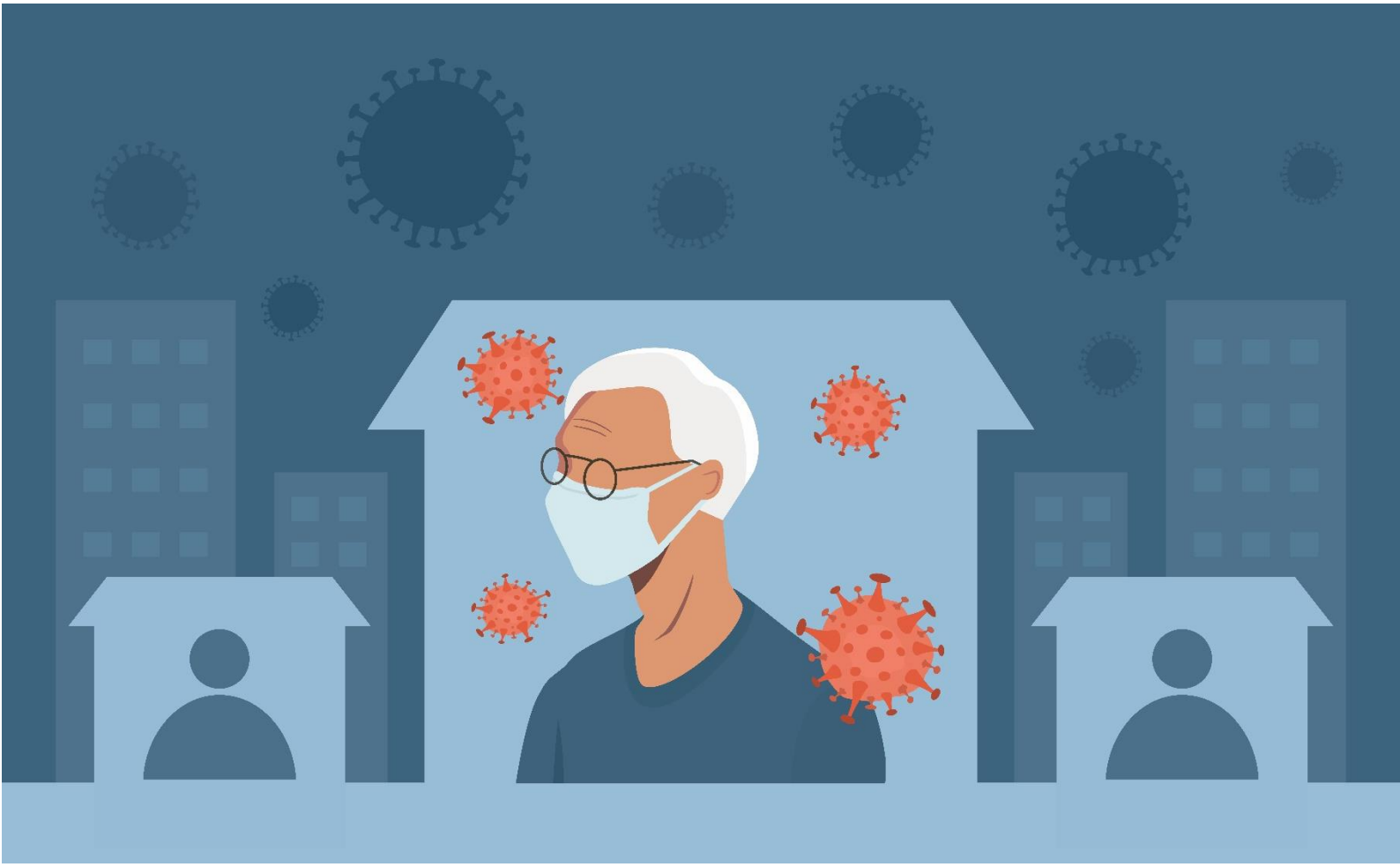
TAKSHASHILA INSTITUTION

Takshashila Policy Advisory

COVID-19: Healthcare Measures to Tackle a Second Wave in India

V1.0, 18 May 2020

By Shambhavi Naik, Sunila Dixit, Anirudh Kanisetti, and Sarthak Pradhan



This paper can be cited as "Shambhavi Naik, Sunila Dixit, Anirudh Kanisetti, Sarthak Pradhan, *COVID-19: Healthcare Measures to Tackle a Second Wave in India,* Takshashila Policy Advisory, May 2020."

Table of Contents

Executive Summary

Countries worldwide are bracing for a second wave of COVID-19 infections in the coming months. A second wave is a resurgence in infections after the existing cases appear to be reducing.

This document proposes a series of measures for India to prepare for possible future waves of the infection. These infections will take a toll on the healthcare system and the economy; thus, preparation should include measures for both contingencies. This document also suggests actionable healthcare measures and categorises them into three sections:

1. Setting up Mechanisms for Early Detection and Containment: The mechanisms that need to be put into place to detect a second wave, in line with our Policy Advisory on a National Reopening Strategy. This includes building capacity for manufacturing diagnostic kits, testing, and quarantining.

2. Building Healthcare Capacity: A strategic reserve for personal protective equipment (PPE) and medical equipment and a concomitant increase in healthcare personnel required to deal with a second wave.

3. Expanding Social Distancing Measures: Social distancing measures need to be tailored to reduce interaction between people in public spaces. These include workplaces and public services such as public transport. Implementation of social distancing policies can mitigate the spread of the second wave.

These measures are proposed as guidelines; their final implementation is left upon the discretion of local authorities. It is important that government and society work together to quickly detect and contain a second wave of infection to prevent the loss of lives and livelihoods.

