DATA VISUALIZATION

Prof. Johannes Reichgelt, PhD

Final Project Report

Educational Attainment: United States Demographical analysis

By Sai Priya Mallampati

U73884430

Introduction

Background

Education has long been recognized as a critical driver of economic prosperity and social mobility. As the global economy increasingly relies on knowledge-based industries, the impact of educational attainment on economic outcomes has become a focal point for policymakers, educators, and researchers. This project aims to analyse how educational attainment varies across different demographic groups, its correlation with income levels, and the influence of higher education on state-level GDP per capita. Understanding these relationships is essential for developing strategies that leverage education to promote economic equality and enhance overall economic performance.

Research Questions

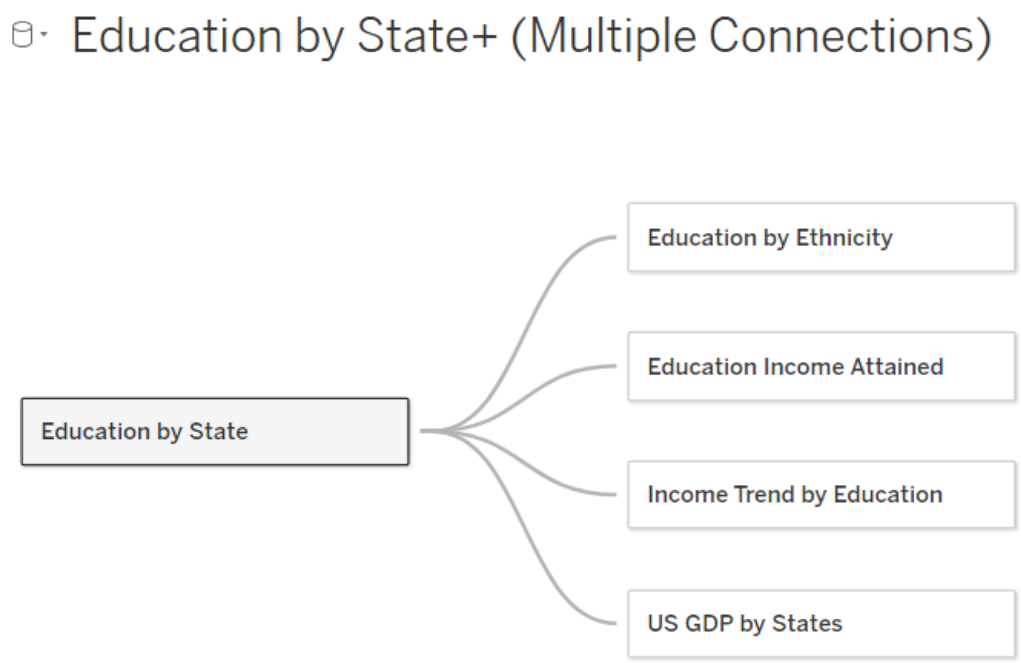
The project is guided by three principal research questions:

- How does educational attainment vary across different demographic groups?
- What is the relationship between educational attainment and income levels?
- Does a higher proportion of individuals with higher education lead to higher GDP per capita in a state?

These questions seek to uncover the broader implications of educational achievements and provide insights that can help in crafting policies to optimize educational impacts on economic development.

Methodology

Data Sources



For this comprehensive study on the impacts of educational attainment on socio-economic outcomes in the United States, several reputable data sources were employed.

1. U.S. Census Bureau Data: **Educational Attainment data**

Description: This dataset provides detailed statistics on educational attainment across various demographics, including ethnicity and state. It offers insights into the distribution of educational levels from high school to doctoral degrees.

2. Annual Earnings by Education Level: **Annual Earnings data**

Description: The NCES dataset tracks annual earnings based on educational attainment, which allows analysis of the economic outcomes associated with different levels of educational achievement.

3. GDP by U.S. States and Territories: **State GDP Data**

Description: This list compiles the Gross Domestic Product (GDP) figures for each U.S. state and territory, facilitating a comparative analysis of economic performance relative to educational attainment levels within states.

Data Analysis Tools

Tableau: Utilized for creating dynamic and interactive visualizations that depict the correlation between educational attainment and various socio-economic indicators such as income and state GDP. Visualizations include pie charts, scatter plots, bar graphs, and maps, which are instrumental in analysing trends and patterns.

