



ANALYZING CORRELATIONS OF EDUCATION AND INCOME

TEACHER VERSION

Subject Level:

High School Geography

Grade Level:

8-12

Approx. Time Required:

120 minutes

Learning Objectives:

- Students will be able to read maps to understand census data.
- Students will be able to analyze data over time, making comparisons to identify trends and correlations in the data.
- Students will be able to propose policies to address issues of income and education.

Activity Description

Students will explore maps containing census data from 1950 through 2000. They will analyze how education levels and median household incomes have changed over time and determine how the two might be correlated. Students will also come up with ideas for policies that could help address issues related to income and education.

Suggested Grade Level:

8-12

Approximate Time Required:

120 minutes

Learning Objectives:

- Students will be able to read maps to understand census data.
- Students will be able to analyze data over time, making comparisons to identify trends and correlations in the data.
- Students will be able to propose policies to address issues of income and education.

Topics:

- Choropleth maps
- Education levels
- Income levels

Skills Taught:

- Analyzing a choropleth map
 - Comparing maps to identify correlations
 - Deciphering census data represented spatially
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Materials Required

- The student version of this activity, 18 pages; it contains images that should be printed in color.
- Teacher computer with Internet access and a projector to display websites

A computer with Internet access for each student (or for pairs of students) is optional.

Activity Items

The following items are part of this activity. The items, their sources, and instructions for viewing them online appear at the end of this teacher version.

- Item 1: Completed High School, 1950 Map
- Item 2: Completed High School, 2000 Map
- Item 3: Completed College, 1950 Map
- Item 4: Completed College, 2000 Map
- Item 5: Median Household Income, 1969 Map
- Item 6: Median Household Income, 1999 Map
- Item 7: Completed College, Largest Metropolitan Areas, 2000 Map
- Item 8: Median Household Income, Largest Metropolitan Areas, 1999 Map

For more information to help you introduce your students to the U.S. Census Bureau, read "[Census Bureau 101 for Students](#)." This information sheet can be printed and passed out to your students as well.

Standards Addressed

See charts below. For more information, read

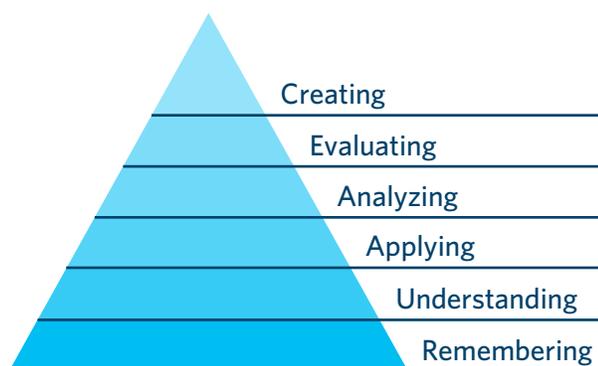
[*"Overview of Education Standards and Guidelines Addressed in Statistics in Schools Activities."*](#)

National Geography Standards

Standard	Grade	The student knows and understands:
1- How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information	8	Properties and Functions of Geographic Representations. The advantages and disadvantages of using different geographic representations—such as maps, globes, graphs, diagrams, aerial and other photographs, remotely sensed images, and geographic visualizations for analyzing spatial distributions and patterns.
9 - The characteristics, distribution, and migration of human populations on Earth's surface	12	Characteristics of Population. Culture, economics, and politics influence the changing demographic structure of different populations.
18 - How to apply geography to interpret the present and plan for the future	12	Using Geography to Interpret the Present and Plan for the Future. Geographic contexts (the human and physical characteristics of places and environments) provide the basis for analyzing current events and making predictions about future issues.

Bloom's Taxonomy

Students will **analyze** choropleth maps containing census data to identify correlations between education and income.



Teacher Notes

Before the Activity

Students must understand the following key terms:

- **Concentration** – a close gathering of people or things
- **Correlation** – generally tells how two variables vary together and one usually looks for one of three cases: (1) As variable A increases, so does variable B (positive correlation); (2) as variable A increases, variable B decreases (negative correlation); (3) no pattern of varying together (near zero correlation).
- **Median household income** – the middle income when the income distribution of households is divided into two equal parts: one-half below and one-half above
- **Scale** – the ratio of the distance on a map to the corresponding actual distance, such as one inch measured on a map equals one mile on the ground
- **Trend** – a general direction in which something is developing or changing

As part of a group discussion, teachers could ask students, “What factors do you think might affect someone’s income?” Teachers should expect answers like: what type of work the person does, whether the person works for a large or small company, whether the person lives in a city or a rural area, etc.

Teachers could follow up by asking, “How do you think someone’s level of education might affect that person’s income?” Teachers should expect answers like: “Working in a restaurant might require only a high school diploma, while working as a doctor requires an advanced degree.”

Teachers should explain that before comparing income over time, we must first adjust for inflation, expressing 1969 dollars in terms of 1999 dollars.

During the Activity

In classrooms where students have access to computers, teachers may choose to direct students (individually or in pairs) to view the maps online — instead of in print — so that they can zoom in to view the data more closely. Teachers will also display the maps on the screen using a projector. Teachers should walk students through part 1 of the activity as part of a whole-group discussion.

Teachers will introduce part 2 of the activity, directing students to work in groups of four. (Teachers may opt to assign only four to six metropolitan areas instead of 11, depending on how much time they want to dedicate to the exercise.)

When students are done with this part, teachers will ask that they share some of their group’s findings with the class. Teachers should try to get students to see the correlation between education and income level— e.g., “In 1999 and 2000 in the vicinity of Gary, Indiana, the maps show that the median household income is less than \$25,000 and that fewer than 10 percent of people completed college. This indicates that many people in this

area have low levels of education and are earning very low incomes. However, in some western suburbs of D.C., you might see high correlations of people with high median household income with college degrees.” Teachers should help students understand that most metropolitan areas have concentrations of very low median household incomes.

Teachers will direct students to work individually on part 3. (This could be assigned for homework if time runs out.)

After the Activity

Ask students to reflect on what they learned.

Extension Ideas:

- Teachers could ask students to read background information about both the education data and the income and poverty data collected by the Census Bureau. The education information is on pages 158-160 of this Census Bureau document: www.census.gov/population/www/cen2000/censusatlas/pdf/10_Education.pdf. The income and poverty information is on pages 212-214 of this Census Bureau document: www.census.gov/population/www/cen2000/censusatlas/pdf/13_Income-and-Poverty.pdf.
- Teachers could direct students to look at data for the town or city where they live and provide recommendations to decision makers about educational and employment opportunities. They could present their ideas to their town or city’s public officials, planning commission, or other applicable agency.

