# Creating thematic maps in ArcGIS Online

In the [previous tutorial](#), we learned how to create an account in ArcGIS Online, and upload a shape file containing City of Toronto neighbourhoods.

In this tutorial, we will learn how to content to those neighbourhoods: COVID-19 infections. We will then create a colour code which helps to visually pinpoint the most vulnerable areas in Toronto.

## What you will learn

1. Label the neighbourhoods in the shape file in ArcGIS.
2. Find the spreadsheet that contains the COVID-19 infection data.
3. Uploading the COVID-19 data to ArcGIS Online.
4. Colour coding our new layer.
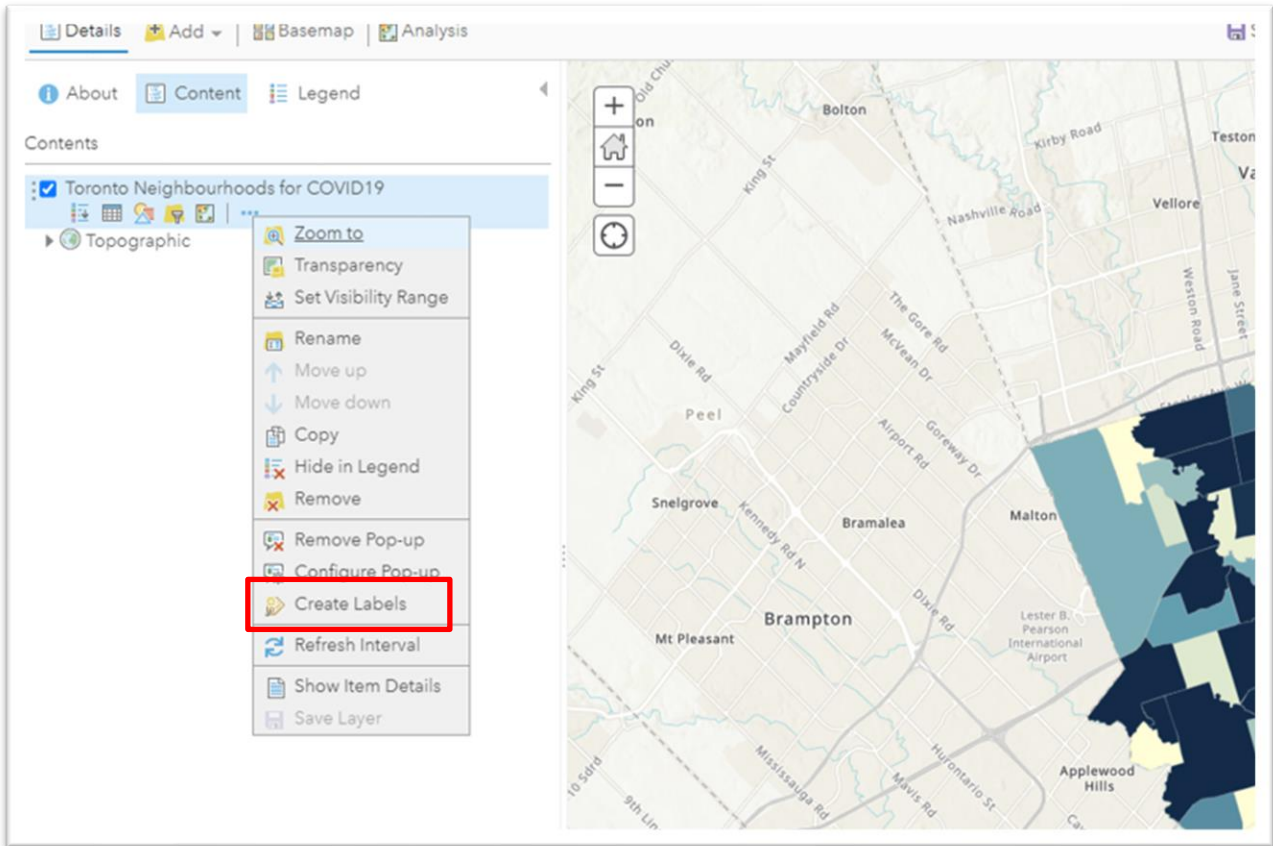5. Obtaining the embed code in order to display your map in a story or blog post.

So, lets get started.

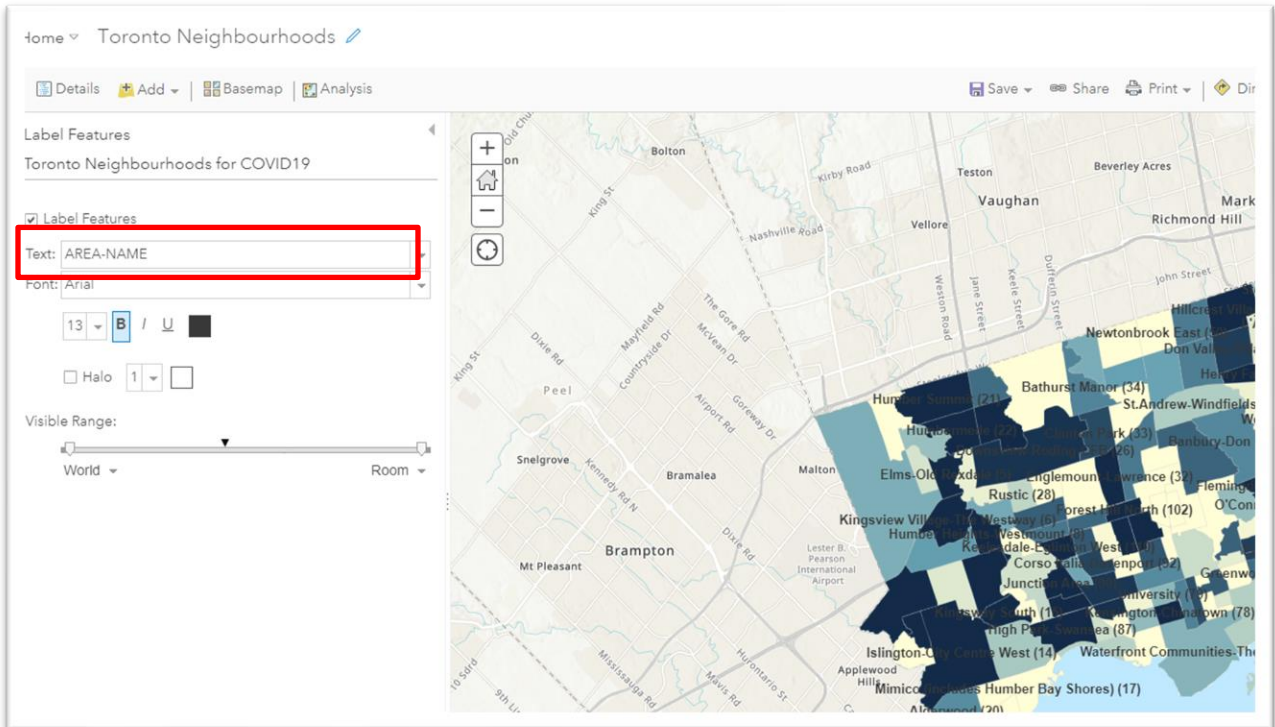## Label the neighbourhoods in the shape file in ArcGIS

Let us begin by putting labels on the neighbourhoods.

Place your cursor over the layer until the three dots appear to the right.

Click the dots to obtain a drop-down menu.

Select the "Create Labels" option.



In the text box under "Label Features" select the field that contains the neighbourhood names and adjust the font size and type if necessary. If you are unsure of which column title to use, return to your layer, hover the mouse over its name once again and select the "show table" icon.

To close the table, click the "X" at its top right-hand corner.

Once you have the correct name, close the label features section from the screen grab in the previous page by clicking the caret at the top right corner.
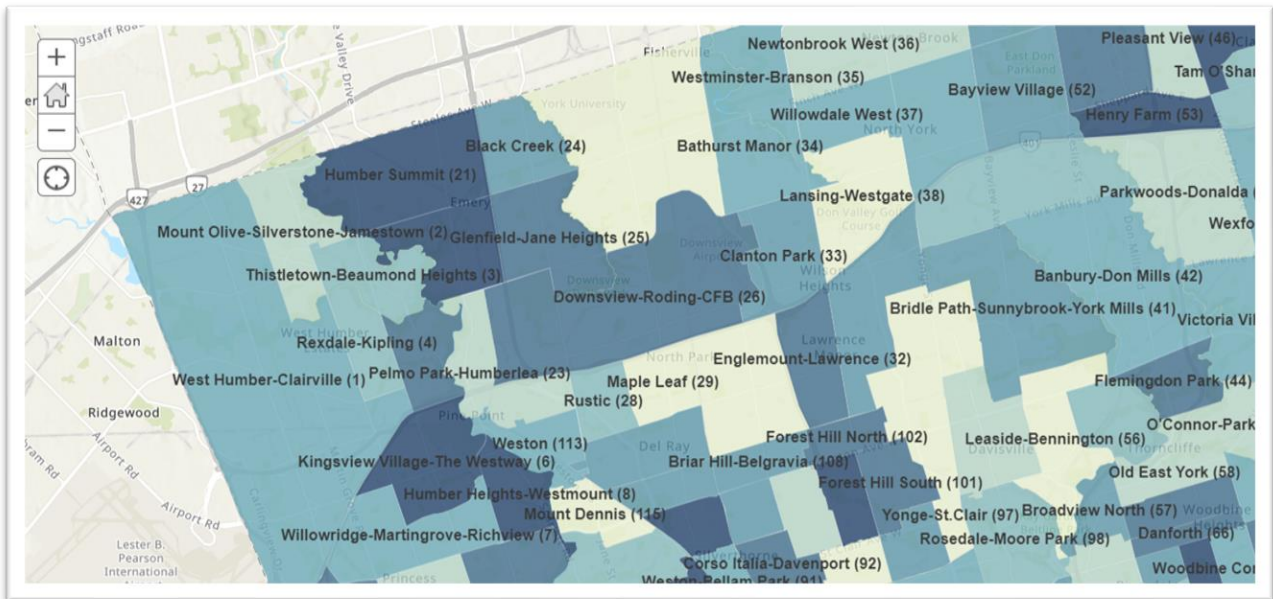


Now it's time to bring in another layer, this time the csv file that contains the up to date COVID-19 infections broken down by neighbourhood.

**Find the spreadsheet that contains the COVID-19 infection data**

You'll find the data at Toronto Public Health's [COVID-19 website](#).



Select the second tab "COVID-19 Toronto Neighbourhood Maps."

The text above explains the map's content with a few caveats to prevent anyone from jumping to conclusions. So, take the time to read it before going any further.



Hovering your mouse over a neighbourhood boundary produces a pop-up box with COVID-19 cases.
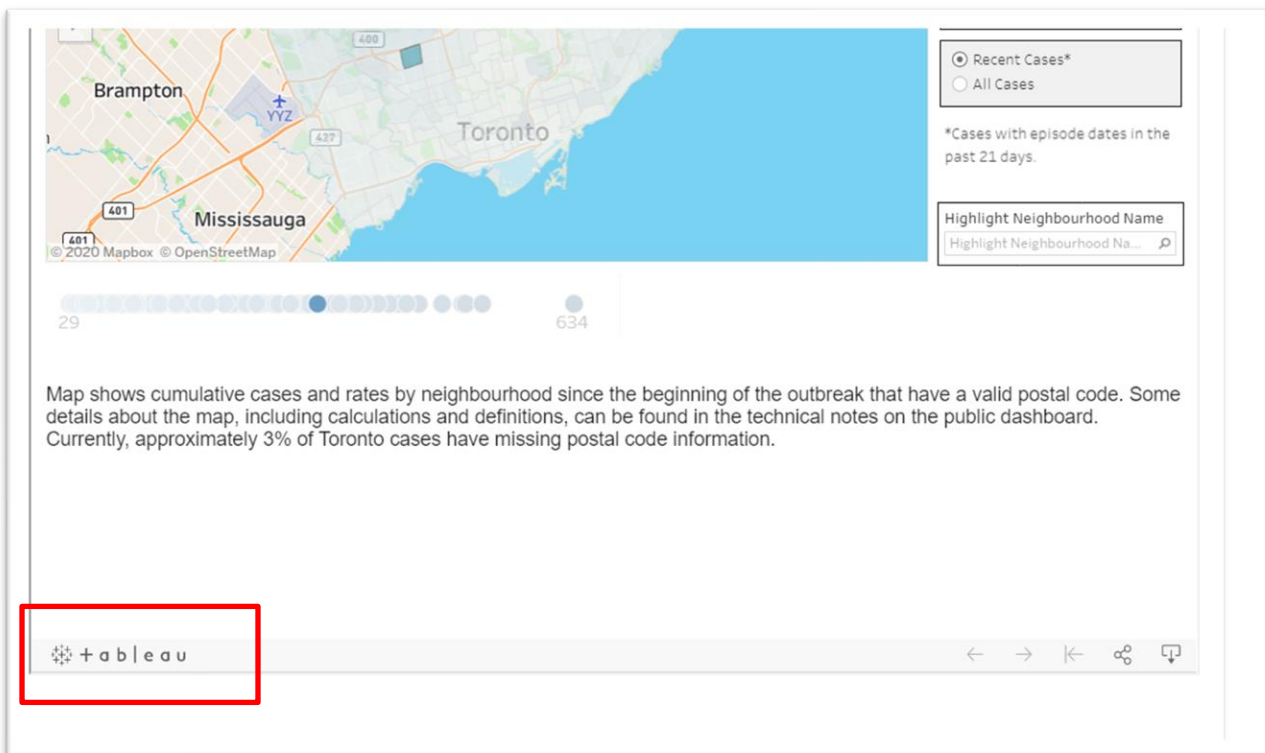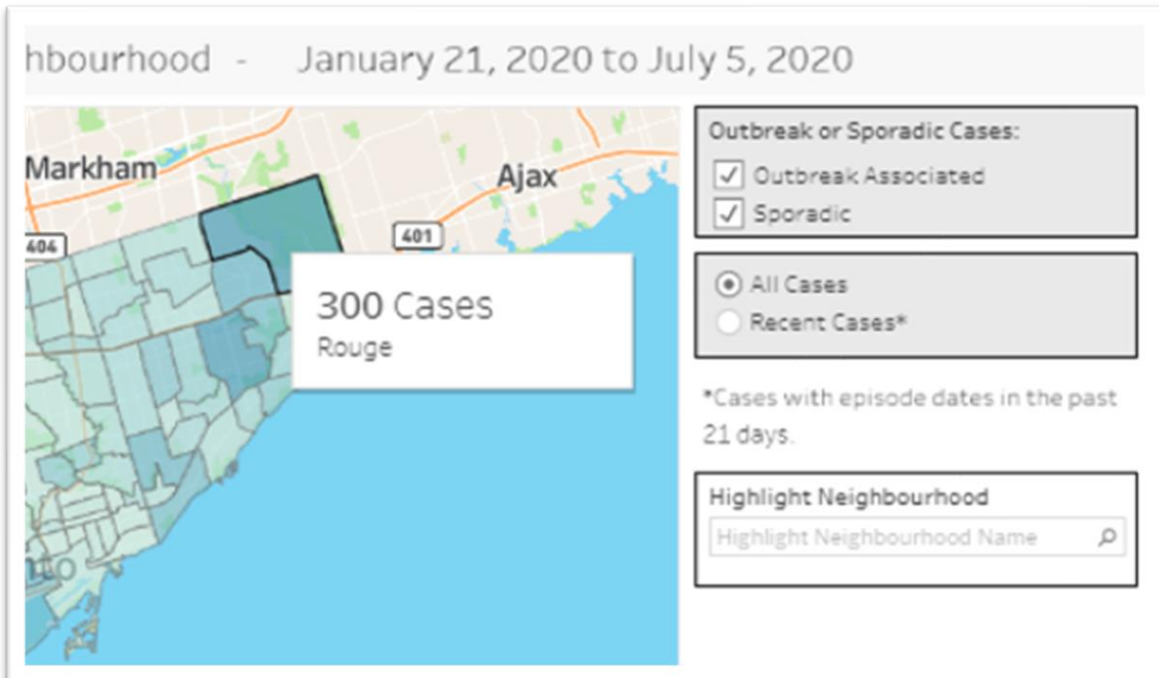
Since we already have the neighbourhood shape file in ArcGIS Online, we only need the COVID-19 data, which we will download from this site as an Excel file.

