Considerations for implementing and adjusting public health and social measures in the context of COVID-19

Interim guidance

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World Health Organization

Key Messages

- Public health and social measures (PHSM) have proven critical to limiting transmission of COVID-19 and reducing deaths.
- The decision to introduce, adapt or lift PHSM should be based primarily on a situational assessment of the intensity of transmission and the capacity of the health system to respond, but must also be considered in light of the effects these measures may have on the general welfare of society and individuals.
- Indicators and suggested thresholds are provided to gauge both the intensity of transmission and the capacity of the health system to respond; taken together, these provide a basis for guiding the adjustment of PHSM. Measures are indicative and need to be tailored to local contexts.
- PHSM must be continuously adjusted to the intensity of transmission and capacity of the health system in a country and at sub-national levels.
- When PHSM are adjusted, communities should be fully consulted and engaged before changes are made.
- In settings where robust PHSMs are otherwise in place to control the spread of SARS-CoV-2, allowing the relaxation of some measures for individuals with natural or vaccine-induced immunity may contribute to limiting the economic and social hardship of control measures. Applying such individualized public health measures must take into account a number of ethical and technical considerations.

Introduction

Public health and social measures (PHSMs) are being implemented across the globe to suppress SARS-CoV-2 transmission and reduce mortality and morbidity from COVID-19.1 PHSMs include personal protective measures (e.g. physical distancing, avoiding crowded settings, hand hygiene, respiratory etiquette, mask-wearing); environmental measures (e.g. cleaning, disinfection, ventilation); surveillance and response measures (e.g. testing, genetic sequencing, contact tracing, isolation, and quarantine); physical distancing measures (e.g. regulating the number and flow of people attending gatherings, maintaining distance in public or workplaces, domestic movement restrictions); and international travel-related measures. In this context, it does not include medical countermeasures such as drug administration or vaccination. PHSMs act in concert, and a combination of measures is required to ensure adequate control. Measures should be implemented by the lowest administrative level for which situational assessment is possible and tailored to local settings and conditions.

Several important developments have occurred since the publication of the previous *Considerations for implementing and adjusting public health and social measures in the context of COVID-19*.[2] First, several COVID-19 vaccines have been approved by national regulatory authorities and through WHO Emergency Use Listing (EUL).[3] Vaccination has begun in most countries, bringing the prospect of significantly reducing severe disease and mortality further. Initial observational studies following rollout of vaccines suggest that vaccines may lead to protection against infection and a reduction in transmission,[4–6] which in addition to PHSMs will help control the spread of the virus. Second, four WHO-classified variants of concern (VOCs) have emerged since December 2020,[7,8] which are more transmissible and some of which may cause more severe disease[9] and/or lead to a degree of vaccine escape, requiring potential adjustments to response measures to account for their different characteristics, including their impact on vaccine effectiveness. Several other variants of interest (VOIs) are also being monitored. Finally, more evidence is now available on the effectiveness of a range of individual and community-level measures (outlined in Table 3 below).

Control of SARS-CoV-2 will depend on: i) the prevalence of infection and of circulating variants; ii) the rate of growth or decline in incidence; iii) the types, use of and adherence to control measures in place; iv) the speed with which vaccination occurs; v) the targeting and uptake of the vaccines among high-risk groups; and vi) vaccine effectiveness and natural immunity in the population.[10] National vaccination strategies should prioritize older individuals at highest risk of severe outcomes and health workers, to rapidly reduce mortality and the burden of disease and protect health care services. However, with successful COVID-19 vaccination of older populations following the prioritization of vulnerable groups, the virus may continue to spread among unvaccinated younger population groups.[11] After achieving high vaccination coverage of SAGE priority groups for stage

I and stage II (as outlined in the WHO SAGE Roadmap For Prioritizing Uses of COVID-19 Vaccines in the Context of Limited Supply)[12] across all countries, accelerating vaccination of other priority groups will be required to lower the infection rate, especially in areas of high population density.[13]

While vaccination is underway, PHSMs will need to continue to be implemented, in a tailored and agile way, particularly considering uncertainty in vaccine performance against known and potentially emerging VOCs and limited sequencing capacity to detect variants worldwide.[14] Moreover, significant inequities in global vaccine access mean that, globally, control of disease will continue to rely on PHSM for the foreseeable future, modulated by different levels of vaccination. Implementation of stricter PHSMs, however, needs to be balanced against their socio-economic impacts, especially in settings with high dependence on daily wages and informal economy. Decisions to tighten, loosen, or introduce PHSMs to control COVID-19 must be weighed against the positive and negative impacts these measures have on societies and individuals. Considerations include impacts on health, economy, security, mental health, and psychosocial wellbeing, human rights, food security, socioeconomic disparities, continuity of other public health programmes, treatment and management of medical conditions other than COVID-19 and gender-based violence. Other important considerations include vaccine acceptance and uptake, confidence, trust, motivational elements to get vaccinated and public sentiment and adherence to PHSMs. The overall health and wellbeing of communities should therefore be at the forefront of considerations when deciding on and adjusting PHSMs.

As the pandemic continues to evolve, PHSMs should be regularly reviewed and adjusted according to the local epidemiology. This requires agile decision-making based on ongoing situational assessments at the most local administrative level possible in a coherent and coordinated manner with neighbouring areas at the sub-national and national levels. Such assessments should be based on available data and take a risk/benefit approach considering the local epidemiology, the health system's capacity to respond and other contextual considerations (such as upcoming mass gathering events that may alter transmission or capacity). Epidemiological indicators and their thresholds will depend on a country's testing and surveillance strategies and capacities, data collection capacity, vaccination strategy and coverage and the overall COVID-19 response strategy. In settings where COVID-19 surveillance or testing capacities are limited, it is important to identify and utilize additional indicators on morbidity, mortality and pressure on the health system, such as bed occupancy for both regular hospital beds and ICU beds, to complement available epidemiological data

This document provides guidance to help Member States assess the situation at national and sub-national levels, as well as key recommendations about the implementation of PHSMs. It should be read in conjunction with WHO interim guidance documents on *Critical preparedness, readiness and response actions for COVID-19*[1] *and Considerations for implementing a risk-based approach to international travel in the context of COVID-19*[15,16], which address several other elements of preparedness, readiness and response for COVID-19 beyond PHSMs.

This guidance document is intended for public health and health services decision-makers at all levels at which decisions about tailored PHSMs are made and technical actors involved in relevant sectors (e.g. community engagement, education, social services) supporting or impacted by PHSMs.

The guidance will be updated as our knowledge evolves, in particular in relation to the impact of VOCs on vaccine-induced and natural immunity, the impact of various COVID-19 vaccines on transmission and the impact of PHSMs on VOCs.

Changes from the previous version

This updated guidance provides updates on the assessment framework that drives decision-making for PHSMs, particularly on the type of indicators and the thresholds in different epidemiological settings, and in the context of vaccine roll-out and circulation of VOCs.

It also contains a new section on considerations for individualized public health measures based on a person's SARS-CoV-2 immunity status following COVID-19 vaccination or past infection in the context of contact tracing, international travel, and private social gatherings.

Recently published WHO scientific briefs and guidance were reviewed and key findings were summarised in Table 3. For the evidence on COVID-19 natural immunity, the document is based on the latest WHO scientific brief on *COVID-19 natural immunity.* [17] For the evidence of vaccines effectiveness, the document relies on the following published work: *SAGE working groups Annexes to WHO interim recommendations for use of the COVID-19 vaccine BIBP: GRADE and Evidence to Recommendations*[18]; *Annexes to the interim recommendations for use of theChAdOx1-S [recombinant] vaccine against COVID-19 (AstraZeneca COVID-19 vaccine AZD1222, SII Covishield, SK Bioscience)*[19]; and *Background document on the mRNA-1273 vaccine (Moderna) against COVID-19.*[20]

Transmission scenarios

Knowing the level of transmission is key to assessing the overall COVID-19 situation in a given area and guiding decisions on response activities and tailoring epidemic control measures.[1]

The community transmission (CT) classification is divided into four levels, as shown below. These definitions are abbreviated; details about the transmission classifications can be found in the Annex to this guidance.

- No (active) cases
- Imported / Sporadic cases
- Clusters of cases
- CT1: Low incidence of locally acquired widely dispersed cases detected in the past 14 days
- CT2: Moderate incidence of locally acquired widely dispersed cases detected in the past 14 days
- CT3: High incidence of locally acquired widely dispersed cases in the past 14 days
- CT4: Very high incidence of locally acquired widely dispersed cases in the past 14 days.

The transmission level classification for a geographic area may improve or worsen over time, and different geographic areas within a country will likely experience different levels of transmission concurrently. In settings with limited surveillance and diagnostic capacities, additional indicators – such as influenza-like-illness (ILI) / severe acute respiratory infection (SARI), all-cause excess mortality trends and all-cause hospitalization rates – should be identified to complement information on COVID-19 cases and deaths. These indicators are meant to capture pressure on the health care system and outcomes from undiagnosed COVID-19 cases and can support assessment of local transmission levels when triangulated with COVID-19 epidemiological data.

The process for determining transmission classification is outlined in the Annex to this document.

Health system response capacity

In addition to assessing the level of transmission, it is also necessary to understand the health system response capacity. Depending on whether there is adequate, moderate or limited capacity, the same level of transmission can result in a drastically different situations and require a different degree of PHSMs. For the purpose of this document, 'response capacity' encompasses both health and public health services, including COVID-19 vaccination, and is measured in terms of both the actual ability to deliver services and the performance of those services.

Situational assessment using transmission level and response capacity

Whether or not vaccination has begun, countries should continue to monitor transmission level and take measures as needed.

Where there is a high level of vaccine-acquired immunity among prioritized groups, the epidemiology may start to change. A decoupling may occur between incidence and hospitalization and/or death rates because individuals most prone to hospitalization and death will have been immunized. In this situation, a greater proportion of cases will occur among younger, less vulnerable population groups. Here, recalibrating the incidence thresholds, focusing on hospitalization and ICU rates and analyzing incidence data by age group – as well as assessing the potential caseload of undiagnosed COVID-19 cases – are essential to guiding the adjustment of PHSMs.

