Policy Report 1:

Considerations towards the opening of the British Virgin Islands to tourism

Table of contents

How to use this document

This document is intended to project which could be the epidemiological scenarios faced by the Caribbean region in the months to come, in particular for Antigua and Barbuda, Barbados, British Virgin Islands, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Anguilla and Montserrat.

The first part introduces the differences in the public health strategies that countries have followed and that have led them to different epidemiological scenarios. A brief mention is made about the irruption of vaccines in these scenarios.

Understanding that the scenario that a country may face can be anticipated and shaped by the implementation of public health measures, the level of compliance and/or enforcement and their timing and duration; WHO's "Situational Levels" are described along with indicators and thresholds to assist the above mentioned Caribbean countries in the identification of the degree of risk at each given moment.

In the second part, non-pharmacological measures for each situational level are presented. For each, the epidemiological, social and economic impact is estimated. Furthermore, the landscape of pharmacological measures - including vaccines and profilaxis - is addressed by paying special emphasis on access, deployment and populations to be prioritized.

01 Potential epidemiological scenarios

1.1. Short introduction to the scenarios faced globally

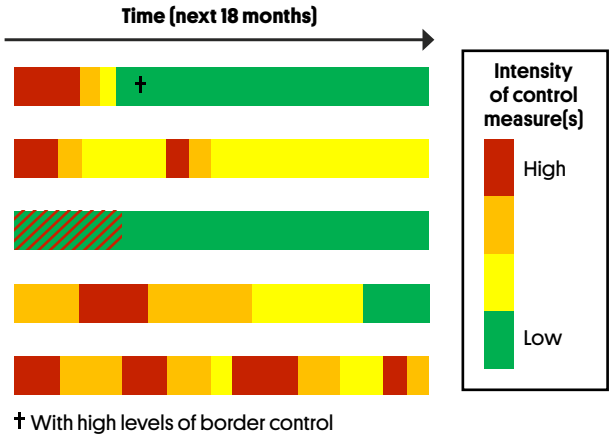
The strategies undertaken to control the COVID-19 pandemic have been diverse worldwide. This has led to countries recovering an almost normal life after the first wave, as Australia or New Zealand, to suffering a more harmful second wave as in the United States. Modelling analysis and observational and ecological studies have made clear that the scenarios faced now are highly dependent on the measures taken and, crucially, their timing.

Countries like New Zealand, South Korea, Taiwan, Singapore or Vietnam prioritized a strategy of elimination or "zero-COVID", implementing stringent measures when transmission was still low and sustaining them until virtually no transmission was reported (Han et al). Other countries have aimed at mitigating the transmission level in order to avoid the collapse of the health system, the so-called "bending the curve" strategy, implementing stringent measures only when community transmission was already very high[1]. However, this partial containment has led to a sway of restrictive measures and has failed to smoothen economic recession (Patel et al).

In this figure we see that implementing very stringent measures during a longer period of time may then be followed by only very mild measures thereafter. This is the strategy followed by New Zealand, which started a strict confinement on the 23rd of March after 100 cases had been declared and lifted it on the 13th of May when no daily cases were being reported. Delaying the implementation of strict measures or prematurely lifting them may imply a partial containment of the transmission and a sway of restrictive measures in the following months. This is the strategy that has been followed by the majority of the countries in Europe, this has led to a surge of cases since October, in some cases forcing reinstatement of confinement as it occurred in France or Austria.

[1] ¿Qué es una estrategia de COVID cero y cómo puede ayudarnos a minimizar el impacto de la pandemia?.

Figure 1 "Illustration of intensity of control measures over time under different strategies" Extracted from Background and overview of approaches to COVID-19 pandemic control in Aotearoa / New Zealand



The basis on which transition and adaptation of public health measures is made has also been diverse. In some countries like Singapore, Norway or Spain, politicians, drawing on expert advice, decide when and which restrictions to relax without previously defined criteria. Whereas Japan, Germany, the United Kingdom (UK) or South Korea, lift or reimpose restrictions on the basis of epidemiological thresholds (Han et al). The UK as an example of transparency, makes available to the public the discussions of the SAGE experts' committee on the latest available evidence that then shape the policies.

We present a table with different scenarios that countries have experienced following implementation of different strategies. These four countries have been chosen due to their high economic dependence on tourism and to the fact of being islands, to illustrate the transmission scenarios that caribbean countries could face in the future.

Reference country	New Zealand	Dominica	French Polynesia	Iceland
Scenario	**"Sustained cero"** Eliminated local transmission after first wave and has since then declared very sporadic cases.	**"Contained basal transmission"** Keeps transmission very low, transmission chains are controlled and mainly within clusters.	**"Epidemic transmission"** Sudden very severe increase of transmission.	**"Alternating pattern"** Sway of restrictive measures and relatively important epidemic waves.
Epidemiological curve (Daily new confirmed COVID-19 cases per million people)	Peak of incidence 15.5 cases/M.	Peak of incidence 37.7 cases/M.	Peak of incidence 1,681 cases/M.	Peak of incidence 253 cases/M.

Strategy and measures taken	**Zero-Covid, hard and early** Four level alert system. Strict lockdown after 100 cases and no deaths, after which mild measures were maintained: no social distancing, mask wearing on public transport except for borders which are closed for tourists. Testing capacity increased; manual and app-based tracing, expansion of ICU capacity [Patel et al].	**Border screening, wide contact tracing and community testing** Lockdown with some exceptions until June. Reopened its borders to international travel in August. Travellers coming from medium and high risk designated areas are required to undergo a rapid diagnostic test on arrival, quarantine for a minimum of 5 days after which a second PCR testing is administered [ref]. Large contact tracing and community testing.	**Favored reopening to tourism with minimal restrictions** One month lockdown. Borders reopened on the 15th July asking a negative PCR result and a self-administered test 4 days after arrival. Tourism has not been restricted although cases ramped reaching one of the highest incidences worldwide.	**Favors tourism sector while adapting public health measures** Quarantine and testing were imposed promptly and avoided a full lockdown. On 15 June, Iceland opened its borders to tourists with robust screening and contact tracing. In mid-September, the number of infections increased abruptly, from 1 to 55 in a week [Nature news], but opted to assume intermittent outbreaks with community transmission without it affecting the tourism industry.
Costs	**Health:** 5 deaths/ million **Economic:** -6.1 GDP, lower than in most high-income countries [IMF]. Tourism sector is highly affected. **Societal:** very strict lockdowns that might be unacceptable for some people given the relatively low risk.	**Health:** 0 deaths **Economic:** tourism has decreased but no official economic report is available.	**Health:** 270 deaths/ million and very likely an increase in other causes' mortality because of the health system collapse **Economic:** very likely worse impact in the long term No official economic report available **Societal:** fear of contagion.	**Health:** 79 deaths/ million **Economic:** –7.2 GDP [IMF] **Societal:** pandemic fatigue, people disregard health precautions after months of being careful.
Savings	**Health:** pandemic impact very low **Economic:** very likely in the long term *(No official projections)* **Societal:** after it's ended society can resume an almost normal daily life.	**Health:** pandemic impact very low **Economic:** saved part of tourism sector **Societal:** saved part of livelihoods of those working in the tourism sector.	**Health:** none Economic: saved part of tourism sector **Societal:** saved part of livelihoods of those working in the tourism sector.	**Health:** lower impact than other European countries **Economic:** saved part of tourism sector **Societal:** measures are not undertaken when risk is perceived "too low" by the population.

