RESEARCH NOTES
AND STATISTICS

Covid-19 in Rural Areas: A Policy Brief

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Abstract: The pandemic affects rural areas as much as it does urban areas, though the spread in rural areas began later than in urban area. However, because of greater health inequities and poor access to health care in rural areas, the consequences of the pandemic could be worse in rural areas. We draw on existing data from various sources including print media in order to examine and contextualise urban-rural differentials and the State's response to the Covid-19 pandemic. In the short run, protecting rural areas from further suffering caused by the pandemic requires a combination of a robust disease surveillance programme, an effective health communication strategy, and a public outreach programme that ensures universal vaccination. In the long run, health systems preparedness and resilience require greater public health expenditure, strengthening public health services, and ensuring that these services have adequate surge capacity and support from effective public health informatics.

Keywords: Covid-19 pandemic, rural India, urban-rural differentials, disease surveillance, vaccination, health systems preparedness, health systems resilience.

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Introduction

The Covid-19 pandemic is an unprecedented challenge to public health. It has caused economic and social disruption, exacerbated inequality, and pushed millions into poverty. Pandemics typically affect thickly populated urban areas first and then move beyond to small towns and rural areas. While many of the measures to respond to the pandemic and curb it arise in urban settings, it is not clear whether the pandemic and the response to the pandemic unfold in the same way in rural

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areas. It is therefore important to understand the nature of urban-rural differences for implementing effective mitigation measures.

In India, information on Covid-19 epidemiology with respect to rural-urban differentials in new infections, deaths, or the effectiveness of response measures is difficult to come by. One of the few reports on such rural-urban differential in the incidence of Covid-19, published in a national newspaper, says that the proportion of rural cases rose from 53 per cent in January 2021 to 65 per cent in May 2021, when the second wave peaked (Radhakrishnan and Sen 2021).[1]

The pattern was the same in the first wave: the outbreak began in urban areas and then spread to rural areas. In Uttar Pradesh and Rajasthan, the proportion of cases in rural areas rose from 69.1 per cent and 69.4 per cent in January 2021 to 78.5 per cent and 74.3 per cent in May 2021. The increase in the rural incidence of Covid-19 was sharpest in Maharashtra. It increased from 40.7 per cent of all cases coming from rural areas in January to 65.9 per cent of all cases from rural areas in May. This pattern also prevailed in Karnataka, Gujarat, West Bengal, and Madhya Pradesh. In Tamil Nadu, though there was a relatively smaller increase in the proportion of rural cases (36.5 per cent to 41.8 per cent between January and May, 2021), it remained largely urban, though rural cases are still increasing. The only exception to this trend is Kerala, where the increase in the rural incidence of Covid-19 dropped from 48.8 per cent to 43.5 per cent (Radhakrishnan and Sen 2021).

This shift of the pandemic from urban to rural areas is not surprising and was seen during the 1918 flu pandemic as well. The focus of this policy brief is to anticipate this shift and its consequences, and consider the state action required in the short run and in the long, for better preparedness and mitigation of the pandemic and its consequences.

Urban-Rural Differences Across States

The consequences of the urban-rural shift of the pandemic are likely to be varied across States. In all States, access to testing is more difficult in rural areas than in urban areas. However, in States with a dispersed urbanisation pattern and relatively good health systems, such as Tamil Nadu, Kerala, and Punjab, most rural areas have relative ease of access to the required hospital care. These are also States with better-developed primary health care systems in both rural and urban areas. But in the States with weak primary health care systems, testing capacity is low and highly skewed across districts. These States, therefore, rely much more upon the Rapid Antigen Test, which is easy to do but has a high level of false negatives. In these States, access to hospital care is a huge challenge.

[1] The rural population constitutes 65 per cent of the total population.

The high levels of morbidity and mortality in poor States are not always reflected in official statistics, whereas the cases per million that are recorded are much higher in the more developed States. This is largely because of the better access such States have to tests and better recording of deaths. There are as yet no clear mortality figures with an urban-rural disaggregation. Nor is rural-urban disaggregation available for testing rates, test positivity rates, or even positive cases.

