



SCIENTIFIC RESEARCH MONITORING ON COVID-19

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SCIENTIFIC RESEARCH MONITORING ON COVID-19

(Issue 433)

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Abu Dhabi Public Health Center (ADPHC) is gathering the latest scientific research updates and trends on coronavirus disease (COVID-19) in a daily report. The report provides summaries on breakthrough or updated research on COVID-19 to allow health care professionals and public health professionals get easy and fast access to information.

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Research

Titles



Statistics



Articles

Summary

Note : All articles presented in this report represent the authors' views and not necessarily represents Abu Dhabi Public Health Center views or directions. Due the nature of daily posting , some minor language errors are expected.

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Evolution of antibody responses up to 13 months after SARS-CoV-2 infection and risk of reinfection

Covid-19 Breakthrough Infections in Vaccinated Health Care Workers

SARS-CoV-2 reinfection trends in South Africa: analysis of routine surveillance data

The durability of immunity against reinfection by SARS-CoV-2: a comparative evolutionary study

A blood marker predicts who gets 'breakthrough' COVID



Figure 1: Total Number of Infected, Recovered, and Death Cases

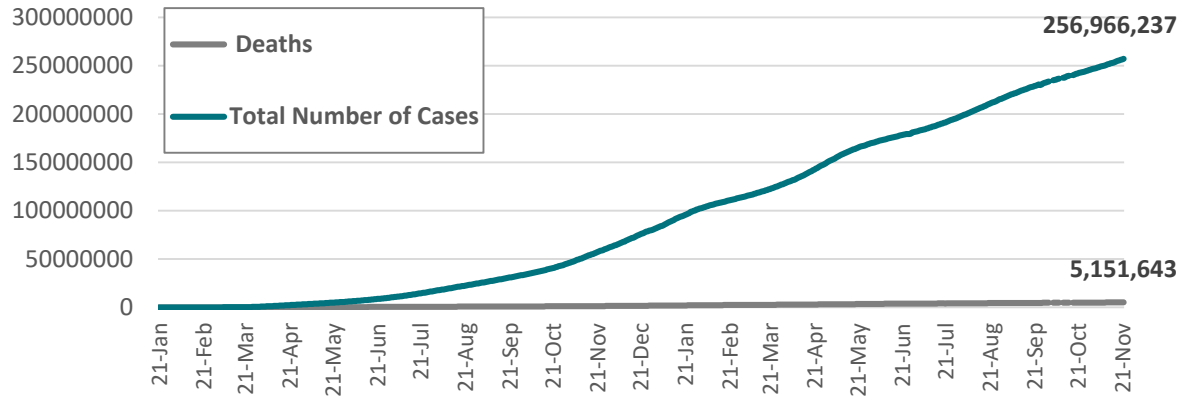


Figure 3: % of people vaccinated fully & partly against COVID-19

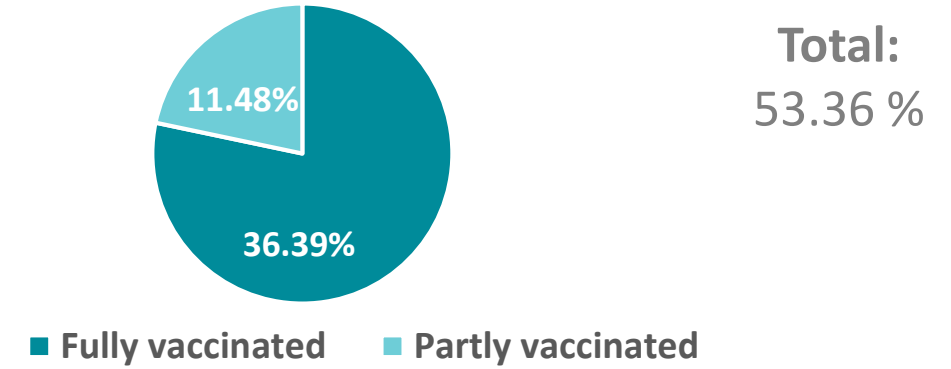
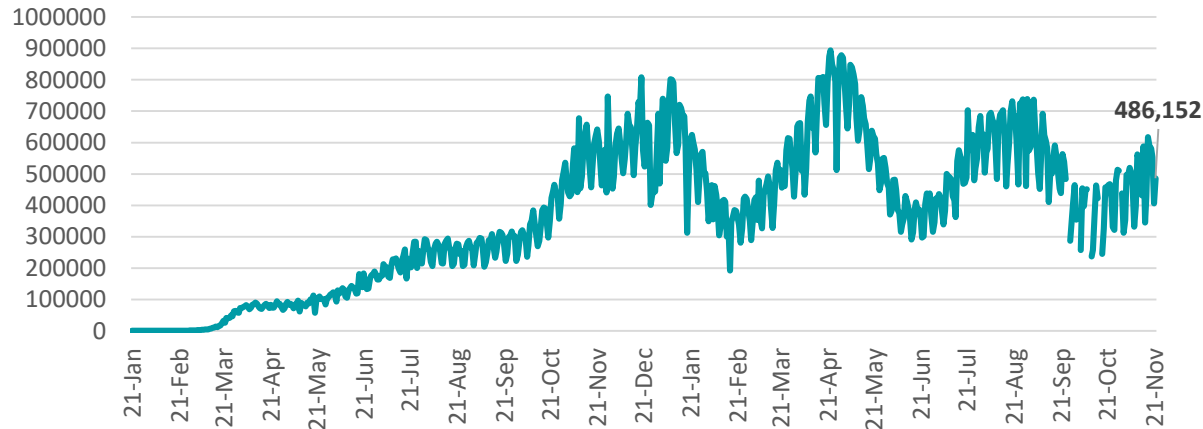