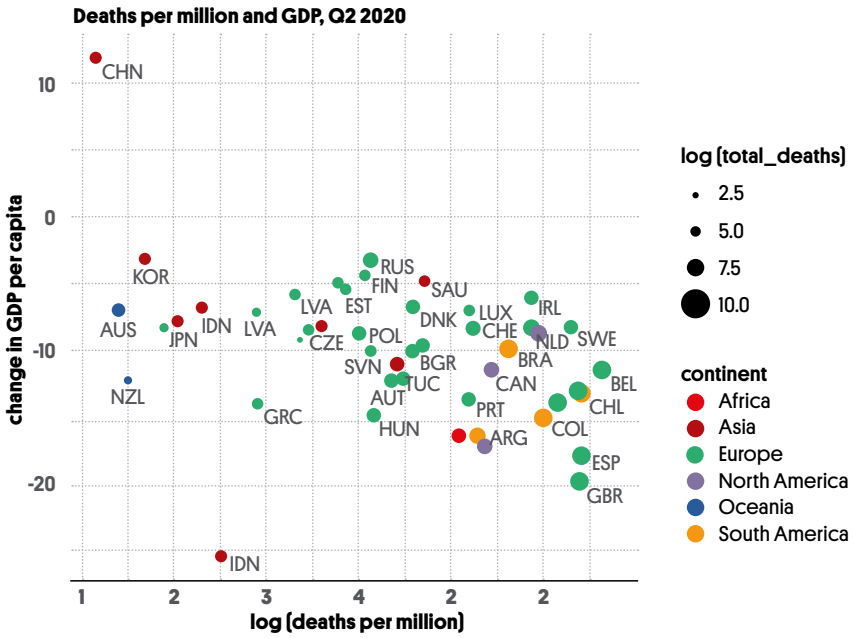
New Zealand opted for the elimination strategy, at the cost of keeping the borders closed, acknowledging that suppressing all risk of importation is unfeasible. However, this strategy might not be an option for most countries in the Caribbean, whose fragile economy substantially relies on tourism.

Dominica reflects the strategy of reopening tourism to safeguard such an important sector, while implementing preventive measures to preserve the health of the population. When it reopened to tourists only thirty cases had been reported in the country. A strict protocol for travellers entry was implemented, seeking to detect any imported case that might otherwise very likely lead to community transmission. So far Dominica has declared 72 cases and no deaths. Most cases have been imported and nearly all cases since the border reopening have been traced back to imported cases. 5,752 PCR tests have been contacted between community testing and contact tracing which has tested up to 131 contacts for a single case.

The **French Polynesia** opted for a more relaxed strategy of travellers screening: a negative PCR result and a self-administered test 4 days after arrival with no restriction of movement. Very few cases were detected by these means and cases ramped from summer to peak in November with figures doubling those in mainland France. As of December 7th the country has above 10,000 active cases (while only 62 had been declared before reopening to tourism) with death rates still increasing. Borders have not been closed, a nightly curfew has been in place since late last month and meetings in public are limited to six people (Source).

Unlike **New Zealand**, which has not opened its borders yet to tourism, elimination was never supported in **Iceland** for fears that the country would go bankrupt without tourism. Iceland opted to assume intermittent outbreaks with community transmission without it affecting the tourism industry. On 15 June, Iceland opened its borders requiring a negative PCR test upon arrival which was then further extended to a five-day quarantine followed by a second clearing PCR test. The incursion of two tourists that tested positive but did not quarantine led to a small bump of cases in August centred on two pubs and a fitness centre visited by the tourists. Then, in mid-September, the number of infections increased abruptly, from 1 to 55 in a week (Nature news). However, domestic infections have exceeded by many folds those imported. The question remains as to which extent domestic cases could be traced back to tourism. Since October 31, a gathering ban of groups over 10 is in effect. Bars and clubs are closed nationwide and a two-metre rule distancing rule is in effect in all regions of the country for those who do not have a close relationship. Mask use is mandatory in shops and on public transportation. Data has been the backbone of the response. Sequencing of the virus has allowed to identify linkages between cases. An open dashboard providing data disaggregated regionally, on border screening, number of quarantined and beyond is daily updated and open to the public.

Graph 1 "Log(deaths per million) by percentage change in Q2 2020 GDP per capita." Extracted from "Data from 45 countries show containing COVID vs saving the economy is a false dichotomy" by Michael Smithson



Governments have justified the timings and aggressivity of restrictions on the trade-off between health and economic costs. However, academics affirm that there is no dichotomy between economy and health. Data from 45 countries represented in the graph above support the notion that rapidly containing the pandemic may well lessen its economic impact. Nations like **New Zealand**, **South Korea**, **Japan or Australia** have suffered lower decreases in GDP per capita and have had fewer deaths per million than countries like **Spain or Great Britain** which have borne a much higher toll in deaths and suffered a bigger recession *(Graph 1)*. The two outliers are **China**, in the upper-left corner, with a positive change in GDP per capita, and India at the bottom. Which might be explained by the fact that China imposed successful hard lockdowns and containment procedures that meant economic effects were limited. India imposed an early hard lockdown but its measures since have been far less effective.

1.2 Anticipating the different scenarios

Although a certain degree of uncertainty and chance might play a (non-negligible) role, the scenarios that a country may face can be anticipated and shaped by (a) the implementation of public health measures, (b) the level of compliance and/or enforcement and (c) their timing and duration.

