Introduction to Human Geography Using ArcGIS Online

Chapter 4 Exercises

Exercise 4.1: Measuring spatial distribution with population ratios

Introduction

In this chapter, you saw how racial and ethnic groups settle in particular spatial patterns based on personal, economic, and societal forces. Now it is your turn to explore these patterns in a place of your choice within the United States. Data for this exercise is derived from the US Census American Community Survey 5-Year Estimates 2011–2015 at the census tract level of analysis. Given that these are estimates, the numbers given for each census tract may vary somewhat from reality.

Objectives

- Describe the spatial distribution of racial and ethnic groups in your city based on choropleth ratio maps.

- Reflect on how spatial interaction helped create patterns via migration, economic resources, personal choice, and discrimination.

1. **Open the Chapter 4 ACS Race, Ethnicity, Ancestry map and sign in to your account:**

- **http://arcg.is/2jVlnnP**

The layer visibility is set so that you must be zoomed in to at least a "county" scale to see the census tracts.

2. **Zoom to a city of your choice in the United States or Puerto Rico.**

3. **Make a choropleth ratio map of a group of your choice.**

4. **Hover over the layer name and click the Change Styles button** 🖼 **.**

5. **Choose an attribute to show: Select a group to map.**

These include racial groups as defined by the US Census Bureau, Hispanic ethnicity, and a wide range of ancestry categories that can help identify ethnic communities.

6. **Select a drawing style: Counts and Amounts (Color), choose Options.**

7. **Divided By: from the drop-down list, choose Total_Population.**

This creates a choropleth map showing your selected group as a proportion of the census tract's total population.

8. **Save your map.**

•   **Click Save, then click Save As.**

•   **Give your map a unique name.**

•   **Click Save Map.**

Question 4.1.1

Describe the spatial pattern shown on the map. Is the group dispersed, randomly distributed, or clustered? What are the socioeconomic characteristics of neighborhoods the group is found in?

Question 4.1.2

Based on your knowledge of the group, explain the role that racial and ethnic attitudes, financial resources, laws and government policies, and discrimination have played in forming the observed patterns.

9. **Print or take a screenshot of your map and submit it. Make sure that the legend is showing and that it is divided by Total Population.**

Conclusion

In this exercise, you described the spatial distribution of a racial or ethnic group in your city. In all likelihood, you saw that the patterns are not random but rather that different groups cluster in neighborhoods with specific socioeconomic characteristics.

Exercise 4.2: Measuring spatial distribution with the location quotient

Introduction

Now you will use the location quotient to identify concentrations of your selected groups. This is a little trickier than making a simple choropleth map since the proportion of a group in each census tract will be compared with the proportion of the group in a wider study area.

- Calculate the location quotient for an area and racial or ethnic group of your choice.

- Identify ethnic enclaves or *ethnoburbs* based on IQ.

- Discuss causes and changes in an ethnic community.

1. **Open the Chapter 4 ACS Race, Ethnicity, Ancestry map and sign in to your account:**

- **http://arcg.is/2jVlnnP**

The layer visibility is set so that you must be zoomed in to at least a "county" scale to see the census tracts.

2. **Zoom to a county of your choice in the United States or Puerto Rico and filter the study area:**

- **Turn off the Make Ratio Map: Race, Ethnicity, and Ancestry layer.**

- **Turn on the Make Location Quotient Map: Race, Ethnicity, and Ancestry layer.**

3. **Begin by filtering a portion of the map for your study area. To do this, you can select the county you are interested in, or in some cases the census place (city).**

4. **Zoom to the place you want to map and click a census tract. (This example uses Suffolk County, MA.)**

5. **From the pop-up window, write down the State_FIPS, County_FIPS, and Census_Place.**

6. **Hover over the layer name Make Location Quotient Map: Race, Ethnicity, and Ancestry and choose Filter .**

7. **In the filter window, set your first expression so that State_FIPS is <enter the state code you wrote down>.**

8. **In the filter window, click Add another expression +Add another expression .**

9. **Set the second expression to County_FIPS is <enter the county code you wrote down>.**

10. **Click Apply Filter.**

As an alternative, you can create a single expression so that Census_Place is <type census place name exactly as in the pop-up window>. Note that many census places may have too few census tracts to serve as a useful comparison.

