

# COVID-19 Weekly Epidemiological Update

Edition 155 published 10 August 2023

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## Global overview

Data as of 6 August 2023

Globally, nearly 1.5 million new COVID-19 cases and over 2500 deaths were reported in the last 28 days (10 July to 6 August 2023), an increase of 80% and a decrease of 57%, respectively, compared to the previous 28 days (Figure 1, Table 1). While five WHO regions have reported decreases in the number of both cases and deaths, the Western Pacific Region has reported an increase in cases and a decrease in deaths. As of 6 August 2023, over 769 million confirmed cases and over 6.9 million deaths have been reported globally.

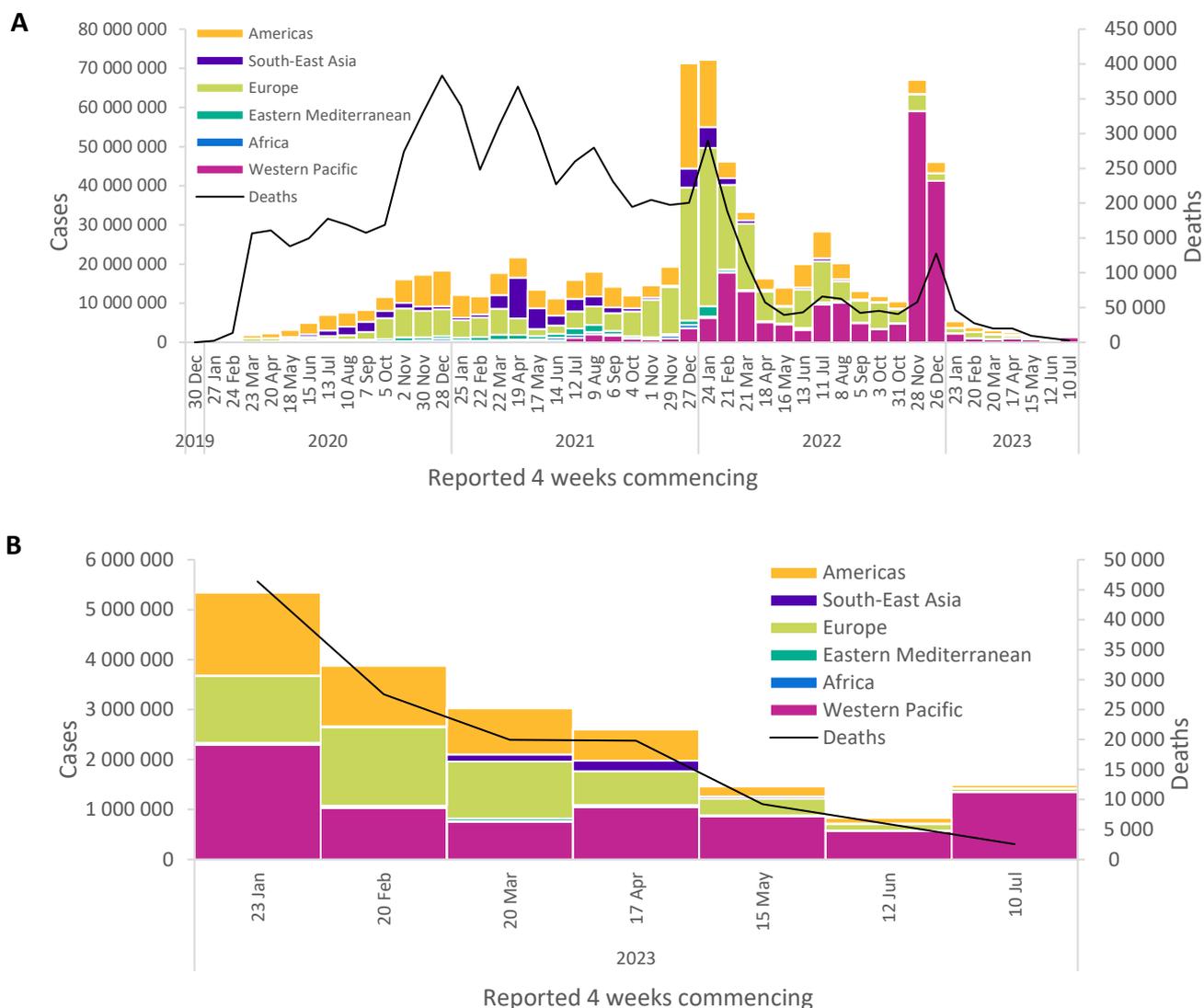
Although the public health emergency of international concern for COVID-19 was declared over on 5 May 2023, COVID-19 remains a major threat. WHO continues to urge Member States to maintain, not dismantle, their established COVID-19 infrastructure. It is crucial to sustain early warning, surveillance and reporting, variant tracking, early clinical care provision, administration of vaccine boosters to high-risk groups, improvements in ventilation, and regular communication.

On 9 August, [standing recommendations for COVID-19](#) were issued by the Director-General of the World Health Organization (WHO) in accordance with the International Health Regulations (2005) (IHR) to guide countries in the longer-term management of COVID-19. These standing recommendations are in effect for all States Parties from 9 August 2023 until 30 April 2025.

Currently, reported cases do not accurately represent infection rates due to the reduction in testing and reporting globally. During this 28-day period, 44% (103 of 234) of countries reported at least one case to WHO – a proportion that has been declining since mid-2022. It is important to note that this statistic does not necessarily reflect the actual number of countries where cases exist. Additionally, data from previous weeks are continuously being updated to incorporate retrospective changes in reported COVID-19 cases and deaths made by countries. Data presented in this report are therefore incomplete and should be interpreted in light of these limitations. Some countries continue to report high burdens of COVID-19, including increases in newly reported cases and, more importantly, increases in hospitalizations and deaths – the latter of which are considered more reliable indicators given the reductions in testing.

We present changes in epidemiological trends using a 28-day interval. Disaggregated data are still accessible on the [WHO COVID-19 dashboard](#), where the full dataset is available for download. Global and national data on SARS-CoV-2 PCR percent positivity are available on [WHO's integrated dashboard provided by the Global Influenza Programme](#). Recent data show that the SARS-CoV-2 PCR percent positivity rate from reporting countries averages approximately 9%.

