

COVID-19 Weekly Epidemiological Update

Edition 76, published 25 January 2022

In this edition:

- [Global overview](#)
- [Special focus: Update on SARS-CoV-2 variants of interest and variants of concern](#)
- [WHO regional overviews](#)
- [Summary of the Weekly Operational Update](#)

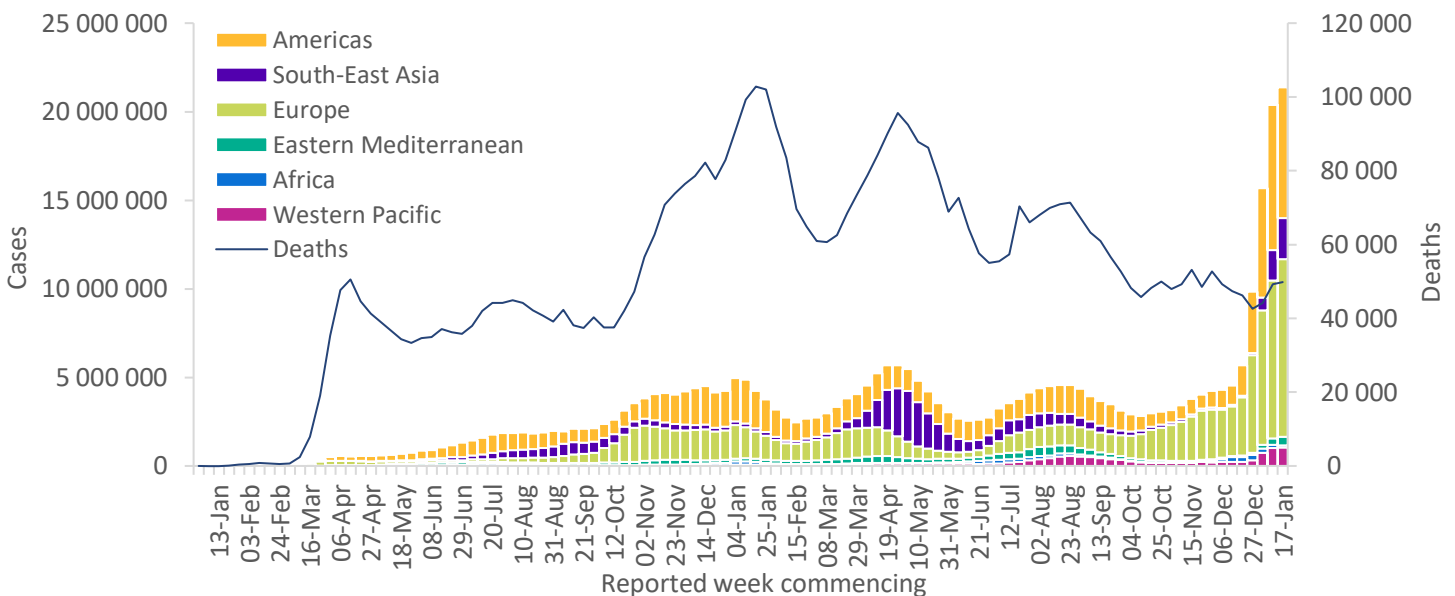
Global overview

Data as of 23 January 2022

Globally, the number of new COVID-19 cases increased by 5% in the past week (17-23 January 2022), while the number of new deaths remained similar to that reported during the previous week (Figure 1). Across the six WHO regions, over 21 million new cases were reported, representing the highest number of weekly cases recorded since the beginning of the pandemic. Nearly 50 000 new deaths were also reported. As of 23 January 2022, over 346 million confirmed cases and over 5.5 million deaths have been reported in total.

A slower increase in case incidence was observed at the global level, with only half of the regions reported an increase in the number of new weekly cases, as compared to five out of six regions in the previous week. The Eastern Mediterranean Region reported the largest increase in the number of new cases (39%), followed by the South-East Asia Region (36%) and the European Region (13%). The African Region reported the largest decrease in the number of new cases (31%), followed by the Region of the Americas (10%), while the number of new cases in the Western Pacific Region remained similar to that reported during the previous week. The number of new weekly deaths increased in the South-East Asia Region (44%), the Eastern Mediterranean Region (15%) and the Region of the Americas (7%), while the other Regions all reported declines in new weekly deaths.

Figure 1. COVID-19 cases reported weekly by WHO Region, and global deaths, as of 23 January 2022**



**See [Annex 2: Data, table, and figure notes](#)

At the country level, the highest numbers of new cases were reported from the United States of America (4 215 852 new cases; a 24% decrease), France (2 443 821 new cases; a 21% increase), India (2 115 100 new cases; a 33% increase), Italy (1 231 741 new cases; similar to the previous week), and Brazil (824 579 new cases; a 73% increase). The highest number of new deaths were reported from the United States of America (10 795 new deaths; a 17% decrease), the Russian Federation (4792 new deaths; a 7% decrease), India (3343 new deaths; a 47% increase), Italy (2440 new deaths; a 24% increase), and The United Kingdom (1888 new deaths; similar to the previous week's figures).

Table 1. Newly reported and cumulative COVID-19 confirmed cases and deaths, by WHO Region, as of 23 January 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	10 040 147 (47%)	13%	129 874 912 (37%)	21 259 (43%)	-5%	1 740 565 (31%)
Americas	7 356 674 (34%)	-10%	126 761 620 (37%)	19 357 (39%)	7%	2 466 600 (44%)
South-East Asia	2 327 997 (11%)	36%	49 773 607 (14%)	3 714 (7%)	44%	730 542 (13%)
Western Pacific	1 027 098 (5%)	1%	14 165 686 (4%)	2 576 (5%)	-12%	164 783 (3%)
Eastern Mediterranean	479 050 (2%)	39%	18 231 556 (5%)	1 232 (2%)	15%	319 500 (6%)
Africa	131 322 (1%)	-31%	7 933 483 (2%)	1 752 (4%)	-14%	162 371 (3%)
Global	21 362 288 (100%)	5%	346 741 628 (100%)	49 890 (100%)	1%	5 584 374 (100%)

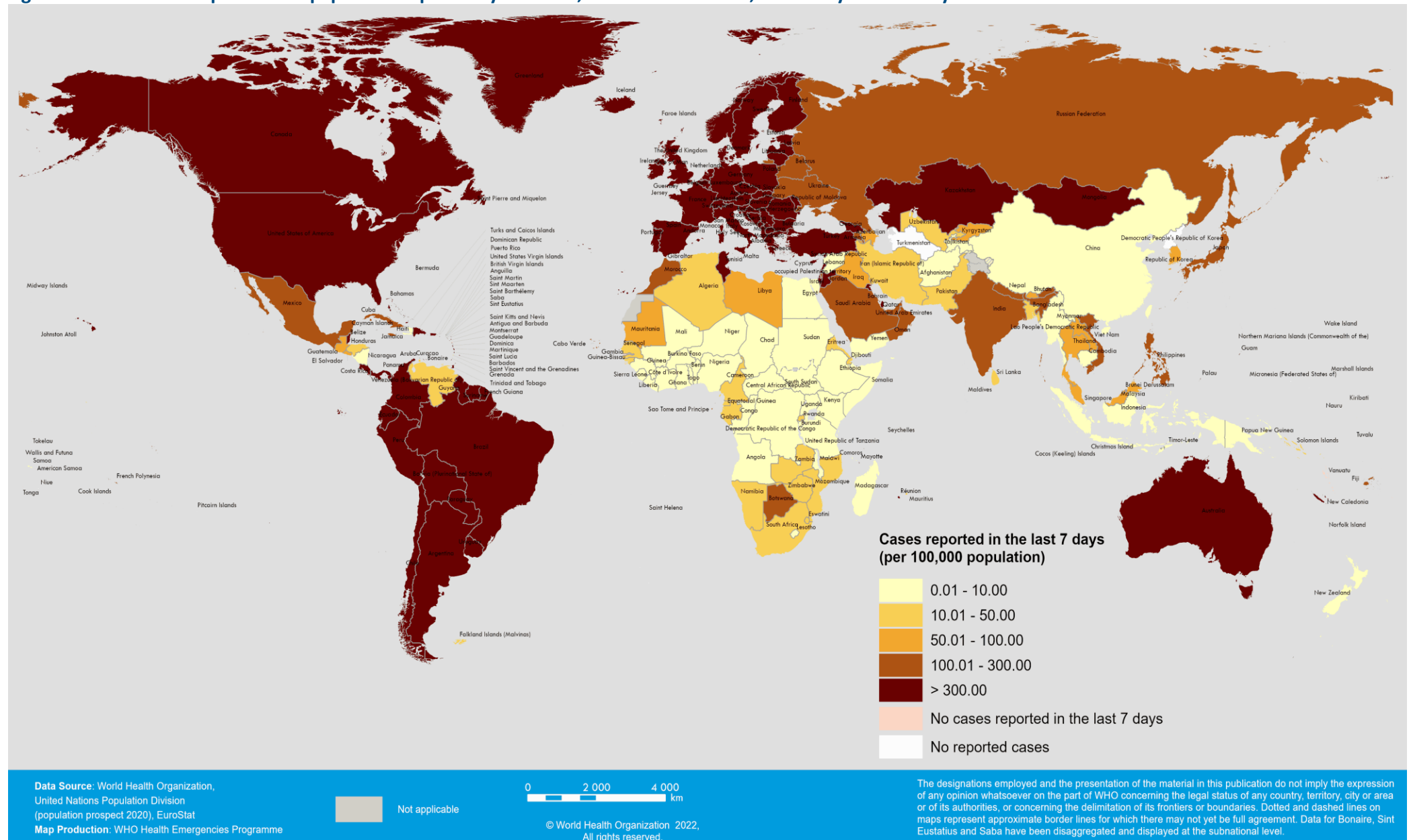
*Percent change in the number of newly confirmed cases/deaths in the past seven days, compared to seven days prior

