COVID-19 Weekly Epidemiological Update

Edition 89, published 27 April 2022

In this edition:

Global overview

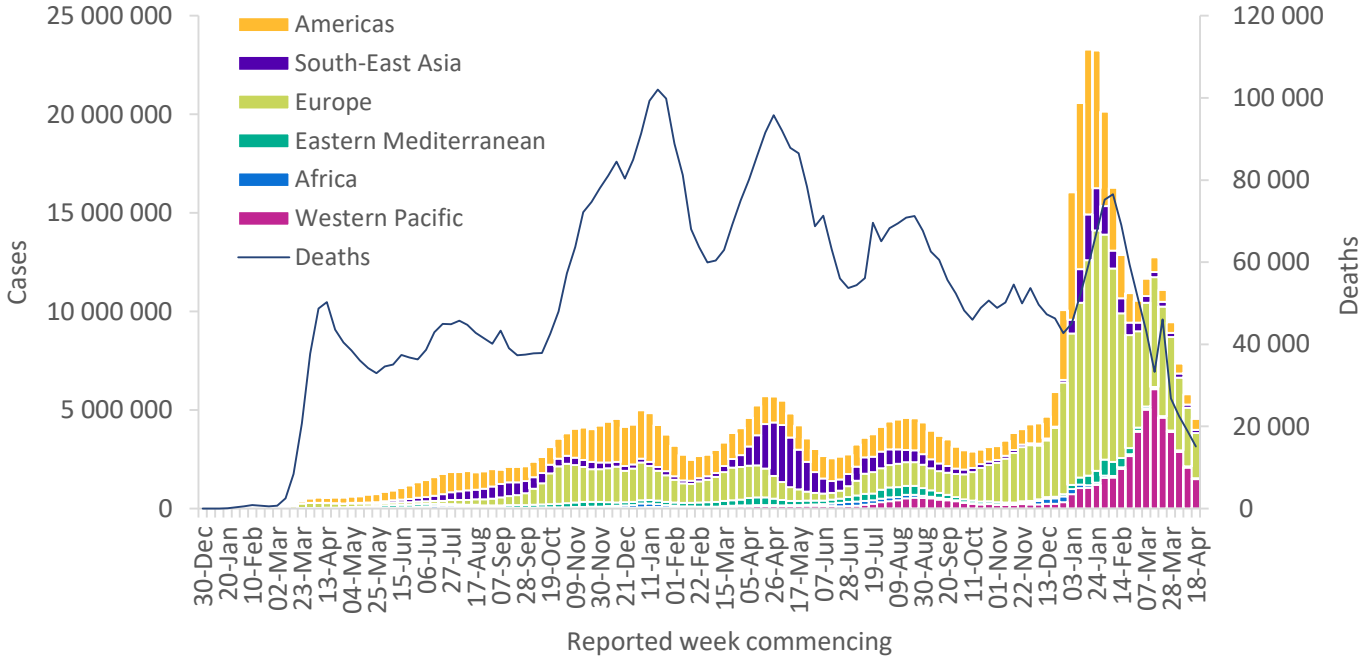
Data as of 24 April 2022

Globally, the number of new COVID-19 cases and deaths has continued to decline since the end of March 2022. During the week of 18 through 24 April 2022, over 4.5 million cases and over 15 000 deaths were reported, decreases of 21% and 20% respectively, as compared to the previous week (Figure 1).

However, not all the Regions have shown a decreasing trend: the number of new weekly cases increased in the Region of the Americas (+9%) and in the African Region (+32%) in the past week, while the number of new weekly deaths increased in the South-East Asia Region (+41%) - due to a delay in reporting of deaths from India - and in the Africa Region (+110%). As of 24 April 2022, over 500 million confirmed cases and over six million deaths have been reported globally.

These trends should be interpreted with caution as several countries have been progressively changing their COVID-19 testing strategies, resulting in lower overall numbers of tests performed and consequently lower numbers of cases detected.

Figure 1. COVID-19 cases reported weekly by WHO Region, and global deaths, as of 24 April 2022**



**See *Annex 1: Data, table, and figure notes*

At the country level, the highest numbers of new weekly cases were reported from Germany (675 022 new cases; -13%), the Republic of Korea (589 442 new cases; -39%), France (542 896 new cases; -34%), Italy (419 374 new cases; -1%), and the United States of America (298 306 new cases; +21%).

The highest numbers of new weekly deaths were reported from the United States of America (2 354 new deaths; -24%), the Russian Federation (1 402 new deaths; -21%), the Republic of Korea (1 041 new deaths; -38%), Italy (1 007 new deaths; +7%), and the United Kingdom (903 new deaths; -47%).

Table 1. Newly reported and cumulative COVID-19 confirmed cases and deaths, by WHO Region, as of 24 April 2022**