**Figure 1. COVID-19 cases reported by WHO Region, and global deaths by 28-day intervals, as of 6 August 2023 (A); 23 January to 6 August 2023 (B)\*\***



\*\*See [Annex 1: Data, table, and figure note](#)

At the regional level, the number of newly reported cases within a 28-day period has decreased across five of the six WHO regions: the African Region (-77%), the South-East Asia Region (-57%), the Eastern Mediterranean Region (-50%), the European Region (-46%), and the Region of the Americas (-42%); while case numbers increased in the Western Pacific Region (+137%). The number of newly reported deaths within a 28-day period has decreased across all six regions: the European Region (-71%), the South-East Asia Region (-65%), the African Region (-62%), the Eastern Mediterranean Region (-51%), the Region of the Americas (-49%), and the Western Pacific Region (-42%).

At the country level, the highest numbers of new cases reported within the 28-day period were from the Republic of Korea (1 278 065 new cases; +243%), Brazil (34 402 new cases; -39%), Australia (19 754 new cases; -77%), Singapore (18 914 new cases; -43%), and Italy (15 769 new cases; -22%). The highest numbers of new 28-day deaths were reported from Brazil (500 new deaths; -42%), the Republic of Korea (340 new deaths; +91%), the Russian Federation (205 new deaths; -52%), Peru (161 new deaths; -61%), and Australia (151 new deaths; -82%).

**Table 1. Newly reported and cumulative COVID-19 confirmed cases and deaths, by WHO Region, as of 6 August 2023\*\***

WHO Region	New cases in last 28 days (%)	Change in new cases in last 28 days *	Cumulative cases (%)	New deaths in last 28 days (%)	Change in new deaths in last 28 days *	Cumulative deaths (%)
Western Pacific	1 351 710 (91%)	137%	<b>206 179 757</b> <b>(27%)</b>	847 (33%)	-42%	<b>415 848</b> <b>(6%)</b>
Europe	67 889 (5%)	-46%	<b>275 818 704</b> <b>(36%)</b>	634 (25%)	-71%	<b>2 246 111</b> <b>(32%)</b>
Americas	63 660 (4%)	-42%	<b>193 210 684</b> <b>(25%)</b>	954 (37%)	-49%	<b>2 958 886</b> <b>(43%)</b>
South-East Asia	5 941 (<1%)	-57%	<b>61 199 192</b> <b>(8%)</b>	92 (4%)	-65%	<b>806 627</b> <b>(12%)</b>
Africa	1 685 (<1%)	-77%	<b>9 546 409</b> <b>(1%)</b>	11 (<1%)	-62%	<b>175 419</b> <b>(3%)</b>
Eastern Mediterranean	1 325 (<1%)	-50%	<b>23 385 863</b> <b>(3%)</b>	22 (1%)	-51%	<b>351 375</b> <b>(5%)</b>
<b>Global</b>	<b>1 492 210</b> <b>(100%)</b>	<b>80%</b>	<b>769 341 373</b> <b>(100%)</b>	<b>2 560</b> <b>(100%)</b>	<b>-57%</b>	<b>6 954 279</b> <b>(100%)</b>

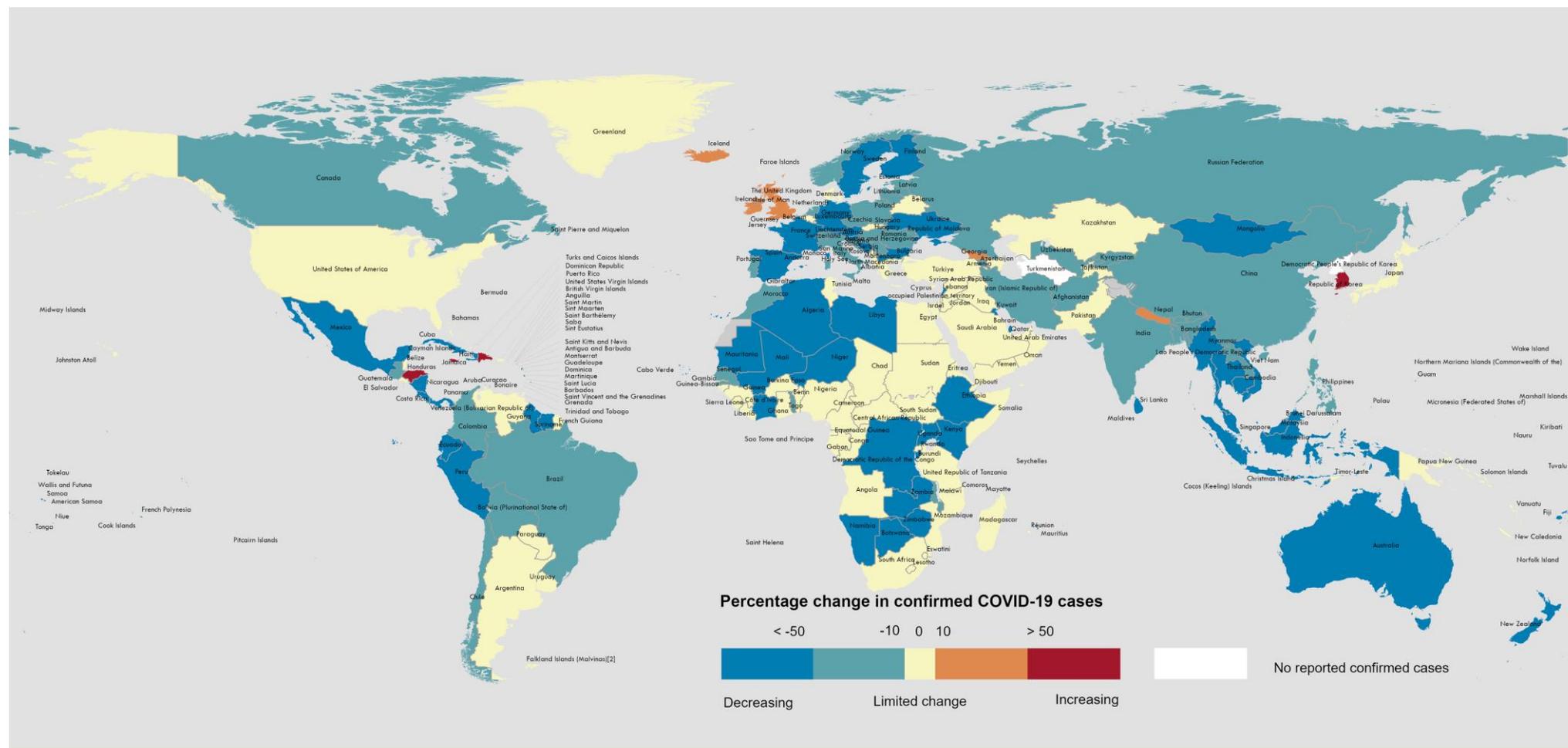
\*Percent change in the number of newly confirmed cases/deaths in the past 28 days, compared to 28 days prior. Data from previous weeks are updated continuously with adjustments received from countries.