Monitoring the transmission level is key to anticipate the unfolding of the different scenarios and be able to adjust public health measures according to which scenario is desired. For example, New Zealand acted "hard and early" mandating a strict lockdown when only 100 cases had been confirmed in the country and no deaths, and went out of lockdown only when transmission was zero. Taiwan, which had previous experience and public health infrastructure from the SARS outbreak, also aimed - and achieved - a transmission zero scenario by anticipating the importa-

tion of cases with border closure and massive testing and quarantines. Before the first case was reported, tests on certain travellers were performed and after the first case flights from China were cancelled and then all borders were closed.

Table 1 Situational Level assessment matrix using transmission level and response capacity indicators to guide adjustment of Public Health and Social Measures. Table from WHO interim guidance on adjusting public health measures in the context of COVID-19.

	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

WHO classifies four **"Situational levels"** according to the **level of transmission and** the **response capacity**, considering that the same level of transmission can result in different situations depending on the capacity of clinical care and public health services and their performance.

- **Situational Level 0** corresponds to a situation where there has not been known transmission of SARS-CoV-2 in the preceding 28 days and the health system and public health authorities are ready to respond.
- **Situational Level 1** clusters of cases or very low community transmission is ongoing but controlled through effective measures around the cases and with limited and transient localized disruption to social and economic life.
- **Situational Level 2** represents the situation with low community incidence or risk of community transmission beyond clusters.
- **Situational Level 3** is a situation of community transmission with limited additional capacity to respond and a risk of health services becoming overwhelmed.
- **Situational Level 4** corresponds to an uncontrolled epidemic with limited or no additional response capacity available.

These four situational levels can serve as a frame to describe the pandemic unfolding, and as triggers to adapt public health measures.

1.2.1. Indicators and thresholds

WHO's situational levels are build up of two main components:

1. The **epidemiological situation / transmission classification** - which responds to the question *"Is the epidemic controlled?"*
2. **Health system and public health services capacity and performance** - which responds to the question *"Is the health system able to detect and cope with COVID-19 cases while maintaining other essential health services?"*

The rationale behind is that if transmission is very low but the health system does not have further capacity, a "worse" scenario or situational level should be expected.

Lists of indicators and their classificatory thresholds are presented in the following tables and in the Annex. Countries should prioritize the use of those indicators that are available and reliable. Trends can be used instead of quantitative thresholds where data are not reliable but denominators are stable.

These indicators could be presented in a dashboard format in official portals like in the case of Iceland, so that people are aware of the trends and the risks and might so adapt their behaviors accordingly. This approach provides an opportunity for citizen engagement and fostering individual responsibility.

Table 2 Primary Epidemiological Indicators and Proposed Ranges to Assess the Level of COVID-19 Community Transmission. Table from WHO interim guidance on adjusting public health measures in the context of COVID-19.

Domain	Indicator	Advantages/ Rationale	Limitations	Transmission level classification					
				No cases	Imported / Sporadic	CT1	CT2	CT3	CT4
Hospitalization Rate	New COVID19 hospitalizations per 100 000 population per week averaged over two weeks.	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.	0	0 - <5	<5	5 - <10	10 - <30	30+
Mortality	Number of COVID-19 attributed deaths per 100 000 population per week averaged over a two-week period.	Minimally influenced by surveillance policy if testing is comprehensive.	Delayed measure of incidence. Peak of mortality occurs 15 days approximately after peak of cases. In small geographical regions can be sensitive to minor fluctuations (e.g. one versus two deaths).	0	<1	<1	1 - <2	2 - <5	5+
Case Incidence	New confirmed cases per 100 000 population per week averaged over a two-week period.	Direct measure of incidence.	Heavily influenced by surveillance system performance, testing policy and laboratory capacity. In small geographical regions, can be sensitive to minor fluctuations in case counts, particularly due to batch reporting.	0	<20	<20	20 - <50	50 - <150	150+

Domain	Indicator	Advantages/ Rationale	Limitations	Transmission level classification					
				No cases	Imported / Sporadic	CT1	CT2	CT3	CT4
Testing	Test positivity proportion from sentinel sites[2] averaged over a two week period.	Not influenced by surveillance capacity or strategy. Minimally influenced by testing strategy or capacity.	May not be representative of the general population if there are only limited sentinel sites. May miss mild or atypical cases if testing criteria require influenza like presentation.	0%	~0%	<2%	<2% - <5%	5% - <20%	20%+
Overall (non-sentinel) test positivity	Test positivity proportion from sentinel sites averaged over a two week period.	Heavily influenced by testing strategy and capacity. If very few tests are performed and only in highly probable cases, the proportion of positives will be very high and not indicative of transmission level. Also informs on how adequately countries are testing.	Useful if there are limited sentinel sites.	0%	0 - 1% [On tourists and their contacts]	<2%	<2% - <5%	5% - <20%	20%+

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, for planning future changes, or putting in place anticipatory measures based on transmission trends.

It must be noted that the increase in incidence rate follows an exponential trend. For example, New Zealand declared 4 new cases on the 17th March, 8 on the 19th, 50 on the 22nd and 85 new cases on March 25th. This illustrates that cases escalate very rapidly and can be 20 fold higher within a week. The "Doubling Time" can assist in making predictions on this escalation, it measures the number of days required to double the total cumulative number of cases (see Annex). In this sense, reactive measures are by definition late, a fact that must be taken into consideration during planning.

[2] If one or two sentinel cohorts are established (doing PCR or antibody (IgM/IgG) tests to the cohort members on a regular basis, e.g. weekly), the PCR / seroconversion rate in these groups would act as sentinel of different settings (community transmission in the case of teachers vs very exposed workers in the case of people in contact with tourists or healthcare workers).

Table 3 Primary Epidemiological Indicators and Proposed Ranges to Assess Level of COVID-19 Health system and public health services capacity and performance. Table adapted to the Caribbean region from WHO interim guidance on adjusting public health measures in the context of COVID-19 and the CT workforce estimator by the Fitzhugh Mullan Institute for Health Workforce Equity.