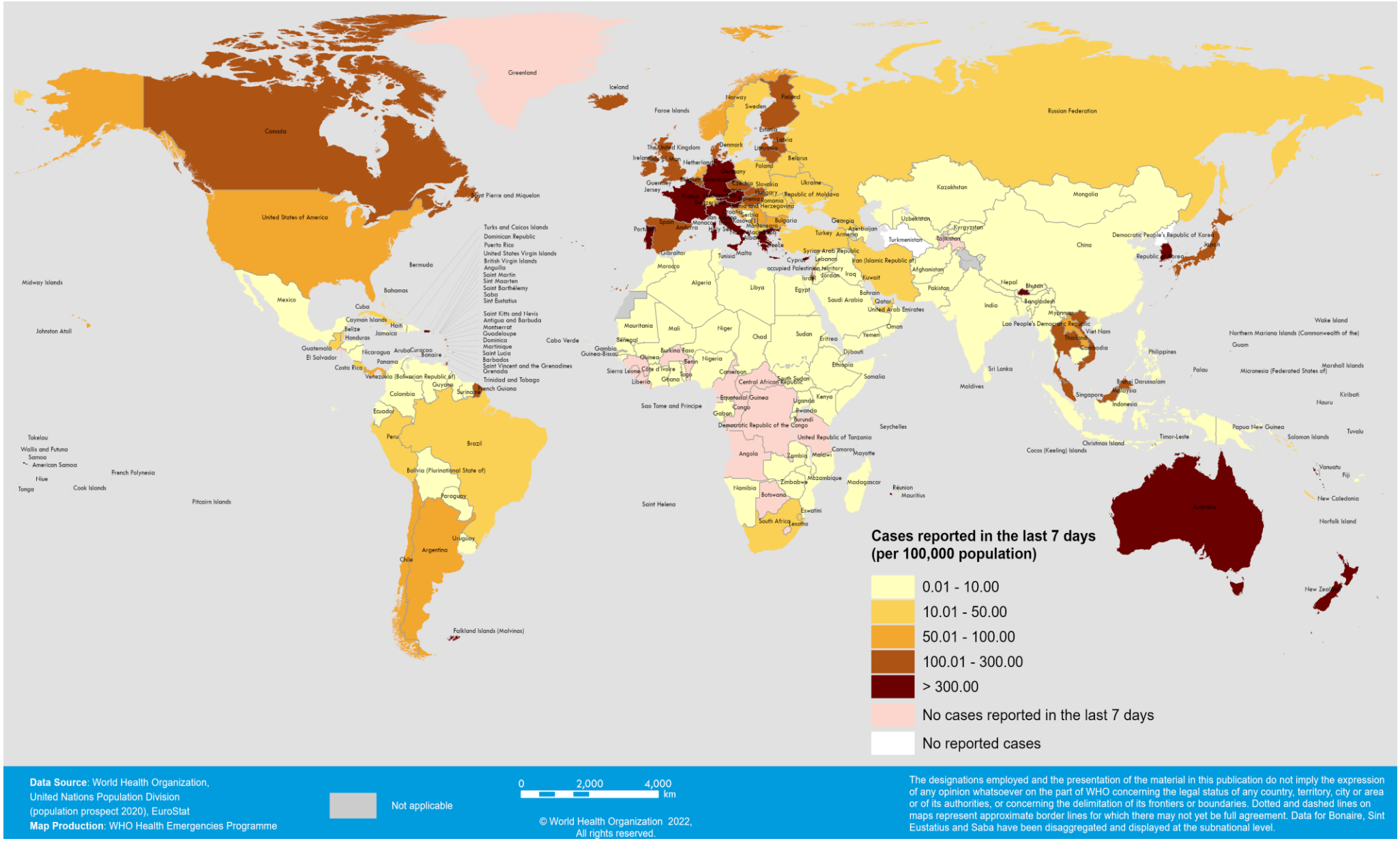
WHO Region	New cases in last 7 days (%)	Change in new cases in last 7 days *	Cumulative cases (%)	New deaths in last 7 days (%)	Change in new deaths in last 7 days *	Cumulative deaths (%)
Europe	2 289 820 (50%)	-23%	213 043 360 (42%)	6 811 (45%)	-23%	1 980 000 (32%)
Western Pacific	1 487 880 (33%)	-28%	53 464 927 (11%)	2 246 (15%)	-33%	222 968 (4%)
Americas	550 015 (12%)	9%	152 533 748 (30%)	4 029 (27%)	-19%	2 719 562 (44%)
South-East Asia	161 639 (4%)	-6%	57 734 555 (11%)	1 580 (10%)	41%	783 530 (13%)
Africa	35 994 (1%)	32%	8 721 105 (2%)	185 (1%)	110%	171 564 (3%)
Eastern Mediterranean	22 878 (1%)	-30%	21 685 928 (4%)	283 (2%)	-34%	342 020 (5%)
Global	**4 548 226 (100%)**	**-21%**	**507 184 387 (100%)**	**15 134 (100%)**	**-20%**	**6 219 657 (100%)**

**Percent change in the number of newly confirmed cases/deaths in the past seven days, compared to seven days prior*
**See *Annex 1: Data, table, and figure notes*

For the latest data and other updates on COVID-19, please see:

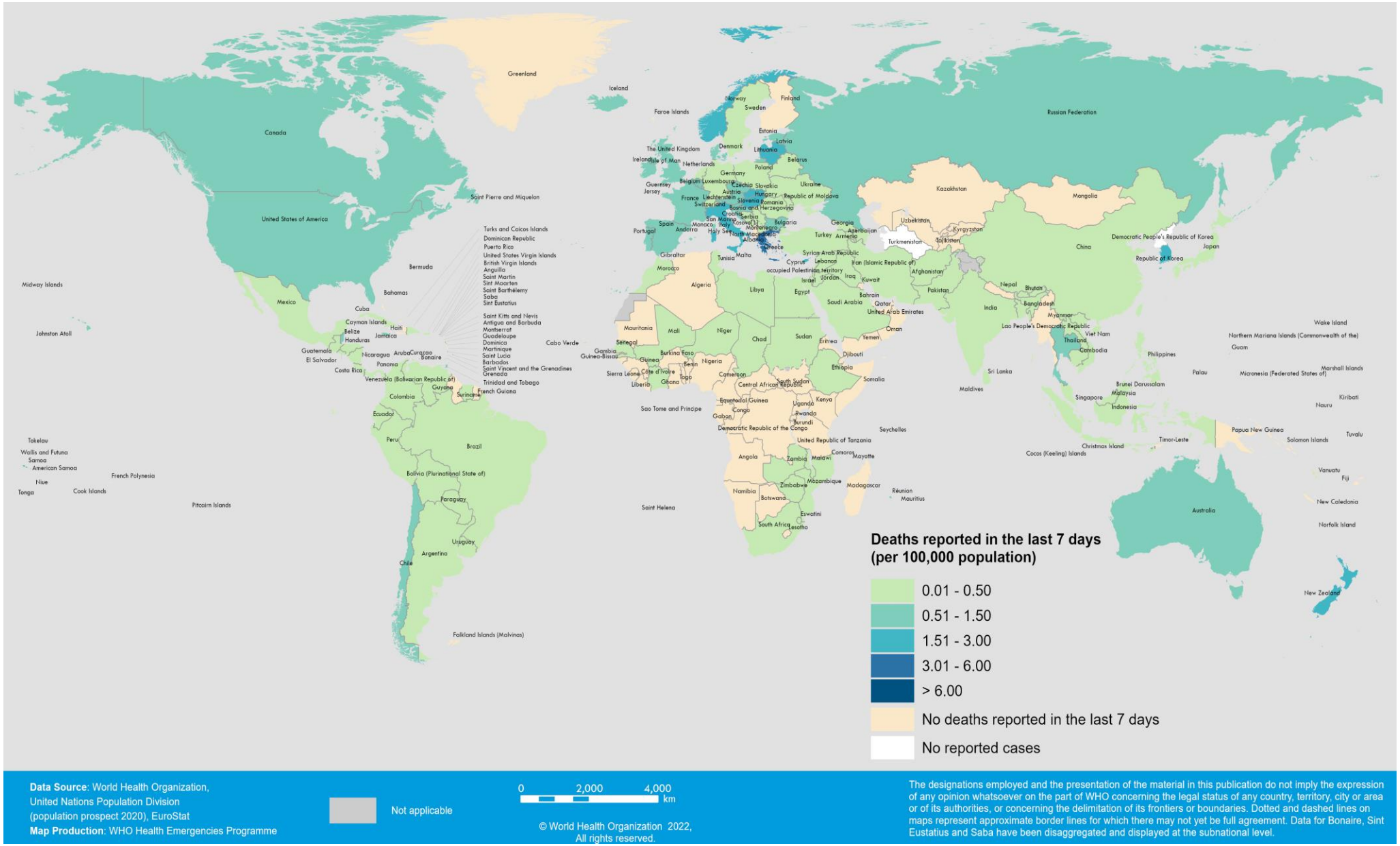
- WHO COVID-19 Dashboard
- WHO COVID-19 Weekly Operational Update and previous editions of the Weekly Epidemiological Update

Figure 2. COVID-19 cases per 100 000 population reported by countries, territories and areas, 18 – 24 April 2022*



**See *Annex 1: Data, table, and figure notes*

Figure 3. COVID-19 deaths per 100 000 population reported by countries, territories and areas, 18 -24 April 2022*



**See *Annex 1: Data, table, and figure notes*

Special Focus: Update on SARS-CoV-2 variants of interest and variants of concern

WHO, in collaboration with national authorities, institutions and researchers, routinely assesses if variants of SARS-CoV-2 alter transmission or disease characteristics, or impact the effectiveness of vaccines, therapeutics, diagnostics or public health and social measures (PHSM) applied to control disease spread. Potential variants of concern (VOCs), variants of interest (VOIs) or variants under monitoring (VUMs) are regularly assessed based on the risk posed to global public health.

