ISM 6419 Data Visualization by

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FINAL PROJECT REPORT

On

Analysis of COVID-19's Impact on Unemployment and Poverty Rates Across the United States

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Introduction

The COVID-19 pandemic has greatly affected many parts of society, including health, the economy, and people's daily lives. Understanding these effects is important. This project looks at how COVID-19 has impacted the United States, focusing on key areas like infection rates, deaths, vaccination, unemployment, and poverty.

Using Tableau, this project creates easy-to-understand visualizations that explore the many impacts of the pandemic. These visualizations help users see trends, find connections, and understand how different states have been affected over time.

Background of the Project:

The project draws upon multiple datasets covering various aspects of the COVID-19 pandemic and its socio-economic impacts. These datasets include COVID-19 case numbers, mortality rates, vaccination coverage, unemployment rates, and poverty rates across different states in the United States. By integrating and visualizing these datasets, the project aims to provide valuable insights into the trends, patterns, and correlations related to the pandemic's impact on public health and socio-economic conditions. The objective is to enhance understanding of how COVID-19 has affected different regions and populations.

Ambitiousness of the Project

This project takes on a big task by bringing together different types of data to give a complete picture of the pandemic's impact. It combines COVID-19 case and death data with information on unemployment, poverty, and vaccination rates. The project provides both state-level and national insights, highlighting regional disparities and trends. This dual perspective is crucial for understanding the varied impact of COVID-19 across different geographic areas. This helps us understand the pandemic's effects on different states and groups of people in a detailed way, showing differences and trends.

Research Question 1:

1.What are the trends in unemployment rates before, during, and after the COVID-19 pandemic, and how do they vary across states?

Focus: Analysis of Unemployment Rates.

Aim: To examine the changes in unemployment rates over time, particularly focusing on the period before, during, and after the COVID-19 pandemic. To identify any significant trends, peaks, or recovery patterns and how these differ between states.

Research Question 2:

2. How have poverty rates changed across different states during the COVID-19 period?

Focus: Comparative Analysis of Poverty Rates

Aim: To assess the impact of COVID-19 on poverty rates across different states. To identify any increases or decreases in poverty rates during the pandemic and to understand how these changes vary Across States.

Research Question 3:

3. What was the severity of COVID-19 across different states in terms of cases and fatalities?

Focus: Analysis of COVID-19 Severity

Aim: To assess and compare the severity of COVID-19 across different states by analyzing the number of confirmed cases, Deaths and fatalities. This includes identifying which states experienced the highest and lowest impacts and understanding the geographic distribution of COVID-19 severity. The analysis will help to reveal any patterns or hotspots of severe outbreaks.

Research Question 4:

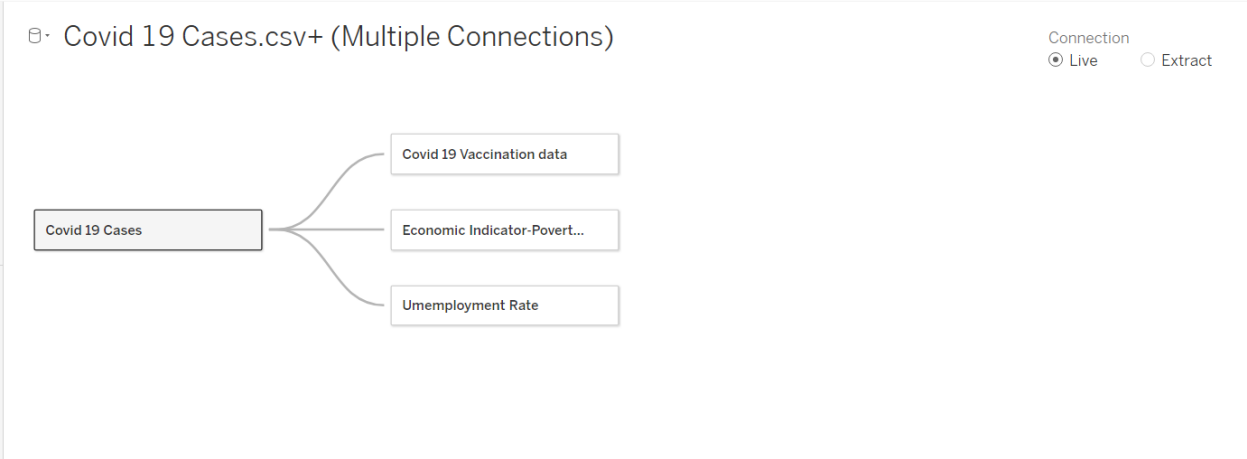
4. How did vaccination rates vary across states and what was their impact on COVID-19 cases?

Focus: Analyze the differences in vaccination rates across various states and examine how these rates influenced the number of COVID-19 cases.

Aim: To identify patterns and correlations between state-level vaccination rates and COVID-19 infection rates. This includes assessing whether higher vaccination rates were associated with lower infection rates and understanding the geographical variations in vaccination uptake and its impact on public health during the pandemic.