As new variants of concern emerge, PHSMs may need to be adapted in the presence of variants that may be more transmissible, cause more severe disease and/or evade immunity induced by vaccination and/or natural infection. All epidemiological and health system indicators should be followed closely and PHSMs applied according to the prevailing epidemiological and health system situation. A greater disease transmissibility (as for all currently identified VOCs) may require keeping PHSMs in place for a longer period or may require intensifying the implementation of existing PHSMs to maintain effects on transmission.

Based on the joint assessment of the transmission scenario and the health system response capacity – which will inform whether and how to adjust PHSMs – a situational level should be assigned to a geographic area (see Table 1). The assessment should rigorously and comprehensively examine quantitative and qualitative information from multiple sources, which should be triangulated to provide an additional reality check on the assessed situational level. The resultant **situational levels should only be considered indicative,** because they may not correspond well to the response required in a specific context and to the COVID-19 control objectives of the country. For example, in a small country with limited capacity or remote areas with limited access to health services, stringent PHSMs may be warranted in the context of a relatively low level of transmission.

Table 1: Situational level assessment matrix using transmission level and response capacity indicators to guide adjustment of PHSMs

	Response capacity*		
Transmission level*	Adequate	Moderate	Limited
No cases	0	0	1
Imported/Sporadic cases	0	1	1
Clusters of cases	1	1	2
• Community - CT1	1	2	2
• Community - CT2	2	2	3
• Community - CT3	2	3	3
• Community - CT4	3	3	4

*Please refer to the Annex for transmission level definitions.

- **Situational Level 0** corresponds to a situation with no known transmission of SARS-CoV-2 in the preceding 28 days. The health system and public health authorities are ready to respond, but there are no significant domestic measures in place and thus no significant restrictions on daily activities.
- **Situational Level 1** is a situation where basic measures are in place to prevent transmission; or if cases are already present, the epidemic is being controlled through effective measures around the cases, with limited and transient localized disruption of social and economic life.
- **Situational Level 2** represents a situation with low community incidence or risk of community transmission beyond clusters. Additional measures may be required to control transmission; however, disruptions to social and economic activities can still be limited. In the context of vaccination, Situational Level 2 may also include areas with moderate levels of community transmission, but limited health service impact given adequate vaccination coverage in at-risk and older age groups.
- **Situational Level 3** is a situation of community transmission with limited additional capacity to respond and a risk of health services becoming overwhelmed. A larger combination of measures may need to be put in place to limit transmission, manage cases, and ensure epidemic control.
- **Situational Level 4** corresponds to an uncontrolled epidemic with limited or no additional health system response capacity available, thus requiring extensive measures to avoid overwhelming of health services and substantial excess morbidity and mortality.

Adjusting public health and social measures

Key principles

Decisions on which measures to implement, lift or strengthen, and the order in which these measures should be implemented, should be based on the following guiding principles:

- Measures with the highest level of acceptability and feasibility and proven effectiveness – and which minimize the negative consequences on health and wellbeing of all members of society and the economy and – should be adopted, using *the* COVID-19 Global Risk Communication and Community Engagement Strategy – interim guidance.21 Acceptability and feasibility should be determined through participatory approaches and shift away from directives and one-way communications. Engaging with the community for this assessment will help to maximize the likelihood of adherence. Effectiveness and potential negative effects of PHSMs should be evaluated through an evidence-based assessment (e.g. literature review, WHO guidance, etc.) and active monitoring of the impact of implemented PHSMs.
- Additional measures should be considered as soon as the situational level rises. Delays in implementation of measures will lead to increased morbidity and mortality and the need for more stringent measures to regain control. In particular, efforts should be made to prevent an intensification in transmission from ‘clusters’ to ‘community transmission.
- When feasible, measures should be adjusted (implemented or lifted) in a controlled, stepwise manner to allow better understanding of the effects of each measure on transmission dynamics.
- Any decision to apply PHSMs must be weighed against the wider impact of the measures on health and well-being (lives lost in the short and long term compared to lives saved by applying PHSMs).

- Public health surveillance data and findings from case and cluster investigations may provide important information on conditions associated with transmission or severity. This is particularly important in the context of circulating VOCs, and potential new variants, since the lifting of PHSMs may provide a better understanding of the transmission and severity characteristics of these variants. Such information may help targeting application or intensification of certain PHSMs without imposing the measures universally on all settings (e.g. settings without these variants).
- Any available information on the level of immunity in the general population – either natural or vaccine-induced – must be taken into consideration when assessing the likely impact on SARS-CoV-2 transmission of lifting PHSMs.
- Protection of vulnerable populations,12 including those clinically at risk for severe disease should be central in the decision to implement, maintain or lift a measure. Vulnerable populations include people aged ≥60 years and/or with comorbidities that increase risk of serious COVID-19 disease; disadvantaged groups such as marginalized populations, vulnerable migrants and refugees; and those in high density/low resource settings and lower income groups. Vulnerable communities and disadvantaged individuals may face immediate challenges in meeting their basic life needs – such as income, shelter and food – when PHSMs are implemented and if implemented without adequate support.22 It is crucial that those essential needs be taken into account when designing different packages of PHSMs and addressed before these packages are implemented to avoid or minimize harm and improve effectiveness. It is critical to safeguard vulnerable and disadvantaged populations by implementing specific measures to support them, mobilizing resources and engaging all relevant sectors and communities to learn about their concerns and receive feedback. This includes ensuring access to health services (using community-based service delivery), which is especially challenging when transportation, clinics/hospitals and other government services are closed or have long waits. Other essential services include supplementary income or food provision; safe places for survivors of and/or those at risk of violence, including gender-based violence; and improvement of infrastructure and safety of public transport (which is used most by workers in vulnerable populations and essential workers) to make it compatible with PHSMs.
- The potential impact of lifting PHSMs on the health and public health systems capacities to rapidly respond to any new increase in cases should be considered. For example:
  - Adequate health system capacities should be in place to detect, test and manage new cases and their contacts.
  - The risk of outbreaks and/or severe disease in settings with vulnerable individuals should be minimized. This requires identifying all major drivers of SARS-CoV-2 transmission (e.g. various types of closed settings such as health care facilities and care homes) in the local context and understanding the vaccination coverage of priority populations in that context, with appropriate measures in place to maximize physical distancing and minimize the risk of outbreaks.
  - Key drivers of transmission in the area under assessment must be well understood using local surveillance data, and measures should be rapidly re-implemented should incidence increase. A particular focus should be on prevention and early detection of potential superspreading events.
- Basic risk mitigation measures aimed at reducing travel-associated exportation, importation and onward transmission of SARS-CoV-2 should always be maintained. For details, please refer to *Considerations for implementing a risk-based approach to international travel in the context of COVID-19*.[15,16]
  - In all cases, international travel should be prioritized for emergencies and humanitarian actions (such as emergency medical flights and medical evacuations); travel of essential personnel (such as emergency responders, providers of public health technical support, and critical personnel in the transport and security sectors such as seafarers); repatriations; and cargo transport for essential supplies such as food, medicines, and fuel.
  - Specific considerations are outlined in this document for the implementation of an individualized approach to quarantine and testing for international travellers with natural or vaccine-acquired immunity.

Community engagement and risk communication strategy

When PHSMs are adjusted, communities should be fully and regularly informed, engaged and enabled before changes are made, to allow them to take ownership of the selected PHSM.[23] It is critical to build and foster trust, especially in contexts where there is little or no involvement of the local population in decision-making. Clear, concise and transparent risk communication, including an evidence-based rationale for adjusting measures, should be developed with communities targeted for PHSM.

In particular:

- Communities should be given recognized roles to provide input and take ownership of when and how PHSMs will be implemented or lifted.
- Communities will be critical to implementing population-wide PHSMs and contributing to the mitigation of the social and economic impact of certain measures (e.g. disrupting availability of food and other needed supplies).
- Civil society organizations, faith-based organizations (FBOs) and volunteers play a critical role in fortifying community services (e.g. provision of food, medicines, mental health and other support services, tests and vaccinations) for those in need (e.g. people who are isolated or quarantined).

- Feedback mechanisms should be established to ensure that any societal impact of changes to PHSMs is quickly identified and reported for action. Communities should lead solutions to ensure adoption of measures that best meet local needs (for example by considering local cultural practices), which can increase the likelihood of adherence.
- Local community-level networks should be leveraged for sustained efforts by building capacity through training of local leaders.
- The infodemic[24] that has emerged from COVID-19 information overload and misinformation should be managed at all stages of the response by providing the right information at the right time to the right people through trusted channels (e.g. community and faith leaders, family doctors and other influential members of society). There should be a monitoring system in place to capture emerging trends (e.g. vaccine confidence and hesitancy, adherence to PHSM) to enable delivery of a targeted communication package.
- A communication and community engagement strategy should be developed before any changes to PHSMs are implemented or adjusted.[3] The strategy should be developed in consultation with relevant stakeholders from government, civil society, FBOs and community groups. Plans should include, at a minimum, behavioural objectives, target audiences, priority channels and a mix of strategies and activities to inform and engage the community.
- The key messages of such plans should cover information important to the community, such as the extent and estimated duration of the measures in place.
- Governments should regularly communicate epidemiological data to the public to further foster trust and increase acceptance and sustained adherence to PHSMs.

Adjustment of PHSMs based on situational assessment

Table 2 provides more detail on the types of domestic measures that may be implemented for each situational level. The measures at each level are only indicative, because some measures may be more or less feasible or appropriate in specific contexts and locations. Note that overall recommendations on international travel can be found in the interim guidance *Considerations for implementing a risk-based approach to international travel in the context of COVID-19*.[15,16]

Measures should be time-bound and regularly re-assessed, at least every two weeks, along with the situational level. The adherence to PHSMs should also be monitored, using sources such as mobility data, and this should be used to further inform future adjustment of PHSMs and the risk communications and community engagement strategy.