Student Activity

Click [here](#) to download a printable version for students.

Activity Items

The following items are part of this activity and appear at the end of this student version.

- Item 1: Completed High School, 1950 Map
- Item 2: Completed High School, 2000 Map
- Item 3: Completed College, 1950 Map
- Item 4: Completed College, 2000 Map
- Item 5: Median Household Income, 1969 Map
- Item 6: Median Household Income, 1999 Map
- Item 7: Completed College, Largest Metropolitan Areas, 2000 Map
- Item 8: Median Household Income, Largest Metropolitan Areas, 1999 Map

Student Learning Objectives

- I will be able to read maps to understand census data.
- I will be able to analyze data over time, making comparisons to identify trends and correlations in the data.
- I will be able to propose policies to address issues of income and education.

You will look at a series of choropleth maps that show Census Bureau data on education levels and median household incomes. Choropleth maps use various color tones to represent the average values of particular variables.

Part 1 – Read Choropleth Maps of the Nation

1. Examine **Item 1: Completed High School, 1950 Map** and **Item 2: Completed High School, 2000 Map** and record your observations. In 1950, where were the percentages of high school completion highest and lowest? What regions of the country seemed to have the most and least educated residents? What about in 2000? Also, what changed from 1950 to 2000?

Student answers will vary but could include:

- **In 1950, there were more high school graduates in the West and Northeast.**
- **In 2000, there appeared to be fewer high school graduates in Texas.**

- **In both 1950 and 2000, southern Alaska seemed to have higher levels of high school completion than northern Alaska.**
 - **Between 1950 and 2000, percentages of high school graduates increased significantly across the country — mostly in the Mountain West/Rocky Mountain region.**
 - **In 2000, the Southeast still lagged significantly behind other regions of the country in terms of high school completion.**
2. Now look at **Item 3: Completed College, 1950 Map** and **Item 4: Completed College, 2000 Map**. Note your observations about college completion, identifying any changes that happened between 1950 and 2000.

Student answers will vary but could include:

- **Very few areas are shaded in purple (the color indicating that 18–23.9 percent of the population completed four or more years of college) in Item 3, meaning that people with four years of college or higher were somewhat rare in 1950.**
 - **There was a significant uptick between 1950 and 2000 in the percentage of people who completed college. In Item 4, the dark purple shading highlights areas where 37–63.7 percent of the population had a bachelor’s degree or higher. In 2000, many urban areas including Seattle, San Francisco, Denver, New York City, and Washington, had many residents with a bachelor’s degree or higher level of college completion.**
3. Reviewing **Items 1–4**, do you see any region where a concentration of high or low rates of college or high school completion changed, or where the concentration intensified?

Student answers will vary but could include the following: In 1950, Maine was all one color to show that 3 to 6.1 percent completed college. By 2000, the state was multicolored to show that some parts of the state had as much as 63 percent of their residents completing college and that others had much lower rates of college completion.

4. Look at **Item 5: Median Household Income, 1969 Map** and **Item 6: Median Household Income, 1999 Map**. Note a few specific areas where median household incomes were very high as well as where they were very low. Are there any concentrations?

Student answers will vary but could include: In Item 6, there is a concentration of high median household incomes in the northeastern corridor — from D.C. to Boston. Also, it seems that the Upper Midwest — northern Illinois, Indiana, Ohio, and southern Michigan — had higher median household incomes, but most of the South had low median household incomes in 1969. By 1999, there were more areas with higher median household incomes in southern states such as Florida, Texas, and Georgia as well as in western states such as Colorado.

5. Are there areas of the country where median household incomes appear to increase from the '60s to the '90s? Are there areas where they appear to decrease? Do you notice a shift in the spatial distribution of wealth in particular states?

Student answers for the first question will vary but could include the following: Higher median

household incomes seemed to spread out from the geographic areas where they were concentrated. Nevada as well as southern and central California saw increased median household incomes from 1969 to 1999. Also, pockets of economic prosperity emerged in the urban areas of the South.

Student answers for the second question will vary but could include the following: There are no obvious decreases — only that the differences in median household income in many locations seem to be less apparent. Certain areas, including eastern Kentucky, West Virginia, and states bordering the lower Mississippi River, remained relatively poor from 1969 to 1999.

Student answers for the third question will vary but could include the following: In 1969, high median household income was concentrated in central Alaska. However, by 1999, this was the lowest median household income area of the state, with higher median household incomes moving around the perimeter.

6. Why do you think any of the trends you found in question 5 may have happened? (Think of specific industries that may have come and gone in certain areas.)

Student answers will vary but could include the downsizing of the manufacturing and automotive industries, concentration of technology industries in California, and migration to the Sun Belt area.

Part 2 - Read Choropleth Maps of Metropolitan Areas

Working as a group of four, refer to **Item 7: Completed College, Largest Metropolitan Areas, 2000 Map** and **Item 8: Median Household Income, Largest Metropolitan Areas, 1999 Map** to complete the table below. Two people in your group should look at **Item 7** (each looking at about half of the metropolitan areas), while the other two should look at **Item 8** (each looking at about half of the metropolitan areas). Write your observations — being sure to note the most interesting concentrations and correlations — in the appropriate cells and, if you have time, share what you observed with the other members of your group.

	Completed College, Largest Metropolitan Areas, 2000	Median Household Income, Largest Metropolitan Areas, 1999
San Francisco-Oakland-San Jose, CA	Areas just north of San Francisco, east of Oakland, and west of San Jose had significant college completion rates (45-74.9 percent), while areas east and southeast of Oakland had much lower college completion rates (10-24.5 percent).	Areas with the highest median household incomes were east of Oakland and west of San Jose (\$100,000-\$199,000), whereas central Oakland saw less than \$25,000, and San Jose fared just slightly better at \$25,000-\$41,000.
Los Angeles-Riverside-Orange County, CA	The area south of Los Angeles, north of Long Beach, and west of Anaheim had a college completion rate of less than 10 percent, whereas the coastal areas had much higher rates of college completion.	Los Angeles itself had a median household income of less than \$25,000, as did Long Beach. There were areas of greater affluence closer to the ocean, where people made \$100,000-\$199,000. The colors are very mottled in between, which means that incomes varied significantly.
Houston-Galveston-Brazoria, TX	Just west of Houston, there were pockets of 45-74.9 percent college completion, but the central and eastern areas had much lower rates of completion.	Houston itself had the lowest median household income (less than \$25,000), but the incomes seemed to increase moving outward from there, with small pockets of very high median household incomes.