Methodology

Data Sources



The data for this project is sourced from multiple reliable sources, including:

1. **COVID-19 Cases and Deaths Data**: This dataset includes the number of COVID-19 cases and deaths by state and year, providing a detailed view of the pandemic's progression.

   https://data.cdc.gov/Case-Surveillance/Weekly-United-States-COVID-19-Cases-and-Deaths-by-/pwn4-m3yp/about_data

2. **Unemployment Data**: This dataset comprises the unemployment rates by state from 2019 to 2022, allowing for an analysis of employment trends relative to the pandemic.

   https://dlt.ri.gov/media/15101/download?language=en

3. **Poverty Rates Data**: This dataset includes poverty rates across states for the years 2020 to 2022, enabling an exploration of socio-economic impacts.

   https://www2.census.gov/programs-surveys/cps/tables/time-series/historical-poverty-people/hstpov18.xlsx

4. **Vaccination Data**: This dataset provides information on the percentage of residents and staff up to date on their vaccines by state, offering insights into vaccination coverage and its effects.

   https://data.cms.gov/provider-data/dataset/avax-cv19

The data is integrated and visualized using Tableau to create interactive dashboards that address the research questions.

Data Pre-Processing Steps for the Project:

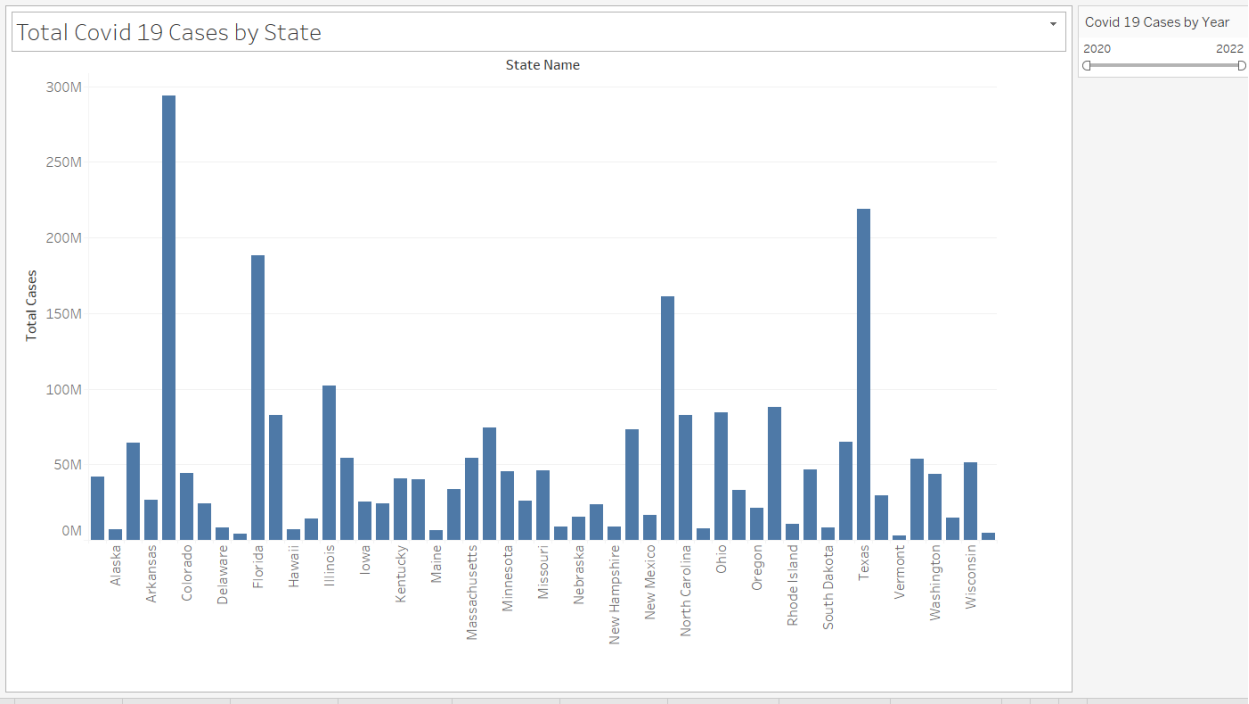
Data Cleaning: Check for and handle missing values in the datasets. Ensure consistency in date formats, state names, and other categorical data. Remove any duplicates that may be present.

Pivot and Format Data: For datasets with year-wise data in columns (e.g. poverty rates for different years), pivot the data so that years become a single column. Ensure that each dataset has a consistent format with columns for State, Year and relevant metrics.

Data Visualization Tool: For the project Data Visualization tool utilized is Tableau. Preferred for its intuitive interface, enabling us to create visually appealing and interactive dashboards effortlessly. Its robust analytical capabilities empower users to explore data insights dynamically, enhancing decision-making processes.