To do this scroll to the top of the page and select the "Download Excel Data" tab.

Download the Excel workbook to this tutorial's hard drive folder.

Open the file  and go to the second tab.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| | Neighbourhood ID | Neighbourhood Name | Rate per 1 | Case Count | |
| 1 | | | | | |
| 2 | 137 | Woburn | 366.4579 | 196 | |
| 3 | 2 | Mount Olive-Silverstone-Jamestown | 503.7325 | 166 | |
| 4 | 132 | Malvern | 351.6463 | 154 | |
| 5 | 131 | Rouge | 324.7591 | 151 | |
| 6 | 26 | Downsview-Roding-CFB | 382.2892 | 134 | |
| 7 | 126 | Dorset Park | 523.9371 | 131 | |
| 8 | 27 | York University Heights | 424.0206 | 117 | |
| 9 | 1 | West Humber-Clairville | 315.2017 | 105 | |
| 10 | 25 | Glenfield-Jane Heights | 341.0843 | 104 | |
| 11 | | Missing Address/Postal Code | | 103 | |
| 12 | 113 | Weston | 500.2223 | 90 | |
| 13 | 127 | Bendale | 293.725 | 88 | |
| 14 | 55 | Thorncliffe Park | 393.2158 | 83 | |
| 15 | 24 | Black Creek | 372.6365 | 81 | |
| 16 | 136 | West Hill | 273.8026 | 75 | |
| 17 | 71 | Cabbagetown-South St. James Town | 634.1589 | 74 | |
| 18 | 62 | East End-Danforth | 346.1017 | 74 | |
| 19 | 117 | L'Amoreaux | 159.1162 | 70 | |
| 20 | 139 | Scarborough Village | 412.5807 | 69 | |
| 21 | 85 | South Parkdale | 306.6502 | 67 | |
| 22 | 6 | Kingsview Village-The Westway | 300 | 66 | |
| 23 | 120 | Clairlea-Birchmount | 240.8835 | 65 | |
| 24 | 35 | Westminster-Branson | 239.7808 | 63 | |
| 25 | 22 | Humbermede | 398.8421 | 62 | |
| 26 | 135 | Morningside | 343.741 | 60 | |
| 27 | 121 | Oakridge | 433.3694 | 60 | |
| 28 | 129 | Agincourt North | 195.7888 | 57 | |
| 29 | 17 | Mimico (includes Humber Bay Shores) | 167.8248 | 57 | |
| 30 | 111 | Rockcliffe-Smythe | 251.7306 | 56 | |
| 31 | 34 | Bathurst Manor | 352.8004 | 56 | |
| 32 | 14 | Islington-City Centre West | 125.0995 | 55 | |
| 33 | 107 | Oakwood Village | 259.3116 | 55 | |
| 34 | 124 | Kennedy Park | 315.3653 | 54 | |
| 35 | 118 | Tam O'Shanter-Sullivan | 189.4629 | 52 | |
| 36 | 119 | Wexford/Maryvale | 186.2664 | 52 | |
| 37 | 32 | Englemount-Lawrence | 223.4937 | 50 | |
| 38 | 39 | Bedford Park-Nortown | 215.1833 | 50 | |

Data Note | **Recent Cases and Rates by Neigh** | Recent Sporadic Cases and Rates | Al

As we do with any file opened in a spreadsheet, take a few minutes to study the contents. The first colunn contains the "Neighbourhood ID", which is important because it will be joined to the colunm in our shape file in ArcGIS with the generic title of "Field 5" or "Field 6", which you may have renamed in the previous tutorial.



You'll notice the numbers in the Excel file are right justified, whereas the numbers in our shape file are left-justified. Under normally circumstances, columns with differently formatted numbers can not be joined. ArcGIS allows you bypass this problem, though the discrepency is still worth noting.

You'll also notice that the neighbourhood ID numbers above have two decimal places, whereas the ID numbers in our Excel file do not have decimal places. Again, the difference is worth noting, but will not affect the join.

As we have noted several times during this tutorial, it's important to pay attention to seemingly small details like formatting when working with data.

Copy the table on the "All Cases and Rates by Neighbourhood" worksheet paste it into a new file.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Neighbourhood ID | Neighbourhood Name | Rate per 1 | Case Count | |
| 2 | 137 | Woburn | 366.4579 | 196 | |
| 3 | 2 | Mount Olive-Silverstone-Jamestown | 503.7325 | 166 | |
| 4 | 132 | Malvern | 351.6463 | 154 | |
| 5 | 131 | Rouge | 324.7591 | 151 | |
| 6 | 26 | Downsview-Roding-CFB | 382.2892 | 134 | |
| 7 | 126 | Dorset Park | 523.9371 | 131 | |
| 8 | 27 | York University Heights | 424.0206 | 117 | |
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| 11 | | Missing Address/Postal Code | | 103 | |
| 12 | 113 | Weston | 500.2223 | 90 | |
| 13 | 127 | Bendale | 293.725 | 88 | |
| 14 | 55 | Thorncliffe Park | 393.2158 | 83 | |
| 15 | 24 | Black Creek | 372.6365 | 81 | |
| 16 | 136 | West Hill | 273.8026 | 75 | |
| 17 | 71 | Cabbagetown-South St. James Town | 634.1589 | 74 | |
| 18 | 62 | East End-Danforth | 346.1017 | 74 | |
| 19 | 117 | L'Amoreaux | 159.1162 | 70 | |
| 20 | 139 | Scarborough Village | 412.5807 | 69 | |
| 21 | 85 | South Parkdale | 306.6502 | 67 | |
| 22 | 6 | Kingsview Village-The Westway | 300 | 66 | |
| 23 | 120 | Clairlea-Birchmount | 240.8835 | 65 | |
| 24 | 35 | Westminster-Branson | 239.7808 | 63 | |
| 25 | 22 | Humbermede | 398.8421 | 62 | |
| 26 | 135 | Morningside | 343.741 | 60 | |
| 27 | 121 | Oakridge | 433.3694 | 60 | |
| 28 | 129 | Agincourt North | 195.7888 | 57 | |
| 29 | 17 | Mimico (includes Humber Bay Shores) | 167.8248 | 57 | |
| 30 | 111 | Rockcliffe-Smythe | 251.7306 | 56 | |
| 31 | 34 | Bathurst Manor | 352.8004 | 56 | |
| 32 | 14 | Islington-City Centre West | 125.0995 | 55 | |
| 33 | 107 | Oakwood Village | 259.3116 | 55 | |
| 34 | 124 | Kennedy Park | 315.3653 | 54 | |
| 35 | 118 | Tam O'Shanter-Sullivan | 189.4629 | 52 | |
| 36 | 119 | Wexford/Maryvale | 186.2664 | 52 | |
| 37 | 32 | Englemount-Lawrence | 223.4937 | 50 | |
| 38 | 39 | Bedford Park-Nortown | 215.1833 | 50 | |

Data Note | **Recent Cases and Rates by Neigh** | Recent Sporadic Cases and Rates | Al

| Neighbourhood ID | Neighbourhood Name | Rate per 1 | Case Count |
|---|---|---|---|
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| 126 | Dorset Park | 523.9371 | 131 |
| 27 | York University Heights | 424.0206 | 117 |
| 1 | West Humber-Clairville | 315.2017 | 105 |
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| 32 | Englemount-Lawrence | 223.4937 | 50 |
| 39 | Bedford Park-Nortown | 215.1833 | 50 |

Sheet1 ⊕

Save this table as a csv file.

Now we're ready to bring this csv file into ArcGIS Online.

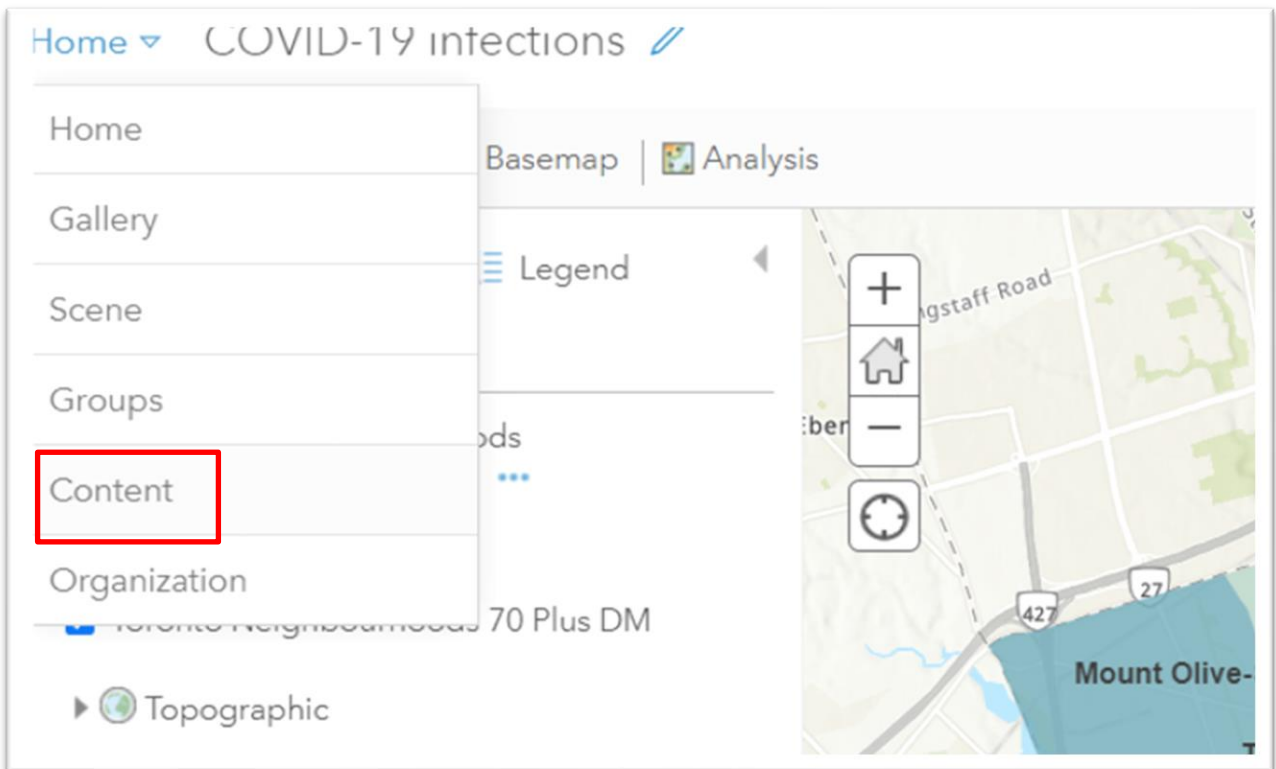## Uploading the COVID-19 data to ArcGIS Online

We will NOT import the data using the "Add" icon, because doing so will not actually save the layer in the cloud, which is a step that must be fulfilled before
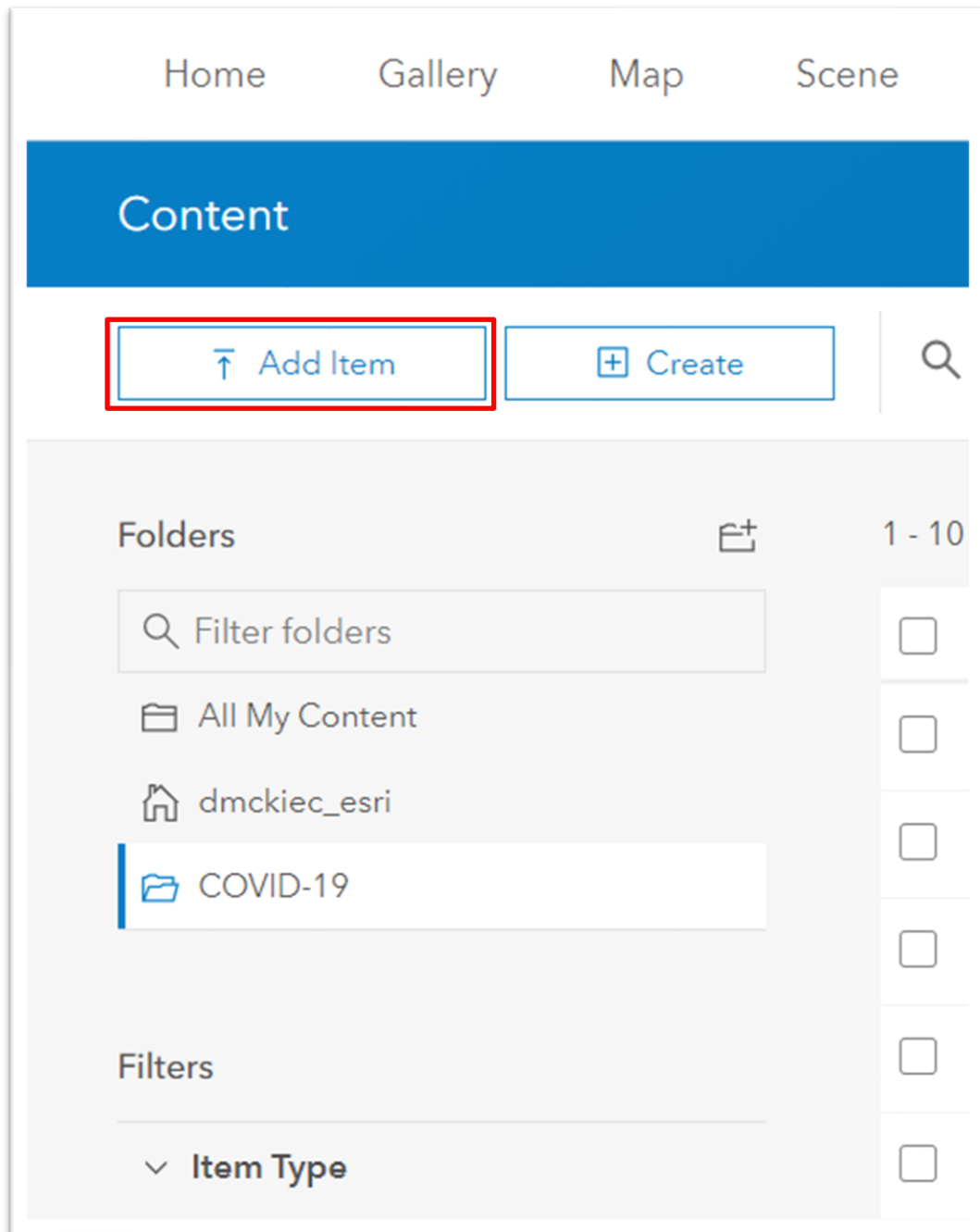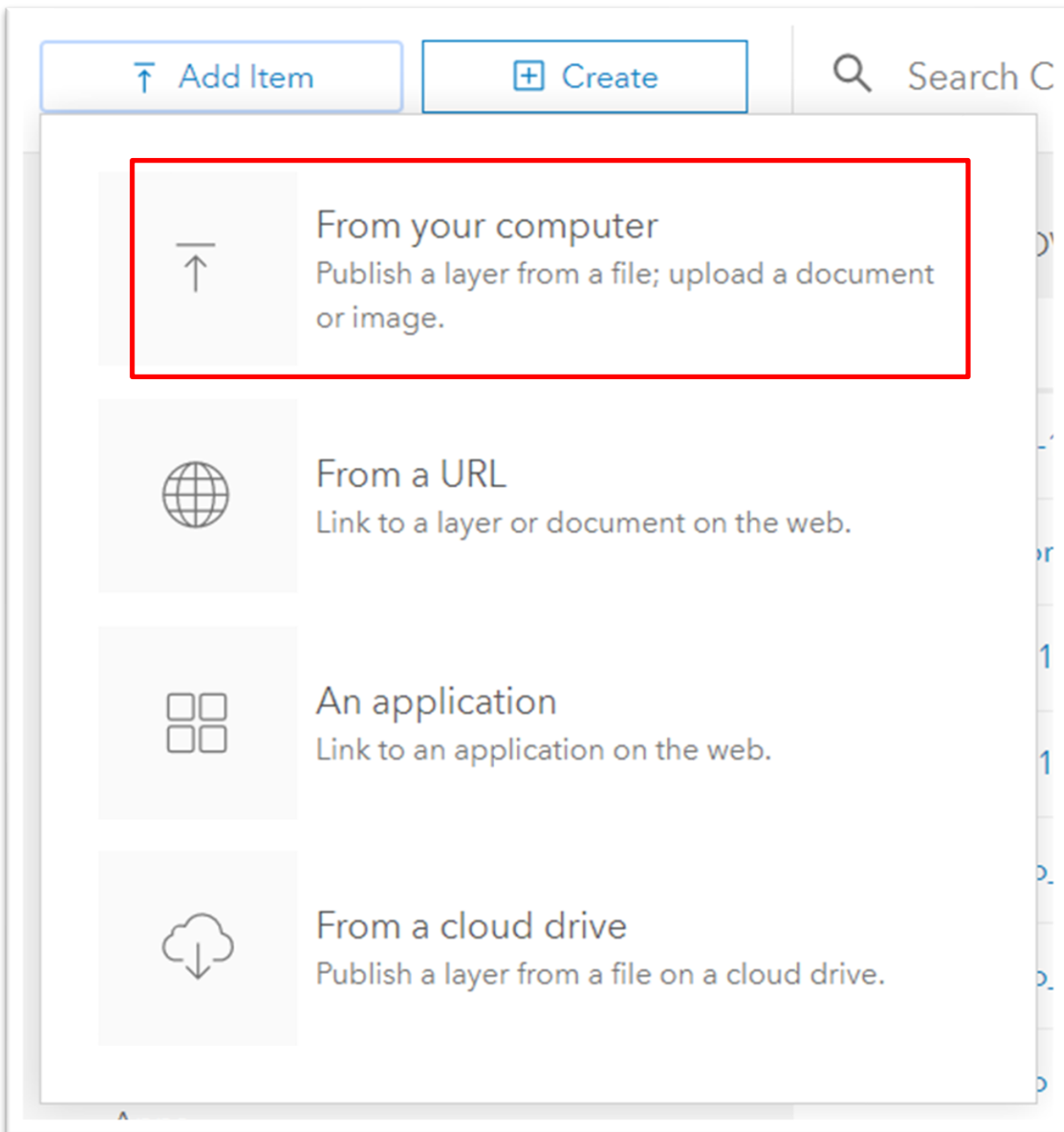
executing our join.
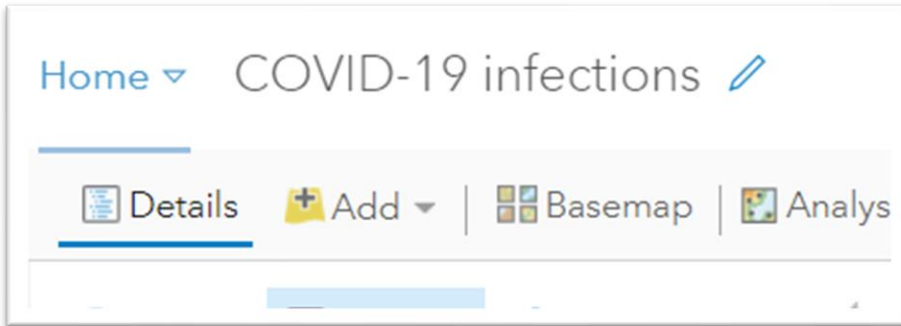


