-on data visualization practice, let's **use Tableau to visualize the moving relationship between income and life expectancy across over 150 nations in the past two hundred years** (from year 1800 up to year 2023).

1. We will download four relevant datasets from **data.world** (<https://data.world/missdataviz-wow2021-w11>). Pls click the underlined link to find the data sets online, and then save the files in your hard drive.

The screenshot shows the data.world website with the URL <https://data.world/missdataviz-wow2021-w11> highlighted in a yellow box. The page title is "WOW2021 W11". On the left, there's an "Overview" section with a "DESCRIPTION" field containing "Gap Minder Data" and a "SUMMARY" field stating "No summary added". In the center, there's a message box with the text: "If you do not have a [data.world](#) account, you need to complete a free online registration first. Otherwise, ask your instructor for his/her guidance." To the right, there's an "About this dataset" section with details like "SHARED WITH Everyone", "CREATED 2 years ago by @missdataviz", "SIZE 958.43 KB · Download", and "DICTIONARY 4 files, 859 columns, 0 tables · View". Below that is a "Recent updates" section showing two entries from "@missdataviz". At the bottom, there's a list of "4 files" with one item visible: "Data Geographies - v1 - by Gapminder.xlsx".

2. Please visit Tableau's official website and then download a 14-day free trial version of the **Tableau Desktop** (<https://www.tableau.com/products/desktop/download>).

The screenshot shows the Tableau website with the URL <https://www.tableau.com/products/desktop/download> highlighted in a yellow box. The page title is "Tableau Desktop: Start your free 14-day trial". It features a "TRY NOW" button and a form for entering personal information: First Name, Last Name, Business E-mail, Organization, and Company Size.

3. We will enable **Tableau Desktop** and then “connect” the datasets to the Tableau canvas [FYI, under **Connect**, select the relevant file types (e.g., a Microsoft Excel file, a .csv text file, or even a .sav SPSS data file). In the **Open** dialog box, navigate to and select a file. Select **Open...**]

The screenshot shows the Tableau Desktop interface. On the left, the 'Connect' menu is open, with 'Text file' highlighted by a red box and a purple arrow pointing to it from the previous step's note. The main area shows the 'Open' dialog box with a preview of a bar chart and the file path '2023-0105\_Tab...'. To the right, a callout box contains text about using a trial version of Tableau Desktop, links to LinkedIn and Google Scholar, and a URL for a citation.

I am using a trial version of the **Tableau Desktop** in this demo. Notably, I also created a heat map demo using a FREE **Tableau Public**, and I will be happy to share that demo upon request via my LinkedIn profile.

LinkedIn (<https://www.linkedin.com/in/maxwell-hsu-47b3039/>)

Google Scholar  
<https://scholar.google.com/citations?user=fpEuLRkAAAAJ&hl=en>

Let's start with the income per person data set. As the "*income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted*" is a .CSV file, we need to connect this file by clicking the "Text file" option. By default, the "Use Data Interpreter" option is not enabled. When we find that the 1<sup>st</sup> row data (e.g., **country, 1800**) correspond to the variable names, we will check the "Use Data Interpreter" box to address the issue (see Step #4).

The screenshot shows the Tableau Desktop interface with the 'Data Source' pane open. A blue box highlights the 'Undo' button at the top of the ribbon. The 'Files' section shows a CSV file named 'income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted.csv' with the 'Use Data Interpreter' checkbox checked. A red box highlights this checkbox. The 'Sheet 1' worksheet shows a preview of the data with a table and a callout box stating "'country' should be recognized a variable name! See Step #4." A red box highlights the first row of the preview table, which includes columns for 'Name', 'Type', 'Field Name', 'Physical Table', and 'Rem...'. The 'F1' column is highlighted with a purple arrow pointing to the 'country' entry.

FYI: The Undo button is here!

income\_per\_person\_gdppercapita\_ppp\_inflation\_ad...

income\_per\_person\_gdpp...

Need more data?  
 Drag tables here to relate them. [Learn more](#)

“country” should be recognized a variable name! See Step #4.

Name	Type	Field Name	Physical Table	Rem...
income_per_person_gdppercapita_ppp_inflation_adjusted.csv	Abc	F1	income_per_person_gdppercapita_ppp_inflation_adjusted.csv	F1
	#	F2	income_per_person_gdppercapita_ppp_inflation_adjusted.csv	F2
	#	F3	income_per_person_gdppercapita_ppp_inflation_adjusted.csv	F3
country				1,800
Afghanistan				603
Albania				667
Algeria				715
Andorra				1,200

4. Let's check mark the "Cleaned with Data Interpreter" option (see the circled red rectangle box and the red circle). Subsequently, we will find that the first-row data (i.e., **country**, **1800**, **1801**, etc.) are recognized as variable names. FYI, **1800** represents year 1800 while **1801** represents year 1801.

The screenshot shows the Tableau Data Source interface. In the top-left corner, under 'Connections', there is a list of files: 'income\_per\_person\_gdpperc.csv', 'life\_expectancy\_years.csv', and 'population\_total.csv'. Below this, under 'Files', there is a section titled 'Cleaned with Data Interpreter' with a checked checkbox and a 'Review the results' link. A red box highlights this section. In the center, there is a preview of the data with the title 'income\_per\_person\_gdpperc...'. The data table has three columns: 'country', '1800', and '1801'. A purple box highlights the first row of the data table. At the bottom, there is a 'Sheet 1' tab.

5. We will re-organize the data structure using the Pivot function (i.e., we will Pivot the income data).

The screenshot shows the Tableau Data Source interface, identical to the previous one but with a callout box. The callout box contains the following text: 'Hold both "Shift" and "Ctrl" keys to highlight all variables (all columns) but the **country** variable. In the highlighted area, click the drop-down arrow next to the column name to find this dropdown menu (see P. 5 for details.).' A red box highlights the 'Pivot' option in the dropdown menu, which is also circled. The rest of the interface is identical to the previous screenshot.

Hint: if you are not familiar with the power of the Pivot function, please check relevant information on this Tableau webpage: [https://help.tableau.com/current/prep/en-us/prep\\_pivot.htm](https://help.tableau.com/current/prep/en-us/prep_pivot.htm) or this Microsoft webpage: <https://bit.ly/3vMzVKd>

[help.tableau.com/current/pro/desktop/en-us/pivot.htm](https://help.tableau.com/current/pro/desktop/en-us/pivot.htm)

As the Tableau site reveals, once we select multiple columns (FYI, a variable would typically occupy one column), we will “click the drop-down arrow next to the column name, and then select **Pivot**. New columns called Pivot field names and Pivot field values are created and added to the data source.”

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What's New in Tableau

› Get Started

› Connect to and Prepare Data

› Connect to Your Data

› Set Up Data Sources

› Plan the Data Source

› Relate Your Data

› Join Your Data

If you encounter any challenges when you attempt to select multiple columns in Tableau, please consider troubleshooting the problem with a Google search on your own or consulting your data analytics instructors.

After you have set up the data source, in the grid, select two or more columns. Click the drop-down arrow next to the column name, and then select **Pivot**. New columns called "Pivot field names" and "Pivot field values" are created and added to the data source. The new columns replace the original columns that you selected to create the pivot.

Abc	#	#	#
Quarter	Samsung	Nokia	Apple
Q4 '11	93.8300	111.7000	35.46
Q1 '12	89.2800	83.1600	33.12
Q2 '12	90.4300	83.4200	28.94
Q3 '12	97.9600	82.3000	24.62

Rename  
Reset Name  
Copy Values  
Hide  
Create Calculated Field...  
**Pivot**

6. Double click "Pivot Field Name" and change it to **Year**. Change "Pivot Field Values" to **Income**. FYI, we should also click the data type icon and change variable **Year**'s data type from ABC (string) to Number (whole) here, but I failed to do so in Step #6 → Check Step #24 to see the consequence & how to fix it.

income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted

income\_per\_person\_gdpp...

Need more data?  
Drag tables here to relate them. [Learn more](#)

income\_per\_person\_gdpp... 3 fields 46513 rows

Name	income_per_person_gdppercapita_ppp_inflation_adjusted.csv	Type	Field Name	Physical Table	Pivot Field Names	Pivot Field Values
country	country	income_per_person_gdppercapita_ppp_inflation_adjusted.csv	Year	Year	Number (decimal)	Number (whole)
Afghanistan	Afghanistan	1804	1805	Geographic Role	Image Role	603
		1806				603

Change the newly created Pivot Field Names to **Year** and **Income**.

7. We will connect the second data set (i.e., population total) to the Tableau canvas with the Drag and Drop trick.

Tableau - Book1

File Data Server Window Help

Connections Add

income\_per\_person... Text file

Files

- Cleaned with Data Interpreter
- [Review the results](#). (To undo changes, clear the check box.)
- income\_per\_person\_gdppercv.csv
- life\_expectancy\_years.csv
- population\_total.csv**

New Union New Table Extension

income\_p... — populatio... ▾

How do relationships differ from joins? [Learn more](#)

income_per_person...	Operator	population_total.csv
Abc country	=	Abc Country (Popula

+ Add more fields

> Performance Options

population\_total.csv # population\_total.csv # population\_total.csv # population\_total.csv

Country (Population Tot... 1800 1801 1802 1802

Afghanistan	3,280,000	3,280,000	3,280,000
Albania	400,000	402,000	404,000
Algeria	2,500,000	2,510,000	2,520,000
Andorra	2,650	2,650	2,650
Angola	1,570,000	1,570,000	1,570,000
Antigua and Barbuda	37,000	37,000	37,000

8. Please highlight all variables but the **country** variable. Likewise, we will re-organize the data structure using the Pivot table function. Change the variables names to "**Year 1**" and "**Population**" (like Step #6). Also, please change **Year 1**'s data type from ABC (a string) to Number(Whole).

