Covid-19 Dashboard Analysis

Introduction

The COVID-19 pandemic has had a significant global impact, affecting public health systems, economies, and daily life across countries and regions. Understanding the patterns of disease spread, mortality, and recovery over time is essential for informed decision-making and effective response strategies. This report presents an interactive dashboard designed to analyze and visualize key COVID-19 indicators, enabling users to explore trends and comparisons at global, continental, and national levels.

Dataset:

The data used in this analysis comes from the **"COVID-19 Dataset"** downloaded from Kaggle. The dataset contains time-series data on COVID-19 cases, including total and new confirmed cases, total and new deaths, as well as location information (countries and regions). This dataset serves as the primary source for all visualizations and insights presented in the dashboard.

Data source: COVID-19 dataset

Libraries Used

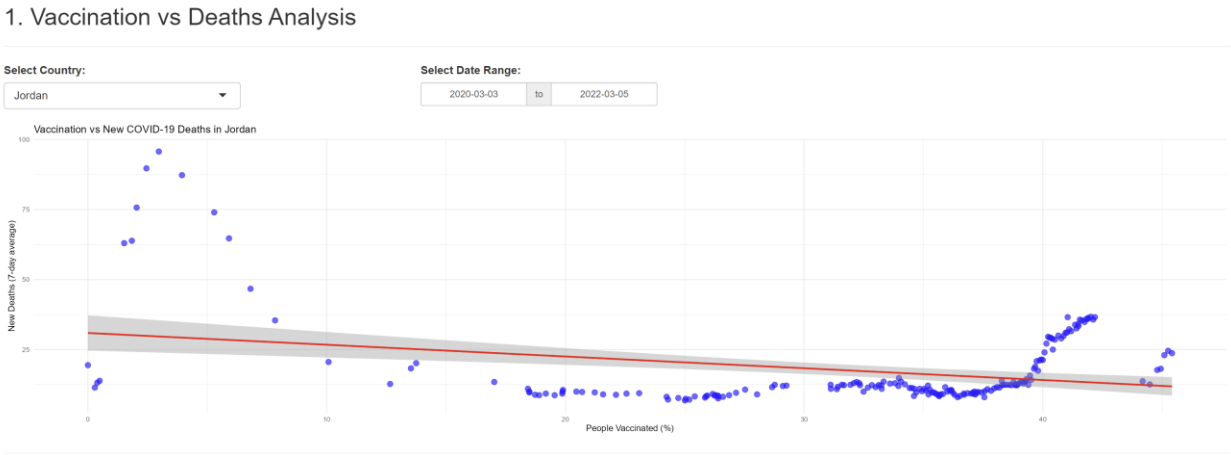
The dashboard was developed using the R programming language and the Shiny framework. The following R libraries were used: **shiny, dplyr, ggplot2, reshape2, plotly, lubridate, RColorBrewer, DT, tidyr, scales, ggrepel, corrplot**.

Dashboard Structure and Visual Analysis

The COVID-19 Analysis Dashboard is organized into multiple sections, each designed to highlight a specific aspect of the pandemic. The dashboard combines summary statistics and interactive visualizations to provide a clear and comprehensive understanding of COVID-19 trends. Each section focuses on a different level of analysis, allowing users to explore global patterns, regional comparisons, and country-specific insights.

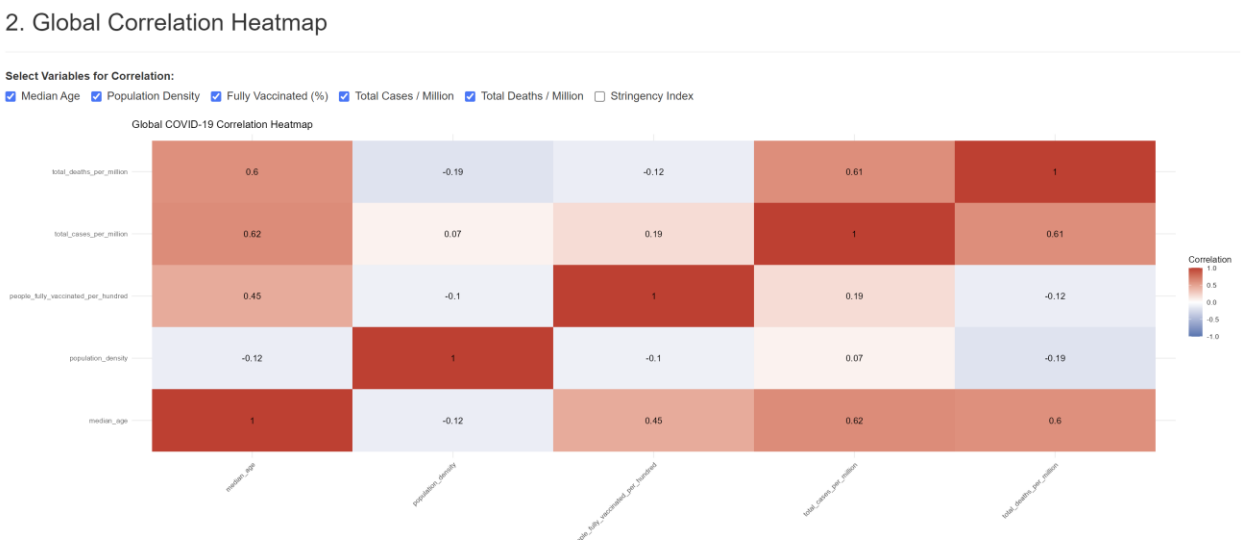
Global Overview

1. Vaccination vs Deaths Analysis



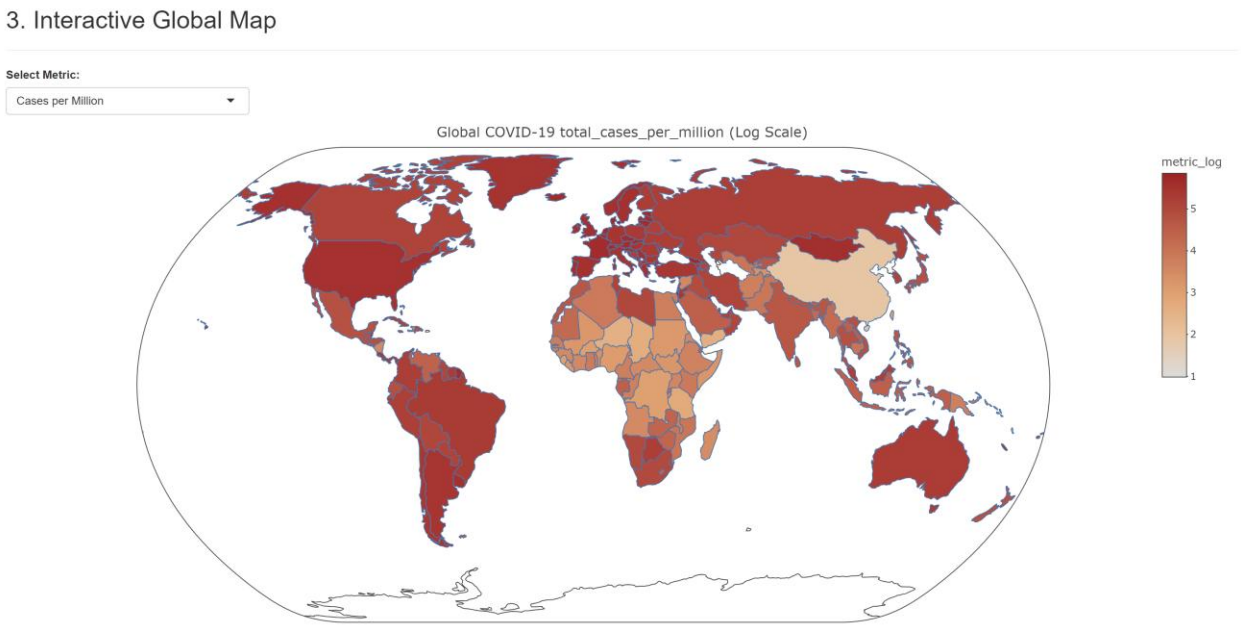
This scatter plot examines the relationship between the percentage of vaccinated individuals and the average number of new COVID-19 deaths in Jordan. Each point represents observed data over time, while the fitted regression line shows an overall negative trend, indicating that higher vaccination coverage is generally associated with lower death rates. The shaded confidence band highlights uncertainty around the trend. This visualization helps reveal the protective impact of vaccination and makes the inverse relationship easier to interpret than raw data alone.