Instead, we will perform the import through the "Content" section, which we can obtain from the menu to your left.

Select "Content".

We'll use the "Add Item" tab to import our data.

Import from your computer.



Choose the csv file we have just created.



Click the "Open" tab at the bottom right.



I have written a shorter title without the hyphen between "COVID" and "19", provided a tag, and specified that this file is to be added as a table ("None, add as table") Importing the csv file this way ensures it goes to the cloud ("Publish this

file as a hosted layer"), a criterion that MUST be fulfilled before we can execute the join.
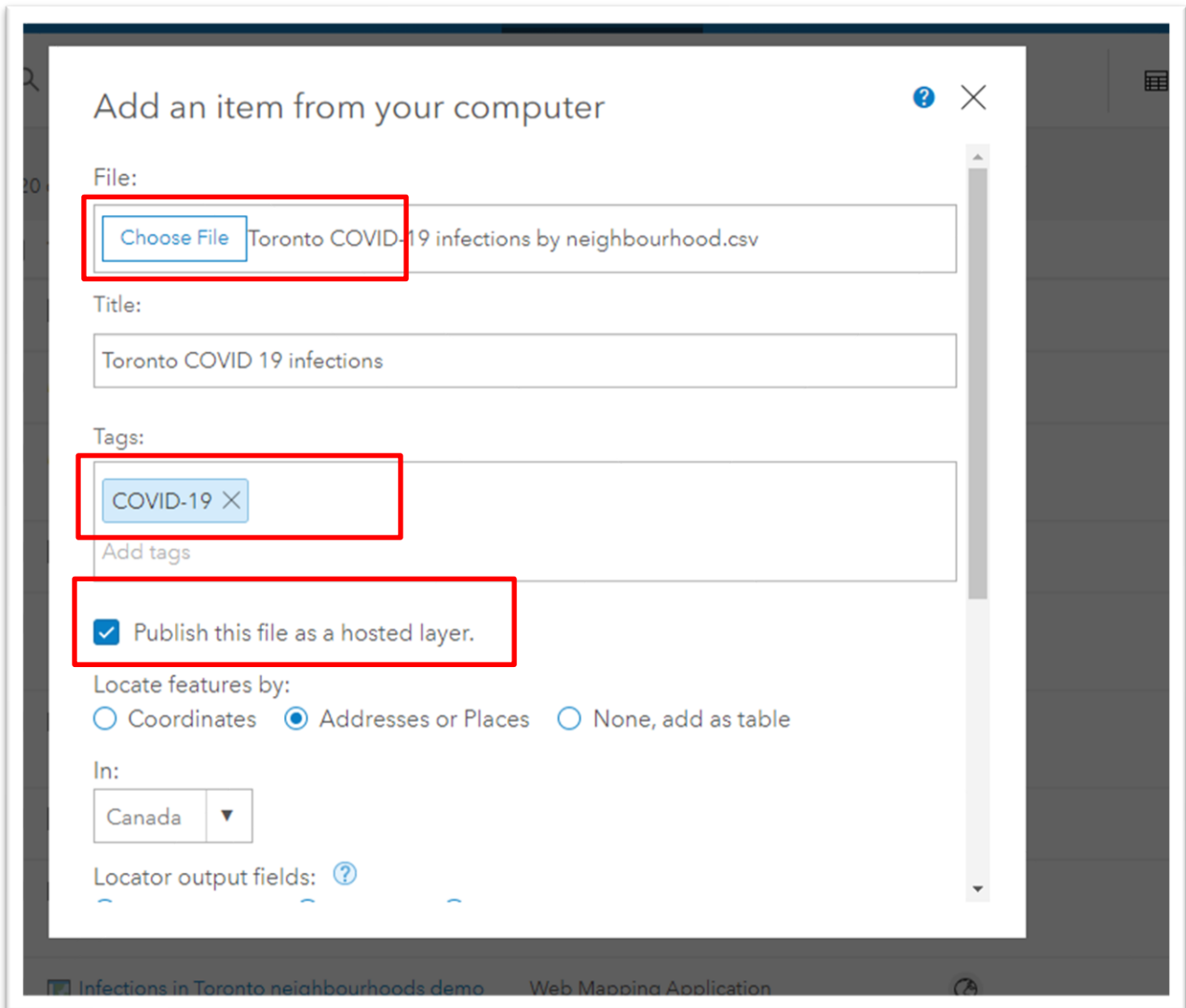


Use the vertical scroll bar on the right to get to the "Add item" tab.

# Add an item from your computer

☑ Publish this file as a hosted layer. (Adds a hosted layer item with the same name.)

Locate features by:
○ Coordinates   ○ Addresses or Places   ⦿ None, add as table

Review the field types. Click on a cell to change it.

| Field Name | Field Type |
|---|---|
| Neighbourhood_ID | Integer |
| Neighbourhood_Name | String |

Time Zone:  [(UTC) Coordinated Universal Time ▼]  ?

[Add Item]   [Cancel]

Before selecting the "Add Item" tab, make sure your selections are the same in the screen grabs above.



It is also possible to reformat the values in the "Field Type" column by clicking inside the cells under the title to obtain a drop-down menu.

We will not worry about formatting in this tutorial. However, it is handy to know how to perform the task when importing data.

Before importing the data, select the "None, add as table" option under the "Locate features by" title.



Select the "Add Item" tab.

Your csv file will be added as a new layer.

# Toronto COVID 19 infections ✏

✏ Edit Thumbnail



☆ Add to Favorites

Add a brief summary about the item.

🏛 Table (hosted) by dmckiec_esri

Created: Nov 5, 2020    Updated: Nov 5, 2020    View Count: 1

✏ Edit

## Description

✏ Edit

Add an in-depth description of the item.

## Tables

| | |
|---|---|
| ▦ **Toronto_COVID_19_infections**<br>Table | › |
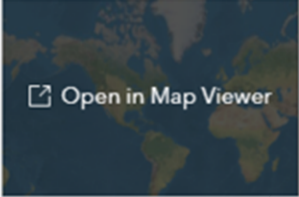
Select the map thumbnail.
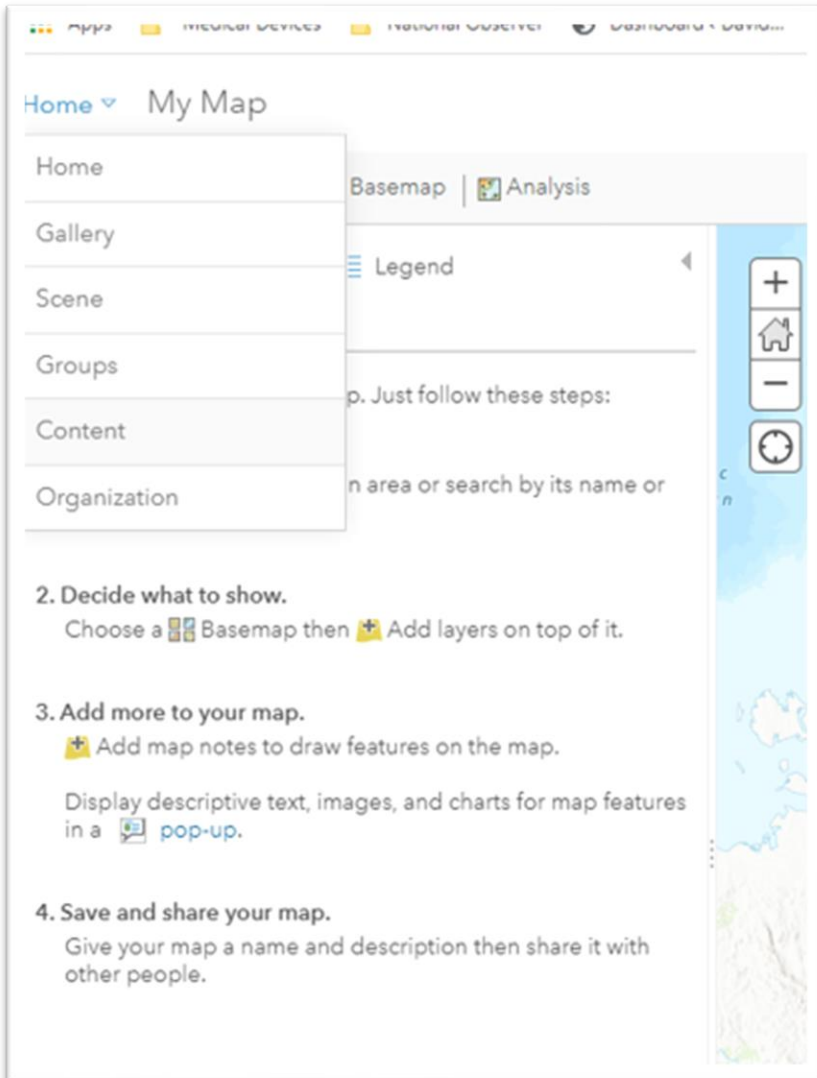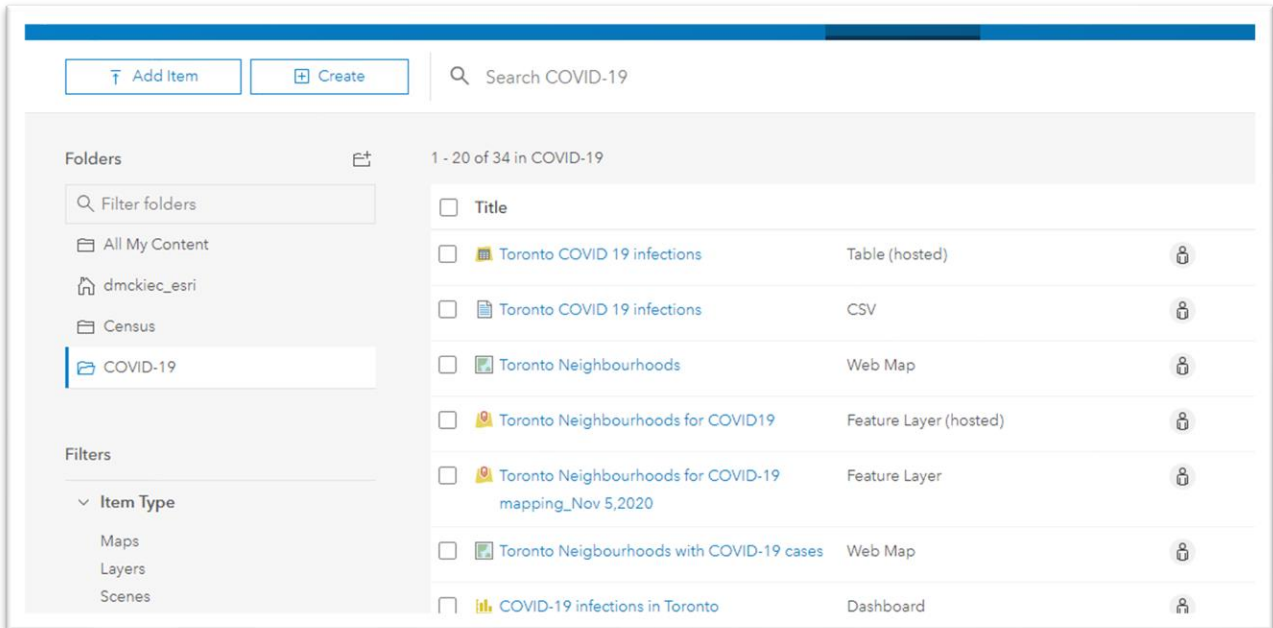
Select the "Yes, open the map" tab.
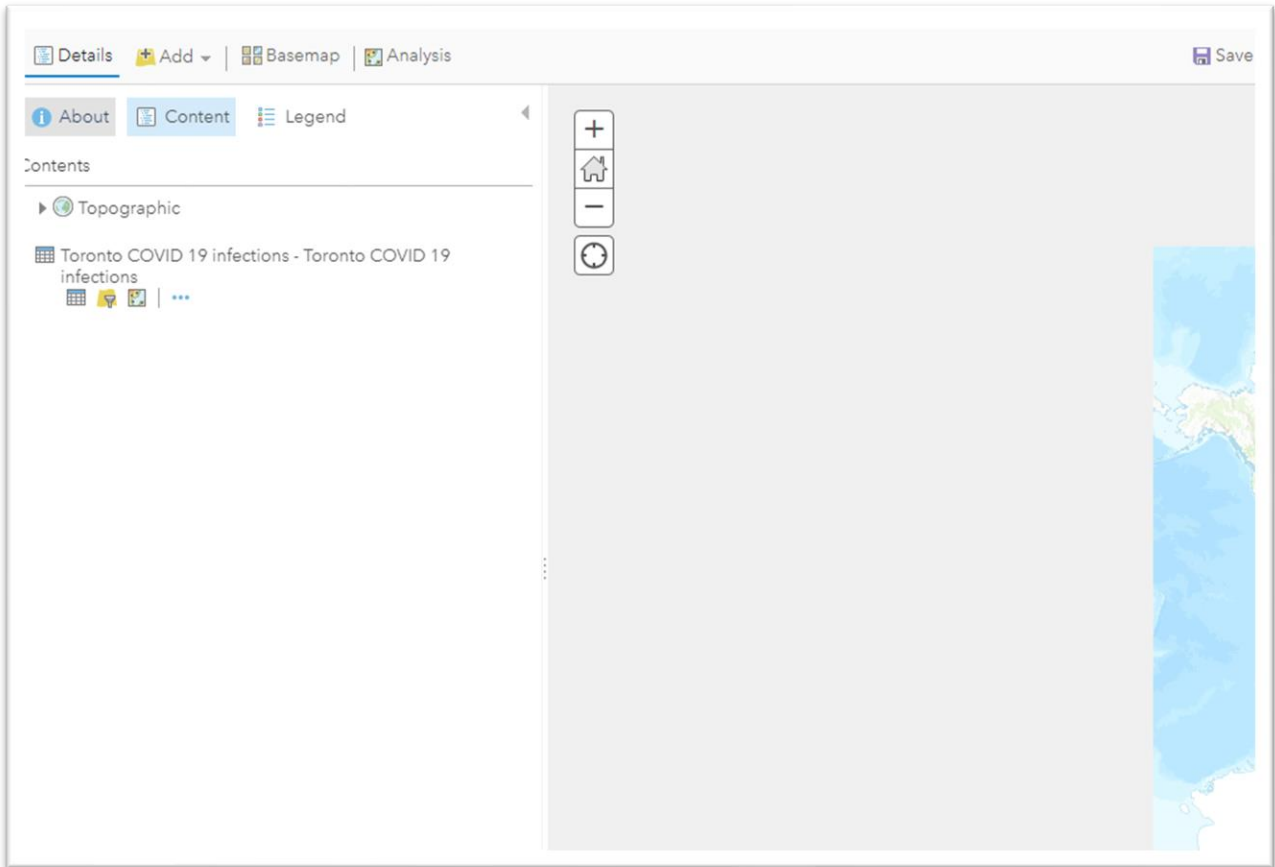


We have created a layer for COVID-19 infections by neighbourhoods. Now we will join it to the neighbourhood shape file we created in the previous tutorial.

