مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

SCIENTIFIC RESEARCH MONITORING ON COVID-19

27 JANUARY 2022

For accessing the full series of published scientific reports please visit the following link:
https://www.doh.gov.ae/ar/covid-19/Healthcare-Professionals/Scientific-Publication

SCIENTIFIC RESEARCH MONITORING ON COVID-19

(Issue 435)

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

Abu Dhabi Public Health Center (ADPHC) is gathering the latest scientific research updates and trends on coronavirus disease (COVID-19) in a monthly 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.

Click on icon to view content

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.
For further inquiries you may communicate with us as PHR@adphc.gov.ae

RESEARCH UPDATES

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

The views and opinions expressed in this report are those of the authors and do not reflect the official policy or position of the Abu Dhabi Public Health Center (ADPHC).

Click on icon to view content

- mRNA-based COVID-19 vaccine boosters induce neutralizing immunity against SARS-CoV-2 Omicron variant
- Effectiveness of BNT162b2 Vaccine against Omicron Variant in South Africa
- Plasma Neutralization of the SARS-CoV-2 Omicron Variant
- Reduced neutralisation of SARS-CoV-2 omicron B.1.1.529 variant by post-immunisation serum

EPIDEMIOLOGY

FROM 21 JAN 2020 TO 26 JANUARY 2022

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

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

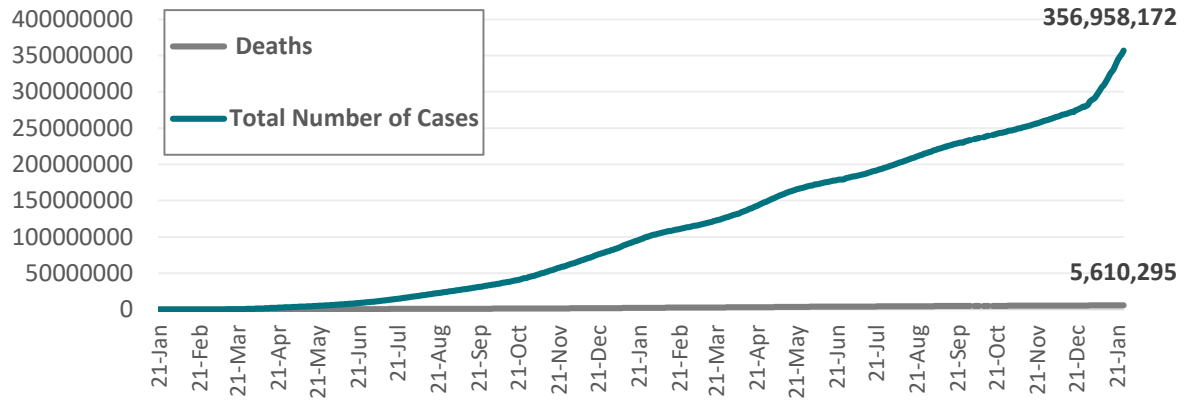


Figure 2: Daily New Infected COVID-19 Cases

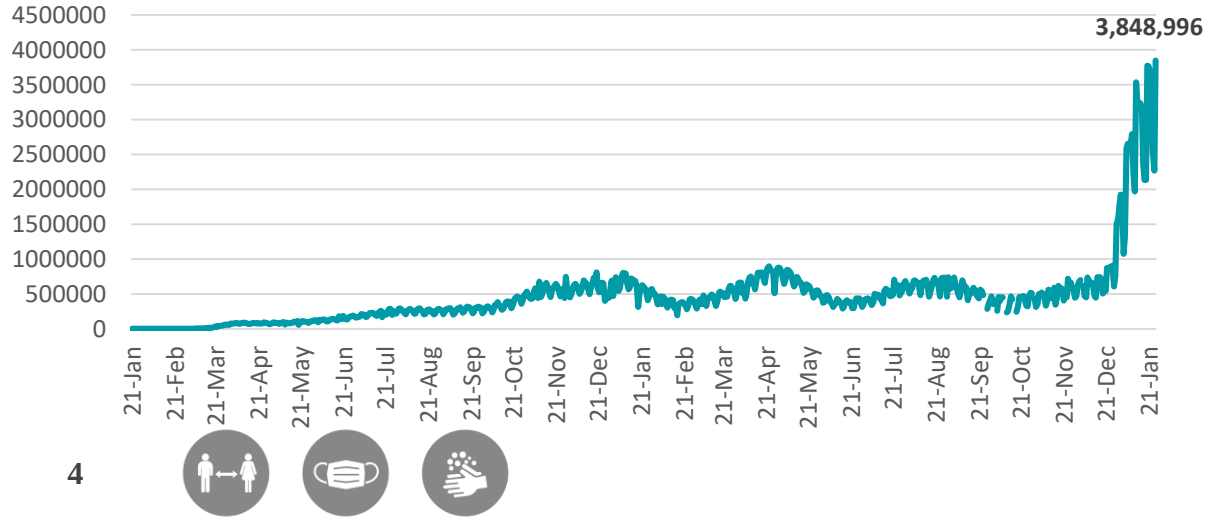
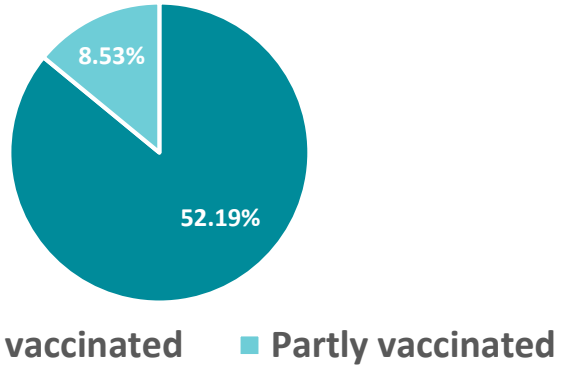
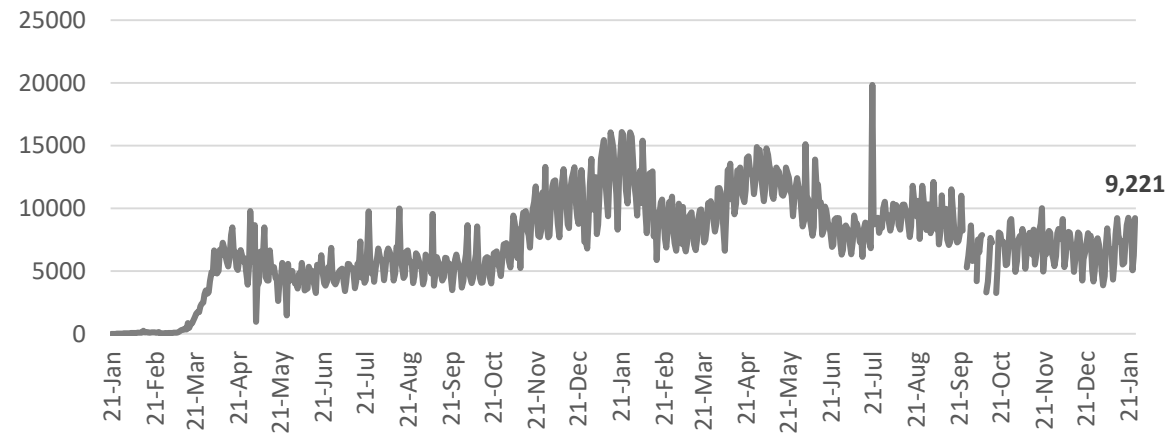