Information From Sero-Prevalence Studies

A sero-prevalence study done in September-October 2020, after the peak of the first wave in one district of Karnataka, showed how a significant proportion of the rural population in a district of south India was susceptible to Covid-19. Only about 6.1 per cent had been infected. The study estimated seven undetected but infected individuals for every RT-PCR confirmed case. The Infection Fatality Rate (IFR) was calculated as 12.38 per 10,000 infections as on October 22, 2020 (Inbaraj, George, and Chandrasingh 2021).

The main reference study on sero-prevalence done across India, between August 18 and September 20, 2020, collected serum samples from 29,082 individuals from 15,613 households. The weighted and adjusted sero-prevalence of SARS-CoV-2 was 6·6 per cent. Sero-prevalence was similar across age groups, sexes, and occupations. It was highest in urban slum areas, followed by urban non-slum, and then rural areas. The rural-urban disaggregation showed that 5.2 per cent of the rural population, nine per cent of the urban non-slum population, and 16.9 per cent of the urban slum population had been infected.

The study estimated a cumulative 74·3 million infections in the country by Aug 18, 2020, with 26–32 infections for every reported Covid-19 case. In other words, one in 15 individuals, aged 10 years or older in India had been infected with SARS-CoV-2 infection by Aug 18, 2020 (Murhekar *et al.* 2021).

A more recent sero-survey that was done after the second wave in June-July 2021 shows that the sero-positivity rate had risen to 67.6 per cent of the population above the age group of six. This survey sampled 28,975 households from 70 districts across 21 States. The results were presented at a press conference by the Director General of the Indian Council of Medical Research (ICMR) on July 20, 2021, but the full study is not published. The figures for urban and rural prevalence from this Survey are not yet in the public domain, although a media report suggests that there is no major difference between the first and second Surveys (*Firstpost* 2021).

After the Second Wave: Likely Scenarios

Sero-surveillance reports after the peak of the second wave in May 2021 are not available. There were two likely scenarios towards the end of the second wave. One

was that the number of new cases, and therefore the spread of the disease, continued at a lower level for one or more months before rising again into a third wave of varying intensity across the States. The intensity of this third wave in a given State would be inversely proportional to the level of herd immunity attained and directly proportional to the susceptible population. If the susceptible population, which is all those who have neither been infected nor vaccinated, is less than 20 per cent, the third wave would be small. If it is more than 50 per cent it could be large. It would also be inversely proportional to the effectiveness of control measures. Another scenario is that, unlike after the first wave, there is no lull period between the second wave, and the disease continues to spread till we approach herd immunity. Subsequent evolution of the pandemic showed that after an initial rapid decline in cases, new cases continued to occur but plateaued at about 40,000 per day from June-end till almost mid-September before they declined further. No third wave occurred, and unless there was a major mutational change in the virus, it is now considered unlikely.

To sum up, epidemiological evidence would suggest that at all times sero-prevalence rates have been higher in urban areas than in rural areas. However, rural areas have been shown to catch up after a lag. Since sero-prevalence in rural areas (with some exceptions) lags behind urban areas, it is likely that in the coming period a larger number of cases and deaths will occur in rural areas. The more herd immunity builds up because of a combination of natural infection and vaccination, and the more effective the public health measures, the less likely a significant third wave.

Controlling The Pandemic

What are the urgent measures that can limit further morbidity and mortality in rural areas?

There are two important means of lowering mortality caused by Covid-19 in rural areas. The first is to reduce the total number of new cases through public health measures, and the second is to ensure timely access to appropriate medical care for the moderate and severe cases of Covid-19.

The reduction of new cases in rural areas rests on four programmatic public health interventions and four health systems contexts.[2]

Programmatic Interventions

Let us now examine how the right programmatic interventions in rural areas could reduce the impact of the epidemic.

[2] We note that public health policy and experience with respect to the pandemic has been different in the State of Kerala. The specific features of Kerala's pandemic experience are not part of the subject matter of this Note. For an account of Kerala's experience in this regard, see Kerala State Planning Board (2021), *Kerala Development Report: Initiatives, Achievements, Challenges*, Government of Kerala, Thiruvananthapuram, Feb. 2021.