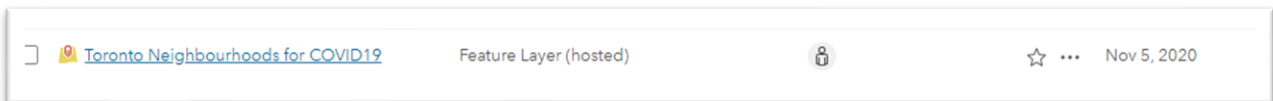Click the arrow to the right of the "Home" tab.

Select "Content."



The layer we just created is should be at the top, identified as a "Table (hosted)", which means it is in the cloud and can now be joined to the Toronto neighbourhood shape file.

That neighbourhood shape file should also be in your content section.

Select it.

Toronto Neighbourhoods for COVID19 ✎                    Overview

✎ Edit Thumbnail

Add a brief summary about the item.

🔖 Feature Layer (hosted) by dmckiec_esri

Created: Nov 5, 2020    Updated: Nov 5, 2020    View Count: 14

☆ Add to Favorites

## Description

This layer will contain the distribution of COVID-19 cases across Toronto neighbourhoods.

Select the shape file thumbnail.

Select the arrow to the right of the "Add" icon.
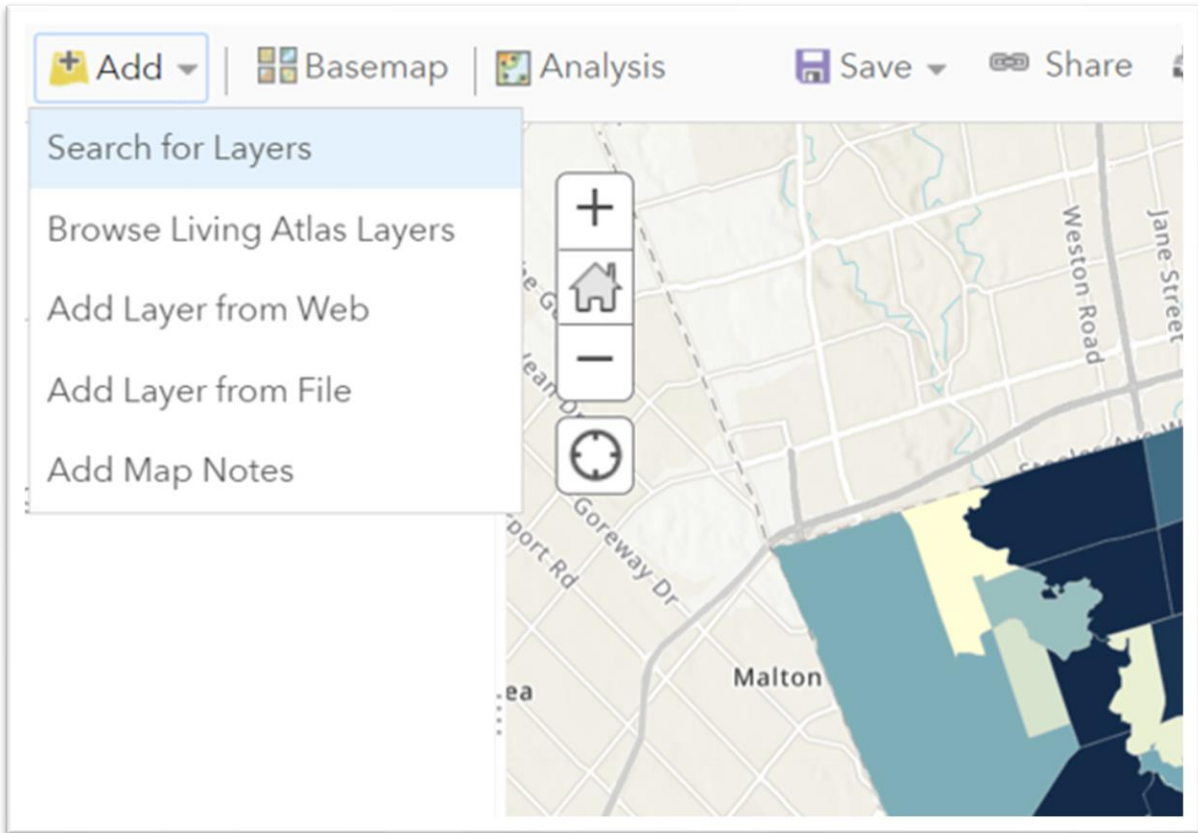
Select the first option, "Search for Layers".
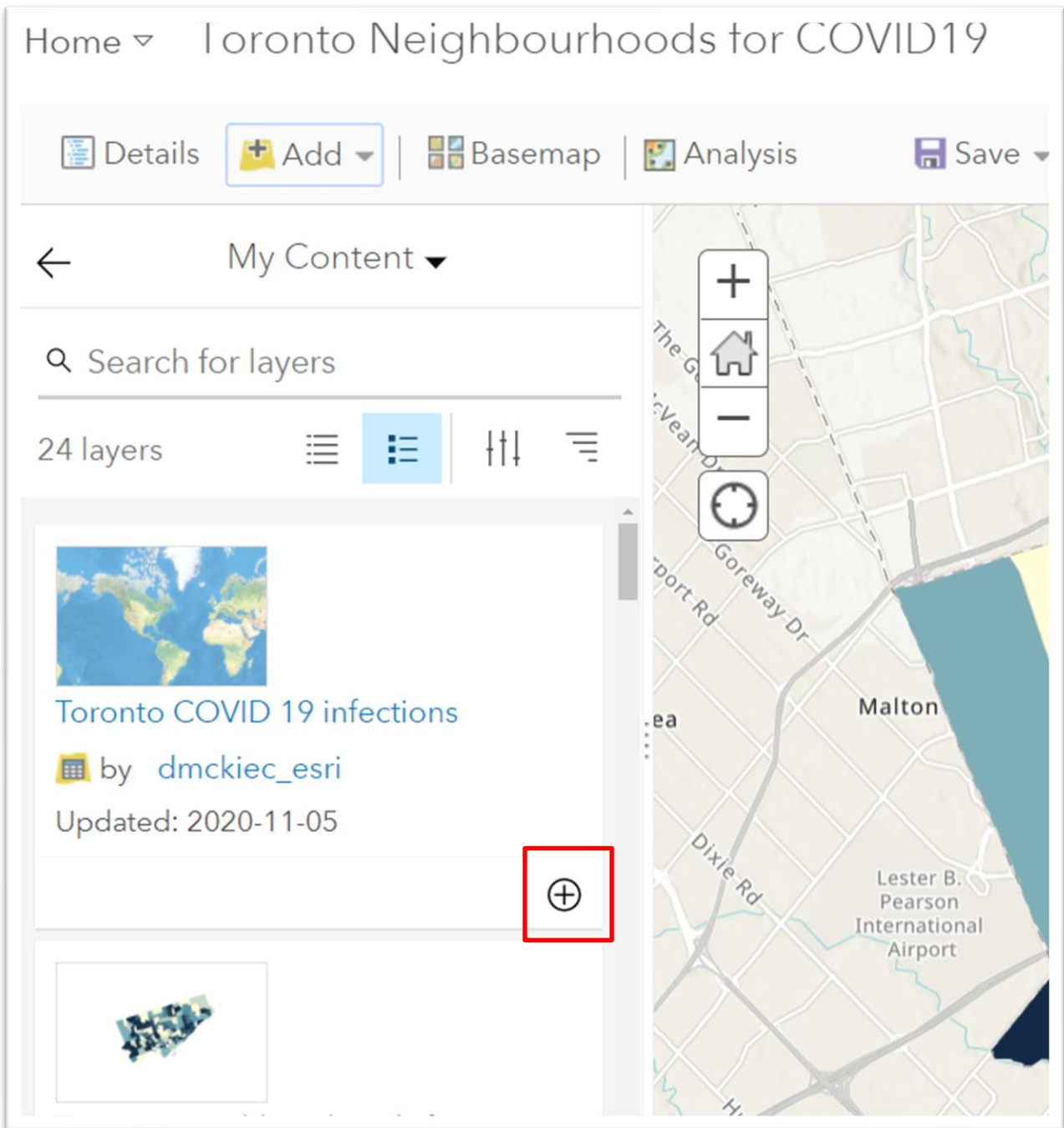


As was the case in the Contents section, the most recent COVID-19 infection layer we created should be at the top.

To add it to the neighbourhood shape file layer, select the "+" sign.
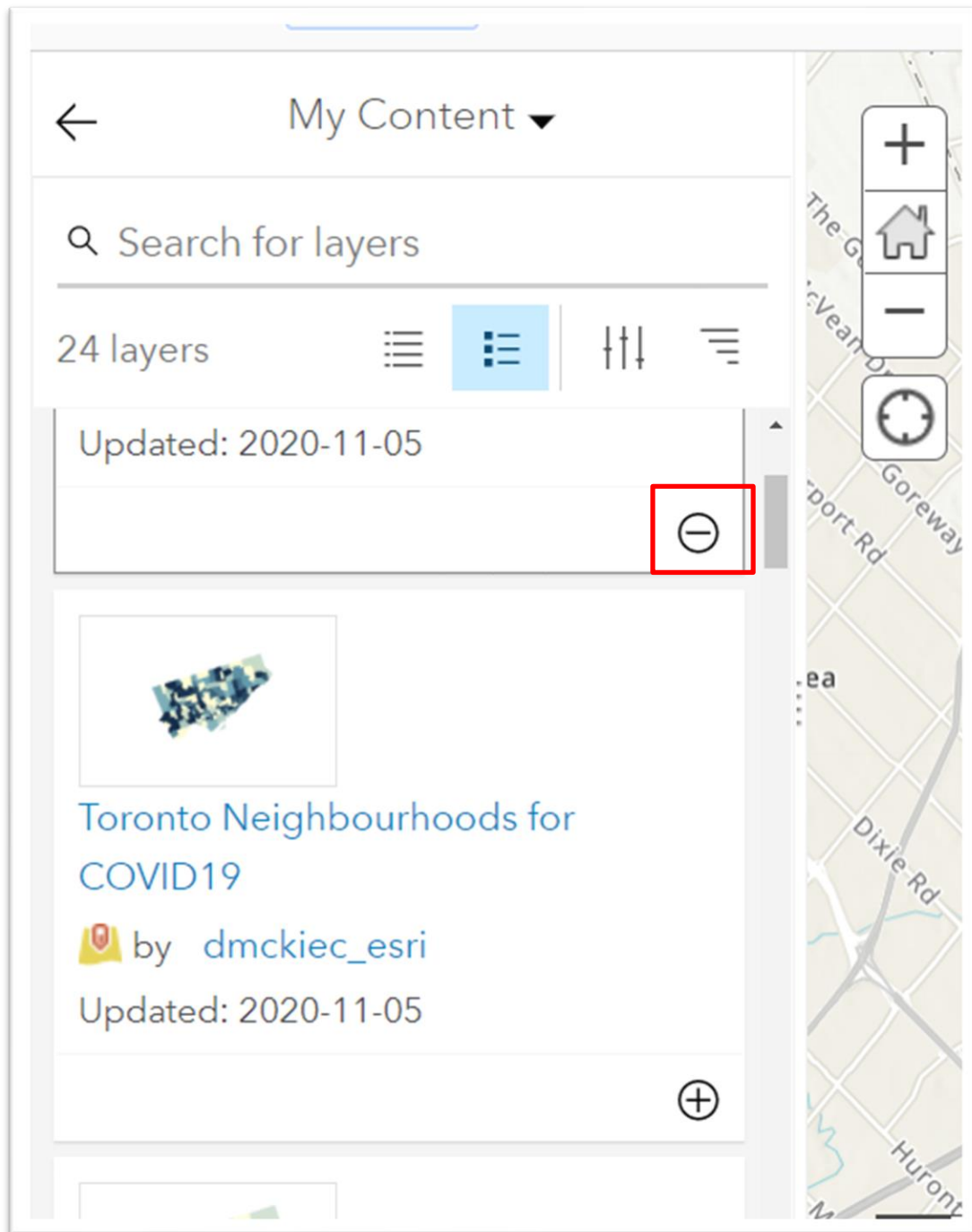


The minus sign means it has been added.

Click the arrow on to the left of "My Content".
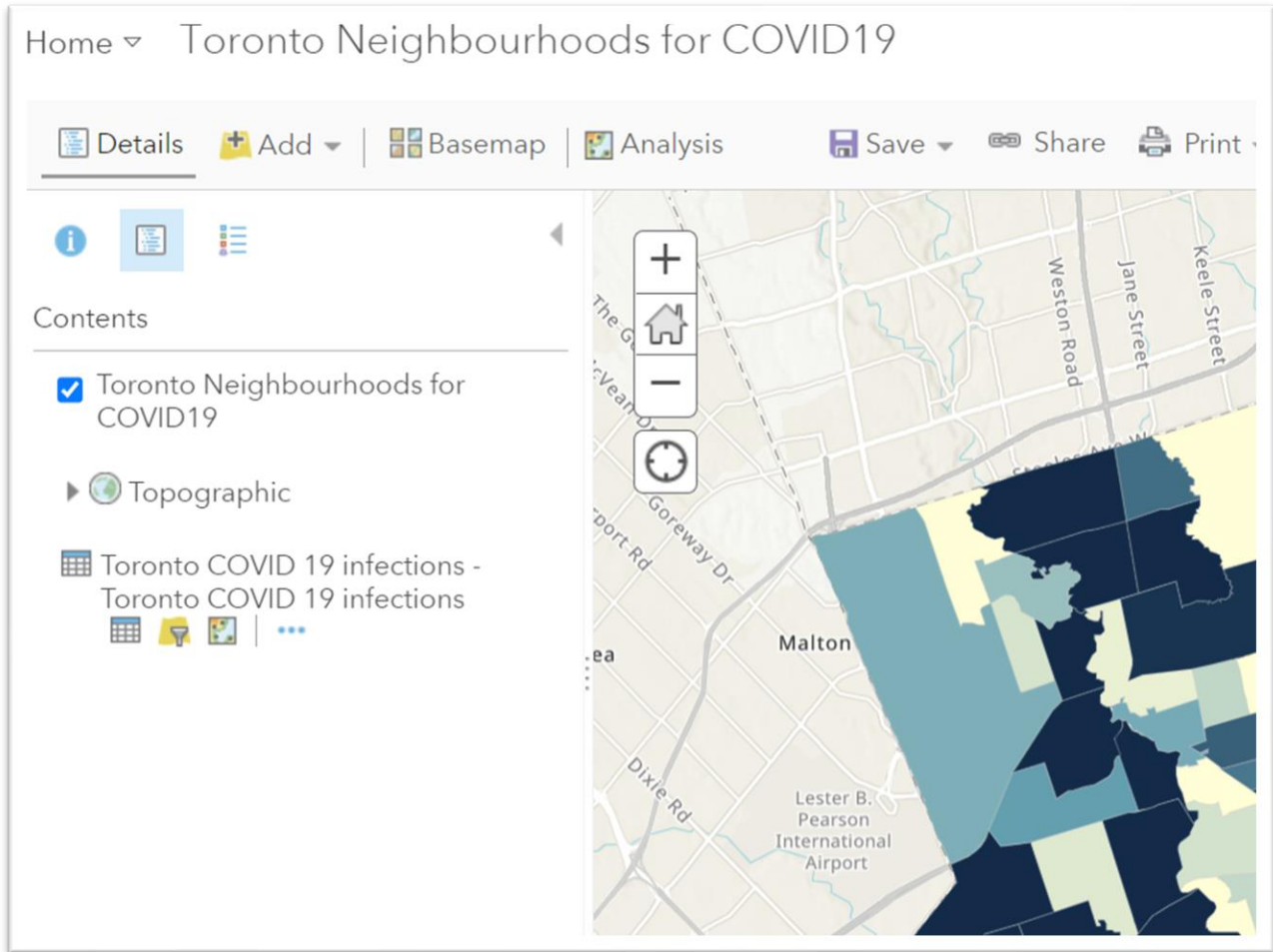


You should have two layers.