**See [Annex 2: Data, table, and figure notes](#)

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

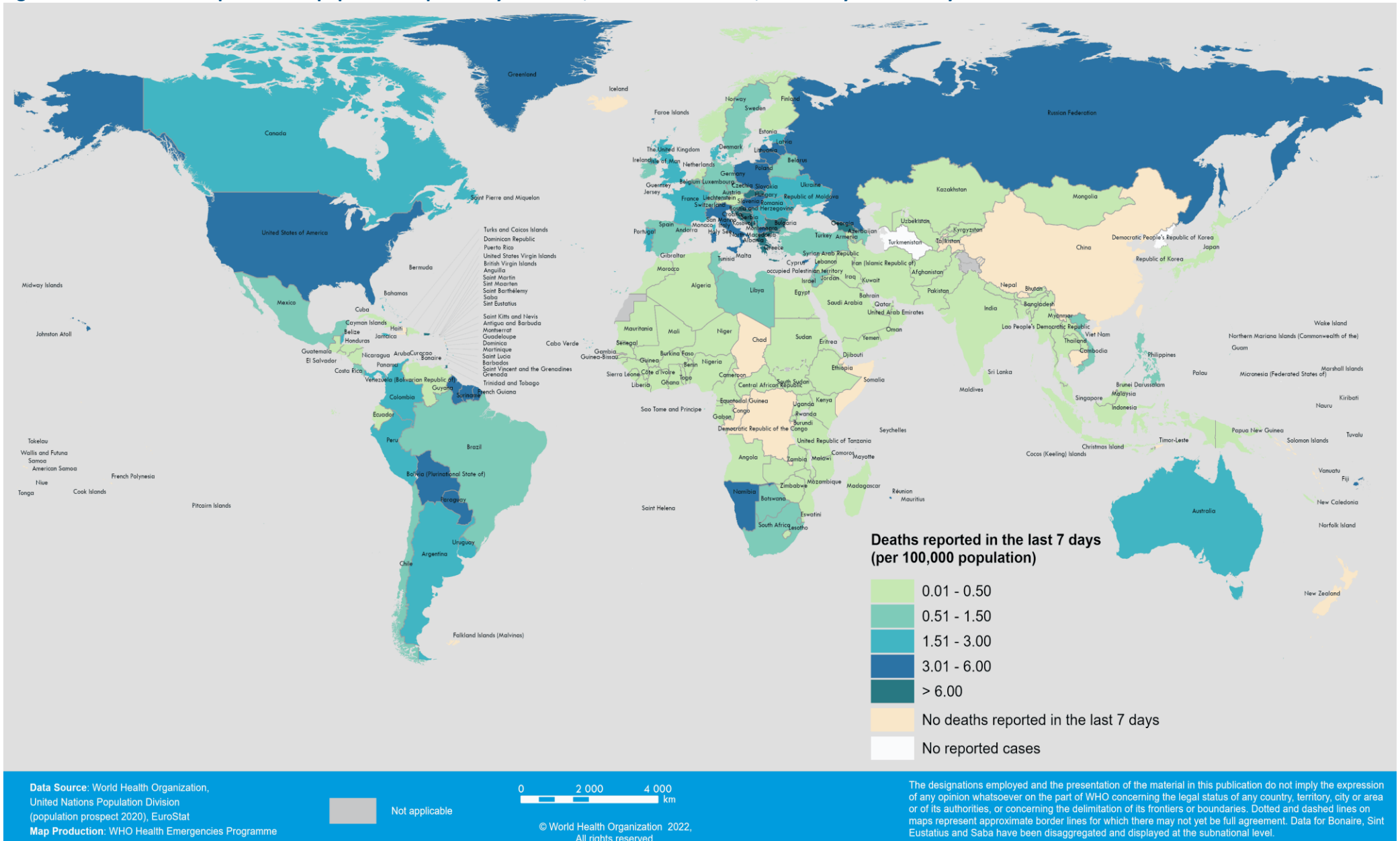
- [WHO COVID-19 Dashboard](#)
- [WHO COVID-19 Weekly Operational Update and previous editions of the Weekly Epidemiological Update](#)

Figure 2. COVID-19 cases per 100 000 population reported by countries, territories and areas, 17 January – 23 January 2022**



**See Annex 2: Data, table, and figure notes

Figure 3. COVID-19 deaths per 100 000 population reported by countries, territories and areas, 17 January – 23 January 2022**



**See Annex 2: 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 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. As evidence becomes available, classifications of variants will be revised to reflect the continuous evolution of circulating variants and their changing epidemiology. Criteria for variant classification, and the current lists of VOCs, VOIs and VUMs, are available on the [WHO Tracking SARS-CoV-2 variants website](#). National authorities may choose to designate other variants of local interest/concern and are encouraged to investigate and report on the impacts of these variants.

Geographic spread and prevalence of VOCs

The current global epidemiology of SARS-CoV-2 is characterized by the dominance of the Omicron variant on a global scale, continued decline in the prevalence of the Delta variant, and very low-level circulation of Alpha, Beta and Gamma variants. The Omicron variant includes Pango lineages B.1.1.529, BA.1, BA.2 and BA.3. BA.1 accounts for 98.8% of sequences submitted to GISAID as of 25 January 2022, although a number of countries have reported recent increases in the proportion of BA.2 sequences. All these variants are being monitored by WHO under the umbrella of 'Omicron'. Following the identification of travel-related cases of the Omicron variant, many countries are now reporting community transmission. Countries that experienced a rapid rise in Omicron cases in November and December 2021 have been or are beginning to see declines in cases.

Among the 372 680 sequences uploaded to GISAID with specimens collected in the last 30 daysⁱ, 332 155 (89.1%) were Omicron, 39 804 (10.7%) were Delta, 28 (<0.1%) were Gamma, four (<0.1%) were Alpha and two (<0.1%) comprised other circulating variants (VOIs Mu and Lambda). To note, global VOCs distribution should be interpreted with due consideration of surveillance limitations, including differences in sequencing capacities and sampling strategies between countries, as well as delays in reporting.

Differences in the characteristics of VOCs

Available evidence on the phenotypic impacts of VOCs is summarized in Table 2, as well as in [previous editions](#) of the COVID-19 Weekly Epidemiological Update. Since the [last update on 11 January 2022](#), there are several new publications on the phenotypic characteristics of VOCs, including recent literature on Omicron. Some of the studies reported have not been peer-reviewed and the findings must therefore be interpreted with due consideration of this limitation.

Update on the Omicron VOC

This section provides a summary of the potential impact of the Omicron variant. Detailed information on this variant and related recommended priority actions for Member States can be found in the [updated Technical Brief and Priority Actions](#) for Member States that was published by WHO on 21 January 2022. Based on the currently available evidence, the overall risk related to the Omicron variant remains very high. Compared to other variants, Omicron has shown an increased ability to spread within the community, leading to a rapid increase in the numbers of new cases in multiple countries where it has replaced other variants, including Delta. Despite this, there appears to be a lower risk of severe disease and death following Omicron infection as compared to other variants. However, due to

ⁱ This includes sequences submitted to [GISAID](#) with sample collected dates from 25 December 2021 to 23 January 2022 (last reported sample at the time of data extraction), excluding low coverage sequences.

the very high numbers of cases, many countries have seen a significant increase in the incidence of hospitalization, putting pressure on healthcare systems.

Transmissibility

The Omicron variant has a significant growth advantage, a higher secondary attack rate and a higher observed reproduction number as compared to the Delta variant, and as a result, it is rapidly replacing the latter globally. It is thought that this transmission advantage is largely due to Omicron's ability to evade immunity following infection and/or vaccination. However, compared to the Delta variant, Omicron is able to more rapidly infect the tissues of upper respiratory tract rather than the lungs, which may also help the spread of this variant. Studies conducted in the United Kingdom and Denmark showed that household contacts of cases with the Omicron variant were more likely to be infected as compared to those who were contacts of cases with the Delta variant: the household secondary attack rate in the study conducted in the United Kingdom was 13.6% for the Omicron as compared to 10.1% for the Delta variant; and for the study conducted in Denmark, 31% for the Omicron as compared to 21% for the Delta variant.¹ Additionally, studies conducted in India and South Africa have reported a higher proportion of asymptomatic infection at the time of testing among individuals infected with Omicron compared to infection with Delta. The higher occurrence of asymptomatic presentation may result in a lower rate of detection, and thus may further contribute to transmission.²

Disease severity

Epidemiological trends continue to show a decoupling between case incidence, hospital admissions and deaths in most countries, when compared to epidemic waves due to previous variants. This is likely due to a combination of the lower intrinsic severity of the Omicron variant (including increased likelihood of replication in the upper respiratory tract rather than the lungs), and preservation of protection against severe disease following vaccination.