Figure 2: Daily New Infected COVID-19 Cases



4



Figure 4: Global Daily New Deaths Due to COVID-19

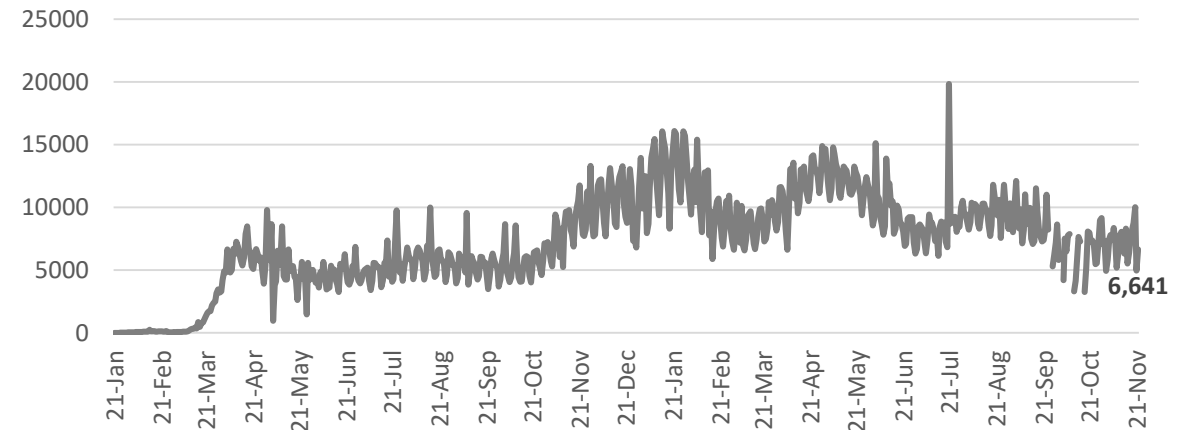
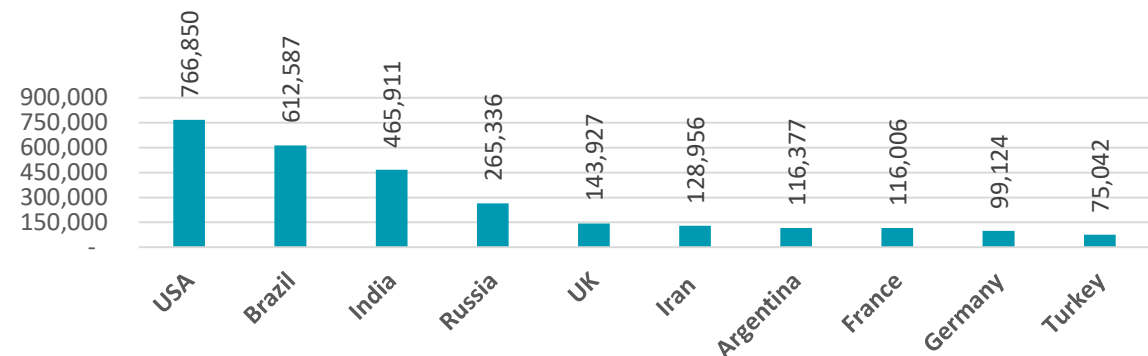
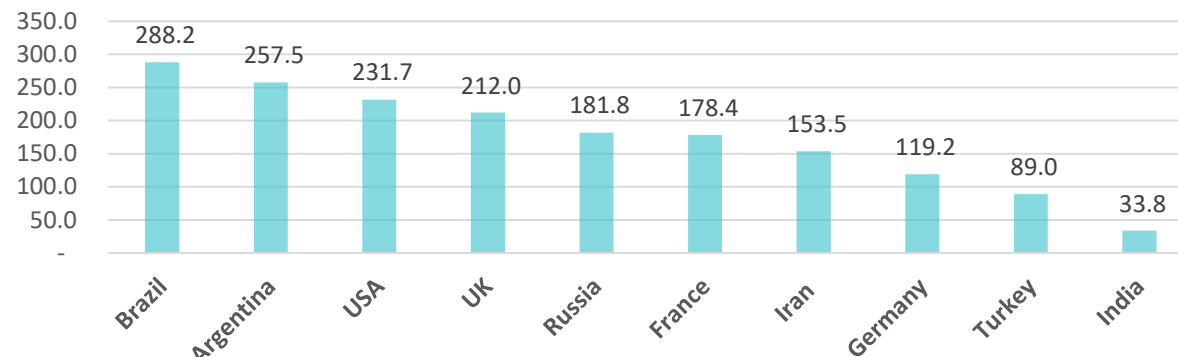


Figure 5: Top 10 Countries in the Total Number of Cases Due to COVID-19

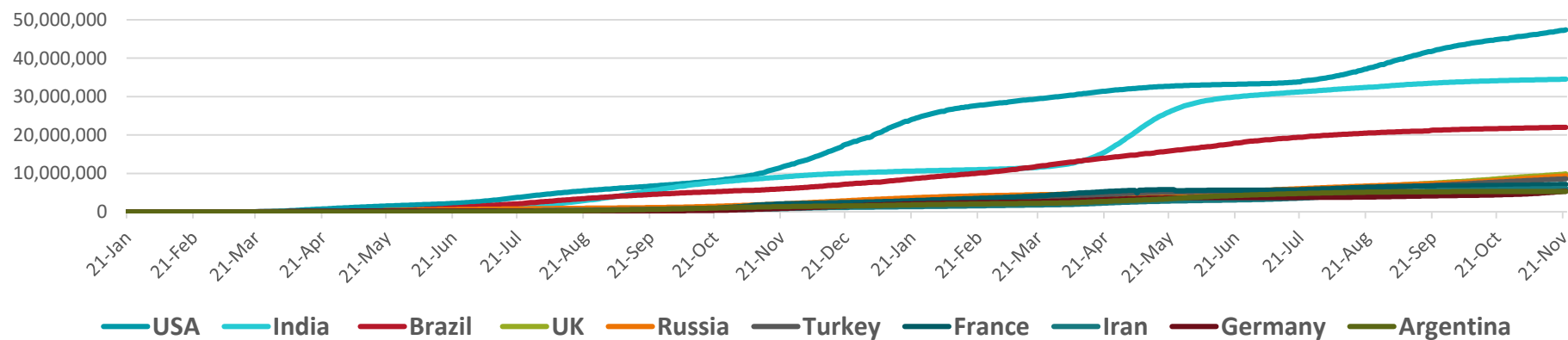
TOTAL DEATHS



DEATHS PER MILLION



TOTAL INFECTED CASES



| | |
|-----------|------------|
| USA | 47,373,195 |
| India | 34,518,901 |
| Brazil | 22,012,150 |
| UK | 9,845,496 |
| Russia | 9,366,839 |
| Turkey | 8,571,554 |
| France | 7,185,901 |
| Iran | 6,077,438 |
| Germany | 5,385,585 |
| Argentina | 5,315,348 |





Figure 8: COVID-19 Status in the UAE (Federal Competitiveness and Statistics Authority Dashboard)

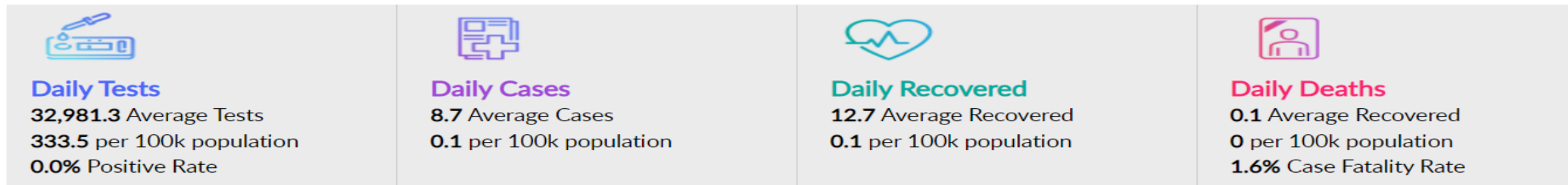


Figure 6A: TOTAL Number Of Infected And Recovered Cases Due To Covid-19 Reported By The UAE