Figure 3: % of people vaccinated fully & partly against COVID-19



Total:
60.72%

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

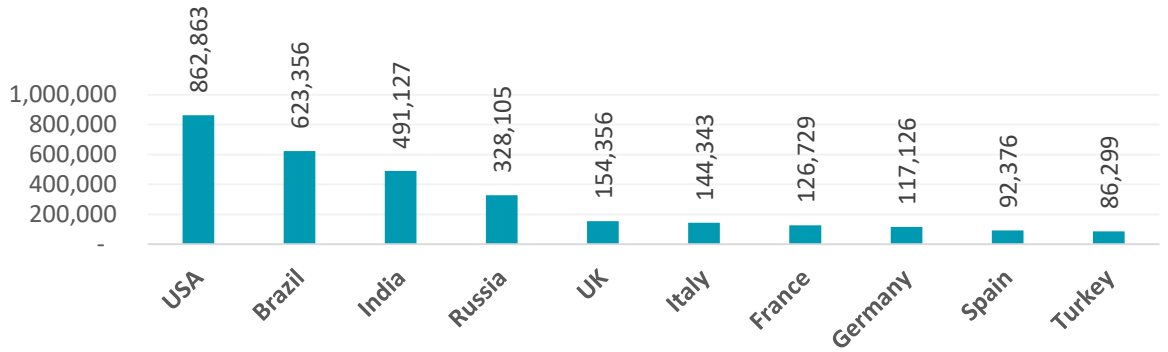


Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: WHO, Our world in data

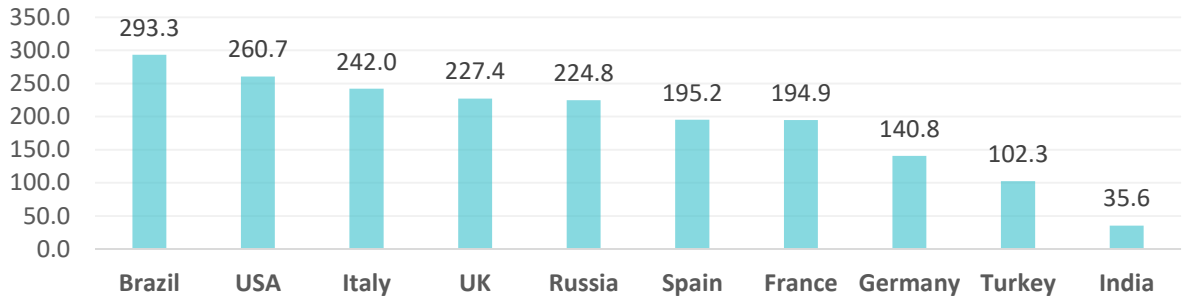
مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

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

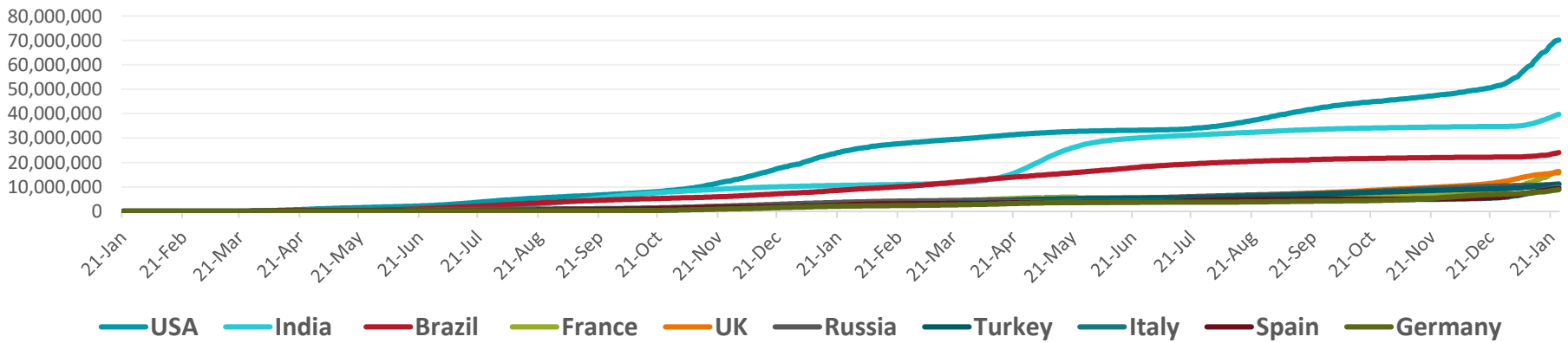
TOTAL DEATHS



DEATHS PER MILLION



TOTAL INFECTED CASES



USA	71,326,407
India	40,085,116
Brazil	24,124,595
France	16,830,895
UK	16,047,720
Russia	11,315,801
Turkey	11,089,602
Italy	10,212,621
Spain	9,395,768
Germany	9,035,795

Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: WHO

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

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

Daily Tests
493,908.4 Average Tests
4,993.8 per 100k population
0.6% Positive Rate

Daily Cases
2,752.9 Average Cases
27.8 per 100k population

Daily Recovered
1,137.1 Average Recovered
11.5 per 100k population

Daily Deaths
4.0 Average Deaths
0.0 per 100k population
0.1% Case Fatality Rate

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

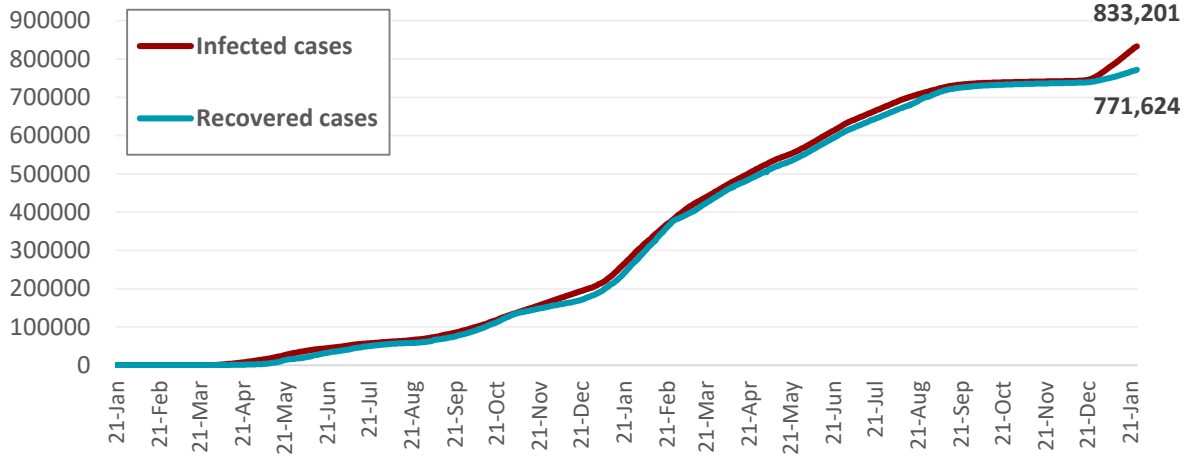
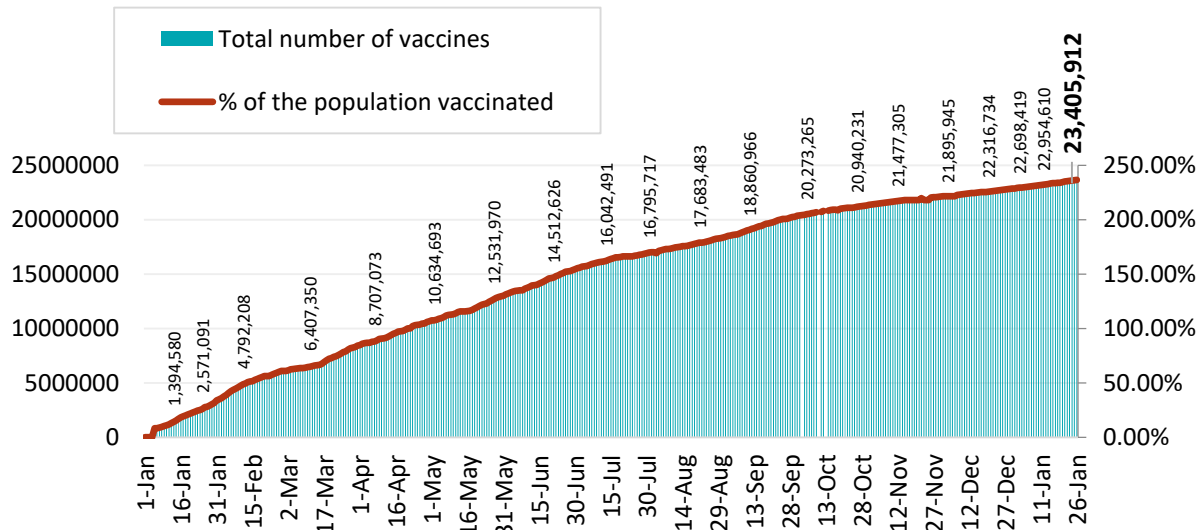