	Completed College, Largest Metropolitan Areas, 2000	Median Household Income, Largest Metropolitan Areas, 1999
Chicago-Gary-Kenosha, IL-IN-WI	The far northern suburbs of Chicago had significant numbers of college completers (with a large area of 45-74.9 percent). However, the central, western, and southern parts of the city had a college completion rate of less than 10 percent, which was also true in Gary.	The areas with the lowest median household incomes were Chicago and Gary (less than \$25,000), with areas just around the cities doing a little better (at \$25,000-\$41,000). Areas much farther north (suburban Chicago) saw significantly higher median household incomes.
Detroit-Ann Arbor-Flint, MI	Ann Arbor saw significant numbers of educated people, with a pocket north of Ann Arbor seeing 75 percent college completion. All areas of Detroit had extremely low college completion rates (less than 10 percent).	There was a significant area around Detroit with a median household income of less than \$25,000. This low median household income was also seen in Flint. The areas in between had higher median household income levels, as was the area around Ann Arbor.
Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH	Boston seemed to have fairly high college completion rates (45-74.9 percent) west of Boston proper, with smaller pockets of even higher college completion rates. However, in the suburbs of Worcester, Brockton, Lowell, and Lawrence, rates were around 10-24 percent.	There were small geographic areas around Boston, Brockton, Worcester, Lowell, and Lawrence with low median household incomes (less than \$25,000). Median household incomes quickly increased moving away from these city centers.
Dallas-Fort Worth, TX	North suburban Dallas appeared to have relatively well-educated residents, with large areas of 45-74.9 percent college completion and more areas surrounding those with at least 25 percent college completion. Southern Dallas and eastern Fort Worth saw college completion rates of 10 percent or lower.	The only areas with high median household incomes were north of Dallas and Fort Worth, with very small pockets seeing incomes of \$100,000-\$199,000. In the cities themselves, as well as to the east, west, and south, incomes were significantly lower (\$25,000-\$41,000).

	Completed College, Largest Metropolitan Areas, 2000	Median Household Income, Largest Metropolitan Areas, 1999
New York-Northern New Jersey-Long Island, NY-NJ-CT-PA	There was a mix of college completion rates. In central Newark, there were areas at less than 10 percent. Just west of that, the rates were significantly higher (more than 45 percent). In New York City, there were areas just east of Manhattan with very low rates (less than 10 percent), but farther into Long Island and in the suburbs of New Jersey, rates went up significantly.	There were low median household incomes in the city centers of New York City and Newark — a mix of less than \$25,000 and \$25,000–\$41,000. However, west of Newark and northeast of New York City (into Connecticut), median household incomes increased significantly.
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	Philadelphia had significantly lower college completion rates in the city (less than 10 percent) than in the areas to the west (more than 45 percent).	Philadelphia had a significant area of low median household income (less than \$25,000). West of Philadelphia, the colors are somewhat mottled, indicating that incomes varied in that small geographic area.
Atlanta, GA	Northern Atlanta seemed to have more highly educated residents (more than 45 percent completing college) than both central Atlanta (less than 10 percent completing college) and southern Atlanta (10–25 percent completing college).	There seemed to be a corridor running north from Atlanta where median household incomes were significantly higher (\$100,000–\$199,000) than in other areas around the city. In central Atlanta, there were very low median household incomes (less than \$25,000).
Washington-Baltimore, DC-MD-VA-WV	Areas to the north of Washington (in Maryland) and to the west of D.C. (in Virginia) saw much higher college completion rates than areas to the east and southeast of the city.	In both Baltimore and Washington, D.C., there were concentrations of low median household incomes (less than \$25,000), but west of D.C. into Virginia, and north of D.C. into Maryland, there were significantly higher median household incomes (\$100,000–\$199,000).

Determine with your group which metropolitan area has the most variability or diversity. How could those data be used by the government (at various levels) to propose programs to improve people's quality of life? What types of goals and priorities do you think people living in that area might have? (Keep in mind that different communities might face different challenges — such as a community in Florida needing to focus more on weather-related challenges compared with a community in Tennessee.)

Student answers will vary depending on the selected metropolitan area.

Part 3 – Propose Policies

Come up with three specific policies that you would propose if you were the mayor of the metropolitan area that your group selected at the end of part 2. Support each policy with a one-paragraph explanation of why it is needed and how it would address the educational and economic situations that exist in that area.

Policy 1:

Student answers will vary.

Paragraph Support:

Student answers will vary.

Policy 2:

Student answers will vary.

Paragraph Support:

Student answers will vary.

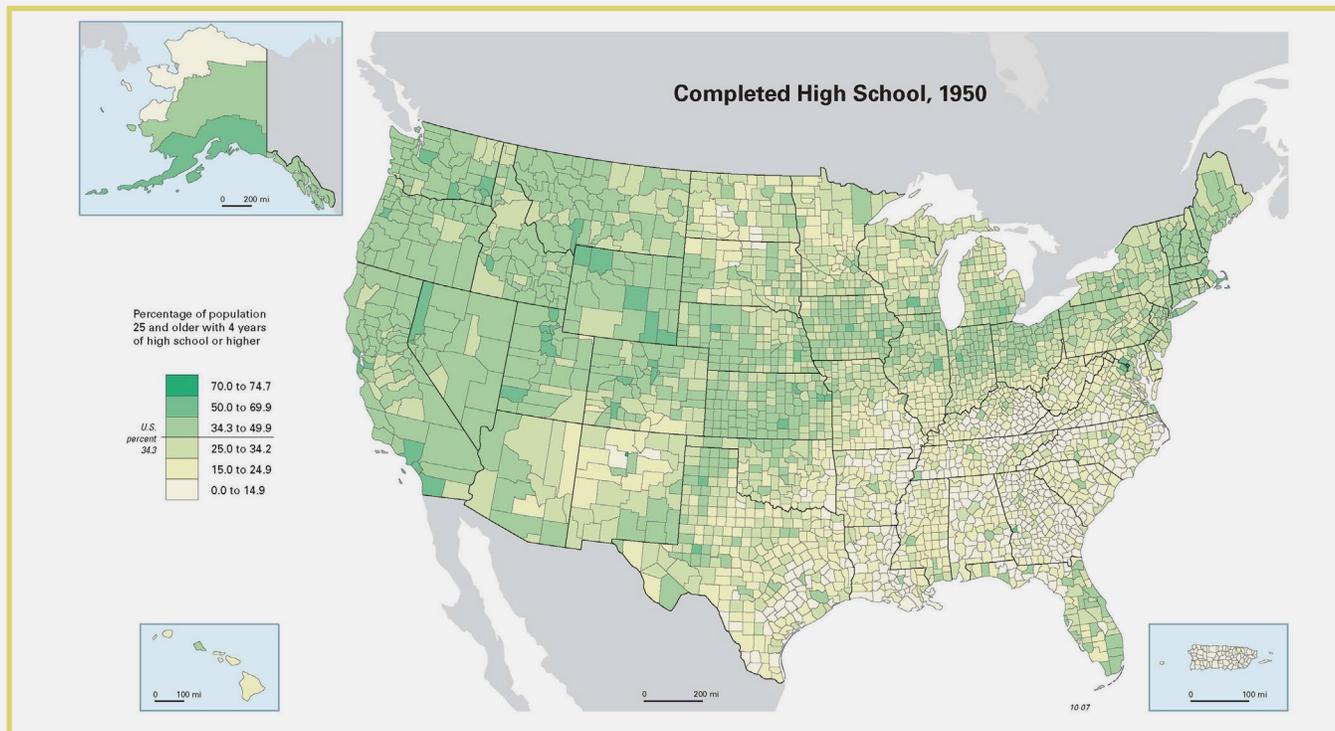
Policy 3:

Student answers will vary.

