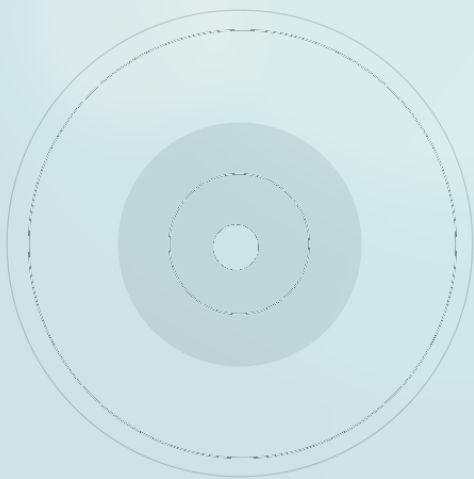


Education Levels in the United States



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Lesson Overview

Earning a [college degree](#) has an intrinsic value in terms of better career prospects, higher income possibilities, and more personal development. But for [communities](#), having better-educated residents means improved civic engagement, volunteer participation, voter turnout, and healthier neighborhoods. According to the [U.S. Census](#), nearly one-third of Americans had earned a bachelor's degree or higher by 2016.

In this lesson, you'll map American education levels for people with a college degree as well as those who have a high-school diploma or no education. This information can help you decide where to search for employment, start a family, buy a house, or locate a new business.

The initial steps in this lesson are explicit so learners can complete them without hesitation. Subsequent steps addressing similar topics are generalized so learners are forced to recall the correct steps from memory or review.

Build Skills in These Areas

- Mapping multiple fields
- Using predominance maps
- Describing trends and patterns

Software requirements

- ArcGIS Online account (obtain a free [ArcGIS Public Account](#) or [ArcGIS trial](#))

Estimated time

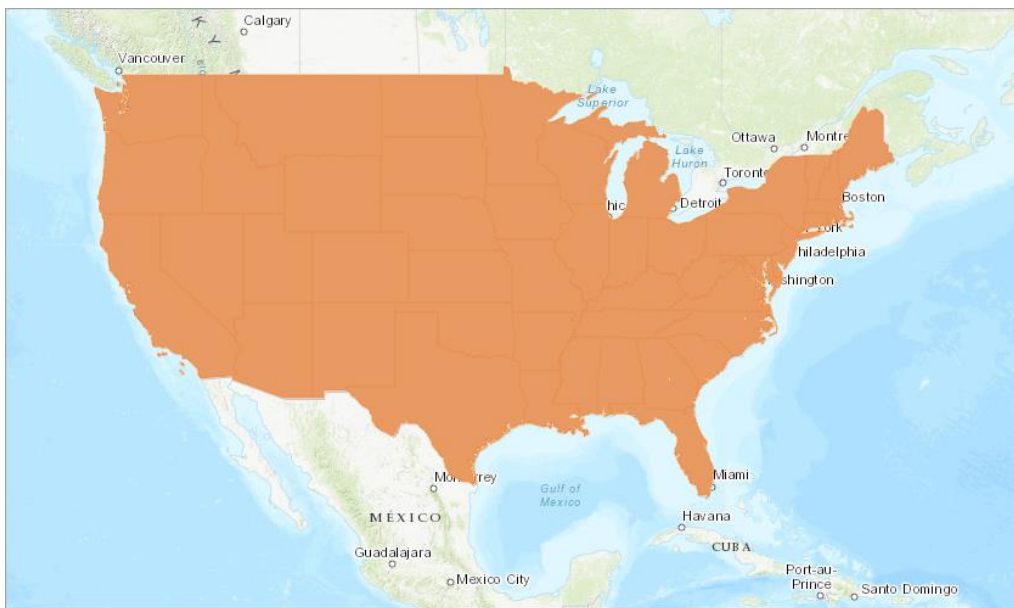
- 1 hour

Exercise

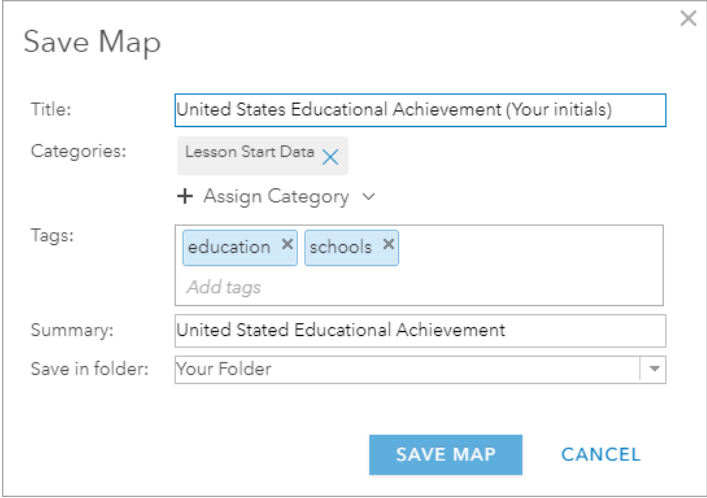
In this lesson, you'll start with a map of the United States and configure its data to show widely dispersed education levels throughout the country.