To join this layer to the previous one we created with the demographic information, hover your mouse over the csv layer.
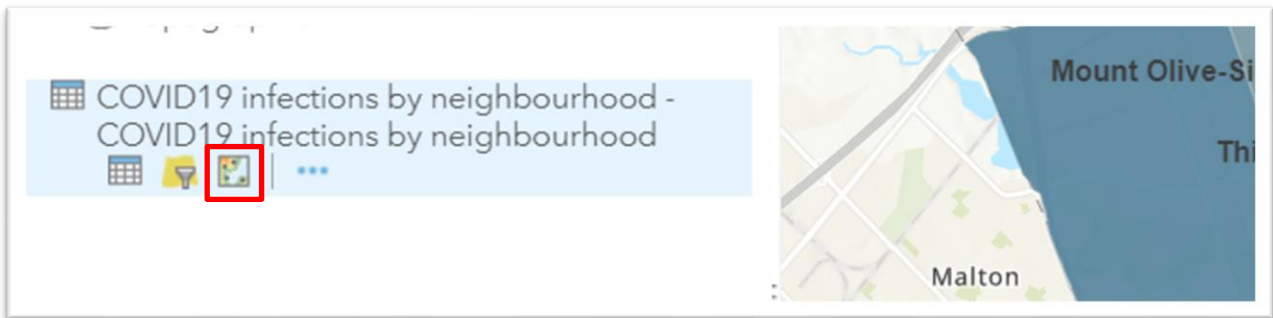
Select the "Perform analysis" icon.
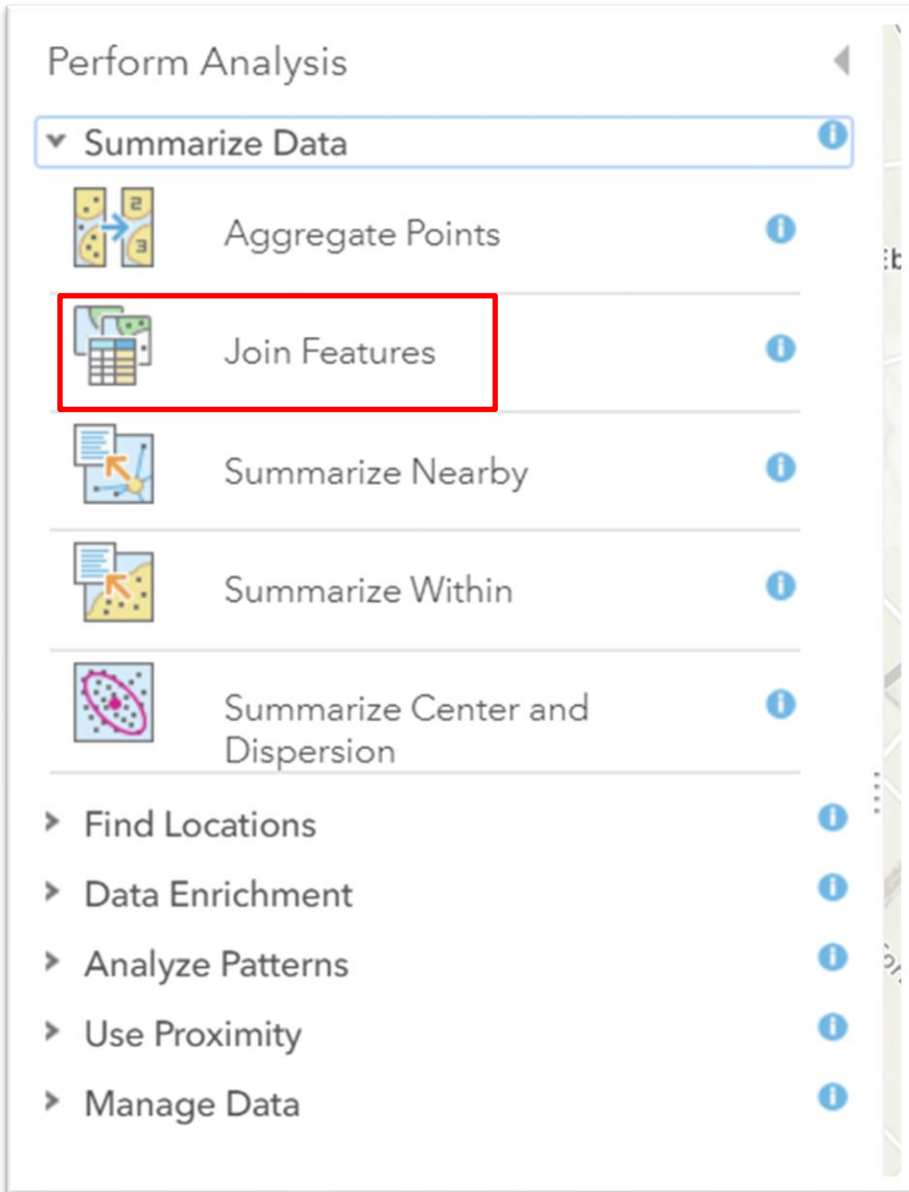
Perform Analysis

> Summarize Data

> Find Locations

> Data Enrichment

> Analyze Patterns

> Use Proximity

> Manage Data

Select "Summarize Data".

Select "Join Features."



Your "target layer" is the original shapefile that contains the neighbourhood boundaries from the first ArcGIS tutorial.
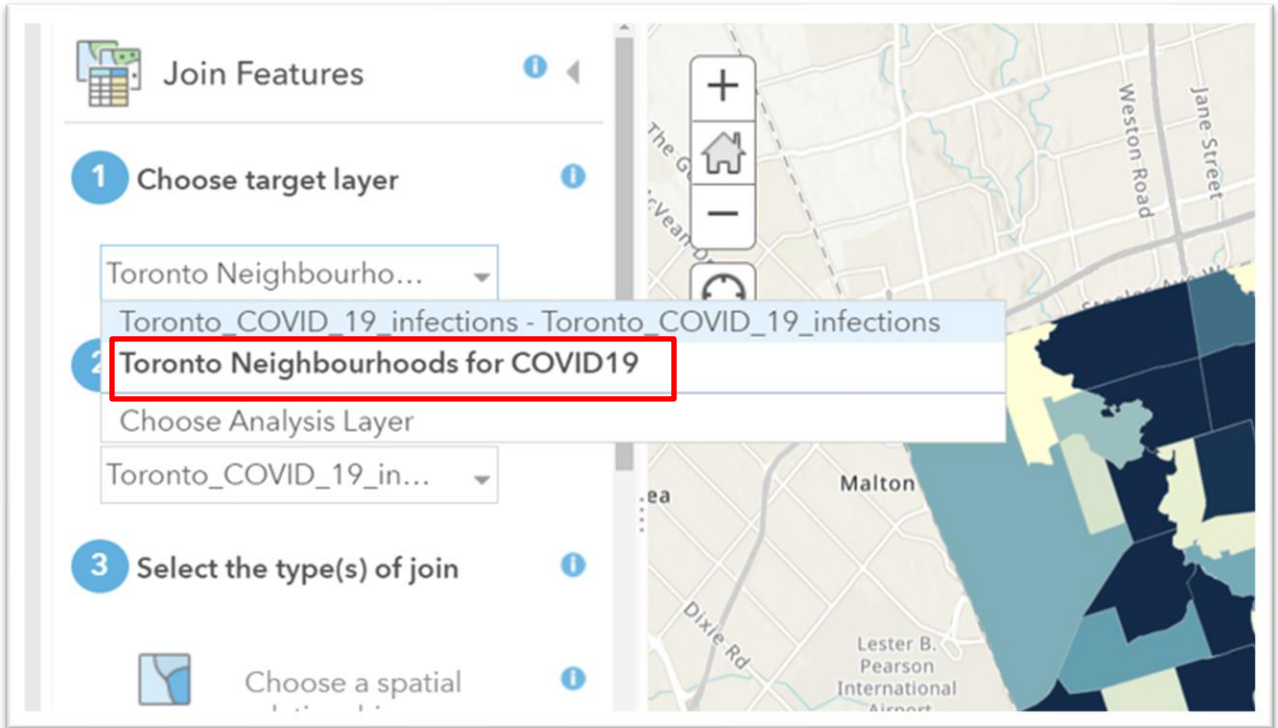
Add the COVID-19 infections layer to the second box.
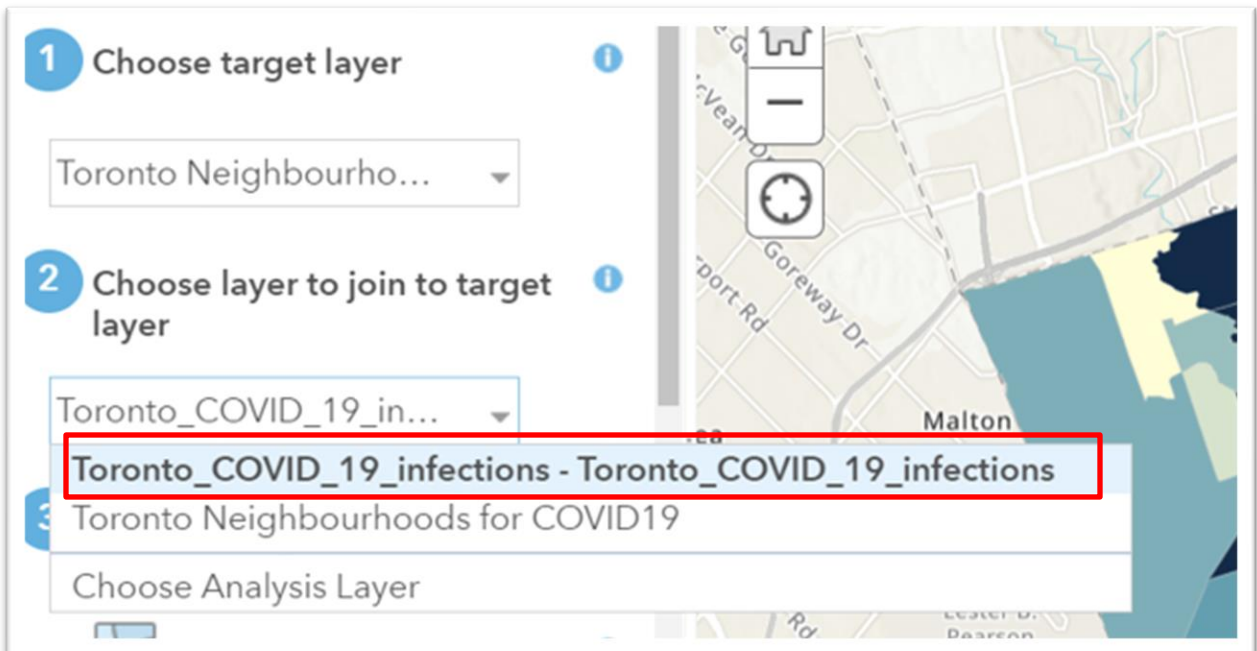
In step three, we want the second choice.
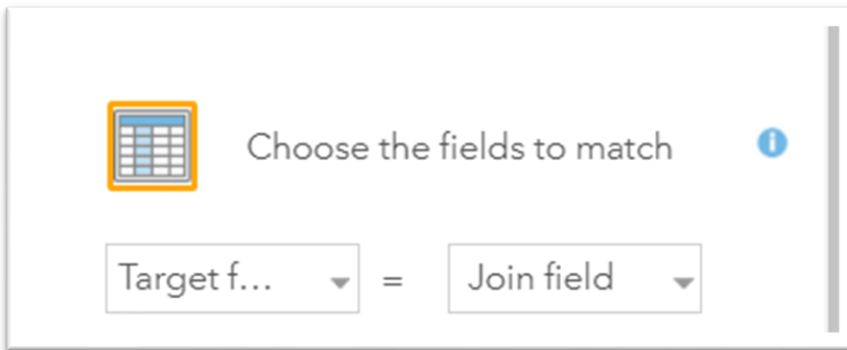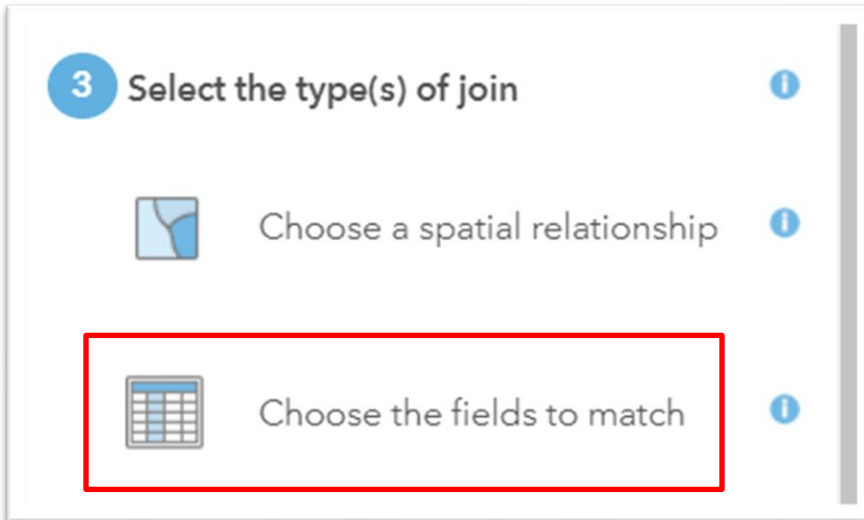




