Asia Pacific Observatory on Health Systems and Policies

COVID-19 Health System Response Monitor

Sri Lanka

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Authors

Dr Lalini C. Rajapaksa, Former Professor in Community Medicine, University of Colombo

Dr Padmal de Silva, National Professional Officer, WHO Country Office, Sri Lanka

Dr Palitha Abeykoon, Former Director WHO Regional Office for Southeast Asia

Editors

Ms Radhika Arora

World Health Organization Regional Office for South-East Asia
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Abbreviations and acronyms

ADIC	Alcohol and Drug Information Centre
APO	Asia Pacific Observatory on Health Systems and Policies
CCP	consultant community physician
CFR	case fatality rate
CIT	COVID-19 Immunization Tracker
COVID-19	coronavirus disease-2019
CPD	continuing professional development
DDGHS	Deputy Director-General of Health Services
DDGPHS	Deputy Director General of Public Health Services
DGHS	Director-General of Health Services
DHIS	District Health Information Software
DReAM	D – Distancing (physical distancing); Re – Respiratory etiquette (cough/sneeze using the inner side of your elbow and not directly in front of you); A – Aseptic techniques (handwashing, using hand sanitizer, avoiding touching your face); M – Mask (proper wearing of a face mask and its proper disposal)
EmNOC	emergency neonatal and obstetric care
EPI	Expanded Programme on Immunization
EQAP	external quality assurance programme
EQAS	external quality assurance service
ETR	Education, Training and Research unit
ETU	Emergency Treatment Unit
FAO	Food and Agriculture Organization
GoSL	Government of Sri Lanka
HPB	Health Promotion Bureau
ICTA	Information and Communication Technology Agency of Sri Lanka
IHR	International Health Regulations
IPC	infection prevention and control
IT	information technology
JEE	joint external evaluation
LOO	lines of operation
MLT	medical laboratory technologist
MOH	Medical Officer of Health
MoH	Ministry of Health
MoHIMS[1]	Ministry of Health and Indigenous Medical Services
MOMH	Medical Officer of Mental Health
MRI	Medical Research Institute
NAPHS	National Action Plan for Health Security

[1] This documented uses MoH for the Ministry of Health. Older documents use the acronym MoHNIMS (which included indigenous medicine and nutrition, and then MoHIMS. The use of MoH is different from MOH which stands for Medical Officer of Health in this document.

NCD	noncommunicable disease
NGO	nongovernmental organization
NIHRD	National Institute of Health Research and Development
NMRA	National Medicines Regulatory Authority
NMRA	National Medicines Regulatory Authority
NOCPCO	National Operation Centre for Prevention of COVID-19 Outbreak
NPL	National Poverty Line
PBIN	Post Basic Institute of Nursing
PHIMS	Patient Isolation and Home Management System
PHM	public health midwife
POA	period of amenorrhea
POE	port of entry
PPE	personal protective equipment
RCCE	risk communication and community engagement
RT-PCR	reverse transcriptase-polymerase chain reaction
SARI	severe acute respiratory illness
SLMA	Sri Lanka Medical Association
SOP	standard operating procedure
SPRP	Sri Lanka Preparedness and Response Plan
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization

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Overview

The Health System Response Monitor (HSRM) is designed to collect and organize up-to-date information on how countries are responding to the coronavirus disease-19 (COVID-19) outbreak. This will be updated periodically (as and when there is a change in COVID-19-related measures) by the respective country contributors. The HSRM focuses primarily on the responses of health systems but also captures wider public health initiatives. The HSRM presents information under six headings:

1. **Preventing local transmission**. This section includes information on key public health measures that aim to prevent the further spread of the disease. It details how countries are advising the general public and people who (might) have the disease to prevent further spread, as well as measures in place to test and identify cases, trace contacts and monitor the scale of the outbreak.
2. Ensuring sufficient physical infrastructure and workforce capacity. This section considers the physical infrastructure available in a country and where there are shortages. It describes any measures being implemented or planned to address them. It also considers the health workforce, including what countries are doing to maintain or enhance capacity, the responsibilities and skill-mix of the workforce, and any initiatives to train or otherwise support health workers.
3. Providing health services effectively. This section describes approaches to service delivery planning and patient pathways for suspected COVID-19 cases. It also considers efforts by countries to maintain other essential services during periods of excessive demand for health services.
4. Paying for services. Health financing describes how much is spent on health and the distribution of health spending across different service areas. The section also describes who is covered for COVID-19 testing and treatment, whether there are any notable gaps (in population coverage and service coverage), and how much people pay (if at all) for those services out of pocket.
5. Governance. This discusses governance of the health system regarding COVID-19-related pandemic response plans and the steering of the health system to ensure its continued functioning. It includes emergency response mechanisms, how information is being communicated, and the regulation of health service provision to patients affected by the virus.
6. Measures in other sectors. This section contains information on measures undertaken in non-health sectors (such as border and travel restrictions, economic and fiscal measures) to tackle the pandemic.

Introduction

Evolution of the epidemic

The first case of COVID-19 infection reported in Sri Lanka was on 27 January 2020 in a Chinese woman travelling as part of a tourist group. As soon as she tested positive for COVID-19, she was isolated, treated and discharged and did not infect anyone else. Following that, the first Sri Lankan, a local tour guide, was confirmed to be carrying COVID-19 on 11 March 2020. By 31 March, the number of confirmed COVID-19 cases in Sri Lanka had increased to 122 and two deaths had been reported, the first of which was on 29 March 2020.

From the first reported infection up to mid-October 2021, the country has experienced three "waves" of COVID-19 infections (Fig. 1). The first "wave" commenced around mid-April 2020 and was confined mainly to two clusters, a cluster in a navy camp in the Colombo district and a drug rehabilitation centre in Kandakadu located in the Polonnaruwa district, both of which were successfully dealt with through enforcement of strict public health measures, testing, contact tracing and quarantine. The total number of cases attributed to the naval and Kandakadu clusters were 950 and 651, respectively. From 30 April 2020, no cases were reported among Sri Lankans except those returning from overseas.

In September 2020, Sri Lanka experienced the emergence of a second "wave"; a cluster in a garment factory located in the Gampaha district (Minuwangoda cluster) and in the central fish market in Colombo, the main hub for collection and distribution of fish in the country. Cases were identified from among harbour workers as well, as they lived in the same neighbourhoods within the Colombo Municipality as the fish market workers and were grouped together as the fish market/harbour cluster. A third cluster of cases appeared among inmates and staff of a few prisons. These three clusters constituted the second wave (94 808 cases). This wave showed progressive expansion into other districts (Fig. 2) but the bulk of cases were identified from the Western and Southern Provinces. It was brought under control by early April 2021. The second wave, which began as two clusters, had spread to the whole island by December 2020/January 2021.

The third "wave", which recorded the identification of two highly transmissible variants of concern (Alpha and Delta variants) as the dominant virus, was the most devastating wave experienced in Sri Lanka. It began around 21 April 2021, following the Sinhala and Hindu New Year celebrations, on 12 and 13 April 2021, respectively. The origin of this wave may be attributed to social mixing and travel during the festive season following some relaxation of the stringent restrictions exercised during the first and second waves. The wave showed an initial peak around 19 May 2021 (3623 daily cases) and a decline to 1420 daily cases by 18 June 2021. The Alpha variant was identified during this period.

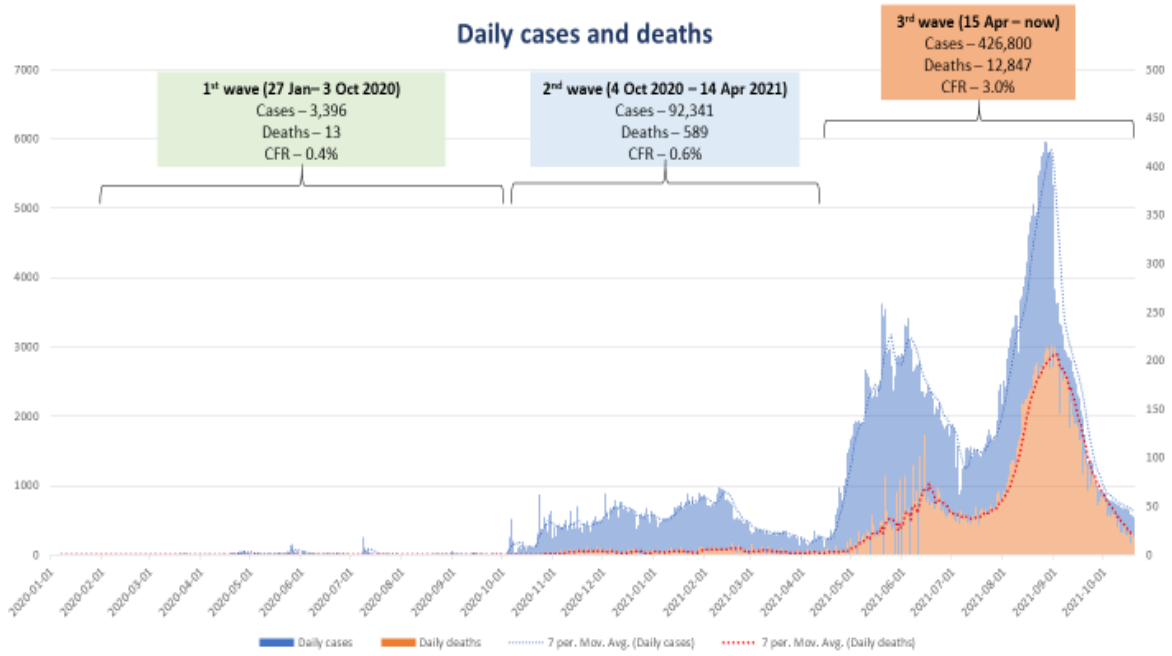
A reversal of the declining trend was noted from around mid-June 2021. The daily cases increased rapidly to a second peak of 5961 cases daily by 26 August 2021 and continued until mid-October 2021. The Delta variant was identified during the second "hump" observed in the third wave. This wave affected all districts in the country and was especially severe in urban settings within the Western Province (Fig. 3). It accounted for 425 759 cases by 15 October 2021 (Table 1).

Table 1. Total number of confirmed cases in the country as of 15 October 2021

Total number confirmed		529 755
Returnees from other countries	Foreigners	328
	Sri Lankans	6946
Cases by cluster	Naval cluster	950
	Kandakadu cluster	651
	Minuwangoda cluster	3059
	Fish market/harbour cluster	82 785
	Prison cluster	8964
	New Year cluster	425 759
	Others	313
Total number confirmed		529 755
Total number recovered		491 958
Total number of deaths		13 429
Hospitalized/on home-based care		24 368

Source: Coronavirus disease 2019 (COVID-19) – situation report – 15.10.2021 *(1)*

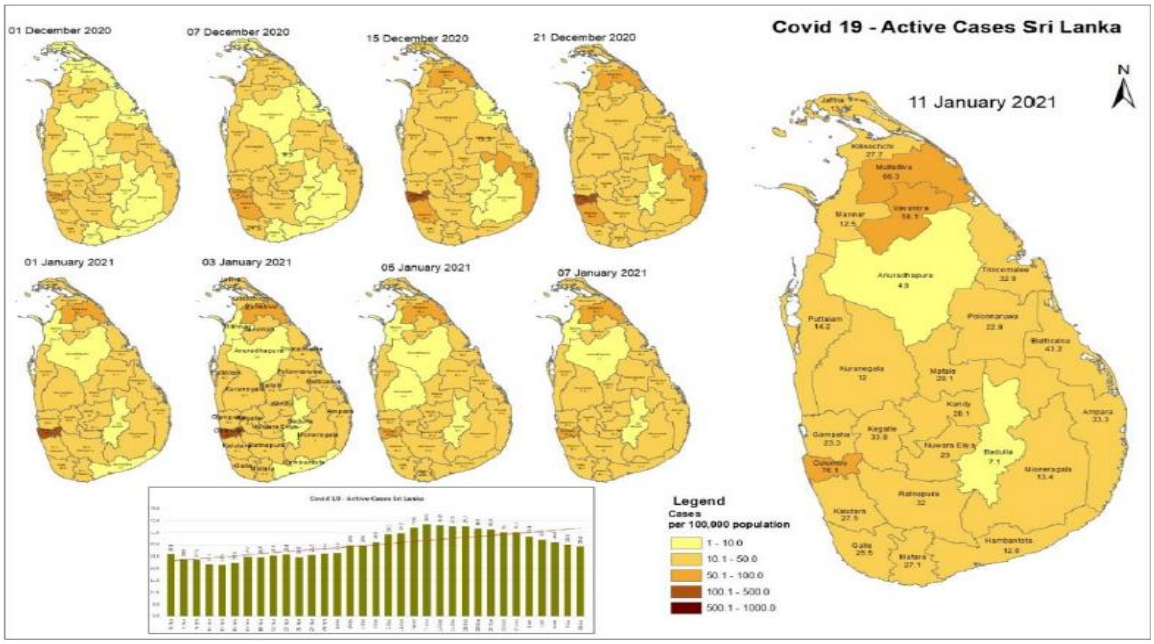
Fig. 1. Daily cases and deaths 27 January 2020 to 19 October 2021



Source: WHO Country Office Sri Lanka, based on situation reports (2, 3)

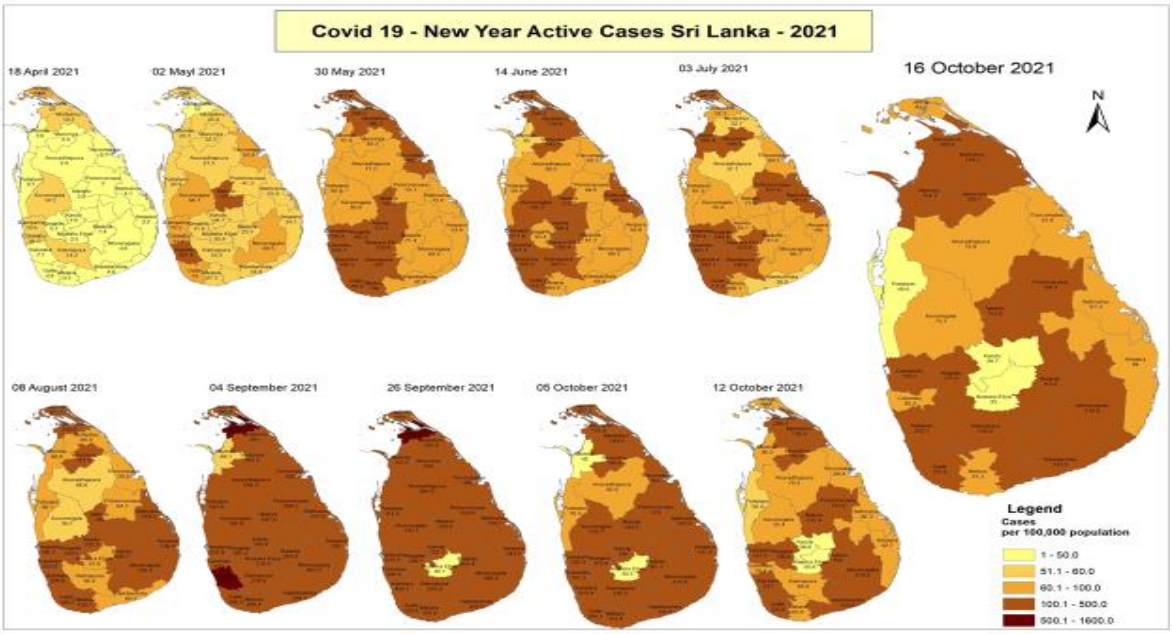
Fig. 1 demonstrates the relative contribution of the case load and deaths during the three waves of infection. The severity of infection in the different districts and its spatial dispersion over time during the second and third waves are shown in the maps given below (Fig. 2 and 3). The figures show that the second and third waves of the epidemic engulfed the whole country.

Fig. 2. District distribution of active cases per 100 000 population, December 2020, and January 2021 (during the second wave)



Source: WHO Country office Sri Lanka, based on data from the MoH situation reports *(3)*

Fig. 3. District distribution of active cases per 100 000 population, April 2021–October 2021 (during the third wave)

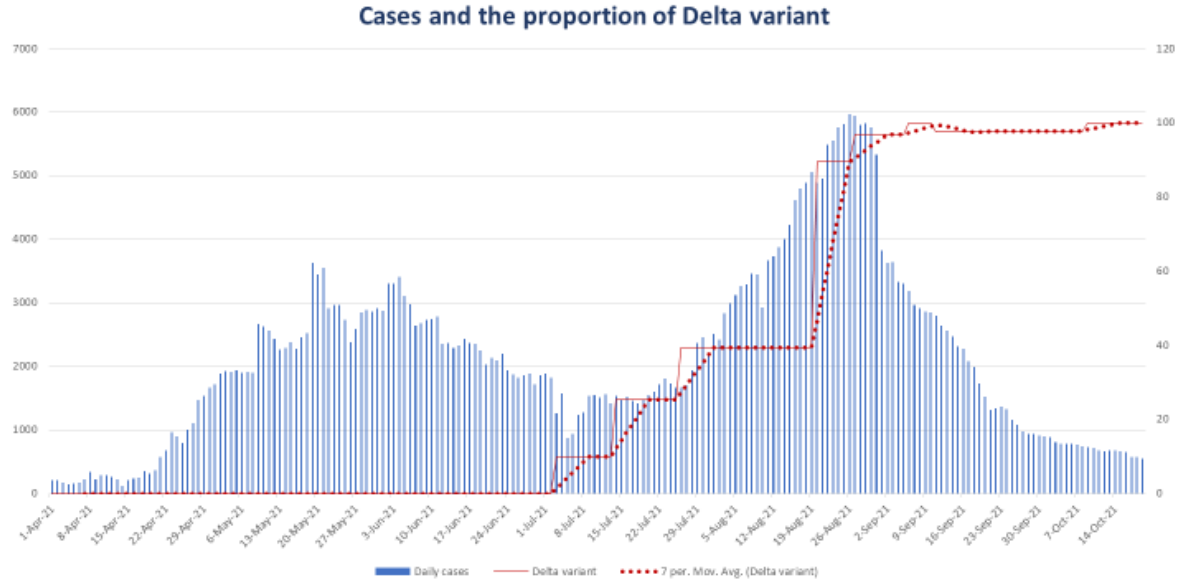


Source: WHO Country office Sri Lanka, based on data from the MoH situation reports *(3)*

As shown in Fig. 3, the density of cases during the third wave was higher than in the second, and by May–June 2021, COVID-19 cases emerged across the island and overwhelmed health services. A decrease in the density of cases was noted from June to August 2021, with an increase again in September 2021.

Fig. 4 shows that during the period August 2021–October 2021 an overwhelming majority of cases were due to the Delta variant.

Fig. 4. Number of cases and the proportion of Delta variant



Source: WHO Country Office Sri Lanka, based on data from the MoH situation reports *(3)*

Mortality

As of 29 October 2021, a total of 13 706 deaths due to COVID-19 were reported in Sri Lanka, of which 50% (6852 deaths) were from the Western Province, the Colombo district accounted for 2893 (21.1%) deaths, with Gampaha and Kalutara accounted for 2619 (19.1%) and 1340 (9.8%) deaths, respectively. Of the total deaths, 55.8% occurred among males and they were marginally younger compared to females (Table 2). Eighty per cent of all deaths occurred in the hospital, 14.7% at home, and 5.4% were found dead on admission at the hospital.