Step 1: Open an academic achievement county map

1. Open [United States Educational Achievement](#) and sign in to your account.



2. On the ribbon, click **Save** and click **Save As**.
3. In the **Save Map** window, complete the following:
 - For **Title**, type **United States Educational Achievement (your initials)**
 - For **Tags**, remove **IGARC2_education** and **teachwithgis**.
 - For **Summary**, accept the default.
 - Save in your folder.



Save Map

Title:

Categories: ✕

+ Assign Category ▾

Tags: ✕ ✕

[Add tags](#)

Summary:

Save in folder: ▾

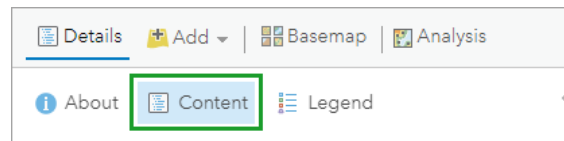
SAVE MAP **CANCEL**

- Click **Save Map**.

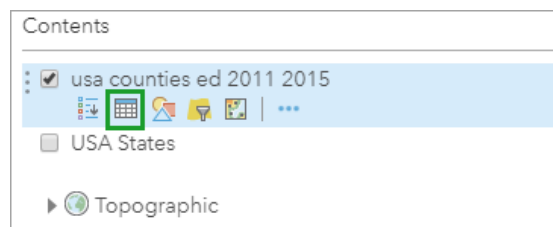
Step 2: Represent data by quantities

In this step, you'll explore the map and answer questions.

1. Click **Content**.

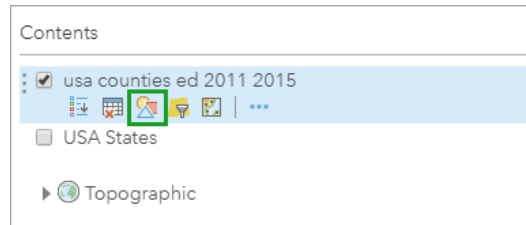


2. Uncheck the **USA States** layer.
3. For the **usa counties ed 2011 2015** layer, click the **Show Table** button.

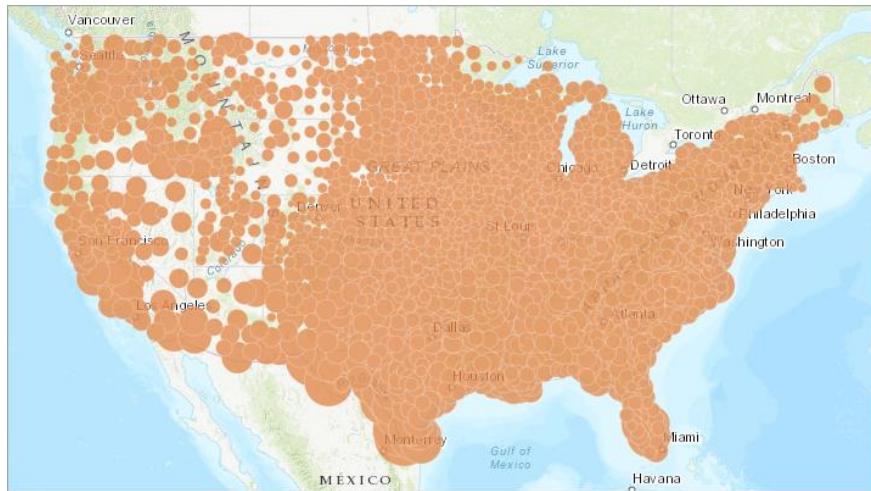


In the table, note the columns with **% No Educational Degree**, **% High School Degree**, and **% College Degree**. These are the three fields you'll map.