Tableau - Book1

File Data Server Window Help

Connections Add

income\_per\_person... Text file

Files

- Cleaned with Data Interpreter
- [Review the results](#). (To undo changes, clear the check box.)
- income\_per\_person\_gdppercv.csv
- life\_expectancy\_years.csv
- population\_total.csv**

New Union New Table Extension

income\_p... — populatio... ▾

How do relationships differ from joins? [Learn more](#)

income_per_person...	Operator	population_total.csv
Abc country	=	Abc Country (Popula

+ Add more fields

> Performance Options

population\_total.csv # population\_total.csv # population\_total.csv # population\_total.csv

2097 2098

2096	2097	2098
75,800,000	75,600,000	75,400,000
1,190,000	1,170,000	1,140,000
70,700,000	70,700,000	70,700,000
62,700	62,600	62,500
179,000,000	103,000	57,200,000

Rename Copy Values Hide

Create Calculated Field...

Pivot Merge Mismatched Fields

In the highlighted area, click the arrow to find this dropdown menu.

Hint: Do NOT highlight the **country** variable when we attempt to generate a Pivot variable ... Also, please change the newly created variable name to **Year 1** (or any variable name but "**Year**" because this variable name has been used and the **Year** variable could be found in the income per person data file).

9. We will recognize the relationship between variable **Year** (in the income per person data set) and variable **Year 1** (in the population total data set). Remember to edit variable **Year 1**'s data type (to Number).

The screenshot shows the Tableau interface with two data sources connected:

- income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted** (Text file)
- population\_total.csv**

A blue arrow points from the 'Year' field in the top data source to the 'Year 1' field in the bottom data source. A red box highlights the 'Number (decimal)' data type for 'Year 1' in the bottom data source's context menu.

Country (Population Total)	Year 1	Population
Afghanistan	1800	1800
Afghanistan	1801	1801
Afghanistan	1802	1803
Afghanistan	1803	1804
Afghanistan	1804	1805

10. We will hide all variables but the **Population** variable (Hint: it's okay if you skip the hiding step, as not hiding other variables won't cause any issues when we create a bubble chart).

The screenshot shows the Tableau interface with two data sources connected:

- income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted** (Text file)
- population\_total.csv**

A red box highlights the 'Hide' option in the context menu for the 'Year 1' field in the bottom data source. A purple arrow points from the 'Year 1' field in the top data source's relationship panel to the 'Year 1' field in the bottom data source's context menu.

Pivot1	Population
1800	3,280,000
1801	3,280,000
1802	3,280,000
1803	3,280,000
1804	3,280,000
1805	3,280,000
1806	3,280,000

Note: the **Year** variable in the income per person data set corresponds to the **Year 1** variable in the population total data set.

11. Now, we will connect the third data set (i.e., life expectancy) to this Tableau project.

Let's connect the Life Expectancy data file to this Tableau canvas (let's mimic what we did in Step #7 to Step #10).

12. Similarly, we will Pivot the life expectancy data (FYI, you may want to revisit Step #8).

How do relationships differ from joins? Learn more

#	life_expectancy_years.csv	life_expectancy_years.csv	life_expectancy_years.csv
097	77.3000	77.4000	2098
	88.0000	88.1000	2099
	88.9000	89.0000	
	null	null	
	79.5000	79.7000	79.8000
	86.7000	86.8000	86.9000
	87.3000	87.4000	87.5000
			87.6000

Hint: Leave the **country** variable intact (i.e., the **country** variable should not be included in the Pivoting task). As a reminder, hold both the **Ctrl** and **Shift** keys when you attempt to highlight multiple columns.

**Year 2**

13. Change/update the Pivot variable names: name them as **Year** and **Life Expectancy**.

The screenshot shows the Tableau interface. On the left, the 'Connections' pane lists 'income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted' as a Text file. The 'Files' pane shows three CSV files: 'income\_per\_person\_gdpperc.csv', 'life\_expectancy\_years.csv', and 'population\_total.csv'. A 'New Union' and 'New Table Extension' option are also listed. The main area displays a relationship between 'income\_per\_person\_gdpp...' and 'life\_expectancy\_years.csv'. A red arrow points from the 'Pivot2.' label in the relationship editor to the 'Year' column in the data grid. Another red arrow points from the 'Pivot2.' label in the data grid to the 'Life Expectancy' column. The data grid shows data for Afghanistan from 1800 to 1806.

Year	Life Expectancy
1800	28.20000
1801	28.20000
1802	28.20000
1803	28.20000
1804	28.20000
1805	28.20000
1806	28.10000

14. It's about time to instruct Tableau to recognize the additional relationships between the data sets.

The screenshot shows the Tableau interface with a red circle highlighting the 'Year' field in the relationship editor. A tooltip for 'Year' indicates it is a relationship calculation. The relationship editor shows 'income\_per\_person...' connected to 'life\_expectancy\_years.csv' via 'Year'. The data grid shows data for Afghanistan from 1800 to 1806.

Year	Life Expectancy
1800	28.20000
1801	28.20000
1802	28.20000
1803	28.20000
1804	28.20000
1805	28.20000
1806	28.10000

15. After we hide variables **country** and **Year 2**, the only “visible” variable in the life expectancy data set will be “Life Expectancy”. Check the red box between Step #14 and Step #15 (a relationship between **Year** in the income data set and **Year 2** in the life expectancy data set has been established).

The screenshot shows the Tableau Data Source interface. On the left, there are connections to three CSV files: 'income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted', 'life\_expectancy\_years.csv', and 'population\_total.csv'. The 'life\_expectancy\_years.csv' file is currently selected. In the middle, a 'Relationships' section shows a connection between 'Year' in the first file and 'Year 2' in the second file. A red box highlights this relationship. On the right, a preview of the 'Pivot2' worksheet shows a single data row: Life Expectancy with a value of 28.20000.

16. We will connect the last data set (i.e., the Geographies) to the current Tableau project. Since this data file is an Excel type, click "Microsoft Excel" and Open "Data Geographies-v1-by Gapminder." Notably, I use Microsoft Windows 11's File Explorer function to reveal all four data sets' filenames.

The screenshot shows the Tableau Data Source interface with the 'Add a Connection' dialog box open. The 'To a File' option is highlighted with a red box and a red arrow points to it from the main interface. The 'File Explorer' window shows four CSV files: 'Data Geographies - v1 - by Gapminder', 'income\_per\_person\_gdppercapita\_ppp\_inflation\_adjusted', 'life\_expectancy\_years', and 'population\_total'. A red box highlights the 'Data Geographies - v1 - by Gapminder' file. A callout box at the bottom says 'Adding the Geographies data to the Tableau database'.

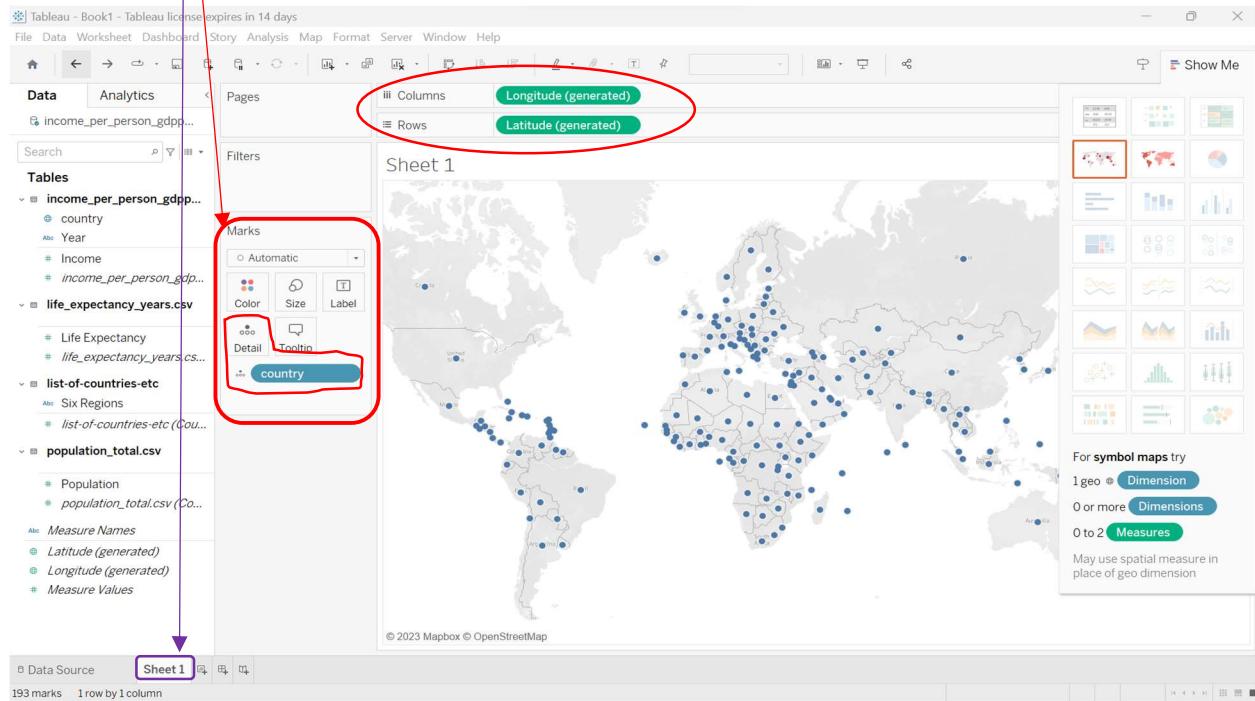
17. Now, let's connect the "list-of-countries-etc" sheet to the income per person data set shown on the Tableau canvas. Establish the relationship between two data sets (i.e., income & list of countries), and the exclamation mark (see the purple circle) will disappear. Note that we need to connect Income data set's **country** variable with list-of-countries-etc data set's **Name** variable.

The screenshot shows the Tableau Data Source interface. On the left, under 'Connections', there is a connection to 'income\_per\_person\_gdpperc.csv'. Under 'Sheets', the 'list-of-countries-etc' sheet is selected. In the center, a 'Drag and Drop' interface is used to establish relationships between the two sheets. A purple circle highlights the path from 'income\_per\_person\_gdpperc.csv' to 'list-of-countries-etc'. A red box highlights the 'Name' field in the dropdown menu for establishing the relationship. The 'Relationships' pane shows a relationship being created between 'income\_per\_person\_gdpperc.csv' (field 'country') and 'list-of-countries-etc' (field 'Name'). An error message says 'Select matching fields to create this relationship.' A red box also highlights the 'Name' field in the dropdown menu.

