

Supplementary Methods

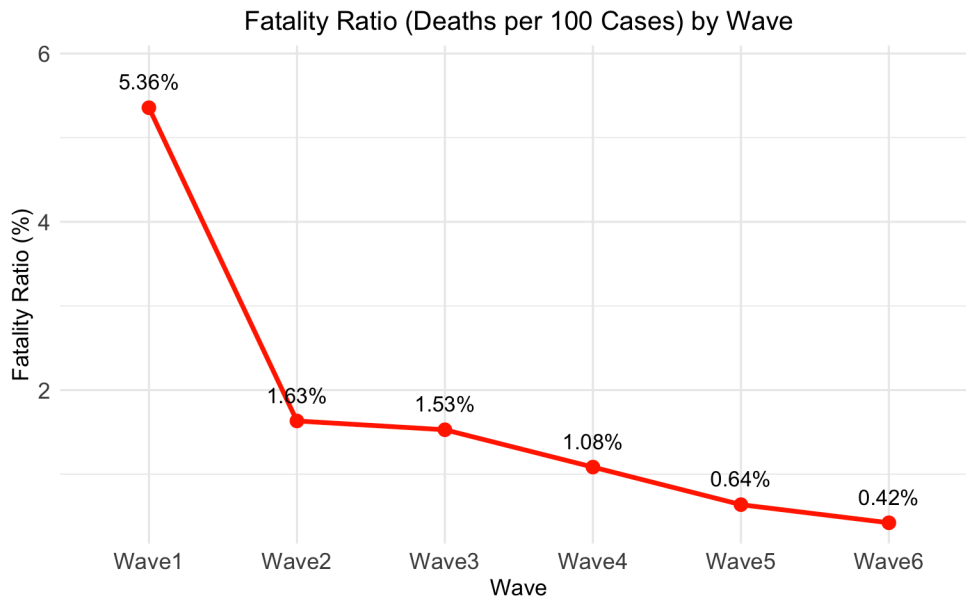
Datasets Selection:

1. Population Data: NST-EST2024-POP.xlsx Source: U.S. Census Bureau Time Frame: 2020–2024 Description: Provides annual state-level population estimates for the years 2020 to 2024. This dataset is used to calculate per capita COVID-19 case and death rates.
2. Population Data: nst-est2020int-pop.xlsx Source: U.S. Census Bureau Description: Contains intercensal population estimates for the United States, bridging the gaps between the decennial censuses of 2010 and 2020. These annual national-level population figures are meticulously curated by the U.S. Census Bureau, making them a reliable foundation for demographic and mortality analyses. Researchers can use this dataset to understand population changes over the decade and their implications for public health and population dynamics.
3. Regional Data Source: JSON file hosted on GitHub Description: Defines regional groupings of U.S. states and territories (e.g., “NY & NJ & PR & VI”) for aggregated regional analysis.
4. COVID-19 Cases and Death Data Source: Centers for Disease Control and Prevention (CDC) API Time Frame: January 22, 2020 – May 10, 2023 Description: Provides daily records of new COVID-19 cases and deaths at the state level from 2020 to 2024.
5. Weekly Counts of Deaths by Jurisdiction and Age Source: National Center for Health Statistics (NCHS) File Used: Weekly_Counts_of_Deaths_by_Jurisdiction_and_Age_20241220.csv Time Period: January 10, 2015 – September 16, 2023 Description: Provides weekly counts of deaths categorized by jurisdiction and age groups across the United States. The data is sourced from the NCHS, a highly reputable authority for health statistics, ensuring its reliability and accuracy. Spanning multiple years, this dataset is a critical resource for analyzing trends in mortality, including patterns observed during significant public health events such as the COVID-19 pandemic. Researchers can trust this data for comprehensive mortality trend analysis and public health assessments.

Visualizations

To address question 3, we present a detailed analysis of the characteristics of the COVID-19 virus across different waves. The first plot captures the declining trend in the fatality ratio (deaths per 100 cases) over time, providing evidence that COVID-19 became less virulent as the pandemic progressed.

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```



The second plot illustrates the trends in COVID-19 cases and deaths across different wave periods. The data reveal that while the virus's fatality ratio decreased, the number of cases increased dramatically, particularly reaching its peak during wave 5. This plot suggests that the virus became more transmissible over time and peaked at wave 5, potentially due to the emergence of highly contagious variants.

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COVID-19 Cases and Mortality with Waves