4. Under the **usa counties ed 2011 2015** layer, click the **Change Style** button.

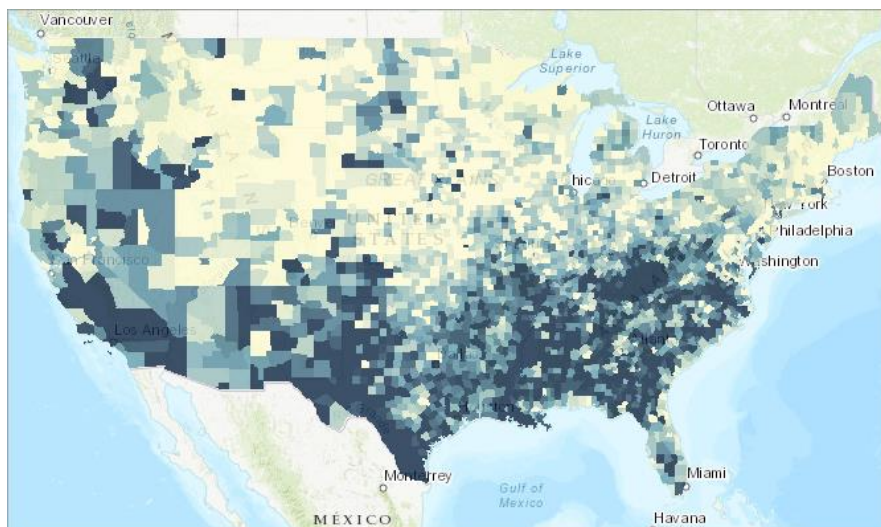


5. In the **Change Style** pane, for **Choose an attribute to show**, select **% No Educational Degree**.



The default rendering style for this map is circles, so the continental United States is covered with differing sizes of circles reflecting the percentage of people without a degree. These circles overlap, so interpreting which circle belongs to which county is confusing at this scale. In the next step, you'll change the drawing style so that the shapes of the circles match the shape of the county. This will clarify the confusion.

6. For **Counts and Amounts (Color)**, click **Select** and click **Done**.

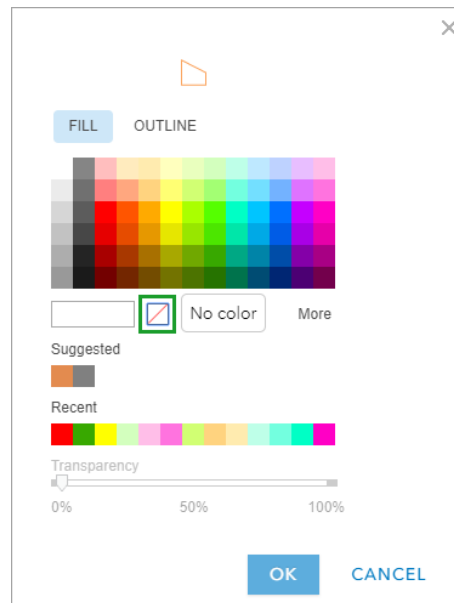


Note: You can minimize the table by dragging its handle up or down. Point to the handle to expand or shrink the table when the pointer turns into a double-sided arrow.



You'll add state boundaries, so you can make the data easier to understand and analyze.

7. Uncheck the layer for **usa counties ed 2001 2015** in the **Content** pane.
8. Check the **USA States** layer.
9. Under the **USA States** layer, click **Change Style**.
10. Under **Select a drawing style**, in **Location (Single Symbol)**, click **Options**.
11. In the **Change Style** pane, click **Symbols**.
12. Change the **Fill** to **No Color**.



13. Click **Outline**, select a shade of red, and change **Line Width** to 2 pixels.



14. Click **OK** twice and click **Done**.



15. Check the **usa counties ed 2011 2015** layer.

16. Pan and zoom the map to answer the following questions. If necessary, in the **usa counties ed 2011 2015** layer, click the **Show Legend** button for an explanation of the map colors.

Q1. What regional trends do you see among states with a high percentage of the population with no educational degree?

A1. _____

Q2. Look at the Mississippi River from its source in Minnesota to its mouth in Louisiana. How would you describe the education levels in the counties adjacent to the river?

A2. _____

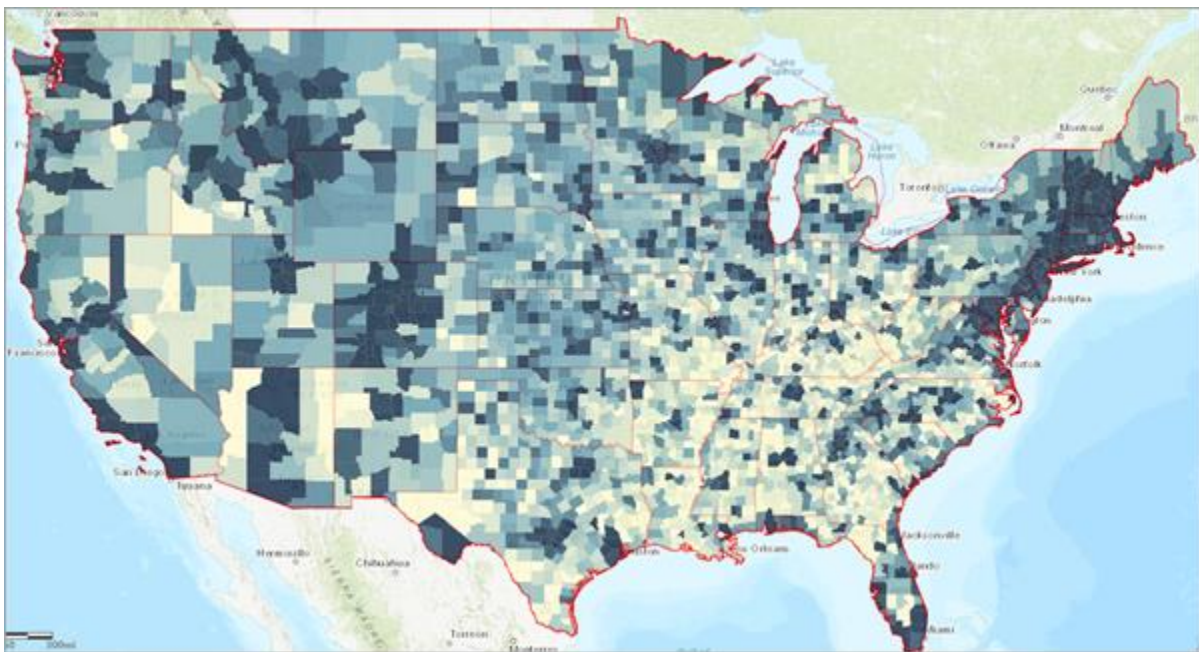
Q3. In Texas, how would you describe the spatial distribution of counties without college degrees? (Zoom in if necessary.)

