Exercise 2: Analyzing Demographics

How can I print an exercise to PDF format?

Instructions
Use this guide and ArcGIS Online to analyze data and maps showing world demographics.

Note: ArcGIS Online is a dynamic mapping solution. The screenshot graphics that you see in course materials may differ slightly from the version of ArcGIS Online that you will use.

Introduction

In this exercise, you will use ArcGIS Online to analyze world demographics data. Feel free to experiment and try things out. Exercises later in this course will present more chances to apply what you learn.

There are questions throughout this exercise. These questions are intended to encourage you to think critically—and spatially.

What you will learn
As a result of this activity, you will accomplish the following tasks:

- Become acquainted with attribute information and how it corresponds to the features in a map.
- Modify the display of the data represented in the map to highlight particular themes or answer spatial questions.
- Reflect on your learning through self-assessment quiz questions.

Technical notes

1. You will make full use of web mapping services throughout this course.
2. Use the latest version of Google Chrome or Microsoft Edge. Other web browsers may not display your maps and apps correctly.

   For information on supported browsers, see ArcGIS Online Help: Supported browsers (https://esriurl.com/browsers).

Note: The exercises in this course include View Result links. Click these links to confirm that your results match what is expected.

Estimated completion time in minutes: Approximately 30 minutes

Expand all steps | Collapse all steps

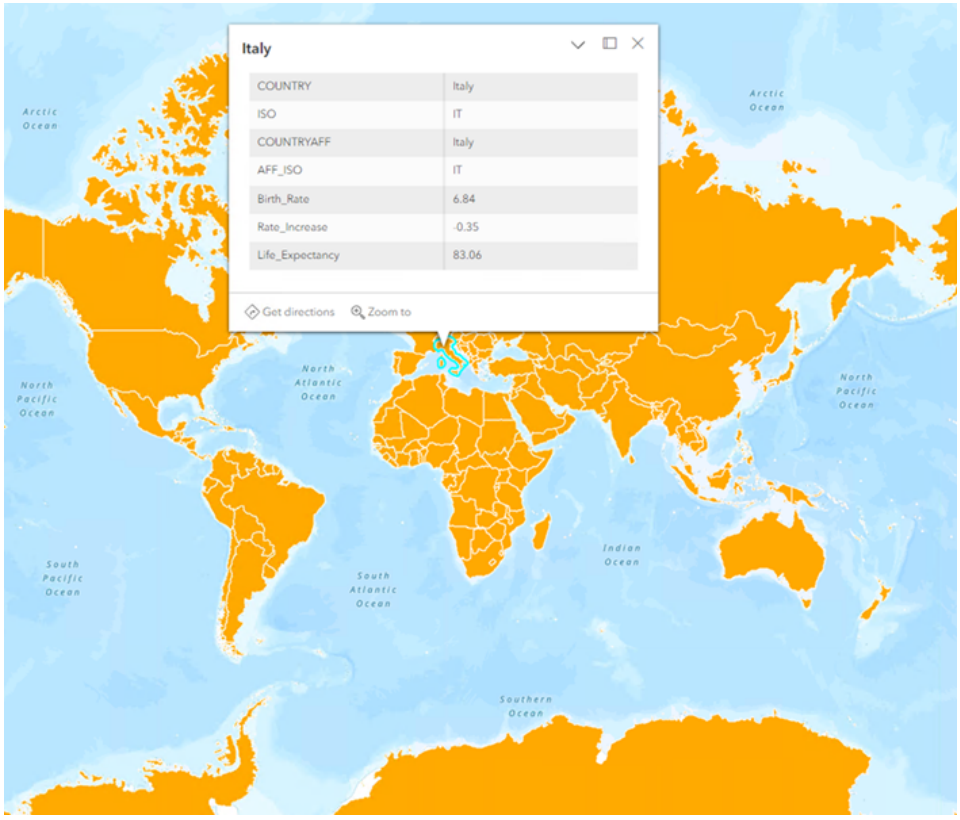
- Step 1: Explore attribute information

Note: If you closed your browser window after completing the previous exercise, complete the following instructions.

- In the address bar, type **www.arcgis.com** and press Enter.
- Click Sign In.
- Sign in to ArcGIS Online using your course ArcGIS credentials.
- Click the Content tab, and choose the Section 1, Exercise 1: Geography Matters: Analyzing Demographics web map that you saved in the previous exercise.
- Click Open in Map Viewer.

Attributes can include how much water is flowing in a specific river segment, the median age in a neighborhood, or the depth of an earthquake. In this map, each feature, or world country, contains information about births, annual rate of population change, and life expectancy. In the first step, you will examine some attribute information.

a On the map, click within a country border.



*Step 1a***: Explore attribute information.*

Note: Your results may vary from the graphic depending on the country selected in the map.