1 *Disease Surveillance Programs*

As the second wave ebbs, we are seeing a lower level of transmission than previously, with many districts reporting less than 10 cases per day and most villages reporting no cases. The Integrated Disease Surveillance Programme (IDSP) is designed to pick up small and unpredicted outbreaks of five cases or less occurring in one or two of the 1000 plus villages of a district. Once detected, an immediate and effective response must be organised. India has already established an IDSP, within which the Flu Surveillance Programme has been functioning for at least a decade (Ministry of Health and Family Welfare (MoHFW), Government of India 2015). There were many weaknesses in the IDSP, ranging from the lack of dedicated staff, the lack of private sector reporting, and weak laboratory support. However, when the pandemic struck, instead of addressing these weaknesses and strengthening a potentially good system, the system was pushed aside only to be replaced by a system in which, instead of experienced public health officials it was often bureaucrats at the district and state level who were supervising the Covid-19 test reporting. Public health officials and epidemiologists had little role in the National Disaster Management Authority.

There is now a renewed opportunity to strengthen the surveillance system.

However, a disease surveillance system needs a minimum level of primary health care infrastructure and staff. Here lies the bottleneck. As compared to health teams of three to four, which are required in a rural health sub-centre, with a larger team at the Primary Health Centre (PHC), most sub-centres have only one health worker and PHCs have only two or three staff. These staff prioritise only some elements of care, like pregnancy and child immunisation, with little time to go beyond this very selective priority. Further, there is an 18 per cent shortfall against the total of 191,461 planned sub-centres, a 20 per cent shortfall in the case of primary health centres (against 31,337 planned), and a 33 per cent shortfall in the community health centres (against 7820 planned) (MoHFW, Government of India 2019). These are the facilities from which all IDSP data is collected.

A network of laboratories is needed to back up a disease surveillance programme. These were to have been established almost a decade ago but were rushed through only after the pandemic broke. By 2015, all district laboratories were to have become public health laboratories, which have the capacity to do a much larger number and variety of laboratory investigations of public health importance. Over 190 medical college laboratories should have become reference laboratories. These targets were not met. Even today, although 2500 Covid-19 testing laboratories have been established, access to these laboratories is low in rural areas, and the capacity of most is limited to testing for Covid-19, whereas for effective surveillance it should be able to test for all acute infections.

2 *Test and Track, Quarantine and Isolate*

A problem of disease surveillance systems has been that even when data are collected they are more often than not passively transmitted up to the next level, without local analysis and action. A pandemic like Covid-19 needs a trained team to trace contacts and quarantine them, as well as look for other positive cases. Contacts, if asymptomatic, are to be tested five to seven days after the contact episode. Those who test positive should be admitted to a Covid Care Centre. In other words, isolate those with mild or no symptoms, and admit to a Covid hospital those with moderate or severe disease. Home isolation, when in place, requires very good support. If these public health measures are effective, then new cases, even in rural areas, should largely emerge only within the cohort that was quarantined.

Of all public health measures, such a test-track-treat approach to containment is the most effective. Yet across rural India and in much of urban India, only testing has occurred and that too at a low frequency. Micro-containment would instead rely on physically blocking off physical access to a space such as a village or a set of urban streets. This is a relatively ineffective law-and-order approach, which worsens stigma and denial in the community, and can only be implemented by security personnel. Good contact tracing, however, is not a policing function. It is a function of a good community health programme where local providers have the community's trust, many volunteers come forward to help, and contacts themselves come forward for testing. In the absence of such cooperation, the disease can spread unchecked through a whole large village, without anyone in the health system or administration even coming to know of it.

The reluctance of the community to identify contacts and those who are potentially positive also flows from both stigma and the reluctance to be placed in quarantine or isolation. There is much fear about these centres in some areas, and the quality of care in such isolation centres leaves much to be desired. The huge gaps in staff and infrastructure in India's primary health care system and the poor engagement with the community and local self-governments could be one of the main reasons why this public health intervention was so weakly implemented.

3 *The Challenge of Health Communication and Behaviour Change*

Public participation in the Covid-19 response has been difficult to secure. One of the main reasons for this is the very high levels of stigma and even frank denial of the existence of the pandemic that is present in rural areas. The stigma is born partly out of fear, and partly out of traditional ways of viewing disease as divine punishment. The sub-text of public messaging about the disease, and the reliance on a law-and-order approach to enforcing behaviour change has also contributed to the high levels of stigma that is prevalent. When there is considerable helplessness in the ability of marginalised sections of the community to follow the recommended

behaviours due to their circumstances – daily life is already a big struggle for existence that the lock-downs have made worse – one of the ways people cope is by denying the very existence of the problem.