Figure 6 B: TOTAL NUMBER and Percentage of UAE population Vaccinated



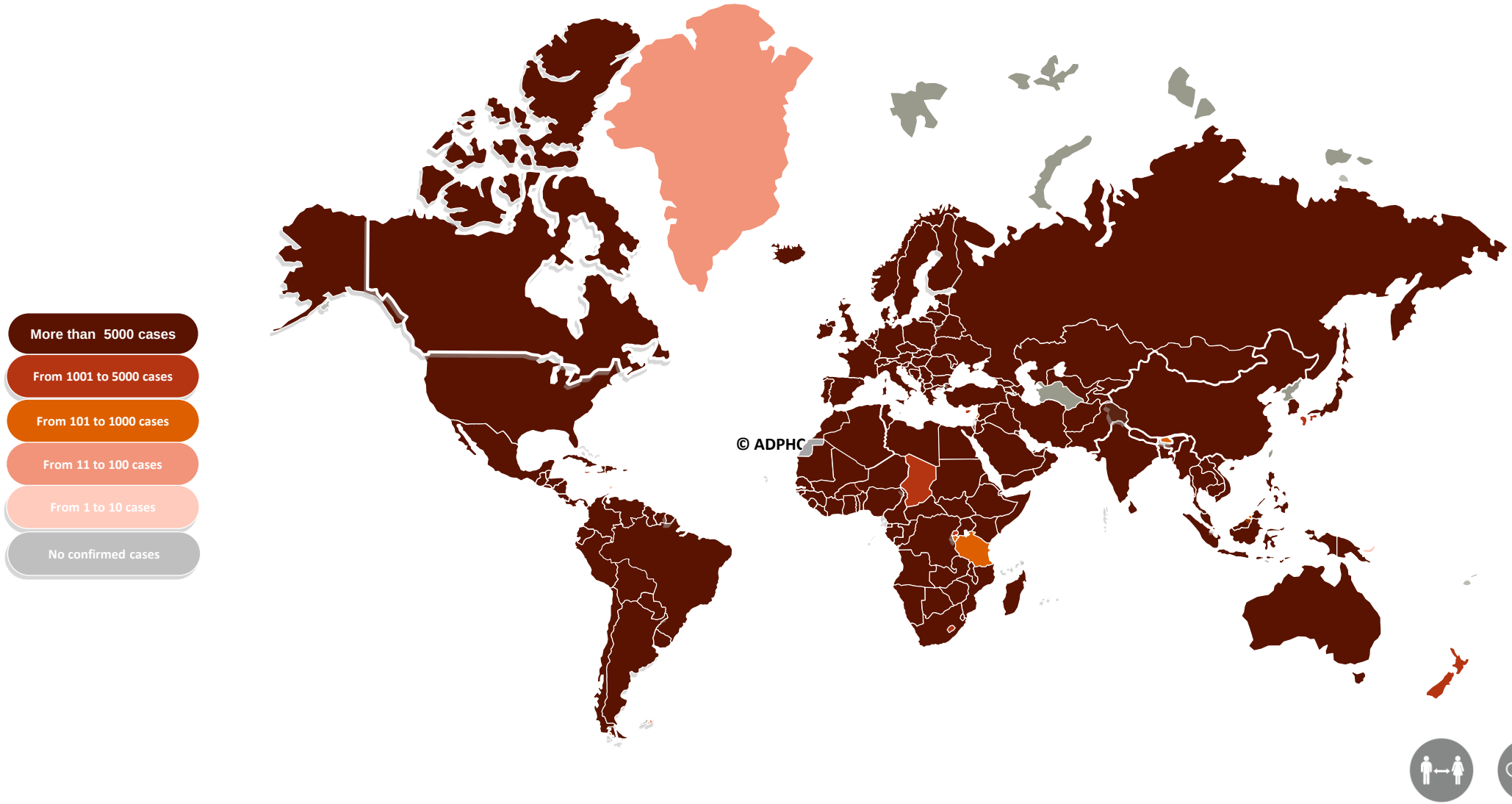
Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: FCSA, WHO, John Hopkins, National Emergency Crisis and Disaster Management Authority

EPIDEMIOLOGY

FROM 21 JAN 2020 TO 26 JANUARY 2022

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

Figure 7A : Global Distribution of COVID-19 Cases



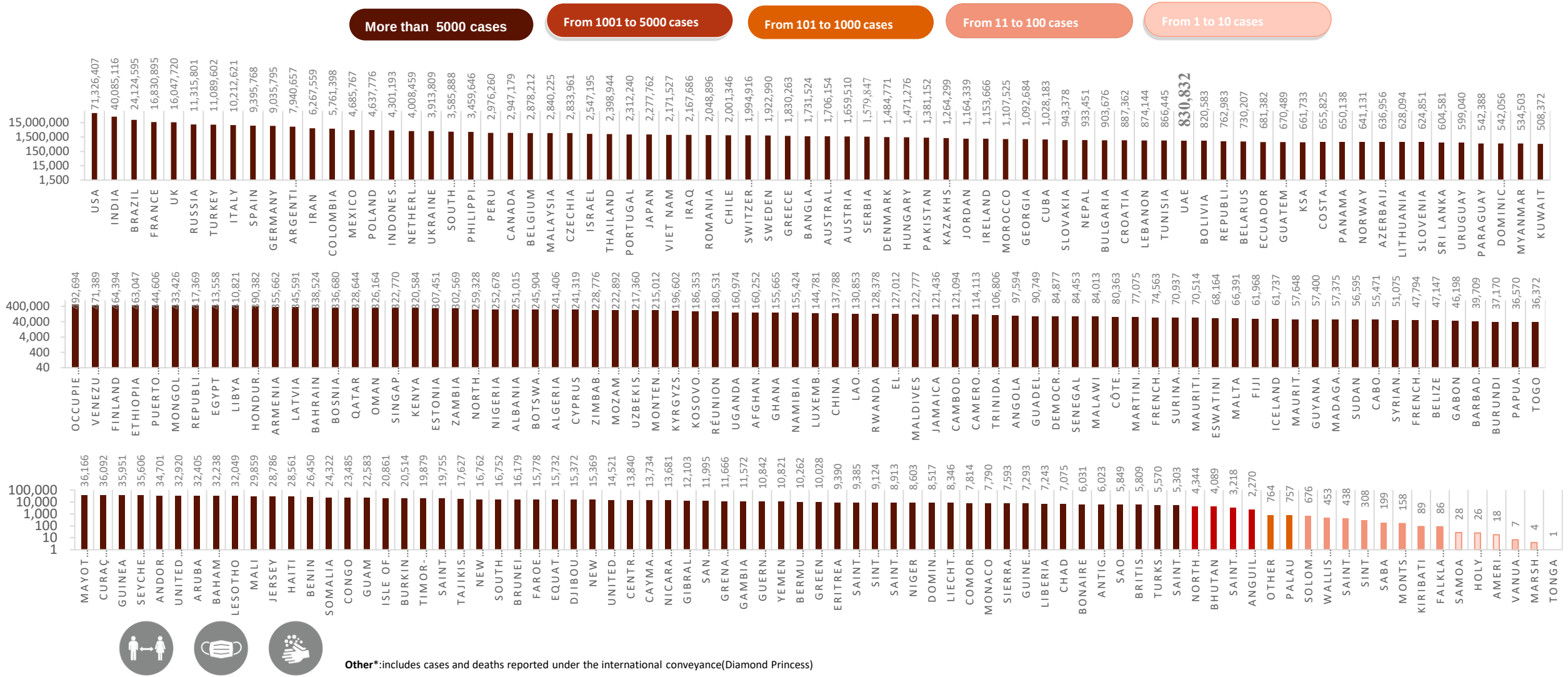
Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: WHO