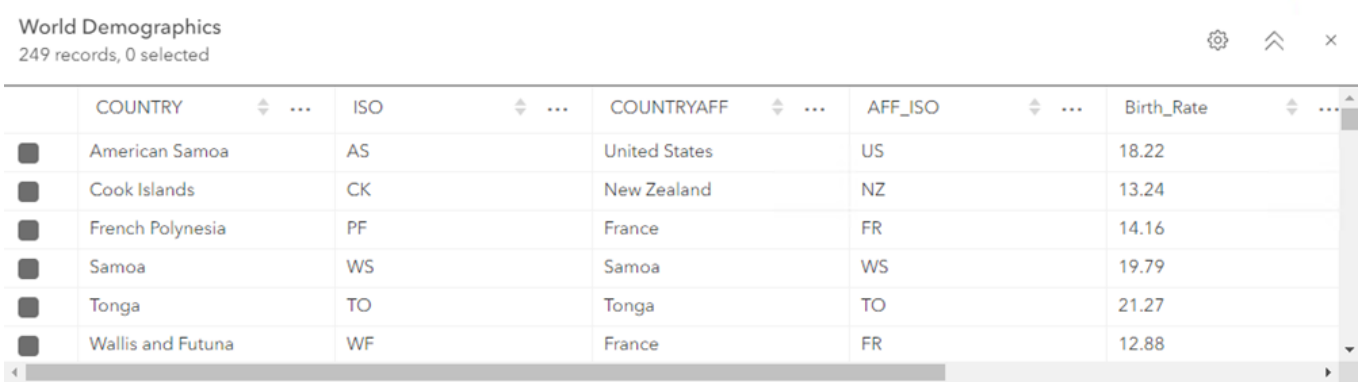
The information in the pop-up window is pulled from the attribute table that is associated with the location that you clicked.

You can think of the map as the G (geographic) part of GIS and the attributes as the I (information) part of GIS.

b Close ✕ the attribute pop-up window.

c If necessary, click Layers to open the Layers pane.

d For the World Demographics layer, click Options ··· and choose Show Table .



COUNTRY	ISO	COUNTRYAFF	AFF_ISO	Birth_Rate
American Samoa	AS	United States	US	18.22
Cook Islands	CK	New Zealand	NZ	13.24
French Polynesia	PF	France	FR	14.16
Samoa	WS	Samoa	WS	19.79
Tonga	TO	Tonga	TO	21.27
Wallis and Futuna	WF	France	FR	12.88

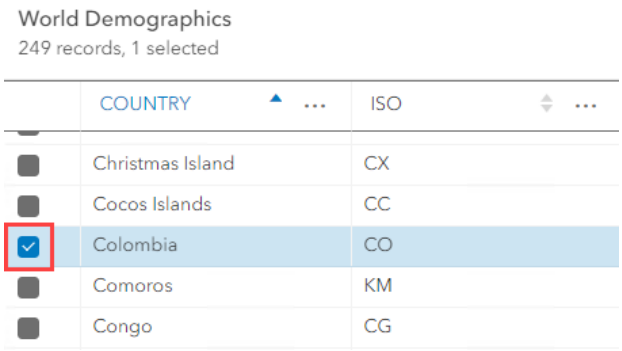
*Step 1d***: Explore attribute information.*

The attribute table appears at the bottom of the map with each country represented by one row, or record, in the table. The variables that you have been examining appear as fields in the table.

? How many records are in this table?

- Answer
There are 249 records in this table.

e In the attribute table, choose a country, and to the left of the country name, click to check the gray box, as indicated in the following graphic.



f On the map, notice how the country that you selected is highlighted.

Note: You may need to zoom or pan to see the highlighted country.

g Conversely, click a country in the map and notice how the corresponding row in the table is highlighted.

Note: You may need to scroll up or down within the table to see the highlighted row.

h Close the pop-up window.

i On the attribute table, click Expand to expand the table.

j In the table, find the Birth_Rate column heading.

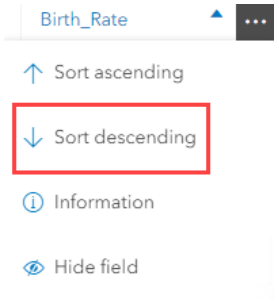
- Hint

In the attribute table, you may have to scroll to the right to find the Birth_Rate column heading.

The Birth_Rate data is the birth rate, or annual number of births per 1,000 total population in each country, according to the U.S. Census Bureau International Database.

k To the right of the Birth_Rate column heading, click Options ···.

l From the drop-down list, choose Sort Descending, as indicated in the following graphic.



According to this dataset, which country had the highest birth rate?

- Answer

Niger had the highest birth rate of any country in the dataset, at 47.76 per thousand.

m Scroll to the bottom of the table.

Which two countries had the lowest birth rates?

- Answer

Monaco and South Korea had the lowest birth rates.