At all Situational Levels, individuals should apply personal protective measures such as hand hygiene, physical distancing, respiratory etiquette, staying home if unwell and wearing a mask where appropriate, and environmental measures (e.g. cleaning, disinfection, ventilation). Clear information should be provided to the public about what to do if unwell and whom to contact for advice, testing and/or treatment.

Table 2: Guidance on the implementation of domestic PHSMs for each Situational Level

Situational level	Considerations for implementation of PHSMs by situational level*
Situational level 0: No known transmission of SARS-CoV-2 in the preceding 28 days. The health system and public health authorities are ready to respond, but there are no significant restrictions on daily activities.	Surveillance should ensure that any new case can be detected and managed as early as possible, but there should be no restrictions on daily activities. Authorities may consider implementing the following measures: • Continue strengthening emergency preparedness, readiness and response actions,[1] ensuring adequate stockpiles of medicines and medical equipment and that sufficient staff have been recruited and trained to handle anticipated surges in cases. • Implement or maintain robust surveillance [25] to rapidly detect and investigate suspected SARS-CoV-2 cases and clusters[26] and ensure public health measures such as isolation and supported quarantine[27] are undertaken to reduce onward spread if cases are confirmed and contacts are identified, respectively. • Apply a risk-based approach based on the three steps of risk evaluation, risk mitigation and risk communication to inform the decision to restrict, modify, postpone, cancel or proceed with holding any mass gatherings, including medium and small events. For public gatherings, the risk assessment should be undertaken by local and national public health authorities and event organizers with input from all relevant stakeholders (emergency management, transport, safety and security, etc.). [28,29]
Situational level 1: Basic measures are in place to prevent transmission; or if cases are already present, the epidemic is being controlled through effective measures around the cases, with limited and transient localized disruption to social and economic life.	Specific measures should be taken around cases and/or clusters, and individual measures should be strengthened, with limited impact on social and economic activities. In addition to measures on emergency preparedness, readiness and response actions[1] and surveillance, personal protective measures and risk communications, authorities may consider implementing the following measures: • Emphasis should be placed on case and cluster detection, investigation, and tracing of contacts. • Promote avoidance of the '3 Cs' – Closed spaces, crowded places and close-contact settings. • Apply a risk-based approach based on the three steps of risk evaluation, risk mitigation and risk communication to inform the decision to restrict, modify, postpone, cancel or proceed with holding any mass gatherings, including medium and small events. For public gatherings the risk assessment should be undertaken by local and national public health authorities and event organizers with input from all relevant stakeholders (emergency management, transport, safety and security, etc.). [28,29] Daily activities and services, such as educational settings[30], businesses[31] and leisure/tourism can remain open with precautionary measures in place to limit the risk of spread. • Put in place measures to protect the most vulnerable, particularly ensuring that there are appropriate measures in place in long-term care[32] and other residential facilities.
Situational level 2: Low community incidence or a risk of community transmission beyond clusters. Additional measures with respect to Situational level 1 may be required to control transmission; however, disruptions to social and economic activities can still be limited	Measures should be applied to limit the number of physical encounters with others outside of the household, while ensuring services can remain open with precautionary measures in place. A wider range of PHSMs may be required to control transmission. In addition to measures on emergency preparedness and response and surveillance, personal protective measures and risk communications, authorities may consider implementing the following measures: • Education settings remain open with precautionary measures in place. • Businesses remain open, with precautionary measures in place, with teleworking encouraged as much as possible. • Improve local transport infrastructure to comply with PHSMs (improve availability, frequency, extension of schedules, etc.). • Apply a risk-based approach based on the three steps of risk evaluation, risk mitigation and risk communication to inform the decision to restrict, modify, postpone, cancel or proceed with holding any mass gatherings, including medium and small events. For public gatherings the risk assessment should be undertaken by local and national public health authorities and event organizers with input from all relevant stakeholders (emergency management, transport, safety and security, etc.) [28,29]. • If required, place further emphasis on protecting the most clinically vulnerable, through strict application of infection prevention and control measures, heightened surveillance and managing visits in long-term care and other residential facilities. • If contact tracing is overwhelmed, consider prioritization of contact tracing (see *Contact tracing in the context of COVID-19.*[33]).

Situational level	Considerations for implementation of PHSMs by situational level*
Situational level 3: Community transmission with limited additional capacity to respond and a risk of health services becoming overwhelmed. A larger combination of control measures may need to be put in place to limit transmission, manage cases, and ensure epidemic control.	Strengthening of all PHSMs is needed to avoid more stringent restrictions on movement and other related measures applied under level 4. All individuals should reduce their social contacts, and some activities may need to close while allowing for essential services, particularly schools, to remain open. In settings with high dependence on daily wages and informal economy, mitigation of the potential socio-economic costs of strengthening PHSMs needs to be planned properly in advance. In addition to measures on emergency preparedness and response and surveillance, personal protective measures and risk communications, authorities may consider implementing the following measures: • Adapt the functioning of businesses to minimize COVID-19 risk, including through remote working, modified service provision, or closure where necessary. • Improve local transport infrastructure to comply with PHSMs (improve availability, frequency, extension of schedules, etc.). • Consider limiting in-person university teaching, and institute e-learning. • Childcare services and primary and secondary schools should remain open with adequate safety and surveillance measures in place as long as the local context allows. Continuity of education for children for their overall well-being, health and safety should be at the forefront of all relevant considerations and decisions. • Due to risk of further transmission in an already high transmission level with limited healthcare resources, all PHSMs may be best applied without relaxing any measures according to individuals' immune status. See section below on "individualized public health measures". • Apply a risk-based approach based on the three steps of risk evaluation, risk mitigation and risk communication to inform the decision to restrict, modify, postpone, cancel or proceed with holding any mass gatherings, including medium and small events. For public gatherings the risk assessment should be undertaken by local and national public health authorities and event organizers with input from stakeholders (emergency management, transport, safety and security, etc.) [28,29]. • Quantify the needs in advance and provide the necessary socio-economic support for low-income individuals and households and those at risk of falling into poverty, ensuring no-one is left behind. Socioeconomic recovery for these vulnerable groups and the general population should also be prepared for in advance and resources secured to the extent possible.
Situational level 4: An uncontrolled epidemic with limited or no additional health system response capacity available, thus requiring extensive measures to avoid overwhelming of health services and substantial excess morbidity and mortality.	Reducing transmission in the community will be challenging, and stringent movement restrictions and related measures will need to be put in place to significantly reduce the number of in-person encounters. Such measures should be geographically limited to where they are needed and be time-bound and aimed to be as short as reasonably possible. In addition to measures on emergency preparedness and response and surveillance, personal protective measures and risk communications, authorities may consider implementing the following measures: • All individuals, including fully vaccinated, partially vaccinated and recovered individuals, should stay at home and limit physical contact with people outside the household. • Essential workers will need to continue activities, with maximum support and safety measures in place. Improve local transport infrastructure to comply with PHSMs (improve availability, frequency, extension of schedules, add private transport to public transport infrastructure, etc.). • Close non-essential businesses, and institute remote working. • Consider all options for continuity of in-person learning. If not possible, limit in-person contact. Options may include in-person or blended learning strategies that strictly limit the number of people physically on site (exceptions would include children of essential workers and their teachers) and remote learning. The closure of educational facilities should only be considered when there are no other alternatives. • All long-term care and other residential facilities should consider strict measures to limit the risk of infection, up to and including temporary suspension of in-person visits. • Cancel or postpone any mass gatherings. • Quantify needs (in advance) and provide necessary socio-economic support for low-income individuals and households and those at risk of falling into poverty, ensuring no-one is left behind. Carefully monitor the impact of strict PHSMs on the livelihoods and well-being of these vulnerable groups. Socio-economic recovery for these vulnerable groups and the general population should also be planned in advance and resources secured to the extent possible.

*The specific measures implemented at each level will need to be carefully considered based on the guiding principles outlined above. The measures at each level are only indicative, since some measures may be more or less feasible or appropriate in specific contexts and locations

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Considerations for the implementation of individualized public health measures

In settings where robust PHSMs are otherwise in place to control the spread of SARS-CoV-2, allowing the relaxation of some measures for some individuals may contribute to limiting the economic and social hardship of control measures. The differential "personal protective measures" for immune (fully vaccinated or recovered from infection) versus non-immune individuals will be referred to as **individualized public health measures**.

Applying **individualized public health measure** recommendations based on someone's immunity status must be carefully considered in the light of a number of aspects, including: the level of transmission of SARS-CoV-2; the evidence around the impact of various COVID-19 vaccines in preventing transmission; effectiveness against disease and duration of vaccine-induced immunity; the level and duration of protection conferred by natural immunity; the COVID-19 response strategy and risk tolerance of the implementing country; the potential circulation of immune-escape VOCs; and important ethical considerations, particularly given current limited availability of vaccines worldwide and existing inequities in vaccine availability across and within countries and population groups.

Ethical considerations

Details on the ethical considerations related to individualized public health measures in the context of COVID-19 are provided in other WHO publications.[17,34] Key considerations can be found below:

- **Proportionate and inclusive approach:** Before implementing individualized public health measures, governments or other competent authorities should, as much as possible, reduce barriers to vaccination; consider measures that least infringe of the rights and liberties of non-vaccinated individuals; and consider options for non-vaccinated individuals such as the results of reliable negative COVID-19 tests and making tests accessible to all (e.g. free testing once a week) or issuing immunity certificates for recovered individuals. This may help ensure that measures for non-vaccinated individuals are proportionate and as socially inclusive (defined here as removing or reducing barriers that prevent people from participating in civil, social and economic life) as possible.
- **Exemptions:** A system of recording and verifying exemptions from COVID-19 vaccination based on medical reasons, or other reasons provided for in law or relevant regulations, should be established if vaccination certificates are introduced to impose individualized public health measures on vaccinated and non-vaccinated individuals. Careful attention should be paid to ensuring that the collection, storage and use of such data are limited to scientifically and ethically justified purposes compatible with sustained public trust and confidence.