Several studies have evaluated the risk of hospitalization and severe disease with Omicron as compared to Delta. An analysis from the United Kingdom Health Security Agency with the Medical Research Council (MRC) Biostatistics Unit, the University of Cambridge, showed a 47% reduction in the risk of presentation to emergency care or hospital admission with Omicron compared to Delta (Hazard Ratio [HR] 0.53, 95%CI 0.50-0.57) and 66% reduction in the risk of admission from emergency departments (HR 0.33, 95%CI 0.3-0.37).³ However, uncertainty remains about the severity and the impact on hospitalizations in populations with low vaccination coverage or prior exposure to SARS-CoV-2 infection.

Impact on immunity

The Omicron variant has an increased ability to evade immunity as compared to prior variants, causing re-infections in those who have had a previous infection and in those who have been vaccinated. Here we summarise the risk of re-infection as further details on vaccine effectiveness are given in the section on vaccines below. A study conducted in the United Kingdom found that, when compared to the Delta variant, the risk of reinfection with the Omicron variant was 5.4-fold higher.⁴ In those who were unvaccinated, this risk was slightly higher at 6.4-fold and in those who were vaccinated, slightly lower at 5.0-fold. A separate study conducted in the United Kingdom found that those who had a lower viral load (higher Ct value) during their previous infection were at a higher risk of reinfection.⁵

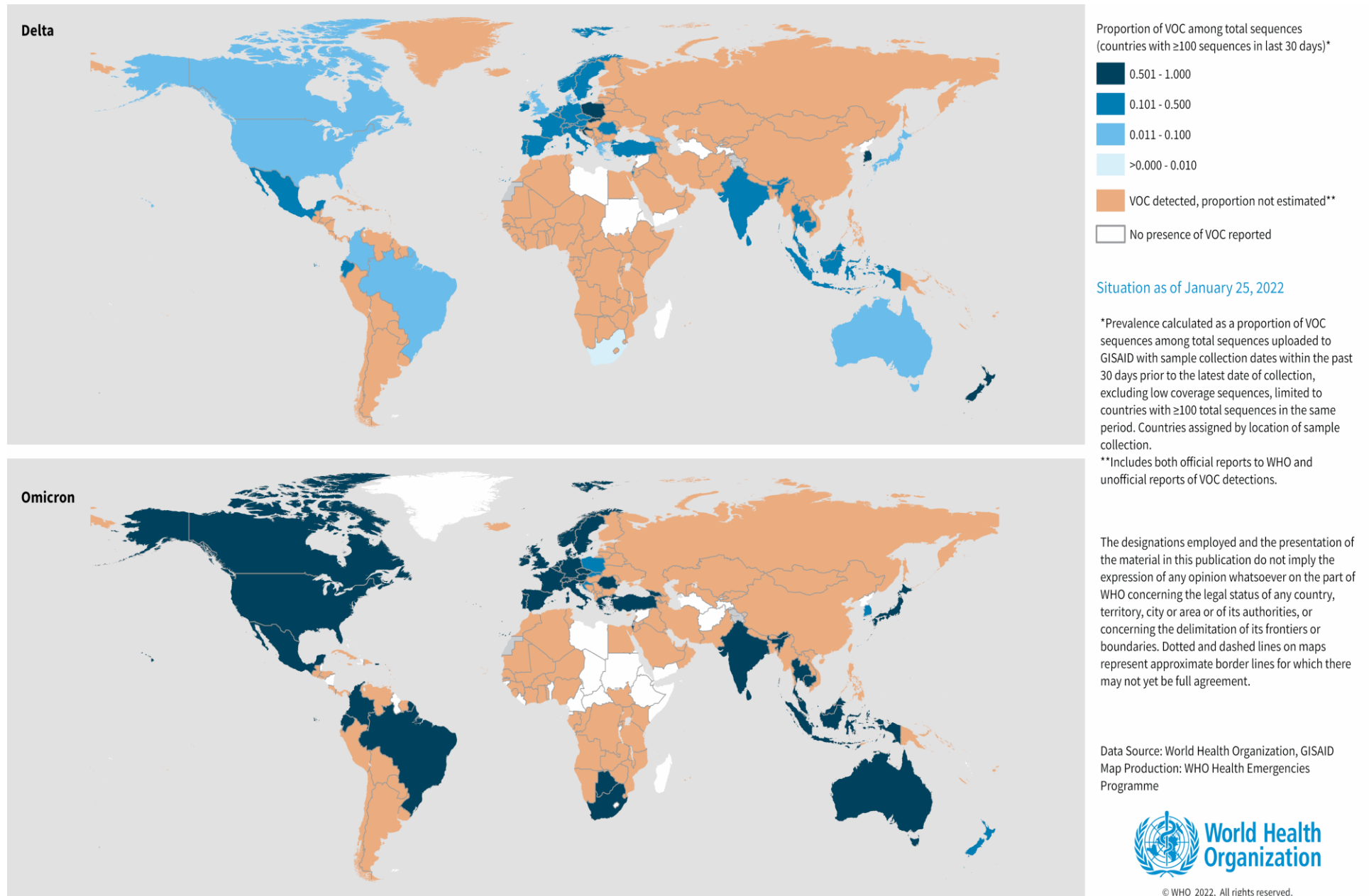
Impact on therapeutics

There is ongoing research to understand the impact of the Omicron variant on therapeutics and treatments. It is expected that corticosteroids and drugs which block the cytokine interleukin 6 (IL-6) will remain effective in those with severe disease. However, preliminary data from non-peer-reviewed publications suggest that some of the monoclonal antibodies may be less effective against the Omicron variant.

Impact on diagnostics and testing

WHO continues to assess the impact of Omicron on diagnostics; however, the diagnostic accuracy of routinely used PCR and the [WHO emergency use listing \(EUL\) approved](#) antigen-detection rapid diagnostic test assays does not appear to be significantly impacted by Omicron.

Figure 4: Prevalence of variants of concern (VOCs) Delta and Omicron in the last 30 days, data as of 25 January 2022



See also [Annex 2](#) for reported VOC detections by country/territory/area

Table 2: Summary of phenotypic impacts* of variants of concern

WHO label	Alpha	Beta	Gamma	Delta	Omicron
Transmissibility	Increased transmissibility ⁶	Increased transmissibility ^{7,8}	Increased transmissibility ^{8,9}	Increased transmissibility ^{8,10,11}	Increased transmissibility. ^{12–15}
Disease severity	Possible increased risk of hospitalization ^{16,17} , possible increased risk of severe disease and death ^{18,19}	Possible increased risk of hospitalization ¹⁷ , possible increased in-hospital mortality ²⁰	Possible increased risk of hospitalization ¹⁷ , possible increased risk of severe disease ²¹	Possible increased risk of hospitalization ^{22,23}	Reduced risk of hospitalization and severe disease ^{24–27}
Risk of reinfection	Neutralizing activity retained ²⁸ , risk of reinfection remains similar ²⁹	Reduction in neutralizing activity reported; T cell response elicited by D614G virus remains effective ³⁰	Moderate reduction in neutralizing activity reported ³¹	Reduction in neutralizing activity reported ^{32–34}	Increased risk of reinfection ^{35,36}
Impacts on diagnostics	Limited impact – S gene target failure (SGTF), no impact on overall result from multiple target RT-PCR; No impact on Ag RDTs observed ³⁷	No impact on RT-PCR or Ag RDTs observed ³⁴	None reported to date	No impact on RT-PCR or Ag RDTs observed ³⁸	PCR continues to detect Omicron. Impact on Ag-RDTs is under investigation: Results are mixed as to whether or not there may be decreased sensitivity to detect Omicron. 12,27,39–41

*Generalized findings as compared to previously/co-circulating variants. Based on emerging evidence, including non-peer-reviewed preprint articles and reports, all subject to ongoing investigation and revision.

