



# COVID-19 visualization

Presented by:  
Nguyen Tung Lam  
Chau Minh Khai  
Dang Duc Dat

# Overview

01 **Introduction**

02 **Data Overview**

03 **Question 1**

04 **Question 2**



# Introduction

- The COVID-19 pandemic has been one of the most significant global health crises in modern history, affecting millions of lives and disrupting economies, healthcare systems, and daily routines worldwide.
- In this project, we developed an interactive Shiny application using RStudio to visualize and explore COVID-19 data dynamically. We want highlight significant findings, uncover correlations, and identify challenges and successes in global responses to COVID-19.

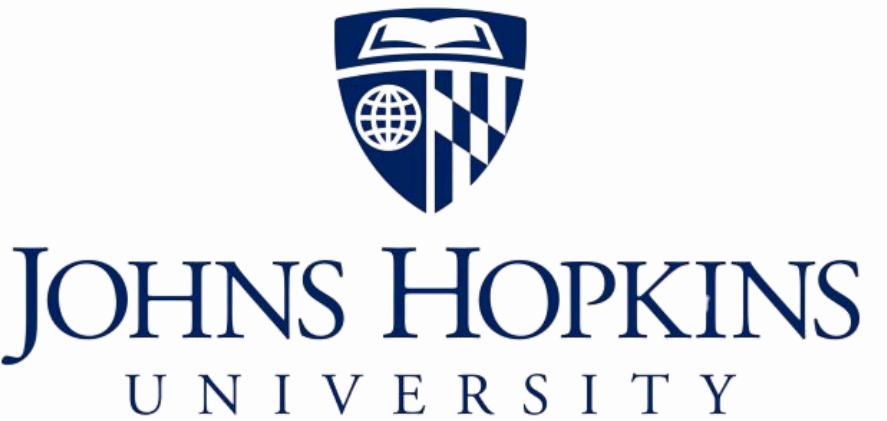


Our Product



# Data Overview

- + This project utilizes the Johns Hopkins University Center for Systems Science and Engineering (JHU CSSE) COVID-19 dataset, covering the time period from January 22, 2020 to March 7, 2023.
- + Main Data Fields Used:
  - Date
  - Country/Region
  - Longitude & Latitude
  - Confirmed Cases
  - Deaths
  - Recovered
- + Loaded and merged multiple CSV files (confirmed, deaths, recovered) from JHU's GitHub repository.

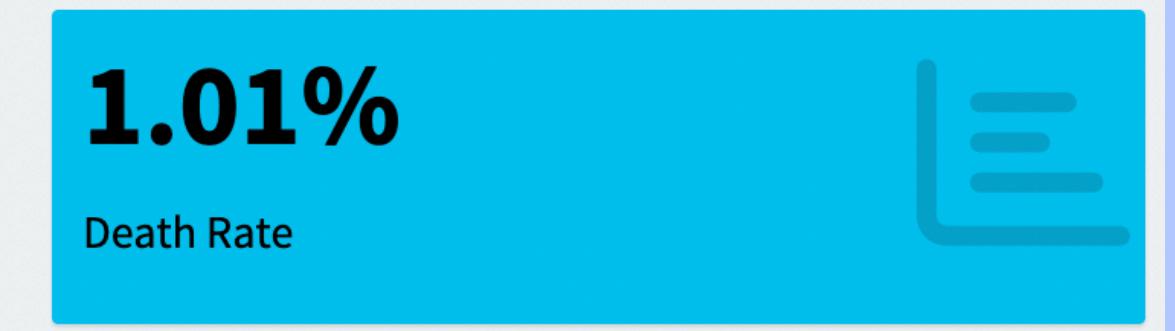
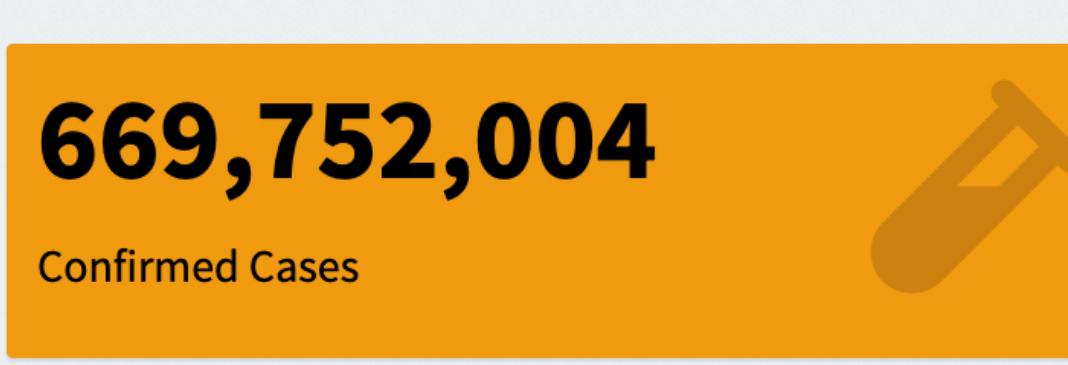


# Question 1

- How does a nation's economic capacity influence its ability to respond to and recover from the COVID-19 pandemic across different continents?