A3. _____

Here, you'll change the map to illustrate populations with the highest percentage of college degrees. In effect, you're changing the appearance of the map by flipping an attribute.

17. Repeat steps 4, 5, and 6, but change **Choose attribute to show** from **% No Educational Degree** to **% College Degree**. Click **Done**.

18. Click **Legend** to see the percentages.



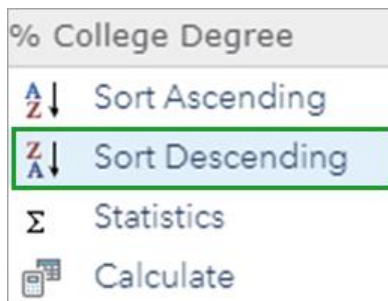
Q4. What are the regional trends among counties with the highest and lowest percentages of college degrees?

A4. _____

Step 3: Filter the data

In this step, you'll build on the percentage of people with college degrees by identifying those counties where at least 50 percent of residents possess college degrees. You'll accomplish this using the **Filter** button.

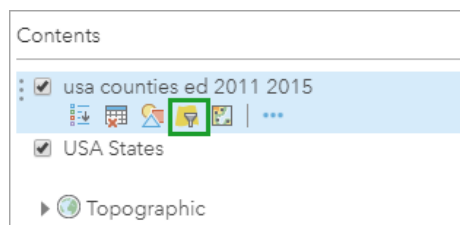
1. If necessary, click **Content** and click the **Hide Legend** and **Show Table** buttons on the **usa counties ed 2011 2015** layer.
2. In the table, click the **% College Degree** header and choose **Sort Descending**.



The table shows that the city of Falls Church, Virginia, leads the United States with 78 percent of counties whose residents have earned college degrees.

Note: Several cities with high concentrations of people with educational degrees are included in the counties layer.

3. On the **usa counties ed 2011 2015** layer, click the **Filter** button.



4. In the **Filter: usa_counties_ed_2011_2015** window, create the expression **% College Degree is greater than 50**.

Filter: usa_counties_ed_2011_2015

Create + Add another expression ☐ Add a set

Display features in the layer that match the following expression

<div style="display: flex; align-items: center;"> <div style="border: 1px solid #ccc; padding: 2px; margin-right: 5px;">% College Degree</div> <div style="margin: 0 5px;">is greater than</div> <div style="border: 1px solid #ccc; padding: 2px; margin-right: 5px;">50</div> <div style="border: 1px solid #ccc; padding: 2px; margin-left: 5px;"> <div style="display: flex; justify-content: space-between; padding: 0 5px;"> Value Field <input checked="" type="radio"/> Unique </div> </div> </div>
<input type="checkbox"/> Ask for values

APPLY FILTER
APPLY FILTER AND ZOOM TO
CLOSE

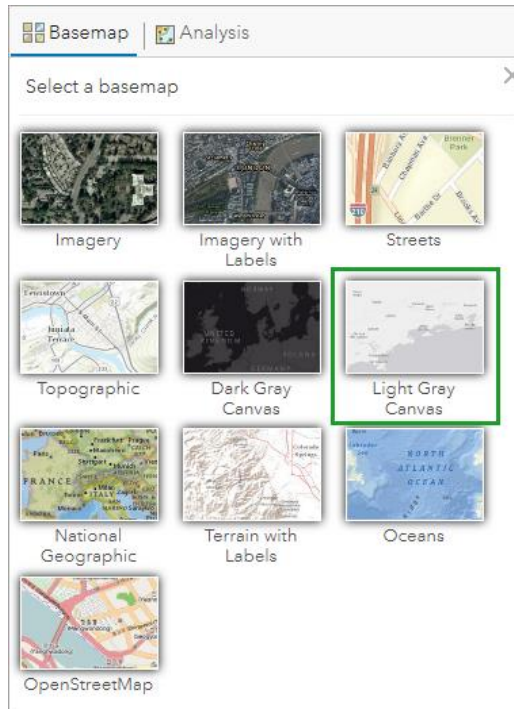
5. Click **Apply Filter**.