Paragraph Support:

Student answers will vary.

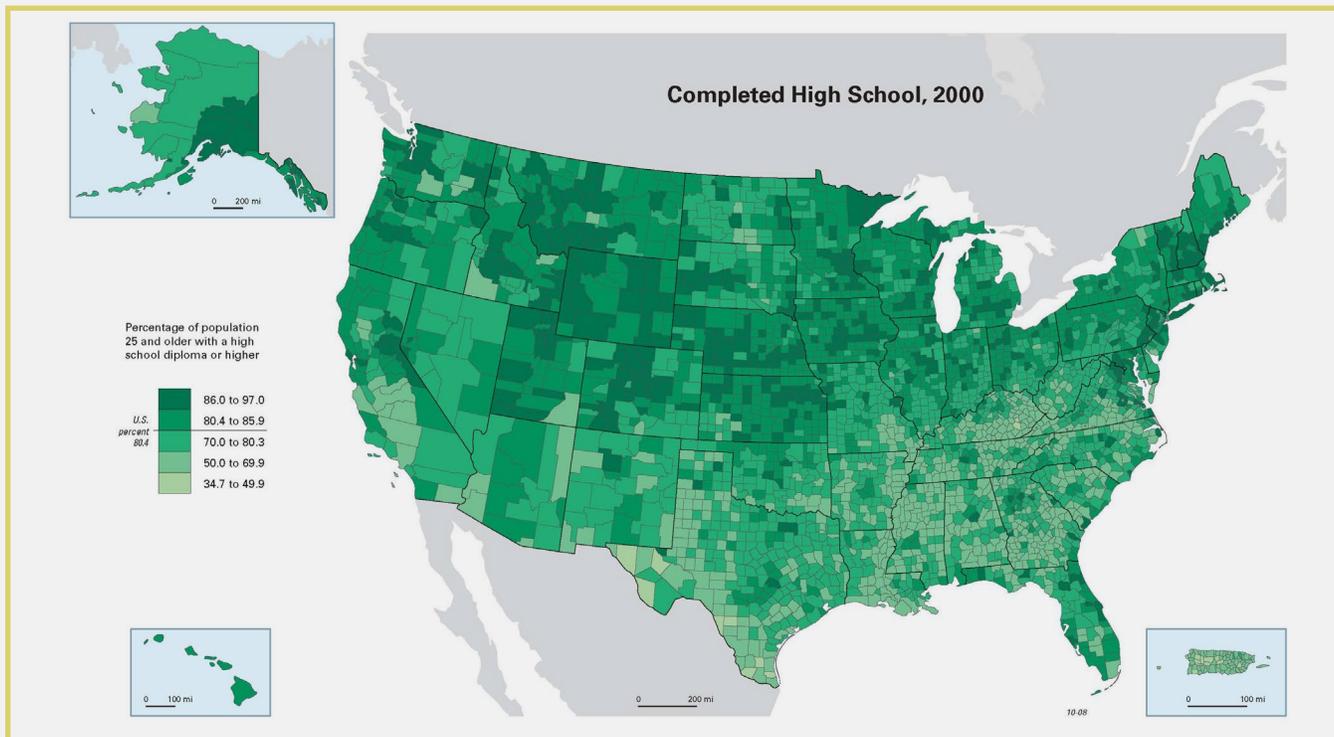
Item 1: Completed High School, 1950 Map



www.census.gov/population/www/cen2000/censusatlas

Click on the link above, then click on the Education PDF. This map appears on page 162 of the original document.