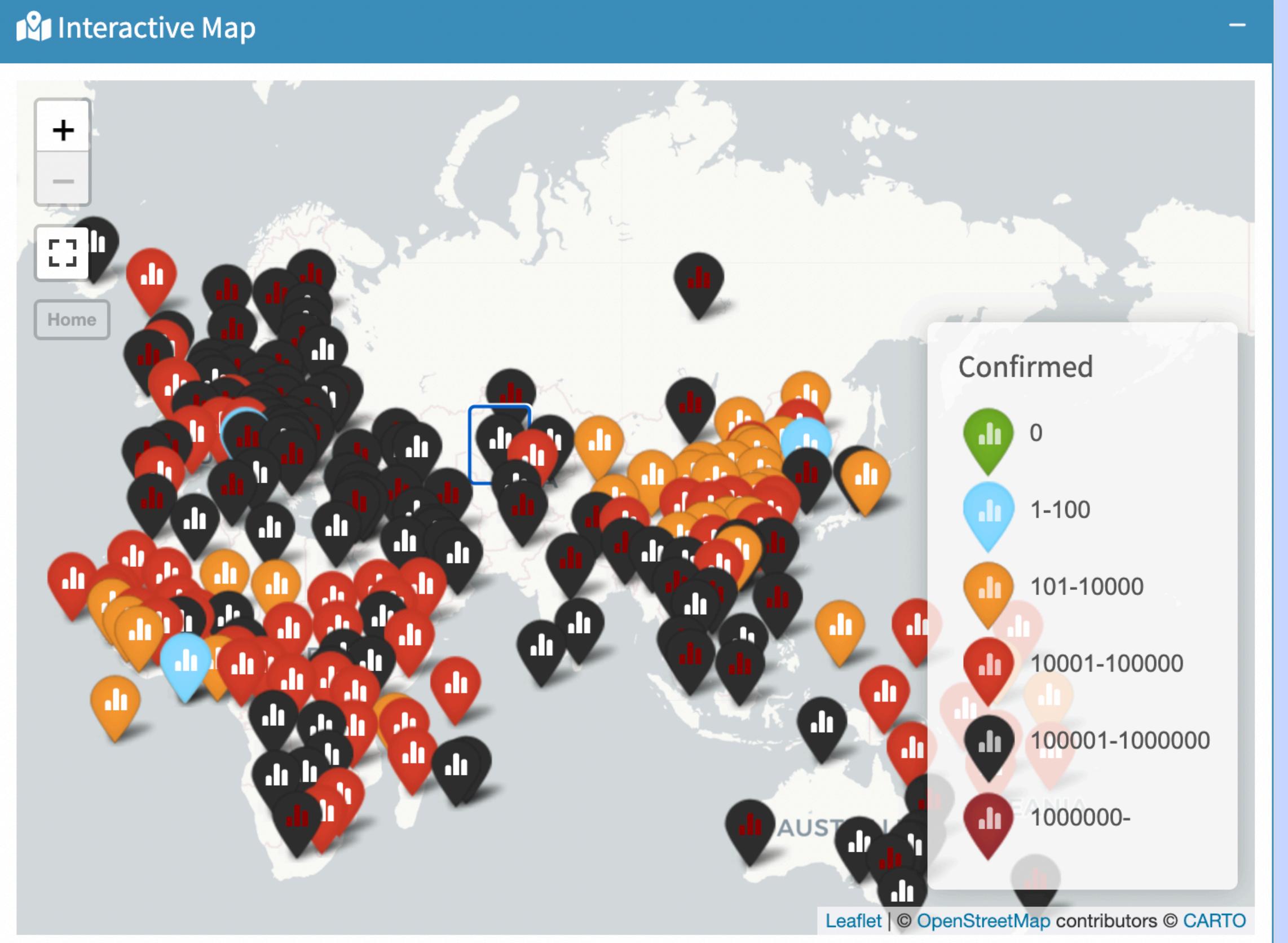
# COVID-19 outcome



However, ...

**However, actual numbers are  
even higher**

**Since many of them are not fully  
recorded**

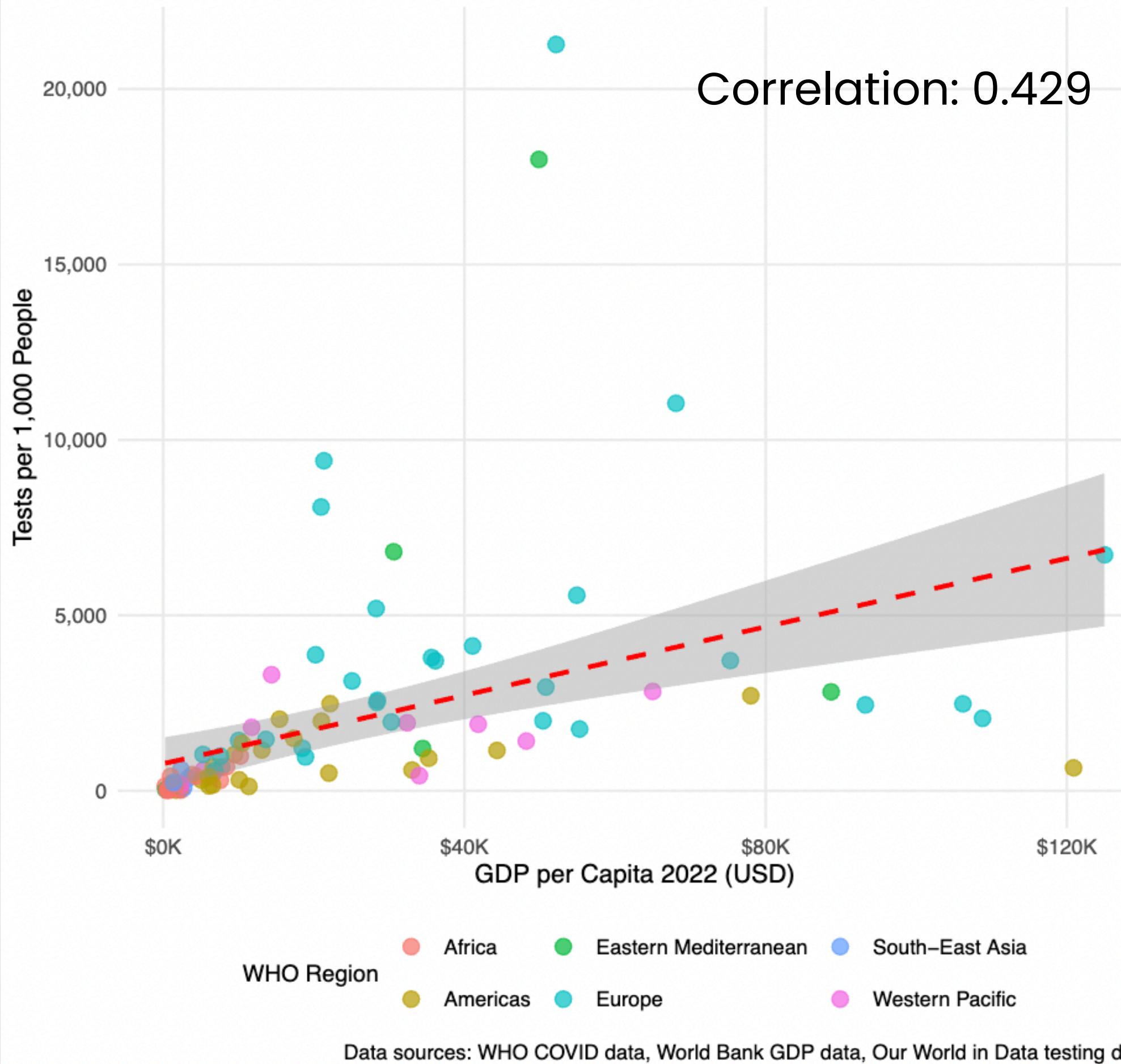


In the interactive map,  
Europe seem to have  
more covid cases than  
Africa.