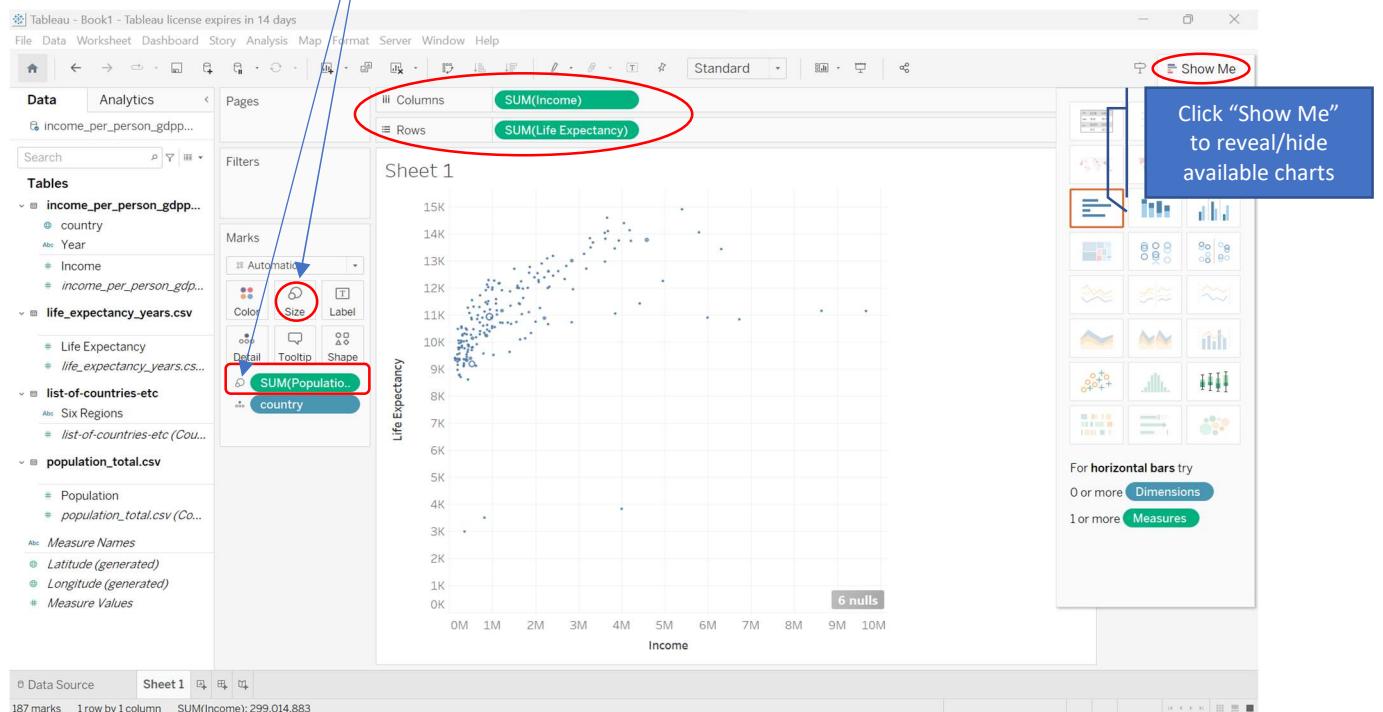
18. Again, we will hide all variables but the "**Six Regions**" variable in the list of countries data set.

The screenshot shows the Tableau Data Source interface. On the left, under 'Connections', there is a connection to 'income\_per\_person\_gdpperc.csv'. Under 'Sheets', the 'list-of-countries-etc' sheet is selected. A checkmark is present next to 'Cleaned with Data Interpreter'. In the center, the 'list-of-countries-etc' sheet is displayed with 197 rows. The 'Fields' pane shows a table with columns 'Type', 'Field Name', 'Phys...', and 'Rem...'. One row is selected, showing 'Type' as 'Abc', 'Field Name' as 'Six Regions', and 'Phys...' as 'list-of...'. A red box highlights the 'Six Regions' field. The 'Fields' pane also lists other regions like 'south\_asia', 'europe\_central\_asia', etc.

19. We are now ready to build a “static” bubble chart. Specifically, please click “Sheet1” at the bottom. After clicking “**Sheet 1**” (on the bottom of the Tableau window), we will need to drag the **country** variable to the **Marks** card (i.e., the Detail).



20. Let's remove the Longitude and Latitude information from the chart. Next, let's associate the **income** variable with the X-axis (i.e., columns) and associate the **life expectancy** variable with the Y-axis (i.e., rows). Notably, the darkness of the dot's color corresponds to each country's population.



21. We will drag the **Year** variable to the “Pages” box (as a dimension). In addition, we will drag the same **Year** variable to the “Filter” box and then exclude the missing data (i.e., Null) from the data visualization task. More details about Tableau’s filtering function could be found online (see p. 14).

A “null” value is a field that is blank, and signifies missing or unknown values. We will instruct Tableau to “exclude” the Null values from the chart.

[help.tableau.com/current/pro/desktop/en-us/filtering.htm](https://help.tableau.com/current/pro/desktop/en-us/filtering.htm)

## Filter Data from Your Views

Applies to: Tableau Cloud, Tableau Desktop, Tableau Server

Filtering is an essential part of analyzing data. This article describes the many ways you can filter data from your view. It also describes how you can display interactive filters in the view, and format filters in the view.

**Watch a Video:** To see related concepts demonstrated in Tableau, watch these free training videos: [Ways to Filter](#) (2 minutes), [Where Tableau Filters](#) (4 minutes), [Using the Filter Shelf](#) (7 minutes), [Interactive Filters](#) (4 minutes), and [Additional filtering topics](#) (7 minutes). Use your [tableau.com](#) account to sign in.

22. We will modify the scale. The way to show the "Edit Axis [income]" is to double click **income** at the bottom of the chart. Once we are in the Edit Axis [Income] pop-up window, check mark "Logarithmic" and uncheck "Include zero."

The screenshot shows the Tableau interface with the 'Edit Axis [Income]' dialog box open. The 'Scale' section is highlighted with a red box, showing 'Logarithmic' checked and 'Include zero' unchecked. A callout box contains the text: 'Do NOT include zero in this data visualization practice.' Another callout box on the right contains the text: 'Don't be confused by the various chart types. In this project, we will focus on creating a bubble chart.'

Hint: The variable "**year**" could be an issue (as it appears the data type is ABC, or a string)... and we will deal with this issue in the next step (i.e., Step #23).

23. The data sets include income and life expectancy information all the way to year 2040.

The screenshot shows a bubble chart in Tableau with 'SUM(Life Expectancy)' on the Y-axis and 'Income' on the X-axis (logarithmic scale). The time slider at the bottom right is highlighted with a red circle, showing the right arrow selected. A callout box contains the text: 'We can click the right arrow to move the time forward (e.g., from 2003 to 2023), and turn the static bubble chart to a dynamic moving bubble chart.'

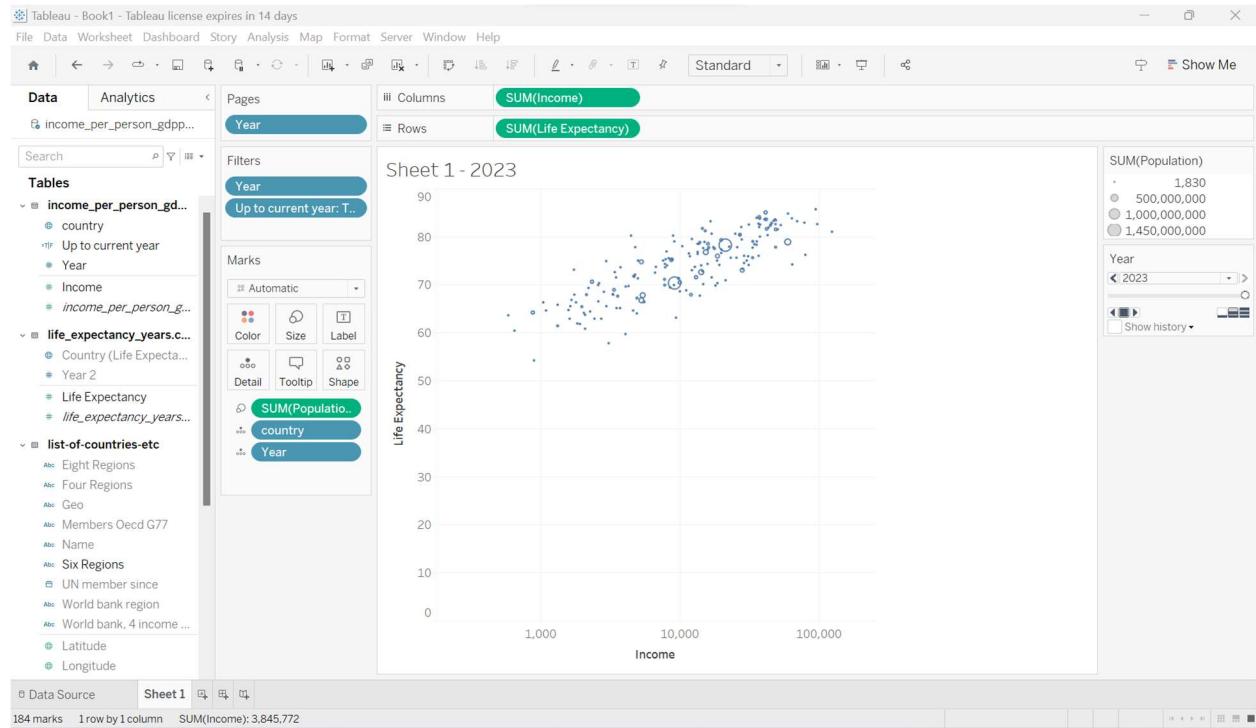
24. We will create a functional filter to reveal the moving bubble charts to the current year (i.e., 2023). Specifically, we will create a calculated field to set the time ceiling to be the current year (e.g., 2023). FYI, the to-be-typed formula in the calculated field box is [Year] <= YEAR(TODAY())

The screenshot shows the Tableau interface with a calculated field dialog open. The dialog title is 'Up to current year' and contains the formula '[Year] <= YEAR(TODAY())'. A callout box with the text 'Click the triangle to create a calculated field.' points to the 'Up to current year' button. The background shows the data source and sheet details.