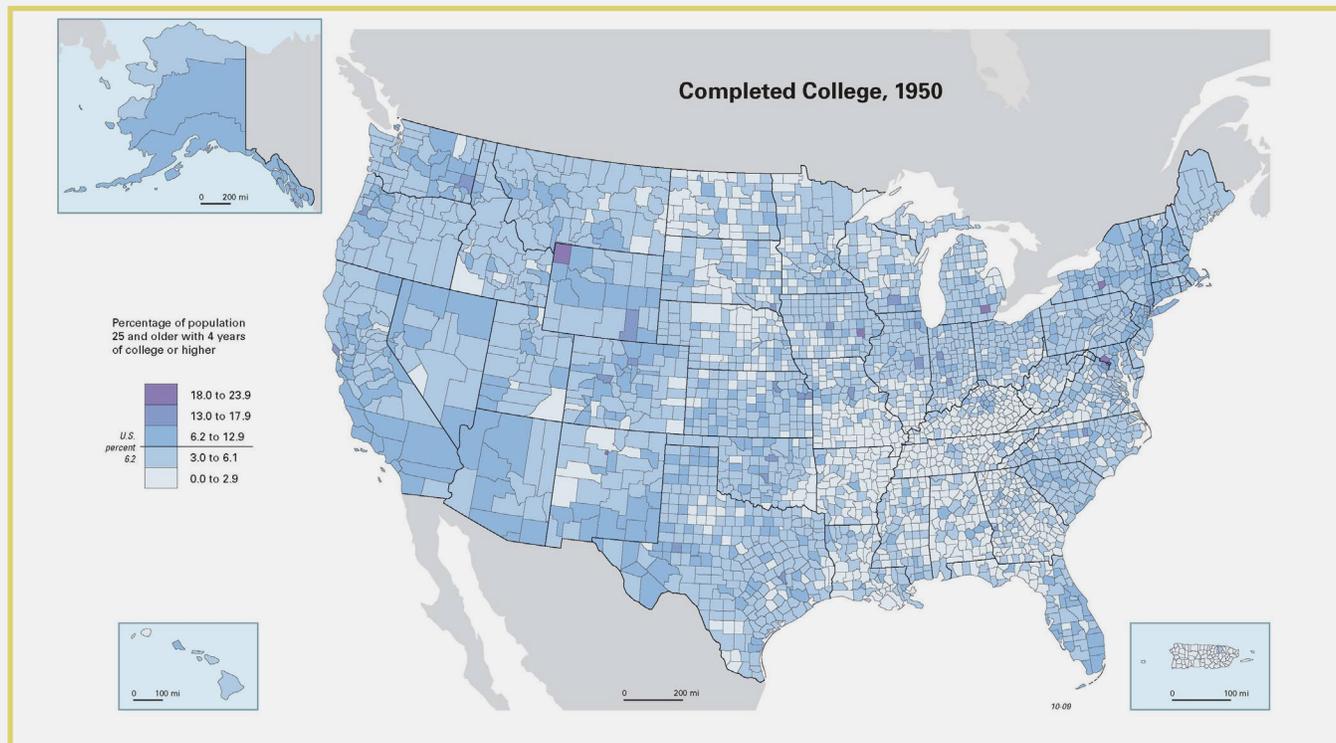
Item 2: Completed High School, 2000 Map



www.census.gov/population/www/cen2000/censusatlas

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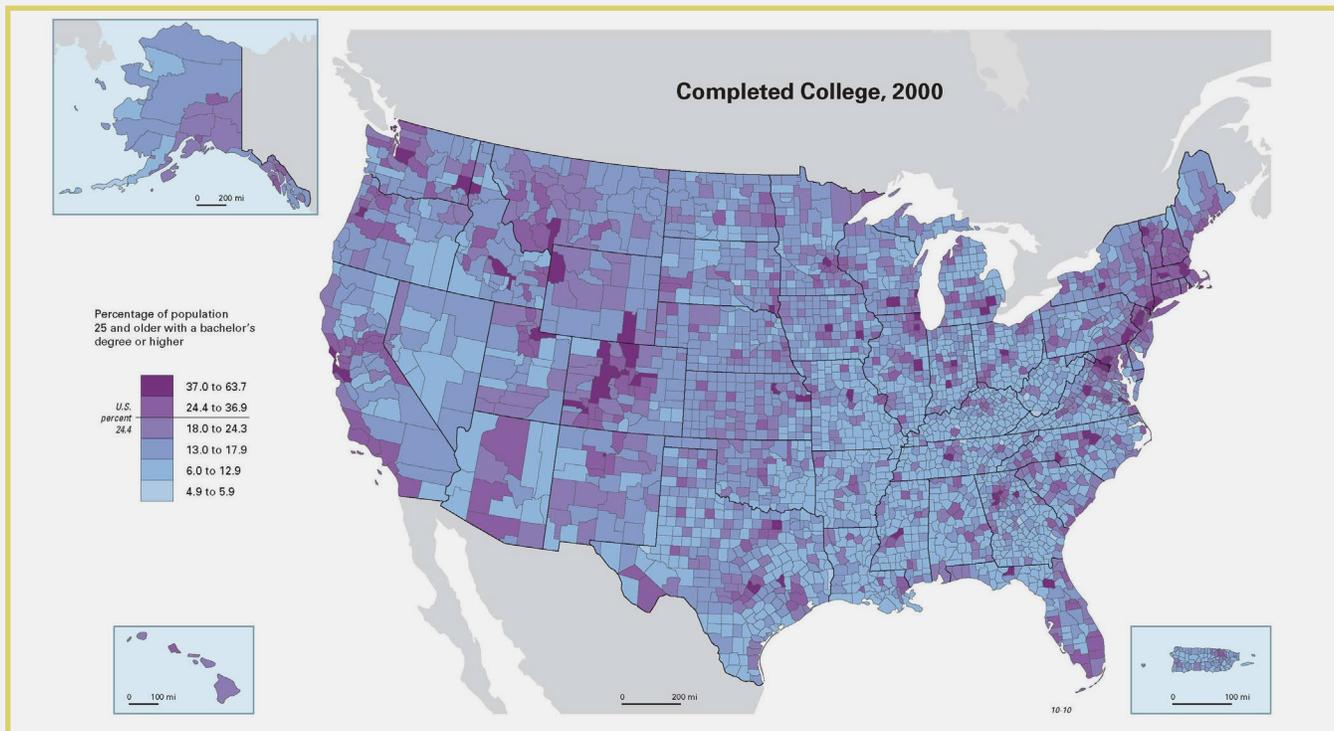
Item 3: Completed College, 1950 Map



www.census.gov/population/www/cen2000/censusatlas

Click on the link above, then click on the Education PDF. This map appears on page 163 of the original document.