\*\*See [Annex 1: Data, table, and figure notes](#)

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

- [WHO COVID-19 Dashboard](#)
- [WHO Monthly Operational Update and past editions of the Weekly Epidemiological Update on COVID-19](#)
- [WHO COVID-19 detailed surveillance data dashboard](#)
- [WHO COVID-19 policy briefs](#)

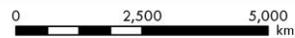
Figure 2. Percentage change in confirmed COVID-19 cases over the last 28 days relative to the previous 28 days, as of 6 August 2023\*\*



Data Source: World Health Organization

Map Production: WHO Health Emergencies Programme

Not applicable

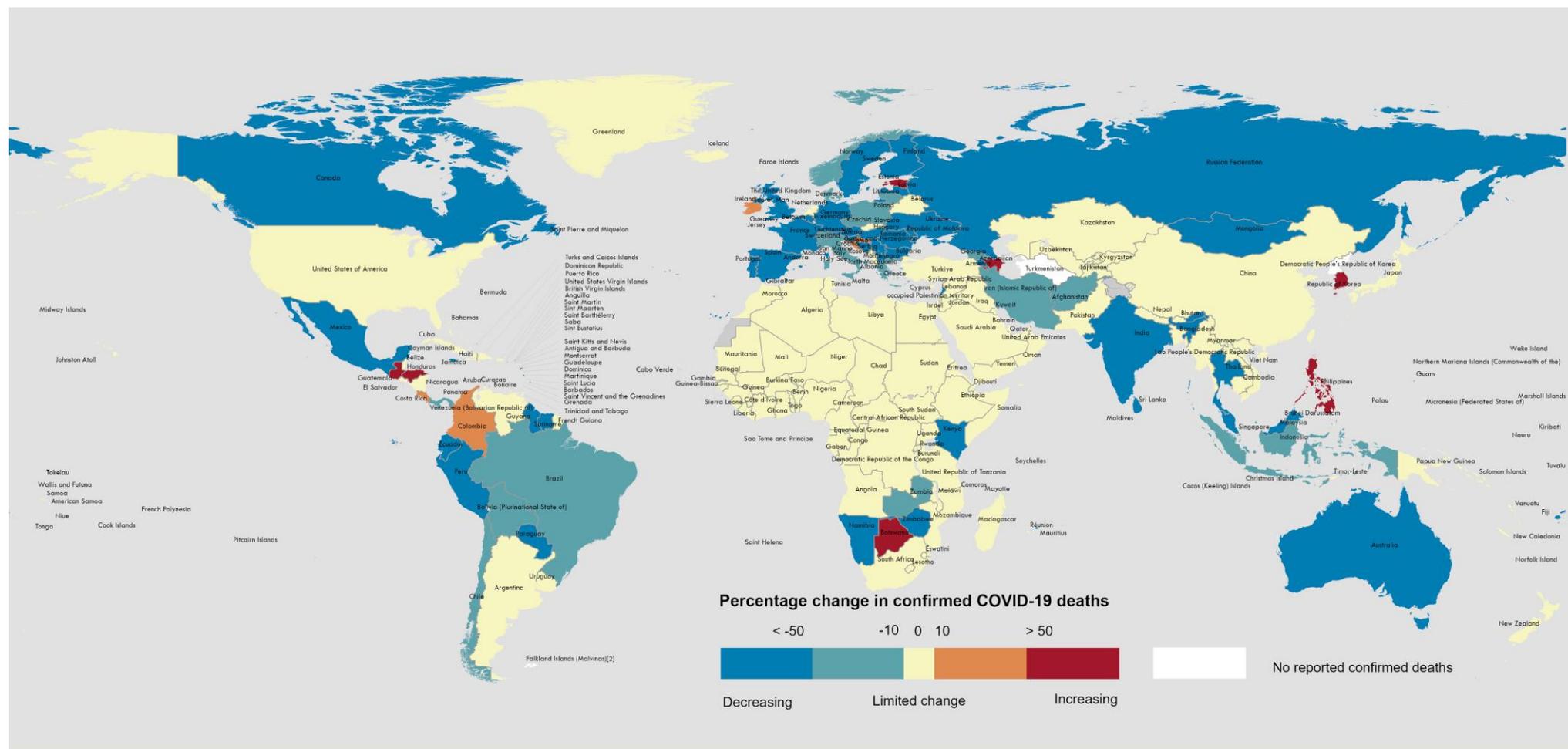


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\*\*See [Annex 1: Data, table, and figure notes](#)

Figure 3. Percentage change in confirmed COVID-19 deaths over the last 28 days relative to the previous 28 days, as of 6 August 2023\*\*



Data Source: World Health Organization  
Map Production: WHO Health Emergencies Programme

Not applicable

0 2,500 5,000 km

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## Hospitalizations and ICU admissions

At the global level, during the analysed 28-day period (3 July to 30 July 2023), 25 of 234 countries reported to WHO a total of 36 533 new hospitalizations, and 23 of 234 countries reported to WHO a total of 580 new intensive care unit (ICU) admissions (Figure 4). This represents a 27% and 68% decrease in hospitalizations and ICU admission, respectively, compared to the previous 28 days (5 June to July 2 July 2023).