The classifications of variants will be revised as needed to reflect the continuous evolution of circulating variants and their changing epidemiology. Criteria for variant classification, and the lists of currently circulating and previously circulating VOCs, VOIs and VUMs, are available on the WHO Tracking SARS-CoV-2 variants website. National authorities may choose to designate other variants and are encouraged to investigate and report on the impacts of these variants. *When referring to the genomic sequence of SARS-CoV-2 identified from the first cases (December 2019), the term 'index virus' should be used.*

Geographic spread and prevalence of VOCs

The Omicron VOC remains the dominant variant circulating globally. Among the 257 337 sequences uploaded to GISAID with specimens collected in the last 30 days[i], 256 684 (99.7%) were Omicron, 47 (<0.1%) were Delta, and 555 (0.2%) sequences were not assigned to a Pango lineage. While the decrease in sequences is consistent with the overall decreasing trend in new cases reported globally, it may also reflect changes in epidemiological surveillance policies in some countries, including changes in sampling and sequencing strategies. WHO recommends maintaining strong surveillance for SARS-CoV-2 through the remainder of the acute phase of the pandemic.

Since the emergence of Omicron in November 2021, the virus has continued to evolve, giving rise to many descendent and recombinant lineages. WHO is monitoring the different Omicron descendent lineages under the umbrella of Omicron (VOC). The genetic diversification of Omicron indicates ongoing selection pressure on the virus to adapt to its host and to its environment. Each lineage has additional and/or different mutations. These may or may not lead to amino acid substitutions in relevant genomic sites; the genetic differences may be small and are often related to local geographic genetic drift rather than having additional amino acid substitutions suspected to impact virus phenotype. Currently, the impacts of each single mutation or constellations of mutations are not well known, and thus it is important to continue to monitor for any associated changes in epidemiology. As for any emerging SARS-CoV-2 variant, WHO applies the same criteria for risk assessment apply to descendent and recombinant lineages.

The previously reported upsurge in cases observed in some countries may be due to the higher intrinsic transmissibility and/or higher immune escape properties of the circulating descendent lineages, waning immunity or a combination of these factors in the context of an evolving genetic landscape. To date, and with limited data currently available, there appears to be a growth advantage for BA.4, BA.5 and BA.2.12 over BA.2. Currently, available evidence does not suggest differences in severity or clinical manifestations. More data are expected as studies are ongoing.

[i] Includes sequences submitted to GISAID with sample collected dates from 23 March to 21 April 2022 (last reported sample at the time of data extraction), excluding low coverage sequences. Proportions are estimated for countries submitting more than 100 total sequences. In the past 30 days, 38 countries submitted a total of 100 sequences and above on GISAID.

Characteristics of Omicron

Available evidence on the phenotypic impacts of VOCs has been reported in previous editions of the COVID-19 Weekly Epidemiological Update. Since the last update on 5 April 2022, there have been several new publications on the phenotypic characteristics of VOCs, including literature on Omicron (Table 2). Some of these studies have not been peer-reviewed and the findings must therefore be interpreted with due consideration of this limitation.

Table 2: Summary of current evidence on Omicron

Domain	Indicator	Main results
Epidemiology	Impact on disease prevalence/ incidence	Following an increase in the first half of March 2022, the number of new COVID-19 cases has continued to decrease in most countries since the third week of March. There was a 21% decline during the week of 18 through 24 April 2022 as compared to the previous week (WEU 88). It is important to note that recent changes in testing policies may influence the number of reported cases. The Omicron variant is the dominant circulating variant globally, representing over 99.7% of samples collected between 23 March 2022 and 21 April 2022.[1]
	Impact on transmission	Analysis of GISAID data[2] have consistently shown Omicron (all lineages) having a higher growth rate advantage over Delta in all countries with sufficient sequence data (last update included data available up to 4 April 2022). In this iteration of the analysis, the results were consistent with the previous iteration regarding the growth rate advantage of the Omicron BA.2 descendent lineage over BA.1, with a pooled mean transmission advantage of 72% (95% CI: 55%-82%) under the assumption of an unchanged generation time. These estimates are stabilising as the cumulative number of Omicron sequences is increasing and data become available from more countries. However, an updated analysis will be performed taking into account the various sub-lineages of the Omicron variant that have recently been identified.
	Impact on disease severity	Omicron has consistently been associated with lower severity when compared to Delta across different settings. [3–6] A recent study conducted in England, United Kingdom, reported lower severity from infection with Omicron compared to infection with Delta. In this study, the adjusted hazard ratio (aHR) for hospitalisation among unvaccinated individuals was 0.41 (95% CI: 0.39-0.43) and the aHR for death was 0.31 (95% CI: 0.26-0.37), which suggests lower intrinsic severity of the Omicron variant.[7]
Immune response	Impact on reinfection	Higher rates of reinfection have been reported for Omicron as compared to other SARS-CoV-2 variants. However, a protective effect of previous infection was reported in a recent study conducted in the United States of America[8], which found increased antibody titres and neutralisation activity (79.5%) against Omicron among vaccinated solid organ transplant recipients who were previously infected with SARS-CoV-2 infection compared to those who had no previous infection (34%). Previous infection with BA.1 has been suggested as potentially conferring protection against infection with BA.2: 94.9% (95% CI: 88.4-97.8%), and 85.6% (95% CI: 77.4-90.9%) protection against BA.1 following infection with BA.2.[9]
	Impact on vaccination	Results of vaccine effectiveness (VE) studies should be interpreted with caution because estimates vary with the type of vaccine administered and the number of doses and scheduling (sequential administration of different vaccines). For further information, see the section 'Interpretation of the results of the VE for the Omicron variant'.
	Impact on antibody responses	Several studies have found lower neutralising antibody titers to BA.1 and BA.2 when compared to the index virus, and similar responses for BA.1 and BA.2.[10,11] Similar non-neutralising antibody responses to BA.1 and BA.2 have also been reported in vaccinated individuals (Bartsch 2022). However, another study reported reduced vaccine-induced and infection-induced neutralization of BA.1 and BA.2, with higher neutralisation activity against BA.2 compared to BA.1.[12] In summary, these results indicate lower humoral responses to BA.1 and BA.2 but inconsistent findings regarding BA.1 versus BA.2.

