COVID-19 Global Risk Assessment

Date of current assessment:	31 December 2024	Led by: CO ☐ RO ☐HQ ☒

WHO regularly conducts risk assessments for graded emergencies in accordance with the WHO Emergency Response Framework. Since January 2020, WHO conducted global risk assessments for COVID-19 every three months. With the lifting of the public health emergency of international concern, WHO has shifted to producing COVID-19 risk assessments every six months.

Overall risk and confidence (based on information available as of 31 December 2024)

Overall risk
Global
High

Confidence in available information
Global
Moderate

Risk assessment summary statement

The global public health risk associated with COVID-19 remains high. There has been evidence of decreasing impact on human health throughout 2023 and 2024, driven mainly by: 1) high levels of population immunity, achieved through infection, vaccination, or both; 2) similar virulence of currently circulating JN.1 sublineages of the SARS-CoV-2 virus as compared with previously circulating Omicron sublineages; and 3) the availability of diagnostic tests and improved clinical case management. These factors have contributed to a progressive global decline in the weekly number of COVID-19-related deaths, hospitalizations, and admissions to intensive care units (ICU) as compared to the 2020-2022 period. However, updated information on hospitalizations and ICU admissions continues to be available from only a limited number of countries (approximately 25% and 15% of countries and territories, respectively, and predominantly from high-income countries (HICs). The decline in COVID-19-related hospitalizations and ICU admissions since the peak years of 2020-2022 has contributed to increased health system capacity to cope with a) potential COVID-19 resurgences, b) burden from other circulating respiratory pathogens, and c) burden of cases of post-COVID-19 condition (PCC). However, uncertainty persists globally, and in particular in settings affected by protracted crises, compounded by the substantial reduction in testing for SARS-CoV-2 and reporting of data. At the present time, while the emergence of novel SARS-CoV-2 variants is certain and there is a risk that they could be more virulent, the currently circulating BA.2.86 and JN.1 sublineages feature immune escape properties but do not appear to be associated with increased severity of infection. Uptake of COVID-19 vaccine booster doses among populations at high risk of severe outcomes has plateaued since early 2023 and has been very low so far in 2024, raising significant concerns of the impact should emerging variants have increased immune escape properties.

SARS-CoV-2 circulation continues at significant levels as indicated by percent test positivity from sentinel sites and wastewater sampling. Since January 2023, the number of reported cases continues to decline, however, case-based reporting is an unreliable indicator of SARS-CoV-2 circulation. While 66 million COVID-19 cases were reported from 208 countries in the first three quarters of 2023, driven by the Omicron wave in the People's Republic of China, approximately 2.7 million cases were reported from 138 countries during the same period in 2024. It is important to note that the decreasing trend in case reports observed since mid-2022 has coincided with a) a significant decline in the availability and use of affordable tests provided by most governments, b) reduced overall global testing rates, and c) a reduction in the number of countries reporting data to WHO. The average number of countries reporting weekly has decreased substantially from 184 in the first quarter of 2023 to 118 in the first quarter of 2024. This means the available data are almost surely an underestimate of the true global circulation of the virus, as evidenced by other indicators such as test positivity rates from sentinel sites

from the expanded Global Influenza and Surveillance system (e-GISRS) and wastewater sampling. According to estimates obtained from viral loads in wastewater surveillance, COVID-19 cases are 2 to 19 times higher than reported numbers. As of the week ending on 3 November 2024, many European countries reported high SARS-CoV-2 activity, with test positivity rates exceeding 10% at sites using systematic testing approaches. Elevated activity was also observed in some countries in Eastern Africa and Southeast Asia. This elevated activity has been persistent in many European countries since early June and some in the Americas since mid-July. These additional indicators suggest that SARS-CoV-2 continues to circulate widely and at high intensity in communities along with other respiratory pathogens, such as seasonal influenza and respiratory syncytial virus (RSV), in all WHO regions. As of 27 October 2024, over 776 million confirmed cases have been reported globally to WHO, while seroprevalence provides evidence that there are orders of magnitude more infections and reinfections. Integration of SARS-CoV-2 into e-GISRS can provide sustainable representative monitoring of the virus in communities. Due to the cessation or significant delay in genomic surveillance data submission from clinical samples in several countries, wastewater surveillance has become the only reliable method for monitoring circulating SARS-CoV-2 variants in countries where it is available.

The number of weekly deaths related to COVID-19 has steadily declined since 2022, with the reported number remaining consistently below 5000 since mid-May 2023. Mortality data is reported, however, from an average of only 40 countries (out of 234 countries/territories). During the first three quarters of 2024, a total of 55 000 deaths were reported from 74 countries, compared to 277 000 from 154 countries for the same period in 2023. In 2024, WHO continued to report an average 1400 new deaths each week from an average of 40 countries. The trend in average weekly deaths has changed from highest level in first quarter of 2024 with over 2300 deaths per week from 40 countries declining to 630 deaths per week from 25 countries in the second quarter before rising to the level of over 1270 deaths per week from 26 countries in the third quarter. The cumulative number of deaths reported globally since the start of the pandemic has now surpassed 7 million, with the number of estimated deaths at least three times higher. At the present time, there are no global estimates available for excess mortality considering impact of COVID-19 during 2022, 2023 and 2024. Therefore, the true mortality is not well understood. WHO is working on new estimates including the data from 2022 and 2023. It is worth highlighting that reporting of COVID-19 surveillance data has declined considerably, and most countries still do not differentiate COVID-19 deaths and hospitalizations directly caused by SARS-CoV-2 from those testing positive for the virus while hospitalized. Individuals aged 65 and over, those with underlying medical conditions, pregnant women, as well as those who have not been vaccinated, or who have not been vaccinated within the last 12 months, consistently continue to be most at risk of severe disease and death. Furthermore, it is important to continue monitoring new birth cohorts and mortality rates among children under five years of age. Data from the WHO clinical platform indicate that, infants exhibit the highest mortality risk among paediatric groups, comparable to that of adults aged 20-45 years.

Since February 2022, SARS-CoV-2 Omicron sublineages have accounted for 97% of all publicly shared sequences globally. As at the end of October 2024, JN.1 and descendent lineages represented 99.5% of all circulating SARS-CoV-2 variants. There are two variants of interest (VOI), i.e. BA.2.86 and JN.1, and seven variants under monitoring (VUM), i.e. KP.2, KP.3, KP.3.1.1, JN.1.7, JN.1.18, LB.1 and XEC. The VOI JN.1 was designated in December 2023, and by the end of January 2024 represented 77.4% of all circulating SARS-CoV-2 variants. JN.1 has continued to diversify into many descendent lineages, with the seven listed VUMs all being JN.1 descendent lineages. As of 9 November 2024, with the exception of VUMS KP.3.1.1 and XEC, the VOIs and VUMs show a decreasing trend in prevalence. While KP.3.1.1 fluctuated between 46% and 50%, XEC has increased in prevalence from 21% on 19 October to 26% on 9 November 2024. The next dominant SARS-CoV-2 variant may emerge from JN.1 descendent lineages. As the virus continues to evolve, descendent lineages and recombinants of Omicron descendent lineages – some with the ability to spread and replace previous Omicron sublineages – have exhibited similar phenotypic characteristics. Crucially, these lineages have exhibited similar or lower levels of severity, on average, compared to previously circulating variants of concern – Alpha, Beta, Gamma, and Delta. However, it is important to note that this does not eliminate the possibility of a more severe variant emerging in the future. The WHO Technical Advisory Group on Virus Evolution (TAG-VE) continues to meet regularly as needed to review and analyse the public health risks posed by circulating and emerging variants based on data from CoViNet and available scientific evidence on variant growth advantage, immune escape and changes in

disease severity, clinical presentation, and diagnostics. Globally representative genomic sequencing and sharing are essential for adequate, robust, and rapid assessment of the SARS-CoV-2 variant landscape; however, this continues to be challenging in 2024 as resources for sequencing have declined.

Progress in reaching high-risk groups, as defined by WHO Strategic Advisory Group of Experts on Immunization (SAGE) recommendations, with COVID-19 vaccines remains a challenge globally. As of the end of 2023, 67% of the total global population had received a complete primary series of a COVID-19 vaccine, and 32% had received at least one booster dose. In older adults, across the Member States reporting at least once (n = 158), 83% had received a complete primary series and 61% had received at least once booster dose by the end of 2023. In health and care workers, across the Member States reporting at least once (n = 143), 89% had received a complete primary series and 31% had received at least one booster dose for the same period. Variations in coverage were present across regions and income strata in all population groups. Moving into 2024, global demand for and uptake of COVID-19 vaccines in high-risk groups has been low. Among older adults, 19.7 million individuals were reported as having received a dose as of 30 September 2024 across the 75 Member States reporting on uptake in this group, corresponding to an uptake of 1.68%. Among health and care workers, 1.3 million individuals were reported as having received a dose so far this year, across the 54 Member States reporting on uptake in this group, corresponding to an uptake of 0.96%. Strong variations continue to be observed across regions and income strata in all population groups. Across all groups, uptake in the Americas (AMR) and European (EUR) region and in high- and upper middle-income income groups was greater than in other regions and income groups. Low- and lower-middle income countries, securing doses through the COVAX mechanism in 2023 or the Gavi COVID-19 programme in 2024, demonstrated the same declining demand as observed at the global level. Gavi, the Vaccine Alliance will discontinue its support for COVID-19 vaccination following the completion of the current 2024-2025 programme on 31 December 2025. To promote programme sustainability, WHO continues to recommend that countries integrate COVID-19 vaccination into primary health care and other routine health services. In particular, WHO encourages countries to explore opportunities to co-administer COVID-19 with other vaccines, notably with seasonal influenza vaccines where the programmes exist. This reduces the number of vaccination contacts needed by individuals, possibly increasing uptake of both vaccines.

At present, COVID-19 vaccines with WHO Emergency Use Listing (EUL) / Pre-qualification (PQ) maintain reasonably high vaccine effectiveness (VE) against severe disease and death. Based on the variants circulating at the time, the WHO Technical Advisory Group on COVID-19 Vaccine Composition (TAG-CO-VAC) advised retaining a monovalent JN.1 lineage as the antigen in future vaccine formulations in December 2024. While there are still no vaccine effectiveness studies using monovalent JN.1 lineage vaccines, available immunogenicity data suggest that the monovalent JN.1 vaccines are likely to provide modestly enhanced protection compared to monovalent XBB-containing vaccines, bivalent variant-containing vaccines, and monovalent index virus vaccines. Vaccination should not be delayed, however, in anticipation of access to the latest variant-containing vaccines as there is a greater benefit in ensuring that persons at high risk of developing severe COVID-19 receive a dose of any available vaccine as compared to delayed vaccination. Considering the latest data, WHO SAGE reaffirmed its Roadmap for prioritizing uses of COVID-19 vaccines in September 2024. Under this Roadmap, WHO recommends a simplified single-dose regimen for most COVID-19 vaccines for individuals in high and medium priority groups who have not yet received a COVID-19 vaccine, as well as periodic re-vaccination of most high priority-use groups and sub-populations with special considerations at an interval of 6-12 months.

Most patients who contract COVID-19 fully recover, however, approximately 6% of symptomatic infections are estimated to develop post COVID-19 condition (PCC) with long-term effects on several body systems. As the virus continues to circulate, the risk of increased burden of PCC continues. Symptoms of PCC can be debilitating and persistent in some cases, affecting daily functioning and quality of life. Of the approximately 6% of symptomatic infections have resulted in PCC, nearly 15% of people had persistent symptoms 12 months after COVID-19 infection. Available data indicate a reduced risk of developing PCC in people who have received two doses of a COVID-19 vaccine. The impact of the emerging variants on PCC rates and relative risk of post-acute and long-term health effects of SARS-CoV-2 infection remain unclear, though recent data suggests that PCC rates following acute infection are lower than earlier in the pandemic. While our knowledge of PCC is growing, our current level of understanding remains inadequate, hindering our ability to effectively care for people with

PCC. Uncertainties also remain about the short- and long-term health risks associated with repeated infections given the widespread current and continued circulation of SARS- CoV-2 globally.