Table 2. Age–sex distribution of COVID-19 deaths up to 29 October 2021

Age group (years)	Female	Male	Total
Below 30	74 (1.2%)	90 (1.2%)	164 (1.2%)
30–59	1151 (19.0%)	1831 (23.9%)	2982 (21.8%)
60 and above	4825 (79.7%)	5735 (74.9%)	10 560 (77.0%)
Total	**6050**	**7656**	**13 706**

Source: COVID-19 confirmed deaths – weekly analysis *(4)*

Eighty-one per cent of COVID-19 deaths occurred in persons with comorbidities, the commonest being diabetes mellitus, which was seen among 53% of those who died, followed by hypertension

(51%), and ischaemic heart disease (22%). The case fatality ratio (CFR) due to COVID-19 increased over time; during the first wave the CFR was 0.38%, this increased to 0.64% during the second wave. The third wave resulted in a further increase in the number of deaths, taking the CFR up to 2.91% by 30 September 2021 – 4.5 times higher than the second wave (4-6).

It is noted that deaths among pregnant women occurred exclusively during the third wave of the epidemic. During the period between 4 May 2021 and 26 September 2021, there were 57 maternal deaths due to COVID-19 infection; 36 of these occurred during August and September 2021. Seventy-five per cent of the deaths occurred in the third trimester (Period of Amenorrhea 28 weeks and above). In comparison, there was a total of 93 (confirmed) maternal deaths in the country in 2019 and 91 (provisional) deaths in 2020.

Deaths in children under 18 years of age

Reports indicate nearly 12% of all diagnosed COVID-19 cases in the country were in children under 18 years of age There were three deaths attributed to COVID-19 reported in children below 18 years in 2020 (personal communication with Dr K Jayaratne, 2021) (4). By July 2021, 10 probable deaths due to COVID-19 were reported to the Child Morbidity and Mortality Unit of the Family Health Bureau by hospitals and the community. Comprehensive information was collected on these 10 cases from the family, field staff, hospital and medicolegal sectors and each was compiled as a case study. These case studies underwent a national-level desk review with the participation of experts from multiple related fields. Gaps in preventing infection and caring for infected children were identified through the review, and this led to a set of recommendations, and a programme of surveillance of all COVID-19 deaths under 18 years of age, which is ongoing.

Surveillance data recorded 67 child deaths by the end of September 2021. Analysis of these showed that the majority (80%) had died in hospital. A little over half (50.8%) of the children were under 1 year of age equally divided between the age groups <1 month and 1 month to 1 year. Fifty-four per cent had comorbid conditions, with congenital abnormalities being the most common (77%) (personal communication with Dr K Jayaratne, 2021).[2]

[2] The second para gives the findings of analysis of child deaths up to end of September that was presented to the College of Paediatricians by Dr Jayaratne at a webinar organized jointly by the Family Health Bureau.

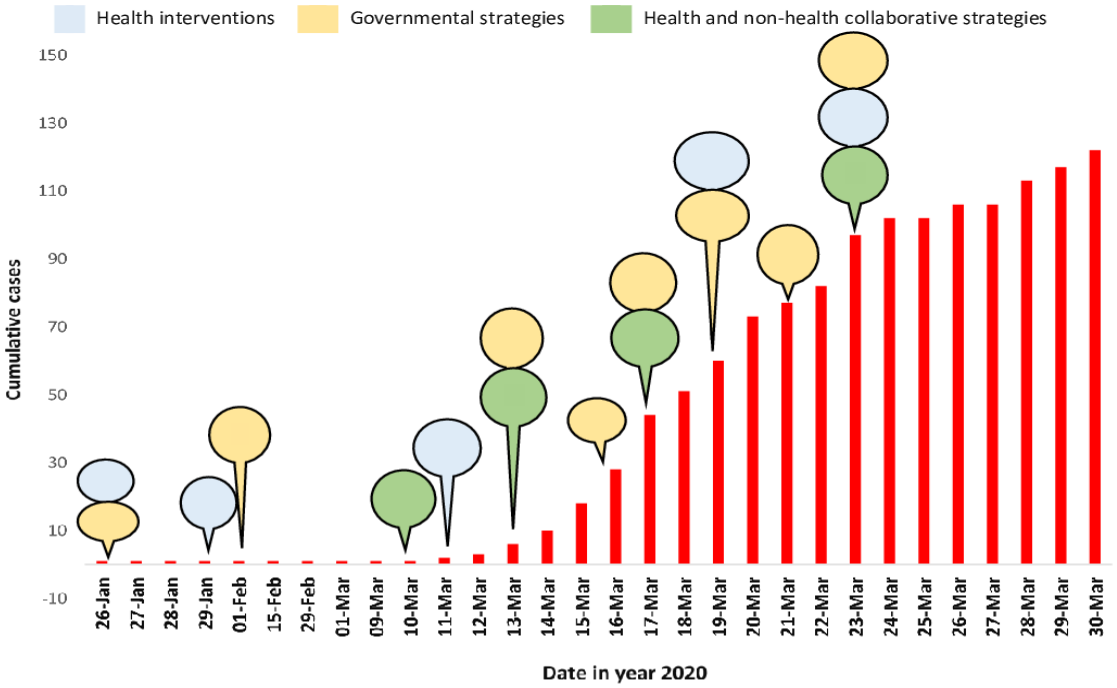
1. Preventing transmission

Sri Lanka's response to the epidemic was guided by the progress of the outbreak in the country. Sri Lanka witnessed the first two COVID-19 stages very rapidly and, by November 2020, was in stage 3 where clusters of outbreaks were observed. The Government of Sri Lanka (GoSL) used an "all-of-government" approach focused on prevention, containment and management throughout, with varying emphasis on the individual components according to the progress of the epidemic. The Ministry of Health (MoH)[3] focused on early case identification, and management, isolation of cases, contact tracing, quarantine of suspected persons, surveillance, risk communication and creating a wide level of awareness among the public on personal hygiene measures to "stay safe". The potential effectiveness of controlling COVID-19-like illness by contact tracing and isolation of cases has been demonstrated using stochastic transmission models *(7)*. With the identification of the first local case and from just prior to it, both health and non-health authorities implemented a set of urgent and aggressive actions. A major challenge as well as a success of Sri Lanka's COVID-19 measures was that the country was able to conduct a Parliamentary election and national examinations following strict guidelines, without them becoming super spreader events.

To restrict the spread of the virus within the country, the government implemented a cascade of stringent measures such as banning all public gatherings and closure of schools and other educational centres including universities. An islandwide curfew was enforced as early as 20 March, about a week after the identification of the first case and non-essential services were restricted with a work from home option where feasible. This was later modified to a night-time curfew in the high-risk districts of Colombo, Gampaha and Kalutara, the three districts that constitute the Western Province and which accounts for 28% of the country's population. The population density of the province is nearly five times that of the population density of the country. The GoSL lifted the curfew completely on 28 June 2020 *(8)*. Isolation of localities was enforced when clusters of cases were identified.

[3] This document uses MoH for the Ministry of Health. Older documents use the acronym MoHNIMS (which included indigenous medicine and nutrition, and then MoHIMS). The use of MoH is different from MOH which stands for Medical Officer of Health in this document.

Fig. 5. Timeline of early decisions



Source of COVID-19 data: Epidemiology Unit, Ministry of Health, Sri Lanka

Date	Strategy	Date	Strategy
26 Jan	Presidential Task Force established to coordinate Sri Lanka's COVID-19 response	17 Mar	Curfew imposed in three districts
	National guidelines on management of COVID-19 patients		National Operation Centre establishment
29 Jan	Screening of air travellers by Quarantine Unit		Inbound flights suspended
1 Feb	Rescue missions to Wuhan and quarantine		Dedicated hospitals for COVID-19 management
10 Mar	Quarantine of returnees from countries with high COVID-19 caseload	19 Mar	Whole country lockdown
11 Mar	Sensitize the public to their active role in the outbreak response		Guidelines for maternal and new-born care
	Expanding testing capacity	21 Mar	Approval for HCQ for COVID-19 management
13 Mar	Closure of schools	23 Mar	Re-emphasized contact tracing with Army Intelligence
	Trace every contact, contact tracing and surveillance		Expansion of COVID-19 dedicated hospitals
16 Mar	Closure of academic institutes/Public Holiday – Work from Home		Disinfection of public places/transport systems

Source: Sri Lanka's early success in the containment of COVID-19 through its rapid response: clinical and epidemiological evidence from the initial case series *(9)*

1.1 Health communication

1.1.1 Risk communication and community engagement

Risk communication and community engagement (RCCE) activities are the responsibility of the Health Promotion Bureau (HPB) of the Ministry of Health and Indigenous Medical Services (MoHIMS, currently referred to as the Ministry of Health – MoH). Preparations commenced in early January 2020, based on the existing National Risk Communication Plan for Avian Influenza and the WHO RCCE plan. An integrated and evolving model was developed for each stage of transmission. A key feature of the plan was its sensitivity to the diverse needs of the community. All communication materials were developed in all three official languages of the country, Sinhala, Tamil and English.

Special RCCE activities were carried out at provincial and regional levels through the regional consultant community physicians (CCPs), health education officers and MoH staff. The equipment necessary for this task was distributed by the HPB. There were also RCCE materials developed by faculties of medicine and teaching hospitals, which were used locally and on social media to a limited extent. The HPB worked actively with groups such as community and religious leaders, musicians and celebrities, youth groups and volunteers, to develop and disseminate various RCCE materials. Community-based nongovernmental organizations (NGOs) played an important role in community engagement activities. Material developed by the HPB was distributed to the health education officers at provincial and district levels. Messages were broadcast through public address systems in places such as banks, supermarkets and through digital billboards in strategic places *(10)*.

Daily updates on the status of the outbreak, as well as the State response to the situation were discussed every morning by the Director-General of Health Services (DGHS), the Commander of the Army as the Head of the National Steering Committee for COVID-19, and the Police spokesperson. The updates were communicated across all TV channels and radio stations and served as a distinct strength of the communication activities. Reports on the epidemic and statistics on testing were presented from time to time by the Chief Epidemiologist and the Head of the Medical Research Institute. These routine communication activities were supplemented with special broadcasts when changes in the situation demanded.

From the beginning, the HPB worked closely with the WHO and the United Nations Children's Fund (UNICEF) and formed alliances with community groups and organizations to reach all levels of the community. It aimed to provide correct information about the illness, its transmission and measures for prevention, stressing the roles and responsibilities of individuals and communities in combating the spread of the illness. The DGHS, Deputy Director-General of Health Services (DDGHS), Deputy Director General of Public Health Services- one (DDGPHS-1)[4], and the chief epidemiologist were identified as spokespersons for risk communications (10).

Different official websites provided up-to-date information to the general public on the epidemic, such as case numbers, both current and cumulative, spatial spread of infection, deaths, and other updates related to the epidemic. Infographics on these were made available on the websites of the HPB and the Epidemiology Unit. Information was also made available by the National Operation Centre for Prevention of COVID-19 Outbreak (NOCPCO) via the President's office and the government's Department of Information. In addition, an official website – https://covid19.gov.lk/ – was launched by the Ministry of Defence, which provided information on the pandemic situation in the country, up-to-date, local, and global COVID-19 statistics, guidelines and circulars related to COVID-19 in Sri Lanka, and information on helplines, etc. The National Operations Centre was dissolved in December 2021 which the Ministry of Health undertaking the responsibility of the functions of the NOCPCO *(11)*. The website of the NOCPCO focuses now on now on "Operation Freedom: Immunizing Sri Lanka".

Rumours, false and misleading information transmitted using unofficial platforms, posed a problem throughout the epidemic. Thus, an important feature of the communication campaign

[4] Note: there are two DDGPHS: 1 & 2

was to address misinformation and misconceptions. The HPB worked with WHO and the UN Resident Coordinator to monitor, identify and analyse rumours and misinformation and counteract these. From the very beginning, key issues were proactively addressed through the mainstream media and via social media *(12)*. The mainstream media disseminated updated information on Covid-19 regularly through news and special programmes such as interviews, discussions with technical experts and planned myth-busting sessions *(10)*.

A 24-hour hotline manned by a specialist community physician was another early and important service initiated by the HPB in March 2020 and maintained to date. A designated COVID-19 website with all information about COVID-19 in Sri Lanka was developed, and a chatbot on Facebook was launched to provide the most current evidence-based information *(13)*. The website of the HPB also provides a live situational analysis dashboard.

WHO and UNICEF heavily supported the work of the HPB of the MoH through their websites and social media networks. Communication on general preventive measures was introduced very early in the epidemic (end of January 2020). There were video clips, pictograms, leaflets, stickers, posters that were prepared in all three languages on hand hygiene, respiratory etiquette, and physical distancing. Individual and community responsibility towards containment of disease was emphasized from the beginning.

WHO supported the MoH to develop and disseminate materials to address specific issues as they arose, such as infection prevention and control (IPC) in quarantine centres, the development of food safety measures for markets in partnership with the Food and Agriculture Organization (FAO) and the World Food Programme (WFP). The WHO Country Office and UNICEF used their websites and social media platforms to inform and engage communities to practise preventive measures for COVID-19 (12)[5,6].

Mobile phone operators came on board with public communication messages incorporated into ring tones. Messages on individual responsibilities to stay safe and ensure the safety of the elderly at home and in the community were displayed in public spaces. Public communication of basic preventive measures received wide publicity through airtime given by the media, and over 30 video clips were developed at zero cost to the government.

Communication materials developed by the HPB at the national level were distributed across levels and districts of the country. Provinces and districts also produced innovative health education materials to use within their areas; however, there are no mechanisms within the MoH and the HPB to use the innovative and good-quality communication materials developed at the levels of the province and districts. With the easing of curfews and lockdowns towards the end of June 2020, the MoH released guidelines on how to ensure safety in workplaces and in the use of public transport. The MoH, Government Medical Officers' Association (GMOA) and WHO worked to develop a social marketing campaign for the new normal called DReAM using different platforms such as national television, radio, billboards, posters and stickers. DReAM stands for: **D** – Distancing (physical distancing); **Re** – Respiratory etiquette (cough/sneeze using the inner side of

[5] WHO Sri Lanka Facebook page (https://www.facebook.com/WHOSriLanka/). Handle: @WHOSriLanka
[6] UNICEF Sri Lanka Facebook page (https://www.facebook.com/UNICEFSriLanka/). Handle: @UNICEFSriLanka

your elbow and not directly in front of you); **A** – Aseptic techniques (handwashing, using hand sanitizer, avoiding touching your face); **M** – Mask (proper wearing of a face mask and its proper disposal).

In addition to DReAM, communication campaigns also focused on avoiding the "3C's"; crowded places, close-contact settings, and confined and enclosed spaces.

The campaign was supported by the Presidential Secretariat and funded by the "Itukama" fund. It had two arms "Meteren Jeewithe" (reference to one meter distancing), which focused on the duties of the general public and "Wagakiyamu" (be responsible), which focused on the obligations of organizations and enterprises.

Health communication also addressed the issues of social stigma, promoting family and social harmony, maintaining positive mental health, and accessing health services.

1.2 Physical distancing

An intensive information campaign on social distancing, called the "stay home" campaign, was introduced and disseminated across all types of media platforms. Special messages aimed at reducing socializing and making "stay at home" attractive were disseminated, especially around the time of cultural festivities in April and religious activities during May and June. Limits were imposed on the numbers of people attending social functions, weddings, funerals, etc.

School holidays, which were to begin in early April 2020, were brought forward and schools were closed countrywide, reopened and remained closed until October 2021. As the number of cases increased, universities and all educational institutions were closed *(14)*. This was followed by a period of "work from home" for those working in the government and private sectors. However, essential services continued, including health, public administration, transportation, banking, food, water, electricity services.

Curfews were imposed on weekends and public holidays to restrict non-essential movement. In districts that showed an increase in COVID-19 cases, curfews were imposed for several weeks. During periods of extended curfews, one person per household was allowed to step out to purchase food and medicine. The country went under lockdown for nearly 7 weeks from 19 March to 11 May 2020.

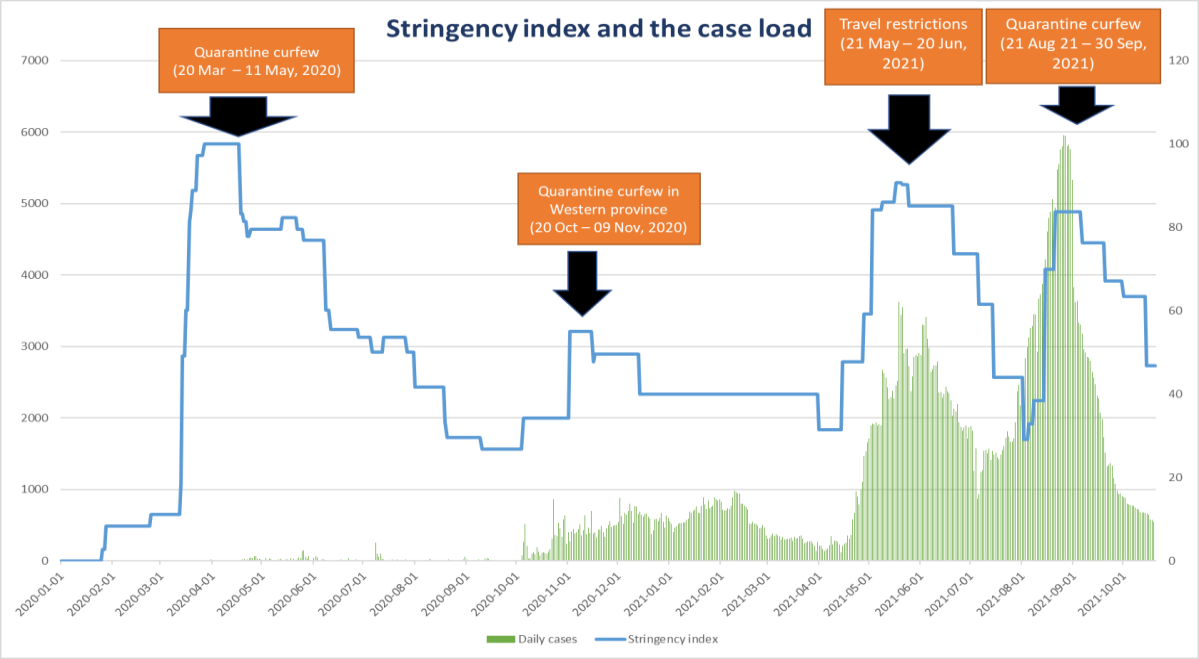
The appearance of clusters of cases led to the identification of "hot spots" and smaller administrative units such as villages, D.S. divisions or police divisions were subject to "lockdown" under the supervision of the public health inspectors (PHIs), medical officers of health (MOHs) and the police.

Following the identification of districts with high caseloads, travel from, to and through such districts was prohibited; the State provided dry food rations to such areas. Interdistrict public transport services were stopped. This limitation of interdistrict movement was not always successful, especially around the time of national/religious festivals, even though the police used roadblocks and made the possession of a valid police permit compulsory to cross borders.

The COVID-19: Containment and Health Index is one of the several policy response indices sourced from the Oxford Coronavirus Government Response Tracker (OxCGRT) *(15)*. The index for Sri Lanka is based (ongoing) on nine metrics: school closure, workplace closure, cancellation of public

events, restrictions on gatherings, stay-at-home requirements, closure of public transportation, public information campaigns, restrictions on internal movement, and international travel controls.