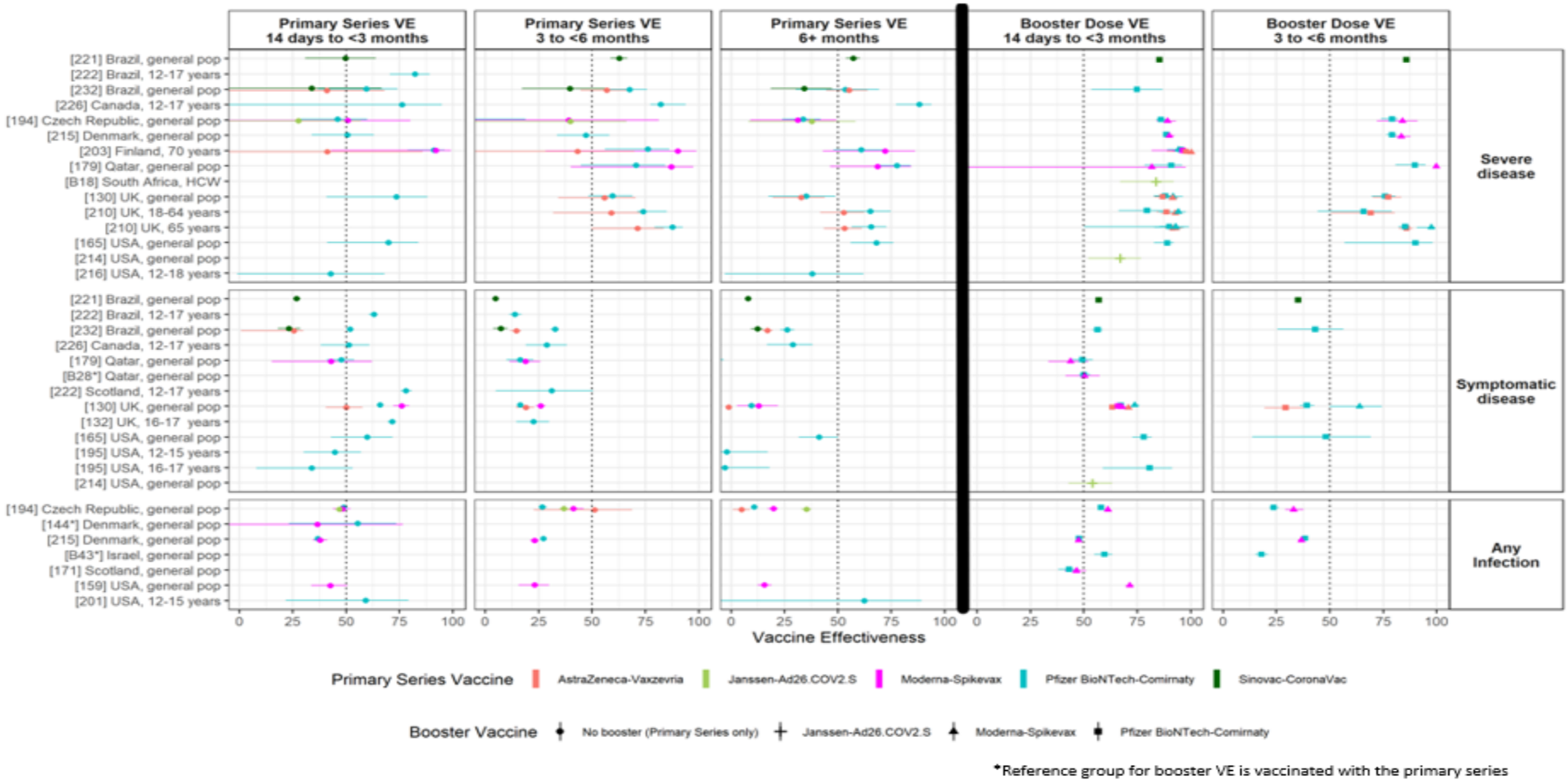
Diagnostic tools	**Impact on PCR assays**	Most BA.2 sequences lack the 69-70 deletion responsible for S-gene target failure; however, a number of BA.2 sequences have been identified having the 69-70 deletion.[1] Assessment of PCR tests for SARS-CoV-2 that include multiple gene targets have predicted limited impact of the Omicron variant on the accuracy of these assays.[13,14]
	Impact on Rapid Diagnostic tests	A recent study conducted in the United States of America found that the sensitivity of Ag-RDT tests was similar for Omicron, Delta and the index virus.[15]
Impact on treatment	**Impact on antivirals**	Consistent with preliminary data showing no difference in the effectiveness of antiviral agents against the Omicron variant, a recent review reported similar efficacy of antiviral agents against Omicron and previous SARS-CoV-2 variants.[16]
	Impact on biologicals	Initially, studies on the effectiveness of monoclonal antibodies for treating patients with Omicron reported conserved neutralizing activity for three broadly neutralizing monoclonal antibodies (sotrovimab, S2X259 and S2H97) and a reduction in effectiveness of other monoclonal antibodies.[12,17–20] However, additional preclinical evidence has shown reduced neutralizing activity of sotrovimab against the BA.2, and lack of efficacy of casirivimab-imdevimab against the BA.1.[21]
	Other treatment options	There is no evidence available on the effectiveness of interleukin-6 receptor blockers and corticosteroids for the management of severe patients with Omicron.

Additional resources

- Tracking SARS-CoV-2 Variants
- COVID-19 new variants: Knowledge gaps and research
- Genomic sequencing of SARS-CoV-2: a guide to implementation for maximum impact on public health
- Considerations for implementing and adjusting public health and social measures in the context of COVID-19
- VIEW-hub: repository for the most relevant and recent vaccine data
- WHO Statement on Omicron sublineage BA.2

Figure 4 summarizes the impact of Omicron VOC, on product-specific vaccine effectiveness (VE) over time for both primary series vaccination and booster vaccination. Since the last update, four new studies, one of which assessed VE against Omicron, and three which assessed VE against both Delta and Omicron, have been added to the figure.[22–26] One study (not yet peer reviewed) provided new VE data on Sinovac-CoronaVac[23], two (both not yet peer-reviewed) on Pfizer BioNTech-Comirnaty[24,25], and one (not yet peer reviewed) on AstraZeneca-Vaxzevria, Janssen-Ad26.Cov2.S, Pfizer BioNtech-Comirnaty, and Sinovac-CoronaVac.[26] Additional information on vaccine performance against VOCs can also be found in Annex 4.

Figure 4. Vaccine effectiveness (VE) of primary series and booster vaccination against the Omicron variant of concern



*Indicates booster dose vaccine effectiveness evaluated using persons completing primary series as reference group, rather than unvaccinated persons. Abbreviations: pop=population; HCW=healthcare workers; EU=European Union. Dots represent point estimates of vaccine effectiveness; horizontal lines represent the 95% confidence intervals. Labels along left side of plot indicate reference numbers [], country, and study population. Reference numbers identify the study and link to the summary table of VE effectiveness studies on view-hub.org (Table 1 in summary table); references starting with a 'B' are studies found in the booster VE table only (Table 2 in summary table). Primary series refers to the completion of two doses of vaccines for AstraZeneca-Vaxzevria; Moderna-Spikevax, Pfizer BioNTech-Comirnaty and Sinovac-CoronaVac and one dose of Janssen-Ad26.COV2.S. Severe disease includes severe disease, hospitalization, and pneumonia; symptomatic disease includes disease of any severity level; any infection can include symptomatic and asymptomatic infection. Additional details on the methods for inclusion of the estimates in the plots provided in Annex 3. Note, three negative point estimates for the primary series are not shown in the Omicron plot: Moderna-Spikevax VE against symptomatic disease at 6+ months (reference 179) as well as Moderna-Spikevax and Pfizer BioNTech-Comirnaty VE against infection at 3-6 months (reference 144).