2. Global Correlation Heatmap



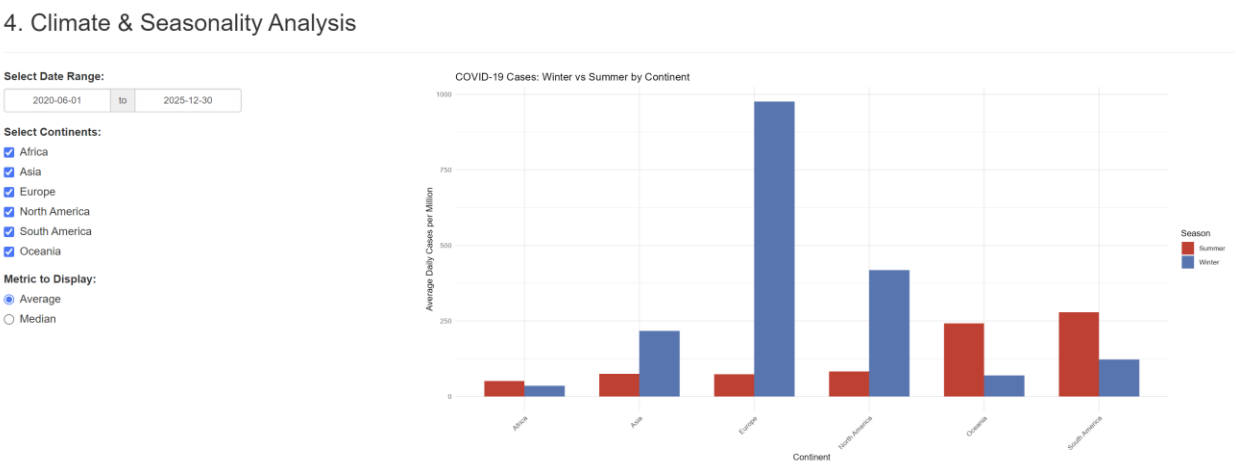
The correlation heatmap illustrates the relationships between median age, vaccination coverage, and total COVID-19 deaths per million across countries. Positive correlations (shown in warmer colors) indicate that countries with higher median age tend to experience higher mortality, while vaccination coverage shows a weak negative correlation with deaths. This visualization is effective because it allows rapid comparison of multiple variables and highlights hidden associations that may not be obvious from individual plots.

3. Interactive Global Map

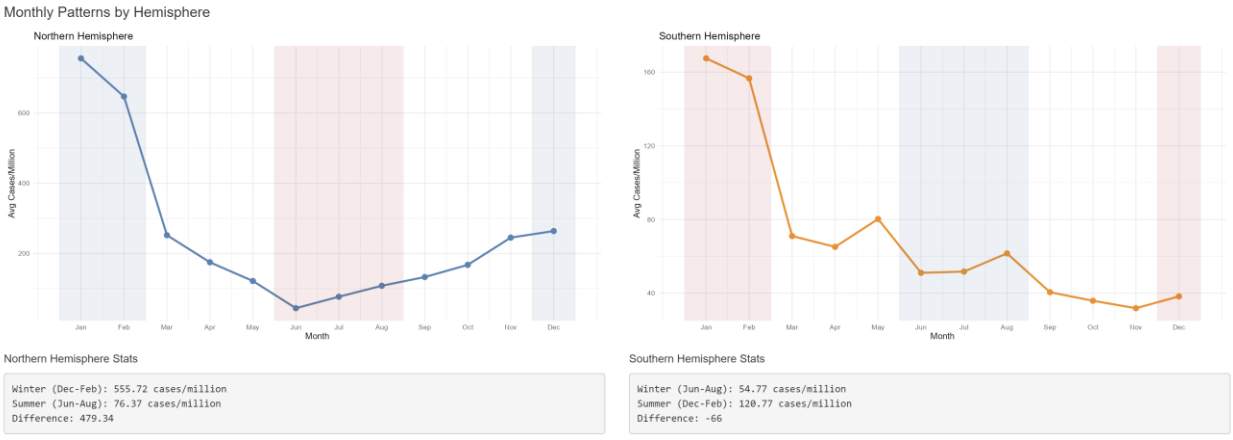


The choropleth map displays the global distribution of COVID-19 metrics (e.g., cases per million) using color intensity on a logarithmic scale. This approach reduces the effect of extreme values and enables fair comparison between countries with very different population sizes. The interactive selection of metrics enhances exploration and helps identify regional patterns and global disparities, making complex global data more intuitive and visually accessible.