EPIDEMIOLOGY

FROM 21 JAN 2020 TO 26 JANUARY 2022

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

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

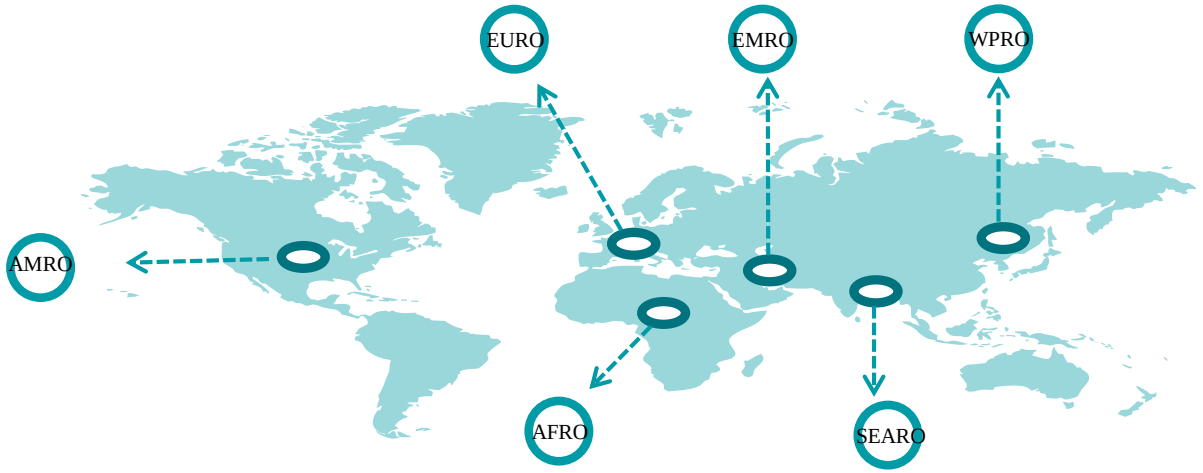


Other*:includes cases and deaths reported under the international conveyance(Diamond Princess)

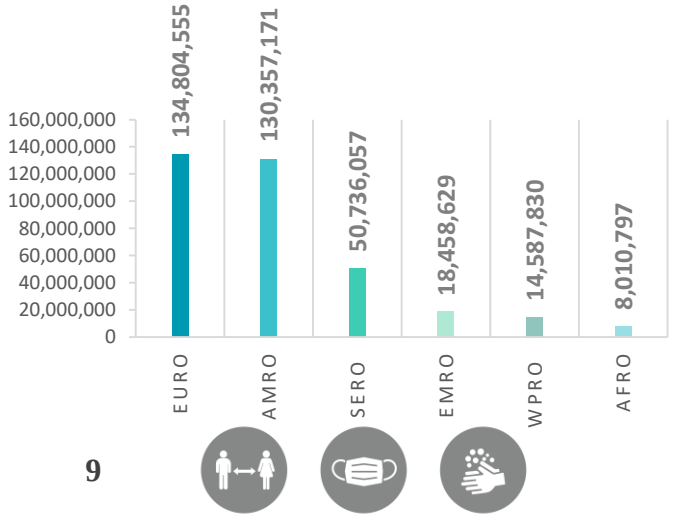
Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: WHO

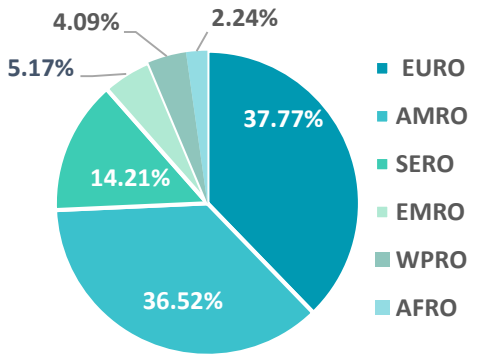
مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