Hint: Check the variable **Year**'s data type. If we do not update variable **Year**'s data type (from ABC to Whole #), we won't be able to adequately create a "calculated field." Thus, we should double click the **Year** variable and then change its data type from ABC (string) to Number (whole).

The screenshot shows the Tableau interface with a 'Filter' dialog open. The dialog title is 'Filter [Up to current year]' and shows the condition 'True' selected. The summary section indicates 'Selected 1 of 3 values' and 'Condition: None'. A callout box highlights the 'True' checkbox in the filter dialog.

25. The current year shown on this revised bubble chart is year 2023.



26. We will bring the “region” information to the chart. FYI, check the Appendix (p. 20) for Tableau’s Replacement function; the **to-be-typed** formula is **UPPER(REPLACE([Six Regions], ‘\_’, ‘’))** → It’s not recommended to copy and paste the formula onto the following box... or you might encounter errors.

Click the triangle to call out a calculated field again.

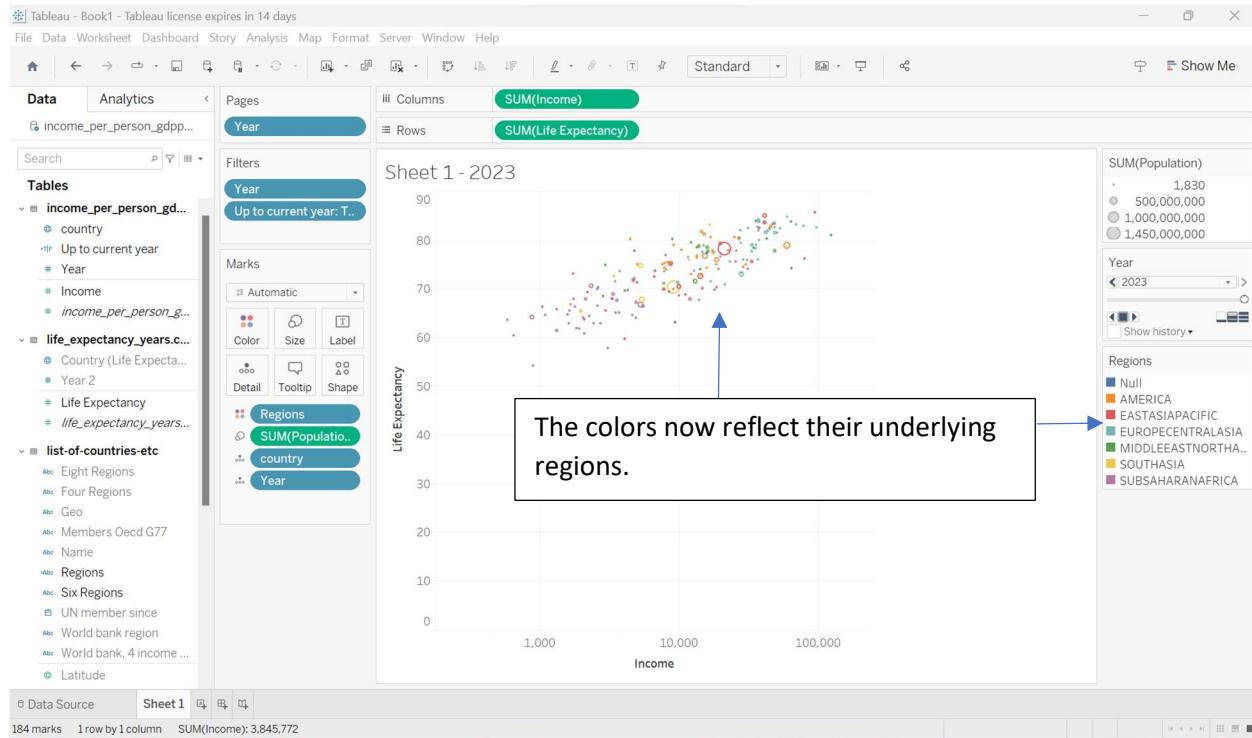
upper(Replace(([Six Regions], '\_', ''))

The calculation is valid.

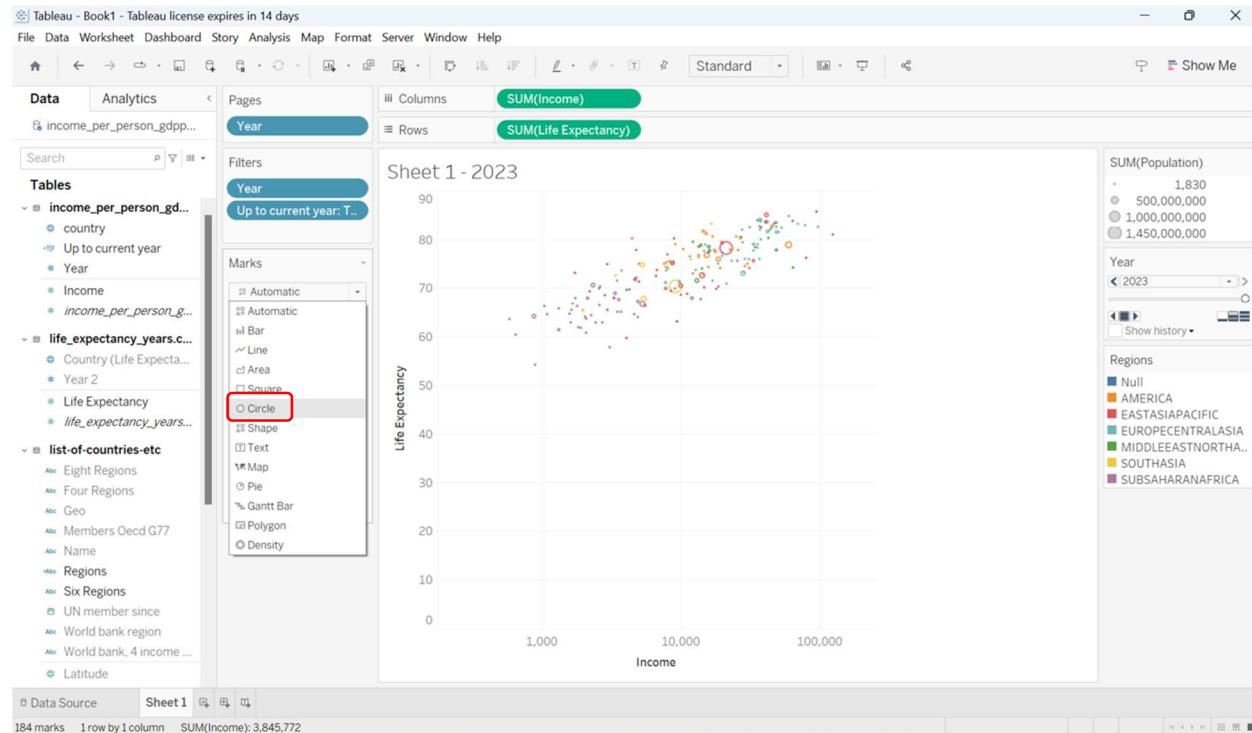
Asiyah Fox (Customer) asked a question.  
January 12, 2022 at 7:53 PM

Trouble with basic copy/pasting on Tableau Desktop for Mac.

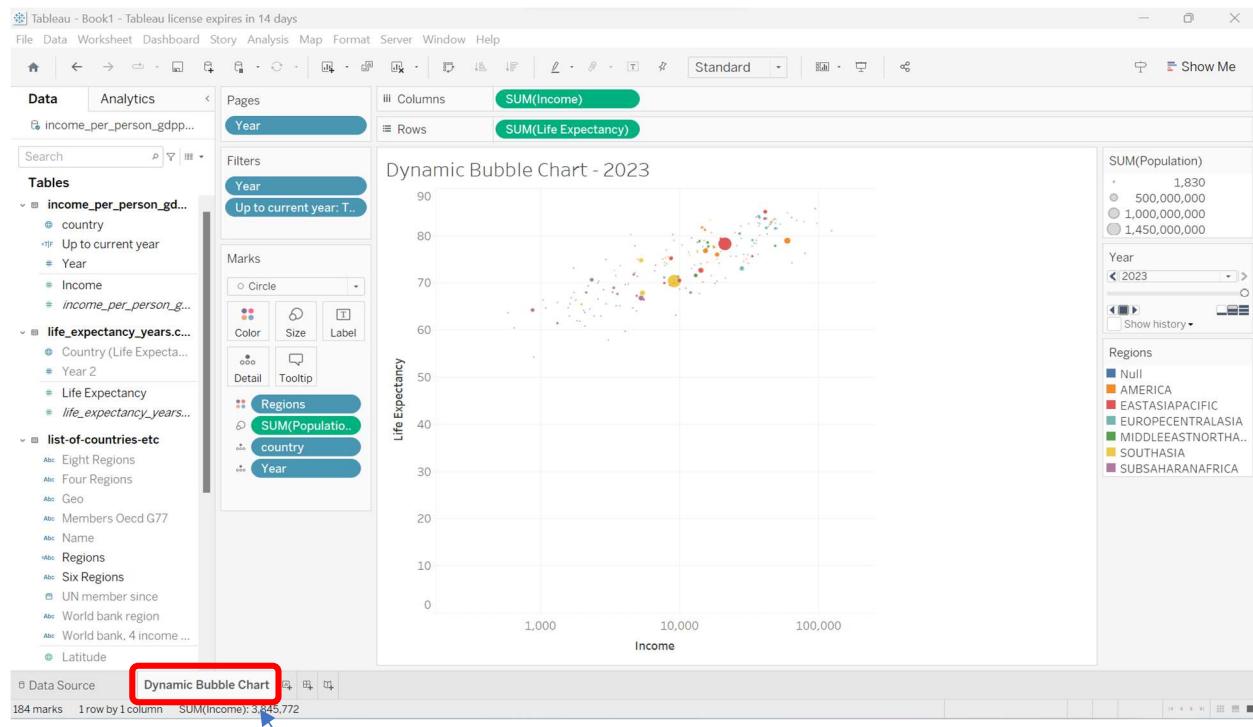
I've worked with Tableau for years at other companies, and I've never experienced this issue previously. However, over the last few years at my current company where we use Macs, several coworkers and I experience an issue when copy/pasting on Tableau Desktop.