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](#)

Table 3. Summary of vaccine performance against variants of concern (data as of 23 January 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-Covavax	Pfizer BioNTech-Comirnaty	Sinovac-CoronaVac	Anhui ZL-Recombinant	Gamaleya-Sputnik V		
Alpha, Beta, Gamma												
Summary of VE*	<i>(see update from 11 January 2022 for details of vaccine performance against Alpha, Beta, and Gamma variants of concern)</i>											
Delta⁹												
Summary of VE*	Protection retained against severe disease; possible reduced protection against symptomatic disease and infection											
- Severe disease ⁺	↔ ₃	-	-	↓ ₁	↔ ₄	-	↔ ₇	-	-	-	-	-
- Symptomatic disease	↔to↓ ₆	-	↓ ₁	-	↔ ₂	-	↔ to ↓ ₅	-	-	-	-	-
- Infection	↔to ↓ ₄	-	-	↓↓↓ ₁	↔ ₅	-	↔ to ↓ ₅	-	-	-	-	-
Neutralization	↓ ₁₃	↓ ₂	↔ to ↓ ₃	↔ to ↓↓ ₉	↓ ₁₄	↓ ₁	↔ to ↓ ₃₉	↓to↓↓ ₈	↔ to ↓ ₂	↓to↓↓ ₃		
Omicron												
Summary of VE*	Reduced protection against infection and symptomatic disease; possible reduced protection against severe disease											
- Severe disease ⁺	-	-	-	-	-	-	↓↓/↓↓↓ ₂	-	-	-	-	-
- Symptomatic disease	↓↓↓ ₁	-	-	-	↓↓↓ ₁	-	↓↓↓ ₁	-	-	-	-	-
- Infection	-	-	-	-	↓↓↓ ₂	-	↓↓↓ ₂	-	-	-	-	-
Neutralization	↓↓↓ ₅	-	-	↓↓↓ ₂	↓↓↓ ₁₄	↓↓↓ ₁	↓↓↓ ₂₃	↓↓-↓↓ ₂	-		↓↓↓ 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% reduction in VE, or VE >90% with no comparator, or that there was a <2-fold reduction in neutralization; “↓” 10 to <20% reduction in VE, or 2 to <5-fold reduction in neutralization; “↓↓” 20 to <30% reduction in VE, or 5 to <10-fold reduction in neutralization; “↓↓↓” ≥30% 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 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. + Severe disease is defined differently across studies and may include outcomes such as hospitalization, critical disease, and other forms of ‘severe’ disease.

Table 3 summarizes the impact of the Delta and Omicron variants on product specific vaccine efficacy/effectiveness (VE) and quantifies the reduction in the VE in the setting of variants compared to non-VOC settings.

Omicron VOC

Since the [11 January update](#), three new studies have provided additional evidence of reduced vaccine effectiveness of mRNA vaccines against infection and symptomatic disease due to the Omicron variant.¹⁻³ These studies report decreased VE of two doses of mRNA vaccines against infection and symptomatic disease due to the Omicron variant compared to the Delta variant within the first few months of receipt of the second dose, with VE estimates decreasing more rapidly with increasing time from completion of the primary series.

A peer-reviewed study from the United States of America reported VE estimates against symptomatic disease of approximately 40% and 30% for Moderna-mRNA-1273 and Pfizer BioNTech-Comirnaty, respectively, one month following two doses of vaccination. However, by 6-7 months following the second dose, VE had declined to 0% for both vaccines.⁴²

A second study of adults in the United States of America (not yet peer reviewed) provides new evidence of the VE of Pfizer BioNTech-Comirnaty against hospitalization due to the Omicron variant.² The vaccine was 70% effective at preventing hospitalization due to Omicron within the first 3 months of the second dose with no decrease in VE found at 6 months. This same study found a third dose of Pfizer BioNTech-Comirnaty increased VE against hospitalization due to Omicron to 89% (83-92%) which was sustained at 3-5 months. However, a VE against emergency department visits not leading to hospital admission decreased from 78% (95%CI 73-82%) immediately following the third dose to 48% (95%CI 14-69%) at 6 months or more.⁴²

In addition to VE against hospitalization, the three studies also showed that a third dose of mRNA vaccine increased VE from 0% to 62-78% for infection and symptomatic disease in the first 3-5 months following a third dose.

Delta VOC

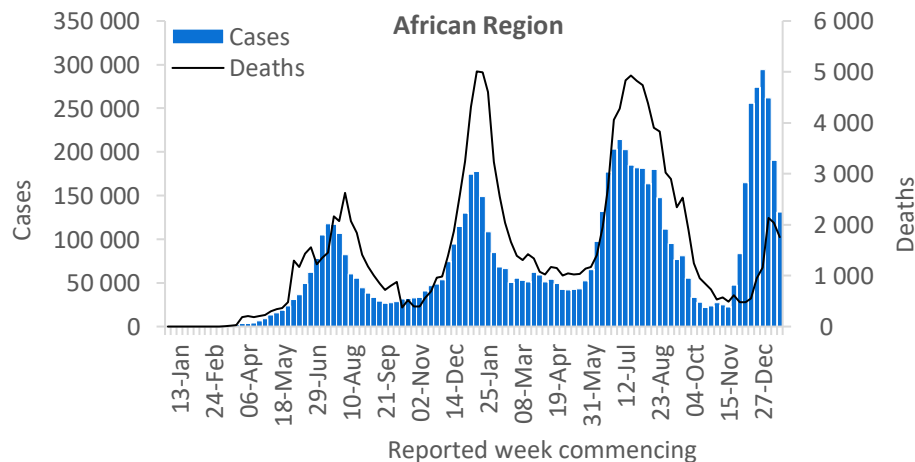
Five new studies (four pre-prints and one peer-reviewed study) provided further evidence of performance of two doses of vaccine against the Delta variant.⁴³⁻⁴⁷ The VE of the Pfizer BioNTech-Comirnaty vaccine against infection and symptomatic disease within 1-3 months after receipt of the second dose ranged from 80-91% but decreased with increasing time to a VE of 53-79% at four or more months following the second dose. The VE against hospitalization for Pfizer BioNTech-Comirnaty was high (88-95%) after the second dose. However, one study showed a reduction in the VE against hospitalization to 74% (65-80%) at six or more months following the second dose.⁴³

Five new studies (three pre-prints and two peer-reviewed studies) also provide further evidence of the vaccine performance of a third dose against infection, symptomatic disease, and hospitalization when the Delta variant was the predominant circulating variant.^{42-44,48,49} The VE of three doses of mRNA vaccines against infection and symptomatic disease ranged from 77-96% across studies.^{42-44,48,49} Two studies (both not yet peer-reviewed) evaluated VE of three doses of the Pfizer BioNTech-Comirnaty vaccine against hospitalization. The first study reported a relative VE (as compared to those receiving two doses, five or more months prior) of 89% (95%CI 87-91%).⁴⁸ The second study reported an absolute VE (as compared to those unvaccinated) of 95% (95%CI 91-97%) against hospitalization due to the Delta variant within three months of receipt of the third dose; however, VE at approximately 3-5 months decreased to 65% (16-85%).⁴³

African Region

The African Region reported a continued decline in case incidence in the past week with over 131 000 new cases reported, a 31% decrease. However, four countries (4/49; 8%) reported increases of 20% or greater: Algeria, Réunion, Burkina Faso (542 vs 425 new cases; 28% increase) and the United Republic of Tanzania (998 vs 831 new cases; 20% increase). The highest numbers of new cases were reported from Réunion (31 401 new cases; 3507.3 new cases per 100 000 population; a 93% increase), South Africa (22 795 new cases; 38.4 new cases per 100 000; a 35% decrease), and Algeria (9052 new cases; 20.6 new cases per 100 000; a 142% increase).

The number of new deaths also continued to decline in the Region with over 1700 new deaths reported, a 14% decrease compared to the previous week. The highest numbers of new deaths were reported from South Africa (785 new deaths; 1.3 new deaths per 100 000 population; a 13% decrease), Ethiopia (105 new deaths; <1 new death per 100 000; a 5% decrease), and Namibia (98 new deaths; 3.9 new deaths per 100 000; an 8% decrease).

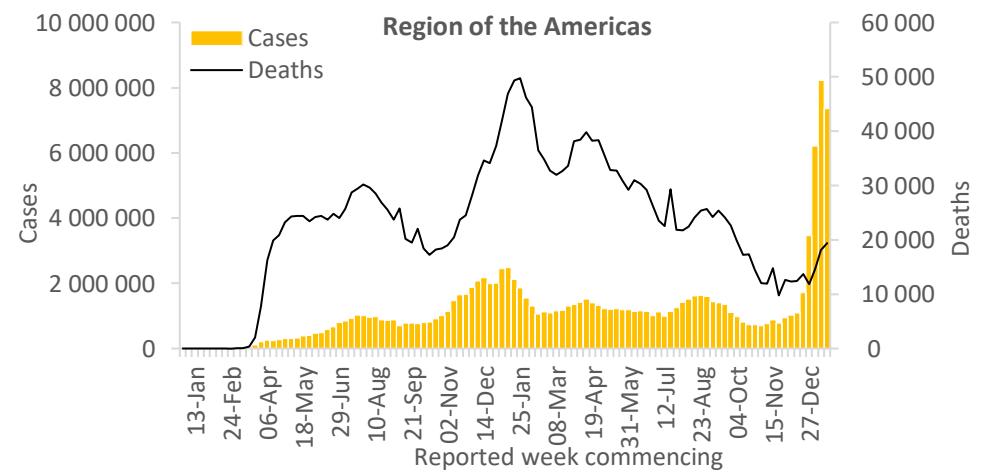


Updates from the [African Region](#)

Region of the Americas

Following four weeks of increases in the number of new cases, the Region of the Americas reported over 7.3 million new cases, a 10% decrease as compared to the previous week. However, nearly one-third of the countries in the Region reported increases of 20% or greater (18/56; 32%), with the highest increases reported from Dominica (754 vs 273 new cases; 176%), El Salvador (3435 vs 1343 new cases; 156%) and Venezuela (Bolivarian Republic of) (13033 vs 6003 new cases; 117%). The highest numbers of new cases were reported from the United States of America (4 215 852 new cases; 1273.7 new cases per 100 000; a 24% decrease), Brazil (824 579 new cases; 387.9 new cases per 100 000; a 73% increase), and Argentina (761 534 new cases; 1685.0 new cases per 100 000; similar to the figures of the previous week).