As you move through the table, you will notice that some data is missing from the table, particularly for some small islands. Like other data, spatial data is imperfect; however, the data is still useful. Managing errors and imperfect data is another key skill that you will build in this course.

When examining spatial data, it is important to look for relationships. You will notice the relationship that seems to be evident when comparing the birth rate to the growth rate (Rate_Increase): higher birth rates correspond to higher growth rates. The relationship is not perfect because immigration, health measures, and other factors also affect a country's growth rate. Nevertheless, thinking about spatial information and relationships is a key skill that you are already fostering in these types of studies.

n In the table, find the heading of the Country column and choose Sort Ascending to reorder the list of countries in the table.

The table is now sorted alphabetically, using the same technique that you used to sort numerically.

o Using the skills that you have learned for sorting columns, sort the Life_Expectancy column so that the highest life expectancies appear first in the table.

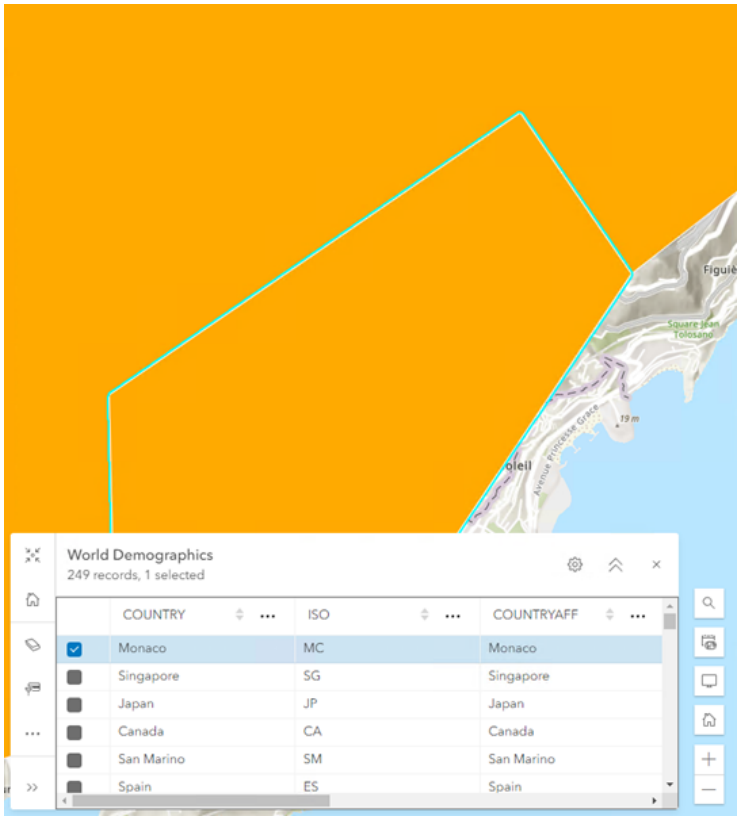
You will notice that Monaco and Singapore have the highest life expectancies.

p Click Collapse to contract the attribute table.

q In the table, click the gray box next to Monaco to select the row.

The polygon representing the country of Monaco is highlighted in bright blue.

r On the upper-left corner of the attribute table, click the Zoom to Selection button .



*Step 1r***: Explore attribute information.*

s On the Layers pane, hover over the World Demographics layer, and click the Layer Visibility button to turn off the layer in the web map.

t Using the navigation tools in the bottom right corner, zoom out as needed to get a sense of the location of Monaco.

*Step 1t***: Explore attribute information.*

In this step, you used the World Demographics attribute table to explore the attributes tied to spatial data in the map. A layer's attribute table provides key information in the ability to understand spatial relationships through visualization and analysis.

- Step 2: Add a bookmark to the map

There may be circumstances in which you need to quickly navigate to a particular location or extent in the map. Bookmarks allow for quick navigation to particular places on the map.

a If necessary, using the navigation tools in the bottom right corner, center the map extent on Monaco.

b On the Contents toolbar, click Bookmarks and choose + Add Bookmark.

c For the Title, type **Monaco - Highest Life Expectancy** and click Add.

d In the table, uncheck the gray box next to Monaco and click the gray box next to Singapore.

e Zoom to Singapore.

- Hint

  On the upper-left corner of the table, click the Zoom to Selection button .

f Now that map display has changed to Singapore, on the Bookmarks pane, click the Monaco - Highest Life Expectancy bookmark.

The map display immediately navigates to the extent at which the bookmark was taken.

g Continue to explore the data in the map and the corresponding attributes in the attribute table.

h When you have completed exploring, keep the attribute table open for the next step.

In this step, you created and navigated the map using a bookmark.