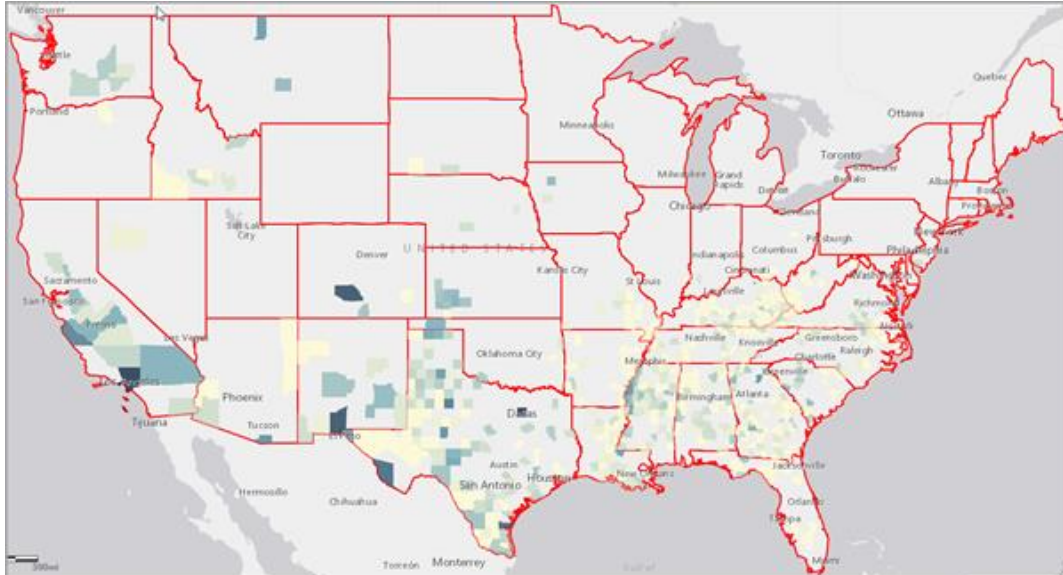
Q5. How many states have two or more counties where more than 50 percent hold college degrees?

A5. _____

6. For the **usa counties ed 2011 2015** layer, open the **Filter** and click **Remove Filter**.
7. Open the **Filter** again, create the expression **% No Educational Degree is greater than 20**, and click **Apply Filter**.
8. On the ribbon, click **Basemap** and select **Light Gray Canvas**.



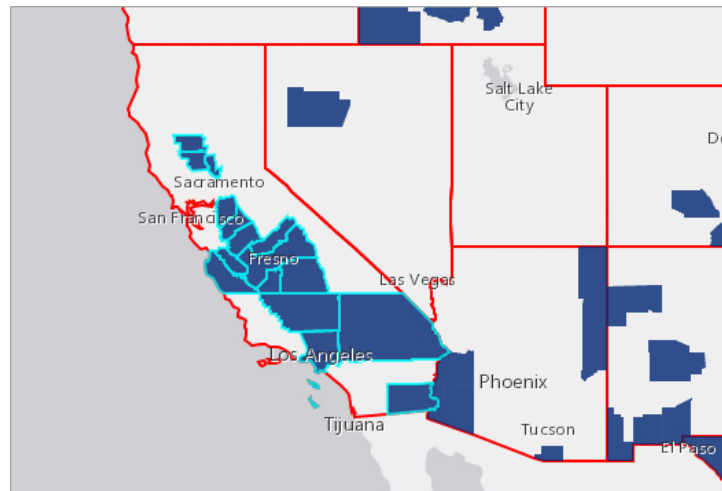
Changing the basemap to a background such as Light Gray Canvas focuses the reader's attention on the data you're featuring.



9. If necessary, open the table for the **usa counties ed 2011 2015** layer.

Q6. Which state has the greatest number of counties in which 20 percent of its people don't possess an educational degree? How high is the total? (Hint: Sort the table in ascending order. In the table,

click the first row with a state and press the Shift key while clicking the field with the last entry from that same state. All the counties you click will be highlighted on the map..)