Alongside, and an equally important factor, is the inadequate adoption of the five relevant Covid-appropriate behaviours, namely, avoiding big gatherings, avoiding gatherings in enclosed spaces and ensuring such spaces are well-ventilated, avoiding close contact (by physical distancing of at least a meter), and the use of masks in any of the three above situations. It also includes hand hygiene. This weakness must be perceived as resulting from an inadequate behaviour-change communication strategy.

The first step to ensuring public participation is effective and intensive health communication efforts. The reliance of the State was largely on a law-and-order approach, where behaviour change is sought to be secured through enforcement with fines and other penalties. This did not consider the different life situations of people and their ability to adopt these changed behaviours. What little health communication is there is a stereotyped universal messaging that would be appropriate to an urban upper-middle-class family, but certainly not to the population living in shanty towns and rural areas. For example, in many poor households, separate rooms and toilets are not available, but there is little clarity on what can be done by them. There are, for example, no messages on how essential family gatherings can be made safer, or of the difficulties of wearing a mask during heavy manual labour.

Messages about where and when to seek testing or medical care, about how isolation centres differ from hospitals, and on what the rest of the family must do if someone tests positive, are also not part of any health communication package. Further, while social media is full of messages, a huge proportion of them are misleading messages that require to be countered. All of this calls for a large-scale, government-managed, volunteer-supported community health communication campaign.

One of the most effective strategies of health communication that should lead to behaviour change is the implementation of two-way interpersonal communication. There is a need to build a communication strategy that deploys Accredited Social Health Activists, better known as ASHA workers – India's one million strong, largely rural community health workforce, all of whom are women. They could be deployed to go door-to-door to talk about the behaviour changes required and explain the need for cooperation in early testing and tracing. Further, these ASHAs must be protected from getting infected themselves. A large contingent of volunteers is also required.

4 *Universal Vaccination*

Universal vaccination represents the single most effective strategy to protect the individual and stop the spread of the pandemic. However, the vaccination programme as it is being rolled out currently has been criticised for being urban-biased. A news report in a national newspaper pointed out on May 14 that only 2.6 per cent of the rural population has received two doses as compared to 7.7 per cent in urban areas (Radhakrishnan 2021). Of residents in urban or semi-urban areas, 49 per cent had received at least one shot as compared to 12 per cent to 15 per cent in rural and semi-rural districts (Radhakrishnan and Sen 2021).

This is the same picture as reported in many of the States. One report (Mondal, Bajwa, and Suryawanshi, S., 2021) showed Mumbai and Pune at 43.11 per cent and 47.31 per cent respectively, while Ghadchiroli and Palghar had only 18.65 per cent and 18.1 per cent coverage respectively. A similar pattern of higher vaccine coverage in urban areas as compared to rural districts was reported from Punjab, Jharkhand, Madhya Pradesh, and West Bengal. The difference between urban and rural vaccine coverage was sharpest in Bihar and least in Rajasthan (Mondal, Bajwa, and Suryawanshi, 2021).

A recent media report (Jha 2021) categorised districts into rural, mixed, and urban, and reported that coverage with a single dose was 53.56 per cent in rural districts as compared to 61.41 per cent in mixed districts and 75.6 per cent in urban districts. For full coverage with both doses, the figures reported were 14.8 per cent in rural districts, 21.36 per cent in mixed districts, and 28.0 per cent in urban districts. The definition of a rural district was one where over 60 per cent of the population lived in rural areas and an urban district as one where less than 40 per cent of the district population lived in rural areas. In mixed districts, the population living in rural areas was between 40 and 60 per cent.

The reasons for the urban bias in vaccination coverage are not difficult to seek. One reason is that most vaccination sites are urban-based. Another important reason is that registration for vaccination was to be through CoWin, an internet-based platform. This was initially mandated as essential for all but later changed as covering only the 18 to 44 age group. As the Supreme Court itself pointed out, Internet access in rural areas is very low, and familiarity with internet-based registration is so rare that in effect most rural inhabitants would not be able to access the vaccines.

Another important reason for decreased access to vaccines relates to health-seeking behaviours. Many residents of rural areas seek healthcare only when sick enough to be unable to go to work. This can be partly explained by the opportunity costs for treating mild illness. Whatever the underlying reason, such a pattern of behaviour exists. Thus, in the case of conditions like diabetes and hypertension, the disease is

not detected till organ damage has set in and a life-threatening complication develops. With this being the pattern of health-seeking, most rural inhabitants, particularly the poor, are unlikely to take time off to travel to a vaccination site, get registered, and take the jab. As the vaccine has side effects (it is a form of infection induced by the virus) stigma against vaccine acceptance hardens further.