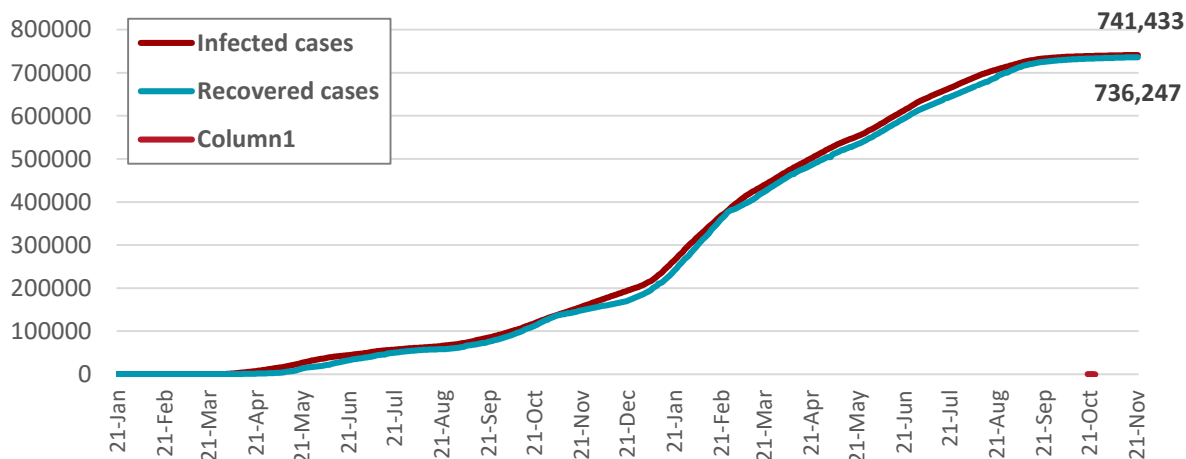


Figure 6 B: TOTAL NUMBER and Percentage of UAE population Vaccinated

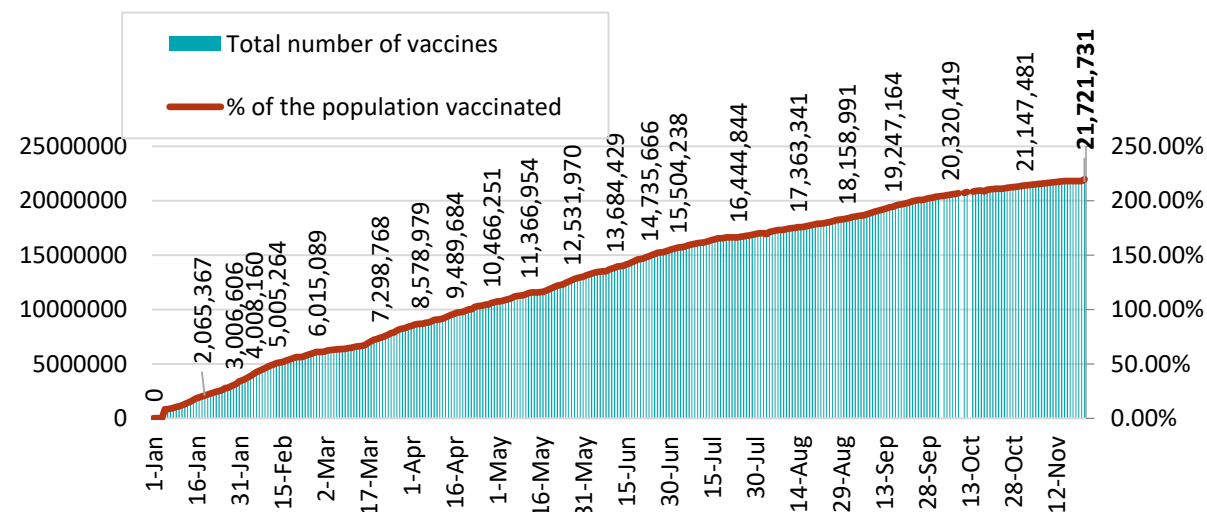




Figure 7A : **Global Distribution of COVID-19 Cases**