Confidence in the available information on global public health risk is mixed. Overall, it remains low to moderate due to various factors. The de-prioritization, defunding, and scale down of SARS-CoV-2 surveillance activities continues, despite consistent advice by WHO. In an effort to enhance the sustainability of these activities, many Member States have moved to integrate SARS-CoV-2 / COVID-19 into existing disease surveillance systems. During the first 44 weeks of 2024, 73% of Member States (n = 141) reported over 20 million SARS-CoV-2 test results to e-GISRS from both sentinel and non-sentinel sites. The proportion of countries reporting varies by region, however, ranging between 41% in Western Pacific Region (WPR) to 96% in the EUR region. Although this represents a 17% improvement compared to the previous assessment in June 2024, the integration of SARS-CoV-2 into existing respiratory disease surveillance systems is proceeding at different rates across regions. The integration of severity and impact surveillance is even more limited. As of 3 November 2024, 30% of Member States (n = 58) provided Severe Acute Respiratory Illness (SARI)-specific test positivity rate. The 58 reporting Member States are concentrated in just three regions: EUR, AMR and Eastern Mediterranean region (EMR). This makes it increasingly difficult to accurately assess the scale of community transmission and burden where the integration is not complete or reporting is lacking or complementary surveillance methods, such as wastewater monitoring, are not utilized. These difficulties are exacerbated by the ongoing reduction in the number of sequences submitted to publicly accessible databases. This hampers WHO's ability to effectively detect, assess, and monitor the circulation and characteristics of current and future variants, as well as outbreaks linked to them. Moreover, surveillance in animals, including wildlife, remains extremely limited globally but a recent study proved the spread to new species in the wild. Uncertainties remain as a result of limited data regarding the phenotypic impact and the degree of protection offered by the different vaccines against future variants.

Risk questions

The below risk questions assess the global public health threat posed by COVID-19 by evaluating its potential impact on human health, the likelihood of its spread, and the sufficiency of current control measures. Each question is analysed using key indicators like likelihood, severity, and rationale, providing a structured overview of risks to inform evidence-based decision-making and preparedness planning. These questions are based on the guidance provided in WHO's Rapid Risk Assessment of Acute Public Health Events document.

Table 1: Analysis of key risk questions for COVID-19, assessing likelihood and consequences

Risk question		Assessment		Risk	Rationale
		Likelihood	Consequences		
Risk for human health?	Global	Likely	Moderate	High	▪ Evidence of decreasing impact on global morbidity and mortality associated with COVID-19, driven by a) increasing population-level immunity from infection, vaccination, or both, b) similar levels of severity observed in the currently circulating Omicron SARS-CoV-2 descendant lineages, and c) improved clinical case management. Available data from a limited number of countries show: ▪ The number of reported COVID-19-associated deaths has continued to decrease and is at its lowest level since mid-March 2020. Weekly average number of deaths decreased from 7000 during the first three quarters of 2023 to 1400 during the same period in 2024. ▪ Hospital and ICU admissions have similarly reached their lowest level since March 2020, a time when the virus was not yet entrenched worldwide. ▪ Global seroprevalence, estimated to have risen to 90% in April 2022 (last robust estimate available), indicates an increase in population- level humoral immunity due to vaccination and the widespread continued circulation of Omicron descendent lineages. ▪ Limited data from a number of countries in 2023 also showed seroprevalence levels of 90% or greater, indicating very high potential levels of population immunity.

					▪ For those with severe immunosuppression or multiple risk factors, COVID-19 remains a serious acute disease. ▪ Post-acute and long-term manifestations: estimates show 6% of symptomatic cases go on to develop PCC, with 15% among them having persistent symptoms up to 12 months. Our understanding of the condition remains inadequate. Other non-PCC, long-term sequelae affecting multiple organ systems contribute to additional morbidity and mortality, particularly cardio- and cerebro-vascular disease. ▪ Despite inequities in access to COVID-19 vaccines having been overcome in large part, demand for and uptake of COVID-19 vaccines is currently very low. Significant gaps in high risk groups are evident based on available data, with very low proportions of those at highest risk of severe COVID-19 reported to be up-to-date on their COVID-19 vaccines. This puts large numbers of people at continued risk for severe disease, hospitalization and death. ▪ There are/remain huge variations among capacities to detect, respond in fragile and conflict affected settings. Large population movements and increasing conflict are drivers for the propagation of respiratory illnesses, when capacities to respond remain inadequate.
Risk of event spreading?	Global	Highly likely	Moderate	High	▪ The surveillance and reporting of SARS-CoV-2 cases continue to decline. Globally, the number of new cases reported has reached its lowest level since March 2020. ▪ Contrary to the 66 million cases reported from 208 countries in the first three quarter of 2023, due to the Omicron wave in the People's Republic of China, approximately 2.7 million cases were reported from 138 countries during the same period in 2024. This marks a significant decrease. ▪ The ongoing reduction in the number of RT-PCR-based tests conducted and reported, as well as the number of sequences submitted to publicly accessible databases continues to make it challenging for WHO and the TAG- VE to effectively detect, assess, and monitor the circulation and characteristics of current and emerging variants and overall SARS-CoV-2 variants landscape. Based on the available data, KP.3.1.1 is the most prevalent SARS-CoV-2 variant, with the recombinant XEC rapidly increasing in prevalence. ▪ Currently circulating variants have exhibited similar or lower levels of severity compared to previous VoCs. However, the possibility of a more severe variant emerging in the future continues. ▪ While efforts towards integration of SARS-CoV-2 into sentinel-based integrated respiratory disease surveillance continue, achieving the global coverage might take time and needs to be supported by complementary surveillance methods. ▪ Most countries have lifted the majority, if not all, of their public health and social measures, which increases the risk of virus spread. At present, reimplementing strict measures, should the need arise, appears unlikely to be practical.
Risk of insufficient control capacities?	Global	Possible	Low	Moderate	▪ The overall risk of severe outcomes associated with SARS-CoV-2 has declined globally, leading to an improved capacity of health systems to cope with COVID-19 and other health threats. ▪ All WHO regions have made continuous efforts to enhance their ability to detect and manage COVID-19. Although most Member States face challenges in maintaining and sustaining surveillance efforts, several countries have shown the capacity to rapidly scale up diagnostic testing in the event of a resurgence driven by emerging SARS-CoV-2 variants. ▪ Maintaining and improving IPC measures at the event of a resurgence remains critical as well as the capacity of increasing the workforce in response. ▪ A future variant associated with high clinical severity could emerge and once again overwhelm health systems.

COVID-19 situation overview and global strategic objectives

The COVID-19 Strategic Preparedness, Readiness and Response Plan (SPRP) in 2022 presented three potential scenarios regarding evolution of SARS-CoV-2 and human immunity: a base case, a best case, and a worst case (Table 1). A fourth, more drastic scenario, the possibility of a "reset", was also presented: the emergence of an entirely new SARS-CoV-2 virus, from either a pre-existing or newly established animal reservoir, or from a recombination event in which a patient co-infected with two distinct variants of SARS-CoV-2 produces a new variant that shares genetic characteristics of both parent lineages. These scenarios, as outlined in 2022, are still applicable in 2024/2025.

Table 2. Base case, best case, and worst case planning scenarios (adapted from SPRP 2022)

Scenario	Description
Base case	The virus continues to evolve. However, severity is significantly reduced over time due to sustained and sufficient immunity against severe disease and death, with a further decoupling between the incidence of cases and severe disease leading to progressively milder outbreaks. Periodic spikes in transmission may occur as a result of an increasing proportion of susceptible individuals over time if waning immunity is significant, which may require periodic boosting at least for high-priority populations; a seasonal pattern of peaks in transmission in temperate zones may emerge.
Best case	Future variants that emerge are significantly less severe, protection against severe disease is maintained without the need for periodic boosting or significant alterations to current vaccines.
Worst case	A more virulent and highly transmissible variant emerges against which vaccines are less effective, and/or immunity against severe disease and death wanes rapidly, especially in the most vulnerable groups. This would require significant alterations to current vaccines and full redeployment and/or broader boosting of all high-priority groups.
Reset case	An entirely new SARS-CoV-2 virus emerges from either a pre-existing or newly established animal reservoir, or through a recombination event in a co-infected patient that produces a virus sharing genetic traits of both parent lineages. This scenario effectively resets population immunity and existing countermeasures, necessitating the development of new vaccines, treatments, and public health strategies.

Nearly six years since the emergence of SARS-CoV-2, we are still in the "base case" scenario with some elements of the "worst case". This includes the continued emergence of highly transmissible variants against which existing vaccines are less effective and the waning of immunity against severe disease and death. New variants have not yet, however, been observed to be more virulent. The current situation requires the on-going review and adaptation of vaccine composition to ensure optimal effectiveness. TAG-VE and TAG-CO-VAC remain active in analysing available data on emerging variants, even if data are increasingly limited.

In 2023, WHO updated its SPRP to support Member States in ending the emergency response phase of the COVID-19 pandemic and transitioning to long-term COVID-19 management. This update aims to reflect the evolving situation epidemiological and programmatic contexts and to provide a strategy for the 2023-2025 period, focusing on integrating the COVID-19 pandemic response into broader infectious disease prevention and control programmes. The primary objective under the revised SPRP is to ensure the long-term management and sustainability of COVID-19 response efforts in the context of other concurrent health crises. It remains critical to address the key factors that drive the transmission and impact of SARS-CoV-2, thereby reducing the risk of the emergence of new SARS-CoV-2 variants of concern while also mitigating the direct and indirect consequences of COVID-19 disease (Table 2). This approach is vital for strengthening the public health foundation for future epidemic and pandemic responses.

Table 3. Drivers of continued COVID-19 transmission and impact (adapted from SPRP 2023-2025)

Drivers of transmission	Drivers of impact
Virus evolution resulting in variants with increased growth rate and immune escape	Low recent vaccination coverage, in particular in low- and middle-income countries and among at-risk priority populations globally
Reducing immunity due to low vaccine demand, incomplete vaccination, and/or waning immunity	Waning protection from vaccination against severe disease and death
Reduced use or lifting of all public health and social measures (PHSM)	Continued lack of access and/or difficulties in sustaining access to lifesaving tools, including oxygen, antivirals and other therapeutics
Inability to adjust and scale up interventions as and when needed	Lack of diagnostics or late diagnosis and delayed entry into the clinical care pathway
Misinformation and disinformation undermining the effectiveness of proven PHSM, therapeutics and vaccines	Emergence of variants that evade diagnosis and/or have reduced efficacy of live-saving tools
	Poorly defined and/or resourced care pathways for post-COVID-19 condition
	Insufficient capacity, limited infrastructure, limited resources and/ or flexibility to scale up during surges of COVID-19, especially in the context of burdens from other infectious diseases such as influenza, RSV and others

In support of the latest strategic framework, the WHO Director-General issued Standing Recommendations to Member States to offer immediate, actionable guidance to countries to support the effective COVID-19 management. Released alongside the Director-General's decision that COVID-19 is an established and ongoing health issue which no longer constitutes a public health emergency of international concern (PHEIC), the Standing Recommendations remain in effect through 30 April 2025. Under the Standing Recommendations, Member States are advised to:

- Revise and implement, as appropriate, national COVID-19 plans and policies that take into account the WHO COVID-19 Strategic Preparedness and Response Plan April 2023-April 2025
- Sustain collaborative surveillance for COVID-19, in order to provide a basis for situational awareness and risk assessment and the detection of significant changes in virus characteristics, virus spread, disease severity and population immunity.
- Continue reporting COVID-19 data, particularly mortality data, morbidity data, SARS-CoV-2 genetic sequences with meta-data, and vaccine effectiveness data to WHO or in open sources so that WHO can understand and describe the epidemiological situation and variant landscape, perform global risk assessments and work with expert networks and relevant WHO advisory groups.
- Continue to offer COVID-19 vaccination based on both, the recommendations of WHO SAGE and on national prioritization informed by cost benefit reviews. Vaccine delivery should be appropriately integrated into health services.
- Continue to initiate, support, and collaborate on research to generate evidence for COVID-19 prevention and control, with a view to reduce the disease burden of COVID-19

- Continue deliver optimal clinical care for COVID-19, appropriately integrated into all levels of health services, including access to proven treatments and measures to protect health workers and caregivers as appropriate
- Continue to work towards ensuring equitable access to safe, effective and quality-assured medical countermeasures for COVID-19.