However, that might  
NOT TRUE

## Testing Rates vs GDP per Capita

Higher GDP countries generally conducted more tests per capita



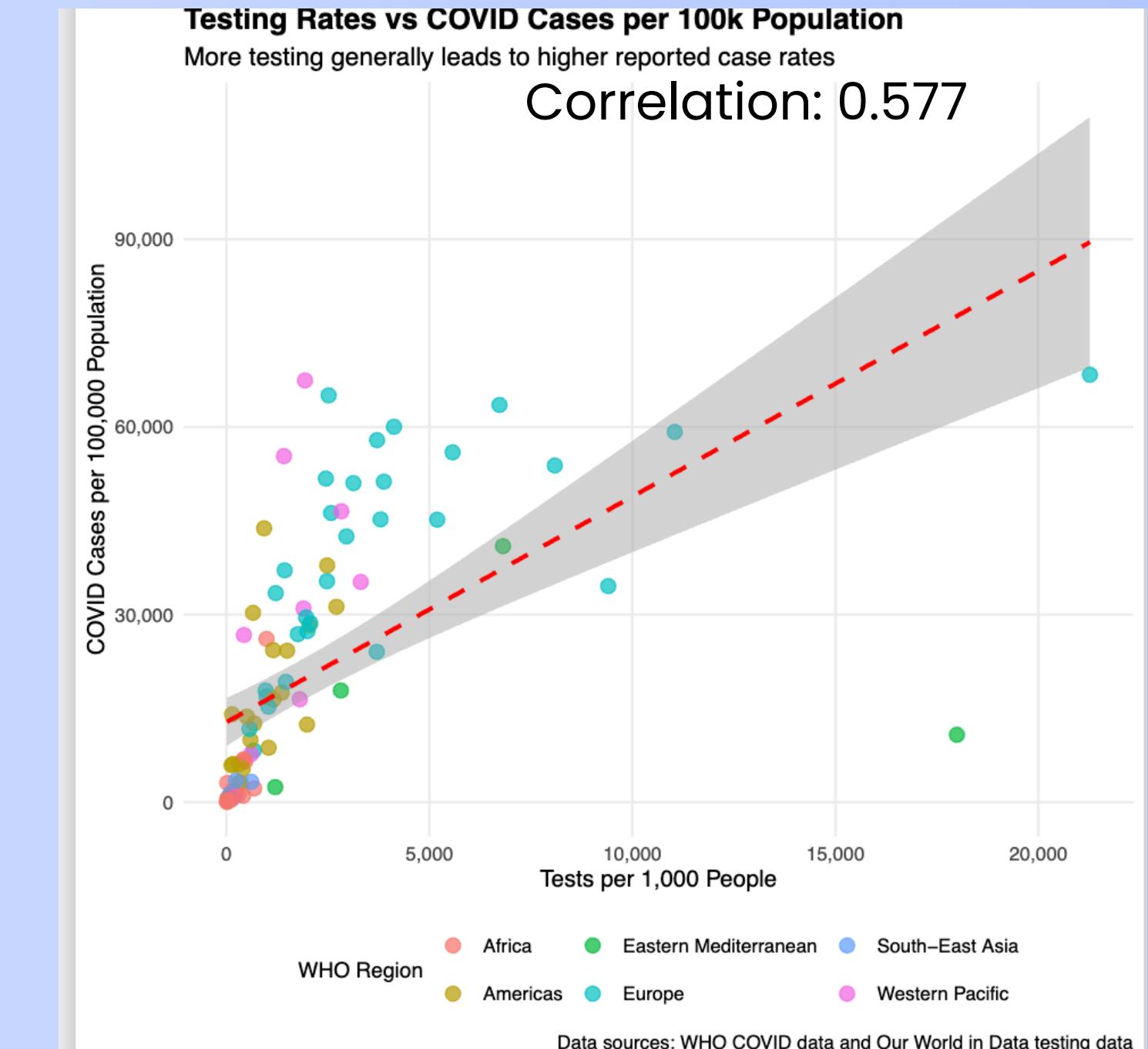
Since, richer nations take more covid tests than poorer ones.

=> Recorded more cases

## Testing Rates vs COVID Cases per 100k Population

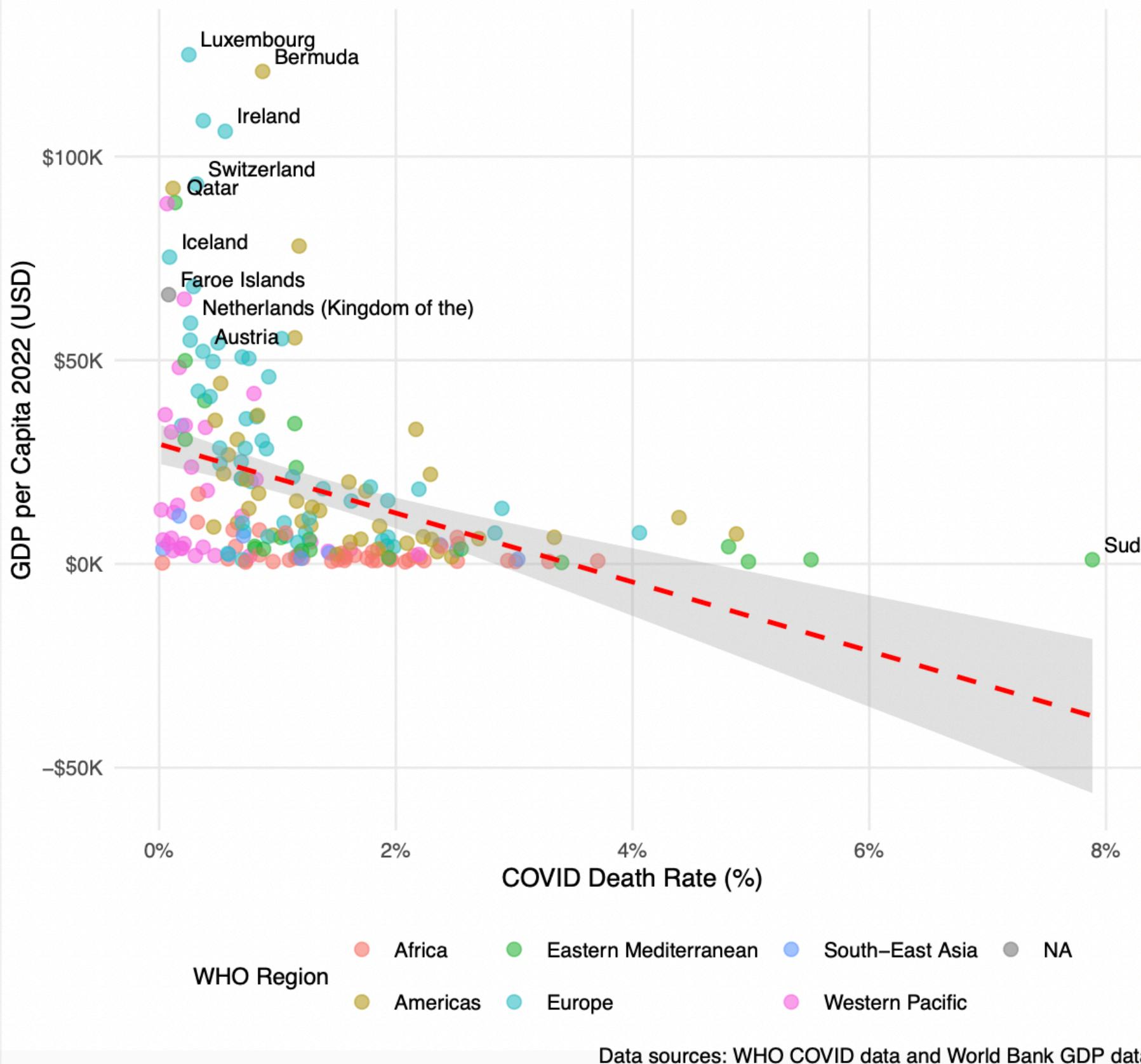
More testing generally leads to higher reported case rates