## 27. We will replace the dots with circles.

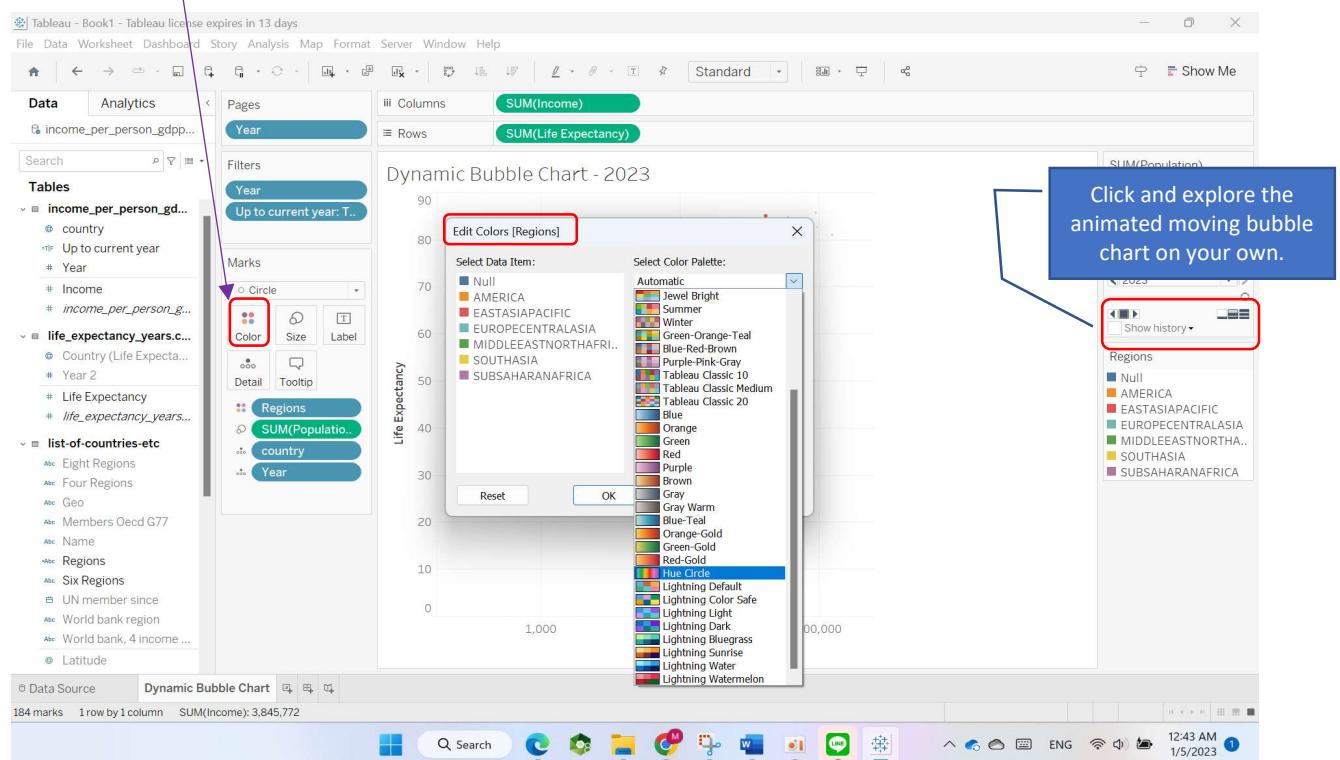


## 28. We will update the chart name (from “Sheet 1” to “Dynamic Bubble Chart”).

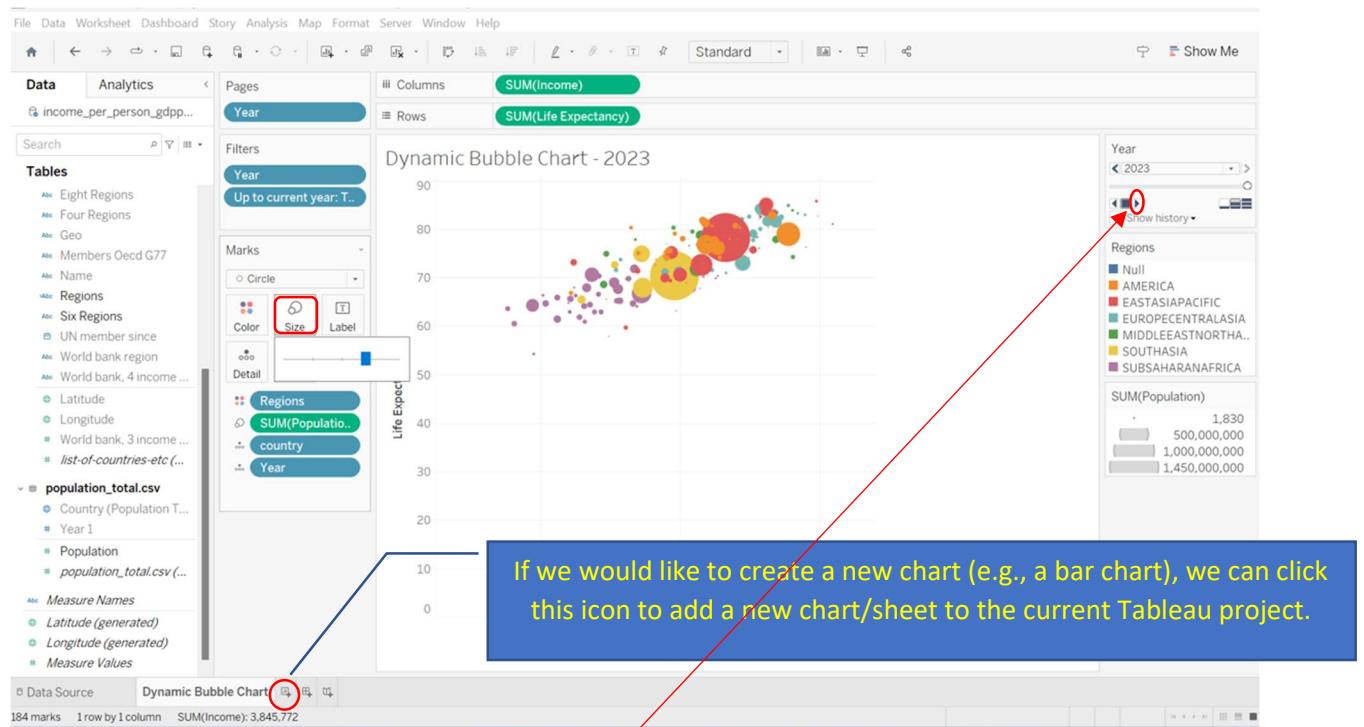


Hint: just click the name of the sheet and we can change its name.

## 29. We can modify the colors for the aesthetic purposes. Just click Color to Edit colors.

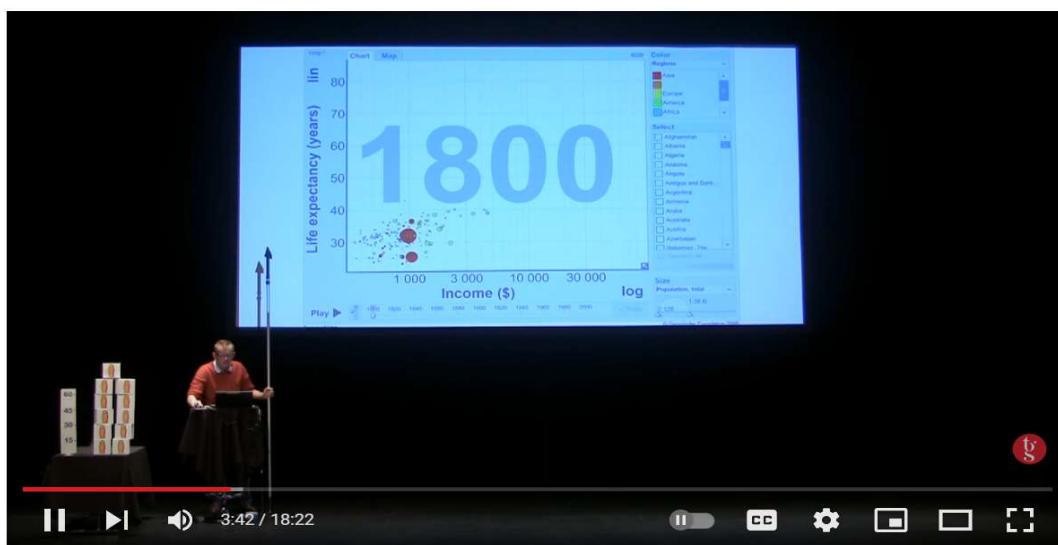


30. We can also click the Size icon to further modify the size of the circles in this bubble chart.



Finally, we are ready to demonstrate an animated moving bubble chart and tell our story by clicking a forward triangle button (see a red circle shown on the above). If you wonder how to give an impressive live presentation using the dynamic charts, you might find **Prof. Hans Rosling's** presentation of relevance. Please click the underlined link for a MUST SEE presentation: Please do watch the first four-minute video, and then feel free to briefly scan through the rest of this YouTube video.