To further support Member States in implementing the Standing Recommendations under the strategic direction of the SPRP, WHO recently released an updated series of COVID-19 policy briefs on 10 December 2024. These policy briefs summarize and distil the latest WHO guidance into key steps for Member States and provide links to further information. The policy briefs highlight important provisions for Member States on how COVID-19-related programming can be sustained in the long-term, linking to WHO's Health Emergency Preparedness, Response and Resilience (HEPR) Framework and to its Preparedness and Resilience for Emerging Threats (PRET) initiative. These policy briefs will continue to be updated periodically to take into consideration the changing epidemiological and programmatic contexts.

As both the updated SPRP and the Director-General's Standing Recommendations will expire end of April 2025, WHO is actively working to develop its strategic approach for the long-term management of COVID-19 as a disease programme from mid-2025. This approach will aim to support the integration of COVID-19 management with the management of other respiratory diseases such as influenza, and other infectious hazards, to ensure that countries remain equipped to address the acute and long term effects of COVID-19, while also promoting longer term programme sustainability. By mutualizing and optimizing disease control efforts for multiple pathogens where there are similarities, countries will be able to not only to build on the strengths of each programme, but also to consolidate programme costs where there are functional overlaps, especially in financial constrained environments. The updated approach is planned for publication in 2025.

Hazard assessment

Virus origins

The Scientific Advisory Group for the Origins of Novel Pathogens (SAGO) is reviewing all published and unpublished available evidence relating to the origins of SARS-CoV-2. SAGO is composed of independent scientific experts whose role is to advise WHO on technical and scientific considerations regarding emerging and re-emerging pathogens, including SARS-CoV-2. SAGO issued a preliminary report on 9 June 2022 providing a) initial recommendations for the development of a global framework to study emerging and re-emerging pathogens of pandemic potential and b) preliminary recommendations on urgent studies needed to better understand the origins of the COVID-19 pandemic. Building on this preliminary work, SAGO is currently preparing an independent assessment of SARS-CoV-2 origins, evaluating all available scientific evidence and outlining the necessary follow up of reasonable leads needed to determine where the virus originated and how it spilled over into the human population.

Based on its initial recommendations, SAGO has developed a global framework to define and guide studies on the origins of emerging and re-emerging pathogens of epidemic and pandemic potential. Published in September 2024, the framework outlines a unified, structured approach for investigating the origins of a novel pathogen. The framework defines a comprehensive set of scientific investigations and studies to be conducted, serving as a "how-to" guide for national health authorities, academia, and partners.

Despite a large number and breadth of research studies conducted to date, the origins of SARS-CoV-2 and its intermediate hosts is still under investigation. To date, two main hypotheses on the origins of SARS-CoV-2 remain: 1) the virus originated from a zoonotic source, with spillover to humans directly from wild animals, an intermediate host or contaminated food source or 2) the virus infected humans through a laboratory breach in biosecurity and biosafety and spread further into the human population through human-to-human transmission. The full independent assessment from SAGO is forthcoming and will be made available the SAGO webpage.

Virus evolution and variants

Omicron, the last designated variant of concern (VOC), has accounted for 97% of all submitted sequences since January 2022. Omicron has diversified considerably and has given rise to more than 2050 descendent lineages. All Omicron descendent lineages share similar phenotypic characteristics, namely higher transmissibility due to immune escape properties and lower apparent severity as compared to pre-Omicron variants.

WHO continuously updates its tracking system and definitions for variants of SARS-CoV-2 to reflect the current global variant landscape. At present, WHO is monitoring two designated variants of interest (VOIs), BA.2.86, and JN.1, and seven designated variants under monitoring (VUMs): KP.2, KP.3, KP.3.1.1, JN.1.7, JN.1.18, LB.1 and XEC. All VOIs and VUMs are descendent lineages of BA.2.86 and JN.1. Between epidemiological weeks 42 and 45, the two VOIs decreased in prevalence, with JN.1 decreasing from 14.0% to 12.4% and BA.2.86 decreasing from 0.1% to no reported sequences. Similarly, for the VUMs and epidemiological weeks 42 and 45, KP.3.1.1 flip-flopped between 46.7% and 50.3%, XEC increased in prevalence from 20.6% to 26.4%, with the remaining VUMs decreasing in prevalence; LB.1 from 1.9% to 0.8%, JN.1.18 from 1.6% to 0.7%, KP.3 from 10.7% to 7.4%, KP.2 from 2.6% to 1.1%, and JN.1.7 only having two sequences over the four weeks. Risk evaluations on current VOIs indicate they do not pose additional public health risks as compared to other currently circulating SARS-CoV-2 lineages.

The latest laboratory and epidemiological studies[1–4] on current SARS-CoV-2 VOIs and VUMs have not identified increased disease severity. In late 2023 and early 2024, however, as the global prevalence of the JN.1 variant increased, there was a rise in cases and hospitalizations in some countries. Nonetheless, these increases were significantly lower as compared to previous waves during 2020-2022.

Despite advances in sequencing capacity made during the pandemic, low, unrepresentative levels of genomic sequencing and sharing pose significant challenges to the assessment of the SARS-CoV-2 variant landscape. 84% of WHO Member States had capacity to sequence for SARS-CoV-2 and 94% had access to timely sequencing either internally or via international reference laboratories as of 31 December 2023. Between January and September 2024, a total of 421 221 sequences were shared globally by 144 countries. This marks a substantial decline compared to 1 139 468 sequences shared by 173 countries during the same period in 2023. Representative levels of genomic sequencing and sharing are essential for adequate, robust, and rapid assessment of the SARS-CoV-2 variant landscape. WHO urges Member States to maintain public reporting and publishing of genetic sequences with relevant meta-data.

The Technical Advisory Group on Virus Evolution (TAG-VE) continues to meet as needed to assess available evidence on circulating SARS-CoV-2 variants. Previously specific to SARS-CoV-2, TAG-VE now has a broad term of reference to include other viruses, including mpox and MERS. Complementing the work of TAG-VE, the Technical Advisory Group on COVID-19 Vaccine Composition (TAG-CO-VAC) also continues to meet regularly to assess the impact of changing variant circulation in the context of determining COVID-19 vaccine composition recommendations, as further described below in the vaccine-related sections.

Human-animal interface

In addition to humans, SARS-CoV-2 can infect numerous animal species. To date, 928 events of natural SARS-CoV-2 infections in 42 species across 40 countries have been reported, most following contact with people with COVID-19 (see SARS-ANI VIS dashboard[5] and the World Organisation for Animal Health (WOAH) website[6]). Unfortunately, approximately 50% of SARS-CoV-2 detections in animals worldwide have not been officially reported to the World Animal Health Information System (WAHIS)[7]. Additional species have been shown to be susceptible in experimental studies[8]. Some susceptible species have been observed to transmit SARS-CoV-2 to other animals (inter- and intra-species) in natural and experimental settings.

Ongoing circulation in several domestic and wildlife animal populations has been confirmed, though surveillance in animals remains insufficient. The largest detected and investigated outbreaks in animals to date have been in European farmed mink and in wild, North American white-tailed deer. In 2022, SARS-CoV-2 outbreaks were reported in mink farms in multiple countries, driven by virus transmission between minks, farm workers, and potentially cats. Control measures, including culling infected minks and enhanced biosecurity, helped control the outbreaks. Circulation in North American white-tailed deer has been sustained since 2021, including vertical transmission to their offspring. A recent study sampling wildlife from May 2022–September

2023 across Virginia and Washington D.C. (USA) further detected SARS-CoV-2 RNA in six of 23 species sampled, including the deer mouse, Virginia opossum, raccoon, groundhog, Eastern cottontail, and Eastern red bat[9], confirming wider spread in additional wild animal populations.[9] Common farm animals such as poultry, swine, and cattle are resistant to infection and do not shed the virus. SARS-CoV-2 surveillance in susceptible animal populations, including whole genome sequencing of virus isolated from animals and traceback investigations, remains fragmented, however. Cost and difficulties in appropriate target/site selection preclude formal surveillance in wildlife - most positive findings to date were due to research activities.

An increasing body of studies have revealed varying percentages of SARS-CoV-2 infections in companion animals of infected owners. Available evidence suggests, however, that they do not significantly contribute to disease spread. As companion animals are not commonly kept in larger groups, continuous circulation, enabling long-term viral evolution, is unlikely. Free roaming, infected (domestic or feral) cats, which shed the virus, have been suggested as potential low risk vectors in the context of the inter-farm spread of the mink farm outbreaks in Europe and the USA.

Animal-to-human transmission appears to be rare and has been observed only from mink (Europe/USA), hamster (Hong Kong), cat (Thailand), and white-tailed deer (USA) after close contact. To minimize this risk, WOAH and Food and Agriculture Organization of the United Nations (FAO) have released several guidance documents for professionals working with animals. While some species have been shown to develop severe illness from SARS-COV-2 infection, including hamsters, most species present with no or mild symptoms. Large scale outbreaks in animals known to develop severe disease, with the potential for ecosystem disruption, have not been observed or described.

Considerable risks remain, however, from ongoing SARS-CoV-2 circulation in animals, including the establishment of animal reservoirs, leading to accelerated virus evolution and potential ecological impacts. Reservoir formation has the potential to drive viral evolution by encouraging the virus to adapt to novel hosts. It also provides the opportunity for the recombination of SARS-CoV-2 with other coronaviruses, which are wide spread in the animal kingdom. Both present the risk of the introduction of novel, potentially recombinant, variants back into the human population. In addition to this risk to human health, viral evolution can lead to changes in animal susceptibility, virus transmissibility among animals (intra- and inter-species), and disease severity in susceptible animals. Robust surveillance and appropriate control measures in animals are needed to adequately characterize and minimize such risks.

WHO, alongside FAO and WOAH, continues to call for increased monitoring of SARS-CoV-2 infection and circulation in wildlife and for action to prevent the formation of animal reservoirs. WOAH has released guidance documents to support Member States in conduct surveillance for SARS-CoV-2 in animals: Considerations on monitoring SARS-CoV-2 in animals[10] and General Guidelines for Surveillance of Diseases, Pathogens and Toxic Agents in Free-ranging Wildlife[11]. Several experimental veterinary SARS-CoV-2 vaccines have been developed, which have thus far been used mainly in zoos and in the fur industry (see FAO situation report[8] for more information). Further research into medical countermeasures for SARS-CoV-2 in animals is needed.

Infection and transmission

SARS-CoV-2 continues to spread mainly through infectious respiratory particles (IRPs) of varying sizes that transmit through the air from an infected person to an uninfected person. This occurs primarily among those in close contact with each other within conversational distance. In these situations, the virus can travel from an infected person's mouth or nose in small particles when they cough, sneeze, speak, sing, or breathe. An uninfected person can then contract the virus when these IRPs are inhaled at short range (short-range airborne transmission, or short-range aerosol transmission using earlier terminology) or if they come into direct contact with the eyes, nose, or mouth (direct deposition, or droplet transmission using earlier terminology). The virus can spread more easily in poorly ventilated and/or crowded indoor settings where people spend long periods of time. In these situations, IRPs can remain suspended in the air for longer or travel further than between individuals at conversational distance (long-range airborne transmission, or long-range aerosol transmission using earlier terminology). Individuals may also become infected by touching their eyes, nose, or mouth after touching surfaces or objects that have been contaminated by the virus.

WHO, in collaboration with partners, continues to monitor modalities of SARS-COV-2 transmission and has developed several tools to support measuring and assessing SARS-CoV-2 transmission. Among them, the Indoor Airborne Risk Assessment in the context of SARS-CoV-2 (ARIA) tool, designed in collaboration with CERN, supports the assessment of SARS-COV-2 airborne transmission risk in residential, public, and healthcare settings. Through use of the tool, users can understand the risk of airborne transmission of SARS-CoV-2 in indoor settings and take steps to mitigate it. The tool uses evidence-based variables to inform preventive measures to significantly reduce the risk of transmission.