Correlation: 0.577



### Death Rate vs GDP with Country Labels

Selected countries with extreme values are labeled



**Despite having MORE CASES,  
high-income nations have  
LOWER DEATH RATE.**

#### Extreme Cases:

- Highest death rates: Sudan (7.89%), Syria (5.51%), Somalia (4.98%)
- Lowest death rates: Nauru (0.018%), Singapore (0.067%), Iceland (0.088%)

#### Regional Patterns:

- Western Pacific: Lowest death rates (0.46% average)
- Eastern Mediterranean: Highest death rates (2.07% average)
- Europe: Low death rates (1.01%) with highest GDP

# Conclusion:

The COVID-19 pandemic revealed stark global inequalities. Poorer nations were significantly more vulnerable due to two key factors:

- Limited testing capacity led to widespread underreporting of cases.
- Weaker health systems resulted in higher death rates and overwhelmed healthcare infrastructure.

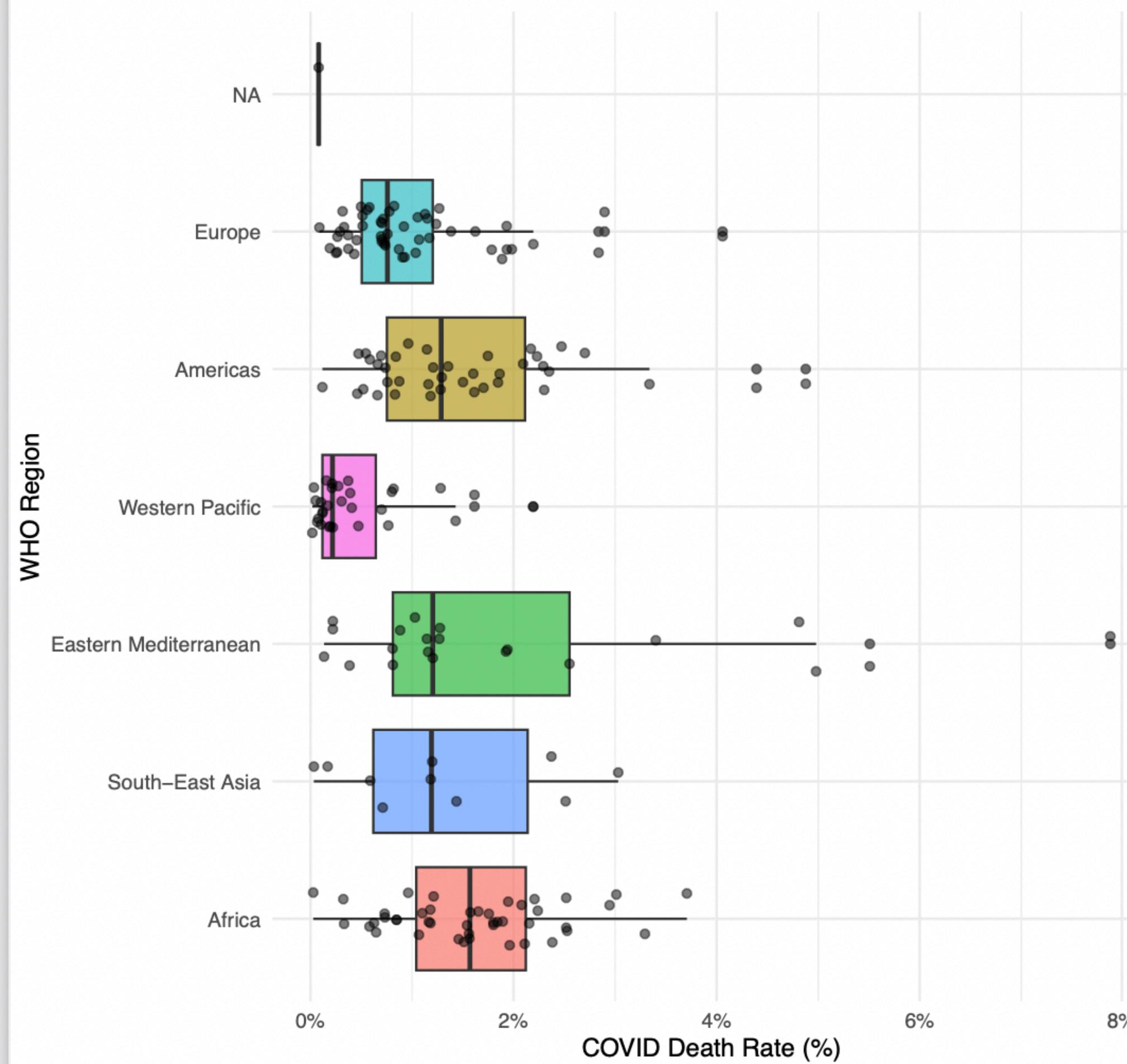


**Why we don't know the real number of COVID-19 deaths in Africa**

**Maybe, million of people died without recording in the pandemic,  
especially in developing and underdeveloped nations**

## COVID Death Rates by WHO Region

Regions ordered by median GDP per capita



Despite having some relationship between GDP per capita and COVID death rates, there are still many outliers due to national policies, which will be explained in the next parts

# Question 2

- What patterns can be observed in the rise, peak, and decline of COVID-19 cases across nations, and how can interactive visualizations of these trends help identify commonalities in effective public health responses that contributed to minimizing outbreaks?