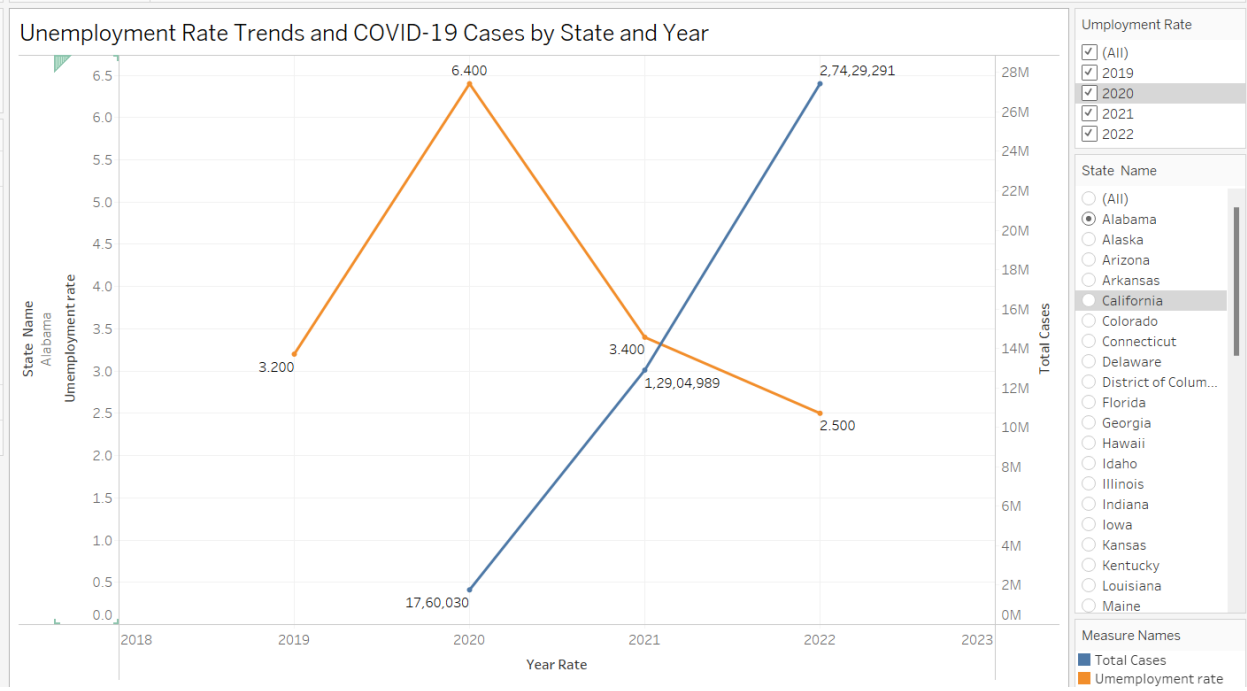
Analysis

Visualization 1:



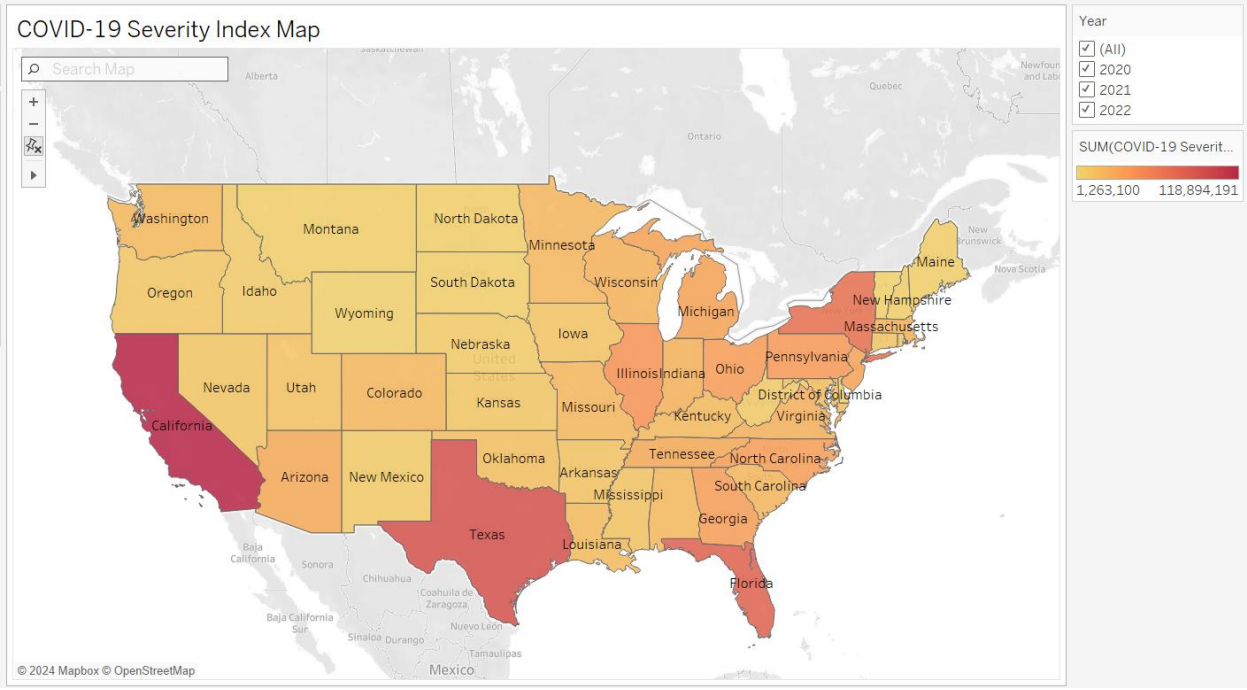
Total COVID-19 Cases by State: A bar chart visualizing the total number of COVID-19 cases by state. visualization is a bar chart that provides a clear and comparative view of the total number of COVID-19 cases across different states in the United States. This chart helps in understanding the distribution and scale of the pandemic's impact across various regions.