Domain	Indicator	Rationale	Limitations	Response capacity classification		
				Adequate	Moderate	Limited
Contact tracing workforce	Number of contact tracers per 100 000 population (full time).	Having enough contact tracers is key to be able to identify, isolate, test and follow contacts.	If the geography of the country is spread like in the case of islands, the numbers might be adapted to each territory, since a contact tracer might spend too many work hours travelling between territories.	>18	18-15	<15
Contact tracing performance	Percentage of cases that are from contact lists and can be linked to known clusters.	If cases can be traced back it indicates that most transmission chains have been identified, offering the opportunity for follow-up. It is a measure of the spread in the community beyond known clusters.	This may be limited by the fact that the information will certainly not have been collected at the height of the epidemic. It is heavily influenced by case investigation and contact tracing capacity.	>90%§	60% - 90%	<60%
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. Laboratories not reporting location of cases may mask disparities in testing (e.g. among nonurban populations). If using rapid diagnostic tests, these should be used according to guidance, and thresholds may need to be raised.	2+	1 - <2	<1
Public health response performance	Proportion of cases for which an investigation has been conducted within 24 hours of identification.	This indicates that 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%
Clinical care capacity	Proportion of occupied hospital beds.	20% of COVID19 cases need hospitalization. High morbidity and mortality will occur if there is insufficient capacity to hospitalize severe cases. Should count all ospitalizations, not only COVID-19.	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%+†

Domain	Indicator	Rationale	Limitations	Response capacity classification		
				Adequate	Moderate	Limited
ICU capacity	Proportion of current ICU beds occupied.	32% of COVID19 hospitalized patients require ICU admission.[3] This indicator assesses sufficient clinical capacity to respond to cases most likely to lead to mortality.	In countries with very few ICU beds can be substituted with proportion of occupied hospital beds +/- oxygen in these situations. If the country relies on another hospital's ICU, capacity for evacuation of patients should be leveraged.	<80%	80% - 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. Must take into account any changes in case detection or testing strategy.	Decreasing trend.	Stable trend.	Increasing trend.
Public health response performance	Support for / Adherence to PHSM.	Qualitative assessment based on observation, media monitoring, perception or behaviour surveys, hotlines, focus groups, etc. Predictor of effectiveness of measures put in place; 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 PHSM. Difficult to assess objectively.	High (nearly universal adherence to most PHSM).	Moderate (modest adherence to most PHSM, or variable adherence across individual PHSM).	Low (minimal adherence to most PHSM).

† Hospital occupancy routinely varies considerably between countries, and so baseline occupancy must be taken into consideration.

§ WHO does not provide thresholds for this indicator and thus they should be interpreted with caution. However, it recommends for transmission to be controlled at least 80% of cases should be contacts of cases and can be linked to known clusters.

Most people recover from the disease without needing special treatment, and for the majority – especially for children and young adults – illness due to COVID-19 is generally minor. About 20%, all ages included, requiere hospital attention of which 32% are estimated to require ICU admission. Of those admitted the mortality rate is about 39% (SM Abate et al).

In general terms, WHO states that for a health system to be sustainable, even if it had to absorb a surge in cases resulting from loosening public health and social measures it must be able to absorb or can expand to cope with at least a 20% increase in COVID-19 case load. This includes sufficient staff, equipment, beds, etc. However, most countries in the Caribbean have very few hospital beds and/or limited ICU capacity. This can be sufficient for normal situations but not to face an epidemic when cases (and consequently also severe cases) can rapidly escalate, specially among tourists that can in some cases cause a several-fold increase the countries populations; and which might typically, in other circumstances, not require ICU services (See Annex). Namely, Anguilla and Montserrat have no ICU capacity. This rebounds in the fact that if a given country has 10 ICU beds, with a habitual occupancy of 80%, only 2 spare beds are available. Although severe cases are only a small proportion, the margin of reaching full occupancy of ICU beds is extremely short. For this reason, considering the lowest capacity response level would be the most prudent.

[3] A meta analysis published in July 2020 by SM Abate et al, estimated the rate of ICU admission was 32% and the mortality rate in those admitted of 39%.

1.3. Scenarios in the case of vaccine availability

Mass vaccination has already started in Russia and the UK and many countries have scheduled to start within the next few months. It has been estimated that 55-80% of a population must be immune to achieve herd immunity and prevent the spread (Kowk et al). Achieving it will depend on the effectiveness of the vaccine, but also on the capacity of its production and delivery and, most importantly, vaccine acceptance by the population.

Besides, the duration of the elicited immune response may be a critical factor. Although to date, immunology studies on natural infection have suggested a long-lasting immune response for greater than six months (Dan et al).

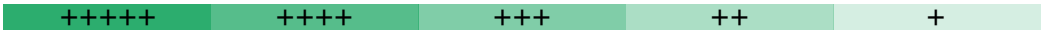
It is thus very likely that, in spite of vaccine rollout, public-health interventions will still be needed.

02 Country Roadmaps: COVID19 control measures and their socio-economic impact

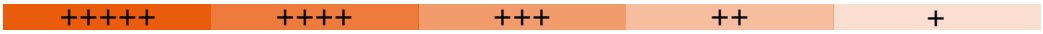
2.1. Non-pharmacological control measures

The following tables suggest non-pharmacological interventions that should be considered for each of the Situational Levels defined by WHO and that can be identified with the indicators previously mentioned.

For each measure an estimated degree of epidemiological impact is identified from very high impact (+++++) to very low impact (+):



Furthermore, the degree in which these measures impact societies and economies has also been estimated and represented as very high impact (+++++) to very low impact (+):



Situational level 0
No transmission detected in the preceding 28 days and health system and public health authorities ready to respond.
Surveillance should ensure that any new case can be detected and managed as early as possible.

Potential measures	Measure impact on transmission	Measure societal impact	Measure economic impact
Robust surveillance in borders and sentinel centers	+++++ Essential at Level 0 to detect any imported case at borders or in the community in the sentinel centers.	+ Impact on tourists.	++ Cost of facilities and tests.
Hand washing and sanitizing available in public spaces	+++ Viable SARS-CoV-2 persists for up to 72 hours on common surface materials indoors. The relative importance of transmission through hands for SARS-CoV-2 is not known. Meta-analyses have found that 20% of respiratory illness can be prevented by all hand hygiene interventions.	+ Very simple.	+ Very cheap.
Communication of individual precautionary measures (hygiene, cough etiquette, physical distancing) and protocol when having compatible symptoms	+++ If people practice hand hygiene and preventive measures they are less likely to spread the virus. If they are trained to identify their symptoms earlier, they reduce the number of days in blue, and hence their overall contagiousness.	+ Very simple.	+ Very cheap.