We know from other immunisation programs that these demand-side barriers can be overcome. Even after four decades of universal immunisation for children, the need for an active outreach programme that consists of community health workers making house-to-house visits, and nurses shifting immunisation sites nearer to homes are both essential to reach targets. In places where this is done, and the supply cold chain is maintained, targets are achieved. But where the Child Health Worker-to-population densities are low, immunisation coverage is also low. There is no reason to believe that it would be any different in the case of adult immunisation programmes. On the other hand, to reach different sections of the adult population, like migrant workers, the elderly, forest workers, and tribal groups, more flexible and sustained public health outreach measures are required.

As part of a *suo moto* inquiry into the government's management of the pandemic, the Supreme Court pointed out a number of lacunae in government policy. (The Supreme Court of India 2021). In response, the Government of India introduced several measures, all of which are presented in the government affidavit to the Supreme Court on June 26th.

First, the government made an assurance of access to free vaccination for all to be delivered by a network of public facilities. Only those who choose to go to the private sector despite the availability of free vaccines in the public sector need to pay for it.

Secondly, it made prior registration in the digital CoWin platform non-mandatory and allowed for registration to be done by the facility at the time of vaccination.

Third, it assured a much larger availability of rural Covid-19 vaccination sites. There are now a total 1,31,204 Covid-19 Vaccination Centres (CVCs) providing vaccination services, of which 33,342 are operated at the Sub-Health Centres, 28,168 at the Primary Health Centres and 9,932 at the Community Health Centres, amounting to 54.45 per cent of the total vaccination centres – all of which are in rural areas. Of 94,044 vaccination centres that have registered so far, 74.45 per cent are stated to be in rural areas. Further, the GOI claims that in the more recent months of May and June, a total of 17.1 crore doses were given, of which 56.24 per cent or 9.62 crores were from rural vaccination centres. This is less than the proportion of the rural population, which is 65 per cent, but clearly, the gap has become less. In tribal areas, the walk-in registrations predominate, and coverage has picked up. This information was given by the Ministry to the Supreme Court in response to the

May 31st Supreme Court order, in the case where it is inquiring *suo moto* into the government's response to the Covid-19 pandemic.

Further, the government has also told the Court that a large number of community-based Near-to-Home Covid Vaccination centres would be started in non-health-facility-based sites to make access even easier. Workplace-based vaccinations, where workers and their entire family members can be vaccinated, have also been started.

As all these measures address the demand-side challenges, those on the supply of vaccines remain. Production of vaccines is now at about 2.5 million doses per day, but consumption can go up to six to eight million doses per day. Clearly, therefore, most sites will run out of stock. For an increase in the production of vaccines, the only sustainable way is to break the monopoly of providers and scale up manufacturing. Considerable change in policy and approach to vaccine manufacture will be required for such scaling up in production.

The Health Systems Context

On May 16, 2021, the MoHFW, Government of India, in a welcome but belated move released a Standard Operating Protocol for Management in peri-urban, rural, and tribal areas where many of the programmatic interventions are outlined (MoHFW, Government of India 2021). However, the challenge is that for all these programme components to roll out effectively, there are several health systems pre-requisites. These are listed as follows:

1 Scaling up Public Health Infrastructure

A significant increase in public health infrastructure and human resources in health to close the gaps that this pandemic has so starkly exposed is required. The thrust of health policy in the last few years has been to shift the government's role from providing services towards purchasing services from the private sector. The pandemic has however shown that the extensive purchasing contracts that were built up under Ayushman Bharat's Jan Arogya Yojana, a government-funded health insurance programme to provide cover for the poor, did not help much in providing health care that would respond to the need. Though Covid-19 care was included in the insurance package, its utilisation was minimal, as the private sector chose to cherry-pick suitable patients and deny care to others. Many private hospitals shut down initially, but when they opened, they refused to see Covid patients or were charged exorbitantly for the same. The correct lesson we should learn from this is to reverse all decisions on privatisation of district hospitals and other government facilities, and instead focus on strengthening public infrastructure and increasing the public health workforce, and improving their conditions of service.