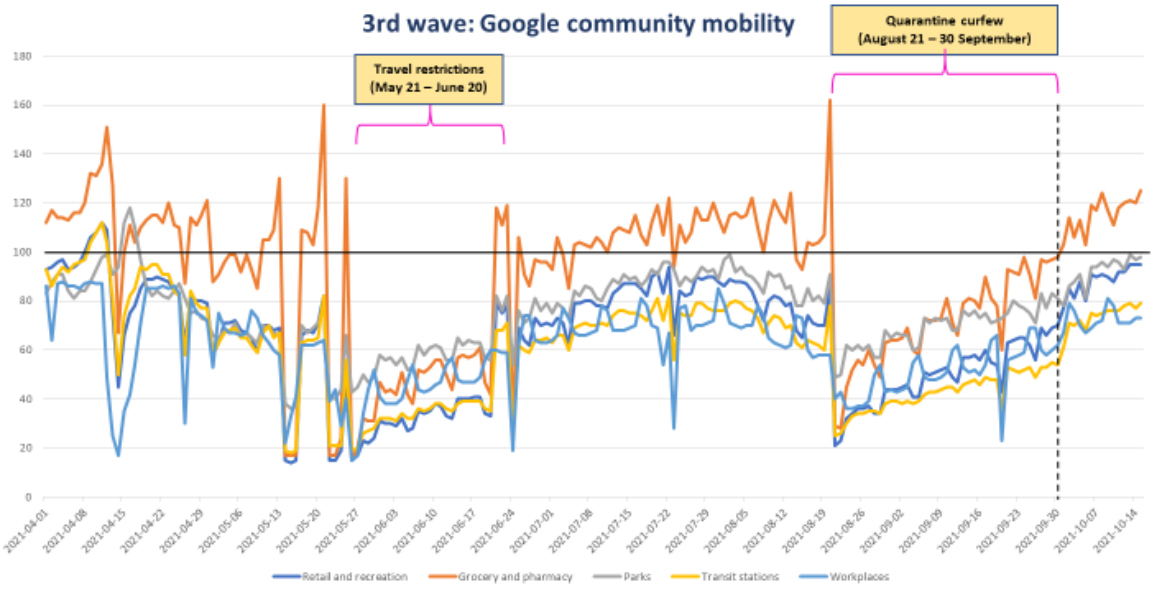
Fig. 6. Stringency index and the case load



Source: WHO Country Office Sri Lanka, based on data from the MoH situation reports *(3)* using the Oxford Stringency Index values *(16)*

Fig. 6 shows the scores of the stringency index during the three waves of the epidemic. It is noted that the highest stringency was observed at the beginning of the epidemic. The score gradually increased up to April 2020 and then started to decline until it was a low 39.1 by September 2020, and followed the epidemic curve after, though it was not as high as during the first wave.

Fig. 7. Google mobility data during the third wave of the epidemic



Source: WHO Country Office Sri Lanka, based on Google mobility data *(17)*

Fig. 7 shows Google mobility data during the third and the most devastating wave. It is seen that movement diminishes with the imposition of restrictions but returns to normal levels.

1.3 Isolation and quarantine

Sri Lanka has a long history of quarantining patients for the control of communicable diseases. Practices and beliefs related to isolation and quarantine of patients with communicable diseases and those exposed to a communicable disease are part and parcel of the culture of the country. Within the public health system of the country, community-based monitoring of people subjected to quarantine is a clearly identified service entity. However, with the reduction in infectious diseases over time, the need to activate these services at scale as before has diminished.

The initial approach to contain the spread of COVID-19 was to prevent the entry of the virus into the country and contain it at the point of entry (PoE). Following the reporting of the first case, the Government of Sri Lanka commenced screening travellers coming into the country. A quarantine period of 14 days was enforced for all travellers who arrived from or transited through China, Italy, Iran, and South Korea. Restrictions were changed based on the risk categorization of countries by the MoH *(18)*. As of 17 March 2020, entry visas were suspended for citizens of many European and some Middle Eastern countries reporting a high incidence of COVID-19 infection as well as all incoming flights to Sri Lanka. Airports were closed for commercial flights and remained closed for almost seven months. The PoEs (ports of entry) were reopened in a phased manner, with strict adherence to public health measures laid down by the health authorities (Situational analysis of the preparedness of Secondary and Tertiary curative settings for COVID 19 response [unpublished report]).[7] During the time that the airport was closed for commercial flights, the government undertook the repatriation of Sri Lankans from abroad. For those arriving in the country, information was collected through the Health Declaration Form at the PoE. This was relayed to the MOH of the area of residence of the individual through the Epidemiology Unit. The PHI with the MOH informed the individual and the household of the procedures to be followed for quarantine. For households under quarantine, a notice to that effect was pasted on the gate or wall of the house so that others in the locality knew that they were in quarantine. Compliance with the quarantine requirements was monitored by the PHI daily under the supervision of the MOH. Release from quarantine was based on a negative reverse transcriptase-polymerase chain reaction (RT-PCR) test. However, compliance during home quarantine was found to be low and institutional quarantine was resorted to as a policy.

Sometimes an identified geographical area such as a village or defined small urban area or a cluster of houses or a block of flats was isolated or locked down usually for periods of 2–4 weeks, occasionally longer. When individuals or areas were isolated, the government ensured the supply of food and water for those affected and prescription medication for those on long-term treatment. The largest such isolation/lockdown was that of a naval camp housing nearly 4000

[7] Situational analysis of the preparedness of Secondary and Tertiary curative settings for COVID 19 response. Unpublished report prepared by the WHO Country Office Sri Lanka on behalf of the Ministry of Health, Sri Lanka (2020).

persons. Nearly a third of persons from here were on home leave at the time of reporting the first case, which resulted in the isolation of six villages and nearly 1300 people to be quarantined in their homes *(19)*.

During the first two waves of COVID-19, quarantine of suspected individuals was carried out mostly at government centres. These were organized and run by the Tri Forces, mainly the Sri Lanka Army, under the supervision of their respective health services. Initially all quarantine centres housed persons free of charge but later "pay and stay" facilities operated by the Army were offered to those who wanted more comfortable "hotel" facilities and were willing to pay for the service. However, with the rapid increase in cases observed during the third wave and the large number of persons needing quarantine, home quarantine was again resorted to. In the event of quarantined cases testing positive for COVID-19, they were transferred to a treatment or isolation facility.

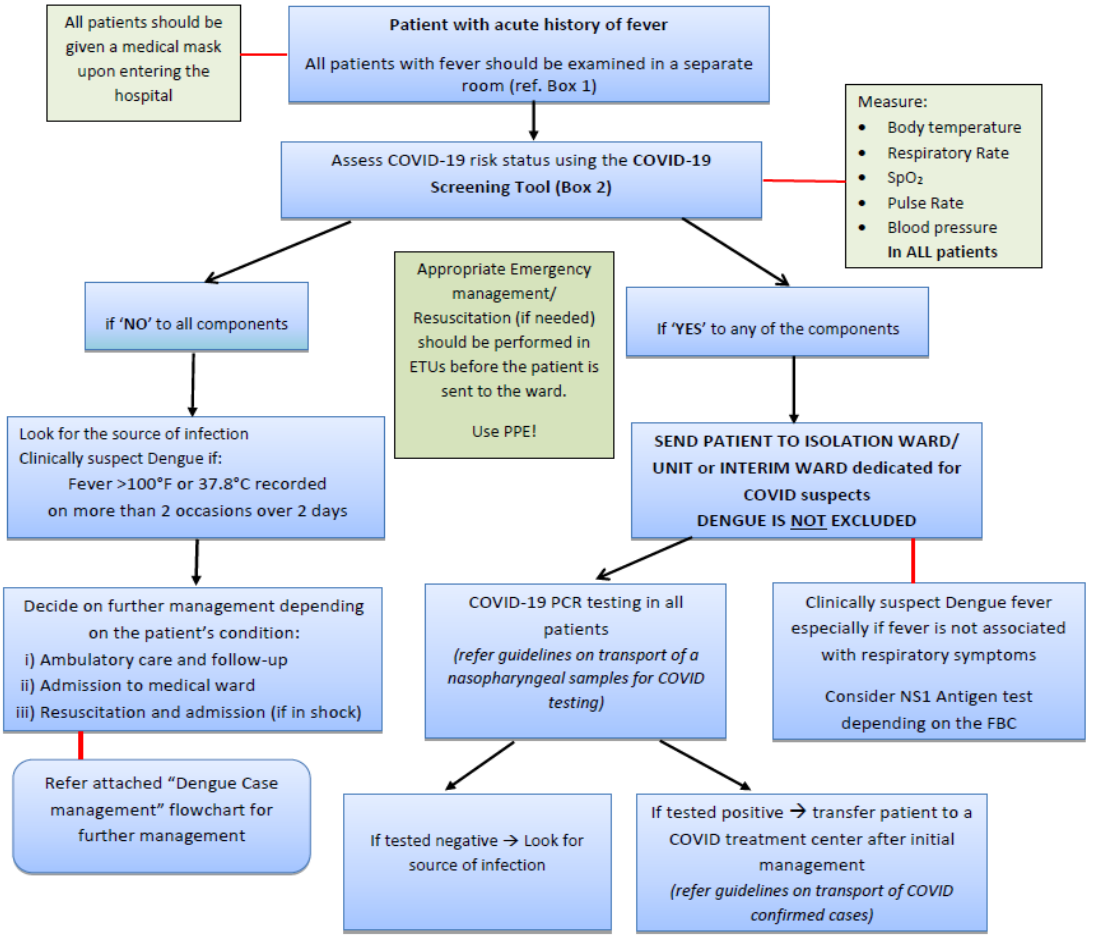
The MoH identified designated intermediate care hospitals and treatment hospitals for COVID-19 patients. These were spread across the country and institutions were added based on need. All confirmed COVID-19 cases with clinical symptoms were admitted to the designated treatment hospitals under consultant physicians. Persons who tested positive but had mild or no symptoms constituted the bulk of patients. They were admitted to intermediate care centres where they were isolated until two consecutive RT-PCR results were negative. At these centres, patients were under the supervision of medical officers. If the symptoms increased during their stay in an intermediate care centre, the patient was transferred to a COVID-19 treatment facility.

Persons at a hospital outpatient department who were clinically suspected of having a COVID-19 infection and did not have another illness that needed medical attention, were housed in an isolation ward or in an isolated section of a ward until their test results became available. If they tested positive, they were transferred to an intermediate care centre or COVID-19 treatment hospital as needed. If they had a condition other than COVID-19 which needed treatment, they were attended to in the hospital to which they presented themselves. The treatment here was undertaken in an isolation ward or in an isolated section of a ward (Care pathway for fever patients presenting at OPD during the COVID-19 pandemic, 2020) (Fig. 8).

Contact tracing and source identification was primarily done by health personnel and supplemented with verification of records by other agencies such as immigration and electoral registers, ground intelligence and big-data analysis. Information from telecommunication services was of value in contact tracing and movement details. Intelligence units of the Tri Forces supported this effort. The detect, isolate, treat (DIT) strategy and involvement of non-health personnel in some of the activities allowed the country to get the maximum out of limited human resources without jeopardizing control of the disease.

A mobile app named COVID Shield was developed in the country to aid people in keeping track of their health status and support them during the isolation and quarantine phases. These test, trace and quarantine activities have been instrumental in the effective containment of the COVID-19 epidemic in Sri Lanka.

Fig. 8. Care pathway for fever patients presenting to the OPD during the COVID-19 pandemic



Box 1 – Fever Room

All hospitals should have a predetermined room allocated for history taking and examination of fever patients.

The room should ideally be a negative pressure room. Air-conditioners should be switched off and pedestal fans directed at the doctor/physician. There can also be an exhaust fan to suck out air. **All staff present in this room should wear PPE** (i.e. surgical masks, gloves).

The patient should be directed to this room from the triage center. There should be clear sign posts to direct patients to this room. Always maintain a 2-meter gap between the staff and the patient while the patient is being directed to this room.

Box 2 - COVID-19 Screening Tool	YES/ NO
Look for the presence of associated symptoms	
• Cough	
• Sore throat	
• SOB	
Travel History	
• Returning to Sri Lanka from ANY COUNTRY within the last 14 days	
• History of travel or residence in a location designated an area of high risk*/lockdown areas within the last 14 days	
• Recent visits to government / private hospital within the last 14 days	
• Attended any Social gathering (Shopping, religious, funerals, etc.) within the last 14 days	
History of contact with any of the following persons:	
• Confirmed COVID19 patient	
• Home quarantined patient	
• A person who had been in a quarantine center	
• Anybody with above symptoms (COVID19 symptoms)	
• Anybody travelled in the high risk/ locked down areas	
• Firstline healthcare worker involved in the management of a COVID-19 suspected/confirmed patient	
• Anyone who had close contact with a foreigner or a returnee from a foreign country who arrived within the last 14 days	

Source: Circular by MoH *(20)*
ETU: Emergency Treatment Unit

1.4 Monitoring and surveillance

The Epidemiology Unit of the MoH is the focal point for disease surveillance activities in the country, and the response to the COVID-19 pandemic in Sri Lanka is led by them. Disease surveillance functions have been extended to the level of the community through regional epidemiologists at the district level, and by MOHs and PHIs at the community level. Surveillance of diseases is supported by a notification system, which makes it mandatory to notify diseases on the "list of notifiable diseases". At the beginning of the epidemic, COVID-19 was declared a notifiable disease. Based on the information from the notification system, the Epidemiology Unit compiled daily situational reports that provided information on which to base the strategy for control of the disease in the country.

Early in the epidemic (26 January 2020), a day prior to reporting the first case in Sri Lanka, the Epidemiology Unit of the MoH published a case definition for surveillance based on the WHO case definition to be used in clinical practice and criteria for testing *(21)*. The sections of the above on case definition and surveillance were updated "with increasing new knowledge on the n-CoV infection" on 6 February. In this, a "suspect case", "probable case" and "confirmed case" were defined in the Revision to Interim Summary Guidelines for Clinical Management of Patients with Novel Coronavirus (NCoV-19) (22).

The case definitions, testing criteria and surveillance strategies have undergone many revisions over time with increasing knowledge and in keeping with outbreak dynamics, reported symptom profile and allowing for more proactive case detection through strategic testing. With limited testing capacity in the early stages of the epidemic, testing was limited to "cases of coronavirus infection" and "suspected cases" as per definitions published by the Epidemiology Unit, based on WHO guidance. Instead of mass testing, the MoH prioritized testing of vulnerable persons/groups in high-risk areas. This coupled with rapid and efficient contact tracing allowed the country to gain the maximum out of the limited testing capacity. The more stringent criteria used for testing in the early stages of the pandemic were liberalized in subsequent revisions of testing guidelines.

Even before the identification of the first Sri Lankan patient with COVID-19 infection, the possibility of the disease entering the country was anticipated. Securing the PoEs was a key component of the prevention plan. Screening travellers at PoEs, with a special focus on those from high-risk countries, and carrying out active surveillance until the incubation period ended was an important surveillance function. To strengthen this activity, the MoH developed a web-based District Health Information Software (DHIS)2 package and a contact-tracing app for active COVID-19 surveillance. This came into use at the end of January 2020 but is not in use currently (DHIS2, 2021).

Active case-finding was carried out among all close contacts and second-level contacts of patients identified from environments with a high risk of transmission such as neighbourhoods of cases. All overseas returnees underwent two weeks of institutional quarantine during which they were tested according to two specific protocols, depending on whether they were from low-risk or high-risk countries. Health-care and other workers engaged with patients and communities at a high risk of exposure, including all severe acute respiratory infection (SARI) patients, and any other patient where the treating physician decided that exclusion of COVID-19 was necessary who were admitted to hospital irrespective of age; all deaths suspected as due to pneumonia, in ward, on

admission or in the field, and community samples as decided by the public health staff in high-risk areas (early active case detection).

In patients in long-term care facilities, regular symptomatic surveillance as well as random asymptomatic surveillance was carried out at sentinel sites for surveillance, followed by outbreak investigation in instances when a positive case(s) was identified. The testing algorithm included community sentinel surveillance where at least 10 samples a day were taken from patients presenting to the OPD with COVID-19-like symptoms of designated hospitals (32 hospitals in the first instance) identified as sentinel sites. Random sampling was done from areas determined by the Epidemiology Unit as high-risk areas from time to time.

During the second wave of the epidemic, one cluster spread from a garment factory in the free trade zone. This resulted in the development of a screening and testing strategy specific for employees in workplaces *(23)*. The management was held responsible for reporting suspected cases to the MOH of the area and the number of suspected cases to the Environment and Occupational Health Unit of the MoH daily. The management was also responsible for the referral of symptomatic workers to the closest divisional hospital or above for testing. This protocol required the identification of cases using the rapid antigen test in people with symptoms for screening purposes as the first step, to be followed up with a PCR test if the antigen test was negative *(23)*.

Surveillance strategies changed with the rapid spread of infection seen during the third wave and the availability of the rapid antigen tests. The testing strategy for workplaces was updated (May 2021) to include procedures for testing during an outbreak and routine surveillance of asymptomatic employees *(24)*. Random asymptomatic surveillance in the community included random testing of people in areas where potential super-spreader events were held. In prisons, long-stay hospital facilities and care homes, inmates were tested prior to admission followed by regular testing of symptomatic people and random testing of asymptomatic people. In addition to the routine surveillance activities based on RT-PCR tests, the country also undertook two Unity serosurveillance studies based on a WHO protocol that would provide information on COVID-19 transmission patterns, immunity, severity, clinical features, and risk factors for infection and help better understanding of control measures. This was carried out in the naval cluster and in the Colombo Municipality cluster. Serological studies were carried out in a sample of cases, their close contacts, and a sample of non-contacts. In addition, the Centre for Dengue Research in the University of Sri Jayewardenepura has carried out genomic sequencing of virus strains regularly over the course of the epidemic in Sri Lanka *(25)*.

1.5 Testing

The initial COVID-19 testing strategy was based on the RT-PCR assay and was designed to serve the needs of individual patient management as well as the needs of IPC during outbreaks of disease. In early January when the country was preparing to face an epidemic of COVID-19, the Medical Research Institute established an in-house molecular test for SARS-CoV-2 and validated the method through the WHO Coronavirus Reference Laboratory, University of Hong Kong (HKU), with 100% concordance of results *(26)*.