Situational level 1 **Clusters of cases or very low community transmission is ongoing but controlled through effective measures.** Specific measures should be taken around cases and/or clusters, and individual measures should be strengthened, with limited impact on social and economic activities.			
Potential measures	**Measure impact on transmission**	**Measure societal impact**	**Measure economic impact**
Contact tracing	+++++ Essential at level 1 to contain the spread.	+ Only impacted those contacts that will have to quarantine.	++ Moderate cost and taskforce.
Intensive testing (NZ) / Community testing	+++++ Allows for detection of asymptomatic or undetected clusters in the community.	+ Little impact on daily life.	+++
Promote avoidance of the '3 Cs': Closed spaces, Crowded places and Close-contact settings	+++++ Social distancing has been estimated to decrease 42.94% Rt [Bo et al].	+++ Moderate impact on daily life.	+++ Moderate impact on the economy.
Mandatory masks in closed spaces and transport. School buses and children under 6 exempt along with people with disabilities or mental health conditions	++ Important because asymptomatic or pre-symptomatic can transmit the virus. Decrease 15% Rt [Bo et al].	+	+
People and organisers of gatherings encouraged to maintain a record of where they have been	++ Facilitates contact tracing.	+ Very simple.	+ Very cheap.
COVID-app	++ Effectiveness may depend on the number of users.	+ Very simple.	++ Moderate cost.
Bans of social gatherings above 100 persons, including weddings, birthdays and funerals	+++ Reduction of 28% in Rt [Brauner et al].	++ Moderate long term harms particularly at the level of communities and social networks.	+++ Moderate impact on the economy.
Close nightclubs	++++ They are big gatherings in closed spaces with close contact and loud speaking.	++ Affects mainly younger age groups.	+++ High direct impacts resulting from loss of income for staff.

Situational level 2 **Low community incidence or risk of community transmission beyond clusters** Measures should be applied to limit the number of social encounters in the community while ensuring services can remain open with safety measures in place.			
Potential measures	**Measure impact on transmission**	**Measure societal impact**	**Measure economic impact**
Temperature checkpoints	+ Transmission mainly occurs before symptom onset and a high proportion of cases are asymptomatic.	+ Very simple.	+ Very cheap.
Work from home when possible	++++ Over 1/3rd of contacts are made at work, often long duration and highly clustered. In UK reduction of 20 - 40% Rt.	++ Mild harms associated with poor ergonomics at home, social isolation and increased prevalence of domestic violence. Inequity: Younger people and those on lower incomes will not be able to telework and will be at increased risk.	+++ Some businesses might be impacted.
Bans of social gatherings above 10 persons including weddings, birthdays and funerals	++++ Reduction of 36% in Rt [Brauner et al].	++ May also create unintended harms by increasing levels of protest, amplifying the numbers of unlicensed music events/house parties and provoking confrontations with police, and have a disproportionate impact on young people.	++ Impacts resulting from loss of income for staff working in these sectors.
Limit inter-regional travel (except for critical workers, and others considered)	+ Impact depends on the level of seeding of the epidemic. If the epidemic is already widespread, then internal travel restrictions will have little benefit.	+ Impact in family visits and work commuting.	++ Might indirectly impact other sectors.
Strict application of PPE and IPC measures, heightened surveillance and managing visits in long term care and other residential facilities	+ Impact can be small at country level but may prevent potentially severe cases leading to death.	++ Loneliness, isolation, caregivers impeded taking care.	+

Situational level 2 **Low community incidence or risk of community transmission beyond clusters** Measures should be applied to limit the number of social encounters in the community while ensuring services can remain open with safety measures in place.			
Potential measures	**Measure impact on transmission**	**Measure societal impact**	**Measure economic impact**
People instructed to stay home in their immediate bubble other than for essential personal movement – including to go to work, school if they have to, or for local recreation	++ Reduction of 10% in Rt (Brauner et al).	++ Increases risk of deepening economic disadvantage (e.g. shared childcare and eldercare between homes).	+
Close businesses that offer services that involve close personal contact (e.g., hairdressing, beauty therapy, etc), except for supermarket, pharmacy, petrol station or hardware store providing goods to trade customers, or it is an emergency or critical situation	++ Reduction of 20% in Rt (Brauner et al) UK estimated the reduction of Rt up to 5% because of the relative infrequency of their use.	+ Low psychological impact through reduced social contact for customers.	+++ High direct impacts resulting from loss of income for staff. Economic impact would most affect the poorest and women.
Closure of indoor gyms, leisure centres, fitness etc.	++ UK estimated reduction of 10% although precises estimation is very difficult. Outbreak reported in fitness class in South Korea.	++ Limits access to exercise for physical and mental health but high potential for substitution to outdoor physical activity though may be harder in winter months.	+++ Loss of income for employees of sports facilities.
Closure of indoor hosterly, while terrace service still allowed	+++ UK estimated 10-20% reduction in Rt Environmental risk in bars, pubs etc is likely to be higher than many other indoor settings due to close proximity of people, long duration of exposure, no wearing of face coverings by customers, loud talking that can generate more aerosols. Some venues are poorly ventilated, especially in winter. Consumption of alcohol impacts on behaviour.	+ Low psychological impact through reduced social contact for customers.	+++ High indirect impacts resulting from loss of income for hospitality employees.

Situational level 3 **Community transmission with limited additional capacity to respond** A strengthening of all PHSM 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 and in particular schools to remain open.			
Potential measures	**Measure impact on transmission**	**Measure societal impact**	**Measure economic impact**
Mandatory masks outdoors	+ Low transmission rates outdoors and most risky contacts are made indoors. May have a small impact for those people who have to come into close contact with others. [UK].	+	+
Close in face secondary school learning	++++ Reduction of 41% in Rt [Brauner et al] UK estimates reduction of 35% in Rt for closure of secondary schools.	+++ Increases in school drop out, reduces quality education, domestic violence. Parent's productivity and work from home reduced.	++
Close in face university learning	++++ Reduction of 41% in Rt [Brauner et al] UK estimates reduction of 30%-50% in Rt for closure of secondary schools.	++ Decreased quality education.	++
Close borders (or partially)	++ Impact depends on the level of transmission in the countries of origin.	++ Impact in family visits and work commuting.	+++++ Tourist sector highly affected.
Bars and restaurants close	+++ UK estimated 10-20% reduction in Rt Could have positive impact on adherence to other measures as it will reduce perceived inconsistencies between home and non-home restrictions.	+ Low psychological impact through reduced social contact for customers.	++++ High indirect impacts resulting from loss of income for hospitality employees.
Businesses closed except for essential services (e.g. supermarkets, pharmacies, clinics, petrol stations) and lifeline utilities	+++ Reduction of 29% in Rt [Brauner et al]. UK estimated very minimal impact on R of closure of non-essential retail.	+ low psychological impact through reduced social contact for customers.	+++++ High direct impacts resulting from loss of income for staff. Economic impact would most affect the poorest given employment in non-essential retail with consequences for health inequalities.