Introduction

The COVID-19 pandemic has infected over 3.8 million people worldwide (as of 8th May) and has been the direct cause of death of over 200,000 people. The rapid spread of the disease has forced several countries to partially shut down their economies to reduce human-to-human transmissions. The economic impact of the lockdowns, the disruptions to global supply chains, and a fall in investor confidence, is still unclear. Further, healthcare operations globally have de-prioritised non-COVID-19 and non-urgent health conditions. This has led to a decrease in vaccination rates and the negligence of other infectious and non-infectious diseases. Therefore, the pandemic has a direct impact in the form of infections and fatalities, but a broader and long-term indirect economic and healthcare impact.

Consequently, governments may start lifting lockdowns when they have reduced the growth rate of infections to a level that can be handled by their healthcare systems. However, this lifting has been correlated with a second wave of infections. China, South Korea[1], and Singapore are a few countries that have seen a resurgence in cases, after the initial clampdown on the growth rate of infections. There are also concerns that later in 2020, a more virulent form of the disease may emerge as the virus evolves. A second wave of infections can be debilitating - to human lives, to already-strained healthcare systems, and to struggling economies. Therefore, it is imperative that a second wave be caught at the earliest, and swift response mechanisms be put in place. Such measures need to be enacted by the State, by enterprises, and individuals.

As many Indian states prepare for a partial or complete lifting of lockdowns to help restore livelihoods, the shadow of a new outbreak hangs over them. A second wave could materialise anywhere, so there is a need for constant vigilance and preparation.

This document outlines capacity gaps in existing public health system and recommends actionable policy measures for governments. Measures such as investment in a National Personal Protection Equipment reserve must be implemented immediately and require direct attention of Union and state governments. Other measures such as expansion of public health cadres are long-term measures which must be accompanied by structural changes. We also recommend that local governments co-ordinate with local businesses and institutions for testing and enabling feasible social distancing norms. Thorough preparation for the second wave is the only way to manage the inevitable trade-off between protecting livelihoods and protecting lives. The only definite way to *prevent* a second wave is through the

vaccination of a substantial percentage of India's population; however, a COVID-19 vaccine is not expected for another year at least[2].

What Constitutes a Second Wave?

A second wave represents an increase in infections in a different population *after* infections in the first wave decrease. A second wave of infections occurs when the number of cases seem to decrease, which leads to easing of public health measures, thereby giving rise to new clusters of infections in unaffected areas as well.

In an Indian context a second wave could happen as:
a. An increase in cases in districts where the spread may look contained for now.
b. Introduction of cases in districts which have so far remained COVID free.

Earlier pandemics such as the 1918 Spanish Flu outbreak have had a second wave of outbreaks a few months after the initial one, and some places saw a third and even a fourth wave. The second wave of the Spanish Flu was deadlier than the first[3].

Not all outbreaks result in a second wave. The 2003 SARS outbreak was not accompanied by a second wave of pandemic proportions. However, the first wave of SARS was also not as widespread as COVID-19 and did not have as many asymptomatic cases. This helped in containment of the disease. COVID-19 meanwhile has a fairly large proportion of asymptomatic cases who may facilitate the rise of a second wave.

Scientists based at Shiv Nadar University and the Indian Institute of Science have opined that a second wave of the current COVID19 may arise in India in July-August[4].

What could cause a second wave?

The following three sources can lead to a resurgence in cases, even under a phased or partial lifting of lockdowns in various parts of the country.

1. **Asymptomatic carriers within the population in India:** Untested asymptomatic carriers can infect other individuals they come in contact with, leading to a rise in cases.

   India's current daily testing rate[5] of about 0.07 per 1000 people (as of 16th May) is relatively poor. As a comparison, India's testing rate

on 24th April was 380 per million when the world's median testing rate was 5897 persons tested per million[6]. Furthermore, The Indian Council of Medical Research (ICMR) believes[7] that about 80% of the cases in India could be asymptomatic, i.e. persons not displaying any outward signs of being infected. Poor levels of community testing, resulting in the insufficient identification of positive cases, could expose those vulnerable to the disease to unidentified asymptomatic carriers once the lockdown is lifted. This could result in a spike in the number of cases and the number of hospitalisations required for those displaying severe symptoms. The movement of people after the removal of restrictions can also lead to the virus being introduced into new places.

2. New imported cases by people visiting/returning to India: Returning Indian nationals or foreign visitors who enter India post the lockdown may bring new cases of infection into the country.
Individuals coming into India from places harbouring the infection may bring fresh cases into the country. Those travelling on flights may be an important threat, as airport terminals and airplanes with high passenger density may act as a crucible for the virus.

3. Contaminated goods: Though less likely, contaminated goods may act as a repository for the virus.

   The virus can survive on certain surfaces for a few hours, which means that goods can also act as a fomite for the virus. However, the Centre for Disease Control in the US suggests[8] that the chances of such viral repositories infecting someone are low, unless a person touches the surface harbouring the virus and then touches their own mouth/nose.

   Unless goods are disinfected and handlers follow appropriate personal protection measures (such as wearing overalls, masks, gloves), this repository may infect a person and subsequently spread to others.

What would be the implications of a second wave?

The severity of the second wave will be determined by the nature of the virus, social distancing measures being practised at the time, accompanying infections at the time and preparedness of the healthcare system.

A second wave could overwhelm an unprepared healthcare system and lead to more lockdowns, impacting the economy further. It is difficult to predict whether the virus will mutate into a more virulent version.

The impact of the second wave can, however, be mitigated by the early detection of infections, the imposition of proportionate lockdowns, and preparations to tackle any new clusters of cases that arise.

India's Strategy to Prepare for a Second Wave

The second wave of COVID-19 will have both health and economic impacts. Therefore, both healthcare and economic measures need to be in place to mitigate the severity of this wave. Healthcare measures would include early detection, containing the spread, and preparation for taking care of the sick. Economic measures would include insulating supply chains and an economic stimulus in case the wave leads to further lockdowns. These sets of measures are essential to mitigate the spread of disease and prevent any further national level lockdowns. Intermittent, local containment zones may be needed as clusters of cases are found, but the implementation of these measures should lead to early detection and immediate sequestering of new cases. This document will focus on the healthcare measures that are needed to prepare for the second wave.