4. Climate & Seasonality Analysis



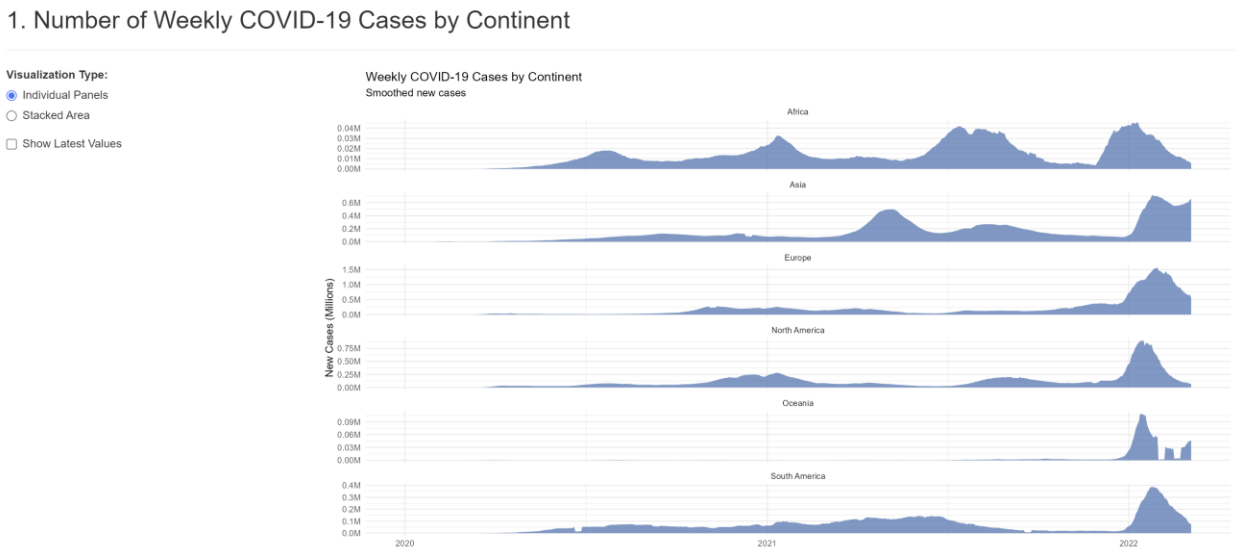
The bar chart compares average daily COVID-19 cases per million during winter and summer across continents. Results show that winter periods consistently exhibit higher case levels, particularly in Europe and North America, suggesting increased transmission during colder months. In contrast, regions such as Africa and Oceania display lower seasonal variation.



The monthly line charts separate Northern and Southern Hemispheres, highlighting opposite seasonal trends. In the Northern Hemisphere, cases peak during winter months (December–February) and decline during summer (June–August). The Southern Hemisphere demonstrates a reversed pattern, with higher transmission during its winter months, reinforcing the role of seasonal climate effects.

Continental Analysis

1. Number of Weekly COVID-19 Cases by Continent



This chart displays the temporal trends of new weekly COVID-19 cases for each continent focusing on the wave patterns. Using free y-axes, it allows users to see the specific timing of local peaks within continents that have very different population sizes. It clearly shows the massive global surge associated with the Omicron variant in early 2022 across all regions. It is used to track the waves of the pandemic and compare when different continents hit their respective breaking points.

2. Total COVID-19 Cases by Continen

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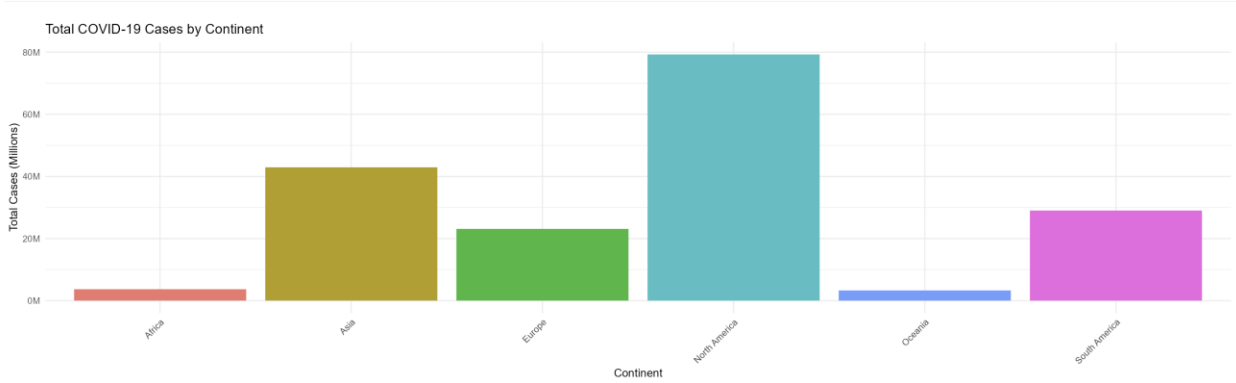
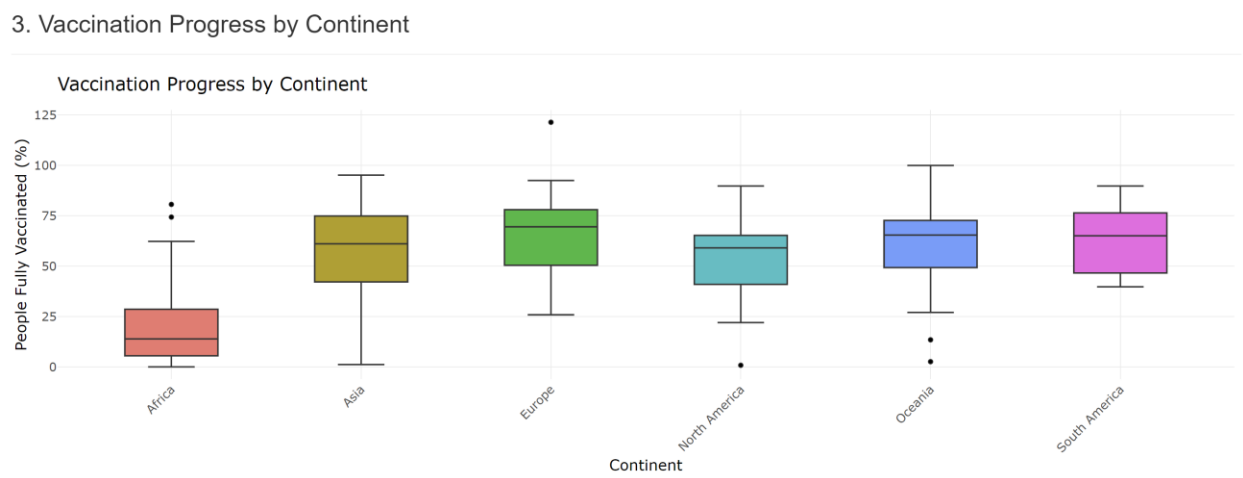


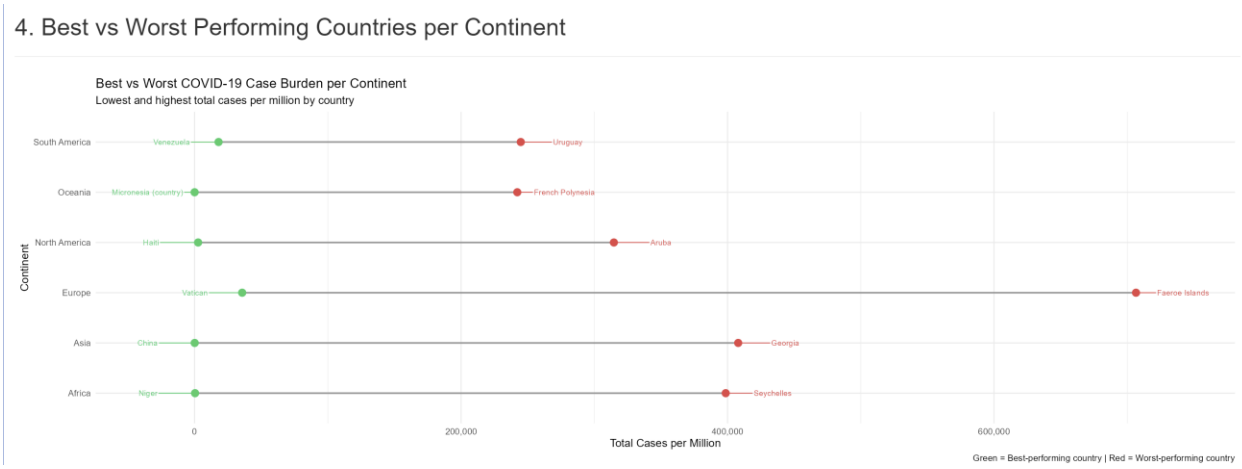
This bar chart visualization utilizes a categorical bar chart to compare the cumulative volume of COVID-19 cases across six continents. The primary analytical purpose is to establish the absolute scale of the pandemic's impact within each geographic boundary. North America is identified as the region with the highest total case count, while Oceania exhibits the lowest, reflecting both population density and reporting variance. By providing a snapshot of aggregate data, the chart allows stakeholders to quickly rank continents by disease burden. It serves as a high-level summary of the global situation before moving into more complex, normalized metrics.