Over 19 000 new deaths were reported in the Region, corresponding to a 7% increase as compared to the previous week. The highest numbers of new deaths were reported from the United States of America (10 795 new deaths; 3.3 new deaths per 100 000; a 17% decrease), Brazil (1767 new deaths; <1 new death per 100 000; an 81% increase), and Mexico (1317 new deaths; 1.0 new deaths per 100 000; an 83% increase).

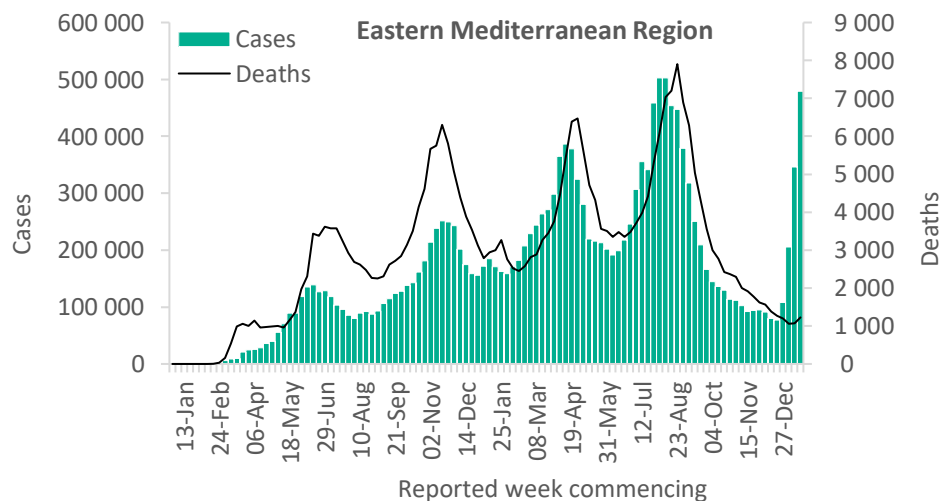


Updates from the [Region of the Americas](#)

Eastern Mediterranean Region

The Eastern Mediterranean Region reported a continued increase in new cases this week, albeit at a lower rate when compared to the previous week; with over 479 000 new cases reported, a 39% increase. Half of the countries (13/22, 59%) reported increases of 20% or greater, with the highest increases reported from Iraq (38 623 vs 13 877 new cases; 178% increase), Afghanistan (870 vs 333 new cases; 161% increase) and the occupied Palestinian territory (7239 vs 3040 new cases; 140% increase). The highest numbers of new cases were reported from Tunisia (66 015 new cases; 558.6 new cases per 100 000; a 67% increase), Morocco (50 753 new cases; 137.5 new cases per 100 000; a 10% increase), and Lebanon (44 217 new cases; 647.8 new cases per 100 000; similar to the previous week's figures).

Over 1200 new deaths were reported in the Region, a 15% increase as compared to the previous week. The highest numbers of new deaths were reported from Egypt (207 new deaths; <1 new death per 100 000; a 12% increase), Tunisia (177 new deaths; 1.5 new deaths per 100 000; a 45% increase), and the Islamic Republic of Iran (158 new deaths; <1 new death per 100 000; a 20% decrease).

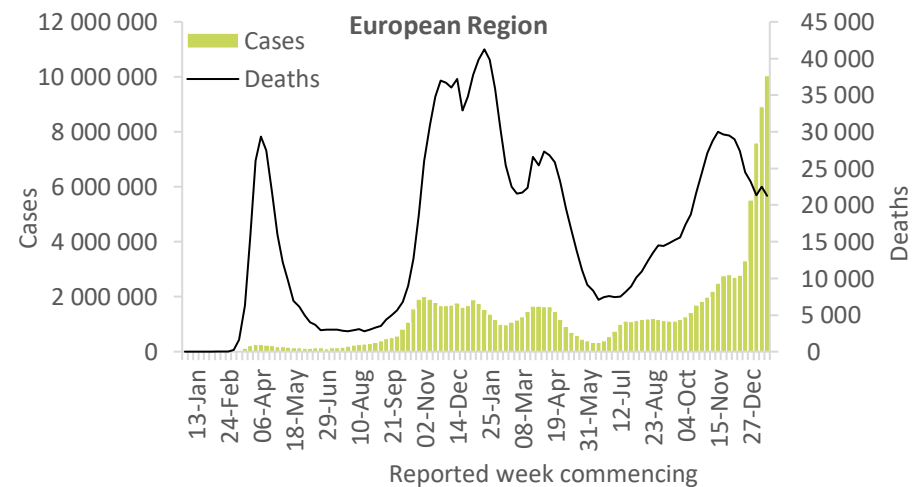


Updates from the [Eastern Mediterranean Region](#)

European Region

Since mid-December 2021, the number of new cases has continued to rise, with the Region reporting over 10 million new cases this week, a 13% increase as compared to the previous week. Thirty-four countries (55%) reported an increase greater than 20%, with the greatest increases reported from Kosovo^[1] (13126 vs 2990 new cases; a 339% increase), the Republic of Moldova (19083 vs 8019 new cases; a 138% increase), and Armenia (4094 vs 1762 new cases; a 132% increase). The highest numbers of new cases were reported from France (2 443 821 new cases; 3757.4 new cases per 100 000; a 21% increase), Italy (1 231 741 new cases; 2065.2 new cases per 100 000; similar to the previous week's figures), and Germany (715 470 new cases; 860.3 new cases per 100 000; a 57% increase).

The number of weekly deaths in the Region decrease by 5%, with over 21 000 reported. The highest numbers of new deaths were reported from the Russian Federation (4792 new deaths; 3.3 new deaths per 100 000; a 7% decrease), Italy (2440 new deaths; 4.1 new deaths per 100 000; a 24% increase), and the United Kingdom (1888 new deaths; 2.8 new deaths per 100 000; similar to the previous week's figures).

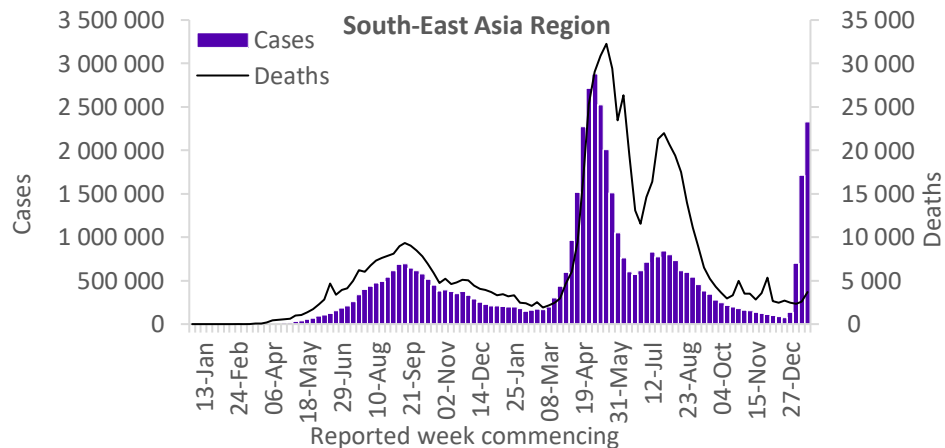


Updates from the [European Region](#)

South-East Asia Region

The number of new cases in the South-East Asia Region increased for the third consecutive week, with over 2.3 million new cases reported this week, a 36% increase as compared to the previous week; this represents a slower rise compared to last week when the increase was 145%. Six out of ten countries in the region reported an increase greater than 20% in the number of new weekly cases, with the largest increases reported from Bhutan (721 vs 147 new cases; a 390% increase), Bangladesh (67 425 vs 24 011; a 181% increase) and Indonesia (14729 vs 5454 new cases; a 170% increase). The highest numbers of new cases were reported from India (2 115 100 new cases; 153.3 new cases per 100 000; a 33% increase), Bangladesh (67 425 new cases; 40.9 new cases per 100 000; a 181% increase), and Nepal (56 656 new cases; 194.4 new cases per 100 000; a 168% increase).

The number of new deaths in the Region increased by 44% as compared to the previous week, with over 3700 new deaths reported. The highest numbers of new deaths were reported from India (3343 new deaths; <1 new death per 100 000; a 47% increase), Thailand (107 new deaths; <1 new death per 100 000; a 7% increase), and Sri Lanka (88 new deaths; <1 new death per 100 000; similar to the previous week's figures).