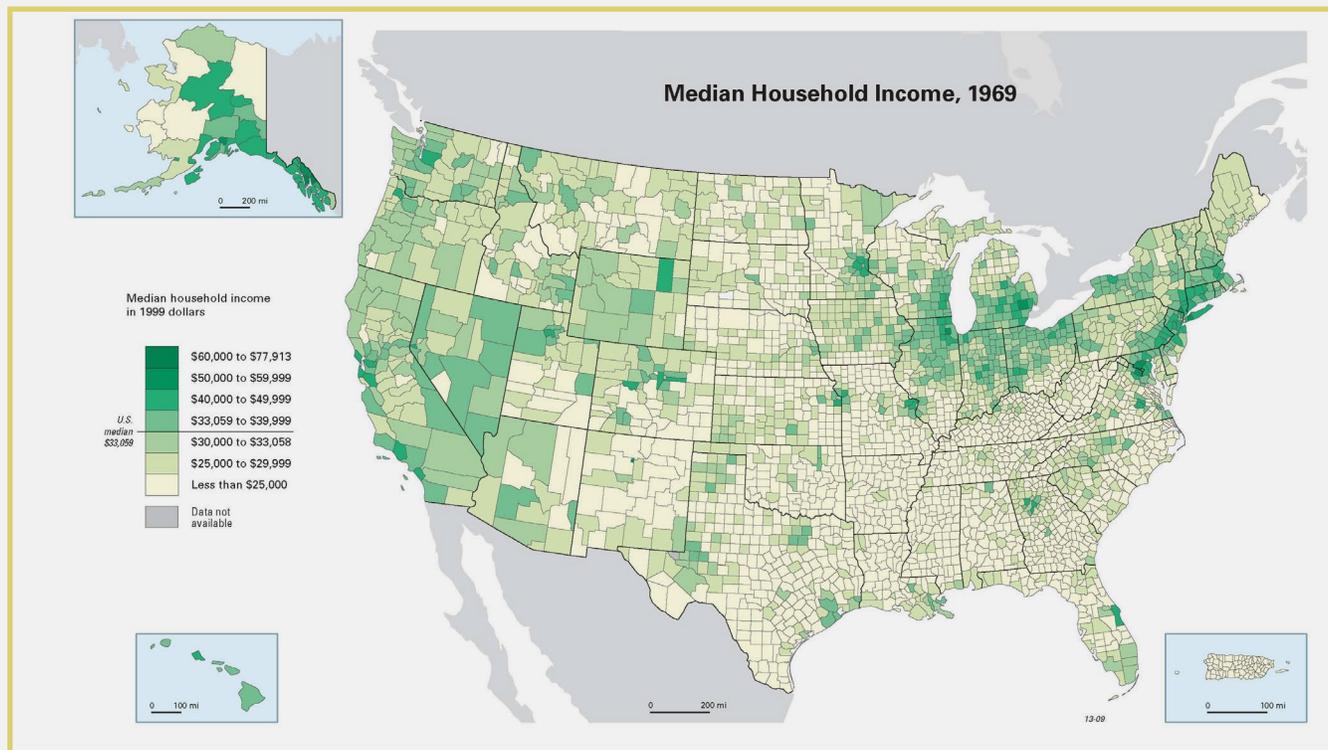
Item 4: Completed College, 2000 Map



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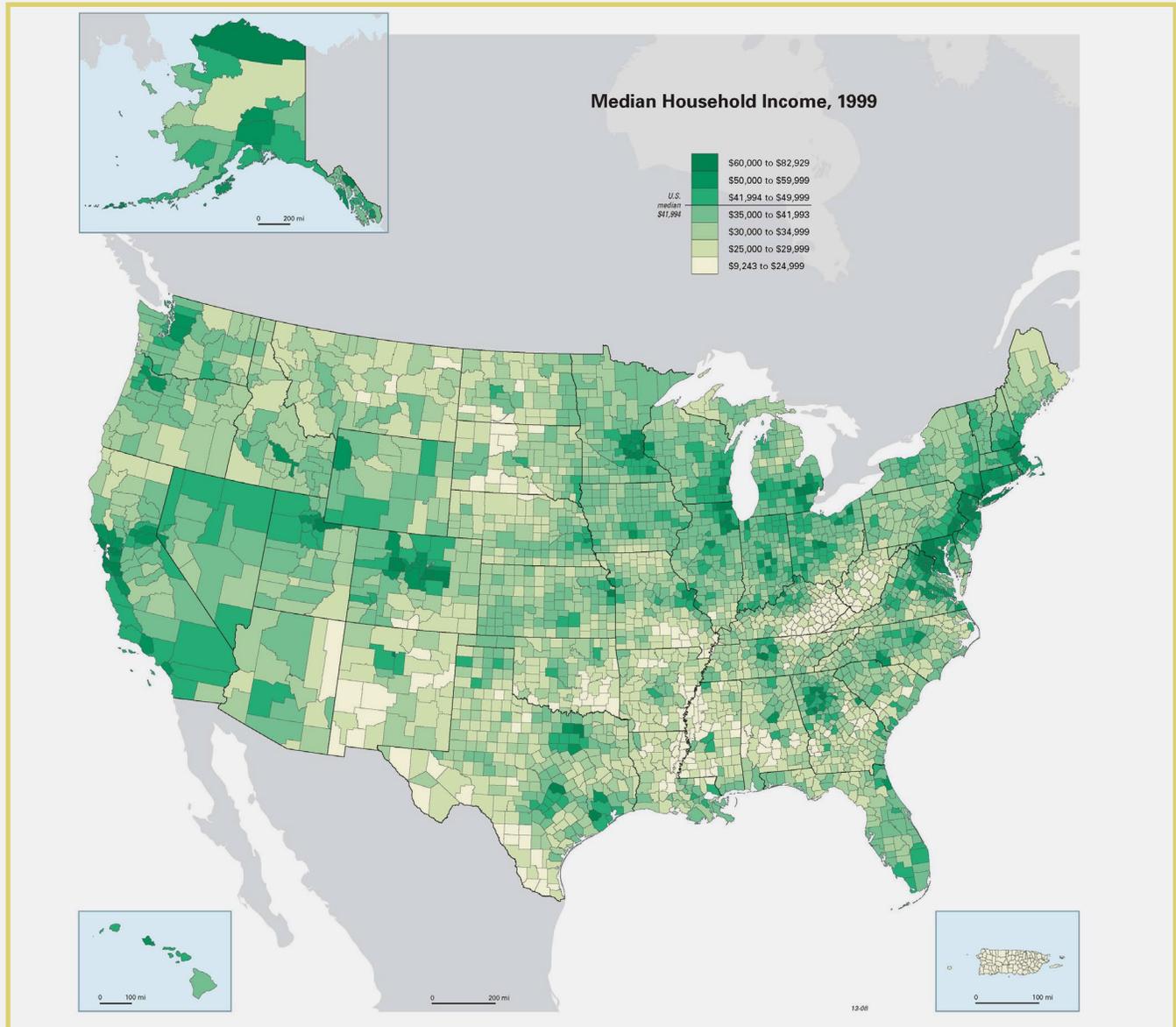
Item 5: Median Household Income, 1969 Map



www.census.gov/population/www/cen2000/censusatlas

Click on the link above, then click on the *Income and Poverty PDF*. This map appears on page 216 of the original document.