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

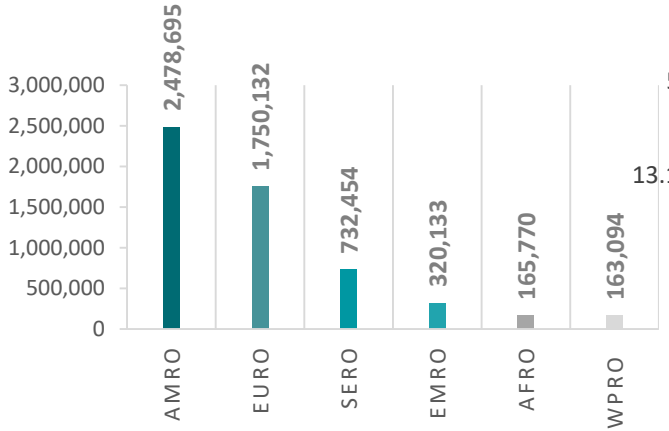


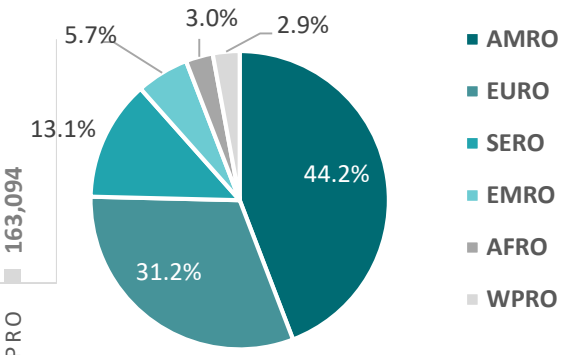
INFECTED





DEATHS





Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: John Hopkins, WHO

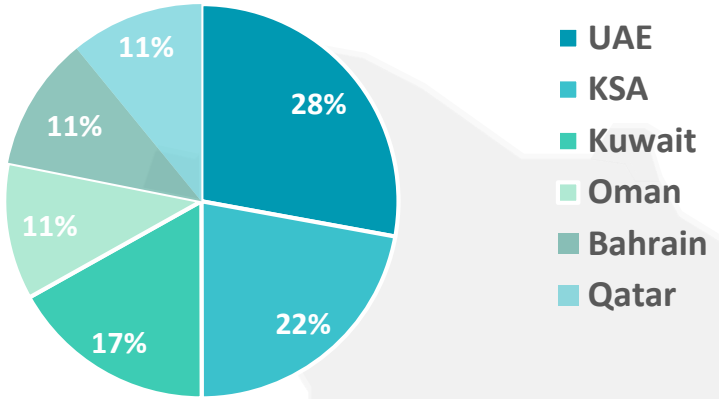
EPIDEMIOLOGY

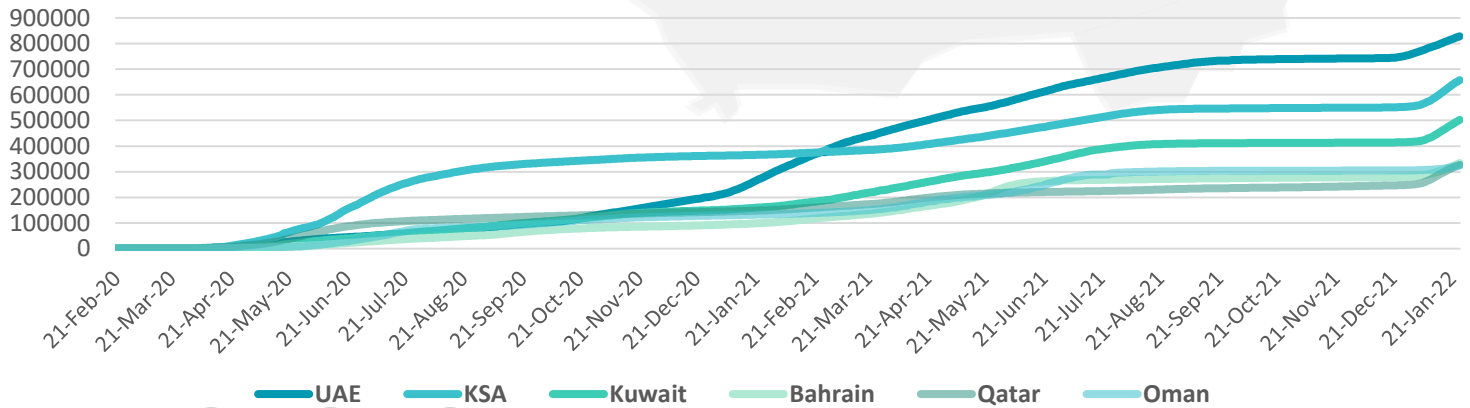
FROM 21 JAN 2020 TO 26 JANUARY 2022

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

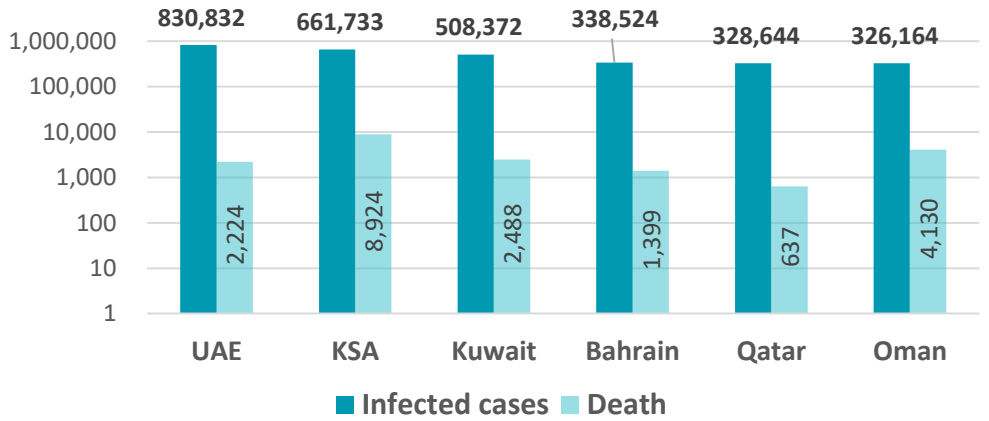
Figure 7: Comparative Analysis of the Distribution of COVID-19 Cases in GCC Countries