3. Vaccination Progress by Continent



This box plot provides a statistical summary of the distribution of vaccination rates across countries, categorized by their respective continents. The visualization displays the median vaccination percentage, the interquartile range (the box), and statistical outliers, such as the high-performing nation in Europe. It clearly demonstrates the global "vaccine gap," with Africa's median and overall distribution sitting significantly lower than those of North America and Europe. This tool is essential for understanding the consistency of vaccine rollouts and identifying which continents suffer from high internal variance in immunization progress. It allows for a more nuanced understanding of global immunity than a simple mean average would provide.

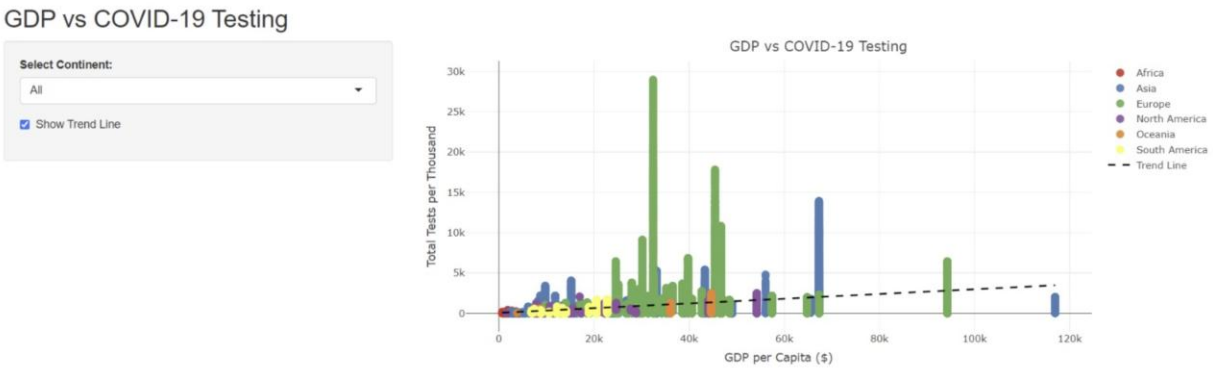
4. Best vs Worst Performing Countries per Continent



This dumbbell plot serves as a comparative analysis tool to illustrate the internal disparity of COVID-19 outcomes within individual continents. The visualization maps the range between the lowest-performing (green) and highest-performing (red) nations based on total cases per million people. It effectively highlights that continental averages often mask significant outliers, such as the dramatic gap between the Vatican and the Faeroe Islands in Europe. The horizontal segments provide a visual representation of regional inequality, emphasizing that geographic proximity does not guarantee similar public health outcomes. Analysts use this to identify national success stories and areas requiring urgent intervention within a specific region.

Socioeconomic Factors

1. GDP vs COVID-19 Testing

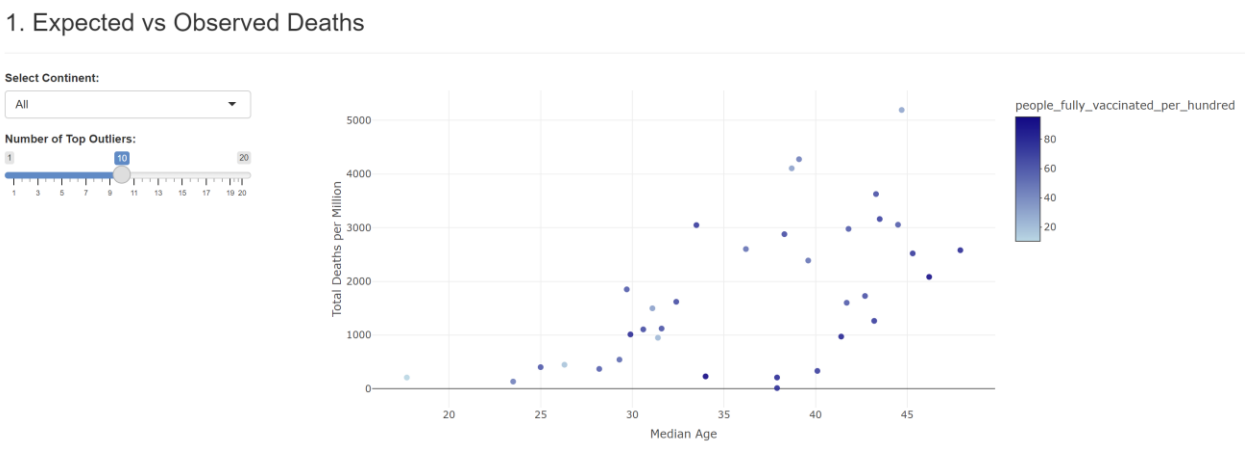


Insight:

Countries with higher GDP per capita generally perform more COVID-19 tests per thousand people.

This suggests that richer countries have better testing infrastructure, which leads to higher reported case numbers due to better detection, not necessarily worse outbreaks.

2. Expected vs Observed Deaths

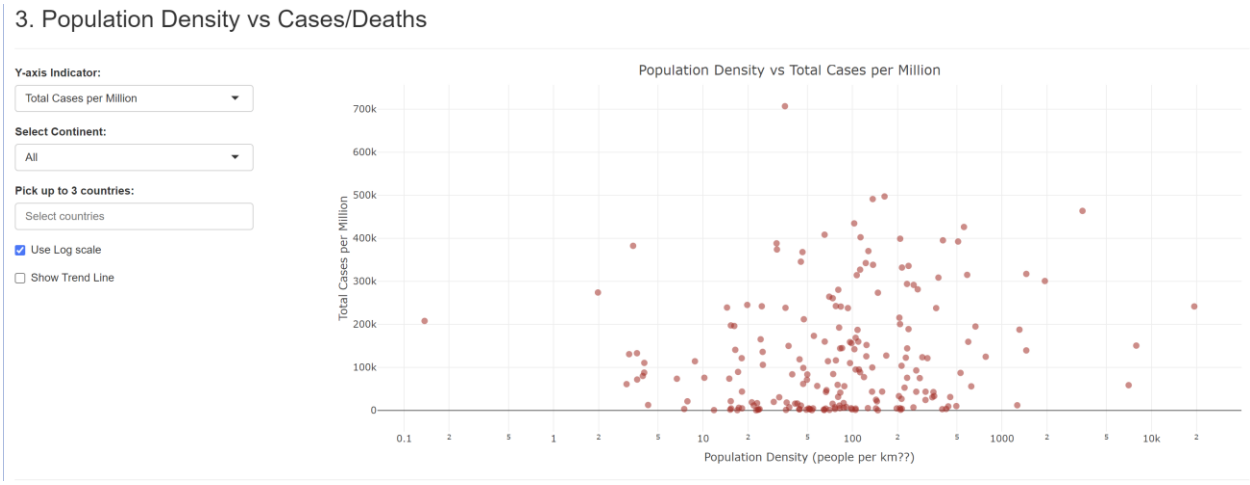


Insight:

Countries with older populations tend to have higher COVID-19 deaths per million, but vaccination levels reduce this effect.