Clinical spectrum of disease

SARS-CoV-2 infection continues to cause the full spectrum of disease, from asymptomatic and mild disease to severe disease and death. Now, most individuals experience mild to moderate symptoms, with many others are asymptomatically infected. The predominant symptoms have remained broadly similar throughout the pandemic, although the severity of disease has declined substantially at the population level due to the high level of immunity achieved through vaccination and/or infection. There appear to have been differences in the relative prevalence of certain symptoms over time (for example, altered sense of smell/taste was previously more dominant). However, the limited testing and sequencing makes it difficult to obtain a comprehensive understanding of clinical symptoms across different descendent lineages of the virus and their relative severity. The latest laboratory and epidemiological studies[1–4] on current SARS-CoV-2 VOIs and VUMs have not identified increased disease severity, however.

WHO's Living guideline on clinical management provides evidence-based information on the clinical management of COVID-19, including on the clinical spectrum of disease. The WHO severity classification remains an important framework for identifying individuals at high risk of severe outcomes and in determining the clinical use case for potential therapeutics, as outlined in the WHO Living Guidelines on Therapeutics for COVID-19, last updated in November 2023. These guidelines continue to recommend the use of therapeutics to reduce hospitalization amongst those at highest risk and to reduce mortality in hospitalized patients. Access to recommended medications, including nirmatrelvir, IL-6 receptor blockers and baricitinib, remains limited in some populations.

Children and infants

Children exhibit similar clinical manifestations of COVID-19 as adults, though typically with milder and less frequent symptoms, and with significantly lower rates of severe disease. Based on data from the WHO Global Clinical Platform on 50 351 COVID-19 cases in children and adolescents, a WHO analysis found that disease severity decreases with increasing age within paediatric groups, with infants having the highest mortality risk, comparable to that of adults aged 20-45 years. A history of fever was the most frequently reported symptom in the paediatric population, observed in 55.3% (6612/11 965) of cases. After adjusting for age and sex, the study found that the presence of underlying conditions, including HIV, chronic cardiac disease, diabetes, and pulmonary disease, increased the risk of presenting with severe disease at hospital admission. Infants may also have feeding difficulties and fever without an obvious source. Seizures have been reported more frequently, however, as a primary manifestation in children admitted to emergency departments than adults hospitalized with COVID-19.

The multisystem inflammatory syndrome in children (MIS-C) is a rare, life-threatening complication associated with immune reactions, targeting the body's own proteins[12], triggered by acute COVID-19 infection. MIS-C has become less frequent since the start of the pandemic with a 95% reported reduction in cases during the Omicron variant period and post widespread vaccination.[13]

Pregnant women

WHO gathered and analysed anonymized data from patients with suspected or confirmed COVID-19 through the WHO Global Clinical Platform. Fifty-seven countries reported 165 761 cases in pregnant women, from which there were 2921 detailed observations for hospitalized pregnant women and of these 1815 women who gave

birth during their hospitalization. Risk factors associated with severe and fatal COVID-19 in pregnancy were similar to those in the general population, including advanced age, diabetes and hypertension. Pregnant women admitted to hospital were less likely to have severe / critical COVID-19 on admission, to be admitted to the ICU, or to die compared with non-pregnant women of reproductive age. WHO will continue to expand the collection and analysis of clinical data of hospitalized pregnant and recently pregnant women to enhance our understanding of optimal clinical management, and encourages countries and stakeholders to contribute to this effort.

Post-acute and long-term health effects of SARS-CoV-2 infection, including Post COVID-19 Condition (PCC)

Available estimates, dating from 2022, suggest that 6.2% of individuals (95% CI 2.4% - 13.3%) with symptomatic acute SARS-CoV-2 infection will go on to develop post COVID-19 condition (PCC), characterized by new or persistent symptoms that last for weeks or months following the initial, acute episode of COVID-19.[10] Most PCC cases are reported to occur after mild acute illness, with females more frequently affected (OR, 1.56; 95% CI, 1.41-1.73).[14,15] Higher rates of PCC were also observed in individuals who were hospitalized. In contrast, lower rates were noted among those who had received prior vaccination. Accurately gauging the burden and relative risk of PCC remains challenging due to unreliable infection rate and other disease surveillance data. While recent data suggest PCC may occur at lower rates now than earlier in the pandemic, the persistently high levels of SARS-CoV-2 transmission mean that even reduced PCC incidence can still translate into a substantial number of overall PCC cases.

The symptoms of PCC are diverse, but the most frequent symptom clusters occur around shortness of breath, fatigue, and cognitive problems.[16] WHO has established clinical case definitions for PCC in both adults and in children. The pathophysiology of PCC is still not fully understood, although abnormalities of multiple organs have been described. Several hypotheses are suggested, including immune dysregulation, autoimmunity, and microvascular blood clotting, among others.[17]

The therapeutic landscape for PCC is limited, although global efforts to trial novel management approaches are underway. People experiencing persistent limitations in daily functioning or a protracted course of PCC will require person-centred, comprehensive and multidisciplinary rehabilitation services delivered in collaboration with primary care practitioners and several medical specialties. WHO's Living guideline on clinical management has 16 recommendations for rehabilitation in patients with PCC. WHO is further developing clinical practice guidelines for management of people with PCC based on new evidence generated by the international medical research community and first responders. To exchange with and disseminate latest information to patients and healthcare providers globally, WHO collaborates on a monthly webinar with research and practice updates on PCC.

In addition to the symptoms and functional impairment related to post COVID-19 condition, other illnesses can be provoked in the aftermath of acute COVID-19 illness. These can also affect different organ systems and include, but are not limited to, cardiovascular and neurological events (such as stroke), and kidney and lung impairments. Subsequent reinfections with SARS-CoV-2 are associated with higher hazards and excess burden of these conditions.[18]

Exposure assessment

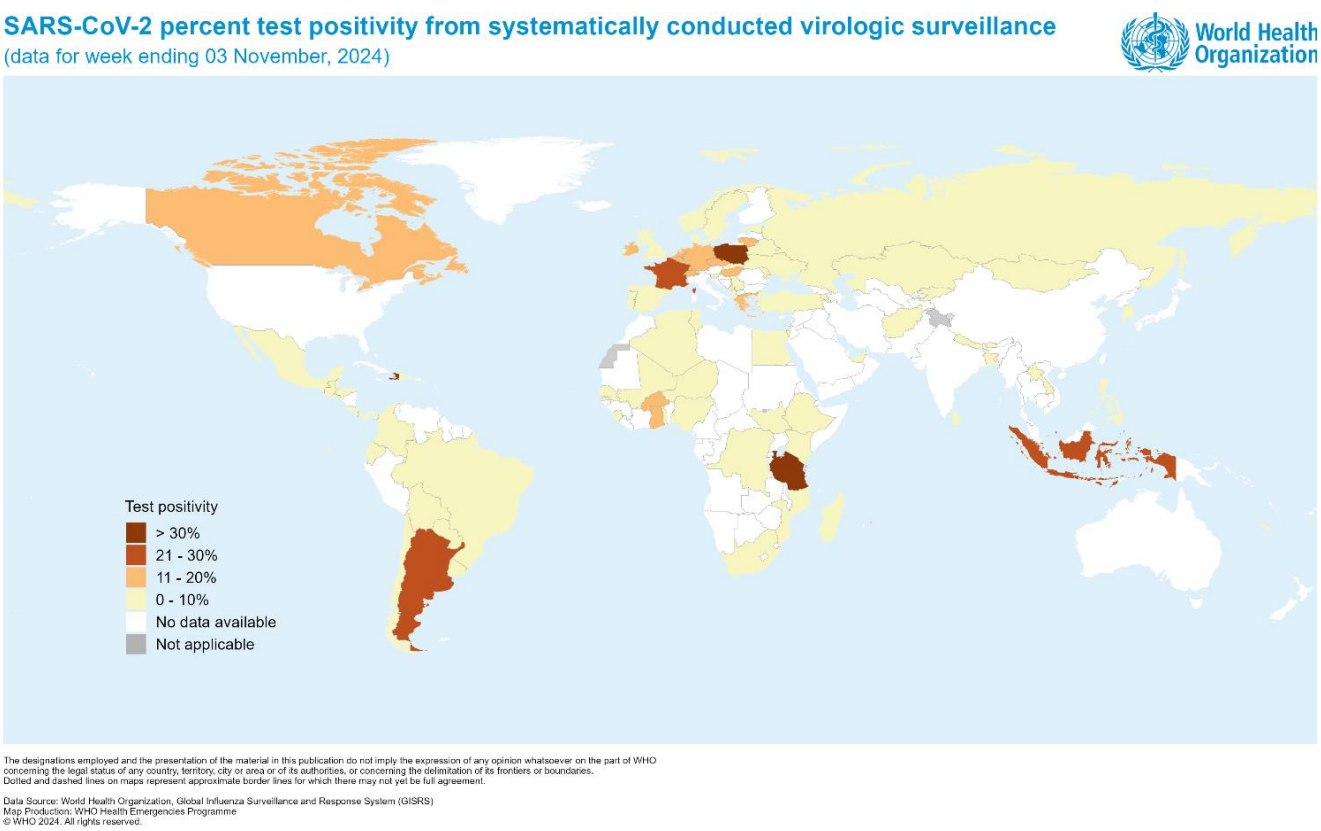
Circulation

Many countries have transitioned from testing every individual case to more sustainable surveillance strategies, such as integrating SARS-CoV-2 / COVID-19 into existing disease surveillance systems like the expanded Global Influenza Surveillance and Response System (e-GISRS) or Integrated Disease Surveillance and Response (IDSR) systems. As a result, test positivity rates from sentinel or other systematic testing sites and SARS-CoV-2 RNA concentrations in wastewater have become more reliable indicators of circulation than incidence rates. In the first 44 weeks of 2024 (as of 3 November), 73% of Member States (n = 141) reported over 20 million SARS-CoV-2 specimen test results to e-GISRS from both sentinel and non-sentinel sites. This represents a 17% improvement in number of countries reporting SARS-CoV-2 data to e-GISRS globally as compared with the

previous assessment in June 2024.

The integration of SARS-CoV-2 into existing respiratory diseases surveillance systems like e-GISRS is proceeding at different rates across regions, however. The proportion of countries reporting SARS-CoV-2 specimen counts at least once ranges between 41% in the Western Pacific Region (WPR) to 96% in the European region (EUR). The integration of severity and impact surveillance is even more limited. As of 3 November, 30% of Member States (n = 58) provided Severe Acute Respiratory Illness (SARI)-specific test positivity rates. The 58 reporting Member States are concentrated in just three regions: 26 out of 53 in EUR, 18 out of 35 in the Americas region (AMR), 13 out of 21 in Eastern Mediterranean region (EMR), and 1 out of 27 in WPR.

Figure 1: Countries reported SARS-CoV-2 specimen test positivity rates from systematic testing to GISRS at week ending on 3 November, 2024 (Data source: GISRS – RespiMART)



As of the week ending on 3 November, many European Member States reported high SARS-CoV-2 activity, with test positivity rates exceeding 10% at sites using systematic testing approaches. Elevated activity was also observed in some Member States in Eastern Africa and Southeast Asia. This elevated activity has been persistent in many European Member States since early June and some in the Americas since mid-July.

Wastewater and environmental surveillance

An increasing number of countries are now monitoring SARS-CoV-2 concentrations and circulating variants in wastewater as part of their surveillance approaches. This approach helps to understand the intensity of virus circulation and identify variants present in the community as countries shift to less broad, more targeted testing strategies. Wastewater surveillance can serve as an early warning signal tool for detecting a potential upsurge in hospitalizations given the lag between infection and hospitalization. According to estimates obtained from viral loads in wastewater surveillance, clinical detection of cases may underestimate the real burden by as many as 2 to 19 times[19,20].

Currently, around 30 Member States across five WHO regions have made wastewater surveillance information publicly available. The list of these countries and access to their dashboards or reports can be found on the wastewater section of the WHO Global COVID-19 dashboard. For the week ending on 3 November, 21 countries

updated their data: four reported high concentration levels, four reported moderate levels, and 13 reported low levels following the increases during summer months. The majority of these countries showed stable or decreasing trends. Two in WPR started to show increases in wastewater concentrations. Twelve countries have also reported data on SARS-CoV-2 variant distribution in wastewater. Several of these countries have either ceased submitting genomic surveillance data from clinical samples entirely or continue to submit only a minimal number of sequences with considerable delays. Consequently, wastewater surveillance has become the sole reliable method for monitoring the circulating SARS-CoV-2 variants in these countries.