Excel: Used for preliminary data analysis and organization before visualization. Excel helped in cleaning and structuring the data to be effectively imported into Tableau for more complex visualizations.

Data Processing

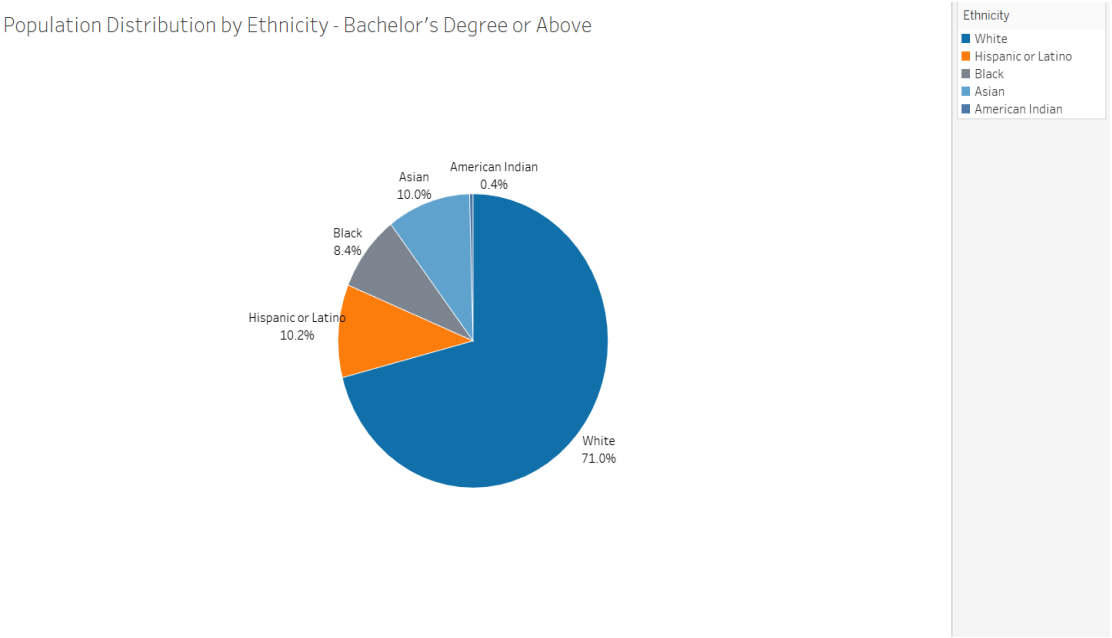
Pre-processing: Data from different sources was cleaned and standardized to ensure compatibility and accuracy in Tableau.

Visualization: Data was then imported into Tableau, where it was used to generate a series of visualizations that address each of the research questions. This included the creation of pie charts, bar graphs, scatter plots, and choropleth maps to visually represent the data in an easily interpretable manner.