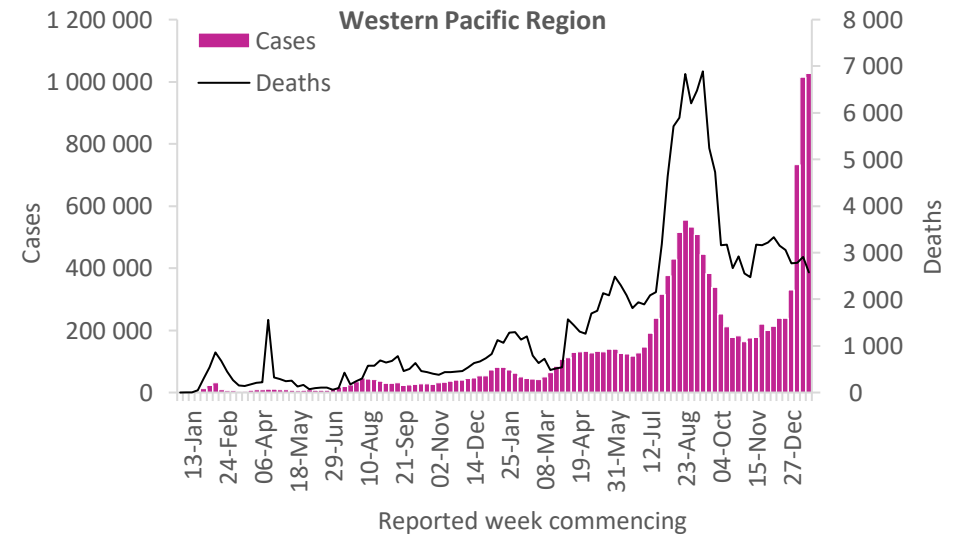


Updates from the [South-East Asia Region](#)

Western Pacific Region

The number of new cases in Western Pacific Region has stabilized, with over one million new cases reported, similar to the previous week's figures. However, ten countries in the Region (36%) reported increases of over 20% in new cases, with the highest proportional increases reported from Palau (319 vs 46 new cases; a 593% increase), New Caledonia (1659 vs 518 new cases; a 220% increase) and Singapore (19290 vs 6184, a 211% increase). The highest numbers of new cases were reported from Australia (302 608 new cases; 1186.7 new cases per 100 000; a 36% decrease), Japan (268 284 new cases; 212.1 new cases per 100 000; a 181% increase), and the Philippines (219 146 new cases; 200.0 new cases per 100 000; a 5% decrease).

The number of new weekly deaths in the Region declined by 12% as compared with the previous week, with over 2500 new deaths reported. The highest numbers of new deaths were reported from Viet Nam (1116 new deaths; <1 new death per 100 000; an 18% decrease), the Philippines (548 new deaths; <1 new death per 100 000; a 24% decrease), and Australia (430 new deaths; 1.7 new deaths per 100 000; a 49% increase).



Updates from the [Western Pacific Region](#)

Summary of the COVID-19 Weekly Operational Update

The [Weekly Operational Update](#) is a report provided by the COVID-19 Strategic Preparedness and Response Plan (SPRP) Monitoring and Evaluation team, which aims to update on the ongoing global progress against the [COVID-19 SPRP 2021](#) framework, and to highlight country-level actions and WHO support to countries. In this week's edition published on 25 January, highlights include the following:

- Partnering to bolster COVID-19 Response in Jamaica
- Leading the development of a comprehensive training package on bioinformatics and molecular epidemiology for SARS-CoV-2 and other high threat pathogens in Turkey
- Concluding a first-of-its-kind workshop for journalists and Ministry of Health communications focal points on public health information sharing and verification in Iraq
- Strengthening health systems in Timor-Leste to respond to pandemic
- Marking two years of pandemic learning response on OpenWHO.org
- Conducting a Joint Operational Review (JOR) in Nigeria
- Updates on WHO's financing to support countries on COVID-19 response implementation to suppress transmission, reduce exposure, and protect the vulnerable and save lives
- Progress on a subset of global indicators that demonstrate country and global progress to end the acute phase of the pandemic

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](#)

Annexes

Annex 1. List of countries/territories/areas reporting variants of concern as of 25 January 2022

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Afghanistan	●	-	●	-	-
Albania	●	-	○	-	○
Algeria	●	-	●	-	●
Andorra	○	○	○	-	-
Angola	●	●	●	●	●
Anguilla	●	-	●	-	●
Antigua and Barbuda	●	●	●	●	●
Argentina	●	●	●	●	●
Armenia	●	-	●	-	●
Aruba	●	●	●	●	●
Australia	●	●	●	●	●
Austria	●	●	●	●	●
Azerbaijan	●	-	○	-	●
Bahamas	●	-	●	●	-
Bahrain	●	●	●	●	●
Bangladesh	●	●	●	○	●
Barbados	●	-	●	●	●
Belarus	●	-	○	-	○
Belgium	●	●	●	●	●
Belize	●	-	●	●	-
Benin	●	●	●	●	-
Bermuda	●	●	●	-	●
Bhutan	●	●	●	-	●
Bolivia (Plurinational State of)	●	-	●	●	●
Bonaire	●	-	●	●	●
Bosnia and Herzegovina	●	●	○	●	○
Botswana	○	●	●	-	●

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Brazil	●	●	●	●	●
British Virgin Islands	●	-	●	●	●
Brunei Darussalam	●	●	●	-	●
Bulgaria	●	●	●	-	○
Burkina Faso	●	●	●	-	●
Burundi	●	●	●	-	-
Cabo Verde	●	●	●	-	●
Cambodia	●	●	●	-	●
Cameroon	●	●	●	●	-
Canada	●	●	●	●	●
Cayman Islands	●	●	●	●	●
Central African Republic	●	●	●	-	-
Chad	●	●	●	-	-
Chile	●	●	●	●	●
China	●	●	●	●	●
Colombia	●	-	●	●	●
Comoros	●	●	●	-	-
Congo	●	●	●	●	○
Costa Rica	●	●	●	●	●
Croatia	●	●	○	●	●
Cuba	●	●	●	-	●
Curaçao	●	●	●	●	●
Cyprus	●	●	○	-	●
Czechia	●	●	●	●	●
Côte d'Ivoire	●	●	○	●	○
Democratic Republic of the Congo	●	●	●	-	●
Denmark	●	●	●	●	●

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Djibouti	●	●	●	-	-
Dominica	●	-	●	-	-
Dominican Republic	●	-	●	●	●
Ecuador	●	-	●	●	●
Egypt	●	-	●	-	●
El Salvador	●	-	●	●	○*
Equatorial Guinea	●	●	●	●	-
Estonia	●	●	○	○	●
Eswatini	●	●	●	-	●
Ethiopia	●	●	●	○	-
Falkland Islands (Malvinas)	●	●	-	-	-
Faroe Islands	●	-	-	●	-
Fiji	○	-	●	-	●
Finland	●	●	●	●	●
France	●	●	●	●	●
French Guiana	●	●	●	●	●
French Polynesia	●	●	●	●	●
Gabon	●	●	●	●	○
Gambia	●	●	●	●	○
Georgia	●	○	●	-	●
Germany	●	●	●	●	●
Ghana	●	●	●	●	●
Gibraltar	●	-	○	-	●
Greece	●	●	●	●	●
Greenland	-	-	●	-	-
Grenada	●	-	●	●	●
Guadeloupe	●	●	●	●	●

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Guam	●	●	●	●	○*
Guatemala	●	●	●	●	●
Guernsey	-	-	-	-	●
Guinea	●	●	●	-	●
Guinea-Bissau	●	●	●	-	-
Guyana	-	-	●	●	-
Haiti	●	-	●	●	-
Honduras	●	-	●	●	○
Hungary	●	○	○	●	●
Iceland	●	●	●	●	●
India	●	●	●	●	●
Indonesia	●	●	●	-	●
Iran (Islamic Republic of)	●	●	●	-	●
Iraq	●	●	●	●	●
Ireland	●	●	●	●	●
Israel	●	●	●	●	●
Italy	●	●	●	●	●
Jamaica	●	-	●	-	●
Japan	●	●	●	●	●
Jordan	●	●	●	●	●
Kazakhstan	●	○	●	-	●
Kenya	●	●	●	●	●
Kosovo[1]	●	○	○	-	●
Kuwait	●	●	●	-	●
Kyrgyzstan	●	●	●	-	●
Lao People's Democratic Republic	●	-	●	-	○
Latvia	●	●	○	●	●
Lebanon	●	-	●	-	●
Lesotho	●	●	●	-	-
Liberia	●	●	●	-	-
Libya	●	●	-	-	-

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Liechtenstein	●	-	○	○	○
Lithuania	●	●	○	●	●
Luxembourg	●	●	●	●	●
Madagascar	●	●	-	○	-
Malawi	●	●	●	-	●
Malaysia	●	●	●	-	●
Maldives	●	-	●	-	●
Mali	●	●	●	-	○*
Malta	●	○	○	●	●
Martinique	●	●	●	●	●
Mauritania	●	●	●	-	●
Mauritius	●	●	●	-	●
Mayotte	●	●	○	-	●
Mexico	●	●	●	●	●
Monaco	●	●	●	-	-
Mongolia	●	-	●	-	○
Montenegro	●	-	○	○	○
Montserrat	●	-	●	●	○*
Morocco	●	●	●	-	●
Mozambique	●	●	●	-	●
Myanmar	●	-	●	-	●
Namibia	●	●	●	●	●
Nepal	●	-	●	-	●
Netherlands	●	●	●	●	●
New Caledonia	●	-	●	-	●
New Zealand	●	●	●	●	●
Nicaragua	●	●	●	●	-
Niger	○	-	●	-	●
Nigeria	●	●	●	-	●
North Macedonia	●	●	○	-	○
Northern Mariana Islands (Commonwealth of the)	○	-	●	-	-