Some countries record fewer deaths than expected for their median age, indicating effective healthcare systems or successful vaccination strategies.

3. Population Density vs Cases/Deaths

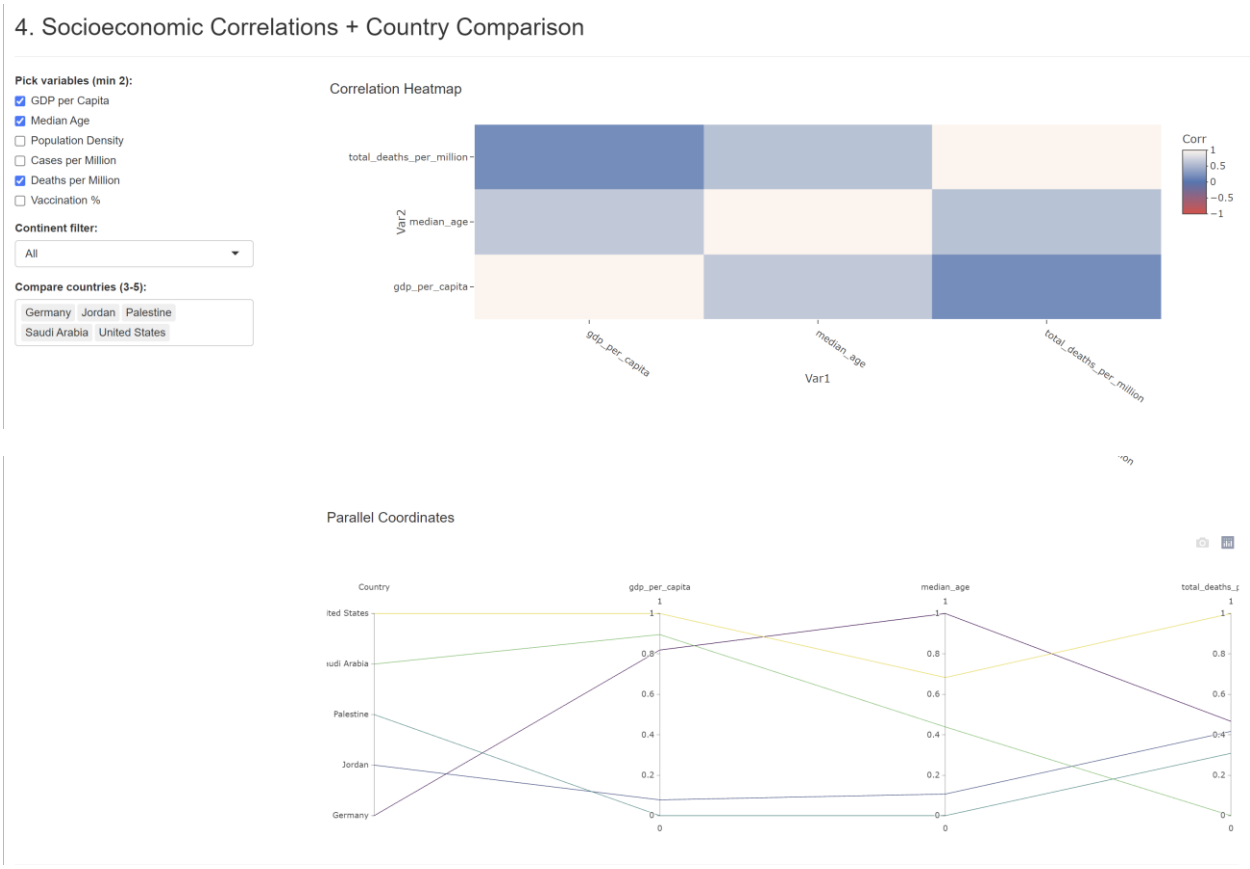


Insight:

Higher population density does not automatically lead to higher cases or deaths.

The wide spread of points shows that policy response, testing, and healthcare capacity matter more than density alone.

4. Socioeconomic Correlations + Country Comparison



Socioeconomic Correlations + Country Comparison

Correlation Heatmap

Insight:

GDP per capita and testing are strongly correlated, while deaths are more related to median age.

Vaccination weakens the link between cases and deaths, showing its protective effect.

Parallel Coordinates (Country Comparison)

Insight:

High-income countries (USA, Germany) score high on GDP and testing, while lower-income countries show lower values across most indicators.

Jordan and Palestine fall in the middle, highlighting regional and economic constraints.

5. Income Tier Comparison

Income Tier Comparison (Low / Middle / High Income)

Insight:

High-income countries show higher reported cases per million, mainly due to extensive testing.

Lower-income countries show fewer reported cases but wider uncertainty, suggesting underreporting rather than lower true spread.

Highest Vaccinated Countries vs Economic Status

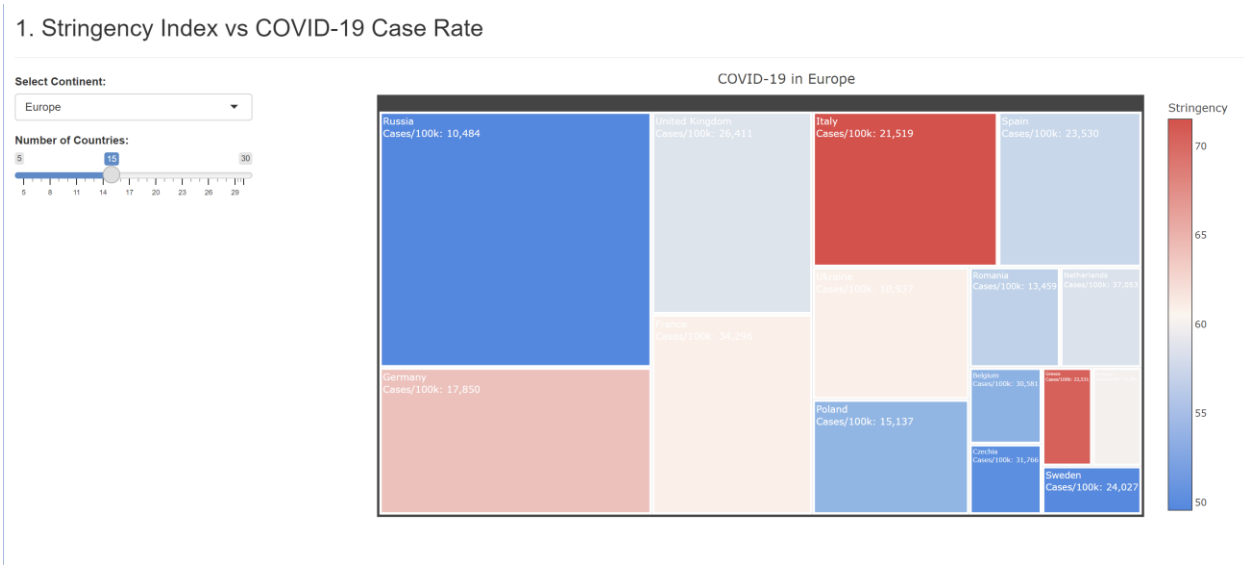
Insight:

The most highly vaccinated countries are mostly high-income nations.