Interpretation of the results of the VE for the Omicron variant

To date, 17 studies of VE against the Omicron variant show reduced protection of primary series COVID-19 vaccinations for all outcomes (*severe disease*, *symptomatic disease*, and *infection*) than has been observed for other variants of concern. Importantly though, VE estimates against the Omicron variant remain higher for *severe disease* than for other outcomes in most studies. Booster vaccination substantially improves VE for all outcomes for all products. However, few studies have followed persons for six months or more after booster vaccination to evaluate longer duration of protection.

For *severe disease*, within the first three months of primary series vaccination, six of 11 (55%) VE estimates for the mRNA vaccines were ≥70%. Three studies for vector vaccines (AstraZeneca-Vaxzevria and Janssen-Ad26.COV2.S) and two studies for inactivated vaccines (Sinovac-CoronaVac) reported VE of <50%. Beyond three months after vaccination, 10 of 25 (40%) VE estimates for the mRNA vaccines were ≥70% while 18 (72%) were ≥50%, one of the 11 (9%) VE estimates for the adenovector vaccines (AstraZeneca-Vaxzevria and Janssen-Ad26.COV2.S) was ≥70% while seven estimates (64%) were ≥50%, and none of the four (0%) VE estimates for Sinovac-CoronaVac were ≥70%, while two (50%) were ≥50%. Between 14 days and three months of receipt of a booster dose, VE against *severe disease* improved in all studies, with only one estimate for Janssen-Ad26.COV2.S below 70% (28 studies evaluated an mRNA booster, three studies a booster dose of Janssen-Ad26.COV2.S, one studies a booster dose of AstraZeneca-Vaxzevria, and two studies a booster dose of Sinovac-CoronaVac). At three to six months post mRNA booster, 12 of 15 (80%) estimates showed VE ≥ 70%, including 11 studies in which an mRNA vaccine was given as the primary series, three studies in which AstraZeneca-Vaxzevria was given as the primary series, and one study in which Sinovac-CoronaVac was given as the primary series.

VE estimates against *symptomatic disease* and *infection* within the first three months of primary series vaccination tended to be lower than against *severe disease*, and VE decreased more substantially over time. For *symptomatic disease* within the first three months of primary series vaccination, three of twelve (25%) VE estimates for the mRNA vaccines were ≥70%; both estimates for AstraZeneca-Vaxzevria and both estimates for Sinovac (CoronaVac) were below 50%. Beyond three months after vaccination, none of the 26 VE estimates were ≥50% (18 studies evaluated mRNA vaccines, four evaluated AstraZeneca-Vaxzevria, and four evaluated Sinovac-CoronaVac). Booster vaccination with an mRNA vaccine after completion of a primary series of an mRNA vaccine, AstraZeneca-Vaxzevria, or Sinovac-CoronaVac improved VE against *symptomatic disease*, with four of 14 (29%) VE estimates ≥70% and 12 (86%) estimates ≥50% between 14 days and three months post booster dose. However, booster dose protection declined with time since vaccination, with only one of six (17%) available estimates indicating a VE of ≥50% at three to six months following receipt of an mRNA booster dose. All estimates for a booster dose of Sinovac-CoronaVac (two estimates) or AstraZeneca-Vaxzevria (one estimate) indicated VE <50%. VE against *infection* showed a similar pattern as that against *symptomatic disease*.

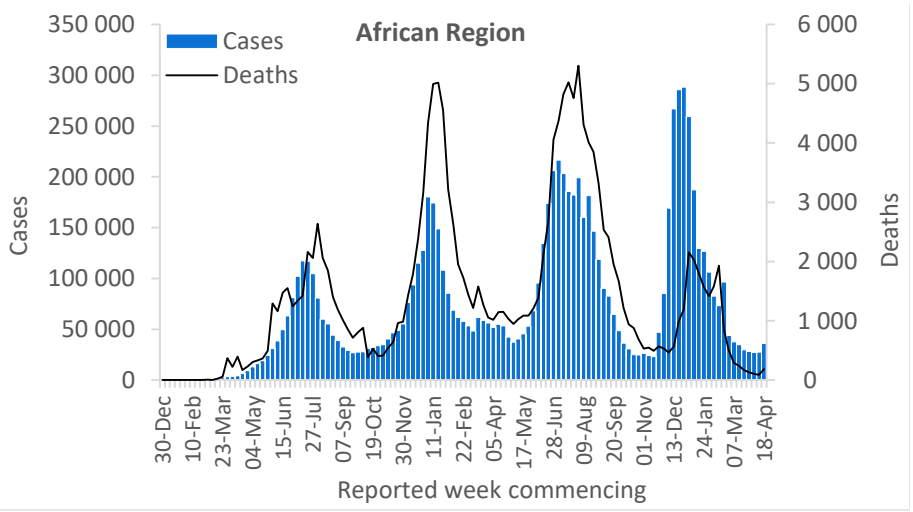
WHO regional overviews:

Epidemiological week 18 – 24 April 2022**

African Region

After a continued decreasing trend in weekly cases since January 2022, the Africa Region reported just under 36 000 new cases and over 185 new deaths, a 32% and a 110% increase respectively as compared to the previous week. Four (18%) countries in the Region reported an increase of over 20% in cases, with some of the greatest proportional increases observed in Burundi (343 vs 103 new cases; +233%), South Africa (19 291 vs 9151 new cases; +111%) and Eswatini (186 vs 132 new cases; +41%). After South Africa, the highest numbers of new cases were reported from Réunion (13 850 new cases; 1546.9 new cases per 100 000; +11%), and Zambia (517 new cases; 2.8 new cases per 100 000; -47%).

The highest numbers of new weekly deaths in the Region were reported from South Africa (154 new deaths; <1 new death per 100 000 population; +221%), Réunion (11 new deaths; 1.2 new deaths per 100 000; similar to the previous week's figures), and Zimbabwe (6 new deaths; <1 new death per 100 000; +20%).