Globally, during the past 28 days, of the 25 (11%) countries that reported data to WHO on new hospitalizations at least once (Figure 5), the European Region had the highest proportion of countries reporting data on new hospitalizations (15 countries; 25%), followed by the South-East Asia Region (two countries; 20%), the Western Pacific Region (three countries; 9%), the Region of the Americas (four countries; 7%), and the African Region (one country; 2%). The Eastern Mediterranean Region did not report hospitalization data during the period. The proportion of countries that consistently<sup>i</sup> reported new hospitalizations for the period was 7% (17 countries) (Table 2).

Among the 17 out of 234 countries consistently reporting new hospitalizations to WHO, two (12%) countries registered an increase of 20% or greater in hospitalizations during the past 28 days compared to the previous 28-day period: Bangladesh (1350 vs 236; 472%) and Kyrgyzstan (10 vs three; +233%). The highest numbers of new hospitalizations were reported from the United States of America (27 693 vs 24 886; +11 %), Brazil (1137 vs 2283; -50%), and Greece (1051 vs 974; +8%).

Globally, in the past 28 days of the 23 (10%) countries that reported data to WHO on new ICU admissions at least once (Figure 5), the European Region had the highest proportion of countries reporting (15 countries; 23%), followed by the Western Pacific Region (four countries; 11%), the South-East Asia Region (one country; 10%), and the Region of the Americas (three countries; 5%). The African Region and the Eastern Mediterranean Region did not report ICU admission data during the period. The proportion of countries that consistently reported new ICU admissions for the period was 6% (13 countries) (Table 2).

Among the 13 countries consistently reporting new ICU admissions to WHO, three (23%) countries showed an increase of 20% or greater in new ICU admissions during the past 28 days compared to the previous 28-day period: Latvia (five vs three; +67%), Ireland (10 vs six; +67%), and Greece (23 vs 19; +21%). The highest numbers of new ICU admissions were reported from Brazil (373 vs 769; -51%), Italy (33 vs 93; -65%), and Greece (23 vs 19; +21%).

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<sup>i</sup> “Consistently” as used here refers to countries that submitted data for new hospitalizations and intensive care unit admissions for the eight consecutive weeks (for the reporting and comparison period).

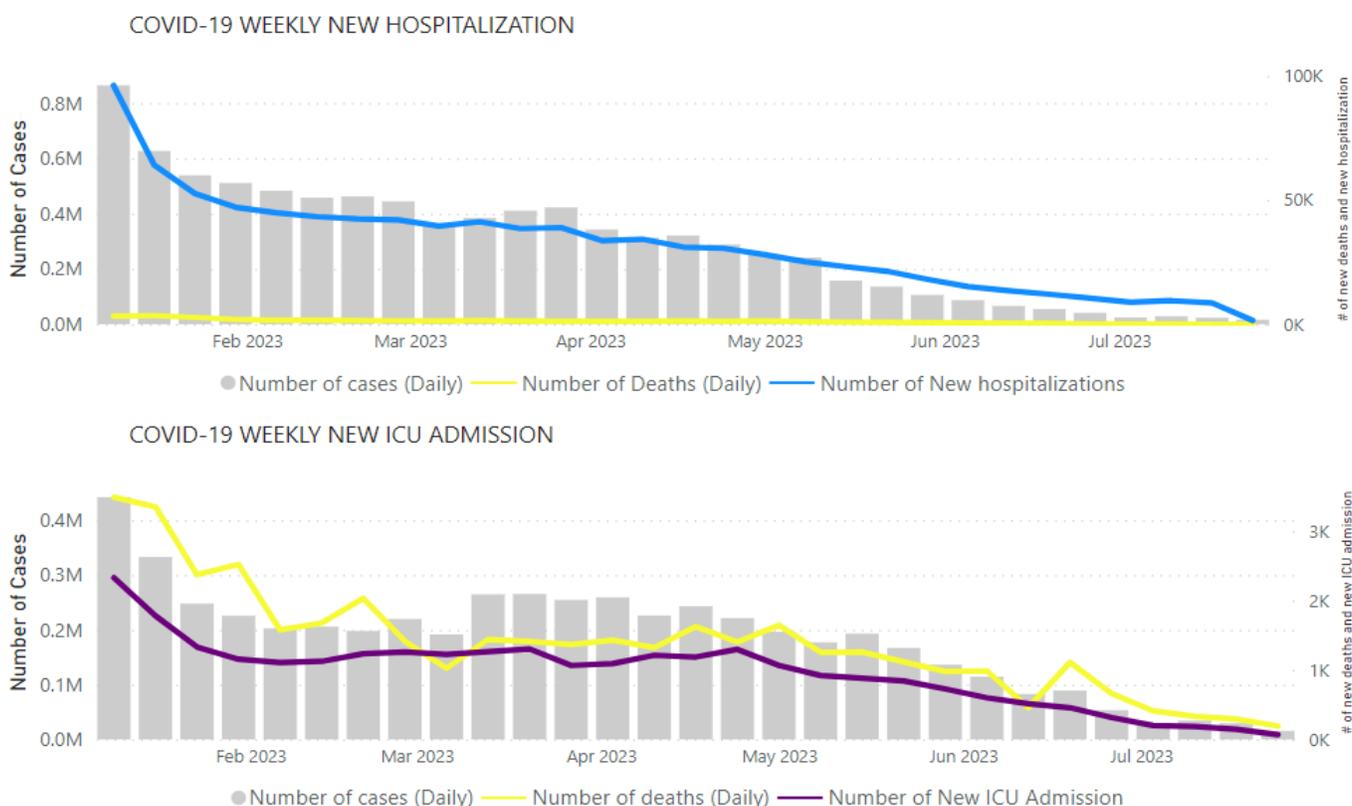
**Table 2. New hospitalizations and ICU admissions in the last 28 days (with percent change) by WHO Region, 3 to 30 July 2023 compared to 5 June to 2 July 2023**