TOTAL NUMBER OF INFECTED CASES

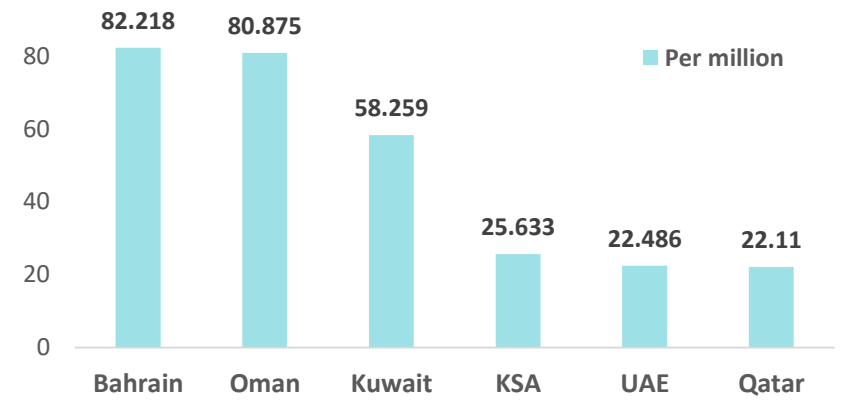




TOTAL NUMBER OF INFECTED, RECOVERED AND DEATHS



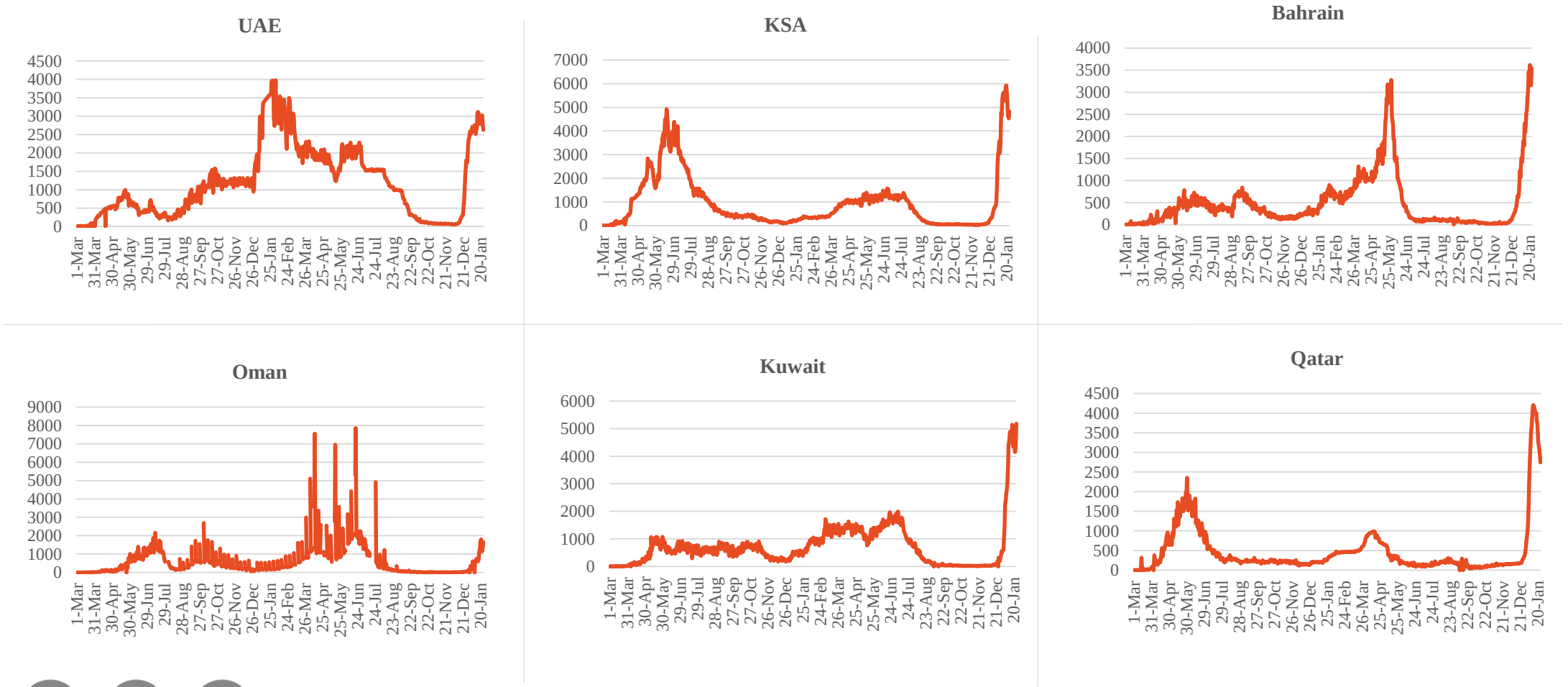
DEATHS PER MILLION



10

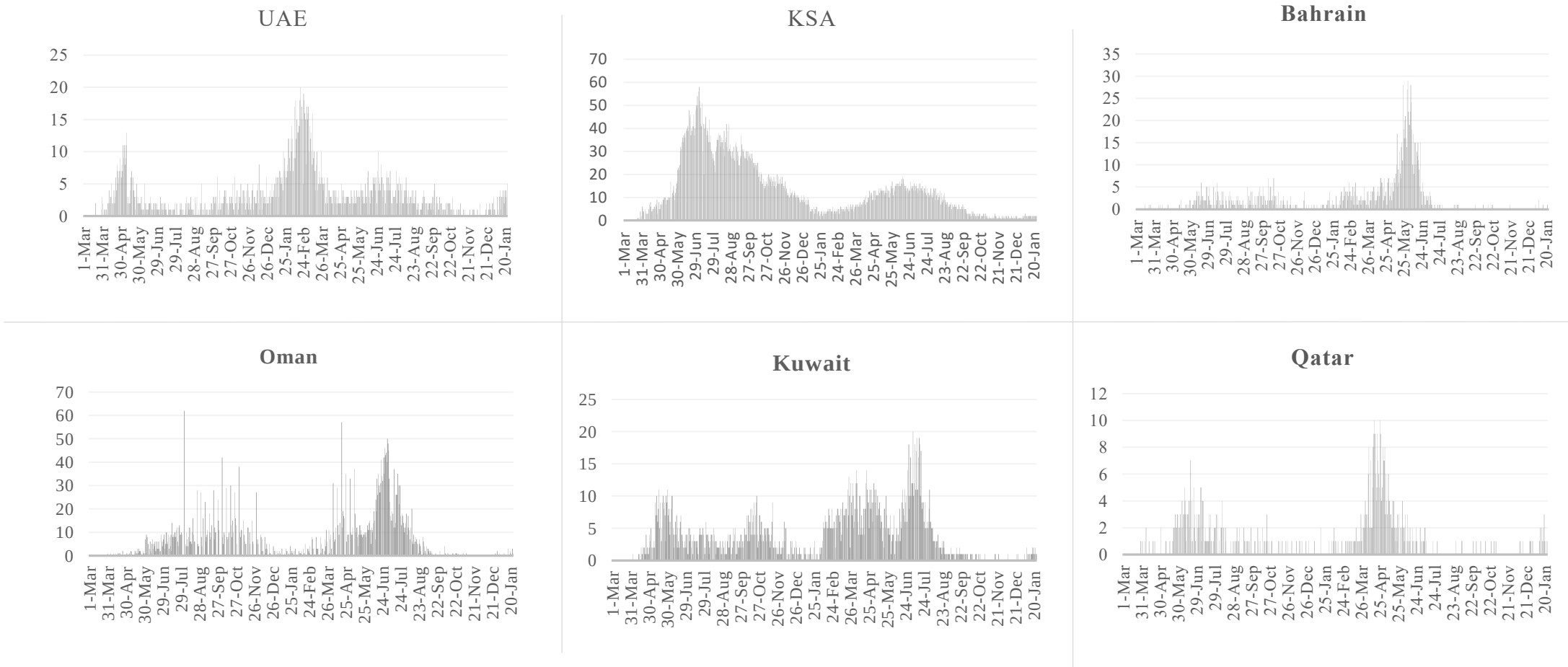
Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: John Hopkins, WHO

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



Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: WHO

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



Graphs published by Abu Dhabi Public Health Center 2021 | Data resources: WHO

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

Article 1

Published January 6, 2022 in Science Direct

mRNA-based COVID-19 vaccine boosters induce neutralizing immunity against SARS-CoV-2 Omicron variant

- The three vaccines available in the U.S. have been successful in inducing humoral and cellular immunity sufficient to neutralize SARS-CoV-2 and significantly reduce severe COVID-19. However, the Omicron variant harbors 36 spike protein mutations that attenuate vaccine-driven immunity. Garcia-Beltran et al. measured neutralization potency of sera from 239 recipients of BNT162b, mRNA-1273, or Ad26.COV2.S (Johnson & Johnson) against wild-type, Delta, and Omicron genetically engineered SARS-CoV-2 pseudoviruses. Sixty-three participants had received a third dose of mRNA vaccine.
- Consistent with prior studies, recipients of the primary mRNA vaccine series demonstrated significantly higher titers against wild-type virus than did Ad26.COV2.S recipients. While neutralization was decreased relative to wild type for recipients of all vaccine types (and Delta neutralization was absent in most individuals >6 months after the primary vaccine series), Omicron neutralization was absent in all primary vaccine recipients, even those recently vaccinated.
- Prior vaccine recipients who had also convalesced from prior COVID-19 infection did retain some detectable Omicron neutralization. Most notably, serum from recent mRNA vaccine booster recipients exhibited potent Omicron neutralization; in particular, such serum showed higher SARS-CoV-2 neutralization titers (via higher anti-spike antibody levels) as well as broader humoral responses cross-reacting against Omicron. In tissue culture studies, Delta was two-fold more efficient at infecting cells than wild-type and Omicron was two-fold more efficient than Delta.

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

Article 2

Effectiveness of BNT162b2 Vaccine against Omicron Variant in South Africa

Published December 29, 2021 at NEJM

- The new variant B.1.1.529 (Omicron) was first identified in November 2021 in South Africa. Few weeks later, the variant was detected in more than 75% of COVID-19 positive tests, and by the end of November, the WHO declared omicron is a variant of concern. In a study of live-virus neutralization assays, omicron was shown to escape antibody neutralization by the BNT162b2 messenger RNA vaccine (Pfizer–BioNTech). Thus, data were needed regarding the effect of the current vaccines against this new variant and specifically to prevent severe symptoms and hospitalization.
- Using data from South Africa, the authors estimated the vaccine effectiveness of two doses of the BNT162b2 vaccine against hospitalization for Covid-19 caused by the new omicron variant. The investigators analyzed the data sets that included the results of PCR assays, preauthorization admission data, a full history of members' medical records, registrations regarding chronic diseases, and data regarding BMI to obtain the number of Covid-19 risk factors per patient, according to the CDC guidelines. The investigators compared the vaccine efficacy against hospitalization associated with the omicron variant before and after the omicron proxy period against comparator period (delta variant) to estimate vaccine effectiveness between **September 1 and October 30.**
- In this study, the investigators used a test-negative design and data-exclusion rules to obtain estimates of vaccine effect, according to the following formula: 1 − odds ratio for Covid-19 hospitalization in the vaccinated population, where the odds ratio was calculated with the use of logistic regression after adjustment for confounders of age, sex, previous Covid-19 infection, surveillance week, geographic location, and the number of CDC risk factors. In this analysis, Covid-19 hospitalization was a dependent variable, and vaccination status was included as an independent variable.
- The investigators performed three sensitivity analyses during the omicron proxy period. First, performed PCR tests showing S-gene target failure as an indication of omicron infection. Second, included only PCR results obtained from patients in the affected province of omicron variant. Third, they limited PCR test results to those obtained from patients who had been hospitalized for respiratory complications.
- The authors analyzed 133,437 PCR results that had been obtained during the study period, of which 28.6% had been obtained at least 14 days after the second vaccine dose. The overall test positivity was 6.4% during the comparator period and 24.4% during the proxy omicron period, whereas the Covid-19 admission rate was 10.8% and 2.2%, respectively. For the proxy omicron period, they analyzed 78,173 PCR test results, of which 41.4% had been obtained at least 14 days after results. Patients with positive cases were younger during the proxy omicron period than during the comparator period.
- During the omicron period, the authors found a vaccine efficacy of 70% (95% CI, 62 to 76), a finding that was supported by the results of all sensitivity tests. This measure of vaccine effectiveness was significantly different from that during the comparator period, when the rate was 93% (95% CI, 90 to 94) against hospitalization for Covid-19.
- The investigators concluded that during the omicron period, the maintenance of effectiveness of the BNT162b2 vaccine (albeit at a reduced level) against hospital admission for Covid-19 that was presumed to have been caused by the omicron variant as compared with the rate associated with the delta variant earlier in the year. The addition of a booster dose might mitigate this reduction in vaccine effectiveness.