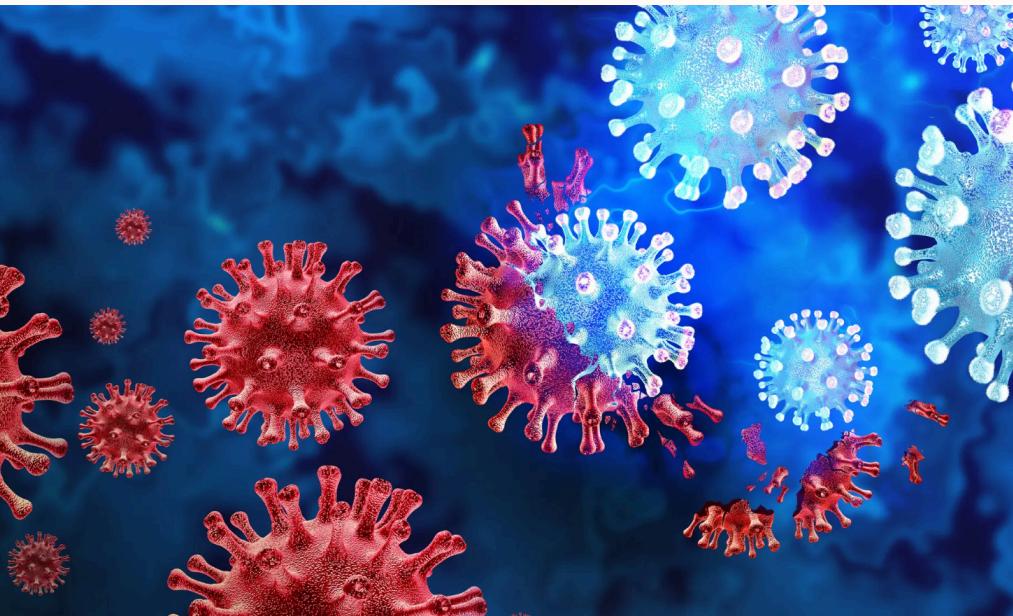
MAY 29, 2025 4:05 AM IT

## What to Know About the New COVID-19 Variant NB.1.8.1

HEALTH COVID-19



by Alice Park  
SENIOR CORRESPONDENT



### Disease Outbreak News

## COVID-19 - Global Situation

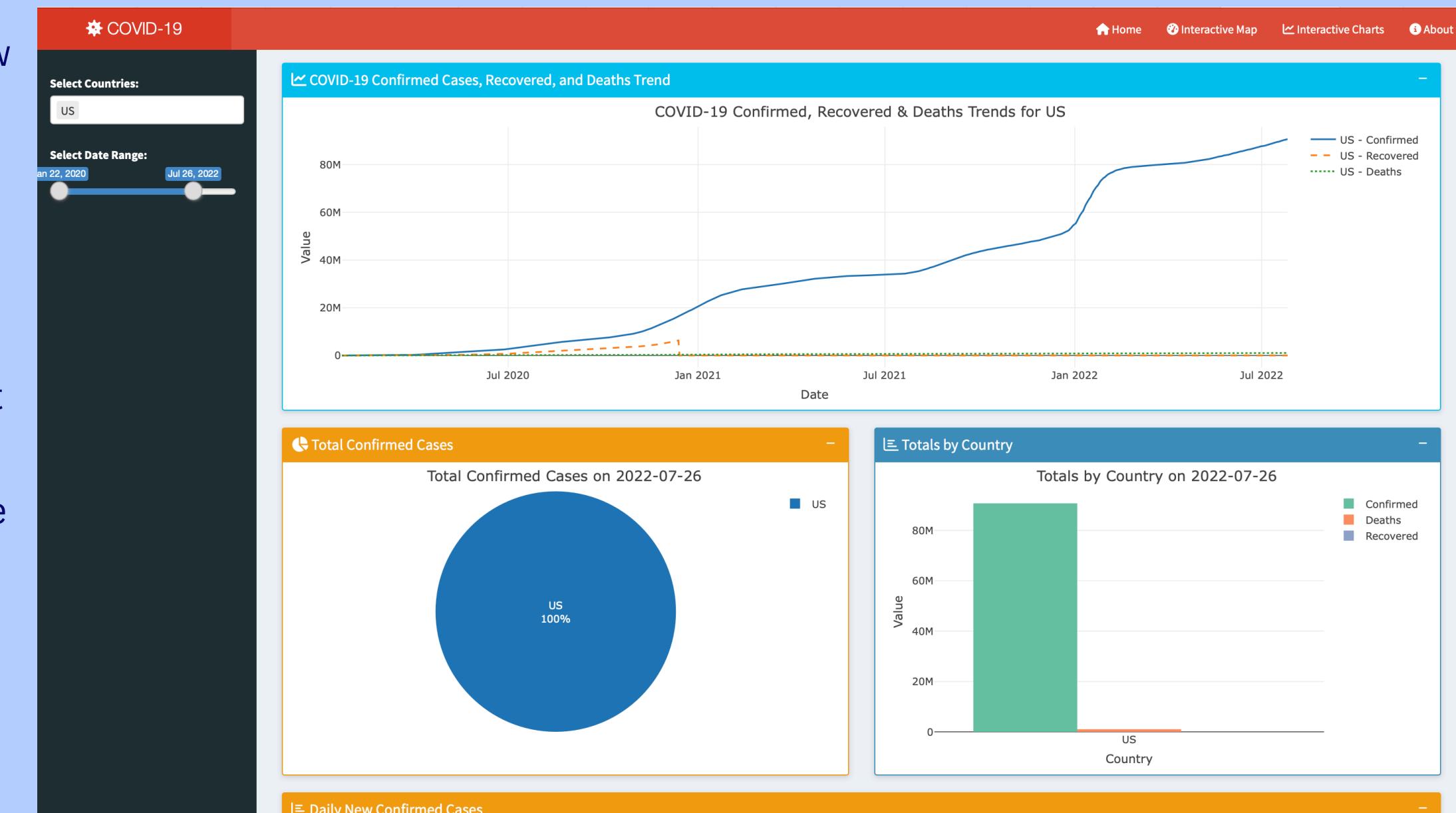
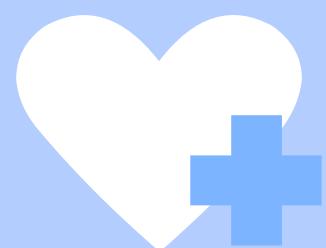
28 May 2025