Visualization 2:



- Unemployment Rate Trends and COVID-19 Cases by State and Year:
- The Unemployment Rate Trends and COVID-19 Cases visualization is a combined line chart that shows the relationship between the number of COVID-19 cases and the unemployment rates over time for different states. This chart helps us understand how the pandemic has affected unemployment rates in various states.
- The orange line represents the unemployment rate.
- The blue line represents the total number of COVID-19 cases
- The chart shows that before the pandemic in 2019, the unemployment rate was relatively low. During the peak of the pandemic in 2020, there was a significant increase in both COVID-19 cases and unemployment rates. After the peak, the unemployment rates started to decline as states began to recover. For instance, in 2021, California's unemployment rate decreased to 7.3%, and further to 4.3% in 2022, while COVID-19 cases continued to rise, reaching 2,74,29,291 by 2022.
- Before the pandemic, unemployment was low. During the pandemic, both cases and unemployment rates went up. After the peak of the pandemic, unemployment rates started to go down as states began to recover, even though COVID-19 cases kept increasing. The chart helps us understand the connection between the pandemic and job losses in different states over time

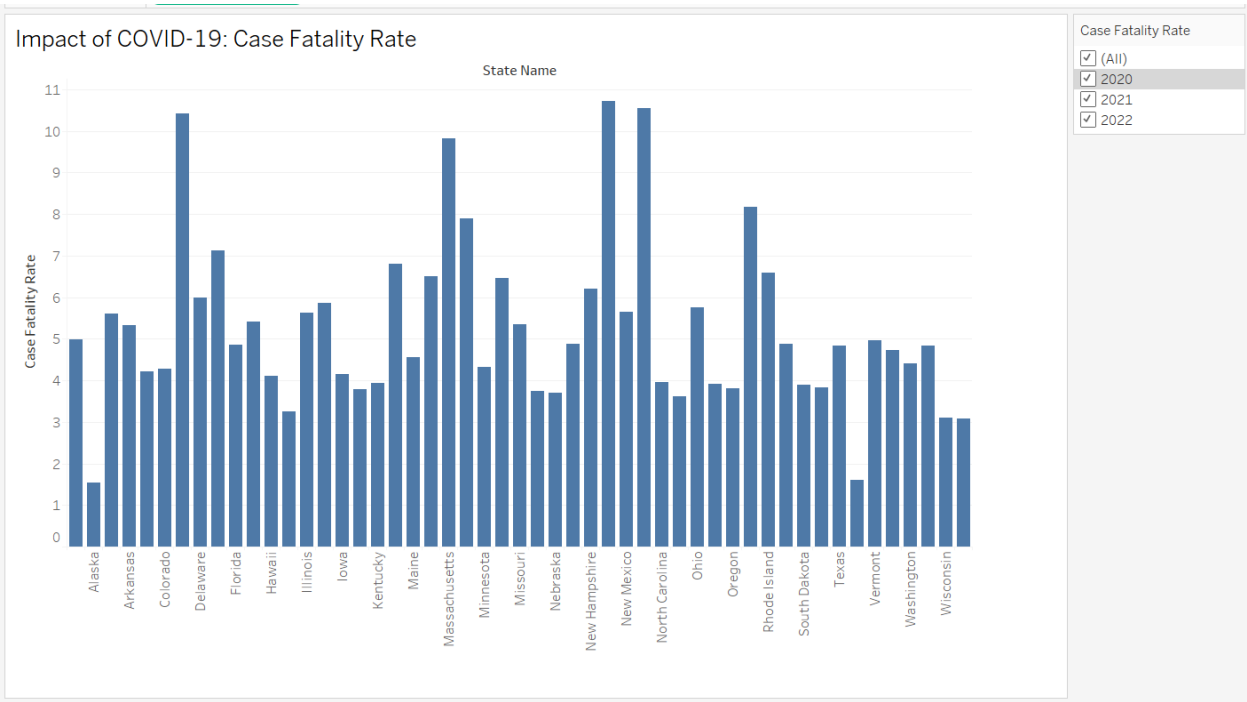
Visualization 3:



COVID-19 Severity Index Map:

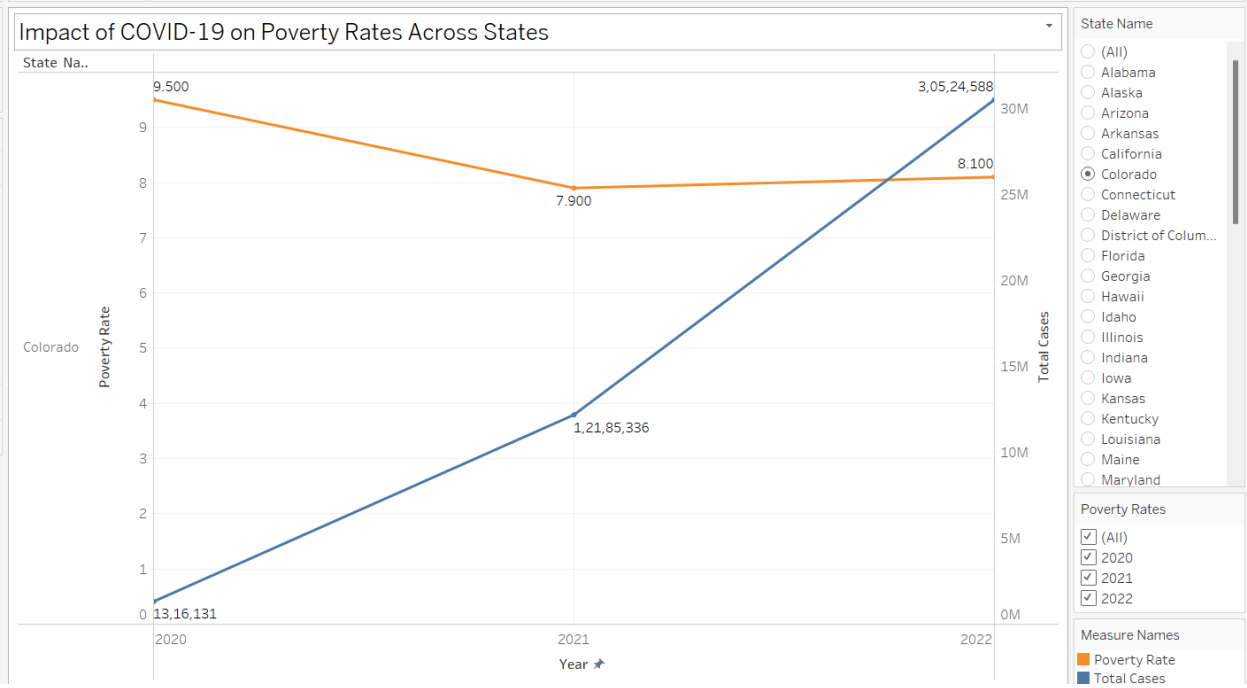
- It illustrates the severity of the COVID-19 pandemic across different states in the United States. This map uses color coding to represent the number of COVID-19 cases and deaths, providing a clear visual representation of the areas most affected by the pandemic.
- Color Coding: The map uses different colors to indicate the severity of the pandemic in each state:
- Dark Red: Indicates states with the highest number of cases and deaths.
- Orange: Represents states with a moderate level of cases and deaths.
- Yellow: Shows states with relatively lower numbers of cases and deaths.
- The severity index is based on a combination of the number of COVID-19 cases and deaths. This comprehensive measure provides a more complete picture of the pandemic's impact than looking at cases or deaths alone.

Visualization 4:



- The visualization is a bar chart that displays the case fatality rate (CFR) of COVID-19 across different states for the years 2020, 2021, and 2022. CFR is calculated as the number of deaths divided by the number of confirmed cases, expressed as a percentage. It represents the lethality of the virus in each state.
- The bar chart allows for a direct comparison of the CFR across different states, providing insights into which states experienced higher or lower fatality rates during the pandemic.
- Many states show a decrease in CFR over the years, reflecting improvements in treatment, healthcare capacity, and possibly the impact of vaccination campaigns.