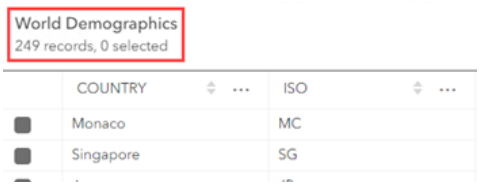
- Step 3: Filter data to limit feature display

Another way to access attribute information is by filtering, or selecting, data. In this step, you will filter the table data to select certain features.

a On the Layers pane, hover over the World Demographics layer, and then click the Layer Visibility button to turn on the layer in the web map.

b To the left of the World Demographics attribute table, click the Clear Selection button to deselect the Singapore feature.

The table header shows 249 features, with 0 selected, as indicated in the following graphic.



c On the Layers pane, click Options , and then choose Zoom To to visualize the entire dataset extent in the map.

Consider the following as an example of how you might use a filter: Imagine that you manage a program at the United Nations. Your team needs to analyze societies that are experiencing rapidly decreasing populations. Using the World Demographics map and associated data, you could use the Filter tool to select countries with population growth rates that meet your criteria.

You will now learn how to filter or query information from the World Demographics layer.

d On the Settings toolbar, click Filter .

You will create an expression (https://esriurl.com/exp) to filter the attribute data and limit the display of data in the map.

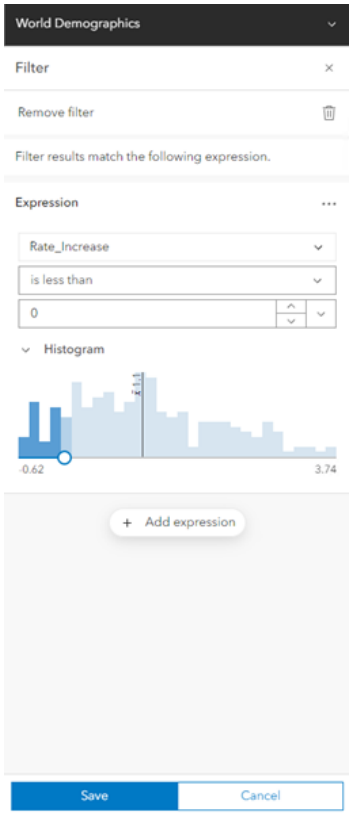
e Click + Add Expression.

f On the Filter pane, under Expression, for the first field, choose Rate_Increase.

Rate_Increase is the annual growth rate of the population in each country year over year, according to the U.S. Census Bureau International Database.

g For the second field, choose Is Less Than.

h For the third field, type a value of **0**.



*Step 3h***: Filter data to limit feature display.*

In plain language, the expression that you created will display features in the map layer when the value of the Rate_Increase field in the table is less than 0.

i Click Save.

> ? Where are the countries with a growth rate less than 0?
>
> - Answer
> Many of the countries are located in Central and Eastern Europe as well as Northern Asia.

- Hint

You may need to zoom out or pan the map to examine the map closely.

j Examine the table and look at the data critically.

> ? How many countries had a growth rate less than 0?
>
> - Answer
> A total of 30 countries had a negative growth rate, or growth rate less than 0.

Although the world population is expected to grow to 9.7 billion by 2050, many countries around the world are experiencing negative growth rates. A key part of spatial analysis is to understand the variables and data that you are using.

k In the table, next to the Rate_Increase column heading, click Options ··· and choose Information.

l In the Information pop-up for RateIncrease, scroll down to review the Statistics section.

> ? What is the minimum rate of growth for the selected countries?
>
> - Answer
> The minimum growth rate for any country in the dataset is -0.62.

m Close the Information pop-up window, and then sort the table by Rate_Increase to answer the following question.

> ? Which country has the lowest growth rate?

- Answer

The lowest growth rate occurred in Bulgaria.

n Close the attribute table.

o On the Settings toolbar, click Filter, and then choose Remove filter to clear the filtered results.

p Close the Filter pane.

As useful as scrolling through the attribute table and filtering are, the map is an even more powerful medium for spatial analysis. You will now practice changing the map symbology.

- Step 4: Change the map symbols

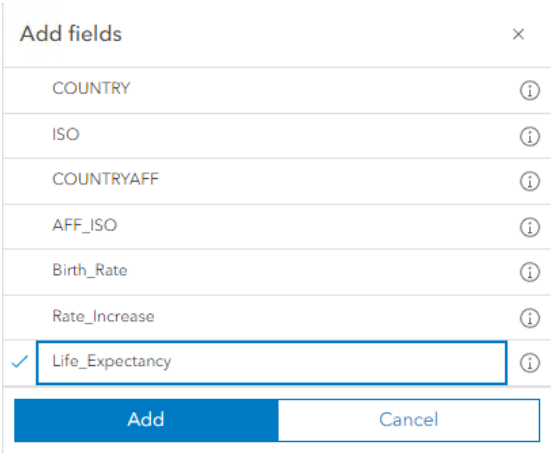
You have been working with a map layer represented as a single symbol. Every polygon (country) is represented as a single color. In this step, you will practice changing the symbol color, transparency, and outline color.