This highlights global inequality in vaccine access, where economic strength strongly influences vaccination coverage.

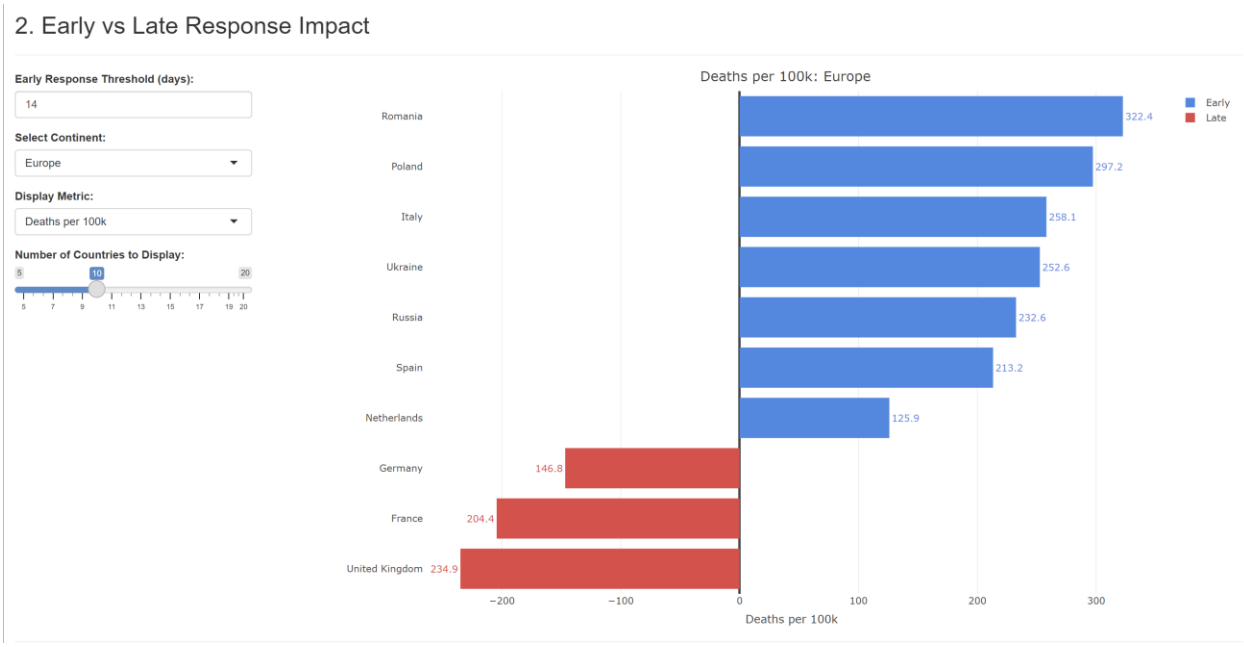
Policy and Epidemiological Dynamics

1. Stringency Index vs COVID-19 Case Rate



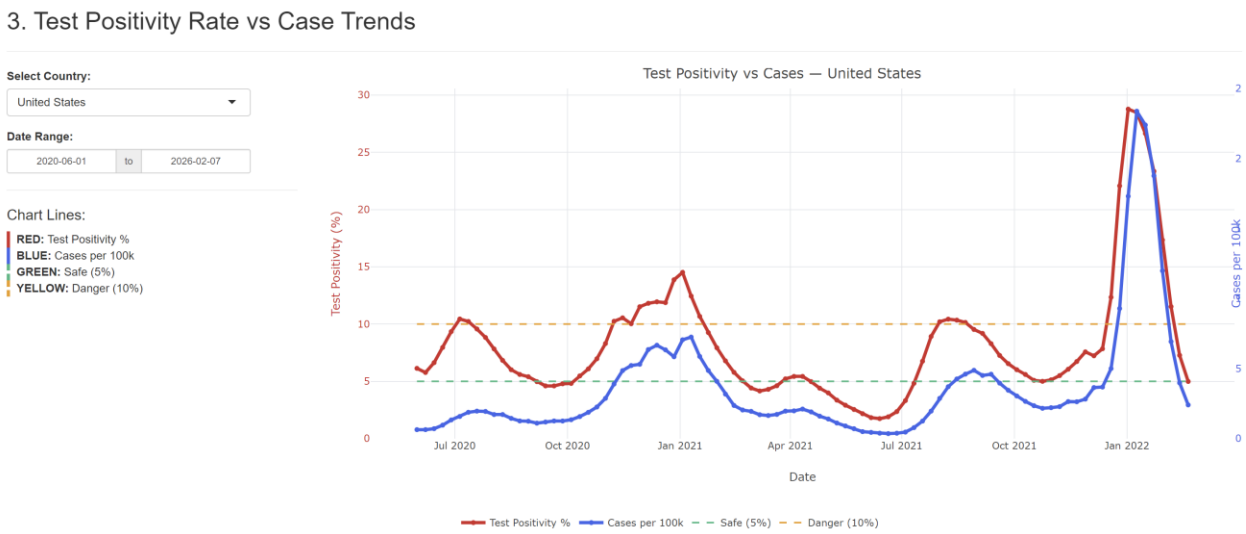
This treemap reveals a complex relationship between policy stringency and COVID-19 case rates across Europe. Poland's large blue rectangle indicates high case volumes with relatively lenient measures, while Spain's red area shows strict policies despite moderate cases. The visualization demonstrates that European countries adopted divergent strategies, with stringency measures not always correlating directly with case burden, suggesting that policy decisions were influenced by factors beyond immediate epidemiological data, including political considerations, healthcare capacity, and risk tolerance.