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

Continued

Table 2. Effectiveness of Two Doses of BNT162b2 Vaccine before and during Proxy Omicron Period.*

Variable	Vaccine Effectiveness (95% CI)	
	Comparator Period	Proxy Omicron Period
	%	
Overall estimate	93 (90–94)	70 (62–76)
Sensitivity analyses of PCR results		
Patients with S-gene target failure	—	69 (48–81)
Patients in Gauteng province	—	70 (59–78)
Patients with Covid-19 symptoms	—	50 (35–62)

* The overall estimates of vaccine effectiveness were calculated according to a test-negative design after adjustment for confounders. The three sensitivity analyses included the results of polymerase-chain-reaction (PCR) tests showing S-gene target failure (as an indication of omicron infection), PCR results obtained only from patients in Gauteng province, and PCR results obtained only from patients who had been hospitalized (i.e., symptomatic population).

Table 1. Hospitalization for Covid-19 and Test Positivity before and during the Proxy Omicron Period in Gauteng Province (September–December 2021).

Vaccination Status	Comparator Period (September 1–October 31)			Proxy Omicron Period (November 15–December 7)		
	Tests Administered (N=133,437)	Positive Test Results (N=8,569)	Covid-19 Admissions (N=925)	Tests Administered (N=78,173)	Positive Test Results (N=19,070)	Covid-19 Admissions (N=429)
	number (percent)					
Not vaccinated	53,371 (40.0)	5,231 (61.0)	684 (73.9)	26,331 (33.7)	7,889 (41.4)	220 (51.3)
BNT162b2 vaccine						
One dose	16,918 (12.7)	1,279 (14.9)	71 (7.7)	6,185 (7.9)	1,481 (7.8)	34 (7.9)
<14 days after second dose	5,200 (3.9)	185 (2.2)	13 (1.4)	653 (0.8)	114 (0.6)	0
≥14 days after second dose	38,155 (28.6)	706 (8.2)	77 (8.3)	32,325 (41.4)	6,290 (33.0)	121 (28.2)
Other vaccine type*	19,793 (14.8)	1,168 (13.6)	80 (8.6)	12,679 (16.2)	3,296 (17.3)	54 (12.6)

* Data are based on a match with the national Electronic Vaccination Data System as of August 25, 2021, since such data were not available from the Department of Health regarding vaccine type and vaccinations administered in the public sector since that date. Thus, estimates of vaccine effectiveness should be viewed as conservative since unvaccinated controls may have inadvertently been included among vaccinated persons. On the basis of the number of Discovery Health patients who had been vaccinated in public-sector sites before August 25, 2021, the rate of misclassification of unvaccinated controls was estimated to be no more than 10%.