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Norway	●	●	●	●	●
Occupied Palestinian Territory	●	●	●	-	●
Oman	●	●	●	-	●
Pakistan	●	●	●	●	●
Palau	-	-	○*	-	-
Panama	●	●	●	●	●
Papua New Guinea	-	-	●	-	●
Paraguay	●	-	●	●	●
Peru	●	-	●	●	●
Philippines	●	●	●	●	●
Poland	●	○	●	●	●
Portugal	●	●	●	●	●
Puerto Rico	●	●	●	●	●
Qatar	●	●	●	-	●
Republic of Korea	●	●	●	●	●
Republic of Moldova	●	-	●	-	○
Romania	●	●	●	●	●
Russian Federation	●	●	●	○	●
Rwanda	●	●	●	-	●
Réunion	●	●	○	●	●
Saba	-	-	●	-	-
Saint Barthélemy	●	-	●	-	●
Saint Kitts and Nevis	-	-	●	-	○
Saint Lucia	●	-	●	-	-
Saint Martin	●	●	●	-	●
Saint Pierre and Miquelon	-	-	●	-	-
Saint Vincent and the Grenadines	-	-	●	●	●
Sao Tome and Principe	●	●	○	-	-
Saudi Arabia	●	●	●	-	●
Senegal	●	●	●	-	●
Serbia	●	○*	●	-	○

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Seychelles	●	●	●	-	●
Sierra Leone	●	●	●	-	●
Singapore	●	●	●	●	●
Sint Maarten	●	●	●	●	●
Slovakia	●	●	●	-	●
Slovenia	●	●	●	●	●
Solomon Islands	-	-	●	-	●
Somalia	●	●	●	-	-
South Africa	●	●	●	●	●
South Sudan	●	●	●	-	●
Spain	●	●	●	●	●
Sri Lanka	●	●	●	-	●
Sudan	●	●	-	●	-
Suriname	●	●	●	●	●

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
Sweden	●	●	●	●	●
Switzerland	●	●	●	●	●
Thailand	●	●	●	●	●
Timor-Leste	●	-	●	-	●*
Togo	●	●	●	●	●
Trinidad and Tobago	●	-	●	●	●
Tunisia	●	●	●	-	●
Turkey	●	●	●	●	●
Turks and Caicos Islands	●	-	●	●	-
Uganda	●	●	●	-	●
Ukraine	●	○	○	-	●
United Arab Emirates	●	●	●	●	●
United Kingdom	●	●	●	●	●
United Republic of Tanzania	●	●	●	●	○

Country/Territory/Area	Alpha	Beta	Delta	Gamma	Omicron
United States Virgin Islands	●	●	●	●	●*
United States of America	●	●	●	●	●
Uruguay	●	●	●	●	●
Uzbekistan	●	●	○	-	●
Vanuatu	-	-	●	-	-
Venezuela (Bolivarian Republic of)	●	-	●	●	●
Viet Nam	●	●	●	-	●
Wallis and Futuna	●	-	-	-	-
Yemen	●	●	-	-	-
Zambia	●	●	●	-	●
Zimbabwe	●	●	●	-	●

*Newly reported in this update. "●" indicates that information for this variant was received by WHO from official sources. "○" indicates that information for this variant was received by WHO from unofficial sources and will be reviewed as more information become available. **Includes countries/territories/areas reporting the detection of VOCs among travellers (e.g., imported cases detected at points of entry), or local cases (detected in the community). Excludes countries, territories, and areas that have never reported the detection of a variant of concern. See also [Annex 2: Data, table, and figure notes](#)

Annex 2. Data, table, and figure notes

Data presented are based on official laboratory-confirmed COVID-19 case 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.

References

1. UK Health Security Agency. *Technical Briefing 33: SARS-CoV-2 Variants of Concern and Variants under Investigation in England.*; 2021. Accessed January 21, 2022. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1043807/technical-briefing-33.pdf
2. Garg R, Gautam P, Suroliya V, et al. *Evidence of Early Community Transmission of Omicron (B.1.1.529) in Delhi- A City with Very High Seropositivity and Past-Exposure!* Public and Global Health; 2022. doi:10.1101/2022.01.10.22269041
3. UK Health Security Agency. Technical briefing: Update on hospitalisation and vaccine effectiveness for Omicron VOC-21NOV-01 (B.1.1.529)-31 December 2021. Published online 2021. Accessed January 21, 2022. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1045619/Technical-Briefing-31-Dec-2021-Omicron_severity_update.pdf
4. Ferguson N, Ghani A, Cori A. *Report 49: Growth, Population Distribution and Immune Escape of Omicron in England.* Imperial College London; 2021. Accessed December 23, 2021. <https://www.imperial.ac.uk/media/imperial-college/medicine/mrc-gida/2021-12-16-COVID19-Report-49.pdf>
5. UK Office for National Statistics. Coronavirus (COVID-19) Infection Survey, characteristics of people testing positive for COVID-19, UK: 19 January 2022. Published 2022. Accessed January 21, 2022. <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/coronaviruscovid19infectionsurveycharacteristicsofpeopletestingpositiveforcovid19uk/latest#reinfections-with-covid-19-uk>
6. Buchan SA, Tibebu S, Daneman N, et al. Increased household secondary attacks rates with Variant of Concern SARS-CoV-2 index cases. *Clinical Infectious Diseases*. 2021;(ciab496). doi:10.1093/cid/ciab496
7. Tegally H, Wilkinson E, Giovanetti M, et al. Emergence of a SARS-CoV-2 variant of concern with mutations in spike glycoprotein. *Nature*. Published online 2021. <https://doi.org/10.1038/s41586-021-03402-9>
8. Sinha S, Tam B, Wang SM. Altered interaction between RBD and ACE2 receptor contributes towards the increased transmissibility of SARS CoV-2 delta, kappa, beta, and gamma strains with RBD double mutations. *bioRxiv*. Published online January 1, 2021:2021.08.30.458303. doi:10.1101/2021.08.30.458303
9. Curran J, Dol J, Boulos L, et al. Transmission characteristics of SARS-CoV-2 variants of concern Rapid Scoping Review. *medRxiv*. Published online January 1, 2021:2021.04.23.21255515. doi:10.1101/2021.04.23.21255515
10. Campbell F, Archer B, Laurenson-Schafer H, et al. Increased transmissibility and global spread of SARS-CoV-2 variants of concern as at June 2021. *Eurosurveillance*. 2021;26(24):2100509. <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2021.26.24.2100509>
11. Dhar MS, Marwal R, Vs R, et al. Genomic characterization and epidemiology of an emerging SARS-CoV-2 variant in Delhi, India. *Science*. Published online October 14, 2021:eabj9932. doi:10.1126/science.abj9932
12. UK Health Security Agency. SARS-CoV-2 variants of concern and variants under investigation in England. Technical briefing 32. 17 December 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1042688/RA_Technical_Briefing_32_D_RAFT_17_December_2021_2021_12_17.pdf
13. Assessment of the further emergence and potential impact of the SARS-CoV-2 Omicron variant of concern in the context of ongoing transmission of the Delta variant of concern in the EU/EEA, 18th update,. Published online December 15, 2021. <https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-assessment-further-emergence-omicron-18th-risk-assessment-december-2021.pdf>
14. Lyngse FP, Mortensen LH, Denwood MJ, et al. *SARS-CoV-2 Omicron VOC Transmission in Danish Households.* Infectious Diseases (except HIV/AIDS); 2021. doi:10.1101/2021.12.27.21268278
15. WHO: Enhancing Readiness for Omicron (B.1.1.529): Technical Brief and Priority Actions for Member States. Published online January 7, 2022. [https://www.who.int/publications/m/item/enhancing-readiness-for-omicron-\(b.1.1.529\)-technical-brief-and-priority-actions-for-member-states](https://www.who.int/publications/m/item/enhancing-readiness-for-omicron-(b.1.1.529)-technical-brief-and-priority-actions-for-member-states)
16. Bager P, Wohlfahrt J, Fonager J, Albertsen. Increased Risk of Hospitalisation Associated with Infection with SARS-CoV-2 Lineage B.1.1.7 in Denmark. doi:Bager, Peter and Wohlfahrt, Jan and Fonager, Jannik and Albertsen, Mads and Yssing Michaelsen, Thomas and Holten Møller, Camilla and Ethelberg, Steen and Legarth, Rebecca and Fischer Button, Mia Sara and Gubbels, Sophie Madeleine and Voldstedlund,