Region	New hospitalizations from countries that reported consistently in the last two 28-day periods			New ICU admissions from countries that reported consistently in the last two 28-day periods		
	Number of countries* (percentage)	Number of new hospitalizations	Percent change	Number of countries* (percentage)	Number of new ICU admissions	Percent change
Africa	1/50 (2%)	13	-70%	0/50 (<1%)	NA**	NA
Americas	3/56 (5%)	29 931	9%	2/56 (4%)	380	-52%
Eastern Mediterranean	0/22 (<1%)	NA	NA	0/22 (<1%)	NA	NA
European	10/61 (16%)	2 992	-53%	8/61 (15%)	89	-46%
South-East Asia	2/10 (20%)	1 543	38%	1/10 (10%)	12	-85%
Western Pacific	1/35 (3%)	28	-94%	2/35 (11%)	0	-100%
<b>Global</b>	<b>17/234 (7%)</b>	<b>34 507</b>	<b>-3%</b>	<b>13/234 (6%)</b>	<b>481</b>	<b>-54%</b>

\* To be able to compare two periods, only the countries reported consistently in both the last and previous 28 days periods are included in the table

\*\* NA represents not available

**Figure 4. COVID-19 cases, deaths, hospitalizations, and ICU admissions reported weekly to WHO, as of 6 August 2023**



Note: Recent weeks are subject to reporting delays and data might not be complete, note to interpret the data with caution. Cases included in grey bars in the graph are only from countries reporting hospitalizations or ICU admissions, respectively.

Source: WHO Detailed Surveillance Dashboard

Figure 5. Weekly proportion of countries reporting new hospitalizations and ICU admissions, epidemiological week 1 of 2020 to week 30 of 2023



Note: Recent weeks are subject to reporting delays and should not be interpreted as a declining trend.

## SARS-CoV-2 variants of interest and variants under monitoring

### Geographic spread and prevalence

Globally, from 10 July to 6 August 2023 (28 days), 10 189 SARS-CoV-2 sequences were shared through GISAID.

WHO is currently tracking several SARS-CoV-2 variants, including:

- Three variants of interest (VOIs); XBB.1.16, XBB.1.5, and EG.5
- Six variants under monitoring (VUMs); BA.2.75, CH.1.1, XBB, XBB.1.9.1, XBB.1.9.2 and XBB.2.3.

Globally, XBB.1.16 remains the most prevalent VOI, reported from a total of 101 countries since its emergence. XBB.1.16 accounted for 25.2% of sequences in epidemiological week 29 (17 to 23 July 2023) compared to 22.2% in epidemiological week 25 (19 to 25 June 2023).

XBB.1.5, reported from a total of 121 countries globally, continues to show a declining trend. XBB.1.5 accounted for 12.7% of sequences in week 29, down from 16.8% in week 25.

On 9 August, WHO published its [first risk evaluation of EG.5](#) and classified EG.5 as a VOI. As of 9 August 2023, EG.5 has been reported from a total of 48 countries. The prevalence of EG.5 continues to increase, going from 7.5% in week 25 to 17.4% in week 29. Based on the available evidence, the public health risk posed by EG.5 was evaluated as low at the global level, aligning with the risk associated with XBB.1.16 and XBB.1.5. While EG.5 has shown increased prevalence, growth advantage, and immune escape properties, there have been no reported changes in disease severity to date. While concurrent increases in the proportion of EG.5 and COVID-19 hospitalizations (lower than previous waves) have been observed in countries such as Japan and the Republic of Korea, no associations have been made between these hospitalizations and EG.5. However, due to its growth advantage and immune escape characteristics, EG.5 may cause a rise in case incidence and become dominant in some countries or even globally.

Among the VUMs, XBB.1.9.1 observed a decrease in prevalence from 15.8% in week 25 to 12.7% in week 29; whilst other VUMs have shown stable trends during the same reporting period (Table 3).

Table 3 shows the number of countries reporting the VOIs and VUMs and their prevalence from week 25 to week 29. The VOIs and the VUMs that have shown [increasing trends are highlighted in orange](#), those that have remained [stable are highlighted in blue](#), while those with [decreasing trends are highlighted in green](#).

**Table 3. Weekly prevalence (%) of SARS-CoV-2 VOIs and VUMs, week 25 to week 29 of 2023**

Lineage	Countries <sup>§</sup>	Sequences <sup>§</sup>	2023-25	2023-26	2023-27	2023-28	2023-29
<b>VOIs</b>							
XBB.1.5*	121	262 884	16.8	13.8	12.0	13.2	12.7
XBB.1.16*	101	44 031	22.2	21.7	22.8	21.7	25.2
EG.5*	48	6 372	7.5	10.5	12.2	14.6	17.4
<b>VUMs</b>							
BA.2.75*	125	123 203	2.8	2.8	2.5	2.5	1.8
CH.1.1*	96	42 816	0.5	0.5	0.7	0.7	0.7
XBB*	130	67 604	6.2	6.0	6.4	6.6	6.7
XBB.1.9.1*	102	53 528	15.8	15.0	13.5	11.3	12.7
XBB.1.9.2*	85	25 295	7.6	7.2	8.1	6.7	5.7
XBB.2.3*	69	8 919	4.6	4.3	4.4	4.9	5.3
Unassigned	94	152 093	3.7	6.9	5.5	6.0	0.0
Other <sup>†</sup>	209	6 766 331	11.4	10.7	11.5	11.5	11.2

<sup>§</sup> Number of countries and sequences are since the emergence of the variants

\* Includes descendant lineages, except those individually specified elsewhere in the table. For example, XBB\* does not include XBB.1.5, XBB.1.16, EG.5, XBB.1.9.1, XBB.1.9.2, and XBB.2.3

<sup>†</sup> "Other" represents other circulating lineages excluding the VOI, VUMs, BA.1\*, BA.2\*, BA.3\*, BA.4\*, BA.5\*. Due to delays in or retrospective assignment of variants, caution should be taken when interpreting the prevalence of the "Other" category.