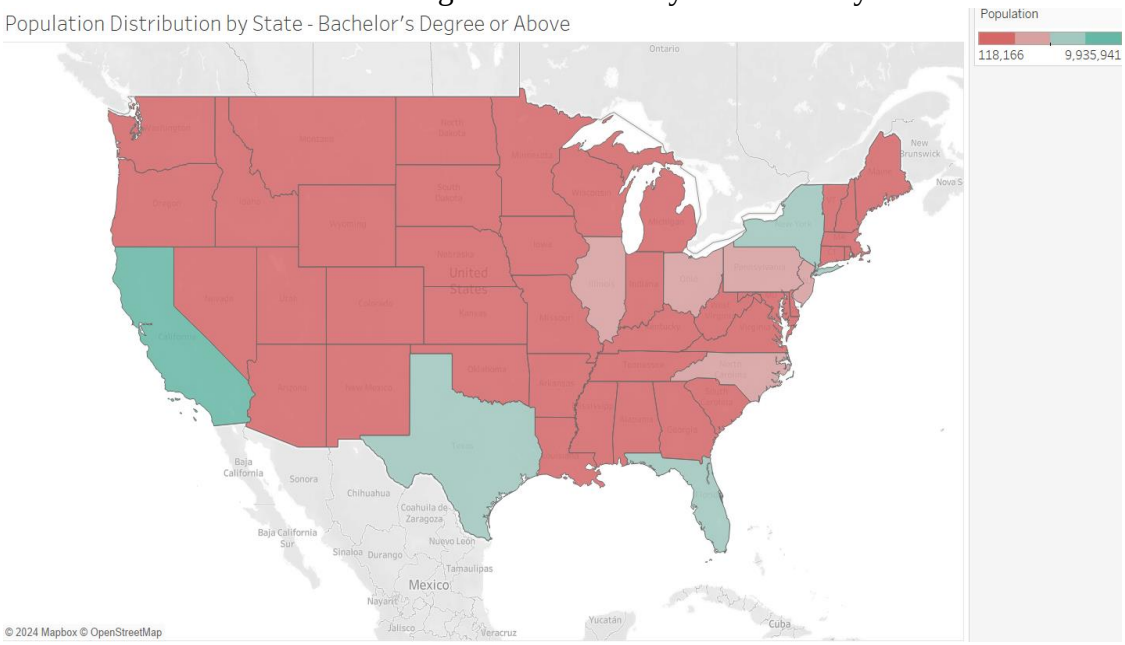
Analysis

1. How does educational attainment vary across different demographic groups?

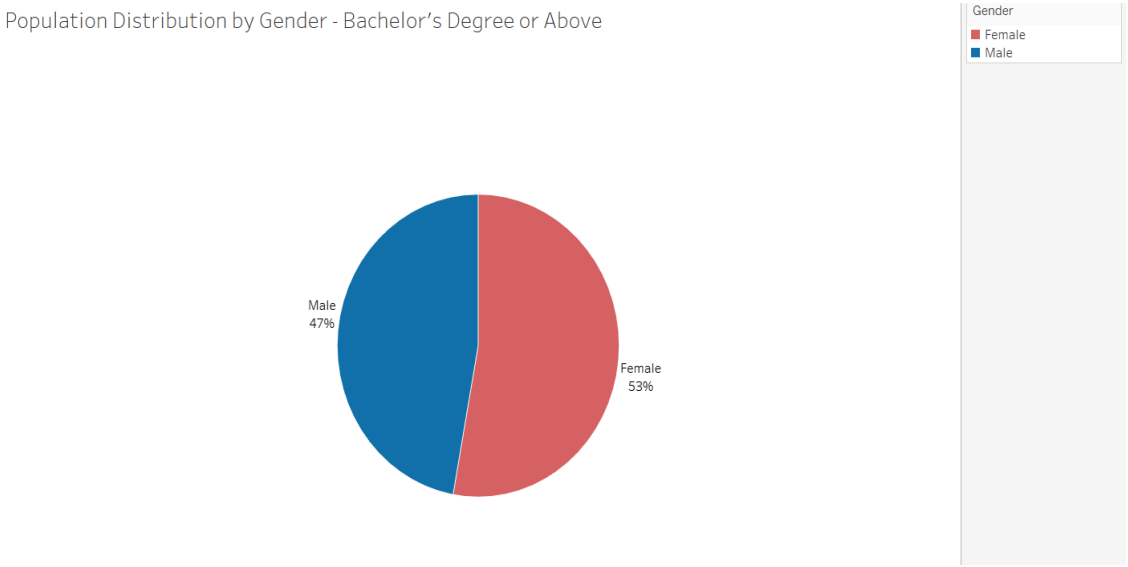
- **Population Distribution by Ethnicity - Bachelor's Degree or Above:**
  The pie chart illustrates the distribution of the U.S. population with a Bachelor's degree or higher across different ethnic groups. The chart segments include White (71.0%), Hispanic or Latino (10.2%), Asian (10.0%), Black (8.4%), and American Indian (0.4%) populations, each represented by a different color for clarity. This visualization addresses the question of how educational attainment, specifically obtaining a Bachelor's degree or higher, varies across different ethnic groups in the U.S. It highlights disparities in higher education attainment across ethnic groups and underscores the need to address these disparities through targeted programs and policies aimed at increasing equity and access to higher education.