- Marianne and Mølbak, Kåre and Skov, Robert Leo and Fomsgaard, Anders and Grove Krause, Tyra, Increased Risk of Hospitalisation Associated with Infection with SARS-CoV-2 Lineage B.1.1.7 in Denmark. Available at SSRN: <https://ssrn.com/abstract=3792894> or <http://dx.doi.org/10.2139/ssrn.3792894>
17. Paredes MI, Lunn SM, Famulare M, et al. Associations between SARS-CoV-2 variants and risk of COVID-19 hospitalization among confirmed cases in Washington State: a retrospective cohort study. *medRxiv*. Published online January 1, 2021:2021.09.29.21264272. doi:10.1101/2021.09.29.21264272
 18. NERVTAG paper on COVID-19 variant of concern B.1.1.7. *GOV.UK*. Published online 2021. <https://www.gov.uk/government/publications/nervtag-paper-on-covid-19-variant-of-concern-b117>, <http://files/64/nervtag-paper-on-covid-19-variant-of-concern-b117.html> %2021/02/08/18:37:19
 19. Pascall DJ, Mollett G, Blacow R, Bulteel N, et al. The SARS-CoV-2 Alpha variant causes increased clinical severity of disease. <https://www.medrxiv.org/content/10.1101/2021.08.17.21260128v1>
 20. Pearson CA, Eggo. Estimates of severity and transmissibility of novel South Africa SARS-CoV-2 variant 501Y.V2. https://cmmdid.github.io/topics/covid19/reports/sa-novel-variant/2021_01_11_Transmissibility_and_severity_of_501Y_V2_in_SA.pdf
 21. Freitas ARR, Beckedorff OA, Cavalcanti LP de G, et al. The emergence of novel SARS-CoV-2 variant P.1 in Amazonas (Brazil) was temporally associated with a change in the age and sex profile of COVID-19 mortality: A population based ecological study. *The Lancet Regional Health - Americas*. 2021;1:100021. doi:10.1016/j.lana.2021.100021
 22. Fisman DN, Tuite AR. Progressive Increase in Virulence of Novel SARS-CoV-2 Variants in Ontario, Canada. *medRxiv*. Published online July 12, 2021:2021.07.05.21260050. doi:10.1101/2021.07.05.21260050
 23. McAlister FA, Nabipour M, Chu A, Lee DS, Saxinger L, Bakal JA. *Lessons from the COVID-19 Third Wave in Canada: The Impact of Variants of Concern and Shifting Demographics*. *Infectious Diseases (except HIV/AIDS)*; 2021. doi:10.1101/2021.08.27.21261857
 24. Madhi SA, Kwatra G, Myers JE, et al. *South African Population Immunity and Severe Covid-19 with Omicron Variant*. *Infectious Diseases (except HIV/AIDS)*; 2021. doi:10.1101/2021.12.20.21268096
 25. Wolter N, Jassat W, Walaza S, et al. *Early Assessment of the Clinical Severity of the SARS-CoV-2 Omicron Variant in South Africa*. *Infectious Diseases (except HIV/AIDS)*; 2021. doi:10.1101/2021.12.21.21268116
 26. WHO Collaborating Centre for Infectious Disease Modelling: Report 50: Hospitalisation risk for Omicron cases in England. Published online December 22, 2021. <https://www.imperial.ac.uk/media/imperial-college/medicine/mrc-gida/2021-12-22-COVID19-Report-50.pdf>
 27. Wang L, Berger NA, Kaelber DC, Davis PB, Volkow ND, Xu R. *Comparison of Outcomes from COVID Infection in Pediatric and Adult Patients before and after the Emergence of Omicron*. *Infectious Diseases (except HIV/AIDS)*; 2022. doi:10.1101/2021.12.30.21268495
 28. Muik A, Wallisch AK, Sanger B, et al. Neutralization of SARS-CoV-2 lineage B.1.1.7 pseudovirus by BNT162b2 vaccine–elicited human sera. *Science*. Published online 2021:eabg6105. <https://science.sciencemag.org/content/sci/early/2021/01/28/science.abg6105.full.pdf>
 29. Gallais F, Gantner P, Bruel T, et al. Anti-SARS-CoV-2 Antibodies Persist for up to 13 Months and Reduce Risk of Reinfection. *medRxiv*. Published online January 1, 2021:2021.05.07.21256823. doi:10.1101/2021.05.07.21256823
 30. Wibmer CK, Ayres F, Hermanus T, et al. SARS-CoV-2 501Y.V2 escapes neutralization by South African COVID-19 donor plasma. *Nat Med*. Published online March 2021. <https://www.ncbi.nlm.nih.gov/pubmed/33654292>
 31. Sabino EC, Buss LF, Carvalho MPS, et al. Resurgence of COVID-19 in Manaus, Brazil, despite high seroprevalence. *The Lancet*. 2021;397(10273):452-455. <https://linkinghub.elsevier.com/retrieve/pii/S0140673621001835>
 32. Public Health England (PHE). *SARS-CoV-2 Variants of Concern and Variants under Investigation in England. Technical Briefing 20*. Public Health England; 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009243/Technical_Briefing_20.pdf
 33. Planas D, Veyer D, Baidaliuk A, et al. *Reduced Sensitivity of Infectious SARS-CoV-2 Variant B.1.617.2 to Monoclonal Antibodies and Sera from Convalescent and Vaccinated Individuals*. *Microbiology*; 2021. doi:10.1101/2021.05.26.445838

34. Public Health England (PHE). *SARS-CoV-2 Variants of Concern and Variants under Investigation..Technical Briefing 18.*; 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1001358/Variants_of_Concern_VOC_Technical_Briefing_18.pdf
35. Altarawneh H, Chemaitelly H, Tang P, et al. *Protection Afforded by Prior Infection against SARS-CoV-2 Reinfection with the Omicron Variant.* *Epidemiology*; 2022. doi:10.1101/2022.01.05.22268782
36. Classification of Omicron (B.1.1.529): SARS-CoV-2 Variant of Concern. Accessed November 30, 2021. [https://www.who.int/news/item/26-11-2021-classification-of-omicron-\(b.1.1.529\)-sars-cov-2-variant-of-concern](https://www.who.int/news/item/26-11-2021-classification-of-omicron-(b.1.1.529)-sars-cov-2-variant-of-concern)
37. Public Health England. SARS-CoV-2 lateral flow antigen tests: evaluation of VOC1 (Kent, UK) and VOC2 (South Africa). GOV.UK. Accessed June 21, 2021. <https://www.gov.uk/government/publications/sars-cov-2-lateral-flow-antigen-tests-evaluation-of-voc1-and-voc2/sars-cov-2-lateral-flow-antigen-tests-evaluation-of-voc1-kent-uk-and-voc2-south-africa>
38. Bekliz M, Adea K, Essaidi-Laziosi M, et al. *Analytical Performance of Eleven SARS-CoV-2 Antigen-Detecting Rapid Tests for Delta Variant.* *Infectious Diseases (except HIV/AIDS)*; 2021. doi:10.1101/2021.10.06.21264535
39. Molenkamp R, Igloi Z. Evaluation of Antigen rapid test and PCR test to Omicron variant. file:///C:/Users/bookelh/Downloads/2021-Evaluation-Omicron-in-PCR-and-Ag-assays%20(1).pdf
40. Goderski G HW, Stanoeva K MA. Technical evaluation of SARS-CoV-2 antigen self-tests with Omicron variant , Final Evaluation report.
41. Adamson B, Sikka R, Wyllie AL, Premsrirut P. *Discordant SARS-CoV-2 PCR and Rapid Antigen Test Results When Infectious: A December 2021 Occupational Case Series.* *Infectious Diseases (except HIV/AIDS)*; 2022. doi:10.1101/2022.01.04.22268770
42. Accorsi EK, Britton A, Fleming-Dutra KE, et al. Association Between 3 Doses of mRNA COVID-19 Vaccine and Symptomatic Infection Caused by the SARS-CoV-2 Omicron and Delta Variants. *JAMA*. Published online January 21, 2022. doi:10.1001/jama.2022.0470
43. Tartof SY, Slezak JM, Puzniak L, et al. *BNT162b2 (Pfizer–Biontech) MRNA COVID-19 Vaccine Against Omicron-Related Hospital and Emergency Department Admission in a Large US Health System: A Test-Negative Design.* *Social Science Research Network*; 2022. doi:10.2139/ssrn.4011905
44. Young-Xu Y. Effectiveness of mRNA COVID-19 Vaccines against Omicron among Veterans. Published online January 18, 2022:2022.01.15.22269360. doi:10.1101/2022.01.15.22269360
45. Suaah JL, Husin M, Tok PSK, et al. Waning COVID-19 Vaccine Effectiveness for BNT162b2 and CoronaVac in Malaysia: An Observational Study. Published online January 16, 2022:2022.01.15.22269326. doi:10.1101/2022.01.15.22269326
46. Olson SM, Newhams MM, Halasa NB, et al. Effectiveness of BNT162b2 Vaccine against Critical Covid-19 in Adolescents. *N Engl J Med*. Published online January 12, 2022:NEJMoa2117995. doi:10.1056/NEJMoa2117995
47. Chiew CJ, M P, Wei WE, et al. *Vaccine Effectiveness Against COVID-19 Infection Among 12 to 18 Year Olds in Singapore.* *Social Science Research Network*; 2021. doi:10.2139/ssrn.3996796
48. Waxman J, Makov-Assif M, Reis B, et al. Comparison of Natural and BNT162b2 Vaccine-induced Immunity, with and without an Enhancer or Booster Dose, on the Risk of COVID-19-Related Hospitalization in Israel. Published online January 23, 2022. doi:10.21203/rs.3.rs-1177969/v1
49. Spitzer A, Angel Y, Marudi O, et al. Association of a Third Dose of BNT162b2 Vaccine With Incidence of SARS-CoV-2 Infection Among Health Care Workers in Israel. *JAMA*. Published online January 10, 2022. doi:10.1001/jama.2021.23641