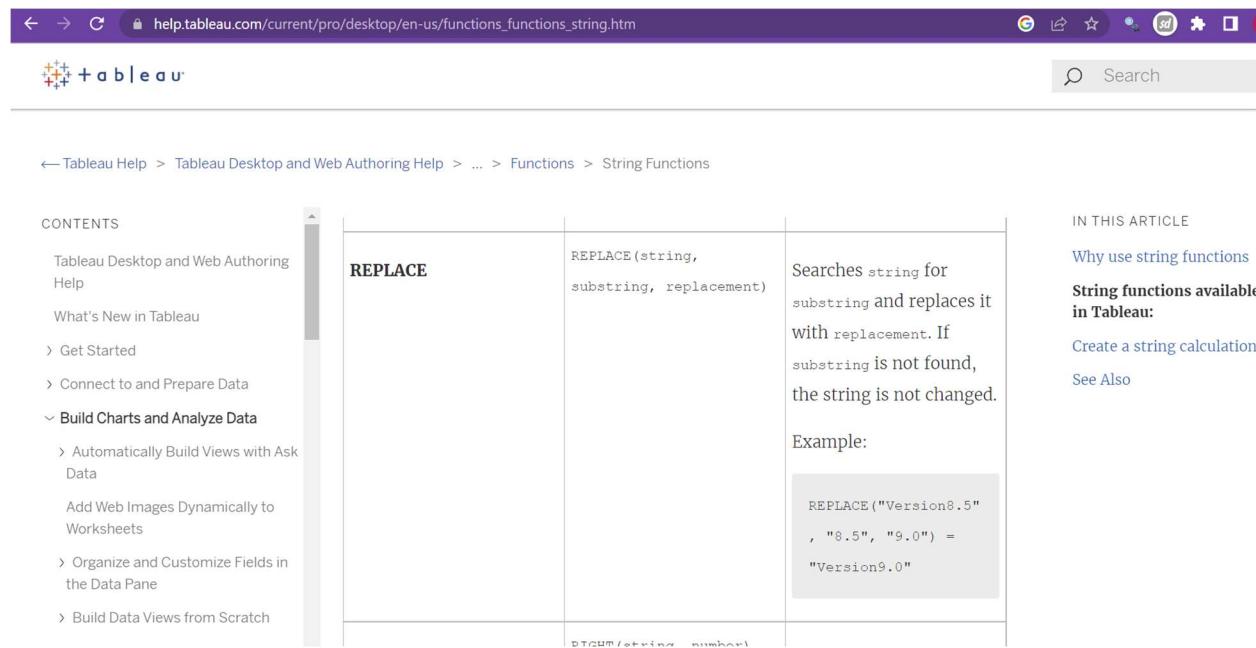
[https://www.ted.com/talks/hans\\_rosling\\_new\\_insights\\_on\\_poverty?referrer=playlist-the\\_best\\_hans\\_rosling\\_talks\\_yo&autoplay=true](https://www.ted.com/talks/hans_rosling_new_insights_on_poverty?referrer=playlist-the_best_hans_rosling_talks_yo&autoplay=true)



Correlating income and life expectancy throughout history | Hans Rosling | TGS.ORG

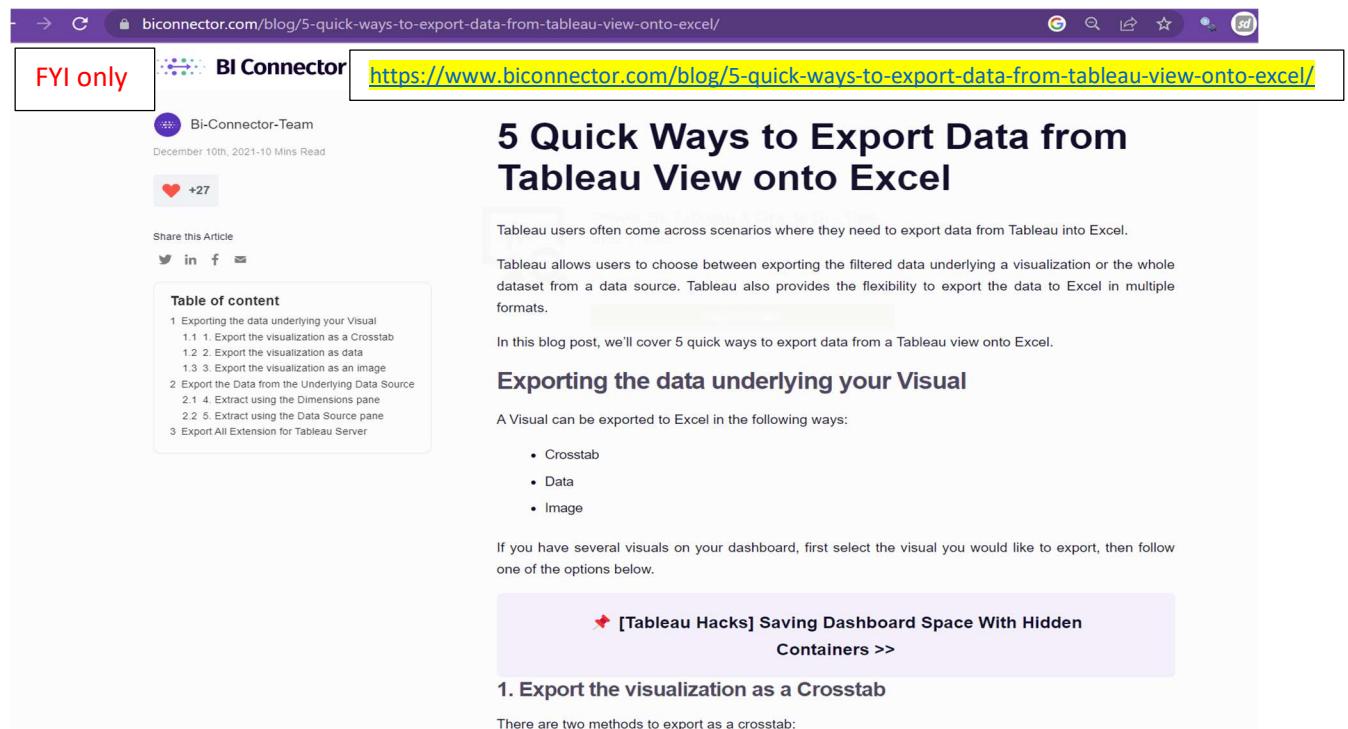
## Appendix:

1. Tableau's main functions (e.g., Replacement) could be found online:  
<https://help.tableau.com/current/pro/desktop/en-us/functions.htm>

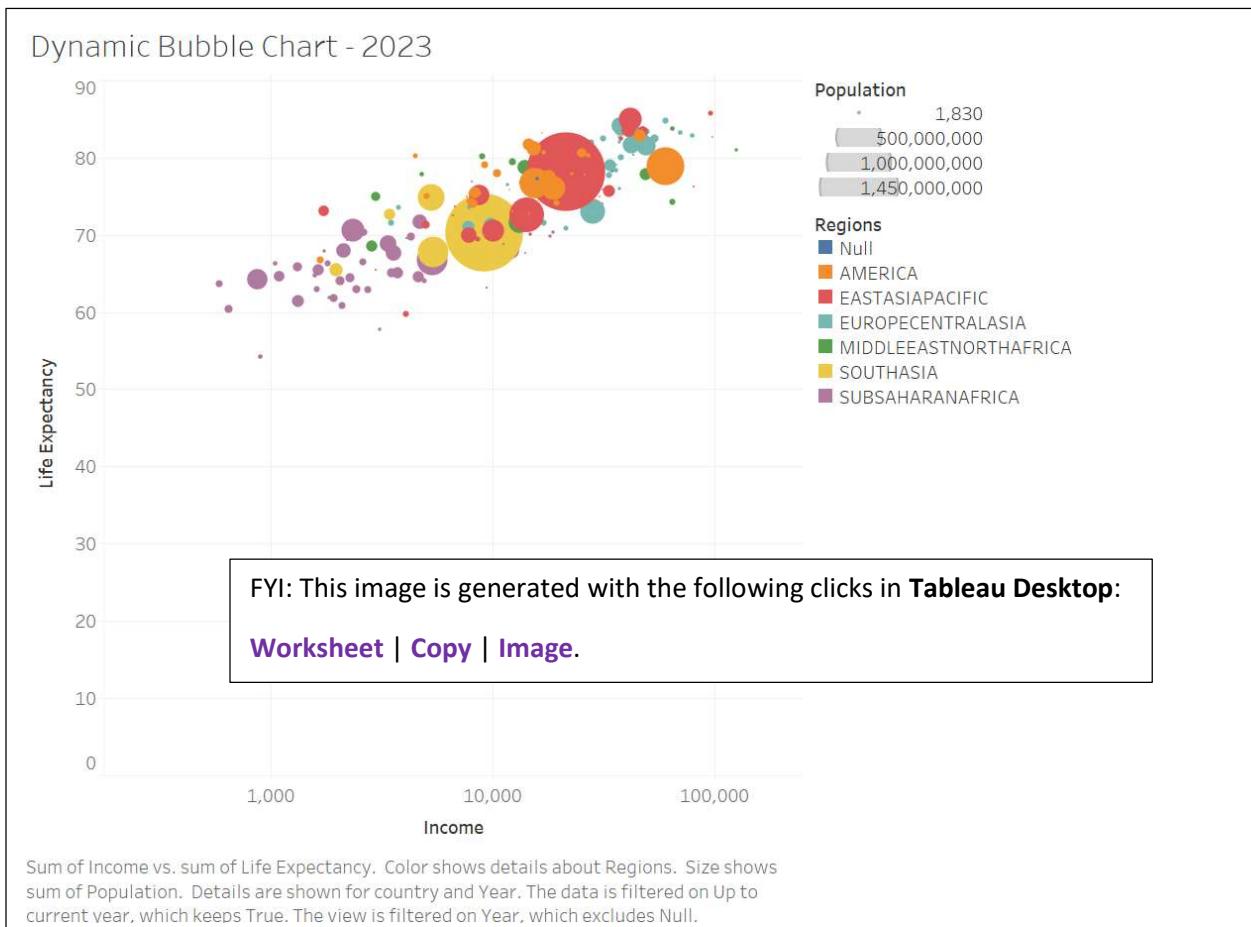
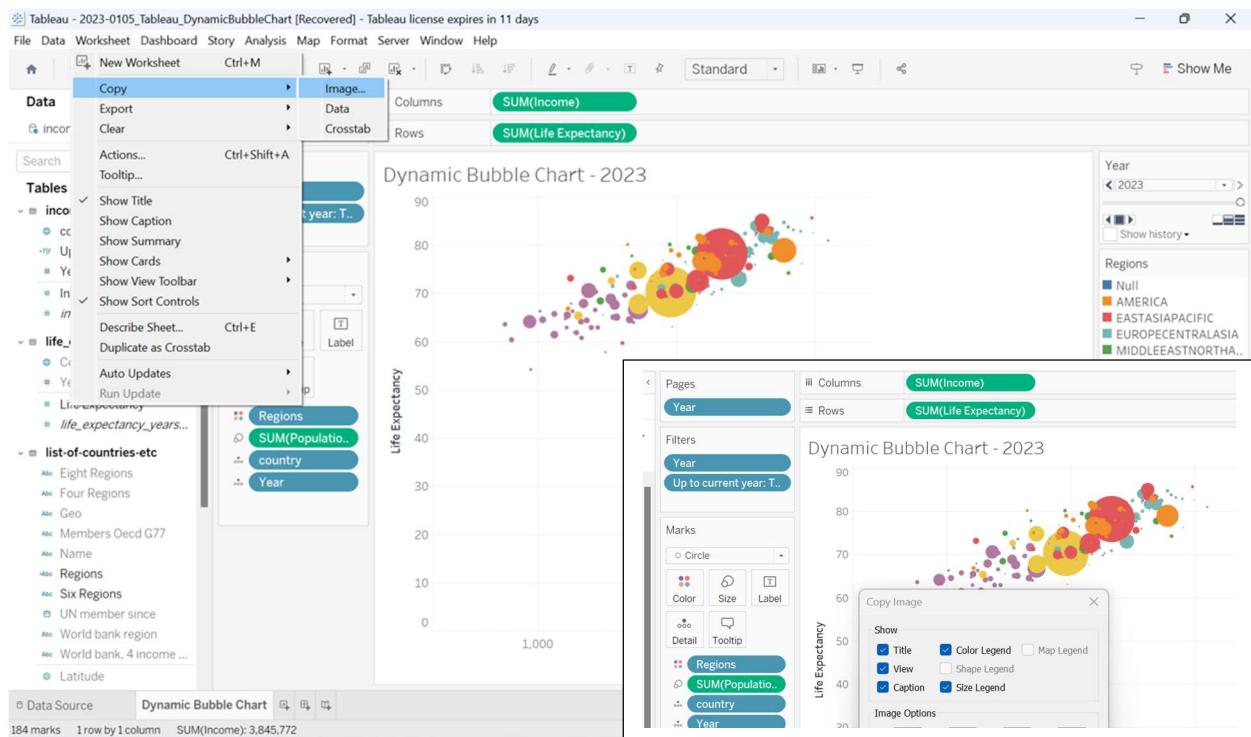