Filter: Chapter 4 ACS Race, Ethnicity, and Ancestry

11. **Calculate the Location Quotient for a Selected Racial/Ethnic/National Group:**

• **Select a group for calculating the Location Quotient.**

• **Hover over the layer Make Location Quotient Map: Race, Ethnicity, and Ancestry layer and click Show Table ▦ .**

• **Scroll along the table and select a group.**

• **Calculate the proportion of your selected group in the study area.**

12. **Click the Total_Population field heading in the Select Statistics table.**

13. **Write the Sum of Values in column A of the table. This is the total population in your filtered study area.**

A = Sum of Values (Total_Population)	B = Sum of Values (Your selected group)	C = B/A

14. **Click the field heading for your selected group (in this example, Puerto_Rican is used) and choose Statistics. Write the Sum of Values in column B of the table.**
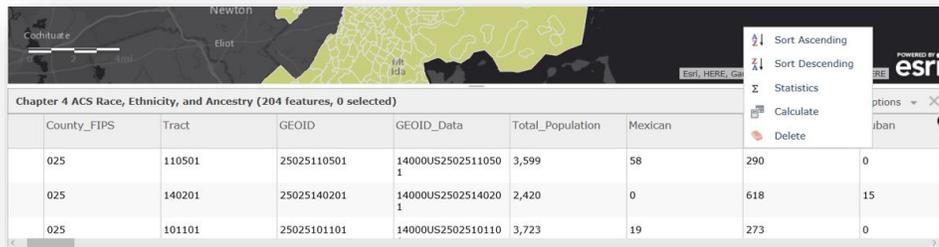
15. **Calculate the proportion by dividing the Sum of Values for your selected group by the Sum of Values for the total population in your filtered study area. Write the answer in column C of the table.**
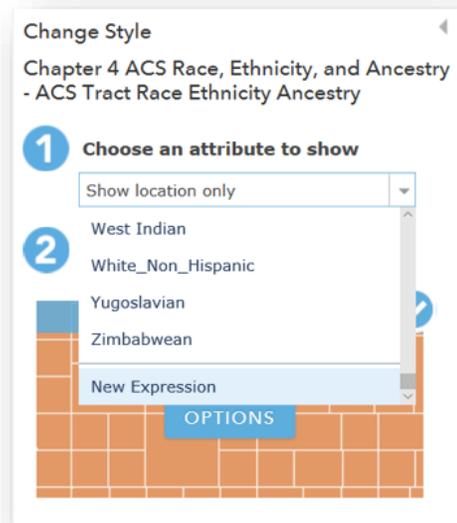
- **Example:**

  o **Puerto Ricans in Suffolk County example: 37,553/747,928 = 0.0502**

  In this example, about ½ percent of the population of Suffolk County is Puerto Rican.

16. **Calculate the Location Quotient for each census tract.**

17. Hover over the layer Make Location Quotient Map: Race, Ethnicity, and Ancestry and click the Change Styles button . Click the drop-down arrow and scroll all the way to the bottom. Click New Expression.

18. In the Custom script window, create a formula to calculate the location quotient for your selected group.

19. In the yellow bar, type a parenthesis.

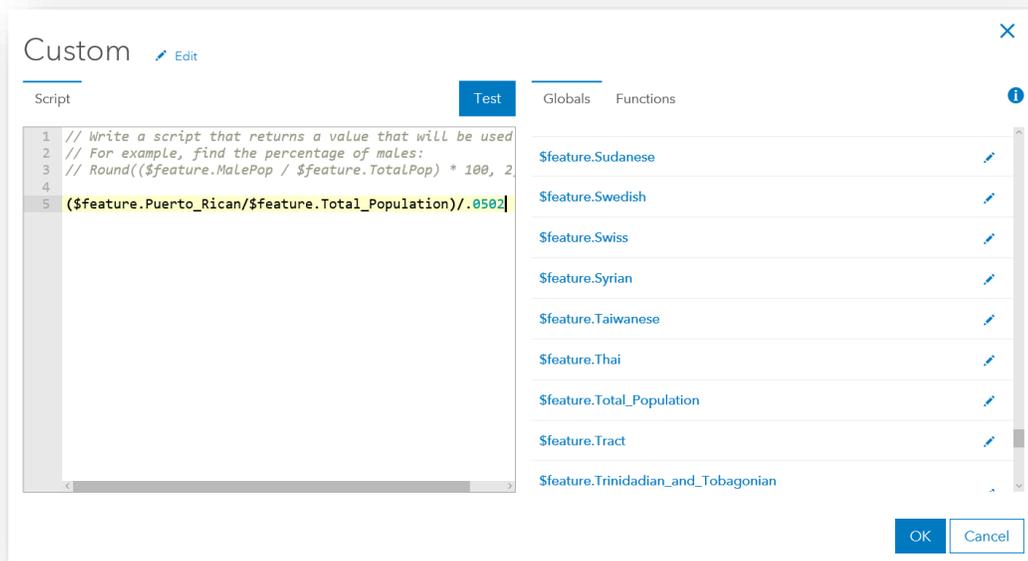20. Scroll down on the right and click the group you selected (in this example, Puerto Ricans).