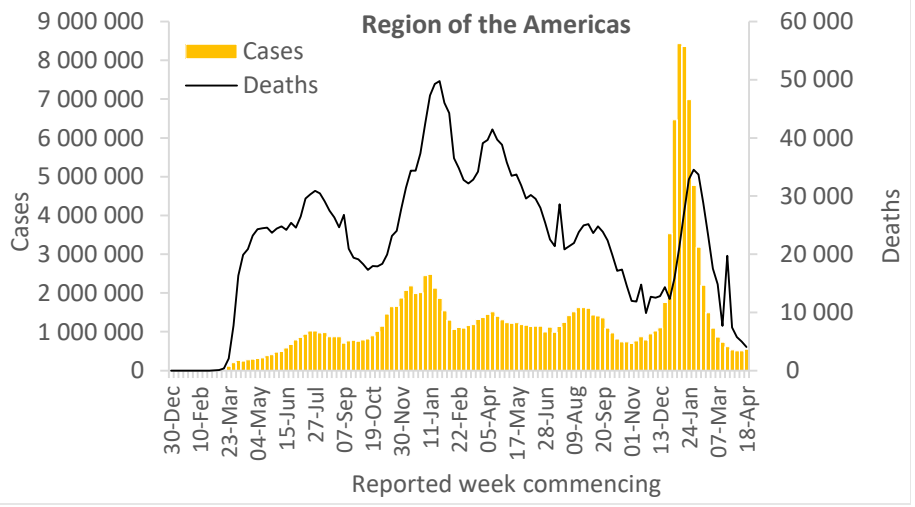


Updates from the African Region

Region of the Americas

The Region of the Americas shows an increasing trend after the continued decline observed since January 2022, with over 550 000 new cases reported, a 9% increase as compared to the previous week. Eighteen (32%) countries in the Region reported increases in new cases of 20% or greater, with the largest increases observed in Saint Vincent and the Grenadines (45 vs 9 new cases; +400%), Puerto Rico (21 622 vs 5106; +323%) and Argentina (24 832 vs 6695 new cases; +271%). The highest numbers of new cases were reported from the United States of America (298 306 new cases; 90.1 new cases per 100 000; +21%), Brazil (91 395 new cases; 43.0 new cases per 100 000; -26%), and Canada (63 247 new cases; 167.6 new cases per 100 000; -6%).

The number of new weekly deaths in the Region decreased by 19% as compared to the previous week, with just over 400 new deaths reported. The highest numbers of new deaths were reported from the United States of America (2354 new deaths; <1 new death per 100 000; -24%), Brazil (650 new deaths; <1 new death per 100 000; -17%), and Canada (452 new deaths; 1.2 new deaths per 100 000; +40%).

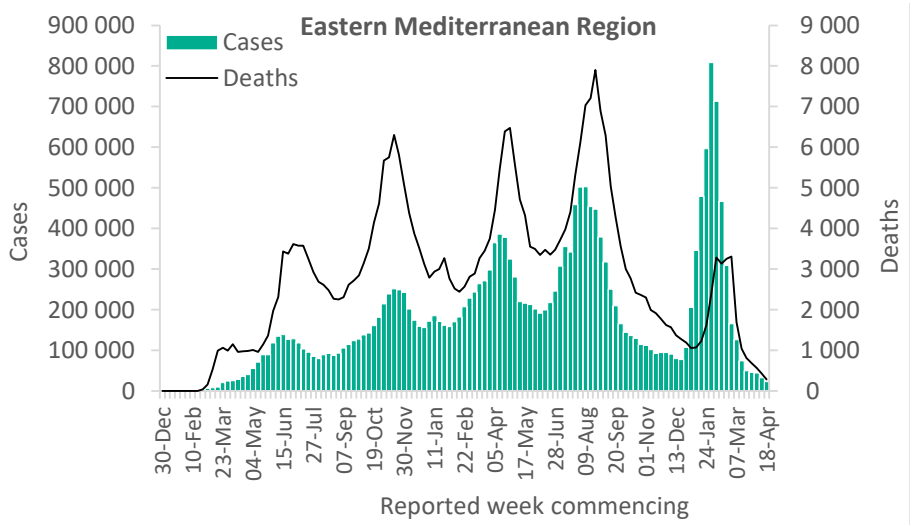


Updates from the Region of the Americas

Eastern Mediterranean Region

In the Eastern Mediterranean Region, new weekly cases have continued to decline after reaching a peak in early February 2022. Over 22 000 new weekly cases were reported last week, a 30% decrease as compared to the previous week. Three (14%) countries in the Region have reported increases in new cases of 20% or greater, with the largest proportional increases observed in Sudan (40 vs 23 new cases; +74%) and Libya (42 vs 28 new cases; +50%). The highest numbers of new cases were reported from the Islamic Republic of Iran (10 448 new cases; 12.4 new cases per 100 000; -36%), Bahrain (3071 new cases; 180.5 new cases per 100 000; -8%), and the United Arab Emirates (1628 new cases; 16.5 new cases per 100 000; -6%).

The number of new weekly deaths in the Region decreased by 34% when compared to the previous week, with just 283 new deaths reported. The highest numbers of new deaths were reported from the Islamic Republic of Iran (162 new deaths; <1 new death per 100 000; -27%), Egypt (42 new deaths; <1 new death per 100 000; -14%), and Tunisia (24 new deaths; <1 new death per 100 000; -71%).

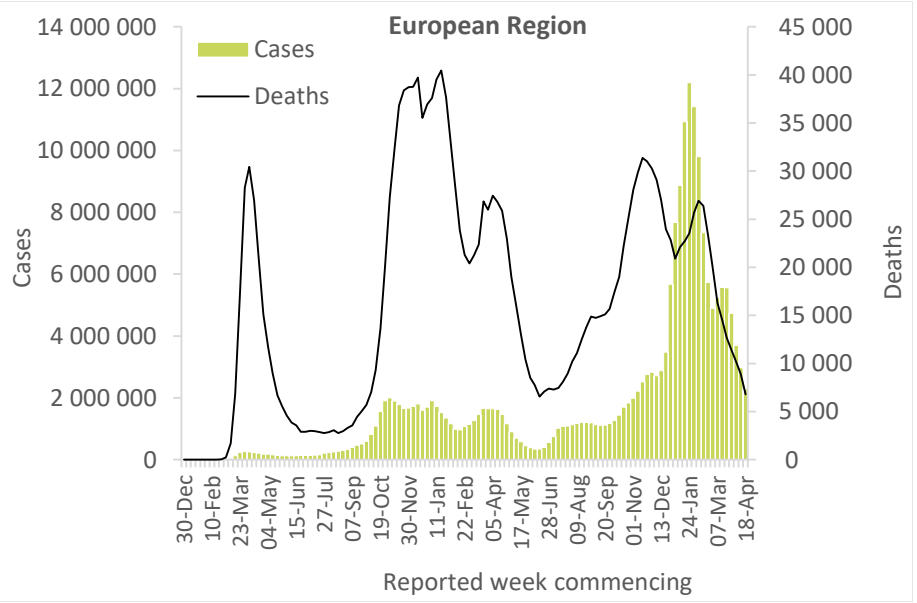


Updates from the Eastern Mediterranean Region

European Region

After the increase observed during the first half of March 2022, new weekly cases continue to decrease in the European Region. Over 2.2 million new cases were reported, a 23% decrease as compared to the previous week. Only one country, Albania, reported an increase in new cases of 21% (329 vs 271 new cases). The highest numbers of new cases were reported from Germany (675 022 new cases; 811.6 new cases per 100 000; -13%), France (542 896 new cases; 834.7 new cases per 100 000; -34%), and Italy (419 374 new cases; 703.2 new cases per 100 000; -1%).