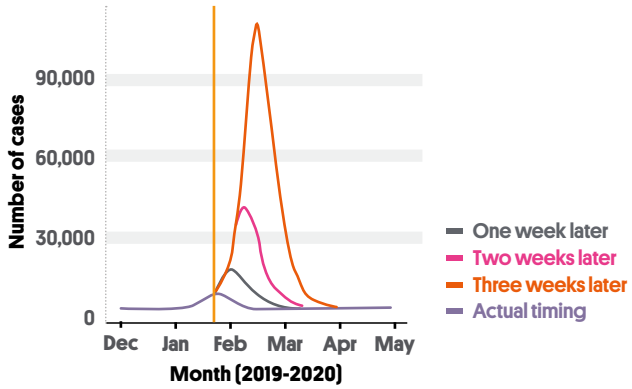
Situational level 3
Community transmission with limited additional capacity to respond
A strengthening of all PHSM is needed to avoid more stringent restrictions on movement and other related measures applied under level 4. All individuals should reduce their social contacts, and some activities may need to close while allowing for essential services and in particular schools to remain open.

Potential measures	Measure impact on transmission	Measure societal impact	Measure economic impact
Closure of places of worship / community centres	++ UK estimated a 10% reduction in Rt. Strong association with places of worship including significant outbreaks linked to religious communities in South Korea, cases in churches in Singapore, and Germany (despite social distancing). Environmental risks vary depending on the building. Small venues are higher risk than large spaces as the volume mitigates aerosol transmission. Some ceremonies involve touch surfaces and proximity for short duration (e.g. communion). Singing/loud talking can enhance risk.	+++ Mental health impacts from limiting social and spiritual connections. Risk of social division / anger if places of worship are closed ahead of recreational sectors (e.g. bars). Places of worship and community centres play a variety of roles beyond their core function: food banks, coordination of volunteers, child contact centres, and more Possible increases in domestic abuse without community refuge.	+

Situational level 4
Uncontrolled epidemic with limited or no additional response capacity available.
Reducing transmission in the community will be challenging, and more stringent movement restrictions and related measures may need to be put in place to significantly reduce the number of in-person encounters.

Potential measures	Measure impact on transmission	Measure societal impact	Measure economic impact
Large scale disinfection	+	+	++
Lockdown except for essential businesses and schools if they remain open	+++++ France reduced 80% the daily incidence within a month [ref]].	+++++ Very high impact on mental health and wellbeing.	+++++ Impact most on the poorest given employment in jobs least amenable to home working with consequences for health inequalities.
School closure	+ + UK estimated a reduction in Rt of 20%-50%. Very few outbreaks have been reported.	+++++ Increases in school drop out, child injury, domestic violence, child abuse. Parent's productivity and work from home greatly reduced.	+++++ School gap, inequality, opportunity cost. WHO recommends to consider all options for continuity of in-person learning. And closure only considered when there are no other alternatives.
In-person visits prohibited in long-term care and other residential facilities	+ Impact can be small at country level but may prevent potentially severe cases leading to death.	++ Loneliness, isolation, caregivers unable to take care.	+ Little to no impact on economy.

Graph 2 "Estimates of the COVID-19 outbreak under various scenarios of intervention timing and lifting of travel restrictions across China". *Extracted from Lai et al.*



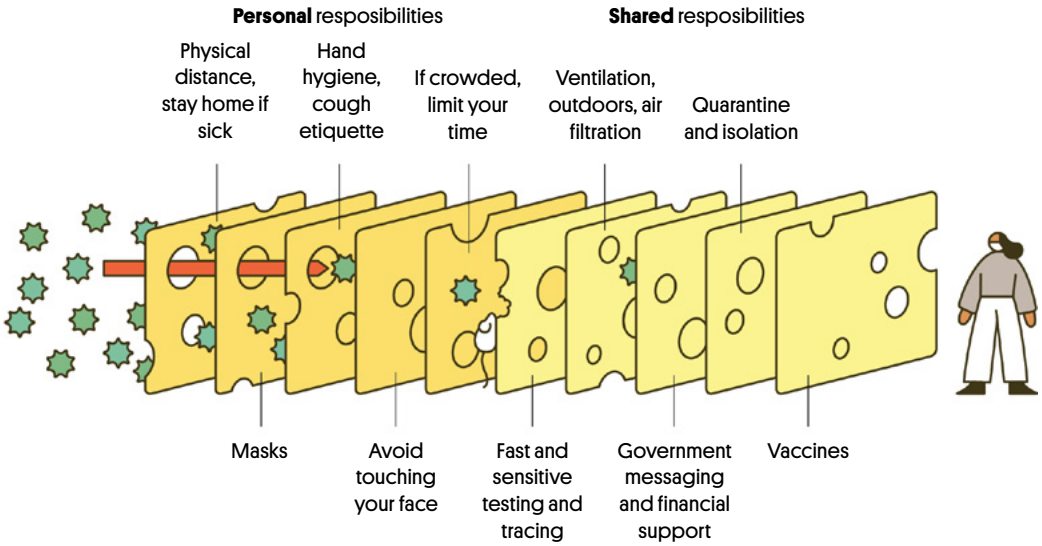
Each situation level should always incorporate the measures already implemented under the previous level or further reinforce them, and consider the ones that were recommended for the previous level but not taken into force. The measures can be applied at country level, or locally if cases are only being detected in a subregion, such as an island.

Timing of implementation of public health measures matters. The sooner the reaction the smother the curve will be, as it can be seen in the following graph. The later the measures are taken, the more stringent they will have to be to rapidly stop the spread at risk of overwhelming the healthsystem.

This is evidenced in the preceding tables. Measures recommended for Level 4 have significantly more impact on non-COVID factors, such as societies and economy than measures recommended for previous levels.

Approximate impact degrees are given for each measure, these will vary depending on the context. Nevertheless, there's clear evidence supporting that a combination of measures will be more impactful, as it is illustrated by Ian Mackay in the so-named "Swiss Cheese Respiratory Virus Pandemic Defense": no one layer is perfect; each has holes, but several layers combined — social distancing, masks, hand-washing, testing and tracing, ventilation, government messaging — significantly reduce the overall risk. Vaccination will add one more protective layer.

Image 1 "Swiss Cheese Respiratory Virus Pandemic Defense" version 3 by Ian Mackay



Source: Adapted from Ian M. Mackay (virologydownunder.com) and James T. Reason. Illustration by Rose Wong

These recommendations are mainly based on the interim guidance by WHO "Considerations for implementing and adjusting public health and social measures in the context of COVID-19". These measures should be updated on the basis of new scientific knowledge about COVID-19 and information about the effectiveness of the interventions in the countries themselves and elsewhere.