Technical considerations for individualized public health measures

Although vaccinated individuals or individuals with documented past infection may still be able to be (re-)infected and transmit the infection, growing evidence (see Table 3) suggests that the risk of infectiousness is substantially lowered. On this basis, countries may decide to relax quarantine requirements for individuals with evidence of immunity, since the burden of quarantine may outweigh the risk of transmission. However, if circulation of variant(s) able to evade established immunity becomes evident, such relaxation may not be advisable, because variants could still be transmitted efficiently.

The lower risk of infection following full COVID-19 vaccination likely varies by COVID-19 vaccine; given the paucity of data for all available COVID-19 vaccines, WHO recommends countries adopt a risk-based approach. This should also consider the local epidemiological context, and the context of the exposure (risk assessment of exposure), as some settings like health-care facilities may pose a higher risk, leading to classification of health-care workers as high-risk contacts.[5]

Table 3 below summarizes the main technical considerations around individualized public health measures in the context of vaccine-induced and natural immunity. The table was drafted based on evidence available as of 14 June 2021.

Table 3: Review of existing evidence on SARS-CoV-2 past infection, COVID-19 vaccines and variants of concern, and main technical considerations for individualized public health measures in the context of vaccine-induced and natural immunity

Element	Considerations
SARS-CoV-2 infection	• Natural immunity confers high levels of protection against reinfection, with estimates varying from around 81% to close to 100% protection in people younger than 65 years or among health workers during follow up of at least five to seven months.[6,35–37] Protection against reinfection appears to vary by age group and is lower (approximately 47%) among people aged 65 years and older.[35,38] • Evidence of immunity to SARS-CoV-2 is most commonly determined by measuring antibodies in sera. Within four weeks following infection, 90-99% of individuals infected with the SARS-CoV-2 virus develop detectable neutralizing antibodies.[14,39,40] • While correlates of protection are yet to be fully established, currently the presence of neutralizing antibodies is the best indication for protection against re-infection. How long protection lasts remains unclear and may differ depending on disease severity. Protection after infection with common cold coronaviruses, which often cause mild disease, is highly transient; and for SARS-CoV-2, there is evidence that immunological memory is 6-8 months.[41,42] • While protection is high, natural immunity does not provide 100% sterilizing immunity. Individuals who have natural immunity are still have a potential risk of reinfection and may be infectious.[43]
COVID-19 vaccination	• Different vaccine products may differ in their effectiveness, including against VOCs. The risk of onward transmission and duration of protection also may vary. Waning immunity and vaccine effectiveness over time will need to be documented as vaccination rollout progresses. • At the time of publication, in human clinical trials, all WHO Emergency Use Listed (EUL) vaccines have demonstrated efficacy (63% to 95%) against symptomatic, laboratory-confirmed COVID-19.[20,44–46] • In human clinical trials, all vaccines that currently have WHO EUL (as of the time of publication) have demonstrated high efficacy (over 89%) against severe COVID-19, indicating that the chance of developing severe disease in a fully vaccinated person is very low for younger and middle-aged adults and very low to moderate for older adults or other persons with underlying risk factors.[47,48] • Results from post-introduction observational studies have reported vaccine effectiveness estimates ranging from 64% to over 97%. The duration of protection remains unclear, because vaccine effectiveness has been measured only shortly after the introduction of the vaccines; but a recent eight-month follow up of recipients of one vaccine reported a durable response to the studied vaccine.[49] • One studied vaccine prevented infection for 70% of individuals at 21 days after a single dose and 85% of individuals at 7 days after two doses, providing real-world estimates of vaccine protection against infection.[50] • There is emerging evidence that vaccination substantially reduces the risk of onward transmission of SARS-CoV-2 to susceptible contacts.[51,52] • There is also emerging evidence that use of COVID-19 vaccines at the population level has a positive impact on the disease dynamics in the population.[53,54]
Variants of concern (VOCs) (as of the time of publication)	• Some SARS-CoV-2 variants, including all currently identified VOCs (i.e. Alpha [B.1.1.7], Beta [B.1.351], Gamma [P.1] and Delta [B.1.671.2], exhibit increased transmissibility as compared to previously/co-circulating variants.[8] This primarily influences transmission levels and the potential need to keep general PHSMs in place for longer or at a higher intensity, rather than specifically influencing considerations for individualized public health measures. • Evidence of increased resistance of some SARS-CoV-2 variants (including all four VOCs) to natural or vaccine-induced neutralizing antibodies has been reported, raising the concern that reinfection after natural infection or breakthrough infection after vaccination may increase in settings where such VOCs circulate widely.[8,55] • The convergent evolution of mutations thought to be associated with higher transmissibility or immune escape (e.g. N501Y, E484K) in VOCs highlights the fact that variants will likely continue to emerge under selective pressures such as population immunity.[56]

Note: references cited do not represent an exhaustive list of all relevant references on these topics

Implementation of individualized public health measures based on available evidence (as of 14 June 2021)

After taking into consideration ethical and technical considerations and transmission levels, countries may consider relaxing some measures for individuals meeting either of the following criteria:

- completion of full vaccination with one of the WHO EUL vaccines or approved by a stringent regulatory authority (and at least two weeks after completion of vaccination)
- SARS-CoV-2 infection confirmed by RT-PCR within the past 6 months and no longer infectious as per WHO's Criteria for releasing COVID-19 patients from isolation.[55]

Depending on the transmission level, below are some options for individualized measures in:

- waiving quarantine following close contact with a confirmed COVID-19 case
- waiving testing and/or quarantine requirements in the context of international travel
- allowing congregating in indoor private settings with other fully vaccinated or recovered individuals without wearing masks and without applying physical distancing.

Decision makers should apply a risk-based approach when considering the use of masks for the general public regardless of vaccination or natural immunity status. In areas of known or suspected community or cluster SARS-CoV-2 transmission: WHO advises that the general public should wear a non-medical mask in indoor (e.g. shops, shared workplaces, schools) or outdoor settings where physical distancing of at least 1 metre cannot be maintained. If indoors, unless ventilation has been be assessed to be adequate, WHO advises that the general public should wear a non-medical mask, regardless of whether physical distancing of at least 1 metre can be maintained.[56] As part of the risk-based approach, local authorities may consider allowing congregation of fully vaccinated or recovered individuals without wearing masks and without applying physical distancing in indoor **private** settings in regions with low SARS-CoV-2 incidence (<20/100000 population). **In community or health care settings, where measures such as mask wearing are recommended, they should continue to apply to everyone.**

Figure 1 provides guidance for a risk-based approach to individualized public health measures, which takes into consideration both risk to individuals and to the population. This figure, which is based on the evidence in Table 3, shows that as the transmission level increases (left column), the risk of infection for individuals and the overall risk of additional infections and onward transmissions increases (arrows in columns 2-5), as does the overall risk of additional cases of severe disease arrows in columns 6-9. The differing gradients of the arrows in columns 2-9 further show that the degree of increased risk varies according to an individuals' age and immunity status.

The resulting options are shown in the column labelled "options for individualized public health measures". At the lowest levels of transmission, individualized measures (waiving quarantine in the context of close contact, waiving quarantine and/or testing in the context of domestic and international travel, freely congregating in private settings with other fully vaccinated or recovered individuals without wearing masks or physical distancing) can be considered for all immune individuals. At the highest transmission levels, measures should be retained for all individuals, irrespective of immune status. At intermediate levels of transmission, there is a disproportionately high risk of transmission and severe disease in recovered individuals ≥60 and/or with underlying risk factors, and authorities may consequently wish to consider retaining measures for this group. Considerations may need to be further tailored to local contexts. For example, in situations with no known domestic circulation, a full quarantine may be required for all travellers, regardless of immunity status, to control the residual risk of importation. Further, in situations where healthcare capacity is extremely limited, measures may need to be retained at relatively lower levels of transmission to avoid overburdening the health care system with any additional cases.

Figure 1. Options for Individualized Public Health Measures

Exposure risk (transmission level)	Factors involved in informing options for individualized public health measures								Options for individualized public health measures	Factors that could increase the risk
	Fully vaccinated ≥60* and/or with underlying risk factors	Fully vaccinated <60	Recovered individuals ≥60 and/or with underlying risk factors	Recovered individuals < 60	Fully vaccinated ≥60 and/or with underlying risk factors	Fully vaccinated <60	Recovered individuals ≥60 and/or with underlying risk factors	Recovered individuals <60		
	Infection risk / Net transmission Risk				Net risk of severe disease					
Lower ↓ Higher	↓	↓	↓	↓	↓	↓	↓	↓	Relax measures for all immune individuals† ↓ Consider retaining measures for recovered individuals ≥60 and/or with underlying risk factors‡ ↓ Retain measures for all individuals§	Presence of immune escape variants

* Most transmission evidence uses an age category of 65 and older, while most severity evidence references persons 60 years and older; for consistency, the more conservative grouping of 60 years and older is retained in this table.

† Relaxing of restrictions and preventive measures (waiving quarantine in the context of close contact, waiving quarantine and/or testing in the context of and international travel, freely congregating with other fully vaccinated or recovered without wearing masks or physical distancing in private settings) for all immune individuals

‡ Due to increasing risk of severe disease and of transmission

§ Due to moderate to high risk of further transmission, all individuals should stay at home and limit physical contact with people outside the household.

The risk matrix presented above is informed by the scientific evidence on SARS-CoV-2 past infection, COVID-19 vaccines and SARS-CoV-2 variants of concern available at the time of this writing. *Infection risk* is a product of the *exposure risk* (which is proportionate to the level of transmission of the virus) and the *susceptibility to infection, if exposed*. The *net transmission risk* is the product of the *infection risk* and the *risk (if infected) of transmitting infection* to non-immune individuals. Given the lack of evidence to the contrary, for the purposes of this framework *the risk (if infected) of transmitting infection* by individuals with reinfection / vaccine-breakthrough infection is assumed to be equal to that seen in primary infection; thus, the *net transmission risk* is assumed to be proportionate to the *infection risk*. *Net risk of severe disease* is the product of the *infection risk* and the *risk (if infected) of severe disease*.