### Situation at a glance

Since mid-February 2025, according to data available from sentinel sites, global SARS-CoV-2 activity has been increasing, with the test positivity rate reaching 11%, levels that have not been observed since July 2024. This rise is primarily observed in countries in the Eastern Mediterranean, South-East Asia, and Western Pacific regions. Since early 2025, global SARS-CoV-2 variant trends have slightly shifted. Circulation of LP.8.1 has been declining, and reporting of NB.1.8.1, a Variant Under Monitoring (VUM), is increasing, reaching 10.7% of global sequences reported as of mid-May. Recent increases in SARS-CoV-2 activity are broadly consistent with levels observed during the same period last year, however, there still lacks a clear seasonality in SARS-CoV-2 circulation, and surveillance is limited. Continued monitoring is essential. WHO advises all Member States to continue applying a risk-based, integrated approach to managing COVID-19 as outlined in the Director-General's Standing Recommendations [1]. As part of comprehensive COVID-19 control programmes, vaccination remains a key intervention for preventing severe disease and death from COVID-19, particularly among at risk groups.

# Features

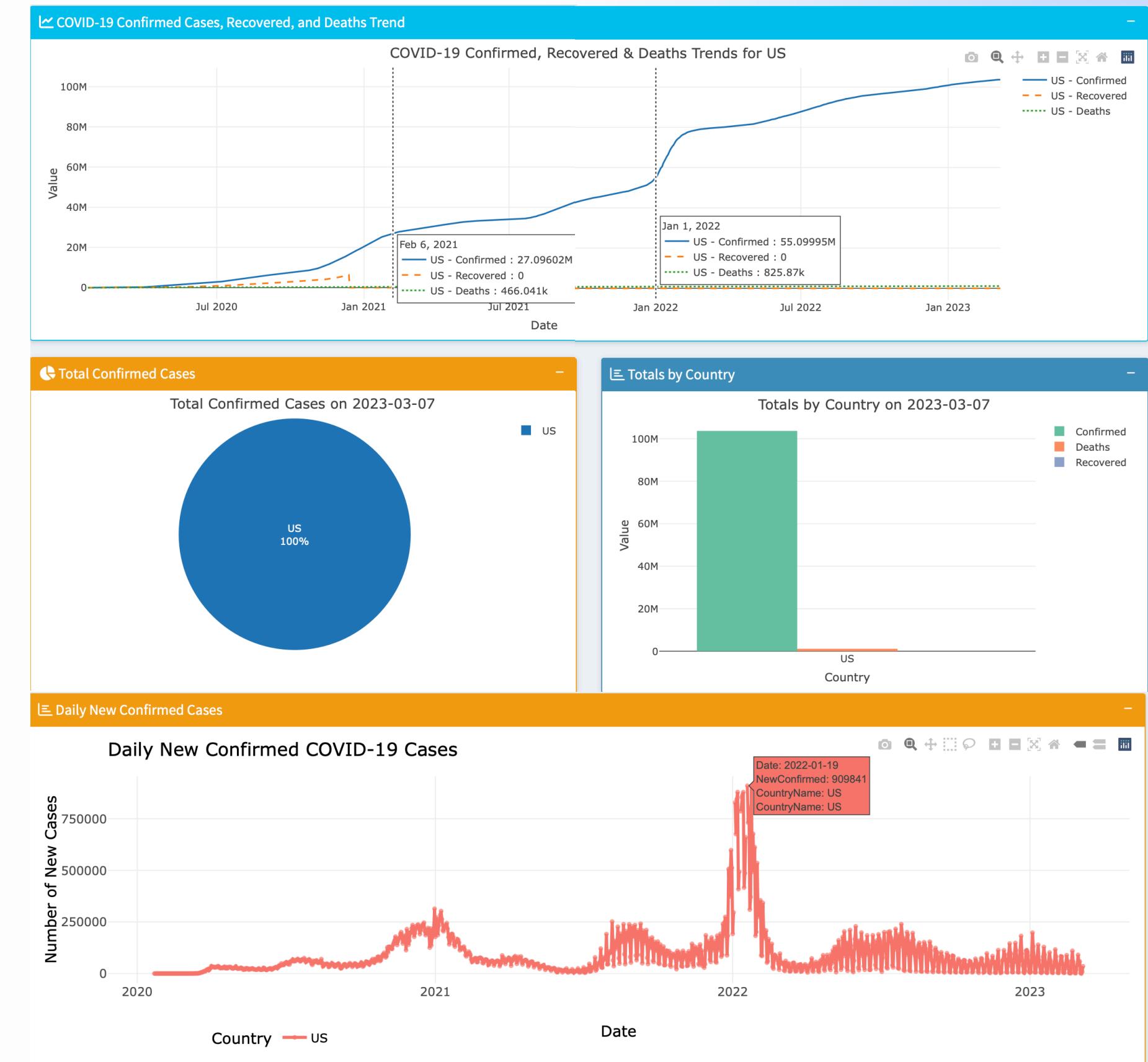
- Demo shows: Confirmed cases, deaths, daily new cases, and recovery.
- Countries/Regions Covered:
  - US
  - EU Nations: Spain, Germany, Italy
  - South East Asia: Vietnam, Thailand, Malaysia
- Our analysis: What policies, behaviors, or variant dynamics shaped these visual patterns?
- Each region is a case study in how states manage public health under uncertainty.