In view of the likely sources of a resurgence in cases, social distancing and avoiding unnecessary physical contact outside immediate family remain the best ways to protect oneself from the disease. Research from the University of Oxford[9] suggests that creating a "bubble" of one's social contacts, and restricting interactions with new people, can limit the exposure to the virus. This bubble concept relies on limited movement outside of a geographical locality, and meeting only a small set of contacts routinely.

Screening and/or quarantining any international passengers coming to India would also help prevent the introduction of new imported cases. However, given the scale of the problem and the diverse incentives and socio-economic contexts in which Indian citizens will operate as lockdowns are lifted, additional steps must be taken to prepare for the second wave.

Preparation for the second wave should be based on the following principles:

1. **Human life and dignity are of the utmost importance:** Preserving the lives and livelihoods of Indian citizens is paramount. Policymakers and business leaders should practice abundant caution to protect both. Wherever possible, working from home or reduced and staggered shifts should be the preferred options. Any new cases of COVID-19 should be immediately reported to the appropriate government agencies, and necessary containment/shutdown

strategies adopted proactively to contain the risk of another outbreak.

2. **Scientifically proven measures should be adopted:** Social distancing (maintaining 6 feet distance), hand washing/sanitising, wearing of appropriate masks (commensurate with the occupational hazard of exposure to the virus), and staying at home if showing any symptoms are measures that must be followed by all.

3. **A sufficient level of testing capacity must be achieved:** A key principle underlying the preparations for a second wave is that aggressive testing for COVID-19 is performed from now onwards. All other preparations for the second wave are dependent on the capacity for the early detection of a resurgence in cases.

This document incorporates these principles into a three-fold strategy to prepare for a second wave.

1. **Setting up Mechanisms for Early Surveillance and Fighting an Outbreak:** The mechanisms that need to be put into place to detect a second wave, in line with our Policy Advisory on a National Reopening Strategy[10]. This includes building capacity for manufacturing diagnostic kits, testing, and quarantining.

2. **Building Healthcare Capacity**: A strategic reserve for personal protective equipment (PPE) and medical equipment required to deal with a second wave. A concomitant increase in healthcare personnel trained to deal with the outbreak of an infectious disease is recommended.

3. **Expanding Social Distancing Measures:** Policies that can help maintain one's social bubble in public spaces such as at work or in public transport. These policies can mitigate the spread of the second wave.

In the following sections, measures for early detection are discussed, followed by healthcare capacity and social distancing measures. In each section, we summarise key recommendations upfront and then expand them in some detail.

1. Setting up Mechanisms for Early Surveillance and Fighting an Outbreak

1.1 Diagnostics

Testing at a massive scale is key to early detection and containment of the outbreak. To increase testing coverage, both the number of testing kits and actual testing capacity must be increased.

1.1.1 Availability of Testing Kits:

There is a good opportunity to increase indigenous manufacturing capacity for diagnostic kits as well as to collaborate with international partners to create a stockpile. Briefly, we recommend advance purchase agreements, GST exemptions, and incentives for research and development to kickstart the indigenous development of diagnostic kits. For purchase from foreign manufacturers, a nation-wide aggregation of demand would help negotiation on volume-based pricing. Additional details may be found in our SlideDoc, *Increasing COVID-19 Testing Capacity in India*[11].

1.1.2 Increase in Testing Capacity:

India currently has capacity to conduct 100,000 tests per day[12]. To ramp up this capacity, more laboratories need to be approved for performing the tests. COVID-19 RT-PCR testing requires BSL2/BSL3 facilities (in the first few stages of processing), other lab equipment and trained workforce. To expedite the approval process for laboratories with existing infrastructure, the government should allow industrial organisations to assess and grant testing approvals. Incentives such as tax exemptions on the purchase of specialised equipment can help increase scale of testing within laboratories. Removal of price caps on testing can incentivise private sector to increase testing. Currently the private sector contributes to only 17% of India's total testing[13].

1.1.3 Testing Strategy:

Real Time-Polymerase Chain Reaction (RT-PCR) remains the gold standard for testing for COVID-19. However, this technique is time consuming and difficult to scale up when individual samples are being tested. On the other hand, antibody test can give rapid results and are cheaper. However, they are not recommended for use as diagnostics. Unless a reliable antibody test is developed, RT-PCR should be used as

the testing method to confirm or screen for COVID-19. If antibody tests are available, they can be used for wider population screening and any positive results can be confirmed with RT-PCR. Antibody tests can determine if someone has had an infection but cannot confirm if the person is currently harbouring and transmitting the virus.

Preliminary screening measures such as temperature testing can be used in public spaces for assessing ill patients, but is not a comprehensive tool for detecting COVID-19.

For early detection of a second wave, pooled testing may be one method to monitor populations at scale[14]. This technique involves pooling of samples from different individuals into one test sample. If the sample tests negative via RT-PCR, all individuals are considered negative for COVID-19. However, if the pooled sample shows a positive result, individual samples may have to be re-tested for ascertaining the COVID-19 positive individual(s). Hence, pooled testing is recommended to be done only at low levels of infection. The ICMR recommends pooled testing if positive samples are less than 2% of population size[15]. Wastewater-based epidemiology may also be a way to monitor disease, though capacity and expertise are issues here[16].