Detailed surveillance

WHO continues to monitor COVID-19 cases, hospitalisations, ICU admissions, and other surveillance indicators. Following the end of the PHEIC in May 2023, WHO released an addendum to the Public Health Surveillance of COVID-19 interim guidance outlining the minimum set of COVID-19 indicators that Member States should share with WHO. Member State surveillance strategies continue to evolve, however, which has resulted in reductions in laboratory testing and increased use of unreported self-testing for mild cases, making these measures unrepresentative. As a result, alongside measures of test positivity and wastewater surveillance described above, the focus is now on understanding hospitalizations. WHO continues to update its weekly surveillance platform and detailed surveillance dashboard with data submitted, despite the limited number of Member States contributing.

As of 27 October 2024, over 776 million confirmed cases have been reported globally to WHO, while seroprevalence estimates suggest that there are orders of magnitude more infections and reinfections that are undetected. At the present time, contrary to the over two million cases per week reported in the first quarter of 2023, only approximately 100 000 cases were reported per week during the same period in 2024. Subsequently, during the second and third quarters of 2024, the average weekly number of cases reported were 37 000 and 66 000, respectively, as compared to 500 000 and 264 000 during the same periods in 2023,[*] respectively. It is difficult to quantify the impact of the change in the testing strategies on the reduction of number of cases reported; however, there has been a notable decline in number of countries reporting these data. The average weekly number of countries reporting cases dropped from 184 in the first quarter of 2023 to 118 in the first quarter of 2024. While the number of reported cases is showing a decreasing trend since mid-2022, happening concurrently with decline in global testing rates and the number of countries reporting these data, sentinel site test positivity rates and wastewater concentrations suggest that SARS-CoV-2 continued to circulate widely and at high intensity in communities alongside other respiratory pathogens in all WHO regions throughout first three quarters of 2024.

Monitoring more targeted indicators, such as morbidity metrics (e.g., new hospitalizations and ICU admissions) continues to be the focus of COVID-19 surveillance. Despite WHO's requests to Member States to report hospitalization and ICU data, the average weekly proportion of countries reporting such information to WHO remained low in 2023, with less than 25% (58 countries) reporting new hospitalizations and less than 15% (35 countries) reporting ICU admissions. This low reporting trend continued through 2024, with the average proportion of countries reporting new hospitalizations falling below 25% (53 countries), with only 15% (35 countries) reporting ICU admissions.

As an indicator of severity, data collected from countries reporting both hospitalizations and ICU admissions show a decreasing trend in number of patients requiring ICU admission per 1000 hospitalizations. ICU admissions per 1000 hospitalizations have decreased since July 2021 when the rate was 257 ICU admissions per 1000 hospitalizations, dropping below 132 in early 2022 and to 69 by 2023. In 2024, the rate increased to 203 ICU admissions per 1000 hospitalizations in mid-March, then declined to 123 at the end of October. The causes for these decreases cannot be directly interpreted from these data but are likely include a combination of increases in infection- and/or vaccine-derived immunity, improvements in early diagnosis and clinical care, reduced strain on health systems, and other factors. It should be noted that it is not possible to infer a decreased intrinsic virulence amongst newer SARS-CoV-2 variants from these data.

[*] Due to the continuous retrospective adjustments done by the countries some values presented in this report might be different than the previous report for a given period.

In the updated policy brief on COVID-19 surveillance addressing policy makers, WHO advises Member States to sustain surveillance for COVID-19 to meet key strategic public health objectives such as maintaining a minimum level of testing and sequencing, with a focus on long-term surveillance of respiratory pathogens within integrated systems (such as e-GISRS and IDSR). Additionally, the brief emphasizes the importance of community sentinel sampling, targeted monitoring of high-risk groups, tracking hospital and intensive care admissions and deaths, and effectively detecting and characterizing new variants.

Mortality

As of 27 October 2024, over seven million confirmed deaths had been reported globally to WHO. The number of weekly reported COVID-19-related deaths has been steadily declining, now consistently below 5000 since May 2023, a level comparable to March 2020. This is a significant decrease as compared to previous periods, such as the 15 000 average deaths reported per week during the first quarter of 2023 and the over 56 000 reported per week during the first quarter of 2022. Similar to case reporting, the weekly average number of countries reporting death data has declined significantly, from 173 countries in the first quarter of 2022 to 88 and 41 in the same periods of 2023 and 2024, respectively. As a result, estimates of case fatality rates are no longer reliable.

In the first quarter of 2024, over 30 000 deaths were reported from 69 countries, averaging more than 2300 deaths per week across 40 countries. In the second quarter, the number of deaths declined to over 8000 from 49 countries, averaging over 630 deaths per week from 25 countries. In the third quarter, deaths doubled compared to the second quarter, with over 16 000 reported from 49 countries, averaging more than 1270 deaths per week from 26 countries.

As an indicator of severity, data collected from countries reporting both hospitalizations and deaths show a decreasing trend in number of deaths per 1000 hospitalizations. The number of deaths per 1000 hospitalizations has been decreasing since June 2021, when it was 258 deaths per 1000 hospitalizations declining to 33 deaths per 1000 hospitalizations as of the end of October 2024. While the causes for this decreases cannot be directly interpreted from data available due to their non-representative nature, they are likely due to a combination of increases in infection- and/or vaccine-derived immunity, improvements in early diagnosis and clinical care, reduced strain on health systems, and other factors. It is not possible to infer a decreased intrinsic virulence of newer SARS-CoV-2 variants from these data.

Nevertheless, the reported figures are an underestimate of the true death toll, which has been estimated by several groups, including WHO.[12] It is worth highlighting that most countries do not differentiate COVID-19 deaths and hospitalizations between those directly caused by SARS-CoV-2 and those testing positive for the virus incidentally. The population aged 65 years and over, and those who are not vaccinated, continue to be most at risk of severe disease and death.

During the third trimester of 2024, the proportion of countries reporting deaths with age information decreased to 19%, down from 24% reporting during the same period in 2023. As of 30 September 2024, information on age is available for 5.6 million deaths, representing 79% of the total 7.1 million reported deaths. The population 65 years and over constituted 89% of all deaths during the third trimester of 2024. While similar to the figure reported for the same period in 2023, it nevertheless represents the highest proportion of deaths attributed to a single age group since the beginning of pandemic. Those aged 15 to 64 years constitute 10.7% of all deaths, presenting a slight decrease from 11.8% since the end of the third trimester of 2023.

Relative mortality risk for COVID-19 in the context of co-circulation with other viruses

COVID-19 and seasonal influenza represent a substantial burden of respiratory illnesses among hospitalized patients, particularly during the winter months in temperate climates. As COVID-19 becomes integrated into broader respiratory virus surveillance systems, understanding its mortality risk in comparison to other respiratory viruses, such as influenza, can be informative.

There are published estimates of in-hospital mortality risk for COVID-19 and seasonal influenza. Using data from a nationwide hospital-based surveillance system in Germany, Dickow J. et al.[21] reported that in-hospital

mortality declined from 16.8% among patients with pre-Omicron COVID-19 to 8.4% among those with Omicron COVID-19. The adjusted odds ratio (aOR) for in-hospital mortality compared to seasonal influenza also fell significantly from 3.5 (95% CI: 3.0–4.1) for pre-Omicron variants to 1.6 (95% CI: 1.3–1.8) during the Omicron period. Similarly, Kojima N. et al.[22], using a population-based hospitalization surveillance system in the United States, assessed COVID-19 mortality risk among hospitalized patients from 1 October 2021 to 30 September 2022. This study showed a decline in in-hospital fatality ratios from 14.6% for the Delta variant to 7.9% for Omicron BA.1, 6.0% for BA.2, and 4.6% for BA.5, closer to the seasonal influenza in-hospital fatality ratio of 2.6% during the same period.

These results would suggest that over the course of the pandemic, the comparative mortality risk between COVID-19 and seasonal influenza among hospitalized patients has decreased. This may be explained by the substantial and continuous evolution of SARS-CoV-2, with the emergence and circulation of SARS-CoV-2 variants with greater intrinsic transmissibility and properties of immune evasion, but lower inherent virulence, as well as the protection against severe disease and death conferred by COVID-19 vaccination and prior SARS-CoV-2 infection. However, both studies are limited to hospitalized patients and in-hospital deaths, and as such do not estimate true mortality burden from either infection, as deaths occurring outside healthcare facilities are not captured. In addition, the selection of hospitalized patients does not capture the full spectrum of disease severity, particularly mild or asymptomatic cases, which potentially leads to an overestimation of the case fatality ratios for both COVID-19 and influenza. Further analyses of the comparative mortality risk for COVID-19 and seasonal influenza among observational studies reporting mortality estimates for COVID-19 and influenza are needed.

Population immunity, including vaccination coverage and seroprevalence

From January 2024, WHO shifted from measuring COVID-19 vaccination coverage since the start of the vaccine rollout to measuring annual vaccination coverage. This change was made to reflect (i) shifts in policy recommendations towards targeting high-risk groups while shifting focus away from targeting otherwise healthy individuals and (ii) increasing evidence demonstrating time since last dose received is a more important indicator of vaccine-induced protection than the number of doses received. As such, previous measures of COVID-19 vaccination coverage were frozen as at end of December 2023 and measures of uptake were reset upon transition to the new indicators.

As of the end of 2023, 67% of the total global population had received a complete primary series of a COVID-19 vaccine, and 32% had received at least one booster dose. In older adults, across the Member States having reported vaccination rates at least once (n = 158), 83% had received a complete primary series and 61% had received at least once booster dose by the end of 2023. In health and care workers, across the Member States having reported at least once (n = 143), 89% had received a complete primary series and 31% had received at least one booster dose for the same period. Variations in coverage were present across regions and income strata in all population groups. Only 5% of the general population in low-income countries (LICs) had received at least one booster dose, as compared to 49% in high-income countries (HICs). This divide was also seen in booster uptake among older adults, with 4% having received at least one booster in LICs, as compared with 94% in HICs. While less pronounced, variations in uptake also existed between regions, especially with regards to booster uptake. Generally, the African (AFR), Eastern Mediterranean (EMR), and South-East Asian (SEAR) regions featured lower coverage levels than the other regions. Baseline vaccine-induced immunity levels were therefore heterogenous before the shift to annual uptake monitoring at the beginning of 2024.

COVID-19 vaccine uptake in high-risk groups has been low so far in 2024. As of the end of the third quarter of 2024, 39.2 million individuals across all population groups were reported as having received a COVID-19 vaccine dose so far this year, in 90 Member States containing 31% of the global population. Of those, 14.8 million individuals received their COVID-19 vaccine dose during quarter 3. Among older adults, 19.7 million individuals were reported as having received a dose so far this year, across the 75 Member States reporting on uptake in this group, corresponding to an uptake rate of 1.68%. This is 8.9 million more older adults than as of end of quarter 2. Among healthcare workers, 1.3 million individuals were reported as having received a dose so far this year, across the 54 Member States reporting on uptake in this group, corresponding to an uptake rate of 0.96%. This is about 311 300 more health and care workers than as of end of quarter 2.

Strong variations in uptake continue to be observed in 2024 across regions and income strata in all population groups. Across all groups, uptake in the American (AMR) and European (EUR) regions and in high- and upper middle-income income groups was greater than in other regions and income groups. In older adults, uptake rates in EUR (5.1%) and AMR (3.6%) were considerably higher than in other regions, all between 0.0-0.3% uptake. Also in older adults, HICs had an uptake rate of 4.3%, as compared with 0.5% in LICs. In health and care workers, again, uptake in AMR (2.8%) and EUR (0.4%) was more than in the other regions, all between 0.0 and 0.2% uptake. Uptake rates in health and care workers further varied between income groups, with UMICs and HICs featuring uptake rates of 2.1% and 0.6%, respectively, as compared with 0.3% and 0.1% in LICs and LMICs, respectively.