WHO provides guidelines on

- preparedness,
- risk communication and community engagement,
- managing the COVID-19 infodemic,
- considerations while resuming international travel,
- improve hand hygiene practices,
- advice on the use of masks,
- public health surveillance,
- investigation of cases and clusters,
- considerations for quarantine,
- considerations for school-related public health measures,
- adapting the workplace,
- infection prevention and control guidance for long-term care facilities
- mass gatherings

Experts at ISGlobal have prepared a series of policy briefs. Of special relevance for this paper are:

- The G20, Vaccines and COVID-19: Why is the Success of the COVAX Initiative Vital?
- What Are the Health Priorities of Older Adults During a Pandemic?
- COVID-19 in Latin America: What does it take to go from a highly-vulnerable region to a pandemic-ready region?
- How Should We Deal With New Outbreaks of COVID-19?
- How Can We Resume International Travel During the COVID-19 Pandemic?
- What Are the Barriers to Achieving Universal Immunisation Against COVID-19?
- Improving Case and Contacts Tracing During the COVID-19 Pandemic
- How Should Work Environments Adapt During the COVID-19 Epidemic?
- Should We Allow Physical Activity During The Coronavirus Disease Pandemic?

2.2. Pharmacological control measures

2.2.1. Vaccines

There are currently more than 100 COVID-19 vaccine candidates under development, with a number of these in the human trial phase. Those in phase 3 clinical trials are foreseen to be in the production pipeline within weeks or months (see *Table*).

Table Current vaccine candidates*

Strategy	Company	Reported efficacy	Conservation
RNAm	Moderna	94% (Phase 3 efficacy)	-20ºC, 4oC (1 month)
	BioNTech/Pfizer	95%*	-70ºC
Viral vector	AstraZeneca/Oxford (ChAd)	70% (preliminary results)	4ºC
	Gamaleya Institute (Ad5, Ad26)	91,4%*	4ºC
	CanSinoBio (Ad5)	Ongoing Phase 3	4ºC
	Johnson & Johnson (Ad26)	Ongoing Phase 3	4oC
Protein	Novavax	Ongoing Phase 3	4ºC?
Inactivated virus	Sinopharm	Ongoing Phase 3	4ºCcases/M
	Sinovac Biotech	Ongoing Phase 3	4ºC
	Bharat Biotechcases/M	Ongoing Phase 3	4ºC

Source: Who to vaccinate first when the first doses become available? Policy & Global Development Brief Series #27. *ISglobal Dec 4th, 2020. *Updated as of November 30, 2020*

Considerations regarding access

WHO is working in collaboration with scientists, business, and global health organizations through the COVID-19 Tools (ACT) Accelerator to speed up the pandemic response making COVID-19 tests, treatments, and vaccines readily available by working in collaboration to accelerate the development, production, and equitable access to. COVAX is the vaccines pillar of the Access to COVID-19 Tools (ACT) Accelerator and it is co-led by Gavi, the Coalition for Epidemic Preparedness Innovations (CEPI) and WHO. Its aim is to accelerate the development and manufacture of COVID-19 vaccines, and to guarantee fair and equitable access for every country in the world, assuring doses for at least 20% of countries' populations by the end of 2021.

COVAX Facility has identified two different groups of countries:

- Self-financing countries, which can either make a firm commitment or acquire options to purchase the number of doses they wish under the same pre-established conditions for all.
- Lower- and middle-income countries, which are eligible for the Advance Market Commitment (AMC) mechanism, a tool that enables Official Development Assistance (ODA) donor countries to fund vaccine access in developing countries once manufacturing begins.

Some Latin American countries, including those of the Eastern Caribbean region are eligible for the AMC mechanism, including Haiti, Bolivia, El Salvador, Honduras, Nicaragua, the Dominican Republic, Grenada, Guyana, Saint Lucia and Saint Vincent and the Grenadines. For the rest, as an ISGlobal policy brief analyzes, the only option would be to choose one of the two modalities offered to self-financing countries under the same conditions as economies with greater resources. Mexico, Argentina, Brazil, Chile, Costa Rica and Suriname have all entered into optional purchase agreements with COVAX. Guatemala, Belize, Panama, Venezuela, Colombia, Ecuador, Peru, Paraguay and Uruguay and many Caribbean countries, including Jamaica, the Dominican Republic and Barbados, have opted for the committed purchase arrangement. Except for Chile, Uruguay and some of the Caribbean nations, the rest of the countries in the region are classified as upper-middle or lower-middle income economies. PAHO recognises COVAX as the key option for providing early access to vaccines for most of the countries in the region and is contributing on behalf of the bloc through the PAHO Revolving Fund for Vaccine Access.

Who to prioritize

Several countries and regions are starting to develop COVID-19 Vaccine Values Frameworks (WHO) and Deployment Strategies (WHO, ECDC, CDC).

Patterns of exposure to SARS-CoV-2, as well as the incidence, burden and geographical distribution of COVID-19, are key asècts that will influence choices about vaccine deployment. There are still some uncertainties about the characteristics of COVID-19 vaccines that could become available worldwide, as well as remaining gaps in the scientific knowledge of the virus and the disease. Vaccination plans and strategies will therefore need to be adapted as more information becomes available.

The following are components that are usually taken into account when a new vaccine is available on the market and integrated into national vaccination schedules:

- a robust COVID-19 disease surveillance system;
- post-marketing studies on effectiveness and impact;
- active and passive monitoring of adverse events following immunization;
- robust and timely vaccination coverage data;
- evidence-based decision-making;
- legal and regulatory frameworks for vaccines deployment;
- vaccine delivery infrastructure and supply chain management;
- monitoring of vaccine acceptability and behavioural research;
- communication plans;
- ethical and equitable access to vaccination.

Once vaccines against COVID-19 are available, their supply is likely to be limited, at least initially. Supply capacity, both initially and over time, will thus determine vaccine usage and delivery prioritisation. Deployment will need to be adjusted accordingly to promptly optimise vaccine allocation and ensure vaccine availability to those most in need. The following non-mutually exclusive approaches for vaccine deployment can be considered when building vaccination strategies, taking into account different levels of vaccine supply and stages of the pandemic:

- focusing on selected groups (e.g. individuals at risk of severe COVID-19, essential workers, vulnerable groups, tourism workers in highly tourist-dependant island economies);
- vaccinating according to age strata (e.g. all individuals above a certain age);
- targeting groups with an increased risk of exposure and onward transmission of SARS-CoV-2 (e.g. exposure in professional settings, younger adults);
- prioritising geographical regions with high incidence of COVID-19;
- deploying the vaccine to control active outbreaks;
- adaptive approaches to be modulated according to circumstances;
- conducting a universal vaccination strategy.