Considerations for quarantine

As per the evidence presented in Table 3, contacts who are fully vaccinated or contacts without risk factors who have recovered from COVID-19 could be considered lower-risk contacts, both in terms of the likelihood of becoming infected and the severity of disease if infected. Consequently, some countries may decide to exempt them from quarantine. However, these contacts should be advised to monitor their symptoms following their exposure; if symptoms develop, they should be tested for SARS-CoV-2, and isolated if they are found to be infected with SARS-CoV-2. Countries may also need to take into consideration the context of the exposure (risk assessment of nature of exposure), because some settings like health-care facilities may pose a higher risk, leading to classification of health-care workers as high-risk contacts. Tailored adjustment for key groups with low risk tolerance may be considered, such as for health care workers or staff of long-term care facilities for the elderly, to minimize risks of potential onward transmission.

As lower risk contacts may still pose some residual risk for onward transmission, countries may opt to quarantine lower-risk contacts if there are concerns about transmission of immune-escape variants, or if their goal is elimination of local transmission.

International travel risk-mitigation measures

At present, WHO does not support the introduction by national authorities or by conveyance operators of requirements for proof of vaccination or natural immunity against SARS-CoV-2, neither as a condition for exiting or entering a country, nor as a condition for traveling internationally.[57]

In the context of the COVID-19 pandemic, international travel should always be prioritized for emergencies and humanitarian actions; travel by essential personnel; repatriations; and cargo transport of essential supplies such as food, medicines and fuel.

At present, international travellers are not considered contacts of SARS-CoV-2 in principle unless a traveller meets the definition of a contact.[15,16] Furthermore, international travellers should not be categorized as suspected COVID-19 cases. Therefore, WHO does not recommend healthy travellers as a priority group for SARS-CoV-2 testing, in particular when resources are limited, to avoid diverting resources from settings and patients where testing can have a higher public health impact and drive action.[15,16]

In line with the individualized approach to public health measures outlined earlier in this guidance, countries may consider fully vaccinated or recovered individuals as lower-risk travellers and may consider waiving testing and/or quarantine of arriving international travellers. Such decisions should be based on a detailed risk assessment that takes into account the COVID-19 control objectives of the arrival country and the SARS-COV-2 incidence, and prevalence of VOCs, in the departure country. For more details, updated interim guidance: Considerations for implementing a risk-based approach to international travel in the context of COVID-19 is forthcoming.[15]

References

1. World Health Organization. Critical preparedness, readiness and response actions for COVID-19: interim guidance, 7 March 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/331422
2. World Health Organization. Considerations for implementing and adjusting public health and social measures in the context of COVID-19: interim guidance, 4 November 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/336374
3. World Health Organization. COVID-19 vaccines [Internet]. [cited 2021 May 3]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines
4. Haas EJ, Angulo FJ, McLaughlin JM, Anis E, Singer SR, Khan F, et al. Impact and effectiveness of mRNA BNT162b2 vaccine against SARS-CoV-2 infections and COVID-19 cases, hospitalisations, and deaths following a nationwide vaccination campaign in Israel: an observational study using national surveillance data. The Lancet [Internet]. 2021 May 5 [cited 2021 May 10];0(0). Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)00947-8/abstract
5. Thompson MG. Interim Estimates of Vaccine Effectiveness of BNT162b2 and mRNA-1273 COVID-19 Vaccines in Preventing SARS-CoV-2 Infection Among Health Care Personnel, First Responders, and Other Essential and Frontline Workers — Eight U.S. Locations, December 2020–March 2021. MMWR Morb Mortal Wkly Rep [Internet]. 2021 [cited 2021 Jun 14];70. Available from: https://www.cdc.gov/mmwr/volumes/70/wr/mm7013e3.htm
6. Hall VJ, Foulkes S, Saei A, Andrews N, Oguti B, Charlett A, et al. COVID-19 vaccine coverage in health-care workers in England and effectiveness of BNT162b2 mRNA vaccine against infection (SIREN): a prospective, multicentre, cohort study. The Lancet. 2021 May 8;397(10286):1725–35.

7. World Health Organization. COVID-19 weekly epidemiological update, 30 March 2021 [Internet]. 2021 Mar. Available from: https://apps.who.int/iris/handle/10665/340513
8. World Health Organization. COVID-19 weekly epidemiological update, edition 43, 8 June 2021 [Internet]. Geneva: World Health Organization; 2021 Jun. Available from: https://apps.who.int/iris/handle/10665/341716
9. Davies NG, Jarvis CI, Edmunds WJ, Jewell NP, Diaz-Ordaz K, Keogh RH. Increased mortality in community-tested cases of SARS-CoV-2 lineage B.1.1.7. Nature. 2021 Mar 15;1–5.
10. Moore S, Hill EM, Tildesley MJ, Dyson L, Keeling MJ. Vaccination and non-pharmaceutical interventions for COVID-19: a mathematical modelling study. The Lancet Infectious Diseases [Internet]. 2021 Mar 18 [cited 2021 Mar 22];0(0). Available from: https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(21)00143-2/abstract
11. Li J, Giabbanelli PJ. Returning to a normal life via COVID-19 vaccines in the USA: a large-scale agent-based simulation study. medRxiv. 2021 Feb 3;2021.01.31.21250872.
12. World Health Organization. WHO SAGE Roadmap For Prioritizing Uses Of COVID-19 Vaccines In The Context Of Limited Supply [Internet]. [cited 2021 May 7]. Available from: https://www.who.int/publications/m/item/who-sage-roadmap-for-prioritizing-uses-of-covid-19-vaccines-in-the-context-of-limited-supply
13. Huang B, Wang J, Cai J, Yao S, Chan PKS, Tam TH, et al. Integrated vaccination and physical distancing interventions to prevent future COVID-19 waves in Chinese cities. Nature Human Behaviour. 2021 Feb 18;1–11.
14. Wells CR, Galvani AP. The interplay between COVID-19 restrictions and vaccination. The Lancet Infectious Diseases [Internet]. 2021 Mar 31 [cited 2021 Apr 8];0(0). Available from: https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(21)00074-8/abstract
15. World Health Organization. Coronavirus disease (COVID-19) travel advice [Internet]. [cited 2021 May 7]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/travel-advice
16. World Health Organization. Considerations for implementing a risk-based approach to international travel in the context of COVID-19: interim guidance, 16 December 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/337858
17. World Health Organization. COVID-19 natural immunity: scientific brief, 10 May 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/341241
18. World Health Organization. Annexes to the interim recommendations for use of the inactivated COVID-19 vaccine BIBP developed by China National Biotec Group (CNBG), Sinopharm: grading of evidence: evidence to recommendation tables, 7 May 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/341254
19. World Health Organization. Annexes to the interim recommendations for use of the ChAdOx1-S [recombinant] vaccine against COVID-19 (AstraZeneca COVID-19 vaccine AZD1222, SII Covishield, SK Bioscience): grading of evidence - evidence to recommendations tables, first issued 10 February 2021, updated 21 April 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/340921
20. World Health Organization. Background document on the mRNA-1273 vaccine (Moderna) against COVID-19: background document to the WHO Interim recommendations for use of the mRNA-1273 vaccine (Moderna), 3 February 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/339218
21. World Health Organization. COVID-19 global risk communication and community engagement strategy, December 2020 - May 2021: interim guidance, 23 December 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/338057
22. WHO Working Group on Ethics & SARS-CoV-2. Ethics & SARS-CoV-2 – Restrictive Measures and Physical Distancing [Internet]. [cited 2021 May 3]. Available from: https://epidemicethics.tghn.org/articles/ethics-sars-cov-2-restrictive-measures-and-physical-distancing/
23. World Health Organization. Risk communication and community engagement (RCCE) readiness and response to the 2019 novel coronaviruses (2019-nCoV): interim guidance, 26 January 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/330678
24. World Health Organization. Infodemic management of WHO Information Net Work for Epidemics [Internet]. [cited 2021 Jun 14]. Available from: https://www.who.int/teams/risk-communication/infodemic-management
25. World Health Organization. Public health surveillance for COVID-19: interim guidance, 16 December 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/337897
26. World Health Organization. Considerations in the investigation of cases and clusters of COVID-19: interim guidance, 22 October 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/336224
27. World Health Organization. Recommendations to Member States to improve hand hygiene practices to help prevent the transmission of the COVID-19 virus: interim guidance, 1 April 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/331661