First, you will apply changes to the map style for better visual representation of the data in the attribute table.

a On the Settings toolbar, click Styles.

b On the Styles pane, under Choose Attributes, click + Field.

c In the Add Fields window, choose Life_Expectancy, as indicated in the following graphic.



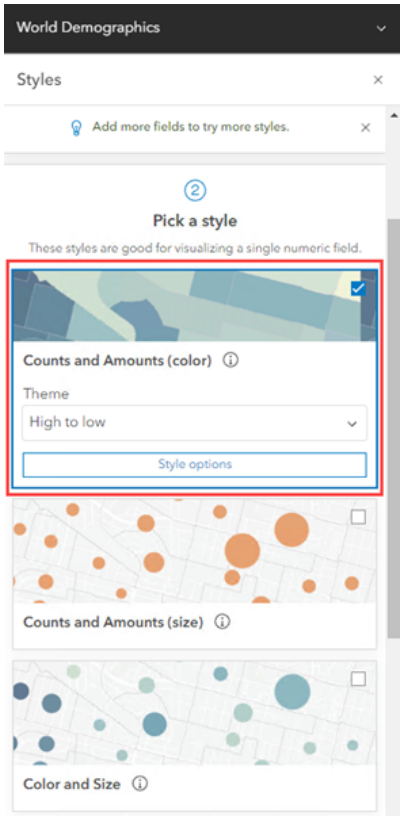
This attribute represents the years of life expectancy at birth in each country, according to the U.S. Census Bureau International Database.

d Click Add.

e Review the updates to the web map.

By default, the map updates symbology using Counts and Amounts (Color) using smart mapping. By choosing the attribute Life_Expectancy, the smart mapping reviews the geometry and attribute information and suggests a potential style that will work well with the your data. However, you always have the option to further adjust the visual representation of the data in the map.

f On the Styles pane, under Pick A Style, click Counts And Amounts (Color), as indicated in the following graphic.



The default color gradient, or color ramp, uses a range of the color blue to represent life expectancy values. However, to more easily visualize the outline between countries, you will change and increase the width of the outline color.

g On the the Style Options pane, click Symbol Style.

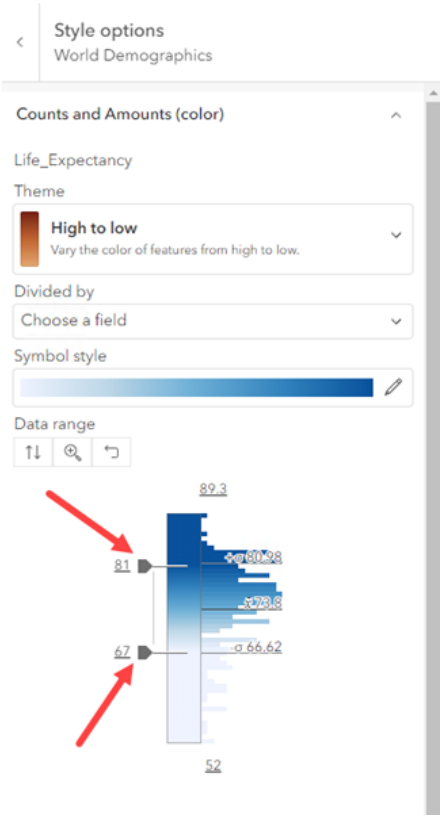
h In the Symbol Style window, complete the following:

- Click the Outline Color, and from the palette, choose an outline color, such as black (hex color #1A1A1A).
- Increase the Outline Width to 1.

i At the top right, click Close ✕ to close the Symbol Style window.

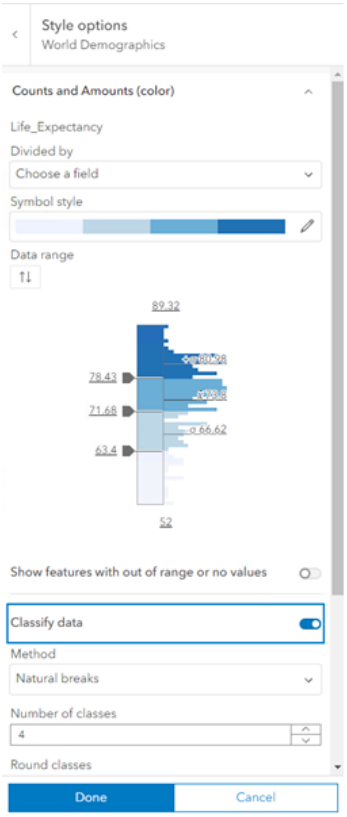
Recall that the color values indicate life expectancy by country. To change how the color ramp is applied to the data, you can use the handles along the color ramp and histogram showing the distribution of life expectancy values for your data.

You can adjust the display by dragging the handles or by clicking the number next to the handle and typing a precise value. Experimenting with the position of the handles allows you to fine-tune the message of the map.