- **Population Distribution by State - Bachelor's Degree or Above:**
  The choropleth map provides a visual representation of the distribution of the population with a Bachelor's degree or higher across the United States, with each state color-coded according to the concentration of residents with at least a bachelor's degree. This map addresses the question of how the distribution of higher education levels varies by state, helping to understand geographical trends in educational attainment. The visualization effectively identifies both high-performing areas and regions that might require additional support or intervention concerning higher education. States such as California and New York show a higher concentration of residents with a bachelor's degree or above, while some states, particularly in more rural regions, display lower percentages. This map serves a critical role in discussions about education policy, economic development, and workforce planning by illustrating the educational foundation from which states can grow economically and culturally.

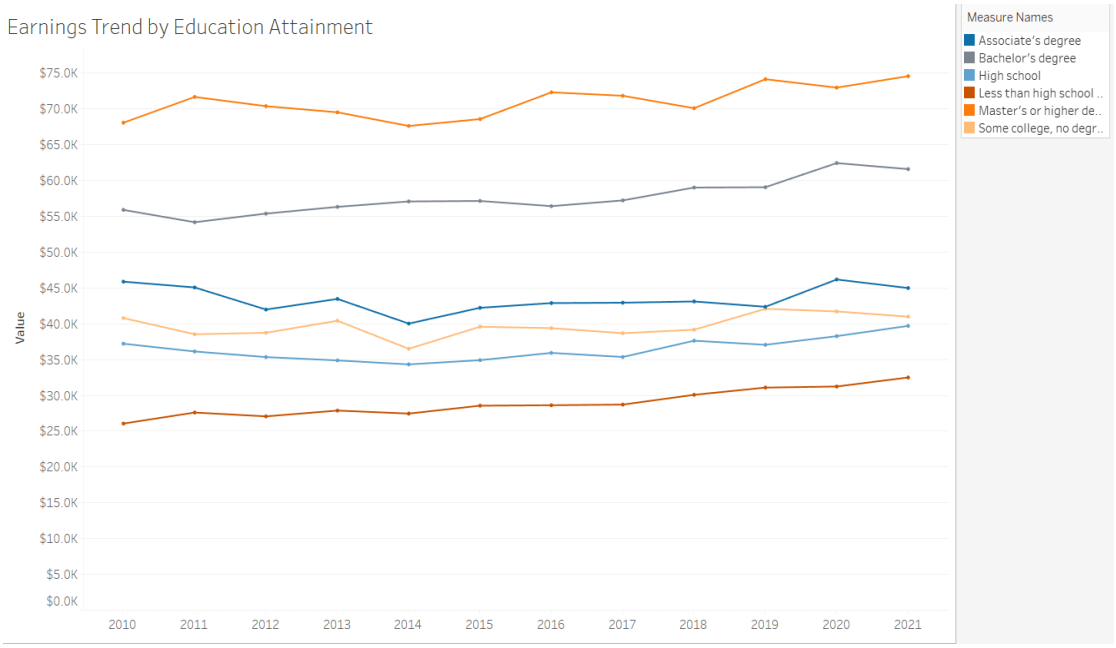


- **Population Distribution by Gender - Bachelor's Degree or Above:**
  The pie chart illustrates the distribution of the U.S. population with a Bachelor's degree or higher, segmented by gender, with females making up 53% and males 47%. This visualization effectively shows the percentage split between males and females who have achieved higher education, providing an instant visual grasp of gender distribution in higher education. The chart reflects a broader trend seen in many educational systems where females are increasingly achieving higher educational levels. Recognizing this distribution can lead to more informed discussions and policies regarding gender dynamics in higher education, potentially influencing efforts to ensure equal opportunities for all genders in academic and professional settings. This visualization effectively communicates key demographic information regarding educational attainment by gender, offering valuable insights into the gender dynamics of higher education.