Beyond vaccination data, up-to-date, globally comprehensive meta-analyses on seroprevalence data have not been available since April 2022, due to a sharp decline in the number of serosurveys published. The most recent globally comprehensive meta-analysis, under the WHO Unity Studies, estimated that the global percentage of seropositive individuals was 90% in April 2022, up from 22% in January 2021. A limited number of studies have since been published sampling in 2023 or later across eight countries. Results from these studies have shown seroprevalence levels of 90% or greater, indicating very high potential levels of population immunity. It is important to note, however, that these data are heterogeneous and are not necessarily generalizable to the general population, nor were they formally meta-analysed.

WHO continues to encourage investigators to undertake seroprevalence studies and to publish the results on public platforms. These studies have been crucial in estimating susceptibility to SARS-CoV-2 in high-priority groups, looking beyond the insights offered by vaccination data alone.

Hybrid immunity provides more robust protection against Omicron infection and severe disease compared to previous SARS-CoV-2 infection without vaccination or vaccination alone. The interim statement on hybrid immunity and increasing population seroprevalence rates, published by WHO in June 2022, defined hybrid immunity as 'the immune protection in individuals who have had one or more doses of a COVID-19 vaccine and experienced at least one SARS-CoV-2 infection before or after the initiation of vaccination'. The protection from hybrid immunity wanes within months, particularly for infection, although it remains high and sustained for preventing hospital admission, severe disease, and death.

Context assessment

Laboratory and diagnostics

The reference tests for SARS-CoV-2 testing are nucleic acid amplification tests, such as PCR. Antigen-detecting rapid diagnostic tests (Ag-RDTs) are also widely available and have high sensitivity and very high specificity in symptomatic individuals. Ag-RDTs can also be performed by individuals in which they collect their own specimen, perform a simple rapid test and interpret their test result themselves at a time and place of their choosing, termed COVID-19 self-testing. Serology (such as ELISA and antibody-detecting rapid diagnostic tests, or Ab-RDT) can be used to assess antibody levels in individuals.

Certain regions of the SARS-CoV-2 genome (e.g. spike protein) have mutated over time, resulting in genetic variation in the population of circulating variants, also called lineages, that can affect certain SARS-CoV-2 diagnostic tests. The U.S. Food and Drug Administration (FDA) has published information on SARS-CoV-2 viral mutations decreasing the accuracy of certain SARS-CoV-2 tests. These typically are rapid antigen tests, as PCR tests generally retain higher accuracy due to multiple targets, including very conserved regions.[23]

In the updated policy brief on COVID-19 testing, WHO advises Member States to continue to offer testing for COVID-19 in line with three main objectives as part of COVID-19 management and control: (i) reduce morbidity and mortality through linkage to prompt care and treatment, (ii) monitor the evolution of the SARS-CoV-2 virus and (iii) reduce the risk of emergence and spread of new SARS-CoV-2 variants that could cause upsurges of cases threatening health system capacities. Early testing of suspected COVID-19 cases, particularly among individuals at higher risk for hospitalization or severe illness, is essential to ensure timely access to supportive care and COVID-19 therapeutics. Testing continue to play a critical role in monitoring the evolution of epidemic and the SARS-CoV-2 virus by contributing data from sentinel, wastewater, and animal surveillance systems.

COVID-19 testing and reporting strategies should be integrated with genomic surveillance and phenotypic assessment. As countries transition to comprehensive, long-term COVID-19 management within broader disease prevention and control programs, they must remain prepared to rapidly scale up testing in response to surges caused by new SARS-CoV-2 variants that could overwhelm health system capacities.

CoViNet

The WHO Coronavirus Network (CoViNet) aims to bring together surveillance programs and reference laboratories to support enhanced epidemiological monitoring and laboratory (phenotypic and genotypic) assessment of SARS-CoV-2, MERS-CoV and novel coronaviruses of public health importance.

The core objectives of CoViNet are:

1. early and accurate detection of SARS-CoV-2, MERS-CoV and novel coronaviruses of public health importance;
2. surveillance and monitoring of the global circulation and evolution of SARS-CoV, MERS-CoV and novel coronaviruses of public health importance recognizing the need for a "One Health" approach;
3. timely risk assessment for SARS-CoV-2, MERS-CoV and novel coronaviruses of public health importance, to inform WHO policy related to a range of public health and medical countermeasures; and
4. support for capacity building of laboratories relevant to the needs of WHO and CoViNet, particularly those in low- and middle-income countries, for SARS-CoV-2, MERS-CoV and novel coronaviruses of public health importance.

In order to inform TAG-CO-VAC deliberations, CoViNet have coordinated the generation of antigenic characterization data within its reference laboratories. This work aims to generate antigenic data for SARS-CoV-2 variants that are likely to have epidemiological importance in the coming season. Data will be generated by nine labs under four main headings:

i. post-vaccination sera (post-XBB.1.5 vaccination and, if possible, post-JN.1/KP.2 vaccination);
ii. community sera,
iii. sera from individuals with known infection histories, including JN.1, and
iv. animal sera.

The variants to be tested vary between labs but include KP.3, LB.1, KP.3.1.1 and XEC. The coordinated analysis will be presented to TAG-CO-VAC on 10th December 2024.

Use of the expanded Global Influenza Surveillance and Response System (e-GISRS) for COVID-19 surveillance

e-GISRS continues to monitor the co-circulation of SARS-CoV-2 and influenza viruses and provides training, technical, and logistical support to resource-limited countries to conduct testing using multiplex RT-PCR assays (i.e., Influenza and SARS-CoV-2). Since 2021, the WHO Collaborating Centre on Influenza at the United States Centers for Disease Control and Prevention (US CDC) has distributed thousands of multiplex RT-PCR kits for influenza A, influenza B, and SARS-CoV-2, to 144 national influenza laboratories in 134 countries through the International Reagents Resource.

Since January 2022, WHO has also supported Member States in adapting and implementing regional frameworks for the integration of various respiratory viruses, including the "Mosaic" framework designed to establish coordinated and effective surveillance approaches to address key priorities related to respiratory pathogens, such as influenza, SARS-CoV-2, MERS-CoV, and RSV.

It remains critical for countries to continue to implement integrated sentinel surveillance to monitor the co-circulation of influenza and SARS-CoV-2, assess risks, and prepare for resurgences of either or both viruses. To this end, WHO has published "Implementing the integrated sentinel surveillance of influenza and other respiratory viruses of epidemic and pandemic potential by the Global Influenza Surveillance and Response

System: Standards and operational guidance". These standards recommend year-round surveillance for acute respiratory infections be conducted, including testing for influenza and SARS-CoV-2 and reporting surveillance data to WHO on a weekly basis.

Environmental surveillance

Globally, an increasing number of jurisdictions are including wastewater sampling in their surveillance of SARS-CoV-2. Environmental Surveillance (ES), including wastewater surveillance, can provide early warning signals of emergence, re-emergence, or surges of SARS-CoV-2, including VOCs and VOIs, at least one week prior to the detection of clinical cases. By detecting hotspot areas and performing targeted surveillance of circulation of the virus in high-risk settings or vulnerable communities, ES can also provide a cost-effective tool for public health surveillance. As COVID-19 control measures and public interest in diagnostic testing decline, the role of ES becomes potentially even more useful to detect population-level trends.

However, many ES programmes are also scaling back in large part due to limited funding to support public health authorities, wastewater utilities, and ES laboratories for such activities. The guidance on Environmental surveillance for SARS-CoV-2 to complement public health surveillance was updated in September 2023. The updated guidance includes demonstrated public health use cases for ES, the minimum requirements for planning and coordinating environmental surveillance in different resource settings, and best practice for sampling and analysis.

Global efforts are evolving rapidly towards multi-pathogen ES, building on longstanding experience and capacity for polio ES and more recent application for SARS-CoV-2. Multi-pathogen approaches for communities and sentinel sites (e.g., airports), which are still in feasibility testing phase, anticipate efficiencies in combining ES for two or more targets and greater integration with clinical surveillance for all targets.

Although more countries are known to be using environmental surveillance as an additional approach for monitoring SARS-CoV-2, the number of countries making this information available to inform the public is limited. While there is an absence of consensus on defining the core indicators and data standards, monitoring wastewater surveillance trends is an important factor to increase visibility on both virus circulation, variant distribution and potential surges in health care system. Currently, there are 30 countries listed with publicly available information products in the WHO Global COVID-19 dashboard. However, most of these are HIC with already maintained core surveillance activities. Adopting environmental surveillance in more countries with limited public health surveillance would fill an important gap.

Public health and social measures (PHSM)

Most countries have phased out public health and social measures (PHSM) for COVID-19 due to changes in disease burden and epidemiological trends, as well as socioeconomic requirements to reopen communities. Monitoring of COVID-19 PHSM measures by WHO and other external groups stopped when most countries had lifted PHSM measures. The number of countries implementing large-scale PHSM for COVID-19 will likely continue to decline in the long- term if no significant changes to disease epidemiology.

Few countries have adequate plans and strategies to re-introduce, scale-up and adjust PHSM in the event of a resurgence of COVID-19 of another respiratory pathogen. This is a critical concern as insufficient PHSM planning and preparedness can result not only in increased cases of and deaths from COVID-19, resulting in increased burden on health systems, but also require the implementation of more stringent PHSM down the line. This can increase the number of negative consequences coming from PHSM. Being able to rapidly re-introduce and scale PHSM as needed is an essential capacity needed in the long-term control of COVID-19 and other infectious diseases.

WHO continues to recommend that countries integrate PHSM and the deployment of medical countermeasures as part of a robust strategy for long-term, sustainable COVID-19 management in the context of overall disease control and prevention programmes. PHSM should be applied in a layered and proportionate manner, based on identified public health risks and evidence of their effectiveness. Mitigation measures should be introduced

to reduce the impact of unintended negative consequences from PHSM implementation, including unemployment, food insecurity, interrupted education, domestic violence, and slowed economic productivity. PHSM should be monitored routinely at the national, subnational and local levels to facilitate transparency and enable evaluation of PHSM effectiveness. Based on routine PHSM and disease situation monitoring, PHSM should be adapted to ensure that they remain relevant, proportional, and effective in the face of evolving contextual factors. Decisions to adjust PHSM may be based on set schedules or thresholds in response to shifts in epidemiological trends, healthcare system capacity, availability and distribution of medical countermeasures, and population immunity, among others.

WHO has published a number of resources to support Member States is developing risk-based, evidence-informed PHSM measures for COVID-19 in an equitable and context-specific manner. In particular, WHO has prepared the PHSM Conceptual Framework to harmonize the understanding and language used to describe how PHSM work during health emergencies. Further, the PHSM Knowledge Hub serves as a publicly accessible gateway to research and resources on PHSM. Additional resources are available via the WHO Public Health and Social Measures Initiative.

Considerable research was conducted on PHSM during the COVID-19 pandemic, yielding important insights for the development and deployment of PHSM in health emergencies. In 2024, under the WHO PHSM Initiative, a systematic review of systematic reviews on the effectiveness and unintended consequences of PHSM in the context of the COVID-19 pandemic was published. This review is considered the most comprehensive and current landscape analysis of the existing research available, including experimental and observational studies. The review further highlighted that the current research base is of predominantly low- to very-low certainty, emphasizing the critical importance of strengthening and harmonizing the research methodologies to measure PHSM effectiveness and consequences. It also underscored the need to increase coordination and alignment of research efforts with the priorities of policy-makers and stakeholders. Readiness and response for future health emergencies requires expanding research efforts in PHSM beyond COVID-19 and adopting an all-hazard approach.

International travel

Most countries have lifted international travel-related COVID-19 measures. WHO's monitoring of international travel-related COVID-19 measures stopped during the third quarter of 2023. The number of countries requiring COVID-19 certificates (vaccination or testing) will likely continue to decline in the long term.

WHO continues to recommend that national authorities adjust any remaining international travel-related measures based on risk assessments and in line with WHO recommendations and guidance. In particular, countries are urged to review the WHO Director-General's Standing Recommendations on COVID-19 and WHO's policy and technical considerations for implementing a risk-based approach to international travel in the context of COVID-19. Countries may further refer to the WHO's evidence review on syndromic entry and exit screening for endemic prone diseases at ground crossings for the latest evidence on health measures conducted at ground crossings during recent decades for epidemic-prone diseases, including for SARS-CoV-2.