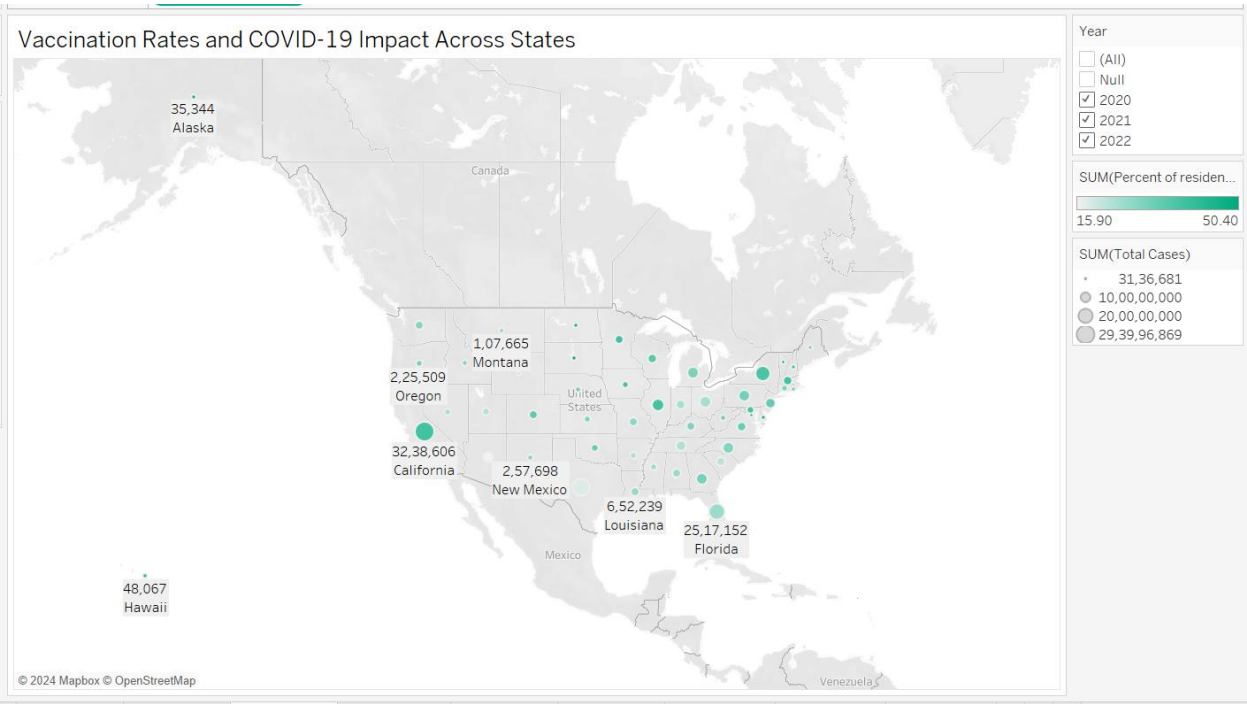
Visualization 5:



Impact of COVID-19 on Poverty Rates Across States:

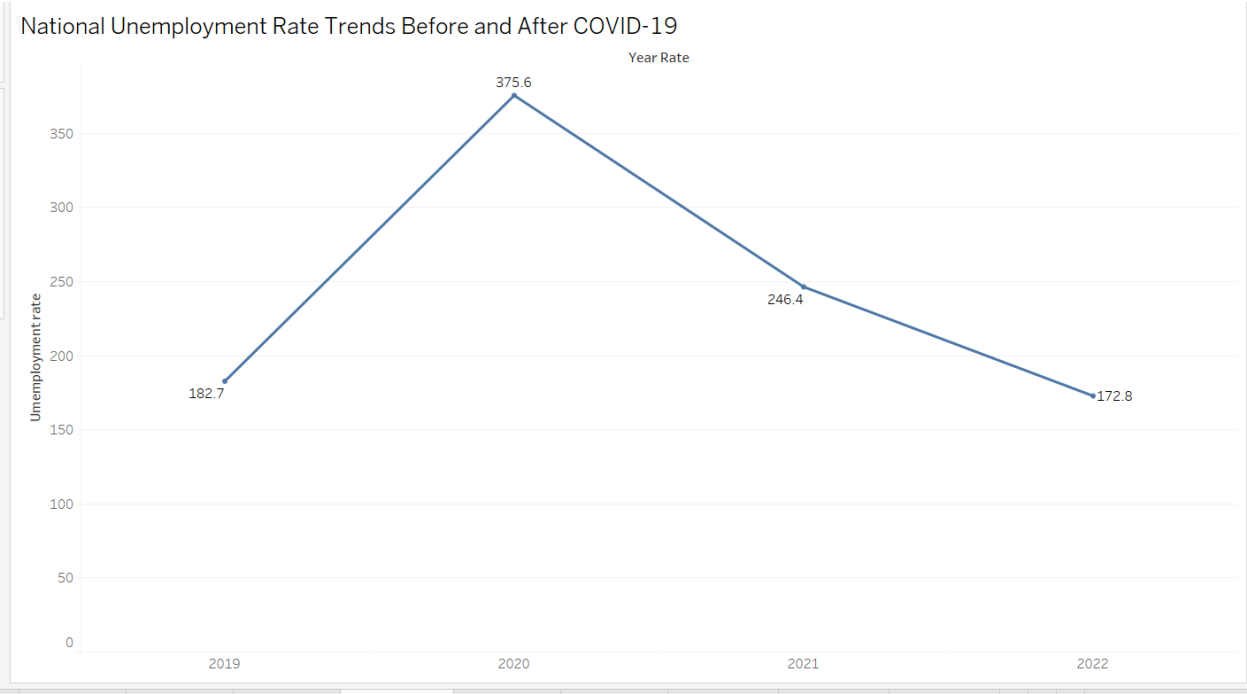
- The "Impact of COVID-19 on Poverty Rates Across States" visualization is a combined line chart that examines the relationship between COVID-19 cases and poverty rates over time in different states. This chart helps us understand how the pandemic influenced poverty levels across various regions.
- Trends Over Time: The horizontal axis represents the years (2020, 2021, 2022). This chart allows us to see how both poverty rates and COVID-19 cases have changed over the years.
- COVID-19 did affect poverty rates, but the impact varied across different states. Some states saw a decrease in poverty rates, while others experienced increases or stability during the pandemic.