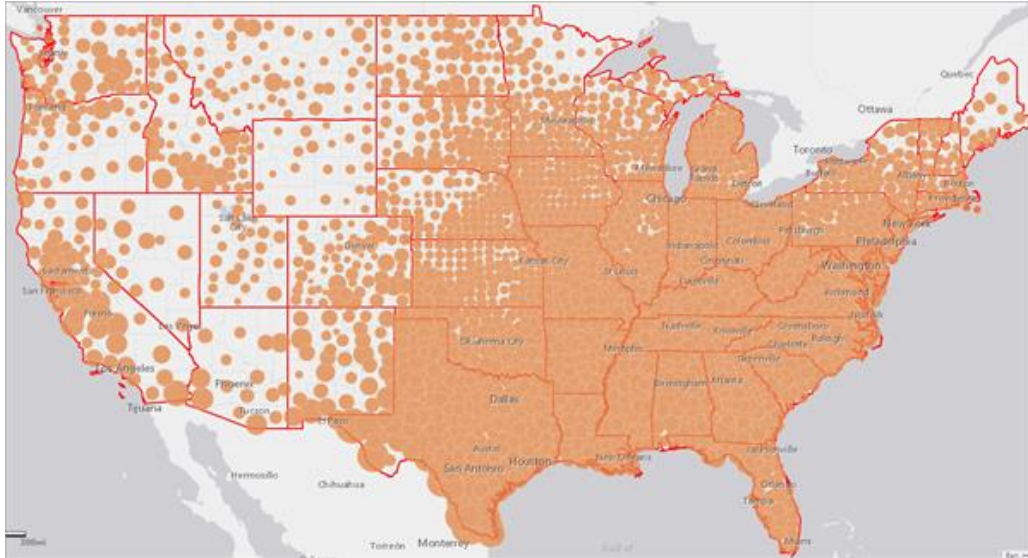
A6. _____

10. Click anywhere on the map to deselect the selected counties.

Step 4: Create a predominance map of academic achievement

A predominant category map allows you to map multiple related attributes and discover which attribute has the highest value. The attributes are compared, and the predominant layer is displayed on the map. In this step, you'll consider the percentage of counties with no degree, a high-school degree, and a college degree. Each attribute is drawn with a different color.

1. Remove the filter from the **usa counties ed 2011 2015** layer.
2. On that same layer, click the **Change Style** button, and for **Choose an attribute to show**, select **% No Educational Degree**.



3. Under **Choose an attribute to show**, click **Add Attribute**.
4. Click the menu and select **% High School Degree**.
5. Add **% College Degree** as an attribute.

Change Style

usa counties ed 2011 2015

1

Choose an attribute to show

% No Educational Degree

% High School Degree

% College Degree

Add attribute

2

Select a drawing style

Set default style

Predominant Category

OPTIONS

6. For **Select a drawing style**, in **Predominant Category**, click **Options**.
7. In the **Change Style** pane, click the blue square next to **% No Educational Degree**.

Change Style

usa counties ed 2011 2015

Predominant Category

Click to edit symbol or label.

	LABEL	COUNT	
:	% High School Degree	2590	
:	% College Degree	454	
:	% No Educational Degree	58	
<input type="checkbox"/>	Other	40	
	No value	40	

8. In the window, click a red square and click **OK**.
9. Select yellow for **% High School Degree**.
10. Select green for **% College Degree**.
11. Under **Transparency**, click **Set from Predominant Percentage**.

Change Style

usa counties ed 2011 2015

Predominant Category

Click to edit symbol or label.

	LABEL	COUNT	
:	% High School Degree	2590	
:	% College Degree	454	
:	% No Educational Degree	58	
<input type="checkbox"/>	Other	40	
	No value	40	