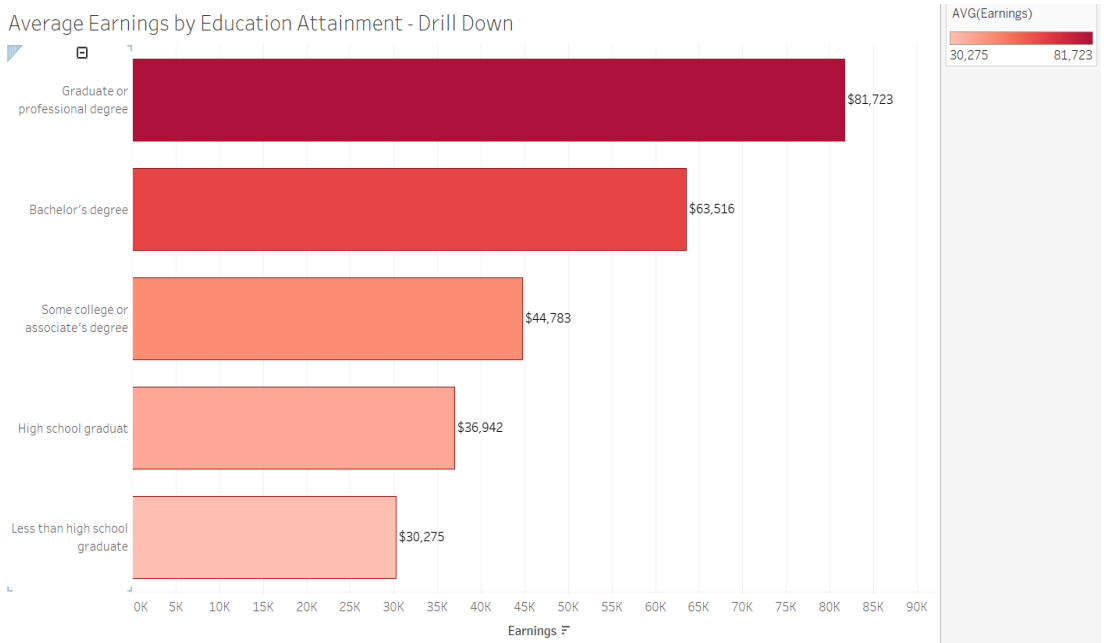


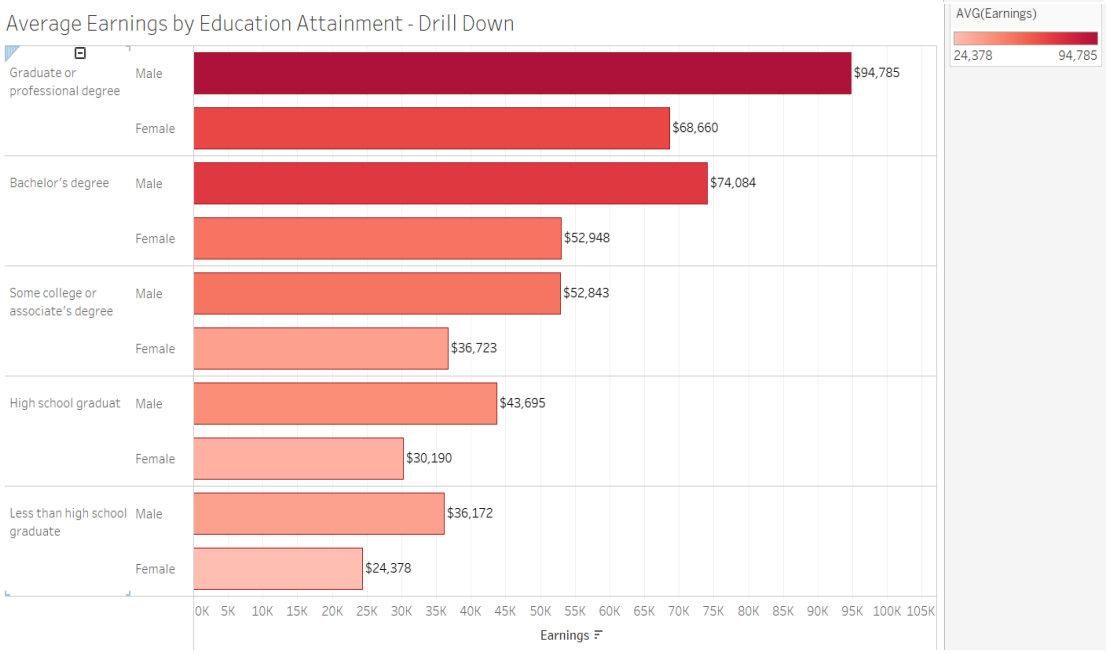
2. What is the relationship between educational attainment and income levels?