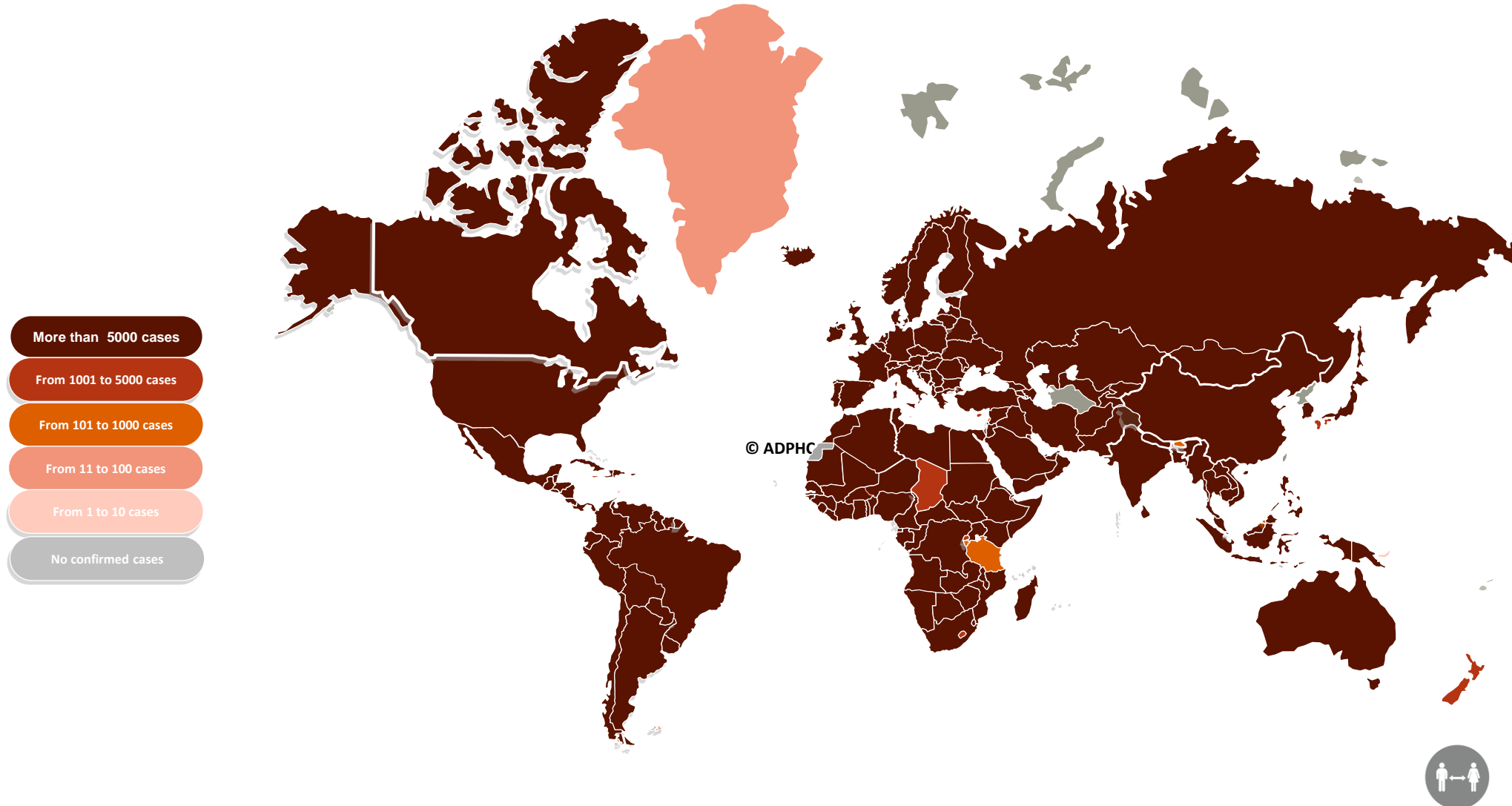




Figure 7B: Bar Chart Illustrates the Global Distribution of COVID19 Cases

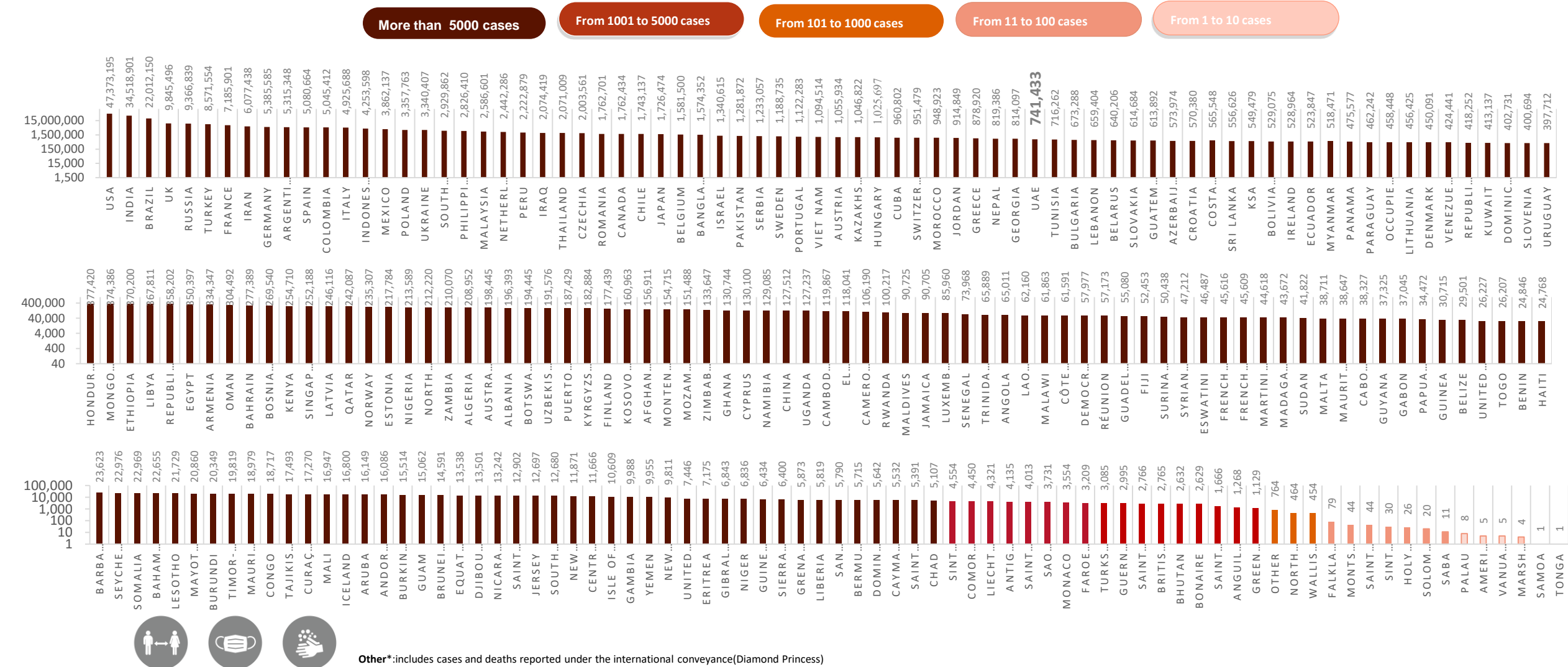
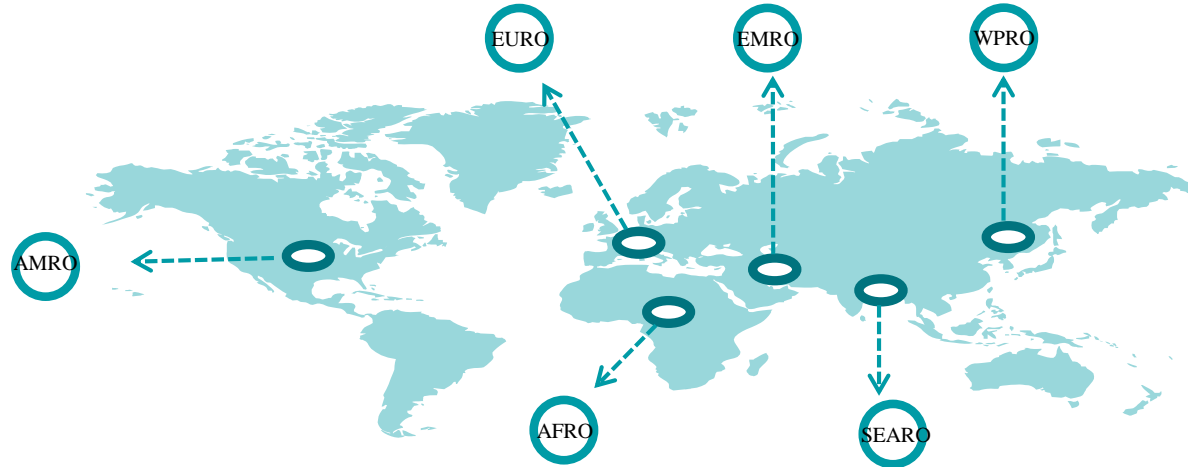
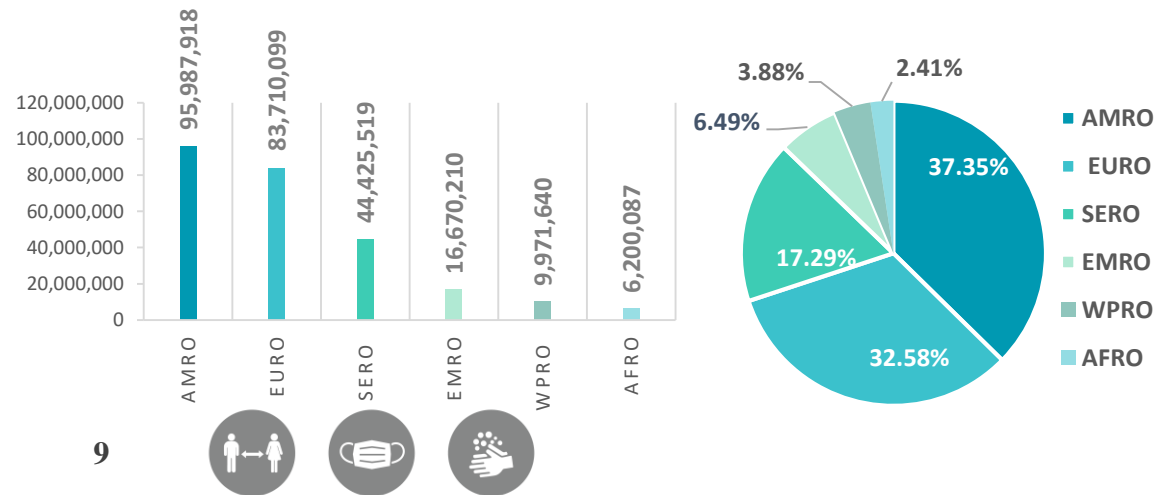