Transparency

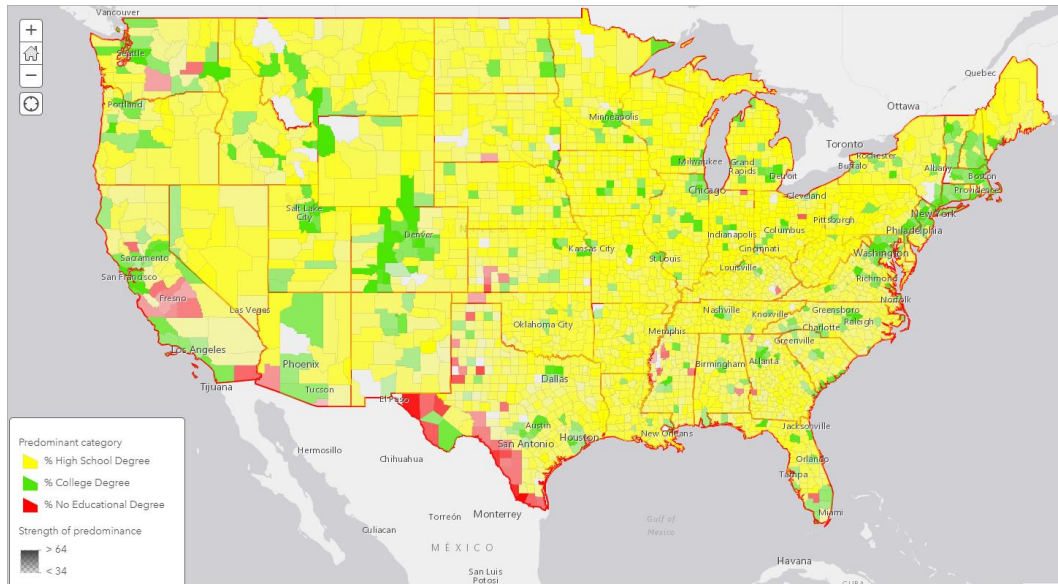
Overall

0% 50% 100%

Per feature

Set from Predominant Percentage

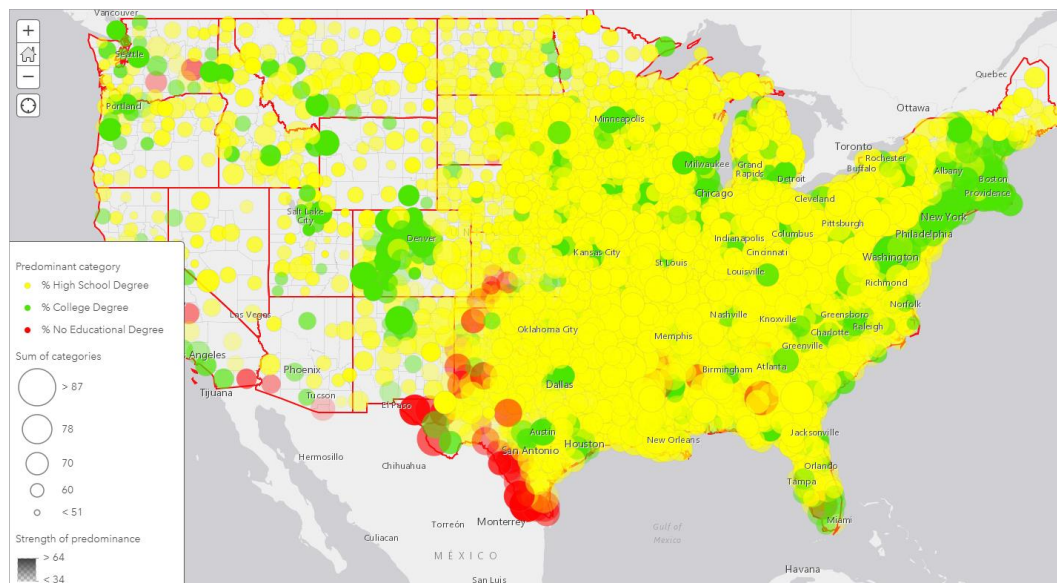
12. Click **OK** twice, but do not click **Done**.



Step 5: Show a predominant attribute

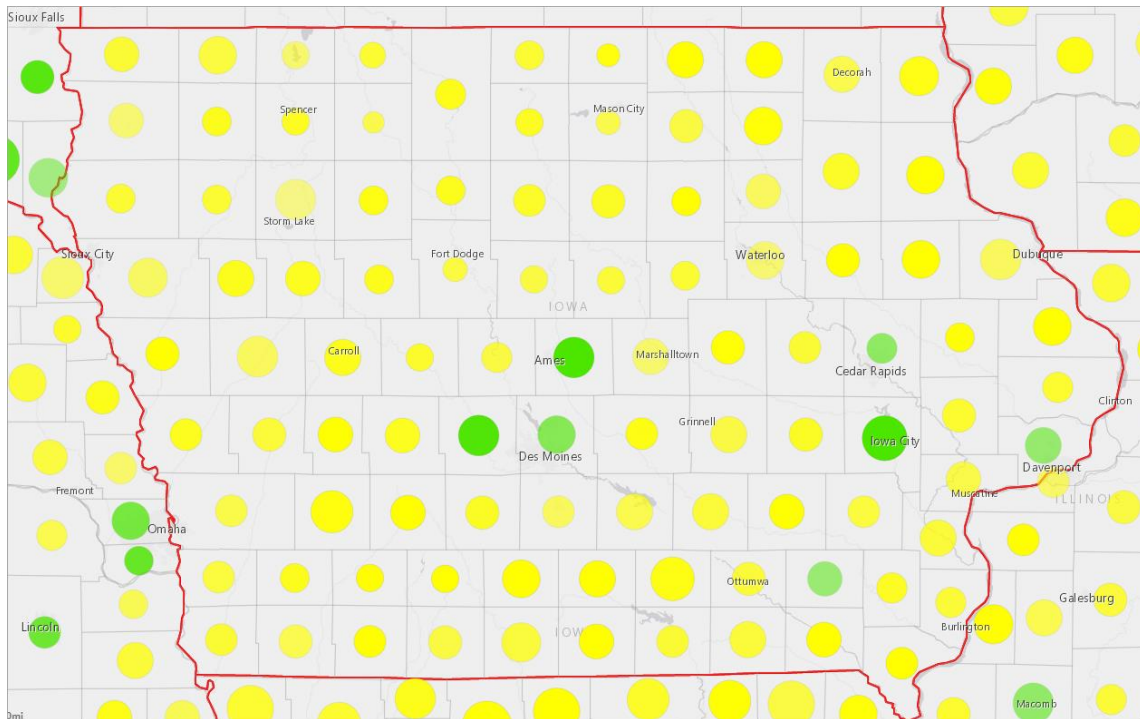
A predominant category and size map not only allow you to map multiple attributes with color and transparency, but it also adds the third element of size, which represents the sum of the attributes for each feature.