21. Type a forward slash to represent division (/).

22. Click scroll to and click Total_Population.

23. Type another forward slash outside the closed parenthesis.

**24.** Type the value from question 4.2.1.

25. Click OK.

26. Map the Location Quotient values.

27. Click Counts and Amounts (Color), then click Options.

28. In the Change Style window, change the Theme to Above and Below.

29. Click the middle value in the legend and set it to 1. This will show all tracts over a value of 1 as one color and those under a value of 1 as another color.

Divided By: None

Theme   Above and Below

Symbols

Invert

Zoom in

34

4.7

1

0

0
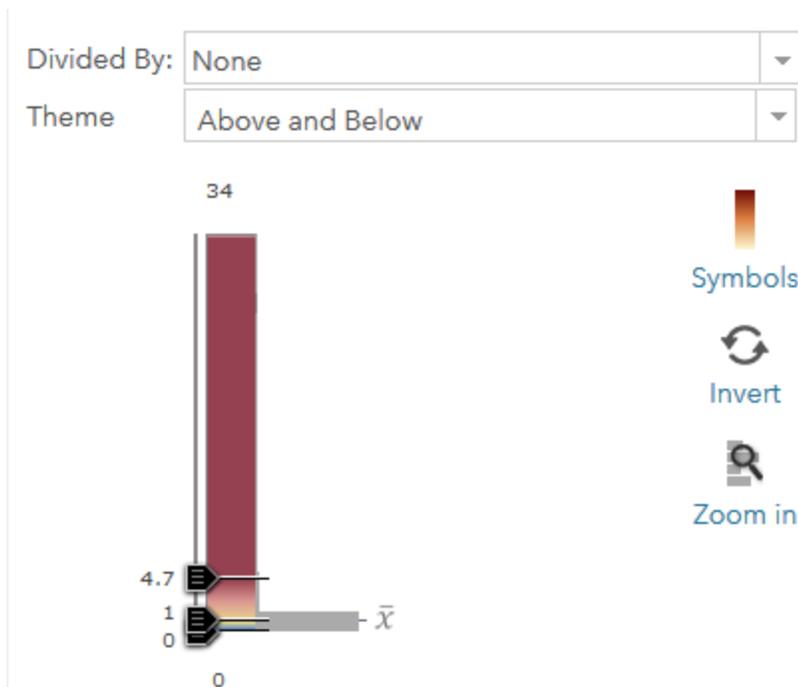
30. Click OK, then click Done.

31. Save your map.

- **Click Save, then click Save As.**

- **Give your map a unique name.**

- **Click Save Map.**

Question 4.2.2

What does a location quotient value of one represent? A value less than one? A value greater than one? Remember that we are talking about race and ethnicity.

Question 4.2.3

Where is your selected group most overrepresented? Based on what you know, is the group in richer or poorer neighborhoods, closer or farther from desirable places, etc.? Why could this be?

Question 4.2.4

Do the tracts with overrepresentation closely reflect the location of that group's most well-known ethnic enclaves or ethnoburbs? Why or why not?

Question 4.2.5

Do you think your selected group is becoming more concentrated in high IQ tracts or is it dispersing and becoming spatially assimilated over time? Why or why not?