The number of new deaths has continued to decrease in the Region, with just over 6800 new deaths reported this week, a 23% decrease as compared to the previous week. The highest numbers of new deaths were reported from the Russian Federation (1402 new deaths; 1.0 new deaths per 100 000; -21%), Italy (1007 new deaths; 1.7 new deaths per 100 000; +7%), and the United Kingdom (903 new deaths; 1.3 new deaths per 100 000; -47%).

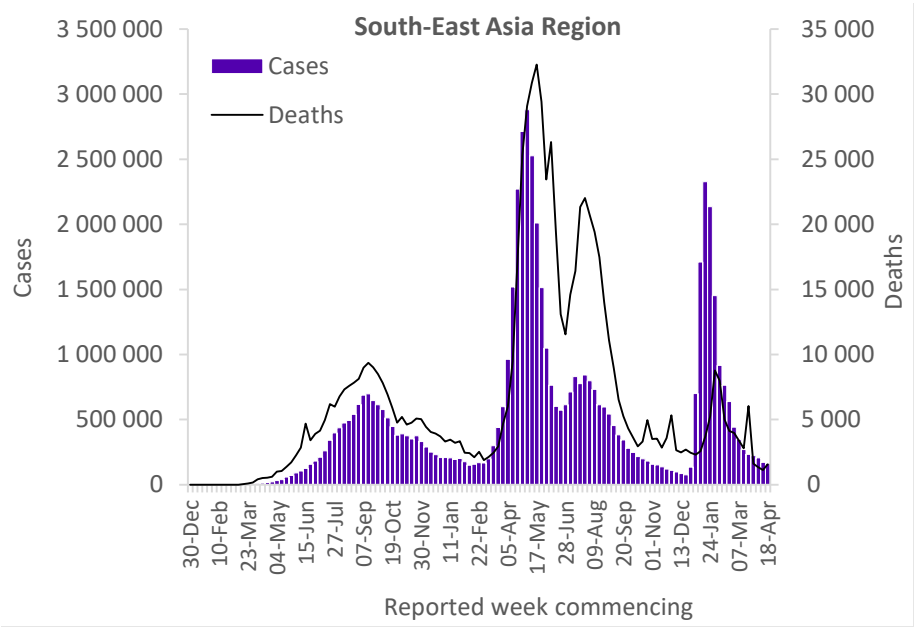


Updates from the European Region

South-East Asia Region

The South-East Asia Region reported over 161 000 new weekly cases, a 6% decline as compared to the previous week, continuing the decreasing trend observed since January 2022. However, India reported an increase in new weekly cases of 126% (15448 vs 6826 new cases). The highest numbers of new cases were reported from Thailand (135 915 new cases; 194.7 new cases per 100 000; -7%), India (15 448 new cases; 1.1 new cases per 100 000; +126% increase), and Bhutan (4975 new cases; 644.8 new cases per 100 000; -53%).

New weekly deaths increased by 41% in the Region as compared to the previous week, partly due to a delay in reporting of deaths from India (n= 150 new deaths). The highest numbers of new deaths were reported from Thailand (893 new deaths; 1.3 new deaths per 100 000; +12%), India (442 new deaths; <1 new death per 100 000; +570%), and Indonesia (234 new deaths; <1 new death per 100 000; -3%).

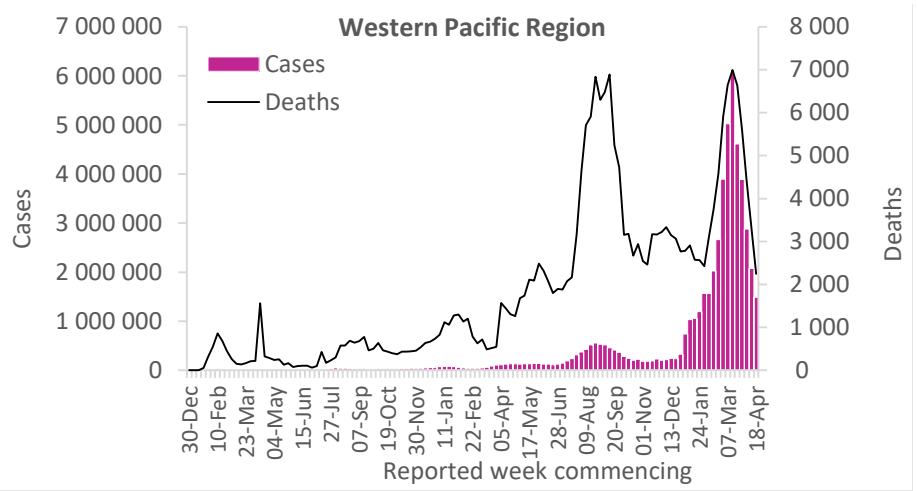


Updates from the South-East Asia Region

Western Pacific Region

After the increasing trend in new cases observed in the Western Pacific Region between December 2021 and March 2022, new weekly cases declined for a fifth consecutive week (-28% as compared to the previous week), with over 1.4 million new cases reported. However, nine (29%) countries in the Region reported an increase of 20% or greater, with some of the largest increases observed in Samoa (2702 vs 772 new cases; +250%), Palau (157 vs 52 new cases; +202%), and New Caledonia (72 vs 27 new cases; +167%). The highest numbers of new cases were reported from the Republic of Korea (589 442 new cases; 1149.7 new cases per 100 000; -39%), Australia (294 982 new cases; 1156.8 new cases per 100 000; -11%), and Japan (287 210 new cases; 227.1 new cases per 100 000; -16%).

The number of new weekly deaths shows a decrease of 33% as compared to the previous week, with over 2200 new deaths reported. The highest numbers of new deaths were reported from the Republic of Korea (1041 new deaths; 2.0 new deaths per 100 000; -38%), Japan (292 new deaths; <1 new death per 100 000; -16%), and China (215 new deaths; <1 new death per 100 000; -47%).



Updates from the Western Pacific Region

Annex 1. Data, table, and figure notes

Data presented are based on official laboratory-confirmed COVID-19 cases and deaths reported to WHO by country/territories/areas, largely based upon WHO case definitions and surveillance guidance. While steps are taken to ensure accuracy and reliability, all data are subject to continuous verification and change, and caution must be taken when interpreting these data as several factors influence the counts presented, with variable underestimation of true case and death incidences, and variable delays to reflecting these data at the global level. Case detection, inclusion criteria, testing strategies, reporting practices, and data cut-off and lag times differ between countries/territories/areas. A small number of countries/territories/areas report combined probable and laboratory-confirmed cases. Differences are to be expected between information products published by WHO, national public health authorities, and other sources.

Due to public health authorities conducting data reconciliation exercises that remove large numbers of cases or deaths from their total counts, negative numbers may be displayed in the new cases/deaths columns as appropriate. When additional details become available that allow the subtractions to be suitably apportioned to previous days, graphics will be updated accordingly. A record of historic data adjustment made is available upon request by emailing epi-data-support@who.int. Please specify the countries of interest, time period, and purpose of the request/intended usage. Prior situation reports will not be edited; see covid19.who.int for the most up-to-date data. COVID-19 confirmed cases and deaths reported in the last seven days by countries, territories, and areas, and WHO Region (reported in previous issues) are now available at: https://covid19.who.int/table.