- **Earnings Trend by Education Attainment:**
  The line graph illustrates the trend of average annual earnings from 2010 to 2021 across various educational attainment levels, including high school, some college (no degree), Associate's degree, Bachelor's degree, and Master's or higher degree. This visualization addresses the research question of what the relationship is between educational attainment and income levels and how it has evolved over the past decade. The graph clearly shows that individuals with a Master's degree or higher consistently earn the most. This visualization highlights the economic implications of educational investments and the importance of continuous educational and professional development for achieving higher income



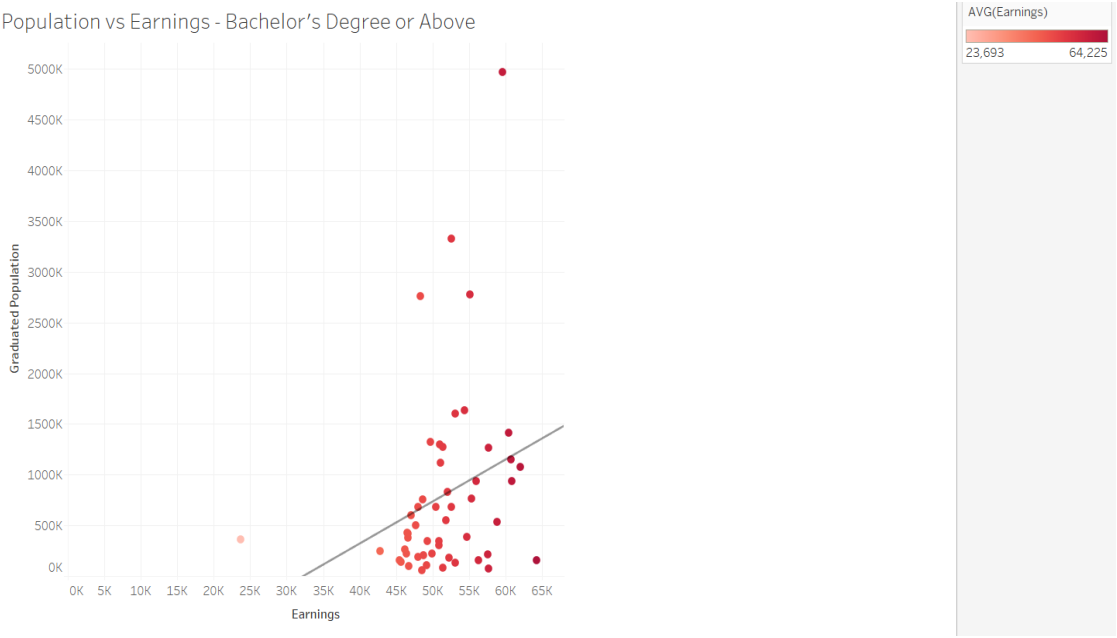
- **Average Earnings by Education Attainment - Drill Down:**
  The bar chart presents the average earnings by level of educational attainment, from less than high school to graduate or professional degrees, illustrating the financial benefits of continued education. The enhanced bar chart with a drilldown feature further segments the average earnings by gender within each educational level, highlighting income disparities between genders. The visualizations effectively demonstrate the incremental increases in average earnings with higher educational attainment and the influence of gender on these economic outcomes. The charts show that individuals with graduate or professional degrees earn significantly more than those with lower levels of education, and there are evident gaps in earnings between males and females at the same education levels. Together, these visualizations offer a comprehensive overview of how education and gender impact earnings, enriching the understanding of economic outcomes associated with educational attainment and emphasizing the need for ongoing efforts to achieve gender parity in the workplace.