2. Early vs Late Response Impact



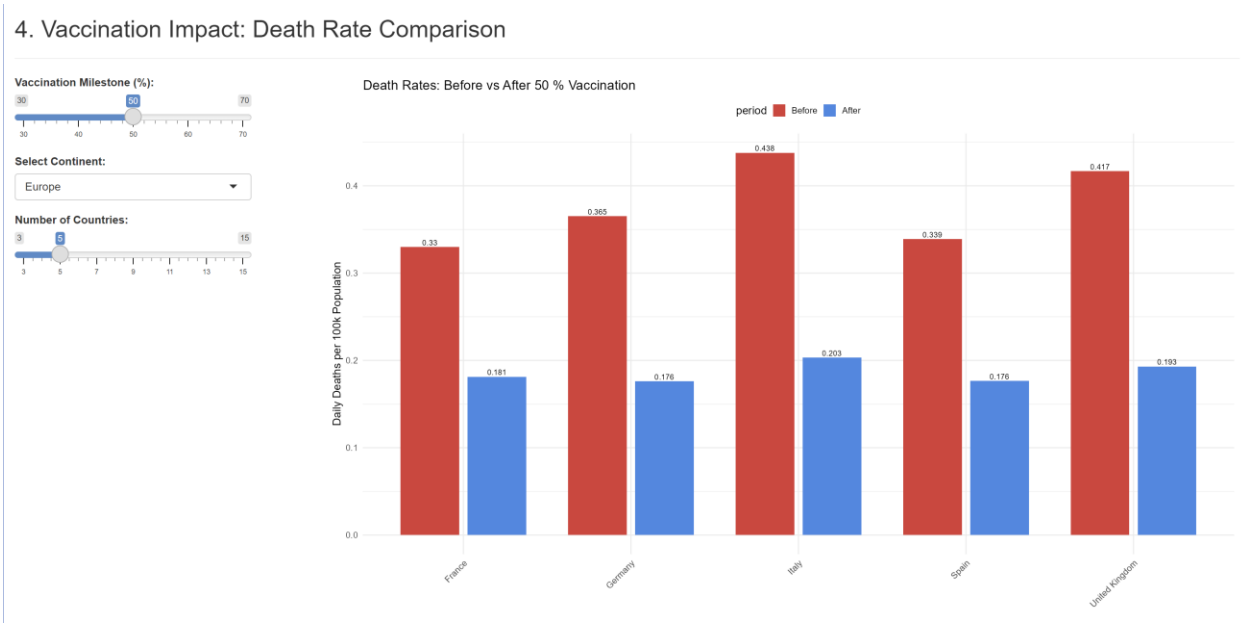
The chart starkly illustrates the mortality cost of delayed pandemic response. Countries implementing measures within 14 days (blue bars) experienced significantly lower death rates than late responders (red bars), with differences of 2-3 fold. Germany, France, and the UK, despite being developed nations with advanced healthcare systems, suffered substantially higher mortality due to delayed action. This provides compelling evidence that response timing was a critical determinant of pandemic outcomes, potentially more influential than healthcare infrastructure alone.

3. Test Positivity Rate vs Case Trends



This time series tracking United States data shows the synchronized movement of test positivity rates and confirmed cases from 2020-2022. The near-perfect alignment during the Omicron surge (late 2021/early 2022) confirms a genuine transmission wave rather than a testing artifact. The moderate positivity rates during most periods suggest adequate surveillance capacity, while the March 2021 annotation marks an optimal testing state. The visualization effectively demonstrates how testing metrics can validate or question the reliability of reported case trends.

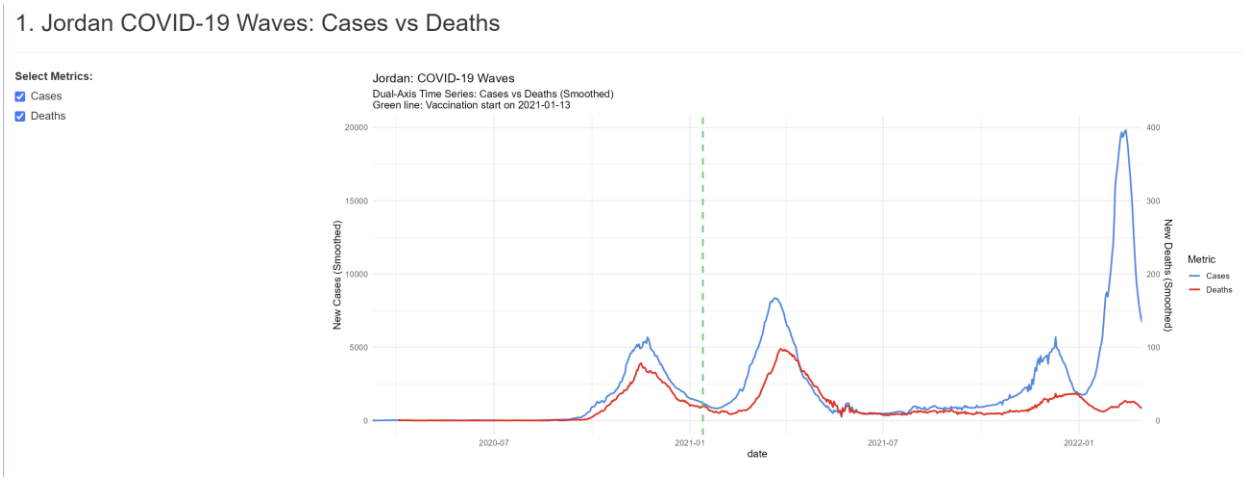
4. Vaccination Impact: Death Rate Comparison



The grouped bar chart provides compelling evidence of vaccination effectiveness, showing consistent 50-70% reductions in death rates across European countries after achieving 50% vaccination coverage. The UK demonstrates the most dramatic improvement, while all countries show substantial mortality decline post-vaccination. However, the persistent variation in post-vaccination death rates across countries indicates that vaccine effectiveness is modulated by additional factors including healthcare quality, demographics, and variant characteristics, underscoring that vaccination was a critical but not singular solution.

Jordan Overview

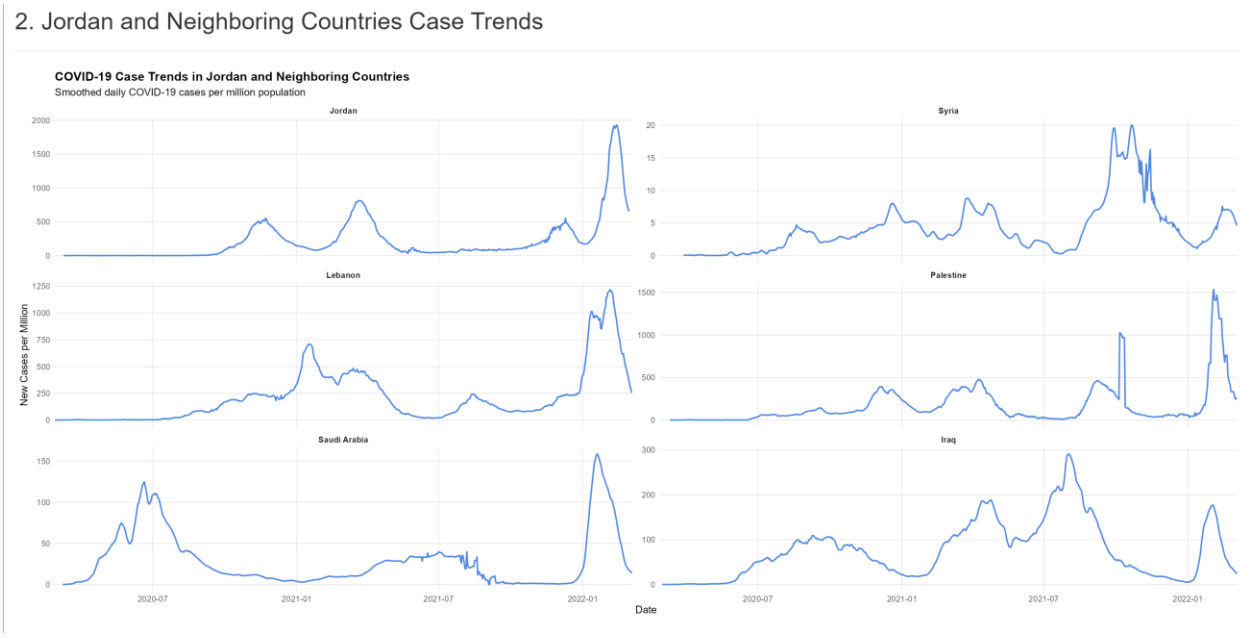
1. Jordan COVID-19 Waves: Cases vs Deaths