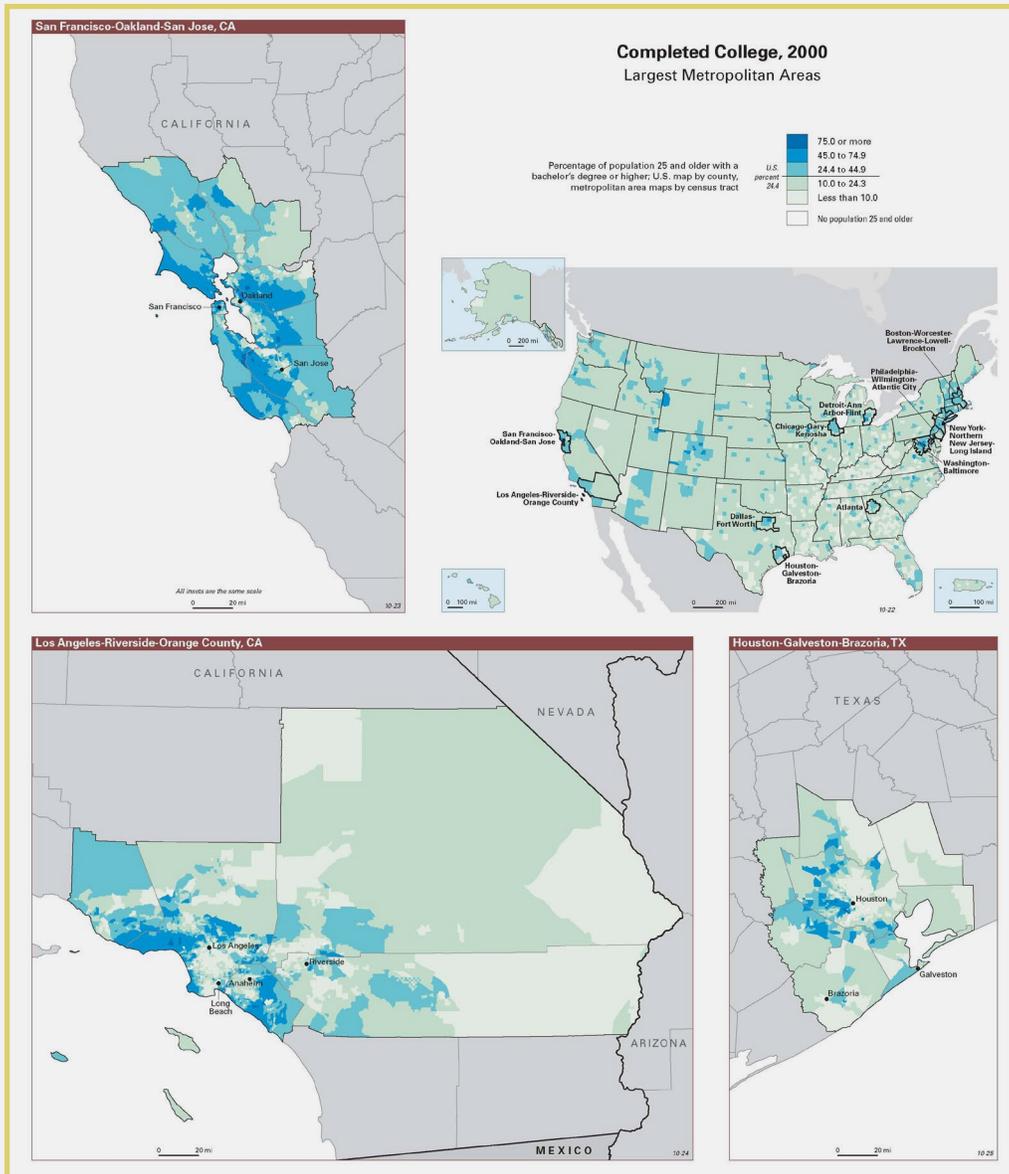
Item 6: Median Household Income, 1999 Map



www.census.gov/population/www/cen2000/censusatlas

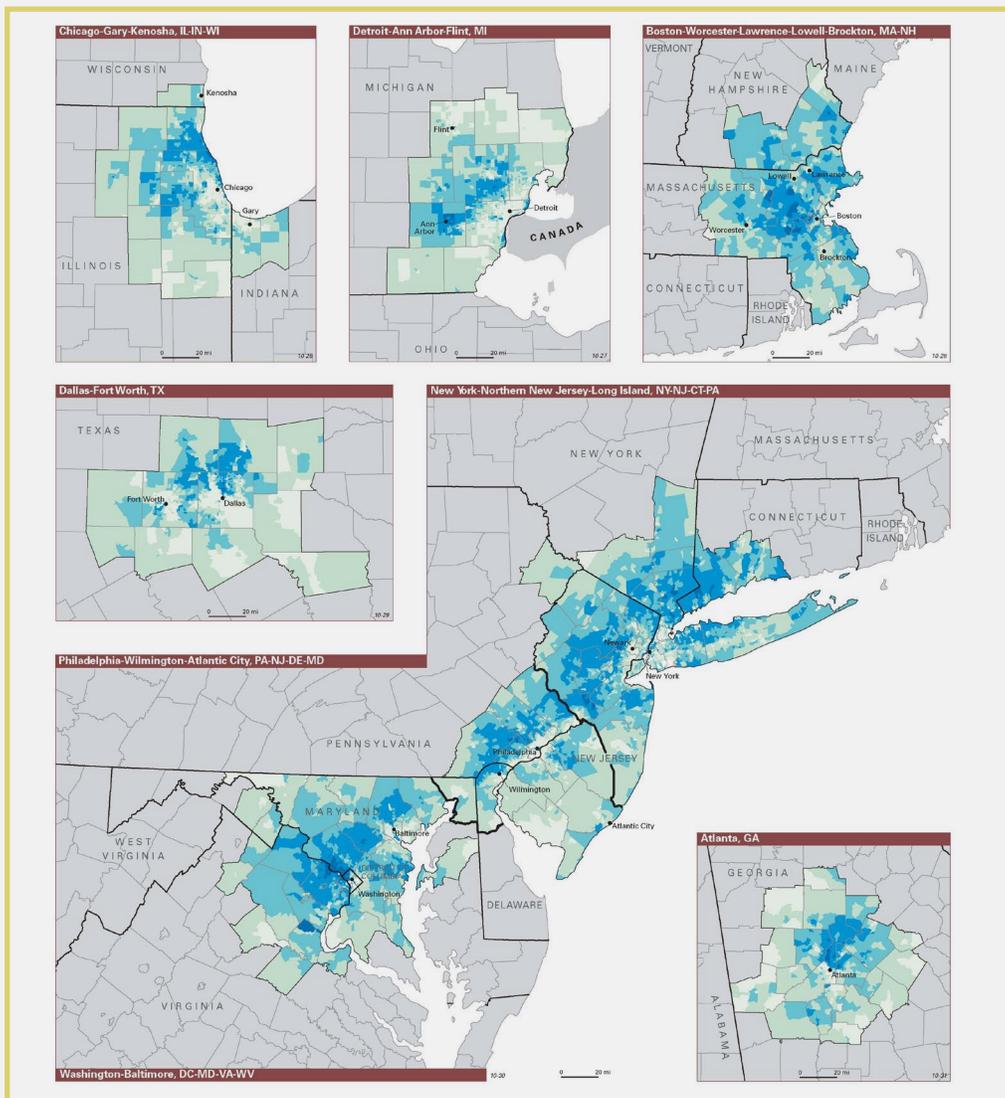
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Item 7: Completed College, Largest Metropolitan Areas, 2000 Map



(Item 7 continues onto the next page)