The screenshot shows the Tableau Help website with the URL [https://help.tableau.com/current/pro/desktop/en-us/functions\\_string.htm](https://help.tableau.com/current/pro/desktop/en-us/functions_string.htm) in the address bar. The page title is "String Functions". On the left, there is a navigation sidebar with "CONTENTS" and a list of topics under "Tableau Desktop and Web Authoring Help". The main content area displays a table for the "REPLACE" function, which includes the syntax `REPLACE(string, substring, replacement)`, a description of how it searches for a substring and replaces it with a replacement, and an example code block showing `REPLACE("Version8.5", "8.5", "9.0") = "Version9.0"`. To the right, there is a "IN THIS ARTICLE" sidebar with links to "Why use string functions", "String functions available in Tableau:", "Create a string calculation", and "See Also".

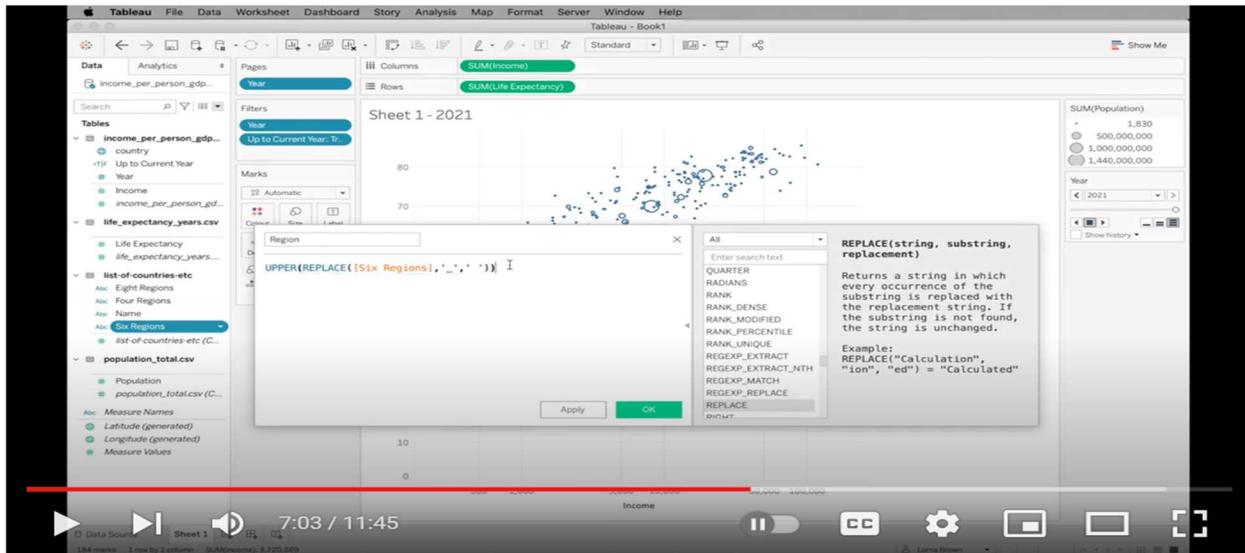
2. Feel free to Google search for additional Tableau tips (e.g., how to export data from Tableau View onto Excel or a relational database).



The screenshot shows a blog post titled "5 Quick Ways to Export Data from Tableau View onto Excel" by Bi-Connector Team. The post has a red "FYI only" box at the top left. It includes a table of contents with five methods for exporting data. The first method is "Exporting the data underlying your Visual". Below this, there is a section titled "Exporting the data underlying your Visual" with a bulleted list of three options: Crosstab, Data, and Image. A note says if you have several visuals on your dashboard, you should select the one you want to export. At the bottom, there is a callout box for "[Tableau Hacks] Saving Dashboard Space With Hidden Containers >>" and a section titled "1. Export the visualization as a Crosstab".



3. If you (the audience) prefer to watch a Tableau bubble chart creation video, you may find the following two YouTube videos of help.



#WOW2021 Week 11 | Tableau : Can you recreate the work of Hans Rosling?

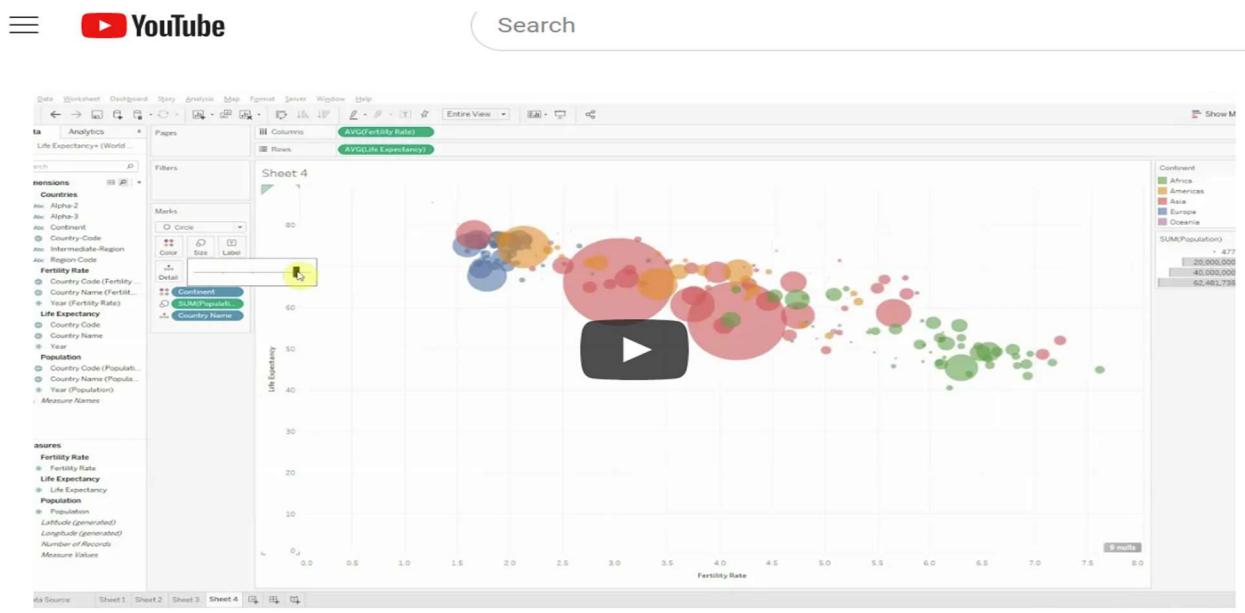
Workout Wednesday  
1.93K subscribers

**Subscribe**

11    Share    ...

<https://www.youtube.com/watch?v=LaCprFuwHk>

\*\*\*\*\*



How to track data evolution over time with Tableau Desktop – Animated Bubble Chart – Skill Pill