To further generalize your map, you can classify the data.

j On the Style Options pane, click the Classify Data toggle to turn the option on.



*Step 4j***: Change the map symbols.*

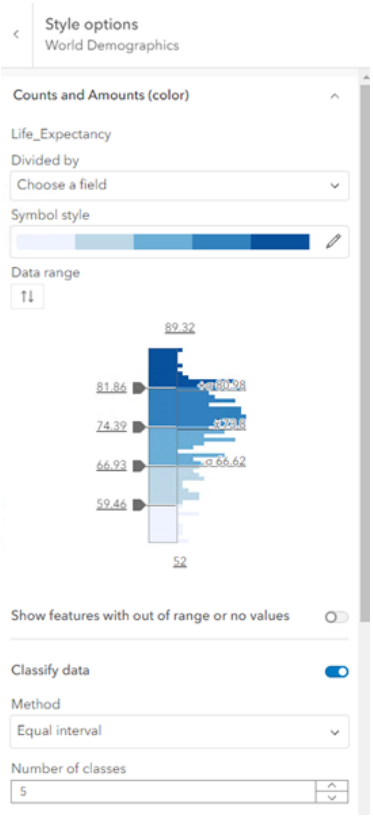
- Hint

  You may need to scroll down in the Style Options pane to find the Classify Data toggle.

k On the Style Options pane, under Method, click the drop-down.

l From the drop-down menu, choose the Equal Interval classification method.

m For the Number Of Classes, choose 5.



*Step 4m***: Change the map symbols.*

The Equal Interval classification method creates equal ranges based on the range of values in your data. In the last step, when you selected 5 for the number of classes, the range of values was broken into 5 equal ranges called classes. Each class was then symbolized based on the color ramp you selected earlier.

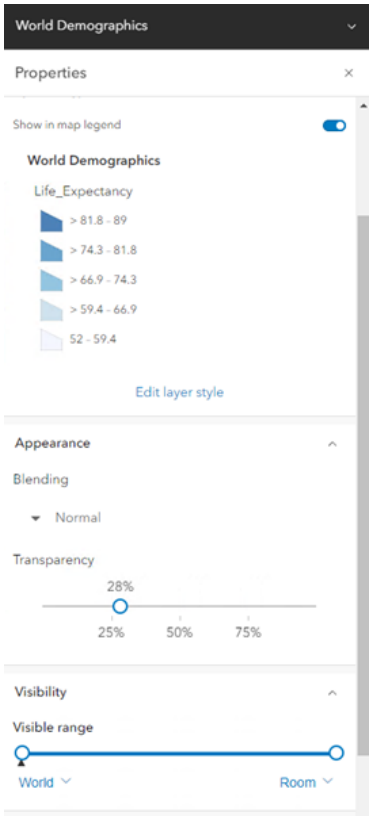
n On the Style Options pane, click Done, and then click Done again to close the Styles pane.

o On the Settings toolbar, click Properties .

p If necessary, on the Properties pane, scroll down to Appearance.

q Under Transparency, move the Transparency slider to the left, and then to the right to explore.

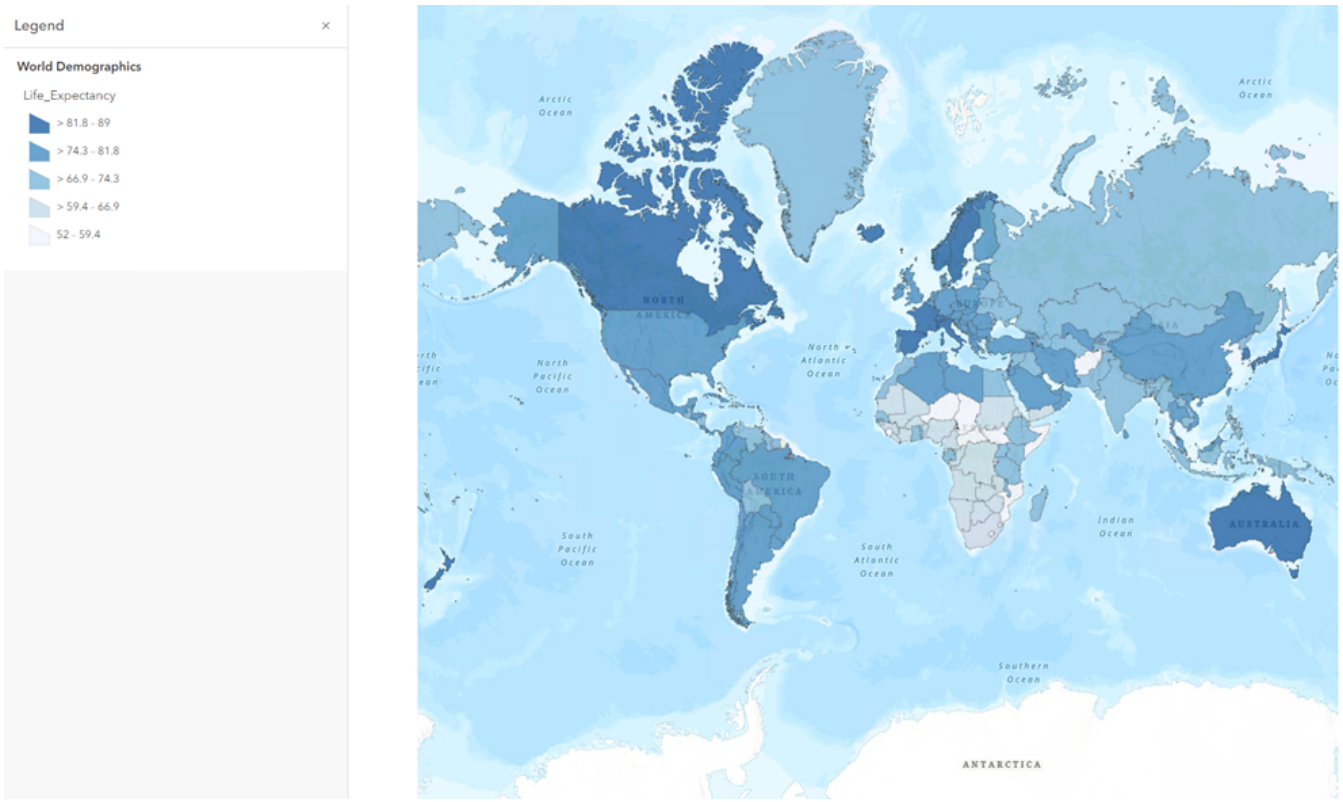
Using the transparency slider allows you to visualize underlying data or basemaps that might provide helpful location reference information or show potential relationships between layers within a map.