Figure 6: Global Distribution of COVID-19 Cases per Region



INFECTED



DEATHS

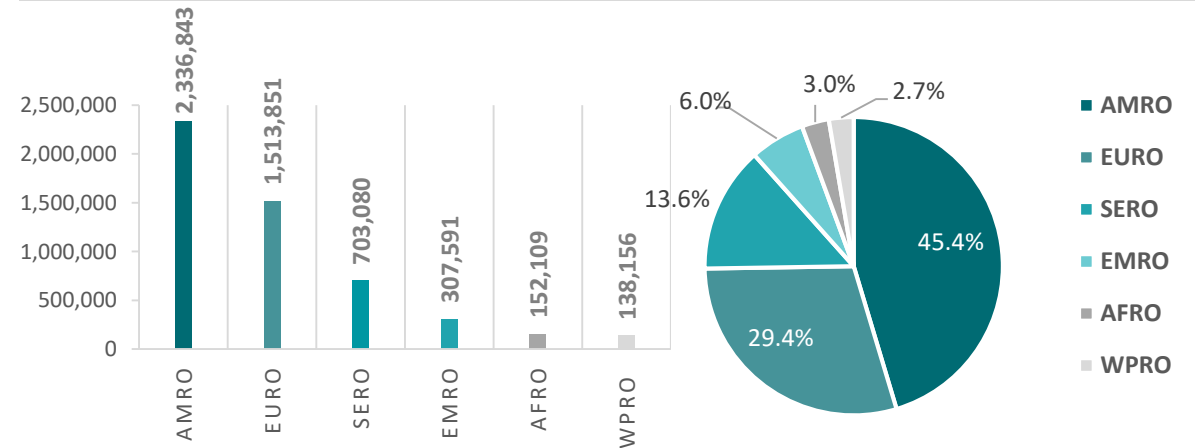
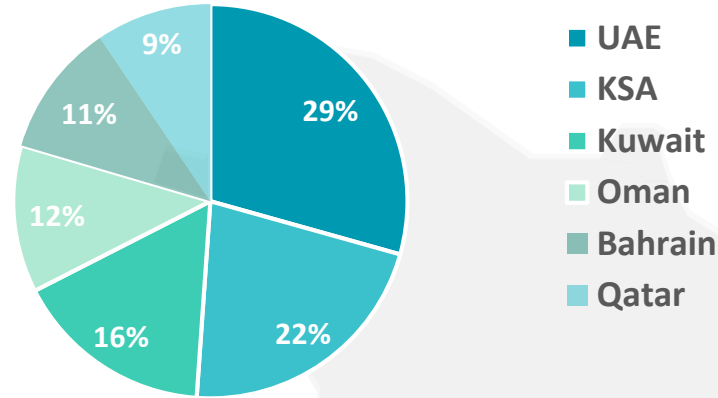
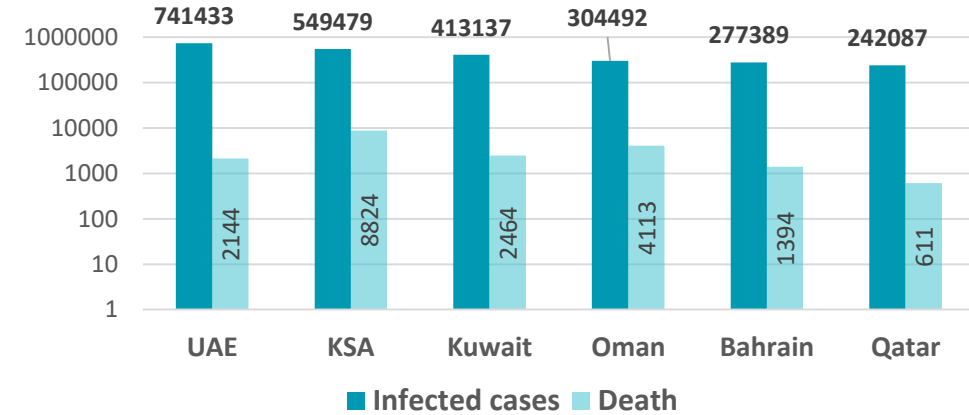


Figure 7: Comparative Analysis of the Distribution of COVID-19 Cases in GCC Countries

TOTAL NUMBER OF INFECTED CASES



TOTAL NUMBER OF INFECTED, RECOVERED AND DEATHS



DEATHS PER MILLION

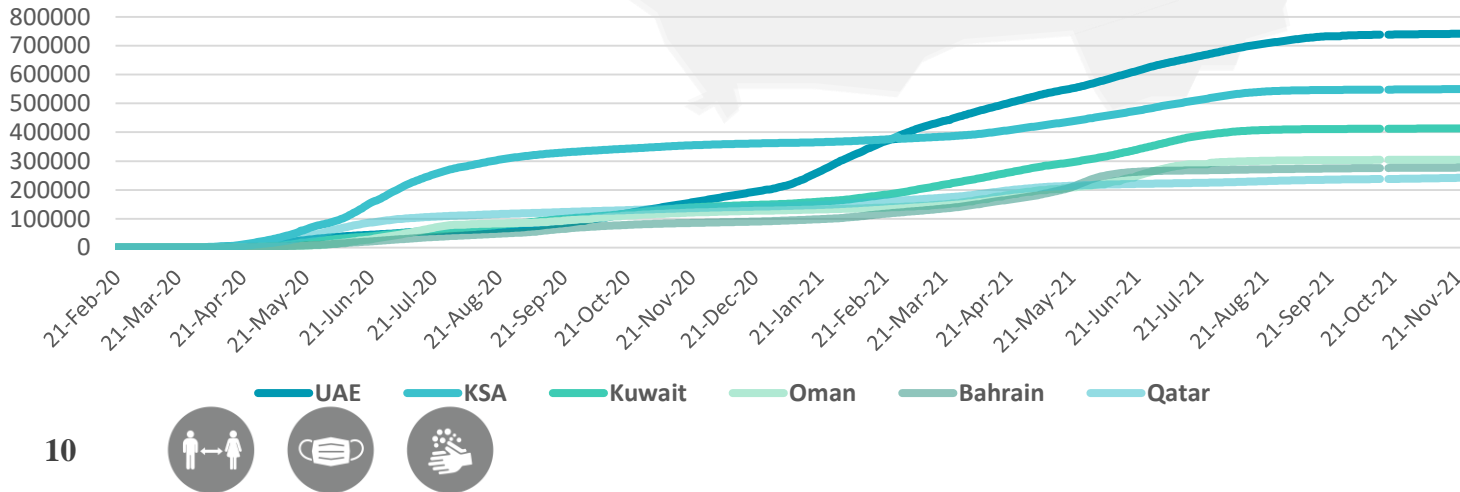
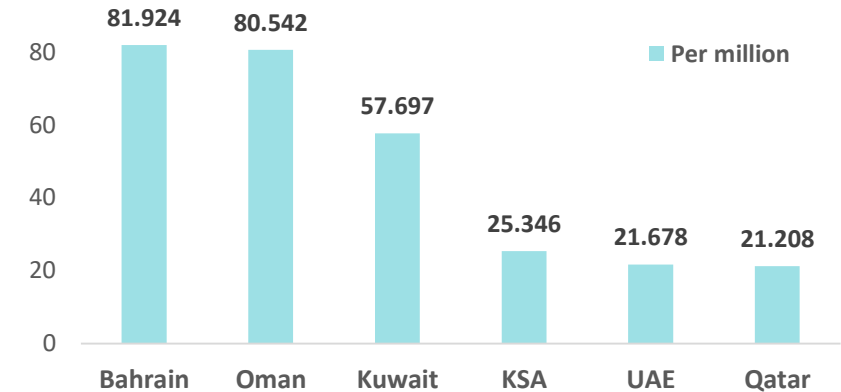