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

Article 3

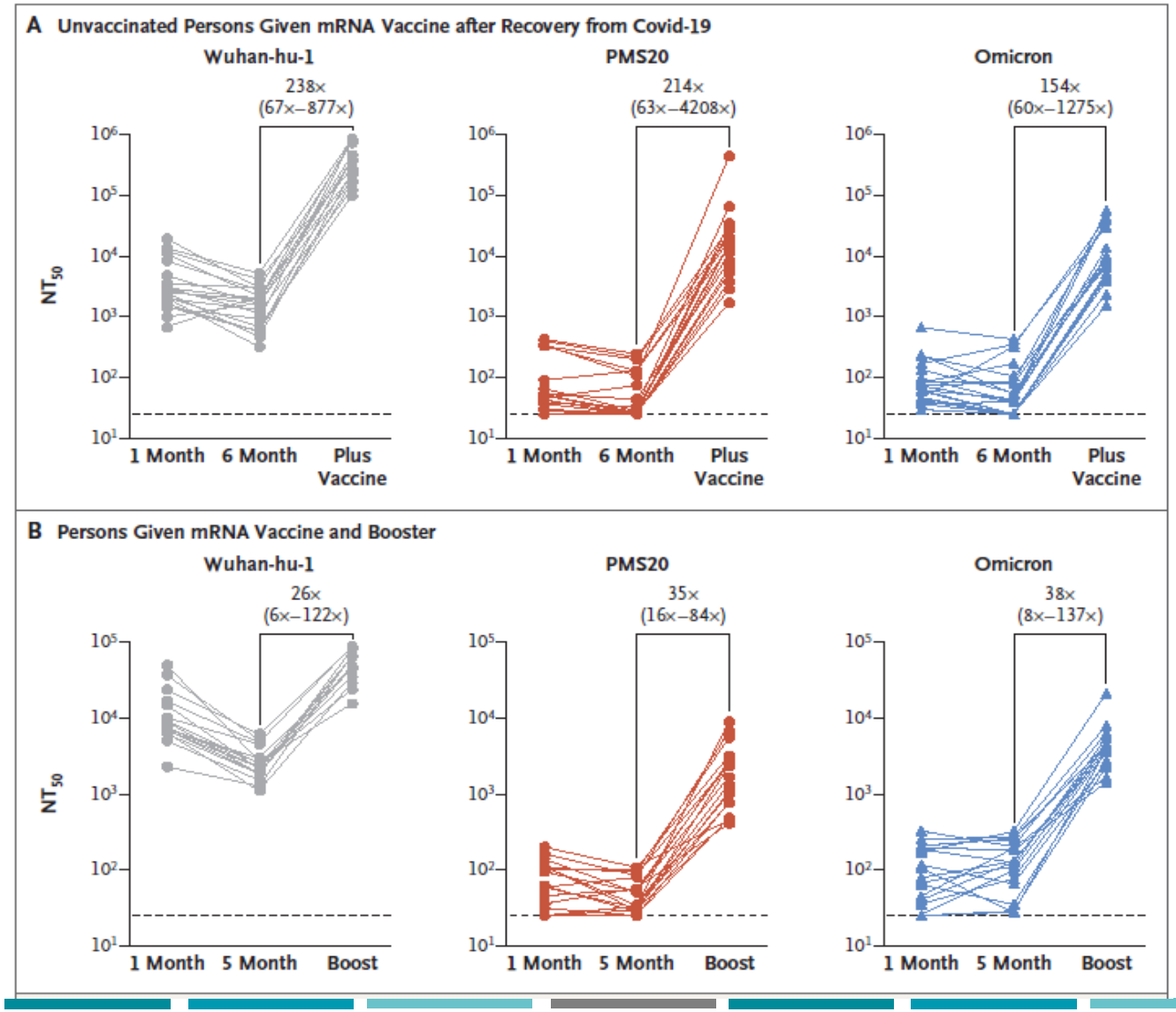
Published December 30, 2021 at NEJM

Plasma Neutralization of the SARS-CoV-2 Omicron Variant

- The newly emerged B.1.1.159 (omicron) variant has a large number of changes in its spike protein relative to that of the original virus (Wuhan-hu-1). The changes were mostly seen in the receptor-binding domain and the N-terminal domain which are the primary targets of neutralizing antibodies. The majority of those who recovered from COVID-19 or received two doses of mRNA vaccines have showed considerable evasion of the polucloncal nerutalizing antibodies due to approximately 20 changes introduced into a synthetic polymutant spike protein (PMS20). Several changes in the PMS20 spike protein are the same as or similar to changes in the omicron variant.
- The investigators of this study measured the neutralizing antibody titers against Wuhan-hu-1, PMS20, and omicron spike pseudotypes in **169 plasma specimens from 47 persons with diverse exposures** to SARS-CoV-2 antigens through infection, vaccination, or both. The study showed 50% neutralization titer (NT50) values of 60±47 at **1 month** and 37±27 at **6 months**, after COVID-19 infection recovery, times lower for PMS20 than for Wuhan-hu-1, and 58±51 and 32±23 times lower for omicron than for Wuhan-hu-1, respectively. **After 1 year** in the same cohort, different patients showed NT50 values that of 34±24 times lower for PMS20 and 43±23 times lower for omicron than for Wuhan-hu-1.
- In patients who received two doses of an mRNA vaccine (BNT162b2 [Pfizer–BioNTech] or mRNA-1273 [Moderna]) 1 to 3 months before sampling, the NT50 values were 187±24 times lower for PMS20 and 127±66 times lower for omicron than for Wuhan-hu-1.
- **At 5 months after vaccination, the neutralization potency was 58±23 times lower for PMS20 and 27±17 times lower for omicron.** In patients who received a single dose Ad26.COV2.S vaccine (J&J) lacked detectable neutralizing activity against PMS20 or omicron at 1 or 5 months after vaccination, which precluded a meaningful quantitative assessment of variant-specific differences.
- However, **vaccination of persons who had recovered from Covid-19 or administration of a third dose of an mRNA vaccine to vaccinated persons at least 6 months after the second dose of an mRNA vaccine** led to a substantial gain in neutralizing activity against PMS20 and omicron. Specifically, after vaccination in persons who had previously been infected with SARS-CoV-2, the NT50 values were 238 times, 214 times, and 154 times greater for Wuhan-hu-1, PMS20, and omicron pseudotypes, respectively, than the prevaccination convalescentphase titers in the same persons. For those who had received **two doses of an mRNA vaccine approximately 6 months earlier and then received a third dose of an mRNA vaccine approximately 1 month before sampling**, the NT50 values after the booster dose were 26 times greater for Wuhan-hu-1, 35 times greater for PMS20, and 38 times greater for omicron. Neutralizing titers against omicron were substantial (1,411 – 56,537) in all persons who had had Covid-19 and were then vaccinated and in those who had received three doses of an mRNA vaccine, but titers were low or undetectable in many unvaccinated persons who had had Covid-19 and in recipients of only two doses of an mRNA vaccine.
- Although these findings indicate that the omicron variant shows an unprecedented degree of neutralizing antibody escape, they also suggest that boosting and promoting affinity maturation of antibodies in persons who have previously been infected or vaccinated, with the use of existing Wuhan-hu-1–based vaccine immunogens, will provide additional protection against infection with the omicron variant and subsequent disease.

VACCINE

Continued



مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

Article 4

Published

Reduced neutralisation of SARS-CoV-2 omicron B.1.1.529 variant by post-immunisation serum

December 20, 2021 in LANCET

Background

- According to WHO, SARS-COV2 is estimated to have caused 265 million infections and more than 5 million deaths over the past 2 years. Current vaccines are based on the original SARS-CoV-2 strain and are designed primarily to raise an antibody response against the spike protein (S), although elicited T-cell responses can also contribute to protection from severe disease.
- The SARS-CoV-2 RNA polymerase is intrinsically error prone, which results in mutation to the viral genome. In the past year, several variants containing multiple mutations in S have been reported: alpha (B.1.1.7), beta (B.1.351), gamma (P.1), and delta (B.1.617.2). These variants contain mutations can lead to increased transmissibility by increasing affinity to ACE2 or lead to immune escape.
- The new variant of concern, omicron (B.1.1.529), first reported in South Africa in Nov 2021 has since been reported in multiple countries. Early reports from South Africa suggest that omicron is highly transmissible, in a population where 60–80% already show serological evidence of previous infection or vaccination, suggesting that omicron is able to break through natural and vaccine-induced immunity; although early reports do not indicate more severe disease.

Methodology

- Neutralisation assays were done on sera from individuals from the immunology cohort of the Com-COV2 study, who were seronegative at enrolment (defined by anti-nucleocapsid IgG). Participants were vaccinated with two doses of Oxford–AstraZeneca's ChAdOx1 nCoV-19 or two doses of Pfizer–BioNTech's BNT162b2 with a priming interval of 8–11 (median 9) weeks. Samples were obtained 28 days (range 25–32) following the second immunisation.
- Live virus neutralisation titres against omicron are compared with titres against Victoria, an early pandemic SARS-CoV-2 strain, together with titres against beta and delta variants.

Results

- Neutralising titres on sera from participants who had received homologous ChAd dropped to below the detectable threshold in all but one participant. Median neutralising titres on sera from participants who had received homologous BNT reduced by 29·8 fold from 1609 (Victoria strain) to 54 (omicron variant), with one participant dropping below the detection threshold. In most cases, samples that did not neutralise with 50% focus reduction neutralisation titres at a dilution of less than 1/20 showed some residual neutralising activity.

Continued

Summary

In summary, **there was a substantial decrease in neutralisation titre in recipients of both homologous ChAd and BNT primary courses, with evidence of some recipients not neutralising at all.** The findings suggest that **omicron is more antigenically distant from the original SARS-CoV-2 vaccine strain** than the previously most distant strains, beta and delta.

Preliminary data from the UK Health Security Agency have shown reduced effectiveness against symptomatic infection after two doses of ChAd or BNT, suggesting a result of increased breakthrough infections in previously infected or double vaccinated individuals, which could drive a further wave of infection. Although there is currently no evidence of increased potential to cause severe disease, hospitalisation, or death, it should be noted that higher transmission will inevitably lead to increased numbers of cases and a greater burden on health systems, even without proportional changes in severity.

It could be that other aspects of the immune response such as non-neutralising antibodies and cellular immunity, which are not expected to be as severely affected by this variant, could confer a degree of protection against severe disease.

Boosting Strategy

Possessing a high starting neutralisation titre against early pandemic strains gives a higher level of neutralisation of omicron, which could be obtained by deploying third booster doses of vaccine. There is some reassurance that a third dose of a COVID-19 vaccine does indeed increase vaccine effectiveness against the omicron variant and as we know more, there will be further understanding of the potential for a boosting strategy as a control measure for omicron infection and transmission.

Conclusion

Should omicron, as expected, become the dominant strain worldwide, given its antigenic distance from ancestral strains, it could be necessary to produce vaccines tailored to omicron; however, these might be unlikely to give protection against previous strains. This development might stimulate **consideration of a switch from the current monovalent vaccine strategy towards multivalent formulations currently used in seasonal influenza vaccines.**

In the meantime**, reaching people who are unvaccinated with current vaccines is a priority,** in order to reduce transmission levels and the potential for severe disease in people who are immunologically naive.

مركز أبوظبي للصحة العامة
ABU DHABI PUBLIC HEALTH CENTRE

ACKNOWLEDGMENT

EDITORS

Dr Shereena Al Mazroui . MBBS, MPH – (**ADPHC**).
Dr Maha Al Safi – MBBS – **(ADPHC).**

TEAM

Hanan Al Mutairi, BSPH - **(ADPHC).**
Shahad Al Shamlan, BSPH - **(ADPHC).**
Ahlam Al Maskari , BSPH- **(ADPHC).**

CONTRIBUTORS

Dr. Mumtaz Meeran, MPH – **(ADPHC).**
Dr. Wasim El Nekidy, PHD in clinical pharmacology – **(CCAD).**
Dr. Zohour Anouassi, MHE, BCPS - **(CCAD).**

ADPHC_AE ADPHCAE ADPHC.AE ADPHC-AE +971 56 231 2171 WWW.ADPHC.GOV.AE