*Step 4q***: Change the map symbols.*

r When you are finished exploring the Transparency setting, return the setting back to 0 and close the Properties pane.

s On the Contents toolbar, click Legend .



*Step 4s***: Change the map symbols.*

The resulting world demographics map shows life expectancy in years based on the equal interval classification method.

? What are patterns that you notice on the resulting map?

- Answer

Answers may vary, but there are notable patterns of higher life expectancies and lower life expectancies across the globe.

? What is the lowest life expectancy in the color ranges?

- Answer
The lowest value for life expectancy is 52.

This map and legend show data based on the equal interval classification method. However, there are alternative methods you can use to classify your data.

- Step 5: Add Effects

Adding effects, such as drop shadows and blurs, can help make certain attributes in your data stand out or simply make the map more visually appealing to your audience.

a On the Settings toolbar, click Effects ✨.

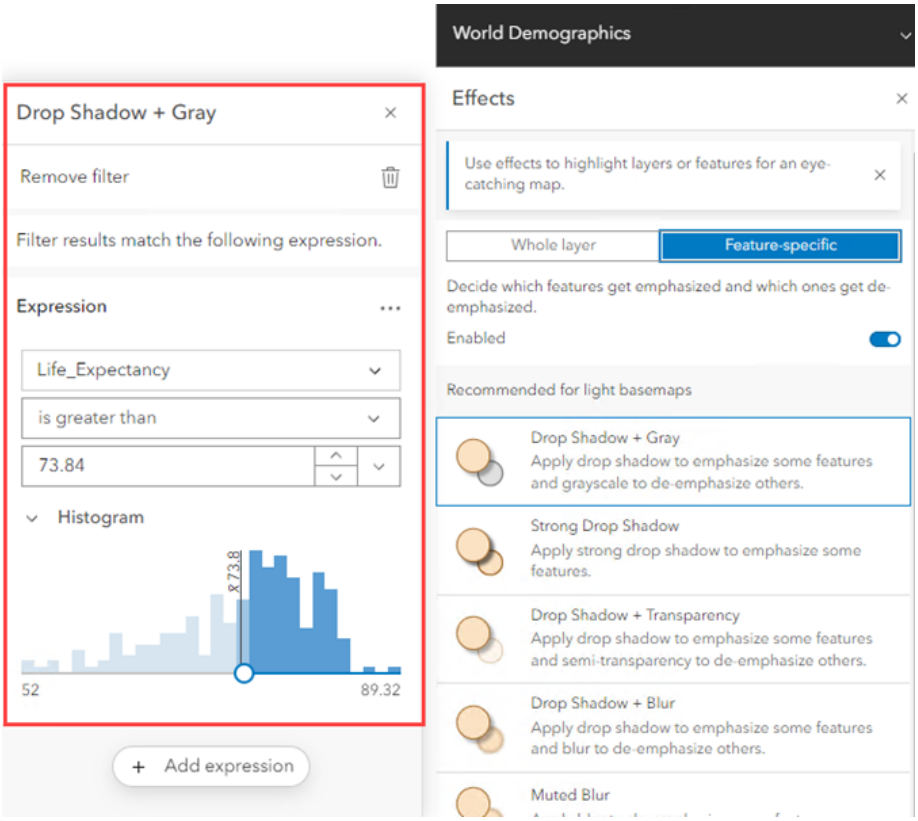
By default, the Effects pane recommends effects based on the whole layer.