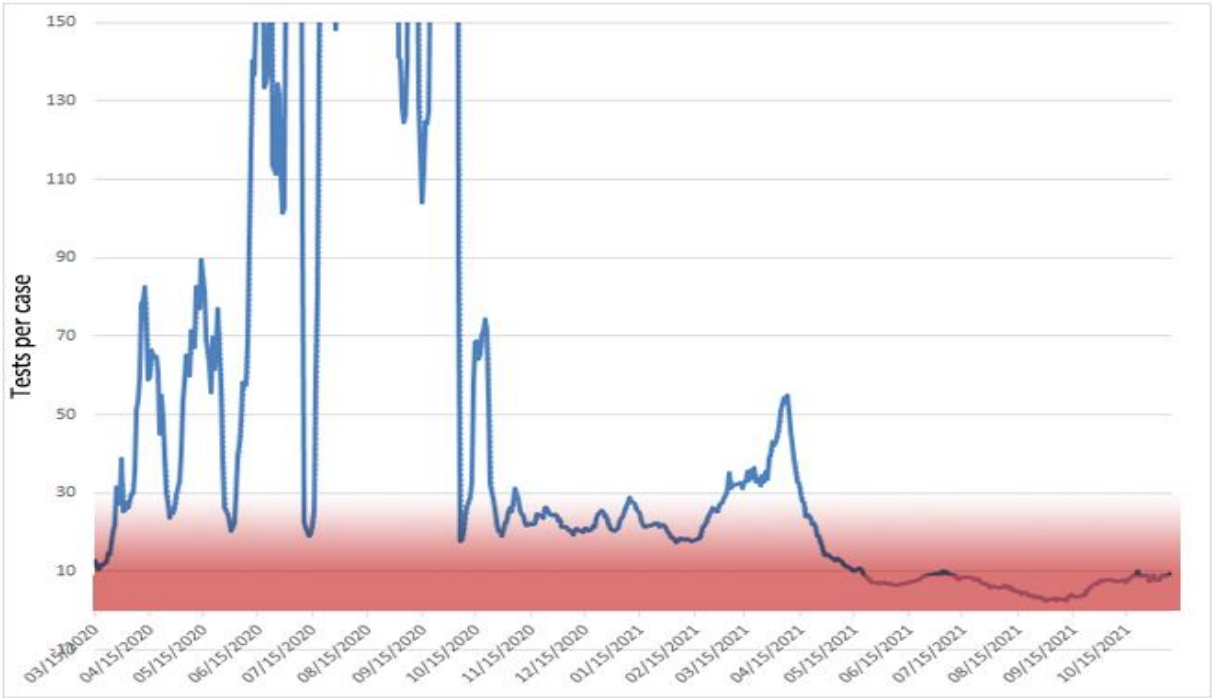
Gradually, more facilities were developed, and, by 1 June, there were 22 more laboratories in the public sector participating in COVID-19 testing. Four more laboratories were validated, gaining

100% concordance with the reference laboratory and an additional 18 laboratories have been enrolled for an external quality assurance programme (EQAP). In addition to the government and four university laboratories, four private laboratories have been added following the guidelines issued by the MoH for carrying out testing in the private sector. RT-PCR testing capability was also established at the Bandaranaike International Airport, and at the Colombo and Galle seaports *(12)*.

WHO provided key support in establishing testing facilities, increasing test capacity and in designing an information technology-based data system to capture the laboratory data of COVID-19 testing. Other international partners joined in helping Sri Lanka to acquire test kits, supplies and equipment for testing when commercial kits were not available.

One of the ways to measure testing capacity is to see how many tests are needed to find one case. Countries that do a few tests per confirmed case are unlikely to be testing widely enough to find all the cases. WHO has suggested 10-30 tests per confirmed case as being a measure of adequate testing *(27)*. Fig. 9 shows that the number of tests per diagnosed case seen in Sri Lanka has been over the minimum 10 tests per case recommended by WHO until about mid-May 2021. After that, with the increase in cases due to the third wave, the country has been unable to maintain the required level of testing (Fig. 9).

Fig. 9. Number of tests per diagnosed case, May 2020 to November 2021



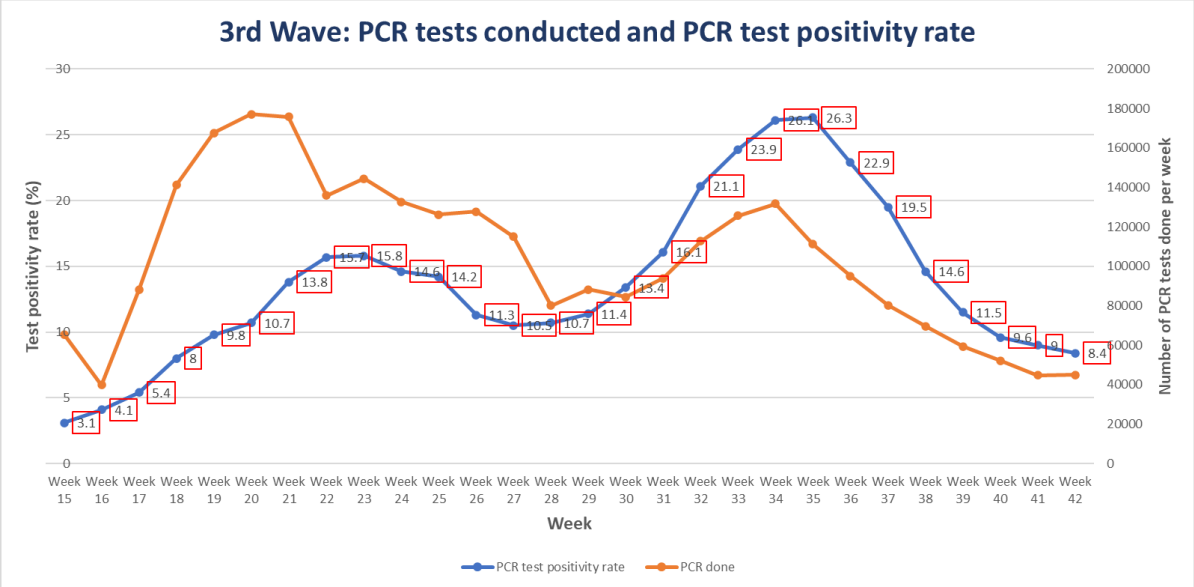
Source: A cross-country database of COVID-19 testing *(27)*

As the second wave of COVID-19 began in the country, the WHO Country Office supplied 100 000 rapid antigen detection tests in November 2020, followed by another 100 000 tests to support COVID-19 surveillance activities. The tests were used to manage the new cluster and for screening high-risk groups beyond the cluster, thus complementing the PCR capacity. The tests were approved by the National Medicines Regulatory Authority (NMRA) and were used both in institutions and in the community to test those with symptoms. Reporting of data from RT-PCR tests was a 100%, but reporting from the use of rapid antigen tests which were used in the

community to test those with symptoms may not have been a 100% and may have resulted in the underreporting of cases based on tests taken. Sri Lanka's testing strategy changed many times over the duration of the epidemic, depending on the stage of disease progression and the tests available. The last revision was in June 2021, and led to a comprehensive document covering institutional and community testing of cases and contacts, giving detailed flowcharts for each scenario considered in the document using both RT-PCR and the rapid antigen test *(24)*.

Another measure of test adequacy is to examine the proportion of tests that show a positive result known as the test positivity rate. It measures the level of testing relative to the size of the outbreak. A low positivity rate means that it takes many tests to identify one case. A high rate means that probably there are high rates of infection in the community. WHO has suggested a test positivity rate less than 5% as being adequate as an indicator of an epidemic being under control in a country.

Fig. 10. PCR test positivity during the third wave of the epidemic



Source: Weekly situation analysis compiled by the WHO Country Office Sri Lanka, based on data from the National COVID-19 Surveillance System (https://COVID-19.health.gov.lk) *(2)*

Fig. 10 shows the test positivity rate during the third wave of infection and confirms that the number of tests done during this period was inadequate *(2)*. It may also be that only the number of PCR tests done was counted as tests since the data on the rapid antigen test were not entered in the testing database. The measure can be used to guide relaxation of restrictions. WHO suggests that there should be a lag time of at least 2 weeks of low positivity rates before reopening and a further two weeks of low positivity rates before relaxation of social restrictions.

2. Ensuring sufficient physical infrastructure and workforce capacity

In preparation for the epidemic, the Armed Forces Engineering Services carried out repairs and extensions at the National Institute of Infectious Diseases (NIID). A set of buildings used earlier by the Voice of America services situated in Iranamadu in the Putlam District was converted and equipped to serve as an intermediate hospital for COVID-19 patients and the Welikanda Divisional Hospital was upgraded to the level of a base hospital and identified for the treatment of COVID-19 patients. Over the course of the pandemic when bed capacity needed to be expanded, hospitals were upgraded and buildings with large capacity were converted to serve as intermediate care centres or isolation centres by the Armed Forces.

2.1 Physical infrastructure

Interim guidelines for the clinical management of patients with novel coronavirus were issued by the DGHS on 26 January 2020 (21). The guidelines identified 12 hospitals across the country as designated hospitals for immediate admission of suspected COVID-19 patients. The NIID was identified as the apex institute for the clinical management of the epidemic and all the other institutions identified were teaching hospitals, provincial or district general hospitals. This was increased to 14 institutions through a revision to the interim guidelines issued on 6 February 2020.

As the number of COVID-19 cases increased, and because most cases were asymptomatic or manifested mild symptoms, a three-tier approach to facilities for the management of COVID-19 was advocated from 12 April 2020. Thirty isolation centres were identified for those who had no symptoms or only mild symptoms, three large hospitals were designated as exclusive COVID-19 treatment centres, and centres with intensive care unit/high dependency unit (ICU/HDU) facilities formed the third tier (Situational analysis of the preparedness of Secondary and Tertiary curative settings for COVID 19 response [unpublished report]) *(28) (29)*In April 2020, the MoH published an illustrated 65-page practical guide on hospital preparedness for COVID-19 and an interim guideline for Sri Lankan primary care physicians (12, 28, 29).

The number of institutions in each category was added according to the need. However, with the rapid spread of highly infective new variants during the third wave, the MoH developed a protocol with the objective of providing physician-guided, patient-centred safe home care for individuals with no symptoms or mild symptoms, and timely identification of patients who needed hospital admission. The intention was to reserve hospital resources for symptomatically ill COVID-19 patients. The system was field tested in June/July 2021 and was instituted islandwide by the DGHS in early August 2021.

Before the first case of COVID-19 was reported in the country, WHO helped to stockpile personal protective equipment (PPE) and increased the buffer capacity of the MoH. Shortage of PPE led to a paediatrician innovating a low-cost PPE, which evolved over thirty design iterations. The final version met all the standards specified by the MoH and was easy to put on and remove safely. Initially the production of the PPE was for use by the paediatric ward staff, but the design was further modified, and mass-scale production for use by the MoH was started by the Sri Lanka Army, Sri Lanka Air Force, and the Civil Defence authority, along with some leaders in the apparel

industry. Currently this is being extensively used in public and private health-care settings in Sri Lanka *(30)*.

The apparel industry also went into the production of masks. Both these products are manufactured for local consumption as well as the export markets. Currently, the country is self-sufficient in PPEs except for N95 masks *(12)*.

During the initial stages of the pandemic, when there was a global shortage of nasopharyngeal and throat swabs, the Sri Lanka Institute of Nano Technology (SLINTEC) developed and tested a nylon flock swab with good absorption and elution of specimens. SLINTEC produced 200 000 swabs for the government and currently about 3000 test kits are manufactured daily in Sri Lanka. This also has gone into commercial production and meets local requirements *(31)*.

2.2 Workforce

The health workforce in Sri Lanka is well trained and there are 33 skilled health personnel (physicians, nurses and midwives) per 10 000 population – short of the WHO-identified minimum density threshold of 44.5 skilled health personnel per 10 000 population in the context of universal health coverage *(32, 33)*. Health workforce statistics indicate severe shortages of some categories of health workers, such as pharmacists, physiotherapists and medical laboratory technologists, in addition to the challenge of an uneven distribution of all categories of staff across the districts. Trained officers of the Tri Forces Medical Corps, mainly that of the Sri Lanka Army in selected field-level public health activities, were engaged to supplement the health workforce.

During the initial months of the pandemic, the Post Basic Institute of Nursing (PBIN) trained a batch of 750 nursing officers in ICU care as part of the surge capacity development efforts, anticipating the need to scale up ICU care for COVID-19 management. However, the percentage of patients needing ICU care did not exceed capacity since the majority of those who tested positive were either asymptomatic or had very mild symptoms *(12, 34)*.

Table 3. ICU capacity in the country and in dedicated institutions for COVID-19 patients

Category	Number in state-sector secondary and tertiary care institutions	Number in institutions dedicated for COVID-19 patients
Available ICU beds	1022	539
Functioning beds	831	430
Functioning ventilators	863	545
Anaesthetists or intensivists	215	146
ICU trained medical officers	997	648
ICU trained physiotherapists	295	198
ICU trained nursing officers	1682	990
Non-ICU trained physiotherapists	179	154

Source: Situational analysis of the preparedness of Secondary and Tertiary curative settings for COVID 19 response (unpublished report). [8]

[8]. Unpublished report by the WHO Country Office Sri Lanka on behalf of the MoH, Sri Lanka (2020).

Over 1000 medical officers and a similar number of nursing officers from 129 government hospitals selected from across all categories of health-care institutions in the country (national hospitals, teaching hospitals, provincial and district general hospitals, base hospitals type A, B, and C, special hospitals) were trained in sample collection for COVID-19 testing. These institutions included those hospitals designated as COVID-19 treatment centres, proposed treatment centres and isolation centres (Situational analysis of the preparedness of Secondary and Tertiary curative settings for COVID 19 response [unpublished report]). In addition, the MoHIMS/Education, Training and Research unit organized a series of online training sessions on a range of topics, including the preparation of hospitals for COVID-19, IPC measures, quarantine, case management, testing and specimen collection, handling of dead bodies, psychological first aid, etc. These were conducted by experts from the MoH as well as experts from different professional colleges. A series of webinars and continuing professional development (CPD) sessions were conducted regularly by the Sri Lanka Medical Association (SLMA) in collaboration with other professional bodies through its Inter Collegiate Committee.

A set of nine modules were developed by the MoH, WHO, and College of Microbiology in all three languages. These were made available to all hospitals through the Directorate of Healthcare Quality and Safety, as well as the College of Microbiology and the SLMA. Digital versions of these modules were made available in a USB drive to all these agencies *(35)*.

WHO is supporting the MoH to develop an electronic learning management system, which covers basic training and in-service training programmes developed by experts and presented in English. These would be made available to all in-service persons and existing frontline health-care providers. WHO will further support the in-service training programme with information technology (IT) hardware and capacity development for the trainers (concept note on the proposed distant educational system for MoH Sri Lanka [unpublished document])[9]. The WHO Country Office played an important role in providing the MoH and other decision-makers with the latest evidence on the pandemic available from headquarters and the Regional Office. A series of webinars was organized by WHO and other development partners, which helped to bring together MoH personnel and their counterparts from outside the country to share knowledge and expertise while the WHO academy and the open WHO platform provided training opportunities for professionals.

2.3 Information management

Although the past few years have seen the development of many electronic information management systems within the health sector, only a few successfully scaled-up models are in use at the national level. Within the MoH there is compartmentalization of information, no clear standard operating procedures (SOPs) on data sharing and moderate use of routine analysis. The country went into the COVID-19 epidemic with a disease surveillance system that was predominantly paper based. Information management was one of weakest aspects of the COVID-19 pandemic response. At the time of the second and third waves of infection, much of the

[9] Concept note on the proposed distant educational system for MoH Sri Lanka. Unpublished document. Colombo: WCO Sri Lanka; 2020.

routine surveillance activities were paper based and could not keep pace with the rapid evolution of the epidemic.

The Health Information Unit of the MoH developed a National COVID-19 Surveillance System for Sri Lanka using the DHIS2 open source software *(2)*. The first module to be developed was the PoE surveillance module, which came into use in January 2020. Following this, 14 more modules were developed covering all aspects of disease surveillance as well as resource review, equipment requirement, ICU bed management, and a national aggregated dashboard. Although the necessary software was developed, the human resources necessary for optimal use were not available, especially at points of generation of data, except in a few instances. Of the 14 components, only the national aggregated dashboard is still in use.

From mid-July 2021, the MoH has in place a National COVID-19 Health Information System, which collects individual-level data on investigations – both PCR and rapid antigen tests, case investigation and management as well as contact tracing. Data are captured at the MOH level (community data), from government and private hospitals and laboratories and is in use islandwide. In addition, the country has a COVID-19 immunization tracker, which is used to collect and analyse individual-level vaccination data and issue a “Smart Vaccination Certificate”.

3. Providing health services effectively

3.1 Planning services

From the onset of the epidemic, the NIID played a central role in providing guidance on case management. The senior consultant physician of the Institute led an eminent group of clinicians and scientists representing professional colleges, who met regularly throughout the epidemic to develop and update guidelines as needed. Until the third wave of the epidemic, the policy of the MoH was to manage all persons who tested positive in hospitals to facilitate observation of patients as well as prevent the spread of infection in the community.

The first national guideline for the management of COVID-19 cases was issued on 26 January 2020, well before the first COVID-19 case was detected on the island. The guideline was shared via a circular letter issued by the DGHS "Interim Summary Guidelines for Clinical Management of Patients with novel coronavirus (2019-nCoV). This was followed by a revision issued on 6 February 2020 (21, 22). The Epidemiology Unit of the Ministry collaborated with the Ceylon College of Physicians to bring together a group of eminent clinicians (Clinical Management Expert Group) to formulate clinical practice guidelines to streamline the management of patients diagnosed with SARS-CoV-2 infections. The first official meeting of this group was held on 10 March 2020, a day before the diagnosis of the first local case of infection and before the WHO declaration of a pandemic.

The Group developed guidance on specific treatment for COVID-19 and this was circulated by the MoH on 27 March. This was followed by a joint publication of the MoH and the Ceylon College of Physicians "Provisional Clinical Practice Guidelines on COVID-19 Suspected and Confirmed Patients" in March 2020 (21, 28). This document provided detailed guidance based on information that was up to date at the time of publication. The DGHS, recognizing the importance of having a national committee to oversee clinical management, formalized the Clinical Management Expert Group as the Clinical Expert Committee on 24 March 2020 by reappointing the same group with an extended mandate, including overseeing clinical training on COVID-19. The committee comprised of consultants in general medicine and respiratory medicine, intensivists, anaesthesiologists, emergency physicians, paediatricians, obstetricians, microbiologists/virologists, clinical pharmacologists, epidemiologists and judicial medical officers, and was chaired by the senior consultant physician at the NIID.

The Clinical Expert Committee included clinicians working in the different provinces of the country thus facilitating a standardized approach and providing opportunities to discuss difficulties encountered under different work settings. These were discussed extensively, and suitable solutions were officially communicated by way of ministry circulars.

During April 2020, three more guidance circulars with updated information were issued. They were: Updated interim case definitions on COVID-19 and Advice on initial management of patients (circular letter dated 04.04.2020); Hospital preparedness for COVID-19 global pandemic (circular letter 12.04.2020), and Sudden discovery of a suspected COVID-19 patient in a hospital (circular letter 24.04.2020) *(36-38)*.

The Committee met regularly throughout the epidemic. It took stock of the COVID-19 situation in the country and evolving evidence in the global context. The original version of the Provisional

Clinical Guidelines (PCG) was revised and updated five times accordingly. Updates on specific sections were communicated through MoH circulars sent under the signature of the DGHS (personal communication with Dr H Tissera on hospital preparedness and response plan for COVID-19, 2021). Version 5 of the "Provisional clinical practice guidelines on COVID-19 suspected and confirmed patients" was published on 3 July 2020. The instructions given in the guideline were applicable to all hospitals/health-care settings, including those in the private sector. In addition to the clinical guidelines, the Committee was also responsible for producing the "Hospital preparedness and response plan for COVID-19" in collaboration with the MoH, which included protocols for each of the following (personal communication with Dr H Tissera, 2021).

1) Establishment of COVID-19 operational cell (in hospitals)
2) Outpatient and emergency patient care
3) Establishing designated interim COVID-19 suspected section/ward
4) Provision of critical care for non-COVID and COVID-suspected patients
5) Safe transferring of patients to a COVID-19-designated hospital/isolation hospital
6) Ensuring safety of health-care staff
7) Managing COVID-19 cured patients.

Guidelines on hospital preparedness for the COVID-19 pandemic and on triage procedures for people with respiratory symptoms were developed and disseminated by the MoH *(39)*. It also issued interim guidelines for Sri Lankan primary care physicians, with strong recommendations to continue their practice. These included private family practice/general practice clinics, primary medical care units, divisional hospitals, doctors working in OPDs of secondary and tertiary hospitals and private hospitals providing OPD care *(29)*. These protocols ensured optimum care for both COVID-suspected and non-COVID patients in hospitals while maintaining the safety of patients and staff.