# USA

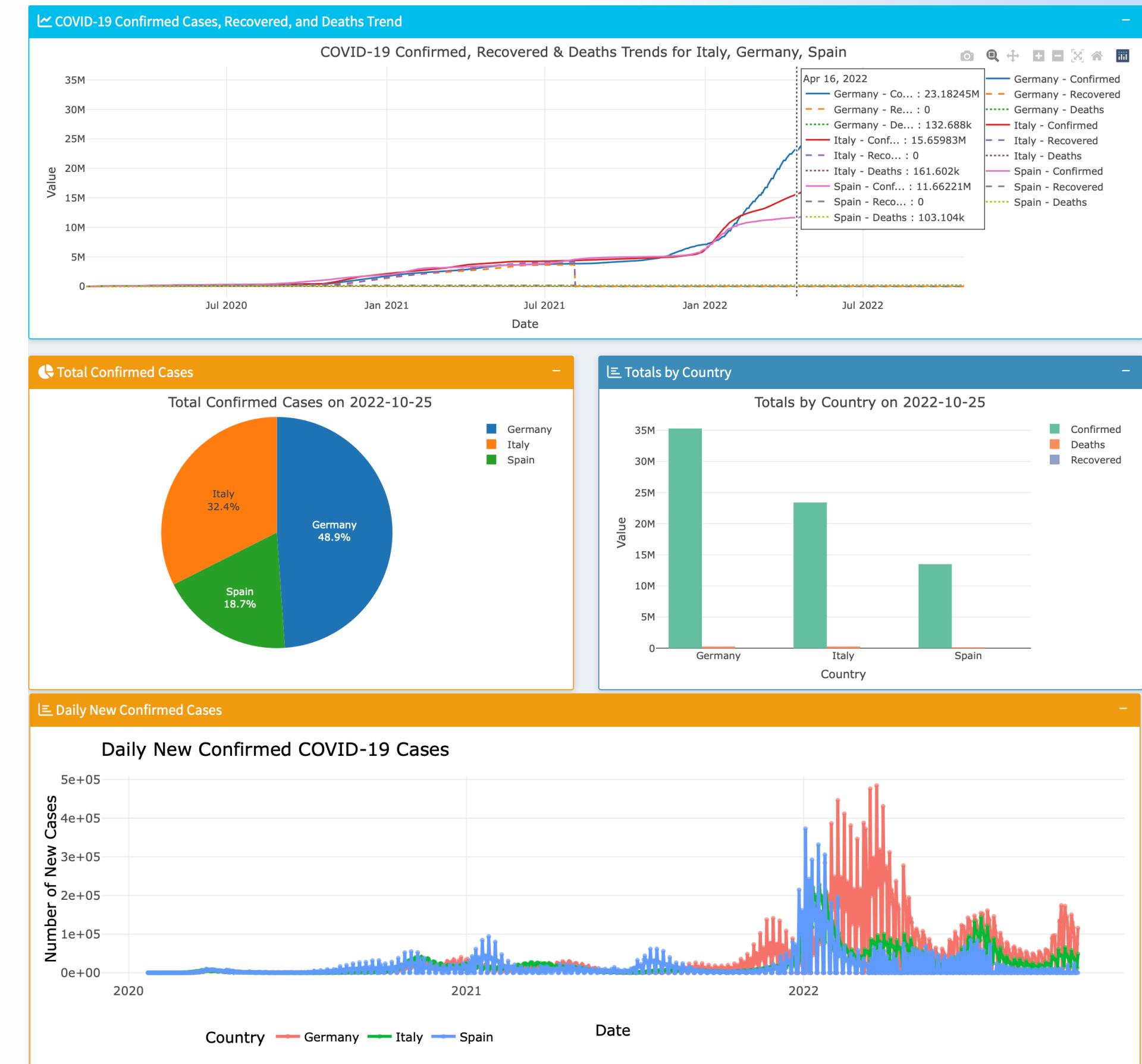
## U.S. Government Response

- Delayed response from federal coordination in 2020, inconsistent state policies, and underestimating the virus. (Brookings, 2020)
- Mixed messages from leaders on masks mandate (ABC News, 2020)
- Omicron spike led to mass testing, boosters, stricter policies
- By Mar 2022, declining cases due to:
  - Widespread vaccine and booster coverage. Diagnosed and non with COVID: >1 dose: 73% and 85%, respectively; full vaccination: 69% and 82%. (Nguyen, March 2022)
  - Expanded access to at-home testing and antivirals