Visualization 6:



- The "Vaccination Rates and COVID-19 Impact Across States" visualization is a bubble map that provides insights into the relationship between COVID-19 vaccination rates and the total number of COVID-19 cases across different states in the United States.
- The map shows a correlation between vaccination rates and COVID-19 case counts. States with higher vaccination rates tend to have larger populations and higher total case counts, likely reflecting the broader impact of the pandemic in more populous areas.
- States like California and Florida have high numbers of total cases and also have higher vaccination rates, suggesting a robust public health response in heavily affected areas.
- States with smaller bubbles like Alaska and Montana show fewer total cases, which may correlate with their lower population densities and potentially different public health challenges.

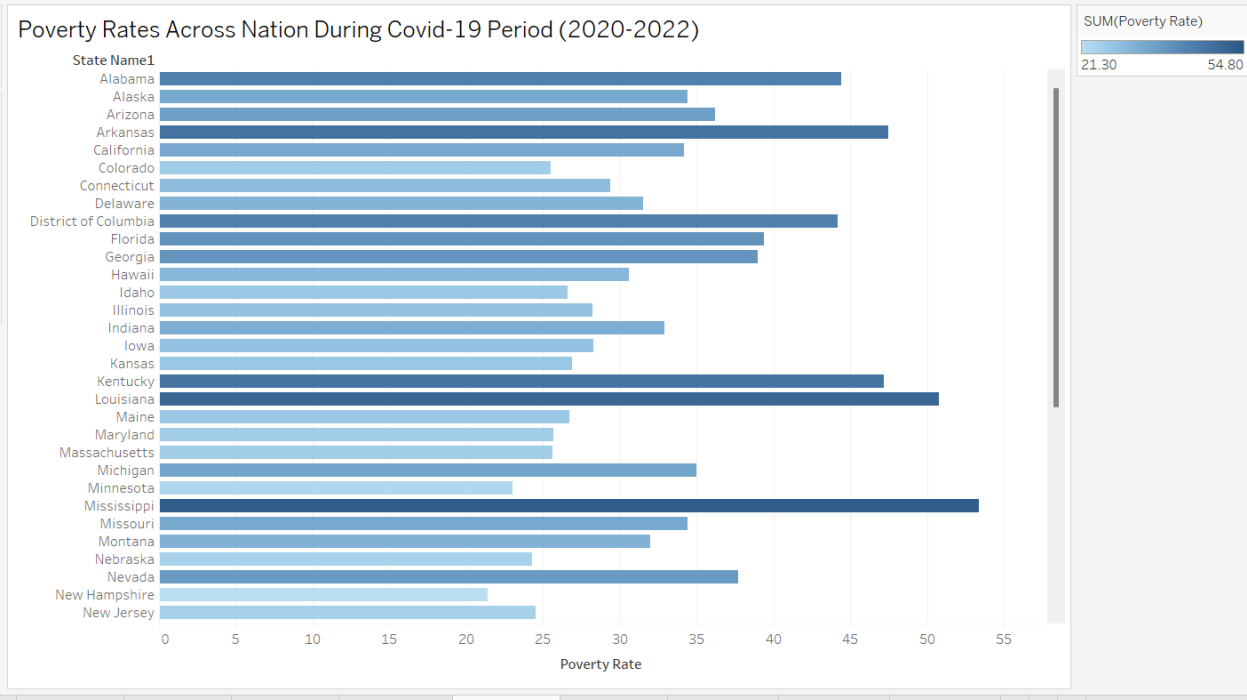
Visualization 7:



National Unemployment Rate Trends Before and After COVID-19.

- The chart clearly shows the dramatic increase in the unemployment rate in 2020 due to the COVID-19 pandemic, followed by a gradual recovery in the subsequent years.
- The declining trend from 2020 to 2022 suggests that the economy is recovering, with unemployment rates moving closer to pre-pandemic levels.