With the general disruption of normal life due to a countrywide lockdown and fear of disease, specific measures were taken to ensure that persons who need services for illnesses other than COVID-19 were served. Interim guidance for surgical and medical procedures in relation to COVID-19 were published by the MoH. The guidelines note that in "*most hospitals non-urgent elective surgery and medical procedures have been temporarily curtailed to ensure adequate hospital capacity to respond to COVID-19. It is recommended that elective surgical and medical procedures should incrementally recommence safely without increasing the risk of the COVID-19 outbreak."* The circular details the procedures to achieve this *(40)*.

3.2 Managing cases

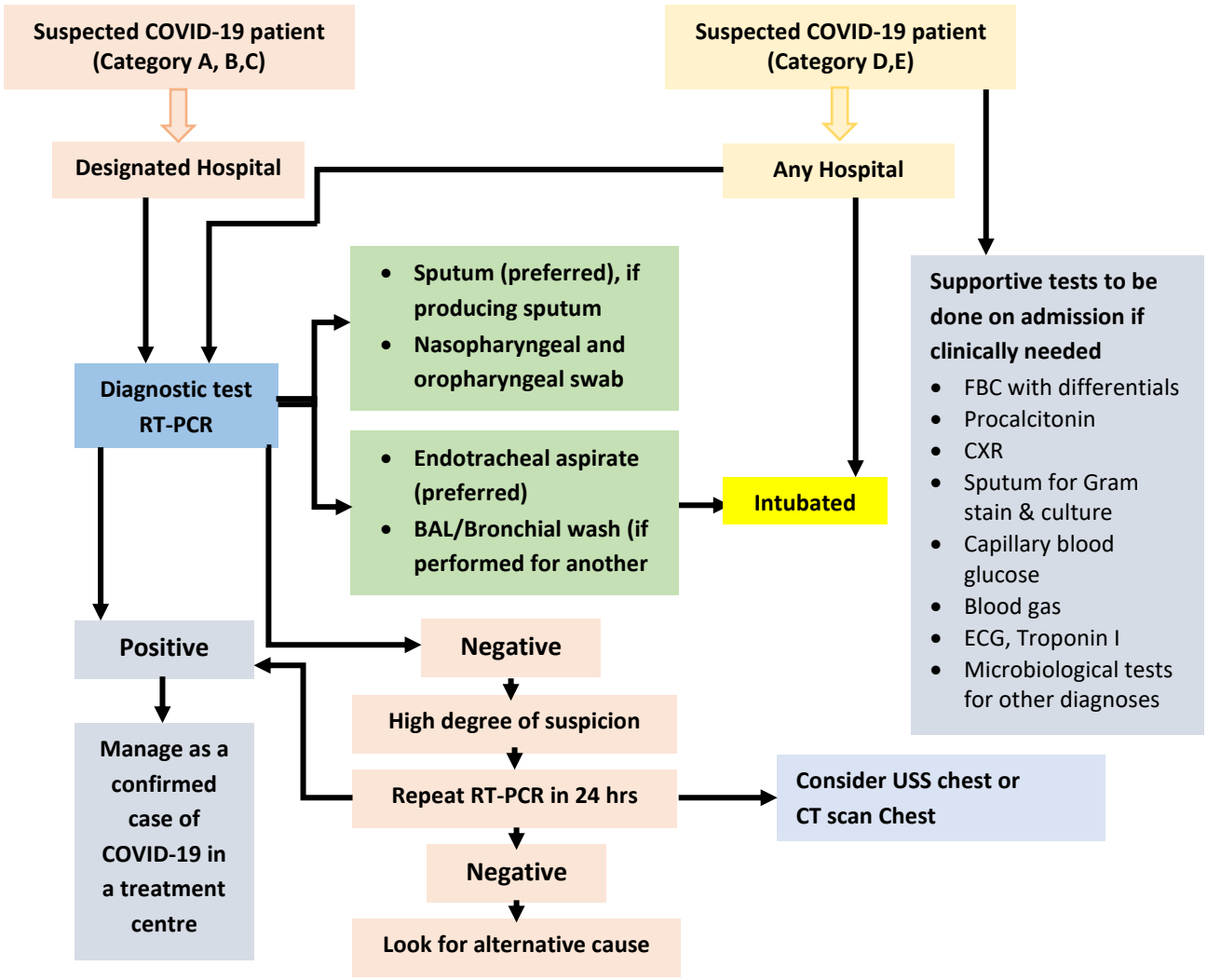
3.2.1 Hospital care

Management of all cases diagnosed as COVID-19 was to be undertaken in one of the designated hospitals according to the national guidelines developed and updated from time to time by the Clinical Expert Committee. This was until the third wave of the epidemic when the surge capacity was exceeded and supervised home-based management of cases was introduced. All services from testing, transport to hospital and in-ward care, including ICU care, were provided free of charge. Case management comprised a three-tier categorization: cases with no symptoms were managed in isolation hospitals; cases with mild-to-moderate symptoms, which may or may not need additional oxygen supply, were treated in hospitals with resuscitation facilities; and critical

cases in hospitals with intensive care facilities. Although the guidelines have changed, the three-tier categorization has remained. This meant that patients with symptoms (the last two categories) were under the direct supervision of consultant physicians.

In the early stages of the spread of COVID-19 in the country, the DGHS shared via circulars the case management procedures to be followed in health-care institution during the pandemic *(20, 28, 41)*. Clinical guidelines were produced in collaboration with the Ceylon College of Physicians (Version 5 June 2020). The MoH provided flowcharts for the procedures to be followed in the investigation of a suspected case of COVID-19 and investigation of a confirmed case. These were specifically identified as being for use in emergency treatment units and general medical wards (*see* Fig. 11 and 12). Fig. 13 provides guidance on when to call for ICU/HDU help. Any physician or an experienced member of the treating team can refer a patient for ICU care and the consultant in charge or an experienced member of the ICU team would assess the patient's trajectory urgently and arrange for admission. No exclusion criteria are given for admission to the ICU.

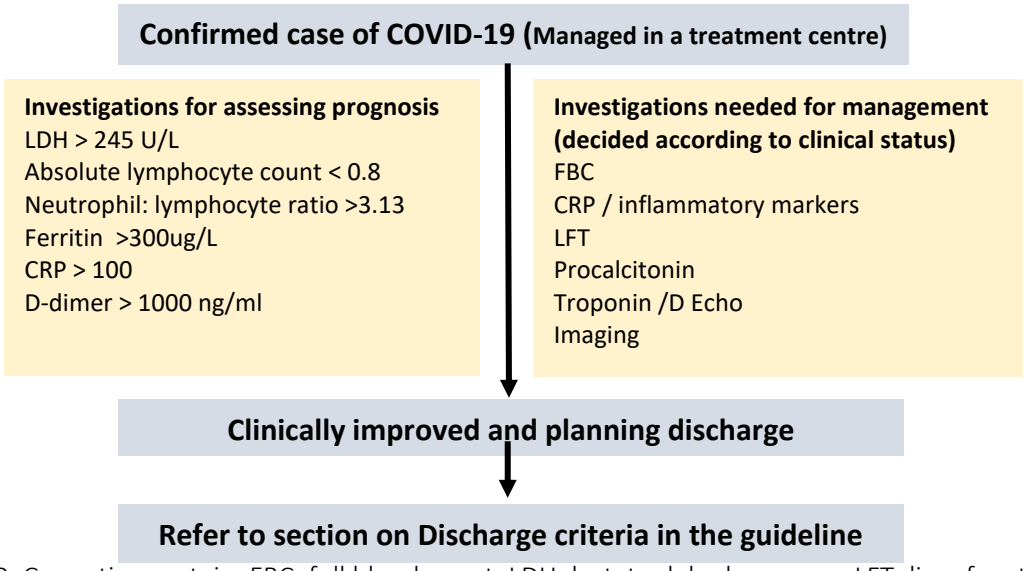
Fig. 11. Investigation of a suspected case of COVID-19



BAL: broncho-alveolar lavage; CXR: chest X-ray; FBC: full blood count; LDH: lactate dehydrogenase; LFT: liver function tests; RT-PCR: reverse transcriptase-polymerase chain reaction: USS: ultrasonogram. Category A, B, C, D, E, and F refer to definitions of "case" given in the guidelines.

Source: Provisional Clinical Practice Guidelines on COVID-19 suspected and confirmed patients *(28)*

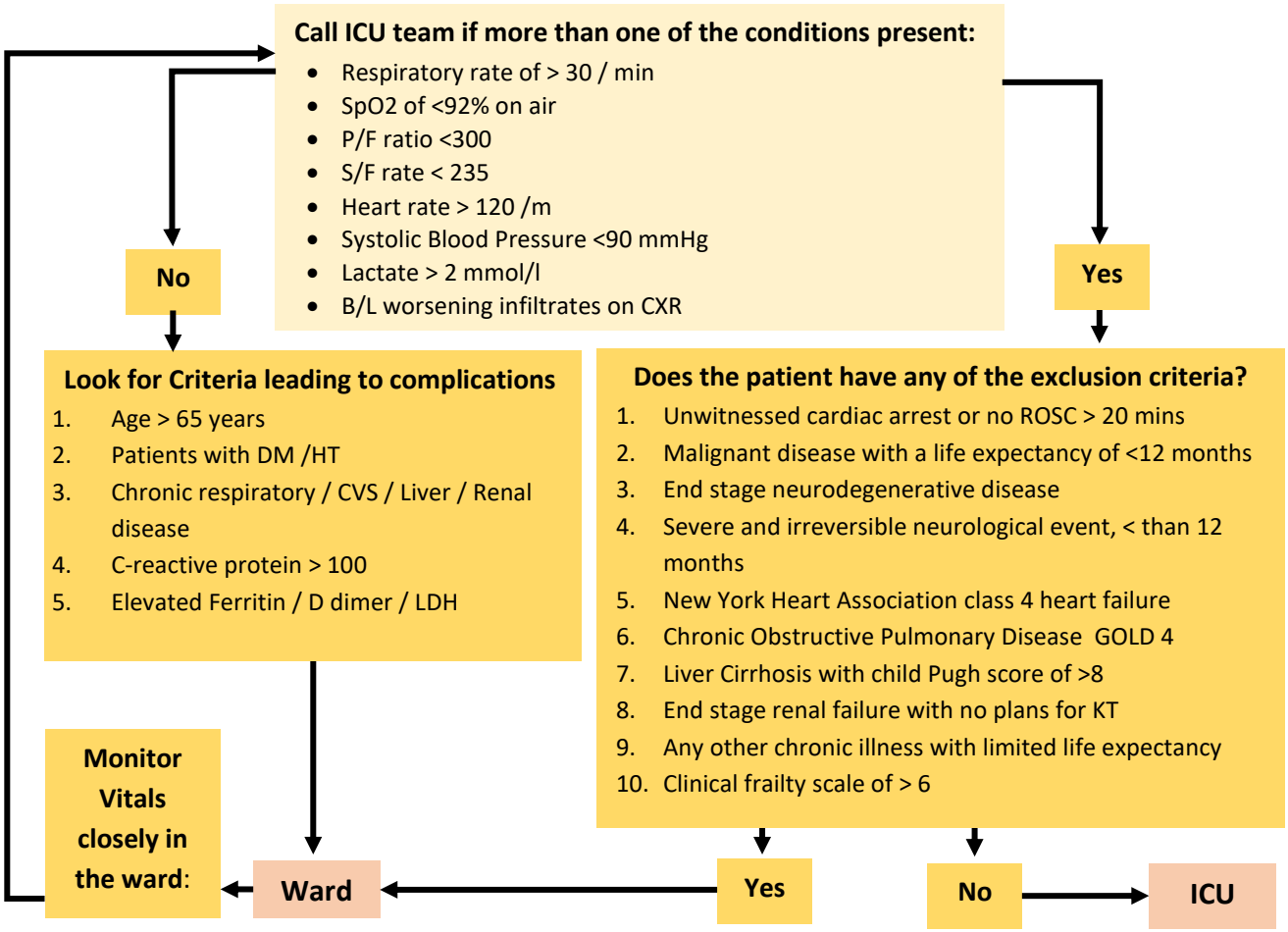
Fig. 12. Investigation of a confirmed case of COVID-19



CRP: C-reactive protein; FBC: full blood count; LDH: lactate dehydrogenase; LFT: liver function tests

Source: Provisional Clinical Practice Guidelines on COVID-19 suspected and confirmed patients *(28)*

Fig. 13. Criteria for HDU/ICU referral for a COVID-19 patient



CVS: cardiovascular system; DM: diabetes mellitus; HT: hypertension; KT: kidney transplantation; LDH: lactate dehydrogenase; ROSC: return of spontaneous circulation; SpO_2: oxygen saturation

Source: Provisional Clinical Practice Guidelines on COVID-19 suspected and confirmed patients *(28)*

3.2.2 Supervised home-based care

During the third wave of the pandemic when there was a rapid increase in the number of cases, a supervised home-based care programme was field-tested and introduced.

When a case of COVID-19 was detected in the community, the MOH of the area assessed the patient based on predetermined clinical criteria as well as the facilities available in the home and obtained informed consent from the patient for inclusion in the supervised home-based care programme. Availability of proper communication facilities was a criterion for inclusion in the programme. The MOH registered the individual in the Patient Isolation and Home Management System (PHIMS) and handed over the responsibility of the patient to the call centre and the medical care team through the PHIMS. An assigned medical officer in the medical team undertook the initial assessment and daily monitoring using a standardized screening tool. Patients requiring admission were identified early and the Regional Director of Health Services was responsible for coordinating with the hospital and arranging transportation *(42)*. The government system was supplemented by a similar system that the SLMA instituted with the College of Family Physicians of Sri Lanka. The latter was active mainly in the Western Province of the country and is still ongoing (October 2021). A formal evaluation of the programme has not yet been done.

3.3 Maintaining essential services

Special measures were introduced to ensure that persons who needed services for illnesses other than COVID-19 were served, and the maintenance of services for noncommunicable diseases (NCDs) in particular was identified as a priority. National guidelines were developed for the management of NCDs and other routine clinics at hospitals and care arrangements for vulnerable groups. Ensuring a continuous supply of medicines was identified as a top priority and measures were developed to ensure these were widely publicized.

Two rounds of the WHO survey that tracked the continuity of essential health services during the COVID-19 pandemic provided data for Sri Lanka at two periods of time: May–September 2020, which was during the first wave of the pandemic, and January–March 2021, which was during the second wave. The first survey reported that 55% (22/40) of essential services were disrupted; this fell to 42% (22/52) in the second survey (Table 4).

Table 4. Level of service disruption by broad service groups

Level of service disruption by service group	Round 1	Round 2
Primary care	Not included in round 1	Some services disrupted
Emergency, critical, and operative care	No services disrupted	Some services disrupted
Rehabilitative, palliative and long-term care	All services disrupted	Some services disrupted
Auxiliary services	Not included in round 1	Some services disrupted
Reproductive, maternal, newborn, child and adolescent health and nutrition	Some services disrupted	Some services disrupted
Immunization	All services disrupted	No services disrupted
Communicable diseases	No services disrupted	Some services disrupted

Neglected tropical diseases	Not included in round 1	Some services disrupted
Noncommunicable diseases	No services disrupted	Some services disrupted
Mental, neurological, and substance use (MNS) disorders	Some services disrupted	Some services disrupted

Source: Tracking continuity of essential health services during the COVID-19 pandemic for Sri Lanka. Sri Lanka essential health services profile *(43)*

Primary care services were included only in the second survey. Results shows that service disruption was less than 5% in promotive and preventive services and in referrals for speciality services. Scheduled visits, care for undifferentiated symptoms and renewal of prescriptions showed a 5–25% disruption. The survey indicated that there were disruptions in emergency, critical and operative care but examination of the subcategories indicated that elective surgeries were the ones that were affected, and that the volume of surgical backlog increased over the three months prior to survey.

Long-term care, rehabilitative care and palliative care – all services were affected in the first round of the survey, but the second round showed some improvements. Immunization, which is a public health field service, was reported as being badly disrupted during the first survey and was restored by the time the second survey was undertaken. Of the tracer services, those that remained affected during the second round of data collection were the management of moderate and severe malnutrition, which continues to be a public health problem in the country, and services to mitigate intimate partner violence. The prevalence of these two conditions per se was aggravated by the pandemic itself or its control measures, thus exacerbating the effects of disruption of services. Laboratory services such as testing for HIV and hepatitis B and C, prevention of HIV and neuroimaging services were interrupted, probably because they are not widely available services.

The reasons for changes in access to some services include: the closure of outpatient services and disease-specific specialist clinics, cancellation of elective procedures and non-functioning of population screening programmes, and inadequate availability of PPE for health-care workers. In addition, travel restrictions resulted in a decrease in patient volume. A positive factor was that the country had a defined national essential health service package in place, had appointed a national focal point and allocated funds. However, there was no regular monitoring of the continuity of essential services.

3.3.1 NCD care

Maintenance of services for NCDs was identified as a priority. National guidelines for the management of NCDs and other routine clinics at hospitals and care arrangements for vulnerable groups were developed *(44)*. It was realized that many of the elderly with chronic illnesses had difficulty in obtaining their regular supply of medicines. For persons who were able to reach their clinics, arrangements were made to issue medicines for a longer period than usual. Mechanisms were also established to provide drugs from health-care institutions nearest to the patient's home. This was especially applicable for those who were being followed up in tertiary- and secondary-care institutions.

For those unable to reach their clinics, alternative delivery methods were organized. A comprehensive list of contact numbers of the NCD clinics held at government hospitals in the country was publicized. The information was disseminated through the mass media, social media, and field health staff. Patients were advised to contact the clinic and get their medicines delivered home. The district-level Medical Officer-NCD coordinated the home delivery of medicines through the postal service and was also responsible for sourcing medicines from both State and private pharmacies. Field-level medical and public health staff as well as non-medical field officers such as the Grama Niladhari Development Officers attached to divisional secretariats, village leaders and volunteers helped in this effort. For patients who were on insulin, arrangements were made to have their supplies collected from the primary care institution closest to their home. Follow-up clinics for cancer patients were held as scheduled, but for those who were unable to attend, the drugs were dispatched to their homes.

The State pharmacies (Osusala) and NMRA-approved private pharmacies set up a collaborative web-based effort to deliver drugs to the home of patients who normally purchased their drugs. Over 1800 pharmacies participated in this effort and a web-based survey of participating pharmacies is being conducted to assess the effectiveness and challenges of this mechanism.

The Family Medicine Department of the Faculty of Medicine, University of Kelaniya developed a system of telephone consultations with private sector collaboration. The teleconsultations started with the land lines that were available in the clinic, and later extended to include video consultations through WhatsApp, Viber, Zoom and other platforms. Guidelines and algorithms were developed, and the system was utilized for consultations to a limited degree in the university practice area. This helped to minimize patient travel for routine services to some extent. With the technical and financial support of the private sector, a telemedicine system was established at 16 nephrology clinics in government hospitals across the country. This enabled patients with a kidney transplant or on dialysis to consult a nephrologist and access advice and consultations via audio, video, or e-chat. This also helped to minimize exposure of high-risk or immunocompromised patients to COVID-19 infection.

The NCD Bureau of the MoH maintained a trilingual hotline for information on how to acquire medicines and relevant services. The MoH operated a hotline to advise patients who needed ambulatory care. This service also provided information and organized admission to a facility whenever necessary.