28. World Health Organization. Key planning recommendations for mass gatherings in the context of the current COVID-19 outbreak: interim guidance, 14 February 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/331004
29. World Health Organization. Considerations for mass gatherings in the context of COVID-19: annex: considerations in adjusting public health and social measures in the context of COVID-19, 14 May 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/332079
30. World Health Organization, United Nations Children's Fund (UNICEF), United Nations Educational Scientific and Cultural Organization. Considerations for school-related public health measures in the context of COVID-19: annex to considerations in adjusting public health and social measures in the context of COVID-19, 14 September 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/334294
31. World Health Organization. Getting your workplace ready for COVID-19: How COVID-19 spreads, 19 March 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/331584
32. World Health Organization. Infection prevention and control guidance for long-term care facilities in the context of COVID-19: interim guidance, 8 January 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/338481
33. World Health Organization. Contact tracing in the context of COVID-19: interim guidance, 1 February 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/339128
34. World Health Organization. COVID-19 Vaccination Certificates/Passports and Lifting Public Health and Social Measures – Key Ethical Issues. Forthcoming 2021.
35. Hansen CH, Michlmayr D, Gubbels SM, Mølbak K, Ethelberg S. Assessment of protection against reinfection with SARS-CoV-2 among 4 million PCR-tested individuals in Denmark in 2020: a population-level observational study. The Lancet. 2021 Mar 27;397(10280):1204–12.
36. Lumley SF, O'Donnell D, Stoesser NE, Matthews PC, Howarth A, Hatch SB, et al. Antibody Status and Incidence of SARS-CoV-2 Infection in Health Care Workers. New England Journal of Medicine. 2021 Feb 11;384(6):533–40.
37. Abu-Raddad LJ, Chemaitelly H, Malek JA, Ahmed AA, Mohamoud YA, Younuskunju S, et al. Assessment of the risk of SARS-CoV-2 reinfection in an intense re-exposure setting. Clin Infect Dis. 2020 Dec 14;
38. European Centre for Disease Prevention and Control. Risk of SARS-CoV-2 transmission from newly-infected individuals with documented previous infection or vaccination [Internet]. European Centre for Disease Prevention and Control. 2021 [cited 2021 Apr 8]. Available from: https://www.ecdc.europa.eu/en/publications-data/sars-cov-2-transmission-newly-infected-individuals-previous-infection
39. Guthmiller JJ, Stovicek O, Wang J, Changrob S, Li L, Halfmann P, et al. SARS-CoV-2 Infection Severity Is Linked to Superior Humoral Immunity against the Spike. mBio [Internet]. 2021 Feb 23 [cited 2021 Apr 8];12(1). Available from: https://mbio.asm.org/content/12/1/e02940-20
40. Wajnberg A, Mansour M, Leven E, Bouvier NM, Patel G, Firpo-Betancourt A, et al. Humoral response and PCR positivity in patients with COVID-19 in the New York City region, USA: an observational study. The Lancet Microbe. 2020 Nov 1;1(7):e283–9.
41. Edridge AWD, Kaczorowska J, Hoste ACR, Bakker M, Klein M, Loens K, et al. Seasonal coronavirus protective immunity is short-lasting. Nature Medicine. 2020 Nov;26(11):1691–3.
42. Dan JM, Mateus J, Kato Y, Hastie KM, Yu ED, Faliti CE, et al. Immunological memory to SARS-CoV-2 assessed for up to 8 months after infection. Science [Internet]. 2021 Feb 5 [cited 2021 Apr 8];371(6529). Available from: https://science.sciencemag.org/content/371/6529/eabf4063
43. Adrielle dos Santos L, Filho PG de G, Silva AMF, Santos JVG, Santos DS, Aquino MM, et al. Recurrent COVID-19 including evidence of reinfection and enhanced severity in thirty Brazilian healthcare workers. Journal of Infection. 2021 Mar 1;82(3):399–406.
44. World Health Organization. Background document on the Janssen Ad26.COV2.S (COVID-19) vaccine: background document to the WHO Interim recommendations for use of Ad26.COV2.S (COVID-19) vaccine, 17 March 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/340180
45. World Health Organization. Background document on the mRNA vaccine BNT162b2 (Pfizer-BioNTech) against COVID-19: background document to the WHO interim recommendations for use of the Pfizer–BioNTech COVID-19 vaccine, BNT162b2, under emergency use listing, 14 January 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/338671
46. World Health Organization. Background document on the AZD1222 vaccine against COVID-19 developed by Oxford University and AstraZeneca: background document to the WHO Interim recommendations for use of the AZD1222 (ChAdOx1-S [recombinant]) vaccine against COVID19 developed by Oxford University and AstraZeneca, 1 March 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/339882
47. Vaccines and Related Biological Products Advisory Committee December 17, 2020 Meeting Announcement - 12/17/2020 - 12/17/2020 [Internet]. FDA. 2021 [cited 2021 Apr 8]. Available from: https://www.fda.gov/advisory-committees/advisory-committee-calendar/vaccines-and-related-biological-products-advisory-committee-december-17-2020-meeting-announcement

48. European Centre for Disease Prevention and Control. Interim guidance on the benefits of full vaccination against COVID-19 for transmission and implications for non-pharmaceutical interventions [Internet]. European Centre for Disease Prevention and Control. 2021 [cited 2021 May 3]. Available from: https://www.ecdc.europa.eu/en/publications-data/interim-guidance-benefits-full-vaccination-against-covid-19-transmission

49. Widge AT, Rouphael NG, Jackson LA, Anderson EJ, Roberts PC, Makhene M, et al. Durability of Responses after SARS-CoV-2 mRNA-1273 Vaccination. New England Journal of Medicine. 2021 Jan 7;384(1):80–2.

50. Leshem E, Lopman BA. Population immunity and vaccine protection against infection. The Lancet [Internet]. 2021 Apr 23 [cited 2021 May 3];0(0). Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)00870-9/abstract

51. Harris RJ, Hall JA, Zaidi A, Andrews NJ, Dunbar JK. Impact of vaccination on household transmission of SARS-COV-2 in England. Pre-print. [Internet]. Available from: https://khub.net/documents/135939561/390853656/Impact+of+vaccination+on+household+transmission+of+SARS-COV-2+in+England.pdf/35bf4bb1-6ade-d3eb-a39e-9c9b25a8122a

52. V Shah AS, Gribben C, Bishop J, Hanlon P, Caldwell D, Wood R, et al. Effect of vaccination on transmission of COVID-19: an observational study in healthcare workers and their households. medRxiv. 2021 Jan 1;2021.03.11.21253275.

53. COVID-19 dynamics after a national immunization program in Israel | Nature Medicine [Internet]. [cited 2021 May 3]. Available from: https://www.nature.com/articles/s41591-021-01337-2

54. Victora C, Castro MC, Gurzenda S, Barros AJD. Estimating the early impact of immunization against COVID-19 on deaths among elderly people in Brazil: analyses of secondary data on vaccine coverage and mortality. medRxiv. 2021 Jan 1;2021.04.27.21256187.

55. Garcia-Beltran WF, Lam EC, St. Denis K, Nitido AD, Garcia ZH, Hauser BM, et al. Multiple SARS-CoV-2 variants escape neutralization by vaccine-induced humoral immunity. Cell. 2021 Apr 29;184(9):2372-2383.e9.

56. Madhi SA, Baillie V, Cutland CL, Voysey M, Koen AL, Fairlie L, et al. Efficacy of the ChAdOx1 nCoV-19 Covid-19 Vaccine against the B.1.351 Variant. New England Journal of Medicine [Internet]. 2021 Mar 16 [cited 2021 May 3]; Available from: https://www.nejm.org/doi/10.1056/NEJMoa2102214

57. World Health Organization. Mask use in the context of COVID-19: interim guidance, 1 December 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/337199

58. World Health Organization. Statement on the seventh meeting of the International Health Regulations (2005) Emergency Committee regarding the coronavirus disease (COVID-19) pandemic [Internet]. [cited 2021 May 7]. Available from: https://www.who.int/news/item/19-04-2021-statement-on-the-seventh-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-coronavirus-disease-(covid-19)-pandemic

Annex

Public health criteria to adjust public health and social measures in the context of COVID-19

Introduction

In response to the COVID-19 pandemic, countries around the globe have implemented public health and social measures (PHSM) for the control of SARS-CoV-2 transmission. As the local epidemiology of the disease changes, vaccines are rolled out and new variants of concern (VOCs) emerge, regular adjustment of such measures will be necessary.

This annex updates the annex to *Critical preparedness, readiness and response actions for COVID*-19 published on 4 November 2020 and outlines a process for decision-making on adapting PHSMs to the epidemiological situation, taking into account surveillance and testing capacities, the vaccination coverage in the target population and the health system's capacity for response. It should be read in conjunction with the main body of this document and the earlier interim guidance.[1]

This annex is intended for the public health divisions of national and sub-national authorities in locations that have introduced PHSMs and are considering adjusting them. Its guidance is restricted to the public health domain. Other documents published by WHO address different considerations that should enter into decision-making about introducing or loosening PHSM, including the welfare of a population.

How to use the guidance in this annex

The public health criteria in this annex are grouped into two dimensions that should be evaluated to address two main questions:

1. **Epidemiological situation/Transmission classification** – Is the epidemic controlled?
2. **Health system and public health services capacity and performance –** Is the health system able to detect and cope with COVID-19 cases while maintaining other essential health services?

These two dimensions should further be considered in the context of the national COVID-19 response strategy. Thresholds for action may depend on the country's overall strategy, and whether it is pursuing an elimination or control strategy.

The criteria are not prescriptive, and it may not be feasible to assess some of them, because of a lack of data, for example. Countries should focus on the criteria most relevant for them to inform decision making. In countries with limited surveillance data, vaccination coverage data among target groups can help steer decisions about PHSM, together with indicators from sentinel surveillance in health facilities or bed occupancy. The thresholds are indicative and may need to be revisited as further information about the epidemiology of COVID-19 and the impact of measures become available. It is recommended to systematically assess these criteria at least biweekly at the **lowest operational subnational administrative level** that is practical to inform tailored local responses.

This Annex also includes a third section presenting risk matrices for informing individualized public health measures.

1. Epidemiological situation/Transmission classification

Transmission classification categories can be used to determine the extent to which the epidemic can be considered controlled within each country/area and at sub-national levels. The transmission categories in one country, if published, are also useful to others when considering adjusting policies on trade and travel.

Defining transmission classification

The transmission classification developed in the last guidance has been maintained, with seven categories, as outlined in Table 1.

Annex Table 1: Definition of the categories for transmission classification

Category name	**Definition** *Countries/territories/areas with:*
No (active) cases	No new cases detected for at least 28 days (two times the maximum incubation period), in the presence of a robust* surveillance system. This implies a near-zero risk of infection for the general population.
Imported / Sporadic cases	Cases detected in the past 14 days are all imported, sporadic (e.g. laboratory acquired or zoonotic) or are all linked to imported/sporadic cases, and there are no clear signals of further locally acquired transmission. This implies minimal risk of infection for the general population.