Figure 10: Comparative Analysis of the Distribution of COVID-19 New Cases in GCC Countries

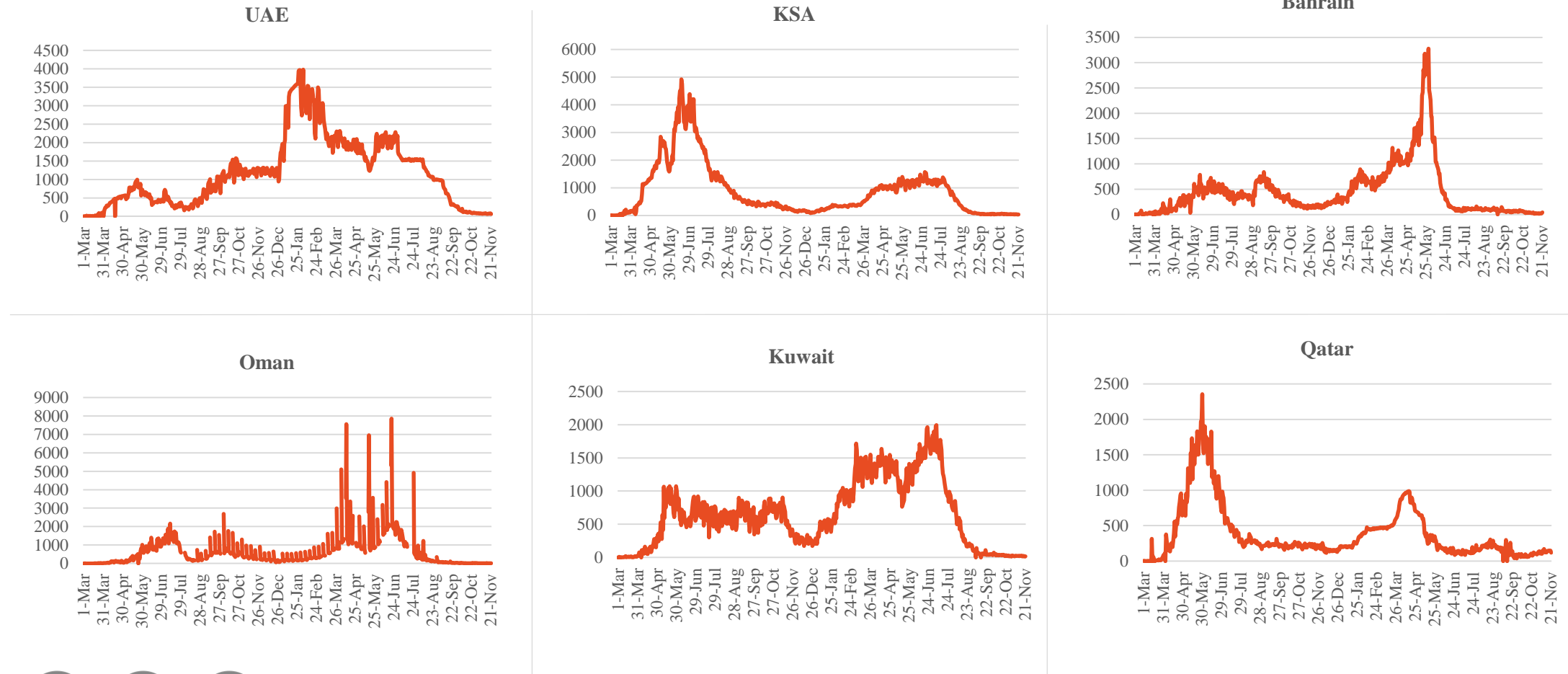
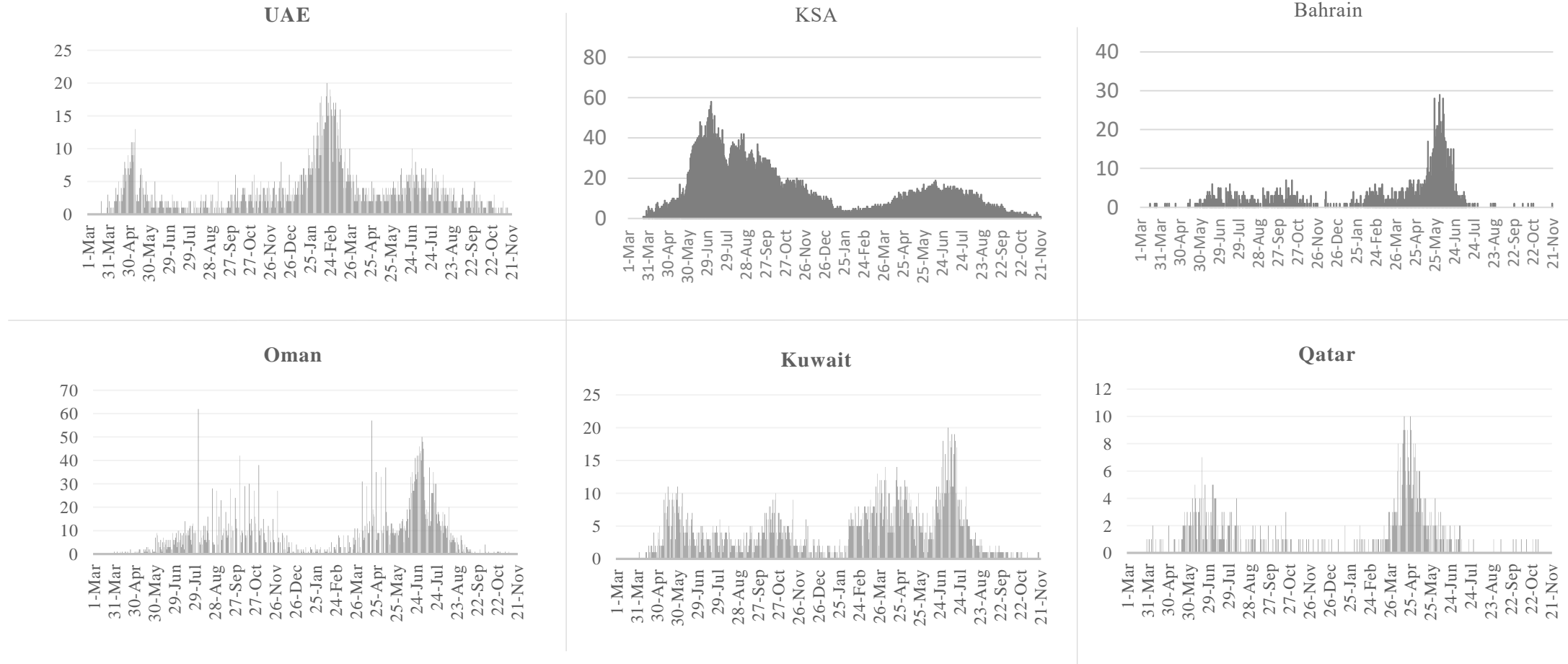




Figure 12: Comparative Analysis of the Distribution of COVID-19 New Death Cases in GCC Countries





Article 1

Evolution of antibody responses up to 13 months after SARS-CoV-2 infection and risk of reinfection

Published

August 26, 2021 in [LANCET](#)

Introduction

This prospective, monocentric, longitudinal, cohort clinical study assesses the kinetics of SARS-CoV-2 antibodies in predicting risk of reinfection and durability of vaccine protection. Data on persistence and long-term efficacy of the immune response are of vital importance in understanding the overall evolution of the pandemic and post-pandemic dynamics, especially in the era of emerging variants.