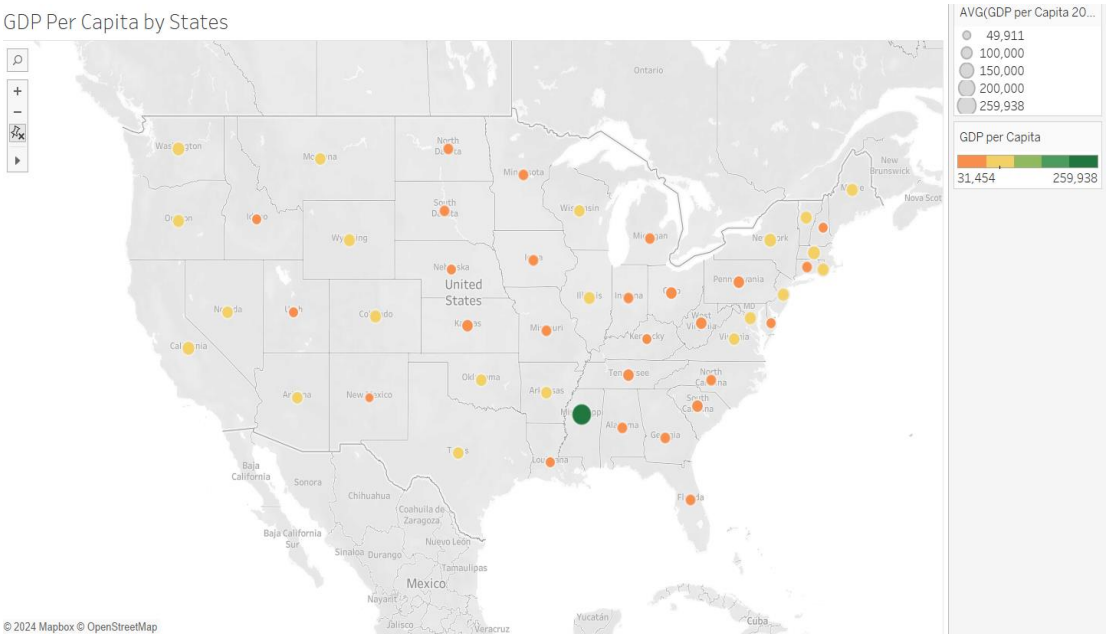
- **Population vs Earnings - Bachelor's Degree or Above**
  The scatter plot examines the relationship between the population size of individuals holding a Bachelor's degree or higher and their average earnings in various regions or demographic groups, with the x-axis representing the graduate population and the y-axis showing average earnings. The plot and trend line help to decipher whether a larger educated population correlates with higher average earnings, aiding stakeholders in assessing the value of educational attainment in economic terms. The trend line suggests a positive correlation between the size of the educated population and average earnings, indicating that regions with more bachelor's degree holders generally have higher earnings. Analyzing these patterns can lead to more targeted educational and economic development programs, especially in regions that underperform economically despite high levels of educational attainment. This visualization offers valuable insights into the interplay between education and economic prosperity,

supporting the hypothesis that higher educational attainment can lead to higher average earnings, thereby bolstering the case for investments in higher education.