Attention was given to promoting healthy lifestyles though confined to home. Healthy food habits and physical exercise routines that could be used in the home as well as special programmes for children were instituted *(45)*.

3.3.2 Emergency care

All government hospitals aimed to keep emergency care services as close to normal as possible. The public was instructed on how to obtain medical assistance and transport to hospitals during an emergency. The telephone numbers for the government-operated free ambulance service “suva seriya” was widely publicized. The public was advised to obtain the contact details of the area PHI and MOH from whom they could seek help during an emergency.

Dialysis services continued as usual, and this facility was made available at the NIID and Base Hospital Homagama in case COVID-infected patients needed such an intervention. Most elective

procedures were postponed. Palliative care services were affected to a great extent. However, public health field staff were requested to provide some of the services such as changing nasogastric tubes and urinary catheters, checking blood pressure in the patient's homes.

3.3.3 Patient information services

Throughout the pandemic, the HPB maintained 24-hour trilingual hotlines manned by a consultant community physician. The service provided general information on the status of the epidemic as well as emergency information. In addition, several specific hotlines were maintained by the different specialities (such as cardiology, neurology, nephrology, endocrinology) to provide advice to patients.

3.3.4 Mental health services

As COVID-19 spread across the country, it spread fear, anxiety, and uncertainty, it was acknowledged that such conditions could precipitate psychosocial problems or lead to deterioration of existing mental health conditions. Thus, the Directorate of Mental Health of the MoH undertook several special interventions for mitigation and promotion of mental health.

The MoH has a network of approximately 180 medical officers of mental health (MOMH) serving in all the districts in Sri Lanka and there are 19 MOMH (focal points) attached to the offices of the Regional Directors of Health Services. The MOMHs provide care for those with mental disorders under the technical guidance of consultant psychiatrists. They are also engaged in promoting mental health and preventive activities in the districts and spearheaded special interventions during the epidemic.

All mental health units in the country were advised to ensure the continuation of medication. Those on oral medication had them delivered to their homes and those on injectables were administered their medication either at the clinic or in the community. The public health services of the country (MOH and team) supported community efforts. Global resources for mental health and psychosocial support (MHPSS) developed by WHO headquarters and *the* Inter-Agency Standing Committee (IASC) *Guidelines on mental health and psychosocial support (MHPSS) in emergency settings* were translated and adopted in the local languages with the support of WHO. Psychological support was continued through the existing helpline of the National Institute of Mental Health (1926) and an additional helpline was initiated and maintained by the Sri Lanka College of Psychiatrists, which also disseminated contact numbers of district-level mental health professionals for direct contact for help. Community-based organizations, the Courage Compassion Commitment Foundation and Sri Lanka Sumithrayo supported the efforts of the MoH by providing "active listening" services to persons with psychological distress. When the HPB helpline received calls complaining of or displaying distress and anxiety, voluntary psychologists and counsellors responded to the need for psychological support.

A survey conducted in all 25 districts using a sample of 2019 persons by the Alcohol and Drug Information Centre (ADIC) identified that the use of alcohol and tobacco decreased by 80% and 60%, respectively, during the first wave of the epidemic when alcohol outlets were closed, and cigarette sales were restricted. The reason given for reduced use by the respondents was non-availability of alcohol and cigarettes *(46)*. Many patients reported withdrawal symptoms during this period. The National Dangerous Drug Control Board set up a hotline manned by trained counsellors to support those addicted to drugs and their families.

Guidelines were prepared for the print and electronic media on using the appropriate and correct terminology in reporting COVID-19 news. Their role in destigmatizing and promoting mental well-being in society was emphasized. Special programmes in this respect were held with media assistance. Video clips and posts on social media were used by the HPB in promoting mental health. Mitigation of gender-based and household violence received targeted attention *(47)*.

3.3.5 Mental well-being of frontline health workers

The need to promote the mental well-being of frontline health workers was recognized. Guidance in this respect was developed by the National Technical Committee on Mental Health for health administrators of curative institutions and the preventive health sector. It is encouraging to note that all institutions have taken initiatives to promote the well-being of their staff. Furthermore, the HPB developed and disseminated messages and video clips that facilitate the mental well-being of health and other frontline staff. The Sri Lanka College of Psychiatrists established a special helpline for quick response. Special mental well-being programmes were conducted for frontline health staff with the assistance of WHO. Messages of appreciation of services were incorporated as ring tones by mobile telephone services and the mass media broadcast songs and video clips in appreciation of services.

3.3.6 Maternal and child health services

An early response by the Director Maternal and Child Health was the development and dissemination of guidelines using electronic media for the smooth continuation of essential services related to maternal and child health (MCH) services in both the curative and preventive sectors. Virtual meetings were held weekly with regional staff and served to identify gaps in implementation and sharing of good practices. A handbook was developed to provide guidance to field staff on how to provide services while staying safe and not inadvertently placing their clients at risk. In selected strategic locations, the MCH clinic centres were kept open daily or on a twice-a-week basis and field health staff continued to provide family planning services, growth monitoring and immunization services. Logistic support was provided to ensure growth monitoring and uninterrupted provision of nutrition commodities for under-five children.

High-risk pregnant women were prioritized for the provision of clinic and domiciliary services. Nutrition and vitamin supplements were delivered to their homes. The women were also categorized based on the risk of COVID-19 transmission in their community and different service provision strategies were adopted accordingly. In areas where there were lockdowns or curfews, women could use their antenatal clinic card as a curfew pass enabling them to get to hospital in an emergency.

An important feature was that, at all times, the public health midwives (PHMs) were in contact with the women registered for care. The importance of continuously communicating with pregnant and lactating mothers under their care was stressed. In areas where lockdowns were implemented, 24-hour ambulance services were made available. Obstetric care services were improved, especially emergency neonatal and obstetric care (EmNOC) services in the divisional hospitals closest to the lockdown areas through repurposing and training available staff or through temporary relocation of staff from a higher-level institution in close proximity. Two hospitals were identified and modified to manage pregnant mothers who were infected with

COVID-19 and their newborns. The care provided in these hospitals was optimized by providing the necessary human resources and facilities such as neonatal intensive care services.

Several measures were used to continue with family planning services even during the lockdown periods. The programme was strengthened through measures for continuous supply of contraceptive commodities. These were delivered to client homes when necessary and the public was made aware of service availability.

The Expanded Programme on Immunization (EPI; all except BCG vaccination, which is given at birth at the institution where delivery takes place) was temporarily halted during the countrywide curfew but was reinstated with the release of this measure. Arrangements were made to clear the backlog of vaccinations either through longer clinic hours or extra clinics. The PHM of the area knew the exact vaccination requirements in her area based on her records and drew up a programme whereby she could bring the vaccinations up to date and batches of children were given appointments in keeping with the COVID-19 regulations. The backlog was cleared in about 4 weeks.

A review of maternal deaths (n=13) during the lockdown was carried out to evaluate the implications of the restrictions on care pathways based on the information in the case notes and reporting formats. In five out of the 13 deaths, delay in receiving optimal care was directly or indirectly related to the epidemic situation in the country. Based on the findings, recommendations were made to further streamline and optimize service delivery.

Monitoring of field services was carried out through district MCH teams using online methodologies. Platforms were created to link field- and district-level staff with central-level programme managers. Routine national MCH reviews were also conducted on online *(48)*.

3.3.7 Healthy lifestyles

Awareness programmes on the need for adopting healthy lifestyles were conducted via mass media (i.e. television and radio channels). Many programmes were telecast with the objective of inculcating positive behaviours, such as engaging in physical activity, home gardening, encouraging creativity, and using the opportunity to spend quality time with children and other family members to strengthen family bonds.

3.3.8 Gender-based violence

The Family Health Bureau is responsible for the health sector response to gender-based violence (GBV). Programmes reach the community through the PHMs. In addition, the MoH provides clinic-based supportive services through “Mithuru Piyasa” (“Friendly Haven”). These have links with the social services and community-based NGOs and international NGOs (INGOs), which provide safe houses and support for affected women. The Police service has special women’s desks manned by female police officers.

Recognizing that GBV would probably increase during curfew periods, due to limitation of normal movements and fear of an unknown disease, field staff were instructed to be vigilant and refer for help when needed. In most instances where a facility had not been taken over for COVID-19 care, the clinic services for GBV functioned. According to the United Nations Population Fund (UNFPA) *(49)*, emerging data show an increase in GBV in Sri Lanka since the pandemic, as evidenced by the increasing number of calls made to the 24-hour national women’s hotline (1938) and other

helplines. It is most likely that this number does not fully reflect the extent of the problem as many women are either not aware of the hotline services or are unable to or would not contact the hotline for social and other reasons.

Several NGOs, including the Asia Foundation, partnered with several community-based NGOs towards empowering community workers and strengthening services such as helping to keep the women's desks at police stations functioning through provision of necessities for handwashing, social distancing, etc.

"She deserves better" was a project by students of the Faculty of Medicine, Colombo to increase understanding of the problem. It addressed masculine norms and toxic masculinity. It encouraged the public to actively participate in resisting violence against women and aimed to send a clear message of zero tolerance towards violence against women (VAW). A series of original videos and posts were created in all three languages, and various platforms were used to disseminate the material. The project initiated discussions online and on social media among a wide range of persons, especially among the youth. Results showed that it was able to empower women and create a move towards zero tolerance of toxic masculinity and behaviour leading to VAW *(50)*.

3.3.9 Preventing the re-emergence of malaria into Sri Lanka

Sri Lanka was certified by WHO as a malaria-free country in 2016. The last reported indigenous case was in 2012. Prevention of re-introduction of the parasite has remained a challenge and this was exacerbated with the repatriation of Sri Lankans from areas with malaria following the COVID-19 epidemic. Furthermore, most of the quarantine centres happened to be located in previously malaria-endemic areas where the vector is known to be present. The Anti-Malaria Campaign (AMC) perceived the imminent threat and developed an integrated three-pronged plan to reduce the risk of transmission i.e. entomological screening, parasitological screening, and situation-specific precautionary measures. An interim guideline for parasitological screening and entomological activities was prepared by the AMC technical team with the participation of the Technical Support Group for Prevention of Re-Introduction of Malaria and was circulated among staff members.

AMC headquarters and regional malaria officers (RMOs) conducted entomological surveys in 60 quarantine centres and, where indicated, vector control activities were done. This information was passed on to the COVID-19 coordinating committee and, whenever possible, returnees from malaria-endemic areas were kept away from malaria-receptive areas.

All returnees from malaria-endemic countries underwent parasitological screening. Symptomatic returnees were screened immediately and asymptomatic individuals before discharge from quarantine. For persons who developed COVID-19 illness during the quarantine period the testing was done at the hospital by AMC staff.

AMC staff were advised to follow all safety guidance issued by the MoH and use PPE so that there were no interruptions in the malaria activities through the illness of trained personnel *(51)*.

4. Paying for services

4.1 Health financing

Government spending on health is mostly financed through domestic resources and, in 2019, the ratio of domestic-to-foreign resources in the Central-level health budget was 96% to 4%. At the provincial level, the internal-to-external resources ratio was 97% internal to 3% external resources for the 2013–2018 period *(52)*.

4.1.1 Financial resources

As of August 2020, the government is estimated to have allocated 0.1% of gross domestic product (GDP) for containment measures and announced an additional allocation of nearly 0.25% of GDP for cash transfers for vulnerable groups under its fiscal package *(53).*

The overwhelming majority of testing for COVID-19, transport of patients and comprehensive clinical treatment as well as isolation and quarantine are carried out in government health facilities and the cost of care is borne by the government. The budget estimates for the health sector for 2021 is Sri Lankan Rupee (LKR) 159.476 billion, LKR 3.1 billion less than the LKR 162.576 billion revised budget for 2020 *(54)*.

It is envisaged that the recurrent costs of the MoH may have been less than planned in 2020 due to savings on overtime payments for staff, reduced routine investigations and procedures, etc. All activities, such as building, renovation and upgrading of government hospitals in preparation for the pandemic as well as equipping and running of quarantine facilities, supplementing immunization services, mobile immunization facilities for the elderly, etc. were undertaken by the Tri Forces, mainly the Army, and as such the funds for these activities came out of their budgets.

The two largest clusters in the first wave of the epidemic (total number of cases in the first wave was 9791 by 30 September 2020) were those at the Naval base at Welisara and the cluster at the Kandakadu rehabilitation centre. The Welisara cluster was handled by the Navy Medical Service Corps with the guidance of the MoH. The cluster at Kandakadu (651 cases) occurred in a drug rehabilitation centre under the Prison Rehabilitation Services and was managed by the Sri Lanka Army Medical Corps. Though government funds were involved, they were from budget lines other than health.

4.1.2 Extrabudgetary measures

On 23 March 2020, as per the decision made at the Cabinet meeting held on 18 March 2020, His Excellency, the President of Sri Lanka established a special fund named the “COVID-19 Healthcare and Social Security Fund”, with a donation of LKR 100 million from the President’s Fund. A special account was opened at the Corporate Branch of the Bank of Ceylon. Donors to the Fund are exempted from taxes and foreign exchange regulations. The Fund is managed by a committee of professionals consisting of Ministry secretaries, bankers, financial analysts, and health authorities and is chaired by the Governor of the Central Bank. The name of the Fund was later changed to “Itukama COVID-19 Healthcare and Security Fund”.

Two of the important stated aims of the Fund is to provide immediate funding requirements of the DGHS to meet all expenditure connected with COVID-19-related health-care facilities, including medicines, testing, equipment and to meet expenses connected with the health care and

safety of health sector employees and all logistic providers working to provide essential public delivery services. The Fund is to address the "critical health-care needs brought on by the COVID-19 pandemic and improve Sri Lanka's national long-term preparedness and capability for addressing health emergencies" *(55)*.

The Fund will reimburse money spent by an institution on COVID-19 activities for which prior approval of the committee has been obtained with the proviso that government procurement procedures have been followed. Under no circumstances will the committee make a direct purchase or direct expenditure. The transactions of the Fund are subject to full audit by the Auditor General of the Government *(56)*. With institutional and personal donations and direct deposits, the balance of the COVID-19 Health-care and Social Security Fund reached SLR 1 668 379 121.74 as of 10 November 2020. Out of the said amount, SLR 402 190 701 has been allocated for the following activities of which SLR 105 001 677 has been spent (Table 5) *(57)*.

Table 5. Activities approved by the Management Committee

Activity	Allocated SLR	Actual expenditure SLR	Implementing agency
PCR testing	100 000 000	42 605 812	Ministry of Health & University Grants Commission
Advocacy programme	100 000 000	24 364 800	Ministry of Health
Quarantine facilities	86 528 701	38 031 065	Ministry of Health & Ministry of Defence
Lab facilities of Batticaloa Teaching hospital	112 140 000	Confirmation anticipated	Ministry of Health

Source: Adapted from the Summary of activities of the COVID – 19 Healthcare and Social Security Fund *(58)*

WHO helped the MoH to map the country's resource gaps and led the country's development partners in resource mobilization efforts. The collaboration included the World Bank, Asian Development Bank (ADB), European Union Delegation, Government of China, Government of Japan, United Kingdom, Norwegian Embassy, German Embassy, Australian High Commission, Australian Department of Foreign Affairs and Trade (DFAT), United States Agency for International Development (USAID), the Global Fund and other UN agencies *(12)*. In identifying priorities for funding, the development partners WHO, UNICEF, World Bank, ADB and others worked together to ensure coordinated financial support for gaps and needs identified in the Health Sector Strategic Preparedness Response Plan of the MoH.

World Bank financing was used to fill resource gaps and to supplement and scale up Sri Lanka's pandemic management strategy. Funds have been allocated to strengthen the National Emergency Operation Unit and its islandwide network. Selected hospitals are being developed as centres for current and future pandemics and the existing laboratory systems strengthened. These

would improve the health system capacity to manage current and future health emergencies. Funds were also used to ensure a steady supply of essential medical necessities, testing kits and PPE, support contact-tracing efforts, and maintain 32 quarantine centres *(59)*.

4.1.3 Other contributions

PPE was in short supply during the initial phases of the first wave. In the preparatory stage, before the first case of COVID-19 was reported in the country, WHO helped to stockpile PPE, increasing the buffer capacity of the MoH. WHO donated IT equipment needed to strengthen surveillance activities of the Epidemiology Unit, established the PCR unit at the Bandaranaike International Airport and was responsible for mobilizing funds from the Australian Government to obtain urgently needed medical equipment. ADB helped to provide funds for a PCR laboratory at the Colombo East Base Hospital, including the construction of infrastructure and supply of all equipment needed to perform 500 tests in 12 hours. Reagents and consumables necessary to perform 30 000 tests were also donated. Private individuals and organizations provided assistance for increasing PCR capacity in the State sector in the form of donations of machines and test kits to the government sector but there was no purchase of services from the private sector.

4.1.4 Funding adjustments

There was no deliberate cutting/reallocation of funds within the MoH. However, the shutdowns and lengthy curfews that resulted in a reduction of routine hospital clinics as well as clinic attendance and cancellation of non-urgent surgeries, etc. may have resulted in reduced spending in hospitals, especially those not involved in COVID-19 care. Expenditure on salaries and drugs (drugs were packed and sent to patient homes using multiple methods) are likely to have remained the same although overtime payments for all categories of staff may have declined and expenditure on routine investigations may have been less. However, there are no data on reprioritization of funds. No changes in financing mechanisms have been put in place except the establishment of the COVID-19 Fund.

There is evidence that utilization of private sector health-care services has declined but it is difficult to separate the impact of curfews, lockdowns, fear of COVID-19, and losses in earnings due to economic factors (many persons have taken pay cuts, some have lost all earnings). No studies have been done on this aspect yet. Although the impact of income reduction could be expected to lead to more public sector utilization, given COVID-19 curfews and fears, it appears that most people have resorted to self-care. This may result in an increase in health-care costs when conditions normalize due to postponed care-seeking for non-life-threatening chronic conditions, postponed routine surgeries and investigations. The costs may be added on because of the need for more extensive investigation and care modalities due to late presentation of disease and complications. On the other hand, it is known that utilization of outpatient services in Sri Lanka in normal times is high for a lower-middle-income country, averaging 4–5 outpatient consultations with physicians per person per year *(60)*. It may very well be that there is a true reduction in respiratory infections through adhering to COVID-19 preventive measures.

4.2 Entitlement and coverage

Sri Lanka, with its free health-care policy, which covers the entire population's treatment, was provided free of charge even to tourists to the country, such as for the first reported case. A government-financed free ambulance service is available for patient transport to treatment

institutions, whether it is from the patient's home or from a quarantine facility. Transport was also made available free of charge from home or airport to quarantine facilities. State facilities have no user charges. The private sector has a limited capacity for performing RT-PCR tests, the cost per test being around LKR 8000–12 000 and there is no information on the number of tests carried out in the private sector. The private sector was advised to transfer all patients who tested positive to a government hospital set apart for COVID-19 care.

Initially, all quarantine facilities were free of charge for the people. However, for persons returning to the country who requested better "hotel" facilities than were available in the free services, a few hotels were identified to serve as quarantine centres and persons who wished to avail themselves of this facility paid LKR 7500 for a single room and LKR 15 000 for a double room with full board. Persons travelling from the airport to such hotels for quarantine may have to pay their travel costs (personal communication with Dr S Semage, 2021).