btProvider

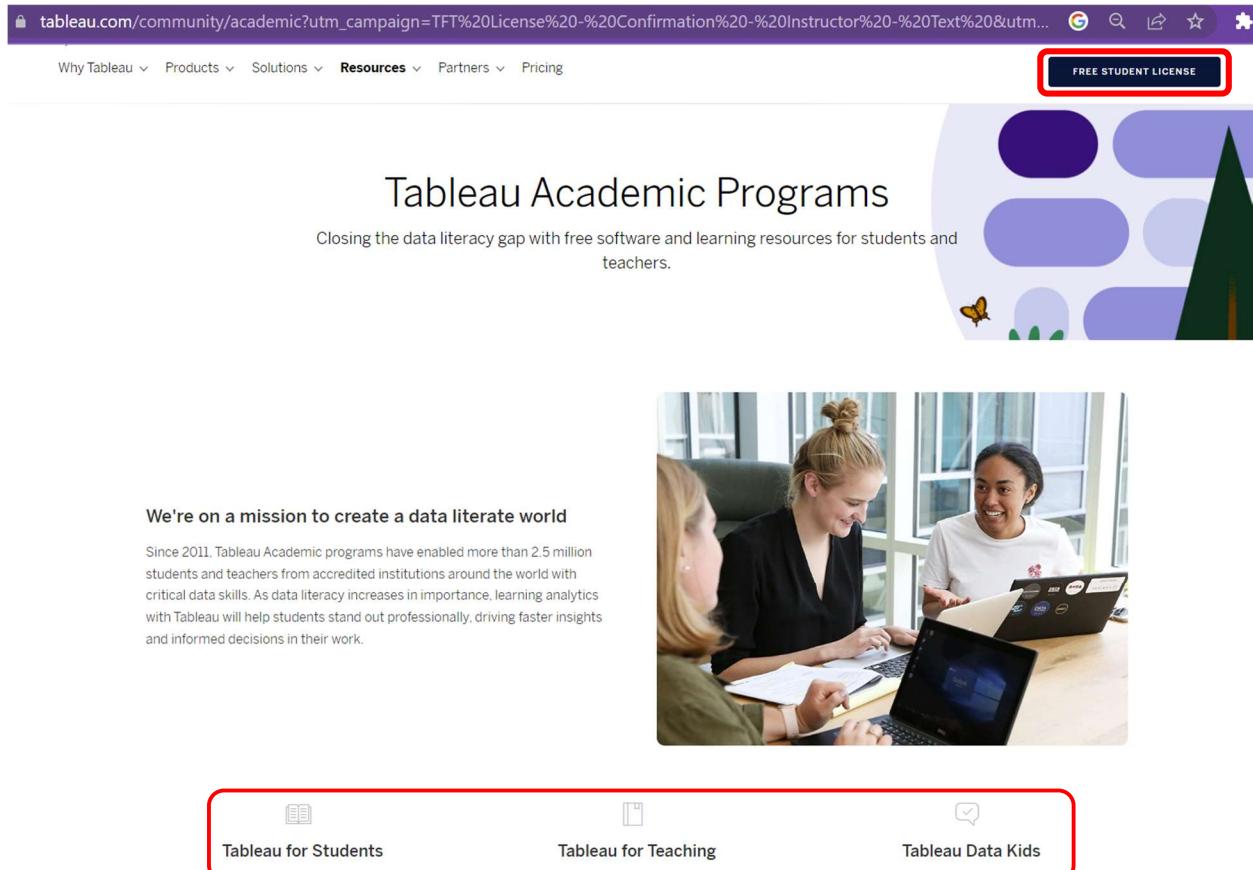
<https://www.youtube.com/watch?v=lK6AE3u6LGs>

4. Tableau also offers quite a few training videos (<https://tabsoft.co/3QuMLGp>). Happy learning!

The screenshot shows the Tableau Learning page for 2022.2. At the top, there's a navigation bar with links for Why Tableau, Products, Solutions, Resources, Partners, and Pricing. On the right, there are buttons for SIGN IN, BUY NOW, and TRY NOW. Below the navigation, a search bar is present. The main content area is titled "Free Training Videos" and "2022.2". A section titled "Creator" describes responsibilities for deep data prep and analysis. It lists three video categories: "Getting Started" (9 videos, 20 min), "Tableau Prep" (2 videos, 10 min), and "1 VIDEO". To the right, a sidebar titled "More ways to learn and connect" includes a link to "What's New in Tableau 2022.4" which features short demos of new functionalities.

The screenshot shows a specific video titled "Getting Started: Web Authoring in Tableau Online" by James Pollard, a Learning Experience Designer. The video player interface shows a play button, volume control, and a progress bar at 0.01 / 0.22. To the right of the video, a sidebar titled "CURRENT TOPIC: Getting Started" lists several video thumbnails with titles and durations: "Getting Started" (1 MIN), "Tableau Cloud" (1 MIN), "Connecting to Data" (2 MIN), "The Workspace Area" (2 MIN), "Map: Profit Ratio by Geography" (2 MIN), "Area Charts: Sales by Category; Sales by Segment" (5 MIN), and "Text Table: Key Performance Indicators" (2 MIN).

5. To learn more about available Tableau programs, check out its Academic Community page:  
<https://tabsoft.co/3vOkq4m>



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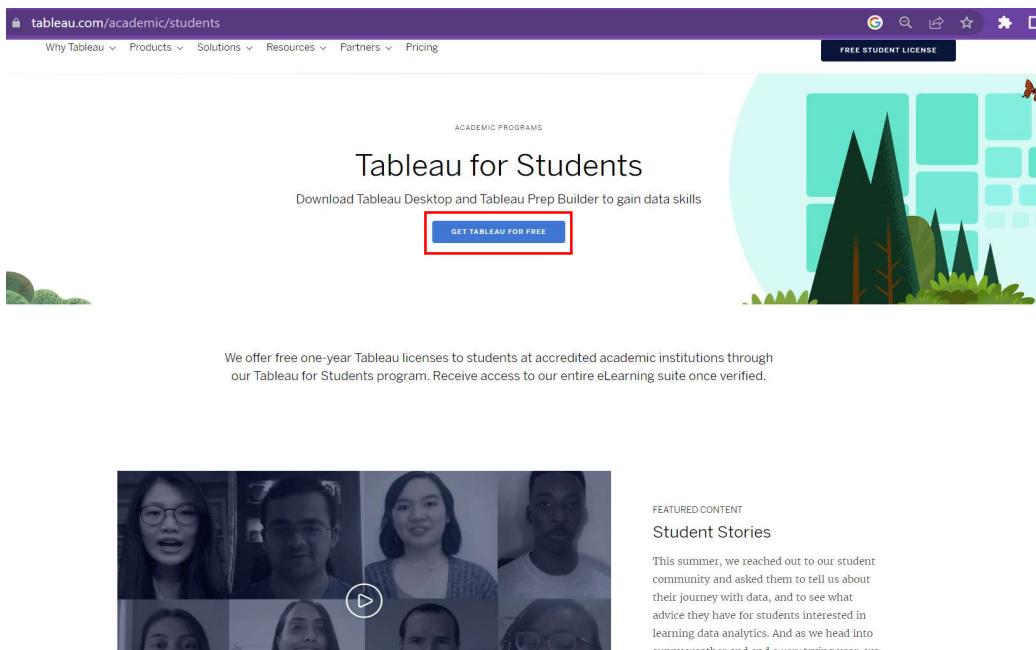


tableau.com/academic/students FREE STUDENT LICENSE

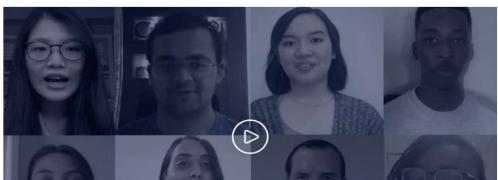
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**FEATURED CONTENT**  
**Student Stories**

This summer, we reached out to our student community and asked them to tell us about their journey with data, and to see what advice they have for students interested in learning data analytics. And as we head into

7. Explore the Tableau Community (<https://community.tableau.com/s/>). For example, click the Forums and then check the **Tableau Public!**

The screenshot shows the Tableau Community website at <https://community.tableau.com/s/>. The top navigation bar includes links for Why Tableau, Products, Solutions, Resources, and Partners. On the right, there are buttons for PRICING, TRY NOW, LOGIN, and a search icon. The main header says "Community". Below it, a navigation bar has links for Home, My Activity, **Forums** (which is highlighted with a yellow box), Ideas, Groups, Resources, Get Started, and Blogs. A "FORUMS" button is also present. The main content area features a "Welcome to the Community!" message, a search bar, and a "ASK A QUESTION" button. A modal window at the bottom encourages users to "Take the Tableau Blueprint Assessment to Start your Year!" with a "TAKE THE ASSESSMENT!" button. The URL in the address bar is <https://community.tableau.com/s/explore-forums>.

The screenshot shows the "Explore Forums" page at <https://community.tableau.com/s/explore-forums>. The top navigation bar is identical to the previous screenshot. The main heading is "Have a Question? Click on a Topic below". Below it, a note says "Choose a topic relevant to your question and select "Ask a Question" within the chosen topic." A red box highlights a note: "New to the Forums? Check out our [First Time Here](#) page for help on how to search for answers and how to best ask questions." The page lists several topics with icons: Tableau Desktop, Tableau Server, Tableau Prep (circled in red), Tableau Cloud, Tableau Public (circled in red), Actions & Filters, Other Popular Topics, Calculations, Dates & Times, Server Admin, Licensing, Data Connectivity, Developers & APIs, Installations & Upgrades, Exports & Subscriptions, Maps & Geocoding, and View all Topics. A blue box with yellow text says "See a text box on page 3." and "I recommend this one too." A red arrow points from the circled "Tableau Public" icon to the "I recommend this one too." text. At the bottom, there's a "Browse All Topics" button.

**Acknowledgement:** Special thanks to Prof. Gary H.T. Chao for his constructive comments toward a draft version of this 30-step Tableau Bubble chart learning tutorial.

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