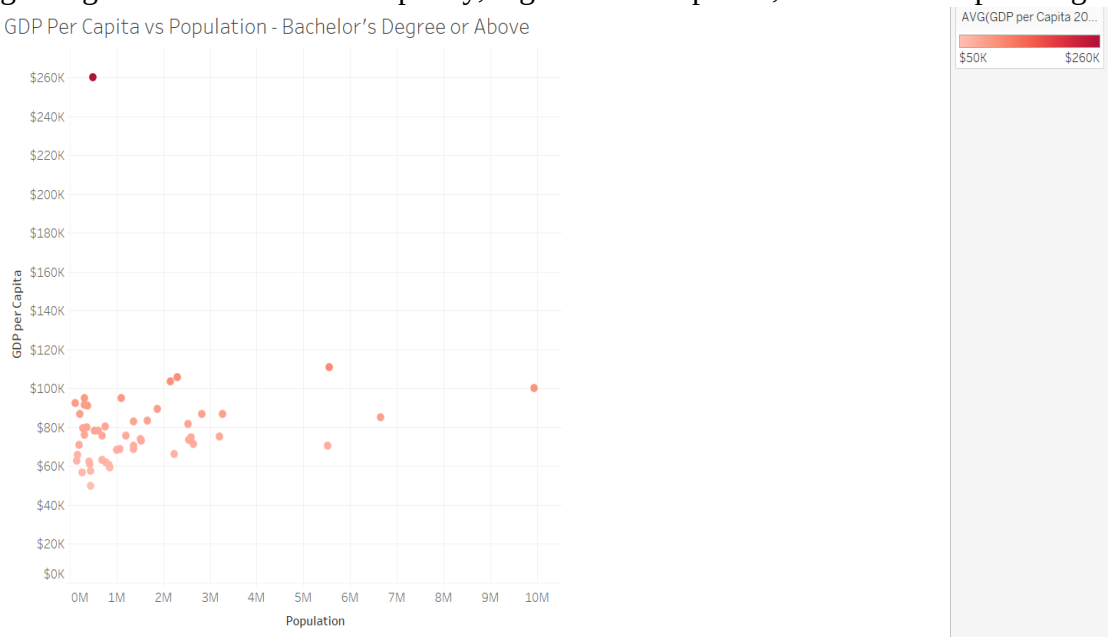


3. Does a higher proportion of individuals with higher education lead to higher GDP per capita in a state?

- **GDP Per Capita by States:**
  The map visualization displays the Gross Domestic Product (GDP) per capita for each state in the United States, using colored circles to represent the varying levels of economic output per person. The map effectively communicates the distribution and intensity of economic activity across the states, providing an intuitive understanding of where the economy is most vibrant and where it may be lagging. States with major urban centers or those known for high-tech industries, finance, or rich natural resources often show higher GDP per capita, while more rural or economically challenged states display lower economic output per person. The visualization serves as a powerful tool for analyzing regional economic disparities, identifying patterns of wealth distribution, and guiding targeted economic policies and investments. It offers clear, spatial insights into the economic health and disparities across the United States, aiding in more informed decision-making at both state and national levels.



- **GDP Per Capita vs Population - Bachelor's Degree or Above:**
The scatter plot charts the relationship between the population with a Bachelor's degree or higher and GDP per capita across various regions or states, exploring whether regions with higher proportions of educated residents tend to have higher GDP per capita. The visualization effectively displays correlations or lack thereof between higher education levels and economic output per capita, providing policymakers, economists, and educational planners with a clear picture of how education impacts economic performance at a regional level. The clustering of data points mainly in the lower GDP per capita range with varying populations may indicate that while higher education is prevalent, its economic impact might be diluted in larger populations or affected by other regional economic factors. Outliers with exceptionally high GDP per capita could be influenced by factors such as the presence of high-paying industries, technology hubs, or financial sectors. This visualization serves as a crucial analytical tool for understanding the impact of educational attainment on economic health, guiding decisions in education policy, regional development, and economic planning.



Conclusion:

Conclusions for Research Questions:

1.How does educational attainment vary across different demographic groups?

The analysis using pie charts and choropleth maps indicates significant variation in educational attainment across ethnic, gender, and geographic lines. Notably, the data reveals a higher percentage of females than males possessing a Bachelor's degree or higher. Furthermore, certain ethnic groups and states exhibit disparities in higher educational achievements, with populations in urbanized states showing higher educational attainment compared to those in more rural areas. This suggests the impact of socio-economic factors, availability of educational resources, and potentially cultural influences on educational outcomes.

2. What is the relationship between educational attainment and income levels?

Line graphs, bar charts, and scatter plots clearly demonstrate a positive correlation between higher educational attainment and increased earnings. Individuals with higher degrees tend to have higher average incomes, with notable gaps between those with graduate degrees and those with lower educational qualifications. This trend underscores the economic value of higher education as an investment in human capital that yields returns in the form of higher earnings.

3.Does a higher proportion of individuals with higher education lead to higher GDP per capita in a state?

The scatter plots and state GDP maps show a general trend where states with a higher proportion of residents holding at least a Bachelor's degree tend to have higher GDP per capita. This correlation suggests that higher educational attainment within a population may contribute to greater economic productivity and prosperity, likely due to a more skilled workforce capable of higher value-added economic activities.

Key Findings:

Educational Resources: States with better-funded and more accessible educational institutions might produce higher levels of educational attainment.

Economic Opportunities: Regions with diverse and dynamic economies may attract and retain highly educated individuals, contributing to both higher individual earnings and greater overall economic output.

Policy and Infrastructure: Differences in policy and infrastructure supporting education across states and demographics can lead to variations in educational outcomes.

Future Research Questions:

1. What are the long-term effects of educational policies and initiatives on economic prosperity?
2. What is the role of education quality and skill development in determining economic outcomes?
3. What is the impact of technological advancements and automation on the returns to education

These further questions aim to delve deeper into the causal relationships and mechanisms behind the observed trends, helping to inform more targeted and effective educational and economic policies to promote equitable educational opportunities and foster economic growth.