#### Additional resources

- [Tracking SARS-CoV-2 Variants](#)
- [WHO statement on updated tracking system on SARS-CoV-2 variants of concern and variants of interest](#)
- [WHO XBB.1.5 Updated Risk Assessment, 20 June 2023](#)
- [WHO XBB.1.16 Updated Risk Assessment, 5 June 2023](#)
- [WHO EG.5 Initial Risk Evaluation, 9 August 2023](#)

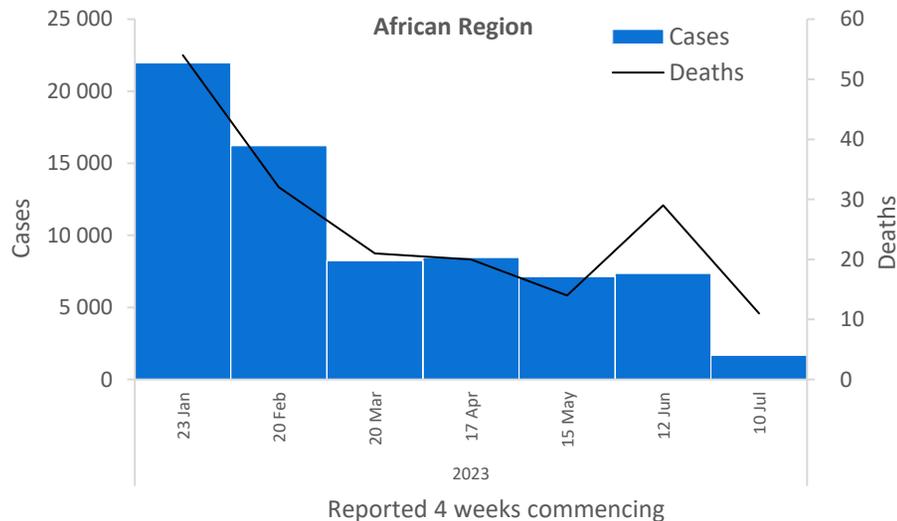
## WHO regional overviews

Data for 10 July to 6 August 2023

### African Region

The African Region reported over 1600 new cases, a 77% decrease as compared to the previous 28-day period. No country has reported increases in new cases of 20% or greater compared to the previous 28-day period. The highest numbers of new cases were reported from Zambia (728 new cases; 4.0 new cases per 100 000; -79%), Mauritius (479 new cases; 37.7 new cases per 100 000; -44%), and Kenya (132 new cases; <1 new case per 100 000; -72%).

The number of new 28-day deaths in the Region decreased by 62% as compared to the previous 28-day period, with 11 new deaths reported. The highest numbers of new deaths were reported from Zambia (five new deaths; <1 new death per 100 000; -17%), Botswana (three new deaths; <1 new death per 100 000; no deaths reported the previous 28-day period), and Zimbabwe (three new deaths; <1 new death per 100 000; -79%).

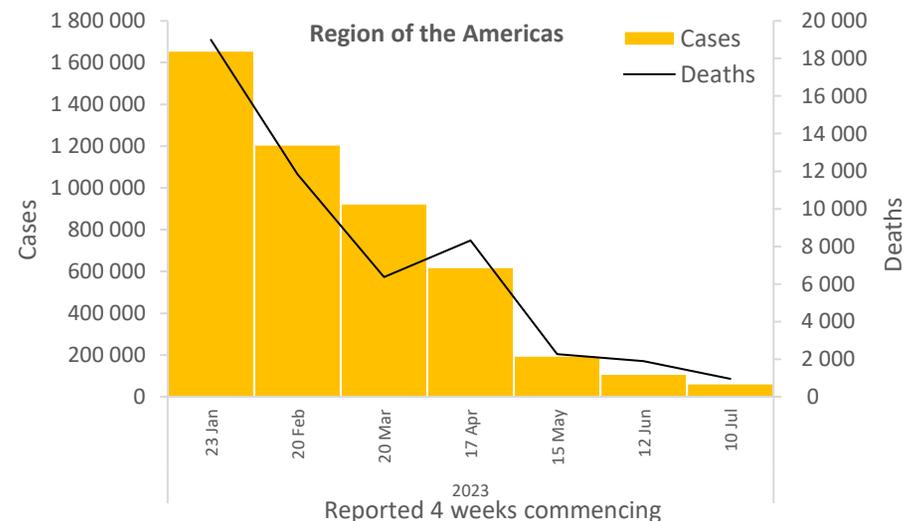


Updates from the [African Region](#)

### Region of the Americas

The Region of the Americas reported over 63 000 new cases, a 42% decrease as compared to the previous 28-day period. Three (5%) of the 56 countries for which data are available reported increases in new cases of 20% or greater, with the highest proportional increases observed in Honduras (1387 vs 439 new cases; +216%), the Dominican Republic (3853 vs 1599 new cases; +141%), and Jamaica (484 vs 313 new cases; +55%). The highest numbers of new cases were reported from Brazil (34 402 new cases; 16.2 new cases per 100 000; -39%), Guatemala (6487 new cases; 36.2 new cases per 100 000; -31%), and Canada (4173 new cases; 11.1 new cases per 100 000; -48%).

The number of new 28-day deaths in the Region decreased by 50% as compared to the previous 28-day period, with 954 new deaths reported. The highest numbers of new deaths were reported from Brazil (500 new deaths; <1 new death per 100 000; -42%), Peru (161 new deaths; <1 new death per 100 000; -61%), and Colombia (100 new deaths; <1 new death per 100 000; +23%).