Recall that the map is currently symbolized to display life expectancy values by country using an equal interval classification method. To further emphasize life expectancy information in the map, you will select the Feature-Specific configuration.

b On the Effects pane, click Feature-Specific.

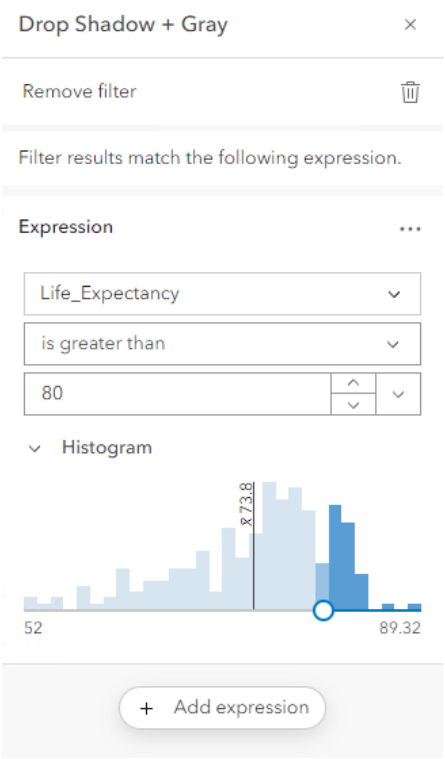
By default, the web map updates the display to a recommended effect. The goal is to emphasize specific features in your map and de-emphasize others. This will not only create an eye-catching map, but it will help your audience understand the story you are trying to convey.

c Note the window to the left of the Effects pane, as indicated in the following graphic.



An expression can be applied to determine which features you would like to emphasize in your map. For example, the default expression has been applied so that the map highlights the countries that have higher life expectancies.

d Change the expression to emphasize countries that have a life expectancy greater than 80 years old.



*Step 5d***: Add Effects.*

e Under Recommended For Light Basemaps, click Strong Drop Shadow.

This effect allows you to emphasize the countries that have a life expectancy greater than 80 years old but still have the ability to visualize the classification symbology for all countries.

f Close the Strong Drop Shadow window, and review the changes in the map.

g On the Contents toolbar, click Save and Open and choose Save.

In this step, you added an effect to the World Demographics layer, but instead of applying an effect to the whole layer, you created an expression to emphasize the countries that have a life expectancy greater than 80 years old.

- Step 6: Review analysis tools

In this step, you will review the Analysis pane to become familiar with the available analysis tools in the Map Viewer.

a On the Setting toolbar, click Analysis .

The Analysis pane is where you can browse and run tools. After running an analysis tool, you can view the history to track progress, review which tools were previously run and the parameters that were used, or even re-run the tool.

b On the Analysis pane, click Tools.

c Expand the various toolsets, and hover over the tools to read the descriptions.

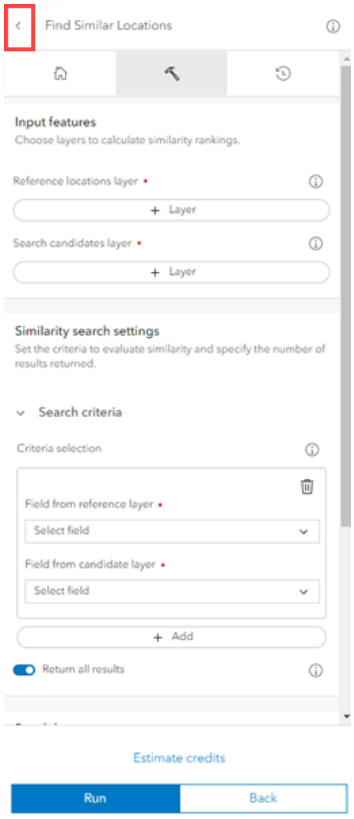
In upcoming exercises in this course, you will be using many of these tools to answer a variety of spatial questions.

d Expand Find Locations, and click the Find Similar Locations tool.

Analysis tools will open in the Analysis pane.

e Review the Find Similar Locations to examine the inputs and parameters.

f Then, at the top of the Find Similar Locations tool, click the back arrow, as indicated in the following graphic.



g Continue to explore the Analysis pane, and when you are finished, close the web browser.

You have investigated a map, its layers, and their associated attribute table. You thought spatially and asked and answered questions about the map by reviewing the table, filtering, and symbolizing the classified the data. Finally, you explored the analysis tools that you will put to use in upcoming exercises. These are key skillsets when analyzing spatial data. You will continue to apply these skills when conducting analysis in ArcGIS Online.

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