32. **Print or take a screenshot of your map and submit it. Make sure that the legend is showing.**

Conclusion

With the location quotient you can identify places where racial or ethnic groups are overrepresented or underrepresented compared with a wider study area. This is useful for identifying clusters over time; it will show where groups are concentrated regardless of overall changes in their numbers within the study area.

Exercise 4.3: Spatial relationships: tapestry segmentation, race, and ethnicity

Introduction

Race and ethnicity often have a strong spatial relationship with consumption patterns in different places. One's racial and ethnic background can influence cultural preferences in terms of food, clothing, entertainment, and more. In this exercise, you will use the racial and ethnic maps from exercise 4.1 or 4.2 to consider how demand for goods and services may differ based on community characteristics.

Objectives

- Identify racial and ethnic concentrations.

- Observe the spatial relationship between racial and ethnic composition and tapestry segmentation.

- Hypothesize as to what goods and services are likely to be in demand in different neighborhoods.

1. **Open your map from exercise 4.1 or 4.2.**

2. **Go to https://www.arcgis.com and sign in to your account.**

3. **Click the Content tab and locate your saved maps.**

Home   Gallery   Map   Scene   Groups   Content   Organization

4. **Click your exercise 4.1 or 4.2 map.**

5. **Click Open in Map Viewer.**
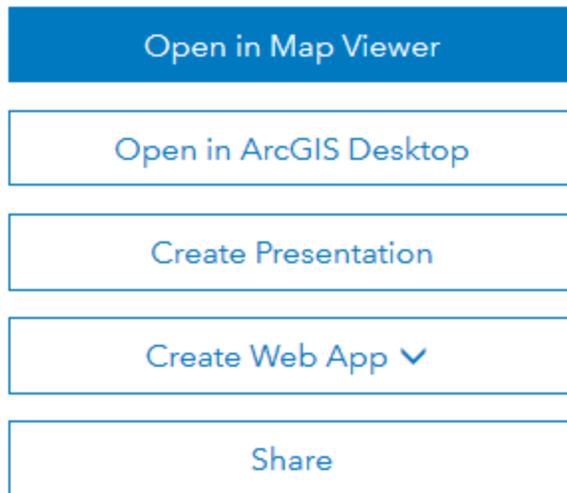
6. **Zoom to the area you mapped in exercise 4.1 or 4.2.**

7. **Turn off all layers except 2016 USA Tapestry Segmentation.**

   This map shows the dominant Tapestry LifeMode Group for each census tract.

8. **Click several tracts and view the pop-up window. This shows some basic socioeconomic data about the group.**

   It also includes a link to the dominant tapestry segment. If you click the link, you will see

a document describing the segment in detail.

9. **Turn on one of the race/ethnicity layers you created in exercise 4.1 or 4.2.**

10. **Click the tracts with the highest concentrations of a racial/ethnic group that you mapped.**

11. **In the pop-up window, click the Next Feature arrow until you see the Tapestry information for your selected tract.**
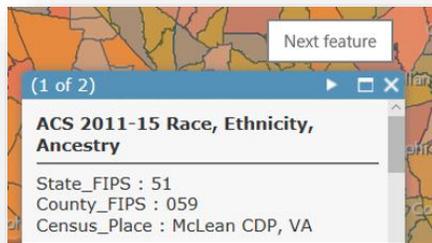
12. **Click the link for the dominant tapestry segment to open the document.**

13. **Repeat for different tracts with high concentrations of your selected race/ethnicity.**

Question 4.3.1

Which dominant tapestry segments are most commonly associated with the census tracts with concentrations of your selected racial/ethnic group?

Question 4.3.2

Based on the tapestry segment descriptions (including the PDF document), describe its socioeconomic characteristics.

Question 4.3.3

Does the tapestry segment description seem to be a good reflection of the neighborhood based on your knowledge?

Question 4.3.4

Based on the tapestry information, what would you sell in the area if you worked for a private company?

Question 4.3.5

Based on the tapestry information, what services would you offer in the area if you worked for the government?

Question 4.3.6

How do those goods and services differ from what you would offer in other parts of the city?

Conclusion

Tapestry segmentation data is used by businesses, government agencies, and nonprofits to better understand the socioeconomic and lifestyle characteristics of places. With this understanding, products and services can be targeted to the places where they are most wanted and needed.