Methodology

Healthcare workers (HCW) from Strasbourg University Hospital were enrolled between April 6th and May 7th, 2020 and followed up to 422 days. Serial serum samples were tested for antibodies against the Receptor Binding Domain (RBD) of the spike protein and nucleocapsid protein (N) to characterize the kinetics of SARS-CoV-2 antibodies and the incidence of reinfection. Live-neutralization assays were performed for a subset of samples before and after vaccination to analyze sensitivity to SARS-CoV-2 variants.

Findings

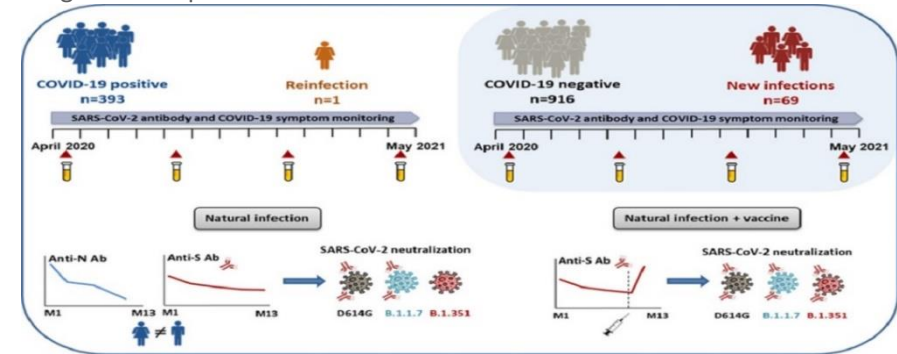
- A total of 4290 samples from 393 convalescent COVID-19 and 916 COVID-19 negative individuals were analyzed. **In convalescent individuals, SARS-CoV-2 antibodies followed a triphasic kinetic model with half-lives at month (M) 11–13 of 283 days for anti-N and 725 days for anti-RBD IgG, which stabilized at a median of 1.54 log BAU/mL (95% CI 1.42–1.67). The incidence of infections was 12.22 and 0.40 per 100 person-years in COVID-19-negative and COVID-19-positive HCW, respectively, indicating a relative reduction in the incidence of SARS-CoV-2 reinfection of 96.7%**

- Live-virus neutralization assay revealed that after one year, variants D614G and B.1.1.7, but less so B.1.351, were sensitive to anti-RBD antibodies at 1.4 log BAU/mL, while IgG ≥ 2.0 log BAU/mL strongly neutralized all three variants. These latter anti-RBD IgG titers were reached by all vaccinated HCW regardless of pre-vaccination IgG levels and type of vaccine.

Conclusion

This study provides crucial information on **the persistence of circulating antibodies against SARS-CoV-2 more than one year after COVID-19, and on the long-term risk of reinfection.** By increasing the levels of cross-neutralizing antibodies, SARS-CoV-2 vaccination may strengthen protection, especially against variants harboring antibody escape mutations like B.1.351. The strong correlation of antibody levels and their neutralizing capacity against variants may be of great help for the interpretation of serological results and for the future determination of a protective anti-RBD IgG level.

Figure 1: Graphical abstract



Article 2

Covid-19 Breakthrough Infections in Vaccinated Health Care Workers

Published

October 14, 2021 in [NEJM](#)

Introduction

Despite the high efficacy of the BNT162b2 messenger RNA vaccine against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), rare breakthrough infections have been reported, including infections among health care workers. This study published in the NEJM aims to characterize these infections and define correlates of breakthrough and infectivity.

Methodology

At the largest medical center in Israel, breakthrough infections were identified by performing extensive evaluations of health care workers who were symptomatic (including mild symptoms) or had known infection exposure. These evaluations included epidemiologic investigations, repeat reverse-transcriptase–polymerase-chain-reaction (RT-PCR) assays, antigen-detecting rapid diagnostic testing (Ag-RDT), serologic assays, and genomic sequencing. Correlates of breakthrough infection were assessed in a case–control analysis.

Patients with breakthrough infection who had antibody titers obtained within a week before SARS-CoV-2 detection (peri-infection period) were matched with four to five uninfected controls and generalized estimating equations were used to predict the geometric mean titers among cases and controls and the ratio between the titers in the two groups. Correlation between neutralizing antibody titers and N gene cycle threshold (Ct) values with respect to infectivity was also assessed.

Findings

- Among **1497 fully vaccinated health care workers for whom RT-PCR data were available, 39 SARS-CoV-2 breakthrough infections were documented.**
- Neutralizing antibody titers in case patients during the peri-infection period were lower than those in matched uninfected controls (case-to-control ratio, 0.361; 95% confidence interval, 0.165 to 0.787). Higher peri-infection neutralizing antibody titers were associated with lower infectivity (higher Ct values).
- Most breakthrough cases were mild or asymptomatic, although 19% had persistent symptoms (>6 weeks). The B.1.1.7 (alpha) variant was found in 85% of samples tested. A total of 74% of case patients had a high viral load (Ct value, <30) at some point during their infection; however, of these patients, only 17 (59%) had a positive result on concurrent Ag-RDT. No secondary infections were documented.

Conclusion

Among fully vaccinated health care workers, the occurrence of breakthrough infections with SARS-CoV-2 was correlated with neutralizing antibody titers during the peri-infection period. Most breakthrough infections were mild or asymptomatic, although persistent symptoms did occur.



Article 3

SARS-CoV-2 reinfection trends in South Africa: analysis of routine surveillance data

Published

November 11, 2021 in [Medrxiv](#)

- Prior infection with SARS-CoV-2 is estimated to provide at least an 80% reduction in reinfection risk. However, the laboratory-based studies indicated that neutralization by convalescent serum for the Beta and Delta variants relative to wild type virus is reduced. However, the impact of these reductions on risk of reinfection is not known.
- Following emergence of the Beta and Delta variants of SARS-CoV-2 in South Africa, it was not clearly known whether there is epidemiologic evidence of increased risk of SARS-CoV-2 reinfection with these variants
- The authors of this study sought to examine whether circulation of the Beta or Delta variants was associated increased reinfection risk and the growing number of individuals eligible for reinfection through time
- The reinfections during the study period was consistent with the null model of no change in
- reinfection risk. Around 16,000 individuals were suspected reinfections during the study period. Analyses, Poisson regression was used after adjusting for possible confounding factors.

- Although the hazards of increasing infection was increased following the introduction of both the Beta and Delta variants, there was no increase in reinfection hazard.
- Additionally, the estimated hazard ratio for reinfection versus primary infection was lower during waves driven by the Beta and Delta variants than for the first wave (relative hazard ratio for wave 2 vs. wave 1: 0.75 (0.59-0.97); wave 3 versus wave 1: 0.70 (0.55-0.90).
- The findings is consistent with a scenario in which variants have increased transmissibility but little or no evasion of immunity
- The authors concluded that there is no evidence that reinfection risk is higher as a result of the emergence of Beta or Delta variants of concern. Further, they suggested that the selective advantage that allowed these variants to spread derived primarily from increased transmissibility, rather than immune escape.