This chart shows the COVID-19 waves in Jordan by comparing confirmed cases and deaths over time. The blue line represents cases, while the red line represents deaths. The dashed vertical line indicates the start of the COVID-19 vaccination campaign in January 2021.

Insight:
The visualization shows that deaths generally increase after rises in cases. However, after the start of vaccination, later waves show high case numbers with relatively lower deaths, suggesting a reduction in

2. Jordan and Neighboring Countries Case Trends

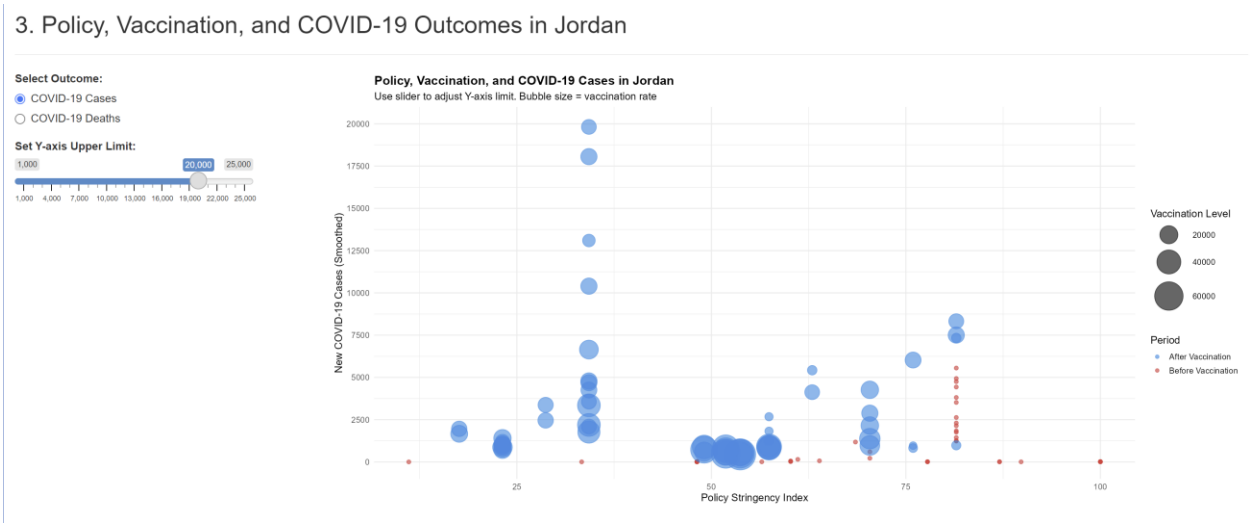


This visualization compares COVID-19 case trends in Jordan and neighboring countries over time. The chart shows smoothed daily cases per million population, allowing for fair comparison between countries despite population differences.

Insight:

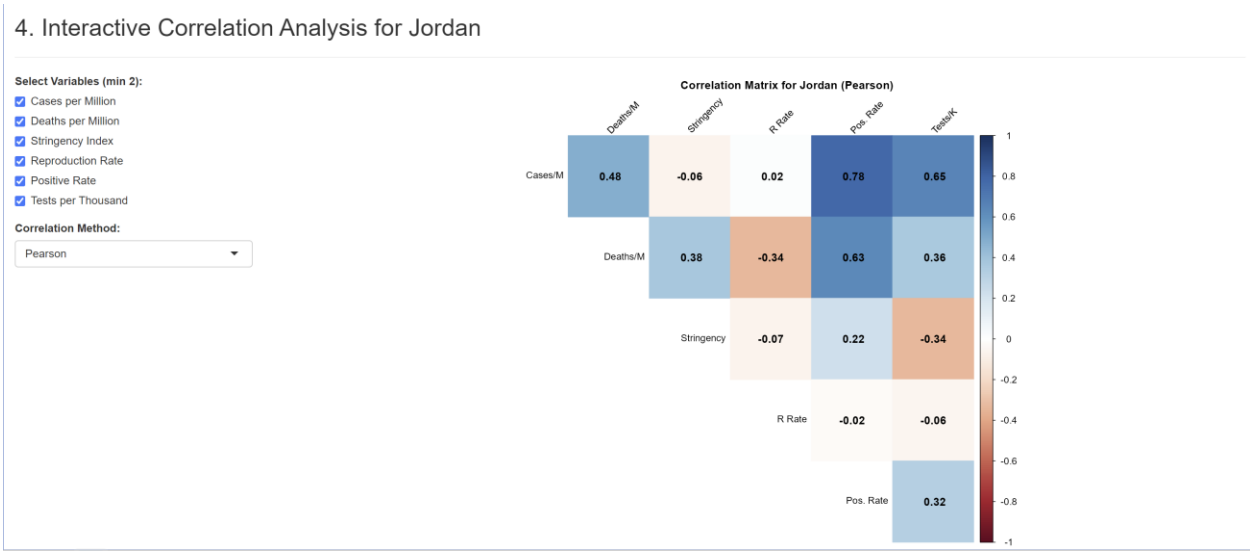
The trends reveal that Jordan and its neighboring countries experienced multiple infection waves, often during similar time periods, indicating regional patterns of virus spread with differences in peak intensity between countries.

3. Policy, Vaccination, and COVID-19 Outcomes in Jordan



This bubble chart shows the relationship between government policy stringency and COVID-19 cases in Jordan. The x-axis represents the policy stringency index, while the y-axis shows smoothed new COVID-19 cases. Bubble size indicates the level of vaccination, and colors distinguish periods before and after vaccination.

4. Interactive Correlation Analysis for Jordan



This heatmap shows the Pearson correlation between selected COVID-19 indicators in Jordan, including cases, deaths, testing, policy stringency, reproduction rate, and positivity rate. The color intensity and values represent the strength and direction of the relationships between variables.

Insight:

COVID-19 cases and deaths show moderate positive correlations with the positivity rate and testing levels, while policy stringency and reproduction rate exhibit weak or negative correlations, suggesting limited direct linear relationships with case and death numbers.