Exercise 4.4: Spatial relationships: income, race and ethnicity

Introduction

As described in the chapter, average incomes still vary by race and ethnicity. In this exercise you will explore the income level of tracts in which the group(s) you mapped in exercises 4.1 and 4.2 live.

- Explore the spatial relationship between your selected racial/ethnic group and census tract income.

- Explain why your selected racial/ethnic group concentrates in tracts of a specific income.

- Identify outlier tracts, where your selected racial/ethnic group is.

1. **Once again, open your map from exercise 4.1 or 4.2.**

2. **Go to https://www.arcgis.com and sign in to your account.**

3. **Click the Content tab and locate your saved maps.**

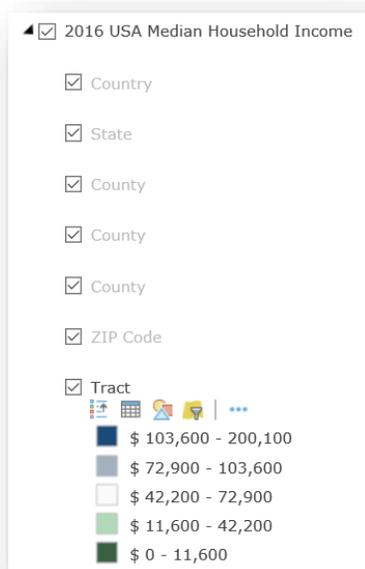Home Gallery Map Scene Groups Content Organization

4. **Click your exercise 4.1 or 4.2 map.**

5. **Click Open in Map Viewer.**
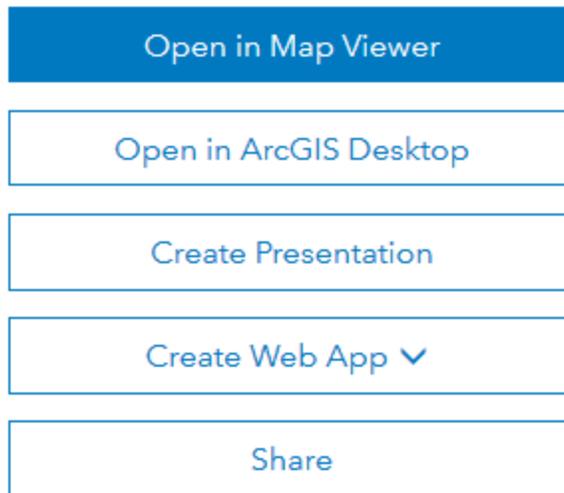
6. **Zoom to the area you mapped in exercise 4.1 or 4.2.**

7. **Turn off all layers except 2016 USA Median Household Income.**

You can view the legend by expanding 2016 USA Median Household Income and clicking

the Show Legend icon under the active layer.

8. **Turn on one of the race/ethnicity layers you created in exercise 4.1 or 4.2.**

9. **Click the tracts with the highest concentrations of the racial/ethnic group that you mapped previously.**

10. **In the pop-up window, click the Next Feature arrow until you see the income information for your selected tract. Write down the income.**

11. **Repeat for different tracts with high concentrations of your selected race/ethnicity.**

Question 4.4.1

What household income range is your selected race/ethnicity concentrated in?

Question 4.4.2

What could be the reasons behind this concentration?

Question 4.4.3

What could be done to have more equally distributed incomes by racial/ethnic group?

Question 4.4.4

Are there any census tracts that are outliers, having a concentration of your selected racial/ethnic group that is in a much higher or much lower income tract? Name and describe the area.

Question 4.4.5

How do residents of your selected group in the outlier tracts differ from others in the group?

Conclusion

Unfortunately, median income still correlates strongly with race and ethnicity in the United States. While progress has been made in reducing many of these differences, as seen in "outlier" communities, there is still much work to be done.

Exercise 4.5: Environmental justice

Introduction

The US Environmental Protection Agency (EPA) has created an environmental justice database that includes a wide range of environmental and demographic data at a local scale, including air pollution concentrations, risk of lead paint exposure, distance to toxic features, and much more. In this exercise you will explore environmental justice in a US city of your choice by comparing the location of different racial/ethnic groups to environmental hazards.

This exercise uses an ArcGIS web mapping application to view a subset of the data. To see a larger subset, go to http://arcg.is/2ku5uBE.

For more information on the data, see https://www.epa.gov/ejscreen.