Clusters of cases	Cases detected in the past 14 days are predominantly limited to well-defined clusters that are not directly linked to imported cases, but which are all linked by time, geographic location **and** common exposures. It is assumed that there are a number of unidentified cases in the area. This implies a low risk of infection to others in the wider community if exposure to these clusters is avoided.
Community transmission – level 1 (CT1)	**Low incidence** of locally acquired, widely dispersed cases detected in the past 14 days, with many of the cases not linked to specific clusters; transmission may be focused in certain population sub-groups. Low risk of infection for the general population.
Community transmission – level 2 (CT2)	**Moderate incidence** of locally acquired widely dispersed cases detected in the past 14 days; transmission less clearly focused in certain population sub-groups. Moderate risk of infection for the general population.
Community transmission – level 3 (CT3)	**High incidence** of locally acquired, widely dispersed cases in the past 14 days; transmission widespread and not focused in population sub-groups. High risk of infection for the general population.
Community transmission – level 4 (CT4)	**Very high incidence** of locally acquired widely dispersed cases in the past 14 days. Very high risk of infection for the general population.

* Note that in situations where COVID-19 surveillance is not robust, a lack of identified cases should not be interpreted as an absence of transmission; alternate indicators (see Table 5) should be examined to assess the possibility of undetected COVID-19 cases.

Primary indicators for assessing the level of community transmission

Four primary indicators to determine community transmission are proposed in Table 2. They are based on data that should be routinely collected during the pandemic. The relative importance of each available indicator will vary according to the local context (e.g. the reliability of the data for each indicator); and described limitations to interpreting each indicator should be taken into account. Indicators should be measured at the lowest administrative level of operations possible to inform targeted public health interventions. To develop transmission classification at a higher administrative level, a separate analysis should be conducted using indicators for that level, rather than attempting to aggregate lower-level transmission classifications.

These indicators should be used alongside other epidemiologic information available either routinely or through special studies or modelling estimates, as well as non-epidemiologic data and other considerations, for informing strategic and operational decisions.

It is recommended that these indicators be assessed biweekly, adopting the epidemiological week definition used in the country.

Ranges for the four indicators in Table 2 were developed through a review of existing data. They can be used to guide the application of the transmission classification at sub-national levels. These ranges are indicative and may require adjustment to local contexts and based on the performance (e.g. sensitivity, representativeness) of the local surveillance system and testing strategy and should be revisited periodically. Caution should be exercised when interpreting changes in indicators that occur in the context of changes to the surveillance system (e.g. an increase in testing rate or a change in the population under surveillance). Note that some indicators (e.g. overall incidence) may be higher in the presence of very large clusters, as in the case of superspreading events, than during community transmission.

It is helpful to monitor the testing rate as a measure of the coverage of surveillance. A minimum recommended rate is at least one person tested per 1000 population per week. Testing should not be limited to specific populations (e.g. only those in urban settings with high access to testing, or travellers). Denominator data must be available at the level of disaggregation being assessed (e.g. district, province). Some authorities may choose to specifically track these indicators among groups of individuals at greatest risk for severe disease and death.

After all available indicators are calculated, if the levels calculated based on each indicator are different, a qualitative review should be undertaken to determine the final transmission classification. It is recommended that if data are not available (or reliable) for all indicators, more weight should be given to the indicators considered more reliable in the local context. In many cases, indicators listed higher in Table 2 may be more reliable than those lower in the table.

In places where indicator values are not reliable, but the system is stable, trends can be used as an alternative assessment. One example would be a situation in which there is a very low testing rate, and many cases are likely missed, but the testing strategy is not changed.

Annex Table 2: Primary epidemiological indicators and proposed ranges to assess the level of COVID-19 transmission

Domain	Indicator	Description/Rationale	Major limitations	Level of community transmission			
				CT 1	CT 2	CT 3	CT 4
Hospitalization Rate	New COVID- 19 hospitalizations per 100 000 population per week*	A subset of all incident cases require hospitalization; thus, this is an indirect indicator of incidence. Unlikely to be subject to surveillance policy changes/differences.	May be influenced by hospitalization policy, e.g. if even mild cases are hospitalized for isolation purposes. Delayed measure of incidence.	<5	5 - <10	10 - <30	30+
Mortality	Number of COVID-19- attributed deaths per 100 000 population per week*	A subset of all incident cases are fatal, and thus this is an indirect indicator of incidence. Minimally influenced by surveillance policy if testing is comprehensive.	Delayed measure of incidence. At low levels and in small geographical regions, can be sensitive to minor fluctuations (e.g. one versus two deaths).	<1	1 - <2	2 - <5	5+
Case Incidence	New confirmed cases per 100 000 population per week*	Direct measure of incidence	Heavily influenced by surveillance system performance, testing policy and laboratory capacity. At low levels and in small geographical regions, can be sensitive to minor fluctuations in case counts, particularly due to batch reporting.	<20	20 - <50	50 - <150	150+
Testing	Test positivity rate per week (non-sentinel)*	This may be useful if there are limited sentinel sites. It may capture atypical cases better than sentinel surveillance.	Heavily influenced by testing strategy and capacity.	< 2%	2% - < 5%	5% - <20%	20%+

*Consider averaging over a two-week period to minimize the effect of random fluctuations.

Note: the thresholds in this table may be updated as additional data become available.

Additional indicators

Additional indicators that can provide further evidence to help classify the level of transmission are listed in Table 3. These indicators may not be readily available at the lowest administrative level of operations, however. They are therefore considered secondary to the primary four indicators listed in Table 2. Furthermore, they may not directly reflect transmission or force of infection of SARS- CoV-2 or may be more difficult to interpret and compare than those listed in Table 2. Thresholds are not presented for the secondary indicators, due to a lack of available data, high local variability or both.

As a last resort, where no indicator values are available, subjective assessment can be used, but this should be done over several weeks to avoid influences from transient or anecdotal observations.

Annex Table 3: Additional epidemiological indicators to assess level of COVID-19 community transmission*

Indicator	Description/Limitations
Intensive care unit (ICU) proportional occupancy	The proportion of new ICU admissions attributed to COVID-19, out of all ICU admissions for the same period (alternatively, proportion of current ICU beds occupied by patients with COVID-19, out of all occupied ICU beds)
Instantaneous reproduction number (Rt)	The instantaneous reproduction number is the average number of secondary cases each current case would produce if conditions remained the same. Rt should be estimated over successive weekly time windows and should be considered in combination with the number of cases at a given time. When there is a large volume of cases at a given time, Rt near 1.0 would sustain a high number of cases. While this is a widely used indicator of transmissibility, it requires familiarity with the various methods for calculation and sufficiently reliable and timely data on incidence. It also assumes a known serial interval distribution, which can in practice be hard to estimate for COVID-19 due to limited data on transmission chains.
Daily growth rate	The daily growth rate measures the epidemic growth or decline of an epidemic. It is approximately the percent of increase/decrease in daily case incidence.
Doubling time	The number of days required for the daily incidence to double. This is directly determined by the daily growth rate *r* and linked to Rt and the serial interval distribution. All else being equal, higher Rt will lead to shorter doubling times.
Proportion of unlinked cases among new cases	This is defined as the proportion of cases not previously listed as contacts (alternatively, the proportion not linked to known clusters/transmission chains). It is a measure of the spread in the community beyond known clusters. It is heavily influenced by case investigation and contact tracing capacity.
Test positivity proportion from sentinel sites averaged over a two- week period	Minimally influenced by testing strategy or capacity. Can provide a good, standardized way to monitor evolution over time if adequate number of samples are collected and sites are geographically representative. May not be representative of the general population if there are only limited sentinel sites.
Influenza-like-illness (ILI) or Severe Acute Respiratory Infection (SARI) trends	This is not directly indicative of COVID-19 cases, but sentinel surveillance for ILI and SARI can also capture a proportion of COVID-19 cases, and thus this is useful for monitoring trends for COVID-19. This measure may be helpful where COVID-19-specific surveillance is not robust.
Secondary attack rates (SAR)	This captures the probability that a contact person is infected following exposure to a confirmed case during their infectious period. Comparison of secondary attack rates in different contexts (e.g. vaccinated versus non-vaccinated individuals, different types of exposures, different variants) can shed light on risk factors for increased transmission.

All-cause hospitalization rate trends	This is not directly indicative of COVID-19 hospitalizations but, where COVID-19 cases make up a substantial proportion of hospitalizations, this can be useful for identifying trends in COVID-19 cases. These rates may decline due to restricted service provision and other public health measures. Trends must be analysed in the context of other potential causes of changes in hospitalization rates (e.g. concurrent influenza circulation). These trends may be helpful where COVID-19-specific surveillance is not robust.
All-cause (excess) mortality trends	This measure is not directly indicative of COVID-19 cases/deaths, but where COVID-19 deaths make up a substantial proportion of overall deaths, this can be useful for identifying trends in COVID-19 cases. Trends must be analysed in the context of other potential causes of changes in mortality rates (e.g. concurrent influenza circulation) and ideally compared with baseline data on mortality to identify excess above expected (e.g. seasonal) fluctuations. While this is a widely used indicator of transmission, it requires careful consideration of the inherent biases in mortality estimation methods.[3] This may also be a delayed indicator, depending on death and vital records system processes. These trends may be helpful where COVID-19-specific surveillance is not robust.
Cumulative vaccination uptake (by first dose or fully vaccinated)	Defined as the proportion of individuals who received a) the first dose, or b) the full recommended series of any COVID-19 vaccine, as percentages of the total population of a country or area. Cumulative vaccination uptake can provide a useful indication of population coverage†, especially in the short term. Over longer timeframes, using uptake data to infer vaccination coverage also needs to take into account changes in the population denominator (including by age group), especially mortality among targeted groups. Uptake and coverage data may provide an indication of population protection from COVID-19 disease during the months following vaccination. It is currently unknown whether such protection might wane over longer timeframes or whether new virus variants might affect vaccine efficacy and effectiveness. Evidence about the role of vaccination in preventing infection and preventing transmission is being assessed.

*This list should not be considered exhaustive. † For further information on COVID-19 vaccination uptake, rate, and coverage, please refer to *Monitoring COVID-19 Vaccination*, Page 5.[4]

Trends in transmission

In addition to calculating the category of transmission classification, it is also important to understand the direction of the trends of contributing indicators (stable, decreasing or increasing) over several weeks. This can assist in determining whether measures implemented are improving the epidemiological situation in the area, and for planning future changes, or putting in place anticipatory changes to public health measures based on a likely change in the transmission classification.