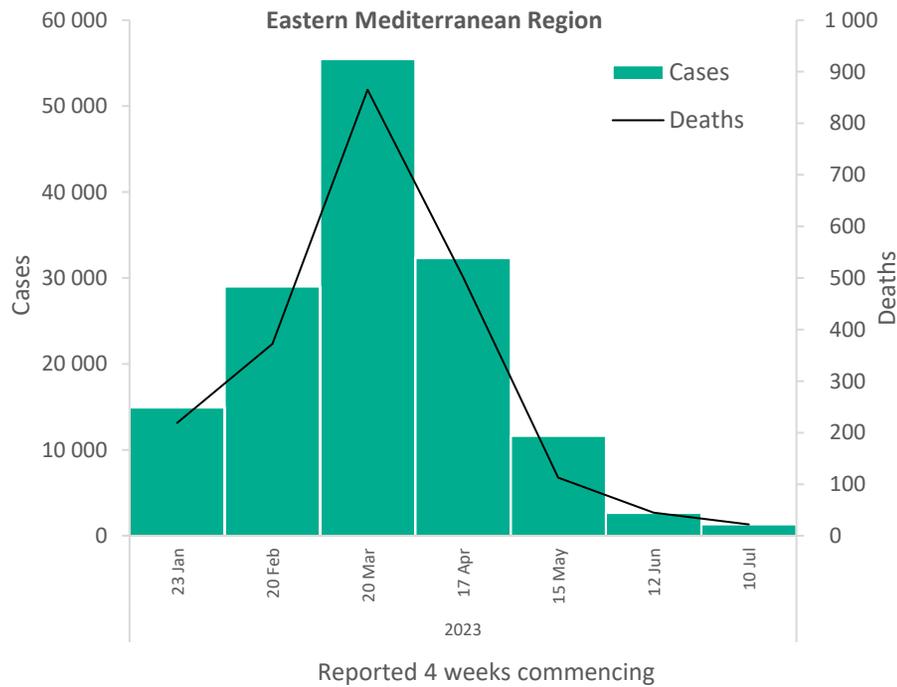


Updates from the [Region of the Americas](#)

## Eastern Mediterranean Region

The Eastern Mediterranean Region reported over 1300 new cases, a 50% decrease as compared to the previous 28-day period. No country has reported increases in new cases of 20% or greater compared to the previous 28-day period. The highest numbers of new cases were reported from Afghanistan (799 new cases; 2.1 new cases per 100 000; -26%), the Islamic Republic of Iran (408 new cases; <1 new case per 100 000; -38%), and Morocco (102 new cases; <1 new case per 100 000; -46%).

The number of new 28-day deaths in the Region decreased by 51% as compared to the previous 28-day period, with 22 new deaths reported. The highest numbers of new deaths were reported from the Islamic Republic of Iran (15 new deaths; <1 new death per 100 000; -46%), and Afghanistan (seven new deaths; <1 new death per 100 000; -36%).

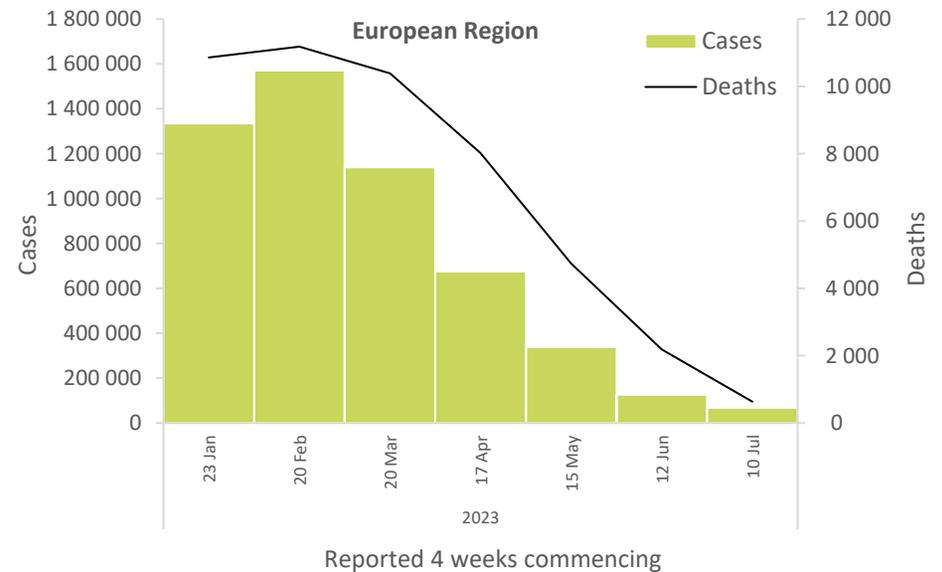


Updates from the [Eastern Mediterranean Region](#)

## European Region

The European Region reported over 67 000 new cases, a 46% decrease as compared to the previous 28-day period. Five (8%) of the 61 countries for which data are available reported increases in new cases of 20% or greater, with the highest proportional increases observed in San Marino (41 vs 15 new cases; +173%), Iceland (63 vs 44 new cases; +43%), and Ireland (1054 vs 806 new cases; +31%). The highest numbers of new cases were reported from Italy (15 769 new cases; 26.4 new cases per 100 000; -22%), the United Kingdom (14 042 new cases; 20.7 new cases per 100 000; +27%), and the Russian Federation (13 586 new cases; 9.3 new cases per 100 000; -36%).

The number of new 28-day deaths in the Region decreased by 71% as compared to the previous 28-day period, with 634 new deaths reported. The highest numbers of new deaths were reported from the Russian Federation (205 new deaths; <1 new death per 100 000; -52%), Italy (137 new deaths; <1 new death per 100 000; -48%), and Greece (58 new deaths; <1 new death per 100 000; -19%).