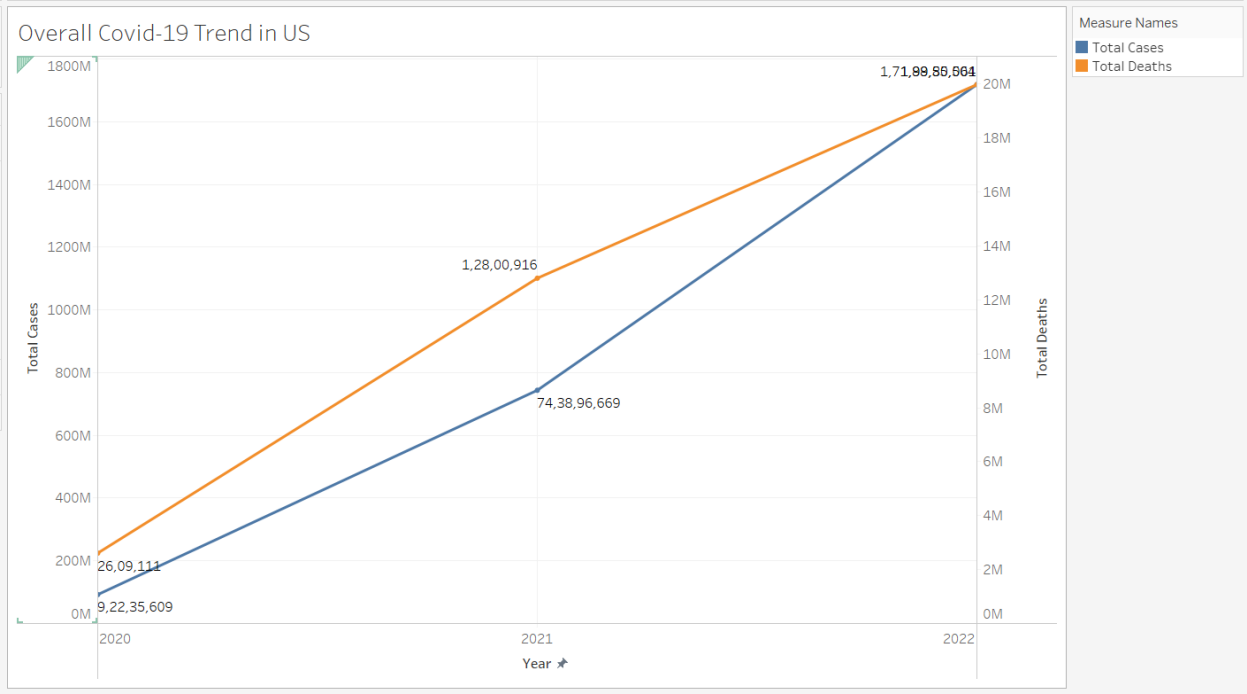
Visualization 8:



Poverty Rates Across the Nation During COVID-19 Period (2020-2022)

- The chart shows significant variations in poverty rates across different states during the COVID-19 period. For instance, states like Mississippi, Louisiana, and Kentucky exhibit higher poverty rates, while states like New Hampshire, Maryland, and Hawaii have comparatively lower poverty rates.
- The pandemic's economic impact is reflected in the poverty rates, with many states showing an increase in poverty. This suggests that the economic disruptions caused by COVID-19, such as job losses and business closures, have had a substantial impact on the financial stability of households.

Visualization 9:



Overall COVID-19 Trend in the US:

The chart clearly illustrates the significant impact of the COVID-19 pandemic in the US, with both cases and deaths rising sharply over the three-year period. The continuous increase in both cases and deaths highlights the need for persistent and adaptive public health strategies.

Conclusion

In Conclusion, the analysis shows a significant increase in unemployment rates across all states during the peak of the COVID-19 pandemic in 2020. The unemployment rates spiked in 2020 and gradually decreased in the following years as the pandemic's immediate economic impacts began to subside. This trend is consistent across the states, indicating a nationwide impact of the pandemic on employment.

The analysis on COVID-19 influence poverty rates across different states reveals a mixed impact of COVID-19 on poverty rates across different states. While some states saw an increase in poverty rates, others experienced a decrease. This variation could be attributed to differing local economic conditions, state-level policies, and federal assistance programs. The data suggests that the pandemic had complex socio-economic effects that varied significantly from one state to another.

The severity index map indicates that states like California, Texas, and Florida experienced the highest severity levels, as reflected by the higher number of cases and deaths. These states were among the most affected throughout the pandemic, likely due to their larger populations and urban centers, which can facilitate the virus's spread.

The vaccination rate map shows significant variability in vaccination coverage across states. States with higher vaccination rates generally had lower total case counts, suggesting the effectiveness of vaccination campaigns in controlling the spread of the virus. However, some highly populated states with high vaccination rates still reported substantial case numbers, indicating that other factors, such as public health policies and population density, also play critical roles.

Future Research questions:

1.What are the long-term socio-economic impacts of COVID-19 on different industries across states?

2. How did COVID-19 affect educational outcomes and disparities across different states?