Even when there is adequate procurement, vaccines may not reach the districts and immunisation sites unless supply chain management is adequate. Adequate vaccine storage and transport facilities and logistics management are essential to ensure that vaccines reach both public and private facilities in a timely and safe manner, and there are no stock-outs. The public sector would be required to handle this. Also, inventory management has to ensure that there is no mismatch between utilisation and allocation at the facility and district level. Further, diverting cold chain infrastructure currently in use for child immunisation would seriously affect that program, as in many states the cold chain facilities are inadequate even for child immunisation. Additional cold chain equipment and major scale-up of storage and transport capacity would be required.

An important consideration in strengthening public health infrastructure is that the public health standards require to be updated upwards based on the current experience. These standards lay down the services, the number of beds, staff, and infrastructure that is the minimum required across every district. The huge gaps both in primary health care and in-hospital care led to a crisis in oxygen supply, intensive care facilities, and ventilators, and contributed to the high death toll. Internationally, the understanding is that public health infrastructure should have an in-built "surge capacity" that can respond to a public health crisis. This is a planned excess capacity that could be under-utilised at normal times but is mobilised when faced with a health crisis or disaster.

2 Data Analytics

The health sector is a knowledge-intensive sector, and there needs to be both a robust health information system and data analytics internally, as well as a network of knowledge generation-and-management institutions that can provide the knowledge required for better outcomes. This too is not built in a day but over decades.

3 Public Health Expenditure

The long neglect of the public health system is reflected in the stark fact that India has one of the lowest ranks for government health expenditure as a proportion of total health expenditure, and its total health expenditure is also far less than the global average. Unless there is a clear commitment to increase public health expenditure in a sustained manner, and also ensure that much of it is spent on good quality infrastructure and adequate numbers of well-trained, appropriately skill-wed human resources, not much progress can be made. The Indian government's financial policy aims to keep salaried employment under the government low. It views any expansion of the public workforce as a problem. Changing that policy is essential for better capacity to manage this pandemic as well as future ones.

4 *Active Local Self-Government*

In parallel to all the above measures, there is a need to strengthen local self-governments and their role in maintaining health and healthcare. Ward committees and village committees, gram panchayats and municipalities, must all be informed and energised to encourage community interventions and provide the support that is required for all the programme interventions listed earlier. Behaviours are largely socially determined. Mobilisation and leadership by local governments have a big role to play in changing the social values and perceptions to create an enabling environment for the required change. Further, local self-governments could identify and reach out to vulnerable sections and ensure that healthcare providers and public health staff are well supported. Very few states have built a strategy for a greater role of local self-governments. But where, like in Kerala, they have done so, it has led to a better quality of response.

Conclusion

The pandemic affects the rural areas as much as it does the urban areas, though the spread starts later in rural areas. Access to both vaccines and hospital care in rural areas lags well behind urban areas. There is therefore a need to strengthen programme interventions and improve health systems preparedness in rural areas.

We recommend the following programme interventions to control the pandemic in rural areas.

1. A robust disease surveillance programme that can spot and respond to small cluster outbreaks, thereby preventing new waves of the pandemic from sweeping through.
2. A much more effective health communication system, one that understands how Covid-appropriate behaviour change is secured in the rural context. Such evidence-based context-specific health communication measures should replace the current victim-blaming, law-and-order approach to behaviour change.
3. Much greater access to Covid-19 testing in rural areas, with an adequate follow-up, wherein everyone who is tested positive is isolated and everyone in close contact is quarantined. This would require adequate, well-trained primary care staff supported by an army of volunteers.
4. The achievement of universal vaccination, which, in turn, requires the following:

    a. Many more vaccinations sites near where people reside.
    b. Well-designed public health outreach programs.
    c. Good public health logistics so that there are always enough vaccines in the facilities, and there are no interruptions in supply or wastage
    d. Adequate vaccine production

In terms of health systems preparedness, the four major requirements are

1. An increase in public health expenditure to over 70 per cent of total health expenditure, and also to at least three to five per cent of GDP.
2. A clear commitment to strengthening public health services, and readiness to invest in and build up the necessary infrastructure and human resources. To ensure that a surge capacity is built-in and is kept ready to use in an emergency.
3. Good public health informatics, that are able to provide the information needed for local planning, analysis, and action.
4. A strengthened role for local self-governments and the panchayat system.

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