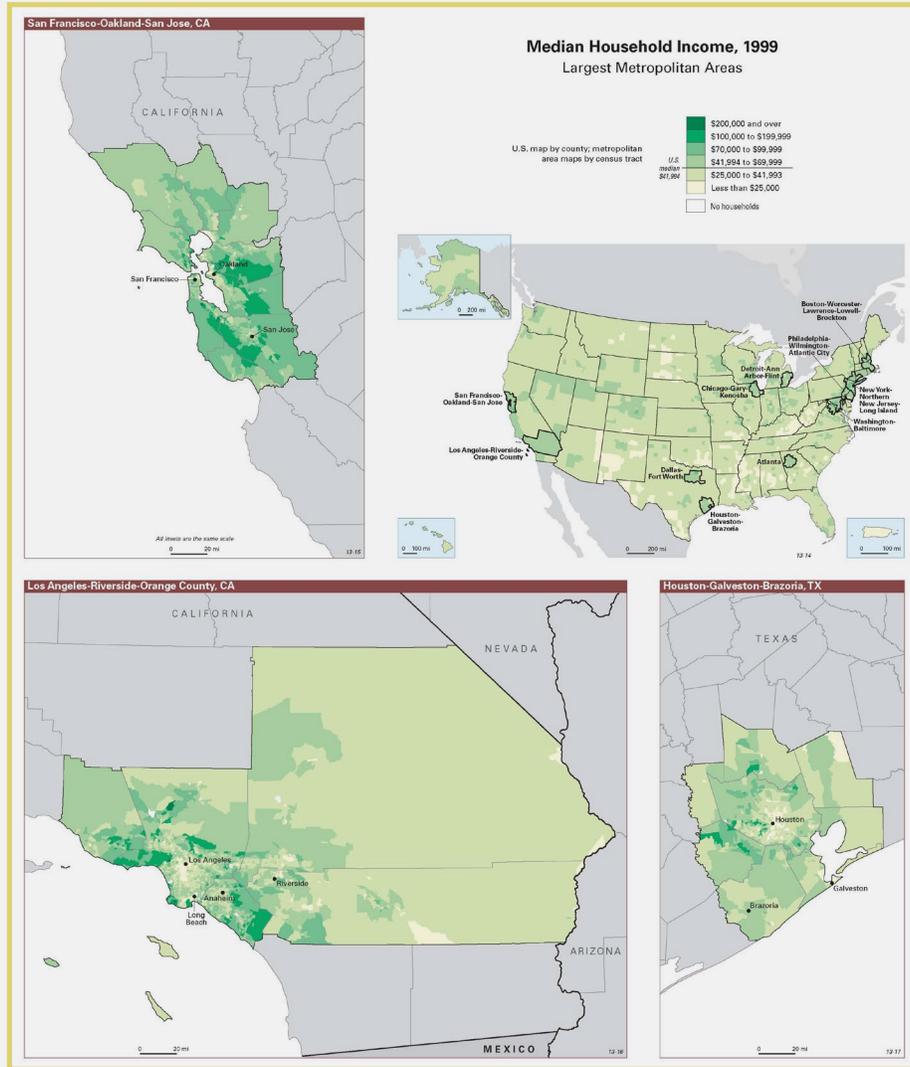
Item 7: Completed College, Largest Metropolitan Areas, 2000 Map (Continued)



www.census.gov/population/www/cen2000/censusatlas

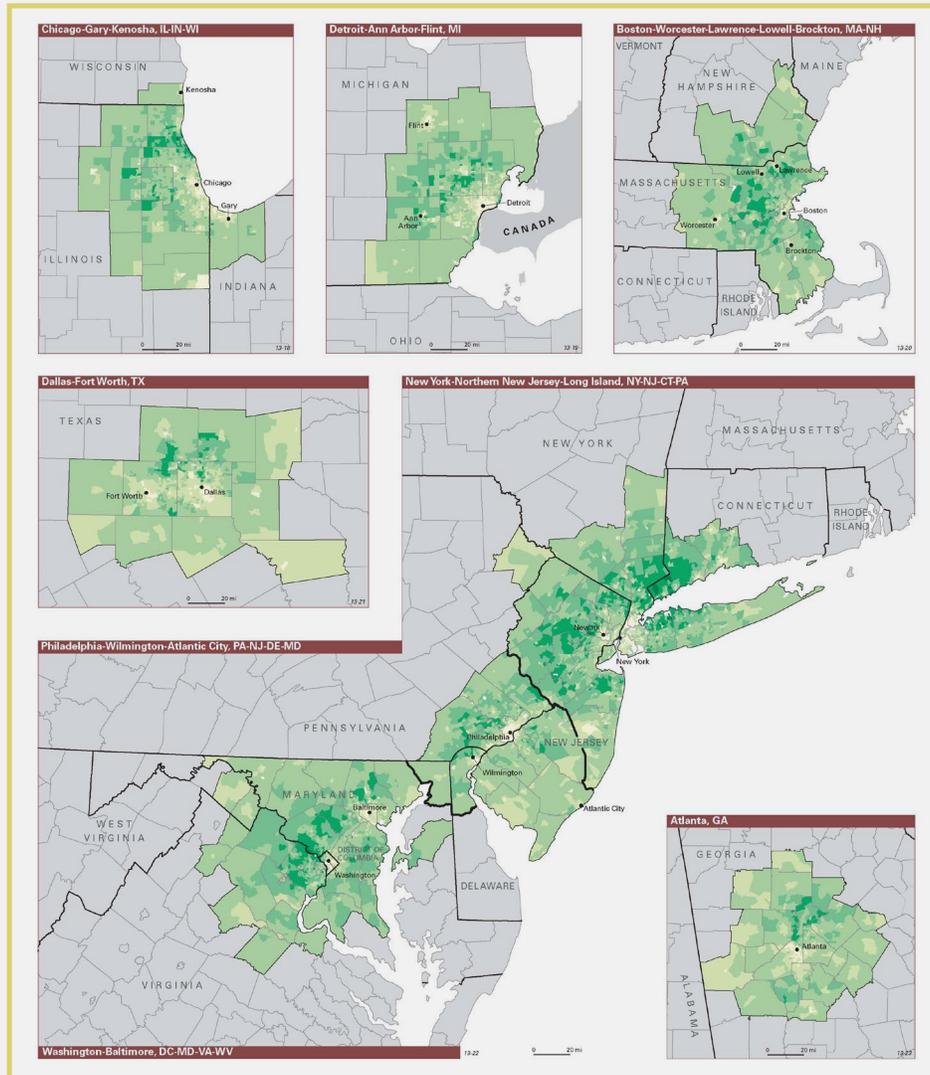
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Item 8: Median Household Income, Largest Metropolitan Areas, 1999 Map



(Item 8 continues onto the next page)

Item 8: Median Household Income, Largest Metropolitan Areas, 1999 Map (Continued)



www.census.gov/population/www/cen2000/censusatlas

Click on the link above, then click on the *Income and Poverty PDF*. This map appears on pages 218–219 of the original document.