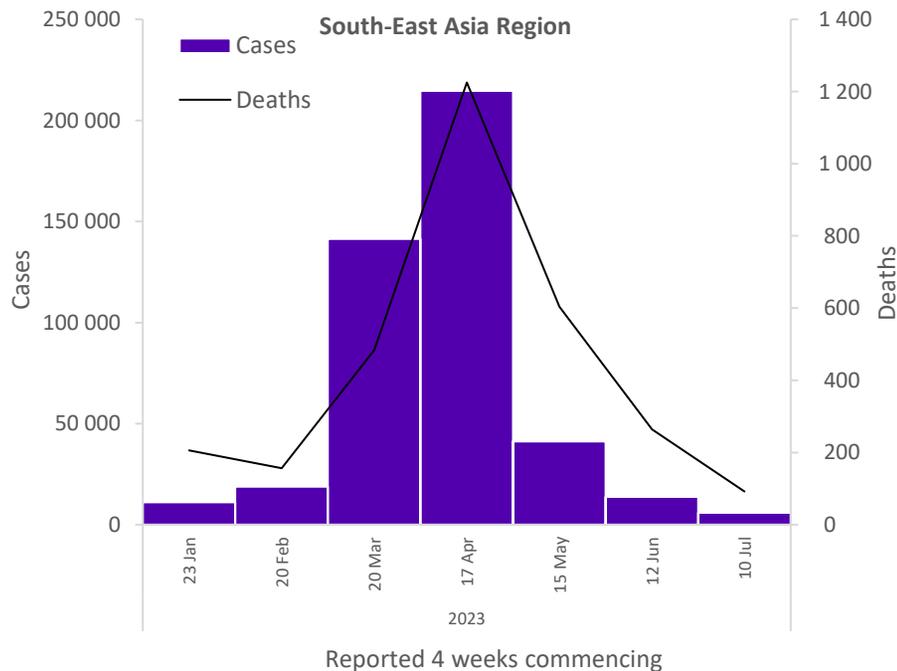


Updates from the [European Region](#)

## South-East Asia Region

The South-East Asia Region reported over 5900 new cases, a 57% decrease as compared to the previous 28-day period. One (10%) of the 10 countries for which data are available reported increases in new cases of 20% or greater: Nepal (26 vs 19 new cases; +37%). The highest numbers of new cases were reported from Thailand (1828 new cases; 2.6 new cases per 100 000; -69%), Bangladesh (1618 new cases; 1.0 new case per 100 000; -40%), and India (1405 new cases; <1 new case per 100 000; -21%).

The number of new 28-day deaths in the Region decreased by 65% as compared to the previous 28-day period, with 92 new deaths reported. The highest numbers of new deaths were reported from Thailand (41 new deaths; <1 new death per 100 000; -75%), Indonesia (32 new deaths; <1 new death per 100 000; -49%), and Bangladesh (12 new deaths; <1 new death per 100 000; +9%).

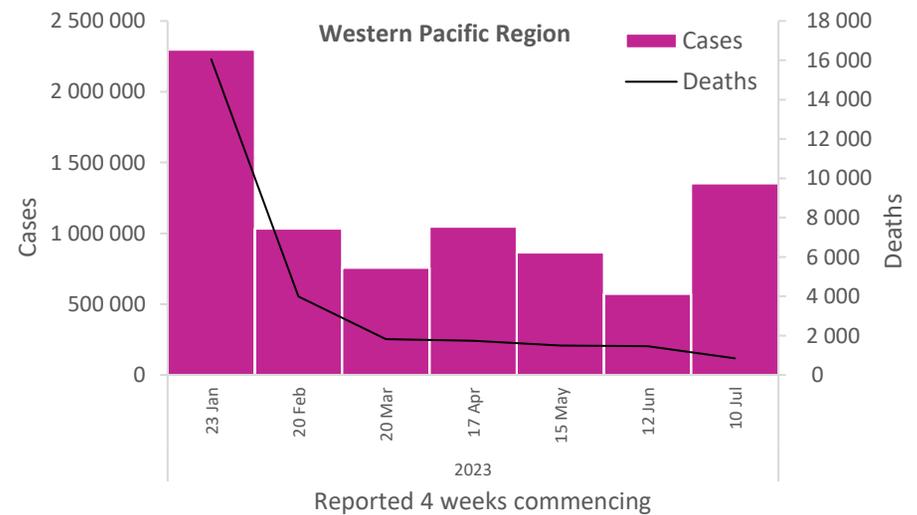


Updates from the [South-East Asia Region](#)

## Western Pacific Region

The Western Pacific Region reported over one million new cases, a 137% increase as compared to the previous 28-day period. Four (11%) of the 35 countries for which data are available reported increases in new cases of 20% or greater, with the highest proportional increases observed in Niue (four vs one new cases; +300%), the Republic of Korea (1 278 065 vs 372 557 new cases; +243%), and the Federated States of Micronesia (10 vs three new cases; +233%). The highest numbers of new cases were reported from the Republic of Korea (1 278 065 new cases; 2492.9 new cases per 100 000; +243%), Australia (19 754 new cases; 77.5 new cases per 100 000; -77%), and Singapore (18 914 new cases; 323.3 new cases per 100 000; -43%).

The number of new 28-day deaths in the Region decreased by 43% as compared to the previous 28-day period, with 847 new deaths reported. The highest numbers of new deaths were reported from the Republic of Korea (340 new deaths; <1 new death per 100 000; +91%), Australia (151 new deaths; <1 new death per 100 000; -82%), and the Philippines (142 new deaths; <1 new death per 100 000; +4633%).



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.

A record of historic data adjustment made is available upon request by emailing [epi-data-support@who.int](mailto: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](https://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 excepted, the names of proprietary products are distinguished by initial capital letters.

Updates on the COVID-19 outbreak in the Democratic People's Republic of Korea are not included in this report as the number of laboratory-confirmed COVID-19 cases is not reported.

## Annex 2. SARS-CoV-2 variants assessment and classification

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 webpage](#). National authorities may choose to designate other variants and are strongly encouraged to investigate and report newly emerging variants and their impact.

WHO continues to monitor all SARS-CoV-2 variants and to track changes in prevalence and viral characteristics. The current trends describing the circulation of variants should be interpreted with due consideration of the limitations of the COVID-19 surveillance systems. These include differences in sequencing capacity and sampling strategies between countries, changes in sampling strategies over time, reductions in tests conducted and sequences shared by countries, and delays in uploading sequence data to GISAID.<sup>1</sup>

## References

1. Chen Z, Azman AS, Chen X, et al. Global landscape of SARS-CoV-2 genomic surveillance and data sharing. *Nature genetics*. 2022;54(4). doi:10.1038/s41588-022-01033-y