Here, ArcGIS is asking us which columns we want to join, which as we learned earlier in this tutorial are the columns what contain the neighourhood identifiers, columns "FIELD 5" and "Neighbourhood ID", respectively.
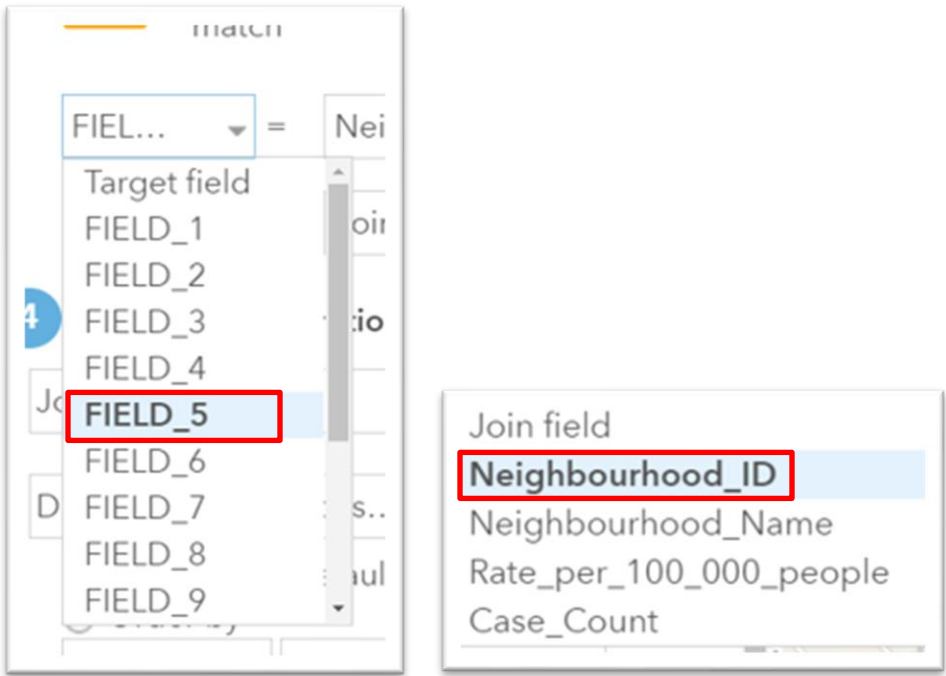
The type of join in step four is one-to-one, meaning the columns containing the neighbourhood identifiers.
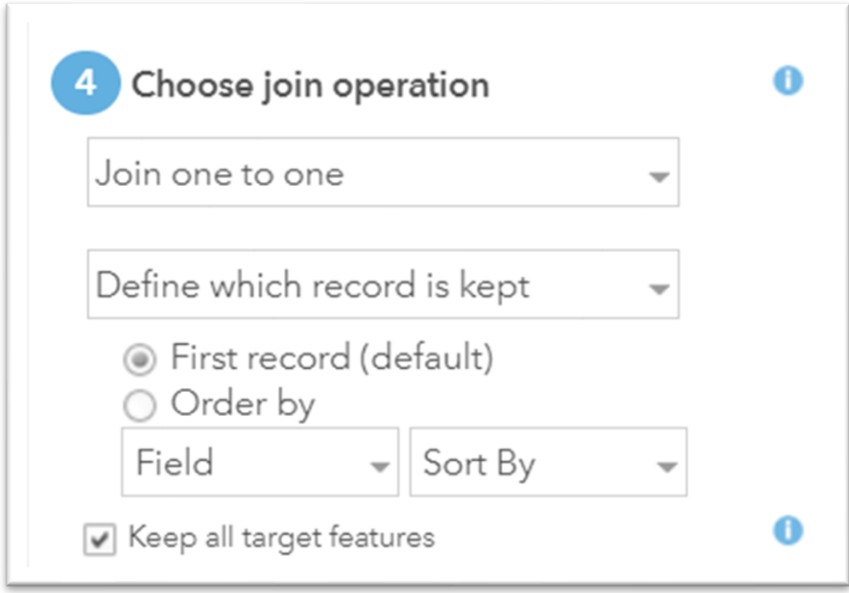


In step five, you will want to rename the layer, check the box to create a new layer and run the analysis.

**5** **Result layer name** ⓘ

COVID 19 Neighbourhood Inf

Save result in  COVID-19 ▾

☑ Use current map extent    Show Credits

Run the analysis.
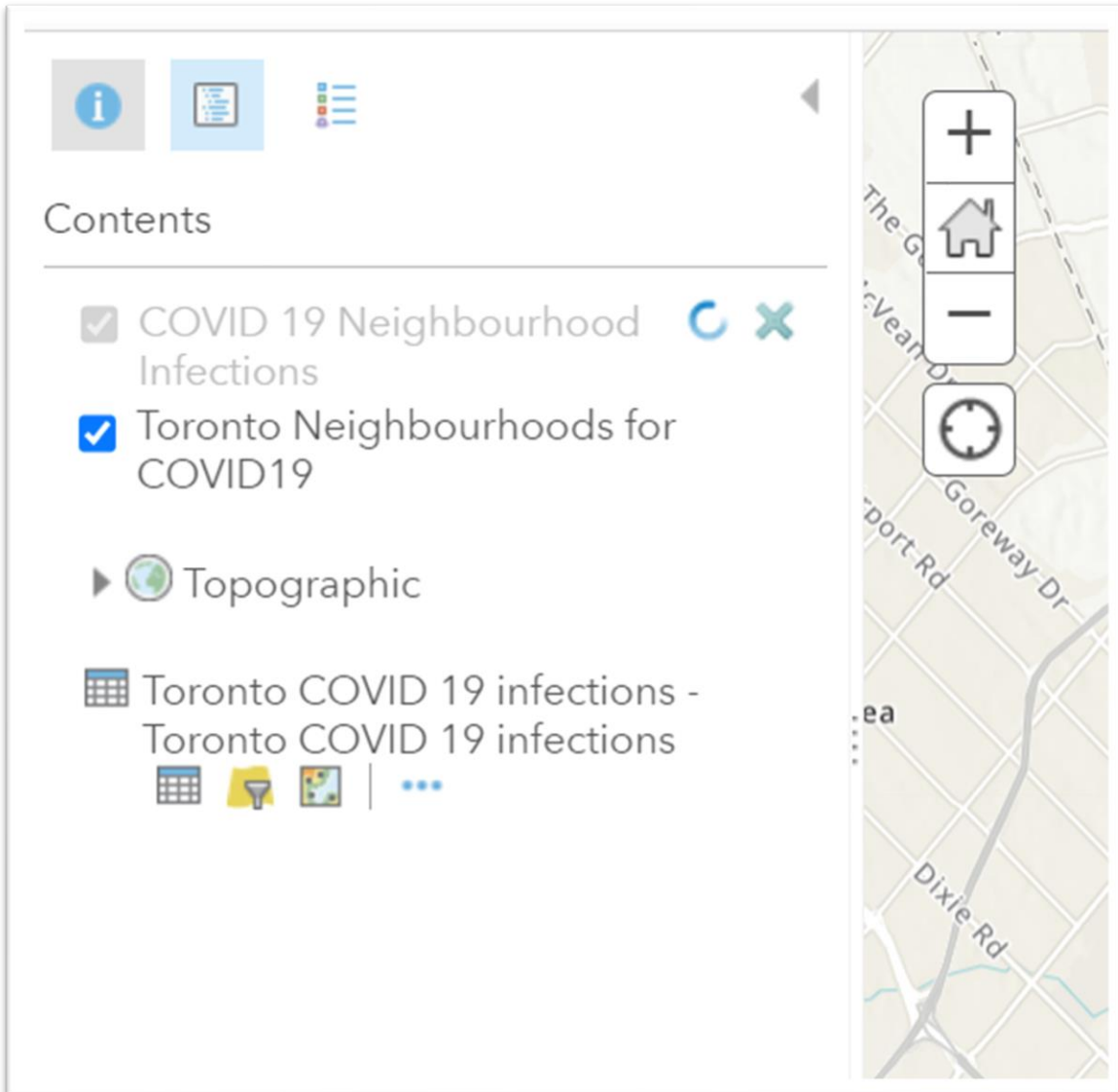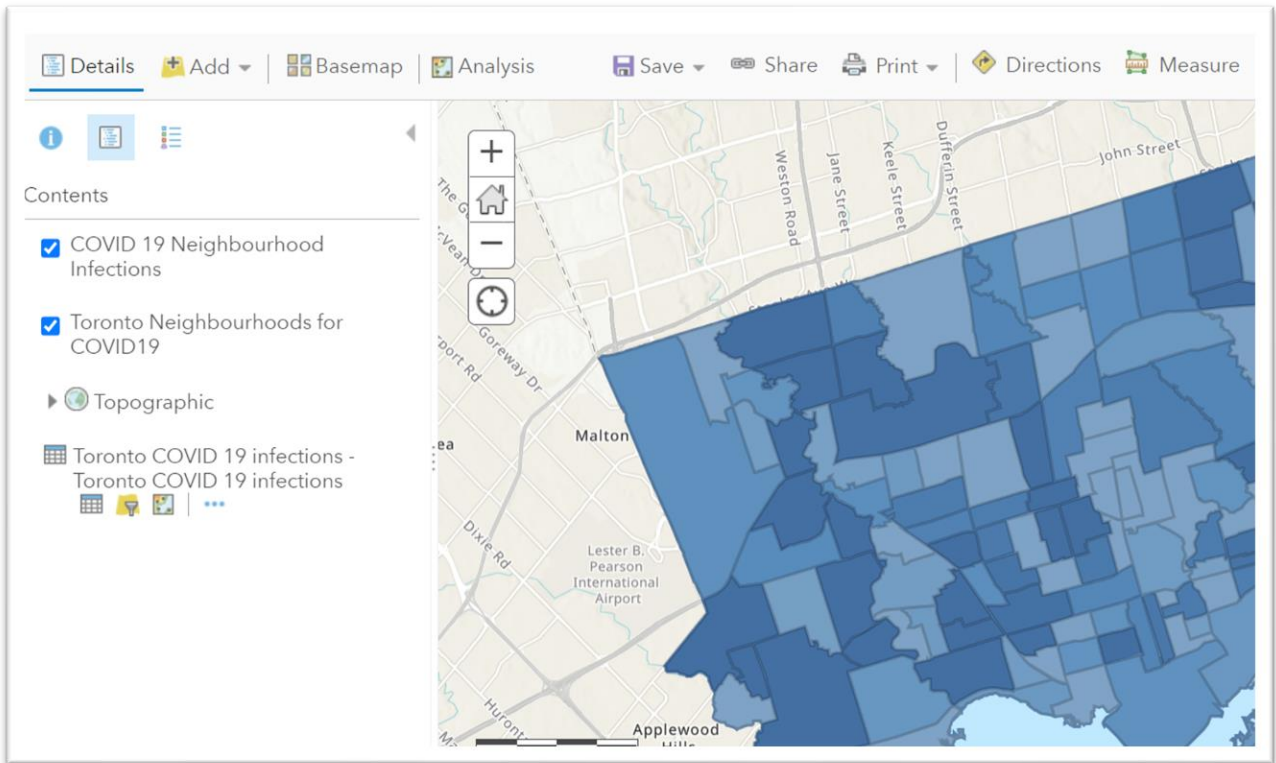
To see the underlying data, hover your cursor over the new layer to obtain the "Show Table" icon.
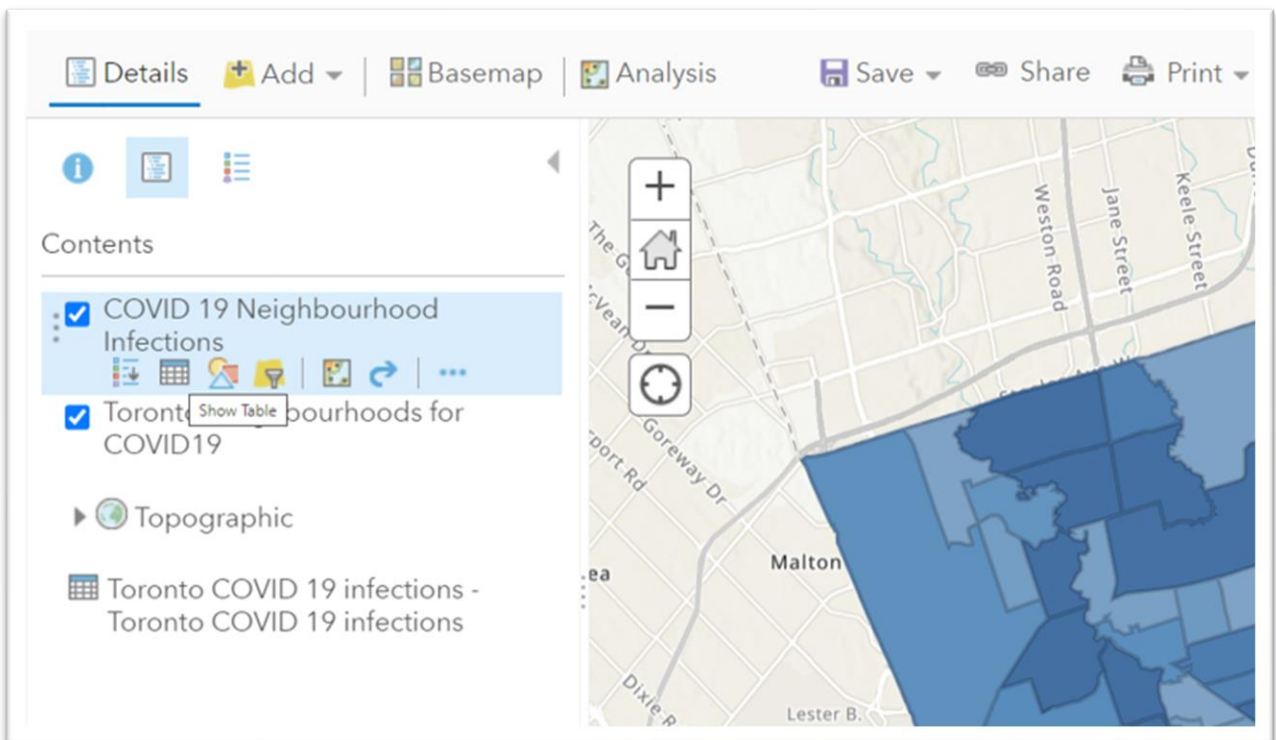
Using the horizontal scroll bar to navigate to the right, we can see that the infection rates and case counts  have been added.
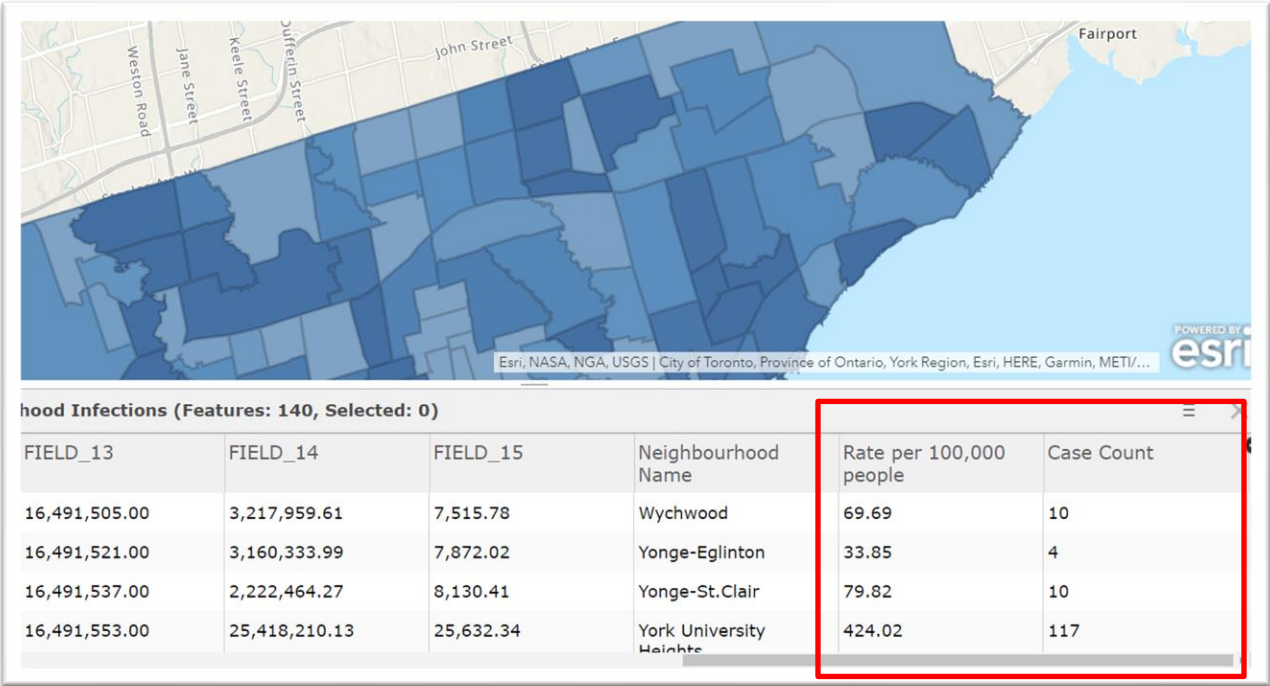


## Colour coding our new layer

Now we can use a colour ramp to show neighbourhoods with the highest number of COVID-19 cases. We can also duplicate the lawyers, which can use different numbers. For instance, one layer might use colours to show the neighbourhoods with the highest number of deaths. A second layer might show neighbourhoods with the highest rates. And a third might show the ratios of COVID-19 infections. It the ability to create multiple layers that give maps their power and advantage over data visualization programs.