1.2 Mechanisms to coordinate reporting tests and response

As epidemiological data is collected, it is crucial to ensure that it provides actionable information to policymakers. We recommend that:

1. Businesses and institutions work with local government officials to conduct periodic testing of their employees who cannot work from home. The testing can be managed by the business/institution and reports sent to local officials. Such a system should be made mandatory for high-economic-value, high-risk areas such as centrally air-conditioned office complexes.
2. The ICMR and Integrated Disease Surveillance Program (IDSP) should coordinate continuous ongoing RT-PCR-based testing of roughly 1% of each district and municipal ward. This should be performed by local administrators. If the disease penetrance is low (<2%) pooled testing can be performed, if higher individual samples should be tested.
3. The IDSP should also conduct its own tests in high-risk areas to offset misreporting.

4. Based on this data, policymakers should impose proportionate restrictions on economic activity.

The key to minimising the spread of a disease is to be aware of when the situation is changing and to take proportionate responses. In our National Reopening Strategy, we suggested "calibrated reopenings" as a "data-based flexible response to an emerging situation." Districts (or smaller administrative units where applicable, such as municipal wards or even neighbourhoods) should be assigned one of six possible threat levels, in increasing order of the risk of the disease spread. Threat levels and projected changes to threat level designations should also be conveyed to the public well in advance, so that businesses and citizens can plan their activities accordingly.

Threat Level	Meaning	Action
RED 3	Massive Community Spread	Maximum Lockdown
RED 2	Significant Local Spread	Lockdown
RED 1	Limited Local Spread & Traceable Imported Cases	Limited Lockdown
ORANGE	Limited Number of Cases/Imported Cases	Restricted Activity
YELLOW	Few New Cases/Limited Spread	Public Caution
GREEN	No New Cases	Monitoring

Figure 1. Proposed threat levels and calibrated actions to reduce disease spread.

1.3 Fighting an Outbreak

Following detection of cases in a community and assessment of threat levels, the next step would be to immediately issue alerts and contain the cases. This entails the following steps: a public communications strategy that ensures public trust, leveraging society and technology to trace those who may be infected, quarantining them safely, and providing them with effective healthcare.

1.3.1 Public Communications:

The responsibility for clear communication and bringing the public on board with containment strategies comes down to elected leaders and state officials in districts and constituencies. This can be done by:

1. Developing a meticulous overall strategy for containment, backed by data and with clear schedules, clearly communicated to local administrations
2. Adjustments to the strategy for local conditions, communicated both to higher levels of the State apparatus and to citizens
3. Websites, apps, chatbots, or government-designed social media forwards to communicate threat levels, the spread of the disease, and measures to be followed to citizens, at a district-by-district or ward-by-ward level
4. Direct communication between healthcare officials, administrators, and community leaders
5. Video conferencing, social outreach programmes, and regular media appearances by elected leaders and public figures

The more decentralised and multicentric the communications strategy is, the more responsive it can be to local conditions and concerns, and the better it will be able to build trust. Failing this, there can be serious impacts on livelihoods and an erosion of cohesion between social groups, leading to the defying of social distancing measures and a compromising of the overall response.

1.3.2 Contact tracing:

Once an outbreak is detected and a containment strategy decided on and communicated to citizens, tracing the contacts of any positive patients is the next critical link in containment.

1.3.2.1 Contact tracing through apps

The Government of India has developed and released the Aarogya Setu App for contact tracing. Internet penetration is the key bottleneck for using it at scale, with hundreds of millions of Indians having poor access to data services, and the effectiveness of Bluetooth-based contact tracing yet to be decisively proved. Tracing contacts through an app may work in urban areas, but it should be paired with other mechanisms, such as through volunteer groups.

We also suggest that Aarogya Setu's data privacy and access protocols be brought up to global standards. The urge to make it mandatory and expand its scope to workplaces and public transport must be resisted: its effectiveness in curbing disease spread is yet to be decisively proven. Furthermore, the app can only curtail disease spread through human-to-human transmission and does not account for the risk of transmission through surfaces.

The Union government should take the initiative to resolve valid concerns raised by security researchers about its purpose, legal framework, and sunset clauses, and allow citizens to see who will access their data and for what purposes. This will help earn public trust, improve reporting, keep the app focussed on fighting the pandemic, curtail future bureaucratic overreach, and prevent undue surveillance of, and interference in, citizen's private lives.

1.3.2.2 *Contact tracing through people*

The strengthening of the ASHA network is critical to reaching citizens without access to mobile devices. NGOs and volunteer groups who want to contribute to contact tracing efforts should be trained and certified. Proper PPE should be provided to all field workers, and they should be routinely medically tested to ensure their proper health.

1.3.3 Building isolation and quarantine capacity:

Sufficient and quality isolation and quarantine capacities need to be built to cater to any new cases that might arise in a second wave. Good quality of isolation capacity can build confidence in the public to report new cases and help in early detection and mitigation of the infection.

We recommend the following actions to effectively isolate infected individuals:

1. Improving the readiness of the healthcare system and reassuring the public
2. Building trust with local leaders through social networks to ensure adherence to quarantine
3. Telemedicine services and the mobilisation of volunteer groups to monitor and assist citizens in home quarantine
4. Increased isolation ward capacity, designated wards for geographic localities, and systems to help citizens find and move to the nearest ward.

Identification, quarantine, and treatment require a high degree of societal trust, as it directly impacts citizens' personal lives and autonomy. Taiwan and South Korea were able to identify and care for citizens through designated local officials or citizen groups, who had been part of, or associated with, the State apparatus for years. It will be crucial to use the time till a second wave to build up public trust in order to successfully identify and minimise the impact of a second wave.

Building trust, reassuring the public of the readiness of the healthcare system (discussed in the isolation wards sub-section) and ensuring transparency are imperative. As discussed in our proposed Public Communications Strategy, State officials should reach out directly to local leaders, including religious leaders or community organisers, and educate them on their plans and the scientific basis of the quarantine strategy. Misinformation and rumour-mongering will otherwise spread fear, lead to vigilantism, and worsen reporting, compromising the containment strategy.