1. For **Predominant Category and Size**, click **Select** and click **Options**.
2. For **Predominant Category**, click **Options**.



3. Click **Set from Predominant Percentage**.

4. In the **Set transparency based on the predominant percentage** window, click **OK**.
5. As with the squares in the previous step, and if necessary, change the circle colors under **Predominant Category** to the following:
 - Yellow for % **High School Degree**
 - Green for % **College Degree**
 - Red for % **No Education Degree**
6. Click **OK** once and **Done** twice.
7. Save the map.
8. Zoom to your home state. (If you're not from the United States, zoom to Iowa in the center of your map and assume your hometown is Des Moines, which is that state's capital city, in Polk County.)



Q7. How does your home county compare with the surrounding counties in terms of education?

A7. _____

Q8. Is the educational level in your home county what you expected? Would you recommend that a friend move there?

A8. _____

Exercise Answers

Q1. What regional trends do you see among states with a high percentage of the population with no college degree?

A1. Answers may vary. But generally, states in the Southeast, Southwest, and California tend to be regions with high percentages of people without an educational degree.

Q2. Look at the Mississippi River from its source in Minnesota to its mouth in Louisiana. How would you describe the education levels in the counties adjacent to the river?

A2. The counties adjoining the Mississippi River tend to have high levels of college degrees in the upper Midwest. As you move south along the river, counties without college degrees increase between southern Missouri and the Gulf of Mexico.

Q3. In Texas, how would you describe the spatial distribution of counties without college degrees?

A3. South and West Texas, along with parts of the Panhandle, are regions with the most counties of people without college degrees. (Zoom in if necessary.)

Q4. What are the regional trends among counties with the highest and lowest percentages of college degrees?

A4. The Northeastern Corridor appears to have the largest concentration of counties of people possessing college degrees. Other parts of the country—such as California, Colorado, and Washington state—also tend to have many counties with high percentages of people possessing college degrees. The Southeast appears to be the region with the highest number of counties where people don't have college degrees.

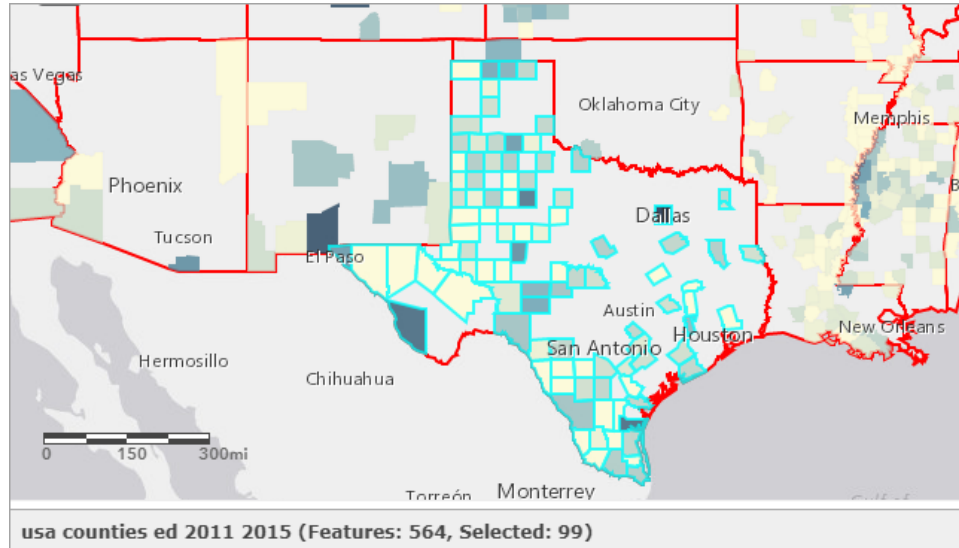
Q5. How many states have two or more counties where more than 50 percent hold college degrees?

A5. Five: California, Colorado, Maryland, New Jersey, and Virginia.

Q6. What state has the greatest number of counties in which 20 percent of its people don't possess an educational degree? How high is the total? (Hint: Sort the table in ascending order. In the table, click the first row with a state and press the Shift key while clicking the field with the last entry from that same

state. All the counties you click will be highlighted on the map. When complete, click anywhere on the map to deselect the highlighted counties.)

A6. Texas, with 99 counties.



Q7. How does your home county compare with the surrounding counties in terms of education?

A7. Answers will vary depending on which county the student chooses; however, in the case of Iowa, the counties with more than 50 percent college degrees are concentrated in Central Iowa and Eastern Iowa.

Q8. Is the educational level in your home county what you expected? Would you recommend that a friend move there?

A8. Answers will vary.

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About the author



Kathryn Keranen is an award-winning teacher and author. She serves as an instructor in geographic science at James Madison University and is the cofounder of the award-winning Geospatial Semester. With Bob Kolvoord, she is the coauthor of the Making Spatial Decisions series from Esri Press.

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