Full documentation and data, including a definition of all variable fields, can be downloaded at https://www.epa.gov/ejscreen/download-ejscreen-data.

Objectives
- Evaluate the level of environmental justice in a US city of your choice.

- Explain why environmental justice issues may exist in your selected city.

- Discuss how environmental justice can be improved in the selected city.

1. **Open the Chapter 4 Environmental Justice map:**

- **https://goo.gl/gRG7Ad**

   The map opens with a view of San Diego, California.

2. **Use the Search bar** to zoom to a US city of your choice.

3. **Click the Layer List icon to see the available layers.**

   The list includes eight types of environmental risk and the primary racial/ethnic

categories used by the US Census Bureau.

4. **Select the Lead Paint Risk Percentile and one of the racial/ethnic groups from the layer list.**

5. **Click the small X to close the layer list.**

6. **Click the Swipe icon , then with the drop-down arrow, select Lead Paint Risk Percentile.**

   This will allow you to compare lead paint risk to your selected racial/ethnic group.

7. **If you do not see your selected racial/ethnic group on the right side of the swipe bar, adjust the zoom level (as shown in the image). The racial/ethnic groups are only visible at the tract scale.**

8. **Click the Legend icon** **and note which colors represent the highest concentrations for the selected environmental risk and selected racial/ethnic group.**

9. **Drag the slider bar back and forth. View the areas with the highest concentration of your selected racial/ethnic group, then see if the selected environmental risk is high in the same locations.**

10. **Click the Layer List icon again and change the racial/ethnic group. Repeat steps 7 and 8 for each of the groups.**

11. **Fill in the table, noting the racial/ethnic group(s) that most overlap with the location of environmental risk. You can also name specific places that seem significant if you are familiar with the area.**

12. **In the layer list, change the environmental risk as you did in step 5. Repeat for all eight types of environmental risk.**

Question 4.5.1

Environmental risk	Group(s) with strongest spatial relationship	Specific places of significance, if applicable (neighborhood name, etc.)
Lead paint risk		
Cancer risk		
Respiratory hazard		
Superfund site proximity		
Accidental toxic release proximity		
Hazardous waste proximity		
Ozone air pollution concentration		
PM 2.5 air pollution concentration		

Question 4.5.2

From the chapter, what causes of clustering and segregation probably play a role in

environmental justice in your selected city?

Question 4.5.3

What can be done to reduce exposure to environmental risk in a more equitable way?

Conclusion

Exposure to environmental risk is not randomly distributed across the city. Rather,

certain groups, often those of racial or ethnic minorities, are exposed at higher rates. In this

exercise, you were able to see how exposure varies within your city and to consider how to best

reduce risk.

Exercise 4.6: The cultural landscape

Introduction

Quantitative data, such as that from the census, is essential for understanding the spatial distribution of racial and ethnic groups and how distributions change over time, but it is not the only useful tool. Getting into the field and visually analyzing places can elicit a great deal of information about places as well. In this exercise you will explore a neighborhood in your city, looking for landscape clues as to who lives there and how the neighborhood is changing.

Objectives

- Read the cultural landscape by visiting a local community.

- Explain how the neighborhood obtained its unique racial or ethnic characteristics.

- Hypothesize as to how the neighborhood is likely to change in the future.

1. **Locate a unique racial or ethnic community in your city to study. You can use the population ratios map from exercise 4.1 or the location quotient map from exercise 4.2. In the case of heterolocal communities, an ethnic commercial district can be studied, even if it does not stand out in one of your maps.**

2. **In your field work, look for clues as to who lives, works, and spends leisure time there. Look at signage, business types, home and yard design, types of vehicles, public and street art, and any other indication of who controls and uses the space.**

3. **Visit the neighborhood and answer the following:**

Question 4.6.1

Where is the neighborhood and which group dominates the area?

Question 4.6.2

How has the group created a cultural landscape that reflects its culture? Describe the landscape clues that show this.

Question 4.6.3

Are there signs of more than one group in the cultural landscape? What are they?

Question 4.6.4

What is the history of immigration and settlement of the group in that neighborhood?

Question 4.6.5

Explain how the neighborhood appears to be changing. Does it appear that it is becoming more ethnically homogeneous or less? Or is it stable?