1.3.3.1 *Home quarantine*

For individuals capable of self-quarantine, local citizens' groups, designated government employees, or volunteer organisations should be mobilised to assist them with grocery shopping or food delivery. Medical assistance should be conveyed regularly, perhaps through special COVID-19 helplines or text updates. In some states like Karnataka, quarantine updates were expected to be sent to the nearest police station. Police personnel are expected to maintain law and order are not necessarily sensitised to the privacy or medical concerns quarantined individuals may have.

Rather, designated telemedicine practitioners should be assigned to monitor quarantine and provide medical assistance if needed. Doctors are trained in maintaining data privacy, and people can trust doctors for medical advice. If there are cases of non-compliance to quarantine, telemedicine practitioners can forward the case to the police. Home quarantine should be encouraged where possible to decrease the burden on healthcare capacity.

1.3.3.2 *Increasing state capacity of isolation wards*

For those unable to quarantine themselves at home, hotels, lodges and community centres should be identified for conversion into isolation wards. Websites or apps that can help find the nearest empty isolation ward should be set up to sequester patients with the least need for

travel. Indian Railways have also demonstrated a capacity to convert unused railway coaches into isolation wards.

Areas with limited access to ICUs, specialised healthcare professionals, and medication should have designated care centres for those with particularly severe symptoms, and arrangements made for the transport of patients to this centre. The marginal cost of creating isolation wards will be less in already-existing urban centres, and this can be used to quickly sequester patients from other areas using dedicated transport services which citizens can access through helplines after consulting with telemedicine professionals.

In the long term, governments should take this as an opportunity to build more healthcare centres and reduce the disparity between urban and rural areas, perhaps as part of a post-pandemic economic recovery and infrastructure larger investment plan.

2. Building Healthcare Capacity

2.1 Securing PPE and medical equipment

It is essential to have sufficient Personal Protection Equipment (PPE) and medical equipment to deal with the second wave of infection. Also, there is a need to create a national stockpile to supplement the state and the local supplies in case there are shortages.

The COVID-19 outbreak has exponentially increased the demand for PPE and medical equipment like ventilators and ICU equipment. As a result, the early stages of the outbreak saw severe shortages. For the second wave of infections, it is necessary that the Union and the state governments are prepared with sufficient PPE and medical equipment. This would help protect the workforce, treat infected patients, and keep the economy running with minimum disruptions.

India is critically dependent on imports for PPE and high-end medical devices. This is attributed to an unfriendly manufacturing environment, due to high import duties on inputs as well as other regulatory hurdles. We suggest easing out regulatory hurdles and incentivising manufacturers based in India to tackle such dependencies. The

following points cover a few strategies to ramp up the production of medical equipment and PPE like masks and coveralls.

2.1.1 Medical equipment (ventilators, defibrillators etc.):

- The Union and/or state government should enter into advance purchase agreements with manufacturers, to incentivise manufacturers.
- Production capacity can be ramped up by promoting collaborative arrangements between medical device manufacturers and automobile manufactures - this can be done by providing licenses for a fixed duration to automobile manufacturers to produce medical devices.
- Greater regulatory clarity on the manufacturing and sale of medical equipment can help build trust with manufacturers.
- The Union government, with its larger fiscal resources, should create a strategic stockpile of ventilators and other ICU equipment like defibrillators, monitors, etc. The stockpile will be used to distribute equipment to states, in case of an emergency.
- Contingency protocols for using other types of equipment (e.g. anaesthesia gas machines) for ventilation purposes if required should be set up.
- More human resources like medical students, doctors (who are not specialists in respiratory health issues, critical care, etc.) and paramedical students/professionals need to be trained to operate these devices.

2.1.2 N95 Masks:

- The creation of a stockpile of N95 masks at national and state levels for provision to healthcare providers as required.
- Assured purchase agreements should be put in place to incentivise importers and reduce the capital risk faced by these manufacturers.
- Textiles, shoe, phone manufacturers have demonstrated the ability to quickly switch to producing N95 masks. Such manufacturers who may be willing to produce N95 masks at a short notice should be identified. They can be used for mask

manufacturing in case of acute shortages or sudden resurgence of cases.
- Contingency protocols for disinfection of masks in cases of acute shortage need to be designed.

2.1.3 Overalls and other PPE required for healthcare workers:

- The main challenges for increasing PPE supply are accessing equipment and accreditation.
- There is also a shortage of hot air seam-sealing equipment used to manufacture PPE, which are primarily imported. Import duty waivers and cheap loans could be provided for the import of this equipment.
- Only three testing and accreditation setups are available for overalls, which should be increased by converting defence ordnance factories into accreditation facilities.
- National guidelines for the production and testing of PPE are needed. However, the procurement of PPE should be left to the states' discretion based on their needs.

2.1.4 Hand Sanitisers:

- The government should waive off the requirement of licenses for manufacturing of sanitisers. Instead, it should come up with guidelines for their safe manufacture.
- For production continuity, the local government should ensure adequate supply of raw materials (such as alcohol, packaging material) and protection of the employees involved in manufacturing.
- The Union and state governments must ensure that there are no price controls in order to minimise market distortions.
- There should be a portal (maintained by DGCI) where firms manufacturing sanitisers can register their facilities and list of products. They should get automatic approval. The registration would only be for managing shortages and product safety issues (in case they arise).