4.2.1 Vaccination programme for COVID-19

Sri Lanka has a well-established and successful immunization programme which is guided by the National Immunization Policy. The Policy has a section that deals with the process of introducing new vaccines. The Epidemiology Unit within the MoH is the agency responsible for the implementation, monitoring and evaluation of all activities related to the Policy and, in this task, they are guided by two statutory national committees; viz. National Advisory Committee on Communicable Diseases (NACCD) and the National Immunization Technical Advisory Group (NITAG). The NACCD/NITAG has proactively reviewed evidence for introduction of the COVID-19 vaccine and in September 2020 formed a Technical Expert Working Group on COVID-19. By January 2021, the Epidemiology Unit had prepared a National Deployment and Vaccination Plan (NDVP) for COVID vaccines. The NDVP includes the identified priority groups for early vaccination, an estimate of cost of vaccination and has identified probable funding sources such as government, development partners and other donors. Gavi agreed to provide COVID-19 vaccines to Sri Lanka free of charge for the initial 20% of the population through the COVAX facility.

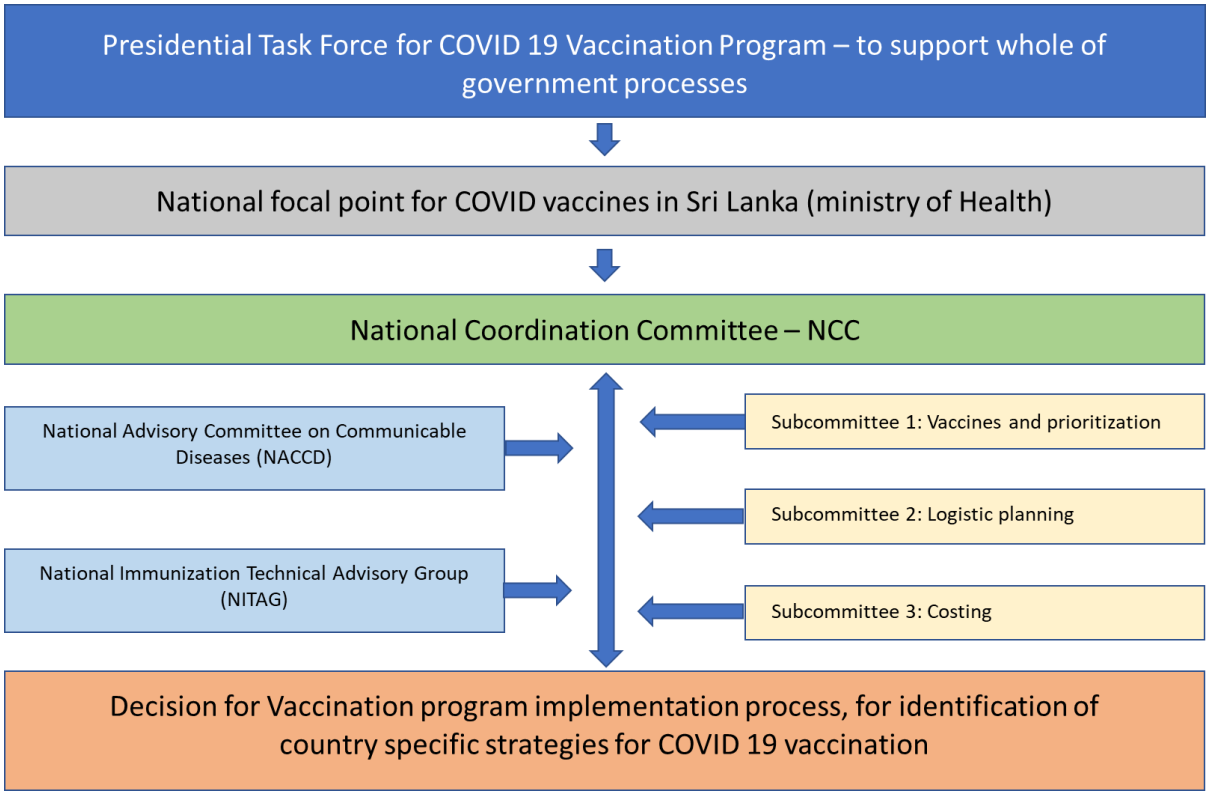
The NMRA, which is the country authority for registering new medicines, including new vaccines, also has legal provision for emergency use authorization of vaccines. The system has an expedited regulatory pathway that takes less than 7 days for regulatory approval under emergency conditions. Astra Zeneca, Sputnik V (Gamaleya), Pfizer, Sinopharm, Sinovac, Moderna and Johnson & Johnson vaccines were granted approval for emergency use within the country. The vaccines are listed in the order they were approved between 22 January 2021 and 28 June 2021.

Recognizing the importance of vaccination in the control of the COVID-19 pandemic and to reduce deaths, two COVID-19-specific bodies were appointed in addition to the existing structures: a high-level taskforce to coordinate the implementation of the vaccination programme, appointed by HE the President of Sri Lanka and a National Coordinating Committee for COVID-19, including different stakeholders and experts appointed by the MoH in November 2020. The National Coordinating Committee has three technical subcommittees: COVID-19 vaccines prioritization and targeting, logistics for COVID-19 vaccination and costing of COVID-19 vaccination.

The vaccination programme of the country has a well-functioning system to maintain the cold chain between 2 and 8 °C. However, some of the COVID-19 vaccines required storage at –70 °C, thus the availability of such ultra-cold storage facilities in the country were identified and methods

of maintaining the cold chain up to the point of injection were identified. Health personnel were trained in the safe transport of vaccines and to maintain the cold chain at these ultra-low levels. Vaccination delivery processes at each vaccination clinic centre were identified and preparations made. Lot release and stock management distribution was planned following the usual country practices. The safety of COVID-19 vaccination process was ensured through training. Screening and observation procedures identified at vaccination clinics and post-vaccination monitoring and reporting processes that are part of the national vaccination programme were revisited. In addition, a robust system for tracking vaccination at the population level was also deployed.

Fig. 14. Overview of the decision-making process for COVID-19 vaccination process



Source: Summary of the National Deployment and Vaccination Plan, Responsive COVID-19 Vaccines for Recovery Project under the Asia Pacific Vaccine Access Facility: report and recommendation of the President *(61)*

The country received an initial 500 000 doses of the Astra Zeneca (Covishield) vaccine in late January 2021 as a donation from the Government of India. The National Coordinating Committee discussed the deployment plans and, with a 20% vaccine supply, the priority groups for vaccination were agreed upon as follows:

(1) health-care workers in the government and private sectors
(2) other non-health key frontline workers actively involved in outbreak management (Military, Police, at PoEs)
(3) population above 60 years of age
(4) others (age cohort 50–59 years) with comorbid conditions.

The decision was made collectively by the task force after discussion of opposing views. However, the plan was changed after the first dose had been given to the first and second groups,

substituting those over the age of 30 years for categories 3 and 4. The rationale was said to be that, since this was the group that was likely to bring infection home to the elderly and sick population, immunizing them would protect the elderly. This resulted in unexpected programme chaos as the younger cohort was a much larger one than those over 60 years of age and resulted in an increase in deaths due to COVID-19 among those over 60 years. The decision was reversed but the planned orderly approach to the programme suffered. The doses that were planned to be kept back for the second dose were also administered and the programme ran into further problems as the Indian supplier of vaccines could not meet the needed second dose on time. The second dose, which was planned to be administered in 4 weeks, was administered 3 months later. Initially, this move was because of unavailability of the AstraZeneca vaccine but later it was justified with emerging evidence from the global community that a delayed second dose would improve the immune response.

With the second wave of COVID-19 globally, and especially with the rapidly escalating epidemic in India, there was a serious shortage of vaccines and the initial order that the Sri Lankan Government had placed with the Serum Institute of India did not materialize, resulting in slowing down of the vaccination programme. The Government of Sri Lanka received a donation of 500 000 doses of Sinopharm vaccine, which was increased by another 500 000 soon after. Following this, the Government of Sri Lanka was able to secure the required doses of Sinopharm vaccines from China and the continuous availability of vaccines in bulk boosted the Sri Lankan vaccination programme.

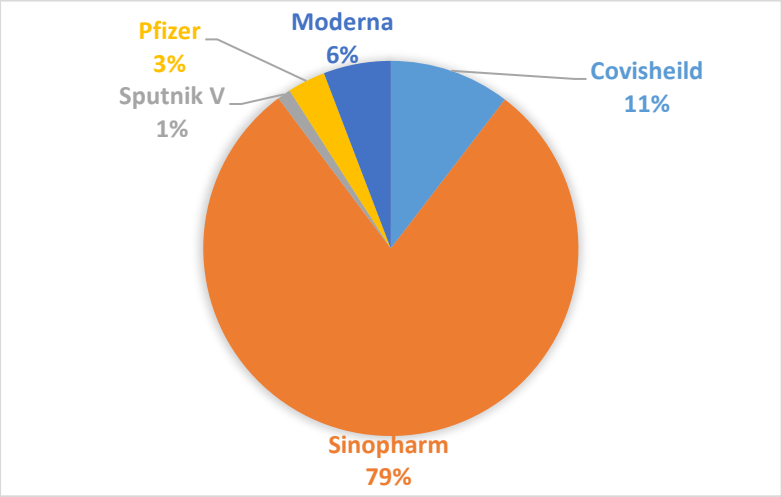
The timing of expansion of the vaccination programme coincided with the rapid increase in cases and deaths during the third wave, at a time when increasing numbers of health service personnel were being deployed for public health surveillance and monitoring and for clinical management. This staffing problem was overcome when HE the President enlisted the Army Medical Corps for the vaccination programme and the Air Force was given the responsibility of ensuring entry of vaccination data in the COVID Immunization Tracker. The Army Medical Corps initially took over the vaccination for the free trade zones and then the urban areas using a system of appointments. They also provided a mobile immunization service for the elderly who were unable to travel to an immunization centre.

An appointment system was introduced by the Colombo Municipal Council for its population to get the vaccine in a more planned and coordinated manner without overcrowding at the vaccination centres. A similar appointment system was later developed by the MoH, WHO and Information and Communication Technology Agency of Sri Lanka (ICTA) which was scaled up in Colombo District. This had the advantage of being in line with the COVID Immunization Tracker. In addition to these appointment systems, there were other systems utilized at subnational levels.

A special effort was made by the MCH field staff to vaccinate all pregnant mothers with two doses of the same vaccine, irrespective of the period of amenorrhea (POA). Vaccination was offered to everyone over 30 years of age, and university students and staff. Schoolchildren over 15 years of age were offered a single dose of Pfizer vaccine prior to school reopening and children 12–19 years with comorbid conditions were offered two doses of the Pfizer vaccine. Health-care workers were given a booster third dose using the Pfizer vaccine and this is being currently (October 2021) extended to all those above 60 years of age.

As of 1 November 2021, the country had vaccinated 15 621 332 persons with the first dose (71.3% of the population) and fully vaccinated some 13 476 941 persons (61.5%) using the vaccines indicated in Fig. 16. This included 79% vaccinated with Sinopharm, 11% with Covishield, 6% with Moderna, 3% with Pfizer and 1% with Sputnik V vaccines.

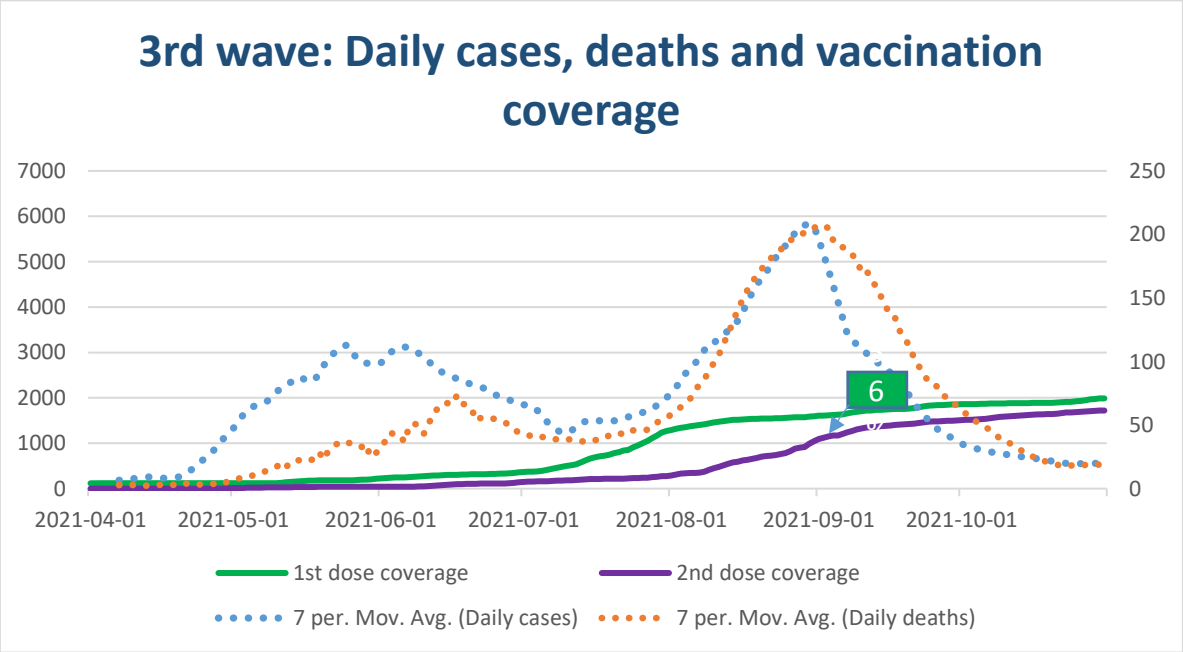
Fig. 15. Percentage use of vaccination by type (completed vaccination) as of 1 November 2021



Source: WHO Country office Sri Lanka, based on data from the Progress Report of COVID-19 Immunization *(62)*

Fig. 16 shows that 56% of the population had received a single dose of vaccine and 26% had received two doses around the time a decline in cases and deaths commenced during the third wave.

Fig. 16. Daily cases, deaths and vaccine coverage



Source: WHO Country office Sri Lanka, based on data from the Progress Report of COVID-19 Immunization *(62)*

The establishment of a robust supply chain information system on stock management and an immunization information system to facilitate monitoring and reporting of vaccine utilization was felt as a priority need. At the request of the MoH, WHO's technical team in partnership with the Health Information System Programme and the core DHIS2 developer community from the University of Oslo, Norway stepped in to develop a COVID-19 Immunization Tracker (CIT). Following this, the MoH mandated that all vaccines used for COVID-19 be entered in the CIT. However, there were problems and delays encountered in entering data from the paper-based records into the Tracker such as missing/incomplete information, lack of clarity in the record, lack of human resources at facility level resulting in a long time lag in entering data, etc. This was expedited with the support of the Air Force. WHO extended support through the provision of Internet routers and Android tablets for the MoH, and by mobilizing support from other NGOs. In addition, the software platform was optimized, and additional software developed for bulk uploading of databases.

The issue of a vaccination certificate is an integral part of the CIT and the software was further upgraded to that of a globally verifiable "Smart Vaccine Certificate (SVC)" through the technical leadership of the WHO Sri Lanka technical team. The SVC has been developed in accordance with the WHO guidelines (63). However, the process of obtaining an SVC encountered difficulties at the ground level. To counteract this, the WHO Country Office team developed an online portal to obtain the smart vaccination card and the process to be followed is presented in an attractive, easy-to-follow format *(64)*.

5. Governance

Sri Lanka's past experience of public health emergencies has resulted in the government placing health security high on its policy agenda. A disaster management and response division was created within the MoH following the Disaster Management Act no. 13 of 2005 *(65)*.. In 2017, the country undertook a joint external evaluation (JEE) of the country's preparedness and response capacity to implement the International Health Regulations (IHR, 2005) guidelines and, based on the recommendations of the JEE, Sri Lanka's National Action Plan for Health Security (NAPHS) 2019–2023 was published in August 2018 *(66)*.

This significantly increased the country's preparedness to respond to public health threats. In the IHR States Parties Self-Assessment annual report for 2019, the average score percentage for Sri Lanka is 53.8% compared to 61% for the South-East Asia Region. In this report, the National Health Emergency Framework is one of the areas that has a low score percentage (33%), while C1–C7, and C9–C11[10] have been given scores ranging from 60% to 80% (67)(68).

5.1 Health system

The health system is partially decentralized. It is regulated and led by the Ministry of Health (MoH headed by a cabinet minister at the Central level and at the provincial level by nine ministries (MoH). The MoH is responsible for stewardship functions such as policy formulation and health legislation, programme monitoring and technical oversight, purchase and distribution of drugs and consumables, development and deployment of human resources, and the operation of 52 tertiary and other selected hospitals. The nine provincial ministries of health are responsible for primary and secondary levels of curative care and all preventive services.

A distinctive feature of the Sri Lankan health system is that it has a comprehensive network of government health facilities dispersed around the island, providing good geographical access to services, which is of importance when dealing with pandemics. The country has a strong and proven preventive health system where trained field health professionals working as a team led by an MOH serves a geographically identified population. There are 353 MOH areas covering the whole country. The public health staff are known, trusted, and respected in the communities they serve *(69)*.

The Epidemiology Unit of the MoH is the focal point for disease surveillance, control, and prevention in the country, with the technical capacity for implementation. It is led by the Chief Epidemiologist, who is represented at the district level by a regional epidemiologist. The disease surveillance activities at the community level are the responsibility of the MOH and the PHIs

[10] C1 – Legislation and financing, C2 – IHR co-ordination and IHR focal point, C3 – zoonotic events and the human–animal interface, C4 – Food safety, C5 – Laboratory services, C6 – Surveillance, C7 – Human resources, C8 – National Health Emergency Framework, C9 – Health service provision, C10 – Risk communication, C11 – IHR-designated ports of entry (PoEs), C12 – Chemical events, C13 – Radiation emergencies (78). 67.World Health Organization. International Health Regulations (2005). Guidance document for the state party self-assessment annual reporting tool. Geneva: World Health Organization; 2018.

working under him/her. The Medical Research Institute (MRI) and HPB provide support when dealing with a pandemic. The MRI is responsible for training of medical laboratory technologists (MLTs) and serves as an external quality control laboratory external quality assurance service (EQAS) for other laboratories in the country. The HPB is responsible for the external dissemination of health information about the pandemic and for empowering and mobilizing communities towards adopting healthy behaviours to prevent the spread of disease.