Mass gatherings

COVID-19-related planning for mass gatherings should continue to rely on a risk-based approach based on three steps: risk evaluation, risk mitigation, and risk communication. This approach should be tailored to the size and type of event, and its context (including local and global SARS-CoV-2 transmission intensity and local health system capacity), with the process and its outcomes aptly communicated. WHO has issued a generic All-hazards Risk Assessment Tool for Mass Gathering Events to identify priority hazards related to the event, assess and quantify overall level of risks, identify and account for precautionary measures to reduce risks, including for SARS-CoV-2. A web application of the tool has also been developed. Planning considerations should extend beyond the event itself and encompass the social context in which the event takes place (e.g., informal side gatherings). Planners should apply a holistic approach, paying close attention to PHSM, transportation, accommodations, and individual behaviours that might lead to unplanned congregation in public spaces.

During the Paris 2024 Olympic and Paralympic Games, WHO conducted event-based surveillance to complement other surveillance activities to detect health-related hazards, including COVID-19. The results were shared with the relevant stakeholders, including but not limited to the French government, the International Olympic Committee, and the European Centre for Disease Prevention and Control, on a daily basis.

While the COVID-19 situation has changed, individuals must still make informed decisions to protect their health when planning or attending public gatherings. The WHO Q&A on small public gatherings considering COVID-19 remains applicable and can be consulted to ensure people planning to meet and attend important events and gatherings can do so safely.

Vaccination

Vaccination policy

WHO COVID-19 vaccine policy recommendations, as published in the Roadmap for prioritizing uses of COVID-19 vaccines in November 2023, were reviewed and re-endorsed by the WHO's Strategic Advisory Group of Experts on Immunization (SAGE) based on the latest available programme, effectiveness, and impact data in September 2024.

According to the Roadmap, WHO recommends a simplified single-dose regimen for most COVID-19 vaccines for individuals in high and medium priority-use groups who have not yet received a COVID-19 vaccine. This simplified dosing regimen aims to improve acceptance and uptake, while providing adequate protection at a time when most people have either had at least one SARS-CoV-2 infection or prior vaccination. High priority-use groups include older adults and other adults living with severe obesity or comorbidities that increase their risk of severe COVID-19. Medium priority-use groups include healthy adults and children and adolescents living with severe obesity or comorbidities that increase their risk of severe COVID-19. The Roadmap outlines several sub-populations with special considerations, notably persons with immunocompromising conditions, pregnant adults and adolescents, and health and care workers with direct patient contact, with distinct vaccination recommendations. Depending on the sub-population, vaccination with 1-3 doses is recommended, based on their risk of severe COVID-19. Vaccination in low priority-use groups, including healthy children and adolescents, can be considered based on country priorities and available resources.

The updated Roadmap further recommends the periodic re-vaccination of most high priority-use groups and sub-populations with special considerations at an interval of 6-12 months, depending on the group. Pregnant women are recommended to be re-vaccinated during each pregnancy. Re-vaccination is not routinely recommended for medium and low priority-use groups.

During the third quarter of 2024, 53 WHO Member States reported at least once on current national COVID-19 vaccination policies for at least one population group. Among those 53 Member States, 45 reported recommending periodic revaccination in at least one population group. Across target groups, older adults are most reported as being recommended to be periodically revaccinated against COVID-19. Adults with chronic conditions are also frequently targeted under national policies for periodic re-vaccination, with over half of responding Member States reporting this. Children and adolescents, and adults were the groups most frequently not recommended for vaccination with 52% (24/46) and 31% (15/49) of responding Member States reporting not recommending vaccination in these groups, respectively.

Vaccine effectiveness and composition

While current COVID-19 vaccines with WHO Prequalification (PQ) or Emergency Use Listing (EUL) continue to provide protection against severe disease and death, the WHO Technical Advisory Group on COVID-19 Vaccine Composition (TAG-CO-VAC) advised using a monovalent JN.1 lineage as the antigen in future vaccine formulations in April 2024.

Available vaccine effectiveness studies show that the current monovalent XBB.1.5 vaccine protects against the currently circulating Omicron XBB- and JN.1-descendent variants, but that protection wanes within the first few months. There are still no vaccine effectiveness studies using monovalent JN.1 lineage vaccines, but available

immunogenicity data suggest that the monovalent JN.1 vaccines are likely to provide modestly enhanced protection compared to monovalent XBB-containing vaccines, bivalent variant-containing vaccines, and monovalent index virus vaccines.

Several vaccine products using updated vaccine antigens, notably JN.1 and KP.2, have been developed. In particular, Pfizer and Moderna have produced both JN.1- and KP.2-adapted versions of their Comirnaty and Spikevax products, respectively. Further, Novavax, CSL Seqirus & Arcturus Therapeutics, and Daiichi Sankyo have all produced JN.1-adapted products, Nuvaxovid, Kosaive, and Daichirona, respectively. Other products are under development. Several of these products have been approved by various national regulatory authorities (NRAs), as described below, and are now in use. In the context of updated COVID-19 vaccine antigen composition, it is important to highlight that KP.2 is a descendent of JN.1, and the difference between the two antigens is two amino acid changes.

As all COVID-19 vaccines with WHO PQ / EUL continue to provide protection against severe disease and death, any COVID-19 vaccine with WHO PQ / EUL can still be used either for primary vaccination or for periodic revaccination if the monovalent JN.1 lineage vaccines are unavailable. Vaccination should not be delayed in anticipation of access to variant-containing vaccines as there is a greater benefit in ensuring that persons at high risk of developing severe COVID-19 receive a dose of any available vaccine as compared to delayed vaccination.

Vaccine product regulation

During the PHEIC, WHO recommended 13 vaccines through the EUL procedure. With the ending of the PHEIC in 2023, vaccine manufacturers were informed that they would need to transition to PQ through submission to WHO of a PQ dossier. At the same time, vaccines that were no longer manufactured were slated to be delisted. To date, of these original 13 products, one has been prequalified and three additional ones are transitioning from EUL to PQ. In addition, one vaccine was prequalified post-PHEIC directly. All of the vaccines with or transitioning to PQ feature XBB.1.5 and/or JN.1 formulations. The other original EUL vaccines are to be removed from the EUL list as they are no longer manufactured, all batches have expired, or address the ancestral strain only.

As of October 2024, JN.1- or KP.2-adapted products are approved and authorized for use in Canada, the European Union, Japan, Switzerland, the United Kingdom, and the United States of America. The countries where each adapted product is authorized is summarized in Table 1.

Table 4: Regulatory authorization status of latest variant-adapted COVID-19 vaccine products (as of October 2024; not exhaustive)

Product	Antigen composition	Countries where authorized
Pfizer-BioNTech Comirnaty	JN.1	European Union (EMA); UK (MHRA); Switzerland (Swissmedic)
	KP.2	USA (FDA); European Union (EMA); Canada (Health Canada); UK (MHRA)
Moderna Spikevax	JN.1	European Union (EMA); UK (MHRA); Switzerland (Swissmedic); Japan (PMDA)
	KP.2	USA (FDA); Canada (Health Canada)
Novavax Nuvaxovid	JN.1	European Union (EMA); Canada (Health Canada)
Kosaive CSL Seqirus & Arcturus Therapeutics	JN.1	Japan (PMDA)
Daichirona	JN.1	Japan (PMDA)

Vaccine supply

A six-fold decline in demand between 2022 and 2023 along with a large number of COVID-19 vaccine producers (49 with EUL in at least one country in 2023) points to a grossly over-supplied market. The concentration of the market is substantial, with mRNA vaccines from only two originators accounting for ~90% of the global market value and ~70% of the global market volume in 2023. Several manufacturers have exited the market in view of declining demand, while several of the remaining manufacturers continue to produce updated products based on vaccine composition recommendations, resulting in available variant-adapted vaccines (BA.4 / BA.5, XBB.1.5, JN.1).

Low- and lower-middle income countries, securing doses through the COVAX mechanism in 2023 or the COVID-19 program in 2024, demonstrated the same declining trends in demand as those observed at the global level. Three products were offered to the 54 countries eligible for support from Gavi, the Vaccine Alliance and to the 37 non-Gavi countries eligible of the COVAX Advanced Market Commitment mechanism who have access to Gavi-supported vaccines procured through UNICEF Supply Division or the PAHO Revolving Fund. A large majority of the vaccine products allocated were of an XBB-adapted vaccine.

Gavi will discontinue its support for COVID-19 vaccination following the completion of the current 2024-2025 programme on 31 December 2025. This decision was taken by the Gavi Board following the outcomes of the Alliance's Vaccine Investment Strategy (VIS) process, which considered the general decline in country demand and the decreasing cost effectiveness of COVID-19 vaccination in certain contexts. Gavi will consider support to countries for COVID-19 vaccination in the event of COVID-19 outbreaks through its pandemic preparedness, prevention and response activities.

Vaccine confidence and demand

Demand for COVID-19 vaccination remains low, including in high priority-use groups and sub-populations with special considerations. WHO recommends that countries use evidence-based and behaviourally informed strategies to increase confidence in and demand for COVID-19 vaccination, particularly in the aforementioned groups. This includes the gathering and use of local data on behavioural and social drivers of vaccination to assess root causes of low uptake and to design and evaluate tailored interventions. Interventions to increase trust and uptake can include: (i) targeted information campaigns via trusted information sources, (ii) partnering with local and community actors to increase community engagement, and (iii) trainings with health and care workers to increase their confidence in recommending COVID-19 vaccination, and (iv) improvements to delivery strategies to increase the ease of access to vaccination, among others.

Co-administration of COVID-19 vaccines with other vaccines, notably those for seasonal influenza, may increase vaccine uptake by reducing the number of vaccination contacts needed by one person. Further, co-administering vaccines and with other health interventions may offer efficiencies in the programmatic delivery of both vaccines, reducing both administrative and programmatic costs and improve the quality of health care. WHO encourages countries to explore opportunities to co-administer COVID-19 and seasonal influenza vaccines to increase uptake of both vaccines.

Vaccine programme sustainability and integration

Given the latest policy recommendations and current COVID-19 vaccine programme goals, WHO recommends that countries integrate COVID-19 vaccination into primary health care and other routine health services, moving away from mass, campaign style vaccination. This recommendation is informed by changing vaccination goals, as the focus moves towards reaching high priority-use groups and away from reaching the general population. From a sustainability perspective, vaccination through routine health services requires less human and financial resources than the mass vaccination approaches that were common early in the rollout.

Routinization of COVID-19 vaccination represents an opportunity for health systems to sustain the gains to vaccination programs and systems made under COVID-19 while also bolstering pandemic preparedness, prevention and response capacity against future threats. It promotes the life course approach to vaccination and the development of vaccine delivery platforms for risk groups, notably for older adults, health and care

workers, and pregnant women. Such delivery platforms can be used in support of optimizing existing vaccination efforts (for example, against seasonal influenza), the introduction of new adult-targeted vaccines, and the 'catch-up' of missed doses for other vaccines or other health interventions targeting the same groups. WHO recommends that countries assess new capacities developed and investments made under COVID-19 and determine those that can be sustained and carried forward in service of broader disease control programmes and health system strength. Examples might include new or reinforced immunization information systems, cold chain equipment or health and care worker training programs, among others.

Risk communication, community engagement and infodemic management (RCCE-IM)

Most countries have phased out RCCE-IM COVID-19 interventions due to changes in disease burden, epidemiological trends, and available resources. This includes rapid research and polling to assess population changes in knowledge, attitudes, perceptions and behaviours associated with COVID-19, making it difficult to measure these variables and associated risks meaningfully. While RCCE-IM interventions were proven to be essential for informed and engaged communities during the COVID-19 pandemic, few countries have actively maintained or integrated existing RCCE-IM resources into broader health emergency and pandemic strategies and plan development.

As coordinated interventions have slowed or stopped, there is some evidence that this has contributed to a decline in adherence to protective behaviours such as wearing a mask, washing hands frequently, testing in case of exposure or symptoms, and staying up to date with COVID-19 vaccines.

The limited social-behavioural data still being collected shows that risk perceptions and demand for COVID-19 information are now relatively low. For example, a study conducted in the WHO EURO region in August 2024 found that most people surveyed in the study were not concerned about COVID-19. The results also found that 65% of the respondents had enough information and that 83% know where to get tested if they fall ill.