2.2 Capacity- building of healthcare professionals and sanitation workers

It is important to have a strong public health system to tackle the outbreak of infectious diseases. The system needs to be strengthened through capacity building of healthcare professionals and sanitation workers. This does not only mean increasing the number of professionals, but also changes at the policy level leading to increase in government spending and strengthening of infrastructure. It should be noted that while short-term fixes are the need of the hour, many long-term measures need to be taken as well, because this pandemic has highlighted the shortcomings of India's public health system and changes at lowest level are essential to build a strong system. We recommend that the Union and state governments should:

2.2.1 In the short term:

- Fill up the already existing vacancies so that the health system can operate at its full capacity.
- Maintain an up-to-date national and state level database of health workforce, to identify shortages.
- To make up for the shortage of public health facilities, existing infrastructure such as unused buildings can be repurposed in the short term.
- State governments can direct Registered Medical Practitioners from private sector to work in dedicated COVID-19 hospitals for a specified duration, by providing them with commensurate pay as well as accommodation. RMPs from departments that see less frequent emergencies may be diverted towards COVID-19 hospitals.
- Since testing and treatment for COVID-19 is now covered under the Pradhan Mantri Jan Arogya Yojana, state governments should empanel more private hospitals and direct them to cater to COVID-19 patients to widen the healthcare reach.
- Online training should be conducted for AYUSH practitioners to qualify them for the management (not treatment) of COVID-19 patients.
- The pay-scale for all public health workers including epidemiologists and frontline workers should be increased as an incentive.
- Guidelines should be set up for safe collection of waste from housing societies and other public places.
- It should be ensured that all sanitation workers are provided with the necessary PPE, as they are one of the most susceptible groups to infections.

2.2.2 In the long term:

- Establish public health cadres at state, district, and block levels, with three levels of workforce
  i. Public health leadership and management positions
  ii. Technical staff - epidemiologists, entomologists, healthcare informatics/surveillance officers
  iii. Frontline workers – ASHAs, Lady Health Visitors, anganwadi workers, male health workers equivalent to ASHAs.
- The focus should be on creating a strong workforce of public health and paramedical professionals, so that the burden on doctors and nurses is reduced and public health management functions are better taken care of.
- Significant investments must be made to build new public health infrastructure at par with Indian Public Health Standards (IPHS).
- Technology should be harnessed for healthcare outreach. Telemedicine for a better outreach in remote areas and wearables for monitoring home-based care are examples of this.

2.2.2 Additional Long-Term Measures:

2.2.2.1 Address the Shortage of Healthcare Workers

A large portion of the healthcare demand in India is serviced by the private sector. The need of the hour is to have a strong public health workforce, as India is going through a major public health crisis. Capacity building in terms of size of the workforce and training is needed. According to the Rural Health Statistics 2018-19, of the 156,231 sub-centres, 54% are without male health workers and 9.2% without Auxiliary Nurse Midwives. As of 31st March 2019, 9.6% Primary Healthcare Centres are without a doctor, 33.4% without a lab technician and 23.9% without a pharmacist[17]. Almost 3,667 sanctioned positions for doctors are unoccupied at district hospitals[18]. It is imperative to recruit more healthcare workers. Newly recruited workers can be trained with online modules that the Ministry of Health and Family Welfare has released for COVID-19[19].

2.2.2.2 Establish Public Health Cadres

The National Health Policy 2017 recognises the importance of having public health cadres in each state[20]. However, only Tamil Nadu and West Bengal have public health cadres as of now. This is a perfect opportunity for states to strengthen their public health systems, by establishing

public health cadres, with their functions clearly defined apart from their medical counterparts.

2.2.2.3 *Improve Public Healthcare Infrastructure*

While recruiting may resolve the issue of shortage of healthcare workforce, it will still be difficult to manage the outbreak, if the public health infrastructure is lacking. It is necessary for both national and state governments to invest more in public health infrastructure. Currently, India spends 1.4% of its GDP on health, which is very low as compared to its counterparts in South Asia. According to Rural Health Statistics 2018-19, there is a shortage of 32,900 sub-centres, 6,430 PHCs and 2,188 CHCs in rural areas. Only 7% of the currently functioning sub-centres, 12% of PHCs and 13% CHCs meet the Indian Public Health Standards[21]. The hospital bed to population is also very low (0.5 beds per 1000 population). Investment in public health infrastructure is a long-term measure and will help in building a resilient public health system that is ready to face outbreaks similar to COVID-19 in the future.

3. Expanding social distancing measures

As the first wave of infections recede, operations will gradually return to normalcy. However, any complacency in social distancing measures will expedite a second wave. Thus, even in the absence of an outbreak, it is essential that social distancing measures be followed in public places. This will help mitigate the spread of the second wave, should it arise.

The other key factor in fighting the second wave would be to detect new cases quickly. The Union government may not have the capacity to aggressively co-ordinate testing across the country. As such, ICMR and IDSP could co-opt local businesses and institutions to augment this disease surveillance capacity by conducting tests, while continuing to randomly test individuals using public services. Such an approach can increase the reach of testing coverage without the significant costs required for improving state capacity.

Certain businesses and institutions would by their very nature be more likely to enable the spread of the disease than others. There are two main facilitators for spread of the disease:

a. **Meeting new people:** Post the lockdown, there are two possibilities for those not exhibiting symptoms of the disease - either they are an asymptomatic carrier or they do not have

the disease. A healthy individual may catch the disease from someone who is an asymptomatic carrier. Consequently, the fewer new people (people outside your routine social bubble) you meet, the less likely you are to get the disease. Research done at University of Oxford suggests that this bubble concept or staying within your "village" could prove critical in the next phase to keep flattening the curve while allowing greater freedoms. Consequently, places where interaction between unknown people is higher, are more likely to turn into hotspots for a second wave.

b. **Physical interaction with others:** The other factor that underlies the spread of the disease is actual physical contact with the virus - either through direct contact with an infected person or through shared use of equipment, tools, or other utilities.

Thus, activities where people from different "bubbles" meet and physically interact with each other are high risk and must be prioritised as potential hotspots and attract more testing requirements. The most important activity under governmental control in this high-risk zone is public transport.

3.1 Proposed Guidance for Public Transport

Public transport is essential for the working of any economy; however public transport in India is often overcrowded. Overcrowded public transport systems force people from different social bubbles to interact with each other, thus becoming crucibles for virus transfer. Hence, monitoring and strict adherence to social distancing measures is crucial for preventing public transport from transforming into a virus hotspot.