Article 4

Published

October 01, 2021 in [LANCET](#)

The durability of immunity against reinfection by SARS-CoV-2: a comparative evolutionary study

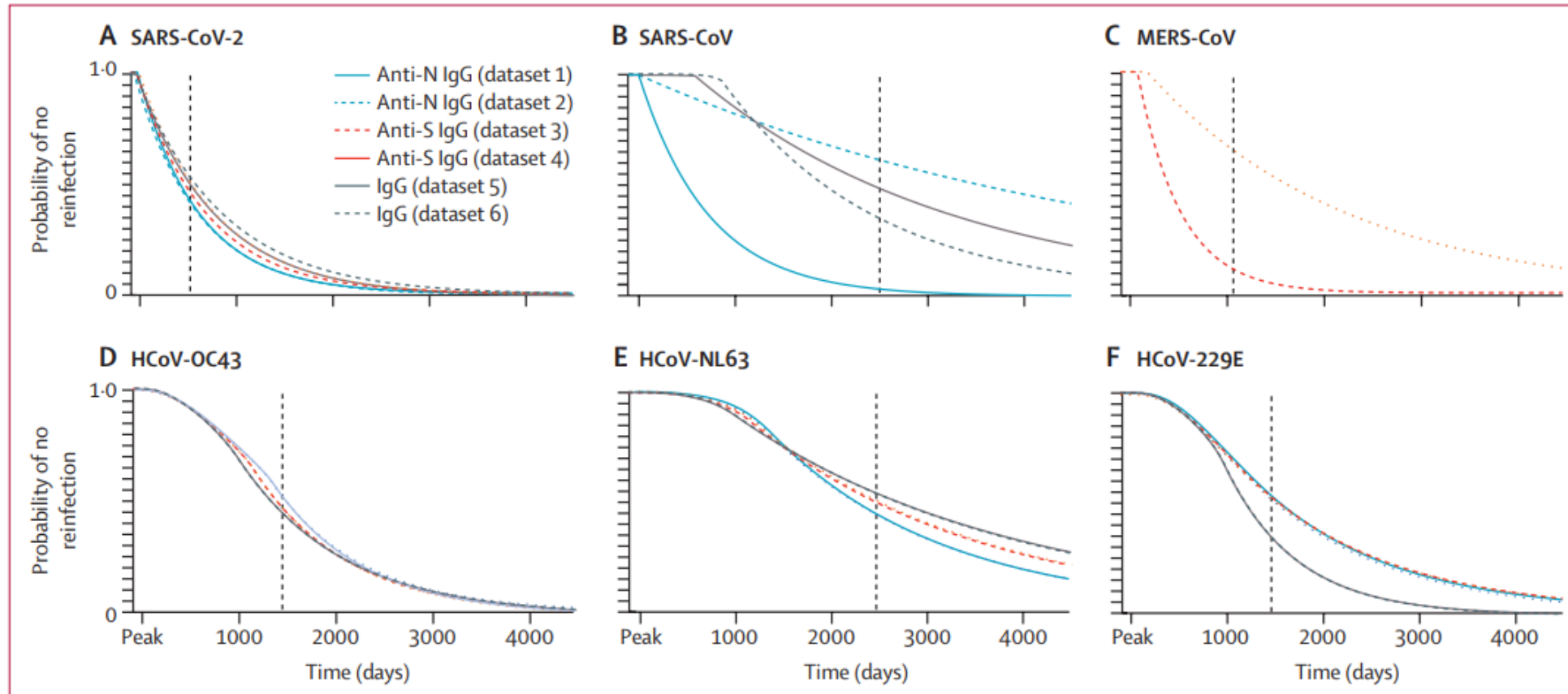
- There are limited direct data on SARS-CoV-2 long-term immune responses and reinfection. Predicting the durability of immunity against the virus causing COVID-19, SARS-CoV-2, remains challenging amid a pandemic.
- This study aimed to use data on the durability of immunity among evolutionarily close coronavirus relatives of SARS-CoV-2 to estimate times to reinfection by a comparative evolutionary analysis of related viruses SARS-CoV, MERS-CoV, human coronavirus (HCoV)-229E, HCoV-OC43, and HCoV-NL63.
- The waning of humoral immunity against SARS-CoV-2, the observed rates of antibody decline after infection, and the probability of reinfection given antibody levels for multiple close relatives of SARS-CoV-2 was estimated using a phylogenetic analysis of the ancestral and descendent states.
- The investigators conducted phylogenetic analyses of the S, M, and ORF1b genes to reconstruct a maximum-likelihood molecular phylogeny of human-infecting coronaviruses.
- This protection is less than half the duration revealed for the endemic coronaviruses circulating among humans (15 months to 10 years for HCoV-OC43, 31 months to 12 years for HCoV-NL63, and 16 months to 12 years for HCoV-229E) For SARS-CoV, the 5–95% quantiles were 4 months to 6 years, whereas the 95% quantiles for MERS-CoV were inconsistent
- The authors concluded that as the COVID-19 pandemic continues, reinfection is likely to become increasingly common.
- Maintaining public health measures that curb transmission—including among individuals who were previously infected with SARS-CoV-2—coupled with persistent efforts to accelerate vaccination worldwide is critical to the prevention of COVID-19 morbidity and mortality.





Continued

Figure 2: Probability of remaining free of reinfection over time and median times to reinfection for human-infecting coronaviruses SARS-CoV-2, SARS-CoV, MERS-CoV, HCoV-OC43, HCoV-NL63, and HCoV-229E.



Article 5

A blood marker predicts who gets 'breakthrough' COVID

Published

July 29, 2021 in [Nature](#)

- This article discusses about real-world evidence from a medical center links high levels of potent antibodies after vaccination to a reduced risk of infection.
- People fully vaccinated against COVID-19 are less likely to become infected with the coronavirus if they have relatively high levels of virus-blocking antibodies, according to a study of thousands of health-care workers who received the Pfizer–BioNTech jab.
- A robust predictive marker, known as a correlate of protection, could help regulators to approve new vaccines without requiring large clinical trials. It could also help them to assess the need for booster shots to guard against emerging viral variants.
- The study, published in The NEJM on 28 July, draws on data from almost 11,500 fully vaccinated health-care workers at Sheba Medical.
- Center near Tel Aviv, Israel. Extensive testing between late January and late April 2021 identified 39 workers who had become infected with SARS-CoV-2 despite being fully vaccinated. All had mild symptoms or none at all, but 19% still had some symptoms 6 weeks after diagnosis.
- The study, published in The New England Journal of Medicine on 28 July, draws on data from almost 11,500 fully vaccinated health-care workers at Sheba Medical Center near Tel Aviv, Israel. Extensive testing between late January and late April 2021 identified 39 workers who had become infected with SARS-CoV-2 despite being fully vaccinated. All had mild symptoms or none at all, but 19% still had some symptoms 6 weeks after diagnosis.



Continued

- For 22 of the 39 workers with ‘breakthrough’ infections, the authors were able to obtain antibody measurements taken either on the day as the infections were detected or in the week before. The researchers also examined data from 104 fully vaccinated workers who matched infected workers for factors such as age but who did not get infected. Comparison showed that levels of neutralizing antibodies were lower among those who got infected. But the difference in antibody levels between trial participants who had breakthrough infections and those who didn’t was not statistically significant.
- The latest study is based on a small number of cases among young and healthy adults, which limits its application, and more studies from vaccine trials are expected soon. Lastly, the analysis does not provide a specific level of antibodies that is associated with protection, say researchers.



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