So, let's colour code our layer according to ratio.

Hover your cursor over the layer and choose the "change style" icon.
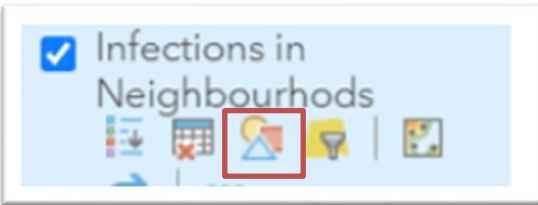
In step one, the attribute you want to show is the "Rate per 100,000 people."
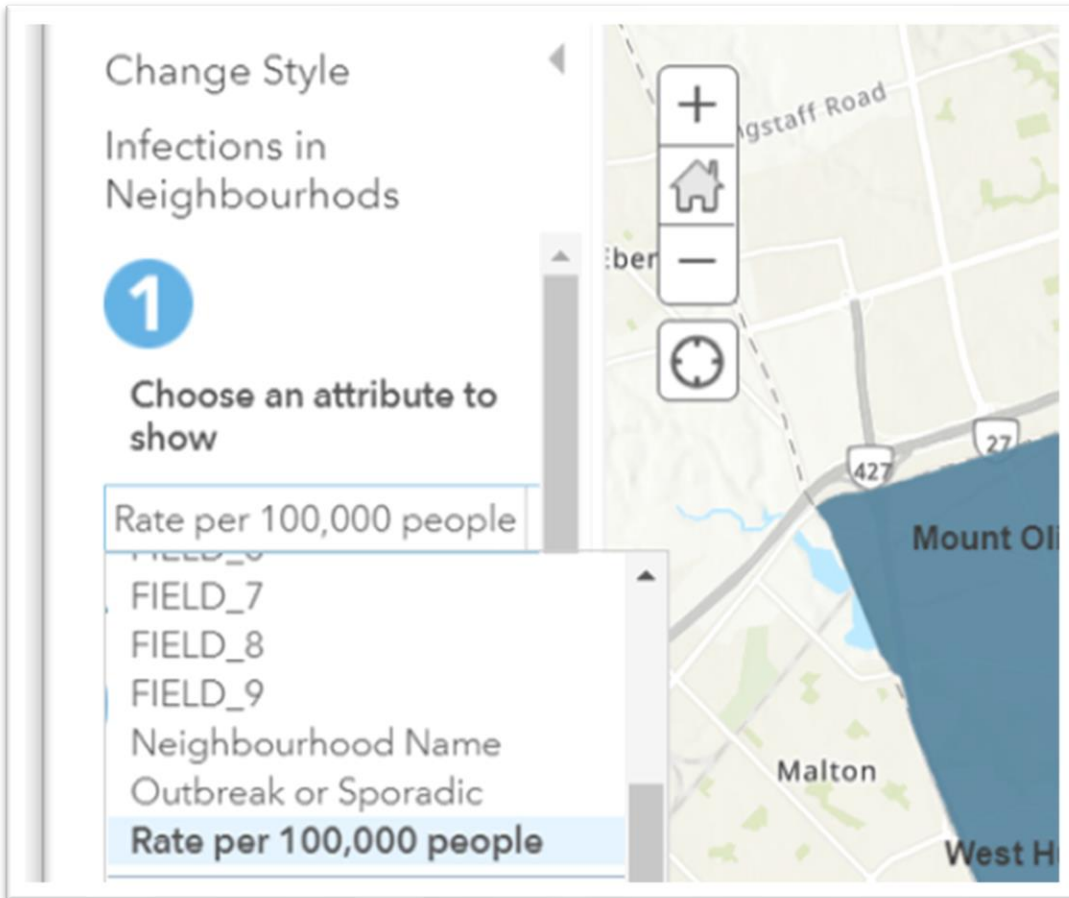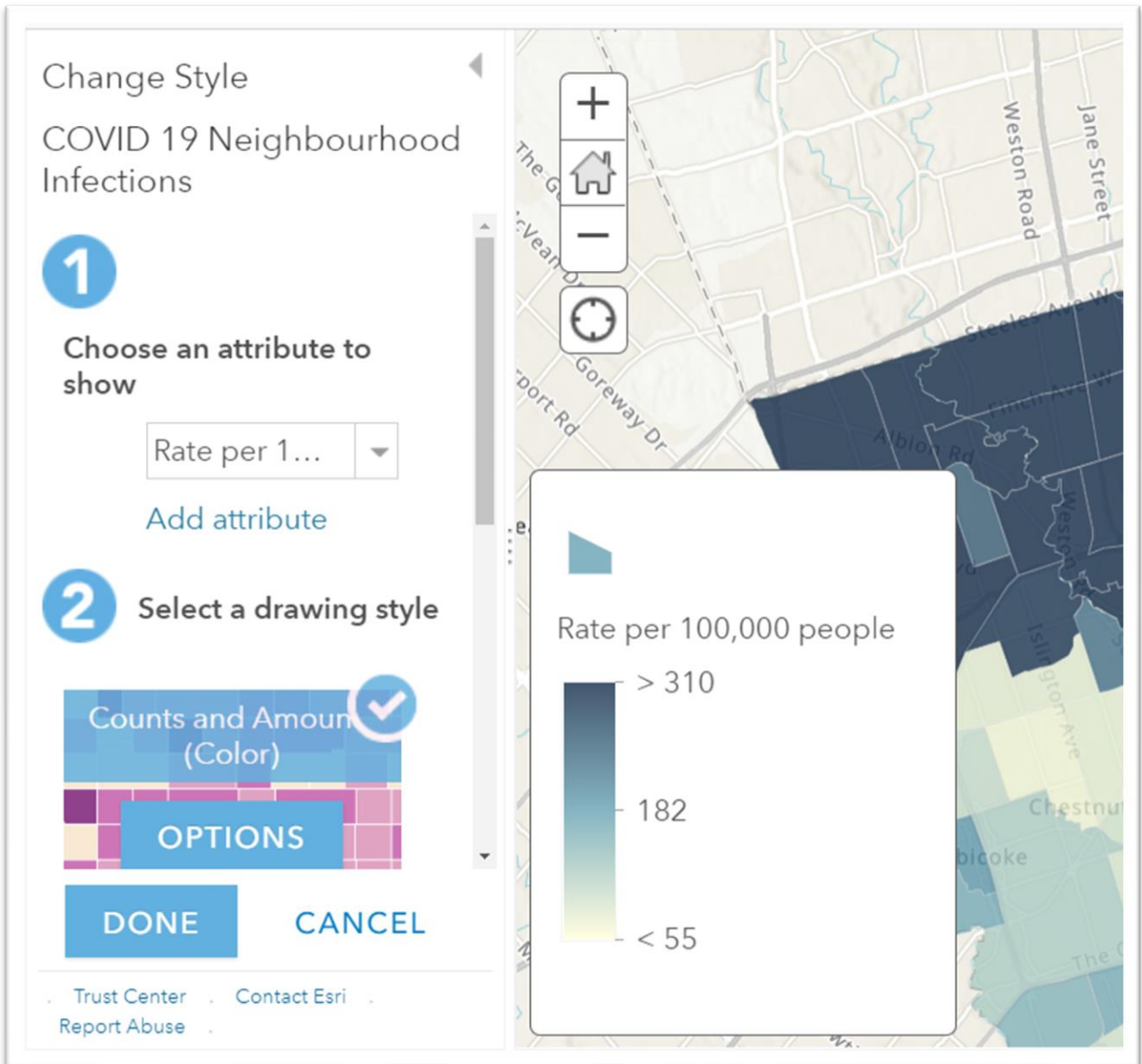
The "drawing style" in step two is the one that is already selected. ArcGIS guessed correctly that we want to build a colour ramp.

Change Style

Infections in Neighbourhods

**2** **Select a drawing style**

Set default style

Counts and Amounts (Color) ✓

OPTIONS

Counts and Amounts (Size)

SELECT

Location (Single symbol)
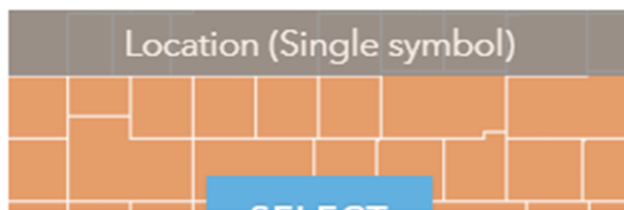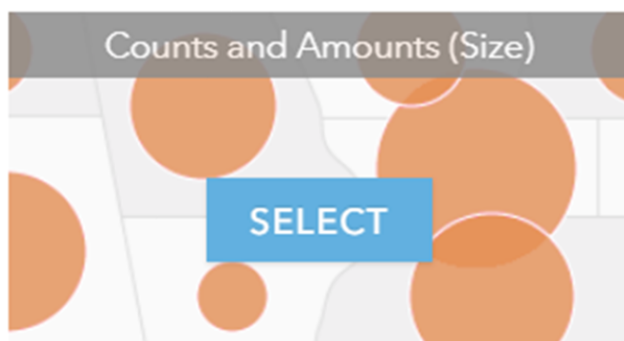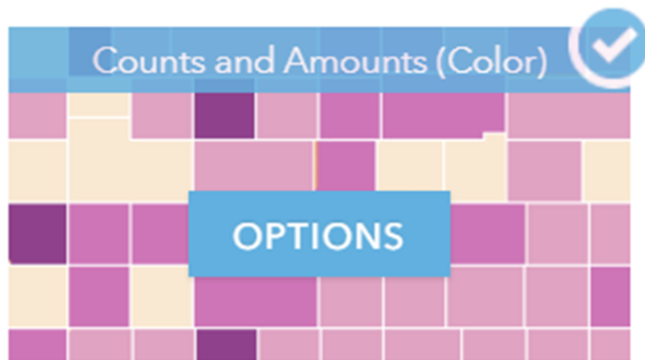
~~SELECT~~

DONE    CANCEL

Click that option.
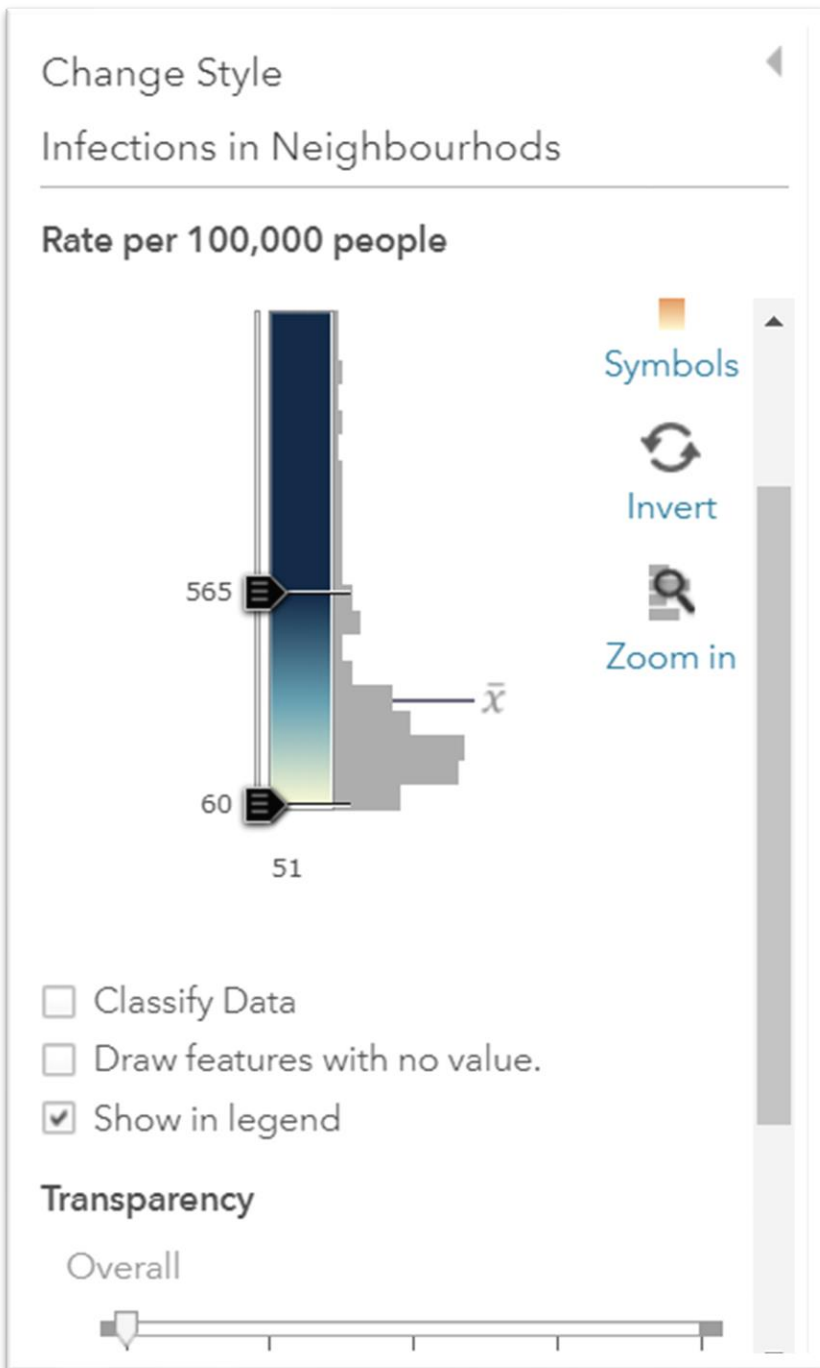


The attribute we want to show is labeled across the top.

Now, we want to "Classify" our data, meaning divid it into ranges.

Select "Classify Data".



Change Style

Infections in Neighbourhods

**Rate per 100,000 people**

Symbols

Legend

784

408

$\bar{x}$

216

51

☑ Classify Data

Using  Natural Breaks  ▼

With  4 ⬍  classes

Round classes:  Select an option  ▼

☐ Draw features with out of range or no value.

OK    CANCEL
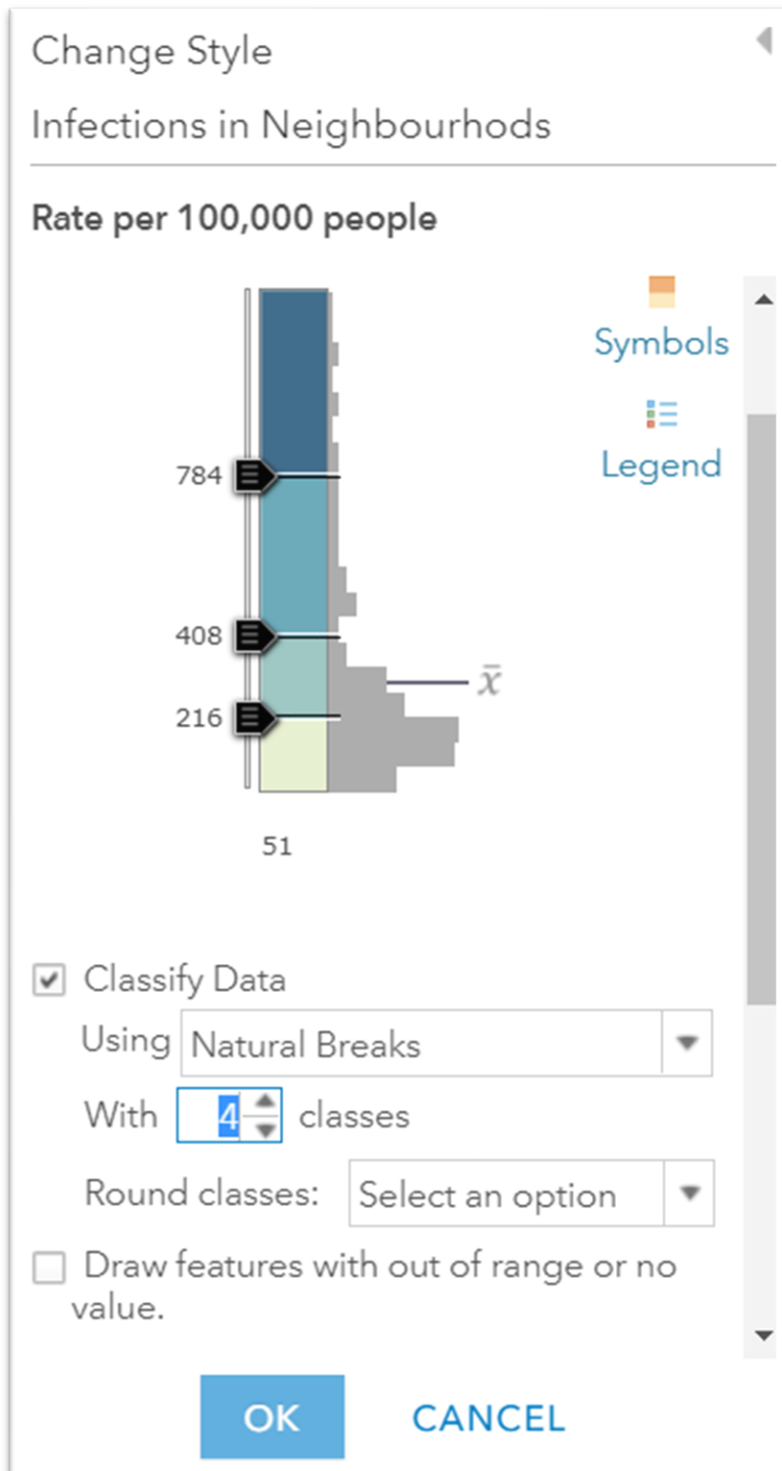
You can change increase the defaul to as many ranges as you want.