Following is an advisory list of measures for use in public transport:

	Must Dos	Recommended
Advisory for Local Buses	Bus drivers and conductors should mandatorily wear N95/3 ply masks and gloves.	Apps can be developed in conjunction with private companies to allow ticketing - this will lower the burden on the bus conductor and reduce

	All passengers to wear cotton masks. Buses should be sanitized at the end of each route.	hand interactions between the conductor and passengers. Buses should have shorter routes and more buses may ply to create capacity for passengers. Bus conductors can do random temperature testing on passengers.
Advisory for Suburban Trains/Metros	All coaches should be sanitised regularly. Temperature checks of passengers should be mandatory. All passengers should wear cotton masks.	Restrict number of tickets per day to enforce social distancing.
Advisory for Outstation Buses/Trains	Temperature checks of passengers should be mandatory. All passengers should wear cotton masks. All buses/trains to be sanitised regularly.	Restrict the number of tickets to ensure social distancing. Sanitiser stations to be placed at regular intervals
Advisory for flights	Flights should be restarted in a staggered manner and passengers should be temperature checked before boarding. Wearing cotton masks should be compulsory. All flights to be sanitised at the end of route.	Sanitiser stations to be placed at regular intervals

	All international passengers to be screened and mandatorily home quarantined for 14 days upon arrival in India.	
Special Transport services	Special transport services should be earmarked for essential service workers so that if there is an outbreak, these services are not compromised.	

3.2 Proposed Guidance for Other Businesses

The below guidance is meant as a policy advisory for businesses to operate as part of a larger surveillance and mitigation system. However, the implementation of these are left to the discretion of local officials and business owners.

Advisory for Low Risk Activities

Activity	**Must Dos**	**Recommended**
Employee hygiene	All employees should be provided with cotton masks. Hand sanitiser stations should be installed at regular intervals, to allow employees to sanitise their hands. Run daily temperature checks on employees. Do NOT use sanitisation tunnels.	Places like the cafeteria and other places of social interaction should have a strict upper limit on the number of people that can be permitted at a time. Tables should be placed at sufficient distances from each other.

	Place sanitiser dispensers and disposable gloves to be worn at any commonly used equipment.	
Working conditions	Cut down on non-critical services, institute split shifts and staggered start and end times, and add more entrances and exits to remove bottlenecks. Encourage non-critical staff to work from home if possible.	Where possible, provide employees transport to discourage the use of public transport.
Training	Train employees to use PPE, sanitise hands and dispose of any worn PPE appropriately. Sanitise any commonly used equipment before use. If anyone develops symptoms of respiratory illness, send them home immediately and arrange for a diagnostic test.	Encourage companies to get their staff vaccinated for diseases such as flu.
Job Mapping	Create a list of essential job roles and identify people who are responsible for those roles. People should be mapped based on their health and geographical location (preferably living close to work) so that essential services can remain working in the event of a lockdown.	

	Cross-train employees to take on these roles so that backup is available in case an essential employee falls ill.	
Medical Insurance	All personnel and their immediate family members should receive medical benefits and be covered for COVID19 treatment.	

Additional Advisory for High Risk Activities

In addition to the advisory for low risk activities, those activities which fall into high risk groups would require additional monitoring and ways to discourage mass gatherings.

For example, large religious institutions should not be open to the public for mass religious festivals. Everyday worship may be allowed as long as social distancing and screening measures are implemented.

Schools and educational institutions which can offer online classes should be encouraged to shift to online teaching. Schools may run on alternative days for students of various grades to lower the number of interactions between students. Instead of the usual pen and paper exams, online assessments should be conducted. It should be ensured that in places like cafeterias, children are sitting at a distance from each other.

Diagnostic centres fall into a high-risk activity because testing staff may be handling blood samples from asymptomatic patients without their knowledge. Hence, all workers at diagnostic centres should be provided with appropriate PPE and tested regularly. All human samples should be handled as if they are COVID positive, unless otherwise established.

Farmer markets or other wholesale markets are also possible high-risk areas and social distancing would be difficult to practice. Access to markets would need to be controlled, to avoid overcrowding. Hand sanitiser stations should be installed at regular distances. Temperature screening and masks should be mandatory.

High risk areas such as markets or malls should be kept open for longer durations to distribute the inflow of people and prevent crowding. However, if operations are being kept open at night, necessary precautions need to be made to ensure law and order. Women employees in particular should be provided with transportation if working beyond daylight hours. Increased

policing and lighting of roads are basic necessities that government would need to provide to facilitate longer operation timings.

Places with high risk activities should have heightened disease surveillance, with more testing requirements than low risk activities. These activities would need to be prioritised for governmental intervention.

5. Conclusion

Future waves of COVID-19 will remain a threat to India's health security. A rejuvenated public health system will help in early detection and mitigation of its spread. In the absence of a vaccine, early response is the only way to prevent further nation-wide lockdowns. Three important capacities need to be strengthened to facilitate this early response:

1. **Mechanisms for Early Detection and Containment:** This includes building capacity for manufacturing diagnostic kits, testing and quarantining. Improved public communication mechanisms, augmentation of on-ground efforts with technology and working with local businesses/institutions to co-ordinate testing can lessen the burden on an already strained administrative capacity to challenge any new incidents of COVID-19 cases.

2. **Building Healthcare Capacity:** A strategic reserve for personal protective equipment (PPE) and medical equipment and a concomitant increase in healthcare personnel required to deal with future waves. The strengthening of India's public health system will positively impact health outcomes, even in the absence of a second wave.

3. **Expanding Social Distancing Measures:** Social distancing measures need to be tailored to reduce interaction between people in public spaces. These include workplaces or public services such as public transport. Implementation of social distancing policies can mitigate the spread of the second wave.