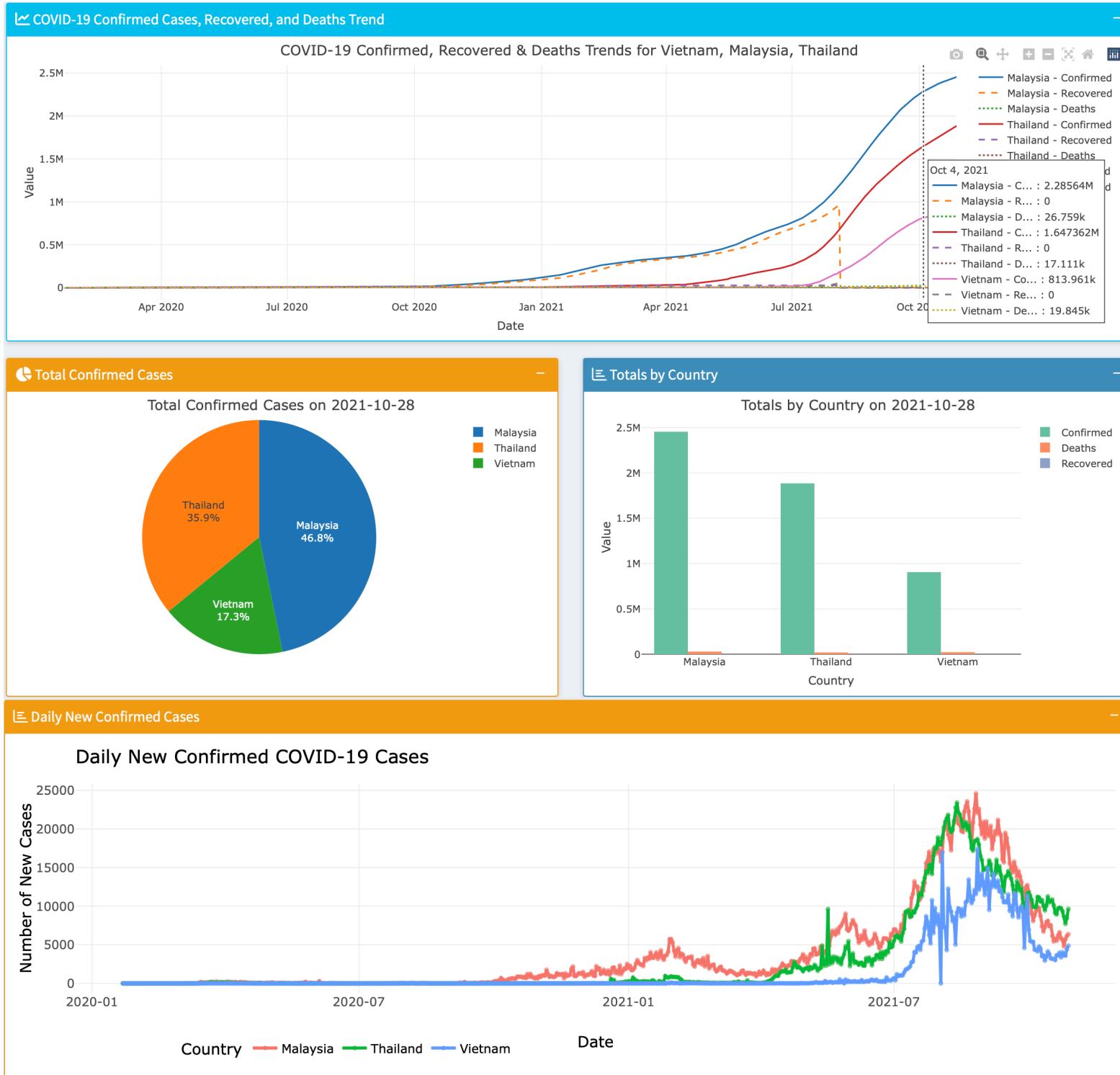
# EU

- Strict lockdowns during Spring 2020
- Italy lockdown on 9<sup>th</sup> March 2020 and Spain on 14<sup>th</sup> March. But these were too late as of 14<sup>th</sup> April, both countries were the two affected hardest in Europe. Rather an attempt to solve not prevent(Cheng & Khan 2020)
- Germany: No plans for lockdown during 2021 causing heavily impacted nation (Turak, 2021)
- Vaccination policy rolled out relatively fast by mid-2021 by all EU nations, prioritizing weak groups such as the elderly, children. (Kessel et. al, 2023)
- Omicron overwhelmed capacity despite vaccines.
- Decline driven by:
  - High vaccine & booster coverage
  - Better hospital protocols & antiviral treatments



# South East Asia

Prior to 2022



After Januray 2022



# South East Asia

## Malaysia & Thailand

- Thailand successfully controlled COVID-19 by strong public health system, previous experience with outbreaks (WHO Thailand, 2020)
- Malaysia is an upper-middle-income country with strong capacity and self-sufficiency in outbreak preparedness and response, as evidenced by its previous experiences to a range of infectious disease outbreaks. (WHO Malaysia, 2020)

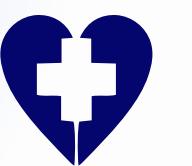
## Vietnam

- Success story in 2020 to July 2021, with low number of cases, which results from taking a serious view to the threat as sharing border with China (Hutt, 2021)
- However, low vaccination rate (25% in 2021) combined with Delta Variants leading to outbreak (Do et. al, 2023). The success from previous cases also caused overconfidence and shortage of medical equipment (Hoang, 2022)
- But later, it got under control with higher vaccination (April 6, 2022, full vaccination rate of 80.1% Hoang (2022)) and change of policy from the government to “new normalization” explains peak in later of 2022, cases increase but nearly no severe cases.

# Recommendation

## Future Prevention Strategy for Vietnam

- Proactive Monitoring: Maintain active surveillance and real-time communication with the public to ensure timely awareness of new developments.
- Public Awareness: Issue regular updates and warnings, especially targeting vulnerable groups (e.g., elderly, children).
- Mask Recommendations: Encourage mask usage in high-risk areas and during periods of rising cases.
- Vaccination Reminders: Promote booster campaigns and expand vaccination coverage to prevent future large-scale outbreaks.



Thanks For  
Listening



# Sources

## United States

- Rubin, O. & Kim, S. R. & Faldeurs, K. (2020, May 06). Mixed messages on masks: A critical tool to slow the pandemic was slowed. ABC News. Retrieved from <https://abcnews.go.com/US/mixed-messages-masks-critical-tool-slow-pandemic-slowed/story?id=70526293>
- Wallach, P. A., Myers, J. (2020, March 31). The federal government's coronavirus actions and failures: Timeline and themes. Brookings. Retrieved from <https://www.brookings.edu/articles/the-federal-governments-coronavirus-actions-and-failures-timeline-and-themes/>
- Nguyen, K. H., Huang, J., Mansfield, K., Corlin, L., & Allen, J. D. (2022). COVID-19 Vaccination Coverage, Behaviors, and Intentions among Adults with Previous Diagnosis, United States. Emerging Infectious Diseases, 28(3), 526-534. <https://doi.org/10.3201/eid2803.211561>

## Europe

- Cheng, S. O., & Khan, S. (2020). Europe's response to COVID-19 in March and April 2020 - A letter to the editor on "World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19)" (Int J Surg 2020;76:71-6). International Journal of Surgery, 77, 109-110. <https://doi.org/10.1016/j.ijsu.2020.04.01>
- Turak, N. (2021, April 5). Europe buckles down for Easter as Covid-19 cases eclipse spring 2020 levels. CNBC. Retrieved from <https://www.cnbc.com/2021/04/05/europe-buckles-down-for-easter-as-covid-19-cases-eclipse-spring-2020-levels.html>
- Kessel, R., Forman, R., Milstein, R., Mastylak, A., Czabanowska, K., Czypionka, T., Durand-Zaleski, I., Hirche, A., Krysinska-Pisarek, M., Maynou, L., Roberts, B., Torbica, A., Vrangbæk, K., Wang, Y., Wouters, O. J., & Mossialos, E. (2023). Divergent COVID-19 vaccine policies: Policy mapping of ten European countries. Vaccine, 41(16), 2483-2492. <https://doi.org/10.1016/j.vaccine.2023.03.036>

## Vietnam

- Toan, D. T. T., Pham, T. H., Nguyen, K. C., Pham, Q. T., Ha, Q. D., Nguyen, H. L., Goldberg, R. J., Pham, L. Q., Le, G. M., Nguyen, T. K., Tran, V. K., & Ta, V. T. (2023). Shift from a Zero-COVID strategy to a New-normal strategy for controlling SARS-CoV-2 infections in Vietnam. Epidemiology and Infection, 151, e104. <https://doi.org/10.1017/S0950268823001048>
  - Hutt, D. (2021, October 14). Vietnam ends zero-COVID: Was it too soon?. Think Global Health. Retrieved from <https://www.thinkglobalhealth.org/article/vietnam-ends-zero-covid-it-too-soon>
  - Hoang, V. (2022). The COVID-19 pandemic in Vietnam – success, crisis, and endemic: Key thresholds and lessons. Journal of Global Health, 12, 03065. <https://doi.org/10.7189/jogh.12.03065>
- Please let me know if you need any adjustments to these citations.