'Countries' may refer to countries, territories, areas or other jurisdictions of similar status. The designations employed, and the presentation of these materials do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement. Countries, territories, and areas are arranged under the administering WHO region. The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by WHO in preference to others of a similar nature that are not mentioned. Errors and omissions except, the names of proprietary products are distinguished by initial capital letters.

[1] All references to Kosovo should be understood to be in the context of the United Nations Security Council resolution 1244 (1999). In the map, the number of cases of Serbia and Kosovo (UNSCR 1244, 1999) have been aggregated for visualization purposes.

Annex 2. Additional notes on VOC impacts on vaccines

- Reductions in VE do not necessarily mean loss of protection, as indicated by the absolute VE estimate. For example, a 10-percentage point reduction in VE against symptomatic disease for mRNA vaccines would still mean high vaccine effectiveness of ~85%. Likewise, vaccines have shown higher VE against severe disease; thus, small reductions in VE against severe disease due to VOCs may still mean substantial protection.
- Annex 4 summarizes the impact of VOCs on COVID-19 vaccine performance in the absence of waning, and, therefore, does not include studies that only assess VE greater than 4 months post final dose.
- Studies reporting VOC-specific VE estimates for full vaccination (≥7 days post final dose) are assessed against a comparator VE estimate for that vaccine product to determine level of reduction in VE. For symptomatic disease, VOC VE is compared against phase 3 RCT results from non-VOC settings. For severe disease and infection, due to instability or lack of phase 3 RCT estimates, VOC VE is compared to non-VOC VE estimates from the same study when available (or to Alpha VE from same study when assessing Beta, Gamma, or Delta); with an exception for AstraZeneca-Vaxzevria for infection (when a phase 3 estimate of VE against infection due to non-VOC is available and used as comparator). In some instances, a study may be included for severe disease or infection outcome even without a comparator if a very high VE estimate is reported against a VOC (i.e., >90%).
- It is also important to note that studies vary in population, outcome definitions, study design and other methodological considerations, which may in part explain differences when comparing VE estimates for a product between different studies. In addition, the reductions summarized in the table represent VE point estimates and do not represent the uncertainty intervals around these estimates which vary substantially across studies. The reductions in VE noted should be interpreted with these limitations in mind.
- Neutralization studies that use samples collected >7 days and < 6 months after complete vaccination and that use an ancestral strain as the reference are included in the Annex 4.

Annex 3. Methods for Figure 4

- Figures include 22 studies from Brazil, Canada, the Czech Republic, Denmark, Finland, Israel, Qatar, South Africa, the United Kingdom, and the United States of America evaluating the VE against the Omicron variant.
- VE studies included in the plot were identified from an ongoing systematic review of COVID-19 vaccine effectiveness studies. All studies were cohort or test-negative studies. Methods for the systematic review and inclusion/exclusion criteria are available on view-hub.org. The studies were conducted during a period when either Delta or Omicron was the predominant circulating variant. Estimates were included if they were of laboratory-confirmed cases of the Omicron or Delta variant. In addition, for the primary series VE, only studies providing VE estimates for discrete time intervals since vaccination, which evaluate changes in VE over time, are included.
- For the primary series VE, estimates are only included in the plot for studies that report VE for more than one time period.

Annex 4. Summary of Primary Series Vaccine Performance against Variants of Concern (VE data as of 21 April 2022; Neutralization data as of 20 April 2022)

	WHO Emergency Use Listing (EUL) Qualified Vaccines[+]								Vaccines without WHO EUL[+]	
	AstraZeneca-Vaxzevria/SII - Covishield	Beijing CNBG-BBIBP-CorV	Bharat-Covaxin	Janssen-Ad26.COV 2.S	Moderna-mRNA-1273	Novavax-Nuvaxovid/SII - Covavax	Pfizer BioNTech-Comirnaty	Sinovac-CoronaVac	Anhui ZL-Recombinant	Gamaleya-Sputnik V
Alpha, Beta, Gamma										
Summary of VE*	*See update from 11 January 2022 for details of vaccine performance against Alpha, Beta, and Gamma variants of concern*									
Delta										
Summary of VE*	*See update from 12 April 2022 for details of vaccine performance against Delta variant of concern*									
Omicron										
Summary of VE*	Reduced protection against infection and symptomatic disease; possible reduced protection against for severe disease but limited evidence									
- Severe disease	-	-	-	-	↓/↓↓[1]	-	↓↓ to ↓↓↓[4]	-	-	-
- Symptomatic disease	↓↓↓[1]	-	-	-	↓↓/↓↓↓[2]	-	↓↓↓[3]	-	-	-
- Infection	↓↓↓[1]	-	-	-	↓↓↓[3]	-	↓↓↓[3]	-	-	-
Neutralization	↓↓↓[7]	↔to↓↓↓[3]	↓↓[1]	↔to ↓↓↓[4]	↓↓↓[18]	-	↓↓↓[45]	↓↓to↓↓↓[5]	-	↓↓[1]

VE refers to vaccine effectiveness and vaccine efficacy. *Summary of VE: indicates the general conclusions but only for the vaccines evaluated against the specific variant. Arrows generalize the magnitude of reduction in VE or neutralization: "↔" <10 percentage point (pp) reduction in VE, or VE >90% with no comparator, or that there was a <2-fold reduction in neutralization; "↓" 10 to <20 pp reductio[27]n in VE, or 2 to <5-fold reduction in neutralization; "↓↓" 20 to <30 pp reduction in VE, or 5 to <10-fold reduction in neutralization; "↓↓↓" ≥30 pp reduction in VE, or ≥10-fold reduction in neutralization. When more than one neutralization study is available, the interquartile range (25th and 75th percentiles) of fold-reductions across all studies for specific vaccine/variant was used. "Moderna-mRNA-1273/Pfizer BioNTech-Comirnaty" indicates that both vaccines were evaluated together in the study. The number of studies is shown as subscripts: vaccine effectiveness and neutralization studies informing this table can be found on the VIEW-hub Resources Library. References indicated by superscripts next to VOC name in column 1 are vaccine efficacy results from randomized controlled trials informing this table.

Technical guidance and other resources

- WHO technical guidance
- WHO COVID-19 Dashboard
- WHO Weekly Operational Updates on COVID-19
- WHO COVID-19 case definitions
- COVID-19 Supply Chain Inter-Agency Coordination Cell Weekly Situational Update
- Research and Development
- Open WHO courses on COVID-19 in official UN languages and in additional national languages
- WHO Academy COVID-19 mobile learning app
- The Strategic Preparedness and Response Plan (SPRP) outlining the support the international community can provide to all countries to prepare and respond to the virus
- EPI-WIN: tailored information for individuals, organizations, and communities
- Recommendations and advice for the public: Protect yourself; Questions and answers; Travel advice

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