Transparent communication, aggressive testing, improved healthcare capacity and strict adherence to social distancing have to be practiced over the next several months to prevent a second wave of the magnitude that will warrant a national lockdown and cost thousands of lives.

References

[1] South Korea did not impose a lockdown, but laid out stringent social distancing, quarantine and contact tracing measures.

[2] Prichep, Elisa. "Why a Coronavirus vaccine takes over a year to produce and why that is incredibly fast." World Economic Forum. April 3, 2020 https://www.weforum.org/agenda/2020/04/why-a-coronavirus-vaccine-takes-over-a-year-to-produce-and-why-that-is-incredibly-fast/ Accessed 27 Apr. 2020.

[3] Gupta, Kanishka."What is the second wave of Covid-19 and why should we be worried?" Business Standard. April 25, 2020 https://www.business-standard.com/podcast/current-affairs/what-is-the-second-wave-of-covid-19-and-why-should-we-be-worried-120042500677_1.html Accessed 27 Apr. 2020.

[4] "India may see second wave of Covid-19 outbreak in monsoon, say scientists." The Economic Times. April 24, 2020 https://economictimes.indiatimes.com/news/science/india-may-see-second-wave-of-covid-19-outbreak-in-monsoon-say-scientists/articleshow/75345793.cms?from=mdr Accessed 27 Apr. 2020.

[5] Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina and Joe Hasell 2020 "Coronavirus Pandemic (COVID-19)". *Published online at OurWorldInData.org*. Retrieved from: https://ourworldindata.org/coronavirus Accessed 18 May 2020.

[6] Basu, Deepankar. "India's COVID-19 testing conundrum: Why the Govt and critics are both right". The Wire. April 27, 2020. https://science.thewire.in/health/india-covid-19-testing-contradiction-rate/ Accessed 27 Apr. 2020.

[7] Choudhary, Srishti. "80% of cases could be asymptomatic: ICMR". liveMint. April 20, May 14, 2020. https://www.livemint.com/news/india/80-of-cases-could-be-asymptomatic-icmr-11587404077691.html Accessed 18 May 2020.

[8] Centres for Disease Control and Prevention. Frequently Asked Questions. https://www.cdc.gov/coronavirus/2019-ncov/faq.html Accessed 27 Apr. 2020.

[9] Block P, Hoffman M, Raabe IJ, Dowd JB, Rahal C, Kashyap R, and Mills MC. *Social network-based distancing strategies to flatten the COVID 19 curve in a post-lockdown world.* arXiv:2004.07052 **[physics.soc-ph]**

[10] Takshashila Working Group, *Covid-19: Towards a National Reopening Strategy for India*, Takshashila Policy Advisory, April 2020. https://takshashila.org.in/takshashila-policy-advisory-covid-19-towards-a-national-reopening-strategy-for-india/

[11] Shambhavi Naik, *Increasing COVID-19 testing capacity in India*, Takshashila Discussion SlideDoc, May 2020. https://takshashila.org.in/increasing-covid-19-testing-capacity-in-india/

[12] Special Correspondent. "Coronavirus | India increases testing capacity to 1 lakh a day". *The Hindu.* https://www.thehindu.com/news/national/coronavirus-india-increases-testing-capacity-to-1-lakh-a-day/article31577961.ece Accessed 18 May 2020.

[13] Sharma, Nidhi. "Covid-19: Private laboratories struggle with price caps, do only 17% tests." *The Economic Times.* April 23, 2020. https://economictimes.indiatimes.com/news/politics-and-nation/private-laboratories-struggle-with-price-caps-on-covid-19-tests-do-only-17-tests/articleshow/75310421.cms

[14] Conger, Krista. "Testing pooled samples for COVID-19 helps Stanford researchers track early viral spread in Bay Area." April 7, 2020. Stanford Medicine News Center https://med.stanford.edu/news/all-news/2020/04/testing-pooled-samples-to-track-early-spread-of-virus.html Accessed 27 Apr. 2020.

[15] Ministry of Health and Family Welfare. *Advisory on feasibility of using pooled samples for molecular testing of COVID-19*. https://www.mohfw.gov.in/pdf/letterregguidanceonpoolingsamplesfortesting001.pdf

[16] W. Ahmed, N. Angel, J. Edson, et al., "First confirmed detection of SARS-CoV-2 in untreated wastewater in Australia: A proof of concept for the wastewater surveillance of COVID-19 in the community, Science of the Total Environment" (2020), https://doi.org/10.1016/j.scitotenv.2020.138764

[17] The Hindu Centre. *Rural Health Statistics 2018-19*. March 31, 2019. https://www.thehinducentre.com/resources/article31067514.ece/binary/Final%20RHS%202018-19_0-compressed.pdf. Accessed 27 Apr. 2020.

[18] Bose, Mampi and Acharya, Nilachala. "Why India's public health facilities may suffer despite a likely rise in spending". IndiaSpend. January 28, 2019. https://www.indiaspend.com/why-indias-public-health-facilities-may-suffer-despite-a-likely-rise-in-health-spending/. Accessed 27 Apr. 2020.

[19] Ministry of Health and Family Welfare. *Training resources for COVID 19*. Retrieved from https://www.mohfw.gov.in/pdf/TrainingresourcesforCOVID1930MARCH.pdf. Accessed 27 Apr. 2020.

[20] Ministry of Health and Family Welfare. *National Health Policy, 2017.* https://www.nhp.gov.in/nhpfiles/national_health_policy_2017.pdf

[21] Bose, Mampi and Acharya, Nilachala. "Why India's public health facilities may suffer despite a likely rise in spending". IndiaSpend. January 28, 2019. https://www.indiaspend.com/why-indias-public-health-facilities-may-suffer-despite-a-likely-rise-in-health-spending/. Accessed 27 Apr. 2020.