Let's choose six.



Rate per 100,000 people

784
408
270
180
126

51

Symbols

Legend

☑ Classify Data

Using  Natural Breaks  ▼

With  6 ⏶⏷  classes

Round classes:  Select an option  ▼
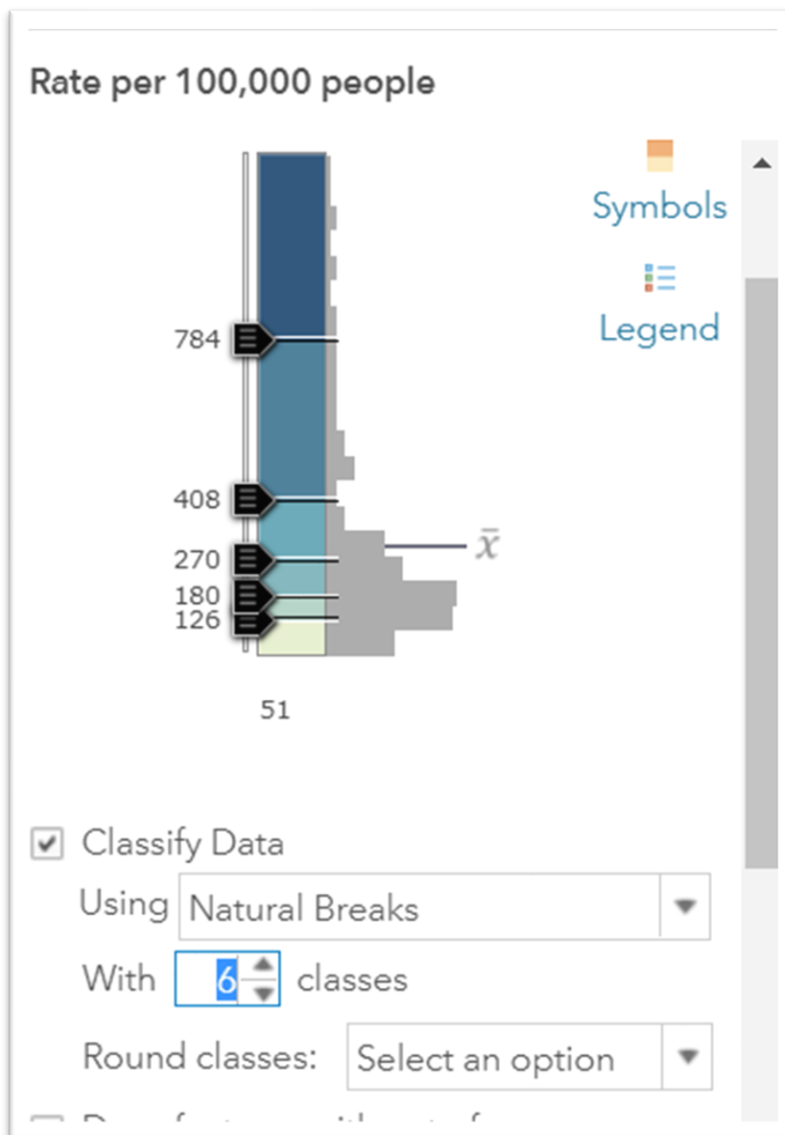
We can use the sliders to adjust the categories to make the intervals more even, or reflective of the data at hand. For instance, it may make more sense have more of the intervals at the higher or lower end, depending on the distribution of your numbers. The choice is yours.

For the purposes of this exercise, let's even out the intervals.
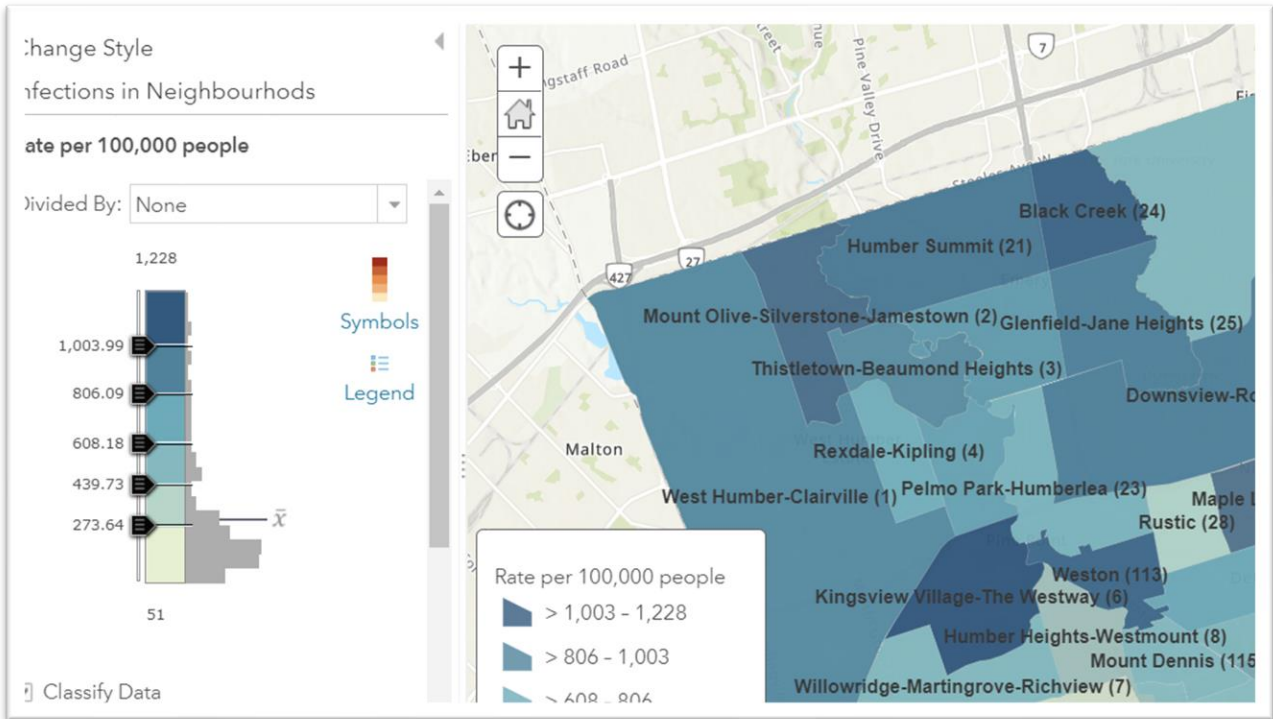


Adjusting the categories produces a result in your map as well as the legend.

☑ Classify Data

Using | Manual Breaks ▼ |

With | 6 ↕ | classes

Round classes: | Select an option ▼ |

☐ Draw features with out of range or no value.

**Transparency**

Overall

0%          50%          100%

Per feature

Set from Attribute Values

**Visible Range**                    Suggest

World ▼                          Room ▼

OK          CANCEL
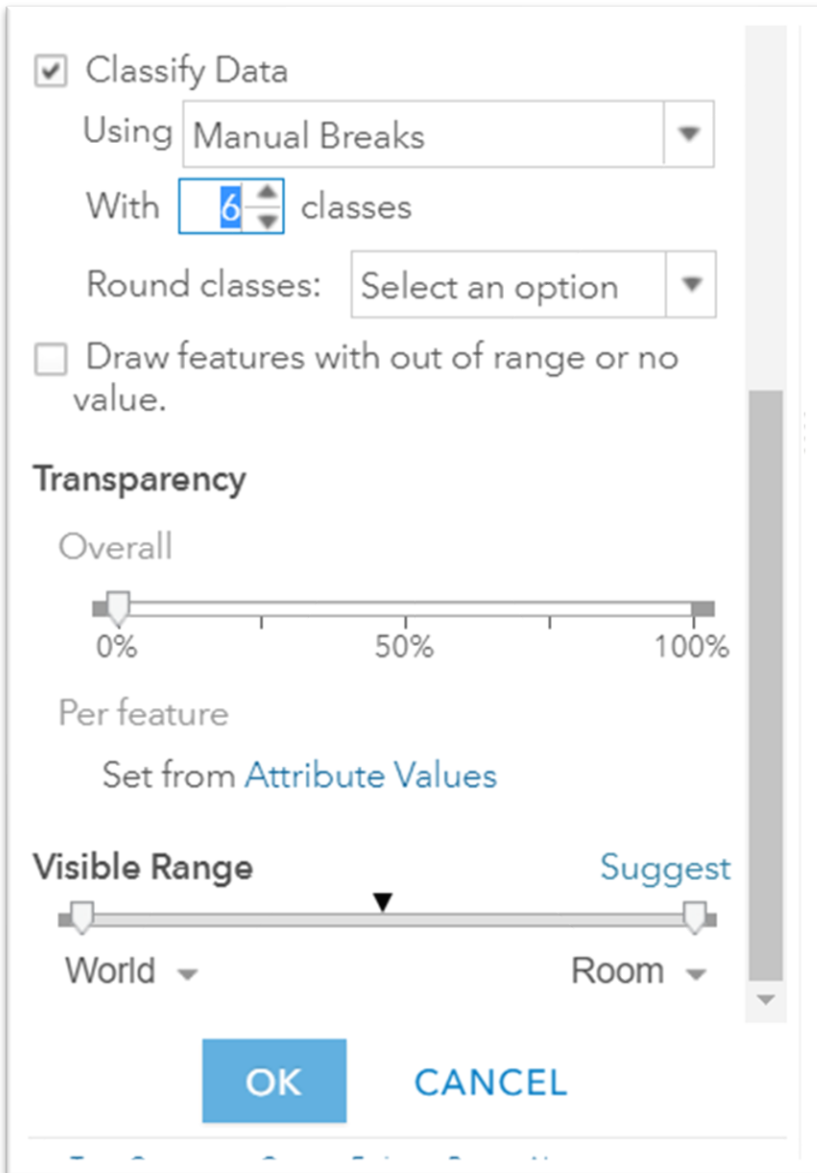
You can also adjust the transparency which allows viewers to see more of the basemap, which comes in handy if you want a better idea of the part of town where the higher rates are located.

If you're happy with the result, press okay.
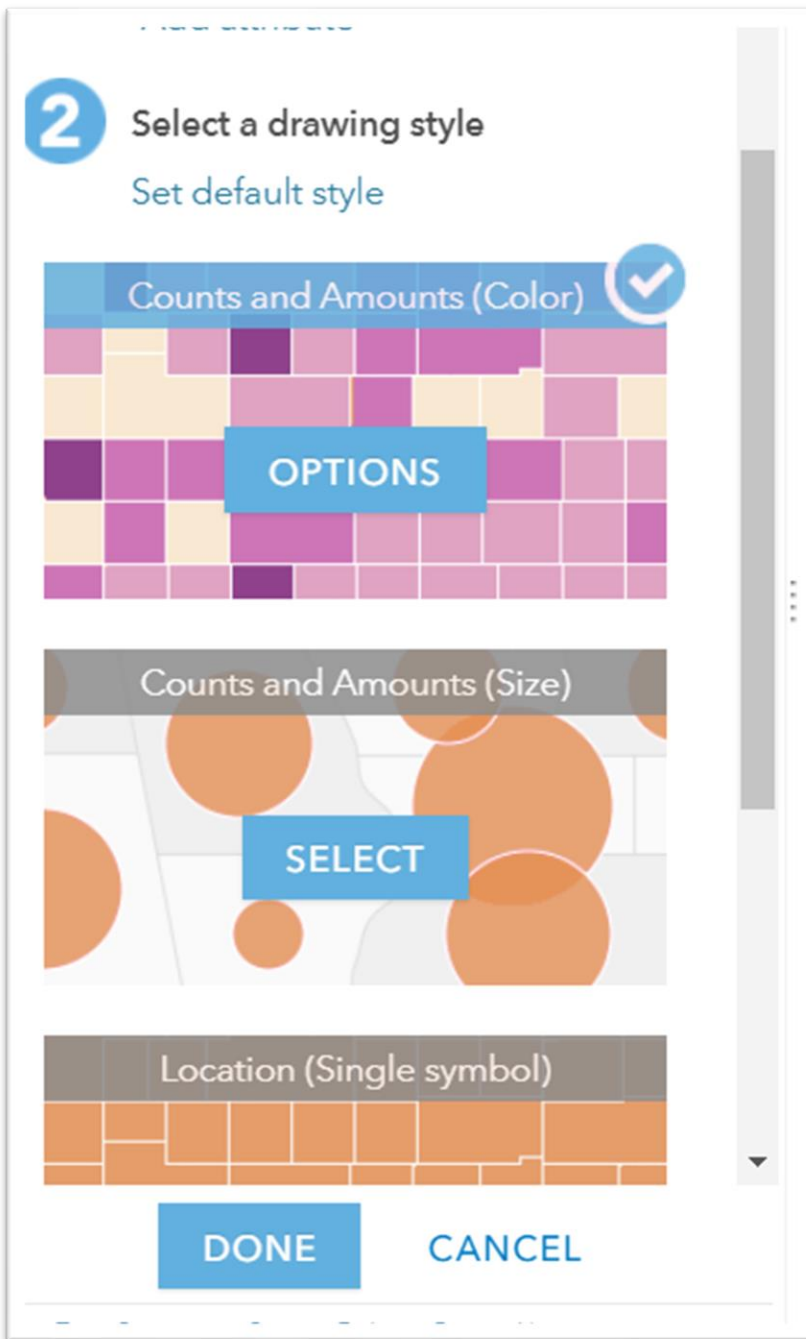


And "Done."

Add neighbourhood labels to your layer and make sure that it is the only one selected.

Details   Add ▾   Basemap   Analysis          Save ▾   Share   Print ▾   Directions   Measure   Bookmarks

About    Content    Legend

Contents

☑ Infections in Neighbourhods

☐ Toronto Neighbourhoods 70 Plus DM

▸ Topographic

COVID19 infections by neighbourhood - COVID19 infections by neighbourhood

| Neighbourhood Name | Rate per 100,000 people | Case Count |
|---|---|---|
| Guildwood | 161.34 | 16 |
| Scarborough Village | 412.58 | 69 |
| Eglinton East | 158.06 | 36 |

At 161.34 cases for every 100,000 people, the Guildwood neighbourhood has one of the highest rates.

You can also copy this layer, and change the coordinates to colour code the neighbourhoods by case counts.

While it may take time to master some of basic functinalities of ArcGIS, it is worth the effort, especially if you are serious about mapping.

From here, you can also create dashboards and story maps.

We have not covered sharing your map by obtaining the embed code.

You'll find embedding information on page 11 of this tutorial, which will also be posted on our syllabus.

Esri Canada's website is full of examples.

And there are many social media discussion groups where people swap ideas and help trouble shoot.