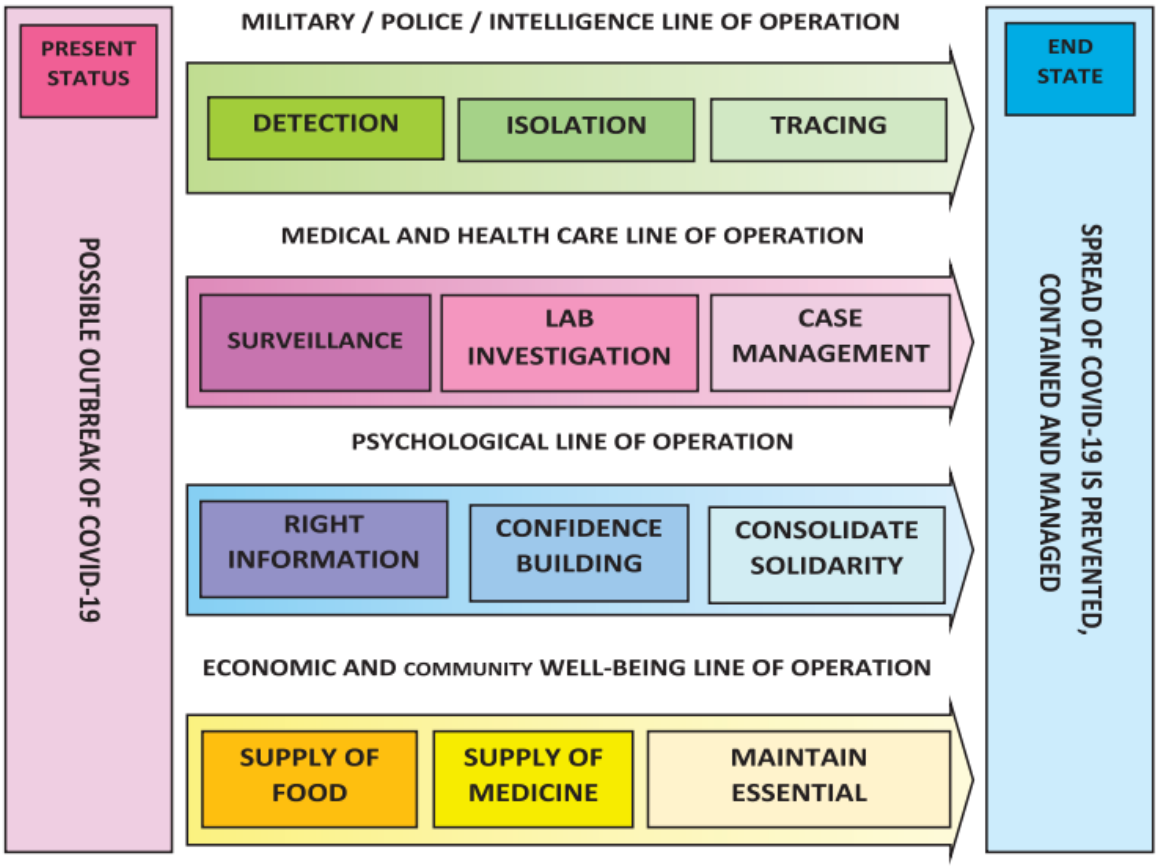
5.2 Response to COVID-19

The first recorded discussion on COVID-19 within the MoH was on 9 January 2020 at the National Technical Committee on Avian/Pandemic Influenza Preparedness – a working group of high-level technical officers of the ministries of health and livestock development. Other relevant government, nongovernment and international donor agencies are represented on it. Members of the Committee meet to monitor and evaluate progress of ongoing activities, and provide guidance to strengthen activities of the Technical Working Group (70). The meeting of the Technical Working Group was followed by swift action to activate the National Influenza Pandemic Preparedness Plan by the Epidemiology Unit of the MoH, which is the national focal point for Communicable Disease Control and Prevention (71).

The Epidemiology Unit and the HPB discussed plans for risk communication, monitoring of rumours, and mitigation in readiness for the epidemic. The Quarantine Unit of the MoH developed the initial plans for prevention of disease at the PoEs into the country *(72)*. Stockpiling of essential supplies, building infrastructure capacity, especially RT-PCR testing, and the need for training of health personnel necessary for quick mobilization of health services were planned. The National Technical Committee on Avian/Pandemic Influenza Preparedness and the National Advisory Committee on Communicable Diseases were convened for expert guidance on policy directives pertinent to the COVID-19 outbreak *(73)*.

The political leadership of the country took proactive action, a National Steering Committee for COVID-19 was established on 26 January based on the principle of a whole-of-government approach, a day before the first patient with COVID-19 was identified (Fig. 17). The Steering Committee included representatives from the MoH, Ministry of External Affairs, Ministry of Defence, Ministry of Finance, Ministry of Ports and Shipping, Civil Aviation Authority, Department of Customs, Department of Immigration and Emigration, Disaster Management Centre, airports, and country consulates.

Fig. 17. Conceptualization of the whole-of-government approach to COVID-19



Source: Journal of College of Community Physicians of Sri Lanka *(74)*

A plan of action with four distinct lines of operation was developed based on the whole-of-government approach. The responsibility for each was given to a separate sector: namely, Tri Forces, Police, and intelligence; medical and health care; community engagement; and economic and psychosocial well-being *(74)*.

Synchronization between all the "lines of operation" (LOO) was the strength of the Sri Lankan approach to combating COVID-19. For example, the Medical and Health Care LOO coordinated with the military/police/intelligence LOO to help trace contacts, and isolate and quarantine individuals. This organizational structure helped coordination and cooperation between the line ministries, Sri Lankan Tri Forces and Police, many government departments, corporations, local government systems and State and private sector partners. A head start on preparation and taking the whole-of-government and whole-of-society approach was beneficial. Fig. 5 shows some of the early steps taken that were important in facing the pandemic. The Global Response to Infectious Disease (GRID) index, which was created to rank countries according to the leadership response to the pandemic, ranked Sri Lanka 10th in April 2020.

In mid-March, a Presidential Task Force, headed by the Minister of Health and Indigenous Medical Services, was established to coordinate the COVID-19 response. The DGHS was appointed as the technical lead on the Task Force, the Chief of Defence Staff and Commander of the Army as the operational leads. In order to enhance coordination within the MoH, a National Action Committee

against COVID-19 comprising medical experts was established in early February, under the guidance of the Minister of Health and the Secretary of Health. The DGHS provided technical and operational leadership and guidance to health sector agencies represented in the committee (12, 75). In addition to the above, the National Advisory Committee on Communicable Diseases and the Advisory Committee on Avian Influenza of the MoH continued to meet and deliberate, which continues to date.

International partners came together as the UN Humanitarian Country Team to support government efforts. The WHO Representative was appointed as the Chair of the Health Cluster, along with the MoH and Civil Society Collective as co-chairs. This effort brought together State and non-State actors to share information, coordinate, and collaborate to implement the Sri Lanka Preparedness and Response Plan (SPRP) *(12, 76)*.

Sri Lanka introduced the Quarantine and Prevention of Disease Ordinance in the country in 1897. This has undergone several revisions since, with the latest revision in 2005. The Ordinance makes general provisions that can be applied to new and emerging diseases. It allows ministers to introduce regulations specific to a disease to prevent the introduction of a new disease and its spread within the country and address any gaps that may be noted in the provisions of the Ordinance when dealing with a new disease. For COVID-19, the MoH brought in new regulations incorporating additional provisions, which would further facilitate the control and prevention of this novel viral disease.

The DGHS is the main “Proper Authority”. The Proper Authority can delegate powers to any person and authorize that person, in writing, to implement the provision of the legislation. During the current pandemic, the MOHs, medical officers of the airport health office and the port health office were named the “Proper Authority” for their areas. Power was also delegated for the Police force to act in disease control activities under the guidance of the MOH/DGHS. This was important in a setting where there was direct involvement of many sectors in community-level activities *(77)*.

The MoH developed a health disaster preparedness, response, and recovery plan (interim) in early March 2020 to respond to the spread of COVID-19. This was replaced by the Sri Lanka Preparedness and Response Plan – COVID-19 in April 2020 to suit the evolving transmission scenario of clusters of cases of COVID-19 and to plan for preventing progress to the next stage of possible community transmission.

5.3 Mobilizing expertise and evidence for decision-making

From the beginning, the MoH/DGHS and the Government of Sri Lanka consulted individual, local, and overseas experts and professional organizations for technical guidance and expert advice on how to plan the country’s response to the epidemic, often on a specific problem/situation. Professional groups such as the SLMA and College of Community Physicians, College of Physicians, and the Government Medical Officers Association produced situational analyses and recommendations as to the best possible course of action in a specific situation when such a need was felt. These were presented to the DGHS or the Minister of Health and sometimes to the NOCPCO but it is difficult to assess the extent to which these efforts influenced policy decisions made by the government. The WHO Country Office facilitated the meetings of an independent group of experts which made recommendations based on the analysis of current data. The analysis focused on desired social/economic outcomes in addition to the health outcomes. The

first meeting was held on 24 July 2021 and the group has met 7–8 times since. The recommendations of the group were presented to the Minister of Health usually prior to that week's meeting of the COVID-19 National Task Force. It appears that this process may have had some impact on decision-making.

Many researchers published country-specific descriptive analyses, predictive models that examined the effects of currently used control methods, forecasting models and web-based tools that would help in monitoring the situation. The National Science Foundation of Sri Lanka organized a two-day event: The National Conference on COVID-19: Impact, mitigation, opportunities and building resilience – from adversity to serendipity, held on 27–28 January 2021. This brought together scientists from Sri Lanka, and eminent scientists of Sri Lankan origin living and working overseas. The pandemic experience of the country was examined from multiple aspects – from health, including the psychosocial aspects, economy, environment, society and education, research, invention, innovation and building resilience. The event included keynote addresses, guest lectures, seminars, and select free papers. A book of abstracts and the conference proceedings have been published in book form and are also available on the National Science Foundation website (https://covidcon.nsf.gov.lk/images/files/BookofAbs-26012021.pdf) *(50)*. However, most of the research efforts have remained academic exercises since to date there is no formal mechanism for such efforts to enter policy discussions.

Training staff to conduct systematic risk assessment using multiple sources of information and surveillance analysis, risk assessment and review of control measures including mathematical modelling was another function specified to be carried out by the Epidemiology Unit in the SPRP (76). However, such analyses carried out by the Epidemiology Unit were not evident during the pandemic. The research and analysis wing of the State Intelligence Services provided this function to some extent. In the long term, a research cell within the MoH/Epidemiology Unit, which can draw on multidisciplinary expertise as needed, is a feasible option to take forward the research agenda during a health emergency. Such collaboration would help focus research efforts into areas that would help the MoH in decision-making. In addition, establishment of independent structures, possibly within the university system, to ensure that evidence-based decision-making is embedded in the policy process of the country, especially during emergencies, is a felt need. This should be included as one of the priorities in the post-pandemic roadmap of Sri Lanka.

6. Measures in other sectors

6.1 Securing borders

6.1.1 Preparation

From the beginning, Sri Lanka considered itself as being at high risk of COVID-19 entering the country through tourists, workers from China employed in various projects returning to work after the new year, and migrant Sri Lankan workers in countries like Italy where the disease was spreading rapidly. In response, the MoH activated the National Public Health Contingency Plan for Designated Airports in Sri Lanka and Public Health Emergency Preparedness and Response Plan for seaports on 21 January 2020. In Sri Lanka, the co-national focal points for IHR (2005) are the Quarantine Unit and the Epidemiology Unit. Although the country has four airports and five seaports through which travellers can enter the country, only two, the Katunayake Bandaranaike International Airport and the Colombo Port are designated PoEs under the IHR (2005). All airport and port health offices are under the Quarantine Unit of the MoH, which has the responsibility of preventing the introduction of COVID-19 to Sri Lanka through the PoEs.

The Quarantine Unit of the MoH worked with all stakeholders to ensure services at the POEs. The MoH undertook a rapid assessment of IHR core capacities and addressed gaps. They carried out training programmes with demonstrations for PoE staff on public health measures at PoEs, personal protective measures, proper use of PPEs and on modification of the working environment to increase the safety of workers.

6.1.2 Screening

Thermal imaging cameras were installed at the airports and seaports by 24 January 2020, and a detailed health declaration form for passengers and crew introduced by 26 January. In addition to this, a Health Status Report (HSR) was developed for use at seaports to obtain passenger information in advance. All vessels entering a seaport were required to submit the HSR 12–24 hours prior to arrival and the port medical officers, after assessing the risk, would decide on permission to berth.

Travellers were educated through leaflets, posters, banners and videoclips about the disease, preventive measures enforced, available health services and airport procedure. These were developed with the HPB and the material was made available in Sinhala, English, Tamil and Chinese. Any individual suspected of having COVID-19 based on body temperature, travel history of the past 14 days, contact history with a patient or suspected patient or persons with symptoms were seen by a medical officer who decided if the person should be sent to a designated hospital or not. The first case of COVID-19 infection in Sri Lanka was a Chinese tourist detected at the Bandaranaike International Airport on 27 January.

6.1.3 Information management

The data collected from the health declaration form was compiled by the Disaster Preparedness and Response Unit of the MoH and sent to the Epidemiology Unit within 24 hours. The Epidemiology Unit informed the relevant MOH (the MOH and the area PHI ensured that the identified person followed instructions on home quarantine for 14 days).

The MoH in collaboration with Health Information Systems Programme (HISP) developed an innovative tracker system that was made operational at the airport within days of the first case being reported, with rapid implementation extended to district and provincial levels. The health declaration forms were directly integrated into the app upon arrival, and this significantly increased the capacity to perform contact tracing and case-based surveillance on those entering the country.

6.1.4 Travel restrictions

From 10 March 2020 onwards, all arrivals from Italy, Iran and the Republic of Korea were quarantined in quarantine centres run by the Army and all other arrivals were requested to undergo 14 days of self-quarantine. Persons who arrived in the country prior to these arrangements were requested to register with the nearest police station and were subjected to home quarantine for 14 days.

Sri Lankan Airlines crew were house quarantined for 14 days after return flights. Crews of foreign airlines were housed in identified hotels with restriction of movement until their outbound flight.

With escalating infection in the countries of origin, foreign nationals from the above high-risk countries were restricted entry into the country. This ban was extended to 13 other countries the next day. Considering the rapid global spread of the pandemic, all PoEs were closed on 19 March. Special repatriation flights commenced on 21 April and all passengers were sent to quarantine centres run by the Tri Forces for two weeks.

6.1.5 Seaports

All disembarking passengers and crew filled a health declaration form and underwent thermal screening. Passenger disembarkation from cruise ships was stopped very early (on 3 March) and all disembarkation was stopped from 19 March 2020. Cargo operations continued and seafarer and bulk crew changes continued in the three main ports. Eight days after the diagnosis of the first Sri Lankan case of COVID-19, all airports and seaports of entry were closed *(78)*.

6.2 Economy

The pandemic and its control measures resulted in adverse economic effects in the country, which soon transformed into an economic crisis and a resultant social crisis. Sri Lanka crossed the threshold for eligibility as an upper- middle-income country in 2019 with a per capita gross national income (GNI) of $4060 but lost that status in the second quarter of 2020 and has been reclassified as a low-middle-income country. The economic downturn was particularly severe as the pandemic came in before the country could recover from the 2019 Easter bomb attacks *(79)*.

The lockdown had a detrimental impact on the manufacturing and tourism sectors, which are the main contributors to the country's GDP. Private remittances of migrant workers, which are responsible for a significant contribution to the county's foreign exchange earnings, also decreased considerably. In the private sector, high levels of unemployment, loss of job security and pay cuts were seen, resulting in anxiety and economic stress among the population. The effect was very severe on small and medium enterprises and daily wage earners.

The country has adopted many measures to minimize the economic fall-out as a priority. The Government of Sri Lanka's strategy for combating COVID-19 has a separate line of operation for

the “economy and well-being of community”. Under this, “a task force was established to revive the economy, paying attention to challenges posed by the epidemic and to ensure continuation of essential services to maintain a degree of normalcy in civilian life in the face of COVID-19 crisis”.

Sixty-eight per cent of the country’s workforce is employed in the informal sector and only 29% of the country’s workforce is covered by social protection. Daily wage earners and those in micro, small and medium enterprises (MSMEs), which account for 52% of total GDP and 45% of national employment, are disproportionately affected in the current crisis *(80)*.

Furthermore, there are a large number of near poor who are highly vulnerable to price volatility, especially food prices. Nearly 400 000 persons live within 10% of the National Poverty Line (NPL), and a million within 20% of the NPL *(81)*.

Taking the above into consideration, the government responded to the crisis by providing a cash transfer scheme. It provided a payment of LKR 5000 per household in April and May 2020. Over 5.7 million payments were made at a total cost of around LKR 55 billion, i.e. 0.33% of GDP but was deemed insufficient for the protection of households.

In addition to short-term measures such as tax cuts and low interest rates to promote spending, more medium-term stabilization measures were implemented. Policy responses were directed at increasing health and non-health spending, as well as revenue side measures, such as extending payment deadlines for income tax, and tax exemptions on health-related imports, etc. The government also granted relief measures such as working capital loans and debt moratoriums. Economic revival measures were taken, such as loans on concessionary terms for investment and to start new business ventures *(53)*.

6.3 Education

One of the most important social impacts of the epidemic has been the closure of all educational institutions, primary, secondary, and tertiary, as well as private support classes, which continued until the third week of October 2021.

All schools in the country were closed early in the pandemic, on 13 March 2020 and remained closed until 10 August 2020. The school system reopened in a staggered manner, both by grade and by district. The Ministry of Education used a participatory approach, in that they involved the regional authorities, school principals and parents in the decision-making process. The schools made every attempt to function by strictly adhering to the guidelines developed by the ministries of health and education. Schools closed again on 4 September 2020 to prepare for and conduct two islandwide examinations, the grade 5 scholarship examination, which involved 10–11-year-olds, and the GCE advanced-level examinations. These were held under the “new normal” guidelines and 58 children who were undergoing quarantine also sat the GCE advanced-level examination under special arrangements. Both examinations were successfully completed without acting as super-spreader events and schools reopened on 23 November 2020 but closed again with the onset of the second and third waves of the epidemic.

The education system responded swiftly to school closures, with multiple and varied interventions undertaken with a view to minimizing long-term implications. The main modality was offering educational services online. These distance learning solutions posed problems to teachers, students, and their families. Teachers needed guidance on the effective delivery of content using

new methods, and parents and students grappled with connectivity and accessibility issues. Many parents did not have the skills needed to help and guide their children in the learning process. Television and radio are other media that were used to provide distance learning opportunities. Thus, the full effects of this move could not be realized and has widened social disparities in education, the effects of which will have to be studied and effective steps taken to mitigate the negative outcomes during the post-pandemic period.

A survey carried out by LIRNEasia in 2020 (ICT device and Internet access among 15–65-year-old population) (82) showed that only 48% of households with children younger than 18 years of age owned a computer or a smart phone and only 34% had an Internet connection *(82)*. Many who accessed the Internet did so using a cell phone, a device not very conducive to reading and absorbing lessons. There were wide disparities in access between urban/rural populations and socioeconomic groups, the rural and the poorer segments of society being worse off. The number of households with Internet access declined to 21% among the lowest socioeconomic group *(83)*.

Furthermore, uneven Internet connectivity, household environment and living conditions that are not conducive to learning, the presence of more than one child of schoolgoing age needing to share devices are problems that may have influenced the learning process. The disparities described mean that a sizable proportion of the student population 5–18 years of age was unable to benefit from an e-learning process, thus widening socioeconomic inequities in the free education system of the country. It is doubtful if the Sustainable Development Goal (SDG) of "quality education leading to relevant and effective learning outcomes" has been achieved through these interventions. It is also anticipated that school dropout rates may be higher than what was experienced earlier. In addition to loss of learning, the loss of the free school meal, which fulfils up to a third of the daily nutritional needs of preschool and primary schoolchildren in nearly 80% of government schools, will adversely affect the malnutrition situation in the country. These nutritional shocks per se can have long-term effects on health and educational outcomes *(84)*.

The transition to online education in the higher education institutions in Sri Lanka was smoother than in the school system. A critical input that contributed to this success was the provision of free Internet access to university learning management systems and remote learning facilities through the Lanka Education and Research Network (LEARN) by all Internet providers in the country. Universities resumed normal activities from July 2020 and the free services were made available until 17 August 2021. This collaboration was made possible through the intervention of HE the President.

The student participation rate was found to be 88% for both State and non-State institutions and more than half the respondents were joining in daily. Adoption of online learning was not different by gender, urban–rural status, and between State and non-State institutions. A wide gap was noted between the highest and lowest income quintiles in non-State sector institutions. It was observed that the online learning experience as well as household income varied between disciplines and universities *(85)*.

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