2. Health and public health services capacity and performance

The capacity to respond to the existing epidemiologic situation of COVID-19 (i.e., the transmission classification) is a key consideration in the decision to adapt PHSM. Clinical care and public health services are two key domains that reflect the ability of a country to adapt and respond to the requirements of both the COVID-19 caseload and the burden of disease more generally. Sufficient clinical care capacity is required to treat both inpatient and ambulatory cases of COVID-19 while ensuring that the health system is not overwhelmed and can continue to treat the regular caseload of patients with other conditions, particularly during seasonal peaks, such as the influenza season, and at times of rapid or large increases in SARS-CoV-2 transmission. The public health response relies on the capacity of the surveillance system to detect and respond to changes in SARS-CoV-2 transmission and focuses on key activities including case detection, diagnostic testing and contact tracing. Each of the two domains (health services and public health) is divided into two principal sub-domains, namely capacity (output indicators) and performance (outcome and impact indicators).

While this section is not aimed to be overly prescriptive, it provides quantitative thresholds (Table 4) to categorize response capacity and performance into three categories: adequate, moderate and limited. It is important to note that capacity needs to be assessed in the context of the current transmission classification. Response capacity that has been considered adequate may, under a higher incidence scenario, be reduced to moderate or limited response capacity.

Assessing the overall level of health system and public health services capacity and performance

To assess the overall capacity and performance of the health system and public health services, authorities should use the same approach as outlined for transmission classification. This includes:

- prioritizing those indicators that are available and reliable and adjusting thresholds to local contexts and reliability of the data
- interpreting changes to indicators in the context of changes to data collection mechanisms
- undertaking a qualitative review to determine the final health system capacity level if the levels calculated based on each indicator are different
- using trends instead of quantitative thresholds where data are not reliable, but denominators are stable
- using subjective assessment as a last resort if no data are available
- observing trends in indicators to anticipate future changes to the health system and public health services capacity and performance level.

Additional indicators that can be used for triangulation are provided in Table 5. Assessments should be updated biweekly.

Annex Table 4: Primary indicators and proposed ranges to assess level of COVID-19 health system and public health services capacity and performance

Domain	Indicator	Description/	Major limitations	Capacity to respond		
				Adequate	Moderate	Limited
Clinical care capacity	Proportion of occupied hospital beds	High morbidity and mortality will occur if there is insufficient capacity to hospitalize severe cases. Should count all hospitalizations, not only COVID-	May be influenced by hospitalization policy (e.g. if all cases are isolated in hospital), which does not indicate true saturation of hospital capacity.	<75%†	75-<90%†	90%+ †
Clinical care performance	Case fatality rate of resolved (i.e., outcome known) hospitalized cases	Overall impact indicator of adequate COVID-19 care.	Highly dependent on age and various biases.[3] Must take into account any changes in case detection or testing strategy.	Decreasing trend	Stable trend	Increasing trend

Public health response capacity	Number of persons tested per 1000 population per week, averaged over a two-week period	Without sufficient testing, it is difficult to appropriately isolate and treat cases.	Not all laboratories are able to report individuals tested; if possible, can count number of new rather than repeat tests; otherwise can count number of tests, but this may be misleading due to repeat testing. Laboratories not reporting location of cases may mask disparities in testing (e.g. among non-urban populations). If using rapid diagnostic tests, these should be used according to guidance, and thresholds may need to be raised.	4+	1 - < 4	<1
Public health response performance	Proportion of cases for which an investigation has been conducted within 24 hours of identification	This indicates the capacity to identify transmission risks and exposed contacts. Where investigation is not recorded directly, can be measured by proxy indicator - proportion of cases with contacts listed.	May be difficult to obtain timely data.	80%+	60 - <80%	<60%
Public health response performance	Support for / adherence to PHSMs (can be further subdivided into personal protective measures versus other measures)	Qualitative assessment based on observation, media monitoring, perception or behaviour surveys, hotlines, focus groups, etc. Analysis including forecasting of effectiveness of PHSM to be considered, it is important to identify not only the current status but any barriers or enablers to improvement.	May be highly variable between sub-groups and across individual PHSMs and over time.	High (nearly universal adherence to most PHSMs).	Moderate (modest adherence to most PHSMs, or variable adherence across individual PHSMs).	Low (minimal adherence to most PHSMs).

† Hospital occupancy routinely varies considerably between countries and health systems. Therefore, baseline (pre-COVID-19) occupancy must be taken into consideration.

** A significantly low hospital occupancy rate may also indicate barriers to access to hospital care, requiring investigation into the causes and remedial actions to be taken. In situations of community transmission, low hospital utilization may indicate large numbers of community deaths, which would potentially not be captured in facility-based mortality reports.

Annex Table 5: Additional indicators to assess level of COVID-19 health system and public health services capacity and performance*

Indicator	Description/Limitations
Number of trained ICU staff per 10 000 population	This indicates sufficient clinical capacity to respond to cases most likely to lead to mortality. This indicator may be more relevant when measured against a population of clinically vulnerable[i] persons, if data are available. This indicator is difficult to measure. It is a necessary but insufficient measure of ability to provide intensive care.
Number of ICU beds per 10 000 clinically vulnerable population[i]	Mortality from COVID-19 will be highest if capacity for intensive care is exceeded. Strictly counting the number of ICU beds does not guarantee successful care if there is inadequate staffing, equipment or supplies.
Proportion of occupied ICU beds	This indicator assesses sufficient clinical capacity to respond to cases most likely to lead to mortality. It may not be useful in countries with very few ICU beds (can be substituted with proportion of occupied hospital beds +/- oxygen in these situations). If this indicator is very low, overall health system capacity should be considered limited, regardless of adequate levels of other capacity indicators.
Proportion of occupied beds with access to oxygen supply	Oxygen is an important treatment for COVID-19, and sufficient capacity to provide oxygen can be useful even in the absence of ICU capacity. This indicator may be difficult to measure and may not be useful in countries with very low capacity.
Crude case fatality rate of COVID-19	This is an overall impact indicator of adequate COVID-19 care. It is highly dependent on age, other risk factors and various reporting biases.[3] Analysis of trends should consider any changes in case detection or testing strategy. Countries are advised to collect additional information on age, as this measure will be heavily affected by the age structure of the population.
Number of contact tracers per 100 000 population [alternatively per number of new cases in a week]	This indicates capacity to conduct sufficient contact tracing to interrupt transmission. It is an input indicator that may not correlate well with actual contact tracing outcomes. There is minimal evidence base for determining thresholds. This may be difficult to accurately measure where contact tracing is done by persons other than formally designated "contact tracers".
Number of points of entry surveillance officers per 100 000 daily travellers	This is a measure of the ability to successfully mitigate the risk of importation. It is a poor indicator of actual internal domestic capacity; is minimally relevant during widespread community transmission; and may be achieved when human resources are inappropriately diverted from internal domestic use.
Proportion of newly confirmed or probable cases interviewed for contact elicitation within 24 hours of identification	This indicator measures the timeliness of contact listing, which shortens exposure to potentially infected persons. A better metric of contact listing timeliness is the actual proportion of contacts identified and traced/quarantined within 48 hours.
Proportion of contacts of new cases who are monitored for 14 days (or locally specified period)	This indicates that contacts are monitored until no longer at risk for becoming secondary cases (linked to a particular source case). This indicator may be particularly important for assessment of public health system performance in the imported/sporadic and clusters transmission scenarios. It can be spuriously inflated by poor contact listing.
Proportion of identified cases isolated within 24 hours of positive test result (or determination as a probable case)	This indicates that investigation and isolation of new cases is sufficiently rapid to minimize the generation of secondary cases. This indicator may be particularly important for assessment of public health system performance in the imported/sporadic and clusters transmission scenarios.
Time from symptom onset to case confirmation	This measures the ability of the surveillance system to promptly detect, test and confirm symptomatic cases. Individual components (i.e., time from symptom onset to detection, detection to testing and test turnaround time) can also be measured independently.
Proportion of cases arising from contact lists	This describes the extent to which new cases are already captured by and known to the surveillance system through adequate case investigation. When this is low, it suggests widespread existence of "hidden" chains of transmission and/or poor-quality case investigation.
Number and proportion of samples sequenced	Wherever resources allow, laboratories could consider genomic sequencing of SARS-CoV-2 PCR-positive sentinel specimens.

*This list should not be considered exhaustive.

i 'Clinically vulnerable' in this context refers to individuals aged ≥ 60 years and/or with comorbidities that increase risk of serious COVID-19 disease, including heart disease, asthma and diabetes.

References

1. World Health Organization. Critical preparedness, readiness and response actions for COVID-19 [Internet]. [cited 2021 May 3]. Available from: https://www.who.int/publications-detail-redirect/critical-preparedness-readiness-and-response-actions-for-covid-19
2. Megan O'Driscoll, Carole Harry, Christl A Donnelly, Anne Cori, Ilaria Dorigatti, A comparative analysis of statistical methods to estimate the reproduction number in emerging epidemics with implications for the current COVID-19 pandemic, Clinical Infectious Diseases, 2020; ciaa1599, https://doi.org/10.1093/cid/ciaa1599
3. World Health Organization. Estimating mortality from COVID-19: scientific brief, 4 August 2020 [Internet]. Geneva: World Health Organization; 2020. Available from: https://apps.who.int/iris/handle/10665/333642
4. World Health Organization, United Nations Children's Fund (UNICEF). Monitoring COVID-19 vaccination: considerations for the collection and use of vaccination data: interim guidance, 3 March 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://apps.who.int/iris/handle/10665/339993
5. European Centre for Disease Prevention and Control. Interim guidance on the benefits of full vaccination against COVID-19 for transmission and implications for non-pharmaceutical interventions [Internet]. European Centre for Disease Prevention and Control. 2021 [cited 2021 May 3]. Available from: https://www.ecdc.europa.eu/en/publications-data/interim-guidance-benefits-full-vaccination-against-covid-19-transmission

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