Given the anticipated initial shortage, countries will need to identify priority groups for vaccination. A broader characterisation of these groups will need to further categorize them into different priority tiers. The identification of the priority groups, and of the tiers within them, will depend on several factors, including the disease's epidemiology at the time of vaccine deployment, the evidence of risk of severe disease and of exposure to COVID-19, the preservation of essential societal services and equity principles, among others.

2.2.2 Perspectives on profilaxis

There is a possibility that a preventative drug will be developed in the coming months and used as a bridge to protect the population until a vaccine is available and deployed. The key difference with a vaccine strategy is that prophylactic drugs would require repeated administration to sustain their effect. Several considerations are important regarding this potential measure.

The first decision to be made is to define whether such a strategy is of interest to the country should it become available.

Potential demand

Just as with vaccines, high demand of a prophylactic drug can be expected. Preparatory activities are advised to facilitate early acquisition and rollout. This may include:

- Enumeration of potentially eligible populations. Scenarios should be calculated with minimally essential and desired coverage. Eligibility could follow the criteria defined above for vaccines.
- Calculation of potential doses required to cover the period until a vaccine is expected to be rolled out.
- Costs for each deployment scenario should be estimated in advance.

Access and deployment

The capacity to cover the demand predicted in each scenario with national funds or the potential requirement for external support should be considered.

In a similar fashion, calculating the potential resources required for the rollout once procurement is completed would be of use in case such a drug becomes available. This includes personnel, warehousing, timing and distribution facilities.

Annex

Additional indicators to assess the level of epidemiological transmission

Indicator	Definition / Rationale	Limitations
Effective reproductive number (Rt)	The number of secondary cases that a given case can generate.	While this is a widely used indicator of transmission, it requires familiarity with the various methods for calculation and sufficiently reliable and timely data on incidence[4].
Doubling time	The number of days required to double the total cumulative number of cases. This is linked to Rt.	-
ICU proportional occupancy	The proportion of current ICU beds occupied by patients with COVID-19, out of all occupied ICU beds.	-

Additional indicators to assess the health system and public health services capacity and performance

Indicator	Definition / Rationale	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 the population of clinically vulnerable persons (individuals aged >60 years and/or with comorbidities), 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 (individuals aged >60 years and/or with comorbidities)	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.

[4] Theoretically, Rt below 1 is the best indication that the epidemic is controlled and declining. A package to estimate Rt is available, together with an interactive application. In countries constituted by several islands, Rt might vary across them and should be estimated at a subnational level.

Health system and public health services capacity and performance indicators in the Caribbean countries

Country	Contact tracing workforce	Public health response capacity	Clinical care capacity	Clinical care performance	ICU capacity	ICU staff
	number of contact tracers / 10,000 pop (source)	number of tests / pop* (source)	number of beds available **	case fatality rate*** (source)	number of ICU beds available **	
Anguilla		1 test every 6 people	Princess Alexandra Hospital: 36 beds	Stable trend (no deaths)	No ICU capacity	NA
Antigua and Barbuda		1 test every 21 people	St John's Medical Center: 185 beds	Decreasing trend	ICU at St John's Medical Center	2 physicians, 33 nurses/10000 (general, no ICU)
Barbados		1 test every 6 people	Queen Elisabeth Hospital:519 beds	Decreasing trend	Intensive Care Unit at Queen Elisabeth Hospital	2005 Total physicians:489 Total nurses:900
British Virgin Islands		1 test every 5 people	Peebles Hospital: 44 beds. 63% occupancy rate [2003]	Stable trend (1 death in April)	Intensive Care Unit at Peebles Hospital. 8 ventilators available	35 physicians registered to practice in the BVI,112 Registered Nurses
Dominica		1 test every 13 people	Princess Margaret Hospital: 224 beds. Occupancy rate 2002: 75,4%	Stable trend (no deaths)	Intensive Care Unit at Princess Margaret Hospital	2000 8,3 physicians/100000 people,48 nurses/10000 people
Grenada	Hired a surveillance official. Contact tracing through nursing students. St. George also supported with PCR testing.	1 test every 18 people	St John's General Hospital: 198 beds. Plus two more acute care facilities. Occupancy rate 2001: 64.1%	Stable trend (no deaths)	2 ICU beds	8 physicians per 10,000 population [2001]

Health system and public health services capacity and performance indicators in the Caribbean countries

Country	Contact tracing workforce	Public health response capacity	Clinical care capacity	Clinical care performance	ICU capacity	ICU staff
	number of contact tracers / 10,000 pop (source)	number of tests / pop* (source)	number of beds available **	case fatality rate*** (source)	number of ICU beds available **	
Montserrat		1 test every 9 people	The 30-bed Glendon Hospital provides medical, surgical and obstetric care. No tertiary care on the island	Stable trend (1 death in April)	No ICU capacity	NA 4 medical practitioners (total) as per 2005
Saint Kitts and Nevis		1 test every 15 people	The country's main referral centers are the 150-bed Joseph N. France General Hospital in St Kitts and the 50-bed Alexandra Hospital in Nevis. Low occupancy rates	Stable trend (no deaths)	Intensive care Unit at Joseph N. France General Hospital	11.8 doctors per 10000 population (2004)
Saint Lucia	No new HR for contact tracing	1 test every 11 people	Victoria Hospital is the main local trauma facility, with 150 beds and 6 acute care beds. Golden Hope Hospital has 162 beds. St Lucia suffers from a great shortage of medical staff, as per 2008	Decreasing trend	6 ICU beds	71 doctors, 248 nurses (2008)

Health system and public health services capacity and performance indicators in the Caribbean countries

Country	Contact tracing workforce	Public health response capacity	Clinical care capacity	Clinical care performance	ICU capacity	ICU staff
	number of contact tracers / 10,000 pop (source)	number of tests / pop* (source)	number of beds available **	case fatality rate*** (source)	number of ICU beds available **	
Saint Vincent and the Grenadines		1 test every 11 people	Milton Cato Memorial Hospital: 211 beds. 2000-2004: bed occupancy averaged 67% 58 beds in 5 rural hospitals, 12 beds in private facilities	Stable trend (no deaths)		2004, per 10000 population: 9.51 doctors, 34 nurses

* Should be estimated weekly averaging two weeks and per 10,000 population.

** Should take into account the percentage of occupied.

*** Due to the small magnitude of the number of cases, this indicator is very sensitive to minor fluctuations.

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