Given ongoing COVID-19 circulation, WHO recommends that tailored and participatory RCCE-IM approaches remain vital for communicating ongoing and changing risks associated with COVID-19 and for co-developing appropriate and actionable solutions, especially with high-risk groups. Listening to and engaging with communities remains critical for understanding needs, addressing emerging concerns and ensuring interventions are tailored and relevant to different contexts and settings. They are essential for promoting the continuation of protective behaviours, especially among high-risk groups and should be used to address misinformation, build trust in public health measures and promote cooperation and inclusion.

WHO continues to recommend several priority actions for countries. These include integrating RCCE-IM resources and capacities into national pandemic response plans and governance structures. Establishing community listening and two-way communication systems, such as hotlines and community feedback loops. Monitoring appropriate platforms for misinformation trends and addressing them through trusted sources and ensuring solutions are co-created with high-risk groups. Building and maintaining trust remains an essential objective of RCCE-IM interventions. The updated WHO COVID-19 policy brief on RCCE-IM provides an overview of the recommended actions for Member States.

A substantial body of evidence on the impact of RCCE-IM approaches was generated during the COVID-19 pandemic. These insights should be leveraged to strengthen RCCE-IM capacities and systems in all countries. Key lessons highlight the critical role of trust in local health authorities and community organizations, the necessity of providing accurate and transparent information in a timely manner during times of uncertainty, and the importance of designing interventions that place communities at the centre of the response. Investing in addressing these factors can lead to more effective and inclusive health emergency programmes.

Infection Prevention and Control (IPC) and Water, Sanitation and Hygiene (WASH)

WHO's Infection prevention and control in the context of COVID-19 guideline consolidates technical guidance developed and published during the COVID-19 pandemic into evidence-informed recommendations for IPC. Updated in December 2023, the document takes into consideration the transition from critical emergency-

response activities to longer-term, sustained COVID-19 disease prevention, control, and management, including an emphasis on integrating IPC activities into routine systems and practices. The guideline emphasises the core elements of IPC principles and practices for implementation in health-care facilities, including 1) the chain of transmission, 2) the hierarchy of control measures and 3) the implementation of standard and transmission-based precautions, and respective elements for the adoption of PHSM for community settings. Health-care facilities remain a high-risk setting for SARS-CoV-2 transmission as they are locations where patients at risk of severe COVID-19 seek care. Updated recommendations for health-care facilities include a focus on IPC practices as described in hierarchy of controls (e.g. engineering, administrative, personal protective equipment (PPE)), standard and transmission-based precautions, and water, sanitation and hygiene (WASH) measures. A summary article of the guideline is also available.

WHO recommends that countries ensure IPC measures are implemented for suspected and confirmed COVID-19 cases in clinical settings and that health and care workers receive adequate training on and access to PPE. Countries are encouraged to continue delivering optimal clinical care for patients with COVID-19, including maintaining measures to protect patients and health workers. National and sub-national level authorities should maintain readiness to respond to the possibility of future surges of COVID-19 that could overwhelm health systems. WHO recommends Member States focus on the following three key objectives for COVID-19 management and control: elevate the importance of IPC programmes; maintain outbreak readiness and response capacities; and establish and maintain appropriate infrastructure needed for safe health service delivery and a resilient health workforce.

Updated training courses aligned with the latest recommendations are available via OpenWHO. The trainings describe IPC practices in healthcare settings, explain the use of PPE for managing suspected or confirmed COVID-19 cases, and outline PHSM to mitigate transmission in community settings.

Essential health services, including mental health

While COVID-19 put tremendous pressure on health systems globally during the peak of the crisis, the burden is now substantially lower even if it still puts pressure on health systems around the world. As a result, essential health services are returning to normal, pre-pandemic levels of operation in most countries. Routine childhood immunization services, for example, have returned to pre-pandemic operational levels in many cases, as evidenced by the latest estimates of immunization coverage. Recovery has been heterogeneous, however, with some countries faring more poorly than others.

The COVID-19 pandemic exposed multiple, substantial barriers faced by certain populations, however, notably older persons. It is thus important while returning to normality to apply the lessons learned. This implies reorienting the systems to provide more inclusive and meaningful solutions to older persons, representing a growing and highly vulnerable population.[24] In this context, the need to bridge health and social care services to deliver a continuum of integrated care to older persons has been repeatedly advocated. Furthermore, the consequences of the disruption of care suffered by older persons during the pandemic should not be overlooked as potentially burdening the current situation. In fact, the COVID-19 pandemic could have substantially reshaped the clinical profile of the population (e.g., changing the prevalence of non-communicable diseases [NCDs]) through a direct action of the infection (e.g., due to premature death, by influencing NCDs' onset or progression, PCC) or indirectly, for example through the necessary public health strategies applied for infection control (e.g., prolonged physical inactivity, social isolation, poor adherence to care interventions, unhealthy diets) or changes in the social determinants of health.[25]

The focus of programming to protect essential health services has shifted to preparing health systems to shoulder possible future waves of COVID-19 and other health emergencies. It is noteworthy how integrated care services might enhance the readiness of systems to react in case of new events. It is important to consider new standards of care for older persons across settings, especially those hosting the most vulnerable individuals.[26] A broader use of technologies might ensure the continuum of integrated care for older people, avoiding disruptions, supporting monitoring processes, and promoting more timely preventive strategies at different levels.

Systematic reviews and lessons learned were documented for maintaining essential maternal, newborn, child

and adolescent health services in the face of pandemics and other disruptions to services. It will be important to include these in preparedness plans for future health emergencies responses. A website was finalized in 2024 with all relevant reviews, and documentation form countries. A review published in 2024 shows that only 13% of 110 plans reviewed included a planned activity for monitoring or mitigating the impact on maternal, newborn, and child health (MNCH) and less than 5% included relevant indicators, costing or integration of services in the incident management system.[27] The learnings gathered from maintaining MNCH services will be applicable to services as they also prepare to reduce the risk of climate change hazards and related events. A scoping review[28] on interventions to maintain essential MNCH services was updated and published in 2024 and identified an important and growing body of evidence of evaluated interventions to maintain essential services for MNCH during COVID-19 in LMICs. To improve preparedness and responsiveness for future disruptions, managers for decision-makers in LMICs could benefit from global efforts to maintain up-to-date inventories describing implemented interventions and evaluations to facilitate evidence-based implementation of strategies, as well as tools for conducting optimal quality operational and implementation research during disruptions (e.g. rapid ethical approvals, access to routine data).

On mental health, WHO recommends that Member States strengthen capacities to address the mental health and psychosocial impacts of COVID-19 and other public health emergencies. WHO is supporting Member States by implementing World Health Assembly Resolution 77.3 on "Strengthening mental health and psychosocial support before, during and after armed conflicts, natural and human-caused disasters and health and other emergencies". WHO continues to support global and country-level multisectoral field-based simulation exercises focused on mental health and psychosocial support capacity strengthening. Further, WHO is implementing the Special Initiative for Mental Health, which was launched in 2019 and scaled up during the pandemic. This program now provides over 52 million people in nine countries—Argentina, Bangladesh, Ghana, Jordan, Nepal, the Philippines, Paraguay, Ukraine, and Zimbabwe —with new or improved mental health services integrated into primary and secondary care.

Strengthening infection prevention and control in primary care to ensure the safety of the aforementioned vulnerable populations, and of health care workers, is also an ongoing activity supporting the safe delivery of essential health services.

Vulnerable populations in humanitarian emergencies

The fragility and vulnerability of populations in humanitarian settings have been slightly decreased, with an estimated 314 million people in need of humanitarian assistance in 2024 compared to 368 million in 2023.[29] Conflict, violations of international humanitarian law and international human rights law will continue to be the most significant drivers of humanitarian need in the near future, causing waves of displacement and impacting livelihoods. Forced displacement persists due to violent conflicts and war, large-scale global food crises, and climate change, which drive people into poverty and heighten vulnerability and humanitarian needs. Countries facing conflict or humanitarian emergencies often have weak or fragmented health systems. These circumstances, which precede the pandemic, severely limit affected countries' abilities to test, isolate, and treat COVID-19 patients. Furthermore, basic requirements for implementing PHSM in humanitarian settings are limited, and their strict enforcement in some settings has led to severe disruption of essential healthcare services and loss of livelihoods. Periods of acute emergency and heightened conflict allow for increased transmission as people are displaced and overcrowding occurs. Affected populations may also lack the financial resources to access care, causing circulation to go undetected due to low testing and reporting rates. People affected by humanitarian emergencies are also at higher risk of severe COVID-19 outcomes due to challenges in obtaining and administering therapeutics early, managing co-morbidities, and receiving healthcare for complications.

Operations support and logistics (OSL)

Global markets for the tools needed to respond to COVID-19 have stabilized, and countries have returned to routine access channels for needed supplies. In light of this, WHO closed its COVID-19 Supply Portal in December 2022, harmonizing COVID-19 supply efforts with those of other ongoing emergencies. The rapid spread of

COVID-19 in 2020 brought WHO OSL to the forefront of the global emergency response to the pandemic. The COVID-19 Supply Chain System set up and coordinated by WHO OSL in 2020 enabled WHO and partners to procure close to US$ 2 billion of PPE, diagnostics and biomedical equipment to support 194 Member States.

Partner coordination, funding, and external relations

In January 2024, WHO launched its global Health Emergency Appeal for US$ 1.5 billion to carry out health interventions in emergency and humanitarian responses. The appeal includes a financial requirement of US$ 138.1 million for ongoing COVID-19 response operations throughout 2024. The mobilization of additional donor resources for the COVID-19 response in 2024 has been limited, however, with only US$ 9.8 million in new funding mobilized as of October 2024. This funding supplements approximately US$ 180.1 million carried forward from 2023 across all levels of the organization, which is available for implementation in 2024. Since this funding is benchmarked, it only partially alleviates the funding requirement for 2024.

The overall financing landscape in 2024 has remained difficult, as several donors have decreased or diverted their Official Development Assistance (ODA) to other priorities. Unlike the 2020-2022 period, donors no longer have funding allocations specific for COVID-19.

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Acronyms and abbreviations

Term	Description
Ag-RDT	Antigen-detecting rapid diagnostic test
ARIA	Indoor Airborne Risk Assessment in the context of SARS-CoV-2
e-GISRS	Expanded Global Influenza and Surveillance system
CERN	European Organization for Nuclear Research
CoViNet	WHO Coronavirus Network
ES	Environmental surveillance
EUL	Emergency Use Listing
EMR	Eastern mediterranean region
EUR	European region
FAO	Food and Agriculture Organization of the United Nations
FDA	United States Food and Drug Administration
HEPR	Health Emergency Preparedness, Response, and Resilience Framework
HIC	High-income country
ICU	Intensive care unit
IDSR	Integrated Disease Surveillance and Response

IPC	Infection prevention and control
IRP	Infectious respiratory particles
LIC	Low income country
LMIC	Lower middle income country
MIS-C	Multisystem inflammatory syndrome in children and adolescents from COVID-19
MNCH	Maternal, newborn, and child health
NCD	Non-communicable diseases
OSL	Operations support and logistics
PCC	Post COVID-19 condition
PHEIC	Public Health Emergency of International Concern
PHSM	Public health and social measures
PQ	Prequalification
PRET	Preparedness and Resilience for Emerging Threats
RCCE-IM	Risk communication, community engagement, and infodemic management
RSV	Respiratory syncytial virus
SAGE	Strategic Advisory Group of Experts on Immunization
SAGO	Strategic Advisory Group for the Origins of Novel Pathogens
SARI	Severe acute respiratory illness
SPRP	Strategic Preparedness and Response Plan
TAG-CO-VAC	Technical Advisory Group on COVID-19 Vaccine Composition
TAG-VE	Technical Advisory Group on Virus Evolution
UMIC	Upper middle income country
US CDC	United States Centers for Disease Control and Prevention
VE	Vaccine effectiveness
VOC	Variant of concern
VOI	Variant of interest
VUM	Variant under monitoring
WAHIS	World Animal Health Information System
WASH	Water, sanitation, and hygiene
WOAH	World Organization for Animal Health
WHO	World Health Organization
WPR	Western pacific region

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